

NOTES ON BLACKFLIES (DIPTERA : SIMULIIDAE) FROM  
KASHMIR, INDIA

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INTRODUCTION

Edwards (1927) described two species, viz., *Simulium stevensoni* and *S. kashmiricum*, and recorded another species, like European *S. equinum* L., from Kashmir. *S. kashmiricum* was, however, later synonymized with *S. indicum* Becher, by Lewis (1973). Puri (1932 a, b) described another two species, viz., *S. chrystophersi* and *S. barraudi*. In 1977, the author collected five species including *indicum* and *barraudi*.

Kashmir lies in the Palaearctic region except its southwestern fringe which is in the Orient (See Map 1). It is, therefore, an unique area having assemblage of Oriental intruders in the Palaearctic fauna. The material reported here reflects on this zoogeographical proximation.

SYSTEMATIC ACCOUNT

Subfamily SIMULIINAE Newman

Tribe SIMULIINI Newman

Genus *Simulium* Latreille

1. *Simulium* (*Eusimulium*) *aureum* Fries

*Simulium aureum* Fries, 1824, *Observ. Ent.* 1 : 16 (♀, ♂); Puri, 1925, *Parasitology* 17 : 354 (pupa, larva).

*Simulium* (*Eusimulium*) *aureum* Fries : Puri, 1933, *Indian J. med. Res.* 21 : 7 (♂, ♀).

*Material examined* : 11 ♂♂, 4 ♀♀ (reared from pupae), 56 pupae, 9 pupal exuviae and 30 larvae, Kashmir, Srinagar, Shalimar Garden, irrigating channels full of floating grasses and trailing vegetation, 11.ix.1977, Coll. M. Datta ; 2 ♂♂, 3 ♀♀ (reared from pupae), 12 pupae, 5 pupal exuviae and 14 larvae, Kashmir, Srinagar, Nishat Garden, irrigating channels with floating grasses and trailing vegetation, 15.ix.1977, Coll. M. Datta.

*Distribution* : India : Himachal Pradesh ; Holarctic Region and ? Pakistan.

*Remarks* : This species originally described from Sweden, is the type-species of the subgenus *Eusimulium* Roubaud. This is recorded from Kashmir for the first time. The unique form of male genitalia shows striking resemblance with that of the species of the Palaearctic subgenus *Wilhelmia* Enderlein, but that does not, however, mean that there is close phyletic relationship between *Eusimulium* and *Wilhelmia* (Crosskey, 1969).

Although the Indian specimens have long been assigned to this species, *S. (E.) aureum* is known to be a species-complex (Crosskey, *op. cit.*), and these specimens may ultimately belong to a new species. In fact, that species may prove to be closer to *S. (E.) latizo-*

*num* (Rubtzov, 1956) or *S. (E.) rubzovianum* (Serban, 1961).

## 2. *Simulium (Wilhelmia) mediterraneum* Puri

*Simulium equinum* var. *mediterraneum* Puri, 1925, *Ann. Mag. nat. Hist.* 16 : 253 (pupa, larva).

*Simulium (Wilhelmia) equinum* var. *mediterraneum* Puri : Puri, 1933, *Indian J. med. Res.* 21 : 12 (♂, ♀).

*Wilhelmia mediterraneum* Puri : Rubtzov, 1956, *Fauna of U. S. S. R., Diptera* 6(6) : 558.

*Simulium (Wilhelmia) mediterraneum* Puri : Crosskey, 1967, *Trans. R. ent. Soc. Lond.* 119 : 28.

**Material examined:** 5 pupae, 1 pupal exuvia and 4 larvae, Kashmir, Srinagar, Shalimar Garden, irrigating channel with floating grasses, 11.ix.1977, Coll. *M. Datta*.

**Distribution:** India : Punjab ; Pakistan, North Africa, Mediterranean Europe and Middle East.

**Remarks:** This species was originally described from the North Africa and Macedonia. This is recorded for the first time by name from Kashmir because in all probability this may be the same species which appeared to Edwards (1927) indistinguishable from *S. equinum* L. Puri (1933) pointed out that neither the pupae nor the larvae of this species appear to have any noticeable distinction from those of *S. (W.) paraequinum* Puri. However, the present specimens from Kashmir agree well with *mediterraneum* following the key given by Lewis (1973). According to

