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Eupholidoptera karatolosi sp.n. and *E. mirzayani* sp.n. (Orthoptera, Tettigoniidae), two new bushcrickets from Greece and Iran

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Abstract

Eupholidoptera karatolosi Mofidi-Neyestanak & Quicke from Greece and *E. mirzayani* Mofidi-Neyestanak & Quicke from Iran, two new species of bushcrickets (Orthoptera, Tettigoniidae: Platycleidini), are described and distinguished from closely related species based on morphology. Species relationships within *Eupholidoptera* Maran are discussed and some species are given new assignments. A simplified illustrated identification key to the species of *Eupholidoptera* is provided to accommodate the new species. They are being described since they have been used to generate DNA sequence data that will be published elsewhere as part of a phylogenetic study of the tribe Platycleidini.

Key words: *Eupholidoptera*, Platycleidini, new species, description, morphology, Mediterranean

Introduction

The Tettigoniidae is a heterogeneous group with more than 1120 recognised genera and 6800 species and are the largest family within the Orthoptera (Bisby *et al.*, 2007). They are also one of the most widespread Old World groups of the order (Jago, 1997). Bushcrickets usually live in the open, mainly dry habitats over a wide range of altitudes, and the Mediterranean region has an especially diverse tettigoniid fauna (Samways, 1989; Çiplak, 2003). Among the Mediterranean countries, Greece is very rich in *Eupholidoptera* Maran species and their allies (Willemse, 1980; Willemse, 1984; Nadig, 1985) and more than third of the species of this genus have been collected from there (Bisby *et al.*, 2007; Eades *et al.*, 2007).

Eupholidoptera is a relatively large genus (Tilmans, 2002), with 45 current recognised species. A checklist giving type-localities is presented (Table 1). Originally Ramme (1951) suggested *Eupholidoptera* as a genus for a group of *Pholidoptera* Wesmael species. However, this was invalidly published because he did not mention any type-species for this new genus (Koçak, 1981). Subsequently Maran (1953) designated *Locusta chabrieri* Charpener as the type-species of *Eupholidoptera* thus making this name available.

Morphologically, the species of *Eupholidoptera* are rather uniform and identification can be difficult. In particular, females of most species are very alike those of the type species and in some cases almost impossible to distinguish. Morphological identification has been mostly done by examining male abdominal terminalia (Karabağ, 1961; Willemse, 1980; Ünal & Naskrecki, 2002; Ünal, 2006) but female terminalia are also valuable and have been used in their taxonomy (Ramme, 1930, 1951; Bey-Bienko, 1967; Harz, 1969; Adamovic, 1972; Salman, 1983; Tilmans, 2002).

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TABLE 1. Accepted species of *Eupholidoptera* (Bisby *et al.*, 2007; Eades *et al.*, 2007).

Valid species of *Eupholidoptera* Maran	Type locality
E. akdeniz Ünal & Naskrecki, 2002	Turkey: Hatay Province
E. anatolica (Ramme, 1930)	Turkey: Güllik-Dagh
E. annamariae Nadig, 1985	Greece: Crete
E. annulipes (Brunner von Wattenwyl, 1882)	Turkey: Taurus
E. astyla (Ramme, 1927)	Greece: Naxos
E. beybienkoi Peshev, 1962	Bulgaria: Lukovit
E. cephalonica Willemse, F. & Willemse, L., 2004	Greece: West
E. chabrieri (Charpentier, 1825)	Cyprus
E. cretica Ramme, 1951	Greece: Crete
E. cypria Ramme, 1951	Syria: Abde; Turkey
E. demirsoyi Salman, 1983	Turkey
E. epirotica (Ramme, 1927)	Turkey: Epirus
E. excisa (Karabağ, 1952)	Turkey: Adana Province
E. femorata Çiplak, 1999	Turkey: Anatolia, Sertavul Pass
E. forcipata Willemse & Kruseman, 1976	Greece: Crete
E. gemellata Willemse & Kruseman, 1976	Greece: Crete
E. giuliae Massa, 1999	Greece: Crete
E. hesperica La Greca, 1959	Italy: Atella
E. icariensis Willemse, F., 1980	Greece
E. jacquelinae Tilmans, 2002	Greece: Crete
E. karabagi Salman, 1983	Turkey
E. kinzelbachi Harz, 1981	Greece: Lanonia
E. krueperi (Ramme, 1930)	Turkey: Makri (Fethiye)
E. latens Willemse & Kruseman, 1976	Greece: Crete
E. leucasi Willemse, F., 1980	Greece
E. lyra (Uvarov, B. P., 1942)	Israel: Nazareth
E. makani Peshev, 1960	Bulgaria: Petritsch
E. marashensis Salman, 1983	Turkey
E. mariannae Willemse & Heller, 2001	Greece: Crete
E. megastyla (Ramme, 1939)	Greece: Zante Island
E. mersinensis Salman, 1983	Turkey
E. palaestinensis (Ramme, 1939)	Israel: Tiberias
E. pallipes Willemse & Kruseman, 1976	Greece: Crete
E. prasina (Brunner von Wattenwyl, 1882)	Turkey: Smyrna (Izmir)
E. raggei Salman, 1983	Turkey
E. rammei Willemse & Heller, 2001	Greece: Crete
E. sevketi (Ramme, 1933)	Turkey
E. smyrnensis (Brunner von Wattenwyl, 1882)	Macedonia: Agais
E. spinigera (Ramme, 1930)	Turkey: Cerico
E. tahtalica (Uvarov, B. P., 1949)	Turkey: South West
E. tasheliensis Çiplak, 1999	Turkey: Antalya
E. tauricola (Ramme, 1930)	Turkey: Taurus
E. tucherti Harz, 1988	Turkey
E. unimaculata Karabağ, 1956	Turkey: Nazimiye
E. werneri Ramme, 1951	Syria

