

- collected from mid hills of western Himalayas. *Industrial Crops and Products*, 22 (32): 241-247.
- POTTIER ALAPETITE G., 1981. - Flore de la Tunisie. *Tunisien Scientific publications*, Tunis.
- RASIKARI H.L., LEACH D.N., WATERMAN P.G., SPOONER-HART R.N., BASTA A. H., BANBURY L. K. & FORSTER P.I., 2005. -Acaricidal and cytotoxic activities of extracts from selected genera of Australian lamiaceae. *Journal of economic entomology*, 98 (4): 1259-1266.
- SCHMUTTERER H., 1992. - Control of diamondback moth by application of neem extracts. pp. 325-332. *In Diamondback moth management and other crucifer pests*, Eds. TALEKAR N.S. & GRIGGS T.D. Proceedings of the 2nd International Workshop, asian Vegetable Research and Development Center, shanhua, Taiwan.
- SINGH G. & UPADHYAY R.K., 1993. - Essential oils: a potent source of natural pesticides. *Journal of scientific & industrial research*, 52: 676-683.
- TUNC I. & SAHINKAYA S., 1998. - Sensitivity of two greenhouse pests to vapours of essential oils. *Entomologia experimentalis et applicata*, 86: 183-187.
- VENZON M., ROSADO M.S., MOLINA-RIGOMA A.J., DUARTE V.S., DIAS R. & PALLINI A., 2008.- Acaricidal efficacy of neem against *Polyphagotarsonemus latus* (Banks) (Acari : Tarsonemidae). *Crop protection*, 27: 869-872.
- YI C.G., KWON M., HIEU T.T., JANG Y.S. & AHN Y.J., 2007.- Fumigant Toxicity of Plant Essential Oils to *Plutella xylostella* (Lepidoptera: yponomeutidae) and *Cotesia glomerata* (Hymenoptera: Braconidae). *Journal of Asia Pasific Entomology*, 10 (2): 157-163.

Bulletin S.R.B.E./K.B.V.E., 147 (2011) : 79-83

A new myrmecophilous *Allochernes* from ant nests in the high altitude of the eastern Spanish Pyrenees (Arachnida: Pseudoscorpiones: Chernetidae)

HANS HENDERICKX^{1,2}

¹ Department of Biology, Universiteit Antwerpen, Groenenborghlaan 171, B-2020 Antwerpen, ² Royal Belgian Institute of Natural Sciences, Department of Entomology, Vautierstraat 29, B-1000 Brussels (Address for correspondence: Hemelrijkstraat 4, B-2400 Mol. E-mail: cavexplorer@gmail.com).

Abstract

Allochernes struyvei sp.n., a new myrmecophilous pseudoscorpion from the Spanish Pyrenees, is described.

Keywords : Pseudoscorpion, *Allochernes struyvei* sp.n., myrmecophilous, Pyrenees, Spain

Introduction

Some species of the pseudoscorpion genus *Allochernes* BEIER occur occasionally with ants (BEIER, 1963), other species of this genus have only been found in the nests of a particular ant species (HENDERICKX & VETS, 2003) and seem restricted to this host.

During collection trips in May and September 2009 an unidentified pseudoscorpion was found in heaps of the ant *Formica paralugubris* SEIFERT, 1996 near Setcases, Spain by Tim STRUYVE (Muizen, Belgium), who was searching

for Myrmecophilous Staphylinidae. The pseudoscorpions were kindly donated to the author and the new species is described in this publication.

Material and methods

All specimens were hand captured by sifting material from the ant-heaps and fixed in 70% ethanol.

Microscopical examination was performed with a Leitz microscope and optics, measurements with a Zeiss calibration grid. A FEI Quanta-200 was used for scanning electron microscopy.

