

**Iranian *Eretmocerus*-species
including two new Species**
(Hymenoptera: Chalcidoidea: Aphelinidae)
Parasitoids of Whiteflies
(Sternorrhyncha: Aleyrodidae)

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Abstract : The genus *Eretmocerus* Haldeman (Hymenoptera: Chalcidoidea: Aphelinidae) contains species which are important biological control agents of whiteflies (Homoptera: Aleyrodidae). A key to the *Eretmocerus* species of Iran with descriptions and illustrations of two new species, *Eretmocerus neomaskelliae* Abd-Rabou & Ghahari and *Eretmocerus ostovani* Ghahari & Abd-Rabou, and collection data and re-descriptions for the 14 previously described species present in Iran are provided.

Key words: Hymenoptera, Chalcidoidea, Aphelinidae *Eretmocerus*, Hemiptera, Aleyrodidae, Iran, biological control, new species

Introduction

The genus *Eretmocerus* Haldeman, 1850 [Hymenoptera: Aphelinidae] consists of approximately 50 described species (HAYAT 1998; DE BARRO et al. 2000) of minute wasps that parasitize whiteflies (Hemiptera: Sternorrhyncha: Aleyrodidae). The general morphology of *Eretmocerus* species is consistently similar. Except for a few species that have exceptional differences in antennal configuration, forewing shape, chaetotaxy or body pigmentation, it is difficult to differentiate species. Detailed morphological studies have been conducted (ROSE & ZOLNEROWICH 1997; ZOLNEROWICH & ROSE 1998) to discern the significance of cryptic but consistent differences between populations that can be reliably used to

discriminate species. Morphological studies such as these that are based on the examination of series of specimens mounted on microslides is important in understanding the degree of variation in the chaetotaxy, sculpture, and body pigmentation of a species and allows for the replication and quantification of the size and shape of homologous features. Comparisons of these characters among and between specimens in series help define consistent similarities and differences. The female antenna is composed of the radicle, scape, pedicel, two funicular segments and an elongate, unsegmented club. Males are easily recognized by their antennae which lack funicular segments and have an extremely elongate, unsegmented club.

Eretmocerus species are solitary, primary parasites. Eggs are deposited under the venter of whitefly larvae. The egg hatches from beneath the whitefly and the wasp larva enters the hosts through an incision made in the venter of the whitefly. *Eretmocerus* species attack many genera of whiteflies in the subfamily Aleyrodinae including various important pest species, and have been used effectively in several biological control programs (ROSE & DEBACH 1991–92; ROSE & ZOLNEROWICH 1997; GHAHARI 1999); no *Eretmocerus* species have yet been reported to attack whiteflies belonging to the subfamily Aleurodicinae.

One of the key management challenges posed by whiteflies especially in the case of *Bemisia tabaci* (Genn.) complex is the ability to develop resistance against insecticides. This is further compounded by the lack of effective insecticides and difficulties in obtaining minor use registration for new effective products in Iran. For this reason, reliance on insecticides as the sole means of managing infestations was considered at best a short-term solution. It is generally considered that long-term, sustainable management of *B. tabaci* complex requires an integrated approach in which a range of management strategies are combined to control the pest. One of the key components in achieving this in other countries has been the use of natural enemies, in particular parasitic Hymenoptera of the family Aphelinidae (GHAHARI 1999). Reductions in the number of whiteflies, through the use of natural enemies, may delay or decrease the need for applications of insecticides, thereby reducing selection pressure on insecticide resistance (DE BARRO et al. 2000). Research has indicated that parasitoids offer the best potential for control (DE BARRO 1995; GOOLSBY et al. 1998).

Until recently, severe infestations of whiteflies on outdoor crops in Iran were not known to occur; and consequently, there had been very little research conducted on these organisms in the country. Therefore, it was concluded that research into the management of *B. tabaci* complex should be initiated before the inevitable economic effects of the pest were felt. Prior to the present study, virtually nothing was known of the fauna of whitefly parasitoids in Iran.

COMPERE (1936) published the first comprehensive key to species of *Eretmocerus*. Several of the descriptions of *Eretmocerus* species, particularly those published before COMPERES 1936 publication, are inadequate and do not provided sufficient morphological details to clearly distinguish them from similar species. However, recent works in North America (ROSE & ZOLNEROWICH 1997; ZOLNEROWICH & ROSE 1998), India (HAYAT 1998), Australia (DE BARRO et al. 2000) and Egypt (ABD-RABOU & EVANS 2002) have increased our understanding of the morphological criteria needed to characterize species in this genus. *Eretmocerus* species are considered to offer great potential as effective biological control agents of whiteflies in Iran; they are consistently among the best-performing parasitoids both in the laboratory and the field in other countries (GOOLSBY et al. 1998). The present paper describes the morphological criteria that are sufficiently discriminatory to enable separation of the different species of *Eretmocerus* attacking whiteflies in Iran.

