REVALUATION OF THE TAXONOMIC CHARACTERS IN FOUR SPECIES OF THE GENUS *CHEYLOSTIGMAEUS* WILLMANN (ACARINA : STIGMAEIDAE)

BY

F. M. SUMMERS and Shôzô EHARA

University of California, Davis, and Hokkaido University, Sapporo, Japan.

Mites of the genus *Cheylostigmaeus* are fairly robust species presumed to be effective predators. Their gnathosomal structures are carried prominently in front and are well armed with strong claws, stout setae and sometimes robust apophyses on basal segments of the pedipalps, especially in males. Certain anatomical features distinguish *Cheylostigmaeus* from the closely allied genus *Ledermuellera* : the gnathosoma is affixed to the idiosoma in an apical or terminal position, not appreciably below an overhang of the propodosoma (as in *Ledermuelleria*) ; the tergal plating of the idiosoma is thin and restricted to dorsum proper, i.e., does not overlap the sidewalls of the body or encroach on the venter ; the legs are longer in relation to body size. In these respects, atypical species or flattened specimens present perplexing problems of judgment.

One feature not emphasized by earlier authors is the adnation of the basal segments of the chelicerae. The union of right and left cheliceral appendages is less perfect than in raphignathids, caligonellids, cheyletids or tetranychids because a median septum persists and a short section of the median furrow is evident on the upper surface of the joined parts. The chelicerae are not joined together in *Ledermuelleria*. All of the species of *Cheylostigmaeus* studied by the writers — those here described and other unidentified specimens examined — show this character so clearly that it may prove to be a very serviceable character for distinguishing *Cheylostigmaeus* from *Ledermuelleria*. However, it cannot now be affirmed that all of the species described from Europe also have joined chelicerae.

Cheylostigmaeus was proposed by WILLMANN, 1951*a*. The genus now comprises twelve species, of which six were described by WILLMANN : *grandiceps* Willm. 1951*a*, 1953 (type ; *angustimaxillatus* Willm. 1951*a*, 1953 ; *pannonicus* Willm. 1951*b* ; *austriacus* Willm. 1951*b* ; *longisetosus* Willm. 1951*b* ; *marinus* Willm. 1957.

The remainder have been described by others : *scutatus* (Halbert, 1920) ; *salinus* Evans, 1954, *howellsi* Evans, 1954 ; *torulus* Summers, 1957 ; and two new species here described.

Few species have been described but these are quite difficult to identify. Recognition is based primarily upon several features of the gnathosoma of males : spinous apophyses on one or more segments of the pedipalps and other sclerotic adornments projecting from the margins of the rostrum. WILLMANN (1952) provided a brief description of the male of *C. scutatus* so that the male of only one species, *C. longisetosus*, is not yet known.

The identification of nine of the previously described species requires good slide preparations of males whereas, for the most part, females of these species are so much alike in appearance that specimens of this sex are currently of little worth to an identifier.

The present project was undertaken to discover, if possible, a variety of anatomical features useful for distinguishing between the females of four species available for study. For this purpose, it was advisable to work only with specimens belonging to series containing individuals of both sexes in order that specific determinations made for females could be confirmed by reference to concurrently determined males.

The intricately folded and sclerotized membranes of the lower genital ducts appear to have sufficient structural integrity in whole, transparent specimens to provide several useful taxonomic characters. The names proposed for some of the genitalic parts are, perforce, topographical terms because their interrelations are imperfectly known.

The aedeagus is a slender tube or grooved sclerite, C-shaped and generally upturned behind. Its shaft originates proximally from the tapered end of a funnel-like distension, the *calyx*. This flared distension is believed to be the thickened intima at the neck of a tubular or vesicular organ, perhaps an ejaculatory device. Close behind the calyx the shaft of the aedeagus passes through or beneath a complex membranous investment. The investment may or may not have a proximal chamber, the *bulb*. In *C. pannonicus* the bulbar part of the investment narrows and continues posteriorly as a dorsal sheath overlying but not comletely enwrapping the aedeagus. In two of the males, *C. pannonicus* and *C. californicus* n. sp., the sheath gives rise to two pairs of elongate accessory organs, the : (1) *unciform* and (2) *forcipiform* appendages. The distal tips of the former are acuminate and sharply bent upwards. The forcipiform appendages may end in rounded, fleshy lobes or spur-like hooks. A pair of looped folds or apodemes, are identifiable near the basal origins of the accessory appendages and are believed to be proximal elements of the unciform appendages. The sclerotic components enclosed within the phallocrypt vary appreciably between species and their homologies are uncertain. In *C. multidentatus* n. sp., for example, a pair of stubby, recurved hooks are the only accessory appendages identifiable.

The cuticular components of the genital chamber in females is so affected by

state of preservation or coverslip pressure that their value for taxonomic purposes is limited — except to confirm adulthood. In general, the roof and sidewalls of the chamber form two pouches, a *preatrium* and a *postatrium* between which there is a constriction, or *waist*. The preatrium may be anteriorly domed, saucer-shaped or bilobed. The entrance of the median oviduct into the genital chamber appears to be identifiable as a radially striated, sometimes umbrella-like stenosis. In several species the postatrium is also bilobed ; each lobe, called an *auricle*, is supported by a rib or crescentic sclerite on which arises a rod-like apodeme. The auricles and apodemes are very conspicuous in some species, e.g., *C. pannonicus*, and may be identified even though the atria are collapsed or otherwise distorted by mounting.

