

STUDIES ON INTERNAL MALE AND FEMALE GENITALIC FEATURES OF *PIDA DECOLORATA* (WALKER) (LYMANTRIIDAE: LEPIDOPTERA) FROM INDIA

Amritpal Singh Kaleka and Navkiran Kaur*

Department of Zoology and Environmental Sciences, Punjabi University, Patiala, Punjab, India

KEYWORDS

Pida decolorata
Genitalia
Internal
Lymantriidae

ABSTRACT: The internal male and female genitalic features of *Pida decolorata* (Walker) of the family Lymantriidae have been studied and illustrated in detail to evaluate their taxonomic significance. Its distribution data have also been updated with its range extension to Himachal Pradesh and Uttarakhand in Northwest Himalayas.

INTRODUCTION

Walker (1869) described this species under genus *Cyclidia* Guenee from Banaras, India. Swinhoe (1923) transferred it to the present genus, i.e., *Pida* Walker. Collenette (1932) and in the present studies, the same nomenclature has been followed. Being large- to medium-sized moths usually of light coloration, this genus is represented by eight species from India, China, Japan, and Nepal. The internal genitalia comprise paired sexual glands, i.e., ovaries/testes; paired gonoducts of mesodermal origin into which the sexual products are discharged and a median duct lined with cuticle derived by invagination from the ventral body wall, forming the vagina in female and the ejaculatory duct in male. In the present studies, the male and female internal genitalic features of *Pida decolorata* (Walker) have been studied in detail. The collection of this species from different localities of Himachal Pradesh and

Uttarakhand is its new range extension to Northwest India.

MATERIALS AND METHODS

During the present studies, the adult moths were collected from different localities of Himachal Pradesh and Uttarakhand. The multiple dissections were made in physiological saline solution to dissect out the internal genitalic parts (Weidner, 1934; Swart, 1966). The terminology for naming various internal genitalic features proposed by Callahan and Cascio (1963) and Justus and Mitchell (1999) has been followed.

RESULTS AND DISCUSSION

P. decolorata (Walker)

Cyclidia decolorata Walker, 1869, *Characters undescr. Lepid. Heterocera*, 1869: 96.

P. decolorata Walker: Swinhoe, 1923, *Ann. Mag. Nat.*

*Corresponding author: E-Mail: apskaleka@gmail.com

Journal Homepage :

www.connectjournals.com/ae

Published & Hosted by :

CONNECT
JournalsTM

www.connectjournals.com

Hist., (9) 11 (61): 81; Collenette, 1932, *Novit. Zool.*, 38: 90; Haruta, 1992, *Moths Nepal, Tinea*, 13: 55.

Dasychira maculosa Matsumura, 1911; *Thous. Ins. Japan.* 3: 96.

Type species: *Pida apicalis* Walker.

Type locality: India (Banaras).

Male

In Figure 1, testis bean-shaped, dark orange, opaque, length 0.6 mm, width 0.9 mm; seminal vesicle-I yellow, translucent, length 0.95 mm, width 0.15 mm, originating from testis in fused state; seminal vesicle-II globular, orange, opaque, with

dark colored matter in center, length 0.75 mm, width 0.45 mm; vasa deferentia yellow, translucent, tubular, length 2.6 mm, width 0.1 mm, entering into ductus ejaculatorius duplex beyond middle toward accessory glands; ductus ejaculatorius duplex straight, dark yellow, opaque, length 2.2 mm, width 0.35 mm; accessory glands highly curled, yellow, opaque, fused at apex, length 8.1 mm, width 0.1 mm, originating free from ductus ejaculatorius duplex; primary simplex divided into five sections; Section-I yellow opaque, long, length 11.05 mm, width 0.2 mm; Section-II orange, translucent, length 2.05 mm, width 0.15 mm; Section-III milky white, opaque, length 1.15 mm, width 0.1 mm; Section-IV transparent, length 4 mm,

