



RANGE EXTENSION AND HIGH ALTITUDINAL RECORD OF *SYMPETRUM MERIDIONALE* (SELYS) (ODONATA: LIBELLULIDAE)

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ABSTRACT

The dragonfly *Sympetrum meridionale* (Selys, 1841) (Odonata-Libellulidae) occurs throughout Asia Minor to Persia and Kashmir. The earlier Indian records of *S. meridionale* are from Yusimarg, 2286 m, and from below Gulmarg, 2438 m, Kashmir valley. Herein, the range extension and high altitudinal record of this species is reported from the Indus riverine, Leh, Ladakh Union territory of India at an elevation of 3500 m. A note on the habitat, which is entirely different from that of Kashmir valley, its originally known habitat, is provided. Study of museum specimens reveals the eastern most record of the species, from Sikkim and an additional new record from Srinagar. The species diagnosis including comparison of male genitalia, along with the need to validate the previous records from Rajasthan and further surveys along Himalaya and lower latitudes are discussed.

Key words: *Sympetrum meridionale*, new record, distribution, Leh, Ladakh, Himalaya, Sikkim, Srinagar, survey, habitat, diagnosis, male genitalia

Range extension records are important especially in the pretext of global climate change. There is a predicted northward shift of many insect species owing to the increased global temperature. The expected shift of species distribution due to the current global climate change trends is towards higher latitude in northern hemisphere (Chen et al., 2011). Climate change mediated high altitudinal shift is also noticed especially in tropical mountains (Chen et al., 2009). Though the exact cause of range extension of a species cannot be correlated directly with climate change but, the range extension records over the years could help in bringing out patterns which will enable predicting a unidirectional shift. Odonata is as an ecologically important indicator of health of ecosystem, many species of which show altitudinal preferences. The order Odonata includes 5952 species and subspecies under 652 genera (Schorr and Paulson, 2014). India harbours 474 species and 50 subspecies under 142 genera in 18 families (Subramanian, 2014). The taxonomy of Indian Odonata is well worked (Fraser, 1924a, 1924b, 1933, 1934, 1936; Davies and Tobin, 1984, 1985; Prasad and Varshney, 1995; Subramanian, 2014). But the

distribution of various species especially rare ones are still not completely understood, particularly in areas with difficult terrain like the Himalaya.

Sympetrum Newman (1833) is one such genus with many species having very less distributional records in India. The genus is characterized (though not unique characters) by an expanded, bilobed prothorax fringed with long setae; slender legs, rounded head, slightly compressed pterothorax (Walker and Corbet, 1975). It includes seven species from India, of which *Sympetrum meridionale* (Selys, 1841) is rather a rare one, distributed throughout S E Europe, N Africa and extending through Asia Minor to Persia and Kashmir (Fraser, 1936). The previous published records of this species are very few. Fraser (1936) described the species from male and female specimens taken by Mr Bainbrigge Fletcher from Yusimarg, 2286 m, and from below Gulmarg, 2438 m. Koli et al. (2014) reported it from 3 locations of Udaipur, Rajasthan. Apart from these, there is no other published record from India. Keeping this in view, an odonates survey was conducted in the Leh the joint capital of Union territory of Ladakh, India, and significant results are presented here.

MATERIALS AND METHODS

The survey was done by the first and the second author from 23rd to 27th July 2018 at various locations of Leh (34.16°N, 77.58°E) the joint capital of Union territory of Ladakh, India. Field photographs were captured using Canon 6D Mark II DSLR camera with Canon EF 100-400 mm f/4.5-5.6 IS ii USM lens. The species identity was determined by comparing the detailed photographs with descriptions furnished by Fraser (1936) and comparison with photographs of examples available at the database gallery of Natural History Museum, London and with museum specimens deposited at National Pusa Collection (NPC) at Division of Entomology, ICAR-Indian Agricultural Research Institute, New Delhi. Additional distributional records were obtained by studying the label data of the museum specimens deposited at the NPC. The identity of the museum specimens were reconfirmed following the original description by Fraser (1936) and comparison with photographs of examples available at the database gallery of Natural History Museum, London. The photographs of museum specimens were captured by lighting up the specimens with white LED light and capturing using Canon 600D DSLR camera fitted with Canon EF 100 mm f/2.8L IS USM lens. Photographs of the male genitalia were captured using Leica DFC 425 digital camera mounted on a Leica M205FA stereozoom microscope and processed with Automontage© software. The lay out of the images were prepared using Adobe photoshop CS software.

