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THE HABITS OF THE POMEGRANATE BUTTERFLY (*VIRACHOLA ISOCRATES*) OF INDIA, AS RECOUNTED BY DE NICEVILLE, (BUTT. INDIA, III., 478-481).

LARVA .8 of an inch in length when full grown; ground-colour blackish-brown, the constrictions between the segments well marked, the head comparatively large, fuscous, covered with rugosities or short semi-circular tubercles, the segments rapidly increasing in size to the fourth, then gradually tapering to the thirteenth, which latter is about as wide as the second segment; second segment anteriorly flesh-coloured, the third segment entirely flesh-coloured, the seventh and eighth bearing a large dorsal square flesh-coloured patch, the three anal segments scutate, all the segments widely pitted and covered with short but coarse black bristles, which are more numerous at the sides and whitish. This larva is very ugly, to be accounted for, perhaps, by its passing its life out of sight in the interior of a fruit. In Calcutta I have reared the larva on the fruit of the *Randia dumetorum* Lamk., which belongs to the Madder family (*Rubiaceæ*). I once found a larva in the fruit of the Loquat (*Eriobotrya japonica* Lindl.), of which it ate the hard central seed or stone only. It emerged on April 4th. Messrs. F. E. Partiger and E. C. Cotes have bred it from the fruit of the Guava (*Psidium guava* Raddi.). Its usual food appears, however, to be the fruit of the pomegranate (*Punica granatum* Linnæus).

PUPA of the usual lycænid shape, brown, marked with a dorsal and lateral black line, the whole surface very rough, covered with tiny pits, furnished with a few short coarse bristles, which are most numerous round the sharp anterior ridge which encloses the head; the wing-cases pale ochreous; head rounded; anal segment blunt.

“This butterfly [*Virachola isocrates*] resides in the larva state in the interior of the pomegranate, seven or eight at least [This is very unusual. I have never found more than one larva or pupa in a single fruit; two or

three would probably be the maximum ordinarily, even then one or more would probably have to emigrate to a fresh fruit before becoming full-fed], having been reared in the interior of the small fruit now exhibited. Of the mode in which the eggs are deposited by the female in the interior of the pomegranate no information has been received; it is, however, probable that this is effected whilst the fruit is in its very young state. [The eggs are laid by the butterfly in the calyx of the flower of the young fruit.] The caterpillars feed upon the seeds and inner part of the fruit, which is thus rendered weak and unable to support its own weight, and consequently liable to have its stem broken and to fall to the ground with the first wind. This, however, would be destruction to the inclosed insects since, in all probability, they would find it impossible to make their escape were the fruit to be suffered to lie rotting upon the ground. To obviate this evil, the caterpillars, when full fed, have the instinct to eat a hole [this is incorrectly stated, there is always a hole in the fruit for the larva to cast forth its dejections,] about a quarter of an inch in diameter through the hard shell of the fruit whilst it remains upon the tree; through this hole they then creep to the stem of the fruit, and spin a white web, which they attach to the basal part of the fruit as well as to the stem, for about the distance of an inch along the latter. This web is sufficiently strong to support the pomegranate from falling after the wind has broken the stem near the fruit

“From the circumstance of this specimen of the fruit exhibited, having as many holes in it as there were caterpillars inhabiting it, it is most probable that the web thus spun is a joint production of the whole. It is curious, as evidencing the instinctive impulses under which each of the inclosed larvæ must have acted, that, instead of availing themselves of the first aperture made in the fruit, each caterpillar should be at the trouble of making a hole for itself, a circumstance which renders it the more probable that all joined in spinning the web.

“But it will be at once asked, what necessity could there be for the caterpillars to secure the fruit from falling after each has bored a hole, and thus made its escape? This question is answered by a curious circumstance that, after so securing the fruit, the caterpillars return again into the pomegranate, in the hollow interior of which they undergo their transformations to the chrysalis state.

“Here, too, we may notice another interesting fact, namely:—that

the insect has the precautionary instinct, which acts as a second inducement, to make the aperture in the fruit in that stage of its existence in which it is furnished with organs best adapted for the purpose, for, had the larva omitted taking this step, the consequence would have been that the poor insect, when come to its butterfly state, would have been a prisoner totally unable to make its escape, being unprovided with any instrument sufficiently powerful to make a hole in the shell.

"The chrysalides are attached horizontally upon the inner walls of the pomegranate by means, first, of a patch of silk laid upon its surface to the centre of which the tail of the chrysalis is attached, and second, of a slender silken thread passing from side to side over the base of the abdominal segments.

"Another curious instance of instinct yet remains to be noticed. The butterfly, so soon as ever it has escaped from the puparium, must make its escape out of the hole formed by the larva. Delay would be death, as the wings would soon acquire their full expansion of nearly a couple of inches, in which state it would of course be unable to creep out.

"In the chrysalis state the belly of the insect is placed in contact with the inner surface of the fruit; consequently, as the slit by which the butterfly escapes out of the puparium extends along the back, the under surface of the latter remains entire, the anterior lateral portions on each side of the slit (extending as far as the whole coverings of the wings), curling up and lying close upon those parts which have covered the breast and limbs, leaving the abdominal portion in the same form as when it enclosed the insect. (*Westwood*, Trans. Ent. Soc. Lond., (I.), ii: I., 1837.

