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The Canadian Entomologist.

VOL. XIII. LONDON, ONT., OCTOBER, 1881. No. 10

ANNUAL ADDRESS OF THE PRESIDENT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

To the Members of the Entomological Society of Ontario.

GENTLEMEN,—While Entomology may be said to deal with small things, the abundance or scarcity of the tiny creatures called insects involves great issues. The truth of this statement has been illustrated forcibly in several directions this year, notably in the case of the Angoumois wheat moth, which has played sad havoc among the stores of corn and wheat in granaries in the South-western States. It is said to have destroyed many thousand bushels of grain, and so widespread has the evil become that it is the opinion of the New York Sun that if the Government or the farmers of America could at this time arrest the progress of this insect by expending five millions of dollars, it would be the best investment ever made by the people.

The Angoumois grain moth, *Butalis cerealella* Oliv., is a small moth the larva of which is very destructive to all sorts of grain. The female lays her eggs on the grain sometimes in the field before it is fully ripened, but more frequently in the bins in the granary. The eggs are of a bright orange red color, and in a few days there issue from them very minute whitish-colored worms, scarcely thicker than a hair, which bore into the grain and occupy it, one larva in each kernel. Each kernel contains sufficient food to support one occupant until it reaches maturity, when it changes to a chrysalis within the grain, which, although hollowed and almost entirely consumed within, appears outwardly sound and plump. On pressing between the fingers the grain is found to be soft and yielding, and when dropped into water it floats on the surface.

When the larva is full grown it spins a white silken cocoon, which occupies one end of the cavity within the grain, the other end being filled with the castings of the worm. The moth makes its escape through a small round hole in the side of the grain, which the larva cuts with its jaws before spinning its cocoon. When preparing this orifice for the

escape of the future moth the larva is careful not to cut entirely through, but leaves a thin tissue-like skin unbroken, which the moth finally ruptures when it makes its escape. The body of the moth is about one-third of an inch long, and its wings when spread measure about two-thirds of an inch across; the fore wings are of a plain brownish-buff color, with a satin-like lustre; the hind wings above and below, as also the under side of the fore wings, are blackish-gray.

This insect is a native of the warmer parts of Europe, and has long been very destructive in France. It was introduced into the southern portion of the United States more than 100 years ago, where it has become fully naturalized. It is often brought into New York in cargoes of grain, but the climate of the Northern United States and Canada appears to be too cold to permit it to thrive amongst us, or to permanently establish itself. It has never yet, to my knowledge, been found within the limits of our Province.

The Chinch Bug, which, although always present in our midst, has happily never yet proved a serious trouble with us, has been very destructive to the corn crop in Missouri and Kansas, and combined with the drought, has seriously affected the yield of this cereal in those States.

The Army Worm has appeared during the season in some portions of the West, and inflicted much damage; and there were good reasons for anticipating trouble from this source in our own Province next year, unless the exceptional drought we have lately experienced, and which has been generally looked upon as an unmitigated evil, should check their natural increase. The Army Worm, in common with many other of our night-flying moths, is double-brooded, but whether the later brood pass the winter in the larval or chrysalis state has never been fully settled. It is probable that with us the bulk of the brood pass the inclement season in the larval condition, the young larva burrowing into the ground for protection during the extreme cold of winter. It has been observed by Entomologists that an unusually wet season which induces a free growth of vegetation is very favorable for the sustenance of these pests, and if preceded by a dry autumn, which appears to have the effect of disseminating the moths over a wider area, the worms are often met with in great abundance. During this summer the Army Worm moths (*Leucania unipuncta*), which are always present with us to a greater or less extent, have been unusually abundant in the western portion of our Province. To the sugar-bait, employed by Entomologists to attract night-flying

moths, these insects have flocked by hundreds, and this has been observed not only in Ontario, but also in the Western States, showing that this moth has been unusually abundant over an extended district. Millions of their eggs must have been deposited on the leaves and stems of grasses, but the intense drought we have had has probably deprived the newly-hatched larvæ of the food necessary to their existence, and we may hope that the evil we have suffered from in the way of drought has saved us to a great extent from serious invasions of Army Worms next year.

Much attention has been paid of late by Entomologists to the natural conditions which favor or prevent the increase of injurious insects; and I think there is good ground for expecting, after a few more years of close observation, that it will not be difficult to prognosticate, with a large measure of accuracy, several months in advance, the probabilities as to the insect pests likely to prevail during any year in any given district. When this can be satisfactorily accomplished, much practical good may be expected to result therefrom, since by avoiding the planting of such crops as are likely to be especially injured by insect hosts, and growing others comparatively free for the time from these troubles, a large saving may be effected.

