A revision of the *Cylindroiulus distinctus* Lucas group from north Africa, with descriptions of six new species (Diplopoda, Julida, Julidae)

HELEN J. READ

_The Natural History Museum, Cromwell Road, London SW7 5BD, UK_

(Accepted 7 January 2004)

Abstract

*Cylindroiulus distinctus* (Lucas, 1846) as redescribed by Attems (1927) is found to be a different species to that originally described. The latter is here described as *C. attensi* sp. n. The former subspecies, *C. distinctus gauthieri* Brölemann, 1931, is here elevated to full species status. Five further species are described as new (*C. djebelensis*, *C. jijelensis*, *C. ouridae*, *C. parvoalgerinus* and *C. maurus*). Full descriptions are also provided for *C. distinctus*, *C. gauthieri* and *C. algerinus* Brölemann, 1897. All are considered to belong to the *C. distinctus* group of species which is seen as equivalent to the subgenus *Phalloiulus* of Brölemann (1897). It was not possible to examine *C. rifanus* Schubart, 1960 but from the published description this species falls within the group as considered here and is a distinct species. Notes on the two other endemic congeners from the region, *C. lohmanderi* (Schubart, 1932) and *C. tunetanus* Attems, 1908, are also given.

Keywords: *Cylindroiulus distinctus* group, Diplopoda, millipedes, new species, north Africa

Introduction

The status of the genus *Cylindroiulus* was examined in detail by Read (1990) and shown to be a valid generic name for those species in the tribe Cylindroiulini that lack setae on the metazonites and have male gonopods always with a flagellum. As noted at that time, the genus contains many species showing a high degree of diversity but is probably monophyletic.

Various subgenera have been proposed for the genus *Cylindroiulus* in the past and a review and key was presented by Attems (1927) who considered there to be nine at that time. Some of the species included by Attems (1927) have subsequently been removed from the genus but other species have been included that were previously described as separate genera (see Read 1990 for more details).

More recent studies have examined species groups within the genus (not necessarily corresponding to formally proposed subgenera) with a view to clarifying the status of individual species and their relationships within the genus as a whole. This approach has
enabled specific identification problems to be dealt with and the genus to be broken down into smaller parts for study without waiting for a full-scale revision to be undertaken. Thus species groups that have received treatment so far are: the *C. perforatus* group in Portugal and Spain (Read 1989a); the *C. horvathi* group (Korsós and Read 1994) from central and eastern Europe; the widespread *C. truncorum* group (Korsós and Enghoff 1990); the species found in the Caucasus (Read 1992); and those in middle Asia (Read 1994). In addition, the genus has been studied extensively on the island of Madeira where there has been considerable adaptive radiation and a large number of species have been found referable to the *C. madeirae* group (Enghoff 1982; Read 1989b).

There are several species of *Cylindroiulus* that have been found from north Africa, some of which have been previously placed in the subgenus *Phalloiulus*. This subgenus was erected by Brölemann in 1897 with *Iulus distinctus* Lucas, 1846 as the type species. Various authors, including Attems, Verhoeff and Schubart have used the spelling *Phallaioiulus* in publications, however this spelling is invalid (Jeekel 1970).

The aim of the present study is to clarify the status of *C. distinctus* and the other species and subspecies previously described in the subgenus *Phalloiulus*. More recent collections from the region have also revealed new species.

**Acronyms of repositories and abbreviations**

Specimens are located in the following places: ZMUC, Zoologisk Museum, Københavnys Universitet, Denmark; BM(NH), The Natural History Museum, London; MNP, Muséum National d’Histoire Naturelle, Paris, France; NMW, Naturhistorisches Museum, Vienna, Austria; MRSN, Museo Regionale di Scienze Naturali, Turin, Italy. (Note that ANNC refers to collections made by pitfall trapping in an area of Cedrus atlantica in the National Park of Djurdjura, Algeria.)

The following abbreviations are used in the figures (unless otherwise stated): B, brachite; S, solenomere; P, phylacum; X, projection X; Y, projection Y; Pr, promerite; M, mesomerite; O, opisthomerite; PCR, paracoxal rim; PCP, paracoxal process; F, flagellum; ANT, anterior.

**Historical account**

In 1846 Lucas described *Iulus distinctus* from Algeria. This species is mentioned by Silvestri in 1896 as *Diploïulus distinctus* from Ain Draham (Tunisia). Brölemann came across the type of this species, along with several others, and in 1897 published descriptions “plus conformes de la méthode nouvelle” which included providing illustrations of the male gonopods. In the same paper Brölemann also described another similar species, *Iulus* (*Phalloiulus*) *algerinus*. Subsequently, in 1908 Attems mentioned the latter species and redescribed it, from the region of Ain Draham, raising the subgenus *Phallaoiulus* to generic status. Then in 1927 Attems wrote his extensive article where he included both these species in the genus *Cylindroiulus*, he also here synonymized Silvestri’s (1896) *D. distinctus* with *C. algerinus*. With his descriptions of both species are some figures of *C. distinctus* from Tunis. Close scrutiny of these reveal certain differences from the figures of Brölemann, notably in the shape of the pro- and mesomerite and in the posterior gonopods seen in anterior view. These indicate that Attems may have been looking at a completely different species.
Then in 1931 Brölemann wrote again on this group of species whilst working on a collection made by M. le Dr H. Gauthier in Algeria. He recorded *C. distinctus* again from Bois de Boulogne close to Algiers in its “typical” form but in another forest area, Akfadou (Kabylie region) close to Algiers, he gave details of a separate and new subspecies he called *C. gauthieri*. From the figures given of the gonopods this does indeed look distinct from other species described so far.

The final species of this group mentioned in the literature so far is *Cylindroiulus (Phallaioidus) rifanus* described by Schubart in 1960 from Rif (Morocco). Again this appears to be a different species. Schubart also provides a key to the three species he considers valid, which includes *C. distinctus*. Unfortunately there are no figures so it is unclear what he considers the species to look like and the gonopod characters mentioned in the key are not very helpful for this species. One further mention of *C. distinctus* was made by Schubart in 1963 where it is listed from several localities, again it is unclear whether he was relying on figures by Brölemann (1897) or Attems (1927) to make the identifications.

**Methods**

An attempt was made to obtain all the relevant type specimens. Recent collections from Algeria and Tunisia were also examined. Unfortunately it proved impossible to locate *C. rifanus*. Specimens of some other *Cylindroiulus* species from the area were also viewed.

The vulvae were examined for those species where females were present. Most of the vulval structures were quite variable within species so comments have been confined to the shape of the operculum as this most visible part did sometimes appear to show some variation between species.

In the following descriptions segment numbers are expressed as, for example, 51+2. This means that there are 51 podous segments, two apodous segments and the telson is additional. In most cases the number of individual ocelli are given as well as the number of rows of ocelli. Reduced eyes refers to a reduction in the maximum number of ocelli gained at each moult. A “readable” eye is one where the rows of ocelli can be clearly distinguished and the number of rows counted (see Enghoff 1982 for more details). The accessory claw is a normally slender structure, ventral to the true claw. The measurements were made using a microscope eyepiece graticule. Maximum vertical diameter is the dorsal to ventral measurement of the largest body ring. The first pair of legs in the mature males of *Cylindroiulus* is typically reduced so that they are of no use for walking but hold the female while mating. A brief description of the form of the first pair of legs is given.

