

TAXONOMIC STUDIES ON SOME INDIAN SPECIES OF THE GENUS *AGROTIS* OCHSENHEIMER AND ALLIED GENERA (NOCTUIDAE, LEPIDOPTERA)

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(With 24 Text-figures and 2 Plates)

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I—INTRODUCTION

Species of the genus *Agrotis* Ochsenheimer (1816) and allied genera, commonly called the 'Greasy cutworms' or 'Surface cutworms' on account of their caterpillars having greasy appearance and the habit of cutting seedlings near the surface of the soil, are of interest from several points of view. The caterpillars remain hidden just below the surface of soil and cause damage to young agricultural crops and seedlings of different kinds of plantations during the night when they come out of their diurnal hidings. The moths of certain species are migratory in habit and have thus attracted the attention of research workers in a number of countries, such as Egypt (Williams, 1924, 1930), India (Fletcher, 1925; Venkataraman 1954; Kapur, 1955), and Australia (Common, 1958), etc. The species are also of interest as some of them are widely distributed and show remarkable colour variations.

Hampson (1903) gave a detailed account of the species from various parts of the world in his *Catalogue of the Lepidoptera Phalaenae in the collection of the British Museum*. Warren (1909) published a taxonomic revision of the species occurring in the palaeartic region, and the species of the same region were later studied by Corti (1933) and Corti & Draudt (1933). Although Hampson (1903) utilised genitalic characters for the separation of genera grouped under the subfamily Agrotinae (=Noctuinae), he placed greater reliance upon the characters of the spurs and spines of the legs and on the shape of the frons. He clearly stated that in the genus *Euxoa* Hübner (1822), the claspers in the male genitalia were bifurcate, but he disregarded this character in the case of Australian species (*vide*, Common, 1958), and certain palaeartic and Indian species. Corti (1933) was consistent in his use of the genitalic characters and transferred a number of species from *Euxoa* to *Agrotis*. Other important revisionary works on the taxonomy of *Agrotis* and the allied genera, following Corti's monograph, are by Boursin (1954a, 1955 respectively) on the species from China and Nepal and by Common (1958) on the Australian species. The two papers by Boursin include a number of species which also occur in India but the paper by Common includes only one species which occurs both in India and Australia. As far as known to us, detailed studies on the Indian species have not been made in recent years, although the need for the same has been expressed by several workers in the past. Beeson (1941) in his book, "*The Ecology and Control of Forest Insects of India and the Neighbouring Countries*" states (p. 644), "There are several species of cutworms in India but the group has not been critically studied there as it has in other countries and little is known of the identity, distribution and food habits of the various larvae. The name *Agrotis ypsilon* has been generally used to denote a cutworm in the plains of India and the term undoubtedly covers several species." In most other books on agricultural entomology in India, various species of cutworms have been referred to under the generic names *Agrotis* Ochsenheimer, *Euxoa* Hübner, *Amathes* Hübner and *Rhyccia* Hübner as will be seen from the taxonomic account of different species.

II—HISTORICAL ACCOUNT

Cotes & Swinhoe (1887-1889) were the first to prepare a Catalogue of Moths of India wherein they listed 24 species of *Agrotis* Ochsenheimer

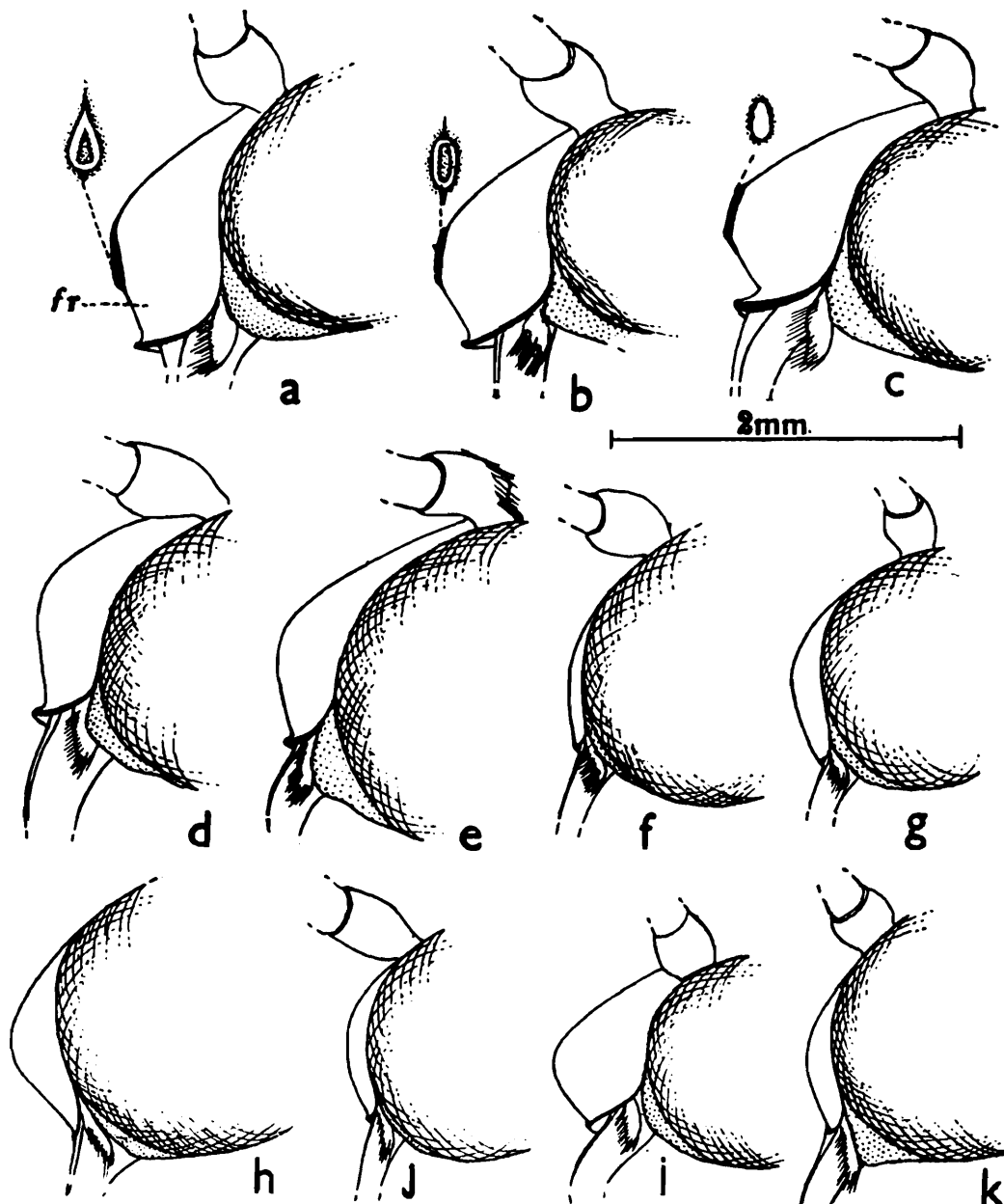
from various parts of India. Hampson (1894) synonymised eight species listed in the above-mentioned catalogue and excluded as many as ten species, thus leaving only six out of the former total of 24 species in the genus *Agrotis*. Hampson (1894), however, included 18 species under the genus *Agrotis* which were referred to by Cotes & Swinhoe under four different genera, viz. *Spaelotis* Boisduval, *Graphiphora* Ochseneheimer, *Ochropleura* Hübner, and *Oxira* Walker. Hampson (1894) also included a number of other Indian species, including four new species, under the genus *Agrotis*, not referred to earlier by Cotes & Swinhoe. He thus raised the total number of recorded Indian species to 35. However, in 1903, Hampson synonymised or transferred 17 species from *Agrotis* to other genera and retransferred to the genus *Agrotis*, ten species which were earlier considered by him (Hampson, 1894) as synonyms, with the result that the genus included at the time only 28 species. Most of the species, transferred from *Agrotis*, were placed in the genus *Euxoa* Hübner, including three well-known species, *A. segetum* (Schiff.), *A. corticea* (Schiff.) and *A. spinifera* (Hübner). This was done in spite of the fact that the male claspers in these species are not bifurcate—a character which Hampson had himself proposed for the genus. Warren (1909) disregarded the name *Agrotis* from his work and proposed the subfamily Euxoinae to include almost all the species previously referred to under the genus *Agrotis*. He placed some of the species under the genus *Euxoa* Hübner, while others were transferred to *Rhyacia* Hübner. Corti (1933), for the most part, accepted the classification given by Hampson (1903) and transferred five species back to *Agrotis*.

Boursin (1954a) studied the species of *Agrotis* and allied genera from China. He dealt with about 70 species, many of which had been referred to earlier under the genus *Agrotis* (*sens. lat.*), while several others, including a few new species, were transferred to eleven known or new genera proposed by him. The paper includes eight Indian species. While Boursin's (1954b) account of the species from Kashmir deals with seven species, including *Agrotis segetum*, that from Nepal (Boursin, 1955) deals with only two species, namely *Amathes c-nigrum deraiota* (Hampson) and *Amathes consanguinea* (Moore).

III — MATERIAL AND METHOD OF STUDY

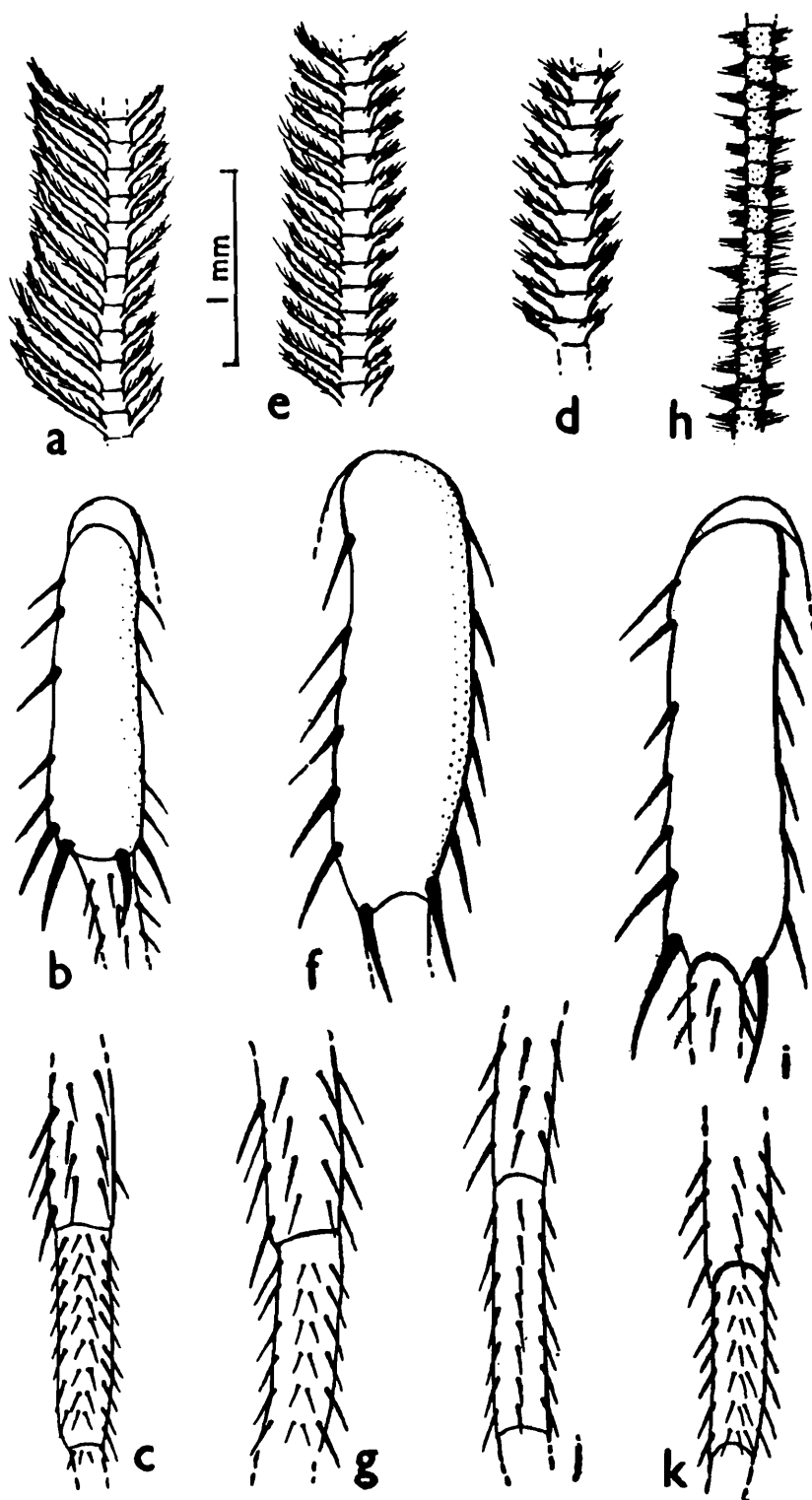
The material before us consists of some 250 specimens belonging to 22 species and four genera, namely, *Agrotis* Ochseneheimer, *Amathes* Hübner, *Diarsia* Hübner and *Chersotis* Boisduval. The material studied is deposited in the National Zoological Collections at the Zoological Survey of India, Calcutta. In addition, material of certain species, available in the entomological collections of the Division of Entomology, Indian Agricultural Research Institute, New Delhi, has been examined. Information on certain species was also obtained from the Entomological Branch, Forest Research Institute, Dehra Dun. We are grateful to Dr. S. Pradhan and Dr. P. N. Chatterjee, of the two institutions mentioned above, respectively, for their cooperation in this study.

Both the external and the genitalic characters have been studied with a view to present, as far as possible, a detailed account of the taxonomy of the species. The characters, which are considered important in this connection are as follows:



TEXT-FIG. 1. Shape of the frons of *Agrotis* and allied genera: (a) *Agrotis segetum* (Schiff.); (b) *A. corticea* (Schiff.); (c) *A. spinifera* (Hübner); (d) *A. ypsilon* (Rott.); (e) *A. flammata* (Schiff.); (f) *A. plecta* (Linn.); (g) *Amathes c-nigrum* (Linn.); (h) *Am. deraiota* (Hampson); (i) *Diarsia sicca* (Guén.); (j) *D. postfusca* (Hampson); (k) *Chersotis triangularis* (Moore).

Frons: The shape of frons varies considerably within a genus; it may be flat, smoothly curved, or produced medially into a light prominence, with or without a raised central structure of variable shape in the different species (Text-fig. 1 a-k). Soaking of frons with toluene or, if necessary, scraping off some of the scales was resorted to for the study of frons.



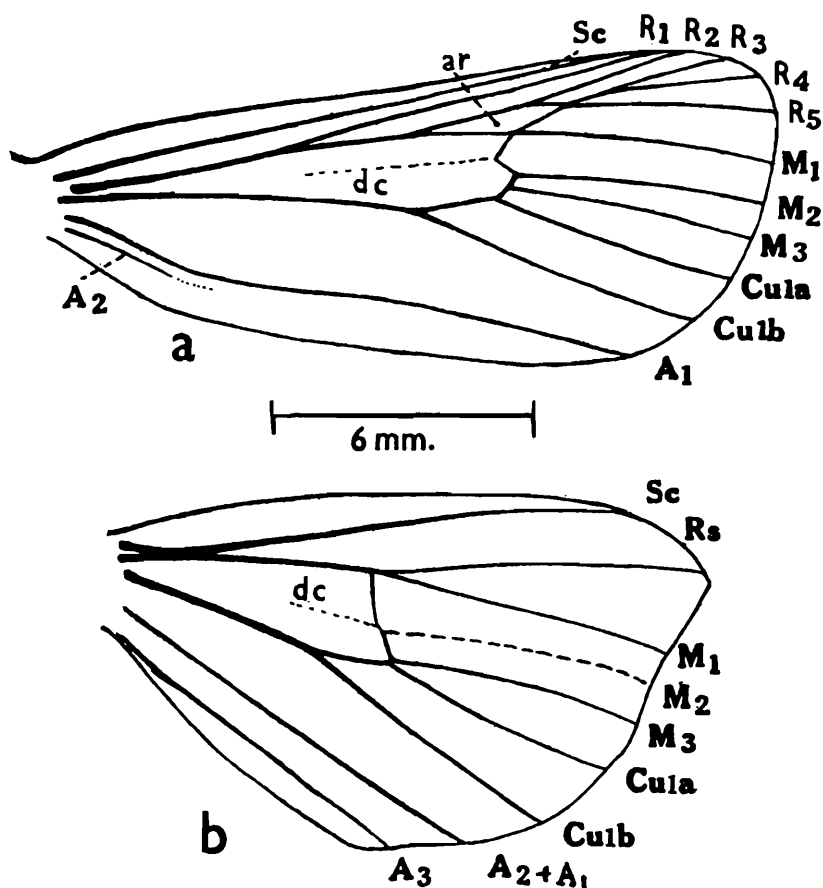
TEXT-FIG. 2. Portion of antennae and legs of the genus *Agrotis*: (a) antenna, (b) fore tibia and (c) hind-tarsal segments of *A. segetum* (Schiff.); (d) antenna of *A. spinifera* (Hübner); (e) antenna, (f) fore tibia and (g) hind-tarsal segments of *A. ypsilon* (Rott.); (h) antenna, (i) fore tibia and (j) hind-tarsal segments of *A. flammatrix* (Schiff.); (k) hind-tarsal segments of *A. plecta* (Linn.).

Antennae: In the male the antennae may be either bipectinate as in *Agrotis segetum* (Schiff.) (Text-fig. 2 a), *A. spinifera* (Hübner) (Text-fig. 2 d), *A. ypsilon* (Rott.) (Text-fig. 2 e), *Diarsia ochracea* (Walker) (Text-fig. 17 a), *D. ruptistriga* (Walker) (Text-fig. 17 f), and

D. postfusca (Hampson) (Text-fig. 17 e), or ciliate or fasciculate as in *Agrotis flammatra* (Schiff.) (Text-fig. 2 h) and *Amathes deraiota* (Hampson) (Text-fig. 13 a). The antennae are wholly simple in the female.

Wing venation: The venation is fairly constant. Typical venation has been described in the case of *Agrotis segetum* (Schiff.) (Text-figs. 3 a-b). It was studied by applying toluene with the help of a fine sable-hair brush. This did not cause any damage to the scales.

Tibial spurs and spines: The tibial spurs and spines, both in respect of their length and number, are useful for generic as well as specific identification. The number of rows of spines on the tarsal segments is also of value in this connection. Toluene was employed for their study, where necessary.



TEXT-FIG. 3. *Agrotis segetum* (Schiff.): (a) fore wing and (b) hind wing venation.

Genitalia: For making genitalic preparations the following method was employed. After a brief study of the external morphology of the abdomen, the whole or, in some cases, the apical half of the abdomen was kept overnight in 10% KOH. If found necessary the period for KOH treatment was prolonged but the material was not treated with hot KOH solution.

After washing thoroughly with distilled water the material was dissected for study and the sketches made. The material was later passed through various grades of alcohol and preserved in 90% alcohol. We have followed Sibatani, *et al.* (1954) and Klots (1956)

in respect of the nomenclature of the genitalia. Important genitalic characters are as follows. In the male genitalia the presence or absence of the harpe, ampulla and clavus may be noted. The shape of the juxta and claspers and the structure of the aedeagus are helpful in distinguishing the genera as well as species. The structure of the female genitalia shows great variety even within the same genus. The signum on the corpus bursae may be present or absent; similarly, in certain species, the sclerotised ribbons inside the corpus bursae may be present. The shape of ostium bursae is also of great help in distinguishing the species in certain cases.

IV — TAXONOMIC ACCOUNT

The subfamily *Agrotinae*, to which *Agrotis* and the allied genera belong, is readily recognised by the obsolescent nature of vein M_2 and the rapid divergence, from the base, of the vein $Sc+R_1$ in the hind-wing; the eyes are usually smooth, but sometimes hairy. The tibial spines vary in size in different genera; these may be present in all the tibiae or absent in one or two tibiae but rarely absent in all the tibiae. For example, the genus *Agrotis* is characterised by the presence of stout and long terminal spines at the distal end of the fore tibiae; in *Amathes* and *Chersotis* the terminal spines of the fore tibia are longer but not stouter than the rest; in *Diarsia* all the spines on the fore tibia are almost equally long and slender. The characters of tibia, together with the number of rows of spines in the middle and hind tibiae are helpful in identifying the genera.

The frons and antennae vary even in the same genus, so that their characters are of little value for the separation of genera. For instance, while certain species of *Agrotis* have pectinate antennae in the males, others have ciliate antennae. In *Diarsia* also both the ciliate and pectinate antennae are found in the males. The same is true of the shape of frons. However, the characters of both the antennae and frons are useful in the identification of species.

The male genitalia is of great importance in recognising the genera as well as the species. Both *Agrotis* and *Diarsia* are characterised by the presence of corona on the claspers, while the corona is absent in *Amathes* and *Chersotis*. The presence of coronal setae along the distal margin of claspers in *Diarsia* is further helpful in differentiating it from *Agrotis*. The clavus and the ampulla are, likewise, useful in separating *Amathes* and *Chersotis*; the ampulla is present and the clavus absent in *Amathes* while the reverse is the case in *Chersotis*. Various characters of the aedeagus and juxta are also useful in the identification of genera.

The female genitalia vary to a greater degree within each genus than is the case with the male genitalia, but these are quite helpful in the identification of the species.

Diagnosis of each genus is given in the respective place where the genus is dealt with. A key to *Agrotis* and the allied genera is given below:

Key to Agrotis and the allied genera

- | | | | |
|--|-----|-----|---------------------|
| 1. Male genitalia with the claspers bifid | ... | ... | <i>Euxoa</i> Hübner |
| Male genitalia with the claspers not bifid | ... | ... | 2 |

2. Fore tibia strongly spined laterally, terminal spines stouter than the rest ; middle and hind tibiae with three rows. Male genitalia with the claspers having corona *Agrotis* Ochsenheimer
- Fore tibia not strongly spined laterally, terminal spines not stouter than the rest ; middle and hind tibiae with two rows of spines. Claspers of the male genitalia with or without corona 3
3. Fore-tibial spines slender, terminal spines not longer than the rest. Claspers in the male genitalia with corona *Diarsia* Hübner
- Fore-tibial spines slender, terminal spines longer than the rest. Claspers in the male genitalia without corona 4
4. Male genitalia with the ampulla present but clavus absent *Amathes* Hübner
- Male genitalia with the clavus present but the ampulla absent *Chersotis* Boisduval

Description of Genera and Species

Genus *Agrotis* Ochsenheimer

1816. *Agrotis* Ochsenheimer, *Die Schmetterlinge von Europa*, 4, p. 66. (Type *Noctua segetum* Schiffermüller).
1816. *Graphiphora* Ochsenheimer, *Die Schmetterlinge von Europa*, 4, p. 68. (Type *Noctua ravidata* Schiffermüller). (For Synonymy see Hampson, 1894, 1903).
1816. *Caradrina* Ochsenheimer, *Die Schmetterlinge von Europa*, 4, p. 80. (Type *C. glareosa* (Esper) (Syn. *vide* Hampson, 1903).
1822. *Chera* Hübner, *Verz. bek. Schmett.*, p. 211. (Type *C. serratilinea* Ochs). (Syn. *vide* Hampson, 1894).
1822. *Megasema* Hübner, *Verz. bek. Schmett.*, p. 222. (Type *Megasema triangulum* Hübner) (Syn. *vide* Hampson, 1903).
1822. *Eugraphe* Hübner, *Verz. bek. Schmett.*, p. 224. (Type *Noctua sigma* Schiffermüller) (Syn. *vide* Hampson, 1903).
1822. *Ogygia* Hübner, *Verz. bek. Schmett.*, p. 224. (Type *Noctua flammata* Schiffermüller) (Syn. *vide* Hampson, 1903).
1825. *Axylia* Hübner, *Verz. bek. Schmett.*, p. 242. (Type *A. exsoleta* Linn.) (Syn. *vide* Hampson, 1894).
1825. *Noctua* Treitschke, *Die Schmetterlinge von Europa*, 5, p. 206. (Type *Noctua ravidata* Schiffermüller) (Syn. *vide* Hampson, 1903).
1840. *Agrotis* Ochs. : Boisduval, *Genera et Index-Meth. Eur. Lep.*, pp. 108-111.
1840. *Spaelotis* Boisduval, *Genera et Index-Meth. Eur. Lep.*, p. 106. (Type *Spaelotis augur* (Fabr.) (Syn. *vide* Hampson, 1894, 1903).
1847. *Agrotis* Ochs. : Zeller, *Isis*, pp. 439-441.
1852. *Agrotis* Ochs. : Guénee, *Noctuelites-I*, 5, p. 267.
1856. *Agrotis* Ochs. : Walker, *List Lep. Brit. Mus.*, 10, pp. 303-355.
1857. *Dichagyris* Lederer, *Noctua Eur.*, p. 206. (Type *Dichagyris melanura* (Kollar) (Syn. *vide* Hampson, 1903).
1894. *Agrotis* Ochs. : Hampson, *Fauna Brit. India, Moths*, 2, pp. 180-190.
1903. *Agrotis* Ochs. : Hampson, *Cat. Lep. Phal.*, 4, pp. 363-462.
1909. *Euxoa* Hübner : Warren, *Euxoinae*, in Seitz *Macrolepidoptera of the World*, 3, p. 23. (Syn. "Agrotis").
1933. *Agrotis* Ochs. : Corti, *Agrotinae*, in Seitz *Macrolepidoptera of the World*, Suppl. 3, pp. 42-49.

1933. *Agrotis* Ochs. : Corti & Draudt, *Agrotinæ*, in Seitz *Macrolepidoptera of the World*, Suppl. 3, pp. 49-96.
 1954(a). *Agrotis* Ochs. : Boursin, *Bonn. zool. Beitr.*, 5, p. 213.
 1958. *Agrotis* Ochs. : Common, *Aust. J. Zool.*, 6(1), pp. 64-88.

Type of the genus : *Noctua segetum* Schiffermüller from Europe.

Distribution : Universal.

Diagnosis.—Frons without or with a prominence, the latter may be smooth, or truncate, with the edges raised slightly. Antennae bipectinate up to basal half or two-thirds the length, fasciculate or ciliate in the male; wholly simple in the female. Eyes smooth, large, rounded. A well developed ocellus present behind each antenna. Proboscis fully developed. Labial palpi oblique, upturned, the second segment longest, with scales in the front; the third segment porrect, generally without scales. Collar with radiating scales. Fore tibiae smaller than the femur, with a row of spines laterally, those at the extremity stout and long; middle and hind tibiae, which are equal to femur and exceed femur in the length, respectively, have three rows of spines each; the number of rows of spines on the tarsal segments vary from three to four on the first and three to five on other segments; all the segments unequal, gradually decreasing in length from the first to the fifth segment; claws with arolium. Abdomen dorsally rather flattened, clothed with hair and scales at the base and having lateral tufts near its extremity. Fore wings long and narrow, coloured differently in different species; frenulum consisting of a single spine in the male and of two or three spines in the female.

Venation.—The venation is almost constant nearly in all the species studied so far. The following description based on an examination of *A. segetum* (Schiff.) will also apply to the species dealt with here under this genus.

Fore wing (Text-fig. 3a) with areole; Sc free; R_1 from the cell; R_2 from the areole; R_3 arising from R_2 and anastomosed with R_4 to form the areole, both R_3 - R_4 arising from near the point of origin of Radial vein R_5 ; M_1 from upper angle of the cell; M_2 and M_3 arise from above the lower angle of the cell; Cubital vein, Cu_1 arises from the angle; Cu_{1b} from behind the angle; Cu_2 absent; 1A well developed, 2A not anastomosing with the latter. Hind wing (Text-fig. 3b) with the vein Sc free at the base but shortly anastomosing with the cell near its base and thereafter diverging towards apex; Rs and M_1 on a short stalk arising from the upper angle; M_2 obsolescent from the discocellulars; M_3 and Cu_{1a} connate, arising from the lower angle; Cu_{1b} arising from behind the angle; Cu_2 absent; 1A + 2A, 3A present and well developed.

Genitalia.—Claspers not bifid; corona well developed, the setae oblique, present along the distoventral margin. Aedeagus with spinous protuberances or process on the distal part of the vesica. Juxta of variable shape in different species. Female genitalia simple or sclerotised; corpus bursae assuming various shapes, with or without signum in different species.

Remarks.—The present study is based on eight species of the genus, viz., *A. segetum* (Schiffermüller), *A. corticea* (Schiffermüller), *A. spinifera* (Hübner), *A. subspinifera* (Hampson), *A. ypsilon* (Rotten-

- Antennae simple and ciliate throughout in the males. Fore wings with a pale costal fascia ... 6
2. Frons sub-rounded, smooth. Legs with four rows of spines on tarsi. Fore wings with the orbicular elliptical ... *ypsilon* (Rottenburg)
- Frons sub-rounded but produced forward medially, not smooth, with central prominence in the front. Legs with three to four rows of spines on tarsi. Fore wings with the orbicular elliptical, elongate or round ... 3
3. Frons with conical or oblong prominence in the front. Fore wings with the orbicular round ... 4
- Frons with oval prominence in the front. Fore wings with the orbicular elliptical or elongate ... 5
4. Frons with conical prominence in the front ... *segetum* (Schiffermüller)
- Frons with oblong prominence in the front ... *corticea* (Schiffermüller)
5. Antennae bipectinate. Fore wings with the orbicular elliptical ... *spinifera* (Hübner)
- Antennae serrate. Fore wings with the orbicular elongate ... *subspinifera* (Hampson)
6. Frons distinctly produced in the front, sub-rounded. Fore wings with the orbicular semi-circular ... *flammatra* (Schiffermüller)
- Frons not distinctly produced in the front, rather flattened. Fore wings with the orbicular elliptical or round ... 7
7. Orbicular elliptical ... *plecta* (Linn.)
- Orbicular round ... *beesoni* sp. n.