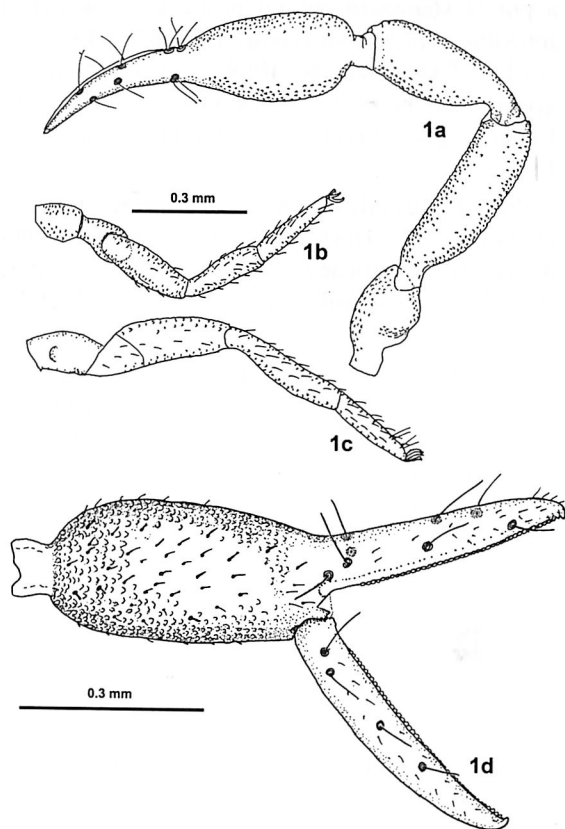


Fig. 1: *A. struyvei* sp.n., holotype. a: right pedipalp, dorsal; b: leg I; c: leg IV; d: chela, antiaxial.

Preparations on slides were embedded in Euparal. All measurements are in mm, the ratio is the length/width index of an article (L/W). Trichobothria names: *t* terminal, *st* subterminal, *sb* subbasal, *b* basal, *et* exterior terminal, *it* interior terminal, *est* exterior subterminal, *ist* internal subterminal, *esb* exterior subbasal, *eb* exterior basal, *isb* interior subbasal, *ib* interior basal.

Description

Allochernes struyvei sp. n.

(Figs. 1a, 1b, 1c, 1d, 2c, 4a, 4c)

Type material: Male holotype in 70% ethanol, both chela separated, preserved in glass vial, labelled (red labels): "M230-1; Setcases (1600 m), España, 42°24'10.03" N 02°17'09.09" E, 25 September 2009 (leg. Tim STRUYVE)"; deposited in The Royal Belgian Institute of Natural Sciences (R.B.I.N.S.), Brussels (I.G. number 31.799). 4 male paratypes, labeled T2-T5, same date and location as holotype. 4 female paratypes, labeled T6-T9, same date and location as holotype. T2 and T8 deposited

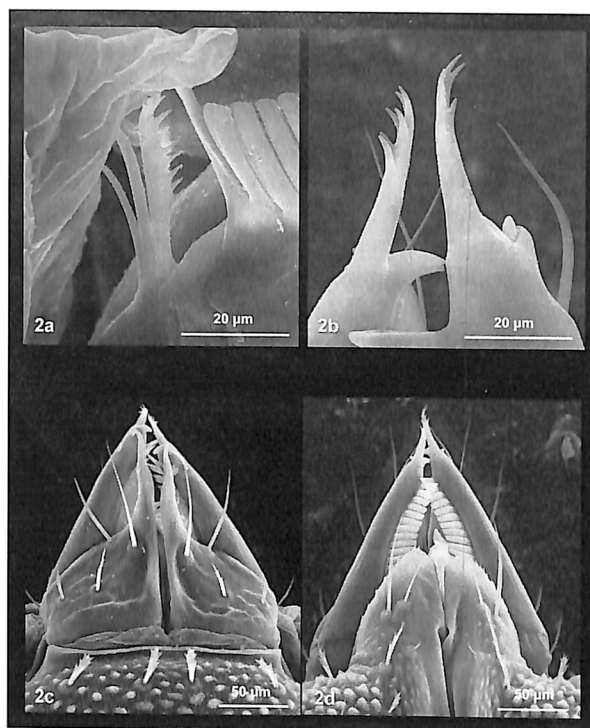


Fig. 2: *A. struyvei* sp.n., male. Setcases, 25 September 2009, SEM (Scanning Electron Microscopy). a: rallum (flagellum); b: galea, ventral; c: chelicerae, dorsal; d: chelicerae, ventral.

in R.B.I.N.S (I.G.: 31.799), T3 and T9 in coll. Juan A. ZARAGOZA, Universidad de Alicante, España, the other paratypes in the collection of the author, female paratype T7 illustrated in Fig. 5a and 5b.

