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Chaetotaxy: An Important Tool in Taxonomic Studies of Blowflies (Diptera: Calliphoridae)

Dr Inderpal Singh Sidhu[1*]

[1]PG Department of Zoology, SGGS College, Sector 26, Chandigarh -160019,
Corresponding Author (email - inderpalsidhu76@yahoo.co.in)

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Abstract

Taxonomy, as a discipline, is the only science that provides a vivid picture of the existing biodiversity. Simpson (1945) described the importance of taxonomy in following words: "Taxonomy is at the same time most elementary and most inclusive part of zoology, most elementary because animals cannot be discussed or treated in a scientific way until some taxonomy has been achieved and most inclusive because (systematics) in its various branches gathers together, utilizes, summarizes, and implements everything that is known about animals, whether morphological, physiological, psychological or ecological." This role of taxonomy is bound to become more important in the 21st century and the present paper is an endeavour for new researchers in the same direction.

Key words: Taxonomy, Systematics, Diptera, Calliphoridae.

Members of family Calliphoridae are usually metallic blue, green, purple or coppery although a number of species are non -metallic as well. The adult blow flies occur commonly on vegetation, flowers, decaying plant or animal substances, excretment, garbage and meat. The females are usually oviparous though some species exhibit larviparous behaviour. The eggs or larvae are laid on decaying organic matter or on insects, earthworms, snails, toads, birds and mammals. The larvae occur on carrion, living animals, excretments and household foods and they can be omnivorous, carnivorous or parasitic in different species.

The family Calliphoridae (Diptera: Calyptratae: Oestroidea) is largely known for its synanthropic, necrophagous, and myiasis-causing species. Within India, there are 129 species belonging to these groups, distributed across 31 genera and nine subfamilies (Bharti 2011,2014, 2015a,b,c; Bharti & Bunchu 2016; Bharti & Verves 2016; Bharti 2018,2019; Bharti & Rognes 2018).

They are reported from varied habitats like forests, bushes, flowers, heaps of garbage, rotting fruits and vegetables, decaying animal remains, excretment of animals etc. Their collection is made keeping in view the saprophagous and oviparous activity of blow flies on decaying organic matter and their feeding on plant saps. Pieces of decaying meat are also used in the field to act as attractant for the adults. Collections are made with the help of short-handled aerial sweeping net.

The collected specimens are killed by putting them in a killing bottle charged with ethyl acetate/tetrachloroethane. The dead specimens are pinned using standard entomological pins piercing the right side of the mesothorax. This is done to ensure that the chaetotaxy remained intact at least on one side. Legs and wings of the pinned specimens are stretched with the help of fine forceps in the field itself. These pinned and dried specimens, when brought to the laboratory, are preserved in tight wooden boxes containing naphthalene balls as fumigant. The boxes are properly fumigated at regular intervals to prevent infestation by mites and beetles. Each specimen is provided with a label on which the information regarding name of locality, altitude of locality, date of collection and name of collector is given. Reference numbers are given to the specimens to facilitate their identification. The terminology proposed by Park (1977) is followed by most

of the current workers has generally been adopted. The arrangement of various bristles present on the thorax is important taxonomically. So, these are carefully studied on both the sides of the insect. Diagrammatic representation of thoracic chaetotaxy is to be done for each species in order to understand it in a better way. Terminology used by Senior-White *et al.* (1940) with some modification by Park (1977) has been followed while describing the chaetotaxy.

Majority dichotomous keys to the subfamilies, genera and species for quick identification are based on chaetotaxy. Labelled diagrammatic illustrations are provided showing all the structures for better understanding the taxonomic characters to be used for taxonomic work/ Identification.
Some of the keys of Subfamilies upto Genera are discussed here demonstrating importance of chaetotaxy. The present paper will be useful for new researchers who want to work on Calliphoridae.

