MILLIPEDS FROM SOUTHERN COSTA RICAN HIGHLANDS[1]

H. F. LOOMIS[2]

5355 S. W. 92nd St., Miami, Florida 33156

ABSTRACT

A collection of millipeds made in southern Costa Rica is enumerated from an area where only 1 species has been known. Sixteen new species are described and illustrated, one being a new genus; 6 established species are again reported, 1 supplementary to the collection.

In the huge area of Costa Rica lying a little south of a line joining Limon, Cartago, San Jose, and Puentarenas, no millipeds have been reported except *Platyrhacus riparius* Carl 1902, known only from the very indefinite locality, "Rio General, Pacific slope," probably not far from San Isidro del General. Thus an opportunity was welcomed in April 1972 by my wife and me to traverse the Inter-American Highway in both directions, from Cartago to near the Panama border, with a few incidental stops for milliped collecting. At the southern terminus of the journey, a day and a half were spent collecting at the R. G. Wilson's "Finca Las Cruces," 4,000 ft elevation, a few miles west of San Vito, Puentarenas Prov., on 17-18 April, with excellent results. Sixteen undescribed species, 1 a new genus, and 5 previously known were found and are reported, plus 1 not included in the collection.

Keys to lower taxonomic entities are included but 2 large Costa Rican genera herein represented, *Nyssodesmus* and *Orthoporus,* contain so many poorly described species, inadequately illustrated, if at all, that revisionary study of large collections and reference to original specimens will be necessary before comprehensive keys can be formulated. The species described in these genera have been compared with what appear to be their closest relatives and therefore should always be recognizable on structural and geographic grounds.

In this paper, as in a recent one on Costa Rican millipeds (Loomis 1972), where the full citation is needed for a scientific name, followed by its author and publication date, it may be determined through use of the present Literature Cited or of Loomis 1968.

In working on the millipeds of this country, it has been noted in the early taxonomic literature that holotype and other localities often were difficult or impossible to find on maps, or were complicated by finding 2 or more places of similar names in different parts of the country. In the latter case, the collections probably came from those places most accessible to the collectors. Solutions of some locality problems have been suggested in the following text.

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[1]Contribution No. 293, Bureau of Entomology, Division of Plant Industry, Fla. Dep. Agr. and Cons. Serv., Gainesville, Fla. 32602.

[2]Research Associate, Florida State Collection of Arthropods, Florida Department of Agriculture and Consumer Services.

Holotypes, some paratypes, and other named specimens, of this collection have been deposited in the Florida State Collection of Arthropods, in Gainesville; the first paratype and possibly other specimens have been sent to the National Museum of Natural History, Smithsonian Institution, Washington, D. C.

CHELODESMIDAE

KEY TO THE GENERA OF CHELODESMIDAE IN COSTA RICA

1. Body large, 35-55 mm long ..... *Chondrodesmus* Silvestri
1′. Body little, if any, over half as long 2
2. Last joint of legs considerably longer than joint 5 ..... *Ethophallus* Chamberlin
2′. Last joint of legs shorter than joint 5 3
3. Outer margin of keels strongly dentate ..... *Isidrona* Attems
3′. Outer margin of keels not strongly dentate 4
4. Males with 20 segments; gonopods rather slender with a variable lobe near apex of basal joint ..... *Trichomorpha Silvestri*
4′. Males with 19 segments; gonopods short and stout, lacking a lobe on basal joint 5
5. Gonopods with outer joint very broad distally, apex acute, strongly reflexed, subbasal lobe trifid, anterior male legs without ventral lobes ..... *Talamancia* new genus
5′. Gonopods with outer joint distally narrower, subbasal lobe simple; joint 5 of some anterior male legs ventrally lobed ..... *Phylactophallus* Pocock

Talamancia new genus

Type species: *Talamancia alba* new species.

Diagnosis: Closely related to *Phylactophallus* Pocock 1909, but distinguished by having segment 1 of different size and shape; last joint of legs longer; fifth joint of all male legs simple; and the distinctive gonopods.

Description: Body of medium size, resembling *Trichomorpha* Silvestri in appearance; males with 19 segments, females probably with 20; body colorless, possibly indicating recent moulting.

Head flattened to slightly concave above line of antennae, followed by a deep furrow to back of vertex; cheeks swollen cephalolaterad of antennae; surface between antennae glabrous, elsewhere sparsely setose; antennal joint 6 longest, joints 2-6 densely hispid.

Segment 1 as wide as head or adjacent segments, sides nearly straight for some distance in front of posterior angles; surface crossed by 3 rows of erect setae. Each of the succeeding segments crossed by 2 rows of 4 setae; metazonites of midbody with transverse median furrow. Lateral keels rather narrow, nearly horizontal; lateral margin with 2 setae; posterior margin of midbody keels with a projecting nodule near base; posterior angles large and acute. Preanal scale rounded at apex which is preceded by a transverse depression. Joint 6 of legs longer than joint 5 which is without a ventral pad.

Gonopods with coxal joints small; distal joints short and stout, the mesal portion overlapping its opposite counterpart. Legs in front of gonopods unmodified; sterna with longitudinal median furrow but none crosswise; sterna of legs 6 and 7 wider than those of 4 and 5, the sixth sternum widest; seventh sternum not especially depressed.

Talamancia alba new species

Holotype male, N side Cerro de la Muerte, Inter-American Hwy., 8,500 ft, 19 April 1972.

Description: Body 12 mm long, 1.7 mm wide, uncolored, poorly chitinized, the dorsum only moderately convex.

Head with a flat or slightly concave, subsemicircular area above antennal level, followed by a deep furrow to back of vertex; surface each side strongly convex; cheek swollen below each antenna, causing antenna to appear deep-seated from below and laterally; surface of head sparsely setose except between antennae; joints 2 and 3 of antennae subequal in length, 4 and 5 gradually shorter, joint 6 longest, all densely hispid; clypeal setae 3-3; labral setae 5-5.

Segment 1 (Fig. 1) about as wide as head or adjacent segments; posterior angle each side large and caudally directed; side straight for a short distance in front of it and with a median seta as well as one farther forward; surface with anterior row of 8 setae, a median and posterior row contain 6 setae each.

Succeeding segments with metazonites crossed by 2 rows of 6 setae each, a furrow between rows on segments 5-15. Lateral keels narrow, almost horizontal, a small lateral tooth behind anterior corner with a small one between it and posterior angle of segments 2-4 (Fig. 2); 2 setae in lateral margins; from segment 7-16 a small acute tooth projects from posterior margin adjacent to base of angle; posterior angles of penultimate segment less than half as long as on segment 17; outer margin of poriferous keels only moderately thickened, the pores opening outward and upward. Anal valves strongly inflated. Preanal scale rounded from side to side but more abruptly across apex which is preceded by a transverse depression. Legs with outer joint distinctly longer than joint 5 which is without a ventral lobe; sterna with only a longitudinal median furrow.

