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BLOW FLIES (DIPTERA : CALLIPHORIDAE) OF WEST BENGAL, INDIA WITH A NOTE ON THEIR BIODIVERSITY

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INTRODUCTION

The blow flies are of medical, verterinary, sanitary, forensic and agricultural importance and are distributed in all zoogeographical regions. They have a great potential role in transmitting various types of viruses, bacteria, fungi, protozoans, helminthes which cause summer diarrhea, bacillary and amoebic dysentery, poliomyelitis, cholera, plague and tuberculosis (Greenberg, 1971). They are regarded as the greatest hygienic important flies as because they are attracted and breed in different kinds of dead bodies, garbages, excreta of different animals and thus make public hazards by transmitting various pathogens mechanically from putrefaction materials to human food.

Most of the larvae of this flies are omnivorous, carnivorous or parasitic and cause myiasis in different parts of man and animals (James, 1947; Dasgupta, 1962; Zumpt, 1965). Some larvae are useful in detecting the approximate time of death of a person in murder case and thus help in forensic science (Smith, 1986). Few larvae are parasitic or predator on earthworms, snails, locusts, toads and frogs (Draber-Mónko, 1981). A very few sterile larvae have been used in surgery for treating tubercular abscesses and complex fractures (Busvine, 1980). A few larvae are also causative agents for the loss of dried fish industry and various kinds of meat products (Esser, 1991).

Very little work has been done on this group from India particularly from West Bengal in comparison to other parts of the world. Senior-White *et al.* (1940) reported few species from this area. Datta (1991a, b; Datta *et al.*, 1997) recorded few species from West Bengal. Nandi (1994, 1997) studied this flies from Kolkata and Darjeeling and added few species to the fauna of West Bengal.

MATERIAL AND METHOD

The author collected most of the flies with the help of butterfly net from different parts of West Bengal in different seasons (Vide Map). They were mainly collected from dead bodies and excreta of different animals, fish market, meat shop, garbages, decaying materials, bushes and flowering

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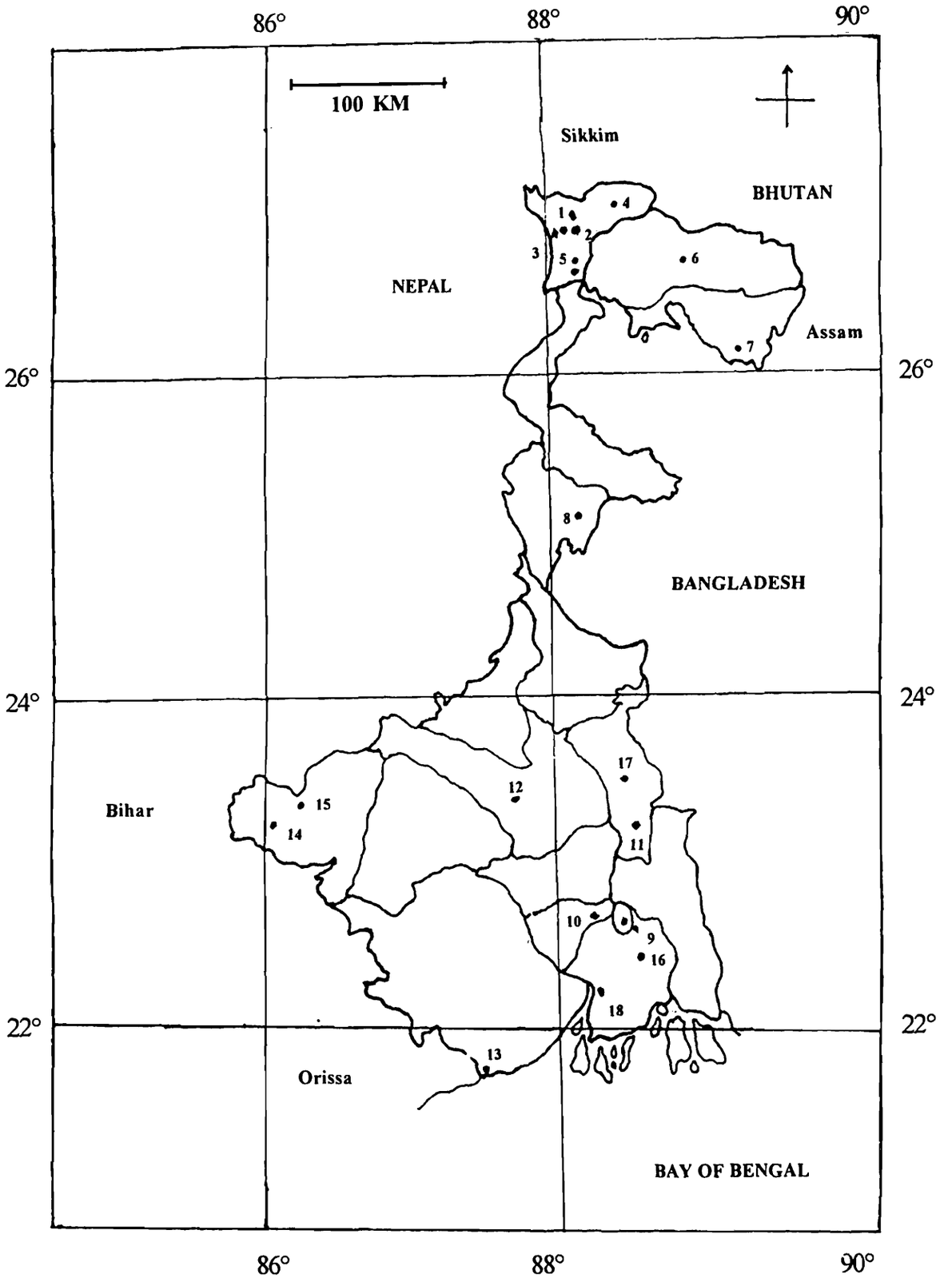
MAP OF WEST BENGAL SHOWING COLLECTION SPOTS