Materials and Methods

Parasitized whiteflies (Sternorrhyncha: Aleyrodidae) from throughout Iran were collected in a series of surveys undertaken from 1994 – 2004. Surveys were carried out in all of the 28 provinces of Iran. Parasitized nymphs were placed in emergence chambers. After the parasitoids emerged, they were removed and placed in vials containing 75% ethanol and stored at room temperature. Each specimen was given a unique code number to identify the location and date of collection, the host plant, the host whitefly species and the collector. All *Eretmocerus* specimens used in this study were slide mounted as described by PLATNER et al. (1999) and identified using identification keys published by TRJAPITSIN et al. (1996), ROSE & ZOLNEROWICH (1997), HAYAT (1998), ZOLNEROWICH &

ROSE (1998) and ABD-RABOU & EVANS (2002). Whiteflies were identified to species by using keys to the fourth-instar pupal case published by BINK-MOENEN 1983; MARTIN 1999; MARTIN et al. 2000; and GHAHARI & HATAMI 2001. All the specimens examined in this study (*Eretmocerus* spp., whiteflies, and host plants) are deposited in the Department of Agriculture, Shahr-e-Rey Islamic Azad University (SRAU), Tehran, Iran and Plant Protection Research Institute, Dokki, Giza, Egypt (PPRI).

Results and Discussion

Fourteen *Eretmocerus* species were collected from the different regions of Iran including two new species, *Eretmocerus neomaskelliae* **n. sp.** and *Eretmocerus ostovani* **n. sp.** that are described and illustrated. Collection data and redescriptions are provided for the fourteen previously described species collected in Iran.

Eretmocerus Haldeman, 1850:111

Type species: *Eretmocerus corni* Haldeman, by monotypy

Syn.: *Ricinusa* Risbec, 1951:403

Type species: *Ricinusa aleyrodiphaga* Risbec; synonymy according to FERRIGRE, 1965:170

Key to the *Eretmocerus*-species from Iran

- 1 Mesoscutum with 2–4 setae 2
- 1b Mesoscutum with 6–setae 7
- 2(1) Antennal club short, 4.5x or less longer than wide 3
- 2b Antennal club medium to long, 5x or more longer than wide 5
- 3(2) Mesoscutum with 1 pair of setae; each parapsis with 3 setae; antennal club 4x as long as wide *neomaskelliae* **n. sp.**
- 3b Mesoscutum with 2 pairs of setae; antennal club 3.5–4.5x as long as wide 4
- 4(3b) Antennal club 4.1–4.5x as long as wide with beaked apex, male abdomen pale *debachi* Rose & Rosen
- 4b Antennal club 3.5x as long as wide with rounded apex of club rounded; male abdomen with dark brown spots *neobemisiae* Jasnosh

- 5(2b) F1 trapezoidal to quadrate, mesoscutum with 2 pairs of setae *mundus* Mercet
- 5b F1 triangular, mesoscutum with 1 or 2 pairs of setae 6.
- 6(5b) Mesoscutum with 1 pair of setae; club 5.25–7.0x as long as wide; male with antennal pedicel yellow *diversiciliatus* Silvestri
- 6b Mesoscutum with 2 pairs of setae; club 5x as long as wide; male with antennal pedicel dark brown *nikolskajae* Myartseva
- 7(1b) Club short, less than 5x as long as wide 8
- 7b Club medium to long, as long or longer than 5.0x as long as wide 11
- 8(7) Mesoscutum with 4 pairs of setae; club 3–4x as long as wide *cadabae* Viggiani
- 8b Mesoscutum with 3 pairs of setae; club 4–5x as long as wide 9
- 9(8b) T1 with 2 setae; TII with 2–4 setae; and TIII–IV each with 4 setae; antennal club 4x as long as wide *flavus* Krishnan & David
- 9b T1–IV of gaster each with 2 setae; antennal club 4x or more as long as wide 10
- 10(9b) Club about 4x as long as wide; ovipositor nearly as long as mid tibia, propodeum brownish *breviclavus* Subba Rao
- 10b Club slightly less than 5x as long as wide; ovipositor longer than mid tibia; propodeum pale yellow *trialeurodis* Hayat
- 11(7b) F1 anelliform; F2 transverse *serius* Silvestri
- 11b F1 and F2 quadrate, trapezoidal or subtriangular 12
- 12(11b) Anterior pair of setae on scutellum minute, less than 0.5x the length of the posterior pair of scutellar setae; each parapsis with 2 pairs of setae; marginal fringe less than 0.2x as long as forewing width *ostovani* n. sp
- 12b Anterior pair of setae on scutellum long, more than 0.5x the length of the posterior pair of scutellar setae; each parapsis with 3 pairs of setae; marginal fringe longer than 0.2x forewing width 13
- 13(12b) Marginal vein about as long as stigmal vein; scape at least 0.66x as long as club; the latter 5.5–6.0 as long as wide with apex slightly beaked *longiscapus* Hayat
- 13b Marginal vein longer than stigmal vein; scape shorter, at most 0.6x as long as club; the latter 5–8.3x as long as wide with apex not beaked forewing lightly infuscate behind venation with basal third distinctly infuscate; club 5–6.5x as long as wide *adustiscutum* Krishnan & David

1. *Eretmocerus adustiscutum* Krishnan & David

Eretmocerus adustiscutum Krishnan & David, 1996:33; HAYAT (1998)

Eretmocerus corni Hayat, 1972:104, misidentification according to HAYAT (1998)

Eretmocerus paulistis Khan & Shafee, 1980:368, misidentification according to HAYAT (1998)

