

# NOTES ON CALLIPHORID FLIES (DIPTERA: CALLIPHORIDAE) FROM SUNDARBANS BIOSPHERE RESERVE AND THEIR IMPACT ON MAN AND ANIMALS<sup>1</sup>

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Systematic accounts of nine species of calliphorid flies, their impact on man and animals, and distributional records from India are given. A new species *Chrysomya indica* is described and illustrated.

**Key words:** Diptera, systematic accounts, impacts, Sundarbans Biosphere Reserve

## INTRODUCTION

Very little is known about the calliphorid flies from Sundarbans Biosphere Reserve except from the works of Mazumder and Parui (2001), and Sinha and Nandi (2002) who reported two species from this area. These flies are important in medical, veterinary and forensic sciences. They carry bacteria, viruses, protozoa and helminths that cause enteric diseases in man and other animals. Some larvae are parasites on earthworms, snails, toads, frogs, nestlings of birds and livestock, while a few cause huge loss in productivity of the dried-fish industry. Some larvae are useful in forensic investigations (Smith 1986) and for the treatment of osteomyelitis. Some are obligate parasites in living tissues and cause malign tissue myiasis in man and animals (Pont 1980).

## MATERIAL AND METHODS

These flies were collected from different parts of Sundarbans Biosphere Reserve with the help of butterfly nets from different habitats like dried and semi-dried fish, crabs and prawns, dead molluscs, decaying garbage, excreta of different animals, fruits and flowering plants in different seasons, as well as meat shops. The flies were then killed in jars using benzene vapour, transferred to a small tissue paper envelope and preserved dry therein. The chaetotaxy was studied using a stereoscopic dissecting microscope. The male genitalia were pulled out with a fine forceps and dissected in cavity block using a stereoscopic dissecting microscope. The dissected parts were dehydrated through alcoholic grades and figures were drawn with the help of Camera Lucida where required. The genitalia were preserved in a small triangular paper board and attached with the respective species specimens. A total of nine species belonging to four genera were found. The taxonomic classification of Rognes (1991) was followed.

Holotype and 2 ♂♂ Paratypes are deposited in the National Collection of Zoological Survey of India, Kolkata. Regn No. 8637/H6.

Systematic accounts

**Subfamily: Calliphorinae**

**Tribe: Calliphorini**

1. *Calliphora* (*Calliphora*) *vicina* Robineau-Desvoidy

1830, *Calliphora vicina* Robineau-Desvoidy, *Mém. pres. div. Sav. Acad. Sci. Inst. Fr.* (2)2: 435.

2000, *Calliphora* (*Calliphora*) *vicina*: Nandi, *Rec. zool. Surv. India* 98(4): 1.

**Specimens examined:** 2 ♂♂, Ghoramara Island, 4.xi.1999.

**Impact on man and animals:** This species is mostly found on dead animals, including human corpses and faeces, and is closely associated with man. The adult flies are biologically associated with polio virus, *Escherichia*, *Aerobacter*, *Proteus*, *Flavobacterium*, *Salmonella*, *Shigella*, *Staphylococcus*, *Streptococcus*, *Bacillus*, *Leptospira*, *Herpetomonas*, *Chilomastix*, *Entamoeba*, *Eimeria*, *Toxoplasma*, *Endolimax* and *Giardia intestinalis*, *Mycobacterium tuberculosis*, *Trichuris trichura*, *Ascaris lumbricoides* and *Vibrio comma* (Greenberg 1971). The larvae cause intestinal and urinary myiasis in humans (James 1947). They are also helpful in forensic science, in detecting the approximate time of death (Smith 1986).

