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INTRODUCTION

IN A RECENT PUBLICATION (1949, Amer. Mus. Novitates, no. 1394) the author called attention to the value of the female genitalia and especially the ovipositor lobes as a means of specific separation of the species of this complicated genus, in which more than 175 North American species are included. Many of these are of great economic importance, the larvae being commonly known as cutworms. Owing to extreme variability in color and pattern of the primaries, correct determinations of the adults are often difficult to make, especially by those whose work is more in the economic field than in the taxonomic one. It has seemed, therefore, that a study of our eastern species, in which particular stress is placed on genitalic characters, both male and female, with full illustrations of these organs, might prove a profitable undertaking; it would not only assist field workers to place correctly their doubtful specimens, but could also pave the way for a comprehensive monograph of the whole genus at some future time.

As this present work progressed, an extraordinary diversity of structure was found to exist in the female organs, amply proving the correctness of my former statement. In the males, while at times valuable specific characters could be noted, the organs in many instances showed such similarity, at the same time revealing a certain amount of variability in individual specimens of a single species, as to make the preparation of a workable key, based on these structures, almost impossible. To offset this, the female genitalia, even in instances where the male organs were closely similar, offered so many divergencies, either in the shape of the ovipositor lobes or in the form of the bursa, or even in the point of exit of the ductus seminalis, as to make the preparation of a key to species, based on such characters, a pleasure rather than the thankless task it so often proves to be. In consequence only a single key is presented, but in the discussion of the individual species the male genitalia are fully characterized, and this, with the illustrations, should, it is hoped, be sufficient

for correct specific determination in instances where no females are available for study.

Most of the species now included in *Euxoa* were placed by older authors in the genus *Agrotis*. Later Grote erected the genus *Carneades* which was adopted by Smith in his agrotid revision of 1890 but replaced by *Paragrotis* Pratt in Dyar's "List of North American Lepidoptera" of 1902, it being discovered that Grote's generic name was preoccupied by *Carneades* Bates. In 1903 Hampson, in volume 4 of his "Catalogue of the Lepidoptera Phalaenae in the British Museum," resurrected the older Hübnerian term *Euxoa* and included in it most of our species now so placed. Later in my own "Generic revision of agrotid moths" (1929, Bull. Natl. Mus. Canada, no. 55, pp. 24, 25) the genus was more definitely defined and certain adjustments of species were made. As the generic characters mentioned then are still valid, there seems little necessity for further recapitulation. It might be mentioned that the sequence of species in the specific discussion should not be taken as an indication of the author's ideas on relationships. The number of species occurring in the faunal region under discussion are so few, as compared with the great bulk of western species, that any attempt to express relationships, except in a very few instances (e.g., *scandens* and *quebecensis*), is bound to be futile. Only when a complete survey of the entire genus is made might it be possible to arrive at satisfactory conclusions in this respect. In consequence the sequence of the 1938 "Check list" has been, in the main, retained.

The illustrations have been based as far as possible on topotypical material or material as nearly topotypical as could be secured. All were originally drawn to the same scale with the 9- \times ocular and the 1- \times objective of a Spencer binocular microscope for the entire organs and a 4- \times objective for the more highly magnified ovipositor lobes. The drawings of both the female genitalia and the ovipositor lobes represent the dorsal view. Most of the specimens studied are contained in the collection of the American Museum of

Natural History, but in the case of certain of the rarer species material was obtained as a loan from the Canadian National Collection through the kind cooperation of the officers in charge, particularly Mr. D. Hardwick who also furnished distributional records of Canadian species. Mr. Douglas C. Ferguson of the Nova Scotia Museum of Science also was most helpful with material for study and data on species indigenous to that province. Special thanks are also due to Mr. John G. Franclemont of the United States National Museum who brought types to New York for study and supplied data on other species. Mr. William J. Gerhard of the Chicago Natural History Museum and Prof. Ray Hutson of the Michigan State College of Agriculture and Applied Science, East Lansing, also furnished information regarding type specimens in their museum collections.

Wherever possible, the sex and location of the holotypes have been indicated in the text. Unfortunately a considerable number of these types has apparently been lost; in other instances, notably species described by Grote from Canadian material, errors of labeling have occurred and great thanks are due to

Mr. W. H. T. Tams of the British Museum of Natural History for supplying data to elucidate this situation. He writes, regarding the type of *versipellis*, "Grote's type label is on a Grote coll. specimen which with several others is simply labelled U. S. America, obviously by Hampson's assistant, R. J. West, and simply because these were all received and registered as the Grote coll. from U.S.A." The lack of any original locality labels on the specimens involved and the later addition of the "U.S.A." labels would explain Hampson's mistaken listings of type localities; under the circumstances it seems fairly obvious that the type labels may be considered as correctly placed by Grote. Further data on the subject are given under the individual headings.

In this connection the following abbreviations have been employed:

B.M., British Museum (Natural History), London
C.N.C., Canadian National Collection, Ottawa
M.C.Z., Museum of Comparative Zoölogy, Cambridge, Massachusetts
U.S.N.M., United States National Museum, Washington, D. C.

STRUCTURAL DETAILS

MALE ANTENNAE

THESE MAY BE either fasciculate, serrate and fasciculate, or, in rare instances, bipectinate. In our eastern species the serrate and fasciculate type is the predominant one, and the serrations may vary somewhat in length in the individual species; if used with care this variability of length can be of considerable use as a specific character. The fasciculate or even ciliate type of antenna is a distinct characteristic of the *ridingsiana* group, a western complex of which only *manitobana* extends into the region under consideration. However, in male antennal structure, as well as in genitalia of both sexes, it has been found that *perpolita* agrees so closely with the other members of the group as to render its placement in this section advisable.

FRONT

Generally speaking, one of the main characters of the genus is the strongly tuberculate front, consisting of a raised, chitinous, oval or circular ring, slightly depressed centrally. In a few instances the tubercle is either vestigial (*detersa*) or entirely lacking (*scandens*, *aurulenta*, *violaris*), although the male genitalia are obviously *Euxoa*-like. Such species appear to have their habitat in sandy areas where the adult in emerging would not meet with much difficulty in forcing its way to the surface of the ground.

MALE GENITALIA

CLASPER: The clasper itself offers little of specific value. It varies somewhat in length and breadth in the different species, and its costal edge may be either straight or slightly convex, but such characters are doubtless subject to variation. The cucullus is slightly expanded apically and in a few cases shows an incipient heel. Of greater systematic value is apparently the number of marginal spines in individual species; these may vary from 12 to 15 in such species as *detersa* and *bostoniensis* to as many as 28 to 30 in *messoria* and *tessellata*, the number remaining reasonably constant in each species. The sacculus proper is generally rather narrow and weakly chitinized, somewhat broader and heavier in

campestris and *tristicula*; its costal edge may be straight or slightly wavy and a small clavus is often discernible at its base, but only in *detersa* does it assume definite proportions.

HARPE: One of the chief generic characters of the genus *Euxoa* is the similarity in the structure of the armature of the clasper, consisting as it does of two prongs joined together at their bases. For the sake of conciseness this structure is termed the "harpe," and throughout the genitalic descriptions the prongs are referred to as the "ventral fork" and the "dorsal fork." As a matter of fact, the ventral fork is really an extension of the sacculus apex, as has been several times pointed out; the dorsal fork represents the true harpe. The length of the two forks is extremely variable, notably that of the ventral one. In some instances (e.g., *perpolita*, *scandens*, *dissona*) this fork is much shorter than the dorsal one and, as such cases are comparatively few, forms an excellent character for differentiation of species. In a few cases (e.g., *ochrogaster*, *tristicula*) the forks are more or less equal, but in most instances the ventral fork is much the longer, extending to or even beyond the ventral angle of the cucullus. A certain amount of asymmetry may also exist between the right and left harpes which, when used with care, can at times be of value in separating species. Another feature worth consideration is the angle at which the two forks connect at their bases; this may be caused either by a basal thickening of the ventral fork (e.g., *campestris*) or by a strong excurvature of the dorsal fork, in which case the intervening space is strongly U-shaped. The dorsal fork in most instances is smooth, with occasional short setae showing along its edges; in a few instances, however, it is quite heavily clothed in its apical two-thirds with very minute hairs (e.g., *decolor*), a character of some value in making determinations. Concluding the discussion of the harpe, it should be pointed out that all the above characters are subject to considerable variation, especially in specimens from widely separated regions. The greatest variation probably exists in the length of the ventral fork and in the relative

position of the two forks. For this reason the compilation of a workable key for the male genitalia is beset by more difficulties than the author cares to tackle.

JUXTA: The juxta plate appears to have considerable value as a differentiating character. In all the species under examination the plates showed similarity in that their apices were bifid and their basal edges drawn out to medial points. In width and height, however, a good deal of variation could be noted which in some instances appeared specific. For instance, in *messoria* the plate is high and narrow, the sides being drawn in medially, forming a sort of waist; such a character persisted even in specimens from regions as far apart as New York and California. In *fumalis* the structure of the plate can apparently be used to separate the species from the closely allied *ontario*, as a reference to the illustrations will show. Again in *violaris* a type of plate is met with which is quite unique, as shown in the drawing.

AEDEAGUS: No very great study was made of this organ, partly owing to the difficulty of securing a similar position of the various mounts and partly because no very salient characters could be noted. In general the organ is somewhat dorsoventrally curved, with a bilobed apex, the lobes showing various degrees of weak chitization and apparently some variation in shape in the individual species. In a number of cases a small spine is present in the vesica, although lacking in many others. Whether or not this is a constant feature can be determined only by the examination of more material than was conveniently available.

FEMALE GENITALIA

OVIPOSITOR LOBES: As has already been noted the ovipositor lobes show an extraordinary degree of variation in the species under consideration, as can be seen from the key and the illustrations presented. In certain species the apices of the lobes terminate in non-setose, chitinous projections of varying shape and size. These projections may be joined at their bases as occurs in *perpolita* and also in the whole *ridingsiana* group. Mostly, however, they are separated from each other and may be short and broadly truncate as in *scholastica*, or long and diver-

gent as in *redimicula* and *fumalis*. A larger proportion of the species lack these chitinous projections and show more or less rounded apices, covered entirely with setae. This setal vestiture is extremely variable and may be either sparse or heavy. A few species such as *detersa*, *servita*, and *scandens* show strong, stubby spining in the apical sections. This spining reaches its maximum development in *aurulenta*, where a row of extremely long, heavy spines extends along the inner margin from apex to base. In most cases the vestiture consists of fine setae, varying considerably in length from very short (*mimallonis*) to fairly long (*bostoniensis*). Another feature that occurs apparently irrespective of the type of setae or even of the condition of the apices of the lobes is the presence or absence of a basal row of very long hairs. These hairs are normally five or six in number, forming a slightly curved row just within the cephalic margin of each lobe, such a type being found in *redimicula* and *servita*. In a few instances these hairs have increased in number and been transformed into long, heavy spines. This condition is very characteristic and occurs in *obeliscoides*, representing the type of apex with chitinous projection, and also in *tessellata*, a type with rounded apex. In this latter instance the character proves a most useful one for separation of the numerous color forms of this variable species from other species with which they are easily confused. In a few instances, such as *detersa* and *mimallonis*, a definite basal row does not occur, although a few longer hairs may be present. Another useful character is the height and width of the lobes. We have, on the one hand, the long, narrow type such as occurs in *mimallonis*, *bostoniensis*, and *decolor*, and, on the other, the broader and shorter type, frequently only weakly chitinated, of which *pleuritica* is an example; all manner of intergrades occur.

OSTIUM: The ostium exists as a broad slit at the cephalic end of the sternite of segment VIII leading into a short, semi-globate or funnel-shaped sac which, for convenience, is termed "ostium pouch" throughout the specific descriptions. This pouch is weakly chitinated or at times slightly strengthened laterally by thin, chitinous bars; in the case of *mimallonis* it is quite abnormal in shape, as

a reference to the illustration will best show. At times a narrow groove between the two lobes of the sternite leads up to the ostium proper.

DUCTUS BURSÆ: From the cephalic end of the ostium pouch the ductus bursæ arises as a membranous tube of varying width and length. It is strengthened inwardly for most of its length by subequal, dorsal, and ventral chitinous bars. The extent to which these chitinous bars may or may not extend beyond the apices of the anterior apophyses is of considerable value as a specific character.

The entrance of the ductus into the bursa occurs normally at some point along the proximal third of the right side; in cases, however, where the shape of the bursa varies from the normal type, the entrance is generally at some point along the caudal margin.

BURSA: The typical shape of this organ, as found in the genotype, *decora* Schiffermüller, and as illustrated by Kozhantshikov [1937, Faune de l'URSS, vol. 13, no. 3, Noctuidae (Agrotinae)] in his figure 287 on page 575, is more or less elliptical with a rounded projection, directed caudad, on the left side proximally; from the apex of this the ductus seminalis arises. Owing to this projection the entrance of the ductus bursæ into the bursa, as already mentioned, is not entirely apical but occurs at varying distances along the right side.

This type of bursa, which, judging by Kozhantshikov's figures, is the predominant one in the Eurasian fauna, is also found frequently in our North American species, and in such instances the term "normal" is applied to the structure in the Key to Species and in other portions of the text. Such normal forms were illustrated recently (1949, Amer. Mus. Novitates, no. 1394, fig. 7A, C) for the species *redimicula* Morrison and *servita* Smith.

Numerous variants from the normal shape occur throughout the group under discussion. In certain instances the bursa shows a variably strong projection to the left proximally which is, however, not directed caudad. In such cases the organ is frequently long and finger-like, a condition that occurs in *fumalis*, *velleripennis*, and *ochrogaster*. In all such forms the exit of the ductus seminalis is found at the apex of the projection, while

the entrance of the ductus bursæ is on the caudal margin. In other cases there is an invagination on the left side of the bursa, at or near the middle, which divides the bursa into two more or less well-defined lobes. The condition otherwise may be more or less normal as in *pleuritica*, or the subequal lobes may be short and chunky with deeper invagination as in *scandens* and *mimallonis*. In a few species such as *declarata* and *bostoniensis* the left lobe exceeds the right lobe in size and is projected both caudad as in the normal form and also cephalad along the side of the other lobe. Finally in *messoria*, *divergens*, and *tristricula* a totally different structure is met. The bursa is definitely bilobed, the left lobe in the first two species being long and finger-like and the ductus seminalis arising from the distal end of this lobe in contradistinction to its normal position. In *messoria* the lobe bends to the right, ventrad of the right lobe, and is then recurved, while in *divergens* it remains straight and directed cephalad. In *tristricula* the lobes are more rounded and subequal, and the exit of the ductus is normal.

It should be emphasized that considerable differences may occur in the shapes of the bursæ in various individuals of a single species. An uninflated bursa, owing to the absence of spermatophores within (probably an unfertilized condition), is much reduced in size and shape, being generally flattened; in such cases the membrane appears very strongly strigate. At the other extreme one finds bursæ so full of spermatophores that an overextended condition is brought about and, especially in the cases of bilobed organs, abnormal shapes are created. The most satisfactory condition is found when one or two spermatophores are present; these are sufficient to inflate the bursa without undue distention, and wherever possible such types formed the basis for the illustrations presented; in such cases the striation is very prominent.

DUCTUS SEMINALIS: In the majority of our North American species this ductus arises proximally from the left side of the bursa. In the species under consideration only two instances have been noted (*messoria* and *divergens*) where it originates at the apex, or distal end, of a long lobe on the left side.

Such a condition is, however, found in the western species, *edictalis*, and may occur in others not as yet examined. It should be noted further that in the *ridingsiana* group, also western, the ductus arises on the right side of the bursa as already indicated in my previous paper (1949, Amer. Mus. Novitates, no. 1394, pp. 1, 2), and this condition is also

present in *perpolita* and *violaris*, the former species belonging in the afore-mentioned group. At its inception the ductus is an extremely fine, hair-like tube which generally expands into a larger, oval sac or series of smaller sacs about halfway to the oviductus, narrowing again immediately.

KEY TO SPECIES, BASED ON FEMALE GENITALIA

1. Ductus seminalis from distal end of long left lobe of bilobed bursa 2
 Ductus seminalis from right side of bursa . . 3
 Ductus seminalis from left side of bursa proximally 5
2. Left lobe of bursa long, straight, finger-like *divergens*
 Left lobe of bursa recurved to right, ventrad of right lobe *messoria*
3. Ovipositor lobes high and rounded apically; ductus seminalis from right proximal corner *violaris*
 Ovipositor lobes with chitinous projections joined at their bases 4
4. Lobes higher than broad; projections short, truncate apically *perpolita*
 Lobes much broader; projections pointed and outcurved *perolivalis manitobana*
5. Bursa definitely bilobed; lobes subequal. Ovipositor lobes rounded apically *tristricula*
 Bursa not bilobed or with only slight invagination on left side 6
6. Ovipositor lobes terminating in non-setose, chitinous projections 7
 Ovipositor lobes with rounded apices and no chitinous projections 14
7. Basal row of strong, long, tapering setae across ovipositor lobes 8
 Basal row composed of fewer and much thinner setae 9
8. Basal setae extremely heavy. Bursa with a medial invagination on left side *obeliscoides*
 Basal setae finer and shorter. Bursa normal, without invagination *albipennis*
9. Bursa normal; chitinous projections long and extended cephalad along inner edges of lobes *redimicula*
 Bursa with a projection to the left, not caudad 10
10. Chitinous projections short and broadly truncate apically; bursa L-shaped, due to strong projection to the left . . . *scholastica*
 Chitinous projections longer and pointed apically 11
11. Ductus bursae and its chitinous rods short, scarcely exceeding apices of anterior apophyses 12
 Ductus bursae long and extending far beyond apices of anterior apophyses 13
12. Chitinous projections of lobes long and pointed; bursa very elongate . . . *fumalis*
 Chitinous projections of lobes shorter and apically truncate; bursa shorter and broader *ontario*
13. Lobes close together; bursa long, finger-like *velleripennis*
 Lobes strongly divergent apically; bursa short and chunky *niveilinea rabiata*
14. Ovipositor lobes furnished with strong, thick spines in apical or inner areas 15
 Ovipositor lobes lacking thick apical spines; clothed with finer setae of varying length 18
15. Bursa of normal shape 16
 Bursa otherwise 17
16. Apices of lobes divergent and rounded; no definite basal row of long setae . . . *detersa*
 Lobes triangular with apices close together; well-defined row of basal setae *servita novangliae*
17. Row of extremely stout spines extending from apex almost to base along inner margin of lobe; bursa a long sac *aurulenta*
 Spines much smaller and confined to apical area of lobe; bursa with invagination on left side *scandens* and *quebecensis*
18. Ovipositor lobes with basal row of long, thick spines *tessellata*
 Ovipositor lobes without basal row of thick spines 19
19. Bursa sac-like, with a projection to the left 20
 Bursa otherwise, with an invagination on left side 21
20. Bursa with its fundus half very long, finger-like; projection to left short . . . *ochrogaster*
 Bursa shorter and broader; projection to left quite prominent *dissona*
21. Ovipositor lobes narrow and very high; vestiture composed mostly of short setae 22
 Ovipositor lobes much shorter and broader; vestiture variable 24
22. Ostium pouch and ductus bursae abnormally chitinized; bursa chunky, rather dumbbell shaped with an extra dorsal bulge, from which ductus seminalis arises . . . *mimallonis*
 Ostium pouch and ductus bursae normal . . 23
23. Ductus bursae very long, extending far beyond the apices of the anterior apophyses *bostoniensis*
 Ductus bursae shorter, not reaching so far beyond the apices of the apophyses *declarata decolor* and *campestris*
24. Very long setae scattered sparsely over whole surface of ovipositor lobes; ostium pouch semi-globate *westermanni*
 Long setae confined to basal row or not

- present at all 25
25. Ductus bursae very long, extending far
beyond apices of anterior apophyses. Bursa
normal except for narrow invagination . .
. *pleuritica*

Ductus bursae shorter, extending only slightly
beyond apices of the apophyses. Bursa
with very strong invagination, appearing
almost bilobed *knoxvillea*

SYSTEMATIC DESCRIPTIONS

***Euxoa perolivalis manitobana* McDunnough**

Figures 1A, 5A, 10A

Euxoa perolivalis var. *manitobana* McDUNNOUGH, 1925, Canadian Ent., vol. 57, p. 243. COOK, 1930, Canadian Ent., vol. 62, p. 262.

The nymotypical race of this species is western and was described from material from Calgary, Alberta. The race *manitobana*, distinguished by the much browner color of the primaries, is also largely western in its distribution, but I believe there is a single specimen in the Canadian National Collection taken at Grand Bend, Lambton County, Ontario, which brings it within the scope of the present article.

Manitobana belongs in the *ridingsiana* group, a group characterized in the male genitalia by the short ventral fork of the harpe, and in the female organ by the origin of the ductus seminalis on the right side instead of the more normal position on the left side; the apices of the ovipositor lobes show chitinous projections which are joined in their basal section, the apices being divergent. In the whole group the genitalia are strikingly similar.

The race is represented in the collection of the American Museum by a topotypical male and a female from Aweme, Manitoba, kindly donated by the Canadian National Collection. The genitalic illustrations were made from dissections of these specimens. It should be noted that the bursa in the female contained no spermatophore and in consequence was not fully inflated, but the general shape is probably correctly indicated. In the male the antennae are only weakly fasciculate, showing virtually no serrations.

MALE GENITALIA: Clasper moderately narrow, expanding slightly at the cucullus; marginal spines about 13 in number and reaching only about half the distance along the outer margin of the cucullus. Sacculus quite narrow, clavus obsolescent. Harpes symmetrical, the ventral fork quite short and projected outward, the dorsal fork much longer, sinuate, and not projecting over costal margin of clasper. Juxta plate rather broad with the usual bifid apex; sides slope outward, forming a slight angle

near middle which may not always be constant; basal margin with pointed medial projection. Aedeagus narrow; in the single specimen studied the left side apically shows a rod-like, rounded projection, while the right flange is armed with a curved band of very fine teeth; there are two small apical spines in the vesica. More material is necessary to show the constancy of these features.

FEMALE GENITALIA: Ovipositor lobes short and broad, placed close together; the apical portions of the inner margins strengthened with chitinous bands which coalesce for a short distance and are then projected pointedly well beyond the caudal margins of the lobes. A thick covering of long setae occurs over the entire dorsal surface of the lobes, and in addition there is a well-defined curved row of much longer, basal setae. Ostium pouch broad and almost semiglobate, the chitinized rods of the ductus bursae extending barely beyond its apex. Remainder of the ductus long and membranous, entering the bursa broadly at its proximal end. Bursa elongate oval with a rounded projection on the right side, from the apex of which the ductus seminalis arises.

TYPE: Holotype, male, Miniota, Manitoba (C.N.C.).

DISTRIBUTION: As already noted, the only eastern record is from southwestern Ontario (Grand Bend). In the west the race extends through Manitoba into Montana where it has been recorded by Cook from Three Forks.

***Euxoa perpolita* (Morrison)**

Figures 1B, 5B, 10B

Agrotis perpolita MORRISON, 1876, Proc. Boston Soc. Nat. Hist., vol. 18, p. 237. LINTNER, 1878, Ent. Contrib., no. 4, p. 123.

Carneades perpolita, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, pp. 145, 151; 1893, *ibid.*, no. 44, p. 91. BEUTENMÜLLER, 1901, Bull. Amer. Mus. Nat. Hist., vol. 14, p. 282.