Gonopods held close together, considerably overlapping, shaped as in Fig. 3. Gonopodial opening with margin elevated on sides. Sterna of legs 6 and 7 considerably wider than between legs 4 and 5; sternum of sixth legs widest.

Trichomorpha Silvestri 1897c

The 2 species described hereafter fit into the key given in Loomis 1972 as follows: the first between couplet 2 and 2′; the second between couplet 3 and 3′.

Trichomorpha esulcata new species

Holotype male, another male and broken female, Finca Las Cruces, San Vito, 17-18 April 1972.

Diagnosis: Except for the dorsal vestiture and gonopods, which seem to associate it with *T. gracilis* Loomis 1972, most other characters ally it with the densely setose *T. capillata* Loomis 1964a from adjacent Panama.

Description: Males 10.5-13.0 mm long, 1.5-1.6 mm wide, narrower than females. Color brownish, except uncolored posterior angle of keels, outer joints of antennae, legs, and ventral surfaces.

Head with vertex furrowed at middle from between antennae to back of head, surface either side convex and with a few long setae; frontal area convex in both directions and quite densely beset with shorter setae.

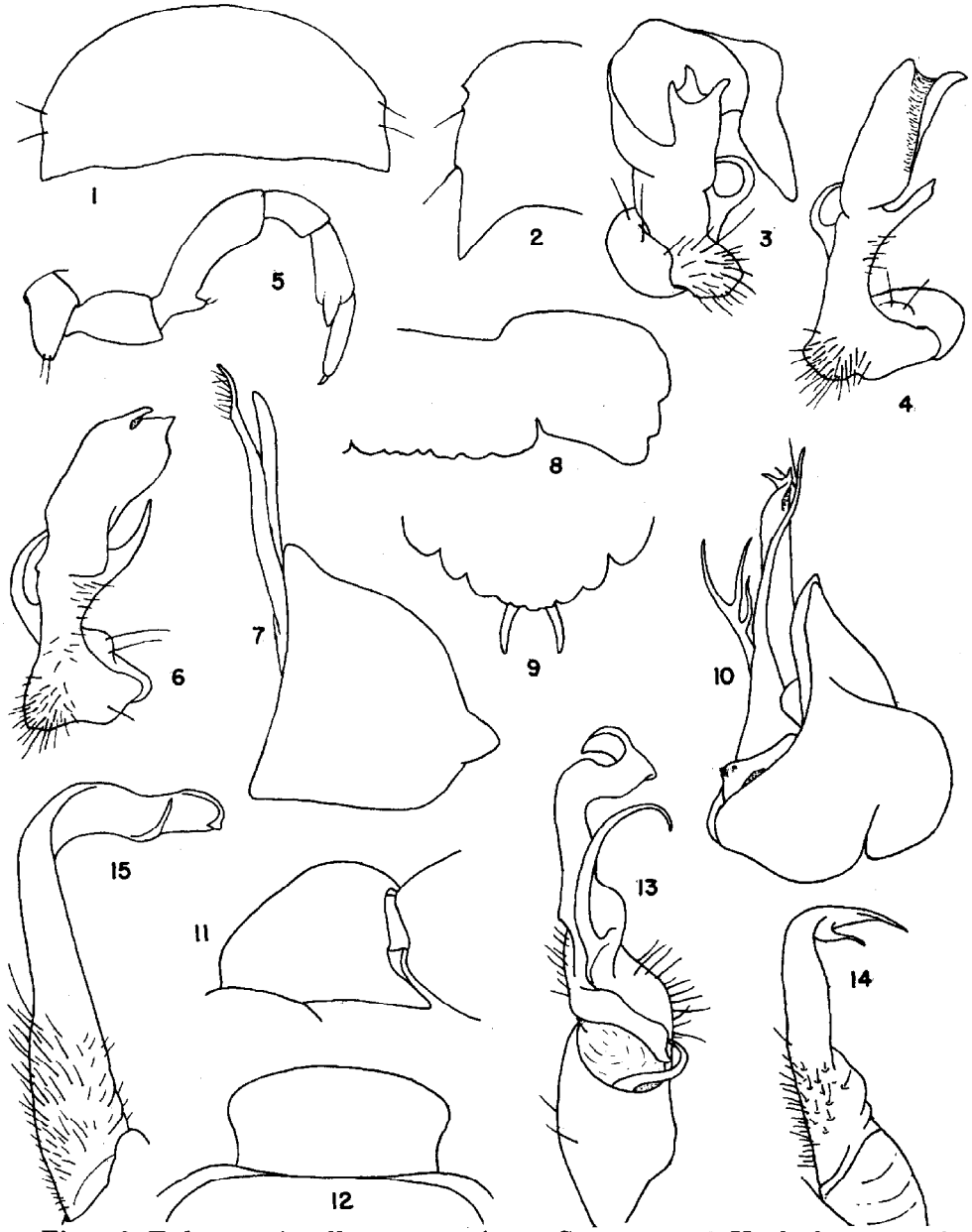

Fig. 1-3. *Talamancia alba* new species: 1. Segment 1; 2. Keel of segment 3; 3. Right gonopod, ventral view from slightly inside.

Fig. 4-5. *Trichomorpha esulcata* new species: 4. Left gonopod in ventral view; 5. Seventh male leg, posterior view.

Fig. 6. *Trichomorpha gracilis* new species: Left gonopod, ventral view.

Fig. 7. *Cyrtodesmus depressus* new species: Left gonopod, ventral view.

Fig. 8-10. *Cyrtodesmus humerosus* new species: 8. Keel and part of metazonite of segment 15; 9. Last segment, dorsal view; 10. Left gonopod, ventral view.

Fig. 11-12. *Cyrtodesmus lobatus* new species: 11. Antennal joint 4, anterior view; 12. Ventral lobe of segment 3 from behind.

Fig. 13. *Amplinus bituberculatus* new species: Right gonopod, mesal view.

Fig. 14. *Nyssodesmus luteolus* new species: Left gonopod foreshortened, sigmoidal curve not showing, outer view.

Fig. 15. *Nyssodesmus vialis* new species: Left gonopod, outer view.

Segment 1 strongly convex in both directions; anterior margin narrowly rimmed throughout from posterior angles; surface with an anterior row of 6 setae, a median one of 4, and possibly some posterior ones, although none was seen there or on following segments; posterior margin triarcuate as is that of segments 2-4 after which it is nearly straight between posterior angles, all of which are increasingly produced backward from segment 2, those of segments 17 and 18 largest, those of segment 19 larger and less separated than in *T. capillata.*

Body strongly convex, brilliantly shining, keels nearly horizontal, narrow, and slightly oblique; posterior angles higher than anterior ones but lacking much of equalling height of mid-dorsum; a small tooth behind anterior corner, none on posterior margin. Metazonites evenly convex from front to back, without an impressed transverse sulcus although an indistinct convexity usually is seen on some near midbody. Last segment longer and more slender than in *capillata*; preanal scale broadly rounded behind.