During the summer a small moth, well known to Entomologists as a common insect throughout the Northern States and Canada, but never before recorded as destructive anywhere, has invaded the pastures in some parts of Northern New York, and inflicted great injury. It is a species of Crambus, *Crambus vulgivagellus*. The Crambidæ are known by the common name of grass moths, from the fact that as far as is known they all feed in the larval state on grass, and hence the moths are found everywhere in meadows, flying about in the daytime, with a short but rapid flight. The moths are small, with narrow front wings, which are usually ornamented with metallic spots and stripes. It was about the middle of May that a serious invasion of what was popularly supposed to be the Army Worm, occurred in St. Lawrence County, New York. The State Entomologist, Prof. J. A. Lintner, at once visited the scene of destruction and found the injury widespread and serious, extending over eight of the northern counties. Hundreds of acres of grass presented a brown appearance, as if winter-killed. A pasture lot of ten acres which, ten days before, offered good pasture, was so thoroughly destroyed that in many places not a blade of grass could be seen to the square yard. The upland pastures were first attacked and entire fields were laid waste in ten

or twelve days. Unlike the Army Worm, the caterpillars were seldom seen, and never observed actively feeding, and it was believed by the farmers that they fed at night, or by drawing the blades of grass into their subterranean retreats. In two instances the larvæ were observed in immense numbers collected on the trunks of trees so that they could have been scooped up by handfuls. The cause of their congregating at these points could not be conjectured; it was not for feeding on the foliage, for the grasses alone are their natural food. The caterpillars were slender, cylindrical worms, about three-quarters of an inch long, of an obscure greenish color, with shining black heads. They were destitute of lines or other ornamentation, excepting some small, warty spots on their upper side. Early in August the moths began to appear, when they were identified as specimens of *Crambus vulgivagellus*, the new enemy proving to be an inconspicuous and hitherto unobtrusive little Crambus. It is quite probable that several accounts of injuries to pasture lands in the New England States during the last three or four years by some unknown depredators are to be credited to this species.

At a late meeting of our Entomological Society, held in London, one of our members, Mr. J. M. Denton, referred to the injuries which were at that time being inflicted on some pasture lands within a few miles of London by the larva of the common May Bug, *Lachnosterna fusca*, and exhibited specimens of their work. He had found whole fields of pasture land with the roots of the grass so eaten that the turf could be readily lifted with the hand by the yard, and underneath were thousands of these grubs feeding on the remaining fragments of roots. In one instance, near the village of Delaware, a field had been so completely destroyed that the farmer had set fire to the withered grass with the hope of scorching the enemy to death. As these larvæ readily burrow in the ground when disturbed, he was advised to adopt a different method and turn his hogs into the field to root amongst the grass and devour the larvæ, which they greedily consume in immense numbers. Such wholesale destruction by this insect is not common, but when it does occur it is very alarming.

In the tenth annual report of the State Entomologist of Illinois, just received, mention is made of a new insect injurious to corn. This is a small beetle closely allied to the common striped Cucumber Beetle, and known to Entomologists under the name of *Diabrotica longicornis*. In Illinois the damage caused by the larva of this insect has been considerable. They are small white worms about half an inch long and very

slender, which attack the fibrous roots of the corn, and so destroy them that the plants may be pulled up very easily with the hand. After a time the plants begin to wither and the grain fails to mature. In some instances it is believed that the injury inflicted by this tiny creature would result in the loss of fully one-third of the crop. The perfect beetle is about one-fifth of an inch long, with a width scarcely equal to half its length, and of a pale, dull greenish yellow color without spots or stripes.

The general alarm which prevailed several years ago in reference to the Colorado Potato Beetle seems now to have to a great extent subsided, and notwithstanding that the insect has been very abundant in some sections, it has not been so generally injurious, and where it has appeared in abundance prompt remedial measures have been successfully employed. It has been claimed, and, I suppose, correctly so, that this pest originally came from the canons in the Rocky Mountains, in the State of Colorado, where it is said to have fed on some wild species of Solanum growing there. It was my privilege during the latter part of August of this year to spend a week in this district, and while there I travelled fully one hundred miles through those canons. Several species of wild Solanum grow in abundance almost everywhere in the adjoining plains as well as in the canons, and every opportunity was embraced of examining them, but in no instance could I detect any evidence of the presence of the Colorado Potato Beetle in any of its stages. Besides, I saw several potato patches, and these also seemed quite free from any insect trouble. This seemed to me not a little singular in view of the extremely prolific nature of the insect. Can it be that it has migrated so completely as to leave over large areas no representatives behind, or have its natural enemies so increased as to almost annihilate the pest? Our farmers here would, I am sure, gladly hail the advent of either of these agencies should it free them from this troublesome insect.