Euxoa perpolita, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 219, pl. 62, fig. 13. HOLLAND, 1903, Moth book, p. 188, pl. 22, fig. 36. DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 41, pl. 6h.

The species is distinctly northern in its distribution. The type specimen was collected at Orono, Maine, by Fernald, and Smith in his agrotid revision mentions having the type before him. Later (1893) he stated correctly that the type is in the Tepper collection which is now in the collection of the Michigan State College of Agriculture and Applied Science at East Lansing.

Based on genitalic characters, *perpolita* is undoubtedly a member of the *ridingsiana* group, and a comparison of the figures of this species and of *manitobana*, as here given, will show the obvious relationship of the two. Farther west, *criddlei*,¹ listed as a race of the British Columbian *exculia* Smith, definitely belongs in the same group, the association with *perpolita* being extremely close. Topotypical specimens of *exculia* from south central British Columbia are extremely rare, and none is available at the present moment for dissection. It would not be surprising if the name fell to *punctigera* Walker, described from Vancouver Island. Its correct identification has always been a puzzle, and several species have masqueraded wrongly under the name. Judging by Hampson's figure of the type in the British Museum, the above association is not at all out of the way, but its correctness can be proved only by genitalic studies, which must be left for some future occasion.

As in *manitobana*, the male antennae are feebly fasciculate. The dark, almost black primaries, with obscure indications of the ordinary spots outlined in black, together with the almost unicolorous, deep smoky secondaries in both sexes, distinguish the species. *Velleripennis*, the only species with which it might be confused, is at once recog-

nized by the whitish secondaries in the male sex.

MALE GENITALIA: (Both sexes based on specimens from the Ottawa region.) Very similar to those of *manitobana*. The clasper is somewhat broader, with a more convex costal margin, and the marginal spines of the cucullus are greater in number, averaging about 16 and reaching farther towards the ventral angle. The dorsal fork of the harpe is farther removed from the costal margin of the clasper, and there are traces of a clavus at the base of the sacculus. In the juxta plate the sides seem evenly convex and show no angulation in the specimen examined. The armature of the aedeagus is much as in *manitobana*.

FEMALE GENITALIA: Of the same general type as in *manitobana*. The ovipositor lobes are narrower and longer, the apical costal projections are shorter and blunter, the longer basal setae are rather more prominent. The ostium pouch is somewhat less broad, and the chitinous rods of the ductus bursae, while still very short, extend slightly farther down the ductus. The bursa, well inflated in the preparation, is broadly oval, with a median rounded projection to the right, from which the ductus seminalis arises.

TYPE: Holotype, male, Orono, Maine (Michigan State College of Agriculture and Applied Science).

DISTRIBUTION: New England states, extending southward into the New York area. Beutenmüller lists it as rare in the vicinity of New York City. In Canada it occurs from Nova Scotia (White Point Beach) westward through Quebec (Baie Ste. Catherine) to the Ottawa region and northern Ontario (Sudbury, Smoky Falls). It should also occur in adjacent areas of northern Michigan. Smith (1893) lists it from Glenwood Springs, Colorado, but this record needs verification.

Buxoa scandens (Riley)

Figures 1C, 5C, 10C

Agrotis scandens RILEY, 1869, First annual report on the . . . insects of the state of Missouri, p. 76, figs. 5-7; 1881, Bull. U. S. Ent. Comm., no. 6, p. 75; 1882, Papilio, vol. 2, p. 42. GROTE, 1875, Bull. Buffalo Soc. Nat. Sci., vol. 2, p. 306 (misidentification); 1881, Papilio, vol. 1, p. 126; 1881, Bull. U. S. Geol. and Geogr. Surv. Terr.,

¹ *Criddlei* has been recorded by Kimball and Jones as occurring both on Nantucket and Martha's Vineyard Islands (1933, Lepidoptera of Nantucket and Martha's Vineyard Islands, p. 53). Since the completion of the present manuscript the writer has been able to examine a male specimen of the original lot on which the record was based. This specimen is in the collection of the Nova Scotia Museum of Science, and a study of its genitalia shows no differences from those of *perpolita*. The reddish brown coloration of the primaries, however, agrees with that of *criddlei* as contrasting with the smoky black color found in the wings of *perpolita*. The exact relationship of the two forms must await a study of more material, especially females.

vol. 6, p. 158. HARVEY, 1876, Bull. Buffalo Soc. Nat. Sci., vol. 3, p. 73. SAUNDERS, 1883, Fruit insects, p. 107, fig. 105.

Carneades scandens, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, pp. 146, 157; 1893, *ibid.*, no. 44, p. 93. BEUTENMÜLLER, 1901, Bull. Amer. Mus. Nat. Hist., vol. 14, p. 282.

Lycophotia scandens, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 529, fig. 91. DRAUDT, in Seitz, Macrolepidoptera of the world, vol. 7, p. 68, pl. 11b.

Euxoa scandens, DOD, 1905, Canadian Ent., vol. 37, p. 55; 1911, *ibid.*, vol. 43, p. 339; 1916, *ibid.*, vol. 48, p. 379. McDUNNOUGH, 1927, Canadian Ent., vol. 59, p. 66. COOK, 1930, Canadian Ent., vol. 62, p. 264. CRUMB, 1932, Bull. Brooklyn Ent. Soc., vol. 27, pp. 75, 81, pl. 10, figs. B, H, pl. 11, figs. B, E (larval structures).

Agrotis scandens form *fulminans* GROTE, 1895, Abhandl. Nat. Ver. Bremen, vol. 14, p. 26.

Setagrotis elata SMITH, 1898, Jour. New York Ent. Soc., vol. 6, p. 106. DOD, 1911, Canadian Ent., vol. 43, p. 339 (synonymy).

Owing to the fact that *scandens* is another of the few *Euxoa* species in which the frontal tubercle is vestigial, considerable confusion appears to have existed as to both its generic position and its identity. As a matter of fact, although variable, it is quite easily recognizable. The color of the primaries varies from pale gray to light ochreous, frequently with tinges of reddish color, this reddish suffusion being particularly prevalent on the basal side of the irregular white s.t. line; Grote's name, *fulminans*, was based on a strongly suffused specimen of this type. The tendency to show such red tinges, along with the prominent black spot at the base of the reniform and the whitish secondaries with only traces of a smoky outer border, is diagnostic. Specimens from the New England coastal area (Martha's Vineyard), kindly submitted by Dr. F. M. Jones of Wilmington, Delaware, are much darker in color than Middle Western material, being quite heavily sprinkled with black on the primaries. The male antennae are narrowly serrate and fasciculate.

MALE GENITALIA: (Based on an Illinois specimen.) Of the usual *Euxoa* type. Clasper of almost even width throughout, with very slight dorsal bend of costa at base of cucullus; marginal spines 12 to 14 in number. Saccus rather short and of moderate width,

with a small decumbent clavus at base. In the harpe the ventral fork is quite short, much shorter than the dorsal one, a character rather infrequent in the genus but apparently of secondary importance as typifying relationship; on the left side this fork is even shorter than on the right one. The dorsal fork is curved at base and then extends along the clasper just within the costal margin, its apex barely projecting beyond it. The juxta plate is broad, with bifid apex and the usual pointed projection at the middle of the basal margin. The aedeagus is rather chunky and is furnished with the usual small apical spine in the vesica.

FEMALE GENITALIA: (Based on a Minnesota specimen.) Ovipositor lobes short, rather widely separated, tapering and rounded apically, with no chitinous projections. On the dorsal surface the apical section of each lobe is armed with a few short, stout spines; the balance of the lobe is sparsely clothed with fine setae of varying length; a basal row of fine, long setae, five or six in number, is present. The ostium pouch is broad and virtually semi-globate. The ductus bursae is broader than usual and rather short, extending only slightly beyond the apices of the anterior apophyses; the interior chitinous rods are broad and very finely shagreened, reaching almost to the distal end of the ductus. The bursa is very chunky, with an invagination about the middle of the left side which causes a partial bilobed condition. The right lobe is the smaller and shows a well-rounded cephalic end; the left lobe projects considerably to the left, terminating rather pointedly, but not apparently directed caudad along the left side of the ductus bursae; the ductus seminalis arises from the apex of this lobe. Owing to the shape of the bursa the entrance of the ductus bursae appears to be at about the middle of the caudal margin on the ventral side.

TYPES: *Scandens*, holotype, male, allotype, female, presumably Missouri but no locality data on label (U.S.N.M.); *elata*, holotype, male, allotype, female, Colorado (C. P. Gillette), presumably Fort Collins (U.S.N.M.); *fulminans* (no data secured).

DISTRIBUTION: Fairly general throughout the northeastern half of the United States, extending northward into Canada where it is

recorded from Nova Scotia (White Point Beach), New Brunswick (Bathurst), Quebec (Knowlton, Norway Bay), and southern Ontario (Trenton, Port Colborne). Apparently the species is more prevalent in the Middle Western states, from one of which it was originally described. Westward the species is known to extend into Colorado, Montana, and the Prairie Provinces of the Dominion of Canada; the synonym, *elata* Smith, was based on Colorado specimens.

***Euxoa quebecensis* (Smith)**

Setagrotis quebecensis SMITH, 1900, Proc. U. S. Natl. Mus., vol. 22, p. 147.

Lycophotia quebecensis, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 530, pl. 74, fig. 9.

Euxoa quebecensis, DOD, 1915, Canadian Ent., vol. 47, p. 40. DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 44, pl. 7d. McDUNNOUGH, 1927, Canadian Ent., vol. 59, p. 66; 1930, *ibid.*, vol. 62, p. 108.

Setagrotis dolens SMITH, 1906, Canadian Ent., vol. 38, p. 226.

Euxoa dolens, DOD, 1915, Canadian Ent., vol. 47, p. 40.

Euxoa quinta SMITH, 1908, Ann. New York Acad. Sci., vol. 18, no. 2, pt. 2, p. 97. DOD, 1915, Canadian Ent., vol. 47, p. 40.

Euxoa moxa SMITH, 1907, Trans. Amer. Ent. Soc., vol. 33, p. 129.

Dod has already noted the close relationship of this species to *scandens* Riley based on maculation and the absence of a frontal prominence. A study of genitalic characters of both sexes fully confirms this view, these organs in the two species being practically identical.

The species is evidently confined to the Canadian zone in the east and, as far as is known, has not been reported from the United States. Very little material, and that from the Canadian National Collection, has been available for study, but, in spite of the close similarity of the genitalia, it would seem advisable to consider *quebecensis* as a good species, based on the grayer ground color of the primaries and the much darker secondaries. Several forms or races have been described by Smith, originally as good species, from western localities. A discussion of these is outside the scope of the present paper, but the bibliographic references and the loca-

tion of the type material are noted for the sake of completeness.

No genitalic figures are given on account of the similarity to *scandens*. It should, however, be noted that in the few slides of the male genitalia examined it was found that the ventral fork of the harpe was considerably longer and the width between the forks at their bases greater than was the case in *scandens*. The dorsal fork showed also less tendency to run parallel to the costal margin of the clasper, its apical portion projecting in consequence beyond it.

TYPES: *Quebecensis*, holotype, female, Quebec, Canada (U.S.N.M.); *dolens*, holotype male, Beulah, Manitoba (location unknown; not at Rutgers University, New Brunswick, New Jersey); paratype, female, Arrowhead Lake, British Columbia (U.S.N.M.); *moxa*, holotype, female, Durango, Colorado (U.S.N.M.); *quinta*, holotype male, High River, Alberta (Rutgers University, New Brunswick, New Jersey); paratype, male, Kaslo, British Columbia (C.N.C.).

DISTRIBUTION: As far as the meager records go, the species occurs in Quebec (Natashquan, Quebec City), extending westward into northern Ontario (Smoky Falls). Two specimens in the United States National Museum from Newfoundland probably belong here.

***Euxoa aurulenta* (Smith)**

Figures 1D, 5D, 10D

Agrotis aurulenta SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 215; 1893, *ibid.*, no. 44, p. 66. HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 373. DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 56, pl. 9d. BARNES AND BENJAMIN, 1926, Insecutor Inscitiae Menstruus, vol. 14, p. 3.

Euxoa aurulenta, McDUNNOUGH, 1927, Canadian Ent., vol. 59, p. 66. COOK, 1930, Canadian Ent., vol. 62, p. 263.

Agrotis aurulenta ab. 1, HAMPSON, 1903, *op. cit.*, p. 373, pl. 69, fig. 26.

Agrotis aurulenta ab. *aurulentoides* STRAND, 1915, Arch. Naturgesch., div. A, vol. 81, no. 12, p. 145 (name based on Hampson's ab. 1). BARNES AND BENJAMIN, 1926, Insecutor Inscitiae Menstruus, vol. 14, p. 3.

The name was originally based on three males and one female from western states

(Colorado, Nebraska, Arizona). All these specimens are in the United States National Museum with the name and the simple word "Type" in writing on the labels. It would seem well to designate as lectotype a male specimen, very pale, taken in the "foothills near Denver, Colo. Bruce." The range of distribution extends eastward. Barnes and Benjamin report it from Illinois, and the Canadian National Collection contains a series taken at Port Colborne, Ontario. It will probably be found on the southern shores of Lakes Erie and Ontario, but its occurrence there has not yet been reported. It would appear to be essentially an inhabitant of sandy areas.

Aurulentoides Strand was proposed for Hampson's "ab. 1," and, as only a single female from Omaha, Nebraska, was recorded and figured by Hampson under the name *aurulenta*, the suggestion by Barnes and Benjamin that this specimen represents the type of *aurulentoides* is correct as is confirmed by Tams. These authors suggest using Strand's name for "the northern-eastern minor race if a division of the species is desired" and using Smith's name for the paler "smooth and uncontrasty forms of Colorado and western states." After a study of the material from Aweme, Manitoba, and Port Colborne, Ontario, in the Canadian National Collection this suggestion hardly seems to hold much weight. The series examined show great variation in the coloration of the primaries, the specimens varying from pale ochreous, rather immaculate forms to those with strong, blackish powdering, mingled at times with some reddish shades.

Because of the smooth front, the species was for a long time placed in the genus *Agrotis*; later, on genitalic characters, it was transferred to *Euxoa*. The male antennae are strongly serrate and fasciculate; those of the female simple, as usual.

MALE GENITALIA: (Both sexes based on Port Colborne specimens.) Considerable similarity exists between this species and *scandens*. Clasper broad and short; cucullus strongly rounded ventrally, not angled; marginal spines numerous, much more so than in *scandens*, being 20 to 22 in number. Sacculus rather short and narrow, with slight decumbent clavus at base. Harpes symmetrical;

ventral fork shorter than dorsal one but considerably larger than in *scandens* and projecting sharply outward. Dorsal fork outcurved at base and then parallel to and just within costal margin of clasper as in *scandens*. Juxta plate with the usual bifid apex and a pointed projection at middle of basal margin. Aedeagus slightly curved, rather broad and apparently without the small spine in the apical section of the vesica.

FEMALE GENITALIA: Ovipositor lobes long, thin, closely approached at their bases, diverging somewhat apically, with rounded apices and no chitinous projections. On the dorsal surface a row of extraordinarily long, thick spines extends from the apex of each lobe nearly to its base, just within the inner margin. The balance of the lobe is sparsely clothed with fine setae of moderate and variable lengths. There are indications of the basal row of long setae but apparently no very definite arrangement. The ostium pouch is narrowly funnel shaped. The membranous ductus bursae is fairly long and extends considerably beyond the apices of the anterior apophyses; the interior chitinous rods are, however, rather shorter than usual and barely reach beyond the aforesaid apices. The bursa is long and sausage shaped, with a short proximal projection to the left, from the apex of which the ductus seminalis arises. The entrance of the ductus bursae is at the right proximal corner.

TYPES: *Aurulenta*, holotype, male, Denver, Colorado (U.S.N.M.); *aurulentoides*, holotype, female, Omaha, Nebraska (B.M.).

DISTRIBUTION: The data on the occurrence of the species in the east are very scanty and, as far as is known, are confined to the Port Colborne, Ontario, record and Barnes and Benjamin's statement that the species is found in northern Illinois. Farther west it is reported from Colorado, Nebraska, and Montana, and in the sand-dune areas of Manitoba, in the vicinity of Aweme, it has been taken quite commonly.

***Euxoa detersa* (Walker)**

Figures 1E, 5E, 10E

Charaas detersa WALKER, 1856, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 9, p. 212.

Carneades detersa, SMITH, 1893, Bull. U. S. Natl.

Mus., no. 44, p. 94. BEUTENMÜLLER, 1901, Bull. Amer. Mus. Nat. Hist., vol. 14, p. 283, pl. 37, fig. 13.

Euxoa detersa, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 229, pl. 62, fig. 32. HOLLAND, 1903, Moth book, p. 188, pl. 22, fig. 39. SMITH, 1910, Ottawa Nat., vol. 24, p. 107. DOD, 1916, Canadian Ent., vol. 48, p. 379 (as *deterra*, typ. err.). DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 40, pl. 6d. McDUNNOUGH, 1927, Canadian Ent., vol. 59, p. 66; 1949, Amer. Mus. Novitates, no. 1394, pp. 3, 4.

Agrotis pitychrous GROTE, 1873, Bull. Buffalo Soc. Nat. Sci., vol. 1, p. 82, pl. 2, fig. 11. BEUTENMÜLLER, 1889, Ent. Amer., vol. 5, p. 38 (larva); 1890, Ann. New York Acad. Sci., vol. 5, p. 211. SNELLEN, 1897, Stettiner Ent. Zeitg., vol. 58, p. 149. LINTNER, 1878, Ent. Contrib., no. 4, pp. 33, 45, 49; 1880, App. Seventh Rept. Surv. Adirondack Region, New York, p. 383.

Carneades pitychrous, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, pp. 146, 159, pl. 5, fig. 66 (clasper).

Agrotis azif STRECKER, 1898, Lepidoptera, Rhopaloceres and Heteroceres, suppl. 1, p. 6.

Euxoa azif, DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 40. McDUNNOUGH, 1949, Amer. Mus. Novitates, no. 1394, p. 4.

Agrotis personata MORRISON, 1876, Proc. Boston Soc. Nat. Hist., vol. 18, p. 238. GROTE, 1880, Canadian Ent., vol. 12, p. 187.

Euxoa personata, SMITH, 1910, Ottawa Nat., vol. 24, p. 108. McDUNNOUGH, 1949, Amer. Mus. Novitates, no. 1394, p. 4.

The variability of this species and its so-called races has been discussed by several authors, and a general summing up of the status of the various names involved was given in my recent publication (1949). The four specimens on which the name *detersa* was based were collected in Nova Scotia by Lieutenant Redman, presumably in the vicinity of Halifax. The specimen figured by Hampson is (a/c Dod *in litt.*) not the holotype, being too dark and with more the appearance of a *personata* form. The type specimens of *pitychrous* were taken on Long Island, New York, and are said by Smith to be in the Lintner collection in the New York State Museum at Albany; the species, however, was not mentioned by Richards in a list sent some time ago of all the presumable types in this collection and the matter needs further

investigation. There seems, however, no reasonable doubt but that *pitychrous* is a direct synonym of *detersa*. The generally rather pale gray color of the primaries is fairly characteristic when compared with those forms occurring farther inland. In typical specimens the costa is markedly paler and the maculation prominent, but in many specimens the whole wing is suffused with gray brown and the maculation is less distinct. All manner of intergrades occur, and the coloration may at times deepen, such specimens being scarcely separable from *personata* forms.

Along the shores of the lower Great Lakes a darker form occurs on which the name *azif* was based. The type specimen in the Chicago Natural History Museum is rather unusual in coloration, being reddish rather than the more usual deep brown. This specimen was taken at Clyde, New York, in the Rochester region, and a good series is present in the Canadian National Collection from Port Colborne, Ontario, on the northeastern shore of Lake Erie; the material contains a few specimens showing the reddish coloration. As already indicated (1949) the name, if desired, can be held in a racial sense for specimens from the lower Lakes region, but as a matter of fact a separation from *personata* seems hardly warranted.

In the original description the name *personata* was stated to be based on a female received from G. M. Dodge from central Illinois. Smith, who appears to have examined the type at some time, gives Galena, Illinois, as the locality, a town in the northwest corner of the state. He also mentions that the type specimen is in the Tepper collection which is now housed in the Michigan State College of Agriculture and Applied Science at East Lansing. From information obtained through the cooperation of Prof. Ray Hutson of the above-mentioned college, it has been learned that the specimen with a type label in the Tepper collection is from "Ohio" and cannot therefore be considered as the authentic type, which appears to be lost. The name has been in general use in a racial sense to designate the dark form occurring in the sandy regions around the southern end of Lake Michigan and extending northward along the Mississippi Valley into Mani-

toba and Saskatchewan, and no harm is done in retaining it in such a sense. Smith, who at one time placed the name in the synonymy of *detersa*, considered later in his article in the *Ottawa Naturalist* (1910) that two species were represented and has given a careful comparison of the distinctive features of maculation. Smith's contention has not, however, been verified by genitalic studies.

Detersa is one of the few *Euxoa* species in which the raised frontal tubercle has been considerably reduced in size, at times becoming almost vestigial. In the male the antennae are serrate and fasciculate; in the female, almost simple. The close relationship to the western *cicatricosa* has already been mentioned (1949).

MALE GENITALIA: (Both sexes based on Long Island specimens.) Of the usual *Euxoa*-like shape. The clasper is rather narrow and of equal width throughout, with only a slight projection of the dorsal margin of the cucullus; the marginal spines are few in number, averaging from 10 to 12 and not attaining the ventral angle. The sacculus is of moderate width, with the costal margin somewhat wavy and with a distinct upright clavus at its costal base, a feature not so prominent in any other of our eastern species. The harpes of the two sides are practically symmetrical. The much longer ventral fork extends beyond the ventral angle of the cucullus, its apex being somewhat incurved. The shorter dorsal fork is strongly convex, projecting well beyond the dorsal margin of the clasper, the space between the two forks being broadly U-shaped. The juxta plate is broad, its basal edge projected to a medial point between the opposing claspers, its apex bifid and somewhat narrowed. The aedeagus is normal and shows a small apical spine in the vesica.

Considerable variation appears to exist in the comparative length of the two forks of the harpe. In a specimen from St. John, New Brunswick, in the Canadian National Collection, the forks are subequal. In another specimen in the same collection from Aweme, Manitoba, the ventral fork is only slightly longer than the dorsal one, whereas in a specimen from Hessville, Indiana, which is more or less topotypical of the form *personata*, the same conditions occur as are found in Long

Island and Nova Scotia specimens.

FEMALE GENITALIA: Ovipositor lobes rather pointed and quite divergent at their apices which are without chitinous projections. On the dorsal surface the inner margin of each lobe is furnished with an irregular and very variable row of extremely stout spines. The remaining areas of the lobes are sparsely clothed with moderately long, thin setae; the basal transverse row of long setae is not definitely developed, although several long, scattered setae occur in this region. The ostium pouch is rather narrowly funnel shaped, contracting speedily into the thin ductus bursae which extends well beyond the apices of the anterior apophyses and enters the bursa on the right side subapically; it is furnished with dorsal and ventral chitinous rods for virtually its entire length, the ventral rod tapering to a point and slightly shorter than the dorsal one. The bursa is normal in shape, the ductus seminalis arising from its apical projection on the left side of the ductus bursae.

TYPES: *Detersa*, holotype, male, Nova Scotia (B.M.); *pitychrous*, holotype, male, Long Island, New York (? New York State Museum, Albany); *azif*, holotype, female, Clyde, New York (Chicago Natural History Museum); *personata*, holotype, female, Illinois (probably lost).

