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Taxonomic studies on Family Noctuidae began in 18th century by great taxonomist Linnaeus, who was the first eminent scientist to contribute on this group of moths. Linnaeus (1758) placed Noctuoidea in two genera: Sphinx and Phalaena. Dennis and Schiffermüller (1775), Cramer (1775-82), Cramer (1780), Borkhausen (1792), Fabricius (1794), Hübner (1805), Stephens (1829), Duponchel (1844), Guenée (1852), Walker (1854), Moore (1867-1883), Staudinger (1871), Butler (1886), and Staudinger & Rebel (1901) were other pioneer workers who contributed to the taxonomy of this group of moths in a major way. Works on genitalic structures goes back to Gosse (1883), Pierce (1909) and Mcdonnough (1911). These authors were having their independent views regarding terminology of genitalic parts.

Several other important workers who worked on the taxonomy of Noctuids from various parts of Globe during 19th century include, Swinhoe (1901, 1916), Seitz (1909), Forbes (1916), Wileman (1902,1912,1914,1915,1922), Girault (1913), Watson (1915), Paulton (1916), Schaus (1916), Barnes and Mc Dunnough (1918), Fletcher (1928), Morgan (1921), Barnes and Benjamin (1923), Blackmore (1927) and Comstock (1898).

Most of the taxonomic work done by earlier workers was based on various morphological features except genitalia. According to Biological species concept, “Species are group of natural occurring populations which can interbreed but are reproductively isolated from other such groups” (Mayr, 1991). The genitalic attributes assume great significance in various groups on the basis of this species concept. Although, earlier workers like Moore and Hampson, relied mainly upon classical taxonomy without studying genitalia yet achieved great success in compiling various families of Lepidoptera.

Smith (1890) in his various publications on North American Noctuidae, used ‘harpe’ as the two outermost lateral valve like appendages of male and ‘clasper’ as a portion of inner armature of harpe, arising from mid ventral surface. However, Rothschild & Jordan (1903) while studying Sphingidae, used these terms in inverse manner. Pierce 1909, while studying genitalia of Noctuidae from Britain, followed
Smith (1890) and described various terms of genitalia. Later on, Mcdonough (1911) tried to solve this confusion by reviewing the previous authors and gave various terms of the male genitalia in Lepidoptera. He followed mainly terminology of Smith and Pierce. Thus, considered claspers, harpe, uncus, scaphium, vesica and saccus as valid terms.

Bethunr-Baker (1914) highlighted the taxonomic value of genital armature in Lepidoptera. In the same year, Pierce (1914) also studied the Genitalia of Geometridae from British Island, highlighting taxonomic importance of this part in moths. Comparative morphology of male genitalia in Lepidoptera was also studied by an Indian worker Mehta in 1933. He studied male genitalia of more than 100 species of family Noctuidae and mainly followed the terminology proposed by Pierce in 1909. A series of publication on external male genitalia was brought out by combined efforts of Sibatini, Okagaki and Ogata. Sibatani et al., (1954), while dealing with male genitalia of Lepidoptera, stressed that the harpe and ampulla should not be considered as irregular projections attached to mesal part of valva and recognized as different regions of valva. These authors provided new term, anellifer, a membranous region situated at the centroproximal part of the mesal surface of the valva. Okagaki et al., 1955 while continuing studies of Sibatani et al., highlighted the significance of sacculus and furca in male genitalia of Lepidoptera. Ogata et al., (1957) discussed various morphological appendages pertaining to tenth somite. In this publication, they redefined term uncus as hook like dorsal process pertaining to tenth segment. Further, they also proposed scaphium as morphological unit and branchia as a part of gnathos. They also discussed connection between tegumen, scaphium and gnathos. According to these authors, Scaphium is associated with tegumen without any intervening sclerites whereas gnathos arises at the base of scaphium.

