



Redescription and New Record of Small Arab Group of Genus *Colotis* (Lepidoptera: Pieridae) from Jamshoro, Sindh, Pakistan.

B. MAL⁺⁺, N. MEMON, M. A. SHAH, N. A. SHAH

Department of Zoology University of Sindh Jamshoro

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Abstract: A group of butterflies commonly known as Small Arab butterflies belong to the genus *Colotis* are redescribed here on the basis of external morphology, specially colouration of wings, structure of mouth parts and internal male and female genitalia. A general description of genus *Colotis* is also given. This group of butterflies is new record from Jamshoro, Sindh

Keywords: Taxonomy, Butterflies, Pieridae, Colotis, Jamshoro, Sindh.

1. INTRODUCTION

Butterflies belong to order Lepidoptera. They are the most beautiful and attractive than most of the insects and have fascinated human imagination and creativity. They are valuable pollinators and play vital role in the cross fertilization when suck the nectar. At the same time they are one of the important food chain components of the birds, reptiles, spiders and predatory insects. They are also good indicators of environmental changes as they are very sensitive to these changes in the environment. *Colotis*, Hübner (1819) is the genus of Pieridae family of Lepidoptera. It is commonly called as Orange tip or Arabs mostly found in Africa and Asia. There are 49 species found all over the world. Most of *Colotis* are pure white on dorsal side, and orange, yellow or crimson tips to the forewings, Bingham (1907), 'Fauna of British India' series, was the first author who gave this name genus *Colotis* in fauna of British India for all Indian species. *Colotis amata* and *Colotis vestalis* have been described by Fabricius (1775), Bingham (1907), Wynter-Blyth (1957), Palot and Soniya (2000), Robert (2001) and Choudry and Soren (2008), only on the morphological characters. Presently here we have revised three species of genus *Colotis* from Jamshoro, Sindh, Pakistan, which is the first record from Jamshoro. The description of these species is based not only on the morphological characters, but we also described and illustrate male and female genitalia.

2. METHODS AND MATERIALS

The specimens were collected from the different locations of district Jamshoro. For external characters the terminology was used by following Hampson (1892) and venation nomenclature was followed of Needham (1970). For the examination of male and female genitalia, the abdomen of the specimen

was removed from the body, boiled into 10% potassium hydroxide for five minutes. The abdomen was opened with the help of fine pointed forceps from lateral side, genitalia was separated from abdomen, washed with tap water and then examined under the dissecting microscope.

Genital material was preserved into micro vial with a drop of Glycerin and pinned with specimen. Genitalic terminology is followed of Klots (1970) and Winter (2000). All measurements are in millimeters. The measurements of various parts of the body were taken with the help of an ocular micro millimeter and illustration was made by using ocular graph on the dissecting microscope.

3. RESULTS

***Colotis vestalis* (Veined Orange)** (Butler, 1876)

Colouration: Ground colour white in both Sexes.

Male Head: (Fig. 1.c) Head black, eyes large, brown in colour, antennae club shaped, apical part spoon shaped, brown in colour, covered with white scales; labial palpi three segmented covered with large white hairs, first segment twice longer than first, last segment very small.

Thorax: Thorax black in colour with sparse white hairs; fore wings triangular (fig. 1.d), margins sinuated, broad, black band in male and dark brown in female, black streak arise from base extend to half of wings, three black spots, one on the discoidal cell and two on submarginal area, underside of forewings greenish yellow. Sub costal (Sc) arise from base of the forewings, reaches to half of wings; Radius vein (R1) small than Radius vein (R2), Radius vein (R3) and Radius vein (R4) anastomosing; Median vein (M1) originates from middle of the cell, Median vein (M2)

⁺⁺Corresponding author, B. MAL email: bhojumar@yahoo.com +92-3332853483

originates from lower angle of cell; Cubitus vein (Cu1) and Cubitus vein (Cu2) parallel; only one anal vein present. Hind wings (Fig. 1.e) oval shaped with uniform black border, underside greenish. Sub costal (Sc) short; Radius vein (R1) and Radius vein (R2) parallel, Median vein (M1) originates from middle of cell, Median vein M2 originates from the lower angle of cell; Sub costal (Cu1) and Sub costal (Cu2) parallel; two anal veins present.

Abdomen: Abdomen black in colour.

