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# New data for a revision of the genus *Ctenolepisma* (Zygentoma: Lepismatidae): redescription of *Ctenolepisma lineata* and new status for *Ctenolepisma nicoletii*

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**Abstract.** As a starting point for the revision of the genus *Ctenolepisma* Escherich 1905, the status of its type-species, *Ctenolepisma lineata* (Fabricius 1775), is clarified. In the present study, this species (originally described from Switzerland) is redescribed by means of many samples from several European countries and a neotype is designated. The constant presence of a third pair of abdominal styli in adult *C. lineata* s. str. leads to abandon the obsolete name *C. lineata* var. *pilifera* (Lucas 1840) for referring to a presumed non-typical variety of this species. The status of *Lepisma pilifera* Lucas 1840 is discussed, concluding that this name must be treated as a new synonym of *Thermobia aegyptiaca* (Lucas 1840). After our redefinition of the characters of *C. lineata*, an examination of many specimens of *Ctenolepisma* that were previously identified as *C. lineata* reveals that some of them are actually members of different taxa. This is the case for a species occurring in the Canary Islands, Northwest Africa, the Iberian Peninsula and the Balearic Islands. In this work this species is ascribed to *Lepisma nicoletii* Lucas 1846, which was described from Algeria and regarded as a synonym of *Ctenolepisma lineata* by Escherich; this species is now redescribed as *Ctenolepisma nicoletii* **stat. res.** This species differs from *C. lineata* in that it bears only two pairs of abdominal styli, and it also differs in the shape of the prosternum and femoral scales. *Lepisma eatoni* Ridley 1881, which was described from Morocco and the Canary Islands and subsequently regarded as synonym of *C. lineata*, is now synonymised with *C. nicoletii*.

**Résumé. Nouvelles données pour une révision du genre *Ctenolepisma* (Zygentoma : Lepismatidae) : redescription de *Ctenolepisma lineata* et nouveau status pour *Ctenolepisma nicoletii*.** Comme point de départ pour la révision du genre *Ctenolepisma* Escherich 1905, on révisé ici le statut de son espèce-type, *Ctenolepisma lineata* (Fabricius 1775). Cette espèce, originalement décrite de Suisse, est redécrite grâce à de nombreux échantillons de plusieurs pays européens. Un néotype est désigné. La présence d'une troisième paire de styli abdominaux chez l'adulte *C. lineata* s. str. mène à l'abandon du nom désuète *C. lineata* var. *pilifera* (Lucas 1840) qui se réfère à une variété réputée non-typique de cette espèce. Le status de *Lepisma pilifera* Lucas 1840 est discuté, pour conclure que ce nom doit être traité comme un nouveau synonyme de *Thermobia aegyptiaca* (Lucas 1840). D'après notre redéfinition des caractères de *C. lineata*, un examen de beaucoup de spécimens de *Ctenolepisma* qui étaient auparavant identifiés comme *C. lineata* révèle que certains d'entre eux appartiennent à d'autres taxons. C'est le cas pour une espèce qui se trouve aux îles Canaries, au nord-ouest de l'Afrique, dans la péninsule Ibérique et les îles Baléares. Dans ce travail, cette espèce est rapportée à *Lepisma nicoletii* Lucas 1846, qui a été décrite d'Algérie et regardée par Escherich comme synonyme de *Ctenolepisma lineata*. Cette espèce est maintenant redécrite comme *Ctenolepisma nicoletii* **stat. res.** Cette espèce diffère de *C. lineata* en ayant seulement deux paires de styli abdominaux, et elle diffère aussi par la forme du prosternum et des écailles fémorales. *Lepisma eatoni* Ridley 1881, décrit du Maroc et des îles Canaries, et vue depuis comme synonyme de *C. lineata*, est maintenant synonymisée avec *C. nicoletii*.

**Keywords:** *Ctenolepisma lineata*, *Ctenolepisma nicoletii*, taxonomy, Zygentoma, Lepismatidae.

The genus *Ctenolepisma* Escherich 1905 comprises approximately one hundred species and is widely distributed throughout warm regions on all continents, with the exception of Australia (where some domestic species have been introduced). The descriptions of the more common species have become obsolete because

they were based only on features such as colour, body length and shape, and appendage length, and not on more reliable characters that can be found in modern microscopic studies. Therefore, the diagnosis of these species needs to be updated. Within the European species of *Ctenolepisma*, the main difficulties arise when studying *Ctenolepisma lineata* (Fabricius 1775). It was stated as the type-species of the genus by Paclt (1967), and Irish (1987) agrees with this in his revisions of South African *Ctenolepisma*. Kaplin (1994) designated *C. targionii* (Grassi & Rovelli 1889)

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as the type-species of this genus, but this is not correct because this entomologist did not follow the rules of the ICZN, and a previous valid designation of a type-species already existed.

*C. lineata* was originally described based on specimens from Switzerland, as Fabricius (1775) literally mentioned (“habitat in Helvetiae muris”), and occurs in most parts of Southern Europe and in some warm valleys of the central area of the continent (Wygodzinsky 1941; Kinzelbach 1968). The chromatic variation and the wide distribution of this species, in addition to its facultative synanthropic habits, have brought about the establishment of numerous synonymous names for it (see Paclt 1967 and tab. 1).

Escherich (1905) considered some previously described species of Lepismatidae to be synonyms of *C. lineata* and stated (erroneously, as this work demonstrates) that this species typically bears two pairs of abdominal styli (most Zygentoma specialists use the term “stylets” for these appendages). He also stated that *Lepisma pilifera* Lucas 1840, described from Egypt as bearing three pairs of styli, must be regarded as *C. lineata* var. *pilifera*, which is a variety without taxonomic value, because he did not find significant differences between the forms with two and three pairs of styli, apart from the number of such appendages. Moreover, Escherich (1905) considered *Lepisma eatoni* Ridley 1881, which was described from the Canary Islands and Morocco, as another variety with two pairs of styli, *C. lineata* var. *eatoni*. He also stated that *Lepisma nicoletii* Lucas 1846, which was described from Algeria, is another synonym of *C. lineata*.

This approach has been followed by all Zygentoma specialists during the 20th century; all of the material from different continents that has been reported as *C. lineata* with two or three pairs of styli has been regarded as belonging to the same species. However, when European forms of “*C. lineata*” with two pairs of styli have been re-examined and compared with European forms with three pairs, it can be demonstrated that they are in fact different species, because new anatomical features have been found that allow us to distinguish between them. In addition, the form that never develops a third pair of styli is absent from Central Europe, as Kinzelbach (1968) suggested and as our studies have corroborated.

To clarify the characterisation of the actual species, *C. lineata*, this study aimed to redescribe this species on the basis of specimens from Switzerland and other countries in Central Europe, and to designate a neotype. This redescription is supplemented with information on the variability of the species that is based on the examination of material from different countries

where the species occurs. Since this species has been artificially widely spread to different continents and used in some laboratory experiments and it is possible that there are species that are reared in labs around the world that are incorrectly called *C. lineata*, or that are *C. lineata* populations with currently invalid names, this redescription has universal utility. The status of most of the synonyms of *C. lineata* (especially *Lepisma pilifera*, *L. eatoni* and *L. nicoletii*) is also discussed, leading us to resurrect the status of *L. nicoletii* as a valid species.

### Material and methods

Specimens that were previously identified and published as *Ctenolepisma lineata* from different countries of the Palaearctic region were examined, as well as some material of *Ctenolepisma* belonging to related species, and this was complemented with the study of new specimens that were collected recently. Geographical coordinates of localities are only provided for the material collected by us (see below, inside the studied material section of each species). For the remaining material, the information of the labels is the only available to find the locality (it usually refers to well known places or regions).

The material that we studied is deposited in the following institutions: NMB, Natural History Museum. Basel (Switzerland); MV, Museo Civico de Historia Natural. Verona (Italy); IEP, Istituto di Entomologia e Zoologia Agraria. Portici (Italy); MK, Museum of Natural History. Institute of Animal Systematics and Evolution. Polish Academy of Sciences, Krakow (Poland); CZ, Zoologia. Instituto de Investigação Científica Tropical. Lisboa (Portugal); UCO, Departamento de Zoología, University of Córdoba. Córdoba. Spain; MNCN, Museo Nacional de Ciencias Naturales. Madrid. Spain.

In an attempt to locate the type-material of all the synonyms of *C. lineata*, requests were made to the above Institutions, as well as the British Museum (London), le Muséum national d’Histoire naturelle (Paris), the Zoological Museum of Copenhagen and through personal communications with Luis F. Mendes, a reputed Zygentoma taxonomist.

Fresh material belonging to *Ctenolepisma* was collected with an aspirator and fixed with 70% alcohol. Both collected by us as those provided by Museums were dissected and mounted in Tendeiro medium (Molero *et al.* 2000) for microscopic study. Some specimens were dehydrated with absolute alcohol and coated with gold for SEM examination.

