

REAPPRAISAL OF SOME INDIAN *CULICOIDES* SPECIES IN THE SUBGENUS *AVARITIA* (DIPTERA: CERATOPOGONIDAE)

A. L. Dyce¹ and W. W. Wirth²

Abstract. Holotypes of 5 of the 9 Indian species of *Culicoides* subgenus *Avaritia* described by Sen & Das Gupta and Das Gupta were re-examined. Study of these and secondary type material in the U.S. National Museum results in the following appraisal: *Culicoides minutus* and *C. pseudo-turgidus* are junior synonyms of *C. imicola*; *C. imperceptus* is a junior synonym of *C. actoni*; *C. superfulvus* is a junior synonym of *C. brevitarsis*; *C. nayabazari* is a junior synonym of *C. orientalis*; *C. dumdumi* and *C. fulvus* are valid species; and *C. autumnalis* and *C. turgidus* are nomina dubiae.

Nine of the 11 *Culicoides* spp. in the subgenus *Avaritia* Fox dealt with by Sen & Das Gupta (1959) and Das Gupta (1962a, 1962b, 1963) were presented as new taxa. Holotypes were stated to be lodged in collections of the Zoological Survey of India, Calcutta and Presidency College, University of Calcutta. Holotypes of 5 and allotypes of 3 of the 9 species were loaned to us for study by Professor S.K. Das Gupta, Presidency College. Holotypes of the other 4 species could not be located. Eighteen slide mounts (9♂, 9♀ labelled A-R by us for individual reference below) representing named series of all relevant species are located, however, in the United States National Museum, Washington, D.C. (USNM) and 3 additional specimens (1♂, 2♀), labelled as paratypes but lacking collection data, are in the British Museum (Natural History), London (BMNH). Analysis of this material in comparison with closely related species distributed elsewhere in the Oriental Region is presented in this paper. Species are discussed in the order of description in the original papers. Passages quoted from the original papers and the specimen labels are shown in quotes.

***Culicoides minutus* Sen & Das Gupta**

1959: 622 (♀ only; figs. thoracic pattern, wing, spermathecae). "Holotype.—Female, DumDum, February 1957. Paratypes.—Three females, DumDum, September 1957."

Specimens examined. Holotype ♀ (red label in handwriting of Das Gupta), "*Culic. minutus* Sen & DG. ♀. Holotype. Coll. DumDum, Lt. tr. February 1957—S.K. Das Gupta." 1♂ (red label in hand of Das Gupta), "*Culic. minutus* Sen & DG ♂. Allotype. [sic] Coll. Chinsurah (W. Bengal). Lt. tr. Decem. 1960." From USNM collection, 1♀ (R) (labels in hand of Das Gupta), "*Culicoides minutus* Sen & Das Gupta ♀. Co-type [sic] status. Hastings (Calcutta), Sticky trap, July, '60. India: Das Gupta." From BMNH collection, 1♂ preserved in alcohol (apparently labelled after received), "Pres. by Sch. Trop. Med. Calcutta. B.M. 1961-213 Paratype [sic]. *C. minutus* ♂"; no other data.

1. CSIRO, Division of Tropical Animal Science*, McMaster Laboratory, Glebe, N.S.W. 2037, Australia. (*Formerly Division of Animal Health.)
2. Systematic Entomology Laboratory, IIBIII, Agric. Res. Serv., USDA, % U.S. National Museum, Washington, D.C. 20560, USA.

Comment. Only the holotype was part of the original type series, since the “allotype” ♂ and the ♀ “co-types” were collected subsequent to publication of the original description and their data differ from the published data. The BMNH specimen, lacking collection data and being ♂, is of doubtful “paratype” status. Now cleared and mounted on a slide, it is quite faded and lacks wings. Bare eyes confirm it is not *C. actoni*, but its poor condition precludes positive identification.

Determination. The holotype ♀ is *Culicoides imicola* Kieffer; “allotype” ♂ and “co-type” *R* are *Culicoides actoni* Smith. We regard *C. minutus* Sen & Das Gupta as a junior synonym of *C. imicola* Kieffer, **new synonymy**.

Culicoides turgidus Sen & Das Gupta

1959: 626 (♂ and ♀; fig. ♀ thoracic pattern, wing, spermathecae, ♂ terminalia). “*Holotype*.—Female, Calcutta, August 1955. *Paratypes*.—Three females and three males, same data as for holotype.”

