

Description of *Atelura valenciana* n. sp. (Insecta, Zygentoma) and distribution and myrmecophilic relationships of *Proatelurina pseudolepisma* in the Iberian peninsula

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Description of Atelura valenciana n. sp. (Insecta, Zygentoma) and distribution and myrmecophilic relationships of *Proatelurina pseudolepisma* in the Iberian peninsula.— The description of a new species, *Atelura valenciana* n. sp., adds to the knowledge of the family Ateluridae in the Iberian peninsula and the Balearic Islands and a large number of new data about the second species of this family found in the studied area, *Proatelurina pseudolepisma* (Grassi, 1887), is reported. This is the first time that the genus *Atelura* has been reported in Spain and significant eco-biological data are included. The possibility of parthenogenesis in some *P. pseudolepisma* populations and their distribution are analysed, and the myrmecophilous relationships in both species are studied.

Key words: Ateluridae, Thysanura, Spain, *Atelura valenciana* n. sp., *Proatelurina pseudolepisma*, Myrmecophily.

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Introduction

Most Ateluridae species are myrmecophilous or termitophilous. They are mainly found throughout warm regions of the world, specially in humid tropical and equatorial climates. The palearctic region is poor in representatives of this family. Until now only one species was known in the Iberian peninsula, *Proatelurina pseudolepisma* (Grassi, 1887). In this paper the genus *Atelura* Heyden, 1855 is reported for the first time in the aforementioned area.

According to previous data about the distribution of the genus *Atelura*, it occurs in Central and Eastern Europe and is represented by two species: *A. formicaria* Heyden, 1855, widespread from France to Crimea and *A. montana* (Stach, 1922), from the Balkans.

In this work, a third species that inhabits a limited region of Spain is described: *A. valenciana* n. sp.

Material and methods

All material studied in this work was obtained from the Spanish peninsular and the Balearic Islands. The specimens were collected with an entomological aspirator; then fixed with 70° alcohol. When taken from ants' nests, some Formicidae specimens were also collected.

The taxonomic studies were carried out as usual: the specimens were dissected and mounted in Tendeiro medium for microscopic observation.

Some antennal features were studied un-

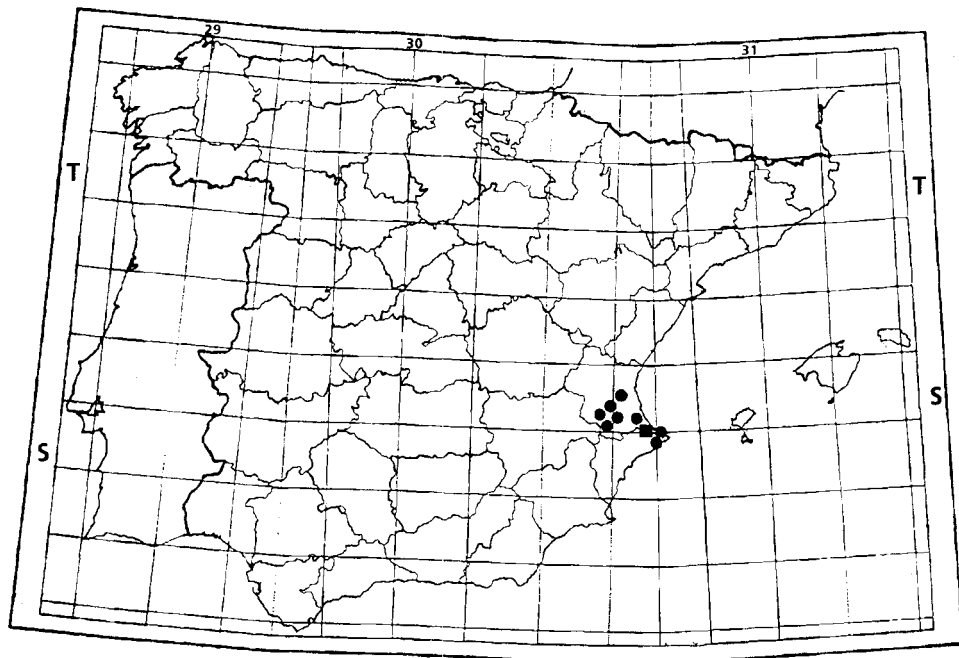


Fig. 1. Distribution of *Atelura valenciana* n. sp. in the Iberian peninsula: ● Sites where the specimens were found in ants' nests; ■ Sites where the specimens were found without ants.

Distribución de Atelura valenciana sp. n. en la península ibérica: ● Localidades donde se encontró en hormigueros; ■ Localidades donde fue encontrada sin hormigas.

der Scanning Electron Microscopy (SEM); the specimens were dehydrated with absolute alcohol, critical point dried and coated with gold.

Results

Atelura valenciana n. sp. (figs. 1-6)

Studied material (fig. 1)

Type material. Holotype (♂), allotype (♀) and paratypes (1♂ + 2♀) from Mogente (Valencia), road to Navalón, pine-tree forest, in a nest of *Camponotus sylvaticus*, 26 IV 92, Ref. Z1374. Deposited in Museo Nacional de Ciencias Naturales in Madrid, Collection number: 12263.

Paratypes. All in the authors' collection in the University of Córdoba except: CZ. L. F. Mendes; UAB. C. Bach de Roca. Alicante, Calpe, 13 IV 92, 1♀ in a nest of *Messor barbarus*, with *Neoasterolepisma foreli*, *N. gauthieri* and *N. spectabilis*, Ref. Z1357; Jávea, 13 IV 92, 1♀ with *Aphaenogaster gibbosa*, Ref. Z1382; Pego, 13 IV 92, 1♂ + 1♀, Ref. Z1346 (UAB). Valencia, Ayora, 26 IV 92, 1♂ with *Lasius niger*, Ref. Z1359; Barx, 4♀ with *C. sylvaticus*, Ref. Z1361; Bicorp, 26 IV 92, 2♀ with *M. barbarus* and *N. spectabilis*, Ref. Z1348; Estubeny, 26 IV 92, 1♂ with *Tetramorium semilaeve*, Ref. Z1501 (CZ); Montroi, 27 IV 92, 1 juvenile with *A. gibbosa* and *N. curtiseta*, Ref. Z1473.

Description

Body. Typical shape, oval-fusiform (atelluriform), thorax wider and slightly shorter than the abdomen. Body length: holotype, 5.75 mm; allotype, 6 mm; maximum observed, 6.2 mm. The females are usually slightly bigger than males. Thorax length: 2-2.2 mm. Thorax width: 1.6-1.9 mm. Maximum conserved length in the antennae: 1.7 mm. Terminal filaments very short, maximum length taken in a cercus: 0.8 mm; 1.2 mm in the paracercus. Epidermal pigment nearly absent, sometimes with a yellowish tonality. Typical golden scales (fig. 2A), giving the insect a uniform yellowish colour, sometimes lighter ventrally.

Head. Without special features, nearly lacking setae except in the clypeus, labrus and the frons in the part close to the clypeus. Antennae short, pedicellus showing a char-

acteristic sexual dimorphism: in males this article shows a digitiform apophysis (figs. 2B-D, 6). This process is slightly bent and thumb-shaped in a lateral view of the head; frontally the apical part is clearly thinner than the basal portion, but the bending can not be observed (fig. 2B). There is an elliptical to oval pit in the basal region of the apophysis, showing a modified integument where 10-12 small setae are inserted. There are 5-8 macrochaetae on the basal, one on the apical and two in the external-medial part. The top of the process widely exceeds the pedicellus, reaching 3/4 of the first segment of the flagellum in big specimens (in young males it is shorter but the chaetotaxy is typical). Galea having one single apical cone (fig. 2E). Last article of the maxillary palp clearly longer than the others, apically provided with several papillae. Labial palp with elongated last article (fig. 2F), showing six papillae in a triangular arrangement (3+2+1).

Thorax. Without special features. Hind legs as in figure 2G. Medial claw of the praetarsus (empodium) smaller than the lateral ones (fig. 2H); these bearing a membranous protrusion reaching the basal half of the claw.

Abdomen. Infralateral areas of urotergites I-VIII provided with 2+2 strong isolated macrochaetae (the internal macrochaetae usually longer) and 2-5 tiny, shorter, external setae of variable relative length and thickness (fig. 3). The distance between the lateral and infralateral macrochaetae is also variable. Moreover, each tergite has very small hairs on the medial part of the hind border. Tergite IXth only with 1+1 long and strong setae on the infralateral part. The shape of the Xth urotergite is trapezoidal but strongly excavated posteriorly (figs. 4A-4D), longer than in other species of the genus (its length, measured from the basis to a posterolateral corner, is equal or slightly longer than half the basal width of the tergite); the concavity is also deeper. Its lateral margins are slightly convergent, nearly parallel if compared with *A. montana* and *A. formicaria*. It is provided with 1+1 strong macrochaetae on its posterolateral corners. In males it also bears 1+1 fields of 20-30 pegs, fewer in young specimens. The shape of this field is very elongated (more than four times longer than wide) and relatively variable but never as ovoid as in the other *Atelura* species.