Gonopods elongate, nearly parallel; 1 shown in Fig. 4. Male legs 1-12 with distoventral lobe on joint 5; seventh legs with large coxal tubercle and a smaller one beneath joint 3 near base (Fig. 5); fourth sternum with transverse truncated tubercle each side; sterna of both sexes rather strongly furrowed along middle but not across, sternum of last male legs deep and with a small conical shoulder adjacent to each coxa, more evident ones on posterior sternum of segment 17.

Trichomorpha gracilis new species

Holotype, 4 other males, 5 females, 1 juvenile, Finca Las Cruces, San Vito, 17-18 April 1972.

Diagnosis: Relationship between *T. evidens* (Chamberlin 1940a) and the foregoing *esulcata* as indicated by the gonopods but perhaps closest to the former species.

Description: Medium size species; largest male (holotype) 18 mm long, 2 mm wide; largest female 19 mm long, 2.5 mm wide; males flatter than females; dorsum smooth and shining, not strongly convex; transverse furrow present on metazonites from segment 5-15 or 16; living color chestnut brown; outer portion of keels, ventral surfaces, and appendages colorless.

Head with strong vertigial sulcus extending back from upper level of antennal sockets; either side convex; surface below antennae moderately convex and densely beset with fine, long, erect setae.

Segment 1 with strong raised rim on sides but very fine across front; lateral margin smooth containing a seta in front of posterior angle; surface strongly convex transversely, crossed by an anterior row of 6 setae, a median row of 4, and possibly a posterior row from which setae have disappeared. Succeeding segments with a few scattered setae that may have been part of 2 rows.

Keels of segments with a tooth on anterior shoulder, followed by another, and a projecting seta on segments 2-4, the seta usually present in the margin of the keels thereafter; posterior angle of all keels produced straight back, those of segment 19 a little more than half as long as those of 18; posterior margins smooth. Segments 1-5 with posterior margin triarcuate between angles but thereafter almost straight across throughout. Transverse sulcus of male metazonites beginning on segment 5 or 6 and continuing through segment 16; sulcus scarcely evident in females.

Gonopod shown in Fig. 6. Males with ventrodistal lobe projecting from end of joint 5 of all legs to those of segment 15; seventh male legs not otherwise modified. Each posterior sternum from about segment 10 caudad has a conical tooth adjacent to each coxa, the largest on segment 17; smaller teeth also present in females; sterna of both sexes with longitudinal sulcus only, that between last pair of male legs very deep.

CYRTODESMIDAE

Cyrtodesmus Silvestri 1897a

KEY TO COSTA RICAN SPECIES OF *Cyrtodesmus*

1. Primary tubercles of dorsum broad and greatly depressed ..... *depressus* new species
1'. Primary tubercles of dorsum not greatly depressed 2
2. Last segment hidden from above ..... *quadridens* Loomis
2'. Last segment more or less exposed from above 3
3. Last segment without transparent hooks ..... *palliatus* Loomis
3'. Last segment with transparent hooks 4
4. Keels strongly shouldered in front adjacent to body; surface of last segment granular, without large tubercles ..... *humerosus* new species
4'. Keels not strongly shouldered in front, last segment with 2 large dorsal tubercles ..... *lobatus* new species

Cyrtodesmus depressus new species

Holotype male, 3 females, 2 young, Finca Las Cruces, San Vito, 17-18 April 1972.

Diagnosis: The gonopods indicate close relationship with *C. hispidulosus* Loomis 1964a, but the greatly repressed primary tubercles, few secondary ones on middorsum, almost complete lack of spicules, and limited coating of organic matter are outstanding differences.

Description: Male 10 mm long, 2.2 mm wide, females a little larger. Dorsum moderately convex, sides of metazonites descend obliquely and from them the keels from segment 3-17 flare outward a little. Metazonites and keels very thinly encrusted with dirt which is lacking from some areas, especially the primary tubercles, the actual surface shining; several very minute, short spicules on a few primary and secondary tubercles.

Head with frontal and interantennal areas of similar height; separated by a narrow channel curving back from middle; upper outer corner each side of front not raised into a free angle, a thin oblique ridge on side of head laterad of antennal socket; each interantennal ridge long, extending half way to back margin of head, surface between them swollen in front; median sulcus of vertex distinct on posterior half. Joint 4 of antennae with a conical tubercle at distoventral limit nearly as large as in *C. lobatus*.

Segment 1 almost hidden from side by segment 2; a large anterior marginal lobe at each outer angle; dorsum a little depressed along middle; surface either side moderately swollen and densely covered with sharp conical tubercles larger than those on next segment.

Segment 2 with the usual expanded keels, their margin not lobed or undulated; inner surface not separated into areas by channels; all tubercles quite small, low, poorly defined, and not especially numerous; dorsum convex with

shoulders indicated only immediately behind upper margin of keels; posterior margin with a median emargination more angular than concave at middle. Primary tubercles indistinct on segment 3, more evident thereafter but not elevated until segment 19. Secondary tubercles well developed on segments 1-3, thereafter almost lacking from middorsum but more evident on sides of dorsum and keels. Keels unusually narrow but long; outer margin more or less rounded to about segment 15 after which it is almost straight; no distinct marginal lobes; posterior margin of keels with the usual outer sinus very deep and narrow, margin mesad of it smooth, continuous, and quite convex; surface of keels convex, the pores opening from it rather than from a special tubercle. Metazonites rising gradually from prozonites, those near posterior end of body especially raised. Supplementary margin of type as shown for *C. dentatus* Loomis 1964a but the elements more slender.

Last segment well exposed and with 2 large submedian dorsal tubercles; posterior margin broad, only a little rounded, the 3 blunt-ended tubercles each side decreasing slightly in size inwardly, separated by deep narrow openings; median tubercle about as wide as outer one; papillate apex not guarded by translucent hooks.

Gonopod (Fig. 7) with coxal joint broad, depressed ventrally, and little higher than coxae of adjacent legs, inner margin nearly straight and close to opposite one; basal structure of outer joint hidden; lateral surface with a large rounded tubercle. Two small transverse tubercles on sternum of ninth legs, a larger, oblique, ridge-like one on surface beyond coxae.

Female with ventral crest of third segment rising gradually from sides to the thin, nearly straight, median portion.

Cyrtodesmus humerosus new species

Holotype male, 2 young males, N side Cerro de la Muerte, Inter-American Hwy., 8,500 ft, 19 April 1972.

Diagnosis: The prominent anterior inner shoulder of the keels, apically bifurcate principal branch of gonopods, and large apical hooks of last segment are distinctive and no close relatives are known.