Materials and methods

Terminology mainly follows Harz (1969). Two new terms are proposed:

Fastigium to hind Femur apex Length (FFL): instead of measuring body length, which is the traditional way of indicating length of orthopterans, the FFL defined as the length from head (fastigial vertex) to apex of hind femur when the femur is horizontal (*i.e.* directed posteriorly) (Fig. 1). This measurement is used because it provides a more consistent estimate of size since the abdomen of dry pinned material of many orthopteroids tends to shrink to various extents and in addition, females may be collected just after egg lying when the abdomen is more elongated than is normally the case.

Collar: the transition area between arm and base in titillators (Fig. 30). This term is used to indicate the characteristics of the male genitalia of the *E. karatolosi* **sp.n.** in comparison with those of closely related species.

Measurements of the smaller body parts were made with a dissecting microscope fitted with a graticule micrometer eyepiece and of larger parts with electronic digital callipers (± 0.01mm) (Rapid Electronics Ltd, 86-1478).

Photographs were taken using Minolta DiMAGE-Z1 digital camera and drawings were made by computer graphic editing facilities of Corel Draw™ from digital photographs. The titillators from dried material were drawn after softening the specimens in water vapour, dissecting them out, and removing residual tissue. Titillators of the alcohol-preserved samples were dissected out and freed of tissue directly. All the dissected genitalia are retained with the specimens.

Abbreviations for depositories of material are HMIM, Hayk Mirzayans Insect Museum, Tehran, Iran and BNHM, Natural History Museum, London, UK.

Descriptions

Genus *Eupholidoptera* Maran, 1953

Type-species: *Locusta chabrieri* Charpentier, 1825

Eupholidoptera karatolosi sp.n.
(Figs 1, 2, 5, 7, 14, 18, 21, 24, 25, 30)

Holotype: GREECE, Ellinoprigos, 39° 23' 59" N, 21° 44' 8" E, 600m, 15 June 2005, Col. Nikolaos Karatolos (sweep net) (HMIM).

Paratypes: 4 males and 2 females, same data as for holotype (1 male and 1 female BMNH; 3 males and 1 female HMIM).

Etymology: The new species is named after Nikolaos Karatolos, the collector of samples.

Diagnosis—differs from the type-species, *E. chabrieri*, as follows: Male: titillators longer, arms straight and parallel; cerci thinner, the basal tooth stronger; tergum 9 with a small emargination medially; tergum 10 deeply emarginated dorsal-medially with two posterior downwards-directed and bent blunt lobes. Female: sternum 7 with a small projection and subgenital plate with V-shaped excision.

Description—male (holotype): Fastigium frontal groove 0.68mm; upper fastigial width 2.0mm; pronotum length 11.6mm; metazona length 6.6mm; pronotal width at sulcus 5.0mm; prozona least width and metazona greatest width 3.3mm and 6.5mm respectively; tegmina length 5.9mm; wing length 0.8mm; longitudinal and transversal inner diameter of speculum 2.42mm and 2.25mm respectively; tegminal stridulatory pegs 95 with 26 on the middle third; fore femur 7.5mm long; hind femur 24.9mm long and 5.0mm maximally wide; sub-