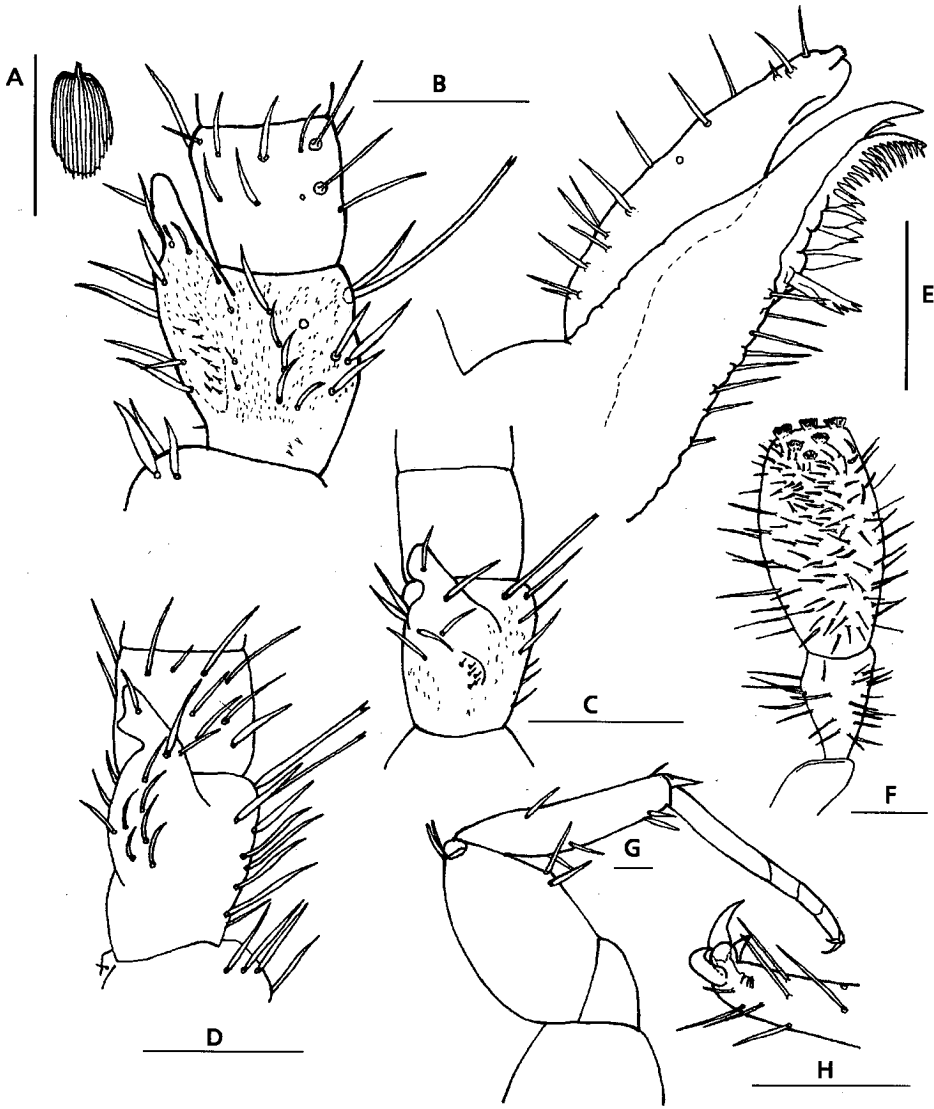


Fig. 2. *Atelura valenciana* n. sp.: A. Typical scale; B. Pedicellus of the antennae of the holotype showing the apophysis, frontal view; C. Idem of the paratype from Barx (Ref. Z1361), lateral view (turned 90°); D. Idem of the paratype from Estubeny (Ref. Z1501) in the same position as the previous figure; E. Lacinia and galea; F. Distal articles of the labial palp; G. Hind leg; H. Pretarsus. (Scale: 0.1 mm.)

Atelura valenciana sp. n.: A. Escama típica; B. Pedicelo de la antena del holotipo, mostrando la apófisis, vista frontal; C. Idem de un paratipo de Barx (Ref. Z1361), vista lateral (girado 90°); D. Idem de un paratipo de Estubeny (Ref. Z1501), en posición similar al anterior; E. Lacinia y gálea; F. Artejos distales del palpo labial; G. Pata III; H. Pretarso. (Escala: 0,1 mm.)

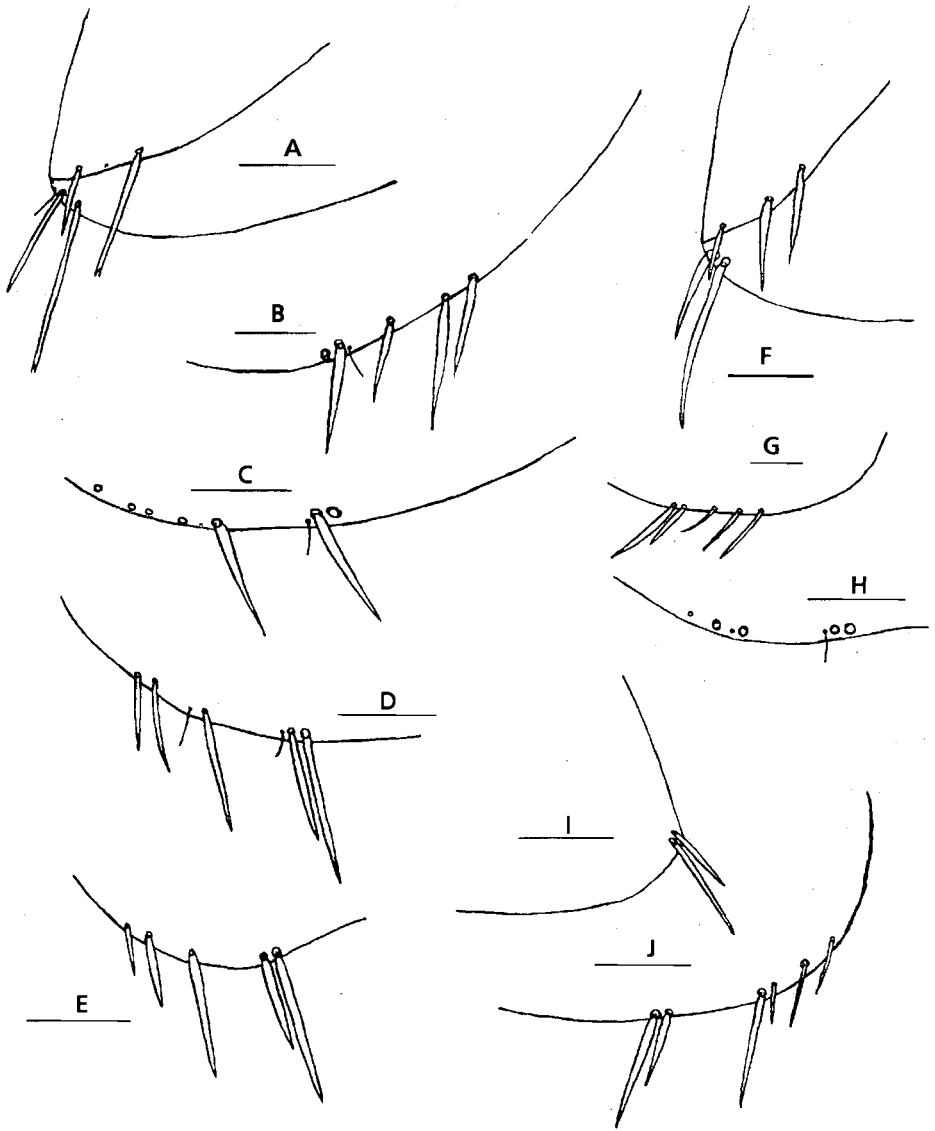


Fig. 3. Urotergal chaetotaxy of *Atelura valenciana* n. sp., Allotype: A. Urotergite I; B. Urotergite II; C. Urotergite V; D. Urotergite VII; E. Urotergite VIII. Holotype: F. Urotergite I; G. Urotergite III; H. Urotergite V (only the setae sockets figured). Paratype: I. Urotergite I; J. Urotergite V. (Scale: 0.1 mm.)

Quetotaxia urotergal de *Atelura valenciana* sp. n., Alotipo: A. Uroterguito I; B. Uroterguito II; C. Uroterguito V; D. Uroterguito VII; E. Uroterguito VIII. Holotipo: F. Uroterguito I; G. Uroterguito III; H. Uroterguito V (sólo son visibles las inserciones de las sedas). Paratipo: I. Uroterguito I; J. Uroterguito V. (Escala: 0,1 mm.)

