

## Taxonomic studies on *Ravinia pernix*, *Boettcherisca peregrina* and *Seniorwhitea reciproca* (Diptera: Sarcophagidae) of Indian origin

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### Abstract

The male genitalia of three species *Ravinia pernix* (Harris), *Seniorwhitea reciproca* (Walker) and *Boettcherisca peregrina* (Robineau-Desvoidy) have been studied in detail. The present work includes the descriptions and detailed illustrations of external male genitalic structures which have not been published so far these three species. A key to the studied species is also given.

**Keywords:** diptera, key, male genitalia, oestroidea, *Parasarcophaga*, sarcophagidae

### 1. Introduction

Sarcophagidae is one of six recognized families in the superfamily Oestroidea, which is generally regarded as sister to the superfamily Muscoidea (McAlpine, 1989, Yeates *et al.*, 2007) [17,38]. A full revision of the family was given by Aldrich (1916), although more restricted revisionary works have been published recently focusing on particular subgroups and/or genera (Pape, 1994; Dahlem and Downes, 1996) [22, 4]. A recent and authoritative list of names and synonymies has been given by Pape (1996) [23].

Sarcophagidae family consists of 126 species, out of which 89 species are from the genus *Sarcophaga* which amounts for 70% of the Indian Sarcophagidae family. The genus *Blaesoxipha* consist of 9 species which amounts for 7% of the Indian Sarcophagidae family (Chakraborty *et al.* 2017) [3]. Sarcophagidae comprises a group of medium sized to fairly large flies of 4 mm to 18 mm length that are widely distributed all over the world except the arctic region. Colour of these flies is generally grayish to black with silvery to golden or yellowish pollen. Eyes are medium or large but without hair, dichoptic and frons is narrower in males than females. Third antennal segment is larger and arista is usually long and plumose along basal half but sometimes bare or pubescent. Palpi are black or yellowish. The thorax is mostly with three dark longitudinal stripes or sometimes entirely grey or black or blackish but without long golden hair. Presutural acrostichal bristles are absent or feebly developed or sometimes moderately developed. Wings are generally hyaline or infuscated along anterior margin. Abdomen may have silvery-grey pollen forming more or less tessellate pattern, but is totally without shining metallic blue or green. Male genitalia has 2-3 segments and is generally complex, diverse and carry the most diagnostic character for specific identification. The penis is very large and complicated in structure. Inner forceps are larger than outer forceps. The females are usually without ovipositor. Most of the flies are larviparous but they sometimes deposit embryonated eggs. (Nandi, 2002) [21].

### 2. Materials and Methods

#### Collections and Preservation

Adult flies were collected from localities falling in the states comprising the North Indian states i.e., Punjab, Jammu & Kashmir, Himachal Pradesh, Uttara Khand and Rajasthan. The collected specimens were killed by putting them in a killing jar charged with ethyl acetate. The dead specimens were pinned using standard entomological pins piercing the right side of the mesothorax.

#### Identification

The genitalia was dissected from the abdomen and put in ascending grades of alcohol. After dehydration, all the structures were preserved in the clove oil for clearance purposes until used for identification and photography. Identification of all the specimens was done using the keys given by Senior-White *et al.* (1940) [34] and Nandi (2002) [21]. Terminology used by Senior-White *et al.* (1940) [34] has been followed while describing the chaetotaxy. The adult specimens were photographed with the help of an Image Processing Unit installed in the DRS laboratory of Department of Zoology and Environmental Sciences, Punjabi University, Patiala.

#### Key to studied tribes

1. Phallic tube present; styli of glans absent; division of theca and paraphallus in penis not distinct.....Raviniini
2. Phallic tube absent; styli of glans generally present or may be absent; division of theca and paraphallus in penis distinct.....Sarcophagini

#### Tribe Raviniini Rohdendorf

This tribe is characterized by the absence of an apical plate of paraphallus but presence of a phallic tube; lateral plate of paraphallus elongated and well sclerotised; ventralia well developed; theca and paraphallus fused; it may be separated from other tribes by the presence of frontal bristles which are not divergent anteriorly. A single genus i.e. *Ravinia* Robineau-

Desvoidy has been studied.