The question of the use of the most suitable and economical poisons for the destruction of injurious insects still attracts much attention, and Paris Green continues to head the list as the most generally useful, notwithstanding the efforts which have been made by interested parties to replace it by London Purple. London Purple is an arsenical mixture, a waste product, which accumulates during the manufacture of aniline dyes. Before its introduction as an insect destroyer it had no commercial value; on the contrary, the dye makers were at considerable expense and trouble in getting rid of it as it accumulated. Arsenic, which is the active

ingredient in this compound, is present in very variable proportions, which is just what one might expect in a waste product. Sometimes it forms less than twenty per cent. of the mixture, while other samples will contain more than forty per cent. It is associated chiefly with lime and coloring matter. The arsenic present is in a very fine state of division, and intimately mixed with the lime and other ingredients, forming a very fine powder. It is much more soluble than Paris Green, and hence more liable to scorch the foliage, while its very variable strength makes it uncertain in its effects. For these reasons London Purple is not likely to take the place of Paris Green as an insecticide, which, when unadulterated, is nearly uniform in its composition and effects. An artificial mixture of arsenic and lime of uniform strength and colored could be supplied at about the same price, and would be more reliable than London Purple; but owing to the more ready solubility of the arsenic in this form and its caustic character, it is apt, unless used with much care, to destroy portions of the tissues of the leaves on the plants to which it is applied, making them appear as if scorched or burnt.

Experiments have been carried on for the past two seasons at the Agricultural College at Lansing, Michigan, by Prof. A. J. Cook, on the use of London Purple as a remedy for the Codling Worm. Early in the summer, while the fruit was quite small, some crab apple trees were syringed thoroughly with London Purple mixed with water, and it is claimed that the poison, which, when the water has evaporated, forms a thin coating on the fruit, either prevents the Codling Moth from depositing her eggs or else poisons the young larvæ as soon as they are hatched, the result being the saving of a very large proportion of the crop from injury, while other trees near by not similarly treated bore very wormy fruit. It is also said that, as the fruit approaches maturity, the most delicate chemical tests fail to show a trace of the poison. I scarcely think that the experiments yet tried in this direction have been sufficiently extended to warrant any general conclusions being based on them, and provided it were proven that this remedy was a certain and safe one, the popular prejudice against applying such virulent poisons directly to the fruit we are to eat would be so strong as to prevent the general use of any such means. Indeed, were it generally known that the apple growers of any district were in the habit of applying arsenic in any form directly to their fruit, it would interfere very seriously with their sales, and it is doubtful if apples so treated would find a ready market anywhere.

It is well known that the seeds of certain noxious weeds will sometimes lie dormant in the soil for almost any number of years, awaiting a favorable opportunity for germinating; but it is not so generally known that the development of insect life is sometimes similarly retarded. It has many times been observed that a few individuals out of a large brood of moths will remain in the chrysalis state over one season and produce the perfect insect the following year, thus remaining a full year more in the dormant condition than is usual, and instances are on record where the perfect insects have escaped after three years spent in this condition of torpor. Recently, Prof. Riley, of Washington, has called attention to a very remarkable case of retarded development in the eggs of the destructive Rocky Mountain Locust, *Caloptenus spretus*. These eggs were laid in 1876 on the grounds of the Agricultural College at Manhattan, Kansas. While grading the ground around the chemical laboratory in the autumn a quantity of the eggs were buried some ten inches below the surface, the covering material being clay, old mortar and bits of stone, and above this a plank sidewalk. On removing and regrading the soil last spring a number of these eggs were disinterred quite sound and fresh-looking, and when exposed to normal influences they readily hatched, so that these locusts' eggs actually remained nearly four years and a half in the ground unhatched, or four years longer than is their wont. How much longer they would have retained their vitality under favorable conditions of temperature and dryness is unknown. This point has a very practical bearing and deserves further investigation, not only in reference to the eggs of this insect, but to those of all injurious species whose eggs are deposited on or under the ground.

The Sub-Section of Entomology of the American Association for the Advancement of Science met this year at Cincinnati, Ohio, where I had the honor of representing our Society. A large number of distinguished Entomologists were present, and many useful papers read and discussions held at the meetings. An account of the proceedings will appear in our Annual Report. It having been decided to hold the next meeting of the American Association in Montreal, I trust that our representative men in all departments of science will be present to greet with a hearty welcome the distinguished scientists from the United States and abroad, who will on that occasion honor the Dominion with their presence. I have strong hopes that the Entomologists of Canada will turn out in good force.

If the progress of a science is to be indicated by its literature and the

number of its devotees, then Entomology has made very rapid progress within the last two or three years. There are on this continent now nearly 500 persons pursuing the study of this important branch of natural history, and during the past year a large number of original papers have been published on the subject. The CANADIAN ENTOMOLOGIST, the monthly organ of our Society, continues to hold its place in the front rank among the most useful periodicals in this connection, while clustering around it now are Psyche, the organ of the Cambridge Entomological Club; the Bulletin of the Brooklyn Entomological Society; and last, though by no means least, Papilio, a journal devoted exclusively to lepidoptera and mainly to descriptions of new species, which has now completed its seventh number. All these are devoted exclusively to Entomology, and will be found of great value to every Entomologist. To these must be added the valuable reports of the U. S. Entomological Commission, whose good work is still being continued; the annual reports of the Entomologist of the Department of Agriculture at Washington, those of the several State Entomologists, the annual report of our own Society, as well as a large number of papers on the subject to be found in the transactions and proceedings of all natural history societies. There has also appeared in the Canadian Sportsman and Naturalist, edited by William Couper, of Montreal, some Entomological items of special interest to Canadian Entomologists.