Klots (1956, 1970) gave a detail view on division of valvae and recognized valvae in 6 major fundamental regions of a valva i.e., costa, co (dorso-proximal); ampulla, am (central and medio dorsal); cucullus, cu (dorso-distal); valvula, vla (ventro-distal); harpe, hrp (central and medio-ventral); and sacculus, sl (ventro-proximal). The anal angle is the lower apical angle of the valva and the anal spine,
part projecting from the anal angle. Marginal spines are outwardly directed structures along the margin. The *pollex* is usually a digitate projection from the *anal angle*, and the *ampulla* a small, knobbed arm, arising from the valva at the base of the harpe.


Viette (1951) reported several new Noctuid species while working on the Ophiderinae of Madagascar for a long time. Some of the species reported by him were *Calesia tamsi*, *Episparis silothyris*, *Gesonia silvestralis*, *Anomis madida*, *A. hawaiensis*, *Ugia rohotela*, *Bocula transducta*, *Calesia migriventris*, *Anomis alludi*, *A. mandeaker*, *Ugia radama*, *Claterna ochreoplague*, *Pandeumo decaryi*, *Plecoptera flectcherana*; *Episparis mekgas*, *Malupa holi*, *M. silvicola*, *Polydesma zethesoides*, *Ugia malagasy* and *U. navana* etc. Todd (1955) devised an identification key based on the characters of genitalia. Later on (Todd 1980a, 1980b) worked on the various species of *Spodoptera* Guenée and characterized various species by incorporating genitalic features in the diagnosis of the concerned species.

Sevatopulo (1956a, b, c & 1957) dealt with moths from Calcutta and studied a total number of 444 species. Out of this, 40% species were that of Noctuid moths along with a new species *i.e.*, *Leucanea irregularis*. Fletcher (1957) separated two
species of genus *Spodoptera* and devised an identification key. In 1958, he published a monograph, in which he described several species available in the oriental region. In 1957, Srivastava reported *Agrotis interecta* (Walker) from the potato fields of Udaipur. Fletcher (1959) published a new species of *Acrapex* from Hawaii. Shull and Nadkerny (1961, 67) enlisted 180 species of moths from Gujarat. Out of these, 71 species were of family Noctuidae. Common (1964) gave the identification and distribution of species of genus *Pseudaletia* from Australia. Hardwick (1965, 1973) studied genus *Euxoa* and described new species along with its external genitalia. Chatterjee (1967) published a compulsive account of genitalia of three species of genus *Spodoptera* Guenée. One species of this genus *i.e.*, *Spodoptera littoralis* Boisduval was recorded for the first time. Buckett (1968) published the revision of the Nearctic genus *Abagrotis* Smith with description of new species. Bhattachaeeojee and Gupta (1971) identified and described three species *i.e.*, *Plusia orichalcea* Fabricius, *Pseudaletia separata* Walker and *Cirphis unipuncta* Haworth as pests of wheat. In 1972, they reported three species of genus *Heliothis* *i.e.*, *H. armigera* (Hübner), *H. assulta* Guenée and *H. peltigera* (Schiff.) along with a new species *i.e.*, *H. rama* from Nagar along with their identification, key and genital characters. Banziger (1971) studied two species of genus *Calpe* Hampson. He gave an account of 35 new Lepidoptera species from Asia in 1976, in which he discussed the Noctuidae of China. Male abdominal brush organs in Noctuidae were studied in detail by Birch (1972). Noctuid fauna of Crimea was studied by Klyuchko(1972). Feige (1971) described two new species of genus *Blosyris* from Venezuela. A Taxonomic revision of 22 species of genus *Agrotis* and allied genera including *Xestia* and *Diarsia* from India, Pakistan, Burma and Sri Lanka was done by Kapur and Arora in 1971. Wiltshire (1971) recorded 27 species and identified 4 new species from Iran and Afghanistan. Lafotaine (1974a, 1974b) discovered new species of genus *Euxoa* and photographed external male and female genitalia. Besides this, he devised a key to five species of this genus from North-America. Mani (1974) described features for identification of five Noctuid species *viz.*, *Polytela gloriosae*, *Cirphus unipuncta*, *Eublemma amabilis*, *E. olivacea* and *Ophideres* species. Nye (1975) published an index of 26500 generic names referable to family Noctuidae on world basis. Gupta and Shukla (1977) studied
Spodoptera compta (Moore), S. mauritia (Boisduval) and Mocis frugalis (Fabricius) in detail. Singh (1979) published an account of Noctuids of Chandigarh and surrounding areas in considerable details. All these workers studied genitalic structures in their listed works. Holloway (1979) listed 216 Noctuid species belonging to 14 subfamilies. Later on in 1999, in his volume 18 of ‘Moths of Borneo’, he described 389 species belonging to 86 genera. The monotypic genus Tiracula Moore and species T. plagiata Walker were redescribed by Mandal and Shukla in 1980. Buszko (1980) gave a key to 22 species of Noctuidae from Poland. He used genitalic features for the preparation of a key. The research work by Pelletier (1982) led to rearrangement of 20 Asian species into 3 genera i.e., Episparis Walker, Episparnia Berio and Episparonia Berio. Dierl (1983, 1984) reported new species of Noctuidae and described their external genitalia from Nepal. Pajni et. al., (1986) described the genitalic features of three species i.e., Grammodes mygdon Cramer, stolida Fabricius and geometrica Fabricius along with their key.

