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Original Article

A Taxonomic Account of Hover Flies (Insecta: Diptera: Syrphidae) with 4 New Records from Cold Dry Zones of Himachal Pradesh, India.

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Abstract

Eighteen (18) species of hover flies (Insecta:Diptera:Syrphidae) under 14 genera and 2 subfamilies has been reported from the Cold dry zone of Himachal Pradesh which includes Kinnaur, Lahul & Spiti and Pangi range of Chamba districs. 4 species namely *Chrysotoxum violaceum* Brunetti, 1923, *Sphiximorpha triangulifera* (Brunetti, 1913),*Mallota (Mallota) orientalis* (Wiedemann, 1824), *Mallota (Mallota) varicolor*(Walker, 1856) has been reported from the first time from this cold and dry zone zone as well as from the state of Himachal Pradesh. Their taxonomic keys and detail diagnosis of the reported species has been discussed along with the distributional pattern of these species along the cold dry zone of Himachal Pradesh.

Keywords: *Taxonomy, Hover flies, Syrphidae, New Record, cold dry zone, Himachal Pradesh.*

Introduction

The flies of family Syrphidae (Insecta: Diptera: Brachycera) is commonly known as Hover flies or flower flies. Hover flies are distributed worldwide largely with 6,000 known species placed in more than 300 distinctive group. (Pape & Thomson, 2018).Almost all adult syrphids visit flower for pollen and nectar while larval stages exhibited a very diverse array of feeding modes with complex morphological and behavioural adaptations. Hoverflies are usually variable in body size ranging from small to large, slender to robust in shape and size. The main identifying features lies in the presence of spurious vein or false vein between the 3rd and 4th vein of the wing. Syrphid flies cabn also be distinguished by yellow and orange markings on head, thorax and abdomen. Many of this pollinator flies are excellent mimics of aculeate hymenoptera.

Syrphidae is one of the most common high altitude insect (Mani, 1968). Syrphis flies act as predominant pollinator especially at an elevational range of 1500 meter and above whereas bees and beetles decreased rapidly in such elevational range. Because climate change is expected to strongly affect the mountain eco systems, it has become urgent to develop a better knowledge of the pollinators involved in pollination in such eco system. Our present study area thus expanding through an elevational range of from 2,200 mt (7,218 feet) to the highest point of greater Himalaya in this state of Himachal

Pradesh. This zone is more commonly known as the Cold & Dry Zone.

Phytophagous flower flies are very important group of insects because of their two fold services to the ecosystem. Larvae are important natural enemies of herbivorous arthropod while adults play dominant role in pollination (Tooker *et. al.,* 2006, Ghahari *et al*.2008). Their importance as predator is equal to that of parasitoid, lady bird beetles, pathogenic fungi. (Ankersmit *et al*.1986).

Pollination and biological control are one of the most important ecosystem service rendered by insects to human being. (Potts *et al.,* 2006). Any loss in biodiversity is a matter of public concern but losses of pollinators are troubling because it will potentially affect the reproduction status of food crops and other plants of agricultural, medicinal importance. Thereby loss of pollinators rise a question while considering our future food security. Therefore taxonomic studies of this pollinators for proper identification is quite necessary. In the present study a brief synopsis on the taxonomy of the family is given along with its distributional pattern in the cold dry zone of Himachal Pradesh.

Materials and Methods

A. Study area:

According to the Department of Agriculture, Himachal Pradesh the agro climatic condition has divided the whole state of Himachal Pradesh into 4 zones namely Shivalik hill zones, mid hill zones, high hill zone and cold and dry zone. Our present work is associated with the study areas from cold and dry zone of Himachal Pradesh. Our current study area includes the whole of Kinnaur, Lahul & Spiti and Pangi range of Chamba districts. Elevation of this zone ranges in approximately from 2,200 mt (7,218 feet) to the highest point of greater Himalaya in this state. This zone comprises about 8% of total geographical area of the State and 2% of the total cultivated area of the total state. The very low temperature range and more less rainfall has reduced the percentile of agricultural contribution from this agro climatic zone of Himachal Pradesh. Along the eastern boundary of this zone, rivers are abundant, main rivers of this range are Satluj, Beas and Spiti. The cold desert of Spiti valley is situated in this Zone. Geographically this zone of Himachal Pradesh is very close to Tibet and Chaina border. Zanskar range on the eastern side of this zone separates Kinnaur and parts of Lahul & Spiti from Tibet. Normal rainfall is remarkably low in this zone (50-100 mm) but snow fall is very heavy resulting in the formation of cold dry zone in this upper elevation area.

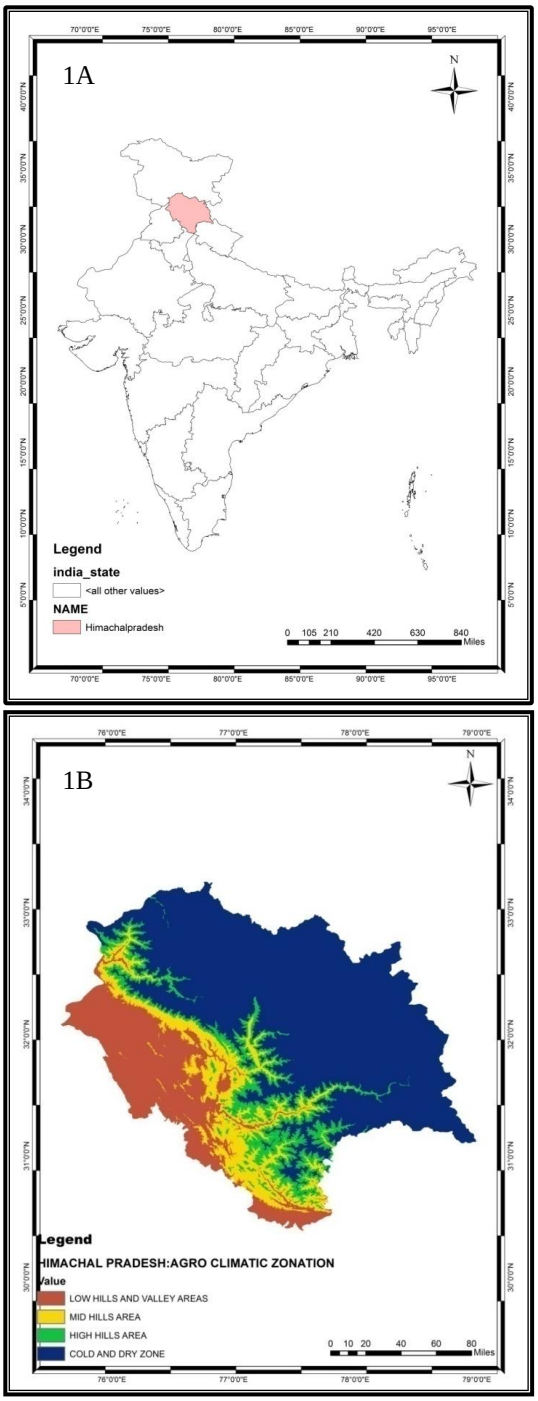

Figure 1A-1B: 3D Map showing 1A: State of Himachal Pradesh, 1B: Agro climatic zonation from the state of Himachal Pradesh.

B. Collection method:

For the purpose of collection of hover flies, a 2 year long survey (2017-2018) has been conducted in this cold dry zone of Himachal Pradesh. Hoverflies were collected from the field during day time by using insect sweep nets, different type of traps like malaise trap, pan trap and UV light traps were used for collecting syrphid fauna. The collected samples are narcotized by using ethyl acetate and stored for further study in insect envelopes in the field. The specimens were later carried back to the laboratory, mounted on insect pins, labelled using the collection site information and stored in insect cabinets for further identification.

