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The Pseudoscorpion Genus *Chitrella* (Chelonethida, Syarinidae)

BY DAVID R. MALCOLM¹ AND JOSEPH C. CHAMBERLIN²

The authors are indebted to Dr. Willis J. Gertsch of the American Museum of Natural History and to Drs. R. V. Chamberlin, A. Petrunkevitch, C. F. W. Muesebeck, and Thomas C. Barr, Jr., for the specimens upon which the present paper is based. Included in this paper are descriptions of three new species, a redescription of *Chitrella cala*, and a key to the several species of the genus.

The types and other material of the new species described herein are deposited in the collections of the American Museum of Natural History. The type of *C. cala* (Chamberlin) is in the J. C. Chamberlin collection. However, a female of this species from Washington County, Utah, is also being deposited in the American Museum collections. Its individual number (JC-1601.01001) and others that follow refer to the accession catalogue of the second author and specifically identify individual specimens on which illustrations, measurements, or other important data are based.

¹ Associate Professor of Biology, Portland State College, Portland, Oregon.

² Entomologist, Entomology Research Division, Agricultural Research Service, United States Department of Agriculture, Forest Grove, Oregon.

SUBORDER DIPLOSPHYRONIDA CHAMBERLIN

FAMILY SYARINIDAE CHAMBERLIN

SUBFAMILY CHITRELLINAE BEIER

GENUS *CHITRELLA* BEIER

The genus *Chitrella* currently comprises five known species, all of which are Nearctic in distribution. So far as known the typical habitat is in leaf mold, soil, and under stones. Two cave forms are also found in the genus: one from Tennessee, the other from West Virginia. Neither is strongly troglobiont in facies.

KEY TO THE SPECIES OF *Chitrella*

1. Blind or with very weakly corneate eyes; palpal femur in excess of four times as long as broad; number of teeth on each finger of the chela many more than 50, often approaching or exceeding 100.....2
 - With two pairs of weakly corneate to distinct and well-marked eyes; palpal femur less than four times as long as broad; number of teeth on each finger of chela about 50.....3
- 2(1). Palpal femur 4.3–4.6 times as long as broad; chela (without pedicel) 3.6–4.1 times as long as broad; fingers of the chela 1.5–1.65 times as long as the hand; number of teeth on the fingers of the chela fewer than 100 on each; eyes apparently absent (blind).....
 -*archeri*, new species
 - Palpal femur more than six times as long as broad; chela (without pedicel) more than six times as long as broad; fingers of the chela 1.8–1.9 times as long as the hand; number of teeth on the fingers of the chela exceeding 100 on each finger; eyes very weakly corneate.....*regina*, new species
- 3(1). Chela in excess of 3.5 times as long as deep (close to four times); small species (female only 2.00 mm. in body length); chela (plus pedicel) of female between 0.8 and 0.9 mm. long; accessory tooth on movable finger of chela opposite about tooth 21....*muesebecki*, new species
 - Chela less than 3.5 times as long as deep; larger species (male 2.2–2.75 mm. and female 2.5–3.0+ mm. in body length); chela (plus pedicel) of male 0.90–1.00 mm. long and chela (plus pedicel) of female 1.10–1.25 mm. long; apparently no accessory teeth on either finger of chela.....4
- 4(3). Seventh sternite of both sexes with a median pair of short, tactile setae originating in large, "bowl-like" areoles; two pairs of weakly defined eyes which are about equal in size and rather close together; males with fifth sternite posteriorly and medianly emarginate, with the emarginate area having a concentration of six or seven small setae cephalad of usual border setae, and sixth sternite with a conspicuous discal sensorium bordered by a complete circlet of 13 to 18 setae.....*cala* (Chamberlin)
 - Seventh sternite of both sexes completely lacking a median pair of tactile setae; two pairs of distinct eyes, posterior pair much smaller than the anterior pair and well separated therefrom; males with

fifth sternite not clearly emarginate posteriorly but with an isolated discal cluster of about nine irregularly disposed but closely grouped setae, sixth sternite normal.....*transversa* (Banks)

***Chitrella archeri*, new species**

Figure 1

MATERIAL: Male holotype (JC-1254.01001), Wonder Cave, Monteagle, Tennessee, collected July 15, 1938. Allotype (JC-2366.01001) and female paratype (JC-2366.01002) collected January 7, 1957, from bat guano in Piper Cave, 19 miles west of Monoville, Smith County, Tennessee, by Thomas C. Barr, Jr.

DIAGNOSIS: Male: Medium-sized, blind species of typical facies, larger than either *Chitrella cala* (Chamberlin) or *C. muesebecki*, new species; somewhat more attenuated than either of the two mentioned species but not typically troglobiont in facies.

Carapace lacking eyes (no vestiges apparent); distinctly longer than broad and definitely broader anteriorly than posteriorly; median stripe well developed and distinct, posterior stripe shallow and weakly defined; derm in general smooth, but weakly granular postero-laterally; setae acute but short and inconspicuous; chaetotaxy 7-6 (32 or 33).

Abdomen relatively narrow and elongate, but little broader than the carapace; tergite 11 fused with sternite 11 to form single circumanal plate. Tergal and sternal scuta entire and smooth; pleural membrane smoothly plicate. Tergal chaetotaxy: 4+ (probably 6 or more):10:10:10:12:12:14:14:14:S2S1S3S (or 10):T1T2T1T:2m. Sternal chaetotaxy (3 to 12 inclusive, genital operculum broken and partly lost):

$$(4)\frac{6}{11}:(4):(4)6(6m)6(4):7(8m)7:\frac{6(60\pm m)8}{17}:16:15:13:11:T2T:2m,$$

the chaetotaxy of sternites 4 to 6 as shown in figure 1D. Central sternal sensory area of segment 6 membranous, encircled by 14 moderate-sized setae, as indicated in the formula, and enclosing a nuclear elliptical area 0.0331 mm. long by 0.0236 mm. broad and comprising 60 or more very tiny and densely packed microsetae. The paired median tactile or sensory setae present on segment 7 of the orthotype seem to be lacking or not significantly differentiated, although there is a possibility that a similar submedian pair may occur on segment 7. The setae, however, are lost, and the areoles are not conspicuously larger, as is the case with the orthotype. Genitalic structures are too poorly preserved to be illustrated, but appear typical. Coxal area of usual facies; of subparallel width.

