

A REVISION OF THE NORTH AMERICAN GENERA  
AND SPECIES OF THE PHALAEINID SUBFAMILY,  
PLUSIINAE (LEPIDOPTERA)\*

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In both the 1917 and the 1938 Check Lists the arrangement of the Phalaenid subfamily *Plusiinae* followed more or less along the lines of Hampson's revision (1913, Cat. Lep. Phal. Brit. Mus., XIII, 401-594). Some minor changes in nomenclature, due to Hampson's unorthodox method of fixing genotypes, were made as noted (1916, Ent. News, XXVII, 400), but it was recognized at the time that, until a careful study of the group with special reference to genitalia could be undertaken, it was probably as well to follow the latest revision.

Not until very recently has it been possible for me to find the time available for such a revision. The results of a careful study of structural characters, notably genitalia, show the necessity for considerable changes in generic terms and also for a shifting of species under the various headings in order to better emphasize their relationship. The present paper is intended to incorporate these results. It should be noted that the literature cited forms by no means a complete bibliography but merely represents some of the more important references.

The subfamily is a compact one and has been sufficiently well characterized by Hampson (as *Phytometrinae*); further definition on my part is, therefore, unnecessary. Our North American species fall quite naturally into three categories, based on the character of the clavus in the male genitalia, as follows:—

- A. Clavus a short, slightly setose knob arising from a broad base.
- B. Clavus a long, thin rod, variably setose.
- C. Clavus not definitely defined.

The bulk of the species are contained in the first two sections; the clavus is obscure only in the small genus *Pseudeva* Hamp. and the species *albavitta* Ottol. Section A comprises all the species (except *sansoni* Dod) with yellow hindwings and also the species of the *rectangula-interrogationis* group; it is further characterized by the presence of readily recognizable tibial spines,

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mostly confined to the portions of the hind tibiae between the spurs, but occasionally found on all tibiae. Section B includes the balance of the species. The tendency in this section to break up into small groups of species is much more marked than in the former one. In general it may be said that tibial spining is lacking; one or two small groups (to be discussed later) still show a recognizable spining, and individual specimens may frequently be found which show a weak spine or two on a tibia, usually a hind one, if the covering vestiture be carefully removed; such cases, however, are quite common throughout the *Phalaenidae* in species normally spineless, and I do not consider the presence of these single spines sufficient to warrant the term "spined tibiae", especially as they are very difficult to locate.

In Section A considerable confusion has existed regarding the identity of a number of the species and for this reason I have discussed at some length each individual species and have included specific keys based on genitalic characters. In the other sections the species are better known and have been adequately figured; I have, therefore, confined my remarks, on the whole, to genera rather than species, in an attempt to place these on a sounder footing.

The closely related genera *Abrostola* Ochs. and *Mouralia* Wlk. are not considered in the present paper as they show no particularly close relationship to the so-called *Plusia* group and, in any case, require no revision.

The drawings of genitalic structures have been made, under my supervision, by Miss Margaret MacKay of our Forest Insect Survey; her excellent and accurate work adds greatly to the value of the present paper.

## SECTION A

### Genus **CALOPLUSIA** Sm.

1884, Smith, Bull. Brook. Ent. Soc., VII, 68 (no species mentioned).

1891, Smith, List Lep. Bor. Am., 52 (includes *devergens* Hbn. & *hochenwarthi* Hochenw.)

1893, Smith, Bull. 44 U.S.N.M., 258 (adds *alticola* Wlk. to other two).

1895, Grote, Abh. Naturw. Verein Bremen (List N. Am. Eupterotidae, etc.), 62 (sinks to *Syngrapha* Hbn.).

1902, Dyar, Jour. N. Y. Ent. Soc., X, 82 (sinks to *Syngrapha*).

1913, Hampson, Cat. Lep. Phal. Brit. Mus., XIII, 405 (designates *hochenwarthi* as genotype).

1916, McDunnough, Ent. News, XXVII, 400 (sinks erroneously to *Syngrapha*).



Palpi upturned, second joint fringed with long hairs in front, third joint free, rather long and pointed, rough-scaled. Eyes rather small and elliptical. Thorax with divided crest and abdomen crested on basal segments dorsally. *Tibiae all spined*; foretibia with row of spines along inner side; mid- and hind-tibiae strongly spined throughout.

MALE GENITALIA. Similar in general type to that of the following genus, *Syngrapha* Hbn. The juxta is armed with a strong, apical spine; the aedeagus is rather long, slightly bulbous at base and strongly shagreened apically; the armature of the vesica consists of a small, basal spine and a short, hollow, *cylinder of chitin*, thickly covered with short spines, situated apically. The eighth abdominal segment has a pair of hair-pencils, at times weak, arising from the cephalic margin.

FEMALE GENITALIA. Ovipositor and ninth segment partially telescoped into the eighth segment. There is no genital plate, the ostium consisting of a membranous opening leading into a short chitinized funnel; it is partially protected by the overlapping caudal margin of the eighth abdominal segment; the ventral side of the funnel may project caudad for a short distance, forming two rounded lobes, giving additional protection to the ostium. Beyond the funnel the ductus bursae is short, of same width as end of funnel and weakly granulose and strigate, somewhat expanding as it enters the bursa at a point on the right side, slightly below the apex of the bursa. Bursa a large oval, membranous sac, the proximal end (apex) of which is produced caudad along the left side of the ductus to form a short auxiliary sac; this sac is strongly shagreened or granulose and from its rounded apex the ductus seminalis arises as a very fine tube.

GENOTYPE. PHALAENA HOCHENWARTHI Hochenw.  
(Lectotype, 1913)

I believe there is justification for the use of *Caloplusia* Sm. for *hochenwarthi* and its North American ally, *ignea* Grt. on the strength of the much stronger tibial spining. Hampson, with probably insufficient material before him, rather confused the issue by placing *devergens* Hbn., the genotype of *Syngrapha*, in *Caloplusia* along with *hochenwarthi*, which led to the sinking in my Check Lists of *Caloplusia* to *Syngrapha*; other authors apparently had fallen into a similar error. Neither in European specimens of *devergens* nor in our good series of specimens of its North American representative, *alticola* Wlk., can I find spining comparable to that of *hochenwarthi*. The spining, with the exception of odd, unimportant, weak spines occurring most frequently on the mid-tibiae and generally quite concealed in the



vestiture, is restricted to the area on the hind-tibiae between the two pairs of spurs. In consequence *devergens* falls into line in this respect with the other yellow-winged species.

#### CALOPLUSIA HOCHENWARTHI Hochenw.

There seem to be enough genitalic differences in both sexes between European and North American specimens to warrant the supposition that typical *hochenwarthi* does not occur in North America. I had at first supposed that the form, smaller and paler than *ignea* Grt., found in Labrador and subarctic regions, could be placed under this name, but find the genitalia do not match, although the general appearance is extremely similar.

In the male genitalia of specimens from the Tyrolese Alps the harpe, which is well-developed with outcurved and pointed apex, is *considerably broader* than in North American specimens; the apical spine on the juxta is in general not so long and the spines of the short, chitinized cylinder in the vesica are more numerous; the width of the clasper is somewhat variable in character.

In the female genitalia the chitinized funnel-like portion of the ostium is definitely longer than in our North American forms, with distinct *bilobed, caudad projection*, entirely lacking in the others. The apex of the bursa, caudad of the entrance of the ductus, is considerably narrowed and forms a *single convolution*; this convolution is not found in North American specimens.

It is a matter of opinion as to whether our North American representative is a distinct species or merely a well-defined race; in view of the definite genitalic differences, particularly in the female, I am following Hampson and treating *ignea* Grt. as specifically distinct from *hochenwarthi* of the European Alps.

#### CALOPLUSIA IGNEA Grt.

Plate I, fig. 1; IV, fig. 1.

PLUSIA IGNEA Grt. 1863, Proc. Ent. Soc. Phila., II, 274.

CALOPLUSIA IGNEA Smith, 1893, Bull. 44, U.S.N.M., 258 (as syn. ALTICOLA); Hampson, 1913, Cat. Lep. Phal. Brit. Mus., XIII, 409, Pl. 236, fig. 3.

SYNGRAPHIA IGNEA Ottolengui, 1902, Jour. N. Y. Ent. Soc., X, 76; Wolley-Dod, 1906, Can. Ent., XXXVII, 46; *id.* 1913, *op. cit.*, XLIV, 241.

The large size and bright orange hind-wings distinguish the species superficially from its European ally. The type material came from Colorado, probably in the vicinity of Denver; the species, however, occurs at higher altitudes all through the Rocky



Mts. and is not uncommon on most of the Albertan peaks; it also occurs in the Cascade and Coast ranges and is recorded as far north as Atlin, B. C. by Blackmore in his B. C. Check List (1927).

In the male genitalia the apical spine of the juxta is very strongly developed; the harpe, while of the same length and shape as that of *hochenwarthi*, is *considerably thinner*; the spines on the chitinous piece of the vesica are fewer but somewhat longer and stouter. In the female genitalia, as already indicated, the ventral, caudad projections of the funnel-like portion of the ductus are lacking, leaving the ostium protected solely by the overlapping eighth segment; the chitinized funnel is shorter than in *hochenwarthi*. The bursa is not so attenuated as in the European species and the portion which extends caudad of the inception of the ductus is shorter and broader, *without a convolution* and more heavily shagreened on its ventral surface.

C. IGNEA var SIMULANS var. nov.

PLUSIA HOCHENWARTHI Moeschler, 1874, Stett. Ent. Zeitschr., 160; *id.* 1884, Verh. z. b. Gesell. Wien, 296.

For the form of *ignea* which occurs on the east coast of Labrador and adjacent regions and which has generally gone under the name *hochenwarthi*, a new varietal name seems necessary. This race is smaller and paler than *ignea*, the yellow color of the hindwings being even paler than in *hochenwarthi* with the smoky basal suffusion extending more strongly along the inner margin. The forewings are practically similar to those of *hochenwarthi* but the silver mark seems on the whole to be narrower and less extended toward the t. p. line; this feature, however, is probably variable, as in all *Plusias*. In genitalia there are only minor differences from those of *ignea*.

HOLOTYPE—♂, Rocky Bay, Quebec Labrador July 7, 1915 (P. A. Taverner). No. 5391 in Canadian National Collection.

ALLOTYPE—♀, Labrador, (R.W. 76). Purchased by Wolley-Dod from Staudinger and Bang-Haas, Dresden and probably a specimen from the Moeschler Collection.

PARATYPES—1 ♂, Labrador, (ex. Coll. Bang-Haas); 1 ♀, Little Charlton Is. James Bay, July 14 (J. M. Macoun).

There is also a male specimen in the collection from Klondike River, Yukon Terr. which appears to belong here; the silver mark is, however, greatly reduced.

Morrison's record of *hochenwarthi* from the White Mts. N. H. (1875, Ann. Lyc. Nat. Hist. N. Y. XI, 99) needs verification. It may refer to the species from the same locality named *monticola* by Packard.



Genus **SYNGRAPHA** Hbn.

1821, Hübner, Verz. bek. Schmett., 250 (includes *ain* Hbn., *divergens* Fabr. and *devergens* Hbn.).

1895, Grote, *op. cit.*, 62 (designates *devergens* Hbn. as genotype).

1902, Dyar, *op. cit.*, 82 (designates *divergens* Fabr.=*hochenwarthi* Hochenw. as genotype, *ultra vires*).

1913, Hampson, *op. cit.* 412 (designates *ain* Hbn. as genotype, *ultra vires*).

Palpi and vestiture similar to that of *Caloplusia* Sm. Eyes elliptical, varying considerably in size from small to moderately large. Fore and mid-tibiae unspined (or practically so); hind-tibiae with spines only between the two pairs of spurs.

**MALE GENITALIA.** Tegumen of moderate height with the vinculum rather short and either bluntly pointed or rounded apically. Uncus thin, simple, in some cases (*interrogationis* group) compressed laterally towards apex, terminating in a small, sharp spine. Clasper of moderate length and of more or less even width throughout, at times slightly expanded costo-apically, with rounded apex and slightly sinuate costal margin; no differentiation of cucullus which remains unspined; in a few instances the costa either shows a preapical spine (*octoscripta*, *epigaea*) or is produced into a sharp spine, projecting slightly beyond the rounded apex of clasper (*variana*, *selecta*). Saccus not greatly expanded at base, giving rise on its costo-basal margin to the short, chunky clavus; it extends as a narrow neck to the base of the harpe which is usually situated well before the middle of the clasper and extends transversely across same; this harpe consists of a chitinous spine or rod, frequently curved, and of very variable length and breadth in the different species. Juxta a large rounded or shield-shaped plate, often with a short, sharp apical spine. Aedeagus variable in size; in some species (*devergens*, *alticola*, *diasema*, etc.) it is short and chunky; in the majority of cases it is narrower and moderately long with either finely spiculate or shagreened apical section; the vesica may be unarmed (*parilis*, *devergens*) but generally shows a strong, terminal, straight or curved spine to which in some instances (*orophila*, *celsa*, *angulidens*) a weaker basal spine is added. In all species examined except the genotype, *devergens*, the eighth abdominal segment is provided with a pair of large ventral hair-pencils, situated in deep pockets; in *devergens* and its close ally *alticola*, these are greatly reduced.

**FEMALE GENITALIA.** In general quite similar to those of *Caloplusia*. The ostium may be a simple opening, unprotected (*parilis*, *sackeni*) or may be partially covered by a chitinous plate, projecting backward from the caudal margin of the funnel, and either entire and ventral (*interrogationis* group) or bifid with latero-ventral arms (*alticola*, *orophila*). The chitinized funnel



varies greatly in length in the various species, quite short in *devergens* and *parilis*, very long in the *interrogationis* group, thus reducing the length of the remainder of the ductus. The entrance of the granulose and strigate portion of the ductus into the bursa is always below its apex but it may enter almost ventrally (*parilis*) or on the right side (*devergens* and the *rectangula-celsa* group) or on the left side as in most of the yellow-winged species (*microgamma*, *orophila*, *diasema*), the *interrogationis-octoscripta* group and *epigaea*. The apex of the bursa, from which the ductus seminalis arises, shows a variable degree of shagreening; the bursa, in general, forms a long membranous sac.

GENOTYPE. NOCTUA DEVERGENS Hbn. (Lectotype, 1895)

The present usage of this generic term conforms more or less to that of Hampson; I cannot, however, agree to Hampson's separation of *parilis* Hbn. into a separate genus (*Autographa* in err.) on the strength of the small eyes. The size of the eyes seems more or less regulated by the size of the insect and all manner of intergrades between small and large exist in the group. In all species, however, the shape of the eye appears to me to be decidedly elliptical and scarcely justifies the term "round" as applied by Hampson in his generic definition.

The identity of most of the species included in the genus has been adequately established by Ottolengui in his two papers (1902, Jour. N. Y. Ent. Soc., X, 57-82, Pls. VI-IX; 1919, *op. cit.*, XXVII, 117-125, Pl. XV). In a few instances, however, due to close similarity of maculation or to rather blurred illustrations, certain names seem to have been misplaced; I shall comment on these in more detail later.

Generally speaking, as noted by Ottolengui, the genitalia, both male and female, furnish excellent characters for differentiation of the various species, and in the keys at the end of the text portion I have endeavored to bring out some of the salient features exhibited by those organs.

#### SYNGRAPHA PARILIS Hbn.

PLUSIA PARILIS Moeschler, 1884, Verh. z. b. Gesell, Wien, XXXIV, 296; Aurivillius, 1890, Bih. k. Sv. Vet.-Akad. Handl., XV (4) 17, Pl. I, fig. 6; Hampson, 1908, Can. Ent., XL, 106.

SYNGRAPHA PARILIS Ottolengui, 1902, Jour. N. Y. Ent. Soc., X, 77, Pl. VIII, fig. 15.

AUTOGRAPHA PARILIS Hampson, 1913, Cat. Lep. Phal. Brit. Mus. XIII, 404.

Apart from the record from the far North on which Walker's synonym, *quadriplaga*, was based, Moeschler records the species from Labrador, and Hampson from the Alberta Rockies. A few specimens from this latter locality (*ex*. Coll. Wolley-Dod) are in our collection and are the only ones I have been able to ex-



amine; the abdomens of these have, unfortunately been crushed very flat and, in consequence, it has been impossible to get a very accurate idea of the exact position of the various parts of the female genitalia.

In both sexes the genitalia show marked similarity to those of *devergens* and *alticola*; in the male genitalia the lack of the prominent spine at apex of juxta is probably the most noticeable character; in the female genitalia the differentiating character I have used may not hold when better material can be examined; there are some slight differences in the size and shape of the initial, chitinized section of the ductus.

#### SYNGRAPHA DEVERGENS Hbn.

With only a single pair of *devergens* from the Swiss Alps available for study I am in doubt as to whether our North American *alticola* can be considered a good species or merely a variety of *devergens*. In the male genitalia there is practically no character on which a separation could be made; in the female genitalia *devergens* appears to lack the pair of sublateral, chitinous appendages at the sides of the ostium which in some specimens of *alticola* are very well defined; as, however, the degree of chitination is rather variable in the different specimens I have examined, I am uncertain whether the character is a specific one.