## Results

### *Ctenolepisma lineata* (Fabricius 1775)

*Lepisma lineata* Fabricius 1775. Syst. Entomol.: 300

*Lepisma vittata* Fabricius 1798. Entomol. Syst., Suppl.: 199

*Lepisma annulisetata* Lucas 1840. Hist. Natur. Crust.: 560

?*Lepisma subvittata* Lucas 1840. Hist. Natur. Crust.: 560

*Lepisma parisiensis* Nicolet 1847. Ann. Soc. Entomol. France 2, 5: 351

*Forbicina lineata* (Fabricius): Kolenati 1858. Wien. Entomol. Mschr. 2: 135

*Forbicina parisiensis* (Nicolet): Kolenati 1858. Wien. Entomol. Mschr. 2: 134

*Lepisma quadriseriata* Packard 1873. Annu. Rep. Peabody Acad. Sci. 5: 47

*Lepisma reticulata* Schött 1897. Proc. Calif. Acad. Sci., s. 2 6: 192

*Ctenolepisma quadriseriata* (Packard): Escherich 1905. Zoologica (Stuttgart) 43: 94

*Ctenolepisma reticulata* (Schött): Escherich 1905. Zoologica (Stuttgart) 43: 96

*Ctenolepisma lineata* var. *pilifera* Escherich 1905. Zoologica (Stuttgart) 43: 91 (nec *Lepisma pilifera* Lucas 1840?)

*Ctenolepisma lineatum* (Fabricius): Paclt 1967. *Genera Insectorum* 218: 41

**Diagnosis.** Three pairs of abdominal styli in adult specimens. Anterior trichobothrial areas associated with the antepenultimate lateral bristle combs in the pronotum, and with the penultimate combs in meso- and metanotum. Short convex urotergite X. Urotergites II-VII bearing 3+3 bristle-combs. Urosternites without median combs, III-VIII with 1+1 lateral combs. Hind margin of the prosternum clearly truncate. Macrosetae of meso- and metasternal combs arranged in a single row. Inner side of tibiae and femora covered with acute lanceolate scales.

**Description.** Body length up to 13.5 mm, of males up to 12.8 mm. Fusiform and relatively robust body; thorax rather wide, detaching slightly from the abdominal base. Epidermal pigment in synanthropic specimens usually very faint, only more intense on appendages; in specimens collected in the wild it can be faint to distinct. Scales dorsally showing a characteristic (but not exclusive) distribution pattern, consisting of some longitudinal fringes alternately light and dark; this pattern was drawn and also photographed (fig. 1) by Kinzelbach (1968). This pattern exhibits an important type of variation: light scales can be more or less dark, giving a more or less uniform coloration to the insect. Scales ventrally transparent, macrosetae usually hyaline or light yellowish. Setation of head as usual for the genus (see fig. 2 in Molero *et al.* 2010). Eyes black, composed of about 13 ommatidia. Antennae up to 16.5 mm, when not broken clearly longer than body length but usually not surpassing 1.5 times the body length. Maxillary palp with long articles, the distal one 1–1.2 times longer than the antedistal and 7–10 times longer

than wide. Distal article of labial palp ovoid, usually widened in its apical half and with five sensory papillae arranged in a single row.

Pronotum with 7–9 + 7–9 lateral bristle-combs, mesonotum with 9–11 pairs of lateral bristle-combs, metanotum with 9–10 pairs. These lateral combs have 2–7 macrosetae. Posterolateral bristle-combs with 4–8 macrosetae each. Trichobothrial areas of the pronotum situated on the last (N) and antepenultimate (N-2) lateral comb, and on the last two lateral bristle-combs (N and N-1) on the meso- and metanotum. All of the anterior trichobothria inserted into an external position inside the area (only one macroseta is inserted closer to the lateral margin in the pronotum); all of the posterior trichobothria inserted into an internal position inside the area, in the inner side of the lateral comb. Anterolateral row of setae of the pronotum with plumose setae.

Prosternum (figs 2–4, 17) slightly longer than wide and with a characteristically truncate (straight or even slightly concave) hind border, not convex as in other European species. The straight area of its hind margin can be more or less extended and its lateral margins can be more or less convergent. Usually with 4–5 + 4–5 bristle-combs with 2–5 macrosetae each (at most, 6–7 on the anterior combs), arranged in a single row or forming an irregular group. The gap separating the antedistal combs is often 9 times wider than the width of each comb.

Mesosternum with 2–3 + 2–3 bristle-combs, also with a few macrosetae (usually 2–6). Hind border widely rounded to slightly truncate. Metasternum (fig. 5) wider than long, with the hind border widely rounded, almost straight distally. There are usually 2+2 combs in the metasternum, with 2–7 macrosetae each, arranged in a single row. Ratio distance between antedistal combs / width of a comb: from 3.5 to more than 12.

Protibiae usually 2.2–3 times longer than wide. Metatibiae 3.5–4.3 times longer than wide and 1.5–1.9 times longer than the protibiae. Tibial macrosetae shorter than or as long as the



**Figure 1**  
*Ctenolepisma lineata* (Fabricius 1775). Photograph of the typical habitus of the species. Body length: 13.5 mm. Provided by R. Kinzelbach.

diameter of the tibiae, usually 3-4 dorsal and 3-6 ventral on tibia I, 3-4 dorsal and 5-8 ventral on tibia III. Inner side of tibiae with many long lanceolate and usually acute transparent scales. Outer side of tibiae without scales. Femora in the inner side and in the apex of the outer side covered by long lanceolate hyaline scales (figs 19, 21).

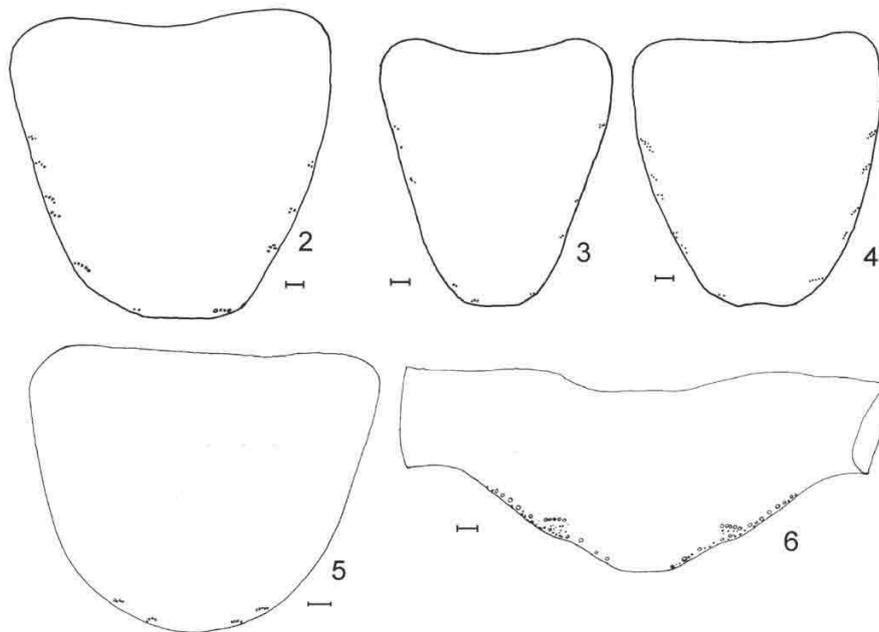
Urotergite I with 1+1 bristle-combs; urotergites II-VII with 3+3 bristle-combs; urotergite VIII with 2+2 bristle-combs. Submedian bristle-combs with 4-9, lateral combs with 4-7 and sublateral combs with 4-12 macrosetae. Urotergite X subtriangular, short, with a rounded apex or shaped into an obtuse angle, bearing 1+1 bristle combs with 5-8 macrosetae each (fig. 6). Urosternites I and II without setae, III-VIII with 1+1 lateral bristle-combs with 7-16 macrosetae each (rarely more). Distance between the lateral combs of an urosternite 5-10 times wider than the width of a comb.

Both sexes bear three pairs of styli, the posterior ones more developed than the others. Styli of urosternite VII appear when specimens reach 7-8 mm in length. Inner process of the coxite IX longer than wide (ratio length / width = 1.1-1.4 in males and 1.8-2.5 in females) and 2.6-4.2 times longer than the outer process in both sexes. Stylus IX 2.2-3.5 times longer than the inner process of the coxite in males and 1.5-2 times in females. Ovipositor long, with 47-52 divisions, reaching beyond the apex of styli IX up to 0.9-2 times the latter's length. Apices of gonapophyses unsclerotised. Caudal filaments long; cerci as long as body, paracercus up to 13 mm (when not broken), with some lanceolate scales similar to those covering the tibiae.

**Type material.** Neotype, ♀. Switzerland, Basel, Albantal, 6.IX.1938, coll. Wygodzinsky, Ref. IC7 h., n. 544 (labelled *Ctenolepisma lineata* var. *pilifera* Lucas). (NMB). This neotype is designated because the types of this species have been

lost (Zimsen 1964), and material from the type locality is available.

