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Linyphiid spiders (Araneae, Linyphiidae) from caves of Morocco

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Linyphiid spiders (Araneae, Linyphiidae) from caves of Morocco. - Nine species of linyphiid spiders are recorded from caves of Morocco, four of which are described as new to science: *Diplocephalus inanis* sp. n., *Lepthyphantes* s. lat. *longipedis* sp. n., *Lepthyphantes* s. lat. *taza* sp. n. and *Megalepthyphantes brignolii* sp. n.

Keywords: Arachnida - North Africa - taxonomy - new species - new records.

INTRODUCTION

A small collection of linyphiid spiders from caves of Morocco is stored in the Muséum d'histoire naturelle de Genève. This material was studied by Paolo Marcello Brignoli in the mid 80s of the last century, and the corresponding manuscript was almost finished. Regrettably, Brignoli passed away in 1986, and his manuscript with the original descriptions cannot be found and is probably lost. Only the line drawings in ink, produced by the Geneva Museum on the basis of Brignoli's pencil sketches, have remained and some of them are used in the current paper.

The collection contains one nominal species (*Lepthyphantes* s. lat. *maurusius* Brignoli, 1978) and eleven species were labeled by Paolo Brignoli as new to science. Today, after 30 years, it is clear that four of these "new species" had already been described at that time: *L.* s. lat. *aelleni* Denis in Denis & Dresco, 1957, *L.* s. lat. *brevihamatus* Bosmans, 1985, *L.* s. lat. *longihamatus* Bosmans, 1985 and *Tenuiphantes tenuis* (Blackwall, 1852), but four others are really new and described below. Three species from the collection represented by females only and I disregard them because the absence of corresponding males makes their identity unclear. This is a female belonging to *Araeoncus* Simon, 1884 or to *Diplocephalus* Bertkau in Förster & Bertkau, 1883, and a few female specimens of two species, probably belonging to the *afer* species-group of *Lepthyphantes* s. lat. (see Brignoli, 1971; Saaristo & Tanasevitch, 1993).

All "*Lepthyphantes* species" mentioned in the current paper are cited as "*Lepthyphantes* s. lat." and they do not belong to the genus *Lepthyphantes* Menge, 1866 sensu Saaristo & Tanasevitch (1996). Recently, the genus *Lepthyphantes* was reassessed and limited to five species only (op. cit.). More than 400 species previously placed in *Lepthyphantes* were transferred to other genera, but about 160 species are temporarily left in *Lepthyphantes* until their taxonomic position is reassessed.

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MATERIAL AND METHODS

The present paper treats linyphiid spiders collected in Moroccan caves in 1974, 1978 and 1979 by P. Strinati, B. Hauser and V. Aellen, and in 1982 by a team of speleologists from Lyon (see Gilbert, 1983). All material is kept at the Muséum d'histoire naturelle, Geneva, Switzerland (MHNG). Sample numbers are given in square brackets.

The majority of the figures used in this paper were made by Paolo Brignoli, I drew a few additional elements, made some corrections and provided figures with abbreviations.

The terminology of genitalic structures in Micronetinae follows that of Saaristo & Tanasevitch (1996), for Erigoninae it mainly follows that of Hormiga (2000). The chaetotaxy of Erigoninae is given in a formula (e.g., 2.2.1.1) which refers to the number of dorsal spines on tibiae I-IV. For Micronetinae the chaetotaxy is given in a different formula, e.g., Ti I: 2-1-1-2(1), which means that tibia I has two dorsal spines, one prolateral spine, one retrolateral spine, and two or one ventral spines (the apical spines are disregarded). The sequence of leg segment measurements is as follows: femur + patella + tibia + metatarsus + tarsus. All measurements are given in millimetres. Brignoli's figures were not drawn to scale, but all of my own illustrations are supplied with scale bars.

The following abbreviations are used in the text and figures: BC - bursa copulatrix; DPS - distal part of scape; DRA - distal radical apophysis; DSA - distal suprategular apophysis; E - embolus; EB - embolus base; EG - entrance groove; EP - embolus proper; Fe - femur; L - lamella characteristica; LW - lateral wall; LWP - lateral wall process; MHNG - Muséum d'histoire naturelle, Geneva, Switzerland; MPS - middle part of scape; Mt - metatarsus; PMP - posterior median plate; PS - proscape; PSB - proscape base; R - radix; St - stretcher; TA - terminal apophysis; Th - thumb; Ti - tibia; TmI - relative position of trichobothrium on metatarsus I.