C. Identification of specimens:

Identification of the adults was done by following the keys of Miranda (2013), Vockeroth (1992) and Brunetti (1923) keeping in mind the recent nomenclatural changes (Pape and Thompson, 2018.Same has been used to construct taxonomic keys. All terminology while describing morphology has followed the recent pattern (McAlpine et al. 1987).All the identified specimens were deposited in the designated repository of National Zoological Collection, Diptera section, Zoological Survey of India, Kolkata.

D. Technical procedure:

The 3D map of study area used here is generated by using ARC GIS software version 10.1. The photograph of habitus were taken by using Leica Microscope M205A, where 0.32x Acro lense was used for habitus photography.

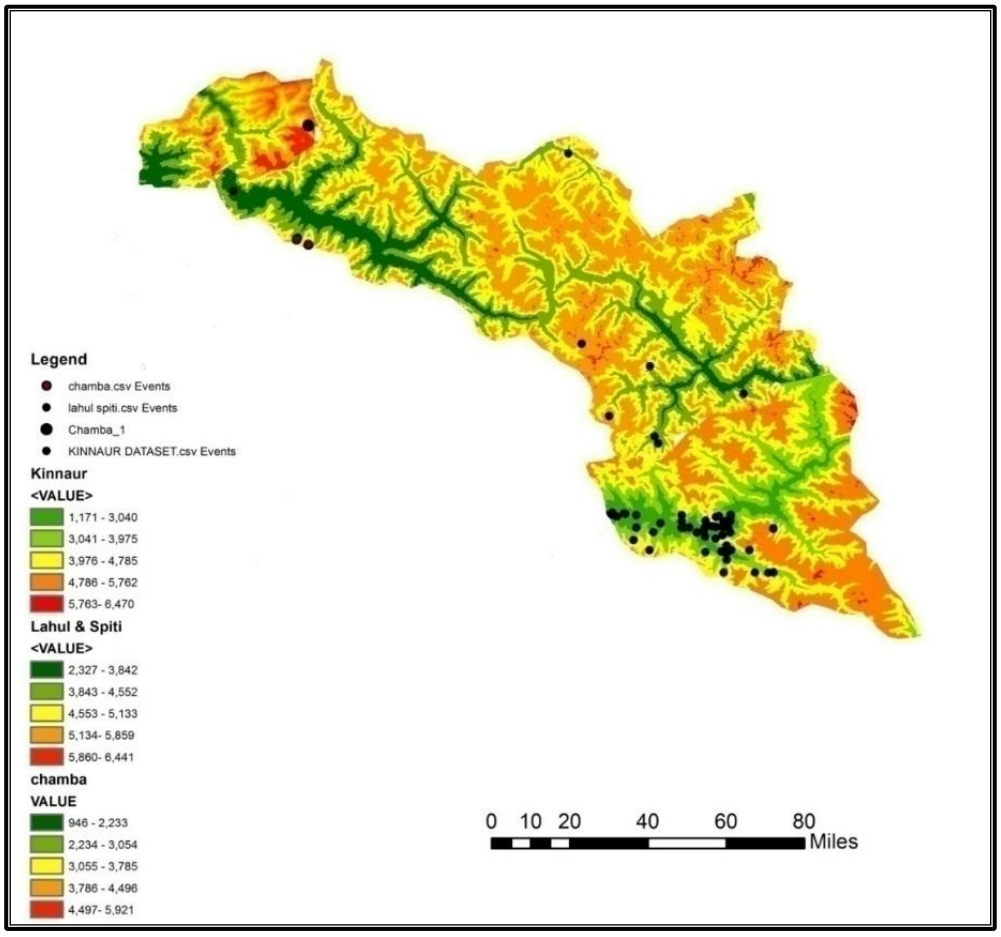

Figure 2: 3D Map showing species richness from Cold and Dry zone from the state of Himachal Pradesh.

Results

Altogether 18 species of hoverflies under 14 genera and 2 sub families have been reported from our study area**.** Among which 4 species namely *Chrysotoxum violaceum* Brunetti, 1923, *Sphiximorpha triangulifera* (Brunetti, 1913), *Mallota (Mallota) orientalis* (Wiedemann, 1824), *Mallota (Mallota) varicolor* (Walker, 1856) has been reported from the first time from this cold and dry zone as well as from the state of Himachal Pradesh. Detailed systematic account along with taxonomic key has been discussed. Distribution pattern of all syrphid species has been discussed in detail.

List of Taxa

Family Syrphidae (New Records from the state of Himachal Pradesh has been demarcated with asterisk)

Subfamily Syrphinae

Tribe Syrphini

I. Genus *Episyrphus* Matsumura & Adachi, 1917

Subgenus *Episyrphus* Matsumura & Adachi, 1917

1. ***Episyrphus (Episyrphus) balteatus* (De Geer, 1776)**

II. Genus *Scaeva* Fabricius, 1805

2. ***Scaeva latimaculata* (Brunetti, 1923)**
3. ***Scaeva pyrastri* (Linnaeus, 1758)****

III. Genus *Sphaerophoria* Lepeletier & Serville, 1828

Subgenus *Sphaerophoria* Wiedemann, 1830

4. ***Sphaerophoria (Sphaerophoriascripta) indiana* Bigot, 1884**

IV. Genus *Syrphus* Fabricius, 1775

Subgenus *Syrphus* Fabricius, 1775

5. ***Syrphus (Syrphus) torvus* Osten Sacken, 1875****

V. Genus *Chrysotoxum* Meigen, 1800

6. ***Chrysotoxum violaceum* Brunetti, 1923****

Tribe **Bacchini**

VI. Genus *Melanostoma* Schiner, 1860

7. ***Melanostoma orientale* (Wiedemann, 1824)**

Tribe **Paragini**

VII. Genus *Paragus* Latreille, 1804

Subgenus *Paragus* Latreille, 1804

8. ***Paragus (Paragus) bicolor* (Fabricius, 1794)**

Subfamily Eristalinae

Tribe Volucellini

VIII. Genus *Volucella* Geoffroy, 1762

9. ***Volucella ruficauda* Brunetti, 1907**

IX. Genus *Sphiximorpha* Rondani, 1850

10. ***Sphiximorpha triangulifera* (Brunetti, 1913)****

Tribe Eristalini

X. Genus *Eristalinus* Rondani, 1845

Subgenus *Eristalodes* Mik, 1897

11. ***Eristalinus (Eristalodes) paria* (Bigot, 1880)**

XI. Genus *Eristalis* Latreille, 1804

Subgenus *Eoseristalis* Kanervo, 1938

12. ***Eristalis (Eoseristalis) cerealis* Fabricius, 1805**
13. ***Eristalis (Eoseristalis) himalayensis* Brunetti, 1908**

Subgenus *Eristalis* Latreille, 1804

14. ***Eristalis (Eristalis) tenax* (Linnaeus, 1758)**

XII. Genus *Phytomia* Guerin-Meneville, 1833

Subgenus *Dolichomerus* Macquart, 1850

15. ***Phytomia (Dolichomerus) crassa* (Fabricius, 1787)**

XIII. Genus *Mallota* Meigen, 1822

Subgenus *Mallota* Meigen, 1822

16. ***Mallota (Mallota) orientalis*** **(Wiedemann, 1824)****

17. ***Mallota (Mallota) varicolor*** **(Walker, 1856)****

XIV. Genus *Syritta* Lepeletier & Serville, 1828

18. ***Syritta pipiens*** **(Linnaeus, 1758)**

Key to sub families, tribe, genera and species of hover flies from the cold dry zone of Himachal Pradesh.

