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THE CANADIAN
ENTOMOLOGIST.

VOLUME XXII.



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No. 1.

BALANINUS—ITS FOOD HABITS.

BY JOHN HAMILTON, M. D., ALLEGHENY, PA.

All the described species of *Balaninus* inhabiting America north of Mexico when larvæ live in the fruit (nuts and acorns) of the various species of *Quercus*, *Castanea*, *Corylus* and perhaps *Fagus* of the order *Cupuliferæ*, and *Carya* of the *Juglandaceæ*. Acorns, somewhat largely used in this country in the arts and in the manufacture of certain dietetics, are mostly imported, the native production being rendered almost worthless by these larvæ; and our chestnuts as soon as collected must be kiln-dried or otherwise treated, which renders them greatly inferior to those of foreign countries. *Balaninus* has not yet received any attention from an economic standpoint, but from the above would

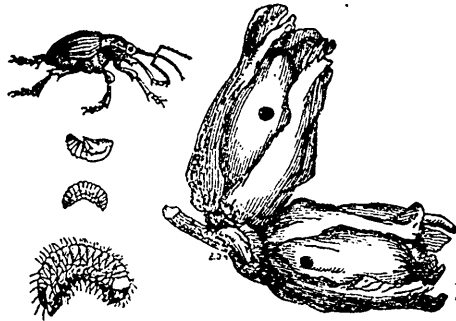


FIG. 1.

seem deserving of some consideration in that direction. The systematic separation of the species has only been effected recently and definite characters furnished for their recognition. Say probably had all the now described species before him, and excluding *proboscoideus*, included them in his *rectus* and *nasicus*. The failure of Say, one of the clearest of describers, to make his species recognizable by description, is suggestive of the absence of points of saliency, and has been the source of much confusion in our literature, some of which is evidenced in the earlier volumes of the CANADIAN ENTOMOLOGIST.

NOTE.—Figure 1, drawn by Miss Ormerod, represents a European species, *Balaninus nucum* Linn., which feeds upon filberts. It conveys a good idea of the characteristic forms of the genus.

The separation of *Balaninus* into species with valid characters was effected by Dr. Geo. H. Horn in a monograph of the genus in 1873 (Proc. Am. Phil. Soc., Phil., xiii., 457, et. seq.). The species assigned to Say's names were determined by the descriptions of Gyllenhal from types sent him by Say, and the assignment has not been questioned—*Requiat*. To the old species, *caryatrypes*, *rectus*, *nasicus* and *uniformis* (Lec., 1857), were added *carya* and *quercus*; and in 1885, Mr. F. Blanchard (Bul. Brook. Ent. Soc., vii., 107,) described *obtusus*. The systematic part of the work has been well done, yet the accurate separation of a mixed collection requires much care and considerable practice, and cannot be effected by mere inspection. To determine whether each species has a preference for some particular species of acorn or nut, or whether there is an absence of choice, I instituted some experiments in rearing them, the results of which I propose to give, without, however, claiming them as finalities. In the year 1888, larvæ from hazelnuts (*Corylus Americana* and *C. rostrata*) collected here by myself; from chestnuts (*Castanea vesca*) purchased in the market, collected in many places in the surrounding country; and from acorns of white oak (*Quercus alba*), chestnut oak (*Q. monticola*), black oak (*Q. tinctoria*), red oak (*Q. rubra*), scarlet oak (*Q. coccinea*) and *Q. imbricaria*, all collected in the same woods, were placed in separate breeding jars, which were kept in my office till the present time, the winter temperature not falling below 40°, nor that of summer exceeding 65°. This was evidently an unnatural condition, and in part accounts for the irregular development of the most of the species, and the not inconsiderable number of larvæ that go over till the next year.

B. proboscoideus Fab. (*caryatrypes* Bohm.).—This species was bred only from chestnuts. The first example appeared June 25 and the last July 12—a period corresponding with the blooming of the chestnut here. At the time of blossoming the chestnuts are fully formed, and larger than might be supposed. The envelope or burr is over three-fourths of an inch in height, soft, and covered with distant tubercles from which the prickles afterwards develop. The ♀ *proboscoideus* at this time deposits her eggs and dies, her life being limited to a week or two at the most—none being found after the bloom has fallen. About eighty examples were reared, the sexes being numerically equal. They were uniform in size and color, and beautifully variegated with fuscous lines and spots interspersed among the dense clothing of ochreous scales on the thorax and elytra. I have, how-

ever, seen in collections examples entirely ochreous. The ♀ beak varies in length from one and one-quarter to about twice that of the body. The character distinguishing it from all the other species is that the first joint of the funicle of the antenna is shorter than the second.

B. rectus Say.—This, like the preceding, was bred from chestnuts only. The first example appeared June 28, and others followed very sparingly, and till date (Oct. 1st) ninety-five examples have been taken. Pupæ in various stages and many larvæ are yet in the earth, and will no doubt go over till next year. The conditions in breeding are evidently unnatural, but why *proboscoideus* was not influenced equally (being in the same vessel) seems strange. In nature the beetles would certainly have been on hand for the chestnuts when in bloom, at which time they are taken by beating the blossoms. Though only raised by me from chestnuts, this species may breed here in acorns, as I took a ♀ May 15th with *nasicus* by beating. Dr. Levette, of Indiana, once sent me a set raised by him from Arizona acorns, the beetles appearing in December of the year in which the acorns grew, which in no way differ from those bred from chestnuts. The individuals vary greatly in size (4 to 7 mm.) and in colour. The general colour of the scales and hair is light brown above, paler below; the thorax has a dark brown discal stripe, limited at the sides and divided longitudinally by a pale yellow line, the elytra being interspersed in various ways with markings of the same colour. I have never seen one entirely unicolorous. The beak of the ♀ is very long and slender, equalling or even exceeding that of the preceding species in proportion to the size; this and the form of the thorax, which is long and conical, will distinguish the ♀ from all others. The ♂ has a shorter thorax, but it is still narrowed anteriorly; this, with small femoral tooth, oval elytra rapidly narrowed from base, and a yellowish or brownish spot of condensed scales on each side of the central line of the metasternum (occasionally obsolete), will, with practice, distinguish it.

