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# The Canadian Entomologist.

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## ON THE DESTRUCTION OF OBNOXIOUS INSECTS BY YEAST.

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

The paper published CANAD. ENT., vol. xi., p. 110-14, was reprinted with some additions as a pamphlet, Cambridge, December, 1879. The recorded experiment on the Potato Bug made by Mr. James H. Burns, proved evidently the poisonous character of the yeast-fungus. The fifty beetles which were sprinkled with it died mostly on the eighth day, and the rest in the four following days. None of them survived. There were collected at the same time, October 2, and at the same place, fifty other beetles, which were kept in the same room. Of these, which were not sprinkled, to Nov. 14th only three had died, and March 1st twenty-five lived as brightly. The experiment is so far a decided success, as it has proved *that insects are killed* by the application of yeast. I may add that an experiment made a few weeks ago in a green-house seems to be successful in killing Aphides.

Dr. Metschnikoff has published a pamphlet, Odessa, 1879, and a record of it, Zool. Anzuger, 1880, Feb., concerning his experiments in destroying obnoxious insects (*Anisoplia* and *Cleonus*) by the application of fungus. The difficulty of raising the fungus chosen by him (*Isaria vixescens*) in sufficiently large quantities he hopes to overcome by raising the *Isaria* in beer-mash.

Mr. A. Giard, Lille, France (Bull. So. de Department de Nord., sec. 2, An. 2, No. 11), has published a paper containing very interesting facts regarding insect epizootics. The discovery of L. Nowakowski of the copulation of some *Entomophthora*, and the conclusive proof given by O. Brefeld that *Tarichium* is only a different form of which the *Status conidiophorus* is the *Empusa*, induce Mr. Giard to retain for the genus the name *Entomophthora*, for its asexual form the name *Tarichium*, for its sexual form the name *Empusa*. In summer, when insects in which those fungi

develop are abundant, the reproduction is an agamous one; in the fall, when insects become scarce, a sexual generation appears, which produces oospores not germinating before the following spring.

Mr. Giard believes that *Tarichium megaspermum*, the parasitic fungus of the caterpillar of *Agrotis segetum*, and first described by Dr. Cohn, could be used by farmers as a very important poison to destroy those obnoxious insects—the more as O. Brefeld has proved by conclusive experiments that the caterpillar of *Pieris brassicæ* is very easily infested by sprinkling with water in which spores of *E. sphaerosperma* (the parasite of this species) are put in. Therefore the mummified caterpillars filled with spores should be collected in winter for use the next spring against this species. (The same has been suggested as long ago as 1874 by Dr. John L. LeConte.) The *Entomophthora* seem to attack by preference the caterpillars of the double-brooded species, which pass the winter without transforming in the chrysalis state. Mr. Giard explains thus the casual rarity of some very common species of *Chelonia*. The hypothesis of O. Brefeld that *Tarichium megaspermum* of *Agrotis* could be perhaps only a different form of *Empusa muscæ* is rejected by Mr. Giard, he having discovered, as he submits, the *Tarichium* state of *Empusa muscæ*, which was not known before. The opinion that both forms of a fungus develop exclusively on the same animal, similarly as other parasitic insects, can, until it is proved by doubtless evidence, hardly be accepted. We know well that the different stages of entozoa develop in very different animals, and the presumption that fungi follow a similar course is at least probable.

There are published objections against my proposition to use the yeast fungus for destruction of insects. All are based upon the same fact, that Dr. Bail's views concerning the identity of some fungi are not accepted by Botanists. As the number of students of microscopical fungi is rather limited, and as I have never studied them, I used the excellent chance to rely upon the views of my savant colleague, Prof. Farlow, which he had kindly communicated to me. Therefore I stated as a fact that "Dr. Bail's views are now not accepted by prominent Botanists," and further that "this question is without any influence regarding my proposition." I believed it to be fair to state that actually Dr. Bail has discovered the yeast fungus to be poisonous to insects, and therefore I was obliged to quote the ways and the experiments which had led him to this discovery. As Dr. Bail had not suggested the use of the yeast for the destruction of insects—

though this suggestion is the evident consequence of his discovery—and as I found it not done by anybody else, I recommended experiments to be made with the yeast fungus. The experiment with the Potato Bug has proved that yeast fungus externally brought in contact with insects, kills them. Therefore objections based on botanical grounds can not more be admitted, and the Botanists will sooner or later find the true explanation of the facts.

It has been contended that “as long as a scientific basis for the use of the yeast is not more established, a practical application of the same is simply out of question.” This assertion is a rather strange one, the more so as nothing is known about the scientific basis of Pyrethrum, of Paris green and other remedies. It has apparently been overlooked that I found in the dead beetles which had been sprinkled, in the large sinus of the wings, spores in quantity. Those spores resembled the figures given by Dr. Rees (*Unters. ueber die Alcoholgaehrungspilze Leipzig, 1870, pl. 1, f. 15, e. d.*) and were so numerous and so distinct that I could not have been deceived, the more as I am familiar with the blood fluid of insects and its corpuscles. I did not find such spores in the sinus of the wings of beetles which had not been sprinkled. There is nothing in the size and the shape of the yeast spores which could prevent them from entering an insect's body and producing disease.

