

THE GENUS *KLINCKOWSTROEMIA* TRÄGÅRDH AND DESCRIPTIONS  
OF NINE NEW SPECIES (ACARINA : TRIGYNASPIDA :  
*KLINCKOWSTROEMIIDAE*)<sup>1</sup>

BY Rose Marie T. ROSARIO<sup>2</sup> and Preston E. HUNTER<sup>3</sup>

GENUS  
REVISED  
NEW TAXA  
ASSOCIATION  
WITH  
PASSALIDAE  
COSTA RICA  
GUATEMALA  
MEXICO

RÉVISION  
DU GENRE  
ASSOCIATION  
AUX  
PASSALIDAE  
COSTA RICA  
GUATÉMALA  
MEXIQUE

ABSTRACT : The genus *Klinckowstroemia* Trägårdh and its five known species are rediagnosed. Nine new species are described and illustrated. The new species are : *Klinckowstroemia starri*, *K. reyesi*, *K. candidoi*, *K. victoriae*, *K. simplisetosa*, *K. schusteri*, *K. multisetillosa*, *K. scotti* and *K. atramaculata*. A key to the species is included.

RÉSUMÉ : Cette étude propose une description modifiée du genre *Klinckowstroemia* Trägårdh et de ses cinq espèces précédemment identifiées. Neuf nouvelles espèces y sont également décrites et illustrées. Ce sont : *Klinckowstroemia starri*, *K. reyesi*, *K. candidoi*, *K. victoriae*, *K. simplisetosa*, *K. schusteri*, *K. multisetillosa*, *K. scotti* et *K. atramaculata*. Une clé taxonomique permettant d'identifier les espèces est proposée.

#### INTRODUCTION

This is a second of three papers resulting from an extensive review of the mite family Klinckowstroemiidae Trägårdh. General morphology, family diagnosis, and a review of the genus *Klinckowstroemiella* Turk are given in the first paper (ROSARIO and HUNTER, 1987). This paper considers the

genus *Klinckowstroemia* Trägårdh which contains the largest number of species in the family. Five species were previously known and nine new species are described here. *Klinckowstroemia* species are associated with at least 14 genera of passalid beetles from Surinam, Mexico, Costa Rica and Guatemala. The remaining genus, *Antennurella* Berlese, and a new genus will be considered in a third paper.

1. Part of dissertation submitted by the senior author in partial fulfillment of the Ph.D. degree, University of Georgia, Athens, USA.  
2. Postdoctoral fellow, Department of Entomology, University of Georgia, Athens, Georgia 30602, USA.  
3. Professor, Department of Entomology, University of Georgia, Athens, Georgia 30602, USA.

Genus *Klinckowstroemia* Trägårdh, 1937

*Klinckowstroemia* TRÄGÅRDH, 1937 : 6 ; TRÄGÅRDH, 1938 : 133 ; BAKER and WHARTON, 1952 : 135 ; CAMIN and GORIROSSI, 1955 : 51 ; KETHLEY, 1977 : 137.

DIAGNOSIS OF ADULTS. Anal shield separated from ventral shield. Metapodal, peritremal and exopodal shields fused, separated from ventral shield by metapodal suture. Hyaline hood forming crescent above gnathosoma that may extend posteriorly along lateral margin of dorsal shield, but not surrounding idiosoma ; only seta *a1* present on anterior dorsal portion of hood (Fig. 1B), or more than 3 pairs of *a* setae present (Figs. 7B, 8B). Dorsal shield with an even margin, without visible constrictions ; posterior portion of dorsal shield without ridges. On leg femora II-IV, seta *av2* arises from tip of protuberance (Fig. 1D). Anteroanal setae longer than other setae on anal shield. Female latigynial shields triangular with pointed, blunt or sinuous medial margins ; sternogynial and mesogynial shields without setae. Sternoventral suture present in males.

TYPE-SPECIES : *Klinckowstroemia trägårdhi* Baker and Wharton, 1952 (by subsequent designation).

In the following descriptions, all measurements are given in microns ( $\mu\text{m}$ ). The terminology for leg setae follows that of EVANS (1963). Designation for holotype and paratype depositions of species as follows : NMNH — The Smithsonian Institution, National Museum of Natural History, Washington, D.C. 20250 ; UGA — Department of Entomology, University of Georgia, Athens, Georgia 30602 ; FMNH — Field Museum of Natural History, Chicago, Illinois 60605 ; AL — The Acarology Laboratory, Ohio State University, 484 W. 12th Avenue, Columbus, Ohio 43210 ; UNAM — Universidad Nacional Autonoma de Mexico, Mexico 20, D.F., Mexico ; MNHN — Museum National d'Histoire Naturelle, Laboratoire de Zoologie (Arthropodes), 61, rue de Buffon. 75231 Paris Cedex 05, France.

*Klinckowstroemia trägårdhi* Baker and Wharton

*Klinckowstroemia trägårdhi* BAKER and WHARTON, 1952 : 135 ; KETHLEY, 1977 : 137.

The following diagnosis is based on TRÄGÅRDH's (1937) original illustration : tetartosternum slightly notched on anterior margin ; lyriform sternal pore 1 near posterior margin of shield and posterior to sternal seta 1 ; sternal seta 1 simple, on midline of tetartosternum. Sternal setae 2-4 simple ; setae 2 shortest, arising anterior to pores 2 [?] ; setae 3 and 4 subequal. Latigynials blunt medially ; with 2 pairs of simple setae. Mesogynial shield pointed anteriorly.

TYPE LOCALITY. Surinam ; female, taken from an unidentified passalid beetle.

LOCATION OF TYPE. Unknown.

*Klinckowstroemia concava* Hunter and Butler

*Klinckowstroemia concava* HUNTER and BUTLER, 1966 : 25 ; CHERNOFF and POPE, 1970 : 152 ; KETHLEY, 1977 : 137.

DIAGNOSIS OF ADULTS. Hyaline hood extending posteriorly to level of coxa I ; seta *a1* simple, subequal to setae *a2-a4*. Anal shield separated from ventral shield, anterior margin convex. Seta *av2* on leg femora II-IV slightly barbed. Female sternal setae 2-4 simple, subequal. Median margin of female latigynial shield pointed, median posterior edge slightly convex ; mesogynial shield with anterior point rounded.

TYPE LOCALITY. San Vito, Costa Rica ; 1 female from *Passalus* sp.

MATERIAL FROM OTHER LOCALITIES. Six females and 6 males, Arroyo Claro, Catemaco Municipio, Veracruz, Mexico, February 21, 1985, from *Verres* sp. inside *Liquidambar* (?) stem, montane mesophytic forest, alt. 890 m, M. L. CASTILLO ; 4 females, 6 males, Bastonal, Catemaco Municipio, Veracruz, Mexico, July 30, 1985, from *Veturius*, sp., inside evergreen oak, montane rain forest, alt. 960 m, M. L. CASTILLO.

LOCATION OF TYPE. NMNH.

*Klinckowstroemia grabowskii* Chernoff and Pope

*Klinckowstroemia grabowskii* CHERNOFF and POPE, 1970 : 145 ; KETHLEY, 1977 : 137.

The following diagnosis of adults is based on CHERNOFF and POPE's (1970) original illustrations and description : hyaline hood crescent-like ; seta *a1* simple. Anal shield separated from ventral shield, anterior margin of anal shield truncate. Female sternal setae simple : setae 1 and 3 longer than setae 2 and 4. Median margin of female latigynial shield truncate.

TYPE LOCALITY. 14.5 mi. northeast of Oaxaca, Cerro San Felipe, 9000', Oaxaca, Mexico ; 24 females and 16 males on *Undilifer incisus* Truqui. Additional specimens were collected from Gueverro, Mexico, on *Oileus rimator* Truqui.

LOCATION OF TYPES. The types are not at the NMNH as stated in the original publication.

*Klinckowstroemia tapachulensis* Chernoff and Pope

*Klinckowstroemia tapachulensis* CHERNOFF and POPE, 1970 : 148 ; KETHLEY, 1977 : 137.

The following diagnosis of adults is based on CHERNOFF and POPE's (1970) original illustrations and description : hyaline hood crescent-like, extending posteriorly to level of coxa II ; seta *a1* long, barbed. Anal shield separated from ventral shield, anterior margin of anal shield truncate. Female sternal setae 1 long, barbed ; setae 2-4 simple, seta 3 longest. Median margin of latigynial shield pointed.

TYPE LOCALITY. 1750', Chiapas, Mexico ; 1 female and 1 male from *Passalus interruptus* Linn. and *Popilius eclipticus* Truqui.

LOCATION OF TYPES. The types are not at the NMNH as stated in the original publication.

*Klinckowstroemia truncata* Hunter and Butler

*Klinckowstroemia truncata* HUNTER and BUTLER, 1966 : 24 ; KETHLEY, 1977 : 137.

DIAGNOSIS OF ADULTS. Hyaline hood crescent-like, extending posteriorly to level of coxa I ; seta

*a1* simple, shorter than setae on sternal shield. Anal shield separated from ventral shield, anterior margin of anal shield truncate. Seta *av2* on femora II-IV sparsely barbed. Female sternal setae simple, seta 2 longest. Median margin of latigynial shield truncate.

TYPE LOCALITY. La Selva, Costa Rica ; 1 female and 1 male, from *Passalus* sp. or *Pseudacanthus* sp.

LOCATION OF TYPES. NMNH.

*Klinckowstroemia starri* sp. nov.

FEMALE. Body oval (Fig. 1A) ; idiosoma length  $738 \pm 49$ , width  $541 \pm 39$  ( $N = 20$ ).

