



Review on Odonate Diversity of Sahastradhara and Distribution Elsewhere in Dehra Dun and Uttarakhand

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ABSTRACT: Present review deals with 53 species belonging to 35 genera 11 families, 6 superfamilies and 2 suborders under order Odonata, recorded earlier from Sahastradhara, north-eastern part of Doon valley, Dehra Dun with an update on their systematic account, sighting period, diagnostic features, measurements, distribution (elsewhere in Dehra Dun and Uttarakhand), perching behavior, conservation status and threats.

Family Libellulidae is found to be the richest, having 43.40 % of species and its genus *Orthetrum* is most diverse, comprising 34.78% species. As regards conservation status, all the species (except *Ophiogomphus cerastis* which fall under 'Data Deficient' category) fall under 'Least Concern' Category of International Union for Conservation of Nature (IUCN) Red list, which is good indication for their survival, provided the habitats are saved and secured.

Keywords: Odonate Diversity of Sahastradhara, Dehra Dun, Uttarakhand.

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INTRODUCTION

Studies on Odonate fauna of Dehra Dun (Uttarakhand) has attracted the attention of various workers during the past (Prasad & Bhargava, 1975; Prasad & Singh, 1976, 1995; Singh & Prasad, 1976a; Kumar & Prasad, 1977a, 1978, 1981; Tyagi, 1982, 1983a,b, 1988; Tyagi & Tyagi, 1989; Tyagi *et al.*, 1986; Sangal & Tyagi, 1984,1985; Lieftinck, 1984; Prasad & Varshney, 1995; Kumar, 1995; Kumar & Mitra, 1998; Hamalainen, 1998; Mitra, 1999, 2000a,b; Prasad, 2002; Mitra, 2005; Prasad & Mondal, 2010; Prasad & Sinha, 2010; Husain, 2014) but no consolidated account on species of Sahastradhara, an important Nature's Hub, is available, except for some scattered records or notes (Prasad & Bhargava, 1995; Prasad & Singh, 1976; Singh &

Prasad, 1976; Tyagi, 1982; Sangal & Tyagi, 1984,1985; Lieftinck, 1884; Hamalainen, 1998; Kumar & Mitra, 1998; Babu *et al.*, 2013) and hence an update on the work done was very much required for the benefit of researchers, field workers and nature lovers. During present study the known Odonate fauna (Anisoptera-Dragonflies and Zygoptera-Damselflies) of Sahastradhara (and personal frequent visits to the site for the purpose) was studied in detail for its systematic account, sighting period, diagnostic features, measurements, distribution (Sahastradhara, elsewhere in Dehra Dun and Uttarakhand), perching behavior, conservation status and threats, which was lacking and very much required for general and scientific knowledge.

As regards present assessment on richness of odonate species in Sahastradhara (53 spp, present total) in relation to Dehra Dun (92 spp, Kumar, 1995) and Uttarakhand (128 spp, Kumar, 1995), it comes to around 57.61% and 41.41% respectively which is very significant for such a small niche. Further, dragonflies are more diverse group in nature than damselflies, being 62.26% (33 spp) and 37.74% (20 spp) in Sahastradhara, 60.87 % (56 spp) and 39.13 % (36 spp) in Dehra Dun and 57.81 % (74 spp) and 42.19 % (54 spp) in Uttarakhand which is almost the same. In general, family Libellulidae is richest as regards number of species and families Gomphidae and Coenagrionidae come next with almost same number of species in all the three areas (Sahastradhara, Dehra Dun and Uttarakhand); with genus *Orthetrum* most dominant under Anisoptera and genus *Calicnemia* under Zygoptera, as regards the number of species.

STUDY AREA: SAHASTRADHARA

Sahastradhara (30°19'51.86" N Latitude and 78° 3'58.22" E Longitude) is located in Lesser Himalaya, at the base of Mussoorie Hills, at a distance of about 14 km north-east of Dehra Dun city and is famous for its Sulphur springs, caves and natural beauty.

Here, limestone stalactites are accumulated over years and created projecting ledges, forming a caves, from the top of which water drips in the form of thousands of water drop-lets, like shower and hence the name 'Sahastradhara' given to the place. There lie, as well, the Sulphur springs of low water temperature and hence the place is also known as 'Sulphur Springs', the water of which is believed to be of medicinal value. The area as a whole is a warehouse of excellence and ecstatic beauty of caves, springs, water falls and gushing stream during rainy season and steppe farming. The water is cool and sweet and attracts a variety of insects, especially dragonflies and damselflies which complete their life cycle here and flourish with great diversity.

Baldi stream is the main water course, torrential and flowing through the area, is fed by small streams from around and by Sulphur springs. It takes its origin from base of Mussoorie hills. Besides cool and sweet, the water is an amalgamation of sulphur and other minerals.

Flora: The area is rich, both in aquatic and terrestrial plants as under:

Algae: *Rhizoclonium* sp. (Green algae), *Oscillatoria* sp. (Filamentous algae), *Chara hydrophytes* etc.

Ferns: *Adiantum* sp. (Walking/Maiden-hair), *Aleuritopteris farinosa*, *Ampelopteris* sp., *Equisetum* sp. (Horse-tail), *Pteris* sp. etc.

Bushes/Shrubs: *Ageratina adenophora*, the Sticky Snake-root; *Ageratum conyzoides*, the Goat weed; *Apluda mutica*, the Tachula; *Bindens* sp., the Cobbler Peg; *Colocasia* sp., the Aalukee; *Debregeasia longifolia*, the Orange Wild Rhea; *Dicliptera roxburghiana*, the Chinese Fold-wing; *Justicia adhatoda*, the Vasaka; *Lantana camara*, the Raimuniya; *Lepidagathis* sp., the Bukhar Jadi; *Mimosa himalayana*, the Shiahkanta (a deciduous shrub); *Nasturtium* sp., the Jakumbhi; *Parthenium hysterophorus*, the Gajar ghaas; *Phoenix* sp. (Palm), *Saccharum munja*, the Munj; *Salix* sp., the Willow; *Solanum hispidum*, the Devil's Fig/Turkey Berry; *Strobilanthes* sp., the Maruadona; *Thysanolaena maxima*, the Tiger Grass/Broom Grass etc.

SYSTEMATIC ACCOUNT OF SPECIES WITH SIGHTING PERIOD, DISTRIBUTION, CONSERVATION STATUS, THREATS ETC.

Class: Insecta Linnaeus, 1758

Order: Odonata Fabricius, 1793

(Dragonflies and Damselflies)

Suborder: Anisoptera Selys, 1854

(Dragonflies)

Superfamily: Aeshnoidea Leach, 1815

(Hawkers)

Family: Aeshnidae Leach, 1815

Genus: *Anax* Leach, 1815

(Subfamily: Aeshninae Leach, 1815)

1. *Anax immaculifrons* Rambur, 1842

Blue Darner, Magnificent Emperor

Anax immaculifrons Rambur, 1842. *Ins. Nevrop.*: 189; Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 145-146, fig 44a.

Sighting Period: April-June, rarely up to October (Kumar & Prasad, 1981); April-August (Kumar & Mitra, 1998); Peak March-May, secondary June-September (Nair, 2011).

Diagnostic Features: Large-sized species with pterostigma long, covering about three cells, ochreous to reddish-brown, legs black.

Male: Eyes sapphire-blue, bordered with black; thorax pale bluish-green above, turquoise blue laterally with two black stripes; abdomen black (segment 1), turquoise-blue with a black mark 'bird in flight' above (Segment 2), broadly turquoise-blue and black (segments 3-8), lack (segment 9) and black/brown above (segment 10); anal appendage pale reddish-brown/ochreous; wings transparent and tinted with amber-yellow from base to tip.

Female: Like male but eyes greenish and turquois-blue replaced by pale greenish-yellow on thorax and base of abdomen, black markings edged with reddish-brown; anal appendage blackish-brown.

Measurements:

Male: Abdomen 52-55, hind-wing 55 mm (Fraser, 1936), abdomen 51.5, fore-wing 56-58 mm, hind-wing 55 mm (Singh & Prasad, 1976).

Female: Abdomen 56, hind-wing 58-60 (Fraser, 1936).

Distribution: 457-2286 m/1500-7500 ft (Fraser, 1936; Husain, 2015); 600-2000 m (Kumar & Prasad, 1981).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976).

Elsewhere in Dehra Dun: Doon Valley (new record, Singh & Prasad, 1976).

Uttarakhand: Dehra Dun and Pauri (Dehra Dun-Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995; Husain, 2015); Western Himalaya (Prasad & Varshney, 1995; Prasad, 2002; Prasad & Sinha, 2010).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: Not threatened, being widespread. However, potential threats could be excessive development, urbanisation and possibly pollution.

Remarks: Perches perpendicularly on vegetation along rocky pools of hill streams (Kumar & Mitra, 1998). Males are seen in large numbers as compared to females which are much lesser (Nair, 2011).

2. *Anax nigrolineatus* Fraser, 1935

Blue-spotted Emperor

Anax nigrofasciatus nigrolineatus Fraser, 1935. *J. Darjeeling nat. Hist. Soc.*, 10: 23-25 (type-locality: India).

Anax nigrolineatus, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 138-140, fig 43b.

Sighting Period: April-October (Kumar & Prasad, 1981); June (Kumar & Mitra, 1998).

Diagnostic Features: Eyes bluish-green; thorax pale green with black markings; legs black and yellowish-green/reddish-brown.

Male: Abdomen black, marked with bluish-green/bluish spots; anal appendage black/blackish-brown; pterostigma ochreous between black nervures, covering 2-3 cells.

Female: Like male but wings palely enfumes brownish, more so towards tips, abdominal markings more greenish-yellow, anal appendage stouter, dark reddish-brown.

Measurements:

Male: Abdomen 53, hind-wing 48 mm (Fraser, 1936).

Female: Abdomen 49-51, hind-wing 50 mm (Fraser, 1936).

Distribution: 1500-2000 m (Kumar & Prasad, 1981); 200-1500 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Kumar & Mitra, 1998, as *Anax nigrofasciatus nigrolineatus*).

Elsewhere in Dehra Dun: As above (new record, Kumar & Mitra, 1998).

Uttarakhand: Uttarkashi, Almora, Nainital and Pithoragarh (Kumar & Prasad, 1981; Kumar, 1995); Uttarakhand/Western Himalaya (Prasad & Varshney, 1995; Prasad, 2002; Prasad & Sinha, 2010).

Conservation Status: IUCN Red List Category-Least Concern (as *A. nigrofasciatus* Oguma, 2015).

Threats: Presently not under any serious threat (as *A. nigrofasciatus*).

Remarks: Perches on exposed stones in streams and bushes around.

Anax nigrofasciatus nigrolineatus Fraser, 1935 (type-locality: Darjeeling, India), synonym of *Anax nigrolineatus* Fraser, 1935 (Subramanian & Babu, 2017), is found in India (Darjeeling and Sikkim), Bhutan, Nepal, China and Thailand (Tsuda, 2000).

Anax nigrofasciatus nigrofasciatus Oguma, 1915 (type-locality: Japan), elevated to *A. nigrofasciatus*, is found in China, Japan, South Korea and Philippines. However, Schorr & Paulson (2018) considered *A. nigrolineatus* as synonym of *A. nigrofasciatus*.

Genus: *Gynacanthaeschna* Fraser, 1921 (Subfamily: Brachytroninae Tillyard, 1917).

3. *Gynacanthaeschna sikkima* (Karsch, 1891)

Cephalaeschna sikkima Karsch, 1891. *Ent. Naschr.*, 17(18): 6-7 (type-locality: Sikkim).

Gynacanthaeschna sikkima, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 77-79, fig. 21.

Sighting Period: September-November (Kumar & Prasad, 1981); October (Hamalainen, 1989).

Diagnostic Features:

Male: Eyes green; thorax dark reddish-brown, marked with grass green; abdomen long and slim, black, marked with green and yellow; anal appendage dark reddish-brown; wings may be palely enfumed, especially towards tips; pterostigma very short, covering 1.5 cells, dark reddish-brown; legs reddish-brown and black.

Female: Differs from male in stouter and compressed abdomen and broader wings (tinted with bright amber-yellow at bases), anal appendage narrow, conical and blackish-brown.

Measurements:

Male: Abdomen 44-46, hind-wing 38 mm (Fraser, 1936).

Female: Abdomen 42-45, hind-wing 40 mm (Fraser, 1936).

Distribution: Altitude range 1200-2100 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Hamalainen, 1989).

Elsewhere in Dehra Dun: As above (new record, Hamalainen, 1989).

Uttarakhand: Chamoli and Uttarkashi (Prasad & Kumar, 1977); Dehra Dun (Kumar, 1995; Prasad & Sinha, 2010).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: Habitat loss through developmental activities.

Remarks: Hamalainen (1989) observed several specimens flying high over a small torrential mountain stream at Sahastradhara.

Superfamily: Gomphoidea Rambur, 1842

Family: Gomphidae Rambur, 1842

(Clubtails)

Genus: *Anormogomphus* Selys, 1854

(Subfamily: Gomphinae Rambur, 1842).

4. *Anormogomphus heteropterus* Selys, 1854

Gomphus (*Anormogomphus*) *heteropterus* Selys, 1854. *Synopsis des Gomphines*: 42 (as generotype of *Anormogomphus* Selys, 1854; type-locality: India) / *Bull. Acad. Belg.*, 21(2): 61.

Anormogomphus heteropterus, Fraser, 1934. *Faun. Brit. India, Odon.*, 2: 174-176, fig. 53.

Sighting Period: Not available.

Diagnostic Features: Eyes pale whitish-yellow; wings pale with black reticulation.

Male: thorax deep yellow above with brownish lines, each side of mid-dorsal stripe, sides grass green tinge; abdomen pale sandy yellow, marked with dark brown; anal appendage yellow with inwardly curved black spine; pterostigma pale yellow between black nervures; legs sandy yellow with black spines.

Female: Comparatively larger than male. Thorax grass green above with dark brown stripes, yellow on sides, abdomen yellow with greenish tinge, marked obscurely with ferruginous and black; anal appendage ferruginous, small and conical; legs greenish-yellow with black spines

Measurements:

Male: Abdomen 25, hind-wing 22 mm (Fraser, 1934).

Female: Abdomen 27, hind-wing 25 mm (Fraser, 1934), abdomen 35, fore-wing 31-33.5, hind-wing 31 mm (Singh & Prasad, 1976).

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Distribution:

Sahastradhara: Sahastradhara/Sulhpur Springs (new record but didn't find any male, Singh & Prasad, 1976).

Elsewhere in Dehra Dun: Donga, Haripur, Kalsi, Timli, Gola Tappar, Lachhiwala, Mianwala and Ramgarh (new record, Singh & Prasad, 1976; Prasad & Singh, 1995).

Uttarakhand: Dehra Dun (new record, Singh & Prasad, 1976; Kumar & Prasad, 1981; Kumar, 1995); Uttarakhand (Prasad & Sinha (2010); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (new record, Prasad & Singh, 1995).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: Habitat degradation.

Remarks: First record from Uttarakhand/Uttar Pradesh (Singh & Prasad, 1976).

Genus: *Lamellogomphus* Fraser, 1922

(Subfamily: Onychogomphinae Chao, 1984).

5. *Lamellogomphus biforceps* (Selys, 1878)

Onychogomphus biforceps Selys, 1878. *Bull. Acad. r. Belg.*, (2) 46: 420 (type-locality: Darjeeling).

Lamellogomphus biforceps biforceps, Fraser, 1923-24. *J. Bombay nat. Hist.*, 29: 332, 983-984 (as generotype of *Lamellogomphus* Fraser, 1923). *Lamellogomphus biforceps*, Fraser, 1934. *Faun. Brit. India, Odon.*, 2: 271-272, figs. 82a, 83c.

Sighting Period: May-October (Kumar & Prasad, 1981; Kumar & Mitra, 1998; Subramanian, 2009; Prasad & Sinha, 2010).

Diagnostic Features: Black and yellow species with bright bottle green eyes, wings transparent, pterostigma black and elongate, anal appendage prominent claw-like with dorsal yellow and ventral black branches and legs black and greenish-yellow.

Male: Thorax black with greenish-yellow 'V' shaped marks above and sides with greenish-yellow stripes; abdomen black with bright yellow spots.

Female: Like male but differ in much larger yellow spots on abdomen.

Measurements:

Abdomen 41, hind-wing 32 mm (Fraser, 1934).

Distribution: Around 1000 m (Kumar & Prasad, 1981); up to 1800 m altitude (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: As above.

Uttarakhand: Uttarakhand/ Western Himalaya (Kumar & Prasad, 1981; Prasad, 2002; Subramanian, 2009; Prasad & Sinha, 2010).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: No information available although water pollution and sedimentation in hill streams could be a potential threat.

Remarks: Usually perch on mid-stream rocks/boulders in hill streams and riparian vegetation (Kumar & Mitra, 1998; Subramanian, 2009).

Genus: *Nepogomphus* Fraser, 1934
(Subfamily: Onychogomphinae Chao, 1984).

6. *Nepogomphus modestus* (Selys, 1878)

Selys's Club-tail

Onychogomphus modestus Selys, 1878. *Bull. Acad.r. Belg.*, (2) 46: 423 (type-locality: India).

Nepogomphus modestus, Fraser, 1934. *Faun. Brit. India, Odon.*, 2: 285-286.

Sighting Period: May-June (Kumar & Prasad, 1981); Summer Season (Husain, 2014).

Diagnostic Features: Eyes green; thorax black with yellow collar and yellow stripes; abdomen black, marked with yellow; legs black and yellow.

Male: Anal appendage bright yellow and brownish-black; wings hyaline; pterostigma black/blackish-brown, covering 3-4 cells.

Female: Wings palely tinted with yellow at bases; pterostigma reddish-brown between black nervures, covering 4-5 cells; anal appendage conical and brightly yellow.

Measurements:

Male: Abdomen 27-29, hind-wing 23-25 mm (Fraser, 1934), abdomen 23, fore-wing 24, hind-wing 22.5 mm (Singh & Prasad, 1976).

Female: Abdomen 27, hind-wing 24 mm (Fraser, 1934), abdomen 24, fore-wing 24, hind-wing 22.5 mm (Singh & Prasad, 1976).

Distribution: 600-1000 m (Kumar & Prasad, 1981); up to 1000 m altitude (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976).

Elsewhere in Dehra Dun: Robber's Cave, Donga, Timli, Rajpur and Motichur (Singh & Prasad, 1976); Vijay Park (new record, Husain, 2014).

Uttarakhand: Dehra Dun, Pauri, Tehri and Pithoragarh (Kumar & Prasad, 1981; Kumar, 1995; Husain, 2014); Almora (Prasad & Sinha, 2010); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Husain, 2014).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: Deforestation and hydropower developmental activities could be significant threats, especially in hill areas.

Remarks: Perches on stream stones and bushes around. Kumar & Mitra (1998) did not record from

Sahastradhara. Singh & Prasad (1976) recorded for the first time from north-west India.

Genus: *Ophiogomphus* Selys, 1854.