Etymology: The species is named after the entomologist Tim STRUYVE (Muizen, Belgium), who collected the new species on his expeditions through the Pyrenees.

Diagnosis: The new *Allochernes* species is characterized by the unique combination of a reduced number of lateral accessory teeth on the chelal fingers (fixed finger with one subterminal medial and one subterminal lateral tooth, movable finger with only one small subterminal lateral tooth), the small size, the slender pedipalps: (femur, patella and chela all have high L/W values) and the high number of setae on the tergites.

Male holotype (M230-1), morphology

Color before fixation brighter than most *Allochernes* sp., opisthosomal plates and legs pale brown-yellow, pedipalps and carapace reddish brown. **Total length** (excluding chelicera): 1.50

Carapace (Fig. 4a) slightly longer than wide (0.61 x 0.58), coarsely granulated, granulations

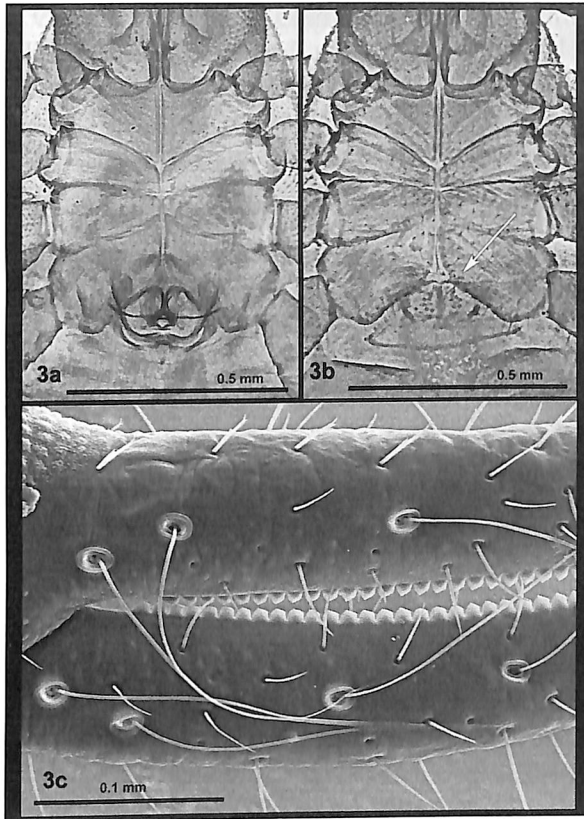


Fig. 3a: *A. struyvei* sp.n., male, coxa and genital structures, ventral, Setcases, 25 September 2009, Euparal slide. 3b: *A. struyvei* sp.n., female, coxa and genital structures, ventral, Setcases, 25 September 2009, Euparal slide. 3c: *A. struyvei* sp.n., female, dentation and trichobothria in the proximal area of the chelal fingers, paraxial face (external view), Setcases, 25 September 2009, SEM.

7-9 μm , 60 typically shaped, ridged and distally expanded 7 toothed setae (0.026 x 0.01) (Fig. 4c). 6 setae on the anterior row, 11 on the posterior margin. Tergal chaetotaxy: 12, 12, 14, 14, 16, 16, 18, 18, 18, 12, 9.

Tergite XI without tactile seta. Sternal chaetotaxy: anterior sternite of genital region 30 setae; posterior sternite 13 setae; sternal formula (IV-XI): 6, 10, 10, 12, 12, 12, 10, 8. Setae on sternites IV-VI single pointed, gradually becoming more flattened on sternite V-XI, on sternite XI with 3 to 4 points.

Coxal chaetotaxy (number of setae, right coxa): pedipalpal coxa: 15; coxa I: 12; coxa II: 12; coxa III: 19; coxa IV: 32.