Chelicera typical, 2.3 times as long as broad and much shorter than the carapace; spinneret absent, the outer curve of the movable finger smoothly rounded; flagellum and serrula interior obscured and not clearly visible, but apparently typical; serrula exterior with 19 or 20 teeth; movable finger with three medium-sized teeth preceded basally by three or four smaller denticles or serrations; fixed finger with 15

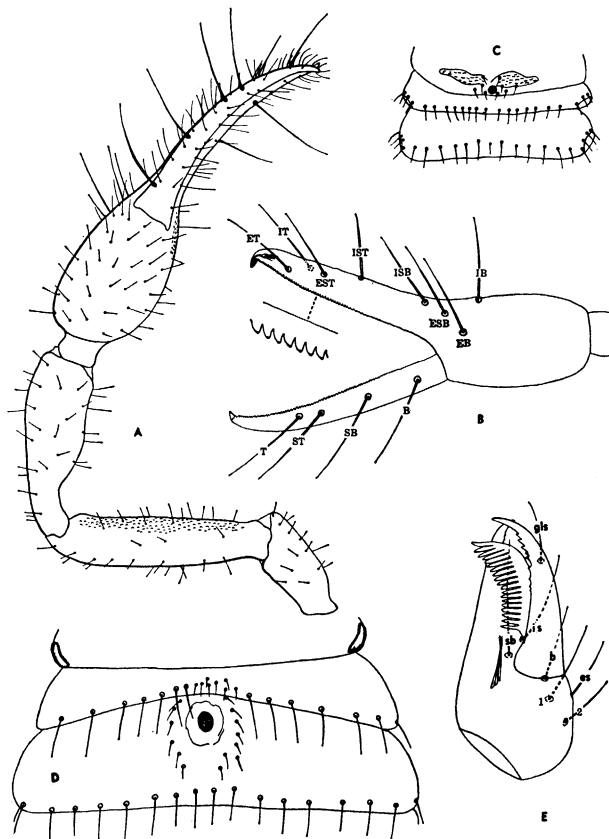


FIG. 1. *Chitrella archeri*, new species. A. Ventral aspect of right palp (female, JC-2366.01002). B. Exterior aspect of left chela (holotype). C. Female genital area (JC-2366.01001). D. Sensory area of sixth male sternite (holotype). E. Interior aspect of left chelicera (female, JC-2366.01001).

or 16 small but irregular teeth or serrations; chaetotaxy normal, *is*, *sb*, *b*, and *es* present on the palm, with one accessory seta caudad of but between *es* and *b*; *ls* absent; *gs* present.

Palps moderately slender, generally smooth but finely and evenly granulated on the anterior surface of the femur and interiorly at the base of the fingers. Trochanter 2.3, femur 4.4, and tibia 2.9, times as long as broad; chela 3.6 (plus pedicel 3.8) times as long as broad and 3.7 times as long as deep; hand 1.4 times as long as broad; fingers 1.5 times as long as the hand.

Chela as illustrated (fig. 1B). Seta *ib* on the dorsum of the hand 0.83 of the hand length from its base; movable finger lacking accessory teeth; marginal teeth contiguous, retroconical anteriorly becoming lower and more rounded basally; nodus ramosus of the fixed finger opposite the fourth marginal tooth; fixed finger with 67, movable finger with 70 marginal teeth.

Legs slender and of typical facies; tactile setae of leg IV lost but probably typical, that of the tibia about median (index 0.55) and that of the metatarsus subbasal (index 0.17); subterminal seta very minutely and apparently only monodenticulate. Pedal proportions: leg I: basifemur 3.9, telofemur 2.8, tibia 5.4, metatarsus 3.2, and telotarsus 4.9, times as long as deep; leg IV: "miofemur" 3.57 times as long as deep; telofemur 1.73 times as long as the basifemur; tibia 6.3, metatarsus 3.2, and telotarsus 4.8–4.9, times as long as deep.

Female: General appearance as in the male; apparently blind, of medium size and possessing considerable pigmentation.

Carapace longer than broad and distinctly broader anteriorly than posteriorly; eyes absent; derm mostly smooth, but lightly granulated laterally; median and posterior stripes poorly developed; vestitural setae simple acuminate; chaetotaxy: 6–6 or 7 (32 or 33).

Abdomen approximately three times as long as broad; derm smooth, tergal and sternal scuta entire; tergites and sternites of segment 11 fused to form typical circumanal plate; pleural membrane smoothly plicate; vestitural setae simple and acuminate; tergal chaetotaxy: 7:10–12:11–12:12:11–15:12–14:13–16:13–14:12–15:8–13:T1–2TT1–2T:2m; sternal chaetotaxy:

$$\frac{4}{5}:(4)15(3):(4)12-13(4):16:18-22:17-18:14-18:14-17:14:T1TT1T:2m.$$

Circular median cribriform plate present and as illustrated (fig. 1C).

Chelicera 1.74 times as long as broad and less than one-half of the length of the carapace; spinneret absent, the outer surface of both fingers smoothly rounded; movable finger with seven large teeth and several small teeth interspaced among the large (fig. 1E); fixed finger with 19 to 22 subequal teeth; serrula exterior with 21 to 24 teeth and

serrula interior with 16 to 17 teeth; flagellum partly obscured but apparently comprising three to four acuminate blades; chaetotaxy similar to that of the male, *is*, *sb*, *b*, and *es* present on the palm, *ls* absent, *gs* present, but with two accessory setae caudad of *b* and *es*, rather than with one as in the male.

Palps (fig. 1A) moderately slender and of normal appearance; derm smooth except finely granulate on the anterior surface of the femur, the anteriopbasal portion of the hand and the base of the fixed finger; vestitural setae simple acuminate; trochanter 2.3, femur 4.4–4.6, and tibia 2.9–3.0, times as long as broad; chela 3.9–4.1 times as long as broad; hand 1.5–1.6 times as long as broad; fingers 1.6 times as long as hand.

Chela with marginal teeth of both fingers evenly contiguous and retroconical, becoming lower and more rounded basally; fixed finger with 85 to 86, and movable finger with 79 to 81, marginal teeth; no accessory teeth on either finger; venom apparatus in fixed finger only with nodus ramosus opposite the third or fourth marginal tooth; movable finger with sheathing device.

