TWO NEW SPECIES OF *EUPHOLIDOPTERA* MARAN (ORTHOPTERA, TETTIGONIIDAE) FROM CRETE WITH A CHECKLIST AND KEY TO THE SPECIES

Willemse, F. & K.-G. Heller, 2001. Two new species of *Eupholidoptera* Maran (Orthoptera, Tettigoniidae) from Crete with a checklist and key to the species. – Tijdschrift voor Entomologie 144: 329–343, figs. 1–52. [ISSN 0040-7496]. Published 1 December 2001.

The Greek island of Crete was already known for a remarkable high number of *Eupholidoptera* species. Two more new species are described from this island: *E. mariannae* and *E. rammei*. A checklist and a key to the ten presently known species of Crete are included.

Correspondence: F. Willemse, Laurastraat 67, Eygelshoven 6471 JH, The Netherlands. E-mail: fer.willemse@worldonline.nl

Key-words. – Orthoptera; Tettigoniidae; *Eupholidoptera*; Greece; Crete; key

Eupholidoptera Maran, 1953 is a large genus. Up to date nearly 50 species are recognized. The habitat of these bush-rickets is variable, ranging from humid to dry. They prefer coarse vegetation, especially prickly bushes and shrubs. They may be found in bramble thickets and other coarse herbage bordering roads or fields, even in gardens or parks in urbanized areas. In southeastern Europe they frequent also shrubby areas with poor vegetation consisting of e. g. *Quercus coccifera* L., coniferous scrubs (Willemse & Kruseman 1976) or low dense shrubs of *Thymus capitatus* (L.) Hoffmanns. & Link (Nadig 1985). In Crete we found populations even above the timberline, cryptically living in very low prickly thickets, e. g. *Astragalus* sp. The song consists of short and commonly isolated syllables, produced at irregular intervals (Heller 1988), heard during daytime but more frequently in the afternoon and after dusk. Individuals are quite alert and agile and usually difficult to discover. Some species, however, are less shy and easier to notice, e. g. *E. forcipata* and *E. annamariae*. The species are believed to be omnivorous. From time to time we observed large numbers of individuals dwelling on the road, feeding on the debris of traffic victims of their own species. The area of distribution reaches from France and Italy through southeast Europe to Turkey and farther east. A few species have a wide range but that of most species is more limited. A remarkable high concentration of species is known from the island of Crete, most if not all of them endemic. It was a surprise to find now again two new species from this island.

MATERIAL AND METHODS

Abbreviations of depositories of material: CH, collection K.-G. Heller, Magdeburg; CW/RMNH, collection Willemse, National Museum of Natural History Naturalis, Leiden (formerly Rijksmuseum van Natuurlijke Historie).

Equipment for bioacoustics: for field recordings UHER 4200 IC with UHER M 645 microphone; laboratory recordings RACAL store 4DS with microphone BRÜEL & KJÆR 4135, protecting grid removed; oscillograms by using a personal computer and the program TURBOLAB (STEMMER AG); wing movements registration by an opto-electronic device (Helvesen & Elsner 1977, modified as in Heller 1988); stridulatory file studied by light microscope and Scanning Electron Microscope (SEM) (Institut für Zoologie I, Universität Erlangen).

Song terminology: syllable, the sound produced by one complete up (opening) and down (closing) stroke of the wing; hemisyllable, the sound produced by one unidirectional movement (opening or closing) of the fore wing.

DESCRIPTIONS

Eupholidoptera mariannae sp. n.
(figs. 1, 11, 22, 36, 49, 51)

Material studied. – ♂ holotype: 'Greece Crete N. Lasithi ca. 500 N.N. 1 km oestl. Anatoli NW Irape-

Figs. 1-10. *Eupholidoptera* species from Crete, left male cercus, dorsal view only or dorsal (a) and lateral (b) view (except in 8, 10). – 1, *E. mariannae*, paratype; 2, *E. rammei*, paratype; 3, *E. pallipes*, paratype; 4, *E. gemellata*, holotype; 5, *E. annamariae*, paratype; 6, *E. forcipata*, paratype; 7, *E. cretica*, after Ramme 1951; 8, *E. giuliae*, a from Chora Sfakion, b from Argoules, both paratypes; 9, *E. latens*, paratype; 10, *E. astyla*, a from Mt. Dikti, b from Mt. Idi. Scale=1 mm.

tra 16. VIII. 1991 leg. K.-G. Heller & M. Volleth' and with additional label '3382' (CW/RMNH); 2 ♂ paratypes: (both labelled) 'Greece Crete N. Lasithi ca. 700m N.N. 2 km oestl. Malles NW Ierapetra 16. VIII. 1991 leg. K.-G. Heller & M. Volleth', one of them with additional label '3196' and 'song', other male with additional label '2906' and except for left fore wing, stored in alcohol (CH).

