

ON A SMALL COLLECTION OF MUSCID FLIES (DIPTERA : MUSCIDAE) OF SUNDARBANS BIOSPHERE RESERVE, INDIA

B. C. NANDI AND SHUVRA KANTI SINHA

Zoology Department, Hooghly Mohsin College, P.O. Chinsurah-712 101, W.B., India

INTRODUCTION

Muscid flies are very little known from Sundarbans Biosphere Reserve except Mazumder and Parui (2001), reported 8 and Sinha and Nandi (2002) 3 species from this Biosphere Reserve. These flies are of great importance in medical, veterinary, forensic and agricultural sciences and are mostly attracted to decaying organic matters, carcasses, dung, privies, salted meat, cheese, dead bodies of different animals and flowering plants. Most of the adult flies are very important because of their relationship with man and dwellings. They carry different types of viruses, bacteria, protozoa and helminthes (Greenberg, 1971; Sinha *et al.*, 2003) and their role in dissemination of gastro enteric diseases are well known. Kettle (1995) reported more than 100 pathogens including the germs of typhoid, paratyphoid, tuberculosis, leprosy and plague which are carried by these flies. Few flies are haematophagous and lick sores of cattle and human and act as vectors of ophthalmic diseases. Some flies also feed on blood and sweat and play an important intermediate host in the cyclical transmission of filarial diseases of domestic stock particularly poultry and also act as potential mechanical vectors of diseases of domestic and wild animals. Some adults are predators and feed on larvae, pupa and adults of Simuliidae and Culicidae (Pont, 1980) and these flies can be used for biological control of some of those vectors. Few species live in the nests of birds and hymenoptera and act as parasites. The larvae of some species produce intestinal, urino-genital, dermal and aural myiasis in man and other domestic and wild vertebrate animals. A few larvae are predator and feed on the larvae of other flies of the genera *Musca*, *Orthellia*, *Haematobia* etc. which occur in dung (Shinonaga and Kano, 1971). Larvae of *Atherigona* are plant feeders and bore into the shoots of cereal crops and grasses causing dead hearts and thus they play a significant role in the destruction of crops.

MATERIAL AND METHODS

Most of the adult flies were collected by the authors with the help of butterfly net from different habitats, such as dung, carcasses, dead bodies of different animals, sweet and meat shops, fish markets, debris and flowering plants from different parts of Sundarbans Biosphere Reserve (Vide Map 1) in different seasons. In some cases, they were collected with the help of bait traps using

SUNDARBANS BIOSPHERE RESERVE



Map 1. : 1. Kakdwip, 2. Beguakhali, 3. Ganga Sagar, 4. Boatkhali, 5. Bani Jungle, 6. Bamankhali, 7. Krishnagar, 8. Sahara Fish Farm, 9. Shibpur, 10. Lothian Island, 11. Bhagabatur, 12. Baradrapur, 13. Chandanpiri, 14. Bakkhali, 15. Frasergunj, 16. Jambu Island, 17. Ghoramara Island, 18. Mohisani Island, 19. Namkhana, 20. Canning, 21. Hasnabad, 22. Nayajat, 23. Sandeshkhali, 24. Gosaba, 25. Sajnekhali, 26. Pakhiralaya, 27. Jharkhali, 28. Basanti, 29. Chotta Mollakhali.

dead fish and meat as their baits. After collection, they were killed with the help of benzene vapour putting them in a killing jar. Then they were preserved in small insect envelope mentioning their localities, date of collection and name of the collectors in a small paper and putting them inside the envelope. When they were required to study, they were transferred into a relaxing jar and kept them over night for relaxation. Then they were pinned with entomological pins and later on they were studied throughly under Sterioscopic Dissecting Bionocular and mainly the chaetotaxy were observed. Later on, the male genitalia parts were dissected out with the help of same Bionocular and studied the different parts of genitalia. After dehydration through alcoholic grades, the different parts of genitalia were drawn with the help of camera lucida when required. For preservation, the genitalia parts were placed in a small triangular paper and the paper was attached with gum along the respective specimens. A total of 16 species under 7 genera have been identified. The classification followed here is after Emden (1965) and Pont (1980).

Types will be deposited in the National Collection of Zoological Survey of India, Kolkata, in due course.

SYSTEMATIC ACCOUNT

Subfamily MUSCINAE

Tribe MUSCINI

1. *Musca (Musca) domestica nebulo* Fabricius

1794. *Musca nebulo* Fabricius, *Ent. Syst.*, 4 : 321.

1965. *Musca (Musca) domestica nebulo* : Emden, *Fauna India, Muscidae*, 7(1) : 55.

Specimens examined : 3♂♂, Canning, 7.ii.2001; 2♂♂, Jambu Island, 16.ii.2001; 1♂, Ganga Sagar, 13.ii.2001; 1♂, Ghoramara Island, 14.ii.2001; 1♂, Frasergunj, 16.ii.2001; 1♂, Boatkhali, 16.ii.2001; 3♂♂, Hasnabad, 12.xii.2001; 2♂♂, Jharkhali, 8.xi.2001; 2♂♂, Basanti, 11.xii.2001.