Female: Body pale yellow, except axillae, metanotum and propodeum yellowish brown, and gaster dark brown. Fore wing usually with a distinct infuscation under the submarginal vein fading distally. Frontovertex width slightly more than 0.5x head width. Setae on eyes fine, each nearly as long as an ommatidium. Radicle and pedicel subequal in length, each slightly less than 0.5x times the length of the scape. Scape 0.75x frontovertex and about 0.5x clava, the latter fusiform, or at least narrowed basally and apically, slightly to distinctly flattened, and 5–6.5x as long as wide. Mesoscutum and scutellum with 6 and 2 long setae, respectively; each parapsis with 3 setae. Fore wing slightly less than 2.5x its maximum width (FWW). Marginal fringe slightly less than 0.33x as long as FWW. Marginal vein slightly longer than stigmal vein. Submarginal vein and anterior margin of marginal vein each with 3 setae. Hind wings 6.5–7.75x as long as wide. Marginal fringe slightly longer than FWW. Mid tibial spur about 0.5x the length of midbasitarsus, the latter about 0.38x of mid tibia. Ovipositor usually a little longer than or subequal in length to both mid tibia and clava.

Male: Similar to female except for the antennal structure and sexual characters.

Material examined: Iran: Kerman (southeastern Iran): Jiroft, 2♂♂, 1♀, 17.v.2002, H. GHAHARI, ex *Lipaleyrodes euphorbiae* David & Subramanian on *Euphorbia pulcherrima* [Euphorbiaceae]; Khorasan: Mashhad, 4♂♂, 30.ix.2003, Z. KARIMIAN, ex *Bemisia tabaci* (Genn.) complex on *Crataegus microphylla* [Rosaceae].

Discussion: HAYAT (1998) lists this species from India on *Bemisia tabaci* (Genn.) complex, *Trialeurodes ricini* (Misra), and two unidentified aleyrodids.

2. *Eretmocerus breviclavus* Subba Rao

Eretmocerus breviclavus Subba Rao, 1984:257; HAYAT (1998)

Female: Body length 0.60–0.62 mm. Frontovertex 0.54x head width. Club nearly 3.5x as long as wide. Radicle less than 0.5x length of scape. Club about 4.0x as long as wide, slightly narrower at apex. Mesoscutum with 6 setae, distance between anteromedial setae less than that between the posteromedial pair. Scutellum with 2 pairs of long setae.

Each parapsis with 3 setae. Forewing nearly 2.2x as long as wide. Marginal fringe 0.25x FWW. Marginal vein with 3 setae along its anterior margin, sometimes an additional small setae present at base. Mid tibial spur slightly less than 0.5x the length of midbasitarsus. Ovipositor about as long as mid tibia and longer than club.

Male: Similar to female except for the antennal structure and sex characters.

Material examined: Iran: Mazandaran (northern Iran): Behshahr, 3♂♂, 1♀, 14.viii.2001, H. GHAHARI, ex *Aleurocanthus zizyphi* Priesner & Hosny on *Ficus carica* [Moraceae]. Golestan (northeastern Iran): Gonbad, 2♂♂, 8.vii.2002, Z. KARIMIAN, ex *Aleurocanthus woglumi* Ashby on *Citrus sinensis* [Rutaceae].

Discussion: Hayat 1998 lists this species reared from an undetermined species of whitefly on *Murraya koenigii* [Rutaceae] in India.

3. *Eretmocerus cadabae* Viggiani

Eretmocerus cadabae Viggiani, 1982:30

Female: Body length 0.80 mm. Body entirely yellowish. Radicle 4x as long as wide, slightly longer than 0.5x length of scape. Pedicel 2x as long as wide. First funicular segment (F1) minute and triangular-shaped. F2 annelliform, 2x as wide as long. Club spatulate and 3.5x as long as wide. Mesoscutum with 8 setae. Scutellum with 4 setae. Metanotum and propodeum very short and narrow. Forewing very broad, slightly more than twice as long as wide. Submarginal vein with 2 setae. Fringe not longer than stigmal vein. Legs with middle spur slightly longer than half length of the basitarsus.

Male: Similar to female but with brown mainly on mesoscutum, metanotum, propodeum and gaster. Antennal club about 10–11x longer than wide.

Material examined: Iran: Gilan (northern Iran): Rasht, 4♂♂, 2♀♀, 26.ix.2002, H. GHAHARI, ex *Aleuroplatus pectiniferus* Quaintance & Baker on *Ficus capensis* [Moraceae].

Discussion: VIGGIANI (1982) described this species from Ethiopia from *Aleuroplatus cadabae* Priesner & Hosny.

4. *Eretmocerus debachi* Rose & Rosen

Eretmocerus debachi Rose & Rosen, 1992:200; ROSE & ZOLNEROWICH (1997)

Female: Body yellow. Mesoscutum with 4 setae. Parapsis with 2 setae. Club 4.1–4.5x as long as its greatest width, with deflexed (beaked) apex.

Male: Mesoscutum with dark fuscous “T” shape, scutellum completely fuscous.

Material examined: Isfahan (central Iran): Isfahan, 6♂♂, 15.v.1999, H. GHAHARI, ex *Parabemisia myricae* (Kuwana) on *Citrus bigaradia* [Rutaceae]; Gilan (northern Iran): Lahijan, 5♂♂, 16.iv.2004, H. GHAHARI, ex *P. myricae* on *Citrus aurantifolia*.