Key to the Indian genera of subfamily Rhiniinae

1. Prostigmatic bristle present.....**2**
– Prostigmatic bristle absent.....**8**
2. Arista long plumose upto tip.....**3**
– Arista bare, pubescent or shortly plumose in basal 2/3.....**6**
3. Presutural acrostichals and dorsocentrals absent or inconspicuous.....***Cosmina*** **Robineau-Desvoidy**
– All acrostichals and dorsocentrals strong.....**4**
4. Ptilinal angle strongly projecting; epistome distinctly projecting below vibrissae.....***Thoracites*** **Brauer et Bergenstamm**
– Ptilinal angle not projecting; epistome indistinctly projecting below vibrissae.....**5**
5. Black setae present in upper part of mesopleuron.....
.....,,,,,.....***Isomyia*** **Walker**
– Black setae absent in upper part of mesopleuron.....
.....,,,,,,..***Strongyloneura*** **Bigot**
6. Arista plumose in basal 2/3.....***Metalliopsis*** **Townsend**
– Arista bare or weakly pubescent.....**7**
7. Antennae separated by distinct carina; propleural depression without long hair.....***Metallea*** **Wulp**
– Antennae not separated by carina; propleural depression bare.....***Rhynchomya*** **Robineau-Desvoidy**
8. Arista plumose on dorsal side only.....**9**
– Arista plumose on both dorsal and ventral sides.....
.....***Borbororhinia*** **Townsend**
9. First posterior cell (R5) not petiolate..... .....**10**
– First posterior cell (R5) petiolate..... .....**11**
10. Dorsocentrals 0+0-1; hind tibia without row of short bristles, only 2-3 outstanding ones present.....***Stomorhina*** **Rondani**
– Dorsocentrals 1+3; hind tibia with a row of short bristles.....
.....***Idiella*** **Brauer et Bergenstamm**
11. Anterior posthumeral absent; epistome not projecting; postsutural dorsocentrals 1; generally metallic flies.....***Chlororhina*** **Townsend**
– Anterior posthumeral present; epistome strongly projecting; postsutural dorsocentrals 2; partially testaceous flies.....***Rhinia*** **Robineau-Desvoidy**

Key to the Indian genera of subfamily Chrysomyinae

1. Sternopleurals 1+1.....**2**
– Sternopleurals 0+1.....***Ceylonomyia*** **Fan**
2. ♂ - outer vertical bristles present; posterior margin of sternite 5 normally concave, ♀ - without outward clinated supra-orbital seta; tergite 5 with median longitudinal suture posteriorly..... .....***Achoetandrus*** **Bezzi**

– ♂ - outer vertical bristles absent; posterior margin of sternite 5 cleaved, ♀-with at least one outward clinated supra-orbital seta; tergite 5 without median suture.....***Chrysomya*** **Robineau-Desvoidy**

Key to the genera of subfamily Helicoboscinae

1. Eyes hairy; posthumerals 2 ..... ***Gulmargia*** **Rognes**
– Eyes bare; posthumerals 3-4..... ***Eurychaeta*** **Brauer et Bergenstamm**

Key to the Indian genera of subfamily Ameniinae

1. Facial carina present; ventral surface of costa setulose between apices of subcosta and R1 (1st radial vein) .....***Silbomyia*** **Macquart**
– Facial carina absent; ventral surface of costa bare between apices of subcosta and R1 (1st radial vein).....***Catapicephala*** **Macquart**

