BULLETIN OF THE UNIVERSITY OF UTAH

Volume 38 September 26, 1947 No. 7

The Vachoniidae — A New Family of False Scorpions

Two New Species from Caves in Yucatan

BY

JOSEPH C. CHAMBERLIN

BIOLOGICAL SERIES, Vol. X, No. 4

PUBLISHED BY

THE UNIVERSITY OF UTAH

SALT LAKE CITY

THE VACHONIIDAE, A NEW FAMILY OF FALSE SCORPIONS REPRESENTED BY TWO NEW SPECIES FROM CAVES IN YUCATAN

(Arachnida, Chelonethida, Neobisioidea)

By JOSEPH C. CHAMBERLIN[1]

It is a matter of unusual interest, at this time, to be able to report the existence of a well-defined and previously unrecognized family of the false scorpions belonging to the superfamily Neobisioidea.

The family characteristics are well marked, the most distinctive being the venom apparatus of the chela, which is functionally developed in the movable finger only. A vestigial and functionless venom duct persists in the fixed finger, thus clearly evidencing the derivation of this family from a stock in which the venom apparatus was equally developed in both fingers. Such a development occurs in the closely related Ideoronicidae and Hyidae, from the former of which the Vachoniidae are probably to be considered a specialized offshoot. In all other families of the Neobisioidea the venom apparatus is either equally developed in both fingers of the chela (Ideoronicidae and Hyidae) or in the fixed finger only (Neobisiidae and Syarinidae).

The new family is based upon two new, closely related but well-marked species of the genus *Vachonium* nov. The material is scanty, each species being represented by a single adult female. The general morphology is fully illustrated and discussed under the various taxonomic categories. Both known species are completely blind, pallid forms and exhibit the typical morphological and color modifications associated with permanent cave inhabitants.

I am indebted and grateful to F. Bonet, of the National School of Biological Sciences Mexico, D. F. for the privilege of studying the material upon which this contribution is based.

Family VACHONIIDAE nov.

TYPE. The genus *Vachonium* nov.

DISTRIBUTION. Mexico, Yucatan.

DIAGNOSIS. Subordinal and superfamily characters without exception, normally developed. Functional venom apparatus present in movable finger only, venom duct elongate, nodus ramosus small and situated only a little distad of median (figs. 9 and 32). A vestigial and functionally non-effective venom apparatus also occurs in the fixed finger of the type genus (figs. 8 and 28). Pleural membrane of the abdomen almost evenly striate; the sclerotization of the striae not uniform throughout their length, but broken into short semicrescentic segments (figs. 18 and 21). Chelicera lacking the lamina exterior and the laminal seta; galea present as a slender unbranched "stylet" (fig. 11); flagellum a single series of 5 slender flattened, acuminate, blades (in type genus) (fig. 36). Femoral articulation of legs III and IV an oblique symphysis, the basifemur a short, triangular sclerite (fig. 16). Subterminal setae denticulate (fig. 23).

[1] U. S. Department of Agriculture, Agricultural Research Administration, Bureau of Entomology and Plant Quarantine, Forest Grove, Oregon.

Chela with the usual 12 tactile setae (figs. 9 and 32). Tracheal trunks with internal, sclerotic reticulations as in the Neobisiidae (figs. 19 and 21). Coxal and maxillary structures as illustrated (figs. 13, 14, 15, and 26).

REMARKS. This new family is known only from the type genus and its two included species. It is to be associated most closely with the families Ideoroncidae and Hyidae. The development of a functional venom apparatus in the movable finger only is unique in the Diplosphyronida and is paralleled only in the family Chernetidae of the Monosphyronida.

As previously noted, there is a reduced venom apparatus present in the fixed finger of the chela in both known species of the type genus. It is undoubtedly functionless as such (contrast figs. 7 and 8). The structure apparently persists either as a vestige or as an organ for some other, and unknown, function It is uncertain whether or not it debouches to the exterior. If so it is not by way of any of the functional teeth, but rather through a pore situated on the rounded apex of the finger. Vestiges of the venom apparatus similarly persist in the fixed finger of many Chernetidae, where the functional apparatus is likewise developed only in the movable finger.

Genus **Vachonium** nov.

ORTHOTYPE. *Vachonium boneti* n. sp.

DISTRIBUTION. Mexico, Yucatan. Caves.