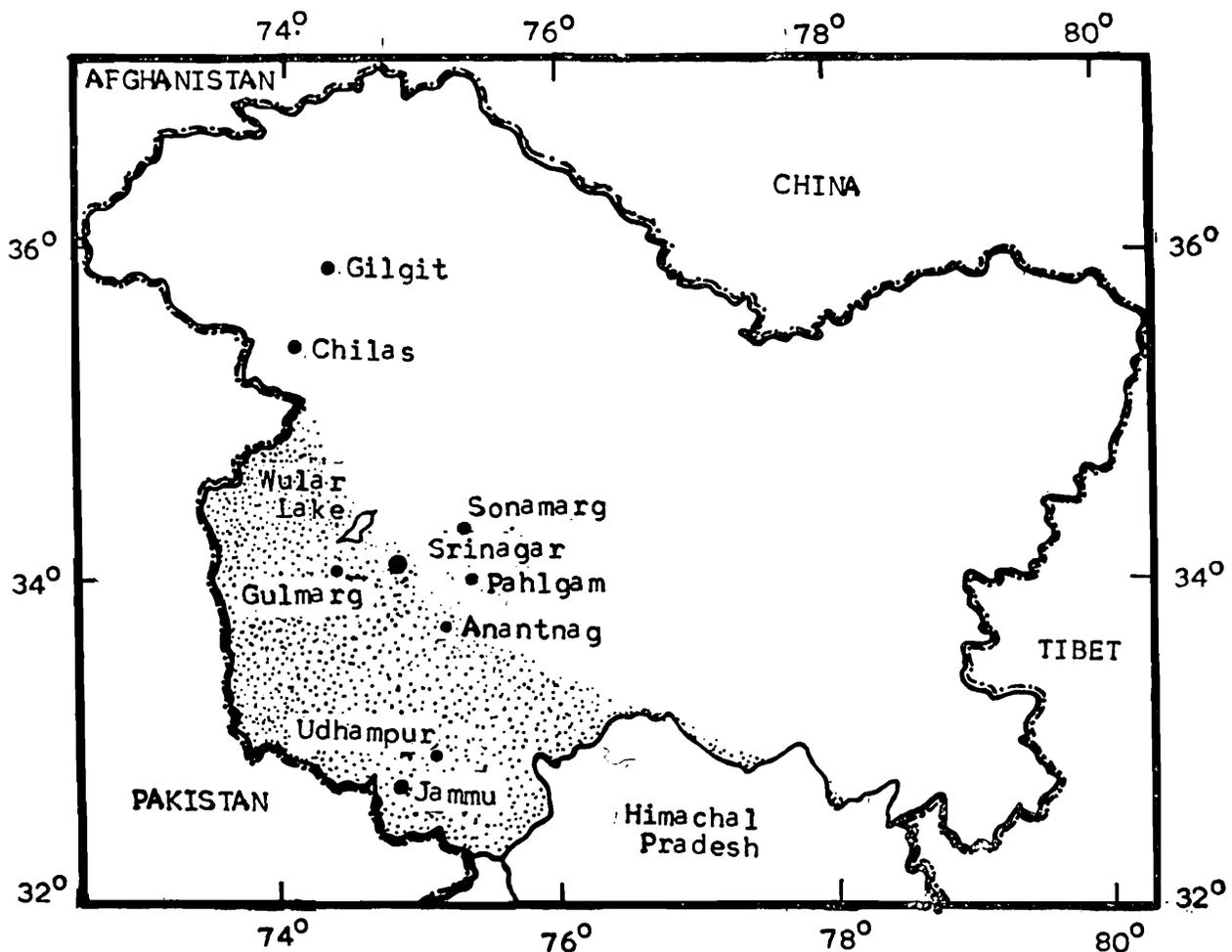


Fig. 1. Map of Jammu and Kashmir, showing places mentioned in the text ; shaded area Oriental region and unshaded area Palaearctic region.

Crosskey (1967, 1969) either of the two species *S. (W.) canariense* Séguy, 1921 and *S. (W.) pseudequiumm* Séguy, 1921, described from the Canary islands may possibly be a senior synonym of *mediterraneum*.

### 3. *Simulium (Himalayum) indicum* Becher

*Simulium indicum* Becher, 1885, *J. Asiat. Soc. Beng.* 53 : 199 (♀).

*Simulium kashmiricum* Edwards, 1927, *Bull. ent. Res.* 18 : 169 (♀).

*Simulium (Himalayum) indicum* Becher : Lewis, 1973, *Bull. ent. Res.* 62 : 462 (♂, pupa, larva) ; Lewis, 1974, *Israel J. Ent.* 9 : 25 (♀ re-described).

*Material examined* : 1 ♀, 1 pupa, 1 pupal exuvia and 2 larvae, Kashmir, Pahalgam, stream mostly with trailing vegetation, 25.ix.1977, Coll. M. Datta.

