

A REVISIÓN OF THE FAMILIES LICNODAMAEIDAE AND LICNOBELBIDAE (ACARI, ORIBATEI) WITH A RECHARACTERIZATION OF THE GENERA **Licnodamaeus** AND **Licnobelba**

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**RESUMO.** As famílias *Licnodamaeidae* e *Licnobelbidae* são recharacterizadas. *Licnodamaeidae* inclui apenas o gênero **Licnodamaeus** Grandjean, com as espécies: **undulatus** (Paoli), **pulcherrimus** (Paoli) e **costula** Grandjean, todas da Europa; o gênero **Licnocepheus** Woolley é removido de *Licnodamaeidae*. *Licnobelbidae* inclui também só um gênero, **Licnobelba** Grandjean, com as espécies: **alestensis** Grandjean, **caesarea** (Berlese) e **montana** Mihelcic, todas da Europa. **Licnodamaeus granulatus** Balogh & Csiszár (Argentina), **Licneremaeus latiflabellatus** Paoli e **Licneremaeus tuberculatus** Paoli (ambas da Itália) são consideradas **incertae sedis**.

**ABSTRACT.** The families *Licnodamaeidae* and *Licnobelbidae* are recharacterized. *Licnodamaeidae* includes the sole genus **Licnodamaeus** Grandjean, with the species: **undulatus** (Paoli), **pulcherrimus** (Paoli) and **costula** Grandjean, all from Europe; the genus **Licnocepheus** Woolley is removed from the family *Licnodamaeidae*. *Licnobelbidae* includes also one single genus: **Licnobelba** Grandjean, with the species: **alestensis** Grandjean, **caesarea** (Berlese) and **montana** Mihelcic, all from Europe. **Licnodamaeus granulatus** Balogh & Csiszár (Argentina), **Licneremaeus latiflabellatus** Paoli and **Licneremaeus tuberculatus** Paoli (both from Italy) are considered **incertae sedis**.

**Family Licnodamaeidae Grandjean**

*Licnodamaeidae* Grandjean, 1954: 434; Balogh, 1961: 268; Balogh 1965: 57; Grandjean, 1965: 103; Pérez-Iñigo, 1969: 263.

**Type genus:** **Licnodamaeus** Grandjean, 1931.

**Characteristics** - Eupheredermes, i.e., nymphs retain exuviae of preceding instars; adults without exuviae. Tracheal system sub-normal, i.e., trachea I missing. Pycnonotics, i.e., without areae porosae on notogaster. Body and legs covered by an abundant polygonal reticulate cerotegument formed by large microtubercles. Notogastral, prodorsal, ventral and leg cuticle reticulate or smooth. **Apo le** absent;

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other prodorsal apodemata generally present, normally sclerotized. **le** dorsal, anterior and away from **ro**; **ro** ventral; **ex** short; **in** short, not on strong tubercle; bothridium dorso-lateral, oblique, leaned against notogaster, small, with two sharp saliences pointing forward and backward; **ss** leaf-shaped, broad, flat. Centro-dorsal setae absent on notogaster; with five pairs of postero-lateral notogastral setae; **ps** setae ventral; **ps1** within the space between **h1**; **ps2** ventral to almost dorsal; **ps3** posterior to **r2 (lp)**; **hl** away from its homologous seta; **r2** dorsal, close and posterior to **ip**. Dorsal lyrifissures large. Notogaster ovate, slightly flat, convex or concave, always with undulate cuticular depressions. Without notogastral tectum between **bng**, **lambda** lines. Small species, ranging from 200u to 450u. **Apo** I complete, without a long curved bar pointed backward; other epimeral apodemata poorly developed, without apodemata extensions; epimeral chaetotaxy 3 : 1 : 3 : 3; epimeral setae of equal size. Genitalia almost rectangular; anal opening almost pyriform; genital and anal apertures not joint or partially joint. Five pairs of genital setae on a sole longitudinal row close to genitalia inner margin, tending to form an arc; **ag** lateral to median genitalia, not too close to it; two pairs of anal setae on a sole longitudinal row. Tectopodia absent; pedotectal tooth **p** present. Leg articulation on proximal sockets, i.e., sockets on proximal tarsi, tibiae, genua; femoral and trochanteral tracheae absent; tibial apophysis large; Tr and Fe - Tr articulation of all legs outside acetabula; proximal femora orientation, after trochantera articulation, almost straight; tarsi pedicels absent; with three heterodactylous claws generally; Ts I famulus free.

