



A study of the genus *Chalybion* Dahlbom, 1843 (Hymenoptera, Sphecidae) in India

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ABSTRACT. Species of the genus *Chalybion* Dahlbom, 1843 from India are studied. The species *C. gracile* Hensen, 1988 is recorded for the first time from India. The reported distributions of *C. bengalense* Dahlbom, 1845 within various states of India are augmented here. A modified key to the species of *Chalybion* from India is provided. Diagnosis, figures, and table showing comparison of newly recorded species, i.e., *C. gracile* with the widely distributed *C. bengalense* is provided. Diagnostic morphological characters of both *C. gracile* and *C. bengalense* are illustrated here.

Key words: blue mud dauber, new record, India, key, morphology

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INTRODUCTION

Blue mud dauber wasps of the genus *Chalybion* Dahlbom (Hymenoptera: Sphecidae) are cosmopolitan in distribution with 51 species worldwide (Pulawski, 2022). Members of this genus normally nest in pre-existing cavities or reuse vacated nests of other wasps such as *Sceliphron* and *Trypoxylon* (Bohart and Menke, 1976). The wasp cleans the nest cell and provisions it with paralyzed spider prey as food for developing larvae (Landes et al., 1987; Pham, 2020). *Chalybion* species hunt for various spiders with the preference to the families Araneidae and Theridiidae (Fateryga et al., 2020). To date, 16 species of *Chalybion* are reported from the Oriental region. Although common in collection, very few species of *Chalybion* are encountered in India with only three described species: *C. bengalense* (Dahlbom), *C. spinolae* (Lepelletier), and *C. malignum* (Kohl). Among them, *C. bengalense* is the most common species. Here we add a fourth species *C. gracile* Hensen, 1988 to the list of Indian *Chalybion*. The present study shed in to light that it is necessary to carefully examine even common species like *C. bengalense* because rare cryptic species may also hide among them.

MATERIAL AND METHODS

The *Chalybion* specimens studied here belong to the Western Ghat Regional Centre, Zoological Survey of India, Kozhikode (ZSIK), along with fresh specimens collected from various localities in India. The

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specimens mounted on entomological pins were studied under a LEICA® M205 stereoscopic binocular microscope and images were captured using the attached LEICA® DFC 500 camera. Habitus images of the species were captured with a digital camera (Canon® Power Shot SX540bHS). Measurements were obtained using Leica® LAS (Leica Application Suite V3.8.0) microsystems by Leica® (Heerburg, Switzerland). Images at varying depths were stacked using Leica Automontage Software V3.8.0 and the final illustrations were processed for contrast and brightness using Adobe® Photoshop CS5 (Version 6.1) software. Freshly collected specimens after curation are added to the National Zoological Collections of ZSIK. The morphological terminology used in this paper mostly follows Bohart and Menke (1976). The differences between *C. bengalense* and *C. gracile* are presented in Table 1.

Museum abbreviations used in the text: **BMNH** – The Natural History Museum, formerly British Museum (Natural History), London, England; **USNM** – National Museum of Natural History, Washington, D.C., U.S.A; **ZMUC** – Zoological Museum, University of Copenhagen, Denmark.