Reticulations over entire dorsal shield. Hyaline hood extending posteriorly to level of coxa I ; seta *a1* long, simple (Fig. 1B).

Tritosternal base wider than long. Tetartosternum (Tst, Fig. 1G) 36 long, 96 wide, notched on anterior margin ; lyriform sternal pore 1 posterior to sternal seta 1, pore near posterior shield margin ; sternal setae 1 simple, near anterior margin of shield. Sternal shield (StS, Figs. 1F) 68 long, 216 wide ; all sternal setae simple ; seta 2 arise posterior to pore 2, setae 3 and 4 arising near posterior margin of shield ; base of 3 slightly anterior to level of 4 ; seta 3 longer than 2 and 4 which are subequal in length ; reticulations as illustrated (Fig. 1G). Sternogynial shield (SgS, Fig. 1E) triangular, reticulations as illustrated (Fig. 1G) ; sternogynial apodeme (SgA, Fig. 1E) with posterior arms extending posteriorly to level of latigynial and mesogynial condyles (LgC and MgC). Latigynial shields (LgS, Fig. 1G) each with an oval pore, 3 or 4 setae, shields pointed medially ; shape of latigynial apodeme (LgA) as illustrated (Fig. 1E) ; lightly punctate. Mesogynial shield (MgS, Fig. 1E) triangular, pointed anteriorly, surface lightly punctate, mesogynial condyles (MgC, Fig. 1E) arising at mid-length on lateral margins of shield. Ventral shield 182 long, posterior margin 432 wide, shield broadly triangular (Fig. 1A), truncate posteriorly, lightly reticulate, with 10 to 13 pairs of small simple setae ; 1 pore at level of posterior margin of coxa IV, second pore at posterolateral corner of shield. Anal shield 104 long, anterior margin 359 wide, separat-

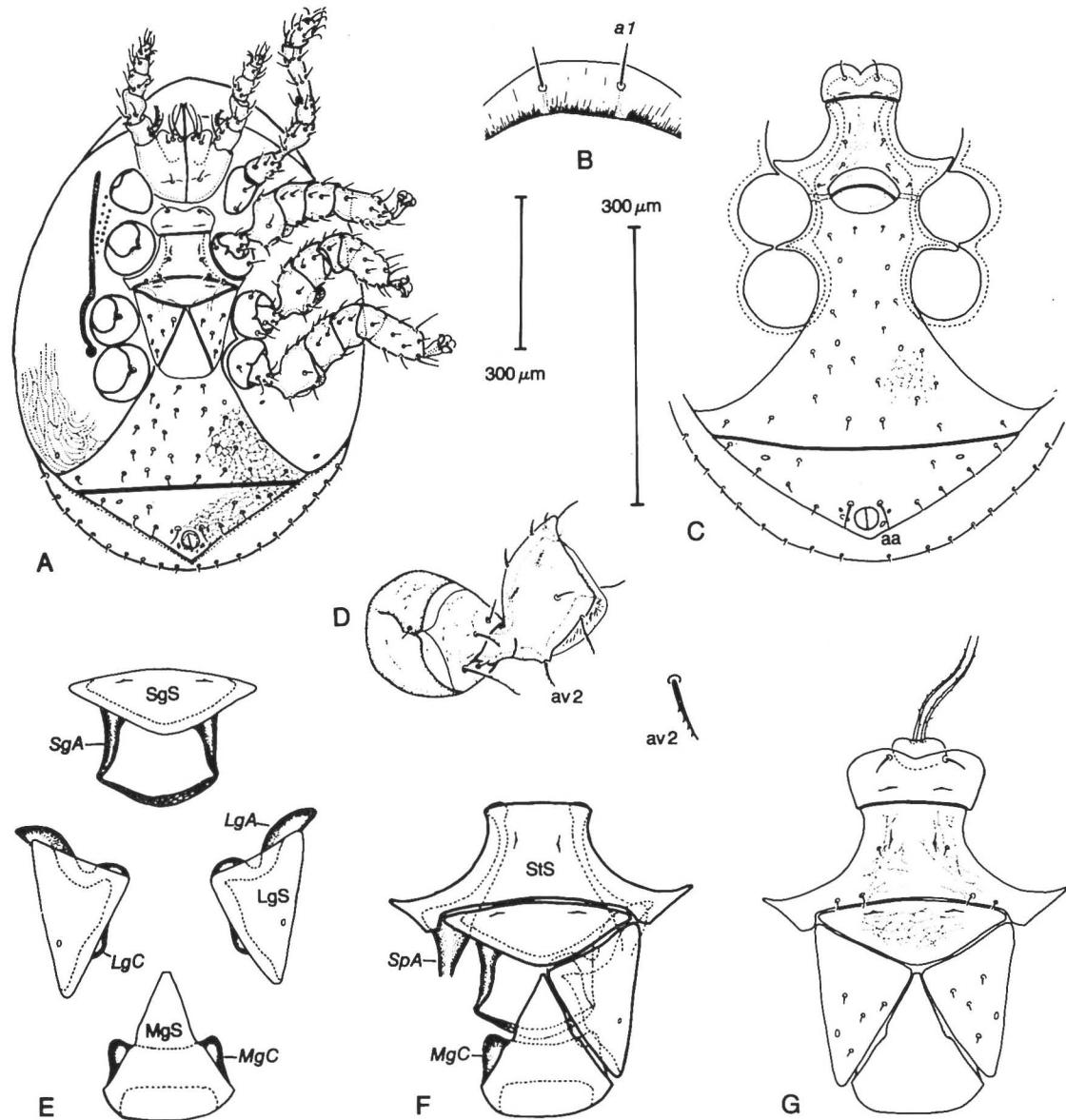


FIG. 1 : *Klinckowstroemia starri* sp. nov. A) ventral view of female ; B) anterodorsal view of hyaline hood ; C) male ventral shields ; D) coxa, trochanter and femur IV ; E) exploded view of female genital shields ; F) female sternal and genital shields ; G) female tritosternum, tetartosternum, sternal and genital shields (see text for character abbreviations).

ed from ventral shield, lightly reticulate, anterior margin truncate, 4 pairs of simple setae plus longer anteroanal seta (aa, Fig. 1C). Metapodal-peritremal-exopodal shield with striations beginning at metapodal line and extending anteriorly to coxa I, two rows of porelike structures medial of peritreme between coxae I and II (Fig. 1A).

All gnathosomal setae simple ; capitular setae

shortest, hypostomal setae 3 shorter than hypostomal setae 1 and 2. Palps with barbed setae on trochanters, femora and genua ; simple setae on tibiae and tarsi.

Most setae on leg I weakly barbed. Legs II-IV with short, simple setae except for some weakly barbed setae on tarsi II-IV ; setae av2 on femora II-IV weakly barbed (Fig. 1D).

MALE. Idiosoma length  $655 \pm 47$  ; width  $468 \pm 38$

(N = 15). Dorsal and leg characters similar to female. Tetartosternum more deeply notched (Fig. 1C). Sternal shield with 3 pairs of small simple setae, 2 pairs of pores; reticulations as illustrated. Genital opening oval, 47 long, 77 wide. Ventral shield with 11-15 pairs of small, simple setae; 2 pairs of oval pores. Anal shield bearing 5 pairs of simple setae plus longer anteroanal setae. Hypostomal seta 2 shorter than hypostomal setae 1 and 3.

**TYPE DATA.** Described from 56 females and 49 males, all from Costa Rican passalid beetles. Holotype female, 2 female, 4 male paratypes, Cerro de la Muerte, 25 August 1970, unidentified passalid, MIKE MAY. Data for other paratypes, same as holotype except as follows: 12 female, 6 male paratypes, D. JEFFREY; 2 male paratypes, J. JACKSON; 6 female, 5 male paratypes, L. K. JOHNSON; 1 male paratype, B. WEBER; 3 female, 2 male paratypes, P. RICH; 24 female, 13 male paratypes, 18 February 1975, *Passalus (Pertinax)* n. sp., C. K. STARR; 4 female, 6 male paratypes, Amubri, Prov. Limon, 23 January 1979, from *P. jansoni*, inside log, edge of cacao plantation, C. K. STARR; 2 female, 1 male paratypes, Sirena, Prov. Puntarenas, 11 February 1979, from *Verres hageni* and *Veturius cirratus*, C. K. STARR; 2 female, 7 male paratypes, Monte Verde, Prov. Guanacaste, 29 January 1975, *Veturius tuberculifrons* Kaup, C. K. STARR; 1 female paratype, Rincon, Osa Peninsula, 20 June 1970, unidentified passalid, M. S. BLUM.

Holotype, 5 female and 5 male paratypes deposited in the NMNH; 2 female and 2 male paratypes each deposited in FMNH, AL, NMHN and UNAM; all other paratypes deposited at UGA.

**ETYMOLOGY.** This species is named after Christopher K. STARR formerly of the Department of Entomology, UGA, Athens, Georgia, who collected most of the passalid beetles from Costa Rica.

**REMARKS.** *Klinckowstroemia starri* was the most common species encountered in the material studied. In the related *K. concava* and *K. tapachulensis*, the female latigynial shields are also pointed medially. However, in *K. starri* females the latigynial shield margin adjoining the mesogynial shield is straight, and the posterior margin of the ventral shield is truncate. In *K. concava* the latigynial shield margin adjoining the mesogynial shield is convex, and the

posterior margin of the ventral shield is concave. Female sternal setae 2-4 are short in *K. starri* while the same setae are relatively long in both *K. concava* and *K. tapachulensis*.

Important diagnostic characters of those characters which vary from the description of *K. starri* will be described for the subsequent species. Letter abbreviations for all specific structures as in *K. starri*.