**Discussion** - The family characteristics presented here are based on **Licnodamaeus** Grandjean, the only one genus accepted in the family. **Licnocephus** Woolley, an American genus of beetle phoretic mites, included in Licnodamaeidae by Woolley (1969), and so recognised by Balogh (1972), has nothing in common with **Licnodamaeus** or any other Gymnodamaeidea genera, being now excluded from this family.

#### Genus **Licnodamaeus** Grandjean

**Licnodamaeus** Grandjean, 1931: 225; 1954: 434; 1965: 104; Woolley, 1969: 480; Pérez-Iñigo, 1969: 263.

**Type species:** **Licneremaeus undulatus** Paoli, 1908.

**Diagnosis** - **Licnodamaeus** is close to **Licnobelba** Grandjean, from which it differs mainly by the following features: exuviae absent from adult body; cerotegument formed by large microtubercles; notogaster cuticle reticulate or smooth; prodorsal apodemata poorly sclerotized and developed; bothridium small, with two sharp saliences pointed forward and backward; **hl** well apart from the homologous seta; **r2 (lp)** subterminal; dorsal lyrifissures large; notogaster almost flat, convex or concave, with cuticular undulations but no warts; epimeral apodemata poorly developed; genital and anal openings contiguous; five pairs of genital setae; femoral tracheae absent; tarsi pedicels absent; free famulus on Ts. I.

**Description** - Body and legs covered by abundant cerotegument, forming polygonal reticula generally, with large free microtubercles. Notogastral, prodorsal, ventral and leg cuticle reticulate or smooth, the microtubercles circling foveae when present. Exuviae absent on adult body. **Apo le** absent; other apodemata generally present, weakly sclerotized; **le** dorsal, anterior and away from **ro**; **in** short; bothridium dorso-lateral, oblique, leaned against notogaster, being small, with two sharp saliences directed one forward and the other backward; **ss** leaf-shaped, broad, flat, with a central spiny nervure. **ps1** at a lower level than **hl**, within the space between

these setae; **ps2**, **ps3** at a lower level than **ps1** or **ps2** almost dorsal; **ps3** posterior to **r2** (**lp**); **hl** dorsal, subterminal, away from its homologous seta, bent to the sagittal plane; **r2** dorsal, subterminal, posterior and close to **ip**, also bent to the sagittal plane. Dorsal lyrifissures large; **ip** quite close to **in**. Notogaster ovate, slightly flat, convex or concave, with deep tegumental depressions. Notogastral tectum absent. Small species, from 200 $\mu$  to 450 $\mu$ . Epimeral apodemata without apodematic bonds, except for **apo** I; epimeral chaetotaxy 3 : 1 : 3 : 3. Genitalia almost square; anal opening pyriform in general appearance; genital and anal apertures not joint together or partially joint; anal plate reticulate or smooth; genitalia smooth on most cases; genitoanal chaetotaxy 5 - 1 - 2 - 0 (**ad** setae absent apparently); genital setae on a sole longitudinal row close to genitalia inner margin, tending to form an arc; **g2** further way from **g1** - **g3** than **g4** in relation to **g3** - **g5**; **ag** lateral to median genitalia, not too close to it; anal setae also on a sole longitudinal row. Tectopodia absent; pedotectal tooth **p** present. Famulus free on Ts I; true tarsi pedicels absent; with three claws, the medial one the strongest on most cases legs on proximal sockets, i.e., sockets on proximal tarsi, tibiae and genua; femoral and trochanteral tracheae absent; tibial apophysis large.

**Discussion** - The characteristics pointed out for **Licnodamaeus** are based on the descriptions and figures of **Licnodamaeus undulatus** (Paoli), **Licnodamaeus pulcherrimus** (Paoli), and **Licnodamaeus costula** Grandjean, presented by Grandjean (1931) and by Pérez-Iñigo (1969), as well as on the general Licnodamaeidae features cited by Grandjean (1965).