B. quercus Horn.—This species was bred from all the species of acorns mentioned except the annuals (white and chestnut oak). The first example appeared June 10th, and till August 1st about one hundred and sixty were observed; scattering ones have since occurred from time to time, and now the earth contains a few pupæ and larvæ, but not so many as in the case of *rectus*. This species seems to have no preference for any of the kinds of acorns mentioned, being reared from each in about

equal numbers. Whether development was retarded or deranged by indoor raising is uncertain, as I never took even a single specimen by beating, though evidently excessively abundant. The individuals vary from 5 to 9.5 mm. in length. The general color of all bred was ochreous brown, nearly uniform on the thorax and variously interspersed on the elytra with small yellowish spots. My specimens from New Jersey and Florida are entirely cinereous, mottled on the elytra with darker spots, and look as if belonging to a different species. The ♂ of this species is distinguished from that of all the others by a very unique and striking character, viz., the pygidium deeply concave, with the cavity smooth and surrounded by an acute rim, fimbriated with long silken hairs. The beak of the ♀ does not equal in length that of either of the two preceding species, but is, in most cases, as long at least as the body; the posterior margin of the hind femoral tooth is oblique; the pygidium is very pilose and fimbriate, and the scape of the antennæ is short—about equal to the first two joints of the funicle (sometimes shorter and sometimes longer, the relative length of these parts not being a constant). The careful observance of these characters will readily separate it from any of its allies.

B. nasicus Say.—This species was bred abundantly from the acorns of the white and chestnut oaks, and six examples from those of the scarlet. The first example appeared June 1st, and one or two daily till July 6th, between which and the 16th about one hundred and fifty were observed, and scattering ones till the present writing (Oct. 1st). Some larvæ and pupæ are still in the earth. In nature, this species is taken here by beating from about the 10th of May till the last week in July in great abundance, and individuals occur till near October. The prevailing colour of the vestiture above is ochreous, variegated on the thorax and elytra more or less with brownish markings, many examples, however, are nearly uniform in colour, varying from pale ochreous to dark brown, and I have a specimen from Florida that might be called cinereous. The beak of the ♀ is about the length of the body in the majority of individuals, and in the remainder either longer or shorter in about equal numbers. The species may be distinguished at a glance from all others except *caryæ* by the larger posterior femoral tooth, the hind border of which meets the femur at a right angle, with no tendency to become sinuate or obtuse.

B. caryæ Horn.—This species has not been taken here, and was not

bred, as I could not obtain last year any hickory nuts containing larvæ, but as more success was had this season I hope hereafter to make known whether *caryæ* will be developed. It is somewhat difficult to find infested hickory nuts, as comparatively few are attacked. The *Carya glabra* seems to be preferred, next the *C. alba* and *C. amara*, while *C. tomentosa*, and *maxima* are nearly exempted. From one to eight larvæ will inhabit a single nut, their size not being affected by the number. Many of them never attempt to gnaw out of their bony habitation, but when full fed shrivel up and die. In size they equal the larvæ of *proboscoideus*. Some of the nuts are also depredated on by a lepidopterous larva, apparently the same as one of the four species I find in acorns. This is not an inquiline, but feeds on the kernel either with the *Balaninus*, or by itself, there being seemingly no place of entrance. Two other species inhabit the thick hulls of *tomentosa* and *alba* which I hope to rear. This species averages larger than *nasicus*, which it much resembles, but differs by the larger femoral teeth; the tibiæ more strongly mucronate at tip, and the narrow hair-like (not oval) scales below. The ♀ beak is rather longer; the last ventral more deeply impressed, and the antennal scape about equals four joints of the funicle. My specimens were bred by Dr. Levette, of Indiana, from *C. olivæformis*, Pecans.

B. uniformis Lec.—This species was bred from the acorns of all the biennials in about equal numbers, and three examples from those of the chestnut oak; forty-two specimens were taken in all—not nearly so numerous as *quercus* with which it was reared. The first example was seen June 21st, and none after August 1st. The individuals were very uniform in size (5.5 to 6.5 mm. in length) and color, being all clothed with cinereous pubescence of a scaly nature, and the elytral intervals variegated with darker spots. My specimens from Texas and New York are exactly similar. This is not the typical color. The species was described from examples taken at Sacramento, California, and at Steilacoom, Washington, which were “concolorous” and “densely fulvo-pubescent,” but colour is of no value in the species of this genus. The nostrum of all the females seen was shorter than the body; the antennal scape short, about as long as the first two joints of the funicle. The femoral tooth in both sexes is comparatively small, with the posterior edge deeply sinuous. This and the foregoing ♀ characters will help to distinguish this species, but in case of doubt, reference in this, as in all other

species, should be made to the two papers mentioned for more minute characters.