Legs moderately slender and of normal appearance; derm smooth; vestitural setae acuminate; tactile seta on tibia of leg IV about median (index, 0.57–0.59), tactile seta on metatarsus of leg IV subbasal (index, 0.20–0.25); subterminal seta, terminally weakly dentate; claws normal and simple; coxa I acutely and coxa II subacutely produced and heavily sclerotized at anterior condylar area; no coxal spines; sides of coxal area parallel. Pedal proportions of leg I: basifemur 3.8–4.1, telofemur 2.7, tibia 5.2–5.5, metatarsus 3.2, and telotarsus 4.2–4.3, times as long as deep. Proportions of leg IV: basifemur 1.4–1.5, telofemur 2.5–2.6, tibia 6.0–6.2, metatarsus 3.4–3.5, and telotarsus 5.0, times as long as deep.

MEASUREMENTS (IN MILLIMETERS): Male holotype: total length, 2.08; abdomen, 0.89 broad. Carapace 0.75 long, 0.62 broad anteriorly, and 0.48 broad posteriorly; "ocular" disk 0.39 long, median disk 0.23 long, posterior disk 0.13 long. Chelicera, 0.418 by 0.180. Palps: trochanter, 0.444 by 0.192; femur, 0.761 by 0.174; tibia, 0.671 by 0.228; chela 1.258 (plus pedicel 1.338) long by 0.348 broad and 0.338 deep; hand 0.497 long; fingers 0.771 long. Leg I: basifemur, 0.418 by 0.107; telofemur, 0.251 by 0.089; tibia, 0.385 by 0.071; metatarsus, 0.189 by 0.059; telotarsus, 0.26 by 0.053. Leg IV: "miofemur," 0.672 by 0.188; basifemur 0.246 long; telofemur 0.426 long; tibia, 0.579 by 0.092; metatarsus, 0.253 by 0.078; telotarsus, 0.320 by 0.066.

Female allotype and female paratype (latter in parentheses): Total length, 2.863 (2.972); abdominal breadth, 0.82 (0.75). Carapace 0.77 (0.77) long, 0.60 (0.53) wide anteriorly and 0.52 (0.48) wide posteriorly.

Chelicera 0.37 (0.37) long by 0.21 (0.21) broad. Palps: trochanter, 0.429 (0.411) by 0.185 (0.178); femur, 0.843 (0.754) by 0.185 (0.170); tibia, 0.685 (0.671) by 0.233 (0.226); chela 1.370 (1.363) [with pedicel, 1.466 (1.452)] long by 0.356 (0.336) broad and 0.356 (0.329) deep; hand 0.541 (0.521) long; fingers 0.863 (0.849) long. Leg I: basifemur, 0.418 (0.390) by 0.110 (0.096); telofemur, 0.260 (0.247) by 0.096 (0.090); tibia, 0.375 (0.356) by 0.069 (0.069); metatarsus, 0.186 (0.181) by 0.059 (0.056); telotarsus, 0.233 (0.233) by 0.055 (0.055). Leg IV: basifemur, 0.251 (0.238) by 0.178 (0.164); telofemur, 0.445 (0.425) by 0.178 (0.164); tibia, 0.575 (0.555) by 0.096 (0.089); metatarsus, 0.247 (0.237) by 0.073 (0.069); telotarsus, 0.319 (0.315) by 0.064 (0.063).

REMARKS: This species is dedicated to Dr. A. F. Archer whose speleological activity has greatly advanced our knowledge of cave chelonethids of the United States.

Chitrella regina, new species

Figure 2

MATERIAL: Female holotype (JC-2257.01001) collected March 21, 1931, at Coffman's Cave, Frankfurt, West Virginia, by J. M. Valentine.

DIAGNOSIS: Female: Medium-sized, well-pigmented, and eyed species of normal facies; about comparable to *Chitrella archeri* in size, but palps and chelae noticeably more slender.

Carapace longer than broad; two pairs of weakly corneate eyes; derm smooth except somewhat "roughened" laterally; anterior stripe very weakly developed and indistinct, median and posterior disks more or less confluent, with posterior stripe obsolete or absent; vestitural setae simple acuminate; chaetotaxy: 6-5 (21±).

Abdomen approximately two times as long as broad; derm of tergites smooth, with prominent elliptical and circular lyrifissures; derm of sternites smooth to lightly tessellated and with prominent circular lyrifissures; tergal and sternal scuta entire; tergite and sternite of segment 11 fused to form typical circumanal plate; pleural membrane smoothly plicate; vestitural setae simple acuminate; tergal chaetotaxy: 5:7:9:9:11:11:10:11:11:8:T2TTT2T:2m; sternal chaetotaxy:

$$\frac{7}{5}:(4)20(4):(4)10(3):13:16:15:13:12:11:TTTT:2m;$$

median cribriform plate circular (fig. 2D).

Chelicera (fig. 2C) 1.97 times as long as broad; spinneret absent; both fingers smoothly rounded; movable finger with approximately six teeth

in addition to several basal irregularities; fixed finger with 13 to 15 subequal teeth; serrula exterior with 24 teeth and serrula interior with 15 teeth; flagellum partly obscured but appears to consist of four acuminate and minutely serrate blades; seta *gs* present, seta *ls* absent, setae *is*, *sb*, *b*, and *es* present on palm, with one accessory seta caudad of *es* and *b*.

