

EAST AFRICAN DIPLOPODA OF THE SUBORDER POLYDESMOIDEA, COLLECTED BY MR. WILLIAM ASTOR CHANLER.

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By O. F. COOK.

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THE COLLECTION which is the occasion of this report is a small one, but the forms included are very interesting, and after a comparison with the types preserved in the Berlin Museum all seem to be new. In attempting to place the species generically, it has been found that the East African genera are mostly distinct from those to which species from that region have been referred by previous writers. The present collection furnishes representatives of but three genera, of which complete descriptions are here attempted. Notices of other African genera are included in the synopses, drawn partly from a considerable collection of African Polydesmoidea belonging to the Berlin Museum. This has seemed desirable in order to better define and show the affinities of the genera established on the specimens belonging to the United States National Museum.

The Polydesmoidea thus far known from East Tropical Africa are comprehended in three families, one of which seems peculiar to that region. East Africa is either strikingly deficient in family types, or very careful collecting has not been done, as may be judged from the table of African families here presented, of which six have been found in West Africa and only three in East Africa.

It is a noteworthy fact of distribution that no species of this suborder is known to be common to the east and west coasts of Tropical Africa, and what is more remarkable, no genus is common to the two sides of the continent except in the cosmopolitan family Strongylosomatidae. That future discoveries may modify these facts is of course probable, for the number of African genera and species will doubtless be increased indefinitely. The larger and more conspicuous forms, however, have been collected quite extensively, and the personal opportunities of the writer warrant him in the opinion that no species closely related to those known from East Africa exist in Liberia, or indeed in the neighboring regions, from Cape Verde down.

The literature of the East African Polydesmoidea is not extensive, and is much scattered. For convenience of reference, uniformly

arranged translations of the original descriptions of all the species have been added and the figures redrawn, except in some cases where they are so imperfect as to be of no use in identification. Hence the present paper may claim to be a monograph of the East African Polydesmoidea as complete as is now practicable.

The notes and drawings of the species in the Berlin Museum were made during a visit in May of the present year, twelve months after the work on the material collected by Mr. Chanler had been completed. The Berlin Museum contains all the types of East African Polydesmoidea thus far described. A new species, *Orodesmus forceps*, is described, at the request of Mr. Pocock, from a specimen in the British Museum; as this was the only mature male of the genus then accessible, Mr. Pocock's kindness gave the opportunity of completing the generic description.

ANALYTICAL KEY TO THE TROPICAL AFRICAN FAMILIES OF POLYDESMOIDEA.

Body minute, contractile into a completely closed sphere, in which the head and first segment are included between the decurved lobes of the enormously enlarged second segment: Family AMMODESMID.E, type *Ammodesmus granum*.

Body small to large, not capable of being more than spirally coiled; second segment not specially enlarged.....

Last segment rudimentary, included and concealed by the penultimate; first segment clypeate, entirely concealing the head; segments densely setose, and with large processes or coarse tubercles; repugnatorial pores on special stalks or lobes: Family STYLODESMID.E, type *Stylodesmus horridus*.

Last segment not concealed; first segment short or flabellate; repugnatorial pores not on stalks or special lobes.....

Carinae strongly decurved; body capable of being coiled into a close spiral; dorsum roughened with clusters of large tubercles or numerous longitudinal carinae: Family CAMPODESMID.E, type *Campodesmus carbonarius*.

Carinae distinctly horizontal; body not capable of being closely coiled .....

Carinae very broad, without thickened margins; repugnatorial pores remote from the lateral margin, located in the anterior part of the subsegment; head concealed under the expanded first segment: Family CRYPTODESMID.E, type *Cryptodesmus olfersii*.

Carinae, if well developed, with a distinct thickened margin or intramarginal ridge bearing the repugnatorial pores; head not concealed .....

Anterior legs of males with a fleshy sole at apex, immediately above the claw; sternum of sixth segment of males with one or two large processes; fifteenth or sixteenth segments of males sometimes with sternal processes; penultimate segment very short; dorsum smooth, with no traces of granules or tubercles: Family GOMPHODESMID.E, type *Gomphodesmus castaneus*, Berlin Museum.

Anterior legs of males without fleshy soles; no processes from the sterna of the sixth and fifteenth segments .....

Lateral surface of segments smooth above the bases of the legs, with distinct longitudinal or oblique carinae; body slender; dorsum smooth; lateral carinae small: Family STRONGYLOSOMATID.E, type *Strongylosoma pallipes*.

Lateral surface more or less beset with conic tubercles; above the bases of the legs two gradually rounded prominences, densely tuberculate: dorsum nearly always tuberculate or granular; carinae distinct; Family OXYDESMID.E, type *Oxydesmus flavomarginatus*, Berlin Museum.

ANALYTICAL KEY TO THE GENERA OF GOMPHODESMID.E.

Antennæ with ten olfactory cones, arranged in a circle: Genus *Astrodesmus*, type *A. stellifer*.

Antennæ with four olfactory cones, as in all other Polydesmoidea.....

Sternum of fifteenth segment of male with a broad triangular ensiform process: Genus *Aulodesmus*, type *A. mossambicus*, Berlin Museum.

Sternum of fifteenth segment without process.....

Repugnatorial pores 11, segments 11 and 14 without pores: Genus *Marpodesmus*, type *M. chanleri*.

Repugnatorial pores 13; segments 11 and 14 provided with pores.....

Sterna of fifth and sixth pairs of male legs each with two distinct processes, those of the sixth much larger; genitalia not strongly curved, pluridentate: Genus *Harmodesmus*, type *H. nitens*, Berlin Museum.

Sternum of sixth segment with a single conspicuous median process, that of the fifth unarmed; apical portion of the genitalia strongly recurved upon the basal and produced into a slender flexuous flagellum.....

Sternal process of sixth segment of male narrow, bidentate; sternum of sixteenth segment with an abrupt verruciform process on the middle of the anterior edge, directed ventrad: Genus *Tyodesmus*, type *T. medius*, Berlin Museum.

Sternal process of sixth segment of males broad, unidentate; sternum of sixteenth segment unmodified.....

Body large, 60-70 mm.; preanal scale with setiferous tubercles greatly enlarged in both sexes, much exceeding the median angle; sterna of seventh and eighth segments of males with a distinct flattened process at the base of each leg of the posterior pair: Genus *Gomphodesmus*, type *G. castaneus*, Berlin Museum.

Body small, 20 mm.; preanal scale with median angle much more prominent than the setiferous tubercles; sterna of seventh and eighth legs without process: Genus *Sphenodesmus*, type *S. rugulosus*, Berlin Museum.

ASTRODES MUS,<sup>1</sup> new genus.

*Eurydesmus pro parte*, of PETERS, GERSTÄCKER, and KARSCH, not of SAUSSURE.

**Diagnosis.**—Body very large.

Antennæ with ten olfactory cones.

Segments dorsally smooth.

Lateral carinae medium, margins thickened, entire.

Repugnatorial pores 13, dorsal on the thickened margins of segments 5, 7, 9-19.

Penultimate segment very short, surpassed by segment 18.

Last segment very short, triangular, the apex narrow.

Sterna with transverse medially interrupted ridges.

Sternum of segment 6 of male with a large process.

<sup>1</sup> The name alludes to the peculiar conformation of the apical joint of the antenna.

Sternum of segment 15 of male with a broad process.

Male legs erassate and inferiorly tuberulate, the first six pairs with a fleshy sole at apex.

*Description.*—Body very large, about five times as long as broad, cavity scarcely depressed; oblong, abruptly narrowed at both ends.

Vertex smooth, sulcus distinct, meeting a transverse inter-antennal sulcus; post-antennal depression deep, the sense organ large.

Labrum not emarginate, with three short, blunt teeth.

Antennae filiform, joints in order of length 2, 4, 5, 3, 6, 1, 7. Seventh joint broader than long, truncate, and with a conic depression in its apical face; ten olfactory cones arranged in a circle around the edge of the depression.

Mandibular stipe with exposed surface divided by sutures into five areas, the basal larger than all the others together.

Hypostoma strongly areuate; rising from each side of the convex median portion is a flattened, oblong process lying against depressions of the lower part of the mentum.

Cardo present, transversely oval.

Mentum broadly triangular, long-pointed in front, very broadly emarginate behind, hirsute.

Stipes over twice as long as broad (2:5) hirsute.

Lingual laminae three times as long as broad, hirsute. Lingual lobes large. Median lobe not evident.

First segment three times as broad as long, with anterior and posterior margins medianly straight and parallel; posterior margin laterally curved forward; anterior corners broadly rounded, the posterior nearly a right angle. The segment is much broader than the head, very slightly narrower and noticeably longer than the second segment.

Segments with dorsal surface smooth, neither granular nor areate.

Lateral carinae subapproximate, about one-fourth as wide as the body cavity, inserted about three-fourths of the distance up; margin abruptly raised and thickened above, especially the lateral; edge blunt, entire; carina of anterior segments curved slightly forward, the posterior with posterior corners more and more produced.

Repugnatorial pores small, dorsal, located in a slight depression of the middle of the thickened margins of the lateral carinae of segments 5, 7, 9–19, surrounded by a fine raised rim.

Below the carinae the segments are finely rugulose, with a small longitudinal carina above the insertion of the legs.

Anterior subsegments smooth.

Supplementary margin long, membranous, finely striate longitudinally, not pectinate.

Penultimate segment very short, included between the projecting corners of the antepenultimate.

Last segment very short, triangular, the apex narrow, truncate or rounded, the whole segment bearing 16 setæ, as follows: Two pairs lateral, two pairs marginal, two pairs dorsal: all these upon larger or

smaller tubercles; one pair apical and one subapical; these last rising from punctations.

Anal valves with compressed, elevated margins and two setigerous tubercles, the upper placed on the outer slope of the raised margin, the lower somewhat removed from it.

Preanal scale semielliptic-triangular, tricuspidate, the three projections close together, the middle flat, the others conic, blunt, with piliferous punctations at apex.

Sterna with a sharp, transverse, medially interrupted ridge between the bases of each pair of legs; between the ridges a transverse furrow.

Sternum of sixth segment of male with a three-cornered process projecting ventrad between the anterior pair of legs. Sternum of the fifteenth segment of male with a broadly ensiform process projecting cephalad from between the anterior pair of legs into a socket in the posterior part of the fourteenth.

Eighteenth segment with the pedigerous laminae very narrow, especially the posterior, so that the legs project obliquely caudad over the preanal scale.

Legs of males long and crassate, the dorsal face of the second joint strongly inflated; all the joints more or less tuberculate on the ventral face and beset with bristles on the apical joints.

First six pairs of male legs with a fleshy sole at apex of the last joint, and the claw shortened.

First pair of legs of male six-jointed like the others; the coxae long, approximate.

Second pair of male legs with the coxae produced ventrad into a large process, in the depression of the flattened ventro-posterior face of which is the seminal opening.

Male genitalia with basal joint very small, flattened; distal joint very large, laterally compressed, tricarinate; ungual portion very long, complicate, thin, and compressed at base to form a flexible pseudo-articulation, above which it is inflated, then extended into a long, flexuous flagellum, very slender distally.

This genus is distinct from *Eurydesmus*, Saussure, in the oblong body, the dorsal pores, the unarmed sterna and femoral joints of the legs, the unarmed fifth segment of the males, the single process of the sixth segment, and that of the fifteenth segment; probably also in the 10 olfactory cones. The two genera probably have no close affinity, notwithstanding the agreement in pore arrangement, the only character of importance which they seem to possess in common.

