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GEOMETRID NOTES.

REVISION OF THE GENUS HYDRIOMENA HUB. GROUP WITH MODERATE PALPI.

BY L. W. SWETT, BOSTON, MASS.

8. *Hydriomena autumnalis* Ström (Det. Kgl. Danske Vid. Skrift. Selsk., p. 85, 1783). Palpi moderate.

We have generally regarded as typical *autumnalis* a grayish form with clear mesial space and slate-coloured bands, bordered with olive. It occurs in June and July in both Europe and America, but there is a May brood which we do not commonly get here. We imagine our species to be the same as the one that is found in Europe, but do we really know the form that Ström described as *autumnalis*? It seems strange that a geometrid occurring only in the early summer should be called *autumnalis*. This same doubt seemed to arise in the mind of a German specialist, for Hoyningen-Heune, in the Berl. Ent. Zeit., Vol. 51, p. 254, 1906, discusses this question, and pleads for the name *trifasciata* Bockhausen for this form. He claims it answers Bockhausen's description better than Ström's, which seemed to him to apply to some unknown or unrecognizable species, possibly *Larentia autumnalis* Bockhausen. Perhaps he is correct, but it would be hard to prove, as Ström might have called it *autumnalis* from his having found the larvæ in the fall or for various other reasons. Since nearly every collector recognizes it by the older name, *autumnalis*, and it is difficult to prove otherwise, I think it better to retain this name. The form found in America is very close to the European in colour and markings, but there are slight differences which, should the genitalia prove different, would refer it to *pluviata* Guenée (Phal., II, p. 378, No. 1505, 1857). Guenée states that the American form has more pointed fore wings, the lines are not so close together, and those bordering the mesial band are more oblique and that the median space is larger. He mentions having a specimen with the mesial space shaded with pink, and to this

form I have given the varietal name *perfracta* (CAN. ENT., XLII, p. 279, 1910). The differences that Guenée points out seem pretty constant, but the enlarged central band does not hold, as he has every variation of it among European specimens. The pointed wings and green or gray ground colour with slate-coloured bands seem to be rather distinctive of the American form; also the basal band is apt to be thicker and the first mesial more pronounced, but I think a careful study of the genitalia with extensive breeding will be necessary before we can be sure. However, I feel that the American form will at least prove to be a good variety of the European, and it might be well later to adopt the name *pluviata*. The uncus in *Hydriomena autumnalis* is very peculiar, being forked while it is spatulate with a tendency to fork in *furcata* Thmb.

Hydriomena autumnalis, *trifasciata* or *pluviata* Gn., if our form proves distinct from the European, is more common in the Atlantic States than the Pacific. In Europe it seems to vary less in colour than here, though the bands are variable in width and the specimens in size. There is more tendency to melanism in the European specimens, but I have some from Saskatchewan, from Mr. A. J. Croker, that are as dark as those from Norway.

H. autumnalis Ström appears to be more common in Maine than Massachusetts, as my friend Mr. Frost took a very large number one day in a cedar swamp at Monmouth, and Mr. Emerton even took a specimen on the summit of Mt. Kataadn. In Europe it is said to feed on alder and willow, but the American food plant has not been recorded to my knowledge. The palpi of the European and American forms are all moderately long and do not vary. My kind friend, Mr. Chagnon, of Montreal, is working on the genitalis, and I hope to publish some notes on his results later. There is an excellent figure of *pluviata* or *autumnalis* in Packard's Monograph, Pl. VIII, fig. 29, which is typical of eastern specimens and of certain of the European specimens in markings, but not wholly in colour. The venation is shown in the Monograph, Pl. I, fig. 6.

Taking *autumnalis* as a whole, it is far less variable in markings than *furcata* or *quinquefasciata*, but is about the same in regard to colour variation. It is very easy to separate the species with moderate palpi, as there are fewer closely-allied forms, the only difficult one being *californiata* Pack., which is liable to be confounded with var. *perfracta* of *autumnalis*. Nearly all the collections I have seen contain *autumnalis*, so I do not think it can be rare in any particular locality in the North Atlantic States.

Var. (a) *perfracta* Swett (CAN. ENT., XLII, p. 279, 1910).

This looks like the normal *autumnalis*, only the mesial space is suffused with a deep pink and the course of the basal line is different. This variety was referred to without name by Guérèe (Phal., Vol. 2, p. 398, 1855, 1857) under *pluviata*. It approaches superficially *H. californiata*, but I have pointed out the differences in the description. The variety seems to be very rare. It was taken in the Catskills by Mr. R. F. Pearsall. There are no other records of it to my knowledge.

Var. (b) *crokeri* Swett (CAN. ENT., XLII, p. 278, 1910).

This variety occurs in the Northwest, most commonly around Victoria. The green shadings of the typical form are replaced by yellow in the variety, and it has an intensely black median irregular band, instead of being of the usual slate colour. It is a very striking and distinct form; there is nothing approaching it among the European varieties.

Var. (c) *columbiata* Taylor (CAN. ENT., XXXVIII, p. 399, 1906).

I have a photograph of the type, kindly sent me by the Rev. G. W. Taylor for comparison, and it approaches the European var. *constricta* Strand very closely, but it lacks the cinereous ground colour, and I think it will remain in good standing. It may be known by the narrow mesial area, shaded with dark where the typical form species is white. The intradiscal band near the inner margin lacks the long-toothed projection of *crokeri*, and the hind wings are light ash with two bands beyond the discal spot. It is also distinguished by the larger size and greenish ground colour.

Var. (d) *constricta* Strand (Ent. Zeit., Gub. XIV, p. 61, 1906) also Berl. Ent. Zeit., Vol. 51, p. 254-257, 1906, and Ach. Naturv. Christiania, XXII, No. 5).

This is a peculiar cinereous form, in which the mesial white space is suffused with smutty striations, giving the whole a rather smoky appearance, approaching melanism. The blue irregular median band is very faint and the lines are all hardly discernible. The variety can best be separated by the dark narrow central space and dark hind wings with prominent discal spots and two extradiscal bands. I have examples from Norway, Germany and North America, the latter being represented by a ♂ and a ♀ from Forest Hills, Mass. (June 20, 1911), and Monmouth, Maine (June 25, 1903), which agree with the European specimens. I have

also seen it from Redvers, Sask., through Mr. Croker. It is not so rare in Europe as in North America, where I have only seen four examples. I have a specimen from England, through Mr. L. B. Prout, which approaches the variety, but it is more suffused and is almost unicolorous.

Var. (e) *nigrescens* Hoyningen-Heune (Berl. Ent. Zeit., 51, p. 254, 1906).

This variety is almost unicolorous, and has the white mesial space entirely suffused with cinereous, giving the wings a dusty appearance. The markings are very indistinct, and the whole insect has a smoky aspect. I have specimens from Berlin, Germany; Southport, England, and have seen a specimen from Redvers, Sask., through Mr. Croker.

These are all the varieties, so far, that have turned up, and are easily distinguished from the normal form by their colour. Walker described in 1860 (Cat. Brit. Mus., XXI, 489) *Boarmia divisaria*, which has been stated to be a synonym of *autumnalis* in Dyar's List, but the description does not seem to apply, and I doubt the reference. The type is in the D'Urban collection. Walker also described *renunciata* (Cat. Brit. Mus., XXIV, 1187, 1862), from Hudson Bay, and *frigidata* (Cat. Brit. Mus., XXVI, 1729, 1862), from Nova Scotia, which are synonyms of *autumnalis* in all probability, as Packard states in his notes on the North American Moths of the family Phalænidæ in the British Museum (5th Rep. Peabody Acad., p. 88, 1873), that they are our common *pluviata*.

9. *Hydriomena transfigurata* Swett (CAN. ENT., XLIV, p. 195, 1912).

