



Short Communication

Colour and Distributional Pattern of *Callaspidia notata* (Boyer de Fonscolombe, 1832) (Hymenoptera: Figitidae: Aspicerinae) from Pakistan

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Authors' Contribution

AGF surveyed and collected the specimens. IB presented the idea of research. MAB did macrophotography and identification. MTR mapped the species. HA, MA and IB wrote the manuscript.

Key words

Colour pattern, Distribution, *Callaspidianotata*, Hymenoptera, Figitidae, Aspicerinae, Pakistan.

ABSTRACT

Callaspidia is a Holarctic genus; some species of *Callaspidia* attack the larvae of order Diptera and Coleoptera. *Callaspidia notata* (Boyer de Fonscolombe, 1832) (Hymenoptera: Figitidae: Aspicerinae) is reported with colour variations like scape, pedicel and basal part of antennal segment 3 slightly darker than remaining segments, scutellum and mesopleura mostly dark reddish with some darker areas, legs also reddish brown except tarsal segments lighter in colouration. Suspected trophic associations with *Ischiodon scutellaris* (F.) via *Aphis nerii* on *Calotropis procera* (Ait.) Ait and *Tinocallis kahawaluokalani* (Kirkaldy) on *Lagerstroemia indica* have been given. Studies suspected that *C. notata* parasitizes the immature of *Ischiodon scutellaris* (F.) like other reported species of this genus. Main diagnostic characters, brief description, morphometrics and illustrations are provided. Comparison of recorded species with type species has been provided. World distribution and distribution in Pakistan has been given using Arc GIS tools.

Genus *Callaspidia* Dahlbom belongs to subfamily Aspicerinae (Hymenoptera: Cynipoidea: Figitidae). The species of this genus possess mostly Holarctic distribution, except one species (*C. formosana*) that is present in the Oriental region (Hedicke, 1913; Ros-Farré and Pujade-Villar, 2009) another (*C. notata*) that has been reported from Holarctic as well as Oriental region (Dalla-Torre and Kieffer, 1910; Hedicke, 1913, 1928; Tavares, 1924; Graham, 1986; Ros-Farré and Pujade-Villar, 2009) and *C. defonscolombi* from the Neotropical region (Ros-Farré and Pujade-Villar, 2009).

The subfamily Aspicerinae is monophyletic and can be recognized by different characters including facial impression and saddle-shaped third abdominal tergum (Ronquist, 1995; Ros-Farré *et al.*, 2000). Eight genera

are included in this subfamily including *Callaspidia* (Ros-Farré, 2007). Dahlbom (1842) proposed the genus *Callaspidia* on the basis of two species: *C. defonscolombi* and *C. westwoodi*. Dalla-Torre and Kieffer (1910) did the last revision of genus *Callaspidia* including six new species of this genus. Ros-Farré and Pujade-Villar (2009) have done the latest revision of this genus and provided a key to six valid species of this genus including *Callaspidia dahlbomi* Ros-Farré and Pujade-Villar n. sp.

The members of this genus can be recognized by the combination of following characters: Occiput with strong transversal carinae; Scutellar foveae about 1/2 as long as scutellum; Vein R1 absent; Petiole at least as long as broad; 3rd tergum with a central patch of pubescence (Ros-Farre, 2007). The biology of *Callaspidia* is not well known. According to certain studies, larvae of dipteran and coleopteran are attacked by some species of *Callaspidia* (Fergusson, 1986; Kirchner, 1867). Rotheray (1979) found that *Callaspidia defonscolombi* was attracted by

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the odour of the aphid. Originally 19 species and two subspecies were included prior to the studies of Ros-Farré and Pujade-Villar (2009). The same authors have redescribed *Callaspidia notata* (Boyer de Fonscolombe, 1832) (Hymenoptera: Figitidae: Aspicerinae). According to them this species might have colour variations of some body parts. Here we report *Callaspidia notata* (Boyer de Fonscolombe, 1832) for the first time from Pakistan along with colour pattern and suspected trophic association.

Materials and methods

The studies were performed during 2018-2019 in various localities of Punjab province of Pakistan. During our surveys for the collection of aphids and their parasitoids, these wasps were collected with the help of insect collection net. They were then killed and preserved in small glass vials in 70% ethanol. Some specimens were preserved dry in vials. Specimens were attached on triangular shaped card and observed under Labomed microscope (CZS6, Labo America, Inc. USA). Identification and observation of colour variations were done by using re-description given by Ros-Farré and Pujade-Villar (2009). LEICA MS 5 (Leica Microsystems (Switzerland) Ltd.) microscope attached with Amscope 18 megapixel camera (Amscope, China) was used for microphotography. Illustrations were processed in Helicon Focus 6 and Adobe Photoshop CS6 (Adobe Inc. USA). Distributional maps of the world and Pakistan were prepared with the help of ARC GIS 10.6.1 (Esri, Redlands, CA, USA) tools. Identified specimens have been deposited in Insect Museum of Department of Entomology, PMAS-AAUR, Pakistan.