Systematic account

Key to sub families

1. Bare post pronotum, head strongly concave at posterior end, in male 5th abdominal tergite is visible from dorsal surface.....**Syrphinae**

- Few sparse hairs on post pronotum, head weakly concave at posterior end, in male 5th abdominal tergite is not visible from dorsal surface.....**Eristalinae**

Sub family **Syrphinae**

Key to tribe

1. Posterior margin of scutellum strongly denticulate……..**Paragini**

Posterior margin of scutellum not denticulate……2

2. Shape of abdomen oval or equilateral, mesopleural haring usually not present.....**Syrphini**

- Shape of abdomen distinctly petiolate, mesopleuron with erect coarse hairs on postero dorsal corner.....**Bacchini**

Key to genera of tribe Syrphini

1. Strongly convex abdomen, elongated antennae usually longer than head.....***Chrysotoxum*** Meigen, 1800

- Shape of abdomen variable, short antennae usually shorter than head.....2

2. Lower lobe of calypter contains long ochre yellow hairs.....***Syrphus,***Fabricius, 1775

- Lower lobe of calypter contains microscopic ground color hairs.....3

3. Entirely black face and scutellum.....***Melanostoma***,Schiner, 1860

- Yellow or partly yellowish face and scutellum.....4

4. Sharply defined lateral or sub lateral stripes present at scutum.....***Sphaerophoria,*** Lepeletier & Serville, 1828

- Poorly defined lateral stripe present at scutum.....5

5. Minutely punctated tergites.....***Paragus*** Latreille, 1804

- Tergites without any punctuation.....6

6. Apical one third half of wing membrane is densely trichose.....***Episyrphus*** Matsumura & Adachi, 1917

- Whole surface of wing membrane covered with very sparse and scattered microtrichia.....***Scaeva*** Fabricius, 1805

Key to species of genera ***Scaeva*** Fabricius, 1805

1. Abdominal tergites with white colored comma like structures extending towards the middle..... ***pyrastri*** (Linnaeus, 1758)

Abdominal tergites with yellow colored comma like structures extending towards the middle.....***latimaculata*** (Brunetti, 1923)

Sub family **Eristalinae**

Key to tribe

1. Anterior part of mesopleuron usually bare, anterior basal patch of setulae on hind femur.....**Eristalini**

- Anterior portion of meso pleuron usually pilose, no patch of setulae on hind femur.....2

2. Wing usually with perpendicular anterior cross vein before middle of discal cell, hind femur with basal patch of setulae.....**Volucellini**

- Wing usually with slanted anterior cross vein beyond middle of discal cell, hind femur without any patch of setulae.....3

3. 3rd antennal segment tapered to a point, always with a terminal style.....**Ceriodini**

- 3rd antennal segment elongated and with a terminal style.....**Milesini**

Key to genera of tribe **Eristalini**

1. Scutellum abnormally wide, frons with wrinkled space above anntenal segment.....***Phytomia*** Guerin-Meneville, 1833

- Scutellum of normal shape, no wrinkled space is there above antennal segment.....2

2. Scuttum unstriped, abdomen dark without pale markings,wing membrane's basal one third portion usually bare.....***Mallota*** Meigen, 1822

- Scutum usually with longitudinal stripes, abdomen with pale markings, wing membrane entirely covered with micro trichia.....3

3. Katepimeron and metepisternum wholly bare.....***Eristalis*** Latreille, 1804

- Katepimeron haired and metepisternum partly haired.....***Eristalinus*** Rondani, 1845

Key to subgenera of genera *Eristalis*

XV.

1. Posterior half of anepimeron bare....***Eoseristalis*** Kanervo, 1938

- Posterior half of anepimeron partlty haired.....***Eristalis*** Latreille, 1804

Key to species of genera *Eristalis*

1. Arista partly or wholly plumose.....2 - Arista completely bare.....***tenax*** (Linnaeus, 1758)

2. Abdominal tergites all black except yellowish margins.....***himalayensis*** Brunetti, 1908

Presence of yellowish spots or markings on abdominal tergites.....***cerealis*** Fabricius, 1805

Key to species of genera ***Mallota***

1. Thorax pale yellow in color, usually smaller species.....*orientalis* (Wiedemann, 1824)

- Anterior portion of Thorax dark brown in color, usually larger species.....*varicolor* (Walker, 1856)

Key to genera of tribe **Volucellini**

1. Frontal prominence absent or much shorter than scape. Long haired flies, mimics bumble bee.....***Volucella*** Geoffroy, 1762

- Frontal prominence at least as long as scape. Flies without dense long hairs on body, never mimics bumble bee.....***Sphiximorpha*** Rondani, 1850

Subfamily Syrphinae

Diagnosis: Face without distinct eye margin, or such a zone only present on lower part of the face. Humeri bare. The majority of species of this subfamily have a distinct colour pattern of spots or bars on abdomen.

Tribe Syrphini

Diagnosis: Yellow scutellum distinguishes this tribe from others. Face in most species is partially or completely yellow. 3rd antennal segment usually more compact or rarely elongated.

I. Genus *Episyrphus* Matsumura & Adachi, 1917

Type species: *Musca balteata* De Geer
Diagnosis:

- Subgenus *Episyrphus* Matsumura & Adachi, 1917

1. *Episyrphus (Episyrphus) balteatus* (De Geer, 1776)

1776. De Geer, *Mem. pour. serv. Hist. Ins.***6**: 116

1924. *Syrphus signatus* Abreu,*Dipt. Tijdsr. Ent.***10**:144

Type locality: Sweden

Material examined: 4♂♂, Bhowen, Chamba district, 2200 mt; 32°29'55.60"N, 76° 5'27.40"E, 15.iv.17, coll: J.Sengupta, 4♀♀, 1♂, Hadsar, Chamba district, 3100 mt, 32°27'22.08"N, 76°36'53.16"E, 16.iv.17, coll: J.Sengupta,1♂, Bhabanagar, Kinnaur district, 1520 mt; 31°33'51"N, 77°55'44"E, 12.iv.18, coll: J.Sengupta, 4♂♂, 5♀♀,Recong peo, Kinnaur district, 1610 mt; 31°30'58"N, 78°5 '47"E,12.iv.18, coll: J.Sengupta, 1♀, Kinnaur hill side, Kinnaur district, 1600mt, 31°33'51"N, 77°50 '25"E, 12.iv.18 coll: J.Sengupta, 2♀♀,Bhujund, Kinnaur district, 3028 mt, 32°45'46.90"N, 76°26'15.16"E, 12.iv.18, coll: J.Sengupta,4♂♂,5♀♀,Sangla,Kinnaurdistrict,1980mt,31°28'32"N,78°11'2"E,13.iv.18,coll:J.Sengupta1♀,1♂, Kuppa, Kinnaur district, 1990 mt, 31°28'56"N, 78°11'4"E, 13.iv.18,coll:J.Sengupta, 2♂♂, 1♀, Baspa valley garden, Kinnaur district, 2680 mt, 31°25'34"N, 78°16'5"E, 13.iv.18,coll:J.Sengupta,1♀, Kugti, Lahul & Spiti district, 4630 mt, 32°28'42.58"N, 76°53'5.95"E, 16.iv.18, coll: J.Sengupta, 1♂, Gemur, Lahul & Spiti district, 4827 mt, 32°36'21.32"N, 77°10'11.76"E, 16.iv.18,coll: J. Sengupta, 2♂♂, Batal, Lahul & Spiti district, 4737 mt, 32°20'35.29"N, 77°42'26.63"E, 16.iv.18, coll: J.Sengupta.

Diagnosis: Double black bands on 3rd and 4th abdominal tergites, strength of this marking is very variable. Anterior black band can be reduced to two black dashes while the dark forms tend to have the lateral margins darkened. Narrow median grey stripe anteriorly flanked by another grey stripe on either side. All these stripes together fused into an extensive grey area at the back of thoracic dorsum. Wing length 6-10.25mm.

Distribution: India: Widely distributed through all the states of India.

Distribution: elsewhere: Australasian Region (Australia), Oriental Region (Widely distributed), Palearctic Region (England).

Remarks: This species is very common throughout the whole of the East in both plain land and hill region during summer. The range of this widely distributed species includes Europe, North Africa, Asia to Japan.

II. Genus *Scaeva* Fabricius, 1805

Type species: *Musca pyrastri* Linnaeus.

Diagnosis: Frons distinctly inflated. Face with a weak stripe not extending above knob. Tergite 3 and 4 entirely black with hairs on lateral margins.