Since the above was in type I have received a letter from Germany stating that sprinkling with the atomizer of diluted (compressed) yeast, a half an ounce package in three liter of water, on Aphides in greenhouses, was successful to an exceeding degree.

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## NOTES ON THE LARVA OF HETEROCAMPA PULVEREA, G. & R.

BY G. H. FRENCH, CARBONDALE, ILL.

Length when at rest, 1.25 inches; in shape tapering slightly from the middle forward, but more rapidly from that point backward; the body deeper than broad. General color bright clear green, a little spotted with white, marked as follows: head gray, a little lighter through the centre; joint 1 contains two dark purplish black warts on the dorsum, reddish

purple at the base, the space between them whitish. From these runs backward a bright brownish purple line, not very dark, at first about one-sixteenth of an inch wide. This expands, reaching the sub-dorsum in the posterior part of joint 4, dividing in the middle in joint 3. The lines run along the subdorsal region to the posterior part of joint 6, when they unite and cover the whole of the dorsal part of joint 7 and all but a little of the posterior part of joint 8, when it again separates and runs as two lines to the posterior part of joint 9. The space on the back of joints 3, 4, 5 and 6 between the purple lines is filled with orange. On joint 4 a spur is given off from the purple line to the third thoracic leg, another runs from joint 6 to the first pro-leg, another short spur on joint 9; both of the last with oblique lines of lighter shade. On joint 9 the orange is outside the purple, extending down the lateral spurs. Joint 10 has no purple nor orange except a little below the stigmata, but it has faint yellow subdorsal lines. Joint 11 has purple subdorsal lines which unite on the anterior part of joint 12, continuing backward as a broad dorsal line, darkest on the anal plate. The space on joint 11 between the subdorsals is filled with orange. Feet and legs purple, but the rest of the under side green; under the glass the above described brownish purple lines are not uniform, but mottled with irregular lighter lines.

The single larva from which the above description was taken was found June 30th on the body of a white oak tree. During the few days before it pupated I fed it on the leaves of *Quercus alba* and *Q. coccinea*, both of which it ate readily. July 6th it entered the dirt of the cage to transform, and produced the imago August 6th.

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## NORTH AMERICAN NOCTUIDÆ IN THE ZUTRAEGE.

### FIRST HUNDRED.

BY A. R. GROTE,

*Director of the Museum, Buffalo Society Natural Sciences.*

*Schinia gracilentia*, 8, fig. 5-6.

"Georgia." I have identified this species among Belfrage's Texan collections,

*Trasteria graphica*, 8, fig. 11-12.

"Georgia." The hind wings are rusty-yellow, "rostgelb"; whether it is the species which passes under the name in our collections might admit of some doubt from the color of secondaries, but the s. t. line is followed by pale dots on the veins as in *graphica*; the band on hind wings is broken in the figure.

*Epizeuxis lituralis*, 9, fig. 19-20.

"Georgia." Described by me as *Megachyta lituralis*, Trans. Am. Ent. Soc., 306, Jan., 1873.

*Hypsoropha monilis* Fabr., 10, fig. 23-24.

"Georgia." I have identified this species in Prof. Snow's Kansas collections.

*Polygrammate hebraicum*, 10, fig. 25-26.

"Georgia." I have identified this species in the Philadelphia collections. It is the *P. hebraicum* of my Check List, No. 80.

*Hypsoropha hormos*, 10, fig. 27-28.

"Georgia." I have collected this commonly in Alabama.

*Ephesia elonympha*, 11, fig. 29-30.

"Georgia." Generally known in collections; Alabama (Grote); various localities in Middle and Western States.

*Zale horrida*, 11, fig. 31-32.

"Georgia." This species is the *Homoptera calycanthata* of Walker and Bethune, but not of Abbot. Common; I proposed to distinguish the genus by the exaggerated thoracic tufts.

*Schinia trifascia*, 11, fig. 33-34.

"Georgia." I have identified this species from Alabama and Texas. See Proc. Bost. Soc. N. H., 242, 1874, in describing an allied species, *S. rectifascia* Grote.

*Phoberia rufimargo*, 13, fig. 45-46.

"Georgia." This is the *Panopoda ruficosta* of Gueneé, the *P. Cressonii* Grote, and brightly colored specimens are, without doubt, the *roseicosta* of Gueneé. A common and variable form throughout Southern New England, south and westward.

*Cryphia nana*, 14, fig. 53-54.

"Georgia." A small obscure form not yet recognized.

*Schinia bifascia*, 14, fig. 55-56.

"Georgia." Unknown to me. It may be a var. of *gracilentata*.

*Ephesia amica*, 14, fig. 57-58.

"Georgia." This is the well-known *Catocala androphila* of Gueneé.

*Cerma cora*, 14, fig. 59-60.

"Georgia." I have this species from Canada. It may be the *Chariptera festa* of Gueneé.

*Fodia rufago*, 15, fig. 61-62.

"Georgia." I have identified this species in several collections. It appears to be southern and western.