Callaspidia notata (Boyer de Fonscolombe, 1832)

Figites notata Boyer de Fonscolombe, 1832: 187; *Onychia notata* Reinhard, 1860: 237; *Homalaspis notata* (Boyer de Fonscolombe) Kieffer, 1898: 266; *Tavaresia notata* (Boyer de Fonscolombe) Kieffer, 1901a: 160; *Callaspidia ligurica* Giraud, 1860: 70; Ros-Farré & Pujade-Villar: 2009: 23; *Onychia ligurica* (Giraud) Förster, 1869: 362; *Onychia rufithorax* Cameron, 1906: 90-91; *Callaspidia rufithorax* (Cameron) Weld, 1952: 169; *Callaspidia binghami*, Hedicke, 1913; Ros-Farré & Pujade-Villar: 2009: 23; *Callaspidia notata* (Boyer de Fonscolombe) Graham, 1986: 39; *Callaspidia dusmeti* Tavares 1924: 20-24 and Ros-Farré & Pujade-Villar: 2009: 23; *Callaspidia mediterranea* Dalla Torre & Kieffer, 1910: 64-65; Ros-Farré & Pujade-Villar: 2009: 23.

Pronotum laterally carinated basally. Scutum with thin transverse carinae between notauli, mainly coriaceous from notauli to parascutal sulcus (Ros-Farré and Pujade-Villar, 2009).

According to Ros-Farré and Pujade-Villar (2009) this species has following coloration of body parts: head black, antenna light brown, scape and pedicel slightly lighter, leg orange, mesosoma black, basally orange, scutellum and mesopleura mostly orange with some darker areas, metasoma black with some orange reflections. They stated that there is a possibility to find some specimens with colour variations ranging from black with some light brown areas to light brown specimens with some darker areas. We found some variations of our specimens as given below.

Scape, pedicel and basal part of antennal segment 3 are slightly darker than remaining segments. Scutellum and mesopleura mostly dark reddish with some darker areas. Legs also reddish brown except tarsal segments lighter in colouration.

Female possesses bright scape and dark pedicel and first third of antennal segment 3. Specimens collected from Rawalpindi and Islamabad possessed darker coloration as compared to those collected from Layyah and Mianwali. This might be due to low temperature ranges in Rawalpindi and Islamabad.

Diagnosis: Head black male (Fig. 1E-H) with transverse carinae in dorsal half. Antennae, thorax and legs dark reddish brown, hind legs slightly darker than other pairs, gaster (abdomen) shiny black and smooth (Fig. 1C). Antenna about 2 mm, 14 segmented, light brown, scape, pedicel and 3rd antennal segment slightly darker as compared to remaining segments. Third antennal segment with outer margin distinctly curved in males. Vertex weakly rugose inside. Gena rounded behind the compound eye, almost smooth, shining and with distinct transverse carinae. Occiput shining and with clear transverse carinae. Pronotum dark reddish brown, coriaceous with a few transverse carinae basally; dorsally coriaceous, sometimes slightly rugose, rarely with weak carinae (Fig. 1A). Scutum coriaceous, with weak transverse carinae, stronger between notauli. Parascutal sulcus mostly smooth, weakly carinated posteriorly. Notauli and median mesoscutal furrow strongly to weakly carinated transversely. Mesosoma dark reddish brown, almost straight (Fig. 1B). Metasoma black. Propodeal carinae straight, sometimes slightly divergent, wider basally than apically. Central area of propodeum pubescent.

Female body ranges from 2.7 to 4.4 mm. Antennae 13 segmented. Third antennal segment straight. Head, antennae, thorax and legs reddish brown, abdomen shiny black. In other characters it is similar to male.

Measurements (mm): In male head: head length (height): 0.36-0.39; head width: 0.9-1; lateral eye diameter: 0.5-0.53; dorsal eye length: 0.36-0.39; dorsal eye

width: 0.15-0.17; distance between compound eyes: 0.46-0.48; distance between compound eye and ocelli: 0.09-0.12.