Discussion: This species was described from specimens reared from *Parabemisia myricae* in California (USA) and has been introduced into Spain, France, Israel, Italy and Turkey (NOYES 2004).

5. *Eretmocerus diversiciliatus* Silvestri

Eretmocerus diversiciliatus Silvestri, 1914:366; Gerling (1970)

Female: Body length 0.55–0.62 mm. Club 7 times as long as wide. Mesoscutum with two setae. Marginal vein subequal in length to stigmal vein. Fore wing comparatively narrow with the disk sparsely ciliated. Marginal fringe 1/3 times as long as the width of disk. Ovipositor 1.14x longer than club.

Male: Similar to female except for antennal structure, color of pedicel (yellowish) and sexual characters.

Material examined: Iran: Kermanshah (western Iran): Kermanshah, 8♂♂, 4♀♀, 11.viii.2003, H. GHAHARI, ex *Aleuroclava similis* (Takahashi) on *Amaranthus retroflexus* [Amaranthaceae].

Discussion: SILVESTRI (1914) described this species from specimens reared from an aleyrodid in Nigeria. GERLING (1970) reported this species from *Aleurocanthus hansfordi* Corbett from Kenya, and described it as a new species, *E. roseni*, from specimens reared from *Acaudaleyrodes citri* [= *A. rachipora* (Singh)] in Israel and misidentified by ROSEN (1960) as *Eretmocerus diversiciliatus*.

6. *Eretmocerus flavus* Krishnan & David

Eretmocerus flavus Krishnan & David, 1996:32; HAYAT (1998)

Female: Body and antennae pale yellow. Posterior ocelli about 1.5 diameters of an ocellus from eye margins. Eyes setose, each seta longer

than an ommatidium Radicle and pedicel subequal in length and each slightly less than 0.5 times as long as of scape. Scape shorter than frontovertex width. Club nearly 4.0 times as long as wide. Mesoscutum and parapsis with 6 and 3 setae, respectively. Wings hyaline. Fore wing nearly 2.5 times as long as wide. Marginal fringe about 0.25 times as long as the width of disc. Marginal and stigmal veins subequal in length. Mid tibial spur 0.42 times of basitarsus. Mid basitarsus 0.42 times of mid tibia. Ovipositor 1.28 times as long as mid tibia and 1.4 times as long as club.

Male: Unknown.

Material examined: Iran: Isfahan (central Iran): Najaf-Abad, 6♂♂, 5.x.2001, H. GHAHARI, ex *Lipaleyrodes euphorbiae* David & Subramaniam on *Euphorbia prostrata* [Euphorbiaceae].

Discussion: KRISHNAN & DAVID (1996) described this species from India on *Lipaleyrodes euphorbiae* David & Subramaniam.

7. *Eretmocerus longiscapus* Hayat

Eretmocerus longiscapus Hayat, 1998:110

Eretmocerus haldemani; HAYAT (1972), misidentification according to HAYAT (1998)

Female: Body length 0.60–0.70 mm. Body golden yellow, except venter of thorax, Legs and gaster pale yellow. Wings hyaline. Fore wing lightly infusate behind venation. Frontovertex 0.45 times of head width, and narrower than length of scape. Radicle 0.4 times of scape and slightly shorter than pedicel. Scape long, projecting distinctly above anterior ocellus. Club at least slightly more than 5.0 times as long as wide and broadest in distal half. Each parapsis with 3 setae. Fore wing 2.3 times as long as wide. [Submarginal vein, anterior margin of marginal vein?], and linea clava proximad with 3, 3, and 12–15 setae, respectively. Hind wing about 6.5 times as long as broad. Marginal fringe nearly as long as the width of disc or slightly shorter. Mid tibial spur 0.5 times of basitarsus. Mid basitarsus 0.4 times of mid tibia. Ovipositor distinctly longer than both mid tibia and club.

Male: Similar to female except for the usual antennal.

Material examined: Iran: Semnan (central Iran): Damghan, 7♂♂, 3♀♀, 11.v.2000, H. SAKENIN, ex *Aleurolobus marlatti* (Quaintance) on *Verbena officinalis* [Verbenaceae]; Khorasan (eastern Iran) Mashhad:

3♂♂, 1♀, 28.ix.2002, H. GHAHARI, ex *Aleurolobus vitis* Danzig on *Vitis vinifera* [Vitaceae].

Discussion: HAYAT (1998) described this species from India on *Aleurolobus* sp. near *niloticus*.