Chelicera (Fig. 2c) with 5 setae on the hand. Movable finger (length without galea=0.14) with 1 distal seta. Large accessory tooth present at the base of the galea. Galea (length=0.024), bifurcate with four apical branches. Cheliceral hand with fixed finger (0.08 x 0.08) ratio 1. Serrula exterior with 17 lamella of which the most proximal is

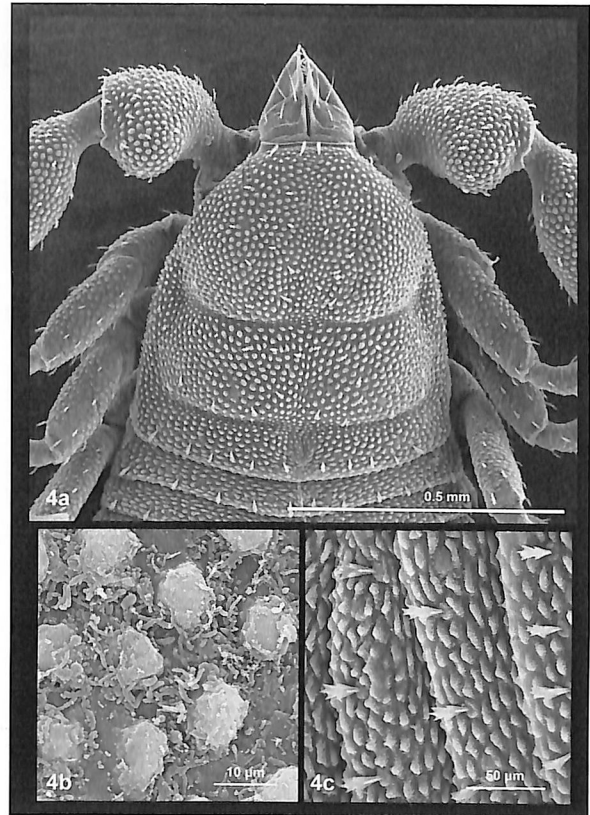


Fig. 4a: *A. struyvei* sp.n., male holotype, carapace with granulation, Setcases, 25 September 2009, SEM.; 4b: *A. struyvei* sp.n., female, granulation with microorganisms; 4c: *A. struyvei* sp.n., male holotype, setae and granulation on the second tergite, 25 September 2009.

enlarged and apically broadened. Rallum (flagellum) 3 bladed, most proximal blade with 10 teeth (Fig. 2a).

Pedipalps (Fig. 1a) coarsely granulated, moderately slender. Hand slightly convex laterally, longer than fingers. Fingers both with terminal claw. Trichobothrium *st* (movable finger) in the middle between *t* and *sb* (Fig. 1d). Trochanter (0.25 x 0.17) ratio 1.47. Femur (0.52 x 0.16) ratio 3.25. Patella (0.45 x 0.17) ratio 2.64. Femur 1.15 x length of patella. Chela (0.90 x 0.24) ratio 3.75. Hand with pedicel (0.50 x 0.24) ratio 2.08; hand without pedicel L=0.43. Fixed finger L=0.43, equipped with 42 close-set and pointed teeth. Fixed finger with one subterminal medial and one subterminal lateral accessory tooth. Movable finger L=0.43, with 44 teeth, with only one small subterminal lateral accessory tooth. **Leg I** (Fig. 1b): trochanter (0.13 x 0.11) ratio 1.18, femur (0.15 x 0.09) ratio 1.66; patella (0.25 x 0.09) ratio 2.7; tibia (0.22 x 0.07) ratio 3.14; tarsus (0.23 x 0.05) ratio 4.6. **Leg IV**

