

VIII.—*A Monograph of Scytonotus.*

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As is the case with nearly all the extra-European genera of Diplopoda, and especially with the American, the more important characters of *Scytonotus* have been misunderstood or entirely overlooked. This is evidenced by the fact that all the European writers who have touched upon the subject have either made direct misstatements concerning the characters and affinities of the genus, or have referred to it species having scarcely any important features in common with the typical form.

The genus is furthermore interesting in that its secondary sexual characters show it to be the most specialized of the Polydesmidae—characters which seem to be entirely unmentioned in the literature of the subject.

Genus **SCYTONOTUS** C. L. Koch.

Systems der Myriapoden.

Segments 19, covered with setiferous granules; supplementary margin pectinate; repugnatorial pores on smooth, rounded elevations of segments 5, 7, 9, 10, 12, 13, 15, 16, 17; male genitalia bihamate.

Body small, 5-6 times as long as broad; cavity slightly depressed.

Antennæ moderately clavate, third joint as long as the two preceding joints taken together, joints in order of length: 3, 6, 5, 4, 2, 1, 7.

Mandibular stipe with exposed surface divided by sutures into six areas, five triangular, one trapezoidal.

Masticatory plate long triangular, with numerous (15-20) transverse ridges.

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Dentate lamellæ with four rounded teeth.

Pectinate lamellæ six.

Mentum triangular-cordate, sub-equal in length and width, moderately emarginate posteriorly, acute-angled anteriorly.

Cardo large, nearly half as long as the mentum.

Lingual lobes with few cones; median lobe with styliform processes.

First segment sub-elliptical, narrower than either the head or the second segment.

Anterior segments laterally curved forward, the posterior with the corners produced caudad; dorsal surface of all the segments densely roughened with setiferous granulations more or less regularly arranged in 4-6 transverse rows.

Lateral carinae narrow, $\frac{1}{2}$ as wide as the body cavity, thick, granular-serrate, reduced or obsolete on segments 6-9 in females.

Anterior sub-segments punctate.

Supplementary margins finely pectinate.

Repugnatorial pores opening dorsally on smooth elevations near the posterior corners of segments 5, 7, 9, 10, 12, 13, 15, 16, 17.

Anal segment tuberculate, decurved, acuminate, truncate at apex, with four setæ.

Anal valves with two setigerous tubercles, not placed on the raised margin.

Pre-anal scale semi-elliptic, with setigerous tubercle on each side.

Legs of male much larger than those of female, some of them crassate and specially modified for copulation; second joint without spine; joints of normal legs in order of length: 6, 3, 2, 5, 4, 1; terminal joint inferiorly tuberculate-serrate in male, the sub-terminal inferiorly papillate.

First pair of legs free, small and slender, the coxa longer than any other joint except the last.

Second pair of legs free in female; of the same shape as the succeeding; coxa not specially modified.

Genitalia of female sub-spherical, external, protrusible.

Genitalia of male bi-hamate, the distal hamus articulated at base, beset with fine laciniae; basal joint expanded to receive the distal.

Segments of adult 19.

Distribution.—Northeastern North America.

From *Polydesmus* this genus differs in having the dorsal surface uniformly covered with small, setiferous granulations, arranged in 4 to 6 rows; in having 19 less segments and no pores on segments 18 and 19; the pores on rounded elevations.

From *Brachydesmus* it is distinct in the convex dorsum covered with sub-equal squamæ arranged in 4-6 transverse rows, instead of having three rows, with the anterior squamæ and those of the carinae several times as large as the others.

From both genera the bi-hamate male genitalia, with the distal joint articulated at base, are a diagnostic character, for the eighth legs of the other genera are replaced by a single falcate structure. Polydesmus and Brachydesmus are much more closely related to each other than either is to Scytonotus.

Porat seems to think that this genus is closely related if not identical with Brachydesmus, because of the 19 segments, but this inference would seem unnecessary. It is evident, too, that he takes an expansive view of generic limitations, necessary to include his species *Scytonotus digitatus*, mentioned again below. Wood had already recorded in his Monograph that the present species has but 19 segments, with no pores on the last two. He also pointed out the fact that the distal joint of the male genitalia is articulated at base, but all European writers seem to have ignored these observations.