genital plate 3.7mm long and 2.9mm wide; cercus 3.0mm long and 0.6mm wide medially; FFL 36.1mm. Head: slightly sloping in lateral view. Lateral margins of fastigium slightly curved; fronto-fastigial groove much narrower than width of the scapus. Pronotum elongated backwards, longitudinal median keel indistinct; discus more or less flattened; sulcus located proximally to middle; metazona longer than prozona, very slightly elevated, without lateral edge, hind margin round; discus very smoothly dotted; humeral notch very shallow. Fore tibiae with 3 dorsal spines, with 6 anterior-ventral and 6 posterior-ventral spines. Tibial tympana slit shape, similar externally and internally. Fore femur armed with 3 spines anterior-ventrally; mid femur unarmed; hind femur armed with 3 spines internal-ventrally, tip with four spurs ventrally, internals shorter and externals not particularly long; hind metatarsal flap (pulvillus) slightly more than half of metatarsus length. Micropterous, tegmina slightly visible, covered mostly by pronotum. Stridulatory file on the upper side of left tegmen on a raised swelling, the portion with widest pegs proximally to the mid. Wings very small. Hind margin of tergum 9 with shallow emargination medially; hind margin of tergum 10 emarginated deeply dorsal-medially with two posterior downwards-bent-extended lobes. Cercus at distal half bent inwards, without apical spine and with strong basal internal tooth that is shorter than width of cercus at point of emerging. Subgenital plate keeled medial-longitudinally, bilobate with deep excision, with two long styles longer than half of length of subgenital plate, at base of each with a long projection ending to two sharp backwardly pointing spines. Titillators long, collar thickened, arms without spines, elongated, parallel, with sharp ends and with wrinkled surface basad, base significantly without spines, the fused half (next to arms) not thickened basad and the free half bent upwards, long and reaching to the collar.

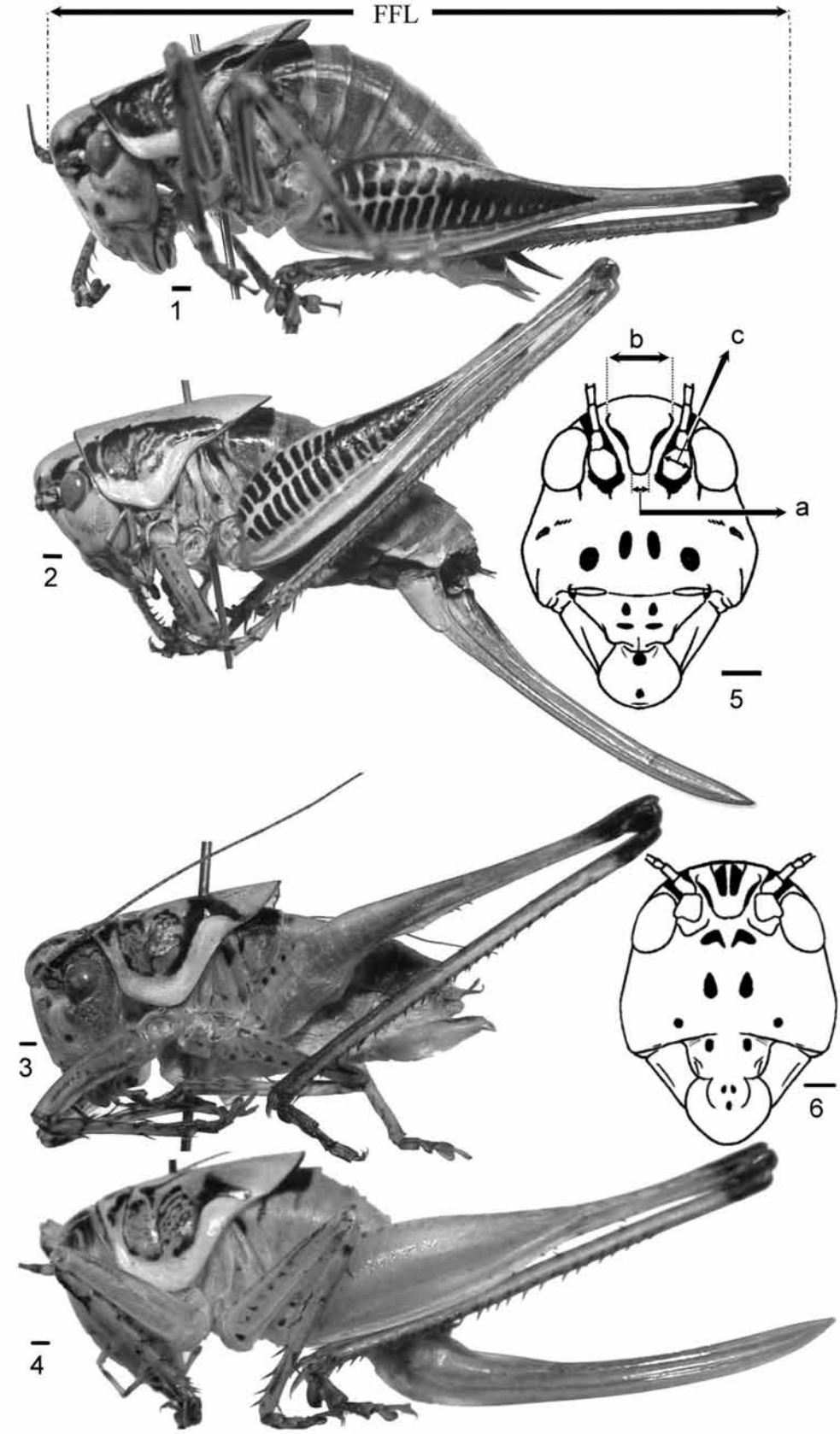
Coloration: Frons and genae pale yellowish-brown; clypeus with four dark spots; frons with four vertically-elongated spots; fastigium with horizontally-elongated dark marks laterally; vertex pale creamy brown. Prozona and metazona pale cream-brown, lateral lobes dark with scattered pale dark marks, ventrally and caudally with wide yellow bands, the caudal narrower. Tegmina brown. Fore and mid legs more or less pale cream-brown with scattered dark marks; hind tibiae dark at proximal seventh part; hind femur with dark brown feather-shaped pattern laterally, dark at distal seventh part. Tergites 1 and 10 dark dorsally, other terga pale castaneous without dark brown marks. Abdomen shiny pale brown dorsally and yellow ventrally except for subgenital plate that is dark laterally. Cercus unicoloured, black, slightly whitened distally.

