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Milliped Miscellany – Part III *)

by

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This is the third part of a series of miscellaneous papers on Millipeds. The first and second part have been published in Entomologische Berichten 14, 1952, p. 71–77 and 15, 1955, p. 412–417, respectively.

STRONGYLOSOMIDAE

Streptogonopus aethiopicus nov. spec.

MATERIAL : Eritrea : Gula (15° 36′ N., 38° 21′ E.), 500 m., 19 July 1953, Coll. W. J. STOWER, 1 ♂ (holotype).

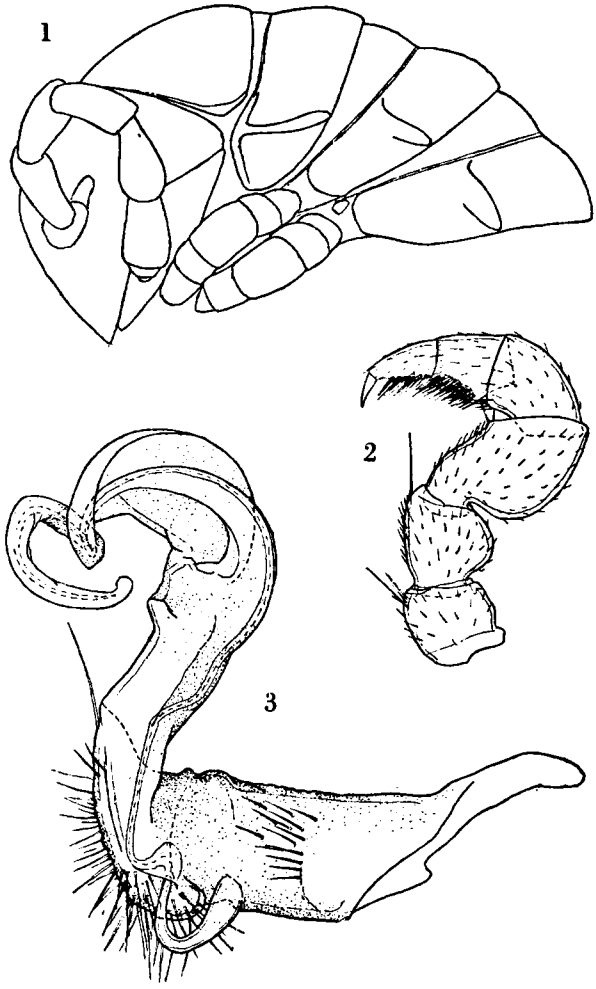
COLOUR : Head, except the lower portion of the clypeus and a sharply demarcated spot at the medio-posterior side of the antennal sockets which are yellowish, very dark brown. Antennae and legs similarly dark, with only the 8th joint of the first and the tarsal tip of the second whitish. Collum and subsequent segments brown, the posterior half of the keels yellow.

WIDTH : 1.9 mm.

HEAD AND ANTENNAE : Labrum moderately emarginate, tridentate. Clypeus moderately impressed towards the labrum, lateral borders straight. Headplate smooth and shining, only in the clypeal part dispersedly set with rather short setae. Vertex moderately convex, with a distinct, moderately impressed sulcus, which runs downward to just below the upper level of the antennal sockets. At the medio-posterior side of these sockets a sharply demarcated, small, somewhat inflated area. Antennal sockets separated by 1¾ times the diameter of one socket, or by the length of the second joint. Antennae of moderate length and width. Length of subsequent joints : $2 > 3 > 4 = 5 > 6$, the 6th joint about $^2/_3$ of the length of the 2nd. 4th to 6th joints of subequal width, slightly wider than the 2nd and 3rd. Especially the distal joints rather densely setiferous ; hairs short.

COLLUM : slightly narrower than the head, subtrapezoidal in dorsal outline. Anterior border very weakly convex, posterior border similarly

*) Received February 1, 1955.



FIGURES 1—3. *Streptogonopus aethiopicus* nov. spec. — (1) Head and anterior 4 segments of holotype ♂, from the left side. (2) Right ambulatory leg of the 7th segment of holotype ♂. (3) Right gonopod of holotype ♂, medial view.

concave. Sides (fig. 1) narrowly rounded, laterally marginated by a thin raised crest. Surface smooth, hairless, longitudinally weakly convex, transversely weakly convex in the middle, but much more strongly so towards the sides.

BODY SEGMENTS : rather weakly constricted by a waist of moderate width, which in the upper and latero-dorsal side is weakly longitudinally striate. Prosomites and metasomites smooth and shining, hairless. Transverse furrow, without sculpture, present from the 3rd up to the 18th segment, being well developed on the 4th to the 17th segment, and almost reaching the dorsal furrow of the lateral keels. Sides somewhat rugulose, dispersedly granular in middle segments, more densely so in the anterior and posterior segments. Pleural keels well developed, present from the

2nd to the 18th segment in the form of raised keels, which are hardly or not produced posteriorly and do not project behind the posterior margin of the segments.

LATERAL KEELS : rather weakly developed. 2nd segment somewhat wider than collum, about as wide as the head. Keels below the level of those of the following segments. From a dorsal view they are weakly convex and diverging slightly into posterior direction. Posterior edge narrowly but bluntly rounded, the narrow posterior border almost transverse on the longitudinal axis. From a lateral view the keels of the 2nd segment are rather thin, thickest in the posterior half (fig. 1). 3rd segment somewhat wider than the 2nd. The keels similarly rounded, from a lateral view somewhat thicker than those of the 2nd segment. 4th segment somewhat wider than the 3rd, but narrower than the 5th. The keels subsimilar to those of the 3rd segment, the posterior edge, however, somewhat less narrowly rounded ; dorso-ventrally they are thicker than those of the 3rd segment. Sides of the keels of subsequent segments hardly diverging, widely convex. Posterior edges narrowly rounded, blunt in the anterior half of the body, slightly acute in the posterior half of the body, though in the latter region hardly projecting beyond the posterior margin of the segments. Keels dorsally with a marginal rim demarcated by a furrow which does not reach the waist. From a lateral view the upper margin of the keels is weakly concave, except in the posterior part of the poriferous keels, where it is a little convex. Lower margin of keels distinct only in their 2nd half, in poriferous keels converging convexly towards the upper margin at an angle of about 45°, in poreless keels converging straightly with an angle of about 30°. Pores on the lateral side of the keels, about ¼ from the posterior margin of the metasomites, lying more closely to the ventral side.

STERNITES AND LEGS : Sternites in middle segments almost quadrate, transverse impression interrupted in the middle, longitudinal impression shallow, not sulciform. Surface moderately set with rather short setae. Anterior sternites without particulars, that of the 5th segment without a trace of a process, with a normal cross impression. Legs (fig. 2) rather short and very strongly incrassate, especially those of the anterior half of the body ; in the posterior half of the body they are slightly less thick, but only the last few pairs are normally slender, though hardly longer than the others. Practically all legs with dense tibial and tarsal brushes. On the last four pairs the tarsal brushes are thinning out, being almost obsolete in the ultimate pair ; the tibial brushes are present up to the last leg, though only on the distal half of the joint. Rest of the joints especially ventrally set with short hairs, aside of the usual ventro-terminal hairs. Tarsal claws rather long and slender, not exceeded by the terminal tarsal bristles. Legs without further particulars.

ANAL SEGMENT : somewhat rugulose, especially the tail, which is rather short and thick, with the sides straightly converging ; the end rather broadly truncate, the posterior margin straight. Tail normally setiferous, without distinct tubercules. Valves with narrow raised margins, the surface somewhat rugulose ; setae on very weak tubercules. Scale almost semicircular, setae not on tubercules.

GONOPODS (fig. 3): Coxa cylindrical, straight, with a medial setiferous area. Coxal hook strongly developed. Praefemur latero-distally demarcated

from femur by an oblique chitinous ridge. Femur of moderate length and width, parallel-sided, with a short, blunt, distal process at the posterior side. Postfemur not demarcated. Spermal channel running along the medio-anterior side of the femur. Tibiotarsus apparently only with the lamina lateralis developed, very long, strongly curved and gradually tapering. The distal end pointing in a posterior direction (through the action of xylol, used for clearing the preparate, the spiral of the tibiotarsus as depicted has coiled up somewhat more strongly). Solaenomerite arising from the anterior side of the femur, very long, the distal portion completely sheathed by the tibiotarsus.

The record of a species of the genus *Streptogonopus* ATTEMS 1914 from Eritrea is of considerable interest from a geographical point of view, since up to the present date the genus has been considered merely Indian in distribution. From India three species have been described, viz. *S. phipsoni* (POC. 1892), *S. nitens* ATT. 1936 and *S. jerdani* (POC. 1892). That the present species is congeneric with these three can hardly be a matter of discussion. The gonopods of *aethiopicus* are differing in small details only, and the other morphological features, such as the strongly incrassate legs, the presence of dense tibial and tarsal brushes, the absence of a process on the sternite of the 5th segment of the male, etc. can only be considered as additional evidence.

In view of the present record it seems very probable that the species described by SILVESTRI as *Strongylosoma neglectum* (1895, Ann. Mus. Genova **35** : 485, fig. 2) from Scioa, Hoghoghè, and provisionally referred to *Habrodesmus* by COOK (1898, Proc. U.S. Nat. Mus. **20** : 704) also should be placed in *Streptogonopus*. The outline of the gonopods is in complete accordance with that met with in this genus. For the rest SILVESTRI's description, short as it may be, fits very well for a species of *Streptogonopus*. However, the description contains practically only characters of generic value, which renders the establishment of the relationship with *aethiopicus* very difficult without a study of the type material.

The following key, largely based upon a similar key given by ATTEMS in the Tierreich **68**, 1937, may be of some help in separating the species of *Streptogonopus*.

1) Lateral keels almost completely wanting, present only in the posterior part of the metasomites. Segments dull, wrinkled. Colour yellowish ..... *S. jerdani* (POC.)
—) Lateral keels rather weakly developed, but distinct. Segments smooth and shining 2
2) Width 2.8—4.5 mm. 3
—) Width up to 2 mm. 4
3) Transversely annulated; metasomites dark brown before the transverse furrow, yellow behind. Pleural keels toothed posteriorly. Marginal furrow of collum sharp ..... *S. phipsoni* (POC.)
—) Metasomites brown, with only lateral keels yellow. Pleural keels rounded posteriorly. Marginal furrow of collum very wide, the margin brimlike ..... *S. nitens* ATT.