Male genitalia:(1.f-1g) Uncus broad at base, ventrally sinuated, distal part pointed directly downward; tegumen triangular, broad at middle, narrow at base from dorsal; vinculum narrow at middle; saccus rod like, sinuated; valva broad, pilose, narrow at base, pointed at distal part; juxta V shaped; aedeagus (Fig. 1.h) long rod like curved, thecal appendage, conjunctival membrane present from dorsal side.

Female genitalia:(Fig.1.i) Papilla analis rounded, pilose, posterior apophysis long rod like; lamella antevaginalis somewhat triangular; anterior apophysis small than posterior apophysis; ductus bursae long rod like curved; corpus bursae balloon shaped; cornuti sickle shaped.

2. *Colotis amata* (Small Salmon Arab) Fabricius 1775

Colouration: Ground colour salmon pink but in female paler than male.

Male, Head: (Fig. 2.c) Head black; eyes large, dark brown; antennae club shaped distal part spoon like, black in colour, white scales present at the base of every segment; palpi covered with white large hair, last segment very small compare to first and second segment.

Thorax: Dorsal side black covered with sparsely light yellow hair, ventral side light yellow; fore wings triangular (Fig:2.d) upperside salmon pink, margin side black bands, variable size black spots present one in cell and second on postdiscal area, underside is greenish yellow. Sc originates from base of wing and its length equal to cell, Radius vein (R1) and Radius vein (R2) equal in length, Radius vein (R3) and Radius vein (R4) anastomosing, Median vein (M1) originates from upper angle of cell, Median vein (M2) originates from lower angle of cell, Cubitus vein (Cu1) is small than Cubitus vein (Cu2), only one anal vein present. Hind wings oval shaped (Fig. 2.e), ground colour salmon pink, outer border black colour. Sub costal vein (Sc) very small, Radius vein (R1) originates from base of wings, large than Radius vein (R2), M1 originates from upper angle of cell, Median vein (M2) originates from lower angle of cell, Cubitus vein (Cu1) and Cubitus vein (Cu2) are parallel two anal veins present.

Abdomen: Dorsal side black, ventral side white in colour.

Male genitalia: (Fig. 2.f-2.g) Uncus sclerotized, broad base, distal part pointed directly downward; tegumen broad anteriorly, narrow posteriorly from dorsal side, slightly longer than uncus; vinculum long than tegumen, slightly curved at middle; valva broad, outer side convex, proximal narrow, distal end pointed, sacculus long, costa long and narrow; juxta V shaped; aedeagus long (Fig. 2.h), highly curved, thecal appendage at ventral side.

Female genitalia: (Fig. 2.i), Papilla anales somewhat rounded with spines, posterior apophysis long rod, lamella antevaginalis somewhat triangular, anterior apophysis small than posterior apophysis; ductus bursae long curved; corpus bursae balloon like; cornuti larva shaped.

3. *Colotis etrida* (Small Orange Tip) (Boisduval, 1836)

Colouration: Ground colour white with orange patches which edge black in wings.

Male, Head: Head black; eyes small (fig. 3.c); frons broad convex; antennae club shaped, black in colour; palpi anteriorly porrect, second segment about twice longer than third segment; proboscis long, highly coiled.

Thorax: Blackish covered with white spurs; forewings: (Fig. 3.d) white with orange patches narrower, having black outer margin slightly longer than hind wing, anterior angle sub acute, outer margin convex, Radius vein (R3) and Radius vein (R4) largely stalked, anastomosing with Radius vein (R5) and Median vein (M1) from upper angle, Median vein (M2) originates from the lower angle, Cubitus vein (Cu1) and Cubitus vein (Cu2) parallel to each other, only one Anal vein 1A present; hind wing: (Fig. 3.e) white with outer margin black, broad somewhat oval shaped, outer margin slightly sinuated, Sc+R1 moderate and separated from Radius vein (R2), Median vein (M1) and Median vein (M2) anastomosing from upper angle of cell, Median vein (M3) originates from lower angle of cell, two anal veins (1A and 2A) present.

