

Taxonomical Study on some Noctuid Moths (Lepidoptera: Noctuidae) from Alexandria, Egypt

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ABSTRACT

The family Noctuidae represents the majority of moth species attracted to light traps at night, with approximately 12,000 species identified worldwide. In Egypt, Noctuidae is represented by 206 species, many of which are pests affecting field crops, fruit trees, and ornamental plants. This study is concerned with 25 species of noctuid moths from family Noctuidae (Lepidoptera). The specimens were collected by light trap operated at the experimental research station of the Faculty of Agriculture, Alexandria University, at Abis district (31.21743, 29.98271). The adults of each species were spread and pinned to help in recording the general appearance. Additionally, some specimens were dissected to prepare slides of male and female genitalia, while wing patterns were also examined as critical taxonomic features these species were classified into eight subfamilies (Amphyprinae, Agrotinae, Hadeninae, Heliiothinae, Acontinae, Plusiinae, Catocalinae and Chleophorinae). Taxonomical keys were restricted on the male and female genitalia. These moths are: *Spodoptera littoralis*, *S. latebrosa*, *S. exigua*, *Sesamia nonagrioides*, *S. cretica*, *Athetis atriluna*, *Hopodrina ambigua*, *Agrotis spinifera*, *A. segetum*, *A. ipsilon*, *Noctua pronuba*, *Leucania unipuncta*, *L. loreyi*, *Polia hepatica*, *Heliiothis peltigera*, *Acontia lucida*, *Autographa gamma*, *Thysanoplusia orichalcea*, *Chrysodeixis chalcetes*, *Cornutiplusia circumflexa*, *Thysanoplusia daubei*, *Syngrapha interrogationis*, *Grammodes bifasciata*, *Dysgonia torrida* and *Earias insulana*.

Keywords: Lepidoptera, Noctuidae, Taxonomical characters, Taxonomical keys.

INTRODUCTION

Family Noctuidae included the majority of the moths that attract to light traps at night, it includes approximately 12000 species worldwide (Keegan *et al.*, 2021). In Egypt, Noctuidae have been represented by 206 species (Salem, 2021). It includes many pests of field crops, fruit plants and ornamental plants. A few noctuid species having piercing sucking mouth parts feeding on mammalian blood (Banziger, 1968 a,b). On the other hand, some noctuid species are considered to be beneficial act as a parasites and predators on scale insects, mealy bugs and thysanopteran insects (Wiltshire, 1948). Taxonomy of family Noctuidae is still appealing to many entomologists. It is divided into

trifine and quadrifine on the bases of cubital vein system (Kitching, 1984), then classified into ten quadrifine subfamilies and eight trifine subfamilies (Scoble, 1995).

Several authors studied the morphology and taxonomy on many species from this family all over the world depending on wing venation, male and female genitalia as follows: Sibatnp *et al.* (1954); Fletcher (1957); Bayer (1960); Oda & Mau (1974); Brown & Dewhurst (1975); McCabe (1980); Dierl (1984); Rezbanyai-Reser (1984); Kononenko (1985); Ronkay (1986); Ahmed & Kamaluddin (1987); Heinicke (1988); Wiltshire (1988); Holloway (1989); Srivastava & Rose (1989); Angulo & Tania (1990); Geertsema (1990); Mlandinov (1990); Navarro (1990); Plante (1991); Fibiger (1992); Heinicke (1992); McCabe (1992); Olivares (1992); Srivastava (1992); Troubridge *et al.* (1992); Klyuchko (1993); Srivastava & Rose (1993); Yoshimatsu *et al.* (1993); Lalanne-cassou *et al.* (1994); Hreblay (1996); Krusek & Behpunek (1996); Lödl (1996); Loedl & Gaal (1996); Mikkola (2008); Sivasankaran *et al.* (2011); Kirti & Dar (2013); Mudasar (2013); Shaheen (2013); Singh & Sekhon (2015); Muddasar (2017); Hoare (2019); Hamza *et al.* (2020); Sarwar *et al.* (2021) and Soomro *et al.* (2021).

Also, in Egypt many researches were done on the morphological and taxonomical characters of family Noctuidae species (Wiltshire, 1948; El-Minshawy, 1963; El-Sawaf *et al.*, 1964; Hammad *et al.*, 1967; Rashed, 1967; Karrom, 1976; Nazmi *et al.*, 1981; Oshibah, 1981; Oshibah *et al.*, 1991a & b; Ramadan, 1998; Badr *et al.*, 2015; Amer & El-Torkey, 2017; Amer, 2013 & 2020; Henaish & Elmetwaly, 2020 and Salem, 2021).

The present study aimed to revising family Noctuidae in Alexandria governorate. Twenty-five species were collected. They are belonging to eight subfamilies (Noctuinae, Amphyprinae, Hadeninae, Heliiothinae and Acontinae) classified under section trifine. Three subfamilies Plusiinae, Chleophorinae and Catocalinae) are classified under section quadrifine.

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MATERIAL AND METHODS

Collecting specimens:

Specimens were captured by light trap operated at the experimental research station of the Faculty of Agriculture, Alexandria University, at Abis district (31.21743, 29.98271). The adults of each collected species were spread and pinned to help in recording the general appearance.

Preparation of the male and female genitalia slides

For preparing slides of genitalia, which considered to be the most important taxonomical characters the abdomen was separated. They were boiled in 10% solution of caustic soda (NaOH) in a water bath for 30 min then washed by distilled water several times. The specimens were passed through a series of ethanol alcohol gradient concentrations from 75% to 95% and then transferred to clove oil for 15 min., abdomen were dissected under stereoscopic binocular microscope (Zeiss, 475052-9901) and genitalia separated and mounted in Canada balsam. Mounted slides were dried at 45°C for 2 weeks. They were photographed by using digital camera under stereoscopic microscope (Model B-150 OPTIKA).

According to Karrom (1976); Oshiaba (1981) and other previous taxonomic studies, the used terminology of the male and female genitalia structure is after that of Sibatanp *et al.* (1954).

The wing pattern: Figure (1) shows clearly the markings colour which distribution in the typical or idealized noctuid wing. There are lines in the wings as follows: - Basal line (b.l) lies at the base of the wing, Anti - medial line (a.m.) transversally - anterior to medial (m) line which is like a medial shade. Post medial line (p.m.l) transverse posterior to the medial line. Subterminal line (s.t.l) at the inner to the terminal line (t.) which lies along the outer margin of the wing. There are three spots; the ordinary or, the orbicular spot (orb.) lies near the costa margin between anti-medial and medial line the claviform spot (cl.) lies also between the anti - medial and medial line but nearer to the anal margin. While the reniform spot (ren.) lies between the medial and post-medial line. The hind wing having simple markings or plain.

The male genitalia:

The male genitalia of the noctuid moths are complicated; it is the appendages of the ninth and tenth abdominal structure segments. As a matter of fact, the nomenclature used here for the components of the genitalia of noctuid moth are according to Sibatanp *et al.* (1954).

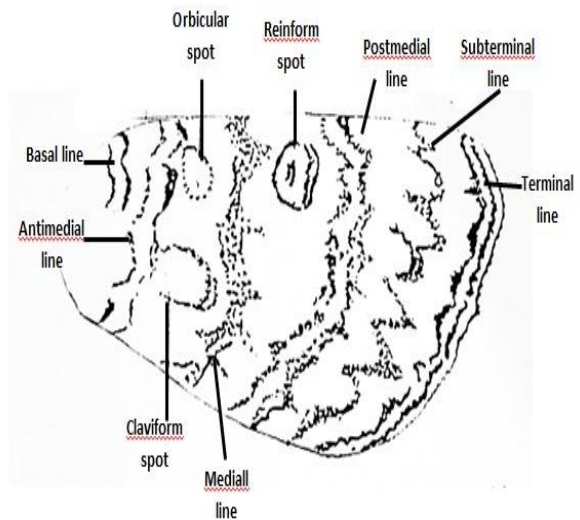


Fig. 1. The fore wing terminology of pattern after <https://bugguide.net/node/view/1448413>

The male genitalia (Figure 2) have many structures of diagnostic significance. Those most often used in this investigation are as follows: the aedeagus as used here is the hollow tubular, often bulbous at the base which houses the structures inverted membranous vesica. Any sclerotized spin-like or rod-like structure is referred to a cornutus (cornuti) at the basal or apical. The valvae are two lateral, somewhat flattened elongated structures projecting caudal. The costa which is a thick sclerotized section along the dorsal side and its dorsal edge is referred as the costal margin. Sacculus is the ventral side and base of valvae, it is often expanded and sclerotized. Clavus is a filiform or knob-like projection or originating on the mesodorsal margin of the sacculus near the base of valvae. It is rounded and setose on the apex. The ampullae are used here to indicate the entire structure arising from the center near the midpoint of the based than centered. It may be small knob produced valva often apically into a sharp spine or long slender rounded and setose at plate-like structure or shield-shape the apex. The juxta is sclerites articulate to the mesal surface of the valvae. It is often produced to a pointed apex, with distinct sclerotized projection on the apex referred to as the spine of the juxta. The tegumen is referred to the dorsal chitinized part of the 9th segment. It articulates at its lower extremities with the vinculum. Vinculum is the ventral chitinized band, representing the sternum of segment, which articulates with the tegumen. Uncus is a hook like structure projecting dorsally from ninth, tenth segments; it is well developed in Noctuidae. Cucullus is a distal part of the valvae; a fold or groove usually separates it from the rest of the valvae. Corona is the terminal spine of the

cucullus. Valvula is a membranous region which can project freely, or attached directly to the outer margin of the cucullus. Clasper is a part of the valvae, which lies on its inner face between cucullus and sacculus. It moves on the valvae by a special muscle. Sometimes clasper is divided into an oblique or V shaped chitinized basal sclerite, an ampulla and chitinized outer process. Digitus is a long oblique process running down and out from distal end of the costa. Editum is a tuft of sensory hairs just at lower edge and near the base of the costa. Transtilla is a cross bar or band - like bridge connecting the valvae at their inner costaledges.