Moeschler (1884, op. cit.) records the species from Labrador; I have seen no material from this region, but judging by the comparison made by Moeschler between Labrador and European specimens, believe such specimens will fall under *alticola*. Winn's record of the species in his List of Quebec Lepidoptera (p. 47) from the Gomin Swamp near Quebec City needs checking; it may very likely refer to *montana* Pack, which occurs around Ottawa in similar localities.

#### SYNGRAPHA ALTICOLA Wlk.

Plate I, fig. 2; IV, fig. 2.

PLUSIA ALTICOLA Hampson, 1908, Can. Ent., XL, 106.

CALOPLUSIA ALTICOLA Hampson, 1913, Cat. Lep. Phal. Brit. Mus., XIII, 407, pl. 236, fig. 2.

SYNGRAPHA ALTICOLA Wolley-Dod, 1913, Can. Ent., XLV, 241.

For the present and pending further study I am treating *alticola* as a species distinct from the European *devergens*, following Hampson.

Besides specimens collected by Mrs. Nicholl in the Alberta Rockies as noted by Hampson, others are before me from Banff, Nordegg and Laggan in Alberta; Mt. Apex and Jesmond in British Columbia; Churchill, Manitoba; Great Slave Lake and Great Bear Lake, N. W. T. and a pair taken by myself on July 25, 1928



on the northern slopes of Mt. Washburn, Yellowstone Park, Wyo., the female being very large and pale, especially in the subterminal area.

**MALE GENITALIA.** Characteristics are found in the sharp, apical spine on the broad, shield-shaped juxta; the short, chunky aedeagus without armature; the broad, well-developed harpe, slightly outwardly oblique, projecting at times over costa, terminated by a sharp spine and with its inner side forming a slight ridge. The twin hair-pencils of the eighth segment are reduced to small tufts of hair.

**FEMALE GENITALIA.** Ostium flanked by a couple of pockets, formed by invaginations of the eighth abdominal segment and connected by irregularly ridged membrane; ostium itself circular, protected not only by the overlapping membrane of the eighth abdominal segment but also by a pair of sublateral crinkly, chitinous projections (wings) of irregular shape and variable in the intensity of their chitinization. The initial portion of the ductus seminalis (funnel) is short, more or less quadrate and rather weakly chitinized with the exception of a narrow, medio-dorsal, membranous strip; beyond the funnel the ductus narrows slightly and forms a short, largely membranous tube, weakly granulose and, prior to its entrance into the bursa, showing numerous fine chitinous striations. The entrance to the membranous bursa is distinctly on the right side, the rounded apex of the bursa projecting caudad of the opening for a short distance; this area is finely granulose and at its extremity gives rise to the very fine ductus seminalis; the remainder of the large sac-like bursa is clear, membranous.

*SYNGRAPHA MICROGAMMA* Hbn.

Plate I, fig. 3.

*SYNGRAPHA MICROGAMMA* Wolley-Dod, 1910, Rep. Ent. Soc. Ont., 1909, 118; *id.*, 1913, Can. Ent., XLV, 240.

*AUTOGRAPHA MICROGAMMA* Barnes & Benjamin, 1923, Can. Ent., LV, 212.

Besides the specimens mentioned by Dod, I have before me single males from Behrens Riv., Man., Harlan, Sask., and Jesmond, B. C. These agree in maculation and genitalia with a specimen from Esthonia, Europe and confirm Dod's determination.

**MALE GENITALIA.** Juxta with well-developed apical spine. Aedeagus moderately long and very slightly bulbous at base, strongly spiculate apically, armed with a short, stout, slightly curved, apical spine, arising from a broadened base, and a very minute basal one, situated in the bulbous portion. Clasper rather narrow, rounded apically, with a long, thin, upright, tapering harpe, projecting well over costal edge.



FEMALE GENITALIA. (Based on a European specimen). Ostium with traces of the lateral pockets found in *alticola*. The opening itself is unprotected but flanked by two lateral, sub-triangular pieces of chitin. Ductus a broad tube, chitinized lightly for practically its entire length, slightly expanded on right side at  $2/3$  and with membranous thickening on this same side; bending somewhat to left below bulge. The entrance to the bursa is on the left side and shows numerous fine chitinous strigae with a certain amount of granulation. The apex of the bursa is rounded and projects caudad for a short distance on right side of ductus beyond entrance; it is strongly shagreened and shows a brownish coloration; the remainder of the sac-like bursa is clear and smoothly membranous.

S. MICROGAMMA var. MONTANA Pack.

PLUSIA MONTANA Packard, 1874, Guide Stud. Ins., 313.

AUTOGRAPHA MONTANA Barnes & Benjamin, 1923, Can. Ent., LV, 212.

Packard's name, based on material from the White Mts., N. H. (probably Mt. Washington) had been overlooked by all previous authors until resurrected by Benjamin who referred the name to *microgamma*. I have two specimens before me from Mt. Albert, Gaspé Co., Que. and another one taken in early June at the Mer Bleue, a peat bog near Ottawa, which seem to match Packard's brief description and certainly justify Benjamin's reference.

In two features of the male genitalia *montana* differs from *microgamma* of Europe and western Canada; the apical spine of the juxta is lacking and the spine at apex of the aedeagus is considerably larger and more curved. As compared with *microgamma* in maculation of forewings my eastern specimens all show a stronger incurve of the t. p. line in the submedian fold followed by a slight outward angle on vein 1; the s. t. line is more strongly marked and the tail of the silver mark seems less drawn out. More material will be needed to determine whether these differences are of specific value; for the present I treat *montana* as an eastern race of *microgamma*.

SYNGRAPHA OROPHILA Hamp.

Plate I, fig. 5; IV, fig. 3.

AUTOGRAPHA DIASEMA Ottolengui (*nec* Bdv.), 1902, Jour. N. Y. Ent. Soc. X, Pl. VIII, fig. 6.

PLUSIA OROPHILA Hampson, 1908, Can. Ent., XL, 105; *id.*, 1913, Cat. Lep. Phal. Brit. Mus., XIII, 416, Pl. 236, fig. 5.

AUTOGRAPHA OROPHILA Wolley-Dod, 1913, Can. Ent., XLV, 239.



This species was confused by earlier authors with *diasema* Bdv. until the error was rectified by Hampson. It occurs all through the Alberta Rockies and we also have specimens from Mt. Apex, near Hedley, B. C.

MALE GENITALIA. Juxta without apical spine. Aedeagus rather short and lightly shagreened apically, characterized by the armature which consists of a thin, fairly long, basal spine and a strong, tapering, apical one, the point of which (in my slide at least) is directed cephalad. Harpe strongly outcurved, decumbent, with pointed apex.

FEMALE GENITALIA. Ostium characteristically protected by two sublateral, pointed projections (wings), arising from the heavily chitinized and strongly strigate ductus-funnel, which is quite long and rather broadly membranous on dorsal side. The continuation of the ductus shows an initial, small, membranous bulge to the right and then is strongly strigate with thin, chitinous strigae, which continue for some distance down the left side of the bursa, beyond the entrance; the right side is almost entirely chitinous. The apex of the bursa bulges caudad only slightly and is covered with a brown chitinous plate, extending down the right side of bursa for some length; remainder of bursa clear and membranous, very feebly granulose.

SYNGRAPHIA DIASEMA Bdv.

Plate I, fig. 6; IV, fig. 4.

PLUSIA DIASEMA Aurivillius, 1890, Bih. K. Sv. Vet.-Akad. Handl., XV, (4), 18.

SYNGRAPHIA DIASEMA Hampson, 1913, Cat. Lep. Phal. Brit. Mus., XIII, 416, Pl. 236, fig. 6.

SYNGRAPHIA DIASEMA BOREA McDunnough (*nec* Auriv.) 1921, Can. Ent., LIII, 85.

AUTOGRAPHIA DIASEMA McDunnough, 1922, Can. Ent., LIV, 139.

Besides a series of 1 ♂, 5 ♀, from Hopedale, Labr. our collection contains single males from Nordegg, Alta. and Gt. Bear Lake, N. W. T. Hampson records it from St. Martin's Falls, Albany Riv., N. Ont., and figures a female; in this the secondaries are much too yellow for *diasema* and the determination will need careful checking. All our specimens agree in maculation and male genitalia with a European specimen from Lule, Lappmark, (*ex* Coll. Dod).

MALE GENITALIA. Apex of aedeagus and the anellus very heavily spiculate, no apical spine on juxta. Aedeagus wide and chunky, armed with a broad dagger-shaped, transversely-placed, apical spine. Harpe upright, thin, pointed, almost reaching to costa of clasper.



FEMALE GENITALIA. Ostium considerably broader than in *orophila*; the two sublateral wings project caudad but their apices are broadly rounded and not pointed. The ductus-funnel is strongly chitinized and strigate, gradually tapering, and noticeably longer than in *orophila*. The continuation of the ductus bends to the left and is short and broad, less heavily strigate and chitinized than in *orophila*, the strigae continued for only a very short distance along the left side of the bursa, below the entrance. The bursa consists of the usual large, membranous sac; the rounded apex projects caudad along the right side of the ductus for a greater distance than in *orophila* and shows none of the chitinization found in this species, being merely finely granulate; the membrane of the remainder of the bursa is smooth.

SYNGRAPHA LULA Strand

Plate IV, fig. 5.

AUTOGRAPHA SACKENI Wolley-Dod (*nec* Grote), 1906, Can. Ent., XXXVIII, 45.

SYNGRAPHA SNOVI Hampson (*nec* Hy. Edw.), 1913, Cat. Lep. Phal. Brit. Mus., XIII, 418, Pl. 236, fig. 8.

SYNGRAPHA SNOWI ab. LULA Strand, 1916, Arch. f. Naturgesch., A, (2), 47.

AUTOGRAPHA DIVERSIGNA Ottolengui, 1919, Jour. N. Y. Ent. Soc., XXVII, 121, Pl. XV, fig. 2; McDunnough, 1921, Can. Ent., LIII, 85; *id.* 1922, Can. Ent., LIV, 139.

AUTOGRAPHA LULA Barnes & Benjamin, 1923, Can. Ent., LV, 212.

A good series is before me from various localities in the Alberta Rockies. It is unfortunate that the name *diversigna* cannot be used for the species; until, however, some authoritative ruling on the status of aberrational names can be secured from a committee on Entomological Nomenclature, I follow Benjamin in raising Strand's aberrational name to specific rank.

MALE GENITALIA. Apex of aedeagus and anellus heavily spiculate, no apical spine on juxta. Aedeagus longer and narrower than in *diasema*; the apical spine is smaller, obliquely-placed and arises from one end of a lengthened base. Harpe much as in *diasema* but showing a slight ridge below the pointed apex.

FEMALE GENITALIA. Sublateral chitinous wings of *orophila* and *diasema* undeveloped. Ductus-funnel much shorter than in those two species, less heavily chitinized and strigate and more goblet-shaped; its dorsal surface is largely membranous and the right side shows a membranous thickening. The continuation beyond the funnel is short and broad, bent somewhat to left at inception and rather irregular, with the usual chitinous strigations, heaviest on the right side but, on the whole, weaker than in the other two species. Bursa smooth, membranous, very slightly granulose on the surface of the rather broadly rounded apex.



## SYNGRAPHA BOREA Auriv.

## Plate I, fig. 4.

PLUSIA DIASEMA var BOREA Aurivillius, 1890, Bih. K. Sv. Vet.-Akad. Handl., XV, (4), 17, Pl. I, fig. 8.

AUTOGRAPHHA SACKENI ? Gibson, 1920, Rep. Can. Arct. Exp., III, (I), 37, Pl. III, fig. 14.

Aurivillius considered *borea*, based on Greenland specimens, as a variety of *diasema*; he characterized it as smaller, with a more V-shaped silver mark but more especially laid stress on the yellower hind wings with narrower dark border.

Besides the specimen from Mayo Lake, Yukon, doubtfully referred by Gibson to *sackeni*, 1 ♂, 4 ♀, are before me from Dawson, Yukon Terr. These all match Aurivillius's description and figure of *borea* excellently and I believe I am correct in placing them under this name. The genitalia in both sexes show, however, that *borea* is a good species, quite distinct from *diasema* and more closely allied to *lula* and *sackeni*. From *sackeni* this species is distinguished by the lack of any yellow patch on primaries near base of costa.

MALE GENITALIA. Juxta and aedeagus much as in *lula*. The harpe is of moderate width throughout with *truncate apex* from the underside of which a minute spine projects; this truncate apex at once distinguishes *borea* from both *diasema* and *lula* in which the harpes taper to sharp points.

FEMALE GENITALIA. Very similar to those of *lula* but with definite suggestions of weakly chitinized wings extending caudad from ostium-margin. Ductus-funnel weakly chitinous and strigate, except for a strip on left side which shows stronger chitination; the base of the funnel is membranous and projects as a short sac below and to the right of the continuation of the ductus; this continuation as well as the bursa are much as in *lula*.

## SYNGRAPHA SACKENI Grt.

AUTOGRAPHHA SACKENI Ottolengui, 1902, Jour. N. Y. Ent. Soc., X, 75, Pl. VIII, fig. 17; *id.*, 1919, *op. cit.*, XXVII, 121, Pl. XV, fig. 1.

This Colorado species is excellently illustrated in Ottolengui's 1919 paper and any confusion which formerly existed as to its identity should now be eliminated. The species is known to me from Colorado (Hall Valley) and from the Bozeman region of Montana. I have had no males available from which to make genitalic slides.

FEMALE GENITALIA. Very similar to those of *borea*. The ductus-funnel is much the same shape but slightly better chitinized and more strigate; the terminal membranous sac on right side found in *borea* seems to be lacking; the distal portion of the ductus bends to the left as in *lula* and is strigate much as in this species.



The apex of the bursa is tinged with brown, due to a very definite shagreening, not found in the allied species mentioned.

SYNGRAPHA SNOWII Hy. Edw.

AUTOGRAPHA SNOWII Ottolengui, 1902, Jour. N. Y. Ent. Soc., X, 75, Pl. VIII, fig. 16; *id.* 1919, *op. cit.*, XXVII, 121, Pl. XV, figs. 2, 3.

This species is unknown to me.

SYNGRAPHA RECTANGULA Kby.

Plate I, fig. 7; IV, fig. 6.

SYNGRAPHA RECTANGULA Hampson, 1913, Cat. Lep. Phal. Brit. Mus., XIII, 423, Pl. 236, fig. 14.

AUTOGRAPHA RECTANGULA ab. DEMACULATA Strand, 1916, Arch. f. Naturgesch. A. (2), 47.

AUTOGRAPHA RECTANGULA race NARGENTA Ottolengui, 1919, Jour. N. Y. Ent. Soc., XXVII, 122, Pl. XV, fig. 8.

By the figures given by Hampson and Ottolengui the species is readily identified. The names *mortuorum* Gn. and *demaculata* Strand are based on variations in the silver mark; as such variations are almost countless throughout the group, it seems of little value to retain the names, even for individual aberrations. *Nargenta* Ottol. applies to the so-called race from British Columbia in which the silver suffusion of primaries is reduced; this feature, however, occurs also among our eastern specimens and some before me can only be separated from western forms by the locality label. The species is common in eastern Canada and we have bred specimens from larvae beaten from hemlock. Brown and McGuffin record the larva (1942, Can. Ent., LXXIV, 56) as feeding also on spruce and balsam fir. I have seen no specimens from the prairie Provinces although Brodie in his Manitoba List records it from eastern Manitoba.

MALE GENITALIA. Juxta a large, subrectangular plate, without apical spine. Aedeagus long with slightly bulbous base, strongly spiculate apically and armed with a stout, curved, pointed spine, arising from an expanded base. Clasper broadened somewhat apically with costa curving gently dorsad; harpe short and chunky, with rounded apex bearing a small spine on inner side; *base of sacculus flat*.

FEMALE GENITALIA. Ostium unprotected. Ductus-funnel goblet-shaped, moderately strongly chitinized and strigate (or crinkled); caudal margin irregular and well excavated medio-ventrally. On ventral side the broadly rounded base of the funnel overlaps shortly a following tubular portion of the ductus, which is lightly chitinized, more strongly on dorsal side where it projects well into the funnel; on the right side apically this tube expands into a small membranous sac. The terminal portion of the ductus



is short, sinuate, expanded as it enters the bursa on the right side, and granulose and strongly strigate. The bursa is a broad, membranous sac, less elongate than in the preceding species; the apex is broadly rounded and is finely granulose, the granulations extending to the entrance of the ductus bursae.

SYNGRAPHA ALIAS Ottol.

Plate I, fig. 8.

AUTOGRAPHHA ALIAS Ottolengui, 1902, Jour. N. Y. Ent. Soc., X, 69, Pl. VIII, fig. 13; *id.* 1919, *op. cit.*, XXVII, Pl. XV, fig. 6; Dod, 1913, Can. Ent., XLV, 191.

AUTOGRAPHHA INTERALIA Ottolengui 1919, Jour. N. Y. Ent. Soc., XXVII, 122, Pl. XV, fig. 5.

This species is very closely related to *rectangula*; the larva is also a feeder on spruce and according to Brown and McGuffin (*op. cit.*) cannot be distinguished from that of *rectangula*. However, as there appears to be a good character in the male genitalia I treat *alias* as a distinct species.

