FIRST RECORDS OF *POECILOCHROA TABORENSIS* LEVY, 1999 (ARANEAE: GNAPHOSIDAE) FROM GREECE AND CYPRUS WITH NOTES ON SOME CLOSELY RELATED SPECIES

Jørgen Lissner[1] & Maria Chatzaki[2]
[1,3]Natural History Museum Aarhus, Wilhelm Meyers Allé 210, Universitetsparken, 8000 Aarhus C, Denmark
[2]Department of Molecular Biology and Genetics, Democritus University of Thrace, Dragana, 68100 Alexandroupolis, Greece. E-mail: maria.chatzaki@gmail.com, mchatzak@mbg.duth.gr
[3]Corresponding author. E-mail: lissner@nathist.dk

ABSTRACT
First records of *Poecilochroa taborensis* Levy, 1999 (Araneae: Gnaphosidae) from Greece and Cyprus with notes on some closely related species
The ground spider *Poecilochroa taborensis* Levy, 1999 previously known only from Israel is reported here from Greece and Cyprus. The relationship with the closely related *Trichothyse africana* (Tucker, 1923) is discussed. *Macarophaeus sabulum* Wunderlich, 2011 was found to be conspecific with *P. taborensis* and views on the placement of the species in *Poecilochroa* or *Macarophaeus* are presented.

Key words: Araneae, Gnaphosidae, *Poecilochroa*, *Trichothyse*, *Macarophaeus*, *Echemus* Group, Lefkada, Rhodes, Crete, Cyprus, Greece

INTRODUCTION

Poecilochroa Westring, 1874 with 41 accepted species worldwide is a genus of the large spider family Gnaphosidae consisting of nearly 2200 species in more than 120 genera (World Spider Catalog, 2016). It is distributed in Africa, Europe, Asia, and the Americas according to the mapped World distribution in Murphy (2007). The genus is unique in having its members divided among two Gnaphosid groups: species with black and white coloured abdomens fall into the *Herpyllus* Group while species with plain-coloured abdomens fall in the large *Echemus* Group (Murphy, 2007). *Poecilochroa* of both groups are characterized by well-developed dorsal scuta in males. *Poecilochroa taborensis* Levy, 1999 was described from a female collected in Israel at Mt. Tabor (Levy, 1999). Ten years later a description of the male was published based on a specimen from Devira, about 150 km to the south of the type locality. Levy also added a third Israeli locality, Lakish (15 km to the north of Devira), at which site a second female was found (Levy, 2009). Here we add new records of the species, the first ones from Greece and Cyprus, and we provide a more detailed description of the female. We also discuss the relationship of *P. taborensis* to two species with similar build of genital organs, *Macarophaeus sabulum* Wunderlich, 2011 known from Portugal (here found to be conspecific with *P. taborensis*) and *Trichothyse africana* (Tucker, 1923) known from South Africa.

MATERIAL AND METHODS

Material comes from four different field expeditions in the Greek islands Lefkada, Crete and Rhodes and in Cyprus. Material from Rhodes and Cyprus was collected by J. Van Keer and Dr. A. Russell-Smith respectively and was kindly provided to us for examination. The specimen from Crete belongs to the collection of the Natural History Museum of Crete and was collected by pitfall traps. All other spider samples were sought by hand. Illustrations of the chelicera, fang, eye region, sternum and maxillae were made from stacked stereomicroscope photos using the vector graphics editor Inkscape. Line drawings of genitalia were produced by a Leica DM 2500 trinocular microscope with a drawing device.

Material abbreviations: CJL: collection Jørgen Lissner, CJVK: collection Johan van Keer, CAR-S: collection Anthony Russell-Smith, NHMC: collection Nat. History Museum of Crete, CJW: collection Jörg Wunderlich. Except for the specimen from Crete, all other specimens are currently stored in the private collections of the corresponding collector, but eventually they will be deposited at the Natural History Museum of Copenhagen (CJL), the Royal Belgian Institute for Natural Sciences in Brussels (CJVK), Manchester Museum (CAR-S).
Abbreviations used in the description: TL: Total length, PL: Prosoma length, PW: Prosoma width, AER: anterior eye row, PER: posterior eye row, AME: anterior median eyes, PME: posterior median eyes Fe: femur, Pa: patella, Ti: tibia, Mt: metatarsus, Ta: tarsus, d: dorsal, v: ventral, pl: prolateral, rl: retrolateral.