#### ***Klinckowstroemia reyesi* sp. nov.**

**FEMALE.** Body oval (Fig. 2A); idiosoma length  $1009 \pm 36$ ; width  $738 \pm 11$  (N = 10).

Hyaline hood (HH, Fig. 2A) extending posteriorly to level of coxa I; seta *a1* long, simple (Fig. 2B).

Tritosternal base oval, widest at middle. Tetartosternum (Fig. 2F) 42 long, 127 wide, with wide tetartosternal notch; sternal seta 1 simple, arising at level of middle of shield. Sternal shield (Fig. 2F) 86 long, 273 wide; setae 2 arise posterolateral to pore 2; setae 2 shortest; reticulations as illustrated (Fig. 2F). Genital shields as illustrated (Fig. 2E). Posterior arms of sternogynial apodeme reaching level of mesogynial condyles. Latigynial shield margins truncate medially, with 2-4 simple setae. Mesogynial shield triangular, pointed at apex, convex at base, posterolateral corners bending slightly anteriorly; mesogynial condyles extend almost to level of shield apex. Shape of vaginal apodemes as illustrated (Fig. 2E). Ventral shield 265 long, posterior margin 598 wide, shield truncate posteriorly, 11-13 pairs of short simple setae. Anal shield 192 long, anterior margin 551 wide, 6-7 pairs of simple setae. The metapodal-peritremal-exopodal shield with a pair of pores and 1 pair of short simple setae near metapodal suture.

Seta *av2* on femora II-IV weakly barbed (Fig. 2D).

**MALE.** Idiosoma length  $988 \pm 55$ ; width  $718 \pm 34$  (N = 8). Dorsal and leg characters as in female. Tetartosternal notch more deeply incised (Fig. 2C). Sternal shield with 3 pairs of short simple setae, 2 pairs of pores; reticulations as illustrated. Genital opening oval; 62 long, 88 wide. Ventral shield with

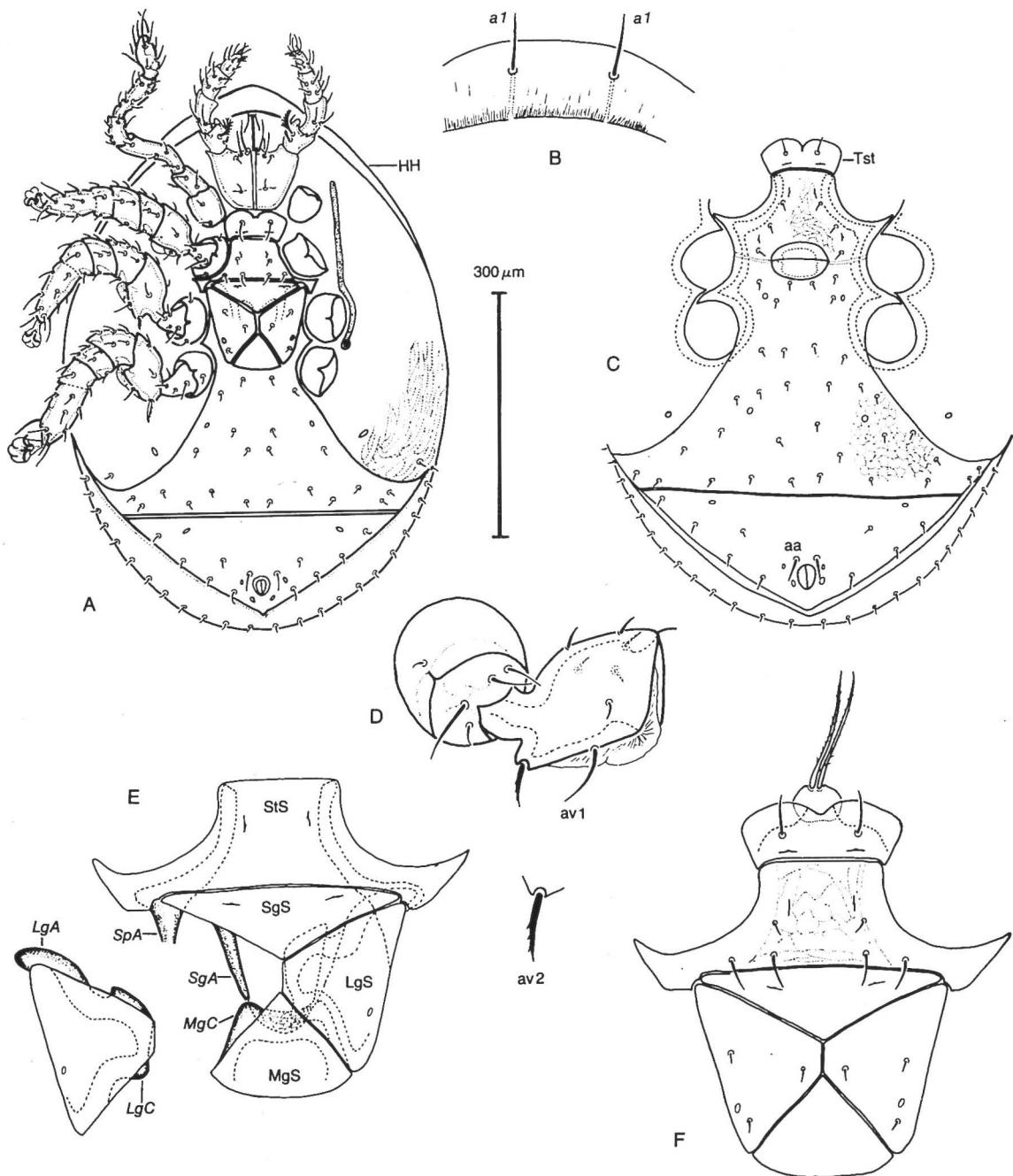


FIG. 2 : *Klinckowstroemia reyesi* sp. nov. A) ventral view of female ; B) anterodorsal view of hyaline hood ; C) male ventral shields ; D) coxa, trochanter and femur IV ; E) female sternal and genital shields ; F) female tritosternum, tetartosternum, sternal and genital shields (see text for character abbreviations).

12-16 pairs of short simple setae, 2 pairs of oval pores. Anal shield with 5-7 simple setae on each side of shield.

TYPES. Described from 12 females and 8 males all

from Mexican passalid beetles. Holotype female and paratype data : altitude 2400 m, Bosque nebuloso, Huautla de Jimenez, Oaxaca, 9 November 1968, from *Petrejoides* sp., Pedro REYES-CASTILLO.

Holotype, 1 female and 2 male paratypes deposited in the NMNH; 1 female and 1 male each deposited in FMNH, AL, MNHN and UNAM; all other paratypes deposited in UGA.

**ETYMOLOGY.** This species is named in honor of Pedro REYES-CASTILLO of the Instituto de Ecología, Mexico, D.F., Mexico who kindly identified most of the passalid beetles.

**REMARKS.** The latigynial shields in *Klinckowstroemia reyesi*, *K. truncata* and *K. grabowskii* are

similar in shape. However, sternal setae 2-4 in *K. truncata* are subequal in length, sternal setae 1 and 3 are long in *K. grabowskii* while sternal setae 2 in *K. reyesi* are shorter than setae 3 and 4.