Description. – Male. General appearance, pronotum and elytra as in type species *E. chabrieri*. Legs relatively shorter, hind femur 2.08–2.12 as long as pronotum (against 2.23–2.36 in nominate *E. chabrieri*), ventral margins of mid and hind femur unarmed in two males but provided with two tiny spines along anterior margin of mid femur in one specimen.

Stridulatory file of left elytron (paratype '2906') (fig. 49): shortest distance between proximal and distal end 3.4 mm, greatest width 0.13 mm; about 90 teeth, including proximal and distal ones; spacing of teeth in mid two thirds of file from 18–20 teeth per mm.

Last abdominal tergite (fig. 11) divided into a pair of widely rounded lateral parts, separated from each other by a short, deep, fissure-like median incision; posterior margin at ventral side, triangularly extending along median incision, tips short, robust, sharp, strongly curved and pointing frontad.

Cercus (fig. 1) almost as long as greatest length of last abdominal tergite; base wide, inner side of proximal half wide, slightly flattened dorsally, tapering distad, provided with a sub-basal, short, stout and hook-shaped tooth; apical part cylindrical, slightly bent dorsad; tip obtusely conical, without hairs.

Subgenital plate (fig. 22) robust, greatest width at base about equal to greatest length, basal part a little depressed at either side of a low median keel; apical part, in lateral view, obtuse-angularly bent dorsad; lateral margins well developed and a little down curved, in profile basally concave and apically convex, in ventral view regularly tapering apically; ventral surface on either side of a weak median keel depressed with transverse wrinkles and bordered laterally with a diverging longitudinal bar-shaped protuberance; tip of apical lobes inflated, spherical; posterior margin with narrow median incision extending along one fifth to fourth of total length of plate, its margins straight to slightly sinuate, smooth; styli short, spherical or slightly compressed laterally, inserted just in front of tip of apical lobes, pointing ventrad or medio-ventrad.

Titillator (fig. 36) with basal parts extending and curved laterad as usual; apical parts narrowly divided in apical third, long, slender, cylindrical, symmetrical, pointing dorsad, tips simply pointed, parallel, close to each other, surface with a series of transverse wrinkles, in profile slightly curved ventro-frontad; tips of titillator reaching in situ the median incision

of last abdominal tergite.

General coloration brown, partly green or with pale green flush. Occiput blackish with median line and pair of longitudinal stripes on either side yellowish brown. Pronotum with lower margin of lateral lobe widely yellow or greenish yellow, remaining part of lateral lobe with scattered dark brown dots, posteriorly more solid black; prozona of disc blackish brown except zone along anterior margin, few lateral dots and a fine median line which are yellowish brown, metazona yellow brown. Elytra with all longitudinal and transverse veins, including R and Sc, pale brown, membrane dark brown, not solid black. Last abdominal tergite, mid part of upper margin of subgenital plate, tooth of cercus and tips of apical parts of titillator brownish black. Hind femur of general colour, without solid black spots, just before the knee, suffused with dark brown.

Female. – Unknown.

Measurements (length in mm) (♂): body 25–27, pronotum 10.0–10.5, hind femur 20–21.

Bioacoustics. – The song is similar to that of other *Eupholidoptera* species (compare Heller 1988). It consists of isolated syllables with the opening hemisyllable much shorter and softer than the closing hemisyllable (fig. 51). The syllables were produced during the evening and repeated at intervals of 8–16 seconds at 20° C (field recordings of both paratypes). A syllable repetition rate of about one syllable per second or higher was observed during acoustical interaction between several males and under laboratory circumstances of the holo- and one paratype (28° C, fig. 51). The broadbanded song contains frequency components higher than 100 kHz, but its maximum is in the audible range between 12 and 17 kHz (examined up to 100 kHz).

Habitat. – The insects were found in low bushes inside open pine forest and groups of planted olive trees. We observed some individuals singing on the branches of olive trees, a few meters above the ground.