*Distribution* : India : Arunachal Pradesh, Assam, Himachal Pradesh, Kashmir, Manipur, Meghalaya, Nagaland, Sikkim, Uttar Pradesh, West Bengal ; Bangladesh ; Bhutan ; Burma ; China ; Nepal ; Pakistan and Thailand.

*Remarks* : This species was originally described from the erstwhile Assam (as per explanation of Datta, 1975) from a female specimen only which had pale abdominal terga 1 and 2. Lewis (1973), while synonymising *S. kashmiricum* Edwards, described the male, pupa and larva of this species. One would certainly hesitate to assign the present Kashmir material to *indicum*, since the female specimen has a less yellow abdominal base and an almost black hind femur as Edwards (1927) said. Lewis (1974), however, did admit this colour variation of Kashmir form and suggested that its position be reconsidered when immature stages be studied from various areas. Edwards (1928) synonymized with this another species *S. nigrogilvum* Summers,

1911, described from Thailand. Incidentally, Lewis (*op. cit.*) made a good attempt to compare *S. indicum* with the African *Simulium (Lewisellum) neavei* Roubaud both in respect of morphology and ecology.

### 4. *Simulium (Tetisimulium) stevensoni* Edwards

*Simulium stevensoni* Edwards, 1927, *Bull. ent. Res.* 18 : 169 (♀).

*Tetisimulium stevensoni* Edwards : Rubtzov, 1963, *Fliegen palaearkt. Reg.* III 4(14) : 500.

*Simulium (Tetisimulium) stevensoni* Edwards : Crosskey, 1967, *Trans. R. ent. Soc. Lond.* 119 : 42 ; Lewis, 1973, *Bull. ent. Res.* 62 : 463.

*Distribution* : India : Kashmir ; Pakistan.

*Remarks* : This species was originally described from female specimens from Kashmir and, the male and immature stages are still unknown. The present material does not contain any specimens of this species. It is, therefore, presumed that this species is confined only to Chilas (type-locality) areas (North-West) of Kashmir.

### 5. *Simulium (Odagnia) adventicium* Datta

*Simulium (Odagnia) adventicium* Datta, *Bull. zool. Surv. India* (In press).

*Material examined* : 6 ♂♂, 8 ♀♀ (reared from pupae), 39 pupae, 11 pupal exuviae and 32 larvae, Kashmir, Srinagar, Shalimar, Garden, irrigating channels full of floating grasses and trailing vegetation, 11.ix.1977, Coll. M. Datta ; 1 ♂, 4 ♀♀ (reared from pupae), 18 pupae, 6 pupal exuviae and 7 larvae, Kashmir, Nishat Garden, irrigating channel with floating grasses and trailing vegetation, 15.ix.1977, Coll. M. Datta ; 10 pupae and 11 larvae, Kashmir, Pahalgam, stream mostly with trailing vegetation, 25.ix.1977, Coll. M. Datta.

*Distribution* : India : Himachal Pradesh.

*Remarks*: The species was originally described from Himachal Pradesh (India). This is recorded for the first time from Kashmir. The occurrence of this species both in Himachal Pradesh and Kashmir appears likely on zoogeographical ground.

#### 6. *Simulium (Simulium) chrystophersi* Puri

*Simulium (Simulium) chrystophersi* Puri, 1932, *Indian J. med. Res.* 19 : 906 (♂, ♀, pupa).

*Distribution*: India: Kashmir and Himachal Pradesh.

*Remarks*: This species was originally described from Kashmir itself. However, the author was unable to collect it during his survey.

#### 7. *Simulium (Simulium) barraudi* Puri

*Simulium (Simulium) barraudi* Puri, 1932, *Indian J. med. Res.* 19 : 1130 (♂, ♀, pupa).

*Material examined*: 1 ♂ (reared from pupa), 2 pupae and 1 pupal exuvia, Kashmir, Pahalgam, stream mostly with trailing vegetation, 25.ix.1977, Coll. *M. Datta*.

*Distribution*: India: Himachal Pradesh and Kashmir.

*Remarks*: The species was originally described from Kashmir. It closely resembles *S. (S.) novolineatum* Puri (Puri, 1932b). The male is, however, clearly distinguishable by its genital characters.