Bionomics : This is a synanthropic species. They are generally called common bazar- and house fly and the adults were mainly collected from food-stuffs, excrement of different animals and slaughter houses. Greenberg (1971) reported its biological association with *Pseudomonas septica*, *Herpetomonas muscarum*, *Leishmania donovani*, *Leptomonas mirabilis* and *Rhynchoidomonas luciliae*.

Distribution : West Bengal (Basanti, Boatkhali, Canning, Frasergunj, Ganga Sagar, Ghoramara Island, Hasnabad, Jambu Island, Jharkhali); Andhra Pradesh; Assam; Bihar; Goa; Himachal Pradesh; Kashmir; Maharashtra; Mysore; Punjab; Sikkim; Tamil Nadu and Uttar Pradesh.

2. *Musca (Musca) domestica vicina* Macquart

1851. *Musca vicina* Macquart, *Mém. Soc. Sci. Agric. Lille.*, 1850 : 225.

1965. *Musca (Musca) domestica vicina* : Emden, *Fauna India, Muscidae*, 7(1) : 55.

Specimens examined : 5♂♂, Jambu Island, 16.ii.2001; 5♂♂, Ghoramara Island, 14.ii.2001; 1♂, Canning, 7.ii.2001; 2♂♂, Basanti, 11.xii.2001; 2♂♂, Hasnabad, 12.xii.2001; 4♂♂, Jharkhali, 9.xi.2001; 1♂, Bakkhali, 16.ii.2001; 12♂♂, Ganga Sagar, 20.viii.2000; 1♂, Gosaba, 8.xi.2001; 1♂, Bani Jungle, 31.i.2000; 1♂, Kakdwip, 3.xi.1999.

Bionomics : This is a synanthropic species. They are generally called common bazar- and house fly and the adults were mainly collected from liquefying food-stuffs, sweets, meats, excrement of different animals, decaying vegetables, garbage, slaughter houses and carcasses. They are oviparous and lay eggs on human faeces, cow, poultry and horse dung. They are capable of transmitting a large number of viral diseases (poliomyelitis, coxsackie virus, Q fever) bacterial diseases (many diarrhoea and enteric fevers, infantile summer dysentery, typhoid and paratyphoid fevers, bacillary dysentery, conjunctivitis, tuberculosis, leprosy, plague, streptococci and staphylococci), protozoan parasites (cysts and trophozoites, trypanosomes, amoebic dysentery), tapeworms and nematodes (Smith, 1973). They are found with cattle or domestic animals in the field, irritate them and gather on food and excrement, especially in rural areas. The larvae produce intestinal, urino-genital, traumatic, aural, nasopharyngeal and cuticular myiasis in man and other domestic animals. Cases of ocular myiasis have also been reported by James (1947). They cause a wide loss of dried fishes in dry fish farm (Sinha and Nandi, 2003). Third stage larva was described by Ishijima (1967) and in nature it breeds in animal excrements and cow dung. Greenberg (1971) reported its biological association with Poliovirus, *Pseudomonas* sp., *Alcaligenes faecalis*, *Escherichia coli*, *Paracolobactrum* sp., *Proteus vulgaris*, *Salmonella typhi*, *Salmonella typhimurium*, *Shigella dysenteriae*, *Shigella flexneri*, *Shigella sonnei*, *Hemophilus influenzae*, *Staphylococcus* sp., *Streptococcus* sp., *Lactobacillus* sp., *Corynebacterium* sp., *Bacillus anthracis*, *Bacillus subtilis*, *Clostridium* sp., *Treponema pertenuis*, *Herpetomonas muscarum*, *Chilomastix mesnili*, *Giardia intestinalis*, *Trichomonas hominis*, *Endolimax nana*, *Entamoeba coli*, *Entamoeba histolytica*, *Iodamoeba bütschli*, *Hymenolepis nana*, *Taeniarhynchus saginatum*, *Trichuris trichiura*, *Ancylostoma* sp., *Enterobius vermicularis*, *Ascaris lumbricoides*, *Allantonema muscae* and *Allantonema stricklandi*.

Distribution : West Bengal (Bakkhali, Bani Jungle, Basanti, Canning, Ganga Sagar, Ghoramara Island, Gosaba, Hasnabad, Jambu Island, Jharkhali, Kakdwip); Andhra Pradesh; Arunachal Pradesh; Assam; Bihar; Goa; Himachal Pradesh; Kashmir; Maharashtra; Mysore; Punjab; Sikkim; Tamil Nadu and Uttar Pradesh.

3. *Musca (Byomya) conducens* Walker

1859. *Musca conducens* Walker, *J. Proc. Linn. Soc. Lond. Zool.*, 4 : 138.

1965. *Musca (Byomya) conducens* : Emden, *Fauna India, Muscidae*, 7(1) : 68.