Specimens examined. Holotype ♀ (red label in hand of Das Gupta), “*Culic. turgidus* Sen & DG. ♀. *Holotype*. Coll. Calcutta, Lt. tr. Aug. 1955.” From USNM collection, 2♂ (*L,M*), 3♀ (*I,J,K*); ♀I (label in hand of Das Gupta and typical of mounting technique employed by him), “*Culicoides turgidus* Sen and Das Gupta. ♀ Co-type [sic] status, Uttarparar (near Calcutta), sticky trap, February '59. India; Das Gupta.” ♀*J,K*, ♂*L,M* (mounted and labelled by Wirth subsequent to publication from alcohol material deposited by Professor Sen in USNM), all labelled “DumDum, India, West Bengal, 1957, P. Sen, *Culicoides turgidus* Sen & Das Gupta.” From BMNH collection, 1♂, 1♀ (each apparently labelled after receipt), “Pres. by Sch. Trop. Med. Calcutta. B.M. 1961–213. *Paratype*; *C. turgidus* ♂” and “*C. turgidus* ♀” (respectively); no other data.

Comment. Only the holotype is considered part of the original type series, since the “co-types” bear data which differ from those published and the “paratypes” bear none at all.

Determination. The holotype ♀ is in fragmentary condition, including folded fragments only of 1 wing. “Co-types” ♂*M*, ♀*I*, and ♀*J* are *Culicoides fulvus* Sen & Das Gupta; ♂*L* is *Culicoides brevitarsis* Kieffer; and ♀*K* is *Culicoides imicola* Kieffer (the characteristic fuscous pattern over vein M2 is obscured by folds in the wing). The BMNH ♂, now cleared and mounted on a slide, lacks wing and antennae; on the basis of the terminalia it is identified as *C. brevitarsis* Kieffer. The BMNH ♀, also mounted, is fragmented and indeterminate. In view of this assemblage of already-named species in the “Co-type” series and the poor condition of the holotype, we place *Culicoides turgidus* Sen & Das Gupta as a **nomen dubium**.

Culicoides dumdumi Sen & Das Gupta

1959: 628 (♂ only; fig. wing and terminalia). “*Holotype*.—Male, DumDum, August 1957. *Paratypes*.—Two males; same data as for holotype.”

Specimen examined. 1♂ (*B*) in USNM (label in hand of Das Gupta), “*Culic. dumdumi* Sen & Das Gupta, ♂. *Paratype* [sic] Status. Baguiati (near Calcutta), light trap, March '58. India: Das Gupta.”

Comment. Dr Das Gupta was unable to locate the holotype specimen.

Determination. Based on the ♂ “paratype” in USNM, *Culicoides dumdumi* Sen & Das Gupta is recognized as a valid species known by us to be more widely distributed elsewhere in SE Asia.

***Culicoides autumnalis* Sen & Das Gupta**

1959: 628 (♂ only; fig. wing and terminalia). "*Holotype*.—Male, DumDum, September, 1957. *Paratypes*.—Two males; same data as for type."

Specimen examined. From USNM collection, 1♂ (*C*) (label in hand of Das Gupta), "*Culic. autumnalis* Sen & Das Gupta ♂. Paratype status. DumDum (near Calcutta) light trap. Sept., '57. India; Das Gupta."

Comment. Dr Das Gupta was unable to locate the holotype specimen. A pale species; specimen mounted with terminalia tilted. Hind margin of 9th tergite bilobate, not "rounded" as described.

Determination. We are unable to positively distinguish this specimen from *Culicoides brevipalpis* Delfinado, 1961, a species widespread in the Oriental Region and extending to northern Australia. We propose retention of *C. brevipalpis* as valid and place *C. autumnalis* Sen & Das Gupta as a **nomen dubium**.

***Culicoides fulvus* Sen & Das Gupta**

1959: 628 (♂ only; figs. wing and terminalia). "*Holotype*.—Male, DumDum, September 1957. *Paratypes*.—Three males; data same as for holotype." Female subsequently described (Das Gupta 1962b) from an undisclosed number of specimens collected at "the same locality"; collection data not given.