***Klinckowstroemia candidoi* sp. nov.**

**FEMALE.** Body oval (Fig. 3A); idiosoma length  $1290 \pm 20$ ; width  $1019 \pm 13$  ( $N = 4$ ).

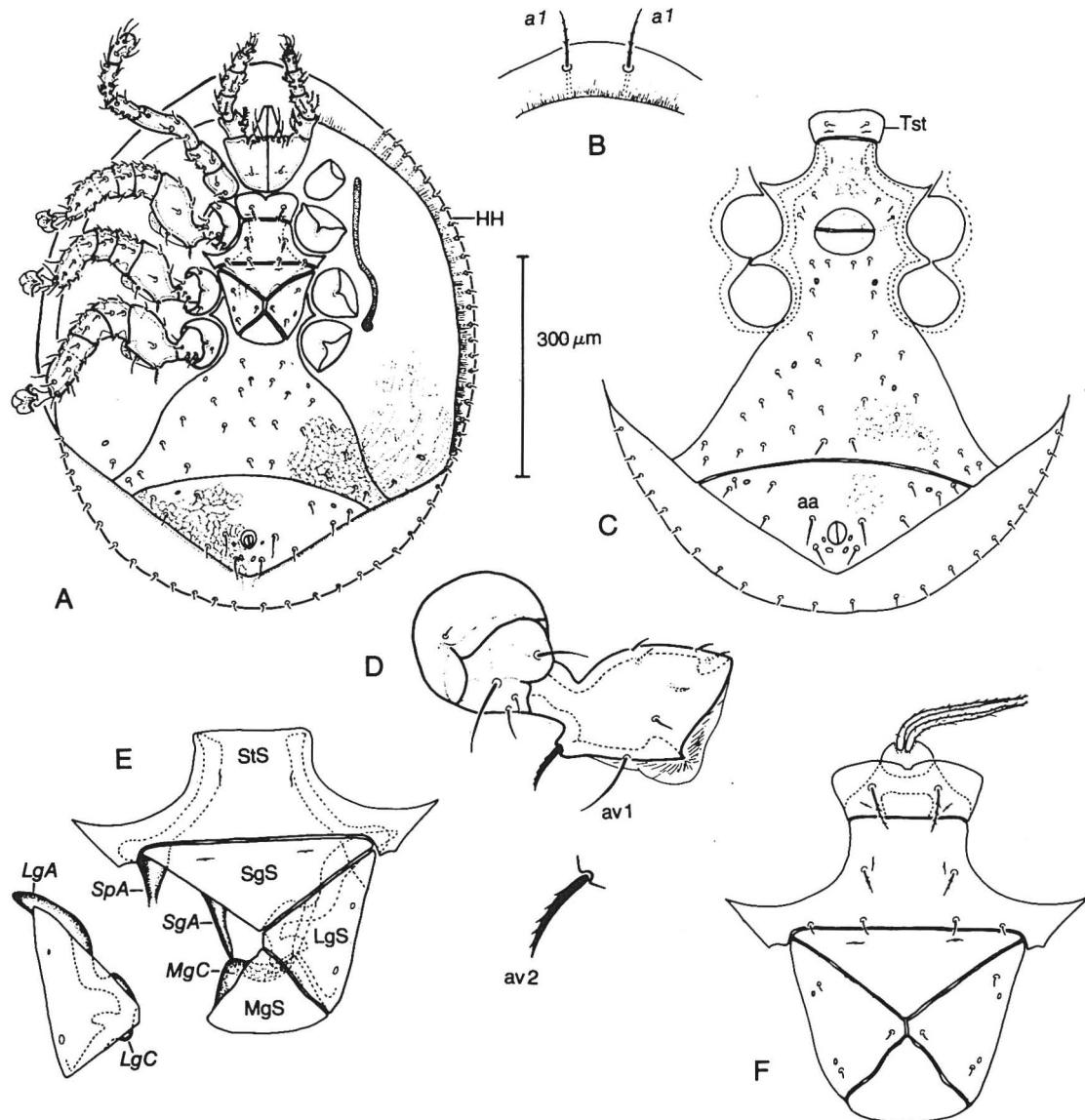


FIG. 3 : *Klinckowstroemia candidoi* sp. nov. A) ventral view of female ; B) anterodorsal view of hyaline hood ; C) male ventral shields ; D) coxa, trochanter and femur IV ; E) female sternal and genital shields ; F) female tritosternum, tetartosternum, sternal and genital shields (see text for character abbreviations).

Hyaline hood extending posteriorly to level of anterior margin of anal shield; seta *a1* long, pilose (Fig. 3B).

Tritosternal base rounded. Tetartosternum (Fig. 3F) 55 long, 140 wide, with shallow tetartosternal notch; sternal seta 1 slightly barbed. Sternal shield (Fig. 3F) 109 long, 328 wide; seta 2 slightly barbed, arising on mediolateral portion of shield and posterior to pores 2, seta 3 and 4 simple, 2 longest, 4 shortest; shield lightly punctate. Genital shields as illustrated (Fig. 3E). Posterior arms of sternogynial apodeme reaching level of mesogynial condyles. Latigynial shield margins truncate medially, with 3-4 short simple setae, 2 oval pores. Mesogynial shield triangular, pointed at apex, mesogynial condyles extend approximately to level of shield apex (Fig. 3E). Ventral shield 322 long, posterior margin 645 wide, shield weakly concave posteriorly, lateral margin weakly convex behind coxa IV, with 11 pairs of short simple setae. Anal shield 229 long, anterior margin 530 wide, with 6 pairs of simple setae. A pair of pores and a pair of simple setae near metapodal line.

Setae *av2* on femora II-IV spinelike, weakly barbed (Fig. 3D).

MALE. Idiosoma length  $1565 \pm 68$ ; width  $1251 \pm 22$  ( $N = 6$ ). Dorsal and leg characters as in female. Tetartosternal notch not as deeply incised (Fig. 3C). Sternal shield with 3 pairs of short simple setae, 2 pairs of pores, shield lightly punctate. Genital opening oval, 78 long, 109 wide. Ventral shield with 16 pairs of short simple setae, 2 pairs of pores. Anal shield with 6 pairs of simple setae, with 3 pairs of pores.

TYPES. Described from 4 females and 6 males, all from Mexican passalid beetles. Holotype female, 2 female and 4 male paratypes, Xicotepec de Juarez, Puebla, 22 March 1969, from *Oileus heros* (Truqui), P. REYES, F. LACHIA and S. LOPEZ; 1 female, 2 male paratypes, Tlapaoyan, Veracruz, 1969, from *Pseudacanthus* sp., C. BOLIVAR.

Holotype, 1 female and 2 male paratypes deposited in the NMNH; the remaining paratypes deposited in UGA.

ETYMOLOGY. This species is named in honor of Dr. Candido V. ROSARIO.

REMARKS. The shape of the latigynials of *K.*

*candidoi* closely resembles that of *K. reyesi* and *K. schusteri*. However, the hyaline hood in the two latter species does not extend posteriorly to the level of the anterior margin of the anal shield as in *K. candidoi*.

#### *Klinckowstroemia victoriae* sp. nov.

FEMALE. Body oval (Fig. 4A); idiosoma length  $853 \pm 19$ ; width  $593 \pm 23$  ( $N = 15$ ).

Hyaline hood extends posteriorly to level of coxa I; seta *a1* simple (Fig. 4B).

Tritosternal base longer than wide. Tetartosternum (Fig. 4F) 47 long, 109 wide; with shallow tetartosternal notch; sternal seta 1 simple, arising near anterior margin of shield. Sternal shield (Fig. 4F) 65 long, 252 wide, lightly punctate, all sternal setae simple, setae 2 arise well posterior to pores 2, seta 3 longer than 2 and 4. Genital shields as illustrated (Fig. 4E). Posterior arms of sternogynial apodeme reaching well below level of mesogynial condyles. Latigynial shields with median margins sinuous, 3 short simple setae. Mesogynial shield triangular, pointed at apex, convex at base, mesogynial condyles extend to level of shield apex. Shape of vaginal apodemes as illustrated (Fig. 4E). Ventral shield 234 long, posterior margin 478 wide, broadly triangular, shield truncate posteriorly, 10-12 pairs of short simple setae. Anal shield 130 long, anterior margin 400 wide, anterior margin truncate, 5 pairs of simple setae.

Seta *av2* on femora II-IV weakly barbed (Fig. 4D).

MALE. Idiosoma length  $811 \pm 18$ ; width  $572 \pm 18$  ( $N = 15$ ). Dorsal and leg characters as in female. Tetartosternal notch more deeply incised (Fig. 4C). Sternal shield with 3 pairs of short simple setae, shield lightly punctate. Genital opening 57 long, 83 wide. Ventral shield with 14 pairs of short simple setae. Anal shield with 5-6 pairs of simple setae.

TYPES. Described from 34 females and 38 males. Holotype female, 2 male paratypes, Xicotepec de Juarez, Puebla, Mexico, 22 March 1969, from *Oileus heros* (Truqui), P. REYES, F. LACHIA and S. LOPEZ. Data for other paratypes as follows: 20 female, 23 male paratypes, log #YC, 2600 m,

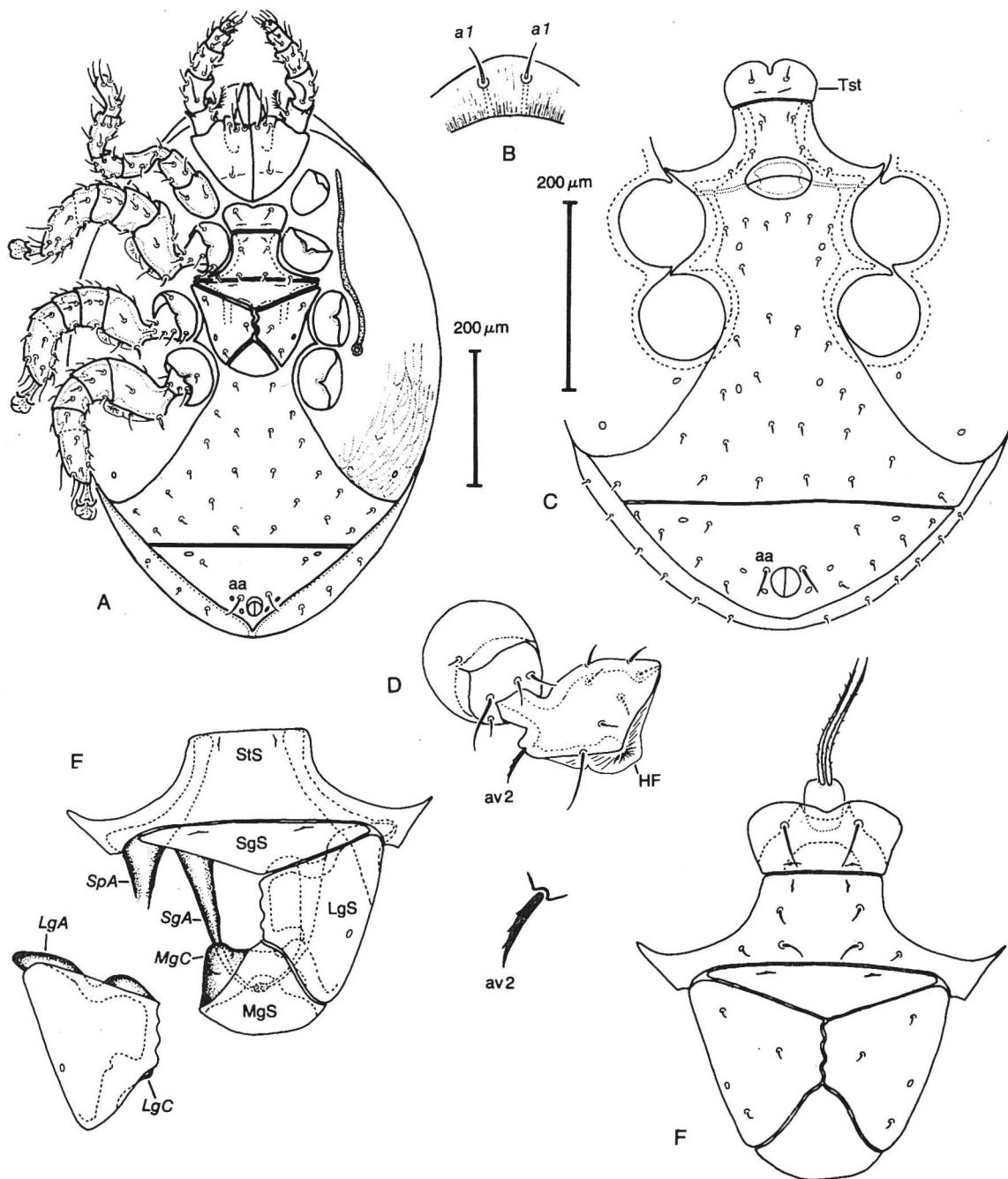


FIG. 4 : *Klinckowstroemia victoriae* sp. nov. A) ventral view of female ; B) anterodorsal view of hyaline hood ; C) male ventral shields ; D) coxa, trochanter and femur IV (HF-hyaline flange) ; E) female sternal and genital shields ; F) female tritosternum, tetartosternum, sternal and genital shields (see text for other character abbreviations).