MATERIAL EXAMINED

Poecilochroa taborensis Levy, 1999: GREECE, Ionian Islands, Lefkada, at Mylos Beach near Aghios Nikitas (38.7878°N 20.6087°E), 1♀, 5 m above sea level, found on sandy beach among sparse vegetation, 12.VII.2009, J. Lissner leg., CJL-5731; Dodecanese islands, Rhodes, 2.3 km W of west of Kattavia village near the chapel Aghios Theodoros (35.9545°N 27.7425°E), 1♀, stones along field road, 16.V.2006, Johan van Keer leg., CJVK

2644; c. 3 km W west of Kattavia village, of the chapel Aghios Theodoros (35.9605°N 27.7357°E), 1♀, stones in dunes on the coast, 16.V.2006, Johan van Keer leg., CJVK 2645; North of Archipoli (36.2729°N 28.0646°E), 1♀, stones along olive orchard, 15.V.2006, Johan & K. van Keer legs, CJVK 2639; Crete: Irakleio, Kommos (35.0972°N 24.7619°E), 1♀, phrygana, pitfalls 1.VI.1999-30.VII.1999, M. Nikolakakis leg., NHMC 900. CYPRUS, Idalion archaeological site (35.0153°N 33.4239°E), 1♀, 250 m above sea level, under stones in phrygana, 1.V.2013, Anthony Russell-Smith leg., CAR-S.
OTHER MATERIAL EXAMINED
Poecilochroa taborensis Levy, 1999: 1♀ holotype, Israel, Mt. Tabor, R. Jackson leg., 29.V.1993 (HUJ15024); Devira, 1♂ allotype, on *Lycium*, 22.VII.2007, Yoni Gavish leg., HUJ15560; Lakhish, 1♀, 23.VIII.2007 Yoni Gavish leg., HUJ15559. *Macarophaeus sabulum* Wunderlich, 2011, 1♀ holotype, Portugal, ca. 20 km NE Faro, sandy area ca. 100-200 m above sea level, (37.1541°N 7.7886°W), Jörg Wunderlich leg., 15.V.2010. Reg. Nr.: Zoologische Staatssammlung München A20 160004 R124/AR/CJW; Ilha da Fuzeta (37.0472°N 7.74419°E), 1♂2♀ in dunes, Jörg Wunderlich leg., 20.V.2016, CJW; Ilha da Armona (37.0193°N 7.7939°E), 1♂, in dunes, Jörg Wunderlich leg.,V.2016, CJW. *Trichothyse* (*Latonigena*) *africana* (Tucker, 1923) ♀, Republic of South Africa, Kroondal, Rustenburg, 21.III.1980, coll. D. Uys (pitfall trap). Nat. Collection, Arachnida Pretoria. AcAT 86/452. Det. J.A. Murphy.

***Poecilochroa taborensis* Levy, 1999**

DIAGNOSIS
The *Echemus* Group of Gnaphosid genera includes *Poecilochroa* and are characterized by species with plain coloured abdomen and the presence of a dorsal scutum in the male. *Poecilochroa taborensis* is morphologically close to *Trichothyse africana* (male unknown). They differ by the curvature of PER: in *P. taborensis* this row is straight or slightly procurved while distinctly procurved in *T. africana* (fig. 2). The shape of the apical edge of the chelicerae as seen in posterior view differs by being smoothly rounded in *P. taborensis*, but slightly jagged in *T. africana* (compare fig. 3a with illustration in Murphy (2007)). The two species also differ by other morphological traits: in *T. africana* the prosoma is more elongated, head more pronounced with parallel sides, also spination of femur III differs from *P. taborensis* in consistently possessing 5 dorsal spines while *T. africana* has 6. Despite their placement in different genera the two species share the same build of the epigyne forming a triangular or trapezoid central area edged by lateral black margins. The triangle is approximately equilateral in *T. africana* (fig. 4f) and triangular to trapezoid in *P. taborensis*, while the width of the epigyne is somewhat variable in this species (figs. 4a-e). The large kidney-shaped spermathecae are similar in both species. The large tibial retrolateral apophysis terminates in a short hook, which is more robust that the delicate hooks found in congeners such as *P. senilis* (Levy, 1999) and *P. perversa* Simon, 1914 (fig. 396 in Simon, 1914). Another species related to *P. taborensis* is *P. patricia* (Simon, 1878). According to the text description in Simon (1914) this species differs by having apical half of femora black while femora of *P. taborensis* are unicoloured yellow-brown.