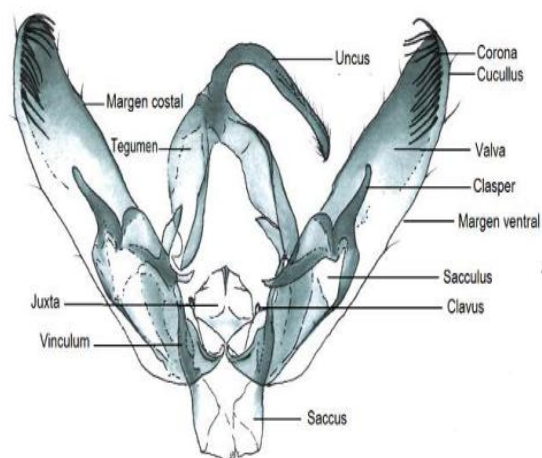


Fig. 2. The typical male genitalia of the noctuid moths after Garretas Muriel and Blázquez-Caselles (2015)

The female genitalia:

Segments 8, 9 and 10 form a retractile ovipositor where the egg passes. The valvae of the ovipositor (anal lobes) are generally clothed with setae. There are two pairs of apophysis, the posterior pair and the anterior pair, which help the telescopic movement of the genital segments. The female genital structures most often used as diagnostic characters, the ostium bursae is differentiated section from external opening originates. In most species it is well defined, sclerotized and pigmented. The duct bursae is an elongated tube partially sclerotized. It most often enters anterior to the caudal end in blind sac termed as corpus bursae. The corpus bursae is usually membranous sac but may have areas of pigmentation and sclerotization (signum). It may be without or with one or more signa. The cephalic end is called the fundus, and the caudal end is the apex, either or both of which may be somewhat defined by a constriction or elongation of the corpus bursae on the end. The apex may be coarse, sclerotized, pigmented, sometimes curved right or left. The appendix bursae is an appendix found laterally to the corpus bursae. The

duct seminalis is a very thin duct arising from the apex in most species, but arises from the fundus in few species, it connects the bursae to the vagina (Figure 3).

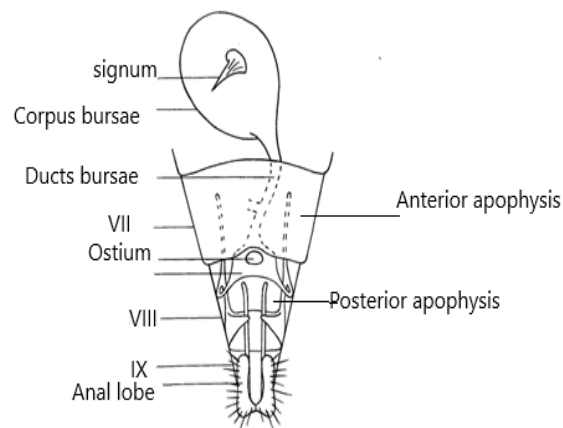


Fig. 3. The typical female genitalia of the noctuid moths after Busck (1942)

RESULTS AND DISCUSSION

I - Sectin: Trifine

A- Subfamily: Amphyprinae

A- 1 *Spodoptera littoralis* (Bois.)

General appearance: Adult moth is brownish in dorsal side, with transvers and longitudinal pale lines and dark gray in ventral side. Wing expanse is about 35 – 40 mm. Fore wing dorsally ochreous, ashed with dark brown. A bluish tint is distinguishing male fore wing and whitish tint in female, narrow longitudinal mid area pale. Anti-medial and post medial lines pale-white and the inner preceded by silvery gray suffusion, subterminal line white preceded by dark shade and followed by fine white lines before termen. Orbicular spot open at the distal end, diagonally elongate or oblique, continuing as a pale stripe as far as the post medial line. Reniform spot more elongate produced apically to a sharp point. The claviform spot is elongate, dark gray with black trace of the reniform spot. Hind wing pearly white in color dorsally and ventrally with brownish margin and pale fringe (Plate 1, 1).

The male genitalia: Aedeagus narrow with sculpture vesica armed with chitinized plate and many small cornuti. The valve with width chitinized costa, sacculus weakly chitinized providing with long setae, ampulla short with setae lies at the base of costa. Juxta is slightly large pentagonal in shape. The tegumen is moderately narrow while the veniculum slightly larger. Uncus curved narrow and long. The cucullus is rounded with wide flap armed with long setae, valvule large and hairy. The clasper is stout reaching the apex of the valve. The digitus crossing over the clasper (Plate 2, 1).

The female genitalia: Posterior apophysis longer three times than anterior apophysis. Ostium, ducts bursa short, wide and with wrinkled base bursa copulatrix with short, broad, fine minute structure the signum and pronounced pointed base diverticulum with a small rounded lobe on the opposite side (Plate 3, 2).

A-2 *Spodoptera latebrosa* (Led.)

General appearance: Adult is dark brown dorsally and dark gray ventrally. Wingspan is 28 – 34 mm long. Head dark gray with dark brown antennae. Fore wing dark gray or grayish brown dorsally. Subterminal line (zigzag line) pale and preceded at the middle by some black wedge shaped marks. The orbicular spot is small more or less circular or slightly rounded ochreous rusty with minute dark center. The reniform spot sometimes concolors but darker than the general color of wing. The claviform spot is small and black fringe dark gray ventrally smooth smoky color. Hind wing is smoky whitish, the termen dark brown. Ventrally white with gray veins; fringe white (Plate 1, 2).

The male genitalia: Aedeagus moderately short with membrane vesica with edge of vesica chitinized armed with transverse needle shape like cornutus. The valve broad about twice as long as wide, its apex provided with long setae and costa short, sacullus moderately chitinized and setose. Ampulla small and setose lies at the base of the costa. Juxta small triangular a pointed apically. Tegumen is moderately small while vinaculum large. Uncus strongly curved slightly thickened in distal half, the apex of it tapered to a point. Cucullus is rounded and hairy, valve hairy and setose. The clasper narrow, curved with two sharp spines at its apex, digitus small and transtilla small (Plate 2, 2).

The female genitalia: Anal lobes nearly wider than long, clothed with setae; posterior apophysis about four times as long as anterior apophysis. The ostium moderately wide, ducts bursae short and sclerotized. Corpus bursae pear-shaped with long narrow signum (Plate 3, 2).

A-3 *Spodoptera exigua* (Hub.)

General appearance: The lesser cotton leaf worm moth is gray in color washed with yellowish color in dorsal side and grayish colored ventrally. Wing expanse is about 25 – 30 mm long. Fore wing grayish brown washed with yellowish color and sculpture with black scale; costal margin spotted with dark color. Wing lines double and waved (Zigzag lines). These lines sometimes pale in color. The subterminal line pale graywhile the terminal line is spotted with dark gray dots. The orbicular spot moderately rounded rusty ringed with black edge. The reniform spot lunal brown pale. Hind wing ventral side grayish-creamy in color. Fringe sometimes lighter than the ground (Plate 1, 3).

The male genitalia: Aedeagus moderate, cylindrical with membranous vesica armed with single and strong heavily chitinized pointed conutus. Valve moderately small, the apex of the valve provided with long hairs. Costa narrow, ampullae not distinguished from costa. Juxta small and triangular with slit like suture. The tegumen hairy angled laterally, veniculum small. Saccus is small, uncus moderate evenly tapered throughtout to a point and setose. Cucillus small, valvula hairy. Saccullus weak, clasper small and curved not reaching the apex of valve. Transtilla moderate (Plate 2, 3).

The female genitalia: Posterior apophysis longer than the anterior one. Ostium moderate ducts bursae short and sclerotized. Corpus bursae narrow curved and finely wrinkled at base. Signum long and lies around the bursae, it is spiny and sclerotized (Plate 3, 3).

A-4 *Sesamia nonagriodes* (Lefebvre)

General appearance: Moth is ochreous in color with dark dust. Ventrally light creamy in color. Wing expanse 25 – 30 mm long. Fore wing dorsally buff color washed with light ochreous dusted finely with dark color on its subterminal and terminal parts which marked with blackish line. Some dark signs found along the subterminal and terminal lines. A longitudinal dark marking or line found in the middle arising from the base and extending to the outer margin of the wing. Postmedial line represented by a curve fouscous line consists of one raw of dots, fringe bright ochreous. Ventrally the wings is ochreous dusted with dark colors especially in the outer margin. Hind wind dorsally light creamy in color with dark line patches on some veins the subterminal line. Ventrally it is creamy in color dusted with dark color in costal and outer margins, fringe creamy in color (Plate 1, 4).

The male genitalia: Aedeagus moderate in length with densely spined vesica and spined cornutus. Valve chitinized wide separate from costa which terminating with distinct setose bearing small spine near to its tip. Sacculus large quadrate in its shape extending to a part bears stout short spines. Juxta conical in shape, its basal part somewhat rounded. Tegumen is large hairy with distinct pencillus. Vinculum slightly large. Uncus short, strong, narrow and setose. Cucullus rounded and narrow bears fine hairs. Valvule weak (Plate 2, 4).

The female genitalia: Anal lobe elongate and triangular with short setae, posterior apophysis longer than anterior one. Ostium wide and ducts bursae moderate in its length with sclerotized area. Corpus bursae oval, large without signum (Plate 3, 4).

A-5 *Sesamia cretica* Led.

General appearance: Dorsally ochreous dusted with brownish color, ventrally lighter. Wing expanse 28 -30 mm long. Fore wing with a longitudinal fuscous line

extending along the margin of the discal cell. A dark brown color found on the outer margin. Fringe long, dense and beige in color. Venter of fore wing paler. Hind wing dorsally ochreous in color. Fringe long, dense and ochreous in color. Venter of hind wing with the same color (Plate 1, 5).