*Interalia*, described as a new species from two females from Nordegg, Alta., bears the same relationship to *alias* that *nargenta* does to *rectangula*, but is even more poorly defined as a race. In a topotypical series from Nordegg before me (including a female compared with Bowman's paratype), I find considerable variation in the amount of silvery suffusion on primaries and the same is true of eastern specimens. The species ranges across the entire Dominion of Canada and a couple of specimens are before me from as far north as Dawson, Yukon Territory.

MALE GENITALIA. Very similar to those of *rectangula*; the harpe is reduced, however, to a mere small knob and the costobasal edge of the sacculus shows a *strong, raised projection*, not found in *rectangula*.

FEMALE GENITALIA. Scarcely distinguishable from that of *rectangula*. The tubular, mid-section of the ductus is somewhat shorter and the lateral projection terminally on the right side is stronger and rather better chitinized. The entrance of the ductus into the bursa seems further down the right side and in consequence the rather narrower apex projects further caudad along the ductus. These differences are quite slight and may not be entirely constant.

SYNGRAPHHA CELSA Hy. Edw.

Plate I, fig. 9; IV, fig. 7.

AUTOGRAPHHA CELSA Ottolengui, 1902, Jour. N. Y. Ent. Soc., X, 72, Pl. 8, fig. 4; *id.* 1919, *op. cit.*, XXVII, 123, Pl. XV, figs. 9, 14.

AUTOGRAPHHA EXCELSA Wolley-Dod, 1913, Can. Ent., XLV, 237, (*partim*).



SYNGRAPHIA ALTERA Hampson (*nec* Ottolengui), 1913, Cat. Lep. Phal. Brit. Mus., XIII, 429, Pl. 236, fig. 22.

SYNGRAPHIA ALTERA ab ALTERANA Strand, 1916, Arch. f. Naturgesch., A. (2), 47.

AUTOGRAPHIA CELSA race SIERRAE Ottolengui, 1919, Jour. N. Y. Ent. Soc., XXVII, 123, Pl. XV, fig. 10.

As indicated by Ottolengui the species is a rather variable one, especially in the amount of dark suffusion in the inner median area; it appears to be widespread throughout the south-central area of British Columbia and on Vancouver Island. I have seen no Oregon specimens but accept Ottolengui's reference as correct. From the two preceding species *celsa* is best separated by the much yellower basal  $2/3$  of the hindwings. *Alterana* Strand, another of Strand's names based on variation in the silver-mark, can be consigned to the synonymy without loss. *Sierrae* Ottol., of which I have only one male before me from Placer County, Calif., seems a good Californian race, characterized by the generally paler color of primaries; a few females, however, from Vancouver Island match my specimen pretty closely and when plenty of Oregon material can be studied it may be found that the two intergrade.

MALE GENITALIA. Juxta without apical spine. Aedeagus rather broad, heavily spiculate apically, base scarcely bulbous, with *distinct small spine*; apical spine *very large and curved*, much longer than in the two preceding species. Clasper of nearly even width throughout with rounded apex at costa; harpe short, stubby and triangular, terminated by a sharp spine at the base of which is sometimes a small wart on outer side.

FEMALE GENITALIA. Ostium flanked by small, weakly chitinized, lateral pockets. Ductus-funnel long, carrot-shaped, heavily chitinized, especially in lower half; the caudal margin projects ventrally only slightly over the ostium, is somewhat crinkly, with a broad, shallow, median excavation; the base of the funnel *bends backward to the right* and terminates in a narrow membranous sac. The continuation of the ductus arises on the dorsal side of the funnel, just above the bend, and consists of a straight tube, about the width of the funnel-base and longer than usual, being somewhat longer than the funnel; it is very heavily strigate with fine chitinous strigae and enters the bursa on the right side, somewhat above the middle. The apex of the bursa extends caudad, along the left side of the ductus, for a considerable distance, is very heavily shagreened and of a brownish color, gradually deepening to almost black at extreme apex; the ductus seminalis arises on the right side just below apex. The lower half of the sac-like bursa is weakly granulose.



## SYNGRAPHA ANGULIDENS Sm.

AUTOGRAPHA ANGULIDENS Ottolengui, 1902, Jour. N. Y. Ent. Soc., X, 71, Pl. VIII, fig. 5.

SYNGRAPHA ANGULIDENS ab. PLUSIOIDES Strand, 1916, Arch. f. Naturgesch., A. (2), 47.

The identity of this species has never been in doubt. Strand's name, based on a specimen without the white dot beyond the silver stigma, belongs in the synonymy. The species occurs in Colorado and adjoining states (Utah, Arizona).

MALE GENITALIA. Allied to those of *celsa* but the juxta shows a weak apical spine; the spiculation of the apical area of aedeagus is much finer, more granulose; the apical spine, while fully as long, is somewhat slimmer. The harpe is *considerably longer* and extends almost to costa with the *pointed apex weakly incurved*.

FEMALE GENITALIA. Differ principally from those of *celsa* in that the membranous appendage at the base of the ductus-funnel projects at right angles on the right side and is *not recurved*. The funnel is scarcely as long as in *celsa* and the entrance to bursa somewhat nearer apex of same.

## S. ANGULIDENS var. EXCELSA Ottol.

Plate I, fig. 10.

AUTOGRAPHA EXCELSA Ottolengui, 1902, Jour. N. Y. Ent. Soc., X, 71, Pl. VI, fig. 3; Wolley-Dod, 1913, Can. Ent., XLV, 236.

SYNGRAPHA EXCELSA ab EXCELSANA Strand, 1916, Arch. f. Naturgesch. A., (2), 47.

AUTOGRAPHA ALTA Ottolengui, 1919, Jour. N. Y. Ent. Soc., XXVII, 125 (*nom. nov.*).

AUTOGRAPHA EXCELSANA Barnes & Benjamin, 1923, Can. Ent., LV, 213.

*Autographa excelsa* Ottolengui is not a primary homonym of *Plusia excelsa* Kretschmar, and, as I disagree with Benjamin's ideas on secondary homonyms, I see no reason for the non-employment of Ottolengui's name as originally used. *Excelsana* is another of Strand's names that is not worth retaining.

*Excelsa* was based primarily on material from Jefferson, N. H. but the author mentions other specimens from the Lake Louise region of Alberta which he considered similar. We have a long series from various points in the Alberta Rockies and from South-central British Columbia but I have been unable to examine any eastern specimens. I can find no differences between the genitalia of *angulidens* and those of western *excelsa* sufficiently



great to be considered as of specific value, in spite of Ottolengui's claim; I treat, therefore, *excelsa* as the northern race of *angulidens*, somewhat smaller in size and darker in coloration of forewings.

The following group, which I have termed the *interrogationis-octoscripta* group, is one of the most difficult in the genus. Primarily the species may be distinguished from those of the preceding *rectangula-celsa* group by the nature of the t. p. line of primaries; in the present group this line is finely and evenly crenulate, especially in the costal half, whereas in the other group the line is irregularly wavy or sinuate, without any finer crenulations.

The species in the group are all very similar in general appearance and distinctly northern or even subarctic in distribution. The lack of adequate material, the difficulty in correctly identifying older existing names and the doubt existing concerning several names proposed by Ottolengui and based generally on single specimens have all added to the confusion; then, too, the not inconsiderable variation in coloration of the forewings in individual specimens of the species involved has made it difficult to judge as to whether we are dealing with good species, races or merely forms. Hampson for instance, sinks practically all of Ottolengui's names as "aberrations" of one species and has been more or less followed in this treatment in our existing Check Lists. With fairly adequate material before me I have made numerous slides of the genitalia of both sexes and have found, in certain instances, excellent characters for separation; these, in the case of the females, can generally be noted by removing a few hairs and scales from the ventral end of the abdomen. I have further been greatly assisted by a careful study of certain of Ottolengui's types, made available to me through the courtesy and co-operation of the authorities of the American Museum of Natural History, New York City.

SYNGRAPHA U-AUREUM Gn.

Plate I, fig. 11; IV, fig. 8.

PLUSIA ARCTICA Moeschler, 1884, Verh. z. b. Gesell. Wien, XXXIV, 296.

PLUSIA U-AUREUM Aurivillius, 1890, Bih. K. Sv. Vet.-Akad. Handl., XV, (4), 16, Pl. I, fig. 7.

PLUSIA U-AUREUM Smith, 1893, Bull. 44, U. S. N. M., 254.

AUTOGRAPHA U-AUREUM Ottolengui, 1902, Jour. N. Y. Ent. Soc., X, 68.

AUTOGRAPHA U-AUREUM Wolley-Dod, 1913, Can. Ent., XLV, 238.



AUTOGRAPHA ARCTICA McDunnough, 1921, Can. Ent., LIII, 84.

AUTOGRAPHA U-AUREUM Benjamin, 1933, Pan Pac. Ent., IX, 61.

The status of *u-aureum* has long been a bugbear to North American entomologists. In the first place it was ostensibly based on material from Dalecarlia, Sweden; later investigation, however, (*vide* Wolley-Dod, *op. cit.*) led European workers to believe that the original specimens came from Labrador. I consider, therefore, that the synonymy as given by Aurivillius is correct and followed it in my recent Check List. The so-called type (a female) of *u-aureum* is now in the U. S. National Museum (*ex* Colls. Oberthur and Barnes); I examined it carefully several years ago and found that it matched Labrador specimens in the same collection; since then Mr. C. Heinrich has kindly made a slide of the genitalia and states that they agree with those of certain Labrador specimens which I sent to him. With a very long series from Labrador before me, and after a study of numerous genitalic slides, I have reached the still somewhat doubtful conclusion that *u-aureum* must be held as a distinct species and not as a race of *interrogationis*; this latter species, or at least a race of it, also occurs sparingly in Labrador. All the older authors (Guenée, Moeschler, Staudinger, Aurivillius) mention as the distinctive characters of *u-aureum* (*groenlandica*, *arctica*), as compared with the European *interrogationis*, the smaller size, greyer color of primaries and, more particularly, the *strongly white-checked fringes*; these characters hold in general in my Labrador series and have enabled me to separate out a small number of larger specimens which I consider as representing *interrogationis* in this region. In the male genitalia I could find no thoroughly satisfactory characters for separation from *interrogationis* but in the females the condition of the chitinized ventral plate, which partially protects the ostium, seemed to offer a better character; in *u-aureum* this plate is normally weak and does not jut out caudad beyond the posterior margin of the eighth abdominal segment which also acts as a partial cover to the ostium; in *interrogationis* it projects distinctly for a moderate distance, and is much more expanded laterally in its terminal portion than is the case in *u-aureum*. Such conditions can generally be observed by simply removing a few hairs from the ventral sides of the female abdomens; in *interrogationis* the end of the plate may then be seen projecting over the hollow which represents the initial portion of the ostium; in *u-aureum* the plate is seldom visible at all; only in those specimens where the rear segments are less telescoped than usual can it be observed beneath the integument of the eighth segment, the posterior margins of the two practically coinciding. I must admit, however, that a few specimens have given trouble when examined in this superficial manner; while



everything in the way of coloration and maculation pointed to *u-aureum*, the ventral plate was distinctly projecting; in such doubtful cases slides are essential.

There is considerable variation in the coloration of the primaries, especially in the amount of dark suffusion in the inner median area; this may be very considerable at times and in one specimen covers almost the entire wing. The silver-mark normally consists of a V followed by a dot; in rare cases this dot may be lacking or may be joined to the V, either at the base or along the outer arm. Besides a long series from Hopedale, Labr. there is a single worn specimen from Churchill, Man. before me which, while lacking fringes, appears to belong here on size and general appearance.

MALE GENITALIA. Juxta rather weakly chitinized<sup>1</sup>, narrowing apically from a broad base and terminated by a weak protuberance with rounded apex. Aedeagus long and with slightly bulbous base, weakly spiculate apically, armed with an apical spine, distinctly short and chunky, arising at one end of an irregularly broadened, chitinous base. Clasper of moderate width, costa slightly upturned at apex and terminating in a sharp point but not produced into a spine; harpe rather variable apparently, generally of moderate length, reaching nearly to costa, with broad base and pointed apex, somewhat incurved; at times of more even width throughout, and again longer and extending over costa; clavus also of variable length and apparently very unstable.

FEMALE GENITALIA. Ostium partially protected by the integument of the eighth abdominal segment which is moderately invaginated, forming the usual pockets at the sides of the ostium. The ductus bursae consists of an initial, long, broad, chitinous tube, extending almost to the bursa and connected with it by the very short membranous section with its usual granulations and chitinous strigations; this distal section is bent sharply to the right and enters the bursa well down on the left side. The proximal half of the chitinous tube gradually expands toward the ostium, *but not strongly so*, and is feebly strigate. It is produced on the ventral side for a short distance caudad, forming the ventral plate which partly protects the ostium. This plate is narrower than in *allied species*, being scarcely more than half the width of the caudal margin of the ductus; it is normally also *shorter* and is entirely covered by the integument of the eighth abdominal segment; it shows considerable variation in size, being at times almost vestigial, and its caudal margin may be either straight or with a broadly V-shaped median excavation, giving it a bilobed appearance. The bursa is a moderate-sized membranous sac, which normally, when containing a spermaphore, is sinuate or *shaped like a question-mark*, due to the fact that the apical portion



bends to the left behind (dorsad of) the ductus and then curves cephalad; the whole apex is distinctly granulose; the fine ductus seminalis arises at the extreme apex and, curving backward, runs caudad along the side of the bent portion of the bursa.

S. U-AUREUM var. PALLIDA Ottol.

AUTOGRAPHA PALLIDA Ottolengui, 1902, Jour. N. Y. Ent. Soc., X, 71, Pl. VI, fig. 7.

After a study of the type, a female from Salmonier, Newfoundland, there seems little doubt that *pallida* has been wrongly placed as a race of *octoscripta* and that the name should be transferred to *u-aureum*. The type is an old, worn specimen of Thaxter's collecting, which accounts for the pale nature of the basal 2/3 of the hindwings in Ottolengui's figure; when in good condition these wings would undoubtedly show the same smoky suffusion in this area as is found in *u-aureum*. Whether the shape of the silver mark, with the dot considerably enlarged and joined to the V-mark, is a normal one I have no means of knowing, as I have seen no other Newfoundland material; such a condition occurs, however, rarely in my Labrador series. For the present I am giving *pallida* racial status until such time as toptotypical series can be examined.

S. U-AUREUM var. VACCINII Hy. Edw.

PLUSIA VACCINII Smith, 1893, Bull. 44, U. S. N. M., 254.

AUTOGRAPHA VACCINII Ottolengui, 1902, Jour. N. Y. Ent. Soc., X, 71, Pl. VIII, fig. 3.

AUTOGRAPHA ARCTICA var. VACCINII McDunnough, 1921, Can. Ent., LIII, 85.

Ottolengui's figure is a good one of this so-called race from the higher regions of the Presidential range, N. H., more particularly from the Alpine Garden of Mt. Washington. It has been recorded from the Adirondacks but Forbes in the "List of the Insects of New York" page 627, states that such references may be based on specimens of *alias*; the record needs verification. It is quite within probability, however, that the species occurs on the higher peaks of the Gaspé region (Mt. Albert) or of the state of Maine.

There is no difference in genitalia from those of *u-aureum*.

SYNGRAPHA INTERROGATIONIS Linn.

Plate IV, fig. 9.

SYNGRAPHA INTERROGATIONIS Hampson, 1913, Cat. Lep. Phal. Brit. Mus., XIII, 430.



AUTOGRAPHIA INTERROGATIONIS Benjamin, 1933, Pan. Pac. Ent., IX, 61.

I have a small series of European *interrogationis* from Scotland before me for comparison with the Labrador series of 3 ♂ 6 ♀ which I picked out, as already mentioned, from the *u-aureum* series on the strength of the larger size, the lack of pure white checkering in the fringes and the more pronounced purple-gray tinges in the pale areas of forewing. The two series appear to agree in the genitalia of both sexes and I am therefore placing the Labrador specimens as *interrogationis*. Eventually, possibly, a racial name may be required but at the present time it seems inadvisable.

As already stated the male genitalia (*vide* Pierce, 1909, Genit. Brit. Noct., Pl. XXIX) show no very marked differences from those of *u-aureum*; the apical portion of the harpe, in those slides examined, seemed to be more bent inwards, and the apical spine in the aedeagus somewhat longer and slightly curved. Whether these characters are definitely of specific value remains to be seen when more material is available for examination. In the female genitalia the mouth of the ostium and the beginning of the chitinous ductus seem definitely broader than in *u-aureum* and the lateral edges are turned downward (cephalad) to form the inner sides of the invaginated pockets; the ventral plate is longer and broader with either a straight or sinuate caudal margin, being at times weakly crinkly. The apical section of the bursa, when a spermaphore is present, is bent to the left below the ductus but *not curved cephalad*, the bursa, in consequence, being more L-shaped than S-shaped. In certain specimens where the bursa contained no spermaphore and was, in consequence, less fully inflated, the apex of the bursa projected caudad on the right side of the ductus without any bend to the left.

S. INTERROGATIONIS var. HERSCHELENSIS Benj.

AUTOGRAPHIA ALTERA ? Gibson, 1920, Rep. Can. Arct. Exp. III, I, 37, Pl. III, fig. 13.

AUTOGRAPHIA INTERROGATIONIS HERSCHELENSIS Benjamin, 1933, Pan. Pac. Ent., IX, 61.