"At the time the pomegranate is in flower, and at a very early period, the Hair Streak may be seen very busily occupied about the flowers, and I have little doubt that the eggs are deposited at the bottom of the calyx, from the position in which I have seen the abdomen of the butterfly placed. As the fruit enlarges the eggs are enclosed, and in this situation matured.

"In order that I might obtain a perfect insect I surrounded several of the fruit with fine gauze, but in such a manner as not in the least to interfere with the caterpillar in its labour of connecting the fruit and stalk by means of the web, but to my astonishment and disappointment this never took place. The caterpillars issued from the fruit, and finding their

escape impeded, underwent their change on the external part, and so soon as this was effected I removed the fruit from the tree for the purpose of placing it in a mosquito gauze house in my room. Subsequently I examined several of the fruit, but I never found any chrysalides or the remains of any inside the fruit. I was very careful in my observations and I came to the conclusion that the caterpillars in this instance deserted the fruit when ready to undergo their change." (*Downes, Calcutta, Journ. Nat. Hist.*, ii: 408, 1842.) Professor Westwood is quite correct; there is no doubt that in nature this butterfly usually pupates within the fruit; on opening these I have found at different times dozens of pupæ or pupæ skins, but never more than one in each fruit. Mr. Downes is also partially right, as if the fruit are cut off the tree and placed in a box the larvæ, when full-fed, will leave the fruit and pupate anywhere on the sides of the box or on the fruit.

There is one interesting question still to be referred to in the life history of this butterfly—is it attended or not by ants in its larval state, and has it the special organs affected by the ants? Mr. W. C. Taylor, of Khorda, Orissa, writes:—"Larva attended by the ant, *Formica nigra*, who clear away their droppings and act as sweepers, as well as guard the pupæ." His daughter, Mrs. Wylly, also writes:—"The larva of *Virachola isocrates*, though louse-like in shape, differs considerably from those of *Catochrysops cnejus*, Fabricius, *Azanus ubaldus*, Cramer, and *Tarucus theophrastus*, Fabricius. The latter are inert and slow, the former is very brisk in its movements, and with the protrusible long neck, small head and strong jaws of a beetle grub, is no doubt well-adapted for the work required in making its home. The length of the larva when full-fed is rather more than an inch, and in colour and shape much resembles a ripe mulberry. It had a glossy, shining skin, very knobby and indented all over, of a blue and purple colour, and its three posterior segments covered with a squarish shield with a raised dingy yellow rim to it. The larva bores for itself when quite young a little clean-cut round hole from the outer rind of the fruit of *Punica granatum* to the heart. In this hole it spends its days with its head inside eating away at the green or ripening pips, and enlarging the hole as it increases itself in size. Sometimes three or four larvæ may be found buried in one pomegranate. When at rest and not eating it plugs up the outer hole deftly with the shield on its tail. It is a curious fact that the ants in the case of this species act as sweepers to the larva, hovering in attendance

round the mouth of each hole and performing all the cleaning out operations with great regularity. The larva never leaves the fruit till full-grown [this is doubtful; I think it often seeks a fresh fruit, as I have frequently found a small fruit with the whole interior eaten and quite clean, and no pupa or pupa-skin, so in all probability the larva which inhabited that fruit had left it and sought another,] and then it descends the bark and seeks some crevice, crack or knot in the stem of the tree, and there undergoes its transformations. The ants, as far as I could see did not convey the larvæ to their nest at the foot of the tree, but as there were many larvæ on the tree and few pupæ, some may have been removed to their nest. [These missing pupæ were probably inside the fruit.] I was unable to find any eggs on the fruit or flowers, nor have I ever observed the ants 'milking' any of the larvæ, nor any appearance of tentacles being present. The larva spins a slight but strong web from its mouth with which it binds the fruit to the stalk to prevent its being blown off by the wind, and later uses the silk to fasten itself to by the tail when ready to change to a pupa. The pupa is also attached by two threads flatly to the trunk, and is of a pinkish-brown colour like the bark of the pomegranate tree, with various speckles and marks of a darker brown, and a dark dorsal line dividing it down the centre. The head of the pupa is covered with a kind of plate rounded in front, straight at the neck." For my own part I have never seen ants attending the larvæ, nor have I been able to find the special organs affected by them, and without these I fail to see why ants should take any trouble for the larvæ.

"It is almost impossible with the net to get a really good specimen of *V. isocrates* or of *V. perse*. They are not only difficult to catch, but exceedingly swift, wary, and given to settling on high trees, but, when caught, difficult to secure without injury. There is a delicate bloom on a fresh specimen which the gentlest touch destroys. It is easily reared however. As is well known, the larva feeds inside the fruit of the pomegranate, and sometime before becoming a pupa eats* its way through the tough rind and fastens the fruit with silk to its stalk, thus preventing it from falling off in case it should wither before the butterfly escapes, as it generally does. This operation is performed at night, and generally repeated night after night. I have taken a pomegranate

*This statement is slightly misleading. From the very earliest stages the young larva makes a hole in the fruit, which it gradually enlarges as it grows, and through which it throws out its dejections. At any period the larva can leave the fruit in which it lives, and in fact not infrequently does so, entering a fresh fruit which suits it better.

infested with these larvæ (several usually inhabit each fruit) and made it stand in an egg-cup; in the morning it was so securely fastened that in taking up the fruit I lifted the cup. Of all animal instincts that I have seen or heard of this is one of the most astonishing and certainly the most difficult to reconcile with any theory of development. As far as I have observed it, the larva never leaves its shelter except for the definite purpose so necessary to its safety, and it taxes ordinary ingenuity to suggest any possible conditions under which some larvæ might have performed the act in the first instance without purpose. I have found this butterfly pretty common in Bombay and Poona from December or January till March at least." (Aitken, Journ. Bombay Nat. Hist. Soc., i: 216, n. 46, 1886.)