1. Darjeeling Padmaja Naidu Himalayan Zoological Park, 2. Kurseong, 3. Senchal Lake, 4. Kalimpong, 5. Siliguri, 6. Rajabhatkhawa, 7. Coochbehar, 8. Malda, 9. Kolkata, 10. Shibpur Botanical Garden, 11. Ranaghat Hijuli Forest, 12. Burdwan, 13. Digha, 14. Bundwan, 15. Purulia, 16. Budge Budge, 17. Krishnagar, 18. Diamond Harbour.

plants. Genitalia characters were taken as the main criteria for identification of the species besides chaetotaxy and the classification followed here is after Schumann (1986) and Rognes (1991). A total of 41 species under 17 genera are included.

SYSTEMATIC ACCOUNT

Subfamily AMENIINAE

Tribe **Catapicephalini**

1. ***Catapicephala pattoni*** Senior-White, Aubertin and Smart

This is generally a forest species and can be collected from decaying leaves and bushes. It is distributed in West Bengal (Kalighat, Ranaghat Hijuli Forest) and Uttar Pradesh.

Tribe **Ameniini**

2. ***Silbomyia asiatica*** Crosskey

This is generally a forest species. Crosskey (1965) first reported it from Mungpoo, Darjeeling. No biological data was mentioned and it is distributed in Darjeeling only.

Subfamily CALLIPHORINAE

Tribe **Calliphorini**

3. ***Aldrichina grahami*** (Aldrich)

This is generally a mountainous species. Adults are oviparous, saprophagous and are attracted to carrion and animal dung. They are associated with man and carry various types of viruses. The larvae are scavengers, breed in faecal matters, carrion and other decaying garbages and the species can be reared on raw meat in the laboratory. It is distributed in West Bengal (Darjeeling); Bhutan; Callifornia; China; East Siberia; Hawaiian Islands; Hong Kong; Japan; Korea; Mexico; North and West America; Pakistan; Russia and Taiwan.

