



RESEARCH PAPER

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First Record of genus *Neoclarkinella* Rema and Narendran, 1996 (Braconidae: Microgastrinae) from Pakistan

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Abstract

Neoclarkinella Rema and Narendran, 1996 is a rarely found genus belonging to subfamily Microgastrinae, previously reported only from Philippines, China, Thailand, Malaysia and India. In the present study this genus was explored from Murree, Rawalpindi, Punjab, Pakistan. To collect the specimens sweep net and mouth operated aspirator was used. Killed specimens were preserved and identified in Biosystematics Laboratory, Department of Entomology, PMAS AAUR. Three species of Oriental genus *Neoclarkinella* Rema and Narendran, 1996 namely, *Neoclarkinella janakikkadensis*, *Neoclarkinella punctata* and *Neoclarkinella narendrani* have been reported first time from Pakistan. A key to these species of genus *Neoclarkinella* Rema and Narendran has been provided along with photographs and their distribution range.

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Introduction

Subfamily Microgastrinae belongs to most conspicuous insect order Hymenoptera. Hymenopteran parasitoids involved in more than two thirds of successful biological control cases of insect pests (Irshad, 2008). All members of subfamily Microgastrinae are single leading group of parasitoids of Lepidopterans larvae. Microgastrinae with more than 2,000 reported species is considered as second richest Braconidae subfamily (Yu *et al.*, 2005 ; Jones *et al.*, 2009). As reported by Mason (1981) that Microgastrinae richness comprises approximately 5,000 - 10,000 species; now over 23000 species have been estimated (Yu *et al.*, 2012). Biological control of Lepidopteran pests has been successfully achieved by more than 100 species of this group (Wharton *et al.*, 1997). The Subfamily Microgastrinae is uniquely identified by specific wing venation feature and an antenna with 16 flagellomeres (Nixon, 1965; Mason, 1981; Achterberg, 1984).

Rarely collected Oriental genus of Microgastrinae *Neoclarkinella* is represented by 4 species from India including *Neoclarkinella nilamburensis* (Rema and Narendran, 1996), *Neoclarkinella punctata* (Ahmad *et al.*, 2005), *Neoclarkinella narendrani* (Veena *et al.*, 2014) and *Neoclarkinella janakikkadensis* (Veena *et al.*, 2014).

Neoclarkinella looks like *Clarkinella* (Mason, 1981) by presence of complete median longitudinal along with basal transverse carina, First metasomal tergite parallel-sided on the basal half, narrowing posteriorly, and long and hairy ovipositor sheath throughout. It can be differentiated in appearance from *Clarkinella* by possessing large scutellar lunules whereas these scutellar lunules are small in *Clarkinella*. Forewing areolet absent in *Neoclarkinella* although it is present in *Clarkinella*, and hypopygium medial striate line in *Neoclarkinella* while it is not striate along medial line in *Clarkinella*.

Neoclarkinella also similar in appearance with *Beyarslania* Kocak and Kemal by having absence of areolet in forewing, with middle longitudinal and transverse carina on propodeum, second metasomal

tergite subtriangular and roughly punctured mesonotum (Kocak and Kemal, 2009). *Neoclarkinella* differs from *Beyarslania* pertaining large triangular scutellar lunules and these lunules are absent in *Beyarslania*, hypopygium large and medial striate line in *Neoclarkinella* while it is short and not striate along medial line in *Beyarslania* and First metasomal tergite not having a medial groove as it is present on T1 in *Beyarslania*. Braconid fauna of Pakistan needs to be explored and requires much research to produce a comprehensive list. The present study reveals a first report of Oriental genus *Neoclarkinella* in Pakistan together with illustrated key of three species of genus *Neoclarkinella*. Diagnosis of the three Oriental species is provided.