Key to the Indian genera of subfamily Calliphorinae

1. Propleuron hairy.....**2**
– Propleuron bare.....**10**
2. Thoracic squamae bare on upper surface.....**3**
– Thoracic squamae hairy on upper surface.....**6**
3. Posterior parasquamal tuft of black hair present on suprasquamal ridge **4**
– Posterior parasquamal tuft of hair absent on suprasquamal ridge.... .....**5**
4. Supraspiracular convexity with long upstanding fine hair.....***Hemipyrellia*** **Townsend**
– Supraspiracular convexity bare or with fine pubescence.....***Lucilia*** **Robineau-Desvoidy**
5. Anterior part of suprasquamal ridge bare; prothoracic spiracle large, sometimes swollen; left and right presutural acrostichals wide apart.....***Caiusa*** **Surcouf**
– Anterior parasquamal tuft of hair present on suprasquamal ridge; prothoracic spiracle small; left and right presutural acrostichals close to each other.....**6**
6. Presutural acrostichal 1 or absent..... .....***Polleniopsis*** **Townsend**
– Presutural acrostichals 2 or more.....**7**
7. Thoracic squama bare on upper surface.....***Paradichosia*** **Senior-White**
– Thoracic squama hairy on upper surface.....**8**
8. Eyes dichoptic in both sexes; length of 3rd antennal segment more than 4X that of 2nd.....***Tainanina*** **Villeneuve**
– Eyes holoptic in ♂, dichoptic in ♀; length of 3rd antennal segment less than 4X that of 2nd.....**9**
9. Presutural intra-alar bristle present.....***Calliphora*** **Robineau-Desvoidy**
– Presutural intra-alar bristle absent.....***Aldrichina*** **Townsend**
10. Prosternum hairy, presutural acrostichals absent.....***Bengalia*** **Robineau-Desvoidy**
– Prosternum bare, presutural acrostichals present.....**11**
11. Body covered with pale soft hair; supra-alars more than 1.....**12**
– Body lacking any pale hair; supra-alar one.....***Morinia*** **Robineau-Desvoidy**
12. Parafacialia haired; lateroscutellars 3-7.....***Pollenia*** **Robineau-Desvoidy**
– Parafacialia bare; lateroscutellars 2.....**13**
13. First posterior cell (R5) closed; mesopleuron with pale soft hair; legs black; Presutural acrostichals 3; presutural dorsocentrals 3; postsutural intra-alars 3; humerals 4; post humerals 2; post-alars 3; supra squamal ridge bare.....***Wilhelmina*** **Schmitz and Villeneuve**
– First posterior cell (R5) open; mesopleuron without hair but with yellow tomentum; legs yellowish brown; presuturalacrostichal 1-2; presuturaldorsocentrals 2; postsutural intra-alars 2; humerals 2-3; posthumeral 1; post-alars 2; supra-squamal ridge hairy.....***Dexopollenia*** **Townsend**

