

## Redescription of *Trigoniophthalmus graecanicus* Wygodzinsky, 1941 (Insecta: Microcoryphia), with first description of the male

Carmen Bach de Roca<sup>1,4</sup>, Miquel Gaju<sup>2</sup>, Luis F. Mendes<sup>3</sup> & Rafael Molero<sup>2</sup>

<sup>1</sup> Departament de Biologia Animal, de Biologia Vegetal i d'Ecologia, Unitat de Zoologia, Facultat de Biociències, Universitat Autònoma Barcelona, E-08193 Bellaterra, Espanya

<sup>2</sup> Universidad de Córdoba, Departamento de Zoología, Edificio Darwin, Campus de Rabanales, E-14014 Córdoba, España

<sup>3</sup> Unidade de Zoologia, IICT/JBT. R. da Junqueira, 14, P-1300-343 Lisboa, Portugal

<sup>4</sup> Corresponding author: Carmen Bach de Roca (e-mail: Carmen.Bach@uab.cat)

### Abstract

The description of the male of *Trigoniophthalmus graecanicus* Wygodzinsky, 1941 (a previous study was only based on females) is here reported. Several samples from Greece allow us to describe the male and also to provide further morphological characteristics of the female that were not properly considered in the original description. The relationship between *T. graecanicus* and its closest related species *T. alternatus* (Silvestri, 1904), is also discussed.

**Keywords:** taxonomy, systematics, Microcoryphia, Machilinae, Greece

### 1. Introduction

In the present paper we have analysed the material sent to us by Prof. Giuseppe Osella who had sampled most of it in Greece. The specimens belong to the 'Museo Civico di Storia Naturale di Verona' (Italy). In this collection we have found specimens belonging to the genus *Trigoniophthalmus* (Verhoeff, 1910). The genus comprises, to date, only nine species. Among them, five species are known in both sexes, while three are known only from females and one has been described based only on the male.

Among the samples examined, we have found females and males of *Trigoniophthalmus graecanicus* Wygodzinsky, 1941. This Greek species was cited only twice by Wygodzinsky (1941a) and Mendes (1984) respectively from mainland Greece (locality not indicated), and from Ewia (Euboea) island (West Aegean, Greece). This paper focuses on the description of the male of *T. graecanicus*. Moreover we also provide some new morphological characteristics of the female that were not considered in the original description.

### 2. Material and Methods

The specimens were received preserved in alcohol. After dissecting them under the stereoscopic microscope, several parts were mounted in Hoyer liquid and dried in a stove for a week and finally observed using an optical microscope.

The following alphabetically ordered abbreviations, will be used in the text: Lc/l: ratio contact line of the compound eyes / maximum length of compound eyes; l/a: maximum length of compound eyes / maximum wide of compound eyes; n/n-1: ratio length of the distal article of maxillary palp / length of the penultimate article of this palp; PI: first pair of legs; PII: second pair of legs; PIII: third pair of legs; pb/pd: basal part of the penis/distal part of the penis; st/cx: ratio length of the abdominal stylet without the terminal spine/length of the abdominal coxite; ts/st: ratio length of the terminal spine/length of the stylet without terminal spine. The specimens studied will be deposited in the collection of the Museo Civico di Storia Naturale di Verona

### 3. Results

#### 3.1. Description of the male

Body length 10 mm, antennal length (damaged) 8–9 mm length of paracercus (broken) 8 mm and length of the cerci 2–2.1 mm. Scale pattern when alive unknown. Body without hypodermic pigmentation. Head with pigmentation below the compound eyes and between the paired ocelli darker around the impair median ocellus. Clypeus with two little longitudinal stripes, labrum with a weak central spot. Clypeus and labrum with thin setae. Pigmentation around antennal bases. Compound eyes dark (colour not preserved), wider than long. Lc/l: 0.43; l/a: 0.80. Ocelli subtriangular in submedian position to the compound eyes, with a white spot in their anterior upper part.

Antennae shorter than body, uniformly slightly brown coloured. Scapus and pedicellus with a row of apical setae (Fig. 1). Distal antennal chains with 10 unities; each unity with 1–2 rows of setae, some distal unities show a sensillum which is not always present (Figs 2, 3).

Maxillary palp (Figs 4, 5) with ciliary setae longer than the half of width of each article, becoming shorter and less numerous in the last two articles. Distribution of hyaline spines on distal three articles as follows: V: 3–4; VI: 9–10; VII: 8. Distal article shorter than the penultimate, ending with two spines, ratio n/n-1: 0.68.