DIAGNOSIS. Based on the female only; males currently unknown. Typical cave genus, pallid in coloration, blind, and with unusually attenuate appendages. All vestitural setae of body and appendages simple and acuminate. Carapace (fig. 2) narrow, much longer than broad and completely lacking eyes, eyespots, or transverse furrows. Vestitural setae sparse, slender, and acuminate. Abdomen elongate, oval; tergites entire, tergite and sternite 11 fused into a terminal circumanal plate (fig. 10). Coxal area narrow, of nearly uniform breadth throughout (fig. 14); foraminal seta of maxilla elongate, extending to tip of maxillary lamina (fig. 13); sternites entire. Vestitural setae of both tergites and sternites uniseriate, with about 8-12 marginal setae. Sternites 6, 7 and 8 with a closely associated, median pair of microsetae (fig. 1). Terminal abdominal segments with relatively short or moderately elongate setae, which may be tactile or semitactile in function; strongly differentiated tactile setae lacking.

Chelicerae of typical neobisioid facies; galea a slender unbranched stylet (figs. 12 and 33); flagellum a series of 5 acuminate, unilaterally weakly dentate blades (fig. 36).

Palps attenuate, evenly and sparsely granulate on all surfaces; femur of palps with a well-developed, subbasal tubercle (apparently a gland or sensorium) on the exterior pedicellar angle (figs. 6 and 27).

Chela with chaetotaxy and dentition as illustrated (figs. 9 and 32); marginal teeth close-set and contiguous. Movable finger of chela much shorter than the fixed finger; tip of fixed finger blunt, multidentate (figs. 5, 8, and 24). Fixed finger with a subdistal, accessory tooth situated interiorly at the approximate point the fingers cross (figs. 28 and 29). Fixed finger with setae ET, EST, IT, and IST situated on the terminal third of the finger, ISB, ESB, and EB basal or prebasal on the fixed finger; IB situated dorsally and subbasally on the bulb of the hand. Movable finger

with setae T and ST situated on distal third of the finger and distinctly distad of the nodus ramosus, SB and B on basal third of finger but not closely associated.

Legs (figs. 16 and 17) attenuate; femoral articulation of legs I and II freely mobile, and basifemur much longer than the telofemur; femoral articulation of leg IV an immobile, oblique symphysis with the basifemur short and triagular. Metatarsus of all legs unusually shortened, between one-fourth and one-fifth as long as the telotarsus (fig. 20); all tarsal claws scimiterlike, simple and acute, subterminal setae curved, with marginal denticulations dorsally; arolium simple, shorter than tarsal claws (fig. 23). Fourth telotarsus with 7 short, semitactile setae; metatarsus with simple, short submedian pseudotactile seta (fig. 20).

REMARKS. This unique and interesting genus is respectfully dedicated to my colleague in the study of the Chelonethida, Max Vachon of Paris, France, whose notable researches have greatly advanced the study of these interesting arachnids.

The development of a rather conspicuous, apparently glandular (or sensory?) tuberclelike structure, exteriorly and basally, on the palpal femur of members of this genus is especially noteworthy. It is probably homologous to the small, often scarcely evident, tubercle which occurs in the same position on the femur of some other neobisioids (e.g. *Microbisium*), but nowhere else is it so strikingly developed. It may serve a specialized function associated with the cavernicolous habitat of the two included species, and should probably not be considered more than generically diagnostic, for the present, at least. For taxonomic purposes this structure is referred to as the femoral tubercle.

Another unique structural development in *Vachonium* is the small, slender, and heavily sclerotic accessory tooth, which is developed interiorly and subterminally on the fixed finger slightly caudad of the nodus ramosus of the vestigial venom duct and close to the point where the dental margin of the movable finger rests when closed (figs. 28 and 29). It suggests a "sheathing" or "stop" arrangement which functions in preventing the fingers from crossing beyond a certain definite limit (see figs. 4 and 5).

The two species currently known to pertain to this genus may be separated by means of the following key.

KEY TO THE SPECIES OF VACHONIUM

(Females only; males unknown)

Hand of chela robust, swollen, proportions (including pedicel) about 1.9 times as long as broad; marginal setae of first 3 tergites, apparently 6 in number; distance from femoral base to apex of lateral tubercle, subequal to condylar breadth of femur (fig. 3); from Cueva de Sabaca, Yucatan.....*boneti* n. sp.