B. obtusus Blanch.—This species was bred from hazelnuts alone. The first example was seen June 25th, and the last July 20th. From about one-third pint of nuts 24 specimens were obtained, the size and colour of which were nearly uniform. Compared with *uniformis*, this species is of a more robust facies; the claw appendices are broader; the beak of both ♂ and ♀ is much thicker and black altogether, or at least to the insertion of the antennæ, the base being in both sexes punctured, and in the ♂ more or less striated. The scape of the antenna of the ♀ is equal in length to that of three of the succeeding joints of the funicle combined; the femoral tooth is stronger than in *uniformis*, with the posterior edge oblique and less sinuate; the last ventral of the ♀ is rounded at tip and strongly pubescent; not at all impressed as in the preceding. The differences are somewhat comparative, but in the absence of more salient points, this is about all that can be done by description. This species in nature seems to be short lived, as I have never obtained it by beating previous to June 20th, nor after July 15th; till about this time the shell of the nut is soft and easily pierced; the puncture for the egg is made directly through the involucre and shell into the kernel near its base.

There is a nondescript form of *Balaninus* which I did not raise, of which about thirty examples were taken in June with *nasicus* in beating oak by Mr. Klages in Westmoreland County, and about a dozen others were received from Mr. S. Auxer, of Lancaster, Pa. It seems to be allied to *obtusum*, *uniformis* and *nasicus*, but cannot well be assigned to either. The form, density of vestiture, shape of the elytra and colour are the same as in *nasicus*, but the femoral tooth is much smaller and oblique, and the beak of the ♀ does not often exceed two-thirds the length of the body; this last character groups it with *uniformis* and *obtusum*, with the former of which it agrees in having the claw appendices acute, but differs by having the beak thickened and punctured at base in both sexes like in *obtusum*, by the longer antennal scape of the ♀, which is equal to at least the three first joints of the funicle (in *uniformis* to joints one and two), and by the denser covering of hair-like scales and less robust form of body; the femoral tooth is a little larger, oblique and less sinuate posteriorly. From *obtusum* it differs by the claw appendages being acute

(not obtuse), its much less robust and posteriorly attenuated form, and by the more or less impressed last ventral segment of the ♀; *obtusus* is much more sparsely clothed. There are other minor differences, but the above suffice to show that it is not in harmony with any of the species mentioned. From a mixed lot of *nasicus* its separation requires an examination of the femoral tooth in every individual, but mixed with the other two, simple inspection will suffice in the most of cases.

It is quite probable other species of *Balaninus* remain to be discovered, only one species of which is known from the Pacific Coast. A very pleasant and certain way to determine this would be for collectors everywhere to rear them from nuts and acorns and publish the results. Other modes of collecting are not to be relied on, as for example, in twenty years collecting here I only took *nasicus* and *obtusus*, and in chestnut time *rectus*, but all this time all the other species (*caryæ* probably included) were sufficiently abundant.

DISTRIBUTION.

B. proboscoideus.—Middle States westward, Horn; Massachusetts, Blanchard; Tennessee, Illinois, District of Columbia, Ulke; Ohio, West Virginia, Pennsylvania.

B. rectus.—Middle and Southern States, Horn; Arizona, Smith; District of Columbia, Virginia, Ulke; Canada, New York, Massachusetts, Pennsylvania, Ohio, West Virginia.

B. quercus.—Illinois, District of Columbia, Ulke; New York, New Jersey, Pennsylvania, West Virginia, Ohio.

B. nasicus.—Canada to Georgia, and westward to Colorado and New Mexico.

B. caryæ.—Illinois, Ulke; Indiana, Levette; Kansas (Douglas Co.), Snow; Pennsylvania, Klages.

B. uniformis.—Canada to Florida, from the Atlantic to the Pacific.

B. obtusus.—Massachusetts, New Hampshire, Blanchard; Texas, Nebraska, Horn; Ohio, Pennsylvania, West Virginia.

Undescribed form.—Massachusetts, North Carolina, Blanchard; Pennsylvania (Lancaster Co., Auxer; Westmoreland Co., Klages).

Balaninus has a single parasite common to all the species, except that it was not reared from *obtusus*; the larva was not observed while living in that of *Balaninus*, but it forms a tough papery cocoon so thin

and transparent that the enclosed larva and pupa can be observed. These cocoons occupy the cell formed by the *Balaninus*, and are shaped much like those of the large ants, but much larger. The imago is quite graceful, the ♀ ovipositor being proportionately as long as in *Rhyssa*. Mr. Cresson would have described this species under the specific name *balanini*, but was anticipated by Mr. W. H. Ashmead, who probably describes the same thing under the name *Urosigalphus armatus* (Proc. U. S. Nat. Museum, 1888, p. 637, but only issued Oct. 1st, 1889). Besides the larvæ of *Balaninus*, those of at least four lepidoptera infest acorns, two of which seem to enter by the holes made by the *Balaninus* in leaving, and live on the debris within. The other two are found with the *Balaninus* larvæ, one of them feeding on the refuse made by them, but the other predepredates on the substance of the acorn, and is sometimes found in acorns by itself; it pupates in the earth without forming a cocoon. The others formed thin papery cocoons against the sides of the jars in which they were confined. I failed to obtain their names, the gentlemen of whom inquiries were made being seemingly unacquainted with these forms.

SUMMARY.

