European Mosquito Bulletin ***28*** *(2010), 45-50*
Journal of the European Mosquito Control Association
ISSN 1460-6127; w.w.w.e-m-b.org
First published online 22 February 2010

Re-description of the pupa of *Uranotaenia unguiculata* (Diptera: Culicidae) and a morphological key for identification of pupae of mosquito genera in the Palaearctic Region

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Abstract

The pupa of *Uranotaenia unguiculata* is described and illustrated for the first time. A table lists the range and mode of the branches of each pupal seta.

Key words: *Uranotaenia unguiculata*, pupa, first description, Spain

Introduction

The genus *Uranotaenia* has a single species in Europe. *Ur. Unguiculata.* The species was described from a male captured in Tiberias, Israel by Edwards (1913). The distribution of this species in basically Mediterranean, although it has been recorded in many countries in Europe, north Africa and Southeast Asia (Table 1).

Table 1: Distribution of *Uranotaenia unguiculata* in Europe and Mediterranean area.

France	Shaffner (1998)
Portugal	Ribeiro *et al*. (1978)
Spain	Melero-Alcíbar *et al.* (2005)
Italy	Romi *et al*. (1997)
Greece	Samanidou & Harbach (2001)
Croatia	Merdic *et al.* (2004)
Turkey	Ramsdale *et al.* (2001)
Russia	Gornostaeva (2000)
Slovakia	Jalili *et al.* (2000)
Romania	Nicolescu *et al.* (2000)
Algeria, Egypt, Saudi Arabia, Iraq, Libya, Morocco	References in Brunhes *et al.* (2000)

Uranotaenia unguiculata was first reported from the Iberian Peninsula by Gil Collado (1935) and Torres Cañamares (1944), in Madrid and Córdoba, respectively. In recent years, it has been reported from the Spanish provinces of Barcelona, Tarragona, Navarra and a new location in the province of Madrid (Melero-Alcíbar *et al*., 2005). In Portugal, it was documented for the first time by Ribeiro *et al*. (1978; 1988) in the Alentejo region based on a single male reared from a pupa, and subsequently collected in 2004 in the Rio Formosa Park (Algarve) (Melero-Alcíbar *et al*., 2005).

The biology of *Ur. unguiculata* is not well known, as most records refer to captures of isolated individuals, either as larvae from the aquatic habitats or as adults caught in light traps, so that the captures were not sufficiently abundant to establish gonotrophic behaviour or phenology.

The immature stage are generally found in small, shady, even slightly polluted pools, which are rich in organic plant matter with salinity indices of 0.1-0.2 per ml (Gutsevitch *et al*., 1974; Ribeiro *et al*., 1978, 1988; Romi *et al*., 1997; Ramsdale & Snow, 2001; Schaffner *et al*., 2001; Melero-Alcíbar *et al*., 2005). However in the Mediterranean area of the African Continent, the salinity, as well as the pH, of the larval habitats is slightly higher: salinity up to 10 g per litre and pH up to 8 (Senevet & Andarelli, 1959). No larvae were found at pH values lower than 7.4.

The pupa of *Ur. unguiculata* was briefly described and illustrated by Barraud (1934) and Senevet & Anderelli (1958). In the present paper, the pupa of *Ur. unguiculata* is described and illustrated in detail for the first time (Figs. 1-3). The description is based on material collected by the authors in the municipality of El Prat de Llobregat in the province of Barcelona, from a coastal marsh with *Phargmites* sp. and *Juncus maritimus* vegetation. The collection of 1 male and 6 females took place in October 2007.

Culiseta subochrea was also collected from the site. *Ochlerotatus caspius* and *Culex pipiens* are common in the area but were not collected during the collection period.

The specimens described in this study were caught as larvae, immediately identified as *Ur. unguiculata*, and reared in the laboratory to the pupal stage. Some of the pupae reached adulthood, thus confirming the identification. The others were killed in hot water and immediately preserved in 80% alcohol.

The range and modal number of branches of each pupal seta are given in Table 2. Chaetotaxy and morphological terminology are based on Harbach & Knight (1980).

The pupa of *Uranotaenia unguiculata* Edwards, 1913

Cephalothorax (Fig.1): Seta 1-9-CT long; 1-3-CT usually with 6 branches; 4-CT usually with 8 branches; 5 -CT with 8-10 branches; 6-CT usually single; 7-CT with 4-5 branches; 8-CT usually with 5 branches; 9-CT with 7-10 branches.

Trumpet (Fig.2): Pigmented. Index 5.5-6.4; mode 6.0.

Metanotum (Fig.3): Setae 10,11,12-CT long; 10,12-CT usually with 7 branches; 11-CT single.