2. *Scaeva latimaculata* (Brunetti, 1923)

1923. *Lasiopticus latimaculata* Brunetti, *Fauna. Br. India. Dipt.***3**:68

1975. *Scaeva montana* Violovitsh, *Ent. Obozr.***54**:173

Type locality: Allahabad, Peshawar, Ferozepore and Abu, India

Material examined: 2♂♂,2♀♀, Rijing, Kinnaur district, 3130 mt, 31°38'55.27"N 78°24'20.72"E, 16.iv.18, coll: J.Sengupta,

Diagnosis: Frons distinctly inflated, maxilla black to brownish orange in colour range, with orange coloured arista. Thorax aeneous black in colour with translucent yellowish scutellum. Abdomen glossy black with 3 pairs of broad orange spots. Abdominal tergites covered with ground coloured pubescence.

Distribution: India: Himachal Pradesh, Delhi, Jammu & Kashmir, Punjab, Rajasthan, Uttar Pradesh, Uttarakhand, West Bengal.

Distribution: elsewhere: Oriental region (Pakistan)

Remarks: This species is demarcated by its broad and oval abdominal spots.

3. *Scaeva pyrastri* (Linnaeus, 1758)**

1758. *Musca pyrastri* Linnaeus, *Syst. Nat.***1**:594

1884. *Syrphus flavoscutellatus* Girschner, *Wien. ent. Ztg.***3** (7): 197

Type locality: Sweden

Material examined: 2♂♂, Kalpa agricultural field, Kinnaur district, 2380 mt, 31°32'59"N,78°15 '6"E, 15.iv.18, coll: J.Sengupta, 1♂, Kalpa garden area, Kinnaur district, 2790 mt, 31°32'23"N,78°15 '9"E, 15.iv.18, coll: J.Sengupta, 2♀♀, Chitkul valley, Kinnaur district, 3350 mt, 31°21'2"N,78°25'5"E, 15.iv.18, coll: J.Sengupta, 2♀♀, Chitkul forest, Kinnaur district, 3360 mt, 31°20'58"N,78°26'14"E, 15.iv.18, coll: J.Sengupta, 2♂♂, Baspa Valley, Kinnaur district, 3400 mt, 31°21'2"N,78°26'10"E, 15.iv.18, coll: J.Sengupta, 3♂♂,2♀♀, Rakcham valley, Kinnaur district, 3410 mt, 31°21'3"N,78°26'12"E, 15.iv.18, coll: J.Sengupta,

Diagnosis: Relatively large conspicuous hoverfly, abdominal tergites have distinctive lunules. Tergite 3 and 4 with hooked bars of almost equal width at each end and with outer end not reaching as far forward as inner end. Markings on abdominal tergites are whitish in colour. R_{4+5} vein bowed, microtrichia are extensively absent.

Distribution: India: Himachal Pradesh, Jammu & Kashmir, Punjab, Uttarakhand.

Distribution: elsewhere: Palearctic Region (Germany), Nearctic Region (Alaska, California, Mexico,)

Remarks: This species is recorded newly from the state of Himachal Pradesh. This species is easily distinguishable by the presence of whitish lunules on dorsal surface of abdominal tergites.

III. Genus *Sphaerophoria* Lepeletier & Serville, 1828

Type species: *Musca scripta* Linnaeus.
Diagnosis: Unmarginated abdominal tergites, ventral scutellar finge usually absent, in make fly, terminalia extremely large.

- Subgenus *Sphaerophoria* Wiedemann, 1830

4. *Sphaerophoria (Sphaerophoriascripta)indiana* Bigot, 1884

1884. *Sphaerophoria indiana* Bigot, *Annls. Soc. ent. Fr.* (6) **4**: 99

1916. *Melithreptus diminutus* Matsumura, *Ent. Mag. Kyoto.***2**: 27

Type locality: Indes.

Material examined: 3♂♂, Hadsar, Chamba district, 3100 mt, 32°27'22.08"N, 76°36'53.16"E, 16.iv.17, coll: J.Sengupta, 7♂♂, Rampur power project, Kinnaur district, 970 mt, 31°23'38"N, 77°36'2"E, 14.iv.18, coll: J.Sengupta, 6♀♀,3♂♂,Kuppa, Kinnaur district, 1990 mt, 31°28'56"N, 78°11'4"E, 13.iv.18,coll:J.Sengupta, 2♂♂, 2♀♀,Bhujund, Kinnaur district, 3028 mt, 32°45'46.90"N, 76°26'15.16"E, 12.iv.18, coll: J.Sengupta, 1♀, Kugti, Lahul & Spiti district, 4630 mt, 32°28'42.58"N, 76°53'5.95"E, 16.iv.18, coll: J.Sengupta, 1♂, Gemur, Lahul & Spiti district, 4827 mt, 32°36'21.32"N, 77°10'11.76"E, 20.iv.18,coll: J. Sengupta, 2♂♂, Batal, Lahul & Spiti district, 4737 mt, 32°20'35.29"N, 77°42'26.63"E, 19.iv.18, coll: J.Sengupta, 4♀♀, Kugti, Lahul & Spiti district, 4630 mt, 32°28'42.58"N, 76°53'5.95"E, 19.iv.18, coll: J.Sengupta,

Diagnosis: Thoracic disc with complete yellow side stripes. Abdomen extends well beyond wing tips. Surstylus very broad. Inner process broad at base, abruptly slender to apex.

Distribution: India: Himachal Pradesh, Arunachal Pradesh, Assam, Bihar, Delhi, Jammu & Kashmir, Karnataka, Kerala, Maharashtra, Manipur, Meghalaya, Mizoram, Punjab, Sikkim, Tripura, Uttarakhand, Uttar Pradesh, West Bengal.

Distribution: elsewhere: Oriental Region (Bhutan, Myanmar, Nepal, Pakistan, Sri Lanka), Palaearctic Region (China, Japan, Korea)
Remarks: This is a very common Indian species distributed widely throughout the

Country occurring mostly from December to May month.

IV. Genus *Syrphus* Fabricius, 1775

Type species: *Musca rebesii* Linnaeus.

Diagnosis: Frons not conspicuously produced, face with central bump, abdomen slender in appearance, marginal cell of wing remain open, lower lobe of calypter with many long coarse yellow hairs.

- Subgenus *Syrphus* Fabricius, 1775

5. *Syrphus (Syrphus) torvus* Osten Sacken, 1875

1875. *Syrphus torvus* Osten Sacken, *Pros. Boston Soc. Nat. Hist.***18**:139

1940. *Syrphus discretus* Szilady, *Ann. Mus. Nat. Hung. (Zool).* **33**:63

Type locality: Canada; Colorado, N.H., R.I., USA.

Material examined: 2♀♀, Bhemkali temple side garden, Kinnaur district, 2130 mt, 31°30'43"N,77°48 '1"E, 14.iv.18, coll: J.Sengupta, 4♀♀, 5 ♂♂, Sarahan village side, Kinnaur district, 2120 mt, 31°30'44"N, 77°48 '1"E 14.iv.18, coll: J.Sengupta.

Diagnosis: Eyes weakly hairy, but hairs can be sparse and inconspicuous, ocellar triangle broadest at base. 3rd and 4th abdominal tergites usually display moustache bands. Tergites carry lunule spots. Front and mid femora with long black posterior hairs in apical quarter. Second basal cell of wing entirely covered in microtrichia. Wing length 8.5-11.75 mm

Distribution: India: Himachal Pradesh, Jammu & Kashmir, Sikkim, Uttarakhand, West Bengal.

Distribution: elsewhere: Nearctic Region (Alaska, Green land, North Carolina, New Mexico), Oriental Region (Nepal, Pakistan).

Remarks: This species has shown wide distribution throughout Nearctic as well as Oriental region.

V. Genus *Chrysotoxum* Meigen, 1800

Type species: *Musca bicincta* Linnaeus.