**Additional material studied.** **Albania:** Tirana, 1934, Bischoff leg., 3 ♂♂ + 1 ♀ (MK); Mamirash, 9.II.1934, 1 ♂ + 1 ♀ (MK). **France:** Aix-en-Provence, 23.III.1938, coll. Wygodzinsky, Ref. IC7e, n. 133, 1 ♀ (NMB). Leucate [42°54'N 3°01'E], 1.VIII.2002, 1 ♀ (UCO, Ref. Z2148); Le Muy [43°27'N 6°33'E], 7.IX.2002, 1 ♂ (UCO, Ref. Z2159). **Germany:** Rüdeshelm, 1967-1969, 3 ♂♂ + 5 ♀♀ (UCO, Ref. Z2167, offered by R. Kinzelbach); Ginsheim, 15 to 25.V.1997, 1 ♀, Dr. H. Kastrop leg. (UCO, Ref. Z2168, provided by Dr. H. Sturm). **Italy:** Zannone island, Caso, Contr. Catunaci, 5.IX.1934, 1 ♂ + 1 ♀ (IEP); S. Vito dei Normanni, 14.IV.1940, 1 ♂ (IEP); Sicily, S. Stefano di Camastra, IV.1940, 8 ♂♂ + 10 ♀♀ + 6 juveniles, (IEP); Montecristo island, Collo di Lecci (200 m), 23.XI.1976, Osella leg., 1 ♂ (MV); Campiglia d'Orcia, in a house [42°56'N 11°40'E], 29.X.1995, 1 ♂ (UCO, Ref. Z2118); Gargano, [41°47'N 15°58'E], 2.IX.2002, 1 ♂ + 1 ♀ (UCO, Ref. Z2166). **Macedonia:** Vlaheani, north of Vales, in a house, 1916, F. Ahlborn leg., 1 ♀ (MK). **Portugal:** Algarve, Carvoeiro, in a house, 11.V.1991, 1 ♀ (CZ, number 4598). **Spain:** Albacete, Almansa, in a bathroom [38°52'N 1°05'W], 25.IV.1992, 1 ♀ (UCO, Ref. Z1152); Almería, Uleila del Campo, Filabres mountains, [37°11'N 2°12'W], 25.III.1989, 1 ♂ (UCO, Ref. Z0401); Balearic islands, Menorca, Sa Mezquida, [39°54'N 4°17'E], 17.V.1992, 1 ♂ + 3 ♀♀ (UCO, Ref. Z1304); Córdoba, Carcabuey [37°26'N 4°15'W], 21.I.1982, 1 ♂ (UCO, Ref. Z0298); Granada, Arenas del Rey [36°57'N 3°53'W], in a house, 20.III.1992, 1 ♀ (UCO, Ref. Z1007); Jaén, near Úbeda [38°00'N 3°22'W], in a house, 18.VIII.1998, 1 ♂ (UCO, Ref. Z0383); Málaga, Ronda, [36°44'N 5°09'W], in houses, 11.IX.1987, 8 ♂♂ + 7 ♀♀ (UCO, Ref. Z0356); Navarra, Pitillas [42°25'N 1°37'W], in a house, 23.VI.1992,



**Figures 2-6**  
*Ctenolepisma lineata* (Fabricius 1775). 2-4 Variations in the shape of the prosternum; 5 - Metasternum; 6 - urotergite X. Scales: 0.1 mm.

1 ♂ + 1 ♀ (UCO, Ref. Z1664); Orense, Ribadavia, [42°17'N 8°08'W], on the outside of a house at night, 17.VII.1991, 1 ♀ (UCO, Ref. Z1899); Tarragona, Flix, Dr. Haas leg. 1916, 2 ♀ (det. Stach) (MK); Zaragoza, Mequinenza, [41°21'N 0°17'E], in a house, 26.VI.1992, 1 ♀ (UCO, Ref. Z1702). **Romania:** Dobrudza, Baleic. Bol., 18.IX.1929, Polinski leg., 1 ♀ (MK). **Switzerland:** Basel, Vasalianum, 24.V.1937, coll. Wygodzinsky, Ref. IC7b, n. 39, 1 badly preserved specimen (NMB). **“Yugoslavia”:** Wyspa Mljet, 7.X.1966, J. Rafalski leg., in a pine-tree forest, 1 ♂ (det. Mendes 1980, MK); Lokrum Isl., near to Dubrovnik, in pine-tree forest, 2 ♂♂, J. Rafalski leg. (det. Mendes, 1980, MK); Rab Isl., 4.X.1963, under stones, J. Rafalski leg., 1 ♀ (det. Mendes, 1980, MK).

**Biology.** *C. lineata* is a facultative synanthropic species. In areas where it is native (see details under “distribution” below), it can be found in houses and also in the wild. It appears in warm places under stones, bark, fallen leaves or trunks, and partially decomposed wood, etc. It exhibits nocturnal habits. The insects living in houses can be seen inside rooms and on the walls, doors and windows outside dwellings. Lasker & Giese (1956) showed that this species (or perhaps a related species that was identified as *C. lineata*) develops a cellulase-activity in the midgut independently of endosymbiotic microbiota. This explains its ability to feed on paper, wood, cardboard and other debris that is rich in cellulose. In some regions, it represents a pest on stored products that are rich in carbohydrates.

**Distribution.** *C. lineata* is widespread over warm regions of Central Europe and over the Northern Mediterranean basin, where it seems to be native.

Available material comes from Portugal, Spain, France, Germany, Switzerland, Italy, Albania, Romania, Macedonia, and from some Mediterranean islands such as the Balearics and Sicily.

In Europe, it has also been reported from Austria (Janetschek 1949), Hungary (Stach 1929), the Czech Republic (Stys & Rozkosny 1996), Slovakia (Kratochvil 1945; Paclt 1979), ex-Yugoslavia (Mendes 1980a), Crimea (Sharov 1964), Bulgaria (Silvestri 1942), Corsica (Mendes 1980a), Sardinia (Irish 1995), Crete (Wygodzinsky 1958), Cyprus (Wygodzinsky 1952; Paclt 1978) and some other Aegean (Mendes 1984), Tyrrhenian and Adriatic islands (Mendes 1980b 1981). All of these references can be reasonably attributed to *C. lineata* and are included in the map of fig. 23.

Furthermore, this species has been transported to different countries and continents and it is difficult to clarify its overall geographic distribution as domestic or existing in the wild. We can state with certainty that all of the material that was reported in the aforementioned references as *C. lineata* var. *pilifera* belongs to authentic *C. lineata* specimens, but many other reports of this species may not correspond to *C. lineata* as we describe it here, but rather to other forms

belonging to the “*lineata*” group. However, it is difficult to demonstrate with certainty without a microscopic re-examination of the specimens because, in many cases when *C. lineata* is reported, neither the number of styli (two or three pairs) nor the habitat where they were collected (in houses or outdoors) were detailed. In North America, where this species is not native, it has been described using several names including *C. quadriseriata* (Packard 1873) and *C. reticulata* (Schött 1897). These names correspond to the synanthropic *C. lineata*, but some *Ctenolepisma* that were previously identified as *C. lineata* (or synonymised with this species, such as *C. rubroviolacea* Schött) have been collected in the wild in North America. A preliminary examination of some specimens from Arizona that we are now studying suggested that they probably must be described as different Nearctic species. A similar situation should probably be expected if many “*C. lineata*” that have been reported from other regions of the world (North Africa, the Near East, the Canary Islands, etc) are reviewed in the future. Therefore, a deeper study of such material from other continents is needed.

### *Ctenolepisma nicoletii* (Lucas 1846) stat. res.

*Lepisma nicoletii* Lucas 1846. Rev. Zool 9: 252

*Lepisma eatoni* Ridley 1881. Entomol. Month. Mag. 18: 14 n. syn.

*Ctenolepisma lineata* var. *eatoni* (Ridley): Escherich 1905. Zoologica (Stuttgart) 43: 91 n. syn.

