

## TWO NEW SPECIES OF GENUS OPIUS WESMAEL OPIINAE: BRACONIDAE: HYMENOPTERA) FROM KHYBER PAKHTUNKHWA PROVINCE OF PAKISTAN

**MIAN SABAHATULLAH,**

Department of Entomology, The University of Agriculture, Peshawar- Pakistan

**MAQSOOD SHAH,**

Department of Entomology, The University of Agriculture, Peshawar- Pakistan

### **Abstract**

The present study deals with the descriptions of two new species of genus *Opius* Wesmael (*Opiinae* : *Braconidae* : *Hymenoptera*;) discovered in Khyber Pakhtunkhwa province of Pakistan. The new species viz. *Opius clypeatasp. n* and *Opius flavocorporissp. n* are described and illustrated. Both species have midpit, no mouth cavity, sculptured propodeum and the mandibles are gradually broadening basally.

**Keywords:** *Braconidae*, *Opiinae*, *Opius*, new species, Pakistan.

### **INTRODUCTION**

*Opiinae* (*Hymenoptera*: *Braconidae*) is a large subfamily with 2,063 valid species in 39 genera (Yu et al., 2016). It is a common group containing generally small (1.3–5.5 mm) parasitoid wasps. These wasps are koinobiont endoparasitoids of pest insects belonging to families *Agromyzidae*, *Ephydriidae*, *Anthomyiidae* and *Tephritidae* (*Diptera*). Hosts of only 300 species are known (Peris- Felipoet al., 2014). Generally, opiine wasp species parasitize leaf mining insects and those infesting fruits and help in minimizing population of injurious insects (Vargas et al., 2007; Tobias, 1999). Due to their importance some species of these wasps have been introduced for the suppression of pests with mixed success (Rousse et al., 2005). Wharton and Marsh (1978) provided a key to the known species of *Opiinae* parasitizing fruit flies in the New World.

Irshad (2003) recorded three opiine wasps in his book on parasitoids and predators of Pakistan. Khalil et al., (2019) studied biodiversity of braconid wasps and recorded two opiine wasp species viz. *Areotetes cariniferus* Li & Achterberg and *Opius pallipes* Wesmael from Punjab Pakistan. Chen and Weng (2005) reported one species of genus *Rhogadopsis* from Pakistan. The opiine wasp fauna of Pakistan especially Khyber Pakhtunkhwa province is poorly known. Only three species, belonging to the genera *Diachasmimorpha* and *Opius*, have been reported from Khyber Pakhtunkhwa. The reason is poor sampling and lack of taxonomic knowledge on this group. Most of the work

done on this group has been done by foreign explorers and biocontrol specialists in their search for natural enemies of pest insects (Irshad, 2008). The present article is one of the series of articles dealing with Opiinae fauna of Khyber Pakhtunkhwa Province. The present work resulted in the discovery of two new species from the area.

## MATERIAL AND METHODS

The specimens were collected by sweep net and malaise traps from different ecological zones of Khyber Pakhtunkhwa province of Pakistan. Marshy places, tall grass, fruits & vegetable gardens and crops were sampled. Specimens already housed in the entomological collection were also examined. Freshly collected specimens were directly killed and preserved in 70 percent alcohol. Critical point drying was conducted following Wharton (1997). Identification was done with the help of reliable literature (Fischer, 1966, 1972, 1987, 2005; Li et al., 2013). Images and measurements were taken using Nikon 745T digital camera mounted on stereomicroscope with magnification up to 350X. For measurements and terminology, Achterberg (1993, 1997) is followed. Li et al., (2013) description of genus *Opius* followed for placement of species. Abbreviations T1, T2 and T3 have been used for metasomal tergum 1, 2 and 3, while F1, F2 and F3 are used for flagellomere 1, 2 and 3. SELUAP stands for Systematic Entomology Laboratory, The University of Agriculture, Peshawar where all the studied material is deposited.