Urosternites II-IX with a pair of stylets, those of the second urosternite placed very close to the sagittal line, only separated by the eversible vesicles. The number of setae inserted in these vesicles ranges from one to three (figs. 4E-G), sometimes showing an asymmetrical pattern (1+2 or 1+3); there are also 1+1 setae inserted above the vesicles. Infralateral part of the urosternites as in figure 4H. Urosternite VIIIth with 1+1 pseudovesicles and, between them, 1+1 macrochaetae and some thinner isolated setae (fig. 5A). Hind border of the VIIIth urosternite nearly straight between the stylets in male, provided with a row of strong macrochaetae and tiny setae irregularly distributed (figs. 5B, 5C). In females this sternum has a semiovoid subgenital plate (fig. 5H), with some setae on its posterior margin. Bag-shaped, subcylindrical paramera; their length is approximately x of the IXth stylets (figs. 5D-G). They are provided with several conical glandular apical setae (figs. 5F, 5G). A teratological case of asymmetry has been observed, concerning the development of the paramera: one of the couple was longer and wider than the other, and the chaetotaxy was different. A similar teratology has been described in *A. montana* (STACH, 1946). Globous and relatively short ovipositor, with 11-12 segments, matching the generic description (figs. 5I, 5J). Basal articles of the cerci showing some pegs with variable distribution (figs. 4A, 4C, 4D), never a pair of them inserted at the same level; there are 0-1 on the basal article, 4-6 on the next one (2-3 rows) and 1-4 on the third. Paracercus lacking pegs.

Discussion

The main features that distinguish *Atelura valenciana* n. sp. from the other two known species (*A. formicaria* and *A. montana*) are:

a) The apophysis of the pedicellus of the antennae of the male. Its shape is more curved in *A. valenciana* than in the other species, narrowing abruptly in the apical part (not gradually towards the apex, see figs. 7A, 7B). The bending of the apophysis cannot be seen in lateral view. The narrowing of the distal half is the essential feature. *A. montana* has a bigger apophysis that reaches the top of the first article of the flagellum (fig. 7B).

b) The shape of the Xth urotergite. The

posterior excavation in *A. montana* is not so deep as in the new species (fig. 7D) and the lateral margins are not so parallel. This excavation in *A. valenciana* n. sp. is similar to *A. formicaria* but slightly deeper; in addition, the lateral margins are more convergent in the latter (fig. 7C). The length/width ratio of this tergite is usually higher in both sexes of *A. valenciana* n. sp.

c) Number and arrangement of T pegs in male Xth urotergite. In the new species, the area occupied by these pegs is more elongated than in *A. montana* and *A. formicaria*, where it is elliptical or ovoid (no more than four times longer than wide). The number of pegs is usually lower than 20 in *A. formicaria* and there are 30 or more in *A. montana*; in *A. valenciana* this number is intermediate.

d) Number and arrangement of the pegs in males cerci. The number of pegs in the new species is similar to *A. formicaria* and smaller than in *A. montana*. In the latter there are usually more than 10 on 1-2 articles and more than three arranged at the same level, forming a row (fig. 7F). In *A. formicaria* (fig. 7E) rows of three pegs are present (to date, groups of two pegs at most have been found in *A. valenciana*).

As a whole, the new species is similar to *A. formicaria*, but clearly different, as confirmed by the geographical isolation that exists between both taxa. *A. valenciana* n. sp. has been found only in the northern part of the Alicante province and in the southern part of the Valencia province, on the south side of the Turia River (fig. 8). It is clearly endemic in the Valencian region in Spain; it has never been found in peripheral regions, where *Proatelurina pseudolepisma* is frequently located. For example, to the north, in Catalonia, all the samples of Ateluridae (more than 30, with at least 80 specimens) belong to *Proatelurina*. The other two species of the genus are spread over Central Europe and the Balkans (fig. 8). *A. formicaria* is relatively close to the area occupied by the new species, but it is found only in the North of France (in addition, these records are doubtful) and in the Alps. It has never been found in southern or Mediterranean France or in Catalonia and the Castellon province in Spain. This probable absence of *Atelura* genus between Valencia and the Alps may prove the isolation of *A. valenciana* n. sp.

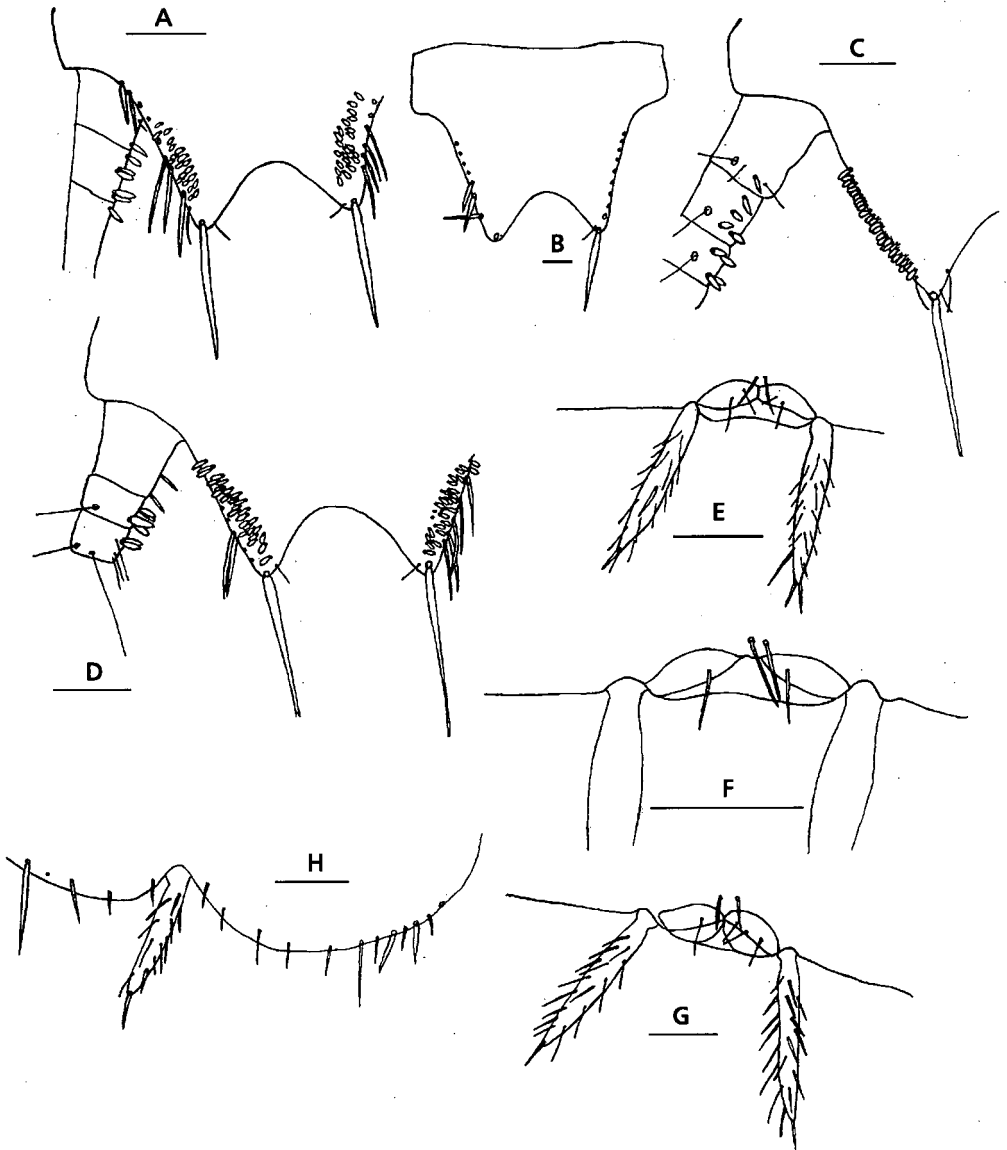


Fig. 4. Urotergites X of *Atelura valenciana* n. sp.: A. Male paratype (Ref. Z1501); B. Female allotype; C. Male holotype; D. Male paratype (Ref. Z1346). Eversible vesicles of urostermite II and stylets: E. Holotype; F. Paratype; G. Allotype. H. Urostermite IV, lateral and infralateral part of the posterior ridge, allotype. (Scale: 0.1 mm.)

Urotergitos X de Atelura valenciana sp. n.: A. Paratipo macho (Ref. Z1501); B. Alotipo hembra; C. Holotipo macho; D. Paratipo macho Z1346. Vesícules exèrtils del uroesternito II y estilos correspondientes: E. Holotipo; F. Paratipo; G. Alotipo. H. Uroesternito IV, parte lateral e infralateral del borde posterior, alotipo. (Escala: 0,1 mm.)