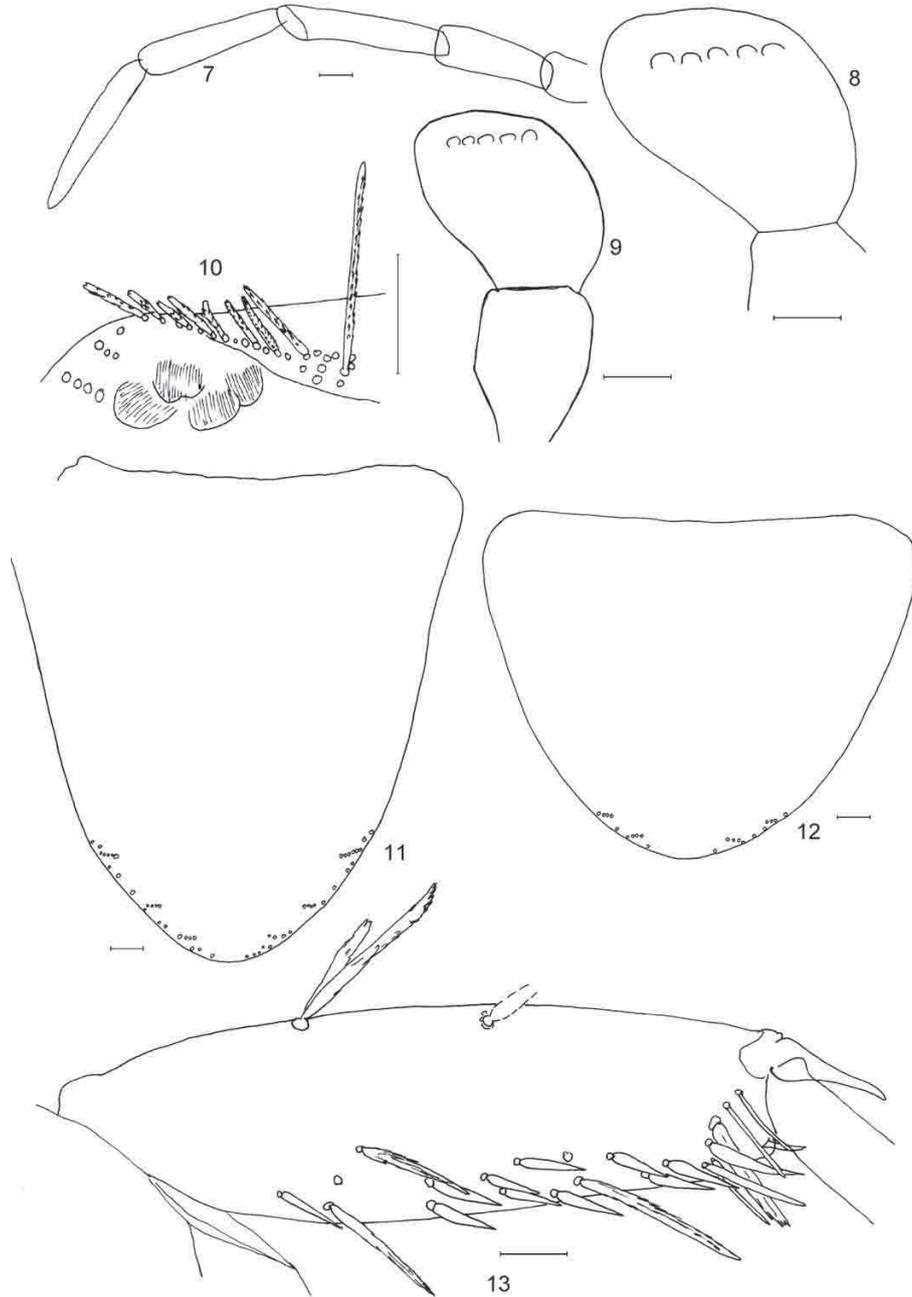
*Ctenolepisma lineata* (Fabricius): Mendes 1978. Arq. Mus. Boc. (2<sup>a</sup> ser.) 4: 292 (partim), non *L. lineata* Fabricius 1775; Mendes 1980. Arq. Mus. Boc. (2<sup>a</sup> ser.) 7: 246 (partim); Gaju et al. 1987. Actas VIII Bienal R. Soc. Española Hist. Nat., I Reunión de Biología y Ecología del Suelo: 526; Bach et al. 1989. Garcia de Orta - Sér. Zool. 13: 71; Mendes 1992. Arq. Mus. Boc. (Nova Sér.) 2 (13): 282; Molero et al. 1992. Zool. baetica 3: 101, 103-104 (partim); Bach et al. 1993. Boln. Assoc. Esp. Entomol. 17: 136; Mendes 1993. Garcia de Orta, Sér. Zool. [1991] 18: 90 (partim); Mendes et al. 1994. Eos 69: 23; Molero et al. 1994. Acta Zool. Fennica 195: 108; Molero et al. 1996. Tómo Extraordinario. 125 Aniversario de la RSEHN: 179 (partim); Mendes 2002. Comunicações Instituto de Investigação Científica Tropical, Série de Ciências Biológicas, 3: 27 (partim).

**Diagnosis.** Shape of the urotergite X, arrangement of notal trichobothria and macrosetae of thoracic sternal combs, abdominal setation and shape of tibial scales as in *C. lineata*. Two pairs of abdominal styli. Most femoral scales are shortened and distally subtruncate or emarginated. Thoracic sternites less truncated than in *C. lineata*, the apical part of the prosternum is rounded-elliptical to slightly truncated.

**Description.** Body length of females up to 13 mm, of males up to 12 mm. Elongated spindle-shaped and relatively robust body, rather wide thorax, slightly detached from abdominal base. Faint to distinct epidermal pigment, with a great deal of variation in its tonality and distribution; it is more or less dark, and usually reddish-brown, yellowish-brown or violet-brown, and notably more distinct on the antennae, palps, tarsi, and hind part of body (including styli and genitalia); on the legs, the pigmentation can be faint, intense or concentrated on the distal

part of the articles. Dorsal scales with a variety of colours and patterns of distribution, ranging from uniformly greyish-brown, more or less dark, to being distributed in longitudinal lines that are alternately light (yellowish to whitish) and dark; this pattern is shared with other species of the genus. Medioventral scales transparent. Macrosetae hyaline to yellowish, plumose.

Head setation typical for the genus. Eyes black, composed of approximately 13 ommatidia. Antennae up to 15 mm (maximum preserved), slightly longer than body length when not broken. Maxillary palp (fig. 7) with long articles, the distal one 0.95–1.15 times longer than the antedistal and 4.8–10 times longer than wide. Distal article of labial palp with



**Figures 7–13**

*Ctenolepisma nicoletii* (Lucas 1846). 7 – Maxillary palp; 8–9 – Labial palp, variability in the shape of the distal article; 10 – Anterolateral row of the pronotum with plumose setae; 11 – Mesosternum; 12 – Metasternum; 13 – Tibia of the hind leg, showing macrosetae and spiniform setae (specimen from Ciudad Real, Spain). Scales: 0.1 mm.

five sensory papillae arranged in a single row, though a few exceptional specimens with 3 or 4 papillae have been found; this article shows a variable degree of dilatation at the apex (fig. 8 and 9), being 1.4–3 times wider at the apex than at the base and 0.9–1.3 times wider than long.

Pronotum with 7–9 + 7–9 and meso- and metanotum with 8–10 + 8–10 bristle-combs with 3–8 macrosetae each (the anterior ones often with a small number, 1 or 2 setae only). Anterolateral row of setae of the pronotum with short plumose setae (fig. 10). Posterolateral bristle-combs with 4–8 macrosetae each. Trichobothrial areas of the pronotum situated on the last (N) and antepenultimate (N-2) bristle-comb, and on the two last bristle-combs (N and N-1) on the meso- and metanotum. Anterior trichobothria inserted in external position inside the area; posterior trichobothria inserted in an internal position inside the area, in the inner side of the lateral comb.

Thoracic sterna shaped as in fig. 11, 12 and 18, with a variable hind border, usually elliptic and with a rounded or slightly acute apex, even truncated but in this case, less widely than in *C. lineata*, the metasternum incidentally depressed apically. Prosternum (fig. 18) with 3–6 + 3–6 bristle-combs with 4–11 macrosetae each; meso- and metasternum with 2–3 + 2–3 bristle-combs with 3–12 macrosetae each. Macrosetae of these sternal combs arranged in a single row; only in the prosternum are combs irregular with 2 poorly-defined rows of macrosetae. Ratio distance between antedistal combs / width of a comb of the metasternum ranging from 1.7 to 7.

Tibiae with variable proportions; protibiae usually 2.5–3 times and metatibiae 3.2–4.5 times longer than wide, but sometimes being even more slender (up to 3.5 times as long in tibia I and 6 times as long in tibia III). Tibial macrosetae shorter than, or as long as, the diameter of the tibia. Tibia I usually with 3–4 dorsal and 3–5 ventral macrosetae; tibia III (fig. 13) with 3–5 dorsal and 3–7 ventral. Inner side of the tibia covered with many narrow lanceolate scales (figs. 20, 22). Outer side of the

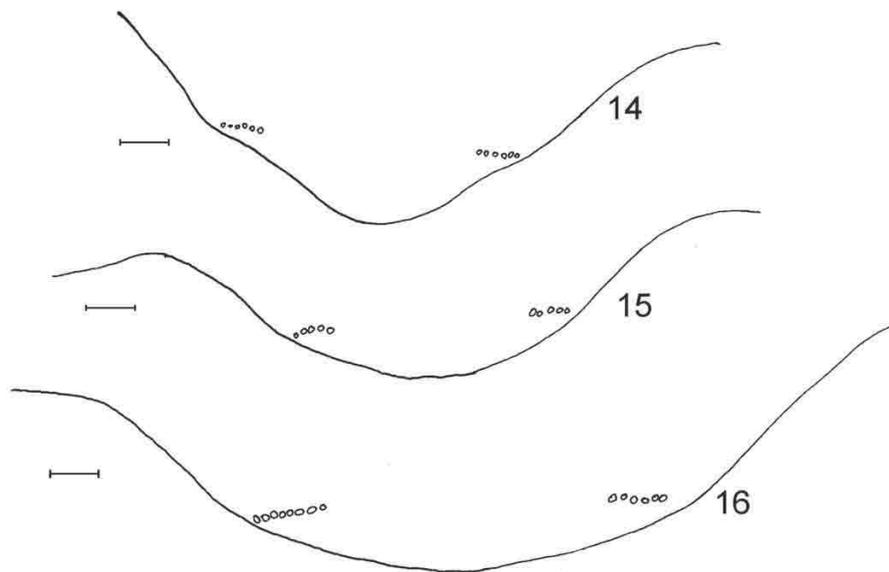
tibia without scales and sometimes with several hyaline and short spines, as seen in fig. 13 (these spines are more frequent in specimens from high regions of the Iberian Peninsula).