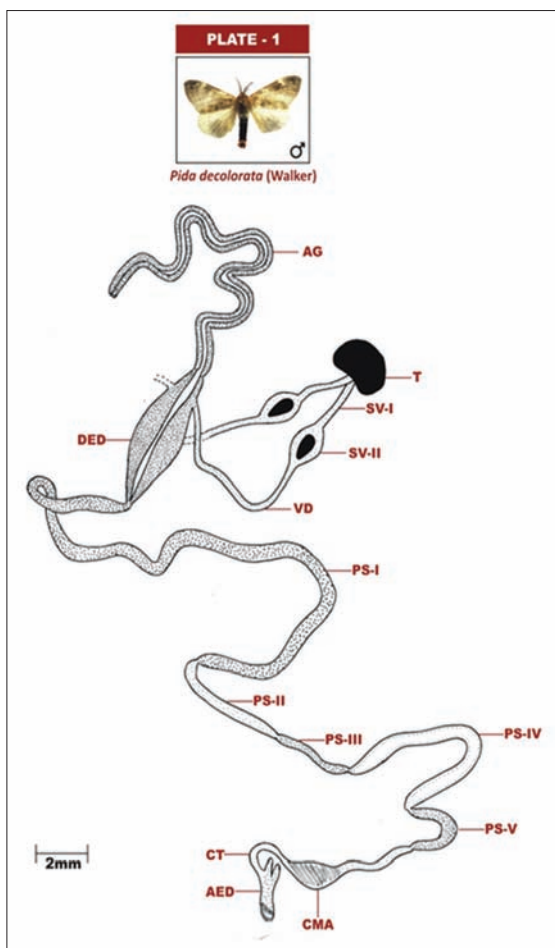


Figure 1: Male reproductive organs of *Pida decolorata* (Walker).

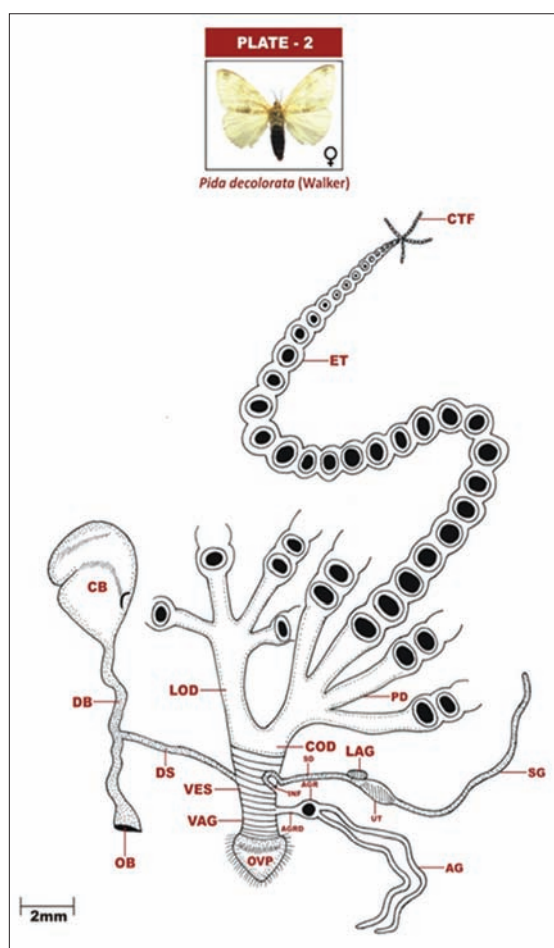


Figure 2: Female reproductive organs of *Pida decolorata* (Walker).

width 0.25 mm; Section-V small, orange, opaque, length 1.6 mm, width 0.25 mm; constrictor muscular area bulbous at posterior end, tubular at anterior end, orange, opaque, length 2.25 mm, width 0.15-0.4 mm; cuticular tube transparent, small, length 1 mm, width 0.1 mm, entering into aedeagus laterally.