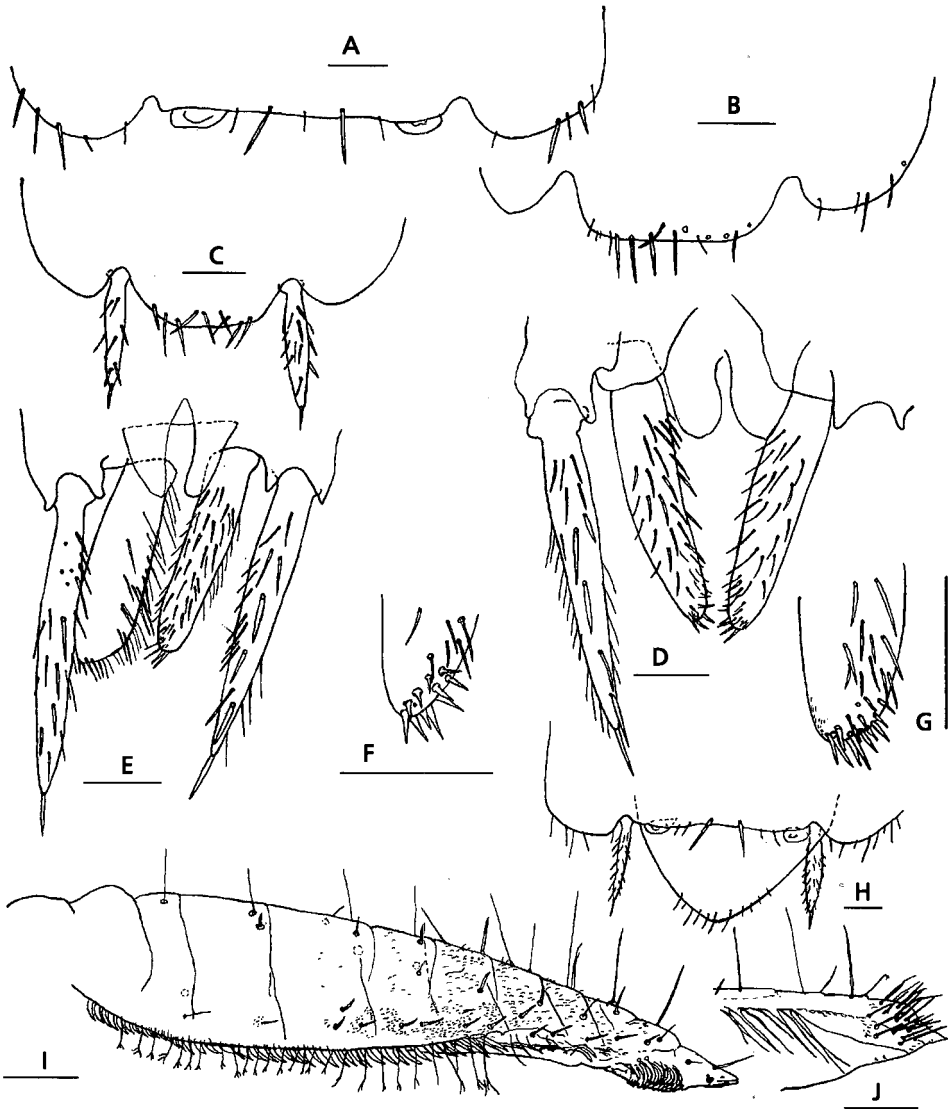


Fig. 5. *Atelura valenciana* n. sp.: A. Urosternite VII, holotype; B. Urosternite VIII, holotype; C. Urosternite VIII, paratype; D. Paramera and stylus IX, holotype; E. Asymmetric paramera, paratype from Pego (Ref. Z1346); F. Paramerus tip, holotype; G. Paramerus tip, paratype (Ref. Z1501); H. Urosternite VII and subgenital plate, allotype; I. Gonapophysis IX; J. Tip of gonapophysis VIII. (Scale: 0.1 mm.)

Atelura valenciana sp. n.: A. Uroesternito VII, holotipo; B. Uroesternito VIII, holotipo; C. Uroesternito VIII, paratipo; D. Parámetros y estilo IX, holotipo; E. Parámetros asimétricos, paratipo de Pego (Z1346); F. Ápice de un parámetro, holotipo; G. Ápice de un parámetro, paratipo Z1501; H. Uroesternito VII y placa subgenital, alotipo; I. Gonapófisis IX; J. Ápice gonapófisis VIII. (Escala: 0,1 mm.)

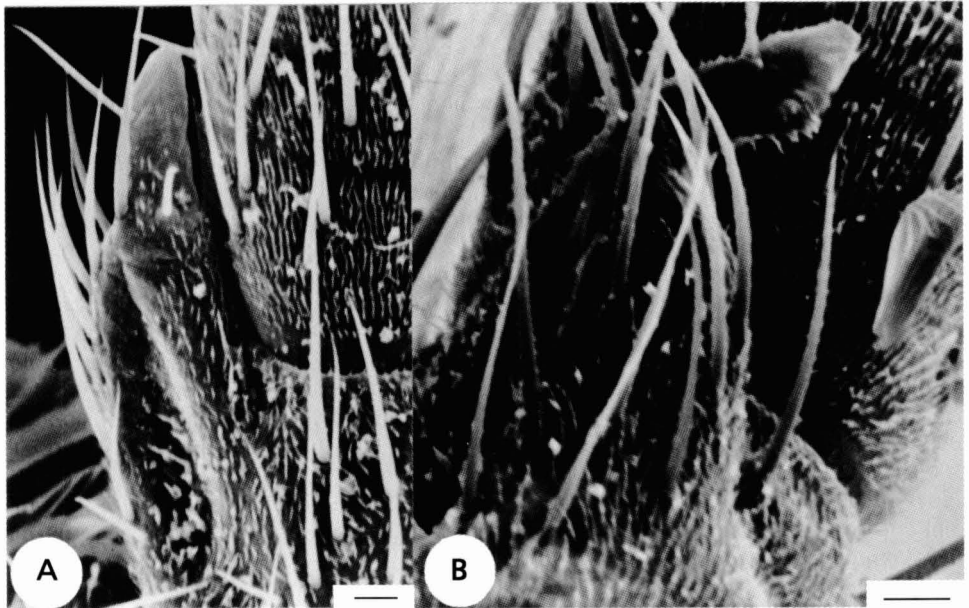


Fig. 6. Apophysis of the pedicellus of antennae of *Atelura valenciana* n. sp. observed under SEM: A. Dorsal side; B. Turned 90°. (Scale: 0.01 mm.)

Apófisis del pedicelo de la antena de Atelura valenciana sp. n. observada con MEB: A. Vista desde su cara dorsal; B. Girada 90°. (Escala: 0,01 mm.)

Myrmecophilic relationships

Specimens of *Atelura valenciana* n. sp. were taken from ant nests of several genera of Formicidae (fig. 11A), with one exception (in this case, no relation with ants could be appreciated). Although the number of records is insufficient, it seems to be an euromyrmecophilic species, like *Proatelurina pseudolepisma* (see further). Although two Iberian species of Ateluridae have never been found in the same nest, they have been observed in the same location. However, they can live together with some Lepismatidae.

Proatelurina pseudolepisma (Grassi, 1887)

New material (fig. 9)

The provinces where the species is found for the first time are marked with an *.

*Albacete: Carcelén, 25 IV 92, 2♀ with *Messor* cf. *hispanicus* and *Neoasterolepisma*

foreli, Ref. Z1220; Chinchilla de Monte-Aragón, 24 IV 92, 1♀ with *M. bouvieri*, Ref. Z1257; Férez, 27 X 91, 1♀ with *Camponotus sylvaticus*, Ref. Z1217; Paterna, 27 X 91, 1♂ + 3♀ with *C. cruentatus*, Ref. Z1154; Peñas de San Pedro, 30 IV 92, 5♀ in a nest of *M. hispanicus* cohabiting with *N. curtiseti* and *N. gauthieri*, Ref. Z1184; Riópar, 27 X 91, 1♀, Ref. Z1262; Robledo, 24 IV 92, 2♀, Ref. Z1211.

*Alicante: Biar, 14 IV 92, 2♀, Ref. Z1340; Cocentaina, 12 IV 92, 1♀ with *Aphaenogaster gibbosa*, Ref. Z1404; Relleu, 14 IV 92, 1♀ with *A. iberica*, Ref. Z1463.

*Almería: Mojácar, 10 IV 92, 2♀ with *M. barbarus*, Ref. Z0891.

*Ávila: Madrigal de las Altas Torres, 23 IX 92, 1♀ with *Tetramorium hispanicum*, Ref. Z1808; Muñana, 22 IX 92, 1♀ with *C. cruentatus* and *N. curtiseti*, Ref. Z1828; Ibid, 1♀ with *T. hispanicum*, Ref. Z1831; Ojos Albos, 22 IX 92, 2♀ with *T. hispanicum*, Ref. Z1825; Ibid, 1♀ with *Pheidole pallidula*, Ref. Z1853.