Femora covered by hyaline scales on the inner side and on the apex of the outer side. Those on the apex of the outer side elongated, lanceolate or slightly truncated or emarginate at the tip. Scales on the inner side variable in shape; some of them are lanceolate with acute tips, like the ones on the tibia, but many are always shorter and truncated with triangular, obovate or cuneiform shape, with the distal border rounded or emarginated; they are specially shortened near the dorsal margin of the tibia (see fig. 20).

Urotergite I with 1+1 bristle-combs, urotergites II–VII with 3+3 bristle-combs and urotergite VIII with 2+2 bristle-combs. Submedian bristle-combs with 4–11, lateral combs with 4–10 and sublateral combs with 5–13 macrosetae. Urotergite X subtriangular, short, with 1+1 bristle-combs with 4–12 macrosetae each and with a rounded apex showing a more or less expanded and pronounced tip (figs. 14–16).

Urosternites I and II without setae, III–VIII with 1+1 lateral bristle-combs with 10–25 macrosetae each (young specimens may bear less than 10 macrosetae, and exceptionally large specimens may bear more than 25). Distance between urosternal combs 3–7 times wider than the width of a comb.

Both sexes with two pairs of styli, the posterior ones more developed. In males the inner process of the coxite IX is nearly as wide as long (length/width = 0.9–1.1) and approximately 3–3.5 times longer than the outer process. In females the length/width ratio ranges from 1.3 to 2, and the inner process is 2.3–3.8 times longer than the outer one. Stylus IX approximately 3 times longer than the inner process of the coxite in males and 2–2.7 times in females. Ovipositor long, with 43–53 divisions (exceptionally up to 60) and reaching beyond the apex of styli IX up to 1.5–2 times the latter's length. Apices of gonapophyses



Figures 14–16

*Ctenolepisma nicoletii* (Lucas 1846). Variations in the shape of the urotergite X of three specimens. Scales: 0.1 mm.

unsclerotised. Caudal filaments long, with some lanceolate scales similar to or narrower than those covering tibiae; paracercus up to body length, cerci slightly shorter.

**Type Material.** Neotype: Algeria: Cap de Fer, [37°04'N 7°12'W], 5.VIII.2004, Salah Hamra-Kroua leg., 1 ♀ (MNCN, Ref. 2021).

A neotype of this species is designated here because the type material is considered to have been lost (after searching in MNHN of Paris, where Escherich (1905) referred to seeing it), and two specimens from Algeria, where the species was originally described, are available.

**Additional material studied.** **Algeria:** Ammi-Moussa, djl. Arouk-Kallel (pine-tree forest, 200 m elevation above sea level), 24.IV.1961, J. François coll, 1 ♂ (CZ). **Balearic Islands:** Mallorca, Sant Llorenç des Cardassar, Sa Coma, Punta Amer, [39°24'N 3°23'E], 3.VI.1990, 4 ♂♂ + 13 ♀♀ (UCO, Ref. Z0626); Menorca, Es Mercadal, Son Saura, Cap des Redoble, [40°01'N 4°10'E], 6.VI.1990, 5 ♂♂ + 1 ♀ (UCO, Ref. Z0636); Ibiza, San José, Sant Francesc de Ses Salinas, [38°51'N 1°23'E], 13.V.1992, 1 ♀ (UCO, Ref. Z1284); Formentera, punta des Far, [38°40'N 1°34'E], 13.V.1992, 4 ♂♂ + 2 ♀♀ (UCO, Ref. Z1294). **Canary Islands:** Tenerife, Bosque de La Esperanza (*Pinus canariensis* forest, under bark and leaves), [28°24'N 16°24'W], 15.VII.1997, 5 ♂♂ + 10 ♀♀ (UCO, Ref. Z2131). Tenerife, Malpaís de Güímar, [28°18'N 16°22'W], 15.VII.1997, 1 ♀ (UCO, Ref. Z2172). **Portugal:** Foz do Odeleite, 10.V.1991 (CZ, number 4590); Salir to Benafim, 1.IV.1991, (CZ, number 4562); Alferce (Monchique), 31.III.1991 (CZ, number 4561). **Peninsular Spain:** Albacete, Alcaraz, [38°39'N 2°29'W], 27.X.1991, 4 ♂♂ + 4 ♀♀ (UCO, Ref. Z1144); Ávila, Muñogalindo, [40°36'N 4°53'W], 21.IX.1992, 2 ♀♀ (UCO, Ref. Z1950); Badajoz, Mérida, [38°57'N 6°21'W], 26.III.1991, 1 ♀ (UCO, Ref. Z0788); Cáceres, Zarza de Granadilla, [40°13'N 6°04'W], 8.VI.1991, 1 ♂ + 1 ♀ (UCO, Ref. Z0800); Cádiz, Alcalá de los Gazules, [36°30'N 5°40'W], 6.V.1992, 1 ♂ + 4 ♀♀ (UCO, Ref. Z0956); Ciudad Real, Retuerta del Bullaque, [39°27'N 4°28'W], 12.IX.1991, 3 ♀♀ (UCO, Ref. Z1214); Cuenca, Cañizares, [40°30'N 2°12'W], pine-tree forest, 20.VIII.1992, 1 ♂ (UCO, Ref. Z1137); Guadalajara, Corduente, [40°50'N 1°29'W], pine-tree forest, 22.VIII.1992, 2 ♂♂ (UCO, Ref. Z1096); Huelva, Rosal de la Frontera, [37°55'N 7°12'W], 28.III.1992, 2 ♀♀ (UCO, Ref. Z0925); Huesca, Riglos, [42°20'N 0°42'W], 24.VI.1992, 6 ♂♂ + 15 ♀♀ (UCO, Ref. Z1663); Jaén, Villarrodrigo, [38°29'N 2°43'W], 24.VI.1992, 7 ♂♂ + 6 ♀♀ (UCO, Ref. Z0951); Murcia, Lorca to La Paca, [37°43'N 1°42'W], 26.X.1991, 2 ♀♀ (UCO, Ref. Z1544); Palencia, Quintana del Puente, [42°06'N 4°11'W], 26.IX.1992, 7 ♂♂ + 3 ♀♀ (UCO, Ref. Z1818); Salamanca, La Alberca, [40°28'N 6°07'W], 18.XI.1968, 3 ♂♂ + 3 ♀♀ (UCO, Ref. Z1910); Sevilla, Aznalcóllar, [37°39'N 6°11'W], 27.III.1992, 1 ♀ (UCO, Ref. Z0929); Teruel, Albarracín, [40°23'N 1°24'W], 29.VII.1987, 1 ♀ (UCO, Ref. Z2066); Toledo, Almorox, [40°15'N 4°22'W], pine-tree forest, 22.VII.1992, 2 ♂♂ + 1 ♀ (UCO, Ref. Z1118); Valencia, Requena, limiting with Albacete province, [39°20'N 1°20'W], 29.IV.1992, 1 ♂ (UCO, Ref. Z1312); Valladolid, Vilorio, [41°27'N 4°28'W], pine-tree forest, 27.IX.1992, 2 ♂♂ + 2 ♀♀ (UCO, Ref. Z1863); Zamora, Toro, [41°32'N 5°26'W], pine-tree forest, 24.IX.1992, 4 ♂♂ + 4 ♀♀ (UCO, Ref. Z1895); Zaragoza, Zuera, [41°51'N 0°54'W], 24.VI.1992, 1 ♀ (UCO, Ref. Z1674). **Morocco:** Tánger, from Espartel cape to Cueva de Hércules, near the beach, [35°47'N 5°55'W], 5.V.1993, 6

♂♂ + 16 ♀♀ + 5 juveniles (UCO, Ref. Z2173); Tleta Rissana to Ksar El Kebir, [35°11'N 5°58'W], 6.V.1993, 4 ♂♂ + 3 ♀♀ (UCO, Ref. Z2150); Draa el Asef to Chefchaouen, [35°04'N 5°22'W], 6.V.1993, 3 ♂♂ + 3 juveniles (UCO, Ref. Z2158); Chefchaouen, [35°09'N 5°15'W], 6.V.1993, 6 ♂♂ + 1 juvenile (UCO, Ref. Z2160); Jbel Musa, Benzú, [35°54'N 5°23'W], 7.V.1993, 1 ♂ (UCO, Ref. Z2157).

**Biology.** *C. nicoletii* is usually found under stones, fallen leaves or bark. It is often linked to pine-tree forests (mainly to *Pinus pinea* and *P. sylvestris* on the Iberian Peninsula and to *P. canariensis* in Tenerife), under fallen pine needles, exfoliated sheets of bark and on the lower part of the trunks of pines and junipers. It also occurs in *Quercus* forests, Mediterranean shrubland, in open areas that are nearly devoid of vegetation, and even in houses (facultative synanthropic species). It is found from the sea level up to 3.000 m in the Sierra Nevada Mountains in Spain. It appears to be more frequent in siliceous than in calcareous soils.

**Distribution.** This species occurs in North Africa in North Algeria and Morocco. It also occurs in the Canary Islands in Tenerife, where it was described as *L. eatoni* (see discussion) and in the Iberian Peninsula and the Balearics (fig. 23).