4. ***Calliphora (s. str.) pattoni*** Aubertin

Adults are larviparous and can be collected from bushes and flowering plants. It is distributed in West Bengal (Darjeeling, Kalighat, Kurseong, Lebong, Rajabhatkhawa, Senchal Lake area), Meghalaya, Sikkim; China; Myanmar; Nepal; Taiwan and Thailand.

5. ***Calliphora (s. str.) vicina*** Robineau-Desvoidy

Adults are oviparous and are attracted to garbages, decaying fruits, carrion, human faeces and different kinds of dead bodies including human corpse. They are associated with man and carry

various types of bacteria, viruses, protozoans and helminthes causing intestinal disorders to human beings. The larvae can be reared on raw meat in the laboratory. They cause intestinal and urinary myiasis and are also involved in forensic science. It is distributed in West Bengal (Alipurduar, Birpara, Darjeeling, Kalimpong, Kurseong, Rajabhatkhawa), Himachal Pradesh, Sikkim, Uttar Pradesh; Australia; Canary Islands; China; Hainan Islands; Hawaiian Islands; Japan; Mauritius; Mongolia; Nepal; New Zealand; Pakistan; Russia; Saudi Arabia; South Africa and USA.

6. ***Calliphora (s. str.) vomitoria*** (Linnaeus)

Adults are oviparous and are attracted to garbages, carrion and excreta of different animals. This species is associated with various types of viruses, bacteria and protozoans. The larvae are scavengers, found in corpse, privies and garbages and breed in dead animals, human faeces and other animal dung. They act as secondary myiasis producer and are also involved in forensic science. It is distributed in West Bengal (Darjeeling, Senchal Lake area, Sukna), Himachal Pradesh, Meghalaya, Sikkim; Afghanistan; Australia; Bhutan; Canary Islands; China; Europe; Hainan Islands; Hawaiian Islands; Hong Kong; Japan; Korea; Manchuria; Mongolia; Morocco; Nepal; New Zealand; North America; Philippines; Russia; Sweeden; Taiwan and Thailand.

Subfamily BENGALIINAE

Tribe **Bengaliini**

7. ***Bengalia labiata*** Robineau-Desvoidy

This is generally a forest species and can be collected from bushes and decaying leaves near termite mound. Adults are aggressive predators and feed on ant pupae. It is distributed in West Bengal (Ranaghat Hijuli Forest), Sikkim; Bangladesh; Indonesia; Malaysia; Sumatra and Thailand.

8. ***Bengalia surcoufi*** Senior-White

This is a forest species and can be collected from decaying leaves and bushes near termite mound. It is distributed in West Bengal (Mungpoo, Nagrakata, Senchal Lake area, Sukna Forest), Assam, Karnataka, Kerala, Meghalaya, Pondichery, Sikkim, Tamil Nadu, Uttar Pradesh and Nepal.

9. ***Bengalia torosa*** (Wiedemann)

Adults are oviparous, forest species and can be collected from decaying leaves near termite mound. It is parasitic on ant pupae and was recorded to rear it from soil. It is distributed in West Bengal (Alipurduar, Buxa, Jainti, Kalchini, Rajabhatkhawa, Ranaghat), Karnataka, Kerala, Pondichery, Sikkim, Tamil Nadu, Uttar Pradesh; Australia; Bangladesh; Indonesia; Japan; Laos; Malaysia; Nepal; Pakistan; Philippines; South China; Sri Lanka; Taiwan and Thailand.

Subfamily LUCILIINAE

Tribe **Luciliini**

10. ***Hemipyrellia ligurriens*** (Wiedemann)

Adults are oviparous, mostly found in fish market and can be collected from garbages and carcases. The larvae are scavengers or parasitic on other animals and breed in dung, carcases, human faeces and other decomposed organic matters. It is distributed in West Bengal (Bijanbari, Burdwan, Buxa, Budge Budge, Kalimpong, Kalyani, Kolkata, Madarihat, Ranaghat, Shibpur, Siliguri, Sukna Forest), Bihar, Sikkim, Tamil Nadu; Australia; Amboina; Bangladesh; Bhutan; China; Indonesia; Japan; Korea; Malaysia; Micronesia; New Britain; New Guinea; Nepal; New Ireland: New Zealand; Pakistan; Philippines; Samoa; Sri Lanka; Taiwan and Thailand.