DESCRIPTION
Measurements ♀ (mm, n=4): TL: 4.25-5.70, PL: 1.93-2.46, PW: 1.33-1.79, OL 2.32-3.54. Habitus of live specimen as in fig. 1. Carapace yellow brown with faintly darker striae radiating from a very short but distinct fovea (fig. 2a) or from the area of a completely reduced fovea (fig. 2b) and clothed fairly densely with white hairs (fig. 1). Eyes large, subequal and forming a compact group (figs. 2, 3b). AME hemispherical in shape. AER recurved, PER straight to slightly procurved with PME oblique (fig. 3b). The area between and behind the anterior median eyes darkened. Chelicerae weak, retromargin without teeth or denticles (fig. 3a), thus lacking the retromarginal tooth present in most genera of the *Echemus* Group. Promargin with a hint of a low keel formed by the seam curving towards the fang socket, only visible in anterior view. Fang weak, distinctly flattened, with a finely serrated lamina facing the chelicera, serration begining at mid position on fang and continuing towards the fang socket (fig. 3a). Sternum almost perfectly oval, only slightly truncated anteriorly (fig. 3c). Labium longer than wide with anterior edge straight (fig. 2d). Labium/maxillae length ratio equals 0.57. Maxillae with anterior edges retracted at inner side (fig. 3d). Abdomen uniformly light grey, densely covered with hairs (fig. 1). Anterior lateral spinnerets with a pair of small major ampullated glands encircled by a sclerotized ring. These glands are situated anterior to three piriform spigots packed approximately parallel to each other and to the surface of the distensible membrane when in resting stage. Plumose hairs only slightly thickened are seen appressed to the distensible membrane of anterior lateral spinnerets, where they form a distal fringe around the tubular segment (rubbed off in some specimens). Legs are short and stout as in most gnaphosid species; leg formula 4123. Scopulae well-developed on tarsi I-IV, extending on to metatarsi I-II. Basal segments of legs coloured as carapace, becoming gradually darker in apical segments (patellae to tarsi), legs I and II in particular. Leg spination: Fe I: 4d; II: 4d; III: 5d; IV:4d; Pa: spineless; Ti I&II: spineless; III: 2d, 4pl, 2rl; IV: 2rl, 2pl, 1v; Mt I & II: spineless; III & IV: spinose. Epigynal sclerotized frame set like a pair of

mirrored sevens and forming an equilateral triangle or a trapezium wider than long (figs. 4a-e, 5a). The relative position of structures may change when the epigyne is detached and cleared with KOH as the epigyne rolls up slightly, hence the trapezium may become narrower (compare fig. 4c with fig. 5a, the latter illustration was prepared using a detached epigyne). Spermathecae large, bean shaped and visible through the integument. There is no scape. Vulva as in fig. 5b.

COMMENTS

In assigning his new species to *Poecilochroa*, Levy (1999) did not provide many diagnostic details, but merely wrote that the species "shows all the characteristic features of the genus along with the peculiar chelicerae and the shape of the spermathecae". In our effort to determine our specimens, we noticed the close morphological resemblance of this species to two others belonging to two different genera, *Macarophaeus* (*M. sabulum*) and *Trichothyse* (*T. africana*). All three species lack any dorsal coloured abdominal pattern, possess similar epigynes and palps (male of *T. africana* unknown) and are without a tooth on the cheliceral retromargin, while their differences are rather small. *Trichothyse africana* (original combination *Latonigena africanus* Tucker, 1923) was removed from *Latonigena* due to lack of abdominal transverse black and white bands considered a constant characteristic of all other species assigned to *Latonigena* (Ott, Rodrigues, & Brescovit, 2012). No longer misplaced in *Latonigena*, the species does not sit well in *Trichothyse* either, as members of this genus possess a small tooth on the cheliceral retromargin according to the genus description provided by Tucker (1923), but such tooth is absent in *T. africana* (Murphy, 2007). The original placement of *T. africana* in *Latonigena* rather than in the similar *Poecilochroa*, is solely attributed to the PER being clearly procurved in *Latonigena* while approximately straight in *Poecilochroa* (key in Tucker 1923) and appears to be the only obvious character preventing the transfer of *T. africana* to *Poecilochroa*. The placement of *T. africana* will need reconsideration once the unknown male is found and described.