## DESCRIPTIONS OF SPECIES

### *Opius clypeata* sp. n.

**Material examined:** Holotype, ♀, Bannu 16-viii-2018, Mian Sabahatullah.

**Diagnosis:** Clypeus short, triangular, 1.5 times as wide as high (Fig. ). Antenna 34 segmented, midpit present, round; notauli present, anteriorly deep, posteriorly represented by shallow and moderately wide furrows (Fig. ); propodeum vermiculate rugose (Fig.); T1 longitudinally rugose, with some broken longitudinal carinae (Fig.); exposed part of ovipositor sheath twice the length of T1 in lateral view (Fig.).

**Description of Holotype Female:** body length 3.3 mm, forewing length 3.2 mm, antenna length 3.5 mm

**Head:** Head transverse, 2.1 times as wide as long, O.D: POL: OOL= 1: 1.044: 2.68 (Fig.); antennae with 34 segments; F1: F2: F3: penultimate segment ratios = 1.7: 1.6: 1.4: 1; F1, F2, F3 and penultimate segments 3.0, 4.0, 3.6 and 2.3 times their width respectively (Fig. ); occipital carina present reaching almost upper level of eye and remains far removed from hypostomal carina; length of compound eyes 1.8 times temples; temple and vertex sparsely setose, smooth and polished; temples comparatively long; frons slightly depressed behind antennae; head height 0.94 times the length of maxillary palpus (Fig.). Face shiny and weakly convex with superficial light microsculpture laterally; twice wider than high; epistomal suture shallow; clypeus short, 1.5 times as wide as high, looking like

a triangular piece above mandibles, apparently smooth, surrounded by strong carina; face and clypeus with sparse setae; mandible not expanded but gradually widening basally and with a light brown wide carina baso-ventrally giving a look like expanded mandible; oral cavity absent. Anterior Tentorial Pits normally rounded; malar suture present, shallow; malar space as long as basal mandibular height; Inter-tentorial pit distance 2.67 times tentorio-ocular distance (Fig.).

**Mesosoma:** Mesosoma 1.7 times as long as high (Fig.); pronope present, large and round; Pronotum laterally smooth and shiny, indistinct striation present. Some microsculpture present on anterior margin. Notauli present, anteriorly deep, posteriorly represented by shallow imaginary lines, extending to lateral margin of mesoscutum anteriorly; midpit present, slightly elongate (Fig. ); scutellar sulcus crenulate. Scutellum triangular, smooth, convex, almost equal sided (Fig.), lateral and posterior margins with setae. Mesopleuron smooth; sternaulus shallow, smooth. Mesosternal groove distinct and crenulate. Metapleuron sculptured basally near coxa. Propodeum granulate- rugose with some horizontal lines medially (Fig. )

**Wings:** Forewings slightly infumate. Stigma discrete, almost triangular. Vein r making a straight line with 3-SR. SR1 reaching almost to wing tip and joining 1R-1.m-cu and cu-a distinctly postfurcal; second subdiscal cell open; vein 2-1A not pigmented CU1b absent for the most part. Basal 1/4<sup>th</sup> of CU1a pigmented. r: 3-SR: SR1= 1: 8: 14.14; r: 2SR: m-cu =1: 4.71: 4. Vein SR1 1.8 times 3-SR. 3-SR 1.5 times 2-SR (Fig.).

Hindwing 0.7 times forewing, 5.5 times its own width. Vein M+CU: 1M: 1r-m= 1.75: 1.78: 1.

**Legs:** Hind femur short and robust, 3 times as long as maximum width; hind tibia 8 times longer than maximum width; hind femur: hind tibia: hind tarsus = 0.67: 1: 1 (Fig.)

**Metasoma:** T1 short, 0.87 times longer than broad; with dorsal carinae present and running towards longitudinal dotted lines present at the posterior 2/3<sup>rd</sup> of the tergum (Fig. 86). Metasoma behind T1 coriaceous. Hypopygium short, blunt at tip, not reaching abdominal tip; ovipositor sheath twice the length of T1 in lateral view (Fig.). Ovipositor as long as abdomen.