In my last annual address I referred to the appointment by the Ontario Government of a Special Commission to enquire into the agricultural resources of the Province, and the progress and condition of agriculture therein. In view of the important bearing of Entomology on successful agriculture, the Government was pleased to appoint your President as one of the Commissioners. The report of the Commission has since been compiled and published, in which the insects injurious to the farmer and fruit grower have been fully dealt with; also the remedies suggested for their destruction, and the beneficial insects which prey upon them. The evidence relating to the subjects of insects and insectivorous birds occupies 104 pages in the full report, and 61 pages in the condensed report, both of which are adorned with many excellent illustrations. The eagerness with which these publications have been sought after is indicative of the estimation in which they are held by the public. It would, I think, meet a strongly felt want if some arrangement were made whereby this valuable work, so useful to every farmer, might become accessible by

purchase to all who are seeking for it throughout the length and breadth of our Dominion. I have the honor to be,

yours very sincerely,

WM. SAUNDERS.

ON THE LENGTH OF LIFE OF BUTTERFLIES.

[Read before the Ent. Sub-Section of the Am. Ass'n at Cincinnati, 19 Aug., 1881.]

BY W. H. EDWARDS, COALBURGH, W. VA.

Not long since I received a letter from a correspondent in Europe, asking what my experience was in regard to the life of butterflies, and this led to much thinking of the matter and reference to my note books, in which for more than fifteen years I have put down everything that has come under my observation relating to butterflies. The current opinion has been that the life of such butterflies as did not hibernate was short, and that in case of hibernators their existence ended soon after copulation in the ♂, and after laying their eggs in the ♀. Dr. Boisduval says, Spec. Gen., 1, p. 28: "The existence of lepidoptera in the perfect state is generally of brief duration; the male perishes some days after copulation and the female after having finished her laying of eggs." Kirby and Spence, Introd., London, 1856, p. 41, say of the perfect insect: "Its almost sole object is now the multiplication of its kind, from which it is diverted by no other propensity; and this important duty being performed, the end of its existence has been answered, and it expires."

I believe that this is a correct statement for a general one. On the other hand, Mr. S. H. Scudder, in various publications, has spoken of butterflies of the summer generations as living for months—2 to 3 months at least.

With regard to the hibernating species, I believe it is the last brood only which hibernates, so that the individuals begin their existence about the month of September. They lay eggs in the spring as soon as the food plant is ready to receive them, and shortly die. Therefore their existence would be limited to 8 or 9 months at the outside. Per contra, Mr. Scudder asserts that Danais *Archippus* lives from a year to 15 or 16 months.

It is not possible to say of butterflies at large exactly when one came from chrysalis, or when it expired, but in the case of any species we observe at a certain time of the year, with great regularity, fresh butterflies are on the wing, and that in a few weeks only here and there can this species be seen, the survivors being old, abraded of wing and broken. If a female be now taken, on dissection there will usually be found a few eggs in the abdomen, perhaps half a dozen, the remains of an original stock of 200 or more. Sometimes not a vestige of the eggs remain. Any collector much in the field will often have seen female butterflies on the ground, sometimes struggling, oftener dead, and if examined these will usually show no sign of violence, but plenty of old age and exhaustion.

In the case of many-brooded species we observe that, periodically, every few weeks a new brood has come, then that the butterflies are old and scarce, and suddenly great numbers of fresh ones are flying. So that in a certain number of weeks a whole generation has come and gone. But the individuals of this generation which emerge earliest, and lay their eggs soonest, will die first, and as the emergence occupies at least half the whole period of the generation, we may say, if a generation is on the wing six weeks, that three or four weeks would be the limit of existence of any particular individual. In many species, in the latitude of West Virginia and further south, there is a new generation on the wing every month, and in such case a butterfly three weeks old would be a patriarch among its kind. In New York and New England, where most species are double-brooded at least, the duration of an individual life may be a trifle greater, but no more, depending upon the time the eggs are laid.

In the case of a seasonally-dimorphic species, and still more of a trimorphic species, like Papilio *Ajax*, we can fix the limits of duration of one or more of the forms with some definiteness. In my section of West Virginia the form *Walshii* is on the wing very early; *Telamonides* appears about a month later, but occasional *Walshii* fly as late as any *Telamonides;* and by first of June the third form, *Marcellus*, appears, and almost at once completely supplants the other two. In a few days not a used example of the other forms will be seen. I find many memoranda in my note books bearing on this point.

In a series of years, from 1871 to 1881, the first appearance of both the forms of *Ajax*, and the last appearance of the two spring forms, is recorded nearly every year.

	Walshii.		Telamonides.	
	Earliest.	Latest.	Earliest.	Latest.
1871.		24 May.	24 May.	9 June.
1872.	11 April.	19 May.	29 April.	30 May.
1873.	8 April.			
1874.	27 April.		14 May.	6 June.
1875.	7 April.		27 May.	
1877.	23 March.	15 May.	18 May.	
1878.	9 March.	15 May.	3 May.	
1880.	March, early in	30 May.	19 May.	
1881.	19 April.	21 May.		