Mr. F. E. Pargiter in 1881 wrote this note:—"The larva [of *V. isocrates*] feeds on the leaves [?] and fruit of the Guava tree. It is rather plentifully clothed with short whitish hair. In the two white spots at the tail are two small horn-like processes, which the larva continually protudes and retracts." This latter note appears to be conclusive as to the larva having the special organs affected by ants and that it is attended by ants, though I have failed to find these.

V. isocrates is very common in Calcutta during the winter, much affecting the flowers of the *Poinsettia*. It appears to occur almost everywhere in the plains of India except the desert tracts, but it is not found in Assam or Burma.

GELECHIA GALLÆDIPLOPAPPI (N. Sp.)

BY REV. THOMAS W. FYLES, SOUTH QUEBEC.

Length of body four lines; expanse of wings eight to nine lines.

Head white, eyes black, labial palpi recurved; first joint large and white; lower half of second joint white; upper brown, with white tip; antennæ filiform, ringed light brown and black.

Thorax reddish chocolate in colour; fore-wings rich chocolate red, with a white divided fascia near the hind margin; under side dark grey; hind wings pale silvery grey; fringes grey, with a faint brownish gloss.

Abdomen golden yellow on the upper side of the three first segments, the rest light brown.

Time of appearance the beginning of August.

Described from four specimens bred from galls on *Aster (diplopappus) umbellatus*.

NEW NORTH AMERICAN HOMOPTERA.—II.

BY E. P. VAN DUZEE, BUFFALO, N. Y.

Pediopsis tristis n. sp.

Cinerous varied with fuscous ; apex of the front and basal angles of the scutellum black ; pronotal rugæ distinct. Length $4\frac{1}{2}$ –5 mm.

MALE.—Face with coarse rugose punctures, arranged in oblique lines on the base of the front ; front black, cinereous at base and next the eyes, with a broad, curved, transverse white band, including the ocelli ; clypeus, loræ and cheeks whitish, the former sometimes tinged with pale green. Form of the pronotum about as in *insignis* ; cinereous clouded with fuscous on the apex and along the posterior margin, with an elongated black spot behind the inner angle of the eye ; rugæ composed of profound elongated punctures. Scutellum obliquely punctured on the disc ; cinereous, with a brownish central band, and black triangular spots within the basal angles. Elytra uniform greyish-brown, subhyaline ; nervures strong, evenly margined with fuscous. Wings pale smoky hyaline, nervures brown ; beneath whitish ; intermediate pectoral pieces with a large black spot, a smaller one just below the propleura, and on the latter a minute dot. Venter dull yellowish, obscured next the connexivum and toward the apex ; tergum more or less embrowned. Legs pale ; sides of the femora and tibiæ, and tips of the tarsi brown or blackish-brown. Plates ligulate, narrowed and somewhat recurved toward the apex ; black or piceous, fringed outwardly with long white hairs. Pygofers white, with a narrow black apical margin, meeting on the ventral aspect almost to their tips, leaving a slightly oblique orifice.

Described from three males collected by Prof. Herbert Osborn at Fairfax, Iowa, June 22nd and 24th, 1889, to whom I am indebted for specimens of this and a number of other interesting western forms.

This sombre coloured species is most closely allied to my *insignis*, from which it may be distinguished by its heavy margined elytral nervures, the large black spot on the apex of the front, and by the rough appearance of the pronotum, contrasting strongly with its peculiar velvety look in *insignis*. Unfortunately there are no females at hand from which to complete this specific diagnosis but there can be no risk in establishing the species on one sex only.

Pediopsis insignis is now known to me from Kansas, Iowa, Michigan,

New York and Ottawa, Ont. It appears to be subject to very little variation.

Thamnotettix lurida n. sp.

Form of *T. subænea*; pale yellow marked with fulvous; elytra deep fulvous, with a whitish commissural spot. Length 5 mm.

Vertex but little longer at the middle than next the eye; surface covered with deep oblique rugæ which emit the broad margins and medial line, and near the hind margin, on either side, is a minutely punctured area. Pronotum transversely wrinkled. Face fulvous; a large spot on the apex of the front and four or five lateral transverse arcs, pale yellow. Vertex and pronotum pale yellowish; the former with a transverse band connecting the ocelli; the latter, with the lateral angles and four more or less distinct longitudinal bands, fulvous. Scutellum pale, with the basal angles and two small spots between them fulvous. Elytra deep fulvous, opaque, especially on the clavus and base of the corium. A large commissural spot near the apex of the clavus, and some smaller, indistinct ones on the discal areoles of the corium whitish. Abdomen and all beneath deep fulvous ♀, or blackish ♂; the pleural pieces and connexivum edged with pale; legs and genitalia of the ♂ fulvous.