Distribution. – Known only from the type series. The localities are near to each other and cover a small area in the extreme southwestern part of the District of Lasithi, eastern Crete.

Previous records from this area refer all to female specimens assigned to *E. astyla* by Ramme (1927): Ierapetra, Anatoli and Kato Chorio. A study of the type series of *E. astyla* reveals that the subgenital plate of these females differs slightly from that of females of this species collected recently from several other sites of Crete. Eventually, it is possible that they do not belong to *E. astyla* but represent the unknown female of *E. mariannae*. From the type-series it came out also

Figs. 11-16. *Eupholioptera* species from Crete, male last abdominal tergite. – 11, *E. mariannae*, dorsal (a) and posterior view (b), paratype; 12, *E. rammei*, dorsal (a) and posterior view (b), paratype; 13, *E. astyla*, dorsal (a) and posterior view (b), from Mt. Dikti; 14, *E. pallipes*, dorso-posterior view, paratype; 15, *E. latens*, dorso-posterior view, paratype; 16, *E. giuliae*, dorso-posterior view, a from Chora Sfakion, b from Argoules, paratypes; 17, *E. cretica*, dorsal (a) and posterior view (b) (after Ramme 1951). Scale=1 mm.

that the occurrence of *E. astyla* in the island of Naxos is doubtful. This record is based on the locality label (grey-blue colour) of a single male from this island (by Ramme designated as holotype of *E. astyla*) reading 'Naxos [printed] Naxos [handwritten] A. Schulz 9. 1925'. A similar label with similar data is found on a specimen of *Poecilimon cretensis* Werner (also recorded

in Ramme 1927). It is rather uncommon for members of *Poecilimon*, especially occurring in dry Aegean islands lacking high mountains, to be still alive as late as September. An explanation could be that the Naxos labels of these *P. cretensis* and *E. astyla* specimens have been exchanged erroneously with those from Crete; compare the data on Schulz's travel in Ramme (1927).

Figs. 18-19. *Eupholidoptera* species from Crete. Male last abdominal tergite, dorsal (a), posterior (b) and left lateral view (c). – 18, *E. annamariae*, paratype; 19, *E. pata*, paratype. Scale=1 mm.

This assumption would eliminate also the strange coincidence that both species of Crete would occur in Naxos which belongs to the Kikladhes group of islands that is biographically quite distinct from Crete.

Etymology. – Named after Marianne Volleth for her help while observing and collecting these and other bush-crickets in Crete.

Discussion. – See below.

Eupholidoptera rammei sp. n.
(figs. 2, 12, 21, 38, 39, 44, 50, 52)

Material studied – ♂ holo-, ♀ allo- & 2 ♂ paratypes: (all labelled) 'Greece Crete N. Lasithi ca.1100m N.N. Katharo – Hochflaeche westl. Kritsa 22. VIII. 1991 leg. K.- G. Heller & M. Volleth', holotype with additional label '3198', allotype with '3199', 1 paratype with '3197' and 'RACAL', 1 paratype with '2903' and, except for left fore wing, stored in alcohol. (♂ holo-, ♀ allotype CW/RMNH; 2 ♂ paratypes CH).

Description. – Male. General appearance as in type species *E. chabrieri*. Legs relatively shorter, hind femur 1.98-2.02 as long as pronotum (against 2.23-2.36 in nominate *E. chabrieri*), ventral margins of mid and hind femora in two specimens unarmed but in one male with one tooth at anterior margin of left and three teeth at right mid femur.

Stridulatory file of left elytron (paratype '2903')

(fig. 50): proximally more curved than distally, shortest distance between both ends 3.2 mm, greatest width 0.11mm, with almost 100 teeth, in mid two thirds of file slightly more widely spaced, about 22-24 teeth per mm.

Hind margin of last abdominal tergite (fig. 12) shallowly depressed in middle with a short and narrow V- to U-shaped medial excision, provided on either side with a short tooth pointing ventrad.

Cercus (fig. 2) slightly longer than last abdominal tergite, slightly tapering apicad; inner margin in proximal two thirds widened and provided with a short but strongly inflated tooth at about one third of cercal length, tip sharp and pointing ventro-mediad; apical half of cercus in profile slightest bent; apical third of cercus cylindrical, tip obtuse conical

Subgenital plate (fig. 21) as described under *E. marianae*; lateral margin of apical part, in lateral view, distinctly sinuate, basally concave, apically convex.