Notwithstanding the fact that several species from different parts of the world have been referred by their authors to Scytonotus, it seems probable that the genus as here described is monotypic, or at least confined to Northeastern North America. Reasons for this view may be stated briefly in detail as follows:

***Scytonotus laevicollis* C. L. Koch.**

System der Myriapoden, p. 131.

Die Myriapoden, II., p. 41, fig. 163.

This species seems to have been founded on an entirely insignificant difference, as the author himself admits. A large suite of specimens from different localities shows that the roughness of the first segment is subject to much variation, being usually less in females (?)

***Scytonotus nodulosus* C. K. Koch.**

System der Myriapoden, p. 131.

Die Myriapoden, II., p. 43, fig. 165

According to the original description this species has 31 legs in the male, a unique condition of things unless the genitalia are enumerated. The diagram gives 20 segments, and the dorsal sculpture (three rows of scale like elevations, the anterior and

lateral larger) is such as to leave no doubt that the species intended is one of a group of small North American forms with 20 segments, not yet separated from *Polydesmus*, but probably more nearly related to *Brachydesmus*. That this latter genus can be maintained *solely* upon the difference of one in the number of segments would seem improbable, for this difference may be reasonably ascribed to arrested development, and the small size of the species with 19 segments gives force to the idea that they are depauperate forms. Nevertheless, the number of segments in the adult has never been known to vary in a species, and this fact gives it great importance.

***Polydesmus* (*Scytonotus*) *arcticollis* Peters.**

Monatsber. d. Akad. f. Wissensch. zu Berlin (1864), p. 539.

This Venezuelan species is given as having 20 segments and a pattern of dorsal sculpture very different from *S. granulatus*. Peters himself afterward placed it in a new subgenus, *Trachelodesmus*.

***Polydesmus* (*Scytonotus*) *cæsius* Karsch.**

Troschel, Archiv. f. Naturgesch (1881), p. 42.

A New Zealand species, apparently having little affinity with the American form, since the author says: "Segmentis alatis subglabris, medio serie transversa arearum subquadratarum circumcissarum ornatis."

***Polydesmus* (*Scytonotus*) *woodianus* Humbert et Saussure.**

Rev. et Mag. de Zool. (1869), p. 152.

A Mexican species with the dorsal surface wrinkled, a few small flattened and scattered granules, broad, dentate carinae, no elevations for the repugnatorial pores, and 20 segments. In their larger work on the Myriapoda of Mexico the authors have ignored *Scytonotus*, even as a subgenus, and referred the species back to *Polydesmus*. That their species is congeneric with *P. complanatus* of Europe cannot be reasonably maintained, and it seems to have even less affinity with *Scytonotus*. Neither does it seem to

accord with any of the described genera, and future investigation may result in the erection of a new genus for its reception.

***Scytonotus cavernarius* Bollman.**

Entomologica Americana, Vol. III, p. 45.

"Allied to *nodulosus* Koch. Pure white throughout. Slender, somewhat depressed, acuminate anteriorly. Antennæ exceeding the width of body, clavate. First dorsal plate elliptical, angles sharp; scales arranged in five transverse series, anterior row sharp, setigerous, all covered with fine granulations. Other dorsal plates with all the lateral sides sharply and deeply four or five toothed, scales arranged in four rows, the posterior row more or less setigerous, on posterior segments the anterior row is not very distinct. Repugnatorial pore scale large and swollen. Legs moderately long and slender.

"Length of body, 11 mm.; width, 1.5 mm.

"*Habitat*: Mayfield's Cave, Bloomington, Indiana.

"This species is described from one female found in motion on the floor of the above cave in October, 1886. As already stated, this species is more nearly related to *nodulosus*, but as *granulatus* is the only species so far found in the vicinity of Bloomington, I suppose it is descended from *granulatus*."

The above original and only description of this species makes its generic assignment a matter of doubt. *Nodulosus*, as has been shown, is not con-generic with *granulatus*. That Mr. Bollman's species is at once more nearly related to *nodulosus*, but descended from *granulatus* necessarily involves the further inference that *nodulosus* and related species are likewise descended from *granulatus*, for which supposition there seems not to be sufficient ground. There is also nothing to indicate that Mr. Bollman counted the segments, and his animal may be a species of *Brachydesmus*, the European species of which are largely cavernicolous.

***Scytonotus setiger* (Wood) Bollman.**

Trans. Am. Philos. Soc. (1865) p. 214.