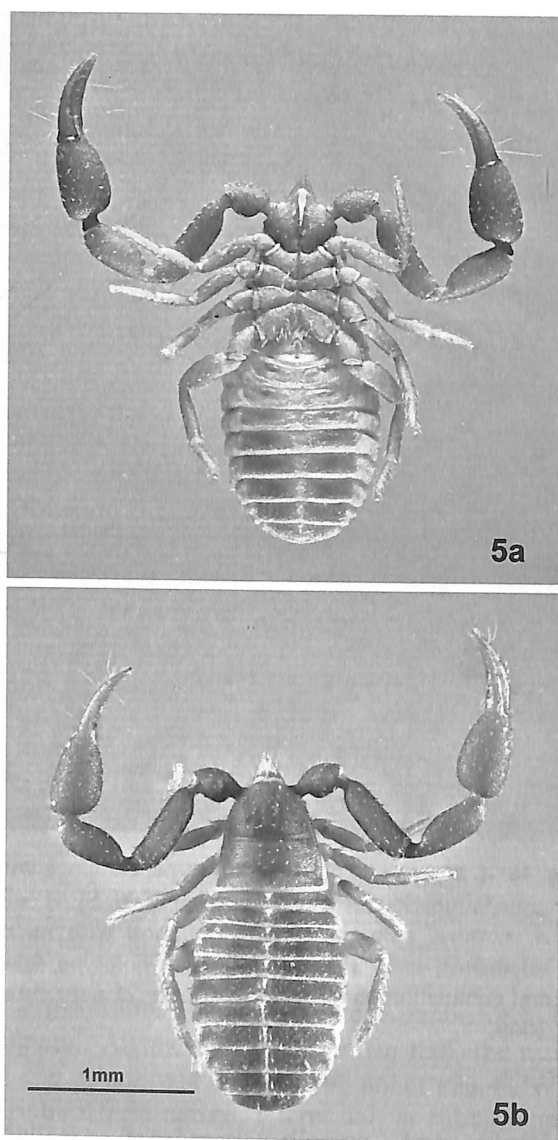


Fig. 5: *A. struyvei* sp.n., female habitus, ventral (5a) and dorsal (5b), 25 september 2009, image combined of 32 stack pictures with Zerene multistacking program.

(Fig. 1c): trochanter (0.20 x 0.11) ratio 1.81; femur (0.14 x 0.11) ratio 1.27; patella (0.30 x 0.11) ratio 2.72; tibia (0.33 x 0.07) ratio 4.71; tarsus (0.23 x 0.05) ratio 4.60 without tactile seta.

Female paratype T6 (F231-4), morphology

Color as holotype. **Total length** (excluding chelicera) 1.60. **Carapace** (0.67 x 0.64). **Chelicera**: Movable finger of chelicera (L without galea) L=0.11 mm, galea L=0.038, bifurcate plus four pointed apical branches. The female galea is longer and more robust than the male galea (Fig. 2b, Fig. 2d). Cheliceral hand and fixed finger (0.11 x 0.08) ratio 1.37. **Pedipalps**: trochanter (0.29 x 0.18) ratio 1.61;

femur (0.52 x 0.17) ratio 3.04; patella (0.49 x 0.19) ratio 2.57; femur 1.06 x length of patella. Chela (0.99 x 0.28) ratio 3.5. Hand with pedicel (0.47 x 0.28) ratio 1.67. Movable finger L=0.53. Fig. 3c shows the shape of the teeth in the proximal area of the chela. **Leg I**: trochanter (0.11 x 0.10) ratio 1.10; femur: (0.16 x 0.11) ratio 1.45; patella (0.29 x 0.09) ratio 3.22; tibia (0.23 x 0.07) ratio 3.28; tarsus (0.23 x 0.05) ratio 4.60. **Leg IV**: trochanter (0.22 x 0.14) ratio 1.57; femur (0.16 x 0.12) ratio 1.33, patella (0.38 x 0.14) ratio 2.71; tibia (0.35 x 0.09) ratio 3.8; tarsus (0.29 x 0.07) ratio 4.14.

Variations in proportions of the pedipalp.

Trochanter - males: 0.25–0.27 x 0.15–0.17, (ratio 1.47–1.66); - females: 0.26–0.31 x 0.17–0.19; (ratio 1.52–1.66). **Femur** - males: 0.48–0.53 x 0.15–0.17; (ratio 3.11–3.35); - females: 0.52–0.61 x 0.16–0.19; (ratio 3.04–3.29). **Patella** - males: 0.45–0.48 x 0.17–0.17; (ratio 2.64–2.82); - females: 0.48–0.60 x 0.18–0.21; (ratio 2.57–2.85). **Chela** - males: 0.87–0.95 x 0.23–0.24; (ratio 3.75–3.95) - females: 0.95–1.13 x 0.26–0.32; (ratio 3.50–3.65). The female chela is slightly more robust than the male chela. **Hand with pedicel** - males: 0.45–0.50 x 0.23–0.24; (ratio 1.95–2.08); - females: 0.50–0.62 x 0.26–0.32; (ratio 1.90–2.00). **Fixed finger** - males: L=0.43–0.50; - females: L=0.47–0.56

Genital structures.

The female genital plate shows an *Allochernes*-typical circular pattern with 28 setae, Fig. 3b; male genitalia Fig. 3a.