11. ***Hemipyrellia pulchra*** (Wiedemann)

Adults are oviparous and are attracted to dead animals, garbages and sometimes to flowering plants and fruits. The larvae develop in human faeces, decaying carcases and garbages. It is distributed in West Bengal (Jaigoan), Bihar, Orissa, Pondichery, Punjab, Tamil Nadu, Uttar Pradesh; Indonesia; Malaysia; Nepal and Thailand.

12. ***Lucilia ampullacea*** Villeneuve

Adults are scavengers and are attracted to garbages and excreta of different animals. The larvae feed on deed animals, animal excreta and can be reared in the laboratory from fish, horseflesh and excreta of different animals. It is distributed in West Bengal (Darjeeling, Siliguri, Sukna Forest), Kerala; Algeria; Australia; Austria; China; Europe; Japan and Korea.

13. ***Lucilia bazini*** Séguy

Adults are attracted to carrion and can be collected from dead bodies of different animals. The larvae can not be reared from decomposed animals but it was reported to be parasitic on insects and other vertebrates. It is distributed in West Bengal (Shibpur Botanical Garden); China; East Siberia; Korea; Japan; Malaysia; Russia and Taiwan.

14. ***Lucilia cuprina*** (Wiedemann)

Adults are oviparous and are attracted to different kinds of dead bodies, garbages and animal dung. They are potential vector of enteric pathogens and are associated with various types of bacteria, protozoans and helminthes. The larvae are scavengers, feed on animal matters producing myiasis in man and other animals and can be reared from fish in the laboratory. It is distributed in West Bengal (Alipurduar, Jaigoan, Kalyani, Rajabhatkhawa, Ranaghat, Sealdah) and almost

cosmopolitan distribution in India; Afghanistan; Australia; Myanmar; Chagos Islands; China; Cuba; Egypt; Europe; Hawaiian Islands; Indonesia; Japan; Kenya; Korea; Kiribati; North and South America; Pakistan; Saudi Arabia; Secylles; Singapore; South Pacific; Sumatra; Taiwan and Uganda.

15. *Lucilia illustris* (Meigen)

Adults are oviparous and found in animal carcases and garbages. The larvae are mostly scavengers and frequently occur in garbages, sometimes may be parasitic on some moths. They are associated with few viruses and cause severe form of myiasis in human beings, and wound, ulcer and subdermal myiasis in other vertebrates also. It is distributed in West Bengal (Darjeeling, Jalpaiguri, Kolkata, Senchal Lake area, Siliguri), Sikkim; Australia; Bhutan; Europe; Japan; Korea; Manchuria; Myanmar; North America and Siberia.

16. *Lucilia papuensis* Macquart

Adults are oviparous and generally found in forests. They are mostly gathered on earthworms and other vertebrate's dead bodies. But James (1971) recorded it from mursupial skull and human excrement. Nothing is known regarding its larval development. It is distributed in West Bengal (Ranaghat), Arunachal Pradesh, Kashmir, Kerala; Amboina; Australia; Bangladesh; Bhutan; Celebes; China; Indonesia; Japan; Korea; Malaysia; Nepal; Papua New Guinea; Philippines; Taiwan and Thailand.

17. *Lucilia porphyrina* (Walker)

Adults are oviparous, saprophagous, attracted to decaying matters and dead bodies of different animals and frequently found in human dwellings. They are associated with various types of protozoans. The larvae are scavengers producing myiasis in different parts of vertebrate animals, feed on decaying matters and breed in carcases of birds and other animals. It is distributed in West Bengal (Burdwan, Coochbehar, Rajabhatkhawa, Ranaghat, Shibpur Botanical Garden), Arunachal Pradesh, Assam, Himachal Pradesh, Kashmir, Sikkim; Australia; Bhutan; Borneo; China; Korea; Indonesia; Japan; Malaysia; Nepal; New Britain; Papua New Guinea; Philippines; Sri Lanka; Taiwan and Thailand.