	Marcellus.
	Earliest.
1871.	1 June.
1872.	5 June.
1874.	6 June.
1880.	30 May.
1881.	7 June.

So that *Walshii*, during a period of eleven years, has been seen as early as 9th March, and as late as 30th May; and *Telamonides* as early as 29th April and as late as 9th June. In the one case there has been a range of 92 days, in the other of 41. The first appearance of *Walshii* depends altogether on the state of the weather. If a few fine days come early in March, some individuals will surely be seen long before the bulk of their generation; and these early comers are invariably cut off by the severe weather which follows. *Walshii* is in fact an April form here, while *Telamonides* is scarcely ever seen in April, but is a May form, not descended from *Walshii* of the same year, but like *Walshii*, coming from over-wintering chrysalids of all three forms of the preceding year. After 1st June, *Marcellus* coming from the eggs of *Walshii*, laid last of April and early in May (before which time the food plant Pawpaw, Anona triloba, does not put forth the first flower bud or leaf bud) abounds, and continues in successive generations till late in the season.

During the middle of the *Walshii* period many females may be seen, worn and broken, evidently some time out of chrysalis, and in their last days. In 1871, 10th April, I recorded that I took 3 ♀ *Walshii* "battered and broken." Whereas, a few days later, on 16th April, I took 4 fresh ♀. One half the generation was passing away while the other was

coming on. A large proportion of these early females must die before the leaves of the Pawpaw first show themselves. In this plant the flowers precede the leaves, and these larvæ do not eat the flower, but eggs are sometimes found on the unopened flower buds and even on the stems, several days before the bursting of the leaf buds.

In 1880, 9th April, I recorded that no good examples of *Walshii* were to be had, all being worn and broken. But same year, on 20th April, I took a pair of *Walshii* in copulation, the ♀ just out of chrysalis, the wings expanded, but still limp - not wholly dried—the ♂ old and broken. Next day I took 3 pairs of same form in copulation, and in each case the female was fresh, while the male was worn and broken.*

Now in that year the first *Walshii* had been seen early in March. On 1st day of April I took a ♀; on 3rd April I recorded that I saw several females about the blossoms of the wild plum and that all were worn. Plainly one division of this generation, in the ♀, was passing away early in April, while 20th April many fresh females were coming from chrysalis. I took all these pairs in one clump of bushes inside my fence, and it is to be presumed that if plenty there, multitudes of *Walshii* were coming from chrysalis throughout this region on those days. The weather had suddenly changed from cold and blustering to fine, and the belated chrysalids were giving butterflies.

The period of *Telamonides* in these same years has been from 29th April to 9th June. In 1871, 9th June, I recorded that I confined 2 ♀ *Telamonides;* on 10th had got no eggs, and concluded from their wasted appearance that they had previously exhausted their stock. That same year, both on 24th and 28th May, I had taken females of *Telamonides* while ovipositing. On 12th May, 1872, I recorded that I shut up a ♀ *Telamonides* and got eggs; on 30th May, that I shut up 2 ♀; and add that many of this form were to be seen, but all were worn. *Telamonides*

* I have again and again noticed in many species of butterflies, where a pair have been taken in copulation, that the male will in most cases show signs of considerable age, while the female is evidently either just from chrysalis or quite recently. Boisduval, Spec. Gen., 1, p. 28, says: "In some instances two or three days elapse between chrysalis and pairing, but only when the sexes cannot come together sooner." But of the hibernators the same author says of the Vanessidæ, all which in temperate regions at least hibernate in the imago: "Their pairing does not take place till seven or eight months after the emergence of the insect." Of my own experience I know nothing as to this.

emerges after the weather is settled, and its extreme period as observed has been 41 days, during 11 years. But in any one year it has been but one month. In 1872 the first were seen 29th April, the last 30th May. So that I doubt if any individual *Telamonides* is alive longer than three weeks.

Marcellus ♀ lays its eggs very soon after chrysalis. The eggs are in part fully formed when it emerges from chrysalis. I dissected a female a few hours after chrysalis, which emerged in my room 13th July, 1881, and found some of the eggs round and deep green (the color when laid), but not hardened externally; others were nearly formed. In *Walshii* it is different, the eggs being at first fatty masses without form. I dissected one of the females taken 21st April, 1880, before spoken of. This was just from chrysalis and in the act of pairing, but the eggs were wholly unformed. The same thing is true of *Telamonides*.