The male genitalia: Aedeagus moderately short and slender, with spinose vesica armed with double rings of spines (cornutus). Valva chitinized, wide and fused with cucullus and sacculus, costa wide, heavily sclerotized and terminating with rounded extension. Cucullus weakly chitinized with rounded end and setose. Sacculus large, moderately chitinized. Juxta T shape, its base more sclerotized than its transverse part. Tegumen large, hairy with small hairy peniculus, uncus short, curved and sharply pointed apically. Vinculum slightly large, saccus wide sclerotized and truncate at base (Plate 2, 5).

The female genitalia: Anal lobe moderately large, elongate, setose and triangular in shape. Posterior apophysis as long as anterior one. Ducts bursae short, sclerotized and wide, corpus bursae large, broad without any signa (Plate 3, 5).

A-6 *Athetis atriluna* Guenée

General appearance: Body of moth brownish creamy dorsally and light creamy ventrally. Wing expanse about 24 —26 mm long. Fore wing dorsally beige with brownish tinged in color. There are some scales having black tips scattered the beige one. Very fine brown dots found along the terminal line. Along the costal margin there are four dark brown dots. The middle one is triangular, while others are dots like. The reniform spot lunate dark brown in color surrounded by a fine light beige color. Ventrally is paler than the dorsal side dusted with dark color especially in the outer margin of the wing. Hind wing buff creamy in color dorsally. It is paler from the ventral side and also fringes (Plate 1, 6).

The male genitalia: Aedeagus moderately short, narrow, cylindrical with a bulb like base and provided with sculptured vesica armed with spinose cornutus. The valva broad, its length about three times as long as wide. It separated from the sacculus weakly chitinized and setose. The apex of the valva concave, triangular in shape and provided with long setae. Cucullus small covered with cluster abrupt setae. Juxta spindle in shape and slightly longer. Tegumen broad and covered with long and densely hairy at base. Vinculum slightly narrow. Uncus narrow, provided with short setae and pointed apically. Clasper in the mid-way of the valva, short, curved upward and setose. The basal part of costa chitinized, while its distal half is hairy and concave. Saccus somewhat pointed apically (Plate 2, 6).

The female genitalia: Anal lobe elongate with rounded tips and covered with long fine hairs. Posterior

apophysis about two times as long as anterior one. Ducts bursae are sculptured and slightly short. Corpus bursae elongate without signa or sculpture but there is a small appendix (Plate 3, 6).

A-7 *Hoplodrina ambigua* (Denis & Schiffermüller)

General appearance: The moth dark creamy (beige) in color with brownish tinged, it is lighter ventrally. Wing expanse about 18 - 20 mm long. Fore wing dorsally covered with light brown scales, their tips are dark brown resulting scattered fine brown spots. The base and the terminal part of the wing slightly darker than the rest of the wing. The basal, the antimedial, the postmedial and the subterminal lines are discontinuous fine zigzag dark lines. The orbicular spot rounded in shape, while the reniform spot large and kidney shaped. Both are brown in color surrounded by a fine creamy line, the scales of fringe are creamy in color with dark tips. Ventrally it ochreous suffused with brownish in color especially on the costal and the outer margins. The subterminal line and the oval spot on its inner side near the costal margin are slightly darker than the rest of the wing (Plate 1, 7).

The male genitalia: Aedeagus slightly short with spinose vesica armed with cornuti consisting of stout 10 - 15 spines. Valva slightly broad with nearly parallel border. Costa chitinized, narrow; cucullus broad with strong corona consists of one row of spines (16 - 22). Valvule moderately developed, membranous and densely hairy. Sacculus weak and also densely hairy, the inner surface of it convex. Sacculus extensions are asymmetrical, one is broad and abrupt, the other is longer, curved and slightly pointed. Clasper narrow with an oblique or V shaped chitinized basal sclerite, ampulla absent. Juxta well-developed, bell-shaped with a heavily chitinized bulb like processes on its base tegumen broad with convex sides and densely hairy. Uncus curved narrow and covered with fine hairs. Veniculum narrow and heavily sclerotized. Saccus moderate with rounded tip (Plate 2, 7).

The female genitalia: Anal lobes small, triangular in shape and heavily setose. Posterior apophysis slightly longer than the anterior one. Ostium broad and chitinized; ducts bursae much shorter and heavily sclerotized. Corpus bursae large, bilobed, the large rounded basal part and the small distal part with v shaped signum. Ducts seminalis arising from the basal part of the corpus bursae (Plate 1, 7).

B- Subfamily: Agrotinae

B-1 *Agrotis spinifera* (Hubner)

General appearance: Body creamy in color. Wing expanse about 28 -30 mm long. Fore wing dorsally creamy in color. The basal and costal margins darker than the rest of the wing. The terminal part of wing has

fine and dark brown basal small triangular spots. They extend to the subterminal part in the form of fine light brown acute tangular reaching the post medial line. There are two dark brown transverse marks, the first extending from the orbicular spot, small white and oval till beyond the reniform spot. The reniform spot large kidney shaped and pale brown surrounded by a fine dark brown line. The second extend from the claviform which is transverse creamy, oval and its outer margin is drk brown crest like. This margin connects with the transverse tapered band. This band is light brown bordered with black brownish in color. There are scattered fine brown dots among the costal margin resulting from the dark tips of scales. Fringe long creamy in color with darker tips giving gray- brown line along the outer margin. Ventrally is creamy in color and the outer part is darker specially the apical angle. The outer gray - brown of the dorsal side. Also there are triangular fine dark brown spots on the terminal margin. Hind wing dorsally and ventrally whitish in color with very fine light brown line along the terminal margin. Fringe long and white (Plate 1, 8).

The male genitalia: Aedeagus lightly short with sculptured membranous vesica narrow band of small spinose cornuti at apex. Valva broad, costa is narrow and fine sclerotization. Cucullus broad with about twenty strong spines corona. Valvule hairy and spinose. Sacculus is weak, narrow and setose. Clasper short more or less at the mid-way of valva and rounded apically. Ampulla absent. Juxta nearly bilobed dorsally and pointed ventrally. Tegumen moderate and hairy in both sides. Uncus slightly curved, tapered at tip and hairy. Veniculum narrow, saccus moderate (Plate 2, 8).

The female genitalia: Anal lobes developed and clothed with long setae. Posterior apophysis longer than anterior one. Ostium moderate, ducts bursae narrow and heavily wrinkled. Corpus bursae and its appendix very narrow long tubes ends by small oval sac. The signum in the corpus bursae rounded in shape (Plate 3, 8).

B- 2 *Agrotis segetum* (Denis & Schiffermüller)

General appearance: Body dark beige in color and dusted with darker color from the dorsal side. Ventrally is creamy in color. Fore wing dorsally dark beige in color and tinged with brown color. The costal and outer margins of fore wing are slightly darker resulting from dark tips of some scales. The anti-medial line and the post medial line rather indistinct each is fine zigzag dark brown line. The orbicular Tounded beige in color surrounded by a fine dark brown incomplete line. The reniform spot large, kidney shaped, dark gray in color surrounded by fine beige line, which surrounds by fine dark brown line. The claviform is small oval beige and surrounded also by fine dak brown incomplete line. Fringe scales are long beige with brown tips. Ventrally

is creamy in color, especially along the costal and outer margins. There are small dark brown triangular spots on the termen the wing. The reniform spot appear ventrally as a shadow of kidney shaped spot. Hind wing dorsally pale creamy in color. The costal margin is slightly darker than the rest of the body and chiny, fringe paler. The veins are slightly dark in colour ventrally is of the same color. Ventrally is of the same color (Plate 1, 9).

The male genitalia: Aedeagus, stout and short with somewhat sculptured sclerotized vesica armed with a small band cornuti, valva broad, somewhat pointed and rounded apically. Cucullus broad, with about nineteen - twenty-two pointed strong spines of corona. Valvule developed, membranous and setose. Sacculus moderate, membranous and densely hairy mid-way of the valva and turns outwards apically. Costa Clasper at mid-narrow, chitinized, with dense hair. Juxta well-developed, wider than long concave dorsally and pointed ventrally. Clavus developed distinct and coarsely setose Tegumen slightly broad with setae on both sides. Uncus somewhat broad in the middle and rounded apically, provided with stout spines directed downwards. Vinculum narrow and sclerotized, the saccus moderate (Plate 2, 9).

The female genitalia: Anal lobes slightly broad with tapered end and heavily setose. Posterior apophysis one and half times as long as anterior one. Ducis bursae slightly broad sculptured with longitudinal dark furrows. Corpus bursae a long tube with oval sac with longitudinal linear dark sgnum. Appendix bursae shorter than the corpus bursae and the ducts seminalis extends from the appendix (Plate 3, 9).

B- 3 *Agrotis ipsilon* (Hufnagel)

General appearance: Body dark gray in color, especially in the thoracic part from the dorsal side with two dark brown patches on the prothorax. Ventrally is beige in color. Wing expanse about 36 – 40 mm long. Fore wing dorsally dark gray, nearly blackish especially on the costal margin and in the medial part of the wing. The area beyond the post medial line and the apical angle are beige in color. Terminal line wavy dark brown with very fine triangular dark brown spots. Fringes dense, beige in color with creamy tips with some fringer scales darker in color forming dark spots. The orbicular spot small and oval, the reniform spot slightly large and the claviform spot rather indistinct oval. Each of them beige in color surrounded by fine dark line. There are three blackish fine acute triangular spots, the first extending from the reniform spot towards the margin. The second and the third are parallel and extending from the subterminal line. Ventrally it is gray washed with dark color especially on the two third basal part of the wing. Hind wing: Dorsally creamy in color with smoky brown veins and margins. The fringes creamy.

Ventrally is whitish in color with smoky brown costal margin (Plate 1, 10).