#### **Licnodamaeus undulatus** (Paoli)

**Licneremaes undulatus** Paoli, 1908: 86, tab. V, fig. 38,54

**Licnodamaeus undulatus** (Paoli) Grandjean, 1931: 227, fig. 2; Rafalski, 1966: 357

**Geographical distribution and habitat** - Firenze, Italy, on mosses (Paoli, 1908); Lugano, Switzerland, on mosses (Grandjean, 1931); Ojcowski Park Narodowy, Poland (Rafalski, 1966).

**Discussion** - **L. undulatus** was redescribed by Grandjean, from Swiss specimens, as **Licnodamaeus** type species.

#### **Licnodamaeus pulcherrimus** (Paoli)

**Licneremaes pulcherrimus** Paoli, 1908: 84, tab. V, fig. 36,53

**Licnodamaeus pulcherrimus** (Paoli) Grandjean, 1931: 230; Pérez-Iñigo, 1969: 266, fig. 24.

**Geographical distribution and habitat** - Firenze, Italy, on mosses and humus (Paoli, 1908); Belmez, La Carolina, Silleda (Spain), Saint-Laurent-le-Minier (France), Lugano (Switzerland) on mosses and litter (Grandjean, 1931); Bulgaria, several localities (Csiszár & Jeleva, 1962); Spain, Poland, Russia, Holland, Alpes Strasburg, France, Italy (Pérez-Iñigo, 1969).

**Discussion** - Species redescribed and transferred to **Licnodamaeus** by Grandjean (1931), from specimens collected in Spain, France and Switzerland, also characterized by Pérez-Iñigo from Spanish materials.



**Licnodamaeus costula** Grandjean

**Licnodamaeus costula** Grandjean, 1931: 232, fig. 3; Pérez-Iñigo, 1969: 263, fig. 25,26.

**Geographical distribution and habitat** - La Carolina, Spain and Ardèche, in humus (Grandjean, 1931); Spain and France, in humus (Pérez-Iñigo, 1969).

**Discussion** - Species described from Spain by Grandjean and redescribed from the same material by Pérez-Iñigo.

**Family Licnobelbidae** Grandjean

Licnobelbidae Grandjean, 1965: 103; Balogh, 1972: 146.

**Type genus:** **Licnobelba** Grandjean, 1931.

**Characteristics** - Eupheredermeres, i.e., nymphs retain exuviae of previous instars; adults bearing exuviae. Tracheal system sub-normal, i.e., trachea I missing. Pycnonotics, i.e., without areae porosae on notogaster. Body (except notogaster) and legs covered by a thick cerotegumental layer, formed by high polygonal pieces. Notogastral cuticle smooth and shiny under the exuviae; other parts equally smooth or reticulate. **Apo le** absent; other prodorsal apodemata generally present, well developed, specially **apo ro**; **le** dorso-lateral, anterior and away from **ro**; **ro** ventral; **ex** short, on tubercle; bothridium dorso-lateral, oblique, large, cup-shaped, the opening long, with a strong salience directed obliquely downward and backward; **ss** large, leaf-shaped, with a very short peduncle, flat and spiny. Notogaster centro-dorsal setae absent; with five (or four) pairs of postero-lateral notogastral setae; **ps** ventral; **ps1** anterior to **h1** alveolus; **ps3** posterior to **r2 (lp)**; **h1** very close to its homologous seta (or **hl** absent), being terminal, bent to the sagittal plane; **r2** marginal, close to the notogastral warts. Dorsal lyrifissures small. Notogaster ovate, convex, with a pair of warts posteriorly. With no notogastral tectum between lines **bng**, **lambda**, **da**. Small species, ranging from 250u to 400u. **Apo I** complete, without a backturned bar; **apo II**, **apo sj** with broad belt-shaped apodemata linking the homologous parts; **apo III** reduced; **apo IV** with a strong apodemata bond before genitalia; epimeral chaetotaxy 3 : 1 : 3 : 3; epimeral setae of equal size. Genitalia almost rectangular; anal aperture pyriform; genital and anal apertures not too close one to the other. With six pairs of genital setae set on arc; **g1** - **g2** further apart than the other setae; **ag** lateral to posterior to genitalia, being away from its outer margin; with two pairs of anal setae on a sole longitudinal row; with three pairs of adanal setae; **ad2** further away from the sagittal plane than **ad3**; **ad1** posterior to the anal opening. Tectopodia absent; pedotectal tooth **p** present. Leg articulations on proximal sockets, i.e., sockets on proximal ends of tarsi, tibiae, genua; femora tracheae present; tibia I apophysis large; Tr and Fe - Tr articulations outside acetabula; femora orientation after trochantera articulations almost straight; tarsi pedicels present, differing however from the usual pattern; with three claws, the medial one larger than the laterals; Ts I famulus enclosed.