The eggs of *Ajax* are laid during several days. The female flies from leaf to leaf and deposits one at a time, and as some scrutiny is exercised, one leaf being selected while another is refused, much time is lost. So that several days may be occupied in laying 200 eggs—perhaps a week. And by this time the insect will have become worn and the wings broken. She cannot possibly exist many days after the laying is finished. That the eggs are either all mature together, or mature with great rapidity, is evident from the ease with which they are obtained in this species from females tied in a bag over the food plant. They usually lay at once and in large numbers. I noticed particularly the condition of *Walshii* and *Telamonides* during the last days of May, 1881. All were old and the males much exceeded the females in number, I should say ten to one. In 1880, 30th May, the last *Walshii* seen that year were two old males. It seems to me probable that many males never have the opportunity of pairing, and that these live longest, their lives enduring much beyond that of any female. The latter is discovered almost as soon as out of chrysalis, and several males at same time may often be seen fluttering about one female. The young males stand no chance at all in competition with the older ones. The former are for some hours limp and weak, and by the time they have attained their strength, the eager crowd of suitors, who are prying in every bush in quest of a mate, have carried off the prize. But when there are no old males, the young one may certainly pair a few hours after chrysalis. I have seen this in Argynnis *Idalia*, when a limp female was taken with a male absolutely perfect in wing and thorax, and

therefore but lately out of chrysalis. So in Argynnis *Myrina*, where I took a pair in copulation both which had emerged in my boxes the previous night. How speedily the males expire after pairing I cannot say; they certainly do sometimes during the process. In 1872, 25th April, Mr. Mead, here at Coalburgh, took in his net a pair of *Ajax* flying by, and found the male not merely dead, but dry, and evidently it had expired many hours before. As I have said, both Boisduval and Kirby and Spence state that the males die very soon after pairing

I think from what I have said, it will be evident that Papilio *Ajax*, which from its size and strength would seem as likely to live several months as any butterfly in our fauna, really does live but a few weeks, and probably not more than three or four, unless in case of males which have not paired; even then but a trifle longer.

Take Lycaena *Violacea*, a dimorphic species of which *Violacea* is the early form and *Pseudargiolus* the later. During 17 years past I have kept record of the first appearance of this Lycaena because it is the earliest butterfly of the year, and the harbinger of spring. The earliest date has been 17th February, and the latest date of first appearance has been 7th April. But except in one year, 1876, the earliest examples seen have been on 6th March. No flowers are in bloom so early, and the Dogwood (Cornus), on the flowers of which *Violacea* deposits its eggs, does not usually begin to put forth its flower buds till about middle of April. The eggs are not formed when the females come from chrysalis, nor till several days have passed. In 1878, 7th April, I dissected a ♀ and found no eggs. The same day the Dogwood was in bud, but I found no eggs after a long search. On 13th April I confined a ♀ over a limb of Dogwood and got 40 eggs. On 16th April, 1880, I took a pair of *Violacea* in copulation, and 17th found the first eggs of the season, though I had been watching daily for them.

On 26th April, 1881, the buds were still unopened but formed, and I found the first eggs on them. In 1879, 27th April, I found eggs, but no young larvæ. Three days later there were scores of eggs, seven on one flower head, but still no larvæ. On 1st May the larvæ were hatching.

Up to the time of laying eggs fresh males and females are to be taken and I repeatedly record this. The latest mention of *Violacea* is on 6th May in one year, when two or three were seen.

The next generation, *Pseudargiolus*, come from eggs laid by the early form, *Violacea*, in these years has been first seen once on 19th April, once

1st May, but in the other years from 7th to 22nd May, their advent depending on the season, and on the date of the previous flowering of the Dogwood, i. e., the laying of eggs by *Violacea.*

The life, therefore, of Lycaena *Violacea* must be limited to three or four weeks at the utmost, and shortly after oviposition this form completely disappears.

There are some species which live but a short time at a particular season of the year, and being single-brooded, pass the greater part of the year in chrysalis. Of such is Anthocharis *Genutia.* I find its earliest appearance at Coalburgh recorded on 17th April, its latest on 14th May, in a series of years.

So Thecla *Henrici;* year after year I record its appearance in April, and in no other month. The earliest seen have been on 11th, the latest 29th April.

For an example of a hibernating butterfly we can have no better example than Danais *Archippus*, and it is the one which Mr. Scudder finds so remarkable in its longevity. It is of large size, and therefore readily distinguished, and is cosmopolitan. In West Virginia there are at least four, and possibly there are five generations of the imago of this species in succession, and it is the last generation which hibernates. Very early in the spring a few of the survivors may be seen about the blossoms of the peach or wild plum trees. About first of May, the leaves of the larval food-plant, Asclepias, begin to show themselves, and at once the females of *Archippus* seek them in order to deposit their eggs. I have watched carefully to see how late these old hibernating females were flying, and the latest date was 2nd June, when I took one. This I dissected, and found the abdomen free from eggs, all having been laid. Also I watched all through the season of 1878 to see what sort of females laid eggs. I had the best possible opportunity, as Asclepias abounds near my house and comes up all through the grass hereabouts. So in the lanes and along the brooks it grows in profusion, and young plants continue to come up quite into September. In every instance the ovipositing female was fresh colored, plainly not long from chrysalis. One generation of the butterflies succeeded another the season through. The first brood of larvæ raised by me came from eggs laid 2nd May. These eggs were found on the plants, and must have been laid by a hibernating female. The butterflies began to emerge from chrysalis 30th May, several days after fresh individuals of the same or first generation were observed flying abroad.