DISTRIBUTION: The species is essentially an inhabitant of sandy regions. The typical form occurs along the Atlantic coast from Nova Scotia to New Jersey. Specimens in the American Museum collection from Franconia, New Hampshire (Slosson collection), and others from Centre, New York (Henry Edwards collection), one of these latter bearing Grote's label "*Agrotis pitychrous*," would indicate a considerable spread inland. It occurs again along the shores of the lower Great Lakes in both Canada and the United States, the specimens, under the name *azif*, being darker and linking up with the form *personata*, common in the Chicago region and extending northward up the Mississippi Valley into Manitoba and the Prairie Provinces. A single female in the collection simply labeled "Col" would indicate a southward distribution into the sandy regions of Colorado, and Smith (1893) mentions its occurrence at Glenwood Springs in this state.

***Euxoa niveilinea rabiata* Smith**

Figures 1F, 5F, 10F

Euxoa rabiata SMITH, 1910, Trans. Amer. Ent. Soc., vol. 36, p. 255. DOD, 1915, Canadian Ent., vol. 47, p. 39.

Euxoa niveilinea rabiata, DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 38.

The typical form occurs in New Mexico and other southwestern states, and its treatment is not within the scope of this paper. *Rabiata* was first placed as a race of the species in the Barnes and McDunnough "Check list" of 1917 without comment but actually because of extensive genitalic studies that had been made at the time; Draudt, in 1924, followed this arrangement.

The type material was collected mostly at Volga, South Dakota, by Judge Truman and submitted to Smith. In the American Museum collection are several specimens from the Bean collection, presumably taken at light at Galena in northern Illinois during the years 1874 to 1877; this record indicates an eastward distribution sufficient to permit of treatment in the present article.

As compared with typical *niveilinea*, the race *rabiata* is smaller and darker, with a tendency to show slight smoky shading along the outer margin of the secondaries which does not occur in the type form. It is liable to be confused with *dargo* Strecker (*rumatana* Smith) which also occurs at Volga, South Dakota, but can be best separated by the practical lack of a pale streak between the claviform and t.p. line on the primaries and by the much paler secondaries; the reniform is also more lunate and less upright than in *dargo*. In outer structural details the frontal tubercle is normally developed, and the male antennae are strongly serrate and fasciculate.

MALE GENITALIA: (From a Galena, Illinois, specimen.) Clasper narrow, slightly expanded apically; marginal spines of cucullus about 12 in number. Sacculus rather short and chunky, with a small, upright clavus at base. Harpes practically symmetrical; ventral fork much longer than the dorsal one, extending close to the ventral margin of the clasper and slightly curving around the lower angle of the cucullus. Dorsal fork gently out-curved and projected well beyond the costal margin of the clasper. The width between the

two forks at the base rather narrow and somewhat obliquely V-shaped. Juxta plate somewhat small and narrow, apex bifid as usual, sides more or less parallel to beyond middle of plate, then expanding and supplied with transverse chitinous ridges, the basal margin pointed medially as usual. Aedeagus with a small apical spine in the vesica.

FEMALE GENITALIA: Ovipositor lobes long, narrow, contiguous at bases but diverging strongly apically; they taper to a point and are supplied with apical, chitinous projections. Dorsal surface of each lobe heavily clothed with long setae; an irregularly placed row of still longer and stronger setae occurs in the basal region. Ostium pouch broadly funnel shaped, rather longer than usual. Ductus bursae together with its chitinous rods extending well beyond apices of the anterior apophyses. Bursa rather short and chunky, tapered distally, broadly projected to the left, the apex of the projection rounded and giving rise to the ductus seminalis.

As it was found that the genitalia, in the only female available from Galena, Illinois, had been partially destroyed by *Dermestes*, the drawing has been largely based on a typical specimen of *niveilinea* from New Mexico. Enough of the organ was, however, intact to show the undoubted similarity of the two preparations.

TYPE: Holotype, male, Volga, South Dakota (Rutgers University, New Brunswick, New Jersey).

DISTRIBUTION: The eastward range of *rabiata* is still very imperfectly known. Records from Galena, Illinois, and also from the Chicago region are the only ones as yet available.

***Euxoa velleripennis* (Grote)**

Figures 1G, 5G, 10G

Agrotis velleripennis GROTE, 1874, Sixth Rept. Peabody Acad. Sci., p. 25.

Carneades velleripennis, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, pp. 145, 153; 1893, *ibid.*, no. 44, p. 92. BEUTENMÜLLER, 1901, Bull. Amer. Mus. Nat. Hist., vol. 14, p. 282.

Euxoa velleripennis, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 220, pl. 62, fig. 17. HOLLAND, 1903, Moth book, p. 188, pl. 22, fig. 35. DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 42, pl. 6h.

This species with its smoky black primaries and white secondaries in the male sex is readily recognizable. The male antennae are strongly serrate and fasciculate, and this character alone would separate it from *perpolita*, the only other species with which it could possibly be confused. According to Tams the type in the British Museum is a male bearing the label "122, N. Y." which corresponds with the data given by Grote in the original description.

MALE GENITALIA: (Based on a New York specimen in the Henry Edwards collection, received from Lintner.) Clasper narrow, costal margin only slightly produced dorsally at cucullus; marginal spines 14 to 15 in number. Sacculus of moderate width, with weak clavus at base. Harpes symmetrical; the ventral fork much the longer and extending rigidly to a point just beyond the ventral angle of the cucullus. The dorsal fork is strongly excurved, projecting well beyond base of clasper; its position is somewhat variable as it may project outward as in the illustration or curve inward apically to run parallel with the costal margin of the clasper. Space between the two forks broadly U-shaped at base. Juxta plate considerably higher than broad, the excavation between the bifid apices deeper than usual, with a globate basal edge; the usual medial projection of the basal margin is present. Aedeagus normal, with a single small apical spine in the vesica.

FEMALE GENITALIA: (Based on a Bear Mountain, New York, specimen.) Ovipositor lobes long, narrow, the inner margins closely approached, apices narrow and drawn out to long, chitinous projections. Lobes heavily clothed dorsally with moderately long setae and with a definite basal row of much longer and stronger hairs. Ostium pouch deeply funnel shaped. Ductus bursae long, reaching well beyond apices of anterior apophyses; interior chitinous rods extending virtually to its distal end; entrance into bursa on the caudal margin, somewhat inward from the right corner. Bursa broad proximally, drawn out distally into a long, finger-like extension; there is a short projection proximally to the left, from the rounded apex of which the ductus seminalis arises.

TYPE: Holotype, male, New York (B.M.).

DISTRIBUTION: Very general throughout

the eastern and Middle Western states. In Canada it ranges from Nova Scotia at least as far west as Manitoba.

Euxoa mimallonis (Grote)

Figures 1H, 6A, 10H

Agrotis mimallonis GROTE, 1873, Bull. Buffalo Soc. Nat. Sci., vol. 1, p. 98; 1875, Canadian Ent., vol. 7, p. 226; 1878, Bull. U. S. Geol. and Geogr. Surv. Terr., vol. 4, p. 175.

Porosagrotis mimallonis, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, pp. 124, 127; 1893, *ibid.*, no. 44, p. 85. BEUTENMÜLLER, 1901, Bull. Amer. Mus. Nat. Hist., vol. 14, p. 281. HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 148, pl. 59, fig. 30. DOD, 1905, Canadian Ent., vol. 37, p. 53.

Euxoa mimallonis, DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 43, pl. 6i. MCDUNNOUGH, 1927, Canadian Ent., vol. 59, p. 194. COOK, 1930, Canadian Ent., vol. 62, p. 264.

Agrotis rufipennis GROTE, 1875, Canadian Ent., vol. 7, p. 83; 1875, *ibid.*, vol. 7, p. 226 (synonymy).

The name was based on a male specimen collected by T. Mead and simply recorded as "New York." According to Grote the type was returned to Mead, but its present location, if existent, cannot be ascertained. In the collection of the American Museum is a female specimen from the Henry Edwards collection, no. 6520, labeled "New York," which according to his "Catalogue" was received from Mead. It is proposed to regard this as topotypical, and the illustration of the female genitalia was made from a dissection of this specimen. The type of *rufipennis* was a male received from Lintner, and Grote himself referred the name to the synonymy. The type is in the British Museum and bears, according to Tams, an unusual label, possibly in Lintner's writing, "*Agrotis rufipennis*, Grote Type, 1825. Schoharie, VIII. 27, ♂" in three lines. The bright red brown color of the primaries with obscure blackish maculation, together with the almost totally white secondaries, renders the species readily identifiable. The male antennae are rather finely serrate and fasciculate. Smith's reason for placing the species in *Porosagrotis* is obscure, as the male genitalia do not fit either his characterization or his figure of the organ in this particular genus. The change to *Euxoa* was made, after genitalic studies, in the Barnes

and McDunnough "Check list" of 1917 and followed later by Draudt in Seitz' work.

MALE GENITALIA: (Based on a Manitoba specimen.) Clasper broad and short, costa curved slightly dorsad at cucullus; marginal spines fine and about 17 in number. Sacculus very broad and stout; no clavus is present, but there are a few short setae at base of costal edge. Harpes symmetrical and quite unique; the ventral fork is very short and broadly spoon shaped; the dorsal fork normal, strongly excurved and projecting far beyond costal margin. Juxta plate broadly excavated apically, sides subparallel until near base when they expand to points and are strengthened by bar-like chitinous thickenings; the usual medial point on basal edge. Aedeagus slightly curved and apparently without the small spine in the vesica. Unfortunately no topotypical male was available for dissection.

FEMALE GENITALIA: (Based on a New York specimen.) Ovipositor lobes fairly contiguous, very long and narrow, rounded apically. On the dorsal surface the apices of the lobes are rather heavily clothed with minute, stubby spining; the balance of the lobes shows a sparse sprinkling of somewhat longer setae. A few longer hairs occur at the base, mostly laterally, but do not form any definite row. The structure of the ostium pouch and the ductus bursae is quite unique and difficult to describe; the former is in the shape of a long funnel with strongly chitinized edges which appear to merge in the median area apically, forming a blunt wedge; beyond this the edges of the ductus on the ventral side show a rough, irregular chitinization which joins to form a V near the distal end of the ductus. The dorsal, rather weakly chitinized rod extends slightly beyond the apex of the V, leaving a quite short membranous section before the entrance to the bursa. The bursa itself is broad and chunky, with a deep invagination about the middle of the left side which thus forms two semi-equal lobes and gives a dumbbell-shaped appearance to the whole organ. In the vicinity of the entrance of the ductus bursae the proximal lobe forms a dorsal, imperfectly outlined bulge from which the ductus seminalis arises.

TYPES: *Mimallonis*, holotype, male, New York (? lost); *rufipennis*, holotype, male,

Schoharie, New York (B.M.).

DISTRIBUTION: Very rare in the eastern United States, the only known records being New York State and Franconia, New Hampshire (Slosson), based on a female specimen in the American Museum of Natural History. In Canada it has been reported from Nova Scotia and extends westward from this province into Manitoba where it is much more common. It has been taken in the Ottawa region and other localities in northern Ontario (Biscotasing, Hymers). In the far west it occurs in British Columbia and Montana.

***Euxoa messoria* (Harris)**

Figures 2A, 6B, 10I

Agrotis messoria HARRIS, 1841, Report on the insects of Massachusetts injurious to vegetation, p. 324; 1862, Insects injurious to vegetation, Flint edition, p. 444.

Carneades messoria, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, pp. 163, 169; 1893, *ibid.*, no. 44, p. 96; 1900, Proc. U. S. Natl. Mus., vol. 22, p. 434. BEUTENMÜLLER, 1901, Bull. Amer. Mus. Nat. Hist., vol. 14, p. 284.

Euxoa messoria, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 256. HOLLAND, 1903, Moth book, p. 188, pl. 22, fig. 40. SMITH, 1904, Jour. New York Ent. Soc., vol. 12, p. 98; 1907, *ibid.*, vol. 15, pp. 142, 143. DOD, 1905, Canadian Ent., vol. 37, pp. 56, 58, 59. DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 43, fig. 6k. McDUNNOUGH, 1927, Canadian Ent., vol. 59, p. 194. COOK, 1930, Canadian Ent., vol. 62, p. 264. CRUMB, 1929, Tech. Bull. U. S. Dept. Agr., no. 88, p. 90, pl. 4k, pl. 7, B, J; 1932, Bull. Brooklyn Ent. Soc., vol. 27, pp. 75, 82, pl. 11, fig. E (biology).

Agrotis spissa GUENÉE, 1852, Histoire naturelle des insectes, vol. 5, p. 261. GROTE, 1882, Bull. U. S. Geol. and Geogr. Surv. Terr., vol. 6, p. 566. BUTLER, 1889, Trans. Ent. Soc. London, p. 379.

Carneades spissa, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 169; 1893, *ibid.*, no. 44, p. 169 (synonymy).

Euxoa spissa, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 256 (synonymy).

Agrotis cochrani RILEY, 1867, Prairie Farmer, July; 1869, First annual report on the . . . insects of the State of Missouri, pp. 74-76, fig. 26; 1881, Bull. U. S. Ent. Comm., no. 6, p. 76; 1882, Papilio, vol. 2, p. 41 (synonymy). GROTE, 1874, Canadian Ent., vol. 6, p. 214; 1881, Papilio, vol. 1, p. 126.

Carneades cochrani, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 169; 1893, *ibid.*, no. 44, p. 96 (as synonym).

Euxoa cochrani, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 256 (as synonym).

Agrotis repentis GROTE AND ROBINSON, 1868, Trans. Amer. Ent. Soc., vol. 1, p. 350, pl. 7, fig. 58. GROTE, 1873, Bull. Buffalo Soc. Nat. Sci., vol. 1, p. 96; 1874, *ibid.*, vol. 2, p. 53 (synonymy); 1881, Papilio, vol. 1, p. 126; 1881, Bull. U. S. Geol. and Geogr. Surv. Terr., vol. 6, p. 150; 1882, *ibid.*, vol. 6, p. 565 (synonymy).

Carneades repentis, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 169; 1893, *ibid.*, no. 44, p. 96 (as synonym).

Euxoa repentis, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 256 (as synonym).

Carneades confracta SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 170; 1893, *ibid.*, no. 44, p. 96.

Mamestra dispiciens WALKER, 1865, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 32, p. 660. SMITH, 1891, Canadian Ent., vol. 23, p. 119 (synonymy).

Agrotis reticens WALKER, 1865, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 32, p. 692. SMITH, 1891, Canadian Ent., vol. 23, p. 119 (synonymy).

Agrotis ordinata WALKER, 1865, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 32, p. 691. SMITH, 1891, Canadian Ent., vol. 23, p. 119 (synonymy).

Mamestra inextricata WALKER, 1865, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 32, p. 658. SMITH, 1891, Canadian Ent., vol. 23, p. 120 (synonymy).

Mamestra indirecta WALKER, 1865, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 32, p. 659. SMITH, 1891, Canadian Ent., vol. 23, p. 120 (synonymy).

Mamestra expulsa WALKER, 1865, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 32, p. 661.

Euxoa expulsa, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 256 (synonymy). DOD, 1911, Canadian Ent., vol. 43, p. 367.

Agrotis friabilis GROTE, 1875, Canadian Ent., vol. 7, pp. 187, 227, pl. 1, fig. 5.

Carneades friabilis, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 176; 1893, *ibid.*, no. 44, p. 99.

Euxoa friabilis, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 249, pl. 63, fig. 29. DOD, 1918, Canadian Ent., vol. 50, p. 11 (synonymy).

The extremely complicated synonymy has been the subject of considerable discussion by various specialists, as indicated in the preceding bibliography. In most instances the synonymic references seem to have been satisfactorily established, but in a couple of cases some doubt still exists. *Spissa* Guenée was based on two North American specimens in the Boisduval collection, and these specimens according to information in correspondence between René Oberthür and Barnes were apparently destroyed. The name was referred to *messoria* largely on the strength of a specimen named as such in the British Museum by Walker, and there is no indication that any worker in this country had ever examined them. The name *confracta* was validated by Smith, who mentions a manuscript name of Morrison's attached to a specimen in the Tepper collection. Judging by Smith's remarks it was taken in Colorado and showed relationship to *balanitis* Grote, at the time erroneously considered by Smith as a *messoria* synonym; an examination of the specimen, if it still exists, in the Michigan State College of Agriculture and Applied Science at East Lansing will be necessary to decide the point. *Expulsa* Walker, based on a Vancouver Island female collected by Lieutenant Colonel Hawkins, is placed by Hampson in the synonymy, although Smith was inclined to refer the name to the species now known as *declarata* Walker. Dod confirms Hampson's placement. Being of western origin, the name might perhaps be better placed with *territoralis* Smith which is considered as a doubtful western race of *messoria*; its treatment is, however, outside the scope of this article. A genitalic slide should definitely decide the status of *friabilis* Grote, described from a female taken in Canada by Norman; in 1913 the type in the British Museum was studied by Dod and the author and the present synonymy agreed on.

Five names of Walker's, viz., *dispiciens*, *reticens*, *ordinata*, *inextricata*, and *indirecta*, were all based on Canadian material collected by Bethune, probably in the southern Ontario peninsula. Smith examined the types in 1891 and made the synonymical references; three of these types were deposited later in the United States National Museum; the others were destroyed by *Dermestes*.

Messoria is one of the most widely distributed species of *Euxoa*, occurring across the entire North American continent. It is also one of the most destructive species in the larval state as a cutworm. In the male genitalia it shows no particularly outstanding feature, but the female genitalia are quite unique, as may be noted from the illustration; in doubtful cases a study of this organ should easily settle the identity.

MALE GENITALIA: (Both sexes based on specimens from New Windsor, New York.) Clasper rather broad, with the costal margin curved moderately dorsad at cucullus. Marginal spines very numerous and placed close together, 29 to 30 in number. Saccus fairly broad, with weak clavus at base. Harpes virtually symmetrical, the forks of the left side tending to be slightly shorter than those of the right side; ventral fork stout, slightly outcurved at apex which attains the level of the ventral angle of the cucullus on the right side; dorsal fork strongly excurved over the base of the costal margin of clasper, then curved inward to run more or less parallel to same and not greatly shorter than the ventral fork. Juxta plate narrow and high, the sides drawn inward medially in a rather characteristic way to form a sort of waist; the median projection of the basal margin long and pointed. Aedeagus slightly tapered apically, the two distal lobes separated by a deep incision; vesica with the usual small spine.

FEMALE GENITALIA: Ovipositor lobes rather weakly chitinized, broad, moderately high and with well-rounded apices; the inner margins are parallel and closely approached. Dorsally the apical vestiture of the lobes consists mostly of very short, blunt setae, the remainder of the surfaces being rather sparsely clothed with fine setae of varying lengths. A basal row of long, somewhat stronger setae is quite apparent. Ostium pouch long, funnel shaped. Ductus bursae with its chitinous rods extending well past the apices of the anterior apophyses; distal end shortly membranous and entering the bursa at its narrow proximal end. Bursa quite unique in shape, consisting of two lobes; the one on the right side and which is entered by the ductus bursae forms a long, broad, oval sac; that on the left side arises

near the proximal end as a long tube which continues parallel to the right lobe, bending beneath it at its distal end and recurving along its right side for a considerable distance, especially in well-inflated specimens containing spermatophores. From the distal end of this lobe the long, thin ductus seminalis arises.

TYPES: *Messoria*, holotype, Massachusetts (M.C.Z., ex collection Boston Society of Natural History); *spissa*, holotype, "Am. Sept." (presumably destroyed); *cochranii*, ?Missouri (no authentic type has been found in the United States National Museum); *repentis*, holotype, male, New York (Academy of Natural Sciences of Philadelphia); *confracta*, holotype (? Michigan State College of Agriculture and Applied Science, East Lansing); *displiciens*, *reticens*, and *indirecta*, Canada west (U.S.N.M.); *ordinata* and *inextricata*, destroyed; *expulsa*, holotype, female, Vancouver Island (B.M.); *friabilis*, holotype, female, Canada (B.M.).

DISTRIBUTION: Widespread over almost the whole of the United States and Canada.

***Euxoa knoxvillea* McDunnough**

Figures 2B, 6C, 10J

Euxoa knoxvillea McDUNNOUGH, 1937, Canadian Ent., vol. 69, p. 153, fig. 1 on p. 155.

This species has only fairly recently been separated from *messoria* with which it had previously been confused. A study of the genitalia of both sexes shows the validity of this action. The species is apparently an inhabitant of the Mississippi Valley region. Based originally on Tennessee specimens, it has been found to occur in Minnesota in the St. Paul region, and several specimens have been picked out from the *messoria* series in the American Museum collection which came from the old Bean collection, purchased by C. F. dos Passos and donated to the Museum. Five specimens are before me at the present time for study, all old and probably considerably faded: two males from the Henry Edwards collection from St. Paul, Minnesota, and two males and one female taken by Bean in 1875 and 1877, presumably at Galena, Illinois. The characters given in the original description whereby *knoxvillea* can be separated from *messoria* do

not seem to hold very well in the above-mentioned series, owing possibly to the age of the specimens. Another character, however, which seems to have greater value is found in the relationship between the reniform and the t.p. line on the primaries; in *messoria* the t.p. line is narrowly excurved around the reniform and then runs rigidly oblique to the inner margin, passing quite close to the base of the reniform; in *knoxvillea* the excurve of the t.p. line around the reniform is greater and the space between the two, in consequence, larger; below the reniform the line is incurved.

MALE GENITALIA: (Both sexes based on Illinois specimens.) Clasper of moderate width, the ventral edge outcurved apically, forming a slight heel at the lower angle of the cucullus, the costal edge also noticeably produced; marginal spines numerous, 20 to 23 in number. Sacculus narrow, with no trace of a clavus. Harpes somewhat asymmetrical, the forks of the right side longer than those of the left. Ventral fork excurved, that of the right side bent inward at apex so as almost to touch the heel of the cucullus. Dorsal fork projected over the base of the costal margin of clasper, in general rather upright. Basal space between the forks broadly U-shaped. Juxta plate much broader than in *messoria*, the sides drawn out to a slight angle below the middle; the bifid apices and the basal medial projection much as usual. Aedeagus with the usual small apical spine in the vesica.

FEMALE GENITALIA: Unfortunately in the only female available for examination the bursa was deflated and without spermatophore. In consequence the shape, as given in the illustration, may not be entirely normal, although quite distinct from that of *messoria*. Ovipositor lobes widely separated, of moderate width and length, narrowing apically, and with slightly concave outer margins, and rounded apices. On the dorsal surface the lobes are sparsely covered with short, stubby spines, intermingled with a few longer setae; a subbasal row of longer setae is evident. Ostium pouch narrow, funnel shaped, gradually tapering into the ductus bursae which extends well beyond the apices of the anterior apophyses; the chitinous internal rods rather shorter than usual, ending only slightly

beyond the apophysis apex. Bursa rather short, with a deep invagination on the left side dividing the organ into two unequal lobes, that on the right side the longer with broadly rounded fundus. The left lobe projects to the left considerably beyond the entrance of the ductus bursae into the right lobe; it also shows a rounded fundus. The ductus seminalis arises normally from the upper left corner of the lobe.

TYPES: Holotype, female, allotype, male, Knoxville, Tennessee (C.N.C.); paratypes, same locality (U.S.N.M.).

DISTRIBUTION: Mississippi Valley states; Tennessee (Knoxville, May, June); Illinois (Galena, June, July); Minnesota (St. Paul). The early date of flight is unusual, as most of the *Euxoa* species appear in early or late fall.

