THE VARIATIONS OF ARCTIA PROXIMA, GUERIN.

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CONTRIBUTIONS TO THE KNOWLEDGE OF NORTH AMERICAN ARCTIIDÆ.—IV.*

BY OTTO SEIFERT, NEW YORK.

Arctia proxima, Guérin.—To obtain a feasible knowledge of the extent and direction of variability in this species, extensive material was procured by recrossing original broods and again their inbred progenies.

Some of the freshly-formed pupæ thus obtained were either subjected to treatment by excessive cold (−12° C. for two to three hours repeatedly), or kept at a temperature of about +4° C. for thirty days, while others were exposed to +38° C. for 100 hours. Gravid females were obtained from Morelos, Mex.; Los Angeles, Cal., and several more through the kindness of Dr. R. E. Kunzé, who took them at Phœnix, Ariz. The female from Morelos deposited only a limited number of eggs by October 26th, which hatched November 5th, producing the form *proxima*, Guérin, in December. The eggs from Los Angeles were obtained the latter part of April, the imagoes appeared the beginning of June, all the males being of the form *autholea*, Bdv.

The eggs of two females taken by Dr. Kunzé at electric light, commenced to hatch October 18th. The larvæ were fed during winter on *Cichorium endivia* and *Lactuca sativa*, var. *Romana* (Cos lettuce), this diet being varied sometimes by winter-spinach. The rearing of the progenies had, of course, to be accomplished at the regular temperature of a dwelling room.

The larvæ grew rapidly; November 16th the first pupæ were obtained, all others finishing their larval state by December 1st; the majority of moths appeared from December 3rd to 15th.

Three successive inbred generations were then reared. Another gravid female taken at Phœnix, April 18th, arrived at New York April 24th; the eggs hatched April 28th, and the final metamorphosis took place from June 4th to 15th.

*Parts I., II. and III. appeared in the Journal N. Y. Entom. Soc., Vol. X.

The course of development, as well as the general appearance of the imagoes of all broods were practically alike. In its life-history, the species differs somewhat from our eastern forms in moulting only five times, and all the individuals of a whole generation passing their transformations quite regular in about eight weeks, from the deposition of eggs to perfect insects. The last larval stage has a prolonged duration and the very restless larvæ at this period are inclined to attack and destroy each other. The very active and erotic males of this and other species of our N. A. Arctians manifest a decided inclination for uniformity of colour, gradually eliminating the probably original black to finally uniform white; the conservative females apparently striving to retain and extend their dark colour. More constant forms like *virgo*, even show in the male sex a varying but decided paleness of the red colour of hind wings. In closely related European and Asiatic genera the wings of the sluggish, retrograde females are rudimentary. *(Ocnogyna; Tancrea pardalina; Rhyparia leopardina.)*

The tendency of the males to diffuse the light colour from the probably original sources—the veins*—and its transmission by the male parent seems to be constantly counteracted by the conservatism conveyed by the female parent. The vacillating, but still aimed variability of some of our more vital species, perhaps finds here its principal solution. In the much-disputed *nais* group, for instance, the females of the four distinct species (all probably originally deriving from *nais*, but now distinct) are recognized and separated from each other without the slightest difficulty, while the males, striving finally towards uniform and light coloration, are naturally bound to create resembling forms, merely by the two antagonistic principles inherited from the male and female parents. To consider these species as lingering in a *status nascens* might as well apply to all variable forms.

Stimulated by high temperature, it seems with the males of *proxima* that the black colour is gradually eliminated; the process generally begins with the area from 2nd to 4th transverse bands, which, widening in excess, leave (as far as the experiments reach) only two black irregular costal marks and a geminate dot at interior margin of middle area, besides traces of the black colour near base; the dorsal black maculation of abdomen is almost entirely superseded by red and the black of terminal

*Dr. Chr. Schrœder, Zeitschrift f. Entom., July, 1904, p. 257.

segment by sordid white. Extreme cold, as well as prolonged low temperature, with the males, seems to destroy or disintegrate the black of the scaling near inner angle of primaries, reducing it near apex more or less, leaving in extreme forms only a few costal spots and at base two broad black dashes; the hind wings losing besides the black marginal spots even the pinkish abdominal margin.

The females are far less inclined to yield in regard to colour and design to the stimulating influences of temperature. Heat mostly widens especially the transverse anterior band, and the deep red of the hind wings is changed to a much paler colour. Low temperature, namely excessive cold, also affects the inner angle of primaries as in the male, but in a far less radical manner; while at the middle and basal area the black predominates, replacing even the transverse bands; leaving only the white submedian stripe with a trace of median line. The hind wings also change to a paler colour and the maculation is reduced in size.

Among the immense number of individuals reared, not a single male was obtained with pinkish hind wings, or a female with yellow secondaries; though many specimens had the black maculation bordered by pale orange, as is often the case with other species of the genus. Melanic forms have a dusky shade cast over the white bands, often only the upper part of primaries to median vein is thus affected.

The weakened condition of the inbred generations made itself evident by an inclination to morbid diseases during the larval period and in general smaller size and less intense colours of the moths.

Arctia proxima may be at once distinguished from its nearest relation and neighbour, *Arctia incorrupta*, Hy. Edw. (Papilio I., p. 38*), by the total absence of the basal half-band in *proxima*; besides, the "median vein is narrowly and continuously lined with white scales" in the latter species (Neum. & Dyar, Revis. of Bombyces).

In size *proxima* varies not inconsiderably; the offspring reared from Los Angeles parents reaching 4.3 Cm. ♂ ♂, and 5.2 Cm. ♀ ♀; Morelos and Arizona progenies from 3.5 to 4.2 Cm. ♂ ♂, and 3.7 to 4.7 Cm. ♀ ♀.

Male and female *proxima* mostly remain in coitu for about twelve hours; one pair even being unfortunate enough to be unable to separate

*Probably by an error in proof-reading the text on page 39, Papilio, I., reads: "3 females, Prescott, Ariz.; 1 male, Dalles, Oregon." Henry Edwards had no females of this species. In his collection at the Museum of Nat. Hist., New York City, are 3 males from Prescott, Ariz., and 1 male from Dalles, Oregon.

again. With many of our eastern species *(virgo, phalerata,* etc.) the pairing generally takes less than an hour.

A sound fertilized female lives about seven days, disposing of about a thousand eggs at intervals, in loosely connected clusters or clumps of more than a hundred eggs each, rarely in patches; some liberated themselves of their whole stock of eggs in two large clumps; others again, as is often the case with *virgo* and *phalerata*, resting on the under side of a leaf and bending the abdomen downward, drop the eggs singly, occasionally changing the place; the eggs are dispersed considerably on account of their springiness.

The eggs of *proxima* are in appearance like those of almost all of our eastern species; rather bright, pale yellowish, more conical than rounded (blunt cones) and measure at base about 0.7 mm. Magnified they show essentially a like reticulation; the same is the case with the eggs of *Arctia incorrupta*, and as Mr. Gibson (CAN. ENT., Vol. XXXII., p. 321) describes the eggs of *Arctia americana*, Harris, also as pale yellowish and semi-ovoid, it is interesting to compare the eggs of *Arctia caja*, L., from Europe, which are decidedly rounded and apple green; while those of *Arctia caja*, from beyond the Ural Mts., are described as pearly white (Berliner Ent. Zeitschr., Vol. XLIX., Aug., p. 36).

The mature larva forms a voluminous resting place, with little spinning, between moss or rubbish on the ground, changing after several days to a dark brown or pale pinkish-brown pupa, which soon becomes covered with bluish bloom; pupæ remaining without this bloom will not develop. The pupal rest extends from fifteen to twenty days; the females appearing first, mostly in the morning.

The wide range of *proxima* still seems to be limited to certain altitudes. In more southern regions the habitat of the moth may be extended to far higher elevations than, for instance, at Phœnix, Ariz., but it seems to avoid continuous severe cold.

All the females obtained from Dr. Kunzé and taken at Phœnix at an elevation of about 1100 ft. were *Arctia proxima*, Guérin, and with every generation derived from these there were always nearly one third *autholea*, Bdv., as well as all intermediate forms to the one with marginal row and discal dots of hind wings. At Prescott, Ariz., with an elevation of about 5400 ft., *proxima* seems to be replaced by *Arctia incorrupta*, Hy. Edw.

In "Entomologica Americana," Vol. I., p. 117, Dr. H. G. Dyar describes the preparatory stages of *Arctia proxima;* hence it would be useless to refer again to the larval stages of this species, did not the rearing in vast numbers reveal similar flexible and pliant endowments for the larvæ, as it did in regard to the imagoes.

The larvæ in their earliest stages change their original whitish ground-colour gradually to light yellow-brown or dull amber, and during their growth toward maturity, to dull or dusky orange and reddish-brown.

At third stage brown pigment accumulating at first patch-like, mostly near the bases of warts I. and II., forms a broad, brown subdorsal sphere or band, in which the two warts are situated. The dull, dark coffee-brown colour, spreading by degrees along the segmental folds to ventral region, increases in extent and deeper shade with the growth of the larvæ. After fourth moult (fifth stage) the larger, central part of segments from dorsum toward stigmatal line and often beyond it, appears deep velvety-black; the dull, greasy brown colour spreading subventrally from the segmental folds, sometimes at this stage overcomes the remaining orange ground colour entirely; mostly though reducing it to irregular, often confluent patches, above and below the bases of subventral warts, thus appearing as broken, irregular bands, even with the mature larvæ.

With their fifth moult the larvæ reach a length of 3.0 to 3.5 Cm., and feeding voraciously at this somewhat lengthened period, grow considerably, reaching at maturity a length from 4.0 to 5.0 Cm. This rapid growth naturally seems to cause a tension of the skin, and the dull, rather greasy, dark coffee-brown colour, before more confined to the segmental folds and subventral region, now prevails again and the velvety-black appears reduced to large quadrangular patches, from which warts I., II. and III. arise.

The dorsal stripe, rarely fully present with the mature larva, is generally retained on three first (thoracic) and two last (8th and 9th abdominal) segments as a fine, obscured whitish line. Fifth to ninth segments have each one irregular, white to brick-red spot, much obliterated, mostly on fourth and tenth segment. Individuals entirely free from dorsal line or spots are darker coloured even subventrally.

The warts of the mature larvæ vary from bright black to gray and glassy bluish-white; while subventral warts are even sometimes orange. The light coloured warts are covered with minute black dots, from which the bristles are emitted.

The bristles of wart III. turned upward are black, those turned downward foxy, or of the same variable reddish tint as all subventral ones. At third moult one single white bristle is emitted straightly from the centre of this wart, not quite as long as the few white ones on eleventh segment; at last stage this bristle appears more ochre and being weaker and more slender than the adjoining ones, it may often be broken by the rapid movements of the larvæ.