Hand of chela slender, proportions (including pedicel (2.4-2.5 times as long as broad; marginal setae of first 3 tergites, normally 4 in number; distance from femoral base to apex of lateral tubercle much greater than the condylar breadth of the femur (1.4 times) (fig. 25); from Cueva de Balaam Canche, Yucatan.....*maya* n. sp.

Vachonium boneti n. sp.

(Figs. 1-23)

HOLOTYPE. Female (JC-2094.01001). Mexico, Yucatan. "Cueva de Sabaca. Sept. 26, 1943. Coll. B. F. Osorio." (F. Bonet Collection No. 788). Type deposited in collections of Escuela Nacional de Ciencias Biologicas, Mexico, D. F.

DIAGNOSIS. Female only; male unknown. Typical cave species of blothroid facies. All vestitural setae slender and acuminate.

Carapace (fig. 2) subrectangular, much broader than long, being about 1.7 times as long as the anterior breadth; completely lacking eyes or eyespots; with very weakly defined, nearly tergiform, posterior depression; tessellate and almost or quite smooth discally, but laterally weakly roughened or semigranulate; chaetotaxy, 6-4 (25); lateral border setae of carapace much smaller than the median pair.

Tergites 1-3 weakly tesselate but smooth; tergites 4-11 smooth and unsculptured; all tergites with a discal zone of clear ovate maculae (fig. 10) (probably areas marked by muscle insertions); chaetotaxy, 5 (probably 6 normally):6:6:6:6:7:6:6:6:P1PP1P:PPPP:2m. Setae, designated as pseudotactile (P) in the preceding formula are relatively short (see fig. 10).

Coxal area as illustrated (fig. 14); foraminal seta of maxilla unusually long, extending slightly beyond the tip of the maxillary lamina (fig. 13). Genital area (chaetotaxy; cribriform areas, spiracles, and tracheae) as illustrated (fig. 21). Median cribriform plate, a distinctive conelike structure (fig. 22); lateral cribriform pores not concentrated into definite areas, but diffusely scattered on the membranous surface of peculiar, lateral, sacculate structures.

Sternites smooth, practically nontessellate, but with a discal zone of maculae (figs. 1 and 10). Chaetotaxy: (17):(1s)21(3s):(3s)9(3s):11:4s (mm)s4:4s(mm)s4:4s(mm)s4:4SS3:S1SS1S1S1S:1PP1:2m. The differentiation of the semitactile and pseudotactile setae is not marked, but is nevertheless quite distinct. As indicated in the formula, sternites 6, 7, and 8 possess a closely adjacent pair of microsetae flanked on either side by rather elongate "semitactile setae" (fig. 1).

Chelicerae with chaetotaxy, dentition and galea as illustrated (fig. 12); exterior face with seta *is, sb* and *b,* well developed, long and slender, with 3 accessory macrosetae between *b* and *es* plus 2 small accessory setae laterally on the interior face of the palm; galeal seta extending to tip of the slender, styletlike galea (fig. 11); serrula exterior with 35 or 36 ligulate teeth. Serrula interior with 22 short, nearly ligulate and posteriorly weak denticulate, teeth; the first or perhaps the first two teeth more slenderly developed and projecting forward, nearly parallel to the long axis of the fixed finger. Flagellum of 5 large, lanceolate, and weakly denticulate blades.

Palps (fig. 3) slender with chela relatively robust; femur slenderly clavate; the femoral tubercle relatively small, not at all protrorse and situated about as far distad of the femoral base as the condylar breadth of the femur (fig. 6); tibia slenderly pedicellate, the pedicel about a third as long as the entire segment; movable finger of chela much shorter than the fixed finger; the fingers definitely crossing when closed (figs. 4 and 5); the fixed finger with a small, heavily sclerotic, lateral tubercle or

accessory tooth at point of crossing. Segments of palp, including all except the tips of the fingers (from point of crossing to their tips), evenly but rather sparsely granulate. Palpal proportions: trochanter about twice as long as broad; femur 6.4-6.5 times as long as broad; tibia 5.3-5.4 times as long as broad; chela about 5.1 (with pedicel, 5.3-5.4) times as long as broad; hand (plus pedicel) about 1.9 times as long as broad and about as broad as deep; both fingers longer than the femur; fixed finger about 1.9 times as long as the hand plus its pedicel; fixed finger 1.1 times as long as the movable finger; movable finger 2.4-2.5 times as long as the venom duct.

