REVISION OF THE GENUS *ELOPHILA* HUBNER (LEPIDOPTERA : PYRALIDAE) WITH A NEW SPECIES FROM PAKISTAN WITH CLADISTIC RELATIONSHIP.

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خلاصہ

جنس ایلوفیلا جنز کا بیان ثانی بشمول نین انواع ایک نئی نوع بحوالہ انکے راسی اجراء، اگلے اور پچھلے جناحیہ اور نر اور مادہ اجزاء کے پاکستان سے کیا گیا ہے۔ نیز انکے ارتقائی تعلق کو بحوالہ دیگر شکلی مد نظر رکھتے ہوئے بحث کی گئی ہے۔

Abstract

Genus *Elophila* Hubner revised to accommodating three species including one new from Pakistan with reference to their head components, venations of mesonotal and metanotal elytron and both sexes genital components. The cladistic relationship is also briefly discussed using their apomorphies.

Introduction

Goater (1986) presented a guide to the identification of British pyralid moths in which he mentioned fifteen species under the sub-family Nymphulinae including four species of the genus *Elophila* viz. *E. nymphaeta* (L.), *E. diffualis* (Snellen), *E. melagynalis* (Agussiz), and *E. manilensis* (Hampson). He described their external morphological characters including colour patterns of both elytron , distributional range and nature of feeding.

Hashmi and Tashfeen (1992) gave a checklist "Lepidoptera of Pakistan" in which they listed 365-species of the family Pyralidae but did not mentioned any species of the genus *Elophila.*

Roberts *et al*., (1998) studied the free ovipositional choice , developmental period , survival and fecundity of *Elophila africana* Hampton. *Mathew (2006)* presented an inventory of Indian pyralids, recorded 1646-species from India but he included only one species *Elophila melagynalis* Agassinz. He also formulated a key for the identification of 17-subfamilies of the family Pyralidae .

Chen *et al.,* (2010) revised the genus *Elophila* Hubner from China including fifteen species to accomodating two new species . They also included the description of genus and sub-genera with reference to their illustrations of adult specimens and genitalia of males and females and a key to three sub –genera and fifteen species is given .

Sterling and Parson (2012) in their field guide to the micro-moths briefly describing the Brown china-mark, the *Elophila nymphaeta* with reference to its body colouration including fore elytron, biology and nature of feeding and also illustrated the colour photograph of adult.

Materials and Method

The representatives of all three species of the genus *Elophila* Hubner were collected from Thatta, Sujawal Sindh Pakistan with the help of light trap and picking method and identified with the help of available literature and internet source . For the study of wing venations , both elytron were detached from base and the prepared slide .

For the study of both males and females genital complex, the abdomen was detached from the base and boiled in 10% KOH solution for about few minutes then wash with tap water and inflate the genitalia in saline waters. The diagrams were made by using graticules and the procedure were followed by Ahmad *et al.,* (1982).

Genus: *Elophila* Hűbner

Elophila, Hubner, 1822, *Syst-alphab. Verz. eur. Schmett.:* 54-57; Speidel, 1984, *Neue. ent. Nachrichten 12:* 46; Yoshiyasu, 1985, *Sci. Rep. Kyoto Prefectunal university (Agric.) 37:* 18; 1987, *Microlep. Thailand 1:* 134; Speidel and Mey, 1999, *Tijdschrift voor Entomologie 142:* 135.

Hydrocampus, Berthold, 1877, *Latreilles Naturliche Familien des Thierreichs:* 485.

Hydrocampa, Stephen, 1829, *Nomenclature of British Insects:* 46.

Diagnostic characters: Body generally briliently coloured with different colour of patches, frons roundly produced, maxillary palpi porrect, thickly clothed with scales, much extending beyond head, proboscis moderate, mesonotal elytron long, apex produced, veins subcostal and radius one parallel to each other, median one arises from inner angle of cell, 2 anal veins are found metanotal elytron broad, veins Sc + R1 usually stemed with Rs, Cu1 arising just below the lower angle of cell, tibiae with moderate size of spurs.