Specimens examined : 1♂, Bamankhali, 21.x.2000; 1♂, Kakdwip, 3.xi.1999; 1♂, Ganga Sagar, 1.ii.2000; 1♂, Bani Jungle, 20.xii.2000; 1♂, Shibpur, 20.xii.2000; 2♂♂, Gosaba, 8.xi.2001.

Bionomics : This is a haematophagous species and the adults were collected from dung of different phytophagous animals. They gather on wounds and sores of cattle and licks from them. Greenberg (1971) reported its biological association with *Stephanofilaria assamensis*. It is also a mechanical vector of stephanofilariasis. It generally feeds on the blood oozing from bites of other insects and acts as intermediate host of *Stephanofilaria* (Shinonaga and Kano, 1971).

Distribution : West Bengal (Bamankhali, Bani Jungle, Kakdwip, Ganga Sagar, Gosaba, Shibpur); Andaman Islands; Andhra Pradesh; Arunachal Pradesh; Assam; Madhya Pradesh; Orissa; Punjab and Uttar Pradesh.

4. *Musca (Byomya) confiscata* Speiser

1924. *Musca confiscata* Speiser, *Beitr. Tierk. Königsberg*, 1924 : 104.

1965. *Musca (Byomya) fasciata* : Emden, *Fauna India, Muscidae*, 7(1) : 67; 1980. Pont, *Cat. Diptera Afrotropical Region*, 724.

Specimens examined : 1♂, Mohisani Island, 22.xi.2000; 2♂♂, Bamankhali, 4.ii.2001.

Bionomics : This is a haematophagous species and the adults were collected from dead bodies of different animals and nearby the grazing animals. The larvae breed on excrement of cow and buffalo. It licks to suck sweat and may locally become bothersome (Emden, 1965).

Distribution : West Bengal (Bamankhali, Kolkata, Mohisani Island); Andhra Pradesh; Madhya Pradesh; Tamil Nadu and Uttar Pradesh.

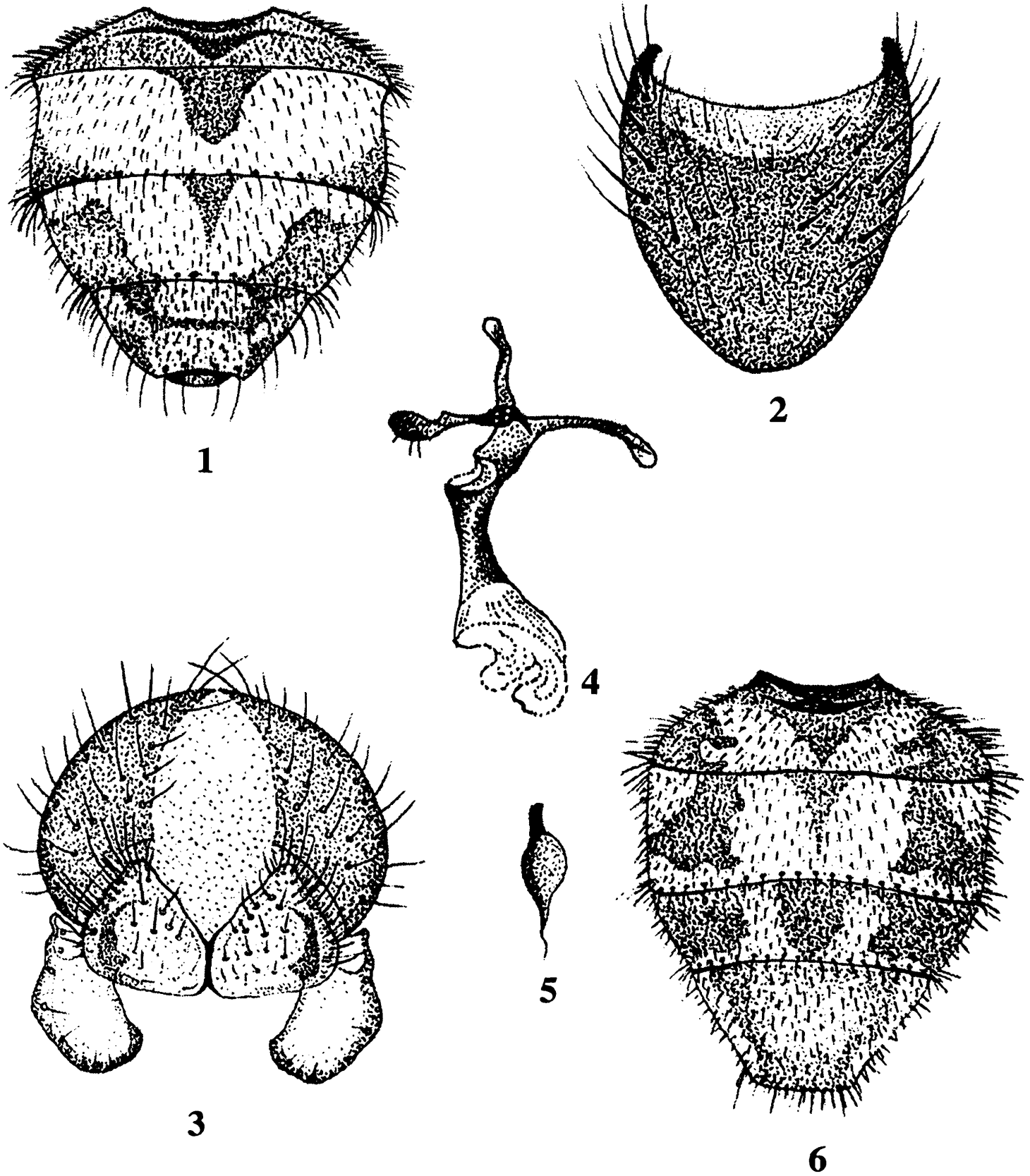
5. *Musca (Byomya) emdeni* n. sp.