*Parallelia bistriaris*, 15, fig. 63-64.

"Georgia." A common moth in all collections.

*Phosphila turbulenta*, 15, fig. 67-68.

"Georgia." I have identified specimens from the Middle States and referred the moth to *Hadena*, Bull. Buff. Soc. N. S., I., 180.

*Drasteria cuspidata*, 16, fig. 69-70.

"Georgia." A well-known species, California and Atlantic district. Referred to *Euclidia* in the Check List.

*Elaphria grata*, 16, fig. 71-72.

"Georgia." I have identified as this species the insect subsequently described by Mr. Morrison as *Hadena rasilis*. Mr. Morrison would see in this species of Hübner's the *Taenioctampa oviduca* of Gueneé, but I am not of this opinion. It is not an easy question to settle.

*Xestia chloropha*, 16, fig. 73-74.

"Georgia." Unknown to me. The figures look a little like *Drasteria convalescens* ♀.

*Phoberia atomaris*, 16, fig. 75-76.

"Georgia." I have identified with this common southern form the *Lyssia orthosioides* of Gueneé. It is often mistaken for the Cotton Moth, and some years ago was sent me by Prof. Baird as having been received by him from a correspondent as specimens of *Aletia*.

*Melipotis jucunda*, 17, fig. 81-82.

"Georgia." A common species, also in California (?). I have never seen a specimen so colored on the disc of primaries. The variety *versabilis* of Harvey is of a uniform dirty gray; Mr. Hy. Edwards has sent me a rubbed specimen from Havilah, which I think belongs to this variety.

*Lithacodia bellicula*, 18, fig. 85-86.

"Georgia." I have little doubt that this is the species generally known

under the name, but the figure is more highly colored than any specimens I have seen.

*Pangrapta decoralis*, 18, fig. 91-92.

"Georgia." I have identified this species with the *Hypena elegantalis* of Fitch., Trans. Am. Ent. Soc., iv., 92. Southern specimens are darker, smaller, and more intensely colored. Collected by Mr. Schwarz at Enterprise, Florida.

*Phaeocyma lunifera*, 19, fig. 97-98.

"Georgia." Figured also by Gueneé, 15, fig. 9. My identification of this species is as yet provisional, nor can I distinguish the genus from *Homoptera*.

*Triaena tritona*, 21, fig. 107-108.

"New Georgia." I have identified this species in the New York collections.

*Paectes pygmaea*, 21, fig. 109-110.

"Georgia." Hübner compares this species with *urticae*; but I think it is a species of *Ingura*, allied to *praepilata*. I never saw a *praepilata* so marked and colored, and have not identified Hübner's species.

*Ptichodis bistrigata*, 21, fig. 111-112.

"New Georgia." Referred by Guen., 3, 303, to *Poaphila*, while Hübner considers it a Geometer. I have not yet met this species, which should be easily recognized from its simple markings.

*Hemeroplanis pyralis*, 23, fig. 127-128.

"Georgia." I took this species in Alabama and identified it Trans. Am. Ent. Soc., iv., 23. It is the type of *Pleonectyptera*, Hübner's generic term being used in the Sphingidæ. Four species are represented in my collection, all from the Southern States.

*Anticarsia gemmatilis*, 26, fig. 153-154.

"Surinam." I have identified this with a common species taken in Texas by Belfrage and in Wisconsin by Westcott. The figures are smaller than my specimens.

I have previously (CAN. ENT., xi., 179) described varieties of this species from Texas and Wisconsin. I wish to add here that this variation takes place only on the upper surface of the wings. Even in their brown ground color the under surfaces are always nearly the same; the common outer line of pale points is always obvious. This illustrates my observations on the method of variation in the Noctuidæ (Pop. Sci. Monthly,



Dec., 1876) in the imago state. In *Anticarsia gemmatilis*, while the upper surface may be brown, gray, or blotchy with black on ochrey, the under surface remains of a dull brown on which the white linear dottings are conspicuous.

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### NEW NOCTUIDÆ.

BY A. R. GROTE, BUFFALO, N. Y.

#### XYLOMIGES DOLOSA, n. s.

Professor C. H. Fernald has sent me a fresh female specimen which evidently belongs to an undescribed species of *Xylomiges*, and for which I propose the specific name *dolosa*. The species is black and grayish white, the black dull and lustreless. Eyes hairy, abdomen a little flattened, the tufts are not discernible. Size of *Mamestra adjuncta*. Thorax black, with gray shading on collar and tegulæ; abdomen blackish. Primaries with the ordinary spot grayish white, of the usual size, reniform upright. Posterior line even, double, followed by venular points. Subterminal line even, whitish, preceded by black cuneiform marks. Terminal space gray, veins marked with black. Fringes black, neatly marked with gray. Hind wings whitish, powdered with fuscous, without marks, beneath with a distinct dark discal spot. The species is remarkable for the evenness of the subterminal line, which wants the usual indentations. The wings are rather long and the somewhat depressed body gives it a resemblance to *Lithophane*. It may be ultimately referred to *Mamestra*, but the thorax and abdomen are untufted, the hind wings rather long and with well marked exterior sinus.