This is a pointed-wing species and closely resembles *irata* Swett in markings, though the antennæ of the latter will quickly separate it. It does not resemble *autumnalis* greatly, but I have generally found it mixed with the latter in collections. *H. transfigurata* can be readily separated by the time of appearance (early May), the tendency of intra- and extra-discal lines to unite near the inner margin, the dark hind wings and the distance of the extradiscal line from the outer margin in fore wings; also the faint median and marginal bands which are prominent in all other species. I should say this species is confined to the Atlantic States, and has occurred more commonly in the last two years than ever before. There is no form like it in Europe so far as I have seen, and it is not very common here, the only localities being Forest Hills and Cohasset, Mass., and New Brighton, Pa.

10. *Hydriomena californiata* Pack. (Proc. Bost. Soc. Nat. Hist., XIII, 396, 1871).

This was a very puzzling species to me for some time, until I received a specimen from Rev. G. W. Taylor like the one I had determined as *californiata*. We had both come to the same conclusion independently, and were the first, I believe, to determine *californiata* correctly. Packard did not understand *californiata* clearly, as he merged all sorts of forms under that name later, but the figure (pl. VIII, fig. 30) is excellent, and leaves no doubt as to the species. The type is not in the collection at Cambridge, and must have been returned to the sender by Packard; it was probably from Jas. Behrens. This species occurs in late July, and bears a slight resemblance to var. *perfracta* Swett, but is only found on the Pacific Coast to my knowledge.

11.—*Hydriomena lanavahrata* Strecker (Lep. Rhop. Het. Suppl., 2, 11, 1899).

According to Dr. Dyar, this is a variety of *californiata*, but I do not feel sure he knows *californiata* correctly, and until I can verify his assertion I think it better to let matters stand as they are. The locality would seem good for varieties, for the vicinity of Berkeley seems to be their Mecca. I have nothing in my collection that answers to the description, though Strecker does not give the essential points for differentiating *Hydriomenas*.

12. *Hydriomena glenwoodata* Swett (CAN. ENT., XLI, p. 231, 1909).

This is a peculiar, small, slender species with the slate-gray irregular line, *s* curved. The mesial space is somewhat suffused with dark atoms, and the whole insect is somewhat suffused with cinereous. It resembles slightly var. *nigrescens* of *autumnalis*. The palpi are very slender and a little longer than normal. I have never seen it from anywhere but the Rocky Mts., my type being from Pike's Peak, 8,000 to 10,000 ft. elevation.

13. *Hydriomena magnificata* Taylor (Ent. News, XVII, No. 6, 1906).

This resembles *sbeciosata* somewhat, differing in the moderate palpi. The description is clear, and the species cannot be confounded with any other.

This completes all the species and varieties known to date of the group with moderate palpi.

GROUP WITH MODERATE PALPI.

- | | | |
|---|---|--|
| 8. <i>Hyd. autumnalis</i> Ström
or <i>pluviata</i> Gn. | { | White mesial space, olive shadings,
slate-coloured bands. |
| Var. (a) <i>perfracta</i> Swett. | { | (a) White mesial space suffused
with pink. |
| Var. (b) <i>crokeri</i> Swett. | { | (b) Green ground colour replaced
with yellow, black bands. |
| Var. (c) <i>columbiata</i> Taylor. | { | (c) As typical, mesial space suffused
with cinereous and narrow, very
large size. |
| Var. (d) <i>constricta</i> Strand. | { | (d) Mesial lines smutty, lines in-
distinct. |
| Var. (e) <i>nigrescens</i> Hoyn.-Hewne. | { | (e) Unicolorous; smutty suffused. |
| 9. <i>Hyd. transfigurata</i> Swett. | { | Green ground colour, tendency of
extra- and intradiscal lines to join
near inner margin. |
| 10. <i>Hyd. californiata</i> Pack. | { | Red shadings to lines and mesial
space. |
| 11. <i>Hyd. lanavahrata</i> Streck. | { | Said to be var. of <i>californiata</i> . |
| 12. <i>Hyd. glenwoodata</i> Swett. | { | Long-winged slender species with
s-shaped intradiscal line. |
| 13. <i>Hyd. magnificata</i> Taylor. | { | Black and green. |

I wish to thank Mr. A. F. Winn and Mr. G. Chagnon for the loan of specimens, and the latter for his help on the genitalia, on which we hope to publish something later. I append a few of the more important references to *Hyd. autumnalis* and its varieties:

1783. *autumnalis* Ström, Kgl. dansk. Vid. Selsk. Skr., p. 85.
 1776. " Dennis & Schiff, Syst. Verz. Wien, 109, 5 (not described).
 1786. *autumnalis* Sepp., II, pl. 5, figs. 1-8.
 1794. *trifasciata* Bork., Eur. Schmett., V, p. 308, No. 141.
 1797. *impluviata* Hüb., Eur. Schmett., 223 (post 1797).
 1810. " Haw., Lepid. Brit, part 2, p. 321.
 1822. " Hüb., Verz. Schmett., 322, 3, p. 106.
 1828. " Treits., Schmett. Europa, VI, part 2, p. 21.
 1829. " Stephens, Nomenc. Brit. Ins., p. 44.
 1830. " Dupon., Lep. France, V, p. 424, pl. 200, fig. 3.
 1831. " Stephens, Ill. Brit. Haust., III, p. 254.

1839. *impluviata* Wood, Lep. Ins. of Great Brit., p. 610.
 1840. " Boisds., Index Method, 1767, p. 214.
 1847. " H.-S., Syst. Bearb. Schmett. Eur., III, p. 168,
 pl. 31, fig. 193.
 1850. *impluviata* Stephens, Cat. Brit. Lep., p. 195.
 1853. " La Harpe, Schmett., p. 295.
 1857. " Verz. Wien., p. 109, K. 5.
 1857. " Gn., Phal., II, p. 377, 1504.
 1857. *fluviata* Gn., Phal., II, p. 378, 1505.
 1860. (*divisaria*)? Walk., List Lep. Brit. Mus., XXI, p. 489.
 1862. *renunciata* Walk., List Lep. Brit. Mus., XXIV, p. 1187.
 1862. *impluviata* Walk., List Lep. Brit. Mus., XXIV, p. 1267.
 1862. *fluviata* Walk., List Lep. Brit. Mus., XXIV, p. 1268.
 1862. *frigidata* Walk., List Lep. Brit. Mus., XXVI, p. 1729.
 1876. *trifasciata* Pack., Monog. Geom., p. 91, pl. VIII, fig. 29.
 1889. *trifasciata* Zieg., B. E. Z., XXXIII, p. 7, S. B.
 1895. *autumnalis* Hulst, Ent. News, XI, p. 43.
 1904. *autumnalis* Dyar, List Koot. Dist., Proc. U. S. Nat. Mus.,
 XXVII, p. 899.
 1904. *autumnalis* Petersen, Mem. Ac. St. Petersburg., XVI, p. 73.
 1906. *constricta* Strand, Ach. Naturv. Christ., XXII, No. 5.
 1906. *nigrescens* Hoyn.-Heune, Berl. Ent. Zeit., LI, p. 254.
 1906. *constricta* Strand, Ent. Zeit., Gub. XIV, p. 61.
 1906. *columbiata* Taylor, CAN. ENT., XXXVIII, p. 399.
 1906. *autumnalis* Hoyn.-Heune, Berl. Ent. Zeit., LI, p. 254.
 1907. " Gatnar, Wien. Jahr. Berl. Ent. Ver., 18, p. 37-42.
 1910. " Dyar, Harriman Alaska Exped., p. 222.
 1910. *perfracta* Swett, CAN. ENT., XLII, No. 8, p. 279.
 1910. *crokeri* Swett, CAN. ENT., XLII, No. 8, p. 278.