The female holotype of *P. taborensis* from Mt. Tabor Israel was compared to the female holotype of *M. sabulum* from NE of Faro, Portugal and found to be conspecific. Also the designated male allotype of *P. taborensis* from Devira, Israel was found to be conspecific with males of *M. sabulum* collected at Fuseta, Portugal. A formal synonymization has been prepared (Wunderlich, in press) and for this reason we do not proceed herein to it. The epigynal frame varies in width from triangular to trapezoid and tends to be generally more narrow in Portuguese specimens than in specimens from Israel, Cyprus and Greece. The structures of the male palp are nearly identical in all specimens examined. According to the description in Wunderlich (2011; 2012) the complete absence of a fovea in *M. sabulum* is a distinctive character. However, newly collected specimens from Portugal possess a short but discernible fovea similar to that of specimens from Israel, Cyprus and Greece. So we notice that in the specimens of *P. taborensis* a fovea may be apparent or lacking irrespective of the the origin of specimens. The species may have a circum-mediterranean distribution and occurrence in other Mediterranean countries is expected.

Macarophaeus sabulum is regarded as a questionable member of *Macarophaeus* (Wunderlich, 2012). This genus was erected to hold some Macaronesian species formerly assigned to *Scotophaeus* (Wunderlich, 2011). Wunderlich also included species of *Poecilochroa* with plain coloured abdomens (*Echemus* Group), including *P. senilis* which is probably the closest relative of *P. taborensis*. While it is unfortunate that *Poecilochroa* has its members divided between the *Herpyllus* and *Echemus* groups, a transfer of *Poecilochroa* with plain cloured abdomens to *Macarophaeus* may not be the best way to solve this problem. *Macarophaeus* seems a rather vaguely defined genus, its members only united by a lack of a median apophysis. Many characters in the genus description show a large variation, e.g. configuration of eyes which may be more separated or closely set, the promarginal keel of the chelicerae may be smooth, serrated, or nearly absent, the retromargin may be toothless or with one tooth, the curvature of PER is "more or less straight", the dorsal pattern of the abdomen is distinct or absent, and the leg spination is very variable. The shape of the squamose setae often considered of important taxonomic value in the Gnaphosidae is not a part of the genus diagnosis. The type species of *Macarophaeus* (*M. varius* Simon, 1893) with its distinct dorsal pattern, serrated carina of promargin, dentate retromargin and widely spaced eyes seems rather distantly related to the *Echemus* Group *Poecilochroa* species. *Macarophaeus* seems not to delineate a group of closely related species and due to the allowed variability in characters it may not be practical for identification purposes either. Thus the placement of *P. taborensis* in *Macarophaeus* seems not well justified and a possible need for transfer should await a revision of *Poecilochroa* and perhaps also the remaining genera of the *Echemus* Group.

ACKNOWLEDGEMENTS: We wish to thank the Scientific Collection Director Dr. Efrat Gavish-Regev, National Natural Collections, Hebrew University of Jerusalem for providing type material of *Poecilochroa taborensis*. Dr. Jörg Spelda and Dipl.-Biol. Stefan Friedrich, Zoologische Staatssammlung München, Arthropoda Varia, München, Germany are thanked for arranging a loan of the type specimen of *Macarophaeus*

sabulum. A. Russell-Smith, Johan Van Keer and Jörg Wunderlich are especially thanked for providing their material for identification and for valuable information on the collection sites.