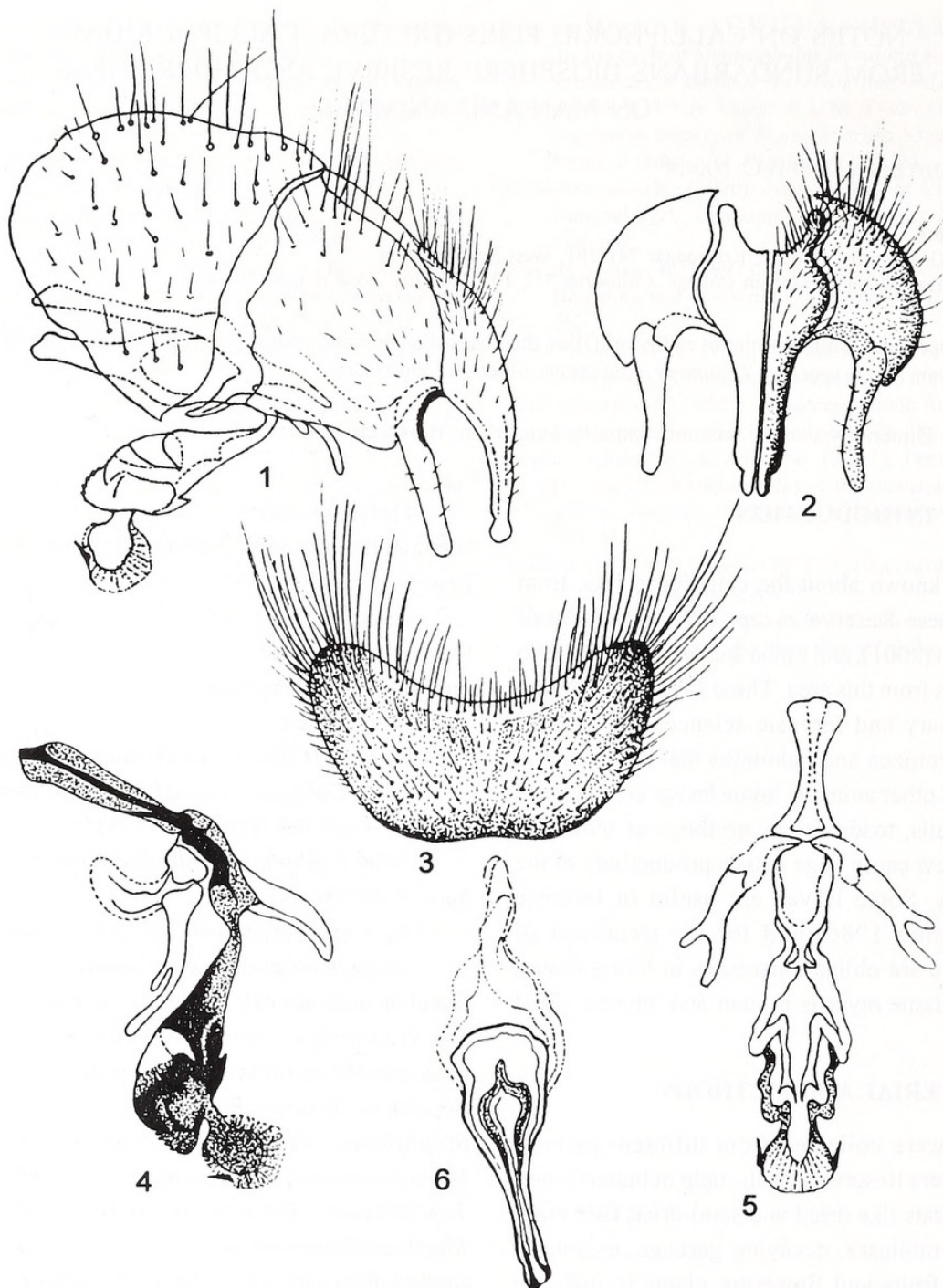
**Distribution:** West Bengal (Alipurduar, Birpara, Darjeeling, Ghoramara Island, Kalimpong, Kurseong, Rajabhatkhawa), Himachal Pradesh (Shimla), Sikkim (Mangan, Phensang) and Uttaranchal (Nainital).

**Subfamily: Luciliinae**

**Tribe: Luciliini**

2. *Hemipyrellia ligurriens* (Wiedemann)

1830, *Musca ligurriens* Wiedemann, *Aussereurop. zweifl. Insekt.* 2: 655.