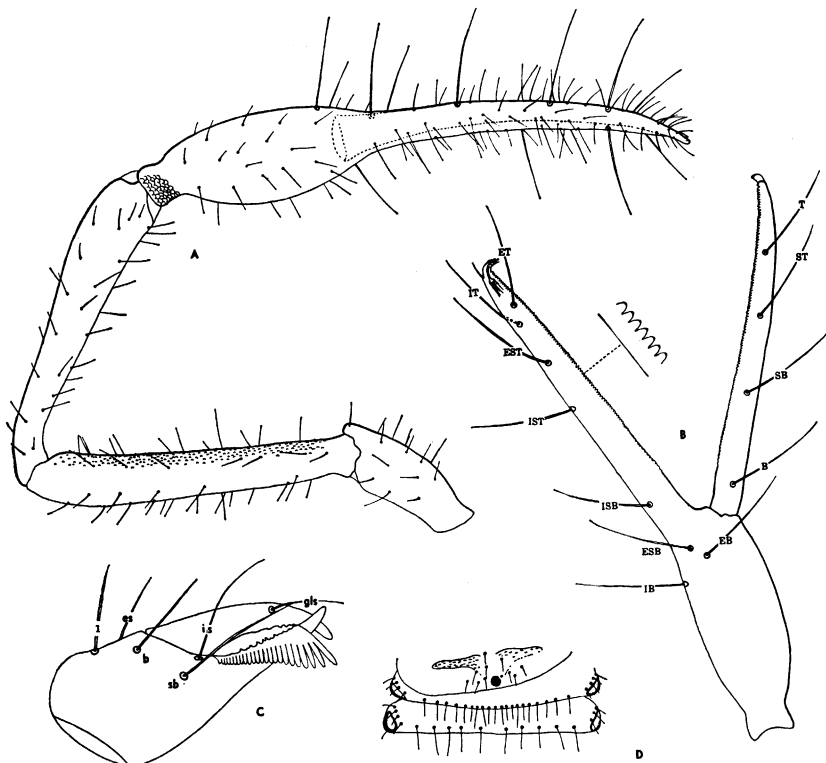


FIG. 2. *Chitrella regina*, new species (all illustrations from female holotype). A. Ventral aspect of left palp. B. Exterior aspect of right chela. C. Exterior aspect of left chelicera. D. Female genital area.

Palps (fig. 2A) quite slender and of normal appearance; derm smooth except finely granulate on anterior aspect of femur, the pedicel and basal portion of which is also slightly scaly; vestitural setae simple and acuminate; trochanter 2.7, femur 6.4, tibia 5.3, times as long as broad; chela 6.1 times as long as deep or broad; hand 2.1 times as long as broad; fingers 1.9 times as long as hand.

Chela with long slender fingers (fig. 2B); venom apparatus in fixed finger only; sheathing device on movable finger; marginal teeth evenly

contiguous, anterior teeth of fixed finger retroconical, becoming more rounded basally; fixed finger with 108, movable finger with 111, marginal teeth; no accessory teeth on either finger; nodus ramosus opposite marginal tooth 4.

Legs rather slender and of normal facies; derm smooth; vestitural setae simple and acuminate; tactile seta on tibia of leg IV distad of median (index, 0.67); tactile seta on metatarsus of leg IV subbasal (index, 0.27); subterminal setae paired and terminally dentate; claws simple; coxa I acutely and coxa II subacutely produced and heavily sclerotized at anterior condylar area; sides of coxal area parallel. Pedal proportions of leg I: basifemur 5.4, telofemur 3.5, tibia 7.8, metatarsus 3.7, and telotarsus 6.5, times as long as deep. Proportions of leg IV: basifemur 2.0, telofemur 3.2, tibia 8.7, metatarsus 3.7, and telotarsus 5.6, times as long as deep.

MEASUREMENTS (IN MILLIMETERS): Female holotype: total length, 2.6; abdominal breadth, 0.92. Carapace 0.85 long and 0.62 wide anteriorly; posterior breadth indeterminable. Chelicera 0.462 long by 0.235 broad. Palps: trochanter, 0.569 by 0.207; femur, 1.185 by 0.185; tibia, 1.159 by 0.218; chela 1.973 (with pedicel 2.081) long by 0.326 broad and 0.322 deep; hand 0.683 long; fingers 1.290 long. Leg I: basifemur, 0.593 by 0.110; telofemur, 0.370 by 0.105; tibia, 0.546 by 0.070; metatarsus, 0.255 by 0.069; telotarsus, 0.393 by 0.061. Leg IV: basifemur, 0.380 by 0.193; telofemur, 0.628 by 0.193; tibia, 0.840 by 0.097; metatarsus, 0.333 by 0.090; telotarsus, 0.462 by 0.083.

Chitrella muesebecki, new species

Figure 3

MATERIAL: Female holotype (JC-1019.01001) collected in "peach orchard soil," Roane County, Tennessee, December 15, 1936. Collector, W. F. Turner (2199) (BEPQ lot 37-5408).¹

DIAGNOSIS: Female: Small species closely resembling the generotype, *Chitrella cala* (Chamberlin), in general facies.

Carapace distinctly longer than broad; the anterior and posterior stripes probably normally developed but very obscure in the KOH cleared type; two pairs of weakly corneate eyes present, anterior eyes 0.037 mm. in diameter, posterior eyes 0.026 mm. in diameter, anterior eyes about their own diameter or less from the anterior carapacial margin and about half of their diameter from the posterior pair;

¹ Turner's collection number and the United States Department of Agriculture, Bureau of Entomology and Plant Quarantine, identification numbers, respectively.

vestitural setae relatively small, slender, and inconspicuous; chaetotaxy: 6-6 ($31 \pm$).

Abdomen relatively narrow and elongate; tergite and sternite of eleventh segment fused to form a single circumanal plate. Tergal scuta entire, smooth, and uniseriate; chaetotaxy: 6:10:12:14:14:13:14:14:14: S1S2S1S:T1T1T1T:2m. Sternal scuta entire, smooth, and uniseriate, lacking any specialized features; chaetotaxy: (7):(2)12(2):(3)12(3):15:15: 15:15:14:P1P2P2P2P1P (or 14):T1T:2m. Genital area and cribriform plate as illustrated (fig. 3D); only central cribriform plate visible, this being a nearly circular convex plate 0.028 mm. in diameter and densely cribrate. Coxal area with subparallel sides, about equally broad across the maxillae and the second to fourth coxae.

Chelicerae (fig. 3C) typical; 2:2 times as long as broad and much shorter than the carapace; spinneret absent, the outer curve of the movable finger smoothly rounded; serrula exterior with 18 or 19 teeth; serrula interior with 15 or 16 blades or teeth; flagellum comprising four flattened, subequal setae, all of which are anteriorly denticulate except the basal one which is smoothly acute; movable finger with eight irregular teeth or denticles, fixed finger with 13 small, somewhat irregular serrations or teeth; chaetotaxy typical, with a total of five setae on the palm (*is*, *sb*, *b*, *es*, and an accessory seta caudad of but between *b* and *es*); seta *ls* absent; *gs* present.