### Genus *Ravinia* Robineau-Desvoidy, 1863

Third antennal segment about twice that of second and reaching up to about lower margin of eye; parafacia broad and about two-fifths that of one eye; costal spines short; R1 usually bare, rarely setose; mid tibia without bristles on ventral surface; third abdominal segment without median marginal bristles; fifth sternite without window, deeply incised but with short spines along inner margin; first genital segment with several strong marginal bristles; second genital segment reddish-orange; theca very short and fused with paraphallus; ventralia very large, paired and petiolate; lateral plate of paraphallus short.

### *Ravinia pernix* (Harris)

(Figs. 1-6)

*Musca pernix* Harris, 1780<sup>[9]</sup>, *Exp. Engl. Ins.*, 84.

*Musca striata* Fabricius, 1794<sup>[6]</sup>, *Ent. Syst.*, 4: 315 (preoccupied by Gmelin, 1790).

*Musca haemorrhoidalis* Fallen, 1817, *K. svenska vetensk. Akad. Handl.*, 3: 237 (preoccupied by Villers, 1789).

*Sarcophaga haematodes* Meigen, 1826, *Syst. Besch. Europ. Zweifl. Insekt.*, 5: 29.

*Myophora haemisphaerica* Robineau-Desvoidy, 1830, *Mem. Pres. div. Sav. Acad. Sci. Inst. Fr.*, 2(2): 346.

*Myophora limpidipennis* Robineau-Desvoidy, 1830, *Mem. Pres. div. Sav. Acad. Sci. Inst. Fr.*, 2(2): 346.

*Myophora korticola* Robineau-Desvoidy, 1830, *Mem. Pres. div. Sav. Acad. Sci. Inst. Fr.*, 2(2): 346.

*Myophora compestris* Robineau-Desvoidy, 1830, *Mem. Pres. div. Sav. Acad. Sci. Inst. Fr.*, 2(2): 346

*Pierretia parva* Robineau-Desvoidy, 1863, *Hist. nat. dipt. Paris*, 2: 427.

*Ravinia sulcata* Robineau-Desvoidy, 1863, *Hist. nat. dipt. Paris*, 2: 437.

*Ravinia hebes* Robineau-Desvoidy, 1863, *Hist. nat. dipt. Paris*, 2: 436.

*Thyrsocnema striata*: Enderlein, 1928, *Arch. klassif. phylogen. Ent.*, 1 (1): 42.

*Sarcophaga aozia* Seguy, 1935, *Mem. Acad. Sci. Inst. Fr.*, 62 (2): 5.

*Ravinia striata*: Rohdendorf, 1937, *Fauna USSR, Dipt.* 19 (1): 391; Kano, Field and Shinonaga, 1967, *Fauna Japonica, Sarcophagidae* : 130 ; Nandi, 1990<sup>[19]</sup>, *J. Beng. nat. Hist. Soc.*, 9 (2): 9; Kano and Shinonaga, 1994, *Jap. J. sanit. Zool.*, 45: 271.

*Gesneriodes disjuncta* Seguy, 1938, *Encycl. Ent.*, (BII), *Dipt.* 9: 43.

*Ravinia pernix* Pape, 1987, *Fauna ent. Scand.*, 19: 42.

### Male

Body length 6-9mm.

### Head

Width of frons about four-fifth that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacia black with silvery pollen; antennae dark brown and reaching up to about 0.8x distance to vibrissae; facial ridge brownish with silvery pollen; vibrissae long, crossed; frontal bristles 7-9, posterior 1 reclinate, anterior 2 below base of antennae, rest cruciate and directed forwards; gena black with silvery pollen and with long hair; post gena black.

### Thorax

Blackish to brown with three black longitudinal stripes; *ac* 2+1; *dc* 3+3; *ia* 0+3; *ps* 1; *h* 3; *ph* 2; *np* 3; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 7; *hpl* 8; upper part of propleura well developed and accompanied with short hair; pro- and mesothoracic spiracle dense brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

### Wings

Hyaline with brown veins; R1 bare; R4+5 with a row of about 9-11 short setae located dorsally and extending up to more than half from basal node to r-m; costal spines short; epaulet black; basicostal scale light brown; squama white; halter brown.