BATS VS. MOSQUITOES.

We have received the following interesting letter from Dr L. O. Howard, Chief of the U. S. Bureau of Entomology, who has kindly given us permission to publish it:

STATE BOARD OF HEALTH OF FLORIDA

Jacksonville, Fla., June 26, 1912.

Dr. L. O. Howard, Chief of Bureau of Entomology, Washington, D. C.

Dear Doctor,—I thank you very much for your favour of the 24th. I had looked askant at the idea of bats reducing the number of mosquitoes

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appreciably. Some twenty years ago, perhaps longer, at Tavares, Fla., a development company undertook to build a winter resort. Tavares was at the time a small municipality with perhaps two or three hundred inhabitants located among the lakes in the southern part of the State.

Among the earlier efforts at developments an opera house was constructed, but owing to the freeze of 1895 it was never completed. The municipality never grew to amount to anything; in fact, I think the number of inhabitants now is what it was about then. The doors and windows of the lower floor of this opera house were securely fastened up to keep intruders out, but the upper windows were only closed by loose boards, which soon dropped out, making it easily accessible to bats. They took advantage of it and in the course of a few years were there in countless thousands. I know of no way of estimating the number, but you may get some idea of it from the fact that the only time I was ever there at the right hour was on a trip to Eustis. The train stopped at Tavares one half-hour before sunset, and remained there something like forty-five minutes. I took advantage of the occasion to see the bats emerge from the building. I had only been watching a few minutes when they began, first a single one, then two or three together, and as if the rustle started them, then they began seriously flying out of the window with incredible swiftness. There must have been at least half a hundred a second. I watched this stream of bats pouring out for half an hour or so, and was told by some of the residents of Tavares that it would continue until something like half an hour after dark, making probably two hours altogether.

It was on this trip, now seven years ago, that I was making some mosquito observations, and I have to confess that I have never seen more mosquitoes in the interior of the State, than I saw at that time.

Some two years ago the opera house in question was cleaned out and converted into a packing house. I have since made inquiry of the citizens in the vicinity of Tavares and Eustis, as to whether they have experienced any appreciable difference in the number of mosquitoes now, and when the bat roost was at its height, and am convinced that the difference, to say the least, is not such as to cause one to notice it.

Again thanking you for your information, I am, very truly and cordially yours,

(Signed)

HIRAM BYRD.

SOME NEW SPECIES OF DELPHACIDÆ.*

BY C. S. SPOONER, GEORGIA STATE BOARD OF ENTOMOLOGY.

The following species were, with one exception, taken by the author during the past five years. In the genus *Pissonotus* they form a very considerable addition to the list of our species.

My thanks are due to Professor A. D. MacGillivray of the University of Illinois for going over the manuscript and for valuable help and suggestions. I also wish to thank Professor J. Chester Bradley of Cornell University for the loan and exchange of specimens and Mr. C. P. Alexander also of Cornell University, for the gift of specimens of several desirable species.

The author has planned an extensive study of the Delphacidæ and would be grateful for the loan or exchange of material. He will gladly name specimens for the privilege of retaining desirable duplicates.

Pissonotus guttatus, n. sp.

Brachypterous ♀.—Eyes oval, deeply indented below to receive the antennæ, colour grey; vertex considerably longer than wide, slightly rounded in front, projecting slightly before the eyes; carinæ of the vertex all present, rather indistinct; vertex uniformly black except the caudolateral angles which are slightly yellowish. Carinæ meeting on the front just below the curve of the vertex, extending distinctly from this point throughout the length of the front, indistinct on the vertex; front considerably constricted between the eyes, deep pitchy black above, becoming gradually lighter until it is white at the base; clypeo-frontal suture curved, the clypeus deep uniform black with the median carina distinct; the black colour of the clypeus extends as a band across the anterior coxæ as is characteristic of the genus.

The second segment of the antennæ about one-fourth as long again as the first, with a few protuberances; antennæ uniform pale honey-yellow.

The length of the prothorax from the anterior to the caudal margins about equal to that of the vertex; caudal margin slightly concave, carinæ distinct; anterior portion deep, shiny black; narrow band on posterior margin dirty white.

Legs normal, pale honey-yellow except tips of the tarsi which are black and two slender brown lines on the outer sides of the tibiæ.

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Scutellum triangular, sides very slightly arcuate ; median carina distinct ; lateral carina inconspicuous, reaching the posterior margin ; colour uniform honey-yellow.

Elytra short, extending to the middle of the first abdominal segment, coriaceous, highly polished, veins almost obliterated ; colour pale honey-yellow with an oval blotch of white in the centre of the apical margin ; abdomen honey-yellow but slightly darker than the scutellum and elytra.

Genitalia uniform honey-yellow, paler than the tergum ; pygofers tapering to a rounded point ; plates extending about one-third the length of the pygofers ; anal style white. Length 3.5 mm.

Described from a single female taken at Ithaca, N. Y., Aug. 1st, 1896. Type in collection of Cornell University.

Very close to *P. delicatus* Van Duzee but easily separable from it by the black front, vertex and prothorax. The prothorax lacks the foveæ so conspicuous in *delicatus* and the shape of the front is quite different.

Pissonotus foveatus n. sp.

Brachypterous ♀.—A fairly large species, form long, oval. Vertex slightly rounded in front ; eyes oval, deeply indented below to receive the antennæ ; colour gray, irregularly mottled with black ; vertex slightly longer than wide, slightly wider behind the eyes than before ; fully carinated ; carinæ sharp, except the posterior median, which tends to fade out posteriorly ; the anterior median carina forked just below the apex of the head ; colour of the vertex yellowish white, with a pair of dark brown foveæ just posterior to the forking of the anterior median carina, one on either side of the carina, and another pair similarly situated, but slightly farther caudad ; there is a yellowish fovea located in each posterior lateral angle of the vertex.

Front with sides slightly convex ; median carina sharp throughout ; colour yellowish white marked with brown. These markings vary somewhat, but may in general be described as follows : According to colour, the front may be divided into four regions ; first, just under the vertex a darker area in which may be found two deep brown lines extending across the median carina ; these lines extend to the edge of the front ; the second area is light, and the only markings on it are a pair of brown dots on each side at the outer margin ; this pale area is about equal in width to the first area. Covering about two-thirds of the remainder of the front is the third area, dark and marked like the first area, except that it is darker and less distinctly marked ; in some specimens it is scarcely more than a

dark brown band. The remainder of the front, comprising the fourth area, is yellowish white devoid of markings.

Clypeu; uniformly black, with the median carina distinct; the black colour extending in a band across the anterior coxæ as is typical of the genus.

Second segment of the antennæ about one-fourth as long again as the basal segment; basal segment and basal half of the second segment yellowish white; distal half of the second segment deep brown.

Prothorax shorter than head, caudal edge concave; the carinæ distinct; a fovea on each side of the median carina, midway to the lateral carinæ and slightly nearer the cephalic than the caudal margin; colour yellowish white, with varied dark brown spots and blotches on the caudal margin; legs yellowish, with a brown band across the proximal portion of the tibiæ.

Scutellum triangular, sides very distinctly arcuate, carinæ distinct, the lateral carinæ extending to the caudal margin; a brownish fovea on each side of each lateral carina, about midway between the cephalic and caudal margins; colour yellowish brown.

Elytra short, extending slightly beyond the middle of the second abdominal segment, coriaceous, polished, veins indistinct; colour greyish white, irregularly spotted with brown.

First, second and third abdominal segments with the dorsum yellowish brown, with a few brown dots; fourth, fifth and sixth segments with their median portions yellowish brown and their lateral portions deep brown.

Genitalia reddish-brown, pygofers tapering to a blunt point, plates extending about one-third the length of the pygofers, light yellow, tip of the ovipositor much lighter brown, style yellow. Length, 3.25 mm.