Benjamin based his name on a single male taken by Owen Bryant at Herschel Island, Yukon Terr. I saw this specimen several years ago and matched it pretty well with a male in our Collection from East Main River, James Bay, Que. Judging by the locality and genitalia the worn specimen mentioned doubtfully by Gibson as *altera* will also fall here. Besides these two males there are single large females before me from Dawson, Y. T., Churchill, Man., and Nordegg, Alta. which show a type of genitalia similar to those of Labrador *interrogationis*. It seems rather



presumptuous to base a racial name on a single specimen especially in a species of known variability, so the exact status of *herschelensis* must remain doubtful until much more material from northern localities is available; for the present I am employing the term to cover all our scanty material from the north-western section of Canada.

SYNGRAPHA ALTERA Ottol.

Plate I, fig. 12; IV, fig. 10.

AUTOGRAPHHA ALTERA Ottolengui, 1902, Jour. N. Y. Ent. Soc., X, 69, Pl. VIII, fig. 9.

AUTOGRAPHHA VARIANA Ottolengui, 1902, Jour. N. Y. Ent. Soc., X, 70, Pl. VI, fig. 10.

Both *altera* and *variana* have been generally misidentified, the former name being applied to specimens of *interrogationis*, whilst the latter was confused with *octoscripta*. A study of the type material and genitalia shows that both names apply to slightly different forms—possibly races—of a single distinct species, closely allied to *octoscripta*.

*Altera* was based on a female specimen from Nipigon, Ont., and a cotype from the Adirondacks, N. Y.; I have been able to match the holotype with a female from Larder Lake, Ont., both in maculation and genitalia. The species is a small one, considerably smaller than *octoscripta* as noted by Ottolengui whose description and figure are quite good. It might be added that on the primaries *altera* shows traces of the ruddy suffusion in the submedian fold, interior to the t. p. line, which is quite characteristic and better developed in *octoscripta* and scarcely ever found in *interrogationis* and *u-aureum*. The darker basal area of the hindwings in *altera* at once separates it from *octoscripta* where the basal 2/3 is largely pale grayish-ochreous.

*Variana* was based on a female specimen from St. John, N. B. and I have matched it very closely with a pair of specimens in our collection from White Pt. Beach, N. S. The abdomen of the type is glued on and I have doubts as to its authenticity; in consequence I have made no genitalic slide. However, my Nova Scotia female is such a good match for the type and agrees in genitalia so exactly with my *altera* female that I have no hesitation as regards the relationship of the two names.

*Variana*, as far as is known, would appear to be a sea-coast form and has the pale areas of the primaries more extended and accentuated than in the type form; this difference, however, is not as great, when the actual type specimens are seen side by side, as one would be led to believe from the figured photographs. Still it is probable that the name *variana* may be used in a racial sense.



MALE GENITALIA. (from a *variana* specimen) Juxta a bulb-shaped plate, terminating apically in a weak, blunted projection. Aedeagus long and moderately broad, strongly spiculate apically and armed with a *thin, long, apical spine* with weak base. Clasper narrow, costa terminating in a *distinct, short, spine* projecting beyond the rounded apical margin of cucullus; harpe *sickle-shaped*, tapering from a broader base.

FEMALE GENITALIA. Ostium well protected by the overlapping integument of the eighth abdominal segment and by a *strongly projected, ventral plate*, the sides of which are parallel and its caudal margin well-excavated centrally. Initial section of ductus heavily chitinized and well strigate in proximal half, *broader than usual*, and with *rounded, chitinous projection*, almost as broad as the ductus-tube, extending beyond the origin of the short, terminal, membranous section. This section is heavily strigate, arises ventrally from the chitinous section, bending slightly to the right and entering the bursa on the left side. Bursa rather *small and narrow* (all specimens examined without spermatophore), with the more strongly granulose apex projecting caudad on right side of ductus.

SYNGRAPHA OCTOSCRIPTA Grt.

Plate I, fig. 13; IV, fig. 11.

AUTOGRAPHA OCTOSCRIPTA Ottolengui, 1902, Jour. N. Y. Ent. Soc., X, 70, Pl. VIII, fig. 14.

AUTOGRAPHA OCTOSCRIPTA Hampson, 1913, Cat. Lep. Phal. Brit. Mus., XIII, 425, Pl. 236, fig. 17. (*partim*).

AUTOGRAPHA OCTOSCRIPTA Wolley-Dod, 1913, Can. Ent., XLV, 191; *id.* 1915, *op. cit.*, XLVII, 130.

AUTOGRAPHA OCTOSCRIPTA ab BETA Strand, 1916, Arch. f. Naturgesch. A. 2, 47.

Grote, since he attributed the species to Sanborn, apparently made no type designation. No specimens of Sanborn's exist in the Cambridge Museum, according to Dr. Banks, so I imagine the female specimen from the Grote Collection in the British Museum with Grote's blue-bordered name-label attached, as mentioned by Dod (*op. cit.*), will have to be considered as the holotype.

Ottolengui's figure, apart from being somewhat blurred, gives a fair idea of the species; Hampson's figure is distinctly poor, with much too yellow secondaries. The species may be distinguished from the other members of the group by its larger size, the square exsertion of the s. t. line below the apex of primaries, along with a ruddy suffusion on the inside of the t. p. line below the cell, and by the paler color of the basal 2/3 of the secondaries. The genitalia are quite characteristic.

*Octoscripta* is transcontinental in distribution, is quite common in certain sections of the Maritime provinces and extends



northward to Labrador and Churchill, Man. The species has been bred at Ottawa from a larva on *Vaccinium*.

MALE GENITALIA. Characterized by a *strong, preapical spine on costa of clasper*, projecting at right angles to the plane of the rounded cucullus; harpe also characteristic, being *broadly triangular*, with sharply pointed apex projecting beyond costa of clasper. Aedeagus slightly expanded at  $2/3$  and then contracted to form the heavily spiculate apical section; armed with a straight spine of moderate size with slightly expanded base.

FEMALE GENITALIA. Ostium with well-developed, invaginated, lateral pockets. Anal plate *very strongly projected caudad*, with *rounded sides*, often considerably fluted and strigate; caudal margin rounded or with a small V-shaped, median excision; the terminal portion of the plate is joined to the chitinized ductus by a narrower bar of chitin, the whole appearing *somewhat paddle-shaped*. The strongly chitinized ductus is similar to that of *altera* but narrower and with the *terminal projection confined to the right side* and only half the width of the ductus; the strongly strigate and membranous portion of the ductus is very short and enters the bursa on left side just below the apex. Bursa much as in *altera*.

S. OCTOSCRIPTA var. EPSILON Ottol.

AUTOGRAPHA EPSILON Ottolengui, 1902, Jour. N. Y. Ent. Soc., X, 70, Pl. VI, fig. 8.

This so-called species was based on a male, collected by the Harriman Alaska Expedition at Kodiak, Alaska, and now in the United States National Museum. Mr. C. Heinrich informs me that a slide of the genitalia shows that the apical portions of the claspers had been broken off and that in consequence the characteristic structural details could not be determined. However, basing my conclusion on other minor genitalic characters and on Ottolengui's excellent figure, I am of the opinion that *epsilon* has been correctly placed as a pale race of *octoscripta*.

S. OCTOSCRIPTA var. MAGNIFICA Ottol.

AUTOGRAPHA MAGNIFICA Ottolengui, 1919, Jour. N. Y. Ent. Soc., XXVII, 124, Pl. XV, fig. 13.

There seems little doubt that *magnifica*, the female type of which from Ucluelet, Vancouver Is. B. C. is before me, is a pale race of *octoscripta*; there is also a male from the same locality in our collection which shows to a somewhat lesser degree the characteristic pale suffusion of primaries which I would term a light lavender-gray rather than the "creamy white" mentioned by Ottolengui. *Magnifica* would seem to be a coastal form, bearing the same relationship to *octoscripta* that *variana* does to *altera*.



## SYNGRAPHA ZETA Ottol.

AUTOGRAPHA ZETA Ottolengui, 1902, Jour. N. Y. Ent. Soc., X, 70, Pl. VI, fig. 1.

The type is a female, bearing one of Neumoegen's old labels "Calgary, N. W. T.", which, as has already been several times pointed out, is a very ambiguous locality.

I have carefully examined the specimen and find that the figure given is excellent. Very characteristic are the deep brownish color (not black-brown) of the median area below the silver mark and the pale, almost whitish, terminal area; the shape, too, of the silver mark is curious but this is probably not constant. The deep brown color of the hindwings precludes reference to *octoscripta* and I have been unable to match the type with anything in our collection. The abdomen has been glued in two places and its authenticity may be doubted, especially as it originally was obtained from Jacob Doll, whom Dyar once termed "a notorious mender of specimens". A superficial examination shows a strongly protruding anal plate which would throw *zeta* into the *octoscripta* group if the abdomen belongs. For the present *zeta* must be placed as a good species following *octoscripta*.

## SYNGRAPHA SURENA Grt.

Plate I, fig. 14.

AUTOGRAPHA SURENA Ottolengui, 1902, Jour. N. Y. Ent. Soc., X, 73, Pl. VIII, fig. 10.

This rare species is adequately figured by Ottolengui. Besides a couple of specimens from Hopedale, Labrador, we have in our collection one from Rimouski, Que. and two from Smoky Falls, near Kapuskasing, Northern Ontario.

MALE GENITALIA. Juxta with small rounded apical protuberance. Aedeagus long and fairly bulbous at base, weakly spiculate apically, armed with a long, straight, sharply pointed, apical spine. Harpe well-developed, of nearly even width throughout, bent inward at apex and terminating in *two short spines*.

I have been unable, from lack of material, to examine the female genitalia.

## SYNGRAPHA EPIGAEA Grt.

Plate I, fig. 16; IV, fig. 12.

AUTOGRAPHA EPIGAEA Ottolengui, 1902, Jour. N. Y. Ent. Soc., X, 73, Pl. VII, fig. 16.

AUTOGRAPHA EPIGAEA Wolley-Dod, 1905, Can. Ent., XXXVII, 252.

SYNGRAPHA EPIGAEA ab. EPIGAEELLA Strand, 1916, Arch. f. Naturgesch., A, (2), 47.



This well-known species is easily determinable by Ottolengui's figure. Strand's aberration is based on a specimen in which the tail of the silver mark is almost lacking. The larva is a *Vaccinium*-feeder and is not uncommon in peat-bogs around Ottawa. It is transcontinental in distribution.

MALE GENITALIA. Juxta without apical spine. Aedeagus broad and long, faintly spiculate apically, armed with a *long, bluntly pointed bar of chitin*, extending from base to well beyond middle of the organ. Clasper with a *strong, costal, preapical spine* and rounded apex; harpe long, thin, and tapering to a point.

FEMALE GENITALIA. Very characteristic. The long, strongly chitinized, proximal  $2/3$  of the ductus is extended caudad over the ostium as *two large asymmetrical, rounded lobes*. The distal portion of the ductus is narrow and membranous in its initial portion but quickly broadens and becomes heavily strigate, entering the bursa obliquely on the left side in a *broad opening that occupies the whole central portion of this side*, the caudal edge of the ductus at the point of entrance, as well as an adjoining section of the bursa, being chitinized. The fundus of the bursa is a smallish, bulbous sac, the bursa narrowing opposite the ductus-opening and expanding in the apical half, with a *large chitinous plate* and some membranous thickening on the right side. The fine ductus seminalis is given off on the left (inner) side of this section, just below the apex.

#### SYNGRAPHA SELECTA Wlk.

Plate I, fig. 15.

AUTOGRAPHHA SELECTA Ottolengui, 1902, Jour. N. Y. Ent. Soc., X, 72, Pl. IX, fig. 7.

SYNGRAPHHA SELECTA Hampson, 1913, Cat. Lep. Phal. Brit. Mus., XIII, 421, Pl. 236, fig. 11.

AUTOGRAPHHA SELECTA Wolley-Dod, 1915, Can. Ent. XLVII, 130.

Another well-known species with transcontinental distribution, and extending into the far north; specimens are before me from Churchill, Man. and Whitehorse and Dawson, Yukon Terr. The stigma is very variable, both in shape and coloration.

MALE GENITALIA. Juxta without apical spine. Aedeagus long and broad, heavily spiculate apically, armed with a *long, thin spine* at base and a curved piece of tapering chitin in the median section, the point directed toward base. Clasper long and narrow, costa terminating in a *small, sharp spine*; harpe small, outwardly oblique, bluntly pointed.



FEMALE GENITALIA. Ductus bursae *entirely membranous* or extremely weakly chitinized; the funnel is represented by a short, broad section with sinuous caudal margin and broad, U-shaped base which slightly overlaps the following section on the ventral side. This is followed by a short, moderately broad, faintly granulose section which, after sending a large sac-like projection to the right, broadens enormously to over twice its previous width and continues thus to the bursa-entrance on the left side where it bends inward and narrows slightly. The bursa is a curved, membranous sac, the narrowed apical section *bending to the left* beneath (dorsad of) the ductus; the apex is heavily shagreened and of a *black-brown color*. The ductus seminalis *arises on the left side*, considerably below the extreme apex.

### Genus **ANAGRAPHA** gen. nov.

Plate II, fig. 1; V, fig. 1.

Similar in vestiture and tibial spining to *Syngrapha*. The male genitalia, however, show a marked degree of specialization. Tegumen much more elongate than in *Syngrapha*, terminating in a long, thin uncus; vinculum broadly rounded terminally, clasper broadening gradually toward apex, the costal margin thickly clothed with fine hair which extends inward to middle of clasper in the apical half; attached to the ventral margin is a closely appressed series of long thick hairs, almost spinelike in character; the costa terminates in a small spine and below this the apical margin is abruptly and irregularly cut off and entirely free of hair. Saccus rather broader at base than in *Syngrapha* with short, knobbed clavus; it is joined by a thin, upright band of chitin to the harpe which is a long, recurved hook, slightly bulbous at extremity, arising from the basal half of the clasper. Juxta a rather weakly chitinized plate with a rounded apical projection. Aedeagus rather long, gradually narrowing from base to apex and finely granulate around the apex; vesica strongly spiculate through its entire length and with a single, large basal spine.

FEMALE GENITALIA. Telescoping of ninth segment and ovipositor feeble. Ostium unprotected, circular, leading into a short, chitinized, quadrate, initial portion of the ductus bursae; beyond this the ductus narrows to a short sinuate, strongly chitinized and strigate tube which leads into a moderate-sized, chitinized and spiculate sac, situated on the right side of the ductus and probably representing the apical portion of the bursa. From the base (cephalic end) of this sac the ductus seminalis arises as a fine tube, curving immediately caudad and running parallel to the ductus bursae. The bursa proper is a large, membranous sac, projecting to the left at right angles to the chitinized apex and semilunate in shape.



GENOTYPE. *PLUSIA FALCIFERA* Kby.

The marked difference in genitalia between *falcifera* and the species included in *Syngrapha* would seem to justify a new generic term; *falcifera* is probably a highly specialized offshoot from this genus.

After an examination of the type of *simplicima* Ottol. a worn female simply labelled "Oregon", I incline to agree with Dod (1913, Can. Ent., XLV, 239) who maintains that it merely represents a small aberrant form of *falcifera*. The type specimen has the coloration of the primaries of the brown *simplex* form and the broad tail to the silver mark is entirely missing; the Dod collection contains a specimen of typical gray *falcifera* with similar reduction of this tail and there is also a specimen before me of *simplex* from Aweme, Man. with reduced tail but with the reduction scarcely carried to such an extent as in *simplicima*. All other maculation of *simplicima* is identical with that of *falcifera*.

## SECTIONS B AND C.

Genus **AUTOPLUSIA** gen. nov.

Plate II, fig. 2; V, fig. 5.

Wings long and narrow with slight emargination of termen below apex. Tibiae as in *Syngrapha* with light spining on hind-tibiae between the spurs. Dorsal and abdominal tufting as usual.

MALE GENITALIA. Tegumen, vinculum and uncus much as in *Syngrapha*. Clavus long and thread-like; sacculus rather broadly expanded in basal portion, the clasper, in consequence appearing to be much narrowed in medial area; shortly before apex the costa forms a rounded or pointed protuberance, opposite which a strong, curved spine projects over the ventral margin (possibly representing the harpe or pollex); cucullus weakly chitinized, rounded and covered with fine hair. Aedeagus long, somewhat sinuate, with slightly bulbous base, and a weak, latero-apical thickening of chitin, bearing a few weak spines; vesica armed with a long band of fine spines and a very strong, pointed apical spine arising from a broad base.

FEMALE GENITALIA. With considerable similarity to those of *Syngrapha*. The semicircular ostium is well protected ventrally by the projecting integument of the eighth abdominal segment and by a broad, chitinous, tricorn plate. The ductus is broad, strongly chitinized for its entire length, and enters the bursa well down on the left side. The rather narrow, elongate, membranous bursa bends apically to the left below (dorsad of) the ductus bursae, the extreme apex being finely granulose and giving rise to the ductus seminalis.

GENOTYPE. *PLUSIA EGENA* Gn.