Female (paratype): Approximately the same size as holotype but tegmina much shorter (1.9mm); subgenital plate much longer and wider (8.8mm and 6.0mm respectively); cercus shorter and more slender (2.2mm long and 0.35mm wide medially); ovipositor length 21.4mm. Approximately the same shape as holotype but head in lateral view some how more sloping, lateral margins of fastigium more curved. Tegmina squamiform, lateral, fully covered by pronotum, overlapping. Hind margin of tergum 10 slightly emarginated, without extended posterior lobe. Cercus more slender and curved inwards than male. Fifth, sixth and seventh sterna approximately the same length, seventh sternum with very small protuberance medially. Subgenital plate without mid-longitudinal keel or groove, with very narrow deep V-shaped excision on hind margin. Ovipositor not very wide at basal third, straight, sword-shaped, tip slightly up-curved; gonagulum soft and smooth.

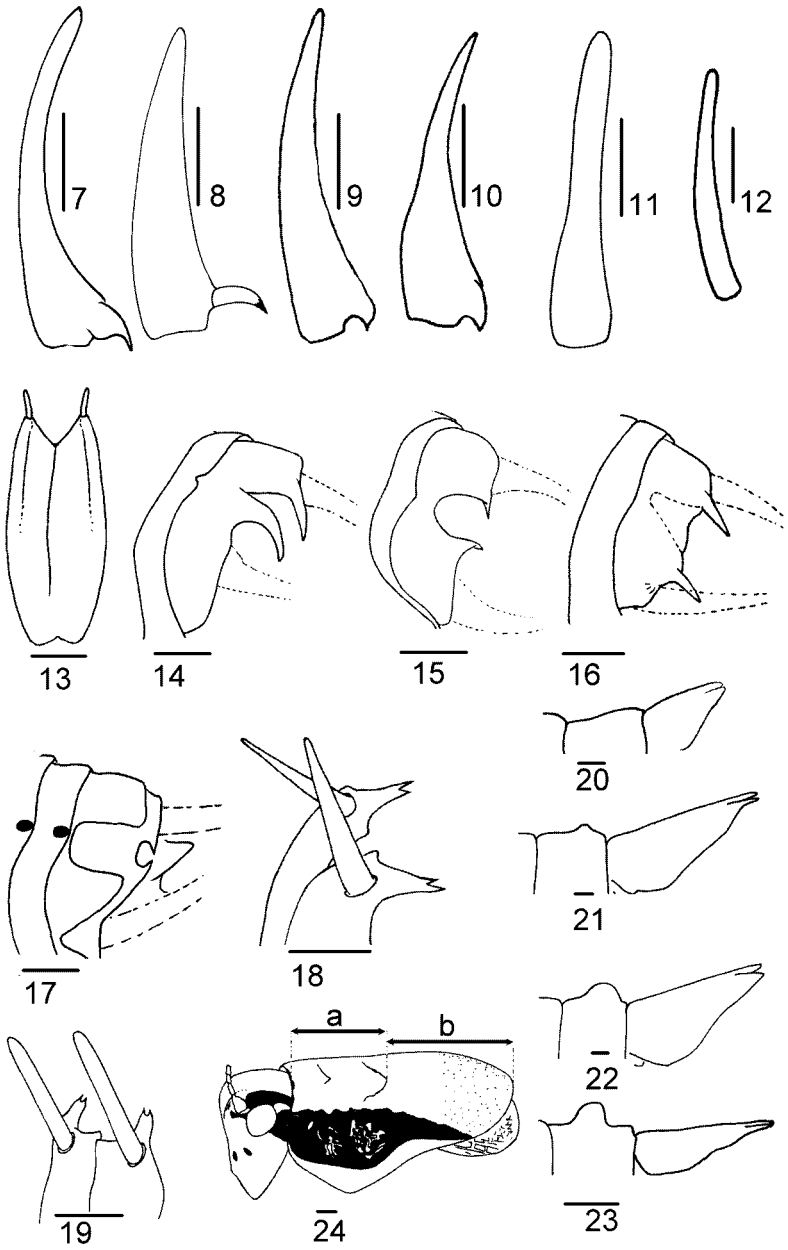
Coloration: Similar to male but the four dark spots of head weaker; frons with four horizontally elongated spots, the lateral ones smaller. Tenth sternum darkened only laterally. Distal darkening of hind femur shorter. Hind tibiae with shorter and more indistinct proximal dark pattern. Cercus less whitened at apex and at most part dark. Ovipositor pale brown, darker at apex; gonagulum dark, distally bright.

