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CATOCALA NOTES.

BY G. H. FRENCH, CARBONDALE, ILL.

C. SAPPHO, Strecker.—Last season five specimens of this rare species were taken near here, and it was found about ten miles further north than before. It is as constant in its markings as any species.

C. RETECTA, Grote.—Both the pale and the dark forms of this species were taken last year, with intergrades. I should probably have taken them this season, but I was away from home at the time they were flying. In the woods the habits of the two forms are alike.

C. FLEBILIS, Grote.—This species is pretty constant here, the ground color being rather dark bluish gray, with the blackish longitudinal shade. A specimen in my cabinet from Pennsylvania that I received for *Flebilis* seems to be a stunted form of *Desperata*.

C. TRISTIS, Edw.—This beautiful little species has been found near here for three seasons.

C. RELICTA, Walk.—Through the kindness of Mr. James Behrens my cabinet contains a specimen of this species taken at Portland, Oregon, one of two captured August 22, 1885. It does not differ materially from our eastern forms, being intermediate between vars. *Bianca* and *Phrynica*. This is the first record I have seen of it further west than Illinois and Wisconsin.

C. WALSHII, Edw.—From the material that I have seen, it would seem to me that this ought to be far enough removed from *Junctura* to be at least a variety. The ground color is pretty uniform, and is nearly the same as that of *Nebraska*.

C. ADOPTIVA, Grote, *Delilah*, Strecker.—Has been taken near here twice, a single example each time; and *C. Consorts* once.

C. PALAEOGAMA, Guen.—Singular freaks in insect life are illustrated in this species. Some seven years ago fifty of these could be taken in the woods in a single afternoon. Since that season scarcely one could be

found till last year, when they began to be numerous again, and are more abundant this year.

C. AMASIA, A.-S. Var. VIRENS, *n. var.*—This differs from the usual form in having more clear white for the ground color, very few brown scales in the median space below the median vein, the costal brown patch inside the t. a. line mixed with olive, a similar patch on the hind or inner margin, with traces only of brown and olive between. In the usual form this forms a continuous shade across the wing. The subterminal shade has only traces of brown in its anterior part, while the rest of the way the brown is pale. But the principal feature is an olive green shading that accompanies nearly all the black markings and forms shades below the forks of the median vein, and shades the terminal space. Described from one ♂, but it does not seem to be a sexual variation. I have males and females without these characters, as well as intergrades.

In the 16th Report of the Ontario Ent. Soc., Mr. Bowles quotes me as whipping trees and taking the *Catocalæ* that fly up in a net. They should be taken by placing the mouth of the poison bottle over them when they settle on the same or another tree. Taking in a net spoils them. While on this subject, I might add that I seldom capture females on trees in the afternoon, while half of those taken at sugar are likely to be females. Can any one say where the females are during the day time?

It is generally understood that *Catocalæ* are to be found on trees in the afternoons if the wind blows from the south or southwest. I find that during extreme dry weather the direction of the wind makes little or no difference.

ON THE GEOGRAPHICAL DISTRIBUTION OF NORTH AMERICAN LEPIDOPTERA.

BY AUG. R. GROTE, A. M.

In the preparation of the present paper I have used articles by myself which have appeared in the "Popular Science Monthly," in the pages of "Silliman's Journal," and elsewhere. I have also noticed what has been printed bearing on the subject by other writers. I have tried to present the whole subject as it now appears to me, at the risk of repeating myself in part. This seemed at times excusable if not unavoidable, but as it is

my own writings that I have chiefly borrowed from, the use of quotation marks is unnecessary, the more so as I have here gone freshly over the subject, digesting my previous observations and adding new ones before preparing the present chapter in a history of our North American Lepidoptera. Some of my views, as here stated, were put forth in a lecture I held in 1885, before the Bremen "Naturwissenschaftlichen Verein." I shall be glad if this paper adds to the interest naturally evoked by this field of study in Natural History.

It is a curious thought that our butterflies and moths have very probably remained unchanged, to any great extent, for real æons of time. These little fringes to the great web of animal life have withstood the tooth of time, while the pattern itself has been frayed out in places and replaced. It is not unlikely that our *Libythea Bachmanii** itself may have sported about the now long extinct Mastodon, alighting on the huge back of this great beast as it sunned itself by summer pools in the willow-hedged meadows and low lands. At the close of the Tertiary we have evidence that our butterflies and moths were much the same as they are to-day—not always the same species, nor the same genera, perhaps; and some of the kinds of these little fluffy ornaments may well have been worn away by the cold and storms of the slowly advancing Ice Period. But the pre-glacial ancestors of the present lepidopterous fauna of the Northern Hemisphere must have greatly resembled their descendants of to-day, while in the ranks of the larger animals great changes were to occur. While in size, structure and appearance these butterflies and moths of the Tertiary probably resembled those of the Quarternary, they were to undergo the vicissitudes of a general change in the climate under which we cannot believe but that they were forced to the South and the great separation of the faunas took place, their former Arctic sporting ground being converted into the frozen wilderness which it is yet so largely to-day. At the opening of the Quarternary the migration commenced to set back, but the conditions of climate under the Tertiary have never