Genital components: In male tegumen short, some what square-shaped, uncus thick, with apex moderate, gnathos usually membranous, herpagon large, longer than tegumen, flipper-shaped, theca large tubular, membranous conjunctiva usually large, lobe-like. In female papillae anales short, both apophysesses well develop, ductus bursae tube-like, corpus bursae balloon-shaped with cornuti.

Comments: This genus has very near resemble with the genus *Nymphula* Schrank nearly briliently colour pattern on both elytron with large number of dark patches isolated from the same in having maxillary palpi anteriorly directed or slightly oblique, 2nd segment of maxillary palpi much longer than 3rd segment and by the other features as listed in the key and explanation.

Type : *Phalaena nymphaeata* Linnaeus
Distribution: Worldwide.

Elophila difflualis **(Snellen)**
(Figs. 1-7)

Hydrocampa difflualis, Snellen, 1880, in Veth, *Midden- umatra, 4* (8): 75.
Isopteryx enixalis, Swinhoe, 1885, *Proc. Zool. Soc. Lond.:* 869.
Nymphula osculatrix, Meyrick, 1933, *Exotic Microlepidoptera, 4:* 394.
Nymphula enixalis, Ulang, 1980, *Economic Insect Fauna of China, 21*: 104.
Elophila enixalis, Speidel, 1984, *Neue entomologische Nachrichten, 12*: 60.
Elophila difflualis, Speidel and Mey, 1999, *Tijdschoift voor Entomologie, 142*: 135.

Colour pattern: Body generally pallish except brownish and light reddish patches on body and both elytron.

Head (Fig. 2): Frons broadly rounded, not produced, palpi well developed, anteriorly porrected, 2nd segment of maxillary palpi 2X the length of 3rd segment, proboscis moderate.

Mesonotal elytron (Fig. 3): Mesonotal elytron with frontal and caudal lines are slightly wavy apical angle sub-acutely produced, veins radius one and radius two largely stemed and arise far beyond upper angle of cell, radius three and radius four unite and arise from upper angle of cell, median one arises from lower angle of cell, two anal veins are found.

Metanotal elytron (Fig. 4): Metanotal elytron with frontal and caudal lines are convex, apical line wavy veins subcostal + radius one stemed with radio suctorial and arise from below upper angle of cell, median one arises from proximal portion of cell, median three arises from lower portion of cell, two anal veins are found.