The male genitalia: Aedeagus short, strong with sculptured vesica armed with band of apical spines, (the cornuti). Valva broader at its distal part than the basal part. Cucullus broad with about 28 to 30 stout spines (corona). Valvule and the sacculus each developed, membranous and setose, juxta bilobed pointed ventrally. Tegumen slightly narrow with setae on both sides. Uncus curved long, narrow and dorsally covered with long hairs. Its tip is beak like with long stout spines. Veniculum narrow and chitinized; saccus moderate, ampullae absent. Clasper broad, chitinized with tapered tip (Plate 2, 10).

The female genitalia: Anal lobes triangular, broad and heavily setose. Posterior apophysis as two times as long as anterior one. Ducts bursae narrow long and wrinkled. Corpus bursae very long wrinkled tube with oval end. There are four signa, three of them vertical formed distinct group and the fourth is horizontal at the tip of corpus bursae. Appendix bursae much longer than the corpus bursae with terminal ducts seminalis, ostium small (Plate 3, 10).

B- 4 *Noctua pronuba* (L.)

General appearance of the moth: Body stout, rufous dark brown in color especially on the thorax. Wing expanse about 48 - 50 mm long. Fore wing dorsally dark beige suffused with brown color, the outer margin with fine brown line. The subterminal line slightly lighter than the rest of the wing and rather indistinct. A black spot on the subterminal line near the costal margin. The orbicular spot beige, rounded and surrounded by fine white line. The reniform spot large, kidney-shaped brown and surrounded by a fine white line. Along the costal margin there is a fine dark brown line with two distinct blackish dots. Ventrally brown except for the costal and outer margins which are yellowish in color. The anal margin golden yellow. Hind wing dorsally yellow color, the costal margin golden yellow at base and brownish at margin. The sub terminal part has a wide dark brown band. The outer margin with fine yellow line, fringes creamy. Ventrally yellow, costal margin rufous brown. Subterminal area provided with brown band ending with yellow line (Plate 1, 11).

The male genitalia: Aedeagus slightly short, with sculptured, sclerotized vesica armed with a cluster of small spines (cornuti) near its apex. Valva wide with heavily chitinized costa. Cucullus hairy, broad and heavily chitinized internally with elongate chitinized hairy process. Sacculus extending well developed and chitinized. Clasper degenerate, ampullae elongate, setose, chitinized and clasper like. Clavus absent Juxta elongate plate, tegumen moderate, sculptured and setose

in both sides. Uncus setose, short with narrow base and spined tip. Vinculum moderate, saccus large and pointed ventrally (Plate 2, 11).

The female genitalia: Anal lobes short and heavily setose. Posterior apophysis longer than anterior one with strong base. Ostium wide and covered with bilobed plate. Ducts bursae elongate, moderately wide and sclerotized. Corpus bursa large, elongate and oval with four long moniliform signa and with small dorsal diverticulum (Plate 3, 11).

C- Subfamily: Hadeninae

C- 1 *Leucania unipuncta* (Haworth)

General appearance of the moth: Body beige, dusted with dark color from the dorsal side. Ventrally, it is somewhat suffused with brown color. Wing expanse about 36- 38 mm long. Fore wing dorsally beige in color with scattered fine dark brown dots. The orbicular and the reniform spots buff with red central dot, the reniform spot slightly larger. A gray longitudinal line runs along the median line and ends by pin puncture like white dot. The terminal part of the wing, especially near the anal angle, dark beige in color, with buff spot near the apical margin. The costal margin lighter than the rest of the wing. Fringes short and creamy in color. Ventrally creamy washed with dark beige specially on the costal and fnet areas near the outer margin, with dark brown dots on the outer margin. Hind wing dorsally creamy shiny in color along the costal and margin. The rest of the wing grayish in color, but darker on the outer and anal margins. Fringes grayish creamy in in color, and the veins dark gray. Ventrally creamy in color with fringe has darker brown dark dots on the outer margin (Plate 1, 12).

The male genitalia: Aedeagus moderate with bulb like base with sculptured chitinized, setose vesica armed with many stout, chitinized spinose cornuti. Valva rounded lobe like, moderately large, heavily sclerotized comuti. Costa small and chitinized. Cucullus somewhat large and setose, rounded, separated from the sacculus by long neck (racket like) with many rows of strong spines, (the corona). Sacculus slightly large, rounded and densely hairy. Clasper small and divided into an oblique or v shaped basal sclerite and small setose ampullae, digitus setose and small. Juxta elongate, bilobed dorsally and slightly rounded with two process laterally on the ventral side. Clavus absent. Tegumen moderate, narrow, dome like and hairy in both sides. Uncus short heavily setose with parallel sides base, middle rounded and narrow truncated end. It is bending downwards. Vinculum moderate and saccus are broad and small (Plate 2, 12).

The female genitalia: Anal lobes slightly small rounded at tips and heavily setose. Posterior apophysis nearly as long as anterior one. Ducts bursae short with

heavily wrinkled and chitinized, corpus bursae long heavily wrinkled sclerotized tube, with oval non sclerotized sac without any signa. Corpus appendix circular with short wrinkled neck. Ducts seminalis extends from appendix (Plate 3, 12).

C- 2 *Leucania loreyi* (Duponchel)

General appearance of the moth: Body brownish in color and covered with creamy scales especially on the thorax from the dorsal side. Ventrally paler. Fore wing dorsally ochreous in color with brownish line extending along the medial vein till the end of discal cell where a fine white dot is found; another dark brown dots are found on the same line at the end of first third. There is lighter smoky brown triangle on the terminal part of the wing. Very fine dark brown dots scattered along the rest of the wing. Subterminal line is represented by fine dark brown dots arranged on the veins. There are fine dark brown dots on the termin. Fringes, long, dense and beige with brown tips. Ventral side pale shiny creamy in color with dark brown fine dots terminally. Hind wing dorsally whitish in color with brown fine line on the termin and veins. Fringe long, dense and whitish in color. It is the same color ventrally (Plate 1, 13).

The male genitalia: Aedeagus moderate, swollen at base with sculptured vesica armed with chitinized bar and with fine thorn at apex (cornutus). Valva broad with somewhat chitinized and broad costa. Cucullus broad, large, rounded apically, densely covered with fine setae and separated from sacculus by a short neck. Sacculus large, chitinized, densely setose and with long, chitinized, angled pointed tip extension. Valvule narrow and setose. Clasper chitinized and setose. Digitus chitinized crossing clasper at right angle and setose. Ampullae elongate chitinized with setose tip. Juxta sclerotized trapezoidal in shape with pointed and bilobed dorsally. Tegumen setose in both sides and dome like. Uncus curved, heavily sclerotized and heavily setose. Vinculum narrow and chitinized. Saccus moderate and broad (Plate 2, 13).

The female genitalia: Anal lobes large, triangular and setose. Posterior apophysis as long as anterior one. Ostium moderately wide and chitinized. Ducts bursae long and chitinized tube. Corpus bursae oval, small without any signa and provided with globular appendix (Plate 3, 13).

C-3 *Polia hepatica* Clerck

General appearance of the moth: Body beige in color somewhat suffused with rufous color from dorsal side. Ventrally it is paler. Wing expanse 28- 30 mm long. Fore wing dorsally creamy in color with scattered fine dark brown dots especially along the costal margin. The orbicular spot pale creamy outlined with dark brown curved line. The reniform spot dark gray in color and somewhat triangular shaped. Between these two spots

there are two vertical wavy dark brown lines. Claviform small creamy in color and surrounded by brown line. The basal line rather indistinct dark brown line. The termen line wavy dark brown in color, followed internally by incomplete rufous line. Fringes long, dense beige with brown tips. Anal margin with scattered dark brown spots. Ventrally creamy with scattered brown fine spots except the anal area which is plane pale creamy in color. Small dark brown spots scattered along the outer margin. The post medial line and the reniform spot appear as a dark brown color ventrally. Hind wing dorsally the costal and the outer margins creamy while the rest of the wing dark gray in color especially on the outer margin. Fringes long dense and creamy in color. Ventrally creamy with fine dark dots scattered on the wing. A brown dark spot found on the middle of the wing. The outer margin has fine triangular dark spots (Plate 1, 14).

The male genitalia: Aedeagus moderate, bulb like at base with sculptured vesica armed with masses of long and strong spine (the cornutus). Valvae developed, cucullus broad slightly rounded and separated from sacculus by long neck. The corona consists of many rows of strong spines directed inwards. Costa narrow and chitinized, valvule hairy and weak. Sacculus moderate, densely hairy. Extending as a distinct lobe. Clasper sclerotized and somewhat tapered apically. Ampullae small, setose and digitus somewhat pointed. Juxta wide pale with truncated edge dorsally and notched ventrally. Tegumen moderate and hairy in both sides. Uncus beak-like and densely hairy. Vinculum narrow and chitinized, saccus moderate (Plate 2, 14).

The female genitalia: Anal lobes somewhat rounded, short and setose. Posterior apophysis nearly equal to anterior one and each with spatulate end. Ducts bursae wrinkled, spinose and heavily sclerotized. Corpus bursae moderate without any signa, Ostium moderate (Plate 3, 14).

D- Subfamily: Heliothinae

D- 1 *Heliothis peltigera* (Denis & Schiffermüller)

General appearance of the moth: Body ochreous in color dorsally and nearly white ventrally. Wing expanse about 28-30 mm long. Fore wing dorsally ochreous, the medial and post – media lines present but appear as fine brown wavy line. The sub terminal area occupied with dark beige band with triangular brown spot on the costal margin. Sub terminal line ochreous followed by slightly rufous line. Fringe beige with rufous tips. Costal margin somewhat darker than rest of the wing, its basal part ochreous with scattered dark brown spots. The reniform spot dark brown and surrounded by incomplete fine rufous line followed by a fine ochreous line. It extends anteriorly as a lighter shadow towards the costal margin. A minute orange spot at the middle end of the basal

third is found. The terminal edge has blackish fine spots. Ventrally creamy in color, the reinform spot appears ventrally as a black spot and the sub termen also ventrally. Hind-wing whitish in color, while the rest of the wing nearly darker from the dorsal side. The outer margin has a smoky brown wide band with lighter spot in its middle. A fine crest like dark brown spot is found on the middle of the wing representing the edge of discal cell. Fringe creamy with brown tips and the veins are smoky in color. Ventrally, it is ochreous with the same dark band on the outer margin (Plate 1, 15).