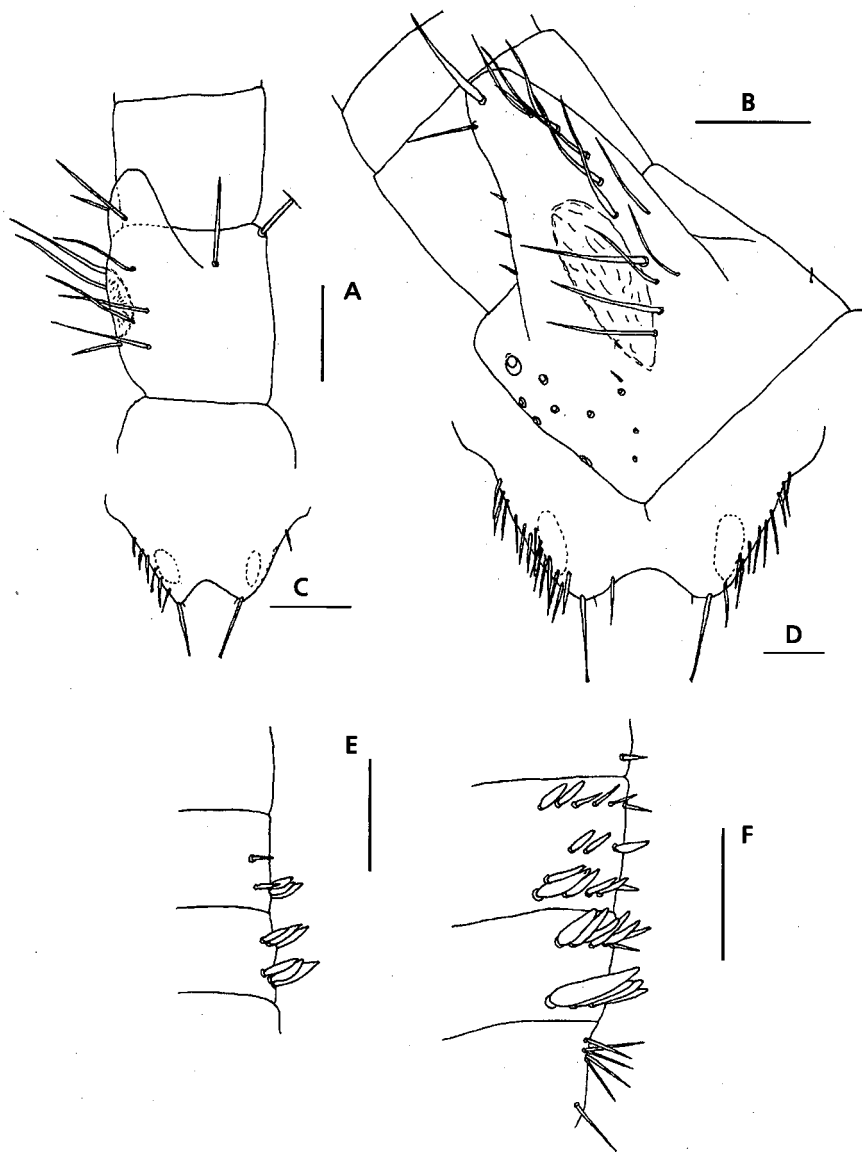


Fig. 7. Some distinctive characteristics of *Atelura formicaria* and *A. montana*. Apophysis of the male antennae pedicellus of: A. *A. formicaria*; B. *A. montana*. Urotergite X of the male of: C. *A. formicaria* (the discontinuous line marks the area of the pegs); D. *A. montana*. Basal segments of the cercus of the male of: E. *A. formicaria*; F. *A. montana*. (Scale: 0.1 mm.)

Algunos caracteres distintivos de *Atelura formicaria* y *A. montana*. Apófisis del pedicelo de la antena en los machos de: A. *A. formicaria*; B. *A. montana*. Uroterguito X del macho de: C. *Atelura formicaria* (donde se marca con línea discontinua el área ocupada por los cónulos sensoriales); D. *A. montana*. Segmentos basales de un cerco del macho de: E. *A. formicaria*; F. *A. montana*. (Escala: 0,1 mm.)

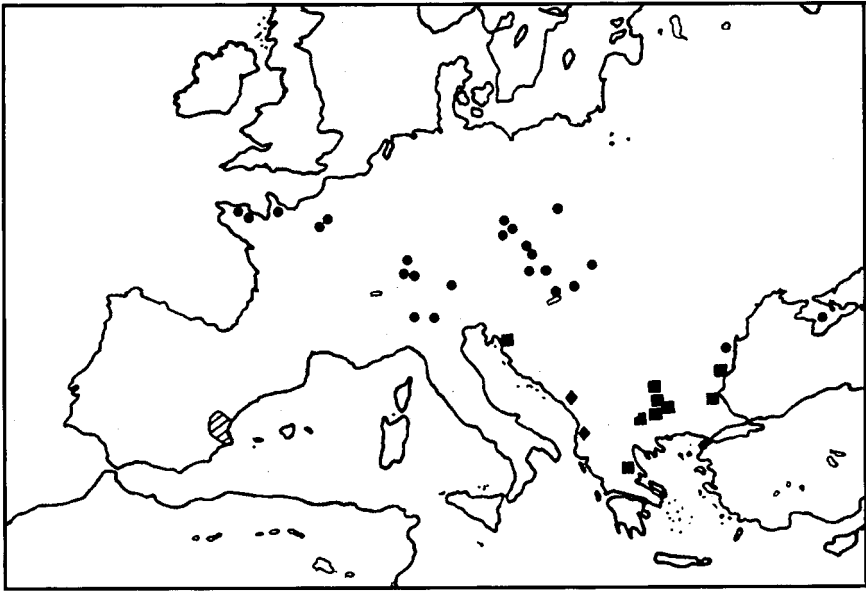


Fig. 8. Known distribution of the species of *Atelura*: *A. formicaria* (●), *A. montana* (■) and *A. valenciana* n. sp. (||||). Doubtful reports of *A. formicaria* (◆).

Distribución conocida de las especies del género Atelura: *A. formicaria* (●), *A. montana* (■) y *A. valenciana* sp. n. (||||). *Citas dudosas de A. formicaria* (◆).

*Badajoz: Castilblanco, 6 VI 91, 1♀ with *Lasius niger*, Ref. Z0817.

*Balears: Capdepera (Mallorca), 3 VI 90, 1♀ with *C. sicheli*, Ref. Z0624; Capdepera (Mallorca), 27 IX 91, 1♀ with *L. brunneus*, Ref. Z0651; Ciudadela (Menorca), 5 VI 90, 3♀ with *L. brunneus*, Ref. Z0630; Ciudadela (Menorca), 16 V 92, 1♀ with *L. brunneus*, Ref. Z1279; Es Mercadal (Menorca), 20 IX 91, 1 juvenile with *T. semilaeve* and *Lepisma baetica*, Ref. Z0645; Escorca 28 IX 91, 1 juvenile with *L. brunneus*, Ref. Z0652; Ferreries (Menorca) 5 VI 90, 1 juvenile with *A. cf. dulcinea*, Ref. Z0628; Mahón (Menorca), 17 V 92, 13♀ + 3 juveniles with *Iridomyrmex humilis*, Ref. Z1275; Sant Josep (Ibiza), 12 V 92, 1♂ + 4♀ with *P. pallidula*, Ref. Z1271; Son Servera (Mallorca), 3 VI 90, 1♀ with *T. cf. meridionalis*, Ref. Z0625.

Barcelona: Argentona, 21 V 92, 1♀ + 1 juvenile with *C. cruentatus*, Ref. Z1610; Castellet i La Gornal, 18 V 92, 2♀, Ref. Z1622; Centelles,

23 V 92, 3♀ + 1 juvenile with *C. aethiops*, Ref. Z1641; Els Prats del Rei, 20 V 92, 3♀ with *Formica subrufa*, Ref. Z1629; Monistrol de Montserrat, 21 V 92, 2♀ with *M. bouvieri*, Ref. Z1579; Olost, 23 V 92, 10♀ with *Messor* sp., Ref. Z1556; Ibid, 23 V 92, 12♀ with *L. niger*, Ref. Z1557; Sagas, 23 V 92, 2♀ + 4 juveniles with *C. cruentatus*, Ref. Z1597.

*Burgos: Castrojeriz, 26 IX 92, 1 juvenile with *Messor* sp. and *N. lusitana*, Ref. Z1897; Ibid, 1♀ with *Camponotus* sp., Ref. Z1900.

