

Notes on nomenclature, taxonomy and phylogeny of the genus *Chrysotoxum* Meigen (Diptera—Syrphidae) in the Oriental region.¹

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Abstract. Some notes on the nomenclature, taxonomy and phylogeny of Oriental *Chrysotoxum* Meigen are included and one species name is here corrected to *baphyrum* nom. emend. (justified emendation), from the original ‘*baphyrus*,’ in keeping with the gender of the genus name and as per recommendations of the ICZN Code. New synonyms of *C. antiquum* Walker, 1852, *C. baphyrum* Walker, 1849, and *C. intermedium* Meigen, 1822, are also proposed here, and a few others confirmed.

This short paper is a happening from another note on a new aphid prey record by Ghorpadé et al. (in prep.) of *Chrysotoxum baphyrum* Walker, recently discovered in peninsular India. These notes on the nomenclature, taxonomy and phylogeny of *Chrysotoxum* Meigen appear necessary to supplement data given in that paper. *Chrysotoxum* is neuter in gender (see ICZN, 1999: Articles 30-34), but Francis Walker (who was a fast and unreliable worker, in those days of multiple species descriptions, which were paid for!) spelled his new species from north Bengal (India) as “*baphyrus*” in 1849 in his “List of Diptera in the British Museum” (3: 542). Though almost all succeeding authors have copied this name, I here emend it to *baphyrum* (justified emendation) in keeping with the gender of the genus name which ends in *-um* (= neuter, vide ICZN Article 31.2) and has many of its species names also ending in *-um*, these in gender conformity. Note also that the Dolichopodidae genus *Chrysosoma* Guérin-Méneville, of neuter gender, has a species spelled *continuum* Curran, 1927 (Dyte & Smith, 1980: 444-445). And incidentally, when I was a postdoctoral fellow at the Smithsonian Institution in 1982-83, I had consulted the now late Dr George Steyskal, expert in names and on scientific nomenclature, about this question and he had agreed that *baphyrum* was the correct species name ending in the genus *Chrysotoxum*.

Enrico Brunetti (1923: 295-303) had placed *Chrysotoxum* in the subfamily Chrysotoxinae and treated seven species from the Indian subcontinent. Ghorpadé (1982: 164) had formally transferred *Chrysotoxum* Meigen from the Tribe Chrysotoxini to the Syrphini, as was suggested by Vockeroth (1969: 12, vide infra). In that paper Ghorpadé had also corrected the original name of the only Afrotropical *Chrysotoxum* species [most probably misprinted, as “*continum*” Bezzi, sp. nov. (Bezzi, 1915: 118) and, incorrectly used subsequently by Curran (1938: 1), Smith & Vockeroth, 1980: 495), and Whittington (2003: 590)], to the correct *C. continuum*, since I had noted then (op. cit.) that this was “evident by the correct spelling printed in the “List of the known Ethiopian Syrphidae” (Bezzi, 1915: 5) at the beginning of the same work.”

Nine species were recorded from the Indian subcontinent (see Ghorpadé, 1994) and one more, *caucasicum* Sack, 1930 added later (vide infra). *C. baphyrum* (as “*baphyrus*”) was reported from all over India, Sri Lanka, Burma and Nepal. Ghorpadé (unpubl. data) recognizes 10 Indian subregion species, also including *C. caucasicum* Sack, 1930 from Afghanistan and *C. intermedium* Meigen, 1822 from Pakistan. Incidentally, Brunetti (1923: 300) had also listed *C. festivum* (Linnaeus), on the basis of one record of a female from “Bishopabad (Bihar).” But this is a Palaearctic species and needed to be confirmed. I studied this specimen in London (BMNH) labeled “Bishopabad [*sic!*]; Bihar Comitatus [= [by] courtesy ?], 19.v.1911” and “Coll by Hon. R.C. Rothschild., 1919-288,” and found this misidentified for what actually is an *arcuatum* (Linnaeus). The only other two species of *Chrysotoxum* from extra-Indian (Sino-Malayan) Oriental areas are *C. formosanum* Shiraki, 1930 and *C. testaceum* Sack, 1913, both recorded from Taiwan (see Knutson et al., 1975: 326-327). For a checklist now in preparation by Ghorpadé & Huo, some 37 species have been listed so far from China (inclusive of Palaearctic species also) recorded by Li & He (1992, 1994), Cheng et al. (1998), Huo & Zheng (2004), Huo et al. (2006, 2007), and Zhang et al. (2010).

¹This paper is dedicated to Enrico Brunetti (1862-1927) in the year of his 150th birth anniversary, and as a posthumous tribute to J. R. Vockeroth (1928-2012) who passed away on 16 November 2012.