RESULTS

Taxonomic hierarchy

Class Insecta Linnaeus, 1758

Order Hymenoptera Linnaeus, 1758

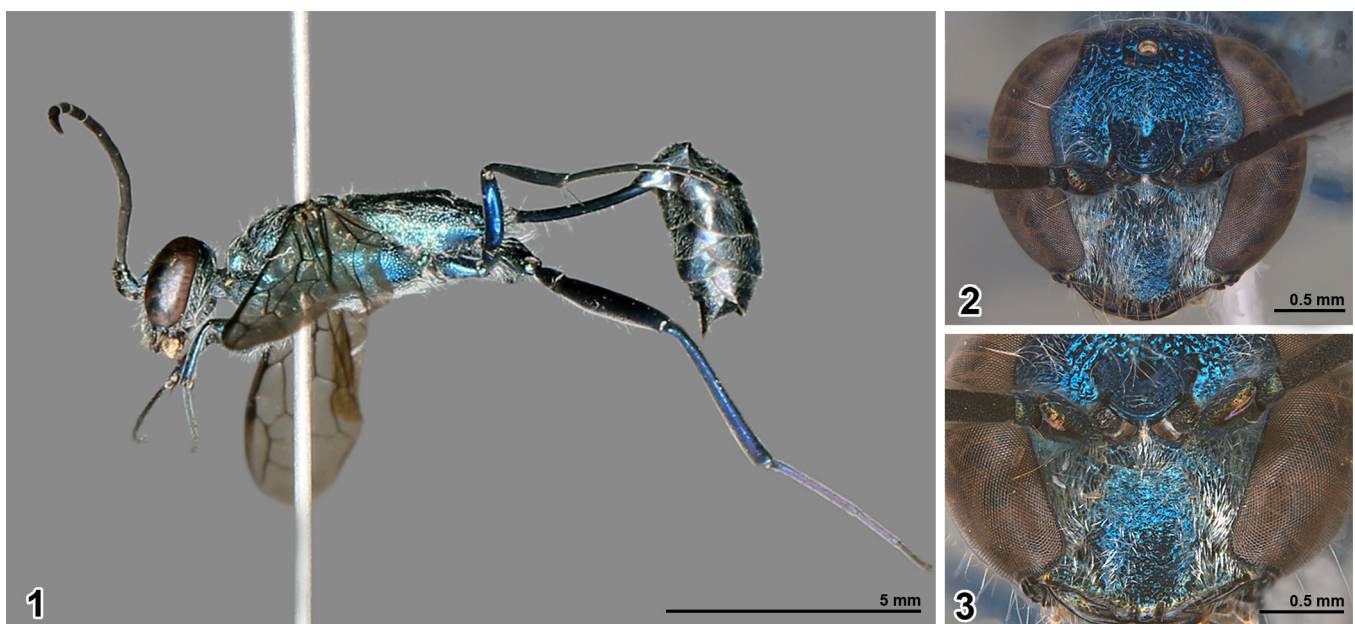
Family Sphecidae (Latreille, 1802)

Genus *Chalybion* Dahlbom, 1843

***Chalybion gracile* Hensen, 1988 (Figs 1-9)**

Chalybion gracile Hensen, 1998:28, ♀. Holotype: ♀, Sri Lanka: Ratnapura District: Sinharaja Forest (USNM).

Diagnosis. Female. Frons strongly rugose reticulate (Fig. 2); clypeus with three teeth (Fig. 3); supra-antennal plate strongly protruding and ventrally delimited by carina which runs along and between antennal sockets, ventral margin forms about quarter of a circle (Figs 2 & 3); pronotal collar medially indented with distinct punctures; mesoscutum transversely strigose with shallow punctuation between striae; scutellum and metanotum with distinct punctures; propodeum transversely strigose, posterior part of propodeum with well differentiated median furrow (Fig. 4); mesepisternum with distinct punctures (Fig. 5);