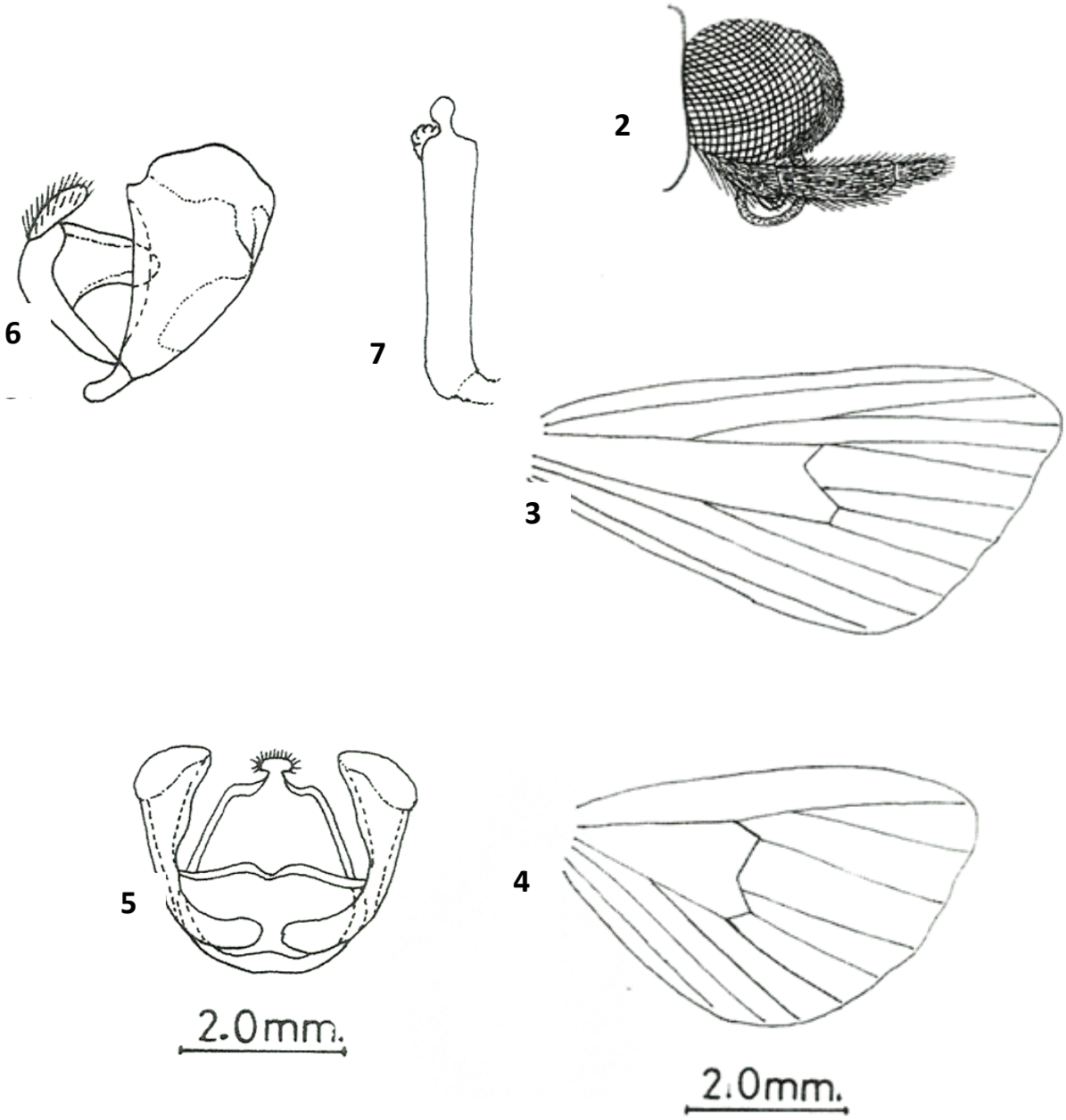
Elytron expansion: size of body 12-18mm. with elytron expansion

Male genital components (Figs. 5-7): Tegumen (Figs. 5 and 6) short, some what square-shaped, saccus broad, saucer-shaped, uncus short broad, dome-like beset with thick scales, shorter than gnathos, later tongue-shaped, herpagon large, apicaly broad, aedeagus (Fig. 7) tube-like, straight, with knob-like thecal appendage, membranous conjunctiva short, without cornuti.

Material studied: Six males, Pakistan, Sindh, Thatta, on light, 20.6.1982, leg. S. Kamaluddin, lodged at supervisor record.

Comments: This species is most closely resemble with *E. nymphaeta* (L.) in nearly mesonotal elytron with veins radius three and radius four unite or only radius four arising from upper angle of cell, in male apex of uncus either sharply pointed or sub-rounded but isolated from the same in having frons convex, maxillary palpi anteriorly directed, aedeagus with knob-like thecal process and by the other features in the explanation and listed in key.

Fig. 1. ***Elophila diffualis*** **(Snellen)**



***Elophila kamali* (Sp.n.)**
(Figs. 8-14)

Colour pattern: Body generally pale except brownish patches on both elytron and longitudinal linings on apex of mesonotal elytron.

Head (Fig. 9): Frons sub-roundly produced, palpi well developed, with thickly scaled, 2nd segment of maxillary palpi about 2.5X the length of 3rd segment, proboscis moderate.

Mesonotal elytron (Fig. 10): Mesonotal elytron with frontal and caudal lines are wavy, apical angle blunt, veins subcostal and radius one parallel to each other, radius two and radius three stemed and further stemed with radius four and unite with radius five, arise from upper angle of cell, median two arises from lower angle of cell, two anal veins are found.