*Eurydesmus* is confined, as far as known, to South America, and the indubitable generic distinctness of the African forms makes stronger the probability that the two continents have little in common in the way of Diplopoda. The present is probably one of many cases where more careful study will show that the Diplopod genera are more circumscribed in their distribution than has been generally supposed.

**ASTRODESMUS STELLIFER, new species.**

(Pl. II, figs. 1-11; Pl. III, figs. 1-9.)

Vertex without hairs, polished and shining; sulcus distinct, meeting a transverse shallow sulcus (and suture) between the antennal sockets.

Clypeus smooth, even, excepting an oblique depression on each side and a few coarse punctations below.

Antennae with basal joints very sparsely hairy, the distal gradually more hirsute.

Mentum hirsute over the posterior two-thirds of its surface.

Stipes densely hirsute, a broad depression along the lateral edge, especially distad.

Lingual laminae very densely hirsute over their entire surface.

Segments dorsally apparently smooth, shining with a dull luster, uniformly covered with minute, irregular, indistinct, impressed lines and wrinkles, and very minutely and densely punctate. Posterior margins of all the segments more or less rough with fine longitudinal notches or very short wrinkles.

Anterior segments with the posterior subsegments slightly convex anteriorly in the middle; broadly emarginate on each side of the convexity.

Lateral carinae about one-fourth as wide as the body cavity; margin abruptly raised and thickened above, the edge entire, blunt; anterior and posterior edges of carinae with a distinct, though fine, raised margin, which does not extend across the segments. Anterior carinae laterally curved slightly forward, the posterior corners at first right angles, gradually more produced, until on posterior segments the rounded projection is more than half as long as the posterior subsegment. On posterior segments the raised margin is gradually broader, until on the penultimate it occupies the entire carina.

Below the carinae the segments are densely rugulose with fine, flexuous wrinkles; a small, subtuberculate, indistinct carina just above the insertion of the legs.

Anterior subsegments shining, very indistinctly marked with longitudinal impressed lines.

Last segment (see Pl. III, figs. 3 and 4) very short, triangular, the apex narrow, truncate, slightly rounded; superior lateral tubercle somewhat above the level of the carina of the nineteenth, the inferior somewhat below; the anterior tubercle near the situation, the posterior about half way between the anterior and the apex. The dorsal bristles close to the margin; apical piliferous punctations rather close together, the subapical somewhat farther apart; apex of segment thick.

Anal valves moderately inflated, with compressed elevated margins; rugulose, especially in the depressions.

Preanal scale with surface nearly smooth.

Sterna sparsely hirsute.

Process of the sternum of the sixth segment somewhat quadrate in posterior view, narrower at base, then broader, then narrowed again to a mucronate apex. The apical faces hirsute with very long hairs. Posteriorly the process, and the sternum below it, is medially deeply canaliculate; antically the process is straight, with fine, raised lateral margins.

Sternum of the fifteenth segment with the process naked, broadly ensiform, medially grooved below. The process consists of an extension of the transverse ridge between the anterior pair of legs, and is directed cephalad into a depression between the posterior legs of the fourteenth segment. Between the posterior legs of the fifteenth segment is also a similar depression, but smaller, although the sixteenth sternum is in no way modified.

Legs of males hirsute with long bristles, especially on the distal joints. Tubercles confined to the ventral face and best developed on the fifth joint; on the posterior legs the tubercles of the other joints are small or rudimentary. Posterior legs more slender than the others, but not much shorter.

First legs of males with the sole less developed and the claw larger than on the five following legs.

Male genitalia (Pl. II, figs. 4-9).

Color in alcohol varying from dirty yellowish-white (bone color) to dark purplish-brown. The carinae are always light, and the posterior margin of the posterior subsegment usually so, also the anterior subsegments, excepting a dark median line and a line on each side along the level of the carinae. Posterior subsegments bordered all around with a fine margin of distinct brown. Legs and antennae reddish-brown, especially the distal joints. First segment usually with a broad margin of light color all around.

Length, 65 mm.; width, 13 mm.

Type.—National Museum collection. Four mature males.

Locality.—Tana River, East Africa, between the coast and Hameye.

One aspect of the male genitalium of this species greatly resembles that of *Eurydesmus luxus*, Gerstaecker, as figured by Karsch, and the first inclination was to identify it with that species in spite of considerable discrepancies in Gerstaecker's description. These are, however, too grave to be reasonably ignored. Compared with most Polydesmidae, the animal would be called very robust instead of slender. Gerstaecker's measurements, however, justify his statement. Neither is it loosely articulated nor slightly convex. The apex of the process of the sixth segment of the male is not a distinct knob, and the shape of the process does not suggest a spherical triangle. The process of the fifteenth segment is not on the "fourth from the last" pair of legs, but the eighth from the last, though in this respect it would not be surprising if a mistake has been made in the description.

## ASTRODESMUS LURIDUS, Karsch.

(Pl. IV, figs. 11, 12.)

*Eurydesmus luridus*, KARSCH, Troschel's Archiv f. Naturw., p. 43, 1881.

Segments convex, nearly smooth, the sides slightly rugulose.

Male genital appendages broad, somewhat compressed, pilose with long hairs, constricted in the middle; falciform process and tooth entirely wanting.

Color dirty testaceous; carinae testaceous yellow; also a large subdiseiform spot on the posterior margin of cariniferous segments, strongly narrowed at the sides.

Length, about 45 mm.; width, 11 mm.

*Locality*.—Mombassa. A male specimen collected by Hildebrandt is in the Berlin Museum.

“A species easily distinguishable from all others previously known by the dirty color and the yellowish spot of the cariniferous segments, and especially by the form of the male genitalia, presuming the (type) specimen to have been mature.”

The genitalia of the type of this species were either broken off or the specimen was immature. In the Berlin Museum are a number of young *Astrodesmi* comparable with this species, but I have not seen the type.

## AULODESMUS MOSSAMBICUS (Peters).

(Pl. III, figs. 17, 18; Pl. VI, figs. 1-3.)

*Polydesmus mossambicus*, PETERS, Monatsber. d. K. Preuss. Akad. d. Wiss., Berlin, p. 81, 1885.*Eurydesmus mossambicus*, PETERS, Reise nach Mossambique, Zoologie, V, p. 533.

Body convex; vertex smooth, the sulcus distinct. Antennæ extending to the third segment, joints 3, 4, and 5 equal, the second slightly shorter, the sixth slightly longer, the seventh very short.

First segment narrow, the lateral angle rounded-triangular, the margin thickened. Segments smooth. Lateral carinae quadrangular, the margin thickened, the anterior angle rounded, the posterior acute. Last segment triangular, rounded at apex, above with four wart-like prominences.

Preanaal scale tringular, tridentate at apex.

Length and breadth of adult 85 and 16 mm.; of young, 25 and 4 mm.

*Locality*.—Island of Mozambique, Cabaceira, Rios de Sena, Querimba.

This species was later described at greater length among the Myriapoda of Mozambique, as follows:

Body broader than high, convex.

Vertex with a fine sulcus.

Antennæ finely hirsute, of moderate length, reaching to the third segment when laid back; the basal and terminal joints are very short, the others gradually decreasing from the second to the sixth; the third, fourth, and fifth differing but little in length.

First segment arched, the lateral angle rounded; the anterior margin straight, the posterior with a shallow emargination, and on account of this and the greater convexity of its posterior portion the segment appears somewhat narrowed in the middle. Submarginal ridge of the lateral margin gradually decreasing on the anterior and posterior margins. The surface of this segment, as well as that of the remainder of the body, shows under the microscope a very fine granulation.

Lateral carinae descending in the direction of the dorsal curve, and making, in the contracted condition of the animal, a connected series, since the pointed and somewhat ascending posterior corner of each carina projects over the anterior rounded corner of the following segment.

Repugnatorial pores located in the middle of the marginal ridge, and as the ridge slopes obliquely downward the pores are distinctly visible from above as well as from the side.

Last segment apically pointed-triangular; on each side of the upper surface four more or less distinct wart-like prominences.

Preanal scale broadly triangular, posteriorly with three rounded points, of which the middle is the smallest.

Legs hirsute, rather strongly granular, but the second joint without a spine.

Sternum of sixth segment of males with a rather long, three-lobed process between the first pair of legs.

Sternum of the fifteenth segment of males with a pointed, anteriorly directed median process and a corresponding depression in the fourteenth segment.

Male genitalia with the basal joint very large.

Males with the dorsum slightly less convex and the antennae slightly longer than in the females.

Young animals differing only in the more cylindrical body, the peculiar structures of the sixth, fourteenth, and fifteenth segments being well developed in young males.

Color of dorsum and antennæ dark reddish brown; the carinae, ventral surface, and legs, brownish-yellow.

Length of largest specimens, 85 mm.; width, 16 mm.; of the young, 25 mm. and 4 mm.

*Locality*.—Dr. Peters says: "I found this species in rubbish heaps on the island of Mozambique and upon the peninsula of Cabaceira in the month of December, at Querimba in May, and also at Tette."

The animals which are referred to as young males are in the Berlin Museum, and belong to a distinct genus.

#### AULODESMUS OXYGONUS (Peters).

(Pl. III, figs. 10-14; Pl. VI, figs. 4-7.)

*Eurydesmus oxygonus*, PETERS, Reise nach Mossambique, Zoologie, V, p. 535.

First segment with a distinct oblique submarginal ridge, which appears to be separated from the posterior, slightly convex margin by a sharp corner.

Lateral carinae directed horizontally, so that the dorsum appears less convex than in *mossambicus*. The submarginal ridges and the posterior spinous pointed corner are more developed.

Sterna of sixth and fifteenth segments, male genitalia, and colors as in *mossambicus*.

Length, 55 mm.; width, 11.4 mm.

*Locality*.—Rios de Sena, near the Zambesi. Dr. Peters collected three male specimens, and at first considered them a variety of *mossambicus*.

#### AULODESMUS LAXUS (Gerstäcker).

(Pl. II; figs. 12, 13.)

*Eurydesmus laxus*, GERSTÄCKER, Decken's Reise, p. 518, 1873

Slender, loosely articulated, slightly convex.

Head and antennæ as in *A. oxygonus*.

Clypeus with a rounded swollen supra-labral ridge.

First segment longer and somewhat narrower, the posterior margin, as on the two following, without a fold-like thickening, from the median slope strongly decurved and directed cephalad. On this account the lateral margin is shorter and more oblique to the head. Without forming a corner, and merely with a slight curve, it merges into the anterior margin. The smooth ridges on the upper side of the lateral margins are, and even more in the second segment, markedly smaller than in *A. oxygonus*.

The flattened arch of the median part of the segments and the slight elevation of the carinae as in *A. oxygonus*, although on the second and third segments the elevation of the carinae is evidently shorter, resulting from the fact that the anterior margin passes into the lateral by a stronger curve.

Posterior segments with the carinae more pointed and farther produced caudad than in *A. oxygonus*; the carina of the penultimate segment have the form of a small and lightly curved spine.

Last segment with the cylindrical apical part separated by a deep transverse furrow and truncate at apex.

Preanal scale without a median projection between the wart-like processes. Anal valves with smooth, swollen margins.

Posterior legs with two basal joints sparsely covered with small, wart-like prominences.

Sternum of sixth segment with an obliquely upright process almost in the form of a spherical triangle, with a well-defined shining brown terminal knob.

