


***Panjaj*, a new subgenus of the genus *Crossocerus* (Hymenoptera: Crabronidae), with description of a new species from Pakistan**

***Panjaj*, новый подрод рода *Crossocerus* (Hymenoptera: Crabronidae), с описанием нового вида из Пакистана**

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Abstract. A new subgenus *Panjaj* **subgen. nov.** of the genus *Crossocerus* Lepeletier de Saint Fargeau et Brullé, 1835 (Hymenoptera: Crabronidae: Crabroninae: Crabronini) is described from Pakistan, with *C. dutti* **sp. nov.** as a type species. The characters for distinguishing the new species from other species of *Crossocerus* known on the Indian Subcontinent are provided. An updated checklist of the genus *Crossocerus* of the Indian Subcontinent is given.

Резюме. Новый подрод *Panjaj* **subgen. nov.** рода *Crossocerus* Lepeletier de Saint Fargeau et Brullé, 1835 (Hymenoptera: Crabronidae: Crabroninae: Crabronini) описан из Пакистана, с *C. dutti* **sp. nov.** в качестве типового вида. Приведены признаки, позволяющие отличить новый вид от других видов рода *Crossocerus*, известных с Индийского субконтинента. Приводится обновленный список видов рода *Crossocerus* Индийского субконтинента.

Key words: Indian Subcontinent, checklist, Crabronidae, Crabronini, *Crossocerus*, new subgenus, new species

Ключевые слова: Индийский субконтинент, список видов, Crabronidae, Crabronini, *Crossocerus*, новый подрод, новый вид

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Introduction

The genus *Crossocerus* Lepeletier de Saint Fargeau et Brullé, 1835 is one of the most diverse genera of the tribe Crabronini. The diagnostic characters of this genus are the presence of ocellus, equilateral ocellar triangle, the absence of ver-

ticalus, the male flagellum usually with ventral hair fringe, and the scape without carina. The genus is closely related to *Crabro* Fabricius, 1775 in having the same palpal formula, similar wing venation, thoracic structure and behavioural traits. The main character differentiating *Crossocerus* from *Crabro* is the shape of ocellar triangle, which is obtuse in *Crabro*. Some members of *Crossocerus*

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resemble *Rhopalum* Stephens, 1829, but differ from the latter in the absence of omaulus (Bohart & Menke, 1976).

Pate (1944) was the first to present a key to the 13 subgenera of *Crossocerus* recognised at the time. Later, Bohart & Menke (1976) presented a key to the 20 recognised subgenera except the subgenus *Ornicrabro* Leclercq, 1963. The Oriental fauna of *Crossocerus* is most diverse, with a half of these subgenera being endemic. In the Palaearctic Region, nine subgenera are most diverse in terms of species richness (Bohart & Menke, 1976). Recently, Leclercq (2009) presented a key to the subgenera of *Crossocerus* for Asia and the Pacific islands. The genus is distributed worldwide (Bohart & Menke, 1976; Pulawski, 2021) and currently contains 249 described species and 30 subspecies. Altogether, 26 species are known from the Indian Subcontinent (Pulawski, 2021) in eight subgenera: *Ablepharipus* Perkins, 1913, *Ainocrabro* Tsuneki, 1954, *Apocrabro* Pate, 1944, *Blepharipus* Lepeletier de Saint Fargeau et Brullé, 1835, *Crossocerus* s. str., *Cuphopteris* A. Morawitz, 1866, *Thao* Tsuneki, 1982, and *Yuchiha* Pate, 1944.

The aim of this article is to describe a new subgenus *Panjali* **subgen. nov.** in *Crossocerus* with a new species *C. dutti* **sp. nov.** from Pakistan. We also provide a partial key to the subgenera of *Crossocerus* (*Blepharipus* Lepeletier et Brullé, 1835, *Bnunius* Tsuneki, 1971, *Ortocrabro* Tsuneki, 1971, *Panjali* **subgen. nov.** and *Paroxyrabro* Leclercq, 1963; modified from Leclercq, 2009) and an updated checklist of the genus *Crossocerus* from the Indian Subcontinent.

Material and methods

An old unidentified sphecid collection from the National Pusa Collection at the Indian Agricultural Research Institute (NPC–IARI), New Delhi, was used for the study. The morphological characters were examined under a Leica S8APO stereomicroscope. Photographs of specimens were taken using a Leica DFC 425 digital camera mounted on a Leica M205 FA stereozoom microscope. Illustrations were edited using Adobe Photoshop 7.0. The new species was identified based on the descriptions and keys by Tsuneki (1971) and Leclercq (2009). Terminology follows that

of Bohart & Menke (1976). The type specimen of the new species has been deposited at NPC–IARI, New Delhi.