Volcan Sta. Maria, Quetzaltenango, Guatemala, 9 February 1977, from *Ogyges laevissimus*, J. SCHUSTER; 13 female, 13 male paratypes, log #HA, 1840 m, Puerto Parada, Guatemala, 8 May 1977, from *Publius agassizi*, J. SCHUSTER.

Holotype, 1 female and 2 male paratypes deposited in NMNH; 2 females and 2 males each deposited in FMNH, AL, MNHN and UNAM; all other paratypes deposited in UGA.

**ETYMOLOGY.** This species is named in honor of Mrs. Victoria T. ROSARIO.

**REMARKS.** *Klinckowstroemia victoriae* was the most common species found in the Guatemala collections. The latigynial shields in this species resembles those of *K. scotti* and *K. simplisetosa* (both described below) from Mexico, although the medial margin is longer in *K. victoriae*. The anterior margin of the anal shield is truncate in *K. victoriae* while it is slightly convex in both *K. scotti* and *K. simplisetosa*.

#### ***Klinckowstroemia simplisetosa* sp. nov.**

**FEMALE.** Body oval (Fig. 5A); idiosoma length  $762 \pm 65$ ; width  $538 \pm 45$  ( $N = 7$ ).

Hyaline hood extends posteriorly to level of coxa I; seta *a1* simple (Fig. 5B).

Tritosternum base longer than wide. Tetartosternum (Fig. 5F) 44 long, 122 wide, tetartosternal notch shallow; sternal seta 1 short, simple, arising slightly anterior to midline of shield. Sternal shield (Fig. 5F) 70 long, 255 wide, seta 2 posterior to pores 2, seta 3 longest, setae 2 and 4 subequal in length; reticulations as illustrated. Genital shields as illustrated (Fig. 5E). Sternogynial shield lightly punctate. Posterior arms of sternogynial apodeme reaching just below level of mesogynial condyles. Medial margins of latigynial shields sinuous, with 3 small, simple setae. Mesogynial shield triangular, lateral margins convex, pointed at apex, convex at base, posterolateral corners bending slightly anteriorly, mesogynial condyles not extending to level of shield apex. Shape of vaginal apodemes as illustrated (Fig. 5E). Ventral shield 229 long, posterior margin 504 wide, shield slightly concave poste-

riorly, with 13 pairs of short simple setae. Anal shield 125 long, anterior margin 338 wide, with 7 pairs of simple setae.

Seta *av2* on femora II-IV spinelike, slightly barbed (Fig. 5D).

**MALE.** Idiosoma length  $751 \pm 25$ ; width  $531 \pm 29$  ( $N = 5$ ). Dorsal and leg characters as in female. Tetartosternal notch deeply incised, up to three-fourths depth of shield (Fig. 5C). Sternal shield with 3 pairs of short simple setae, 2 pairs of pores. Genital opening oval, 55 long, 91 wide. Ventral shield with 15 pairs of short simple setae. Anal shield with 5-6 pairs of simple setae.

**TYPES.** Described from 17 females and 11 males, all from passalids from Veracruz, Mexico. Holotype female and 1 male paratype, Dos Amates (Catemaco), 4 April 1969, from *Verres hageni*, Pedro REYES-CASTILLO; 7 female paratypes, Balzapote, San Andres Municipio, Tuxtla, alt. 80 m, April 4, 1986, from *Verres corticicola* (Truqui), inside stem of *Turpinia occidentalis*, M. L. CASTILLO; 7 female and 5 male paratypes, evergreen forest, alt. 150 m, Tropical Biology Station, San Andres Municipio, Tuxtla, May 28, 1986, from *Verres corticicola* (Truqui), M. L. CASTILLO; 4 female paratypes, mesophytic forest, alt. 900 m, Arroyo Claro, Catemaco, February 21, 1985, from *Heliscus tropicus* (Percheron), M. L. CASTILLO; 2 female paratypes, Balzapote, San Andres Municipio, Tuxtla, October 6, 1985, from *Passalus (Pertinax) punctatostriatus* Percheron, M. L. CASTILLO; 1 male paratype, Laguna Escondida, San Andres Municipio, Tuxtla, December 15, 1985, from *Verres corticicola* (Truqui), M. L. CASTILLO.

Holotype female and 1 male paratype deposited in the NMNH; 1 male and 1 female paratypes each deposited in FMNH, AL, UNAM and MNHN; all other paratypes deposited at UGA.

**ETYMOLOGY.** The species name *simplisetosa* refers to the small, simple setae on the female venter.

**REMARKS.** The medial margins of the latigynial shields in *Klinckowstroemia simplisetosa* and *K. scotti* are similar in shape. However, the latigynial shield setae in *K. simplisetosa* are small and simple while they are long and pilose in *K. scotti*.

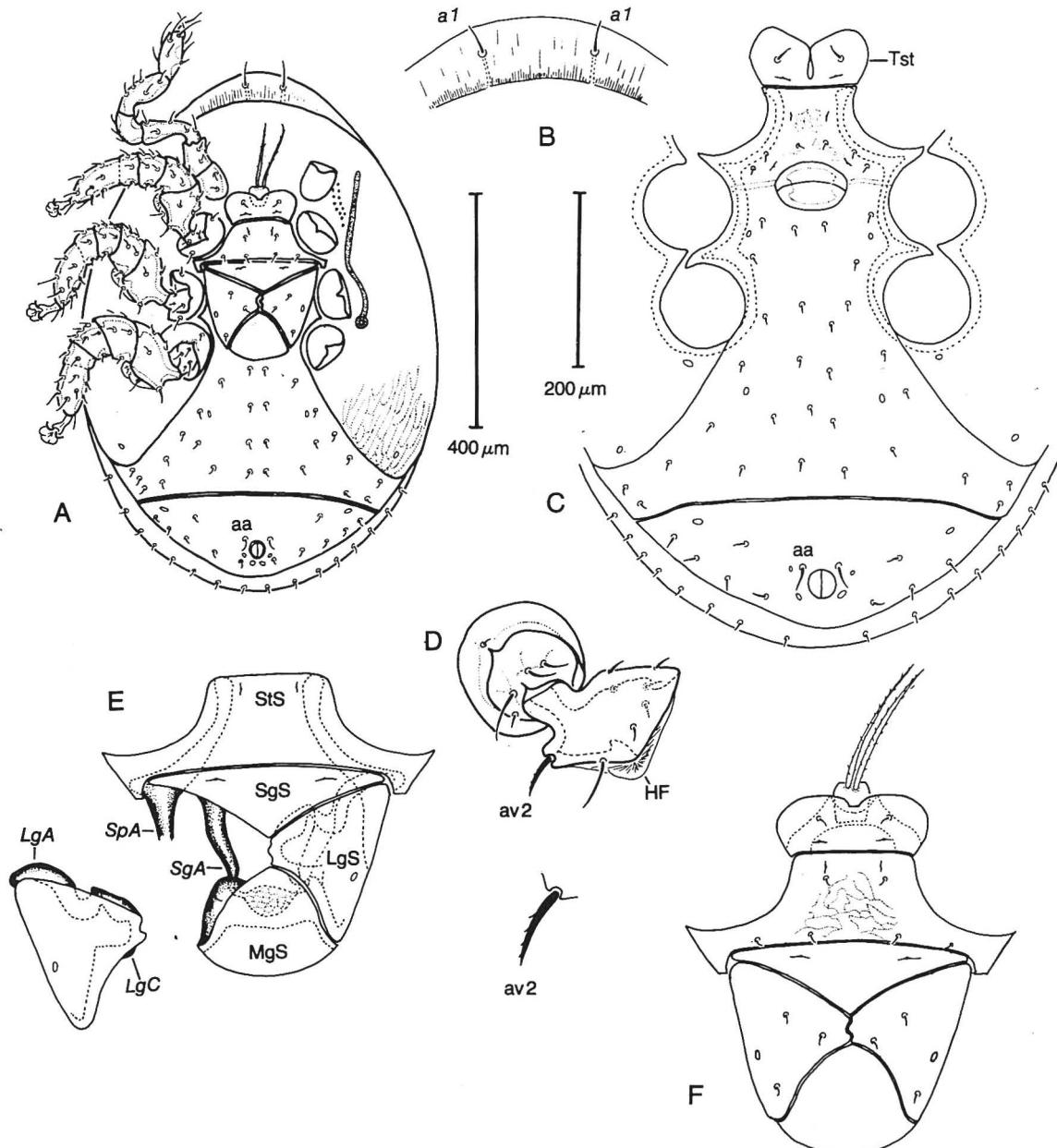


FIG. 5 : *Klinckowstroemia simplisetosa* sp. nov. A) ventral view of female ; B) anterodorsal view of hyaline hood ; C) male ventral shields ; D) coxa, trochanter and femur IV (HF-hyaline flange) ; E) female sternal and genital shields ; F) female tritosternum, tetartosternum, sternal and genital shields (see text for other character abbreviations).