Along with *egena* Gn., my characterization of which is based on specimens from San Diego, Calif., *olivacea* Skin. must obvi-



ously be included; this species is represented in our collection by three specimens from Strontia Spgs., Colo., and Half Moon Bay, Calif., and looks to a casual glance like a very dark *egena*. There is just a possibility that *egenoides* Strand, based on Hampson's "Ab 1. Much Darker." may take precedence over *olivacea* but as Strand's type would probably be a Central or South American specimen I prefer, pending further information, to continue the usage of *olivacea* for our North American species. The male genitalia are quite distinct from those of *egena*, showing the sacculus drawn out to a long, fine, ventral point and the subapical projections on both sides of the clasper stronger and more pointed.

### Genus **TRICHOPLUSIA** gen. nov.

Plate II, fig. 3; V, fig. 6.

Similar in abdominal squamation and lack of tibial spining to *Argyrogramma* Hbn. Wings narrower and more elongate. Strikingly different in genitalia, especially those of the female.

**MALE GENITALIA.** Clasper (typically) much broader than in *Argyrogramma* with broadly rounded cucullus, thickly covered with spine-like hairs, arising from small tuberculate bases; harpe situated (typically) halfway between base and apex of clasper, strong, bent at right angles, the tapering apex projected slightly over costal margin; sacculus weak with moderately long, finger-like clavus. Tegumen long and narrow; vinculum well-produced, but not nearly so abnormally long as in *Argyrogramma*, apex bluntly pointed. Aedeagus much as in *Argyrogramma*.

**FEMALE GENITALIA.** Characterized by the *extraordinary development of the ductus bursae* which is *tape-like* and weakly chitinized, extending to the cephalic end of the abdomen, then bending back almost to its point of inception and again recurved to about the central section of the abdomen where it enters the small membranous bursa, slightly expanded, on what appears to be the right, ventral side. The fine *ductus seminalis* arises from the *narrowed apex of the bursa*. Ostium unprotected, goblet-shaped, weakly chitinized, connected by a very short membranous section with the slightly enlarged, bulbous initial section of the ductus bursae.

### GENOTYPE. *PLUSIA NI* var. *BRASSICAE* Riley.

I can find no difference in male genitalia between a Sicilian specimen of *ni* Hbn. and our North American *brassicae*; at the best it would seem only possible to retain the name *brassicae* as a doubtful North American race of the almost cosmopolitan *ni*, characterized by the somewhat darker color of the primaries. I include *oxygramma* Geyer in this genus as it shows the long lateral tufts of hair on the abdomen and possesses the same attenuated tape-like type of ductus in the female genitalia. It lacks the comb of spines on the basal half of the first joint of the male tibia and



the male genitalia vary in several details from those of *ni*. While the tegumen, uncus, vinculum, clavus and aedeagus are more or less in agreement, the clasper is very small and narrow, with a curious row of specialized, frond-like hairs along the ventral edge; the cucullus is spined but the harpe is an inconspicuous, fine, chitinous finger, situated near base of clasper. When more Central and South American material can be studied a further subdivision may be necessary.

*Abrota* Druce, a species unknown to me, I am including here temporarily on account of the abdominal tufting.

### Genus **ARGYROGRAMMA** Hbn.

Plate II, fig. 4; V, fig. 2.

1823, Hübner, Zutraege z. Samml. exot. Schmett., II, 29 (includes *omega* Hbn. and *questionis* Fabr.).

In general characters similar to *Autographa* Hbn. (*Phytometra* Hamp.) but abdomen of male with lateral tufts of long hair on posterior segments. All tibiae unspined; on first joint of hind tarsus of male a comb of long, fine spines on inner side of basal half may be present or absent. Eighth abdominal tergites and sternites modified and strengthened with chitin and with specialized tufts of hair and hair-pencils.

**MALE GENITALIA.** Very small for the size of the insect. Tegumen long and narrow; uncus thin, long, and terminating bluntly; vinculum *produced to an abnormal extent* and either broadened to a large plate (typical) or narrower and rounded apically. Claspers small and very narrow; slightly expanded apically; cucullus rounded apically and *covered with fine spines*, arising from small tubercles; clavus a thin rod, arising from costo-basal angle of the weak sacculus; harpe a short, oblique rod, arising near base of clasper. Juxta a weakly chitinized plate of varying shape, attached to a long, tube-like, highly spiculate anellus. Aedeagus *very long and narrow*, with moderately bulbous base; it is partially supported by a chitinized strip on the ventral side which expands apically, forming a half-ring; the dorsal side projects beyond this, forming a weakly chitinized, truncate projection, feebly spiculate at its base. There are one or two thin, long spines in the bulbous basal portion.

**FEMALE GENITALIA.** Ostium unprotected and membranous, leading into a weakly chitinized and spiculate, goblet-shaped, initial section of the ductus bursae. The mid-section of the ductus is a short, narrow membranous tube (forming the stem of the goblet); this, in turn, leads into a longer, chitinized and at times strigate, terminal section which enters the bursa *on the dorsal side* below apex. The membranous bursa is variable in size but tapers to a *bluntly pointed fundus* from which the long, fine ductus *seminalis* arises, bending backward along the left side of the bursa.



GENOTYPE - ARGYROGRAMMA OMEGA Hbn. = VERRUCA Fabr.

Hübner's generic term has not been heretofore employed but becomes available for certain North American species of presumable southern origin. It was based on the species *omega* from Georgia, figured in the "Zutraege" (figs. 373/4), and in the text Hübner also mentions *questionis* Fabr. (*sic*) which, judging by the data in the "Verzeichniss", he was inclined to confuse with *oo* Cram.; in this same work he proposed the new name *omicron* for Cramer's fig. F of Pl. 311 which he rightly considered to represent a different species from fig. E, to which the name *oo* is now restricted. *Omicron* (1821) would apparently have priority over *omega* but both are placed by Smith & Hampson in the synonymy of *verruca* Fabr., an action which I am presuming to be correct. To avoid any confusion regarding the genotype of *Argyrogramma* I designate *omega* Hbn. as such genotype. *Quaestionis* Fabr., a synonymy of *chalcytes* Esp., falls, in any case, into the genus *Chrysodeixis* Hbn. of which the European *chalcytes* is the genotype. This genus is evidently closely allied to *Argyrogramma* but in the male genitalia (the only sex examined) the harpe is entirely lacking.

Along with *verruca* Fabr. I am including in the genus *basigera* Wlk.; both species occur in the southern section of our faunal area and can be readily recognized by Ottolengui's figures. They agree in general characters of squamation, etc. but *basigera* lacks the comb of fine spines on the first joint of the hind tarsi found in *verruca*. The genitalia, while showing a number of differences which can be presumed to be merely specific, are, on the whole, of the same general type. I am emphasizing particularly the rather curious point of origin of the ductus seminalis in the female genitalia; this would seem to show very satisfactorily a close relationship of the two species. It is probable that other Mexican or Central and South American species can be included here when opportunity for study occurs.

### Genus **PSEUDOPLUSIA** gen. nov.

Plate II, fig. 6; V, fig. 4.

Similar to *Autographa* in squamation, tufting and lack of tibial spining. Differs, however, very considerably in genitalia.

MALE GENITALIA. Tegumen narrow and elongate, giving rise at its lateral bases to two lobes, weakly chitinized, which nearly meet in the median line dorsally. Uncus thin and long, terminating in a small spine; vinculum produced to a long, fine point. Clasper of normal size, slightly broadened apically, the rounded cucullus being thickly covered with fine spines; harpe very long and thread-like, arising from the extreme base of the clasper; sacculus very weak with long, thin clavus, slightly thicker



than the harpe. Transtilla strong and beak-like apically. Juxta weak, terminating in a sharp spine. Aedeagus long, with bulbous base; central section much narrowed, spiculate in proximal section and partially chitinized; apical half again expanded and then tapering and conical, weakly chitinized and strongly spiculate; a transverse row of short, blunt spines occurs at the extreme base and two thin, longer spines are found at the neck of the bulbous section. The hair-pencils of the eighth abdominal segments are considerably reduced.

FEMALE GENITALIA. Ostium *broad, bowl-shaped, well-spiculate* and with the base folded and wrinkled. The ductus bursae originates in a narrow, raised central area attached to the margin of the bowl and is a narrow, membranous tube, somewhat expanded in the proximal half, then narrowed and feebly strigate and spiculate; it enters the bursa on the dorsal side just below the apex. The bursa is rather broad and chunky, the fundus drawn out to a *long tube which curves back along the left side* of the bursa almost to apex and *gives rise to the thread-like ductus seminalis*.

GENOTYPE. PHALAENA oo Cram. (fig. E, not F.).

The very divergent genitalia seem to warrant the erection of a new generic term for oo Cram. The genus is probably most closely related to *Argyrogramma* Hbn. but the lateral tuftings of hair on the abdomen are lacking, aside from the different genitalia.

Oo is a distinctly southern species but recently a few specimens have been received from points in Quebec Province.

### Genus **RACIPLUSIA** Hamp.

Plate II, fig. 5; V, fig. 3.

1913, Hampson, Cat. Lep. Phal. Brit. Mus., XIII, 410 (includes *nu* Gn. and *pedalis* Grt. (=ou Gn.)

The genus is characterized by the presence of spines on all the tibiae. I have been unable to examine specimens of the genotype *nu* Gn. and base my characterization on our series of *ou* Gn. which Hampson wrongly included in his genus *Phytometra*, although the ab. *pedalis* Grt. was correctly placed.

In *ou* the foretibiae show two terminal spines on the inner side; the mid- and hind-tibiae are moderately spined.

MALE GENITALIA. Tegumen short and broad; uncus thin, pointed; vinculum with *broadly truncate apex*, the terminal margin gently excavated. Clasper broadening toward apex which is rather squarely cut off, the cucullus being without spines or hairs; *harpe absent*; sacculus weak; clavus extremely *long and thread-like*. Juxta broad and weakly chitinized; anellus forming a conical sheath. Aedeagus rather thin and curved, with faintly bulbous



base; apex weakly shagreened; vesica with traces of a basal spine-cluster and with *two small median clusters* of short spines, 3-6 in a cluster. Hair-pencils well-developed.

FEMALE GENITALIA. Ostium partially protected ventrally by a *bilobed plate with square-cut, median excavation* of caudal margin; this plate projects from a weakly chitinized and faintly strigate, initial, barrel-shaped section of the ductus. The continuation of the ductus forms a *straight, rather narrow tube*, at first membranous, then weakly chitinized and finally, for the greater part of its length, membranous and strigate, the strigations increasing in intensity towards the bursa-entrance. The entrance to the large sac-like bursa is *ventrally in the median area* of the bursa, just distad of a *narrow invagination of the right-side* which extends inward for half the width of the bursa and partially separates it into two subequal sections. The ductus seminalis arises at the upper end of this invagination, just to the right of the ductus bursae, and is directed caudad across the ventral surface of the bursa.

### Genus **CHRYSASPIDIA** Hbn .

Plate II, fig. 7; V, fig. 8.

1821, Hübner, Verz. bek. Schmett., 252 (includes *bractea* Schiff., *aemula* Schiff., and *festucae* Linn.).

1896, Grote, Proc. Amer. Philos. Soc. (1895), XXXIV, 3A, 417 (designates *festucae* Linn. as genotype).

1913, Hampson, Cat. Lep. Phal. Brit. Mus., XIII, 452. (designates *bractea* Schiff. as genotype, *ultra vires*).

EUCHALCIA Dyar (*nec* Hübner), 1902, Jour. N. Y. Ent. Soc., X, 81.

PHYTOMETRA Hampson (*nec* Haworth), 1913, Cat. Lep. Phal. Brit. Mus., XIII, 452, (*partim*).

PALAEOPLUSIA Hampson, 1913, Cat. Lep. Phal. Brit. Mus., XIII, 581 (genotype *venusta* Wlk.).

Characterized chiefly by the lack of any tooth at the tornus of primaries and by the great reduction of the dorsal abdominal tuftings, especially on the third segment. As a rule there are one or two spines on the hind tibiae between the spurs.

MALE GENITALIA. Very similar to those of *Autographa* Hbn. (*vide* Pierce, 1909, Genit. Brit. Noct., Pl. XXIX, for fig. of *festucae*). Clasper shorter and broader, less expanded apically; harpe placed considerably further basad and rather stronger. Juxta with weak apical projection. Tegumen broader and chunkier; vinculum forming a long V. Aedeagus of moderate length, only slightly constricted medially, armed with a single short spine and with apical area weakly spiculate.



FEMALE GENITALIA. Ostium broad and largely unprotected, leading into a short, broad, chitinous pocket, the caudal margin of which is sinuate and weakly spiculate, the whole pocket being feebly granulose. The ductus bursae arises from the rounded base of the pocket as a narrow membranous tube, slightly sinuate and comparatively short and enters the bursa practically at its apex. The bursa forms a long leg-like sac, expanded somewhat at fundus to form the foot and at times strengthened over a good portion of the left side by a chitinous bar. The ductus seminalis arises from the apex of the bursa, dorsad of the entrance of the ductus bursae.

GENOTYPE. PHALAENA FESTUCAE Linn.

Grote's designation of *festucae* Linn. as the genotype is the first type fixation I have found and must be adhered to; *Palaeoplusia* Hamp., based on *venusta* Wlk., will fall as a synonym, both species being congeneric. This was recognized by Dyar in 1902 who, however, employed the wrong generic term for the group. Hampson's designation of *festucae* as the type of *Phytometra* is erroneous. The included North American species are *venusta* Wlk., *putnami*, Grt., *nichollae* Hamp. and *contexta* Grt.

### Genus **AUTOGRAPHA** Hbn.

Plate III, fig. 1; V, fig. 9; VI, fig. 1.

1821, Hübner, Verz. bek. Schmett. 251 (13 species including *parilis* Hbn., *circumflexa* Hbn., and *gamma* Linn.).

1895, Grote, Abh. Nat. Ver. Bremen, XIV, (1), 61 (cites *gamma* Linn. as genotype).

1902, Dyar, Jour. N. Y. Ent. Soc., X, 81 (designates *circumflexa* Hbn. = *gutta* Gn. as genotype, *ultra vires*).

1913, Hampson, Cat. Lep. Phal. Brit. Mus., XIII, 404 (wrong usage with *parilis* Hbn. as genotype, *ultra vires*).

1916, McDunnough, Ent. News, XXVII, 400.

PHYTOMETRA Hampson (*nec* Haworth), 1913, Cat. Lep. Phal. Brit. Mus., XIII, 452, (*partim*).

The genus is characterized by the strong dorsal tufting on thorax and abdomen, the lack of lateral hair-tufts on the abdomen and by the practical lack of tibial spining, although individual specimens occur in which one or two spines are present between the hind-tibial spurs. The genitalia run, in both sexes, very true to type, with one or two slight exceptions.

MALE GENITALIA. (*vide* Pierce's figures, Genit. Brit. Noct., Pl. XXVIII). Tegumen narrow and high; uncus simple, long,



thin, terminating in a short spine; vinculum forming a long V, usually with two small, opposed projections on inner edges near apex. Juxta weak; apical spine present typically but generally lacking in our North American species. Clasper long and moderately broad, ventral margin slightly sinuate, cucullus expanding somewhat costo-apically but not differentiated and *clothed merely with long hair*; harpe a straight or outcurved thin rod, arising in median section of clasper; sacculus narrow and weak with thin, long clavus, arising costo-basally. Aedeagus long, with bulbous base usually containing a short spine, a much constricted median area, partially strengthened by chitin, and a more or less expanded apical section, weakly chitinized and spiculate. Hair-pencils well-developed.

FEMALE GENITALIA. Ostium largely unprotected, broad, leading into a short, *chitinous, goblet- or mitten-shaped, weakly granulose, initial section* from the base of which the *rope-like ductus bursae* arises. This ductus is variable in length, generally somewhat twisted, brown in color, and strigate and granulose; it enters the bursa just *below the apex on the right side*, (rarely on the left side). The bursa is variable in shape, depending partially on the number of sinuate spermaphores it contains; in general it is attenuate with rounded apex and frequently some membranous thickening in the region of the ductus-entrance, at times partially encircling this section. The ductus seminalis *arises from the apex of the bursa*.

GENOTYPE. PHALAENA GAMMA Linn.

The bulk of the species in Section B belong in this genus; they are as follows:-

<i>bonaerensis</i> Berg	<i>pasiphaeia</i> Grt.
<i>biloba</i> Steph.	<i>sansoni</i> Dod
<i>precationis</i> Gn.	<i>rubida</i> Ottol.
<i>ottolenguii</i> Dyar	<i>bimaculata</i> Steph.
<i>ampla</i> Wlk.	<i>mappa</i> G. & R.
<i>v-alba</i> Ottol.	<i>pseudogamma</i> Grt.
<i>corusca</i> Stkr.	<i>californica</i> Speyer
<i>speciosa</i> Ottol.	<i>metallica</i> Grt.
<i>labrosa</i> Grt.	<i>flagellum</i> Wlk.

Of the above species *bonaerensis* Berg. and *ottolenguii* Dyar have not been examined. *Biloba* Steph. shows in genitalia (Pl. V, fig. 9) considerable resemblance to species of *Chrysaspidia* and if it had not been for the well-developed dorsal abdominal tufting I should have been inclined to place it in this genus; the aedeagus is unarmed. *Precisionis* Gn. (Pl. III, fig. 1; VI, fig. 1.) is also somewhat aberrant and tends toward the *Argyrogramma* group; the clasper is long and thin with the harpe more basad than is



typical for *Autographa*; the cucullus is covered with minute tubercles which, however, do not give rise to definite spines; the ventral margin is clothed with specialized scale-like hair; the aedeagus has a very bulbous spiculate base and a strongly contracted median section.