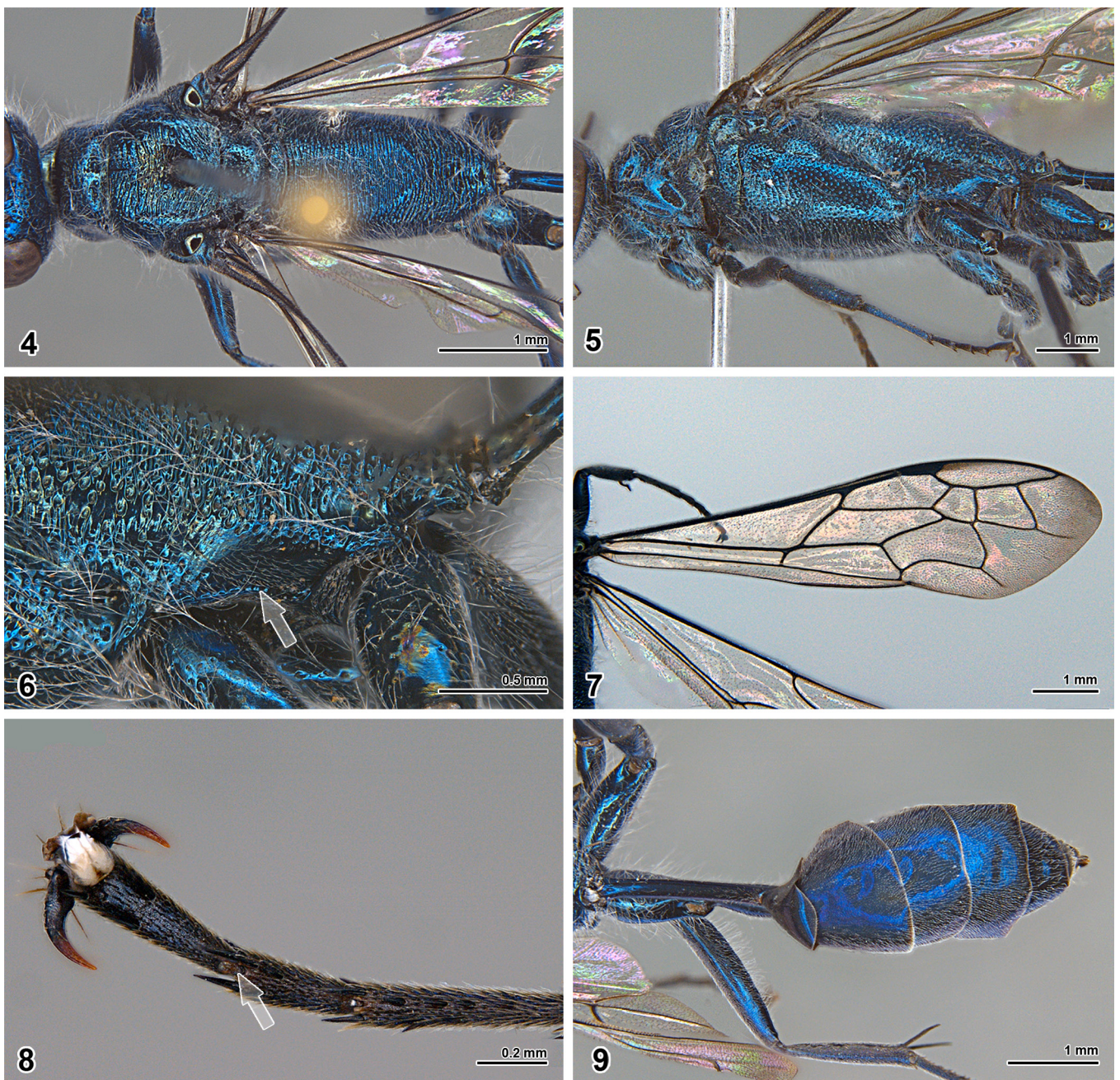


Figures 1-3. *Chalybion gracile* Hensen, 1988, ♀. **1.** Habitus, lateral view; **2.** Head, frontal view; **3.** Clypeus.

first metasomal tergite slender, pubescence of metasoma silvery white (Fig. 9); cellular wing area clearly hyaline (Fig. 7).

Material examined. INDIA: Karnataka, Udupi, Golihole, 1 ♀, 17.vi.2022, Coll. V.D. Hegde & Party, ZSIK Regd. No. ZSI/WGRC/I.R.-INV. 21313. Kerala, Idukki district, Kulamavu, 1♀, November 2019, Coll. Tessa Rajan, ZSIK Regd. No. ZSI/WGRC/I.R.-INV. 18066; Wayanad district, Ponkuzhi, 1♀, 7.ii.2021, Coll. K.A. Subramanian & party, ZSIK Regd. No. ZSI/WGRC/I.R.-INV. 18067; Palakkad district, Silent Valley, 1♀, 12.iii.2021, Coll. S. Anagha, ZSIK Regd. No. ZSI/WGRC/I.R.-INV. 18175.

Distribution in India (new record). Karnataka, Kerala. *Elsewhere:* Sri Lanka (Pulawski, 2022).



Figures 4–9. *Chalybion gracile* Hensen, 1988, ♀. **4.** Mesosoma, dorsal view; **5.** Mesosoma, lateral view; **6.** Metapleuron (arrow mark shows carina); **7.** Fore wing; **8.** Hind tarsi (arrow mark shows plantula); **9.** Metasoma, dorsal view.