***Klinckowstroemia schusteri* sp. nov.**

FEMALE. Body oval (Fig. 6A) ; idiosoma length  $1327 \pm 43$  ; width  $945 \pm 31$  ( $N = 8$ ).

Hyaline hood extending posteriorly to level of coxa I ; seta  $a2$  long, pilose (Fig. 6B).

Tritosternal base rounded. Tetartosternum (Fig. 6F) 53 long, 169 wide ; with shallow tetartosternal notch, sternal seta 1 pilose, arising near anterior margin of shield. Sternal shield (Fig. 6F) 104 long, 370 wide, seta 2 varying in position in different specimens, setae 3 and 4 near posterior margin of

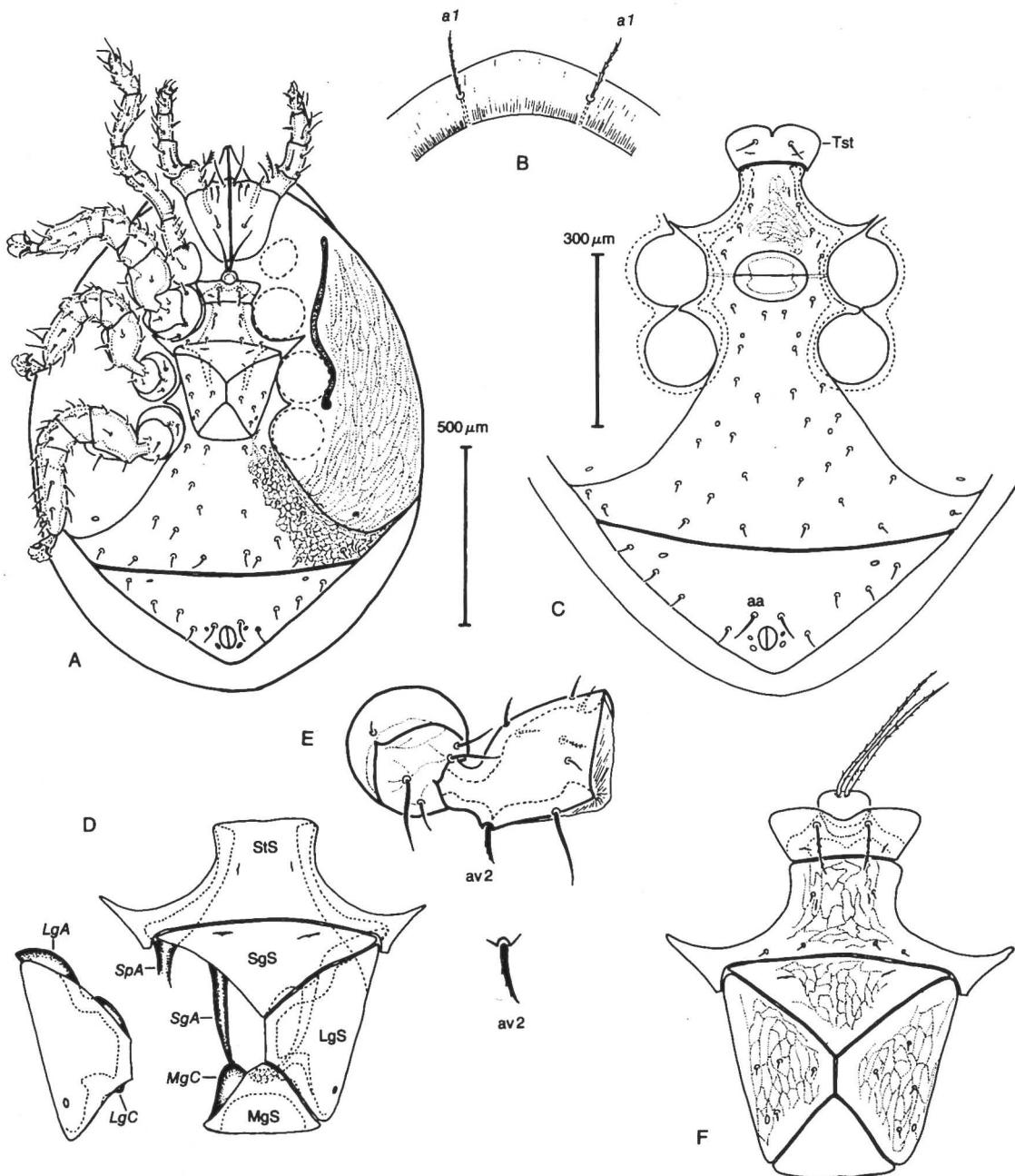


FIG. 6 : *Klinckowstroemia schusteri* sp. nov. A) ventral view of female ; B) anterodorsal view of hyaline hood ; C) male ventral shields ; D) female sternal and genital shields ; E) coxa, trochanter and femur IV ; F) female tritosternum, tetartosternum, sternal and genital shields (see text for character abbreviations).

shield, sternal seta 1 longest, setae 2, 3 and 4 subequal ; reticulations as illustrated (Fig. 6F). Genital shields and reticulations as illustrated (Fig. 6D). Posterior arms of sternogynial apodeme reaching slightly below of mesogynial condyles.

Medial margins of latigynial shields truncate, 3-4 simple setae. Mesogynial shield triangular, pointed at apex, mesogynial condyles extend to level of shield apex. Shape of vaginal apodemes as illustrated (Fig. 6D). Ventral shield 326 long, posterior margin

727 wide, shield weakly convex posteriorly, 10-12 pairs of small simple setae. Anal shield 220 long, anterior margin 623 wide, anterior margin weakly concave, 5 pairs of simple setae.

Seta av2 on femora II-IV weakly barbed (Fig. 6E).

All gnathosomal setae pilose, capitular and hypostomal setae 3 shortest.

MALE. Idiosoma length  $1340 \pm 36$ ; width  $941 \pm 27$  ( $N = 6$ ). Dorsal and leg characters as in female. Tetartosternum notch more deeply incised (Fig. 6C); sternal seta I simple. Sternal shield with 3 pairs of small simple setae, 2 pairs of pores; reticulations as illustrated. Genital opening oval, 90 long, 140 wide. Ventral shield with 16 pairs of fine, simple setae. Anal shield with 5 pairs of simple setae.

TYPES. Described from 8 females and 6 males all from Guatemalan passalids. Holotype female and paratype data as follows: log #FI, 2800 m, bud forest, 13 miles south of San Mateo Ixtatan, Huehuetenango, 6 April 1977, from adults of *Petrejoides* sp., Jack C. SCHUSTER.

Holotype female, 1 female and 2 male paratypes deposited in the NMNH; other paratypes deposited in UGA.

ETYMOLOGY. This species is named in honor of the collector, Jack C. SCHUSTER.

REMARKS. *Klinckowstroemia schusteri* and *K. candidoi* have sternal seta 1 pilose and latigynial shields with medial margins truncate. The hyaline hood in *K. schusteri*, however, does not extend posteriorly beyond coxa I while in *K. candidoi*, the hood extends posteriorly to the level of the anterior margin of the anal shield. The posterior margin of the ventral shield is concave in *K. candidoi* but is slightly convex in *K. schusteri*.

#### ***Klinckowstroemia multisetillosa* sp. nov.**

FEMALE. Body oval, egg-shaped, tapering slightly posteriorly (Fig. 7A); idiosoma 936 long, 634 wide.

Hyaline hood forming thin crescent over gnathosoma; seta *a1-a6* simple, subequal in length (Fig. 7B).

Tritosternal base rounded. Tetartosternum (Fig. 7G) 34 long, 120 wide, with weak tetartosternal notch, sternal setae 1 short simple. Sternal shield (Fig. 7G) 78 long, 270 wide, setae 2 arising anterior to pore 2, all sternal setae subequal in length; shield lightly punctate. Genital shields as illustrated (Fig. 7D). Sternogynial shield lightly punctate, posterior arms of sternogynial apodeme almost reaching posterior margin of mesogynial shield. Medial margins of latigynial shields pointed, 5 short simple setae. Mesogynial shield triangular, pointed at apex, convex at base, lower posterolateral corners bending slightly anteriorly, mesogynial condyles extend only to level of middle of shield. Shape of vaginal apodemes as illustrated (Fig. 7D). Ventral shield 328 long, posterior margin 520 wide, shield truncate posteriorly, with 11 pairs of short simple setae, 1 unpaired seta near posterior margin of shield. Anal shield 203 long, anterior margin 411 wide, anterior margin truncate, 6 pairs of simple setae.

Seta av2 on femora II-IV weakly barbed (Fig. 7E, 7F).

MALE. Idiosoma length 884; width 582. Dorsal and leg characters as in female. Tetartosternum (Fig. 7C) without distinct notch, anterolateral margins tapering posteriorly. Sternal shield with 3 pairs of small, simple setae, 2 pairs of pores; shield lightly punctate. Genital opening oval, 49 long, 68 wide. Ventral shield with 16 pairs of fine, simple setae. Anal shield with 6 pairs of simple setae.