4) Head, antennae and legs very dark brown; body brown, with posterior half of keels yellow. Antennae of moderate length. Lateral keels rather small ..... *S. aethiopicus* nov. spec.
—) Colour pale reddish, top of antennae blackish. Antennae long. Lateral keels rather large ..... *S. neglectus* (SILV.)

Streptogonopus aethiopicus was sent to me for identification by Dr. W. J. HALL, of the Commonwealth Institute of Entomology, London. The type will be preserved in the Zoological Museum at Amsterdam.

SPHAEROTRICHOPIDAE

Vanhoeffenia ATTEMS

1908 *Vanhoeffenia* ATTEMS, in: VON DRYGALSKI, Deutsche Südp. Exped. 1901—1903, Zool. **9** : 426.
1926 *Gnomeskelus* ATTEMS, in : KÜKENTHAL & KRUMBACH, Handb. Zool. **4** : 146.
1938 *Pelmatotylus* ATTEMS, Proc. Zool. Soc. London **108B** : 376
1940 *V.* and *G.* ATTEMS, Tierreich **70** : 165, 388.

Type of the genus: *V. nodulosa* ATT. (monotypy)

DISTRIBUTION : numerous species in South Africa, one introduced into Hawaii.

Vanhoeffenia was made the type of the *Vanhoeffeniidae* by ATTEMS in 1914 (Arch. f. Naturgesch. **80A** (4): 158), a family which from the beginning appears to have been the dumping place of all Polydesmoid genera not clearly referable to either one of the families of *Polydesmidae, Cryptodesmidae, Sphaerotrichopidae, Peridontodesmidae* or *Oniscodesmidae*. Its heterogeneity has been discussed and criticized by various authors, but so far no one has made a serious attempt to reconsider the systematic position of the genera involved. On the contrary, some authors have continued using the name *Vanhoeffeniidae* and, by adding new genera to this 'family' even in recent years, increasing the confusion.

To re-allocate the genera referred to this group will be a difficult task. Indeed, some of them show relationship to the *Polydesmidae* (e.g. *Solaenaulus* ATT.), some to the *Oniscodesmidae* (e.g. *Eutrichodesmus* SILV.), etc., but others may represent distinct family-types.

As for *Vanhoeffenia*, BRÖLEMANN (1916, Ann. Soc. Ent. France **84** : 587) apparently has been the only author who has tried to define the systematic place of the genus, apparently ignorant of ATTEMS' treatment. However, he referred it to the list of *genera Polydesmoidearum incertae sedis'*, a conclusion justifiable by the poor knowledge of the South African milliped fauna at that time.

Considering the status of *Vanhoeffenia* in the light of our present knowledge of that fauna we have to arrive at the conclusion that, on account of both morphological and geographical reasons, this genus should find a place among the *Sphaerotrichopidae* as defined by ATTEMS in 1914 and 1940.

Of the order *Polydesmida* South Africa possesses, aside from *Vanhoeffenia* and a number of Sphaerotrichopid genera, only the widely different families *Strongylosomidae* and *Gomphodesmidae*, so that the inclusion of *Vanhoeffenia* in the first family is supported by a strong geographical argument. It is quite astonishing that no one has been impelled by this circumstance to search for the nearest relatives of *Vanhoeffenia* among the *Sphaerotrichopidae*. For the gonopods of *Vanhoeffenia nodulosa* ATT. show a great resemblance to those of some other South African *Sphaerotrichopidae*, and the other characters of the species, in particular the presence of setiferous tubercules on the ventral surface of the 5 distal joints of the legs of the male, only support its location into that family. In fact, when we try to identify *Vanhoeffenia* as described with the key to the families of the *Polydesmida* given by ATTEMS in 1937 (Tierreich **68** : 22), we arrive without any difficulty at the *Sphaerotrichopidae*. The fact that ATTEMS in 1928 referred the nearest relatives of *V. nodulosa* to the Sphaerotrichopid genus *Gnomeskelus*, shows that this author, quite unintentionally came to the same conclusion as expressed here!

V. nodulosa comes close to *V. repanda* (ATT.) (*Gnomeskelus r.* ATTEMS 1928, Ann. S. Afr. Mus. **26** : 263, pl. 6, fig. 141-146, pl. 7, fig. 147) and *V. mixta* (ATT.) (*Gnomeskelus m.* ATTEMS 1944, Zool. Anz. **144** : 233). The first of these two names probably represents a *mixtum compositum* of a number of species. This was proved by the fact that the gonopod drawing given in 1928 differs notably from the one given in 1940 (Tierreich **70** : 393, fig. 547), reason why the specimen after which the latter drawing was made received the name of *G. mixtus* in 1944. It seems not unlikely that specimens of *V. nodulosa* were also included among the type material of *V. repanda*, as the type locality of *nodulosa*, Simonstown, was mentioned as one of the many collecting stations given for *repanda*. In any case the relationship of the three forms as demonstrated by their gonopod structure is so close, that it is not impossible that they are representing geographical variations of one rather widely distributed species.

The location of *Vanhoeffenia* in the *Sphaerotrichopidae* has as the unfortunate consequence that this family name should be changed into *Vanhoeffeniidae*, since the latter name, proposed in the same paper, has page priority over the first. However, for the present this change of name should be avoided, not only because the lot of confusion it might arouse, but also because this change of names might prove to be only a temporary one.

As a matter of fact both names are antedated by one proposed for a Madagascar Polydesmoid species by COOK in 1896. The name meant here is that of *Dalodesmidae* COOK (Brandtia p. 26) based on *Dalodesmus tectus* COOK 1896 (*l.c.*)..Although the description of *Dalodesmus* is too brief to define the relationship of this genus with any degree of certainty, a comparison with the description of *Tuberculatium* ATTEMS 1898, the only Sphaerotrichopid genus known from Madagascar, reveals a striking similarity, so that the identity of these two genera seems far from improbable. It seems therefore senseful to await a re-examination of *Dalodesmus* before dropping the long-established name *Sphaerotrichopidae*.

Philocaffrus engeli nov. spec.

MATERIAL: South Africa: Cape Province: Bam's Gorge, near Wellington, 13 September 1938, Coll. Dr. H. ENGEL, 1 ♂ (holotype), 2 juv. ♂ ♂, 5 juv. ♀ ♀.

COLOUR: pale brownish to dirty white.

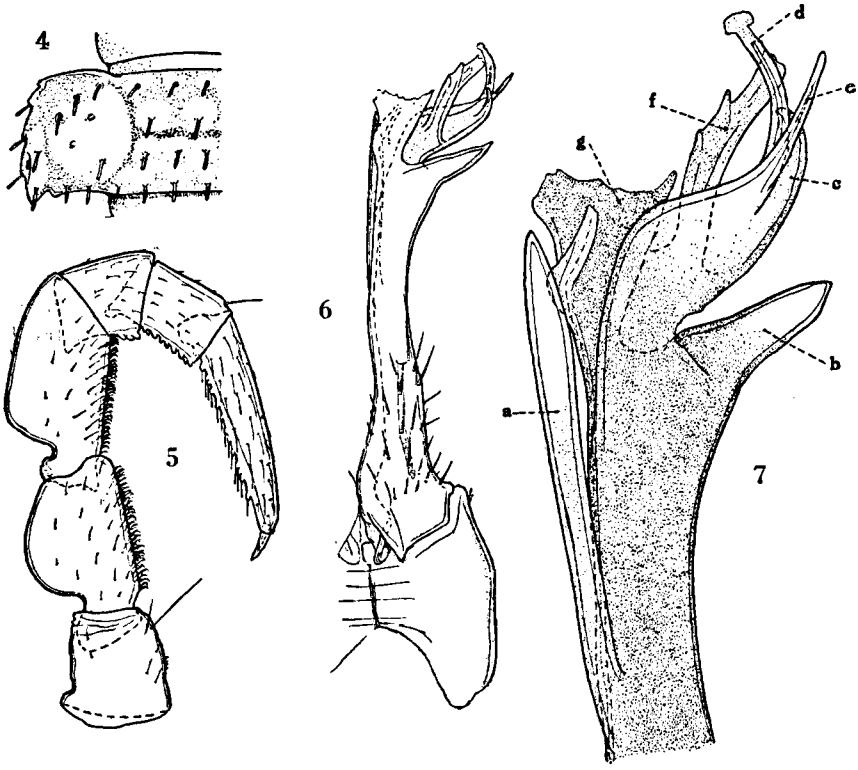
DIMENSIONS: ad. ♂ (20 segments), width 1.3 mm., length 9.5 mm.; juv. ♂ ♂ and ♀ ♀ (19 segments), width 1.3-1.5 mm., length 8.5-10.0 mm.

HEAD AND ANTENNAE: Labrum moderately emarginate, tridentate. Clypeus weakly convex, normally impressed towards the labrum. Lateral borders of clypeus very weakly concave. Headplate, except the upper portion of the vertex, rather densely set with short setae. Antennal sockets separated by almost two times the diameter of one socket, or 1½ times the length of the second joint. Vertex moderately convex, vertigial sulcus fine, hardly impressed. Antennae rather short, clavate, rather densely setiferous especially in the distal joints. 2nd and 3rd joint of subequal length, 4th joint about 3/5th of the 3rd. 6th joint longer than the others, 5th about 3/5th of 6th slightly longer than 4th.

COLLUM: hardly narrower than the head, subsemicircular in dorsal outline. Anterior border evenly rounded, posterior border very weakly emarginate in the middle, weakly convex laterally. Latero-posterior edge sharply rounded, rectangular, slightly raised. Surface hardly convex in the middle, much more so towards the sides, uneven. Along the anterior margin a row of about 20 clubshaped or truncate setae. Along the posterior margin about 14 of such setae, on the surface 4 irregular rows, placed on low swellings.

BODY SEGMENTS (fig. 4): moderately constricted; waist smooth, of moderate width, distinctly demarcated from pro- and metasomites. Teguments dulled by fine cellular structure, especially distinct on prosomites. Metatergites weakly convex, except towards the lateral sides on the anterior segments, where a little inflated. Transverse furrow rather weakly developed on the 3rd, 4th and 18th segments, but very distinct from the 5th up to the 17th. Metatergites with two rows (6 and 4) of setae before the transverse furrow and two rows (6 and 8) behind it. On the keels the setae are more irregularly arranged. Marginal fringes of the posterior border of the somites as described for *P. divisus* ATT. (*vide infra*). Sides without pleural keels.