Sternum of the fourth from the last pair of legs with a flattened, longitudinally furrowed process, nearly equilaterally triangular, blunt-pointed, pitch-brown.

First and second joints of posterior legs of male only sparsely beset with small, wart-like prominences.

Male genitalia noticeably broader than in *A. oxygonus*, on the inner margin near the base, more rounded, and hence appearing to be more nearly approximate.

Color of alcoholic specimen dirty testaceous yellow, the lateral ridges of the carinae lighter and clearer yellow, and with the anterior and posterior margins brown. Margins on the median portion of the segments, antennæ, and legs more ferruginous.

Length, 78 mm.; width, 12 $\frac{1}{3}$  mm.

*Locality*.—A single male specimen from Mombassa.

"Near *Eurydesmus oxygonus*, Peters, but noticeably larger and distinct on account of the posterior margins of the three first segments without fold-like thickenings; the first segment with the posterior margin decurved cephalad on the sides; the much smaller marginal ridges on the carinae of the second segment, the longer and more pointedly attenuate carinae of the three segments before the last, the sparsely and finely granulated basal joints of the posterior pairs of legs, etc."

Karsch's drawing of the genitalia of this species bears considerable resemblance to *Astrodesmus stellifer*. If there is really a process on the sternum of the seventeenth segment ("des viertletzten Beinpaares"), it would probably be necessary to establish another genus.

#### AULODESMUS COMPACTILIS (Gerstäcker).

*Eurydesmus compactilis*, GERSTÄCKER, Decken's Reise, p. 519, 1873.

Body short and stout, proportionally strongly arched, slightly shining.

Vertex with a fine, though sharp, median furrow; clypeus below more strongly contracted than in *A. laxus*, the curved line above the middle of the margin distinct, the part below densely punctate.

Antennæ somewhat more slender than in *A. laxus*.

First segment with anterior margin even, moderately arenate, passing with the same curve into the lateral margins; posterior edge emarginate in the middle, and also on each side, so that the lateral corners are sharp and slightly produced caudad; marginal ridges smooth, linear, continued on the anterior margin and gradually narrowed.

Subsequent segments strongly arched dorsally. Second to fourth segments with an evident emargination on each side of the posterior edge.

Lateral carinae small, below the middle height of the segments; on the anterior segments scarcely evident, but more pronounced from the fifth back, slightly arched, the posterior edge slightly more elevated. Marginal ridges of segments 2-4, also of 6 and 8, linear, more pronounced than on the first segment. Carinae gradually larger from segment 10; from 14 with evident tooth-like projections beyond the posterior margin. Projection of segment 18 smaller than that of 17, that of 19 small, blunt-papilliform.

Last segment with a distinct, fine, transverse furrow limiting the posterior caudal projection, which is short triangular, with a blunt, almost truncate, above swollen, apex, and has on each side a stout, wart-like knob. Both the knobs and the apex of the segment bear bristles.

Anal valves light gray, with smooth yellow margins. Preanal scale transversely subhexagonal, with small median knobs between the lateral wart-like prominences.

Second leg of the female with a long styliform process directed obliquely caudad and ventrad, and lying between the legs of the third pair.

Color in alcohol pale bone-yellow, with a light-brown posterior margin of the dorsal portion of the segments, and with more or less evidently brown posterior corners of the anterior and posterior carinae. Antennae and legs light ferruginous.

Length, 49 mm.; width, 10.5 mm.

*Locality*.—One mature female specimen and an immature male, collected at Mombassa.

The male specimen was 31 mm. long and 8 mm. broad, and had 19 segments. There was no trace of the button-like process of the coxa of the second leg, which bears the genital opening, nor of the processes of the pedigerous laminae of the sixth and fourth from the last pairs of legs. In place of the not yet developed genitalia, between the coxae of the legs of the seventh segment were two transversely quadrate-cushion-like prominences.

As the mature male of this species is not known, it is not possible to determine its generic affinities. The peculiar processes of the coxae of the second legs of the female indicate the probability that it constitutes a generic type.

#### TYCODESMUS FALCATUS (Karsch).

(Pl. III, figs. 15, 16.)

*Eurydesmus falcatus*, KARSCH, Troschel's Archiv f. Naturgesch., p. 43, 1881.

Segments somewhat convex, nearly smooth.

Carinae rather broad and thick.

Male genital appendages compressed at base, strongly curved, distally provided with a stout, rather long spine; beyond this produced into a very long, slender, falcate structure, slightly bifid at apex.

Color uniform pale testaceous.

Length, about 40 mm.; width, about 8 mm.

*Locality*.—Seriba Ghattas. One male specimen, collected by Dr. Schweinfurth, preserved in alcohol in the Berlin Museum.

"A new species, distinct from *Eurydesmus mossambicus* and *oxygonus* in the simply curved falciform apical processes of the male genitalia." (Karsch.)

The genitalia of this species seem quite different from those of any other, and the species may prove to be generically distinct. For the present the size and habit seem to indicate affinity with *Tyodesmus*.

**SPHENODESMUS CAFFRARIUS (Porat).**

*Eurydesmus caffrarius*, PORAT, Ofersigt af K. Vetensk. Akad. Forh., No. 5, p. 13, 1872.

Body strongly convex, glabrous above, setose below between the coxae, scarcely attenuate posteriorly.

Head with very few setigerous foveæ. Vertex medianly longitudinally sulcate, subglabrous. Clypeus subglabrous, margin setose.

Antennæ shorter than the breadth of the body, 6 mm. long.

First segment with anterior margin laterally thickened, oblique, nearly straight or very slightly sinuate; posterior straight, sides curved forward, processes rounded.

Segments glabrous, nearly smooth, or irregularly coriaceous under a lens; lateral carinæ thickened, somewhat ascending posteriorly, anterior angle rounded, posterior slightly acute, slightly prominent, more acute on segments 16-19; ventral surface between segments 6 and 7 with a prominent triangular lamina.

Repugnatorial pores rather dorsal than lateral, placed a little behind the middle of the carina.

Last segment prolonged, apex truncate, transversely impressed near the apex; setæ few.

Anal valves margined, with two pairs of setæ. Preanal scale large, simple, or indistinctly trifid, the median lacinia far the longest; setigerous tubercles two.

Legs of pairs 1-6 with a pulvillus on the last joint; a triangular prominent lamina between segments 6 and 7.

Legs shorter than the breadth of the body, 5 mm.

Copulatory legs much protruding, spiral, setose, the external margin bidentate, with a lacinia near the inflexed apex.

Color of alcoholie specimens testaceous.

Length, 34 mm.; breadth, 6.5 mm.

*Locality*.—Caffaria.

This species is much larger than the type of the genus, and does not belong to the tropical fauna. From Porat's description, however, there seems to be no important point of difference from the present genus, except that the dorsum of *Sphenodesmus rugulosus* is somewhat roughened.

**MARPTODESMUS,<sup>1</sup> new genus.**

*Diagnosis*.—Body of moderate size.

Antennæ with four olfactory cones.

Segments dorsally smooth.

Lateral carinæ medium; margins thickened, entire.

Repugnatorial pores 11, dorsal on the thickened margins of segments 5, 7, 9, 10, 12, 13, 15-19.

Penultimate segment very short, surpassed by segment 18.

<sup>1</sup>The generic name has reference to the numerous secondary sexual characters.

Last segment very short, triangular, the apex narrow.

Sterna spined at the base of each leg.

Sternum of segment 6 of male with two processes.

Sternum of segment 15 of male normal.

Male legs crassate and inferiorly tuberculate, the first six pairs with a large, fleshy sole.

*Description.*—Body of medium size, about four times as long as broad, oblong, very abruptly narrowed anteriorly, truncate posteriorly.

Vertex smooth, sulcus distinct; post-antennal sense organ very large, distinct from the antennal socket by less than half the diameter of the organ; post-antennal suture distinct; lateral margin subentire.

Labrum with shallow emargination and three small rounded teeth of moderate length; supralabral bristles very numerous.

Antennæ filiform, second joint longest; joints 2, 3, 4, 5, 6 subequal; olfactory cones four, arranged in a square.

Mouth parts probably as in the genus *Aulodesmus*.

First segment three times as broad as long; anterior and posterior margins medianly straight and subparallel; lateral end rounded, the posterior corner broadly truncate, the anterior slightly so; the segment is much broader than the head, twice as long, and somewhat narrower than the exposed portion of the second segment.

Segments smooth and shining, without markings.

Lateral carinae approximate, about one-fourth as wide as the body cavity, inserted half-way up; a fine raised margin broadest laterad, especially on poriferous and caudal segments.

Below the carinae the posterior subsegments are finely and rather faintly striate longitudinally, somewhat prominent some distance above the insertion of the legs.

Anterior subsegments smooth and shining, with faint, irregular, impressed lines.

Supplementary margin short, longitudinally finely striate, not pectinate.

Repugnatorial pores opening subdorsally in a large, deep, rounded depression of the outer slope of an intramarginal ridge of segments 5, 7, 9, 10, 12, 13, 15, 16, 17, 18, 19.

Preanal segment very short; anal segment very short, the apical portion triangular, truncate at apex, and with four punctations there; twelve other punctations, ten located as in Pl. IV, fig. 6, and two others lower down on the sides, below the level of the carinae (Pl. IV, fig. 7.)

Anal valves with strongly elevated margins; two setigerous punctations, the superior marginal, the inferior submarginal.

Preanal scale semielliptic, a broad, rounded, setigerous prominence on each side of the middle, which is not produced, but rather truncate.

Sterna broad, and densely hirsute, except the first and last.

Sternum of the fifth segment of male, with two large papilliform hirsute processes between the second pair of legs.

Sternum of segment 6 with two similar processes between the anterior pair of legs

Sterna of post-genital segments of male with a stout, sharp, conical spine at the base of each leg, more pronounced on posterior segments and larger between the posterior pair of legs of each segment.

Sternum of segment 15 not different from its neighbors.

Legs of male crassate, hirsute, with long bristles, the joints in order of length 3, 2, 4, 5, 6, 1.

Second legs of male with the coxae produced ventrad into a rounded-conic, somewhat recurved process; genital opening on the median face of the coxa, at the base of the process.

Seventh pair of legs with a broadly conic process on the apex of the inflated coxa, directed mesocephalad.

Pregenital legs of male with the distal joint supplemented at apex by a cushion-like process as long as the very slender claw.

Two distal joints of male legs roughened on the ventral face by papilliform tubercles, very large on postgenital legs.

Male genitalia with a broad basal joint; second joint incurved at base, ungual portion subequal in length with the other, slender, straight, bifid at apex.

This genus is remarkable in the number of secondary sexual characters, rivaling *Scytonotus* in that sort of specialization. Like *Scytonotus*, it appears to be very distinct from the related genera, though in habit the resemblance to *Aulodesmus* is very striking. Approximations in habit between members of widely different families are, however, too numerous among Diplopoda to warrant the inference of affinity except from a combination of the more constant structural characters. To indicate such an agreement for the present genus is not easy, bat in spite of the difference in pore formula in the numerous secondary sexual characters no genus suggests itself as having more in common with the present than *Aulodesmus*, agreeing as it does in habit, mouth parts, the small basal joint of the male genitalia, and in the tuberculation and membranous sole of the anterior male legs.