8. *Eretmocerus mundus* Mercet

Eretmocerus mundus Mercet, 1931:395; ZOLNEROWICH & ROSE (1998); HAYAT (1998)

Eretmocerus aligarhensis Khan & Shafee, 1980:365; synonymy according to HAYAT (1998)

Eretmocerus longipilus Khan & Shafee, 1980:366; synonymy according to HAYAT (1998)

Female: Body length 0.61–0.63 mm. Body pale yellow. Fronto-vertex slightly more than 0.5 times of head width, slightly narrower than scape length. Frons and occiput with transverse, substrigulate microsculpture. Lower face more vertically substrigulate. Radicle 3.6–3.8 times as long as wide. Scape 5.1–6.4 times as long as wide, 2.4–2.6 times length of radicle, 1.9–2.3 times length of pedicel, 7.0 times length of club. Pedicel 2.6–3.4 times as long as wide, 1.1–1.2 times length of radicle, 0.5 times length of scape, 0.34–0.37 times length of club. First funicular segment (F1) 1.0–1.5 times as long as wide. F2 1.1–1.7 times as long as wide. Clava 5.6–6.8 times as long as wide, 1.4–1.5 times length of scape, 2.7–3.4 times length of pedicel. Apex of club truncate. Linea clava proximad with 6–10 setae. Mesoscutum with 4 and with reticulate sculpture except posteriorly longitudinally reticulate and posteromedially longitudinally reticulate to substrigulate. Each parapsis with 2 setae and reticulate to substrigulate sculpture. Axilla with 1 seta and substrigulate sculpture. Scutellum with longitudinally reticulate sculpture laterally and substrigulate sculpture medially and with 4 setae. Wings hyaline. Fore wing very lightly infusate behind venation. Forewing length 0.57–0.62 mm, 3.0–3.6 times as long marginal fringe, 0.20–0.31 times maximum width of disc. Longest posterior alary fringe 0.36–0.45 times width of disc. Basal cell of wing with 1 seta. Costal cell distally with 2–3 setae. Marginal vein markedly longer than stigmal. Anterior margin of marginal vein with 3–4 long setae. Linea clava closed posteriorly by setae. Approximately 5–9 tubercles present on ventral surface of wing near posterior end of linea clava. Hindwing 7.4–7.9 times as long as wide. Mid tibial spur nearly 0.33 times of basitarsus. Mid basitarsus 0.46 times of

mid tibia. Ovipositor slightly exserted, 1.0–1.1 times as long as antennal club, 1.3–1.6 times as long as scape, 1.0–1.1 times length of midtibia. Ovipositor slightly longer than both mid tibia and antennal club.

Male: Similar to female except for body with more brownish suffusions on thorax, pedicel dark brown, and club 15–16 times longer than wide.

Material examined: Iran: Fars (southern Iran): Darab, 9♂♂, 5♀♀, 12.viii.1994, H. AL-E-MANSOOR, ex *Bemisia tabaci* (Genn.) complex on *Gossypium hirsutum* [Malvaceae]; Golestan (northeastern Iran), Gorgan, 13♂♂, 7♀♀, 8.viii.1998, Z. KARIMIAN, ex *Bemisia tabaci* (Genn.) complex on *Hibiscus esculentum* [Malvaceae]. Tehran: Varamin, 5♂♂, 3♀♀, 24.v.1999, A. A. TALEBI, ex *Bemisia tabaci* (Genn.) complex on *Gossypium hirsutum*. Mazandaran: Ghaemshahr, 7♂♂, 5♀♀, 2.vi.2003, H. GHAHARI, ex *Rosanovia hulthemiae* Danzig on *Ajuga gorganica* [Labiateae]. Mazandaran: Behshahr, 3♂♂, 10.ix.2003, H. GHAHARI, ex *Aleyrodes loniceræ* Walker on *Crataegus microphylla* [Rosaceae].

9. *Eretmocerus neobemisiae* Jasnosh

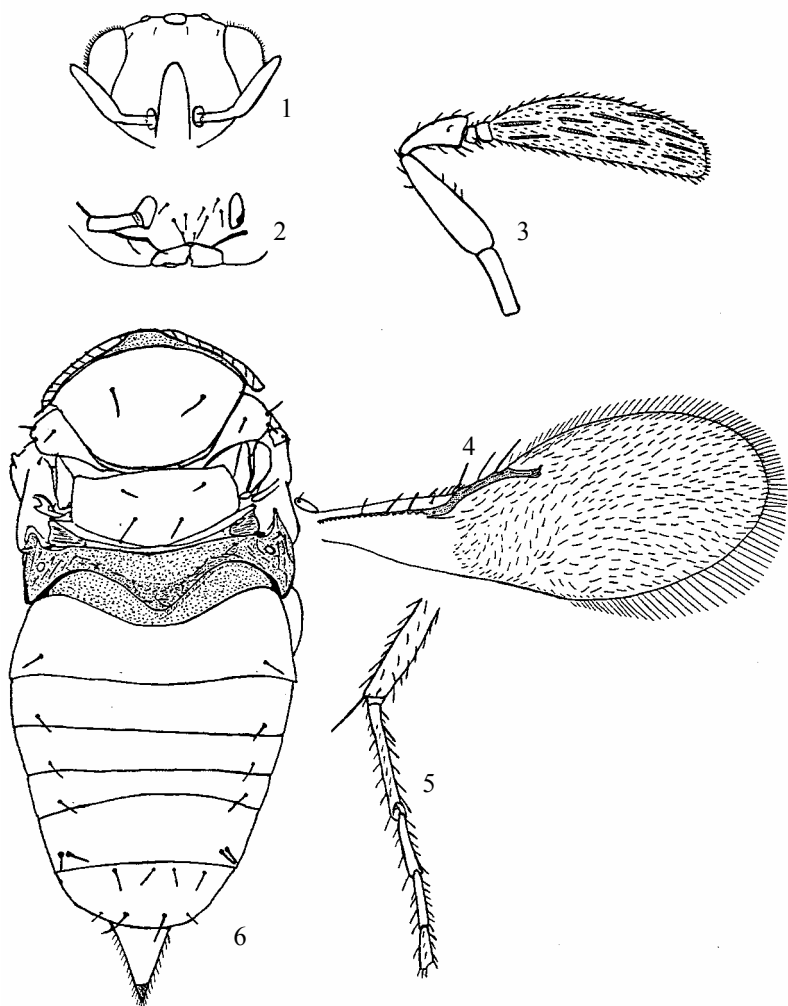
Eretmocerus neobemisiae Jasnosh, 1974:713