### Legs

Black; fore femur with two rows of long bristles along postero dorsal surface; fore tibia with 3-4 bristles along basal half of antero dorsal surface; mid femur with 2-3 short bristles along middle portion of anterolateral surface; mid tibia with 2 bristles along middle portion of antero dorsal surface; hind femur with a pair of rows of bristles along antero dorsal surface; hind tibia with 2 long and several short bristles along antero dorsal surface.

### Abdomen

Black with golden checkered pattern; median marginal bristles on second and third abdominal tergites absent but each with a pair of lateral marginal bristles, fourth with a pair of median and 3 lateral marginal bristles, fifth with a row of about 12-14 marginal bristles; sternite first to fourth with short black hair; sternite fifth V-shaped.

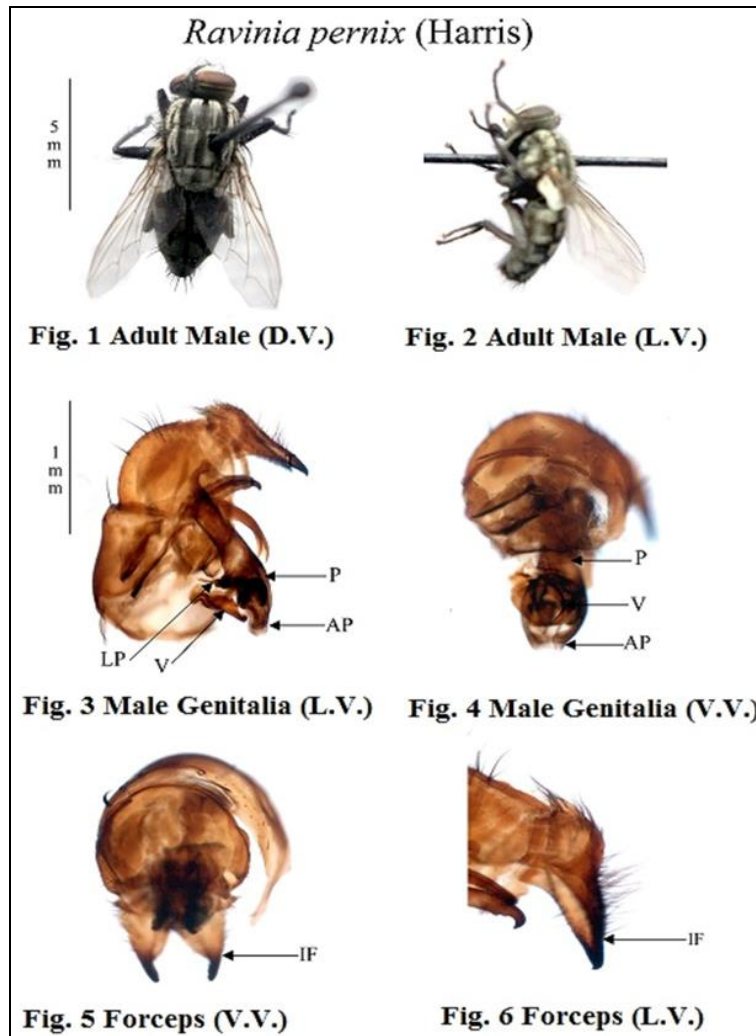


Fig 1-6

**Genitalia**

Inner forceps elongated and slightly curved at end; outer forceps slightly elongated with long hair terminally; anterior paramere elongated and bifurcated at end; posterior paramere elongated, strongly curved at end and with short subapical process; theca short and fused with paraphallus, both sclerotised; apical portion of paraphallus blunt at end; lateral plate of paraphallus short and pointed terminally; styli of glans absent; ventralia well developed, paired and petiolate.

**Material examined**

Uttara khand: - Uttra kashi, 1. vi. 2000 - 1♂.

**Distribution**

India: Arunachal Pradesh, Bihar, Himachal Pradesh, Jammu & Kashmir, Uttar Pradesh, Uttara khand and West Bengal; Bangladesh; Nepal; Bhutan; Pakistan; Afghanistan; China; whole of Europe; Japan; Korea; Libya; Mongolia; Morocco; Russia; Saudi Arabia; South China; Syria; Tajikistan; Turkmenistan; Ukraine; United Kingdom; Uzbekistan and Yemen.