Specimen details given here are those on the labels in the relevant vials.

**Results**

Close observation of the specimens and the literature have revealed that *C. distinctus* as described by Attems 1927 is different and clearly distinct from *C. distinctus* of Lucas (1846). It is therefore here described as *C. attemsi* sp. n. *Cylindroiulus distinctus gauthieri* is also considered sufficiently different from *C. distinctus* to consider it of specific status and it is here elevated to full species. It seems likely that *C. rifanus* is a different species and in addition recent collections have revealed five further new species from the area.
**Cylindroiulus distinctus** (Lucas, 1846)
(Figures 1–7)

*Iulus distinctus* Lucas 1846: 286.

*Iulus* (*Phalloiulus*) *distinctus*: Brölemann 1897: 266.

*Cylindroiulus* (*Phalloiulus*) *distinctus*: Brölemann 1931: 125.

*Cylindroiulus* (*Phalloiulus*) *distinctus*: Schubart 1963 (but as there are no illustrations it is only presumed to be the correct species).

**Material studied.** Algeria: ♂ (in poor condition as previously a dry specimen, gonopods absent), Type de la collection Lucas, Algérie, coll. Brölemann 1902 (MNP); 1♂, 2♀, (Type A) Algérie, Lucas, Brölemann vid. (same sample as above?) (MNP); 1♂ (gonopods absent), Petit Atlas, 1600 m, Blida, No. CCCLXVI, April 1896, Brölemann det. (MNP); 1♀, details as above (MNP); 1♂ (illustrated), 7 juvenile ♂, 1♀, G. Kabylie, Forêt d’Akfadou, Azerou n”Taghat, 1300 m, 3 May 1983, Osella leg. (ZMUC); 2♂? (one illustrated), 2♀, Sott. (Kabylie), 1000 m, 9 June 1980, F. T. d’Akfadou, G. Osella ded., 1983 (ZMUC); 1♂, 4 juvenile ♂, 4♀, Bois de Boulogne près Alger, H. Gauthier, 14 December 1930 (MNP); 9♀, details as above (MNP); 1♂, Sittirt 11.4.19.267 (BMNH).

**Total material examined.** 39 (8♂).

**Diagnosis.** A large dark species with a long accessory claw and clear, not reduced eyes. Gonopods with the four major parts of the opisthomerite (brachite, solenomere, projections X and Y) roughly even in size and all directed laterally.

**Descriptive notes.** Body length 35–41.5 mm (♂) to 43 mm (♀); maximum vertical diameter 2.5–2.6 mm (♂) to 3.5 mm (♀); number of podous body rings 50–51 (♂), 47–52 (♀).

**Colour.** Head chestnut brown, telson, anal valves and apodous rings dark chocolate brown. Main trunk of body with dark brown metazonae and paler (in younger specimens) or glaucous (older specimens) prozonae. With very thin black mid-dorsal line. Sometimes darker dorsally.

**Eyes.** Clearly readable, not reduced. Males with 10–11 rows of ocelli, females up to 11.

**Telson.** Usually lacking any dorsal projection but a slight protuberance in mature males (Figure 1). Preanal ring with 10–15 pairs of setae usually arranged evenly around it. Ventral scale with two to three pairs of setae. Anal valves with eight to 19 pairs of setae mostly marginal, a few sometimes forming a double row.

**Overall body shape.** Anterior constriction slight, posterior attenuation present in younger specimens. Metazonal vaulting slight, striae close and even.

**Legs.** Legs 0.61 × body height in male, accessory claw surpassing claw by 125% of the claw length.

**Male sexual characters**

*Mandibular stipites.* With well-developed lobes (Figure 2).

*First pair of legs.* Small sharp hooks.
Figures 1–7. Male Cylindroiulus distinctus from Algeria, G. Kabylie, Forêt d’Akfadou, Azerou n’Taghat. (1) Telson and anal valves (V, ventral scale). (2) Expanded mandibular stipites. (3) Right gonopods from lateral view. (4) Right gonopods from mesal view. (5) Right gonopods from posterior view. (6) Right gonopods from anterior view. (7) Posterior gonopods in anterior view. Scale bars: 1 mm (1, 2); 0.1 mm (3–7).
Gonopods (Figures 3–7). Promerite long and narrow, coming to long point apically and widest subapically. In anterior view with apparent “window” (cf. *Cylindroiulus perforatus*; Read 1989a) caused by thin region where mesomerite fits. Flagellum normal. Mesomerite shorter than promerite, slim, hooked apically. Paracoxal process absent, paracoxal rim very high. Opisthomerite large and complex with many processes. Solenomere broad, rounded apically, whitish in colour (in both males examined). Extra projection (X) dorsally in same antero-posterior plane of almost equal size and clearly visible in lateral and posterior view. Large phylacum projecting from the posterior surface and running the whole length of opisthomerite. Large brachite, hood-like in shape when seen from lateral view, straight-ended apically in posterior view, with additional tooth meso-apically (not on Brölemann’s figures) and larger additional projection (Y) most clearly seen in lateral view and in viewing the posterior gonopods from the anterior side.

Female sexual characters

Operculum wide and flat topped.

Comments

The gonopods of the specimens described above clearly represent the same species as Figures 22–25 of Brölemann (1897). The segment numbers agree with those of Brölemann but the body lengths he gave of 29–30 mm for the males and maximum of 33 mm for the females seem a bit low in comparison to measurements made here.

Pocock (nd) lists *Diploilulus distinctus* (Lucas) from Monaco with a note that “this Algerian species is new to the European fauna”. The specimens (BM 1892.9.1.266–271) were re-examined, dissected and discovered to be *Cylindroiulus limitaneus* (Brölemann 1905).

*Revision of the Cylindroiulus distinctus Lucas group* 1497

---

**Cylindroiulus algerinus** (Brölemann, 1897)

(Figures 8–15)

*Iulus (Phalloiulus) algerinus* Brölemann 1897: 269.

*Diploilulus distinctus*: Silvestri 1896: 160.

*Phalloiulus algerinus*: Attems 1908: 113.

*Cylindroiulus (Phalloiulus) algerinus*: Attems 1927: 208.

**Material studied.** **HOLOTYPE:** Algeria: 3♀, CCCLXV, Brölemann (coll. Lucas) (MNP), 1♂, as above, probably C. algerinus (MNP). Tunisia: 1♀ (illustrated), 4 juvenile ♀, 4♂, 12 km S of Thala, 10 March 1986 (ZMUC); 1♀, 1 juvenile ♀, 3♀, 13 km N of Ain Draham, 22–24 March 1986 (ZMUC); 2♀, 8 juvenile ♀, 25♀, 7 km S of Ain Draham, Les Chènes, 22 March 1986 (ZMUC); 4♂, 22 juvenile ♀, 57♀, as above (ZMUC); 20♀, 1♂, Ain Draham area, 5–18 May 1988 (ZMUC); 6♀, 12♂, Ain Draham, sous les feuilles mortes et les pierres, Kerville leg. (NMW); 3♀, 2 juvenile ♀, 4♂, Region d’Ain-Draham, sous les feuilles mortes et les pierres, Gad. de Kerville coll. Det. Attems 1908 (MNP).