Since the relative lengths and spatial relations of certain setae are useful characters involving lengthy descriptions, they are condensed to abbreviated notations. The numbers of setae and sensilla counted on each of the leg segments are identical for the four species described (both sexes) : coxae 2-2-2-2, femora 6-5-3-2, genua 4-4-1-1, tibiae 7-6-6-6, tarsi 14-10-8-8 (all tarsi of males have an additional long solenidion, *w*♂). Illustrated but not described are pairs of symmetrically arranged groups of markings on the dorsal plates. The relations of these marks with occasionally visible striated fibers indicate that at least some of these are areas of muscle attachment. They fluctuate somewhat in size and disposition within population samples but have not provided any satisfactory basis for distinguishing species.

Key to Species — Males.

1. Three pairs of paragenital setae ; *w*♂ on tarsus I overreaches base of *w* ; intercoxal bridge absent 2
   Two pairs of paragenital setae ; solenidion *w*♂ projects about one-half distance to *w* ; intercoxal bridge present (fig. 22) ..... *torulus* Summers
2. Posterolateral margin of rostrum with a lamellar process on which anterior subcapitular seta inserts ; aedeagus with sclerotized accessory organs appended to its midregion ; bulb present 3
   Posterolateral margin of rostrum with an oblique row of 4 similar, knobby teeth (fig. 11) ; aedeagus without a complex of accessory parts appended to its midregion ; no bulb .... *multidentatus* n. sp.
3. Rostral lamella broad, expanded, deeply incised to form two anteriorly directed cusps (fig. 12) ; unciform appendages relatively stout, tapered to acutely upturned points, forcipiform appendages spatulate ; bulb distended (fig. 10) ..... *pannonicus* Willm.
   Rostral lamella a simple lobe, outer margin straight, entire anterior angle acutely rounded (fig. 6) ; unciform appendages extremely slender, finely pointed, forcipiform appendages end in incurved hooks ; bulb a compact annulus closely appressed to middle of aedeagus (fig. 7) ..... *californicus* n. sp.

Key to Species — Females.

1. Length of seta *a* equal to or slightly exceeds distance *a-b* ; intercoxal bridge absent ; sheaths on dorsal setae well developed, rounded at ends 2

Length of seta *a* equals two-thirds distance *a-b* ; intercoxal bridge present (fig. 22) ; sheaths on setae incipient, pointed at ends..... *torulus* Summers

2. Sheaths on dorsal hysterosomal setae not overreaching tips of shafts ; humeral seta averages 63 μ long ; no sheathed setae on palpfemur..... 3

Sheaths on dorsal hysterosomal setae prolonged considerably beyond pointed tips of shafts (fig. 17) ; humeral seta averages 88 μ long ; proximodorsal seta on palpfemur usually sheathed..... *multidentatus* n. sp.

3. Transverse spacing of setae *b-b* = *c-c* ; lengths *be/ae* = 1.5 ; mean length of cheliceral stylet 69 μ..... *californicus* n. sp.

Transverse spacing *b-b* > *c-c* ; lengths *be/ae* = 1.3 ; mean length of cheliceral stylet 88 μ..... *pannonicus* Willm

Cheylostigmaeus pannonicus Willm.

Cheylostigmaeus pannonicus WILLMANN, 1951 (b), *Sitzungsber. Osterr. Akad. Wissensch., Mathem-naturw.* Kl., Abt. I, 160 : 137-8 ; SUMMERS, 1957, *Pan-Pacific Ent.* 33 : 163-6.

Female. — Ornamentation of dorsal plating variable : in well-tanned individuals, plates minutely punctate and with shallow ovoid dimples uniformly distributed ; otherwise minute punctations not observable and dimpling apparent only on anterior parts of hysterosomal and/or propodosomal plates (fig. 2) ; when major plates feebly sclerotized, only a few shallow dimples appear near front margin of propodosomal plate. Dorsal setae fairly rigid, shafts straight or slightly curved, sparsely barbed ; a hyaline sheath covers their pointed ends (fig. 23) ; sheath on most of them slightly dilated and well-rounded at end, completely enveloping acuminate tip of shaft ; pointed ends of *ae* and *ce* barely protrude beyond endings of their sheaths. Comparative lengths of setae : *be=li>de=b=c>ae=ce=be=a*. Lengths *be/ce* = 1.3. Verticals *ae* approximately as long as, or slightly longer than distance to *be*. Length *a* = distance *a-b* (center to center) ; length *b* = distance *b-c* ; transverse spacings *b-b>c-c>a-a*. Preatrium of genital chamber bilobed ; postatrium also bilobed, each lobe (auricle) with a sclerotized supporting rim on which arises a long, posteriorly directed, rodlike apodeme (fig. 14) ; length of apodeme approximately equals length of paragenital seta *pg* 3. Spine *k* on genu I at least as long as tactile seta immediately behind. Numbers of sheathed seta on leg segments as follows : one on femora I-IV incl. (fig. 21), three on genu I, one on genua II-IV (genu II sometimes with 2) ; macroseta only on tibia III and IV. No sheathed setae on palpfemur. Average length measurements in microns (n = 10) ; idiosoma 423±21, chelicera stylet 88±5 ; setae : *ae* 67±3, *be* 87±7, *ce* 67±4, *de* 75±4, *he* 63±6, *a* 67±4, *b* 73±5, *c* 79±5 ; *li* 91±5 ; distances : *ae-be* 64±5, *a-a* 90±9, *b-b* 122±11, *c-c* 110±7, *li-li* 85±5, *a-b* 69±4, *b-c* 75±6, *c-li* 60±4.