Euxoa scholastica McDunnough

Figures 2C, 6D, 10K

Euxoa scholastica McDUNNOUGH, 1920, Canadian Ent., vol. 52, p. 161, pl. 4, fig. 3. DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 43.

Apparently the species is not so rare as was originally supposed. Besides the type specimens from the Ottawa region, the Canadian National Collection contains a good series captured by the author at White Point Beach, Queens County, Nova Scotia. In the collection of the American Museum is a series taken at Bear Mountain, New York, by C. H. Curran, besides single specimens from Ithaca and New Windsor in the same state. The flight is a rather early one, taking place in June and July at Bear Mountain.

The rather characteristic brown color of the primaries and the almost entirely smoky brown secondaries distinguish the species from *messoria* and *knoxvillea*. The small, circular orbicular, outlined in black and filled with pale ochreous, is also quite characteristic. In general appearance the species approaches closest to *terrena* Smith, although the genitalia are totally different.

MALE GENITALIA: (Both sexes based on Bear Mountain specimens.) Clasper moderate in width, with parallel sides and costal margin slightly curved dorsad at apex. Marginal spines much fewer than in *messoria*, being 12 to 14 in number. Sacculus fairly

strong but rather narrow, with a minute clavus at base. Harpes symmetrical; ventral fork thin, straight, reaching just beyond ventral angle of cucullus; dorsal fork bent across costal margin of clasper and then nearly upright, clothed with numerous very fine hairs, except at base, this being a characteristic feature. Space between the forks broadly U-shaped. Juxta plate rather high and narrow, sides expanding somewhat towards base and slightly thickened with chitin; a deep incision between the two apical lobes and the usual median pointed projection on the basal margin. Aedeagus with a lightly chitinized, rounded, apical projection on the left side; the vesica contains two small spines, one very minute.

FEMALE GENITALIA: Ovipositor lobes of moderate width and height, closely approximate in basal area, sharply divergent and outcurved apically; the apices show short, broadly truncate, chitinous projections. The dorsal surface of each lobe is very sparsely clothed with fine, short setae which tend to lengthen in the lateral area. A very definite basal row of long, strong setae is present. Ostium pouch broadly funnel shaped; ductus bursae very long, the membranous portion extending considerably beyond the ends of the chitinized internal rods and entering the bursa at the right proximal corner. Bursa inverted L-shaped, the proximal half projected strongly to the left, the fundus broad and rounded. The ductus seminalis arises from the proximal left end of the projection.

TYPES: Holotype, male, allotype, female, Ottawa, Ontario (C.N.C.).

DISTRIBUTION: Eastern states (New York, Pennsylvania), Canada (Nova Scotia, Ontario).

***Euxoa fumalis* (Grote)**

Figures 2D, 6E, 10L

Agrotis fumalis GROTE, 1873, Bull. Buffalo Soc. Nat. Sci., vol. 1, p. 98.

Carneades fumalis, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 151; 1893, *ibid.*, no. 44, p. 91. BEUTENMÜLLER, 1901, Bull. Amer. Mus. Nat. Hist., vol. 14, p. 282.

Euxoa fumalis, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 220, pl. 62, fig. 16. DRAUDT, *in* Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 44, pl. 7b.

Agrotis permunda MORRISON, 1874, Proc. Boston Soc. Nat. Hist., vol. 17, p. 163. GROTE, 1881, Bull. U. S. Geol. and Geogr. Surv. Terr., vol. 6, p. 151 (synonymy). SMITH, 1893, Bull. U. S. Natl. Mus., no. 44, p. 91.

The name was based on a male specimen (no. 130) collected in New York by T. L. Mead. The location of this type is unknown; it is not listed as being in the British Museum, although Hampson records and figures a New York specimen from the Grote collection which may have come from Mead. In the collection of the American Museum is a male from the Henry Edwards collection, labeled "New York. 6521"; a reference to his "Catalogue" shows that it was received from Mead, but the specimen is smaller and less maculate than the original description would indicate and can only be regarded as possibly topotypical. Several other similarly small specimens from New York localities are in the collection, all with obscure maculation. Larger specimens from Maine show better defined cross lines and match Hampson's figure fairly closely. These specimens all show an even, deep brown coloration of the primaries and a strong outward projection of the t.a. line above the inner margin.

Morrison himself, according to Grote, referred his species *permunda* to *fumalis* as a synonym. The name was based on specimens from "Canada" and "Massachusetts," but the location of these, if still existing, cannot be discovered. Two specimens in the Michigan State College of Agriculture and Applied Science from "N.H." bear the name *permunda* but no type label. In view of the apparent loss of the types of both names, it would seem well to consider Hampson's figure and the New York specimen on which it was based as representative of the species.

MALE GENITALIA: (Both sexes based on New York specimens.) Clasper moderately broad, the sides slightly expanded apically; marginal spines numerous, 19 to 20 in number, and extending virtually across the entire cucullus. Sacculus narrow and weak, costal margin straight, with a few basal hairs but no definite clavus. Harpes nearly symmetrical, the ventral fork of the right side being a shade longer than that of the left side, both pointed apically. Dorsal fork excurved across the base of the costa of clasper, then subparallel

to same and considerably shorter than the ventral fork. Basal space between the two forks broad and U-shaped. Aedeagus stout, with a characteristic, thinly chitinized, apical bar bearing several minute teeth; the usual small spine in the vesica is also present. Juxta plate with the central section virtually membranous so that it appears to consist of two parallel, chitinous bars, broadly joined at the base; this character would appear, along with the teeth in the aedeagus, to separate the species from the closely similar *ontario* and *vestitura*. The usual pointed projection of the basal edge is present.

FEMALE GENITALIA: Ovipositor lobes broad and rather short, tapering and terminating apically in long chitinous projections, slightly divergent at their tips. On the dorsal surface a heavy clothing of long, fine setae covers each lobe. A number of longer basal setae are present but do not form any very definite row. The caudo-dorsal half of segment VIII is more heavily clothed with setae than usual. Ostium pouch broad and funnel shaped, tapering into the short ductus bursae; this section with its chitinous rods barely extends beyond the apices of the anterior apophyses and enters the bursa proximally on the right side. Bursa a long sac with a slight, rounded proximal projection to the left from which the ductus seminalis arises.

TYPES: *Fumalis*, holotype, male, New York, T. Mead (location unknown); *permunda*, types probably destroyed.

DISTRIBUTION: New York State, extending northward into Maine and southern Ontario. Smith records "Middle States" and "District of Columbia" without further locality data. Canadian specimens which may belong here have been taken in Ontario (Ottawa region, Queenston).

***Euxoa ontario* (Smith)**

Figures 2E, 7A

Carneades ontario SMITH, 1900, Proc. U. S. Natl. Mus., vol. 22, p. 440.

Euxoa ontario, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 259, pl. 64, fig. 13. DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 44, pl. 7b.

Euxoa vestitura SMITH, 1905, Canadian Ent.,

vol. 37, p. 201. DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 44 (as form of *fumalis*).

There is no doubt that *ontario* is closely allied genitally to *fumalis* and still closer to *vestitura*. The name was based on a male from Sudbury, Ontario, and John G. Franclemont, who has kindly made a genitalic slide of the holotype in the United States National Museum and compared it with slides of these organs in *vestitura* and *fumalis*, expresses the opinion (*in litt.*) that all three might readily be forms of a single species. After a careful study there seem to be sufficient grounds for considering *fumalis* as distinct from *ontario*, but *vestitura* should be transferred to the synonymy of *ontario* rather than considered as a race of *fumalis* as was done in the "Check lists" of 1917 and 1937.

The species is distinctly a northern one and not well represented in collections. Series from the Canadian National Collection and the United States National Museum have, however, been available for study, ranging from specimens from Hymers, Ontario, in the Thunder Bay District, west of Lake Superior, to those from the Laurentian region of Quebec, north of Montreal, along with a single specimen from Bathurst, New Brunswick. In coloration of the primaries *ontario* is distinctly more of a deep smoky gray without the brown shades found in *fumalis*; in maculation, which appears to be as a rule fairly well defined, the distinctly geminate t.a. line is more upright and without the strong outward projection above the inner margin characteristic of *fumalis*. In the male and female genitalia there are slight but apparently constant differences which will be dealt with later. *Vestitura*, which is not uncommon in the Bay of Fundy region and along the south shore of Nova Scotia, shows the same characters as *ontario* but is larger in size; this may not be of great moment as two specimens in the American Museum collection from Rangeley, Maine, and Franconia, New Hampshire, are intermediate between the two; if desired, the name *vestitura* may be retained in a racial sense for specimens from the Atlantic coast region of the Maritime Provinces.

MALE GENITALIA: (Based on a specimen from Val Morin, Quebec.) Structure essen-

tially the same as in *fumalis*. The main differences lie in the entire lack of armature of the aedeagus and in the shape of the juxta plate in which the large central membranous section is wanting and the plate, in consequence, quite normal in appearance. The ventral forks of the harpe are equal and possibly slightly longer than those of *fumalis*, the space between them and the dorsal forks being rather narrower.

FEMALE GENITALIA: (Based on a specimen from Hymers, Ontario.) The ovipositor lobes appear slightly broader than in *fumalis*, and the apical chitinous projections appear considerably shorter and more truncately cut off in the few specimens examined. This character is, however, a rather doubtful one and is probably not entirely constant. The bursa is less elongate and somewhat broader. Otherwise the parts agree.

TYPES: *Ontario*, holotype, male, Sudbury, Ontario (U.S.N.M.); *vestitura*, holotype, male, allotype, female, St. John, New Brunswick (Rutgers University, New Brunswick, New Jersey); paratypes, same locality (U.S.N.M.).

DISTRIBUTION: Northern Ontario, extending eastward into Quebec and northern New Brunswick and southward into the northern New England states. *Vestitura* is apparently confined to the Atlantic coast region of New Brunswick and Nova Scotia where it occurs quite commonly.

***Euxoa bostoniensis* (Grote)**

Figures 2F, 7B, 11A

Agrotis bostoniensis GROTE, 1874, Proc. Acad. Nat. Sci. Philadelphia, vol. 26, p. 203. HARVEY, 1876, Bull. Buffalo Soc. Nat. Sci., vol. 3, p. 74, pl. 3, fig. 7.

Carneades bostoniensis, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 165; 1893, *ibid.*, no. 44, p. 94. BEUTENMÜLLER, 1901, Bull. Amer. Mus. Nat. Hist., vol. 14, p. 283, pl. 37, fig. 6.

Euxoa bostoniensis, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 235, pl. 63, fig. 14. DRAUDT, *in* Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 44, pl. 7c.

The species is already so well known from the published figures that further description is scarcely necessary. The deep ash gray color of the primaries with obscure maculation, except for the dark median shade, together with the white secondaries in the male,

renders the species a rather striking one. Smith's claim that the vestiture is "almost entirely hairy" is scarcely justified; as a matter of fact, it is largely composed of hair-like scales with bifid apices. The male antennae are strongly serrate and fasciculate. The material in the American Museum collection consists principally of specimens from the northern Atlantic states, where it appears to be not uncommon. The extent of its distribution westward is uncertain, although Smith records "Middle States"; it is known to occur occasionally in Canada.

MALE GENITALIA: (Both sexes based on New York specimens.) Clasper quite narrow, cucullus with slight indication of a "heel"; marginal spines few, 10 to 12 in number. Sacculus narrow but fairly strong; base of costa with numerous hairs but no indication of clavus. Harpes symmetrical, the two forks subequal in length and forming a broad U at their basal junction. Ventral fork straight, rather shorter than usual, not attaining ventral angle of the cucullus; dorsal fork slightly sinuate and projecting over the costal margin of clasper. Juxta plate narrow and upright in the apical half, with slightly convex sides and broadly rounded apical projections with deep evagination between them; basal section broadening laterally and strengthened by chitinous thickening; the usual medio-basal pointed projection. Aedeagus stout, with apparently no small terminal spine in the vesica.

FEMALE GENITALIA: Ovipositor lobes high and narrow, with rounded apices, rather weakly chitinized, the opposing margins well separated and subparallel. Dorsal surfaces rather sparsely clothed with fine setae of varying length, more numerous and shorter in the apical area. Distinct basal row of long fine hairs. Ostium pouch rather narrowly funnel shaped, gradually tapering into the long ductus bursae which extends far beyond the apices of the anterior apophyses; chitinous rods reaching almost to its distal end. Bursa large and partially divided into two lobes by an invagination on the left side; it projects caudad, in more or less normal fashion, along the left side of the ductus bursae; the fundus is rounded and somewhat bulging. The entrance of the ductus bursae is on the right side, proximad of the middle; the ductus

seminalis arises normally on the left side from the apex.

TYPE: Holotype, male, allotype, female, Newtonville, Massachusetts (B.M.).

DISTRIBUTION: Northern Atlantic states, extending westward through Pennsylvania, to Tennessee, and possibly to Illinois. In Canada it is recorded from Queenston, Coldstream, and St. Thomas, all in the southern Ontario peninsula.

***Euxoa tessellata* (Harris)**

Figures 2G, 7C, 11B

Agrotis tessellata HARRIS, 1841, Report on the insects of Massachusetts injurious to vegetation, p. 324; 1862, Insects injurious to vegetation, Flint edition, p. 445.

Carneades tessellata, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 192; 1893, *ibid.*, no. 44, p. 103. BEUTENMÜLLER, 1901, Bull. Amer. Mus. Nat. Hist., vol. 14, p. 284, pl. 37, fig. 2.

Euxoa tessellata, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 285, pl. 65, fig. 28. HOLLAND, 1903, Moth book, p. 189, pl. 23, fig. 4. DOD, 1905, Canadian Ent., vol. 37, pp. 59, 60; 1911, *ibid.*, vol. 43, p. 368. DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 45, fig. 7d. CRUMB, 1929, Tech. Bull. U. S. Dept. Agr., no. 88, pp. 86, 94, pl. 4L; 1932, Bull. Brooklyn Ent. Soc., vol. 27, pp. 75, 83. COOK, 1930, Canadian Ent., vol. 62, p. 265.

Agrotis nigricans var. *maizi* FITCH, 1865, Ninth report on the noxious and other insects of the State of New York, p. 237, pl. 4, figs. 2, 3. RILEY, 1869, First annual report on the insects of Missouri, p. 81. GROTE, 1877, Bull. U. S. Geol. and Geogr. Surv. Terr., vol. 3, p. 118; 1881, *ibid.*, vol. 6, p. 150 (synonymy). LINTNER, 1878, Ent. Contrib., no. 4, p. 122 (synonymy).

Mamestra insulsa WALKER, 1856, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 9, p. 234. GROTE, 1882, Illustrated essay on the Noctuidae of North America, p. 43.

Carneades insulsa, SMITH, 1893, Bull. U. S. Natl. Mus., no. 44, p. 102 (*err. det.*).

Euxoa insulsa, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 256 (*err. det.*). DOD, 1911, Canadian Ent., vol. 43, p. 364 (correct synonymy).

Agrotis perlentans WALKER, 1856, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 10, p. 332. SMITH, 1907, Bull. U. S. Natl. Mus., no. 38, p. 210 (unknown).

Euxoa perlentans, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British

Museum, vol. 4, p. 285 (synonymy). SMITH, 1907, Jour. New York Ent. Soc., vol. 15, p. 144. DOD, 1911, Canadian Ent., vol. 43, p. 338.

Agrotis insignata WALKER (*nec* Walker), 1856, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 10, p. 353 (homonym). HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 285 (synonymy). SMITH, 1907, Jour. New York Ent. Soc., vol. 15, p. 143.

Agrotis illata WALKER, 1857, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 11, p. 742 (new name for *insignata*).

Agrotis subsignata WALKER, 1857, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 32, p. 706 (new name for *insignata*).

Only the most salient references in the much involved synonymy are given. The worst confusion occurred with regard to *insulsa* Walker (spelled at times *insula* by Smith). This was for a long time treated by North American workers as a prior name for what is now known as *declarata* Walker (*decolor* Morrison). Hampson complicated the matter still further by placing the name as a synonym of *messoria* Harris, and it was not until 1911 that the correct association with the *tessellata* complex was made by Dod. Walker twice proposed new names for his preoccupied *insignata*.

No attempt has been made in the present paper to deal with the numerous western forms, which will involve a careful study of the genitalia of type material. A few slides of the very characteristic female genitalia have, however, been made, based on Albertan and Californian material, and these bear out the present association as given in the lists.

The typical form, as described by Harris, is the one in which the primaries show a fairly well-defined maculation, a black streak at the base, and a dark patch between the paler reniform and orbicular; the color is generally a brownish gray, with slight tinges of purplish. Characteristic of the males is an ochreous shoulder patch at the base of the primaries, which in the female inclines to white. This feature led to the name *flaviscapula*, proposed by Smith for one of the western forms, and is often most useful in placing specimens with suffused coloration. Variation in color and maculation is very prevalent, and specimens from any given

locality may run all the way from the normal type to such as show an almost unicolorous dark coloration with obsolescent maculation. For these latter variants, names such as *atropurpurea* Grote could be used, although the name was originally based on a Colorado specimen. The male antennae are rather feebly serrate and fasciculate.

MALE GENITALIA: (Both sexes based on specimens from Lenox, Massachusetts.) Clasper long and narrow, costa at apex bent strongly dorsad, marginal spines numerous and close together, 26 to 28 in number. Sacculus narrow, with waved costal edge and scarcely an indication of a clavus. Harpes asymmetrical, the ventral fork of the right side much longer than that of the left and reaching to about the level of the ventral angle of the cucullus; on the left side this fork is scarcely longer than the dorsal fork. Dorsal forks of the two sides subequal in length, upright with little excurve, and projecting only slightly beyond the costal margin of the clasper. The basal spaces between the two pairs of forks rather narrow and obliquely U-shaped. Juxta plate broad, the sides gradually expanding from the bifid apex; basal edge forming the usual medial point. Aedeagus slightly tapering apically, bilobed, with a deep rounded excavation between the lobes; vesica with the usual small apical spine which sometimes appears to be lacking.

FEMALE GENITALIA: Ovipositor lobes long and narrow, close together at base but somewhat divergent apically; apices rather broadly truncate and only slightly rounded. Entire dorsal surface of each lobe thickly covered with short stubby spines, intermingled with a few longer setae. The most characteristic feature is a basal row of long and extremely thick spines, about eight on each lobe, which are usually visible without the necessity of making a slide, and this at once separates the species from *messoria*, *declarata*, and other allies. Ostium pouch broad and almost semi-globate; ductus bursae not so long as usual but still exceeding the apices of the short anterior apophyses considerably; the chitinous rods are extended almost to the distal end; its entrance into the bursa is on the caudal margin to the right. Bursa broadened proximally, with a short projection to the

left side from which the ductus seminalis arises, then narrowing to a long, finger-like extension.

TYPES: *Tessellata*, holotype, Massachusetts (M.C.Z., ex collection Boston Society of Natural History); *maizi*, holotype, male, New York (probably in collection New York State Museum, Albany); *insulsa*, holotype, female, Orillia, Ontario (B. M.); *perlentans*, holotype, male, New York (B. M.); *insignata* (*illata*, *subsignata*), holotype, male, no locality (B.M.).

DISTRIBUTION: Widespread throughout the United States and Canada from the Atlantic to the Pacific coasts. In the east it extends through the southern Atlantic states to Florida, being one of the two species of *Euxoa* recorded in Grossbeck's list as occurring in this state.

Euxoa pleuritica (Grote)

Figures 3A, 7D, 11C

Agrotis pleuritica GROTE, 1876, Check list of the Noctuidae of America, pt. 2, p. 47.

Carneades pleuritica, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 170; 1893, *ibid.*, no. 44, p. 97.

Euxoa insignata, HAMPSON (*nec* Walker), 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 269, pl. 64, fig. 31. SMITH, 1904, Jour. New York Ent. Soc., vol. 12, p. 99.

Euxoa pleuritica, DOD, 1905, Canadian Ent., vol. 37, pp. 56, 59. DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 46. McDUNNOUGH, 1932, Canadian Ent., vol. 64, p. 234, pl. 8, fig. 4 (genitalia). COOK, 1930, Canadian Ent., vol. 72, p. 265.

The specific name was based on a male specimen from "Canada (Saunders)," the collector's name indicating that it was probably taken in the vicinity of London, Ontario. There seems to have been some mistake in the attaching of a type label, for Hampson records the type as a male from "N. New York, Grote Coll." and figures what is apparently this specimen and an excellent representation of the species. Tams comments, "obviously a labelling error as the original Grote type label is on the specimen but without locality." Under the circumstances it seems best to consider this type as authentic.

The species is rare in the east but occurs

much more commonly in the western states and the Prairie Provinces of Canada. The peculiar olivaceous suffusion on the primaries is characteristic and, once noted, should render *pleuritica* easily distinguishable from *tessellata*; in doubtful cases recourse can be had to the genitalia.

MALE GENITALIA: (Based on a specimen from northern Ontario.) Clasper long and narrow, sides parallel but curving outward apically to form a sort of foot-like cucullus; marginal spines numerous, 26 to 29 in number. Sacculus rather broad, with sinuate costal edge and traces of a clavus at base in shape of minute, scattered hairs. Harpes asymmetrical, the ventral fork of the right side being longer than that of the left side and extending to just beyond the ventral angle of the cucullus; on the right side the space between the two forks is broader than on the left side and more U-shaped. The dorsal fork of the right side is excurved over the costal margin of the clasper, while on the left side this fork rests entirely on the clasper and is not projected beyond its edge. Juxta plate quite narrow, with parallel sides terminating apically in bifid, pointed projections; basal area broadened by a curved thickening of chitin and the basal margin with the usual medial point. Aedeagus narrow, curved, and somewhat expanded apically.

FEMALE GENITALIA: (Based on a Manitoba specimen.) Ovipositor lobes weakly chitinized, moderately broad, close together at bases, divergent apically; apices narrowed and rounded. Dorsal surfaces sparsely clothed with fine, moderately long setae with shorter ones along margins; no particular indication of a basal row of long setae. Ostium pouch broad and short, semi-globate, narrowing rapidly to a long ductus bursae, extending with its chitinous rods far beyond the apices of the anterior apophyses. Bursa more or less normal, except for an invagination about the middle of the left side. Entrance of the ductus bursae on the right side; exit of the ductus seminalis apically on left side.

TYPE: Holotype, male, Canada (B.M.).

DISTRIBUTION: Northern New York, extending into Maine and New Hampshire. In Canada, rare in Ontario and probably western Quebec. Westward the species ranges into the Prairie Provinces, where it is more

common, and southward into the Rocky Mountain states (Colorado, Montana).

***Euxoa declarata decolor* (Morrison)**

Figures 3B, 7E, 11D

Agrotis decolor MORRISON, 1874, Proc. Boston Soc. Nat. Hist., vol. 17, p. 162; 1875, Canadian Ent., vol. 7, p. 214. GROTE, 1877, Bull. Buffalo Soc. Nat. Sci., vol. 3, p. 212; 1881, Bull. U. S. Geol. and Geogr. Surv. Terr., vol. 6, p. 151.

Carneades insignata, SMITH (*nec* Walker), 1890, Bull. U. S. Natl. Mus., no. 38, pp. 179, 190 (*partim*).

Carneades insulsa, SMITH (*nec* Walker), 1893, Bull. U. S. Natl. Mus., no. 44, p. 102 (*partim*). BEUTENMÜLLER, 1901, Bull. Amer. Mus. Nat. Hist., vol. 14, p. 284 (as *insula*).