#### MAMESTRA DEFESSA, n. s.

Also allied to *trifolii*, but with the subterminal line irregular and dusky; reniform concolorous with an inferior black stain. The fore wings are pale ochrey clay color, the lines double, faint, stigmata concolorous, with dark defining lines. Thorax concolorous with primaries; no lines on the collar. Hind wings whitish at base with discal lunule and broad exterior fuscous band. Beneath there is a discal cloud and common extra mesial dotted line, which is joined to the discal spot on primaries by

dusky scales along the median nervules. Size of *trifolii*. Two specimens, Santa Clara, California, May 22, collected by Baron Osten Sacken.

This inconspicuous form can hardly be a geographical variety of *trifolii*, as the subterminal line seems quite different in character, but the markings are otherwise very nearly the same.

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### CORDYCEPS RAVENELII ON THE LARVÆ OF PHYLLOPHAGA.

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

I am indebted to Mr. P. H. Mell, Auburn, Ala., for this beautiful species. This fungus is described by Rev. N. J. Berkeley in Journal of Proceed. Linn. Soc. Lond., 1856, vol. i., p. 159, pl. 1, f. 4, after specimens in Rev. M. A. Curtis' herbarium, and collected by Mr. H. W. Ravenel in S. Carolina. I was shown by Prof. W. G. Farlow, who possesses now the herbarium of Curtis, the original types, which are identical with those collected by Mr. Mell—as far as identity can be ascertained without making cuts for microscopical examination. Mr. Curtis remarks: "S. Carolina in May; grows out on first joint of thorax on one or both sides of dead larvæ of *Ancylonycha (Phyllophaga)*, buried one to two inches under ground; also from Texas, C. Wright. The fungus is brown. Head two inches or more high, flexuous, compressed or grooved, at first minutely tomentose, at length smooth; head  $\frac{3}{4}$  inch long, cylindrical, but slightly attenuated at either end. Peritheria free, ovate; asci very long; sporidia very long, filiform, breaking up into joints 0,0001 inch long."

It would be impossible to determine the larva from Alabama nearer than as one belonging probably to *Phyllophaga*. All we know of the larvæ of this genus (even of Melolonthidæ) from U. S. is a notice of *Ph. puncticollis* in Sillim. Jour., viii., p. 269, of *Macroductylus spinosus* and the descriptions and figures of *Ph. fusca*, which are not sufficient. From Europe are some species described, but after all the larvæ of this family need to be worked out and studied entirely as new.

## ON CERTAIN SPECIES OF SATYRUS.

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

(Continued from Page 55.)

ARIANE.—I have not seen Dr. Boisduval's type of *Ariane* (many of his types of American butterflies he sent me), but the species is easily recognized by his description. He says it is size of *Phœdra* (or like *Nephele*), in color brown-black; the fore wings with two black ocelli pupilled with white and with pale irides; 6 small ocelli on hind wing below, pupilled with white and circled by fulvous; the same wing crossed by two sinuous black lines; the females with large ocelli having yellow-fulvous irides; the small ocelli much less distinct than in the male.

I have received several *Ariane* ♂ and one ♀, taken by Mr. Behrens at Soda Springs, Cal., 1879. These examples agree well with the above description. They are almost black on upper side. Beneath black-brown; the two stripes across disk and basal area of hind wings are heavy and black, standing out clearly on the brown ground, and the fine, abbreviated streaks are distinct from base to the discal stripe. This stripe at the end of the cell curves irregularly outward, and at the summit of the curve is indented angularly. In the other members of this group, from *Pegala* to *Boopis*, there is a similar projection of the discal stripe, but it is rounded and often flattened. Except in this single point, the typical *Ariane* male seems undistinguishable from some examples of *Nephele*. No doubt the latter sometimes will be found to show variation in the outline of the stripe and these two forms become identical. The single female sent by Mr. Behrens has a paler shade over the extra discal area of fore wings; the ocelli have indistinct narrow yellow irides and white pupils. The stripes on under side of hind wings are distinct, and the area beyond is paler and slightly gray; one white dot with narrow black edging on the second median interspace, and a similar one in lower subcostal interspace, are the only traces of ocelli. Dr. Behr mentions an example in his collection in which the second ocellus on fore wing is suppressed. He says the species is wanting near San Francisco, but is found at San Diego and Santa Cruz; also at Mono Lake.

From Mr. O. T. Baron I have received 15 ♂, 2 ♀ of a *Satyrus* allied to *Ariane*, but differing considerably from Dr. Boisduval's description, and

from the Soda Springs examples. They were taken in various localities in Northern California in 1879. They are not black, or "brown-black," but of a cinereous-brown, a little dusky over the basal area of fore wings; the under side is light brown with a yellow tint throughout, and over the whole area beyond the discal stripe on hind wing there is a gray shade, either whitish or a brown-gray. On this part of the wing the fine dark streaks are obliterated, and the two stripes being heavy and dark, while the intervening space is also darker than other parts of the wing, there is a strong contrast of color between the extra discal area and this so-formed band. The indentation seen in the outer stripe in *Ariane* is here present, but is deeper. The small ocelli are normally six, but in half the examples they are more or less wanting and are always very small. As to the two females, on the upper side they look like the males, but beneath they are considerably more cinereous, and that from base to margin, while the discal stripe (or the outer line of the band) is more broken into crenations. All this is unlike *Ariane* and unlike *Nephelc*. While *Ariane* as described may in both sexes be matched in a series of *Nephelc*, except perhaps in the single point before spoken of, the indentation against cell in the outline of the band, this form cannot be, and this is as good a test as need be of its distinctness from *Ariane*. I call this *Baroni*, after my indefatigable friend, who has contributed so much to our knowledge of the Californian lepidoptera.