Described from two examples, a ♂ received from Prof. Osborn, labelled "Ames, Iowa, May 19th, 1881," and a ♀ from Mr. G. C. Davis labelled "Agricultural College, Mich., Oct. 24th, 1888."

This pretty little insect is very near my *T. subænea* from California, but it is broader and shorter; the vertex is not so long as in that species, and with the pronotum is distinctly wrinkled; the elytra are deeper coloured and almost opaque; the valve of the ♂ is produced medially in a short blunt tooth, and the plates are broader, especially toward their slightly divergent tips, and are less heavily fringed. In the ♀ the central tooth on the hind margin of the last ventral segment is narrower and more acute than in its ally.

T. subænea and *lurida* are characteristic of neither this genus nor *Athysanus*, to either of which they might be referred. Genus *Phlepsius* could, perhaps, be modified so as to include them, as they want only the elytral reticulations of being very good Phlepsiids. From *Scaphoideus* they are debarred by their shorter antennal setæ and broader form. For a note on this genus see *Entomologica Americana*, Vol. VI., p. 52.

SUBDIVISION OF GENERA.

BY G. H. FRENCH, CARBONDALE, ILL.

I was pleased to see Mr. Cockerell's article on this subject in the September number of the *CANADIAN ENTOMOLOGIST*, and hope we may hear from others on the question. It seems to me that a genus should, as far as possible, represent a natural division of a group of plants or animals so distinct from other groups that the species forming the genus are easily referred to it. In botany we recognize at a glance such natural genera as *Carex*, *Rosa*, *Quercus*, etc. The fact that the first of these is a large genus is, it seems to me, no good reason why any subdivisions of it should be called genera, for each plant in any one of the divisions is as much a *Carex* as any other one. If the genus is too large to suit the convenience of the practical worker in some part of his work, I have no objection to a subdivision of the genus into groups; in fact every botanist knows that the species do readily divide into such groups. Perhaps it is best to give names to these group divisions instead of numbers or letters as is sometimes done. The main objection I can see to this is that some one, in labelling the specimens in his cabinet and in making his exchanges, will use these names as generic, leading to more or less confusion.

But what is the custom among systematists in different groups of natural history? To answer this question I turn to a few works that come to my hand, and find the following:—

In Botany I find that Wood divides *Carex* into two groups without names; the genus *Aster* into four groups with names. Mann's Catalogue makes no division of the genera; published 1868. Gray in his "Manual," 1856, subdivides fifty-four genera, using names for the subdivisions, five of these being in the Mosses and Liverworts. In his "School and Field Book" he does substantially the same thing. In his "Synoptical Flora of North America," 1886, he pursues the same plan, the names in most, if not all cases, such as had been used for such subdivisions by some other writer in calling them genera.

In Ornithology I find that Coues in "Key to North American Birds," 1872, makes no divisions of the genera. Baird, Brewer and Ridgway, in "History of N. A. Land Birds," 1874, divide eleven genera by using subgenera names, and divide one genus by sections that are numbered. Mr. Ridgway does the same thing in "Birds of Illinois," 1885.

In Conchology I consulted George W. Tryon's "Structural and Systematic Conchology," 1882. In this a large part of the genera are subdivided into subgenera and subgenus names are used. If space would permit, a review of Mr. Tryon's course in regard to these names would be interesting.

In Hymenoptera I find Dr. A. S. Packard, "Revision of Fossorial Hymenoptera," divides five genera into groups by capital letters; published in 1865. Dr. Henri de Saussure, "Synopsis of N. A. Wasps," 1875, divides genera into subgenera with subgenus names, in a few cases dividing a subgenus into groups and using names for these groups also. Edward Norton, "Cat. of the Tenthredinidæ," 1867-69, uses names in some genera and numbers in others. E. T. Cresson, in his various publications, divides only a few genera, and part of those are divided with names and the rest by numbers.

In Diptera I find Osten Sacken, in his "Cat. of Diptera," 1878, divides two genera into subgenera with names, the genus *Trypeta* into thirty-seven, and *Chlorops* into six subgenera. I have other works on Diptera, but they were not consulted.

In Hemiptera, P. R. Uhler, "Check List of Hemiptera Heteroptera," 1885, no subgenus names used. The other works I had access to were not consulted.

In Coleoptera only Horn's and Henshaw's Check Lists were consulted, and neither of these use any form of subdivision of genera.

In Neuroptera, Dr. H. Hagen, "Synopsis of Neuroptera of N. A." 1861, divides a few genera by the use of subgenus names, others are divided by reference marks as in analytical keys.

In Lepidoptera I find P. A. J. Duponchel, "Cat. of the Lep. of Southern Europe," 1844, divides large genera for analytical purposes, sometimes using a capital letter. "Accentuated List of British Lep." contains no division of genera; published in 1858. Boisduval and Guenee, "Species General," 1874, divide genera into groups by letters, numbers and reference marks, but do not use names. Guenee in his part of the work does the same thing. Grote, in his new "Check List of N. A. Moths," divides *Apatela* and *Agrotis* into subgenera, using names. This is the list of 1890. His lists of 1875 and 1882 contain some section subdivisions, both with and without names. W. F. Kirby, in his "Cat.

of Diurnal Lep.," 1871, uses no form of division of the genera. Mr. Edwards, as we all know, divides the genera into groups and numbers the groups.