* I chose this species not only on account of the fact that I believe it to be a very ancient form of butterfly, but because I found it very plentiful in Alabama about swampy places on the roadside, from whence the species flew up in numbers to play in the air, some settling on my horse in a particularly fearless manner, allowing me to catch one on the very reins I held in my hand. This species is rare and solitary in New York, and illustrates what I have to say here about the increase in *numbers* of certain species as we go southward.

again obtained and probably will never do so. The first conditions, then, for the presence of a species of Lepidoptera are those of warmth and food—a minimum of cold to be supported, a sufficiently extended time of warmth during which the insect can provide for its metamorphoses. The summers running too short, will prevent the existence of species, even where the food is abundant; while a few kinds of Arctic butterflies seem to take two years in which to perform their life changes, an acquired habit with the other phenomena of hibernation. In this respect there is a difference of hardiness between the species; it is probable that the *average* temperature is not of so much consequence as the point of its absolute lowness at given times, exposure to which, in certain of its states, the insect cannot survive. The same amount of cold might be innocuous to the egg, which would kill the chrysalis. That food itself is not sufficient for the presence of the species to which it is adapted, is a fact well known to collectors. While there are a good many accidental causes to account for this, in any one region, it is found also that the range of the plant is not necessarily co-extensive with the range of the species feeding upon it; here the climate (humidity, degree of cold) is one of the determining causes. After warmth and food we must next consider enemies, parasites, competing species. This is a vast field for observation. The number of ichneumon flies is apparently influenced by special causes, so that in some years they do not destroy so many caterpillars; in shifting their ground the lepidopterous hosts sometimes evade their guests for a season. The birds destroy yearly a large percentage of these insects, but they, as well, are more or less plentiful from causes which are independent of the supply of insect food.

There is then to be considered the physical geography and the geology of the country. What are called by Entomologists "Chalk insects," are those species which inhabit by preference this formation, the geology of a district influencing its flora, and this in turn its insects. Forests are also protective to some considerable extent, less from depredators and enemies than from high winds, which tear our frail friends to pieces; and from sudden changes of temperature at an awkward moment, such as the change of dress from the caterpillar to the chrysalis state, or the previous and various steppings out of the larval skin, which, like getting out of one's trousers, is always a risky undertaking. The forest itself may seem to be bare of insects as compared with the open fields, where the broad bits of color of a butterfly's wings come into quick notice. But, in

reality, the edges of the woods are usually, and the interior quite often, where not too dark, the haunting place of these hamadryads where they escape notice for a time, while the moths, which I here especially discuss, are fond of these quieter dusky places in the daytime.

To understand the way in which our species of North American Moths are distributed (and by North American we mean those inhabiting the territory north of Mexico and the West Indies) we must then study the physical geography of the continent. There are a host of species which for the most part depend on special kinds of plants, and their diffusion is in this way limited by the range of the plants upon which their caterpillars subsist. The botany of a region is, to this extent, an index to its entomology. But, from their greater activity, these flying flowers, the Moths, range on occasion out of the way of the plants upon which they have fed in their young stages. If we take a map giving a bird's-eye view of the continent, with the elevations marked, we can understand the problem better. Ranges of mountains obstruct, valleys and river channels assist the dispersion of Moths. They travel on the wings of the wind, and an important factor in their range is the prevailing seasonal direction of the air-currents. There is, in North America, a summer migration of many species from the South to the North, aided by the prevailing winds, so that, towards the Fall, several tropical kinds have followed for long distances the coast line, or up the valley of the Mississippi. The Cotton-worm Moth, which, in its caterpillar state, inflicts great damages upon the plantations, is a case in point. If the direction of the prevailing winds in early summer from South to North were reversed, the Cotton Worm would not come up North. I have noticed that its advent along the coast was retarded by contrary or no strong winds. This seems to be the view held by planters along the coast of Georgia. Individual specimens or flocks of other moths, such as the Great Owlet, *N. Agrippina*, the Blue and Green Hawk, *Argens Labruscae*, visit us yearly, coming up from the West Indies, with other of the larger stronger-winged Sphingidæ and Noctuidæ. They die out in the winter and leave no progeny behind to continue the species the ensuing spring. But many kinds have effectually colonized themselves in South Florida, and there is probably an irregular line of successful hibernation for all these foreigners, including the Cotton-worm Moth, to be drawn through the Southern States. It is, then, clear that the provisions of Nature for the sustenance of these animals render a certain exertion necessary on the part of the Butterflies