LATERAL KEELS (fig. 4): well developed. 2nd segment wider than collum and head. Keels somewhat bent downward and reaching more ventrally than collum or keels of the 3rd segment. Anterior border shouldered at the base, straight, transverse on the longitudinal axis. Latero-anterior edge obtusely angular. Lateral margins weakly convex, slightly diverging in the posterior direction, with 4 setiferous notches. Posterior angle obtuse. Posterior border weakly emarginate. 3rd, 4th and 5th segment each somewhat wider than the preceding ones. Keels of 3rd segment subsimilar to those of 2nd, but somewhat less bent downward. Keels from the 4th segment onward horizontal. Posterior edges gradually becoming acute; posterior margins emarginate, with a blunt tooth. From the 3rd segment the latero-posterior edges are projecting behind the posterior margin of



FIGURES 4—7. *Philocaffrus engeli* nov. spec. — (4) Left side of metasomite of 10th segment of holotype ♂, dorsal view. (5) 2nd leg of 8th segment of holotype ♂. (6) Left gonopod of holotype ♂, posterior view. (7) Distal portion of right gonopod of holotype ♂, anterior view. — a, femoral process; b, post-femoral process; c, d, e, f, processes of tibiotarsus; g, solaenomerite.

the somites. Dorsal surface of keels inflated. Posterior, anterior part of lateral, and especially anterior borders with a fine marginal rim. Pores latero-dorsal.

STERNITES AND LEGS : Sternites of middle segments quadrate, with rather deep cross impressions. In the adult male densely set with short setae, similar to those on the ventral surface of the three proximal joints of the legs. Sternite of 5th segment of male with a narrow posterior incision. Sternite of 6th segment not raised above the surface of the ventral side of the ring, so as to make room for the gonopods. On each side a high longitudinal ridge at the base of the legs. Between the anterior and posterior leg the ridge is incised. Gonopod opening transversely elliptical. Legs (fig. 5) of male incrassate, especially the praefemur and femur, except those of the last pairs, which are normally slender. The three proximal joints ventrally densely set with short falcate bristles. Postfemur and tibia ventrally tuberculate; tarsus with setiferous tubercules.

ANAL SEGMENT : with some transverse rows of setae. Tail conical, the sides rather strongly converging, the end narrowly truncate. Valves with

rather strongly raised margins. Scale trapezoidal, the sides weakly emarginate, the posterior margin straight. Setae not on tubercules.

GONOPODS (fig. 6 and 7): Coxae rather small, anteriorly somewhat coalesced with each other. On the anterior side a number of bristles. Praefemur elongate, posteriorly setiferous. Near the distal end on the posterior side of the praefemur is the opening of a praefemoral gland. Femur slender, not demarcated from praefemur. Near the middle of the femur, at its medio-anterior side, a styliform prong arises, indicated as the femoral process (a). The distal portion of the telopodite consists essentially of three parts: a lateral process (b) possibly arising from the postfemur, a medial process (g) or solaenomerite and a tibiotarsus which is subdivided in 4 prongs (c, d, e and f). The spermal channel runs along the medial side of the femur, along the posterior side of the base of the femoral process. It ends on a short process of the solaenomerite, the distal end of the latter being lamellar.

This and the following species were found in an interesting collection of millipeds which was brought together by Dr. H. ENGEL, now Director of the Zoological Museum at Amsterdam, during his stay in South Africa in 1938. I take pleasure in dedicating to Prof. Dr. H. ENGEL both this and one of the following new species. The material is preserved in the Amsterdam Museum.

The new species quite evidently is closely related to *Philocaffrus divisus* ATTEMS (1928, Ann. S. Afr. Mus. **26**: 268, pl. 7, fig. 155-159) from Gt. Winterhoek. The gonopods of the two species are very similar, but *divisus* differs in the following points from *engeli*. The postfemoral branch (b) is much more slender. Branch e (fig. 7) of the tibiotarsus is shorter and branch f quite differently shaped. In the solaenomerite the lamellar portion is also different. The solaenomerite arises somewhat more proximad. The sculpture of the metatergites in *divisus* also appears to be different, having only three rows of setae. However, in view of the close relationship between the two species this point needs verification.

SPIROSTREPTIDAE

Camaricoproctus pauciannulatus nov. spec.

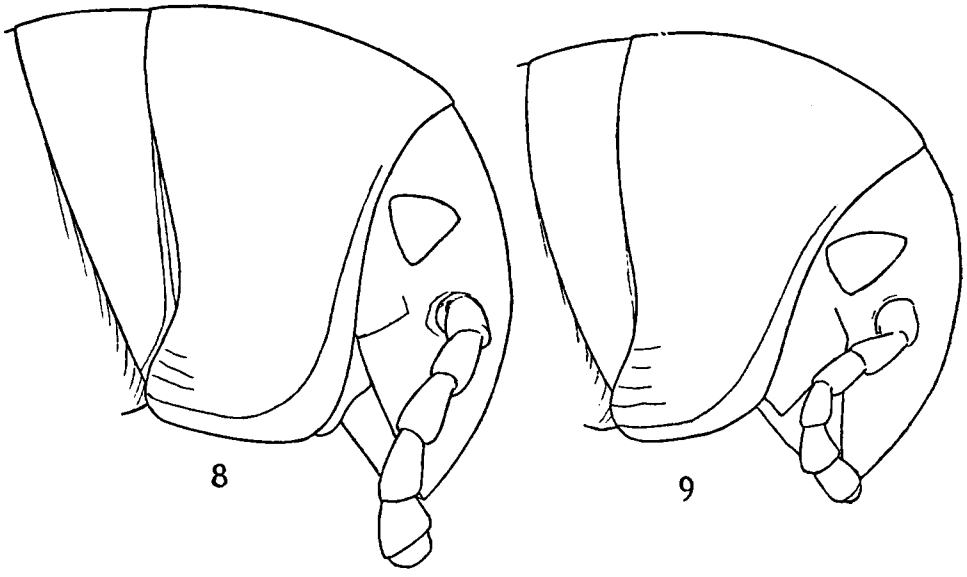
MATERIAL: South Africa: Transvaal: Castle Gorge, between Hartebeestpoortdam and Rustenburg, W. of Pretoria, 6 November 1938, Coll. Dr. H. ENGEL, 1 ♂ (holotype), 2 ♀♀.

COLOUR: faded. Head now dark gray in the vertigial portion, pale brownish in the frontal and clypeal part. Antennae greyish. Collum and subsequent segments dark grey, metasomites somewhat darker, the posterior border transparent, brown. No yellow spots. Legs brownish yellow. Anal segment dark grey.

DIMENSIONS: ♂ holotype, 36(-1) segments (?, fragmented specimen), width 4.4 mm., ♀ paratype, 40(-1) segments, width 4.3 mm., approximate length 32 mm.; ♀ paratype, 39(-1) segments, width 3.6 mm., approximate length 26 mm.

HEAD AND ANTENNAE : Labrum with one strong median tooth, incisions of the two lateral teeth weak or almost obsolete. Clypeus moderately impressed towards the labrum, number of supralabral foveolae inconstant: one in holotype, 4 in the two other specimens. Headplate shining, dispersedly punctate; when seen under high power of magnification rather densely punctulate and finely striolate. Vertex somewhat more densely punctate. Distance between antennal sockets distinctly smaller than distance between the eyes. Eyes separated by about 2½ times the diameter of one eye, composed of about 60 rather convex ocelli (holotype; about 53 in the first paratype ♀). Vertigial sulcus very fine, hardly impressed. Interocular sulcus obsolete. Antennae short, clavate, with the 5th and 6th joints somewhat thicker than the others. 2nd joint longest, somewhat longer than the 6th. 3rd to 5th joints of subequal length, somewhat shorter than the 6th. Distal joints rather densely setiferous.

COLLUM : dispersedly punctate, and rather densely finely punctulate and striolate. Lateral sides broad (fig. 8 and 9), the latero-anterior edge in the male somewhat more narrowly rounded than in female. Posterior border laterally concave. Along the latero-anterior and lateral border a well developed sulcus. Near the latero-posterior edge a few abridged longitudinal furrows.



FIGURES 8—9. *Camaricoproctus pauciannulatus* nov. spec. — (8) Collum and adjacent parts of holotype ♂, from the right side. (9) The same of ♀ paratype.

BODY SEGMENTS : Prosomites dulled by fine cellular structure. 10-12 concentric striae, laterally and ventrally curving towards the suture. The posterior one situated at about 3/5th of the length of the prosomite, reaching the suture above the pore level. Posterior 2/5th of prosomite and anterior 2/5th of metasomite rather densely punctate and striolate. Posterior 3/5th of metasomite dispersedly punctate and rather densely punctulate. Suture well impressed, dorsally with very short striae, which

gradually grow longer towards the sides. At pore level they extend to halfway the metasomite. Not far below the pores they reach the posterior border of the somite. In the lower half of the metasomites the longitudinal striae are moderately deeply impressed and moderately dense. Pores present from the 6th segment onwards, somewhat below the middle of the sides. They are situated in the middle of a small smooth area, close behind the suture.