Titillator (figs. 38-39) slender; basal parts extended and curved laterad, strongly sclerotized; apical parts long, slender, cylindrical, fused basally and at mid-length narrowly divided and moderately curved ventrad, parallel to each other and distinctly deviating laterad, either to the left or right, tips tapering into simple acute points, the right and left ones divergent, the medial one pointing more dorsad, the lateral one more laterad; surface with transverse wrinkles, tips in situ extending dorsally beyond hind margin of left or right part of last abdominal tergite or reaching base of the cercus.

Figs. 20-24. *Eupholioptera* species from Crete. Male subgenital plate in ventral (a) and left lateral (b) view. – 20a, *E. astyla*, from Mt. Dikti; 21, *E. rammei*, paratype; 22, *E. mariannae*, paratype; 23, *E. giuliae*, paratype from Chora Sfakion; 24, *E. latens*, paratype. Scale=1 mm.

General coloration brown, head, pronotum and legs partly with green flush or dark green. Occiput blackish with median line and pair of longitudinal stripes on either side yellowish brown. Lower margin of pronotal lateral lobe broadly yellow, remaining part of lateral lobe more or less blackish brown especially in dorsal area, disc in prozona partly dark brown or blackish except area along anterior margin, lateral areas and fine median line which are yellow, metazona yellowish brown. Elytra with membrane blackish, longitudinal and transverse veins between

anterior edge of wing and Sc, R and M pale brown, remainder of longitudinal and transverse veins dark brown or blackish. Last abdominal tergite, mid part of upper margin of subgenital plate, ventral side of cercus black; cercal tooth, anterior half of basal parts of titillator, tips of titillator brownish black. Hind femur of general color, preapically, just before the knee, narrowly suffused with black, no solid black spots.

Female. – Subgenital plate (fig. 44) longer than wide; hind margin U-shaped with median incision along one third of total length, apical lobes not di-

Figs 25-29. *Eupholidoptera* species from Crete. Male subgenital plate in ventral (a) and lateral (b) view. – 25, *E. annamariae*, paratype; 26, *E. forcipata*, paratype; 27, *E. cretica*, after Ramme 1951; 28, *E. gemellata*, holotype; 29, *E. pallipes*, paratype. Scale=1 mm.

verging but touching each other, tips obtusely pointed; lateral sides slightly impressed, ventral side also slightly impressed on both sides of a low median ridge, no wrinkles. Lateral sclerites without particulars. Ovipositor almost twice as long as pronotum, proximal two thirds straight, apical third slightly curved dorsad. Coloration as male.

Measurements (length in mm): body ♂ 25-26, ♀ 24; pronotum ♂ 8.7-9.1, ♀ 8.2; hind femur m18.3-19.1, ♀ 21.5; ovipositor 15.5.

Bioacoustics. – The song, observed in the evening, is similar to that of other species of the genus. It con-

sists of isolated syllables with the opening hemisyllable much shorter and quieter than the closing one (fig. 52). Intervals between the syllables ranging from 2-6 seconds at 15° (field observation of several simultaneously singing males) to about 1 second or shorter at 27° (laboratory conditions of two singing paratypes). The broadband song has its frequency maximum in the audible range between 12 and 25 kHz (examined up to 40 kHz).

Habitat. – The new species was found in a 1-2 m high *Quercus* shrub, one of the few shrubs still existing in the Katharo plain; most of this plain is covered

Figs. 30-35. *Eupholidoptera* species from Crete. Male, titillator, dorsal (a), posterior (b) and right lateral (c) view or posterior (a) and right lateral (b) view. – 30, *E. giuliae*, paratype from Chora Sfakion; 31, *E. forcipata*, paratype; 32, *E. latens*, paratype; 33, *E. pallipes*, paratype; 34, *E. gemellata*, holotype; 35, *E. cretica*, after Ramme 1951. Scale=1 mm.

Figs. 36-38. *Eupholidoptera* species from Crete. Male, titillator, dorsal (a), posterior (b) and right lateral view (c). – 36, *E. mariannae*, paratype; 37, *E. annamariae*, paratype; 38, *E. rammei*, paratype. Scale=1 mm.

by cultivated vineyards or consists of bare ground.