In this genus the first segment is much more rounded laterally than in *Aulodesmus*, being without an apparent angle; the whole segment is more convex, making the ends more decurved; it is narrower in comparison with the second segment. It is, furthermore, not subemarginate toward the ends, as in *Aulodesmus*.

The greater convexity is shared by the entire body, which has the dorsum more arched and the carinae more depressed than in *Aulodesmus*.

#### MARPTODESMUS CHANLERİ, new species.

(Pl. IV, figs. 1-10.)

Vertex smooth and shining, sulcus transversely rugulose, not deeply; postantennal depression subvertically rugulose near the lateral margin.

Clypeus smooth and shining, a sharp, oblique depression parallel to the lateral margin, halfway between the margin and the antennal

sockets; below, a few scattering bristles, gradually longer; supralabral bristles long and very numerous, a crowded row next the margin, otherwise without apparent arrangement.

Antennæ sparingly hirsute, the distal joints moderately so; basal joint bulbous, the others, except the last, obconic, with equal diameters; length 4.5 mm.; diameter, 0.25 mm.; length of second joint, 0.8 mm.

Mentum, stipes, and lingual laminae densely hirsute with short hairs—except distally; stipes and laminae with long bristles along the margin.

First segment smooth and shining, a slight transverse depression in front of the middle; lateral ends with a fine raised margin. Medianly the segment is slightly and broadly emarginate.

Subsequent segments like the first, slightly broader and longer to the fifth; surface smooth and shining, very finely and regularly reticulate; areolate under sufficient magnifying power.

Lateral carinæ irregularly rugulose inside the raised margin, more especially on posterior segments; on the first four segments the posterior margin is curved forward, while on subsequent segments it is turned more and more caudad and produced into a conical point until the projection of the eighteenth segment exceeds the nineteenth segment in length (see Pl. IV, fig. 6).

Posterior segments with scattering longitudinal wrinkles above, the submarginal wrinkles more pronounced.

Anal segment above irregularly rugulose transversely; setigerous punctations very inconspicuous. No setæ were found, though their absence is probably accidental.

Anal valves not inflated, vertically rugose, the margins thick, raised, but not so strongly compressed as to be bounded by a definite furrow.

Preamal scale very thick, somewhat rugulose on the edge, mostly smooth and shining.

Sterna, especially the posterior, densely hirsute with fine, long hairs.

Processes of the sternum of the fifth segment of males straight, erect subspatulate, flattened cephalo-caudad, armed at base with a few long, divergent bristles; naked and nearly smooth distad.

Processes of the sixth segment similar in shape, armed with long bristles on their inner faces, otherwise naked; in size they are slightly larger than those of the fifth segment.

Legs of male crassate, more or less densely hirsute with very long hairs.

Coxæ of first pair of male legs approximate, moderately hirsute distad. Coxæ of second male legs somewhat separated, conically produced ventrad, and with irregular prominences caudad; naked except a few long bristles. Coxæ of third and subsequent legs widely separated, more or less hirsute. Coxæ of seventh legs of males prominent mesad, especially the anterior corner; these prominences, with the processes from the sternum, give protection to the genitalia.

Pregenital legs of male with the claw much reduced, and a white membranous or fleshy sole projecting nearly as far as the claw. This is

doubtless to assist in grasping the female; the same contrivance is found among the smooth Iulidae.

Postgenital legs of males with coarse, rounded, chitinous tubercles on the inner face of the apical joint; smaller tubercles also on the subapical joint.

Male genitalia simple, the basal joint very small, almost hidden under the expanded reniform base of the apical, which is densely hirsute on its median face, and has some especially long bristles at the base of the ungual portion. This last is bifid nearly half its length, the divisions subequal, one strongly falcate, the other oblique and less falcate.

Color in alcohol a faded light brown, the carinæ and ends of the anterior segments whitish. The posterior median part of each segment is lighter than the rest, except the carinæ, and the anterior part of the animal is lighter than the posterior. Legs and antennæ also light brown.

Length, 24 mm.; width, 6 mm.

*Locality*.—Tana River, East Africa.

*Type*.—One mature male in the National Museum collection.

#### SYNOPSIS OF AFRICAN GENERA OF STRONGYLOSOMATIDÆ.

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Legs 4-6 of male with the third joint crassate and enlarged below into a distinct tuberculoid process: Genus *Cnemodesmus*, type *C. thysanopus* (Cook and Collins).

Third joint of male legs not specially modified.....

Dorsum slightly convex, the suture crenulate, carinæ well developed, all sharply produced at the posterior corners; legs and antennæ short; sterna broad, all unarmed: Genus *Orthomorpha*, type *O. coarctata* (Saussure).

Dorsum strongly convex, the suture not crenulate, carinæ inconspicuous, not produced except on a few subterminal segments; legs and antennæ long and slender; sterna narrow, especially the posterior of each segment of males; anterior sternum of fifth segment with one or two spinose processes.....

Males slender and with long antennæ and legs; females robust, antennæ and legs much shorter; sterna unarmed or slightly prominent, sternum of the fourth pair of legs with two distinct conic spines; coxae of last pair of legs separated at base by at least the thickness of a leg; carinæ of all the segments distinct, slightly produced beyond the posterior margin on posterior segments: Genus *Habrodesmus*, type *H. latus*.

Males and females subequal, both with very long legs and antennæ; sterna, especially the posterior of each segment, armed at the base of each leg with a distinct conic spine; sternum of fourth legs with a stout process, bidentate at apex; coxae of last pair of legs almost in contact at base; carinæ represented by rounded elevations, not produced; those of segments 3, 4, 6, 8, 11, and 14 indicated only by the superior impressed line: Genus *Scolodesmus*, type *S. grallator*.

## HABRODESMUS HARTMANNI (PETERS).

*Strongylosoma hartmanni*, PETERS, Monatsber. d. K. Preuss. Akad. d. Wiss. zu Berlin, p. 534, 1864.

"This beautiful species is, as regards the habit, the form of the carinæ, and the great length of the antennæ and legs, very close to *S. aculeatum*, but is distinct in the coloration. Head, the middle of the first and the greater part of the remaining segments reddish-brown or blackish-brown; the margin of the first segment, the posterior margin of the following segments, the carinæ, two spots on the anterior subsegments, and the apex of the last segment ocher yellow; antennæ dark brown, yellow at the articulations; legs and ventral surface grayish-brown." (Peters.)

Length, 27 mm.; width, 2.3 mm.

*Locality*.—Sennar. Three specimens in the Berlin Museum collected by Dr. Hartmann.

The following notes were made on the type specimens:

Closely related to the type of the genus. Segments with posterior broad yellow band and distinct transverse furrow.

Sterna of posterior legs of each segment with conical spines.

Antennæ rather long, but not so much as in *Scolodesmus*.

Genitalia ending in a spiral curve, but the point blunt and rounded.

## HABRODESMUS ACULEATUS (PETERS).

(Pl. V, figs. 6, 7.)

*Strongylosoma aculeatum*, PETERS, Monatsber. d. K. Preuss. Akad. d. Wiss. zu Berlin, p. 81, 1885.

Antennæ long.

Lateral carinæ triangular, reflexed, acute at posterior corner. Last segment rostriform.

Legs long, the third joint almost twice as long as the first and second taken together.

Color: head, antennæ, and dorsum vinaceo-fuscous; legs, venter, and the apices of the carinæ, pale yellow.

Segments, 20; pairs of legs, 31 (the three anterior segments with a single pair each).

Length of female, 25 mm.; antennæ, 4.5 mm.; last legs, 6.3 mm.; width of head, 2.2 mm.; width of body, 2.7 mm.

*Locality*.—Terra Boror, 18° south latitude. The type specimen is dried; it has the inferior carinæ and transverse dorsal sulcus distinct, and the last segment much projecting.

## ANALYTICAL KEY TO THE GENERA OF OXYDESMIDÆ.

Dorsum densely beset with several (5 to 6) transverse rows of coarse granules: Genus *Scytodesmus*, type *S. kribi*, Berlin Museum.

Dorsum nearly smooth, finely granular, or with three rows of polygonal areas, each with a large tubercle or granule in the middle.....

First three or four segments with one or more large tubercles or processes from the middle of the posterior margin: Genus *Orodesmus*, type *O. forceps*, British Museum.

Granules of third and fourth segments, if present, not conspicuously enlarged or coalesced into a process .....

Posterior subsegments faintly rugulose, apparently smooth and shining; no tubercles or granules; no trace of a transverse furrow: Genus *Mimodesmus*, type *M. parallelus*, Berlin Museum.

Posterior subsegments either tuberculate or granulate, and with a distinct transverse furrow .....

Apex of last segment broad, rounded, faintly emarginate, not exceeded by marginal tubercles: Genus *Oxydesmus*, type *O. flavomarginatus*, Berlin Museum.

Apex of last segment narrow, included in a distinct sinus between the posterior pair of marginal tubercles .....

Carinae not distinctly margined, the pores located in a distinct depression, not in a bead-like, poriferous marginal callus: Genus *Isodesmus*, type *I. immarginatus*.

Carinae distinctly margined, especially cephalad, and with a bead-like, poriferous marginal callus.....

Fourth segment slightly, though distinctly, narrower than the third and fifth; carinae coarsely dentate along the posterior margin, somewhat areate dorsally: Genus *Anisodesmus*, type *A. cerasinus*.

Fourth segment equal to the others; carinae entire, not areate: Genus *Tylodesmus*, type *T. crassipes*.

ORODESMUS,<sup>1</sup> new genus.

*Oxydesmus*, pro parte, of KARSH and PORAT.

*Diagnosis*.—Body moderately large.

Antennæ with four olfactory cones.

Segments dorsally granular-rugose, with three transverse rows of tubercles.

Segments 1–4 with some of the middle tubercles hypertrophied.

Lateral carinae large, thin, more or less dentate at the lateral edge.

Repugnatorial pores 11, dorsal on the outer slope of the intra-marginal ridge of segments 5, 7, 9, 10, 12, 13, 15–19.

Penultimate segment exceeding segment 18.

Last segment broad, subquadrate, the apex strongly dentate; superior lateral tubercle very large.

Sterna without spines, ridges, or processes.

Male legs somewhat crassate.

Male genitalia not flexed, free.

<sup>1</sup> The name alludes to the dorsal prominences.

*Description.*—Body moderately large, about five times as long as broad, broadest about the fifth segment, tapering very gradually caudad, cavity circular.

Vertex prominent, rough; sulcus very deep.

Antennæ scarcely clavate; third joint nearly as long as second; joints in order of length 6, 2, 3, 4=5, 1, 7.

Mouth parts probably as in *Oxydesmus*.

First segment suberescetic (shorter than in *Oxydesmus*), much broader than the head and slightly narrower than the second segment, with three transverse rows of distinct tubercles.

Segments with dorsal surface granular rugose; three transverse rows of conic tubercles, each (except on some anterior segments) located in a distinct area. Posterior row of areas oblong, the others rounded or subsquare.

Segments 1-4 with the two middle tubercles of the last row coalesced and hypertrophied into a large conic process bifid at apex, the neighboring granules sharing more or less in the elevation.

Lateral carinæ thin, inserted about three-quarters up, in width equal to about one-half the body cavity; anterior carinæ curved somewhat forward, the posterior with the corners more and more produced caudad. Margin more or less distinctly dentate or sinuate, with a distinct intramarginal ridge.

Repugnatorial pores opening dorsally in a depression between the margin and the intramarginal ridge of segments 5, 7, 9, 10, 12, 13, 15-19, surrounded by a fine raised rim.