B. proboscoideus is so far only known to predate on chestnuts.

B. rectus has been reared here from chestnuts only, but elsewhere from Arizona acorns.

B. quercus was reared in about equal numbers from the acorns of all the biennial fruiting oaks mentioned.

B. nasicus prefers the acorns of the annual fruiting oaks (white and chestnut), but predepredates sparingly on those of biennials.

B. caryæ has been reared from pecan hickory nuts elsewhere, and many larvæ from nuts grown here are now in rearing and will almost certainly develop this species.

B. uniformis prefers the acorns of biennials, but will predate occasionally on those of annuals (chestnut oak).

B. obtusus is only known to predate on hazel nuts.

The indescrpt form probably lives in acorns in the larva state, but has not been reared.

Obs.—The acorns of all species were collected from oaks growing in the same place promiscuously, so that the parent beetles evidently discriminated in their choice.

PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 219, Volume xxi.)

Genus ARCTIA Schrank.

1802—Schrank, Fauna Boica II., 2, 152.

The typical genus of the family—a general favorite with collectors and the source of a good deal of worry and uncertainty to describers. I have seen very large series of specimens of many species, and have seen nearly all the species. From a rather careful study of the species I can see no reason why they should not be as easily recognizable or limited as those of any other Lepidopterous genus—indeed, the problem strikes me as a remarkably easy one, the key to which lies in the fact that no amount of obsolescence of maculation authorizes a species, while change of *pattern* can be easily detected even in specimens with the markings much broken. Reference for general papers, lists, &c., relating to American species, are:—

- 1816—Hübner, Verzeichniss, 183.
- 1856—Walker, C. B. Mus. Lep. Het., III., 594, syn. sp.
- 1860—Clem, Proc. Ac. N. Sc. Phil., XII., 526.
- 1873—Stretch, Zyg. and Bomb., 73, fig. and syn. sp.
- 1876—Moeschl., Stett. Ent. Zeit., 37, 296.
- 1883—Neumoegen Papilio, III., 150, list sp.
- 1887—Smith, Ent. Amer., III., 117.

In the paper last cited I give at some length the features to be relied upon for specific separation in this genus.

The head is retracted, tongue weak and short, palpi almost rudimentary, antennæ moderate in length; bipectinated in the ♂, simple in the ♀. The legs are moderate in length, the posterior longer; spurs short and weak, but normal as to number; the tarsi are finely spinulose, the claws simple.

Moeschler, in the Stett. Ent. Zeit., 1876, v. 37, p. 296, says:—*A. nais*, *phyllira* and *virgo* have a distinct claw on the fore tibia, but I utterly failed to find any trace of it on any specimens examined by me.

The venation of *virgo* and *arge*, compared, showed no differences; ten out of the subcostal in each, neither with an accessory cell. In other respects it agrees with the venation typical of the family.

The recent suggestions as to synonymy have been so conflicting, and none being based on a monographic study, they are simply indicated under the proper head, but not adopted.

A. achaia Grt. & Rob.

1867—Grt. & Rob., Trans. Am. Ent. Soc., I., 334, pl. 6, ff. 44, 45,

Arctia.

1868—Bd., Lep. Cal. (Am. Soc. Ent. Belg., XII.) 76, *Chelonia*.

1873—Stretch,* Zyg. and Bomb., 74, *Arctia*.

1873— “ “ “ 124, pl. 5, ff. 17-21, *Arctia*.

1875—Hy. Edw., Proc. Cal. Ac. Sci., V., 187, *Arctia*.

1881—Butl., Papilio, I., 131, *Arctia*.

1882—Stretch, Papilio, II., 91, varieties of.

1887—Smith, Ent. Amer., III., 111, *Arctia*.

var. *barda* Edw.

1881—Edw., Papilio, I., 39, *Arctia*.

var. *ochracea* Stretch.

1873—Stretch, Zyg. and Bomb., 124, pl. 5, ff. 18 and 21.

1881—Butl., Papilio, I., 131, an sp. dist. *Achaia*.

Habitat—No. Calif., Oregon.

A. anna Grt.

1863—Grt., Proc. Ent. Soc. Phil., II., 335, pl. 8, f. 1, *Arctia*.

1873—Stretch, Zyg. and Bomb., 74, 220, pl. 9, f. 6, ♀, *Arctia*.

1875—Streck., Lep. Rhop. et. Het., I., 106, =*persephone*.

1875—Grt., CAN. ENT., VII., 196, an sp. dist.

1878—Streck., Proc. Dav. Ac. Sci., II., 273, =*persephone*.

1879—Graef, Bull. Bkln. Ent. Soc., I., 4, =var. *persephone*.

1883—Hulst, Bull. Bkln. Ent. Soc., VI., 70, =*parthenice* var.

1883—Neum., Papilio, III., 149, =*persephone*.

var. *persephone* Grt.

1863—Grt., Proc. Ent. Soc. Phil., II., 433, *Arctia*.

1864—Grt., Proc. Ent. Soc. Phil., III., 77, *Arctia*.

1873—Stretch, Zyg. and Bomb., 74, *Arctia*.

1886—Grt., CAN. ENT., XVIII., 110, =*anna* var.

1887—Smith, Ent. Amer., III., 110, *Arctia*.

virguncula † Wik.

- 1856—Wlk., C. B. Mus. Lep. Het., III., 609, *Arctia*.
 1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 71, pr. syn.
 Habitat—Penna., N. Y.