and Moths themselves, to partake of them. This exertion it is which, in its results, assists in the formation of distinct species. To get their food, rest, protection, etc., a certain amount of work has to be done, and to do this work to the best advantage the functional systems are impressed. The food even of a caterpillar does not fall into its mouth. With all their apparent helplessness when discovered, it is only necessary to consider how difficult it is generally to find these helpless beings which exert themselves constantly to avoid observation from their enemies. Insects as well as man have probably much to learn, and are probably learning after their peculiar fashion every day. In particular I have been struck with the conscious way in which insects seem to provide for their escape from observation. They become rigid in their efforts to keep still. I do not think, however, that the "death mimicry" is a tenable theory. It is by the *keeping still* that the insects seem to me to appear to "feign death," of the existence of which latter they could have no knowledge. Hard-shelled beetles readily tumble to the ground, not caring for the fall, but soft-skinned caterpillars cling tenaciously. They seem to know that they cannot support the shock of a fall, the practical result of which accident I have often observed by finding dead Sphinx larvæ on the sidewalks after a storm which had blown them from their perches. Hairy caterpillars stick less closely than naked ones, relying on their bristles to act as buffers, and coiling themselves so as to shield the head, legs and under surface.

Rivers assist in the dispersion of insects, and in a less degree, perhaps the particular insects we are now discussing. Nevertheless, upon leaves and sticks the eggs of moths are floated on the current, while the commerce of the water routes and the great ocean itself brings eggs and pupæ with the vegetables and fruits which are carried from place to place in boats and ships. In this way the White Cabbage Butterfly has been introduced from Europe, and probably the Currant Borer, *Aegeria Tipuliformis*. A bird's-eye view of the continent of North America shows us the elevations of the Rocky Mountains and parallel spurs in the West and the Alleghanies in the East. These mountain ranges stand in the way of the spreading of Moths, which perish in the cold atmosphere and the storms which gather about their rocky summits. Our faunæ can be best appreciated by studying the elevation of the land above the level of the sea. Over the vast plains east of Colorado, the same kinds of Moths generally prevail. The canons and valleys of the West, on the other

hand, contain everywhere peculiar varieties and kinds often more local than in the East. In New York we are cut off again from several kinds plentiful in Ohio and Indiana. Our tropical wanderers come to us up and along the coast. I have met, sailing along the Gulf Stream, flights of moths, mostly of one and the same species, which fell on the rigging and sides of the vessel in numbers. In the autumn, on Staten Island, I have captured many Owllet Moths whose true home is the West Indies, such as *Perigea Epopea*, *Aletia Argillacea*, *Anomis Erosa*. The light houses on the coast attract many moths, and here specimens of *Euthisanotia Tinais*, the Spanish Moth, are not unfrequent in the late summer; this species breeds in South Florida, as discovered by my friend, Mr. Roland Thaxter.

Although smaller faunæ, limits of particular species, may be traced over the entire eastern portion of the continent, our mountain ranges are the best guide as to changes of a more general character in the Moths. When we get to the Rocky Mountain region we part with most of the Eastern species, though a few traverse the entire continent from East to West. As a whole the Californian and Western fauna resembles the European more than the Eastern. In the Butterflies this is seen in the more numerous kinds of Meadow Browns and the presence of a species of *Papilio* which greatly resembles the common European *P. Machaon*. In the Moths we have such genera as *Nemophila* not found in the East; while, conversely, in the East we have Mexican, or South American forms, which do not seem to ascend the coast on the west side of the Rocky Mountains, such as the genus *Citheronia*. These and other facts lead me to a study of the origin of our various structural types of Moths, and the conclusion that we have three proximate sources for our fauna: 1. Descendants from a former Northern fauna, which in the Tertiary obtained in Northern Europe, Asia and America; 2. Immigrants and descendants of a migration from the South which is still going on; 3. Descendants of a former fauna, proper to North America itself and surviving the Glacial Epoch. An attempt to sort the genera of the family Sphingidæ under these three headings will be found in the pages of the American Journal of Science and Arts.

So true it is that one branch of a subject leads us to questions and matters quite foreign to the immediate enquiry, that here the subject of the geographical range of North American Moths leads us into myth and poetry. For, in finding out that we have species of moths closely related to or identical with some found on other quarters of the globe, the ques-