Diagnosis: Antennae elongated, sometimes longer than head, scape and pedicel often longer than wide. First flagellomere at least 3 times longer. Abdomen convex dorsally, marginated, postero lateral angles of abdominal tergites remain projecting.

6. *Chrysotoxum violaceum* Brunetti, 1923**

1923. *Chrysotoxum violaceum* Brunetti, *Fauna. Br. India.***3**:302

Type locality: Darjeeling, India.

Material examined: 1♀, Shong Thong, Kinnaur district,1910 mt,31°31'8"N, 78°16'13"E, 13.iv.18, coll: J.Sengupta, 4♂♂, Recong Peo, Kinnaur district, 4044 mt, 32°35'28.59"N, 76°40'30.94"E,14.iv.18, coll: J.Sengupta,

Diagnosis: Face shining bright yellow in colour, face with median black stripe. Vertex with large violet black spot. Abdominal tergites deep violet blue in colour, scutellum with bright lemon yellow in colour. Legs orange yellow in colour, hind femora wholly black, wing color gradually fading towards grey on hind margin.

Distribution: India: Himachal Pradesh, West Bengal.

Distribution: elsewhere: NIL

Remarks: This species has shown endemic distribution to India, as well as this species has been reported from the first time from this cold and dry zone as well as from the state of Himachal Pradesh.

Tribe **Bacchini**

Diagnosis: Face entirely black, abdomen usually slender in shape.

VI. Genus *Melanostoma* Schiner, 1860

Type species: *Musca mellina* Linnaeus

Diagnosis: Face entirely black with two distinct central bump, facial pruinescence neither punctated nor rippled. Thorax and scutellum entirely black. Legs in male lacks hairs/hair tufts or bristles.

7. *Melanostoma orientale* (Wiedemann, 1824)

1824. *Syrphus orientalis*, Wiedemann, *Analec. Ent.* : 36

Type locality: Ind. Or

Material examined: 1♀, Bhowen, Chamba district, 2121 mt, 31°31 '8"N, 77°47'46"E, 16.iv.17, coll: J.Sengupta, 4♀♀,3♂♂, Rampur power project, Kinnaur district, 970 mt, 31°23'38"N, 77°36'2"E, 14.iv.18, coll: J.Sengupta, 1♀, Wangtoo, Kinnaur district, 1580 mt, 31°33'48"N , 77°59 '30"E, 14.iv.18, coll: J.Sengupta, 1♂, Peo hill side, Kinnaur district, 2000 mt, 31°29'58"N,78°13 '27"E, 14.iv.18, coll: J.Sengupta, 2♂♂, Recong Peo, Kinnaur district, 4044 mt, 32°35'28.59"N, 76°40'30.94"E,14.iv.18, coll: J.Sengupta, 3♂♂, Indrasen, Lahul & Spiti district, 4134 mt, 32°15'52.47"N,77°29'1.18"E, 22.iv.18, coll: J.Sengupta.

Diagnosis: Blackish antennae with microscopic pubescent arista, face with small two bump like structure, 3rd and 4th abdominal tergites with a pair of big quadrate to oblong orange yellow spots. Hind tibiae with broad black median stripe. Wings with normal syrphid venation.

Distribution: India: Assam, Arunachal Pradesh, Himachal Pradesh, Jammu & Kashmir, Karnataka, Meghalaya, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, and West Bengal.

Distribution: elsewhere: Oriental Region (Bhutan, Nepal, Pakistan, Sri Lanka)

Remarks: Apparently the commonest and most widely distributed species of the genus in the East, occurring throughout the warm weather in the plains and hills.

Tribe Paragini

Diagnosis: Species usually very small, third antennal segment modestly elongated.

VII. Genus *Paragus* Latreille, 1804

Type species: *Mulio bicolor* Fabricius.

Diagnosis: Eyes distinctly haired, 1st abdominal tergites well developed, tergites always minutely punctated.

- Subgenus *Paragus* Latreille, 1804

8. *Paragus (Paragus) bicolor* (Fabricius, 1794)

1794. *Syrphus bicolor* Fabricius, *Ent. Syst. aucta.* **4**(6):297

1865. *Paragus tacchettii* Rondani, *Atti. Soc. Ital. Sci. Nat. Mus. Civ. Nat. Milano.***8**:140

Type locality: Barbariae

Material examined: 3♀♀, Tapri garden side, Kinnaur district, 1600 mt,31°32'5"N, 78°1 '8"E, 13.iv.18, coll: J.Sengupta,

Diagnosis: 3rd antennal joint noticeably elongated, dark thorax with indistinct pale lines on disc, frons usually shinning blue black in colour, 2nd and 3rd abdominal tergites with reddish secluded spots. Hind metatarsi marginally puffy, clear wing with brownish stigma.

Distribution: India: Himachal Pradesh, Jammu & Kashmir.

Distribution: elsewhere: Oriental Region (Afghanistan; Pakistan), Palearctic Region (Austria, France, Italy).

Remarks: Larvae of this species feed on aphids occurring on *Centaurea* and *Sonchus.*

Subfamily Eristalinae

Diagnosis: Anterior cross vein at or after middle of discal cell, marginal cell always remain closed. 3rd vein diagonally looped downward into first posterior cell.

Tribe Volucellini

Diagnosis: Upper outer cross vein re-entrant, arista plumose.

VIII. Genus *Volucella* Geoffroy, 1762

Type species: *Musca bombylans* Linnaeus.

Diagnosis: Long haired flies. Apical portion of M_1 curved, strongly toward wing base, anterior anepsternum haired. This genera is well known for mimicking bumble bees.

9. *Volucella ruficauda* Brunetti, 1907

1907. *Volucella ruficauda* Brunetti, *Rec. Indian Mus.***1**: 379

Type locality: Sikkim, India.

Material examined: 2♀♀, Choling garden, Kinnaur district, 1780 mt, 31°30'60"N, 78°9 '9"E,13.iv.18, coll: J.Sengupta, 1♀, Tapri garden side, Kinnaur district, 1600 mt,31°32'5"N, 78°1 '8"E, 13.iv.18, coll: J.Sengupta, 2♀♀, Shong Thong, Kinnaur

district,1910 mt,31°31'8"N, 78°16'13"E, 13.iv.18, coll: J.Sengupta.

Diagnosis: Well shaped epistome with ferruginous antennae. Scutellum is also bright ferruginous red in colour. Legs slender and wholly dark in colour. Large brown uneven spot in the centre of the forefront border of wing.

Distribution: India: Himachal Pradesh, Jammu & Kashmir, Sikkim.

Distribution: elsewhere: NIL

Remarks: This species shows batesian mimicry with bumble bees. This species has shown endemic distribution to India.

IX. Genus *Sphiximorpha* Rondani, 1850

Type species: *Ceria subsessilis* Illiger

Diagnosis: First flagellomere shorter than both scape and pedicel, frontal prominence mostly absent, post coxal bridge incomplete. Bases of hind coxae consist of a membranous area on the above surface.

10. *Sphiximorpha triangulifera* (Brunetti, 1913)**

913. *Ceria triangulifera* Brunetti, *Rec. Indian Mus.***9**: 273

Type locality: Darjeeling District, India

Material examined: 1♀, Bhowen, Chamba district, 2121 mt, 31°31'8"N, 77°47'46"E, 16.iv.17, coll: J.Sengupta.

Diagnosis: Large semi-circular black spot present embracing the antennal prominence, which is ferruginous brown in colour. Yellow scutellum with a basal black crescent spot. 1st abdominal tergites with yellow spots at each side, hind pair of legs with a transitional black band which is extensively wider on under side. Spurious vein narrowly but very distinctly infuscated.

Distribution: India: Himachal Pradesh, West Bengal

Distribution: elsewhere: NIL

Remarks: This species usually show several intra species variation especially in the leg colour. Besides this species has been reported from the first time from this cold and dry zone as well as from the state of Himachal Pradesh. This species has also shown endemic distribution to India.