I have recently received from Mr. Morrison, at Olympia, Washington Territory, one ♂, two ♀, close to *Nephelc*, and yet showing important differences in some respects. The male, placed by the side of a *Nephelc* ♂ from White Mountains, is undistinguishable on upper surface, being of the same black-brown color, with similar ocelli, these having no rings, but white pupils; the anal ocellus on both has a white pupil. Beneath, while the eastern example is brown throughout, the other is largely gray-white over whole surface, but especially at apex and along hind margin of primaries, and over the extra discal area of secondaries. The large and small ocelli are alike in both, the latter six in number. The two females are lighter colored than the male, agreeing with many eastern *Nephelc* in this, and also in having a paler shade over the space which in *Alope* is occupied by the yellow band. About the ocelli are hazy yellow rings. On the under side the stripes of hind wings are nearly lost, the basal one totally in one example. One has three minute ocelli, the other four. The color of this surface is brown with a yellow tint, and the apex and hind margin and

extra discal area are suffused with gray more decidedly than in the male. I have seen no *Nephele* of such a complexion, but the general resemblance of the three examples is closer to *Nephele* than to *Ariane*. Whether Mr. Morrison found this form common or not I am not informed, but it seems to have been the only large *Satyrus* taken by him in that region. I call this variety *incana*.

GABBII.—The female of this species is of a light yellow-brown on upper side, with a broad, clouded, yellowish band on fore wings, and an obscure yellow shade over the outer half of secondaries. On the hind wing are three and four ocelli in every example which I have seen, the one in lower median interspace largest, and pupilled, and all in hazy yellow rings. On the under side the color is yellow-gray next base, beyond to margin whitish, and the whole surface, from base to hind margin, is streaked uniformly with brown. There is a cloudy stripe across middle of wing, and either none at all or an obsolescent one towards base. The male is darker and without yellow, with two or three ocelli on hind wings, these, as well as the ocelli on fore wings, in yellowish rings. All examples seen, of either sex, have six ocelli on hind wing beneath, generally complete and conspicuous. *Gabbii* flies from Utah to Oregon. On the under side it greatly resembles the Texan *Alope*, but on the upper, by reason of the clouded yellow, is unlike any other species.

WHEELERI.—The female of this species also has three ocelli on upper side of hind wing. The upper ocellus on fore wings in both sexes appears to be always duplex, with two pupils, and on under side of hind wing there are always six ocelli. Of these the middle one of each group of three is long and narrow—lenticular, and not rounded or oval, as in all the other species. Across the disk is a wavy brown stripe, and nearer base a straight one. As this species is figured in *Butterflies of N. A.*, vol. 2, and also in Mead's Report on the *Butterflies of Colorado*, I do not here describe it farther. Its habitat is south-eastern California and Arizona.

STHENELE.—Dr. Boisduval described this species in 1852 as follows: Upper side brown, with the fringes ashy-gray, cut with black; the fore wings with two ocelli with white pupils; the hind wing without spots. Under side ashy-gray, deepest colored at base; the fore wings with two large ocelli circled with yellow-fulvous; hind wing crossed by a broad angular band and marked towards anal angle by two little ocelli. The

female a little larger, and the ocelli circled with fulvous on both surfaces. No locality given, but spoken of as very rare. *Sthenele* seems indeed to be one of the rarest of the Californian butterflies. Mr. Henry Edwards informs me that all the examples of this species hitherto known in collections are believed to have been taken in a certain locality now included in the limits of San Francisco, and that no other locality is known. Practically the species is extinct. The same is true of *Lycaena Xerxes*, which was taken at same spot with *Sthenele*, but no where else. I have received from Dr. Behr and Mr. Edwards some half a dozen examples of *Sthenele* at different times, of which I now have 3 ♂, 1 ♀. The ♂ expands from 1.3 to 1.4 inch, the ♀ 1.2. The upper side agrees with the above description. Beneath, the fore wing is yellow-brown, with a slight gray shade over outer half. The hind wing is brown just at base and next hind margin, and all the interior part of the wing is whitish, and on this area is a broad angular brown band, unlike anything in our other species. The inner side of this band is circular and is roughly and irregularly crenated; the outer side is sinuous, there being a broad and deep rounded sinus on the subcostal and another on the median interspaces, while between these projects a broad, angular dentation; in one ♂ and the ♀ this is rounded. The ocelli are as described by Dr. Boisduval. This species belongs to another group from those which follow.