tion arises at once, How did they get here? They could not fly over from Europe, nor could they cross Behrings Straits with the cold climate there existing in recent times. We have historic evidence of the importation of but one or two species. We may surmise that others have at different times made their way across through commerce. I conjecture this may be the case with the Boll Worm and other species of the genus *Heliothis*. I think that the Cabbage *Pl.isia*, *P. Ni* of Hübner, is likewise an imported species. This latter insect is characterized by curious abdominal tuftings, which no other species of the genus shares; it is, in my opinion, its strongest specific character, and it is an absurdity to make a different species out of the American specimens (which have the same tufting as the European) on the strength of some infinitesimal differences, which, small as they are, are not even well made out to be constant. Much greater differences are exhibited by the American specimens of the Boll Worm; the race which I have called *umbrosus* being larger, paler, more greenish or olive tinted than the European, but other specimens occur also equally of a dirty ochrey, and undoubtedly equivalent to the European. It is the case also with the Cabbage Butterfly, that a sulphur colored variety, which has rarely been found in England, is not unfrequent in America, and for aught I know the form *umbrosus* may also occur in Europe, where, on the whole, this species of *Heliothis* is rare. The genus *Pyrrhia* resembles *Heliothis* in general structure, but differs decidedly generically by the tibiæ being unarmed, without spines or claws; the thorax is closely and thickly haired with a slight longitudinal crest; the face between the eyes is smooth, elevated. The wings are pointed at the tips, and the colors are peculiar, light yellow and dark orange red. We have in our fauna a species with rusty reddish yellow fore wings, crossed by darker lines, which is described by Walker as *Exprimens*, but is undoubtedly equivalent to the European *P. Marginata* Fabr. We have then a second form, not found in Europe, occurring in the Middle and Eastern States and Canada, *P. Angulata* Grote (= *P. exprimens* Speyer nec Walk.) Besides these two Eastern species we have a third, *P. stilla* Grote, found by Prof. Snow in Colorado, which has the fore wings of a bright orange red, smooth, evenly colored; the usual stigmata are wanting; the deep brown even median shade forms a band, acutely angulated on cell, strongly contrasting, diffuse outwardly; fringes with a bright red tint. The hind wings of this highly colored, lovely species, are light yellow, with a blackish lunule, blackish at base and with

a vague terminal blackish band tinged with red outwardly. Beneath yellow; the fringes on primaries red; red exterior bands and discal marks. This perfectly distinct species I have fully described in the pages of the North American Entomologist, 45. Here it is evident that a separation into several species has resulted from the isolation of the American original stock, unless we consider the form *marginata* to have been imported by commerce, of which we have no historical data, but yet which may have well happened. Not only *H. Armiger*, but I now believe the other European species of *Heliothis*, viz., *Dipsacea* and its variety *Maritima*, with yellow secondaries, and *Scutosus*, also occur in America, where I have given them other names when first discovered, not having European specimens at hand to compare, and also under the impression, which was first, I think, disseminated among us by Agassiz, that the European and North American species were distinct as a whole, and that the forms which resembled each other were "representative species." There is then a class of *identical* species of moths which have been probably disseminated by commerce, such as the above species of *Plusia* and *Heliothis*, the Codling Moth, *Carpocapsa Pomonella*, the Clothes Moths, *Tinea* and *Tineola*. But there are other *identical* species which have evidently *not* been so distributed. An example of this class is *Scoliopteryx Libatrix*, the Drinker Moth, which is found very far north in Hudson's Bay Territory, and occurs on the Atlantic coast at least as far south as Virginia. We then find species which, if found side by side with the type in Europe, would hardly be considered distinct; but, since the American specimens show a slight character in all stages, they may be held correctly to have attained the rank of species. Such species as *Apatela occidentalis*, *Hadenà finitima*, *Hyppa xylinoides*, *Mamestra atlantica*, among the Noctuidæ, *Deilephila Chamaenerii* among the Hawk Moths, *Clisiocampa Americana* among the Spinners, fall under this category. In fact, as I have shown, there is an ascending scale of differences increasing in obviousness and importance until we arrive at what appear to me to be perfectly distinct species. In a number of different papers, published in various scientific journals since 1873, I have adduced facts bearing on the identity and difference of our species with European forms, and illustrating the existence of this element in the North American fauna. The latest and most interesting discovery made by me is that of a species inhabiting Arizona and allied to the European *Mamestra Brassicæ* of Authors. This species and the European constitute, in my

opinion, a distinct genus from the presence of a claw on the front tibiæ; the species have hairy eyes and otherwise generally agree with the very numerous forms of the genus *Mamestra*. I have called the new genus *Copimamestra*, and described our Western species as *C. Occidentia*. So wide a geographical separation as that of these two species, which, in structure as well as markings, agree so closely, must have a deeper reason and in my opinion points conclusively to a former common habitat which has become disturbed by climatic and geologic change.

We shall have to leave Entomology and go back into past geologic epochs to explain the existence in our North American moth fauna of this large number of forms with varying European affinities. Imaginative persons have supposed the existence in former times of an Atlantic continent now submerged and which bridged the chasm of the waves. The myth of the Atlantis has been refurbished anew and on an immense scale by certain writers under the inducement of the facts supplied by the discovery of a plateau at the bottom of the Atlantic Ocean by the soundings of H. M. S. Challenger, in its famous voyage of oceanic discovery around the world.*

It is sure that there was formerly a warm climate in the arctic zones during the Tertiary and preceding geological age. This was a certain measurable time ago, when the circumpolar regions had a warm average temperature, with no winter, and the probable identity of the fauna ex-

* I print here the following note received from the lamented Naturalist, R. von Willemoes-Suhm, after whom I named the now well known genus of eyeless Crustacea (found in the Atlantic at great depths by the Expedition):—

“Challenger, Yeddo, May 7th, 1875.