(Figs. 1–6)

Male : Body length 5.0–5.8 mm.

Head : Eyes bare; frons slightly open and its narrowest part about one-tenth and at the vertex about one-fifth that of head width; frontal vitta brown; face black with grayish pollen; parafrontals and parafacials black with silvery pollen; upper half of parafrontal very narrow; gena and metacephalon black with silvery pollen and numerous black hairs; gena about one-fourth that of eye height; frontal bristles 12–14; antennae blackish, second antennal segment dark-brown, third brown with grayish pollen and its length about two and half times that of the second; arista dark-brown with long plumose and its length about equal to the length of third antennal segment; ocellars very short and only inner vertical moderately long; vibrissae long; palpi dark-brown.

Thorax : Blackish-brown with silvery pollen; scutum grayish appearance and with 4 conspicuous well separated undusted vittae; *ac* 0+1; *dc* 2+3; *ia* 1+2; *h* 3; *ph* 1; *np* 2; *ps* 1; *sa* 2; *pa* 2; *st* 1+2; *mpl* 6; hypopleuron bare; upper part of propleura with tuft of hairs; mesothoracic spiracles slightly



Figs. 1-6 : *Musca (Byomya) emdeni* n. sp.

1. Male abdomen; 2. Fifth sternite of male; 3. Genital tergite with inner and outer forceps; 4. Phallosome (lateral view); 5. Ejaculatory duct of male; 6. Female abdomen.

brown; metathoracic spiracles brown; apicoscutellar, lateroscutellar and discoscutellar bristles 1 pair each.

Wings : Hyaline; R_1 bare; M_{1+2} sharply bending forward; R_5 open; third section of costa about half the length of fifth; basicosta orange; epaulet brown; subcostal scale orange brown and without hairs; squamae light brown; lower squama broad posteriorly; halter orange white.

Legs : Brown; fore femur with a row of short bristles along posterodorsal surface and a row of bristles along posteroventral surface; fore tibia with 2 pre apical bristles on anterodorsal surface; mid femur with 2 bristles on middle portion of anterodorsal surface, a row of bristles along posteroventral surface, a row of sparse bristles along basal half of anterolateral surface, a row of long bristles along distal part of posteroventral surface at about one-third the distance from the distal part and 2 bristles on posteroventral surface medially; mid tibia with 3–4 bristles along distal part; hind femur with a row of long bristles along anterodorsal surface, a row of bristles along distal half of posteroventral surface and 1 long bristle on distal part of anterolateral surface; hind tibia with a row of bristles along posterodorsal surface at about one-third the distance from the distal end and 1 bristle on anterolateral surface.

Abdomen : Silvery grayish checkered pattern with numerous black hairs and dark basal excavation, a median vitta on second segment and the vitta usually more narrow at the third segment, fourth segment without any median vitta; first to fourth sternites light brown with numerous hairs; fifth sternite deep brownish, serrated at terminal projections and with several black hairs; hypopygium dark; genital tergites black with numerous hairs; inner forceps with more hairs than the outer forceps; penis brown; apical part of paraphallus membranous; theca and epiphallus light brown; anterior paramere with three spines of which one long and another two comparatively short; posterior paramere short; apodeme thin and slightly curved; ejaculatory apodeme spindle shaped.

Female : Body length 5.5–6.1 mm.

Head : Frons widely open and about one-third that of width of vertex; frontal vitta light brown; parafrenal with numerous proclinate short hairs along its length and with 8–9 short bristles along frontal ridge; outer vertical bristles well developed.

Thorax and legs : Similar to male.

Abdomen : Narrow and the fourth abdominal segment more darker than that of the male.

Female described here collected in couple.

Specimens examined : *Holotype* : 1♂, South 24-Parganas; Sagar Island (Bamankhali), 18.vi.2001, B. C. Nandi and Shuvra Kanti Sinha; *Paratypes* : 2♂♂, Kakdwip, 3.xi.2001, B. C. Nandi and Shuvra Kanti Sinha; *Allotype* : 1♂, Same data as *Holotype*.

Distribution : West Bengal; South 24-Parganas (Bamankhali and Kakdwip).

Discussion : This species is almost similar to *Musca (Byomya) pattoni* (Austen, 1910) but differs from it by the grayish abdomen with silvery checkered pattern. Moreover, 2+3 dorsocentral bristles present in this species.