Brachypterous ♂.—Smaller; form and markings about as in female, with not quite so much brown.

Genitalia, opening of the pygofers rather narrow, oval; superior wall of the anal tube prolonged into two incurving tusks, the points of which rest upon two large pointed projections extending inward from the inferior wall of the pygofers; colour yellow, except the ends of the tusks and the points of the projections, which are reddish brown. Length, 2.5 mm.

This species was taken quite abundantly on a species of *Compositæ* by the author at Corpus Christi, Texas. Types, taken May 19, 1907, in the author's collection.

Pissonotus variegatus, n. sp.

Macropterous ♀.—Form and size of *P. pallipes*. Head rounded in

front; eyes large and oval, slightly indented below to receive the antennæ; colour yellowish around the edge, black in the centre; vertex about one-third again as long as broad, projecting slightly beyond the eyes, quite strongly rounded in front, in which it differs from *pallipes* where it is nearly straight; the posterior carina wanting, other carinæ sharp and distinct; colour light yellow, except outside the anterior median carinæ, where it is marked by two brown dots on each side.

Front slightly wider below the eyes than between them; median carina distinct throughout the length of the front, forked just below the vertex; colour, anterior two-thirds yellow, much mottled with brown, posterior third pure light yellow; clypeus uniformly black, with the median carina distinct, the black band continuing across the anterior coxæ.

First and second antennal segments subequal, proximal segment and proximal half of the second segment yellow, distal half of the second segment reddish brown, roughened by numerous protuberances.

Prothorax equal in depth to the head, posterior edge concave, almost angled at the centre; carinæ all distinct, lateral ones reaching caudal margin of the prothorax, quite widely divergent; colour brown, marked with yellow, especially in the centre; legs yellow, with a brown band around the distal end of the femora and proximal end of the tibiæ; tips of the tarsi black.

Scutellum triangular with the sides very much arcuate, apex rounded, scutellum about twice as deep as the prothorax; carinæ distinct, reaching to the caudal margin; colour brown with yellow markings. One-fourth of the elytra extending beyond the tip of the abdomen; milky in colour with brown dots along the veins. Genitalia dark brown; pygofer bluntly pointed, plates dark yellow, extending over one-third the length of the pygofer, very much curved; style white. Length, including elytra, 3.5 mm.

Described from a single female taken by the author at Corpus Christi, Texas, June 19, 1907. Type in the author's collection.

Pissonotus divaricatus, n. sp.

Macropterous ♀.—Form and general appearance of *P. basalis*, although not quite so large and heavy an insect; eyes oval, not deeply emarginate below to receive the antennæ.

Vertex a little longer than wide, sides nearly straight, very slightly wider in front of the eyes than behind them; all the carinæ distinct, posterior

foveæ fairly deep ; colour reddish brown with the carinæ and margins light yellowish brown.

Front about twice as long as wide, sides very slightly arcuate, widest a little below the eyes ; clypeo-frontal suture slightly curved, median carina distinct, forked just below the apex of the head ; colour uniform reddish brown except a narrow strip along the clypeo-frontal suture, which is light yellow.

Clypeus uniformly black with the median carina fairly distinct.

Second segment of the antennæ a little more than twice as long as the first segment, second segment roughened by tubercles, proximal segment black, second segment yellowish brown.

Prothorax not quite so deep as the vertex, carinæ distinct, the lateral carinæ quite widely divergent, fading out just before the posterior margin, posterior margin distinctly concave ; colour reddish brown, except the narrow posterior edge, which is almost white.

Coxæ light yellow ; femora and most of the tibiæ reddish brown, tips of the tibiæ and the first two tarsal segments very light yellow, last tarsal segment dark brown, spur almost white with large, prominent, black serrations.

Scutellum almost twice as deep as the prothorax, sides very decidedly arcuate, tip a rounded point, carinæ all distinct, lateral carinæ reaching the posterior margin of the scutellum and curving outward ; colour dark brown, except the tip, which is light yellow, almost white.

Elytra extending one-third their length beyond the tip of the abdomen, veins brown, membrane smoky ; abdomen uniformly dark brown.

Genitalia : Pygofer \bar{s} ending in a blunt point, reddish brown, ovipositor reddish brown at the tip, lighter at the base, plates dark within, lighter on the free edge, apex very gradually curved, extending about one-third the length of the pygofer \bar{s} , style light yellow. Length, including elytra, 3 mm.

Macropterous $\bar{\sigma}$.—Same form, size and general characters as the female. Genitalia : Opening of the pygofer \bar{s} broad oval, superior wall of anal tube prolonged into long, incurving, tusk-like horns, the points resting in indentations of the inferior wall of pygofer \bar{s} , styles large hook like organs with the hooks pointing outward ; colour dark reddish brown.

Described from a pair taken by the author at Middletown, N. Y., July 12, 1910. Two females of this species were taken at the same locality on July 11 and 18, 1910. Types in the author's collection.

Pissonotus piceus, n. sp.

Brachypterous ♀.—A small species slightly smaller than *P. brunneus* and not so stout. Head short, very slightly curved in front. Eyes slightly indented below to receive the antennæ; colour light gray around margins, black in the centre; vertex about as deep as wide in front, sides curving between the eyes, narrower behind the eyes than before; all the carinæ present, but all rather weak, fovæ not very deep; colour deep shiny black.

Front rather wide and short, sides nearly straight. median carina very faint; anterior three-fourths deep shiny black, posterior one-fourth pure white.

Clypeus uniformly black; median carina but a mere suggestion; the black band carried across the anterior coxæ as usual; posterior of this a band of white and towards the tip of the abdomen, black.

Basal segment of the antennæ about one-third as long as the second segment; basal segment brown, second segment honey-yellow spotted with white, tuberculate.

Prothorax about as deep as the head, posterior margin very slightly concave, median carina practically indistinguishable, lateral carinæ distinct for about two-thirds of their length and then fading out; colour pure white.

First and second pairs of legs with the coxæ light brown, shading through black on the femora and tibiæ to white on the first two tarsal segments, the last tarsal segment black, tibiæ of the first and second pairs of legs foliaceous; third pair of legs shading from dark brown at the base of the femora to honey-yellow on the tibiæ to white on the tarsi, tips of the tarsi black.

Scutellum triangular, sides straight, not visible for its entire breadth, covered by the prothorax on its outer edges; median carina indistinct, lateral carinæ short, curved outward, poorly defined; colour uniform deep shiny black.

Elytra short, not quite covering the first abdominal segment, coriaceous, polished, veins indistinct; colour, basal three-fourths deep shiny black, posterior one-fourth pure white.

Abdomen uniform shiny black; genitalia deep reddish brown, almost black; pygofers tapering to a blunt point, plates very short, extending only one-fourth of the length of the pygofers, only a small edge visible; style white. Length, 2.5 mm.

A very pretty and delicate insect. The foliaceous tibiae recall *Phyllodinus*, but the carinae of the prothorax are straight and the other characters agree with *Pissonotus*; it may deserve to be placed in a new genus, but for the present I prefer to place it in *Pissonotus*. The species is very easily identified by the white thorax and white margin of the elytra and by the deep shiny black of the rest of the body. Described from a specimen taken by the author at Middletown, N. Y., July 11, 1910. Two other specimens were taken at the same locality July 18 and 21, 1910. Type in the author's collection.

Pissonotus binotatus, n. sp.

Brachypterous ♀.—Form and general appearance of *P. marginatus*, but considerably smaller.

Eyes oval, deeply indented below to receive the antennae; colour dark gray, almost black, with a yellow margin; vertex about as long as wide, very slightly produced before the eyes, anterior margin slightly curved; carinae all present, very pronounced, posterior foveae very deep; colour uniform dark reddish brown.