**Discussion** - All Licnobelbidae characteristics were taken from **Licnobelba**, the only one genus so far described in the family.

**Genus Licnobelba** Grandjean

**Licnobelba** Grandjean, 1931 : 241; 1954: 434; Balogh, 1961:268; 1965 : 25; 1972: 58; Pérez-Iñigo, 1969: 267.

**Type species:** *Licnobelba alestensis* Grandjean, 1931.

**Diagnosis** - *Licnobelba* is close to *Licnodamaeus* Grandjean, from which it differs mainly by the following characteristics: adults bearing exuviae on dorsal body; thick cerotegument formed by high polygonal pieces; notogastral cuticle smooth, shiny; prodorsal apodemata well developed and sclerotized; bothridium cup-shaped with just one salience turned back; **h1** very close to the homologous seta; **r2 (lp)** marginal; dorsal lyrifissures small; notogaster convex, with a pair of warts; epimeral apodemata well developed; genital and anal apertures not too close one to the other; six pairs of genital setae; three pairs of adanal setae; femora tracheae present; tarsi pedicels present; enclosed famulus in Ts I.

**Description** - Body (except notogaster) covered by a thick cerotegumental mass formed by high polygonal pieces. Notogastral cuticle smooth, shiny; all other parts smooth or reticulate. Reticulate exuviae adherent to adult body. **Apo le** absent; **apo ro** with strong transversal bar presenting anterior and posterior extensions generally, forming an "H" on rostrum; **apo c** reduced; **apo in** short, bearing **in**; **apo bo**, **apo ex** absent. **le** dorso-lateral, anterior and away from **ro**; **ro** ventral; **in** on tubercle; bothridium dorso-lateral, oblique, large, cup-shaped, with a strong salience pointed downward and backward; **ss** large, leaf-shaped, with a short peduncle, flat, spiny. **ps1** within the space between **h1** alveoli; **ps3** posterior to **r2**; **h1** very close to its homologous seta (or **h1** absent), being terminal, bent to the sagittal plane; **r2** marginal, very close to the **ip** wart. Dorsal lyrifissures small. Notogaster ovate, convex, with a pair of postero-lateral warts. Notogastral tectum absent. Small species, ranging from 250u to 400u. **Apo II**, **apo sj** with apodematic extensions as broad belts provided with anterior and posterior projections; **apo III** reduced; **apo IV** well developed presenting an apodematic projection before genitalia; epimeral formula 3 : 1 : 3 : 3. Genitalia almost rectangular; anal aperture pyriform; genital and anal apertures smooth, not too close one to the other. Genitoanal chaetotaxy 6 - 1 - 2 - 3; genital setae on arc, the median setae closer to genitalia inner margin than the others; **g1** - **g2** further apart than the other setae; **ag** lateral or posterior to genitalia, being away from the outer margin; anal setae on a sole longitudinal row close to inner margin; **ad2** further away from the sagittal plane than **ad3**; **ad1** posterior to the anal opening. Tectopedia absent; pedotectal tooth **p** present. Ts I famulus enclosed; tarsal pedicels present, differing from the usual pattern however; with three claws, the medial one larger than the laterals; femora tracheae dorsal; Tb I apophysis large.

**Discussion** - The genus characteristics pointed out above were based on the descriptions and drawings of *Licnobelba alestensis* Grandjean, *Licnobelba caesarea* (Berlese) and *Licnobelba montana* Mihelcic, presented by Grandjean (1931) and by Pérez-Iñigo (1969), besides Grandjean's considerations on the genus and on the family, published in 1965.