#### Key to Species of Simuliidae from Kashmir\* (Males)

- |                                   |     |     |   |
|-----------------------------------|-----|-----|---|
| 1. Basal section of radius haired | ... | ... | 2 |
| Basal section of radius bare      | ... | ... | 4 |

- |  |     |  |   |
|--|-----|--|---|
| 2. Pleural membrane haired   | ... | ( <i>Wilhelmia</i> )<br><i>mediterraneum</i> |   |
| Pleural membrane bare  | ... | ...  | 3 |
| 3. Postnotum with scale patch ; genitalia with very small distimere and large basimere | ... | ( <i>Eusimulium</i> )<br><i>aureum</i>       |   |
| Postnotum bare ; genitalia with distimere much longer than basimere                    | ... | ( <i>Himalayum</i> )<br><i>indicum</i>       |   |
| 4. Pleural membrane haired ; ventral plate with antero-ventral beak-like process       | ... | ( <i>Odagmia</i> )<br><i>adventicium</i>     |   |
| Pleural membrane bare ; ventral plate as well as its process shaped otherwise          | ... | ( <i>Simulium</i> )                          | 5 |
| 5. Ventral plate narrow with keel-like process   | ... | <i>chrystophersi</i>                         |   |
| Ventral plate broad with tongue-like process   | ... | <i>barraudi</i>                              |   |
| ( Females )  |     |  |   |
| 1. Basal section of radius haired  | ... | ...  | 2 |
| Basal section of radius bare   | ... | ...  | 4 |
| 2. Pleural membrane haired   | ... | ( <i>Wilhelmia</i> )<br><i>mediterraneum</i> |   |
| Pleural membrane bare  | ... | ...  | 3 |
| 3. Postnotum with scale patch ; tarsal claw with large basal tooth                     | ... | ( <i>Eusimulium</i> )<br><i>aureum</i>       |   |
| Postnotum bare ; tarsal claw with a small basal tooth                                  | ... | ( <i>Himalayum</i> )<br><i>indicum</i>       |   |
| 4. Pleural membrane haired   | ... | ...  | 5 |
| Pleural membrane bare  | ... | ( <i>Simulium</i> )                          | 6 |
| 5. Scutum with three broad dark vittae ; abdominal terga 6-8 entirely pollinose        | ... | ( <i>Tetisimulium</i> )<br><i>stevensoni</i> |   |

\*The male, pupa and larva of *stevensoni*, and the larva of both *barraudi* and *chrystophersi* are unknown and, hence not placed in the key.

Scutum with paired horse-shoe-shaped pattern ; abdominal terga 6-8 shiny ...	( <i>Odagnia</i> ) <i>adventicium</i>	
6. Scutellum black ; tarsal claw with subbasal tooth ...	<i>chrystophersi</i>	
Scutellum brownish black ; tarsal claw simple ...	<i>barraudi</i>	
( Pupae )		
1. Abdominal terga without any trace of spine-combs ...	...	2
Abdominal tergum 8 invariably with spine-combs (often on terga 6-9 in addition) ...	...	3
2. Respiratory organ with 6 filaments ...	( <i>Himalayum</i> ) <i>indicum</i>	
Respiratory organ with a pair of large inflated basal arms bearing 6 tubes between them ...	( <i>Wilhelmia</i> ) <i>mediterraneum</i>	
3. Respiratory organ with 4 filaments ...	( <i>Eusimulium</i> ) <i>aureum</i>	
Respiratory organ with more than 4 filaments ...	...	4
4. Respiratory organ with 6 filaments ...	( <i>Simulium</i> ) <i>chrystophersi</i>	
Respiratory organ with 8 filaments ...	...	5
5. Abdominal tergum 8 only with spine-combs ; cocoon non-necked and non-fenestrate but with a large lateral aperture ...	( <i>Simulium</i> ) <i>barraudi</i>	
Abdominal terga 7-8 with spine-combs ; cocoon fenestrate anteriorly and especially on neck ...	( <i>Odagnia</i> ) <i>adventicium</i>	

( Larvae )

1. Postgenal cleft much longer than postgenal bridge ...	...	2
Postgenal cleft much shorter than postgenal bridge ...	...	3
2. Head-spots virtually negative ; thoracic and abdominal cuticle with fan-shaped scales ...	( <i>Himalayum</i> ) <i>indicum</i>	
Head-spots distinct ; thoracic and abdominal cuticle bare ...	( <i>Wilhelmia</i> ) <i>mediterraneum</i>	
3. Antenna 4-segmented ; respiratory histoblast with 4 filaments ; ventral papillae large and conical ...	( <i>Eusimulium</i> ) <i>aureum</i>	
Antenna 4-segmented with a secondary annulation ; respiratory histoblast with 8 filaments ; ventral papillae inconspicuous ...	( <i>Odagnia</i> ) <i>adventicium</i>	

SUMMARY

Seven hitherto known and newly recorded species of the Simuliidae (Diptera) from Kashmir are presented, with remarks on distribution. Keys to the species, based on ♂, ♀, pupa and larva, are also appended.

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