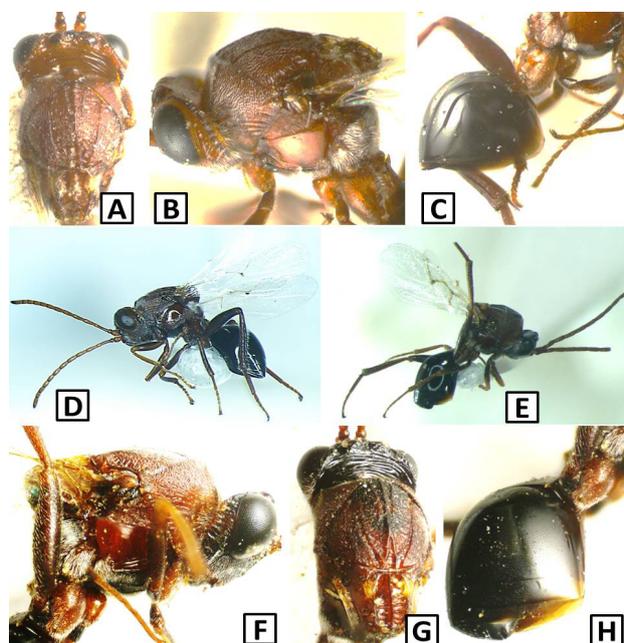


Fig. 1. Morphology of *Callaspidia notata* (Boyer de Fonscolombe, 1832) female (A to D) and male (E to H). A, Dorso-lateral view of head and pronotum (Prosoma and mesosoma); B, Lateral view of mesosoma; C, Metasoma; D, Adult female; E, Adult male; F, Lateral view of mesosoma; G, Dorso-lateral view of head and pronotum (Prosoma and mesosoma); H, Metasoma.

Antennae: Scape: 0.12-0.14; pedicel: 0.062 -0.072; 3rd antennal segment: 0.26-0.28; 4th antennal segment: 0.22-0.25; 5th antennal segment: 0.25-0.26; 6th antennal segment: 0.25-0.26; 7th antennal segment: 0.25-0.26; 8th antennal segment: 0.25-0.26; 9th antennal segment: 0.25-0.26; 10th antennal segment: 0.25-0.26; 11th antennal segment: 0.29-0.3.

Forewing: length: 2.8-2.9; width: 1-1.

Female head: head length (height): 0.38-0.39; head width: 0.98-0.99; lateral eye diameter: 0.4-0.5; dorsal eye length: 0.38-0.39; dorsal eye width: 0.16-0.17; distance between compound eyes: 0.45-0.48; distance between compound eye and ocelli: 0.10-0.12.

Antennae: Scape: 0.11-0.12; pedicel: 0.071-0.072; 3rd antennal segment: 0.25-0.26; 4th antennal segment: 0.22-0.20; 5th antennal segment: 0.20-0.22; 6th antennal segment: 0.18-0.19; 7th antennal segment: 0.18-0.19; 8th antennal segment: 0.13-0.14; 9th antennal segment: 0.11-

0.12; 10th antennal segment: 0.11-0.12; 11th antennal segment: 0.27-0.29.

Forewing: length: 2.8-0.29; width: 1-1.1.

Pakistan: Rawalpindi (PMAS-AAUR) (33.648172N, 73.081733E, 1674 ft) 3♂, 2 ♀, 15.v.2019; Rawalpindi (Nawaz Sharif Park) (33.648608N, 73.077050E, 1686ft) 3♂, 4 ♀, 29.iv.2019; Islamabad (Kachnar Park) (3. 33.672142N, 73.080244E, 1695ft) 3♂, 1 ♀, 9.iv.2019; Islamabad (Daman e koh.) (33.739597N, 73.055481E, 2373ft) 3♂, 2 ♀, 10.v.2018; Layyah (30.984400N, 70.971669E, 482ft) 1♂, 4 ♀, 12.iii.2018; Layyah (30.987789N, 70.964953E, 490 ft) 2♂, 2 ♀, 27.ii.2019; Mianwali (32.585708N, 71.539928E, 697ft) 5♂, ♀, 11.iii.2016; Mianwali (32.561181N, 71.579289E, 696 ft) 3♂, 2 ♀, 19.iii.2019 (voucher specimens were deposited in Insect Museum of Department of Entomology, PMAS-AAUR, Pakistan).

Aphis nerii Fonscolombe (Hemiptera, Aphididae) on *Calotropis procera* (Ait.) Ait. (Asclepiadaceae) (From Layyah and Mianwali area) and *Tinocallis kahawaluokalani* (Kirkaldy) (Hemiptera, Aphididae) on *Lagerstroemia indica* L. (Lythraceae) (from Rawalpindi and Islamabad). In both associations, *Ischiodon scutellaris* (F.) (Diptera, Syrphidae) was suspected to be at the third trophic level. Whenever specimens were collected its maximum population was examined on both plant species. Adults of *I. scutellaris* (F.) were always found to be hovering along the adults of *C. notata*. So it may be suspected that *C. notata* parasitizes the immature of *I. scutellaris* feeding on *Aphis nerii* and *Tinocallis kahawaluokalani*. So further research is needed for the confirmation of this trophic association.