Abdomen: Dorsal side black and ventral side white

Male genitalia: (Fig. 3.f-3.g) Uncus sclerotized slightly curved pointed directly downward, tegumen broad, anterior narrow, posterior narrow from the dorsal side; vinculum large than tegumen, broad toward the tegumen; valva broad, outer side convex, proximal narrow, distal end pointed; aedeagus long (fig. 3.h), thecal appendage at ventral side, conjunctival membrane present

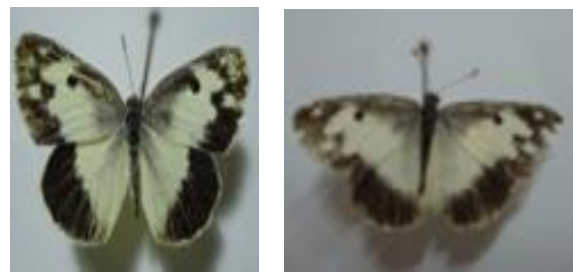
Female genitalia: (Fig. 3.i) Papilla anales somewhat rounded with spines, posterior apophysis small, lamella antevaginalis somewhat triangular, ductus bursae long curved; corpus bursae bilobed; cornuti larva shaped on the proximal corpus bursae.

is a new distribution record of the species in the Jamshoro district of Sindh.

4. DISCUSSION

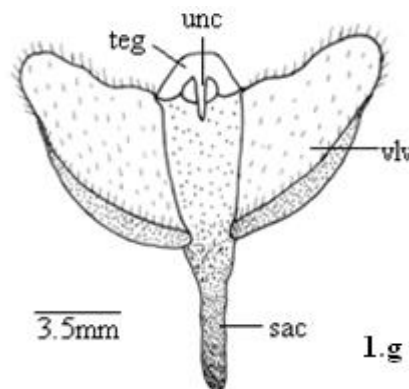
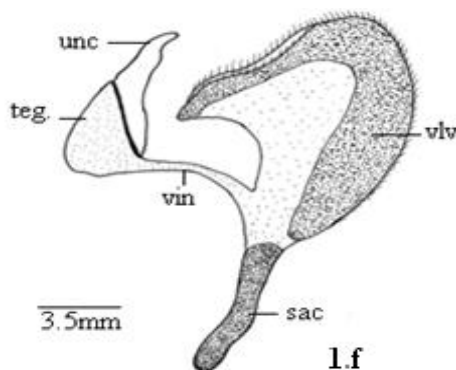
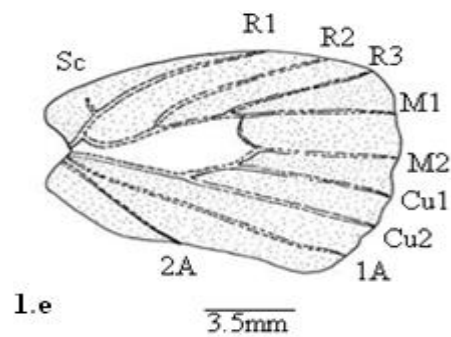
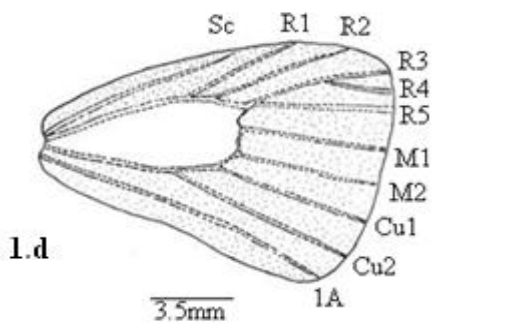
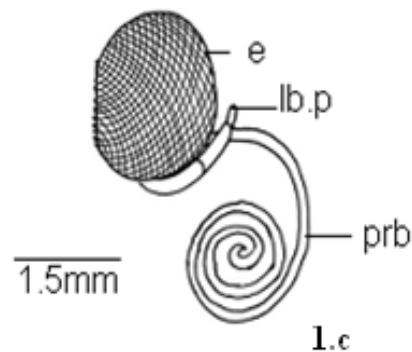
Genus *Colotis* is the most common butterflies found in Africa and Asia. The butterflies of this group are mostly found in every month of the year. Description of morphological characters of this genus given by Fabricius (1775), Bingham (1907), Wynter-Blyth (1957), Palot and Soniya (2000), Robert (2001) and Choudry and Soren (2008), there is no literature available on the internal male and female genitalia. Here we described three species on the bases of morphology and genital characters. It is observed that all species have wings venation same number in fore and hind wings, Radius R3-R4 veins of forewings are anastomosing in *Colotis amata* and *Colotis vestalis* but Radius R2-R3 forewings veins are anastomosing in *Colotis etrida*. In genitalia it is observed that in male genitalia tegumen and valva broad in all species, in aedeagus structure there is some difference in thecal appendages and conjunctival membrane. In female genitalia of *Colotis amata* and *Colotis vestalis* have only one lobe of corpus.