Figs 1-6: *Chrysoma indica* sp. nov.; 1. Epandrium, inner and outer forceps and phallosome (lateral view), 2. Inner and outer forceps (posterior view), 3. Fifth sternite of male, 4. Phallosome, anterior and posterior parameres (lateral view), 5. Phallosome, anterior and posterior parameres (ventral view), 6. Ejaculatory duct

2000, *Hemipyrellia ligurriens*: Nandi, *Rec. zool. Surv. India* 98(4): 3.

**Specimens examined:** 1 ♂, Ganga Sagar (Sagar Island), 20.viii.2000; 1 ♂, Narayanpur, 16.iv.2000; 2 ♂♂, Bhagabatpur, 18.x.2000.

**Impact on man and animals:** This scavenger is mostly found on carcasses and human excrement. The adult flies are regarded as the most potential vectors of enteric pathogens, as they visit both human food for consumption

and excrement. The larvae with parasitic adaptation are able to utilize pre-existing wounds under laboratory conditions (Roy and Dasgupta 1971) and different animals.

**Distribution:** West Bengal (Bhagabatpur, Bijanbari, Budge Budge, Burdwan, Buxa, Ganga Sagar, Kalimpong, Kalyani, Kolkata, Madarihat, Narayanpur, Ranaghat, Shibpur, Siliguri, Sukna Forest), Bihar (Purnea), Sikkim (Phensang, Swistik Camp) and Tamil Nadu (Chennai).

### 3. *Lucilia (Lucilia) cuprina* (Wiedemann)

1830, *Musca cuprina* Wiedemann, *Aussereurop. zweifl. Insekt*, 2: 654.

2002, *Lucilia (Lucilia) cuprina* Nandi, *Rec. zool. Surv. India* 100 (1-2): 121.

**Specimens examined:** 4 ♂♂, Bani Jungle (Sagar Island), 31.i.2000; 15 ♂♂, Ganga Sagar (Sagar Island), 1.ii.2000; 1 ♂, Dhabalhat Shibpur (Sagar Island), 31.i.2000; 7 ♂♂, Jambu Island, 16.ii.2001.

**Impact on man and animals:** A scavenger, it is mostly available on carcasses. The adults are associated with *Escherichia coli*, *Proteus mirabilis*, *Proteus morganii*, *Proteus rettgeri*, *Proteus vulgaris* and *Ascaris lumbricoides*, and may cause dysentery in humans. They also carry *Morganella* sp. (Kano and Shinonaga 1968). The larvae cause external myiasis in sheep, toad and wound myiasis in man. They are obligate parasites in living tissue and may cause malign tissue myiasis in man. This species is the notorious sheep maggot of Australia and causes extensive loss in sheep farming. This species is suspected to transmit poliomyelitis virus to human beings (Rognes 1991).

**Distribution:** West Bengal (Alipurduar, Bani Jungle, Dhabalhat Shibpur, Ganga Sagar, Jaigaon, Jambu Island, Kalyani, Rajabhatkhawa, Ranaghat, Sealdah) and cosmopolitan distribution in India.

### 4. *Lucilia (Lucilia) papuensis* Macquart

1842, *Lucilia papuensis* Macquart, *Mém. Soc. Sci. Agric. Lille* 2(3): 298.

1997, *Lucilia (Lucilia) papuensis* Nandi and Bhattacharya, *J. Beng. Nat. Hist. Soc.* 16(2): 23.

**Specimens examined:** 3 ♂♂, Kakdwip, 12.ix.2000; 1 ♂, Bamankhali (Sagar Island), 31.i.2000; 3 ♂♂, Krishnagar (Sagar Island), 24.viii.2000.

**Impact on man and animals:** This species is frequently attracted to decaying animal matter, particularly dead earthworms. James (1971) recorded it from marsupial skull and human excrement.

**Distribution:** West Bengal (Kakdwip, Bamankhali, Krishnagar, Shibpur, Rajabhatkhawa, Ranaghat), Sikkim (Jorhang), Assam (Sadiya), Arunachal Pradesh (Pasighat), Himachal Pradesh (Shimla), Jammu & Kashmir (Gulmarg) and Kerala (Thiruvananthapuram).

### 5. *Lucilia (Lucilia) porphyryna* (Walker)

1856, *Musca porphyryna* Walker, *J. Proc. Linn. Soc. Lond. Zool.* 1: 24.