**Color:** Body predominantly light brownish- yellow. Vertex, temple posteriorly brown; metasoma posteriorly light brownish-yellowish except terminal 3 segments brown. Tip of mandibles, telotarsi, antenna and ovipositor sheath dark brown.

**Male:** Unknown.

**Distribution:** only known from the type locality (Bannu district of Khyber Pakhtunkhwa) where it flies in August.

**Hosts:** Unknown.

**Etymology:** The name “clypeata” is derived from clypeus. The clypeus is high and triangular.

**Comments.** In Samiuddin et al., (2009) and Fischer (1972) and Tobias et al., (1986) keys the specimen will quickly run to genus *Nosopaeopius*. Samiuddin et al., (2009) however have not given any weight to the shape of mandible in their key. The type species of *Nosopaeopius* has distinctly toothed mandible (Fischer, 1987) and on that basis Li et al., (2013) synonymized *Nosopaeopius* with *Opius*. Fischer (1972) has included species with gradually broadening mandible and basally toothed mandible as well in subgenus *Nosopaeopius*. In the present specimen the mandible is not toothed or abruptly basally expanded rather gradually broadening basally. Fischer (2005) and Li et al., (2013) have classified opiines with gradually broadening mandible as genus *Opius*. If Li et al., (2013) characterization of *Opius* is followed then species placed in *Nosopaeopius* with gradually broadening mandibles have to be transferred from the *Nosopaeopius*; this new species is thus difficult to place. The oral cavity is absent therefore it cannot be placed under *Phaedrotoma*. We however are not proposing any taxonomic changes and identify the species as *Opiusclypeata* sp. n.

The specimen will run to *Opius* (*Nosopaeopius*) *crassicus* Thompson in Fischer (1972) and Tobias et al., (1999) keys, while in Samiuddin et al., (2009) it runs to *Opius* (*Nosopaeopius*) *longiterebrata*. The species is different from *crassicus* because antenna is 34-segmented in *clypeata* (27-28-segmented in *crassicus*); 3<sup>rd</sup> antennal segment 3 times as long as broad in *clypeata* (3<sup>rd</sup> antennal segment 4 times width); *Opius clypeata* sp. n. is predominantly yellow (*crassicus* is dark brown).

*Opius clypeata* sp. n. is also similar in many characters to *Opius* (*Nosopaeopius*) *longiterebrata* Samiuddin and Ahmad but mandible is gradually broadening towards base in *Opius* (*Nosopaeopius*) *clypeata* while it is expanded basally in *longiterebrata*. Antenna 34 segmented in *clypeata* (32 segmented in *O. (N.) longiterebrata*). T1 is 0.87 as long as wide {1.2 times in *O. (N.) longiterebrata*}.

The combination of gradually broadening mandible, 34-segmented antenna, presence of midpit, long ovipositor, short, high and triangular clypeus, closed oral cavity, sculptured propodeum and the light brownish-yellowish colour make it distinct from all the *Opius* species.

It is a very rare species, only one specimen was found during the collection efforts.

### ***Opius flavocorporis* sp. n.**

#### **Material Examined**

**Holotype:** ♀, 10 km north-east of Swabi, 29.ix.2002, Inayatullah.

**Paratypes:** 1 ♀ Swabi 09.ix.2000, Khalid Usman; 1 ♂, Baragali, 12-vii-2000, Inayatullah.

**Diagnosis:** Metasoma flat, ovate and uniformly light orange yellow (Fig. ); antenna 34 segmented, stemmaticum and surrounding area brown; oral cavity absent; maxillary palpus as long as head height; mid-pit present, teardrop-shaped; propodeum densely rugose (Fig. ). Vein m-cu and cu-a postfurcal; T1 as long as apical width, gradually broadening distally; exerted part of ovipositor sheath 1.5 times longer than T1 in lateral view (Fig.). Hind femur thick, 2.43 times maximum width (Fig.).

### Description of Holotype Female

Body length 1.8 mm, forewing 1.8 mm, antennae 2.3 mm.