7. *Ophiogomphus cerastis* Selys, 1854

Ophiogomphus cerastis Selys, 1854. *Synopsis des Gomphines. Bull. Acad. r. Belg.*, 21 (2): 22, 41: (type-locality: Nepal, though without any specific location).

Gomphus (*Onychogomphus*) *cerastis*, Selys, 1858. *Monogr. Gomph.*: 323 (vide World Catalogue of Odonata, Issue 110:172).

Onychogomphus cerastis, Fraser, 1934. *Faun. Brit. India, Odon.*, 2: 260-261.

Sighting Period: Not available.

Diagnostic Features:

Male: Thorax black with yellow marking above, yellow with black markings on sides; abdomen yellow and black; wings slightly tinted with yellow at bases; pterostigma reddish-brown, bordered with black nervures covering over 5 cells; legs black and yellow.

Female: Differs from male in abdomen compressed, last segments slightly dilated; anal appendage yellow, slightly longer than last segment, slender and pointed.

Measurements:

Male: Abdomen 40, hind-wing 32-34 mm (Fraser, 1934), abdomen 32, fore-wing 30, hind-wing 28 mm (Singh & Prasad, 1976).

Female: Abdomen 43-45, hind-wing 35-37 mm (Fraser, 1934).

Distribution:

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976).

Elsewhere in Dehra Dun: Timli (Singh & Prasad, 1976).

Uttarakhand: Dehra Dun (Kumar & Prasad, 1981 and Kumar, 1995 as *Onychogomphus cerastis* Selys, 1854).

Conservation Status: IUCN Red List Category-Data Deficient.

Threats: No information available. However, habitat loss through deforestation (for agriculture and logging) and hydropower development may be one of the threats.

Genus: *Paragomphus* Cowley, 1934
(Subfamily: Onychogomphinae Chao, 1984).

8. *Paragomphus lineatus* (Selys & Hagen, 1850)

Common Hook-tail, Lined Hook-tail

Lindenia lineata Selys & Hagen, 1850. *Revue Odon. Libell. europ.* Paris: 336 (type-locality: Himalaya).

Onychogomphus lineatus, Selys, 1854. *Synopsis des Gomphines*: 17.

Mesogomphus lineatus, Fraser, 1934. *Faun. Brit. India, Odon.*, 2: 230-234, fig. 73.

Paragomphus lineatus, Davies & Tobin, 1985. *The Dragonflies of the World, Utrecht*, 2: 47.

Sighting Period: Almost throughout the year but most common from September to November (Fraser, 1934); February-October (Kumar & Prasad, 1981); February-November, common during September-November (Kumar & Mitra, 1998); throughout the year (Subramanian, 2009; Husain, 2014); peak May & August-September, secondary March-April & June-July & October (Nair, 2011).

Diagnostic Features: Medium-sized yellow and black species with black and brown markings; anal appendage dull sandy yellow; wings with yellowish-white costa.

Male: Eyes bluish-grey; thorax sandy yellow, with dull/dark brown/blackish-brown 'X' shaped and an oblique mark on back, sides with three parallel brown stripes; abdomen black, marked with yellow (or yellow marked with black), last segments (8th, 9th) with oar-like expansions; anal appendage hook-shaped; wings transparent, with yellowish-white costa, extending to pterostigma; pterostigma pale reddish-brown, heavily bordered with black, covering 4-6 cells; legs yellow and black.

Female: Similar to male but less brightly coloured (much paler than male and less marked with brown or black), eyes pale bluish but duller in colour, without abdominal expansions and hooked tip, wings palely suffused/saffronated at base, pterostigma similar to male but paler.

Measurements:

Male: Abdomen 32-37, hind-wing 24-27 mm (Fraser, 1934), abdomen 29, fore-wing 25, hind-wing 23 mm (Singh & Prasad, 1976).

Female: Abdomen 31-36, hind-wing 24-27 mm (Fraser, 1934), abdomen 33, fore-wing 31, hind-wing 29 mm (Singh & Prasad, 1976).

Distribution: 300-800 m (Kumar & Prasad, 1981)

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Donga, Kandholi, Langha, Bhaniawala, Asarori, Motichur, Rishikesh and Raipur (Singh & Prasad, 1976); Asan Reservoir (Mitra, 2000); Vijay Park (new record, Husain, 2014).

Uttarakhand: Dehra Dun and Nainital (Dehra Dun-Fraser, 1934 and Kumar, 1972; Kumar & Prasad, 1981 and Kumar, 1995 as *Mesogomphus lineatus*; Husain, 2014, 2015); Almora and Dehra Dun (Prasad & Sinha, 2010); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1995; Husain, 2014; 2015).

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Conservation Status: IUCN Red List Category-Least Concern.

Threats: Agriculture and associated water pollution having a direct effect on its habitat.

Remarks: Perches low on bare earth, damp sand, mid-stream, side stones, rocks, some nearby vegetation along stream etc. (Kumar & Mitra, 1998; Nair, 2011).

Genus: *Scalmogomphus* Chao, 1990

(Subfamily: Onychogomphinae Chao, 1984)

9. *Scalmogomphus bistrigatus* (Hagen in Selys, 1854)

Gomphus bistrigatus Hagen in Selys, 1854 (nec Fraser, 1934). *Synopsis des Gomphines: 27* (type-locality: India).

Onychogomphus m-flavus Selys, 1894. *Ann. Soc. ent. Belg.*, 38: 169 (type-locality: Darjeeling).

Onychogomphus bistrigatus, Fraser, 1922. *Rec. Indian Mus.*, 24: 424 (India); Hamalainen, 1998. *Odonotologica*, 18(1): 13-20= *O. m-flavum* Selys, 1854 (River Rispana at Tapovan, Rajpur, Dehra Dun Valley); Kumar & Prasad, 1981. *Rec. zool. Surv. India*, Occ. Paper No. 20: 47, 84.

Onychogomphus M-flavum, Kumar & Prasad, 1981. *Rec. zool. Surv. India*, Occ. Paper No. 20: 47, 84.

Scalmogomphus bistrigatus, Subramanian & Babu, 2017. *Checklist of Odonata (Insecta) of India: 29*. Version 3.0, www.zsi.gov.in (last updated: 25th September, 2017).

Sighting Period: June-September (Kumar & Mitra, 1998).

Diagnostic Features: Black and yellow species. Abdomen black, marked with bright yellow, becoming ochreous towards tip;

Male: Eyes black above; thorax black above, marked with bright greenish-yellow; anal appendage golden yellow, darker above; wings faintly tinted with greenish at base; pterostigma dark brown, margined with black nervures, covering 4-5 cells; legs black and yellow.

Female: Wings slightly suffused; pterostigma dark brown/blackish, covering 4.5-5.5 cells; anal appendage dark yellow and short; legs black and yellow.

Measurements:

Male: Abdomen 38, hind-wing 30-33 mm (Fraser, 1934); abdomen 34, fore-wing 31, hind-wing 30 mm (as *Onychogomphus M-flavum* Selys, 1854 Singh & Prasad, 1976).

Female: Abdomen 39, hind-wing 32-36 mm (Fraser, 1934).

Distribution:

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976 as

Onychogomphus M-flavum Selys, 1854; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Herbertpur and Robber's Cave (new record, Singh & Prasad, 1976, as *Onychogomphus M-flavum* Selys, 1854); Rispana river at Tapovan, Rajpur (new record, Hamalainen, 1989, as *Onychogomphus bistrigatus*); Dehra Dun (Kumar, 1995, as *Onychogomphus M-flavum* Selys, 1854 and *Onychogomphus bistrigatus*, Hagen in Selys, 1854).

Uttarakhand: Chamoli, Tehri, Uttarkashi and Pithoragarh (Kumar & Prasad, 1981; Kumar, 1995, as *Onychogomphus M-flavum* Selys, 1854 and *Onychogomphus bistrigatus*, Hagen in Selys, 1854); Chamoli and Rudraprayag (Prasad & Sinha, 2010 as *Onychogomphus bistrigatus*); Dehra Dun (vide IUCN Red List, as *Scalmogomphus bistrigatus*); Western Himalaya (Prasad, 2002).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: No specific information is available but it is likely that its habitat is being lost through deforestation (agriculture and logging) and hydropower development.

Remarks: New record from Uttarakhand and Uttar Pradesh (as *Onychogomphus m-flavum* Selys, 1854 Singh & Prasad, 1976). Usually perches on adjacent vegetation near stream (Kumar & Mitra, 1998).

Superfamily: Libelluloidea Leach, 1815

Family: Libellulidae Leach, 1815

Genus: *Brachydiplax* Brauer, 1868

(Subfamily: Brachydiplacinae Tillyard, 1917).

10. *Brachydiplax sobrina* (Rambur, 1842)

Little Blue Marsh Hawk

Libellula sobrina Rambur, 1842. *Ins. Nevrop.*: 114.

Brachydiplax sobrina, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 325-327.

Sighting Period: Summer (Kumar & Prasad, 1981); May-September (Kumar & Mitra, 1998).

Diagnostic Features: Small species with dense bluish-white pruinescence on thorax and abdomen.

Male: Eyes coffee brown above, pale yellowish below; thorax dark brown/olivaceous-brown to greenish-yellow with black/metallic markings by pruinescence; abdomen black with bluish pruinescence on segments 1-7 and fully black on rest of segments (marked with yellow in teneral); anal appendage black; wings transparent; pterostigma pale yellow between black nervures, covering 1.5 cells; legs black and yellow.

Female: Similar to male, except in thorax bright yellow with glossy black stripes.

Measurements:

Male: Abdomen 20-24, hind-wing 25-28 mm (Fraser, 1936).

Female: Abdomen 16-22, hind-wing 22-26 mm (Fraser, 1936).

Distribution: Up to 1700 m altitude (IUCN Red List).

Sahastradhara: Sahastradhara/Sulphur Springs (new record, Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Asan Reservoir (new record, Mitra, 2000).

Uttarakhand: Dehra Dun (Kumar & Prasad, 1981; Kumar, 1995; Husain, 2014); Uttarakhand/Western Himalaya (Prasad, 2002; Prasad & Sinha, 2010).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: No major threats at present, although urbanisation may harm its habitats.

Remarks: Immature and females rest on tall trees while adult males perch on vegetation in the midst of water bodies (Mitra, 2005).

Genus: *Orthetrum* Newman, 1833

(Subfamily: Libellulinae Leach, 1815).

11. *Orthetrum brunneum brunneum* (Fonscolombi, 1837)

Southern Skimmer

Libellula brunnea Fonscolombi, 1837. *Ann. Soc. Ent. France*, 6: 141.

Orthetrum brunneum brunneum, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 294-295.

Orthetrum brunneum, Subramanian & Babu, 2017. *Checklist of Odonata (Insecta) of India*: 32. Version 3.0, www.zsi.gov.in (last updated: 25th September, 2017).

Sighting Period: June-November (Kumar & Prasad, 1981).

Diagnostic Features: Medium-sized species.

Male: Thorax and abdomen pruinose blue, thorax light blue, abdomen broad at base and taper behind, wings tinted with brownish, pterostigma ochreous between black nervures, legs black and brown/reddish-brown or ochreous.

Female: Differs from male in thorax ochreous-brown above and marked with blackish and olivaceous; abdomen olivaceous/brownish-yellow, marked with black; anal appendage dark brown, conical; wings palely tinted with brownish; legs yellowish and black.

Measurements:

Male: Abdomen 29-31, hind-wing 33-34 mm (Fraser, 1936).

Female: Abdomen 26-29, hind-wing 29-35 mm (Fraser, 1936), abdomen 29, fore-wing 35, hind-wing 34 mm (Singh & Prasad, 1976).

Distribution: 600-2000 m (Kumar & Prasad, 1981).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976).

Elsewhere in Dehra Dun: Donga, Kandholi, Kansrao, Karwapani, Phanduwalla and Ramgarh (Singh & Prasad, 1976; Prasad & Singh, 1995).

Uttarakhand: Dehra Dun, Pauri, Tehri, Uttarkashi, Almora, Nainital (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995; Prasad & Singh, 1995); Uttarakhand/ Western Himalaya (Prasad & Varshney, 1995; Prasad, 2002; Prasad & Sinha, 2010); Rajaji Tiger Reserve (new record, Prasad & Singh, 1995).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: Habitat destruction and agriculture and associated water pollution main threats.

Remarks: Perches on exposed stones in streams and bushes around.

Other subspecies, *Orthetrum brunneum cycnos* (Selys, 1848), is distributed from Europe to Mongolia.

12. *Orthetrum glaucum* (Brauer, 1865)

Blue Marsh Hawk

Lebellula glauca Brauer, 1865. *Verh. Zool.-Bot. Ges. Wien*, 15: 1012 (type-locality: East India).

Orthetrum glaucum, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 307-309, fig. 92c.

Sighting Period: June-November (Kumar & Prasad, 1981); October (Hamalainen, 1989); in May at Sikkim (Mitra, 2006); May-October (Subramanian, 2009); peak May-June & August-September, secondary April & July & October (Nair, 2011); summer-early winter (Husain, 2014).

Diagnostic Features: Medium-sized species with greyish-black thorax and blue abdomen in male, olivaceous and reddish-brown respectively in female.

Male: Eyes dark green, capped with reddish-brown; thorax greyish-black with fine black-blue/black hairs; abdomen bulged/dilated anteriorly then very slim and pale blue; anal appendage black; wing transparent, bases tinted with dark amber-yellow (smoky brown in old); pterostigma dark reddish-brown; legs black and pale.

Female: Eyes paler, very different from male; thorax olivaceous above, bordered by a broad reddish-brown lateral stripe, sides reddish-brown with two yellowish-white narrow stripes; abdomen reddish-brown with a broad greenish-yellow stripe

above, last segments black above; anal appendage blackish-brown and conical; wings more enfumed; pterostigma pale brown; legs black and yellow.

Measurements:

Male: Abdomen 29-35, hind-wing 33-40 mm (Fraser, 1936), abdomen 28.5-30, fore-wing 36.5-38.5, hind-wing 35-37 (Singh & Prasad, 1976).

Female: Abdomen 28-32, hind-wing 32-37 mm (Fraser, 1936), abdomen 29-30, fore-wing 35-37, hind-wing 34-36 (Singh & Prasad, 1976).

Distribution: Plains and above altitudes of 1219 m /4000 ft (Fraser, 1936); 300-800 m (Kumar & Prasad, 1981); up to 2600 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976; Hamalainen, 1989; Prasad & Sinha, 2010).

Elsewhere in Dehra Dun: River Rispana at Tapovan, Rajpur (new record, Hamalainen, 1989); Asarori, Donga, Haripur, Kandholi, Kalsi, Kansrao, Lachhiwala, Manduwala, Motichur, Nalapani, Raipur, Rajpur, Ramgarh, Robber's Cave and Satyanarain (new records, Singh & Prasad, 1976; Prasad & Singh, 1995); Doon Valley (Kumar & Prasad, 1977); Maldevta (Prasad & Sinha, 2010); Vijay Park (new record, Husain, 2014); Wildlife Institute of India campus (new record, <http://www.indianodonata.org>).

Uttarakhand: Chamoli, Dehra Dun, Pauri, Tehri, Rudraprayag, Nainital, Pithoragarh (Kumar & Prasad, 1981; Kumar, 1995; Prasad & Sinha, 2010; Husain, 2014); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1995; Husain, 2014).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: No major threats.

Remarks: Not recorded from Sahastradhara by Kumar & Mitra (1998), though reported by other workers as above. Perches closer to ground; males have favourite perches and small territories and readily seen while females solitary and lesser in number (Nair, 2011).

13. *Orthetrum internum* McLachlan, 1894

Orthetrum japonicum internum McLachlan, 1894. *Ann. Mag. Nat. Hist.*, 13: 431 (type-locality: Szechwan); Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 304-305.

Orthetrum internum, Subramanian & Babu, 2017. *Checklist of Odonata (Insecta) of India*: 33, 39. Version 3.0, www.zsi.gov.in (last updated: 25th September, 2017).

Sighting Period: During May (Fraser, 1936); June-January (Kumar & Prasad, 1981).

Diagnostic Features: Pterostigma short, covering 2 cells and reddish-ochreous; legs black with reddish-brown and a large bright citron yellow spot.

Male: Eyes bottle green; thorax olivaceous-green above with a broad reddish-brown stripe, pale whitish-green/bluish from pruinescencwith a broad oblique reddish-brown stripe, dark brown below; abdomen broad at base, tapering towards end, pulverulent bluish-white/chalky white; anal appendage black; wings with amber-yellow tint at base and with blackish-brown towards tips.

Female: Similar to male but without any pruinescence on thorax and abdomen, abdomen bright yellow with finely black and a broad blackish-brown stripe, anal appendage black separated with a bright yellow protuberance.

Measurements:

Male: Abdomen 28-30, hind-wing 34 mm (Fraser, 1936), abdomen 27.5, fore-wing 35, hind-wing 33 (Singh & Prasad, 1976).

Female: Abdomen 26-29, hind-wing 32-34 mm (Fraser, 1936), abdomen 27.5, fore-wing 35, hind-wing 33.5 (Singh & Prasad, 1976).

Distribution: 300-3000 m (Kumar & Prasad, 1981); up to 3000 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976).

Elsewhere in Dehra Dun: Kansrao, Rajpur and Robber's Cave (Singh & Prasad, 1976; Prasad & Singh, 1995).

Uttarakhand: Dehra Dun, Pauri and Nainital (Kumar & Prasad, 1981; Kumar, 1995; Prasad & Singh, 1995); Western Himalaya (Prasad & Varshney, 1995; Prasad, 2002; Mitra, 2006; Prasad & Sinha, 2010); Rajaji Tiger Reserve (Prasad & Singh, 1995; Husain, 2014).

Conservation Status: IUCN Red List Category-Least Concern (as *O. japonicum*, Uhler, 1858).

Threats: Not threatened (as *O. japonicum*, Uhler, 1858).

Remarks: Mostly perch on exposed sones in streams and bushes around.

14. *Orthetrum luzonicum* (Brauer, 1868)

Tri-coloured Marsh Hawk

Libellula luzonica Brauer, 1868. *Verh. Zool.-Bot. Ges. Wien*, 18: 169, 732 (type-locality: Philippines).

Orthetrum chrysostigma luzonicum, Fraser, 1936. *Fauna Brit. Ind. Odon.* 3: 298-300, fig. 90a.

Orthetrum luzonicum, Subramanian & Babu, 2017. *Checklist of Odonata (Insecta) of India: 33*. Version 3.0, www.zsi.gov.in (last updated: 25th September, 2017).

Sighting Period: May-Novemver (Kumar & Prasad, 1981); May-mid November (Kumar &

Mitra, 1998; Prasad & Sinha, 2010); throughout the year (Subramanian, 2009); peak May-June & August-September, secondary July (Nair, 2011).

Diagnostic Features: Medium-sized species with azure-blue (male) or yellow (female) with brown/black markings, pterostigma yellowish and legs bluish-black.

Male: Eyes bluish-green with brownish spots; thorax pale olivaceous-green, marked with brown and yellow lateral stripes, upper side with a distinct 'Y' shaped yellow mark (brown-yellow/yellow markings replaced by pale blue pruinescence in older specimens); abdomen pale azure-blue and dialated at base, slender behind.