The abbreviations for measurements used in the text are as follows: BL, body length; FWL, fore wing length; POD, distance between lateral ocelli; OOD, distance between lateral ocellus and compound eye; PPL, pygidial plate length.

Taxonomic part

Order **Hymenoptera**

Family **Crabronidae**

Subfamily **Crabroninae**

Tribe **Crabronini**

Genus ***Crossocerus*** Lepeletier de Saint Fargeau et Brullé, 1835

Subgenus ***Panjali* subgen. nov.**

Type species: *Crossocerus (Panjali) dutti* **sp. nov.**

Diagnosis. The new subgenus is based on the female characters only. It shares several important characters with the subgenera *Bnunius* and *Ortocrabro*: mandible apically tridentate; mesopleuron with conspicuous precoxal tubercle; pronotum shallowly notched medially, notch from behind not reaching anterior margin of pronotum; propodeal enclosure well limited posteriorly; occipital carina not reaching hypostomal carina; fore femur distinctly hollowed on outer surface, with its upper and lower margins acutely edged; hind femur flattened beneath.

The new subgenus shares some characters with *Bnunius* (posterior margin of tergum V finely punctate; antennomere III 2.3 times as long as broad at apex) and some characters with *Ortocrabro* (innermost apical tooth of mandible small and obtuse; pronotum with transverse furrow and carina in front of posterior margin, with roundly curved anterior margin and bluntly produced anterolateral angles; propleural tooth present).

The new subgenus differs from both *Bnunius* and *Ortocrabro* in the following characters: recurrent vein joining submarginal cell beyond its middle; clypeal medial apical margin with a distinct protruding tridentate lobe along with lateral

teeth, lateral tooth emarginate; inner margin of mandible with large tooth; tergum I nodose at apex; pygidial plate in shape of isosceles triangle, with inconspicuous carina laterally, with large punctures basally, dorsal surface slightly concave; prosternal tooth present; anterolateral surface of fore coxa with a tooth.

Etymology. The subgeneric name is derived from the Pir Panjal Mountain Ranges (Murree Hills), where the holotype was collected. Gender is feminine.

Insertion of *Panjal* subgen. nov. into a key to the subgenera of the genus *Crossocerus*

18. Head broad, transverse, wider than thorax; pygidial plate slightly depressed posteriorly; mandible bidentate, inner margin toothless; clypeus short; pronotal collar with median notch; mesopleuron with precoxal tubercle; propodeal enclosure bordered posteriorly by very fine groove (not crenulate); terga completely black; body length 3–4.5 mm; male unknown. (Distribution: Philippines) ***Paroxy crabro***
- Head subquadrate; pronotal collar usually (possibly, always) with median notch 19
19. Inner mandibular margin without tooth (sometimes with a small denticle, e.g. in *P. tyuzendzianus* Tsuneki, 1954); mandible bidentate, tridentate, or quadridentate; propodeal enclosure often not bordered posteriorly; pygidial area with or without anterior hump; mesopleuron with or without precoxal tubercle ***Blepharipus***
- Inner mandibular margin with tooth; other characters varying 20
20. Female: inner mandibular margin with a large tooth (Figs 4 and 5); recurrent vein joining submarginal cell beyond its middle (Figs 2 and 3); prosternal tooth present (Figs 11 and 12); anterolateral surface of fore coxa with tooth (Fig. 7); tergum I longer, nodose at apex (Fig. 16); pygidial plate in shape of isosceles triangle, inconspicuously carinate laterally, with large punctures basally, slightly concave dorsally (Fig. 17). Body length 7.74 mm ***Panjal* subgen. nov.**
- Female: inner margin of mandible with a small tooth; recurrent vein joining submarginal cell at its middle; prosternal tooth absent; anterolateral surface of fore coxa without tooth. Other characters varying 21
21. Female: tergum I shorter, slightly nodose at apex (Fig. 46 in Tsuneki, 1971); pygidial plate simple, slightly convex anteriorly. Body length no more than 6.5 mm. Male unknown ***Bnunius***

- Female: tergum I more distinctly elongate, simply rounded at apex; pygidial plate with anterior Y-shaped hump (Tsuneki, 1990: Fig. 25). Male: mandible bidentate, without tooth at inner margin (Tsuneki, 1990: Fig. 16); mesopleuron with a small precoxal tubercle. Body length at most 7.5 mm ***Ortocrabro***

Crossocerus (Panjal) dutti sp. nov.