Materials and methods

A survey was conducted in Pothwar tract of Punjab for collection of Braconid wasps during 2016-17. Specimens were collected using sweep net over host plants including grasses and weeds from forest of Murree and brought in the Biosystematics laboratory Department of Entomology, PMAS- Arid Agriculture University Rawalpindi Pakistan. Ethanol was used to preserve examined specimens and Hexame thyl disilazane (HMDS) was used for further processing and later on mounted on card. Illustration of identified species were made under Labomed CZM6 stereozoom microscope (10x/22 W.F). Measurements of body parts were taken by Micrometry and measuring scale. Photographs were taken by attaching camera over Labomed CZM6 stereozoom microscope (10x/22 W.F). All specimens are deposited in Department of Entomology PMAS-AAUR, Pakistan.

Terminology

For illustration of morphological terms, followed Achterberg (1988), Austin and Dangerfield (1992), for terms of wing venation followed the Comstock-Needham (Eady, 1974; Achterberg, 1979) and for sculpturing description follow Eady (1968) and Harris (1979). The 'medial field' term (after Nixon, 1965) was used to narrate delimited medial part on metasomal tergites.

Key to the Oriental species of *Neoclarkinella* Rema and Narendran

1. Small scutellar lunules; T1 rugose on apex (Fig. 1-d); width of eye 2.4 x than medial temple in lateral view; head 2x as wide as face in anterior view.....*Neoclarkinella janakikkadensis* (Veena et al., 2014).
- Large Scutellar lunules; T1 punctate on apex (Fig. 2-d); width of eye 2.4 x than medial temple in lateral view; head 2x as wide as face in anterior view2.
2. First metasomal tergite (T1) about 3.6x long than its apical width; sub-triangular shape second metasomal tergite (T2) without any sidewise elevation (Fig. 2-d); height of mesosoma 0.53x its length; pterostigma 0.29x as wide as long; vein m-cu 0.74x as long as r; r 0.9x as long as 2SR; pterostigma 0.8x as long as R1.*Neoclarkinella punctata* (Ahmad et al., 2005).
- First metasomal tergite (T1) 2.6x as long as its apical width; triangular shape second metasomal tergite (T2) with sidewise elevation (Fig.3-d); height of mesosoma 0.9x its length; width of pterostigma 0.3x its length (Fig.3-e); vein m-cu 0.71x as long as r; r 1.0x as long as 2SR; pterostigma 0.83x as long as R1*Neoclarkinella narendrani* (Veena et al., 2014)

Neoclarkinella janakikkadensis (Veena et al., 2014)

Material examined: Pakistan, Murree, Kuldana, 3♂ 55.315 N, 073° 24.212 E, 1(♀), 1(♂), 20.vii.2017, Coll. Noushaba Nargis.

Diagnosis

In anterior view head oval shaped (Fig. 1-b); head 2x as wide as face; face coarsely punctate, faintly rugose, pilose with well-defined median carina (Fig. 1-b); clypeus glossy, roughly punctate and hairy; basal width of mandible 0.5x length of malar space; distance between lateral ocelli (POL) 1.25x distance from lateral ocelli (OOL) to edge of eye; antennae more long than body length. Punctate and scattered pubescent mesoscutum; small scutellar lunules; glossy and roughly punctate scutellum, deep smooth

crenulated furrows are bordered by lateral sides of scutellum; rugose propleuron; punctate mesopleuron on anterior side, smooth on posterior side; distinct median carina and transverse carina at basal end of propodium (Fig. 1-d); Pterostigma 4.2x its width; R1 1.24x as long as pterostigma; width of pterostigma 0.75x length of vein r; 2SR is 1.1 x as long as r vein; vein r is almost as long as m-cu; hindwing with convex vannal lobe; vein 2 r-m present; length of hind femur 2.9x its width; hind tibia 5.7x as long as its width; T1 2.9x as long as apically wide, punctate, narrowing towards apex, U-shaped area on basal half and punctate towards apex (Fig. 1-d); T2 with subtriangular shape, smooth without sidewise elevation and posterior margin convex (Fig. 1-d); remaining metasomal tergites less pilose.