Below the carina the posterior subsegments are more or less tuberculate along the margins and prominent above the insertion of the legs.

Anterior subsegments finely coriaceous.

Supplementary margin long, membranous, very finely striate longitudinally, not peeltinate.

Last segment rugose on its posterior portion, which is broad and subquadrate; with three setigerous tubercles along the margin on each side of the truncate, minutely dentate apex. Two dorsal setigerous tubercles, two apical and two subapical. The lateral setigerous tubercles large, conic, especially the superior, which has the appearance of a carina.

Anal valves with two setigerous tubercles, the upper placed on the raised margin, the lower somewhat removed from it.

Preanal scale broadly triangular, with a prominent setigerous tubercle on each side near the apex.

Second pair of legs of male with the coxae somewhat produced medianly.

Male genitalia rising from a small aperture; basal joint small, hirsute; apical portion large, twisted, complex, not inserted under the edge of the aperture as in *Oxydesmus*.

Segments of adult, 20.

*Locality*.—East coast of Tropical Africa.

This genus has evident affinity with *Oxydesmus*; it may also be said that the two genera are more related to each other than either is to any third. They are, however, easily distinguishable by the curious processes of the first four segments of *Orodesmus*, the shape of its last segment, and the altogether different type of male genitalia, not to mention many minor or quantitative distinctions.

All the East African species described under *Oxydesmus* seem to have their affinities here rather than with the true *Oxydesmi* of the west coast.

**ORODESMUS FORCEPS**, new species.

(Pl. IV, figs. 13-16.)

Vertex prominent, rugose, with a very deep sulcus.

Antennæ scarcely clavate, sixth joint thickest; when the animal is extended the antennæ reach to the fourth segment.

First segment broadly emarginate in the middle posteriorly, and on each side of the middle anteriorly.

Segments 1-4 with the two middle granules of the posterior row coalesced and developed into a high conic process slightly bifid at apex. This process is inconspicuous on the first segment and largest on the fourth. Posterior part of fifth segment slightly more elevated than the following, the granules on each side and in front of the process partaking more or less in the elevation.

Segments with their dorsal surface finely rugulose, the impressed lines between the areas distinct.

Lateral carinae sinuate denticulate, with a prominent intramarginal ridge, sinuate opposite the pores, straight on other segments.

Repugnatorial pores on the outer slope of the ridge, not facing directly upward.

Last segment somewhat transversely rugose above, the superior lateral tubercles increased into a long spine. Marginal tubercles prominent, the anterior acute, the second broad, the third not so near the margin as in the following species, projecting obliquely upward. Dorsal tubercles slightly behind a line which would connect the two anterior marginal. Apex medianly emarginate, bipunctate; two subapical setigerous punctations.

Preanal scale triangular, on each side of apex a rounded tubercle.

Male genitalia viewed from below appearing difform and contorted; an elevated narrow ridge on the inner side apically is impressed with transverse lines; lower down it crosses to the other side (Pl. IV, fig. 13). A side view shows (Pl. IV, figs. 14, 15) small basal and apical joints, with the ungual portion slender and pedicel-like below, bearing a somewhat dumb-bell-shaped structure with a long curved spine projecting ventrad (or cephalad) and the apical end deeply excavate, the ends connivent, resembling a pair of forceps, whence the specific name.

Color very dark wine-red, slightly paler on the posterior part of the segments and carinæ.

Length, 42 mm.; greatest width, 8 mm.

*Locality*.—East Africa. One male specimen in the British Museum.

This species, rather than the following, is made the type of the new genus because the male is known. The two species are, however, closely related. From the above description some minor details are wanting which have been supplied in the case of the next species. In most of these the two species are more probably alike than different, but careful comparisons could not be made, for the descriptions were not made with both specimens at hand.

**ORODESMUS BICOLOR, new species.**

(Pl. V, figs. 8-14.)

Vertex without hairs, very prominent, densely rugose, the wrinkles somewhat longitudinal, below irregular and gradually becoming obsolete. A very deep and broad sulcus, the sides of which are rugose like the neighboring surface. Above and outside of the antennal sockets is a large oblique depression, in which the wrinkles are coarser, but not so dense. Post-antennal organ prominent, with a raised margin.

Clypeus shining and nearly smooth, very sparsely hirsute below, except just above the labrum, where a transverse furrow contains a row of hairs. A broad, rather deep, obliquely oval depression subparallel to the margin below and laterad from antennal sockets.

Labrum with a moderately deep three-toothed emargination, above which is a distinct transverse furrow with a row of very numerous, fine, decurved bristles.

Antennæ wanting.

Stipes of gnathochilarium hirsute with long hairs along the anterior and lateral margins.

First segment suberescetic; medianly convex anteriorly and broadly emarginate on each side of the convexity; anterior corners broadly rounded, the posterior pointed, slightly less than a right angle. Lateral margins with three broad, rather indistinct teeth. Surface of segment granular rugulose, with three transverse rows each of four pointed conic tubercles, the surface about each somewhat elevated, but not divided into areas. The tubercles are confined to the middle of the segment, not extending to the carinæ; the first row, close to the anterior margin, is nearly straight, the tubercles close together, at equal distances, with the middle ones somewhat larger and slightly farther ahead than the others. The second row has the tubercles much wider apart, at equal distances, with the middle ones considerably ahead of the others, but not noticeably larger. The posterior row, close to the posterior margin, is somewhat shorter than the anterior, the two middle tubercles very close together, very much the largest of the segment, and somewhat behind those of the same row. Near the end of the carinæ is a well-pronounced ridge, starting from the posterior corner,

regularly curved, anteriorly diverging from the margin. Around the entire segment is a well-defined, raised margin, broadest in front and broken into small, irregular teeth behind.

Second segment somewhat broader and much shorter than the first, subsimilar in general shape except that it is deeply and broadly emarginate in front instead of convex. There are three transverse rows, each of six tubercles, the two middle ones of the posterior row very close together, coalesced, forming a large subpyramidal apically bifid process. The middle tubercles of the second row are also close together, somewhat enlarged and forming a part of the large process, as do also the pair of tubercles of the third row neighboring to the middle ones. The raised margin of the segment is carried up on the process, leaving a somewhat concave posterior face below it.

Third segment slightly longer than the second, the process considerably larger, the two middle tubercles of the posterior row forming the apex, the next pair projecting about half way down the sides.

Fourth segment slightly longer than the third, the process somewhat smaller, about as high as that of the second segment, but broader.

Fifth segment noticeably longer than the fourth, the process entirely disappeared, the four middle tubercles of the last row equal and at equal distances, with an evident transverse sulcus in front. All the tubercles of this segment located in subquadrate or hexagonal areas more or less defined by furrows. A tendency to areation is also apparent in the preceding segments, but the difference between this and the fourth segment is very abrupt.

Subsequent segments similar; the tubercles becoming more numerous (8–12 in a row) and less elevated in middle segments, and again more prominent on the latter segments, especially along the posterior margin.

Penultimate segment with a row of ten sharp, conic, papilliform tubercles projecting upward and backward from its posterior margin. Surface of this and preceding segments more coarsely uneven than on middle segments, but still shining.

Lateral carinae with three rather obscure teeth on segments 1–5; after that with three or four teeth. Intramarginal ridge gradually closer to the margin, until it becomes nearly obsolete on segments 11 and 14. On poriferous segments, however, it remains distinct, more or less arcuate opposite the pore; posterior corner of carina thickened, especially on posterior segments.

Repugnatorial pores on anterior segments located slightly behind the middle of the segment, nearer to the ridge than to the margin; on posterior segments the pores are gradually farther back, and in a deeper and deeper depression midway between the ridge and lateral margin.

Below the carinae the segments are irregularly rugulose, becoming granular, coarsely tuberculate along both margins of the subsegment below; prominent above the insertion of the legs, and with two large long-pointed tuberculate processes, the anterior larger, directed

obliquely ventro-cephalad. On posterior segments these processes nearly disappear, the tubercles being smaller and smaller and confined to a row along each margin, the posterior row extending nearly up to the carina.

Anterior subsegments apparently smooth, but not shining; very minutely punctate-coriaceous, with occasional indistinct longitudinal striae.

Supplementary margin rather long, especially on middle segments, rather firm, faintly striate, not pectinate.

Last segment above anteriorly like the anterior subsegments, the projecting posterior portion separated by a gentle transverse depression or constriction, densely rugose, with eight well-pronounced tubercles, two on the upper surface and three along the margin on each side of the apex. The dorsal tubercles nearly on a transverse line between the posterior pair of marginal. The posterior pair of marginal tubercles directed somewhat upward. The apex itself is truncate, minutely four-dentate, or rather notched in the middle, and with a piliferous punctation on either side. A pair of subapical punctations somewhat farther apart than the apical, as in the species of *Oxydesmus*. On each side, below the level of the carinæ, two large, conic, setigerous tubercles, the superior larger, appearing like a carina to the last segment.

Anal valves moderately convex, with moderately elevated, but not compressed margins; the superior setigerous tubercle located on the margin about five-sixths of the way to the top; inferior tubercle rather distant from the margin about half way up. Surface of the valves irregularly or subvertically rugose, especially in the more depressed portions.

Preanal scale broadly triangular, thickened, with a prominent conic tubercle on each side, near the rounded apex, and not exceeding it. Surface very finely rugulose.

Sterna smooth and shining, only impressed between the legs of either side.

Color in alcohol dark vinous red, alternating with obscure pinkish. Head very dark vinous, nearly black, a spot above the antenna, and the labral region yellowish. Anterior segments somewhat lighter than the head, the carinæ and posterior crests reddish and yellowish. These median lighter spots become gradually broader, until near the middle of the body they unite with the yellow of the carinæ, so that the posterior subsegment is yellow, irregularly infused, and stained with various shades of vinous along its anterior margin, and especially at the base of the carinæ. The carinæ also have a very narrow margin of vinous not so dark as that of the dorsum; anterior subsegments uniformly dark vinous. Posterior segments merely reddish, darker than the middle. Posterior half of last segment red. Anal valves very dark, preanal scale somewhat lighter, ventral surface and legs vinous-red, lighter than above.

Legs of female (Pl. V, fig. 11) proportioned as in *Oxydesmus*; basal joints scarcely hirsute, the last joint densely so.

Length, about 35 mm.; width, 7 mm.

*Locality*.—Tana River, East Africa.

*Type*.—National Museum collection, obtained by Mr. Chanler; one female specimen.

#### ORODESMUS UNICOLOR, new species.

(Pl. VI, Figs. 8-10.)

Intermediate between *O. mastophorus* and *O. bicolor*, more nearly related to the latter, with the description of which as here given it coincides, except in the following characters.

First segment with anterior tubercles smaller and farther apart than in Plate V, fig. 12. Median tubercles of posterior row not so large and not coalesced.

Second and third segments also with median tubercles not coalesced; those of the middle (longitudinal) row larger than in fig. 12; the three median tubercles on each side, as in *mastophorus*, united into a longitudinal ridge, but separated medially, though not so widely as in *mastophorus*.

Fourth and succeeding segments with the tubercles gradually smaller, the median not specially enlarged or coalesced.

Segments with the three rows of dorsal areas very distinct, the surface of the areas coarsely granular rugose, much more than in *O. bicolor*; tubercles also somewhat more prominent.

Below the carinae the tubercles are much as in Plate V, fig. 9; the process somewhat larger, but the individual tubercles less numerous and not so long.