Kaur (1988) described and illustrated the genitalia of 54 species belonging to subfamily Catocalinae and 34 of Acronictinae from Punjab and Chandigarh. Srivastava (1988) studied genitalic features of nine species of Ophiderinae from North and North-eastern parts of India. Genitalic structures of Platyja unninia (Cramer) were studied by Rose and Srivastava (1988). The authors also reported a new species of Ophiderinae i.e., Indocala punjabensis from Punjab. Srivastava (1989, 1989a) studied the taxonomy of 8 species of genus Anomis from Punjab. Srivastava (1990a) described the genitalic attributes of Oxyodes scrobiculata Fabricius. In the same year, Srivastava (1990b) studied the male and female genitalia of Hypocala violacea Butler. In 1992, he described two species of Hulodes i.e., caranea (Cramer) and drylla alongwith an identification key. Srivastava (1993, 1993a) studied male and female external genitalia of 11 Ophiderinae collected from North-Cachar hills, Assam. In the same year, he studied genitalic structures of 14 species of Ophiderinae. Again in 1995, he studied Noctuids from Himachal Pradesh. New taxa of Acronictinae from mountains of South Siberia were studied by Dubatolov (1995).

Lodl (2001) revised various genera of subfamily Hypheninae by incorporating
external genitalia. Sviridov et al., in 1996 reported new species of Catocala from Afghanistan and compared its genitalia with sympatric species. Troubridge and Crabo (1999) described nine new Oncocnemis species and two subspecies alongwith illustrations of adults and male genitalia from the Pacific Northwest.


African-Arabian and Asian-Pacific “Mocis frugalis” was differentiated by Zilli (2000) on account of genitalic characters. Zilli et.al., (2005) gave description of seven new Noctuid species of genus Speiredonia i.e., cthulhui Zilli & Holloway martabanica Holloway & Zilli, Sandokana Zilli and Holloway, ibanorum Holloway & Zilli, gawa Holloway & Zilli, levis Holloway & Zilli and celebensis Hogenes & Zilli from Indo-Australian area. Furthermore, they described habitat and genitalia of two species viz., Speiredonia substruens (Walker) and S. cymosema (Hampson), besides giving brief characterization and illustrations of above mentioned species.

Yoshimatsu (2001) described a new species Mythimna martoni along with comprehensive checklist and description of adult genitalia of new species from Taiwan. Mathew and Mohandas (2001) enlisted 22 species of this family while publishing insect fauna of the shola forests of Munnar and Wynad. Angulo and Olivares (2003) catalogued 21 species of Copitarsia Hampson and illustrated male genital morphological characters of Copitarsia turbata Herrich-Schaeffer and
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Copitarsia incommode Walker.