Distribution: India, Pakistan.

Remarks: *Neoclarkinella janakikkadensis* reported as a new record for Pakistan.

Discussion: *N. janakikkadensis* is more closely related to *N. punctata* by having almost same length of vein r and almost 1.4 x width of pterostigma, subtriangular shape second metasomal tergite without side-wise elevation, but differentiate in the following characters: distance from lateral ocelli to edge of eye (OOL) 0.8x distance between lateral ocelli (POL) in *N. janakikkadensis* as OOL 1.2x POL in *N. punctata*, T1 rugose on apex in *N. janakikkadensis* but it is punctate in *N. punctata*; narrow scutellar lunules in *N. janakikkadensis* but these are wide in *N. punctata*.

Neoclarkinella punctata (Ahmad et al., 2005)

Material examined: Pakistan, Murree, Kuldana, 3♂ 55.315 N, 073° 24.212 E, 2 (♂), 20.vii.2017, Coll. Noushaba Nargis.

Diagnosis

In anterior view head oval shaped with not clearly defined punctate clypeus, vertex and temple (Fig. 2-b); basal width of mandible about as long as malar space; indistinctly punctate, pilose face with a median longitudinal carina and smooth occiput; distance from lateral ocelli to edge of eye (OOL) 1.25x as long

as distance between lateral ocelli (POL); mesoscutum with strongly punctate, pilose and on apex lightly punctate; mesopleuron smooth on medio-posterior side, roughly punctate remaining area; white pilose propodeum observed with distinct longitudinal carina and transverse carina on basal side (Fig. 2-d); pterostigma 3.3x as long as wide; pterostigma 0.8x as long as R₁; 2SR 1.12 x as long as r; m-cu 0.7x as long as r (Fig 2-e).

slightly convex vannal lobe of hind wing and slightly pilose, 2r-m present; smooth and large hind coxa, slightly punctate; hind femur 0.86x as long as hind tibia; T₁ about 3.6x long than its apical width; narrowing towards apex, T₁ with broad U-shaped area on basal half and punctate on apex (Fig 2-e); T₂ smooth and sub triangular shape and convex on posterior margin.

Distribution: India, Pakistan.

Remarks: *Neoclarkinella punctata* reported as a new record for Pakistan.

Discussion: Species resemble to *Neoclarkinella narendrani* as having punctations on first metasomal tergite (T₁), length of hind femur 0.85x length of hind tibia; but differs in the following characters: T₁ subtriangular shape without sidewise elevation but in *N. narendrani* T₁ triangular shape with sidewise elevation, T₁ 0.28x as wide as long but in *N. narendrani* T₁ 0.4 x as wide as long; face, vertex, clypeus not clearly punctate but in *N. narendrani* strong punctuation exist.

***Neoclarkinella narendrani* (Veena et al., 2014)**

Material examined: Pakistan, Murree, Kuldana, 33° 55.315' N, 73° 24.212' E, 3 (♂), 20.vii.2017, Coll. Noushaba Nargis.

Diagnosis

Head oval shaped anteriorly (Fig. 3-b); width of head 0.5x its length in dorsal view; face, clypeus punctate and slightly pubescent (Fig. 3-b); temple, vertex slightly punctate; smooth occiput (Fig. 3-c); basal

width of mandible 0.5x length of malar space; distance between lateral ocelli (POL) almost equal to distance from lateral ocelli to edge of eye (OOL); antennae 1.1x as long as body length; height of mesosoma 0.9x its length.

Mesoscutum and scutellum punctate; large scutellar lunules; propleuron punctate and scattered pubescent was observed on propleuron; mesopleuron punctate on antero-lateral side.