Female: Eyes brownish; thorax brownish green with yellowish markings; abdomen thin, yellowish and with black lateral lines.

Measurements:

Male: Abdomen 28-30, hind-wing 30-32 mm (Fraser, 1936), abdomen 29, fore-wing 29, hind-wing 27 mm (Singh & Prasad, 1976).

Female: Abdomen 28-32, hind-wing 30-32 mm (Fraser, 1936), abdomen 28, fore-wing 32, hind-wing 31 mm (Singh & Prasad, 1976).

Distribution: 300-2000 m (Kumar & Prasad, 1981); up to 1500 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Herbertpur, Motichur, Robber's Cave and Rishikesh (Singh & Prasad, 1976); Asan Reservoir (Mitra, 2000).

Uttarakhand: Dehra Dun, Pauri, Tehri, Uttarkashi, Nainital and Pithoragarh (Kumar & Prasad, 1981; Kumar, 1995; Husain, 2015); Gobind Pashu Vihar, Uttarkashi (Kumar, 2004); Western Himalaya (Prasad, 2002; Mitra, 2006).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: Not threatened.

Remarks: Differs from the published description in middle portion of labium black and its sides pale yellow, face slightly greenish yellow, reticulation in subcostal, cubital and discoidal areas may be black or yellowish (Singh & Prasad, 1976). Commonly found perched low on vegetation and grass, even on ground (Subramanian, 2009; Nair, 2011).

15. *Orthetrum pruinosum pruinosum* (Burmeister, 1839)

Crimson-tailed Marsh Hawk

Libellula pruinosus Burmeister, 1839. *Handb. Ent.*, 2: 853 (type-locality: Java).

Libellula neglecta Rambur, 1842. *Hist. nat. Ins. Nevrop.*, Paris: 86 (type-locality: China).

Orthetrum pruinosum neglectum, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 311-313, fig. 91a.

Orthetrum pruinosum, Subramanian & Babu, 2017. *Checklist of Odonata (Insecta) of India*: 33, 39. Version 3.0, www.zsi.gov.in (last updated: 25th September, 2017).

Sighting Period: Throughout the year (Kumar & Prasad, 1981); throughout the year except extreme winter months (Kumar & Mitra, 1998); Subramanian, 2009); throughout the year (Prasad & Sinha, 2010); peak May-June & August-September, secondary: March-April & July & October-November (Nair, 2011); almost throughout the year (Husain, 2014).

Diagnostic Features: Pterostigma reddish-brown, covering 2 cells; legs black and reddish-brown.

Male: Eyes blue-black above and bluish-grey below; thorax reddish-brown/dull purple, covered with fine hairs; abdomen purplish-red due to pruinescence (bright red in teneral); anal appendage red; wings transparent, pale brown towards tip, basal area marked with reddish-brown.

Female: Differs from male in eyes yellowish and capped with brown, thorax reddish-brown/dull ochreous with indistinct lateral brown stripe, abdomen dull ochreous with each segment thinly bordered with black, anal appendage dark ochreous and conical, basal wing marking indistinct/much paler.

Measurements:

Male: Abdomen 28-31, hind-wing 32-36 mm (Fraser, 1936), abdomen 28, fore-wing 35.5, hind-wing 34 mm (Singh & Prasad, 1976).

Female: Abdomen 30 mm, hind-wing 37 mm (Fraser, 1936), abdomen 25.5-28, fore-wing 34-37, hind-wing 32-36 mm (Singh & Prasad, 1976).

Distribution: 300-1800 m (Kumar & Prasad, 1981).

Sahastradhara: Sahastradhara/ Sulphur Springs (new record, Prasad & Bhargava, 1975; Singh & Prasad, 1976; Hamalainen, 1989; Kumar & Mitra, 1998; Prasad & Sinha, 2010).

Elsewhere in Dehra Dun: Asan Barrage (Hamalainen, 1989); Asarori, Bhogpur, Barkot, Bhoorpur, Bhaniawala, Ballupur, Donga, Dehra Dun, Herbertpur, Jaintanwala, Kalsi, Kandholi, Kansrao, Lachhiwala, Langha, Motichur, Nalapani, Rishikesh, Robber's Cave, Raipur, Rajpur, Sahaspur, Sabhawala and Timli (Singh & Prasad, 1976; Prasad & Singh, 1995); Doon Valley (Kumar & Prasad, 1977); Asan Reservoir (Mitra, 2000); Maldevta (Prasad & Sinha, 2010); Vijay Park (new record, Husain, 2014).

Uttarakhand: Chamoli, Dehra Dun, Pauri, Rudraprayag, Tehri, Uttarkashi, Almora, Nainital

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and Pithoragarh (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995; Prasad & Sinha, 2010; Husain, 1914); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1995; Husain, 2014).

Conservation Status: IUCN Red List Category- Least Concern (as *O. pruinosum*).

Threats: Not threatened but populations may be threatened due to developmental work.

Remarks: Males seen perched on shrubs, stones etc. (Subramanian, 2009; Nair, 2011). Prasad & Bhargava (1975) made interesting observations on its coitus behaviour at Sahastradhara.

Other subspecies, *Orthetrum pruinosum schneideri* Forster, 1903, is found in Indonesia. *Orthetrum pruinosum neglectum* Rambur, 1842 is synonym of *Orthetrum pruinosum*, Burmeister, 1839 (Subramanian & Babu, 2017).

16. *Orthetrum sabina sabina* (Drury, 1770)

Green Marsh Hawk, Slender Skimmer, Sober Skimmer,

Tiger Skimmer, Vaiegated Green Skimmer

Libellula sabina Drury, 1770. *Ill. Exot. Ins.*, 1: 114-115.

Orthetrum sabina, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 300-302, fig. 90e.

Orthetrum sabina sabina, Kumar & Prasad, 1981. *Rec. zool. Surv. India, Occ. Paper No. 20*: 58, 92.

Sighting Period: Dry and cold weather (Fraser, 1936); almost round the year, except December to February (Kumar & Prasad, 1981); almost throughout the year (Subramanian, 2009; Prasad & Sinha, 2010; Husain, 2014); peak May-September, secondary March-April & October-November (Nair, 2011).

Diagnostic Features: Medium-sized greenish-yellow species.

Male: Eyes green mottled with black; thorax greenish-yellow with black tiger-like stripes; abdomen green with broad black bands (segments 1-3) and swollen at base, inner edge of hind-wing tinted with yellow; pterostigma black with reddish-brown, legs black and yellow.

Female: Almost like male except for thinner tip of abdomen.

Measurements:

Male: Abdomen 30-36, hind-wing 30-36 mm (Fraser, 1936), abdomen 33, fore-wing 30-34 mm, hind-wing 30-33 mm (Singh & Prasad, 1976).

Female: Abdomen 32-35, hind-wing 31-35 mm (Fraser, 1936), abdomen 31, fore-wing 33 mm, hind-wing 30 mm (Singh & Prasad, 1976).

Distribution: 500-1200 m (Kumar & Prasad, 1981); up to 2300 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Asarori, Bhoorpur, Gola Tappar, Herbertpur, Jaintanwala, Jasowala, Johari, Kansrao, Mahant Majri, Rishikesh, Ramgarh, Sahaspur, Satyaran and Timli (Singh & Prasad, 1976; Prasad & Singh, 1995); Doon Valley (Kumar & Prasad, 1977); Asan Reservoir (Mitra, 2000); Vijay Park (new record, Husain, 2014).

Uttarakhand: Dehra Dun, Pauri, Tehri and Nainital (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995; Prasad & Sinha, 2010); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1995; Husain, 2014).

Conservation Status: IUCN Red List Category- Least Concern.

Threats: Not threatened.

Remarks: Perches motionless on shrubs, branches, dry twigs, rocks or ground for long time (Subramanian, 2009; Nair, 2011).

Other subspecies, *Sabina sabina viduatum* Lieftinck, 1942, is found in New Guinea.

17. *Orthetrum taeniolatum* (Schneider, 1845)

Small Skimmer, Taeniolate Marsh Hawk
Libellula taeniolata Schneider, 1845. *Stett. ent. Ztg.*, 6: 111 (type-locality: Rhodos).

Orthetrum taeniolatum, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 296-298, fig. 90b.

Sighting Period: During the dry season or just prior to bursting of the monsoon (Fraser, 1936); almost round the year (Kumar & Prasad, 1981); throughout the year except extreme winter months (Kumar & Mitra, 1998); drier part of the year or premonsoon (Mitra, 2006); peak April-July & September, secondary March & October (Nair, 2011).

Diagnostic Features: Medium-sized species with pterostigma ochreous between thick black nervures, covering 2.5 cells.

Male: Eyes greyish-blue; thorax and abdomen pulverulent blue, may be pruinose; abdomen very slender and pale blue; anal appendage black; legs black, yellow and bright ochreous.

Female: Differs in not being pulverulent, eyes pale brown, thorax pale brown above, with pale olivaceous and blackish-brown; abdomen olivaceous-yellow with a narrow black stripe; anal appendage brown and conical; wings may be enfeebled with pale brown; legs olivaceous-brown and black;

Measurements:

Male: Abdomen 22-25, hind-wing 25-27 mm (Fraser, 1936), abdomen 24, fore-wing 29, hind-wing 27 mm (Singh & Prasad, 1976).

Female: Abdomen 24, hind-wing 28 mm (Fraser, 1936), abdomen 22-23.5, fore-wing 28, hind-wing 27 mm (Singh & Prasad, 1976).

Distribution: 300-1800 m (Kumar & Prasad, 1981); up to 2700 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976; Kumar & Mitra, 1998; Prasad & Sinha, 2010).

Elsewhere in Dehra Dun: Asarori, Barkot, Bhaniawala, Bhagwantpur, Bhoorpur, Donga, Haripur, Herbertpur, Johari, Jaintanwala, Jaspur, Jhajra, Kandholi, Karwapani, Kansrao, Kalsi, Kuwanwala, Khera, Langha, Lachhiwala, Maldevta, Motichur, Nalapani, Pondha, Phandowala, Prem Nagar, Raipur, Rajpur, Robber's Cave, Satyanarain, Sahaspur, Timli and Thanu (Singh & Prasad, 1976; Prasad & Singh, 1995); Doon Valley (Kumar & Prasad, 1977); Asan Reservoir (Mitra, 2000).

Uttarakhand: Chamoli, Dehra Dun, Haridwar, Pauri, Rudrapur, Tehri, Uttarkashi, Nainital and Pithoragarh (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995; Prasad & Singh, 1995; Prasad & Singh, 2010); Western Himalaya (Prasad, 2002; Mitra, 2006).

Conservation Status: IUCN Red List Category- Least Concern.

Threats: Not threatened.

Remarks: Perches on sand or rocks, sometimes squat on water surface (Nair, 2011).

18. *Orthetrum triangulare triangulare* (Selys, 1878)

Blue-tailed Forest Hawk

Libellula triangularis Selys, 1878. *Mitt. Mus. Dresden*, 3: 314 (type-locality: Sikkim).

Orthetrum triangulare triangulare, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 305-307, figs. 89, 91b. *Orthetrum triangulare*, Subramanian & Babu, 2017. *Checklist of Odonata (Insecta) of India*: 33. Version 3.0, www.zsi.gov.in (last updated: 25th September, 2017).

Sighting Period: June-October (Kumar & Prasad, 1981; Kumar & Mitra, 1998; Prasad & Sinha, 2010); Peak May-June, secondary July-October (Nair, 2011); summer-rainy season (Husain, 2014).

Diagnostic Features: Medium-sized species with black thorax, blue abdomen and a black-brown patch at wing base, anal appendage black, legs black.

Male: Eyes dark blue; thorax velvety black with a broad bright apple-green stripe; abdomen broad at base, tapering behind towards tip and pruinose pale azure blue; hind-wing with a triangular blackish-brown spot at base, pterostigma black covering 2 cells.

Female: Differs from male in eyes brown; thorax olivaceous-green above, may be suffused with reddish-brown, sides dark reddish-brown with two bright yellow stripes; wings may be suffused with brown, hind-wing without basal black area but tinted with golden yellow; pterostigma brownish-black.

Measurements:

Male: Abdomen 29-33, hind-wing 37-41 mm (Fraser, 1936), abdomen 27-28.5, fore-wing 36-39, hind-wing 35-38 mm (Singh & Prasad, 1976).

Female: Abdomen 29-32, hind-wing 37 mm (Fraser, 1936), abdomen 29, fore-wing 38-40, hind-wing 37-39mm, (Singh & Prasad, 1976).

Distribution: Altitude range 1676-2286 m/5500-7500 ft (Fraser, 1936); 300-2300 (Kumar & Prasad, 1981).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976; Hamalainen, 1989; Kumar & Mitra, 1998; Prasad & Sinha, 2010).

Elsewhere in Dehra Dun: River Rispana at Tapovan, Rajpur (Hamalainen, 1989); Donga, Kansrao, Kandholi, Kalsi, Lachhiwala, Nalapani, Rajpur, Raipur and Robber's Cave (Singh & Prasad, 1976; Prasad & Singh, 1995); Doon Valley (Kumar & Prasad, 1977); Asan Reservoir (Mitra, 2000); Maldevta (Prasad & Sinha, 2010); Vijay Park (new record, Husain, 2014); Wildlife Institute of India campus (<http://www.indianodonata.org>).

Uttarakhand: Chamoli, Dehra Dun, Pauri, Rudraprayag, Tehri, Uttarkashi, Almora, Nainital and Pithoragarh (Kumar & Prasad, 1981; Kumar, 1995; Prasad & Singh, 1995; Prasad & Singh, 2010); Western Himalaya (Prasad & Varshney, 1995; Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1995; Husain, 2014).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: Not threatened.

Remarks: Very sedentary and found day after day at the same perch, has a liking for sun-lit spots or shady environs (Nair, 2011).

Other subspecies, *Orthetrum triangulare malaccensis* Forster, 1903, is distributed from Thailand to Java.

Genus: *Palpopleura* Rambur, 1842
(Subfamily: Palpopleurinae Tillyard, 1917)
(Widows)

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19. *Palpopleura sexmaculata octomaculata* Fraser, 1935

Blue-tailed Yellow Skimmer

Palpopleura sexmaculata octomaculata Fraser, 1935. *J. Darjeeling nat. Hist. Soc.*, 10: 26 (type-locality: North India); Fraser, 1936. *Faun. Brit. India, Odon.*, 320-321.

Palpopleura sexmaculata sexmaculata, Kumar & Prasad, 1981. *Rec. zool. Surv. India, Occ. Paper No. 20:* 59-60, 92.

Sighting Period: October (Hamalainen, 1889); May-October (Kumar & Prasad, 1981; Kumar & Mitra, 1998; Prasad & Sinha, 2010).

Diagnostic Features: Small-sized species with greenish-yellow thorax and blue abdomen, legs bright yellow and black.

Male: Eyes bluish-grey/olivaceous above, capped with brown; thorax pale greenish-yellow, marked with dark brown and black; abdomen pruinose pale blue, yellow on sides and below, black stripe below; fore-wings with three black streaks and a black spot at node (covering 0.5-1.5 cells), anal appendage black; hind-wings tinted with yellow and two black streaks, pterostigma black with central white streak (yellow in tenerals).

Female: Thorax ochreous with a brown stripe on each side above and a vestigial black stripe on sides; abdomen bright ochreous with a black stripe above and a broad black stripe on sides, wings more broadly marked with blackish-brown and black, more deeply tinted with amber-yellow, pterostigma black and creamy yellow.

Measurements:

Male: Abdomen 14-16, hind-wing 15-21 mm (Fraser, 1936), abdomen 13, fore-wing 19, hind-wing 18 mm (Singh & Prasad, 1976).

Female: Abdomen 13-14, hind-wing 18-21 mm (Fraser, 1936), abdomen 11.5, fore-wing 19, hind-wing 16- 18 mm (Singh & Prasad, 1976).

Distribution: 300-2300 m (Kumar & Prasad, 1981); up to 2700 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Lachhiwala Reserve Forest; Barkot, Bhoorpur, Donga, Herbertpur, Gola Tappar, Johari, Kalsi, Kandholi, Kansrao, Kuanwala, Lachhiwala, Langha, Motichur, Maldevta, Raipur, Rajpur, Rishikesh and Timli (new records, Singh & Prasad, 1976; Prasad & Singh, 1995); Doon Valley (Kumar & Prasad, 1977); Asan Barrage (Hamalainen, 1989; Mitra, 2000).

Uttarakhand: Chamoli, Dehra Dun, Pauri, Tehri, Uttarkashi, Almora, Nainital and Pithoragarh (Kumar & Prasad, 1981; Kumar, 1995; Prasad &

Husain

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Singh, 1995; Prasad & Sinha, 2010); Western Himalaya (as *P. sexmaculata sexmaculata* Fabricius, 1787, Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1995); Gobind Pashu Vihar, Uttarkashi (Kumar, 2004) (as *P. sexmaculata sexmaculata*).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: Not threatened presently but developmental work could be risky for their habitats.

Remarks: Found perching on vegetation along slow pary of streams and small side pools.

Subramanian & Babu (2017) considered *Palpopleura sexmaculata octomaculata* Fraser, 1935 as Indian form and Fraser (1936) from Assam. This subspecies has also been recognised by 'Species 2000 & ITIS Catalogue of Life, April, 2013/August, 2015'. Fraser (1936) shown the distribution of *P. sexmaculata sexmaculata* (Fabricius, 1787) in India (Western, Eastern and South India and Eastern Ghats), Ceylon, Tibet, China, Indo-China and Malaysia.

Genus: *Acisoma* Rambur, 1842

(Subfamily: Sympetrinae Tillyard, 1917)

20. *Acisoma panorpoides panorpoides* Rambur, 1842

Asian Pin-tail, Bulb-bodied Skimmer, Grizzled Pin-tail, Trumpet-tail

Acisoma panorpoides Rambur, 1842. *Hist. nat. Ins. Nevrop.*, Paris: 28 (type-locality: Bengal).

Acisoma panorpoides panorpoides, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 330-331, fig. 97.

Sighting Period: March-September (Kumar & Prasad, 1981; Prasad & Sinha, 2010); October (Hamalainen, 1989); peak- August-September, secondary April-July & October (Nair, 2011).

Diagnostic Features: Small blue species with characteristically bulged abdomen, resembling a trumpet.

Male: Eyes bright blue and glossy brown spotted with black behind; thorax azure-blue and marbled with black; abdomen azure-blue, marked variously with black, anterior segments broadly dilated (underside with broad black border) and abruptly narrow and cylindrical behind; anal appendage long and white/yellow and black; pterostigma, covering more than one cell and pale yellow between black nervures; legs black and yellow.

Female: Similar to male but blue replaced with greenish-yellow in eyes.

Measurements:

Male: Abdomen 15-18, hind-wing 16-21 (Fraser, 1936), abdomen 17, fore-wing 22, hind-wing 20 mm (Singh & Prasad, 1976).

Female: Abdomen 15-18, hind-wing 17-22 (Fraser, 1936), abdomen 16.5-17.5, fore-wing 22-23, hind-wing 20-21 mm (Singh & Prasad, 1976).