Distribution and bionomics

The species was found in numbers, adults and nymphs, in the nest material from the specific ant. Not a single specimen could be found in the litter around the nest, therefore the species can be considered as connected with the host ant. The species is known from the type locality near Setcases in the eastern Spanish Pyrenees only. The eastern Pyrenees have a huge biodiversity : in 2003 another new *Allochernes* was described from the eastern geographic extension of the Pyrenean orogen near sea level, the area of Cap Creus (HENDERICKX & VETS, 2003). It is likely that more local endemics will be found in these ancient geological structures.

Discussion

Six *Allochernes* species are currently known in Spain: *A. masi* (NAVÁS, 1932), *A. pityusensis* BEIER, 1961, *A. powelli* (KEW, 1916), *A. wideri* (KOCH, 1843), *A. longepilosus* MAHNERT, 1997 and *A. deceuninckorum* HENDERICKX & VETS, 2003 (HARVEY, 2009). *A. longepilosus* MAHNERT, 1997 is only known from Tenerife (MAHNERT, 1997) and has stout pedipalps. *A. powelli* females also have slightly more robust pedipalps than the males, but this species has less setae on tergites VI and VII (12-14) and a distal obtuse seta on tarsus IV. *A. wideri* is known to occur with *Formica* ants (BEIER, 1963) and the myrmecophilous *A. deceuninckorum* is also described from the Pyrenean orogen near sea level (HENDERICKX & VETS, 2003). These two *Allochernes* species could be considered as closest to the new species. However, *A. struyvei* sp. n. differs clearly from the latter by the reduced number of accessory teeth on the chelal fingers, the size and the characteristic slender shape of the chela. The femur length of *A. wideri* varies from 0.69-0.75, of *A. deceuninckorum* from 0.61-0.69; the femur of *A. struyvei* sp. n. is much smaller: 0.48-0.53.

Biology

All specimens of *A. struyvei* sp.n. were found in nests of the ant *Formica paralugubris*. The presence of tritonymphs in the ant nests indicates that the species also develops in these nests. It can therefore be considered as myrmecophilous. This pseudoscorpion might feed on larval stages of the ant, on ant symbionts or on ant parasites. Myrmecophilous staphylinidae as well as myrmecophilous spiders were also found in these nests. Higher magnification (Fig. 4b) reveals the presence of micro-organisms (filamentous chains

as well as undivided specimens) that are most probably bacteria (Jan BOSSELAERS, personal communication).

The *F. paralugubris* nests were located in exposed, south-facing grassland near the road, in heaps of about 30 cm high. No nests were found at lower or higher altitude.

Acknowledgements

Thanks are due to Tim STRUYVE for his outstanding collecting work and notes concerning the bionomics, to Ann DUPONT (Mol) who visited the interesting location with the author, to François VANKERKHOVEN (Diest) for the identification of the ant, to Dr. Luc DE BRUYN (University Antwerp) and Dr. Ron VERHAGEN (University Antwerp) for laboratory facilities, to Dr. Patrick GROOTAERT, Dr. Herman GOETHALS and Julien CILLIS (Royal Belgian Institute of Natural Sciences) for support with the FEI Quanta-200 electron microscope. The author wishes to thank Dr. Wouter DEKONINCK (R.B.I.N.S.), Dr. Tamas SZUTS (California) and an anonymous referee for reviewing the manuscript.

References

- BEIER M., 1963. - Ordnung Pseudoscorpionidea (Afterskorpione); vol. 1 In d'AGUILAR, J., BEIER M., HERBERT F. & RAW F. (Eds.) *Bestimmungsbücher zur Bodenfauna Europas*, Akademie-Verlag, editors: Berlin.
- HARVEY M.S., 2009. - Pseudoscorpions of the World, version 1.2. Western Australian Museum, Perth. Online at <http://www.museum.wa.gov.au/arachnids/pseudoscorpions/> (access date February 2011)
- HENDERICKX H. & VETS V., 2003. - A new myrmecophilous *Allochernes* (Arachnida: Pseudoscorpiones: Chernetidae) from Catalunya, Spain. *Zootaxa* 366: 1-10.
- MAHNERT V., 1997. - New species and records of Pseudoscorpions (Arachnida, Pseudoscorpiones). *Revue Suisse de Zoologie* 104(3): 559-585.