Distinct median carina was observed on propodeum and a transverse carina on basal one third part, slightly rugulose sculpturing on remaining part of propodeum (Fig. 3-d), hind tibia almost as long as hind femur; width of pterostigma 0.3x its length; length of R₁ 1.2x length of pterostigma; length of r 1.4x length of m-cu; 2SR length 1.0x as length of r; convex vannal lobe of hind wing is observed; vein 2r-m also present (Fig. 3-e). T₁ 2.5x as long as its width on apical side; T₁ punctate, tapering towards posterior side (Fig. 3-d); T₂ triangular shape with elevated portion lateral side (Fig. 3-d).

Distribution: India, Pakistan.

Remarks: *Neoclarkinella narendrani* reported as a new record for Pakistan.

Discussion: Species closely resembled to *N. punctata* by punctuation on first metasomal tergite (T₁); this species closely resembled to *N. janakikkadensis* by having following characters: width of pterostigma 0.75x length of vein r, convex margin of vannal lobe; but differentiate from both species on the following basis: First metasomal tergite (T₁) is triangular shape.

With sidewise elevation whereas in *N. janakikkadensis* and *N. punctata* T₁ is subtriangular shape without side elevation; pterostigma 2.5x as long as its width but in *N. janakikkadensis* and *N. punctata* pterostigma more than 3x long than its width; length of 2SR 1x than length of vein r whereas in *N. janakikkadensis* and *N. punctata* length of 2SR more than 1x than length vein r.

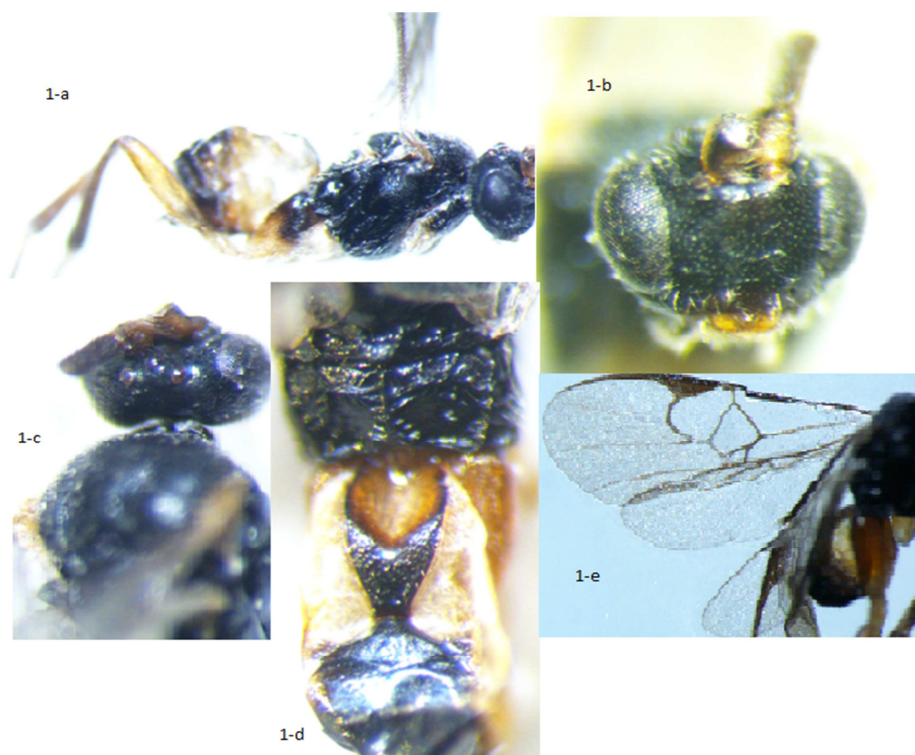


Fig. 1. *Neoclarkinella janakikkadensis* Female a) habitus lateral view, b) head anterior view, c) head dorsal view, d) propodeum and metasoma dorsal view, f) forewing.