The stigmata, just after moult, are white with black slit, but gradually darkening in the vast majority of the larvæ to the variable brown colour of subventral region.

EXPLANATION OF PLATE 3.

1. ♂ imago, 14, xii., normal.
2. " " 4, xii., + 38° C., for 100 hours.
3. " " 8, vi., " "
4. " " 8, vi., " "
5. " " 1, xii., " "
6. " " 10, xii., " "
7. " " 8, vi., " "
8. " " 8, vi., " "
9. " " 8, i., extreme cold.
10. " " 10, xii., + 38° C., for 100 hours.
11. " " 30, xii., extreme cold.
12. " " 10, vii., continuous cold.
13. " " 12, vii., " "
14. " " 29, vi., extreme cold.
15. " " 12, iii., continuous cold.
16. " " 10, vii., " "
17. " " 10, iii., " "
18. " " 6, vi., normal, 4th generation.
19. ♀ " 3, xii., + 38° C., for 100 hours.
20. " " 11, xii., normal.
21. " " 12, xii., normal.
22. " " 8, i., extreme cold.
23. " " 27, vi., " "
24. " " 19, vi., " "
25. " " 27, vi., " "
26. " " 6, vi., normal, 4th generation.

PRACTICAL AND POPULAR ENTOMOLOGY.—No. 3.

How do Insects Pass the Winter?

BY JAMES FLETCHER, OTTAWA.

There are few things in nature quite so remarkable as the hibernation of insects and animals in a torpid condition. That life should still persist when animationis reduced so low, as must necessarily be the case, with these small creatures in close contact with frozen substances or even imbedded in solid ice, would be quite incredible, were there not so many instances which can be examined by those who wish to do so, every day throughout our long and cold winters. In fact, it may be said that the intensity of cold has little or no effect upon insects which have prepared themselves naturally to pass through their long winter sleep, and the remarkable thing is that however low the thermometer may drop, if the insect is in a healthy condition, it never actually freezes in the sense of becoming hard and brittle. This, however, will take place if an insect be disturbed and taken from the place where it had prepared itself for winter, and such insects, if they do actually freeze, seldom or never revive. If they do, they are, as a rule, seriously or fatally crippled. The coverings made by some insects for their protection during the winter are sometimes surprisingly slight, but are sufficient for their needs.

Anyone wishing to investigate this interesting subject can find ample opportunity, for there is no time in the whole year when studies in the lives of insects may not be carried on, and,not only will this work be one of great fascination, but the exact knowledge as to the manner and stage in which any species passes the winter may be of great value in suggesting a method of preventing injury by a destructive crop enemy, or in protecting or even introducing from a distant country a beneficial parasite. In the north the long period of inactivity in which insects live through the winter is known as hibernation, and there is a corresponding season in southern arid regions known as æstivation, in which also animation is to a large measure suspended during the inhospitable season when all vegetation is also at rest owing to drought and lack of moisture. An insect may pass through these periods in any of its stages of development—as an egg, a larva, a pupa, or in the perfectly developed form. In almost every instance each species of insect has its own special habit in this respect. Full details of the life-histories, with the duration of the stages, is lacking with regard to many of our commonest and most destructive pests. This information, however, is of great importance and presents a very wide and

little traversed field of useful work, which is open to the veriest tyro in the study of insect life. In addition to this, many inaccurate statements have been made and ofttimes repeated as to the life habits of common injurious insects. Some of these errors have stood for years and have only been disclosed by more careful observations being made on all the stages, whether it was thought they were necessary or not. Instances of such faulty work may often be found in printed records of the time, place and method in which the eggs are laid, the condition and situation in which winter is passed and the duration of the various stages. Accuracy as to every one of these facts is of the greatest necessity when devising a practical remedy for those kinds of insects which do harm. A practical remedy is one which will do the work aimed at—*effectively*, so as to prevent damage to the crop; *easily*, so that people of ordinary intelligence can apply it without danger of mistake, and *cheaply*, so that the application of the remedy may not cost more than the value of the crop to be saved. The best remedy for a given crop pest must mainly depend upon how it will answer these three requirements, and the special work of the economic, or practical, entomologist is to devise the best remedy possible under varying circumstances. No remedy can be expected to give perfect immunity from loss, any more than the best remedy in the hands of a skilful medical practitioner can be expected to save every patient entrusted to his care. In both cases there are many contingent circumstances which may neutralize the effects of the best of remedies applied in the best known manner.

The foundation of all safe generalizations must rest upon as large a mass of proved facts as possible. In entomology, as in every other branch of knowledge, proved facts are wanting concerning very many common objects. I know of no more fertile field of useful work in the study of insects than that which deals with the life-history of any species in its home, including particularly its method of adjusting itself to its surroundings. Such facts as will be brought out in this work are now grouped together and spoken of as the ecology of a species. Ecology (or more properly Œcology, the word being derived from the Greek *oikos*, a home) is as yet a rather unfamiliar word, but is so complete and expressive that it must surely soon come into more general use. A consideration of the winter home of an insect and its manner of living there comes naturally under this head. Information on the subject should be sought for by careful personal observation, and to secure the best results each fact as learnt should be noted down at the time, for future correlation and

ultimately for comparison with observations made by others. Nothing not actually proved must ever be taken for granted. The true nature of things should be sought for, not the confirmation of theories. By working in this way every observation, however small it may seem to be, may be of value in completing a life-history or correcting an error.

As stated above, the possibilities for useful work are unlimited, and even the most inclement season of the year offers many opportunities.

At the present time much of Canada is covered with snow, and it may be fairly asked what kinds of insects could now be procured for carrying on these studies. As a reply, let us take a short excursion over the fields and swamps and through the woods. At Ottawa three feet of snow on the level renders snowshoes just now a necessity, but what an added charm is given by the exhilarating exercise thus provided. Starting with a congenial companion on one of the sunny crisp days which make up so large a proportion of our Canadian winter, supported on the light frame-work of the snowshoes and stimulated by their rattle and the crunch of the snow, let us pass easily over such obstacles as ravines, streams and rivers, now frozen and still, over barbed-wire fences muzzled by a blanket of snow, and let us make for the woods where, warm and sheltered from the coldest wind, we can carry on our search at ease. But let us first of all consider what we are likely to find. It is wonderful how many things will turn up when we go out with a set purpose of looking for them. Insects may be looked for in all stages and in almost any place. To one who has never collected in winter, it will be a great surprise to find how much may be done. Even among the butterflies, which are such favorites on account of their beauty and because so few are injurious, there are many gaps to be filled in as to the way they hibernate. We know a good deal about many species; but it must not be taken for granted that every species, even, in the same genus, will behave in exactly the same manner. Among those kinds of butterflies which may possibly be found in winter during our rambles are the different Vanessians, such as the Graptas, the two Tortoise-shells, the Painted Ladies and the Camberwell Beauty, which should be looked for snugly tucked away in the deepest recesses of some old hollow tree. In the same kind of places or under a fence rail the chrysalids of some of our Swallow-tail butterflies or of the Whites, and just possibly of a Thecla or Blue, may be found. Every clump of grass sticking above the snow, or bunch of dead leaves on bush or tree should be examined. Among the grasses or sedges the small larvæ of the Satyrids and of some Skippers pass the winter, and the difficulty of finding them will only stimulate to closer search. Some Skippers hibernate as pupæ and may be found beneath old

logs, chips of wood, or other objects, frequently covered with ice. In the crevices of the rough bark of trees many treasures may be looked for. The cocoons of such species as spin up on the trunks of trees are as a rule very difficult to distinguish from their surroundings because the caterpillars when spinning gnaw off from the surface many particles which they weave in with the silk, giving to the cocoon the exact appearance of the bark of the tree. The Acronyctas and Ceruras, or Kittens, spin cocoons of this nature. A dead leaf hanging on a hawthorn or apple tree may direct our attention to the egg cluster of a Tussock moth, to the larval case of the Apple Leaf-crumpler, Case-bearers or some other small moths. On the fruit spurs or smaller twigs will be seen easily the beautiful slender white cocoons of the Apple Bucculatrix, and, by closer search, the short brown pseudococoons of the half-grown larvæ of the Eye-spotted Bud-moth, or the similar true cocoons of *Nepticula pomivorella* may be detected. Much more conspicuous than these, cocoons of some of the large Saturnians or Emperor moths should be found on any afternoon's tramp through the woods or orchards in most parts of Eastern Canada. The larger number of the caterpillars, as a rule, spin up near the ground among grasses or other low growth, but good cocoons, as well as many which have been parasitized, may always be found high up in the trees or bushes. On maples, birches and other trees around the edges of woods the large irregular cocoons of Cecropia will catch the eye, as well as the smooth, oval cocoons of Polyphemus. On lilac bushes in gardens, or on ash trees, sometimes half a dozen at once, the hanging cocoons of Promethea may generally be easily obtained. Strange to say, all of these large cocoons may be more frequently found on shade trees in streets than in the woods. This is possibly owing to the females having been attracted to street lights in the vicinity and having laid their eggs on the trees.

In passing through an orchard, many eggs of moths, as well as of other insects, will reward the keen observer. The eggs of the Tent Caterpillar moths will show, when examined under a lens, that the tiny caterpillars were fully formed and able to move inside the egg-shells before the winter cold set in. If an egg cluster is taken into a warm room and the eggs then opened, the young caterpillars, when taken out, move awkwardly, like young kittens taken from their warm nest before their eyes are open. The eggs of the Cankerworms may also be found with the above, as well as those of many kinds of Aphids. Occasionally a patch of eggs of the predaceous bug, *Phymata Wolffii*, may be found on a bough. These somewhat resemble those of a moth, but each egg is bottle-shaped and they are gathered together in small clusters of about a dozen or fifteen

embedded in a coating something like that on the Tent Caterpillar eggs, but with the neck of each protruding through the covering. Several kinds of scale insects will probably turn up during our ramble; on apple and many other trees the Oyster-shell scale, Putnam scale, the Scurfy Bark scale, and some others of the armoured scales, will occur, also the young of some of the Lecaniums, or Soft Scales. These latter differ very much in habit from the armoured scales in that, instead of passing the winter as eggs beneath the old scales, the young insects hatch in summer and, as winter approaches, leave the foliage and crawl on to the young twigs, where they hibernate as minute flat brown scales resembling tiny turtles. When vegetation revives again in spring these small insects crawl about until they have found a suitable place, when they attach themselves to the bark and never again move.