Front about one and one-third times as long as broad, widest below the eyes, sides slightly arcuate; clypeo-frontal suture straight, median and lateral carinae quite prominent, median carina forked just below the apex of the head; colour uniform reddish brown, except a very narrow band along the clypeo-frontal suture, which is light yellow.

Clypeus of the form of a truncated triangle; median carina fairly prominent; colour black, the black band extending across the anterior coxae.

Basal segment of the antennae a little less than one-half the length of the second; the second segment lacks the protuberances so often found; basal segment reddish brown, second segment light yellow.

Prothorax a little deeper than the head, caudal margin almost straight, very slightly emarginate on the sides and a suggestion of an emargination in the centre; median carina very prominent, lateral carinae strong on proximal two-thirds of the prothorax, fading out before reaching the posterior margin; colour uniform reddish brown.

Anterior legs yellow, lined with brown; second and third pairs of legs with yellow coxae, femora and proximal half of tibiae brown, the tibiae becoming gradually lighter in colour toward the distal end, the distal end of the tibiae and first two tarsal segments light yellow, almost white; last tarsal segment dark brown; tarsal spur rather small, light yellow, almost white.

Scutellum triangular, about one and one-third times as deep as the prothorax, sides straight, median and lateral carinae prominent, the latter attaining the posterior margin; colour uniform reddish brown.

Elytra short, practically covering the first abdominal segment, highly polished, veins indistinct; colour reddish brown, with two yellowish white dots on the apical margin of each elytron.

Abdomen uniformly reddish brown, a prominent carina extending along the middle of each tergum; genitalia reddish brown, pygofers ending in rather a sharp point; plates short, extending only one-third the length of the pygofers, a little lighter in colour; style white. Length, 2 mm.

Brachypterous ♂.—Form and markings the same as that of the female, considerably smaller in size. Genitalia, aperture of the pygofers quite long and narrow, superior wall of the anal tube produced in long outcurving horns, these rest on projecting points of the ventral margins of the pygofers; styles small; anal style light yellow, rest of the genitalia dark reddish brown. Length, 1.5 mm.

This species resembles *P. marginatus* quite closely. It is a much smaller species, there are distinct differences in the proportions of the front and antennae, the spur is smaller proportionally. There are also differences in the genitalia and some noticeable colour differences. *P. binotatus* lacks the white on the prothorax, the front is much darker, and has two white spots on the apical margin of the elytra instead of a full white band as in *marginatus*.

Type of the male and female taken at De Witt, Mitchell Co., Ga., April 6, 1912, by the author. Types in the author's collection.

Liburnia dolera, n. sp.

Macropterous ♂.—A medium-sized form for this genus. Eyes oval, deeply and narrowly indented below to receive the antennae; colour gray, darker in the centre. Vertex slightly longer than wide, projecting a little beyond the eyes, carinae distinct, except the posterior median, which is quite faint; foveae deep; colour dark reddish brown.

Front widest a little below the eyes, constricted considerably between the eyes, sides curved, the median and lateral carinae sharp and prominent, the former forked at the vertex; clypeo-frontal suture slightly curved; colour reddish brown, with the ventral portions of the lateral carinae dark yellow. Clypeus a lighter brown than the front, the carina distinct.

Basal segment of the antennae one-third the length of the second segment, dark brown; second segment rather thick, tubercled; light yellow in colour.

Prothorax a very little deeper than the vertex ; hind margin concave, almost angled at the centre ; carinæ very distinct ; colour uniform shiny reddish brown.

Legs brown, becoming lighter toward the distal end of the tibiæ ; the tarsi yellow ; spur wide at base and very finely serrate.

Scutellum triangular, about twice as deep as the prothorax, sides arcuate, apex a rather sharp point, carinæ distinct, the lateral carinæ attaining the posterior margin, the median carina is obsolete toward the apex ; colour shiny, reddish brown, with the margins and apex yellow.

Elytra nearly twice as long as the abdomen ; colour smoky brown, veins darker brown with dark dots along them.

Tergum of the first two abdominal segments yellow, remainder of the abdomen reddish brown. Genitalia, aperture of the pygofers large, oval, wider than long ; ventral edge of the pygofers deeply notched, styles large, broad, divergent from their base, following the curve of the pygofers to the anal tube, a few long setæ at their apical end. Length, including elytra, 3.5 mm.

Taken on reeds by the author in Renwick Swamp, Ithaca, N. Y., July 20, 1908. Five specimens are before me, one of these shows much more yellow on the vertex and front. Type in the author's collection.

This species suggests the macropterous form of *L. lineatipes* Van Duzee, but the colouring is different and, besides other minor differences, the genitalia are decidedly unlike that species.

Achorotile foveata, n. sp.

Macropterous ♀.—Eyes oval, deeply emarginate below to receive the antennæ ; colour gray. Vertex as wide as long, rounded before, extending a little beyond the eyes ; carinæ distinct, except the posterior median, which is weak ; posterior foveæ deep ; colour yellowish brown, lighter posteriorly.

Front twice as long as wide, widest near the middle, sides gently curving ; clypeo-frontal suture straight ; the median carinæ curved, following the curve of the sides to the front ; just outside of each median carina there is a row of pustules, six on each side, three near the vertex and three near the clypeus ; between these two groups are two pustules on each side along the outer margin of the front ; colour deep reddish brown.

Clypeus shiny black with an indistinct carina. Second segment of the antennæ about one and one-third times as long as the first, covered with pustules ; basal segment reddish brown, second segment yellowish brown.

Prothorax two-thirds as deep as the vertex; lateral carinae distinct, following the curve of the eye; behind each carina a row of seven pustules; median carina faint, a puncture on each side of it about the middle of the prothorax; posterior margin quite deeply concave; colour deep reddish brown.

Legs yellow lineated with brown; tarsal claws black; spur triangular, finely toothed. Scutellum a little more than twice as deep as the prothorax; triangular, sides strongly arcuate, terminating in a rather sharp point; two pustules on each side near the middle of the lateral margin; median carina distinct, lateral carinae rather faint, divergent; colour polished black with yellowish tip.

Elytra extending one-third of their length beyond the abdomen; veins brown, membrane slightly smoky.

Abdomen black, except the dorsum of the first two segments, which is yellowish; along the lateral margins of the dorsum of each segment is a transverse row of four pustules.

Genitalia: pygofers tapering to a blunt point, dark reddish brown; plates about one third as long as the pygofers, only a narrow edge showing, light brown in colour; ovipositor and anal tube dark honey-yellow.

Length, including elytra, 3.5 mm.

Described from a female taken by Professor J. Chester Bradley at Felton, Santa Cruz Mts., California, May 17, 1907. Type in the collection of Cornell University.

This species may be readily told from *A. albosignata* by the deeper vertex, the different coloration, and by the presence of four instead of two pustules on each side of the abdominal segments.

THE NORTH AMERICAN ÆSHNID DRAGON-FLIES.

At the present time, when the air is full of nomenclatural discussion, when there are many entomologists who are devoting themselves almost exclusively to naming and classifying insects from dried skins, "systematists" they are called, and we often seek in vain for the system, it is as refreshing as a woodland brook to a tired traveller to read a monograph of the nature of Dr. Walker's "North American Dragon-flies of the genus *Æshna*."* Here we have a systematic study of a group in which the

*University of Toronto Studies, Biological Series, No. 11, VIII, 213 pp., 28 plates (6 coloured). Publ. by the Librarian, University of Toronto Library, 1912. \$2.00.