(b) *Based on the male genitalia*

1. Clasper strongly incurved beyond the middle, with its distal part—the cucullus, about half as wide as in the middle; aedeagus with a well developed, long and hard cornuti ... 2
- Clasper straight or excurved beyond the middle, with the distal part—the cucullus, either more than, or as wide as, in the middle; aedeagus with a slender and short cornuti or several short cornutus ... 3

2. Juxta triangular, broad, medially raised into a well developed sac ... *plecta* (Linn.)
 Juxta triangular, narrow, slightly raised medially ... *beesoni* sp. n.
3. Anellus lobes present ; clavus present, glabrous, aedeagus with several spines distally on the vesica ... *segetum* (Schifferrmüller)
 Anellus lobes absent ; clavus indistinct or hairy when present ; aedeagus with either several spines distally, or a single, hard and short cornuti ... 4
4. Clavus indistinct ; aedeagus small, with several spines only distally ... 5
 Clavus indistinct, or hairy when present ; aedeagus large, with single or several spines distally as well as internally on the vesica ... 6
5. Juxta almost spherical and rounded laterally, pointed below ... *corticea* (Schifferrmüller)
 Juxta pentagonal ... *spinifera* (Hübner)
6. Clavus present, hairy, aedeagus without short process distally ... *ypsilon* (Rottenburg)
 Clavus indistinct, glabrous ; aedeagus with a short process distally ... *flammatra* (Schifferrmüller)

(c) *Based on the female genitalia*

1. Corpus bursae with or without sclerotised ribbons; signum present or absent; receptaculum seminalis separate ... 2
 Corpus bursae with sclerotised ribbons inside it; signum present; receptaculum seminalis not separate ... *plecta* (Linn.)
2. Sclerotised ribbons present in corpus bursae and receptaculum seminalis; corpus bursae without signum ... *subspinifera* (Hampson)
 Sclerotised ribbons absent in both; corpus bursae with or without stripe or signum ... 3
3. Corpus bursae without sclerotised stripe or signum ... 4
 Corpus bursae with either stripe or signum present ... 5
4. Ductus bursae lightly sclerotised, without striations ; corpus bursae and the receptaculum seminalis striated, the latter smaller than corpus bursae ... *flammatra* (Schifferrmüller)
 Ductus bursae unsclerotised, with slight bands; only the corpus bursae slightly striated; receptaculum seminalis longer than corpus bursae ... *corticea* (Schifferrmüller)

5. Ductus bursae lightly sclerotised, with bands; corpus bursae with stripes, signum absent *segetum* (Schiffermüller)
- Ductus bursae unsclerotised, without bands; signum present, stripes absent 6
6. Corpus bursae with the signum complete and oval-shaped; ductus bursae long *ypsilon* (Rottenburg)
- Corpus bursae with the signum short and incomplete and elongate; ductus bursae comparatively short *spinifera* (Hübner)

1. *Agrotis segetum* (Schiffermüller)

(Plate I, Fig. 1; Text-figs. 4 a-e)

1776. *Noctua segetum* Schiffermüller, *Wien. verz.*, pp. 81, 252. (Type loc.—Europe).
1806. *Agrotis segetis* Hübner, *Tentamen*, 2 pp. (*segetis* as type of *Agrotis* Hübner).
1816. *Agrotis segetum* (Schiff.) : Ochsenheimer, *Die schmetterlinge Von Europa*, 4, p. 212.
1826. *Noctua praecox* Hübner, (*nec* Linn.) *Eur. Schmett. Noct.*, p. 77, fig. 359. (Type loc.—Europe) (Syn. of *Euxoa segetis* (Schiff.), *vide* Hampson, 1903).
1826. *Noctua fervida* Hübner, *Eur. Schmett. Noct.*, p. 153, fig. 711. (Type loc.—Europe) (Syn. of *Euxoa segetis* (Schiff.), *vide* Hampson, 1903).
1840. *Agrotis sicula* Boisduval, *Genera et Index-Meth.*, p. 109. (Type loc.—Sicilia, Neopolis) (Syn. of *Euxoa segetis* (Schiff.), *vide* Hampson, 1903).
1847. *Agrotis dimidia* Zell., *Isis*, p. 439. (Type loc.—Sicily) (Syn. of *Euxoa segetis* (Schiff.), *vide* Hampson, 1903).
1852. *Agrotis segetum* Hübner (*nec* Schiffermüller): Guén. *Noctuelites-I.*, 5, p. 275. (Syn. of *Euxoa segetis* (Schiff.), *vide* Hampson, 1903).
1852. *Agrotis sicania* Boisduval : Guén., *Noctuelites-I.*, 5, p. 275. (Type loc.—Sicile) (Syn. of *Euxoa segetis* (Schiff.), *vide* Hampson, 1903).
1856. *Caradrina triturrata* Walker, *List. Lep. Brit. Mus.*, 10, p. 295. (Type loc.—Sierra Leone) (Syn. of *A. segetis* (Schiff.), *vide* Hampson, 1894).
1856. *Agrotis marginalis* Walker, *List Lep. Brit. Mus.*, 10, p. 339. (Type loc.—South Africa). (Syn. of *A. segetis* (Schiff.) and *Euxoa segetis* (Schiff.), respectively, *vide* Hampson, 1894, 1903).
1856. *Agrotis obliuosa* Walker, *List Lep. Brit. Mus.*, 10, p. 340. (Type loc.—Cape, S. Africa) (Syn. of *A. segetis* (Schiff.) and *Euxoa segetis* (Schiff.), respectively, *vide* Hampson, 1894, 1903).
1856. *Agrotis dividens* Walker, *List Lep. Brit. Mus.*, 10, p. 342. (Type loc.—Port Natal) (Syn. of *A. segetis* (Schiff.), *vide* Hampson, 1894).
1856. *Agrotis aversa* Walker, *List Lep. Brit. Mus.*, 10, p. 345. (Type loc.—Punjab) (Syn. of *A. segetis* (Schiff.) and *Euxoa segetis* (Schiff.), respectively, *vide* Hampson, 1894, 1903).
1856. *Agrotis correcta* Walker, *List Lep. Brit. Mus.*, 10, p. 345. (Type loc.—North India). (Syn. of *A. segetis* (Schiff.) and *Euxoa segetis* (Schiff.), respectively, *vide* Hampson, 1894, 1903).
1860. *Agrotis denticulosa* Wallengren, *Wien. ent. Mon.*, 4, p. 168. (Type loc.—Caffraria) (Syn. of *Euxoa segetis* (Schiff.), *vide* Hampson, 1903).
- 1865(a). *Agrotis repulsa* Walker, *List Lep. Brit. Mus.*, 32, p. 696. (Type loc.—South Hindustan) [S. India] (Syn. of *A. segetis* (Schiff.) and *Euxoa segetis* (Schiff.), respectively, *vide* Hampson 1894, 1903).
- 1865(a). *Agrotis certificata* Walker, *List Lep. Brit. Mus.*, 32, p. 697. (Type loc.—Shanghai) (Syn. of *A. segetis* (Schiff.) and *Euxoa segetis* (Schiff.), respectively, *vide* Hampson, 1894, 1903).
1878. *Agrotis ingrata* Butler, *Ann. Mag. nat. Hist.*, (5) 1, p. 162. (Type loc.—Yokohama) (Syn. of *Euxoa segetis* (Schiff.), *vide* Hampson, 1903).

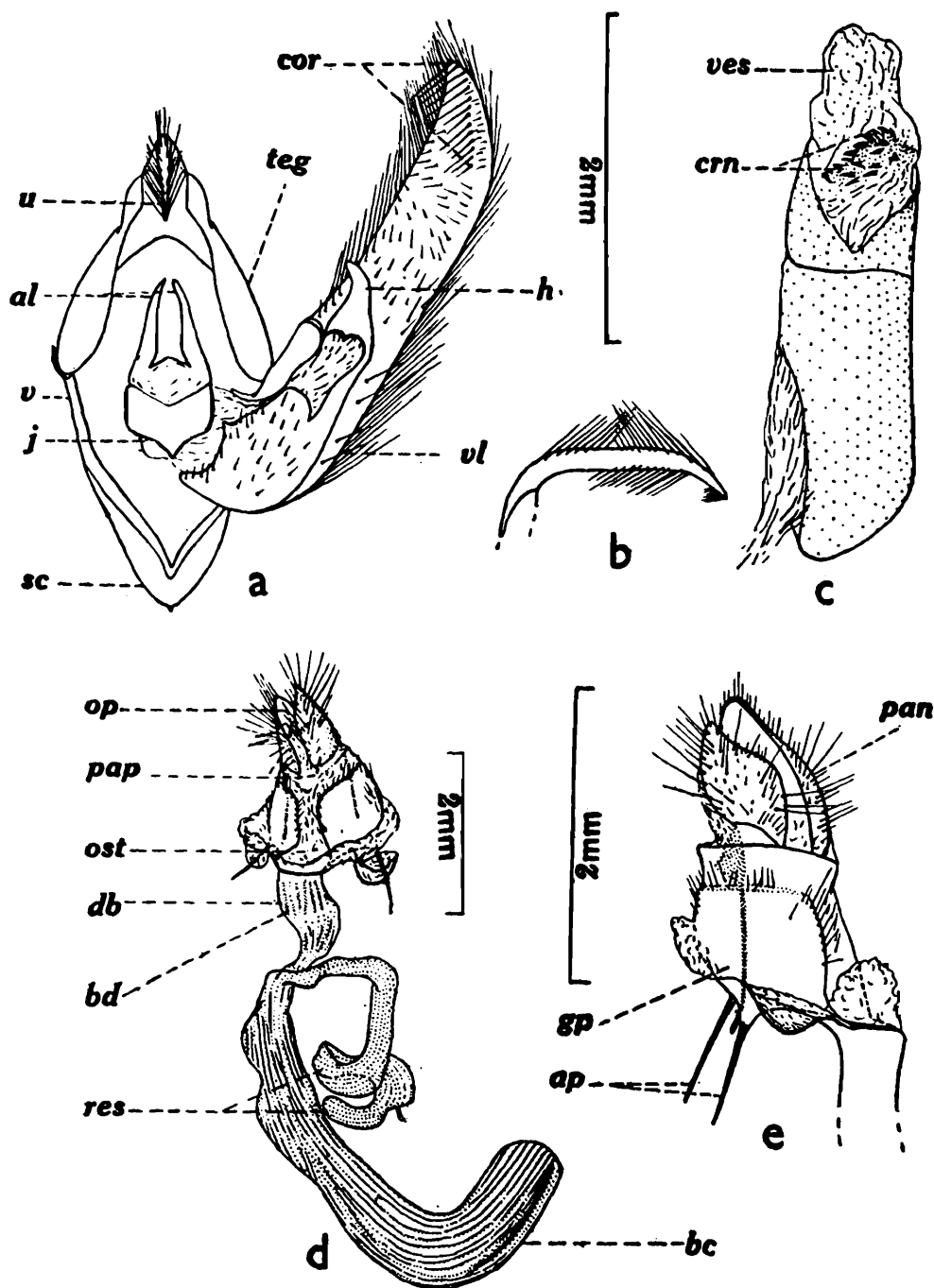
1881. *Agrotis segetum* (Schiff.) var. *pallida* Stgr., *Stett. ent. Zeit.*, p. 423 (Type loc.—Central Asien) (Syn. of *Euxoa segetis* (Schiff.), vide Hampson, 1903).
1881. *Agrotis fucosa* Butler, *Trans. ent. Soc. Lond.*, p. 179. (Type loc.—Tokei, Japan) (Syn. of *Euxoa segetis* (Schiff.), vide Hampson, 1903).
1886. *Agrotis lassa* Swinhoe, *Proc. zool. Soc. Lond.*, p. 444. (Type loc.—Mhow) (Syn. of *A. segetis* (Schiff.) and *Euxoa segetis* (Schiff.), respectively, vide Hampson, 1894, 1903).
1888. *Agrotis segetum* (Schiff.) : Cotes & Swinhoe, *Cat. Moths of India*, p. 309.
1894. *Agrotis segetis* (Schiff.) : Hampson, *Fauna Brit. India, Moths*, 2, p. 181.
1903. *Euxoa segetis* (Schiff.) : Hampson, *Cat. Lep. Phal*, 4, p. 167.
1905. *Euxoa segetis* (Schiff.) : Hampson, *J. Bombay nat. Hist. Soc.*, p. 455.
1909. *Euxoa segetis* (Schiff.) : Lefroy, *Indian Insect Life*, p. 445.
1909. *Euxoa segetum* (Schiff.) : Warren, in Seitz *Macrolepidoptera of the World*, 3, p. 35.
1914. *Euxoa segetis* (Schiff.) : Fletcher, *Some South Indian Insects*, p. 375.
1933. *Agrotis segetis* (Schiff.) : Corti, in Seitz *Macrolepidoptera of the World*, Suppl. 3, p. 43.
1941. *Euxoa segetis* (Schiff.) : Beeson, *Forest Insects*, p. 644.
- 1954(b). *Agrotis segetum* (Schiff.) : Boursin, *Bull. Soc. Fouad Ier entom.*, 38, p. 84.
1955. *Euxoa segetis* (Schiff.) : Lal, *Plant Protect. Bull.*, 7, pp. 2-7, 9, 27, 33.
1963. *Agrotis segetum* (Schiff.) : Singh, *Plant Protect. Bull.*, 11, pp. 5, 7, 30.
1964. *Agrotis segetum* (Schiff.) : Srivastava, *Entomology in India*, p. 85.
1964. *Euxoa segetum* (Schiff.) : Sohi, *Entomology in India*, p. 146.
1964. *Euxoa segetum* (Schiff.) : Mathur & Anand, *Entomology in India*, pp. 273-274.

Head with the frontal tufts and thorax pale brown to brownish ochreous. Antennae brownish. Eyes dark brown. Labial palpi dark on the outer sides. Collar with a dark brown line across. Fore wings pale brown, marked with brownish subbasal, antemedial and postmedial lines across the length; subbasal running straight from the costa to the base of anal vein, slightly interrupted at the cell, the other two lines waved, running from costal to the inner margin; claviform outlined with black; the orbicular and the reniform with brownish boundaries and fuscous centres; the subterminal area fuscous, with pale brown outer line and small dentate dark brown spots from veins R_3 to M_3 ; subterminal line indistinct at costa, brownish below, double and waved; cilia light brownish white. Hind wings whitish, the veins and the outer margin brown; cilia white, shining. Abdomen whitish brown.

Head with the frons (Text-fig. 1 a) produced medially, with a prominent conical structure. Antennae with the shaft having some eighty segments, strongly unequally bipectinate nearly up to basal two-thirds or less, *i.e.* those branches on the inner row long, the longest rami as long as three to four segments, the apical part simple and minutely ciliate; in the female the antennae simple and minutely ciliate. Labial palpi obliquely upturned, the third segment short, porrect. Fore wings with the orbicular round; claviform elongate usually small. Legs with the pair of tibial spurs subequal (Text-figs. 2 b, c), there being one pair on the middle tibiae and two pairs on the hind tibiae; spurs white at the base and the tip; fore tibia with a row of spines present laterally (Text-fig. 2, b), those at the extremity long and stout than the rest; middle and hind tibiae each with three rows of spines; tarsi each with three to four rows of spines. Frenulum consisting of three spines in the female.

Genitalia.—Male (Text-figs. 4a-c) with the uncus long and narrow,

the distal end bent slightly downwards, beset with long hair near the distal part and short setae near the tip; tegumen long and narrow, beset with hairs; vinculum u-shaped; saccus conical. Claspers about four times as long as width at the middle, lightly sclerotised; corona well developed, oblique, along the disto-ventral margin on mesal side; harpe horn-shaped, short and blunt, curved upward; clavus small and



TEXT-FIG. 4. *Agrotis segetum* (Schiff.): (a) male genitalia, ventral view, with the clasper stretched (b) uncus, lateral view (c) aedeagus (d) female genitalia, ventral view (e) Ovipositor and the genital enlarged. (Text-figs. a-c of same magnification).

glabrous; claspers broadest in the middle; costal margin produced basally into a slender, elongated membranous fold. Juxta semi-circular,

with a pointed tip towards the saccus and distally with distinct anellus lobes. Aedeagus short and stout, about four times as long as its width at the middle, with only slight differentiation into the base and the apex, the latter sclerotised and with a cluster of spinous protuberances. Female (Text-figs. 4 d-e) with the ostium bursae simple, the margin sclerotised; ductus bursae short, with sclerotised bands on the lateral and ventral side, leading into long, slender and non-tubular corpus bursae, the latter without signum but striated throughout and with sclerotised stripe on one side; from the point of union of the corpus bursae with the ductus bursae arises receptaculum seminalis which is flattened, irregularly shaped and longitudinally striated; ductus spermathecus arises from the latter and enters into the genital tube to open into common oviduct, the latter opening at the ovopore.

Wing expanse.—Males, 34-40 mm.; females, 34-38 mm.

Distribution.—Throughout India, Burma and Ceylon.

Material examined.—39 examples. INDIA: Himachal Pradesh; Solan, 1 ♂, —.vii. 1887 (*Swinhoe*), Kangra Valley, 2895.55 m. (9500 ft.), 1 ♀, —.vi. 1899, 3 ♂♂, 2 ♀♀, —.vii. 1899 (*G. C. Dudgeon*), Kulu, 1 ♂ (*Young*) [no further data]. Bihar; Champaran, 2 ♀♀, —.viii. 1891 (*L. deNiceville*) (on Indigo), Ranchi, 2 ♀♀ [no further data]. Maharashtra; Mahabaleshwar, 2 ♀♀, —.v. 1887 (*Swinhoe*), Poona, 536.44 m. (1760 ft.), 1 ♀ —.v. 1951 (*S.S.J.E.*), 548.63 m. (1800 ft.), 1 ♂ 26.x.1951 (*S.S.J.E.*), Bombay, 1 ♂, 3.iii.1951 (*S.S.J.E.*), 1 ♂, 14.iii.1951 (*A.E. Bean*), 1 ♂ 19.iii.—(*A.E. Bean*). Mysore; Mysore, 3 ♀♀, 2 ♂♂ [no date of collection] (*R.H. Morris*) (on coffee). Sikkim: 1 ♂, 1 ♀ [no date of collection] (*O. Möller*); 1 ♂, 1 ♀, 15.vii.1888 (*G.C. Dudgeon*).

YARKAUD: 2 ♂♂, 29.v.1874 (Yarkaud Mission, no further data available).

CEYLON: Pundaluoya, 1 ♂, 1 ♀, —.xii.1893, 1 ♂, —.ii.1902; Madulsima, 1 ♂, —.xi.1907, 1 ♀ [no further data] — (all *E.E. Green*); 2 ♂♂ (Colombo Museum) [no further data].

GERMANY: PRUSSIA: 1 ♂, 1 ♀ [no further data].

Host-range.—Bajra (*Pennisetum typhoideum* Rich.): Lal, 1955; Singh, 1963. Beet (*Beta vulgaris* Linn.): Fletcher, 1921. Cabbage (*Brassica oleracea* Linn.): Fletcher, 1914, 1917. Coffee (*Coffea arabica* Linn.): Cotes, 1896; Fletcher, 1914, 1917, 1921; Lal, 1955; Singh, 1963. Cotton (*Gossypium indicum* Lamk.): Sohi, 1964. Gram (*Cicer arietinum* Linn.): Lal, 1955; Singh, 1963; Srivastava, 1964. Indigo (*Indigofera tinctoria* Linn.): Barlow, 1900. Jowar (*Sorghum vulgare* Pers.): Lal, 1955; Singh, 1963. Lesser millets (*Panicum miliare* Linn.): Lal, 1955; Singh, 1963. Maize (*Zea mays* Linn.): Lal, 1955; Singh, 1963. Menthol (*Mentha arvensis* Linn.): Mathur & Anand, 1964. Peas (*Pisum sativum* Linn.): Lal, 1955; Singh, 1963. Potato (*Solanum tuberosum* Linn.): Fletcher, 1914, 1917; Lal, 1955. Sugarcane (*Saccharum officinarum* Linn.): Fletcher, 1921. Tobacco (*Nicotiana tabacum* Linn.): Fletcher, 1921.

Remarks.—Referrable to the genus *Agrotis* Ochseneimer, it has sometimes been placed under *Euxoa* Hübner, along with two other common species, viz., *A. corticea* and *A. spinifera*, probably, since the publication of Hampson's (1903) catalogue (p. 177). He characterised the species as having pectinate antennae in male with moderate branches up to the basal half, the distal half serrate. These, however, do not

possess "bifurcate claspers". There seems to be no record of studies on the genitalia of this species.

It can be distinguished from the other species by the well defined colour pattern on the wings, especially the rounded orbicular; besides hind wings are semi-hyaline. Its male genitalia are characterised by the elongate lobes of the anellus. In the female genitalia, the ductus bursae is marked with sclerotised bands, corpus bursae is without the signum but there is a sclerotised stripe near the apical part on it.

Boursin (1955) transferred this species to the genus *Scotia* without assigning reason for the same but in the light of work done by Common (1958) there is no doubt it belongs to the genus *Agrotis*.

2. *Agrotis corticea* (Schifferrmüller)

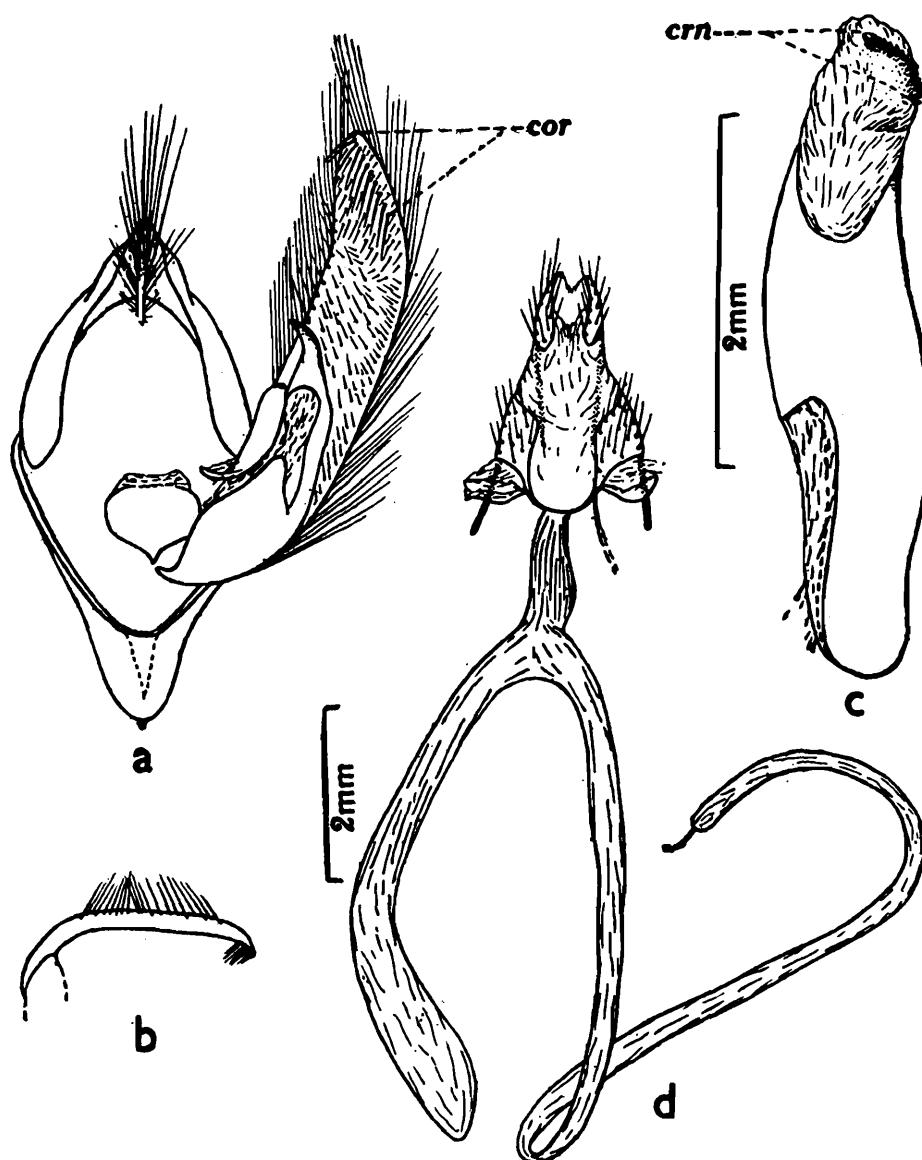
(Plate I, Fig. 2; Text-figs. 1b, 5 a-d)

1776. *Noctua corticea* Schifferrmüller, *Wien. Verz.*, p. 81. (Type loc.—Europe).
 1850. *Agrotis sincerii* Freyer, *Neu. Beitr. Schmett.*, pl. 544, f. 2. (Type loc.—Switzerland) (Syn. of *Euxoa corticea* (Schiff.), *vide* Hampson, 1903).
 1852. *Agrotis corticea* (Schiff.), Guénee, *Noctuelites-I*, 5, p. 281.
 1856. *Agrotis transversa* Walker, *List Lep. Brit. Mus.*, 10, p. 354. (Type loc.—Ignotus) (Syn. of *Euxoa corticea* (Schiff.), *vide* Hampson, 1903).
 1858. *Noctua obscura* Freyer, *Neu. Beitr. Schmett.*, pl. 628, ff. 1, 2 (Type loc.—Switzerland) (Syn. of *Euxoa corticea* (Schiff.), *vide* Hampson, 1903).
 1891. *Agrotis corticea* (Schiff.) : Hampson, *Ill. Lep. Het. Brit. Mus.*, 8, p. 14.
 1892. *Agrotis amurensis* Staudinger, *Rom. Mem.*, 6, p. 421. (Type loc.—Amur, U.S.S.R.) (Syn. of *Euxoa corticea* (Schiff.), *vide* Hampson, 1903; Warren, 1909).
 1894. *Agrotis corticea* (Schiff.) : Hampson, *Fauna Brit. India, Moths*, 2, p. 181.
 1903. *Euxoa corticea* (Schiff.) : Hampson, *Cat. Lep. Phal.*, 4, p. 172.
 1905. *Euxoa corticea* (Schiff.) : Hampson, *J. Bombay nat. Hist. Soc.*, 16, p. 455.
 1909. *Euxoa corticea* (Schiff.) : Lefroy, *Indian Insect Life*, p. 445.
 1909. *Euxoa corticea* (Schiff.) : Warren, in Seitz *Macrolepidoptera of the World*, 3, p. 26.
 1933. *Agrotis corticea* (Schiff.) : Corti, in Seitz *Macrolepidoptera of the World*, Suppl. 3, p. 44.

Head with the frontal tufts dark brown, mixed with blackish scales. Antennae dark brown. Labial palpi blackish brown on the outer sides, paler below, at the tips and on the inner side. Vertex and the collar dark brown, mixed with darker scales, the latter marked across the middle by a curved blackish brown line, the basal area paler. Thorax dark brown. Fore wings brown; stigmata less prominently outlined by dark brown lines; orbicular and reniform with pale annuli; the antemedial lines darker, interrupted in the middle by pale scales; the postmedial lines brown, rather poorly marked and almost like the ground colour; the area beyond the postmedial and up to the submarginal line pale brown, marked across by numerous striae of pale brown to brown colour; submarginal area brown, with the terminal line darker; the terminal series of dots almost of the same colour as the terminal line; cilia darker at the base than in the middle and at the tip. Hind wings with the veins and the submarginal line pale brown; cilia pale brown, darker in the middle. Legs darker than those in *A. segetum* (Schiff.) but with whitish band like in *A. segetum*, at the end of each segment of the tarsus and the tibial spur, the latter whitish at the base also. Abdomen pale brown.

Head with the frons (Text-fig. 1 b) sub-rounded, with an oblong scar

in the middle. Antennae bipectinate in the male, simple in the female. Labial palpi well developed, obliquely upturned, the second segment with projecting scales below and slightly in the front, the third segment porrect, slender. Fore wings with the stigmata almost as in *A. segetum* (Schiff.) except that claviform more elongate, orbicular usually small and round, the reniform slightly angled inwards at its lower extremity on the median nervure; antemedial lines double, not reaching costa; postmedial line double, dentate on the inner side; a series of dentate spots on terminal line present in between each vein, from apex to below vein Cu_1 , or along the termen. Legs with the tibial spines, the spurs and the rows of tarsal spines as in *A. segetum* (Schiff.).



TEXT-FIG. 5. *A. corticea* (Schiff.): (a) male genitalia, ventral view (b) uncus, lateral view (c) aedeagus (d) female genitalia, ventral view (Text-figs. a-c of same magnification).

Genitalia.—Male (Text-figs. 5 a-c) with the uncus, tegumen, vinculum and the claspers more or less similar to *A. segetum* (Schiff.). The claspers, however, more elongate, slightly raised in the middle and beset with fine, cream-white, long hairs; corona oblique, present

mesally on the disto-ventral margin. Juxta almost spherical, without lobes. Aedeagus stout, slightly widened between the base and the short distal part, the latter with the vesica protruded and beset with short spines. Female (Text-fig. 5 d) simple. Ostium bursae leading through unsclerotised ductus bursae, the latter with bands, into a long tubular corpus bursae which is broader proximally and without signum or sclerotised bands; the receptaculum seminalis long and tubular.

Wing expanse.—Male, 31 mm.; Female, 33 mm.

Distribution.—Reported as occurring in Europe and many states of India, (Hampson, 1903, p. 176) such as Kashmir, Himachal Pradesh, Punjab, Assam and Madras; also Sikkim.

Material examined.—3 examples. SIKKIM: 1523.98 m. (5000 ft.), 1 ♂, 28.ii.1887, 1 ♀ —.ix.1888 (G.C. Dudgeon); 2133.57 m. (7000 ft.), 1 ♂, —.iv.1890 (O. Möller).

Host range.—Lefroy (1909) recorded it as a 'pest in India'

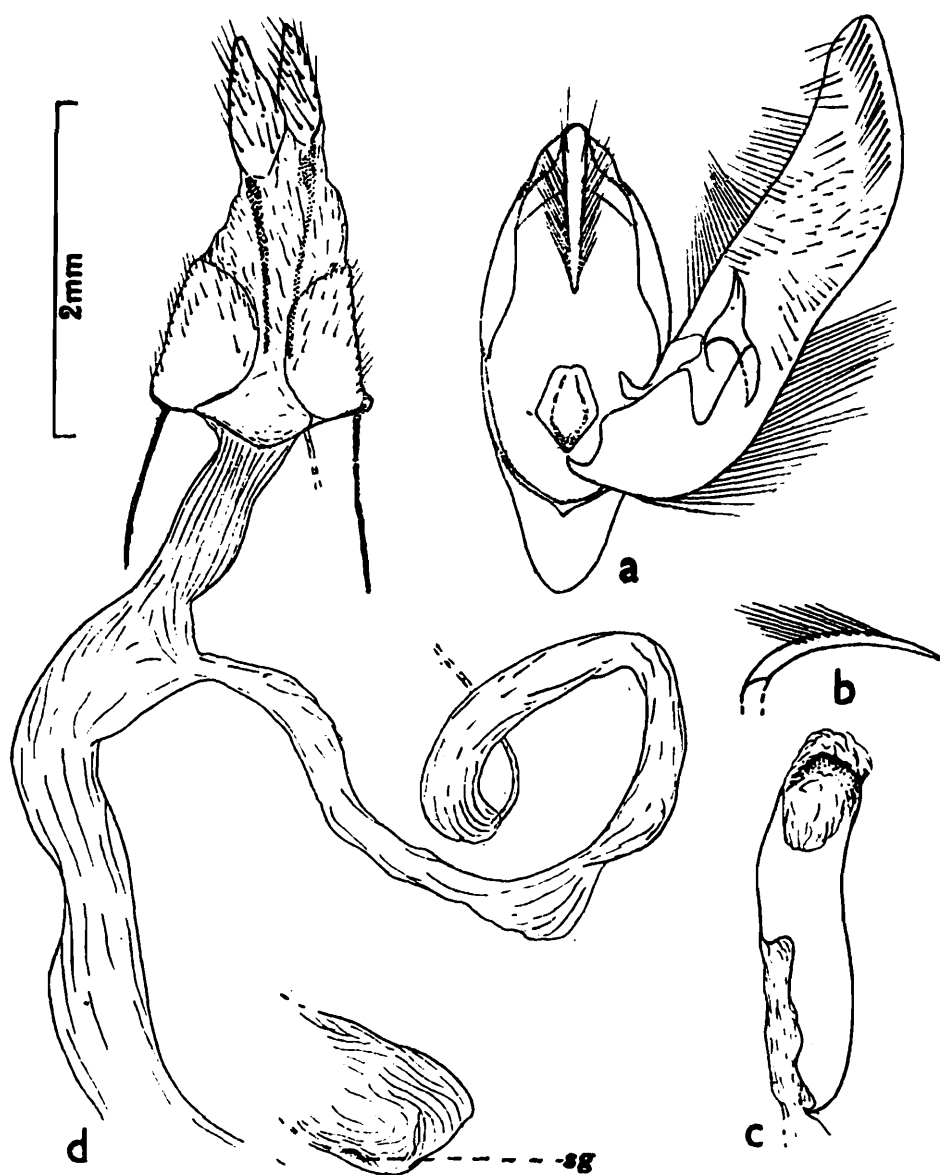
Remarks.—Referrable to the genus *Agrotis* Och., it is less common than *A. segetum* (Schiffermüller), in India. It closely resembles *A. segetum* in the shape of frons, but can be readily distinguished from it by the wings, especially the hind wings which are pale brown and not white and hyaline, as in *A. segetum*; the claviform in the fore wing also long. In the male genitalia the lobes of the anellus are absent, unlike the case in *A. segetum*. In the female genitalia sclerotised bands on the ductus bursae are absent; the corpus bursae and receptaculum seminalis are more or less tubular; the corpus bursae without signum, or sclerotised stripe unlike the case in *A. segetum* (Schiff.).