Genus *Colotis* is reported from the different localities of Jamshoro for the first time. Accordingly, it



1.a

1.b



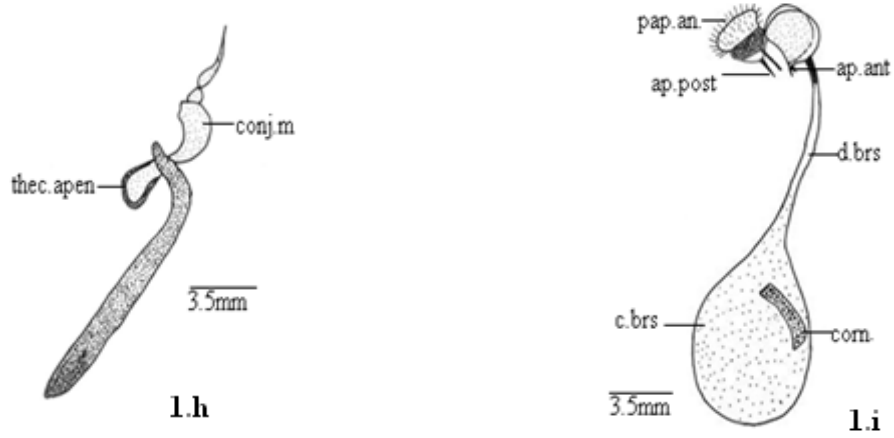


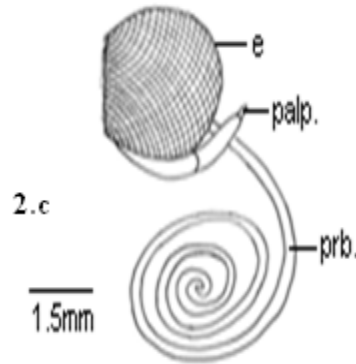
Fig:1, (1.a) *Colotis vestalis* (male). 1.b *Colotis vestalis* (female). 1.c Mouth parts. 1.d Fore wing venation. 1.e Hind wing venation. 1.f Male genitalia (lateral view). 1.g Male genitalia (ventral view). 1.h Aedeagus (lateral view). 1.i Female genitalia (lateral view).