A discoloured slight swelling in the side of a raspberry cane will give us a row of the eggs of the Snowy Tree-cricket, and if we split the same cane right down to the bottom we may find a fat caterpillar of the Raspberry Root Borer *(Bembecia marginata)*. Dead stems, seed pods and the flowering stems of perennials, should always be examined. By splitting dead stems, many small beetles, or the larvæ and pupæ of minute moths, will be disclosed. In the seed pods of mullein we may look for the caterpillars of *Penthina hebesana*, whilst almost every head of the burdock will give us ample supplies of the short, fat larvæ of the tiny imported moths, *Metzneria lapella*.

On the edges of swamps we may see a patch of bullrushes or cattails. In the seedheads we shall find the caterpillars of a tiny moth, and, by cutting open the stems, the large, olive-brown caterpillars of *Sphida obliquata* will be brought to light, as well also, perhaps, as some strange sculptured weevils of the genus *Sphenophorus* and the maggots of several, kinds of flies. Growing near these a matted web just coming through the snow may give us the winter tent of a colony of the orange and black caterpillars of the Baltimore Fritillary *(Melitæa phaeton)*. In the woods, tufts of moss or lichens growing on the sides of trees will well repay the trouble of detaching them and shaking them over a sheet of paper. The same may be done with moss from near the roots of trees, when an incredible number of small insects of nearly every order will be sifted out. Where swamp moss can be obtained, as along the edges of a running stream, this should be raked out and tied in small bags for taking home and examining at leisure. A convenient way is to tie up two or four small bags and hang them in a tree until frozen. They can then be slung

over the shoulders in pairs and can be carried without trouble or discomfort.

Even in the depth of winter many insects will be found moving at the bottom of open water, in streams, etc. Large water beetles and bugs are frequently dipped up by farmers through holes made in the ice for watering their cattle in winter. The curious case-bearing larvæ of Caddice flies can easily be secured by raking together the debris from the bottom of the water. In addition to our bags of frozen moss we should always take home with us some twigs and dead boughs from any dead trees we may notice. In these, when split and examined at home, we may get many kinds of bark beetles, or even a colony of the interesting Ambrosia beetles, or Shot-hole borers, the males and females all crowded so closely together in their burrows that it would be impossible to force another into the space. These interesting little creatures will richly reward anyone who will give them special study. It has only recently been discovered that they have a social life somewhat approaching in interest that of the social wasps, bees and ants, a tunnel being bored into a tree by the female for the purpose of rearing her young, not upon the wood of the tree, but upon special kinds of fungi which she cultivates there for her young brood.

In those more favoured localities where the ground is not covered with snow in winter there are, of course, many more opportunities for collecting than in colder districts with a heavy snowfall. The sifting of moss from swamps, from the sides of trees and of dead leaves from woods and along fences, will give an endless number of species of small beetles, flies, leaf hoppers, mites, spiders, etc. In looking for these, the material can be collected and carried home in bags for examination at any convenient time, when it should be sifted over a large sheet of paper with a good light and with several small bottles close at hand so as to catch the many specimens as they revive and begin to move. By using a large white pie-dish with a sloping edge some of the exceedingly active species will be prevented from escaping. It will be required that every sense be on the alert to secure all the material brought home even in a small bag. Every collection, for a long time at any rate, will give useful information concerning the life-histories of insects with which we were not fully acquainted. Anything which seems stranges, hould be noted down at the time. The specimens themselves should be sorted out and mounted at once. Those of interest to the collector should be put carefully away where they will not be injured by dust or museum pests, and all not required should be sent off at once to anyone else who is known to be interested in the various orders represented.

THE TONAL APPARATUS OF RANATRA QUADRIDENTATA, STAL.

BY J. R. DE LA TORRE BUENO, NEW YORK, N. Y.

In "The Canadian Entomologist" for August, 1903 (*), I called attention to the sounds produced by *Ranatra fusca*, Pal. B. Further study has shown me that the bug I then referred to was in reality *Ranatra quadridentata*, Stal., and that *R. fusca* is very rare in the north, if, indeed, it occurs at all, the former being the commonest species in the Eastern United States, the latter, on the other hand, being more southern. The notes referred to, therefore, apply to *R. quadridentata*, Stal.

Subsequent observation on a larger number of specimens has confirmed the exactness of my original observation, and I have found that adults as well as nymphs stridulate, and that the sound is produced under water as well as out of it. When in the water, however, the vibrations produce a louder chirp. Since the time this phenomenon was noted, I have consulted a number of papers on the sounds produced by the Heteroptera, but in none of them have I found any data bearing on the stridulation of Ranatra. Indeed, Mr. Kirkaldy, who is one of the most erudite Hemipterists and has a very perfect knowledge of the literature of this group, has brought to my attention that this is a heretofore unrecorded faculty in this water-bug.

The character of the sound and the insect's motions while producing it are substantially as previously described, except for unimportant individual variations.

Dissection has revealed the tonal apparatus. It consists essentially of two opposing rasps, one on the coxa near the base, with longitudinal striations, and the other on the inner surface of the cephalic margin of the lateral plate of the coxal cavity, which plate, by its thinness, must act somewhat in the nature of a sounding-board, intensifying the sound and imparting its vibrations to the surrounding medium. The position of the legs, somewhat obliquely held to the axis of the body, brings the coxal rasp against the coxal plate rasp, and the bug's jerky motions of the legs

*"Notes on the Stridulation and Habits of *Ranatra fusca*, Pal. B." Can. Ent., Vol. XXXV., pp. 235/7. March, 1903.

produce the rasping chirps previously described. The figure herewith shows the position of the first pair of legs in stridulating. (Fig. 5.)

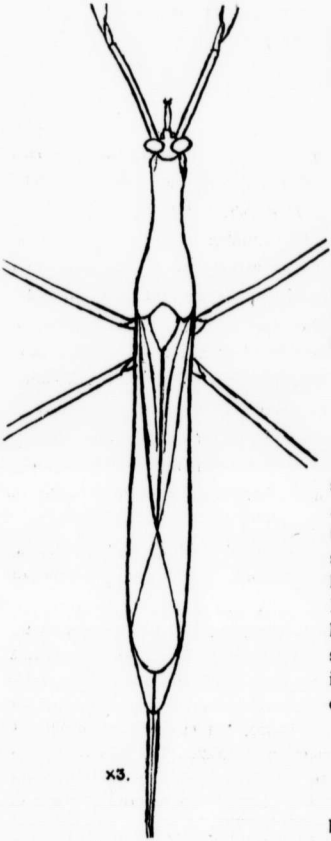

FIG. 5

The figures given are largely diagrammatic, for the purpose of bringing out the structural details of the tonal apparatus. Figure 6

FIG. 6.

shows the coxal plate from the side, and gives a good idea of its shape and proportional size. One side only of the prosterum is given in figure 7 to show the

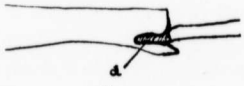

FIG. 7.

slit-like elongated coxal cavity. As may be gathered from the two figures, this structure allows considerable vertical but limited lateral motion, and, in fact, Ranatra can lay the first pair of legs against the upper or lower side of the body with ease. The inner surface of the hollowed coxal plate is shown in figure 8,

FIG. 8.

but only the mere shell, to show the position of the roughened

area. From these views, the thinness of this plate can readily be appreciated. The broader outline of the cephalic edge indicates the position of the coxal plate rasp, *r;* and figure 9 is the base of the coxa, showing in black the position of the roughened elevated area of the coxal rasp. The coxal rasp is a roundedly triangular callosity made up of irregular longitudinal lines, about .3 mm. long and .2 mm. wide (Fig. 10), and the coxal plate rasp consists of a series of parallel regular striations about .05 mm. long along its anterior edge for a distance of perhaps .8 mm. (Fig. 11).

FIG. 9

×35

FIG. 10.

×35

FIG. 11.

ARISTOTELIA YOUNGELLA—A CORRECTION.

The Gelechiid described by Mr. Wm. D. Kearfott in the January number of the CANADIAN ENTOMOLOGIST, page 15, as *Aristotelia Youngella* is *Enchrysa dissectella*, Zeller.

[Verh. Zool.-bot. Gesel., Wien., XXIII., p. 283. 1873.—Busck. Revision American Gelechiidæ, Proc. U. S. Nat. Mus., XXV., p. 919. 1903.—Dyar's List, No. 5677.]

It is well figured by Zeller on his plate IV., fig. 29.

AUGUST BUSCK, U. S. National Museum, Washington, D. C.

NOTE ON FOOD OF *ALABAMA ARGILLACEA.*

On October 19th, 1904, at Urbana, Illinois, during a week of high south-west gales, I observed a fresh, unrubbed moth at rest on a small tomato that had been placed on a bench in the sun to finish ripening, and in the process had cracked open. The haustellum was extended down deep into the juicy fruit and the moth gave every appearence of sucking the juice. No other individuals were noticed abroad at that time.

F. M. WEBSTER.

The Curator desires to acknowledge with grateful thanks the receipt of a large number of specimens, representing over a hundred species of Coleoptera, sent by Prof. H. F. Wickham, of Iowa City, to fill some of the gaps which he had noticed in the Society's collection when he took part in the proceedings of the last annual meeting.

Also a second contribution of a number of specimens of Lepidoptera and Cicindelidæ from Mr. Norman Criddle, of Aweme, Manitoba.

NOTE ON SIMAETHIS FABRICIANA, L.

BY ARTHUR GIBSON, CENTRAL EXPERIMENTAL FARM, OTTAWA.

For over three years we have had in the collection at Ottawa specimens of a pretty little Yponomeutid moth, which we have been unable to get identified.

Larvæ were first observed by the writer at Aylmer, Que., on May 24th, 1901. They were found feeding on stinging nettle (*Urtica gracilis*, Ait.), and appeared to be fairly abundant in one locality. Specimens collected on this date spun up within two or three days, and the moths emerged on June 7. These larvæ were noticed to have drawn the leaves together at the tips of the plants, and were living within the tents thus made. The cocoon is white and rather thickly woven. The pupa is slender and of a pale brown colour. After the moth has emerged, the empty pupa-case remains protruding conspicuously from the cocoon.

The following is a description of the larva: Length full-grown, 9 mm.; width at widest part, 1.5 mm. Head erect, bilobed, shiny, black, pale brownish towards clypeus, which is mostly pale and reaches almost to vertex; two or three pale spots are also present on each cheek. Body slender, dull yellowish, no markings on the skin. Thoracic shield black, divided in centre of dorsum. Tubercles black, shiny, large; lower lateral and ventral series smaller than i., ii., iii. and iv. Anal plate dark, mottled with black. Thoracic feet black; prolegs concolorous with venter.

During the past year Mr. C. H. Young also reared the species from larvæ found on the same food-plant, the moths emerging on the 4th, 8th and 10th June. Two of these bred specimens were sent to Mr. W. D. Kearfott, who identified them as *Simaëthis Fabriciana*, L. Writing under date of Oct. 26, Mr. Kearfott says: "This is a European species, never before recorded from this side of the water. The Ottawa specimens are 2 or 3 mm. larger than any of the European examples in my collection, but the fasciation and maculation seem to agree perfectly."