**Remarks**

This species may be distinguished from other species by the

presence of presutural acrostichal bristles, reddish or brownish genital segment; short coastal setae and the structure of male genitalia.

**Tribe Sarcophagini Macquart**

This tribe is characterized by having straight or anteriorly bent inner forceps and well developed lateral plate of paraphallus; phallic tube absent; 3 or 4 post sutural dorsocentral bristle. It is the largest tribe of Sarcophagidae in the world and was divided into several subtribes by Rohdendorf (1965), Lopes *et al.* (1977) and Verves (1986). The studied species belong to two subtribes i.e. Parasarcophagina and Seniorwhiteina

**Key to subtribes**

1. Apical plate of paraphallus always large, clearly demarcated, sclerotised and often bearing many processes or protuberances; propleura sometime setiferous; post abdomen sometime light coloured; penis short, heavily sclerotised; lateral plate of paraphallus well developed; basal part of styli coiled.....Parasarcophagina
2. Usually 4 postsutural dc (rarely 6, 5 or 3) which are equal in length and the largest at the rear. Arista basally plumose, parafacial and gena often with black hair; lateral plate of paraphallus ill-developed, short and slightly

projecting; apical part of paraphallus separate; penis very large slightly sclerotised and vesiculate; lateral plate of paraphallusill-developed.....Seniorwhiteina

**Subtribe Seniorwhiteina Rohdendorf**

This subtribe is characterized by having large penis, lateral plate of paraphallus asymmetrical and inner forceps with tuft of basal bristles. This is a small subtribe and only one genus *Senior white* Rohdendorf occurs in the Oriental region.

**Genus *Senior white* Rohdendorf, 1937**

Antennae long, third segment long, slender and about two and half to three times that of second; arista long, plumose along basal half; R1 bare; paraphallus with distinct theca; apical plate of paraphallus extensively membranous or with membranous cylindrical apical process and always with conspicuous projection; lateral plate of paraphallus less developed, chitinous and well pigmented; ventralia small and chitinous; styli of glans directed anteriorly; penis very large, slightly sclerotised and vesiculate.

***Seniorwhitea reciproca* (Walker)**

(Figs. 7-12)

*Sarcophaga reciproca* Walker, 1856, *J. Proc. Linn. Soc. Lond. zool.*, 1: 22.

*Sarcophaga krameri* Boettcher, 1912, *Ent. Mitt.*, 1: 166.

*Sarcophaga orientaloides* Senior-White, 1924<sup>[32]</sup>, *Rec. Indian mus.*, 26(3): 244; Senior-White, 1930<sup>[33]</sup>, *Rec. Indian mus.*, 32 : 73.

*Sarcophaga procax* Seguy, 1932, *Bull. Mens. Ass. Nat. Vall. Loing.*, 8: 23.

*Seniorwhitea orientaloides* : Fan, 1965, *Synan, flies China*, 15: 260.

*Seniowhitea krameri*: Lopes, Kano, Shinonaga and Kurahashi, 1977, *Cat. Dipt. Orient. Region*, 3: 581.

*Seniorwhitea reciproca*: Lopes and Kano, 1979, *Revta brasil Biol.*, 39(2): 315; Verves, 1986, *Cat. Palae. Dipt.*, 12: 179; Nandi, 1992<sup>[20]</sup>, *J. Beng. Nat. Hist. Soc.*, 11(2): 44.

*Harpagophalla reciproca*: Sygyiyama and Kano, 1984, *Jap. J. sanit. Zool.*, 35(4): 349.

**Male**

Body length 6-15mm.