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life histories, ecology and seasonal and geographical distribution have been given the attention which they merit and which is necessary for a sound basis of classification. A classification which is not based on morphological characters considered in relation to and together with biological data must of necessity be incomplete. One thing is certain, that only further study of the bionomics of insects will settle the disputes of the "lumpers" and "splitters," to use colloquial but expressive definitions. The present monograph is an admirable illustration of this fact, and were this the only outstanding feature of this most thorough piece of work, the author would deserve the thanks of his entomological confreres. But his complete treatment of what he rightly characterizes as a "neglected group" of insects renders the volume additionally welcome both to entomologists and to those interested in zoögeography,

The monograph may be roughly divided into three sections, namely, taxonomic, bionomic and systematic. Perhaps the most important feature of the section on the taxonomy of the group is the fact that the author calls attention to the necessity of a study not only of a large series but of the colour pattern. The exclusive reliance upon structural features and the neglect to take into consideration the colour pattern has resulted in a "lumping" of species which a study of the natural colours does not support. A very careful study of colour patterns has therefore been made, and the six excellent coloured plates illustrating the same make this section of the work invaluable to the Odonatist.

Perhaps the most interesting, and, to the writer's mind, certainly the most important part of the bionomic section, is that dealing with variation and geographical segregation. If more than a brief reference were attempted here this review would exceed the appointed limits. In this section the author has, as it were, struck a rich metalliferous vein, and we are eager to follow it; it is too rich and promising to be left, and we hope it will be followed up by further investigation. It is found that there occur in the females varieties in colour, in the length of the apparently functionless abdominal appendages and in the depth of the third abdominal segment and further, that there is a distinct correlation between the variations of the last two structures. These variations are dependent to a large extent upon locality, and hence, possibly upon climatic conditions. Here then is an unrivalled field awaiting the attention of the biometrician. Important observations have been made by the author upon the life-history, and his work is made increasingly valuable by the excellent

illustrations, especially of the acts of oviposition, copulation and emergence of the adult.

The North American species of *Aeshna* appear to resolve themselves into six groups, and about two-thirds of the monograph is devoted to very full and orderly descriptions of the twenty species and geographical subspecies found in North America. As an example of monographic treatment, this volume would be difficult to surpass, both in its broad and thorough character and in the unusual excellence of the author's numerous illustrations.

In congratulating the Editor of our journal on the production of so useful and excellent a monograph, which will bring great credit to Canadian entomology, we should also like to express our great indebtedness to the author's father, Sir Edmund Walker, for his generosity in rendering possible the illustration of the monograph by so excellent and large a series of plates, and which has enabled justice to be done to the exceptionally well-drawn figures.

C. GORDON HEWITT.

A NEW PAPILIO FROM CENTRAL AMERICA.

BY GEORGE A. EHLMANN, PITTSBURG, PA.

Papilio chromealus, sp. n.

Closely allied to *P. copanae* Reakert. Upper side of all the wings with a golden sheen (bluish-green in *P. copanae*); submarginal arrow-shaped spots of the fore-wings orange instead of yellow. On the upper side of the hind wings the submarginal row of spots is identical with that of *P. copanae* except in colour, the costal spot between nervules 1 and 2 being pale buff, the other four spots between nervules 2 and 5b deep orange chrome. The spot between nervules 5b and 5c is pure white. The spot between nervules 5c and 6 is the last spot and is also deep orange chrome.

The colour and all the markings of the underside are the same as in

P. copanae.

Habitat.—Honduras, Central America.

This fine *Papilio* was collected near the base of the Congrehoy Peak in the Province of Yoro by the late Dr. Carl Thime and sent to me with several thousand other Lepidoptera from various localities in Honduras.

P. chromealus is a very conspicuous *Papilio* and if not a distinct species it is assuredly a beautiful variation of *P. copanae* Reakert, from Guatemala.

August, 1912.

NEW SPECIES OF COLEOPTERA OF THE GENUS AGRILUS.

BY C. A. FROST, SOUTH FRAMINGHAM, MASS.

For several years considerable study has been given the specimens of this genus and some of the more important results are here presented :

Agrilus champlaini, new species. *Holotype* a male. Form of *muticus*, robust, colour black with a purplish tint, subopaque. *Antennæ* reaching the middle of the prothorax, serrate from the fourth joint, bronzed; *head* densely coarsely punctured, strigate above and pubescent below the middle, occiput somewhat concaved, the median impressed line extending to the middle of the front, eyes dark. *Prothorax* one-fourth wider than long, widest at the middle, one-fourth wider at the base than at the apex, sides regularly arcuate, hind angles obtuse with a rather strong carina, lateral margin sinuous, two discal foveæ in front of the middle, basal depression distinct, lateral faint; surface transversely rugose, becoming confused and finer at the sides and anterior angles. *Scutellum* not carinate, notched. *Elytra* nearly parallel to the apical seventh, tips separately and broadly rounded with coarse unequal serrations, disc slightly flattened with a vague costa, suture elevated behind the middle, surface rather coarsely irregularly granulate imbricate, finer in the basal depressions which are moderately deep. *Body* beneath more shining, bronzed, with purplish reflections especially along the sides and apex of the abdomen; *prosternal* lobe sinuate-truncate, intercoxal process broad, acute at tip, surface roughly densely punctate, propleuræ granulate; *metasternum* rather closely granulate becoming subasperate posteriorly like the coxal plates; *abdomen* finely punctate, sparsely along the middle, more closely along the sides, resembling imbricated scales on the first segment and with undulating lines connecting the punctures on the others; *pygidium* coarsely punctate with a strong projecting carina. First abdominal segment flat or slightly concave, second with smooth groove extending nearly to the posterior suture, last ventral eroded-truncate at the tip, vertical portion of abdomen granulate, inferior margin serrate, apex smooth and truncate. Front and middle tibiæ mucronate; *claws* similar on all feet, cleft with the inner parts broad and curving inward, the apices nearly touching.

Length 8 mm. Width at base of elytra 2.3 mm.

The females at hand have the front less pubescent and more concave, granulations of the eye more distinct, sides of the prothorax more arcuate, being widest in front of the middle, discal depressions more pronounced and with the intervals between the strigæ more distinctly

punctate, surface of the elytra more finely and regularly imbricate; the abdomen is smoother and more shining bronze, with the first ventral slightly flattened; the claws are alike on all the feet, the inner portion quite broad and curving inward slightly, leaving a much wider space between the apices than in the male.

The pubescence of this species is not at all evident except on the post-clypeal area, the anterior angles of the prothorax, and the apices of the elytra. The sexes do not vary much in this respect, but I suspect that my males do not show the normal elytral pubescence; possibly it is discoloured. On the under side of the body the vestiture is short and sparse, giving a silver tint to the abdomen; it becomes more dense on the prosternum of the males.

This species would naturally be placed next to *angelicus* in Dr Horn's table (Trans. Am. Ent. Soc., XVIII, p. 283). Through the kindness of Mr. H. C. Fall, of Pasadena, Cal., I have been enabled to examine a specimen of *angelicus*, and can say that it does not resemble the present species in colour, form or punctuation. *Champlaini* might be confused with *anxius* and allies, but the darker colour, more robust and shorter form, sculpture, and structure of the claws should at once distinguish it.

This species is represented by three specimens (emerged May 29, 1911), two females and one male, all bred from the twigs of the hornbeam, *Ostrya virginica*, by Mr. Alfred B. Champlain, at New Haven, Connecticut. The specimens and two of the galls were sent to me by Dr. W. E. Britton from the State Agricultural Experimental Station in that city. It is through the kindness of these two gentlemen that the above description has been made. The galls were collected at Lyme, Conn., April 30, 1911.