McCabe (2003) studied distribution and revised taxonomy of Hadena ligata Moschler with external male genitalic characters. Sohn (2003) reported three Noctuid species viz. Anoratha paratalis (Walker), Orthosia fausta Leech and Grammodes geometzica (Fabricius) from Korea. Sohn et.al., (2004) studied three Noctuid species i.e. Orthogonia basimacula (Draudt), Hyperzypnaides submarginate (Walker) and Maliattha khasanica Zolotarenko and Dubatolor from South Korea and two new species of Maliattha vialis species group from Asia. In 2005, they reported five Noctuid species from Korea. Sohn et.al. (2005) described 165 Noctuid species from Korea. These workers reported Ischyja manlia (Cramer) for the first time from Korea in 2005a and gave detailed genitalic account of this species. Sohn et.al., (2005b) again published a taxonomic report of six Noctuid species which were new records from Korea. The photographs of adults and their genitalia for each species were also provided in the research paper. Sohn and Ronkay (2011) described two new species of Lophomilia Warren from Asian tropics. Sohn et.al., (2012) described two new species of Stenoloba Staudinger from Taiwan and two new species of Lophomilia Warren along with external genitalic attributes from China and Taiwan in his subsequent two publications.

Simmons and Pogue (2004) redescribed two often confused pests, Copitarsia decolora (Guenee) and C. incommoda (Walker) using adult morphology and external genitalic attributes. Ronkay and Sohn (2004) photographed and described adults and genitalia of two new species of Maliattha vialis species group from Asia. Metlevski (2005) studied a new species of owlet moth, Meropleon linae from Kansas. This species was distinguished from other species by shape of valva and structure of aedeagus.


Stojanovic and Dodok (2007) studied two new species for the Fauna of Serbia along with study of external male and female genitalia. Behounek (2007) updated the taxonomical status of *Wittstrothia flavannomica hunta* from North Thailand. Behounek *et al.*, in his subsequent five publications *i.e.*, 2011a, 2011b, 2011c, 2011d, 2011e and 2012 reviewed various genera and described many new species along with the illustrations of external genitalic characteristics. Fibiger *et al.*, (2007, 2007a) described and illustrated male and female genitalia of two new species from Iran. In the same year (2007b), he recorded five species from Malta for the first time and one species from France and provided external male genital attributes along with distribution and life history. Fibiger *et al.*, (2008) revised subfamily *Araeoteroninae* Fibiger from Russia and neighboring countries along with descriptions of four new species. Han *et al.*, (2007) studied a Noctuid species *Trisuloides rotundipennis* Sugi along with its female genitalic features for the first time from Korea. In the same year, Han and Ronkay reported two Noctuid moths from China. The external characteristics, genitalic photographs and distributional ranges were provided in this paper. Han and Byun (2007) described adult and male genitalia of *Hepatica nakatanii* Sugi for first time to the fauna of Korea. Han *et al.*, (2007) reported two species of Noctuid moths from China. In 2008, they first time reported three species from China and provided photographs of adults and male-female genitalic characteristics. Han and Kononenko (2011) described 12 new species of *Athetis* Hübner from China. Kravchenko *et al.*, (2007) reported a new species *Catocala ammonfridbergi* Kravchenko from Israel.