18. *Lucilia sericata* (Meigen)

Adults are oviparous, scavengers and typically a domestic species. They can be collected from decaying matters, carrion, open wounds, faeces, fruits and foods in the market. They are associated with various types of viruses, bacteria, protozoans and helminthes. The larvae are serious pests of sheep in Australia and can be reared on fish in the laboratory. It has also forensic importance. The larvae cause myiasis in different parts of animals and the sterile larvae have been used earlier in

surgery (Pont, 1980). It is distributed in West Bengal (Kalimpong, Malda, Siliguri, Sukna, Takvar); Australia; Easter Island; Europe; Hawaiian Islands; Marshall Islands; Pakistan; Sri Lanka; Volcano Islands; Wake Islands and almost cosmopolitan in distribution.

Subfamily CHRYSOMYINAE

Tribe **Chrysomyini**

19. ***Chrysomya bezziana*** Villeneuve

Adults are found in bushes and leaves. The larvae never breed in carrion or decomposed matters but produce myiasis in man and domestic animals. It is distributed in West Bengal (Budge Budge, Burdwan, Kolkata, Shibpur Botanical Garden), Arunachal Pradesh; Africa; Bismark Archipelago; Indonesia; Malaysia; Philippines and Sri Lanka.

20. ***Chrysomya megacephala*** (Fabricius)

Adults are oviparous, saprophagous and are attracted to dead fishes, human excreta, carcases and sweets. They are associated with various types of viruses, bacteria, protozoans and helminthes. The larvae are scavengers and feed on decaying matters. They produce myiasis in different parts of man and domestic animals and can be reared on dead animals in the laboratory. They are serious pest of fish products. It is distributed in West Bengal (Alipurduar, Bijanbari, Diamond Harbour, Digha, Jaigoan, Jayanti, Kalyani, Kolkata, Kurseong, Malda, Ranaghat, Rajabhatkhawa, Panitanki, Shibpur Botanical Garden, Siliguri, Singla Bazar, Sukna Forest, Sikkim, Tamil Nadu; Bhutan and almost cosmopolitan in distribution.

21. ***Chrysomya pinguis*** (Walker)

Adults are forest species and rarely enter houses in search of foods. The larvae breed in carcases of birds and other animals including garbages. It is distributed in West Bengal (Darjeeling), Assam, Arunachal Pradesh, Himachal Pradesh, Meghalaya, Tamil Nadu; Bangladesh; China; Hainan Islands; Indonesia; Japan; Korea; Malaysia; Nepal; Philippines; Sri Lanka; Thailand and Taiwan.

22. ***Chrysomya rufifacies*** (Macquart)

Adults are viviparous, saprophagous and are attracted to garbages, dead bodies of different animals and excreta of man. They are associated with various types of bacteria, protozoans and helminthes. The larvae are primarily scavengers but may be predator on other dipteran larvae also. They can be reared on meat in the laboratory. The larvae produce secondary myiasis in different animals. It is distributed in West Bengal (Alipurduar, Bijanbari, Jaigoan, Kalyani, Kurseong, Madarihat, Rajabhatkhawa, Ranaghat, Panitanki, Sealdah, Shibpur, Singla Bazar, Siliguri), Nicobar Islands, Sikkim; Bangladesh and almost cosmopolitan in distribution.

Subfamily MELANOMYINAE

23. ***Melinda bengalensis*** Nandi

Adults are attracted to flowering plants and can be collected from flowers and bushes. It is distributed in West Bengal (Shibpur Botanical Garden).

24. ***Melinda scutellata*** (Senior-White)

Adults are oviparous, generally attracted to flowering plants and can be collected from flowers and bushes. It is distributed in West Bengal (Birpara, Mungpoo), Sikkim, Meghalaya; Malaysia; Myanmar and Nepal.