***E. mirzayani* sp.n.**
(Figs 3, 4, 6, 12, 13, 17, 23, 28, 32)

Holotype: IRAN, Khuzestan, Andimeshk, Bidrubeh, Sardabeh, 32° 36' 58" N, 48° 17' 11" E, 750m, May 2001, Col. Mohsen Mofidi-Neyestanak, Ebrahim Gilasian, and Abolfazl Hajesmailian (sweep net) (HMIM).



FIGURES 1–6 (scale bar = 1mm). 1–4 Habitus: 1- *karatolosi* **sp.n.** holotype male, FFL (Fastigium to hind Femur apex Length); 2- *karatolosi* **sp.n.** paratype female; 3- *mirzayani* **sp.n.** holotype male; 4- *mirzayani* **sp.n.** paratype female; 5–6 head frontal view: 5- *karatolosi* **sp.n.** holotype male, a- frontal groove width, b- fastigium upper width, c- scapus width; 6- *mirzayani* **sp.n.** holotype male.



FIGURES 7–24 (scale bar = 1mm). 7–12 male cercus: 7- *karatolosi* **sp.n.** holotype male; 8- *gemellata* (redrawn from Willemse & Heller 2001); 9- *chabrieri schmidti*; 10- *smyrnensis*; 11- *cretica*; 12- *mirzayani* **sp.n.** holotype male. 13- subgenital plate, *mirzayani* **sp.n.** holotype male. 14–17 male terminal terga: 14- *karatolosi* **sp.n.** holotype male; 15- *megastyla*; 16- *smyrnensis*; 17- *mirzayani* **sp.n.** holotype male. 18–19 male subgenital plate: 18- *karatolosi* **sp.n.** holotype male; 19- *megastyla*. 20–23 female subgenital plate, lateral view: 20- *chabrieri garganica*; 21- *karatolosi* **sp.n.** paratype female; 22- *annulipes*; 23- *mirzayani* **sp.n.** holotype male. 24- pronotum, *karatolosi* **sp.n.** holotype male a- prozona, b- metazona.

Paratypes: 2 females; same data as for holotype (1 female HMIM, 1 female BMNH).

Etymology: The new species name is dedicated to the late Hayk Mirzayans, the first author's teacher, who spent all his life studying the insect fauna of Iran and founded the HMIM.