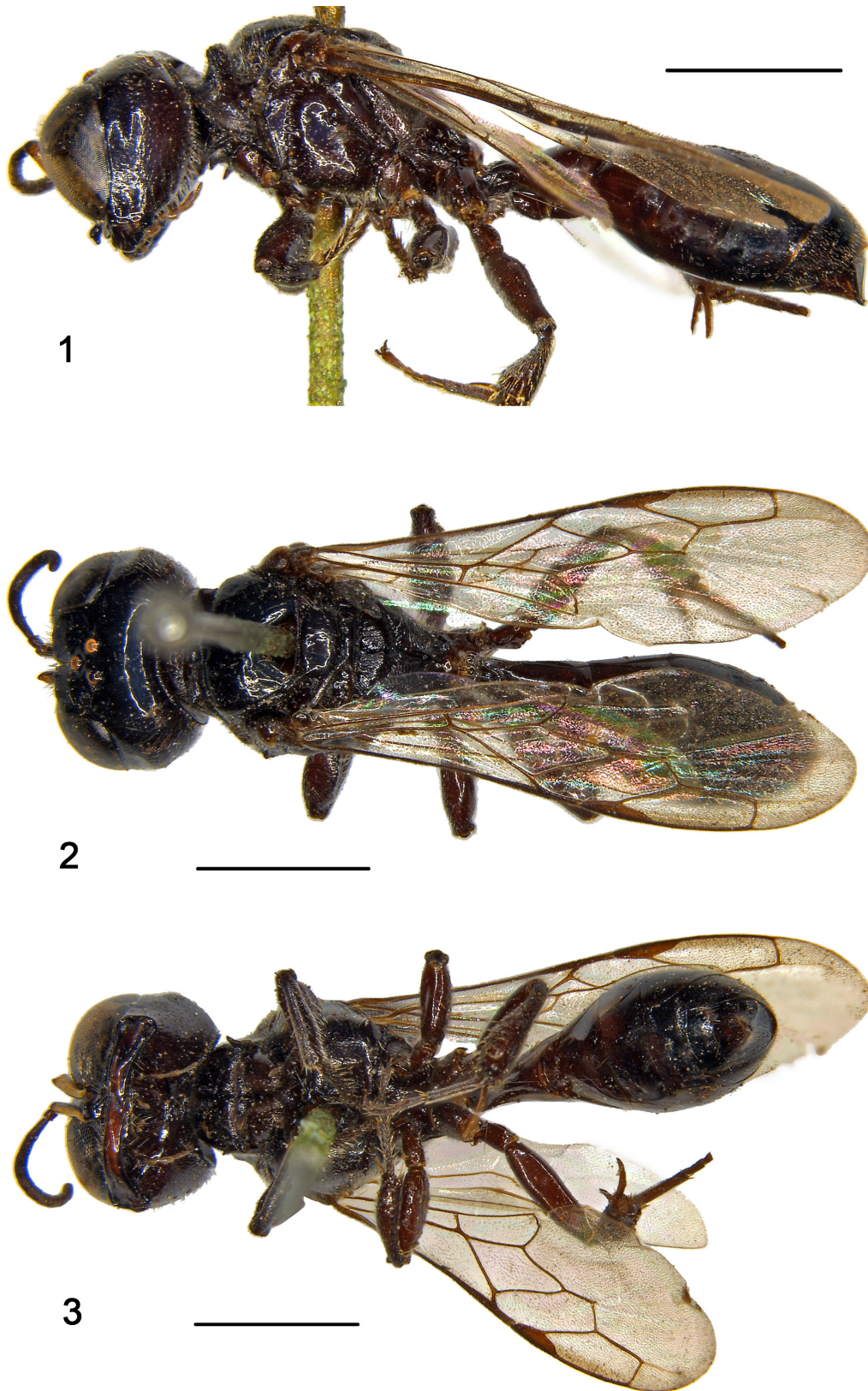
(Figs 1–17)

Holotype. Female, **Pakistan**, *Punjab*, Murree Hills [now Pir Panjal Mountain Ranges], 7500 ft, V.1920, G.R. Dutt leg. (NPC–IARI).

Description. *Female.* BL = 7.74 mm; FWL = 5.71 mm; PPL = 0.43 mm.

Colour pattern and pubescence. Body brownish black except following parts: scape ventrally yellow; pronotal lobe, tergum III at posterior margin, terga IV–V, and pygidial plate black; head, mesonotum, scutellum and mesopleuron with bluish tinge; mandible basally and apically, and tegula dark brown; inner half of mandible reddish brown; wing veins, lateral side of terga I–III and all legs brown; body covered with short silvery setae; wings hyaline (Figs 1–3).