**Total material examined.** 174 (38♀).

**Diagnosis.** A large brown species, some specimens appearing striped vertically. Gonopods with small but variable mesomerite. Opisthomerite divided into two major parts (brachite...
Figure 8–15. *C. algerinus* from Tunisia. (8–12) Gonopods of male from 12 km S of Thala. (8) Lateral view. (9) Mesal view. (10) Posterior view. (11) Anterior view. (12) Anterior view of posterior gonopods. (13, 14) Gonopods of male from 7 km S of Ain Draham. (13) Lateral view (L, lamella). (14) Posterior view of anterior gonopods. (15) Vulvae of female (O, operculum; B, bursa). Scale bars: 0.1 mm.
and solenomere) by a large gulf. Projections X and Y lacking, small phylacum. Brachite with “wings” apically. Operculum of female vulvae very long, often protruding from body.

**Descriptive notes.** Length 31–37 mm (♂) to 47 mm (♀); maximum vertical diameter 2.2–2.8 mm (♂) to 3.5 mm (♀); number of podous rings 46–51 (♂), 52 (♀).

**Colour.** Head and first four rings chestnut brown, telson darker brown. Trunk glaucous dorsally to repugnatorial glands, ventrally chestnut/ginger with darker suture between pro- and metazonae. Usually with thin black mid-dorsal line. Older specimens distinctly bleached.

**Eyes.** Clearly readable, hardly reduced. Males with 10–11 rows of ocelli, females up to 12.

**Telson.** Mature males with slightly protruding dorsal projection (except Algerian specimens), females and juveniles without. Preanal ring with around 12 pairs of setae situated dorsally and ventrally with a clear gap laterally. Ventral scale with approximately 10 setae. Anal valves usually with a single row of 10–14 pairs of setae although Algerian specimens with fewer (one with only three pairs).

**Overall body shape.** Posterior attenuation almost absent. Males distinctly swollen on rings 6–8 then slight constriction before head. Metazonal vaulting quite strong in some immature animals, less so in matures.

**Legs.** Legs 0.59 × body height, accessory claw surpassing claw by 100% of the claw length.

**Male sexual characters**

**Mandibular stipites.** Smoothly expanded into a lobe.

**First pair of legs.** Simple sharp hook.

**Segment 7.** With wide opening and definite keel (ventral expansion of edges of opening). Whole area swollen, promerites clearly protruding through opening (unusual for *Cylindroiulus*).

**Gonopods (Figures 8–14).** Promerite tall and slender in all views. Flagellum normal, seeming quite long. Mesomerite usually very small and thin but variable (see Figures 9, 14). Algerian male with more stocky mesomerite, that from 12 km south of Thala with mesomerite so reduced as to be almost lacking. Paracoxal process probably lacking (see comments under phylacum). Paracoxal rim very high and extensive. Opisthomerite with clear and obvious separation between solenomere (with phylacum) and brachite, which are linked only basally. Solenomere linked by thin lamella to phylacum which has a clear, strongly sclerotized ridge marking the division. Phylacum quite long and stretching almost to tip of solenomere (this is possibly a paracoxal process but in view of the other members of the group it seems unlikely). Brachite is three-flanged at tip, a large beak-shaped projection points distally with two more lamellal wing-like flanges directed anteriorly. In posterior view the phyllacum is seen as a rounded tipped structure with the solenomere and flagella clearly seen behind. The brachite appears as a thin plate-like structure behind this.
In some specimens [e.g. that from 7 km south of Ain Draham (Figure 13) and that figured by Attems 1908] have an extra membraneous flange on the solenomere. When the posterior gonopods are viewed from anterior the two broad wings of the brachite obscure almost everything else.

**Female sexual characters (Figure 15)**

Operculum of vulvae very long, although variable, and often protruding from the body of the animal.

**Comments**

The specimens described here clearly represent the same species as illustrated by Brölemann (1897) in his Figures 34–38. The posterior gonopods in external view and the anterior gonopods in posterior view are the clearest illustrations presented by Brölemann (1897), these are not as clear as his for *Cylindroiulus distinctus*.

**Cylindroiulus attemsi** sp. n.

(Figures 16–20, 58)

*Cylindroiulus (Phallaioiulus) distinctus*: Attems 1927: 207.

**Material studied.** **Holotype:** Algeria: 5, Bona 1869, F. Meinert leg. (ZMUC). **Paratypes:** Algeria: 2 5 (1 5 SEM), 3 juvenile 5, 19 9. 1 5, Jijel F. t. de Guerrouch, 4 November 1984, 900 m, collected by the MRSN Spedizione “Algeria’84” Boffa, Casale, Cavazzuti, Gavetti, Giachino, Levi (MRSN); 2 5, 9 juvenile 5, 15 9, data as above (MRSN); 1 5, 5 9, Jijel F. t. de Guerrouch, 10 November 1984, 900 m, collected by the MRSN Spedizione “Algeria’84” Boffa, Casale, Cavazzuti, Gavetti, Giachino, Levi (MRSN); 1 5, Philippeville, 1893, F. Werner (specimen described by Attems in 1927) (NMW).

**Total material examined.** 59 (8 5).

**Diagnosis.** Large species, darker dorsally. Gonopods with distinctive saw-like brachite. Solenomere and brachite linked by lamella. Projection Y small, X absent.

**Descriptive notes.** Length 31–39 mm (5) to 52 mm (9); maximum vertical diameter 2.2–3.0 mm (5) to 4.2 (9); number of podous rings 44–48 (5), 52 (9).

**Colour.** Head, first six segments, telson and anal valves chestnut brown, trunk pale chestnut below repugnatorial glands, glaucous above. Metazonae brownish, prozonae bluish. Thin black mid-dorsal line, sometimes broken.

**Eyes.** Clearly readable, hardly reduced, except the specimen described by Attems which are a little muddled. Males with 8–11 rows, females up to 12.

**Telson.** Mature males with slightly protruding dorsal projection, others without. Preanal ring with 5–14 pairs of setae usually in a single row. Ventral scale usually with two to four setae but males and occasional females with up to 20. Anal valves usually with single row of approximately 10–15 pairs of setae, those in Meinert’s collection often with more.
Overall body shape. As C. distinctus. Metazonal vaulting slight, striae close and even.

Legs. Legs 0.55 × body height in males, accessory claw surpassing claw by 100% of claw length.

Male sexual characters

*Mandibular stipites.* Smoothly expanded.

*First pair of legs.* Small, sharp hook.

Segment 7. Wide opening.

*Gonopods (Figures 16–20, 58).* Promerite long and narrow in lateral view, bluntly pointed in anterior view. Flagellum normal. Mesomerite simple, shorter than promerite and fitting snugly against it. Paracoxal process absent, paracoxal rim quite high but not extensive. Solenomere appearing to have a 90° bend laterally and subapically, ending in rounded knob. Small phylacum on posterior surface. Brachite narrow, curved, saw-like and lamellal, not hood-like. Dorsally to it, another projection slightly smaller in size, probably equivalent to Y. Thin lamella connecting solenomere to brachite seen best in lateral view.