The form *anna* is much the least common, being in fact but a suffused form of *persephone*. By the operation of the law of priority this suffused and aberrant form must remain the species, while the normal form remains the variety. It is much more widely distributed than above indicated.

A. approximata Stretch.

- 1885—Stretch, Ent. Amer., I., 104, *Arctia*.
 Habitat—Canada.

A. arge Dru.

- 1770—Drury, Illustr., I., 35, pl. 18, f. 3, *Noctua*.
 1791—Oliv., Enc., Meth., V., 92, (*Phalaena*).
 1816—Hübner, Verz., 183, *Arctia*.
 1837—Westw., ed. Drury, I., 33, *Spilosoma*.
 1841—Harris, Rept. Ins. Mass., 244, *Arctia*.
 1856—Wlk., C. B. Mus. Lep. Het., III., 609, =*dione*.
 1858—Duncan in Jard. Nat. Lib., XXXII., 174, pl. 19, f. 2,
Spilosoma.
 1860—Clem., Proc. Ac. N. Sci. Phil., XII., 528, *Arctia*.
 1862—Harris,* Ins. Inj. to Veg. ed. Flint, 346 (*life hist.*)
 1873—Stretch,* Zyg. and Bomb., 74, 225, pl. 9, ff. 10 and 11,
Arctia.
 1874—Lintner,* Ent. Contr., III., 143, *Arctia*.
 1875—Grt., CAN. ENT., VII., 196, *Arctia*.
 Andrews,* Psyche, II., 79, *Arctia*.
 1882—Gilbert,* Papilio, II., 50, *Arctia*.
 1887—Smith, Ent. Amer., III., 111, *Arctia*.
dione Fabr.
 1775—Fabr., Syst. Ent., 572, *Bombyx*.
 1781—Fabr., Spec. Ins., II., 186, *Bombyx*.
 1787—Fabr., Mant. Ins., II., 116, *Bombyx*.
 1793—Fabr., Ent. Syst., III., 1, 442, *Bombyx*.
 1797—Sm. Abb.,* Ins. Ga., I., 125, pl. 63.
 1816—Hübner, Verzeichniss, 180, *Euplagia*.

- 1837—Westw., ed. Drury Illustr., I., 32, pr. syn.
 1856—Wlk., C. B. Mus. Lep. Het., III., 609, *Arctia*.
 1860—Clem., Proc. Ac. N. Sci., Phil., XII., 528, *Arctia*.
 1862—Clem.,* App. to Morris, Syn., 340, pr. syn.
 1863—Saund., Synopsis Can. Arct., p. 7, *Arctia*.
 1864—Pack., Proc. Ent. Soc., Phil., III., 118, pr. syn.
 1868—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 78, *Chelonia*.
 1883—Neum, Papilio, III., 150, an sp. dist.
 1886—Grt., CAN. ENT., XVIII., 108, *Arctia*.
 1887—Smith, Ent. Amer., III., 111, pr. syn.
 Habitat—Canada to Georgia, Texas, west to California, Vancouver ;
 abundant.

Recorded food plants are *Plantago* and *Polygonum*, but the list is much larger.

A. blakei Grt.

- 1864—Grt., Proc. Ent. Soc., Phil., III., 523, pl. 5, f. 2, ♀, *Arctia*.
 1873—Stretch, Zyg. and Bomb., 74, 224, pl. 9, f. 9, ♂, *Arctia*.
 Habitat—Colorado.

A. bolanderi Stretch,

- 1873—Stretch, Zyg. and Bomb., 74, 76, pl. 3, f. 13, *Arctia*.
 1887—Smith, Ent. Amer., III., 111, *Arctia*.
 Habitat—California.

A. brucei Edw.

- 1888—Edw., Ent. Amer., III., 183, *Arctia*.
 1888—Bruce,* Ent. Amer., III., 219, *Arctia*.
 Habitat—Colorado.

Food plants are *Plantago* and *Polygonum*.

A. celia Saund.

- 1863—Saund., Proc. Ent. Soc., Phil., II., 59, *Arctia*.
 1863—Saund., Syn. Can. Arct., p. 13, *Arctia*.
 1865—G. & R., Ann. Lyc. Nat. Hist., N. Y., VIII., 368, =*figurata*.
 1869—Saund.,* CAN. ENT., II., 74, *Arctia*.
 1873—Stretch, Zyg. and Bomb., 74, var. *figurata*.
 1883—Hulst, Bull. Bkln. Ent. Soc., VI., 70, =*nais*.
 1887—Smith, Ent. Amer., III., 111, *Arctia*.
 Habitat—Canada.

A. cervinoides Strk.1876—Strk., Proc. Ac. N. Sci., Phil., XXVIII., 151, *Arctia*.1879—Strk., Rept. Chief, Eng., 1878-79, V., 1860, pl. II., f. 4,
Arctia.1887—Smith, Ent. Amer., III., 112, *Arctia*.

Habitat—Colo., July 15.