Metanotal elytron (Fig. 11): Metanotal elytron with frontal and caudal lines are convex with apical with wavy lines veins subcostal+radius one parallel to radio suctorial, later largely stemed with median one unite with median two and arise from proximal angle of cell, Cu1 arises from lower angle of cell, only-one anal vein is found.

Elytron expansion: size of body 12-18mm. with elytron expansion.

Male genital components (Figs. 12-14): Tegumen (Figs. 12 and 13) short, about square-shaped, saccus short, somewhat V-shaped, uncus thick, apex truncated, slightly shorter than gnathos, later membranous, herpagon large, flipper-like, beset with thickly scales on apical half, two spine shaped apendages at inner margin, aedeagus (Fig. 14) tube-like, stout, membranous conjuctival lobe elongated wih a comb-like cornuti at base and inverted U-shaped cornuti near apex.

Material studied: Holotype, male, Pakistan, Sindh, Thatta, on light, 25.8.88, leg. Syed Kamaluddin, lodged at supervisor record. Paratypes, four males, same data as holotype lodged at supervisor record.

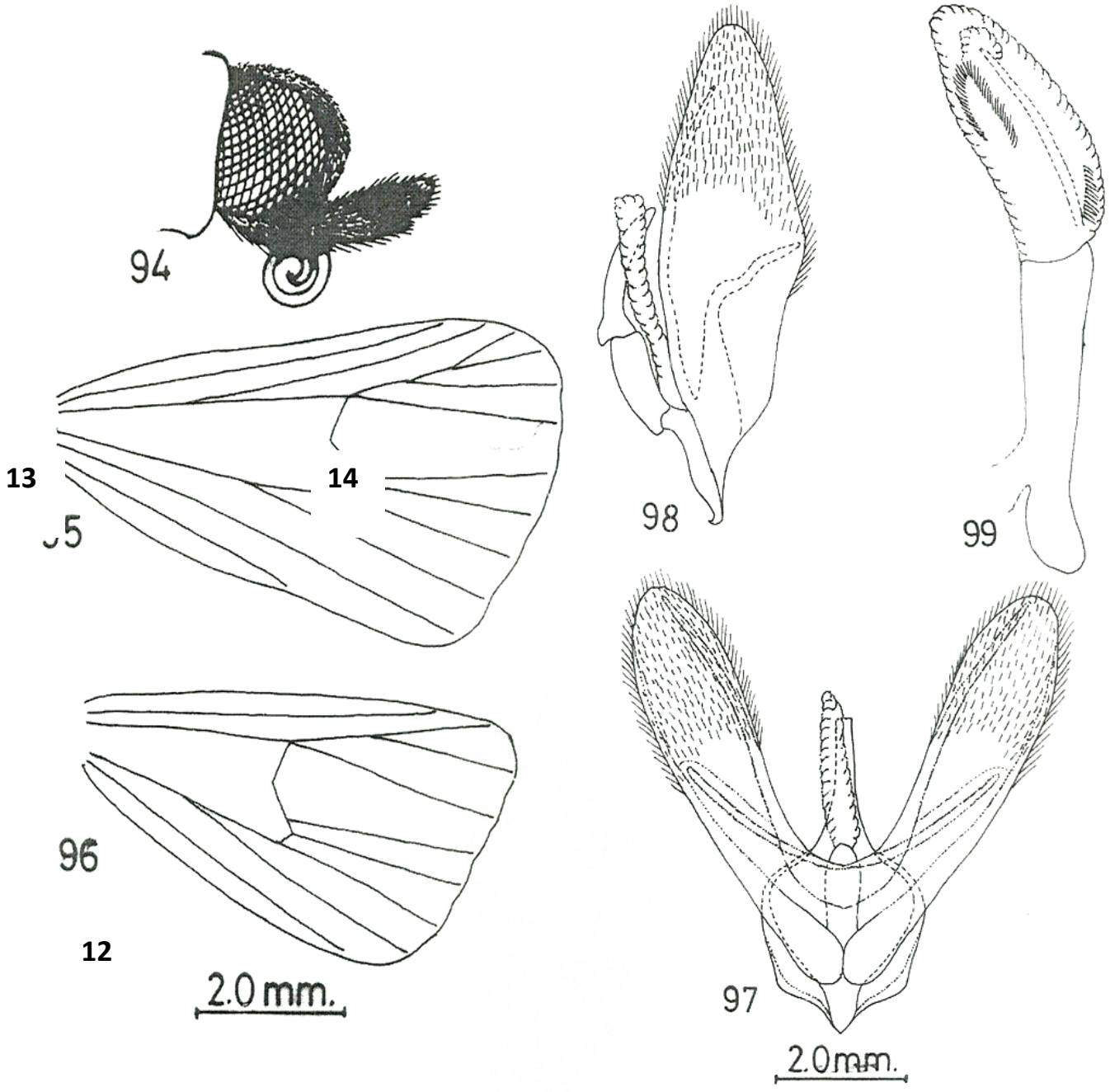
Comments: This species is most closely resemble with *E. diffualis* (Snellen) in nearly maxillary palpi anteriorly directed or slightly oblique, mesonotal elytron with two anal veins but isolated from the same in nearly mesonotal elytron with veins radius two and radius three stemed, further stemed with radius four and unite with radius five and arising from proximal angle of cell, in male apex of uncus truncated and by the other characters as listed in the key and explanation.