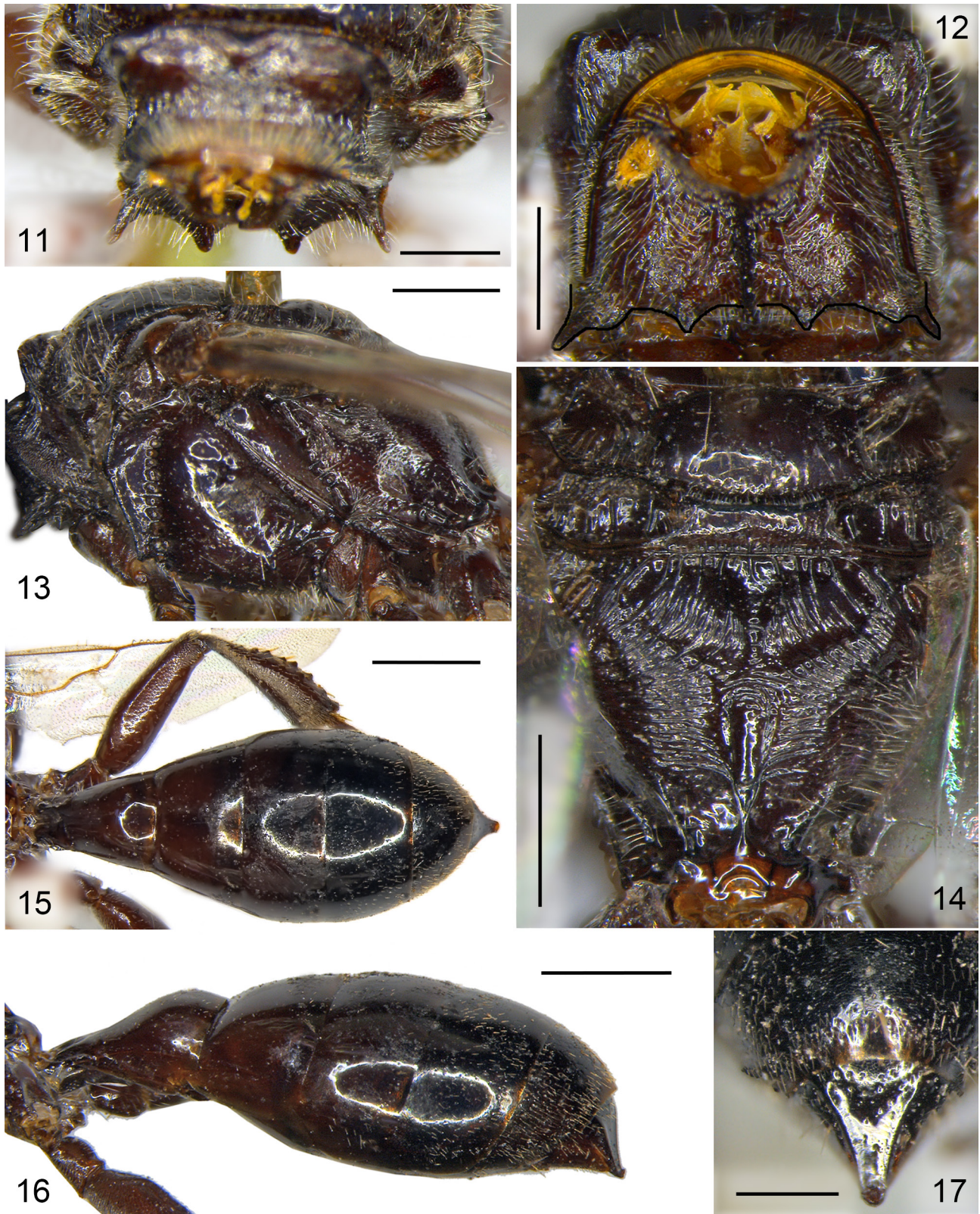
Head shiny, nearly quadrilateral, finely sparsely punctate dorsally, 0.6 times as long as wide. Orbital fovea indistinct, elliptical, slightly curved inside, close to compound eye. Area near ocelli impressed (Fig. 8). Inner margins of compound eyes convergent ventrally. Frontal furrow broad and shiny, round ventrally (Fig. 4). Scapal basin shiny, slightly concave; inner orbit of compound eyes near scapal basin with sparse silvery pubescence. Clypeus broad, with silvery pubescence, without median longitudinal carina; median apical margin of clypeus with prominent protruding tridentate lobe and lateral tooth; lateral tooth emarginate and more distinctly produced anteriorly (Figs 4 and 5). Vertex with a fine longitudinal furrow starting from anterior ocellus and not reaching occipital carina. Gena shiny, setiferous, depressed near outer orbit of compound eyes (Fig. 6). Occipital carina distinct, conspicuously protruding, not reaching hypostomal carina, ending without dentation (Fig. 7). Mandible tridentate apically, with a distinct tooth at inner margin; inner apical tooth of mandible small and obtuse (Fig. 4). Antennal sockets contiguous. Scape ecarinate. POD 0.51



Figs 1–3. *Crossocerus (Panjal) dutti* sp. nov., holotype (female). **1** – habitus, lateral view; **2** – habitus, dorsal view; **3** – habitus, ventral view. Scale bars: 1 mm.