3. *Agrotis spinifera* (Hübner)

(Text-figs. 1c, 2d, 6 a-d)

1826. *Noctua spinifera* Hübner, *Eur. Schmett. Noct.*, p. 83. (Type loc.—Europe).
1827. *Telmia spinula* Hübner, *Verz. bek. Schmett.*, p. 288. (Syn. of *Euxoa spinifera* (Hübner), *vide* Hampson, 1903).
1848. *Agrotis biconica* Kollar, in C. F. Von Hugel's "*Kaschmir und das Reich der Sick*", 4, p. 480. (Type loc.—Kashmir) (Syn. of *Euxoa spinifera* (Hübner), *vide* Hampson, 1903).
1848. *Agrotis exigua* Kollar, in C.F. Von Hugel's "*Kaschmir und das Reich der Sick*", 4, p. 481. (Type loc.—Kashmir) (Syn. of *Agrotis biconica* Kollar and *Euxoa spinifera* (Hübner), *vide* Hampson, 1894, 1903, respectively).
1852. *Agrotis spinifera* (Hübner) : Guénee, *Noctuelites-I*, 5, p. 265.
1852. *Agrotis speculifera* Guén., *Noctuelites-I*, 5, p. 266. (Type loc.—Sicily) (Syn. of *Agrotis biconica* Kollar and *Euxoa spinifera* (Hübner), *vide* Hampson, 1894, 1903, respectively).
1852. *Agrotis aristifera* Guén., *Noctuelites-I*, 5, p. 266. (Type loc.—Inde-Centrale) (Syn. of *Agrotis biconica* Kollar and *Euxoa spinifera* (Hübner), *vide* Hampson, 1894, 1903, respectively).
1874. *Agrotis ferina* Felder and Rogenhofer, *Reise Novara*, pl. 110, fig. 12. (Type loc.—S. Africa) (Syn. of *Euxoa spinifera* (Hübner), *vide* Hampson, 1903).
1878. *Agrotis hodnae* Oberthur, *Et. Ent.*, 3, p. 45, pl. 5, fig. 8. (Type loc.—Algeria) (Syn. of *Euxoa spinifera* (Hübner), *vide* Hampson, 1903).
1882. *Agrotis spinifera* (Hübner) : Kirby, *European Butterflies and Moths*, p. 204.
1888. *Agrotis aristifera* Guén. : Cotes and Swinhoe, *Cat. Moths of India*, p. 306.
1891. *Agrotis biconica* Koll. : Hampson, *Ill. Lep. Het. Brit. Mus.*, 8, p. 7.

1894. *Agrotis biconica* Koll. : Hampson, *Fauna Brit. India, Moths*, 2, p. 182.
 1900. *Agrotis biconica* Koll. : Swinhoe, *Cat. East & Aust. Lep.*, pt. II, p. 7.
 1901. *Agrotis spinifera* (Hübner) : Staud., *Cat. Lep. Palaearc.*, p. 417.
 1903. *Euxoa spinifera* (Hübner) : Hampson, *Cat. Lep. Phal.*, 4, p. 177.
 1905. *Euxoa spinifera* (Hübner) : *J. Bombay nat. Hist. Soc.*, 16, p. 456.
 1909. *Euxoa spinifera* (Hübner) : Lefroy, *Indian Insect Life*, p. 445.
 1909. *Euxoa spinifera* (Hübner) : Warren, in Seitz *Macrolepidoptera of the World*, 3, p. 27.
 1921. *Euxoa spinifera* (Hübner) : Fletcher, *Proc. 3rd Ent. Mtg., Bull.*, 100, p. 23.
 1933. *Agrotis spinifera* (Hübner) : Corti & Draudt, in Seitz *Macrolepidoptera of the World*, Suppl. 3, p. 52.
 1941. *Euxoa spinifera* (Hübner) : Beeson, *Forest Insects*, p. 644.
 1955. *Agrotis spinifera* (Hübner) : Lal, *Plant Protect. Bull.*, 7, p. 36.
 1963. *Agrotis spinifera* (Hübner) : Singh, *Plant Protect. Bull.*, 11, pp. 7, 34.
 1964. *Agrotis spinifera* (Hübner) : Srivastava, *Entomology in India*, p. 85.
 1964. *Euxoa spinifera* (Hübner) : Sohi, *Entomology in India*, p. 146.



TEXT-FIG. 6. *A. spinifera* (Hübner) : (a) male genitalia, ventral view (b) uncus, lateral view (c) aedeagus (d) female genitalia, ventral view (Text-figs. a-c of same magnification).

Head and thorax grey white, mixed with pale brown and black scales. Frontal tufts brown. Antennae brown. Labial palpi dark brown on the outer sides, whitish at the tips and inner side. The collar with a very faint dark line across the middle, unlike *A. segetum* (Schiffermüller) where it is well marked. Fore wings at the base and along the costa, mixed with dark scales; the stigmata generally marked by a dark boundary; the claviform elongate, with dark brown centre, reaching vein Cu_{1b} ; the orbicular and the reniform with brownish centre and with ochreous annuli; the former elliptical, with its posterior end produced into a point, often open above; the cell filled up, partly, with dark brown scales between the stigmata; the subbasal, antemedial and the postmedial lines faint; the area beyond the postmedial line pale, marked with elongated triangular dark brown patches up to the terminal line; the terminal series of dark brown triangular spots present; the cilia pale brown at the base and a dark brown band across it. Hind wings semihyaline white, with brownish tinge on the inner margin, veins and terminal line; the upper margin with shining brownish scales, grizzled all along the costa up to the apex. Abdomen pale brown. The legs with the tarsal segments and the spines coloured as in *A. segetum*; the tibial spurs and the tibiae pale on the inner side. Under side with the wings shining whitish to pale brown.

Head with the frons sub-rounded, with a small nearly oval scar. The antennae, about 75-80 segmented, bipectinate, with unequal short rami in the male, up to nearly two-thirds from the base, the distal part simple; the rami very short, the longest not exceeding the length of two segments in the middle of shaft; antennae wholly simple in the female. Labial palpi obliquely upturned, the second segment with projecting scales in front, the third segment porrect. The legs with the rows of tarsal spines as in *A. segetum* (Schiff.)

Genitalia.—Male (Text-figs. 6 a-c). More or less similar to *A. segetum* (Schiff.) from which it can be easily differentiated by the claspers which are about five times as long as the width at the middle and by harpe which is slightly shorter. Juxta pentagonal, with the base pointed downwards but without lobes. The aedeagus not differentiated into the base and the apex, the latter with its vesica protruded and spined. Female (Text-fig. 6 d) with the ostium bursae simple; the ductus bursae without sclerotised bands; the corpus bursae with an incomplete and elongate signum.

Wing expanse.—Males, 26.5-28 mm.; females, 27.5-36 mm.

Distribution.—India; Kashmir, Himachal Pradesh, Delhi, Uttar Pradesh, Rajasthan, Madhya Pradesh, Bihar, Bengal, Assam, Orissa, Andaman & Nicobar Is., Maharashtra, Mysore and Madras; Sikkim & Bhutan.

Besides the above, Hampson (1903) recorded it from the following localities: S. France; Spain; Italy; Sicily; Canaries; Algiers; Egypt; Eritrea; British East Africa; Mashonaland; Transvaal; Natal; Basutoland; Cape Colony; Syria; Persia; Ceylon; and Burma.

Material examined.—27 examples. INDIA: Himachal Pradesh; Solan, 1 ♀ [no date of collection] (*Swinhoe*), Kangra Valley, 1371.58 m. (4500 ft.), 1 ♀, —.iv.1899 (*G. C. Dudgeon*), Kulu, 1 ♀ [no date of collection] (*Young*). Rajasthan; Sardarshahr, 1 ♀, —.i.1957, 2 ♂♂,

15.v.1958, 3.viii.1958 (*T. G. Vazirani*), Dt. Bikaner, Lunkaransar, 1 ♀, 28.ix.1960 (*M. Chander*), Dt. Jaisalmer, 1 ♀, 29.viii.1960 (*B. Biswas*). Madhya Pradesh; Mhow, 2 ♂♂ [no date of collection] (*Swinhoe*). West Bengal; Calcutta, Behala, 1 ♀, 25.xi.1965 (*G. S. Arora*). Maharashtra; Poona, 1 ♀, 9.xi.1951, Bombay, 1 ♂, —.xii.1950, 1 ♀, 9.i.1951, 1 ♀, 19.iii.1951 (all *S.S.J.E.*). Sikkim: 548.63 m. (1800 ft.), 1 ♂, 2 ♀♀, —.vi.1896, —.iv, vi.1897 (*G. C. Dudgeon*).

CEYLON: Colombo, 1 ♂, —.viii.1912, 2 ♂♂, —.ii.1905, Kandy, 1 ♀, —.x.1906, 1 ♀, —.v.1907, 1 ♀, —.x.1907, Mahallupalama, 1 ♂, 1 ♀, —.viii.1900 (all *E. E. Green*).

PAKISTAN: Karachi, 1 ♀, [no date of collection] (*Karachi Mus.*).

Host range.—Cotton (*Gossypium indicum* Lamk.): Burt 1918; Fletcher, 1921; Sohi, 1964. Gram (*Cicer arietinum* Linn.): Fletcher, 1921; Chopra, 1928; Singh, 1963; Srivastava, 1964. Peas (*Pisum sativum* Linn.): Singh, 1963. Grasses: Fletcher, 1917, 1921. Indigo (*Indigofera tinctoria* Linn.): Barlow, 1900, 1903. Poppy (*Papaver somniferum* Linn.): Fletcher, 1917; Lal, 1955; Singh, 1963.

Remarks.—Referrable to the genus *Agrotis* Ochseneimer by the typical characters of stout and longer tibial spines and well-developed corona on the claspers in the male genitalia. It resembles closely both *A. segetum* (Schiff.) and *A. corticea* (Schiff.) in as far as the pectination of antennae in the males and the structure of frons are concerned. But the length of rami is comparatively shorter here than in *A. segetum* (Schiff.); the frontal scar nearly oval, unlike in the preceding species. Fore wings with the stigmata, especially the orbicular and the claviform, different from the preceding species, the former elliptical, often open above, the latter long and slender. Hind wings with the veins drawn. Hampson (1903) classified it under a separate subgroup which he characterised as having "Antennae bipectinate with short fasciculate branches, the apical, part serrate", whereas the antennae, in the male, in the latter part are not serrate but simple and ciliate, the pectination confined only up to the basal half.

The structure of the male genitalia is more like that of *A. segetum* (Schiff.) except that the anellus lobes are absent here as in *A. corticea* (Schiff.). The female genitalia are with an incomplete signum on the corpus bursae but without sclerotised lines or bands; the ductus bursae without bands, unlike the case in *A. segetum* (Schiff.).

4. *Agrotis subspinifera* (Hampson) comb. nov.

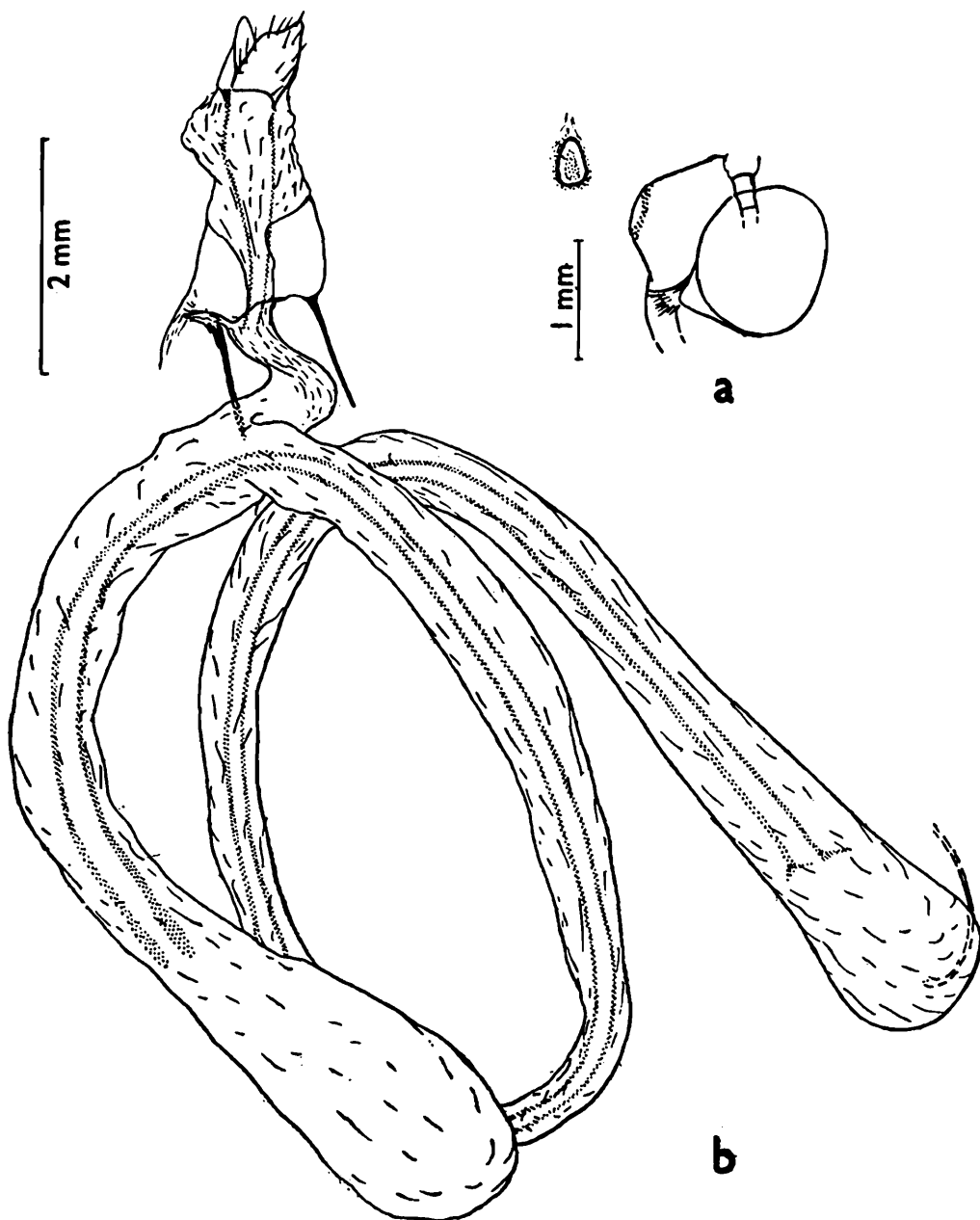
(Plate II, Fig. 1; Text-fig. 7)

1903. *Euxoa subspinifera* Hampson, *Cat. Lep. Phal.*, 4, pp. 205-206, pl. LXI, fig. 19, ♂ (Type loc.—Punjab, Ferozepur).

Head with the frontal tufts, thorax and abdomen ochreous, mixed with white scales. Labial palpi ochreous, mixed with dark scales on the outer side, paler below and on the innerside. Fore wings whitish, suffused with light brown above; costa, at the base and apex, irrorated with patches of dark scales which are continued along the outer margin up to tornus; the claviform very long, light brown in the centre and defined by dark scales; the orbicular long, open above and confluent with the reniform, defined by dark lines; veins beyond

the cell with slightly dark streaks; a subterminal line represented by white lunules from the apical margin to vein Cu_{1b} and defined by dark scales on both the sides, curved inwards in the middle and outwards at vein R_5 , the terminal series represented by dark patches, or lunules, followed by ochreous cilia through which passes a dark line. Hind wings white; the veins ochreous; the terminal line darker. Under side with the head, thorax and abdomen ochreous and the fore wings ochreous mixed with white scales and the hind wings white.

Head with the frons slightly sub-rounded, with a medial conical scar. The antennae simple, ciliate and about half the length of costa. The labial palpi well developed, obliquely upturned, the third segment correct. The hind wings with two frenulum spines. The legs with the tibiae and tarsi each with three rows of spines.



TEXT.-FIG. 7. *A. subspinifera* (Hampson): (a) the shape of frons, lateral view (b) female genitalia, ventral view.

Genitalia.—(Text-fig. 7) Ostium bursae simple, leading through

unsclerotised ductus bursae into a long and narrow corpus bursae, the end of which is enlarged and rounded; corpus bursae simple and without signum or stripes; receptaculum seminalis, meets at the point of union of corpus bursae with the ductus bursae, which is also extremely long being about three times as long as the corpus bursae, two lightly sclerotised ribbons running throughout the length of corpus bursae and receptaculum seminalis.

Wing expanse.—Females, 37-38 mm.

Distribution.—India; Punjab (Ferozepur), Rajasthan (Sikar).

Material examined.—Two examples. INDIA: Rajasthan, Sikar ♀ ♀, 10.xi.1960 (M. Chandra).

Remarks.—The males are not present with us at the time of study and have been described in details by Hampson (1903). From the females, the male can be differentiated by the antennae which are "strongly serrate & fasciculate" Easily referable to the genus *Agrotis* Ochs., on account of the stout fore tibial spines and a well-marked conical scar on the frons. It bears a strong resemblance with *A. spinifera* (Hübner) in coloration. In respect of the structure of the female genitalia it bears a close resemblance to *Agrotis corticea* (Schiff.) especially in the absence of signum on the corpus bursae and in the length of receptaculum seminalis. It appears to be an intermediate species between *A. corticea* (Schiff.) and *A. spinifera* (Hübner); it differs from the latter by the absence of the signum and from both the species by the presence of the sclerotised ribbons in corpus bursae.

Hitherto recorded only from the Punjab (Type loc.—Ferozepur), it is recorded here from the neighbouring State of Rajasthan for the first time.

5. *Agrotis ypsilon* (Rottenburg)

(Plate I, Fig. 3; Text-figs. 1d, 2 e-g, 8 a-d)

1776. *Noctua ypsilon* Rottenburg, *Naturf.*, **11**, p. 141.
 1776. *Noctua suffusa* Schiffermüller, *Wien. Verz.*, p. 80. (Syn. of *A. ypsilon* (Rott.), *vide* Hampson, 1894).
 1782. *Phalaena idonea* Cramer, *Papil. Exot.*, **3**, pl. 275 H. (Syn. of *A. ypsilon* (Rott.), *vide* Hampson, 1894).
 1852. *Noctua robusta* Blanch., *Gay's Chile*, p. 75, pl. 6, fig. 9. (Type loc.—Chile) (Syn. of *A. ypsilon* (Rott.), *vide* Hampson, 1903).
 1856. *Agrotis bipars* Walker, *List Lep. Brit. Mus.*, **10**, p. 334. (Type loc.—Venezuela) (Syn. of *A. ypsilon* (Rott.), *vide* Hampson, 1903).
 1860. *Agrotis frivola* Wallengren, *Wien. ent. Mon.*, **4**, p. 169. (Type loc.—Montevideo) (Syn. of *A. ypsilon* (Rott.), *vide* Hampson, 1903).
 1882. *Agrotis ypsilon* (Rott.): Kirby, *European Butterflies and Moths*, p. 205.
 1888. *Agrotis suffusa* (Schiff.): Cotes & Swinhoe, *Cat. Moths of India*, p. 309.
 1894. *Agrotis ypsilon* (Rott.): Hampson, *Fauna Brit. India, Moths*, **2**, p. 182.
 1900. *Agrotis ypsilon* (Rott.): Swinhoe, *Cat. East. & Aust. Lep. Het.*, Part II, p. 8.
 1903. *Agrotis ypsilon* (Rott.): Hampson, *Cat. Lep. Phal.*, **4**, p. 368.
 1909. *Agrotis ypsilon* (Rott.): Lefroy, *Indian Insect Life*, p. 445.
 1909. *Agrotis ypsilon* (Rott.): Warren, in Seitz *Macrolepidoptera of the World*, **3**, p. 37, pl. 8c.
 1917. *Agrotis ypsilon* (Rott.): Fletcher, *Rep. & Proc. 2nd. Ent. Mtg.*, pp. 8, 48, 79, 205, 269, 273, 278-284, 297.
 1921. *Agrotis ypsilon* (Rott.): Fletcher, *Proc. 3rd. Ent. Mtg.*, Bull. **100**, p. 24.
 1933. *Agrotis ypsilon* (Rott.): Corti & Draudt, in Seitz *Macrolepidoptera of the World*, Suppl. **3**, p. 43.
 1941. *Agrotis ypsilon* (Rott.): Beeson, *Forest Insects*, pp. 644-645.
 1945. *Rhyacia (Agrotis) ypsilon* (Rott.) Sevastopulo, *J. Bengal nat. Hist. Soc.*, **19**, p. 120.

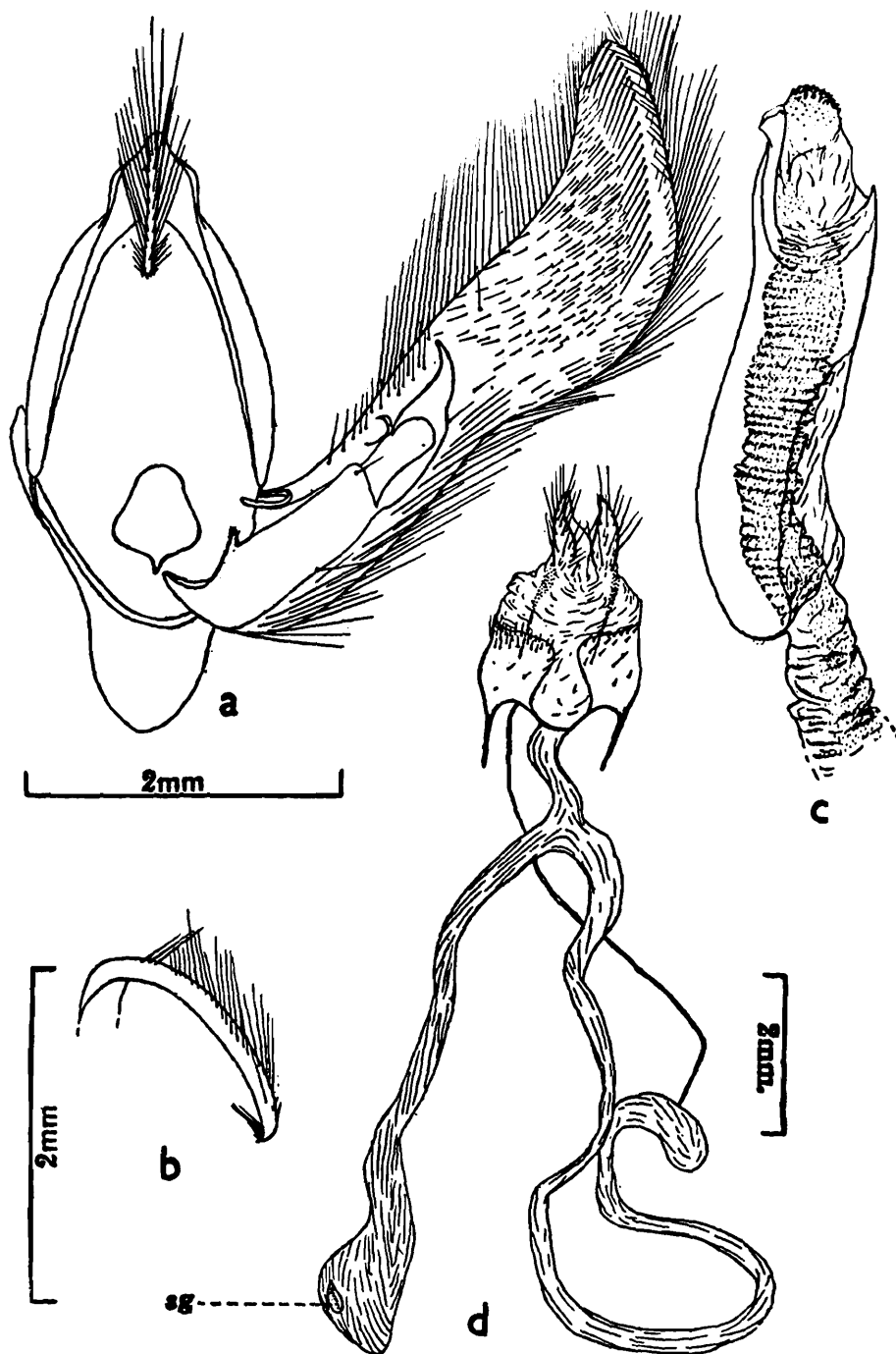
1954. *Agrotis ypsilon* (Rott.): Sibatani *et al.*, *Ann. ent. Soc. Amer.*, **47**, pp. 96, 98.
 1955. *Agrotis ypsilon* (Rott.): Kapur, *Indian J. Ent.*, **17**, pp. 289-294.
 1955. *Agrotis ypsilon* (Rott.): Lal, *Plant Protect. Bull.*, **7**, pp. 5, 9, 35.
 1958. *Agrotis ypsilon* (Rott.): Common, *Aust. J. Zool.*, **6**(1), pp. 72-75, 82.
 1958. *Agrotis ypsilon* (Rott.): Bhasin, Roonwal and Singh, *Indian For. Bull. (N.S.)*, **171**(2), pp. 65, 102.
 1959. *Agrotis ypsilon* (Rott.): Mathur and Singh, *Indian For. Bull. (N.S.)*, **171**(7), p. 76.
 1963. *Agrotis ypsilon* (Rott.): Singh, *Plant Protect. Bull.*, **11**, pp. 4, 5, 7, 24, 33, 34.
 1964. *Agrotis ypsilon* (Rott.): Srivastava, *Entomology in India*, pp. 85, 86.
 1964. *Agrotis ypsilon* (Rott.): Lal, *Entomology in India*, p. 187.
 1964. *Agrotis ypsilon* (Rott.): Mathur and Anand, *Entomology in India*, p. 276.

Head greyish brown. Frontal tufts brown, mixed with grey scales. Antennae dark brown; a dark brown streak on the inner side of the antennal base, running posteriorly. Labial palpi blackish brown, paler below and on the inner side. Collar marked across the middle by a narrow brownish line, with the inner line hardly reaching the middle, the outer line dark brown. Thorax and abdomen grey brown; with tufts on the tegulae; the basal segments of the abdomen and the tip pale brown to brown, or smoky brown. Fore wings brown, marked across by the slightly darker subbasal, antemedial and postmedial lines; the area beyond postmedial and submarginal lines paler, with dark brown double marks on veins Cu_{1a} , Cu_{1b} and $1A$, the inner ones touching the outer line of the postmedial lines; the stigmata with brown centres; the claviform with dark brown boundary; a small wedge-shaped dark brown patch beyond the reniform; submarginal line pale, the inner side between veins M_1 - M_2 and M_2 - M_3 dark brown, with a smoky brown patch at their bases; subterminal series of spots brown; cilia brown. Hind wings semi-hyaline white, with its base, along the costa, shining; the veins in the outer half and the terminal line brown. Under side with the fore wings whitish to pale brown at the base, irrorated with brown scales at the apex and the submarginal area. Body pale fuscous. Fore legs pale brown on the upper side, brown on the under side; tarsal segments and the tibial spurs as in *A. segetum* (Schiff.).

Head with the frons (Text-fig. 1 d) smooth, sub-rounded. Antennae about 90 segmented, bipectinate, with unequal rami nearly up to basal two-thirds in the male (Text-fig. 2 e); pectination comparatively shorter than in *A. segetum* (Schiff.), the longest rami as long as two to three segment at the middle of shaft, those on the inner side longer, on the outer side shorter, almost half the length of inner side; pectination at the base, on the outer side, negligibly small; antennae in the female wholly simple and minutely ciliate. Labial palpi obliquely up-turned. Fore wings with the stigmata present; the orbicular elliptical; the claviform moderate to elongate, reaching about mid-way between the antemedial and vein Cu_{1b} ; all the stigmata well defined by a black boundary. Legs (Text-figs. 2 f-g) with the tibiae and the tarsi having two and four rows of spines, respectively.

Genitalia.—Male (Text-figs. 8 a-c) with the uncus strongly curved, bent downward and beset with long hair; tegumen and vinculum long and narrow; saccus large. Claspers with the dorsal margin smooth but the ventral, near the distal end, strongly excurved and much broader than the base; corona consisting of a row of strong spines,

the number of spines being much more than in the preceding species ; costa produced into a short process ; harpe horn-shaped, rather straight. Juxta conical, without lobes. Aedeagus simple, about three times as long as its width at the middle, lightly sclerotised and undifferentiated, apex broadened, the vesica beset with short



TEXT-FIG. 8. *A. ypsilon* (Rott.) : (a) male genitalia, ventral view (b) uncus, lateral view (c) aedeagus (d) female genitalia, ventral view (Text-figs. b-c of same magnification).

black spines on the whole surface. Female (Text-fig. 8 d) with the ostium bursae simple, unsclerotised ; ductus bursae simple, short and bifurcates into two elongate but flattened tubular structures, the shorter one being the corpus bursae which is broad proximally and striated obliquely ; two signa present on the corpus bursae ; the receptaculum

seminalis long and uniformly broad, except at the base, and striated longitudinally.

Wing expanse.—Males, 40.5—42 mm.; Females, 41—48.5 mm.

Distribution.—Universally distributed.

Material examined.—50 examples. INDIA: Kashmir; 1 ♀, -. 1897 (*J. G. Pilcher*), 3 ♂ ♂ [no further data except “destructive to hop plants in Kashmir”] (*J. L. Kaye*). Himachal Pradesh; Simla, 2377.40 m. (7800 ft.), 1 ♂, -.iv.1898 (*J. G. Pilcher*), Kangra Valley, 1371.58 m. (4500 ft.), 1 ♀, -.vi.1899 (*G. C. Dudgeon*), Kulu, 2 ♂ ♂, 2 ♀ ♀ [no date of collection] (*Young*), Rhotang Pass, 4267.12 m. (14000 ft.), on snow, 1 ♂, 5.vi.1955, 1 ♀, 19.vi.1955, 4206.16 m. (13800 ft.), 8 ♂ ♂, 18 ♀ ♀, 19.vi.1955 (all *A. P. Kapur*) [Many more examples preserved in spirit]. Uttar Pradesh; Gonda, 2 ♀ ♀ [no date of collection] (*J. Cockborn*), 1 ♀ [no date of collection] (*J. Christian*), Sahabad, 3 ♂ ♂ [no date of collection] (*J. Christian*). Bihar; Patna, 1 ♂, -.iii.1958 (*Cent. Potato Res. Inst.*). Bengal; Calcutta, 1 ♂, [no date of collection] (*L. deNiceville*). Sikkim: 1 ♂, -.xi.1895 (*G. C. Dudgeon*).

CEYLON: Hakgala, 2 ♀ ♀, -.iii.1907, 1 ♀, -.v.1907 (all *E. E. Green*).

Host range.—Atropine (*Atropa belladonna* Linn.): Mathur and Anand, 1964. Bajra (*Pennisetum typhoideum* Rich.): Lal 1955; Singh, 1963. Barley (*Hordeum vulgare* Linn.): Cotes, 1891; Lal, 1955; Singh, 1963. Beet Root (*Beta vulgaris* Linn.): Fletcher, 1921. Cabbage (*Brassica oleracea* Linn.): Fletcher, 1917, 1921. Cha-chai (*Camellia sinensis* Linn.): Bhasin, Roonwal and Singh, 1958. Clover: Fletcher, 1921. Coffee (*Coffea arabica* Linn.): Cotes, 1891. Deodar (*Cedrus deodara* Roxb.): Bhasin, Roonwal and Singh, 1958. Gram (*Cicer arietinum* Linn.): Cotes, 1891; Fletcher, 1917, 1921; Lal, 1955; Singh, 1963; Srivastava, 1964. Ground nut (*Arachis hypogaea* Linn.): Fletcher, 1921. Guava (*Psidium guyava* Linn.): Mathur and Singh (1959). Hop plant (*Humulus lupulus* Linn.): Barlow, 1900. Indigo (*Indigofera tinctoria* Linn.): Fletcher, 1917. Jower (*Sorghum vulgare* Pers.): Lal, 1955; Singh, 1963. Lessermilletts (*Panicum miliare* Linn.): Lal, 1955; Singh, 1963. Linseed (*Linum usitatissimum* Griseb.): Fletcher, 1921. Lucerne (*Medicago sativa* Linn.): Fletcher, 1917, 1921. Maize (*Zea mays* Linn.): Lal, 1955; Singh, 1963. Mustard (*Brassica campestris* Linn.): Fletcher, 1921. Oats (*Avena sativa* Linn.): Cotes, 1891; Singh, 1963. Onion (*Allium cepa* Linn.): Fletcher, 1917. Opium (*Papaver somniferum* Linn.): Cotes, 1889, 1891; Barlow, 1900, 1903; Fletcher, 1921; Lal, 1955; Singh, 1963. Peas (*Pisum sativum* Linn.): Cotes, 1891; Fletcher, 1917, 1921; Lal, 1955; Singh, 1963. Potato (*Solanum tuberosum* Linn.): Cotes, 1889, 1891; Fletcher, 1917, 1921; Lal, 1964. Tea (*Camellia theifera* Griff.): Cotes, 1891. Tobacco (*Nicotiana tabacum* Linn.): Fletcher, 1917, 1921; Lal, 1955; Singh, 1963. Wheat (*Triticum vulgare* Vill.): Cotes, 1891; Fletcher, 1921; Lal, 1955; Singh, 1963.