***Chalybion bengalense* (Dahlbom, 1845)** (Figs 10–19)

Sphex violaceus Fabricius, 1775:346, ♀, ♂ (as *violacea*, incorrect original termination), junior primary homonym of *Sphex violaceus* Scopoli, 1763. Lectotype: ♀, South Africa: Cape of Good Hope (ZMUC).

Pelopoeus bengalensis Dahlbom, 1845:433, ♀, ♂. Holotype or syntypes: India: Bengal: no specific locality (Lund).

Chalybion bengalense: F. Smith, 1871:360 (new combination, in catalog of Oriental Aculeata).

Pelopoeus convexus F. Smith, 1876:449, ♂. Syntypes: ♂, Mascarenes: Island of Rodriguez (BMNH).

Diagnosis. Female (Figs. 10–17). Frons punctate to punctate reticulate (Fig. 11); clypeus with five teeth (Fig. 12); supra-antennal plate not strongly protruding (Fig. 11); pronotal collar, mesoscutum, scutellum, and metanotum distinctly punctate; propodeum transversely strigose with shallow punctures, punctate to rugose punctate laterally (Fig. 13); mesepisternum densely coarsely punctate to rugose-punctate (Fig. 14); first metasomal tergite slender, with white pubescence (Fig. 16); cellular wing area subhyaline with a brownish tinge (Fig. 15). **Male** (Figs. 18–19). Resembles female in most aspects except clypeus with three teeth (Fig. 19).