This species is named in honour of Emden, F. I. Van of renowned Oriental Dipterologist.

Bionomics : This species was collected from cow-dung and the larvae breed therein.

6. *Musca (Byomya) pattoni* Austen

1910. *Musca pattoni* Austen, *Ann. Mag. Nat. Hist.*, (8)5 : 114.

1965. *Musca (Byomya) pattoni* : Emden, *Fauna India, Muscidae*, 7(1) : 64.

Specimens examined : 1♂, Kakdwip, 3.xi.1999; 2♂♂, Gosaba, 8.xi.2001.

Distribution : India : West Bengal (Canning, Gosaba, Kakdwip); Andhra Pradesh; Assam; Bihar; Tamil Nadu and Uttar Pradesh.

Bionomics : This species is commonly found in bazars and is attracted to sores of living and dead animals. The larvae are generally found on cow-dung.

7. *Musca (Byomya) sorbens* Wiedemann

1830. *Musca sorbens* Wiedemann, *Aussereurop, Zweifl. Insekt.*, 2 : 656.

1994. *Musca (Byomya) sorbens* : Shinonaga and Singh, *Jap. J. sanit. Zool.*, 45 : 106.

Specimens examined : 2♂♂, Baradapur, 19.x.2000; 2♂♂, Ganga Sagar, 21.xi.2000; 1♂, Bani Jungle, 20.xi.2000; 3♂♂, Jharkhali, 8.xi.2000; 1♂, Ghoramara Island, 4.xi.1999; 3♂♂, Pakhiralaya, 6.xi.2001; 1♂, Krishnagar, 4.xi.1999; 1♂, Nayajat, 8.xi.2001; 1♂, Sahara Fish Farm, 5.xi.1999.

Bionomics : This is a synanthropic species and are very common and bothersome in camps and bazars. The adults are attracted to food-stuffs, wounds, eyes on sores, lesions and diseases of human being and poultry. They feed on food-stuffs and the larvae are found in garbage, dumps and dung of different animals including human faeces and the larvae breed therein. Pont (1980) mentioned it as vector of ophthalmic diseases.

Busvine (1980) reported this species swarming over children's faces in the villages and it transmits the germs of trachoma. The larvae can be reared from dung of pig, dog, horse and cow, refuse and carcasses. Adults are frequently attracted to eye and nose and are the principal mechanical vectors of certain eye infections (ophthalmia, blepharitis and corneal ulcers) which may result in permanent damage to the eyes (Smith, 1973). They are associated with cattle or other domestic animals in the field and irritate them. This species is also a vector of hebronemiasis (Shinonaga and Kano, 1971). They can transmit the germs of tuberculosis, leprosy, yaws, streptococci and staphylococci. The larvae cause traumatic myiasis (Smith, 1973). Ishijima (1967) described its third stage larva from Japan. Greenberg (1971) reported its biological association with *Shigella dysenteriae*, *Shigella flexneri*, *Haemophilus influenzae*, *Streptococcus* sp., *Staphylococcus* sp.,

Sarcina sp., *Neisseria gonorrhoeae*, *Corynebacterium* sp., *Bacillus* sp., *Clostridium* sp., *Mycobacterium leprae*, *Mycobacterium tuberculosis*, *Treponema pertenue*, *Herpetomonas muscarum*, *Leishmania donovani*, *Leishmania tropica*, *Trypanosoma brucei*, *Trypanosoma congolense*, *Trypanosoma rhodesiense*, *Trypanosoma suis*, *Chilomastix mesnili*, *Giardia intestinalis*, *Trichomonas hominis*, *Endolimax nana*, *Entamoeba coli*, *Entamoeba histolytica*, *Iodamoeba bütschlii*, *Octosporea muscae-domesticae*, *Taeniarhynchus saginatum*, *Trichuris trichura*, *Ancylostoma* sp., *Ascaris lumbricoides*, *Habronema megastoma* and *Habronema muscae*.

Distribution : West Bengal (Bani Jungle, Baradapur, Ganga Sagar, Ghoramara Island, Jharkhali, Nayajat, Sahara Fish Farm, Pakhiralaya, Krishnagar); Andhra Pradesh; Arunachal Pradesh; Assam; Bihar; Goa; Tamil Nadu and Uttar Pradesh.

8. *Musca (Byomya) ventrosa* Wiedemann

1830. *Musca ventrosa* Wiedemann, *Aussereurop. Zweifl. Insekt.*, 2 : 565.

1994. *Musca (Byomya) ventrosa* : Shinonaga and Singh, *Jap. J. sanit, Zool.*, 45 : 107.

Specimens examined : 1♂, Mohisani Island, 22.xi.2000; 4♂♂, Bhagabatpur, 18.x.2000; 1♂, Bamankhali, 21.x.2000; 2♂♂, Sajnekhali, 6.xi.2001; 1♂, Nayajat, 8.xi.2001; 4♂♂, Jharkhali, 9.xi.2001; 6♂♂, Gosaba, 8.xi.2001.