Male. — Femur and tibia of palpus without sharply defined apophyses or spine-like elevations, but midsection of palpfemur pinched-in or furrowed on its median face to produce, in some specimens, a slight ventromedian boss. Lateral lamellae

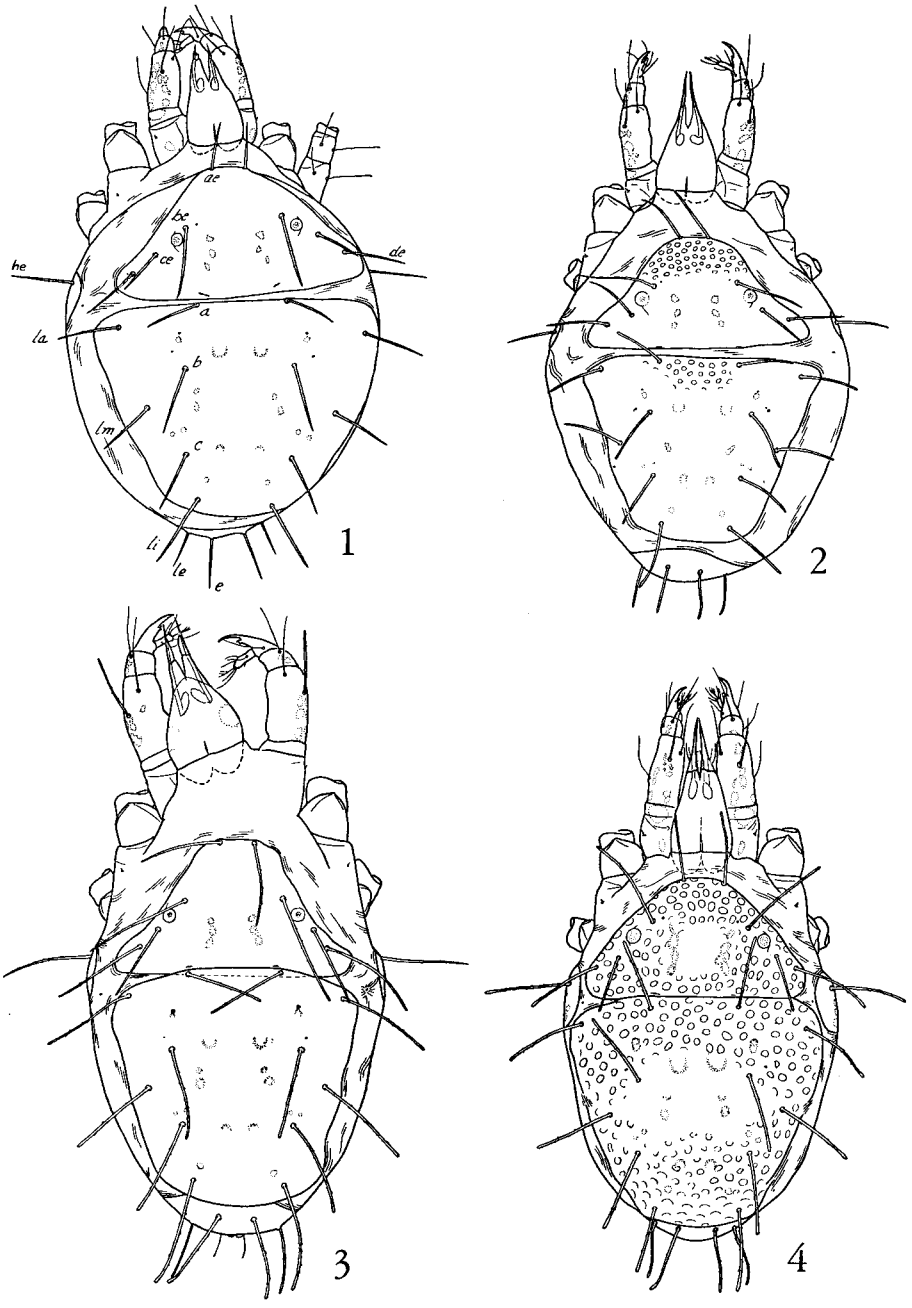


FIG. 1-4. — Dorsal aspect of females : 1, *C. torulus* ; 2, *C. pannonicus* ; 3, *C. multidentatus* ; 4, *C. californicus*.

strongly developed on rostrum, each lamella thick and rounded at posterior angle, membranous, bicuspidate in front ; median cusp more anteriorly produced than lateral cusp ; anterior subcapitular seta *m* situated on membrane of lamella, between cusps (fig. 12). Dorsal body plates lightly sclerotized, not obviously dimpled or reticulate. Three pairs of paragenital setae, third pair beneath lateral suranals *le*. Calyx of aedeagus cup-shaped, with flared rim ; bulb capacious. Two pairs of accessory capulatory appendages (fig. 10) : unciform appendages (unci. app.) divergent posteriorly, ending in minute, sharply recurved points ; forcipiform appendages (forc. app.) narrow, spatulate, ends lie close beside tip of retracted aedeagus. Male solenidion $w\delta$ on tarsus I very long, slightly overreaches base of distal solenidion *w*.