“MY DEAR PROF. GROTE,—

“There can be no doubt, I think, that Prof. Thompson will allow me to put aside specimens of *Willenoesia* when we come back to Europe. Just now they are all packed away and sent home, where the bottles remain unopened until we come back, which will be in about a year's time, and I shall then be very happy in sending you the desired Crustaceans.

I am, with great respect, your obed't serv't,

“(Signed) R. VON WILLEMOES-SUHM.

“TO PROF. AUG. RADCLIFFE GROTE, Buffalo, N. Y.”

This was the second and last note that I received from this enterprising Naturalist, who died on board the Challenger shortly after, and before the ship left the Japanese waters. So we may hope to get safely back home from our journeys and never see it again!

tending from Scandinavia, across Siberia to Greenland. During this time we must imagine that no impediment existed to the migrations of animals, and, among them, insects, across what is now Behring's Straits. Were this narrow channel then existing, it could be easily crossed by the flight of almost any Moth, and of itself could make no effective barrier against a constant interchange of species.

It is probable that the Tertiary, as it witnessed the first appearance of Man, saw also his first wanderings in North America. He, too, came from Asia by way of the North and the Strait. Evolution had performed surprising work in the meanwhile with one branch of the human family, members of which sailing to the West and landing from Scandinavian or Spanish ships, met, upon American soil, the descendants of a migration from Asia to America in a former geological period, and to the East! At the close of this Tertiary period of the earth's history, cold and snow and ice set in; the long winter of the ages made its appearance in the shape of the Glacial Epoch. The circumpolar Moths, whose more humble fortunes we must be content here alone to follow, were forced gradually southward by the change in climate which gathered its frigid strength in the North. The European, Asiatic and American faunæ then became separated, the latter the most completely, and by barriers both of ice and ocean. The American species of Moths which formerly lived by the Arctic Ocean, were gradually forced downwards to the South, year by year, until they reached Mexico or the then elevated portions of the Southern States. When the ice sheet melted and slowly drained away through the valleys and water channels of a continent awakening for the first time to a Spring and released from a Winter of the Years, the Moths, modified as to species in the long conflict with the climate, retraced their way to the North. As marks of this retreat and return, colonies of Butterflies and Moths were left on the mountains to tell of the flood. On the White Mountains we find to-day the White Mountain Butterfly, *Oeneis Semidea*, and the Arctic Lappet Moth, *Larix Rossii*.* At this time the Western Clawed Cut-worm, *Copimamestra Occidentis*, had become permanently separated from what is now the European *C. Brassicae*, and the differences which separate the two to-day as distinct species are the result

* See a number of papers on this subject, in particular my original communication read before the American Association for the Advancement of Science, August, 1875, and an article entitled "A Colony of Butterflies," originally printed in the *American Naturalist*.

of the action of the total environment upon what was, once the same undistinguishable form. The element in our Moths which has its affinity with the European and Siberian fauna, must be traced back to the time when the species were throughout the same and inhabited a common territory.

Let us turn back to the other theory, that of a submerged Atlantic Continent. Whatever may be finally proven by geology as to the existence of such an Atlantic bridge, it is clear that the myth of the *Atlantis*, cited to support the theory, must be separated from such facts as being of recent and even historic origin. Primitive Man existed æons before the notions which were worked into the poetic and semi-historical myth of the Hesperides and Atlantides. The setting sun was followed by human eyes for untold ages, as it bathed itself in the golden flush of evening and sank behind the purple veil of clouds into an ocean whose waters were at first believed to surround the circular, flat earth. The sun was the golden apple of the garden of the Hesperides, the Golden Fleece after which Jason sailed. The poets transformed the primitive notions into charming myths, which probably had their origin in the observation of low-lying clouds, floating, like islands, in a sun-flushed western sky. In this region of conjecture and romance it is excusable to take to rhyme :

ATLANTIS.

The western sky is all ablaze,
And, floating on that golden sea,
The clouds, like islands in a maze,
Blest dwelling-places seem to be.

When first this sight was viewed by man,
He thought the earth was flat, not round ;
That all about its rim there ran
An ocean which the land did bound.

The poet in those early days
Immortalized the sun-flushed seas ;
He peopled those far slopes and bays,
And called the isles Atlantides.

And so the legend grew until
The clouds in evening's dreamy light,
With which the poet showed his skill,
Had vanished from the mental sight ;

Instead, the story true appeared
And every sailor did his best,
While straight from port the vessels steered
For those far islands in the west.