Palps (fig. 3A) generally slender and mostly smooth except for the inner face of the femur which is weakly but distinctly and evenly, although sparsely, granulated; trochanter 2.2, femur 3.7, and tibia 2.5, times as long as broad; chela 3.9 (plus pedicel 4.2) times as long as deep (breadth indeterminable); hand 1.5 times as long as deep; finger 1.6 times as long as the hand.

Chela as illustrated (fig. 3B); seta *ib* situated on the dorsum of the hand 0.82 of the hand length from its base; marginal teeth contiguous, anteriorly retroconical, becoming lower and rounded basally; exteriorly with a rounded accessory tooth closely adjacent to the twenty-first marginal tooth of the movable finger; venom apparatus in fixed finger only; nodus ramosus of fixed finger opposite the fifth marginal tooth; fixed finger with 47 to 49, movable finger with 50 to 53, marginal teeth.

Legs slender and of typical facies; short, weakly differentiated tactile setae occur medially on the tibia of leg IV (index value, 0.51) and subbasally on the metatarsus of leg IV (index value, 0.19); subterminal setae minutely and inconspicuously laterally denticulate. Pedal proportions: leg I: basifemur 2.9, telofemur 2.2, tibia 4.0, metatarsus 2.5, and telotarsus 4.2, times as long as deep; leg IV: "miofemur" 3.2 times

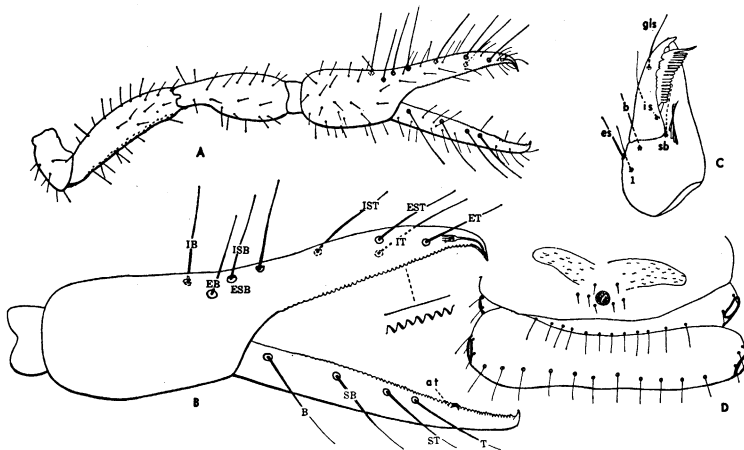


FIG. 3. *Chitrella muesebecki*, new species (all illustrations from female holotype). A. Sublateral aspect of right palp. B. Exterior aspect of right chela. C. Interior aspect of right chelicera. D. Female genital area.

as long as deep; telofemur 1.7 times as long as the basifemur; tibia 4.7, metatarsus 2.6, and telotarsus 4.7, times as long as deep.

MEASUREMENTS (IN MILLIMETERS): Female holotype: total length, 2.0; abdominal breadth, 0.69. Carapace 0.51 long and about 0.41 broad across the eyes (posterior breadth indeterminable). Chelicera, 0.318 by 0.146. Palps: trochanter, 0.262 by 0.121; femur, 0.476 by 0.129; tibia, 0.410 by 0.166; chela, 0.836 (plus pedicel, 0.886) by 0.213 deep (breadth indeterminable but no doubt about the same as the depth); hand 0.321 long; fingers 0.522 long. Leg I: basifemur, 0.224 by 0.077; telofemur, 0.151 by 0.068; tibia, 0.213 by 0.054; metatarsus, 0.114 by 0.045; telotarsus, 0.169 by 0.040. Leg IV: "miofemur," 0.410 by 0.129; basifemur 0.154 long; telofemur 0.256 long; tibia, 0.330 by 0.070; metatarsus, 0.144 by 0.055; telotarsus, 0.226 by 0.048.

Chitrella cala (Chamberlin)

Figures 4, 5

Chitra cala CHAMBERLIN, 1930, Ann. Mag. Nat. Hist., ser. 10, vol. 5, p. 41, fig. 2X (maxilla), fig. 2JJ (marginal teeth of chela); 1931, Stanford Univ. Publ., univ. ser., biol. sci., vol. 7, no. 1, pp. 82, 170, 218, fig. 13K (chelicera), fig. 17O (tips of cheliceral fingers), fig. 33P (marginal teeth of chela), fig. 36C (chela showing chaetotaxy); fig. 40R (subterminal seta), fig. 43L, M (legs I and IV); fig. 47Z (fifth to seventh sternites of male showing median sensorium of segment 6 and median tactile setae of segment 7); fig. 57 (dorsoventral view of entire animal).

Chitrella cala BEIER, 1932, Das Tierreich, vol. 57, p. 165 (*Chitra* Chamberlin, 1930, shown to be homonym of *Chitra* Gray, 1844). ROEWER, 1937, in Bronn, Klassen und Ordnungen des Tierreichs, vol. 5(4), book 6, p. 254 (listed). HOFF, 1956, Amer. Mus. Novitates, no. 1780, pp. 23–24 (discussed in connection with redescription of *Chitrella transversa* [Banks]); 1959, Publ. Biol., Univ. New Mexico, no. 8, pp. 4, 26, 34, 60 (ecological discussion).

The original description of *Chitrella cala* by Chamberlin in 1930 did not contain detailed measurements and is too incomplete for one to distinguish between it and more recently described members of the genus. Because the type material noted in the original description was treated with KOH *in toto*, the appendages were more or less flattened, rendering the pedal and palpal proportions somewhat suspect. Therefore, the present discussion supplements the original description of the holotype and one of the paratypes and further includes measurements and proportions from specimens not at hand in 1930.

MATERIAL: Male holotype (JC-276.01001), from debris and grass roots at base of willow tree on bank of San Francisquito Creek, Stanford University campus, California, collected by J. C. Chamberlin, December 17, 1927; female paratype (JC-42.01003), collected January, 1920, at Berkeley, California (Cornell University Collection). Additional material as follows: female (JC-710.01001) collected from under a stone by J. C. Chamberlin at Bryce Canyon National Park, Utah, August 20, 1930; male (JC-1548.01001) collected by R. V. Chamberlin, 10 miles north of Pintura, Utah, April 15, 1932; female (JC-1548.01002), collected by R. V. Chamberlin, 10 miles north of Pintura, Utah, October 7, 1932; female (JC-1606.01001), collected by R. V. Chamberlin at Diamond Valley, Washington County, Utah, April 19, 1932.