In a further letter, dated Nov. 28, Mr. Kearfott says with regard to this species:

"I see nothing else than to add this name to our lists. Dr. Dyar spent a night with me a couple of weeks ago. I showed him the two specimens and my European series, and he entirely agreed with my conclusions. The only difference is a slight increase in size."

March, 1903.

ASSINIBOIA MICRO-LEPIDOPTERA, COLLECTED BY MR. T. N. WILLING.

BY W. D. KEARFOTT, MONTCLAIR, N. J.

(Continued from page 48.)

Proteopteryx Willingana, Kearf.—Two additional specimens; Regina VII., 20. One strongly marked ♀ and one almost unicolorous ♂, the same as the types.

Ancyclis mediofasciana, Clem.—One specimen; Regina, VI., 18. Does not differ from Eastern examples; already recorded by Dyar from Kaslo.

Epinotia pseudotsugana, Kearf.—One specimen; Regina, VIII., 15. Not differing from my types. This species comes very close to *pinicolana*, Zell., differing principally in the front wings being of a dull leaden gray colour, while in *pinicolana* both ground colour and fasciæ are of bright brown shades. When describing this species I overlooked the palpi, the outer joint of which is entirely exposed, hence it should be placed in *Epinotia* and not *Cydia (Thiodia)*.

Cenopis reticulatana, Clem.—One specimen; Regina, VIII., 1. Less red than the Eastern examples in my collection. I am not aware of any previous record as far west as Regina.

Sparganothis puritana, Rob.; *vocaridorsana*, var. nov. Differing from *puritana*; in short central fascia, reaching only to middle of fore wing; entire absence of spot before outer margin, and in the costal spot doubled in width, covering costa from middle to apex.

Head, palpi and thorax yellow, much mixed with ferruginous, palpi paler on inner sides and above at base. Fore wing light yellow, paler than *puritana*. The spots and marks are a pinkish red, with a light purple tinge at some angles. A short basal dash of this color, below the costa and above the middle. A short fascia from costa at inner fourth obliquely to lower vein of cell, irregularly straight on its inner edge, the outer edge sharply and deeply indented by a spur of ground colour on upper half of cell. Costal spot begins at middle of costa and extends to, but does not involve apex, flatly triangular, its lowest point covering vein 7. A small discal spot. On dorsal margin are a few scattered reddish scales between outer third and anal angle, beginning with a tiny spot. Cilia tinged with pink. The costa from base to fascia is also narrowly edged with reddish. Hind wings evenly gray; cilia paler.

Under side fore wing: Yellow and ferruginous in a narrow band along costa, repeating the colours of the upper surface, below this dark

gray, cilia yellowish. Hind wings very pale gray, cilia a shade paler, preceded by a pale yellow line. Abdomen gray above; beneath, anal tuft and legs cinereous. Expanse 25 mm. Six ♂, Regina VI., 16; Aweme, VII., 10 (Norman Criddle) Winnipeg, (Hanham). Co-types, U.S. Nat. Mus., No. 8209, and my collection.

I have described this as a variety of *puritana*, but should not be surprised if it should prove to be a good species.

Archips cerasivorana, Fitch.—Three bred specimens, labelled "cherry web-worm," Medicine Hat, July. Not differing from specimens from the Middle and Western States.

Archips argyrospila, Walk.—One specimen; Calgary, VIII., 1. The dark form common to California.

Archips virescana, Clem.—One specimen; Regina, VIII., 13, very badly rubbed, but no doubt this species; common in the Eastern and Middle States, and also recorded from Arizona.

Archips persicana, Fitch.—Two specimens; Portage, VII., 10, and Regina, VII., 18. Darker than either Eastern Canada or British Columbia specimens, and with the white costal mark broader on the costa and more nearly resembling Zeller's figure of his *conigerana;* with a sufficient series showing this constant difference, I would be disposed to restore Zeller's name, at least to varietal rank.

Pandemis Canadana, sp. nov.—Fore wing very dark rusty brown, more or less overlaid with grayish-brown scales, with an oblique, purplish-black fascia from middle of costa to anal angle, a half-round spot of same colour on costa between fascia and apex, and an irregular basal band.

Head, palpi and thorax cinereous-gray sprinkled with darker specks. Antennæ cinereous. Fore wing rusty brown, overlaid with gray or grayish-brown, especially in basal patch and between it and central fascia. The dark scales in basal patch became more concentrated outwardly thus sharply defining the patch against the lighter ground colour which succeeds it; the outer edge begins at the inner quarter on costa, is slightly concave above and below median line, and convex outwardly on median line, widest on dorsal margin where it extends a third the length of wing and is shortly truncated. The central fascia is nearly straight, on its inner edge, from costa to middle, thence convex towards base for a quarter of its length, thence straight to dorsal margin, which it touches at two thirds; outer edge of this fascia concave on its upper quarter, thence nearly straight to anal angle; the lower, outer

half of this fascia more or less overlaid with ground colour and less sharply defined than inner edge and upper half. A broad, half-round spot on costa is the darkest of all the marks on costa. It covers between one-fifth and one-fourth the length of wing and leaves an equal division of ground colour on each side, between fascia and spot and spot and apex. On the costa are a number of short, hardly oblique, dark dashes; four or five in basal patch, two in ground colour succeeding it, three in fascia and two or three in ground colour beyond. A broken line of dark scales before outer margin. The fascia and spot are outlined by a lighter brownish-ochreous line. In one specimen the dark colour replaces the brown entirely, the spot and fascia being indicated only by the paler border lines. Cilia ground colour, preceded by a narrow dark line, the tips paler ochreous-brown. Hind wing and abdomen very dark fuscous, paler above cell, cilia pale fuscous. Legs cinereous, first and second pair clouded with gray-brown in front. Expanse, ♂, 19 to 21 mm.

♀ marked same as ♂, but all marks nearly obsolete and indicated more by the darker outer lines than their internal colour. Expanse, ♀, 24.5 mm.

Eight ♂ ♂, Regina, VIII., 13 to 15; St. Albert, VII., 20; Aweme, VII., 31, to VIII., 15, (Norman Criddle.) One ♀, Regina. Co-types, U. S Nat. Mus., No. 8208, Mr. Willing's and my collection.

I at first identified these specimens as an unusually dark form of *Pandemis limitata*, Rob., but the outline of the basal patch and central fascia are quite different and are sufficient to warrant separation, even if there were not such a considerable difference in the colour. The outer line of the basal patch ranges from nearly straight to slightly indented below the middle in *limitata*, while in *Canadana* this line is deeply scalloped above and below the middle. In *limitata*, the inner edge of central fascia is straight, with, in some specimens, a small tooth projecting at a third below costa, while in *Canadana*, this line bulges out widely below the middle. The fascia of ground colour between basal patch and central fascia is much narrower in *limitata*, with sides nearly straight.

Tortrix Alleniana, Fern.—Four ♂, Regina, VIII., 13 and 15; Macleod, VII., 2; two ♀, Lethbridge, VII., 11; one ♂, bred, Medicine Hat, larva on poplar, V., 30; pupated VI., 7; issued VI. 20. Prof. Fernald has kindly loaned me two ♂ and one ♀ types of this species, and while the ♀ ♀ cannot be separated and compare exactly, the ♂ ♂ have necessitated a very considerable amount of study, and I should not be surprised if additional material from points between Regina and

Maine would prove the existence of two good species, especially if a ♀ form should be found constantly different from the ♀ of *Alleniana*.

The fore wings of the ♂ types of Alleniana are yellowish-brown, very finely and lightly reticulated with a darker shade of brown, an oblique fascia from centre of costa in one specimen extends barely to cell, and in the other is obsolete; on costa before apex is a faint indication of a spot. The hind wings are immaculate, of a very light buff shade. Several of the Regina ♂ ♂ compare closely with the types, except that the central fascia is strongly developed, continuing down to and disappearing just above the anal angle, while the pre-apical spot is large and dark, and has a tendency to run into a curved sub-marginal darker shade that involves the outer margin. The balance of the ♂ specimens have distinctly grayish-brown fore wings, with reticulations, fascia and marks the same; but the hind wings are fuscous, with the pale straw colour costal and apical borders finely reticulated. I think it quite likely that this is the species referred to in a letter from Dr. Fletcher (VII., 15, 1904) that is suspected of doing considerable damage to the *Populus tremuloides* of the Northwest. I should like to have given the name *populana* to this species, but find it impossible to separate from *Alleniana* with the material before me.

Tortrix symphoricarpana, sp. nov.— ♂, 27 mm. Head and palpi grayish-tawny-brown, outer ends of scales and outer joint of palpi dark slaty brown; thorax and front wing tawny-brown or grayish-yellow. An oblique, blackish-purple fascia from middle of costa to hind margin before anal angle, narrowest on costa; indented and partly interrupted on upper median vein, inner edge well defined, nearly straight but swelling out slightly in cell, with two very slight indentations, one at middle of cell and one on median vein, slightly concave below cell; outer edge of fascia less distinctly defined, the dark colour becoming paler and approximating the ground colour; indented between costa and upper median vein, below latter convex to before anal angle. A duplicate spot on costa half way between fascia and apex, somewhat triangular but rounded on inner edge, and is twice as wide on costa as fascial spot on costa, most intense on inner edge; from lowest point of spot is a dark, outwardly curved, much broken line to anal angle; several short, vertical reticulations between this line and outer margin, crossed by horizontal reticulations. The balance of the wing is coarsely reticulated vertically, in the type there being seven points touching the costa between base and fascia and three between fascia and costal spot. Cilia tawny-yellow. Hind wing pale cinereous, clouded basally and dorsally with fuscous, and apically

with ochreous. Cilia paler. Under side front wing light tawny brown below costa and before outer margin; central part of wing from base to end of cell, dark, brownish fuscous. The reticulations of upper side are duplicated on costa and outer margin, with three well-defined short costal streaks beneath the inner and outer edge of fascia and inner edge of costal spot. Abdomen grayish-brown, tuft ochreous, legs pale ochreous.

♀, 25 mm. Marked generally same as ♂, but ground colour is darker brown, causing the fascia and spot to be less distinctly defined; the reticulations are also more obscure, except between the submarginal line and outer margin they are more distinct and form a submarginal dark shade. Hind wings slightly paler. One ♂. Two ♀. Medicine Hat, VII., 21, from larvæ on Snowberry, *Symphoricarpa*, sp. Co-types U. S. Nat. Mus., No. 8207, and my collection.