This is enough to show that the custom among the best writers in the various departments of natural history varies. Quite a large majority divide the large genera into some form of groups, indicating the relation of the species to each other in this way, while a few shirk all responsibility of showing such relation by arranging the species in large genera alphabetically. Of those given above who divide genera, about twice as many use subgenus names as divide the genera without using names, several using both methods in the same work, and occasionally in the same genus. I noticed, further, that most of these subgenus names are the names that have been used by some former writer for genera, the one using them for subgenus names having either united the genera himself, or taken the work of some one else in that line. This is in line with what Mr. Cockerell suggests.

A NEW FORM OF CERURA FROM CALIFORNIA.

BY HARRISON G. DYAR, RHINEBECK, N. Y.

Cerura cinereoides n. var. or n. sp. Head, collar and tegulæ light cinereous; throat above largely mixed with orange and metallic blue scales, below somewhat paler cinereous; tarsi ringed with black; abdomen concolorous with the thorax, the segments banded behind with paler cinereous, the last segment in the female sprinkled with black scales, the anal tuft in the male nearly white. Antennæ white, the pectinations dark brown, long in the male and diminishing toward the tip; short in the female. Primaries pale, almost whitish cinereous, paler basally, much the colour of *Cerura occidentalis* Lintn., and marked after the pattern of *C. cinerea* Walk. A minute black basal spot on the submedian, a little further on another on the subcostal; an extra basilar row of six small black spots on the nervules in a curved line, three on the costa close together, but separable by a lens, one on median, one on submedian vein and one on internal margin, the latter, in one female, faint. The median band composed of black and a few orange scales is faint, much the colour

of the lower part of that in *C. bifida* Steph. (but not that shape). Its internal border is arcuate in the male, more angular in the female. Its outer border is twice indented, once at median vein and again on submedian. The borders are very faint, hardly to be distinguished from the rest of the band. Beyond the band are a few black scales on costa, median and submedian veins. A minute spot on discal cross vein, visible only in one specimen. Beyond this a very obscure undulated diffuse line, hardly to be distinguished at all in the male, and a crescentiform line, darkest on the costa preceding the abbreviated blackish subterminal band, which is broad on the costa, narrows to the first median venule and borders slightly the crescentiform line to internal margin. In this line are a series of small venular orange spots, and it is preceded by a row of seven small venular black spots, the one on the costa elongated, those opposite the cell faint. Terminal intervenular spots very small, about as in *C. aquilonaris* Lintn.

Secondaries white, with black discal spot and small terminal spots.

Beneath primaries paler than above, shaded with black to correspond with the bands. Secondaries white. Both wings have a large discal black spot, and the terminal spots larger than above. In the female there is a common macular median black band. Expanse 36-38 mm.

Described from one male and two females from Los Angeles, California.

This species approaches *C. cinerea* most closely of any of the species in Grote's list, but may readily be distinguished by its pale cinereous colour and small marginal spots. Of the species added by H. Edwards * it is not *albicoma* Strk., nor *bifida* Steph., both of which are before me. Prof. Lintner kindly informs me that it can not be near *bicuspis* Bork., as this is allied to *borealis* Bd., and it can not be *scolopendrina* Bd., as the author describes this as having the wings and collar white—"ses ailes sont d'un beau blanc ainsi que le collier." †

The species, therefore, seems distinct. Since writing the above I have had the opportunity of comparing the larva of this form with that of *C. cinerea*, and find the difference between them to be so slight as not to

* Ent. Amer., Vol. III., p. 231.

† Lep. de la Cal., p. 86.

warrant specific separation. *Cinercoides* is the California form of the species, of which *cinerea* is the eastern form. The marked difference in the colour between the two is the same as in other species which are found from the Atlantic to the Pacific, as for example *Triptogon modesta* Harr., and its variety or form *occidentalis* Hy. Edw. I shall refer more fully in another place to the larval stages of *cinereoïdes*.

PREPARATORY STAGES OF TOLYPE VELLEDA, STOLL.

BY G. H. FRENCH, CARBONDALE, ILL.

Egg.—Cylindrical, ends rounded; .06 inch long by .04 inch in diameter, smooth. Colour chestnut-brown. Duration of this period about 195 days.

Young larva.—Length .15 inch; cylindrical, a little larger at anterior part; each joint with six tubercles from which arise spreading hairs, varying in length from short ones, that are not longer than the diameter of the body to those that are as long as the body, the two kinds distributed over the whole body; the short ones white and long ones grey; the longest hairs at the anterior and posterior parts of the body a little longer than the long ones on the middle; colour grey, black. Duration of this period three days.

After 1st moult.—Length .22 inch. Colour lead gray; a dorsal line of this colour bordered each side by a pale yellow, not clearly defined, line that is more or less obsolete on the thoracic joints; a subdorsal line of orange-yellow spots, connected by a pale yellow line; two lateral lines of pale yellow; tubercles small, black, those on joint 2 make a sort of collar for the head; hairs pale; legs and venter pale. Duration of this period four days.

After 2nd moult.—Length .25 inch. Much as in the preceding period; mostly lead colour on the back; dorsal line blackish with a whitish line each side of it; subdorsal line yellow, somewhat orange where the orange blotches were before, and paler between, but this time a continuous line; below this a whitish line and still lower two pale yellow lines, the separating lead line wider than the yellow, the lead line containing the stigmata; the ground colour on the sides almost black. There are four tubercles to each

joint; those on joint 2 all prominent and pointing forward; the dorsals on joints 3 and 4 a little less prominent, those on 5 to 11 small, those on 12 and 13 about the same as those on 3 and 4; lateral tubercles just above the legs, large, long and pointing outward and downward giving the body a flattened appearance; hairs on the dorsum not very long, the clusters moderate as to number, the anterior and lateral full and long; all grey. Head black. Duration of this period seven days.