Tribe Eristalini

Diagnosis: Wing with R_{4+5} strongly looped, lower and upper outer cross veins form an almost continuous vein parallel with wing margin.

X. Genus *Eristalinus* Rondani, 1845

Type species: *Musca sepulchralis* Linnaeus

Diagnosis: Distinguished dark spots across eyes, anepimeron below the wing base is partly haired. Tuft of strong black hairs on post alar ridge.

- Subgenus *Eristalodes* Mik, 1897

11. *Eristalinus (Eristalodes) paria* (Bigot, 1880)

1880. *Eristalomyia paria* Bigot, *Ann. Soc. Ent. Fr. ser.* **5**, **10**: 218

1916. *Eristalis arisanus* Matsumura, *Thousand insects of Japan. Additamenta.***2**:264

Type locality: Sri Lanka.

Material examined: 3♀♀, Sarahan village side, Kinnaur district, 2020 mt, 31°31 '8"N, 77°47'46"E, 14.iv.18, coll: J.Sengupta, 1♀, Kalpa garden area, Kinnaur district, 2810 mt, 31°32'24"N, 78°15 '9"E, 14.iv.18, coll: J.Sengupta, 3♀♀, 2♂♂, Sangla, Kinnaur district, 2650 mt, 31°25'35"N,78°15'52"E,14.iv.18, coll: J.Sengupta.

Diagnosis: Face with 2 bare broad longitudinal median stripes on each side of the central bump. Eyes with six narrow parallel longitudinal dark stripes. Thorax dorsum with four approximately equal dull black stripes, abdominal tergites yellowish with black stripes on dorsum. Legs mainly aeneous black, minute dark brown spot at tip or auxiliary vein.

Distribution: India: Himachal Pradesh, Arunachal Pradesh, Chandigarh, Jammu & Kashmir Karnataka, Manipur, Meghalaya, Mizoram, Sikkim, Tamil Nadu, Uttarakhand, Uttar Pradesh, West Bengal.

Distribution: elsewhere: Oriental Region (Sri Lanka, Taiwan), Indo-Australian Region (Java, Moluccas)

Remarks: This species is distinguished by the presence of longitudinal stripes on eye.

XI. Genus *Eristalis* Latreille, 1804

Type species: *Musca tenax* Linnaeus

Diagnosis: Katepimeron haired, scutum without patches of yellow tomentum, 3rd vein of wing looped downward into 1st posterior cell.

- Subgenus *Eoseristalis* Kanervo, 1938

12. *Eristalis (Eoseristalis) cerealis* Fabricius, 1805

1805. *Eristalis cerealis* Fabricius, *Syst. Antliat.***14**: 232

1880. *Eristalis barbata* Bigot, *Ann. Soc. Ent. Fr. ser.* **5**, **10**:214

Type locality: China.

Material examined: : 4♀♀, 1♂, Hadsar, Chamba district, 3100 mt, 32°27'22.08"N, 76°36'53.16"E, 16.iv.17, coll: J.Sengupta, 2♀♀, 1♂,Dienkund, Chamba district, 2632 mt, 32°31'7.11"N, 76°2'1.8"E, 16.iv.17, coll: J.Sengupta, 3♂♂, 2♀♀, Sarahan village, Kinnaur district, 1820 mt, 31°31'8"N, 77°47 '30"E, 13.iv.18, coll: J.Sengupta, 2♀♀, Tapri, Kinnaur district, 1760 mt, 31°30'53"N, 78°7'30"E, 13.iv.18, coll: J.Sengupta, 1♀, Saltuj, Kinnaur district, 1681 mt, 31°31'0"N, 78°5 '48"E, 13.iv.18, coll: J.Sengupta, 1♂, 2♀♀, Bandhal, Kinnaur district, 1570 mt, 31°32'38"N, 77°49 '15"E, 13.iv.18, coll: J.Sengupta, 1♀, Recong Peo, Kinnaur district, 2490 mt, 31°32'22"N, 78°16 '11"E, 13.iv.18, coll: J.Sengupta, 4♀♀, Garam Pani area, Kinnaur district, 1670 mt, 31°31'2"N, 78°6'19"E, 13.iv.18, coll: J.Sengupta,

Diagnosis: Dark antennae with long feathered arista, frons with dense black or dark brown pubescence, thorax with a soberly wide oblique stripe, 2nd abdominal tergite with a pair of big triangular spot, presence of pale yellow and black hairs blended on black parts of tibia and tarsi. Wing with 3rd vein looped downward into 1st posterior cell.

Distribution: India: Assam, Himachal Pradesh, Jammu & Kashmir, Meghalaya, Sikkim, Tamil Nadu, West Bengal.

Distribution: elsewhere: Widespread in Oriental region, Palearctic region (Russia)

Remarks: This species looks quite similar with *tenax,* apparently common throughout the Himalayas throughout the summer.

13. *Eristalis (Eoseristalis) himalayensis* Brunetti, 1908

1908. *Eristalis himalayensis* Brunetti,*Rec. Indian Mus.***2**:70

Type locality: Indostan

Material examined: 1♂, Chitkul village, Kinnaur district, 3140 mt, 31°22'45"N ,78°22'6"E, 13.iv.18, coll: J.Sengupta, 2♀♀, Chitkul bridge side, Kinnaur district, 3420 mt, 31°21'1"N,78°26'10"E, 13.iv.18, coll: J.Sengupta,

Diagnosis: Eyes wholly covered with pubescence, additionally band of dense dark brown pubescence present. Central bump less prominent. Blackish antennae with strongly plumose brownish arista. Thorax blackish with bright yellow scutellum. Abdomen bluntly conical, blackish. Legs completely black. A large yellow brown spot present at middle of costa.

Distribution: India: Himachal Pradesh, Arunachal Pradesh, Jammu & Kashmir, Sikkim, Uttarakhand, West Bengal

Distribution: elsewhere: Oriental Region (China, Java, Myanmar, Nepal Sri Lanka). Indo-Australian Region (Malaya, Philippines, Sumatra, Sumbawa.)

Remarks: This species is apparently common throughout the Himalayas above the elevational range of 5,000 feet throughout the summer.