Female

In Figure 2, common terminal filament light yellow, opaque, length 0.55 mm, width 0.05 mm; ovaries dark orange colored comprising four egg tubes on both sides; egg tube length 12.5 mm, width 0.2-0.7 mm; eggs dark orange, opaque, ellipsoid, covered by a thin translucent yellowish membrane/sheath; pedicel present, yellow translucent, length 1.25 mm, width 0.45 mm; lateral oviduct dark yellow, opaque, length 1.4 mm, width 0.5 mm; common oviduct dark yellow, opaque, length 0.75 mm, width 1.05 mm; complex sperm storage system with spermathecal gland simple, yellow, opaque, tubular length 4.2 mm, width 0.1 mm; infundibulum length 0.3 mm, width 0.1 mm; spermathecal duct translucent, tubular, length 1.25 mm, width 0.1 mm; utriculus pear shaped, yellow, opaque, length 0.7 mm, width 0.3 mm; lagena opaque, ellipsoidal, length 0.3 mm, width 0.15 mm, corpus

bursae large, dark brown, opaque, pear-shaped, length 2 mm, width 1.55 mm; ductus bursae tubular, curled, sclerotized, opaque, length 3.25 mm, 0.2 mm; ostium bursae bulbous, length 0.1 mm, width 0.5 mm; ductus seminalis tubular, straight, length 2.15 mm, width 0.1 mm, originating from middle of ductus bursae; bulla seminalis absent; accessory gland reservoir duct straight, length 0.4 mm, width 0.1 mm; lateral and common accessory gland reservoirs fused, opaque, orange, length 0.35 mm, width 0.3 mm; accessory gland ducts originating free from accessory gland reservoir, transparent, less curled, length 3.75 mm, width 0.1 mm; vestibulum opaque, simple, length 0.6 mm, width 0.7 mm; vagina opaque, length 0.25 mm, width 0.65 mm.

Material Examined

Himachal Pradesh: Draman, 19.V.2015, 2♀♀; Janitri, 13.V.2015, 1♂; 14.V.2015, 2♂♂; Narag, 06.VII.2014, 2♀♀; Ghanahatti, 04.VI.2016, 4♂♂; Kumarhatti, 12.VI.2017, 1♂; Uttarakhand: Berinag, 12.VI.2015, 2♂♂, 2♀♀; Kausani, 14.VI.2015, 2♂♂.

Distribution

India: Himachal Pradesh, Uttar Pradesh, Uttarakhand; China.

Table 1: Morphometry of internal male reproductive organs of *Pida decolorata* (Walker).

S. No.	Organ	Intraspecific range in length (mm)	Intraspecific range in width (mm)
1.	Testis	0.60-0.65	0.85-0.90
2.	Seminal vesicle- I	0.90-0.97	0.12-0.15
3.	Seminal vesicle- II	0.72-0.78	0.44-0.46
4.	Vasa deferentia	2.60-2.65	0.10-0.13
5.	Ductus ejaculatorius duplex	2.21-2.24	0.34-0.37
6.	Accessory gland	8.10-8.15	0.10-0.15
7.	Primary simplex	20.30-20.37	0.23-0.26
8.	Constrictor muscular area	2.22-2.25	-
9.	Cuticular tube	1.0-1.05	0.95-0.10



Table 2: Morphometry of internal female reproductive organs of *Pida decolorata* (Walker).

S. No.	Organ	Intraspecific range in length (mm)	Intraspecific range in width (mm)
1.	Common terminal filament	0.52-0.55	0.02-0.06
2.	Egg tube	12.47-12.51	0.15-0.70
3.	Pedicel	1.23-1.27	0.44-0.48
4.	Lateral oviduct	1.40-1.44	0.50-0.55
5.	Common oviduct	0.74-0.77	1.02-1.05
6.	Infundibulum	0.30-0.32	0.05-0.10
7.	Spermathecal duct	1.24-1.27	0.05-0.10
8.	Utriculus	0.65-0.70	0.25-0.30
9.	Lagena	0.27-0.32	0.14-0.18
10.	Spermathecal gland	4.15-4.20	0.05-0.10
11.	Corpus bursae	2.0-2.05	1.53-1.56
12.	Ostium bursae	0.1-0.12	0.45-0.50
13.	Ductus bursae	3.22-3.25	0.15-0.20
14.	Ductus seminalis	2.12-2.17	0.05-0.10
15.	Bulla seminalis	Absent	-
16.	Accessory gland reservoir duct	0.35-0.40	0.04-0.8
17.	Accessory gland reservoir	0.33-0.37	0.27-0.31
18.	Accessory gland	3.72-3.76	0.10-0.12
19.	Vestibulum	0.55-0.60	0.68-0.71
20.	Vagina	0.20-0.25	0.60-0.65