TYPE. Holotype female, 1 male paratype, log #DT, Baja Verapaz, near Purulha, Guatemala, 9 May 1976, from *Proculus mriszechi*, Jack C. SCHUSTER.

Holotype and paratype deposited in the NMNH.

ETYMOLOGY. The species name *multisetillosa* (multi, L. — many; setillosa, L. — little hairs) refers to the 6 pairs of *a* setae on the anterior hyaline hood.

REMARKS. *K. multisetillosa* differs from all other *Klinckowstroemia* mites by having 6 pairs of *a* setae on the anterior hyaline hood.

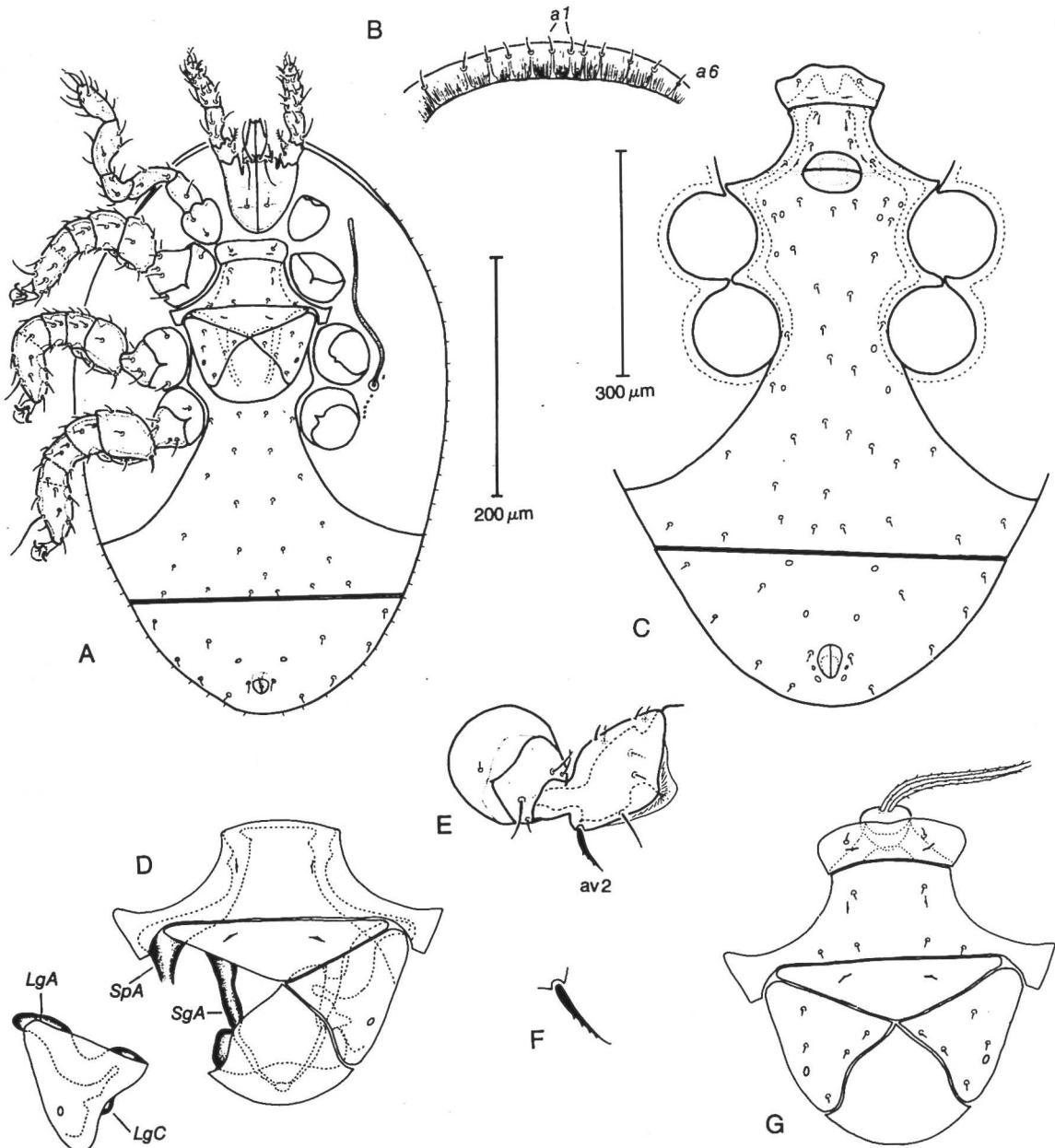


FIG. 7 : *Klinckowstroemia multisetillosa* sp. nov. A) ventral view of female ; B) anterodorsal view of hyaline hood ; C) male ventral shields ; D) female sternal and genital shields ; E) coxa, trochanter and femur IV ; F) seta  $a_2$  of femur IV ; G) female tritosternum, tetartosternum, sternal and genital shields (see text for character abbreviations).

***Klinckowstroemia scotti* sp. nov.**

FEMALE. Body oval (Fig. 8A) ; idiosoma  $1292 \pm 202$  long,  $989 \pm 102$  wide ( $N = 2$ ).

Hyaline hood extending posteriorly to level of posterior margin of coxae IV (Fig. 8A) ; setae  $a_1$ - $a_4$

simple, seta  $a_2$  at least twice length of other  $a$  setae, with 1 unpaired  $a$  setae (Fig. 8B).

Tritosternum not clear on specimen. Tetartosternum (Fig. 8F) 60 long, 179 wide, with shallow tetartosternal notch ; sternal seta 1 long, arising anterior to sternal pore 1.

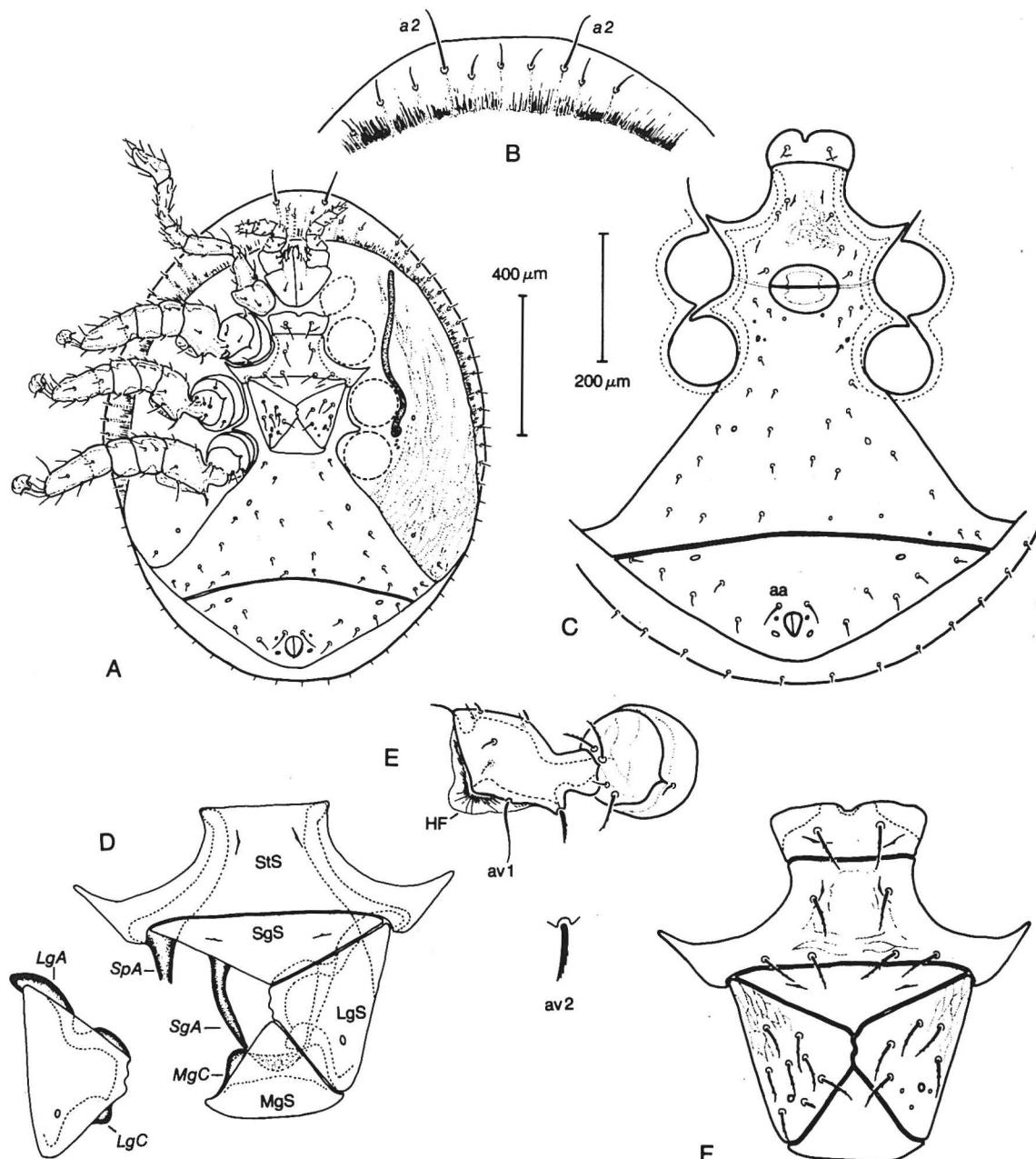


FIG. 8 : *Klinckowstroemia scotti* sp. nov. A) ventral view of female ; B) anterodorsal view of hyaline hood ; C) male ventral shields ; D) female sternal and genital shields ; E) coxa, trochanter and femur IV (HF-hyaline flange) ; F) female tetartosternum, sternal and genital shields (see text for other character abbreviations).