Subfamily POLLENIINAE

Tribe **Polleniini**

25. ***Onesia (Melindopsis) khasiensis*** (Senior-White)

Adults are oviparous and can be collected from flowering plants. It is distributed in West Bengal (Darjeeling, Lebong), Assam, Meghalaya, Sikkim; Bangladesh and Malaysia.

26. ***Dexopollenia testacea*** (Townsend)

Adults are oviparous and can be collected from bushes and flowering plants. A few larvae are parasitic on Lepidoptera. It is distributed in West Bengal (Bijanbari, Darjeeling, Jaigoan, Sukna Forest), Assam and Nepal.

27. ***Polleniopsis pilosa*** Townsend

Adults are oviparous and can be collected from bushes, decaying leaves and flowering plants. It is distributed in West Bengal (Darjeeling, Kalimpong, Sukna Forest), Assam, Bihar and Meghalaya.

Subfamily RHINIINAE

Tribe **Rhiniini**

28. ***Stomorhina discolor*** (Fabricius)

Adults are found in forest and can be collected from flowering plants. The larvae seem to be predacious, attack other larvae and feed on them and the larvae breed in termite nests. It is distributed in West Bengal (Darjeeling, Sukna Forest), Arunachal Pradesh, Assam, Sikkim; Australia; Bangladesh; Borneo; China; Fiji; Hawaiian Islands; Indonesia; Irian Jaya; Malaysia; Nepal; New Caledonia; Pakistan; Papua New Guinea; Philippines; Sri Lanka; Taiwan and Thailand.

29. ***Stomorhina procula*** (Walker)

Adults are collected from bushes and flowering plants. It is distributed in West Bengal (Darjeeling), Assam, Tamil Nadu; Africa; Borneo; China; Malaysia; Myanmar; Philippines and Queensland.

30. ***Idiella euidielloides*** (Senior-White)

Adults are forest species and can be collected from bushes and flowering plants. It is distributed in West Bengal (Darjeeling), Assam, Meghalaya, Orissa, Kerala, Sikkim; Irian Jaya; Malaysia; Philippines; Sri Lanka; Taiwan and Thailand.

31. ***Idiella mandarina*** (Wiedemann)

Adults are forest species and can be collected from flowering plants and bushes. Some larvae are sangunivorous. It is distributed in West Bengal (Darjeeling), Assam, Bihar, Gujarat, Haryana, Kerala, Madhya Pradesh, Maharashtra, Orissa, Uttar Pradesh; Bangladesh; China; Indonesia; Key Islands; Malaysia; Myanmar; Sri Lanka; Taiwan and Thailand.

32. ***Idiella tripartita*** (Bigot)

Adults are collected from flowering plants and bushes. It is parasitic on vertebrates and blood sucker of pig and sometimes also attack white mouse and pupa of ant. It is distributed in West Bengal (Darjeeling), Sikkim; China; Nepal and Philippines.

33. ***Rhinia apicalis*** (Wiedemann)

Adults are collected from flowering plants. It is distributed in West Bengal (Darjeeling), Gujarat, Maharashtra, Meghalaya, Nicobar Islands; Australia; Canary Islands; Fiji; Hawaiian Islands; Irian Jaya; Philippines and Solomon Islands.

34. ***Rhinia mallochi*** (Senior-White, Aubertin and Smart)

Adults are collected from bushes and flowering plants. It is distributed in West Bengal (Budge Budge, Kalimpong, Kolkata, Krishnagar, Purulia, Sukna Forest) and Sikkim.

35. ***Metallea setosa*** (Townsend)

Adults are collected from flowering plants and bushes. It is distributed in West Bengal (Kurseong, Siliguri); China; Malaysia; Myanmar; Nepal; Singapore; Taiwan and Tibet.

36. ***Isomyia ditissima*** (Walker)

Adults are collected from flowering plants and bushes. It is distributed in West Bengal (Darjeeling); Indonesia; Myanmar; New Guinea; Philippines and Thailand.