The second brood came from eggs laid 1st June. I saw the female ovipositing, caught her and confined in bag over a plant, and got many eggs. This female was nearly perfect, and not long from chrysalis. (It was on the next day, 2nd June, that I caught the hibernating female before spoken of.) The butterflies from this brood began to emerge 25th June.

The third brood raised by me came from eggs laid 29th–30th July, by a fresh female, confined as before. (During the interval between 25th June, when the previous brood began to emerge from chrysalis, and the 29th July, when these eggs were laid, there was plenty of time for an additional brood.) The butterflies began to emerge 20th August.

The fourth brood raised by me came from eggs laid 30th August, and the butterflies from these began to emerge 29th September.

Now plainly the history of *Archippus* does not differ from that of any other many-brooded species, except that in some the chrysalis hibernates, while in others it is the imago.*

I could adduce other instances, as Argynnis *Cybele*, Satyrus *Alope*, Apatura *Celtis*, Limenitis *Disippus*, etc., but I have given enough to show that butterfly life is of short duration; that in the summer generations it cannot exceed a few weeks, and that in all cases it probably terminates shortly after copulation in one sex, and oviposition in the other; and that the current opinion on the subject among lepidopterists is correct.

NOTE.—I learn from Prof. Lintner that *Archippus* is three-brooded in New York. It may be so in the lowlands, and in the mountains be but double-brooded. But whatever the number of broods, the behavior of the species will be the same in one place as in another. This butterfly being cosmopolitan, adapted to all climates except the arctic, with a wide range of flight in the individual, often migrating indeed from one region to another, we may be sure that the length or the shortness of the season in special or in any localities cannot possibly effect a radical change in its habits. Therefore it was with much surprise that I read the following statement gravely propounded by Mr. Scudder, in Psyche for J[illegible]875, respecting this species, under the name of Danais *Plexippus*: "In North

* To show how readily *Archippus* lays its eggs in confinement, on 19th August, 1879, I tied a female over Asclepias, and within 24 hours had gotten 82 eggs. This also shows that the eggs mature for deposition, not singly, but *en masse*. Fourteen days later the larvæ from these eggs were pupating.

America" (not, be it observed, in one part of it, but everywhere) "*it is single-brooded* (not double-brooded, as asserted by Mr. Riley), the butterflies hibernating. It leaves its winter quarters later in the season than other hibernating butterflies, *and continues upon the wing until July and August, laying eggs all the time,* SO THAT *the insect may be found in its earlier stages throughout most of the summer*"; and "*the perfect insect lives a full year, mingling on the wing with its own progeny, and witnessing the decay and renewed growth of the plant which nourished it.*" That is to say: the caterpillars of *Archippus* which may be found throughout most of the summer come from the eggs of these old hibernating females, and not from young females of a new generation. These last are compelled to go over winter before they can lay eggs. It follows that females hatched from the early eggs of one season must or may exist till the close of the following season, and therefore live not merely a full year, but a year plus the time from June till September.

I knew enough of *Archippus* to be assured that it had a history in no way peculiar in respect to its propagation. No butterfly on earth has a habit such as is above stated, and the author would seem to have had in his mind something quite outside of lepidoptera. But that I might be able to speak with precision, I carefully made observations reaching through the whole season of 1878, and which I have just recited herein. These were published at length in Psyche, Dec., 1878, and showed conclusively that in one part of North America the hibernating females came early from their winter quarters, began to lay eggs at first sight of the food plant, and were extinct soon after. Therefore that the hibernating female was not laying her eggs all through the summer, and did not give birth to the succession of fresh butterflies of that season. But it was clearly shown that the eggs of the hibernating female produced the first generation of butterflies, and that females of the first produced the second, the second the third, and so to the end.

I was considerably more surprised, therefore, on reading Mr. Scudder's recent book, "Butterflies," 1881, on page 136, to find this story repeated word for word, with no allusion to my published history or to the observations of Mr. Riley or any other person, and with no verification on the author's part or data whatever. The first account might have been excused in an author of restricted experience in the field, contriving in his closet a theory which should explain imperfectly observed phenomena, but what shall be said of its subsequent repetition, without note or com-

ment, after an interval of years! "It is the longest-lived of our butterflies"; "continues upon the wing until July and August, laying eggs all the time"; "the perfect insect often lives a full year, mingling on the wing with its own progeny, and witnessing the decay and growth of the plant which nourished it"!!

Throughout this book *Archippus* is ostentatiously called THE MONARCH, I apprehend in right of its amazing history. If it lives as long for a butterfly as Methusaleh lived among men, it may be entitled to some sort of distinctive appellation, and if it has so changed the habits of its kind as to breed like a mammal, laying eggs at intervals in the closing half of its long life, and gathering its progeny about its tibiæ, perhaps it ought to have some superlative title. We read that Methusaleh lived after he begat Lamech seven hundred and eighty and two years, and begat sons and daughters, but his long life appears to have been that venerable man's sole claim to distinction. We do not read that he attained regal honors, or even the chieftainship of a tribe. In view, therefore, of this high precedent, I suggest that the correct thing would have been to designate this long-lived, phenomenal butterfly not THE MONARCH, but THE PATRIARCH.