Proc. U. S. Nat. Mus. (1888) p. 340.

Mr. Bollman referred this species to *Scytonotus* probably because he recognized in it a congener of *S. nodulosus* Koch.

***Scytonotus digitatus* Porat.**

Nya Bidrag till Skand. Halföns Myriap. (1889) p. 24.

This species was described from a conservatory in Sweden and is, no doubt, exotic and probably tropical. Its characters are certainly very remarkably different from those of *Scytonotus*, and from any other described genus. We suggest that it be considered the type of a new genus, under the name **Poratia**. The digitately lobed carinae are a character sufficiently bizarre, but equally important as a means of distinguishing it from *Scytonotus* is the fact that the 5th antennal joint is longest and thickest, followed in length by the 6th, 2d, 4th, 3d, and 7th, and that the 2d joint of the legs is nearly as long as the 6th.

***Scytonotus granulatus* (Say) Bollman.**

Polydesmus granulatus Say.

Scytonotus scabricollis C. L. Koch,—System der Myriapoden, p. 130.—Die Myriapoden II, p. 41, fig. 164.

Scytonotus levicollis C. L. Koch,—System der Myriapoden, p. 131.—Die Myriapoden II, p. 43, fig. 165.

Scytonotus granulatus Bollman,—Entomologica Americana III, p. 46.

There can be little doubt that *Polydesmus granulatus* Say is the animal described by C. L. Koch as *Scytonotus scabricollis*. Say's description includes several statements which could not apply to any other known North American diplopod:

"Body with short hair, pale tinged with red beneath, and feet paler; head dusky with short dense hairs; labrum whitish; segments somewhat convex, granulated, granules rounded, or longitudinally oblong-oval, elevated, obtuse, approximate and arranged transversely in about four nearly regular series, anterior segment transversely oval, narrower than the head or second segment; stigmata elevated.

"Found in Pennsylvania."

Especially diagnostic are the number and arrangement of the granules and the location of the repugnatorial pores. Like most of the old descriptions, the above is very meagre and a more detailed one will be in place.

Body 5-6 times as long as broad (fig. 65), subfusiform, narrowed very gradually cephalad, very abruptly caudad, sub-depressed, above moderately convex.

Vertex very minutely punctate, appearing smooth, rather densely hirsute with short hairs; median furrow distinct, though not deep, extending slightly more than half to the antennal sockets; on each side a very faint, somewhat arcuate, oblique line extends from the end of the median furrow to the antennal sockets, indicating sutures which join that of the median furrow; the angles included between these three lines are subequal, the lower slightly smaller than the others. These diagonal sutures should probably be looked upon as the lines of demarcation between the vertex and clypeus, as there is no trace of a suture lower down. Above the antennal sockets the vertex is prominent, while laterad from them is a sudden depression or broad groove. The disc like structure to be found just above or outside of the antennal socket in most Polydesmidae is here not apparent. Under good magnification the vertex furrow is seen to be occupied by minute transverse wrinkles.

Clypeus somewhat less hirsute than the vertex, prominent between the antennae, and especially on the sides below the antennal groove mentioned above; lower down the clypeus is flattened or with a broad shallow depression, and with fine transverse wrinkles. Along the lateral margins, below the prominence is a sub-plane with a sharp edge, and just above the labrum a transverse elevated one. A deep, curved incision extends from the lateral margin nearly to the antennal socket, just above the lateral prominence.

Labrum with two rows of bristles, 6-8 in the lower row, 4 in the upper; broadly and deeply emarginate, the emargination with three rounded teeth, which do not project as far as the edges of the emargination.

Antennae rather densely pilose, 2.25-2.75 mm. long, third joint slightly longer than the first two taken together; sixth joint much the thickest, all but the first and last obconic.

Mandibular stipes large, projecting laterally beyond the first segment, above and posteriorly angled (see fig. 47); exposed surface divided by sutures into 6 areas, of which 5 are triangular and 1 trapezoidal (figs. 48-49); masticatory plate elongated triangular, with numerous transverse ridges closer together towards the small end (fig. 55). One side fringed with denticulated processes (fig. 56). Under a high power the ridges are seen to be pinnately branched, and toward the small end of the plate the ridges become indistinguishable and pass gradually into a fine raised reticulation (fig. 57). Between the ridges, toward the large end the plate is perforated by numerous round openings—possibly of the salivary ducts.