Posterior segments with the lateral margins distinctly narrower than in Plate V, fig. 13, and the pore much closer to the edge.

Preanal scale with median process shorter than in *mastophorus*.

Color of dry specimen light dirty brownish with a pinkish tinge, very distinct on the carinae and posterior segments; legs, head, and antennae also pinkish.

Animal with more of the aspect of *O. mastophorus* than of *O. bicolor*; dorsum less arched than in *O. bicolor*; about the same as in *O. mastophorus*.

Length, 38 mm.; width, 6 mm.

*Locality*.—A female specimen from Mombassa, one of the types of *O. mastophorus*, Gerstäcker, as is noted under that species. The pinned specimen is in the Berlin Museum.

#### ORODESMUS MASTOPHORUS (Gerstäcker).

(Pl. VI, figs. 12-15.)

*Polydesmus mastophorus*, GERSTÄCKER, Decken's Reise, p. 517, 1873.

*Polydesmus (Oxydesmus) mastophorus*, KARSCH, Troschel's Archiv, p. 45, 1881.

Vertex with deep sulcus, on each side along the first segment rugose. Antennae slender.

First segment short, slightly bisinuate in front, more strongly trisinuate behind; posteriorly broader, the posterior corners sharply pointed and decurved; submarginal ridge like that of the following segments, its interior edge sharply defined.

First four segments: the tubercles lying along the median line are very different from the others, which appear small and irregularly distributed, and are conspicuously large and arranged in two longitudinal rows, three (tubercles) in each row. Those of the first segment are lower and isolated, those of the two following coalesce into two dentate ridges, those of the fourth segment highest.

Subsequent segments ornamented with three transverse regular rows of tubercles; those of the posterior row more mammilliform, higher, and the remainder of the surface finely granulated.

Lateral carinae projecting above the lateral middle of the body, distinctly, though not strongly ascending, slightly higher caudad; the margins usually with five or six teeth; the first and second segments with three sharp teeth, the third with four; posterior corner on middle segments slightly angled, on the three segments next to the last with a gradually more prominent dentiform process.

Last segment above granular rugulose, posteriorly with a quadrangular process, rounded at apex, and on each side with three teeth, notched between; above, on each side, a wart-like tubercle.

Preanal scale with two blunt-conic setiferous tubercles; between them a shorter process.

Color reddish-brown, the tubercles ferruginous or yellowish; margin of carinae yellow or light ferruginous. Clypeus on either side ferruginous in the middle, with a broader yellow margin; ventral surface ferruginous. Antennæ ferruginous, the apex brownish. Legs ferruginous yellow.

Length, 44–47 mm.; width,  $6\frac{1}{4}$ – $6\frac{2}{3}$  mm.

*Locality*.—Two female specimens from Mombassa.

The types of this species are dried specimens, preserved in the Berlin Museum, belonging to two distinct species. The following notes were based on the specimen, to which Gerstäcker evidently gave the most of his attention, and which was the subject of his plate. The other species is here described as *O. unicolor*:

Vertex prominent hirsute, granular rugose.

Clypeus, as described for *bicolor*, rather smooth, hirsute, especially below.

First segment shaped as in Pl. V, fig. 12, but more emarginate posteriorly toward the lateral corners; tubercles in three rows, stronger than in fig. 12, especially the median. Rows 4, 6, 6, situated somewhat as in fig. 12, but the median tubercles wide apart; also those of posterior row, which are large, conico-papilliform. Margin more coarsely dentate than in *O. bicolor*.

Second and third segments also with all the median tubercles wide apart, much larger than the others, the posterior largest, and all three

united into a longitudinal dentate ridge. On the third segment the tubercles of posterior row next the median ones also very large, but showing no tendency to coalesce with the others.

Fourth segment with tubercles abruptly smaller and showing no tendency to coalesce; tubercles, however, larger than on succeeding segments.

Posterior row of tubercles stronger than the others, but all very distinct.

Pores, especially on anterior segments, facing almost directly laterad.

Length of type specimen, 42 mm.; width, 6.5 mm.

The habit of this species is quite distinct from all the others by reason of the square carinae and the stronger marginal teeth. Gerstäcker's figure gives a rather correct idea of the general effect.

#### ORODESMUS PECTINATUS (Karsch).

(Pl. V, fig. 2; Pl. VI, fig. 11.)

*Polydesmus (Oxydesmus) pectinatus*, KARSCH, Troschel's Archiv, 1881, pp. 36, 46.

Vertex strongly rugose.

Segments nearly flat, above with two rather deep transverse furrows; obsolete on segments 1-4, each segment with three rows of granule-bearing areas, the posterior row armed with seven to nine acute tubercles.

Fourth segment sparsely covered with irregularly arranged granules; in the middle of the posterior margin armed with a somewhat flattened, six-toothed, comb-like process, yellow in color and equal in length to the fifth segment; the two outer teeth of process shorter.

Lateral carinae wing-like; those of segments 1 and 2 with margin oblique, three-toothed; segment 4 four-toothed; subsequent segments six-toothed.

Color of head and segments dorsally black; carinae yellow (in alcohol); antennae and feet pale.

Length, 43 mm.

*Locality*.—Wito, East Africa. One female, collected by Dr. Fischer. Type in the Berlin Museum.

This species is strikingly distinct from all others yet known in the possession of the remarkable process of the third segment. So peculiar a structure did this appear that I suspected that it was abnormal. An examination of the type and only extant specimen at Berlin shows that there is no ground for such a supposition. The following notes were made on the type specimen:

First segment shaped like Plate V, fig. 12 (*O. bicolor*), the tubercles similarly arranged, but with four in the middle row and eight in the last; none especially enlarged or coalesced. Anterior raised margin very distinct.

Second segment also without special modification, except that the median tubercles of the last two rows are slightly larger than the others.

Third segment with the median six tubercles of the last row and the median two of the middle row coalesced into a large, horizontal dentate and fluted process, projecting caudad, and entirely covering the median part of the fourth segment. The lateral tubercles of the process small.

Fourth segment normal, as far as can be seen under the process (the specimen is dry).

Remainder of body resembling *O. mastophorus*, but the dorsum less convex and smoother, the tubercles smaller and more broadly conic; the surface of the areas only faintly granular; marginal teeth usually four instead of six, as in *O. mastophorus*. Anterior marginal tooth largest and most prominent.

Last segment of type with apex injured.

Length, 40 mm.; width, 6.75 mm.

#### ORODESMUS FISCHERI (Karsch).

(Pl. V, figs. 3, 4.)

*Polydesmus (Oxydesmus) fischeri*, KARSCH, Ber. über d. Naturh. Museum z. Hamburg, p. 133, 1884.

Segments 1–3 armed with coarse granules, larger toward the middle, especially the two median.

Segments dorsally divided into three transverse rows of tuberculariferous areas.

Lateral carinae with the anterior corners rounded, the lateral margin subdenticulate.

Male genitalium twisted, forked somewhat above the middle of its length; the inner fork apically faintly notched, broad and lamellar; the outer apically notched and terminating in a long, thin, pointed, strongly curved hook.

Color black, the carinae margined with yellow, each segment with a yellow transverse spot on the middle of the posterior margin; last segment black. On the middle segments the yellow spot covers the four middle areas of the two posterior rows. On the anterior segments the spot covers only two adjacent areas; on the first segment only the posterior areas, on the second and third segments two from all three rows are yellow.

Length of adult male, 54 mm.

*Locality*.—Massai Land, collected by Dr. Fischer.

"This beautiful East African species belongs to the same group as *effulgens*, Karsch, also East African, and is to be distinguished from that species by its greater length and proportional breadth. The anterior corners of the carinae are rounded in *O. fischeri*, and distinctly pointed in *O. effulgens*. Last segment black in *O. fischeri*, yellow in *O. effulgens*. While in *O. effulgens* the yellow color is continuous from the under side of the carinae over the entire ventral surface, in *O. fischeri* the under side of the carinae is black, and only the anterior margin is yellowish, as far as the legs extend." (Karsch.)

Of all the species here referred to *Orodesmus*, the present seems to be most nearly related to the West African genus *Oxydesmus*, and more especially to *Oxydesmus togoensis*, an undescribed form differing from the other West African species in the greater proportional width and the tendency toward enlargement manifested by the tubercles of the anterior segments. The coloration is also similar to that of *O. fischeri*. The specimen belongs to the Berlin Museum.

#### ORODESMUS EFFULGENS (Karsch).

(Pl. V, fig. 1.)

*Polydesmus (Oxydesmus) effulgens*, KARSCH, Troschel's Archiv, 1881, pp. 36, 46.

Vertex strongly rugose.

First segment anteriorly rounded. Segments having the appearance above of transverse oblong rectangles convex in the middle, each marked with three transverse rows of eight subquadrate areas, each armed with a tubercle in the middle; tubercles of the anterior and middle rows (located somewhat behind the middle) rounded, those of the posterior row tooth-like, directed caudad, situated on the posterior margin of the segments.

Lateral carinae wing-like, armed in the middle with a low tubercle.

Last segment armed with up to four lateral denticles.

Color black or fuscous-brown, the carinae and four median areas of the middle row yellow.

Length, about 33 mm.

*Locality*.—Maid, Somali Land, East Africa, altitude 2,000 feet. Specimens of both sexes collected by Hildebrandt and preserved in the Berlin Museum.

#### EXPLANATION OF PLATES.

##### PLATE II.

###### *Astrodesmus stellifer*.

- Fig. 1. Third leg of male.
- 2. Thirteenth leg of male.
- 3. Thirty-first leg of male.
- 4-7. Views of male genitalium.
- 8. Male genitalia in situ; also the ventral part of the sixth segment.
- 9. Male genitalium, side view, drawn from a specimen in the British Museum.
- 10. Anterior view of the sternum of the sixth segment, showing the peculiar median process and two basal joints of the legs.
- 11. Posterior view of the process mentioned.

###### *Aulodesmus laxus*.

- 12. Genitalium, median view, after Karsch.
- 13. Same, lateral view, after Karsch.

## PLATE III.

*Astrodesmus stellifer.*

- Fig. 1. Dorsal view of first three segments.  
 2. Subdiagrammatic cross section of a segment.  
 3. Dorsal view of the last three segments.  
 4. Lateral view of same.  
 5. Preanal scale.  
 6. Gnathochilarium, including hypostoma.  
 7. Plan of the eighth joint of an antenna.  
 8. Last three joints of an antenna.  
 9. Ventral view of the fourteenth and fifteenth segments of male, showing the process of the fifteenth and the corresponding depression of the fourteenth.

*Aulodesmus oxygonus.*

10. Sixth and seventh segments, ventral view, after Peters.  
 11. Fifteenth segment, ventral view, after Peters.  
 12. Posterior view of a segment, after Karsch.  
 13. Male genitalium, lateral view, after Peters.  
 14. Curve of the tooth of same, ventral view, after Karsch.

*Tycoedesmus falcatus.*

15. Genitalium, ventral view, after Karsch.  
 16. Same, median view, after Karsch.

*Aulodesmus mossambicus.*

17. Posterior view of segment, after Peters.  
 18. Genitalium, lateral view.

## PLATE IV.

*Marpodesmus chanleri.*

- Fig. 1. Dorsal view of head and first three segments.  
 2. Antenna.  
 3. Fifteenth leg of male, anterior view.  
 4. Third leg of male, posterior view.  
 5. End of last joint of same, more magnified, anterior view.  
 6. Last five segments, dorsal view.  
 7. Last four segments, lateral view.  
 8. Preanal scale.  
 9. Male genitalia in situ and ventral parts of sixth and seventh segments.  
 10. Lateral view of male genitalium, more magnified.