All of the material from Portugal and Spain that was previously published as *C. lineata* (Mendes 1978, 1992, 2002; Mendes *et al.* 1994; Gaju *et al.* 1987; Bach *et al.* 1989, 1993; Molero *et al.* 1992, 1994, 1996) actually corresponds to *C. nicoletii* and not to *C. lineata* (except for the specimens that were explicitly identified then as *C. lineata pilifera* and all of the material that was found in the province of Almería, which corresponds to *C. almeriensis*). This species is distributed throughout all the Mediterranean regions of the Iberian Peninsula with Atlantic influence, becoming scarce in Eastern Spain (it has not been found in the coastal provinces of Valencia and Catalonia) and apparently absent from the Eurosiberian region (Northwest, Cantabric slope, Pyrenees). In the rest of Europe, reports of *C. lineata* probably do not correspond to *C. nicoletii*, but rather to authentic *C. lineata* specimens. However, all of the European adult specimens of *Ctenolepisma* that were previously characterised as *C. lineata* that bear only two pairs of styli should be re-examined.

In all of the aforementioned areas, this species seems to be indigenous. To define its range outside of Europe requires further study because other undescribed species with two pairs of styli that are closely related to *C. nicoletii* may be found in these regions.

## Discussion

### *Ctenolepisma lineata*

Our redescription of *C. lineata* has been based on specimens from the type locality and was complemented with data from specimens from several countries in Europe to examine the variability of several features. We conclude that all specimens are very similar on the basis of the characteristics included in our diagnosis of this species.

The number of abdominal styli is the most remarkable feature for discussion. The main mistake of Escherich (1905), Wygodzinsky (1941, 1952, 1958, 1972) and other authors was to consider the specimens with both two and three pairs of styli as belonging to the same species, such that, in their opinion, *C. lineata* could indifferently bear two or three pairs of styli and they did not consider this variability to be of important taxonomic value. Our studies on this species demonstrate that there is only one situation in which *C. lineata* bears two pairs of styli, i.e., when the specimens are young, and they have not developed the third pair. All of the specimens that we have reared in the laboratory develop a third pair when reaching 7–8 mm length. As *Zygentoma* are ametabolous insects, size is the first external character for determining the adult state, because maturity cannot be distinguished by other characteristics for the following reasons: juveniles and adults are morphologically similar; the size and the chaetotaxy of the external genitalia develop progressively; adults continue moulting after they reach their sexual maturity; and they never stop growing. Young specimens of *C. lineata* (i.e., shorter than 7 mm and with undeveloped genitalia) showing two pairs of styli are undistinguishable in the field from other related species from Europe such as *C. nicoletii*, but a microscopic examination can reveal differences in scale covering, shape of the pronotum, among others, that allow confirmation of the specific identity.

When adult specimens of *Ctenolepisma* that are similar to *C. lineata*, but with two pairs of styli, have been found in other regions of the world (but never in Central Europe), it can be demonstrated that these individuals belong to different species by taking into account the new features emphasised in this work. Furthermore, a preliminary revision of the available specimens from other continents that bear three pairs of styli (as was commented on in the section on the distribution of *C. lineata*) show characteristics that indicate that they are actually not *C. lineata*, though they have been labelled with this identity in previous works.

### *Lepisma pilifera*: a valid *Ctenolepisma* species or variety?

*Lepisma pilifera* was described by Lucas 1840, on the basis of specimens from Egypt at the same time as some other species deserving today the status of synonyms of *C. lineata* (as *L. vittata*, *L. subvittata* or *L. annuliseta*). As discussed in the introduction, the main features that were taken into account for distinguishing these “species” at that time, were ones that are currently not considered taxonomically relevant. On that basis they are considered so imprecise as to be obsolete.

In describing *L. pilifera*, Lucas referred in his work to a drawing by Savigny (1817) where three pairs of styli appear at the ventral tip of the abdomen. For this reason, since the revision of Lepismatidae that was made by Escherich (1905), *Lepisma pilifera* had been considered to be a variety of *C. lineata* with three pairs of styli; it was also understood that the typical form of this species bears two pairs. Therefore, when insects were previously identified as *C. lineata* by *Zygentoma* specialists, they were reported as *C. lineata* var. *pilifera* (Lucas 1840) if they bore three pairs of styli. However, as Kinzelbach (1968) suggested and as is established here, all of the specimens from Switzerland (and all of Central Europe), from where *C. lineata* was described, show three pairs of styli when they become adults, and specimens with two pairs are juveniles (see above).

If the name “*pilifera*” has no relevance for referring to actual individuals of *C. lineata*, it is then possible to inquire about the real status of *L. pilifera*. To answer this question, specimens from Egypt that were provided by MK and determined by Stach (1935) to be *Ctenolepisma lineata pilifera* have been re-examined here, and it has been found that they do not belong to *C. lineata*, but rather, surprisingly, to *Thermobia aegyptiaca* (Lucas 1840); these specimens show only 2+2 pairs of combs in all urotergites, as is typical of the genus *Thermobia*. Therefore, *C. lineata pilifera* is a new synonym for *T. aegyptiaca* (because *Lepisma aegyptiaca* was described previously in the same work). The mistake of the generic affiliation that was made by Stach was probably due to the fact that he did not dissect and observe these specimens under the microscope. The description of *C. lineata pilifera* from Egypt that was made by Stach indicates that it bears 3+3 pairs of urotergal combs, which is typical in the genus *Ctenolepisma*. This leaves us unsure as to which species he had referred to, and thus whether or not *Ctenolepisma* species with three pairs of styli occur in Egypt. For the moment, we prefer to consider that *T. aegyptiaca* and *L. pilifera* are two names for the same taxon and a neotype of *T. aegyptiaca* is thus established:

***Thermobia aegyptiaca* (Lucas 1840)**

= *Lepisma pilifera* Lucas 1840 (non *Ctenolepisma lineata* var. *pilifera* sensu Escherich 1905) **n. syn.**

Neotype: Egypt, Heluan (=Helwan), no date, one slide-mounted female (from a vial with two specimens in alcohol, labelled by J. Stach as *Ctenolepisma lineata pilifera*; the other specimen of the vial is a male which has also been slide-mounted and considered as a paraneotype). Both specimens deposited in MK. The

neotype is designated because types of this species are not available for study (Irish 1988) and because specimens from the typical locality (Egypt) are now available. The species is clearly distinguishable from related ones as has been stated by Irish (op. cit.).

These conclusions lead us to abandon applying the word “*pilifera*” to name any *Ctenolepisma* taxon. The status of other ancient synonyms of *C. lineata* is presented in tab. 1.

Table 1: Commented list of synonyms for *Ctenolepisma lineata*.

| Name                         | Author and reference  | Type data (Smith 1998)   | Status   |
|------------------------------|---|--|--|
| <i>Lepisma lineata</i>       | Fabricius (1775) p. 300   | Status and whereabouts unknown; neotype designated in this work  | <i>Ctenolepisma lineata</i> (Fabricius 1775), valid species, in this work it is redescribed and its status clarified   |
| <i>Lepisma vittata</i>       | Fabricius (1798) p. 199   | Status and whereabouts unknown   | As the type locality of <i>L. vittata</i> is Italy, and <i>Ctenolepisma lineata</i> is common and <i>C. nicoletii</i> is absent in this country, <i>L. vittata</i> must be considered as a synonym of <i>C. lineata</i> , as it was stated by Escherich 1905   |
| <i>Lepisma subvittata</i>    | Guérin (1838) p. 10   | Status and whereabouts unknown   | As the type locality of <i>L. subvittata</i> is Paris and <i>Ctenolepisma lineata</i> is domestic and <i>C. nicoletii</i> is absent in this city, <i>L. subvittata</i> must be considered as a synonym of <i>C. lineata</i> as was stated by Escherich 1905  |
| <i>Lepisma annuliseta</i>    | Lucas (1840) p. 560   | Status and whereabouts unknown   | As for <i>L. subvittata</i>  |
| <i>Lepisma pilifera</i>      | Lucas (1840) p. 560   | Status and whereabouts unknown   | This name is synonymised now with <i>Thermobia aegyptiaca</i> (Lucas 1840) and is regarded as an invalid designation for any <i>Ctenolepisma</i> species. See discussion in the text   |
| <i>Lepisma nicoletii</i>     | Lucas (1846) p. 253   | Status and whereabouts unknown; neotype designated in this work  | Resurrected as a valid species, <i>Ctenolepisma nicoletii</i> (Lucas 1846); see its discussion in the text   |
| <i>Lepisma mauritanica</i>   | Described in Lucas (1846)<br>The synonym with <i>C. lineata</i> is given by Paclt (1967):<br>Ridley (1881) 14; nec Lucas 1846 | Status and whereabouts unknown   | <i>Ctenolepisma mauritanica</i> is a valid taxon easily distinguishable from <i>C. lineata</i> . This synonym corresponds only to a misidentification; according Paclt, Ridley erroneously identified as <i>C. mauritanica</i> some specimens that probably belong to <i>C. lineata</i> (or to a related species such as <i>C. nicoletii</i> )   |
| <i>Lepisma parisiensis</i>   | Nicolet (1847) p. 351   | Status and whereabouts unknown   | As for <i>L. subvittata</i>  |
| <i>Lepisma quadriseriata</i> | Packard (1873) p. 47  | Status and whereabouts unknown   | The type locality of <i>L. quadriseriata</i> is in the USA and in this country, <i>Ctenolepisma lineata</i> is domestic and <i>C. nicoletii</i> is absent, so <i>L. quadriserata</i> is actually a synonym of <i>C. lineata</i> , which agrees with Wygodzinsky (1972), who showed that <i>C. quadriseriata</i> corresponds with domestic <i>C. lineata</i> introduced from Europe   |
| <i>Lepisma eatoni</i>        | Ridley (1881) p.14  | Status and whereabouts unknown   | This name is a synonym of <i>Ctenolepisma nicoletii</i> (Lucas 1846). The specimens of <i>Ctenolepisma</i> from the regions where <i>L. eatoni</i> was described (Tenerife and Morocco) are conspecific with Algerian <i>C. nicoletii</i> , as it is argued in the discussion of this species  |
| <i>Lepisma rubroviolacea</i> | Described as <i>Lepisma rubroviolacea</i> by Schött (1897) p. 190 (figs 45–51)  | Neotype CAS 6233 (California Academy of Sciences)<br><br>(Schött types were probably lost in the 1906 San Francisco earthquake and fire) | This species was described from California and redescribed by Wall (1954) as <i>C. rubroviolacea</i> . Paclt (1967) considered this as a synonym of <i>C. lineata</i> . Some <i>Ctenolepisma</i> from SW USA are free-living, and several specimens have been revised and do not agree with European <i>C. lineata</i> , or with any other described valid species, so <i>C. rubroviolacea</i> is probably a valid species, and it must be redescribed and compared with <i>C. lineata</i> |
| <i>Lepisma reticulata</i>    | Schött (1897) p. 192 (figs. 52–57)  | Status unknown, presumably destroyed   | These are domestic <i>Ctenolepisma</i> , and the description and the data given by Wygodzinsky (1972) suggest that <i>C. reticulata</i> is actually a synonym of <i>C. lineata</i> , introduced in the USA from Europe   |