RESULTS

Diplocephalus inanis sp. n. Figs 1-8

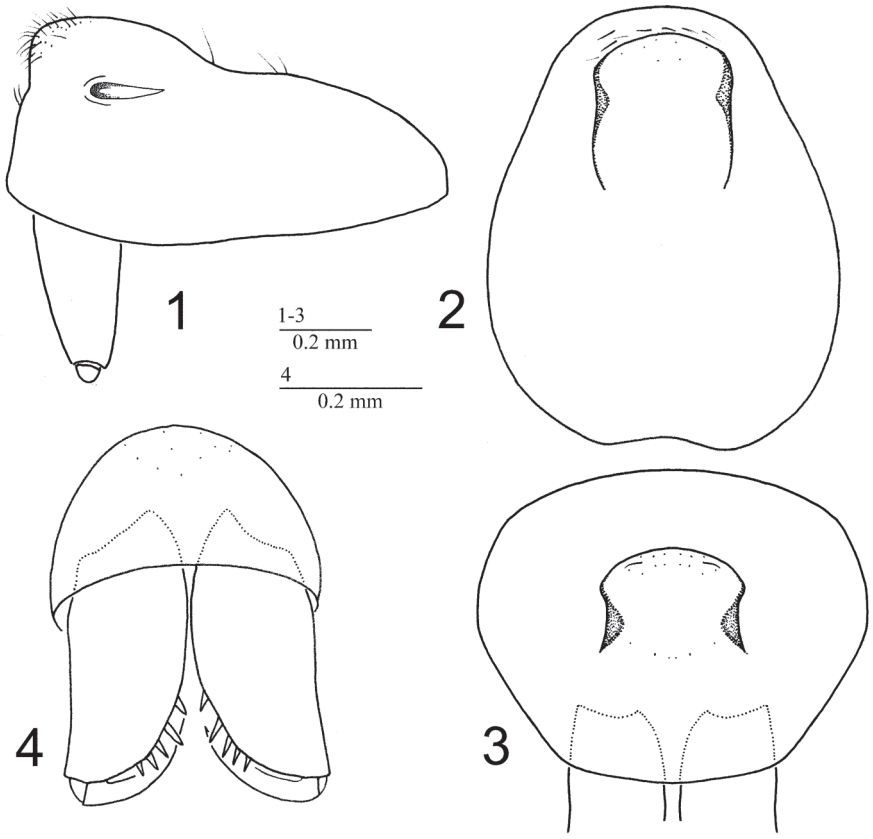
HOLOTYPE: ♂; MOROCCO, Middle Atlas Mts, south west of Taza, Châra, near AinTeslit, "Ifri Tselet" Cave, 1250 m a.s.l.; 3.VI.1978; leg. P. Strinati [Mar78/14].

PARATYPE: 1 ♀; collected together with the holotype.

ETYMOLOGY: The specific epithet is a Latin adjective; one of its many meanings is "eyeless".

DIAGNOSIS: The new species is characterized by the absence of eyes in both sexes, by the absence of any process on the male palpal tibia, as well as by the thick seminal ducts which are clearly visible through both parts of the epigynal ventral plate.

DESCRIPTION: Male (holotype), partly damaged. Total length 1.30. Carapace 0.58 long, 0.48 wide, pale brown, almost yellow. Cephalic part slightly elevated, sulci present, narrow, almond-shaped; eyes totally reduced (Figs 1-3). Chelicerae 0.23 long, unmodified. Legs mostly broken off. FeI 0.68, FeIV 0.80 long. Chaetotaxy unknown. Palp (Figs 5-7): Palpal tibia thickened, without apophyses but with a wide distal lobe. Distal suprategular apophysis developed as a long stripe, narrowing in distal part.

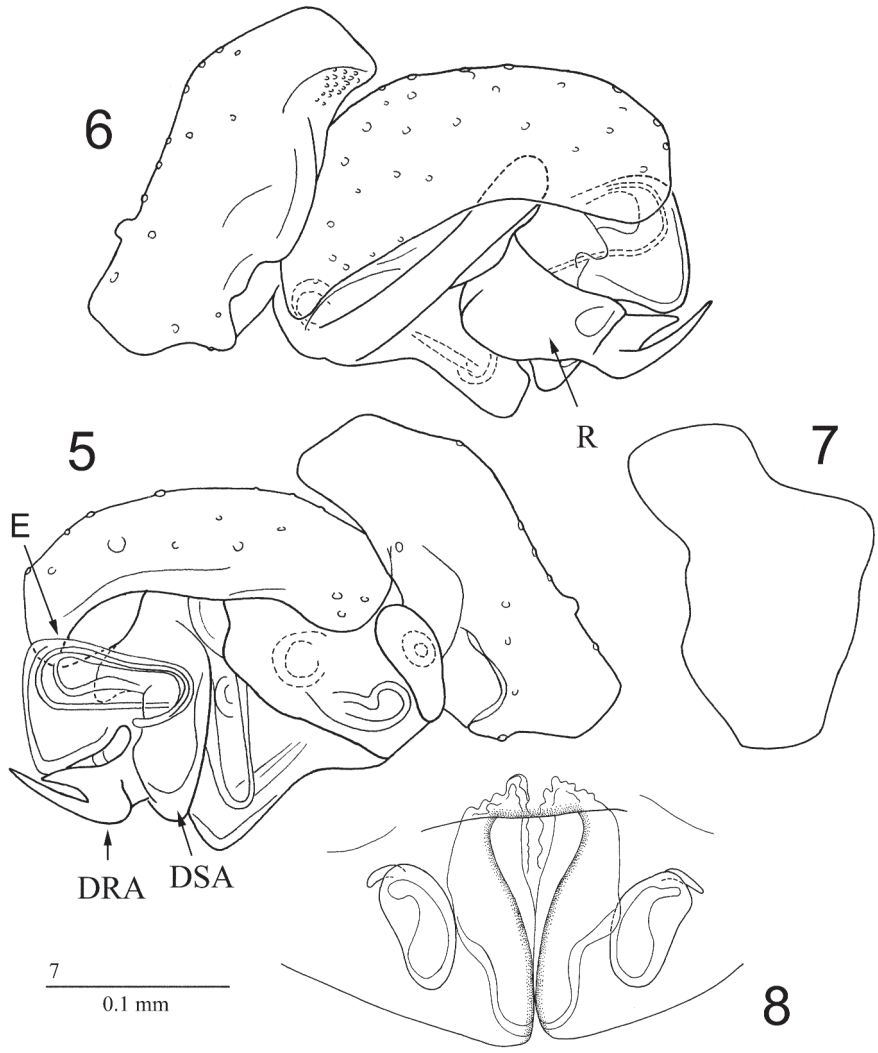


FIGS 1-4
Diplocephalus inanis sp. n., ♂ holotype (1-3) and ♀ paratype (4). (1) Carapace, lateral view. (2) Same, dorsal view. (3, 4) Same, frontal view.