Figs 4–10. *Crossocerus (Panjal) dutti* sp. nov., holotype (female). 4 – head, frontal view; 5 – clypeus (lateral parts of ventral margin outlined with a black line); 6 – head, lateral view; 7 – head, ventral view; 8 – head, dorsal view; 9 – antenna; 10 – mesosoma, dorsal view. Scale bars: 0.5 mm (4, 6–8, 10), 0.2 mm (5, 9).



Figs 11–17. *Crossocerus (Panjal) dutti* sp. nov., holotype (female). **11** – prothorax, dorso-frontal view; **12** – prothorax, frontal view (ventral margin outlined with a black line); **13** – mesosoma, lateral view; **14** – propodeum, dorsal view; **15** – metasoma, dorsal view; **16** – metasoma, lateral view; **17** – pygidial plate. Scale bars: 0.2 mm (11, 12, 17), 0.5 mm (13–16).

times as long as OOD; antennomere III 2.3 times as long as broad at apex (Fig. 9); relative lengths of scape : pedicel : flagellomeres I : II : III : IV : V : VI : VII : VIII : IX : X as 49 : 0.9 : 18 : 12 : 10 : 10 : 11 : 0.9 : 0.9 : 10 : 11 : 14.

Mesosoma shiny. Pronotum shallowly notched medially (notch not reaching pronotal fore margin), with transverse furrow and carina in front of posterior margin, anterior margin roundly curved, anterolateral angles bluntly produced, anterior and posterior angles with transverse carina laterally (Fig. 10), propleural and prosternal teeth distinct (Figs 11 and 12). Scutum shiny, finely and sparsely punctate, with well-defined notaulus, parapsidal and admedian lines. Scutellum shiny, sparsely punctate, prescutellar sulcus without distinct foveae. Metanotum shiny, finely punctate dorsally (Figs 10 and 14). Mesopleuron finely sparsely punctate dorsally; epicnemial sulcus with distinct large foveae; precoxal tubercle conspicuous; mesopleural suture with small foveae. Mesosternum with elongate silvery pubescence; metapleuron smooth and shiny; omaulus distinctly bordered, continuous with acetabular carina (Fig. 13). Propodeum shiny, enclosure well limited posteriorly, its anterior margin with a distinct transverse carina and well-defined foveae, dorsal surface anteriorly with fine longitudinal ridges; longitudinal furrow of dorsal surface impressed anteriorly; dorsal and posterior surfaces separated by furrow; posterior surface dorsally with fine transverse ridges, with longitudinal furrow broad anteriorly and convergent towards apex; lateral propodeal carina starting from propodeal apex not reaching mid-length of propodeum; dorsolateral surface of propodeum with elongate silvery pubescence; lateral surface of propodeum shiny and finely punctate; preapical depression delimited anteriorly with elliptic carina (Fig. 14). Fore femur distinctly hollowed on outer surface, its upper and lower margins acutely edged. Hind femur flattened beneath. Hind tibia slightly swollen apically, with short spines dorsally (Figs 1–3).

Metasoma. Gaster sessile. Tergum I longer than wide, nodose apically (Fig. 16). Tergum II without basal transverse constriction. All terga dorsally with short pubescence (Fig. 15), shiny, impunctate except posterior margin of tergum V.

Pygidial plate as isosceles triangle, shiny, broader basally, narrow apically, slightly concave dorsally, with large punctures dorsally (Fig. 17).

Male. Unknown.

Etymology. The species is named after the collector of the holotype Mr G.R. Dutt, in-charge of economic records and insect collections at NPC-IARI, New Delhi, from 1906 to 1932.

A checklist of the genus *Crossocerus* of the Indian Subcontinent

Crossocerus (Apocrabro) aeta aeta Pate, 1944

Crossocerus (Apocrabro) aeta Pate, 1944: 285 (as “*aëta*”). Type locality: Mount Apo (Philippines: Mindanao). Holotype: female.

Distribution. India, Indonesia, Philippines and Thailand.

Crossocerus (Crossocerus) ardens (Cameron, 1890)

Crabro ardens Cameron, 1890: 273. Type locality: Barrackpore (India: West Bengal). Syntypes: female, male.

Crossocerus (Crossocerus) ardens: Leclercq, 1950a: 4.

Distribution. India.

Crossocerus (Cuphopterus) assamensis (Cameron, 1902)

Crabro assamensis Cameron, 1902: 59. Type locality: Khasia Hills (India: Assam [now Meghalaya]). Syntypes: female, male.

Crossocerus (Cuphopterus) assamensis: Leclercq, 1950b: 16.