*Cáceres: Berzocana, 7 VI 91, 1♂ with *P. pallidula*, Ref. Z0858; Cabezuela del Valle, 7 VI 91, 2♀ with *Tapinoma nigerrimum*, Ref. Z0763; Ibid, 1♀ with *C. cruentatus*, Ref. Z0801; Ibid, 1♀ with *P. pallidula*, Ref. Z0859; Garganta la Olla, 7 VI 91, 1♀ with *P. pallidula*, Ref. Z0844; Guijo de Santa Bárbara, 29 III 91, 1♀ with *M. structor*, Ref. Z0774; Hernan-Pérez 8 VI 91, 1♀ with *P. pallidula* and *L. chlorosoma*, Ref. Z0815; Ibid, 1♂ with *C. cruentatus*, Ref. Z0826; Jaraiz de la Vera, 29 III 91, 1♂ with *L.*



Fig. 9. Distribution map of *Proatelerina pseudolepisma* in the Iberian peninsula: Δ Previous reports without ants; \blacktriangle Previous reports in ants' nests; \circ New reports without ants; \bullet New reports in ants' nests.

Mapa de distribución de *Proatelerina pseudolepisma* en la península ibérica: Δ Citas previas sin hormigas; \blacktriangle Citas previas en hormiguero; \circ Nuevas citas sin hormigas; \bullet Nuevas citas en hormiguero.

niger, Ref. Z0802; Serradilla, 21 III 91, 1♀ with *P. pallidula*, Ref. Z0765; Ibid, 4♂ + 1♀ with *C. pilicornis*, Ref. Z0766; Talayuela, 7 VI 91, 1♀ with *T. nigerrimum*, Ref. Z0764; Ibid, 1♂ with *L. emarginatus*, Ref. Z0827, Ibid, 1♀ with *L. niger*, Ref. Z0833; Toril, 27 III 91, 1♂ with *P. pallidula*, Ref. Z0851.

*Castellón: Albocácer, 28 IV 92, 2♀ with *Messor* sp., Ref. Z1442; Alcalá de Chivert, 28 IV 92, 1♂ + 1♀ with *M. barbarus*, *N. foreli* and *N. crassipes*, Ref. Z1500; Alcora, 28 IV 92, 1♂ + 2♀ with *C. sylvaticus*, Ref. Z1368; Ibid, 1♀ with *A. gibbosa*, Ref. Z1369; Alcudia de Veo, 1 VII 89, 2♀ with *C. cruentatus*, Ref. Z1516; Altura, 27 IV 92, 2♂ with *P. pallidula*, Ref. Z1480; Bejis, 21 IV 92, 1♀ with *M. capitatus* and *N. spectabilis*, Ref. Z1437; Benicasim, 28 IV 92, 3♀ with *C. sylvaticus*,

Ref. Z1513; Chert, 15 V 92, 1♂ + 1♀ with *P. pallidula*, Ref. Z1428; Sant Rafel del Maestrat, 14 V 92, 1♂ + 2♀ with *C. cruentatus*, Ref. Z1370; Torres de Embesora, 28 IV 92, 3♂ + 3♀ with *A. gibbosa*, Ref. Z1452; Val de Uxó, 29 IV 92, 2♂ with *P. pallidula*, Ref. Z1488; Zucaina, 14 V 92, 1♂ + 1♀ with *T. hispanicum*, Ref. Z1365.

*Ciudad Real: Alhambra, 13 IV 91, 1 juvenile with *T. hispanicum*, Ref. Z1159; Retuerta del Bullaque, 12 IX 91, 1♀ with *F. subrufa*, Ref. Z1193.

Córdoba: Cardena, 12 VII 89, 1♂ + 2♀ with *L. alienus*, Ref. Z0448; Córdoba, 15 III 91, 6♂ + 3♀ + 2 juveniles with *L. niger*, Ref. Z1064; Montilla, 11 X 92, 4♀, Ref. Z1645.

*Cuenca: Barajas de Melo, 16 IX 91, 2♀ with *M. barbarus*, cohabiting with *N. lusitana*

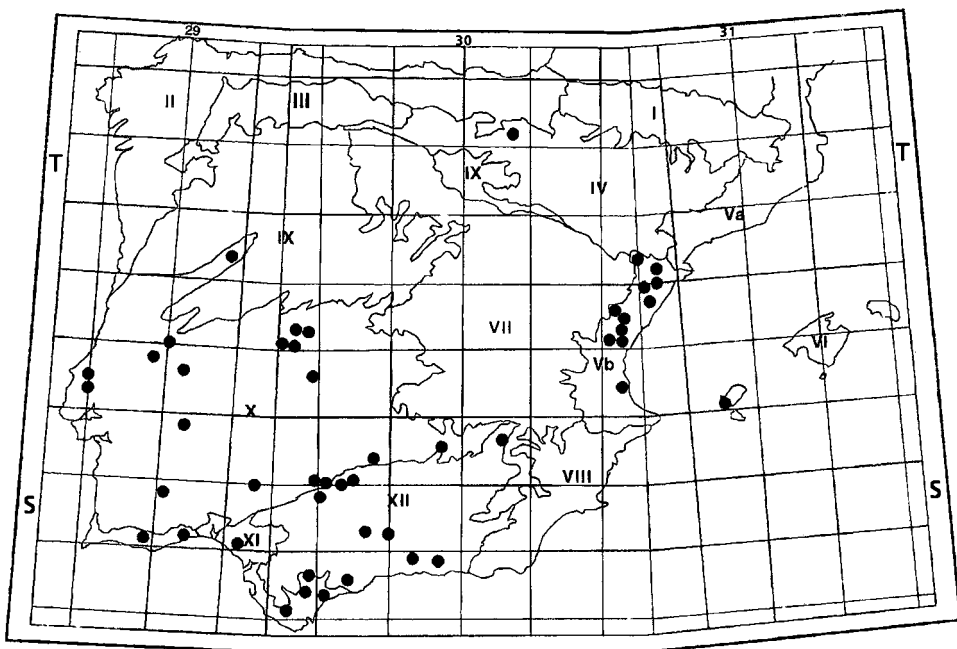


Fig. 10. Map showing the localities where males of *Proateturina pseudolepisma* were found (●) (see also fig. 9). The area is divided in biogeographical provinces, slightly modified from RIVAS-MARTÍNEZ (1987) (the name of provinces is given in table 1.)

Localidades donde se encontraron machos de Proateturina pseudolepisma (●) (compárese con fig. 9). El área está dividida en provincias biogeográficas modificadas a partir de las establecidas por RIVAS-MARTÍNEZ (1987) (nombres de las provincias en tabla 1.)

and *N. spectabilis*, Ref. Z1196; Campillos-Paravientos, 14 V 92, 1♀ with *M. hispanicus* and *N. curtisetia*, Ref. Z1248; Cañizares, 20 VIII 92, 1♀ + 1 juvenile with *C. cruentatus*, Ref. Z1139; Cañizares, 20 VIII 92, 1♀ + 1 juvenile with *P. pallidula*, Ref. Z1140; Fuentes, 14 V 92, 2♀ with *P. pallidula*, Ref. Z1141; Villar de Olalla, 13 V 92, 7♀ with *L. niger*, Ref. Z1246.

*Gerona: Bagur, 22 V 92, 10♀ with *T. semilaeve*, Ref. Z1613; Hostalric, 21 V 92, 6♀ with *T. hispanicum*, Ref. Z1643; Llorca, 22 V 92, 1♀ with *T. erraticum*, Ref. Z1638; Palamós, 21 V 92, 2♀ with *I. humilis*, Ref. Z1594; Tossa de Mar, 22 V 92, 2♀ with *I. humilis*, Ref. Z1604.

Granada: Arenas del Rey, 20 III 92, 1♂ + 2♀ with *A. dulcinea*, Ref. Z1001; Castril, 24 X 91, 1 juvenile with *M. capitatus* and *N. spectabilis*, Ref. Z1045; La Puebla de Don Fadrique,

25 X 91, 2♀ with *P. pallidula*, Ref. Z1062; Lanjarón, 18 III 92, 1♂ + 1♀ with *A. dulcinea*, Ref. Z1029.

*Guadalajara: Sayatón, 13 IX 91, 1 juvenile with *T. caespitum*, Ref. Z1108; Casas de San Galindo, 23 VIII 92, 1♀ with *M. capitatus* and *N. lusitana*, Ref. Z1223; El Pedregal, 22 VIII 92, 2♀ with *M. cf. hispanicus*, Ref. Z1124; Esplegares, 24 VIII 92, 2♀ with *A. gibbosa*, Ref. Z1238; Herrería, 22 VIII 92, 2♀ with *P. pallidula*, Ref. Z1128; Mondéjar, 13 IX 91, 3♀ with *C. aethiops*, Ref. Z1205; Sigüenza, 24 VIII 92, 7♀ with *P. pallidula*, Ref. Z1093.