**Head**

Width of frons about one-third that of one eye; frontal vitta black; parafrontal and parafacial black with silvery pollen; antennae brown and reaching up to about 0.85 distance to vibrissae; arista long, plumose along basal two-thirds; facial ridge brown with silvery pollen; vibrissae long; frontal bristles 9, posterior 2 reclinate, anterior 3 below base of antennae and

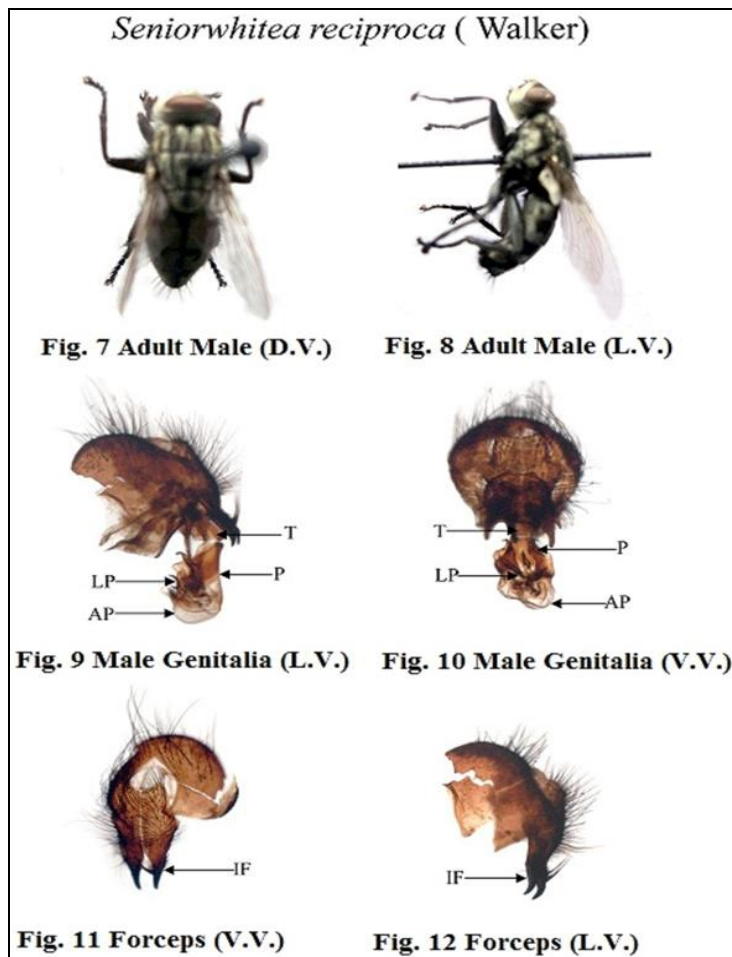


Fig 7-12



Reaching up to about two-thirds of antennal segment, rest cruciate and directed forwards; gena black with silvery pollen and black hairs; post gena black; ocellar triangle black with short black hairs; palpi slender and black; proboscis blackish.

**Thorax**

Grey with three black longitudinal strips; *ac* 0+1; *dc* 5+5 (posterior 2 *dc* stout); *ia* 1+2; *ps* 1; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 6; *hpl* 9; upper part of propleura bare, black and with silvery pollen; pro-and mesothoracic spiracles brownish; prostigmatic and propleural bristles well developed and accompanied with short hairs; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

**Wings**

Hyaline with brown veins; R1 bare; R4+5 with a row of about 9-10 short setae; fifth coastal segment more than one and half time that of the third, the former with short spines along basal two-fifths of its anterior margin; costal spines stout; epaulet black with short spines and 2 long bristles; basicostal scale light brown; squama white; halter brown.

**Legs**

Black; fore femur with a pair of rows of long bristles along postero dorsal surface and a row of bristles along posterior margin of ventral surface; fore tibia with a row of 3 bristles along basal half of antero dorsal surface and 1 bristles on posterolateral surface at about one-third the distance from the distal end; mid femur with a row of 4 bristles along middle portion of anterolateral surface; mid tibia with a row of 2 bristles along basal two-thirds of postero dorsal surface; hind femur with a pair of rows of bristles along antero dorsal surface; hind tibia with a row of bristles along antero dorsal surface.

**Abdomen**

Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but each with a pair of lateral marginal bristles, fourth with a pair of median and 2 pairs of lateral marginal bristles, fifth with a row of about 12 marginal bristles; sternite first and second with black hairs, third and fourth with a tuft of long hairs along posterior margin; fifth sternite v-shaped with short hairs laterally and short spines apically on arms.