No unique character has been found on females of this species. The best combinations for segregating *C. pannonicus* from the three others described here are enumerated in the key to females. The identity of these males may be determined from the configuration of the bicuspidate rostral lamellae and the elaborate organization of the accessory genital parts.

Cheylostigmaeus multidentatus n. sp.

Female : Idiosomal plating weakly sclerotized, no obvious dimples or micropunctations (fig. 3). Dorsal setae moderately long in relation to body length, shafts very sparsely barbed, gradually tapered to finely pointed, somewhat flexible tips, ensheathed. Sheath on most setae prolonged considerably beyond pointed tip of shaft (fig. 17) ; *ae* and *de* exceptional, their shafts slightly project beyond ends of sheaths. Comparative lengths of setae : $be=li>de=he>b=c>ae=ce=a$. Lenths $be/ae = 1.4$; length *ae*> distance $ae=be$. Length *a* equal to or less than distance *a-b* ; *b* equal to or greater than *b-c*. Preatrium of genital chamber domed, voluminous (fig. 15). Lumen through oviductal stenosis provided with an upright tuft of small villi ; postatrium evidently not bilobed ; no identifiable auricles with posteriorly projecting apodemes. Spine *k* on genu I approximately 1/3 longer than sheathed seta immediately behind. Numbers of sheathed setae on femora and genua of legs I-IV as described for *C. pannonicus* ; tibiae III and IV each with 2 sheathed setae (macroseta and dorsolateral seta). Proximodorsal seta on palp-femur often sheathed. Average measurements in microns (n = 7) : idiosoma 355 ± 42 ; cheliceral stylet 89 ± 4 ; seta : *ae* 70 ± 9, *be* 99 ± 9, *ce* 70 ± 5, de 86 ± 7, *he* 88 ± 5, *a* 69 ± 5, *b* 79 ± 7, *c* 83 ± 9, *li* 97 ± 7 ; distances : *ae-be* 57 ± 4 ; *a-a* 91 ± 5 ; *b-b* 121 ± 7 ; *c-c* 105 ± 6 ; *li-li* 84 ± 6 ; *a-b* 72 ± 5 ; *b-c* 70 ± 5 ; *c-li* 55 ± 4.

Male. Palp segments indistinguishable from those of female except proximodorsal seta on femur not sheathed. Rostrum bears on each basal margin an oblique row of four similar, knobby teeth (fig. 11) ; anterior subcapitular seta *m* inserted below third tooth, on rostrum proper. Dorsal plates plain. Sheaths of dorsal setae not appreciably longer than shafts. Three pairs of paragenital setae.