Female: First funicular segment triangular and smaller than second segment. Antennal pedicel 3 times longer than wide. Club broadened apically. Forewing fringe length about 1/5 times as long as the width of disc. club $42/12=3.5$; pedicel $10/3=3.3$; scape $15/4=3.75$; p/c = 0.24; p/sc = 0.66.

Male: Body length 0.8–1.0 mm. Pedicel triangular, not longer than wide. Club slightly more than 10 times longer than wide.

Material examined: Iran: Golestan (northeastern Iran), Gonbad, 3♂♂, 1♀, 9.v.2001, Z. KARIMIAN, ex *Asterobemisia atrophaxius* (Danzig) on *Atraphaxis spinosa* [Polygonaceae]; Gilan (northern Iran), Fooman, 2♂♂, 3.x.2002, H. GHAHARI, ex *Asterobemisia carpini* (Koch) on *Corylus avellana* [Betulaceae].

Discussion: JASNOSH (1974) described this species from Georgia on *Asterobemisia* [= *Neobemisia*] *atrophaxius*.



Figs. 1–6: *Eretmocerus neomaskelliae* **n. sp.**, female: 1) Head, 2) Mandible, 3) Antenna, 4) Fore wing, 5) Middle leg, 6) Thorax and gaster.

10. *Eretmocerus neomaskelliae* Abd-Rabou & Ghahari n. sp.

(Figs 1–6)

Female: Length 0.59–0.64 mm. Head yellow brown. Malar space infusate brown. Tips of mandible reddish brown. POL nearly 2.2 times OOL. Posterior ocelli slightly more than one ocellus diameter to eye margins. Pronotum, mesoscutum except a median yellow line, mesepimeron and metapleuron brown. Axilla light brown. Metanotum, propodeum especially on sides, brown to dark brown. Legs yellow with last tarsal segments brown. Gaster dorsum yellow brown. Frontoververtex with at least 4 pairs setae of which 2 pairs around ocellar triangle. Vertex-occipital margin with a long seta at each side and a line of setae between these two long setae. Eyes setose, each seta slightly longer than an ommatidium. Frons and occiput with transverse, substrigulate microsculpture; lower face more vertically substrigulate. Radicle 4 times as long as wide, slightly longer than half length of scape. Pedicel twice as long as wide. F1 minute, triangular, F2 annuliform. F1 and F2 slightly longer than wide. Club 4 times as long as wide with a rounded apex. Mesoscutum with 2 setae, anterior half with reticulate sculpture, posteriorly longitudinally reticulate, posteromedially longitudinally reticulate to substrigulate. Each parapsis with 3 setae and substrigulate sculpture. Axilla with 1 seta and reticulate to substrigulate sculpture. Scutellum with longitudinally reticulate sculpture laterally, substrigulate medially and with 4 setae. Endophragma usually extending to almost the posterior margin of gastral tergite 2.

Wings hyaline. Forewing length 0.55–0.70 mm, 2.8–3.0 times as long as wide, 2.5–2.7 times as long as the width of disc. Longest setae of marginal fringe on anterior margin 0.12–0.20 times maximum width of disc, longest marginal fringe seta on posterior margin of wing 0.30–0.38 times width of disc. Basal cell with 1 seta. Costal cell distally with 4–6 setae. Anterior margin of marginal vein with 3 long setae, separated from linear calva by irregular row of about 8 setae. Linea calva closed posteriorly by setae. Approximately 12–15 tubercles present on ventral surface of wing near posterior end of linea calva. Hindwing 6.5–7.5 times as long as wide. Mid tibial spur 0.60 times length of basitarsus. Length of hind tibial spur subequal to mid tibial spur.

Gastral tergite I with weak, transverse reticulate microsculpture, becoming more substrigulate laterally. Gaster about 1.25 times as long as thorax. T1–VII with 1+1, 1+1, 1+1, 1+1, 2+2, 2+2, 4 setae. Ovipositor longer (1.35 times) than mid tibia and subequal to club. Ovipositor sub-

equal to slightly longer than first and second valvula. Second valvifer 2.6 times as long as third valvula, the latter approximately subequal to mid basitarsus (18:19). Ovipositor stylets 1.25 times as long as ovipositor.

Material examined: Holotype (♀) and 6♀♀ paratypes: Iran: Mazandaran (northern Iran), Ghaemshahr, 25.viii.2003, H. GHAHARI, ex *Neomaskellia bergii* (Signoret) on *Sorghum halepense* [Graminae], deposited in SRAU and PPRI.