Distribution: 300-800 m (Kumar & Prasad, 1981).

Sahastradhara: Sahatradhara/Sulhpur Springs (new record, Kumar & Mitra, 1998)

Elsewhere in Dehra Dun: Bhaniawala, Herbertpur, Mianwala Rishikesh and Selakui (new records, Singh & Prasad, 1976); Asan Reservoir (Hamalainen, 1989; Mitra, 2000).

Uttarakhand: Dehra Dun, Pauri, Tehri, Uttarkashi and Nainital (Kumar & Prasad, 1981; Kumar, 1995); Gobind Pashu Vihar, Uttarkashi (Kumar, 2004); Uttarakhand/Western Himalaya (Prasad, 2002; Prasad & Sinha, 2010).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: Destruction of their habitats could be a potential threat.

Remarks: Flies weakly for short distances and low, often perching in exposed aquatic vegetation, water hyacinth leaves and grasses along streams and pools; never found away from water (Kumar & Mitra, 1998; Subramanian, 2009; Nair, 2011).

Other subspecies, *Acisoma panorpoides ascalaphoides* Rambur, 1842 is found in Africa and Madagascar.

Genus: *Brachythemis* Brauer, 1868

(Subfamily: Sympetrinae Tillyard, 1917)

21. *Brachythemis contaminata* (Fabricius, 1793)

Ditch Jewel

Libellula contaminata Fabricius, 1793. *Ent. Syst.*, 2: 382 (type-locality: Madras).

Brachythemis contaminata, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 365-366, fig. 103.

Sighting period: April-October (Kumar & Prasad, 1981; Prasad & Sinha, 2010); throughout the year (Subramanian, 2009); peak August-September, secondary: February-July & October-November (Nair, 2011); summer-rainy season (Husain, 2014).

Diagnostic Features: Medium-sized species with dark brown legs.

Male: Eyes olivaceous-brown above and bluish-grey below; thorax olivaceous-brown/reddish-brown above with two reddish-brown lateral stripes; abdomen bright red; wings with reddish venation with a broad bright orange patch at base; pterostigma rusty brown/reddish.

Female: Eyes pale brown above and bluish-grey below; thorax pale greenish-yellow with a narrow brown stripe above and a dark brown stripe on sides; abdomen pale olivaceous-brown with black stripe above, segments 2-6 with a sub-dorsal

brown stripe separated by yellow, wings without orange patch but hind-wing tinted with yellow at base; pterostigma yellow.

Measurements:

Male: Abdomen 18-21, hind-wing 20-23 mm (Fraser, 1936), abdomen 17, fore-wing 23, hind-wing 22 mm (Singh & Prasad, 1976).

Female: Abdomen 18-20, hind-wing 22-25 mm (Fraser, 1936), abdomen 17, fore-wing 23.5, hind-wing 21.5 mm (Singh & Prasad, 1976).

Distribution: 300-800 m (Kumar & Prasad, 1981).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Barkot, Bhaniawala, Bhoorpur, Herberpur, Jasowala, Kansrao, Lachhiwala, Mahant Majri, Rishikesh, Selakui and Timli (new records, Singh & Prasad, 1976; Prasad & Singh, 1995); Doon Valley (Kumar & Prasad, 1977); Asan Reservoir (Mitra, 2000); Vijay Park (new record, Husain, 2014).

Uttarakhand: Dehra Dun, Pauri and Nainital (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995; Nainital- Prasad & Sinha, 2010); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1995; Husain, 2014).

Conservation Status: IUCN Red List Category- Least Concern.

Threats: Not threatened.

Remarks: Perches close to the ground, on vegetation adjacent to streams and pools, emergent aquatic weeds (Kumar & Mitra, 1998; Subramanian, 2009; Nair, 2011).

Genus: *Bradinopyga* Kirby, 1893

(Subfamily: Sympetrinae Tillyard, 1917).

22. *Bradinopyga geminata* (Rambur, 1842)

Granite Ghost

Libellula geminata Rambur, 1842. *Ins. Nevrop.*: 90.

Bradinopyga geminata, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 349-350, fig. 101.

Sighting Period: Throughout the year (Subramanian, 2009); March-October (Kumar & Prasad, 1981; Prasad & Sinha, 2010); April-August (Mitra, 2006); peak August-September, secondary February-July & October-November (Nair, 2011); late winter-rainy season (Husain, 2014).

Diagnostic Features: Medium-sized greyish species.

Male: Eyes brown above, pale greyish below; thorax and abdomen greyish marbled and with cryptic black and white markings; wings

transparent; pterostigma black in middle and white at both ends; legs grey.

Female: Very similar to male but with slightly stouter abdomen.

Measurements:

Male: Abdomen 26-29, hind-wing 33-36 mm (Fraser, 1936), abdomen 25, fore-wing 33, hind-wing 32 mm (Singh & Prasad, 1976).

Female: Abdomen 26-29, hind-wing 32-36 mm (Fraser, 1936), abdomen 25, fore-wing 33-35, hind-wing 32-34 mm (Singh & Prasad, 1976).

Distribution: Up to 457 m/1,500 ft (Fraser, 1936); around 100 m (Kumar & Prasad, 1981).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Dehra Dun city (new record, Singh & Prasad, 1976); Doon Valley (Kumar & Prasad, 1977); Vijay Park (new record, Husain, 2014).

Uttarakhand: Dehra Dun and Nainital (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995); Pauri (Prasad & Sinha, 2010); Western Himalaya (Prasad, 2002).

Conservation Status: IUCN Red List Category- Least Concern.

Threats: No information.

Remarks: Perches on granite walls, compound stone walls, boulders, rocky overhangs etc. where it camouflaging colouration makes difficult to spot (Subramanian, 2009; Nair, 2011).

Genus: *Crocothemis* Brauer, 1868

(Subfamily: Sympetrinae Tillyard, 1917).

23. *Crocothemis servilia servilia* (Drury, 1770)

Oriental Scarlet, Ruddy Marsh Skimmer, Scarlet Skimmer

Libellula servilia Drury, 1770. *Ill. Ex. Ins.*, 1: 112-113, pl. xlvii, fig. 6 / Drury, 1773. *Ill. Ex. Ent.*, 1: 47 (type-locality: China).

Crocothemis servilia servilia, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 345-347, fig. 100.

Crocothemis servilia, Subramanian & Babu, 2017. *Checklist of Odonata (Insecta) of India*: 31. Version 3.0, www.zsi.gov.in (last updated: 25th September, 2017).

Sighting Period: Throughout the year (Kumar & Prasad, 1981); almost throughout the year (Kumar & Mitra, 1998; Subramanian, 2009; Husain, 2014); rainy season (Mitra, 2006); peak August-September, secondary: April-July (Nair, 2011).

Diagnostic Features: Medium-sized species.

Male: Eye blood red above, purple below; thorax blood red/bright orange; abdomen blood red with a thin black line along above; wings transparent,

base marked with rich amber; pterostigma dark brown; legs reddish.

Female: Eye brown above, olivaceous below; thorax and legs dark brown; abdomen yellowish-brown with mid-dorsal black stripe; wings transparent but basal amber marking paler; pterostigma pale yellow;

Measurements:

Male: Abdomen 24-35, hind-wing 27-38 mm (Fraser, 1936), abdomen 22-25, fore-wing 27.5-31, hind-wing 26-29 mm (Singh & Prasad, 1976).

Female: Abdomen 25-32, hind-wing 31-37 mm (Fraser, 1936), abdomen 19-21.5, fore-wing 27-28.5, hind-wing 27 mm (Singh & Prasad, 1976).

Distribution: 300-1800 m (Kumar & Prasad, 1981); up to 1000 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Asarori, Bhoorpur, Barkot, Bhogpur, Bhaniawala, Donga, Dehra Dun, Doiwala, Gola Tappar, Haripur, Herbertpur, Jaintanwala, Johari, Kansrao, Kuanwala, Karwapani, Jaspur, Jhajra, Kalsi, Kandholi, Langha, Lachhiwala, Motichur, Mianwala, Manduwala, Maldevta, Phanduwala, Pondha, Ramgarh, Raipur, Rajpur, Rishikesh, Robber's Cave, Sabhawala, Sahaspur, Satyanarain, Timli and Tunwala (new records, Singh & Prasad, 1976); Doon Valley (Kumar & Prasad, 1977); Beriawala forest, Dholkhand forest, Lachhiwala, Maldevta, Malta, Satyanarain (Prasad & Sinha, 2010); Asan Reservoir (Mitra, 2000); Vijay Park (new record, Husain, 2014); Tiger Falls, Chakrata (<http://www.indianodonata.org>).

Uttarakhand: Chamoli, Dehra Dun, Haridwar, Pauri, Tehri, Uttarkashi, Almora, Nainital and Pithoragarh (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995; Prasad & Singh, 1995; Prasad & Singh, 2010); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1995; Husain, 2014); Gobind Pashu Vihar, Uttarkashi (Kumar, 2004).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: No major threats.

Remarks: Perches on aquatic weeds and chase any passing by dragonflies (Subramanian, 2009), females found away from water and prefer low near ground (Nair, 2011).

Other subspecies, *Crocothemis servilia novaguineensis* Forster, 1898 occur in New Guinea and *C. servilia mariannae* Kiauta, 1985, occur in New Guinea and Japan respectively.

Genus: *Neurothemis* Brauer, 1867

(Subfamily: Sympetrinae Tillyard, 1917)

24. *Neurothemis fulvia* (Drury, 1773)

Fulvous Forest Skimmer

Libellula fulvia Drury, 1773. *Ill. Exot. Ins.*, 2: 84-85, pl. xlvi, fig.2 (type-locality: China).

Neurothemis fulvia, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 353-354.

Sighting Period: April-September (Kumar & Prasad, 1981); October (Hamalainen, 1989); throughout the year but large number can be seen between May-September (Subramanian, 2009); April-October (Prasad & Sinha, 2010); peak August-September, secondary May-June & October (Nair, 2011).

Diagnostic Features: Medium-sized rusty/reddish-brown species with wings with transparent tips; anal appendage and legs dark ferruginous.

Male: Eyes dark reddish-brown above, golden brown below; thorax, abdomen and legs reddish-brown; wings opaque dark reddish-brown/ rusty-red except for an irregular triangular transparent area at tips; pterostigma dark reddish-brown.

Female: Very variable; typical form having eyes pale brown, colour of head, thorax and abdomen generally much paler/rusty brown/ochreous with some dark brown clouding; wings clear amber-yellow with a dark ray extending to tip of fore-wing, may have irregular triangular transparent area at tip of wing; pterostigma yellowish-brown.

Measurements:

Male: Abdomen 21-26, hind-wing 27-32 mm (Fraser, 1936), abdomen 19, fore-wing 25-27, hind-wing 25-27.5 mm (Singh & Prasad, 1976).

Female: Abdomen 20-24, hind-wing 26-32 mm (Fraser, 1936), abdomen 18, fore-wing 25, hind-wing 25 mm (Singh & Prasad, 1976).

Distribution: Up to 914 m/3,000 ft (Fraser, 1936); 300-600 m (Kumar & Prasad, 1981); up to 2390 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Hamalainen, 1989).

Elsewhere in Dehra Dun: Doon Valley (Kumar & Prasad, 1977); Asan Reservoir (Mitra, 2000).

Uttarakhand: Dehra Dun and Nainital (Kumar & Prasad, 1981; Kumar, 1995; Prasad & Singh, 1995); Tehri (Prasad & Sinha, 2010); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1995); Gobind Pashu Vihar, Uttarkashi (Kumar, 2004).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: Not threatened.

Remarks: The clear uncoloured apices of wings will help to distinguish it from other red Asian

dragonflies. Perch with their typical 'drop-winged' manner on vegetation, fallen logs and shrubs. A large number of them can be found together in canopy gaps and forest edges. During wet season they move to non forested areas (Subramanian, 2009; Nair, 2011).

25. *Neurothemis intermedia intermedia* (Rambur, 1842)

Ruddy Meadow Skimmer

Libellula intermedia Rambur, 1842. *Hist. Ins. Neuropt.*, Paris: 91 (type-locality: Bombay).

Neurothemis intermedia atlanta, Ris. 1919. *Coll. Zool., Selys de Longchamps*, Bruxelles, 16: 1168 (type-locality: Assam).

Neurothemis intermedia intermedia, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 337-338.

Neurothemis intermedia, Subramanian & Babu, 2017. *Checklist of Odonata (Insecta) of India*: 32, 39. Version 3.0, www.zsi.gov.in (last updated: 25th September, 2017).

Sighting Period: April-November (Kumar & Prasad, 1981); Peak August-September, secondary April-June & October-November (Nair, 2011).

Diagnostic Features: Medium-sized red species with a broad amber patch at base of wings, extending to almost 1/3rd, pterostigma bright reddish-brown.

Measurements:

Male: Abdomen 22-24, hind-wing 24-27 mm (Fraser, 1936), abdomen 23, fore-wing 30, hind-wing 28.5 mm (Singh & Prasad, 1976).

Female: Abdomen 21-24, hind-wing 25-28 mm (Fraser, 1936), abdomen 21.5, fore-wing 27, hind-wing 25 mm (Singh & Prasad, 1976).

Distribution: 600-1000 m (Kumar & Prasad, 1981); up to 1000 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976).

Elsewhere in Dehra Dun: Barkot, Haripur, Herbertpur, Jhajra, Kalsi, Kansrao, Kuanwala, Motichur, Phanduwala and Timli (new records, Singh & Prasad, 1976; Prasad & Singh, 1955).

Uttarakhand: Dehra Dun (Kumar & Prasad, 1981; Kumar, 1995; Prasad & Singh, 1955); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1955).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: Not threatened.

Remarks: Can be seen perched low or at medium height, often inside dry forests, away from water.

26. *Neurothemis tullia* (Drury, 1773)

Pied Paddy Skimmer

Libellula tullia Drury, 1773. *Ill. Exot. Ins.*, 2: 46 (type-locality: India).

Neurothemis tullia tullia, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 360-362.

Neurothemis tullia, Subramanian & Babu, 2017. *Checklist of Odonata (Insecta) of India*: 32. Version 3.0, www.zsi.gov.in (last updated: 25th September, 2017).

Sighting Period: March-September (Kumar & Prasad, 1981); October (Hamalainen, 1989); March-August (Kumar & Mitra, 1998); found throughout the year but peak abundance in July-September (Subramanian, 2009); March-October (Prasad & Sinha, 2010); peak May-June & August-September, secondary March-April & July & October (Nair, 2011).

Diagnostic Features: Pterostigma dull brown.

Male: Eyes blackish-brown above and violaceous below, thorax black with creamy stripe above, abdomen black with a broad creamy-white stripe above, basal half of wing opaque blue-black and bordered by a milky white patch towards tip, legs black.

Female: Eyes pale brown above and pale olivaceous below, thorax greenish-yellow with a bright yellow stripe (bordered with black) above, abdomen bright yellow with a broad black band above and underside black, wing bases bright amber-yellow, front margin blackish-brown broadening into a large blackish-brown spot (in hind-wings irregular or sickle-shaped) extending to rear edge of wing, tips of all wings broadly blackish-brown, legs yellow and black.

Measurements:

Male: Abdomen 16-20, hind-wing 19-23 mm (Fraser, 1936), abdomen 19, fore-wing 24, hind-wing 23 mm (Singh & Prasad, 1976).

Female: Abdomen 16-19, hind-wing 20-23 mm (Fraser, 1936), abdomen 18, fore-wing 24, hind-wing 23 mm (Singh & Prasad, 1976).

Distribution: 600-1000 m (Kumar & Prasad, 1981); up to 800 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Rishikesh (new record, Singh & Prasad, 1976); Doon Valley (Kumar & Prasad, 1977); Asan Reservoir (Hamalainen, 1989; Mitra, 2000).

Uttarakhand: Dehra Dun (Kumar & Prasad, 1981; Kumar, 1995); Uttarakhand/Western Himalaya (Prasad, 2002; Prasad & Sinha, 2010).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: Not threatened.

Remarks: Perches low near wetlands; weakly flutters away to a nearby perch on being disturbed. Other subspecies, *Neurothemis tullia feralis* (Burmeister, 1839, found in Indo-China, Myanmar, Malaysia and Malay Archipelago, is elevated to *N. feralis* (Burmeister, 1839) as per 'World Catalogue of Odonata, Issue 110: 459.'

Genus: *Sympetrum* Newman, 1833
(Subfamily: Sympetrinae Tillyard, 1917)

27. *Sympetrum commixtum* (Selys, 1884)

Diplax commixta Selys, 1884. *Ann. Soc. Ent. Belg.*, 28: 38.

Sympetrum commixtum, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 372-373, fig 107a.

Sighting Period: August (Fraser, 1936); April-December (Kumar & Prasad, 1981); October (Hamalainen, 1989); June-December, common October-November (Kumar & Mitra, 1998); October-December (Prasad & Sinha, 2010).

Diagnostic Features: Eyes reddish-brown above, olivaceous below, thorax dark olivaceous above, bright citron-yellow to dull olivaceous on sides, legs black, pterostigma ferruginous above and pale ochreous below (reddish-brown and membrane whitish-brown as per Singh & Prasad, 1976).

Male: Abdomen red above, black below, anal appendage red and tipped with black, wings tinted with amber-yellow.

Female: Like male but paler in colour, abdomen ochreous with dark sutures above and black below, anal appendage conical and yellow.

Measurements:

Male: Abdomen 28-30, hind-wing 31-33 mm (Fraser, 1936), abdomen 26.5, fore-wing 33, hind-wing 31.5 mm (Singh & Prasad, 1976).

Female: Abdomen 30, hind-wing 32 mm (Fraser, 1936), abdomen 25, fore-wing 31, hind-wing 29.5 mm (Singh & Prasad, 1976).

Distribution: 300-2300 m (Kumar & Prasad, 1981); 1490-3660 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: As above (new record, Singh & Prasad, 1976); Rispana river at Tapovan, Rajpur (Hamalainen, 1989).

Uttarakhand: Dehra Dun, Pauri and Nainital (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995); Rudraprayag and Pithoragarh (Prasad & Sinha, 2010); Western Himalaya (Prasad, 2002).

Conservation Status: IUCN Red List Category- Least Concern.

Threats: Not threatened.

Remarks: Perch on bushes and leaves and branches of trees along streams and pools, preferring height from water level (Kumar & Mitra, 1998).

Genus: *Pantala* Hagen, 1861
(Subfamily: Trameinae Tillyard, 1917)

28. *Pantala flavescens* (Fabricius, 1798)

Global Skimmer, Globe Wanderer, Wandering Glider

Libellula flavescens Fabricius, 1798 (nec Fischer, 1791). *Ent. Syst. Suppl.*: 285 (type-locality: India).

Pantala flavescens, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 414-416, fig. 115.

Sighting Period: September-November (Fraser, 1936); May-October (Kumar & Prasad, 1981); June-October (Kumar & Mitra, 1998); September-October (Mitra, 2006); throughout the year but seen in large numbers during September-December (Subramanian, 2009); May-October (Prasad & Sinha, 2010); peak July-September, secondary March-June & October (Nair, 2011); summer-rainy season (Husain, 2014).