The male genitalia: Aedeagus short with sculptured and tuberculos vesica armed band of pinose cornuti at apex. Valva narrow, elongate with a chitinized and hairy costa. Sacculus small, tuberculos and spinose. Valvule somewhat developed and covered with fine hairs. Cucullus broader than the valva with three rows of strong spines (the corona). Clasper narrow and nearly tapered apically. Juxta bilobed dorsally and truncated ventrally. Ampullae and clavus absent. Tegumen moderate and heavily densely hairy, uncus strong heavily and broad at base beak - like at apex. Vinculum narrow and saccus moderate rounded ventrally (Plate 2, 15).

The female genitalia: Anal lobes triangular in shape and setose. Posterior apophysis long as anterior one and have a swollen base, both apophysis with spatulate end. Ostium large as sany and surrounded by leaf- like sclerotized structure. Ducts bursae short somewhat sclerotized and wrinkled. Corpus bursae rounded with three longitudinal feathers - like dark brown signa. Appendix bursae slightly rounded (Plate 3, 15).

E- Subfamily: Acontiinae

E- 1 *Acontia lucida* (Hufnagel)

General apperance of the moth: Body pure white in color dorsally and slightly creamy ventrally especially on the abdomen. Wing expanse about 20-22 mm long. Fore wing: dorsally the wing with three parts of coloration angle brown. Basal third pure white in color with fine black spot near humeral angle and a fine gray spot on the costal margin. Middle third grayish brown in color the distinct claviform dark brown tinged with yellowish coloration on the middle. Terminal third of wing has a quadrate white spot on the costal margin. The white wavy sub terminal line rather indistinct. Between the post medial and the subterminal line, three black dots are arranged in a line. Fine black dots scattered on the outer terminal of the wing. Fringe long, dense and brown in color. Ventrally, wing have the same color but slightly lighter than the dorsal side. Hind wing dorsally white with dark brownish gray band on the sub terminal area and an elongate spot of the same color near the costal margin which is creamy in color. There is a smoky shadow near the anal margin.

Ventrally it is the same color but slightly lighter (Plate 1, 16).

The male genitalia: Aedeagus short, narrow basely with sculptured sclerotized vesica armed with band of spinose cornuti near its apex. Valva ablong, broad with truncated tip and with beak like pointed end directed outwards. Costa narrow, heavily sclerotized and densely hairy. Valvule broad and densely setose, sacculus elongate, chitinized and setose. Clasper thumb -like and setose. Digitus sclerotized; juxta bilobed dorsally, broadened ventrally and with rounded notched ventrally. Tegumen moderate, much shorter than valva, weakly chitinized. Uncus long narrow, curved with pointed tip and with fine setae. Vinculum moderate and chitinized, saccus small (Plate 2, 16).

II- Section: Quadrifine

A- Subfamily: Plusiinae

A -1 *Autographa gamma* (L.)

General appearance of the moth: Body dark grayish brown in color ventrally it is slightly paler. Wing expanse about 34 – 36 mm long. Fore wing dorsally is grayish brown in color at the base. The costal margin is rufous brown in its basal third. The middle third beige white the terminal third creamy with scattered brown fine spots. The middle part of the wing dark brown surrounded by two fine irregular buff lines. The orbicular spot is oblique pear-like, brown, surrounded by creamy line located just anterior to the silvery Y shaped mark. Whitish patch is found between the post medial and the subterminal lines. The sub terminal line is wavy, beige in color followed by grayish brown color area which ends by wavy dark brown line. The fringe is dense, long with whitish basal part, brown middle part and beige terminal part resulting three consequence lines. Ventrally it is brown in color but the basal part is beige in color the Y shaped mark appears ventrally but faint. Hind wing dorsally dark beige in color with smoky brown band on the outer termin. Fringe dense, long, and whitish in color with dark brown base of some scales resulting scattered dark dots. The veins are dark in color. Ventrally dark beige in color and the anal margin has a smoky brown band (Plate 1, 17).

The male genitalia: Aedeagus moderately long bulbous-like at base with sculptured spinose vesica, sclerotized bar with strong spine found near apex. Vesica armed with strong large spine, thorn - like cornutus. Valva elongate and broad apically, costa densely hairy sclerotized and moderate. Cucullus broad, heavily setose and with about six strong long setae each arising from a small tubercle. Valvule narrow and setose. Sacculus slightly chitinized with spines and long setae. Clasper finger like attached to the mid-way of valva and setose at its tip. Clavus shorter than clasper with rounded setose tip. Juxta blunt apically. Tegumen

moderately broad and elongate. Uncus long, setose, curved with beak - like tip. Vinculum narrow and saccus elongate (Plate 2, 17).

The female genitalia: Anal lobes slightly quadrate curved and setose. Posterior apophysis shorter than anterior one and with spatulate end. Ostium wide, spinose, wrinkled and sclerotized. Ducts bursae slightly, sclerotized and wrinkled. Corpus bursae elongate with rounded sclerotized sculptured and spinose base and without any signa, its wall covered with sharp minute spine (Plate 3, 16).

A -2 *Thysanoplusia orichalcea* (Fabricius)

General appearance of the moth: Body brownish in color, washed with buff color especially on the head. T shaped mark was found on the thorax dorsally. Ventrally it is slightly lighter with the rufous color. Wing expanse about 34 -36 mm long. Fore wing dorsally brown in color. The costal, anal and outer margins brown in color. The orbicular spot rather indistinct brown in color surrounded by a very fine golden line. There is a triangular dark brown spot on the center of the wing. The claviform spot is golden in color and fused with wide golden sub terminal band. Fringe long dense and with beige spots alternated with rufous brown spots. Ventrally, it is beige washed with smoky gray shiny color especially near the base of the wing. The terminal line brown, wavy and followed by yellowish line resulting from bases of the scale's fringe. Hind wing dorsally, with basal half beige in color, the outer half smoky brown in color. The terminal line wavy and yellowish followed by brown line resulting from the base of scale's fringe. Fringe long dense with beige color bases and tips, with brown color on its middle parts. Ventrally slightly lighter than the dorsal side with a fine dark dot on the middle of the wing (Plate 1, 18).

The male genitalia: Aedeagus long with bulbous like base. Vesica sculptured chitinized armed with a comb of small strong spines and a dense of minute spines on its apex, and with very long clefted thorn like cornutus on the base. Valva long and moderately broad. Cucullus broader than valva, rounded bases with long hairs on the outer side and many small tubercles on the inner side. Costa moderately sclerotized and setose. Valvule moderately developed and setose. Saccus moderate, covered with dense tubercles and setose. Clasper finger-like attached near the base of the valva and setose. Clavus short and setose. Ampulla absent; juxta elongate at its tip, with pointed two lobes ventrally and dorsally but the ventral one are small. Tegumen broad, short, sculptured and setose. Uncus very long, linear curved, setose and beak like apically. Vinculum narrow and saccus elongate, arrow-like and with rounded apex ventrally (Plate 2, 18).

The female genitalia: Anal lobes slightly quadrate in shape and setose. Posterior apophysis as long as anterior one. Ostium small; ducts bursae long tube with wrinkled broad, setose with chitinized distal part. Corpus bursae elongate and pear like with dark brown signa (Plate 3, 17).

A -3 *Chrysodeixis chalcetes* (Esper)

General appearance of the moth: Body brownish dorsally with rufous tint. Ventrally creamy in color, head covered with creamy scales. Scape covered with brownish scales while the flagellum covered with creamy scales. Wing expanse about 30 – 32 mm long. Fore wing dorsally brown rufous in color. Costal margin shiny beige in color, the anal and outer margins are golden in color. The sub terminal line is brown in color distinct and wavy, and it is spaced into two branches near the costal margin. The terminal line creamy wavy, followed by incomplete dark brown line. Fringe long, dense and brown in color with creamy tips on the middle of the wing; there are two oval silvery spots each surrounded by a dark brown fine line arranged in an oblique line. Ventrally it is ochreous in color with smoky brown patch near the terminal part of the wing. Anal margin shiny creamy in color. Hind wing dorsally smoky brown in color and darker on the terminal third. Fringe long, dense brown in color with creamy bases and tips, forming a creamy terminal line. Ventrally it is shiny beige in color at the base and sides and with smoky brown band on the sub terminal area. Brown elongate spot is found on the middle part of the wing near the costal margin (Plate 1, 19).

The male genitalia: Aedeagus long and narrow, its base spherical large (bulb -like). Its vesica sculptured, sclerotized and armed with strong spines, (the cornuti), divided into short and curved one on the bulb and long and straight one along the entire length. Valva elongate, narrow distally and widened at base, with narrow, chitinized heavily setose costa. Cucullus narrow with heavily curved strong setae. Valvule narrow and setose; saccus is small, narrow and hairy. Clasper narrow attached near the base of the valva, and setose apically and much shorter than clavus. The latter is elongate, narrow and setose apically. Juxta triangular with somewhat rounded base. Tegumen very broad at tip forming roof like structure. Uncus articulates with tegumen in its narrow base, it is short, broad, curved, hairy and beak-like apically. Vinculum narrow and elongate. Saccus very long and tapered apically (Plate 2, 19).

The female genitalia: Anal lobes moderately large, trapizoid in shape with spinose tip and denselly hairy. Posterior apophysis nearly as long as anterior one and swollen at its base. Ostium large, ducts bursae chitinized moderately long and with spinose lateral process.

Corpus bursae elongate somewhat wrinkled with two longitudinal signa each one biforked and with tubular distal elongation where the ducts seminalis arising (Plate 3, 18).