Female sexual characters

Operculum in one specimen examined was rather swollen.

Etymology

Named after Carl Attems who made the original description of this species.
Comments

The specimens examined clearly fit the illustrations of the anterior view of the posterior gonopods illustrated by Attems.

_Cylindroiulus gauthieri_ Brölemann, 1931 status nov.
(Figures 21–25, 59)

_Cylindroiulus (Phalloiulus) distinctus Gauthieri_ Brölemann 1931: 127.

_Material studied._ **LECTOTYPE** (here designated): Algeria: ♂, Forêt de Chênes à Tala Kitane (Kabylie), H. Gauthier coll., 11 December 1930, 2755; 5♂, 4 juvenile ♂, 6♀, details as above; 1♂ (illustrated), 1 juvenile ♂, 13♀, El Kseur, F. t. d’Akfadou 1320 m, F. ne des IFS, 29 October 1984, collected by the MRSN Spedizione “Algeria’84” Boffa, Casale, Cavazzuti, Gavetti, Giachino, Levi (MRSN); 2♂ (1♂ SEM), 1♀, Tizi Ouzou Azazga F. t. des Beni-Ghobri, 620 m, 28 October 1984, collected by the MRSN Spedizione “Algeria’84” Boffa, Casale, Cavazzuti, Gavetti, Giachino, Levi (ZMUC); 1♂, El Kseur, F. t. d’Akfadou, 900 m 12 November 1984, collected by the MRSN Spedizione “Algeria’84” Boffa, Casale, Cavazzuti, Gavetti, Giachino, Levi (MRSN); 1♂, Kabylie (Gauthier), 2738 (MNP); 1♂, Kabylie (Gauthier), 2736 (MNP); 1♀, 1 juvenile ♂, Forêt de Pins de Baïnem près Alger (Gauthier), 11 November 1930 (MNP). The original description (Brölemann 1931) was made on the basis of specimens collected by H. Gauthier as listed above.

_Total material examined._ 38 (11♂).

_Diagnosis._ Fairly large, predominantly dark species. Gonopods with an extremely large phylacum, brachite appearing hooded or wing-like, solenomere sometimes with seta-like projections. Large projection X and smaller projection Y.

_Descriptive notes._ Body length 33.5–40.5 mm (♂) to 49 mm (♀), maximum vertical diameter 2.3–2.8 mm (♂) to 3.5 (♀). Number of podous body rings 49–52 (♂), 47–56 (♀).

_Colour._ Very similar to _C. distinctus_. Thin black mid-dorsal line usually present but not continuous. Anterior portions of metazonae often yellowish.

_Eyes._ Usually clearly readable, not reduced. Males with 10–11 rows, females up to 11.

_Telson._ Pointed, slightly projecting dorsal projection in males, less so in females. Preanal ring usually with 9–12 pairs of setae, mostly arranged dorsally and ventrally with few laterally. Ventral scale with one to four pairs of setae, more usually three or four. Anal valves with 10–15 pairs usually arranged in two rows. (Brölemann’s specimen mostly one row.)

_Overall body shape._ No obvious posterior attenuation or anterior constriction. Metazonal vaulting slight, striae close and even.

_Legs._ Legs 0.56 × body height, accessory claw surpassing claw by 83% of claw length.
Male sexual characters

Mandibular stipites. Well developed.

First pair of legs. Small sharp hook.

Segment 7. With wide gap ventrally.

Gonopods (Figures 21–25, 59). Promerite long and slender, slightly hooked apically in lateral and mesal views, rounded in anterior view. No clear “window” (cf. C. distinctus). Flagellum normal. Mesomerite slightly shorter than promerite, fitting snugly against promerite in mesal and lateral views. Paracoaxal process absent, paracoaxal rim high. Solenomere rounded subapically and narrower in mesal view than C. distinctus, with apical hook pointing laterally. Large phylacum projecting from posterior surface of solenomere running from just below the apex, with square-ended apical projection bent laterad. Large projection X triangular in anterior view, beak-shaped in lateral view. Large brachite triangular in shape in anterior view, hood-like in lateral view and more extensive than in C. distinctus and lacking additional meso-apical tooth. Small projection Y most clearly seen in anterior view of posterior gonopods. In one male the brachite appears more as if there are two flanges rather than a hood-like structure. The presence/absence of setae-like projections on the solenomere is variable.

Female sexual characters

Operculum broad, as in C. distinctus but with central depression.
Comments

This species seems sufficiently different from *Cylindroiulus distinctus* to be considered a species rather than a subspecies. Notable differences are: the shape of promerite, the shape of brachite including projections X and Y, the extent of the phylacum.

*Cylindroiulus rifanus* Schubart, 1960

(Figures 26, 27)

*Cylindroiulus (Phalloiulus) rifanus* Schubart 1960: 184.

No specimens of this species were available for examination but the illustrations of the gonopods and the original description by Schubart are good and show that this species is clearly different to any of those above. For the sake of completeness, a brief description is provided here.

**Locality.** Morocco: Southern Chauen, Rif.

**Descriptive notes.** Body length 24 mm (♂) to 25 mm (♀). Diameter 1.9 mm (♂) to 2.2 mm (♀); number of body rings 53 (♂) to 56 (♀).

**Telson.** Not described. Anal valves with five to seven pairs of setae.

**Male gonopods (Figures 26, 27).** The promerite, mesomerite and flagellum do not appear of particular note. The paracoxal rim seems high. The solenomere and brachite appear separate, but linked. There seem to be at least two other projections from the posterior gonopods that might be synonymous with those termed here X and Y. The anterior view of the posterior gonopods seems to be the clearest for separating this from the other species described here.

*H. J. Read*

---

Figures 26, 27. Gonopods of *C. rifanus* from Schubart (1960). (26) Mesal view. (27) Anterior view of posterior gonopods. Scale bar: 0.1 mm.
Material studied. Holotype: Algeria: ♂, Setif Djebel Barbor, 2100 m, 5 November 1984, collected by the MRSN Spedizione “Algeria’84” Boffa, Casale, Cavazzuti, Gavetti, Giachino, Levi (MRSN). Paratypes: 3 juvenile ♂, 2♀ details as above; 1♂, 4♀/juvenile ♂, details as above (ZMUC); 1♂, 5♀/juvenile ♂, details as above (MRSN).

Total material examined. 17 (3♂).

Diagnosis. A smaller, paler species, with accessory claws surpassing claws by only 66% of the claw length, sometimes with “extra” smaller ocelli. Gonopods most similar to *C. distinctus* but with a large accessory projection on the brachite and a much smaller projection X.

Descriptive notes. Holotype: ♂, 51+2, length 31.5 mm, diameter 2.1 mm, 35 ocelli in ?rows. Paratypes: body length 29–31.5 mm (♂) to 39 mm (♀); maximum vertical body diameter 2.1 mm (♂) to 3.4 mm (♀); number of body rings 51–53 (♂) to 57 (♀).