Euxoa decolor, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 284, pl. 65, fig. 27. DOD, 1905, Canadian Ent., vol. 37, pp. 56, 58 (*partim*). BARNES AND MCDUNNOUGH, 1918, Canadian Ent., vol. 50, p. 195.

The oldest available name for the species is *declarata* Walker, but as this was based on Vancouver Island specimens and therefore rather outside the scope of the present article, it has been decided to employ Morrison's name *decolor* in a rather doubtful racial sense. This name has at least the advantage of having been described from eastern material, although, the original types being apparently lost, its actual identity remains somewhat problematic as indicated by Barnes and McDunnough (1918). Morrison's original description was brief and vague. The following year he amplified it, making Grote's *campestris* a synonym, and apparently considering the type to be a common form in which on the primaries "the median space is dark purple-brown, and the basal and subterminal space bright even yellowish brown," a feature not mentioned at all in his earlier description. Smith (1893), who states he had seen the type, confirms Morrison's later idea, and Hampson also figures under this name a somewhat similar Nova Scotian female; there is, however, no existing type in the Tepper collection at East Lansing to confirm this determination. In view of the confusion that existed in the minds of older authors regarding its correct identity, the only alternative seems to be to accept as typifying *decolor* specimens agreeing with

Morrison's later diagnosis, which would thus fit in with the treatment by Smith and Hampson.

The Vancouver Island nymotypical *decolorata* is much larger than eastern *decolor* and the primaries are more or less even purple brown in color, so that a possible racial distinction may be indicated. It is true that similarly colored specimens of *decolor* are found in eastern material, but generally speaking an even purple brown coloration is indicative of *campestris* rather than of *decolor*.

MALE GENITALIA: (Based on a specimen from the New York City area.) Clasper moderately wide, slightly broadened basally, and with costal edge curving somewhat dorsad at apex; marginal spines relatively few, about 15 in number. Sacculus moderate in width, costal edge with slight median bulge and with a minute clavus at base. Harpes almost symmetrical, the ventral fork of the left side being slightly longer and less excurved than that of the right side, a probably rather inconstant feature as considerable individual variation in the length of the ventral forks exists. The right ventral fork is gently excurved, the apex bending inward to a point near the ventral angle of the cucullus; the dorsal fork is strongly excurved over the costa of clasper, then more or less parallel to same and subequal in length to the ventral fork; it is covered in its apical half with minute hairs; the space between the forks on both sides is broadly and evenly U-shaped, a distinctive feature of separation from the closely allied *campestris*. On the left side the dorsal fork is similar in length to that of the right side, but owing to the longer and straighter ventral fork, it appears shorter. Juxta plate narrowly upright, with parallel side and long, bifid, apical projections; the median point of the basal edge is quite pronounced. Aedeagus slightly curved, of moderate width, and apparently without small apical spine in the vesica.

FEMALE GENITALIA: (Based on a Massachusetts specimen.) Ovipositor lobes narrow and long, broadly separated for their entire length; apices slightly narrowed and rounded; dorsal vestiture consists of sparse, short setae with a few much longer hairs in a weak basal row. Ostium pouch rather narrow, long, and funnel shaped, gradually merging

into the very long ductus bursae which extends far beyond the apices of the anterior apophyses; the chitinized rods terminate considerably before its distal end. Bursa normal, except for a fairly deep invagination on the left side above the fundus, producing a slightly bilobed condition.

TYPES: Apparently lost.

DISTRIBUTION: Very general throughout the northeastern United States. In Canada the more or less typical form extends from the Maritime Provinces to Manitoba and Saskatchewan.

Euxoa campestris (Grote)

Figure 3C

Agrotis campestris GROTE, 1875, Canadian Ent., vol. 7, p. 188; 1875, *ibid.*, vol. 7, p. 227, pl. 1, fig. 8 (type); 1875, Proc. Acad. Nat. Sci. Philadelphia, vol. 27, p. 423 (resdescription); 1877, Bull. Buffalo Soc. Nat. Sci., vol. 3, p. 212.

Carneades insignata, SMITH (*nec* Walker), 1890, Bull. U. S. Natl. Mus., no. 38, p. 190 (*partim*).

Carneades insulsa, SMITH (*nec* Walker), 1893, Bull. U. S. Natl. Mus., no. 44, p. 102 (*partim*).

Euxoa decolor, HAMPSON (*nec* Morrison), 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 284 (*err. det.*).

Euxoa insulsa, HOLLAND (*nec* Walker), 1903, Moth book, p. 189, pl. 23, fig. 3. DOD, 1905, Canadian Ent., vol. 37, p. 58.

Euxoa campestris, BARNES AND McDUNNOUGH, 1918, Canadian Ent., vol. 50, p. 193 (good species). DRAUDT, *in* Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 46, pl. 7g, h. COOK, 1930, Canadian Ent., vol. 62, p. 265.

The status of this species was never fully understood by the earlier North American workers, even by Grote himself. The name was based primarily on a female taken by G. Norman at Orillia, Ontario, and this specimen was figured and designated "type" later in the same volume by Grote. Together with Norman's specimen, casual mention was made in the original description of other specimens from Vancouver Island and New York. In his redescription Grote appears to have laid more stress on these latter specimens and evidently changed the type label to the New York specimen, as this is listed by Hampson as the type. Barnes and McDunnough claimed (1918) that this action was *ultra vires* in view of the specimen figured in 1875, and this procedure appears to be cor-

rect. Tams comments, "Canada (Norman) 75-94 is obviously the type and the New York, (Mead) No. 131 is also here, and looks rather like the specimen figured."

The Vancouver Island specimen is listed in Grote's second paper as coming from the Henry Edwards collection, no. 5644; this specimen, a female, has been found in the American Museum collection and proves to be a topotypical *declarata*. It is evident that Grote did not know the true limitations of his species, although in 1877 he separated it fairly accurately from *decolor* on characters of maculation. Such characters do not unfortunately always hold, and final recourse must be had to the male genitalia in doubtful cases, as pointed out by Barnes and McDunnough who rescued the name from the synonymy of *declarata* where it had reposed since Smith's revision of 1890. The distribution of the species appears to be more northerly than that of *decolor*, and no specimens from the eastern United States have been examined. In all probability it will be found in the New England states and should also occur in northern Michigan. In Canada it extends across the entire continent, although not particularly common in the east.

MALE GENITALIA: (Based on a Calgary, Alberta, specimen.) Entire organ smaller and chunkier than that of *decolor* but in general very similar. Clasper shorter and broader. Saccus definitely broader. Harpes asymmetrical, with the ventral forks curved inward at apices and definitely longer than the dorsal ones which are shorter than in *decolor*. The main point of distinction from *decolor* lies in the shape and position of the ventral fork on the right side; this is thickened at its base and in consequence its junction with the dorsal fork is an oblique one, the resulting curve being much less U-shaped than in the allied species. This distinction is less evident on the left side. The juxta plate is also shaped somewhat differently, the sides being expanded somewhat at their bases and showing some chitinous, rod-like thickening; the basal edge is strongly V-shaped.

FEMALE GENITALIA: In spite of a number of genitalic slides made from Canadian material in the Canadian National Collection, no characters could be discovered whereby the species could be separated from *decolor*.

TYPE: Holotype, female, Orillia, Ontario (B.M.).

DISTRIBUTION: Extends across Canada from the Maritime Provinces to British Columbia, but rare in the east. Will probably be found to occur in adjacent areas of the eastern United States.

Euxoa albipennis (Grote)

Figures 3D, 8A, 11E

Agrotis albipennis GROTE, 1876, Bull. Buffalo Soc. Nat. Sci., vol. 3, p. 80.

Carneades albipennis, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 193; 1893, *ibid.*, no. 44, p. 103. BEUTENMÜLLER, 1901, Bull. Amer. Mus. Nat. Hist., vol. 14, p. 285.

Euxoa albipennis, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 286, pl. 65, fig. 30. HOLLAND, 1903, Moth book, p. 189, pl. 23, fig. 7. DOD, 1905, Canadian Ent., vol. 37, p. 58; 1916, *ibid.*, vol. 48, pp. 379, 380. DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 46, pl. 7g. COOK, 1930, Canadian Ent., vol. 62, p. 266.

Agrotis albipennis var. *nigripennis* GROTE, 1881, Bull. U. S. Geol. and Geogr. Surv. Terr., vol. 6, p. 159.

Carneades nigripennis, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 193 (synonymy); 1893, *ibid.*, no. 44, p. 103.

Euxoa nigripennis, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 286.

In the original description, based on Californian material from Henry Edwards (no. 5611) and a Canadian female, presumably taken at London, Ontario, from W. Saunders, Grote erroneously states that both sexes have white hind wings. This led him to describe the correct female with dark hind wings as the variety *nigripennis*, females from New York State being types. According to the Henry Edwards' catalogue, the number 5611 applies to specimens taken in Napa County in June, and these types are listed by Hampson as being in the British Museum, the type label being attached to a female specimen, according to Tams; what has become of the Saunders' specimen is unknown. From Hampson's listing it reads as if the type of *nigripennis*, also in the British Museum, came from California, and Tams confirms this statement. Some error of labeling appears to have been made in both cases.

No eastern specimens are available for study at the present time, but from previous examinations it would seem that no obvious differences of either color or maculation exist between specimens from eastern and western United States. *Albipennis* is rather uncommon in eastern localities but apparently widespread, as Smith records it from "Northern United States east of the Rocky Mountains" and Canada. Two names proposed by Smith are now used in a racial sense, viz., *malis* for a paler race from Manitoba and the Prairie Provinces, and *bialba* for the form from Utah and adjacent Rocky Mountain states. The species has often been confused with *declara-rata*, especially in the west with the form *verticalis* Grote. Apart from the white secondaries in the male and the deep smoky ones in the female, the coloration of the primaries differs in that the basal area contrasts with the median area, being of a light tan brown as compared with the smokier color of the median portion of the wing, a feature especially noticeable in the females. Hampson's figure, which is probably of one of the male types, shows this fairly clearly.

MALE GENITALIA: (Based on a specimen with no locality label *ex* collection Newcomb.) Clasper rather narrow, little expanded apically; marginal spines about 17 in number. Sacculus moderately strong, costal edge slightly sinuate, with the merest indication of a clavus at base. Harpes symmetrical; the ventral fork long and thin, extending beyond the ventral angle of the cucullus; the dorsal fork upright, slightly thickened medially and feebly setose; space between the forks rather narrowly U-shaped. Juxta plate broad, with the usual bifid apex; basal portion broadened, with rounded edges and slight chitinous thickening; the basal edge pointed medially. Aedeagus somewhat curved, broadly bilobed; vesica with the usual small spine.

FEMALE GENITALIA: (Based on a topotypical specimen from Napa County, California.) Ovipositor lobes rather weakly chitinized, broad at base, tapering apically, the apices produced into chitinous projections, somewhat divergent at tips. Dorsal surfaces of lobes clothed with numerous fine, long setae, intermingled with shorter ones, these latter most prevalent along the inner and basal edges. The most characteristic

feature is found in the increased number of long, strong, basal spines which form more or less of a double row and are 14 to 16 in number. Ostium pouch narrowly funnel shaped, followed by a long ductus bursae in which the chitinous rods extend virtually to its tip. Bursa and entrance and exit of the two ducti normal.

TYPES: *Albipennis*, holotype, female, Napa County, California (B.M.); *nigripennis*, holotype, female, New York (ostensibly in the British Museum but wrong locality label attached).

DISTRIBUTION: General throughout the northeastern states and Canada but apparently rare. The Canadian National Collection contains specimens collected in the Ottawa region.

Euxoa divergens (Walker)

Figures 3E, 8B, 11F

Agrotis divergens WALKER, 1856, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 10, p. 327.

Carneades divergens, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 201, 1893, *ibid.*, no. 44, p. 107.

Euxoa divergens, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 304, pl. 66, fig. 22. DOD, 1905, Canadian Ent., vol. 37, p. 148; 1911, *ibid.*, vol. 43, p. 396; 1916, *ibid.*, vol. 48, pp. 379, 380. BARNES AND McDUNNOUGH, 1912, Contributions to the natural history of the Lepidoptera of North America, vol. 1, no. 4, p. 37, pl. 17, fig. 5. DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 47, pl. 7i. COOK, 1930, Canadian Ent., vol. 62, p. 266.

Agrotis versipellis GROTE, 1875, Canadian Ent., vol. 7, p. 172; 1875, *ibid.*, vol. 7, p. 227, pl. 1, fig. 9 (type). BUTLER, 1889, Trans. Ent. Soc. London, p. 380 (synonymy).

Euxoa versipellis, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 304.

As explained in the Introduction, Hampson's recording of the type of *versipellis* as from "U.S.A." is erroneous. The original type locality is Orillia, Ontario, but unfortunately no such label is attached to what may be considered as the authentic holotype.

The species appears to be rather northerly in its distribution in the east, being much commoner in Canada than in the northeastern

states. In the west it tends to racial forms for which several names are available; the exact status of these names requires study, but this must be deferred at the present time.

The relationship of the species is rather obscure, as the female genitalia show characters found only in *messoria* with which it would seem to have little association from the standpoint of maculation. Superficially it resembles most closely *servitus* and *redimicula* but can at once be distinguished by the white line along the cubital vein. Grote's original figure of the type *versipellis* is excellent. The male antennae are rather strongly serrate and fasciculate.

MALE GENITALIA: (Based on a Liberty, New York, specimen.) Clasper of moderate width, very slightly expanded basally, and with the usual weak, dorsal curve of the costal edge at apex; marginal spines 13 to 15 in number, reaching only two-thirds across the cucullus. Saccus narrow, with somewhat sinuate costal edge which shows a small but fairly definite clavus at base. Harpes nearly symmetrical, the ventral fork of left side being slightly the longer; both forks subequal in length, the space between them broadly U-shaped at base; ventral forks slightly incurved apically and extending to, or nearly to, the ventral angle of the cucullus; dorsal forks upright, excurved at base. Juxta plate broad and of normal shape. Aedeagus long, rather broad, seemingly without small spine in the vesica.

FEMALE GENITALIA: (Based on a New Hampshire specimen.) Ovipositor lobes high and narrow, widely separated, rounded apically. Dorsal surfaces heavily clothed with numerous rather short, thick spines, intermingled with an occasional longer seta; basal row of five to six long hairs quite obvious. Ostium pouch forming a narrow, elongate funnel. Ductus bursae moderate in length but extending well beyond the apices of the rather short and broad anterior apophyses; chitinous rods shorter than usual, leaving the distal portion of the ductus entirely membranous. Bursa very characteristic in its shape, definitely bilobed, the right lobe much the shorter, broadly oval, with the entrance of the ductus bursae at its proximal end. The left lobe forms a long, finger-like sac, with its apex reaching well beyond that of the right

lobe; the ductus seminalis arises from its fundus, a feature found only in *messoria*, and extends caudad along its left margin.

TYPES: *Divergens*, holotype, male, Nova Scotia (B.M.); *versipellis*, holotype, male, Orillia, Ontario (B.M.).

DISTRIBUTION: General throughout the northern United States and Canada.

Euxoa obeliscoides (Guenée)

Figures 3F, 8C, 11G

Agrotis obeliscoides GUENÉE, 1852, Histoire naturelle des insectes, vol. 5, p. 293.

Agrotis obelisca WALKER (nec Hübner), 1856, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 10, p. 323.

Carneades obeliscoides, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 199; 1893, *ibid.*, no. 44, p. 105. BEUTENMÜLLER, 1901, Bull. Amer. Mus. Nat. Hist., vol. 14, p. 285.

Euxoa obeliscoides, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 292, pl. 66, fig. 7. HOLLAND, 1903, Moth book, p. 190, pl. 23, fig. 12. DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 47, pl. 8a.

Agrotis sexatilis GROTE, 1873, Bull. Buffalo Soc. Nat. Sci., vol. 1, p. 100; 1875, *ibid.*, vol. 2, p. 303 (synonymy); 1875, Canadian Ent., vol. 7, p. 102.

The species is sufficiently recognizable from Hampson's and Holland's figures and needs no further discussion. A paler form from Manitoba lacking the reddish suffusion of the primaries has been named *intrusa* by Smith. The type bears no label other than the name in Guenée's handwriting. It was one of the specimens collected by E. Doubleday on his North American trip, and in this connection the following note from the British Museum's register is supplied by Tams: "A portion of this collection [i.e. Doubleday's] is in the hands of M. Guenée at Paris for description in his part of the Suites à Buffon. These will be returned with the author's name attached. E.D."

MALE GENITALIA: (Based on a specimen from Bronxville, New York.) Clasper long and considerably broadened at base, dorso-apical curve of costal edge well defined; marginal spines heavy, closely appressed, about 20 in number. Saccus moderately broad, with straight costal edge and a small

clavus at base. Harpes slightly asymmetrical, owing to the greater length of the ventral fork on the right side; junction at base rather narrowly U-shaped. On the right side the ventral fork extends to the level of the ventral angle of the cucullus; the dorsal fork is long and upright, only slightly shorter than the ventral one. On the left side both forks appear somewhat shorter, and the space between them is a little wider. Juxta plate large, the sides sloping outward from the usual bifid apices and with slight concavities near bases; basal edge pointed medially. Aedeagus broad, with the apical spine of the vesica somewhat larger than usual.

FEMALE GENITALIA: (Based on a New York specimen.) Ovipositor lobes moderately wide, close together at bases, divergent apically and produced into strong, chitinous projections. Dorsal surfaces of lobes thickly covered with rather long, fine setae, varying somewhat in their lengths, especially laterally and basally. The most characteristic feature is an irregularly placed basal row of very strong spines, 10 to 12 in number, which taper to fine points apically and almost reach the tips of the lobes laterally; these spines are much stronger than those found in *albipennis*, although the general structure of the lobes is rather reminiscent of this species. The caudal half of the dorsum of segment VIII is heavily clothed with quite long hairs, much more so than is the usual case in *Euxoa* species. Ostium pouch narrowly funnel shaped and gradually merging into the ductus bursae which extends well beyond the apices of the anterior apophyses, the chitinous rods terminating considerably before its distal end. Bursa fairly normal in shape except for an invagination on the left side about the middle which gives a partially bilobed appearance to the organ.

TYPES: *Obeliscoides*, holotype, male, "Am. Sept.," probably upstate New York (B.M.); *sexatilis*, holotype, male, New York (B.M.).

DISTRIBUTION: General throughout the United States and Canada, with the possible exception of some of the Southern states.

***Euxoa redimicula* (Morrison)**

Figures 3G, 8D, 11H

Agrotis redimicula MORRISON, 1874, Proc.

Boston Soc. Nat. Hist., vol. 17, p. 165 (as *redimacula*, typ. err.); 1875, Proc. Acad. Nat. Sci. Philadelphia, vol. 27, p. 57 (spelling corrected).

Carneades redimicula, SMITH, 1890, U. S. Natl. Mus., no. 38, p. 202; 1893, *ibid.*, no. 44, p. 107. BEUTENMÜLLER, 1901, Bull. Amer. Mus. Nat. Hist., vol. 14, p. 286.

Euxoa redimicula, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 306 (*partim, nec fig.*). HOLLAND, 1903, Moth book, p. 190, pl. 23, fig. 9 (fig. too dark). DOD, 1911, Canadian Ent., vol. 43, p. 396 (as *redimacula*). McDUNNOUGH, 1949, Amer. Mus. Novitates, no. 1394, pp. 5-10, figs. 1, 2, 7A, 7B (type limitation).

The species has already been fairly adequately discussed and figured in a recent number of the American Museum Novitates, and further comment is scarcely necessary.

MALE GENITALIA: (Based on a Massachusetts specimen.) Clasper narrow, both edges somewhat excurved apically; marginal spines widely spaced and few in number, 12 to 13. Saccus narrow with virtually no indication of a clavus. Harpes slightly asymmetrical, the forks of the right side somewhat longer than those of the left one, especially the thin ventral fork, the apex of which exceeds the ventral angle of the cucullus; dorsal fork rather upright, little excurved at base; space between forks narrowly U-shaped. Juxta plate broad and normal in shape. Aedeagus fairly broad and without spine in the vesica.

FEMALE GENITALIA: (Based on a Maine specimen.) Ovipositor lobes close together, moderately broad and rather short, tapering apically into long, chitinous, divergent projections. Dorsal surfaces rather sparsely clothed with short, rather stubby setae and with a distinct basal row of about six long hairs. Caudal margin of segment VIII with a double row dorsally of rather long hairs. Ostium pouch a long, narrow funnel, merging gradually into the ductus bursae which, with its chitinous rods, extends well beyond the apices of the anterior apophyses. Bursa of normal shape.

TYPES: Described from specimens from New York, Massachusetts, and Colorado, this latter specimen presumably referable to the following species. Smith states, without mentioning a locality, that "the type is in the

Tepper collection." This has been verified by Professor Hutson who states that the type bears the label "Cambridge, Mass." which would coincide with the restriction made in my former paper.

DISTRIBUTION: Northern New York, New England states, extending in Canada into Nova Scotia, southern Quebec, and Ontario. Its range westward is uncertain.

***Euxoa servita* (Smith)**

Carneades servitus SMITH, 1895, Ent. News, vol. 6, p. 336, pl. 15, fig. 8.

Euxoa servita, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 308, pl. 66, fig. 29. DOD, 1905, Canadian Ent., vol. 37, p. 148. MCDUNNOUGH, 1949, Amer. Mus. Novitates, no. 1394, p. 8, fig. 7C, D.

Euxoa redimicula, HAMPSON (*nec* Morrison), 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, pl. 66, fig. 26.

Euxoa redimacula, DOD (*nec* Morrison), 1911, Canadian Ent., vol. 43, p. 396.

For a number of years *servita* was considered as an aberration of *redimicula*, but in 1949 it was again given specific rank because of marked differences found in the ovipositor lobes of the two species. The type is a female from Calgary, Alberta, in the United States National Museum, with more brown suffusion in the central portion of the primaries than is usually the case and a broad whitish suffusion along the costa which obscures all maculation. In consequence the specimen is quite aberrational in appearance.

Typical *servita* is essentially a Rocky Mountain species and is characterized in its normal form by the large amount of light gray coloration occurring in the basal and subterminal areas as well as along the costa of primaries. Specimens from New England appear to be constantly deeper in coloration and warrant the following subspecific name.

***Euxoa servita novangliae*, new subspecies**

Figures 4A, 8E, 11I

Euxoa servita, MCDUNNOUGH, 1949, Amer. Mus. Novitates, no. 1394, p. 8, fig. 7C, D.

As compared with the topotypical subspecies from Alberta and the Rocky Mountain region, the eastern race is characterized by the much browner coloration of its primaries,

the contrast, in consequence, between the light-colored basal, subterminal, and costal regions being much less evident, these areas being lightly suffused with a pale brownish shade. The maculation is essentially the same, the t.a. line directed strongly outward, the ordinary spots prominent and pale, and the inward projections of the dark marginal area into the paler subterminal band fairly obvious. The figures given in my previous paper show these characters excellently and are based on specimens which are made respectively holotype and allotype of this new race.

MALE GENITALIA: (Both sexes based on Maine specimens.) Very similar to those of *redimicula*. The clasper is somewhat wider, with the costal margin scarcely produced dorsad at apex. The harpes are symmetrical, and the ventral fork is longer than that of *redimicula* and slightly curved around the ventral angle of the cucullus.