DISCUSSION

The representatives of the genus *Elophila* Hűbner, are distributed throughout the world specially the warmer areas. This genus plays sister group relationship with *Nymphula* Schrank by their synapomorphies like briliently colour patterns on both elytron with large number of dark patches but isolated by its autapomorphies like second segment of maxillary palpi much larger than third segment.

The present study includes the detail study of three species of the genus *Elophila* including one new species viz. *E. Diffualis,E. Kamali* and *E.nymphaeta* first time from Pakistan. Among the above species the *nymphaeta* and *diffualis* play sister group relationship to each other having synapomorphies like mesonotal elytron with veins radius three and radius four join or only radius four arising from upper angle of cell and apex of uncus either sharply pointed or somewhat blunt, and out group relationship with *kamali* having autapomorphies like mesonotal elytron with viens radius two and radius three stemed , further stemed with radius four and unite with radius five and arise from proximal angle of cell. Apex of uncus truncated

Fig. 8. *Elophila kamali* (Sp.n.)



Elophila nymphaeata **(L.)**
(Figs. 15-22)

Phalaena (Geometra) nymphaeata, Linnaeus, 1758, *Systema Naturae 1*(10): 529.
Phalaena (Pyralis) nymphaealis, Denis & Schiffermuller, 1776, *Systematoshes verzeichnif der Schmetlerlinge der Wienergegend:* 121.
Hydrocampa rivulata, Scopoli, 1763, *Entomologia Carniolica:* 573.
Hydrocampa obscuralis, Selys-Longchamps, 1845, *Memoires de La Societe Royale des Sciences de Liege, 2:* 19, 28.
Nymphula nymphaeata latifaseata, Rothschild, 1923, *Journal of the Bombay Natural History Society, 28:* 178.
Nymphula nigrolinealis sordidior, Rothschild, 1923, *Journal of the Bombay Natural History Society, 28:* 178.
Nymphula nymphaeata latifasciata, Klima, 1937, *Lepidopterorum Catalogus:* 75.
Elophila nymphaeata, Speidel, 1984, *Neue entomologische Nachrichten, 12:* 49.
Elophila interruptalis ezoensis, Yoshiyasu, 1985, *Scientifict reports of the Kyoto Prefectural University, Agriculture, 37*: 24.

Colour pattern: Body generally pellish except dark brown basal, median and apical area on both elytron and two wavy horizontal lining on mesonotal wing.

Head (Fig. 16): Frons sub-rounded, slightly produced, palpi well developed, thickly scaled, slightly upturned, 2nd segment of maxillary palpi 2.5X the length of 3rd segment, proboscis moderate.

Mesonotal elytron (Fig. 17): Mesonotal elytron with frontal margin distinctly convex, caudal and apical margin sinuated, apical angle sub-acute, veins subcostal + radius one are parallel to each other, radius four arises from proximal angle of cell, median one arises from lower angle of cell, two anal veins are found.