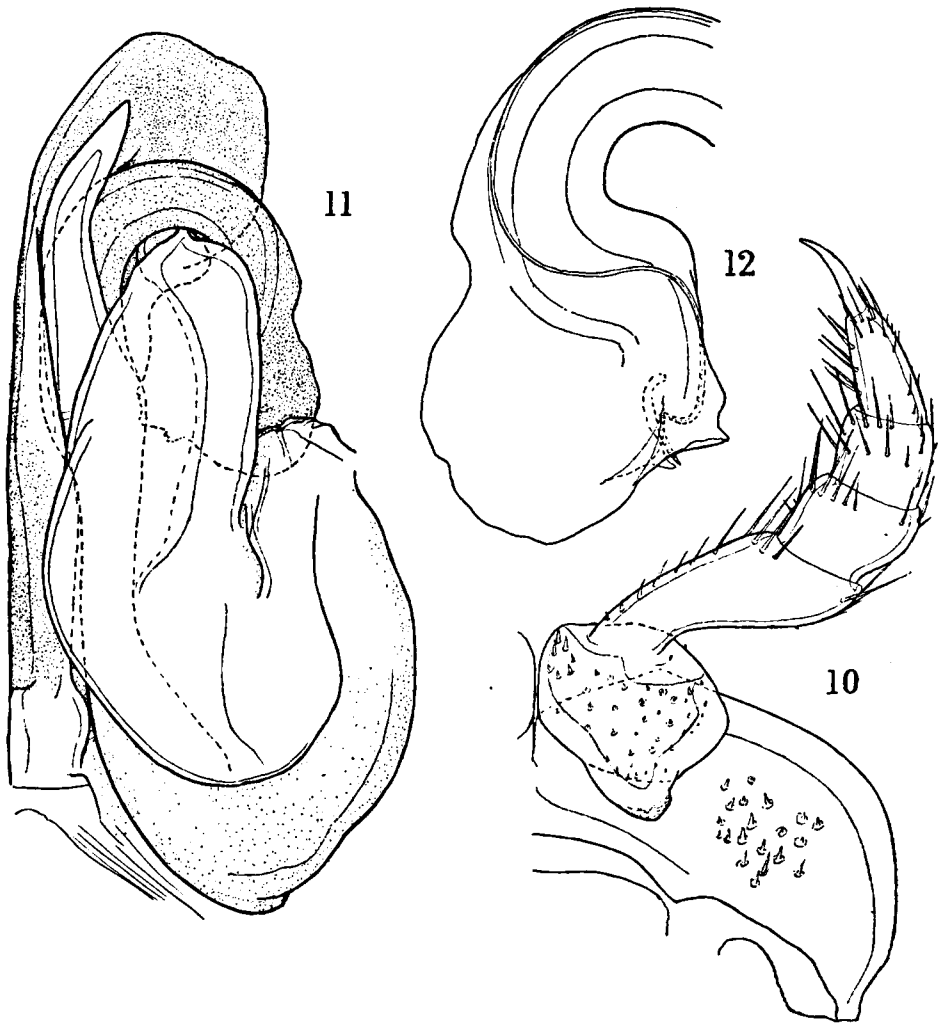
STERNITES AND LEGS : Sternites dulled by fine cellular structure, without transverse striae. Stigmae triangular, not extending laterally of the sternal margins. Legs of moderate length, in the females somewhat shorter than in the male. First pair of the male (fig. 10) with praefemora about half as wide as half of the coxosternum. Medial sides of praefemora converging strongly towards the distal margin of the coxosternum. Basal process directed cephalo-proximad. Entire anterior surface set with short to very short setae. Coxosternum with the usual setiferous area; setae short. The distal margin moderately convex. The two penultimate joints of the legs of the male from the third pair onwards with well developed pulvilli. In most of the legs the length of the 5 distal joints is subequal. All joints with ventral hairs, in the three distal joints arranged in two series, those of the tarsus spiniform. Tarsal claw long and slender; three supra-apical spines, the middle of which is the longest.

ANAL SEGMENT : rather densely punctate and irregularly rugulose. Dorsal lappet ending in a rounded angle of about 160°. Valves moderately convex; marginal rims thick, but hardly raised. Scale broad, posteriorly not angular, but almost straight.

GONOPODS (fig. 11 and 12) : Paracoxite large, about half the length of the entire coxite. Telecoxite simple, distally rounded, without lateral cone. Pargonocoel hairless; distal border oblique, not produced. Telopodite proximad of the knee with a very strongly developed basal process. Distal portion of the free telopodite broad, lamelliform. The spermal channel ends on the tip of a very small solaenomerite. In addition the distal end of the telopodite is complicated by some small lamellae.

From the type and only other known species of the genus, *C. bombycinus* ATTEMS (1928, Ann. S. Afr. Mus. **26** : 345, pl. 12, fig. 293-294) from various localities in the Cape Province, *C. pauciannulatus* may be distinguished by the following characters. *C. bombycinus* has 45-47 segments and a width of 2.5-2.8 mm. The prosomites have only 4 concentric lines. The pores are present from the 5th segment onwards. In the gonopods there are slight differences in the shape of the telocoxite. The telopodite has an additional basal process.

In the characters of the gonopods and in the shape of the collum *Camaricoproctus* ATT. is quite disjunct from the other *Spirostreptidae* known from Africa. It may come nearest to *Metriostreptus* SILVESTRI (1910, Ann. Mus. Genova **44** : 471) based on a single species from Uganda. This relationship is demonstrated by the similarity of the sides of the collum in both genera. For, contrary to the more or less strongly produced anterior angle found in the majority of males of *Spirostreptidae*, this angle is not at all produced but rounded in the males of *Camaricoproctus* and *Metriostreptus*. The emargination above the latero-posterior edge in these two genera is also quite characteristic. In the gonopods the



FIGURES 10—12. *Camaricoproctus pauciannulatus* nov. spec. — (10) Right leg of first pair of holotype ♂, anterior view. (11) Right gonopod of holotype ♂, anterior view. (12) Telopodite of right gonopod of holotype ♂, posterior view.

width of the free telopodite is notable. In particular the distal dilatation of the telopodite in *Camaricoproctus* somewhat suggests the condition found in the genus *Orthoporus* and allies, in which the telopodite ends in a conchiform blade from the base of which a solaenomerite arises. In *Camaricoproctus* as well as *Metriostreptus*, however, the solaenomerite is very small and its relation to the distal portion of the telopodite appears quite different. Both genera are characterised furthermore by the proximal position of the basal process (marked D by SILVESTRY, *l.c.* fig. VII).

At present there remain sufficient characters justifying a generic sepa-

ration of the two genera despite their similarities. *Metriostreptus* has for instance a gonopod-telopodite which is much more complicated in structure than that of *Camaricoproctus* by the presence of no less than four additional processes (marked E, G, H and M by SILVESTRI).

TRIGONIULIDAE

Chersastus ATTEMS

The Spirobolid millipeds occurring in the Southern and South-Eastern part of Africa are medium-sized, generally conspicuously coloured creatures, which, as far as their generic position has been identified, belong to the above mentioned genus. As yet twenty two of them have been described, although it remains to be seen whether an equal number of species is really involved, since half of them has been described before the beginning of this century, thus in a time when a study of the gonopods was either completely ignored or thought to be of only secundary importance, the other half having been published in later years without any reference to previous work.

The first species, *Spirobolus elegans*, was described as far back as 1841 by BRANDT (Recueil de Mém. etc.: 118), a second, *S. luctuosus*, by PETERS in 1855 (Monatsber. K. Akad. Wiss. Berlin **1855** : 80) and a third, *S. litoralis*, by L. KOCH in 1865 (Verh. Zool. Bot. Ges. **15** : 884). Of great importance has been the work of VON PORAT, who in 1872 (Öfvers. Vet. Ak. Förh. 1872 (5): 17-22) described 5 new species: *S. strigosus, S. formosus, S. coriaceus, S. saussurii* and *S. tessellatus*, besides giving a re-description of *S. elegans* after specimens presumed to be identical with BRANDT's originals. In 1893 POCOCK (Ann. Mag. Nat. Hist. (6) **11** : 138) described *S. digrammus* and discarded the name *S. tessellatus* POR. as a synonym of *S. litoralis* KOCH. In the same year VON PORAT (Bih. Sv. Ak. Handl. **18** (7) : 31-34) added three more species, *S. arcuosus, S. pococki* and *S. sabulosoides*. Finally, mention must be made of the fact that COOK in 1897 (Brandtia p. 74) introduced a new genus name, *Centrobolus*, for *S. luctuosus* PET.

Very little, if anything, is known about the gonopods of these species, which implies that without further evidence they can neither be recognised with any degree of certainty, nor be located systematically. Still, the earlier work, especially that by VON PORAT, is of a high standard and even today deserves appraisal for the accuracy with which the external characters of the species were studied.

The only author who has since studied members of this group, has been ATTEMS, who in 1928 (Ann. S. Afr. Mus. **26** : 300-308) recognised its Trigoniulid characters and proposed a new genus *Chersastus*, distinguishable from *Trigoniulus* POCOCK by the absence of minute scales on the so-called tibial process of the posterior gonopods, to which, aside from some Madagascar and Indonesian species, he assigned 7 new species from Southern Africa: *C. fasciatus, C. splendidus, C. ruber, C. silvanus, C. vulpinus, C. atrophus* and *C. inscriptus*. Three more of these were added in 1934 (Ann. Natal Mus. **7** : 477-480): *C. vastus, C. anulatus* and *C. striolatus*.

Unfortunately the study of the gonopods has obviously induced to some degree the neglect of the external characters previously used by VON PORAT for distinguishing his species. In any case a comparison of the descriptions from the two periods is almost impossible. It is moreover quite unintelligible why ATTEMS discarded all the species of the first period as *'Spiroboloidea incertae sedis'*, since with the evidence he had in hand it became quite apparent that the majority of them are *Trigoniulidae*, in all probability belonging to *Chersastus*. At least, referring VON PORAT's species to *Chersastus* would not have been more venturous than was the assignment to this genus of *C. striolatus*, of which only the female is known.

Chersastus angelicus nov. spec.

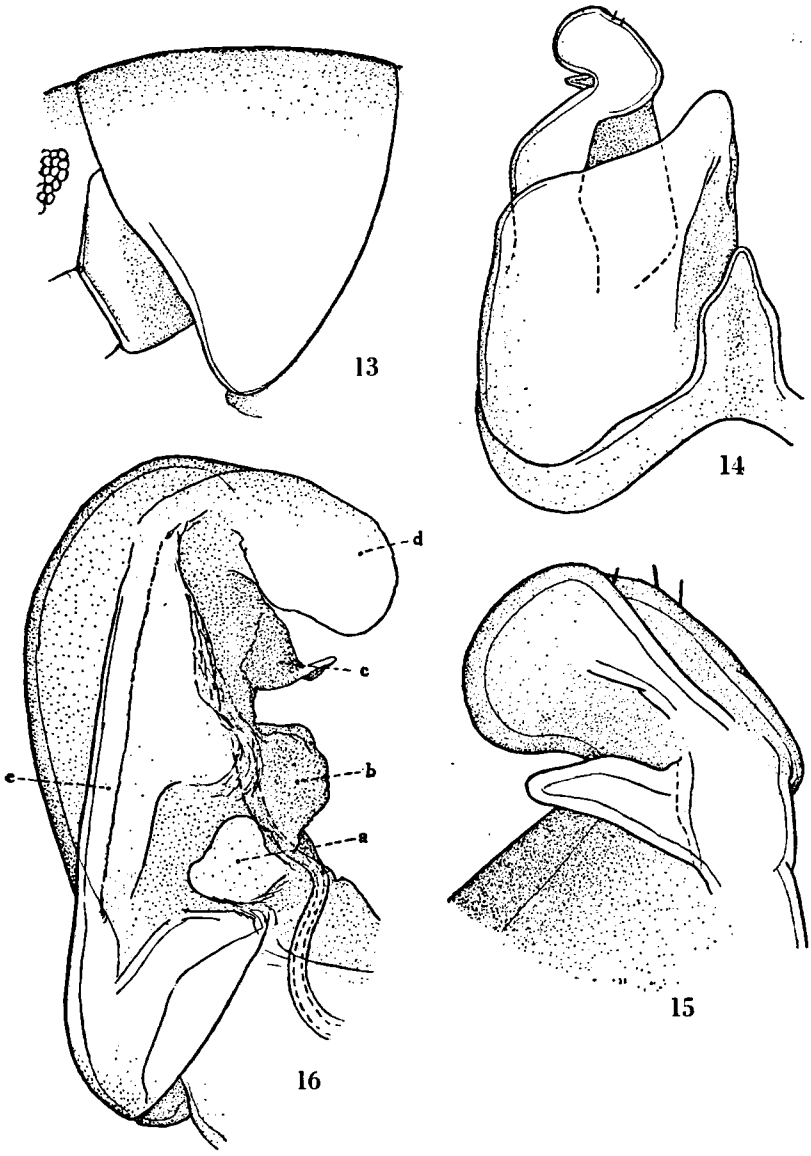
MATERIAL: South Africa: Cape Province: Pluto's Vale, near Grahamstown, 1 September 1938, Coll. Dr. H. ENGEL, 1 ♂ (holotype); near Grahamstown, 22 September 1938, Coll. Dr. H. ENGEL, 1 ♂.