Description: Length 12.5 mm, width 3 mm. Body with metazonites moderately convex and abruptly raised high above interzonal furrow; keels flaring abruptly from metazonites from ventrocaudal limits of segments 2-19, especially on segments 17-19 where they project at almost a right angle; keels of segments 3-19 prominently shouldered in front, at junction with body (Fig. 8); outer portion of keels bent downward, especially on midbody segments; pores nowhere evident. Surface of all segments with sharply raised tubercles ending in a short but thick spicule.

Front of head and interantennae area joined at same level, former without raised angulation near antennal socket, latter with anterior margin broadly rounded from side to side; interantennal ridges unusually low, oblique, wide in front but more slender behind, intervening surface flat and granular; median sulcus present on posterior half of vertex, weak and narrowly impressed. Antennal joint 4 normal, lacking a terminal tubercle.

Segment 1 distinctly margined in front by a row of irregularly shaped, raised tubercles; surface moderately depressed along middle, a circular area either side considerably swollen.

Segment 2 with sides much expanded, the rounded posterior corner and lobe of back margin above it flaring outward; basal surface of expansion

broadly and deeply concave in front of middle; margin of expansion faintly 5-lobed; dorsum convex, not noticeably shouldered each side behind rim of expansion. Primary tubercles of inner row first evident on segment 4, little differing from the sharply raised secondary ones and not increasing in size on succeeding segments until segment 14, after which they increase rapidly in size and height to segment 18; outer row of tubercles not distinct on any segment. Keels of segments 3-5 distinctly bilobed on outer margin, trilobed thereafter; posterior corner of keels of segment 19 considerably less than square. Supplementary margin of metazonites somewhat as in *C. dentatus* Loomis 1964a, but the elements are longer, more slender, and closer together. Last segment broad but little exposed behind segment 19; surface strongly convex, densely granular without large tubercles; sides oblique; outer lobe each side much the largest (Fig. 9); translucent hooks large.

Gonopod (Fig. 10) with coxal joint hemispherical, projecting well beyond coxae of adjacent legs; principal branch bifurcate at apex. Sterna of legs 6 and 7 widened and strongly convex from side to side; that of ninth legs wide, with median depression, no tubercle on outer side near coxa.

Cyrtodesmus lobatus new species

Holotype female, another female, 7 young, Finca Las Cruces, San Vito, 17-18 April 1972.

Diagnosis: Although based on females, characters of segments 3 and 20, and lobation of joint 4 of antennae readily mark this species. Finding of males may show it allied to *C. palliatus* Loomis 1972.

Description: Largest female 14 mm long, 2.8 mm wide. Dorsum strongly convex, lateral keels flaring from sides of segment 3 to midbody after which they almost continue descent of sides of metazonites. Surface of all segments without setae or spicules but everywhere coated with organic matter which is very thin on apex of larger tubercles.

Head with frontal and dark interantennal areas of equal height, separated by a deep narrow channel; a free, distinctly raised, square corner laterad of middle of antenna; interantennal ridges thick, short, and quite oblique, the space between them swollen in front; a short, deep, median sulcus on back half of vertex; joint 4 of antennae extended distoventrally into a large conical lobe (Fig. 11).

Segment 1 very faintly lobed along front margin behind which is an uneven row of 6-8 large rounded tubercles; remainder of surface densely beset with sharply raised tubercles varying from small to as large as in frontal row; dorsum flattened from midpoint caudolaterally to back margin, surface either side strongly inflated, showing above segment in lateral view.

Segment 2 moderately expanded on sides, first lobe of posterior margin, above lower extremity, unusually large; lateral limits flaring only slightly; dorsum slightly convex between the angular shoulders which are a continuation of the edge of the expansion; posterior margin evenly emarginate across median third. Segment 3 without shoulders, the 4 rows of primary tubercles evident but moreso thereafter where they are broadly rounded and elevated only a little from surrounding surface, except on segment 19 where they become higher, the 2 submedian rows forming a distinct ridge; each tubercle with a median pit, possibly a follicle from which a seta has disappeared; secondary tubercles very low and indistinct except on segments 1, 2, and outer surface of keels. Pores on a low tubercle, slightly larger than the secondary

ones, just behind middle of keels. Supplementary margin of metazonites as shown for *C. dentatus* Loomis 1964a. Last segment with 2 large dorsal tubercles; outer marginal lobe each side about equal to the 2 others combined; midlobe broad with apex opposite that of adjacent lobes; ventral papillate area bounded each side by an elongate translucent process, rather than a hook, its apex opposite that of median lobe.

Females with ventral anterior margin of segment 3, behind cyphopods, broadly elevated into a high, thin, basally somewhat constricted lobe (Fig. 12), its anterior face strongly concave from side to side.

EURYURIDAE

Amplinus Attems 1899

Amplinus bituberculosus new species

Holotype male, another male, 2 females, 1 young, Finca Las Cruces, San Vito, 17-18 April 1972.

Diagnosis: Next to the largest Central American species and differing from all in the elongate tubercle or ridge on the sternum of many legs of both sexes adjacent to the coxa; gonopods also distinctive. The other Central American species are keyed in Loomis 1964a, under *Pycnotropis* and *Seminellogon,* now considered synonyms of *Amplinus.*

Description: Males 53-55 mm long, 8 mm wide; females as long but 8.5 mm wide. Living color differing only in minor details from *A. magnus* Loomis 1964a.

Head with median sulcus deep, sharply impressed, extending from between antennae to near posterior edge of vertex; swelling in front of each antenna large and abruptly raised; clypeus with 4 equidistant macrosetae across middle, another seta considerably removed each side.

Segment 1 with surface almost smooth but dorsum of segments thereafter increasingly coriaceous and shining to posterior end of body. Ventral surface of metazonites finely conic-tuberculate near posterior base of keels, tubercles continuing across surface in advance of posterior margin. Last segment with sides parallel to the broadly rounded apex. Anal valves elevated at their lateral limit into a large rounded tubercle intruding slightly into the almost semicircular preanal scale. From the third legs to those of segment 17 in male, but not so far back in females, the sternum adjacent to each coxa is elevated into an elongate ridge, the ends distinctly shouldered or, on some anterior sterna, raised into a rounded tubercle.

Gonopods (Fig. 13) with distal portion of main branch bent mesad and crossing opposite branch, the blade wider than in other species, acute at apex. Gonopodial opening with posterior raised rim increasing in height laterally into a prominent rounded or angular shoulder.

PERIDONTODESMIDAE

Hexodontia Verhoeff 1932

Hexodontia electa (Chamberlin 1914)

A great many specimens, mostly mating, found under dead leaves in crannies of rock cliff above river, Dulce Nombre, near Cartago, 19-20 April 1972.

Living color slate gray above, colorless below. Attems (1933, p. 264) shows apex of gonopod decidedly setose or hispid. In the above specimens the apex was glabrous.

PLATYRHACIDAE

Nyssodesmus Cook 1896

Nyssodesmus luteolus new species

Holotype male, male and female, Finca Las Cruces, San Vito, 17-18 April 1972, Claude Hope.