Embolic division large, distal radical apophysis with two pointed apophyses of different lengths. Embolus relatively short, directed backwards, strongly curved distally. Abdomen about 0.83 long, 0.50 wide, pale, almost white.

Female. Total length ca 1.60. Carapace 0.65 long, 0.48 wide, pale brown, unmodified, eyes totally reduced (Fig. 4). Chelicerae 0.50 long. Legs pale brown. Leg I 2.57 long (0.75+0.20+0.65+0.55+0.42), leg IV 2.59 long (0.78+0.18+0.68+0.67 +0.38). Chaetotaxy 2.2.1.1. Metatarsus IV without trichobothrium. TmI 0.36. Abdomen 0.95 long, 0.58 wide, pale, almost white. Epigyne (Fig. 8): Both parts of bisected ventral plate wide apart proximally, virtually in contact with each other distally. Dorsal plate shaped like a narrow rectangle. Entrance ducts thick and well visible through both parts of ventral plate in median fissure area.

REMARKS: There is only a single known eyeless species of *Diplocephalus* Bertkau in Förster & Bertkau, 1883, *D. caecus* Denis, 1952, which was described from a male from a cave in Rochefort, Belgium. *Diplocephalus inanis* sp. n. can easily be



FIGS 5-8

Diplocephalus inanis sp. n., ♂ holotype (5-7) and ♀ paratype (8). (5-6) Left palp, retrolateral and prolateral view, respectively. (7) Palpal tibia, dorsal view. (8) Cleared epigyne, ventral view.

distinguished from that species by the absence of any process on the palpal tibia, as well as by some other details of the palp.

The absence of any apophyses on the palpal tibia is a rare phenomenon among members of *Diplocephalus*, and elsewhere only found in the North-African *D. mystacinus* (Simon, 1884), which occurs in Algeria and Tunisia (and which also has a distal lobe), and in the European-Mediterranean *D. graecus* (Cambridge, 1872). The new

species clearly differs from both species by the absence of eyes and by details of the genitalia.

DISTRIBUTION: Known from the type locality only.

Lepthyphantes s. lat. ***aelleni*** Denis in Denis & Dresco, 1957 Figs 9-13

MATERIAL: 1 ♂; MOROCCO, Middle Atlas Mts, Taza, near Daya Chiker, "Gouffre du Friouato" Cave, 1450 m a.s.l.; 1.VI.1978; leg. P. Strinati [Mar 78/6]. – 1 ♀; same data, 1.VI.1978; leg. B. Hauser [Mar78/7]. – 1 ♂, 1 ♀; same data, 1.X.1979; leg. P. Strinati.

DISTRIBUTION: *Lepthyphantes aelleni* is known from two potholes, the "Gouffre de Kaf el Bouk" and the "Gouffre du Friouato", in the region of Taza, Morocco only (Denis & Dresco, 1957; Bosmans, 2006). Detailed information on these localities can be found in Strinati (1952).

Lepthyphantes s. lat. ***brevihamatus*** Bosmans, 1985 Figs 14-15

MATERIAL: 20 ♀; MOROCCO, High Atlas Mts, "Ifri El Kaid" Cave, near AïtMehammed south of BinelOuidane; 1580 m a.s.l.; 5.VI.1978; leg. P. Strinati [Mar 78/24]. – 11 ♀; "Ifri El Kaid" Cave; 5.VI.1978; leg. B. Hauser [Mar78/26].

DISTRIBUTION: The species has been reported from caves in the High Atlas Mts of Morocco only (Bosmans, 1985, 2006).

Lepthyphantes s. lat. ***longihamatus*** Bosmans, 1985 Fig. 16

MATERIAL: 1 ♂; MOROCCO, High Atlas Mts, "Ifri El Kaid" Cave, near AïtMehammed south of BinelOuidane; 1580 m a.s.l.; 5.VI.1978; leg. P. Strinati [Mar 78/24].

DISTRIBUTION: The species has been reported from caves in the High Atlas Mts of Morocco only (Bosmans, 1985, 2006).