- Subgenus *Eristalis* Latreille, 1804

14. ***Eristalis (Eristalis) tenax* (Linnaeus, 1758)**

1758. *Musca tenax* Linnaeus, *Syst. Nat. Ed.* ***10***: 591

1924. *Eristalis claripes* Abreu, *Mems R. Acad. Cienc. Artes*. **19**(1): 104

Type locality: Europe

Material examined: 7♂♂, 4♀♀, Dienkund, Chamba district, 2632 mt, 32°31'7.11"N, 76°2'1.8"E, 15.iv.17, coll: J.Sengupta, 2♂♂, 6♀♀, Hadsar, Chamba district, 3100 mt, 32°27'22.08"N,76°36'53.16"E, 16.iv.17, coll: J.Sengupta, 2♂♂, Sarahan village, Kinnaur district, 1960 mt, 31°30'58"N,77°47 '50"E, 13.iv.18, coll: J.Sengupta, 2♂♂,2♀♀ Sarahan village, Kinnaur district, 2000 mt, 31°31'50"N,77°47'48"E, 13.iv.18, coll: J.Sengupta,1♀ Sarahan village panchayet area, Kinnaur district, 1710 mt, 31°31'39"N,77°47 '16"E, 13.iv.18, coll: J.Sengupta, 3♀♀ hill side road, Kinnaur, Kinnaur district, 1600 mt, 31°33'51"N,77°50'25"E, 14.iv.18, coll: J.Sengupta, 2♂♂,1♀ Chowra, Kinnaur district, 1540 mt, 31°34'28"N,78°51'14"E, 14.iv.18, coll: J.Sengupta, 1♂,1♀ Salding, Kinnaur district, 1600 mt, 31°33'46"N, 78°58'21"E,14.iv.18, coll: J.Sengupta, 1♂,1♀ Nathpa, Kinnaur district, 1690 mt, 31°30'59"N,78°5'50"E, 14.iv.18, coll: J.Sengupta, 3♂♂,Wangtoo, Kinnaur district, 1680 mt, 31°34'20"N, 77°51 '25"E, 14.iv.18, coll: J.Sengupta, 3♂♂,2♀♀ Saltuj river side, Kinnaur district, 1810 mt, 31°29'16"N,78°10'58"E, 13.iv.18, coll: J.Sengupta, 2♀♀ Sangla, Kinnaur district, 2520 mt, 31°26'1"N,78°14'53"E, 13.iv.18, coll: J.Sengupta, 3♂♂,4♀♀ Sangla, Kinnaur district, 3070 mt, 31°23'50"N,78°20'52"E, 13.iv.18, coll: J.Sengupta, 1♀ Rakcham Valley, Kinnaur district, 2770 mt, 31°25'40"N,78°15'50"E, 13.iv.18, coll: J.Sengupta, 2♀♀ Nogulsari, Kinnaur district, 1650 mt, 31°33'27"N,77°52 '59"E, 14.iv.18, coll: J.Sengupta, 2♂♂, Trinda Mataji Mandir area, Kinnaur district, 1600 mt, 31°34'9"N,77°53 '17"E, 13.iv.18, coll: J.Sengupta, 1♀ Sungra, Kinnaur district, 1530 mt, 31°34'4"N,77°55 '46"E,15.iv.18, coll: J.Sengupta, 2♂♂ Bhaba nagar river dam side, Kinnaur district, 1530 mt, 31°33'45"N,77°58 '41"E,15.iv.18, coll: J.Sengupta, 5♂♂1♀ Tukpa valley, Kinnaur district, 2530 mt, 31°25'59"N, 78°14'36"E,15.iv.18, coll: J.Sengupta, 1♀ Tharmanga village, Kinnaur district, 2660 mt, 31°25'39"N,78°15'51"E,15.iv.18, coll: J.Sengupta, 2♂♂, Batal, Lahul & Spiti district, 4489 mt, 32°17'58.04"N 77°36'34.95"E, 19.iv.18, coll: J.Sengupta, 3♂♂, Gemur, Lahul & Spiti district, 4827 mt, 32°36'21.32"N, 77°10'11.76"E, 20.iv.18,coll: J. Sengupta, 2♀♀, Kugti, Lahul & Spiti district, 4630 mt, 32°28'42.58"N, 76°53'5.95"E, 19.iv.18, coll: J.Sengupta,

Diagnosis: Face with black central stripe, very wide. Stripes of dark hairs down the eyes, almost completely dark hind tibia with long hairs on the dorsal and ventral surface and the very broad black face stripe. The abdominal tergites vary in colour range of abdominal markings from black to orange. Wing length 9.75-13 mm.

Distribution: India: Himachal Pradesh, Arunachal Pradesh, Chandigarh, Jammu & Kashmir, Manipur, Meghalaya, Mizoram, Nagaland, Punjab, Sikkim, Uttarakhand, West Bengal.

Distribution: elsewhere: Australasian Region (Australia), Indo-Australian Region (Hawaii), Palaearctic Region (China, Japan), Oriental Region (Myanmar, Pakistan, Sri Lanka), Australasian Region (New Zealand).

Remarks: This species is reported to cause accidental genital myiasis in human from Iran in the year 2010. (Gonzalez et.al, 2009)

XII. Genus *Phytomia* Guerin-Meneville, 1833

Type species: *Eristalis chrysopygus* Wiedemann

Diagnosis: Whole body densely punctuate, presence of a small wrinkled surface just below the antennae, 3rd antennal joint oblong and ovate, drooping, scutellum distinctly large.

- Subgenus *Dolichomerus* Macquart, 1850

15. *Phytomia (Dolichomerus) crassa* (Fabricius, 1787)

1787. *Syrphus crassus* Fabricius, *Mant. Ins.* **2:**334

1849. *Dolichomerus crassus,* Macquart*, Dipt. Exot.,* **4**: 132

Type locality: Tranquebar, Chennai, Tamil Nadu, India

Material examined:2♀♀ Khokpa, Kinnaur district, 3652 mt, 31°35'12.81"N, 78°27'19.17"E, 15.iv.18,coll: J. Sengupta.

Diagnosis: Frontal callus mostly conquer 3/4th of frontal triangle, blackish antennae with plumose orange arista, 2nd to 4th abdominal tergites with a deep imprint of a large circle. A slender dark brown stripe running through 2nd to 4th vein encircles the anterior cross vein of the wing.

Distribution: India: Himachal Pradesh, Andhra Pradesh, Assam, Chennai (Tamil Nadu).

Distribution: elsewhere: Oriental region (Sri Lanka, Laos, Nepal, Thailand), Indo-Australian Region (Sulawesi, Malaya)

Remarks: This species is characterised by the presence of toothed a hind femora, a species widely distributed throughout Oriental region.

XIII. Genus *Mallota* Meigen, 1822

Type species: *Syrphus fuciformis* Fabricius

Diagnosis: Flies are remarkably long haired, Abdomen dark coloured without any distinguished pale markings. They efficiently mimics bumble bee and other hairy bees.

- Subgenus *Mallota* Meigen, 1822

16. *Mallota (Mallota) orientalis* (Wiedemann, 1824)**

1842. *Imatisma orientalis* Macquart, *Dipt. Exot.* **2**(**2**):69

Type locality: Indonesia. Java

Material examined: 2♀♀, Dhar Mane Rang, Kinnaur district, 4930 mt, 32° 0'43.27"N 78°19'33.83"E,19.iv.18, coll: J.Sengupta.

Diagnosis: Dark antennae with sub basal arista, sub quadrate thorax with relatively small blackish scutellum, 2nd and 3rd abdominal tergites broader than other segments. Incrassate hind legs with a tuft of black hairs below, wing with a brownish spot at base of sub marginal cell.

Distribution: India: Himachal Pradesh, Sikkim, West Bengal.

Distribution: elsewhere: Oriental region (Taiwan, Java, Laos)

Remarks: This species has been reported from the first time from this cold and dry zone as well as from the state of Himachal Pradesh.

17. *Mallota (Mallota) varicolor* (Walker, 1856)**

1857. *Merodon varicolor,* Walker, *Proc. Linn. Soc. Lond.* **1**: 122

Type locality: Malaysia. Sarawak.

Material examined: 1♀, Mahoun, Kinnaur district, 4304 mt, 32°23'54.01"N, 76°39'11.90"E,19.iv.18, coll: J.Sengupta, 3♀♀, Sarahan village side, Kinnaur district, 2110 mt, 31°31'18"N,77°47 '52"E, 13.iv.18, coll: J.Sengupta,

Diagnosis: Frons magnificently black, face with a medium dark brown tripe, dorsum of thorax with four equidistant narrow longitudinal stripe, 2nd abdominal tergite with a diamond shaped yellow spots, hind legs with a distinctive tooth just beyond base, a dark brownish stain in stigmatic region.

Distribution: India: Himachal Pradesh, Assam, Meghalaya, West Bengal.

Distribution: elsewhere: Indo- Australian Region (Borneo)

Remarks: This species has been reported from the first time from this cold and dry zone as well as from the state of Himachal Pradesh. According to literature, this species is mainly confined to high altitudinal landscape.

XIV. Genus *Syritta* Lepeletier & Serville, 1828

Type species: *Musca pipiens* Linnaeus.

Diagnosis: Metasternum haired, hairs longer than hind coxa, hind femur distinguishingly greatly enlarged. On apical third an anteroventral spinose ridge is present.