SILVESTRIS.—The male expands about 1.5 inch and female 1.5 to 1.6 inch. The former is dark brown, with two small blind ocelli on fore wing, and a black sexual dash along the lower side of cell. The under side is tinted yellow; the two ocelli are large, pupilled white, and with yellow rings. The hind wing has one or two white dots near angle, indicating obsolete ocelli; across the disk a broad indistinct band, not darker than the rest of the wing, its outlines very irregular—on the basal side rather serrated, on the outer side against the cell two long serrations projecting with a sharp and deep sinus between them. The female is lighter colored above, the ocelli larger, pupilled and with a hazy yellow ring, and yellowish nimbus over the adjacent area; there is a small ocellus at anal angle, and the fringes are alternately light and dark, whereas in the male they seem to be wholly brown. The under side is more grayish than in the male, and the markings more distinct. Mr. Baron sent me quite a number of perfect specimens, obtained by him in northern California. In my Catalogue, 1877, I have credited this species to Nevada and Montana, but I am not now sure of these localities.

CHARON.—A little smaller than *Silvestris* on the average, though individuals occur fully as large; dark brown in both sexes. The male has a sexual dash under cell, and a single blind ocellus; the female has two ocelli and about them slight yellow rings. The under side is yellow tinted; the hind wings sometimes, but not always, have a faint gray shade beyond the band; primaries have two complete ocelli, the rings yellow, but often the lower ocellus is reduced to a black dot; the hind wing has from one to six minute ocelli, or points. The band is shaped as in *Silvestris*. The fringes are sometimes wholly brown, but sometimes those of fore wings are mixed with dark gray. This species is common in Colorado at high elevations, and inhabits Montana, Wyoming and New Mexico. I have received a single example from north-eastern California. Mr. Morrison sent me a pair from Nevada, 1877, in which the light part of the fringes is almost white, and the under side of hind wings is much lighter, or more hoary, than usual, the outlines of the band standing out clearly.

PHOCUS.—This form is a modification of *Charon*, a little larger, the expanse being, ♂ 1.6 to ♀ 1.8; the fringes same color as the wings. Under side yellow tinted, but without gray, the band of hind wings frequently wholly absent, but in some examples just enough is discernible of the outer line to show that it is of same shape as *Silvestris*. I have but one ♀, and this has two small ocelli on upper side, in pale yellow rings, and beneath these is no trace of the band. The only locality known to me is Lake Lahache, British Columbia, from which I have had several examples, taken by the late G. R. Crotch.

MEADII.—The ♂ expands 1.5 to 1.7, ♀ 1.8 to 1.9 inches. Upper side light brown with a strong russet tint on the disk and the area which includes the ocelli. Two pupilled ocelli and one at anal angle. The under side is brown, sometimes with a little gray on extra discal area of secondaries; the russet shade more decided and covering nearly all of primaries; the ocelli large in fulvous rings; the outline of the band on hind wings like that of the *Pegala* group, with a rounded projection against end of cell; the small ocelli two or three in number. This well marked species inhabits Colorado and Arizona, probably New Mexico.

## ENTOMOLOGY FOR BEGINNERS.

## SOME WOOD-EATERS.

BY W. HAGUE HARRINGTON, OTTAWA, ONT.

It is to the Hymenoptera that the student must look for the most varied and interesting phases of insect life. Here he finds numerous avocations conducted with much intelligence, and in many families sees strong social instincts developed. It is not, however, of these latter that I intend now to speak, but of a few solitary ones. Even those just entered upon the study of insect life must be fully aware of the continual destruction of our fruit and timber trees, both alive and in process of manufacture, by the boring, wood-eating larvæ of various insects. The loss thus annually inflicted is not uncommonly set down as due to the obnoxious habits of Coleopterous larvæ entirely, but a not inconsiderable part of it is due to similar tastes on the part of insects belonging to other orders. Such are found even among the Lepidoptera, one species of which—*Cossus Robinia*—bores half-inch tunnels into the trunks of living oaks, with such deadly effects that Dr. Fitch has stated that: "Of all the wood-boring insects in our land this is by far the most pernicious, wounding the trees most cruelly." In the Neuroptera need only be mentioned the universally renowned *Termites* or "white ants." So among the Hymenoptera are found the common wood ants, constructing elaborate tunnels and galleries. I have selected for the subject of the present paper the *Uroceridæ*, a family in the above order, the members of which in the larval state have tastes and habits in common with the young of our Capricorn beetles. They are stated "to abound in temperate climates where forests of pines and firs prevail." Their popular name—"Horntails"—is derived from a sharp horny point at the end of the body, varying in shape with the different species. These insects bear a considerable resemblance to wasps, and the females carry a formidable-looking boring apparatus, which is often mistaken for a sting, but which at most is only capable of pricking the skin, and discharges no poison, so that they may be handled fearlessly. The possession by the females of this "augur," "borer" or "piercer," has caused much dispute as to the life history of the Horntails and led to their being classed by early writers among the ichneumons.