A -4 *Cornutiplusia circumflexa* (L.)

General appearance of the moth: Body light gray in color tinged with dark gray color especially on the thorax. Abdomen whitish in color with buff color on the middle, ventrally pale. Wing expanse about 36 - 38 mm long. Fore wing dorsally dark gray in color tinged with buff color. The basal small third light gray near anal margin, basal line dark gray near costal margin and lighter near anal margin, followed by whitish line. A whitish gray wavy band extending from base of wing towards its middle part surrounded by silvery line. The orbicular spot small spindle shaped with dark fine border. Post medial line and sub terminal lines wavy light and followed by fine dark gray lines. Between the previous two lines a white shadow extending from costal margin. Medial part of wing tinged with buff color near the anal margin. A fine buff line found on the outer margin. Fringe long, dense, whitish with dark gray bases in some scales resulting fine triangular dots. Hind wing dorsally dark smoky gray in color with darker veins. Fringe long, dense with whitish bases and tips. Fine triangular dots on the termin resulting from the dark middle part of the fringe (Plate 1, 20).

The male genitalia: Aedeagus moderately short with swollen base and sculptured membranous vesica armed with many small stout spines and long thorn like cornuti. Valva moderately broad distally than base. Cucullus rounded without corona but with long setae. Costa and valvule are narrow and setose. Sacculus small, membranous and setose. Clasper finger-like as long as clavus found on the mid-way of valva, with rounded setose tip. Tegumen broad, uncus curved, setose with pointed tip. Vinculum and saccus narrow, the latter with rounded tip (Plate 2, 20).

The female genitalia: Anal lobes small covered with long setae. Anterior apophysis longer than posterior one. Duct bursae slightly long and chitinized, corpus bursae elongate with short appendix. Each of corpus and its appendix chitinized and spinose (Plate 3, 19).

A - 5 *Thysanoplusia daubei* (Boisd.)

General appearance of the moth: Body brownish in color. Head and thorax covered with rough, dense brown scales. Ventrally it is beige in color but the thorax is darker than the abdomen. Wing expanse about 26 -28 mm long. Fore wing dorsally brown in color with silvery striations. Basa fine silvery in color. The sub terminal line double, the inner line silvery in color followed by brown line with creamy shadow. The terminal edge has wavy creamy band with scattered dark brown marks, followed by double light creamy

lines and discontinuos dark brown line at the outer margin. A silvery curved line extends near the anal margin till middle of the wing, then extends to the outer margin and bents towards the costal margin forming an acute angle by beige area. The central reniform spot small surrounded by two curved silvery lines and followed by dark brown lines. Fringe long, dense and silvery in color with dark brown tips. Ventrally it is beige in the basal third, smoky beige in the middle third and smoky brown in the outer margin. The post medial line dark brown and the terminal line wavy and slightly darker than the rest of the wing. The terminal part creamy in color. Hind wing dorsally beige in color with smoky brown wide terminal band. The costal margin creamy in color. The veins are smoky brown. Fringe long, dense and creamy in color. Ventrally it is creamy and medial, post medial and terminal lines distinct and brown in color (Plate 1, 21).

The male genitalia: Aedeagus elongate, bulbous like at base with sculptured spinose vesica armed with needle like, sclerotized and clefted cornutus near its base. Valva long, slightly broader distally with narrow setose costa. Valvule is narrow and setose. Cucullus setose, rounded and moderately broad. Sacculus small and setose. Clasper arising near base of valve with three fine setae at its rounded tips. Clavus slender, longer than clasper (about three times long) and setose. Juxta oblong and membranous. Tegumen short, broad and setose. Uncus long, densely hairy with beak like end. Vinculum narrow, saccus elongate with an internal small tooth on each side and rounded tip (Plate 2, 21).

The female genitalia: Anal lobes triangular in shape and setose. Posterior apophysis as long as anterior one. Ostium slightly large and chitinized. Ducts busae somewhat long, wrinkled and chitinized tube. Corpus bursae oblong without any signa and with rounded chitinized tuberculated base (Plate 1, 20).

A -6 *Syngnapha interrogationis* (L.)

General appearance of the moth: Body brownish in color washed with golden color dorsally. Ventrally it is paler. Wing expanse about 24 -26 mm long. Fore-wing dorsally brown washed with golden scales; basal part of the wing with golden color also a triangular golden color found near the termen of the wing. Subterminal line rather indistinct. Reniform spot, oblique, with golden color, golden patch below median vein, with two silvery spots almost fused together, ventrally paler. Hind-wing dorsally beige, in color, with smoky brown veins, and broad dark brown band on the termin (Plate 1, 22).

The male genitalia: Aedeagus elongate, tubular, swollen base with membranous vesica armed with sclerotized setae and horn-like plotch at apex. Valva elongate and moderately broad with sclerotized broad

costa. Cucullus rounded and with long setae, clasper near the base of valve and as long as clavus and setose apically. Tegument moderately broad with slender, setose uncus which pointed apically. Vinculum sclerotized and narrow; saccus elongate, with abrupt edge having two lateral small process (Plate 2, 22).

The female genitalia: Anal lobes oval and setose. Anterior apophysis shorter than posterior one. Ductus bursae membranous and moderately long, with small spines on the entrance, corpus bursae oval and sclerotized (Plate 3, 21).

B- Subfamily: Catocalinae

B -1 *Grammodes bifasciata* Petagna

General appearance of the moth: Body beige and suffused with dark brown color especially on the thorax dorsally. Ventrally it is creamy in color. Wing expanse about 36 - 38 mm long. Fore wing dorsally brown, basal part and costal area dark beige in color. The rest of the wing velvety dark brown in color. It is divided vertically into three parts by two pure white straight lines. The outer margin divided into two parts by the wavy creamy subterminal line, the outer wider and dark beige in color, the inner dark brown. There is a fine creamy wavy line on the termin of the wing just before the fringe. Fringe long, dense and beige in color with creamy bases tip. Ventrally slightly the two vertical white lines are distinct. The basal third creamy while middle the outer parts are brown. The apical angle slightly darker. Fringe creamy with wavy line on the termin. Hind wing dorsally smoky in color, it divided into two parts by an oblique white band. There is an irregular creamy patch on the anal angle. Fringe long, dense and pure white in color. Ventrally creamy on the basal two third part and smoky brown in the outer third. The medial and post medial lines smoky brown on color. The termin shiny beige in color (Plate 1, 23).

The male genitalia: Male genitalia of this species is asymmetrical. Aedeagus cylindrical and short with sculptured, sclerotized, spinose vesica armed with thorn-like spine (cornutus). In addition, to a tiny strong tooth at its tip. Valva membranous with no distinct costal margin and with truncate densely setose cucullus. Valvule developed moderately sclerotized and setose. Clasper arising from wide heavily sclerotized sclerite. Right clasper moderately wide with rounded setose spoon like tip and its ampullae small and somewhat pointed apically. Left clasper similar to the right one but much larger and its ampullae long and with rounded tip. Saccus moderate, and heavily setose with triangular heavily chitinized pointed saccus extension. Juxta triangular in shape with sharp pointed apex dorsally. Tegumen slightly broad, chitinized and asymmetrical, the right part with long, chitinized extension with beak like tip, it is provided with minute spines. Uncus short,

setose with rounded concave tip, arising from an oval densely hairy plate on its base. Vinculum moderately broad and chitinized. Saccus small and broad (Plate 2, 23).

The female genitalia: Anal lobes slightly rectangular and setose. Posterior apophysis much longer than anterior one (about 2 times long) and slightly swollen near its tip. Anterior apophysis with widened tip. Ostium surrounded by chitinized, triangular setose plate. Ducts bursae short, chitinized and with strong spines near its connection with corpus bursae. Corpus bursae small all with sharp spinose wall and without any signa (Plate 3, 22).

B -2 *Dysgonia torrida* (Guenee)

General appearance of the moth: Body brownish in color especially on the thorax where the scales are dark brown in color from the dorsal side. Ventrally is creamy in color. Wing expanse about 40-42 mm long. Fore wing dorsally brownish and divided into three parts. Basal part dark brown in color followed by wide beige band surrounded by fine white lines. Middle part dark brown in color with irregular outer edge wider in the middle part. Outer part beige and ends by creamy color. Apical angle provided with dark brown, triangular spot and a small dark brown spot. Fringe long, dense and beige in color with brown tips. Fine dark brown dots scattered on the termin. Ventrally it is paler with the same coloration. Hind wing dorsally divided into two parts by pure white line, the basal part smoky brown in color. The outer part divided into a dark smoky wide band and an outer lighter brown color. A fine white line found on the termin. Fringe long dense and creamy in color with bases of some scales forming dark brown dots. Ventrally it is paler with the same coloration (Plate 1, 24).

The male genitalia: Aedeagus short, cylindrical with sculptured spinose vesica armed with long-sickle like spine cornutus. Valva broad and setose. Valvule narrow and setose, cucullus heavily setose, broad, with angled tip. Costa narrow and chitinized, clasper heavily chitinized with two arms the inner one, setose, broad with rounded tip. The other is clubbed at tip, the club is clefted ventrally and with small triangular project dorsally (like the animal head). Ampullae heavily chitinized and setose with well-developed base. Juxta sclerotized elongate and vase shaped. Saccus developed chitinized wrinkled basally, heavily setose and membranous. Tegumen chitinized, setose the outer side concave. Uncus stout, articulate with tegumen, broad ended with pointed sharp two spines. A dense tuft of setae found on its top. Vinculum broad and heavily chitinized. Saccus is small and broad (Plate 2, 24).

The female genitalia: Anal lobes triangular in shape and heavily setose. Posterior apophysis with swollen

part near its apex, and it is longer than anterior one (about three times long). The latter is wide truncated edge. Ostium provided with narrow notched chitinized plate. Duct bursae short, chitinized and spinose. Corpus bursae oval membranous and slightly wrinkled. Its wall provided with sharp minute spines (Plate 3, 23).