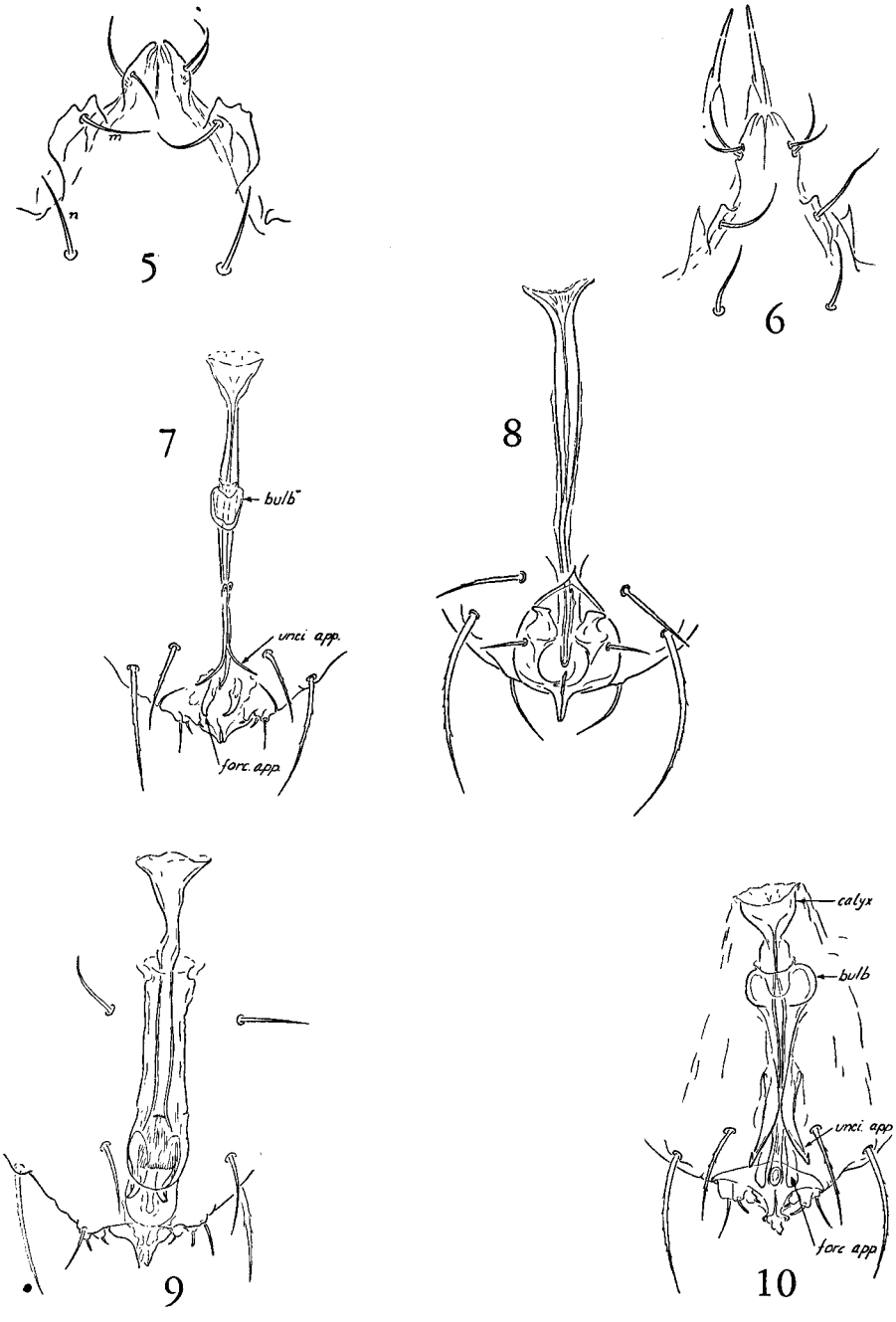


FIG. 5-10. — 5, Rostrum of *C. torulus*, male, ventral aspect ; 6, Rostrum of *C. californicus*, male, ventral aspect. Male genitalia : 7, *C. californicus*, from above ; 8, *C. multidentatus*, from above ; 9, *C. torulus*, from below ; 10, *C. pannonicus*, from above.

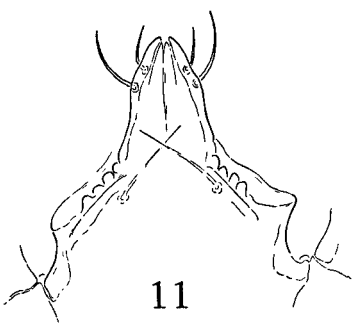
Calyx of aedeagus conical, shaft sinuate, considerably thickened in proximal half then narrows to a slender sclerite of uniform caliber (fig. 8), sharply upcurved near tip ; accessory parts confined to hindermost part of opisthosoma ; upturned section of shaft appears to be ensheathed but no bulbar distension is identifiable ; unciform appendages not recognizable as such ; forcipiform appendages scarcely more than a pair of stubby, anteriorly directed talonlike sclerites having blunt, outwardly projecting hooks (when retracted). Solenidion *w*♂ well developed on all tarsi ; *w*♂ surpasses base of *w* on tarsus I.

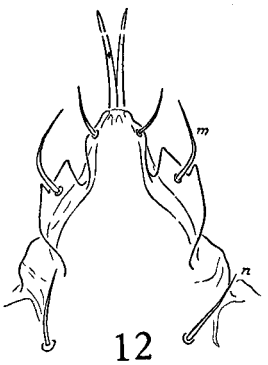
Types. Holotype ♂, allotype ♀ and 1♂, 4♀ paratypes, Jardin Botanico National, Vina del Mar, CHILE, May 16, 1961 ; 1♂, 2♀ paratypes, Quebrada Lo Rojas, La Cruz, Valparaiso, CHILE, April 21, 1961, L. M. SMITH from soil near spring. Holotype and 1♀ paratype deposited in U.S. National Museum, others filed in stigmaeid collection, University of California, Davis.

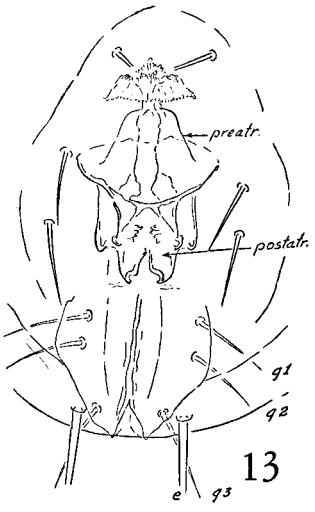
Among four species, females of only *C. multidentatus* have overlong sheaths on the dorsal idiosomal setae and often one sheathed seta on the palpfemur. The males are easily recognized by the long, sinuate aedeagus which has no accessory sclerites covering its anterior and middle sections. The toothed ridges on the rostrum are troublesome to find on partly rotated specimens.

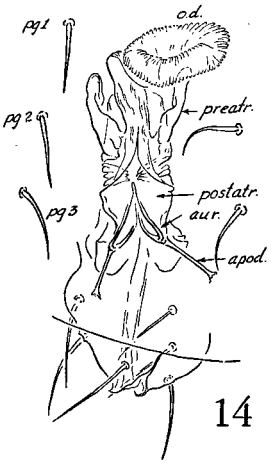
Cheylostigmaeus californicus n. sp.