2000, *Lucilia (Lucilia) porphyryna* Nandi, *Rec. zool. Surv. India* 98(4): 4.

**Specimens examined:** 2 ♂♂, Dhabalhat Shibpur (Sagar

Island), 31.i.2000.

**Impact on man and animals:** A scavenger, it is attracted to carcasses of mammals, birds and reptiles. The adult is biologically associated with *Herpetomonas muscarum* and *Leptomonas mirabilis* and could cause harm to humans (Greenberg 1971).

**Distribution:** West Bengal (Burdwan, Coochbehar, Dhabalhat, Shibpur, Rajabhatkhawa, Ranaghat, Shibpur Botanical Garden), Assam (Sadiya), Arunachal Pradesh (Pasighat), Himachal Pradesh (Shimla), Jammu & Kashmir (Gulmarg) and Sikkim (Jorhang).

### 6. *Lucilia (Lucilia) sericata* (Meigen)

1826, *Musca sericata* Meigen, *Syst. Besch. Europ. zweifl. Insekt.* 5: 53.

1997, *Lucilia (Lucilia) sericata* Nandi, *J. Beng. Nat. Hist. Soc.* 16(2): 67.

**Specimens examined:** 2 ♂♂, Bamankhali (Sagar Island), 1.ii.2000; 1 ♂, Ghoramara Island, 4.xi.1999; 1 ♂, Ganga Sagar (Sagar Island), 20.viii.2000.

**Impact on man and animals:** This is a synanthropic species, and mostly available near human dwellings. Greenberg (1971) reported its biological association with polio virus, Coxsackie virus, *Proteus*, *Flavobacterium*, *Aerobacter*, *Serratia*, *Enterococcus*, *Pneumonia*, *Salmonella*, *Shigella*, *Herpetomonas*, *Clostridium*, *Staphylococcus*, *Streptococcus*, *Bacillus*, *Escherichia*, *Leptospira*, *Crithidia*, *Entamoeba*, *Toxoplasma*, *Trichuris*, *Ancylostoma*, *Mycobacterium* and *Ascaris*. They also carry *Morganella* sp. (Kano and Shinonaga 1968). The larvae cause wound myiasis in man and other animals, and are serious pests of sheep in Africa, Britain, Europe and Australia, causing myiasis, an important economic and welfare problem in many areas (Fisher *et al.* 1998). The larvae have been used in surgical cases (Stewart 1934) and have forensic importance as they help to detect the approximate time of death of a person.

**Distribution:** West Bengal (Bamankhali, Darjeeling, Ganga Sagar, Ghoramara Island, Kalimpong, Malda, Siliguri, Sukna, Takvar).

### Subfamily: Chrysomyinae

#### Tribe: Chrysomyini

### 7. *Chrysomya megacephala* (Fabricius)

1794, *Musca megacephala* Fabricius, *Ent. Syst.* 4: 317.

2000, *Chrysomya megacephala* Nandi, *Rec. zool. Surv. India* 98(4): 4.

**Specimens examined:** 1 ♂, Jambu Island, 1.ii.1999; 12 ♂♂, Ganga Sagar (Sagar Island), 1.ii.2000; 7 ♂♂, Dhabalhat Shibpur (Sagar Island), 31.i.2000; 8 ♂♂, Kakdwip, 3.xi.1999; 6 ♂♂, Kakdwip, 16.iv.2000; 3 ♂♂, Namkhana, 16.iv.2000; 3 ♂♂,

Bhagabatpur, 19.x.2000; 4♂♂, Mohisani Island, 12.xi.2000; 1♂, Canning, 7.ii.2000; 11♂♂, Frasersganj, 17.iv.2000; 1♂, Chandanpiri, 20.x.2000; 4♂♂, Ganga Sagar (Sagar Island), 1.ii.2000; 2♂♂, Lothian Island, 18.x.2000.