Kirti *et al.*, (2008) published a list of serious pests of Indian crops belonging to family Noctuidae. In 2010, Kirti *et al.*, gave genitalic studies on two Indian species of genus *Acronicta* Ochsenheimer. Kirti *et al.*, (2011) while dealing with Noctuidae from Western Ghats published an Inventory of subfamily Catocalinae (Noctuidae: Lepidoptera) from this area. In the same year,(2011a) he recharacterized genus
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*Hypocala* Guenée by incorporating its external genitalic attributes. Apart from this, Kirti *et al.*, (2011b) studied external genitalic structures of two Indian species of genus *Agrotis* Ochsenheimer. In the very next year, Kirti *et al.*, (2012) published an inventory of subfamily Calpinae (Noctuidae: Lepidoptera) from Western Ghats of India. Kirti and Singh (2013) published an inventory of subfamily Catocalinae (Noctuidae: Lepidoptera) from North-East India and reported 42 species under 25 genera in this group. Kononenko, in his series of valuable publications (2008a, 2008b, 2009a, 2009b, 2009c, 2010a, 2010b, 2011, 2012) described many new species and genera based on external features including male and female genitalic characters from different parts of the world. Muller *et al.*, (2008) studied species group related to *Catocala lesbian* Christoph and described adults and genitalia of three new species and one subspecies. Speidel *et. al.*, (2008) reported new species, *Catocala lehmanni* Speidel and studied external morphology and its male genitalia from China. Another *Catocala* species *laura* Saldaitis was reported from Tajikistan by Saldaitis *et al.*, (2008). This species belong to puerperal species-group and distinguished on wing colour and genitalia. In their two subsequent publications in 2011, they described two new species *i.e.*, *Orthosia wangere* Saldaitis, Benedek & Visinskiene and *Cirrichia spalvota* Saldaitis, Benedek & Visinskiene and *Bireta morozovi* Saldaitis, Ivinskis & Rimsaite from China. Both the species resemble related congeneric species and were distinguished by differences in wing pattern, genitalia and distribution. In year 2013, he reported a new species *Lasianobia pensottii* Saldaitis *et al.*, from China. This species clearly differs in appearance and genitalia from its closest known species and sympatric species.

Lafontaine and Poole (2010) reviewed 138 species and assigned under seven genera in the new world genera of subfamily Acontiinae. Illustrations of adults and genitalia of representatives of seven genera were provided in this publication. In the same year, Lafontaine and Troubridge (2010) studied two new species of *Euxoa* Hübner from Northern and Western Canada. Status of *Euxoa chimoensis* Hardwick was revised and diagnosis of *E. westermanni* species group given with descriptions and illustrations of genitalia of new species.

Sivasankaran *et al.*, (2011) studied external morphology of 15 species of subfamily Catocalinae. Later on in 2012, these authors recorded 15 more species of this subfamily. Qi *et al.*, (2011) gave the taxonomic revision of Stictopterinae from China and described seven genera and 40 species. Apart from this, five new species were reported and external genitalia of 27 species described. Varga (2011) revised genus *Xenophysa* Boursin and described a new subgenus and new species on basis of male genital characters along with redescriptions of two species. Babics and Ronkay (2011) reviewed genera *Perinaemia* and *Isoura* and described four new species on basis of external genitalic features. Babics *et al.*, (2012) proposed a new genus and three new species of subfamily Xyleninae, besides forming three new combinations. A new species of *Amphipyra* Ochsenheimer was studied from China by Babics *et al.*, (2013). Fuqiang *et al.*, (2012) reported 10 species of *Acontia* Ochsenheimer from China along with genitalia based key for identification. Four species of genus *Perigrapha* Ledrèr were reviewed and key was also formulated to the genus in Iran by Shirvani *et al.*, in 2012.

Pekarsky (2012) described two new species viz., *Pseudohadena anatine* Pekarsky and *Pseudohadena gorbunovii* Pekarsky from Kazakhstan. He illustrated adults and genitalia of both the sexes. In year 2013, Perkarsy and Saldaitis reported a new species of *Stenoloba* from the *olivacea* species group from China. Illustrations if male holotype and its genitalia were also provided. Volynkin (2012) reviewed the genus *Dasypolia* Guenée from Russian part of the Altai Mountain Country with the descriptions of two new species. Chen and Xue (2012) reviewed *Micardia* Butler and
reported six species from China. Benedek (2012) described four new species *owadaglaea* Hacker and Ronkay from Nepal, China and Myanmar along with the checklist of genus. Hu et al., (2013) reported five new species of genus *Meganola* Dyar from China and adjacent regions along with figures of adults and genitalia. Rabieh et al., (2013) recorded a new species, *Chersotis curvispina* Boursin for the first time for the fauna of Iran. Illustrations of male genitalia and species distribution are also given in this publication.