But none returned of all who went,
Who sight of those fair islands caught,
Through the white waves the tempest sent
The barks which shattered home were brought.

And some returned no more—but these
Were fabled to have reached the strand,
Where, anchored in luxurious ease,
Their ships will never leave the land ;

The crews lie on those sunny slopes,
Purple with fruit, with vintage blest ;
The ships are held by flowery ropes
In sleepy bays content to rest.

The poet steps into his boat,
The sunset makes his starting fair,
Through the long night with Death he'll float,
And in the morning he'll be there.

The study of the geographical distribution of our Moths has led us a long way back in the history of our race and the birth of our ideas. We have now somewhat briefly, but, I hope, clearly, discussed the basis for this first element in our Moth fauna, and I would merely point out that in studying the unequal differences which show themselves between the allied forms, I have found a certain system in the variational characters. These, when compared, are first obvious on the upper surface of the fore wings, then on the upper surface of secondaries, and finally beneath. In other words, this variation follows the exposure of the different surfaces to the air and light, the moths resting chiefly by daylight with the primaries more or less deflexed and their upper surfaces exposed, covering the hind wings. An instance in point is the White Underwing, *Catocala Relicta*, an insect which has a certain range of variation in the general color of the fore wings, which are sufficiently unlike those of its near European ally, the Blue Underwing, *Catocala Fraxini*. The upper surface of the hind wings is very much like that of the European species, except that the narrow median band is *white*, not dusky *blue*. But I have originally

shown,* and my statement has been copied by later Entomologists, that in some specimens of our species the band shows blue scales on the edges, evidently a trace of a former greater resemblance between the two, on the under surface yet very similar species.

The second element in our Moth fauna is that which is South American or intertropical in its character. In the Hawk Moths such genera as *Aellopos*, *Enyo*, *Cautethia*, *Philampelus*, must be reckoned as such, while in this category we must distinguish between those forms of recent and partial or more ancient and entire acclimatization in the United States and Canada. As coming under the latter head we may reckon the genera *Citheronia* and *Eacles* among our larger Moths which enjoy a much greater representation in species in Mexico and South America.

The final element of peculiarly North American genera is a large one and in every family of Moths has abundant representation. In the Hawk Moths *Arctonotus*, *Lepisesia*, *Deidamia*, *Everyx* and *Cressonia* are instances; both the Spinners and the Owlet Moths have numerous examples of this category.

(To be Continued.)

A NEW PHYTOPTOCERIDIUM FROM NORTH AMERICA, ON ACHILLEA.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

In the middle of September, 1886, Prof. W. G. Farlow sent to me several specimens of the heads of Achillea (probably *A. millefolium* L.) collected on Mt. Washington. They correspond well with the deformity described by Dr. Fr. Thomas in Giebel's Zeitschr., 1872, vol. 39, p. 464, on *A. moschata* Wulf. The flowers are to a large part changed in white hairy sacs or galls, containing a number of living Phytoptas. As far as

* In the CANADIAN ENTOMOLOGIST, vol. vii., p. 186; also *Ann. Lyc. Nat. Hist. N. Y.*, xi., p. 301, 1876, where I show that certain writers are at fault in considering the variation in the color of primaries in this prominent species as sexual, the whitest examples being given as the males; consult also an article in the CANADIAN ENTOMOLOGIST entitled: "On Species of *Catocala*," pp. 229-232.

known to me, this gall is not yet described from the U. S., and is very similar to those of *A. millefolium* described by Mr. Fr. Loew, Verhdl. Wien. Z. B. Ges., 1878, vol. 28, p. 130, which is to be found in Baron Thuemen Herbar. mycol. oeconom. Suppl., I., No. 60. Our collection possesses a specimen by Prof. Thomas with the indication of *Tylenchus (Anguillula) millefolii* Loew. At first I believed to see also in Prof. Farlow's specimens, besides the Phytoptas, some *Anguillula*. But the polarised light showed directly that I had mistaken some fragments of the fine white hairs for *Anguillula*; the polarised light would have shown directly the muscular apparatus in the *Anguillula*. It is nevertheless probable that other plants of *Achillea* may contain the *Tylenchus*. I believe that the galls before me may have contained before a Cecidomyia, though the European species is not yet recorded from the U. S. As *Achillea millefolium* is common in the north of the U. S., I desire to draw the attention of Entomologists to this plant. The European literature on the parasites of *A. millefolium* is somewhat large.

ENTOMOLOGICAL CLUB, A. A. A. S.

The Club met at Buffalo, N. Y., on August 17, 1886, at the rooms of the Buffalo Society of Natural History, 14 members being present.