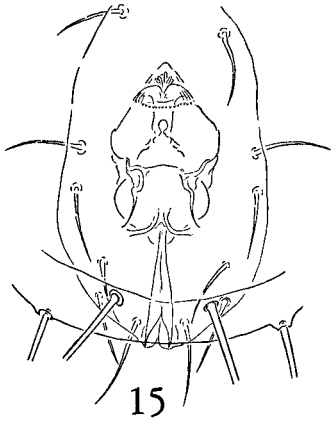
Female. — Relatively small species having variably ornamented dorsal plating — micropunctations and shallow, ovoid dimples uniformly distributed on both large plates (fig. 4) or dimpled only on front part of propodosomal plate. Dorsal setae moderately long in relation to body dimensions ; shafts slightly curved, sparsely barbed, sheathed only to tips (fig. 18) ; sheaths noticeably dilated near rounded ends. Comparative lengths of setae as follows : $be=li>de=he=b = c>ae=ce=a$. Ratio lengths $be/ae=1.5$. Length a = distance a-b ; b = b-c ; spacings : c-c = b-$b>a$-a. Genital chamber with preatrium very weakly sclerotized, outline ill-defined, not describable except for winglike folds projecting forward from waist (fig. 16) ; intima in lower end of oviduct appears as a longitudinally pleated tube confluent with preatrium ; postatrium supported by a pair of hooked sclerites which form two auriculae behind ; hindermost flexion of each auricula bears a short, brushy apodeme. Spine *k*1 as long as sheathed seta immediately behind. Numbers of sheathed setae on femora and genua of legs I-IV as in *C. pannonicus* ; one sheathed seta (macroseta) on tibia III, two on tibia IV (macroseta and dorsolateral seta). Dorsal setae on palpfemur without sheaths. Average measurements in microns (n = 5) : length idiosoma 322±54, cheliceral stylet 69±2 ; setae : *ae* 49±2 ; *be* 75±4 ; *ce* 48±4 ; *de* 63±4 ; *he* 63±4, *a* 56±4, *b* 62±4, *c* 66±4, *li* 74±3 ; distances : *ae-be* 46±2 ; *a-a* 78±5, *b-b* 98±5, *c-c* 95±5, *li-li* 71±3, *a-b* 56±3, *b-c* 63±2, *c-li* 49±2.











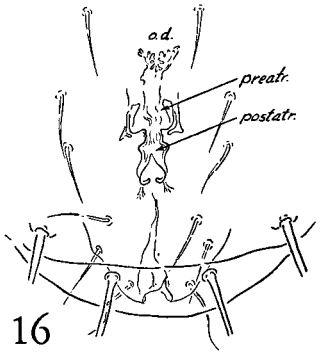


FIG. 11-16. — 11, Rostrum of *C. multidentatus*, male, viewed dorsally ; 12, Rostrum of *C. pannonicus*, male, from below. Female genitalia : 13, *C. torulus*, dorsal view ; 14, *C. pannonicus*, dorsal view ; 15, *C. multidentatus*, dorsal view. 16, *C. californicus*, dorsal view.

Male. — Gnathosomal cuticula well tanned, micropunctate, with generally prominent foveae (roughened or cancellous areas of muscle fiber attachment) etched on palpfemur and basis capituli ; idiosomal plating thin, without noteworthy ornamentation. Palpfemur grooved on median face, producing a rounded boss on its ventromedian aspect. Rostrum bears a pair of thickened, sclerotic ridges (fig. 6) ; anterior angle of each ridge produced into one small, rounded cusp ; anterior subcapitular seta *m* inserted on rostrum near baseline of ridge. Three pairs of paragenital setae. Aedaeagus long, thickened in midregion, very attenuate and upcurved posteriorly (fig. 7) ; calyx campanulate. Bulb small, compact, enwraps thickened midsection of aedeagus. Two pairs of accessory copulatory appendages ; unciform appendages long, very slender, basal pieces tightly appressed to basal third of aedeagus, hooked ends widely divergent, barely upturned at tips ; forcipiform appendages end in slightly curved sclerotized blades having mesially directed, pointed ends. Male solenidion *w*♂ on tarsus I surpasses base of *w*.

Types. — Holotype ♂, allotype ♀ and 2♂, 3♀ paratypes, Post Pile Camp, Tehama County, California, June 30, 1960, R. O. SCHUSTER and A. A. GRIGARICK, from rotting logs. Paratype examples sent to U. S. National Museum ; others retained.

Females of *C. californicus* are most nearly like small replicas of *C. pannonicus*, and measurement data are required to separate them. The presence of a small bulb on the midsection of the aedeagus and needle-like unciform accessory appendages serve to distinguish the males.

Cheylostigmaeus torulus Summers.

Cheylostigmaeus torulus SUMMERS, 1957, *Pan-Pacific Entomologist*, 166-9.

Female. — Body and appendicular skeleton plain, in most specimens without noteworthy ornamentation (fig. 1), tanned and micropunctate in a few individuals. Dorsal setae comparatively short, straight, rigid, tapered only near ends, sharply pointed ; very sparsely barbed, sheathed near tips ; sheath on each seta incipient (fig. 20), its diameter not greater than diameter of shaft, end pointed, coextensive with tip of shaft. Verticals *ae* considerably shorter than distance to *be* ; length ratio *be*/*ae* = 1.5. Relative lengths : *be* = *li*>*de* = *he* = *b* = *c*>*ae* = *ce* = *a*. Dorso medians *a* and *b* much shorter than intervals to setae next behind ; spacing of pairs : *b*-*b*>*c*-*c*>aa. Slender apodemes protrude from mesal apices of coxae III and IV, beneath intercoxal plate, to form a crescentic bridge between coxae of same side (fig. 22), bridge usually perfect or complete in both sexes, occasionally two arched elements incompletely joined in middle. Genital chamber with waist cylindrical, preatrium comprises a tapered dome resting upon a broad concave base (fig. 13) : postatrium not wider than waist, bilobed ; auricles incipient, with short, ill-defined apodemes projecting outward in transverse plane. Spine *k* on genu I as long or slightly longer than lateral seta behind. Sheaths on leg setae somewhat

difficult to discern, only one such seta generally apparent on dorsum of femora I, II, genua I, II, III, tibia IV (macroseta). No sheathed setae on palpfemur. Average measurements in microns (n = 7) : length idiosoma 437±28, chelicera stylet 74±2 ; setae : *ae* 58±3, *be* 89±7, *ce* 57±4, *de* 73±4, *he* 75±3, *a* 61±2, *b* 68±4, c 70±4, *li* 86±3 ; distances : *ae-be* 75±2, *a-a* 114±7, *b-b* 144±4, *c-c* 126±7, *li-li* 92±4, *a-b* 92±4, *b-c* 97±6, *c-li* 58±2.