The gall is in each case about one inch in length, fusiform, expanding to a diameter of 12 millimeters in the middle, and on branches of about six millimeters in diameter. One of the galls was split open and the bark removed from one side, so that the course of the larva was shown to be a spiral from the point of entrance toward the end of the twig. It circled the twig in four distinct courses, each one increasing in diameter about one-half the previous one and leaving a ridge between them. They are tightly packed with debris and are wholly in the wood, leaving the bark intact. On the fourth spiral the gallery leads directly to the heart of the branch, from whence it is hollowed out in an arcuate course downward until it intersects the bark in an oblong exit very near the point of entrance. The exit in the two specimens at hand measures three by two millimeters, the long diameter being transverse to the twig.

Since the above was written a male specimen has been received from Mr. H. B. Kirk, which was taken at Harrisburg, Pa., June 16, 1911. It differs slightly from the Connecticut male in the following particular: The front is more concave, the two discal foveæ of the prothorax are very indistinct, the prosternal lobe is distinctly emarginate in front, the scutellum is not notched, and the form is slightly more cuneate; with the elytral tips normally serrate.

The *holotype* and *allotype* are in my collection, and the remaining female *paratype* is in the collection of the Connecticut Agricultural Experimental Station.

A. crategi, new species.—*Holotype* a male. Form of *obsoletoguttatus*, elongate. Colour olive-æneous, suffused with cupreous on apical third, varying to entirely cupreo-æneous, shining. *Antennæ* reaching the middle of the prothorax, serrate from the fourth joint, æneous. *Head* slightly flattened, greenish, granulate-punctate, more closely in a post-clypeal pubescent area, smooth spaces near the eyes finely alutaceous; occiput impressed, punctures tending to form strigæ posteriorly; median line extending to the middle of the front, where it ends in a slight depression. *Prothorax* one-fourth wider than long, varying in the specimens at hand from sides nearly parallel to regularly arcuate, hind angles rectangular, with a strong, nearly straight carina extending almost half the length of the prothorax, lateral margin slightly sinuate; disk with an anterior circular depression and a posterior oblong one, lateral oblique depressions moderate; surface transversely strigate with punctures between the strigæ. *Scutellum* transversely carinate. *Elytra* slightly sinuate behind the humeri and faintly dilated behind the middle, apices separately rounded and serrulate, disk slightly flattened, with the faintest indication of a costa, basal depressions rather slight, surface imbricate in very regular transverse series, gradually becoming finer toward the apex, pubescence very indistinct, visible only in the basal depression of the elytra and the anterior angles of the prothorax. *Body* beneath shining æneous with a faint cupreous tinge; prosternal lobe distinctly emarginate, granulate-punctate, with a thick mat of erect brownish hair extending from the anterior margin down the intercoxal process to the acute tip, and covering a small patch between the meso-coxæ; propleuræ and sides of metasternum granulate-imbricate, sparsely pubescent; metasternum smoother at middle. *Abdomen* imbricate on the first ventral, finely imbricate and sparsely punctate on the others; first ventral with a small patch of brownish hair on the

intercoxal process, last ventral oval and eroded at tip; inferior margin of the vertical portion of the abdomen serrulate. *Pygidium* with an evident carina, not projecting, coarsely sparsely punctured. *Claws* similar on all the feet in both sexes, nearly bifid. Length 6 to 8 mm. Width 1.5 to 2.3 mm.

The females at hand differ as follows: Head cupreous or æneus, more concaved along the median line, more coarsely sparsely sculptured, an opaque depressed area above the clypeal carina; sides of prothorax slightly more arcuate; beneath sparsely pubescent, no erect brownish hair.

The two extremes in size, as given in the above description, are both females; the other specimens average 6.5 mm. in length.

A pair of this species first came to me from Mr. A. B. Champlain, with the label, "Chinchilla, Pa., VII, 2." The past year Mr. H. B. Kirk sent me four male and two females bred from the dead fallen trunk of *Cratægus*, which was also infested with *Xylotrechus colonus* and *Neoclytus luscus*. The material was collected by Mr. W. S. Fisher, of Highspire, Pa., and Mr. Kirk, at Harrisburg, Pa., March 11, 1911, and the specimens are labelled "Emerged IV, 6-11."

This species should be placed between *politus* and *fallax* in Horn's table, but it resembles neither of them so much as *obsoletoguttatus* in size and shape. From the two latter it can at once be distinguished by the lack of pubescent spots on the elytra, and the structure of the claws. It resembles the narrower forms of *politus* somewhat, but the hairy prosternum will at once separate the males, and the claws, form of prothorax, broader head, and the more parallel form will be sufficient to distinguish either sex in a series of *politus*.

The distribution of the types is as follows: *Holotype*, *allotype* and two *paratypes* in my collection, a male and female *paratype* in the collection of Mr. H. B. Kirk, a male *paratype* in the collection of Mr. W. S. Fisher, and a male *paratype* in the collection of Mr. Chas. Liebeck, to whom I am much indebted for comparing many specimens with the Horn types.

A. cephalicus Lec.—Original description (Trans. Am. Phil. Soc., XI, p. 249). Obscurus, ænescens, capite cupreo, haud pubescente fortiter haud confluent punctato, sat profunde canaliculato, thorace latitudine haud brevior, dorso canaliculato et biimpresso, lateribus subrectis fortiter impressis, basi bifoveato, angulis posticis oblique carinatis, elytris sat fortiter dense granulatis, subunicostatis, apice subserratis rotundatis. Long. .18-.25. Locality: "Middle States and Lake Superior."

The above species was suppressed as a synonym of *egenus* by Dr. Horn in his monograph without explanation or remarks, and it seems to be entirely unwarranted. In making an examination of the *egenus* series in the Le Conte collection at Cambridge, I was much surprised to find that the specimen bearing the label "*A. cephalicus* Lec." (and also "*egenus* No. 11") belonged to a different group, having the antennæ serrate from the fourth joint. Numbers 3, 5 and 16 were also this species, and there were seven specimens having the fourth joint serrate and the inner lobe of the claws incurved; these are probably *otiosus*. The type of *puncticeps* Lec., which has the fourth joint serrate, is placed as No. 13 in the *egenus* series. This was also made a synonym of *egenus* by Dr. Horn. The exact standing of *puncticeps* is at present doubtful; I was inclined to place it in the *otiosus* group, although I was unable to see the claws of the middle tarsi, which were the only ones intact; but since reading Le Conte's synopsis, in which he places it in the group with the inner lobe of the claws contiguous, I consider it to be a valid species. If it should prove to be identical with *cephalicus*, the name *puncticeps* will have priority.

The Le Conte specimen bearing the label *cephalicus* is a female, and I have prepared the following re-description from five males from High-spire, Pa., June 12 to 20, 1909, and June 14, 1910, all collected by Mr. W. S. Fisher, of that place. He also sent me two males from Jeanette, Pa.

A. cephalicus Lec. Re-description: Form of *otiosus*; colour æneous-olive. *Antennæ* moderate, bluish æneous, serrate from the fourth joint, second and third joints with rather long pubescence on the under side. *Head* convex, bluish, median line varying from distinctly to faintly impressed, and extending to a post-clypeal pubescent area, sparsely punctate, finely alutaceous, strigate on the occiput. *Prothorax* a little wider than long, narrowed at the base, sides feebly arcuate, lateral margin nearly straight, hind angles with a well defined carina, disk convex, subequally bi-impressed on the median line, an oblique lateral depression; surface transversely strigate, strigæ becoming confused anteriorly. *Scutellum* transversely carinate. *Elytra* subparallel, narrowed at the apical third to the rounded serrulate apices; disk flattened, faintly costate; surface densely imbricate, basal impressions moderate. *Body* beneath bluish varying to greenish æneous. *Prosternal* lobe distinctly emarginate and covered with an erect grayish pubescence, or hair, that extends to near the middle of the first ventral segment; it is shorter and less noticeable on the metasternum; tip of the intercoxal process of pros-

ternum acute; propleuræ and coxal plates subgranulate, sparsely pubescent; metasternum scabrous-imbricate; ventrals imbricate, becoming finer toward the apex and sparsely punctate along the middle, tip of last ventral oval, granulate. *Pygidium* coarsely irregularly punctured without distinct carina. *Tibiæ* mucronate on all the legs. *Claws* with a broad obtuse tooth at the base, similar on all the feet. Length 4.5 to 6 mm. Width 1.2 to 1.4 mm.