***Ctenolepisma nicoletii* and *Lepisma eatoni***

*Lepisma nicoletii* was described from Oran (Algeria). It was synonymised with *C. lineata* by Escherich (1905) after examining the types of *L. nicoletii* from the MNHN of Paris. Escherich suggested that all specimens with two and three pairs of styli were conspecific. However, specimens recorded recently from Northern Algeria prove to be different than typical *C. lineata* as it is described in this work, and this is mainly on the basis of the three following features:

1.- Different shape of the thoracic sternites, mainly evident in the prosternum, whose apical portion is always widely truncated in *C. lineata* and from rounded-elliptical to slightly truncated or even poorly concave in *C. nicoletii*. See fig. 17 and 18

2.- Different covering of scales on the femora (all lanceolate in *C. lineata*, many shortened and subtruncate in *C. nicoletii*). See figs. 19–22.

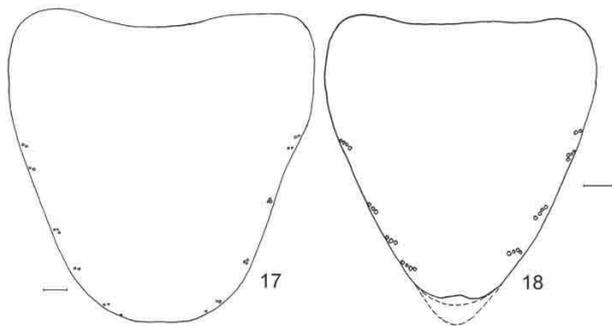
3.- Different number of abdominal styli: three pairs in adult *C. lineata* and two pairs in *C. nicoletii*.

This clearly different species is designated as *C. nicoletii* because *Lepisma nicoletii* is the most ancient name for all of the synonyms of *C. lineata* that can be ascribed to this form (taking into account the geographic and morphological data from the imprecise original description by Lucas). Thus, the status of *L. nicoletii* is resurrected (for other synonyms of *C. lineata*, see tab. 1).

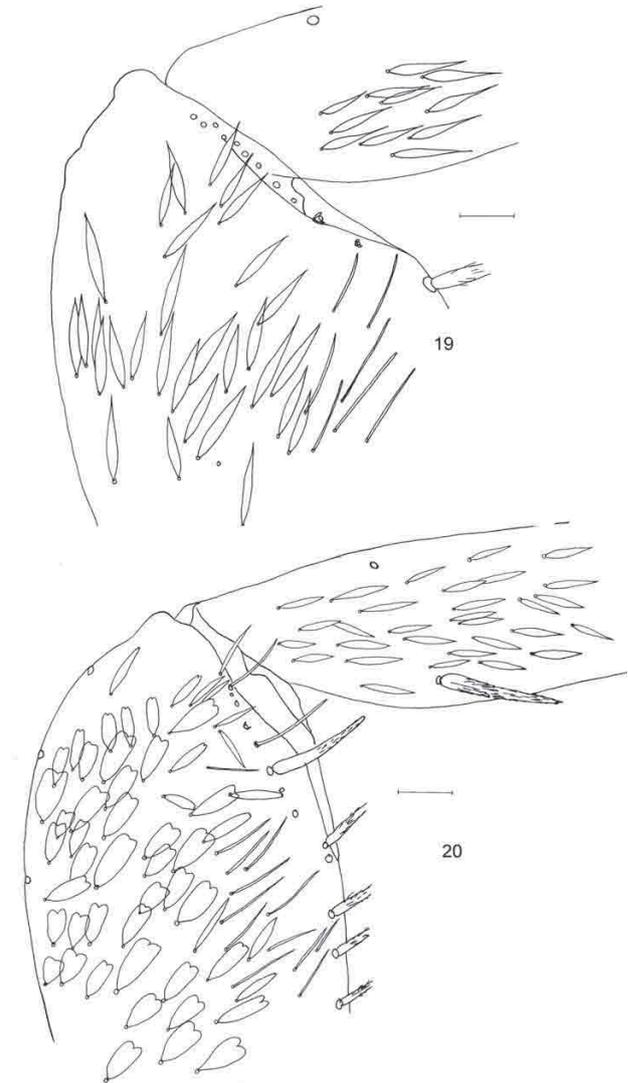
As a result of this, *Ctenolepisma nicoletii* appears to be a common and widespread species occurring in Southwest Europe, North Africa and the Canary Islands. The range of variation that has been observed in specimens from all of these regions is included in the description.

Ridley (1881) described *Lepisma eatoni* from

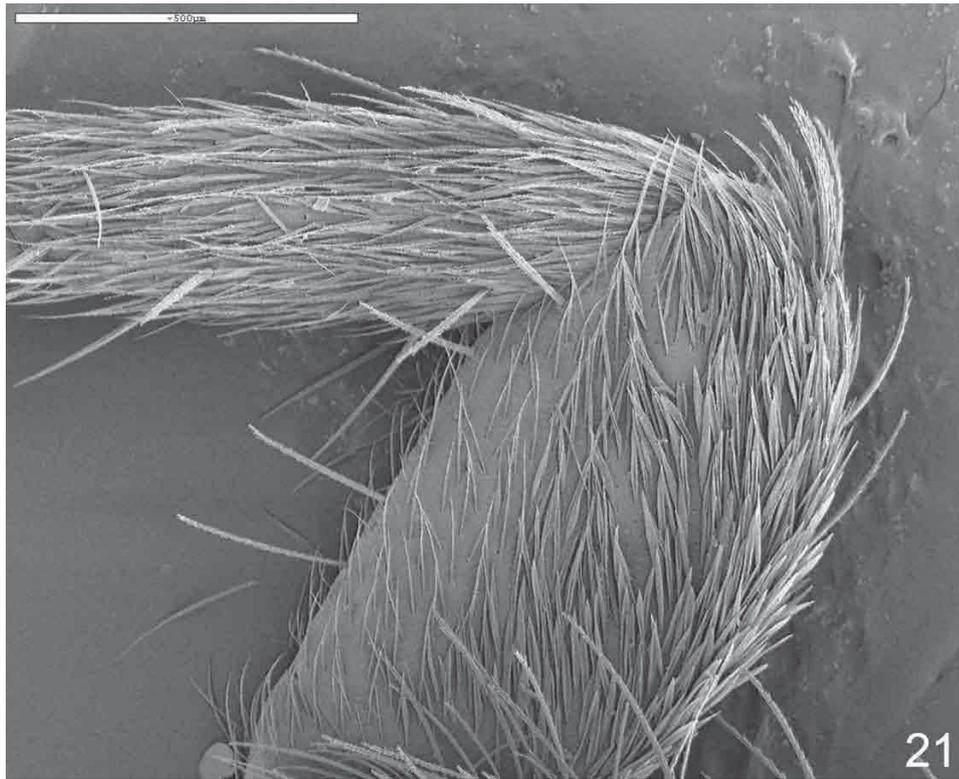
Tenerife and Morocco. This species was established only on the basis of a different chromatic pattern of the dorsal scales. The specific value of this difference was refuted by Escherich (1905), who considered this taxon to be *Ctenolepisma lineata* var. *eatoni*. Escherich established that this variety has two pairs of styli, whereas *C. lineata* var. *pilifera* bears three pairs. Wygodzinsky (1952), studying Canarian *Ctenolepisma*, wrote: "I am convinced that the var. *eatoni* Ridley 1881, does not deserve taxonomic rank, and thus consider it as a simple synonym of *lineata*".