*Astrodesmus luridus.*

11. Genitalium, lateral view.  
 12. Same, ventral view.

*Orodesmus forceps.*

13. Male genitalia, in situ.  
 14, 15. Lateral views of male genitalia, more magnified.  
 16. Last three segments, more magnified.

## PLATE V.

*Orodesmus effulgens.*

Fig. 1. Male genitalium, after Karsch.

*Orodesmus pectinatus.*

2. Third and fourth segments, after Karsch.

*Orodesmus fischeri.*

3. Male genitalium, after Karsch.

4. Same, apex of slender arm.

*Orthomorpha vicaria.*

5. Male genitalium, after Karsch.

*Habrodesmus aculeatus.*

6. Lateral view of three segments.

7. Last segment, ventral view.

*Orodesmus bicolor.*

8. Posterior outline view of third segment.

9. Posterior outline view of one of the middle segments.

10. Lateral view of last two segments.

11. Normal leg of female.

12. Head and first two segments, dorsal view.

13. Last three segments, dorsal view.

14. Last segment, ventral view.

## PLATE VI.

(Drawn from type specimens in the Berlin Museum.)

*Aulodesmus mossambicus.*

Fig. 1. Last three segments, dorsal view.

2. Male genitalium, lateral view.

3. Same, median aspect, the anterior side toward the right.

*Aulodesmus oxygonus.*

4. Last three segments, dorsal view.

5. Male genitalium, lateral view.

6. Same, median view, the anterior side toward the left.

7. Apex of process of sixth segment.

*Orodesmus unicolor.*

8. Last segment and part of penultimate, dorsal view.

9. Parts of tenth and eleventh segments, showing sculpture and location of pores.

10. First three segments, dorsal view.

*Orodesmus pectinatus.*

11. Segments 2-4, dorsal view, showing remarkable process of the third segment.

*Orodesmus mastophorus.*

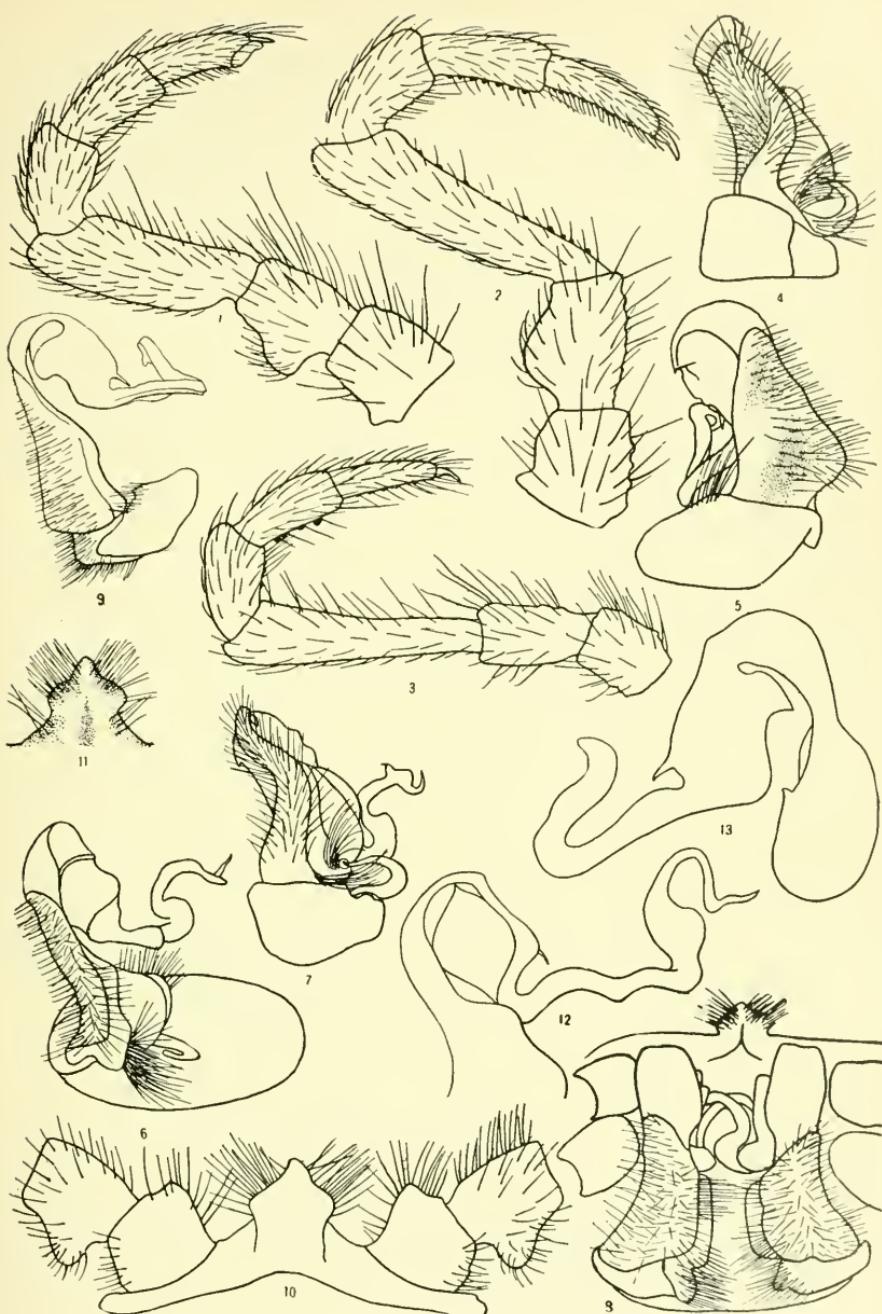
12. Antenna.