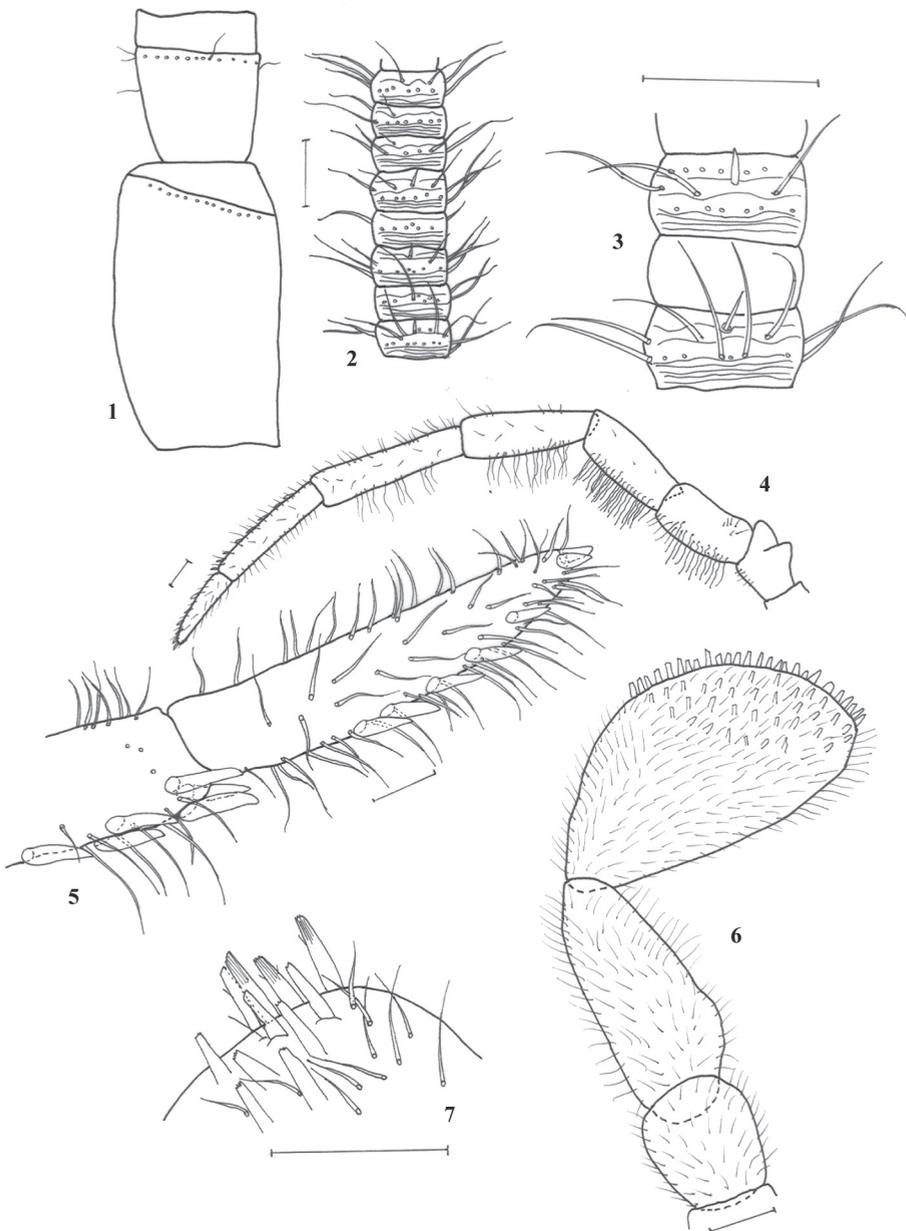
Labial palp with the third article enlarged in its apical part with abundant (more than 60) longitudinally striated conules and with 1–2 tiny setulae (Figs 6, 7).

Legs strong with coxal stylets on PII and PIII. PI more robust than the others, with a sensorial field on the external distal part of the femur (Fig. 8); this field with some rows of short simple setae surrounded by smooth longer ones (Fig. 9). Chaetotaxy as follows: on the dorsal side of the coxa there are 8–12 ciliary setae; on the ventral side of trochanter, femur, tibia and tarsus only setae, no spines. In the last two articles there are also spiniform setae. PII and PIII (Figs 10, 11) more slender than PI, with chaetotaxy as in PI except for absence of the ciliary setae on the coxa and the femoral sensorial field.