COLOUR: Head very dark brown, almost black, with the lower part of the clypeus and its lateral margins pale brownish. Antennae also very dark brown. Collum deep red, the posterior quarter black except for a narrow reddish zone along the posterior margin. Subsequent segments red in the upper half with the posterior third or quarter black except for a reddish marginal zone; below the pores black. Legs dark brown, the proximal joints slightly paler, the tip of the tarsi conspicuously pale brownish. Anal segment, valves and scale red, the margins of the anal segment narrowly blackened (not in paratype).

DIMENSIONS: ♂ holotype, 43(-1) segments, width 6.2 mm.; ♂ paratype, 43(-1) segments, width 5.3 mm.; approximate length 5.5 to 6.5 cm.

HEAD AND ANTENNAE: Labrum probably normally tridentate with four weak incisions. However, in the holotype the labrum is bidentate with a deep median incision, possibly due to an injury during the course of development. Labral emargination weak. Labrum rather deeply impressed, clypeal angle about 120°. Clypeus with 4 foveolae. The median sulcus rather deeply impressed at the margin, but rapidly growing finer and fading away towards the frontal region. Headplate up to the lower portion of the vertex finely and moderately densely punctulate. Posterior portion of vertex more coarsely punctulate. Vertigial sulcus fine but distinct, disappearing between the eyes. Eyes separated by about 2½ times the largest diameter of one eye, composed of 41 to 44 ocelli each, arranged in 8 or 9 rows, in holotype numbering from above to below as follows: 2, 4, 4, 5, 6, 6, 6, 6, 5, and 3, 4, 5, 6, 6, 6, 6, 5, respectively. Ocelli flat. Antennae short, proximal joints almost hairless, distal joints rather densely setiferous. Length of joints 2 to 5 gradually decreasing, 6th joint about as long as 5th and about half as long as 2nd. 5th joint thickest, the 6th slightly thicker than the 4 proximal ones, which are of subequal width. 4 sensory cones.

COLLUM (fig. 13): Surface finely punctulate like the head, but with additional rather coarse punctae, which are dispersed over the entire surface. Sides widely emarginate behind the cheeks (in paratype somewhat



FIGURES 13—16. *Chersastus angelicus* nov. spec. — (13) Left side of collum of holotype ♂. (14) Left anterior gonopod of holotype ♂, anterior view. (15) Terminal portion of right anterior gonopod of holotype ♂, posterior view. (16) Posterior gonopod of holotype ♂, telopodite. — a, inflated basal lobe; b, tibial process; c, d, distal lamellae; e, chitinous ridge.

less than in holotype). Anterior margin with a fine premarginal sulcus up to the level of the eyes. Lateral edges narrowly rounded.

BODY SEGMENTS: Anterior segments not concave ventrally. Prosomites divided by a fine but complete line into two zones. The first zone,

normally covered by the preceding somite, has the surface dulled by fine cellular structure and some fine transverse striae. Scobinae present from about the 5th segment onwards up to the penultimate segment. On a few anterior segments they are rather weakly developed but on the majority of the segments they are)-shaped impressions separated from each other by about 2 or 2½ times the width of one segment. The impressions are followed up by long triangular areas of very fine transverse ridges, which extend almost to the transverse line. The second area of the prosomites has a more shining surface and is finely longitudinally striolate and punctulate. Except on the posterior part it has dorsally fine undulating, partly interrupted transverse striae. More laterally these are curving in a ventro-posterior direction, extending over the second part of the second zone and reaching the suture just below the pores. In the lower quarter of the somites they are arranged more densely. Below the pore-level the prosomites are demarcated from the metasomites by a weakly impressed suture. The pores are lying somewhat above the middle of the segments, from the 6th segment onwards. They are rather large and situated before the suture, at a distance of hardly the diameter of one pore. Metasomites shining, the anterior half dispersedly, but rather coarsely punctate, the posterior half very finely punctulate to smooth. Along the posterior margin there are fine longitudinal striae, very short or almost obsolete on the dorsal part of the metasomite, but gradually growing longer below the pore level and in the lower quarter extending over the entire length of the metasomite, being continuous with the striae of the second zone of the prosomite.

STERNITES AND LEGS: Sternites with about 8 rather coarse transverse striae. Legs without coxal processes, of moderate length. Length of joints: $3 = 6 > 2 > 4 = 1 > 5$. Claw rather long. Except in a few of the anterior legs the first to the 4th joint each with one ventro-terminal hair, the 5th with two, the 6th with one supra-apical and a number of ventral bristles arranged in two rows. Tarsal pads present from the 3rd pair up to and inclusive the 2nd pair of the 37th or first pair of the 38th segment.

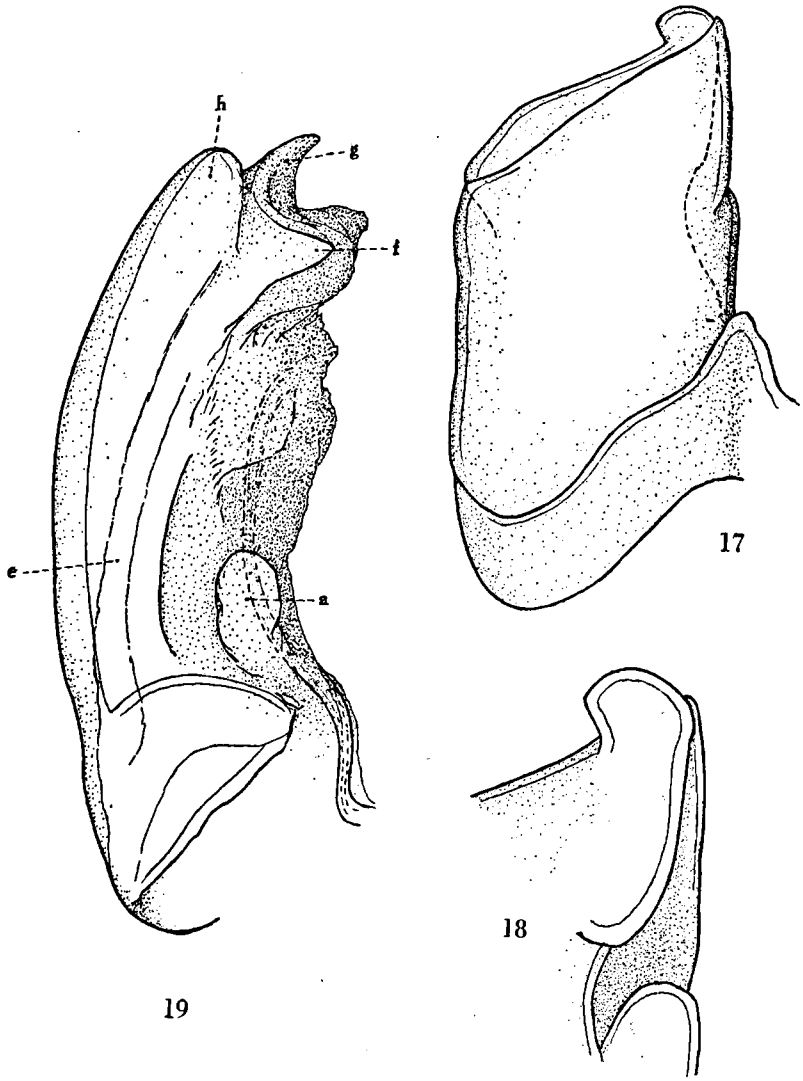
ANAL SEGMENT: Rather dispersedly and coarsely punctate and finely longitudinally striolate. Upper lappet with sides widely concave, posterior angle about 120°, narrowly rounded. Valves weakly convex, striolate punctulate. Margins thickly rounded, smooth, demarcated by a rather weak premarginal depression, but not by a distinct sulcus. Scale broadly triangular, longitudinally striolate, weakly emarginate at the sides, posterior angle of about 135°, narrowly rounded.

GONOPODS: Anterior gonopods (fig. 14) with medial process of sternite reaching approximately halfway of the basal joints. Process in the proximal half almost parallel-sided, distally triangular. Distal joint with a rounded terminal knob (fig. 15), the latter showing on the posterior side of the base a little process directed laterally. Terminal knob with some tiny hairs. Posterior gonopods (fig. 16) with an inflated lobe at the base of the telopodite (a). Tibial process (b) rather short and broad, the spermal duct opening at the distal side of its base. Distal end of telopodite with two lamellae (c and d). Longitudinal chitinous ridge (e) well developed, almost complete to the distal end.

Chersastus erythroproctus nov. spec.

MATERIAL: South Africa: Cape Province: Plettenbergbay, 18 September 1938, Coll. Dr. H. ENGEL, 1 ♂ (holotype).