Remarks.—Referrable to the genus *Agrotis* Ochsenheimer, it is one of the most serious pest of agricultural crops and plants of forest and medicinal importance, which is distributed almost throughout the world. It was recorded from India as early as 1874 by Scott who referred it to Cotes (1889).

It resembles the preceding species in the bipectinate nature of the antennae, but differs from them in the frons being smooth and without any structure; in the stoutness of the body; tarsi with four rows of

spines. In respect of the male genitalia it bears general resemblance to the preceding species but for the juxta which is conical here; besides, the coronal spines are in thick cluster. The female genitalia is characterised by the presence of two signa on the corpus bursae; also the receptaculum seminalis is longer than the corpus bursae.

The species shows slight variation in its colour markings on the wings, especially in the large number of examples collected on snow (coll. *A. P. Kapur*), but in the various specimens examined the character of the genitalia (both male and female) were observed to be uniform.

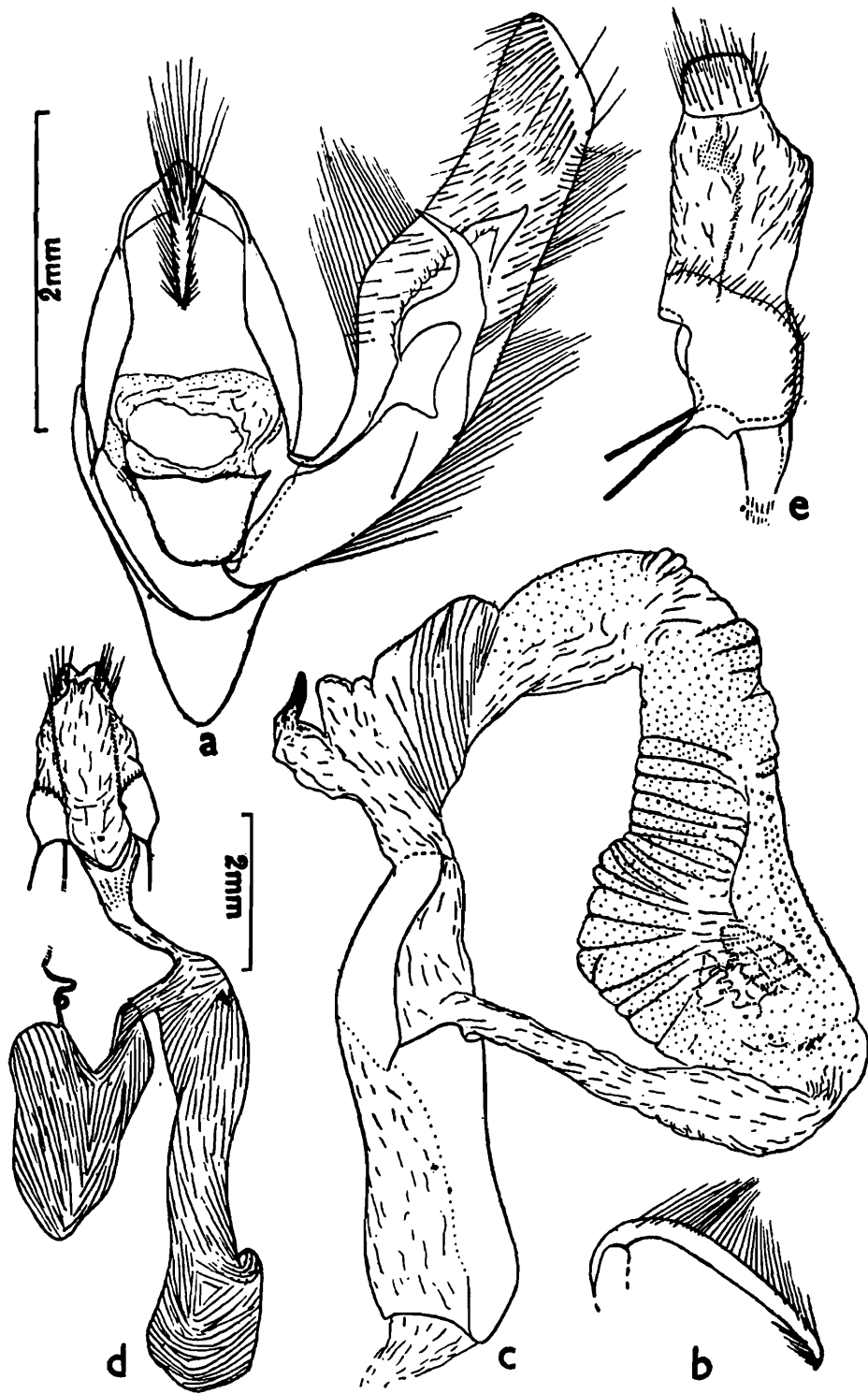
6. *Agrotis flammata* (Schiffermüller)

(Plate 1, fig. 4; Text-figs. 1 e, 2 h-j, 9 a-e)

1776. *Noctua flammata* Schiffermüller, *Wien. Verz.*, p. 80.
 1787. *Noctua flammata* Fabricius, *Mant. Inst.*, 2, p. 155.
 1822. *Ogygia flammata* (Schiff.) Hübner, *Verz. bek. Schmett.*, p. 225.
 1850. *Agrotis deleta* Kollar, *Denkschr. Wiss.*, 1, p. 53. (Syn. of *Agrotis flammata*, vide Hampson, 1903).
 1856. *Agrotis basiclavis* Walker, *List Lep. Brit. Mus.* 10, p. 346. (Type loc.-Hindustan) (Syn. of *Agrotis flammata* (Schiff.), vide Hampson, 1894, 1903).
 1882. *Agrotis flammata* (Schiff.) Kirby, *European Butterflies and Moths*, p. 199.
 1888. *Ochropleura flammata* (Schiff.) Cotes & Swinhoe, *Cat. Moths of India*, p. 313.
 1894. *Agrotis flammata* (Schiff.): Hampson, *Fauna Brit. India, Moths*, 2, p. 189.
 1900. *Chera flammata* (Fabricius) [*nec.* Schiff.] Swinhoe, *Cat East & Aust. Lep. Het.*, pt. II, p. 13.
 1903. *Agrotis flammata* (Schiff.): Hampson, *Cat. Lep. Phal.*, 4, p. 393.
 1909. *Agrotis flammata* (Fabr.) [*nec.* Schiff.]: Lefroy, *Indian Insect Life*, p. 445.
 1909. *Rhyacia flammata* (Schiff.) Warren, in Seitz *Macrolepidoptera of the World*, 3, p. 43, pl. 9g.
 1917. *Agrotis flammata* (Schiff.): Fletcher, *Rep. & Proc. 2nd Ent. Mtg.*, pp. 48, 94, 122.
 1921. *Agrotis flammata* (Schiff.): Fletcher, *Proc. 3rd Ent. Mtg.*, pp. 24-25.
 1933. *Rhyacia flammata* (Schiff.): Corti & Draudt, in Seitz *Macrolepidoptera of the World*, Suppl. 3, p. 64.
 1941. *Agrotis flammata* (Schiff.): Beeson, *Forest Insects*, p. 644.
 1954(b). *Ochropleura flammata* (Schiff.): Boursin, *Bull. Soc. Fouad Ier. entom.*, p. 84.
 1955. *Ochropleura flammata* (Schiff.): Boursin, *Veröff. zool. Stsamml. Münch. Teil-II*, 8, p. 13, pl. vi, fig. 13.
 1955. *Agrotis flammata* (Schiff.): Lal, *Plant Protect. Bull.*, 7, pp. 5, 7, 9, 35.
 1963. *Agrotis flammata* (Schiff.): Singh, *Plant Protect. Bull.*, 11, pp. 4, 5, 7; 24, 33.
 1964. *Agrotis flammata* (Schiff.): Srivastava, *Entomology in India*, p. 85.
 1964. *Agrotis flammata* (Schiff.): Sohi, *Entomology in India*, p. 146.

Head with the frontal tufts pale brown. Antennae brown. Eyes blackish brown. Labial palpi pale brown, pale below and on the inner side. Collar with posteriorly projecting scales, dark brown, coloured at their bases, thus forming a triangular patch on each side. Thorax pale brown to brown. Fore wings pale brown to brown or red brown; costal fascia greyish brown; an elongate dark brown spot present at the base between the median nervure and the inner vein 1A+2A; stigmata with the outlines dark brown, except on the outer side of reniform; centres pale, except in reniform where it is more or less fuscous; cell area, from antemedial to the postmedial, brown; a series of small triangular brown spots present at the margin;

cilia pale brown with a continuous streak across the centre. Hind wings pale brown to brown, un-marked; cilia pale brown. Legs brown on the upper side, with the whitish segmental ring on each tarsus;



TEXT-FIG. 9. *A. flammatra* (Schiff.) : (a) male genitalia, ventral view (b) uncus, lateral view (c) aedeagus (d) female genitalia, ventral view (e) ovipositor and the genital plate enlarged (Text-figs. a-c, e of same magnification).

under side almost uniformly pale brown. Abdomen, both the upper and the under side, and the wings pale brown, the latter shining and devoid of any pattern, whatsoever of the upper side.

Head with the frons (Text-fig. 1e) smooth, sub-rounded and slightly produced in the middle; frontal tufts thickest below the bases of antennae, across and along the side of the frons, those on sides converging in the middle into a straight line. Antennae (Text-fig. 2h) simple in both the sexes, profusely ciliate in the male, minutely in the female. Labial palpi long and upturned, the third segment short, without projecting scales in front. Fore wings with the orbicular semi-circular, open above; claviform small, elongate, reaching only mid-way between the antemedial and the vein Cu_{1b} ; the antemedial, postmedial and submarginal lines double, waved, extending from the costal to the inner margin, except the antemedial which is interrupted at the costa. Thorax with the tufts of scales reaching up to the base of abdomen, the latter with the segmental tufts. Legs with one and two pair of spurs in the middle and the hind tibiae, respectively; tibiae and tarsi with only two and three rows (Text-figs. 2 i-j) of spines respectively.

Genitalia.—Male (Text-figs. 9 a-c) with the uncus curved downwards, beset with blackish brown setae on the dorso-lateral and on the under side near the tip; tegumen and vinculum as in the preceding species. Clasper elongate, about four times as long as its width at the middle; beset with long hair on both sides, with the mid-dorsal part slightly raised; harpe horn-shaped, curved strongly and pointed; a weakly developed ampulla present. Juxta almost quadrangular, narrowed basally, without lobes but sclerotised on sides. Aedeagus large, about thrice as long as its width at the middle, sclerotised only on one side longitudinally, leaving the remaining portion membranous; vesica large, beset with fine blackish short spines, scattered throughout except at the distal part which is with a single cornutal process. Female (Text-fig. 9 d) with the ostium bursae simple, having slightly sclerotised margin; ductus bursae slightly sclerotised; corpus bursae long, broad and semi-circular below, raised on one side into a small protuberance and obliquely striated throughout forming a definite pattern of small islands here and there; receptaculum seminalis more or less triangular.

Wing expanse.—Males, 41-55 mm.; females, 50-53 mm.

Distribution.—India; Kashmir, Himachal Pradesh, Punjab, Delhi, Uttar Pradesh, Rajasthan, Gujarat, Madhya Pradesh, Bihar, Bengal, Assam, Orissa, Andaman & Nicobars, Maharashtra, Mysore, Andhra Pradesh, Madras, Kerala. Also Sikkim and Bhutan.

Material examined.—26 examples. INDIA: Himachal Pradesh; Kangra valley, 1371.58 m. (4500 ft.), 1 ♂, 1 ♀—iv.1899, 1 ♂, 1 ♀, —v.1899, 1 ♂, 1 ♀—vi.1899, (all *G.S. Dudgeon*). Punjab, Punj-pul Nallah, 1981.16 m. (6500 ft.). At light, 1 ♀, —v.27 (*S. L. Hora*). Haryana; Kharar (Ambala), 1 ♂ 12.iv.1945 (*Miss Mathew*). Uttar Pradesh; Fategarh, 1 ♂ (*J. Cockborn*), Gonda, 2 ♂ ♂, 1 ♀ (*J. Cockborn*). Bihar; Chupra (Chhapra), 3 ♂ ♂, 2 ♀ ♀ (*J. A. Bourdillon*). Sikkim: 1 ♂ [no date of collection] (*O. Möller*), 548.63 m. (1800 ft.), 1 ♂, 1 ♀—v.1897 (*G. C. Dudgeon*). Bhutan: 1 ♂, —.1899 (*G. C. Dudgeon*). CHITRAL MISSION: 1523.98 m. (5000 ft.), 1 ♂, 18.vii. 1885, 1 ♂, 11.x.1885. NEPAL: Phalong karmo, near mouth of Khumbu glacier, 4571.94 m. (15,000 ft.), Khumbu, At light, 1 ♀, 3.iv.1954; Longmocha, longmocha valley, 4876.71 m. (16000 ft.), Khumbu, 2 ♂ ♂, 20.iii.1954 (all *B. Biswas*).

Host range.—Atropine (*Atropa belladonna* Linn.): Mathur & Anand, 1964. Bajra (*Pennisetum typhoideum* Rich.): Lal, 1955; Singh, 1963. Barley (*Hordeum vulgare* Linn.): Lal, 1955; Singh, 1963. Bhindi (*Hibiscus esculentus* Linn.): Fletcher, 1917. Cotton (*Gossypium indicum* Lamk.): Sohi, 1964. Gram (*Cicer arietinum* Linn.): Cotes, 1889, 1903; Fletcher, 1917, 1921; Lal, 1955; Singh, 1963; Srivastava, 1964. Jowar (*Sorghum vulgare* Pers.): Lal, 1955, Singh, 1963. Lesser millets (*Panicum miliare* Linn.): Lal, 1955, Singh, 1963. Linseed (*Linum usitatissimum* Griseb.): Cotes, 1889, 1903. Maize (*Zea mays* Linn.): Lal, 1955; Singh, 1963. Mustard (*Brassica campestris* Linn.): Cotes, 1889, 1903. Niger seed (*Guizotia abyssinica* Cass.): Fletcher, 1917. Oates (*Avena sativa* Linn.): Lal, 1955; Singh, 1963. Peas (*Pisum sativum* Linn.): Cotes, 1889, 1903; Lal, 1955; Singh, 1963. Poppy (*Papaver somniferum* Linn.): Cotes, 1889, 1891, 1903; Fletcher, 1921. Piazzi (*Asphodelus fistulosus* Linn.): Fletcher, 1921. Potato (*Solanum tuberosum* Linn.): Fletcher, 1921; Lal, 1955; Singh, 1963; Lal, 1964. Tobacco (*Nicotiana tabacum* Linn.): Fletcher, 1921; Lal, 1955; Singh, 1963. Wheat (*Triticum vulgare* Vill.): Lal, 1955; Singh, 1963.

Remarks.—Boursin (1954 b) states that most of the species recorded from Punjab, Kashmir and Spiti, actually belong to *Ochropleura herculea* Corti & Draudt and not to *Ochropleura flammatra* (Schiff.). He differentiates *herculea* by the reddish brown ground colour of the fore wing and its strong colour markings, and the male genitalia. Later, in 1955, he figured the male genitalia of the specimens of *O. herculea* Corti & Draudt from Kashmir and Nepal and of *O. flammatra* (Schiff.) from France. He lays considerable stress on the coloration in these species but from the extensive material before us we find this character to be quite variable. However, until types of the two species are examined for their genitalic and other characters, it is considered advisable to continue to regard the Indian examples as belonging to *A. flammatra* (Schiff.).

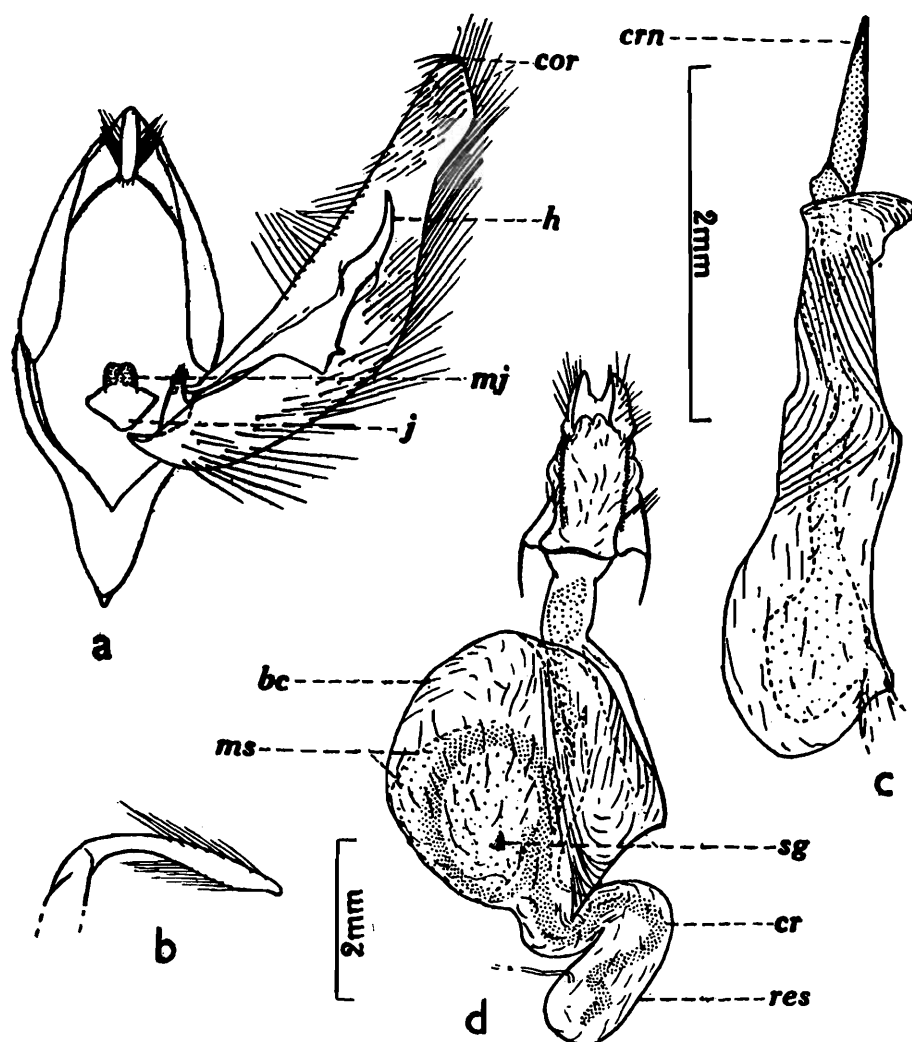
7. *Agrotis plecta* (Linnaeus)

(Plate I, fig. 5; Text-figs. 1 f, 10 a-d)

1761. *Phalaena noctua plecta* Linnaeus, *Fauna Svec.*, p. 321. (Type loc.—Sylvis).
 1822. *Ochropleura plecta* (Linn.): Hübner, *Verz. bek. Schmett.*, p. 223.
 1856. *Ochropleura vicaria* Walker, *List Lep. Brit. Mus.*, 10. (Type loc.—Cape Colony) (Syn. of *A. plecta* (Linn.), vide Hampson, 1903).
 1882. *Agrotis plecta* (Linn.): Kirby, *European Butterflies and Moths*, p. 194. pl. 36, fig. 4a.
 1894. *Agrotis plecta* (Linn.): Hampson, *Fauna Brit. India, Moths*, 2, p. 183.
 1900. *Peridroma plecta* (Linn.): Swinhoe, *Cat. East & Aust. Lep. Het.* pt. II, p. 9.
 1903. *Agrotis plecta* (Linn.): Hampson, *Cat. Lep. Phal.*, 4, p. 405.
 1909. *Rhyacia plecta* (Linn.): Warren, in Seitz *Macrolepidoptera of the World*, 3, p. 44, pl. 9k.
 1933. *Rhyacia (Diarsia) plecta* (Linn.): Corti & Draudt, in Seitz *Macrolepidoptera of the World*, Suppl. 3, p. 79.

Head with the frontal tufts greyish brown. Antennae dull brown. Eyes brown. Labial palpi mostly reddish. Vertex reddish brown posteriorly, the collar reddish brown, mixed with grey and with a dark brown line at its base. Thorax purple-reddish brown. Fore

wings purple-reddish brown except on the costa, postmedial and the inner margin near the base which are whitish; the area beyond the sub-marginal line slightly fuscous; the antemedial and postmedial lines reddish brown; the claviform obsolete; the orbicular reddish brown in the centre; reniform with brown centre; the series of terminal triangular spots blackish, and the cilia brown. Hind wings whitish, without markings, with the veins very lightly-pale brown. Fore legs brownish dorsally, pale ochreous laterally and ventrally. Abdomen greyish brown on both the dorsal and ventral sides. Under side with the fore wings having brown spots at the discocellulars; a well-marked brown, uninterrupted, postmedial line and a subterminal series of brown spots; hind wings also with a brown discocellular spot, irrorated with brown scales at the costa and a broken postmedial line brownish in colour.



TEXT-FIG. 10. *A. plecta* (Linn.): (a) male genitalia, ventral view (b) uncus, lateral view (c) aedeagus (d) female genitalia, ventral view (Text-figs. a-c of same magnification).

Head with the frons (Text-fig. 1 f) smooth and flat. Antennae fasciculate in the male, simple in the female. Labial palpi obliquely upturned, the third segment short and porrect. Fore wings with the orbicular and the reniform clearly marked; the former oval, open

above and pointed towards the base of the wings; the antemedial and postmedial lines single and waved, the former interrupted at the costa. Legs with one and two pairs of spurs in the middle and hind tibiae, respectively; the middle and hind tibiae and the first tarsus with three rows of spines, the second to fifth segments of tarsi with four to five rows of spines.

Genitalia.—Male (Text-figs. 10 a-c) with the uncus narrow basally, becoming broad from beyond the middle nearly up to the tip, the latter narrow, about half the width of middle; tegumen and the vinculum as in the preceding species; saccus conical, with a fine point at the end. Clasper about four times as long as its width at the middle, narrow distally, about half the width of the middle portion and with a weak coronal setae; harpe curved, horn-shaped, with a short projection near the base at the sacculus; clavus hairy. Juxta triangular, dome-shaped in the middle. Aedeagus about four times as long as its width at the middle, the base broad, gradually becoming narrow distally; vesica retracted in the normal course, striated-black on one side; cornuti well developed, long and sclerotised into a process which is about one-third of the body length and as wide as one-sixth of its length, at the middle. Female (Text-figs. 10 d) with the ostium bursae sclerotised, leading through ductus bursae into a flattened, almost circular, corpus bursae; with a short appendix in continuation with the latter at its base which serves the purpose of receptaculum seminalis; sclerotisation on the ductus bursae continuous with the corpus bursae on one side, with the inner wall of the latter folded and with several sclerotised ribbon-like structures which extend into the receptaculum seminalis; a fine duct, the ductus spermathecus, arises from the receptaculum seminalis to enter into the genital tube; a well developed signum present on the corpus bursae.

Wing expanse.—Males, 33.5—34 mm.; females, 35—36 mm.

Distribution.—India; Punjab (Hampson, 1894, p. 189). Also Sikkim and Ceylon (Hampson, 1903, p. 405).

Material examined.—4 examples. CEYLON: Ohiya, 2 ♂♂, 2 ♀♀, —.xi.1907 (E. E. Green).

Remarks.—Referrable to the genus *Agrotis* Ochsenheimer, due to the presence of well-developed harpe, and the cucullus bearing the corona. It can be readily distinguished from *A. segetum* (Schiff.), *A. corticea* (Schiff.), *A. spinifera* (Hübner), *A. subspinifera* (Hampson) and *A. ypsilon* (Rott.) by the fasciculate antennae in the male. With regard to the female, it is characterised by the presence of sclerotised coiled ribbons in the corpus bursae of the genitalia. On account of the latter structure it comes close to the genus *Amathes* Hübner. A well-defined median dome of the juxta in the male genitalia further helps in differentiating this species from the other species of the genus mentioned above.

8. *Agrotis beelsoni* sp. n.

(Plate II, fig. 2; Text-figs. 11 a-e)

Head, thorax and abdomen brown. Frontal tufts pale brown, followed by brown vertex, the latter with two dark brown patches on the inner side of each antenna. Antennae brown. Labial palpi

blackish on the outer sides up to the second segment, the third segment pale brown. Collar with a black brown line at its base. Fore wings brownish; costal area whitish from the base to a little beyond the upper angle of the cell; the orbicular semi-circular, not open above, with a pale brown centre and a greyish outer line; the claviform obsolete; area below the median nervure suffused with dark-reddish brown from the base to vein Cu_{11} , and up to the submedian fold, reddish posteriorly up to vein 1A and paler in the anal area; reniform with a pale brown to brown centre, the outer line greyish but confluent on the upper and the lower margins with the ground colour of the wing; the area between the orbicular and the reniform and also slightly beyond the latter dark-reddish brown in colour; subbasal and the antemedial lines indistinct, the postmedial line double, wavy and slightly curved outwardly below the costa, thereafter incurved below vein M_3 and making an acute curve inwards in the submedian area before running obliquely to reach the inner margin; of the double line mentioned above, some spots on the outer line prominent; subterminal line greyish brown, indistinctly marked and wavy; a terminal series of black spots present from the apex to the tornal angle. Hind wings whitish, semi-hyaline, with the veins pale brown. Under side of the wings greyish brown, the costal area irrorated with fuscous spots; fore wings pale fuscous, with the postmedial series of small streaks up to vein Cu_{16} ; the cell very dark; hind wings whitish, with small discocellular spot. Fore legs with the tibiae and tarsi pale brown on the upper side. The tibiae of middle and hind legs darker; tibial spurs pale at the base and the tip.

Head with the frons smooth. Antennae in the male ciliate, reaching a little beyond the upper angle of the cell of the fore wing. Labial palpi obliquely upturned. Legs with the spurs and spines as in *A. plecta* (Linn.).

Genitalia.—Uncus long, narrow at the base, broad from beyond the middle nearly up to the tip, the latter part narrow and blunt, about less than half the width of the broadest portion; tegumen and vinculum long and narrow; saccus conical. Clasper long, having its dorsal margin straight but smooth, the ventral margin incurved beyond middle towards the distal end, the latter half the width of the middle; harpe long and narrow. Juxta broadly triangular, only slightly raised. Aedeagus well developed, long, about five times as long as its width at the middle, with its base broad and round, gradually narrowing distally, the latter with a well developed, long and narrow sclerotised process which is about one-third of the body length but as wide as one-eighth of its length.

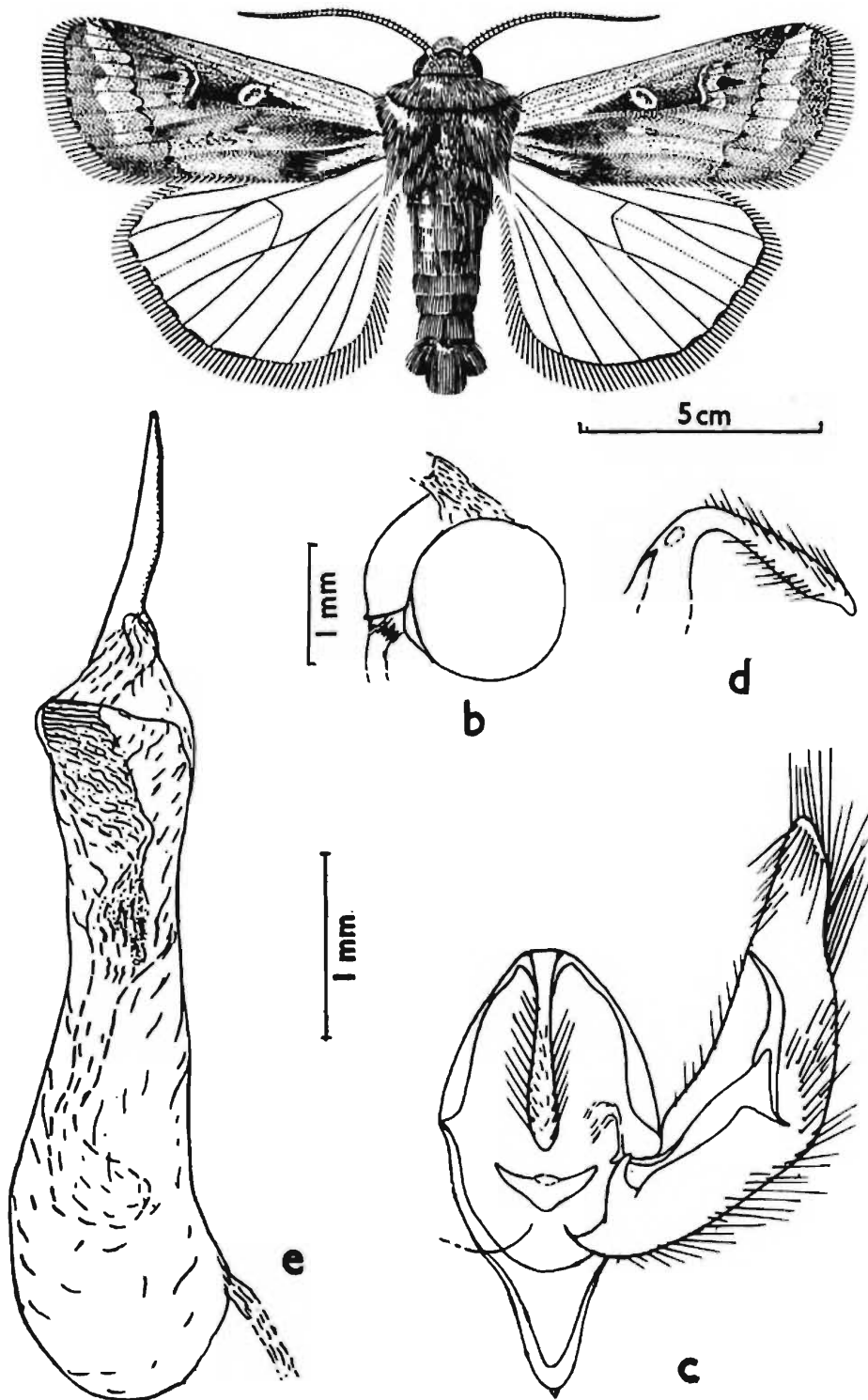
Female.—Not known.

Wing expanse.—28-29 mm.

Holotype.—One Male: Darjeeling, 2133.56 m. (7000 ft.), —.vi.1912, Govt. House Grounds. Five Paratypes: Darjeeling Govt. House Grounds, 3 ♂♂, 2133.56 m. (7000 ft.)—v.1912, 2 ♂♂, 2133.56 m. (7000 ft.)—vi.1912. (all in the Zoological Survey of India, Calcutta) (all Lord Carmichael).

Remarks.—*Agrotis beelsoni* sp. n., bears close resemblance to other species of *Agrotis* with regard to the venation and to *Agrotis plecta* (Linn.) both in the external characters and in the male genitalia. The most striking similarity between the two species being the costal

fascia on the fore wings, not extending beyond the discocellulars; shape of smooth frons, ciliation of antennae, and spines on legs, etc., are other characters which show its close resemblance with *A. plecta* (Linn.). It can, however, be differentiated from *plecta* (Linn.) ex-



TEXT-FIG. 11. *A. beelsoni* sp. n.: (a) a complete sketch of the male, showing pattern of the wing (b) shape of the frons (c) male genitalia, ventral view (d) uncus, lateral view (e) aedeagus (Text-figs. c-e of same magnification).

ternally by the presence of blackish brown patch on the vertex near the inner side of each antenna ; by almost semi-circular orbicular ; and by the general coloration of the body and wings which, unlike in *A. plecta* (Linn.), are without purple tinge. In the male genitalia the two species show considerable resemblance with each other except in juxta which, in this species, is almost without dome-shaped structure in the middle. This difference in the two species is significant since the other species of *Agrotis* Ochs. are completely without such structure, almost as in *A. beasoni*, where as the presence of this character in *A. plecta* (Linn.) brings its affinities with the genus *Amathes* Hübner.