The session continued at intervals during the meeting of the A. A. A. S. The following persons were in attendance during the meeting: J. A. Lintner, Albany, N. Y.; J. H. Comstock, Ithaca, N. Y.; S. A. Forbes, Champagne, Ill.; L. M. Underwood, Syracuse, N. Y.; T. B. Stowell, Courtland, Ill.; Rev. R. Benjamin, Cincinnati, O.; E. W. Claypole, Akron, O.; Dr. J. B. Tweedale, St. Thomas, Ont.; D. S. Kellicott, E. M. Chamot, O. Reinecke, C. D. Zimmerman, Ph. Fischer, E. P. Van Duzee, Buffalo.

The Entomological Society of Ontario was duly represented by Mr. Wm. Saunders, Rev. C. J. S. Bethune, Mr. J. Alston Moffat, and Mr. E. Baynes Reed.

The President, Prof. J. A. Lintner, took the chair, and Mr. E. B. Reed acted as Secretary in the absence of Mr. J. B. Smith, of Washington.

The President gave his annual address, which was a very able review of the progress of Entomology, as shown in publications which have appeared since the last meeting.

Prof. Lintner also alluded to the absence of some who were usually attendant at the Club meetings, referring especially to Prof. C. V. Riley, who was then in Europe for the benefit of his health.

Dr. D. S. Kellicott, on behalf of the Buffalo Society of Natural History, placed the rooms at the disposal of the members of the Club.

The President paid a high compliment to the contributions to Entomology that had emanated from the rooms where they were meeting.

Prof. Comstock explained a new method of arranging collections by which loss of time is avoided in transferring specimens so as to make room for additional species, or making necessary changes in their arrangement. The main feature of this plan consists in having movable blocks on which the insects are pinned, but made in sections to fit the cases.

The following officers were elected for the ensuing year :—

President	-	Prof. J. H. Comstock	-	Ithaca, N. Y.
Vice-do	- -	Prof. S. A. Forbes	- -	Champaigne, Ill.
Secretary	-	Mr. E. Baynes Reed	-	London, Ont.

The following is a summary of papers read before the meeting during the session :—

Prof. S. A. Forbes—Notes of the Past Year's Work: The Hessian Fly, *Cecidomyia destructor*, has been found to hibernate in Southern Illinois as a naked white grub, not forming puparium until May following, and emerging before harvest; these are probably the offspring of a mid-summer brood, which develop in volunteer wheat. The Clover Seed Midge, *C. leguminicola*, was observed first in 1879 in Illinois. A new Chalcid parasite, *Tetrastichus*, has been reported, but its worst enemy so far observed was *Triphleps insidiosus*. The young of this species are often so abundant on the clover heads as to be mistaken for the injurious midge, but a little observation will show their beneficial character. The Wheat-stem Maggot, *Meromyza Americana*, is shown to have three broods instead of two only. Eggs and half-grown larvæ were found in abundance, August 4th. Two species of *Melanotus*, *communis* and *cribulosus*, were bred to maturity, and a third Elaterid not yet determined, of which figures and precise descriptions have been prepared. Larvæ of these, and of *Agriotes mancus*, and of a *Cardiophorus*, were reported as injurious to

Indian corn, the peculiar larvæ of the last boring the roots in all directions in sandy soil. *M. cribulosus* pupates in July and forms imago in September. The Corn-root Worm, *Diabrotica longicornis*, is reported as seriously affecting crops in Southern Illinois. The common pale Flea Beetle, *Systema blanda*, was bred from larvæ feeding on kernels of sprouting corn in the earth. *Epicærus imbricator* taken feeding on leaves of pear; eggs laid in single layer on leaves, concealed by the insect fastening together the opposed surfaces of the leaves. Larva of *Sphenophorus parvulus* found to infest the roots of meadow grass (timothy). The midge sucks the sap from stems of wheat and corn. The Corn-plant Louse, *Aphis maidis*, was very injurious; observation shows that they are strictly dependent on the ant, *Lasius alienus*, which mines along the principal roots, collects the plant lice and conveys them into these burrows and there watches over and protects them. The ants have nothing to do with the hibernation of the lice, their winter nests never containing them in any form, either in corn-fields or other situations; the facts indicate that the lice hibernate as wingless females on the earth of fields previously infested. The Currant Worm, *Nematus ventricosus*, was mentioned as a case of retarded development. Mr. Bethune had noticed a similar case in *Attacus promethea*. The Root Web-worm, *Crambus zeellus*, was very destructive to corn in Illinois. A detailed description was given of its earth nest and the method and character of injury done to corn by this species. It hibernates as a larva, pupates in a tubular nest in June, emerging June and July.

A paper was read from H. Garman: Contribution to Life History of *Aphis maidis*.

Paper read from W. L. Deveraux: A Dangerless Insecticide for Collecting Bottles. The best vegetable container of prussic acid is the bark of the wild cherry, *Prunus serotina*, to be used for the Serotina bottle for young collectors, like the Laurel bottle of European entomologists.