In the present study, it has been revealed that in males, the seminal vesicle-I is short and originates from testis in a fused state. The vasa deferentia enter in ductus ejaculatorius duplex beyond middle, i.e., toward accessory glands. The accessory glands are highly curled and fused at apex. The primary simplex is long and divided into five sections. The constrictor muscular area is bulbous at posterior end and tubular at anterior end. The cuticular tube is simple and short, entering aedeagus laterally. In females, the internal genitalia are characterized by long egg tube; distinct pedicel; tubular spermathecal gland; pear-shaped utriculus; distinct

lagena; and tubular and straight ductus seminalis originating from middle of ductus bursae and without bulla seminalis. The lateral and common accessory gland reservoirs are fused and accessory gland reservoir duct is straight. The accessory gland ducts are less curled and originate freely from accessory gland reservoir. The morphometric analysis of internal male and female genitalic features of the species under reference has also been analyzed (Tables 1 and 2). During the present studies, it has been concluded that the internal genitalic features of this species are distinct and can be easily used for its diagnosis.

ACKNOWLEDGMENT

The authors are thankful to UGC for providing financial assistance.

ABBREVIATIONS

AEG: Aedeagus
AG: Accessory gland
AGD: Accessory gland duct
AGR: Accessory gland reservoir
AGRD: Accessory gland reservoir duct
CB: Corpus bursae
CMA: Constrictor muscular area
COD: Common oviduct
CT: Cuticular tube
CTF: Common terminal filament
DB: Ductus bursae
DED: Ductus ejaculatorius duplex
DS: Ductus seminalis
ET: Egg tube
INF: Infundibulum
LAG: Lagena
LOD: Lateral oviduct
OB: Ostium bursae
OVP: Ovipositor
PD: Pedicel
SD: Spermathecal duct
SG: Spermathecal gland
PS: Primary simplex
SV-I: Seminal vesicle-I
SV-II: Seminal vesicle-II

T: Testis
UT: Utriculus
VAG: Vagina
VD: Vas deferens
VES: Vestibulum.

REFERENCES

- Callahan, P. S. and Cascio, T. 1963. Histology of the reproductive tracts and transmission of sperms in the corn earworm, *Heliothis zea*. *Ann. Entomol. Soc. Amer.* **56**, 535-556.
- Collenette, C. L. 1932. The Lymantriidae of the Malay Peninsula. *Nov. Zool.* **38**, 49-102.
- Justus, K. A. and Mitchell, B. K. 1999. Reproductive morphology, copulation and inter populational variation in the diamondblack moth, *Plutella xylostella* (Linnaeus) (*Lepidoptera: Plutellidae*). *Int. J. Insect Morphol. Embryol.* **28**, 233-246.
- Swart, P. L. 1966. Anatomy and histology of the external and internal reproductive organs in the male and female false codling moth: *Argyroplaca leucotreta* M. (*Lepidoptera*). *Ann. Univ. Stell.* **41**, 597-652.
- Swinhoe, C. 1923. A revision of the genera of the family *Liparidae*. *Ann. Mag. Nat. Hist.* **11**, 47-97.
- Walker, F. 1869. Characters of Undescribed *Lepidoptera* Heterocera. E. W. Janson, Museum Street, W. C, London. pp. 128.
- Weidner, H. 1934. Contributions to morphology and physiology of the genital apparatus of the female *Lepidoptera*. *Z. Angew. Entomol.* **21**, 239-290.

Accepted: 30 April 2019