FEMALE GENITALIA: Ovipositor lobes vastly different from those of *redimicula*; triangular in shape, with quite pointed apex but no chitinous extensions. The apical half of the dorsal surfaces is clothed with short, thick spines, the basal portion very sparsely furnished with much finer setae; a basal row of five long hairs is quite evident. The ostium pouch is much as in *redimicula*, the ductus bursae, however, and its accompanying chitinous rods much longer, extending far beyond the apices of the anterior apophyses. The bursa is of the normal shape but somewhat more contracted proximally than is the case with *redimicula*.

HOLOTYPE: Male, Franconia, New Hampshire (Slosson), in the American Museum of Natural History.

ALLOTYPE: Female, Orono, Maine, 1885, in the same collection.

PARATYPES: Two males, Maine, no. 6553 (Henry Edwards collection); one male, Orono Maine, 1885; two males, Franconia, New Hampshire (Slosson); one female, Rangeley, Maine, August 10, 1933 (dos Passos), in the American Museum of Natural History; one female, Maine; one female, Montreal Island, Quebec, July 24, 1908; two females, Trenton, Ontario, June 24, July 11, 1908 (Evans); these last four in the Canadian National Collection.

Euxoa ochrogaster (Guenée)

Figures 4B, 8F, 11J

Noctua ochrogaster GUENÉE, 1852, Histoire naturelle des insectes, vol. 5, p. 327. GROTE, 1882, Bull. U. S. Geol. and Geogr. Surv. Terr., vol. 6, p. 566 (unknown); 1901, Canadian Ent., vol. 33, p. 177.

Carneades ochrogaster, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 196; 1893, *ibid.*, no. 44, p. 104. BEUTENMÜLLER, 1901, Bull. Amer. Mus. Nat. Hist., vol. 14, p. 285.

Euxoa ochrogaster, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 290. HOLLAND, 1903, Moth book, p. 190 (*nec* figure). DOD, 1905, Canadian Ent., vol. 37, p. 145; 1911, *ibid.*, vol. 43, p. 393. DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 49 (*nec* figure).

Paragrotis ochrogaster, DYAR, 1904, Proc. U. S. Natl. Mus., vol. 27, p. 837.

Agrotis insignata WALKER, 1856, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 10, p. 330.

Euxoa insignata, SMITH, 1907, Jour. New York Ent. Soc., vol. 15, p. 143. DOD, 1911, Canadian Ent., vol. 43, p. 393.

Agrotis cinereomacula MORRISON, 1874, Proc. Boston Soc. Nat. Hist., vol. 17, p. 164. GROTE, 1875, Proc. Acad. Nat. Sci. Philadelphia, vol. 27, p. 423 (*err. det.*).

Agrotis turrus GROTE, 1875, Canadian Ent., vol. 7, p. 226; 1882, Bull. U. S. Geol. and Geogr. Surv. Terr., vol. 6, p. 582.

Agrotis gularis GROTE, 1875, Proc. Acad. Nat. Sci. Philadelphia, vol. 27, p. 424.

Euxoa gularis, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, pl. 66, fig. 5 (fig. type, as *ochrogaster*). DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, pl. 8b (copy of Hampson's fig.).

The great variability of the species has led to the proposal by the earlier authors of various specific names which are now recognized as referring to mere color forms. A good deal of the synonymy was worked out by Smith in his agrotid revision, but it was not until 1907 that the correct status of *insignata* was recognized, Hampson's idea of the species, in spite of having the type before him, being erroneous. Strange to say, no figure of the typical form appears to have been published. Hampson's figure is obviously that of the type of *gularis*, and this has been copied by Draudt. Holland's figure might also be *gularis* but is referred by Dod to *declarata*.

What is now considered to be the typical form is a well-maculated one, the primaries light ochreous, heavily overlain with ruddy shading; the costa is paler, and there is a distinct black basal dash followed by a black claviform; the ordinary pale spots are prominent and separated by a blackish patch; the outer margin is blackish. The form *insignata*, with *cinereomacula* as a synonym, is the one in which the primaries are a light ochreous or sand color, with frequently obsolete maculation. The basal dash and claviform are constantly obsolete, although the reniform is generally quite obvious. *Gularis*, on the other hand, is an even deep reddish, with the maculation of the type form rather obscured by the deep ground color. The types of both *gularis* and *turrus* are said by Hampson to be in the British Museum, but he lists them as from "U.S.A.," whereas they are from Canada, collected by Norman. This is the same discrepancy that has been mentioned previously and that has been satisfactorily explained by Tams.

MALE GENITALIA: (Based on a specimen of the typical form from Manitoba.) Clasper broad, with little dorsad extension of the costa apically. Marginal spines closely spaced, about 20 in number. Sacculus weak, with slightly sinuate costal edge and a distinct clavus at base. Harpes virtually symmetrical, the two forks subequal in length, the left ventral one slightly the shorter. Neither of the ventral forks comes near to attaining the ventral angle of the cucullus. Wide U-shaped separation between the forks on each side. Juxta plate with sides sloping outward from the bifid apices, with slight rounded projection basally; median point of basal edge sharper than usual. Aedeagus slightly tapered apically; spine of the vesica thinner and longer than usual.

FEMALE GENITALIA: (Based on a New York specimen.) Ovipositor lobes close together at the base, divergent apically, weakly chitinized, higher than broad, with rounded apices. Dorsal vestiture composed of fine, rather long setae, varying considerably in individual lengths; a basal row of long hairs is fairly obvious but rather irregular. Ostium pouch broad and semi-globate, the more heavily chitinized edge continuous on the ventral side across the ductus bursae which

is quite short, with even shorter chitinous rods which barely exceed the apices of the anterior apophyses. Bursa long and sac-like, considerably broadened proximally, with the ductus bursae entering on the caudal margin at the right side. The ductus seminalis arises from the apex of a slight bulge to the left.

TYPES: *Ochrogaster*, holotype, male, "Amérique septentrionale" (apparently destroyed); *insignata*, holotype, female, Nova Scotia (B.M.); *cinereomacula*, holotype, St. Louis, Missouri (location unknown); *turris*, holotype, female, Canada (B.M.); *gularis*, holotype, male, Canada (B.M.).

DISTRIBUTION: General throughout the northern and eastern states and Canada, extending westward to the Pacific regions of both countries where, as the red-backed cutworm, it often does considerable damage to crops.

***Euxoa tristicula* (Morrison)**

Figures 4C, 9A, 11K

Agrotis tristicula MORRISON, 1875, Proc. Acad. Nat. Sci. Philadelphia, vol. 27, p. 429.

Carneades tristicula, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 183; 1893, *ibid.*, no. 44, p. 100.

Euxoa tristicula, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 273, pl. 69, fig. 13 (from drawing of type). DOD, 1905, Canadian Ent., vol. 37, p. 148; 1911, *ibid.*, vol. 43, p. 397. SMITH, 1907, Jour. New York Ent. Soc., vol. 15, p. 143 (*err. syn.*). BARNES AND MCDUNNOUGH, 1912, Contributions to the natural history of the Lepidoptera of North America, vol. 1, no. 4, p. 38, pl. 17, fig. 17. DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 49, fig. 8c. COOK, 1930, Canadian Ent., vol. 62, p. 267.

Euxoa nesilens SMITH, 1903, Jour. New York Ent. Soc., vol. 11, p. 192. DOD, 1905, Canadian Ent., vol. 37, p. 145; 1911, *ibid.*, vol. 43, p. 393; 1918, *ibid.*, vol. 50, p. 11. BARNES AND MCDUNNOUGH, 1918, Canadian Ent., vol. 50, p. 195 (correct synonymy).

This species was described from material taken at Orono, Maine, by Professor Fernald. Judging by the description, Morrison must have had a male before him, but the only known type is a female in the United States National Museum, *ex* Neumoegen collection, which, according to my notes, bears no locality label. Smith mentions having seen another

topotypical specimen in Mrs. Fernald's collection, but the location of this is not known.

Apparently the species is extremely rare in the east but much more common in the west. The only eastern specimens examined have been one male and three females, taken at Round Hill, Annapolis County, Nova Scotia, and kindly lent by Douglas C. Ferguson of Halifax; from genitalic slides of these specimens the drawings were made. In Manitoba and Alberta *tristicula* is not uncommon, and Cook mentions it as of quite frequent occurrence and of some economic importance in Montana. It also extends into the Californian Sierras, judging by specimens so labeled in the Henry Edwards collection.

The large size and pale grayish white ground color of primaries render the species easily recognizable. The typical form shows a black basal streak and dark shading between the orbicular and reniform. Another form in which the black markings are lacking has received the name *nesilens*. Two females of this form are in the Henry Edwards collection as spurious types of *remota* Smith, the error being commented on by Barnes and McDunnoUGH in 1918.

MALE GENITALIA: (Both sexes based on Nova Scotian specimens.) Clasper short and broad, with little upcurve of the costal margin apically; traces of a slight heel in some specimens. Marginal spines thick, 12 to 14 in number, occasionally supplemented by two or three smaller spines above anal angle of cucullus. Sacculus strong and broad; costal edge almost straight, with small clavus at base. Harpes virtually symmetrical, the ventral fork equal to, or slightly shorter than, the dorsal one. Ventral fork thick, slightly outcurved apically, and pointed; space between forks very broad, owing to a strong excurving of the dorsal fork across the costal margin of clasper, particularly on the left side; apex of fork projected considerably beyond this margin. Juxta plate narrow at the bifid apices, broadening considerably basally; pointed medial prominence of basal margin weak. Aedeagus thick and somewhat curved; apical lobes with truncate edges and rather strongly chitinized; no small spine in the vesica.

FEMALE GENITALIA: Ovipositor lobes relatively short and weakly chitinized, apices

rounded; dorsal surfaces sparsely clothed with short, fine setae, intermingled with occasional longer ones. A definite basal row of four or five long hairs is present. Ostium pouch broad and semi-globate. Ductus bursae rather long, extending, with its chitinous rods, well beyond the apices of the anterior apophyses. Bursa definitely bilobed, the right lobe, at the caudal end of which the ductus bursae enters, being long and sac-like, directed cephalad. The left lobe is connected with the right one by a broad membranous bridge, projects well to the left, and is more or less globate in appearance; the ductus seminalis arises from its upper left corner.

TYPE: Holotype, female, no label attached but presumably Orono, Maine (U.S.N.M.).

DISTRIBUTION: Rare in the east, occurring in Maine (Orono) and probably adjacent states. In Canada it has been found in Nova Scotia (Round Hill) and will in all likelihood extend across Quebec and Ontario into the Prairie Provinces where it is more common. It extends down the Rocky Mountains into Montana and adjacent states, and along the Coastal Ranges into the Sierras of California.

***Euxoa westermanni* (Staudinger)**

Figures 4D, 9B

Noctua westermanni STAUDINGER, 1857, Stettiner Ent. Zeitg., vol. 18, p. 303.

Agrotis westermanni, AURIVILLIUS, 1890, Bihang Svenska Vetensk.-Akad. Handl., vol. 15, pt. 4, no. 1, p. 14, pl. 2, fig. 8.

Carneades westermanni, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 198; 1893, *ibid.*, no. 44, p. 105.

Euxoa westermanni, McDUNNOUGH, 1922, Canadian Ent., vol. 54, p. 137. DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 48, pl. 13g. CORTI, in Seitz, 1932, Macrolepidoptera of the world, vol. 3, suppl., p. 29, pl. 3 l.

Agrotis westermanni var. *polaris* BANG-HAAS, 1910, Deutsche Ent. Zeitschr. Iris, vol. 24, p. 35; 1922, *ibid.*, vol. 36, p. 35, pl. 7, fig. 7 (type). CORTI, in Seitz, 1932, Macrolepidoptera of the world, vol. 3, suppl., p. 29.

This species was confused for a considerable time with *Pachnobia scropulana* Morrison, and both Hampson and Warren (*in* Seitz) erred in this respect, their figures being of this latter species and not of the true *westermanni*. The type specimens came from Greenland, and the true type is in the Copenhagen

Museum, not, as stated by Smith, in the Berlin Museum, although these specimens are probably paratypes. The so-called variety *polaris* of Bang-Haas was based on a Labrador female, characterized by a duller costal area, but this is hardly of sufficient value to warrant racial separation in view of the close proximity of the type localities and the widespread range of the species in the Arctic regions. The species is not represented in the American Museum collection, but a small series, made available from the Canadian National Collection, contains, besides a male Labrador specimen, others from Nordegg, Alberta; Cameron Bay, Great Slave Lake, Northwest Territories; and Dawson, Yukon Territory.

MALE GENITALIA: (Based on a specimen from Hopedale, Labrador.) The whole organ very similar to that of *dissona*. Clasper rather long and narrow, costal margin little up-curved at apex. Marginal spines 12 to 15 in number, reaching scarcely more than halfway across the cucullus. Saccus shorter and broader than in *dissona*; costal edge nearly straight, with indication of a small decumbent clavus at base. Harpes symmetrical, much as in *dissona*, the ventral fork much shorter than the dorsal one. Dorsal fork rather upright, with its apex projecting slightly beyond the costal edge of the clasper. Juxta plate broad and chunky, the invagination between the bifid apices broad and rounded basally; the median projection of the basal edge improminent. Aedeagus slightly curved, without small spine in the vesica.

FEMALE GENITALIA: Two females were available for dissection, one from Nordegg, Alberta, and the other from Dawson, Yukon Territory. Unfortunately the dorsum of segment VIII had been split at some time in the former specimen, but the main parts of the genitalia were intact. Considerable difference was noted in the shape of the bursae of the two specimens, although in other respects the parts were similar. Both bursae were well inflated, but in the case of the Nordegg female the bursa showed a partial bilobed condition due to an invagination on the left side. In the Dawson female there was no invagination, and the organ appeared very similar to that of *dissona*. No trace of a wrong abdomen

having been glued on either specimen could be detected, and the similar maculation of the primaries certainly pointed to specific oneness. Until more material is available for study, this discrepancy cannot be cleared up. In the meantime the Nordegg specimen, being one of a small series, is being considered as typical rather than the unique Dawson one. The following description is, therefore, based accordingly:

Ovipositor lobes thinly chitinized and weak. On the dorsal surface the sparse vestiture consists in the main of fine, short setae, but long hairs are scattered at intervals over the entire surface and form a more or less evident basal row as well. Apophyses, especially the anterior pair, short. Ostium pouch broad and semi-globate. Ductus bursae short, the chitinous and rather broad rods extending only slightly beyond the apices of the anterior apophyses. Entrance of ductus into bursa proximal and dorsal to the right. Bursa partially bilobed, owing to an invagination on the left side; in general rather chunky, especially the proximal portion of the left lobe from the outer left corner of which the ductus seminalis arises.

Types: *Westermanni*, holotype, Greenland (Copenhagen Museum); *polaris*, holotype, female, Labrador (Berlin Museum, *ex* Staudinger collection).

Distribution: Greenland, Labrador, Arctic regions of Canada, extending down the Rocky Mountains into Alberta (Nordegg).

Euxoa solitaria (Smith)

Agrotis solitaria SMITH, 1885, Ent. Amer., vol. 1, p. 14; 1885, Stettiner Ent. Zeitg., vol. 46, p. 223; 1887, Proc. U. S. Natl. Mus., vol. 10, p. 462.

Carneades solitaria, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 195; 1893, *ibid.*, no. 44, p. 104.

Euxoa solitaria, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 280. DRAUDT, *in* Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 48.

The specific name is based on a single Labrador female Smith received from Moeschler as "*conflua* var.," which he maintained was an error on account of the tuberculate front. Later Smith records the type as being in the Moeschler collection, but it is not figured by Bang-Haas among Moeschler's

other agrotid types (1922, Iris), and there is no record as to its present location.

The species is entirely unknown to me. A copy of one of Smith's original descriptions is appended. "Primaries somewhat yellowish rust red, powdered with blackish scales; most densely so in the median space. Transverse lines pale gray, even, not well defined. S.t. line also gray, but little sinuate. Terminal space powdered with black. Claviform obsolete. Ordinary spots distinct, moderate, yellowish. Orbicular round; reniform normal. Color between the spots darker brown. Secondaries blackish. Beneath deep smoky gray, powdery; discal lunules evident. Head pale, thorax carneous gray. Expands 1.32 inches (33 m.m.). Habitat.—Labrador."

Euxoa drewseni (Staudinger)

Agrotis drewseni STAUDINGER, 1857, Stettiner Ent. Zeitg., vol. 18, p. 302. AURIVILLIUS, 1890, Bihang Svenska Vetensk.-Acad. Handl., vol. 15, pt. 4, no. 1, p. 14, pl. 2, fig. 7 (type). SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 206.

Carneades drewseni, SMITH, 1893, Bull. U. S. Natl. Mus., no. 44, p. 97.

Euxoa drewseni, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 270.

Euxoa drewseni, CORTI, *in* Seitz, 1932, Macrolepidoptera of the world, vol. 3, suppl., p. 36, pl. 4h.

The name was based on two males and one female collected in Greenland. Smith states that the male and female types are in the Berlin Museum. Aurivillius and Corti, on the other hand, affirm that the type is in Copenhagen, and in view of the fact that the material originally came from a Danish collector, this latter statement is probably correct. The two specimens in the Berlin Museum are most likely, however, the remaining portion of the type lot. Corti (*in* Seitz, vol. 3, suppl.) figures a specimen which matches the Copenhagen type in all except size and suggests that it may be "a local race or aberration of *dissona*." Judging by the figure and the known variability of *dissona* in color and maculation, this does not seem improbable, and in such a case the name *drewseni* would take priority. As no material has been examined which could possibly be referred to this name, the matter must remain for the present in abeyance.

TYPE: Holotype, male, Greenland (Copenhagen Museum).

DISTRIBUTION: Greenland and probably adjacent Arctic regions.

Euxoa dissona (Moeschler)

Figures 4E, 9C

Agrotis dissona MOESCHLER, 1860, Wiener Ent. Monatschr., vol. 4, p. 365, pl. 9, fig. 4. PACKARD, 1868, Proc. Boston Soc. Nat. Hist., vol. 11, p. 38. BANG-HAAS, 1922, Deutsche Ent. Zeitschr. Iris, vol. 36, p. 38, pl. 14, fig. 20 (type).

Carneades dissona, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 184; 1893, *ibid.*, no. 44, p. 101.

Euxoa dissona, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 274, pl. 65, fig. 7. HOLLAND, 1903, Moth book, p. 189, pl. 23, fig. 5. BARNES AND BENJAMIN, 1924, Contributions to the natural history of the Lepidoptera of North America, vol. 5, no. 3, p. 109 (synonymy). CORTI, in Seitz, 1932, Macrolepidoptera of the world, vol. 3, suppl., p. 35, pl. 4h.

Agrotis opipara MORRISON, 1874, Proc. Boston Soc. Nat. Hist., vol. 17, p. 165; 1875, Psyche, vol. 1, pp. 42, 85. GROTE, 1875, Psyche, vol. 1, pp. 77, 99 (*err. det.*).

Carneades opipara, SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 183; 1893, *ibid.*, no. 44, p. 100.

Euxoa opipara, HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 272, pl. 65, fig. 5. CORTI, in Seitz, 1932, Macrolepidoptera of the world, vol. 3, suppl., p. 34.

Agrotis islandica var. *labradoriensis* STAUDINGER, 1881, Stettiner Ent. Zeitg., vol. 42, p. 419. SMITH, 1885, Stettiner Ent. Zeitg., vol. 46, p. 223 (synonymy). BANG-HAAS, 1922, Deutsche Ent. Zeitschr. Iris, vol. 36, p. 38, pl. 14, fig. 21 (type).

Considerable confusion existed among earlier authors as to the identity of this species, which they were inclined to associate with either *islandica* Staudinger or *norwegica* Staudinger. The matter was partially cleared up by Smith and later (1922) more satisfactorily treated by Barnes and Benjamin, resulting in the synonymy as indicated in the above bibliography.

Moeschler's and Staudinger's types from Labrador have been figured by Bang-Haas. *Opipara* was described from Mt. Washington, New Hampshire, and is the form, more preva-

lent in the male, with strong, black basal dash and claviform, similar to *labradoriensis*. The only known type is in the British Museum, the Tepper collection at East Lansing containing a topotypical specimen but without type label. Hampson's figure is a good representation but not of the type.

MALE GENITALIA: (Both sexes based on Labrador specimens in the Canadian National Collection.) Clasper moderately broad, with the usual slight dorsal curve of costa at apex. Marginal spines 15 to 17 in number. Sacculus narrow, with slightly irregular costal edge and a minute clavus at base, indicated by several short setae. Harpes symmetrical, with a tendency for the ventral fork on the left side to be somewhat shorter than that on the right side. Ventral forks much shorter than dorsal ones, outwardly oblique; dorsal forks rather upright, their apices projecting slightly beyond the costal margin of clasper. Juxta plate broad at base, narrowing towards the bifid apices; median projection of basal margin rather blunt. Aedeagus without small spine in vesica.

FEMALE GENITALIA: Ovipositor lobes weakly chitinized, widely separated, short, with rounded apices. Dorsal surfaces sparsely clothed with fine, moderately long setae, more numerous and longer in the apical sections; several much longer setae in the median area and an irregular row of long basal hairs. The long hairs are much more numerous on the ventral surfaces. Both pairs of apophyses shorter than usual. Ostium pouch broad, semi-globate. Ductus bursae short, with broader chitinous bars than normal; entrance to bursa near the right proximal corner. Bursa broadly sac-like, with a decided projection to the left, from the rounded apex of which the ductus seminalis arises.

TYPES: *Dissona*, holotype, female, Labrador (Berlin Museum, *ex* collection Staudinger); *labradoriensis*, holotype, male, Labrador (Berlin Museum, *ex* collection Staudinger); *opipara*, holotype, female, Mt. Washington, New Hampshire (B.M.).

DISTRIBUTION: Labrador (Hopedale); Mt. Washington region, New Hampshire. The species will probably be found to have a wide distribution in subarctic areas, as there is a male specimen in the Canadian National

Collection from Port Churchill, Manitoba, and others from Knob Lake (latitude 54° 47' N., longitude 66° 47' W.).

***Euxoa violaris* (Grote and Robinson)**

Figures 4F, 9D, 11L

Agrotis violaris GROTE AND ROBINSON, 1868, Trans. Amer. Ent. Soc., vol. 1, p. 353, pl. 7, fig. 59. SMITH, 1890, Bull. U. S. Natl. Mus., no. 38, p. 63; 1893, *ibid.*, no. 44, p. 66. BEUTENMÜLLER, 1901, Bull. Amer. Mus. Nat. Hist., vol. 14, p. 270. HAMPSON, 1903, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 4, p. 372, pl. 68, fig. 32. DRAUDT, in Seitz, 1924, Macrolepidoptera of the world, vol. 7, p. 56, pl. 9c.

Euxoa violaris, McDUNNOUGH, 1927, Canadian Ent., vol. 59, p. 66; 1929, Bull. Natl. Mus. Canada, no. 55, p. 25.

This rare species was retained by all revisers in the genus *Agrotis*, presumably on account of the virtually smooth front. Not until 1927 was it transferred to *Euxoa*, after a study of the male genitalia which do not differ to any marked extent from those of other species belonging to the genus. The general type of maculation of the primaries is not particularly *Euxoa*-like, as may be seen by a reference to Hampson's figure. A study of the female genitalia shows also a considerable divergence from the normal type, notably in respect to the position of the exit of the ductus seminalis. The male antennae are strongly serrate and fasciculate, almost bipectinate.