Comments: This is the third species of *Eretmocerus* having only 2 setae on the mid lobe of the mesoscutum; the other two species being *E. diversiciliatus* Silvestri and *E. bisetae* Hayat. It is easily distinguished from *E. diversiciliatus* by its short antennal club which is only 4 times as long as wide versus 7 times longer than wide in *E. diversiciliatus*. It is most similar to *Eretmocerus bisetae* Hayat described from a *Dialeurodes*? species on *Ficus religiosa* from India, which also has a short antennal club, but is only 3.3x as long as wide and has a beaked apex.

11. *Eretmocerus nikolskajae* Myartseva

Eretmocerus nikolskajae Myartseva, 1973:80

Female: First funicular segment nearly triangular, smaller in size than second segment. Club broadened apically. Forewing fringe length reaches about 1/3 as long as the width of disc. Mesoscutum with 2 pairs of setae; club spatulate, 5x as long as wide; submarginal vein with 3 setae.

Male: Body length 0.9–1.1 mm. Pedicel two times longer than wide. Club slightly more than 10 times longer than wide.

Material examined: Iran: Golestan (northeastern Iran), Gorgan, 4♂♂, 1♀, 26.iv.2001, H. GHAHARI, ex *Bulgarialeurodes cotesii* (Maskell) on *Rosa hemisphaerica* [Rosaceae]; Khorasan, Kashmar, 3♂♂, 19.vi.2002, M. HOSSEINI, ex *Tetralicia erianthi* Danzig on *Rununculus arvensis* [Rununculaceae]; Mazandaran (Northern Iran), Babol, 5♂♂, 2♀♀, 10.vii.2003, H. GHAHARI, ex *B. cotesii* on *Rosa canina* [Rosaceae]. MYARTSEVA (1973) described this species from Turkmenistan reared from *Bulgarialeurodes cotesii* and *Tetralicia erianthi*.

12. *Eretmocerus ostovani* Ghahari & Abd-Rabou n. sp.

(Figs 7–13)

Female: Length 0.62–0.66 mm. Head dorsum, thoracic dorsum and gaster yellow brown. Face, malar space, venter and sides of thorax pale brown. Pronotum anterior margin narrowly yellow, rest of thoracic

dorsum and sides of gaster with brown suffusions. Tips of mandibles reddish brown. Radicle and scape pallid, pedicel and flagellum pale yellow. Legs entirely yellow; gaster yellow brown. Axilla dark brown.

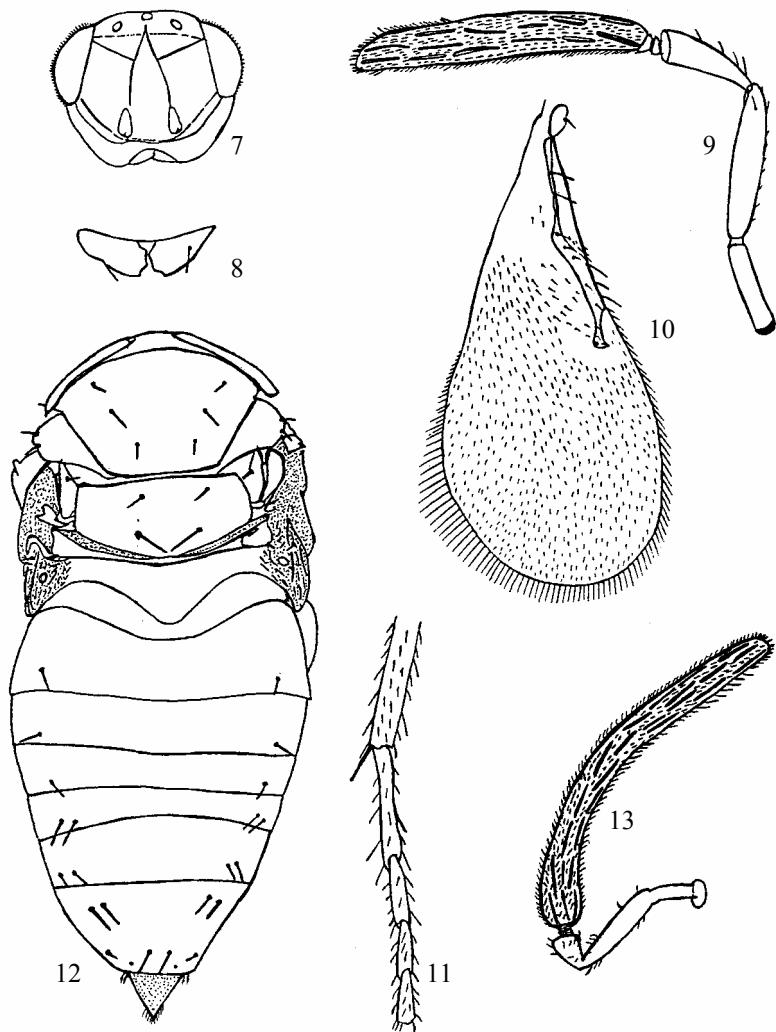
Frontovertex usually slightly more than 0.5 times of head width. Posterior ocelli 1.5–2 times their diameters to eye margins. POL more than 2.6 times of OOL (40:17). Eyes shortly setose, setae not visible at lower magnifications, each seta shorter than an ommatidium. Radicle slightly longer than 0.5 times of scape and nearly as long as pedicel. Pedicel twice as long as wide Scape slightly shorter than frontovertex width. Club subcylindrical, slightly flattened. Mesoscutum with 6 setae, second pair of mesoscutal setae longer than posterior pair. Each parapsis and axilla with 2 and 1 setae, respectively. Scutellum with 4 long setae. Posterior pair of scutellar setae longer than third pair of mesoscutum setae. Axillar setae and the anterior pair of scutellar setae minute. Median length of propodeum only slightly less than scutellar length. below the marginal and stigmal veins, before the closed speculum. Fringe not longer than stigmal vein. Hindwing 7.5 times as long as broad. Marginal fringe slightly shorter than the width of disc. Disc almost bare except for the usual lines of very fine setae distad of venation, immediately under marginal vein and along posterior margin. Legs with middle spur shorter than half length of basitarsus. Mid tibial spur 0.45 times of basitarsus. Hindtibial spur slightly shorter than midtibial spur.