Colour. Paler than most of the other species, with clearly seen ozopores.
Figures 28–32. Gonopods of *C. djebolensis* from Algeria, Setif Djebel Babor. (28) Lateral view (AC, accessory to brachite). (29) Mesal view. (30) Posterior view. (31) Anterior view. (32) Anterior view of posterior gonopods. Scale bars: 0.1 mm.
*Eyes.* Usually readable, several specimens with reduced-sized ocelli especially in early rows. Also some with “extra” small ocelli.

*Telson.* Lacking dorsal projection in females and juveniles, slightly more pronounced in mature males, but not as obvious as in, for example, *C. distinctus.* Preanal ring with 7–13 pairs of setae, ventral scale two to five pairs, anal valves 13–20 pairs mostly in a single row.

*Overall body shape.* Posterior attenuation absent, anterior constriction present in segments 2–4. Segment 7 very swollen in mature males.

*Legs.* Legs 0.58 × body height in male. Accessory claw surpassing claw by 66% of claw length.

*Male sexual characters*

*Mandibular stipites.* Expanded very smoothly with no apparent demarcation between extension and basal part.

*First pair of legs.* Very small tight hooks.

*Segment 7.* Very swollen, pro- and mesomerite protruding through wide opening.

*Gonopods* (Figures 28–32). Promerite very slender in anterior view and quite straight. Flagellum of normal length. Mesomerite very slightly longer than promerite, slender and directed anteriorly when seen from lateral and mesal views. Paracoaxal process absent, paracoaxal rim high and strong. Solenomere fairly broad and with large projection X curved basally especially when seen from posterior view. Brachite large and with additional blunt accessory process terminally seen in lateral and mesal views, appearing more as an integral “wing-like” part of brachite in anterior and posterior views. Flange Y present though small. Brachite linked to solenomere by clear connection. Phylacum present and well sclerotized though rather smaller than other species of the group. Brachite slightly variable in two males examined, that not illustrated has the accessory process bent anteriorly.

*Female sexual characters*

The operculum of the specimen examined is rather swollen and misshapen.

*Etymology*

Djebel means mountain.

*Comment*

This species most resembles *C. distinctus* in the form of the gonopods, although there are consistent differences in the shape of the brachite, shape of projection X, size of projection Y and the shape of the promerite. There are also differences between somatic characters, for example the number of segments in mature specimens, the overall size and the length of the accessory claw.
Cylindroiulus jijelensis sp. n.
(Figures 33–37)

Material studied. Holotype: Algeria: ♂, Jijel F. t. de Guerrouch, 1100 m, 10 November 1984, collected by the MRSN Spedizione “Algeria’84” Boffa, Casale, Cavazzuti, Gavetti, Giachino, Levi (MRSN). Paratypes: 1 juvenile ♂, 2♀, details as above.

Total material examined. 4 (1♂).

Diagnosis. A smaller, pale species. With very high, steep paracoxal rim, solenomerite with large tooth-like projection. Projections X and Y present but small/medium.

Descriptive notes. ♂ (holotype), 53+2, length 29 mm, diameter 2.2 mm, 40 ocelli in either 10 or 11 rows; ♀ (paratype), 42+4, length 24 mm, diameter 2.3 mm, 29 ocelli in eight rows; ♀ (paratype), 47+4, diameter 2.0 mm, ocelli in nine rows; juvenile ♂ (paratype), 32+5, diameter 1.4 mm, ocelli in six rows.

Colour. Much paler than all other species so far described. Head and first three segments pale to mid-brown, telson brown. Main trunk pale yellow with darker ozopores in mature male. Middle-sized female tinged with grey dorsally.
Figures 33–37. Gonopods of *C. jijelensis* from Algeria, Jijel F. t. de Guerrouch. (33) Lateral view. (34) Mesal view. (35) Posterior view. (36) Anterior view. (37) Anterior view of posterior gonopods. Scale bars: 0.1 mm.
Eyes. More or less readable, not greatly reduced.

Telson. Lacking any dorsal projection even in male. Preanal ring with 9–17 setae, ventral scale with three or more setae. Anal valves with around 11–15 pairs of setae mostly marginal.

Overall body shape. Posterior attenuation absent, anterior constriction almost absent.

Legs. Legs 0.59 × body height in male, accessory claw surpassing claw by 80% of claw length.

Male sexual characters

Mandibular stipites. Smoothly expanded.

First pair of legs. Small simple hooks.

Gonopods (Figures 33–37). Promerite simple and rounded in anterior view. Flagellum normal. Mesomerite longer than promerite and more slender, curved anteriorly at apex. Paracoxal process absent. Paracoxal rim very high and steep though not extensive along the antero–posterio axis. Extensive phylacum posteriorly. Solenomere with large projection apically, seen most clearly in anterior or posterior view. Projection X flange-like in lateral view, clearer in posterior view. Brachite with “hood” shape, and a small projection Y just below the apex.

Female sexual characters

The operculum of the female dissected was small and simple.

Etymology

Jijel refers to the place where this species was found.

Comments

In gonopods this species resembles others in the group but has relatively small projections X and Y and is distinctive in the shape of the brachite and the large extension to the solenomere. It differs from all other previous species by the relative lengths of pro- and mesomerites and height and sharpness of the paracoxal rim. Apart from C. djebelensis it also differs from others in the group in its small size, pale colour and relatively short accessory claw.

Cylindroiulus ouridae sp. n.
(Figures 38–42, 60, 61)

Material studied. Holotype: Algeria: 3♂, ANNC. National Park of Djurdjura, Wilaya de Tizi Ouzou, Djebel du Djujura, 1420 m, from pitfall traps in Cedrus atlantica forest, 17 May 1993 (ZMUC). Paratypes: 3♂ (1♂ SEM), ANNC, details as above, 17 May 1993 (ZMUC). Other specimens: 1♂, 1♀, ANNC. National Park of Djurdjura, Wilaya de Tizi
Ouzou, Djebel du Djurdjura, 1420 m. From pitfall traps in *Cedrus atlantica* forest, 17 May 1993 (MNP).

*Total material examined. 6 (5).*

*Diagnosis.* A large species with relatively short legs and short accessory claws. Gonopods with mesomerite longer than promerite, large solenomere and brachite and smaller projections X and Y.
Descriptive notes. 1♂ (holotype): 50+2, length 36.5 mm, diameter 2.5 mm, 40 ocelli in 10 rows; 1♂: 51+2, diameter 2.4 mm; 1♂: 53+2, ocelli in nine or 10 rows; 1♂: 50+1, diameter 2.8 mm, ocelli in nine or 10 rows; 1♂: 51+1, ocelli in 11 rows (MNP specimens); 1♀: 49+1, diameter 2.9 mm, ocelli in 11 rows (MNP specimens).

Colour. Gingery brown in colour, especially metazonae, with faint mid-dorsal line. (Colour may be the result of pitfall trapping and not true coloration.)

Eyes. Rows sometimes not readable, not greatly reduced.