C- Subfamily: Cheophorinae

C- 1 *Earias insulana* (Boisd.)

The spiny boll-worm *E. insulana* has four types of coloration. Its color varies from dark green to yellow.

General appearance and wing pattern: Adult small with wing expanse about 18 -20 mm long. In all types, the ventered of the fore wing with creamy costal margin. Hind wing pearly white in color with brownish fine line and the anal margin while ventrally it is whitish in color. Fringe long, dense and whitish green from the dorsal side (Plate 1, 25).

A) Green type:

Dorsally head, thorax and fore wings green in color. The abdomen is beige in color. Ventrally the body covered with whitish scales. Fore wing fringe long, dense and green in color.

B) Yellow type:

Dorsally head, thorax and fore wings pale yellow in color. Ventral body covered with whitish scales. Fore wing fringe long, dense and pale yellow.

C) Green- brown type:

Fore wing dorsally green in color with fine scattered white dots resulting from the tips of green scales. A dark brown triangular spot enending from the middle third of the anal margin reaching near the costal margin. Also, a dark green patch is found beside the brown spot. Fringe long, dense and green in color. Ventrally the fore wing creamy washed with rufous color. The dark brown spot appears ventrally.

D) Zigzag type:

Fore wing dorsally greenish-yellow in color with medial and subterminal - lines are wavy dark green in color. Fringe long, dense and greenish- yellow in color. Ventrally it is creamy with beige color on the termin. The dark lines distinct ventrally.

The male genitalia: Aedeagus long, cylindrical with slightly sclerotized base. Vesica membranous with rounded tip. Valva broad with biforcated rounded tip. Valvule narrow, setose and somewhat chitinized. Costa moderately broad, chitinized and setose. Sacculus large, chitinized with fine setae. Cucullus densely setose, chitinized and with long strong scikle like seta arise from an elongate base and directed downwards. Clasper broad triangular, setose and sclerotized. Juxta Y shaped linear plate. Tegumen broad wirh double sclerotized short uncus. Vinculum moderately broad and

sclerotized. Saccus small and somewhat pointed ventrally (Plate 2, 25).

The female genitalia: Anal lobes slightly rectangular in shape with very long strong setae at base and long setae distally. Posterior apophysis with swollen base and longer than anterior one (about 1.5 long). Ostium moderate, duct bursae wrinkled and short. Corpus bursae oval. Chitinized wrinkled and with dark sclerotized signa forming longitudinal striation especially on the central part (Plate 3, 24).

KEYS TO THE STUDIED SPECIES

Key to trifinae subfamilies:

- 1 Meso and Meta tibia more or less covered with spines, eye naked.....2
- Meso and Meta tibia without spines.....3
- 2 Valva of male genitalia broad (about half as length) Agrotinae
- Valva of male genitalia narrow (about quadrate length) Heliiothinae
- 3 Eyes naked..... 4
- Eyes hairy..... Hadeninae
- 4 Cucullus indistinct, M, of the hind wing present..... Acontinae
- Cucullus distinct, M of the hind wing absent.....Amphipyriinae
- Key to Amphipyriinae male moths
- 1 Cucullus narrow..... 2
- Cucullus broad..... 4
- 2 Tegumen without penicellus, costa more or less chitinized (*Athetis* spp.). valva with concave apex..... *Athetis atriluna*
- Tegumen with distinct penicellus, costa heavily chitinized (*Sesamia* spp) 3
- 3 Costal margin sharbly pointed provided with small tooth, juxta conical shaped.....
-*Sesamia nonagriodes*
- Costal margin abrupt and rounded, juxta T shaped..... *Sesamia cretica*
- 4 Cucullus with distinct corona, clasper somewhat sclerotized; Juxta bell like; vesica with many spine like cornutus.....*Hopolodrina ambigua*
- Cuculus without corona; clasper heavily sclerotized; Juxta and comutus not as above.....
-*Spodoptera* spp
- 5 Clasper sharp pointed reaching apex of vaiva, juxta pentagonal shape; uncus very long and slender.....*Spodoptera littoralis*
- Clasper more or less pointed apically not reaching the apex of valva, juxta triangular with longitudinal slit, uncus with peak like tip.....
- *Spodoptera exigua*

Clasper with two sharp spines apically, juxta triangular and small, uncus with thickened tip

..... *Spodoptera latebrosa*

key to Amphipyridae female moths:

1 Corpus bursa without signa 2

Corpus bursa with signa..... 4

2 Ducts bursa sculptured; corpus bursae elongate with small appendix *Athetis atriluna*

Ducts bursa without such sculpture; corpus bursae oval, without appendix 3

3 Posterior apophysis longer than anterior one ostium wide..... *Sesamia nonagriodes*

Posterior apophysis as long as anterior one; ostium narrow. *Sesamia cretica*

4 Corpus bursa oval and narrow with long signum 5

Corpus bursa somewhat rounded, broad with short signum..... 6

5 Corpus bursa narrow with spiny long signum on its convex part *Spodoptera exigua*

Corpus bursa narrow with transverse signum..... *S. latebrosa*

Corpus bursa rounded with quadrate shape signum..... *S. littoralis*

Corpus bursa with a median evagination anteriorly with V shape signum.....

..... *Hoplocleris ambigua*

Key to Agrotinae male moths

1 Valva without corona or clavus, valva wide, heavily sclerotized, ampullae elongate.....

..... *Noctua pronuba*

Valva with corona and distinct clavus..... *Agrotis*..... 2

2 Corona about twenty spines

..... 3

Corona about thirty spines; clasper pointed apically, curved to the inner surface of valva; uncus

hairy and long..... *A. ipsilon*

Corona about twenty spines; clasper straight, rounded apically vesica with spinose band cornu

..... *A. spinifera*

Corona about nineteen - - twenty-two spines; clasper rounded apically and curved to the outer side of valva..... *A. segetum*

..... *A. segetum*

Key to Agrotinae female moths

1 Corpus bursa with one signum..... 2

Corpus bursa with more than one signa..... 3

2 Signa of corpus bursa linear, tube of appendix shorter than tube of corpus bursa

..... *Agrotis segetum*

Signa of corpus bursa rounded in shape, tube of appendix longer than corpus bursa tube

..... *A. spinifera*

3 Tube of appendix bursa much longer than tube of corpus bursa, corpus bursa with four signa

three horizontally and fourth at its tip

..... *A. ipsilon*

Tube of corpus bursa short and wrinkled, with rounded membranous diverticulum, the four signa

on corpus bursa longitudinal and moniliform in shape..... *Noctua pronuba*

Key to Hadeninae male moth

1 Clasper more or less sclerotized digitus flap like *Polia* sp. cucullus rounded with elongate

neck and many rows of spines corona. *Polia hepatica*

2 Clasper heavily sclerotized; digitus slender crossing the clasper..... *Leucania* spp. 2

Cucullus rounded with elongate neck and with scattered spines corona, uncus short with broad base, sacculus without extension

L. unipuncta

Cucullus rounded, hairy without corona; uncus long, hairy with beak like tip. Sacculus with spine right angle shaped *L. loryei*

Key to female moths

1 Appendix of bursa absent, both anterior and posterior apophysis with spatulate ends, ducts bursa wrinkled

..... *Polia consanguis*

Appendix of bursa present, apophysis not as above..... 2

2 Ducts bursa heavily sclerotized, wrinkled and long appendix bursa with wrinkled and

sclerotized neck.....

..... *Leucania unipuncta*

Ducts bursa sclerotized, slightly long; appendix of bursa globular in shape without neck

..... *L. loryei*

Key to Quadrifinae subfamilies

1. Mid tibia with series of spines on the outer side, valve without simple clasper but with complex structure

..... *Catocalinae*

Mid tibia without spines, clasper not as above..... 2

2 Fore wing with metallic marks, clavus well developed

..... *Plusiinae*

Fore wing without marks, clavus absent..... *Chleophorinae*.

Key to Plusiinae male moths

1 Tegumen very broad, roof like, saccus pointed apically..... *Chrysodeixis chalcetes*

Tegumen broad. not as above, saccus broad apically..... 2

2 Clasper in the mid-way of the valva, valva broad distally..... 3

- Clasper near the base of valva, valva narrow.....4
- 3Cucullus with truncate edge and with long 6 hairsvesica armed with thorn like cornuts....
.....*Autographa gamma*
- Cucullus with rounded edge, hairless. Vesica armed with many sclerotized spines cornuti
.....*Cornutiplusia circumflexa*
- 4 Clasper longer than clavus, saccus rounded apically.....*Thysanoplusia orichalcea*
- Clasper equals or shorter than clavus.....
Trichoplusia spp..... 5
- 5Vesica armed with single clefted cornutus, saccus rounded apically, uncus hairy
.....*Thysanoplusia daubei*
- Vesica armed with many chitinized spines, saccus truncate apically with lateral processes, uncus hairless.....*Cornutiplusia circumflexa*
- Key to female moths
- 1Corpus bursa with short appendix
.....*Cornutiplusia circumflexa*
- Corpus bursa without appendix..... 2
- 2Posterior apophysis as long as anterior one
.....3
- Posterior apophysis shorter than anterior one.....4
- 3 Corpus bursa elongate, pear like with dark signum
.....*Thysanoplusia orichalcea*
- Corpus bursa elongate, wrinkled and with two longitudinal biforked signa
.....*Chrysodeixis chalcetes*
- 4 Ostium wide, wrinkled and spinose; corpus bursa elongate with rounded heavily sclerotized base.....*Autographa gamma*
- Ostium slightly wide and spinose; corpus bursa oval..... 5
- 5Anal lobes triangular in shape; ducts bursa long and wrinkled.*Thysanoplusia daubei*
- Anal lobes oval in shape; ducts bursa moderately long and membranous.....*Cornutiplusia circumflexa*
- Key to Catocalinae male moths
- 1 Male genitalia asymmetrical, with left clasper and ampulla longer, with peak like extension on the right tegumen, uncus arising from oval plate
.....*Grammodes bifasciata*
- Male genitalia symmetrical, uncus with dense tuft setae on apex and with 2 sharp pointed tip
.....*Dysgonia torrida*
- Key to Catocalinae female moths
- 1 Ostium covered partially with genital plate, genital plate cup-shaped...*Grammodes bifasciata*
- Ostium covered completely with genital plate, genital plate narrow, notched and chitinized.
.....*Dysgonia torrida*

Plate 1. showing general appearance of

- 1) *Spodoptera littoralis* , 2) *Spodoptera latebrosa*, 3) *Spodoptera exigua* 4) *Sesamia nonagrioides*, 5) *Sesamia cretica* 6) *Athetis atriluna* 7) *Hoplodrina ambigua* 8) *Agrotis spinifera* 9) *Agrotis segetum* 10) *Agrotis ipsilon* 11) *Noctua pronuba* 12) *Leucania unipuncta* 13) *Leucania loreyi*, 14) *Polia hepatica* 15) *Heliothis peltigera* 16) *Acontia lucida* 17) *Autographa gamma* 18) *Thysanoplusia orichalcea* 19) *Chrysodeixis chalcetes* 20) *Syngrapha interrogationis* 21) *Thysanoplusia daubei* , 22) *Syngrapha interrogationis* 23) *Grammodes bifasciata* 24) *Dysgonia torrida* 25) *Earias insulana*.