This will prove an undersized *phyllira*, with black secondaries.*A. complicata* Wlk.1864—Wlk., C. B. Mus. Lep. Het. Supp., XXXI., 279, *Arctia*.1868—Grt., Tr. Am. Ent. Soc., II., 117, *Arctia*.1873—Stretch, Zyg. and Bomb., 74, 79, =*dahurica*.1883—Neum. Papilio, III., 149, =*achaea* var.*A. dahurica* Bdv.1843—Bdv., Icon., Hist. Lep., 126, pl. II., f. 1, *Chelonia*.1845—H. Sch., Schmett Eur., II., 145, *Chelonia*.1852—Bdv., Lep. Cal. (Ann. Soc. Ent. Fr.), 49, *Chelonia*.1856—Wlk., C. B. Mus. Lep. Het., III., 597, *Arctia*.1860—Clem., Proc. Ac. N. Sci., Phil., XII., 527, *Arctia*.1862—Clem., App. to Morris Syn., 341, *Arctia*.1867—G. & R., Tr. Am. Ent. Soc., I., 336, pl. 6, f. 41, ♂, *Arctia*.1873—Stretch, Zyg. and Bomb., 78, pl. 3, f. 10, ♀, *Arctia*.1883—Neum., Papilio, III., 150, var. *complicata*.

Habitat—California.

A. decorata Saund.1863—Saund., Syn. Can. Arct., p. 12, *Arctia*.1863—Saund., Proc. Ent. Soc., Phil., II., 60, *Arctia*.1864—Grt., Proc. Ent. Soc., Phil., II., 77, pl. I., f. 4, ♀, *Arctia*.1865—Grt., Ann. Lyc. N. Hist., N. Y., VIII., 369, =*nais*.1873—Stretch, Zyg. and Bomb., 74, =var. *nais*.1878—French,* 7th Rept. Ins. Ills., 182, *Arctia*.1881—French,* Papilio, I., 8, *Arctia*.1882—French,* Papilio, II., 179, *Arctia*.1883—Hulst, Bull. Bkln. Ent. Soc., VI., 70, =*nais*.1883—Neum., Papilio, III., 149, an sp. dist. *nais*.1887—Smith, Ent. Amer., III., 111, =*nais*.*colorata* Wlk.

1864—Wlk., C. B. Mus. Lep. Het., XXXI, 302, *Aloa*.

1868—Grt., Tr. Am. Ent. Soc., II., 117, pr. syn.

Habitat—Can., N. Y., Penna.

The citation of *colorata* as a synonym of *decorata* was made by Mr. Grote before he concluded that *nais* and *decorata* referred to the same forms. I leave the reference as made, since the monographic study of the species may develop the above as the correct conclusion. See under *nais* for further references.

A. determinata Neum.

1881—Neum., Papilio, I., 28, *Arctia*.

Habitat—Colorado.

A. docta Wlk.

1856—Wlk., C. B. Mus. Lep. Het., III., 592, *Euprepia*.

1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 71, = *mexicana*.

mexicana Grt. & Rob.

1865—G. & R., Ann. Lyc. N. Hist., N. Y., VIII., 367, pl. 13, f. 3.

1883—Neum., Papilio, III., 150, = *docta*.

autheola Bdv.

1868—Bdv., Lep. Cal. (Ann. Soc. Ent. Belg., X.), 76, *Chelonia*.

1876—Stretch, Zyg. and Bomb., 74, pl. 3, ff. 3, 4, *Arctia*.

1881—Butler, Ann. & Mag., N. H., Ser. 5, VIII., 310, = *docta*.

1883—Neum., Papilio, III., 150, = *docta*.

arizonensis Stretch.

1873—Stretch, Zyg. and Bomb., 217, pl. 9, f. 4, *Arctia*.

1876—Stretch, Rept. Surv. West. 100 Mer., V., 799, pl. 46, ff. 2 and 3, = var *docta*.

1883—Neum., Papilio III., 150, = *docta*.

Habitat—Ariz., Calif., Mexicana.

A. dodgei Butler.

1881—Butl., Ent. Mo. Mag. XVIII., 136, *Arctia*.

Habitat—Unknown.

According to Mr. Butler this may be a Mexican representative of Drury's species *phyllira*, but the single specimen bears no locality label.

(To be continued.)

NOTE ON THE LARVAL ORNAMENTATION OF THE N. AM.
SPHINGIDÆ.

BY A. R. GROTE.

In my "Hawk Moths of North America," I have assumed that the caudal horn is a prolongation of the skin itself, stiffened by chitine (p. 41). It supports a bristle, or pair of bristles, and Dr. W. Müller, whose valuable work on the *Nymphalidæ* of South America in their larval stages (Zoologischen Jahrbuchern, 1886.) I have noticed in these pages, figures the horn of *Dilophonota*, p. 249, and regards it as a prolongation of the base supporting the two normal bristles of the eleventh segment. We may assume that the caudal horn is a later development, and that the surmounting bristles were originally sessile as in the *Attacinae*. The bristles themselves may have disappeared, and the horn itself, the prolongation of the base, remain. I would draw attention to this character as supporting generally my arrangement of the family. The thoracic "horns" of *Ceratonia* are probably homologous with those of *Citheronia*. This character, together with the comparatively sunken head and soft brown colors of the moth allies *Ceratonia* with *Triptogon*, as I have pointed out. Dr. Wm. Müller concludes that the caudal horn of the Hawk Moths is the remains of what was once a system of bristles, and that there is a perfect homology with the *Saturnidæ*. This entirely agrees with my idea as to the derivation of the family, which may have thus been thrown off from the Spinners in a parallel direction with the *Ceratocampinae*. The modern *Smerinthinae* remain as the descendants of intermediate phases, the ocelloid spots and colors of the moth are retained. In this sense they are synthetic characters appearing in the other three or four groups which are to be referred to Smerinthoid affinities. The relatively small and sunken head, and the square prothoracic parts, the pectinate antennæ, are probably low characters in the Hawk Moths, recalling the Bombyces. In this view the shape of the body in *Hemaris* and allies is a point of widest departure, and warrants the position I assign to the *Macroglossinae*. The method of pupation needs further elucidation. It must be studied in this group, with regard to the physical nature of the surface. Probably the cocoon is older than the absence of silk, the tendency to spin silk appearing by reversion in species to-day where it seems to have become gradually lost as a character. The change to pupation in the earth may have had some relation to changes in the surface conditions in past ages.