Distribution. India.

Crossocerus (Ainocrabro) aswad (Nurse, 1902)

Crabro aswad Nurse, 1902: 88. Type locality: Mathuran (India: Maharashtra). Holotype or syntypes: male(s).

Crossocerus (Crossocerus?) aswad: Leclercq, 1950a: 4.
Crossocerus (Ainocrabro) aswad: Leclercq, 2009: 161.

Distribution. China, India, Japan, Nepal, Malaysia and Thailand.

Crossocerus (Yuchiha) brahmanus

Leclercq, 1956

Crossocerus (Crossocerus) brahmanus Leclercq, 1956a: 229. Type locality: Madurai, Shembaganur (India: Tamil Nadu). Holotype: male.

Crossocerus (Yuchiha) brahmanus: Leclercq, 1978: 122.

Distribution. India.

Crossocerus (Blepharipus) distortus

Leclercq, 1955

Crossocerus (Coelocrabro) distortus Leclercq, 1955: 190. Type locality: Kumaon west of Almora (India: Uttar Pradesh [now in Uttarakhand]). Holotype: male.

Crossocerus (Blepharipus) distortus: Leclercq, 2009: 168.

Distribution. India.

Crossocerus (Panjal) dutti sp. nov.

Crossocerus (Panjal) dutti sp. nov.: present publication: 89. Type locality: Pir Panjal Mountain Ranges (Pakistan: Punjab). Holotype: female.

Distribution. Pakistan.

Crossocerus (Ablepharipus) eques

(Nurse, 1902)

Crabro eques Nurse, 1902: 89. Type locality: Shimla (India: Himachal Pradesh). Holotype or syntypes: female(s).

Crossocerus (Ablepharipus) eques: Leclercq, 1956b: 293.

Distribution. India.

Crossocerus (Cuphopterus) flavopictus flavopictus (F. Smith, 1856)

Crabro flavopictus F. Smith, 1856: 391 (as “*flavopictus*” [hyphenated]). Type locality: North India. Holotype or syntypes: female(s).

Crossocerus (Cuphopterus) flavopictus: Leclercq, 1950b: 16.

Crabro odontophora Cameron, 1890: 271. Type locality: Barrackpore (India: West Bengal). Syntypes: males.

Distribution. China, India, Indonesia, Japan, Laos and Nepal.

Crossocerus (Crossocerus) gerardi

Leclercq, 1956

Crossocerus (Crossocerus) gerardi Leclercq, 1956a: 223. Type locality: Darjeeling (India: West Bengal). Holotype: male.

Distribution. India.

Crossocerus (Crossocerus) hasalakae

Leclercq, 1986

Crossocerus (Crossocerus) hasalakae Leclercq, 1986: 247. Type locality: Angunakolapelessa (Sri Lanka: Monaragala District). Holotype: male; paratypes: 12 females, 4 males.

Distribution. India, Pakistan and Sri Lanka.

Crossocerus (Crossocerus) hingstoni

Leclercq, 1950

Crossocerus (Crossocerus) hingstoni Leclercq, 1950a: 2. Type locality: Tropde (China: Tibet). Holotype: male.

Distribution. Tibet (China) and Nepal.

Crossocerus (Crossocerus) kohli (Bischoff, 1921)

Crabro kohli Bischoff, 1921: 6. Type locality: Kul at Yarkand River (China: Sinkiang Uighur). Syntypes: females.

Crossocerus (Crossocerus) kohli: Leclercq, 1954: 225.

Crabro diacanthus Gussakovskij, 1930: 75. Type locality: Kara-Kul Lake (Pamir Mountains in Tajikistan). Holotype: male.

Distribution. China, India, Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan and Uzbekistan.

Crossocerus (Ablepharipus) mukalanae

Leclercq, 1986

Crossocerus (Ablepharipus) mukalanae Leclercq, 1986: 244. Type locality: Weddagala in Sinharaja Forest (Sri Lanka: Ratnapura District). Holotype: female.

Distribution. Sri Lanka.

Crossocerus (Thao) nitidicorpus weddagalae

Leclercq, 1986

Crossocerus (Thao) nitidicorpus weddagalae Leclercq, 1986: 250. Type locality: Weddagala in Sinharaja

Forest (Sri Lanka: Ratnapura District). Holotype: female.

Distribution. Japan, Malaysia and Sri Lanka.

Crossocerus (Ablepharipus) pakistanus

Leclercq, 2009

Crossocerus (Ablepharipus) pakistanus Leclercq, 2009: 178. Type locality: Rawalpindi (Pakistan). Holotype: male; paratype: male.

Distribution. Pakistan.