Lepthyphantes s. lat. ***longipedis*** sp. n. Figs 17-21

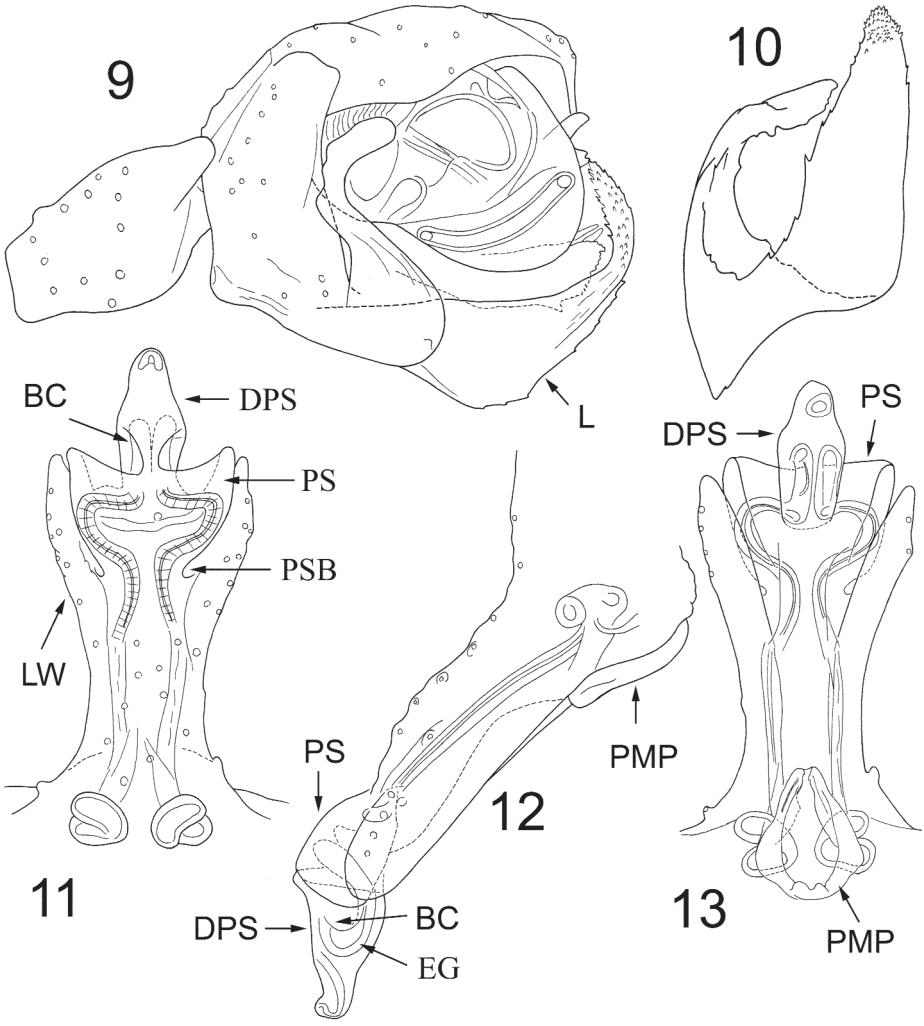
HOLOTYPE: ♂; MOROCCO, Middle Atlas Mts, Beni Mellal, Jbel Ighnayene, near Ouaouizaght Village, pothole JI 11; 22.VI.1982; leg. J. Delore, B. Gailleton & A. Gilbert.

PARATYPES: 1 ♂, 5 ♀; collected together with the holotype.

ETYMOLOGY: The specific epithet, an adjective, means "long-legged", referring to the length of legs in this species.

DIAGNOSIS: The new species is characterized by the thin and very long legs, as well as by the small, reduced eyes in both sexes. The male can easily be recognized by the shape of the lamella characteristica, as well as by the thick embolus with a large thumb and with a toothed base. The female is distinguished by the peculiar shape of its posterior median plate.

DESCRIPTION: Male (holotype), partly damaged. Total length 2.30. Carapace 1.25 long, 1.05 wide, pale brown, unmodified. Eyes relatively small, with dark rings. Chelicerae 0.53. long, anterior margin with two large teeth and one small denticle. Legs pale brown to yellow, thin and very long, most of them broken off. FeI and II 2.75 long each. Chaetotaxy unknown. Palp (Figs 17-19): Patella unmodified. Cymbium without posterodorsal outgrowth. Paracymbium with a tooth in middle part, and with a wide, short, backward-directed projection. Lamella characteristica broad, its upper branch obtuse and slightly widened distally. Embolus with a large thumb and a few

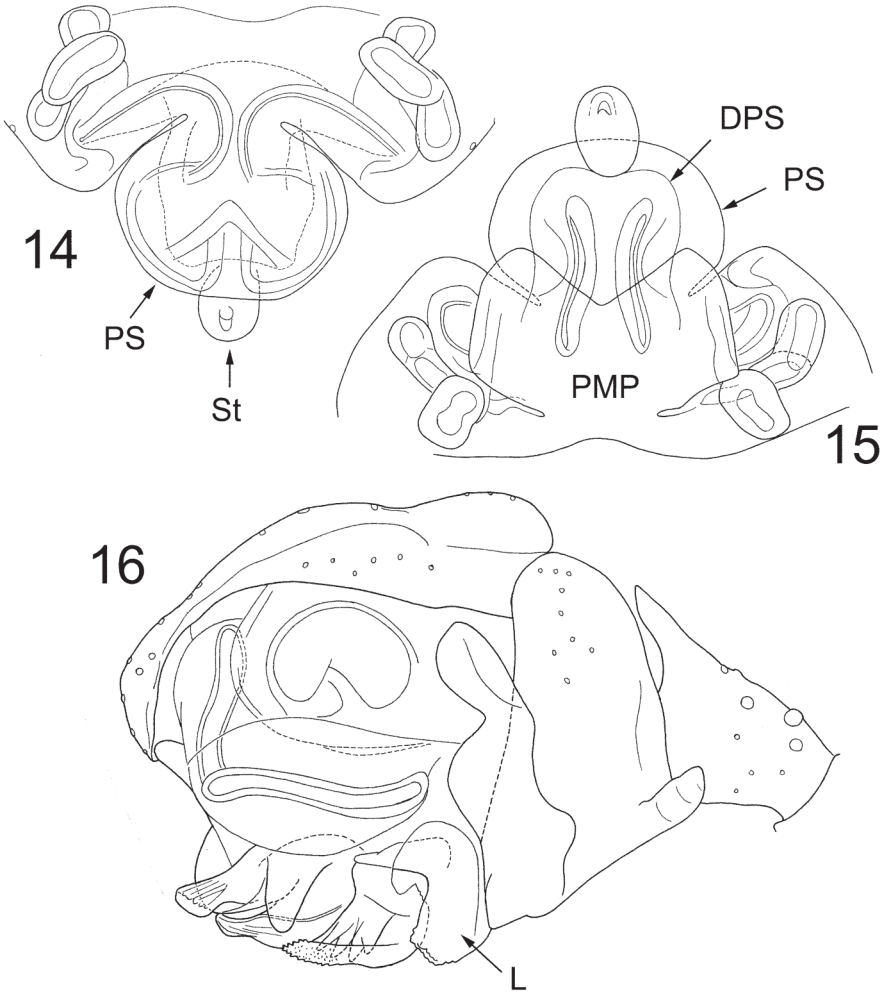


FIGS 9-13

Lepthyphantes s. lat. *aelleni* Denis in Denis & Dresco, 1957. (9) Right palp, retrolateral view. (10) Lamella characteristica, lateral view. (11-13) Epigyne, ventral, lateral and dorsal view, respectively.

strong teeth on embolic base. Abdomen 1.20 long, 0.80 wide, pale, almost white, dorsal pattern absent.