Male. — Cuticula on gnathosoma thick, tanned, micropunctate, with foveae clearly outlined on palpfemora and basis capituli. Median surface of femur deeply notched at anterior third ; a bluntly pointed, conical apophysis projects upward from dorsomedian surface of femur immediately behind posterior lip of furrow ; femur also excavate basally to accommodate rear expansion of rostrum, anterior rim of this excavation forms a pronounced median apophysis on basal third of segment. Peg sensilla on dorsolateral aspects of maxillicoxa inserted on a strongly elevated tubercles, such that these sensilla appear to be an additional pair of spines on gnathosoma. Rostrum bears two pairs of lateral processes : a pair of winglike lamellae (fig. 5) and a pair of heavily sclerotized, knobby cornicles overlying baseline of lamellae ; outer margin of lamellae serrate, with two major and, in some specimens, several minor cusps ; anterior subcapitular seta *m* inserted on lamella. Basis capituli has a pair of inconspicuous, rounded tubercles on ventral surface, one on each side near posterolateral margin. Chelicerae bear a pair of minute, rounded tuberosities on dorsal midsection, one on each chelicera. Dorsal body plating weakly sclerotized, plain. Paragenital setae : two pairs only. Aedeagus straight, a thin walled trough or tube, uniform in caliber for most of length (fig. 9) ; calyx delicate, funnel-shaped ; distal end of aedeagus appears to terminate in a longitudinally striated, eversible sac ; distal two-thirds of aedeagus enclosed within a loosely fitting, cylindrical investment having no bulb in front ; unciform appendages not identifiable ; forcipiform appendages comprise two broad, S-shaped sclerites reposing in dorsal wall of phallocrypt, their bluntly pointed ends projecting outward when intromittent organs retracted. Male solenidion *w*♂ on tarsus I reaches only to bases of proximal eupathids, approximately one-half distance to *w*.

Possibly the very inconspicuous skeletal processes springing from the mesal rims of coxae III and IV each side (intercoxal bridge) may be unique. The male genitalia least resemble the genital parts of other species known to the writers. The occurrence of only two pairs of paragenital setae in males only is a convenient spot character ; three pairs in both sexes is usual.

Discussion.

The results of this study show that females of the four *Cheylostigmaeus* species considered tend to adhere closely to a common pattern of structural organization ; their differences are trivial and their similarities preponderant. A few odd-lot