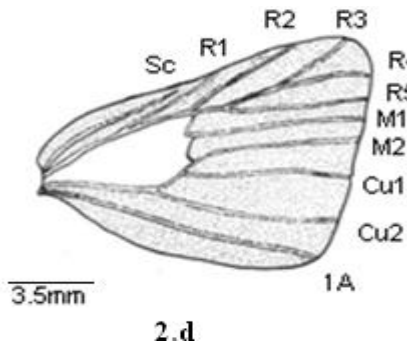
2.a



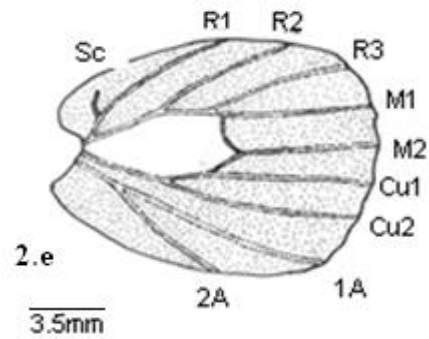
2.b



2.c



2.d



2.e

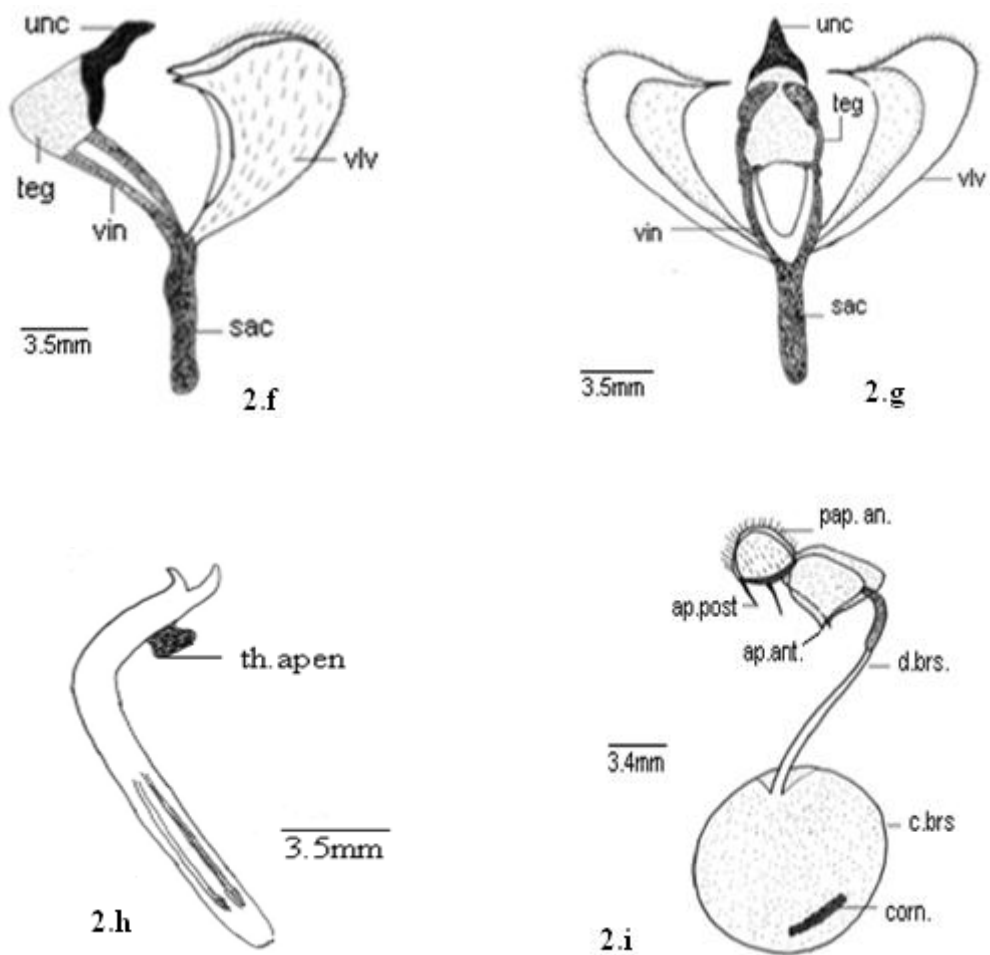


Fig. 2, 2.a *Colotis amata* (male), 2.b *Colotis amata* (female), 2.c Mouth parts. 2.d Fore wing venation. 2.e Hind wing venation. 2.f Male genitalia (lateral view), 2.g Male genitalia (ventral view), 2.h Aedeagus (lateral view), 2.i Female genitalia (lateral view).