Gaster 1.3 times as long as thorax. TI – VII with setae as follows: 1+1, 1+1, 1+1, 2+2, 2+2, 2+2, 6. Ovipositor subequal in length to first and second valvulae, slightly longer (1.15 times) than mid tibia and 1.35 times as long as club. Second valvifer 2.3 times as long as third valvula, the latter slightly shorter than mid basitarsus (17:21). Ovipositor stylets 1.15 times as long as ovipositor.

Male: Similar to female except for the usual antennal structure.

Material examined. Holotype (♀), 7 ♂♂ and 10 ♀♀ paratypes: Iran: Mazandaran (Northern Iran): Behshahr, 22.ix.2003, H. GHAHARI, ex *Aleyrodes elevatus* Silvestri on *Ficus religiosa* [Moraceae], deposited in SRAU and PPRI.

Comments: The new species is dedicated to the first authors' colleague, Dr. Hadi OSTOVAN, Department of Entomology, Science and Research Branch, Teheran Islamic Azad University.



Figs. 7–13: *Eretmocerus ostovani* n. sp., female: 7) Head, 8) Mandible, 9) Antenna, 10) Fore wing, 11) Middle leg, 12) Thorax and gaster, 13) Male antenna.

13. *Eretmocerus serius* Silvestri

Eretmocerus serius Silvestri, 1928:46; GERLING (1970); HAYAT (1998)

Female: Body yellow. Radicle about 0.33 times of scape. Pedicel less than 0.5 times length of scape. F1 small and ring-like, F2 small and triangular. Club about 7.0 times as long as wide. Mesoscutum with 6 setae. Wings hyaline. Fore wing slightly less than 2.5 times as long as broad. Marginal fringe about 0.2 times as long as the width of disc. Marginal vein distinctly longer than stigmal. Submarginal and marginal veins with 2 and 3 setae, respectively. Disc excluding the circum-marginal setae, with less than 100 setae. Mid tibial spur about 0.5 times of basitarsus. Ovipositor as long as mid tibia and shorter than club.

Male: Similar to female except for the 3-segmented antenna.

Material examined. Iran: Khusestan (southwestern Iran) Ahwaz, 4♂♂, 2♀♀, 27.vii.1998 (F. KOCHIL) ex *Bemisia tabaci* on *Hibiscus esculentum* [Malvaceae]; Azarbayjan (Western North Iran): Ourmieh, 2♂, 1.x.1999 (S. Aramideh) ex *Aleurocanthus spiniferus* (Quaintance) on *Citrus bigaradia* [Rutaceae]; Fars (southern Iran) Shiraz, 3♂♂, 1♀, 10.vii.2001, S. Hesami, ex *Aleurocanthus woglumi* Ashby on *Citrus aurantium* [Rutaceae].

Discussion: This is an Asian species known from Myanmar, Malaysia, Singapore, Sri Lanka, Thailand that was introduced into Cuba, South Africa, Central and South America for the control of the citrus blackfly, *Aleurocanthus woglumi*. HAYAT (1998) stated that he considered the records of *E. serius* from hosts other than *Aleurocanthus woglumi*, as dubious, and probable misidentifications for *Eretmocerus delhiensis*.

14. *Eretmocerus trialeurodis* Hayat

Eretmocerus trialeurodis Hayat, 1998:108

Female: Body length 0.50–0.55 mm. Body yellow. Head dorsum, mesoscutum and scutellum yellow-brown. Antenna and legs pallid. Eyes setose, setae fine and each seta longer than an ommatidium. Radicle and pedicel subequal in length, each less than 0.5 times of scape. Scape about 0.6 times of clava club at least slightly less than 5 times as long as wide, broadest in distal half, and with apex very slightly beaked. Mesoscutum and parapsis with 6 and 3 setae. Setae on mesoscutum and scutellum long. Sculpture fine and weak, hardly visible at higher magnification. Mid basi-

tarsus 0.37–0.42 times of mid tibia. Mid tibial spur 0.45 times of basitarsus. Ovipositor distinctly longer than both mid tibia and club.

Male: Unknown.

Material examined: Iran: Kerman (southeastern Iran) Jiroft, 4♂♂, 3.ix.2003, H. GHAHARI, ex *Trialeurodes ricini* (Misra) on *Ricinus communis* [Euphorbiaceae].

Comment. HAYAT (1998) reported this species from India on *Trialeurodes ricini*.

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