After 3rd moult.—Length .50 inch. Marked as before but the body more a series of alternate lines, and the pale lines more a clear yellow the black lines where wide are mottled with yellow; a whitish patch on the posterior part of the dorsum of joint 4 and the anterior part of 5, and the same on joints 8 and 9, the latter more almond-shaped than the first; tubercles, larger; head and venter lead-black. Duration of this period thirteen days.

After 4th moult.—Length .85 inch. General appearance as before, the yellow mottlings in the black more prominent and the light lines less conspicuous; the lateral hairs white, the tufts full and the hairs long; the dorsal tufts short and spreading; the tubercles lead-black. Duration, of this period fourteen days.

After 5th moult.—Length 1.40 inches. The general colour grey, composed of a great number of fine alternate longitudinal light and dark grey lines, giving a paler shade than during the preceding period; a deep black transverse stripe back of joint 4, shaded each side with dark grey, the black not always showing on account of being more or less covered by the inter-segmental folds; the dorsal tubercles on joint 4 large, buff, studded with short black spines; all the other dorsal tubercles small and hairy, with only about six short black spines to each; the lateral tubercles large, extending outward, from the upper part of the outer end of the tubercles about twelve black bristles or hairs as long as the body is wide; below these are finer white hairs many of which are longer than the black ones; mingled with these white hairs are about a dozen that are tipped with triangular fan-shaped tips resembling somewhat the tips on the tail feathers of the peacock; under parts orange with a round black patch on each joint.

Mature Larva.—Length 2.25 inches. The markings and characters are as at the beginning of this period. Duration of this period from twenty-four to fifty-six days.

Cocoon.—Outline elliptical, fastened to the flat side of the box; 1.50 inches long by .70 inch wide and .30 inch high or deep, a thin film of silk next to the board between the pupa and the upper side of the cocoon that extends out beyond the cocoon as though the larva had first covered an area of the board before forming the other part of the cocoon; the outer part compact except next to the head where it is less so, as though preparing a place to emerge; the hairs of the body woven into the cocoon with the silk; smooth inside; the pupa not attached. Colour light grey, yellowish white inside. The larva makes the cocoon by beginning at one end and working towards the other, and after completion loosely fastening the entrance.

Chrysalis.—Length 1.05 inch, width of joint 5 .40 inch, depth .30 inch, length to the posterior part of the wing cases .55 inch, these extending to the middle of joint 5; length of tongue case .40 inch. The shape is oblong, flattened, ventral side more so than the dorsal, rounded about equally at both ends, no hooks or cremaster at the anal end but six pointed elevations that are not prominent, a dorsal ridge or pronotum. Colour chestnut-brown, dorsal line darker, head pale, anterior part almost greenish-white. Duration of this period about fifty-five days.

There is only one brood in a season, the aggregate of the figures given in the periods of duration of the different stages amounting to 347 days. The eggs from which these notes were taken were sent me by my friend Mr. James Angus, of West Farms, N. Y. The letter accompanying them stated that the eggs were deposited the latter part of September, 1888. There were two masses of them, in elongate strings, not quite straight, one on a leaf and the other on a twig of apple. The mass on the leaf was about 1.15 inches long, the other was about .80 inch. Each string was a single row of eggs; each egg covered over with black hairs from the abdomen of the mother moth. They were placed obliquely on their sides in the string.

During the first part of their larval period they eat about as voraciously and grow as rapidly as most moth larvæ, but after the last moult they feed but little from day to day, the most of the time lying stretched out at full length on a twig or on the side or top of the box. With the rather flat body, made to appear much more so by the lateral tubercles and their tufts of spreading hairs, they simulate perfectly a slight enlargement in an apple twig or small limb.

ON THE FOOD-HABITS OF NORTH AMERICAN
RHYNCHOPHORA.

BY WM. BEUTENMULLER, NEW YORK.

(Continued from page 203.)

Orchestes niger and *O. subhirtus* are both found on willow when in bloom. (Harrington Can. Ent. 16, p. 119.)

Orchestes niger and *O. pallicornis* were taken together in July on the leaves of low willows by Mr. Chittenden. *O. ephippiatus* was found in abundance on willow (*Salix fragilis*) by Mr. C. W. Leng and myself on Staten Island, N. Y.

Miarus hispidulus has been observed to breed in the seed capsules of *Lobelia inflata*. Blanchard (Ent. Am. II., p 87).

Cionus scrophulariæ attacks the fruit of the plum, feeding in the kernel. The first mention and figure was given by De Geer in 1775 (Mem. V). In Europe it is found on *Scrophularia* and *Verbascum*.

Gymnetron teter may be found in abundance on the stalk of mullen (*Verbascum Thapsus*.) The larva lives in the seed pods.

Rhyssomatus lineaticollis may be found infesting the seed pods of milkweed (*Asclepias*.)

Tyloderma fragariae lives in the strawberry, excavating the crown and roots of the plant. (Riley.)