Dentate lamella with four rounded teeth, the margin beyond the teeth with one or two indistinct notches (fig. 53).

Mentum pointed-cordate, slightly longer than broad, the surface tuberculate-papillose, a few short bristles near the apex (fig. 50).

Stipes three times as long as their greatest width; a transverse row of long bristles anteriorly, a median area rather sparsely covered with somewhat shorter bristles extending nearly to the proximal end of the stipes.

Cardo irregularly trapezoidal, over twice as long as broad. External process with 6-8 cones, the internal with 10-14 (fig. 51).

Lingual lamina more than three times as long as broad, with a few long bristles. Lingual lobes large, somewhat broader than long, truncate distad, 2-3 very small cones at the interior corner. Median lobe clavate, truncate or acuminate at apex, or truncate below and acuminate above; on either side, near the apex, rises a styliform process, sometimes bidentate at apex (fig. 52).

First segment sub-elliptical, more arcuate in front, about twice as broad as long, much narrower than the head or second segment; surface rough with setiferous granules of varying distinctness, sometimes the central ones are nearly obliterated, sometimes all except the posterior row.

Second segment shortest, about half as long as the first, sub-lunate, the ends longer than the middle, and embracing the first segment; surface very convex and rough with granules usually without evident regularity of arrangement.

Subsequent segments gradually longer, the anterior projection of the carinae gradually disappearing, though the anterior corner is prominent on nearly all the segments. Beginning with the fifth the posterior angle becomes more and more prominent, especially on pore-bearing segments, and on some of the caudal segments takes the form of a triangular projection from the posterior margin. The granules become more regularly arranged in five or six transverse rows; the furrow in front of the third posterior row is usually deeper than the others, and a somewhat pronounced median furrow runs from it to the anterior margin of the subsegment.

Repugnatorial pores situated in a slight depression on top of the large smooth sub-elliptical elevation at the corner of posterior segments and nearer the middle of the lateral edge of the anterior.

Lateral carinae thick, the edges granulate-serrate, smooth below; the granules usually larger and irregularly arranged.

Supplementary margin (fig. 58) finely pectinate, the teeth transparent, lance-like, simple or with a small tooth on one side, rarely on both.

Anterior subsegments densely and minutely punctate; between the subsegments a somewhat abrupt constriction.

Last segment the dorsal surface rough with spine-like, setiferous tubercles, not arranged with regularity; conic, decurved, truncate at apex, and with four small pits from each of which rises a long bristle. On each side above the apex is a larger tubercle (fig. 67).

Anal valves smooth or faintly wrinkled, the margins compressed, elevated, a groove on either side, in which is located two setigerous tubercles, one near the middle, the other near the upper corner.

Pre-anal scale much broader than long, sub-triangular with the apex broadly truncate or rounded, on each side a tubercle from which rises a long bristle, appressed to the anal valves.

Color horn-brown, some specimens with a decided tinge of cherry red, others dirty white; extremities of antennae and legs colored like the body, sometimes darker and sometimes lighter; ventral surface and basal joints of legs and antennae pale.

Length 12-14 mm.; width 1.5-1.75 mm.

Habitat: Among leaves and rotting debris in moist deciduous woods of Eastern North America. Pennsylvania (Say); reported by Dr. Wood from Pennsylvania, Michigan and Canada; Mr. Bollman records it as abundant in Indiana. The writers have collected specimens in the following places: Syracuse, N. Y., and several places in the vicinity, Tully, Marcellus, Jamesville, Clyde and Wolcott, Wayne county, N. Y.; Lebanon, Pa.; Washington, D. C., and on the Virginia side of the Potomac near Washington.

The species is seldom abundant, but in the right locations a few specimens are usually to be found. At Lebanon, Pa., a large number of individuals were found among rotting leaves piled up during high water near a brook. About a hundred specimens form the basis of the present study. The proportions of the sexes seem to be about equal.