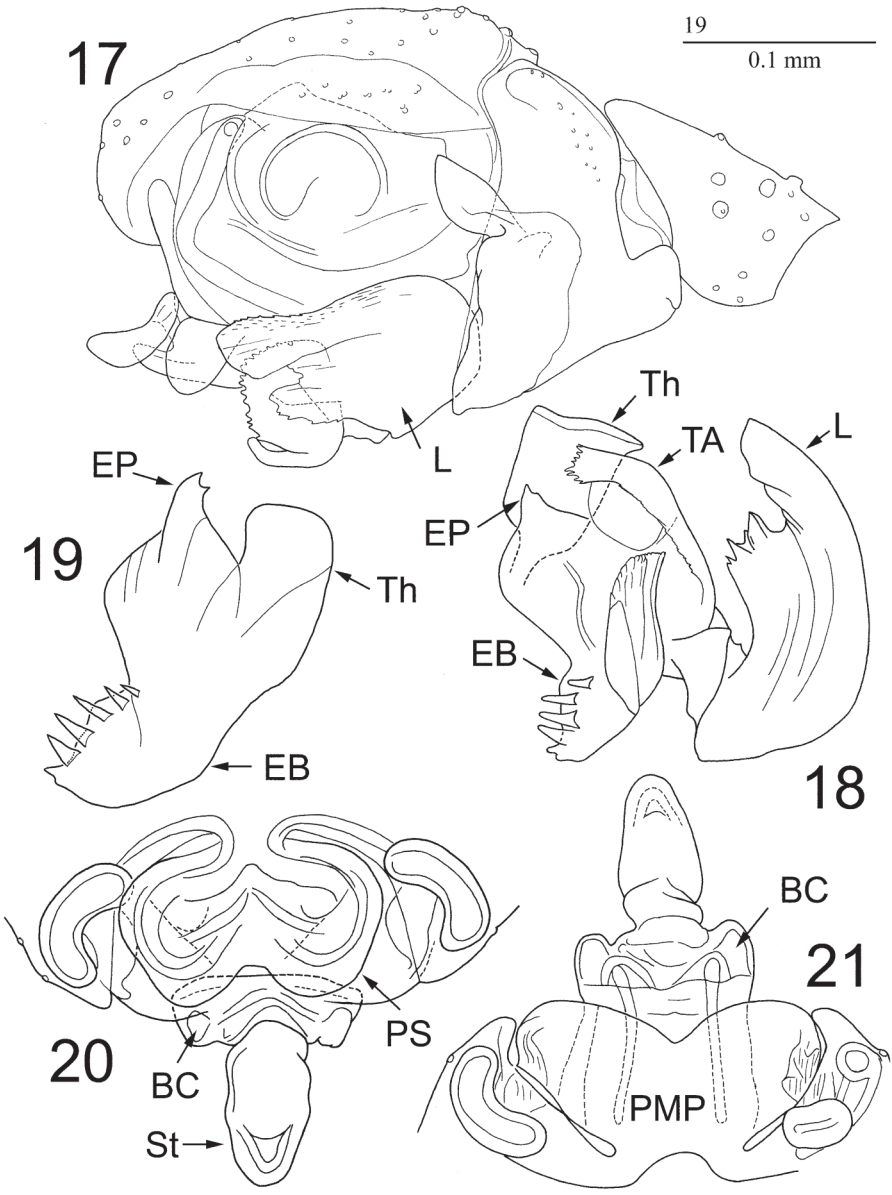
Female. Total length 3.05. Carapace 1.50 long, 1.20 wide, pale brown, unmodified. Eyes relatively small. Chelicerae 0.90 long. Legs pale brown to yellow, thin and very long, most of them broken off. FeI 3.00, FeII 2.90 long. Abdomen 1.90 long, 1.20 wide, pale, almost white, dorsal pattern absent. Epigyne (Figs 20-21): Proscape broad, rounded, with a narrow base and a deep notch distally. Lateral lobes reduced, stretcher large, oblong. Posterior median plate like a wide "V" with rounded ends.



FIGS 14-16
Lepthyphantes s. lat. *brevihamatus* Bosmans, 1985 (14-15) and *L*. s. lat. *longihamatus* Bosmans, 1985 (16). (14-15) Epigyne, ventral and dorsal view, respectively. (16) Left palp, retrolateral view.

REMARKS: According to the general genitalia conformation, the new species belongs to the afer species-group of *Lepthyphantes* s. lat. (see Saaristo & Tanasevitch, 1993) and seems to be most similar to *L. longihamatus*, but shows typical troglobiontic features, i.e., small, reduced eyes, pale leg and body coloration, as well as very long legs: leg I of the male paratype is 5 times longer than its body.

Beside that, the male of *L.* s. lat. *longipedis* sp. n. differs from *L. longihamatus* by the shape of the paracymbial tooth (wide and blunt in *L.* s. lat. *longipedis* sp. n., narrow and pointed in *L. longihamatus*), by the shape of the lamella characteristica, as



FIGS 17-21

Lepthyphantes s. lat. *longipedis* sp. n., ♂ (17-19) and ♀ paratypes (20-21). (17) Left palp, retrolateral view. (18) Embolic division. (19) Embolus. (20-21) Epigyne, ventral and dorsal view, respectively.

well as by some other details of the palp. The female of the new species differs from that of *L. longihamatus* by the shape of the proscape, which is considerably broader than long versus being about as long as broad in *L. longihamatus*. The epigene of *L.* s.

lat. *longipedis* sp. n. also resembles to that of *L*. s. lat. *brevihamatus*, but clearly differs by the much deeper hole on the posterior edge of the proscape, as well as by the rounded ends of the V-shaped posterior median plate.