Telson. Slight dorsal projection in males, pre-anal ring with 7–10 pairs of setae, anal valves with 13–25 setae in almost complete row, ventral scale with two to seven pairs.

Overall body shape. Posterior attenuation lacking.

Legs. Legs 0.49 × body height in male, accessory claw surpassing claw by 71% of claw length.

Male sexual characters

Mandibular stipites. Well developed.

First pair of legs. Small hooks.

Segment 7. With gonopods protruding.

Gonopods (Figures 38–42, 60, 61). Promerite sub-rectangular in shape in anterior view, rather blunt and uneven apically. Flagellum normal. Mesomerite taller and slimmer than promerite. No paracoxal process, high and sharp paracoxal rim. Opisthomerite with large
solenomere and brachite joined closely by a thick lamella. Processes X and Y variable in size in the different specimens examined but both large in anterior and posterior view. Y sometimes with serrated or jagged appearance. Brachite sub-rectangular with a mesal tooth in anterior view, from lateral view with part bent dorsally. Phylacum extensive and quite large.

**Etymology**

Named after Dr Ourida Abrous-Kherbouche who has worked on millipedes in Algeria and collected some of the specimens.

**Comments**

This species resembles both *C. djebelensis* and *C. jijelensis* in the structure of the gonopods but differs in the relative sizes of processes X and Y and the shape of the brachite—the blunt accessory process in this species being reduced to a small tooth. The phylacum is also larger in this species and it is also larger in overall size.

*Cylindroiulus cf. ouridae*

(Figures 43–47)

*Material studied.* Algeria: 2♂ National Park of Chrea, Wilaya Blida, Djebel Chrea, 1400 m, Vallée station, *Cedrus atlantica* forest with some *Quercus ilex*, from pitfall traps, 27 January 1990, Abrous-Kherbouche leg. (MNP)

*Total material examined.* 2♂
Diagnosis. This sample of two males shows characters that seem to be intermediate, in terms of gonopod structure, to *C. djebelensis* and *C. ouridae*. The promerite and mesomerite are very similar in length, the mesomerite being just longer. Of the posterior gonopods, the solenomere is very similar to that of *C. ouridae*. It has a small lamellal-like projection on the mesal side (visible most easily in lateral view) like that of *C. ouridae*. Projections X and Y are
also similar in size and location, although X is of slightly different shape when seen in
anterior view. The brachite, however, is unlike that of *C. ouridae* but similar to *C. djebelensis.*
It is wing-like, consisting of two almost equal parts and in anterior view completely hides
the solenomere. The gonopods are also notable for their very large size and very “open”
structure.

In body size they are probably closer to *C. ouridae* although the very spiralled and broken
condition of the two specimens makes accurate measurement difficult. They are pale in
colour but this is probably due to the method of capture. The telson area seems to be more
setose than that of *C. ouridae.* The other notable feature of these specimens is the length of
the accessory claw, surpassing the claw by only 25%, shorter than in *C. ouridae* (71%) or *C.
djebelensis* (66%)

The differences between these specimens and *C. ouridae* are small, just the shape of the
brachite tip, and size of the gonopods and length of accessory claw, so they are here regarded
as aberrant specimens. When more information is known about the variability in some of the
new species described here it may be possible to assign them to a species with more certainty.

Other details are given below:

*Descriptive notes.* *1♂:* 54+2 rings, diameter 2.8 mm, 13 rows of ocelli; *1♂:* 55+1 rings,
diameter 3.0 mm, 11 rows of ocelli.

*Colour.* Gingery brown in colour, mid-dorsal line weak.

*Telson.* With no dorsal projection, pre-anal ring with complete row of setae, anal valves
with more than 17 pairs (one with approximately 30 in two rows), ventral scale with six or
more pairs.

*Legs.* Legs 0.52 × body height in male, accessory claw surpassing claw by 25% of claw
length.

*Male sexual characters*

*Mandibular stipites.* Well developed.

*First pair of legs.* Small hooks.

*Gonopods.* See Figures 43–47.

**Cylindroiulus parvoalgerinus** sp. n

(Figures 48–52)

*Material studied.* Holotype: Algeria: *♂,* ANNC in National Park of Djurdjura, Wilaya de
Tizi Ouzou, Djebel Du Djurdjura, 1420 m, pitfall traps in *Cedrus atlantica* forest with a
north aspect, 17 May 1993, Abrous leg. (ZMUC donated by Dr Abrous-Kherbouche).
Paratypes: 2♀ (details as above).

*Total material examined.* 3 (1♂).

*Diagnosis.* A small species. Gonopods resembling *C. algerinus* but brachite simpler and a
clear, though thin, connection between the brachite and solenomere. Very small projection
Y but no X.
Descriptive notes. Male and one female so badly broken that it is impossible to tell which segments belong to which millipede. Therefore length, diameter and segment numbers could not be measured or counted with any accuracy. ♂ (holotype): diameter possibly 1.5 mm but this could be the body of a female, other specimen unable to measure, 32 ocelli in nine rows; ♀ (paratype): 32 ocelli in eight rows; ♂ (paratype): 51+3, 43 ocelli in nine rows, length 30 mm, diameter 2.1 mm.
Colour. Yellow/orange with prominent glands but this is probably a result of the preservation.

Eyes. Largely readable.

Telson. With no dorsal projection. Single row of setae on anal valves varying from three to six pairs. Usually one pair of setae on each of ventral scale and telson.

Overall body shape. Very slight anterior constriction, slight posterior attenuation.

Legs. Length of leg compared to body height unable to be measured due to damaged specimen. Accessory claw surpasses claw by 35%.

Male sexual characters

Mandibular stipites. Smoothly but not greatly expanded.

First pair of legs. Hook shaped.

Gonopods (Figures 48–52). Promerite rather short and squat. Mesomerite considerably shorter than promerite. Paracoaxal process absent. Paracoaxal rim of medium height. Solenomere bent laterally and anteriorly at apex, with no projection X. Brachite with prominent “beak” pointing posteriorly. Broader at the apex in lateral/mesal views than posterior/anterior. No winged or hooded structure at the apex. Very small projection Y. Brachite linked to solenomere by very thin lamella. Phylacum small in extent and narrow.
Etymology

The name reflects the similarity in gonopod structure to *C. algerinus* but the smaller body size.

Comments

The gonopods of this species superficially resemble *C. algerinus*. They differ in the structure of the brachite, the lamella link between the brachite and solenomere, and the shape of the pro- and mesomerite. The species is also much smaller than *C. algerinus* and has a shorter accessory claw.

*Cylindroïdulus maurus* sp. n.

(Figures 53–57)

Material studied. Holotype: Algeria: ♂, ANNC in National Park of Djurdjura, Wilaya de Tizi Ouzou, Djebel du Djurdjura, 1420 m, pitfall traps in *Cedrus atlantica* forest with a north aspect, 20 June 1993 (MNP).

Total material examined. 1♂.

Diagnosis. A very small species with much simpler gonopods than the rest of the group. No projections X or Y, brachite separated from solenomere by a small area that is poorly sclerotized. Brachite broadened apically into hood shape laterally. Mesomerite low and squat.