MALE GENITALIA: (Both sexes based on Long Island specimens.) Clasper rather narrow and slightly irregular in outline; a fairly definite heel is formed at the anal angle of the cucullus. Marginal spines about 16 in number. Sacculus narrow, with a very sinuate costal edge and a small clavus at base. Harpes symmetrical, the ventral fork much longer than the dorsal one, and the space between broadly U-shaped. The ven-

tral fork bends slightly outward apically and extends well beyond the heel of the cucullus; the dorsal fork is well excurved at base and then upright. The juxta plate is fairly large and shows a thin chitinous projection arising from the base of the invagination between the bifid apices, a feature not met with elsewhere; the sides are more or less parallel, with slight outward angle at base; the medial projection of the basal edge is rather blunt. Aedeagus thick and rather short; the vesica contains two small apical spines, closely appressed.

FEMALE GENITALIA: Ovipositor lobes well chitinized, long and narrow, with rounded apices; dorsal surfaces rather heavily covered with long and quite strong setae; the apical area shows a few short, stubby spines; there are also a few long setae at base, but they do not form any definite row. Setae on the dorso-caudal portion of segment VIII few in number and minute. Ostium pouch broadly semi-globate, the sides thickened with chitin which connects with the ventral chitinous rod of the ductus bursae, the dorsal rod being slightly the longer and reënforced with linear bars of chitin. The anterior apophyses are considerably longer than usual, and the ductus bursae, although quite long, extends only slightly beyond their apices. Bursa broadly oval, expanded somewhat to the left; on the right side proximally a small, rounded projection extends caudad, and from its apex the ductus seminalis arises. The ductus bursae enters the bursa broadly and ventrally on the caudal margin.

TYPE: Holotype, male, Atlantic district (M.C.Z.).

DISTRIBUTION: Very restricted as far as is known. Found on Long Island, New York (Brooklyn, Aqueduct), and recorded by Leonard from Rye, New York. The original description lists a specimen from Pennsylvania, and Smith mentions its capture in New Jersey (Riverton, Manumuskin).

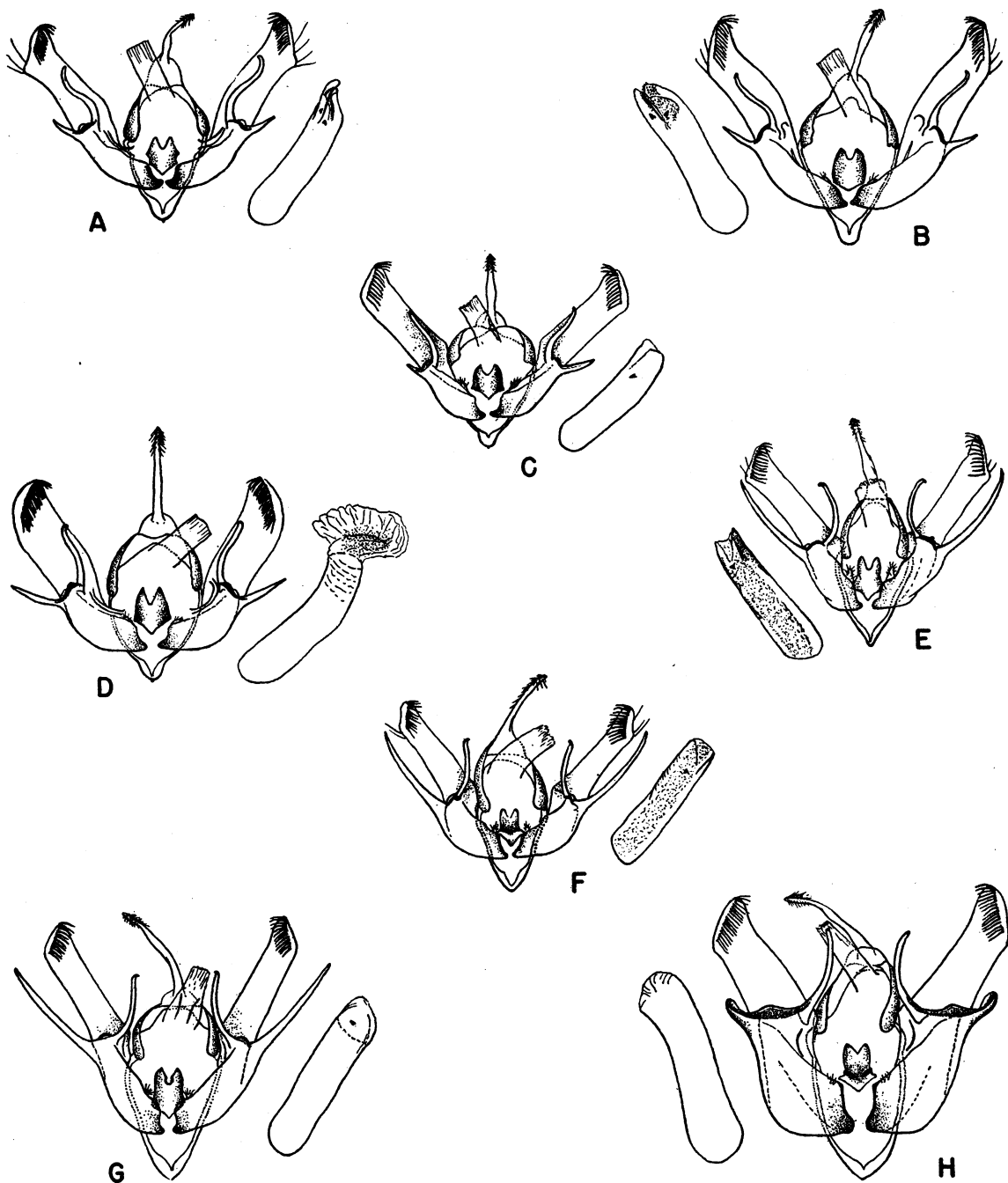


FIG. 1. Male genitalia. A. *Euxoa perolivalis manitobana* McDunnough. B. *E. perpolita* (Morrison). C. *E. scandens* (Riley). D. *E. aurulenta* (Smith). E. *E. detera* (Walker). F. *E. niveilinea rabiata* Smith. G. *E. velleripennis* (Grote). H. *E. mimallonis* (Grote).

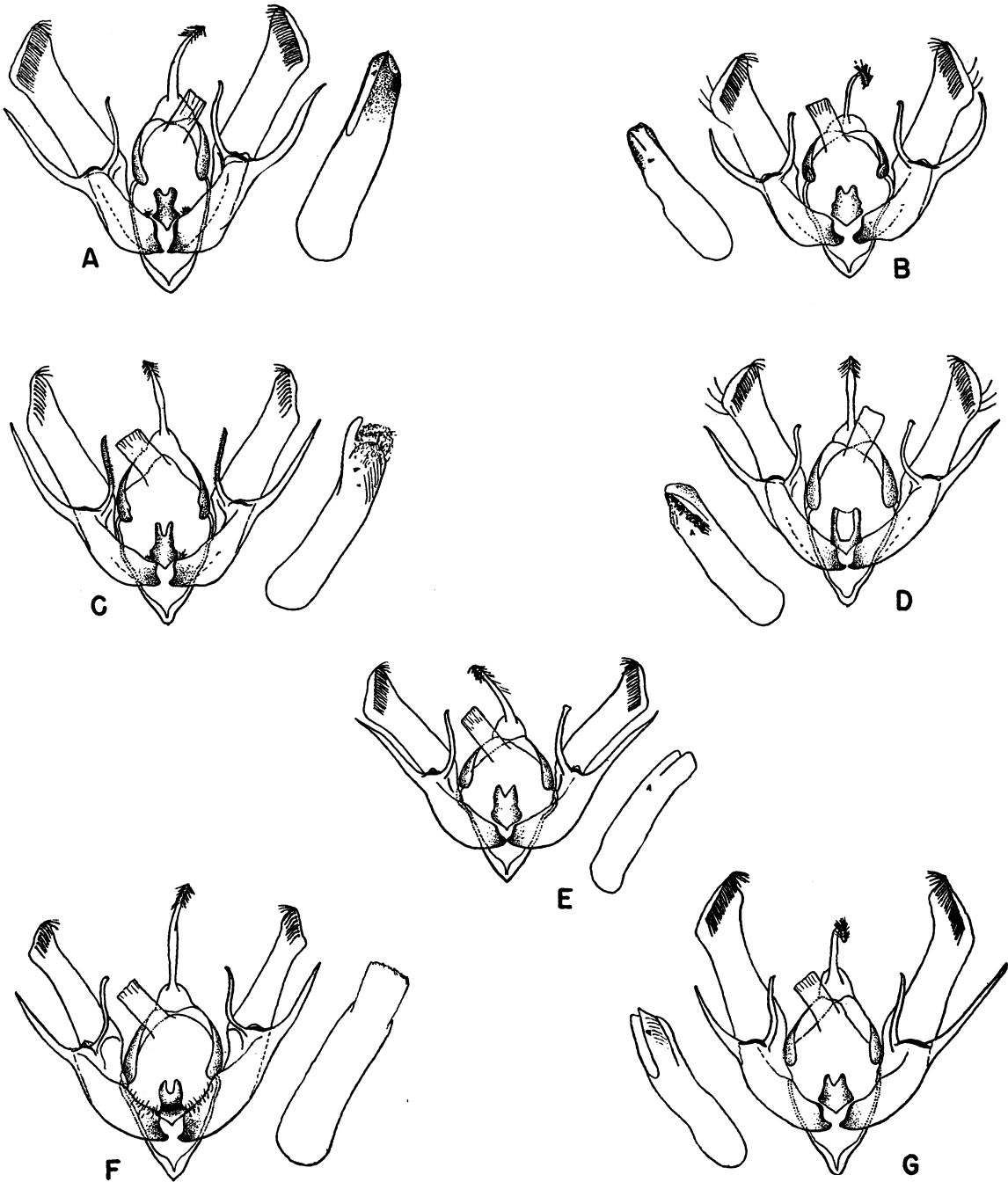


FIG. 2. Male genitalia. A. *Euxoa messoria* (Harris). B. *E. knoxvillea* McDunnough. C. *E. scholastica* McDunnough. D. *E. fumalis* (Grote). E. *E. ontario* (Smith). F. *E. bostoniensis* (Grote). G. *E. tessellata* (Harris).

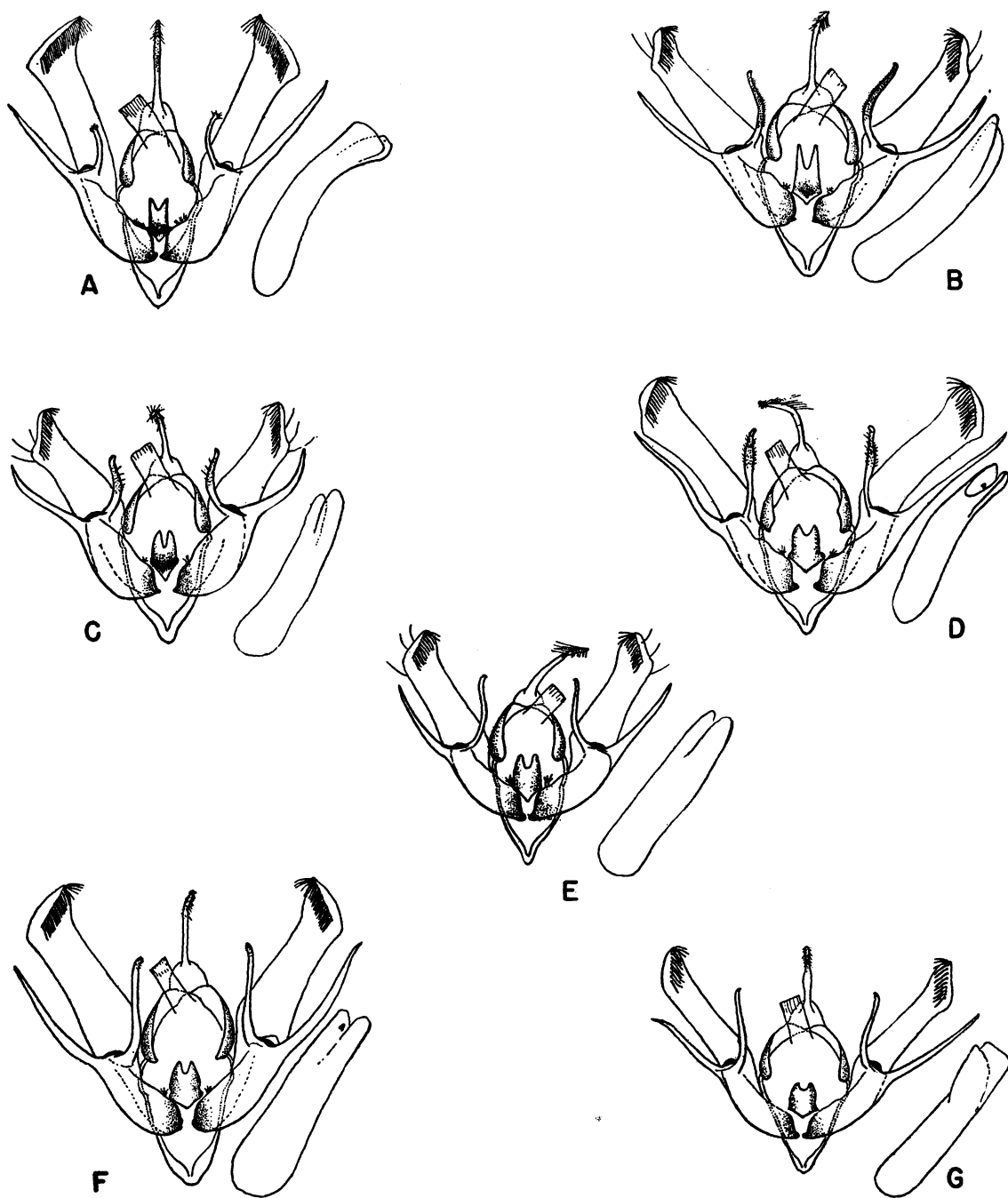


FIG. 3. Male genitalia. A. *Euxoa pleuritica* (Grote). B. *E. declarata decolor* (Morrison). C. *E. campestris* (Grote). D. *E. albipennis* (Grote). E. *E. divergens* (Walker). F. *E. obeliscoides* (Guenée). G. *E. redimicula* (Morrison).

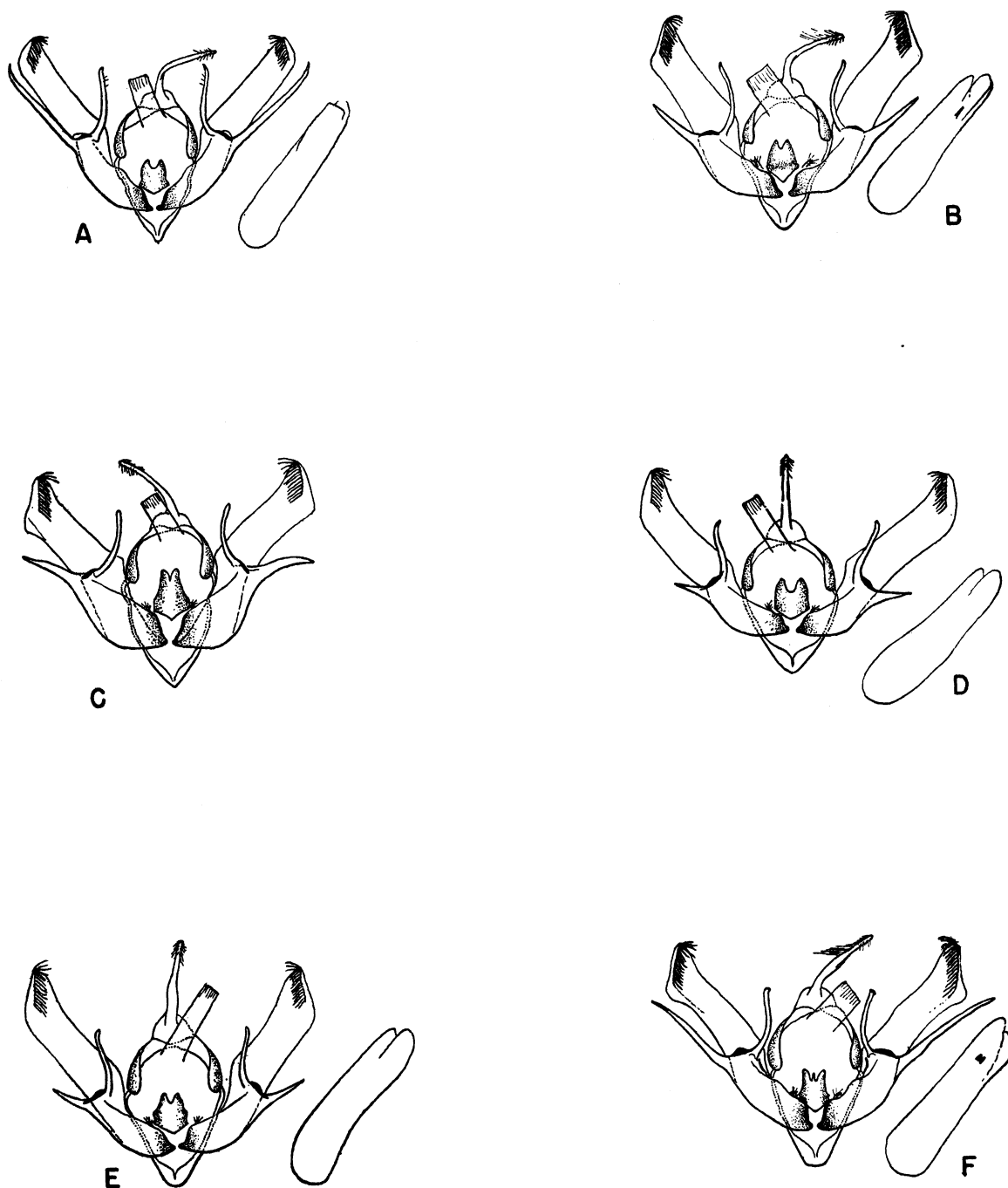


FIG. 4. Male genitalia. A. *Euxoa servita novangliae* McDunnough. B. *E. ochrogaster* (Guenée). C. *E. tristicula* (Morrison). D. *E. westermanni* (Staudinger). E. *E. dissona* (Moeschler). F. *E. violaris* (Grote and Robinson).

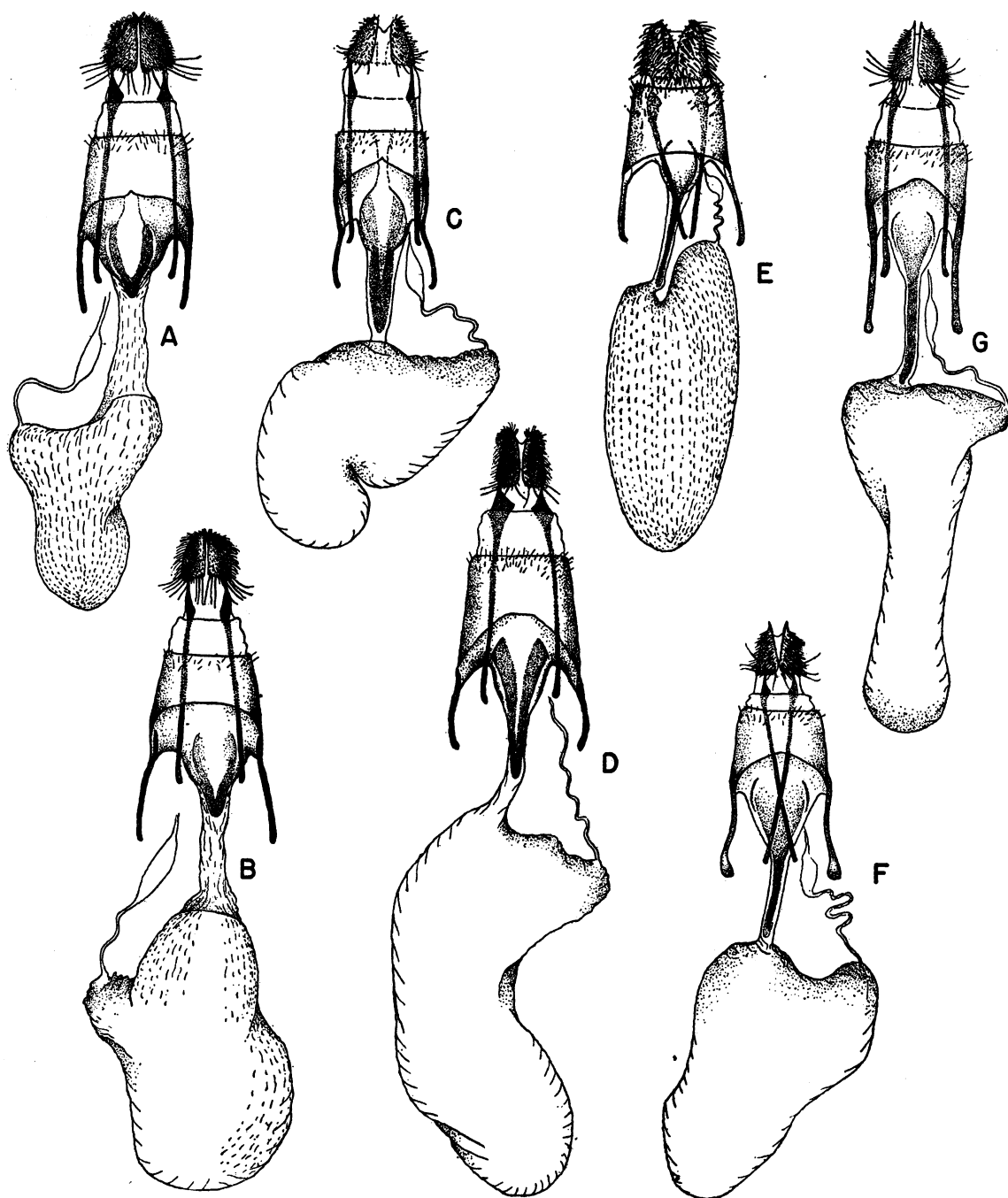


FIG. 5. Female genitalia. A. *Euxoa perolivalis manitobana* McDunnough. B. *E. perpolita* (Morrison). C. *E. scandens* (Riley). D. *E. aurulenta* (Smith). E. *E. detera* (Walker). F. *E. niveilinea rabiata* Smith. G. *E. velleripennis* (Grote).