The remaining species fall into two minor groups on male genitalic characters. The listed species from *ampla* to *pasiphaeia* show a shorter and broader clasper. In the second group the clasper is long and narrow with considerable costo-apical widening; the harpe is generally thinner and the aedeagus noticeably longer and more contracted medially.

In the female genitalia the entrance of the ductus bursae is normally on the right side of the bursa; only in *californica* does the ductus-entrance appear to be on the left side. *Metallica* Grt. (which is closely allied to the European *bractea* Schiff.) is somewhat aberrant; the ductus bursae is longer than usual, much twisted, and with a small appendage near its origin. The bursa is shaped like a French horn, the main portion being disk-shaped, the tubular apical region arising on the left side near the middle and curving caudad closely appressed to the side of the bursa; the ductus bursae enters this tubular portion on the right side just below the apex.

### Genus **CHRYSANYMPHA** Grt.

Plate III, fig. 4; VI, fig. 2.

1896, Grote, Proc. Amer. Philos. Soc. (1895), XXXIV, 3A, 417 (monotypical genus for *formosa* Grt.).

Scarcely separable from *Autographa* and with similar type of male and female genitalia. Third palpal joint longer and thinner than in *Autographa* and the squamation of the second joint more appressed with scarcely a trace of any long ventral hairs. Apex of forewing well-rounded and outer margin strongly convex and oblique with strong tornal tooth.

In view of the dissimilarity of *formosa* Grt. in general appearance to the species included in *Autographa* I retain Grote's generic term. Hampson's placement of *formosa* in *Abrostola* is quite erroneous.

### Genus **EOSPHEOPTERYX** Dyar

Plate III, fig. 8; VI, fig. 3.

1902, Dyar, Jour. N. Y. Ent. Soc., X, 80 (monotypical genus for *thyatyroides* Gn.).

1913, Hampson, Cat. Lep. Phal. Brit. Mus., XIII, 446.

Similar to *Chrysanympa* in length of third palpal joint; second joint more heavily scaled beneath. Forewings much narrower and more pointed than in either *Chrysanympa* or *Autographa*. The genitalia seem to warrant the generic separation.



MALE GENITALIA. Tegumen chunkier and vinculum longer than in *Autographa*. Clasper with a *very strong medio-ventral bulge*, narrowing rapidly to a rather pointed and well-haired apical section; harpe a *small, finger-like projection*, situated medially; sacculus weak, with long, thin clavus. Aedeagus long, thin, unarmed except for a convolute and spiculate section of the vesica.

FEMALE GENITALIA. Ostium represented by a *broad lunate plate*, moderately spiculate, which leads into a *rectangular, chitinized section* of the ductus, twice as long as broad. The short terminal section of the ductus is sinuous and strigate, entering the bursa on *the left side below the rounded and narrowed apex* which is directed dorsad and fairly heavily granulose. The bursa is short and broad, tapering somewhat toward the fundus. The ductus seminalis arises from the dorsal side of the apex of the bursa.

### Genus **POLYCHRYZIA** Hbn.

Plate VI, fig. 6.

1821, Hübner, Verz. bek. Schmett., 251 (monotypical genus for *moneta* Fab.).

1902, Dyar, Jour. N. Y. Ent. Soc., X, 80.

CHRYSOPTERA Latreille, 1825, Fam. Nat., 476; Hampson, 1913, Cat. Lep. Phal. Brit. Mus., XIII, 439.

DEVA Smith (*nec Walker*), 1893, Bull. 44, U. S. N. M., 246 (*partim*).

This genus is characterized by the long recurved palpi with fringes of hair on the knife-like third joint in front. It is evidently allied to *Autographa* as the genitalia only differ in minor particulars. In the male genitalia the clasper is shorter and broader, more as in *Chrysaspidia*; the harpe is longer and projects well over the costal margin; the clavus is somewhat reduced. The aedeagus is shorter and less constricted medially, being weakly spiculate apically and armed with a short spine. The female genitalia closely resemble those of *Autographa*, the short ductus bursae entering the bursa on the left side below apex.

Our North American form of *moneta*, for which Smith proposed the name *trabea*, (based on a specimen from Calgary, Alta.) has generally gone under the name, *esmeralda* Oberth., a name proposed for the Siberian and Asiatic paler race of *moneta*. While there is no doubt that the two forms are closely allied, judging by a single "Sajan" specimen of *esmeralda* before me, I think that, in view of the great distance between the type localities and the modern tendency to split into races on minor characters, it would be well to resurrect Smith's name. Along with *trabea* Sm. *morigera* Hy. Edw., a species I have not examined, will be included in the genus.



Genus **PSEUDEVA** Hamp.

Plate III, fig. 2; VI, fig. 4.

1913, Hampson, Cat. Lep. Phal. Brit. Mus., XIII, 447 (type designated as *purpurigera* Wlk.).

PANCHRYSIA Dyar (*nec* Hübner), 1902, Jour. N. Y. Ent. Soc., X, 80.

Separated from *Polychrystia* by the less recurved palpi and by the falcate external margin of the primaries. The eyes do not appear to be lashed. The genitalia appear to bear out the separation.

MALE GENITALIA. Obviously of the *Autographa* type but the *clavus* is merely represented by a few hairs on a slight rounded prominence of the sacculus. The clasper is short and broad; the finger-like harpe well basad of the middle of clasper; the sacculus very weak. The aedeagus feebly constricted medially and with moderately bulbous base, weakly spiculate apically and armed with a single basal spine and a cluster of small spines somewhat as in *C. hohenwarthi*, placed more apically. The apical portion of the vinculum is long and narrow.

FEMALE GENITALIA. Allied to those of *Autographa* species. Bursa short and broad (ham-shaped), tapering quickly to a rounded apex, just below which on the left side the entrance of the ductus bursae is situated. This ductus is short and rather broad, elbowed rectangularly just before bursa-entrance. Ostium bowl-shaped and feebly chitinized and spiculate. Ductus seminalis arises from apex of bursa. Besides *purpurigera* Wlk., the only species I have examined, the genus includes *palligera* Grt. and *rubigera* Hamp.

Genus **ADEVA** gen. nov.

Plate III, fig. 3; VI, fig. 9.

Palpi much as in *Autographa*; second joint clothed with long hairs beneath, third joint moderate, rounded, rather closely scaled. Male antennae moniliform, female antennae less so. Eyes large, rounded, feebly lashed. Thoracic and abdominal tufting much as in *Autographa* but the patagia with better defined terminal scaling, giving the appearance of tufts. Tibiae unspined. Forewing with pointed apex, well-rounded outer margin and no tornal scale-tooth.

MALE GENITALIA. Tegumen short and chunky; uncus long, thin; vinculum broadly V-shaped. Clasper short and broad, rounded apically; harpe long and outwardly oblique, finger-shaped; sacculus weak; *clavus undeveloped*. Juxta lengthily triangular, better chitinized than usual. Aedeagus short and broad, unarmed, slightly spiculate apically.



FEMALE GENITALIA. Ostium broad, weakly membranous, shallowly bowl-shaped. Ductus bursae *almost entirely membranous*, short and rather broad, with indications of striations and granulations before entrance into bursa; this entrance occurs on the dorsal side of the bursa just below the rounded apex. Bursa long and narrow, membranous. Ductus seminalis from apex of bursa.

GENOTYPE. *AUTOGRAPHA ALBAVITTA* Ottol.

The genitalic differences between species under *Autographa* and *albavitta* would seem to warrant a generic separation, especially as the whole appearance of the insect is distinctly non-Autographine.

Typical *albavitta* from the coastal regions of California has a distinct pale brownish hue on the primaries; in the desert race *hutsonii* Sm. (described as a *Behrensia*) this brownish coloration is replaced by smoky-gray.

### Genus **PLUSIA** Ochs.

Plate III, figs. 6, 7; VI, figs. 7, 8.

1816, Ochsenheimer, Schmett. Eur., IV, 89 (cites 19 species including *chrysitis* Linn.).

1829, Duponchel, Hist. Nat. Lep. Fr., VII, (2), 72 (names *chrysitis* as genotype).

1893, Smith, Bull. 44 U. S. N. M., 247 (employs in an extended sense).

1895, Grote, Abh. naturw. Ver. Bremen, XIV, (1), 60 (cites same genotype and employs as subgenus for *aerea*, *aeroides* and *balluca*).

1902, Dyar, Jour. N. Y. Ent. Soc., X, 80 (employs similarly as genus but adds *metallica*).

1916, McDunnough, Ent. News XXVII, 400 (suggests same usage as Grote).

DIACHRYSLIA Hbn. (Verz. 252) has been sunk by Dyar (*op. cit.*) to *Plusia* with genotype cited as *orichalcea* Fabr. I have had no opportunity of examining the genitalia of this European species but judging by Pierce's figure (Gen. Brit. Noct., Pl. XXIX) the male genitalia bear great resemblance to those of *Autographa* species.

DYACHRYSLIA Geyer (Zutr. IV, 22) is given by both Neave and Hemming as a valid genus. It was based primarily on *balluca* but in the text *chrysitis* is also mentioned, a species included by Hübner in his genus *Diachryslia*. I imagine that Geyer's spelling is merely a mistake or a misprint for *Diachryslia* and was never intended for a new generic term. In any case it is doubtful whether the name would hold as "i" and "y" are regarded in the International Rules of Nomenclature as synonymous.



The three North American species at present included under *Plusia* do not show, according to genitalia, any close resemblance either to each other or to the genotype, *chrysitis* Linn. In this species (*vide* Pierce, *op. cit.*) the main genitalic differences from *Autographa* in the male appear to be the less elongate tegumen, the closer approximation of the harpe to the base of the clasper, the broader basal area of the sacculus, and the more even width and heavier chitization of the aedeagus which is *split apically into two dissimilar lobes*, one of which is spiculate. In the female the similarity to *Autographa* is also marked. The initial portion of the ductus is, however, elongate-rectangular and not goblet-shaped, the ductus-tube is more membranous and the bursa top-shaped, the ductus (in the single specimen examined) entering ventrally in the middle of the upper, broad portion, and the ductus seminalis given off from a small finger-like projection immediately to the left of this entrance. I was unable to check as to whether such conditions were constant.

On account of the great divergence of genitalia (especially in the male) from the above type, I am removing *aerea* Hbn.—for which, fortunately, a generic term is available—from the genus *Plusia*. For the present I am leaving *aereoides* Grt. and *balluca* Geyer as they stand; such action at least saves a well-known generic term for our North American lists.

The male genitalia of *aereoides* approach closest to those of the genotype. Apart from the rounded apex of the clasper (pointed in *chrysitis*) which probably does not mean a great deal, the harpe is broad and knife-shaped, jutting obliquely over the costal edge. Other characters are similar.

In the female genitalia the ostium is broad and unprotected, the initial chitinated portion of the ductus being broadly oval (not elongate-rectangular); the remainder of the ductus tube is more weakly membranous, narrowing distally and entering the bursa on the right side below apex. The bursa is more normal in shape, being elongate with the narrowed and rounded apex giving rise to the thread-like ductus seminalis.

The above differences can easily be regarded as specific, in which case *aereoides* fits quite well into the genus *Plusia*. The wing shape, with the slightly falcate outer margin also agrees.

*Balluca* shows more divergence in genitalia from the generic type than does the previous species. In the male the claspers are shorter and broader with well rounded apex and less prominent sacculus; the harpe is a thin, upright rod, tapering and slightly incurved in its apical half; it arises from before the middle of the clasper and is rather reminiscent of the type found in certain species of *Syngrapha*. The vinculum is very much longer and drawn out to a blunt point. The shield-shaped juxta has two small raised chitinous flaps at base and a well-developed apical spine; the *anellus forms a narrow high collar*, strongly spined apically. The aedeagus is more typical with the apical lobes well



defined, one being spiculate. In the female the two *lateral invaginations* of the eighth abdominal segment (pockets) are well-developed. The ostium forms a shallow, chitinous, *broadly V-shaped pocket*, with sinuate caudal margin; from the dorsal (inner) side of this the short rope-like ductus (as in *Autographa*) arises, a *large, oval spiculate sac* being attached to its right side just before entrance into the bursa; this entrance is *dorsal*, slightly to the right, below the apex of the bursa. The bursa is a long, narrow sac with granulate, rounded apex, from which the ductus seminalis arises.

Combining, as it does, genitalic characters of both the *Syngrapha* and *Autographa* groups, it is possible that *balluca* is of very ancient origin, its close associations being lost in antiquity.

### Genus **AGRAPHA** Hbn.

Plate III, fig. 5; VI, fig. 5.

1821, Hübner, Verz. bek. Schmett., 250 (includes *aerea* Hbn. and *ahenia* (*glauca* Cram.) ).

1895, Grote, Abh. naturw. Ver. Bremen, XIV, (1), 60 (sinks to *Plusia*).

1902, Dyar, Jour. N. Y. Ent. Soc., X, 81 (cites *aerea* as genotype but sinks to *Plusia*).

While other characters agree with those of the genus *Plusia* the genitalia of *aerea* are so divergent as to afford justification for the resurrection of Hübner's generic term.

**MALE GENITALIA.** Tegumen short and chunky, vinculum very *long drawn-out*, narrowed slightly apically, but rounded and not pointed; uncus thin, pointed apically. Clasper short and broad with *strong broad sacculus* with rounded costo-basal section and apex forming a *scoop-shaped projection* which extends over the ventral edge of clasper at middle; harpe *broad and flat*, outcurved and arising from a *large rectangular base*. Clavus long, terminating in a *distinct, oval, slightly setose knob*. Aedeagus long and thin; in apical section strengthened laterally with chitinous bars, the left one showing a *long series of small teeth* or spines on its edge, the right one with a small cluster of 3 or 4 spines at apex.

**FEMALE GENITALIA.** Invaginations of eighth abdominal segment forming *well-defined pockets*, containing short tufts of hair. *Ventral plate well-developed*, spiculate, broadly rectangular with sinuate caudal margin. Initial portion of ductus membranous, broad, sac-like; the short, bent, terminal section narrowed and strigate, *entering the bursa ventrally*, a little to the left side and almost apically, the apex of the rather shortly elongate bursa forming a small rounded projection to the right (or dorsad) of the ductus-entrance and giving rise to the ductus seminalis.



# KEY TO NORTH AMERICAN SPECIES OF *SYNGRAPHA* BASED ON MALE GENITALIA

1. Costa of clasper with preapical spine ..... 2  
Costa without preapical spine..... 3
2. Aedeagus with thick rod of chitin extending from base to beyond middle; harpe long, thin.....*epigaea* Grt.  
Aedeagus with thin, straight, apical spine; harpe broadly triangular ..... *octoscripta* Grt.
3. Costa produced apically into a distinct, small, sharp spine .... 4  
Costa without apical spine; apex merely angled or rounded .... 5
4. Aedeagus with small basal and curved median spine; harpe small, outwardly oblique ..... *selecta* Wlk.  
Aedeagus with only a thin, straight, apical spine; harpe moderate, sickle-shaped ..... *altera* Ottol.  
*variana* Ottol.
5. Aedeagus unarmed, short, stout ..... 6  
Aedeagus armed with one or two spines: usually longer and thinner ..... 7
6. Juxta with strong apical spine; harpe tapering from broad base and terminating in sharp spine ..... *alticola* Wlk.  
Juxta with apical spine practically undeveloped; harpe narrower and without terminal spine ..... *parilis* Hbn.
7. Aedeagus with both basal and apical spines ..... 8  
Aedeagus with basal spine lacking.....11
8. Basal spine minute; harpe long and pointed, extending beyond costal margin ..... *microgamma* Hbn.  
Basal spine well-developed, rod-like ..... 9
9. Harpe long and strongly outcurved, decumbent; basal spine of aedeagus long; apical spine straight, pointed...*orophila* Hamp.  
Harpe not outcurved; basal spine of aedeagus shorter; apical spine strongly curved ..... 10
10. Harpe of moderate length with broad base, tapering to a slightly incurved point ..... *angulidens* Sm.  
*excelsa* Ottol.  
Harpe very short and chunky with broad base and short, terminal spine ..... *celsa* Hy. Edw.
11. Aedeagus short and broad, of equal width throughout ..... 12  
Aedeagus rather thin, long, with slightly bulbous base ..... 14
12. Aedeagus very broad with broad, transverse, dagger-shaped apical spine; harpe thin and pointed ..... *diasema* Bdv.  
Aedeagus thinner with smaller and thinner, obliquely-placed spine with extended base ..... 13
13. Harpe with truncate apex and very small terminal spine..... *borea* Auriv.  
Harpe tapering to a strong terminal spine ..... *lula* Strand
14. Harpe terminated by a bifid spine; aedeagus with a long, straight, apical spine ..... *surena* Grt.  
Harpe not bifid at extremity ..... 15
15. Harpe short and tubercle-like ..... 16  
Harpe longer, thin, pointed, incurved apically ..... 17
16. Harpe minute; sacculus with raised ridge at base; aedeagus with strong, curved, apical spine on broad base .... *alias* Ottol.  
Harpe somewhat larger, sacculus without raised ridge; aedeagus similar to preceding ..... *rectangula* Kby.
17. Harpe moderately long, gently tapering to a point with weakly incurved apex; spine in aedeagus short and stubby (rose-thorn) ..... *u-aureum* Gn.  
*vaccinii* Hy. Edw.  
Harpe very similar but with more strongly inbent apex; spine in aedeagus somewhat longer ..... *interrogationis* L.  
*Sackeni* Grt. and *snowi* Hy Edw., which also belong in *Syngrapha*, have been omitted in the key, owing to lack of material.