**Impact on man and animals:** A synanthropic species, it is available on dead fish, sweets, carcasses, human excrement and fruits. The adult flies are vectors of infectious diseases of the digestive tract and have been reported to carry *Morganella* sp., which causes summer diarrhoea. Greenberg (1971) reported its biological association with polio virus, *Escherichia coli*, *Proteus mirabilis*, *Proteus morganii*, *Proteus rettgeri*, *Proteus vulgaris*, *Salmonella typhi*, *Shigella dysenteriae*, *Leptomonas mirabilis*, *Chilomastix mesnili*, *Giardia intestinalis*, *Trichomonas hominis*, *Endolimax nana*, *Entamoeba coli*, *Entamoeba histolytica*, *Iodamoeba bütschlii*, *Hymenolepis diminuta*, *Trichuris trichiura*, *Ancylostoma duodenale* and *Ascaris lumbricoides*. He also reported it as vector of enteric pathogens in malnourished individuals living under unsanitary conditions. Its forensic importance has been mentioned by Smith (1986), and Wells and Kurahashi (1994). In Southeast Asia, these larvae are parasitic on semi-dried and dried fish, causing a major problem in the fish industry (Esser 1991). It is a secondary myiasis producer in man and domestic animals.

**Distribution:** West Bengal (Alipurduar, Bhagabatpur, Bijanbari, Canning, Chandanpiri, Dhabalhat Shibpur, Diamond Harbour, Digha, Frasersganj, Ganga Sagar, Jaigaon, Jainti, Jambu Island, Kakdwip, Kalyani, Kolkata, Kurseong, Malda, Mohisani Island, Namkhana, Panitanki, Rajabhatkhawa, Ranaghat, Shibpur, Shingla Bazar, Siliguri, Sukna) and almost throughout India.

#### 8. *Chrysomya rufifacies* (Macquart)

1842, *Lucilia rufifacies* Macquart, *Mém. Soc. Sci. Agric. Lille* 2(3): 303.

2000, *Chrysomya rufifacies* Nandi, *Rec. zool. Surv. India* 98(4): 4.

**Specimens examined:** 1♂, Bamankhali (Sagar Island), 21.x.2000; 2♂♂, Chandanpiri, 20.x.2000; 2♂♂, Begnakhali, 13.ii.2001; 1♂, Ghoramara Island, 4.xi.1999.

**Impact on man and animals:** This synanthropic saprophage is attracted to carcasses. The adults are biologically associated with *Bacillus* sp., *Mycobacterium tuberculosis*, *Leptomonas mirabilis* and *Taeniarhynchus saginatus* (Greenberg 1971). The larvae are primarily scavengers and have been successfully used for treating osteomyelitis (James 1947). It produces secondary myiasis in humans and other animals. It is one of the main pests of sheep in Australian region, and in Hawaii a serious parasite, especially of young calves (Shishido and Hardy 1969). It is

likely to transmit enteric pathogens under unsanitary condition.

**Distribution:** West Bengal (Alipurduar, Bamankhali, Begnakhali, Bijanbari, Chandanpiri, Ghoramara Island, Jaigaon, Kalyani, Kurseong, Madarihat, Panitanki, Rajabhatkhawa, Ranaghat, Shibpur, Singala Bazar, Siliguri) and almost throughout India.

#### 9. *Chrysomya indica* sp. nov. (Figs 1-6)

**Male:** Body length 7-8 mm.

**Head:** Eyes bare; upper half of facets not enlarged; frons slightly separated; narrowest part of frons less than the width of ocellar triangle; frontal vitta black; frontal bristles short and weak; parafrontal blackish brown with silvery pollen and numerous fine black hairs; parafacilia blackish brown with silvery pollen and white hairs; gena and metacephalon dark brown with silvery to golden pollen and numerous white hairs; second antennal segment dark brown, third brownish; arista dark brown, long plumose; palpi yellowish and slender.

**Thorax:** Scutum and scutellum metallic blue with bluish iridescence; four dark not prominent longitudinal stripes on presutural region; *ac* 0+2; *dc* 3+3; *ia* 0+1.; *h* 3; *np* 2; *pa* 2; *ph* 1; *st* 1+1; *hp*-2; *mp* 6; apicoscutellar bristles 1 pair; discoscutellar bristles 3 pairs; lateroscutellar bristles 3-4 pairs; suprasquamosal ridges hairy; prostigmatic bristles present; mesothoracic spiracles white; metathoracic spiracles dark brown.