By examining types, I am here proposing the following new synonyms : *C. baphyrum* Walker, 1849 [= *C. testaceum* Sack, 1913, *fasciatus* Kohli, Kapoor & Gupta, 1988.], *C. antiquum* Walker, 1852 [= *C. violaceum* Brunetti, 1923], and *C. intermedium* Meigen, 1822 [= *C. fuscomarginatum* Brunetti, 1923, *ladakense* Shannon, 1926.], and confirming some others.

Kohli et al. (1988: 115, figs 8-9) described *fasciatus* from a single female specimen taken in the Panjab University campus in Chandigarh. This holotype ♀ was deposited in the National Pusa Collection (NPC) in the IARI, New Delhi and was examined by me recently. It is a highly teneral female, with one wing on a slide, and collected on 27.x.1983 (no collector name given), and conspecific with *baphyrum* Walker. *C. baphyrum* is extremely variable in markings on the face, and in relative lengths of antennal segments, the opaque yellow scutellar patches, black markings on terga 2 to 5, posterior anepisternum (which may also be yellow in some specimens), black sternal fasciae (especially on sternum 4), facial black vitta, infuscation on wing, etc. The extreme bases of first and second basal cells may be narrowly bare, and the barett and anterior anepisternum may be black in some specimens. Examination of a homotype (determined by Richard Vockeroth), along with a male from Takao (Taiwan) collected by Hans Sauter and identified as *testaceum* Sack by P. Sack, showed this to be a new synonym of *baphyrum* Walker. Brunetti (1923: 296) indicated *indicum* Walker, 1852 ('East Indies'), *sexfasciatum* Brunetti, 1907 (Bijnor Dt, Uttarakhand), and *citronellum* Brunetti, 1908 (Sri Lanka) as synonyms of *baphyrum* Walker, this repeated by Knutson et al. (1975: 326-327), and my examination of types of these three species in the NHM (London) and ZSI (Calcutta) confirms this. Knutson et al. (1975: 327) also gave *mundulum* Hervé-Bazin, 1923 as another synonym of *baphyrum*, which needs confirmation through study of the type in MNHN (Paris). The type of *atratum* de Meijere, 1921 (Sumatra) was not traceable (not in ZMA, Amsterdam) but could also be another *baphyrum* synonym ?

I have examined the holotype ♂ of *antiquum* Walker, 1852 ("India") in the NHM, London, and the holotype ♂ of *violaceum* Brunetti, 1923 (Sureil, 5000ft, Darjiling Dt); they are conspecific. Specimens of the latter species, with entire black abdomen showing violet reflections are curiously taken only from the the Darjiling Himalaya, but I have seen another specimen collected at Mussoorie on the Western Himalaya. In CNC, Ottawa there is a paratype ♀ of *antiquum* collected from Sureil, Darjeeling Dt., 5000 ft. I found that the NPC collection (IARI, New Delhi) has two ♀ 'cotypes' from Sureil, Mangpu [= Mungphu], Darjiling dist., 5000 ft, which are "duplicates" originating from the Indian Museum (ZSI, Calcutta).

Determined specimens of *C. intermedium* Meigen, 1822 in the NHM (London) and USNM (Washington, DC) have been compared by me with the holotypes of *ladakense* Shannon, 1926 (Rupshu Ladak) and *fuscomarginatum* Brunetti, 1923 (Chitral) in the USNM, Washington, DC and NHM, London and found to be synonymous. *C. intermedium* is widespread in Europe, northern Africa, through to Iran, Afghanistan (Peck, 1988: 60) and now to Pakistan and NW. India through these synonyms.

The holotype of *quadrifasciatum* Brunetti, 1923 (Khasi Hills) in the NHM (London) and that of *rotundatum* Hervé-Bazin, 1920 (Ban Daban, Laos), in MNHN (Paris) were examined and found to be conspecific, confirming the synonymy in Knutson et al. (1975: 327).

My own experience with *Chrysotoxum* in India has been that species are generally uncommon except *C. baphyrum* which is peregrine here and flies close to the ground, hovering around 1-2 m high from the ground. In May 2011 last year I found a superabundance of this species at Clovelly Estate near Kunjappanai (1,013m) on the Nilgiri Hills, flying and hovering close to the ground in an 'organic' interplanted tea estate with forest all around. No mating or egg-laying behaviour was noticed though.