RESULTS AND DISCUSSION

Sympetrum meridionale (Selys, 1841)

Diagnosis: *S. meridionale* is rather a yellow to brilliant red species (the colour changes as per the age). The labrum, face, anterior surface of frons colour varies from chrome yellow to red (Fig.1 b₃, c₂, c₄). The upper side of frons with a narrow basal black line. The middle lobe of prothorax with a black spot. Thorax with a narrow brownish antehumeral stripe. Area after the stripe olivaceous. The narrow black humeral sutures are interrupted at places and the posterior lateral suture are black (Fig.1 a₁, b₁, c₁). The abdominal colour variable with a pair of subapical spots on each segments (Fig.1 a₁). Base of segment 1 and 2 dark. The female specimens are paler with antehumeral stripe pale greenish white (Fig.1 a₂) and distinct and ventral borders of abdomen distinctly black and segment 8 and 9 with small basal black spot (Fig.1

a₂, a₃, c₆). Out of the seven described species under the genus from the Indian region, *S. meridionale* is closely related to *Sympetrum decoloratum* (Selys) but can be differentiated by it is slightly larger size, yellow upper surface of the legs, black flexor surface, diffuse greenish antehumeral stripe and dorsal markings on thorax. Another species commonly encountered in the lower Himalayas and North Eastern region *Sympetrum comixtum* (Selys), which can be easily differentiated from *S. meridionale* by the overall ferruginous thorax and reddish abdomen with black ventral borders and black humeral and posteriolateral sutures. The latter feature along with the sub dorsal black stripes help to distinguish the female of the species from *S. meridionale*. The male genitalias of *S. meridionale*, *S. decoloratum* and *S. commixtum* show prominent structural differences (Fig.1 d₁, d₂, d₃).

Distribution and habitat: The survey resulted in the first high altitudinal record of *S. meridionale* from Indus riverine, Leh, Ladak Union territory of India at an elevation of 3505 masl. A total of 5 individuals (one red coloured male and four yellowish orange coloured females) were observed on the partially flooded bank of the river Indus near Palam Bridge at Agling, Spituk village, Leh district, perching on bare thorny branches or twigs of Sea buckthorn (*Hippophae* sp.). The species was early found in Yusimarg and Gulmarg of Kashmir below 2438 masl (Fraser, 1936). The range extension and high altitudinal record of *S. meridionale* in Leh is noteworthy given its habit of preferring the Kashmir valley habitat below 2438 masl.

Study of museum specimens deposited at NPC revealed two additional new distributional records viz. Srinagar and Shillong. A total of six specimen (2 female, 4 male) of *S. meridionale* were studied out of which one specimen (male) was from Shillong (Meghalaya) (Fig.1 b₁-b₃), two specimens (1 female and 1 males) were from Srinagar (Kashmir) (Fig.1 c₁-c₆), two (males) from Gulmarg (Kashmir) and remaining one (female) was from Yusimarg (Kashmir). The species have been distributed Throughout S Europe, N Africa, and extending through Asia Minor to Persia and Kashmir. Previous Indian records of the species with in the above mentioned distributional range was from Yusinagar and Gulmarg below 2438 m. (Fraser, 1936). The present record of the species from Spituk village, Leh district (3505 m) is the first high altitudinal record of the species from India and the distributional record from the Shillong (Meghalaya) is the Eastern most record of the species in India. The previous published record of



Fig. 1. a₁-a₃: *S. meridionale*: male (lateral), female (lateral), female (dorsal), b₁-b₃: *S. meridionale* museum specimen from Shillong: male (lateral), label, male (frontal); c₁-c₆: *S. meridionale* museum specimen from Srinagar: male (lateral), male (frontal), label, female (frontal), label, female (lateral); d₁-d₃: male genitalia: *S. meridionale*, *S. decoloratum*, *S. commixtum*.

the species from Badi lake (479 m), Udai Sagar lake (543 m), Menar lake (474 m) of Rajasthan (Koli, 2014) needs to be validated as it is out of the distributional range mentioned in Fraser (1936) and also are from lower latitudes.

The habitat of the Indus riverine from which the

high altitudinal distribution record is reported possessed vegetation with impenetrable thickets of sea buckthorn which was a highly preferred perch for *S. meridionale* and the thorns probably aids protection for the perching dragonflies from avian predators. The valley of Leh in Ladakh is a high-elevation Trans-Himalayan desert in the rain shadow of the Himalayas, with sparse

precipitation -10 cm annually, received mostly as snow in winter. The habitat is entirely different from that of Kashmir valley from which the species was previously reported. Natural vegetation in the study area is sparse, except along water ways. The flooded river basins and luxuriant growth of the sea buckthorn plants promoted ample activity of the species. This observation is relevant as sea buckthorn is a multipurpose commercial plant species grown for its nutritionally rich berries and also for afforestation purpose, which can grow well in the cold deserts (Husain et al., 2018). Such species grown along the river basins can serve as a very good niche facilitator for *S. meridionale*.

This study represents the high altitudinal, northern and eastern range extension of *S. meridionale* from India. The field study presents the first high altitudinal Indian record of the species from the Indus basin of Spituk village, Leh (Ladakh) and the study of museum specimens reports the eastern most distributional record from Shillong (Meghalaya). Further the flooded habitat of the Indus basin in Leh vegetated with Sea buckthorn plants were found preferred by the species. Given the extremely low records of the species further studies are needed to find out more about distribution of the species all along the Himalayas and North East as well as to the lower latitude to confirm its actual distribution range; which could help assess its conservation status and will aid species conservation efforts, especially since the species was found showing preference to river basins with vegetation growth of an important multipurpose crop, the sea buckthorn. Further such studies targeting high altitude species over a long time can help in predicting climate change mediated species shift happening in the ecologically important Himalayan ranges.

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