MEETING OF THE SUB-SECTION OF ENTOMOLOGY OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

(Continued from Page 189.)

On Saturday morning the Entomological Sub-section was again in session, when the following papers were read:

The Egg Case of *Hydrophilus triangularis*, by C. V. Riley; on the Oviposition of *Prodoxus decipiens*, and also one on the Cocoon of *Gyrinus* by the same author. Following these a paper was presented by B. P. Mann, entitled, Suggestions of Co-operation in Furthering the Study of Entomology; and another by C. V. Riley, on New Insects Injurious to American Agriculture.

In this latter paper the author called attention to several insects hitherto unknown as injurious, which during the present year have proved very destructive to one crop or another. Such hitherto unknown and unreported injury is either caused by, 1st, imported species; 2nd, native species previously known but without destructive habit; 3rd, unknown or

undescribed species. The author gave an account of the injury which had been done to clover plants by a beetle, *Phytonomus punctatus*, in Yates Co., New York. The cocoons of the beetles were found on the ground in the fields, but the beetles were difficult to find on account of their shyness, as they fall to the ground when approached. Mr. Riley also reported that much injury had been done to corn in South Carolina and Georgia by a borer which was probably the larva of a Pyralid moth.

After the reading of papers an informal discussion on Entomological subjects took place.

Mr. A. J. Cook remarked that *Heliothis armigera* had attacked corn in Michigan for the first time in 1880. That was a very wet year, whereas this year had been very dry, and this season the Army Worm, *Leucania unipuncta*, had been observed injuring it for the first time.

Mr. W. Saunders said that the imagos of the Army Worm, *Leucania unipuncta*, had been unusually abundant in Ontario during the summer, and had been seen at sugar in great numbers, and referred to the fact that the destructive brood of this inseet was not the first brood. Mr. Cook had found the moths similarly abundant in Michigan.

Mr. Cyrus Thomas stated that he had positive proof that the eggs of *Leucania unipuncta* had been deposited in fields of oats. He also said that wet weather was very favorable for the development of this insect.

Mr. J. A. Lintner spoke of the great abundance of the Clover-seed Midge, *Cecidomyia leguminicola*, which was rapidly spreading over a large area. Mr. B. P. Mann considered that the rearing of insects in the house tended to prolong the life of the larvæ, and to shorten that of the pupæ. Mr. C. V. Riley agreed with him, but Mr. Thomas held the opposite view.

Mr. S. H. Peabody, speaking of the duration of life of some moths, remarked that in *Endropia* and in *Ctenucha virginica* the period of existence of the imago was short.

Mr. Riley said that *Anisota rubicunda* feeds on both the hard and soft maple trees, and that the coloring of the imago in the western limits of the region where the moth is found is very pale in color. Mr. J. A. Lintner stated that he had captured this insect at Schoharie, N. Y., having a yellow color with only a slight tinge of rose.

Mr. W. H. Edwards remarked that he had found *Thecla henrici* only in April. It feeds on the wild plum tree. The larva eats into the unripe plums, burying its head and shoulders in the fruit, and eats no other kind of food. The larva becomes full grown by the time that the plum has

become half grown. The insect has but one brood in the year. Mr. Edwards also remarked that *Lycaena violacea* feeds upon many different food plants.

The meetings of the Entomological Sub-section were throughout very interesting and profitable, and the "brethren of the net" separated with regret, the hope being expressed by all that they might be privileged to meet again next year in Montreal.

BOOK NOTICE.

Butterflies: Their Structure, Changes and Life Histories. By Samuel H. Scudder.

We are indebted to the author for a copy of this beautiful book, a well printed octavo volume of 322 pp., illustrated with 201 figures. The work is divided into thirteen chapters, the first six of which treat of the structure of butterflies in all the stages of their growth from the egg to the perfect insect. A chapter is devoted to the internal organs of caterpillars and another to the transformation of these organs during growth. The remaining chapters deal with the life histories of these attractive insects and the changes which they undergo under varying circumstances. Following these is an appendix containing instructions for collecting and preserving insects, etc., a list of the common and scientific names of butterflies, and a list also of the food plants of their caterpillars, all written in a plain and popular style. It is a great pity that a work of this character, coming from so well known and talented an author, and containing as it does so much useful and valuable information, should be marred by the introduction of a series of new names for our butterflies which to the great bulk of the Entomologists of America seems to be a most unreasonable imposition and against which their is a general feeling of revolt. That any author should persist in carrying the rules of priority so far as to resurrect old documents the authority of which is of the most questionable value, and on the strength of these insist on the changing of nearly all the names of our butterflies, is a tax on the patience of the practical man which few can endure, and a serious bar to the progress of our favorite science. Neither do we think that the introduction of a large number of newly invented common names will add in any degree to the popularity of Entomology; it were far better, in our opinion (with few exceptions), to use the specific name of the insect for this purpose, which is as easily learnt and conveys a more definite idea than is possible with such common names as those given by this author.