Specimens examined. ♀ (red label in hand of Das Gupta), "*Culic. fulvus* Sen & DG. ♀ Allotype [sic]. Coll.—DumDum, Lt. tr., Sept. 1960." From USNM collection, 2♂ (*P, Q*), 1♀ (*O*): ♂*P* (labelled in hand of Das Gupta), "*Culicoides fulvus* Sen & Das Gupta ♂. Co-type [sic] status. Baguiati (near Calcutta), by light trap, May, '57. India: Das Gupta"; ♀*O* (label in hand of Das Gupta), "*Culic. fulvus* Sen & Das Gupta ♀. Co-type [sic] status. DumDum (near Calcutta), sticky trap, Febr. '61. India: Das Gupta"; ♂*Q* (mounted and labelled by Wirth from alcohol material), "DumDum, India, West Bengal. Aug. 1957, P. Sen. *Culicoides fulvus*, Paratype ♂."

Comment. Dr Das Gupta was unable to locate the holotype specimen. While the locality given on slide ♂*P* does not correspond exactly with the published type-locality, DumDum and Baguiati are nearby each other. Comparison of its terminalia with those illustrated by Sen & Das Gupta (1959, fig. 51) leaves us without doubt that this was the specimen from which the illustration was prepared. Whereas the label data on ♂*Q* coincide exactly with the type series data as published, the method of mounting and labelling are those of Wirth. Label data and form indicate that ♀*O* was certainly available for the Das Gupta (1962b) description. Fig. 51 (Sen & Das Gupta 1959) shows unusual asymmetrical enlargements on the terminal sector of both parameres; examination of the slide ♂*P* shows these to consist of droplets of an oily residue adhering to the specimen.

Determination. The 4 specimens are conspecific and *Culicoides fulvus* Sen & Das Gupta stands as a valid species.

***Culicoides pseudoturgidus* Das Gupta**

1962a: 538 (♂ and ♀; fig. ♀ wing, spermathecae, ♂ terminalia). "*Holotype*.—Female in slide, DumDum; July, 1960. *Paratype*.—Many females and males from type locality and Thakurpukur; August, 1960–January, 1961."

Specimens examined. Holotype ♀ (red label in hand of Das Gupta), "*Culic. pseudoturgidus* DG. ♀. Holotype. Coll. DumDum, Lt. tr. July 1960." ♂ (red label in hand of Das Gupta), "*Culic. pseudoturgidus* DG. ♂ Allotype."

DumDum, Lt. tr. July 1960." From USNM collection, 1♂ (*F*), 2♀ (*G,H*), all labelled in hand of Das Gupta: ♂*F*, ♀*H*, "*Culic. pseudoturgidus* Das Gupta. Paratype Status. Thakurpukur (near Calcutta), Oct., '60, stick [sic] trap. India; Das Gupta"; ♀*G*, "*Culicoides pseudoturgidus* Das Gupta, August, '60, DumDum (near Calcutta); stick [sic] trap. Paratype status. India: Das Gupta."

Comment. All 5 specimens are from the type series.

Determination. Holotype ♀, ♀*G*, and ♀*H* are *Culicoides imicola* Kieffer; the "allotype" ♂ and ♂*F* are *C. fulvus* Sen & Das Gupta. We place *Culicoides pseudoturgidus* Das Gupta as a junior synonym of *C. imicola* Kieffer, **new synonymy**.

***Culicoides imperceptus* Das Gupta**

1962a: 538 (♂ only; fig. wing and terminalia). "*Holotype*.—Male in slide, South Calcutta; August, 1959. *Paratype*.—many males in slide, same as type."

Specimens examined. Holotype ♂ (red label in hand of Das Gupta), "*Culic. imperceptus* DG. ♂ Holotype Coll. S. Calcutta Lt. Tr., Aug. 59. S.K. Das Gupta." From USNM collection, 2♂ (*D,E*), both labelled in hand of Das Gupta: ♂*D*, "*Culic. imperceptus* DG ♂ paratype status. Ballygunge Sc. College Campus (Cal.) St. tr. August '59. India: Das Gupta"; ♂*E*, "*Culic. imperceptus* Das Gupta. ♂ paratype status. Ballygunge Science College Campus Calcutta); Sticky trap, August '59. India: Das Gupta."