Larval form: Six-legged larvæ (fig. 70) of this species were found near Wolcott, Wayne county, N. Y., in May of the present year, among leaves on a wooded hill-side. They are sluggish in their movements and might be mistaken for *Lipura*. In color they are pure white. Like the larva of *Polydesmus* in the six-legged conditions they have seven segments, with a repugnatorial pore on the fifth. The first pair of legs is apparently attached to the first segment. The legs seem to be six-jointed, as in the adults, but the antennæ have only four¹ joints. There are four olfactory cones (also agreeing with *Polydesmus*²), and are proportionally longer than in the adult. The third joint has on one side a single marginal row of the finger-like sense-organs found on the sixth joint of the adult. The fourth joint has the transparent cones and long hair of the seventh joint of the adult. This

¹The antennæ of the Helminthomorpha have, in reality, eight joints, although nearly always reckoned as seven-jointed, the terminal being reduced to a cap or disk bearing the four olfactory cones. Sometimes this is retracted into the end of the seventh joint. In the larva under examination the terminal is not so rudimentary as it afterward becomes. From Rath's diagram (*Beiträge zur Kenntniss der Chilogathen*, pl. 2, fig. 24) it appears that this is to an even greater extent the case with the European *Polydesmus complanatus*.

²Heathcote (*Philos. Trans. Royal Soc., London* (1888), pl. 27, fig. 3) figures the antennæ of a six-legged *Iulus terrestris* as 7-jointed (8 joints with the terminal) and two olfactory cones. This difference is certainly noteworthy if the figures referred to prove correct.

indicates that the additional joints are either intercalated between the others or at base, probably the latter, for the second joint of the larval antenna also has some of the finger-like sense-organs, like the fifth joint of the adult.

There are five pectinate lamellae, the number being constant in the three individuals of which the mandibles were examined.

The styliform processes of the median lobe of the gnathochilarium are much larger proportionately than in the adult, and are tridentate as in Chordeumidae. The cones of the processes of the stipes are very few.

The greatest difference between the young and the adult is that the former is covered with clavate, *barbed*, bristles (fig. 69). Such have been reported as occurring on the embryo of *Strongyl-osoma guerrini*, but do not seem to have been noticed at a more advanced stage. Both Rath and Packard have observed the six-legged larva of *Polydesmus*,¹ and both report the bristles as clavate, but do not mention that they are barbed, though the importance of this latter fact would have doubtless been realized on account of the attempt to connect the Archepolypoda with the modern Diplopoda by means of the barbed hairs of *Polyxenus*. On the larval *Seytonotus* the hairs are more clavate dorsally, on the sides and below becoming more and more of the usual shape.

The four bristles of the apex of the last segment are also in notable contrast to those of the adult, both in their great size and large pedicels. All the hair-structures of the larva have more or less of a raised base, except those of the legs and antennae.

The larval claw is distinctly bifid, though the inside hamus is very small (fig. 71). In the adult an exceedingly minute rudiment of this may be found under a quarter-inch objective.

The larvae measure 1.25 mm. in length, and .4 mm. in width. A considerable number were found together, and they were probably newly hatched.

¹Dr. A. S. Packard has reported (*American Naturalist*, 1886, p. 651) the six-legged larva of *Polydesmus canadensis* from Florida, as having eight segments. We have not seen *canadensis* from the South. Other similar species replace it there.

Comparative Differences Between the Sexes.

1. The antennæ of the female are shorter and more clavate than those of the male (cf. figs. 40 and 41).

2. The legs of the female are about one-third shorter, and about half as thick as those of the male (cf. figs. 1-29 and 30-39). These differences are sufficient to make the sexes distinguishable at sight, the female appearing much more slender, though the diameter of the body is not less than in males.

The size and shape of the first pair of legs is nearly the same in the two sexes (cf. figs. 1 and 3), and the coxal joint is in both cases densely papillose, except on its posterior face. The difference in size between the sexes begins to appear in the second legs, whose coxæ are papillose on the outer face in both sexes. Occasionally the coxæ of other male legs show a slight roughening of the outer face.

3. The pedigerous laminae of females are much broader than those of males (fig. 62), a partial compensation for the shortness of the female legs.

Secondary Sexual Characters of Males.

1. Legs 13-20,¹ inclusive, are more or less conspicuously different from the others, some of the joints being more crassate and otherwise modified. The legs increase in size gradually from the 1st to the 13th, the penultimate joint of which is much inflated, as is also that of the 14th, 19th and 20th, and to a less degree that of the 15th, 16th, 17th and 18th. The 21st legs are apparently different from the 12th. The legs behind the 21st pair are gradually more slender and slightly shorter. In the legs which are most modified, the 13th, 14th, 19th and 20, the last joint is shorter than the normal, the penultimate being hypertrophied.