Reaumur (writing before the middle of the last century), in publishing the results of his investigations on the ichneumons, divided these flies into two classes, according to the position of the *tarriere*, or augur, of the female. The first class comprised the true ichneumon flies, but the second consisted of those now included in the family *Uroceridae*. He says: "The females of the ichneumons placed in the second class have also, like the others, an augur, but they carry it applied against the under side of the body; ordinarily its end does not project, or projects but little, beyond that of the body; it is lodged in a sheath made of two pieces hollowed like a gutter, and adheres to the body for the first half, and sometimes for more than the half of its length." He regarded them "all as flesh-eaters when they are in the form of worms," adding, "if, however, any fly resembling an ichneumon is found which in the grub form does not feed upon some other insect, it can still be regarded as an ichneumon, but would have to be excepted from the general rule." The old fallacy that exceptions prove the rule has not been fulfilled in respect to these so-called ichneumons, and they have long since been divested of this title. In describing a large species received by him from a traveller in Lapland as one of the largest he had seen, he expresses much astonishment that such a cold country should furnish a larger species than the mild climate of France, because from warm countries, especially from tropical ones, came the largest insects known. The species in question was *Sirex gigas*, which much resembles in size and coloring our large Pigeon Tremex hereafter described. A few years later, De Geer (a Swede) published a valuable series of *Memoires*, confirming and supplementing those of Reaumur. One of these treats of ichneumons, which are divided into nine classes, according to the shape of the abdomen and the manner of its attachment to the thorax. The first class comprised: "The ichneumons of which the antennæ are conical threads, or diminish little by little in size toward the tip, ending in a fine point; of which the body is not attached to the thorax by a thread, but toward the base is of the same or nearly the same size as the thorax, and terminates in a horny, elongated point in the form of a short tail. This tail must not be confounded with the augur and its sheath; it is only a prolongation of the body. The large ichneumon which M. de Maupertuis brought from Lapland and gave to M. de Reaumur, is of this class." This observant naturalist calls attention to the curious mechanism on the hinder wing of these insects, by which the wings, when extended, are so connected as to form a single surface, thus sustaining a more

powerful flight than if they moved separately. The junction is  $\epsilon_1 \cdot 7_{11}$  by means of a number of minute hooks on the front edge of the wing, which grasp the nervure or vein on the edge of the fore wing. These hooks can be easily seen with a microscope of even low power, and form a very interesting object. On a wing of *Urocerus albicornis* which I have just examined there are thirty-eight of these hooks, giving the edge of the wing the appearance, on a very small scale, of one of those horse-rakes with curved teeth. De Geer informs us that he counted "more than forty upon each hinder wing of a large ichneumon of the first class. Their extremity is not pointed, it is rounded and as large as all the rest. They are implanted in the nervure by which the wing is bordered," and he adds: "I do not recall that M. de Reaumur nor any other author has made mention of this property of the wings." He then proceeds to describe some remarkable ichneumons of which the places of birth were unknown, beginning with a "grand ichneumon of which the abdomen, ending in a pointed tail, is not held to the thorax by a thread; of which the thorax is black, the body half black and half yellow, and the antennæ and legs yellow." Of this insect—*Sirex gigas*—already mentioned by Reaumur, a detailed account is given, both of the male and female. It is styled peculiar to the northern countries, and one of the largest, if not the largest species found in Europe. It is to be seen flying in full day, noisily humming like the hornets and bees, and agitating continually its wings and antennæ like all ichneumons, of which this last feature is characteristic. "I do not know their grubs, nor the place where they live, but the long augur of the female is enough to show that they should lay their eggs in other bodies, like other ichneumons. *It would be curious to know all their history. Linnaeus is mistaken in placing them in the family of the Saw-flies (Tenthredines).*" Yet these insects, whether we consider the shape of their bodies, the formation of the female appendages, or the shape and habits of their grubs, appear much less removed from the Saw-flies than the ichneumons, or in other words, to occupy an intermediate place between these groups. We know that in the Saw-flies the females are provided with a complex instrument for cutting slits in which to deposit their eggs. This instrument consists of six parts, two of which form a sheath for the rest. Of these, two resemble very fine blades, notched on the edge like a saw, and strengthened when in use by the remaining two acting as backs. The saws, when not employed, are enclosed in the sheath and received in a groove on the under side of the abdomen, so as