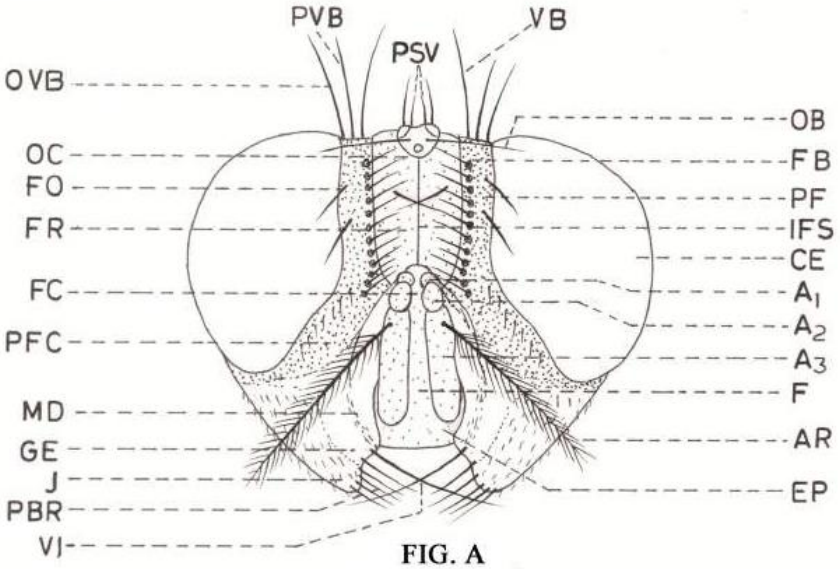

FIG. A

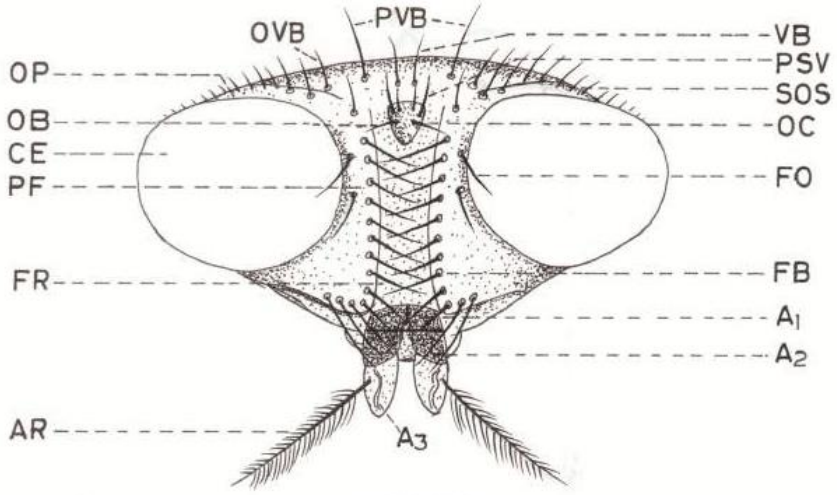

FIG. B

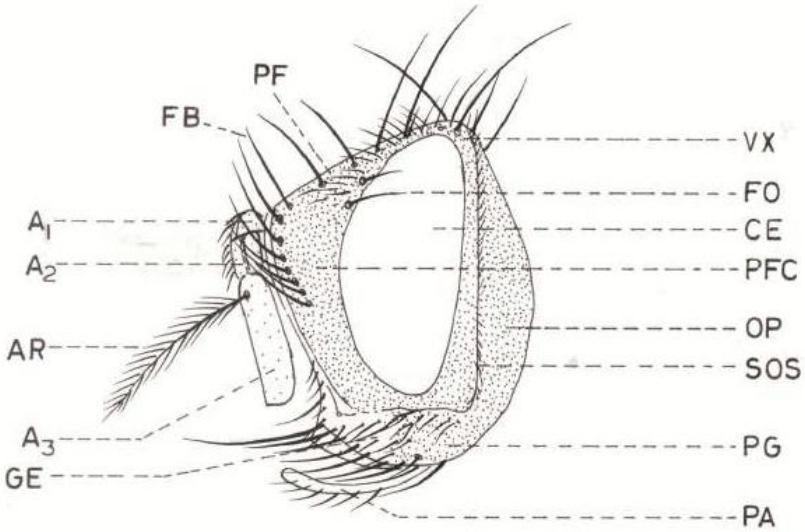

FIG. C

EXPLANATION TO FIGURES

FIG. A- Anterior view of head (Diagramatic)
FIG. B - Dorsal view of head (Diagramatic)
FIG. C - Lateral view of head (Diagramatic)

Explanation to abbreviations: A_1- 1st antennal segment; A_2- 2nd antennal segment; A_3- 3rd antennal segment; AR-Arista; CE-Compound eye; EP-Epistome; F-Face; FB-Frontal bristles; FC-Facial carina; FO-Fronto-orbital bristles; FR-Frons; GE-Genae; IFS-Inter frontalia Suture; J - Jowls; MD-Medianae; OB-Ocellar bristle; OC-Ocellus; OP-Occiput; OVB - Outervertical bristle; PA-Palpi; PBR-Peristomal bristles; PF-Parafrontalia; PFC-Parafacialia; PG-Postgenae; PSV-Postvertical bristle; PVB-Prevertical bristle; SOS-Supra orbital setae; VB-Vertical bristle; VI-Vibrissae; VX-Vertex.