Distribution. – Known only from the type-locality, the eastern offshoots of Mt. Dikti, in the western part of the District of Lasithi, eastern Crete.

Etymology. – Ramme studied the genus of *Pholidoptera* extensively (Ramme 1927, 1930, 1939, 1951). In 1951, reviewing the Pholidopterini, he described four new genera: *Eupholidoptera*, *Apholidoptera*, *Parapholidoptera* and *Uvarovistia* and gave a key, full descriptions and a checklist of included species. Maran (1953), dealing with some members of *Pholidoptera*,

pointed out that Ramme had forgotten to indicate the type species of his genera and selected them quite easily from the context of Ramme's study. Until recently, the author of these genera has always been referred to Ramme (1951). However, according to the International Code of Zoological Nomenclature in which genus-group names published after 31 December 1930 must be accompanied by the definite fixation of a type species, Ramme's genera became valid only after Maran's (1953) action. According to the Code, the name of the genera should be referred consequently not to the original author Ramme but to Maran (Koçak 1981). Ramme was one of the greatest orthopterologists

Figs. 39-41. *Eupholidoptera* species from Crete. Male, titillator, dorsal (a), posterior (b), right lateral (c) and left lateral (d) view. – 39, *E. rammei*, paratype; 40, *E. astyla*, from Mt. Dikti; 41, *E. astyla*, from Mt. Idi. Scale=1 mm.

Figs. 42–48. *Eupholidoptera* species from Crete. Female subgenital plate in ventral (a) and left lateral (b) view. – 42, *E. astyla*, from Mt. Dikti; 43, *E. forcipata*, allotype; 44, *E. rammei*, allotype; 45, *E. giuliae*, paratype from Argoules; 46, *E. latens*, allotype; 47, *E. annamariae*, paratype; 48, *E. pallipes*, allotype. Scale=1 mm.

of the past century. He deceased the 24th of August 1953. We are glad to name this species after him.

DISCUSSION

A survey of the Greek species of the genus, including classification, distribution and a key are found in Willemse (1980, 1984, 1985, 1986). Bioacoustic data are found in Heller (1988). A checklist for all European species is given in Heller et al. (1998). The species occurring in Turkey are discussed in Salman (1983), a new one was described by Harz (1988) and recently two other new species by Çiplak (1999). The two new

species of Crete, described here, are very well characterized by their male abdominal terminalia and readily distinguished from all other members of the genus.

Distinction of the two new species among its congeners in Crete can be summarized as follows.

In *E. mariannae* the shape of the male last abdominal tergite, though different in details, is shared with *E. rammei* and *E. astyla*. The male cercus of *E. rammei*, *E. gemellata* and *E. pallipes* is also provided with a tooth, but the location of the tooth in *E. mariannae* is the most basal one. The general shape of the male subgenital plate in combination with short styli in *E. mariannae* is shared with *E. rammei*, *E. astyla*, *E. giuliae*, *E. latens*, *E. annamariae* and the short styli alone

Figs. 49-50. *Eupholidoptera* species from Crete. Stridulatory file of left male elytron, ventral view, distal end to the left; whole file (a) and close-up of mid part (b). – 49, *E. mariannae*, paratype '2906'; 50, *E. rammei*, paratype '2903'. Scale=100 μm.

with *E. forcipata*. The titillator in *E. mariannae* is unique. A divided apex with tips parallel and close to each other occurs also in *E. annamariae* but is distinctly larger, stronger and but slightly asymmetrical.

In *E. rammei* the last abdominal tergite of the male resembles those of *E. mariannae* and *E. astyla*, the median excision is between both of those of the latter species. The tooth of the male cercus of *E. rammei* is

more distad than in *E. mariannae* and obviously shorter than in *E. pallipes* and *E. gemellata*. The general shape of the male subgenital plate in *E. rammei* in combination with its moderately deep median incision and short styli is like that in *E. annamariae*, *E. astyla*, *E. giuliae* and *E. latens*. The titillator of *E. rammei* is unique. Asymmetry of the apical part is also present in *E. astyla* and *E. annamariae* but more obvi-

Figs. 51-52. *Eupholidoptera* species from Crete. Male, synchronous registration of left elytron movement (upper curve; upward deflection represents opening, downward closing) and oscillogram (lower curve) of calling song of *E. mariannae* (51a upper and 51b below left) and *E. rammei* (52a middle, oscillogram only and 52b below right) (scale=0.1 or 1.0 second, as indicated).

ous in the former and scarcely so in the latter species. The female subgenital plate of *E. rammei* can be readily distinguished from that in *E. astyla* as it is inflated and impressed both at lateral and ventral side (fig. 44) while only weakly convex in *E. astyla* (fig. 42).