Detailed information on the type locality of this species was given by Gilbert (1983).

DISTRIBUTION: Known from the type locality only.

Lepthyphantes s. lat. ***maurusius*** Brignoli, 1978

TYPE MATERIAL EXAMINED: ♀ holotype (MHNG); MOROCCO, Middle Atlas Mts, "Sidi Mejbeur" Cave; 2.V.1974; leg. P. Thibaud & P. Strinati.

OTHER MATERIAL: 1 ♀; MOROCCO, Middle Atlas Mts, "Sidi Mejbeur" Cave, 1270 m a.s.l.; 4.VI.1978; leg. P. Strinati [Mar78/19].

DISTRIBUTION: The species is so far known only from a cave near Taza, Morocco (Brignoli, 1978). The male is still undescribed.

Lepthyphantes s. lat. ***taza*** sp. n. Figs 22-24

HOLOTYPE: ♀; MOROCCO, Middle Atlas Mts, "Ifri Tselet" Cave near Ain Teslit, Châra region south-west of Taza, 1250 m a.s.l.; 3.VI.1978; leg. P. Strinati [Mar 78/14].

PARATYPES: 2 ♀; same data, "Ifri Tselet" Cave; 3.VI.1978; leg. B. Hauser [Mar 78/15].

ETYMOLOGY: The specific epithet is a noun in opposition that refers to the region of the type locality.

DIAGNOSIS: The new species is characterized by the peculiar conformation of the epigyne, such as: the presence of a long process on each lateral wall, the absence of the proscape, as well as the reduced, lateral lobes and stretcher.

DESCRIPTION: Female (holotype). Total length 2.50. Carapace 1.13 long, 0.88 wide, pale brown, unmodified. Eyes relatively small, with dark rings. Chelicerae 0.42. long, anterior margin with two teeth and a denticle; posterior margin with a very small and poorly visible denticle. Legs pale brown to yellow, relatively thin and long. Leg I 7.23 long (1.88+0.42+1.95+1.88+1.13), leg IV 6.09 long (1.83+0.33+1.38+1.67 +0.88). Chaetotaxy. Fe I: 0-2-0-0, II-IV: 0-0-0-0; TiI-II: 2-2-2(3)-0, III-IV: 2-1-1-0; MtI-IV: 1-1-1-1. TmI 0.13. Abdomen 1.46 long, 0.83 wide, pale, almost white, dorsal pattern absent. Epigyne (Figs 22-24): Lateral walls very long, each one with a long apical process. Proscape and middle part of scape totally reduced. Distal part of scape massive, bucket-shaped, lateral lobes and stretcher reduced. Posterior median plate drop-shaped.

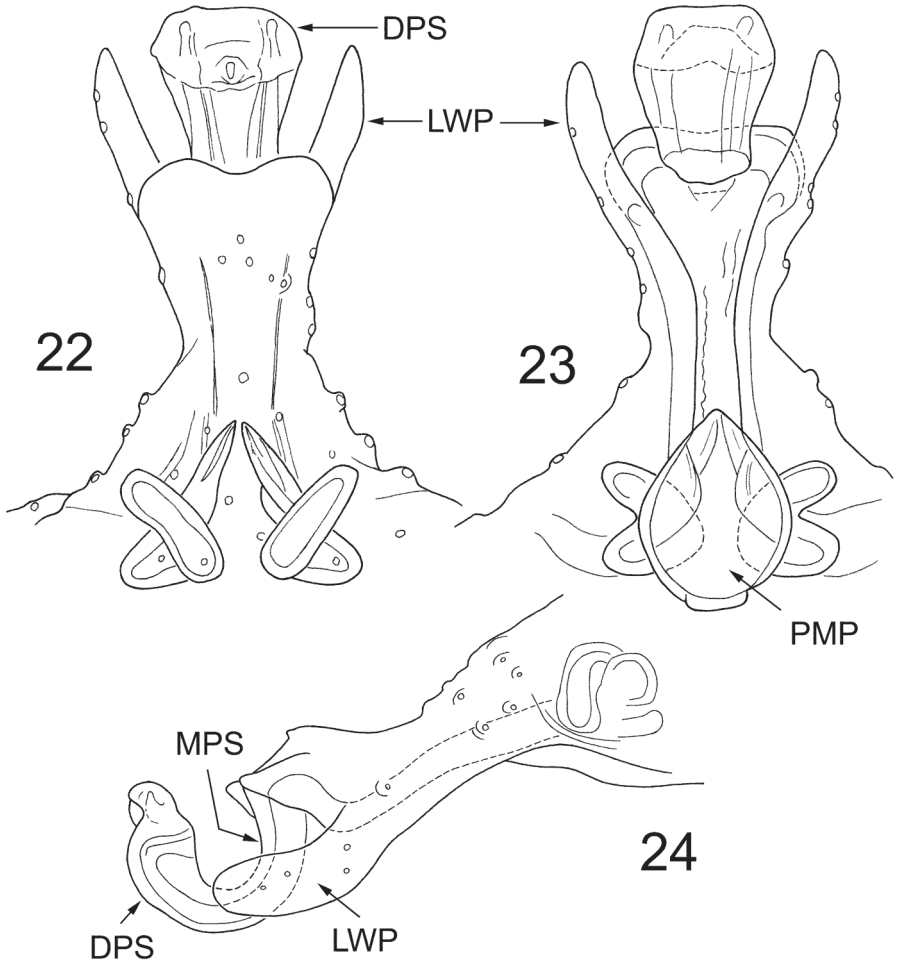
REMARKS: The general appearance of the epigyne of *L*. s. lat. *taza* sp. n. is similar to that of the cave-dwelling *L*. s. lat. *aelleni* and *L*. s. lat. *maurusius*, but the proscape in the new species is totally reduced, while in the other species the proscape is distinct.