Genus *Amathes* Hübner

1822. *Amathes* Hübner, *Verz. bek. Schmett.*, p. 222.
 1894. *Amathes* Hübner: Hampson, *Fauna Brit. India, Moths*, 2, p. 180 (as Syn. of *Agrotis* Och.).
 1910. *Amathes* Hübner: Warren, in Seitz *Macrolepidoptera of the World*, 3, p. 150.
 1934. *Amathes* Hübner: Draudt, in Seitz *Macrolepidoptera of the World*, Suppl. 3, p. 150.
 1954(a). *Amathes* Hübner: Boursin, *Bonn. zool. Beitr.*, 5, p. 263.
 1954(b). *Amathes* Hübner: Boursin, *Bull. Soc. Found. Ier. ent.*, 38, p. 83.
 1955. *Amathes* Hübner: Boursin, *Veröff. zool. Stsamml. Münch.*, pp. 15-18.

Type of the genus: *Noctua litura* Linn. from Europe.

Distribution.—Widely distributed. Warren (1910) records the distribution of *Amathes* species from Europe (France, Switzerland, Italy, Hungary), Asia Minor, Russia (Armenia, Siberia), etc., but none from India. Lately however, Boursin (1955) recorded certain species from Nepal Expedition, and regarded the genus as distributed in the Himalayas in so far as the Indian subregion is concerned. We in this paper have dealt with four species of the genus of which three occur in the plains. One of the latter, *Amathes deraiota* (Hampson) is known from Ceylon only.

Diagnosis.—Frons smooth (Text-figs. 1 g-h). Antennae ciliate in both the sexes. Eyes large and glabrous. A well developed ocellus present behind each antenna. Proboscis fully developed. Labial palpi obliquely upturned, the third segment short and generally porrect, rarely upturned or reaching beyond the frons. Legs with two rows of spines on all the tibiae, the terminal spines on fore tibiae longer than the rest ; middle tibiae with a single pair and hind tibiae with two pairs of tibial spurs ; tarsi with three rows of spines, and a well developed arolium. Fore wings long and narrow ; stigmata present in the cell, which is generally wholly coloured ; frenulum consisting of a single spine in the male, with two or three spines in the female.

Venation.—The venation is almost constant in all the species of the genus and generally agrees with that of *Agrotis segetum* (Schiff.) except for the following. In the fore wing vein M_1 arise from below or above the upper angle of the cell ; and in the hind wing the veins M_1 and R_3 may be on a short or a long stalk.

Genitalia.—Male with the claspers smooth and rounded distally, without corona ; the setae sparse on the whole surface ; sacculus large, without clavus ; ampulla weak, extending to the ventral margin and generally protruding beyond it ; the harpe well developed. Juxta

triangular, provided with a dome in the middle. Aedeagus generally simple. Female genitalia generally of large size; corpus bursae variable in both shape and size; ostium bursae generally sclerotised, with the edge raised into a shallow cup.

Remarks.—*Amathes* Hübner was included under the subfamily Cucullianae, which is chiefly differentiated from Agrotinae by the presence of long, over-hanging lashes on the eyes, and by the absence of spines on the middle and the hind tibiae (Draudt, 1934, p. 151). However, in 1955, Boursin has included it in Agrotinae. Though he did not give any character or reason for the change our studies support this change on account of the presence of the tibial spines on all the legs and the absence of over-hanging lashes on eyes.

The present study is based on four species, viz. *Am. c-nigrum* (L.), *Am. deraiota* (Hampson), *Am. curviplena* (Walker) and *Am. consanguinea* (Moore) which are represented by 25 examples. Although Boursin (1955) treated *deraiota* as a subspecies of *c-nigrum* we have regarded it as a distinct species on the basis of the external and genitalic characters of the specimens from the type locality.

Out of the four species mentioned above *Am. c-nigrum* is the widely distributed and well known species on account of its being a pest of crops. The following keys are given for the identification of the species dealt with in this paper.

(a) *Based on the external characters*

1. Fore wings with the cell not filled up with colour between the base and stigmata; the orbicular round and closed; the claviform small; fore wings with small circular rings; Hind wing pale-ochreous brown *curviplena* (Walker)

- Fore wings with the cell filled up with colour between base and stigmata; the orbicular v-shaped or elliptical, open anteriorly; the claviform small or indistinct; fore wings without circular rings. Hind wings pale white to dark brown 2
2. Orbicular v-shaped, with the centre ochreous 3
- Orbicular oval, obliquely placed, with the centre pale brown *consanguinea* (Moore)
3. Claviform v-shaped; hind wings ochreous white *c-nigrum* (Linn.)
- Claviform obsolete; hind wings brown *deraiota* (Hampson)

(b) *Based on the male genitalia*

1. Uncus broadest in the middle, the distal end narrow. Juxta with the median sac broad, beset with fine setae *c-nigrum* (Linn.)

- Uncus not broadest in the middle.
Juxta with the median sac narrow,
with or without spines 2
2. Uncus broad at the base, tapering
gradually towards the distal end.
Juxta with the median sac without
spines. Aedeagus with a short
tooth distally *deraiota* (Hampson)
- Uncus broad at the base, with the
dorsal surface bulged slightly,
tapers gradually into a fine point.
Juxta with the median sac beset
with short spines. Aedeagus with
several spines on the vesica *curviplena* (Walker)

(c) Based on the female genitalia

1. Corpus bursae large, with sclerotised
ribbons, without stripes; ductus
bursae heavily sclerotised *deraiota* (Hampson)
- Corpus bursae large or small, without
sclerotised ribbons, with four
stripes on it; ductus bursae
lightly sclerotised 2
2. Corpus bursae as long and broad as
the receptaculum seminalis; ductus
bursae without bands *consanguinea* (Moore)
- Corpus bursae longer than the
receptaculum seminalis; ductus
bursae with or without bands 3
3. Ductus bursae with sclerotised bands;
receptaculum seminalis oval *c-nigrum* (Linn.)
- Ductus bursae without bands;
receptaculum seminalis as a short,
blunt, lobe *curviplena* (Walker)

9. *Amathes c-nigrum* (Linn.)

-(Plate I, fig. 6 ; Text-figs. 1 g, 12 a-e)

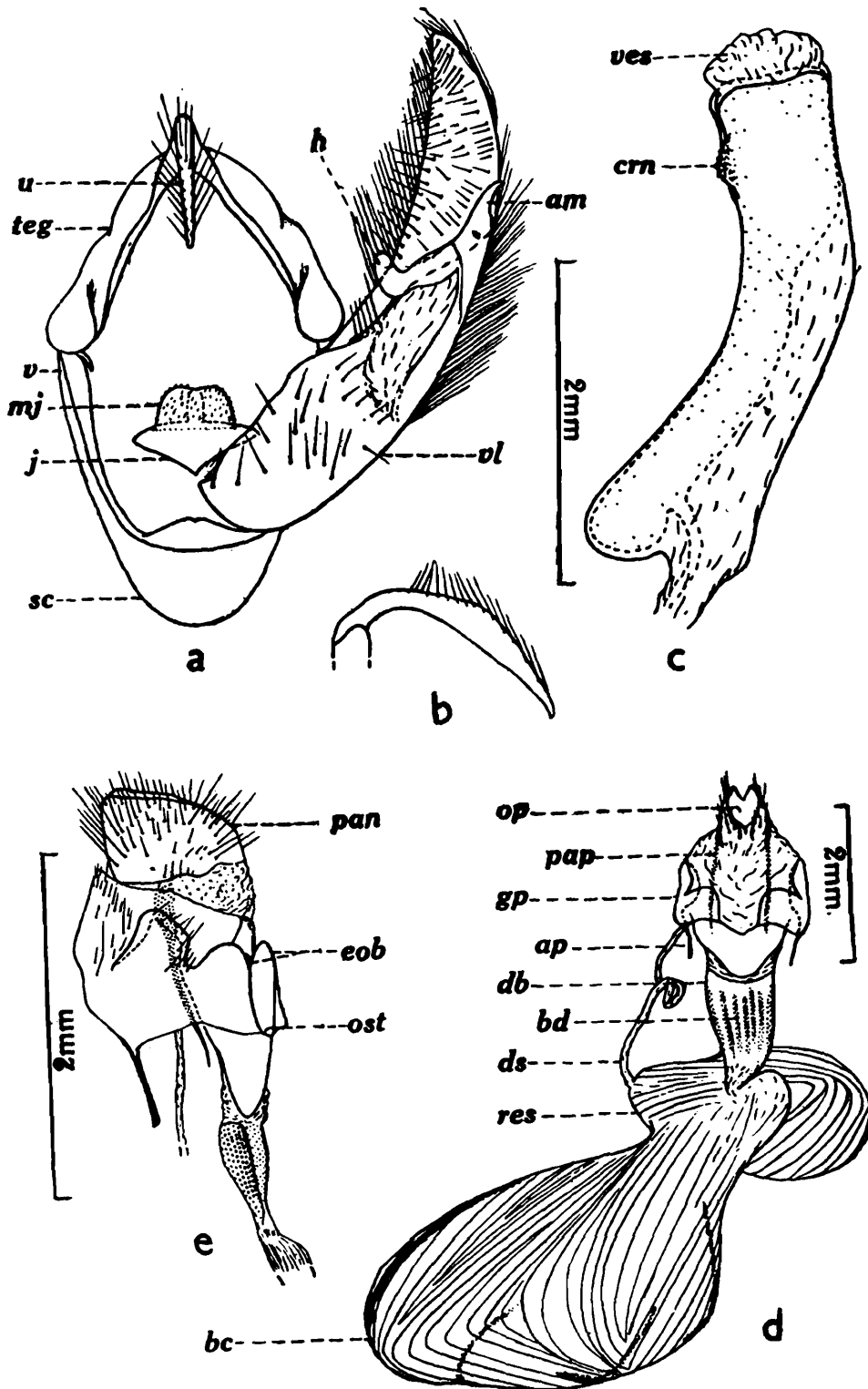
1758. *Noctua c-nigrum* Linnaeus, *Syst. Nat.*, 10th ed., p. 516. (Type loc.—
Europe).
1787. *Noctua c-nigrum* Linn. : Fabricius, *Mant. Ins.*, 2, p. 154.
1822. *Megasema c-nigrum* (Linn.) : Hübner, *Verz. bek. Schmett.*, p. 223.
1867. *Graphiphora c-nigrum* (Linn.) : Moore, *Proc. zool. Soc. Lond.*, p. 54.
1882. *Agrotis c-nigrum* (Linn.) : Kirby, *European Butterflies and Moths*, p. 192.
1888. *Graphiphora c-nigrum* (Linn.) : Cotes & Swinhoe, *Cat. Moths of India*,
2, pp. 311-312.
1894. *Agrotis c-nigrum* (Linn.) : Hampson, *Fauna Brit. India, Moths*, 2, p. 188.
1900. *Chera c-nigrum* (Linn.) : Swinhoe, *Cat. East & Aust. Lep. Het.*, Part II,
p. 13.
1903. *Agrotis c-nigrum* (Linn.) : Hampson, *Cat. Lep. Phal.*, 4, pp. 389-390.
1909. *Agrotis c-nigrum* (Linn.) : Lefroy, *Indian Insect Life*, p. 445.
1909. *Rhyacia c-nigrum* (Linn.) : Warren, in Seitz *Macrolepidoptera of the
World*, 3, p. 43, pl. 98.
1921. *Agrotis c-nigrum* (Linn.) : Fletcher, *Proc. 3rd. ent. Mtg.*, 100, p. 24.
1933. *Rhyacia (Diarsia) c-nigrum* (Linn.) : Corti & Draudt, in Seitz *Macrole-
pidoptera of the World*, Suppl. 3, p. 79.
1935. *Rhyacia (Agrotis) c-nigrum* (Linn.) : Sevastopulo, *J. Darjeeling nat. Hist.
Soc.*, 10, p. 61.

1941. *Agrotis c-nigrum* (Linn.) : Beeson, *Forest Insects*, p. 644.
1955. *Amathes c-nigrum* (Linn.) : Boursin, *Veröff. zool. Stsamml. Münch.*,
8, p. 15. (Syn. *A. c-nigrum deraiota* (Hampson)).
1959. *Agrotis c-nigrum* (Linn.) : Mathur & Singh, *Indian For. Bull. (N.S.)*,
171(7) p. 43.

Head pale or deep purple brown, mixed with white scales. Frontal tufts pale below, dark brown above. Antennae brown. Labial palpi dark brown, mixed with white up to the extremity of second segment, the latter pale, the third segment pale brownish. Vertex also dark brown. Collar whitish, marked with double pale brown band across it. Thorax and fore wings purple brown. Fore wings marked with double, black subbasal line extending from costa to vein 1A and interrupted at the cell; with some black suffusion beyond it in the submedian fold; antemedial line black and double, curved from costa to the inner margin, slightly faint below the cell; claviform v-shaped, faintly marked; orbicular brownish white, v-shaped, open above and confluent with the brownish-white medial costal area; reniform rufous above, with the centre brown and the boundary line black; the area in between stigmata in the cell filled up with chocolate brown colour; postmedial line black, double, excurved below the costa above vein R_5 and at M_3 ; thereafter incurved, slightly dentate and with some spots on the veins; a sinuous subterminal line present from the black striga on the costa, followed by a series of terminal short spots. Hind wings whitish, tinged with fuscous on the apical half; veins brown. Under side with the fore wing purple grey, marked across by faint postmedial line and a pale costal area from the base to near the apex; hind wings, whitish, with a postmedial line and a brown discocellular spot. Legs brown, with white bands on the tibial spurs and tarsi. Abdomen pale brown to brown.

Head with the frons (Text-fig. 1 g) smooth, only slightly or not at all produced forward. Antennae in both the sexes ciliate, reaching about two-thirds the length of costa from the base. Labial palpi well developed, obliquely upturned, the third segment short and porrect. Legs with three rows of spines on all the tarsal segments.

Genitalia.—Male (Text-figs. 12 a-c) with the uncus long, sharply bent downwards, with the base broad, the mid-dorsal area raised, the distal end narrow and pointed; tegumen short; vinculum long, slender v-shaped; saccus semicircular. Claspers simple, without corona, the setae sparse; ampulla weak, lightly sclerotised, extending up to the distal one-third and protruding beyond the ventral margin; harpe indistinct. Juxta triangular, sclerotised, dome-shape in the middle and beset with fine, dark spines, Aedeagus simple, mostly undifferentiated; vesica beset with fine spines. Female (Text-figs. 12 d-e) with the ostium bursae having its margin highly sclerotised and raised midventrally over the opening, into a u-shape or horse-shoe shape; ductus bursae small and narrow, distended in the middle, heavily sclerotised on the sides and the middle in the form of longitudinal bands; corpus bursae striated, large, balloon-shaped; receptaculum seminalis transverse oval, both the corpus bursae and the receptaculum seminalis striated longitudinally throughout except at the base, the former with three lateral and one sub-lateral stripes; ductus spermathecus arises from the receptaculum seminalis, long and uniformly narrow.



TEXT-FIG. 12. *Amathes c-nigrum* (Linn.): (a) male genitalia, ventral view (b) uncus, lateral view (c) aedeagus (d) female genitalia, ventral view (e) ovipositor and the genital plate enlarged (Text-figs. a-c of same magnification).

Wing expanse—Males, 39—47.5 mm.; females, 31.5—38.5 mm.

Distribution.—India; N.W. Himalayas, Punjab, Bihar, Maharashtra, Madras. Also Sikkim.

Material examined.—Seven examples. INDIA: Himachal Pradesh; Kulu, 1 ♀ (A. G. Young) [no date of collection]. Bihar; Ranchi, 2 ♀ ♀

(*W.H. Irvine*) [no date of collection]. Maharashtra ; Bombay, 1 ♂, 1 ♀, — vii.1884 (*Swinhoe*).

GERMANY: Prussia, 1 ♂, 1 ♀ (*A. Kricheldroff*).

Host range.—*Platanus orientalis* Linn.: Mathur and Singh, 1959. Potato (*Solanum tuberosum* Linn.): Fletcher, 1917, 1921. Lefroy (1909) and Beeson (1941) simply reported it as pest in India.

Remarks.—Referrable to the genus *Amathes* Hübner, it has a rather close similarity with *Am. deraiota* (Hampson). The latter was treated as a subspecies of *Am. c-nigrum* by Boursin (1955) but it is apparently a distinct species, as originally proposed by Hampson because it differs considerably in coloration on the wings and in the genitalic characters, especially by the presence of sclerotised stripes on the corpus bursae unlike the case in *Am. deraiota* (Hampson) which is without stripes or signum on the corpus bursae but with two sclerotised ribbons.

Present record from Bihar is the first from the locality.

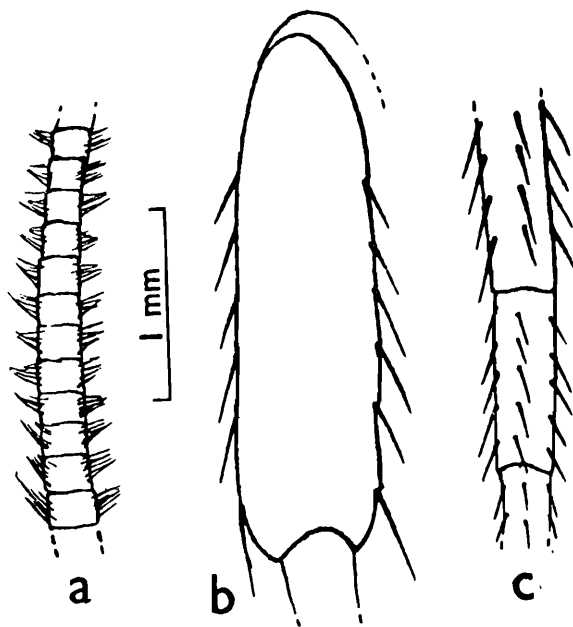
10. *Amathes deraiota* (Hampson)

(Plate I, fig. 7 ; Text-figs. 1 h, 13 a-c, 14 a-d)

1902. *Agrotis deraiota* Hampson, *J. Bombay nat. Hist. Soc.*, **14**, p. 198. (Type loc.—Maturatta, Ceylon).
1903. *Agrotis deraiota* Hampson, *Cat. Lep. Phal.*, **4**, p. 391.
1955. *Amathes c-nigrum deraiota* (Hampson): Boursin, *Veröff. zool Stsamml. Münch.*, **8**, p. 15, pl. VII, fig. 24.
1893. *Amathes c-nigrum* Hampson, [*nec.* Linn.] *Ill Lep. Het.*, **9**, p. 94, p. 176, fig. 4. (Syn. of *A. deraiota* (Hampson), *vide* Hampson, 1903).

Head with the frontal tufts pale brown, irrorated with dark scales and marked with a black bar. Antennae brown. Labial palpi brown, mixed with dark scales and heavily fringed with the scales in the front. Vertex pale brown. Collar as in *Am. c-nigrum*, pale ochreous, except at the end which is chocolate brown. Thorax brown, with the tips of some scales grey. Abdomen grey brown. Fore wings pale-red brown, suffused with purplish grey, the female being slightly lighter in colour than the male ; cells filled up with chocolate brown colour between the stigmata ; claviform indistinct ; orbicular open above, v-shaped and confluent with the purple grey costal area ; subbasal line black and short, running from costa to vein 1A, interrupted at the cell ; antemedial line black, wavy and double from costa to the inner margin ; postmedial line indistinct, represented by short, black, double dots on the veins, excurved below the costa to vein M₃, thereafter incurved to the inner margin ; sinuous subterminal line defined by an elongate patch on the inner side near the apex, and running towards the inner margin ; the area beyond it up to the terminal line as well as the cilia purple tinged with fuscous ; the cilia slightly paler at their tips. Hind wings pale brown. Under side with the wings pale-brownish white ; fore wings sometimes tinged with fuscous ; postmedial line in both wings and an indistinct discocellular line in hind wings brown. Legs ochreous brown below, dark above ; the tibial spurs white at the base and the tip.

Head with the frons (Text-fig. 1 h) smooth and not produced. Antennae (Text-fig. 13 a) minutely ciliate in both sexes, profusely in the male than in female. Labial palpi obliquely upturned, the third segment short and porrect. Frenulum consisting of a single spine in the male and three spines in the female.



TEXT-FIG. 13. *Amathes deraiota* (Hampson): (a) Portions of antenna (b) fore tibia and (c) hind-tarsal segments (all of the same magnification).

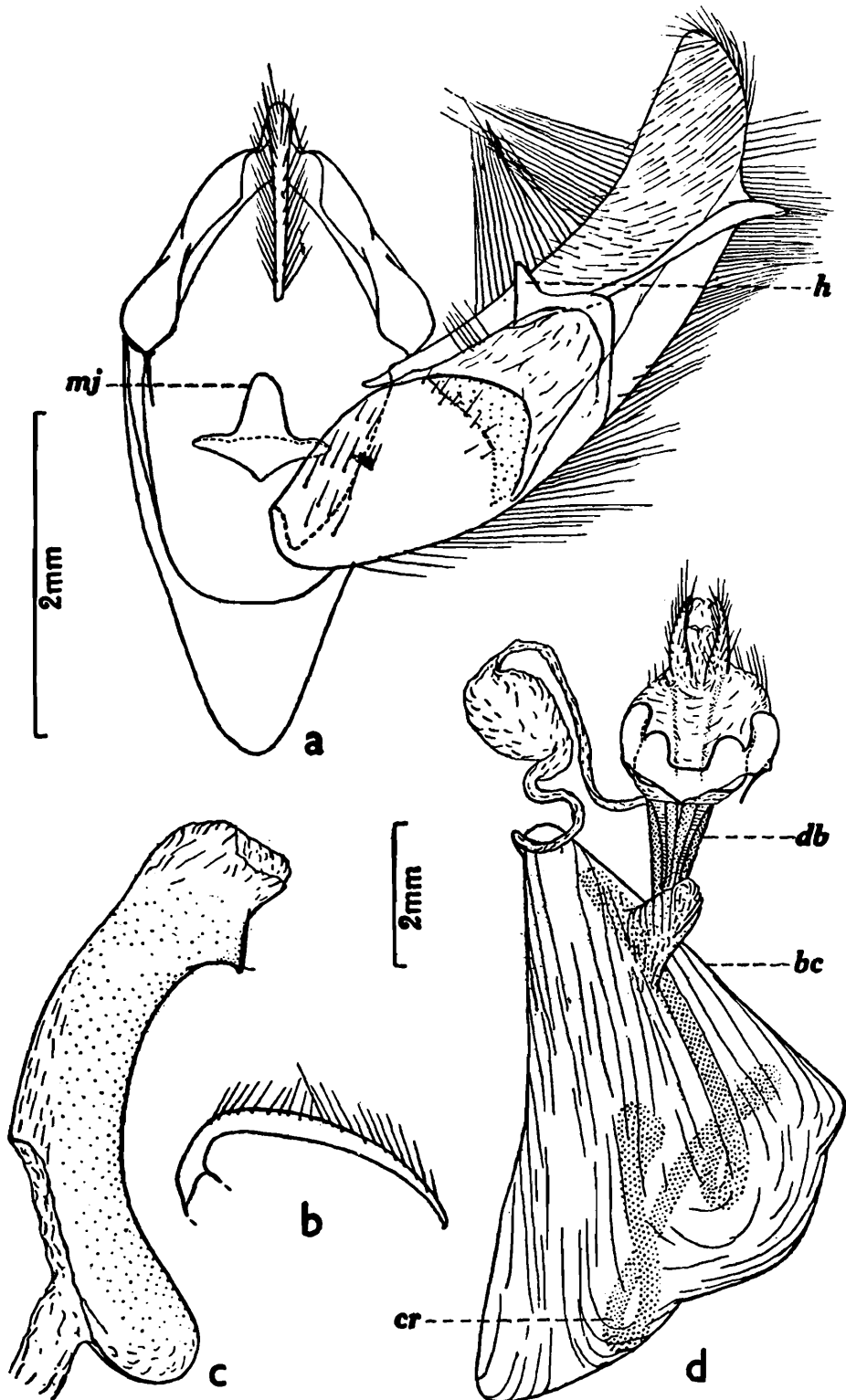
Genitalia.—Male (Text-figs. 14 a-c) with the uncus sharply bent downwards, gradually tapering into a fine point; tegumen and vinculum as in *Am. c-nigrum*; saccus also slightly more pointed than in the latter, claspers slightly broader; ampulla narrow and produced beyond the margin; harpe tapering and rather slender unlike in *Am. c-nigrum*. Juxta large, subtriangular, with a medial elongate dome which is without spines. Aedeagus sclerotised weakly and along one side, the other remaining membranous; the distal part with a short tooth. Female (Text-fig. 14 d) genitalia large; ostium bursae sclerotised as in *Am. c-nigrum*; ductus bursae sclerotised, broad distally; corpus bursae large, subtriangular, with two sclerotised ribbons in it, and without any stripes or signum and unlike the case in *c-nigrum* (fig. 14 d), receptaculum seminales almost spherical in the middle.

Wing expanse.—Males, 38.5—40 mm; females, 43—44.5 mm.

Distribution.—Ceylon.

Material examined.—Four examples. CEYLON: Hakgala, 1 ♂, —.iii.1907, 2 ♀ ♂ —.iv.1907 (E. E. Green).

Remarks.—Referrable to the genus *Amathes*, it has a close resemblance to *Am. c-nigrum* (Linn.) specially in respect of the colour pattern on the wings. However, the two differ in details of the pattern and structure of the genitalia as described earlier under the account for *Am. c-nigrum*,



TEXT-FIG. 14. *Amathes deraiota* (Hampson): (a) male genitalia, ventral view (b) uncus, lateral view (c) aedeagus (d) female genitalia, ventral view (Text-figs. a-c of same magnification).

11. *Amathes curviplena* (Walker) comb. nov.

(Plate I, fig. 8 ; Text-figs. 15 a-e)

1865(b). *Orthosia curviplena* Walker, *List Lep. Brit. Mus.*, p. 715. (Type loc.—Darjeeling).

1888. *Orthosia curviplena* Walker: Cotes & Swinhoe, *Cat. Moths of India*, p. 297.
 1894. *Agrotis curviplena* (Walker): Hampson, *Fauna Brit. India, Moths*, 2, p. 185.
 1900. *Chera curviplena* (Walker): Swinhoe, *Cat. East & Aust. Lep. Het.*, Part II, p. 9.
 1903. *Richia curviplena* (Walker): Hampson, *Cat. Lep. Phal.*, 4, p. 596, pl. LXXVI, fig. 13.

Head with the frontal tufts and the vertex ochreous, with the tips of some scales rufous. Antennae brown. Labial palpi brown except at the extremity of the second segment and whole of the third segment which are ochreous. Thorax and fore wings ochreous, with the tips of some scales rufous, on the whole giving a slightly rufous tinge; the lines also rufous; subbasal line rufous and double, from costa to the submedian fold; the antemedial line rufous, double and waved, with an indistinct striga before it in the cell; an indistinct striga before it in the cell; an indistinct rufous medial line excurved at vein M_3 ; the postmedial line rufous and double, with the inner line heavily dentate; the subterminal line straight and oblique from apical margin; a fine, waved terminal line present, cilia ochreous; not filled up with a distinct colour in the area between stigmata; the claviform small and oval; the orbicular and reniform large, with their boundaries rufous. Hind wings ochreous, tinged with fuscous nearly up to the subterminal area; terminal line rufous; cilia ochreous. Abdomen ochreous, tinged with fuscous above. Under side with the fore wings tinged with fuscous up to the subterminal area, ochreous beyond it; hind wings and abdomen ochreous, the former marked with a rufous terminal line. Legs ochreous, tinged with pale brown, rarely with white bands on the spurs and tarsi.

Head with the frons smooth, subrounded, slightly produced forward. Antennae simple and ciliate in both sexes but with the cilia more profuse in the male. Labial palpi obliquely upturned, the third segment short and porrect.

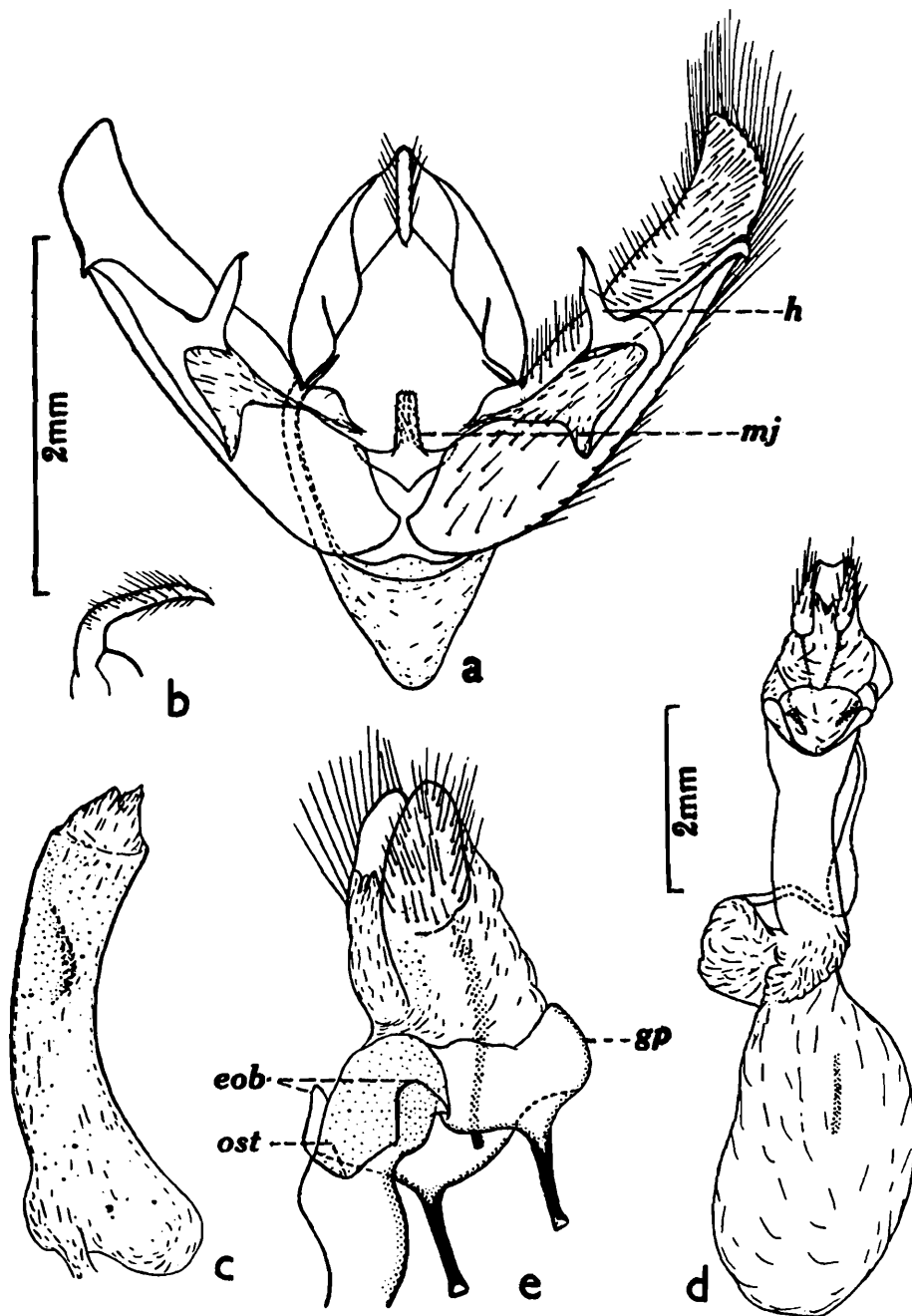
Genitalia.—Male (Text-figs. 15 a-c) with the uncus broad at the base, slightly curved dorsally, tapering into a fine point; tegumen short and broad; vinculum slender; saccus large and subtriangular. Claspers long, generally of uniform width throughout except near the distal end which is slightly narrow; cucullus without corona, the setae sparse; ampulla extending along the mesal side and protruding outside the ventral margin; harpe long and pointed. Juxta triangular, with the so-called median dome elongate, long and beset with fine setae. Aedeagus simple, lightly sclerotised, beset with short spines on the vesica. Female (Text-figs. 15 d-e) with the ostium bursae having its margin highly sclerotised, its edge formed into a horse-shoe shape cover over the opening; ductus bursae sclerotised, long and broad; corpus bursae striated longitudinally, with four stripes *i.e.*, two lateral, one dorsal and one ventral. From the left side, ventrally, the receptaculum seminalis arises as a small lobe; ductus spermathecus long and narrow except for the slight enlargement in the middle (fig. 15 d).