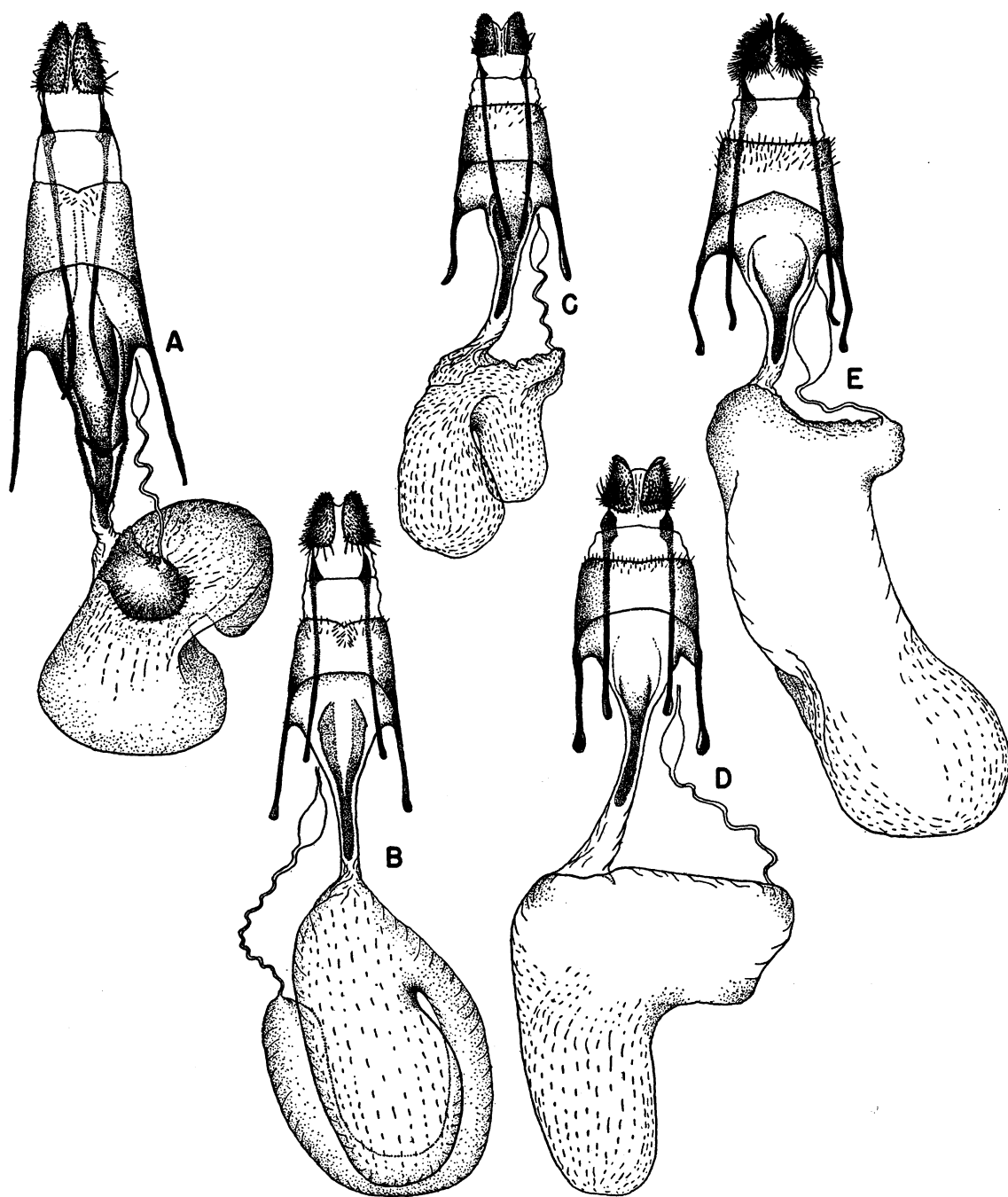


FIG. 6. Female genitalia. A. *Euxoa mimallonis* (Grote). B. *E. messoria* (Harris). C. *E. knoxvillea* McDunnough. D. *E. scholastica* McDunnough. E. *E. fumalis* (Grote).

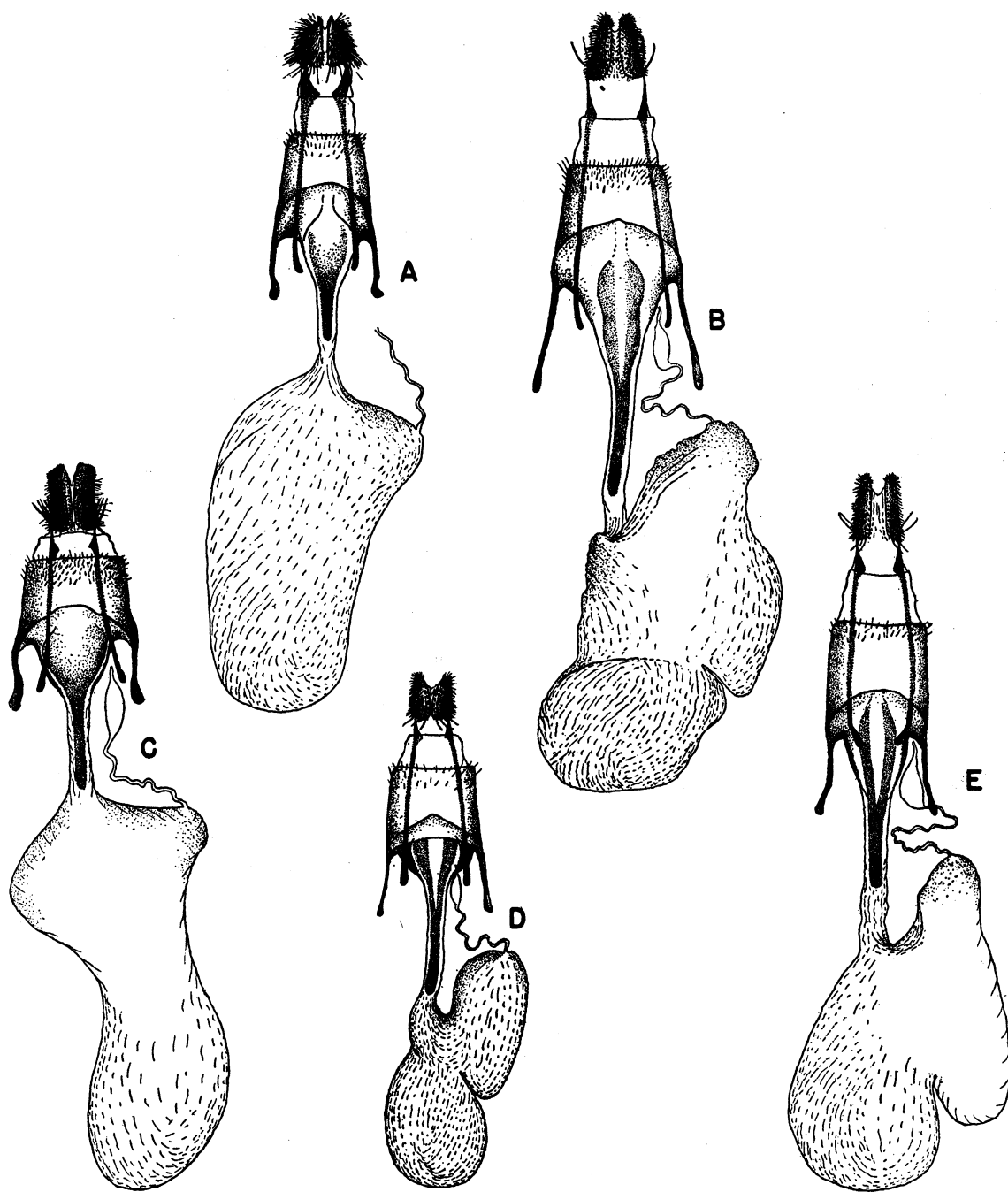


FIG. 7. Female genitalia. A. *Euxoa ontario* (Smith). B. *E. bostoniensis* (Grote). C. *E. tessellata* (Harris). D. *E. pleuritica* (Grote). E. *E. declarata decolor* (Morrison).

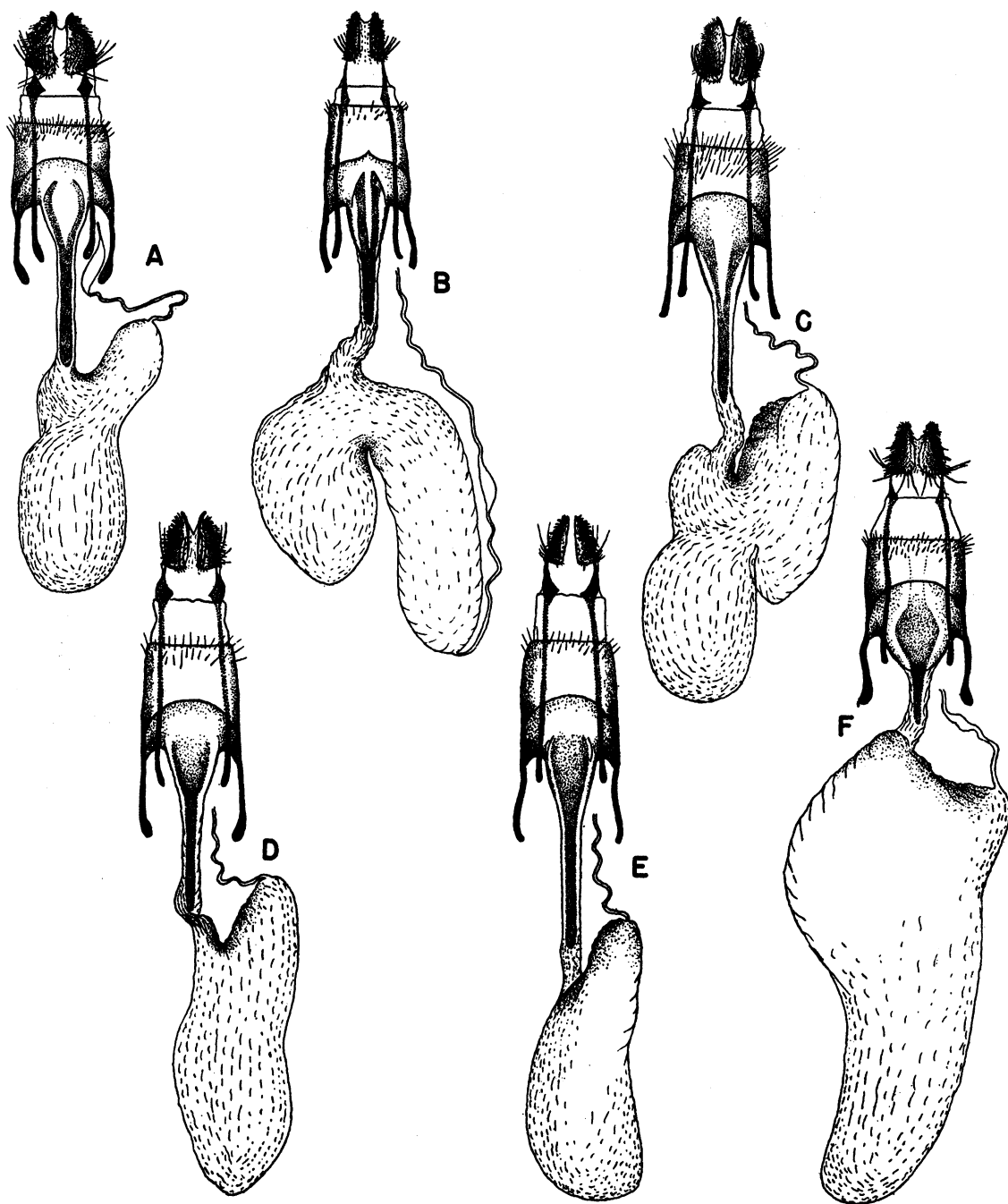


FIG. 8. Female genitalia. A. *Euxoa albipennis* (Grote). B. *E. divergens* (Walker). C. *E. obeliscoides* (Guenée). D. *E. redimicula* (Morrison). E. *E. servita novangliae* McDunnough. F. *E. ochrogaster* (Guenée).

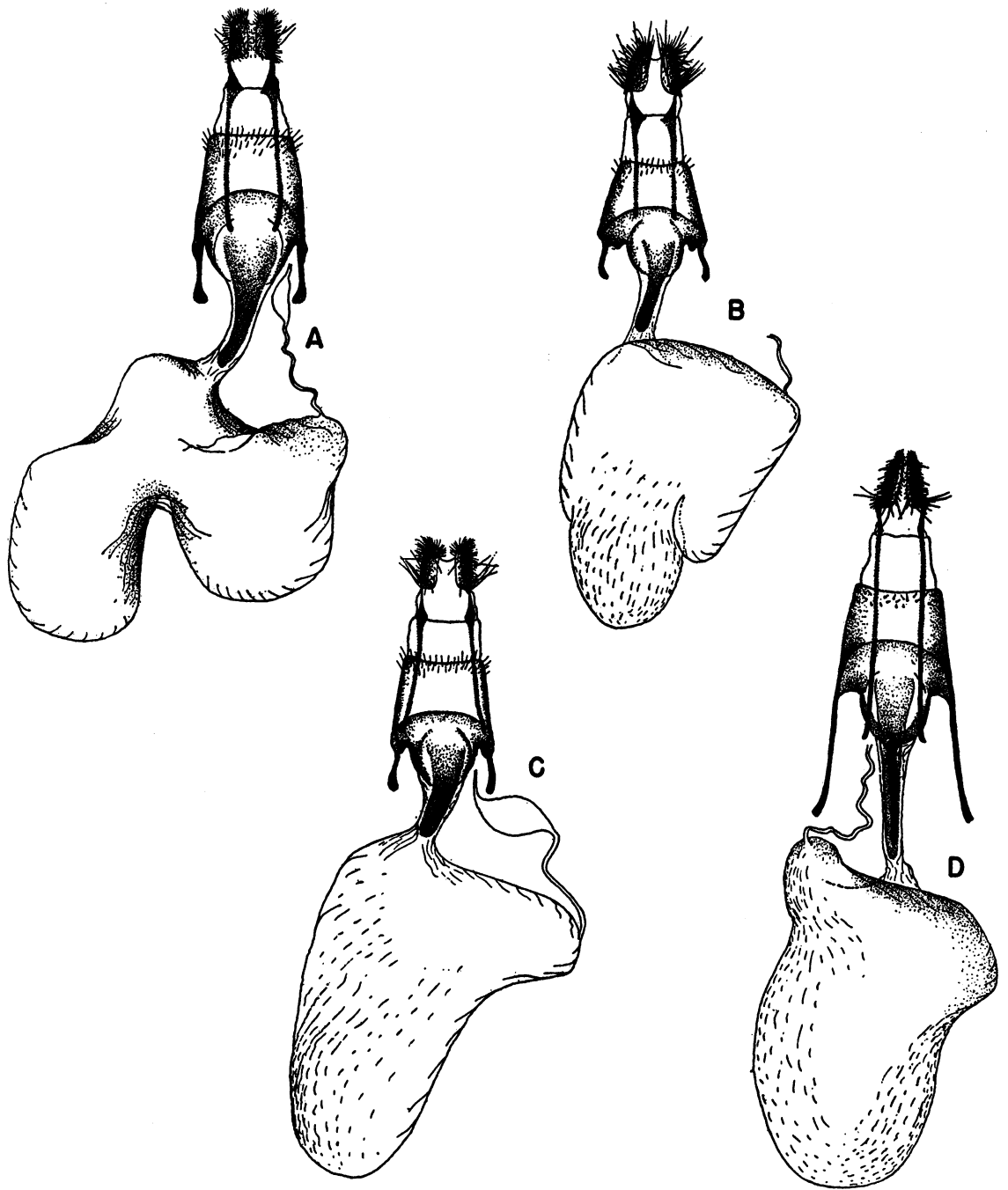


FIG. 9. Female genitalia. A. *Euxoa tristicula* (Morrison). B. *E. westermanni* (Staudinger). C. *E. dissona* (Moeschler). D. *E. violaris* (Grote and Robinson).

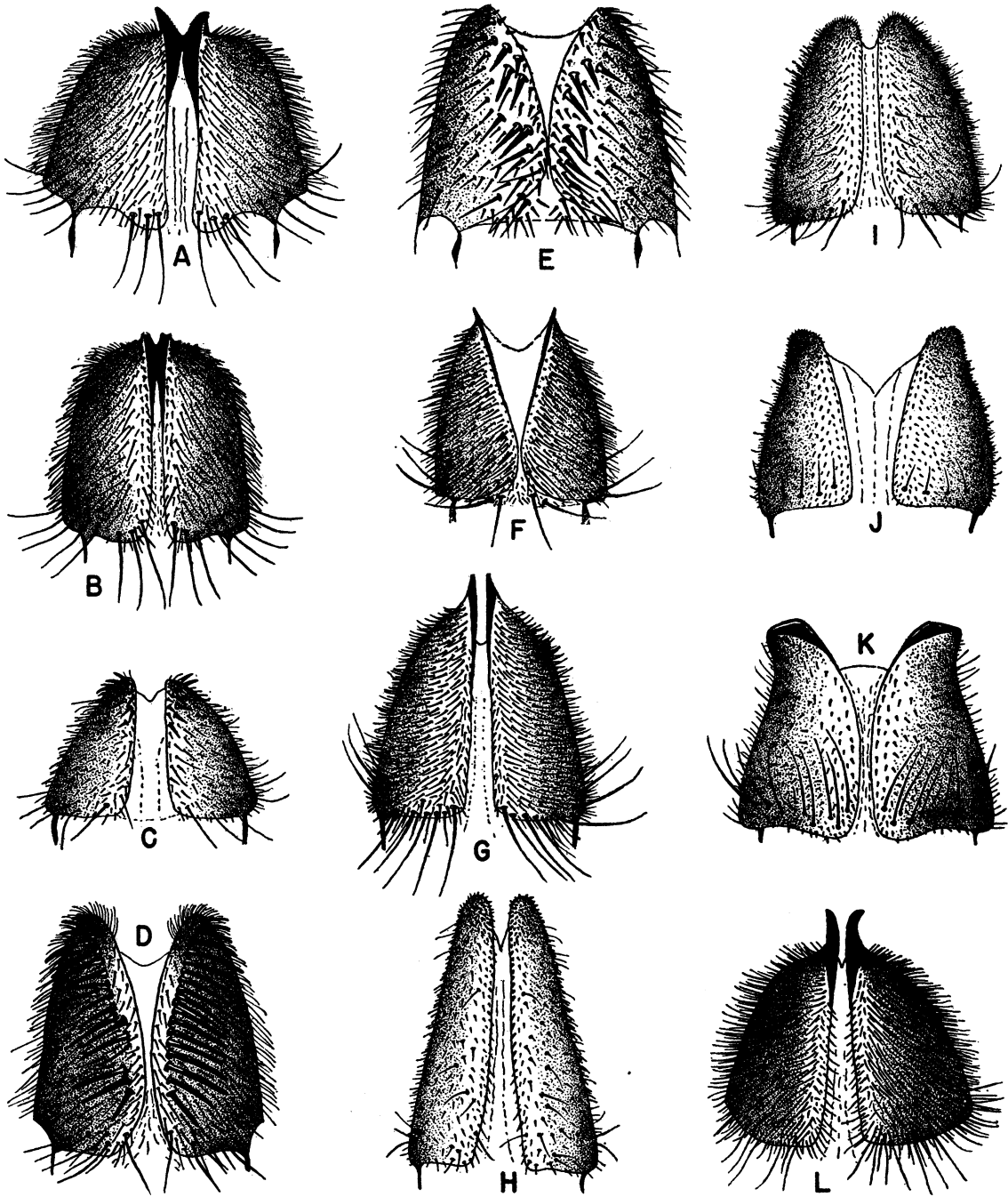


FIG. 10. Ovipositor lobes (enlarged). A. *Euxoa perolivalis manitobana* McDunnough. B. *E. perpolita* (Morrison). C. *E. scandens* (Riley). D. *E. aurulenta* (Smith). E. *E. detera* (Walker). F. *E. niveilinea rabiata* Smith. G. *E. velleripennis* (Grote). H. *E. mimallonis* (Grote). I. *E. messoria* (Harris). J. *E. knoxvillea* McDunnough. K. *E. scholastica* McDunnough. L. *E. fumalis* (Grote).

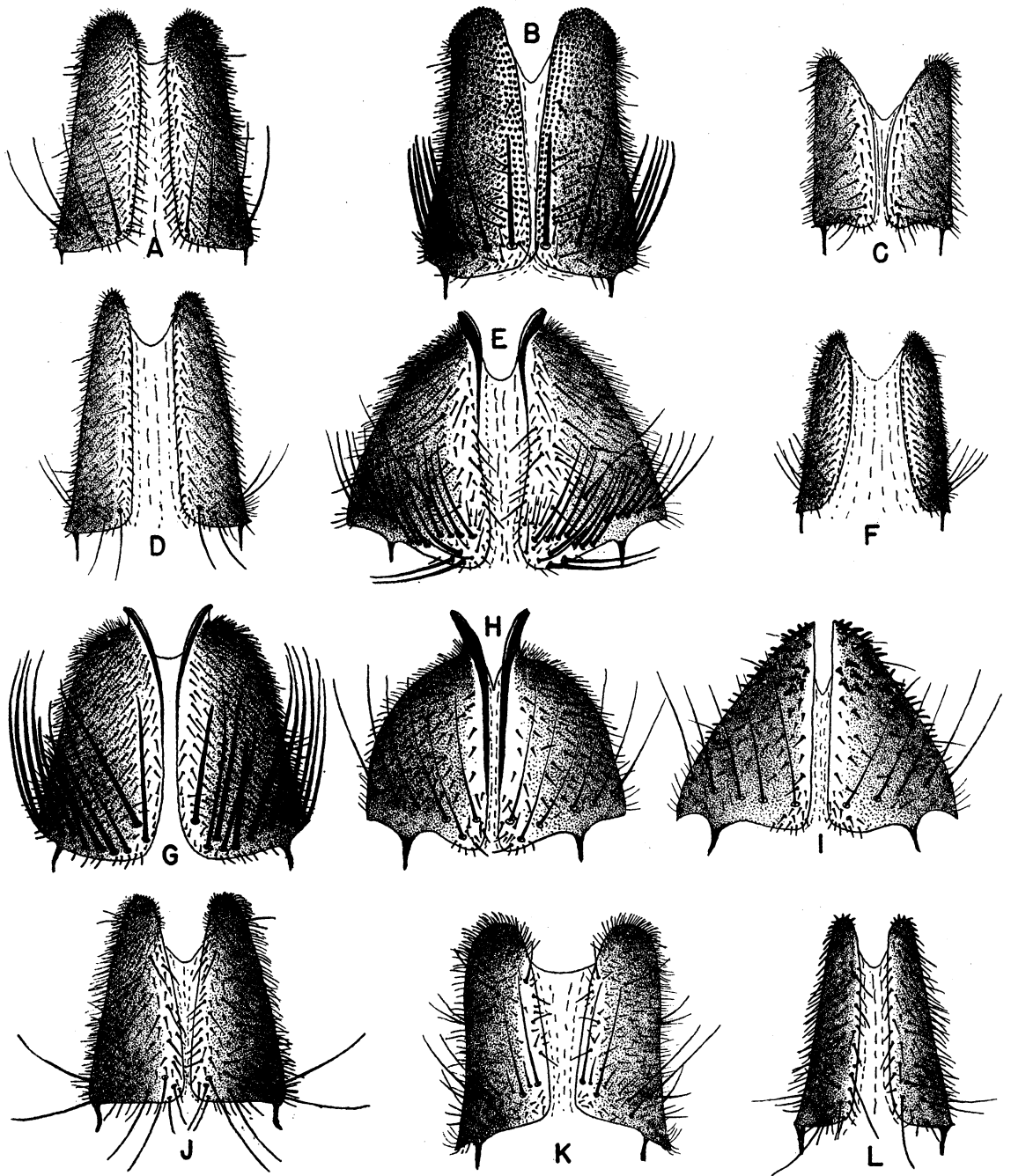


FIG. 11. Ovipositor lobes (enlarged). A. *Euxoa bostoniensis* (Grote). B. *E. tessellata* (Harris). C. *E. pleuritica* (Grote). D. *E. declarata decolor* (Morrison). E. *E. albipennis* (Grote). F. *E. divergens* (Walker). G. *E. obeliscoides* (Guenée). H. *E. redimicula* (Morrison). I. *E. servita novangliae* McDunnough. J. *E. ochrogaster* (Guenée). K. *E. tristicula* (Morrison). L. *E. violaris* (Grote and Robinson).