Metanotal elytron (Fig. 18): Metanotal elytron with frontal and caudal lines are convex , apical line is wavy, veins Sc+R1 medially close to Rs but not meeting, Rs arises from upper angle of cell, M2 arises from lower angle of cell, three anal veins are found.

Elytron expansion: size of body 15-25mm. with elytron expansion.

Male genital components (Figs. 19-21): Tegumen (Figs. 19 and 20) short, inverted glass-shaped, saccus broad, saucer-shaped, uncus very large, apically sharply pointed, rod-shaped much longer than narrowed membranous gnathos, herpagon large, flipper-shaped, apical half beset with thick scales, two spine-shaped apendages at inner margin, aedeagus (Fig. 21) tube like and a lobe-like thecal process

Female genital components (Fig. 22): Papillae anales narrowed, strip-like, beset with thick scales, membranous conjunctiva moderate, without cornuti, apophyses posterior slightly shorter than apophyses anterior, both with pointed apex and medially dilated, lobus vaginalis rectangular-shaped, ductus bursae moderate tubular, corpus bursae balloon shaped with two triangular-shaped cornuti.

Material studied: Three males and four females, Pakistan, Sindh, Sujawal, on light, 25.6.2010, leg. Zubair Ahmad, lodged at supervisor record.

Comments: This species is most closely resemble with *E. diffualis* (Snellen) in nearly metanotal elytron with vein either Rs or M1 arise from upper angle of cell, in male apex of uncus either sharply pointed or sub-rounded but it can easily be isolated from the same frons blunt sub-roundly produced, in male apex of herpagon narrowly rounded, aedeagus with lobe-like thecal process and by other features in explanation as listed in the key .