Diagnosis: Apparently most closely associated with *N. concolor* Loomis 1964a, but considerably smaller; with a brown spot each side on prozonites; head, antennae, and anal valves also dark; posterior corner of keels less produced and the pore more centrally located; gonopods with minor differences.

Description: Males 60-64 mm long, 11-12 mm wide, flatter than female which is 65 mm long, 13 mm wide. Living color of dorsum dull yellowish white except a brown spot on prozonites near base of keels; head, antennae, and anal valves mostly dark brown; legs, preanal scale, and ventral surfaces a little darker than dorsum.

Head with frontal area somewhat inflated, rather coarsely but smoothly rugulose; remainder of surface densely beset with coarse, rounded, and shining granules except on a small median area at back of vertex which is minutely granulose; mesocaudal rim of antennal socket almost smooth, not wrinkled. Crest of vertex with a low transverse elevation either side; sulcus broad, deeply depressed along middle. Clypeus with median macrosetae 2-2, each surrounded by a raised rim, another macroseta each side considerably removed from inner ones. Labrum with median setae 6-6 and another well removed each side.

Segment 1 with posterior margin of its lateral extension oblique and distinctly concave; midmargin straight. Segment 2 with posterior corner of keels squarely angular; on succeeding keels the posterior angles are almost squared and less produced than in other species; outer margin slightly convex, lacking obvious teeth but with 5-6 small, quite uniformly spaced undulations; anterior rim thin, not sharply set off, and poorly developed on posterior half of body. Keels of males broad, nearly horizontal, and projecting from dorsal quarter of body. Entire dorsum dully shining; metazonites without quadrangular areas or 3 transverse rows of tubercles, these represented on a few posterior segments by tiny shining granules; surface of a few anterior metazonites and all keels coarsely coriarious, made up of numerous confluent, low, shining swellings; posterior metazonites becoming almost smooth. Prozonites densely and minutely granulate above and below; ventral surface of keels and adjacent sides of metazonites more coarsely granular. Pores depressed in a broad rim far removed from all margins. Segment 19 with inner margins of keels short, straight, and only faintly diverging. Last segment elongate, sides a little convex, almost parallel, apex broadly rounded. Anal valves inflated, finely granular, as is the scale which has sides deeply concave; margin between the large apical tubercles thick and concave. Sterna from third legs caudad in both sexes with a conical elevation near each coxa, those between male legs 3-6 high and slenderly conical, succeeding ones decreasing in size, present on caudal sterna as low swellings ending acutely.

Gonopod in lateral view (Fig. 14), sigmoidal in ventral view, touching opposite one at outermost curve but not crossing it; principal branch long, slenderly acuminate. Rim around gonopods low, thin, and shining in front, much higher behind and uniformly thickened, thicker at sides; apex coarsely rugulose.

Nyssodesmus vialis new species

Holotype male, Inter-American Hwy., between Cerro de la Muerte and San Isidro General, 5,000 ft., 16 April 1972, R. G. Wilson.

Diagnosis: Related to *N. concolor* Loomis 1964a but with sharply distinct color pattern, no large vertigial tubercles; dorsum much less granular, distal portion of gonopod wider and more parallel sided.

Description: Male 90 mm long, 17 mm wide. Living color of outer portion of keels and broad middorsal area yellowish white; basal portion of keels and adjoining similar area of metazonites, head except vertex, valves, except raised margins, and preanal scale, except terminal tubercles, black to dark brown.

Head with clypeus depressed behind the 4 subequally spaced median macrosetae, another macroseta more removed each side and rising from a broad low swelling; labral setae about 16, a broad but moderately convex swelling laterad of each antenna, its surface densely granular, as is vertex except its posterior median portion; crest of vertex lacking a transverse elevation either side; median furrow broad and deep. Antennae short and thick; joints 2-5 subequal in length, joint 6 a little longer, distinctly clavate.

Segment 1 with supramarginal row of low, shining, rather indefinite tubercles and much less distinct ones near posterior margin; outer limit each side more rounded than angular, a broad concavity dorsad of it; front margin along lateral extension slightly concave. Body more convex than *N. luteolus,* with the narrow keels equal to less than half the diameter of body, almost continuing descent of dorsum and projecting from approximately upper third of body. Dorsum dully shining; metazonites smoothly subgranular, the usual 3 transverse rows of granules evident only behind midbody; outer surface of keels with low, convex, contiguous, shining elevations absent from inner surface; under side of keels and adjacent metazonites not tuberculate, at most with indistinct granules, larger but fewer than the very dense ones of prozonites. Keels of segments 2-4 with outer margin strongly convex and only a little irregular, margin of keels thereafter with 2, 3 or 4 large rounded projections; a distinct concavity usually in margin opposite pore except on segments 18 and 19 where margin is almost smooth and convex; anterior raised rim of keels narrow, complete only on those on front half of body; posterior corner of keels behind midbody noticeably produced. Segment 19 with inner margins of keels divergent. Last segment short and broad, almost evenly rounded from its definitely constricted base. Anal valves moderately convex; ventrolateral limit of each not raised as a tubercle, scarcely inflated, and not extending into preanal scale; surface, and that of scale, indistinctly granular. Scale concave from front to back; lateral margins evenly concave from apex to each low, thick apical tubercle to outer angle; margin between tubercles broad, thick, and straight.

Platyrhacus propinquus Carl 1902

In Loomis 1968, the type locality of this species is incorrectly listed as "Las Delicias, Santa Clara Prov., Costa Rica." There is no such province, and a recent oil company road map shows 3 villages named only Delicias—1 in northern Alajuela Province, 1 near the tip of Peninsula de Nicoya, Puentarenas Province, and 1 in western San Jose Province. Carl gave the type locality of *propinquus* as "Las Delicias, Sta-Clara (Costa Rica) 300 m," at the same time describing *P. biolleyi* from "Las Delicias (Costa Rica)," both species having been collected by Biolley. Since only the Alajuela village of Delicias is close to another named Santa Clara, it seems safe to conclude this is the probable type locality of both species.

SPHAERIODESMIDAE

Colobodesmus Brolemann 1905

KEY TO THE SPECIES OF *Colobodesmus*

1. Size small, 4-5 mm in diameter ..... *crucis* new species
1′. Size larger, at least 6 mm in diameter 2
2. Body 8-8.5 mm in diameter ..... *biolleyi* Brolemann
2′. Body not over 6.5 mm in diameter 3
3. Gonopods heavy, strongly contorted and with 3 subdivisions differing in size ..... *triramus* Kraus
3′. Gonopods not contorted and with only 2 rather slender, subequal subdivisions ..... *cobanus* (Chamberlin)

Colobodesmus crucis new species

Holotype male, 5 females, Finca Las Cruces, San Vito, 17-18 April 1972.

Diagnosis: The smallest member of the genus, obviously most closely related to *C. cobanus* (Chamberlin 1952a) but with significantly different gonopods.