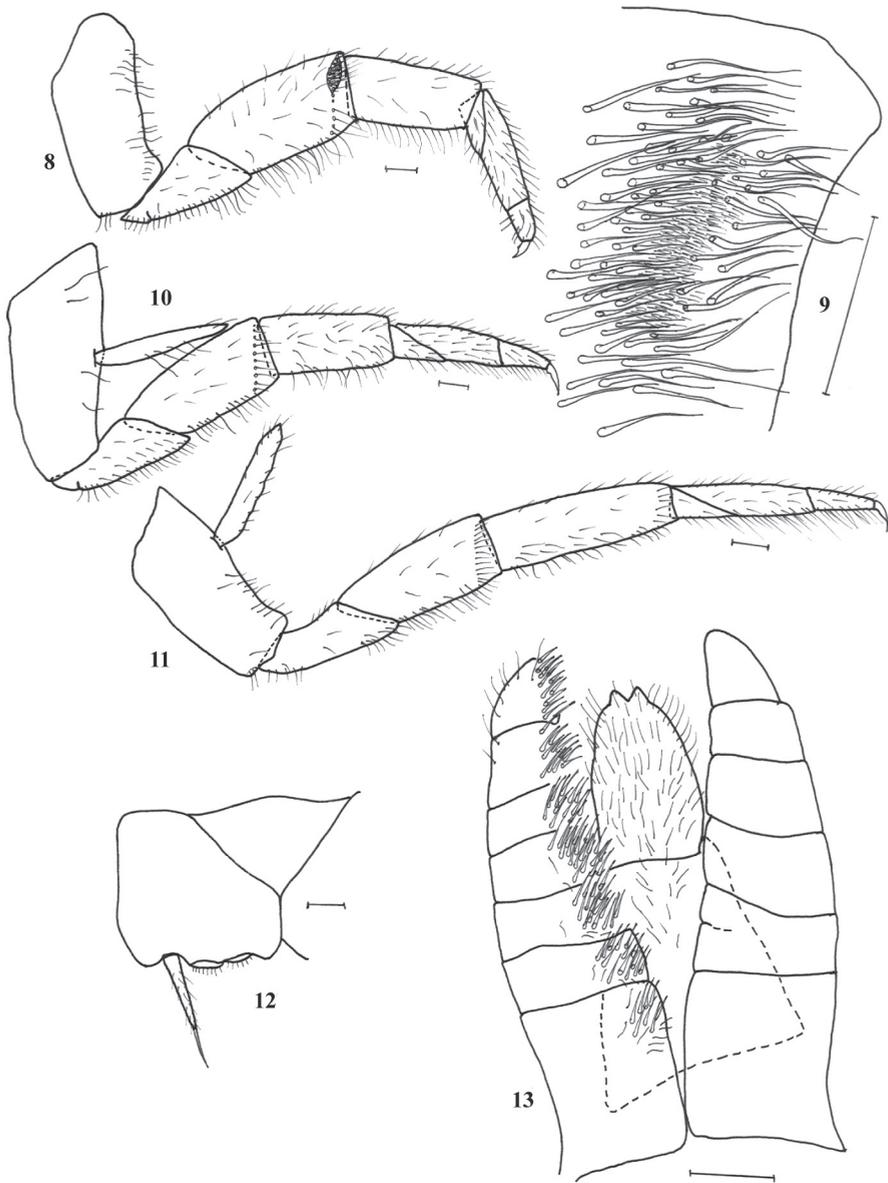
Urosternites I, V, VI and VII with 1+1 coxal vesicles; II–IV with 2+2 (Fig. 12). Coxites I–VI lacking spines; coxite VII and VIII respectively with 2 and 3 pairs of spines on their postero-external part, and IX with 4 but more medially situated. Sternites acute-angled, ratios st/cx: II–VII: 0.53, VIII: 0.65, IX: 0.74; ts/st: II–VII: 0.46, VIII: 0.53, IX: 0.38.

Paramera only present on urosternite IX, with 1+6 unities, covered internally with short spines. Penis shorter than paramera, with apical thin and long opening (Fig. 13). Apical part shorter than basal one, ratio pb/pd: 1.8.