REFERENCES

Levy, G. 1999. Spiders of six uncommon drassodine genera (Araneae: Gnaphosidae) from Israel. – Israel Journal of Zoology, 45: 427–452.
Levy, G.2009. New ground-spider genera and species with annexed checklist of the Gnaphosidae (Araneae) of Israel. – Zootaxa, 2066: 1–49.
Murphy, J. A. 2007. Gnaphosid Genera of the World. – St Neots, Cambs: British Arachnological Society.
Ott, R., Rodrigues, E. N. L., & Brescovit, A. D. 2012. Seven new species of Latonigena (Araneae, Gnaphosidae) from South America. – Iheringia. Série Zoologia, 102(2): 227–238.
Simon, E. 1914. Le Synopsis général et le catalogue des espèces françaises de l'ordre des Araneae; 1re partie. – Les Arachnides de France 6: 1–308.
Tucker, R. W. E. 1923. The Drassidae of South Africa. – Annals of the South African Museum 19: 251–437.
World Spider Catalog. (2016). World Spider Catalog. Retrieved November 27, 2016, from http://wsc.nmbe.ch.
Wunderlich, J. 2011. Taxonomy of extant and fossil (Eocene) European Gnaphosidae. – Beiträge Zur Araneologie 6: 19–97.
Wunderlich, J. 2012. Few rare and a new species of spiders (Araneae) from Portugal, with resurrection of the genus *Chiracanthops* Mello-Leitao 1942 (Clubionidae: Eutichurinae). – Beiträge Zur Araneologie 8: 183–191.
Wunderlich, J. 2017, in press. Descriptions, notes and synonyms of some mainly mediterranean and Macaronesian spiders (Araneae) of various families. – Beiträge Zur Araneologie, 10.

Fig. 1. *Poecilochroa taborensis* Levy, 1999. Habitus of live female from Mylos Beach, Aghios Nikita, Lefkada, Greece.

Fig. 2. Photos of prosoma of females in dorsal view. A) *Poecilochroa taborensis* Levy, 1999 (Lefkada, Greece); B) same species (Lakhish, Israel); C) same species, the female holotype in the description of *Macarophaeus sabulum* Wunderlich, 2011 (Portugal); D) *Trichothyse. africana* (Tucker, 1923) (Republic of South Africa). Scale bar 1.0 mm.

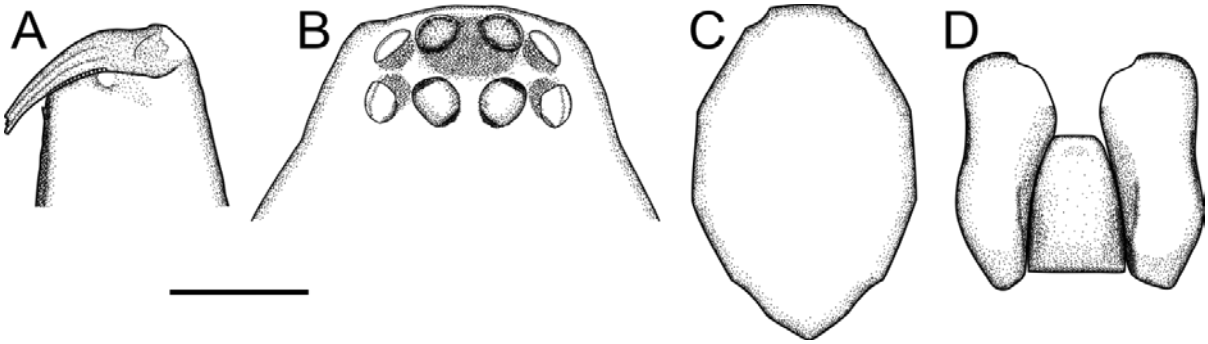

Fig. 3. *Poecilochroa taborensis* Levy, 1999, female (Lefkada, Greece). A) left chelicera viewed in posterior view. Apex of fang is broken off. There are no retromarginal keel or teeth. The basal half of the fang facing the chelicera is very finely serrated. Scale bar 0.2 mm. B) eyes in dorsal view**.** Scale bar 0.5 mm. C) sternum in ventral view. Scale bar 0.5 mm. D) maxillae and labium, note straight anterior edge of labium. Scale bar 0.2 mm.