Description: Entirely colorless in life but with an internal dark median line quite evident when in preservative. Male 13 mm long, 4 mm wide; largest female 16 mm long, 5 mm wide.

Labrum and clypeus with a margining series of at least 20 setae each; frontal area behind the clypeal series with numerous setae; interantennal space more swollen in males than females, the median furrow above it much deeper in anterior half; surface either side of vertex slightly more swollen in males, especially caudolaterad of each antenna.

Segment 1 (Fig. 16) subrectangular; anterior corners nearly square; anterior margin broadly convex. Segment 4 (Fig. 17) with sides narrow, outer angle subacute. Segment 5 projecting below outer limit of segments 4 and 6, the anterior and posterior margins almost parallel, outer margin truncately rounded.

Gonopods (Fig. 18) diverging greatly from bases which are separated by a backwardly produced, triangular lobe from sternal apex, their outer portions more strongly chitinized and brownish. Gonopodial opening almost straight across in front, its rim scarcely raised; sides and back margin strongly curved, the rim high and much swollen each side in front but thin between coxae of ninth legs where it descends vertically to the sternum. Penes with basal half thick and cylindrical, ending in 2 divergent spicules. Sterna between male legs 4-7 at least twice as wide as in females; sternum between ninth legs considerably wider than pregenital ones and very short; sterna 10 and 11 only half as wide, those thereafter as in females.

Colobodesmus biolleyi Brolemann 1905

Male and female found by John Kethley, Field Museum of Natural History, at Rincon, Osa Peninsula, Puentarenas Prov., 27 March 1973.

This is the first report of the species since it was described.

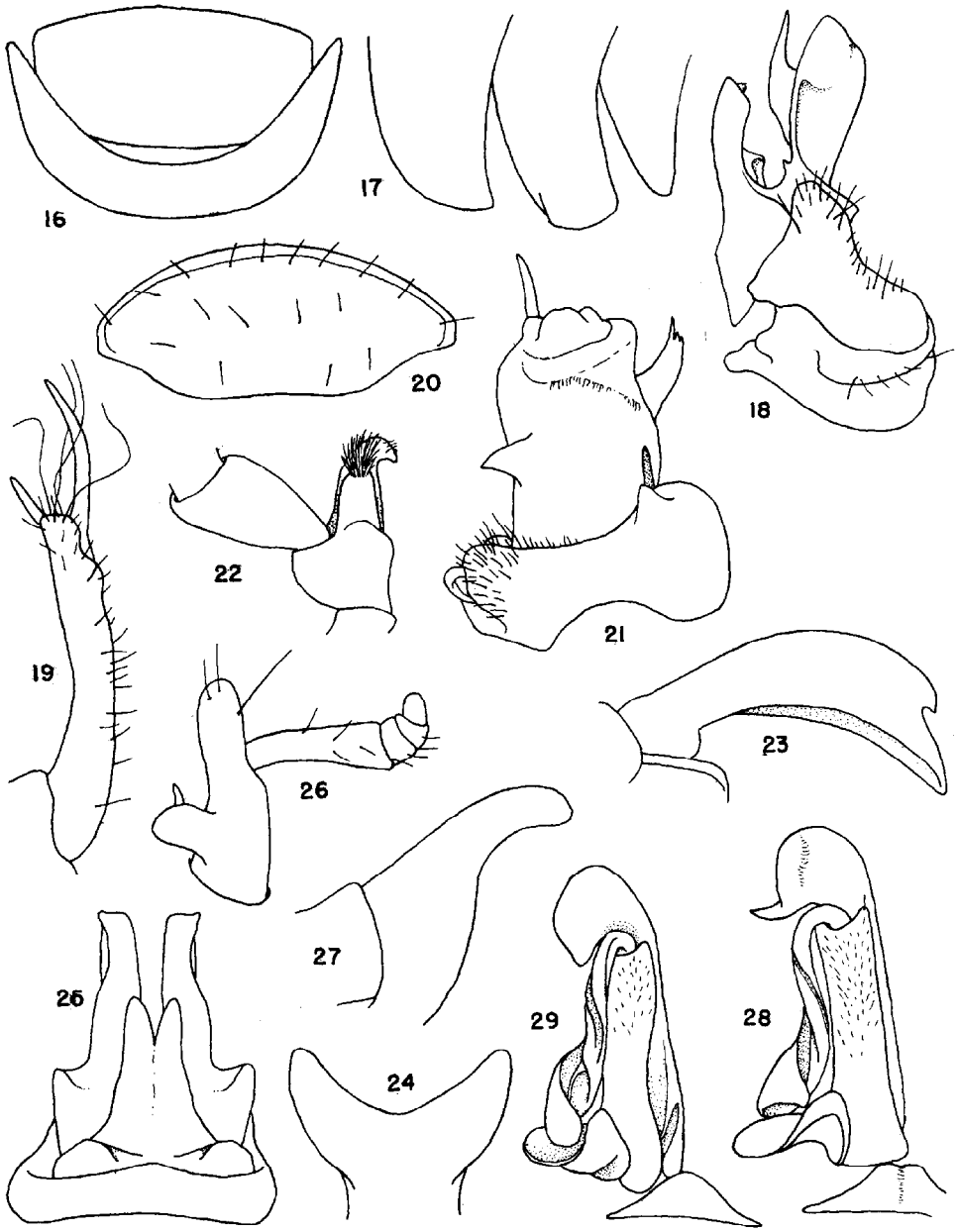

Fig. 16-18. *Colobodesmus crucis* new species: 16. Segments 1 and 2, dorsal view; 17. Segments 4-6, lateral view; 18. Right gonopod, mesoposterior view.

Fig. 19. *Sphaeriodesmus filamentosus* new species: Right gonopod, lateral view.

Fig. 20-22. *Cylindrogonus tumidus* new species: 20. Segment 1, dorsal view; 21. Left gonopod slightly forward of mesal view; 22. Joints 2 and 3 of first male leg, anterior view.

Fig. 23-24. *Cleidogona bifurca* new species: 23. Right gonopod beyond coxa of leg 7 and side of segment 6; 24. Lamina of twelfth legs, posterior view.

Fig. 25-27. *Dybasia interamericana* new species: 25. Gonopods, anterior view; 26. Leg 9, anterior view; 27. Sternal lobe of twelfth legs, lateral view.

Fig. 28. *Orthoporus nodosus* new species: Right gonopod and sternum, anterior view, the telopodite unnaturally rolled.

Fig. 29. *Orthoporus vialis* new species: Right gonopod and sternal plate, anterior view.

Sphaeriodesmus Peters 1864

Sphaeriodesmus filamentosus new species

Holotype male and over 25 other specimens, Finca Las Cruces, San Vito, 17-18 April 1972.

Diagnosis: This is the only Costa Rican species and is distinct from those elsewhere in its small size and the very long, filamentous setae terminating the gonopods. It seems to approach *S. longiramus* Kraus 1954b, of El Salvador, in its relationship among known species.