Crossocerus (Crossocerus) pusanoides

Leclercq, 1963

Crossocerus (Crossocerus) pusanoides Leclercq, 1963: 7. Type locality: Yercaud in Shevaroy Hills (India: Tamil Nadu). Holotype: male; paratype: female.

Distribution. India.

Crossocerus (Crossocerus) pusanus

Leclercq, 1956

Crossocerus (Crossocerus) pusanus Leclercq, 1956a: 224. Type locality: Pusa (India: Bihar). Holotype: male; paratypes: 4 females.

Distribution. India.

Crossocerus (Apocrabro) pyrrhus

Leclercq, 1956

Crossocerus (Apocrabro) pyrrhus Leclercq, 1956a: 231. Type locality: Dalhousie (India: Himachal Pradesh). Holotype: female.

Distribution. India.

Crossocerus (Blepharipus) quinlani

Leclercq, 1989

Crossocerus (Blepharipus) quinlani Leclercq, 1989: 238. Type locality: 2 miles southeast of Sikha (Nepal). Holotype: male.

Distribution. Nepal and Pakistan.

Crossocerus (Yuchiha) rimatus Leclercq, 1963

Crossocerus (Microcrabro) rimatus Leclercq, 1963: 14. Type locality: Naduvatam in Hilgiri Hills (India: Tamil Nadu). Holotype: male; paratypes: 2 males, 1 female.

Crossocerus (Yuchiha) rimatus: Leclercq, 1978: 121.

Distribution. India and Japan.

Crossocerus (Crossocerus) simlaensis

(Nurse, 1902)

Crabro simlaensis Nurse, 1902: 89. Type locality: Simla (India: Himachal Pradesh). Holotype or syntypes: female(s).

Crossocerus (Crossocerus) simlaensis: Leclercq, 1950a: 4.

Distribution. India and Indonesia.

Crossocerus (Crossocerus) taxus Leclercq, 1956

Crossocerus (Crossocerus) taxus Leclercq, 1956a: 220. Type locality: Shillong (India: Assam [now in Meghalaya]). Holotype: male; paratypes: 9 females.

Distribution. India and Nepal.

Crossocerus (Cuphopteris) traductor

(Nurse, 1902)

Crabro traductor Nurse, 1902: 88. Type locality: Simla (India: Himachal Pradesh). Holotype or syntype: male(s).

Crossocerus (Cuphopteris) traductor: Leclercq, 1950b: 16.

Distribution. India.

Crossocerus (Apocrabro) ursidus Leclercq, 1956

Crossocerus (Apocrabro) ursidus Leclercq, 1956a: 233. Type locality: Shillong (India: Assam [now in Meghalaya]). Holotype: male.

Distribution. China, India and Nepal.

Crossocerus (Ablepharipus) weeratungei

Leclercq, 1986

Crossocerus (Ablepharipus) weeratungei Leclercq, 1986: 245. Type locality: Udawattakele Sanctuary in Kandy (Sri Lanka: Kandy District). Holotype: female; paratypes: 4 females.

Distribution. Sri Lanka.

Crossocerus (Crossocerus) yerburii

(Cameron, 1898)

Crabro yerburii Cameron, 1898: 32. Type locality: Trincomali (Sri Lanka). Holotype or syntypes: female(s).

Crossocerus (*Cuphopterus*?) *yerburii*: Leclercq, 1954: 241.

Crossocerus (*Crossocerus*) *yerburii*: Leclercq, 1986: 249.

Distribution. Sri Lanka.