Descriptive notes. 1♂: 44+3 rings, diameter 1.8 mm, nine rows of ocelli.

Colour. Brown head and first two rings, rest yellowy brown with thin black mid-dorsal stripe. Slightly darker posteriorly.

Eyes. Rows muddled but not much reduced.

Telson. Slight dorsal projection in males, rather more sparsely setose, pre-anal ring with six pairs of setae, anal valves with eight pairs of setae in almost complete row, ventral scale with one pair.

Legs. Legs 1.8 × body height in male, accessory claw surpassing claw by 16% of claw length.

Male sexual characters

Mandibular stipites. Expanded.

First pair of legs. Small hooks.

Segment 7. Previously dissected so unknown if gonopods protrude.

Gonopods (Figures 53–57). Promerite short and wide with asymmetric apex. Flagellum normal. Mesomerite very short, approximately half the length of the promerite and flat topped. No paracoaxal process and low paracoaxal rim (unlike others in the group). Posterior
Figures 53–57. Gonopods of *C. maurus* from Algeria National Park of Djurjura, Wilaya de Tizi Ouzou. (53) Lateral view. (54) Mesal view. (55) Posterior view. (56) Anterior view. (57) Anterior view of posterior gonopods. Scale bar: 0.1 mm.
Figures 58–61. Scanning electron micrographs of male gonopods. (58) *C. attensi* from Algeria, Jijel F. t. de Geurrouch. Anterior and slightly ventral view of posterior gonopods. (59) *C. gauthieri* from Algeria, Tizi Ouzou Azazga F. t. des Beni-Ghobri lateral and slightly ventral view of posterior gonopods. (60, 61) *C. ouridae* from Algeria, National Park of Djindjura, Wilaya de Tizi Ouzou, Djebel du Djurdjura. (60) Lateral view of posterior gonopods. (61) Anterior view of posterior gonopods.
gonopods of similar overall appearance to others in group but much more two-dimensional and no signs of projections X or Y. Solenomere fairly slim, brachite hood-like and “hanging” over solenomere at least on lateral side. Phylacum clearly present, not as extensive as in some species and not as thickened.

Etymology

Maurus means a native of north Africa.

Comments

This species is smaller and has simpler gonopods than others in the group. It is the least similar of the species described here but does show other characteristics that are similar, such as the shape of the telson, the lack of paracoxal process, the presence of a phylacum and the overall shape of the opisthomerite.

Distribution

The distributions of the various species are shown in Figure 62. *Cylindroiulus rifanus* (Morocco), *C. algerinus* (mostly in Tunisia!), *C. distinctus* (around Alger) and *C. attensii* (Annaba and Jijel) have fairly discrete distributions at present. Most of the other species have only been found from single localities so it is difficult to conclude much. It should be noted that three species (all new ones) have been found from pitfall traps in the National Park of Djurdjura. All other localities have just had single species recorded from them.

Comments on the *distinctus* group

The species described here form a clear group with similar characteristics (with the possible exception of *C. maorus*). As such they probably represent a monophyletic group with the elaboration of the posterior gonopods and increased body size as apomorphic characters for the group within the genus. The group as described here corresponds to the subgenus *Phalloiulus* as described by Brölemann (1897). In the original description of the subgenus he mentioned a variety of characters, most common to the genus *Cylindroiulus* as defined by Read (1990). However, he stressed the more complicated posterior gonopods and stated that they are generally divided into two parts. In expanding the membership of this group to include more species, as has been done here, there is no deviation from the definition of the subgenus by Brölemann.

*Cylindroiulus* has already been demonstrated to be an especially speciose genus and this has been additionally demonstrated by the adaptive radiation that has occurred on Madeira (Enghoff 1982; Read 1989b). The presence of so many species sharing similar features in north Africa may be another example within the same genus.

The *C. distinctus* group as defined here is characterized by:

- Lack of (or very small) telson projection.
- Tendency for a large body size (for *Cylindroiulus*).
- Tendency for large female cyphopods (in several species they appeared larger than normal for the genus).
- Tendency for male gonopods to protrude from the body wall (unusual for *Cylindroiulus*).

In the male gonopods the characteristics are as follows:

- Lack of paracoxal process.
- Tendency for complicated (for *Cylindroiulus*) gonopods.
- Tendency for the mesomerite to be reduced.
- Tendency for a large paracoxal rim.
- Opisthomerite consisting of solenomere and brachite well separated or appearing well separated but linked by a lamella.
- Solenomere tending to have a projection (X) on the lateral side.
- Brachite tending to have a projection (Y) on the lateral or anterior side.
- Brachite tending to be complex at the tip.
- Variability of certain structures between individuals of the same species (such as the size of the mesomerite and some of the flanges and setae on the solenomere).

Most of the species are easily identified by examining the posterior gonopods in anterior view. There seem to be many variations in the structure of the posterior gonopods and Table I summarizes the characteristics of each species.

**Other *Cylindroiulus* species from the region**

*Cylindroiulus tunetanus* Attems, 1908

This species was described from the Ain-Draham area of Tunisia and has also been found in the G. Kabylie region of Algeria (specimens in ZMUC). Externally the species is similar to those described above, although rather smaller in size than most. The gonopods differ by the presence of a large paracoxal process that is apparently spinose at the apex and it is thus unlike any of the species of the *C. distinctus* group. The posterior gonopods are described by Attems (1908) as “quite simple”, but the tip of the solenomere does bear a small projection (a brachite?). Interestingly, there is a small, thin flange on the solenomere, reminiscent of projection X. For the present time, however, the presence of a paracoxal process places this species outside the group.

*Cylindroiulus lohmanderi* (Schubart, 1932)

Syntypes of this species, from Tanger, Morocco were examined (ZMB No. 5568, leg. Collin, 2♂, 3♀). It was originally described as *Solaenoiulus lohmanderi* but the monotypic genus was synonymized with *Cylindroiulus* by Read (1990). The millipedes externally resemble those of the *Cylindroiulus distinctus* group. The gonopods, however, were not so easy to examine. One set is mounted on a slide and being thick they are not easy to see when mounted. The opisthomerite of one half is broken, that of the other closely resembles the drawing by Schubart (1960). There is another male that has been dissected and the gonopods are not slide mounted. Half of the gonopods are badly twisted and may also be partly broken. The other half has part of the opisthomerite broken and although it...
Table I. Summary of the gonopod features for the *Cylindroiulus distinctus* group