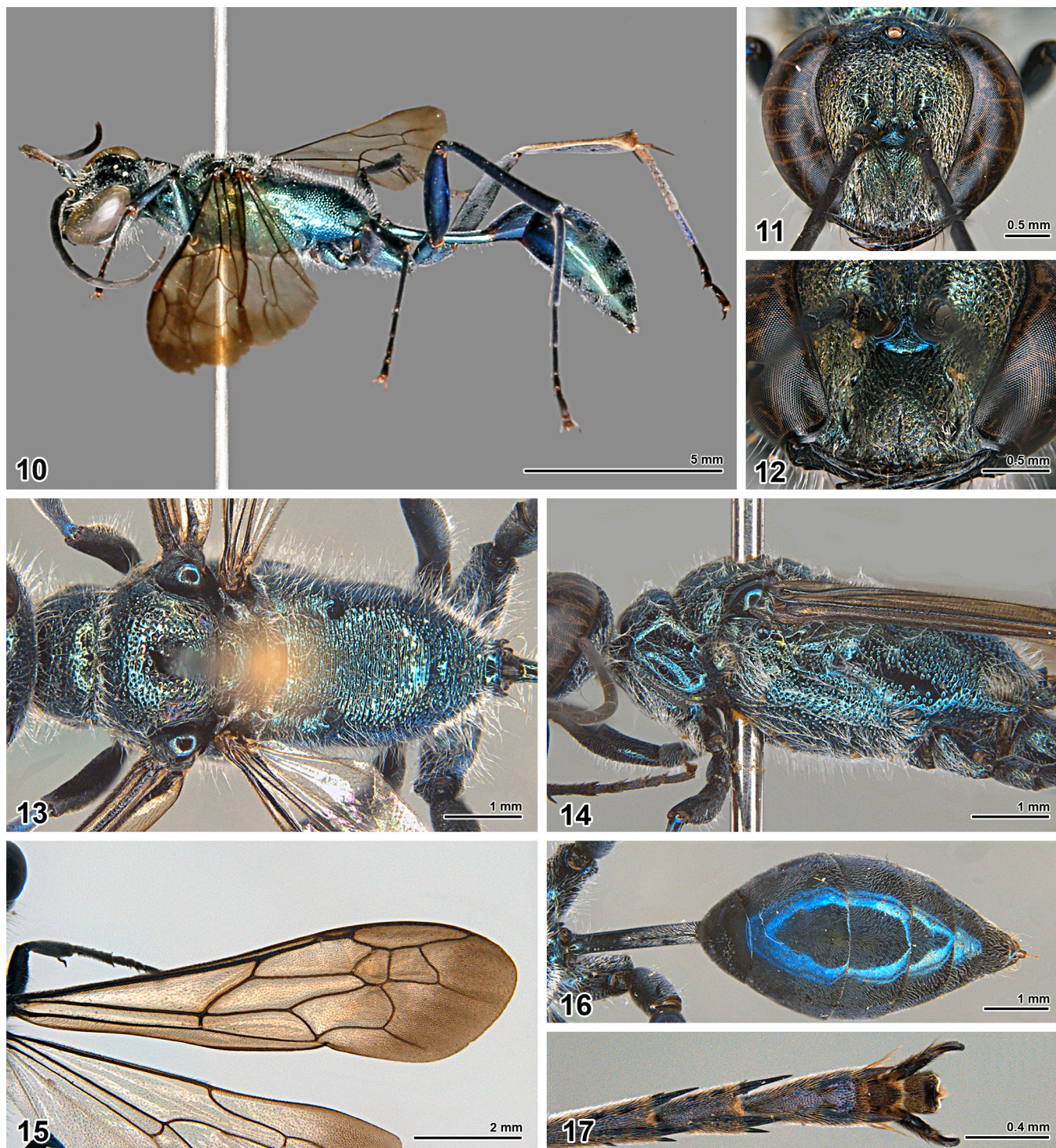
Material examined. INDIA: **Andaman and Nicobar Island**, South Andaman district, Port Blair, 1♂ & 1♀, 7.iv.2021 & 16.v.2021, Coll. A.K. Dubey, ZSIK Regd. Nos. ZSI/WGRC/I.R.-INV. 17976 & 17977. **Karnataka**, Kodagu district, Thondoor, 1♂, 22.xii.2019, Coll. P. Girish Kumar, ZSIK Regd. No. ZSI/WGRC/I.R.-INV. 18049; Kodagu district, Bettathur near Madikeri, 1♀ & 3♂♂, 24.xii.2019, Coll. P. Girish Kumar, ZSIK Regd. Nos. ZSI/WGRC/I.R.-INV. 18050–18053. **Kerala**, Kozhikode district; Kottooli wetland, 2♀♀, 20.vi.2017, Coll. P. Girish Kumar, ZSIK Regd. Nos. ZSI/WGRC/I.R.-INV. 10004–10005; Kannur district, Madayipara, 1♀, 2.xii.2018, Coll. Sandra, ZSIK Regd. No. ZSI/WGRC/I.R.-INV. 12842; Thiruvananthapuram district, Agasthyamalai, Neyyar WLS, 5♀♀ & 3♂♂, 16.i.2019, Coll. P. Girish Kumar, ZSIK Regd. Nos. ZSI/WGRC/I.R.-INV. 16881–16888; Idukki district, Chinnar, Koottaram, 1♂, 28.xi.2018, Coll. S. Anagha, ZSIK Regd. No. ZSI/WGRC/I.R.-INV. 17112. **Tamil Nadu**, Tirunelveli district, Rosemiyapuram, 6♂, 25.ix.2018 & 27.ix.2018, Coll. P. Girish Kumar, ZSIK Regd. Nos. ZSI/WGRC/I.R.-INV. 16855–16857 & 16858–16860; Kanyakumari district, Kanyakumari WLS, Alagiyapandipuram range, Kalikesham, 4♂♂, 16.ii.2020, Coll. Souvik Sen & party, ZSIK Regd. Nos. ZSI/WGRC/I.R.-INV. 16889–16892; Kanyakumari district, Kanyakumari WLS, Kulashekaram range, 2♀♀, 19.ii.2020, Coll. Souvik Sen & party, ZSIK Regd. Nos. ZSI/WGRC/I.R.-INV. 16893–16894. **Uttarakhand**, Dehradun district, WII Campus, 3♀♀ & 1♂, 10–13.viii.2017, Coll. P. Girish Kumar, ZSIK Regd. Nos. ZSI/WGRC/I.R.-INV. 17251–17254; Dehradun district, Kalsi, 4♀♀ & 11♂♂, 18.vii.2019, Coll. P. Girish Kumar, ZSIK Regd. Nos. ZSI/WGRC/I.R.-INV. 18032–18046. **Madhya Pradesh**, Mandla district, Kanha National Park, 1♀, 18.vi.2019, Coll. David Raju, ZSIK Regd. No. ZSI/WGRC/I.R.-INV. 18030. **West Bengal**, S-24 Parganas, Sunderban, Sagar island, 2♀♀ & 2♂♂, 17.iii.2018 and 25.iii.2018, Coll. Sunita Patra, ZSIK Regd. Nos. ZSI/WGRC/I.R.-INV. 18058 and 18059–18061.