COLOUR: Head black in the frontal and upper clypeal region, reddish orange in the lower clypeal part; vertex and lateral parts of the head dark reddish brown. Antennae orange red. Collum black with narrow pale margins. Somites black, the ventral quarter reddish. Prosomites each with



FIGURES 17—19. *Chersastus erythroproctus* nov. spec. — (17) Left anterior gonopod of holotype ♂, anterior view. (18) Terminal portion of right anterior gonopod of holotype ♂, posterior view. (19) Posterior gonopod of holotype ♂, telopodite. — a, inflated basal lobe; e, chitinous ridge; f, g, h, distal processes of telopodite.

a pair of paramedian, quadrate, reddish orange spots; metasomites with narrow pale posterior margins. Legs orange red. Anal segment black, the margins of the valves reddish orange.

DIMENSIONS: ♂ holotype: 44(-1) segments, width 3.3 mm.

HEAD AND ANTENNAE: Labrum tridentate, clypeal angle 90°. Posterior portion of vertex somewhat more coarsely rugulose and punctulate. Eyes separated by about three times the diameter of one eye, each composed of 30 to 32 flattened ocelli arranged in 7 rows as follows: 1, 3, 5, 6, 6, 6, 3 and 1, 4, 5, 6, 6, 6, 4, respectively. Length of 3rd, 4th and 5th antennal joints subequal, shorter than 2nd and longer than 6th. Length of 6th joint about ¾ of 2nd.

COLLUM: Surface rather dispersedly but distinctly punctate, though not as coarsely as in *angelicus*. Sides anteriorly very weakly concave.

BODY SEGMENTS: Transverse line dividing the prosomites incomplete and only partly distinct. First zone of prosomites without or with very few transverse lines. Scobinae absent or very weakly indicated by minute striolae. 2nd zone of prosomites with transverse striae more short and interrupted; they extend laterally over the 2nd part of the 2nd zone, but do not reach the suture above the lower quarter of the segment. Surface of 2nd zone of prosomites and of the anterior portion of the metasomites longitudinally striolate and punctulate and rather dispersedly punctate. Posterior portion of metasomites smooth and shining. Suture visible below the pores, distinct only in the lower quarter of the segments. Pores very close to the suture.

STERNITES AND LEGS: Sternites with about 9 transverse lines. 6th joint of legs somewhat longer than 3rd. 2nd joint as long as 4th. Tarsal pads present up to last leg.

ANAL SEGMENT: Sides of dorsal lappet hardly emarginate. Marginal rim of valves set off by a depression which in some part of its length is a furrow. Margins thickly rounded in their lower half, more narrowly so in the upper half.

GONOPODS: Median process of sternite of anterior gonopods (fig. 17) triangular, reaching distad to about 1/3rd of the length of the proximal joint. Proximal joint with a medial incision. Distal joint with a rounded terminal knob (fig. 18) without hairs. No process at the posterior side of its base. Tibial process of posterior gonopods absent (fig. 19). Inflated lobe (a) present. Distal end of telopodite with three short processes (f, g and h). Of these f and g may be homologous with either d, or d and c, in *angelicus*, h is absent in *angelicus*. Longitudinal chitinous ridge rather weakly developed (e).

In the characters not mentioned *erythroproctus* agrees with *angelicus*.

Chersastus silvanus ATTEMS

MATERIAL: South Africa: Cape Province: Boschkreek, near Knysna, 17 September 1938, Coll. Dr. H. ENGEL, 1 ♂, 1 ♀, 2 juv. ♀ ♀; Knysna, 18 September 1938, Coll. Dr. H. ENGEL, 1 ♂, 1 ♀.

COLOUR: in most specimens indistinct by preservation. In the specimens the condition of which seemed best, it is as follows: Head and antennae

reddish, with only the eyes black. Collum red with two paramedian black bands, which do not reach the anterior margin; in addition on each side a very large black spot. Body segments with two dorsal black bands and, on each side, a broader black band at pore level. The rest of the somites reddish. Legs reddish. Anal segment reddish with the black longitudinal bands not reaching the posterior margin.

DIMENSIONS: ♂, 44(-1) segments, width 4.3 mm.; ♀ 44(-1) segments, width 5.2 mm.; juv. ♀, 44(-4) segments, width 3.3 mm.; juv. ♀, 27(-6) segments, width 1.7 mm.; ♂, 44(-1) segments, width 4.5 mm.; ♀, 44(-1) segments, width 5.4 mm.

HEAD AND ANTENNAE: Labrum tridentate, clypeal angle about 130°-140°. Headplate densely punctulate, with some transverse wrinkles. Posterior portion of vertex also very finely and irregularly rugulose. Eyes separated by 2 times the diameter of one eye, each composed of 9 rows of rather convex ocelli, 48 to 51 in the males, 53 to 55 in the females. In one male the ocelli are arranged as follows: 3, 4, 5, 6, 6, 6, 7, 7, 5 and 3, 4, 5, 6, 7, 7, 7, 7, 5, respectively. 6th joint of antennae about 2/3rd of 2nd.

COLLUM: hardly emarginate at the anterior margin. Surface finely punctulate.

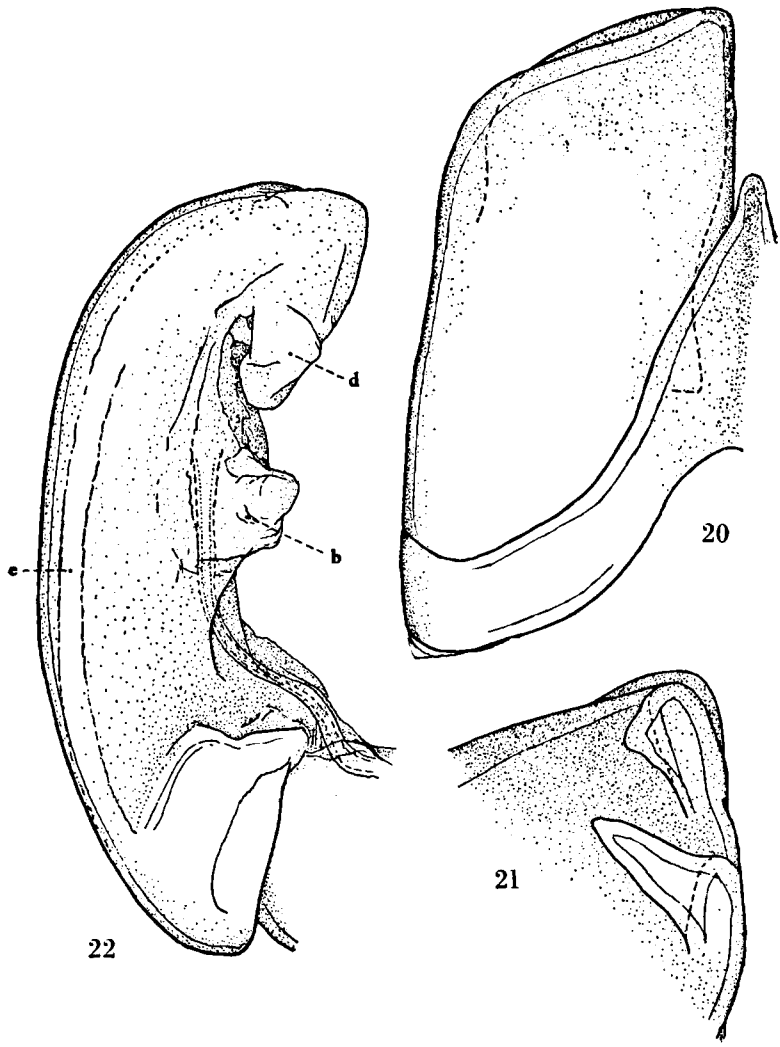
BODY SEGMENTS: First zone of prosomites of males as in *angelicus,* in females much more sharply demarcated from the 2nd zone. Scobinae weakly to well developed. In some specimens represented by emarginations of the anterior border of the metasomites, with the triangular zones of fine ridges indistinct or absent. In other specimens well developed as in *angelicus,* in which case they are separated by the width of one to one and a half of one scobina. Generally they are present from about the 7th segment, disappearing between the 30th to 38th segment. Sculpture of 2nd zone of prosomites and metasomites in male specimens as in *angelicus,* but without coarse punctae. In the female specimens the sculpture is much more coarse. The transverse lines of the dorsum are present also on the 2nd half of the 2nd zone of the prosomites and even on the anterior part of the metasomites. Punctulation and striolation in females also more coarse. Suture more distinctly impressed than in the preceding species, also visible above the pores.

STERNITES AND LEGS: Sternites with about 12 striae. The 5th joint of the legs with one ventro-terminal hair, eventually accompanied by a much smaller one. Tarsal pads present up to the 2nd leg of the 36th segment.

ANAL SEGMENT: Upper lappet with sides hardly concave. Posterior angle of about 100°. Valves hardly convex, the margins thickly rounded, not demarcated by a sulcus or depression. Posterior angle 120°-130°.

GONOPODS: Median process of sternite of anterior gonopods (fig. 20) narrowly triangular, reaching to about 3/5th of the length of the proximal joints. Distal joints (fig. 21) without a terminal knob. At the posterior side a small, broad distal lappet and somewhat more proximally a narrow triangular process directed laterally. Posterior gonopods (fig. 22) without an inflated lobe at the basis of the telopodite, but with a short, broad tibial process (b). Distal end with a proximally directed lobe (d). Chitinous ridge (e) weakly developed.

In characters not mentioned here, *silvanus* agrees with the description of *angelicus.*



FIGURES 20—22. *Chersastus silvanus* ATTEMS. — (20) Left anterior gonopod of ♂ from Boschkreek, anterior view. (21) Terminal portion of right anterior gonopod of same ♂, posterior view. (22) Posterior gonopod of same ♂, telopodite. — b, tibial process; d, distal process of telopodite; e, chitinous ridge.

Before discussing the relationship of the presently described new species, it seems best to review all the known forms according to their geographical distribution. In the map (fig. 23) the localities of the *Spirobolida* described from Africa south of 20° S. are indicated by numbers to which will be referred in the following text.

I. — As will be seen at once, one species, *Spirobolus arcuosus* POR. 1893, from Damara (1) is geographically so disjunct from those occuring in the area from Capetown to Inhambane, that for this reason alone a

close relationship to the other forms already seems doubtful. However, *arcuosus* is also morphologically quite distinct, for instance by having 54 segments as against 40 tot 47 in the other species, by a suture which is dorsally distinct, by having no scobinae and by lacking the tarsal pads of the male. Unfortunately, the gonopods of *arcuosus* have been described inadequately and no other Spirobolid is known from the same area so that we do not have the slightest hint as to its generic position.