| Feature                  | distinctus | algerinus | attensi | gauthieri | rifanus | djebelensis | jijelensis | ouridae | parvoalgerinus | maurus |
|--------------------------|------------|-----------|---------|-----------|---------|-------------|------------|---------|----------------|--------|
| Promerite                | Pointed    | Normal    | Normal  | Normal    | Normal  | Slender and straight | Normal    | Blunt ended | Short and squat | Asymmetrical in anterior view |
| Mesomerite               | Shorter than promerite | Very small variable | Shorter than promerite | Just shorter than promerite | Shorter than promerite | Equal to promerite | Longer than promerite | Longer than promerite | Much shorter than promerite | Very short and squat |
| Paracoxal rim            | High       | High      | Low     | Medium    | High    | Medium/high | Very high  | High and sharp | Low/medium | Low |
| Solenomere setae        | Absent     | Absent    | Absent  | Present   | Absent? | Absent      | Absent     | Absent   | Absent         | Absent |
| “Gulf” between solenomere and brachite | Yes, but closely linked | Yes, but no link | Yes, but linked | Apparently large, but linked | Yes, but linked | Yes, but linked | Yes, but linked | Yes | Yes, very closely |
| Nature of link           | Large, thick not lamella-like | No link† | Large, thick not lamella-like | Large, thick not lamella-like | ?Present | Large, not lamella-like | Large, not lamella-like | Large, not lamella-like | Very thin lamella | Thick lamella |
| Brachite shape           | Spoon-like | Pointed and “winged” | Sickle-shaped, saw-like | Hooded (in one specimen more wing-like) | Rounded? | Winged | Spoon-shaped | Sub-rectangular | Simple | Hooded |
| Extension on solenomere  | Absent     | Absent    | Present, solid | Usually: narrow, small and variable | ? | Absent | Large, hooded | Lamella-like variable | Absent | Absent |
| Projection Y             | Absent     | Present, solid | Small | Probably present | Small | Small | Medium | Very small | Absent |
| Projection X             | Absent     | Present, jagged | Absent | Large | Large and bent laterally | Medium | Medium | Absent | Absent |
| Phylacum                 | Long       | Long      | Shorter | Very large broad, with central dip? | ? | Small | Swollen and misshapen | Large | Large | Small |
| Vulval operculum         | Broad      | Very long | May be swollen | ? | ? | Simple | – | – | – |

†In some specimens there is evidence of the start of a link, via a short lamella-like projection.
resembles that of the drawn gonopod it does not look completely identical. The gonopods
that are not slide mounted show similarities with the C. distinctus group. There is a very
high paracoxal rim and no paracoxal process. There seems to be a brachite that is separate
from the solenomere. The brachite does seem to be forked and in postero-mesal view
expanded slightly apically, which is not apparent from the drawing by Schubart. Also not
figured in the original drawing is a small projection on the solenomere in lateral view,
perhaps corresponding to projection X. These details of the brachite and solenomere are
not distinguishable on the slide-mounted gonopods.

In conclusion, Cylindroiulus lohmanderi may belong to the C. distinctus group. However,
more specimens in better condition would be desirable before it is possible to be sure.
There may be more specimens from the type series in Brazil (where it is known that part
of Schubart’s collection is now kept) but it has not been possible to establish this for certain.

Acknowledgements

This work was made possible through the support of the European Community—Access to
Research Infrastructure action of the Improving Human Potential Programme (in the form
of a COBICE grant to work in Copenhagen). I am very grateful to Henrik Enghoff for
support, encouragement and help with German translations. I would also like to thank the
Natural History Museum for allowing me to work there as a Scientific Associate and Jan
Beccaloni for her help with the collection and references. Ourida Abrous-Kherbouche
provided some of the specimens, kindly drew the maps and made some valuable comments
on the manuscript for which I am very grateful. Paul Read helped prepare the SEM figures
for publication. The following people kindly lent specimens from their collections: E.
Gavetti of the Museo Regionale di Scienze Naturali, Turin, Italy; Jürgen Gruber of the
Naturhistorishes Museum Wien; Jean-Paul Mauries of the Muséum National d’Histoire
Naturelle, Paris; Jason Dunlop of the Museum für Naturkunde in Berlin; Paul Hillyard and
Jan Beccaloni of the Natural History Museum, London.

References

Attems C. 1908. Note sur les Myriapodes recueillis par M. Henri Gadeau de Kerville en Khroumirie et description
de deux espèces et d’une variété nouvelles provenant de cette région de la Tunisie. In: Gadeau de Kerville H.,
editors. Voyage zoologique en Khroumirie (Tunisien). Rouen. p 105–114, 2 pls.
Attems C. 1927. Über palaearktische Diplopoden. Archiv für Naturgeschichte 92:114–256.
Brölemann HW. 1897. Iules d’Algérie. Annales des Sciences Naturelles Zoologiques 8(4): 253–276.
Brölemann HW. 1931. Myriapodes recueillis par M. le Dr. H. Gauthier en Algérie. Bulletin de la Société
d’Histoire Naturelle de l’Afrique du Nord 21:121–134.
Enghoff H. 1982. The millipede genus Cylindroiulus on Madeira—an insular species swarm (Diplopoda, Julida:
Julidae). Entomologica Scandinavica Supplement 18:1–142.
Jeekel CAW. 1970. Nomenclator generum et familiarum Diplopodorum. Monografieën van de Nederlandse
Entomologische Vereniging 5:1–412.
Korsós Z, Enghoff H. 1990. The Cylindroiulus truncorum-group (Diplopoda: Julidae). Entomologica Scandinavica
21:345–360.
Korsós Z, Read HJ. 1994. Revision of the horvathi group and description of a new species of Cylindroiulus
(Diplopoda: Julidae). Journal of Natural History 28:841–852.
Lucas H. 1846. Note sur quelques nouvelles espèce d’Insectes (Myriapodes) du Nord de l’Afrique. Revue
Zoologique, p. I. Soc. De Cuvier IX, 1846, 283–289.
Pocock RI, nd, Contributions to our knowledge of the Diplopoda of Liguria. Annali del Museo Civico di Storia
Naturale di Genoa, Serie 2 XIV, XXXIV, 505–523.
Read HJ. 1989a. The Cylindroiulus perforatus group, with the description of a new species and notes on variation
within C. perforatus Verhoeff, 1905 (Diplopoda, Julida: Julidae) Entomologica Scandinavica 20:243–249.
Read HJ. 1989b. New species and records of the *Cylindroiulus madeirae*-group, with notes on phylogenetic relationships (Diplopoda, Julida: Julidae). Entomologica Scandinavica 19:333–347.

Read HJ. 1990. The generic composition and relationships of the Cylindroiulini—a cladistic analysis (Diplopoda, Julida: Julidae). Entomologica Scandinavica 21:97–112.

Read HJ. 1992. The genus *Cylindroiulus* Verhoeff 1894 in the faunas of the Caucasus, Turkey and Iran. Senckenbergiana Biologica 72, 4–6, 373–433.

Read HJ. 1994. The millipede genus *Cylindroiulus* Verhoeff, 1894, in Middle Asia (Diplopoda Julida Julidae). Arthropoda Selecta 3(1/2): 117–132.

Schubart O. 1932. Zwei neue mediterrane Cylindroiulinae (Diplopoda). Zoologischen Anzeiger 100(9/10): 251–257.

Schubart O. 1960. Ein weiterer Beitrag zur Diplopoden-Fauna Marokkos. Bulletin de la Société des Sciences Naturelles et Physiques du Maroc 40:159–232.

Schubart O. 1963. Ueber einige diplopoden aus Algier. Bulletin de la Société des Sciences Naturelles et Physiques du Maroc 43(2): 79.

Silvestri F. 1896. Una escursione in Tunisia. Il Naturalista Siciliano, (Nuovo Serie) 1:143–161.