**Head:** Head in dorsal view 0.45 times as long as wide; OD: POL: OOL = 1: 1.24: 3.53 (Fig.). Antennae with 34 segments, 1.3 times the length of body and the wing; scape 1.4 times as long as its maximum width and 0.87 times third segment; third segment as long as fourth segment and 1.15 times fifth segment (Fig.); third, fourth, fifth and penultimate segments 3.0, 3.0, 2.7 and 3.52 times their width respectively. Vertex and temples smooth; frons with depression behind antennal sockets; compound eyes 2.3 times as long as temple in dorsal view; in lateral view 1.5 times its maximum width (Fig.); vertex and temple gradually narrowed behind compound eyes. Face sparsely setose without any sculpture; clypeus with sparse setae, twice broader than its maximum height; epistomal suture distinct; mandible smooth, shiny, gradually broadening towards base and with ventral carina; oral cavity absent, labrum tip hardly visible; anterior tentorial pits rather more distinct; Inter tentorial distance 2.7 times tentorio ocular distance; malar space rugose, about as long as basal mandibular height; malar suture present, wide and shallow (Fig.); maxillary palpus as long as head height. Occipital carina present laterally, reaching upper level of compound eye, broadly absent dorsally, remains far removed from hypostomal carina.

**Mesosoma:** Mesosoma 1.5 times its maximum height (Fig.); pronotum smooth for the most part with some light sculpture and weak longitudinal striations on lateral side; prosternum smooth; anterior marginal furrow of pronotum crenulate; pronope present, round and distinct (Fig.). Mesoscutum broader than long, smooth and shiny, lateral carinae present. Notauli present, anteriorly well impressed and gradually becoming very shallow posteriorly, not reaching midpit. Midpit present, slightly elongated and tear drop shaped (Fig. ). Scutellar sulcus wide with 10 crenulae. Scutellum smooth, shiny, slightly convex (Fig. ); setae present laterally and on posterior 1/3<sup>rd</sup>. Episternal scrobe smooth, sternaulus very shallow, smooth and indistinct. Prepectal area and mesosternum smooth. Anterior and posterior mesosternal groove without any sculpture. Epicnemial area smooth. Metapleuron rugose, metapleural suture almost smooth. Propodeum uniformly granulate, granulations more pronounced distally (Fig. ).

**Wings:** Forewing 3 times as long as its maximum width; pterostigma triangular with r arising from the center; vein 3-SR 1.36 times vein 2-SR; Vein SR1 2.3 times vein 3-SR. Vein m-cu and cu-a postfurcal. Vein 1M and m-cu parallel. Vein 2-SR 1.8 times r-m. Second submarginal cell weakly narrowed distally. Vein r half as long as width of pterostigma, making weak angle with 3-SR. 1-R1 reaching wing tip and about 1.6 times longer than pterostigma. CU1 present, CU1b present but not distinct making first subdiscal partly opened (Fig. 98). Hindwing M+CU: 1-M: 1r-m= 2.5: 2.1: 1 (Fig. 99)

**Legs:** All femora robust. The ratio among hind femur, tibia and tarsus is 1: 1.6: 1.45. Hind femur and tibia 2.43 and 12 times their maximum widths respectively. Hind tibia with two spurs about half as long as basitarsus (Fig.).

**Metasoma:** Ovate and somewhat dorso-ventrally flattened (Fig.); T1 as long as its apical width, gradually widening posteriorly with irregular broken carinae running posteriorly giving vermiculate- rugose look. Lateral carinae distinct, strong and reaching the apex of T1 (Fig.). T2 and the following segments smooth and shiny. Hypopygium short, not reaching metasomal tip. Exposed part of ovipositor sheath 1.5 times longer than T1 in lateral view (Fig.).

**Male:** As female except the small size.

**Colour:** body Uniform yellow; vertex, occiput, stemmaticum, area between interior ocellus and antennae (except scape yellow) yellowish brown; telotarsi, stigma and veins, tip of mandibles and ovipositor sheath dark brown.

**Distribution:** Available data show that this species occurs in Swabi (1100 ftasl) (agro-ecological zone C) and mountainous areas of Hazara Division (5700 asl) (AE Zone B) where it flies from July to September.