Tyloderma faveolatum bores in the stems of evening primrose (*Cenothera biennis*). Also bred from *Epilobium* by Dr. C. M. Weed.

Cryptorhynchus lapathi bores in the stems of willow and alder.

Cryptorhynchus bisignatus was found by Dr. Packard on the leaves of oak. Several specimens were taken by Mr. F. H. Chittenden in the latter part of May at Clifton, N. J., on a chestnut log infested with *Leptostylus macula*, and during the last part of June fifteen or sixteen examples were found on another log of chestnut, some of them copulating; also taken on the trunk of a living birch tree infested with Scolytids.

Cryptorhynchus parochus lives under the bark of butternut. (Schaupp, Bull. Bklyn. Ent. Soc., IV., p. 35.)

Pseudonus truncatus is found on dead limbs of old butternut trees, according to Mr. Harrington. (CAN. ENT., 16, p. 118.)

Conotrachelus naso has been bred from the fruit of hawthorn (*Crataegus*) by Dr. Hamilton. (CAN. ENT., 21, p. 34.) *C. crataegi* also lives in the fruit of the *Crataegus* as well as that of the plum.

Conotrachelus nenuphar is destructive to the apple, apricot, cherry, peach, pear and quince, feeding in the fruit. *C. juglandis* inhabits walnuts.

Conotrachelus anaglypticus, according to Say, breeds in the fruit of the walnut (*Juglans*). *C. elegans* was obtained by Say on *Pinus rigida*. (Leconte Ed. I., p. 283.)

Craponius inaequalis is destructive to the grape, stinging the fruit and sometimes destroying the whole bunch.

Rhinoncus pyrrhopus. A pair of these little beetles were taken by Mr. F. H. Chittenden *in coitu* on a common species of dock (*Rumex* sp.), and being confined in a small vial with a part of a dock leaf consumed it almost entirely within a week. The species has also been observed by Mr. M. L. Linell on a species of *Rumex*. June.

Caeliodes flavicaudis, according to Mr. Chittenden, occurs in great abundance on the common nettle (*Urtica dioica*) in May, June and July.

C. acephalus is abundant along the coast of New Jersey on the evening primrose (*Oenothera biennis*). June, July and August.

Acoptus suturalis Lec. lives in the dead wood of beech trees. Mr. F. H. Chittenden has found the imagines in the wood March 27th to April 20th in company with larvæ apparently of the same species. One of these larvæ taken May 26th appeared about to pupate. The beetles were crawling on the trunk of the tree early in July.

Mononychus vulpeculus infests the seed pods of the blue-flag (*Iris*). It also occurs on the flowers of *Ceanothus americanus* and *Verbascum thapsus*. (Say, Vol. I. Lec. Ed., p. 286.)

Ceutorhynchus cyanipennis. According to Mr. Jülich this insect is said to be found on grass (Ent. Am., 5, p. 57). In Europe it lives in the roots of cabbage.

Ceutorhynchus assimilis occurs on the radish and *C. rapæ* infests the rape, and *C. septentrionalis* is found on mustard (*Sisymbrium officinale*).

Trichobaris trinotata bores in the stalk of the potato, causing the stem to wilt.

Ampelogypter sesostris makes a gall on the grape vine, as also does *A. ater*. (Riley, Bull. Bklyn. Ent. Soc.; VI., p. 61.)

Centrinus scutellum-album I found on the flower heads of the daisy.

Balaninus quercus, *B. nasicus*, *B. uniformis* were bred from different kinds of acorns. *B. obtusus* inhabits hazel nuts. *B. caryæ* lives in hickory nuts. *B. proboscideus* and *B. rectus* were bred from chestnuts. The latter also inhabits acorns. (Hamilton, CAN. ENT., 22, p. 1-6).

Cylas formicarius bores in the roots of the sweet potato in Florida. (Comstock Rep. Dept. Agricul., p. 250, 1879.)

Eupsalis minuta bores under the bark of oak, chestnut and maple.

Rhynchophorus cruentatus lives in the lower parts of the trunk and roots of the palmetto. I have taken about one hundred individuals at Enterprise, Florida, in May. The specimens were caught boring in the soft pulpy substance in the trunk of a young and freshly cut palmetto tree. *R. palmarum* also lives in the palmetto.

Rhodænus 13-punctatus I found on evening primrose (*Oenothera*). Probably lives in its larval stage also upon the plant. It also infests the stems of *Ambrosia*, *Xanthium strumarium* and thistle.

Cactophagus validus has been found exclusively under decaying *Opuntia* leaves, the larva no doubt living within the leaves or roots of the same plant. (Insect Life, I., p. 199.)

The genus *Sphenophorus* infests roots or lower parts of the stems of various wild or cultivated *Graminaceous* plants (l. c.). *S. parvulus* lives in the roots of meadow grass (*Timothy*), and *S. robustus* in the roots of maize or corn, and *S. ochreus* in the roots of *Scirpus atrovirens*.

Calandra granaria and *C. oryzæ*. Both these species depredate upon stored wheat, corn, rice and other grains.

The genera *Yuccaborus* and *Scyphophorus* infest plants of the genus *Yucca* (l. c., p. 199).

The genera *Dryotribus*, *Gononotus*, *Macrancylus*, *Mesites* (?), *Elasoptes* are strictly maritime, and live in larva and imago states in old boards and roots, etc., washed up on the beach. (l. c., p. 198).