Huelva: Alosno, 28 III 92, 1♀ with *P. pallidula*, Ref. Z0921; Ayamonte, 26 III 92, 1♂ with *T. nigerrimum*, Ref. Z0928; Cortecconcepción, 27 III 92, 1♀ with *Cataglyphis hispanica*, Ref. Z0987; El Campillo, 30 III 92,

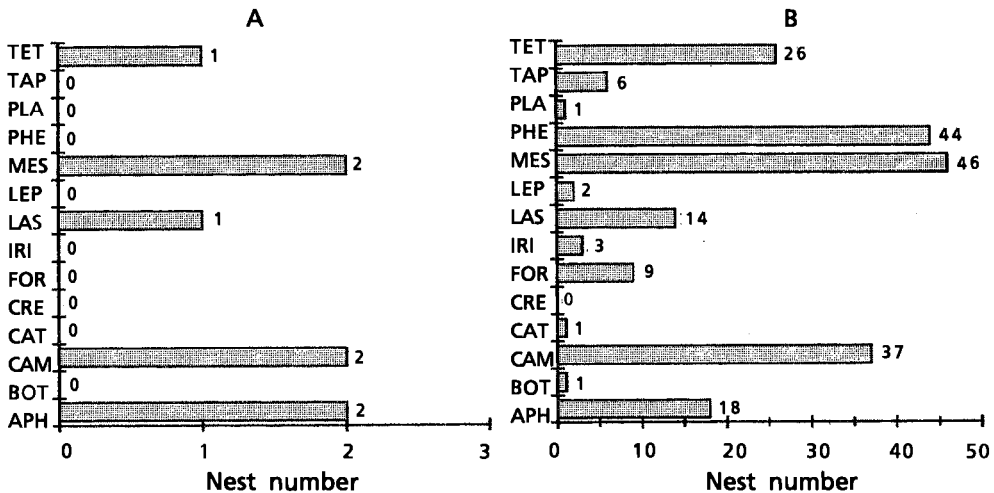


Fig. 11. Frequency of Iberian Ateluridae in nests of different genera of Formicoidea where they were found: A. *Atelura valenciana* n. sp. (n = 8); B. *Proatelurina pseudolepisma* (n = 208). Formicoidea genera: APH. *Aphaenogaster*; BOT. *Bothriomyrmex*; CAM. *Camponotus*; CAT. *Cataglyphis*; CRE. *Crematogaster*; FOR. *Formica*; IRI. *Iridomyrmex*; LAS. *Lasius*; LEP. *Leptothorax*; MES. *Messor*; PHE. *Pheidole*; PLA. *Plagiolepis*; TAP. *Tapinoma*; TET. *Tetramorium*.

Frecuencia de aparición de los Ateluridae ibéricos en los nidos de los distintos géneros de Formicoidea con que han sido hallados: A. *Atelura valenciana* sp. n. (n = 8); B. *Proatelurina pseudolepisma* (n = 208) (Para las abreviaturas de los géneros Formicoidea ver arriba.)

1♀ with *F. subrufa* and *N. curtiseti*, Ref. Z1021; Rosal de la Frontera, 28 III 92, 1♀ with *M. barbarus*, *N. spectabilis* and *N. lusitana*, Ref. Z0994.

*Huesca: Ainsa-Sobrarbe, 9 VII 92, 1♀, Ref. Z1680; Berdún, 10 VII 92, 6♀ with *P. pallidula*, Ref. Z1752; Fraga, 26 VI 92, 1 juvenile with *P. pallidula*, Ref. Z1653; La Fueva, 14 VII 92, 1♀ + 1 juvenile with *P. pallidula*, Ref. Z1697; Ibid, 1♀ + 1 juvenile with *A. gibbosa*, Ref. Z1698; Las Peñas de Riglos, 24 VI 92, 1♀, Ref. Z1675; Las Peñas de Riglos, 11 VII 92, 3♀ with *T. hispanicum*, Ref. Z1723; Loarre, 24 VI 92, 4♀ with *C. sylvaticus*, Ref. Z1685; Loarre, 24 VI 92, 2♀ with *C. aethiops*, Ref. Z1757; Loporzano, 9 VII 92, 1♀ in a nest of *C. cruentatus* cohabiting with *N. curtiseti* and *N. wasmanni*, Ref. Z1734; Sabiñánigo, 9 VII 92, 2♀ with *P. pallidula*, Ref. Z1779; Siétamo, 25 VI 92, 1♀ with *Plagiolepis pygmaea*, Ref. Z1797.

Jaén: Beas de Segura, 24 IV 92, 1♀ with *M. barbarus*, *N. foreli* and *N. lusitana*, Ref. Z0947; Ibid, 1♀ with *C. cruentatus*, Ref. Z0949; Quesada, 24 X 91, 1♀ with *M. structor*, Ref. Z1063.

*León: Ponferrada (N-VI, Km 381, 650 m), 24 IX 89, 4♀ + 1 juvenile with *P. pallidula*, Ref. Z1891; Santa María del Páramo, 25 IX 92, 7♀ + 1 juvenile with *T. hispanicum*, Ref. Z1936; Ibid, 1♀ with *M. barbarus*, Ref. Z1937.

*Lérida: Ager, 15 VII 92, 1♀ with *Messor* sp. and *N. crassipes*, Ref. Z1593; Alfarrás, 26 VI 92, 1♀ with *M. capitatus*, *N. crassipes* and *N. wasmanni*, Ref. Z1590; Isona, 23 V 92, 1♀, Ref. Z1642; Ibid, 1♀ with *F. gerardi*, Ref. Z1565; La Pobla de Segur, 27 V 86, 1♀ with *Tapinoma* sp., Ref. Z1551; Os de Balaguer, 15 VII 92, 1♀ with *C. cruentatus*, Ref. Z1626.

*Logroño (La Rioja): Anguiano, 25 VIII 92, 5♀ with *Messor* sp., Ref. Z1781; Arnedo, 21 VI 92, 1♀, Ref. Z1677; Murillo de Río Leza,

21 VI 92, 2♀ with *P. pallidula*, Ref. Z1716.

Madrid: Navas del Rey, 21 VII 92, 1♀ with *T. semilaeve*, Ref. Z1113; Olmeda de las Fuentes, 13 IX 91, 3♂ + 1 juvenile with *P. pallidula*, Ref. Z1204; Robledo de Chavela, 20 VII 92, 1♀ with *P. pallidula*, Ref. Z1098; Valdemorillo, 20 VII 92, 2 juveniles with *T. semilaeve*, Ref. Z1260.

Málaga: Casares, 6 XII 91, 3♂ with *P. pallidula*, Ref. Z1042; Coín, 6 XII 91, 1♂ + 1♀ with *M. barbarus*, Ref. Z1073; Valle de Abdalajís, 6 XII 91, 1♀ with *M. barbarus*, *N. lusitana* and *N. spectabilis*, Ref. Z1057.

*Murcia: Cartagena, 10 IV 92, 1♀ with *C. sylvaticus*, Ref. Z1372; Cieza, 15 IV 92, 2♀ with *A. iberica*, Ref. Z1332; Jumilla, 15 IV 92, 1♀ with *T. hispanicum*, Ref. Z1525; Moratalla, 27 X 91, 1♀ with *C. sylvaticus*, Ref. Z1349; Murcia, 11 IV 92, 1♀ with *L. brunneus*, Ref. Z1444.

*Navarra: Carcastillo, 23 VI 92, 3♀ with *P. pallidula*, Ref. Z1778; Los Arcos, 23 VI 92, 2♂ + 1 juvenile, Ref. Z1773; Pitillas, 23 VI 92, 1♀, Ref. Z1758; Ibid, 3♀ with *M. barbarus* and *N. crassipes*, Ref. Z1666; Tafalla, 23 VI 92, 1♀, Ref. Z1721; Ibid, 1♀ with *C. sylvaticus*, Ref. Z1763, and 3♀ with *T. hispanicum*, Ref. Z1764; Yesa, 10 VII 92, 1 juvenile with *Messor sp.*, Ref. Z1708.

*Palencia: Fuentes de Valdepero, 25 IX 92, 3 juveniles with *T. caespitum* and *L. chlorosoma*, Ref. Z1874; Husillos, 27 IX 89, 1♀ with *M. structor*, Ref. Z1932; Quintana del Puente, 26 IX 92, 1♀ + 1 juvenile with *P. pallidula*, Ref. Z1819; Ibid, 2♀ with *C. aethiops*, Ref. Z1820.

*Salamanca: Saucelle, 23 IX 92, 1♂ + 1♀, Ref. Z1804; Valdelosa, 23 IX 92, 1♀ with *M. barbarus* and *N. spectabilis*, Ref. Z1814.

*Segovia: Maderuelo, 27 VIII 92, 1♀ with *Messor sp.* and *N. spectabilis*, Ref. Z1912; Sepúlveda, 27 VIII 92, 1♀ with *C. pilicornis*, Ref. Z1883; Villacastín, 22 IX 92, 2♀ with *P. pallidula*, Ref. Z1810; Ibid, 1♀ with *Messor sp.* and *N. spectabilis*, Ref. Z1822, Ibid, 1♀ + 3 juveniles with *T. hispanicum*, Ref. Z1823.

*Soria: Deza, 20 VI 92, 2♀ with *T. caespitum*, Ref. Z1833; Garray, 26 VIII 92, 3 juveniles with *Messor sp.* and *N. curtiseteta*, Ref. Z1859.