Distribution in India. Andaman and Nicobar Island, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Odisha, Punjab, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, West Bengal. **Elsewhere:** Australia; Bangladesh; Chagos Archipelago; China (including

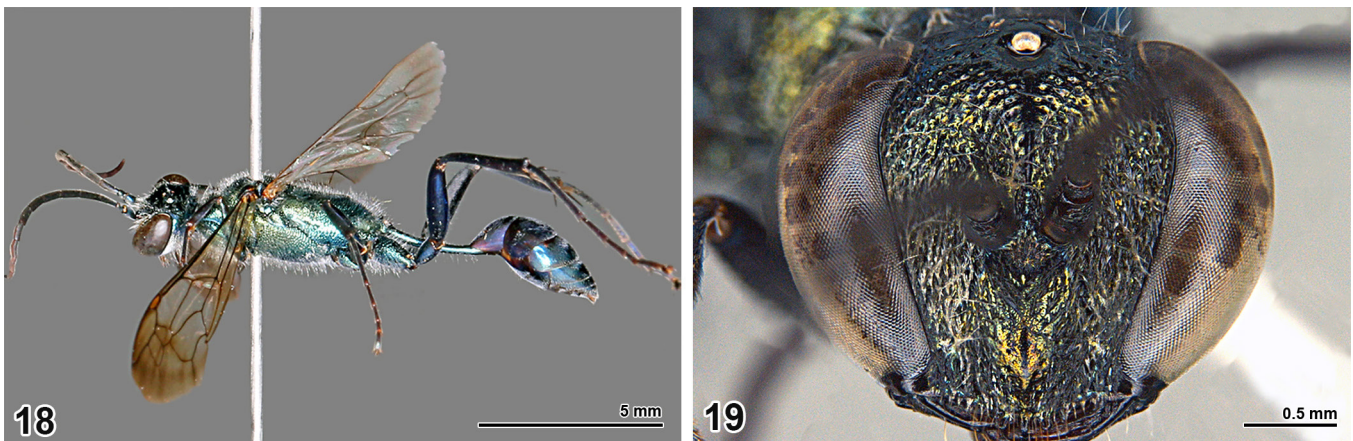
Table 1. *Chalybion bengalense* (Dahlbom) vs. *Chalybion gracile* Hensen (Based on Females).

Characters	<i>Chalybion bengalense</i> (Dahlbom)	<i>Chalybion gracile</i> Hensen
Tarsi of legs	Without plantulae	With plantulae
Metapleuron	Acarinate	With angular carina above midcoxa
Supra-antennal plate	Not protruding, ventrally without carina	Strongly protruding, ventrally delimited by carina
Dentition at clypeal margin	Five teeth	Three teeth
Mesoscutum	Distinctly punctate	Transversely strigose
Cellular area of fore wing	subhyaline with brownish tinge	Clearly hyaline

Hong Kong); Egypt; Eritrea; Ethiopia; French Polynesia; Gilbert Island; Greece; Guam Island; Hawaiian island; Indonesia; Iraq; Italy; Japan; Kenya; Laos; Madagascar; Malaysia; Maldives; Mascarenes; Mauritius; Micronesia; Mozambique; Myanmar; Nepal; New Caledonia; Philippines; Phoenix island; Seychelles islands; Singapore; South Africa; Sri Lanka; Taiwan; Tanzania; Thailand; Vietnam; Yemen (Anagha & Girish Kumar, 2020; Pulawski, 2022).