The Island of Crete is of particular interest by its remarkable large number of *Eupholidoptera* species. Up to 1976 two species were known (Ramme 1951). In 1976 four more species were described (Willemse & Kruseman 1976), in 1986 another one (Nadig 1986) and quite recently Massa (1999) described again a new species from this island. As we believe, all of them are endemic to Crete. The total number of *Eupholidoptera* species known from this island has now increased to ten. This concentration of species is quite remarkable and further studies on their phylogeny are in preparation. For convenience a checklist and a key to the species known from Crete is given here. A distribution map, however, is postponed particularly because Ramme's (1927) records of *E. astyla* from Crete need re-examination.

Checklist

Species occurring in Crete, chronologically arranged according to the year of description.

Eupholidoptera Maran, 1953

astyla (Ramme 1927)

cretica Ramme 1951

forcipata Willemse & Kruseman 1976

latens Willemse & Kruseman 1976

pallipes Willemse & Kruseman 1976

gemellata Willemse & Kruseman 1976

annamariae Nadig 1986

giuliae Massa 1999

mariannae sp.n.

rammei sp.n.

Key to the species of *Eupholidoptera* from Crete

1. Male cercus with a tooth at inner margin, close to its base or a little more distad (figs. 1-4)2
 - Male cercus without a tooth (figs. 7-10), at most slightly indicated (figs. 5-6, 8a)6
2. Male subgenital plate with slender styli, more than four times as long as wide (figs. 27-29)3
 - Male subgenital plate with short styli, less than four times as long as wide (figs. 20-26)5
3. Male subgenital plate without spines near bases of styli (fig. 27); male cercus, last abdominal tergite, and titillator as in figs. 7, 13 & 35; known only from the holotype, female unknown*cretica*

- Male subgenital plate with thorn-like spines near bases of styli (figs. 28-29)4
- 4. Apex of titillator undivided, tip with a tiny lateral spine (fig. 33); male cercus and last abdominal tergite as in figs. 3 & 14; female subgenital plate as in fig. 48 *pallipes*
- Apex of titillator divided with a median incision, laterally rounded without spine (fig. 34); male cercus as in fig. 4, last abdominal tergite resembling fig. 14 (in holotype shriveled); known only from holotype, female unknown *gemellata*
- 5. Tooth of male cercus sub-basal (fig. 1); titillator symmetrical, pointing vertically (fig. 36); male last abdominal tergite and subgenital plate as in figs. 11 & 22; female unknown *marianae*
- Tooth of male cercus slightly more distant from base (fig. 2); titillator asymmetrical, pointing dorsad either to the left or right (figs. 38 & 39); male last abdominal tergite and subgenital plate as in figs. 12 & 21; female subgenital plate as in fig. 42 *rammei*
- 6. Apical parts of titillator pointing upwards and strongly laterad, either to the left (commonly) or the right (figs. 40-41); male cercus, last abdominal tergite and subgenital plate as in figs. 10, 13 & 20; female subgenital plate as in fig. 42 *astyla*
- Apical parts of titillator pointing vertically upwards (figs. 30-32) or at most slightly laterad (fig. 37) 7
- 7. Divided parts of apical parts of titillator close to each other, pointing upwards and slightly laterad, either to the left or right side (fig. 37); hind margin of last abdominal tergite with pair of remarkably large and strongly sclerotized apical extensions pointing ventrad (fig. 18); male cercus and subgenital plate as figs. 5 & 25; female subgenital plate with pair of elongate concavities divided by median ridge as in fig. 47 *annamariae*
- Divided parts of apical parts of titillator strongly divergent, symmetrical (figs. 30-32); hind margin of male last abdominal tergite with more simple apical extensions (figs. 15, 16 & 19) 8
- 8. Male subgenital plate with a deep and wide median excision, short styli pointing horizontally and distad (fig. 26); male last abdominal tergite with apical lobes well developed (fig. 19); male cercus and titillator as in figs. 6 & 31; female subgenital plate short but wide (fig. 43) *forcipata*
- Male subgenital plate with median excision narrower and not deep, styli pointing ventrad or medio-ventrad (figs. 23-24); male last abdominal tergite with apical lobes shorter (figs. 15-16) 9
- 9. Male subgenital plate about as wide as long (fig. 23); titillator large (fig. 30); male cercus and last abdominal tergite as in figs. 8 & 16; female subgenital plate with a pair of basal pits as in fig. 45