In the discussions that took place,

Prof. Forbes stated that the attacks of *myrmis* had considerably lessened the number of grasshoppers in Illinois.

The President called attention to the unusual number of Aphides in New York State. They had been found on apple, black currant, tomato, and on potato in the Eastern States. The hop crop was almost destroyed by them in New York.

Mr. Bethune had also found them very numerous on the north shore of Lake Ontario.

In reply to a question, Prof. Liitner stated that European entomologists had come to the conclusion that the *Aphis* of the wild cherry and of the hop were identical.

Mr. Fischer called attention to the probable identity of *Spilosoma fuliginosa* and *rubricosa*. He also exhibited a specimen of *Catocala obscura* just taken by him for the first time in Buffalo.

The President called attention to the fact of the earth worm being the host of a parasite, and therefore dangerous to fowls and poultry.

An excursion of members of the Club took place to Ebenezer, where a very pleasant afternoon was spent, and some interesting captures were made, among the most interesting being *Cicindela ancocisconensis*.

The Club adjourned to the call of the President at the next meeting of the Association.

THE HIGHEST ELEVATION FOR NEUROPTERA IN THE UNITED STATES.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

Mr. H. W. Turner, U. S. Geol. Survey, San Francisco, Cal., has sent to me Phryganid cases from Mt. Conness, Mono Co., living in water at an altitude of over 10,500 feet. They are 15 m. m. long, the front half made by irregular small bits of stones, the apical half of short bits of pine leaves, and the case being narrower; around the case are placed longer parts of pine leaves or grasses in a herring-bone fashion. A few dry larvæ and the shape and arrangement of the cases show them to belong to the family of Limnophilidæ, and to the group of Hallisus.

Other cases were collected from a small lake on the north side of Mt. Dana, at an altitude of over 11,500 ft. These cases are smaller, 10 m. m. long, of little bits of mica and other stones, more cylindrical, sloping a little to the end. They seem to belong to the family of Sericostomidæ, which is at least not contradicted by some remnants of dry larvæ.

At the same place were collected a few sub-imagoes of *Ephemerina*, probably belonging to the group of *Potamanthus*; wings and body are blackish.

As far as I know, this is the highest elevation in the U. S. from which Phryganid larvae and *Ephemerina* are reported to live. From South America I have Phryganid cases out of Lake Titicaca.

CORRESPONDENCE.

Dear Sir: In the July No. of the CANADIAN ENTOMOLOGIST for this year, is a list of the North American Sphingidæ, by A. R. Grote, A. M., in which, amongst other valuable matter, there is a paragraph which reads thus: "We have in South Florida a West Indian colony, the extent of which is not yet known. Stragglers from the south, as *Ello*, *Titan*, *Labrusca*, invade even New England. How far north these breed with us is not known. They seem hardly to belong to the North American fauna, but are all included here so far as they have been reported to me as being taken within the political limits of the United States." I have now to report that *Dilophonota Ello* Linn. has reached this locality, four specimens having been taken this fall, three by Mr. Johnston in the city, and one by Mr. Kyle in Dundas. Mr. Grote's remarks seem naturally to suggest the question, Did these specimens fly to us from a distance, or were they bred here? If they were bred in this locality, then the next thing in order will be information about its food plant. It seems to appear somewhat late in the season, one being taken on 1st of October.

In June last I took a beetle seldom seen in Canadian collections, *Anthophila viridis* Lec., which I identified by a specimen in the fine collection of Mr. Reinecke, of Buffalo, the attractive, sparkling golden-green of its elytra giving it far more the appearance of a South American species, than one to be got in the North. Some information about its habits would be very acceptable. I captured my specimen on the wing.

J. ALSTON MOFFAT.

A RARE MOTH.

On the 23rd of August last, I had the gratification of capturing a female *Erebus odora* at Niagara Falls, Ont. The specimen, which was fresh and perfect, evidently just emerged from the chrysalis, was resting on an awning close to an electric light, on the verandah of the Clifton House. It was about 11 p. m. when I made the capture; the evening was warm, and a gentle rain had been falling for some hours. Close to it I also obtained a beautiful specimen of *Catocala relictæ*, a moth that I have rarely taken of late years.

C. J. S. BETHUNE, Port Hope.

A few days ago Professor Ropes, Andover, Mass., had the kindness to show me the library of the Theological Seminary. The books of the library, i. e., the back of the binding, as the Professor wrote to me some time ago, are injured to a very large extent by *Lepisma*. Most of the bindings were from Germany, covered with varnished paper, but some bindings were from England and from the U. S. Some loose sheets of printed paper are eaten on the margins and have many holes besides. The Professor believes that Turkish-Morocco bindings stand best against these pests.

H. A. HAGEN, Cambridge, Mass.

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