37. ***Isomyia flavicornis*** (Bigot)

Adults can be collected from flowering plants. It is distributed in West Bengal (Darjeeling, Kolkata), Assam, Bihar, Maharashtra, Meghalaya; Bangladesh; Borneo; Malaysia; Irian Jaya; Nepal and Sri Lanka.

38. ***Isomyia malayensis*** (Townsend)

Adults can be collected from flowering plants and bushes. It is distributed in West Bengal (Darjeeling, Lebong, Sukna Forest), Sikkim; Malaysia and Singapore.

39. ***Isomyia nebulosa*** (Townsend)

Adults can be collected from flowering plants. It is distributed in West Bengal (Darjeeling), Assam; Laos and Myanmar.

40. ***Isomyia phryxea*** (Séguy)

Nothing is known regarding its bionomics and the specimen was not available for study. It is distributed in West Bengal (Kurseong).

41. ***Isomyia viridana*** (Townsend)

This species can be collected from flowering plants. It is distributed in West Bengal (Kolkata) and Assam.

NOTE ON BIODIVERSITY

The genus *Aldrichina* is totally mountaneous species and has less speciation. The adults are oviparous, saprophagous and the larvae have diversified habitats living on excreta and dead bodies of different animals. They carry the germs of various diseases and take part in major role in public health.

The species of the genera *Calliphora, Chrysomya, Lucilia* and *Hemipyrellia* have diversified habitats and mostly are synanthropic, few are forest habitants and are generally attracted to garbages, dead bodies of different vertebrate animals and the larvae are found therein. They carry the various types of viruses, bacteria, protozoans and helminthes and have public interest in transmission of enteric diseases. They have also medical, hygienic and forensic importances and most of them are oviparous and few are larviparous. The larvae mostly develop in meat and fish and many of them produce myiasis in man and wild or domestic animals. These genera have wide diversification in speciation.

Species of the genera *Bengalia, Catapicephala* and *Silbomyia* are mostly forest species and found in decaying leaves and bushes. Species of *Bengalia* are found in termite mound and are

aggressive predators feeding on pupae and hover the adult termites. Sometimes they snatched the prey from the ant (Pont, 1980). *Bengalia* has rich in speciation in comparison to *Catapicephala* and *Silbomyia*.

Species of the genera *Onesia, Metallea, Idiella, Rhinia, Isomyia* and *Stomorhina* are forest species and are attracted to flowers rather than dead bodies of different animals. Kurahashi and Tumrasvin (1992) reported their association with Hymenoptera, Isoptera and Orthoptera. Their most important role is in pollination. One species of *Rhinia* has been reared from nest of sand-wasp. Larvae of *Stomorhina* breed in termite nest and are predaceous or predator on eggs capsule of locust. A few larvae of *Idiella* are sanguinivorous and are mostly found in decaying garbages and meat. *Idiella* and *Isomyia* have more diversity in speciation in comparison to *Rhinia* and *Metallea*. Few larvae of *Onesia* are parasitic or predator on earthworms and snails. *Onesia* and *Metallea* have less speciation.

Species of the genera *Pollenia* and *Melinda* are attracted to flowering plants besides decaying leaves and bushes. Their larvae are found in garbages and decaying meat. The larvae of the former genus are parasitic on Lepidoptera but the later genus are on land snails. *Melinda* has less speciation than *Pollenia*. They are important in pollination.

Species of the genus *Polleniopsis* is attracted to flowering plants and help in pollination. Nothing is known regarding their larvae. The adults are viviparous and the genus has less speciation.

West Bengal is very much rich in faunal diversification due to its variety of biogeographic features and ecological diversity and it is expected that more known and unknown species will be available in near future if thorough faunistic survey is done from different parts of this state of India. The study of this group and their biological diversity will not only help the taxonomists but will be helpful for the medical and veterinary practitioners and forensic entomologists.

SUMMARY

This paper deals with the systematic position of 41 species of calliphorid flies, most of them collected from different parts of West Bengal in different seasons. Biological diversity and distributional records of the species from West Bengal as well as from rest of the world are included. A note on biodiversity of the species under each genera are also incorporated.

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