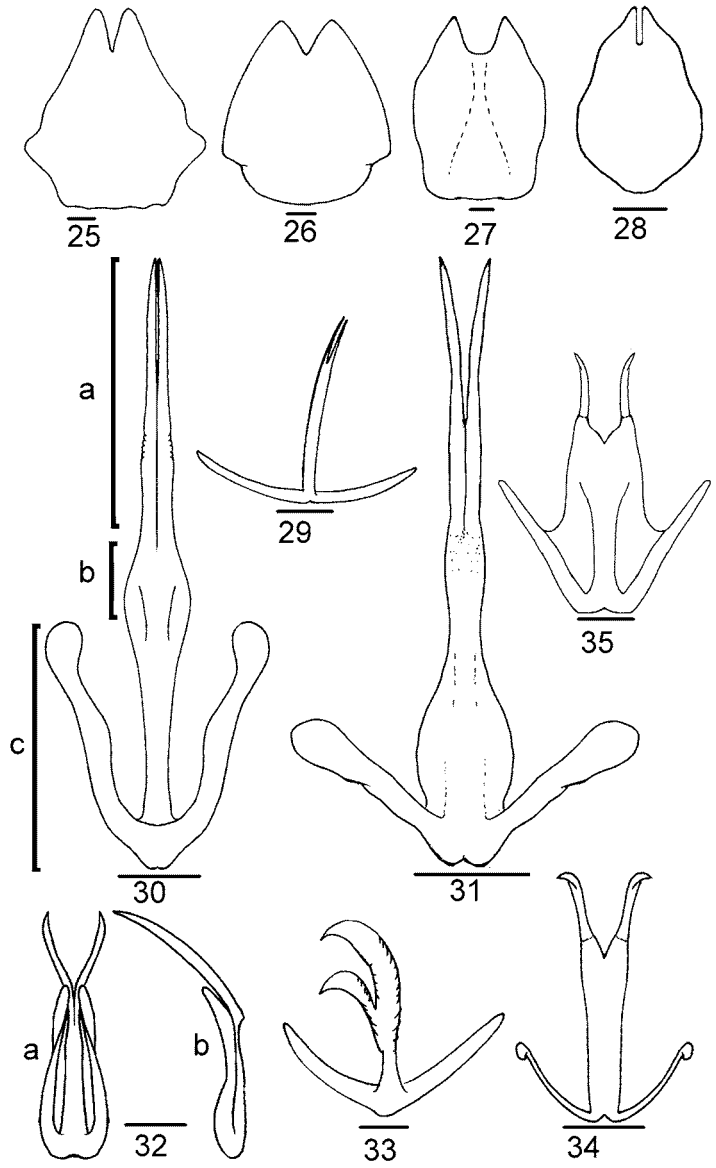
Diagnosis—differs from the type-species, *E. chabrieri*, as follows: Male: titillators long, arm bent forwards, base bent upwards; cerci thinner and without internal tooth; terga 9 and 10 with large and small emarginations respectively; all terga with a medial black spot posteriorly. Female: sternum 7 with a round projection medially; subgenital plate with a very narrow and deep excision.

Description—male (holotype): fastigium frontal groove 0.7mm; upper fastigial width 2.0mm; pronotum length 10.4mm; metazona length 5.1mm; pronotal width at sulcus 5.4mm; both prozona least width and metazona greatest width 5.2mm; tegmina length 2.15mm; longitudinal and transversal inner diameter of speculum 1.43mm and 2.13mm respectively; number of left tegminal stridulatory pegs 124 with 49 on the middle third; fore femur 7.2mm long; hind femur 21.6mm long and 3.7mm maximally wide; subgenital plate 4.1mm long and 2.1mm wide; cercus 2.8mm long and 0.27mm wide medially; FFL 32.3mm. Head, pronotum, tegmina, abdomen, and legs are as of the type species; however, smaller. Head very slightly sloping in lateral view, lateral margins of fastigium slightly curved; fronto-fastigial groove more or less equal to the scapus. Pronotum elongated backwards, longitudinal median keel indistinct, hind margin round; discus cylindrical; sulcus distally to the middle; metazona slightly shorter than prozona, flat and without lateral edge; humeral notch indistinct. Fore tibiae with 3 dorsal, 6 anterior-ventral and 6 posterior-ventral spines. Tibial tympana slit shape, similar externally and internally. Fore femur with 3 spines anterior-ventrally; mid femur with one posterior-ventral spine; hind femur with 5 internal-ventrally and 2 external-ventrally spines; hind tibiae at tip with four spurs ventrally, the internal ones shorter and the externals not markedly longer; hind metatarsal flap (pulvillus) less than 0.5 of metatarsus. Micropterous, tegmina not visible, covered fully by pronotum. Stridulatory file on the upper side of the left tegmen on a raised swelling with approximately 125 pegs, the portion with the widest pegs located medially. Wings extremely reduced. Hind margin of tergum 9 with very deep and wide U-shaped emargination dorsal-medially; hind margin of tergum 10 with small emargination and two small converging pointed lobes. Cercus slender and without apical or internal spine. Subgenital plate elongated, more or less keeled medial-longitudinally, with shallow V-shaped excision and with two medium length styles. Titillators long, arm-base angle at collar 180°, arms with sharp ends bent towards tergum 10, without spines, slender, diverging, base smooth, fused half (next to the arms) not flattened and free half long, extending beyond the collar, bent upwards, rather flattened and twisted.