Diagnostic Features: Medium-sized species with pterostigma bright reddish-brown/bright ochreous with white membrane and short (unequal in fore and hind-wing), legs black with yellow.

Male: Eyes reddish-brown above and lilaceous/bluish below, thorax rusty/olivaceous; abdomen bright reddish-brown/ochreous and tinted with bright brick-red above and segments 8-10 with black spots above; anal appendage dilated at apical half and acuminate at apex, ochreous and black; hind-wing base with amber-yellow/pale golden yellow patch on base of hind-wings and narrow apical brown spot at hind border of wings.

Female: Like male but eyes olivaceous-brown above, abdomen lack reddish wash, wings enfumed and without apical brown spot, abdomen not constricted at segment 3, stouter, robust and paler olivaceous on sides but lacking red colouring above, anal appendage elongate, conical.

Measurements:

Male: Abdomen 29-35, hind-wing 38-40 mm, (Fraser, 1936), abdomen 29, fore-wing 40.5, hind-wing 38.5 mm (Singh & Prasad, 1976).

Female: Abdomen 30-33, hind-wing 39-41 mm (Fraser, 1936), abdomen 27, fore-wing 39, hind-wing 37 mm (Singh & Prasad, 1976).

Distribution: 300-3000 m (Kumar & Prasad, 1981).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Asarori, Bhaniawala, Donga, Jaintanwala, Johari, Kandholi, Langha, Mianwala, Dehra Dun, Motichur, Phanduwala, Rajpur and Thanu (new records, Singh & Prasad, 1976; Prasad & Singh, 1995); Doon Valley (Kumar & Prasad, 1977); Asan Reservoir (Mitra, 2000); Vijay Park (new record, Husain, 2014).

Uttarakhand: Dehra Dun, Pauri, Nainital and Pithoragarh (Dehra Dun-Kumar & Prasad, 1981; Kumar, 1995); Haridwar (Prasad & Sinha, 2010); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1995; Husain, 2014).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: No significant threats presently affecting its population, being a migrant.

Remarks: Perch on terraced paddy fields, adjoining hill streams (Kumar & Mitra, 1998).

Genus: *Trithemis* Brauer, 1868

(Subfamily: Trithemistinae Tillyard, 1917)

29. *Trithemis aurora* (Burmeister, 1839)

Common Marsh Glider, Crimson Marsh Glider
Libellula aurora Burmeister, 1839. *Handb. Ent.*, 2: 859.

Trithemis aurora, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 383-385, fig. 109b.

Sighting Period: May-November (Kumar & Prasad, 1981); October (Hamalainen, 1989); throughout the year (Mitra, 2006; Subramanian, 2009); May-November (Prasad & Sinha, 2010); peak May-June & August-September, secondary March-April & July & October (Nair, 2011); summer season (Husain, 2014).

Diagnostic Features: Medium-size species.

Male: Eyes crimson above, brown laterally and lilaceous beneath; thorax reddish with dull purple pruinescence; abdomen swollen at base and also red but with violet tinge; anal appendage red; wings transparent, with crimson/pinkish-red venation and a broad amber patch; pterostigma short, dark reddish-brown between black nervures; legs black and ferruginous.

Female: Eyes pale/purplish-brown above and lilaceous/grey below; thorax olivaceous/olive brown with brown and black stripes; abdomen subcylindrical, sides parallel, ochreous with black markings which enclose reddish-brown spots; anal appendage black, conical; wings transparent, often broadly tipped with brown, reticulation bright yellow/brown; pterostigma reddish-brown; legs dark grey and yellow.

Measurements:

Male: Abdomen 21-29, hind-wing 24-34 (Fraser, 1936), abdomen 20.5, fore-wing 25, hind-wing 24 mm (Singh & Prasad, 1976).

Female: Abdomen 19-27, hind-wing 24-31 mm (Fraser, 1936), abdomen 21, fore-wing 28, hind-wing 27 mm (Singh & Prasad, 1976).

Distribution: Up to 1219 m/4000 ft (Fraser, 1936); 300-1000 m (Kumar & Prasad, 1981); up to 1500 m (IUCN Red List).

Sahastradhara: Sahastradhara/ Sulhpur Springs (new record, Singh & Prasad, 1976; Hamalainen, 1989; Kumar & Prasad, 1998).

Elsewhere in Dehra Dun: River Rispana at Tapovan, Rajpur and Asan Barrage (Hamalainen, 1989); Asarori, Bhaniawala, Barkot, Chandrabani, Donga, Dehra Dun, Gola Tappar, Herbertpur, Jhajra, Kansrao, Karwapani, Langha, Lachhiwala, Mianwala, Motichur, Rajpur, Rishikesh, Satyanarain and Timli (new records, Singh & Prasad, 1976; Prasad & Singh, 1995); Asan Reservoir (Mitra, 2000); Maldevta and Satyanarain (Prasad & Sinha, 2010); Vijay Park (new record, Husain, 2014).

Uttarakhand: Dehra Dun, Pauri, Tehri, Nainital and Pithoragarh (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995; Dehra Dun and Nainital- Prasad & Sinha, 2010; Husain, 2014); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1995; Husain, 2014).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: Not threatened.

Remarks: Males among the most beautiful and eye-catching, with their crimson colour, habit of perching on exposed twigs, and characteristic 'drop-winged' posture; often seen obelisking during hot weather; females less common (Nair, 2011).

30. *Trithemis festiva* (Rambur, 1842)

Black Stream Glider, Indigo Drop-wing
Libellula festiva Rambur, 1842. *Hist. nat. Ins. Nevrop.*, Paris: 92 (type-locality: Bombay).

Trithemis festiva, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 387-389, 108, 109c.

Sighting Period: March-December (Kumar & Prasad, 1981); October (Hamalainen, 1989); May-November (Subramanian, 2009); peak August-September, secondary: April-July & October (Nair, 2011); summer-early winter (Husain, 2014).

Diagnostic Features: Medium-sized species with pterostigma black and anal appendage black.

Male: Eyes dark brown above with purplish tinge and bluish-grey below; thorax black with purple pruinescence; abdomen very thin, triquetral and black with bluish pruinescence, having yellowish streaks; hind-wings with a dark opaque brown patch at base; legs black.

Female: Eyes dark brown above but lilaceous/grey below, thorax greenish-yellow/olivaceous/olive-brown with a broad blackish-brown and inverted 'Y' shaped stripes, abdomen cylindrical and bright yellow with black stripes enclosing wedge-shaped spot; wings transparent with dark reddish-brown tip; legs black and yellow.

Measurements:

Male: Abdomen 22-28, hind-wing 26-32 mm (Fraser, 1936), abdomen 20-22, fore-wing 28-31, hind-wing 26-30 mm (Singh & Prasad, 1976).

Female: Abdomen 21-24, hind-wing 24-29 mm (Fraser, 1936), abdomen 20-22, fore-wing 28-30, hind-wing 27-29 mm (Singh & Prasad, 1976).

Distribution: 300-1500 m (Kumar & Prasad, 1981); up to 2000 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976; Hamalainen, 1989; Kumar & Mitra, 1998; Prasad & Sinha, 2010).

Elsewhere in Dehra Dun: River Rispana at village Tapovan, Rajpur (Hamalainen, 1989); Asarori, Bhaniawala, Barkot, Dehra Dun, Donga, Doiwala, Gola Tappar, Herbertpur, Haripur, Johari, Jhajra, Jaintanwala, Kandholi, Kalsi, Kansrao, Karwapani, Khera, Lachhiwala, Langha, Mianwala, Motichur, Pondha, Raipur, Rajpur, Ramgarh, Rishikesh, Robber's Cave, Sahaspur, Satyanarain and Timli (new records, Singh & Prasad, 1976; Prasad & Singh, 1995); Asan Reservoir (Mitra, 2000); Maldevta, Ranibagh and Rishikesh (Prasad & Sinha, 2010); Vijay Park (new record, Husain, 2014).

Uttarakhand: Chamoli, Dehra Dun, Pauri, Tehri, Uttarkashi, Almora, Nainital and Pithoragarh (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995; Prasad & Singh, 1995; Prasad & Sinha, 2010; Husain, 2014); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1995; Husain, 2014).

Conservation Status: IUCN Red List Category- Least Concern.

Threats: No significant threats.

Remarks: Males perch on their favourite twigs or rocks, chasing away intruders from their small territory; characteristic 'drop-winged' posture; obelisks vertically during hot noons (Nair, 2011).

31. *Trithemis pallidinervis* (Kirby, 1889)

Dancing Drop-wing, Long-legged Marsh Glider
Sympetrum pallidinervis Kirby, 1889. *Trans. Zool. Soc. Lond.*, 12: 327 (type-locality: India).

Trithemis pallidinervis, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 389-391.

Sighting Period: April-July (Kumar & Prasad, 1981); October (Hamalainen, 1989); rainy season (Mitra, 2006); throughout the year (Subramanian, 2009); peak August-September, secondary April-July & October (Nair, 2011).

Diagnostic Features: Medium-sized yellowish-brown species with long spider-like black and bright yellow legs; pterostigma black with creamy ends.

Male: Eyes reddish-brown above, brown on sides and bluish-grey below; thorax olivaceous-brown above with a dark brown triangular mark and black stripes; abdomen bright yellow with black stripes, enclosing wedge-shaped yellow spot; anal appendage black with bright yellow tip; wings transparent with reddish venation, fore-wing base with bright amber-yellow markings.

Female: Like male but abdominal base broadly black and wings tinted with yellow/reddish-brown towards apical half, anal appendage long, conical and yellow.

Measurements:

Male: Abdomen 28-32, hind-wing 30-36 mm (Fraser, 1936), abdomen 24, fore-wing 31, hind-wing 30 mm (Singh & Prasad, 1976).

Female: Abdomen 26-28, hind-wing 30-32 mm (Fraser, 1936), abdomen 23, fore-wing 30, hind-wing 28 mm (Singh & Prasad, 1976).

Distribution: 300-800 m (Kumar & Prasad, 1981); up to 800 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Herberpur, Lachhiwala and Raipur (new records, Singh & Prasad, 1976; Prasad & Singh, 1995); Doon Valley (Kumar & Prasad, 1977); Asan Reservoir (Hamalainen, 1989; Mitra, 2000).

Uttarakhand: Dehra Dun, Pauri and Nainital (Kumar & Prasad, 1981; Kumar, 1995); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1955).

Conservation Status: IUCN Red List Category- Least Concern.

Threats: Not threatened.

Remarks: Generally perches on top of tall reeds/aquatic weeds, bare ends of shrubs, emerging twigs and dried branches, elevating itself by its long spidery legs (Fraser, 1936; Subramanian, 2009; Nair, 2011).

Genus: *Zygonyx* Selys in Hagen, 1867
(Subfamily: Zygonychinae Fraser, 1957)

32. *Zygonyx torridus isis* Fraser, 1924
Ringed Cascador, Torrent Glider

Zygonyx isis Fraser, 1924. *Rec. Indian Mus.*, 26: 426, 440-441.

Zygonyx torrida isis Fraser, 1931. *Rec. Indian Mus.*, 33: 446; Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 401-402, fig 111c.

Zygonyx torridus isis, Subramanian & Babu, 2017. *Checklist of Odonata (Insecta) of India*: 35. Version 3.0, www.zsi.gov.in (last updated: 25th September, 2017).

Sighting Period: September-November (Fraser, 1936); May-September (Kumar & Prasad, 1981; Prasad & Sinha, 2010); peak May-June, secondary July-September (Nair, 2011).

Diagnostic Features: Large-sized species with eyes brown/olive above, dark lilaceous below; thorax dark metallic green, marked with yellow; pterostigma black; legs black and yellow.

Male: abdomen black, marked with bright yellow; anal appendage black; wings tinted with yellow except bases, tips may be enfumed with brown; pterostigma, longer in fore-wing than in hind-wing.

Female: Comparatively larger and more robust. Also differs in abdomen with yellow markings more prominent; anal appendage narrow, acuminate, long and black; wings more deeply tinted with yellow or may become burnt brown towards tips; pterostigma longer.

Measurements:

Male: Abdomen 37-39, hind-wing 44-46 mm (Fraser, 1936).

Female: Abdomen 42, hind-wing 48-50 mm (Fraser, 1936); abdomen 39, fore-wing 50, hind-wing 48 mm (Singh & Prasad, 1976).

Distribution: Around 600 m (Kumar & Prasad, 1981).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Johari (new record, Singh & Prasad, 1976).

Uttarakhand: Rudraprayag and Tehri (Prasad & Kumar, 1977); Dehra Dun (Kumar & Prasad, 1981; Kumar, 1995); Uttarakhand/Western Himalaya (Prasad, 2002; Prasad & Sinha, 2010).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: Not thought to have widespread threats.

Remarks: Adults can be seen in rapid and tireless flight, above streams in spate, periodically descending low to hawk midges (Dipterans) over foaming rapids; occasionally perch in 'hanging' posture on stream-side (Nair, 2011).

Family: Macromiidae Needham, 1903 (Cruisers)

Genus: *Macromia* Rambur, 1842

(Subfamily: Macrimiinae Tillyard, 1917)

33. *Macromia moorei* Selys, 1874

Macromia (Macromia) moorei Selys, 1874. *Synopsis des Cordulines*, Add.: 17 (type-locality: Himalaya)/*Bull. Acad. Belg.*, 37: 28.

Macromia moorie, Fraser, 1936. *Faun. Brit. India, Odon.*, 3: 164-166, figs. 50-52b.

Macromia moorie moorie, Mitra, 2006. *Handbook-Common Indian Dragonflies*: 90.

Sighting Period: April-August (Fraser, 1936); October (Hamalainen, 1989); April-November (Kumar & Prasad, 1981); Kumar & Mitra, 1998; (Prasad & Sinha, 2010).

Diagnostic Features:

Male: Eyes emerald green; thorax reddish-brown, darker above; wings may be tinted with brown; pterostigma black; abdomen black, marked with citron-yellow; anal appendage black/very dark reddish-brown; legs black and reddish-brown.

Female: Very similar to male except metallic reflex less evident on above thorax, annules on abdomen broader, wings deeply tinted with brown, anal appendage black.

Measurements:

Male: Abdomen 48-52, hind-wing 43-45 mm (Fraser, 1936), abdomen 47, fore-wing 46, hind-wing 44 mm (Singh & Prasad, 1976).

Female: Abdomen 48-51, hind-wing 46-49 mm (Fraser, 1936), abdomen 47, fore-wing 47, hind-wing 46 mm (Singh & Prasad, 1976).

Distribution: 600-2000 m (Kumar & Prasad, 1981); 600-2380 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Singh & Prasad, 1976; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Kandholi and Dehra Dun (new record, Singh & Prasad, 1976); river Rispana at Tapovan, Rajpur (new record, Hamalainen, 1989); Maldevta (Prasad & Sinha, 2010).

Uttarakhand: Dehra Dun, Tehri, Nainital, Almora and Pithoragarh (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995; Prasad & Sinha, 2010); Uttarakhand/ Western Himalaya (Prasad, 2002; (Mitra, 2006).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: Not threatened.

Remarks: Perches on riparian vegetation over exposed stones in stream.

Suborder: Zygoptera Selys, 1854 (Damselflies)

Superfamily: Calopterygoidea Selys, 1850

Family: Calopterygidae Selys, 1850

Genus: *Neurobasis* Selys, 1853

(Subfamily: Calopteryginae Selys, 1850)

34. *Neurobasis chinensis chinensis* (Linnaeus, 1758)

Green-winged Demoiselle, Oriental Green-wing, Stream Glory

Libellula chinensis Linnaeus, 1758. *Syst. Nat.*, 1: 545 (type-locality: Tibet).

Neurobasis chinensis chinensis, Fraser, 1934. *Faun. Brit. India, Odon.*, 2: 121-124, figs. 35-36.

Neurobasis chinensis, Subramanian & Babu, 2017. *Checklist of Odonata (Insecta) of India*: 14. Version 3.0, www.zsi.gov.in (last updated: 25th September, 2017).

Sighting Period: February-October (Kumar & Prasad, 1981; Kumar & Mitra, 1998); May to November (Subramanian, 2009); peak August-September, secondary May-July & October (Nair, 2011).

Diagnostic Features: Large species with emerald green wings in male.

Male: Eyes blackish- brown above and bluish-green below; thorax metallic green with light brown tines; abdomen also iridescent green above but black below, last segments (9-10) whitish; fore-wings tinted with pale yellowish-green and having emerald green venation; hind-wings opaque with basal 2/3rds metallic green/peacock blue, apical third blackish- brown with violet tinge and metallic green nervures, underside blackish- brown with dull coppery/golden tinge; anal appendage black, green and white; pterostigma absent; legs very long, slim, dark bronze, brown, white and black.

Female: Eyes brownish-black above and yellowish-white below, abdomen dull metallic bronzy-green with golden tinge above and black below, green metallic lateral stripe (bordered above and below with black); anal appendage stout, conical, pointed and dark brown; wings amber/light coffee brown and with a creamy yellow central opaque patch; pterostigma very much reduced or absent in fore-wing and creamy white in hind-wings; legs as in male but pale parts creamy yellow.

Measurements:

Male: Abdomen 45-50, hind-wing 32-38 mm (Fraser, 1934), abdomen 46, fore-wing 34, hind-wing 32 mm (Prasad & Singh, 1976).

Female: Abdomen 44-50, hind-wing 36-40 mm (Fraser, 1934), abdomen 39, fore-wing 36, hind-wing 34 mm (Prasad & Singh, 1976).

Distribution: Up to about 2286 m/7500 ft, usually 914-1219 m/3000-4000 ft (Fraser, 1934); 500-2000 m, usually 600-1200 m (Kumar & Prasad, 1981); up to an altitude of 2250 m, commonly

between 500-1200 m (Subramanian, 2009); up to 1700 m (vide IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Prasad & Singh, 1976; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Barkot, Gola Tappar, Haripur, Herbertpur, Kalsi, Kansrao, Maldevta, Raipur, Rajpur, Ramgarh and Timli (new records, Prasad & Singh, 1976).

Uttarakhand: Dehra Dun, Pauri, Tehri, Uttarkashi, Nainital and Pithoragarh (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995); Almora (Prasad & Mondal, 2010); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1995).

Conservation Status: IUCN Red List Category- Least Concern.

Threats: No major threats.

Remarks: Perches on stream-side foliage (ferns like *Adiantum* sp., the Maiden-hair Ferns; *Pteris* sp., the Feathery Ferns) or on overhanging vegetation (*Ageratina adinophora*, the Crofton Weed or Sticky Snake-root; *Debregeasia longifolia*, the Orange Wild Rahea), mid-stream rocks, partially submerged stones or fallen logs (Kumar & Mitra, 1998; Nair, 2011).

Other subspecies, *N. chinensis longipes* Hagen, 1887 is found in Borneo.

Family: Chlorocyphidae Cowley, 1937

Genus: *Aristocypha* Laidlaw, 1950

35. *Aristocypha quadrimaculata* (Selys, 1853)

Black Emperor

Libellago (Rhinocypha) quadrimaculata Selys, 1853. *Syn. Cal.*: 60 (type-locality: India).