Determination. Holotype ♂ and ♂*E* are *Culicoides actoni* Smith; ♂*D* is *C. brevitarsis* Kieffer. We place *C. imperceptus* Das Gupta as a junior synonym of *C. actoni* Smith, **new synonymy**.

***Culicoides superfulvus* Das Gupta**

1962b: 253 (♀ only; fig. palpus, mandible, wing, tibial comb, and spermathecae). "*Holotype*.—Female mounted on slide, Baguiati, near DumDum, suburb of Calcutta, sticky trap, August, 1960. *Paratypes*.—Eight females, data as type."

Specimen examined. ♀ (*N*) in USNM (label in hand of Das Gupta), "*Culic. superfulvus* Das Gupta, ♀. Co-type [sic] Status, Baguiati (near Calcutta). by sticky trap, August, '60. India: Das Gupta."

Comment. Dr Das Gupta was unable to locate the holotype specimen.

Determination. The holotype ♀ is apparently lost. The only available specimen from the original type series is *C. brevitarsis* Kieffer, under which we sink *Culicoides superfulvus* Das Gupta as a junior synonym, **new synonymy**.

***Culicoides nayabazari* Das Gupta**

1963: 35 (♀ only; fig. inner eye margins, terminal antennal segment, palpus, mandibular teeth, wing, spermathecae). "*Holotype*.—Female in slide, Nayabazar (West Sikkim), September, 1960; *Paratypes*.—Two females and six males; same data as type."

Specimens examined. Holotype ♀ (red label in hand of Das Gupta), "*Culic. nayabazari* DG. ♀. Holotype. Coll. Nayabazar (W. Sikkim). Lt. tr. Sept. 1960." From USNM collection, 1♀ (*A*) (label in hand of Das Gupta), "*Culic. nayabazari* Das Gupta ♀. Nayabazar (W. Sikkim), Light trap, September, '60. India; Das Gupta."

Determination. We identify both females as *Culicoides orientalis* Macfie, under which we sink *Culicoides nayabazari* Das Gupta as a junior synonym, **new synonymy**.

DISCUSSION

Apart from the above 9 *Avaritia* species, Sen & Das Gupta (1959) and Das Gupta (1962b) dealt with *Culicoides actoni* Smith and *C. orientalis* Macfie, which also belong in this subgenus. The first authors apparently did not recognize *C. actoni* in their collection, and Dyce (1980) has already pointed out that their figure of male terminalia identified as *C. orientalis* is of *C. brevitarsis*. Figures presented for *C. orientalis* by Das Gupta (1962b) seem to be authentic.

The above series of determinations extend the known distribution of *C. brevitarsis* and *C. imicola* to India and draw attention to the need for confirming the occurrence there of *C. brevipalpis*. *C. fulvus* is widely distributed in the Oriental Region and extends into Australasia where for some years it has been generally known as *Culicoides (Avaritia)* sp. No. 5. Its wing was mistakenly figured (Delfinado 1961) for *Culicoides radicitus* Delfinado, a species subsequently sunk in synonymy under *C. brevitarsis* by Dyce (1979).

LITERATURE CITED

- Das Gupta, S.K.** 1962a. Some *Culicoides* of Calcutta and the neighbouring areas. *Sci. Cult.* **28**: 537-39.
1962b. *Culicoides* (Dipt., Ceratopogonidae) from suburbs of Calcutta. *Entomol. Mon. Mag.* **98**: 253-54.
1963. Report on a collection of Sikkim *Culicoides* (Diptera: Ceratopogonidae). *Proc. Zool. Soc. (Calcutta)* **16**: 33-43.
- Delfinado, Mercedes D.** 1961. The Philippine biting midges of the genus *Culicoides* (Diptera: Ceratopogonidae). *Fieldiana, Zool.* **33**: 629-75.
- Dyce, A.L.** 1979. *Culicoides radicitus* Delfinado; a synonym of *Culicoides brevitarsis* Kieffer (Diptera: Ceratopogonidae). *J. Aust. Entomol. Soc.* **18**: 52.
1980. Redescription of *Culicoides orientalis* (Diptera: Ceratopogonidae). *Pac. Insects* **21**: 286-92.
- Sen, P. & S.K. Das Gupta.** 1959. Studies on Indian *Culicoides* (Ceratopogonidae: Diptera). *Ann. Entomol. Soc. Am.* **52**: 617-30.