Bionomics : This is a synanthropic and haematophagous species and the adults are available on cattle, horse and human bodies and feed on wounds, sores and tears. They are attracted to dung of different animals and the larvae breed there usually that of cow and buffalo. Ishijima (1967) described its third stage larva from Japan. Greenberg (1971) reported its biological association with *Habronema megastoma* and *Habronema muscae*.

Distribution : West Bengal (Bhagabatpur, Bamankhali, Gosaba, Mohisani Island, Nayajat, Sajnekhali, Jharkhali); Andhra Pradesh; Arunachal Pradesh; Assam; Bihar; Tamil Nadu and Uttar Pradesh.

9. *Musca (Eumusca) hervei* Villeneuve

1922. *Musca hervei* Villeneuve, *Ann. Sci. nat. Zool.*, 10(5) : 335.

1965. *Musca (Eumusca) hervei* : Emden, *Fauna India, Muscidae*, 7(1) : 75.

Specimens examined : 5♂♂, Sandeshkhali, 11.xi.2001; 2♂♂, Chotta Mollakhali, 7.xi.2001; 1♂, Gosaba, 8.xi.2001.

Bionomics : This is a haematophagous species and is generally found on cattle, horses and cow-dung. It feeds on wounds and tears of cattle. This species is oviparous and the eggs are laid in patches on fresh cow-dung in the field. It was reported as vector of *Thalazia* sp. (Shinonaga and Kano, 1971).

Distribution : West Bengal (Darjeeling, Chotta Mollakhali, Gosaba, Sandeshkhali); Assam; Himachal Pradesh; Punjab; Sikkim and Uttar Pradesh.

Tribe HYDROTAEINI

10. *Orthellia timorensis* (Robineau-Desvoidy)

1830. *Lucilia timorensis* Robineau-Desvoidy, *Essai Myodaires*, 2(2) : 460.

1977. *Orthellia timorensis* : Pont, *Cat. Orient. Diptera*, 3 : 465.

Specimens examined : 1♂, Beguakhali (Sagar Island), 1.xi.2001; 1♂, Gosaba, 8.xi.2001; 2♂♂, Sajnekhali, 6.xi.2001; 1♂, Sandeshkhali, 11.xi.2001; 1♂, Bhagabatpur, 18.x.2001; 1♂, Canning, 7.xi.2001; 1♂, Ganga Sagar, 20.viii.2001; 1♂, Baradapur, 19.x.2000; 9♂♂, Basanti, 12.xii.2001.

Bionomics : This species is generally found on cattle dung, human faeces and also often available on plants and houses.

Distribution : West Bengal (Baradapur, Basanti, Beguakhali, Bhagabatpur, Canning, Ganga Sagar, Gosaba, Sajnekhali, Sandeshkhali); Andhra Pradesh; Arunachal Pradesh; Assam; Bihar; Kerala; Sikkim; Tamil Nadu and Uttar Pradesh.

11. *Neomyia indica* (Robineau-Desvoidy)

1830. *Lucilia indica* Robineau-Desvoidy, *Essai Myodaires*, 2(2) : 453.

1965. *Orthellia indica* : Emden, *Fauna India, Muscidae*, 7(1) : 126.

1994. *Neomyia indica* : Shinonaga and Singh, *Jap. J. sanit. Zool.*, 45 : 115.

Specimens examined : 1♂, Baradapur, 19.x.2000; 1♂, Bhagabatpur, 18.x.2000; 11♂♂, Beguakhali (Sagar Island), 13.ii.2001; 1♂, Ganga Sagar, 20.viii.2000; 2♂♂, Ghoramara Island, 1.ii.2001; 4♂♂, Canning, 7.ii.2001.

Bionomics : The species is generally found on dung of cattle and horse and the larvae breed therein. It is also found on human excrement.

Distribution : West Bengal (Baradapur, Bhagabatpur, Beguakhali, Canning, Ganga Sagar, Ghoramara Island); Andhra Pradesh; Assam; Bihar; Madhya Pradesh; Maharashtra; Tamil Nadu and Uttar Pradesh.

12. *Neomyia lauta* (Wiedemann)

1830. *Musca lauta* Wiedemann, *Aussereurop. Zweifl. Insekt.*, 2 : 410.

1965. *Orthellia lauta* : Emden, *Fauna Inaia, Muscidae*, 7(1) : 128.

1994. *Neomyia lauta* : Shinonaga and Singh, *Jap. J. sanit. Zool.*, 45 : 116.

Specimen examined : 1♂, Bhagabatpur, 18.x.2000.

Distribution : West Bengal (Bhagabatpur); Andhra Pradesh; Assam; Bihar; Madhya Pradesh; Maharashtra; Tamil Nadu and Uttar Pradesh.

Bionomics : This species is commonly found on cow-dung, dead animals and meat and breed therein.