# KEY TO NORTH AMERICAN SPECIES OF *SYNGRAPHA* BASED ON FEMALE GENITALIA

1. Entrance of ductus bursae on right side of bursa, somewhat below apex ..... 2  
Entrance of ductus bursae on left side of bursa, below apex .... 7
2. Ductus bursae with proximal, funnel-shaped portion, weakly chitinized; without appendage ..... 3  
Ductus bursae with funnel generally more strongly chitinized and with lateral membranous appendage on right side .... 4
3. Lateral chitinous flaps projecting caudad from margin of ostium; entrance of ductus definitely on right side of bursa ..... *alticola* Wlk.  
Ostium unprotected by chitinous flaps; entrance of ductus into bursa subventral ..... *parilis* Hbn.
4. Funnel of ductus short, broad, rounded at bottom and moderately chitinized; apex of bursa weakly granulate and hyaline ..... 5  
Funnel of ductus long, gradually tapering, strongly chitinized; apex of bursa strongly shagreened and darkened in color .. 6
5. Membranous portion of ductus shorter than chitinized section; appendage quite small and scarcely chitinized.. *rectangula* Kby.  
Very similar, but membranous portion of ductus longer than the chitinized section and appendage slightly larger and better chitinized ..... *alias* Ottol.
6. Appendage of ductus-funnel recurved and running caudad, parallel to ductus ..... *celsa* Hy. Edw.  
Appendage shorter, not recurved but jutting out at right angles ..... *angulidens* Sm.  
*excelsa* Ottol.
7. Ductus bursae practically entirely membranous, distal section very broad, apex of bursa strongly shagreened and brown, curved to left.....*selecta* Wlk.  
Ductus bursae with at least portions well chitinized ..... 8
8. Chitinized portion of ductus long, extending as a straight, cylindrical tube almost to bursa-entrance ..... 9  
Chitinized portion of ductus shorter ..... 14
9. Caudad extension of ductus-funnel bifid, forming sublateral wings, partially enclosing ostium ..... 10  
Caudad extension of ductus entire, forming a simple ventral plate ..... 11
10. Wings large, rounded apically, somewhat asymmetrical; ductus strongly chitinized; apex of bursa with large, oval plate of chitin ..... *epigaea* Grt.  
Wings slight, subtriangular projections; ductus moderately chitinized; apex of bursa merely granulate .. *microgamma* Hbn.
11. Apex of bursa bent to left behind ductus-tube; projection of ventral plate over ostium weak or moderate ..... 12  
Apex of bursa upright, on right side of ductus-tube; projection of ventral plate strong ..... 13
12. Apex of bursa curved downward and pointing cephalad; ventral plate weak, usually not projecting beyond hind-margin of eighth abdominal segment ..... *u-aureum* Gn.  
Apex of bursa not downcurved, merely pointing to left; ventral plate stronger and broader, projecting distinctly beyond margin of eighth segment ..... *interrogationis* Linn.
13. Chitinous projection at distal end of ductus-tube small, situated on right side and about half the width of the tube.....  
..... *octoscripta* Grt.  
Chitinous projection larger, as wide as the ductus-tube .....  
..... *altera* Ottol.  
..... *variana* Ottol.



14. Apex of bursa with chitinous plate; ductus-funnel strongly chitinized and strigate, extended caudad as two sublateral pointed projections (wings) ..... *orophila* Hamp.  
Apex of bursa merely granulate or shagreened ..... 15
15. Funnel portion of ductus long, tapering, strongly strigate, with two rounded, caudal projections (wings); distal portion of ductus wide, bulging to left from apex of funnel....  
..... *diasema* Bdv.  
Funnel shorter and broader, more weakly chitinized and with caudal projections barely indicated ..... 16
16. Apex of bursa very weakly granulate and entirely hyaline ..... 17  
Apex of bursa strongly shagreened, giving it a brown tinge; ductus with membranous bulge on left side below funnel  
..... *sackeni* Grt.
17. Base of funnel produced into a small, blind, membranous sac, situated on right side and projecting somewhat beyond continuation of ductus ..... *borea* Auriv.  
Very similar but membranous sac seems to be lacking .. *lula* Strand  
*Surena* Grt. and *snowi* Hy Edw. have been omitted owing to lack of material.

## SECTIONS B &amp; C

## KEY TO GENERA

1. Spining on all three tibiae ..... *Rachiplusia*  
Spining only on hind tibiae between the spurs ..... *Autoplusia*  
No spining on tibiae ..... 2
2. Abdomen of male with strong lateral tufts of hair ..... 3  
Abdomen of male without lateral tufts of hair ..... 4
3. In female genitalia ductus seminalis arises from fundus of bursa ..... *Argyrogramma*  
In female genitalia ductus seminalis arises from apex of bursa; ductus bursae very long, sinuate and tape-like .... *Trichoplusia*
4. Cucullus in male genitalia spined; harpe long and thread-like, arising from extreme base of clasper ..... *Pseudoplusia*  
Cucullus in male genitalia hairy; harpe short and finger-like, from near middle of clasper ..... 5
5. Palpi long and recurved; third joint tufted with hair in front. .... *Polychrystia*  
Palpi not recurved, upright ..... 6
6. Third joint of palpi long, acuminate ..... 7  
Third joint of palpi shorter, rounded ..... 9
7. Forewings with outer margin excised below apex; third palpal joint hairy below ..... *Pseudeva*  
Forewings with outer margin evenly rounded; third palpal joint smooth ..... 8
8. Forewings short with rounded apex and strongly convex outer margin ..... *Chrysanympa*  
Forewings long and narrow; apex pointed; outer margin more oblique ..... *Eosphoropteryx*
9. Dorsal abdominal tufting lacking or greatly reduced.. *Chrysaspidia*  
Dorsal abdominal tufting well-developed, especially on third segment ..... 10
10. Clavus in male genitalia undeveloped; male antennae moniliform ..... *Adeva*  
Clavus in male genitalia a long thin process; male antennae finely ciliate ..... 11
11. Forewing with well-developed metallic sign; outer margin rounded ..... *Autographa*  
Forewing without metallic sign; outer margin slightly falcate .. 12
12. In male genitalia clavus with distinct apical knob; sacculus terminating in a scoop-shaped projection extending beyond ventral margin of clasper ..... *Agrapha*  
In male genitalia clavus thin, finger-like; no projection of sacculus across ventral margin of clasper ..... *Plusia*



## EXPLANATION OF PLATES

## PLATE I

## Male Genitalia of:-

1. *Caloplusia ignea* Grt. .... Denver, Colo.
2. *Syngrapha alticola* Wlk. .... Laggan, Alta.

## Right Male Clasper of:-

3. *Syngrapha microgamma* Hbn. .... Harlan, Sask.
4. *Syngrapha borea* Auriv. .... Dawson, Yukon Terr.
5. *Syngrapha orophila* Hamp. .... Nordegg, Alta.
6. *Syngrapha diasema* Bdv. .... Lapland, Europe
7. *Syngrapha rectangula* Kby. .... Meach Lake, Que.
8. *Syngrapha alias* Ottol. .... Gaspe, Que.
9. *Syngrapha celsa* Hy Edw. .... Kaslo, B. C.
10. *Syngrapha excelsa* Ottol. .... Nordegg, Alta.
11. *Syngrapha u-aureum* Gn. .... Hopedale, Labrador
12. *Syngrapha variana* Ottol. .... White Pt. Beach, N. S.
13. *Syngrapha octoscripta* Grt. .... Mer Bleue, Ottawa, Ont.
14. *Syngrapha surena* Grt. .... Rimouski, Que.
15. *Syngrapha selecta* Wlk. .... Wellington, B. C.
16. *Syngrapha epigaea* Grt. .... Duncan, Vanc. Is., B. C.



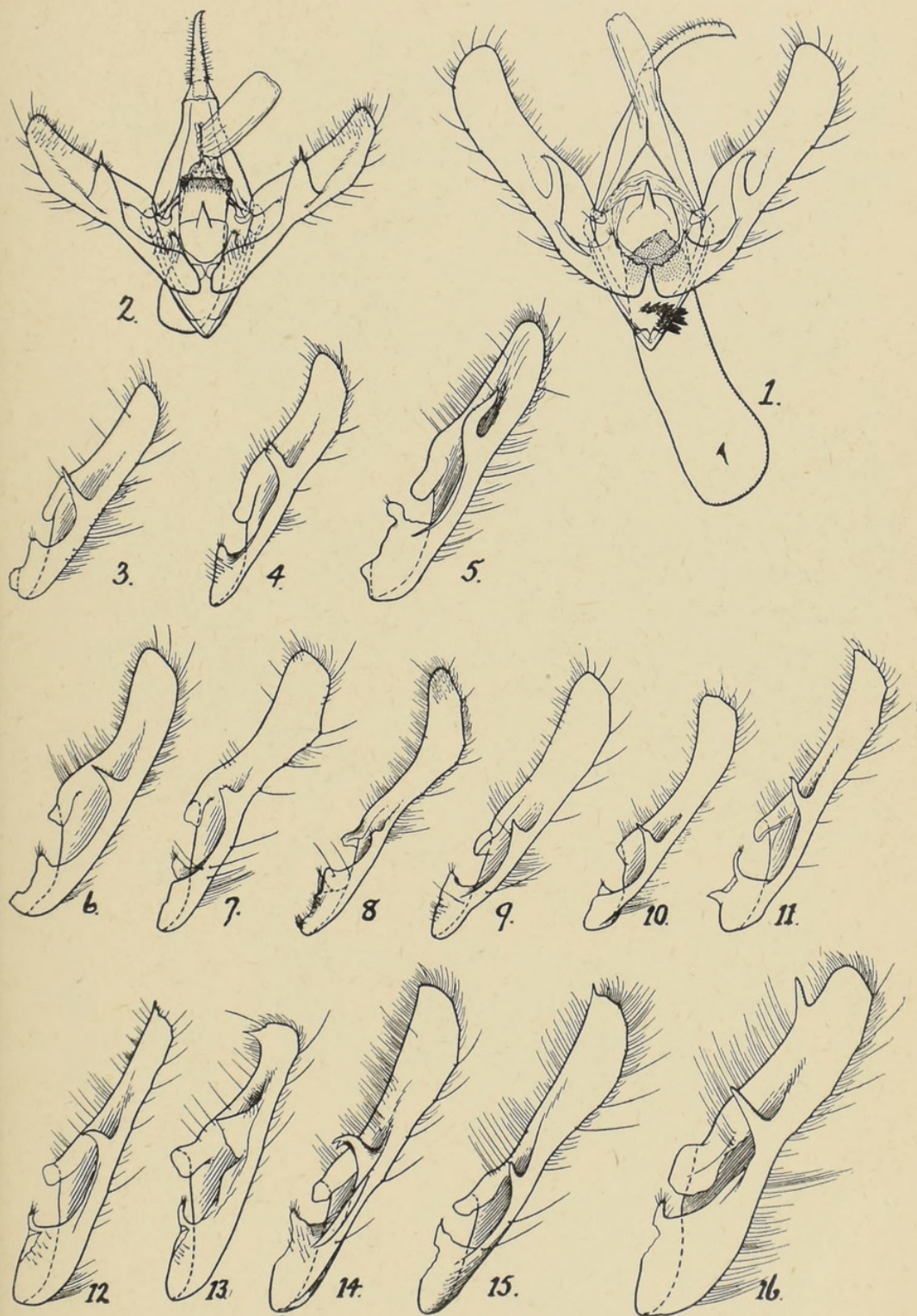


PLATE I



## PLATE II

Male Genitalia of:-

1. *Anagrapha falcifera* Kby. .... Logan, Utah
2. *Autoplusia egea* Gn. .... San Diego, Calif.
3. *Trichoplusia ni* v. *brassicae* Riley .... Chicago, Ill.
4. *Argyrogramma verruca* Fabr. .... Orlando, Fla.
5. *Rachiplusia ou* Gn. .... Georgetown, Tex.
6. *Pseudoplusia oo* Cram. .... Hope, Ark.
7. *Chrysaspidia venusta* Wlk. .... Baddeck, N. S.



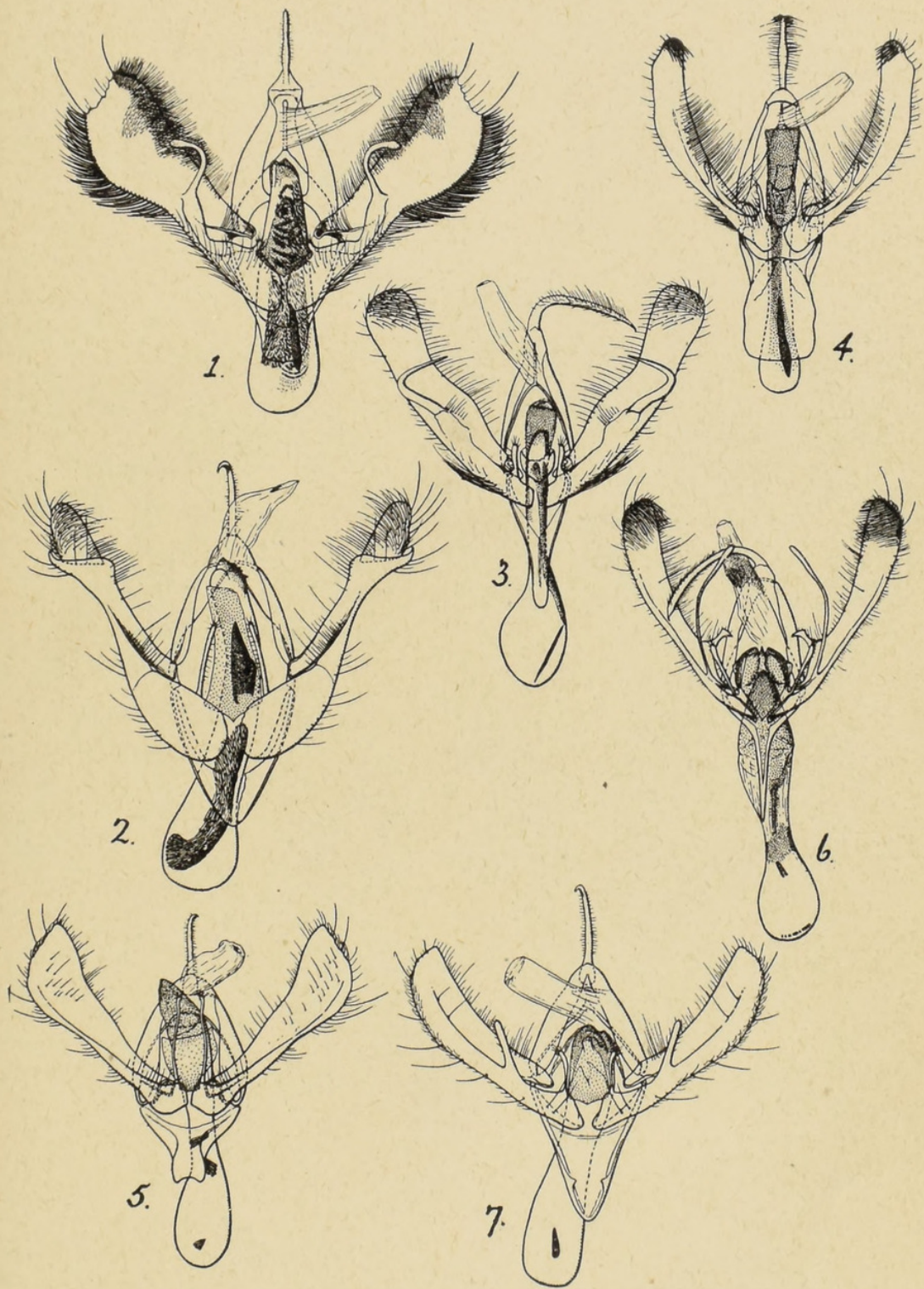


PLATE II



## PLATE III

Male Genitalia of:-

1. *Autographa precationis* Gn. .... Trenton, Ont.
2. *Pseudeva purpurigera* Wlk. .... Calgary, Alta.
3. *Adeva albavitta* Ottol. .... S. Calif.
4. *Chrysanympha formosa* Grt. .... Winnipeg, Man.
5. *Agrapha aerea* Hbn. .... Ottawa, Can.
6. *Plusia aeroides* Grt. .... Baddeck, N. S.
7. *Plusia balluca* Geyer .... Gracefield, Que.
8. *Eosphoropteryx thyatyroides* Gn. .... Ottawa, Ont.