DESCRIPTIONS OF LEPIDOPTEROUS LARVÆ,

BY WM. BEUTENMÜLLER, NEW YORK.

MAMESTRA LOREA, Güen.

Head black, with dirty, whitish, irregular markings; antennæ pink. Body of a dirty, creamy, brown color, except the first three segments blackish. Along the dorsum is a series of lozenge shaped blackish patches, one on each segment; on the dorsum are also two rows of minute piliferous spots and two rows along each side, where there is also on each segment an ill-defined, oblique, blackish stripe. Underside semi-translucent whitish, with a number of minute piliferous spots which bear a short pale brown hair, as also do the spots above. Thoracic feet pale brown. Length 34 mm. Collected April 21st. Imago emerged May 18th. Food-plants, strawberry and wild geranium.

PHYCIS RUBIFASCIELLA, Pack. variety.

Head deep chestnut brown, rugose; mouth parts whitish, cervical shield chestnut brown. Body brown, with a pinkish hue; on each side of the body are scattered a few minute piliferous spots each, with a short pale brown hair; on each side of the first and second segment is a shiny black spot. Thoracic feet black; abdominal leg concolorous to the body, which is the same as above. Length, 13 mm. Collected May 30th. Imago emerged June 17th. Food plant, alder. Living in a horn-shaped case. Another form of this species was published by me in the Ent. Amer., V., p. 38.

SALEBRIA CONTATELLA, Grote.

Head jet black, shining, as is also the cervical shield. Body pale green, with a series of about four or five longitudinal stripes, almost of the same hue, along each side, where there are three rows of minute piliferous spots, each bearing a short, light brown hair. Underside of body same color as above, except the first segment, dull black. The segments slightly decrease in size toward the posterior portion of the body. Length, 15 mm. Food-plant, locust (*Robinia pseudacacia*). Living singly between two leaves spun together flatly. June 5th. Imago emerged July 8th.

BOTYS FISSALIS, Grote.

Head small, pale brown, shiny; mouth parts pitchy. Body very shiny, yellowish white, semi-translucent, with a number of piliferous spots concolorous to the body, except those in the first, second and third seg-

ments, which are brown. Each spot with a light brown hair. The cervical shield same color as the body; lateral edges brown; underside same as above; thoracic feet tipped with brown. Length, .24 mm. Food-plant, asters; drawing together several leaves so as to form a bunch. May 31. Imago emerged June 18th.

SALEBRIA CELTELLA, Hulst (MS.)

Head pitchy black, with irregular, dirty, whitish markings, and an oblique stripe of the same color on each side. Body pale green, with a number of pea green, equidistant, longitudinal stripes, as broad as the intervening spaces. Cervical shield jet black, and on which the stripes of the body are sordid white. Along the subdorsum is a row of minute piliferous spots, and two rows along the sides. Body beneath green, and without marking, except the first segment is jet black, as are also the first pair of thoracic feet. A few hairs are also scattered over the body. Length, .22 mm. Food plant, *Celtis occidentalis*, folding together a few of the terminal leaves. Aug. Spins a rude cocoon between leaves.

NOTE ON THE GENUS CROCOTA AND PROF. J. B. SMITH.

BY A. R. GROTE.

Readers of Mr. Smith's papers will have noticed the frequent critical remarks at my expense, and it may have appeared to them that I have been often most culpable. But, in every case, although I have not the pleasure of knowing all of Mr. Smith's publications, these criticisms can be shown to be perversions of the case. So in the genus *Crocota*, in which determinations are difficult, Mr. Smith says (p. 193, vol. XXI.) :— "The matter has been further confused by Mr. Grote's persistent refusal to refer to Mr. Reakirt's species," and further that "he ignores them altogether." I ask anyone how I can "confuse" the "matter" by simply not referring to Mr. Reakirt's species by name, seeing that I do not know these species, have never seen the types, and am not disposed to believe in them? And, moreover, since Mr. Reakirt's descriptions refer to Eastern species, *postdating* my own, and those of other author's which I discuss, if they are not distinct species they are thus clearly synonyms, and Mr. Smith says the descriptions may be "poor," as indeed they seem to me to be. But the whole statement is inaccurate, for everywhere,