2. The ventral face of the distal portion of the second joint is papillose on the 18th, 19th and 20th legs. The papillæ are fewest on the 18th and most numerous on the 19th, on which also the papillose surface is considerably elevated, the same condition obtaining on the 20th, but to a less degree.

¹The drawings of the male legs are numbered as they occur on the animal.

3. The ventral face of the third joint is more or less papillose on legs 3-7, 9-12, and 18-29. The papillae are few on legs 3-12, and are confined to the distal part of the joint. On the 18th legs there is a papillose area near the middle of the joint, while on the 19th and 20th the roughened surface is large and prominent, with more scattered papillae covering a large part of the ventral face of the joint. On legs 21-29 the papillae are about the same as on 3-12, becoming gradually fewer and smaller. The absence of papillae on legs 13-17 is noteworthy, considering the fact that these legs are much modified in other respects.

4. The third joint of legs 19 and 20 is stouter than that of the others and has its distal margin noticeably more oblique, conditions probably correlated with special roughness of the joints of these legs.

5. The fourth joint is papillose on its inner face on all the legs except numbers 1 and 13-17, which have the third joint also smooth.

6. The fourth joint of legs 19 and 20 is shorter, broader, and more papillose than the others.

7. On legs 13-18 and 21-23 the apical margin of the fourth joint is very oblique, probably to make it possible to flex the enlarged fifth joint. Thus the oblique margin of the *fourth* joint of these legs corresponds functionally to that of the *third* joint of legs 19 and 20, or in other words, the fourth joint of legs 19 and 20 has become a part of the fifth, while that of legs 13-18 and 21-23 is functionally more like a part of the third. The peculiar form and the abundance of papillae on the fourth joint of legs 19 and 20 give force to this suggestion. Transitions between the two types of arrangement are not wanting, for legs 18 and 21-23 gradually shade off into the normal form. When, however, we compare 13 with 20 there can be no doubt that the necessity of special provision for flexing the abnormally crassate joints has been met in two different ways.

8. The ventral face of the fifth joint of all the legs is papillose, except that the roughening is nearly or quite obsolete on the first pair. On legs 13-20 the roughened surface is much more extensive.

9. Legs 13-20 have the ventral face of the fifth joint much inflated, most on the 13th, and slightly less on the 14th, 19th and 20th. The prominent papillose surface is much longer on the

19th and 20th than on the other legs, this being allowed by the conformation of the third and fourth joints.

10. On the posterior face of the distal part of the fifth joint of the 13th-18th legs is a protuberance, very large and curved on the 13th, gradually smaller on the 14th, 15th, 16th and 17th, inconspicuous or wanting on the 18th.

11. Rising from the *anterior* face of the distal part of the 19th and 20th legs is a similar large protuberance.

12. On the ventral side of the sixth joint of all the legs except the 1st and 2d pairs there are three or more rows of 11-14 coarse, rounded, conic teeth, each of which is extended on the distal side into a long bristle. Similar structures occur on the males of *Polydesmus*, the tubercles being larger and less numerous.

Secondary Sexual Characters of Females.

1. The coxae of 2d pair of legs are ventrally inflated and densely papillose, and are separated by a median prolongation of the pedigerous lamina.

2. The pedigerous lamina is prolonged between the legs of the third pair, and is medianly deeply lobed and papillose.

3. The first, second and third joints of all the legs are more or less papillose on the *dorsal* face, the papillae being more and more obscure on the legs of the last few segments.

4. The carinae of segments eight and nine, and usually of one or two adjacent segments are much reduced or entirely wanting, causing the female to appear much more slender. The reduction or absence of carinae is no doubt correlated with the special modification of the 13th and immediately following legs of the male, for in copulation these legs clasp the segments mentioned.

The above secondary differences between the sexes are in many respects the greatest known to occur in the present sub-class. The genitalia of *Polydesmidae* are, of course, much less complex than those of the other families of the *Helminthomorphous* group, but one pair of legs being transformed for this purpose, while in the *Iulidae* two are used, and in the *Chordeumnidae* sometimes as many as four pairs. In the *Chordeumnidae*, also, the secondary modifications are in some cases very considerable, but are almost entirely confined to the legs in front of the genitalia, and special adaptations of legs far behind the genitalia do not appear. It is,

however, in comparison with other Polydesmidae, that the high degree of specialization of *Scytonotus* becomes apparent.