**Genitalia**

First genital segment brownish-black with short hairs, second black with long hairs; inner forceps curved, pointed at end and with tuft of long hairs at the end; outer forceps mostly triangular with short hairs; anterior paramere long, pointed, curved sharply and with a short hairs posteriorly on distal half; posterior paramere elongated, terminally hook-shaped and with four hairs anteriorly on terminal half; theca shorter than paraphallus with 2 rounded lateral and small median elongated lobes; apical plate of paraphallus with blunt projection; lateral plate of paraphallus asymmetrical, strongly chitinised and with ventral process; basal part of paraphallus straight; styli of glans with a pair of rounded membranous lateral lobes, a long median process and a pair of long and well chitinised styli of

glans which remain within paraphallus; ventralia small, well chitinised and inserted internally between apophyses of paraphallus.

**Material examined**

Punjab: - Roopnagar, 7. viii. 2010 - 3♂♂, Patiala, 6. ix. 2010 - 2♂♂.

**Distribution**

India; Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Punjab, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal and union territories of Andaman and Nicobar Islands, Chandigarh, Pondicherry; Bhutan; Myanmar; Nepal; Pakistan; Sri Lanka; China; France; Hainan Islands; Hawaiian Islands; Indonesia; Laos; Malaysia; Singapore; Taiwan and Thailand.

**Remarks**

This species was placed by Sugiyama and Kano (1984) under the genus *Harpagophalla* Rohdendorf due to presence of straight basal part of styli and absence of paraphallus but later on Nandi (2002) [21] placed it under genus *Seniorwhitea* because according to him most of the characters are shared with genus *Seniorwhitea*.

**Subtribe Parasarcophagina Rohdendorf**

This subtribe is characterized by having styli of glans elongated and narrow and occasionally covered by apical plate of paraphallus. A total of 14 genera under this subtribe have been reported by Lopes *et al.* (1977) from the oriental region but I have studied five genera: *Sarcosolomonina*, *Boettcherisca*, *Bercaea*, *Parasarcophaga*, *Lioproctia*.

**Key to studied genera**

1. Upper part of propleura covered with black hair, often rather densely so.....2Upper part of propleura bare.....3
2. Presutural *ac* bristles distinct; fourth abdominal sternite of male with dark spots and short black bristles.....*Sarcosolomonina* Presutural *ac* bristles wanting; fourth abdominal sternite of male without dark spots.....*Boettcherisca*

**Genus Boettcherisca Rohdendorf, 1937**

Frons very narrow, its width at narrowest point of frons about one-third that of one eye; antennae slender; propleura hairy in middle; hind tibia of male without tuft of long hair; fourth abdominal sternite without dark spots; theca shorter than paraphallus; inner forceps not slender but curved; penis medially transparent, apical plate of paraphallus distinct; lateral plate of paraphallus elongated with process and bifurcated distally; styli of glans with short and very stout lateral process bearing spines; ventralia well developed, lamellate, membranous, bilobed and covered with short spines. Only single species of this genus has been studied.

***Boettcherisca peregrina* (Robineau-Desvoidy)**

(Figs. 13-18)

*Myophora peregrina* Robineau-Desvoidy, 1830, *Mem. Pres. div. Sav. Acad. Sci. Inst. Fr.*, (2)2: 356.

*Myophora subrotunda* Robineau-Desvoidy, 1830, *Mem. Pres. div. Sav. Acad. Sci. Inst. Fr.*, (2)2: 357.

*Myophora rapidia* Robineau-Desvoidy, 1830, *Mem. Pres. div. Sav. Acad. Sci. Inst. Fr.*, (2)2: 360.

*Sarcophaga trironia* Macquart, 1851, *Mem. Soc. Sci. Agric. Lille*, 4: 234.

*Sarcophaga ochripalpis* Thomson, 1869, *K. Svenska fregatten Eugenie resa omkring jorden*, 2(1): 537.

*Sarcophaga fuscicauda* Boettcher, 1912, *Ent. Mitt.* 1: 168.

*Sarcophagi irrequieta* Johnston and Tiegs, 1921, *Proc. R. Soc. Qd.*, 33(4): 63 (not Walker, 1849, misidentification)

*Sarcophaga hutsoni* Parker, 1923, *Ann. Mag. nat. Hist.*, (9)11: 127.