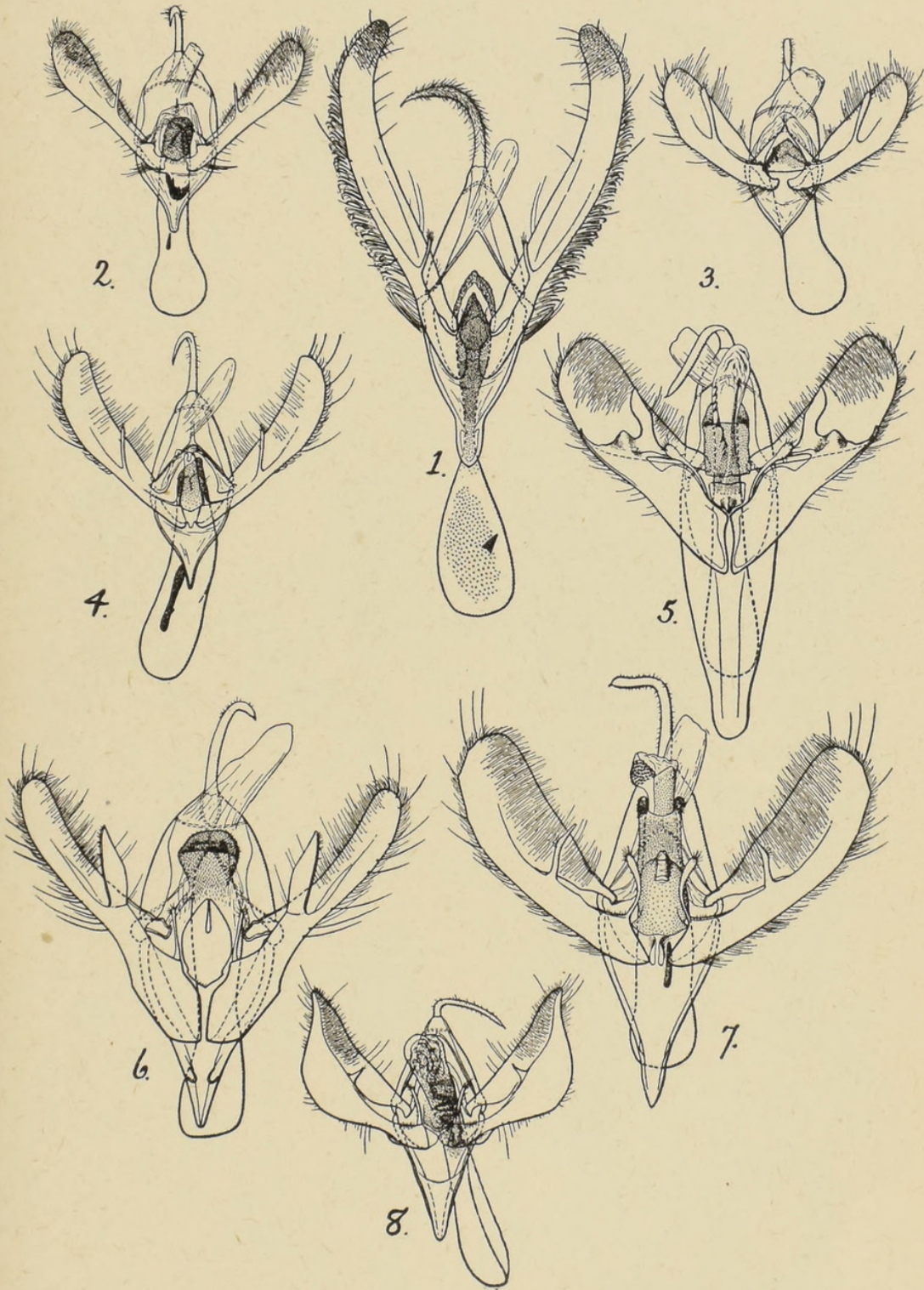


PLATE III



## PLATE IV

## Female Genitalia of:-

1. *Caloplusia ignea* Grt. .... Banff, Alta.
2. *Syngrapha alticola* Wlk. .... Nordegg, Alta.
3. *Syngrapha orophila* Hamp. .... Kaslo, B. C.
4. *Syngrapha diasema* Bdv. .... Hopedale, Labr.
5. *Syngrapha lula* Strand .... Banff, Alta.
6. *Syngrapha rectangula* v. *nargenta* Ottol. .... Seton Lake, B. C.
7. *Syngrapha celsa* Hy. Edw. .... Duncan, Vanc. Is., B. C.
8. *Syngrapha u-aureum* Gn. .... Hopedale, Labr.
9. *Syngrapha interrogationis* Linn. .... Hopedale, Labr.
10. *Syngrapha altera* Ottol. .... Larder Lake, Ont.
11. *Syngrapha octoscripta* Grt. .... Bathurst, N. B.
12. *Syngrapha epigaea* Grt. .... Trenton, Ont.



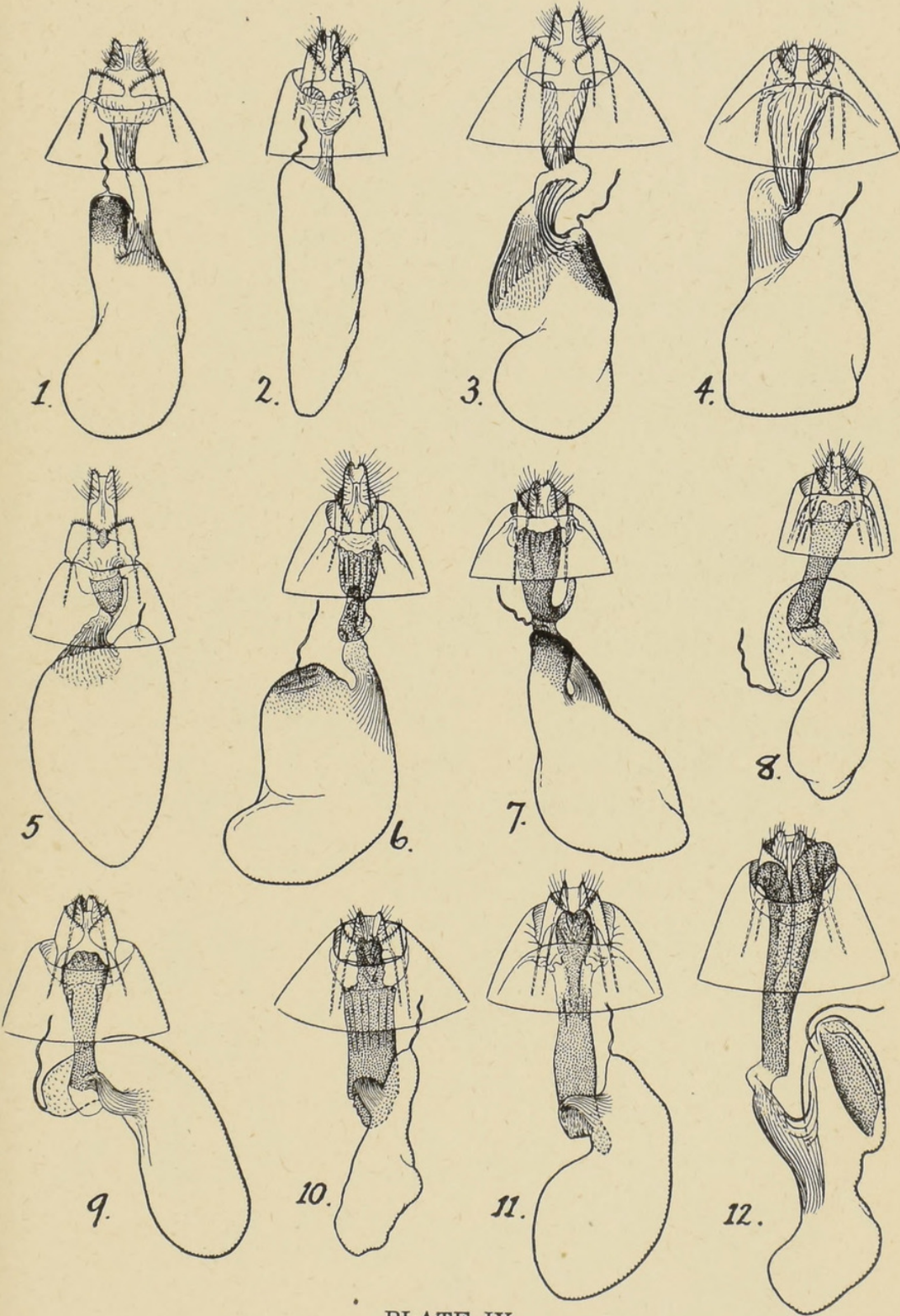


PLATE IV



## PLATE V

Female Genitalia of:-

1. *Anagrapha falcifera* Kby. .... Ottawa, Ont.
2. *Argyrogramma verruca* Fabr. .... Orlando, Fla.
3. *Rachiplusia ou* Gn. .... Georgetown, Tex.
4. *Pseudoplusia oo* Cram. .... Knoxville, Tenn.
5. *Autoplusia egena* Gn. .... San Diego, Calif.
6. *Trichoplusia ni* v. *brassicae* Riley .... Chicago, Ill.
7. *Autographa corusca* Stkr. .... Duncan, Vanc. Is., B. C.
8. *Chrysaspidia venusta* Wlk. .... Trenton, Ont.
9. *Autographa biloba* Steph. .... Georgetown, Tex.



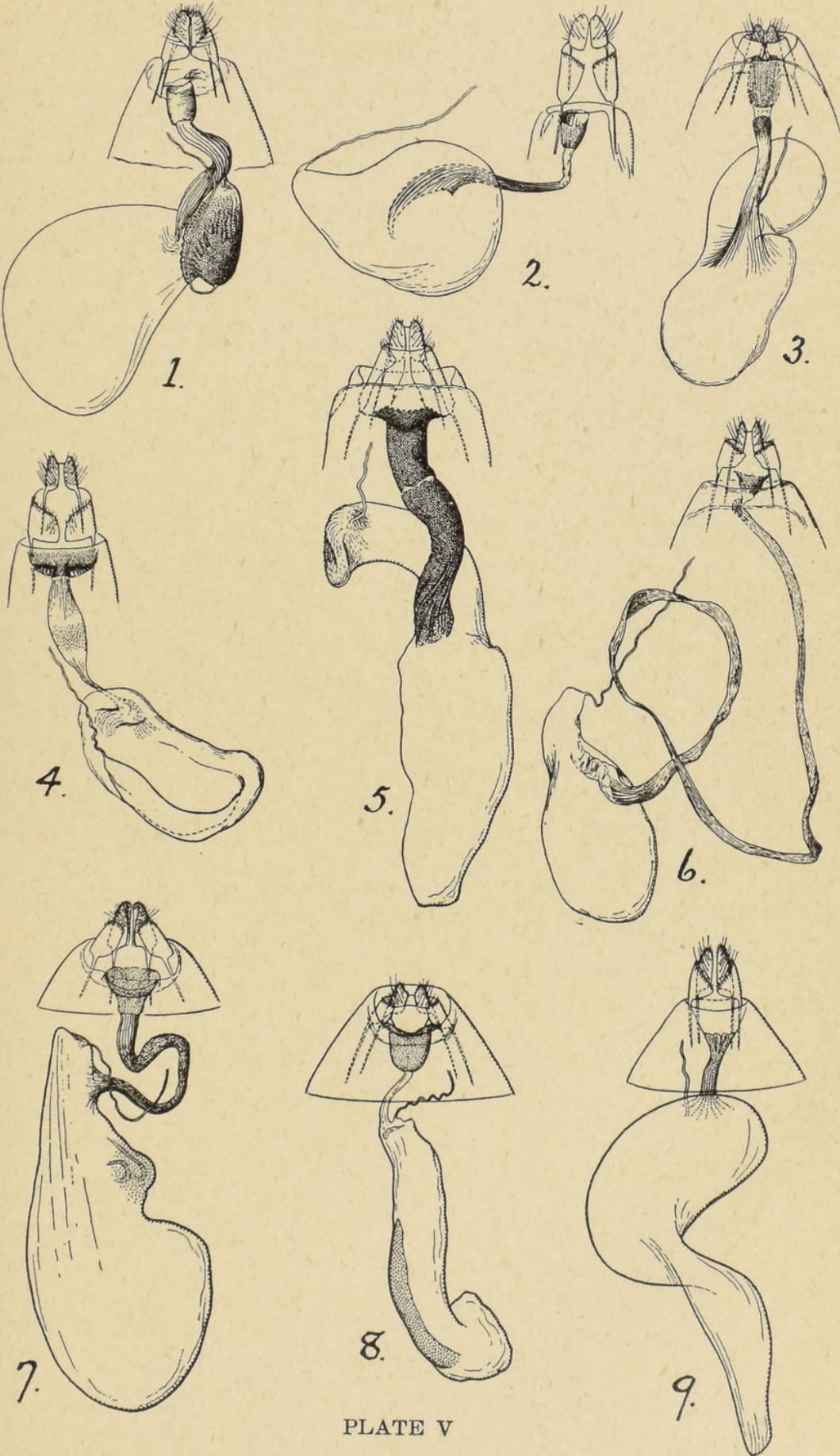


PLATE V



## PLATE VI

Female Genitalia of:-

1. *Autographa precationis* Gn. .... Ottawa, Ont.
2. *Chrysanympha formosa* Grt. .... Laniel, Que.
3. *Eosphoropteryx thyatyroides* Gn. .... Ottawa, Ont.
4. *Pseudeva purpurigera* Wlk. .... Meach Lake, Que.
5. *Agrapha aerea* Hbn. .... Bear, Mt., N. Y.
6. *Polychrysia moneta* v. *trabea* Sm. .... Calgary, Alta.
7. *Plusia balluca* Geyer .... Hastings, Co., Ont.
8. *Plusia aereoides* Grt. .... Hymers, Ont.
9. *Adeva albavitta* v. *hutsoni* Sm. .... Mojave Desert, Calif.



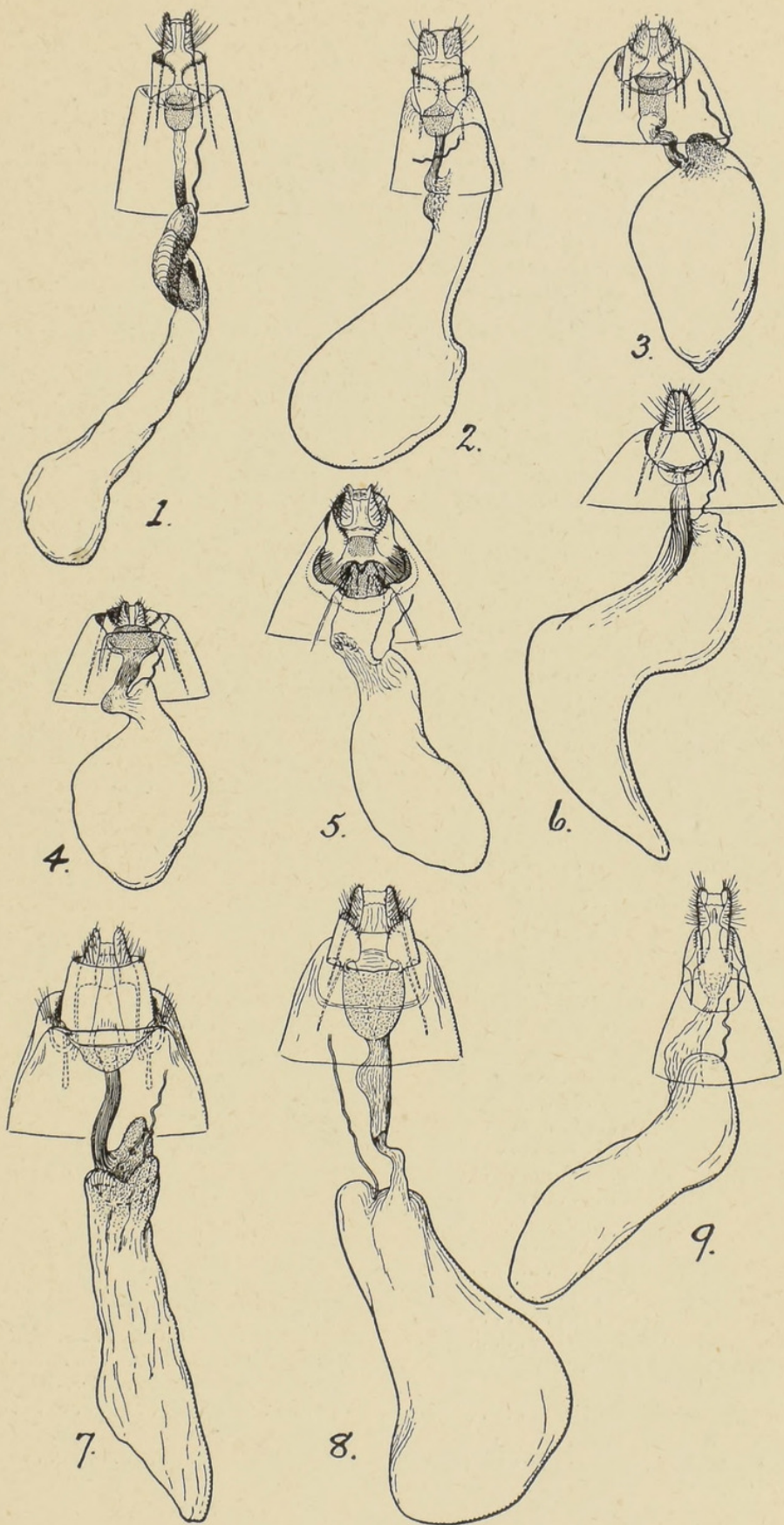


PLATE VI



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