DISTRIBUTION: Known from the type locality only.

Megalepthyphantes brignolii sp. n. Figs 25-28

HOLOTYPE: ♂; MOROCCO, Middle Atlas Mts, Bab bou Idir, region of Taza, Ras Chiker Cave, 1410 m a.s.l.; 30.IX.1979; leg. P. Strinati & V. Aellen.

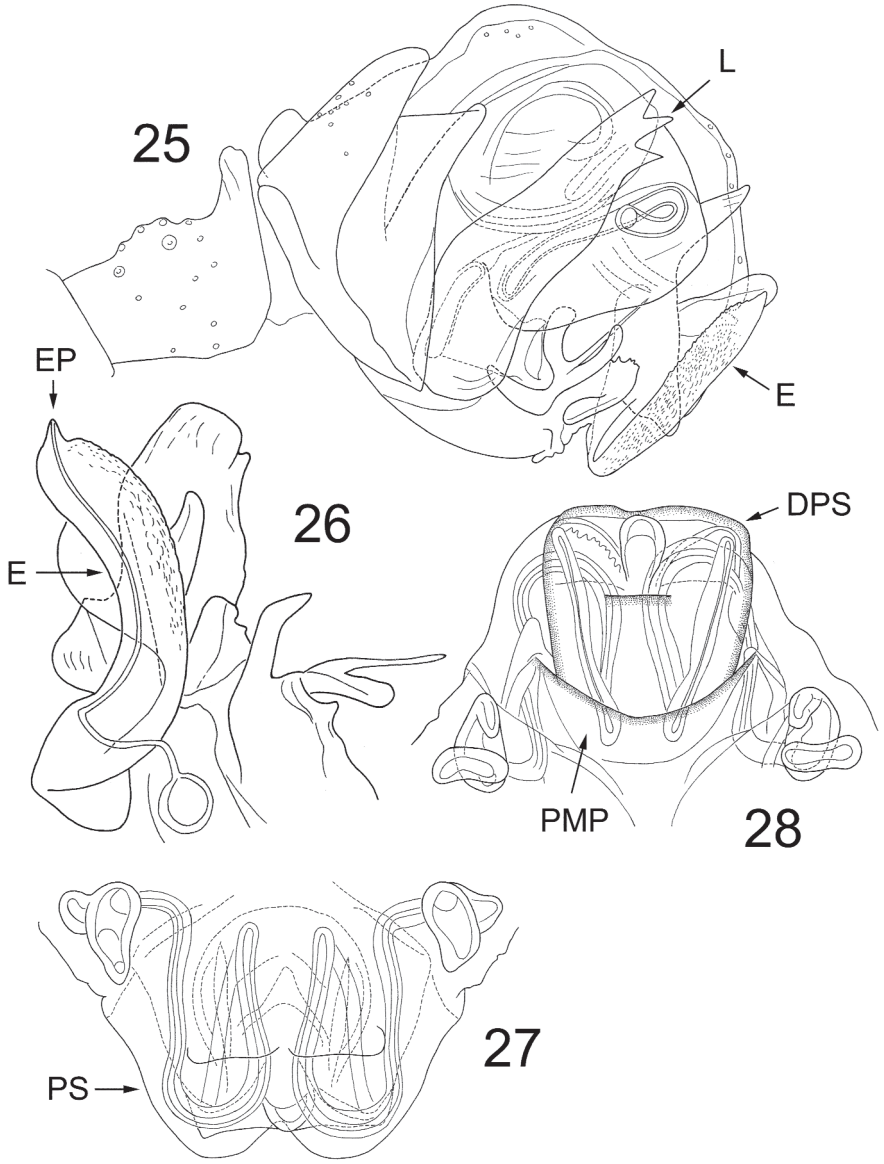
PARATYPE: 1 ♀; from same locality, collected together with the holotype.



FIGS 22-24
Lepthyphantes s. lat. *taza* sp. n., ♀ paratype. (22-24) Epigyne, ventral, dorsal and lateral view, respectively.

DIAGNOSIS: The new species is characterized by the trifid apex of the lamella characteristica, as well as by the narrow, long, smoothly curved posterior median plate of the epigyne.