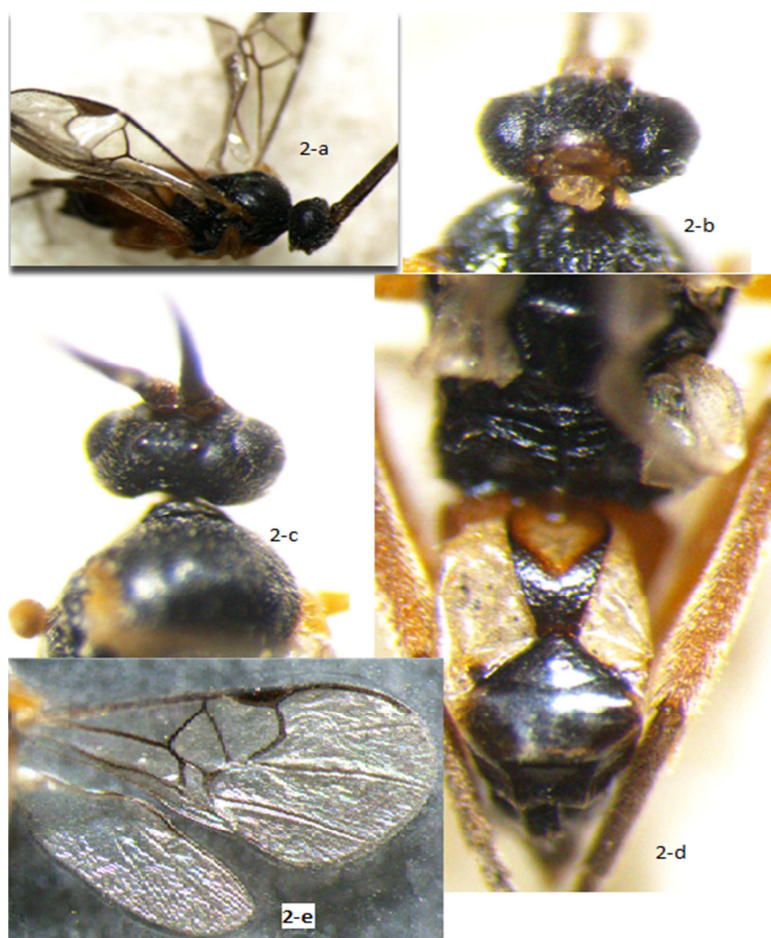


Fig. 2. *Neoclarkinella punctata* male a) habitus lateral view, b) head anterior view, c) head dorsal view, d) propodeum and metasoma dorsal view, e) forewing.