*Boettcherisca peregrina* : Rohdendorf, 1937, *Fauna USSR*,

*Dipt.*, 19(1) : 271; Nandi, 1992 [20], *J. Beng. nat. Hist. Soc.*, 11(2): 36.

*Sarcophaga meriani* Zumpt, 1951, *J. ent. Soc. sth. Afr.*, 14(2): 182.

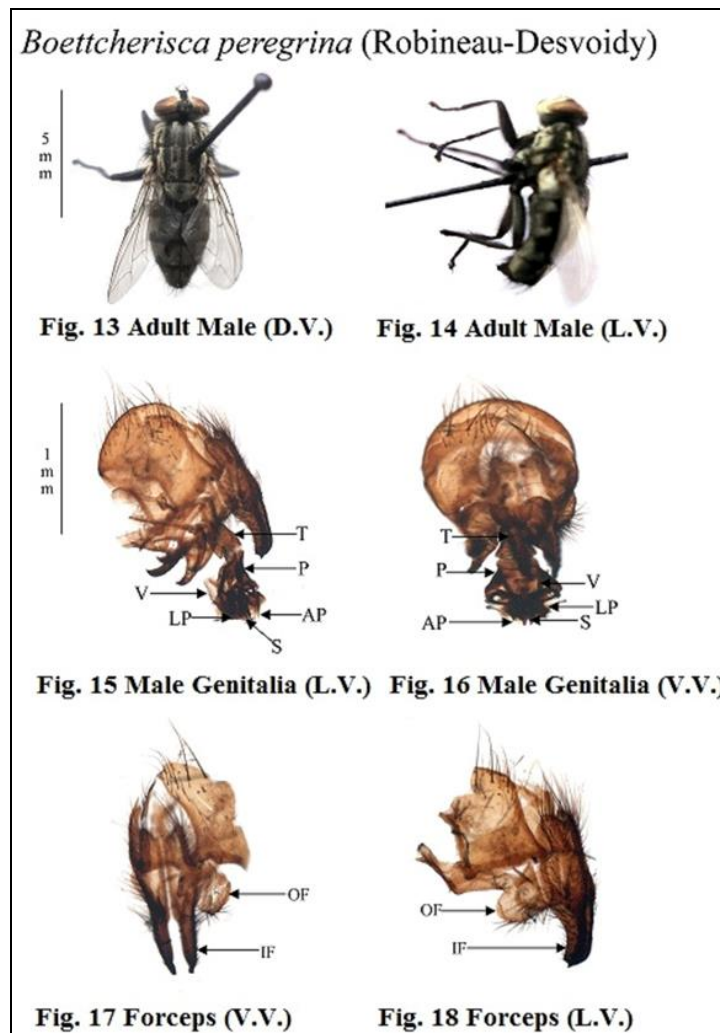
*Sarcophaga peregrina* : Kano and Shinonaga, 1994, *Jap. J. sanit. Zool.*, 45: 263.

**Male**

Body length 9-12mm.

**Head**

Width of frons about two-fifths that of one eye; frontal vitta black, its width at narrowest point of frons about twice that of each parafrontal; parafrontal and parafacial black with silvery to golden pollen; antennae blackish-brown and reaching up to about 0.8x distance to vibrissae; facial ridge light black with white pollen; vibrissae long; frontal bristles 10-12, posterior 2 to 3



**Fig 13-18**

reclinate, anterior 2 below base of antennae and reaching up to about half of second antennal segment, rest cruciate and directed forwards; gena black with numerous black hair; palpi slender and dark brown; proboscis black.

**Thorax**

Blackish, silvery to golden pollen and with three black longitudinal stripes; *ac* 0+1; *dc* 5+5 (posterior 2 *dc* short); *ia* 1+2; *ps* 1; *h* 3; *ph* 2; *np* 4; *pa* 2; *sa* 3; *st* 1+1+1; *mpl* 7; *hpl* 8;

upper part of propleura brownish-black, silvery pollen and with black hair; prostigmatic and propleural bristles well developed and accompanied with short hair; pro- and mesothoracic spiracle brown; apicoscutellar and discoscutellar bristles 1 pair each; lateroscutellar bristles 2 pairs.