18. *Syritta pipiens* (Linnaeus, 1758)

1758. *Musca pipiens* Linnaeus, *Systema naturae.***1**: 594

1974. *Spheginoides tenofemorus* Dzhafarova, *Uchen. Zap. Univ., Ser. biol. Baku.***1**: 40

Type locality: Europe

Material examined: 3♂♂, 5♀♀ Dhar Ula, Kinnaur district, 4710 mt, 32° 6'52.73"N, 77°58'45.43"E, 16.iv.18,coll: J. Sengupta, 2♀♀ Dhar Sajam, Kinnaur district, 4975 mt, 32°54'8.73"N, 77°40'37.98"E, 16.iv.18,coll: J. Sengupta,4♀♀ Sarahan, Kinnaur district, 1280 mt, 31°30'53"N, 77°44'56"E, 13.iv.18,coll: J. Sengupta, 2♂♂, 1♀ Sangra, Kinnaur district, 1450 mt, 31°33'16"N, 77°55 '7"E, 13.iv.18,coll: J. Sengupta, 1♀ Kuppa, Kinnaur district, 2070 mt, 31°28'13"N, 78°11'9"E, 13.iv.18,coll: J. Sengupta.

Diagnosis: Small narrow fly. Hind femur swollen in a compact manner, with small spines beneath apically. Presence of long spine at the base of inner surface of hind femur. Wing length 4.25-7 mm.

Distribution: India: Himachal Pradesh, Jammu & Kashmir, Uttarakhand, Uttar Pradesh and West Bengal.

Distribution: Nearctic Region (California & Florida), Neotropical region (British Columbia, Mexico)

Remarks: This species is distinguished by the highly swollen area of hind leg.

Figure 3A-3I: Habitus of 3A: *Mallota (Mallota) varicolor* (Walker, 1856),3B: *Melanostoma orientale* (Wiedemann, 1824), 3C: *Phytomia (Dolichomerus) crassa* (Fabricius, 1787), 3D: *Chrysotoxum violaceum* Brunetti, 1923, 3E:*Episyrphus (Episyrphus) balteatus* (De Geer, 1776), 3F:*Sphiximorpha triangulifera* (Brunetti, 1913),3G:*Sphaerophoria (Sphaerophoria) indiana* Bigot, 1884, 3H:*Eristalis (Eristalis) tenax* (Linnaeus, 1758), 3I:*Volucella ruficauda* Brunetti, 1907.

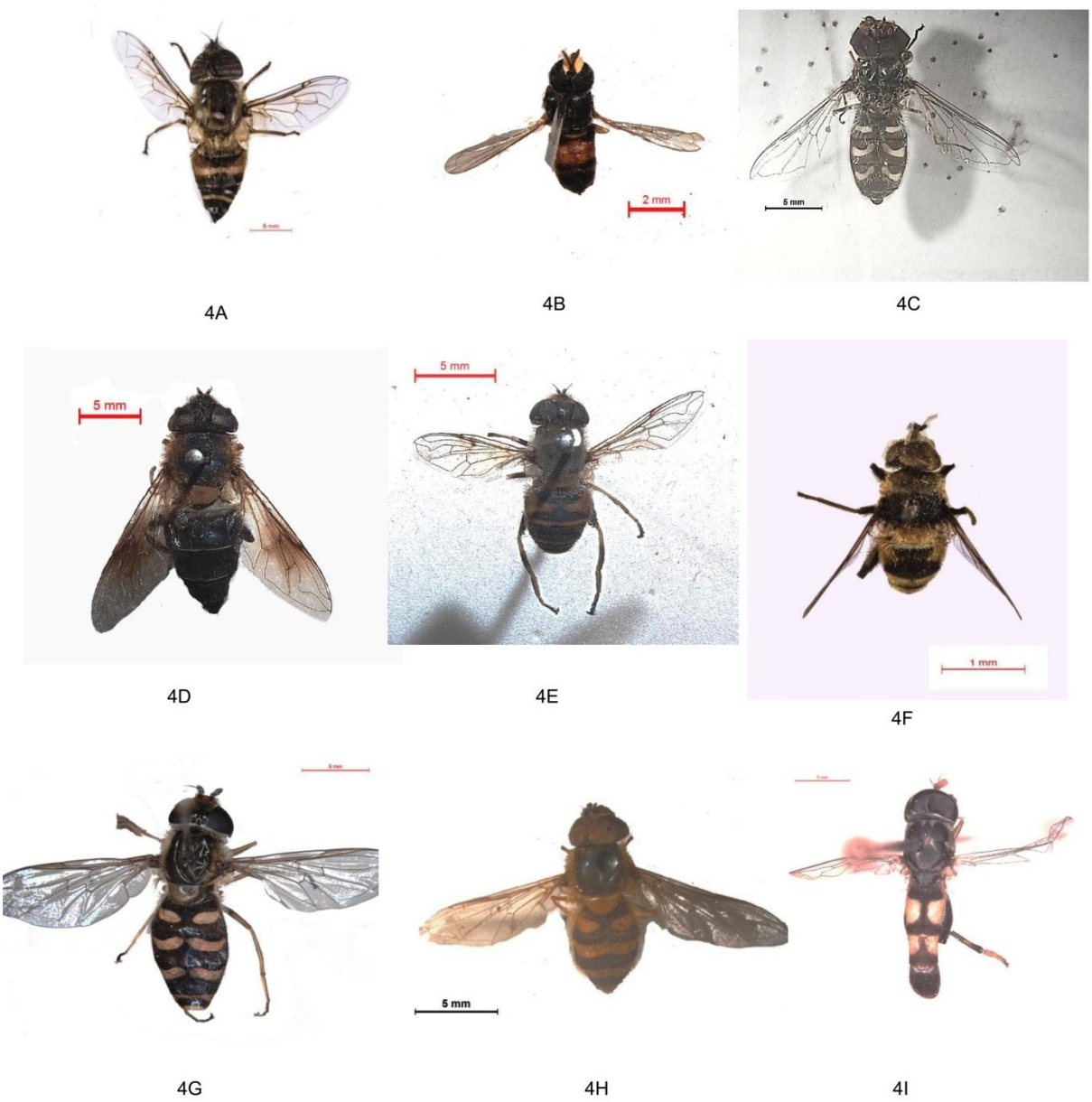

Figure 4A-4I: Habitus of 4A: *Eristalinus (Eristalodes) paria* (Bigot, 1880),4B: *Paragus (Paragus) bicolor* (Fabricius, 1794), 4C: *Scaeva pyrastri* (Linnaeus, 1758), 4D: *Eristalis (Eoseristalis) himalayensis* Brunetti, 1908, 4E: *Eristalis (Eoseristalis) cerealis* Fabricius,1805, 4F: *Mallota (Mallota) orientalis* (Wiedemann, 1824), 4G: *Scaeva latimaculata* (Brunetti, 1923), 4H: *Syrphus (Syrphus) torvus Osten Sacken, 1875*, 4I:*Syritta pipiens* (Linnaeus, 1758)

Conclusion

Altogether 18 species of hoverflies under 14 genera and 2 sub families have been reported from our study area**.** Among which 4 species namely *Chrysotoxum violaceum* Brunetti, 1923, *Sphiximorpha triangulifera* (Brunetti, 1913), *Mallota (Mallota) orientalis* (Wiedemann, 1824), *Mallota (Mallota) varicolor* (Walker, 1856) has been reported from the first time from this cold dry zone as well as from the state of Himachal Pradesh. Hoverflies are found to be abundant mostly during late morning to early noon time throughout all the season, although during winter season this zone of Himachal Pradesh remain isolated from rest of the world due to very heavy snow fall, thus abundance of hoverflies during winter season could not be determined from this zone. This is one of the

gap areas which should be attempted in future days. Among the reported 18 species, 6 species found to be widely distributed throughout the year while 3 species found to be endemic from the state as well as from India. As this zone of Himachal Pradesh is very close to the boundary of China and Tibet, so many of the species reported from this area has shown a more oriented distribution towards the Palaearctic region. But overall the species richness as well as species abundance is low from this area which is mostly due to unfavourable climatic condition excessive low level of precipitation as well as adverse geographical characteristics including dry and cold landscape of this zone. Further study from this area especially in winter time will give a clearer picture of hoverfly diversity from this area of Himachal Pradesh.

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