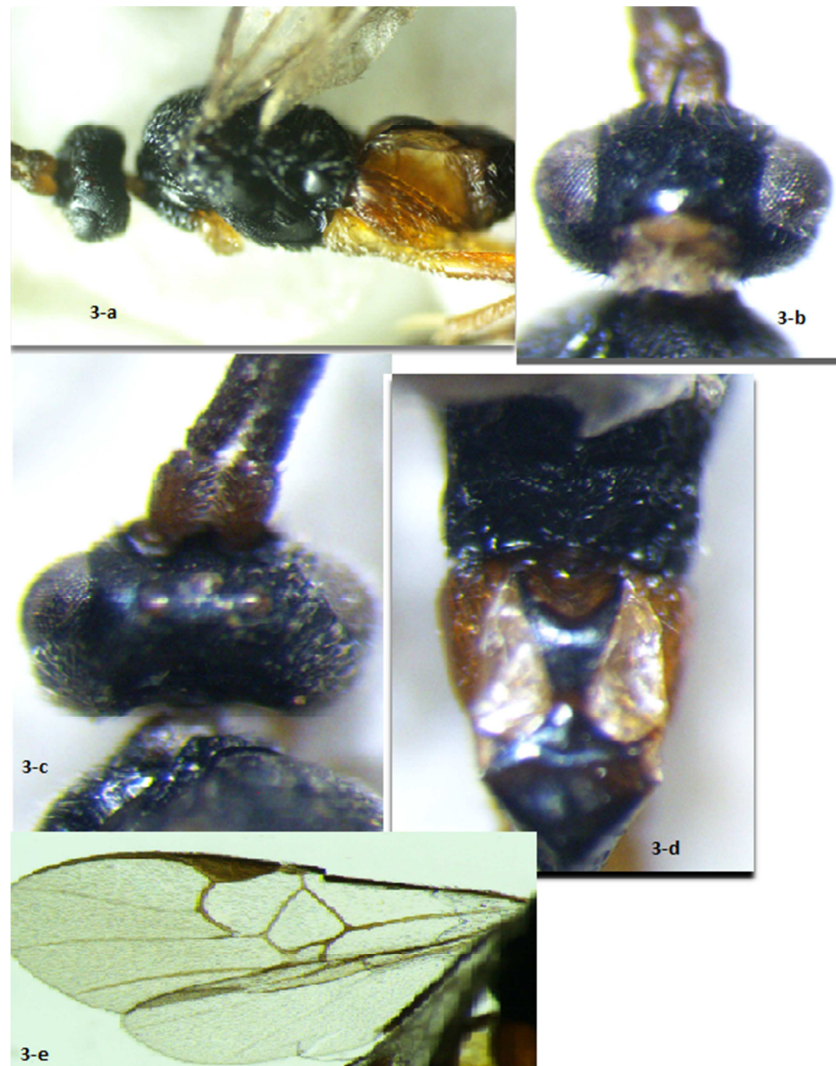


Fig. 3. *Neoclarkinella narendrani* male, a) habitus lateral view, b) head anterior view, c) head dorsal view, d) propodeum and metasoma dorsal view, f) forewing.

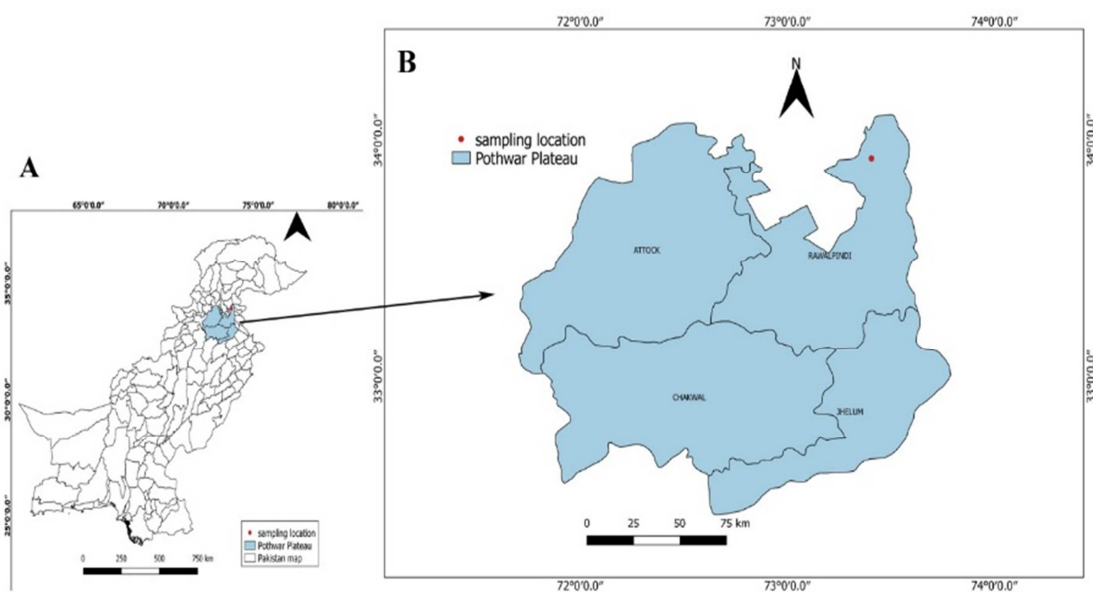


Fig. 4. A)-distributional map of Pakistan B)-distributional map of study area showing sampling location.