- *giuliae*
- Male subgenital plate elongate, strongly tapering towards apex (fig. 24); titillator small (fig. 32); male cercus and last abdominal tergite as in figs. 9 & 15; female subgenital plate deeply incised and laterally impressed as in fig. 46 *latens*

ACKNOWLEDGEMENTS

We are grateful to Prof. Dr. T. Wasserthal for his permission using the SEM and Dr. W. Heimler for his technical assistance.

REFERENCES

- Çiplak, B., 1999. Two new species of *Eupholidoptera* Maran (Orthoptera, Tettigoniidae): *E. tasheliensis* n. sp. and *E. femorata* n. sp. – Italian Journal of Zoology 66: 75-78.
- Harz, K., 1988. Eine neue *Eupholidoptera* – Art aus der Türkei. – Articulata 3: 133-135.
- Heller, K.-G., 1988. Bioakustik der europäischen Laubheuschrecken. – Verlag Josef Margraf, Weikersheim, 358 pp.
- Heller, K.-G., O. Korsunovskaya, D. Ragge, V. Vedenina, F. Willemse, R. Zhantiev & I. Frantsevich, 1998. Check-list of European Orthoptera. – Articulata, Beiheft 7: 1-61.
- Helversen, O. von & N. Elsner, 1977. The stridulatory movements of acridid grasshoppers recorded with an opto-electronic device. – Journal of comparative Physiology 122: 53-64.
- Koçak, A. O., 1981. On the nomenclature of some genera of Orthoptera. – Priamus 1: 126-128.
- Maran, J., 1953. Contribution to the knowledge of the genus *Pholidoptera* Wesm. – Acta Entomologica Musei Nationalis Pragae 28(1952): 209-221.
- Massa, B., 1999. Ortoteri dell' area Mediterranea e delle isole Azzorre nuovi o poco noti (Insecta). – Atti dell' Accademia Roveretana degli Agiati 249 (1999), ser.7, vol. 9B: 57-80.
- Nadig, A., 1985. Zur Orthopterenfauna Kreta's mit Beschreibung einer neuen Art: *Eupholidoptera annamariae* sp. nova. – Mitteilungen der schweizerischen Entomologischen Gesellschaft 58: 325-335.
- Ramme, W., 1927. Die Dermapteren und Orthopteren Siziliens und Kreta. – Eos, Madrid 3: 111-200.
- Ramme, W., 1930. Neue Orthopteren aus Westasien (Acrid. et Tettigon.). – Mitteilungen aus dem Zoologischen Museum in Berlin 16: 395-396.
- Ramme, W., 1939. Beiträge zur Kenntnis der paläarktischen Orthopteren Fauna III (Tett. et Acrid.) – Mitteilungen aus dem Zoologischen Museum in Berlin 22: 41-150.
- Ramme, W., 1951. Zur Systematik, Faunistik und Biologie der Orthopteren von Südost-Europa und Vorderasien. – Mitteilungen aus dem Zoologischen Museum Berlin 27 (1950): 1-431.
- Salman, S., 1983. Turkish bush-cricket of the genus *Eupholidoptera* (Decticinae). – Systematic Entomology 8: 313-338.
- Willemse, F., 1980. Classification and distribution of the species of *Eupholidoptera* Ramme of Greece (Orthoptera, Tettigonioidae, Decticinae). – Tijdschrift voor Entomologie 123: 39-69.

Willemse, F., 1984. Catalogue of the Orthoptera of Greece.
– Fauna Graeciae 1: i-xii, 1-275.

Willemse, F., 1985. Supplementary notes on the Orthoptera of Greece. – Fauna Graeciae 1a: 1-47.

Willemse, F., 1986. A key to the Orthoptera species of Greece. – Fauna Graeciae 2 (1985): 1-288.

Willemse, F. & G. Kruseman, 1976. Orthopteroidea of Crete. – Tijdschrift voor Entomologie 119: 123-164.

Received: 16 January 2001

Accepted: 22 March 2001