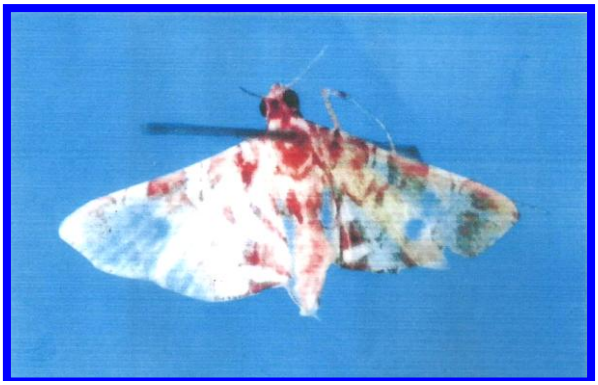


Fig. 15. ***Elophila nymphaeata*** **(Linnaeus)**

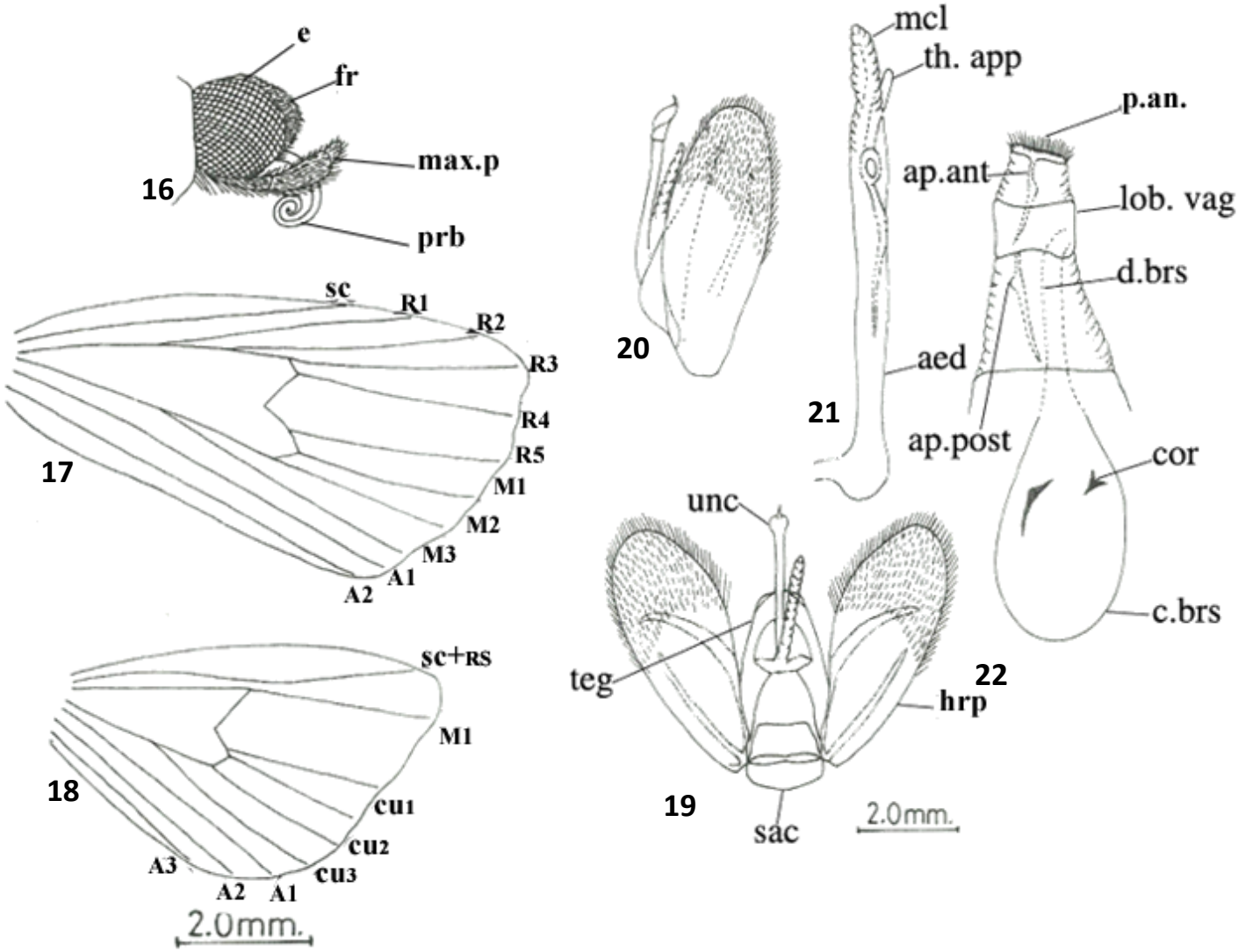


Illustration of Figures

Elophila diffualis (snellen):
Fig. 1-7; 1. entire, dorsal side, 2. head, lateral side, 3. mesonotal elytron, dorsal side,
4. meteanotal elytron dorsal side, 5. tegument, ventral side, 6. Same lateral side, 7. aedeagus, lateral side.
Elophia Kamali (sp.n.):
Fig 8-14; 8. entire, dorsal side, 9. head, lateral side, 10. mesonotal wing, dorsal side,
11. metanotal wing, dorsal side, 12. tegument, ventral side, 13. same lateral side,
14. aedeagus, lateral side
Elophila nymphaeata (L.):
Fig 15-22; 15. entire, dorsal side, 16. Head, lateral side, 17. mesonotal wing, dorsal side
18. metanotal wing, dorsal side, 19. tegument, ventral side, 20. same, lateral side,
21. aedegus, lateral side, 22. female genital component, lateral side.
key to the laterling

Key to the laterling
aed. aedeagus
ap.ant. apophyses anteriors
ap.post. apophyses posteriors
c.brs.corpus bursae
cor. cornuti
d.brs. ductus busae
fr. frons
lob.vag.lobus veginalis
max.p. maxillary palp.
mcl. membranous conjuctival lobe
p.an. Papillae anales
prb. Proboseis
hrp. herpagon
teg. tegumen
unc. uncus
A1-A3. anal veins 1 to 3
Cu1-Cu3. cutibus veins 1 to 3
M1-M3. median veins 1 to 3
R1-R5. radius veins 1 to 5
Rs-radio suctorial vein
Sc.subcostal vein
Sc+R1. subcostal and radius 1 veins

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