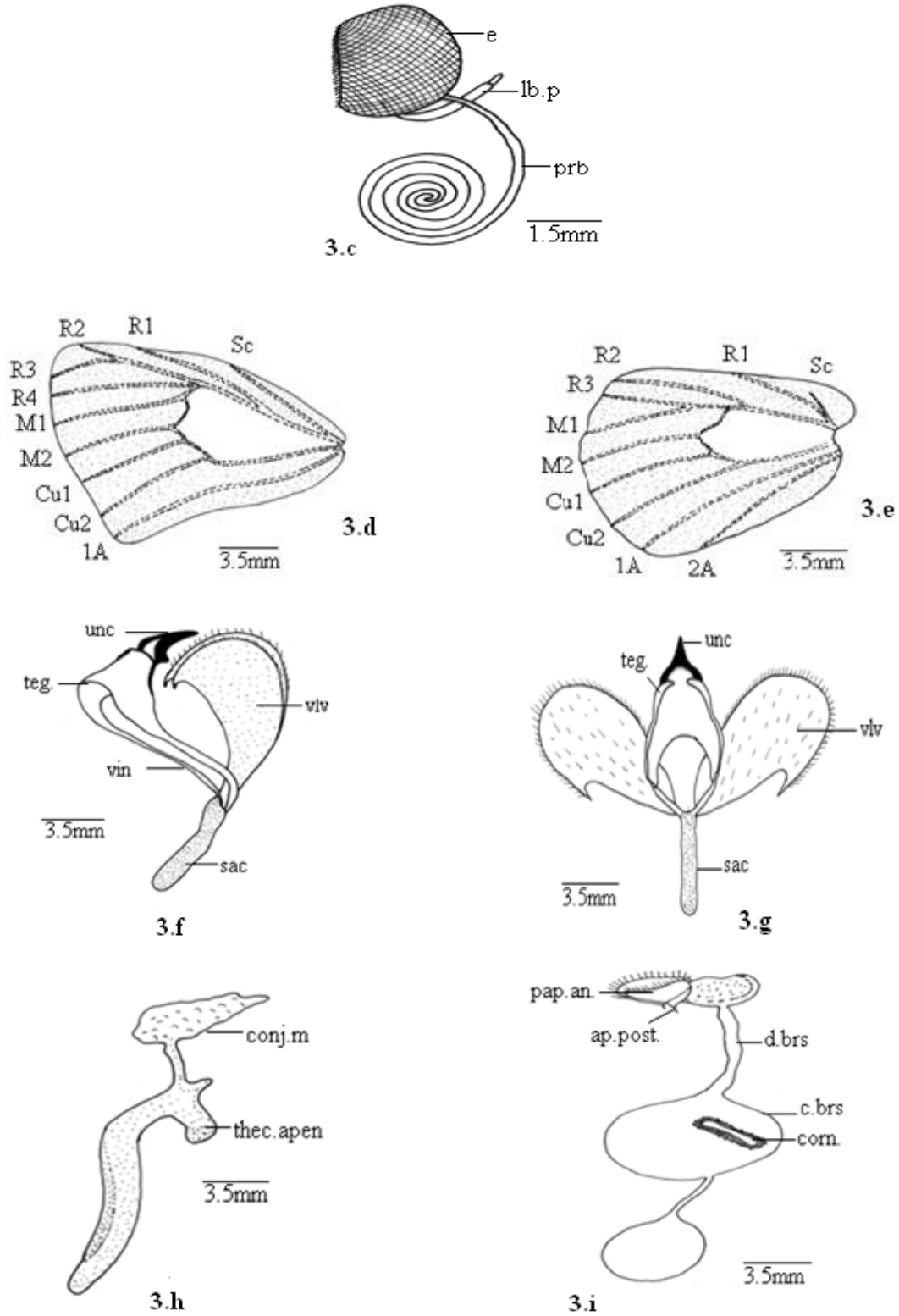


Fig.3, (3.a) *Colotis etrida* (male). 3.b *Colotis etrida* (female). 3.c Mouth parts. 3.d Fore wing venation. 3.e Hind wing venation. 3.f Male genitalia (lateral view). 3. g Male genitalia (ventral view). 3.h Aedeagus (lateral view). 3.i Female genitalia (lateral view).

Abbreviation

- A - Anal vein
- Aed- Aedeagus
- Ap.ant- Apophysis anterior
- Ap.post Apophysis posterior
- C.brs- Corpus bursae
- Conj.m- Conjuntival membrane
- Cu- Cubitus
- D.brs- Ductus bursae
- E- Eye
- Lb.p- Labial palpi
- M- Median vein
- Prb- Proboscis
- R- Radius vein
- Sac- Saccus
- Sc- Sub costal
- Teg- Tegumen
- Thec.apen- Thecal appendage
- Unc- Uncus
- Vlv- Valva

Table 1: Measurement of different parts of *Colotis vestalis*

Body parts of species	Male ♂ mean	Female ♀ mean
Length of head	1 mm	1mm
Length of thorax	4 mm	5mm
Length of abdomen	6 mm	7mm
Total body length	11mm	13mm
Length of antenna	6mm	6mm
Fore wing span	16mm	17mm
Hind wing span	12mm	13mm

Table 2: Measurement of different parts of *Colotis amata*

Body parts of species	Male ♂ mean	Female ♀ Mean
Length of head	1.5 mm	1.5 mm
Length of thorax	4.5 mm	5 mm
Length of abdomen	8 mm	8.5 mm
Total body length	14 mm	15 mm
Length of antenna	8 mm	8 mm
Fore wing span	19 mm	21 mm
Hind wing span	15 mm	16 mm

Table 3: Measurement of different parts of *Colotis etrida*

Body parts of species	Male ♂ mean	Female ♀ mean
Length of head	1.0 mm	1.0 mm
Length of thorax	4.5 mm	4.5 mm
Length of abdomen	6.5 mm	7 mm
Total body length	12 mm	12.5 mm
Length of antenna	7 mm	7 mm
Fore wing span	18 mm	20 mm
Hind wing span	15 mm	16 mm

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REFERENCES:

Ahsan, M. and J. Iqbal, (1975) A contribution to butterflies of Lahore with the addition of new records. *Biologia* 21(2):143-158.