#### *Licnobelba alestensis* Grandjean

*Licnobelba alestensis* Grandjean, 1931: 242, fig. 6,7.

**Geographical distribution and habitat** - Alés, France, on litter; Lugano, Switzerland, also on litter (Grandjean, 1931); Bulgaria, several localities (Csiszár & Jeleva, 1962).

**Discussion** *L. alestensis* is the type species for *Licnobelba*, being restricted to Europe.

**Licnobelba caesarea** (Berlese)

**Licneremaeus caesareus** Berlese, 1910:229 tab. XXI, fig.. 71.

**Licnobelba caesarea** (Berlese) Grandjean, 1931: 248; Pérez-Iñigo, 1969: 267, fig. 22,23.

**Geographical distribution and habitat** - Populonia, Etruria and Tiarno, Italy, on moss (Berlese, 1910); Constantine and Guelma, Algeria; Lugano, Switzerland (Grandjean, 1931); Chinchón, Spain, on **Quercus** litter (Pérez-Iñigo, 1969).

**Discussion** - **L. caesarea** was summarily described by Berlese from specimens collected in Italy. In reviewing **Licneremaeus**, Grandjean redescribed the species from specimens collected in Algeria and in Switzerland. A later characterization of **L. caesarea** was made by Pérez-Iñigo from material collected in Spain.

**Licnobelba montana** Mihelcic

**Licnobelba montana** Mihelcic, 1957: 56, fig. 10; Pérez-Iñigo, 1969: 268, fig. 27, 28.

**Geographical distribution and habitat** - Cerdilha and Madrid, Spain (Mihelcic, 1957); Sierra de Guadarrama, Spain (Pérez-Iñigo, 1969), substrate not referred.

**Discussion** - **L. montana** was redescribed on some detail by Pérez-Iñigo.

**Incertae sedis**

**Licnodamaeus granulatus** Balogh & Csiszár

**Licnodamaeus granulatus** Balogh & Csiszár, 1963: 471, fig. 9, 10.

**Geographical distribution and habitat** - Rio Negro, El Bolsón, Mt. Piltriquitron, Argentina, in humid moss grown on rocks and on the soil, from a **Libocedrus** - **Lomatia** forest.

**Discussion** - **L. granulatus** was described from the Neotropics, that is to say outside the original **Licnodamaeus** geographical area of occurrence (Palaeartic region of Europe). The species has some **Licnodamaeus** features as five pairs of genital setae; two pairs of anal setae; **im**, **ip** large; and small size. However, **ss** is not flabellate; there is only four (?) pairs of very short notogastral setae; and **r2** is anterior to **ip**. All these characteristics must be checked before anything positive can be stated.

**Licneremaeus latiflabellatus** Paoli

**Licneremaeus latiflabellatus** Paoli, 1908: 87, tab. V., fig. 39, 55; Grandjean, 1931: 247; Mihelcic, 1957: 56; Pérez-Iñigo, 1969: 271.

**Geographical distribution and habitat** - Monte della Torre, near Pisa, Italy on moss (Paoli, 1908).

**Discussion** - In reviewing **Licneremaeus**, Grandjean (1931) found great similarity between specimens collected by him and the unavailable holotype of **L. latiflabellatus** described by Paoli (1908). All these specimens matched nicely with **Licnobelba**,



and so, according to Grandjean, *L. latiflabellatus* could be transferred to this genus. However, one of the most notorious *Licnobelba* features, i.e., the presence of notogastral warts was not mentioned in the original description and drawings of *L. latiflabellatus* by Paoli. This observation was confirmed by Pérez-Iñigo (1969), who suggested that *L. latiflabellatus* should be a "species dubia".

**Licneremaeus tuberculatus Paoli**

*Licneremaeus tuberculatus* Paoli, 1908: 88, tab. V., fig. 40, 56; Grandjean, 1931: 222.

**Geographical distribution and habitat** - Firenze, Italy, on litter.

**Discussion** - In Grandjean's 1931 revision of the *Licneremaeus*, it is mentioned that *L. tuberculatus* was never sampled from many surveys made posteriorly by the author; consequently this species could not be re-examined, remaining with the original Paoli incomplete characteristics.

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