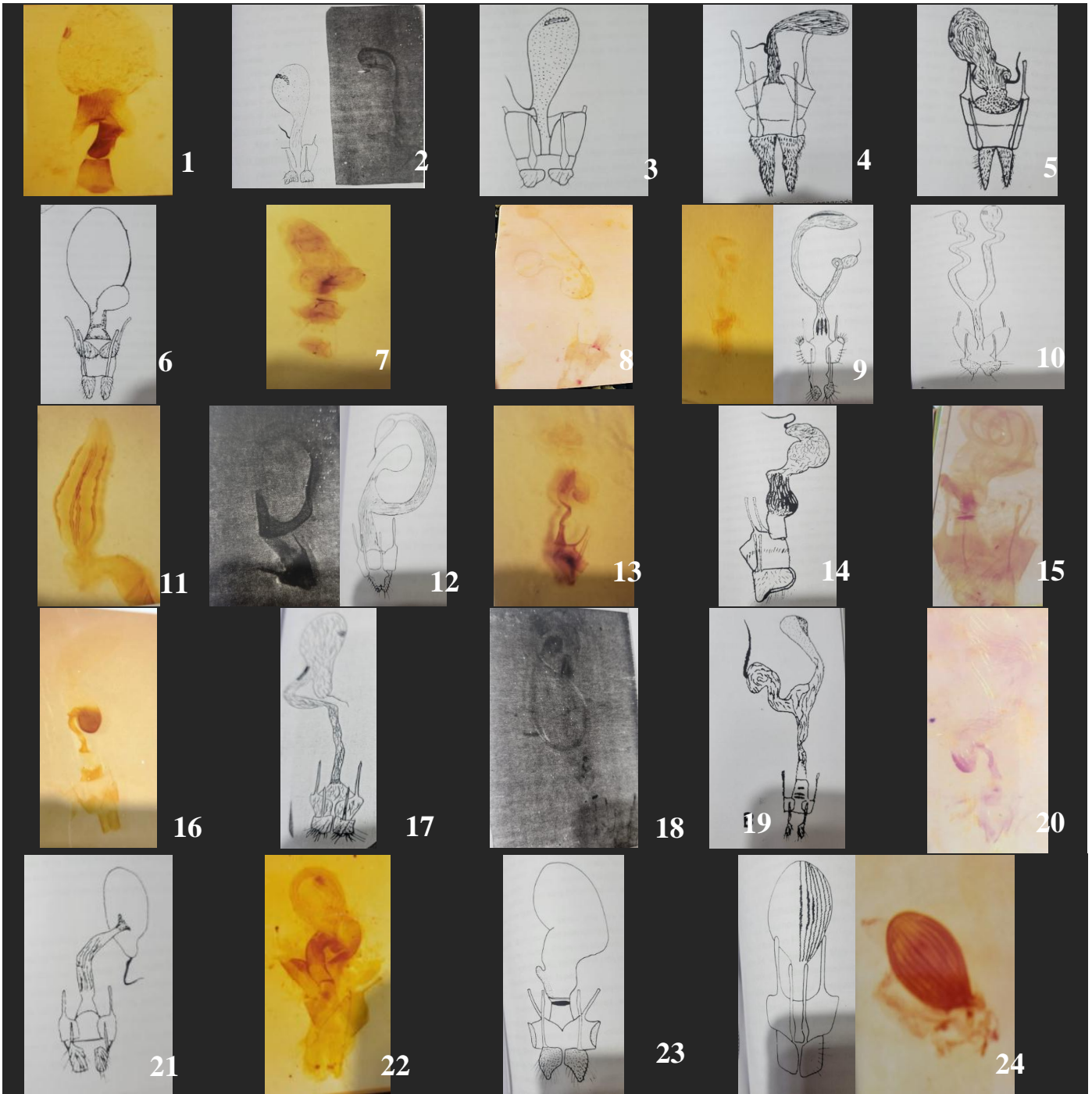
Plate 2. showing male genitalia of

1) *Spodoptera littoralis* , 2) *Spodoptera latebrosa*, 3) *Spodoptera exigua* 4) *Sesamia nonagriodes*, 5) *Sesamia cretica* 6) *Athetis atriluna* 7) *Hoploclidra ambigua* 8) *Agrotis spinifera* 9) *Agrotis segetum* 10) *Agrotis ipsilon* 11) *Noctua pronuba* 12) *Leucania unipuncta* 13) *Leucania loreyi*, 14) *Polia hepatica* 15) *Heliothis peltigera* 16) *Acontia lucida* 17) *Autographa gamma* 18) *Thysanoplusia orichalcea* 19) *Chrysodeixis chalcetes* 20) *Syngrapha interrogationis* 21) *Thysanoplusia daubei* , 22) *Trichoplusia circumscripta* 23) *Grammodes bifasciata* 24) *Dysgonia torrida* 25) *Earias insulana*.



Plate 3. showing female genitalia of

- 1) *Spodoptera littoralis* , 2) *Spodoptera latebrosa*, 3) *Spodoptera exigua* 4) *Sesamia nonagrioides*, 5) *Sesamia cretica* 6) *Athetis atriluna* 7) *Hoploclidris ambigua* 8) *Agrotis spinifera* 9) *Agrotis segetum* 10) *Agrotis ipsilon* 11) *Noctua pronuba* 12) *Leucania unipuncta* 13) *Leucania loreyi*, 14) *Polia hepatica*, 15) *Heliiothis peltigera* 16) *Autographa gamma* 17) *Thysanoplusia orichalcea* 18) *Chrysodeixis chalcetes* 19) *Syngnatha interrogationis* 20) *Thysanoplusia daubei*, 21) *Trichoplusia circumscripta* 22) *Grammodes bifasciata* 23) *Dysgonia torrida* 24) *Earias insulana*.



CONCLUSION

25 noctuid moth species were collected by light trap from experimental research station of the Faculty of Agriculture, Alexandria University, at Abis district (31.21743, 29.98271). Diagnostic characteristics (wing pattern, male genitalia and female genitalia) of these species were described and photographed. Taxonomical keys were designed for both male and female according to male and female genitalia.

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الملخص العربي

دراسة تصنيفية على بعض فراشات العائلة الليلية النشطة (Lepidoptera Noctuidae) من الإسكندرية، مصر

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الذكور والكيس السفادى من الإناث حيث أن هذه الصفات تعتبر من أهم الصفات التقسيمية فى هذه العائلة. وباستخدام المفاتيح التقسيمية المختلفة تم تصنيف هذه الأنواع إلى ثماني تحت عائلات كما يلي: Agrotinae، Amphyrinae، Plusiinae، Acontinae، Heliothinae، Hadeninae و Catocalinae و Chleophorinae. هذه الأنواع من الفراشات هي: *S. exigua*، *S. latebrosa*، *Spodoptera littoralis*، *Athetis atriluna*، *S. cretica*، *Sesamia nonagriodes*، *A. segetum*، *Agrotis spinifera*، *Hoplocleris ambigua*، *L. Leucania unipuncta*، *Noctua pronuba*، *A. ipsilon*، *Acontia*، *Heliothis peltigera*، *Polia hepatica*، *loreyi*، *Thyanoplusia orichalcea*، *Autographa gamma lucida*، *Cornutiplusia circumflexa*، *Chrysodeixis chalcetes*، *Syngrapha interrogationis*، *Thyanoplusia daubei*، *Earias* و *Dysgonia torrida* و *Grammodes bifasciata* و *insulana*.

تضم عائلة Noctuidae أغلب أنواع افراشات التي تتجذب إلى مصائد الضوء ليلاً، وتضم حوالي ١٢٠٠٠ نوع على مستوى العالم. وفي مصر، تضم عائلة Noctuidae حوالي ٢٠٦ نوع. وتضم العديد من آفات المحاصيل الحقلية ونباتات الفاكهة ونباتات الزينة. وتتناول هذه الدراسة خمسة وعشرين نوعاً من الفراشات من عائلة الفراشات الليلية: (Lepidoptera Noctuidae) وقد تم اصطياد الفراشات بواسطة المصائد الضوئية المثبتة في محطة البحوث التجريبية بكلية الزراعة، جامعة الإسكندرية، بمنطقة أبيس (٢٩،٩٨٢٧١، ٣١،٢١٧٤٣). وقد تم تصبير الفراشات لتسجيل المظهر العام ونمط الأجنحة لكل نوع. كما تم تشريح بعض من الفراشات وعمل شرائح لكلا من آلة السفاد من