Wing expanse.—Males, 30—37.5 mm.; females, 33.5—36 mm.

Distribution.—India; West Bengal. Sikkim.

Material examined.—Nine examples. INDIA: West Bengal; Darjeeling, 2133.57 m. (7000 ft.), 2 exs. (? sex) [no further data] (Z. S. I. colln.). SIKKIM: 1 ♂, —x.1895 (*J. G. Pilcher*), 3 ♂♂, 1 ex. (? sex)

(*O. Möller*) [no date of collection]. 2 exs. (? sex) [no locality or any other data].



TEXT-FIG. 15. *Amathes curviplena* (Walker): (a) male genitalia, ventral view (b) uncus, lateral view (c) aedeagus (d) female genitalia, ventral view (e) ovipositor and the genital plate enlarged. (Text-figs. a-c, e of same magnification).

Remarks.—Referrable to the genus *Amathes* Hübner, it is characterised by the absence of any distinct colour between the stigmata in the cell, unlike the case in *Am. c-nigrum*, the subspherical shape of corpus bursae and in the position of four sclerotised stripes (bars) as described above.

12. *Amathes consanguinea* (Moore)

(Text-fig. 16)

- 1881(a). *Ochropleura consanguinea* Moore, *Proc. zool. Soc. Lond.*, p. 353. (Type loc.—Solan, Himachal Pradesh).
 1888. *Ochropleura consanguinea* Moore : Cotes & Swinhoe, *Cat. Moths of India*, p. 312.
 1903. *Agrotis consanguinea* (Moore) : Hampson, *Cat. Lep. Phal.*, 4, p. 396.
 1909. *Rhyacia consanguinea* (Moore) : Warren, in Seitz *Macrolepidoptera of the World*, 3, p. 44, pl. 9h.
 1933. *Rhyacia (Diarsia) consanguinea* (Moore) : Corti & Draudt, in Seitz *Macrolepidoptera of the World*, Suppl. p. 79.
 1955. *Amathes consanguinea* (Moore) : Boursin, *Veröff. zool. Stsamml. Münch.*, Teil II, 8, p. 15, p. VIII, f. 26.

Head with the frontal tufts and antennae brown to dark brown. Labial palpi dark brown up to the second segment, the third segment blackish, the tips of some scales greyish and black. Vertex dark brown. Collar pale ochreous, except at the tips which are dark. Thorax ochreous brown mixed with scales which are grey at the tips. Fore wings dark brown, with pale ochreous costal fascia to nearly two-thirds from base; the area of the cell between the stigmata and the base filled up with dark colour, stigmata defined by black boundaries; the claviform not as distinct as the orbicular and the reniform; the orbicular somewhat oblique, elliptical and open above but with the centre darker than the costal fascia; the reniform large and well defined; subbasal line reduced to a small spot on the costa; antemedial and postmedial lines black, wavy, double and indistinctly marked; subterminal line defined on the inner side by an oblique and short black bar. Hind wings dark brown to fuscous. Under side with the wings and the legs fuscous, except at the costal area and the inner area which are pale fuscous.

Head with the frons smooth. Antennae ciliate in the female. Labial palpi upturned, the second segment fringed with scales in the front, the third segment slight and upturned.

Venation same as in *Agrotis segetum* (Schiffermüller) (Text-figs. 3 a-b) except that veins $R_5 + M_1$ generally not stalked in hind wings.

Genitalia.—Female (Text-fig. 16) with the ostium bursae having its inner surface sclerotised; the margin sclerotised and formed into a u-shape cover over the opening; ductus bursae lightly sclerotised; corpus bursae large, bag like, with four patches *i.e.*, 3 sub-lateral and one ventral; receptaculum seminalis almost as large as the corpus bursae and membranous; genital tube short, with the ovipositor oblique.

Male not studied.

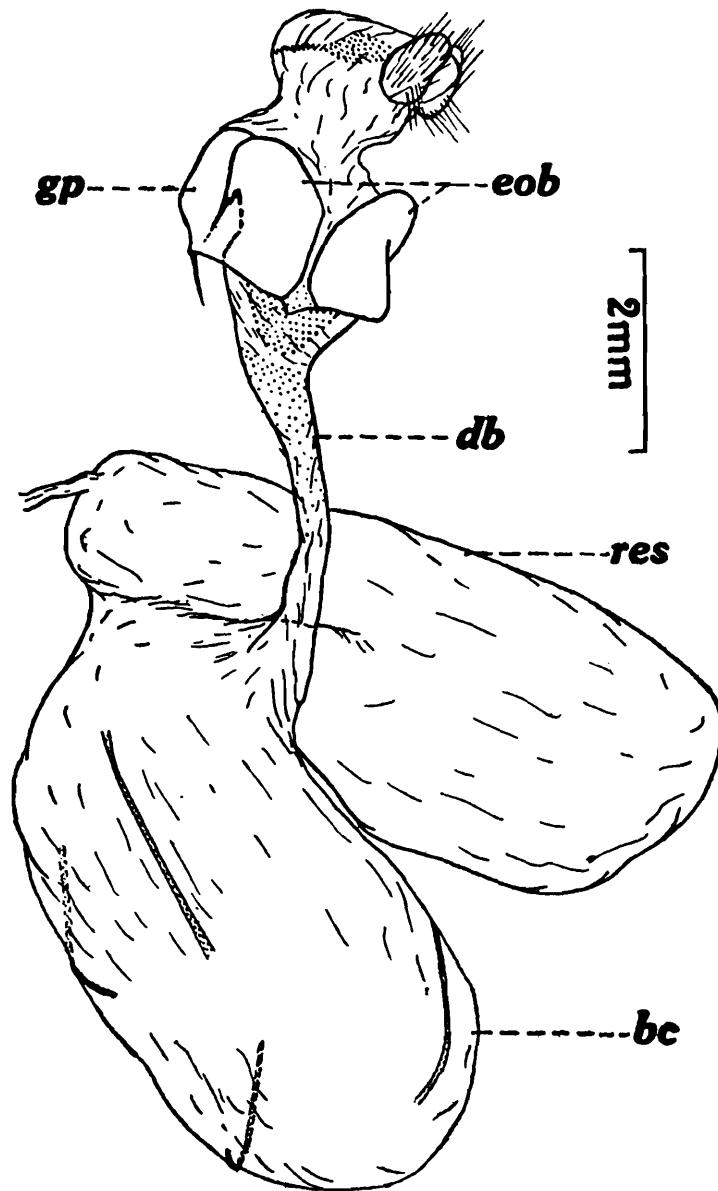
Wing expanse.—45 mm.

Distribution.—India; Kashmir and Himachal Pradesh. Also Tibet and China.

Material examined.—One example. INDIA: Himachal Pradesh; Kangra Valley, 1371.58 m. (4500 ft.), 1 ♀ —.ix.1899 (*G. C. Dudgeon*).

Remarks.—There is only one female specimen from Kangra Valley (Himachal Pradesh) and is not in a well preserved condition. It is referable to the genus *Amathes* Hübner due to the presence of characteristic u-shape cover, which is as large as the 8th segment, over the ostium bursae, thus differing from, both *Am. c-nigrum* and *Am. curviplena*, though agreeing with the latter species, in general.

It, however, differs from the former by the sclerotisation on the inner surface of ostium bursae and in the size of receptaculum seminalis which is as large as the corpus bursae and in the position of sclerotised stripes.



TEXT-FIG. 16. *A. consanguinea* (Moore) : Female genitalia, latero-ventral view.

Genus *Diarsia* Hübner

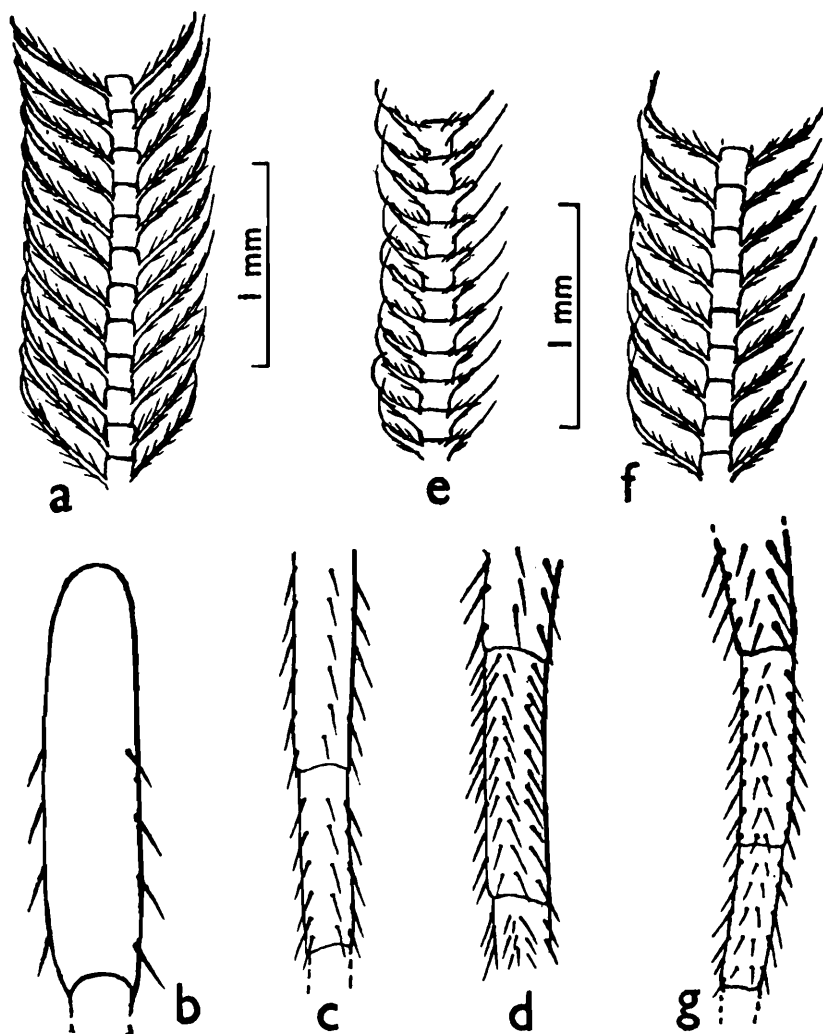
1822. *Diarsia* Hübner, *Verz. bek. Schmett.*, p. 227.
 1933. *Diarsia* Hübner : Corti & Draudt, in Seitz *Macrolepidoptera of the World*,
 Suppl. 3, p. 74.
 1954. *Diarsia* Hübner : Boursin, *Bonn. zool. Beitr.* 5, nos. 3-4, pp. 213-252,
 pls. ii-iv, vii-x, 101 figs.

Type of the genus : *Diarsia dahlii* (Hubner) from Europe.

Distribution.—India ; Burma ; Ceylon ; Japan ; W. China.

Diagnosis.—Frons (Text-figs. 1 i-j) smooth, flat or produced medially into a sub-rounded shape. Antennae (Text-figs. 17 a, f) strongly bipectinate in the male as in *D. ochracea* (Walker) and *D. ruptistriga*

(Walker); short biserrate in the male as in *D. postfusca* (Hampson) (Text-fig. 17 e); or ciliate in both sexes as in *D. cerastioides* (Moore), *D. erubescens* (Butler), *D. nigrosigna* (Moore), *D. putris* (Linn.), *D. rubicilia* (Moore) and *D. sicca* (Guén.). Eyes glabrous; a well developed ocellus present behind each antenna. Proboscis fully developed. Labial palpi generally upturned, the third segment porrect or upturned. Legs (Text-figs. 17 b, c, d, g) with the tibiae longer than the first tarsal segment and beset with two rows of slender spines; fore tibia shorter than the femur; mid-tibia equal to the femur and having one pair of spur, the hind tibiae longer than femur and having two pairs of spurs; tarsi with three rows of spines on the first tarsal segments, three to five rows on other segments; a well developed arolium between the claws present. Frenulum consisting of a single spine in the male; two to three spines in the female.



TEXT-FIG. 17. Portion of antennae and legs of the genus *Diarsia*: (a) antenna, (b) fore tibia and (c) hind tarsal segment of *D. ochracea* (Walker) (d) hind-tarsal segments of *D. nigrosigna* (Moore); (e) antenna of *D. postfusca* (Hampson) (f) antenna and (g) hind-tarsal segments of *D. ruptistriga* (Walker).

Venation as described in the case of *Agrotis segetum* (Schiff.) (Text-figs. 3 a-b) except in variation of the origin of veins R_5-M_1 in the hind wing and vein M_1 in the fore wing.

Genitalia.—Male well developed. Claspers with the cucullus well developed and differentiated, produced forwards disto-ventrally as in *D. ochracea* (Walker), *D. ruptistriga* (Walker), *D. cerastioides* (Moore), *D. rubicilia* (Moore) and *D. erubescens* (Butler), or not so as in *D. nigrosigna* (Moore) and *D. postfusca* (Hampson); most of the species are with an additional cluster of setae below the corona except in *D. sicca* (Guén.); ampulla short and blunt; clavus present only in *D. nigrosigna* (Moore), *D. rubicilia* (Moore) and *D. cerastioides* (Moore); harpe always present. Juxta variable in shape. Aedeagus with several short spines or a single hard structure on the vesica. The female genitalia is extremely variable and therefore given in details in the text. It had not been possible to generalise the characteristics.

Remarks.—The present study is based on nine species; viz. *D. cerastioides* (Moore), *D. erubescens* (Butler), *D. nigrosigna* (Moore), *D. rubicilia* (Moore), *D. putris* (Linn.), *D. sicca* (Guén.), *D. ochracea* (Walker), *D. ruptistriga* (Walker) and *D. postfusca* (Hampson), which have been placed under this genus by studying their external morphological and the genitalic characters, in the light of recent revisionary work of Boursin (1954a, 1954b, 1955). Except for *D. postfusca* (Hampson) and *D. sicca* (Guén.) others have been included by Corti & Draudt (1933) under *Rhyacia* (*Diarsia*), and latter in 1954(a) Boursin separated them as distinct species under the genus *Diarsia* Hübner. Two have been included in *Diarsia* Hübner, for the first time.

The following keys have been prepared on the basis of external and the genitalic characters, both in the male and the female.

(a) *Based on the external characters*

- | | | | | | |
|--|-----|-----|-----|-----|-----------------------------|
| 1. Antennae bipectinate or serrate in the male | ... | ... | ... | ... | 2 |
| Antennae fasciculate in the male | ... | ... | ... | ... | 4 |
| 2. Antennae with the branches short or long. Fore wings filled up with colour in the cell between the stigmata | ... | ... | ... | ... | 3 |
| Antennae with the branches long. Fore wings not filled up with colour in the cell between the stigmata | ... | ... | ... | ... | <i>ochracea</i> (Walker) |
| 3. Antennae with the branches long. Labial palpi with the third segment long and upturned | ... | ... | ... | ... | <i>ruptistriga</i> (Walker) |
| Antennae with the branches short. Labial palpi with the third segment short and porrect | ... | ... | ... | ... | <i>postfusca</i> (Hampson) |
| 4. Labial palpi with the third segment porrect. Hind legs with three rows on all the tarsal segments | ... | ... | ... | ... | <i>sicca</i> (Guén.) |
| Labial palpi with the third segment variable. Hind legs with three or more than three rows of spines on second to fifth tarsal segment | ... | ... | ... | ... | 5 |

5. Fore wings with one or more
stigmata not distinct in the cell ... 6
- Fore wings with all the stigmata
distinct in the cell ... 7
6. Fore wings with the reniform
distinct, the orbicular and clavi-
form obsolete; submarginal area
pale, marked with some distinct
streaks before it ... *rubicilia* (Moore)
- Fore wings with all the stigmata
indistinct; submarginal area pale,
marked with some indistinct
streaks ... *erubescens* (Butler)
7. Labial palpi with the third segment
variable. Fore wings not filled up
with colour between the stigmata ... 8
- Labial palpi with the second segment
upturned, the third segment
obliquely porrect. Fore wings filled
up with colour between the
stigmata ... *cerastioides* (Moore)
8. Labial palpi with the third segment
upturned. Fore wings with
ochreous fascia on the costa;
numerous small black streaks on
the veins in the area M_1 and M_2
in between the outer margin and
discocellular ... *putris* (Linn.)
- Labial palpi with the third segment
porrect or downwardly curved.
Fore wings without fascia and
streaks on the veins ... *nigrosigna* (Moore)

(b) *Based on the male genitalia*

1. Cluster of strong bristles below
the corona and ampulla present,
rarely absent below the ampulla;
saccus large. Juxta short and
broad. Aedeagus usually with the
spines well developed ... 2
- Cluster of such setae absent: saccus
short. Juxta long and broad, with
lateral prolongations. Aedeagus
simple and without cornuti ... *sicca* (Guén.)
2. Claspers with the cucullus narrow
and produced forwards disto-
ventrally ... 3
- Claspers with the cucullus not narrow
and not produced disto-ventrally ... 7
3. Clavus present ... 4
- Clavus obsolete ... 5

4. Uncus broad, abruptly ending in a point distally; saccus triangular. Claspers with the cucullus about half the width of the middle portion, not sharply differentiated *ochracea* (Walker)
- Uncus broad but flattened distally; saccus large and conical. Claspers with the cucullus narrow, less than half the width of the middle portion, sharply differentiated *ruptistriga* (Walker)
5. Ampulla short and thin, with bristles below it; harpe z-shaped *cerastioides* (Moore)
- Ampulla short and thick, without bristles below it; harpe not as above 6
6. Corona having a dense cluster of bristles below it and a few below ampulla; saccus large *rubicilia* (Moore)
- Corona not having any dense cluster below it and ampulla; saccus short *erubescens* (Butler)
7. Harpe and ampulla pointed and narrow. Juxta bifurcated into two narrow lobes distinctly. Aedeagus large, with numerous spines on the vesica *nigrosigna* (Moore)
- Harpe and ampulla not pointed, but broad at the end. Juxta small and not produced at the end into two lobes, but extended laterally. Aedeagus with a row of spines inside on the vesica *postfusca* (Hampson)

(c) *Based on the female genitalia*

1. Ostium bursae with the margin sclerotised and extending over the opening; corpus bursae large or small, with or without sclerotised ribbons; receptaculum seminalis present or absent 2
- Ostium bursae simple, with the margin not extending over the opening; corpus bursae large, with sclerotised ribbons; receptaculum seminalis absent *sicca* (Guén.)
2. Corpus bursae with ribbons 3
- Corpus bursae without ribbons 4
3. Corpus bursae long bladder like, with a single ribbon, receptaculum seminalis large and spherical *uptistriga* (Walker)
- Corpus bursae more or less cylindrical, with two ribbons; receptaculum seminalis elongate and broad, narrowing abruptly at its end *nigrosigna* (Moore)

- | | | | |
|----|---|-----|-----------------------------|
| 4. | Receptaculum seminalis present,
small | ... | 5 |
| | Receptaculum seminalis absent | ... | 7 |
| 5. | Corpus bursae with sclerotised
stripes on it | ... | 6 |
| | Corpus bursae without stripes on it | ... | <i>erubescens</i> (Butler) |
| 6. | Ductus bursae uniformly sclerotised;
corpus bursae short and broad | ... | <i>ochracea</i> (Walker) |
| | Ductus bursae with two sclerotised
areas, one on each side; corpus
bursae long, with its base rounded | ... | <i>postfusca</i> (Hampson) |
| 7. | Ductus bursae sclerotised fully or
partly; corpus bursae short and
broad | ... | 8 |
| | Ductus bursae membranous; corpus
bursae long and narrow | ... | <i>rubicilia</i> (Moore) |
| 8. | Ductus bursae long; corpus bursae
broad almost rounded | ... | <i>cerastioides</i> (Moore) |
| | Ductus bursae short; corpus bursae
broad, more or less rounded at
the base only, the apical part
narrow | ... | <i>putris</i> (Linn.) |

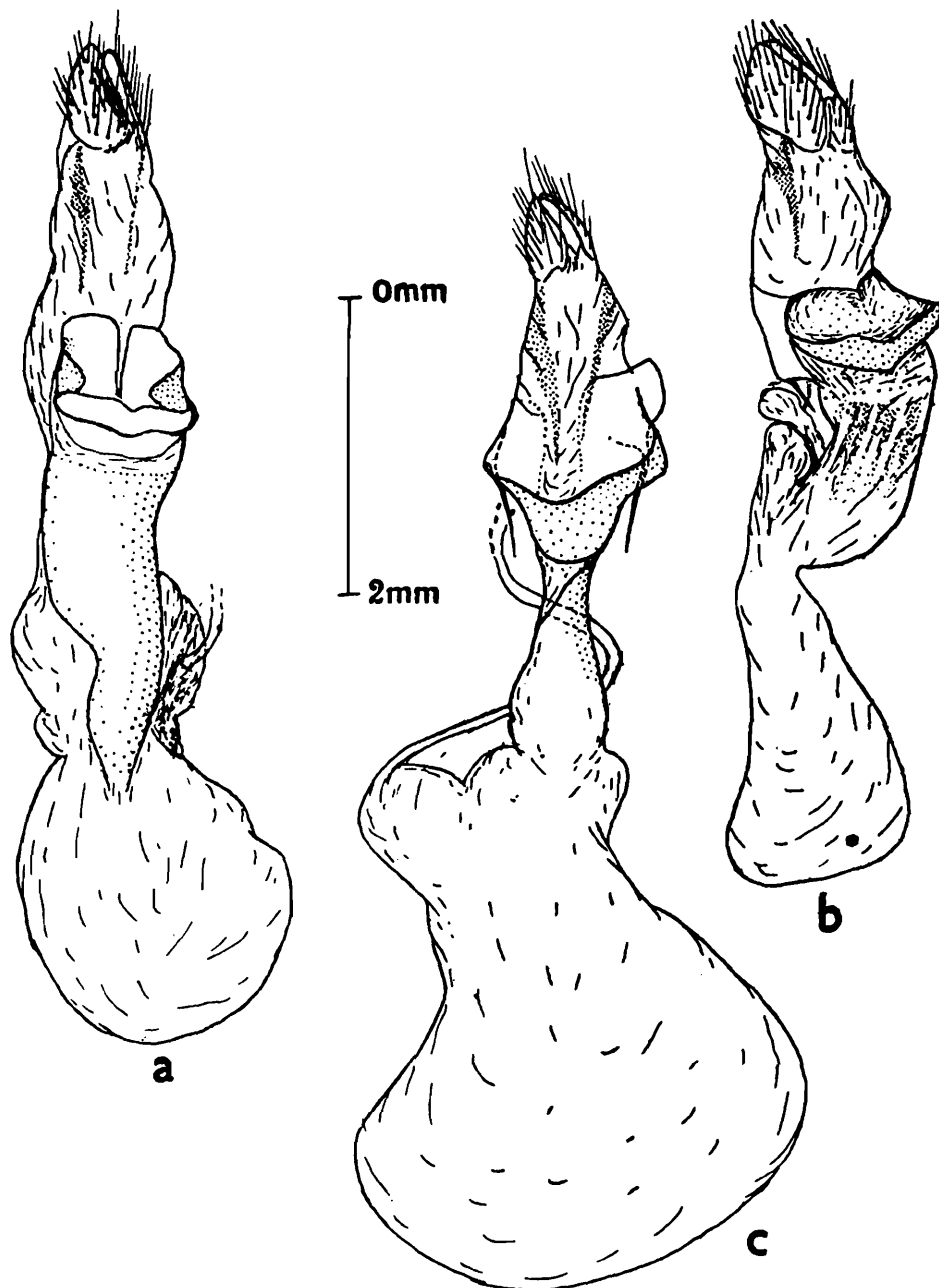
13. *Diarsia cerastioides* (Moore)

(Text-fig. 18 a)

1867. *Graphiphora cerastioides* Moore, *Proc. zool. Soc. Lond.*, p. 54. (Type loc.—Darjeeling).
1888. *Graphiphora cerastioides* Moore : Cotes & Swinhoe, *Cat. Moths of India*, p. 310.
1894. *Agrotis cerastioides* (Moore) : Hampson, *Fauna Brit. India, Moths*, 2, p. 185.
1903. *Agrotis cerastioides* (Moore) : Hampson, *Cat. Lep. Phal.*, 4, p. 430.
1909. *Rhyacia cerastioides* (Moore) : Warren, in Seitz *Macrolepidoptera of the World*, 3, p. 47.
- 1954(a). *Diarsia cerastioides* (Moore) : Boursin, *Bonn. zool. Beitr.*, 5, pp. 219, 225, 249, pl. IX, fig. 35 ♂ genitalia).

Head with the frontal tufts, vertex and the thorax dark reddish brown, mixed with grey. Antennae with the base pale-ochreous brown, the shaft brown. Labial palpi dark brown up to the second segment. Fore wings dark reddish brown; the subbasal and antemedial lines indistinct, the postmedial lines dark, double and waved, excurved below the costa and in the middle, incurved below vein M_3 ; the subterminal line indistinct, curved outwards below vein R_5 ; the terminal line pale and indistinct; light brown colour present between the stigmata in the cell; the claviform indistinct; the orbicular almost rounded, with the centre red brown; the reniform almost red brown, both the stigmata defined by brown boundaries and greyish annuli. Hind wings brownish white, the veins darker. Under side with the fore wing dark-reddish brown; hind wings paler. Legs with the tibiae and the tarsi fuscous, tibial spurs with the pale bands at base and the tips present.

Head with the frons smooth. Antennae ciliate in both sexes, the ciliation profusely in the male than in the female. Labial palpi obliquely upturned, the third segment short and narrow. Legs with two rows of spines on all the tibiae and three rows on all the tarsal segments, rarely with four rows on the fore tarsi.



TEXT-FIG. 18. Female genitalia of (a) *D. cerastioides* (Moore); (b) *D. erubescens* (Butler); (c) *D. putris* (Linn.).

Genitalia.—Boursin has described its male genitalia in details. The main feature being that the uncus is strong, the claspers relatively short and broad; cucullus well differentiated, with slender bases; corona normal; harpe z-shaped, with broad bases; ampulla very short and thin; clavus obsolete. Aedeagus short and thick. (After Boursin, 1954, a). Female (Text-fig. 18 a) with the ostium bursae having its margin sclerotised, leading through the sclerotised ductus bursae;

corpus bursae almost rounded, without stripes and signum; receptaculum seminalis absent; ductus spermathecus, instead, arises from the basal part of corpus bursae which is slightly enlarged than the ductus bursae.

Distribution.—India; Himachal Pradesh, Punjab, Bengal. Also Sikkim.

Wing expanse.—Males, 34—37 mm.; females, 30—33 mm.

Material examined.—Four examples. INDIA: West Bengal, Darjeeling, 1 ♀, [no more data]. Sikkim: 1 ♀, 1.xi.1890 (G. C. Dudgeon), 2 ♂♂ (O. Möller) [no date of collection].

Remarks.—Referrable to this genus, it has some external characteristic features which agree with *D. erubescens* (Butler) and *D. rubicilia* (Moore), but, however, differs from them in the absence of receptaculum seminalis in the female genitalia and in the shape of corpus bursae, which is almost circular at base.

Though there are several specimens in the collection, only one, a female, had the intact abdomen, therefore the genitalia of the male could not be studied and in this regards the characters given by Boursin (1954, a) have been employed.

14 *Diarsia erubescens* (Butler)

(Text-fig. 18 b)

1880. *Orthosia erubescens* Butler, *Ann. Mag. nat. Hist.*, (5) 5, p. 224. (Type loc.—Neilgherries) (as Syn. of *A. descripta* (Bremer), and *A. dahlia* (Hübner), *vide* Hampson, 1894, 1903, respectively).
1888. *Orthosia erubescens* Butler: Cotes & Swinhoe, *Cat. Moths of India*, p. 297.
1891. *Chera erubescens* (Butler): Hampson, *Ill. Lep. Het. Brit. Mus.*, 8, p. 78, pl. 145, fig. 7.
1894. *Orthosia erubescens* Butler: Hampson, *Fauna Brit. India, Moths*, 2, p. 185 (as a Syn. of *A. descripta* Bremer).
1903. *Orthosia erubescens* Butler: Hampson, *Cat. Lep. Phal.*, 4, p. 423. (as a Syn. of *A. dahlia* (Hübner)).
1954. *Diarsia erubescens* (Butler): Boursin, *Bonn. zool. Beitr.*, 5, pp. 225, 249-250, pl. iv, figs. 7 ♂, 8 ♀, pl. x, fig. 36 (♂ genitalia).

There is a single female specimen from Kulu (coll. Young) which is not in a well-preserved state especially for the description of its body colour and the pattern of the wings. Butler (1880) has described its coloration. Some of the diagnostic characters are as follows: Head with the vertex and the labial palpi in the front white. Fore wings above shining pinky brown; the base crossed by small dots; discoidal spots imperfectly represented by interrupted black outlines; the medial lines indistinctly greyish, and waved; the costa towards apex suffused with blackish. Hind wings pale-sericeous greyish brown, slightly cupreous upon the margin, whitish at the base. Under side with the wings shining chalky white, with pink brownish costal border; discocellular stigma and an abbreviated discal line greyish; fore wings with the discoidal area greyish. Abdomen greyish brown, with testaceous lateral and anal tufts; under side testaceous, washed at sides with dull reddish.

Head with the frons smooth. Antennae simple and ciliate throughout. Labial palpi obliquely upturned, thickly fringed with scales in the front, reaching the frons, with the third segment slight and porrect.

Legs with two rows of spines on all the tibiae ; tibial spurs with white band at the base and tip ; tarsal spines not distinct.

Genitalia.—Boursin (1954, a) has described the genitalia of which diagnostic characters are as follows. Uncus strongly expanded in the middle, flattened at the distal end. Claspers relatively short and very broad ; cucullus strongly differentiated, with narrow bases ; corona normal, without setae at the inner angle ; harpe short, broad and strong, blunt at the end ; ampulla very small and hardly beset with bristles below it, clavus absent ; saccus normal. Juxta v-shaped, with v-shaped processes. Aedeagus short and stout, armed with several densely settled cornutus. Female (Text-fig. 18 b) with the ostium bursae having sclerotised margin extended but, unlike the other species, not cup-shaped ; ductus bursae sclerotised, with number of stripes on its distal part ; corpus bursae broader basally than at the distal part, without stripes ; receptaculum seminalis small ; genital plate and the papilla anellus lightly sclerotised.

Wing expanse.—Female 34 mm.

Distribution.—Himalayan sub-tropical.

Material examined.—One example. INDIA : Himachal Pradesh ; Kulu, 1 ♀, (Young) [no date of collection].

Remarks.—Referred to this genus only in 1954(a), by Boursin, as an independant species, it was considered till then as a synonym of *A. descripta* (Brem.) along with *D. rubicilia* (Moore) and *D. nigrosigna* (Moore), (*vide* Hampson, 1894) or of *D. dahlii* (Hübner) (*vide* Hampson, 1903). Boursin identified them separately only on the basis of male genitalia, the female genitalia are described here for the first time. The two species, *viz.* *D. erubescens* (Butler) and *D. rubicilia* (Moore), which were considered as synonyms of *descripta*, however, differ from each other on account of indistinct stigmata in *D. erubescens* (Butler), this being distinct in *D. rubicilia* (Moore) ; the male genitalia are without dense cluster below the corona in *D. erubescens* (Butler) unlike in *D. rubicilia* (Moore) and the female genitalia with small receptaculum seminalis unlike the case in *D. rubicilia* (Moore) where it is obsolete.