The maculation of this species is very much like Robinson's figure of *Archips zapulata*, except that the dark basal area shown on the figure is entirely absent. It is also very much darker than *zapulata*, and as the ♂ has no costal fold, it cannot even be referred to the same genus.

Tortrix pallorana, Rob.—Twelve specimens, Lethbridge, VII., 11, Regina, VII., 10, to IX., 2. ♂'s average 25 mm; ♀ 30 mm. I have so far found it impossible to satisfactorily separate Robinson's two species, *pallorana* and *lata*. Mr. Willing's specimens agree in size with *lata*, but in colour and shape they are nearer *pallorana*, although they do not exactly agree in any one particular with either, except that the fore wings are immaculate. We may have a new species, but I should hesitate describing it without very much more complete data of the larval stages. *Pallorana* is on record as bred from *Verbena* and *Cerasus*.

Tortrix albicomana, Clem.—One specimen, Lethbridge, VII., 11; The canary-yellow form, rather heavily overlaid with pale purple scales, concentrated in two half fasciæ from costa and a whole fascia before the cilia on the outer margin. It is the intermediate form, between the type, which is the palest canary-yellow, and the other extreme, where the whole fore wing is overlaid with deep lustrous purple, excepting a short basal yellow patch, continuing in a line along the costa and running into the outer marginal yellow fascia. I have recently separated this form, calling it var. *semipurpurana*. This Regina specimen is of the form commonly bred on Rose, and which has usually been mistaken for *bergmanniana*, Linn. I have considerable doubt that the latter really occurs in America.

MOSQUITO NOTES.—No. 3.

BY C. S. LUDLOW, M. SC.,
Laboratory of the Office of the Surgeon General, U. S. A., Washington, D. C.

In a very interesting collection of mosquitoes lately sent me from the Philippine Islands by Dr. Eugene R. Whitmore, 1st Lt. Asst. Surg. U. S. A., occur a couple of forms which seem entitled to position as new genera, and some others of merely specific interest. The new genera are separated, in the first instance by a combination of values that makes it seem secure, while in the second case it lies between Finlaya and Macleaya, and the differences are not so marked.

Reedomyia, nov. gen.—Head covered with slender curved scales, forked scales on the occiput, and flat lateral ones, as in Culex; palpi two jointed in the female; thorax clothed with curved scales; scutellum with broad flat scales only; metanotum nude; fork cells of wing short.

The genus is named after Major Walter Reed, Surgeon U. S. A., whose invaluable work in proving *Stegomyia fasciata*, Fab., the intermediate host in the transmission of "yellow fever" is too well known to need more than mention.

Reedomyia Pampangensis, n. sp.—♀. Head densely covered with slender curved scales and flat lateral ones; a brown triangular (base caudad) median spot bordered by a white stripe, followed laterally by brown scales and then by lateral white flat scales, no tuft of scales between the eyes, but many bristles around the eyes, and a border of curved light-yellow scales around the eyes, fork scales numerous and extending well up on the vertex; antennæ brown, verticels and pubescence brown, basal joint light brown and partly brown scaled, first joint has a few brown scales; palpi brown, somewhat constricted at base of ultimate joint; proboscis brown dorsally, and fawn coloured ventrally to about three-quarters its length, apical quarter dark, tip brown; eyes brown; clypeus brown.

Thorax when viewed directly from above is of general reddish brown colour and darker in other lights; prothoracic lobes testaceous with white slender curved scales and dark brown bristles. In these specimens, as in some others lately received, these lobes appear to be stalked, the stalks running in a curve up the cephalic aspect of the thorax, and the "lobes" on the dorsal end as a cap, reminding one somewhat of a "mushroom." Mesonotum is a light reddish brown with light yellow and dark brown slender curved scales rather indefinitely arranged—an indefinite white

band across the cephalic end—a narrow indefinite light lateral band extending half way to wing joint, and a small spot dorsad of the end of this line, but the markings are very indefinite, general effect being a reddish brown, sparsely covered with an irregular arrangement of dark and yellowish scales. A heavy bunch of dark brown bristles near the wing joint, and a short line of very long and heavy dark brown bristles on either side of the "bare spot." Scutellum light brown, all three lobes densely covered with broad flat white scales; six large bristles on mid-lobe and several smaller ones also; metanotum brown, bare. The brilliant white scutellum is very effective and marks the insect at once.

Abdomen light, covered with brown flat scales and many golden apical hairs, with now and then a suggestion of narrow white basal bands, and with distinct white basal lateral spots. Venter partly white scaled, but with brown apical bands.

Legs, coxæ and trochanters light, white scaled; hind femora light at the base, otherwise all the femora brown scaled dorsally—creamy scaled on the ventral side; a brilliant white apical spot; all the tarsal joints brown. The legs are rather prominently light bristled throughout, which even suggests, with the hand lens, light spots on the hind tibiæ. Fore ungues large, equal and uniserrate.

Wings clear yellowish, covered with dark brown scales, except a small spot at the very base of the costa, which is brilliant white. Cells short; scales rather broad and truncate, costal edge shows some tendency to the spinous scales found in *Uranotaenia*. First submarginal is about a sixth longer and the same width as the 2nd posterior, the stems of each about the same length and about two-thirds as long as the cells; mid and supernumerary cross-veins meet and are nearly equal, posterior cross-vein is a trifle shorter and distant twice its own length from the mid. Halteres light, with dark knob.

Length, 4–5 mm.

Habitat.—Angeles, Pampanga, Luzon, P.I. Taken in Sept.

Described from three specimens sent by Dr. Eugene R. Whitmore, 1st Lt. Asst. Surg. U.S.A., marked "Caught in the woods and in the Quarters."

Popea, nov. gen.—Head covered with flat, forked, and slender curved scales, the latter occurring *only* on the median line; palpi long in the male; thorax with slender curved scales; scutellum with median scales on each lobe flat, and slender curved scales between the lobes and

forming an apical border to all the lobes. Abdomen normal in shape, bearing ventral medium tufts of long clavate scales. Wing cells short, and the scales suggesting *Taeniorhynchus;* ungues uniserrate in the male. This evidently lies between *Finlaya*, Theob., and *Macleaya*, Theob.

The genus is named in honour of Lt.-Col. B. F. Pope, Deputy Surg. Gen. U.S.A., under whose authority, as Chief Surgeon Division of the P. I., this investigation was originally begun in connection with the work of the Board of Health, Manila.

Popea lutea, n. sp.—♂. Head covered on median line with curved white scales, the remainder of the head with flat and a few forked scales, a narrow stripe of yellow flat scales next to the median line of curved ones, then a broader stripe of brown flat scales, followed by white flat scales; brown and yellow forked scales on the occiput, white ones near the vertex, a few light hairs projecting forward; antennæ plumose, light brown, light bands on each joint, a few dark flat scales on the first joint, basal joint brown, a few white flat scales on the median side; palpi light, long and slender, irregularly mottled with yellow, white and brown scales, the tuft is small and light coloured, tip dark; proboscis rather heavily scaled, mottled yellow and brown, the basal part brown, followed very irregularly by deep ochraceous yellow, so that it amounts to a broad irregularly shaped band, the apex narrowly brown, (tip missing); eyes brown; clypeus brown.

Thorax brown, prothoracic lobes brown scaled, with yellow and white flat scales; mesonotum brown, covered with yellow, white and brown curved scales arranged in indefinite groups, yellow, flat scales at the nape; pleura dark brown, with patches of white clavate flat scales; scutellum testaceous, the median portion of each lobe with flat, the interlobular parts and caudal edge with rather closely placed slender curved scales; the flat scales on the median lobe are brown, with a line of yellow at each side, those on the lateral lobes are brown, the curved scales are light sulphur yellow, fine bristles on median lobe; metanotum brown, bare.

Abdomen light, covered with dark brown and yellow scales, mostly yellow; a broken median line of dark brown irregularly-placed spots—*i. e.*, sometimes apical, sometimes basal—extends the whole length of the abdomen, and the ultimate segment has an apical brown band, the broad lateral yellow stripe is occasionally broken by a few brown scales, but the effect is distinctly yellow: yellow apical, lateral and ventral hairs; venter yellow, white and brown, there are well-marked tufts of long

brown scales on the median line of the venter on most of the segments, but on the ultimate segment the tuft is yellow. These scales are clavate, and not denticulate. A few white scales appear in connection with the lateral (yellow) stripes and the dorsal basal white band on the ultimate segment is largely of white scales. The claspers are large and there is a fan-shaped tuft of long yellow spatulate scales just beside them on the ventral side.

Legs all mottled; coxæ and trochanters testaceous with white and brown scales, femora irregularly spotted with brown and white scales, a few yellow ones also occur; tibiæ much lighter, and mostly yellow scaled, a few brown scales in small bunches giving the mottled look; tarsal joints mostly yellow scaled, on the hind legs there are tiny basal brown spots; in the fore and mid legs the brown scales are somewhat lighter and have no definite arrangement, but the last tarsal on the fore legs are mostly covered with these lighter brown scales. Ungues slightly unequal, both uniserrate, hind ungues equal and simple.

Wings very light and delicate and of slightly yellowish cast, covered with broad yellow and brown median and lateral scales, suggesting *Taeniorhynchus* scales; the ventral scales are, however, slender. The wing is apparently partly denuded, but the apex is light, and there is a well-marked yellow costal spot near the junction of sub-costa and extending on the wing field to the 3rd longitudinal in the vicinity of the cross-veins; there is a smaller yellow spot on the costa interior to this, and the costa is light continuously from the base of the wing nearly one third its length; the fork cells are small, nearly as small as those of *Uranotaenia*, and the costa has spinous scales as in that genus; 1st submarginal is a little longer and a little narrower than 2nd posterior. Mid and supernumerary cross-veins meet and are about equal in length, posterior cross-vein is about same length as the others and distant from the mid nearly twice its own length, interior. Basal cell is very long. Halteres light, knob mostly yellow scaled.

Length, 5.5 mm.

Habitat.—Camp Stotzenberg, Angeles Pampanga, Luzon, P. I. Taken Sept.

Described from one very perfect specimen sent by 1st Lt. Eugene R. Whitmore, Asst. Sug. U.S.A., with the legend, "Caught in the woods and banana trees."

This is a very beautiful sulphur yellow and brown species, and the peculiar scaling of the scutellum, the short fork cells, broad wing scales and abdominal tufts assign it at once to its place between *Finlaya* and *Macleaya*.

Taeniorhynchus argenteus, n. sp.—♀. Head dark brown, almost black, covered with white curved scales, white and light ochraceous fork scales, and a few brown mixed with the white flat lateral scales, small white curved scales between the eyes, and a few dark brown bristles around the eyes; antennæ brown, verticels dark brown, pubescence white, basal joint testaceous; palpi dark brown with a few white scales at the tip; proboscis dark brown, with ochraceous band at basal part of apical half; clypeus dark brown; eyes brown and gold.