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References

- Bischoff H.** 1921. Einige Bemerkungen zu den paläarktischen Crabronen des Zoolog. Museums zu Berlin. *Archiv für Naturgeschichte* (A), **87**(10): 4–7.
- Bohart R.M. & Menke A.S.** 1976. *Sphecid wasps of the World, a generic revision*. Berkeley, Los Angeles & London: University of California Press. xi + 695 p. <https://doi.org/10.1525/9780520309548>
- Cameron P.** 1890. Hymenoptera Orientalis [sic], or contributions to a knowledge of the Hymenoptera of the Oriental Zoological Region. Part II. *Memoirs and Proceedings of the Manchester Literary & Philosophical Society* (Series 4), **3**: 239–284.
- Cameron P.** 1898. Hymenoptera Orientalia, or contributions to a knowledge of the Hymenoptera of the Oriental Zoological Region. Part VII. *Memoirs and Proceedings of the Manchester Literary & Philosophical Society*, **42**(11): 1–84, pl. 4.
- Cameron P.** 1902. Descriptions of new species of fossorial Hymenoptera from the Khasia Hills, Assam. *The Annals and Magazine of Natural History* (Series 7), **10**: 54–69, 77–89. <https://doi.org/10.1080/00222930208678635>
- Gussakovskij V.V.** 1930. Hymenoptera Aculeata. In: *Pamirskaya ekspeditsiya 1928 g. Trudy ekspeditsii* [Pamir expedition of 1928. Proceedings of expedition], II. *Zoologiya* [Zoology]: 67–78. Leningrad: Publishing House of the USSR Academy of Sciences. (In Russian).
- Leclercq J.** 1950a. Crabroniens nouveaux ou peu connus (Hymenoptera Sphecidae). *Bulletin Institut Royal des Sciences Naturelles de Belgique*, **26**(35): 1–19.
- Leclercq J.** 1950b. Notes systématiques sur les Crabronines pédonculés (Hymenoptera Sphecidae). *Bulletin Institut Royal des Sciences Naturelles de Belgique*, **26**(15): 1–19.
- Leclercq J.** 1954. *Monographie systématique, phylogénétique et zoogéographique des Hyménoptères Crabroniens*. Liège : Les Presses de "Lejeunia". 371 p. + 84 maps.
- Leclercq J.** 1955. *Crossocerus* (Coelocrabro) distortus, Crabronien nouveau du Nord de l'Inde (Hym. Sphecidae). *Bulletin et Annales de la Société Royale d'Entomologie de Belgique*, **91**(7–8): 190–192.
- Leclercq J.** 1956a. Contribution à l'étude des *Crossocerus* (Lepeletier de St-Fargeau et Brullé 1834) vivant au Sud de l'Himalaya (Hym. Sphecidae Crabroninae). *Bulletin et Annales de la Société Royale d'Entomologie de Belgique*, **92**(9–10): 217–235.
- Leclercq J.** 1956b. Le Crabro eques Nurse, 1902, de Simla, est un *Crossocerus* du sous-genre *Ablepharipus* Perkins, 1913 (Hymenoptera, Sphecidae, Crabroninae). *Bulletin de la Société Royale des Sciences de Liège*, **5**: 293–295.
- Leclercq J.** 1963. Crabroniens d'Asie et de Philippines (Hymenoptera Sphecidae). *Bulletin et Annales de la Société Royale d'Entomologie de Belgique*, **99**: 1–82.
- Leclercq J.** 1974. Pour la connaissance des *Crossocerus* asiatiques du sous-genre *Cuphopterus* Morawitz (Hymenoptera Sphecidae Crabroninae). *Bulletin de la Société Royale des Sciences de Liège*, **43**: 659–668.
- Leclercq J.** 1978. *Crossocerus* asiatiques du sous-genre *Yuchiha* Pate (Hymenoptera, Sphecidae, Crabroninae). *Bulletin et Annales de la Société Royale d'Entomologie de Belgique*, **114**: 119–126.
- Leclercq J.** 1986. Crabroniens de Sri Lanka appartenant au genre *Crossocerus* Lepeletier & Brullé, 1835 (Hymenoptera: Sphecidae). *Bulletin et Annales de la Société Royale Belge d'Entomologie*, **122**: 243–252.
- Leclercq J.** 1989. Crabroniens du genre *Crossocerus* Lepeletier & Brullé trouvés notamment au Népal et au Tibet (Hymenoptera, Sphecidae). *Bulletin et Annales de la Société Royale Belge d'Entomologie*, **125**: 237–242.
- Leclercq J.** 2009. Hyménoptères Crabroniens d'Asie du genre *Crossocerus* Lepeletier & Brullé 1835 (Hymenoptera: Crabronidae Crabroninae). *Entomologie faunistique – faunistic Entomology*, (2008), **61**(4): 157–192.
- Nurse C.G.** 1902. New species of Indian Hymenoptera. *The Journal of the Bombay Natural History Society*, **14**: 79–92.

- Pate V.S.L.** 1944. The subgenera of *Crossocerus* with a review of the Nearctic species of the subgenus *Blepharipus* (Hymenoptera: Sphecidae: Pemphili-dinae). *Lloydia*, **6**: 267–317.
- Pulawski W.J.** 2021. *Catalog of Sphecidae* [online]. California Academy of Sciences. <https://www.calacademy.org/scientists/projects/catalog-of-sphecidae> [viewed 27 December 2021].
- Smith F.** 1856. *Catalogue of hymenopterous insects in the collection of the British Museum. Part IV. Sphegidae, Larridae and Crabronidae*: 207–497. London: Taylor & Francis.
- Tsuneki K.** 1971. Studies on the Formosan Sphecidae (VIII). A supplement to the subfamily Crabroninae (Hymenoptera). *Etizenia*, **51**: 1–29.
- Tsuneki K.** 1990. Descriptions of two new subgenera, six new species and one undescribed female of the Sphecidae from the Island of Okinawa, the Ryukyus (Hymenoptera). *Special Publications of the Japan Hymenopterists Association*, **36**: 81–99.

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