Cossonus corticola I found in abundance under the bark of dead pine trees. At Enterprise, Florida, *C. piniphilus*, *C. concinnus* and *C. crenatus* also live under pine bark. (Ricksecker, Ent. Am., I., p. 96).

Cossonus platalaea has been found by Mr. Harrington in numbers under the bark of a partly decayed poplar tree. (Ent. Am., p. 19).

The genera *Allominus*, *Caulophilus*, *Amaurorhinus*, *Rhyncholus* and *Stenoscelis* live under bark of dead and decaying wood or bore into decaying wood of deciduous or coniferous trees. (Insect Life, I., p. 198).

Dryophthorus corticalis was found under dead pine bark (*Pinus rigida*) by Mr. J. Sherman.

Wollastonia quercicola lives in decaying wood of cottonwood. (Knaus, Bull. Bklyn. Ent. Soc., VII., p. 150).

Himatium errans is inquilinous in the galleries of *Tomicus cacographus* under bark of yellow pine. (Schwarz, l. c.) *H. conicum* has been found breeding under the bark of Tulip-tree, also taken under pine bark by Mr. Chittenden.

Phlaeophagus apionides lives in the trunks of wild cherry (*Prunus serotina*) and ash. *P. minor* was found on birch, willow and elm by Mr. F. H. Chittenden; also taken on ash by Mr. Jülich, who found the European *P. spadix* in water-soaked drift wood at the sea shore of Long Island.

Stenoscelis brevis has been taken from old maple and poplar stumps by Mr. Harrington (Ent. Am., I., p. 19); also found on linden, beech, birch, butternut, sycamore and willow by Mr. Chittenden.

Rhyncholus brunneus has been found in wood of *Prunus serotina* by Mr. F. H. Chittenden.

Choragus Sayi was found by Mr. Schwarz in the twigs of dead beech trees which were injured by fungus.

Cratoparis lunatus lives in fungus found on dead oak trees.

Brachytarsus limbatus was raised by Mr. Schwarz from the flower heads of *Helenium tenuifolium*.

B. variegatus breeds in the smut of corn. (Schwarz.)

B. tomentosus was found on rag weed by Dr. Hamilton. (CAN. ENT., 18, p. 114). Also taken on the same plant by Mr. J. Sherman.

Euxenus piceus was found on dry palmetto leaves in Florida by Mr. Schwarz (l. c., p. 85).

NOTE.—I should be pleased to hear from anyone that may be able to inform me of any Food-Habits of North American Rhynchophora not mentioned in the forgoing paper, so that I can notice the same in an appendix which will shortly appear.—W. B.

BOOK NOTICES.

MANUAL OF INJURIOUS INSECTS, AND METHODS OF PREVENTION: By Eleanor A. Ormerod. (Second Edition.)

A greatly enlarged and revised edition of Miss Ormerod's excellent manual has just appeared. There is so much that is new in it that it can hardly be considered the same work. As stated by the editors of *Insect Life*:—"On account of its convenient size, admirable arrangement, plain language, and abundant illustration, it is almost a model of what such a work should be." These merits render it intelligible, and, indeed, indispensable to every farmer, gardener, or fruit-grower who wishes to carry on his work in the most successful manner. The different kinds of attacks are arranged alphabetically under the three headings of Food Crops, Forest Trees, and Fruit. At the end is an alphabetical list of the insects mentioned, and as an appendix an Introduction to Entomology, specially prepared for farmers and others who have no knowledge of the science, in such a way as to enable "the observer of a crop attack to tell at least what kind of an insect is before him." This is followed by a glossary of entomological terms, and a full index. The whole forms a most readable, valuable and reliable work of 410 pages, copiously illustrated with 155 excellent figures.

A noticeable feature is the adoption of the use of the arsenites in the warfare against insects, which has only very recently found favour in England; this Miss Ormerod boldly and wisely advocates.

The advance made during the last decade in the science of reducing the injury to crops by insects, is in a large measure due to the talented authoress of the above work, which, we think, cannot be too highly praised.

J. F.

BUTTERFLIES OF NORTH AMERICA, Third Series, Part X.: By W. H. Edwards.

The last part of Mr. Edwards's superb work has just come to hand. It is of exceptional beauty and interest. Plate I. illustrates the complete life-history of *Argynnis Alcestitis*. Plate II. *A. Adiante*, ♂ ♀, and *A. Atossa*, ♂ ♀ (n. s.). Plate III. *Satyrodes Canthus*. Complete life-history. The letter-press is very full. The two first-named species have a peculiar interest since the appearance of Mr. H. J. Elwes's "Revision of the Genus *Argynnis*," and Mr. Edwards's "Notes" thereon. (CAN. ENT., Vol. XXII., p 82.). *A. Alcestitis* is shown to be distinct from *A. Aphrodite* in all its stages. *A. Adiante*, ♂ is figured from Dr. Boisduval's actual type. Most Lepidopterists will, I think, agree with Mr. Edwards, that this is a good species and quite distinct from *A. Zerene* or *A. Monticola*.

J. FLETCHER.

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CORRECTION.—Through a clerical error I have given, on page 189, line 23, *Carabus baccivorus* Fisch. as a var. of *chamissonis* Fisch., instead of a var. of *tædatus* Fab.

W. H. HARRINGTON.