Coloration: Frons pale yellowish-brown, with 6 dark spots, the two top ones bigger and eyebrow-shaped; clypeus with 2 dark spots; vertex with two long dark bands. Pronotum: prozona and metazona brown with black spots. Lateral lobes dark with scattered pale dark marks, ventrally and caudally with wide pale yellow bands. Tegmina pale brown. Fore and mid legs more or less pale cream-brown with scattered dark marks; hind tibiae dark at proximal seventh part; hind femur pale unicoloured with 4–5 small dark spots proximal-dorsally, dark at the distal seventh part. Abdomen: first tergum dark dorsally, other terga pale castaneous with one small black spot dorsal-medially; sterna yellow; subgenital plate dark laterally and yellow ventrally; cercus rather unicoloured pale brown.

Female (paratype): Approximately the same size as male but metazona wider (5.3mm); hind femur longer (23.6mm) and wider (4.3mm); subgenital plate much shorter (3.0mm) and slightly narrower (2.0mm); cercus much shorter (2.0mm); ovipositor 18.3mm long, and FFL 33.1mm. The same shape as male except for: head, lateral view, some how more sloping. Tegmina shortened, squamiform, fully covered by pronotum, not overlapping. Wings extremely reduced. Hind edge of tergum 10 very slightly emarginated. Fore femur with 3 spines anterior-ventrally; mid femur with one posterior and one anterior spine ventrally; hind femur with 3 internal-ventrally and 4 external-ventrally spines. Cercus shorter and more fusiform than ones of male. Fifth, sixth and seventh sterna approximately equal in length, seventh modified medially with a hook-shaped protuberance. Subgenital plate without mid-longitudinal keel or groove and with very narrow excision on hind margin. Ovipositor not very wide at basal third, almost slender, straight, tip slightly up-curved, sword-shaped; gonagulum soft and smooth.

Coloration: Approximately the same colour as male but the frontal spots weaker and smaller; terga with smaller and weaker dorsal-medial black spots; hind femur with shorter dark mark at apex; ovipositor pale brown, ventrally yellowish; gonagulum entirely pale cream-brown; subgenital plate without dark patterns laterally.



FIGURES 25–35 (scale bar = 1mm). 25–28 female subgenital plate: 25- *karatolosi* **sp.n.** paratype female; 26- *chabrieri garganica*; 27- *megastyla*; 28- *mirzayani* **sp.n.** paratype female. 29–35 Titillators: 29- *annamariae*; 30- *karatolosi* **sp.n.** holotype male, a- arm, b- collar, c- base; 31- *megastyla*; 32- *mirzayani* **sp.n.** holotype male, a- frontal view, b- lateral view; 33- *astyla*; 34- *chabrieri schmidti*; 35- *smyrnensis*.

Simplified key to enable recognition of males of the new described species

1. Internal tooth of cercus present or with distinct internal protuberance (Fig. 7–10) 8
- Internal tooth or protuberance of cercus entirely absent (Fig. 11, 12)..... 2
2. Arms of titillators pointed upwards or slightly laterally (Fig. 29)..... 3
- Arms of titillators strongly pointed laterally either to left or right (Fig. 33) ..... *astyla*
3. Arms of titillators symmetric..... 4
- Arms of titillators asymmetric (Fig. 29) ..... *annamariae*
4. Styli of subgenital plate short or reduced ..... *latens, giuliae, tauricola, mersinensis, unimaculata*
- Styli of subgenital plate not short or reduced 5
5. Tergum 10 with large emargination dorsally, its lateral lobes diverging or straight.....

..... *icariensis, jacquelinae, demirsoyi, anatolica, excisa, sevketi, prasina, cretica, tahtalica*

- Tergum 10 with small emargination dorsally, its lateral lobes converging (Fig. 17) 6

6. Titillator arms short and close to each other 7
- Titillator arms much elongated and diverging (Fig. 32) ..... *mirzayani* **sp.n.**

7. Subgenital plates with spine at base of styli ..... *krueperi*
- Subgenital plates without spine at base of styli ..... *karabagi*

8. Internal tooth of cerci emerging basally (Fig. 7, 9, 10) 9
- Internal tooth or protuberance of cerci emerging medially to sub-basally (Fig. 8) .... *leucasi, mariannae, pallipes, gemellata, forcipata, annulipes, marashensis, raggei, rammei*

9. Arms of titillators very close to each other, at most a little separated at tip (Fig. 30, 31) 10
- Arms of titillators clearly separated or diverging along whole length (Fig. 34, 35) .... *chabrieri, epirotica, werneri, cyprica, smyrnensis*

10. Hind margin of tergum 9 with small projection medially (Fig. 15); titillator arms a little separated at tip, collar not thickened, basal part of fused section of base thickened, the free parts of base short, usually not reaching to collar, mostly not bent upwards (Fig. 31) ..... *megastyla*
- Hind margin of tergum 9 with small emargination medially (Fig. 14); titillator arms very close to each, collar visibly thickened, basal part of fused section of base not thickened, the free parts of base short, more or less reaching to collar, mostly bent upwards (Fig. 30)..... *karatolosi* **sp.n.**