Chela with chaetotaxy, venom apparatus, and dentition as illustrated (fig. 9). Movable finger with 90 marginal teeth; fixed finger with 123 or 124. Marginal teeth of movable finger gradually tending toward obsolescence distally, merging into the smoothly produced and curved finger tip which bears the slender, acute venedens and lamina defensor (fig. 7). Tip of the fixed finger truncate, with a series of 4 teeth on either side of usual marginal teeth (10 in all, on blunt and somewhat expanded dental face of the finger tip (figs. 5 and 8). Marginal teeth of fixed finger not quite uniform, tending to be weakly heterodentate, but still contiguous.

Nodus ramosus of venom duct of movable finger opposite the 37th or 38th marginal tooth, that of the vestigial venom duct of the fixed finger, caudad of the lateral accessory tooth and about opposite the 31st or 32nd marginal tooth.

Legs slender, as illustrated (figs. 16 and 17). Proportions, leg I: basifemur 5.1 times as long as deep, telofemur 2.5 times as long as deep; tibia 9 times as long as deep; metatarsus twice as long as deep; telotarsus 4.5 times as long as the metatarsus and about 11.4 times as long as deep. Proportions of leg IV: "miofemur" 4.8 times as long as deep; tibia about 9 times as long as deep; metatarsus 1.7 times as long as deep; telotarsus 4.9 times as long as the metatarsus and 11.5 times as long as deep. Structure of claws and subterminal setae as illustrated (fig. 23).

MEASUREMENTS (mm.). Female holotype. Total length (abdomen KOH expanded) 5.12. Abdomen 3.8 x 1.9±. Chelicera .85 x .38. Carapace 1.34 long; .77 broad anteriorly and .89 broad posteriorly.

Palps: trochanter .84± x .41; femur 2.18 x .336 (condylar breadth of femur .266; base of femur to apex of lateral tubercle .246); tibia 1.96 x .361 (tibial pedicel .62 long); chela 3.65 (plus pedicel 3.80) long by .71 broad and .70 deep; hand 1.19 (plus pedicel 1.33 long); fixed finger 2.48, movable finger 2.21 long (from lateral aspect, fixed finger 2.54, movable finger 2.31 long). Venom duct .93 long, functionless venom duct of fixed finger .48 long.

Leg I: basifemur 1.03 x .204; telofemur .443 x 177; tibia 1.05 x .114; metatarsus .205 x .103; telotarsus .922 x .081. Leg IV: "miofemur" 1.58 x .330; tibia 1.39 x .154; metatarsus .244 x .144; telotarsus 1.19 x .103.

REMARKS. This species is respectfully dedicated to F. Bonet.

Where appendages are as attentuate as in this and the following species, it is probable that rather large variations in appendicular proportions will occur.

Vachonium maya n. sp.

(Figs. 24-36)

HOLOTYPE. Female (JC-2095.01001). Mexico, Yucatan. "Cueva de Balaam Canche. Chichen Itza. Sept. 28, 1943. Coll. D. F. Osorio." (F. Bonet No. 791). Type deposited in the collections of the Escuela Nacional de Ciencias Biologicas, Mexico, D. F.

DIAGNOSIS. Female only, male unknown. Typical cave species, extremely similar in facies and structure to *V. boneti,* but differing distinctly in the more slender appendicular proportions, the cribriform plate structures, and in other, relatively minor details.

Carapace subrectangular, about 1.9 times as long as anterior breadth, completely eyeless and lacking definite transverse furrows, but with weakly depressed tergiform area along its posterior border. Derm tessellate but smooth discally; laterally very weakly roughened. Chaetotaxy 6-4 (24) posterior lateral border setae of carapace dwarfed, much shorter than the median pair.

Tergites 1-3 smooth but distinctly tessellate, 4-11 smooth and at most very obscurely tessellate, each with an irregular but distinct transverse discal zone of large maculae (in stained material). Chatetotaxy: 4:3 (normally 4): 4:5 (normally 4 or 6): 6:5 (normal, 6):6:6:6:6:4:2m. Tactile development of setae of posterior tergites not noted (broken) but no doubt as in *V. boneti.*

Coxal area essentially as in *V. boneti;* formaminal seta of maxilla extending beyond tip of maxillary lamina.

Genital chaetotaxy and cribriform areas of female as illustrated (fig. 34). Median cribriform plate apparently ligulate, not distinctly conical as is the case in *V. boneti* (fig. 35).