To have the legs of males larger and stronger than those of females is a character general, if not universal, in Polydesmidae. There are, too, among the different genera different contrivances to assist in copulation, for example, in *Fontaria* the claw of the male leg is proportionally much larger and longer than in the female, and strongly decurved (figs. 44-45), while in *Oxydesmus* (figs. 42-43) the claw is decidedly shorter in the males.

Some of the special structures, such as the tuberculation of the distal joint of the legs of males, *Scytonotus* has in common with *Polydesmus* and *Paradesmus*,¹ but in none of the genera is there known to occur any such abrupt and apparently abnormal modifications of shape and structure as are exhibited by the legs of the 13th-20th pairs, much less any corresponding adaptation of the female as the atrophy of the carinae; in fact, no similar case seems to have been noted among the Diplopoda.

Huntington, N. Y., 15 August, 1893.

¹ In *Polydesmus* the tubercles are more knob-like than in *Scytonotus*, they appear on the three distal joints of the legs, and are seta-tipped, as in *Scytonotus*. In *Paradesmus* the tubercles are to be found on four joints, are conic, and without setae.

EXPLANATION OF THE PLATES.

PLATE VI.

Scytonotus granulatus.

Figs. 1-21.—Legs of the male, the number of the figures corresponding to that of pair.

Fig. 8.—Genitulum of male, median face.

Fig. 13a.—The 13th leg, joints 3-5, posterior face.

Fig. 13b.—The same, with joint 6, dorsal face.

PLATE VII.

Scytonotus granulatus.

- Figs. 22-29.—The remaining male legs.
Figs. 30-35.—Legs of the female pairs, 1-6 respectively.
Figs. 36-39.—Legs of the female pairs, 26-29.
Fig. 40.—The antenna of the male.
Fig. 41.—Antenna of female.

Oxydesmus sp.

- Fig. 42.—Claw of male.
Fig. 43.—Claw of female.

Fontaria trimaculata.

- Fig. 44.—Claw of male.
Fig. 45.—Claw of female.

PLATE VIII.

Scytonotus granulatus.

- Fig. 46.—Labrum, showing the two rows of bristles.
Fig. 47.—Parts of first segment, vertex and mandibular stipes. Superior-posterior view.
Fig. 48.—Mandibular stipes, lateral face.
Fig. 49.—Same, ventral face.
Fig. 50.—Gnathochilarium, with hypostoma.
Fig. 51.—Same, distal part, interior face.
Fig. 52.—The median lobe of gnathochilarium, with styliform processes.
Fig. 53.—Mandible.
Fig. 54.—First four segments of the female, ventral view. The head has been removed. The pedigerous laminae of the first and second pairs of legs are free. On the third segment are the female genitalia, their aperture at the lateral edge of the diagram.
Fig. 55.—The masticatory plate.
Fig. 56.—Fringed processes from the edge of the masticatory plate near the base, much magnified.
Fig. 57.—The apex of the masticatory plate, much magnified.
Fig. 58.—The supplementary margin.
Fig. 59.—End of antenna, much magnified, showing the sense-organs of the three distal joints.

PLATE IX.

***Scytonotus granulatus*.**

Fig. 60.—Seventh segment of male, ventral face, showing the genitalia *in situ*.

Fig. 61.—Same, the distal joints of genitalia bent downward (backward), showing the concavities of the expanded basal joint, in which the distal joints are partially concealed.

Fig. 62.—Diagrammatic cross-sections of the eighth segment of the two sexes.

***Polydesmus canadensis*.**

Fig. 63.—Diagrammatic cross-sections of the two sexes.

***Scytonotus granulatus*.**

Fig. 64.—Three terminal segments, with anal valves and anal scale, lateral view.

Fig. 65.—Dorsal view of entire animal.

Fig. 66.—Segments 6-11 of female, showing the atrophied carinae of the eighth and ninth segments.

Fig. 67.—Terminal segments ventral view.

Fig. 68.—Terminal segments of the six-legged larva.

Fig. 69.—Barbed hairs from the six-legged larva.

Fig. 70.—Six-legged larva.

Fig. 71.—Claw of same.