Thorax: prothoracic lobes brown, with white curved scales, and a few brown bristles; mesonotum dark brown, almost black, covered with white curved scales, except two ante-scutellar sub-median brown bar-like spots projecting forward from the scutellum about one third the length of the mesonotum, and two very small round brown spots nearer the cephalic end; there are also a few light bristles, but not making distinctly marked lines. Scutellum dark brown, with white curved scales, and brown bristles, six on edge of median lobe, four on each of the lateral lobes; pleura dark brown, with small bunches of white flat scales; metanotum dark brown.

Abdomen dark brown, narrow basal light (slightly ochraceous) bands, occasionally a few apical light scales, small basal white lateral spots on some of the segments; ventrally mostly light scaled.

Legs, coxæ and trochanters dark brown and white scales; all the femora dark brown, with a sprinkling of white scales, so as to make them quite speckled, ventrally lighter, and on the mid and fore legs mostly light scaled; tibiæ of mid legs markedly speckled, the others darker; metatarsus brown on all the legs; with small basal light bands, and the other tarsal joints are also brown and have small basal light spots, sometimes developed into bands, except the ultimate joint of the hind legs, which is dark throughout. Sometimes these spots or bands are very faint. Ungues simple and equal.

Wings clear, rather heavily brown-scaled, especially in the apical half; the median scales heavy, clavate, somewhat truncate, the lateral scales spatulate, and the ventral scales slender; the ventral scaling is unusually heavy. Fork cells short; the 1st submarginal somewhat

shorter and narrower than the 2nd posterior; supernumerary cross-vein slightly shorter than the mid, which it meets; posterior equal to mid and distant twice its own length. Halteres light. Length, 4–4.5 mm.

Habitat.—Angeles Pampanga, Luzon, P. I. Taken Sept. ? ———.

Described from several specimens sent by Dr. Whitmore.

A well-marked *Taeniorhynchus*, and the white scaled head and thorax and speckled femora make it easily differentiated from the other species, though at first glance it suggests *T. tenax*, Theob.

Stegomyia Gardnerii, n. sp.—♀. Head densely covered with broad flat brown and white scales. A very broad median white stripe from occiput to vertex, with a dark brown somewhat triangular brown spot on either side, bordered by white and followed laterally by a brown and then a white stripe; a few bristles around the eyes, projecting forward, two bristles between the eyes; very few or no fork scales; antennæ dark brown, verticels and pubescence dark brown, basal joint dark brown, heavily covered with flat white scales; palpi dark brown with brilliant white tip; proboscis brown; eyes brown, and a white rim around them made of smaller, perhaps spindle-shaped, but not true curved scales.

Thorax: Prothoracic lobes brown, with white flat scales; mesonotum brown covered densely on the median portion, so as to occupy about one third the width of the mesonotum, with dark brown spindle-shaped scales (bronze iridescence), a few curved white scales on the cephalic edge, and laterad, a broad white stripe extending about one half the length of the mesonotum, brown scales exterior to this; a large white spot in front of the wing joint; the caudad half of the mesonotum is dark brown, with a short median line of fine white or yellowish scales, and a short indefinite line on each side, just in front of the scutellum, and here the scales become very long, curved and spatulate flat scales, so they fringe out over the scutellum. Scutellum brown, covered with long spatulate flat scales; brown scaled at the base, with a broad white border on the apical edge; pleura brown, with heavy bunches of white scales; metanotum brown.

Abdomen heavily covered with rather large flat brown iridescent scales, white basal lateral spots of varying sizes on most of the segments and four white dorsal basal spots—one on the penultimate—is lacking on the antepenultimate, and present on the three segments cephalad to this. Ventrally there are heavy white basal spots, so that the venter is at least half white scaled.

Legs: Coxæ and trochanters light brown, white scaled; fore femora white scaled ventrally, otherwise dark brown, iridescent scales; metatarsi brown, with very small basal white spot; first tarsal joint brown with small basal white spot; second, third and fourth joints brown; ungues small, equal and uniserrate; mid-femora dark brown with a few white scales at the base, a small white spot midway on the cephalic aspect, and a white spot near the apex, which under the hand lens looks like a knee spot, but the very apex is brown; tibiæ brown; metatarsi brown, with a small basal white spot, a little larger than those on the fore legs; first tarsal joint with small basal white spot, other joints brown; hind femora white scaled ventrally and dorsally, except a large brown dorsal spot near the apex, which, however, leaves the apex white; tibiæ brown; metatarsi brown, with basal white spot; all the tarsal joints brown, with large basal white spots so wide as almost to include the whole joint on the distal joints, but not always marked on the ventral side.

Wings clear, with brown scales, the median scales large, broadly truncate, and the lateral, which are about twice as long, are comparatively slender, and also truncate; the ventral scales more slender; first submarginal cell is about one-third longer than and the same width as the second posterior; supernumerary cross-vein equals the mid, which it meets, and the posterior cross-vein is a little longer than the mid and about twice its own length distant; halteres have light stem and dark knob.

Length, about 5 mm.

♂.—In general the male differs little from the female; palpi slender, longer than the proboscis, brown, a small white spot at the base of ultimate, a slightly larger one at base of penultimate, a band at base of the ante-penultimate joints, and another white spot nearly as wide as the band, near the base: palpi not tufted. Ungues unequal, the larger uniserrate, the smaller simple.

Length, 3.5 mm.

Habitat—Bulacao, Mindora Is., and Angeles, Pampanga, Luzon Is., P. I. Taken Aug. 20, (Bulacao), Dr. Gardner. Sept. ?, (Angeles), Dr. Whitmore.

Described from specimens sent by Dr. Fletcher Gardner, Cont. Surg. U. S. A., taken at Bulacao.

From Camp Gregg, Bayambang, in the large and interesting collection from Capt. W. P. Chamberlain, referred to above, comes another new mosquito whose wing scales, occurring in connection with flat scutellar

scales, and its extremely short female palpi, are distinctive. As I have only one specimen, I have not been able to demonstrate the exact number of joints, but they must of necessity be few.

O'REILLIA, nov. gen.

Head clothed with curved, forked, and flat scales, much as in *Culex*; scutellar scales flat; wing scales usually symmetrical, very broadly truncate, and notched; palpi extremely short in the female.

The genus is named after Gen'l Robert M. O'Reilly, Surgeon-General, U.S.A., whose broad interest in all scientific study in any way connected with Medical work has made possible many researches, and among them the continuance of this mosquito work.

O'Reillia Luzonensis, n. sp.— ♀. Head dark, covered with light (almost white) curved scales, very broad forked scales having markedly fimbriate (under ⅔ in objective denticulate) tops, which in some lights are white; a couple of bristles between the eyes; white rim around the eyes; white flat lateral scales; antennæ dark, verticels and pubescence light, basal joint testaceous with a few small, white, flat scales; palpi extremely small, dark, with a few white scales at the tip; proboscis mostly yellow scaled, the base, and a very narrow rim at the apex being dark brown; clypeus brown; eyes brown.

Thorax brown; prothoracic lobes with flat, somewhat spindle-shaped white scales; pleura testaceous; scutellum brown, with brown and white, rather long, flat scales on the mid-lobe, lateral lobes with white flat scales; metanotum brown.

Abdomen light, covered with dark brown and orange-yellow flat and somewhat spatulate scales, irregularly placed so as to be "speckled"; venter rather lighter than dorsum, but "specked"; light apical hairs.

Legs all light; all coxæ and trochanters covered with brown and yellow scales; all femora and tibiæ speckled yellow and brown and are darker than the rest of the legs, ventral side lighter; fore tibiæ are dark, the metatarsi and tarsal joints light with faint brown spots; mid-tibiæ are dark near apex and the metatarsi and tarsal joints are all light, with faint light brown spots on some of the joints; the hind tibiæ are dark near apex, metatarsi light, and the tarsal joints brown; *i.e.*, light brown, with light basal bands on the first, second and third joints, the fourth joint covered entirely with the light brown scales. Ungues simple and equal.

Wings clear, covered with brown and white (or light yellow), broad scales, the apical ends truncate and notched; the ventral scales obovate

or clavate and very thin and white. There seems to be no arrangement into spots, the wing being simply "speckled." 1st submarginal cell is nearly twice as long and a little narrower than the 2nd posterior cell, its stem being about one-half the length of that of the posterior; mid and supernumerary cross-veins are about equal and meet, the posterior cross-vein nearly twice as long, and a little more than its own length distant. On the costal edge the scales show something of the spinous shapes found in *Uranotaenia*. Halteres light.

Length 3.5–4 mm.

Habitat —Bayambang, Pangasinan, Luzon, P. I.

Taken Sept. 11, "Outside screens of screened house. Rainy night."

Described from one very perfect specimen sent by Capt. Chamberlain, from Camp Gregg.

The wing scales are as broad in this genus as those usually found in *Mansonia*, the large notch or indentation at the apex being easily recognizable, and in connection with the flat scales on the scutellum are distinctive. No metallic scales occur on the insect.

(To be continued).

COLLECTING MOTHS IN THE AUTUMN AND WINTER.

BY HENRY ENGEL, PITTSBURGH, PA.

During October and November, 1904, I had the pleasure of learning some interesting features of the habits of a certain group of moths which appear at that season of the year. The abundance of these species under seemingly very unfavourable climatic conditions was a great surprise to me. The observations made on these hardy creatures of the insect tribe may prove interesting to Lepidopterists who are willing to exert a bit of energy in the pursuit of their hobby. During the last few years I have learned that we must take the topography of the country into account in selecting a place to bait for the moths, which appear after we have observed the first autumn frosts on the landscape. I will, therefore, briefly describe the vicinity of my collecting grounds. My home is situated in a ravine, back of the hills south of Pittsburgh, Pa. The difference in the altitude of the valley and the hilltops is about five hundred feet. On the slopes near my house are about twenty-five acres of woods, consisting chiefly of oak, ash, maple, a few hickory, elm, locust trees and very little underbrush. Beyond this woods are pasture fields and farm lands, the fences of which are lined with wild cherry trees.