Rhinocypha quadrimaculata, Fraser, 1934. *Faun. Brit. India, Odon.*, 2: 14-17, fig. 4.

Aristocypha quadrimaculata, Subramanian & Babu, 2017. *Checklist of Odonata (Insecta) of India*: 15. Version 3.0, www.zsi.gov.in (last updated: 25th September, 2017).

Rhinocypha quadrimaculata quadrimaculata, Kumar & Prasad, 1981. *Rec. zool. Surv. India*, Occ. Paper No. 20: 43, 82.

Sighting Period: April-November (Kumar & Prasad, 1981; Kumar & Mitra, 1998); May-July (Subramanian, 2009).

Diagnostic Features: Medium-sized black species with eyes black and legs black and white.

Male: Thorax black with median pinkish triangular patch/stripe and faint yellow lateral stripes, abdomen black and unmarked, wing transparent on basal 1/3rd with yellow tint, and rest 2/3rd glossy black with metallic violet streaks, restricted into two sets of bands at middle and tip, pterostigma black with white outer edge, legs black and white.

Female: Black with bright ochreous spots and streaks on head, thorax and abdomen, wings uniformly brown, pterostigma black with yellow clouding on outer part.

Measurements:

Male: Abdomen 19, hind-wing 21 mm (Fraser, 1934), abdomen 19, fore-wing 24, hind-wing 22.5 mm (Prasad & Singh, 1976), abdomen 25, hind-wing 27 mm (Subramanian, 2009).

Female: Abdomen 20, hind-wing 25 mm (Fraser, 1934), abdomen 19, fore-wing 26, hind-wing 24 mm (Prasad & Singh, 1976), abdomen 21, hind-wing 31 mm (Subramanian, 2009).

Distribution: 300-1500 m (Kumar & Prasad, 1981); usually above 2500 m (Subramanian, 2009); 300-1400 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Prasad & Singh, 1976; Kumar & Mitra, 1998; Prasad & Mondal, 2010).

Elsewhere in Dehra Dun: Dehra Dun (Fraser, 1934- locality not given); Barkot, Donga, Kalsi, Kandholi, Motichur, Raipur and Ramgarh (new records from these localities, Prasad & Singh, 1976).

Uttarakhand: Dehra Dun (also Fraser, 1934; Mitra, 2006), Pauri, Tehri, Uttarkashi, Almora and Nainital (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995; Almora and Bageshwar- Prasad & Mondal, 2010); Western Himalaya (Prasad & Varshney, 1995; Prasad, 2002).

Conservation Status: IUCN Red List Category- Least Concern.

Threats: No specific threats known, however agricultural runoff, sedimentation and hydroelectric dams may impact their habitats.

Remarks: Usually found perched on partially submerged large stones/boulders in streams and riparian vegetation along fast flowing channels (Kumar & Mitra, 1998).

36. *Aristocypha trifasciata* (Selys, 1853)

Libellago (Rhinocypha) trifasciata Selys, 1853. *Syn. Cal.*: 61 (type-locality: India).

Rhinocypha bifasciata Selys, 1879. *Bull. Acad. r. Belg.*, 48: 386 (type-locality: Darjeeling).

Rhinocypha trifasciata, Fraser, 1934. *Faun. Brit. India, Odon.*, 2: 31-33, fig. 10, pl. 2, fig. 3.

Aristocypha trifasciata, Subramanian & Babu, 2017. *Checklist of Odonata (Insecta) of India*: 15. Version 3.0, www.zsi.gov.in (last updated: 25th September, 2017).

Sighting Period: April-November (Kumar & Prasad, 1981; Kumar & Mitra, 1998).

Diagnostic Features: Medium-sized black species.

Male: Thorax black, marked with yellow, mesothorax triangle very large and pale blue; abdomen black, marked on sides of segments 1-3 with yellow spot; anal appendage black; wings partially hyaline and pale yellow at base, hind-wing with three blackish-brown bands and apical band; pterostigma blackish-brown, central part of hind-wing paler; legs black and pruinose white.

Female: Very similar to male except for mesothorax triangle, dark ochreous.

Measurements:

Male: Abdomen 24, hind-wing 27 mm (Fraser, 1934), abdomen 20, fore-wing 25.5, hind-wing 24 mm (Prasad & Singh, 1976).

Female: Abdomen 22, hind-wing 29 mm (Fraser, 1934), abdomen 20, fore-wing 28, hind-wing 28 mm (Prasad & Singh, 1976).

Distribution: 300-1500 m (Kumar & Prasad, 1981); up to 1700 m altitude (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Prasad & Singh, 1976; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Donga and Kandholi (Prasad & Singh, 1976).

Uttarakhand: Dehra Dun, Pauri, Tehri, Nainital and Pithoragarh (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995; Mitra, 2006; Almora and Bageshwar- Prasad & Mondal, 2010); Western Himalaya (Prasad & Varshney, 1995; Prasad, 2002).

Conservation Status: IUCN Red List Category- Least Concern.

Threats: No specific threat known but pollution in streams might have some impact. However, being found in irrigation channels it may be tolerant of disturbance and is unlikely to be threatened.

Remarks: Usually found perched on partially submerged large stones/boulders in streams and riparian vegetation along fast flowing channels (Kumar & Mitra, 1998). Singh & Prasad (1976b) studied the identity of *Rhinocypha trifasciatus* and *R. bifasciata*.

Genus: *Paracypha* Fraser, 1949.

37. *Paracypha unimaculata* (Selys, 1853)

Emerald Prince

Rhinocypha unimaculata Selys, 1853. *Syn. Cal.*: 61 (type-locality: India); Fraser, 1934. *Faun. Brit. India, Odon.*, 2: 27-29, fig. 8.

Paracypha unimaculata, Fraser, 1949. *Bull. Inst. Sci. nat. Belg.*, 25(6): 11 (as generotype of *Paracypha* Fraser, 1949).

Sighting Period: May-June (Fraser, 1934); April-November (Kumar & Prasad, 1981; Kumar & Mitra, 1998).

Diagnostic Features: Medium-sized species with black and yellow eyes, black anal appendage, blackish-brown and outer half paler pterostigma, black and white legs.

Male: Thorax glossy black with fine bright yellow stripes on back and sides; abdomen glossy black with small bright yellow spot on sides of anterior segments, segments 1-6 with yellow ventral stripe on either; wing base transparent with deep amber tint, remaining part opaque black, upper side of both wings brilliant coppery red, under side of hind-wing with an iridescent peacock blue or green band.

Female: Very similar to male but markings more extensive, thorax with six small yellow spots below, abdomen black and marked with yellow stripes on all around, wing uniform amber brown.

Measurements:

Male: Abdomen 24, hind-wing 27-30 mm (Fraser, 1934), abdomen 22, fore-wing 29, hind-wing 28 mm (Prasad & Singh, 1976).

Female: Abdomen 22, hind-wing 31-32 mm (Fraser, 1934), abdomen 22, fore-wing 32, hind-wing 30 mm (Prasad & Singh, 1976).

Distribution: 300-1500 m (Kumar & Prasad, 1981); 440-1800 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Prasad & Singh, 1976; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Khera (new record, Prasad & Singh, 1976).

Uttarakhand: Dehra Dun, Pauri, Tehri, Uttarkashi, Almora, Nainital and Pithoragarh (Dehra Dun-Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995); Uttarakhand/Western Himalaya, Prasad, 2002; Prasad & Mondal, 2010).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: No species specific threats known but habitat degradation due to agricultural run-off and recreational use could be a threat.

Remarks: Usually found perched on partially submerged large stones/boulders in the stream of on hanging riparian vegetation (Kumar & Mitra, 1998; Subramanian, 2009).

Family: Euphaeidae Jakobson & Bainchi, 1905

Genus: *Anisopleura* Selys, 1853

38. *Anisopleura comes* Hagen in Selys, 1880

Anisopleura comes Hagen in Selys, 1880. *C. R. Soc. ent. Belg.*, 23: 113 (type-locality: Himalaya); Fraser, 1934. *Faun. Brit. India, Odon.*, 2: 87-89, figs. 27, 28a.

Sighting Period: April-June (Fraser, 1934); May-October (Kumar & Prasad, 1981; Kumar & Mitra, 1998).

Diagnostic Features: Moderate-sized black species with eyes black above, dark olivaceous below; thorax black, with very fine line; abdomen black, marked with greenish-yellow; anal appendage black; wings transparent, tips of fore-wing dark brown; legs and yellow.

Male: Pterostigma black, covering 3.5-4 cells.

Female: Stout and more robust than male but marked very similarly, pterostigma yellowish-brown, between black nervures.

Measurements:

Male: Abdomen 36-40, hind-wing 29-34 mm (Fraser, 1934), abdomen 37, fore-wing 33, hind-wing 31 mm (Prasad & Singh, 1976).

Female: Abdomen 32-33, hind-wing 33 mm (Fraser, 1934).

Distribution: From about 914-1219 m/3000-4000 ft (Fraser, 1934); 600-2000 m (Kumar & Prasad, 1981); 400-2600 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Prasad & Singh, 1976; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: As above.

Uttarakhand: Chamoli, Dehra Dun, Tehri and Pithoragarh (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995); Western Himalaya (Prasad, 2002; Prasad & Mondal, 2010; Mitra, 2006).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: No major threats known.

Remarks: Perches on partially submerged stones or on sideby vegetation (*Equisetum* sp., the Horse-tail) or on vegetation hanging over water (*Storbilanthes* sp., the Maruadona) (Kumar & Mitra, 1998).

39. *Anisopleura lestoides* Selys, 1853

Euphaea (Anisopleura) lestoides Selys. 1853. *Synopsis des Calopterygines*: 48 (as genotype of *Anisopleura* Selys, 1853; type-locality: India).

Anisopleura lestoides, Fraser, 1934. *Faun. Brit. India, Odon.*, 2: 86-87, fig. 26b.

Sighting Period: May-September (Fraser, 1934); October (Hamalainen, 1989); May –October (Kumar & Prasad, 1981; Kumar & Mitra, 1998).

Diagnostic Features: Medium-sized species with eyes blackish-brown above, olivaceous green below; thorax black, marked with a stripe, broad below, tapering above; abdomen black, marked with greenish-yellow; anal appendage black; wings transparent, fore-wings tips dark brown, bases pale saffron; pterostigma black, covering 3.5-4.5 cells; legs short but robust, black and greenish.

Male: Older specimens with marked pruinescence on prothorax, thorax and end of abdomen.

Female: Very similar to male in markings but more extensive on short and very robust abdomen.

Measurements:

Male: Abdomen 36-38, hind-wing 28-30 mm (Fraser, 1934), abdomen 36, fore-wing 29, hind-wing 27 mm (Prasad & Singh, 1976).

Female: Abdomen 30, hind-wing 29 mm (Fraser, 1934).

Distribution: At about 914-1524 m/4000-5000 ft (Fraser, 1934); 600-2000 m (Kumar & Prasad, 1981); 640-2500 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Prasad & Singh, 1976; Hamalainen, 1989; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Jhajra (Prasad & Singh, 1976); River Rispana at village Tapovan, Rajpur (Hamalainen, 1989); Maldevta, Mussoorie and Tiger Falls, Chakrata (<http://www.indianodonata.org>).

Uttarakhand: Chamoli, Dehra Dun, Pauri and Nainital (Kumar & Prasad, 1981; Kumar, 1995; Bageshwar- Prasad & Mondal, 2010); Western Himalaya (Prasad, 2002).

Conservation Status: IUCN Red List Category- Least Concern.

Threats: Habitat loss through deforestation.

Remarks: Perch on partially submerged stones or on sideby vegetation (*Equisetum* sp., the Horsetail) or on vegetation hanging over water (*Storbilanthes* sp., the Maruadona) (Kumar & Mitra, 1998).

Genus: *Bayadera* Selys, 1853.

40. *Bayadera indica* (Selys, 1853)

Blue Bayadera

Euphaea (*Epallage*) *indica* Selys, 1853. *Synopsis des Calopterygines*: 49 (type-locality: India).

Bayadera indica, Fraser, 1934. *Faun. Brit. India, Odon.*, 2: 79-81, fig. 25a.

Sighting Period: April-October (Kumar & Prasad, 1981; Kumar & Mitra, 1998).

Diagnostic Features: Medium-sized black species.

Male: Eyes dark brown above, bluish-grey/olivaceous below; thorax black with bright greenish yellow and turquoise blue stripes on back and sides respectively; abdomen black with medial narrow yellow stripe, lateral stripes greenish yellow and narrow, last segments without any markings; wings transparent with smoky black tip; pterostigma black and elongated; legs black.

Female: Similar to male but more robust and wings are transparent with an amber tinged base and without apical smoky markings.

Measurements:

Male: Abdomen 38-40, hind-wing 34 mm (Fraser, 1934), abdomen 36, fore-wing 33.5, hind-wing 32 mm (Prasad & Singh, 1976).

Female: Abdomen 36, hind-wing 37 mm (Fraser, 1934), abdomen 32-36, fore-wing 36, hind-wing 32-36 mm (Prasad & Singh, 1976).

Distribution: 500-2000 m (Kumar & Prasad, 1981); 300-1800 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Prasad & Singh, 1976; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Haripur and Khera (Prasad & Singh, 1976).

Uttarakhand: Chamoli, Dehra Dun, Pauri, Tehri, Uttarkashi, Almora and Nainital (Dehra Dun-Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995); Western Himalaya (Prasad & Varshney, 1995; Prasad, 2002; Prasad & Mondal, 2010; Mitra, 2006).

Conservation Status: IUCN Red List Category- Least Concern.

Threats: Habitat loss through deforestation.

Remarks: Usually found perched on partially submerged boulders/stones or side by stones and riparian vegetation (Kumar & Mitra, 1998; Subramanian, 2009).

Superfamily: Coenagrionoidea Kirby, 1890

Family: Coenagrionidae Kirby, 1890

Genus: *Agriocnemis* Selys, 1877

(Subfamily: Agrionemidinae Selys, 1877).

41. *Agriocnemis pygmaea* (Rambur, 1842)

Pygmy Dart-let, Pygmy wisp, Wandering Midget, Wandering Wisp

Agriocnemis pygmaeum Rambur, 1842. *Hist. nat. Ins. Nevrop.*, Paris: 278 (type-locality: India).

Agriocnemis pygmaea, Fraser, 1933. *Faun. Brit. India, Odon.*, 1: 398-401, figs. 163, 171.

Agriocnemis pygmaea pygmaea, Mitra, 2006. *Handbook- Common Indian Dragonflies*: 64.

Sighting Period: October (Hamalainen, 1989); March-October (Kumar & Prasad, 1981); March-September (Kumar & Mitra, 1998); throughout the year (Mitra, 2006); October-January (Subramanian, 2009); peak August-September, secondary: February-July & October-November (Nair, 2011).

Diagnostic Features: Small-sized species.

Male: Eyes black above, paleapple green below; thorax black above with pale apple green lateral stripes, yellow beneath; abdomen broadly black above, anterior segments pale apple green, terminal ones brick red; anal appendage brick red; wings transparent; pterostigma pale yellow in forewings and black in hind-wings (very finely paler at

its circumference outwardly in hind-wings); legs yellow and black.

Female (Red form): More robust and differ from male in eye apple green to greenish-yellow with black cap; body (head, prothorax and thorax) dark brick red, except a broad band above, terminal segments of abdomen suffused with black and a narrow black stripe above; anal appendage small, conical and yellow; pterostigma yellow, framed in dark coloured nervures, in both wings.

Measurements:

Male: Abdomen 19, fore-wing 11.5, hind-wing 10 mm (Prasad & Singh, 1976).

Female: Abdomen 15, fore-wing 11, hind-wing 10 mm (Prasad & Singh, 1976).

Distribution: 500-1400 m (Kumar & Prasad, 1981); up to 1700 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Prasad & Singh, 1976; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Bhaniawala, Bhogpur, Haripur, Herbertpur, Jasowala, Kansrao, Lachhiwala, Maldevta, Mianwala, Motichur, Raipur, Rishikesh, Sabhawala, Satyanarain and Selakui (Prasad & Singh, 1976; Prasad & Singh, 1995); Doon Valley (Kumar & Prasad, 1977); Asan Reservoir (Hamalainen, 1989; Mitra, 2000).

Uttarakhand: Dehra Dun, Pauri and Nainital (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995); Tehri, Uttarkashi, Almora, Bageshwar and Nainital- Prasad & Mondal, 2010); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1995).

Conservation Status: IUCN Red List Category- Least Concern.

Threats: Being widespread, no immediate threats.

Remarks: Darts/perches among vegetation and flies very close to the ground (Subramanian, 2009; Nair, 2011).

Genus: *Amphiallagma* Kennedy, 1920
(Subfamily: Ischnurinae Fraser, 1957)

42. *Amphiallagma parvum* (Selys, 1876)

Agrion (*Enallagma*) *parvum* Selys, 1876. *Synopsis des Agrionines*, Add., 5: 120 (type-locality: India)/*Bull. Acad. Belg.*, 41: 537.

Enallagma parvum, Fraser, 1933. *Faun. Brit. India, Odon.*, 1: 376-378, fig. 162.

Amphiallagma parvum, Subramanian & Babu, 2017. *Checklist of Odonata (Insecta) of India*: 18. Version 3.0, www.zsi.gov.in (last updated: 25th September, 2017).

Sighting Period: Greater part of the year (Fraser, 1933); March-September (Kumar & Prasad, 1981; Kumar & Mitra, 1998); peak August-September,

secondary April-July & October (Nair, 2011); throughout the year (vide India Biodiversity Portal).

Diagnostic Features: Small species with wings transparent; pterostigma small, covering less than one cell, very oblique distally, blackish (yellow in tenerals) with a fine plae frame and thick black enclosing nervures; legs white and black.

Male: Eyed deep sky-blue above, paler below; thorax black above, with very broad azure blue and narrowly bordered with black stripes; abdomen pale sky blue, marked with black; anal appendage slightly shorter than last segment.

Female (Isochrome form): Eyes paler azure blue; thorax greenish-yellow/yellow above, pale blue below; abdomen with dorsal stripes broader, last segments broadly black above but border of segment 10 ; anal appendage very small, conical and blue.

Measurements:

Male: Abdomen 17, hind-wing 11 (Fraser, 1933), abdomen 17, fore-wing 11, hind-wing 11 mm (Prasad & Singh, 1976).

Female: Abdomen 17, hind-wing 11 (Fraser, 1933), abdomen 17.5, fore-wing 12, hind-wing 11 mm (Prasad & Singh, 1976).

Distribution: 600-1500 m (Kumar & Prasad, 1981).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Prasad & Singh, 1976; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Bhaniawala, Haripur, Herbertpur, Kalsi, Kansrao, Mianwala, Raipur and Timli (Prasad & Singh, 1976, 1995); Doon Valley (Kumar & Prasad, 1977); Asan Reservoir (Hamalainen, 1989; Mitra, 2000).

Uttarakhand: Dehra Dun and Nainital (Kumar & Prasad, 1981; Kumar, 1995; Nainital- Prasad & Mondal, 2010); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1995).

Conservation Status: IUCN Red List Category- Least Concern.