DIAGNOSIS (EMENDED): Male: Relatively small, four-eyed species of slender facies (fig. 4). Carapace distinctly longer than broad, sides nearly parallel but somewhat broader anteriorly than posteriorly; with a moderately developed median transverse stripe and a more weakly defined posterior stripe; with four well-marked but not strongly corneate eyes, of which the anterior pair is about twice their own diameter from the cheliceral condyle or anterior carapacial margin and about half of their own diameter from the posterior eyes; diameter of both anterior and posterior eyes approximately 0.033 mm.; derm smooth, except granulated laterally; vestitural setae slender and inconspicuous; chaetotaxy of holotype d6d-7 ($31 \pm$) [i.e., with a pair of reduced or dwarfed (d) marginal setae anterolaterally in addition to six median macrosetae]; chaetotaxy of specimen JC-1548.01001, 9-10 ($55 \pm$).

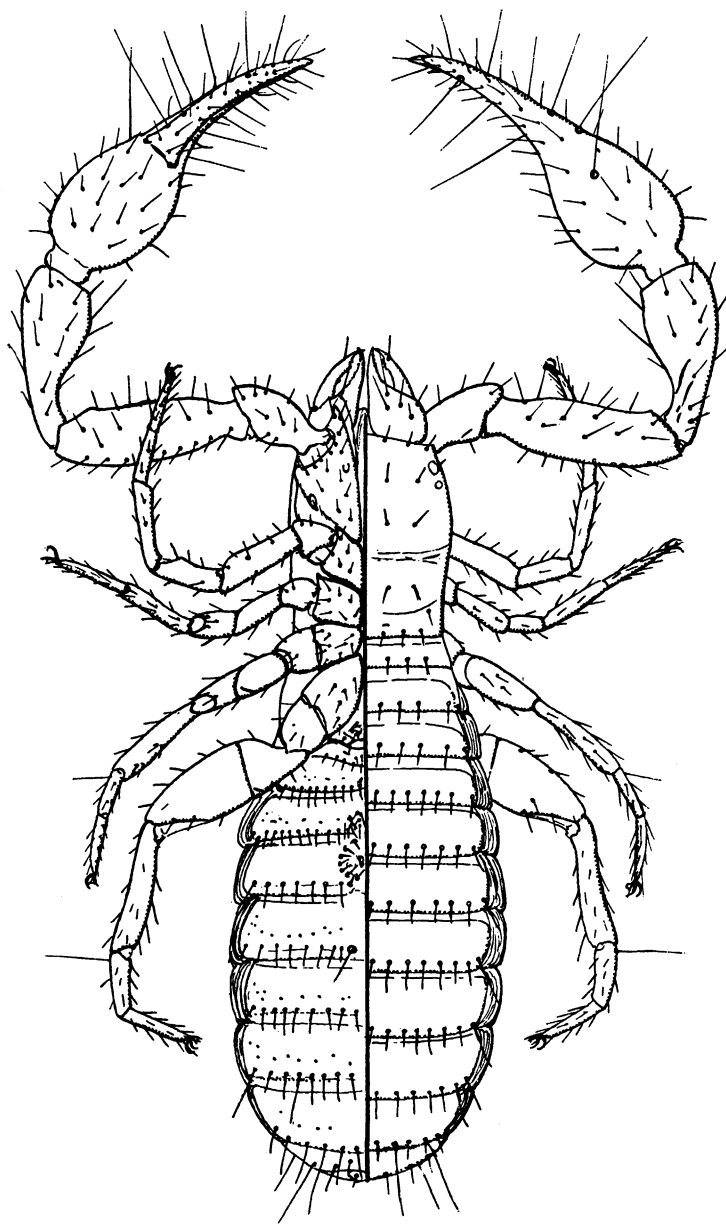


FIG. 4. *Chitrella cala* (Chamberlin). Right side dorsal; left, ventral. Male holotype.

Abdomen relatively slender, with subparallel sides; derm smooth; tergite and sternite 11 fused to form typical circumanal plate; scuta entire except for the secondary sexual modification of sternite 6; tergites and sternites uniseriate; tergal chaetotaxy of holotype: 7:11:11:14:14:13:14:12:14:12:T2T:2m; of specimen JC-1548.01001: ? :11:12:12:11:12:13:13:14:10:TTTT:2m; sternal chaetotaxy of holotype:

$$\frac{9}{(1-1)}:(4)\frac{3}{14}(3):(4)9(5m)10(4):7(11m)10:\frac{7(N)7}{16}:8T1T7:17:16:T1T2T2T2T1T$$

(or 14):T1T3T1T(or 9):2m,

and sternal chaetotaxy of JC-1548.01001:

$$\frac{7}{(1-1)}:(4)\frac{3}{9}(4):(4)15(4):18:\frac{9N8}{14}:\frac{TT}{14}:14:14:13:TTTTTT(\text{or } 6):2m$$

Paired microsetae indicated for the genital plate (denominator of fraction) apparently internal and located on male genitalia. Sternite 6 of holotype with a comparatively large, nearly circular, central, membranous area surrounded by 14 macrosetae and containing a very small oval nuclear plate of microsetae (indicated by N in the above formulas). This nuclear area measures 0.026 mm. long by 0.091 mm. broad. Central membranous area of specimen JC-1548.01001 is similar except that it is surrounded by 17 macrosetae and contains four separate clusters of microsetae varying from as many as 40 or more to as few as three or four in a cluster. As indicated in the above formulas, sternite 7 is provided with a pair of fairly short and stout tactile setae set in large areoles just anterior to the row of setae on the posterior margin.

Chelicerae typical (fig. 5B), about twice as long as broad; spinneret completely absent, apices of both fingers smoothly rounded; movable finger with seven or eight small, protrorse, irregularly spaced teeth or denticles; fixed finger with 13 to 15 small, rather irregular, retrorse serrations or denticles; serrula exterior of 22 to 25 blades and serrula interior of 16 to 20 blades (the basal four or five blades are reduced and very closely appressed); flagellum comprising six or seven flattened setae of which the basal two are acuminate, the others unilaterally denticulate; chaetotaxy typical, *is*, *sb*, *b*, and *es* present plus a single accessory seta caudad of and between *b* and *es*, *gs* present, *ls* absent.