Abdomen (Fig.3): Seta 0-II-VIII minute, single; seta 1-I with 13-18 branches on basal one-third, 1-II-VII moderately long, 1-II usually with 9 branches, 1-III with 8-12 branches, 1-IV usually with 7 branches, 1-V with 6,7 branches, 1-VI usually with 4 branches, 1-VII with 5,6 branches, 1-IX relatively short, single. Seta 2-I, III-VII, single, relatively short, spine-shaped; 2-II moderately long, single. Seta 3-I-VII moderately long, 3-I usually double, 3-II,III,VI usually triple, 3-IV with 3-6 branches, 3-V with 2-4 branches, 3-VII usually with 5 branches. Seta 4-I, short, 4-II,III,VI,VII moderately long, 4-IV,V relatively short, 4-VIII long, 4-I pedunculate, with 5-9 branches, 4-II usually with 6 branches, 4-III, usually with 5 branches, 4-IV,VI,VIII usually double, 4-V with 4-6 branches, 4-VII usually triple. Seta 5-I short, pedunculate, usually with 5 branches, 5-II-VI, moderately long, 5-VII relatively short, 5-II, IV usually with 7 branches, 5-III with 8-15 branches, 5-V with 6,7 branches, 5-VI with 4,5 branches, 5-VII usually double. Seta 6-I-VI moderately long, 6-VII relatively short, 6-I usually triple, 6-II with 2-5 branches, 6-III,V,VI usually with 5 branches, 6-IV with 5-7 branches, 6-VII usually double. Seta 7-I,VI,VII long, 7-II-V relatively short, 7-I,II,V usually triple, 7-III 3,4 branches, 7-IV,VII double, 7-VI, single. Seta 8-III-VII short; 8-III,V-VII usually with 4 branches, 8-IV with 3-5 branches. Seta 9-III-VI short, 9-VII relatively short, 9-VIII moderately long, 9-I with 1-3 branches, 9-II usually single, 9-III-VI single, 9-VII usually with 4 branches, 9-VIII usually with 6 branches. Seta 10-III-VII long, 10-III,V,VI single, 10-IV,VII, single, occasionally double. Seta 11-III-VII short, single. Seta 14-III-VII minute, single, 14-VIII single, occasionally double.

Paddle (Fig.3): Ovoid, apex rounded and emarginated, inner part broader than outer part; the distal 0.33 of the inner and outer margin spiculate. Mid-rib weakly sclerotised. Seta 1-P moderately long, single. Index-1.5-1.9; mode 1.6**.**

Table 2: Branching of the setae on pupae of *Uranotaenia unguiculata* (range with the mode in parentheses).

Cephalothorax		**Abdominal segments**									**Paddle**
Seta	**CT**	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**Pa**
0			1	1	1	1	1	1	1	-	-
1	6,7	13-18 (18)	7-12 (9)	8-12 (12)	5-10 (7)	6,7	3,4 (4)	5,6 (6)	-	1	1
2	6	1	1	1	1	1	1	1	-	-	-
3	6,7 (7)	1,2 (2)	2,3 (3)	3-5 (3)	3-6 (5)	2-4 (4)	2,3 (3)	4,5 (5)	-	-	-
4	8-11(8)	5-9 (6)	5-9 (6)	3-6 (5)	2,3 (2)	4-6 (4)	2,3 (2)	2-4 (3)	2,3 (2)	-	-
5	8-10	4-7 (5)	5-9 (7)	8-15 (10)	6-8 (7)	6,7	4,5 (4)	1-3 (2)	-	-	-
6	1,2 (1)	3-5 (3)	2-5 (4)	4-8 (5)	5-7 (7)	5,6 (5)	4-6 (5)	2-5 (2)	-	-	-
7	4-5 (5)	2-4 (3)	2-5 (3)	3,4 (4)	2	2,3 (3)	1	2	-	-	-
8	3-7 (5)	-	-	4,5 (4)	3-5 (3)	3-5 (4)	3,4 (4)	4-6 (4)	-	-	-
9	7-10	1-3 (3)	1,2 (1)	1	1	1	1	3-5 (4)	5,8 (6)	-	-
10	5-8 (7)	-	-	1	1,2 (1)	1	1	1,2 (1)	-	-	-
11	1	-	-	1	1	1	1	1	-	-	-
12	5-7 (7)	-	-	-	-	-	-	-	-	-	-
14	-	-	-	1	1	1	1	1	1,2 (1)	-	-

Identification key for pupae of the genera of Palaearctic mosquitoes

1. Seta 2-P present, anterior 1-P; seta 9-VIII simple and spine-like..... *Anophelinae*

− Seta 2-P present or absent, if present borne lateral to 1-P; seta 9-VIII simple or branched, not spine-like..... ..... *Culicinae*.... 2

2(1). Paddle elongate ovoid, posteriorly emarginated; seta 1-P absent; trumpet modified for piercing plant tissue. ……..... *Coquillettidia*