On the other hand, a comparison of the descriptions of the other 23 species, in spite of the fact that the gonopods of only a minority are known, quite evidently shows that these are belonging to one systematic category*). At this moment of course it is impossible to ascertain whether one or more genera are involved, but in any case there are two generic names available, *viz. Centrobolus* COOK and *Chersastus* ATTEMS, the former of which having priority. Therefore it seems best to refrain from nomenclatorial changes, pending a more comprehensive study of this group.

II. — Not less than 6 species have been recorded from Capetown and its wider surroundings. These are: *S. pococki* POR. 1893 from Capetown (2), *S. sabulosoides* POR. 1893 from the same locality (3), *S. digrammus* POC. 1893 from Simons Bay near Capetown (4), *C. fasciatus* ATT. 1928 from various localities around Capetown, ranging from Tulbagh to the River Zonder End (5), *C. atrophus* ATT. 1928 from three localities near Capetown (6) and finally *S. tessellatus* POR. 1872 from Capetown (17).

Doubtlessly, a study of the types involved will greatly reduce the number of species known from this area. POCOCK already suggested the identity of the *tessellatus* specimen from Capetown with his *digrammus*. Moreover a comparison of *digrammus* with *sabulosoides* and *fasciatus* yields hardly any character of distinction. According to the descriptions *sabulosoides* can be separated from *digrammus* by the absence of the tarsal pads of the male. Considering the males of all species known from Capetown to Inhambane are provided with tarsal pads, one may suspect VON PORAT of having described a subadult male. The description of the gonopods of *sabulosoides* seems to indicate also that these organs were not fully developed. *C. fasciatus* has the same characteristic coloration as the two others and although ATTEMS' description does not offer sufficient possibilities for comparison, what is known of the morphology of his species conforms with the two other species. The drawing of the anterior gonopods of *digrammus* seems to correspond with those of *fasciatus*.

The two other species, *pococki* and *atrophus*, may be identical. Even the description of the anterior gonopods of *pococki* agrees with the situation present in *atrophus*. The only difference to be found between the two species is, that in *atrophus* scobinae are missing, whereas these are present in a few of the anterior segments in *pococki*. As was indicated in the above description of *silvanus* this character is a variable one, and of little use for the distinction of species.

*) *S. mundulus* KARSCH 1881 (*Z.* ges. Naturw. **54** : 58) from *'Prom. Bonae Spei'*, which was overlooked by ATTEMS in 1928, is not taken into consideration here, on account of its totally insufficient description. It does not belong to this group, having about 60 segments and 8 or more supralabral foveolae.

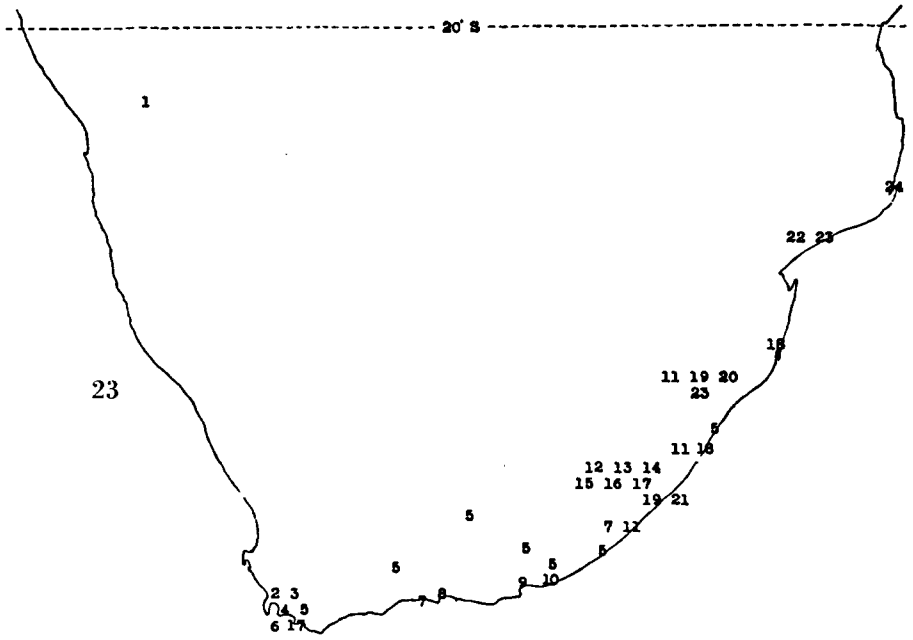


FIGURE 23. Map of Africa south of 20° S. showing the known distribution of the *Spirobolida*. 1, *Spirobolus arcuosus* POR.; 2, *S. pococki* POR.; 3, *S. sabulosoides* POR.; 4, *S. digrammus* POC.; 5, *Chersastus fasciatus* ATT.; 6, *C. atrophus* ATT.; 7, *C. silvanus* ATT.; 8, *C. erythroproctus* nov. spec.; 9, *S. litoralis* KOCH; 10, *C. angelicus* nov. spec.; 11, *C. ruber* ATT.; 12, *S. strigosus* POR.; 13, *S. formosus* POR.; 14, *S. elegans* BRDT-POR.; 15, *S. coriaceus* POR.; 16, *S. saussurii* POR.; 17, *S.tessellatus* POR.; 18, *C. inscriptus* ATT.; 19, *C. vastus* ATT.; 20, *C. anulatus* ATT.; 21, *C. striolatus* ATT.; 22, *C. splendidus* ATT.; 23, *C. vulpinus* ATT.; 24, *Centrobolus luctuosus* (PET.).

III. — From the area between Swellendam and East London comparatively few species have been recorded. *C. fasciatus* ATT. 1928 has been recorded from Prince Albert, Graaff Reinet, Cookhouse, Grahamstown and East London (5). *C. silvanus* ATT. 1928 from Knysna (7), *C. erythroproctus* nov. spec. from Plettenbergbay (8), *S. litoralis* KOCH 1865 from Algoabay (9), and *C. angelicus* nov. spec. from Grahamstown (10).

Of these five species, all but *angelicus* are longitudinally banded. The first two, *fasciatus* and *silvanus*, differ from *litoralis* in having the reddish dorsal bands continuous, instead of these being composed of two series of spots lying somewhat remote from the posterior margin of the segments.

In this latter character *erythroproctus* agrees with *litoralis*, but *litoralis* appears to be distinguishable by the colour of the head, which was described as reddish brown, thus, without a dark frontal region. Furthermore, no mention was made of the conspicuous red margins of the anal valves. Unfortunately, the description of *litoralis* does not offer further possibilities for comparison, mentioning only characters of generic value.

Of the other *Spirobolida* from Southern Africa the gonopods of which are unknown, *C. erythroproctus* comes nearest to *S. tessellatus* POR. 1872 from Caffraria. This species has been put into the synonymy of *litoralis*

by POCOCK, an action for which no reasons were offered. Indeed, the description of *litoralis* fits very well with *tessellatus* though on account of its incompleteness the eventual identity of the two can only be inferred from their similarity in colour. *C. erythroproctus* thus differs from *tessellatus* in the same colour features as it does from *litoralis*. No other distinguishing morphological characters could be found.

C. angelicus is the only species known from this area without longitudinal bands. *S. pococki* may be distinguished from it by colour, the lower number of ocelli: only 25 to 30 as against 41 to 45, etc. Of the species described by VON PORAT from Caffraria, *angelicus* belongs in the group which has a clypeal angle of more than 90°, thus among *S. formosus, S. elegans* and *S. coriaceus*. Of these *formosus* is longitudinally banded, apparently differing also in sculpture and by having only one ventroterminal hair on the 5th joint of the legs. *S. elegans* and *coriaceus* have the metasomites red instead of black, the distance between their eyes is 1½ instead of 2½ times the diameter of one eye, and the number of ocelli is considerably larger than in *angelicus*, being 60 and 55 as against 41 to 44. The sculpture of these two forms appears to be different too, and they are said to have only one subapical hair on the 5th joint of the legs. *C. striolatus* ATT. from Port St. Johns, based on a female, in colour comes close to *angelicus*, but the metasomites are black dorsally of the pores only. It differs furthermore in the coarsely striolate posterior portion of the prosomites and the metasomites. However, as pointed out in the above description of *silvanus* the sculpture of the segments in one species may be subject to considerable variation, the females of *silvanus* being much more coarsely striolate and punctate than the male specimens. Analogous to the condition found in *silvanus* it may be possible that the males of *striolatus* will prove to have a quite normal sculpture. *Centrobolus luctuosus* (PET.) from Inhambane has all the legs of the male, except the first two pairs. provided with tarsal pads; it is entirely black to dark brown in colour.

IV. — In the eastern part of the Cape Province the following species occur: *C. silvanus* ATT. 1928 and *C. ruber* ATT. 1928 from Kentani (7, 11), *S. strigosus* POR. 1872, *S. formosus* POR. 1872, *S. elegans* BDT.-POR. 1872, *S. coriaceus* POR. 1872, *S. saussurii* POR. 1872 and *S. tessellatus* POR. 1872 all from Caffraria (12 to 17), *C. vastus* ATT. 1934 and *C. striolatus* ATT. 1934 both from Port St. Johns (19, 21).

In this area *strigosus, formosus* and *tessellatus*, and *vastus* and *silvanus* are provided with reddish paramedian bands. *C. silvanus* may be distinguished from *strigosus* and *formosus* by the entirely reddish colour of the head and by the larger number of ocelli: 48 to 55 as against 44. From *tessellatus* it differs by the continuity of the dorsal bands, and by having only one subapical hair on the 5th joint of the legs. *S. tessellatus* also has a smaller number of ocelli: 35. *C. vastus* in colour comes nearest to *formosus* and particularly to *strigosus*, but *formosus* appears to differ in having two reddish paramedian spots on the collum and *strigosus* has concentric striae on the dorsal side of the metasomites, which in *vastus* are 'polished like a mirror', apparently in both sexes.

The colour if *ruber* approaches that of *elegans* and *coriaceus*, but *elegans* has the prosomites black instead of red, and *coriaceus* has a dorsal black spot on the prosomites. The sculpture of *striolatus* evidently sug-

gests that of *strigosus,* but the colour of the two species is different. In colour *striolatus* is more like *saussurii* but the metasomites of the latter are entirely dark, whereas in *striolatus* they are black dorsally and red-brown below the pores.