**Wings:** Hyaline and its basal part infuscated; *R*<sub>1</sub> bare; *M*<sub>1+2</sub> sharply bending anteriorly; length of third costal segment more than twice that of the fifth; basicosta and epaulet black; upper squama white; lower squama brownish; halter brown.

**Legs:** Black to blackish brown; fore femur with a pair of rows of long bristles each along posterodorsal and a row of bristles along posteroventral surfaces; fore tibia with several short bristles along the anterodorsal surface and with short and comparatively long bristles along the distal end and one bristle on distal one-third of the posteroventral surface; mid femur with 2 short bristles on the middle part of anterodorsal surface, a row of setae each on the distal half of anterodorsal and posterodorsal surfaces, 2 bristles on the basal part of anteroventral surface and 3 bristles along the distal part of posterodorsal surface; mid tibia with 1 bristle each on the anterodorsal, anteroventral and posterodorsal surfaces on one-third the distance from the distal end and 2 short bristles on the posteroventral surface; hind femur with a row of long bristles each along anterodorsal and anteroventral surfaces; hind tibia with a row of short bristles along anterodorsal surface and 1 bristle each on distal one-third of anteroventral and posterodorsal surfaces.

**Abdomen:** Metallic; second abdominal tergite darker

than the others and third and fourth tergites with dark transverse bands posteriorly; marginal bristles on abdominal sternites poorly developed; sternites first to fourth dark-brown with greyish pollen and numerous short hairs; fifth sternite cup-like with long hairs on each arm; genital tergites bluish with black hairs; forceps elongated; anterior paramere wide, slightly curved anteriorly; posterior paramere bifurcated at end; acrophallus wide at end and with a wide stalked projection posteriorly.

**Female:** Unknown.

**Specimens examined:** **Holotype:** 1 ♂, India: West Bengal; Sundarbans Biosphere Reserve (Canning), 7.ii.2001, Shuvra Kanti Sinha; **Paratypes:** 6 ♂♂, same data as Holotype.

**Distribution:** INDIA; West Bengal (Canning).

**Etymology:** The species is named after India.

**Remarks:** This species is similar to *Chrysomya rufifacies* (Macquart 1842), but differs in having 6 mesopleural bristles (*C. rufifacies* has 5 mesopleural bristles) and a wide stalked acrophallus projecting posteriorly (in *C. rufifacies* the acrophallus is unstalked, projecting anteriorly).

**Impact on man and animals:** Not known.

## DISCUSSION

Most calliphorid flies are important because of their relationship with man. There is a direct relationship between fly density and diarrhoeal diseases (Greenberg 1964). Most calliphorid flies breed on excrement and carcasses, and are mechanical transmitters of gastrointestinal diseases when they settle, regurgitate or excrete on food for human consumption. Most people in the Sundarbans Biosphere Reserve use open or unhygienic latrines. These are the main breeding grounds

of calliphorid flies, and ideal for pathogens. *Lucilia* (*Lucilia*) *cuprina* and *Lucilia* (*Lucilia*) *sericata* cause widespread loss of livestock and in a bad outbreak 30% of the flock die (Kettle 1995). Baumgartner and Greenberg (1984) mentioned that a few species threatened livestock in the jungle area. Myiasis in goat and cow caused by *Chrysomya rufifacies* has been observed in Ghoramara Island and Sagar Island (Sinha and Nandi 2002). Individuals engaged in dried fish industry suffer most, as the density of flies in dried fish area is high and so is the presence of different types of bacteria, viruses and protozoa. *Calliphora* (*Calliphora*) *visina*, *Lucilia* (*Lucilia*) *sericata* and *Chrysomya megacephala* are known to transmit gastrointestinal diseases such as, summer dysentery, bacillary dysentery and amoebic dysentery among individuals in dried-fish farm.

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## Abbreviations used in the text

*ac*-acrostichal bristles, *dc*-dorsocentral bristles, *ia*- intra alar bristles, *h*-humeral bristles, *np*- notopleural bristles, *ph*-posthumeral bristles, *pa*- post alar bristles, *st*- sternopleural bristles, *hp*-hypopleural bristles, *mp*- mesopleural bristles.

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