Threats: Being widespread, no immediate threats.

Remarks: This species is often placed in the genus *Enallagma* Charpentier, 1840, especially in older literature. Usually perches on *Saccharum* sp. (Boomsedge grass), *Salix* sp. (Willow), *Debregaesia longifolia*, the Orange Wild Rhea and other vegetation along side of small pools (Kumar & Mitra, 1998) and sometimes perch on ground (Nair, 2011).

Genus: *Ischnura* Charpentier, 1840
(Subfamily: Ischnurinae Fraser, 1957).

43. *Ischnura aurora* (Brauer, 1865)

Aurora blue-tail, Blue-tail, Golden Dart-let, Gossamer, Wandering Blue-tail
Agrion delicatum Hagen, 1858. *Verh. Zool.-Bot. Ges. Wien*, 8: 479.

Agrion aurora Brauer, 1865. *Verh. Zool.-Bot. Ges. Wien*, 15: 510.

Ischnura delicata, Fraser, 1933. *Faun. Brit. India, Odon.*, 1: 360-362, fig. 155.

Ischnura aurora, Subramanian & Babu, 2017. *Checklist of Odonata (Insecta) of India*: 18. Version 3.0, www.zsi.gov.in (last updated: 25th September, 2017).

Ischnura aurora aurora, Prasad & Mondal, 2010. *Odonata : Zygoptera*. In: *Fauna of Uttarakhand. State Fauna Series*, 18 (Part-2): 21.

Sighting Period: October (Hamalainen, 1989); almost throughout the year (Kumar & Prasad, 1981); throughout the year except extreme winters (Kumar & Mitra, 1998; Subramanian, 2009); peak June-September, secondary March-May & October-November (Nair, 2011).

Diagnostic Features: Small species with olive eyes.

Male: Eyes dark olive/olive-green above with a semilunar black spot border, pale olive below; two azure blue spots behind eye; thorax bronzed black above, marked with narrow grass green stripes, laterally pale green with a small black streak, white beneath; abdomen citron yellow, last segments azure blue, 10th with a black spot above; pterostigma pale ochreous, tipped with black/suffused with reddish-brown; wings transparent; pterostigma rose red in fore-wing, pale grey in hind-wing; legs pale citron yellow and black.

Female: Stout and dull coloured as compared to male; eye pale yellowish-green, with narrow black cap; abdomen with a broad black stripe above, broadly yellow on sides, paling /greenish below, last segments without azure blue markings; anal appendage very short, conical; pterostigma pale pink.

Measurements:

Male: Aabdomen 16-20, hind-wing 10-12 mm (Fraser, 1933), abdomen 16-20, fore-wing 11, hind-wing 10.5-12 mm (Prasad & Singh, 1976, as *Ischnura delicata*, Hagen, 1858).

Female: Aabdomen 18-20, hind-wing 14-15 mm (Fraser, 1933), abdomen 17, fore-wing 13, hind-wing 12.5 mm (Prasad & Singh, 1976, as *Ischnura delicata*, Hagen, 1858).

Distribution: At altitude 2286 m/7500 ft (Fraser, 1933); 500-1500 m (Kumar & Prasad, 1981); up to 2500 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Prasad & Singh, 1976 as *Ischnura delicate* Hagen, 1858; Kumar & Mitra, 1998 as *I. aurora aurora*).

Elsewhere in Dehra Dun: Asarori, Bhaniawala, Barkot, Bhoorpur, Chandrabani, Gola Tappar, Haripur, Herbertpur, Jasowala, Jhajra, Kalsi, Kansrao, Kuanwala, Lachhiwala, Langha, Mahant Majri, Maldevta, Mianwala, Motichur, Rishikesh, Robber's Cave, Sahaspur, Satyanarain, Selakui and Timli (Prasad & Singh, 1976, 1995); Doon Valley (Kumar & Prasad, 1977, as *I. delicata*); Asan Barrage, Dakpathar Barrage and a seasonal pond at village Tapovan, Rajpur (Hamalainen, 1989); Asan Reservoir (Mitra, 2000).

Uttarakhand: Dehra Dun, Tehri, Nainital and Pithoragarh (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995; Prasad & Mondal, 2010); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1995); Gobind Pashu Vihar, Uttarkashi (Kumar, 2004).

Conservation Status: IUCN Red List Category- Least Concern.

Threats: No major widespread threats known but introduced predatory fishes may threaten its larval stages.

Remarks: Found perched on vegetation/weeds along banks of hill streams (Kumar & Mitra, 1998).

44. *Ischnura forcipata* Morten, 1907

Forcipate Dart-let

Ischnura forcipata Morten, 1907. *Trans. Ent. Soc. Lond.*: 306, pl. 24, figs. 1-3; Fraser, 1933. *Faun. Brit. India, Odon.*, 1: 354-357, fig. 153.

Sighting Period: April-May-June (Fraser, 1933); October (Hamalainen, 1989); throughout the year except extreme winters (Kumar & Prasad, 1981; Kumar & Mitra, 1998); April-September (Mitra, 2006).

Diagnostic Features: Small-sized species.

Male: Eyes orange above, pale bluish-green/olivaceous below; thorax black above, marked with a pair of narrow stripes, laterally pale blue, white beneath; abdomen with blue, bright chrome-yellow and azure blue and black dorsal marking; anal appendage black and white; wings transparent; pterostigma of fore-wings twice the size of that of hind-wing and black and blue, colourless or faintly grey in hind-wings; legs yellow and black; legs pale yellow and black.

Female (Heterochrome form): More robust. Eyes with black cap above, pale bluish-green below; thorax olivaceous with a broad black band above, pale bluish on sides and greenish beneath; abdomen bright orange changing to pale yellow or greenish; anal appendage minute, yellowish/blue;

pterostigma similar to that in hind-wings of male but pale yellow with a little darker centre; legs yellow and blackish-brown.

Measurements:

Male: Abdomen 22-23, hind-wing 13-14 mm (Fraser, 1933); abdomen 23, fore-wing 17, hind-wing 15.5 mm (Prasad & Singh, 1976).

Female: Abdomen 23, hind-wing 13 mm (Fraser, 1933; abdomen 21, fore-wing 17, hind-wing 15 mm (Prasad & Singh, 1976).

Distribution: 600-1500 m (Kumar & Prasad, 1981).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Prasad & Singh, 1976; Hamalainen, 1989; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Mussoorie (Morten, 1907); Asarori, Bhaniawala, Bhoorpur, Donga, Gola Tappar, Haripur, Herbertpur, Jasowala, Kalsi, Kandholi, Kansrao, Karwapani, Lachhiwala, Langha, Motichur, Nalapani, Rishikesh, Robber's Cave, Seasonal pond at village Tapovan, Raipur, Rajpur, Satyanarain, Selakui and Timli (Prasad & Singh, 1976, 1995); Doon Valley (Kumar & Prasad, 1977); river Rispana at Tapovan, Rajpur (Hamalainen, 1989); Asan Reservoir (Mitra, 2000).

Uttarakhand: Chamoli, Dehra Dun, Pauri, Tehri, Uttarkashi, Almora, Nainital and Pithoragarh (Kumar & Prasad, 1981; Kumar, 1995; Prasad & Singh, 1995; Nainital- Prasad & Mondal, 2010); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1995).

Conservation Status: IUCN Red List Category: Least Concern.

Threats: Not threatened.

Remarks: Generally found mixed with earlier species (*Ischnura aurora*) perching on weeds along banks hill streams (Kumar & Mitra, 1998).

Genus: *Ceriagrion* Selys, 1876

(Subfamily: Pseudagrioninae Tillyard, 1917)

45. *Ceriagrion coromandelianum* (Fabricius, 1798)

Coromandel Marsh Dart

Agrion coromandelianum Fabricius, 1798. *Ent. Syst. Suppl.*: 287 (type-locality: India).

Ceriagrion coromandelianum, Fraser, 1933. *Faun. Brit. India, Odon.*, 1: 315-316, figs. 132, 133.

Sighting Period: Greater part of the year (Fraser, 1933); October (Hamalainen, 1989); almost throughout the year (Kumar & Prasad, 1981; Kumar & Mitra, 1998; Subramanian, 2009); Peak May-September, secondary February-April & October-November (Nair, 2011)

Diagnostic Features: Medium-sized species with golden/pale yellow pterostigma.

Male: Eyes olivaceous above, pale greenish-yellow below; thorax uniformly olive-green above and tinted with ochreous, citron yellow on sides, pruinosed white beneath; abdomen uniform citron yellow, last segment deeply emarginate; anal appendage citron yellow/ochreous and tipped with black; wings transparent; pterostigma golden yellow, framed in brown nervures, covering one cell; legs yellow with black spines.

Female: More robust and dull coloured. Differ from male in eyes pale greenish; thorax golden olivaceous brown above, paler on sides, thinly pruinosed beneath; abdomen uniformly olivaceous with an ochreous or golden brown/rusty tint above, deepening behind; anal appendage olivaceous/golden brown; pterostigma pale yellow.

Measurements:

Male: Abdomen 30, fore-wing 20, hind-wing, 19 (Prasad & Singh, 1976), abdomen 28-30, hind-wing 18-20 mm (Fraser, 1933).

Female: Abdomen 28, fore-wing 20.5, hind-wing, 19 (Prasad & Singh, 1976), abdomen 29-32, hind-wing 20 mm (Fraser, 1933).

Distribution: 300-2000 m (Kumar & Prasad, 1981); up to 2500 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Hamalainen, 1989; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Asan Barrage (Hamalainen, 1989); Bhaniawala, Bhogpur, Chandrabani, Gola Tappar, Haripur, Herbertpur, Jasowala, Kansrao, Lachhiwala, Langha, Mianwala, Raipur, Rishikesh, Sabhawala, Selakui and Timli (Prasad & Singh, 1976, 1995); Doon Valley (Kumar & Prasad, 1977); Asan Reservoir (Hamalainen, 1989; Mitra, 2000).

Uttarakhand: Chamoli, Dehra Dun, Uttarkashi and Nainital (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995; Prasad & Singh, 1995; Tehri and Nainital- Prasad & Mondal, 2010); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1995); Gobind Pashu Vihar, Uttarkashi (Kumar, 2004).

Conservation Status: IUCN Red List Category: Least Concern.

Threats: Not threatened.

Remarks: Males generally found perching/flying amongst grasses and herbs close to edges of streams and other water bodies, while females often venture away (Subramanian, 2009; Nair, 2011).

***Ceriagrion fallax fallax* Laidlaw, 1932**

Black-tailed Marsh Dart

Ceriagrion fallax Ris, 1914. *Ent. Mitt.*, Berlin, 3: 47 (type-locality: China); Fraser, 1933. *Faun. Brit.*

India, Odon., 1: 321-323, fig. 137a,b; Santock, , 1955. *Agra Univ. J. Res.*, 4 Suppl.: 747 (Himalaya).

Ceriagrion fallax cerinomelas Lieftinck, 1927. *Tijdschr. Ent.*, 70: 88-90.

Sighting Period: June-October (Kumar & Prasad, 1981); June-August (Kumar & Mitra, 1998).

Diagnostic Features: Medium-sized yellow species with black tipped abdomen.

Male: Eyes dark olivaceous above and pale below; thorax olivaceous- green and yellow with a black stripe above and a black spot at wing base; abdomen citron-yellow with fine black basal rings in anterior segments, rest entirely black; anal appendage black and yellow; pterostigma narrow, elongate, covering one cell, brown with yellow and black nervures; legs yellow and black.

Female: Dull in colouration, slightly more robust, thorax similar to male or dark olivaceous with a golden sheen above, pruinosed white below; abdomen olivaceous-brown above, with a reddish/carneous tint, segments 5-10 black above; anal appendage very short, black; legs similar to male.

Measurements:

Male: Abdomen 30-32, hind-wing 20-21 mm (as *C. fallax* Ris, 1914, Fraser, 1933).

Female: Abdomen 28-34, hind-wing 21-24 mm (as *C. fallax* Ris, 1914, Fraser, 1933).

Distribution: 1000-2000 m (Kumar & Prasad, 1981); up to 2000 m (IUCN Red List, as *Ceriagrion fallax* Ris, 1914).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Doon Valley (new record, Kumar & Mitra, 1998).

Uttarakhand: Dehra Dun (as above).

Conservation Status: IUCN Red List Category-Least Concern (as *Ceriagrion fallax* Ris, 1914).

Threats: Not threatened (as *Ceriagrion fallax* Ris, 1914, vide IUCN Red List).

Remarks: Found amidst vegetation along streams (Kumar & Mitra, 1998).

Ceriagrion fallax cerinomelas Lieftinck, 1927 is synonym of *C. fallax* Ris, 1914 (Fraser, 1933; Subramanian & Babu, 2017; Schorr & Paulson, 2018). Steinmann (1997) considered three subspecies viz. *C. fallax fallax* Ris, 1914, *C. fallax cerinomelas* Lieftinck, 1927 and *C. fallax pendelburyi* Laidlaw, 1931 and shown their distribution in India also.

Genus: *Pseudagrion* Selys, 1876

(Subfamily: Pseudagrioninae Tillyard, 1917).

46. *Pseudagrion rubriceps* Selys, 1876

Saffron-faced Blue Dart

Pseudagrion rubriceps Selys, 1876. *Bull. Acad. Belg.*, 42: 510; Fraser, 1933. *Faun. Brit. India, Odon.*, 1: 296-299, fig. 125.

Sighting Period: Almost throughout the year (Kumar & Prasad, 1981); almost throughout the year except January and December (Kumar & Mitra, 1998); throughout the year (Subramanian, 2009); peak July-September, secondary April-June (Nair, 2011).

Diagnostic Features: Medium-sized blue species with characteristic bright orange face (male)/rusty-brown (female).

Male: Eyes olivaceous-green above, bright-orange on sides and bluish below; thorax olivaceous-green with azure-blue sides and black lines; abdomen olivaceous-green, azure-blue and black-bronzed-green on different segments; pterostigma reddish-brown; legs yellow and black.

Female: Eyes dark blue above and azure-blue below; thorax similar to male but dull bluish-green; abdomen similar to male but stouter, more extensive black markings and less extensive blue markings; pterostigma pale brown.

Measurements:

Male: Abdomen 29, fore-wing 19, hind-wing 19 mm (Prasad & Singh, 1976), abdomen 29, hind-wing 18-20 mm (Fraser, 1933).

Female: Abdomen 28, fore-wing 21, hind-wing 21 mm (Prasad & Singh, 1976), abdomen 29, hind-wing 21 mm (Fraser, 1933).

Distribution: 300-1800 m (Kumar & Prasad, 1981; IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, Prasad & Singh, 1976; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Bhaniawala, Bhoorpur, Haripur, Herbertpur, Kalsi, Kansrao, Langha, Mahant Majri, Rishikesh and Selakui (Prasad & Singh, 1976, 1995); Doon Valley (Kumar & Prasad, 1977); Asan Reservoir (Hamalainen, 1989; Mitra, 1996, 2000).

Uttarakhand: Dehra Dun, Pauri, Tehri and Nainital (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995; Prasad & Singh, 1995); Western Himalaya (Prasad, 2002); Rajaji Tiger Reserve (Prasad & Singh, 1995); Gobind Pashu Vihar, Uttarkashi (Kumar, 2004).

Conservation Status: IUCN Red List Category-Least Concern.

Threats: No major threats known.

Remarks: Usually perches on aquatic and other plants (*Colocasia* sp., the Tarul, *Nasturtium* sp., Ferns and nearby vegetation) on stream/river banks and seen in small groups of 3-4 males, females hard to spot except when pairing (Kumar & Mitra, 1998; Subramanian, 2009; Nair, 2011).

Family: Platycnemididae Yakobson & Bainchi, 1905

Genus: *Calicnemia* Strand, 1928

(*Calicnemis* Selys, 1863, nom. preoccupied)

(Subfamily: Calicnemiinae Fraser, 1957).

47. *Calicnemia doonensis doonensis* Sangal & Tyagi, 1984

Calicnemia miles Kumar & Prasad, 1977 (nec Laidlaw, 1917). *Entomon*, 2(2): 225-229, figs.1-2 (larva and imago, Sulhpur Springs, Dehra Dun).

Calicnemia sp., Tyagi, 1982. *Fraseria*, 3: 9-10 (Sulhpur Springs, Dehra Dun, nomenclat. note).

Calicnemia miniata doonensis Sangal & Tyagi, January 1984. (stat. nov.) *Proc. First Indian Symp. Odon.*, Madurai: Abstract (type-locality: Sulhpur Springs, Dehra Dun; nomen nudem vide Mitra, 2005, as no description is given); Sangal & Tyagi, 1985. *Proc. First Indian Symp. Odon.*, Madurai: 193 (Sulhpur Springs, Dehra Dun).

Calicnemia carminea pyrrhosoma Lieftinck, September 1984. (syn. nov.) *Odontologica*, 13(3): 360 (type-locality: Sulhpur Springs/Sahastradhara, ca. 700 m, Dehra Dun valley); Prasad & Mondal, 2010. Odonata: Zygoptera. In: Fauna of Uttarakhand. *State Fauna Series*, 18 (Part-2): 23.

Calicnemia doonensis doonensis, Hamalainen, 1989 (stat. nov.). *Odontologica*, 18(1): 15-16 (Sulphur Springs/Sahastradhars) (with *C. carminea pyrrhosoma* Lieftinck, 1984 as its synonym).

Calicnemia carminea, Subramanian & Babu, 2017 (in part). *Checklist of Odonata (Insecta) of India*: 20 (with *C. doonensis* Sangal & Tyagi, 1984 and *C. pyrrhosoma* Lieftinck, 1984 as its synonyms). Version 3.0, www.zsi.gov.in (last updated: 25th September, 2017).

Sighting Period: October (Hamalainen, 1989); May-October (Kumar & Mitra, 1998).

Diagnostic Features:

Male: Light marks of varying shape and size on lower surface of head, hindermost spot bright yellow, subrectangular or oval, broadly attached to eye; thorax black and yellow, marked with orangish and vestige of red spots; abdominal segment 1 yellow with mid-dorsal stripe, 2 with diffused brownish tinge on either side of a pale mid-dorsal streak, incomplete distally, upon middle of segment and a somewhat larger, marginal one placed alongside basal 1/3rd of same, obscure spots and streaks, placed lengthwise, also above and sides of 8-10, the ill-defined obscure marks on segments less defined and generally smaller, especially the wedge-shaped black basal mark on sides 2 less pronounced; anal appendage tip not definitely bifid, terminal lobe ending in a pair of narrow

ribbon-like branches; length of discoidal cell variable, costal side usually about one and one-fifth as long as distal side in fore-wing, more than twice as long in hind-wing; legs red/orange, incompletely spotted or striped with black;

Female: Unknown (Lieftinck, 1984).

Measurements:

Male: Abdomen + anal appendage 27.5-31, hind-wing 20.5-23 mm (Lieftinck, 1984)

Female: Unknown (Lieftinck, 1984).