Description: Largest specimen, the holotype, 10 mm long, 4 mm wide. Living color mostly white with gray markings which disappear in preservative.

Vertex of head uniformly smooth, shining; median sulcus beginning well above upper line of antennal sockets, deeper and broader in front, continuing to posterior margin. Clypeus with an anterior series of 18-20 setae varying in length; behind them 30 or more large setae scattered over frontal area; labrum with 20 or more small setae of variable length. Antennal joints 2, 3, and 5 subequal in length, joint 6 only a little longer, joint 4 shortest.

Segment 1 subtrapezoidal, over twice as wide as long, anterior margin almost parallel with the straight posterior margin but lateral margins divergent from in front, the posterior angles rounded. Segment 5 as large or larger than segment 4. Keels of segments 5-10 or 11 outwardly rounded, posterior angulation becoming evident thereafter. Anal valves depressed in front of lateral margins of preanal scale, their surface with coarse wrinkles extending dorsad.

Gonopods with outer joints almost in contact throughout their length, curved slightly toward body; apex with 2 slender branches, the principal one considerably exceeded by about 4 fine, flexuous setae not known in other species (Fig. 19). Gonopodial opening not rimmed behind and only slightly so in front but quite high on each side, a large hemispherical tubercle laterad of rim. Sterna between legs 4-7 scarcely wider than in females, sternum between ninth legs slightly wider but thereafter the sterna subequal in both sexes.

TRICHOPOLYDESMIDAE

Cylindrogonus Loomis 1964a

Cylindrogonus tumidus new species

Holotype male, 2 others, 2 females, N side Cerro de la Muerte, Inter-American Hwy., 8,500 ft, 19 April 1972.

Diagnosis: Larger than *C. copiosus* Loomis 1964a, the only other species, and differing particularly in the swollen prominence on vertex, shape of segment 1, and larger terminal joint of each gonopod.

Description: Largest male 10 mm long, 2 mm wide; largest female 12 mm long, 2.2 mm wide; living color light brown; males with 19 segments, females with 20; surface of body finely reticulated, dull.

Head of males with a high, thick, subcrescentic, and glabrous swelling originating near upper side of each antennal socket and extending inward and backward across front of vertex; frontal area convex in advance of interantennal area, a strong swelling cephalolaterad of each antenna, ending outwardly in a rounded shoulder; females with a shallow crescentic channel across front of vertex, in contrast to swelling of males; median furrow deep on vertex; surface between antennae glabrous but most of remainder of head

densely and finely spiculate. Antennae much as in *copiosus* but joints 2, 3, 5, and 6 subequal in length, a sensory area on latter; antennal sockets encircled by a high, thin ridge.

Segment 1 (Fig. 20) with raised rim not continued along posterior margin. Succeeding segments of males with dorsum flatter than females; keels distinctly wider and more abruptly raised from metazonites, especially on anterior segments; keels of females projecting almost horizontally. Interzonal channel deep, broad, and nearly flat; prozonites descending vertically to it, the metazonites descending more gradually. Metazonites with 2 setae on anterior portion and 4 behind, each centered in a large convex area; median area crossed by a definite sulcus; posterior margin of segment 18 with 6 large projecting setae that are merely indicated by slight bumps on segment 17. Keels with a tiny acute tooth in outer margin behind anterior corner and followed by a heavy seta; nonporiferous keels with a single tooth, others with 2 teeth between anterior seta and posterior angle, teeth usually with a minute spicule at apex; entire posterior margin of keels of segments 2-16 broadly emarginate, a small triangular tooth projecting near basal two-fifths but a little closer to body on caudal segments, the teeth less evident in females; posterior angles on segment 15 little produced backward, more so on next segment, but much larger and more abruptly produced on segment 17; those of segment 18 very much smaller; surface of keels with submedian seta considerably removed from base, another at base of posterior angle; pores opening obliquely outward and backward from a large swollen area. Last segment with a row of 6 long, heavy, erect setae across middle. Preanal scale a little inflated, sides straight to the 2 terminal tubercles which end in a very long seta, posterior margin between them wide, only faintly rounded.

Gonopods shown in Fig. 21. Gonopodial opening bluntly oval, surrounded by a low narrow rim. First male legs with joints 2 and 3 shown in Fig. 22; coxae of second legs adjacent, a conical tubercle at each mesocaudal corner; other legs not modified. Sterna of legs 3-7 elevated, deeply and narrowly separated and setose at apex, becoming most extreme on legs 6 and 7.

Irazunus Attems 1933

Irazunus chiriquensis Loomis 1964a

Specimens of both sexes, Finca Las Cruces, San Vito, 19 April 1972. Sensitive area on antennal joints 6 and 7 subequal in size.

Irazunus reimoseri Attems 1933

Male, S side Cerro de la Muerte, Inter-American Hwy., 9,600 ft, 16 April 1972.

PARADOXOSOMATIDAE

Oxidus Cook 1911c

Oxidus gracilis (Koch 1847)

Very common, Finca Las Cruces, San Vito, 17-18 April 1972.

CLEIDOGONIDAE

Cleidogona Cook 1895[3]

Cleidogona bifurca new species

Holotype male, 2 young females, Dulce Nombre, near Cartago, 20 April 1972.

Diagnosis: Especially differing from *C. curvipes* (Loomis 1966) in the shorter, less curved gonopods, and the spreading lobes of the sternal lamina of twelfth legs of male.

Description: Length 12 mm. Ocelli of eye clusters 5-5-4-4-3-2 or 5-5-4-4-3-2-1, beginning from lower side of head; other body characters much as in *curvipes*.

Gonopods (Fig. 23) shorter, heavier, and less curved backward than in *curvipes*. Ninth legs much like that species, their sternum somewhat as in Fig. 168 for *C. laminata* Cook and Collins (1895), but apparently larger, extending farther outside the coxae, and with its outer third each side abruptly bent ventrad, its apex rounded from front to back; coxae of legs 10 and 11 well separated; sterna of legs behind twelfth pair produced obliquely forward and inward as a ridge separating the posterior base of the coxae just in front; coxae of legs 10 and 11 with long inflated pouches, smaller ones on some coxae behind midbody, and what appear to be small retracted ones near inner angular base of ninth legs. Lamina in front of twelfth legs (Fig. 24) with heavy, widely divergent, and forwardly curving terminal lobes.

Dybasia Loomis 1964a

Ogkomus Loomis 1964a, see Shear (1972)

Solemia Loomis 1964a, see Shear (1972)

Dybasia interamericana new species

Holotype, 21 anterior segments of male, S side of Cerro de la Muerte, Inter-American Hwy., 9,600 ft, 16 April 1972.

Diagnosis: The gonopods associate this species most closely with *D. humerosa* Loomis 1964a, but differences of anterior male legs further distinguish it. The 3 previously known species have been keyed in Shear (1972).