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References

- Achterberg C.** 1979. A revision of the subfamily Zelinae auct. (Hymenoptera, Braconidae). Tijdschrift Voor Entomologie **122**, 241-279.
- Achterberg C.** 1984. Essay on the phylogeny of Braconidae (Hymenoptera: Ichneumonoidea). Entomologisk tidskrift **105**, 41-58.
- Achterberg C.** 1988. Revision of the subfamily Blacinae Foerster (Hymenoptera: Braconidae). Zoologische Verhandelingen Leiden **249**, 1-324.
- Ahmad Z, Pandey K, Haider AA, Shujaiddin.** 2005. Description of a new species of the genus *Neoclarkinella* Rema & Narendran (Hymenoptera: Braconidae) from India. Journal of the Bombay Natural History Society **102(2)**, 208-209.
- Austin AD, Dangerfield PC.** 1992. Synopsis of Australasian Microgastrinae (Hymenoptera: Braconidae) with a key to genera and description of new taxa. Invertebrate Taxonomy **6**, 1-76.
- Eady RD.** 1968. Some illustrations of microsculpture in the Hymenoptera. Proceedings of the Royal Entomological Society of London, Series A **43**, 66-72.
- Eady RD.** 1974. The present state of nomenclature of wing venation in the Braconidae (Hymenoptera); its origins and comparison with related groups. Journal of Entomology, Series B (Taxonomy) **43**, 63-72.
- Harris RA.** 1979. A glossary of surface sculpturing. California Department of Food and Agriculture, Bureau of Entomology, Occasional Papers **28**, 1-31.
- Irshad M.** 2008. Biological control of insects and weeds in Pakistan. D.G.Administration. Higher Education Commision Islambad Pakistan 319 P.
- Jones OR, Purvis A, Baumgart E, Quicke DL.** 2009. Using taxonomic revision data to estimate the geographic and taxonomic distribution of undescribed species richness in the Braconidae (Hymenoptera: Ichneumonoidea). Insect Conservation and Diversity **2(3)**, 204-212.
- Kocak AO, Kemal M.** 2009. A replacement name in the family Braconidae (Hymenoptera). Miscellaneous papers, Centre for Entomological Studies Ankara 147-148 P.
- Mason WRM.** 1981. The polyphyletic nature of *Apanteles* Foerster (Hymenoptera: Braconidae): a phylogeny and reclassification of Microgastrinae. Memoirs of the Entomological Society of Canada **115**, 1-147. <http://dx.doi.org/10.4039/entm113115fv>
- Nixon GEJ.** 1965. A reclassification of the Tribe Microgasterini (Hymenoptera: Braconidae). Bulletin of the British Museum (Natural History), Entomology **2** (Supplement), 1-284.
- Rema CG, Narendran TC.** 1996. A remarkable new genus of Braconidae (Hymenoptera) from India. Journal of the Bombay Natural History Society **93**, 264-267.
- Veena T, Ranjith AP, Santhosh S, Kishore L.** 2014. Review of the Oriental genus *Neoclarkinella* Rema and Narendran, 1996 (Hymenoptera: Braconidae, Microgastrinae) with the description of two new species from India. Zootaxa **3857(3)**, 423-432.
- Wharton RA, Marsh PM, Sharkey MJ. Eds.** 1997. Manual of the new world genera of the family Braconidae (Hymenoptera). The International Society of Hymenopterists, Washington DC, USA. 395 P.
- Yu DS, Van Achterberg K, Horstmann K.** 2005. World Ichneumonoidea 2004 Taxonomy, Biology, Morphology and Distribution. Taxapad, Vancouver. British Columbia, Canada.