Distribution: 350-1700 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new species, Sangal & Tyagi, 1984, 1985 as *Calicnemia miniata doonensis* Lieftinck, 1984; Lieftinck, 1984- as *Calicnemia carminea pyrrhosoma*; Hamalainen, 1989 and Kumar & Mitra, 1998 as *C. doonensis doonensis*); Babu *et al.*, 2013- *C. pyrrhosoma* Lieftinck, 1984).

Elsewhere in Dehra Dun: Dehra Dun (Prasad & Mondal, 2010, as *Calicnemia miniata doonensis* Sangal & Tyagi, 1984); Dehra Dun valley (IUCN Red List).

Uttarakhand: Dehra Dun (Kumar, 1995; Prasad & Mondal, 2010).

Conservation Status: IUCN Red List Category- Least Concern.

Threats: Deforestation and hydro-power developmental activities may have impact.

Remarks: Usually found perched half-open wings on riparian vegetation (*Adiantum* sp., the Maiden-hair Fern; *Apluda mutica*, the Mauritian Grass; *Pteris* sp., the Ferns and *Salix* sp., the Willows) adjacent to slow water falls/ hill streams (Kumar & Mitra, 1998).

The status of *Calicnemia miniata doonensis* Sangal & Tyagi, 1984, being in confusion, has been studied in detail by various workers (Lieftinck, 1984; Hamalainen, 1998; Mitra, 2005; Mitra & Babu, 2010; Subramanian & Babu, 2017) who came out with different views. Schorr & Paulson (2018), in World Odonata List (Last revision: 23 January 2018), listed *Calicnemia doonensis* Sangal & Tyagi, 1984 (with *C. carminea* Lieftinck, 1984 and *C. carminea pyrrhosoma* Lieftinck, 1984 as its synonyms). Some earlier workers (Kumar, 1995 and Kumar & Mitra, 1998- *Calicnemia miniata doonensis* Sangal & Tyagi, 1984; Prasad & Varshney, 1995- as *C. doonensis*; Mitra, 2002 and 2005- *C. carminea pyrrhosoma* Lieftinck, 1984; Prasad & Mondal, 2010- *C. carminea pyrrhosoma* Lieftinck, 1984; Subraanian, 2009b and Babu *et al.*, 2013- *C. pyrrhosoma* Lieftinck, 1984) followed differently.

Steinmann (1997) considered *Calicnemia doonensis doonensis* Sangal & Tyagi, 1984 from

Dehra Dun and *C. doonensis carminea* Lieftinck, 1984 from Nepal as valid taxa, following Hamalainen (1997) and this has been followed here; same is also in IUCN Red List.

48. *Calicnemia eximia* (Selys, 1863)

Scarlet Open-wing

Platycnemis (Calicnemis) eximia Selys, 1863 (in Kollar MS). *Synopsis des Agrionines*, Add., 4: 16 (as generotype of *Calicnemis* Selys, 1863; type-locality: India).

Calicnemis atkinsoni Selys, 1886 (nec Selys, 1891). *Mem. Cour.*, 38(4): 131 (type-locality: India).

Calicnemis eximia, Fraser, 1933. *Faun. Brit. India, Odon.*, 1: 174-175.

Calicnemia miles, Kumar & Prasad, 1977 (nec Laidlaw, 1917). *Entomon*, 2(2):225-229, figs. 1-2 (larva and imago, Sulhpur Springs, Dehra Dun); Carfi *et al.*, 1983 (nec Laidlaw, 1917). *G. it. Ent.*, 1: 262 (male, Himachal Pradesh and Kashmir, record).

Calicnemia spec. Indet. (not *miles*), Tyagi *et al.*, 1986. *Occ. Publ. S.I.O. Nat. Off. India*, No. 2: 1-14.

Tyagi, B. K., Tyagi, A. and Sangal, S. K., 1986. An up-to-date catalogue and bibliography of dragonfly fauna of the Dehra Dun Valley (India). *Occ. Publ. S.I.O. Nat. Off. India*, No. 2: 1-14.

Sighting Period: May-June (Fraser, 1933; Subramanian, 2009); April-September (Kumar & Prasad, 1981); April-October (Kumar & Mitra, 1998); October (Hamalainen, 1989).

Diagnostic Features: Small scarlet and black species, thorax black above.

Male: Eyes scarlet with a brown cap above and yellowish below; thorax black with scarlet (above) and pale yellow (on sides) stripes; abdomen scarlet; pterostigma dark reddish-brown.

Female: General colouration yellow instead of scarlet, abdomen ochreous and black; wings longer, extending to end of abdomen.

Measurements:

Male: Abdomen 30-34, hind-wing 21-23 mm (Fraser, 1933); abdomen 28-28.5, hind-wing 19.5-20.5 (Thailand) and abdomen 33, hind-wing 22.5 mm (Shillong) (Lieftinck, 1984).

Female: Abdomen 28-30, hind-wing 23-25 mm (Fraser, 1933).

Distribution: 500-1500 m (Kumar & Prasad, 1981); 300-2900 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulhpur Springs (new record, as *C. miles*- nec Laidlaw, 1917, Prasad & Kumar, 1977; Hamalainen, 1989; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: River Rispana at village Tapovan, Rajpur (Hamalainen, 1989);

Dehra Dun Valley (Kumar, 1997); Asan Reservoir (Hamalainen, 1989; Mitra, 2000).

Uttarakhand: Dehra Dun, Almora (Kapkot and Loharkhet, Lieftinck, 1984; Kumar & Prasad, 1981; Almora and Nainital- Kumar, 1995), Nanda Devi Biosphere Reserve- Chamoli and Pitoragarh districts (Kumar, 1997); Western Himalaya (Prasad & Varshney, 1995; Prasad, 2002); Gobind Pashu Vihar, Uttarkashi (Kumar, 2004); Tehri (Prasad & Mondal, 2010).

Conservation Status: IUCN Red List Category: Least Concern.

Threats: Threatened by deforestation and forestry and hydropower developmental activities.

Remarks: Gregarious, usually found perched half-open wings on riparian vegetation (*Adiantum* sp. the Maiden-hair Fern; *Apluda mutica*, the Mauritian Grass; *Pteris* sp., the Ferns; *Salix* sp., the Willows) adjacent to slow water falls/ hill streams (Kumar & Mitra, 1998; Subramanian, 2009).

According to Lieftinck (1984), one of the last instar larvae collected from Sulphur Springs by Kumar & Prasad (op. cit.) was erroneously named as *C. miles*.

49. *Calicnemia miles* (Laidlaw, 1917)

Calicnemis miles Laidlaw, 1917 (nom. nov.), *Rec. Indian Mus.*, 13: 330 (type-locality: Puepoli, Burma); Fraser, 1933. *Faun. Brit. India, Odon.*, 1: 173, 178-181, fig. 80.

Calicnemis atkinsoni Selys, 1891. *Ann. Mus. civ. Genova*, (2), 10 (30): 503-505 (Puepoli).

Calicnemia miles, Lieftinck, 1977. *Entomol. basil.*, 2: 20-22, figs. 10-14 (Puepoli; redescription).

Sighting Period: May (Fraser, 1933); May-September (Kumar & Prasad, 1981).

Diagnostic Features: Medium-sized species.

Male: Eyes reddish-brown above, pale below; thorax black above with narrow bright brick-red stripes, pale yellow on sides and below, with a broad black stripe on sides; abdomen blood red and greenish-yellow with brown and black spots; anal appendage dark reddish-brown, paler at base (red and tipped with blackish, Lieftinck, 1984); pterostigma elongate, covering 1.5-2 cells, rhomboid-shaped, pale reddish-brown framed in thick; legs ferruginous and femora darker behind, tibiae and tarsi black.

Female: Differs from male. Thorax-ground colour on sides and antihumeral stripes bright citron-yellow, black stripe narrower and incomplete below; abdomen bright yellow, tinted with brown/reddish-brown above with black markings on segments; anal appendage minute, conical and dark reddish-brown with yellow conical

protuberance; wings transparent, little broader with slightly more rounded tips than in male; pterostigma paler with a fine frame of yellow lining enclosing black nervures within (sepia grey, lacking pale border, Lieftinck, 1984); legs bright yellow and femora marked with black (yellow with slight pinkish hue and femora with a black stripe) .

Measurements:

Male: Abdomen 33, hind-wing 25 mm (Fraser, 1933); abdomen 30.5-34, hind-wing 22-24 mm (Thailand), abdomen 28.8, hind-wing 22.2 mm (Holotype, S. Burma/Myanmar) (Lieftinck, 1984).

Female: Abdomen 31, hind-wing 25 mm (Fraser, 1933); abdomen 29, hind-wing 24.7 (Lieftinck, 1984).

Distribution: 500-1500 m (Kumar & Prasad, 1981); 500-1300 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulphur Springs (new record, Prasad & Singh, 1976).

Elsewhere in Dehra Dun: Donga, Kandholi, Raipur, Selakui and Timli (Prasad & Singh, 1976).

Uttarakhand: Chamoli, Dehra Dun, Pauri, Tehri and Uttarkashi (Kumar & Prasad, 2081; Kumar, 1995); Nanda Devi Biosphere Reserve-Pithoragarh district (Kumar, 1997); Western Himalaya (Prasad & Varshney, 1995; Mitra, 2006).

Conservation Status: IUCN Red List Category: Least Concern.

Threats: Habitat loss through clear-cutting of forests.

Remarks: Perches on riparian plants and exposed stones in streams.

Genus: *Copera* Kirby, 1890

(Subfamily: Platycnemidinae Jacobson & Bianchi, 1905).

50. *Copera vittata serapica* (Selys, 1863)

Blue Bush Dart

Psilocnemis serapica Selys, 1863. *Bull. Acad. Belg.*, (2) 16: 171 (type-locality: Nikobar Major).

Copera vittata, Fraser, 1933. *Faun. Brit. India, Odon.*, 1: 198-201, figs. 88, 89.

Copera vittata serapica, Mitra & Babu, 2010. *Rec. zool. Surv. India, Occ. Paper No. 315*: 26.

Sighting Period: June-September (Kumar & Prasad, 1981); June-October (Kumar & Mitra, 1998); August-November (Subramanian, 2009); peak August-September, secondary March-July & October (Nair, 2011).

Diagnostic Features: Characteristic black band between two eyes, with a black ring.

Male: Eyes black above, olivaceous-green below; thorax black above, chocolate brown/bright greenish-yellow on sides with a few coarse yellow spots and a narrow yellow and bluish/yellowish stripe below; abdomen black above with reddish-

yellow, pale blue and blue colouration on segments; anal appendage pale blue or creamy; pterostigma reddish-brown; legs reddish-yellow/bright citron yellow.

Female: Eyes dark brown above and pale apple green below, thorax pale brown but marked as in male; abdomen pale brown with dark purplish black, segments pale yellowish-brown and pale brown colouration; anal appendage brownish-white; pterostigma blackish-brown; legs yellow.

Measurements:

Male: Abdomen 28-34, hind-wing 16-18 mm (Fraser, 1933).

Female: Abdomen 28-30, hind-wing 18 mm (Fraser, 1933).

Distribution: 300-600 m (Kumar & Prasad, 1981); up to 1100 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulphur Springs (new record as *C. vittata serapica* Selys, 1863, Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: Herbertpur (as *C. vittata*, Selys, 1863, Prasad & Singh, 1976).

Uttarakhand: Dehra Dun (Kumar & Prasad, 1981; Kumar, 1995); Uttarakhand/Western Himalaya (Prasad, 2002; Prasad & Mondal, 2010).

Conservation Status: IUCN Red List Category: Least Concern.

Threats: Not threatened.

Remarks: Perches on leaves of *Agaratina adenophora*, the Crofton Weed/Sticky Snake-root, near stream (Kumar & Mitra, 1998).

Mitra & Babu (2010) considered three subspecies viz. *Copera vittata serapica* (Selys, 1863), *C. vittata assamensis* Laidlaw, 1914 and *C. vittata deccanensis* Laidlaw, 1917 from western, eastern and southern India respectively while Subramanian & Babu (2017) considered only the later two subspecies, *assamensis* and *deccanensis*.

Superfamily: Lestoidea Calvert, 1901

Family: Lestidae Calvert, 1901

Genus: *Lestes* Leach, 1815

(Subfamily: Lestinae Calvert, 1901).

51. *Lestes praemorsus decipiens* Kirby, 1893

Sapphire-eyed Spread-wing

Lestes (Lestes) praemorsa Hagen in Selys, 1862. *Synopsis des Agrionines, Add.*, 2: 36 (type-locality: Manila) / *Bull. Acad. Belg.*, (2) 13: 320.

Lestes praemorsa praemorsa, Fraser, 1933. *Faun. Brit. India, Odon.*, 1: 30-33, figs. 10-12.

Lestes decipiens Kirby, 1893. *J. Linn. Soc. Lond., Zool.*, 24: 565-566 (type-locality: Ceylon).

Lestes praemorsa decipiens, Subramanian & Babu, 2017. *Checklist of Odonata (Insecta) of*

India: 13. Version 3.0, www.zsi.gov.in (last updated: 25th September, 2017).

Sighting Period: June (at Pwepoli, Myanmar, Fraser, 1933), June-September (Kumar & Prasad, 1981); throughout the year (Subramanian, 2009); peak July-September, secondary May-June & October-November (Nair, 2011).

Diagnostic Features: Small turquoise blue and metallic green species with sapphire blue eyes, pterostigma dark reddish-brown/blackish-brown, covering two cells and.

Male: Eyes sapphire blue, thorax glossy metallic green with zig-zag bronze-green stripe above, bordering pale turquoise blue on sides; abdomen pale blue, marked with bronzed green/coppery metallic and mat black, segments with stripes/bands; anal appendage pale yellow/ochreous and with black tip; legs black and pale bluish-green.

Female: Thorax yellowish/pale greenish-blue and heavily pruinose on sides and below; abdomen greenish-yellow and segments with more distinct markings; anal appendage creamy white and pointed; legs ochreous and dark brown.

Measurements:

Male: Abdomen 32-35, hind-wing 21-22 mm (Fraser, 1933).

Female: Abdomen 30-32, hind-wing 20-21 mm (Fraser, 1933).

Distribution: 500-2000 m (Kumar & Prasad, 1981); up to 2000 m altitude (IUCN Red List).

Sahastradhara: Sahastradhara/Sulphur Springs (new record, as *L. praemorsa praemorsa* Hagen in Selys, 1862, Prasad & Singh, 1976).

Elsewhere in Dehra Dun: Asarori, Bhaniawala, Jaintanwala, Kandholi, Mahant Majri, Mianwala and Timli (Prasad & Singh, 1976); Doon Valley (Kumar & Prasad, 1977); Asan Reservoir (Mitra, 2000) (as *L. praemorsa praemorsa* Hagen in Selys, 1862).

Uttarakhand: Dehra Dun and Nainital (Dehra Dun- Kumar, 1972; Kumar & Prasad, 1981; Kumar, 1995); Gobind Pashu Vihar, Uttarkashi (Kumar, 2004- as *L. praemorsa praemorsa* Hagen in Selys, 1862); Western Himalaya (Prasad, 2002; Prasad & Mondal, 2010).

Conservation Status: IUCN Red List Category: Least Concern.

Threats: No known threats.

Remarks: Usually perches with open wings on aquatic vegetation (Subramanian, 2009).

Other subspecies *L. praemorsus sikkima* Fraser, 1929 from India is found in Kurseong, Sikkim.

Family: Synlestidae Tillyard, 1917

Genus: *Megalestes* Selys, 1862

(Subfamily: Megalestinae Tillyard & Fraser, 1938)

52. *Megalestes major* Selys, 1862

Giant Emerald Spread-wing

Lestes (Megalestes) major Selys, 1862. *Bull. Acad. Belg.*, (2), 13: 293/Synopsis des Agrionines, 2: 9 (type-locality: India).

Megalestes major, Fraser, 1933. *Faun. Brit. India, Odon.*, 1: 21-23, figs. 6-7.

Sighting Period: October (Hamalainen, 1989); July-October (Kumar & Mitra, 1998); August-October (Mitra, 2006); May-October (Subramanian, 2009).

Diagnostic Features: Large metallic green species.

Male: Eyes dark brown; thorax brilliant glossy metallic emerald-green above with bright yellow and black markings, pruinose white; abdomen dull metallic green above and on sides, segments /pale yellow/brilliantly metallic /pruinose white, anal appendage black; wing may be palely enfumed at tips, pterostigma black (yellow/brown in tenerals); legs bright yellow and dull black/enfumed.

Female: Like male but anal appendage comparatively shorter.

Measurements:

Male: Abdomen 48-54, hind-wing 33-36 mm (Fraser, 1933).

Female: Abdomen 45-47, hind-wing 35-36 mm (Fraser, 1933).

Distribution: Up to 2438 m/8000 ft (Fraser, 1933); 700-3000 m (IUCN Red List).

Sahastradhara: Sahastradhara/Sulphur Springs (new record, Hamalainen, 1989; Kumar & Mitra, 1998).

Elsewhere in Dehra Dun: As above.

Uttarakhand: Chamoli, Dehra Dun, Almora, Nainital and Pithoragarh (Kumar & Prasad, 1981; Kumar, 1995); Nanda Devi Biosphere Reserve-Almora and Chamoli districts (Kumar, 1997); Uttarakhand/Western Himalaya (Prasad, 2002; Prasad & Mondal, 2010).

Conservation Status: IUCN Red List Category- Least Concern.

Threats: No major threats.

Remarks: Usually perches with wings half open on riparian vegetation (Subramanian, 2009).

CONCLUSION

(i) A review on 53 species/subspecies belonging to 35 genera, 11 families, 6 superfamilies, 2 suborders under order Odonata, recorded from Sahastradhara / Sulphur Springs (Dehra Dun), has been provided.

(ii) Relative abundance: Anisoptera- 33 species, 62.26 % of 53 species; family Libellulidae- 23 species, 69.70 % of 33 species; genus *Orthetrum*- 8 spp, 34.78 % of 23 spp.

Zygoptera- 20 species, 37.74 % of total 53 species; family Coenagrionidae- 7 spp, 35.00 % of 20 spp; genera *Ceriagrion* and *Ischnura*- 2 each spp, 28.57 % of 7 spp, though genus *Calicnemia* (family Platycnemididae) has 3 spp, the maximum number.

(iii) Systematic status with important synonyms or names by past workers, if any, as per relevant literature has been adopted.

(iv) Sighting Period: It is based on frequent site visits and field observations by various workers during the past.

(v) Brief diagnostic features and body measurements of species have been given.

(vi) Family Libellulidae is the most diverse as regards number of species as it has 70% and family Macromidae the least as having 3% out total dragonflies, whereas family Coenagrionidae has 35% and Lestidae and Synlestidae 3% each.

(vii) Conservation Status as per IUCN Red List: Interestingly, they are not threatened and fall under 'Least Concern' Category. *Ophiogomphus cerastis* Selys, 1854 is kept under Data Deficient Category.

(viii) Threats: Potential habitat loss/degradation may have some impact on their population.

(ix) Distribution in Sahatradhara/Sulphur Springs, elsewhere in Dehra Dun and Uttarakhand has been provided as per records.

(x) Perching styles/vegetation preferences of species are given.

(xi) Distribution of related subspecies, if any, has been provided for distributional pattern of species.

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