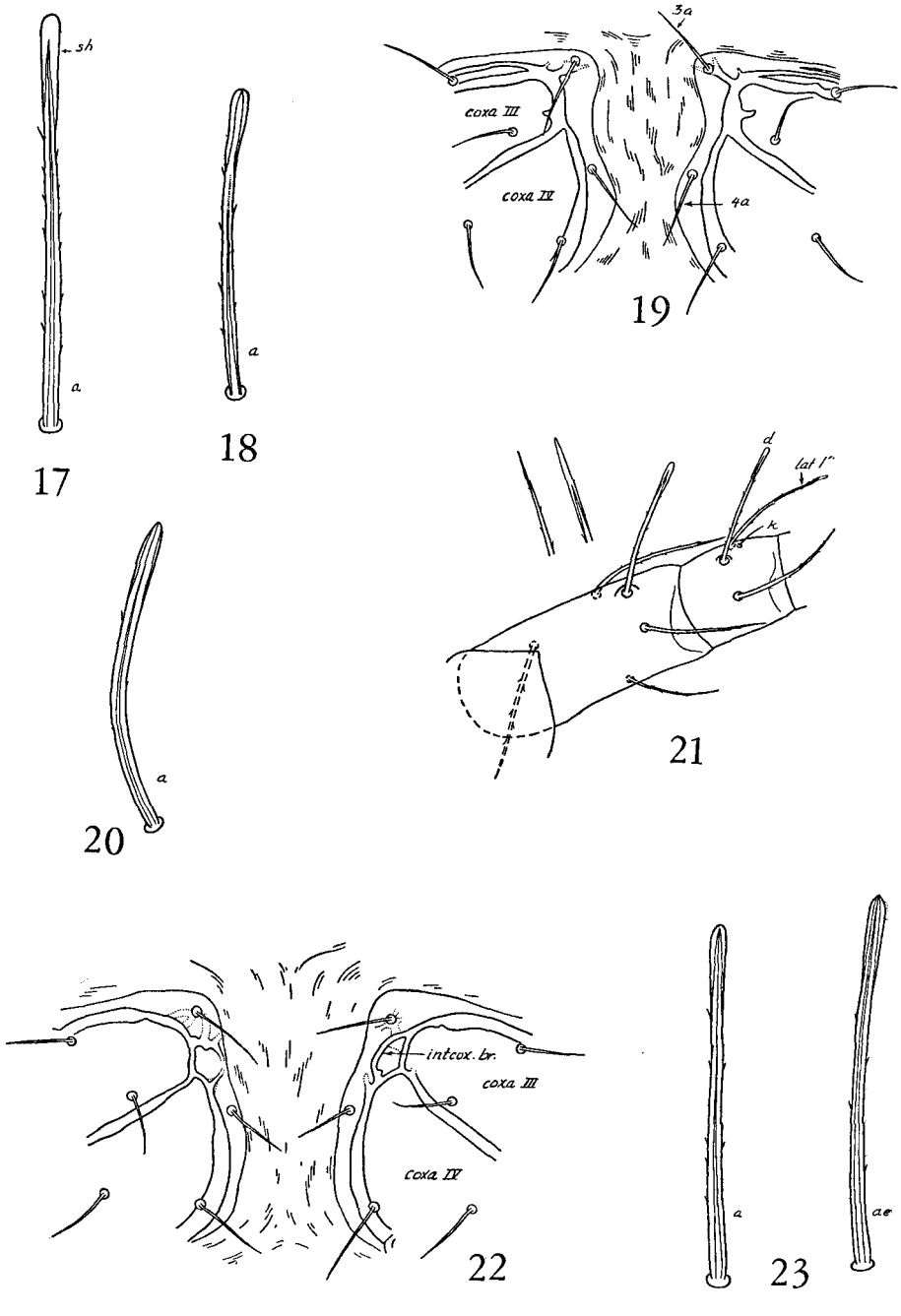


FIG. 17-23. — Miscellaneous detail : 17, seta *a*, *C. multidentatus*. 18, seta *a* *C. californicus*. 19, metasternal area of *C. pannonicus* — no intercoxal bridge. 20, seta *a*, *C, torulus*. 21, mesal aspect of left femur and genu, leg II, *C. pannonicus*, to locate sheathed setae — tip of lateral seta (l) on genu II shown with and without sheath in different specimens. 22, metasternal area of *C. torulus*, with intercoxal bridge (intercox. br.) on each side. 23, seta *a* (left) and seta *ae* (right) of *C. pannonicus*.

specimens indicate that unique or bizarre species do occur in the genus. But the forms dealt with in this study are so alike that it is difficult to discern any phyletic perspective. For these species, and undoubtedly for others among the species described from Europe, the discriminative characters tend to be essentially quantitative in nature rather than meristic or discrete. A critically limiting factor in obtaining adequate measurement data is short series or samples of small size because, as it now appears, mites of this genus tend to be sparsely distributed in nature.

Numerous measurements of lengths and spacings of dorsal setae are incorporated in the descriptions. Not all are needed or useful for separating the four species. For example, *C. pannonicus* and *C. multidentatus* differ very significantly in perhaps not more than three measurements. On the other hand nearly every measurement given for *C. californicus*, except length of idiosoma, is peculiar for this one of the four species. Those data singled out for spot or key characters are believed to be those easiest to obtain and which are the most divergent ($P = <0.01$). Standard deviations, calculated as for small samples, are included to emphasize variations within samples. Significant differences between means, taken two at a time, were determined by *t*-tests (SIMPSON and ROE, 1939).

No particular feature of the internal folds of the genital chamber of females can be featured as a recognitional character because this entire structure is too frequently broken or mashed. Nevertheless, for favorably oriented specimens, the form of the genital chamber is useful to confirm diagnoses. The internal genitalia of males are rather better in this respect since the hard parts are more compact and rigid ; but, even so, not all male specimens are serviceable.

It is the writers' belief that *Cheylostigmaeus* is destined to become one of the important genera in the family Stigmaeidae. The evaluation and usefulness of its taxonomy is apt to require close attention to minute morphological detail and establishment of good confidence limits for measurement data.

REFERENCES

EVANS (G. Owen), 1954. — Some new and rare species of acarina. *Proc. Zool. Soc. London* 123 : 793-811.

HALBERT (J. N.), 1920. — The acarina of the seashore. *Proc. Roy. Irish Acad.*, Sec. B, 35 : 106-152.

SIMPSON (G. G.) and (A.) ROE, 1939. — Quantitative Zoology (First Ed.) McGraw-Hill Book Co., N. Y.

SUMMERS (F. M.), 1957. — Two mites of the genus *Cheylostigmaeus*, including a new species from Point Barrow, Alaska. *Pan-Pacific Entomologist* 33 : 163-169.

WILLMANN (C.), 1951 *a*. — Die hochalpine Milbenfauna der mittleren Hohen Tauern, insbesondere der Grossglocknev-Gebietes (Acari). *Bonner Zool. Beitr. Mus. Alexander Koenig* 2 : 141-176.

WILLMANN (C.), 1951 *b*. — Untersuchungen über die terrestrische Milbenfauna im pannonischen Klimagebiet Österreichs. *Sitzungsber, d. Österr. Akad. Wissensch., Mathem.-naturw. Kl.*, Abt. I, 160 : 91-176.

WILLMANN (C.), 1952. — Die Milbenfauna der Nordseeinsel Wangerooge. *Verofftl. Inst. Meeresforsch. Bremerhaven* 1 : 139-186.

WILLMANN (C.), 1953. — Neue Milben aus den östlichen Alpen. *Sitzungsber. d. Österr. Akad. Wissensch., Mathem.-naturw. Kl.*, Abt. I, 162 : 449-519.

WILLMANN (C.), 1957. — Revision einiger Milbengattungen und-arten von der Küsten Nord-und Ostsee. *Abh. naturw. Ver. Bremen* 35 : 162-188.