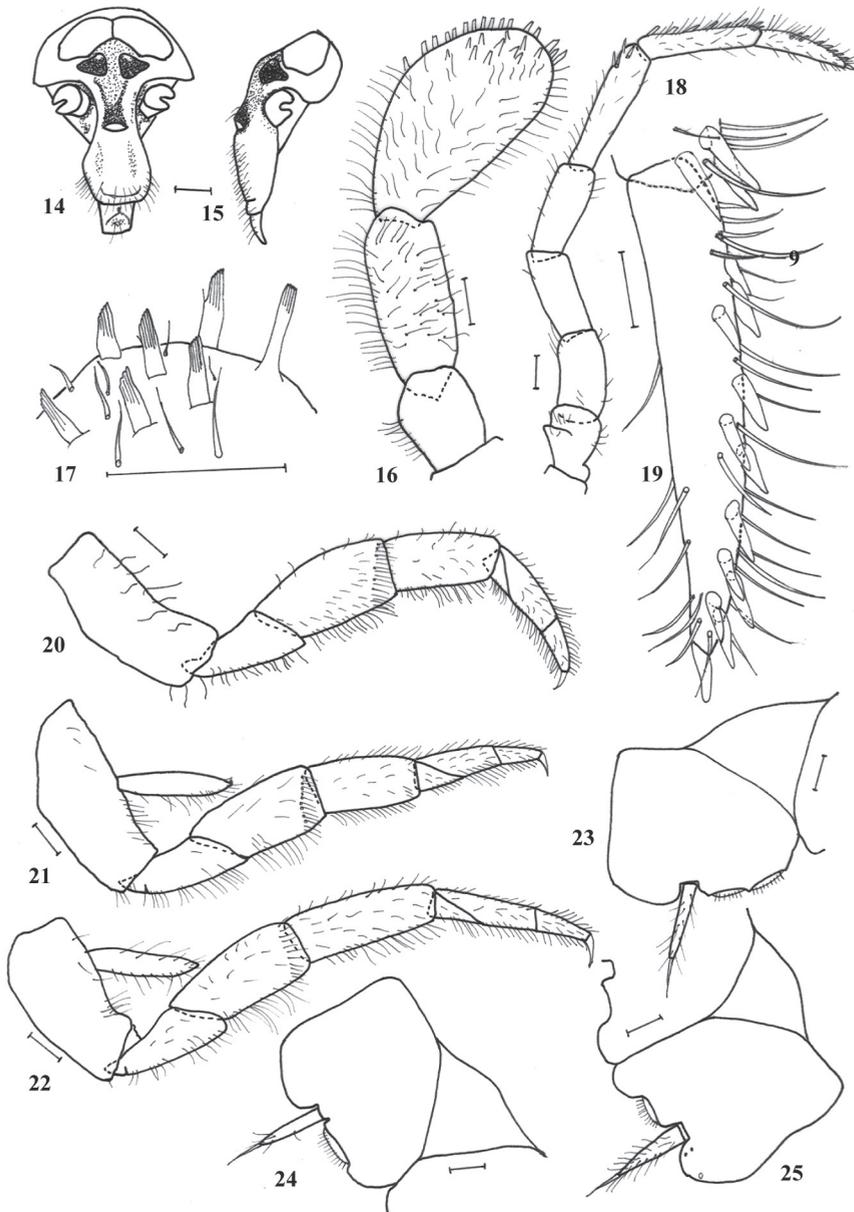
Posterior filaments damaged.



**Figs 1–7** *Trigoniophthalmus graecanicus* ♂. 1: Scapus and pedicellus of antennae; 2: Part of the distal chain of antennae; 3: Chaetotaxy of distal unities of antennae; 4: Maxillary palp; 5: Last article of maxillary palp; 6: Labial palp; 7: Conules of apex of the third labial palp article. Scale: 0.1 mm.



**Figs 8–13** *Trioniophthalmus graecanicus* ♂. **8:** PI; **9:** Sensorial field of fore femur; **10:** PII; **11:** PIII; **12:** Urosternite IV; **13:** Penis and paramera. Scale: 0.1 mm.



**Figs 14–25** *Trigoniophthalmus graecanicus* ♀. **14:** Head, frontal view; **15:** Head, lateral view; **16:** Labial palp; **17:** Conules of apex of third labial palp article; **18:** Maxillary palp; **19:** Last article of maxillary palp; **20:** PI; **21:** PII; **22:** PIII; **23:** Urosternite IV; **24:** Urosternite V; **25:** Urosternite VII. Scale: 0.1 mm.