Palps (fig. 4) moderately slender and of normal proportions; derm generally smooth except finely and evenly granulated on anterior surface of the femur, anterodistal face of the tibia and inner face of the chela at base of the fingers on the holotype (the anterior surface of the trochanter but not the tibia of specimen JC-1548.01001 is granulated); palpal proportions of holotype: trochanter 2.2, femur

3.6, tibia 2.3, and chela 3.1 (plus pedicel 3.4), times as long as broad; chela 3.3 (plus pedicel 3.5) times as long as deep; hand 1.3 times as long as broad, fingers 1.5 times as long as hand; palpal proportions of specimen JC-1548.01001: trochanter 2.3, femur 3.5, tibia 2.5, chela 2.9 (plus pedicel 3.2), times as long as broad, chela 3.1 times as long as deep, hand 1.4 times as long as broad; fingers 1.2 times as long as hand.

Chela with chaetotaxy typical (fig. 5A), i.e., seta *ib* situated on dorsum of hand 0.6 to 0.8 of the hand length from its base; movable finger with 50 to 55 marginal teeth, retroconical in shape, becoming lower and more rounded basally; fixed finger with 37 to 47 similar marginal teeth; no accessory teeth on either finger; nodus ramosus opposite marginal tooth two to three on fixed finger only.

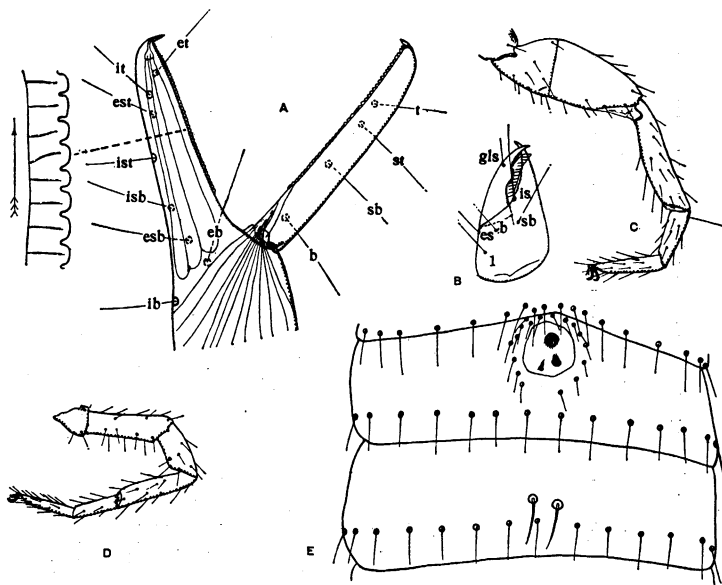


FIG. 5. *Chitrella cala* (Chamberlin). A. Interior aspect of left chela (holotype). B. Exterior aspect of left chelicera (holotype). C. Leg IV (holotype). D. Leg I (holotype). E. Fifth, sixth, and seventh sternites of male, showing median sensorium (JC-1548.01001).

Legs (fig. 5C, D) moderately robust and of typical facies; short and weakly differentiated tactile setae on tibia and metatarsus of leg IV (0.56 to 0.58 and 0.18 to 0.25 of the segment length from its base, respectively); subterminal setae of all legs markedly bipinnate terminally; pedal proportions of leg I: holotype: basifemur 3.2, telofemur 2.2, tibia 4.2, metatarsus 3.1, telotarsus 4.6, times as long as deep;

TABLE 1
MEASUREMENTS (IN MILLIMETERS) OF SIX REPRESENTATIVES OF *Chitrella cala* (CHAMBERLIN)

	Male		Female		Female		Female	
	JC-276.01001	JC-1548.01001	JC-42.01003*	JC-710.01001	JC-1548.01002	JC-1606.01001		
Total length	2.43	2.03	3.15	Indet.	2.55	2.67		
Carapace L ^b	.623	.615	.705	.697	.759	.861		
Ocular B	.49±	.435	.56±	.524	.483	.590		
Posterior B	.46±	.426	...	.491	.483	.549		
Anterior disk L	.344	.344	...	.386	.414	.454		
Median disk L	.213	.197	...	.221	.255	.300		
Posterior disk L	.066	.074	...	.090	.090	.107		
Chelicerae L × B	.361 × .180	.303 × .151	.377 × .189	.366 × .177	.311 × .186	.426 × .213		
Palps								
Trochanter L × B	.358 × .164	.361 × .156	.348 × .184	.388 × .167	.418 × .185	— × .212		
Femur L × B	.590 × .162	.567 × .164	.640 × .180	.662 × .173	.691 × .193	.745 × .226		
Tibia L × B	.508 × .220	.528 × .213	.585 × .259	.580 × .242	.635 × .275	.710 × .310		
Chela L, L ped	.951, 1.022	.877, .954	1.066, 1.137	.976, 1.057	1.063, 1.159	1.158, 1.251		
Chela B × D	.303 × .292	.303 × .287	.339 × .330	.317 × .302	.367 × —	.426 × .413		
Hand L	.394	.410	.448	.432	.469	.558		
Fingers L	.592	.492	.635	.544	.580	.635		

*This specimen was treated *in toto* in KOH, thus rendering some of these figures (especially those for the breadths and depths of the palpal segments) somewhat doubtful.

^bAbbreviations: B, breadth; basifemur; D, depth; L, length; L, length; ped, pedicel; telof, telofemur.