**Comments:** The species will easily run to genus *Nosopaeopius* in all available keys (Fischer, 1972, Samiuddin et al., 2009, Tobias et al., (1999). Tobias et al., (1999) have placed subgenera *Nosopaeopius* Foerster and *Snoflakopius* Fabricius as synonym of *Cryptonastes* Foerster. Keys of Fischer (1972) and Samiuddin et al., (2009) are silent on mandible shape; both keys identify the genera mainly on the presence or absence of midpit on mesoscutum. Tobias et al., (1999) have used the mandible shape for the identification of genera and species. Fischer (1972) divided *Nosopaeopius* in to two groups in his key to species: species with gradually broadening mandible and species with basally expanded or toothed mandible. In this new species the mandible is not abruptly widened basally but gradually broadening towards base.

Li et al., (2013) synonymized *Nosopaeopius* with *Opius* s.s. despite the fact that *Nosopaeopius* also include species with gradually broadening mandible. The new species is thus difficult to place in the classification of Li et al., (2013). However we are not proposing any taxonomic changes and placing the new species as *Opius flavocorporis*.

In both Fischer (1972) and Tobias et al., (1999) the species will run to *Opius crassicus* Thompson which has antenna 27-28 segmented, F1 4 times longer than broad, r issuing from basal 3<sup>rd</sup> of pterostigma and with predominantly black body. *Opius flavocorporis* sp. n is different from *crassicus* because it has 34 segmented antenna, F1 3 times longer than broad, r issuing from center of pterostigma and the colour is predominantly yellow.

*Opius flavocorporis* is adapted to a wide range of temperature. It was collected from high elevation snowfall areas and from plain areas where summer temperature reaches 45<sup>o</sup>C.

**Etymology:** The name is derived from “flavo” (Latin for yellow) and “corporis” (Latin for body) because the body is yellow.

## CONCLUSION AND RECOMMENDATIONS

The Opiinae fauna of Khyber Pakhtunkhwa province need to be further explored for opiine species as these parasitoids are important in the natural and biological control of dipterous pests. Rearing of dipterous pests, especially those infesting fruits and vegetables should be done to ascertain the hosts of these species.

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*Opius flavocorporis* sp. n.; Face



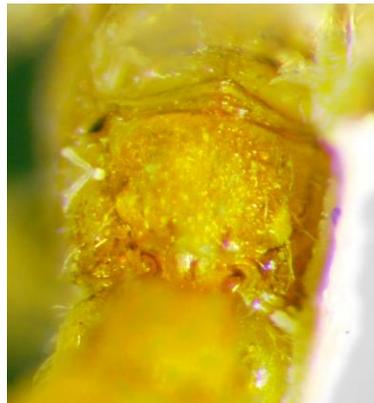
*Opius flavocorporis* sp. n.; Fore wing



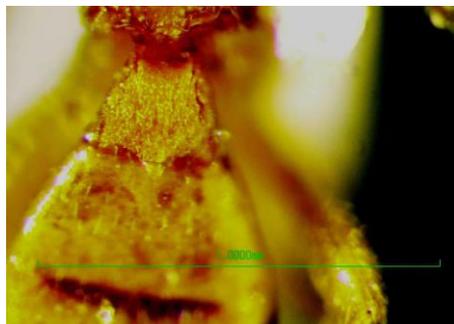
*Opius flavocorporis*; Habitus



*Opius flavocorporis* sp. n. Arrow pointing to a, pronope; b notaulices; c. midpit.



*Opius flavocorporis* sp. n. propodeum



*Opius flavocorporis*; T1



*Opius flavocorporis* sp. n. metasoma



*Opius clypeata* sp. n.; face



*Opius clypeata* sp. n. metasoma and ovipositor



a  
Opius clypeata sp. n. Habitus



Opius clypeata sp. n. Thorax dorsal, showing notauli, midpit



Opius clypeata sp. n. propodeum.



Opius clypeata sp. n. T1