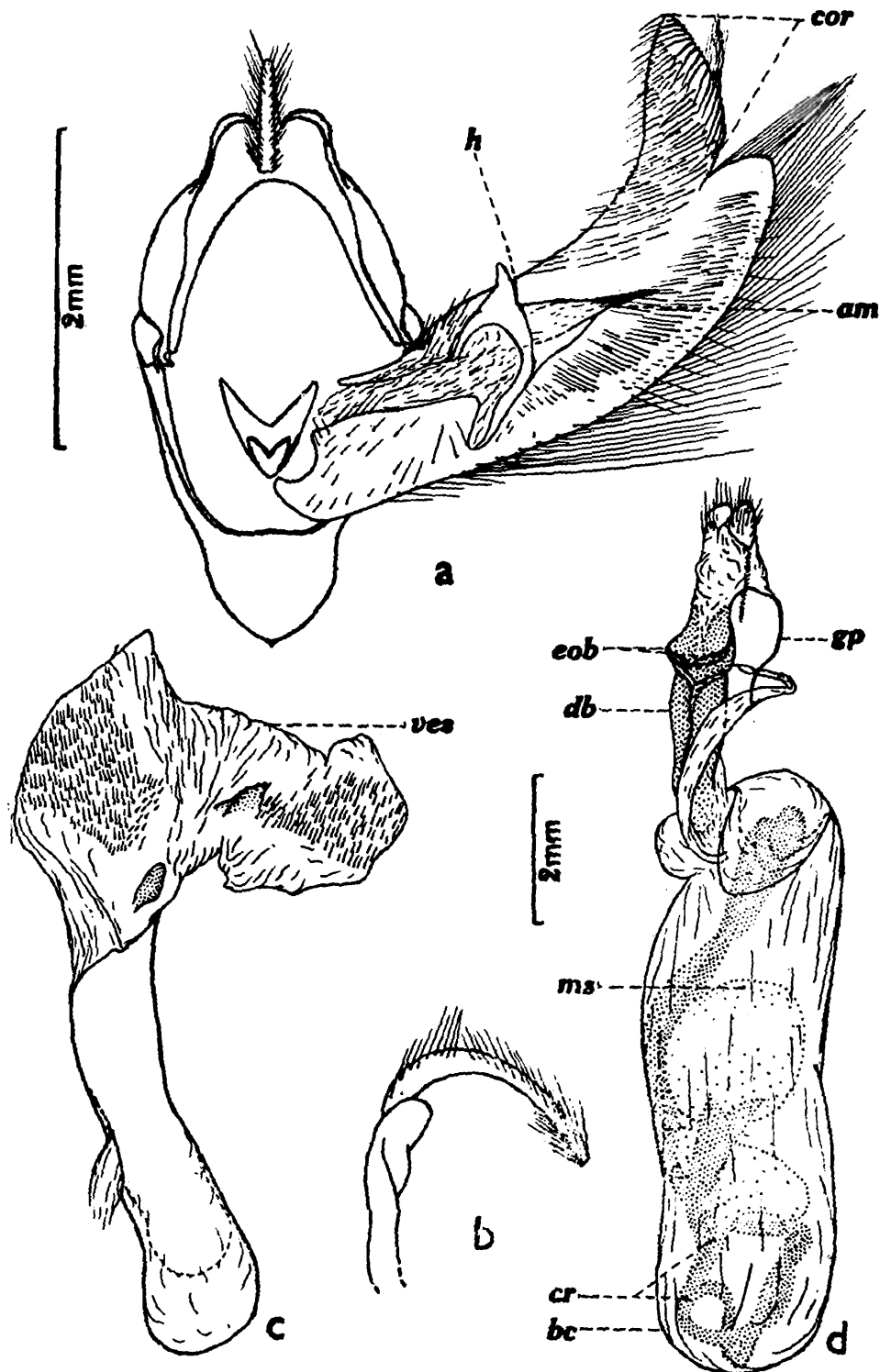
15. *Diarsia nigrosigna* (Moore)

(Plate I, fig. 9 ; Text-figs. 17 d, 19 a-d)

- 1881(a). *Graphiphora nigrosigna* Moore, *Proc. zool. Soc. Lond.*, p. 352, pl. 38, fig. 4. (Type loc.—Sikkim) (Syn. of *A. descripta* Bremer, *vide* Hampson, 1894 and *A. rubicilia* (Moore), *vide* Hampson, 1903).
- 1888 *Graphiphora nigrosigna* Moore : Cotes & Swinhoe, *Cat. Moths of India*, p. 311.
1894. *Graphiphora nigrosigna* Moore : Hampson, *Fauna Brit. India, Moths*, 2, p. 185. (as a Syn. of *Agrotis descripta* Bremer).
1903. *Graphiphora nigrosigna* Moore : Hampson, *Cat. Lep. Fal.*, 4, p. 426 (as Syn. of *A. rubicilia* (Moore)).
1909. *Rhyacia nigrosigna* (Moore) : Warren, in Seitz *Macrolepidoptera of the World*, 3, p. 46, pl. 10f. (as a Syn. of *Rhyacia rubicilia* (Moore)).
1933. *Rhyacia nigrosigna* (Moore) : Corti & Draydt, in Seitz *Macrolepidoptera of the World*, Suppl. 3, p. 76 (as a Syn. of *Rhyacia rubicilia* (Moore)).
- 1954(a). *Diarsia nigrosigna* (Moore) : Boursin, *Bonn. zool. Beitr.*, 5, pp. 225, 230, pl. II, figs. 15 ♂, 18 ♀, pl. VIII, fig. 12 (♂, genitalia).

Head with the frontal tufts and vertex ochreous brown. Antennae brown, except at the base which is ochreous brown. Labial palpi

dark brown on the outer sides up to the second segment, ochreous on the inner side, tip of second segment and the entire third segment. Fore wings ochreous brown; the subbasal line indistinct; the ante-medial and the postmedial lines indistinct, waved and pale brown; the claviform represented by a dark stigmata below the median nervure; the orbicular nearly round, with the boundaries brown; the reniform also defined by a brown boundary, with ochreous suffusion around its



TEXT-FIG. 19. *D. nigrosigna* (Moore): (a) male genitalia, ventral view (b) uncus, lateral view (c) aedeagus (d) female genitalia, ventral view (Text-figs. a-c of same magnification).

upper part and along the costa ; the subterminal line waved and pale ; the area beyond it suffused with fuscous ; the terminal line almost confluent with the ground colour except at the tornus where series of spots are present from vein M_2 to vein 1A. Hind wings pale brown, suffused with fuscous in the later portion. Abdomen fuscous brown, with the anal tufts slightly rufous. Under side with the body and both the wings pale brown, the fore wing tinged with dark suffusion in the cell. Legs on the under side pale brown generally up to the tibiae ; tarsal segments fuscous, irrorated with whitish scales ; tibial spurs fuscous, paler at base and the tip.

Head with the frons smooth and not produced forward. Antennae ciliate in the male, reaching as far as the cell angle. Labial palpi obliquely upturned and reaching the frons, the third segment short and thick. Legs with two rows of spines on all the tibiae, three on the first tarsal segment and four to five rows on second to fifth tarsal segments (Text-fig. 17 d).

Genitalia.—Male (Text-figs. 19 a-c) with the uncus narrow distally ; tegumen narrow ; vinculum short, sclerotised ; saccus globular. Claspers slightly sclerotised, broad and of uniform width almost throughout except at the base and the apex which are narrow ; with cleavage at two-thirds the length of the dorsal margin ; ampulla well developed, broadest at base, tapering gradually ; harpe also well developed and pointed ; clavus almost obsolete. Juxta bifurcate. Aedeagus large and simple, beset with many small spines on the vesica. Female (Text-fig. 19 d) with the ostium bursae having its margin sclerotised and of cup shape ; ductus bursae heavily sclerotised, broad mid-ventrally ; corpus bursae more or less cylindrical and membranous, without signum but with two sclerotised ribbons, each ending in a large membranous sac, receptaculum seminalis elongate and large.

Wing expanse.—Males, 34 — 44 mm. ; females, 39 — 41 mm.

Distribution.—India ; Kashmir, Himachal Pradesh, Punjab. Sikkim and Bhutan ; Himalayan subtropical.

Material examined.—Seven examples. Sikkim : 2 ♂♂, —.xii.1890, 1 ♂, 1 ♀ [no other data]. Bhutan : 1 ♂.—1896, 1 ♂.—iii.1893. Rotung : 1 ♀, 23.xii.1911 (At light).

Remarks.—This species, was treated along with *D. erubescens* (Butler) as a synonym of *A. descripta* Brem. by Hampson in 1894, but was later, regarded by him (Hampson 1903) as a synonym of *rubicilia* (Moore). Boursin (1954a), however, considered it to be a valid species mainly on the basis of genitalic characters and placed it under the genus *Diarsia* Hübner. It differs externally from both *D. erubescens* (Butler) and *D. rubicilia* (Moore) on account of the absence of distinct colour between the stigmata. With regard to the male genitalia, it differs from the above mentioned two species in that the cucullus is neither narrow nor produced forward (Text-fig. 19 a). The female genitalia are characterised by the presence of well developed ribbons in the corpus bursae, the ribbons being absent in the other two species.

16. *Diarsia rubicilia* (Moore)

(Text-figs. 20 a-c)

1867. *Graphiphora rubicilia* Moore, *Proc. zool. Soc. Lond.*, p. 55. (Type loc.—Darjeeling).

1888. *Graphiphora rubicilia* Moore : Cotes & Swinhoe, *Cat. Moths of India*, p. 312.
1894. *Graphiphora rubicilia* Moore : Hampson, *Fauna Brit. India, Moths*, 2, p. 185 (as a Syn. of *A. descripta* Brem.).
1900. *Chera rubicilia* (Moore) : Swinhoe, *Cat. East & Aust. Lep. Het.*, Part. II, p. 9.
1903. *Agrotis rubicilia* (Moore) : Hampson, *Cat. Lep. Phal.*, 4, p. 426.
1909. *Rhyacia rubicilia* (Moore) : Warren, in Seitz *Macrolepidoptera of the World*, 3, p. 46, pl. 10f.
1933. *Rhyacia (Diarsia) rubicilia* (Moore) : Corti & Draudt, in Seitz *Macrolepidoptera of the World*, Suppl. 3, p. 76.
- 1954(a). *Diarsia rubicilia* (Moore) : Boursin, *Bonn. zool. Beitr.*, 5, p. 225, pl. x, fig. 40 (♂ genitalia).

Head with the frontal tufts and vertex reddish brown or slightly lighter in colour. Antennae brown. Labial palpi dark reddish upto the second segment, the tip of the latter and the third segment pale or ochreous. Thorax reddish brown. Abdomen greyish, the anal tufts tinged with rufous. Fore wings pale rufous, with slight purplish suffusion from the middle of costa to the subterminal area; the sub-basal, antemedial and postmedial lines present, indistinct and rufous; claviform indistinct, represented by some points at the extremity; orbicular indistinctly round; reniform with blackish boundary, with the colour of the centre same as the ground colour; postmedial line produced into fine streaks on the veins; subterminal line greyish; terminal line represented by series of spots. Hind wings fuscous brown. Cilia reddish. Under side with both the wings pale red and the costal area deep red. Legs brownish ochreous on the outer sides up to the tibiae, tarsi dark fuscous; tibial spurs fuscous except at base and the apex.

Head with the frons smooth. Antennae simple and ciliate in both sexes. Labial palpi upturned, reaching slightly beyond the frons, the third segment short and nearly porrect. Legs with two rows of spines on all the tibiae, three rows on the first tarsal segment and three to five rows on the second to fifth segment.

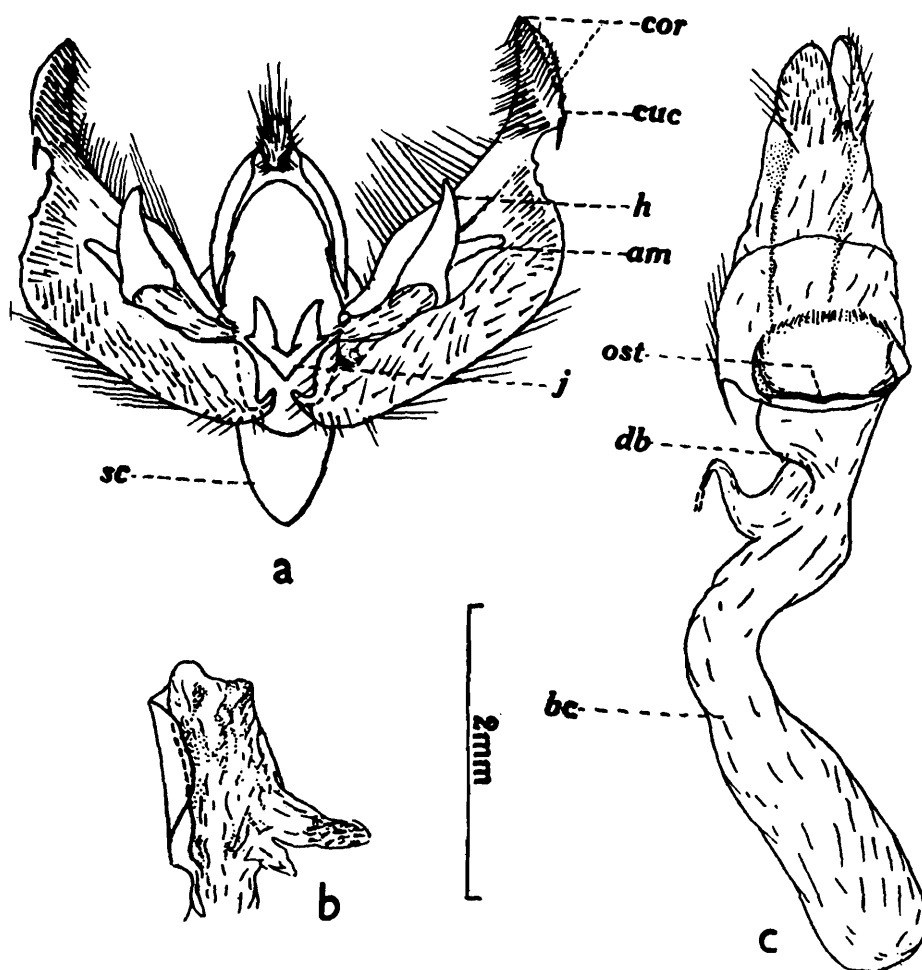
Genitalia.—Male (Text-figs. 20 a-b) with the uncus narrow at the base than the broad and flattened distal end, beset with setae above and below; tegumen and vinculum narrow; saccus large, almost semicircular. Claspers with the cucullus well differentiated and extending beyond the lower disto-ventral part; harpe almost triangular and upturned; ampulla straight and slender distally, without cluster of bristles below it; clavus obsolete. Juxta broad v-shaped, acute at the base. Aedeagus sclerotised, short and beset with short spines on the vesica. Female (Text-fig. 20 c) with ostium bursae simple, the margin sclerotised; ductus bursae not sclerotised, leading into a long tubular corpus bursae, the latter without signum and stripes; receptaculum seminalis short, almost obsolete at the junction of the corpus bursae and ductus bursae. Genital plate and the ovipositor lightly sclerotised.

Wing expanse.—Males, 29-34 mm.; females, 30-34 mm.

Distribution.—India; Kashmir, Punjab, Bengal. Also Sikkim, Bhutan and Burma.

Material examined.—Eight examples. INDIA: West Bengal; Darjeeling, 3 ♂♂, 1 ♀ [no further data]. Sikkim: 1 ♂, 3.iv.89 (J. C.

Pilcher, 2 ♀ ♀, [no date of collection] (*G. C. Dudgeon*). Bhutan: 1 ♂, —.ix.89 (*G. C. Dudgeon*).



TEXT-FIG. 20. *Diarsia rubicilia* (Moore): (a) male genitalia, ventral view (b) aedeagus (c) female genitalia, ventral view. (all of the same magnification).

Remarks.—This species was transferred to the genus *Diarsia* Hübner by Boursin (1954, a), as stated earlier. It differs from both *nigrosigna* (Moore) and *erubescens* (Butler) externally, by the colour pattern of the wings, and in the characters of the male genitalia especially in the shape of the cucullus which is narrow and is produced posteriorly. The female genitalia are characterised by the tubular and long corpus bursae.

17. *Diarsia putris* (Linn.)

(Text-fig. 18 c)

1764. *Phalaena noctua putris* Linn., *Faun. Svec.*, p. 315. (Type loc.—“Hortis”).
 1823. *Noctua lignosa* Hübner, *Eur. Schmett. Noct.*, fig. 50. (Syn. of *A. putris*, vide Hampson, 1894, 1903).
 1882. *Agrotis putris* (Linn.): Kirby, *Eur. Butterflies & Moths*, p. 195.
 1888. *Axylia triseriata* Moore, *Proc. zool. Soc. Lond.*, p. 409. (Type loc.—Kangra). (Syn. of *A. putris* (Linn.), vide Hampson, 1894, 1903).
 1894. *Agrotis putris* (Linn.): Hampson, *Fauna Brit. India, Moths*, 2, p. 186.
 1903. *Agrotis putris* (Linn.): Hampson, *Cat. Lep. Phal.*, 4, 452.

1909. *Rhyacia putris* (Linn.) : Warren, in Seitz *Macrolepidoptera of the World*, 3, p. 49, pl. 10 k.
 1933. *Rhyacia* (*Diarsia*) *putris* (Linn.) : Corti & Draudt, in Seitz *Macrolepidoptera of the World*, Suppl. 3, p. 80, pl. 12 b.

Head with the frontal tufts, vertex and the collar ochreous brown, the latter with a medial line and the tip rufous; frontal tufts with a dark fuscous line across the middle. Antennae ochreous brown to rufous at the bases, the shaft fuscous. Labial palpi tinged with rufous on the outer sides, paler on the inner side. Thorax and tegulae fuscous, the latter whitish on inner side. Abdomen fuscous. Fore wings ochreous; the costal area and the cell suffused with reddish brown; an indistinct subbasal line represented by two short striae at the base from the costa; antemedial line strongly incurved below the median nervure at vein 1A and again incurved below vein 1A; orbicular round or shortly oval, reniform s-shaped, defined by dark reddish brown boundary, with fuscous centre and ochreous annulus; postmedial line strongly dentate on the outer side, with the points ending in streaks on the veins; a rufous streak above and below vein M_2 from beyond the reniform to the outer margin; two rufous spots near the tornus, one at vein Cu_{1b} and another at vein 1A; a terminal series of black dots present. Hind wings whitish to ochreous, tinged with brown; cilia ochreous, with brown suffusion at some places. Under side with the fore wings ochreous brown, the anterior half tinged with fuscous nearly up to the subapical part; hind wings as on the upper side. Fore legs ochreous above throughout; femora fringed with dark fuscous scales; middle and hind legs ochreous at places on the tibiae and at the bases and tips of the spurs, otherwise wholly fuscous.

Head with the frons smooth. Antennae simple and mainly ciliate. Labial palpi upturned, reaching beyond the frons, the third segment short. Legs with two rows of spines on all the tibiae and three rows on the tarsi.

Genitalia.—Female (Text-fig. 18 c) with the ostium bursae lightly sclerotised; the margin not showing any modification, the genital plate much lighter in colour than the ovipositor; ductus bursae short, sclerotised and broader at the base, leading into the corpus bursae which is without signum or stripes; receptaculum seminalis absent.

Male not studied.

Wing expanse.—Females, 34-39 mm.

Distribution.—India; Himachal Pradesh, Bengal and Sikkim. Also China, Japan, Russia, Korea, Germany, Austria, Hungary, Switzerland, N. Spain, Italy, France and Britain.

Material examined.—Six examples. INDIA: Himachal Pradesh, Simla, 1 ♀ 2133.56 m. (7000 ft.) -vii.97 (*Pilcher*). West Bengal, Kurseong, 2 ♀ ♀ (Purchased) [no further data], Darjeeling, Government House, 1 ♀ [no further data]. Sikkim: 1 ♀ [no further data], 1 ♀, 9.x.1890 (*G. C. Dudgeon*).

Remarks.—The female genitalia is characterised by the simple ostium bursae, the absence of ribbons and absence of signum or stripes in corpus bursae. This brings it closer to *D. cerastioides* (Moore) and *erubescens* (Butler) but it differs from the latter by the absence of receptaculum seminalis and from the former by the short ductus bursae and the corpus bursae.

The species is recorded from West Bengal for the first time.

18. *Diarsia sicca* (Guén.) comb. nov.

(Text-figs. 1 i, 21 a-d)

1852. *Axylia sicca* Guénee, *Noctuelites-I.*, 5, p. 135. (Type loc.—M. N.).1881(a). *Axylia renalis* Moore, *Proc. zool. Soc. Lond.*, p. 341. (Type loc.—Sind Valley, Kashmir) (Syn. of *A. sicca* (Guén.), *vide* Hampson, 1903).1903. *Agrotis sicca* (Guén.) : Hampson, *Cat. Lep. Phal.*, 4, p. 451, pl. LXXI, fig. 30.

Head with the frontal tufts brownish ochreous, with a fuscous bar across it. Antennae fuscous. Labial palpi fuscous except at the tips which are brownish ochreous. Vertex and the collar ochreous, the latter rufous, with some dark scales at the tips. Thorax fuscous or brownish. Abdomen greyish brown. Fore wings brownish ochreous; the costal area purplish fuscous; subbasal line represented by a double streak from costa to the cell; an indistinct antemedial line strongly curved below the cell; orbicular small and round, with its centre brownish and the annulus dark; reniform with brownish centre and dark annulus; claviform represented by a small black dot at the extremity; cell, between the stigmata, filled up by the deep chocolate brown colour, that beyond the reniform extending in the form of streaks up to the outer margin; postmedial line double, produced into a double series of spots on the veins, bent outwards below the costa and thereafter incurved below vein M_3 ; subterminal line indistinct; a terminal series of black dots present. Hind wings brownish ochreous to ochreous, semi-hyaline. Under side with the wings irrorated with brown. Legs brownish above upto the tibiae; tarsi fuscous.

Head with the frons (Text-fig. 1 i) subrounded, produced forward but smooth. Antennae ciliate in both sexes, more profusely in the male. Labial palpi obliquely upturned, reaching the frons, the third segment short and porrect. Frenulum consisting of a single spine in the male and of three spines in the female. Legs with two rows of spines on all the tibiae, three rows on all the tarsi.

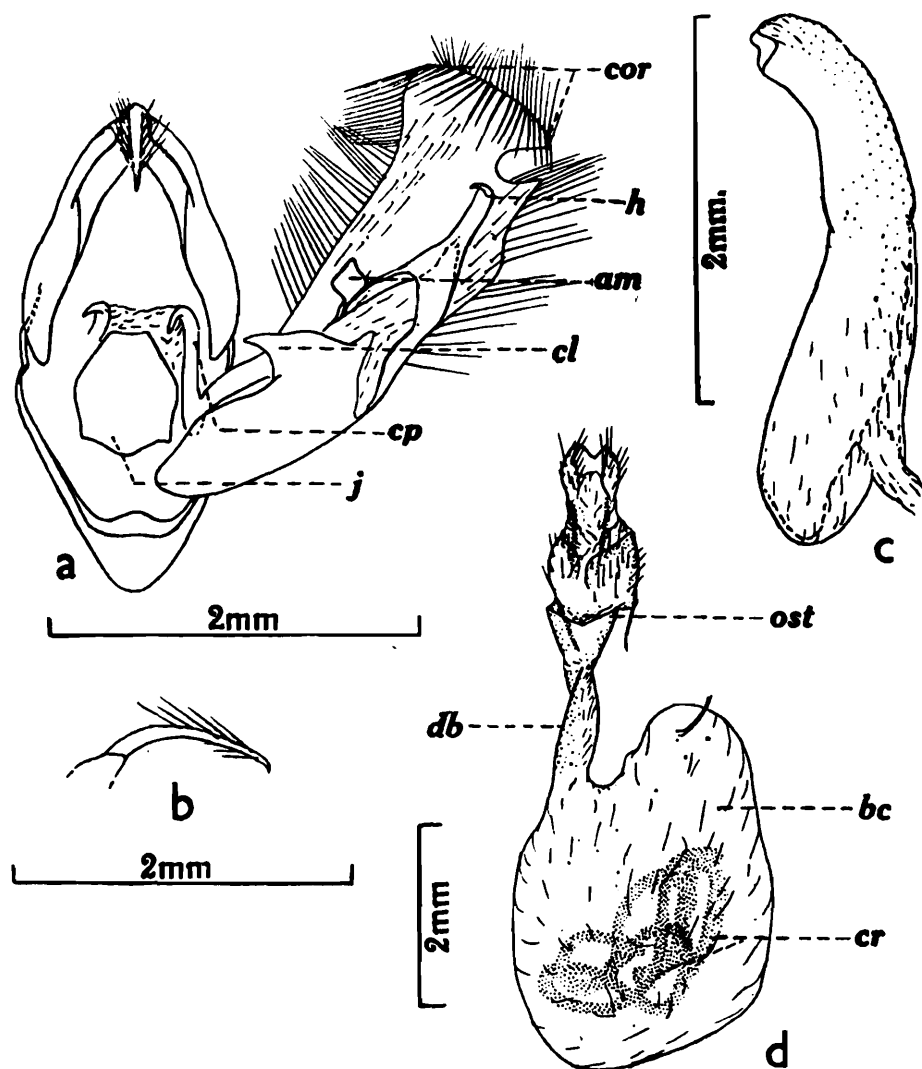
Genitalia.—Male (Text-figs. 21 a-c) with the uncus slender, bent almost at right angle to the tegumen, gradually tapering; tegumen slender; vinculum v-shaped; saccus short. Claspers short and broad, of uniform width throughout, with both the margins smooth, except near the disto-ventral margin which is slightly incised; corona represented by a distal row of marginal setae, rest of the setae sparse; harpe well developed and upturned; ampulla short; clavus present; costa produced basally into a fold which unites with anellus on each side. Juxta broad. Aedeagus slightly sclerotised and without cornuti. Female (Text-fig. 21 d) with the ostium bursae simple and unsclerotised; ductus bursae short and sclerotised; corpus bursae large, bulged on one side, with coiled sclerotised ribbons; signum absent; ductus spermathecae short and narrow, arising from the bulged portion of corpus bursae.

Wing expanse.—Male, 29-32 mm.; female, 31.5 mm.

Distribution.—India: Himachal Pradesh, Punjab.

Material examined.—Six examples. INDIA: Himachal Pradesh: Kangra Valley, 1371.58 m. (4500 ft.), 1 ♂, 1 ♀, -.vii.1899, 3 ♂♂, 1 ♀, -.vii.1899 (G. C. Dudgeon).

Remarks.—The species is characterised by the fasciculate antennae in the male; labial palpi with the third segment porrect, by the fore wing with the cell filled up by a distinct colour between the stigmata; and by the presence of three rows of spines on all the tarsal segments. It is further characterised by the male genitalia having distinct corona at the distal margin, having cucullus curved and tapering and presence of distinct clavus, ampulla and harpes (Text-fig. 21 a-c).



TEXT-FIG. 21. *Diarsia sicca* (Guén.): (a) male genitalia, ventral view (b) uncus, lateral view (c) aedeagus (d) female genitalia, ventral view.

Female genitalia are distinct on account of the simple ostium bursae and corpus bursae, the latter is without signum or sclerotised patches, further it has coiled ribbon and is devoid of receptaculum seminalis.

It is transferred to the genus *Diarsia* principally on account of the presence of fore tibial spines and the presence of distinct corona on the distal margin of claspers in the male. The fore tibial spines are short and slender in *Diarsia* unlike the case in the genus *Agrotis* where these are long and stout. Similarly the corona in *Agrotis* consists of an oblique row of setae situated much before the distal margin unlike the case in *Diarsia*.

19. *Diarsia ochracea* (Walker)

(Text-figs. 17 a-c, 22 a-d)

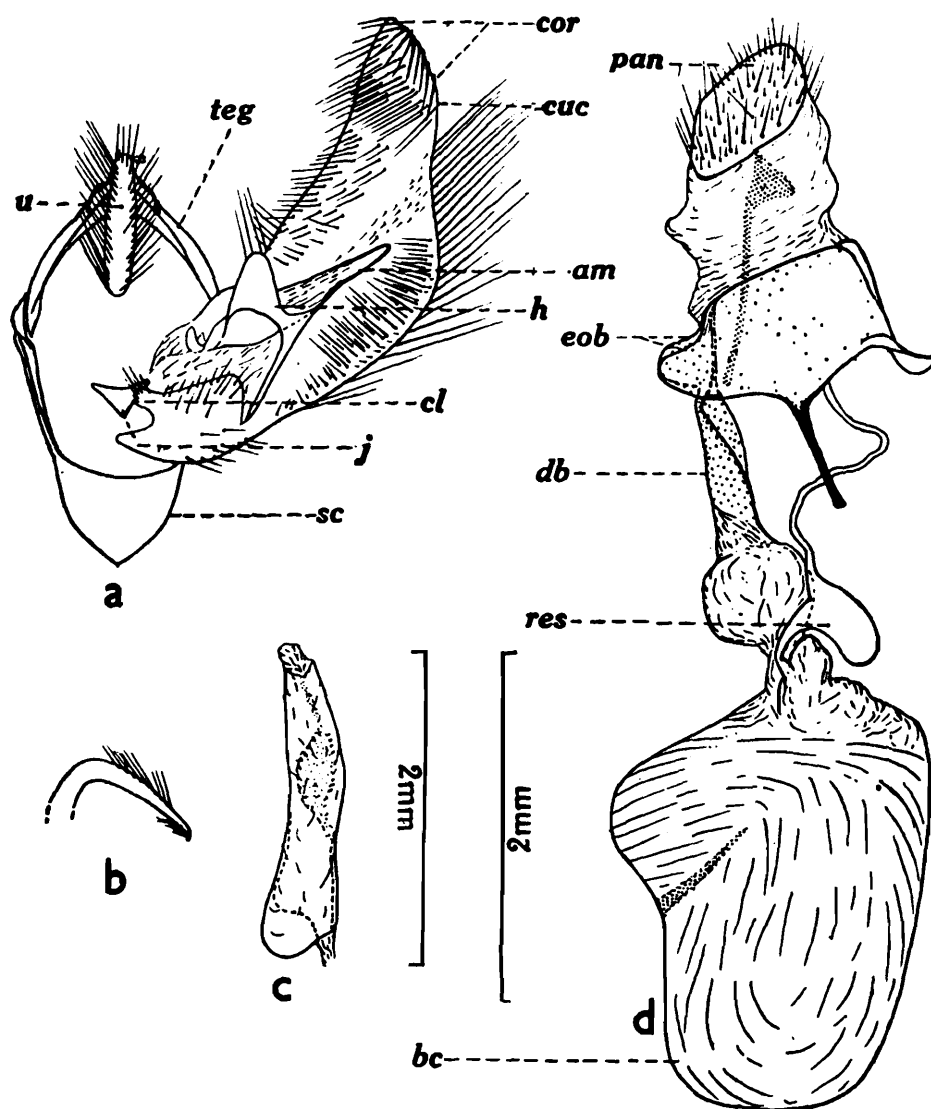
- 1865(b). *Oxira ochracea* Walker, *List Lep. Brit. Mus.*, 33, p. 657. (Type loc.—Ceylon).
1887. *Graphiphora frontalis* Moore, *Lep. Ceylon*, 3, p. 35. (Type loc.—Ceylon) (Syn. of *ochracea* (Walker), *vide* Hampson, 1894, 1903).
1889. *Graphiphora varia* Swinhoe, *Proc. zool. Soc. Lond.*, p. 412. (Type loc.—E. India) (Syn. of *ochracea* (Walker), *vide* Hampson, 1894, 1903).
1894. *Agrotis ochracea* (Walker): Hampson, *Fauna Brit. India, Moths*, 2, p. 182.
1900. *Agrotis ochracea* (Walker): Swinhoe, *Cat. East & Aust. Lep. Het.*, Part II, p. 8.
1903. *Episilia ochracea* (Walker): Hampson, *Cat. Lep. Phal.*, 4, p. 480.
1933. *Rhyacia (Diarsia) ochracea* (Walker) : Corti & Draudt, in Seitz *Macrolepidoptera of the World*, Suppl. 3, p. 75.
- 1954(a). *Diarsia ochracea* (Walker) : Boursin, *Bonn. zool. Beitr.*, 5, p. 229, pl. vii, fig. 7 (♂ genitalia).