### 3.2. Redescription of the female

Body length 9–9.5 mm (10 in Wygodzinsky's original description, p.89), length of antenna 3 mm (broken); paracercus and cerci damaged. Scale pattern unknown; body without hypodermic pigmentation.

Head as in the male (Figs 14, 15). Ratios Lc/l: 0.53; l/a: 0.81 (0.5 and 0.8 respectively in Wygodzinsky's original description).

Antennae as in the male, but in the female the apical sensilla on some unities are more frequent.

Maxillary palp without the ventral ciliary setae as found in the male (Fig. 18), last article ending with one spine (Fig. 19). Distribution of hyaline spines on three terminal articles as follow: V: 3–4; VI: 13–14; VII: 12–14; ratio n/n-1: 0.87.

Third article of labial palp enlarged, apical conules less numerous than in the male (Figs 16, 17).

Legs in shape and chaetotaxy as in the male, femur of PI without sensorial field (Figs 20, 21, 22).

Urosternites (Figs 23–25), terminal spine of the stylet always long and thin, ratios st/cx: II–VII: 0.44, VIII: 0.64–0.66, IX: 0.73; ts/st: II–VII: 0.53, VIII: 0.51, IX: 0.38.

Ovipositor not exceeding posterior angle of coxite IX (Figs 26, 29). Gonapophyses VIII with 20 divisions (18–22 in Wygodzinsky's original description, p. 90); apical division with a terminal spine longer than two most distal divisions, plus 8–10 little sensorial spines; 4–5 terminal divisions with little spines and short setae (Fig. 28); middle divisions with long setae as long as or longer than total length of 5–6 divisions (Fig. 27). Gonapophyses IX with 18–19 divisions (Fig. 29); distal division with a terminal spine as long as three terminal divisions, 5–6 little sensorial spines and 3–4 short setae; similar spines and setae also on distal divisions (Fig. 30); middle divisions with long setae; the basal ones without setae. Terminalia broken.

### 3.3. Material examined

Euboea: Mte. Dirphys, 1500 m, 19.VII.1982, 1♂ + 1♀ + 2 juv. + 4♀♀ of *Machilinus* sp., M. & G. Osella leg.; id. 1100 m, 4.IX.1982, 1♂, Litle leg.; Epirus: Mt. Tymfi (Papingo-Konitsa), 1100–2000 m, 1.VII.1982, 5♂♂ + 5♀♀, M. & G. Osella leg.; Central Greece: Mt. Tymfristos, 2000 m, 7.VII.1982, 1♂ + 1♀, M. & G. Osella leg.; id. Pindos: Mt. Peristeri (Lakmos), 1900–2100 m, 12.VII.1982, 1♀ + 2♀♀ of *Lepismachilis* sp., Osella – Belló leg.; id. Ioannina: Mt. Peristeri (Lakmos) 1910–2160 m, 11.VII.1984, 4♂♂ + 2♀♀ + 2♀♀ of *Trigoniophthalmus csikii*, M. & G. Osella leg.