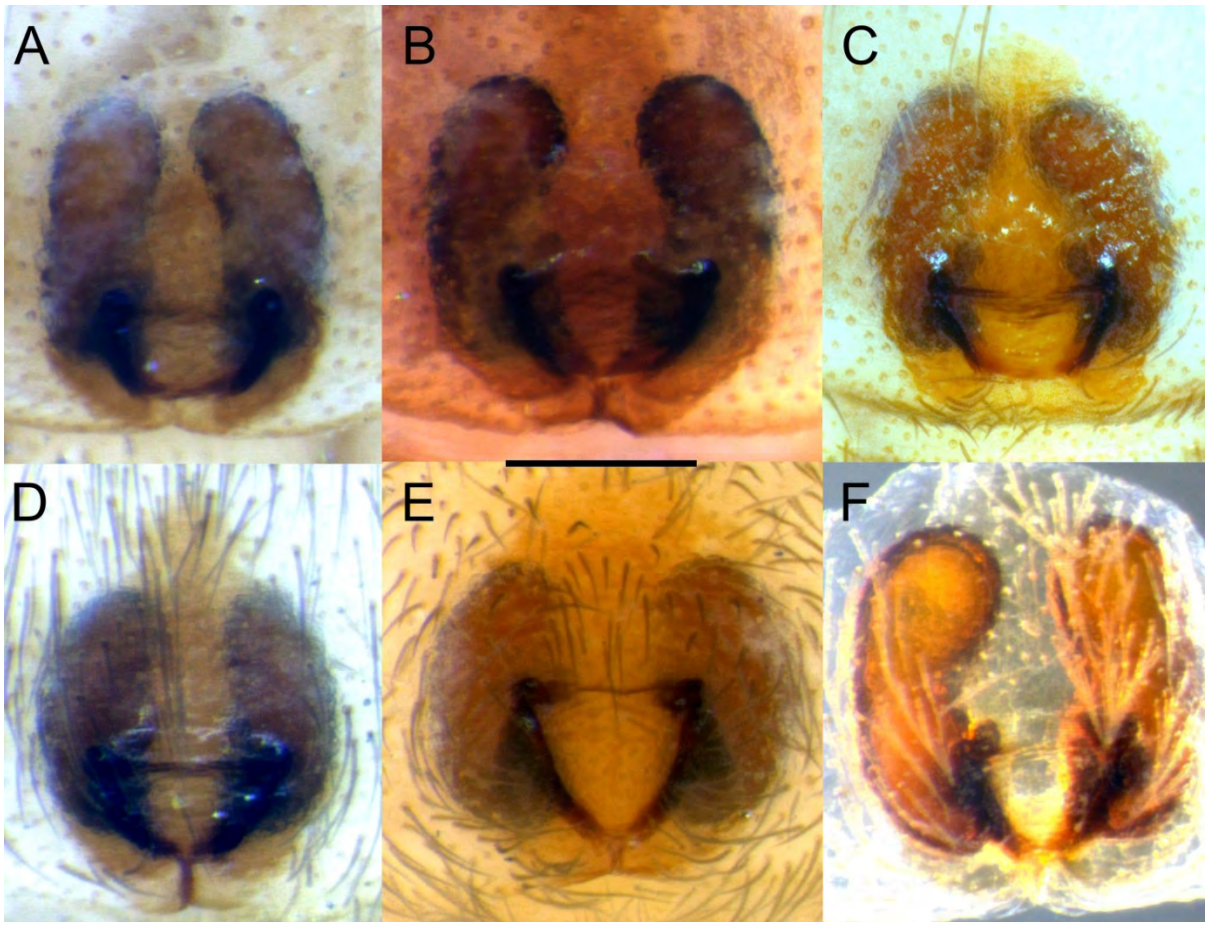

Fig. 4. Photos of epigynes in ventral view. A-E) *Poecilochroa taborensis* Levy, 1999; A) specimen from Lakhish, Israel; B) type specimen from Mt. Tabor, Israel; C) specimen from Lefkada, Greece, D) specimen from Idalion, Cyprus; E) specimen from Faro, Portugal (female holotype of *Macarophaeus sabulum* Wunderlich, 2011); F) *Trichothyse africana* (Tucker, 1923), detached epigyne. Scale bar 0.2 mm.