The genus *Chrysotoxum* Meigen, with its peculiar morphology and habitus, has always been enigmatic with respect to its phylogenetic placement in the family Syrphidae. Thompson & Rotheray (1998) separated it early in their key to Palaearctic species and noted that 71 species were so far known and "widespread" in this region. Mengual et al. (2008: 12) in an impressive study of Syrphidae phylogeny, presented a parsimonious cladistic tree, and concluded that "*Chrysotoxum* was resolved as part of Syrphini s.s." Its closest related genus on the tree was *Epistrophe* Walker, and more distantly *Xanthogramma* Schiner and *Epistrophella* Dušek & Láška, which were broadly clustered along with *Didea* Macquart, *Megasyrphus* Dušek & Láška, *Dideoides* Brunetti, *Eriozona* Schiner and *Dideoopsis* Matsumura, in the Tribe Syrphini.

My suggested genus-groups of Syrphini (Ghorpadé, 2007: 16) had *Xanthogramma* and *Dideoides* placed in the *Chrysotoxum*-group (*Syrphus*-Section) that I had proposed, which also included *Dasysyrphus* Enderlein, *Doros* Meigen and *Notosyrphus* Vockeroth (vide supra). The consensus tree of Ståhls et al. (2003: 449) confirms my basic division of the Tribe Syrphini

into a *Syrphus*—Section and a *Sphaerophoria*—Section, q.v., and they treated *Chrysotoxum* near *Syrphus*, q.v. Rotheray & Gilbert's (1999: 12) consensus tree, based on larval characters, was unspecific about the relationships of *Chrysotoxum*, broadly clustering this genus with *Dasysyrphus*, *Epistrophe*, *Eriozona*, *Leucozonia*, and *Paragus*. Again, Rotheray & Gilbert's (1989: 47) consensus tree placed *Chrysotoxum* as an 'out group' basal to (*Dasysyrphus* (*Didea*—*Megasyrphus*) *Eriozona* (*Eupeodes*—*Scaeva*)). Ultimately, Shatalkin's (1975) analysis, which Mengual et al. (2008) found most congruent with theirs, had placed *Chrysotoxum*, "an aberrant genus," in a separate subtribe of Syrphini—the Chrysotoxina. In the same way, Shatalkin separated *Xanthogramma* and *Doros* in a tribe Xanthogrammini, whose position within the Syrphinae was termed uncertain.

Vockeroth (1969: 12) in a landmark world generic revision of the tribe Syrphini wrote: "The tribe Chrysotoxini contains a single genus of large, brightly coloured, wasp-like species . . . superficially rather distinct from the Syrphini [but] . . . the male terminalia are extremely similar to those of *Syrphus* and of *Epistrophe*, and inclusion of *Chrysotoxum* in the Syrphini may eventually be necessary."

Besides Mengual et al. (2008), the taxonomic history of Syrphinae, spanning a century from Rondani to Hull, was given by Goffe (1952) who treated *Chrysotoxum* in a supertribe Syrpharia, tribe Chrysotoxini, subtribe Chrysotoxina, with *Xanthogramma*, *Doros* and *Didea* (cf vide supra).

Finally, Violovitsh (1974) wrote a detailed review of the Palaearctic species of *Chrysotoxum*, presenting a detailed diagnostic key to 53 of the 59 then known Palaearctic species from Europe and northern Asia. The Oriental—Papuan Region has the next most numerous species of *Chrysotoxum* (18+), followed by the Nearctic (7), and a single Afrotropical one (op. cit.).

Acknowledgements

I am grateful to Drs Ximo Mengual (Bonn, Germany) and Graham Rotheray (Edinburgh, Scotland) for comments on a ms draft of this paper. I am also thankful to Dr R.R. Patil, Professor and Head, Department of Agricultural Entomology, University of Agricultural Sciences, Dharwar, India for bringing to my notice, for identification, the specimen of *C. baphyrum* reared from a sugarcane root aphid in northern Karnataka, which resulted in this paper on Oriental *Chrysotoxum* species. I am also much obliged to Dr V.V. Ramamurthy, National Coordinator of the ICAR Network Project on Insect Biosystematics, Division of Entomology, Indian Agricultural Research Institute, New Delhi, for help and permission to study their Syrphidae collection and types.

This paper is dedicated to Enrico Brunetti, whose published work on Indian Syrphidae, culminating in the FAUNA OF BRITISH INDIA volume published in 1923, was the foundation for my own researches on this family, and is also my honored tribute to J. Richard Vockeroth whose landmark generic revision of the Syrphini in 1969 and his later guidance and support through correspondence, and personal meetings in Ottawa (Canada) in 1983, helped elevate the quality of my taxonomic work on our Syrphidae (see also Ghorpadé, 1994: 14).

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