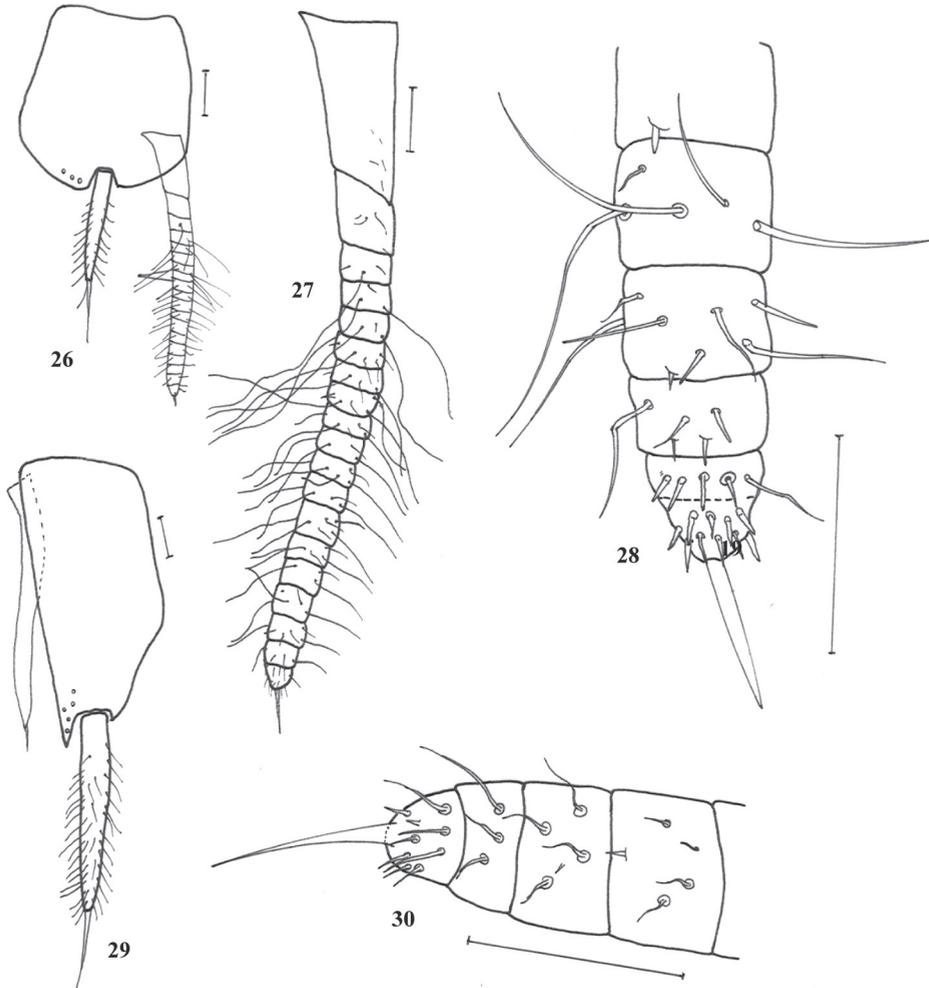
## 4. Discussion

As mentioned by Wygodzinsky (1941a) *T. graecanicus* and *T. alternatus* are closely related and differ from each other only in the number of eversible vesicles on the urosternites. In fact, the former species has only 2+2 vesicles on II–IV, while *T. alternatus* has 2+2 on II–V. This character is also reported in the keys provided by Wygodzinsky (1958).

The male in both species has a sensorial field of setae on the femur, however in *T. alternatus* this field has dentate setae at its apex (Wygodzinsky 1941b, Tab. VI, Fig. 90), while in *T. graecanicus* they are smooth (Fig. 9).

We completed Wygodzinsky's (1958) description providing and drawing some new morphological characteristics. Some of them regard features of antennae and legs as well as

the chaetotaxy of the palps. As a final conclusion we can argue that the females studied here agree rather well with Wygodzinsky's description, hence we have no doubt on identifying the specimens as belonging to *T. graecanicus*, which differs from *T. alternatus* not only by the number of eversible vesicles but also in the fine chaetotaxy of the ovipositor.



**Figs 26–30** *Trigoniophthalmus graecanicus* ♀. **26:** Urosternite VIII and gonapophysis; **27:** Gonapophysis VIII; **28:** Apex of gonapophysis VIII; **29:** Urosternite IX and gonapophysis; **30:** Apex of gonapophysis IX. Scale: 0.1 mm.

## 5. Acknowledgements

We are very grateful to Prof. Giuseppe Osella for sending us a lot of material for our studies. We thank also the two unknown reviewers for their invaluable comments.

## 6. References

- Mendes, L. (1984): The fauna of the Aegean Island of Santorini. Part 7 Microcoryphia and Zygentoma, with additional Records from other Greek Localities. – *Stuttgarter Beiträge zur Naturkunde (ser A)* **372**: 1–12.
- Wygodzinsky, P. (1941a): Zur Kenntnis einiger europäischer Dipluren und Thysanuren. – *Verh. Naturf. Ges. Basel* **52**: 63–100.
- Wygodzinsky, P. (1941b): Beiträge zur Kenntnis der Dipluren und Thysanuren der Schweiz. – *Denkschr. Schweiz. Naturforsch. Ges. Basel* **72**(2): 110–227 + 10 plates.
- Wygodzinsky, P. (1958): Notes et descriptions de Machilida et Thysanura paléarctiques. – *Revue Française d'Entomologie*, **25** (4): 298–315.

Accepted 30 September 2011