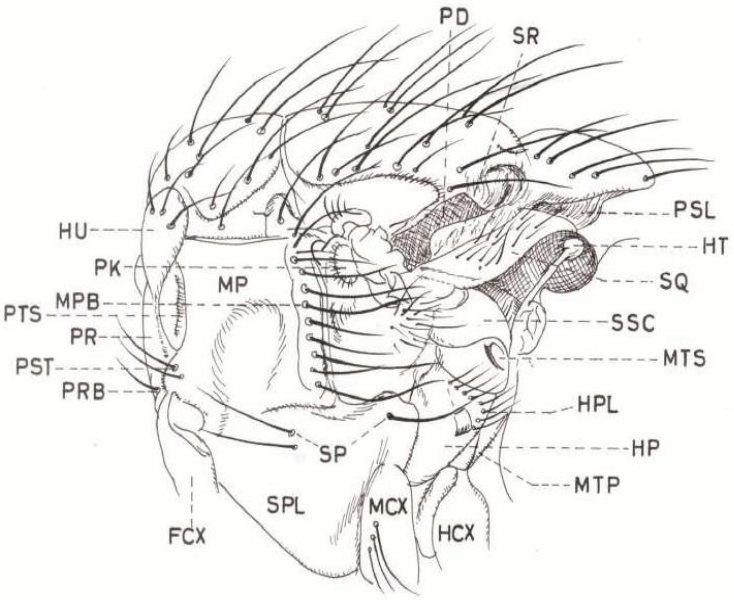

FIG D

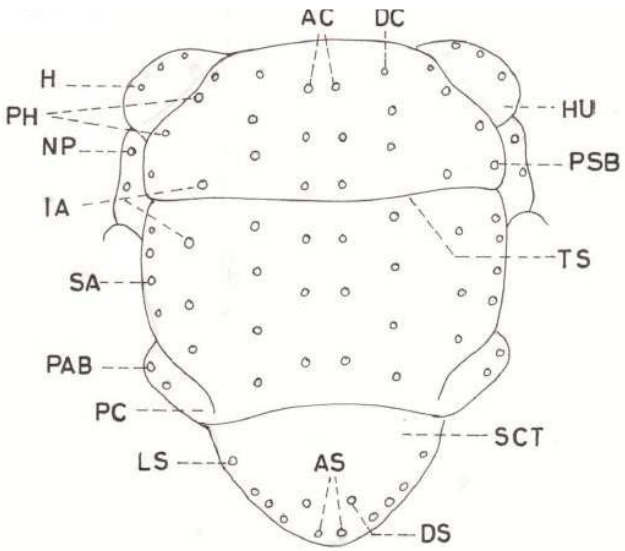

FIG E

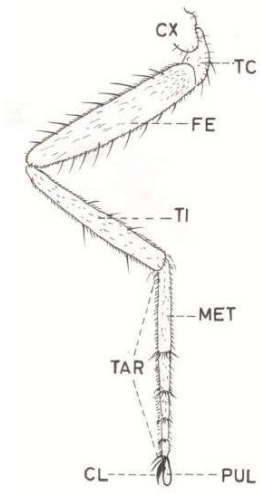

FIG F

EXPLANATION TO FIGURES

FIG. D- Lateral view of thorax (Diagramatic)
FIG. E- Chaetotaxy of dorsal view of thorax (Diagramatic)
FIG. F- LEG (Diagramatic)

Explanation to abbreviations:
AC-Acrostichal bristles; AS-Apicoscutellar bristles; CL-Claws; CX-Coxa; DC-Dorsocentral bristles; DS-Discoscutellar bristles; FCX-Forecoxa; FE-Feur; H-Humeral bristles; HCX-Hindcoxa; HP-Hypopleuron; HPL-Hypopleural bristles; HT-Haltere; HU-Humerus; IA-Intra-alar bristles; LS-Lateroscutellar; bristles; MCX-Midcoxa; MET-Metatarsus; M-M-Medial cell vein; MP-Mesopleuron; MPB-Mesopleural bristles; MTP-Metapleuron; MTS-Metathoracic spiracle; NP-Notopleural bristles; PAB-Post-alar bristles; PC-Postalar Callus; PD-Postalar declivity; PH-Posthumeral bristles; PK-Prealar knob; PR-Propleuron; PRB-Propleural bristle; PSB-Presutural bristle; PSL-Postscutellum; PST-Prostigmatic bristle; PTS-Prothoracic spiracle; PUL-Pulvillus; SA-Supra-alar bristles; SCT-Scutellum; SP-Sternopleural bristles; SPL-Sternopleuron; SQ-Squama; SR-Suprasquamal ridge; SSC-Supraspiracular convexity; TAR-Tarsi; TC-Trochanter; TI-Tibia; TS-Transverse suture.

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