Discussion

Traditionally, *Eupholidoptera* species are divided into two main groups, based on absence (*E. spinigera, E. icariensis, E. prasina, E. astyla, E. latens, E. cretica, E. forcipata, E. annamariae, and E. giuliae*), or presence of a tooth (or distinct protuberance) on the internal side of the male cercus (Fig. 7–12). *Eupholidoptera cretica* was classified in the toothed group by Willemse and Heller (2001) but in fact it should be placed in non-toothed group (Harz, 1969; Willemse, 1980), as the cercus completely lacks any internal tooth (Fig 11).

In the toothed group, based on the position of the tooth or protuberance, two sections can be recognized. Taxa with the tooth emerging at the base including *E. chabrieri, E. epirotica E. werneri, E. cyprica, E. smyrnensis, E. megastyla,* and *E. karatolosi* **sp.n.** and species with a medial to sub-basal tooth, including *E. leucasi, E. mariannae E. pallipes, E. gemellata, E. annulipes, E. marashensis, E. raggei,* and *E. rammei*. In the former group, *E. smyrnensis* is quite different in having a very wide medial excision on tergum 10 (Fig. 16). *Eupholidoptera mariannae* and *E. rammei* can be simply separated from the other species of the first group in having short robust styli on the subgenital plate. For the rest, the shape, length and curvature of titillators can be used to distinguish almost all the species. Among the basal-toothed group, the arms of the titillators may be separated (*E. chabrieri, E. epirotica, E. werneri, E. cyprica,* and *E. smyrnensis*) or positioned very close to each other as in *E. megastyla* (Fig. 31) and *E. karatolosi* **sp.n.** (Fig. 30). Males and females of *E. megastyla* and *E. karatolosi* **sp.n.** are rather alike but there are clear differences in their terminalia and genitalia. In the males, the titillator of *E. megastyla* is not broad at its collar but is obviously thickened at the fused base (Fig. 31-b), the free parts of the base are shorter, usually not reaching to the collar, and are mostly not bent upwards (Fig. 31-c). In contrast, in *E. karatolosi* **sp.n.**, titillator is clearly thickened at the collar and is not wide at the fused base. In addition, the free parts of the base are longer, more or less reaching to the collar, and are visibly bent upwards. In females, the subgenital plate of *E. karatolosi* **sp.n.** is excised much narrowly as V-shaped (Fig. 25) and is more alike that of *E. chabrieri* (Fig. 26) than *E. megastyla* (Fig. 27). Furthermore, in having a small protuberance on the dorsal part of sternite 7 (Fig. 21), *E. karatolosi* **sp.n.** is similar to *E. annulipes* (Fig. 22), though the protuberance of the latter is larger and more hook-shaped. Thus, this new species is well distinguished by its unique male and female terminalia and genitalia.

In the non-toothed group, *E. astyla* and *E. annamariae* may be separated in having asymmetrical titillators, either strongly in *E. astyla* (Fig. 33) or weakly in *E. annamariae* (Fig. 29). Of the species with symmetric titillators, styli of male subgenital plate may be shortened and reduced as in *E. latens, E. forcipata, E. giuliae, E. tauricola, E. mersinensis,* and *E. unimaculata*. Traditionally, *E. forcipata* is classified within the unarmed-cerci group (Willemse, 1980) or at most with the explanation of cerci as 'at most slightly indicated' (Willemse & Heller, 2001). Here, this species and the others with any internal protuberance are placed in armed-cerci group and a more easily understood classification proposed. Among the species with medium to long styli on the male subgenital plate, examining of male tergum 10 is important. This structure may have a large emargination on dorsal margin with diverging or straight lateral lobes (*E. icariensis, E. jacquelinae, E. demirsoyi, E. anatolica, E. excisa, E. sevketi, E. prasina, E. cretica,* and *E. tahtalica*) or have a small emargination with converging lobes. Within the latter group, *E. mirzayani* **sp.n.** is unique in having larger titillators with much more elongated and diverging arms (Fig. 32 a and b) and so can be distinguished easily from both *E. krueperi* and *E. karabagi* because their titillators are much smaller, the arms are shorter and they are not diverging.

With the description of these two new species and considering the recently described species of the genus (Salman, 1983; Harz, 1988; Massa, 1999; Çiplak, 1999; Willemse & Heller, 2001; Tilmans, 2002; Willemse & Willemse, 2004), the genus now concludes 47 species (Table l).

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