Globally this species is reported in Palaearctic and Oriental regions (Ros-Farré and Pujade-Villar, 2009) (Fig. 2) while in Pakistan it is available Layyah, Mianwali, Rawalpindi and Islamabad.

This species is reported for the first time from various locations of Pakistan. Specimen collected from Pakistan were compared with published description by Ros-Farré and Pujade-Villar (2009) and found to be similar excepting color variations of various body parts. In our observed specimens, mesosoma dark reddish brown, legs also reddish brown except tarsal segments are lighter in coloration as compared to other parts of the leg. Scutellum and mesopleura mostly dark reddish with some darker areas. While in type species as given by Ros-Farré and Pujade-Villar (2009) mesosoma black, basally orange; scutellum and mesopleura mostly orange with some darker areas. Similarly antenna light brown, scape and pedicel slightly lighter, legs orange.

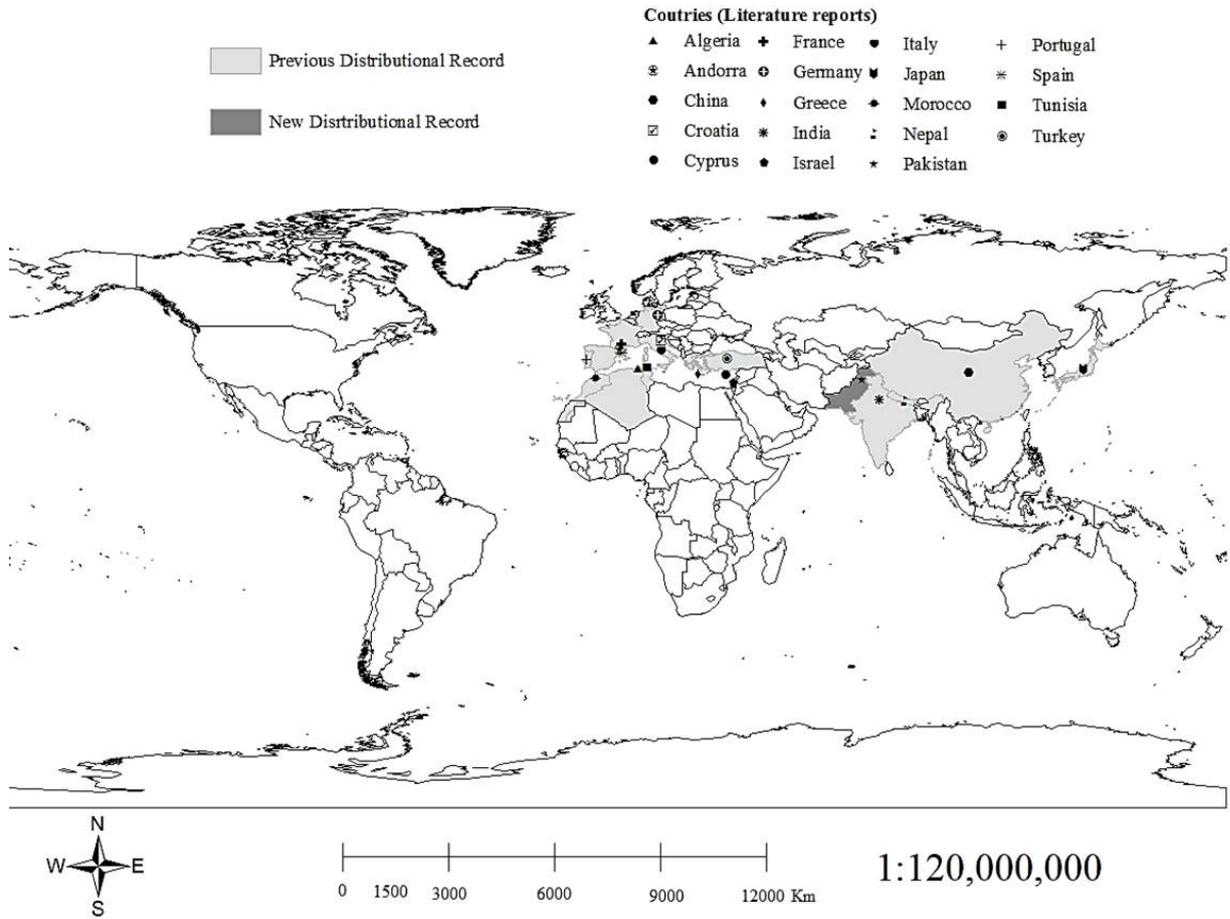


Fig. 2. World distribution of *Callaspidia notata* (Boyer de Fonscolombe, 1832).

Statement of conflict of interest

The authors have declared no conflict of interest.

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