Bingham, C.T. (1907) The fauna of British India including Ceylon and Burma. Butterflies, Vols. 1-2. *Taylor and Francis Ltd., London*. XV. 528 Pp.

EVANS, W. H. (1923) The identification of Indian butterflies (Papilionidae, Pieridae). *J. Bombay Nat. Hist. Soc.* (29): 230-260.

Common, (1970) Lepidoptera, the insects of Australia, chapter 3b, CSIRO, *Division of Entomology, Melbourne*. 765-866

Goodden, R. (1977) The Wonderful World of Butterflies and Moths. *Hamlyn Pub. Group Ltd., London*. 96 Pp.

Hasan, S. A. (1994) Butterflies of Islamabad and the Murree Hills. Asian Study Group, Islamabad. Biogeography and diversity of butterflies of North West Himalaya. In Biodiversity of Pakistan, *Museum of Natural History, Islamabad, Pakistan*, 181-204.

Iqbal, J. (1978) A preliminary report on Butterflies of district Rawalpindi and Islamabad. *Biologia* 24 (2): 237-247.

- S. A. Mufti, C. A. Woods and S. A. Hasan. (1998) Pakistan Museum of Natural History, Islamabad and Florida Museum of Natural History, Gainesville. 181-204.
- Klots, A. B. (1970). *Lepidoptera. In: Tuxen, S.L. (ed.), Taxonomists Glossary of Genitalia in Insects.* Munksgaard, Copenhagen. 115-130.
- Malik, J. M. (1970) Notes on the Butterflies of Pakistan in the collection of Zoological Survey Department Karachi, Part I. *Rec. Zool. Surv. Pakistan* 2 (2): 25-54.
- Mohammad Jafar palot and V. P. Soniya (2000) The preliminary report on the butterflies of Keolado national park". *Zoo's print journal* 15 (6): 287-288
- Winter, W. D. (2000) Basic techniques for observing and studying moths and butterflies. *Lepidopterists' Society, New Haven, CT.* 433Pp.
- Puri, H. D. (1931) Butterflies of Lahore. *Bull. Dept. Zool., Punjab univ.,* 1: 61Pp.
- Rafi, M. A., M. R. Khan and M. Irshad (2000) Papilionid (Swallowtails) Butterflies of Pakistan. Gul Awan Printers, 33Pp.
- Roberts, T. J. (2001) *Butterflies of Pakistan.* Oxford University Press, London and New York, 200Pp.
- Smith, D. S., and S. A. Hasan, (1997) A preliminary survey of diversity and distribution of butterflies of Northern Pakistan. Gilgit to Khunjerab. In *Biodiversity of Pak.* Editors: S.A. Mufti., C.A. Woods and S.A. Hasan. Pak. Museum of Natural History, Islamabad and Florida Museum of Natural History, Gainesville. 205-211.
- Stewart, R.R. (1982) History and Exploration of Plants in Pakistan and Adjoining Areas. In Nasir, E. and S.I. Ali (ed.). *Flora of Pakistan.* Published by authors. 21-23
- Stokoe, W. J. (1974) *The Observer's book of Butterflies.* W.J. Frederick Warne and Co., London. 191Pp.
- Swinhoe, C. (1887) On the Lepidoptera of Karachi and its Neighborhood. *J. Bombay Nat. Hist. Soc.* 2 (1): 269-280.
- Talbot, G. (1939) *Fauna of British India including Ceylon and Burma. Butterflies #1 and #2.* Taylor and Francis Ltd. London. 835 Pp.
- Wynter-Blyth, M.A. (1940-1957). *Butterflies of Indian region, 1st Edition.* Bombay Nat. Hist. Soc. Bombay. 275 Pp.