**Figures 17–18**  
Prosternum of *Ctenolepisma lineata* (17) and *C. nicoletii* (18) showing the different shape of the hind margin and its variations in the latter species. Scales: 0.1 mm.

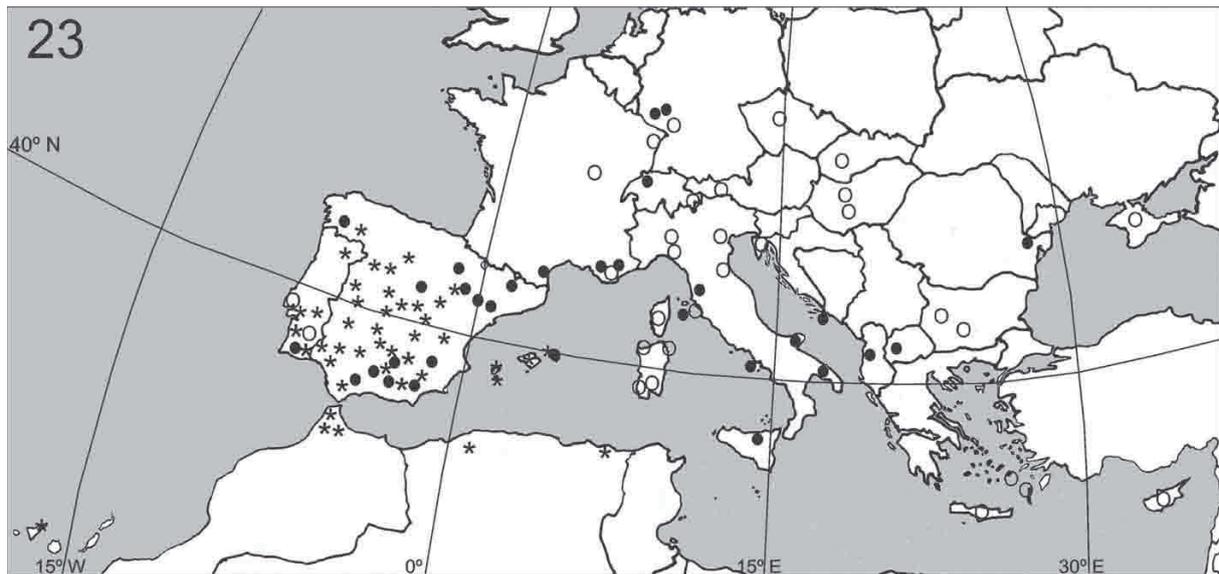


**Figures 19–20**  
Coverings of scales on the femur and the tibia of *Ctenolepisma lineata* (19) and *C. nicoletii* (20), showing the different shape of the femoral scales. Scale: 0.1 mm.



**Figures 21–22**  
Coverings of scales on the femur and the tibia of *Ctenolepisma lineata* (21) and *C. nicoletii* (22), SEM photos. Scales: 500 µm in Fig. 21; 200 µm in Fig. 22.

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**Figure 23**  
Distribution map of *Ctenolepisma lineata* (circles); white: previous data; black: new data and *C. nicoletii* (stars). Only verified reports are included.

Our studies on specimens from the South-Eastern part of Tenerife, where Ridley (1881) mentioned that the specimens described as *L. eatoni* were collected, reveal that they are different from *C. lineata* as redescribed here, but they are conspecific with the neotype of *C. nicoletii*. This results in *L. eatoni* being a junior synonym of the species described from Algeria because *Lepisma nicoletii* precedes *L. eatoni*.

In other sectors of Tenerife and in other islands of the Canarian Archipelago, many specimens have been identified and published as *C. lineata* (Wygodzinsky 1952; Paclt 1966; Mendes 1982; Mendes *et al.* 1992; Mendes 1993; Mendes *et al.* 1993). Although all of them could now be considered to be *C. nicoletii*, a revision of many of these insects, together with new material, has revealed a noticeable variability. This suggests that on the archipelago several species might be distinguished and that *C. nicoletii* is not the only species of the “*lineata*”-group that occurs on the islands (apart from *C. vieirai* Mendes 1981). A revision of all of the *Ctenolepisma* belonging to the *lineata*-group is, thus, needed in the Macaronesian region.

The nearest species to *C. nicoletii* is *C. almeriensis*, which was recently described and compared with Iberian “*C. lineata*” (Molero *et al.* 2005). Thus, the specimens of “*C. lineata*” that were used for comparison with the new species actually belong to *C. nicoletii*. The main difference between these two species is the arrangement of the macrosetae on the thoracic sternites (one row in meso- and metasternum in *C. nicoletii* and two rows in *C. almeriensis*).

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SMITH C. S. & BECCALONI G. (EDS.). 2010. **Natural Selection and Beyond. The Intellectual legacy of Alfred Russel Wallace.** Oxford University Press, Oxford, U. K. : 482 p. £ 18.99 ; US \$ 35.00.

Un gros livre, oeuvre de deux « éditeurs » et de 23 autres « contributeurs », illustré de nombreuses photos en noir et blanc. Un hommage à celui qui fut, avec Darwin, le découvreur de la sélection naturelle et son modeste second, trop longtemps couvert par l'ombre du patriarche de Downe. Un grand voyageur aussi à une époque, à peine moins dangereuse que la nôtre, mais où la faune et la flore étaient encore quasiment intactes des destructions et des pollutions. Le thylacine prospérait encore durant ces années bénies en Tasmanie et il y avait encore des aborigènes vivants là-bas pour les observer. L'époque de Wallace, c'était encore l'époque des Empires coloniaux, un temps où la chasse et la récolte n'étaient pas soumises à des restrictions drastiques. On a beaucoup reproché à Wallace d'avoir fait tourner des tables, de s'être mêlé, en les contredisant d'ailleurs, aux farfelus de la Flat Earth Society, d'avoir été contre la vaccination, d'avoir eu des idées socialisantes, un scandale à l'époque Victorienne, mais il le fit par curiosité, par défi, par excentricité. Il était déjà pour le vote des femmes. Il était socialiste, disait-il, parce que la loi la plus importante de l'humanité, c'était la justice ! Sorte de Bernard Shaw, avant l'heure, il était aussi antimilitariste et il fuyait systématiquement les honneurs, même royaux. Son oeuvre naturaliste est importante et ses récits de voyages restent encore d'actualité.

Lorsqu'il reçut, en 1908, à 85 ans, de la London Linnean Society, la médaille d'or Darwin-Wallace, notre naturaliste s'étonna pourquoi tellement de grands intellectuels échouèrent, quand Darwin et lui-même trouvèrent aisément (pensait-il) la solution de l'irritant problème de l'Evolution ? C'était, dit-il, parce que dans leurs débuts Darwin et lui-même étaient des chasseurs de Coléoptères ! Comme quoi les Coléoptères mènent à tout, même à la gloire ! La médaille de 1908, commémorant la découverte de 1858, ne fut décernée que deux fois en 1958 et en 2008. Elles furent en or (celle de Wallace), puis

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en argent et Darwin, mort en 1882, ne put la recevoir. Wallace mourut en 1913, âgé de 90 ans. Jusqu'au bout, il publia.

Il y a beaucoup d'évolution et de souvenirs dans ce livre, et même une liste, avec photos, de ses nombreuses résidences, car il en changeait souvent et les voulait avec un beau parc et une belle vue. Celles-ci étaient un peu plus modestes en Indonésie, bâties sur pilotis. L'entomologie est largement servie et le chapitre intitulé « *Ardent Beetle Hunters* » est l'oeuvre de Andrew Berry, du Musée d'Harvard. Il ne faut pas non plus oublier l'apport de Wallace dans le mimétisme, les glaciations, la biogéographie, lui qui avait pour la première fois désigné, en Indonésie, la ligne Wallace et évoqué les régions faunistiques encore reconnues actuellement. Les couleurs des animaux et leur rôle dans la biologie le frappèrent intensément. Il suggéra le premier la notion d'aposématisme.

Wallace, un esprit universel, un polymath comme disent les anglais, une sorte de Darwin-bis, un de ces génies du XIX<sup>e</sup> siècle qui eut la bonne idée de s'intéresser aux coléoptères et aux papillons. Il les collectionna, les étudia et les chassa, ce qui le différencie de ces naturalistes en chambre de l'époque, les ronds-de-cuir du cabinet du Roy. Cela fit entrevoir à Wallace la biologie et l'écologie avant l'heure. Il fut certainement un massacreur d'oiseaux, de reptiles, d'orang-outans et de grands singes. Il est excusable. Il fallait chasser pour ramener les dépouilles dans les musées et le péril de l'extinction et de la pollution, c'était théoriquement pour les siècles suivants. Il a toutefois évoqué la déforestation de Ste Hélène. Tous les aspects de la philosophie de Wallace ont été soigneusement détaillés par les nombreux auteurs de ce livre et il serait fastidieux de les rapporter ici.

A lire absolument, en complément des récits de voyage du grand naturaliste. Rien n'a vieilli dans ces aventures, et on ne peut que déplorer le naufrage qui lui fit perdre totalement ses collections américaines. Que d'espèces actuellement éteintes ont ainsi disparu sous la mer !

Pierre JOLIVET