Subfamily PHAONIINAE

Tribe PHAONIINI

13. *Synthesiomyia nudiseta* (van der Wulp)

1883. *Cyrtoneura nudiseta* Wulp, *Tijdschr. Ent.*, 26 : 42.

1965. *Synthesiomyia nudiseta* : Emden, *Fauna India, Muscidae*, 7(1) : 192.

Specimens examined : 6♂♂, Namkhana, 4.xi.2001.

Bionomics : The species is generally found on decaying vegetables. It is also attracted to carcasses and dead molluscs but rarely enters houses. The larvae breed in various animals and vegetable materials like human and animal cadavers, decaying cotton seeds, dead locusts, faeces and kitchen refuse and generally develop on carrion and human faeces. Greenberg (1971) reported its biological association with Poliovirus, *Escherichia coli* and *Shigella dysenteriae*. This species has been recorded as involved in secondary wound myiasis (James, 1947) but has little hygienic significance. The larvae form cocoon gallery on dried grasses, pieces of wood and sands.

Distribution : West Bengal (Bhawanipore, Kolkata, Namkhana).

14. *Ophyra leucostoma* (Wiedemann)

1817. *Anthomyia leucostoma* Wiedemann, *Zool. Mag. Keil.*, (1)1 : 82.

1965. *Ophyra leucostoma* : Emden, *Fauna India, Muscidae*, 7(1) : 302.

Specimens examined : 3♂♂, Canning, 7.ii.2001; 1♂, Mohisani Island, 22.xi.2001; 4♂♂, Sajnekhali, 6.xi.2001; 7♂♂, Beguakhali (Sagar Island), 13.ii.2001; 1♂, Bhagabatpur, 18.x.2000; 2♂♂, Chotta Mollakhali, 1.ii.2001; 2♂♂, Gosaba, 8.xi.2001; 2♂♂, Jharkhali, 9.xi.2001; 1♂, Basanti, 11.xi.2001; 2♂♂, Chandanpiri, 20.x.2000.

Bionomics : This is a synanthropic species. They are generally available on decaying animals and vegetable matters and the larvae breed in garbages, privies, decaying vegetables and dead animals. The larvae are coprophagous or saprophagous and are found on faeces, carrion, garbages and privies. Ishijima (1967) described its third stage larva from Japan. Greenberg (1971) reported its biological association with Poliovirus, *Alcaligenes faecalis*, *Flavobacterium devorans*, *Flavobacterium invisible*, *Escherichia coli*, *Aerobacter aerogenes*, *Klebsiella cloacae*, *Serratia marcescens*, *Proteus inconstans*, *Proteus morgani*, *Proteus rettgeri*, *Proteus mirabilis*, *Proteus vulgaris*, *Citrobacter freundii*, *Staphylococcus afermentans*, *Staphylococcus lactis*, *Staphylococcus aureus*, *Staphylococcus saprophyticus*, *Streptococcus durans* and *Bacillus cereus* var. *mycoides*.

Distribution : West Bengal (Basanti, Beguakhali, Bhagabatpur, Canning, Chandanpiri, Chotta Mollakhali, Gosaba, Jharkhali, Mohisani, Sajnekhali); Kashmir.

15. *Gymnodia tonitrui* (Wiedemann)

1824. *Anthomyia tonitrui* Wiedemann, *Anal. ent.*, 1824 : 52.

1965. *Gymnodia tonitrui* : Emden, *Fauna of India, Muscidae*, 7(1) : 631; 1977. Pont, *Cat. Orient. Diptera*, 3 : 475.

Specimens examined : 2♂♂, Bamankhali, 8.vii.2001.

Bionomics : This species is abundantly available on faeces and in low bush adjacent to native village.

Distribution : West Bengal (Bamankhali); Andhra Pradesh; Assam; Himachal Pradesh; Madhya Pradesh; Maharashtra and Uttar Pradesh.

Subfamily STOMOXYINAE

16. *Stomoxys calcitrans* (Linnaeus)

1758. *Conops calcitrans* Linnaeus, *Syst. Nat.*, 10(1) : 604.

1965. *Stomoxys calcitrans* : Emden, *Fauna India, Muscidae*, 7(1) : 160; 1994. Shinonaga and Singh, *Jap. J. sanit. Zool.*, 45 : 142.

Specimens examined : 2♂♂, Bamankhali, 8.vii.2001; 2♂♂, Bhagabatpur, 18.xi.2000; 2♂♂, Gosaba, 8.xi.2001.