For several seasons I have endeavoured to obtain some of the late-flying moths by sugaring, but met with indifferent success. The evenings at this season of the year are nearly always cold, especially in the dales of our undulating country. Therefore, the much-desired *Scopelosoma*, *Xylina* and other more or less rare species did not accumulate very fast in my cabinet. About the middle of October, when the nights became too cold for collecting at light, my season was practically ended. If we peruse the various local lists of Lepidoptera published in our periodicals, we are impressed with the fact that the collecting carried on is, with a few exceptions, rather superfiical, and that little or no efforts are made to obtain the very early and the late appearing kinds. The interested student always finds a source of knowledge in looking over the collections of his colleagues. We observe material collected by certain methods and during periods which we have hitherto neglected. The various species which appear very early in the spring have been found quite successfully by the local collectors. My friend, Mr. Fred Marloff, some years ago initiated the sugaring method in this section for the late-occurring kinds. His home is about one mile farther south from Pittsburgh than mine, on top of a hill. Mr. Marloff continued sugaring until late in November, and was quite successful in getting material. The bait consisted of rotten apples and pears rubbed on the trees in his orchard. Overripe, mushy apples are by far the best material for luring moths that has come to my knowledge, and there is only one objection, they discolor the hands of the operator. This may be avoided by wearing a pair of rubber gloves.

On October 2nd, I spent the day with Mr. Marloff and was informed of the capture of *Xylina Bethunei* the previous week. The first visit to the baited trees that evening resulted in the capture of *Xylina pexata* and *signosa*, one *Glæa sericea* and a number of common species. So here was the beginning of the harvest, and I concluded to try the hill near my home. On the following day the consent of a farmer was obtained to take all the rotten apples I wanted if they were of any use to me. A bushel was taken home, and more subsequently as I needed them. Commencing with the fence posts in my lot, each one of which received a patch of crushed apples, I extended my line along a path in the woods for about 200 yards to the pasture field. Then along the edge of the woods for a quarter of a mile on a row of trees at right angles from the woods to the highest part of the hill, about 150 yards, then along a dividing fence down hill towards the starting point. All the conveniently situated trees and every third fence

post along this route were baited. After the first few applications a crust is formed and only a little refreshening need be applied every evening. On days when the atmosphere is damp the moths will be strongly attracted without any additional applications. The lure should be put on a little before dusk, as the moths start flying quite early in the evening.

To give a fair idea of what is missed by neglecting the opportunities of late collecting, I have appended a list of the species taken by Mr. Marloff and myself during the last fall and winter. The kinds which occurred in one locality only are followed by the name of the collector. A little discourse, however, on several remarkable evenings experienced, seems appropriate and may lead others to experiment when similar conditions of weather prevail.

On October 4th and 5th we had rather warm and sunny days. Shortly after starting on my luring expedition on the latter date a thunderstorm suddenly came up. A lively shower freshened things up and a drizzling rain continued for about an hour. When the rain commenced I started on the homeward journey, somewhat disappointed at the interference with an evening's recreation. Happily the reverse proved to be the case, for I learned that evening how congenial a damp atmosphere is to the moths. The black clouds caused darkness to settle quickly. Induced by this, and, no doubt, by the moisture in the air, which appears to give a greater range to the aroma of the lure, the moths were noticed to appear so abundantly on the baited trees that I resolved to stay and see the affair through. Nearly one hundred specimens were collected, including some good species. Of the commoner kinds hundreds might have been taken, but only the desirable varieties were selected.

Collecting was continued every evening with variable success; a capture of one or two moths some evenings new to my list making the matter interesting until October 17th. On the following three days very warm weather prevailed and some good material was taken. I collected every evening on these days until about 10.30 p. m., when I was quite tired of travelling up and down the hill. Early on the morning of October 21st a good rain fell and after a cloudy and windy day the temperature was quite cool towards evening. At 5 p. m. rain again set in, accompanied by high wind. Recollecting my experience on the other rainy evening I ventured outdoors about dusk to take a peep at the baited fence posts. The weather was abominable, but on every post were nice newly-emerged examples of *Scopelosoma*. These

were quickly bottled, and putting three cyanide jars in my pockets I went on a journey up the slippery hill. Moths were plentiful on every baited post and tree. *Orthosia bicolorago* predominated everywhere. On warm, wind-still evenings the trees must be approached cautiously, as these common loafers will quickly take wing and disturb what more desirable species may be there. On the evening in question, however, every moth held on for dear life, with its wings fluttering in the breeze. The desirable species were readily selected, but the *Scopelosoma* and *Xylina* have the very vexing habit of dropping to the ground at the slightest disturbance. It is advisable, therefore, to clear away all rubbish and dry grass from around the posts and trees. The *Xylina*, with their wings closely folded around the abdomen and their colours blending to perfection with the dry grass in most of the species, are very difficult to find by the flickering light of a lantern. Usually when I reached the highest part of my route I could see Mr. Marloff's light circling about in his orchard on the next hill, but on this memorable evening I did not succeed in getting to the summit. The wind in the open field was so high that my light was extinguished, and I had to retire to the lower section of the hill. Five trips over part of the route were made, and 72 *Scopelosoma*, representing six species, were taken up to 11 p. m. The appearance of these kinds in such numbers was a novelty to me and I paid little attention to the common forms. *Anticarsia gemmatilis* was taken for the first time in my experience.

On the following two days, October 23rd and 24th, the weather was cold, with frosts at night. Eleven *Xylina* were collected about dusk on these days. The weather moderated considerably on the 25th, and after a cloudy day, a cool, drizzling rain set in about dusk. With an easy breeze stirring, matters looked very favourable for a good catch. The entire collecting route was gone over five times that evening and 91 *Scopelosoma*, 3 *Glæa sericea*, several interesting kinds of *Xylina* and some of the common forms of the latter were taken. At nearly midnight I left off with 118 specimens safely stored away to be mounted. Frosty nights prevailed after this, but with the exception of several evenings a few moths were always found about dusk until November 7th. A cold, drizzling rain fell that evening and 27 specimens were collected. These represented *Scopelosoma* and *Xylina*. On the following day it was cool and the atmosphere very heavy and damp. The captures that evening were 28 specimens. Up to November 18th but little collecting was done, owing to intervening cold weather. The following three days were warm and 180 moths were taken,

including 108 *Scopelosoma*, some of the rarer *Xylina* and one *Glæa signata*. Several kinds of moths reappeared on November 20th, which had not been observed for more than two weeks. *Peridroma saucia*, *Agrotis ypsilon* and about a dozen *Orthosia bicolorago* were seen; the latter were all worn. *Hypena scabra* also was frequently noticed, but it is very sly and does not easily submit to capture.

On November 21st it was too cold for anything to stir, and on the morning of the 22nd there was a heavy frost. It turned warmer during the day, and 22 specimens were taken after dusk. Among these was a male *Hybernia tiliaria*, which was encountered flying in the pasture field. After a short chase, it settled on a weed and was bottled. Cold and damp nights prevailed up to November 28th, and but few moths were observed. November 29th was warm and cloudy, with a trace of rain. I took 44 specimens, representing three species of *Scopelosoma*, *Xylina unimoda*, *Peridroma saucia*, *Agrotis ypsilon*, *Homoptera lunata* and *Hypena scabra*.

Snow and frost held sway after this until December 23rd, when a thawing spell set in. By the evening of the 25th the snow had disappeared and the weather was quite warm. Out of mere curiosity, I took a walk after dusk over the collecting route and observed 21 specimens. No lure had been applied since late in November, but the thawing out of the old crusts on the trees was sufficient to offer attraction. With the exception of one *Xylina antennata*, all specimens observed were the common species of *Scopelosoma*. These looked very much worn and bedraggled, and it seems as if their abode over winter is among the leaves on the ground. December 26th and 27th offered opportunities for collecting, and *Hypena scabra* was observed in addition to the other hibernating species. On the morning of December 28th the ground was covered with snow and a very cutting wind prevailed. Cold weather continued until December 30th. By January 1st, 1905, the snow had disappeared and an ideal bright day ushered in the New Year. In company with Mr. Marloff, both our routes were gone over that evening and a dozen specimens were found.

By this time I had acquired a fancy for collecting on rainy evenings. On the 2nd I decided to freshen up the baited trees, and went over the route supplied with a bucket of rotten apples. Although the day was cloudy, it was quite daylight yet, and I was surprised to find *Scopelosoma* resting on the bait on the first few trees I came to in the woods. Several were observed flying to the trees, and by searching among the leaves at the base of the trees a number were found. The apples were rubbed on the

trees and after dusk I made a second visit. There was quite an assemblage observed for this time of the season. *Xylina unimoda, laticinerea, antennata* and *Bethunei, Scopelosoma Moffatiana, tristigmata, sidus* and *Morrisoni* were among the captures. Mr. Marloff, in addition to some of these, took two *Scopelosoma devia*. The foregoing may suffice to show under what conditions collecting may be done, and I will record a few observations and experiments made to test the ability of these moths to withstand cold.

Of the captures made on my last trip on January 2nd, some twenty *Scopelosoma* were taken from the jars upon my return home and left to recover. One after the other they came back to life, vibrated their wings for a while and took flight. Soon my room reminded me of a warm summer evening, when the collecting lamp brings in dozens of specimens, with these creatures bobbing along the ceiling. This fancy, however, was disproved by the whistling wind outdoors, giving warning of the approaching blizzard. The temperature dropped rapidly and snow made its appearance. I captured a dozen specimens and let them fly out. Three of these were found the next morning, frozen to the floor of the porch, and two imbedded in snow which had drifted against the side of the house. All specimens were brought into the room and placed near the stove. Those which had the protection of the snow at once made feeble movements, and in less than fifteen minutes flew to the window. The specimens found frozen to the floor and exposed to the cold wind over night did not recover.

One of the remaining specimens in the house was found one morning frozen in a thin sheet of ice which had formed in a vessel. It was placed near the stove to thaw out and soon crawled about. After a rest in a warm position for half an hour, it flew away to the window, none the worse for its experience. The wonderful vitality of this creature surprised me, and I decided on a more severe test. A specimen was immersed in water and this left to freeze into a solid lump of ice. With the exception of the upper part of the thorax, the specimen was encrusted in ice. It was left in this condition for twenty-four hours and then placed in the room to thaw out. When the ice had melted the moth appeared to be dead. It was thoroughly water-soaked and I placed it near the stove to dry off. Feeble movements of its forelegs were observed about an hour later, and gradually it became more active and crawled about. This specimen was kept alive for more than a week. Several times it was placed on a piece

of mushy apple and was observed to feed. It did not regain its power of flight, but was able to freely vibrate the wings.

I dissected about twenty females of different species of *Scopelosoma* from the captures of December and January, in search of ova, but none were found. So we have an interesting problem: Why do these moths hibernate?

Any person residing in a section where the surface of the ground is of a rolling nature will have observed the early autumn frosts destroying tender vegetation in the valleys long before any harm is done to plants in higher situations. In my travels up and down the hill during this collecting period I noticed that the change in the temperature in this short difference in altitude was remarkable. Many evenings when the air was very cold in the valley and always followed by severe hoarfrost during night, no moths were observed until half way up the hill, when I reached what I might call the frost line. Only reversed from the usual application of this term in relation to higher mountain sections; the frost extended down instead of up the hill. On rainy nights and during generally warm weather the moths were evenly distributed over hill and valley and some good captures were made in my lot on the baited posts.