- Paddle usually sub-ovoid, seta 1-P present……...3

3(2). Seta 1- IX present; inner part of paddle broader than outer part, inner part clearly widened in mid-region…..... *Uranotaenia*

− Seta 1- IX present or absent; inner part of paddle otherwise.……..... 4

4(3). Paddle margin smooth; Seta 1-P branched; setae 8,9-CT with insertions removed from trumpet..…….……..... *Orthopodomyia*

− Paddle margin with spicules; setae 8,9-CT with insertions near trumpet..... 5

5(4). Seta 9-VIII situated in the posterior angle in sub-terminal position. Paddle with setae 2-P..... *Culex*

− Seta 9-VIII situated in a terminal position. Paddle without seta 2-P..... *Culiseta*, *Aedes* and *Ochlerotatus*

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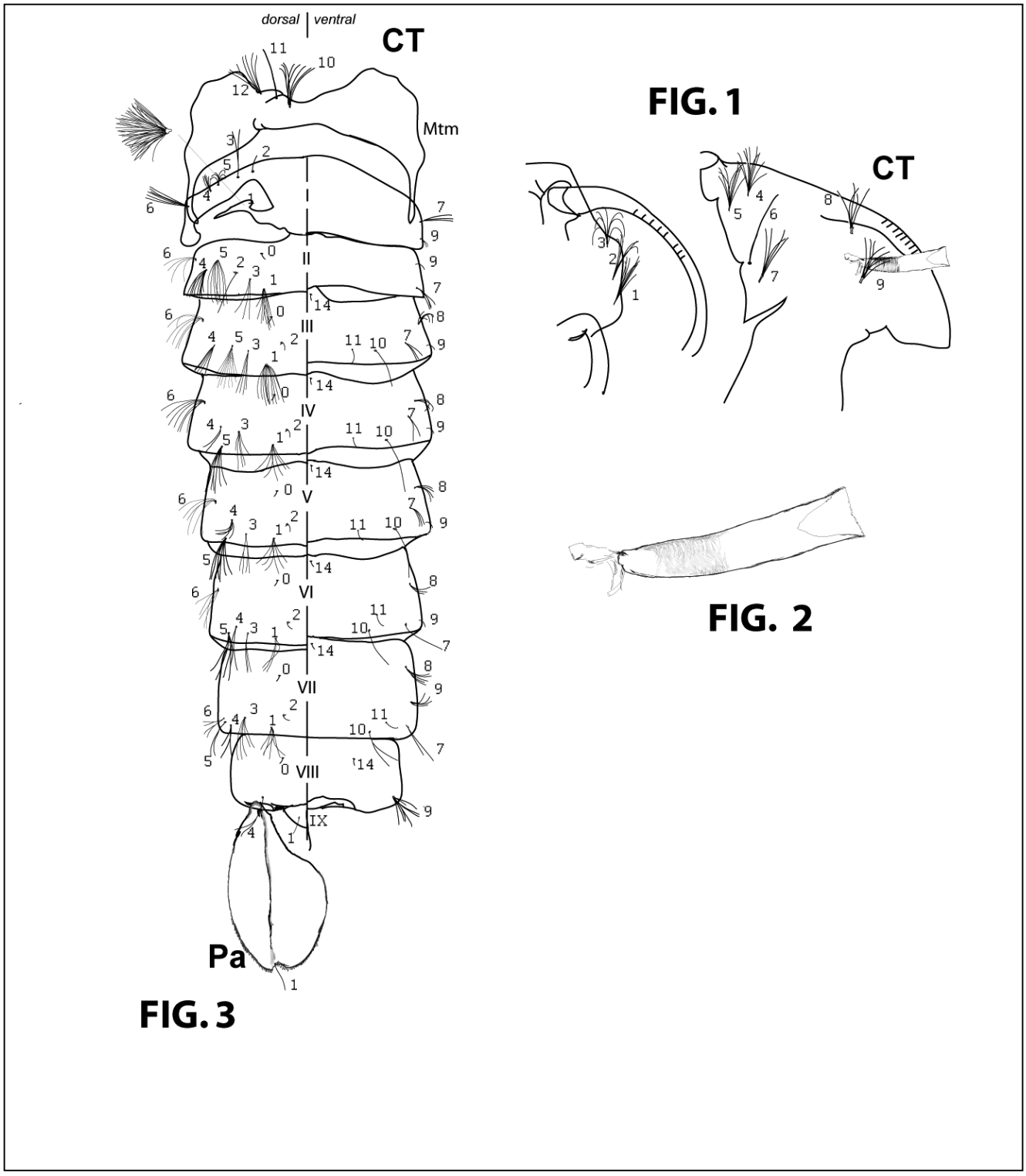

Figures 1-3. Pupa of *Uranotaenia unguiculata*
1. cephalothorax (CT); 2. trumpet; 3. metanotum, abdomen and paddle (Pa); I-IX abdominal segments.