### Wings

Hyaline with brown veins; R1 bare; R4+5 with a row of about 8-9 short setae located dorsally and extending up to more than half from basal node to r-m; costal spines not stout; epaulet black; basicostal scale brown; squama white; halter brown.

### Legs

Black; fore femur with two rows of long bristles along posterodorsal surface; fore tibia with row of short bristles along basal half of anterodorsal surface; mid femur with row of 3-4 bristles along middle portion of anterolateral surface; mid tibia with single bristle on anterodorsal surface; hind femur with pair of rows of bristles along anterodorsal surface; hind tibia with row of 2 long and several short bristles along anterodorsal surface.

### Abdomen

Black with silvery checkered pattern; median marginal bristles on second and third abdominal tergites absent but each with pair of lateral marginal bristles, fourth with pair of median and 3 pairs of lateral marginal bristles, fifth with row of 18-20 marginal bristles; sternite first to fourth with dense short black hair; fifth sternite Y-shaped with double rows of closely set bristles laterally on few arms and few hair apically.

### Genitalia

First genital segment black with black hair, second blackish brown with black hair but without marginal bristles; inner forceps blunt at apex and with many lateral subapical spines; outer forceps almost triangular, broad at apex and with hair along distal half; anterior paramere with pointed apex but without flap; posterior paramere slightly curved at apex with two subapical hair; theca shorter than paraphallus, both sclerotised; apical plate of paraphallus curved, pointed at apex and with pair of long wide slender lateral processes; lateral plate of paraphallus well developed with pair of short, two-pointed equal lateral processes; styli of glans with median and two lateral processes; ventralia bilobed, spinous and with membranous projection at anterior margin of each lobe.

### Material Examined

Punjab: Patiala, 5. vii. 2012 - 2♂♂. Uttarakhand: Dehradun, 18. vi. 2000 - 2♂♂.

### Distribution

India; Assam, Bihar, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Madhya Pradesh, Manipur, Meghalaya, Nagaland, Odisha, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, Uttarkhand, West Bengal and Andaman Nicobar, Dadra and Nagar Haveli, Pondicherry, Bangladesh; Bhutan; Myanmar; Nepal; Sri Lanka; Australia; Bonin Islands; Borneo; Fiji; Gilbert Islands; Guam; Hainan Island; Hawaiian Island; Indonesia; Japan; Kiribati; Korea; Madagascar; Malaysia; Mariana Islands; Mauritania; Mauritius; New

Britain; New Zealand; Niue; Norfolk Island; Ogasawara; Singapore; South China; Taiwan; Thailand and Volcano Islands.

### Remarks

This species is similar to *B. kargnyi* and *B. septentrionalis* but differs from them by the structure of lateral plate of paraphallus and inner forceps. Moreover, the detailed structure of lateral plate of paraphallus and styli of glans in this species are quite distinguishable from them.

### Figures

#### *Ravinia pernix* (Harris)

Fig.1-Adult (D.V.); Fig. 2-Adult (L.V.); Fig. 3-Male Genitalia (D.V.); Fig. 4- Male Genitalia (L.V.); Fig. 5-Forceps (V.V.)

#### *Seniorwhitea reciproca* (Walker)

Fig.7-Adult (D.V.); Fig. 8-Adult (L.V.); Fig. 9-Male Genitalia (D.V.); Fig. 10- Male Genitalia (L.V.); Fig. 11-Forceps (V.V.); Fig. 12-Forceps (L.V.)

#### *Boettcherisca peregrina* (Robineau-Desvoidy)

Fig.13-Adult (D.V.); Fig. 14-Adult (L.V.); Fig. 15-Male Genitalia (D.V.); Fig. 16- Male Genitalia (L.V.); Fig. 17- Forceps (V.V.); Fig. 18-Forceps (L.V.)

### List of Abbreviations Used

AP: Apical plate, DV: Dorsal View, IP: Inner Forceps, LP: Lateral Plate, LV: Lateral View, OP: Outer Forceps, P: Paraphallus, S: Styli of Glans, T: Theca, V: Ventralia, VV: Vertical View

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