Sternites smooth; sternite 4 distinctly, 5 and 6 weakly tessellate. All except 11th sternite with a discal zone of clear maculae as in the tergites. Chatetotaxy: (12):(3s)18(1s):(2s)7(3s):10:5(mm)5: 5(mm)4:4(mm)5:7: 8:1PP1: 2m. Differentiation of ventral setae not clear (lost) but probably as in *V. boneti.* The median, paired microsetae of sternites, 6, 7, and 8 are definitely as in *V. boneti.*

Chelicerae (fig. 33) essentially as in *V. boneti;* dorsally tessellate but otherwise smooth; chaetotaxy of the palm variable, but with 3 macrosetae in addition to *sb, b, is,* and *es* plus a variable number of small accessory setae (in holotype, 3 on right and 1 on left chelicera). Flagellum 5 bladed, as illustrated (fig. 36); serrula exterior with 36-37 ligulate teeth; serrula interior with 20-21 nearly ligulate teeth of which the terminal one (or 2 ?) is unusually elongated and directed forward, parallel to the long axis of the fixed finger.

Palps including the chela very slender (fig. 25); femur gently clavate, the lateral tubercle (fig. 27) well developed and weakly protrorse, the distance of the apex of the lateral tubercle from the base of the segment about 1.4 times the condylar breadth of the femur; tibia clavate, with an elongate, slender pedicel which is slightly less than one-third the total length of the segment; movable finger of chela about one-tenth shorter than the fixed finger. Accessory tooth or tubercle of fixed finger present as in *V. boneti* (figs. 28 and 29). All palpal segments sparsely but evenly granular, the granulations reduced on ventral surface of trochanter and basal portion of tibia; chelal fingers granulate except for about the terminal fourth of their length.

Palpal proportions: trochanter 2.3 times as long as broad; femur 7.9 times as long as broad; tibia 6.9-7.0 times as long as broad; chela 6.9-7.0 (plus pedicel, 7.1-7.2) times as long as broad or deep, the breadth and depth of the chela being subequal; hand 2.2-2.3 (plus pedicel 2.4-2.5) times as long as broad; fixed finger 1.9 times as long as hand plus the pedicel, or 2.1 times as long as hand minus the pedicel; fixed finger 1.1 times as long as the movable finger; movable finger 2.4-2.5 times as long as the venom duct.

Chela with dentition, chaetotaxy, and venom apparatus as illustrated (figs. 28-32), essentially the same as in *V. boneti.* Marginal teeth of movable finger 104; of fixed finger 142. Terminal cluster of teeth on the ventral face of the fixed finger tip numbering 8 or 9 (fig. 24). Nodus ramosus of functional venom apparatus (movable finger) situated opposite the 45th to 47th marginal tooth; that of the vestigial venom duct of the fixed finger, caudad of the lateral accessory tooth and about opposite the 27th or 28th marginal tooth (fig. 28).

Legs essentially similar in structure to those of *V. boneti* but more slender. Proportions, leg I: basifemur 5.8 times as long as deep; telofemur 2.9 times as long as deep; tibia 9.6-9.7 times as long as deep; metatarsus very short, twice as long as deep; telotarsus 4.5 times as long as the metatarsus and about 11.4 times as long as deep. Proportions, leg IV: "miofemur" 6.2 times as long as deep; tibia 10.5 times as long as deep; metatarsus 1.8 times as long as deep; telotarsus 4.8 times as long as the metatarsus and about 11.6 times as long as deep. Structure of claws and subterminal setae as in *V. boneti;* subterminal seta curved, subterminally, unilaterally denticulate.

MEASUREMENTS (mm). Female, holotype. Total length (abdomen KOH expanded) 4.58. Abdomen 3.2 long and about 1.6 broad. Chelicera .82 x 36. Carapace 1.38 long; .72 broad anteriorly; .86 broad posteriorly.

Palps: trochanter .850 x .369; femur 2.37 x .300 (basal condylar breadth of femur .246; distance from femoral base to apex of lateral tubercle .344); tibia 2.14 x .308 (tibial pedicel .62 long); chela 3.74 (plus pedicel, 3.86) x .541 broad and .533 deep; hand 1.22 (plus pedicel, 1.33) long; fixed finger 2.54 long; movable finger 2.31 long (from lateral aspect, 2.36 long). Venom duct .95 long; functionless venom duct of fixed finger .41 long.