to be not easily seen. In the *Uroceridæ* this complex instrument, modified to form a borer, is much larger, projecting generally beyond the body and easily examined. There are still the hollowed pieces which when closed form the scabbard, but the parts which were seen acting as backs to steady the saws, are now joined or welded together into a cylinder, within which are placed two spiculæ or needles corresponding to the original saws. These needles, as fine as bristles, are worked by independent muscles, and can thus be protruded a little beyond the end of the borer, acting like small drills. In the true ichneumons this apparatus is still further modified, and in some species attains a great length. If the piercer of a Horn-tail be extracted from its scabbard and the tip felt with the finger, it will be found appreciably roughened, and even the naked eye shows it to be ridged. Under the glass it has much the appearance of a diminutive augur. The tapering end is notched at close intervals, while on each side the dividing line which runs along the under side of the cylinder are short ridges placed diagonally to the line and forming triangles, with the apex toward the end of the instrument. Early investigators, as has been shown, were unacquainted with the larvæ of the *Uroceridæ* and concluded them to be insectivorous, and as late as the time of Westwood this view still had adherents. Reliable observations have long since proved them to be wood-eaters, and have established the fact that the borer of the female fly is used not for depositing eggs in other insects, but for drilling holes in wood in which to place them. It is not only in soft wood that these holes are bored, for I have seen the insects at work on such tough trees as elm, oak and beech, both living and dead. The fly stands up upon its long legs so that its body is kept well out from the wood; the borer is then bent down so as to be at right angles to the body of the insect, and perpendicular to the surface to be pierced. The end is then inserted by pressure accompanied by a movement of the body from side to side, and by such awl-like motions the holes are pierced sometimes to the depth of half an inch or more. Often the insect is unable to withdraw the augur, so firmly has it been worked in, and I have found many dead ones which had thus perished in the discharge of their duty, that of continuing their species. The grubs hatched from the eggs thus laboriously deposited are fleshy and cylindrical, with rounded, horny heads and very strong jaws capable of cutting deeply into the trees infested by them. Indeed, apparently well authenticated instances are recorded of their having perforated lead to some depth, a feat which

several other species of insects have also been credited with. The duration of their life as larvæ has not yet been ascertained, but when full grown they transform within their burrows in a light cocoon composed of silk and sawdust. The perfect insects are generally clad in liveries composed of black, blue-black, white and different shades of yellow, and a description of the largest and most frequently observed of the few species inhabiting Canada will give a good idea of the others. It has received the name of *Tremex columba*, or the Pigeon Tremex, the latter word meaning a maker of holes. Under the name of *Sirex columba* (given by Linnaeus) this insect was figured and described by De Geer as much resembling *Sirex gigas*, except that it was smaller, being only one inch long, while the other was an inch and two lines. But his must have been an under-sized specimen, for I have found their ordinary length to be one and a quarter inches, while some attain to over an inch and a half. The cylindrical body of the female is long and stout, the extremity being rounded and terminated by the usual short tail, which is yellow; the body itself is black with transverse bands (several broken) of yellow. The head, thorax and antennæ are rust-yellow, with black markings; the legs a light ochre-yellow with blackish thighs. The borer is black and its sheath rust-yellow. The smoky wings expand about two inches. The male is very much smaller and of different shape, the abdomen being more flattened, while as it is without any borer, it might easily be mistaken for another species of insect.

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#### CORRESPONDENCE.

We are pained to announce the death of one of our active members in the Worcester Natural History Society, Otto R. Gunther, who died suddenly, Feb'y 27, of hemorrhage, at the age of 23. He was interested in many branches of Natural History, particularly that of Entomology, of which department he was Curator. Born of German parents, and inheriting from his father a love for study, and especially the study of Entomology, he had for several years past devoted his leisure hours, both early and late, in this direction. His attention was chiefly directed to Coleoptera, and by his industry in collecting, together with his many exchanges, he has left a valuable collection of well-determined species. He was a congenial companion, exemplary, thorough and systematic in his favorite study, giving promise, if he had lived, of being a prominent co-worker in this branch of science.

T. A. D., Worcester, Mass.

## NOTES FROM WOLLASTON, MASS.

DEAR SIR,—

During the season of 1878 I have found at this place, situated within two miles of the limits of Boston, some species of butterflies which are seldom found in this vicinity. On the 8th of October I obtained a nice specimen of *C. eurytheme*, which had probably left the chrysalis but a short time before. It was flying in a meadow in company with great numbers of *C. philodice*. The orange-colored tinge of the wings is lighter than on specimens taken farther south. If I am rightly informed, this is the first instance of the capture of this species in this vicinity. On the 29th of June a specimen of *L. arthemis* was taken, and another July 3rd; both specimens had just emerged from the chrysalis. The larvæ evidently fed on the *Quercus alba*, which was very abundant in that locality. A number of specimens of *F. cœnia* have been taken here within the last three years, in the month of August or early in September. *Cœnia* seems to be rather widely distributed through Massachusetts, and though quite rare, I have found it more common in this vicinity than elsewhere. This species seems to prefer meadows and lowlands to higher ground, and is quite fond of the flowers of the Golden-rod.

F. H. SPRAGUE, Wollaston, Mass.

DEAR SIR,—

In answer to numerous enquiries and a letter in No. 3, all in reference to my letter in No. 2, page 39, regarding the Larvæ of a Cossus, allow me to state that I did not write that letter with a view to publication, but have since corresponded freely with some good authorities on the subject, and am quite sure this Cossus is a new one, much larger than *centerensis* or *robinia*. I also learned that the rearing of Cossus in dead wood is likely not to be crowned with success; they require living wood in which sap rises, etc. I have since obtained Cossus larvæ of large size in willow saplings; these I have now growing in large flower-pots, and am likely to be successful with them. I have also found five more trees close to my place of business, literally perforated with this Poplar Cossus. I have also made accurate drawings of this larva and sent them to Dr. Bailey, of Albany, and in due time further articles will appear, likely with illustrations, on the Cossus generally, by his able pen.

A. H. MUNDT, Fairbury, Ill.