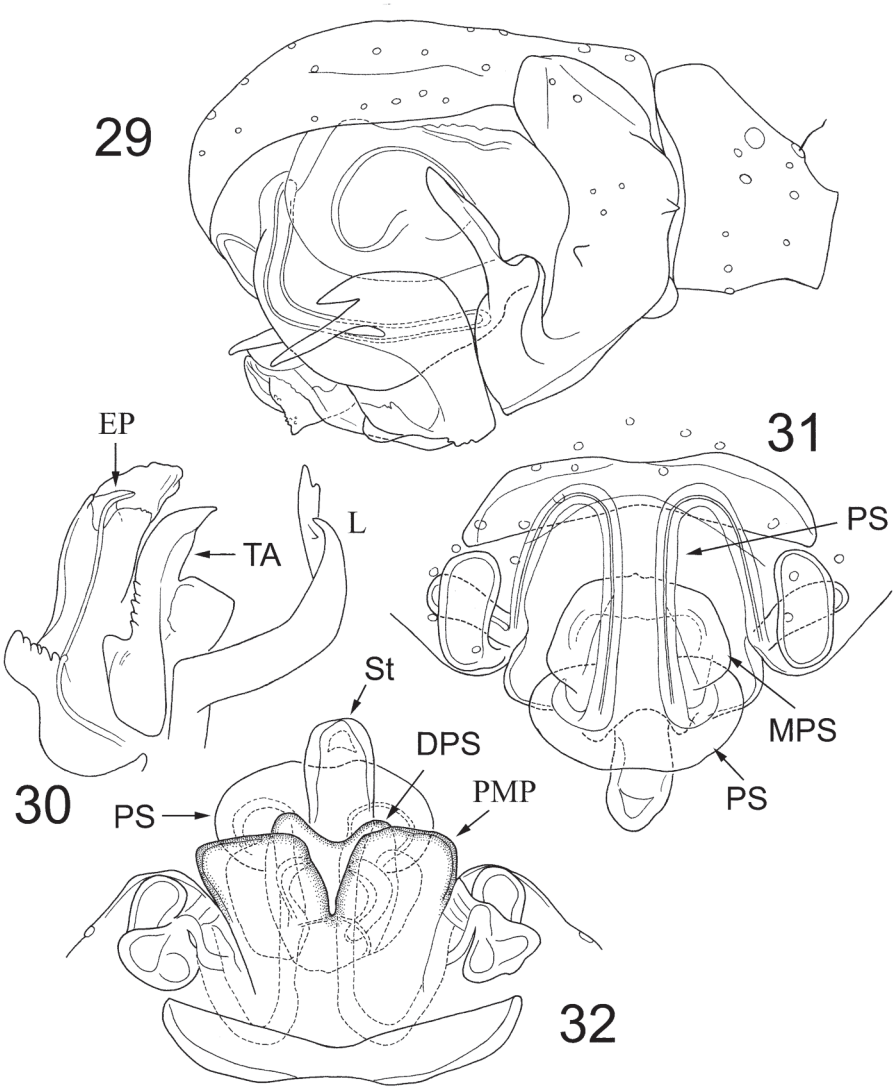
DESCRIPTION: Male (holotype), partly damaged and previously probably dried up; only one palp present, separated. Cephalic part of carapace with chelicerae dissected and lost, remaining part of carapace pale sandy-yellow, 1.05 wide. Legs pale yellow, almost transparent, probably bleached. Legs thin and relatively long, leg I 10.25 long (2.80+0.50+2.60+2.80+1.55), IV 9.90 long (2.75+0.40+2.50+2.80+1.45). Chaetotaxy: TiI-II: 2-1-1-2(3), III-IV: 2-1-1-0; MtI-IV: 1-1-1-0. Metatarsus IV without trichobothrium. TmI unknown, trichobothrium not found. Palp (Figs 25-26): Patella



FIGS 25-28

Megalepthyphantes brignolii sp. n., ♂ holotype (25-26) and ♀ paratype (27-28). (25) Right palp, retrolateral view. (26) Part of embolic division. (27-28) Epigyne, ventral and dorsal view, respectively.

dissected and lost. Tibia with a small rounded apical outgrowth. Cymbium with a posterodorsal protuberance. Paracymbium relatively large, posterior pocket transformed into an obtuse tooth directed upward. Lamella characteristica trifurcate apically. Embolus narrow, crescent-shaped, carina present. Abdomen 1.50 long, 1.10



FIGS 29-32
Tenuiphantes tenuis (Blackwall, 1852). (29) Left palp, retrolateral view. (30) Embolic division. (31-32) Epigyne, ventral and dorsal view, respectively.

wide, dorsally pale, with an indistinct grey median stripe flanked by grey paramedian spots connected to it with thin bands and transverse bands posteriorly.

Female. Total length 4.10. Carapace 1.50 long, 1.10 wide, brown. Eyes normal. Chelicerae 0.65 long; anterior margin with two large teeth and one denticle, posterior margin with four denticles. Legs pale brown. Leg I 10.15 long (2.80+0.50+2.80+2.60 +1.45), IV ?, FeIV 2.50 long. TiI: 2-1-1-3(4), II: 2-1-1-?, III-IV: 2-1-1-0; MtI-IV:

2-1-1-0. TmI unknown, trichobothrium not found. Abdomen 2.65 long, 1.90 wide, dorsal pattern as in male. Epigyne (Figs 27-28): Proscape strongly sclerotized, wider than long, with a deep notch apically. Lateral lobes and stretcher merged together, forming rectangular distal part of scape. Posterior median plate like a long, narrow, smoothly curved stripe.

REMARKS: The new species resembles the Algerian *M. bkheitae* (Bosmans & Bouragba, 1992), but males of both species differ by the shape of the palpal tibia and by the structure of the lamella characteristica. The female of the new species differs by the tapered proscape, while in *M. bkheitae* the proscapus has parallel edges.

DISTRIBUTION: Known from the type locality only; detailed information on it can be found in Gigon *et al*., 1980.

Tenuiphantes tenuis (Blackwall, 1852) Figs 29-32

MATERIAL: 1 ♂; MOROCCO, Middle Atlas Mts, "Ifri Tselet" Cave near Ain Teslit, Châra region south-west of Taza, 1250 m a.s.l.; 3.VI.1978; leg. P. Strinati [Mar 78/14]. – 1 ♀; "Ifri Tselet" Cave; 3.VI.1978; leg. B. Hauser [Mar 78/15].

DISTRIBUTION: *T. tenuis* has an originally European-Ancient Mediterranean distribution, and was introduced to New Zealand (Millidge, 1988), to Chili and Argentina (Millidge, 1991), as well as to North America (Paquin *et al.*, 2010). Probably this is the first record of *T. tenuis* from a cave.

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