where I have referred collectively to the species of *Crocota*, I have also expressly referred to Mr. Reakirt's descriptions, giving my reasons for not particularly citing the species by name. Hence, my writings have had the exactly contrary effect, to that stated by Mr. Smith, "of causing others to lose track of" Mr. Reakirt's "descriptions." I always reminded students of the existence of Mr. Reakirt's descriptions, though I confessed I could not make them out. Nor is Mr. Smith apparently any wiser than I. I did, indeed, suppose that *nigricans* was a synonym of *opella*, or founded on the dark form of that species, but I kept this and all other surmises to myself, because I had no certain data to go upon, and a scientific writer must, in such cases, have a reasonable certainty. With regard to *leta*, I, in my first list, am the first to refer *treatii* here, to show that I had probably rediscovered a totally unknown species since Boisduval's figure. I first, in fact, directed attention to this unrecognized figure, which has been copied in Encyc. Brit. To me belongs the credit of directing Mr. Smith's attention to this figure of *leta* and its probable identity with *treatii* in my first Check List. This identification is not quite assured in the absence of any description; hence, in my new Check List, I made a query. If Mr. Smith had written correctly and impartially on the genus *Crocota* he should have said: Mr. Grote first refers this genus to the *Arctiinae* on account of the presence of ocelli, and removes it from the *Lithosiinae* where he leaves *Ameria*. Further, Mr. Grote has figured the species he described in Proc. Ent. Soc., and no doubt exists, in a confusing genus, of the species he intended. Instead of this, with the evident intention of making an adverse criticism *coute qui coute*, we have the perversions above exposed. As was the case when Mr. Smith replied to my statement, that, in the *Deltoidinae*, the eyes were always "naked," that in one genus the eyes were "lashed" (as if these characters were contradictory or exclusive), it must seem clear that the limit of proper criticism is exceeded by Mr. Smith. The errors of an author must be judged by the material at his command in specimens and literature. If under all the circumstances under which he laboured his work is of a character virtually to advance the study of his subject, and if a large proportion of his determinations are accurate and in the state of the science very opportune, no right-minded person should be able to bring himself to prevent such labours. I may remark, in conclusion, that I do not regard *Cydosia*, *Cerathosia* or *Gnophala*, as *Arctiinae*, and I believe

that they are thus incongruously placed and associated. Both *Cydosia* and *Gnophæla* appear to me to be *Zygenidæ* with Bombycid analogies *in sensu* Packard. I hope Dr. Packard may be induced to study these forms. Neither do I believe our Texan species of *Cydosia* to be the *nobilitella* of Cramer. But all these questions, which ever way a full knowledge of these moths may determine us, must be entered into without temper and without unnecessary animadversions upon those whose experience has led them to opposite conclusions from those reached by the final verdict, a verdict which Mr. Smith's studies will, we may hope, be of a character to influence.

NOTES.

NOTES OF THE YEAR.

Dear Sir: With few exceptions insects were unusually scarce last season, probably on account of the continued cool weather and heavy rains. *Colias Philodice*, generally so abundant, was almost entirely absent, a few appeared in midsummer and the fall brood was more plentiful, but by no means abundant, and the latter might be said of most of our diurnals. The Noctuas were also conspicuous by their absence, at least at sugar, the baits failing to attract even the commonest species. *Eufitchia ribearea* was observed in numbers in a plot of black currant bushes, in an old orchard now included in Mount Royal Park, and *Orgyia leucostigma* was abundant on shade trees about the city. In the fall I found several species of *Eristalis* common on solidago blossoms, *E. Bastardi* and *E. Brousi* being especially abundant, while *E. transversus*, *E. Tenax* and *E. dimidiatus* were less common. The other orders were poorly represented, making it one of the worst collecting seasons in my experience.

F. B. CAULFIELD, Montreal.

ACKNOWLEDGMENT.

Dear Sir: The photograph from which the beautiful figure on p. 204, vol. xxi. of *Papilio Turnus* (aberrant form) was taken by Mr. H. N. Topley, of Ottawa, by the new Isochromatic process, and the engraving was made direct from the photograph. This acknowledgment should have appeared in the article, but was accidentally omitted from the proof.

J. FLETCHER.

A CORRECTION.

Dear Sir : In my note which appeared in your November number, I wrote, through inadvertence, *Phytolacca decandra*. The plant I referred to is *Veratrum viride*—not the "Garget," but the "Indian Poke" or "Poison Poke." I am ashamed at having to take up valuable space with a correction.

THOMAS W. FYLES.

CORRESPONDENCE.

THE COTTON WORM.

Dear Sir : The cotton worm (*Aletia Xylina*, Say). This interesting moth has been tolerably abundant during the middle of September in this district, and is as much of an entomological conundrum as ever. I took several specimens round the electric lights. They seemed quite fresh and presented no appearance of being travel-worn by their supposed journey from the cotton fields of the "land of Dixie" I captured two specimens on September 19 and endeavoured to hibernate them but failed, one dying on October 12th and the other on October 15th. I hope to make another attempt at some future day. It does seem curious that we cannot solve the problem of the northern food-plant of this moth.

E. BAYNES REED, London, Ont.

CHRYSLIDS DEVOURED BY CATERPILLARS.

Dear Sir : A few days ago I found a number of *Pyraucis cardui* larvæ and also several (4) of the common reddish brown hairy caterpillars (*Spilosoma Isabella*), so often seen about gardens in the fall feeding on plants of the common garden hollyhock (*Althæa rosea*). Not having extra boxes to spare I placed both species in a roomy pasteboard box with a plentiful supply of hollyhock leaves. In the course of a day or two several of the *Cardui* larvæ hung themselves to the corner of the box, and in a short time three more transformed to chrysalids. What was my surprise on looking into the box this morning to see if any more had hung or transformed to find the reddish brown caterpillars had devoured two of the *Cardui* chrysalids, and one of the caterpillars was actually engaged eating the third and had consumed fully one-half of it. This was not done from lack of food, as there was an abundance in the box. Here, then, is a new source of destruction to our butterflies—a sort of cannibalism among caterpillars.

SHELLEY W. DENTON, Wellesley, Mass.

Mailed January 9th.