13. Tenth and eleventh segments, dorsal view.

14. Last segment and part of the penultimate, dorsal view.

15. Preanal scale.



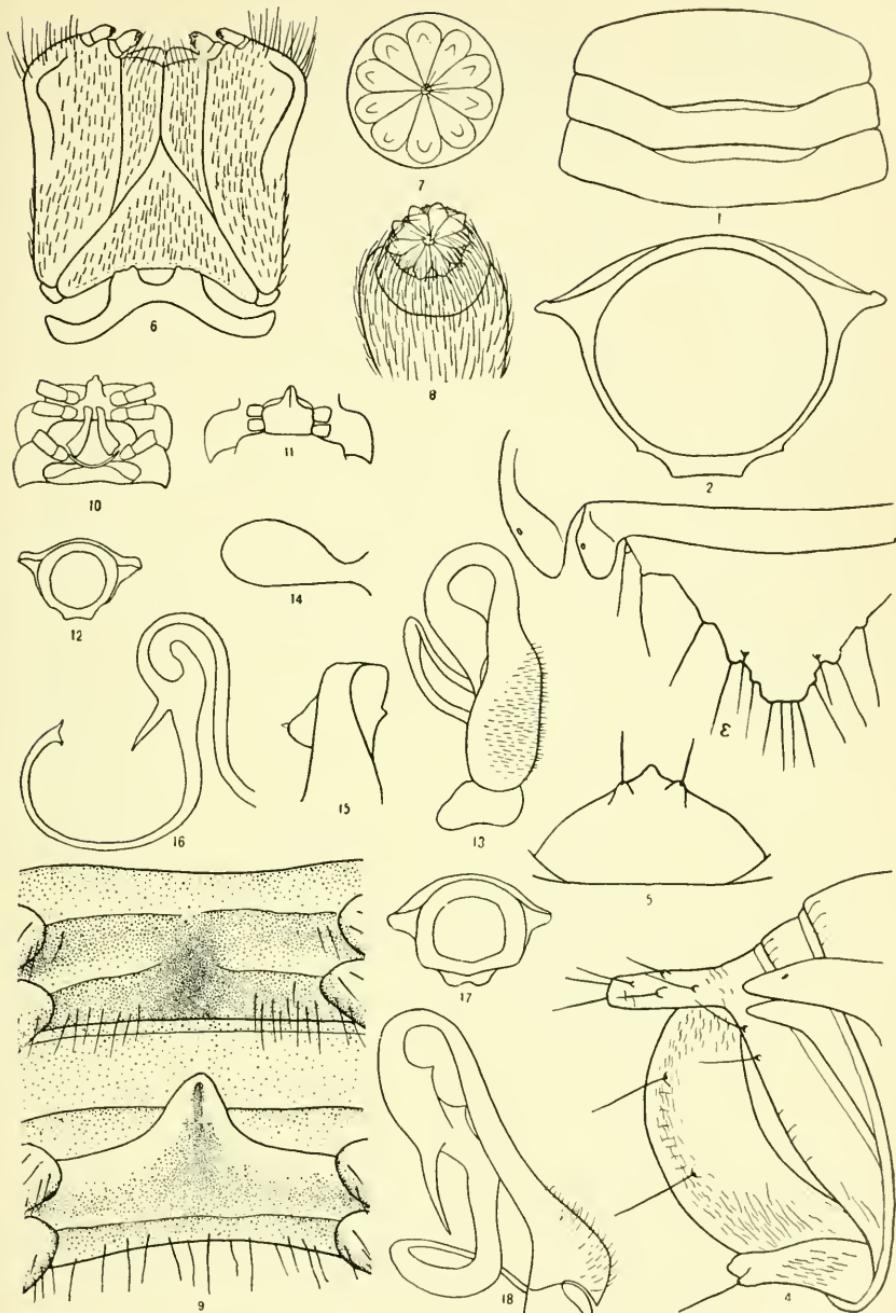


## SPECIES OF DIPLOPODA FROM EAST AFRICA

Figs. 1-11. *Astrodesmus stellifer*  
 Figs. 12, 13. *Aulodesmus luxus*

FOR EXPLANATION OF PLATE SEE PAGE 109





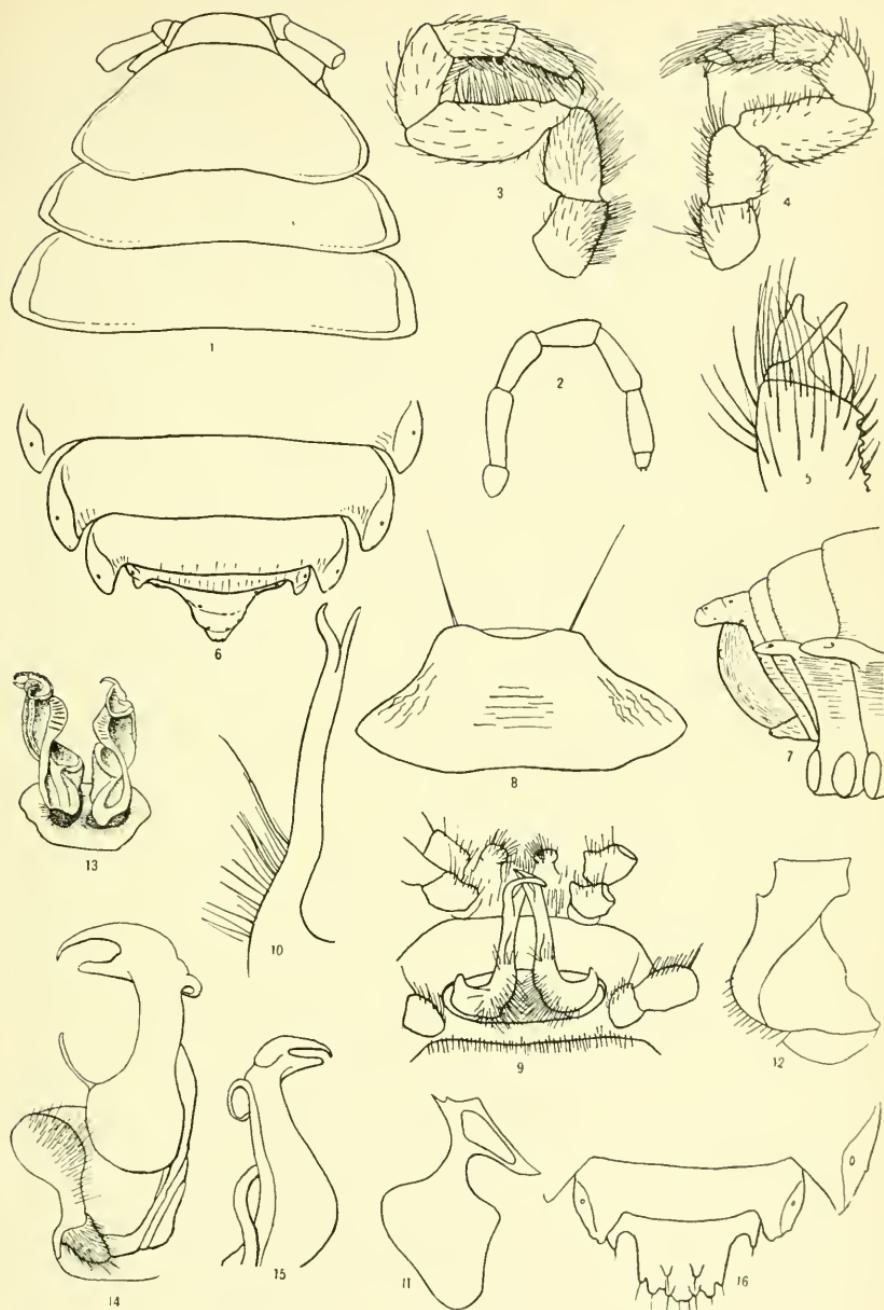
## SPECIES OF DIPLOPODA FROM EAST AFRICA

Figs. 1-9. *Astrodesmus stellifer*  
Figs. 10-11. *Autodesmus oxygonus*

Figs. 15, 16. *Tycodesmus falcatus*  
Figs. 17, 18. *Autodesmus mossambicus*

FOR EXPLANATION OF PLATE SEE PAGE 110



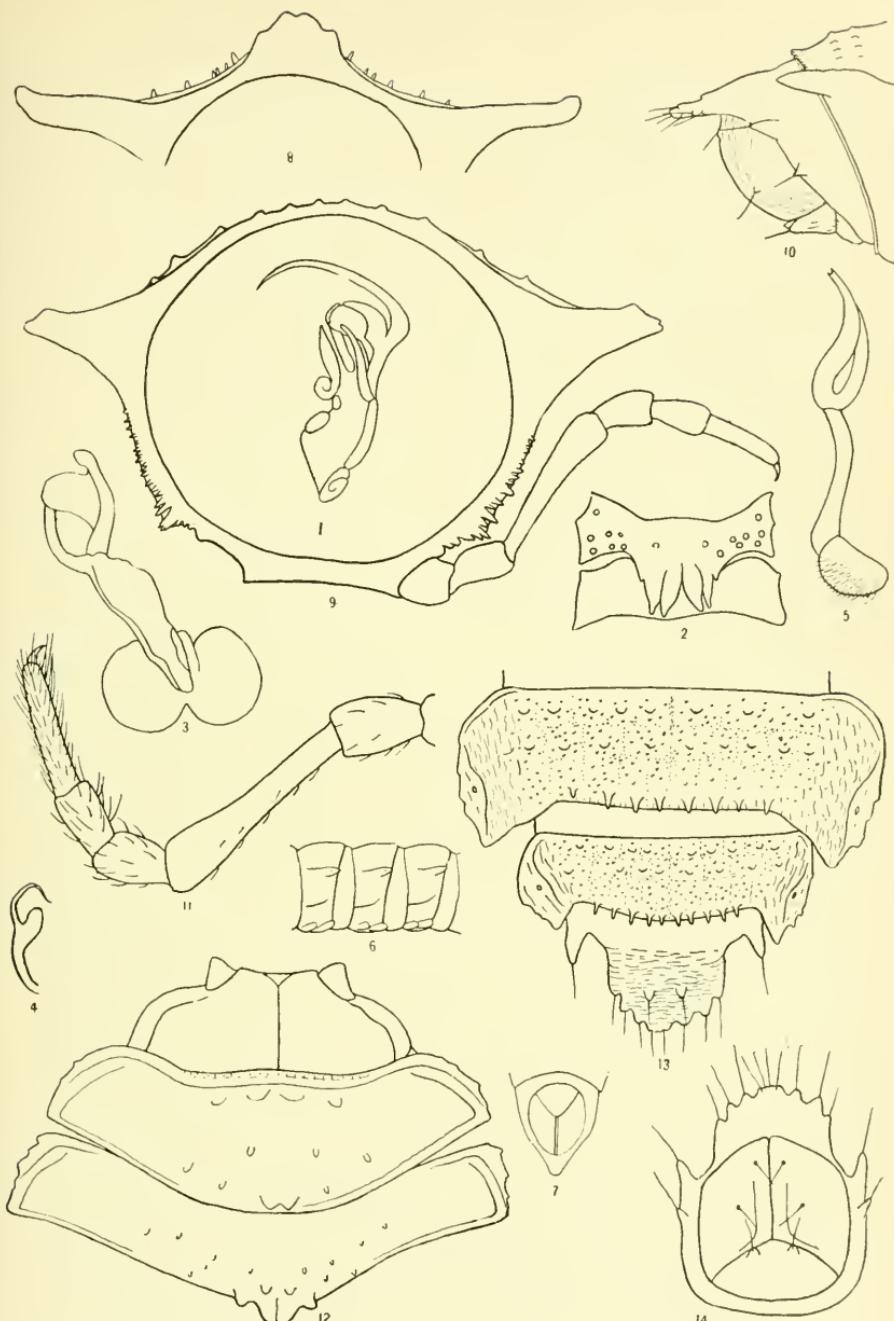


## SPECIES OF DIPLOPODA FROM EAST AFRICA

FIGS. 1-10. *Marptodesmus chanleri*  
 FIGS. 11, 12. *Astrodesmus luridus*  
 FIGS. 13-16. *Orodeshmus forceps*

FOR EXPLANATION OF PLATE SEE PAGE 110





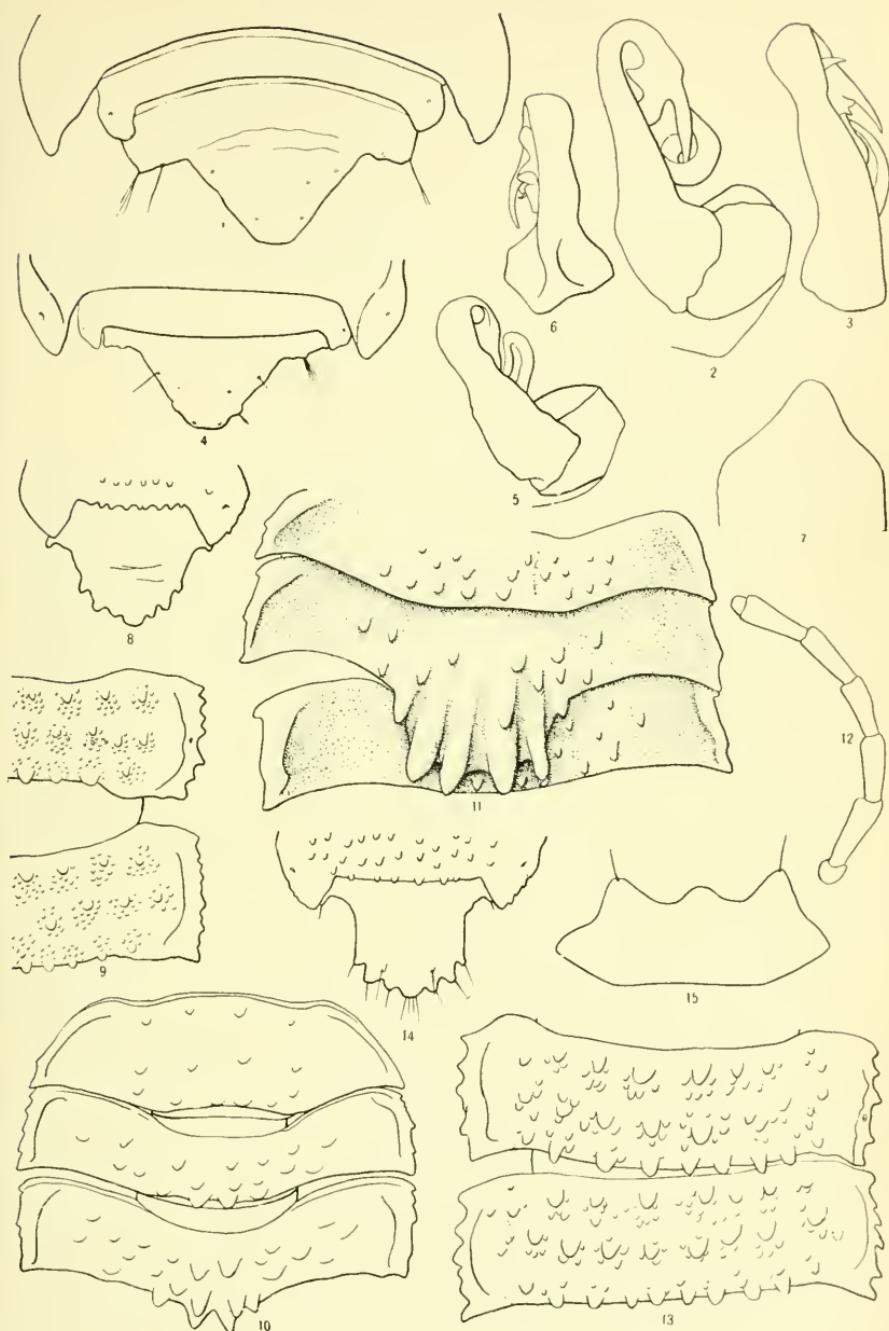
## SPECIES OF DIPLOPODA FROM EAST AFRICA

FIG. 1. *Orodeshmus effulgens*  
 FIG. 2. *Orodeshmus pectinatus*  
 FIGS. 3, 4. *Orodeshmus fischeri*

FIG. 5. *Orthomorpha vicaria*  
 FIGS. 6, 7. *Habrodesmus aculeatus*  
 FIGS. 8-14. *Orodeshmus bicolor*

FOR EXPLANATION OF PLATE SEE PAGE 111





## SPECIES OF DIPLOPODA FROM EAST AFRICA

FIGS. 1-3. *Autodesmus mossambicus*  
FIGS. 4-7. *Autodesmus oxygonus*

FIGS. 8-10. *Orodesmus unicolor*

FIG. 11. *Orodesmus pectinatus*

FIGS. 12-15. *Orodesmus mastophorus*

FOR EXPLANATION OF PLATE SEE PAGE 111