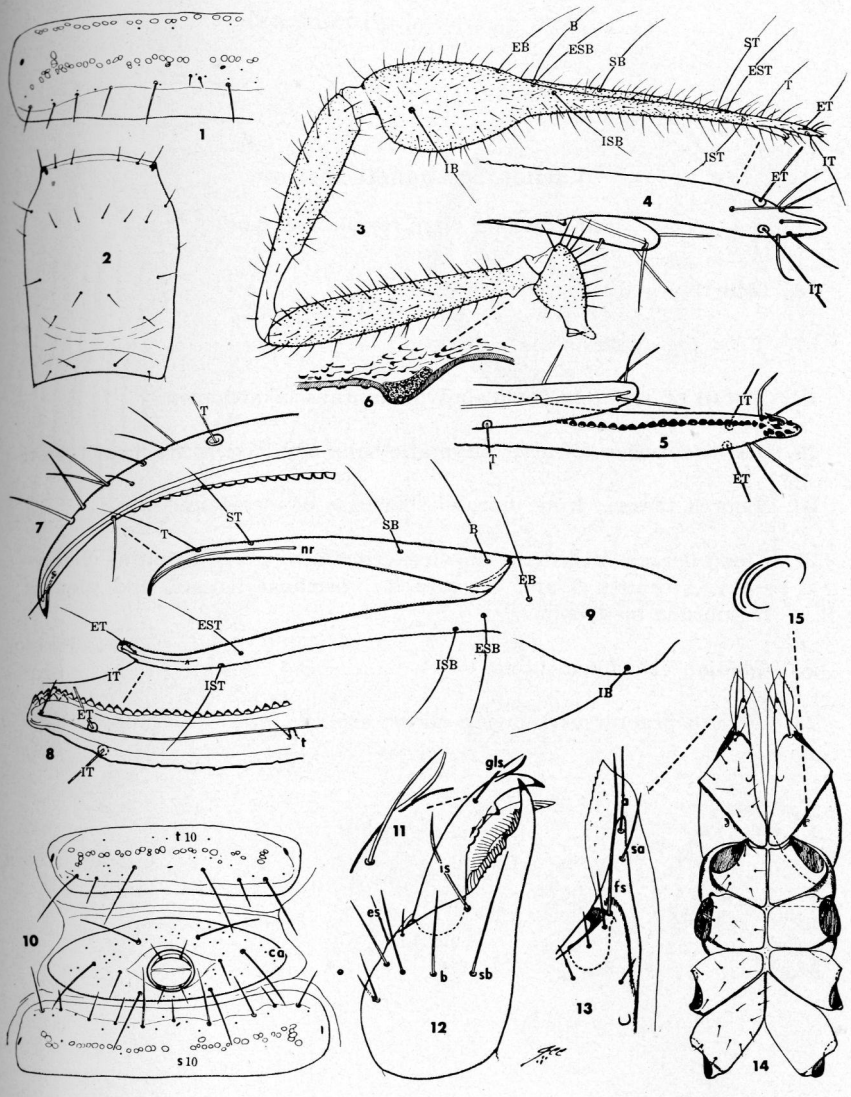
Leg I: basifemur 1.07 x .184; telofemur .476 x .162; tibia 1.03 x .107; metatarsus .198 x .099; telotarsus .902 x .079. Leg IV: "miofemur" 1.71 x .277; tibia 1.51 x .144; metatarsus .238 x .132; telotarsus 1.14 x .098.

Vachonium boneti sp. nov.

(All drawings from female holotype)

1. Left half of sternite 8, showed paired, median microsetae and flanking macrosetae.
2. Carapace.
3. Dorsal aspect of left pedipalp.
4. Dorsal aspect, tips of chelal fingers.
5. Ventral aspect, tips of chelal fingers.
6. Femoral tubercle or gland (?).
7. Exterolateral aspect, tip of movable finger of chela showing dentition and venom duct.
8. Exterolateral aspect of tip of fixed finger showing dentition, vestigial venom duct, and accessory tooth (t).
9. Exterolateral aspect of left chela.
10. Terminal aspect of tip of abdomen showing chaetotaxy, dermal markings and circumanal plate (semidiagrammatic). (t10, tergite 10; ca, circumanal plate and s10, sternite 10).
11. Galea and galeal seta.
12. Exterior aspect of left chelicera.
13. Ventral aspect of tip of maxilla. Note unusual length of foraminal seta (fs) as compared to apical (a) and subapical (sa) setae. (Also note U-shaped median maxillary lyrifissure.
14. Coxal area. Setae omitted from left side.
15. Posterior maxillary lyriform organ.