Bionomics : This species generally bites man and cattle and also on other domestic animals such as dogs, horses and occasionally birds if no other blood source is available. It may reduce milk yield of cattle by 25%, or as much as 40–60% (Greenberg, 1973). The larvae develop on animal faeces or decaying vegetable material and they on rare occasions produce gastric and traumatic myiasis (James, 1947). Greenberg (1971) reported its biological association with Poliovirus, *Pseudomonas aeruginosa*, *Vibrio comma*, *Escherichia coli*, *Escherichia freundii*, *Escherichia intermedia*, *Aerobacter aerogenes*, *Aerobacter cloacae*, *Serratia marcescens*, *Proteus vulgaris*, *Salmonella blockley*, *Salmonella paratyphi*, *Salmonella typhi*, *Shigella dysenteriae*, *Pasteurella multocida*, *Pasteurella pestis*, *Pasteurella tularensis*, *Brucella abortus*, *Brucella melitensis*, *Brucella suis*, *Bacteroides vulgatus*, *Staphylococcus aureus*, *Diplococcus pneumoniae*, *Streptococcus durans*, *Streptococcus faecium*, *Erysipelothrix insidiosa*, *Bacillus anthracis*, *Bacillus mesentericus*, *Bacillus subtilis*, *Bacillus thuringiensis*, *Clostridium botulinum*, *Mycobacterium leprae*, *Dermatophilus congolensis*, *Spirochaeta stomoxyae*, *Borrelia anserina*, *Borrelia berbera*, *Borrelia recurrentis*, *Leptospira conicola*, *Leptospira grippotyphosa*, *Colesiota conjunctivae*, *Anaplasma marginale*, *Entomophthora muscae*, *Crithidia haematopota*, *Leishmania mexicana*, *Leishmania tropica*, *Leptomonas stomoxyae*, *Trypanosoma brucei*, *Trypanosoma congolense*, *Trypanosoma equinum*, *Trypanosoma evansi*, *Trypanosoma gambiense*, *Trypanosoma rhodesiense*, *Trypanosoma vivax*, *Entamoeba histolytica*, *Eimeria irresidua*, *Eimeria perforans*, *Toxoplasma gondii*, *Choanotaenia*

infundibulum, *Echinolepis carioca*, *Rhabditis axei*, *Habronema megastoma*, *Habronema microstoma*, *Habronema muscae* and *Setaria cervi*.

Distribution : West Bengal (Bamankhali, Bhagabatpur, Canning, Gosaba); Andhra Pradesh; Arunachal Pradesh; Assam; Bihar; Goa; Kerala; Orissa; Sikkim; Tamil Nadu and Uttar Pradesh.

A BRIEF DISCUSSION ON THE IMPACT OF SPECIES ON MAN AND ANIMALS

Some of the muscid flies are blood sucker and play an important role in the transmission of filarial diseases of poultry and cattle. Few species are pests of cattle due to irritation caused to the animals by the habit of feeding in number in the body. We have observed their restlessness is due to a number of flies in and around the cattle-sheds and in the grazing centers and the species involved for this nuisance are *Musca (Musca) domestica vicina* and *Musca (Byomya) sorbens*. Different types of protozoa and helminthes parasites like *Giardia intestinalis*, *Trichuris trichura* and *Ancylostoma duodenalis*, etc. are mechanically transmitted from infected persons, excrement, vomiting drops, etc. to human food through their appendages, hairs, bristles which feed on such media and the species involved for dissemination are *Musca (Musca) domestica vicina*, *Musca (Byomya) sorbens* and *Ophyra leucostoma*. They have also considerable importance as mechanical carriers during epidemic of intestinal diseases like cholera, bacillary and amoebic dysentery and bacterial diseases (diarrhoea and summer dysentery) and the people of this Biosphere Reserve are most sufferers due to non-hygenic conditions of the localities. *Stomoxys calcitrans* is very dangerous causing a wide loss of milk production besides transmitting various types of bacteria, viruses, protozoa and helminthes. Some larvae cause diarrhoea with discharge of blood from the infected persons due to injury of intestinal mucosa and as a result vertigo and less violent pain in the abdomen occur. Few larvae develop in the human digestive tract after being ingested along with contaminated food causing vomiting and fever. A few larvae cause intestinal or wound myiasis in man and domestic animals. A very few larvae are parasite in the mouth, ear, eye and nose causing extensive facial tissue destruction besides the genital organ of man and other animals. We do not come across the larvae of wild animals due to difficulties of examining them on their bodies. A few larvae of the flies develop in dead fishes which are kept for drying up in fish processing centers causing less production of dried fishes. The species involved is *Musca (Musca) domestica vicina* and due to their high density a great loss of dried fishes was observed by Sinha and Nandi (2003). The loss of dried fishes is a great havoc for the people in the fish processing centres of this Biosphere Reserve and careful survey should be conducted for proper maintenance of the dried fish industry. A few larvae can be used for the purpose of medicolegal cases which might help in establishing the approximate time of death of a person in murder case.

ABBREVIATIONS USED IN THE TEXT

ac—acrostichal bristles, *dc*—dorsocentral bristles, *h*—humeral bristles, *ia*—intraalar bristles, *mpl*—mesopleural bristles, *np*—notopleural bristles, *pa*—postalar bristles, *ph*—posthumeral bristles, *ps*—presutural bristles, *sa*—supraalar bristles, *st*—steernopleural bristles.

SUMMARY

Systematic position of 16 species of muscid flies under 7 genera from Sundarbans Biosphere Reserve and their bionomics and distributional records from India are included. One new species *Musca (Byomya) emdeni* is described and illustrated. A note on their impact on man and animals is also added.

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