Description: Living color mostly blackish gray. Body size approximately as in other species.

Head flat between antennae which resemble those of *D. humerosa* Loomis 1964a; surface in front of them considerably swollen; clypeal area shallowly depressed, with much longer setae on sides than medianly; no distinct anterior row of setae near the rather long, smooth labrum, the posterior part of which is distinctly swollen; ocelli in rows of 8-5-5-4-3-2-1 on one side of head and 7-5-5-4-3-1 opposite, counting upward from below; lingual laminae of gnathochilarium rather narrow.

Segment 1 with anterior margin not evenly rounded but slightly more so than shown for *D. chiriquia* (Loomis 1964a). Succeeding segments with well impressed median sulcus; surface of segments finely and evenly reticulated.

Gonopods and ninth leg shown in Fig. 25 and 26. Legs 3-7 heavier than those either side and without swellings or tubercles on any joint; tenth legs

[3]Extensive synonymy in this genus, including *Costaricia* Loomis 1966, will be found in Shear (1972).

with coxae lacking a ventral submedian tubercle; coxae of eleventh legs with a large rounded tubercle at each distomesal angle, beyond and behind the eversible sack opening; sternum of twelfth legs with a large, forwardly directed, median process curving slightly toward body (Fig. 27).

SPIROSTREPTIDAE

Orthoporus Silvestri 1897a

Orthoporus nodosus new species

Holotype and 2 other males, 5 females, 5 young, Finca Las Cruces, San Vito, 17-18 April 1972.

Diagnosis: Obviously closely related to *O. typotopyge* (Brolemann 1905) but smaller, with major differences of the gonopods, and minor ones elsewhere.

Description: Largest male, holotype, 84 mm long, 6 mm wide, 59 segments; largest female 90 mm long, 6 mm wide, 62 segments. General color gun-metal gray, the back part of segments lighter.

Head with a very fine vertigial sulcus. Ocelli in a teardrop shaped group of 6 or 7 rows, counting from behind—10-9-9-9-9-7, plus 4 small indistinct ones at lower edge between antennal socket and segment margin; another eye—12-12-10-8-7-3; eyes separated by 1.5 times their longest dimension. Antennal joints 5 and 6 with a small round sensory pit on upper side near distal end.

Segment 1 with a deep sulcus above a thick lateral ridge which is increasingly thickened behind middle to the rounded end which is not separately set off or projecting beyond margin; inner surface with 5-6 striae.

On segment 2-10 or 11 the ventral striae are deeply impressed, the intervals strongly elevated, the upper 3 or 4 more strongly so, ending in a rounded prominence, almost knoblike, especially on segments 2 and 3, and slightly projecting beyond the margin. On succeeding segments the striae become slightly impressed, intervals flat; striae nowhere reaching close to pores which begin on segment 5 and are about at the anterior third of subsegment. Surface of segments densely minutely punctate each side of the strongly impressed transverse sulcus; a faintly impressed median sulcus present on most posterior subsegments. Last segment densely punctate; the thickened apex considerably exceeded by anal valves which have strongly raised margins; surface finely punctate; preanal scale scarcely angled behind at apex, inflated throughout, especially near apex, finely punctate, anterior margin broadly convex.

Gonopods shown in Fig. 28. Coxae of male legs 5 and 7 with distomesal shoulders thickened and much more angularly prominent than on legs 4 and 6 and with 4-5 long stiff spines, only about 3 on adjacent coxae; inflated distoventral pads on joints 4 and 5 of all legs except first 2 pairs, pads reduced on caudal legs. Segment 7 with pleural lobes long, broadly rounded within where they are slightly depressed and widely separated.

Orthoporus vialis new species

Holotype male, S side Cerro de la Muerte, Inter-American Hwy., 5,000 ft, 16 April 1972.

Diagnosis: Closely related to the foregoing *nodosus* and *O. typotopyge* (Brolemann 1905); the main difference is in the gonopods.

Description: Body 92 mm long, 5.5 mm wide, 64 segments; color as in *nodosus*.

Head with median sulcus strongly impressed on vertex; ocelli in rows of 11-10-10-8-5-4, counting from behind, the eyes separated by no more than 1.4 times their greatest diameter; both antennae lacking 3 outer joints.

Segment 1 with lateral ridge set off above by a broad deep channel, ridge beginning just above eye, increasing a little in height but widening more rapidly from behind, its back end bluntly rounded; surface below ridge considerably inflexed, crossed by 7-8 striae, and descending to a lower rounded corner. Segments 2-11 or 12 with deep lateral striae, intervals raised into sharp ridges, lower than in *nodosus,* ending in rounded shoulders at posterior margin; on a few segments immediately behind gonopods the lateral striae are present well above pores which begin on segment 5; transverse sulcus of segments strongly impressed across dorsum; no median sulcus present; surface of all segments finely punctate, intermixed with mostly short, fine, longitudinal scratches. Last segment with apex slightly swollen, not approximating anal valves, a slight depression preceding it; valves and preanal scale much as in *nodosus,* the scale not quite as swollen.

Gonopods as in Fig. 29. Pleural lobes of segment 7 shorter than in *nodosus,* more narrowly rounded, nowhere depressed, and less widely separated; coxae of legs 5 and 7 thickened, mesal shoulders rounded, not angularly prominent, with 1 or 2 fairly long spines and 1 or 2 short ones; ventrodistal pads present on joints 4 and 5 of third legs to within a few pairs of caudal end of body.

Orthoporus conifer Attems 1950

Although not represented in the present collection, it seems desirable to point out that the type locality of this species was given as "Pons," and was so listed in Loomis 1968. It has been impossible to find such a locality or town on maps or through questioning country residents. It seems quite likely that the name resulted from misreading a specimen label for "Poas," name of an often-visited volcano not far northwest of San Jose.

PLATYDESMIDAE

Desmethus Chamberlin 1922

Desmethus chiriquensis Loomis 1964a

Female, N side Cerro de la Muerte, Inter-American Hwy., 8,500 ft, 16 April 1972.

Length 12 mm, width 3 mm; 37 segments; living color pinkish-orange.

Literature Cited

Cook, O. F. and G. N. Collins. 1895. The Craspedosomatidae of North America. Ann. New York Acad. Sci. 9:1-100.

Loomis, H. F. 1966. Two new families and other North American Diplopoda of the suborder Chordeumidea. Proc. Biol. Soc. Washington 79:221-230.

Loomis, H. F. 1968. A checklist of the millipeds of Mexico and Central America. U. S. Nat. Mus. Bull. 266:1-137.

Loomis, H. F. 1972. Millipeds from the Atlantic lowlands of Costa Rica. Fla. Ent. 55:185-206.

Shear, W. A. 1972. Studies in the milliped Order Chordeumida (Diplopoda): A revision of the family Cleidogonidae and a reclassification of the Order Chordeumida in the New World. Bull. Mus. Comp. Zool. 144:151-352.

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