V. — From Natal and Zululand are known: *C. fasciatus* ATT. 1928 from Merebank, Durban (5), a doubtful record based on a female, *C. ruber* ATT. 1928 from Ifafa and Umzimkulu (11), *C. inscriptus* ATT. 1928 from Scottsburgh and East Zululand (18), *C. vastus* ATT. 1934 from Ifafa (20), and *C. vulpinus* ATT. 1928 from Izotsha (23).

Although in the earlier period no species have been described from this area, a comparison of the forms mentioned above with those described by VON PORAT from nearby Caffraria may be of some use.

C. fasciatus differs from *tessellatus* by the dark vertex and the continuous dorsal bands, and in having no scobinae; from *strigosus* by the sculpture of the metasomites, by the continuity of the dorsal bands and by having the anal segment black instead of ferrugineous.

C. inscriptus may be at once distinguished from *elegans* and *coriaceus* by the black metasomites. In this character it resembles *saussurii,* but the latter has the clypeal angle acute, lacks scobinae and has no anterior red margin on the collum. *C. anulatus* may be a re-description of *elegans,* as it has the same characteristic coloration, whereas *vulpinus* cannot be satisfactorily separated from *coriaceus.*

VI. — Lorenço Marquez has only three known species: *C. splendidus* ATT. 1928 and *C. vulpinus* ATT. 1928 from Chai Chai (22, 23), and *Centrobolus luctuosus* (PET. 1855) from Inhambane (24).

C. luctuosus may be separated from all other species by its entirely black to dark brown colour. It comes near to *splendidus* by the male having tarsal pads up to the last legs. *C. splendidus* has the head and collum dark red.

On account of the above discussion a re-examination of the type material may result in the synonymy of the following species:

S. digrammus POC. = *S. sabulosoides* POR. = *C. fasciatus* ATT.
S. pococki POR. = *C. atrophus* ATT.
S. litoralis KOCH = *S. tessellatus* POR.
S. elegans BRDT.-POR. = *C. anulatus* ATT.
S. coriaceus POR. = *C. vulpinus* ATT.

As a matter of fact coloration in millipeds is a character too precarious to be of any use as the sole distinctive character between species. Variability in Europe in a common species like *Schizophyllum sabulosum* (L.) is known to range between a uniform black and a situation in which broad continuous yellowish dorsal bands predominate. Similar conditions may well exist among the present group; they are at least indicated by such forms as *C. vastus* ATT. and *C. anulatus* ATT., which are said to have identical gonopods, but which are entirely differently coloured. However, with our present poor knowledge of the group it is entirely impossible to judge the systematic value to be ascribed to these forms.

The following key, based almost exclusively on colour characteristics, is not meant to be indicative of any relationship, but is to serve merely as a guide to the published descriptions, whatever value these may have.

1) Longitudinally banded: dorsal portion of segments either with two reddish paramedian bands or a series of spots on a dark background, or with a series of dark median spots on a reddish ground colour 2
—) Segments unicolorous or transversely annulated 9
2) Head black or black to ferrugineous in the clypeal part; antennae black; legs black to dark ferrugineous. Segments reddish with a black dorsal spot on the prosomites ..... *S. coriaceus, C. vulpinus*
—) Head entirely red or reddish brown, or partly red, partly black; antennae red. Legs red to ferrugineous 3
3) Head entirely red or reddish brown 4
—) Head partly black, partly red 5
4) Dorsal bands composed of two series of reddish paramedian spots somewhat remote from the margins of the metasomites. Anal segment black ..... *S. litoralis, S. tessellatus*
—) Dorsal bands continuous, eventually the median black band divided by a median reddish band. Anal segment reddish ..... *C. silvanus*
5) Anal segment and valves entirely dark red, with eventually only the top infuscate 6
—) Anal segment black, valves entirely red or with red margins ... 8
6) Collum black, anterior margin and two paramedian spots red .... *S. formosus*
—) Collum black, with only the anterior margin red 7
7) Metasomites polished, smooth ..... *C. vastus*
—) Metasomites transversely striate dorsally ..... *S. strigosus*
8) Anal valves black with reddish margins. Dorsal bands composed of two series of spots on the prosomites ..... *C. erythroproctus*
—) Anal valves reddish. Dorsal bands continuous ..... *S. digrammus, S. sabulosoides, C. fasciatus*
9) Metasomites red. Head, antennae and legs black 10
—) Metasomites at least dorsally of the pores black 11
10) Prosomites black ..... *S. elegans, C. anulatus*
—) Prosomites red ..... *C. ruber*
11) Legs black or very dark brown 12
—) Legs ferrugineous, yellowish brown, or brownish yellow 14
12) Colour entirely black to dark brown ..... *C. luctuosus*
—) Prosomites at least dorsally not black 13
13) Metasomites entirely black, not coarsely striolate ... *C. angelicus*
—) Metasomites black above the pores, dark red brown in the sides, densely and rather coarsely striolate ..... *C. striolatus*
14) Head and collum without red colour. Legs yellowish .... *S. pococki, C. atrophus*
—) Head or at least collum partly red. Legs ferrugineous to dark yellowish brown 15
15) Head and collum dark red ..... *C. splendidus*
—) Head and collum partly black 16
16) Collum black with a red anterior margin ..... *C. inscriptus*
—) Collum red in the middle and at the sides ..... *S. saussurii*

Up to now the gonopods of only 9 species have been described or depicted sufficiently to enable a comparison with the forms described as new in the present paper. These are *C. fasciatus, splendidus, ruber, silvanus, vulpinus, atrophus, inscriptus, vastus* and *anulatus*.

In the shape of the anterior gonopods *C. angelicus* suggests *atrophus, inscriptus, vastus* and *anulatus*, in particular as regards the shape of the terminal knob of the distal joint. However, *angelicus* differs in lacking the setiferous tubercules on this knob, present in the 4 species mentioned. Other differences in the anterior gonopods, as for instance in the sternite, will be found by actual comparison of the drawings. The distal portion of the posterior gonopods of *angelicus* is quite characteristic in outline as compared with the other species. The presence of two lamellae (fig. 16, c and d), the former of which seems absent or at least reduced in the 4 species mentioned, is typical for *angelicus*. For differences in colour, see above.

C. erythroproctus has the gonopods so clearly distinct from those of the 9 species mentioned above, that a discussion is hardly necessary. In the anterior gonopods the medial incision in the middle of the distal joint and the absence of a distal lappet distinguish this form from nearly all other species. A distal lappet is also absent in *C. ruber**), but in this species the posterior gonopods are quite distinct from those in *erythroproctus*. In those of the latter species the complete lack of a tibial process is characteristic and serves to distinguish *erythroproctus* from any other of the 9 forms mentioned. The colour differences are expressed in the above key.

The material of *C. silvanus* studied here differs in some points from the description given by ATTEMS. ATTEMS describes his species as having one black median band and a lateral one on each side at pore level. In the present material the median band, at least in the adult specimens, is divided by a narrow reddish area, into two paramedian bands, resulting in the presence of 4 longitudinal black bands in total. Furthermore, in contradistinction with ATTEMS' description, scobinae were present in all adult specimens studied, though in some specimens represented only by rather weak emarginations of the anterior border of the prosomites. It seems therefore that the development of the scobinae varies rather considerably in one species, so that the absence or presence of scobinae probably can hardly be considered a specific character.

The following key to the species of Chersastus from Southern Africa is primarily based on males and refers only to those species of which the gonopods are known.

1) Tarsal pads of the male present on all legs from the third pair onwards 2

—) Tarsal pads wanting on a number of legs in the posterior half of the body 4

2) 40 segments. Median process of sternite of anterior gonopods reaching almost to their distal end. Transversely annulated: prosomites red with a dark median spot, metasomites dorsally black ... *C. splendidus*

*) At least according to the original description of 1928, but in 1934 stated by ATTEMS to be present.

—) 44 tot 47 segments. Median process of sternite of anterior gonopods reaching to a third or half of the length of the gonopods. Longitudinally banded: two reddish paramedian bands or a series of spots on dark background 3

3) Median process of sternite of anterior gonopods reaching to about halfway their length. Distal joint of anterior gonopods with a lappet near the terminal end. Posterior gonopods with a tibial process, its distal lappets partly covered by minute scales. Dorsal bands continuous .... *C. fasciatus*

—) Median process of sternite of anterior gonopods reaching to a third of the length. Proximal joint with a medial incision. Distal joint of anterior gonopods without a lappet near the terminal end. Posterior gonopods without a tibial process, distal lappets not covered by minute scales. Dorsal bands composed of two series of spots on the prosomites .... *C. erythroproctus*

4) Distal joint of anterior gonopods with a distinct terminal knob, bearing a few hairs or covered with setiferous tubercules 5

—) Distal joint of anterior gonopods without a distinct terminal knob 9

5) Terminal knob of distal joint of anterior gonopods with only a few tiny hairs. Posterior gonopods with two rather large terminal lappets. Collum red with a transverse black band along the posterior margin ... . *C. angelicus*

—) Terminal knob of distal joint of anterior gonopods covered with numerous setiferous tubercules. Posterior gonopods with a rather large terminal lappet and eventually a small one more proximally. Collum entirely red, entirely black or black with a transverse red band along the anterior margin 6

6) Sternite of anterior gonopods with the median process rather broadly rounded. Tarsal pads missing on the last 5 to 8 pairs of legs. Colour blackish brown, antennae and legs yellowish ..... *C. atrophus*

—) Sternite of anterior gonopods with the median process pointed, narrowly rounded (not known for *vastus* and *anulatus*). Tarsal pads missing on the last 14 to 16 pairs of legs. Colour of at least the anterior margin of the collum reddish, antennae and legs dark yellowish brown to black 7

7) Head, antennae and legs black ..... *C. anulatus*

—) Antennae and legs reddish brown or dark yellowish brown 8

8) Longitudinally banded ..... *C. vastus*

—) Tranversely annulated ..... *C. inscriptus*

9) Posterior gonopods with one distal process, curved strongly into proximal direction. Head, antennae and legs reddish ..... *C. silvanus*

—) Posterior gonopods with two terminal lappets, not strongly curved proximally. Head, antennae and legs black 10

10) Lappet of the distal joint of the anterior gonopods situated rather proximally, directed laterally. Segments red with a black spot on the dorsal side of the prosomite ..... *C. vulpinus*

—) Lappet of the distal joint of the anterior gonopods near the distal end, directed proximally. Segments red ..... *C. ruber*

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