Head with the frontal tufts, vertex and the thorax brownish ochreous to ferruginous brown, rarely with fuscous tinge. Antennae with the shaft brownish ochreous above, up to the basal half, the branches and the under side fuscous brown in the male, brownish ochreous in a few basal segments in the female. Labial palpi deep-chocolate brown on the outer side up to the second segment, brownish ochreous at the end of second segment and the third segment and on the inner side. Fore wings ochreous, tinged with ferruginous, olive brown or rufous; the subbasal line double wavy, with a black spot in and below the cell; the antemedial line also double and wavy; the orbicular round, defined by brownish boundary, with the colour in the centre same as ground colour of the wing; claviform represented by a dot at its extremity; reinform defined by a brown boundary, the centre similar to ground colour of the wing, with a grey annulus and a fuscous patch at its lower part; medial line indistinct, the part from below the cell angle to the inner margin represented by rufous suffusion; the postmedial line double and waved, the outer line dentate and with the fine black and white dots on areas crossing the veins forming short streaks; the subterminal line brownish ochreous, with black suffusion on its inner side near the apex; terminal series of black points present. Hind wings fuscous brown; cilia ochreous or red brown. Abdomen fuscous brown. Legs brownish ochreous on the inner side, dark brown to fuscous above; tibial spurs whitish at the base and the tip. Under side brown to fuscous brown.

Head with the frons smooth. Antennae bipectinate, in the male strongly so in the basal 6/7th part, the branches nearly equal, the distal part simple and ciliate (Text-fig. 17 a); the shaft consisting of nearly 60 segments, with the pectination up to 45 segments, the longest rami about the length of four segments of the shaft in the middle; female with the antennae simple and finely ciliate. Labial palpi obliquely upturned, the third segment short and narrow, about half of the second segment. Tibiae and tarsi with two and three rows of spines, respectively (Text-figs. 17 b-c).

Genitalia.—Male (Text-figs. 22 a-c) with the uncus immediately bent downwards, ending into a point; tegumen and vinculum slender; saccus short, broad and triangular. Claspers broadest in the middle than at the base and apex; cucullus about the width of the middle part;

corona consisting of a row of strong setae on the distal margin and a cluster of densely settled setae below it; meso-ventral part, immediately below the ampulla, also beset with densely settled setae; ampulla almost straight; harpe broad and blunt dorsally but in the form of a membranous fold; costal margin smooth. Juxta short; clavus hairy. Aedeagus short and simple, with tooth-like cornuti at the apex. Female



TEXT-FIG. 22. *Diarsia ochracea* (Walker): (a) male genitalia, ventral view (b) uncus, lateral view (c) aedeagus (d) female genitalia, lateral view (Text-figs. a-c of same magnification).

(Text-figs. 22 d) with the ostium bursae sclerotised at the margin, cup-shaped; ductus bursae sclerotised; corpus bursae more or less quadrangular, without signum and ribbons but with small sclerotised stripes on it; receptaculum seminale as a short prolongation from near the point of union of ductus bursae with the corpus bursae.

Wing expanse.—Males, 28-29 mm.; females, 32-34 mm.

Distribution.—Ceylon.

Material examined.—Four examples. CEYLON: 1 ♀, -.xii.1894, 1 ♂, -.iii.1907, 1 ♀ -.iv.1907 (Hakagala), 1 ♂, -.x.1907 (all *E. E. Green*).

Host range.—Tea (*Camellia theifera* Griff.): Andrews, 1921.

Remarks.—Referred to the genus *Diarsia*, by Boursin 1954 (a), who stated that the species was restricted to Ceylon, contrary to the

earlier record given by Hampson (1903) from India, Japan, W. China, Tibet, etc., and excluded most of its synonyms, given by Hampson and recognised them as distinct species, viz. *D. deparca* (Butler), *D. ruptistriga* (Walker) and *D. stictica* Pouj.

The species is characterised by the presence of sexual dimorphism, especially in its colour-markings, the male being very much lighter in colour than the female; besides the antennae are bipectinate in the male. In respect of the genitalic characters it may be stated that the claspers are well developed and have a double set of setae on the cucullus; in the female genitalia signum is absent on the corpus bursae.

20. *Diarsia ruptistriga* (Walker)

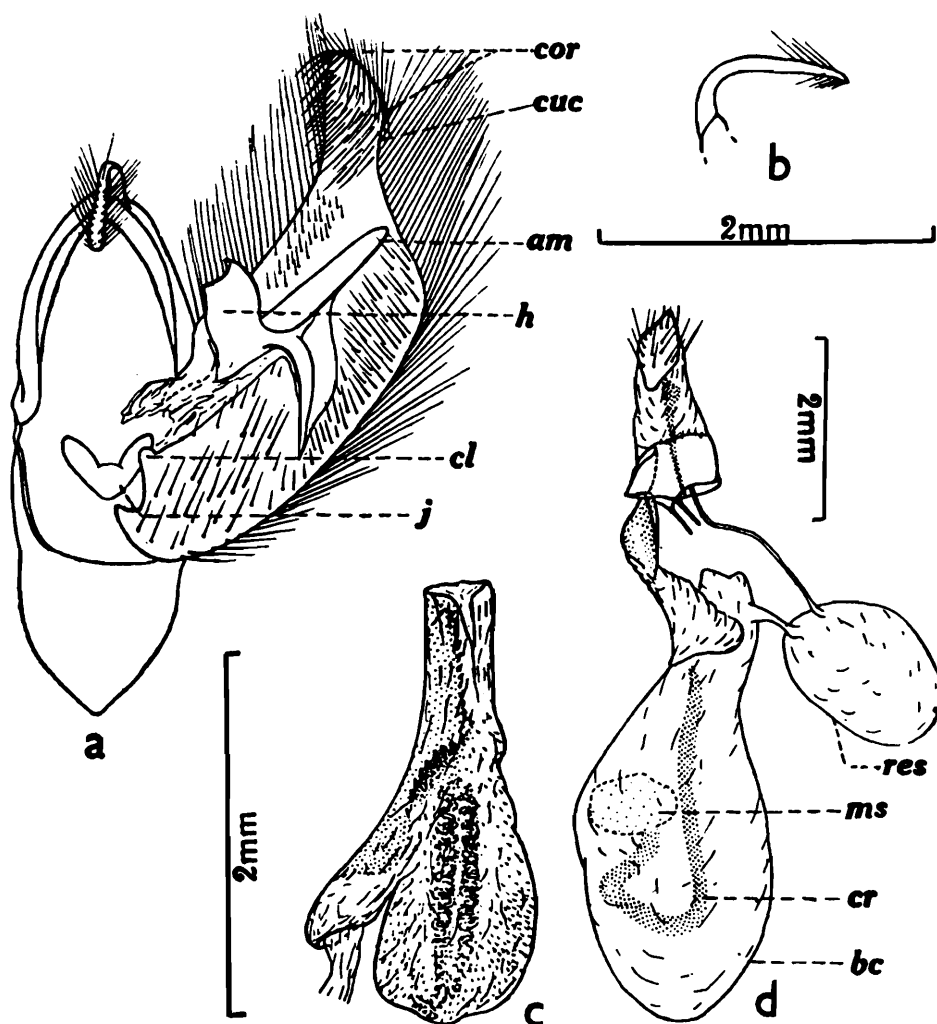
(Plate I, fig. 10; Text-figs. 17 f-g, 23 a-d)

- 1865(b). *Hadena ruptistriga* Walker, *List Lep. Brit. Mus.*, **33**, p. 739. (Type loc.—Ceylon).
 1893. *Amathes ruptistriga* (Walker): Hampson, *Ill. Lep. Het. Brit. Mus.*, p. 94.
 1894. *Hadena ruptistriga* Walker: Hampson, *Fauna Brit. India, Moths*, **2**, p. 182 (as Syn. of *A. ochracea* Walker).
 1903. *Hadena ruptistriga* Walker: Hampson, *Cat. Lep. Phal.*, **4**, p. 480 (as Syn. of *Episilia ochracea* (Walker)).
 1909. *Rhyacia ruptistriga* (Walker): Warren, in Seitz *Macrolepidoptera of the World*, **3**, p. 37.
 1954(a). *Diarsia ruptistriga* (Walker): Boursin, *Bonn. zool. Beitr.*, **5**, p. 229, p. VII, fig. 8 (♂ genitalia).

Head with the frontal tufts brownish, irrorated with black scales. Antennae deep brown. Labial palpi brownish ochreous, irrorated with deep chocolate brown or rufous on the outer side, paler at the end of second segment and the third segment. Collar oliver brown at the base. Thorax fuscous. Abdomen greyish brown. Fore wings ochreous to ferruginous brown, tinged with olive brown or grey brown; the subbasal line double and wavy, from costa to vein Cu_2 , darker on the inner side, whitish on the outer side; the medial line double and wavy, slightly ochreous brown, brownish or rufous before the inner margin; claviform represented by a deep-chocolate brown line at its extremity; orbicular oblique and round, with brownish centre and grey annulus; reniform with a slight patch at its lower part, with grey annulus and brownish centre; the cell filled up by deep chocolate colour between the stigmata; the postmedial line double, dentate on the inner side, with small indistinct grey and black points on the veins on the outer side, the subterminal line starting from a deep-chocolate brown patch in the subapical area, ochreous on the outer side; the terminal line represented by a series of points. Hind wings fuscous or greyish brown. Legs ochreous to brownish ochreous below, deep-chocolate brown above, with ochreous bands at the end of tibiae and tarsi; tibial spurs ochreous at the base as well as the tips. Under side greyish brown to deep brown, irrorated with fuscous; the postmedial line and a discocellular spot on the hind wing prominent.

Head with the frons smooth. Antennae (Text-fig. 17 f) bipectinate in the male [in our specimen the distal portion of the antennae broken]; simple and ciliate in the female. Labial palpi obliquely

upturned, reaching the frons, the third segment longer and narrow than in *D. ochracea* (Walker) with which it was once considered synonymous. Legs with two rows of spines on all the tibiae, three rows on the first tarsal segment, three to four rows on second to fifth segment (Text-fig. 17 g). Frenulum consisting of a single spine in the male, two spines in the female.



TEXT-FIG. 23. *Diarsia ruptistriga* (Walker): (a) male genitalia, ventral view (b) uncus, lateral view (c) aedeagus (d) female genitalia, lateral view (Text-figs. a and c of same magnification).

Genitalia.—Male (Text-figs. 23 a-c) with the uncus broad at the base, flattened distally; tegumen and vinculum as in *ochracea* (Walker); saccus large and conical. Claspers with the dorso-distal portion oblique, much narrowed, becoming almost less than half the width of the middle of the clasper; corona well developed; ampulla straight, slender and long; harpe present as a sclerotised fold; clavus small. Juxta v-shaped. Aedeagus short and stout, with the cornutus appearing like the teeth of a saw. Female (Text-fig. 23 d) with the ostium bursae simple, without sclerotisation at the margin, nearly cup-shaped; ductus bursae sclerotised near the opening, the latter membranous; corpus bursae large, bag-like, with a sclerotised ribbon ending in a sac; from the corpus bursae arises another fine duct which enters into a spherical receptaculum seminale.

Wing expanse.—Male, 28.5 mm.; females, 29-30 mm.

Distribution.—Ceylon.

Material examined—Eight examples. CEYLON: Pattipola, 2 ♀♀, -.iii.1906; Hakagala, 1 ♂, -.iii.1907, 1 ♀ -.iv.1907; Ohiya, 4 ♀♀, -.xi.1907 (all *F. E. Green*).

Remarks.—Boursin (1954, a) separated it as a distinct species from *D. ochracea* (Walker) and *D. stictica* (Pouj.). It is so far known only from Ceylon. It resembles *D. ochracea* (Walker) in the bipectinate nature of the antennae in the male, but differs from the latter species by the presence of distinct colour between the stigmata. In respect of the male genitalia it can be differentiated from *D. ochracea* (Walker) by the narrow and prominently produced cucullus, and by the shape of saccus; with regard to the female genitalia it can be easily differentiated from *D. ochracea* (Walker) by the presence of sclerotised ribbon in the corpus bursae.

21. *Diarsia postfusca* (Hampson) Comb. nov.

(Plate I, fig. 11; Text-figs. 1 j, 17 e, 24 a-d)

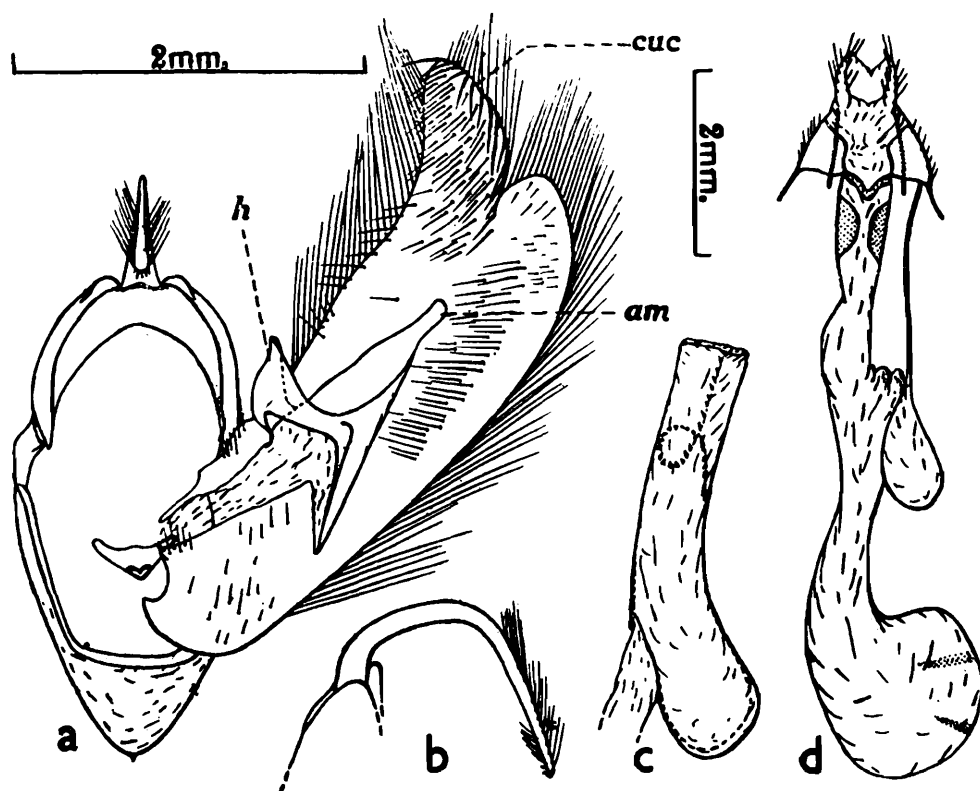
1896. *Agrotis postfusca* Hampson, *Fauna Brit. India, Moths*, 4, p. 508. (Type loc. — Ceylon).

1903. *Episilia postfusca* (Hampson), *Cat. Lep. Phal.*, 4, p. 477, pl. 72, fig. 22.

Head with the frontal tufts brownish ochreous. Antennae with the bases brownish ochreous, the shaft tinged with fuscous. Labial palpi deep-chocolate brown on the outer sides up to the second segment, paler on the inner side and the tips, the third segment brownish ochreous, irrorated with fuscous. Vertex brownish. Thorax brownish ochreous, tinged with fuscous. Abdomen brownish, with fuscous tinge. Fore wings whitish to brownish ochreous, tinged with olive yellow towards the costa and the inner margin; the subbasal line indistinct, double and wavy from costa to vein Cu_2 , with a dark brown dot at its base; the antemedial line double and wavy, excurved below the costa and strongly incurved below vein Cu_2 ; claviform represented only by a small streak or a dot at its extremity; orbicular and reniform large and whitish, the former obliquely round, the latter with its lower part generally with a patch; the area in the cell, between the stigmata, filled up by a deep chocolate colour, and deep-ferruginous brown beyond the medial line; the postmedial line double and wavy, excurved below costa and curved at vein M_3 towards the inner margin; the subterminal line confluent with the dark area before it; the area beyond the subterminal line tinged with olive yellow; the terminal line represented by a series of dark dots. Hind wings fuscous. Under side with both the wings whitish, tinged with fuscous; cilia yellow, tinged with fuscous. Legs heavily fringed with fuscous hair scales on the femur and tibiae on the inner side; fuscous brown above throughout, with white rings at the base of each tarsal segment, tibiae and the tibial spurs, the latter also whitish at the base.

Head with the frons (Text-fig. 1 j) smooth. Antennae (Text-fig. 17 e) shortly biserrate in the male, nearly, up to three-fourths from the base, the distal part ciliate and simple, as in the female. Labial palpi obliquely upturned, the third segment short and slender, porrect or

slightly ascending. Frenulum consisting of a single spine in the male, two spines in the female. Legs with two rows of spines on all the tibiae, three rows on all the tarsal segments.



TEXT-FIG. 24. *Diarsia postfusca* (Hampson): (a) male genitalia, ventral view (b) uncus, lateral view (c) aedeagus (d) female genitalia, ventral view (Text-figs. a-c of same magnification).

Genitalia.—Male (Text-figs. 24 a-c) with the uncus bent and curved like a bow, flattened distally; tegumen short and slender; vinculum slightly longer than the tegumen; saccus normal. Claspers almost as in *D. nigrosigna* (Moore), especially in regard to the cleavage in the distal margin of the clasper; raised mid-dorsally, becoming wider in the middle than at the base and apex; corona well developed; ampulla well developed and blunt at the end; clavus well developed. Juxta well developed, laterally extended but not distinctly bifurcated. Aedeagus simple, sclerotised, rounded at the base, with a row of spines inside the vesica and a few spines distally. Female (Text-fig. 24 d) with the ostium bursae having its margin sclerotised, cup-shaped; ductus bursae short and with sclerotised area on either side; corpus bursae without ribbons, more or less flask-shaped, with sclerotised stripes; receptaculum seminalis large and oval.

Wing expanse.—Male, 29 mm.; females, 34-35 mm.

Distribution.—Ceylon.

Material examined.—Four examples. CEYLON: Muskeliya, 1 ♀, — i.—, 1 ♂, —.ii.1905, 1 ♂, —.ii.—; Hakgala, 1 ♀ —.iii.1907 (all *E. E. Green*).

Remarks.—The species is characterised by the presence of bipectinate antennae in the male, the branches being short and appearing like serrations; it differs in this respect from both *D. ochracea* (Walker)

and *D. ruptistriga* (Walker) which possess prominent antennae with long pectinations. It however, resembles the latter on account of the presence of distinct colour between the stigmata which is not the case in *D. ochracea* (Walker). In respect of the male genitalia it differs from both the species mainly in the structure of the cucullus which is cleavaged. In the female genitalia, as is the case in *D. ochracea* (Walker), the corpus bursae is without ribbons, unlike the case in *ruptistriga* (Walker). It differs from the former, however, on account of flask like shape of corpus bursae.

Genus *Chersotis* Boisduval

1840. *Chersotis* Boisduval, *Gen. et Index-Meth.*, p. 103.
 1903. *Chersotis* Boisduval: Hampson, *Cat. Lep. Phal.*, 4, p. 364. (Syn. of *Agrotis* Ochs.).
 1933. *Rhyacia* (*Chersotis*) Hübner: Corti & Draudt, in *Seitz Macrolepidoptera of the World*, Suppl. 3, p. 59.
 1954(a). *Chersotis* Boisduval: Boursin, *Bonn. zool. Beitr.*, 5, No. 34, pp. 261-264.

Type of the genus.—*Chersotis rectangula* (Schiffermüller).

Distribution.—India, Sikkim, Tibet and Japan. Boursin (1954, a) has also recorded its distribution from central and eastern Asia, Siberia to Japan, N. China, Europe and North Africa.

Diagnosis.—Frons smooth and without prominence. Antennae ciliate in both the sexes. Eyes smooth and large. Ocelli well developed. Proboscis fully developed. Labial palpi upturned, the third segment porrect. Legs with two rows of short and slender spines on all the tibiae and three rows of spines on all the tarsi, terminal spines on fore tibiae longer than the others, the tibiae longer than the first tarsal segment; fore tibiae smaller than the femur, mid tibiae equal to the femur and hind tibiae longer the femur; mid tibiae with a pair of spurs, hind tibiae with two pairs of spurs; arolium well developed.

Venation almost constant and agrees in general with that of *Agrotis segetum* (Schiff.) (Text-figs. 3 a-b).

Genitalia.—Male with the uncus long and slender, or short and stout, slightly beset with short spines at the end. Claspers very short and stout, moderately broad, with the ends rounded; without corona, only small hairs or very fine bristles present; harpe well developed; clavus present, sometimes buldged; ampulla absent. Juxta short. Aedeagus mostly beset with one or two strong cornutus, sometimes absent. Female genitalia large and stout; corpus bursae without signum; receptaculum seminalis present.

Remarks.—Only one species, viz. *C. triangularis* (Moore), is available for study. It has been transferred to this genus for the first time, specially on the basis of the male genitalic characters, as described by Boursin (1954, a). It can easily be distinguished from the genera *Agrotis* Ochs., *Amathes* Hübner and *Diarsia* Hübner by the character of the tibial spines and by structure of the male genitalia as described above.

22. *Chersotis triangularis* (Moore) comb. nov.

(Plate I, fig. 12; Text-figs. 1 k, 25 a-d)

1867. *Ochropleura triangularis* Moore, *Proc. zool. Soc. Lond.*, p. 55. (Type loc.—Darjeeling).

1888. *Ochropleura triangularis* Moore: Cotes & Swinhoe, *Cat. Moths of India*, p. 313.
1891. *Ochropleura triangularis* Moore: Hampson, *Ill. Lep. Het. Brit. Mus.*, p. 14.
1894. *Agrotis triangularis* (Moore): Hampson, *Fauna Brit. India., Moths*, **2**, p. 189.
1900. *Chera triangularis* (Moore): Swinhoe, *Cat. East. & Aust. Lep. Het.*, Part II, p. 13.
1903. *Ochropleura triangularis* Moore: Hampson, *Cat. Lep. Phal.*, **4**, p. 388. (Syn. of *Agrotis stentsi* (Led.)).
1909. *Rhyacia triangularis* (Moore): Warren, in Seitz *Macrolepidoptera of the World*, **3**, p. 43, pl. 9f.
1933. *Rhyacia triangularis* (Moore): Corti & Draudt, in Seitz *Macrolepidoptera of the World*, Suppl. **3**, p. 63.

Head with the frontal tufts, vertex and thorax pale-purple brown. Antennae brown. Labial palpi dark brown on the outer side, pale on the inner side. Collar with an ochreous line across it near the base, deep-chocolate brown at the apex. Fore wings pale brown, the costal area ochreous white from base to near the upper angle of the cell, purple brown beyond the cell; the subbasal line obsolete, instead a dark streak above vein Cu_2 , expanding to a triangular deep-chocolate brown coloured patch; the antemedial line indistinct from costa to the inner margin; claviform represented by a small spot at its extremity; orbicular small, semi-circular, open above and confluent with ochreous white fascia above; reniform with a fuscous centre and an ochreous lunule in it, the latter defined on its inner side by black; postmedial line minutely dentate, excurved below the costa and at the middle and thereafter oblique below vein M_3 ; subterminal line defined on the inner side by deep-chocolate brown streak and slight suffusion, followed below by three points; terminal line rufous. Hind wings fuscous. Abdomen greyish brown. Legs with the fore tibiae and the tarsi ochreous white above; the remaining portion purple brown to fuscous.

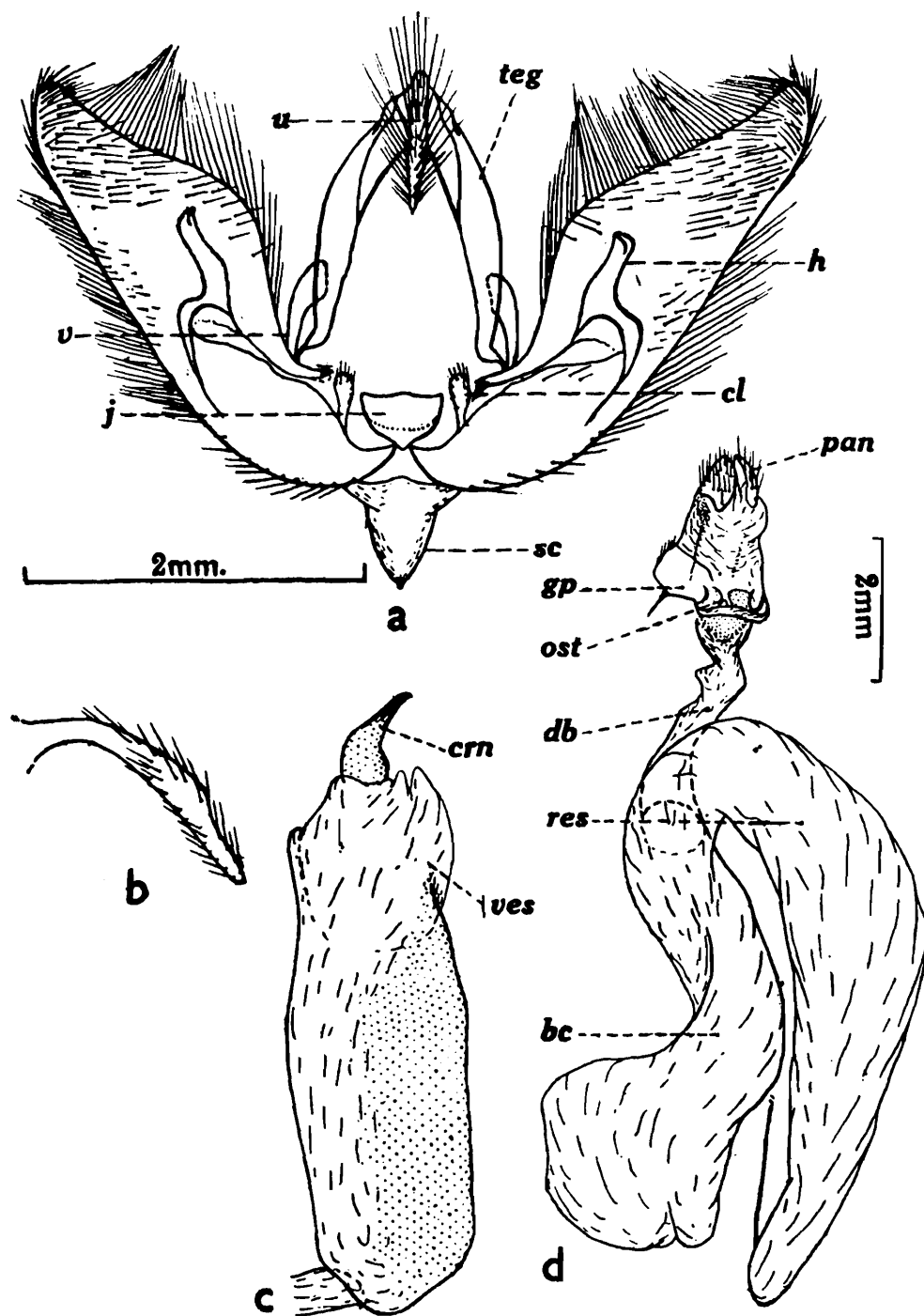
Head with the frons (Text-fig. 1 k) smooth and not produced medially. Antennae ciliate in both sexes. Labial palpi upturned, the third segment short and porrect. Legs with two rows of spines on fore tibiae, the terminal ones longer than the others, other tibiae rarely with three rows of spines; tarsi with three rows of spines; a well developed arolium present.

Genitalia.—Male (Text-figs. 25 a-c) with the uncus broad at the base, increasing in width from the middle up to three-fourths of the length, the distal part becoming narrow and dorsally flattened, almost half as wide as in the middle part; tegumen long and narrow; vinculum u-shaped; saccus small. Claspers simple, without corona, broadest in the middle; harpe present, slightly bent and pointed upwards; ampulla absent; clavus present at the base of clasper and beset with hairs. Juxta short. Aedeagus short and stout, with a very strong cornuti on the vesica. Female (Text-fig. 25 d) with the ostium bursae sclerotised on the sides, leaving a small unsclerotised area in the middle; ductus bursae short, slightly sclerotised, leading into a large membranous corpus bursae, the latter broad at the other end; receptaculum seminalis equally long, or slightly longer than the corpus bursae, the latter without signum, stripes or ribbons.

Wing expanse.—Males, 37—41 mm.; females, 38—41 mm.

Distribution.—India, Sikkim, Bhutan, Tibet, Siberia and Japan.

Material examined.—Five examples. INDIA: West Bengal, Darjeeling, 2133.56 m. (7000 ft.), 2 ♂♂ 1 ♀ [no further data]. Sikkim 1 ♂, (O. Möller) [no date of collection]. Bhutan: 1 ♂, 10.x.1894 (G. C. Dudgeon).



TEXT-FIG. 25. *Chersotis triangularis* (Moore): (a) male genitalia, ventral view (b) uncus, lateral view (c) aedeagus (d) female genitalia, ventral view (Text-figs. a-c of same magnification).

Remarks.—The species is referred to this genus for the first time, on the basis of studies of the male genitalia and other characteristics, as also given by Boursin (1954, a). *C. triangularis* (Moore) can be differentiated, externally, from those of the other genera by the character

of fore-tibial spines which are slender at the distal end of the tibiae and are longer than the rest, and by the male genitalia which is characterised by the absence of corona. It, however, resembles species of the genus *Amathes* generally in the above characters but is easily distinguished from the latter on account of the absence of ampula in the male genitalia, and in the well developed corpus bursae and receptaculum seminalis in the female.

V—SUMMARY

Species of *Agrotis* and the allied genera are commonly called the 'greasy cutworms' or the 'Surface cutworms', because their caterpillars are greasy in appearance and have the habit of cutting seedlings of a number of cultivated plants, whether the agricultural crops or plants of horticultural and medicinal importance. The range of host plants for each species has been given, where possible.

The present study is based on twentytwo species represented by about 250 specimens, which come from what may be conventionally called the Indian region, including namely Burma, Ceylon, India and Pakistan. Most of the specimens are deposited in the National Zoological Collections at the Zoological Survey of India, Calcutta.

The taxonomic revision is based both on the external morphological characters, such as the pectination of antennae in the male, the shape and structure of frons, the wing pattern and the character of tibial spurs and spines; the male genitalic characters are extremely useful in separating the genera as well as the species.

Most of the species dealt with here, were formerly considered as belonging to the genus *Agrotis* Ochsenheimer (1816), (*Sens. lat.*). Lately, however, mainly due to the studies made by Boursin (1954 [a, b], 1955) several of them were transferred to other genera, such as *Diarsia* Hübner (1822), *Rhyacia* Hübner (1822), *Amathes* Hübner (1822) and *Chersotis* Boisduval (1854). Boursin, however, did not have before him as extensive a material from India as the present authors have. As a result of our studies, we find that some species continue to remain under the genus *Agrotis* Ochsenheimer, several others clearly belong to other genera such as *Amathes*, *Diarsia* and *Chersotis*. Our findings are also supported by the recent work of Common (1958) on the genus *Agrotis* as based on the Australian species.

Keys for the identification of genera and species dealt with have been given at the appropriate places.

New combination for the following species have been proposed in the paper. (1) *Agrotis subspinifera* (Hampson); (2) *Amathes curviplena* (Walker); (3) *Diarsia sicca* (Guén.); (4) *Diarsia postfusca* (Hampson); and (5) *Chersotis triangularis* (Moore).

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EXPLANATION OF THE ABBREVIATIONS

al	--	anellus lobes
am	—	ampulla
ap	—	anterior apodemes
ar	—	areole
bc	—	corpus bursae
bd	—	bands on ductus bursae
cl	—	clavus
cor	—	corona
cp	—	costal process or prolongation
cr	—	sclerotised ribbons
crn	—	cornutus/cornuti
cuc	—	cucullus
dc	—	discocellular cell
ds	—	ductus spermathecus
eob	—	sclerotised plate over the ductus bursae
fr	—	frons
gp	—	genital plate
h	—	harpe
j	—	juxta
mj	—	median dome-shape structure of juxta
ms	—	membranous sac/s of the ribbons
op	—	ovopore
ost	—	ostium bursae
pan	—	ovipositor with papilla anales
res	—	receptaculum seminalis
sc	—	saccus
sg	—	signum/sclerotised stripes on corpus bursae
teg	—	tegumen
u	—	uncus
v	—	vinculum
ves	—	vesica
vl	—	clasper/valve