Tarragona: Calafell, 24 V 92, 1♀ + 1 juvenile in a nest of *M. barbarus*, cohabiting with *N. crassipes* and *Tricholepisma aurea* Ref. Z1619; El Perelló, 15 V 92, 1♀ with *M. bouvieri* and *N. crassipes*, Ref. Z1572; El Pla de Santa María, 18 V 92, 2♀ with *M. structor*

and *N. crassipes*, Ref. Z1575; Falset, 24 V 92, 2♀ with *C. cruentatus* and *N. curtiseteta*, Ref. Z1607; Horta de Sant Joan, 24 V 92, 1♀ with *M. structor*, Ref. Z1581; La Bisbal del Penedés, 18 V 92, 4♀ with *T. nigerrimum*, Ref. Z1584; Mas de Barberans, 15 V 92, 1♀ with *M. barbarus*, Ref. Z1586; Prades, 18 V 92, 1♀ with *Messor sp.* and *N. crassipes*, Ref. Z1561; Roquetes, 20 II 90, 1♂ + 1♀ with *P. pallidula*, Ref. Z1606; Ibid, 1♀ with *F. subrufa*, Ref. Z1640; Santa Coloma de Queralt, 19 V 92, 1♀ with *C. aethiops*, Ref. Z1630; Tivenys, 15 V 92, 1♀, Ref. Z1602; Vimbodí, 18 V 92, 1♀ with *P. pallidula*, Ref. Z1639:

*Teruel: Albarracín, 21 VIII 92, 2♀ + 4 juveniles with *M. capitatus*, Ref. Z1704; Cañizar del Olivar, 21 VIII 92, 2♀ with *M. capitatus* and *N. curtiseteta*, Ref. Z1776; Híjar, 27 VI 92, 2♀ in two nests of *A. iberica*, Refs. Z1713 and Z1789; La Fresneda, 24 V 92, 2♂ + 1♀ with *P. pallidula*, Ref. Z1768.

*Toledo: Belvís de La Jara, 22 VII 92, 6♀ with *A. gibbosa*, Ref. Z1162; La Puebla de Montalbán, 12 IX 91, 3♀ with *P. pallidula*, Ref. Z1243.

*Valencia: Aras de Alpuente, 14 V 92, 3♀ with *C. cruentatus*, Ref. Z1521; Ayora, 25 IV 92, 1♀ + 1 juvenile with *P. pallidula*, Ref. Z1388; Barx, 26 IV 92, 2 juveniles with *A. gibbosa*, Ref. Z1362; Casinos, 29 IV 92, 2♀ with *Camponotus sp.* and *N. spectabilis*, Ref. Z1339; Cullera, 27 IV 92, 1♂ with *P. pallidula*, Ref. Z1534; Requena, 25 IV 92, 3♀ with *M. hispanicus*, Ref. Z1440; Requena, 29 IV 92, 1♀ with *F. subrufa*, Ref. Z1315.

*Valladolid: Castromonte, 26 IX 92, 1♀ with *P. pallidula*, Ref. Z1930.

*Zamora: Castronuevo, 24 IX 92, 3 juveniles with *P. pallidula*, Ref. Z1890; Faramontaos de Tábara, 24 IX 92, 2♀ in two nests of *P. pallidula* they were cohabiting with *L. chlorosoma*, Refs. Z1903 and Z1964; Villar del Buey, 23 IX 92, 1♀ + 1 juvenile with *T. hispanicum*, Ref. Z1571.

Zaragoza: Ariza, 20 VI 92, 1♀ with *M. capitatus*, Ref. Z1728; Belchite, 27 VI 92, 1 juvenile with *M. capitatus*, *N. crassipes* and *N. wasmanni*, Ref. Z1793; Mequinenza, 26 VI 92, 1♀ with *F. subrufa* and *N. curtiseteta*, Ref. Z1706; Pina de Ebro, 6 X 91, 1 juvenile, Ref. Z0597; Santa Cruz del Moncayo, 21 VI 92, 1♀ with *A. iberica*, Ref. Z1695; Ibid, 2♀ with *T. caespitum*, Ref. Z1799; Zuera, 24 VI 92, 1♀ with *M. barbarus*, Ref. Z1656; Zuera, 24 VI 92, 2♀

Table 1. Occurrence of *P. pseudolepisma* males in the studied samples. Data grouped in biogeographical provinces (P) slightly modified from RIVAS-MARTÍNEZ (1987): I. Pirenaica; II. Cantabro-atlántica; III. Orocantábrica; IV. Aragonesa; Va. Catalana (N del Ebro); Vb. Valenciana (S del Ebro); VI. Baleárica; VII. Castellano-Maestrazgo-Manchega; VIII. Murciano-almeriense; IX. Carpetano-Ibérico-Leonesa (sin Duero); X. Luso-extremadurese (con Duero); XI. Gaditano-onubo-algarviense; XII. Bética. N. Number of samples; F. Females collected; M. Males collected; S. Sex ratio; Pp. Possibility of parthenogenesis: w. Widespread; I-I. Located or lacking.

Presencia de machos de P. pseudolepisma en las muestras estudiadas. Los datos se han agrupado por provincias biogeográficas levemente modificadas de RIVAS-MARTÍNEZ (1987). (Para las abreviaturas, ver arriba.)

P	N	F	M	S	Pp?
I	0	0	0	-	-
II	0	0	0	-	-
III	0	0	0	-	-
IV	41	62	2	31:1	w
Va	22	70	0	-	w
Vb	24	34	15	2.25:1	I-I
VI	10	24	1	24:1	w
VII	28	56	0	-	w
VIII	8	10	0	-	w
IX	16	30	0	-	w
X	45	71	28	2.5:1	I-I
XI	8	7	7	1:1	I-I
XII	20	27	22	1.3:1	I-I
Total	222	391	75	5.2:1	

with *C. sylvaticus*, Ref. Z1738; Zuera, 24 VI 92, 2♀ with *M. barbarus*, *N. crassipes* and *N. wasmanni*, Ref. Z1767; Zuera, 24 VI 92, 1♀ with *C. sylvaticus*, Ref. Z1785.

Distribution

This species was recorded for the first time in Spain, as *Atelura pseudolepisma* by STACH (1930). In spite of its relative abundance, it was not cited again in the Iberian peninsula until recently (MENDES, 1980 in Portugal and GAJU-RICART & BACH DE ROCA, 1986, in Spain), then as *Proatelura pseudolepisma*. The great number of records given in this work reveal its real abundance. It is widespread over the whole Mediterranean region in the Iberian peninsula and the Balearics, lacking probably in the Euro-Siberian region. All the new and previous reports of this species are included in the map in figure 9.

Possibility of parthenogenesis

The map in figure 10 shows the localities where males of *P. pseudolepisma* were found (concerning the data from Portugal, those given in MENDES, 1980 have been selected). Some biogeographical regions (such as Catalonia or the Northern submeseta), indicate where a great number of samples and specimens were found (see table 1) but all except one were females. This might mean the populations are parthenogenetic in some regions. Different external factors, such as climate and the lack of representatives of this family in most regions, give rise to this phenomenon.

In the area where distributions of *Atelura valenciana* n. sp. and *P. pseudolepisma* overlap, both species have populations with males (also in the neighbouring areas for *P. pseudolepisma*), while in other peninsular regions the latter seems to be parthenogenetic. Competition due to the occurrence of *A. valenciana* may explain this phenomenon.

Myrmecophile relationships

This species is found together with a great number of species of Formicidae (grouped by ant genera in figure 11B). For this reason it could be considered panmyrmecophile (or eurimyrmecophile because of its widespread preference in its association with ants). It could thus be considered as a generalist myrmecophile *Zygentoma* and differentiated from other myrmecophile species from the Spanish fauna that show a great specialization [unpublished data, MOLERO-BALTANÁS (1995)].

Resumen

Descripción de Atelura valenciana sp. n. (Insecta, Zygentoma) y distribución y relaciones mirmecófilas de Proatelurina pseudolepisma

En este trabajo se amplía el conocimiento de la familia Ateluridae en la península ibérica y Baleares, con la descripción de una nueva especie, *Atelura valenciana* sp. n. (figs. 2-6), siendo la primera vez que se cita este género en la fauna española.

Se comparan las características de la nueva especie con las otras dos previamente conocidas del género (fig. 7) y se constata su aislamiento geográfico (figs. 1, 8).

También se aportan numerosos datos que precisan significativamente la distribución de la otra especie ibérica de la familia, *Proatelurina pseudolepisma* (Grassi, 1887) (fig. 9); en ésta, es destacable la existencia de numerosas poblaciones donde sólo se han hallado hembras, lo que sugiere la posibilidad de que las mismas sean partenogenéticas (fig. 10, tabla 1). Además se incluyen datos significativos sobre las relaciones mirmecófilas de las dos especies (fig. 11).

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