A male from Lyme, Conn. collected by Kirk and Champlain July 4, 1911, seems to belong to this species but does not quite accord in some particulars. A male from Vicksburg, Miss., sent me by Col. T. L. Casey, agrees very well with the Pa. specimens, but it is somewhat smaller and of a lighter bronze-aeoneous colour.

A female from Highspire, Pa., which agrees well with the type, shows the following sexual differences: form slightly more robust, colour bronze-aeoneous, head larger and broader between the eyes, more densely punctate, less pubescent, aeoneous in colour; prothorax less narrowed behind; elytra slightly dilated behind the middle; the median area of denser pubescence of the male is here lacking. Two females from Jeannette, Pa., are somewhat smaller and resemble the males more nearly in form. I have also seen a male from Lafayette, Ind., June 21, 1907; collection of Mr. A. B. Wolcott, Chicago, Ill.

In the type there is an apparent carina of the pygidium which is caused by a median smooth space sharply limited by the coarse and irregularly confluent punctuation on each side of it. The punctures are very sparsely placed toward the margin. The pygidium of a single male that I have dismembered shows similar characteristics.

Agrilus auricomus, new species. *Holotype* a male. Form elongate, depressed, broadest at the base of the elytra, black or olivaceous black, shining; thorax shining aeoneous with a path of golden pubescence in the lateral depression extending to the anterior angles. *Antennæ* reaching the middle of the prothorax, aeoneous, serrate from the fourth joint. *Head* densely coarsely punctate, becoming transversely strigate above the middle; occiput feebly impressed; the median impressed line extending from the back of the head nearly to the clypeus; a triangular patch of golden pubescence above the clypeus, the suture of which is indicated by a fine carina; granulations of the eye unusually fine or indistinct. *Prothorax* one-third wider than long, base very slightly wider than the apex, at the middle equaling the elytra at the base, sides regularly arcuate, lateral margin sinuate; disk depressed and with a shallow median impression; two small circular foveæ each side in front of the middle, vaguely defined by surrounding smooth space; lateral depressions deep, causing sides to appear explanate; surface transversely strigate; hind angles with a faint carina. *Scutellum* carinate at the sides, interrupted at the middle. *Elytra*

slightly sinuate behind the prominent humeri, feebly broadened behind the middle, basal depressions deep with two very faint impressions behind them; the junction of the discal flattened portion with the convex sides of the elytra has the appearance of obtuse costæ curving inward from the humeri and vanishing near the middle of the elytra; apices separately rounded, subacute and serrulate; surface coarsely imbricate-granulate. *Body* beneath shining aeneous with golden pubescence which is sparse on the middle of the abdomen and becomes very dense on the episterna, sides of the metasternum, outer half of the coxal plates, vertical portion of the abdomen, and a triangular patch on each side of all the abdominal segments. *Prosternum* thickened, swollen behind the lobe which is slightly sinuate-truncate in front and with a distinct marginal bead; intercoxal process slightly concave, longitudinally with an acute and depressed tip; surface densely punctate. *Metasternum* rather densely punctate, becoming rather strigate at the sides. *Abdomen* with the first segment flattened and rather coarsely densely punctate at the middle, becoming strigate at the sides; second segment with a deep smooth groove with sharply defined edges narrowing and vanishing at the posterior third, sparsely coarsely punctate; last three segments finely and less sparsely punctate; apex of the last segment subtruncate with a slight tendency to emargination; median carina of the pygidium strong and projecting. *Claws* cleft alike on the middle and hind tarsi; nearly bifid on the front pair with the inner lobes less incurved; front and middle tibiæ distinctly mucronate. Length 10 mm. Width 2.4 mm. at the base of the elytra.

Three males of this species were taken at Framingham, Mass., May 31, 1909. One of these is now in the collection of Prof. H. C. Fall, Pasadena, Cal., and to him I am indebted for an examination of this specimen with reference to the above description. There is very little variation in the two specimens in my collection, the type being slightly more cuneate in form.

A female collection by Mr. A. B. Champlain at Lime, Conn., now in the Experiment Station collection at New Haven, May 29th, 1910, is referred to this species. It differs in being more black in colour (but not the opaque black of *bilineatus*) and more robust in every way while being only slightly longer—10.8 mm. The occiput is more impressed, and the granulations of the eyes normal. The carina of the hind angles of the thorax is more distinct; the prosternal lobe shows a slight emargination in front and is less swollen behind it. The punctation is more dense beneath and the golden pubescence covers less area. The claws are cleft alike on all the feet, the inner lobe being nearly as long as the outer and somewhat incurved. The last abdominal segment is slightly eroded-granulate and faintly truncate. The thorax at the middle, the elytra at the base and at the enlargement behind the middle measure 3 mm.

Another female from New Haven, Conn., June 12, 1911, collected by Mr. B. H. Walden is similar to the preceding except in the following details: occiput less impressed; thorax with a larger and more elongate

basal depression; lacking the two anterior foveæ; lateral margin more sinuate; at middle slightly broader than the elytra at the base; carina of the hind angles obsolete; tips of the elytra more acute and prolonged and having a sutural angle equal to one-seventh the length of the elytra; between the first and second segments of the abdomen there is a distinct suture extending half way to the middle of the body; last segment rounded with the edge eroded-granulate; the pubescence is a yellowish white. Length 11.8 mm., width 3 mm. at base of elytra and 3.5 mm. behind the middle at the enlargement. The colour of this specimen is slightly olivaceous as in the type.

This species is closely related to those specimens that have been referred to by Dr. Horn (Trans. Am. Ent. Soc., Vol. XVIII., page 308) as the olivaceous variety of *acutipennis* but the form and the golden pubescence should at once separate it from that variety.

It appears to me that the term "last abdominal segment serrate" has not been hitherto clearly defined or the serrations have escaped notice in many species. In the present species the lower edge of the vertical portion of the abdomen is strongly serrate. The serrations begin near the middle of the last segment where the overhang of the superior part commences to be prominent, and, increasing in coarseness, extends to the smooth apical area where the two edges of the superior portion merge directly beneath the pygidial carina. The inferior portion of the last segment at the tip, which is the part referred to in the previous description, is granulate near the edge. In the females the first four abdominal in the larger specimen and the first three in the other are visible when the specimens are viewed from directly above. In the males only the first two segments are so visible.

The short grayish pubescence that covers the elytra and thorax in specimens of *anxius* and related species is here almost invisible except on the apices of the elytra and for a short distance along the suture. This pubescence arises from slight depressions in the furrows between the rugæ and is seen to be arcuately decumbent in a lateral view across the elytra toward the light. Under a high-power hand lens it appears as minute silvery points on the elytral disk of this species. By placing specimens with the head toward the light and the body inclined backward toward the observer pubescent spots and apical vittæ can be seen on many species that have been described as being without elytral pubescence.

In conclusion it may be said that the studies in the *otiosus* and *anxius* groups have been, so far, rather disappointing, due to the difficulty of getting series of both sexes. The only species at all abundant in this locality is *otiosus*, taken on oak leaves. The olivaceous variety of *acutipennis* has been encountered quite often on oak, and *bilineatus* occurs in favourable places on oak sprouts; but in general the species turn up singly or in pairs, with aggravating slowness. Several very interesting problems are suggested by the material at hand, and more specimens from widely separated localities may present a solution.

Mailed August 6th.