Vachonium boneti sp. nov.



Vachonium boneti sp. nov.

(All drawings from female holotype)

16. Fourth leg (same scale as palp).

17. First leg (same scale as palp).

18. Detail of striations of pleural membrane of abdomen.

19. Right anterior spiracle; stigmatic helix and base of tracheal trunk.

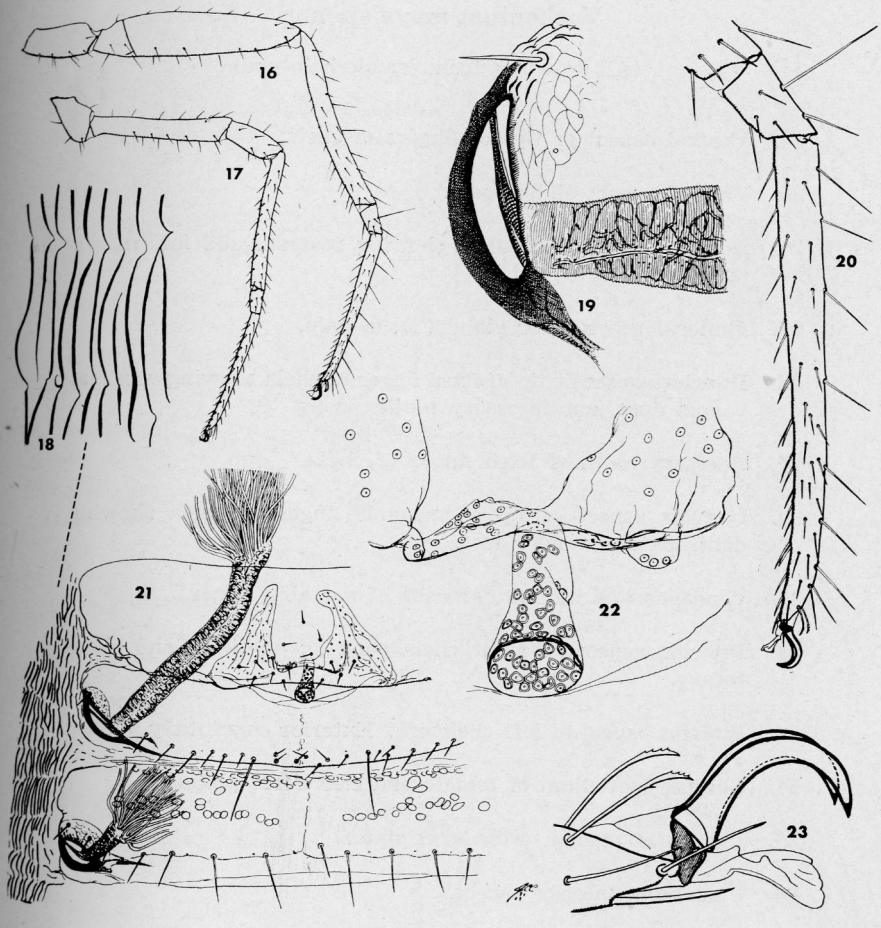
20. Fourth tarsus. Note unusual shortness of metatarsus.

21. Genital area of female showing cribriform plates; genital chaetotaxy; sternites 3 and 4; spiracles, tracheal trunks, and pleural membrane of abdomen.

22. Median cribriform plate.

23. Fourth praetarsus showing claws, arolium, and subterminal setae.

Vachonium boneti sp. nov.



Vachonium maya sp. nov.

(All drawings from female holotype)

24. Ventral aspect of tips of fingers of chela.

25. Ventral aspect of left palp.

26. Dorsal aspect of maxillae showing rostrum and intermaxillary jugum.

27. Femoral tubercle, or gland (?), of palp.

28. Interior aspect of tip of fixed finger of chela showing vestigial venom duct and accessory tooth.

29. Acessory tooth of fixed finger of chela.

30. Interior aspect of tip of movable finger of chela showing dentition and venom duct.

31. Venedens and lamina defensor of movable finger.

32. Interior aspect of right chela showing dentition and chaetotaxy.

33. Interior aspect of left chelicera. Exterior chaetotaxy dotted.

34. Genital operculum of female and cribriform plates.

35. Details of median cribriform plate.

36. Flagellum. Interior aspect.

Vachonium maya sp. nov.