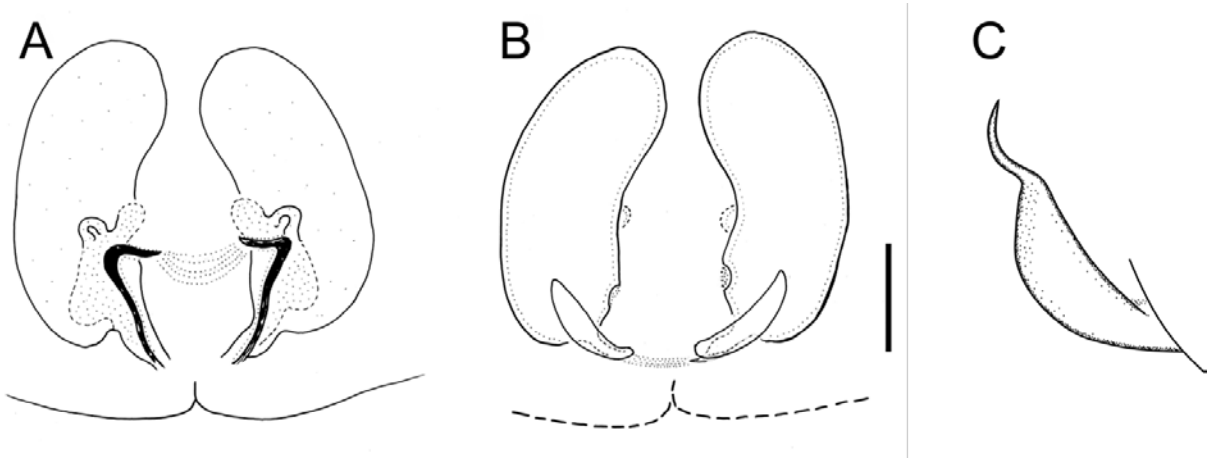

Fig. 5. *Poecilochroa taborensis* Levy, 1999 (Lefkada, Greece). A) epigyne in ventral view. B) vulva in dorsal view. C) embolus of left palp in retrolateral view. Scale bar A-B) 0.1 mm, C) 0.025 mm.

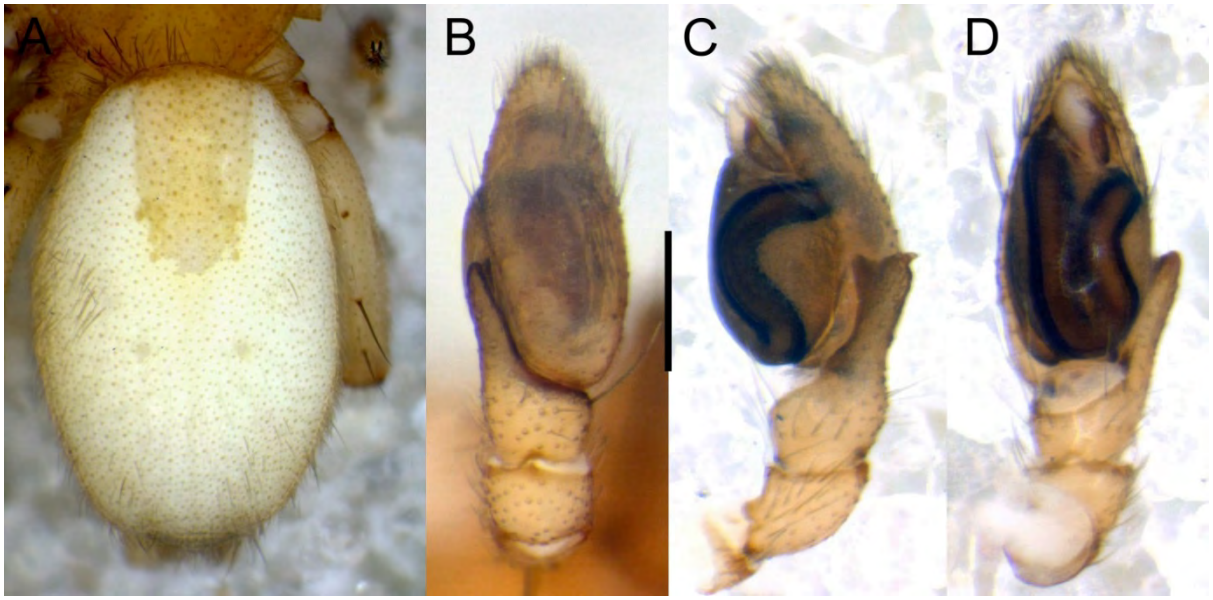

Fig. 6. *Poecilochroa taborensis* Levy, 1999 (designated male allotype from Devira, Israel). A) scutum of male abdomen. B) palp in dorsal view. C) retrolateral view. D) ventral view. Scale bar A), 0.5 mm, B-D) 0.5 mm.