An interesting phase in the study of insects is the distribution of certain species. For instance, in the case of *Scopelosoma* and *Glæa*, which apparently find their food-plants among the hard timbers, Mr. Marloff, although he collected just as diligently as I did and over considerable territory, took but few of the former in comparison to the material I collected, and *Glæa* were nearly totally absent in his section. The woods are farther removed from his collecting grounds, and it would seem as if these moths do not venture very far from their breeding place. Again, several kinds were taken by Mr. Marloff during this period which did not occur at all with me. These probably find their food among fruit trees, berry fields or other vegetation in farm lands which are the environments of that section. Although a certain species may range over a large territory, it may, nevertheless, be extremely rare in intermediate sections between the known limits of its habitat, all depending on the absence or presence of the natural conditions favourable to the existence of its kind. During October and November I took thirteen species of *Xylina* here, some of which are reported common in the New England States and some occur as far west as British Columbia. Leaving *antennata*, *laticinerea*, *Grotei* and *unimoda* out of consideration, I may safely say that the balance are

quite rare here when I consider the time spent and the extent of the territory collected over by myself and Mr. Marloff. Our captures of *Bethunei* were twenty, and of *ferrealis* nine specimens. The other kinds occurred in one, two or three examples only.

Apparently, collecting of a similar nature to that described here was done by Mr. Charles F. Goodhue, of Webster, N.H., if we may judge from his very creditable list of Noctuidæ published in "Entomological News," Vol. X., page 221. If we speculate on the possibilities of what might be accomplished in the course of a few years if all Lepidopterists who have the suitable environments would turn in and do a little work on this basis, it certainly seems natural to wish that all would do so. Not only late in the fall but early in the spring and all through the season should the different methods of collecting be practised, if one desires to have the fauna of his locality approximately complete. The collecting of all caterpillars unknown to the collector and the rearing of these to maturity is a very essential part in the study of entomology and should not be neglected. The beginner will derive more knowledge from carefully observing the life-history of half a dozen species than by rushing in and accumulating a thousand more or less dilapidated looking creatures in a year. In most cases these first captures tumble about in all manners of boxes, and in a year or two, when the eye is trained to notice the appearance of properly prepared material, they are discarded and the work is done over again. It is a pleasure to possess a collection, be it ever so small, if nicely arranged. By making the proper beginning—that is, starting slow and learning to know the species in the collection—the student gradually gains an intimate knowledge of the classification of insects, and his interest deepens as the years pass by.

List of species taken at sugar during the period mentioned in the preceding paper:

Perigea xanthioides, *Guenée*.—Oct. 10–20. Common.
" vecors, *Guenée*.—Oct. 5–20. Common.
Oligia grata, *Hübner*.—Oct. 4–17. Common.
Hadena mactata, *Grote*.—Oct. 3–19. Fairly common.
Pyrophila pyramidoides, *Guenée*.—Oct. 3–29. Common.
Prodenia commelinæ, *Smith* and *Abbot*.—Oct. 5. One specimen. (Engel.)
Prodenia ornithogalli, *Guenée*.—Oct. 5–18. Not abundant this season.

Laphygma frugiperda, *Smith and Abbot.*—Oct. 7–18. Rare this season.

Magusa dissidens, *Felder.*—Oct. 10–17. Two specimens. (Marloff.)

Agrotis badinodis, *Grote.*—Oct. 3–20. Not abundant.

" ypsilon, *Rott.*—Oct. 7–Nov. 29. Common.

Peridromia margaritosa, *Haworth.*—Oct. 3–29. Common.

" incivis, *Guenée.*—Oct. 1–20. Four specimens. (Marloff.)

Feltia annexa, *Treit.*—Oct. 25. Two specimens. (Marloff.)

Paragrotis Bostoniensis, *Grote.*—Oct. 4–17. Rare.

Heliophila unipuncta, *Haworth.*—Oct. 7–20. Common.

" pseudargyria, *Guenée.*—Oct. 4–20. Not common.

" multilinea, *Walker.*—Oct. 18–Nov. 4. Rare.

Xylina disposita, *Morrison.*—Oct. 20–25. Two specimens.

" antennata, *Walker.*—Oct. 5–Jan. 2. Abundant.

" laticinerea, *Grote.*—Oct. 16–Jan. 2. Common.

" Grotei, *Riley.*—Oct. 19–Nov. 20. Fairly common.

" ferrealis, *Grote.*—Oct. 4–Nov. 20. Nine specimens.

" signosa, *Walker.*—Oct. 2–20. Three specimens. (Marloff.)

" innominata, *Smith.*—Oct. 20–Nov. 20. Two specimens.

" Bethunei, *Grote and Rob.*—Oct. 1–Jan. 2. Twenty specimens.

" oriunda, *Grote.*—Oct. 8. One specimen. (Engel.)

" unimoda, *Lintner.*—Oct. 16–Jan. 2. Abundant.

" tepida, *Grote.*—Oct. 17. One specimen. (Engel.)

" querquera, *Grote.*—Oct. 20. One specimen. (Engel.)

" nigrescens, *Engel.*—Oct. 25–Nov. 20. Three specimens. (Engel.)

" pexata, *Grote.*—Oct. 2–Nov. 8. Three specimens.

Calocampa curvimacula, *Morrison.*—Oct. 16–Nov. 2. Five specimens. (Marloff.)

Jodia rufago, *Hübner.* Oct. 20–Nov. 20. Three specimens. (Marloff.)

Eucirrœdia pampina, *Guenée.*—Oct. 4–10. Quite common.

Orthosia bicolorago, *Hübner.*—Oct. 3–Nov. 20. This variable species was the commonest observed, dozens occurring on some of the baited trees.

Scopelosoma indirecta, *Walker.*—Oct. 21. Four specimens.

Scopelosoma Moffatiana, *Grote.*—Oct. 5–Jan. 2. Not rare, most of them occurred late in October.

Scopelosoma Pettiti, *Grote.*—Nov. 8. One specimen. (Engel.)
" tristigmata, *Grote.*—Oct. 13–Jan. 2. Fairly common.
" Walkeri, *Grote.*—Oct. 21–Nov. 20. Rare.
" sidus, *Guenée.*—Oct. 17–Jan. 2. Common.
" Morrisoni, *Grote.*—Oct. 13–Jan. 2. Abundant.
" devia, *Grote.*—Oct. 5–Jan. 2. Ten specimens.
Glæa inulta, *Grote.*—Oct. 4-20. Ten specimens. (Engel.)
" sericea, *Morrison.*—Oct. 2–25. Rare.
" signata, *French.*—Nov. 20. One specimen. (Engel.)
Heliothis armiger, *Hübner.*—Oct. 5–12. Rare.
Alabama argillacea, *Hübner.*—Oct. 5–17. Common.
Anomis erosa, *Hübner.*—Oct. 1–18. Two specimens. (Marloff.)
Galgula hepara, *Guenée.*—Oct. 6–20. Not common this season.
Catocala vidua, *Smith & Abbot.*—Oct. 5. One specimen. (Engel.)
" cara, *Guenée.*—Oct. 8–12. Several specimens.
" piatrix, *Grote.*—Oct. 8–20. Three specimens. (Engel.)
" cerogama, *Guenée.*—Oct. 8. One specimen. (Engel.)
" habilis, *Grote.*—Oct. 10. One specimen. (Engel.)
Hypocala andremona, *Cramer.*—Oct. 10. One specimen. (Marloff.)
Remigia repanda, *Fabricius.*—Oct. 4–15. Common and very variable.
Anticarsia gemmatilis, *Hübner.*—Oct. 21. One specimen. (Engel.)
Homoptera lunata, *Drury.*—Oct. 5–29. Common and extremely variable.
Epizeuxis americalis, *Guenée.*—Oct. 4–10. Several specimens.
Plathypena scabra, *Fabricius.*—Oct. 20-Dec. 27. Common.
Pseudothyatira expultrix, *Grote.*—Oct. 11–Nov. 2. Several specimens. (Marloff.)
Macaria simulata, *Hulst.*—Oct. 4. One specimen. (Marloff.)
Sabulodes transversata, *Drury.*—Oct. 2–25. Common.

PROFESSOR ALPHÆUS S. PACKARD, M.D., PH. D.

It is with profound regret that we record the death of Dr. Packard, which took place at his residence in Providence, Rhode Island, on the 14th of February; he was sixty-six years of age. This distinguished entomologist was the author of a large number of both popular and scientific books and papers on insects during the last forty years. Among the more important of these are his "Guide to the Study of Insects"; "Synopsis of the Bombycidæ of the United States"; "Monograph of the Bombycine Moths of North America, Part i, Notodontidæ;" "Monograph

of the Geometrid Moths of the United States"; "Entomology for Beginners"; "A Text-book of Entomology," etc. He also published a series of class-books for schools and colleges on general Zoology; "Outlines of Comparative Embryology," etc. As long ago as 1877 he was appointed, with the late Prof. Riley and Dr. Cyrus Thomas, a special Entomological Commission by the United States Congress to report upon the depredations of the Rocky Mountain Locust in the Western States and Territories. For this purpose he traversed a large region of country on both sides of the Rocky Mountains and as far as the Pacific cost, and was joint author with his colleagues of the voluminous reports which were subsequently published. In November, 1868, he was elected an honorary member of the Entomological Society of Ontario, and was an occasional contributor to this magazine. At the time of his death he was Professor of Zoology and Geology at Brown University.

BOOK NOTICE.

THE LEPIDOPTERA OF THE KOOTENAI DISTRICT OF BRITISH COLUMBIA — By Harrison G. Dyar. (Proc. U. S. National Museum, vol. xxvii., pages 779-938.)

This paper, published last year, is not a mere list of names, but an annotated record of species collected by Dr. Dyar and others at Kaslo and other places in the mountain districts of Southern and South-eastern British Columbia during 1903, and by Mr. J. W. Cockle, of Kaslo, during several previous seasons. Six hundred and fifty-three species are recorded from the district, from an examination of about 25,000 specimens, and one hundred and sixty-seven species of larvæ are noticed, some of them in all their stages, and a large number of these are described for the first time. There are a number of species new to science described in the paper, and several from the district and out of the same material are treated of that the author has recently described elsewhere. It is rather to be regretted that no references to these are given. Comparison of obscure or doubtful forms with material from other localities is a noteworthy feature, and some changes in synonymy are proffered. Dr. Dyar wishes it to be known that he is willing to send a copy of the paper to any Canadian collector who will write to him for one, as long as his separates last. It should certainly be in the hands of everyone interested in the order.

F. H. WOLLEY DOD.

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