TABLE 1—(Continued)

	Male		Male		Female		Female		Female	
	JC-276.01001	JC-1548.01001	JC-42.01003	JC-710.01001	JC-1548.01002	JC-1606.01001				
Leg I										
Basifemur L × D	.295 × .091	.258 × .088	.328 × .129	.331 × .120	.333 × .105	.369 × .110				
Telofemur L × D	.191 × .088	.188 × .078	.216 × .118	.218 × .110	.221 × .098	.228 × .116				
Tibia L × D	.280 × .066	.250 × .063	.326 × .085	.317 × .090	.331 × .074	.361 × .083				
Metatarsus L × D	.160 × .052	.147 × .052	.167 × .063	.171 × .055	.177 × .055	.171 × .066				
Telotarsus L × D	.206 × .045	.195 × .048	.216 × .045	.221 × .059	.243 × .050	.258 × .061				
Leg IV										
"Miofemur" L × D	.541 × .197	.481 × .195	.589 × .230	.595 × .186	.614 × .179	.628 × .197				
Basif L, telof L	.205, .336	.200, .280	.238, .351	.278, .367	.255, .359	.254, .374				
Tibia L × D	.446 × .098	.418 × .087	.476 × .131	.477 × .098	.515 × .097	.517 × .108				
Metatarsus L × D	.205 × .077	.195 × .074	.213 × .090	.207 × .069	.235 × .076	.233 × .083				
Telotarsus L × D	.246 × .052	.258 × .061	.279 × .056	.277 × .055	.299 × .061	.312 × .063				

specimen JC-1548.01001: basifemur 2.9, telofemur 2.4, tibia 4.0, metatarsus 2.9, telotarsus 4.1, times as long as deep; pedal proportions of leg IV: holotype: "miofemur" 2.8 times as long as deep, telofemur 1.6 times as long as the basifemur, tibia 4.6, metatarsus 2.7, telotarsus 4.7, times as long as deep; for specimen JC-1548.01001: "miofemur" 2.5 times as long as deep, telofemur 1.4 times as long as basifemur; tibia 4.8, metatarsus 2.6, and telotarsus 4.2, times as long as deep.

MEASUREMENTS: See table 1.

Female: Larger and somewhat more robust than male.

Carapace distinctly longer than broad and broader anteriorly than posteriorly; moderately developed median transverse stripe and weakly developed posterior stripe demarcate three quite distinct carapacial disks; two pairs of corneate eyes, anterior pair approximately twice their own diameter from anterior carapacial margin and about one-third of their own diameter from the posterior pair, both pairs approximately the same size, i.e., from 0.040 to 0.044 mm. in diameter; derm as in male, smooth except fairly granulated posterolaterally; chaetotaxy apparently quite variable, as follows: anterior margin 6-10 (mean, 7.75), posterior margin 7-13 (mean, 9.75), and total 32-60 (mean, 43.75).

Derm of abdomen smooth and with simple acuminate vestitural setae; circumanal plate typical; tergites and sternites entire; pleural membrane smoothly plicate; chaetotaxy as shown in table 2. Median cribriform plate on anterior genital operculum is strongly convex; coxal area with parallel sides; well-developed and highly sclerotized projections at anterior condylar area of coxae I and II.

TABLE 2

ABDOMINAL CHAETOTAXY OF THREE FEMALES OF *Chitrella cala* (CHAMBERLIN)

JC-42.01003

Tergites: 8:13:14:14:16:15:15:16:16:13:S2S:2m

Sternites: (8):(4)16(4):(4)15(4):20: $\frac{1}{19}$:8T1T8:17:18:16:T1T3T1T:2m

JC-1548.01002

Tergites: 10?:12:12:12:13:14:14:14:14:13:TT1TT:2m

Sternites: 9:(?)15(4):(4)13(4):16:17?:18:16:16:TT3TT:2m

JC-1606.01001

Tergites: 9:11:13:14:12:13:13:13:12:10:TT1TT:2m

Sternites: 9:(4)16(4):(4)13±(4):16:18:7T1T6:14:16:12:T2T:2m

Chelicerae with facies and proportions as in male; no spinneret present; movable finger with six to 10 irregular, protrorse denticles, fixed fingers with 13 to 17 irregular and somewhat retrorse denticles

or teeth; serrula exterior with 21 to 24 blades and serrula interior with 15 to 17 blades; flagellum apparently composed of four to six blades, some of which are dentate; chaetotaxy as in male.

Palps of typical facies and normal appearance; derm smooth except finely and evenly granulated on inner surface of femur, inner distal surface of tibia, inner face of hand at base of fingers, and on inner surface of trochanter of some specimens; palpal proportions: (extremes, with means in parentheses) trochanter 1.89–2.32 (2.22), femur 3.29–3.84 (3.57), tibia 2.26–2.40 (2.32), chela 2.72–3.14 (2.96) [plus pedicel 2.93–3.35 (3.19)], times as long as broad; chela 2.80–3.23 (3.09) times as long as deep; hand 1.28–1.36 (1.32) times as long as broad; and fingers 1.14–1.42 (1.27) times as long as hand. Chaetotaxy of chela similar to male; movable finger with 46 to 55 (mean, 52) marginal teeth that are retroconical in shape, becoming lower and more rounded basally; fixed finger with 37 to 49 (mean, 43) marginal teeth, similar in shape to those of the movable finger; no accessory teeth; nodus ramosus opposite second to third marginal tooth on fixed finger.

Legs of normal appearance; derm smooth; vestitural setae simple acuminate; tactile or pseudotactile setae located on tibia (index, 0.58–0.65) and metatarsus (index, 0.24–0.25) of leg IV; subterminal setae terminally denticulate; pedal proportions of leg I: (extremes with means in parentheses) basifemur 2.54–3.35 (2.96), telofemur 1.83–2.25 (2.01), tibia 3.54–4.71 (4.11), metatarsus 2.58–3.20 (2.88), telotarsus 3.72–4.89 (4.41), times as long as deep; pedal proportions of leg IV: telofemur 1.41–1.61 (1.49) times as long as basifemur; "miofemur" 2.56–3.40 (3.09), tibia 3.63–5.31 (4.65), metatarsus 2.36–3.09 (2.82), and telotarsus 4.93–5.03 (4.93), times as long as deep.

MEASUREMENTS: See table 1.

Chitrella transversa (Banks)

Obisium transversum BANKS, 1909, Canadian Ent., vol. 41, p. 307.

Microcreagris transversa BEIER, 1932, Das Tierreich, vol. 57, p. 157.

Chitrella transversa HOFF, 1956, Amer. Mus. Novitates, no. 1780, pp. 21–24, figs. 11 (palp) and 12 (chela). (Quotes Banks's original description and supplements it with an extensive redescription based on new material.)

Hoff's redescription must be depended upon for the actual definition of this species.