Figures 10–17. *Chalybion bengalense* (Dahlbom, 1845), ♀. **10.** Habitus, lateral view; **11.** Head, frontal view; **12.** Clypeus; **13.** Mesosoma, dorsal view; **14.** Mesosoma, lateral view; **15.** Fore wing; **16.** Metasoma, dorsal view; **17.** Hind tarsi.



Figures 18–19. *Chalybion bengalense* (Dahlbom, 1845), ♂. **18.** Habitus, lateral view; **19.** Head, frontal view.

Key to Indian species of genus *Chalybion* Dahlbom (modified from Hensen, 1988)

- 1 Ventral margin of clypeus with broadly projecting median lobe, which may be weakly emarginate medially in female or bi or trilobate in male (see Fig. 2 of Hensen, 1988); petiole and legs with partly yellow markings; tarsi without plantulae. *spinolae* (Lepelletier)
- Ventral margin of clypeus with three or five teeth or lobes; petiole and legs without yellow markings; tarsi with or without plantulae. **2**
- 2 Tarsi with plantulae (Fig. 8); metapleuron with carina, which run along outer side of midcoxa and bend sharply outwards posteriorly, to end above base of hind coxa (Fig. 6). *gracile* Hensen
- Tarsi without plantulae (Fig. 17); metapleuron without angular carina. **3**
- 3 Clypeus with five teeth, the median three close together, more or less fused, lateral teeth sharp and rather distant from others; sixth sternite of female flat and wide, apically broadly truncate. *malignum* (Kohl)
- Clypeus with three or five teeth, in latter lateral teeth not sharply pointed and not distant from median three (Fig. 12); sixth sternite of female not markedly wide, apically rounded. *bengalense* (Dahlbom)

DISCUSSION

With the new record of *C. gracile*, the Indian Sceliphroninae is having 16 species under 2 genera. After the present study, out of 16 species of *Chalybion* reported from the Oriental region, only four species are known to occur in India. Since India is a tropical country with vast biodiversity, there is a chance to get more species of *Chalybion*. So, further intensive and extensive surveys are needed especially on those areas such as north-east and western India which are comparatively less explored. Distribution of newly recorded species *C. gracile* is very limited and so far recorded only from Sri Lanka and southern India. The Western Ghats of southwestern India and the highlands of southwestern Sri Lanka are similar in their geology, climate and evolutionary history. Hence, *C. gracile* may be an endemic species to Sri Lanka – Western Ghats hotspot. Instead, *C. bengalense* is a widely distributed species.

AUTHOR'S CONTRIBUTION

The authors confirm their contribution in the paper as follows: S. Anagha & P. Girish Kumar: designed methodology; S. Anagha: wrote the manuscript with support from P. Girish Kumar & V.D. Hegde. All authors discussed the results and contributed to the final manuscript. All authors read and approved the final version of the manuscript.

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AVAILABILITY OF DATA AND MATERIAL

Not applicable.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this paper.

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بررسی گونه‌های جنس *Chalybion* Dahlbom, 1843 (Hymenoptera, Sphecidae) در هند

سین آناگا*، پوتووایی گیریش کومار و ویشواناث هگ

مرکز منطقه‌ای گهات غربی، بخش مطالعات جانورشناسی هند، کراالا-۶۷۳۰۰۶، هند.

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چکیده: گونه‌های جنس *Chalybion* Dahlbom, 1843 در هند بررسی شدند. گونه‌
C. gracile Hensen, 1988 برای اولین بار از هند گزارش شد. پراکنش ثبت شده گونه‌
C. bengalense Dahlbom, 1845 در ایالت‌های مختلف هند مستندسازی شدند. یک
کلید تغییر یافته برای شناسایی گونه‌های جنس *Chalybion* در هند، ارائه شد. ویژگی‌های
افتراقی، تصاویر و جدول مقایسه‌ای گونه‌ گزارش جدید، یعنی *C. gracile* با گونه‌ دارای
پراکنش وسیع *C. bengalense* ارائه شد. خصوصیات مرفوژیک افتراقی هر دو گونه
C. gracile و *C. bengalense* به تصویر کشیده شد.

واژگان کلیدی: زنبور گل آبی، گزارش جدید، هند، کلید شناسایی، ریخت‌شناسی