Sternal shield 120 long, 439 wide ; sternal seta 2 arising posterolateral to lyriform pore 2, all sternal setae pilose and subequal in length. Genital shields and reticulations as illustrated (Fig. 8D, 8F). Posterior arms of sternogynial apodeme reaching to

level of mesogynial condyles. Medial margins of latigynial shields sinuous, with 8 long pilose setae (3 setae broken off on right shield). Mesogynial shield triangular, sharply pointed at apex, posterolateral corners bending slightly anteriorly, mesogynial

condyles extend only to middle of shield. Shape of vaginal apodemes as illustrated (Fig. 8D). Ventral shield 364 long, posterior margin 837 wide, shield concave posteriorly, 12 paired and 1 unpaired simple setae. Anal shield 270 long, anterior margin 598 wide, 5-6 setae on each half of shield.

Seta av2 on femora II-IV slightly barbed (Fig. 8E).

MALE. Idiosoma  $1199 \pm 119$  long,  $876 \pm 90$  wide ( $N = 3$ ). Dorsal and leg characters as in female. Tetartosternal notch more deeply indented on anterior margin and shield rounded at anterior corners (Fig. 8C), with 1 pair of simple setae. Sternal shield with 3 pairs of short, simple setae, reticulations as illustrated. Genital opening oval, 88 long, 122 wide. Ventral shield with 18 simple setae on left half and 17 on right half. Anal shield with 6 pairs of simple setae.

TYPES. Described from 2 females and 3 males, all from Mexican passalid beetles. Holotype female and 1 male paratype from Agua Blanca, Hidalgo, 5 July 1970, from *Proculejus*, sp., J. GIMATE; 1 female and 2 male paratypes, 15 km before Tenango de Doria, Hidalgo, mixed forest, May 5, 1980, from *Proculejus* sp. tunnels, M. L. CASTILLO.

Holotype and 1 male paratype deposited in UNAM; the remaining paratypes deposited in UGA.

ETYMOLOGY. This species is named after Norman SCOTT who collected some of the passalid beetle hosts of klinckwostroemiids.

REMARKS. *Klinckwostroemia scotti* differs from other mites in the genus by having 4 pairs of *a* setae. Most species in this genus have only *a1* present. *K. multisetilosa* has 6 subequal pairs but in *K. scotti*, only one pair, *a2*, is longer than the others. Other diagnostic characters for *K. scotti* are the following: medial margins of latigynial shields sinuous; hyaline hood extending posteriorly to level of posterior margin of coxa IV; anterior margin of anal shield weakly convex.

#### ***Klinckwostroemia atramaculata* sp. nov.**

FEMALE. Body oval (Fig. 9A); idiosoma length  $1175 \pm 33$ ; width  $941 \pm 36$  ( $N = 8$ ).

Hyaline hood extending to level of coxa I; seta *a1* simple (Fig. 9B).

Tritosternal base round. Tetartosternum (Fig. 9F) 56 long, 145 wide, with shallow tetartosternal notch, sternal seta 1 long, pilose, arising near anterior margin of tetartosternum. Sternal shield 77 long, 352 wide, seta 2 arise anterolateral of pore 2, sternal seta 1 much longer than other sternal setae; 2 raised areas appearing as darker colored regions or strongly reticulate pattern on anterior of shield; reticulations as illustrated (Fig. 9F). Genital shields as illustrated (Fig. 9E). Sternogynial shield lightly punctate, posterior arms of sternogynial apodeme reaching below level of mesogynial condyles. Medial margins of latigynial shields blunt, with 3 simple setae. Mesogynial shield with anterolateral margins rounded, pointed at apex, convex at base, posterolateral corners bending slightly anteriorly, mesogynial condyles extend to level of shield apex. Shape of vaginal apodemes as illustrated (Fig. 9E). Ventral shield 242 long, posterior margin 599 wide, shield truncate posteriorly, with 11-12 pairs of short simple setae. Anal shield 199 long, anterior margin 503 wide, 6 pairs of simple setae.

Seta av2 on femora II-IV weakly barbed (Fig. 9D).

MALE. Idiosoma length  $1227 \pm 59$ ; width  $910 \pm 52$  ( $N = 2$ ). Dorsal and leg characters as in female. Tetartosternal notch more deeply incised (Fig. 9C). Sternal shield with 3 pairs of short, simple setae, 2 pairs of pores; reticulations as illustrated. Genital opening oval, 78 long, 99 wide. Ventral shield with 13-15 pairs of short simple setae. Anal shield with 6 pairs of simple setae.

TYPES. Described from 6 females and 2 males all from Costa Rican passalid beetles. Holotype female and paratypes from Monteverde, Prov. Puntarenas, date unknown, unidentified passalid, C. W. PALMER.

Holotype and 1 paratype male deposited in the NMNH; 1 female each deposited in FMNH, AL, MNNH and UNAM; all other paratypes deposited in UGA.

ETYMOLOGY. The species name *atramaculata* refers to the raised areas appearing as dark colored regions on the female sternal shield.

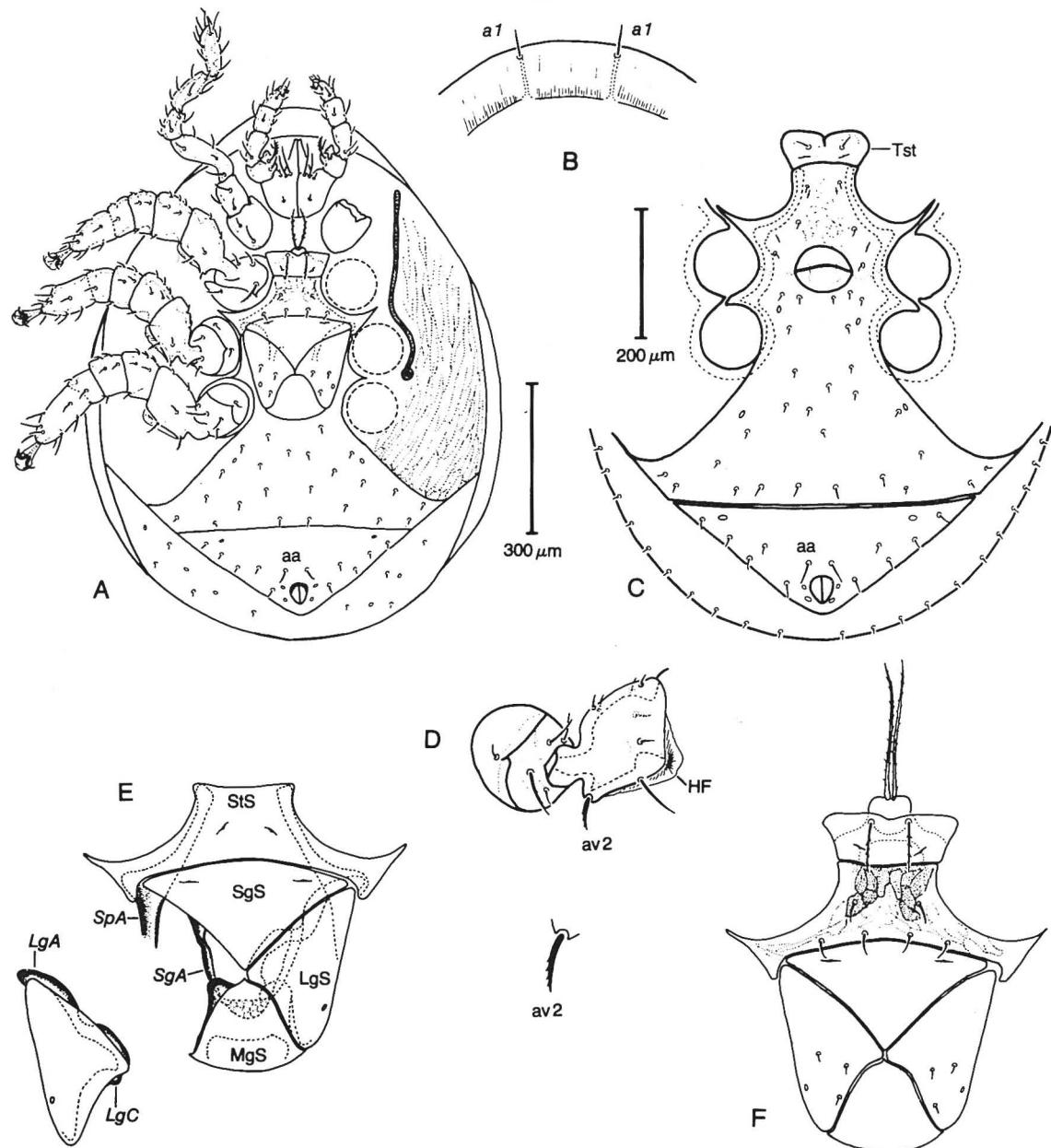


FIG. 9 : *Klinckowstroemia atramaculata* sp. nov. A) ventral view of female ; B) anterodorsal view of hyaline hood ; C) male ventral shields ; D) coxa, trochanter and femur IV (HF-hyaline flange) ; E) female sternal and genital shields ; F) female tritosternum, tetartosternum, sternal and genital shields (see text for other character abbreviations).

**REMARKS.** *K. atramaculata* is a relatively large klinckowstroemiid and is easily recognized by the raised areas that appear in slide mounted specimens as strongly reticulated or dark colored regions on the female sternal shield. The raised areas are clearly seen in scanning electron micrographs of the mite's sternal shield.

Key to the Species of *Klinckowstroemia*  
(Based on females)

1. Medial margins of latigynial shields wavy (Fig. 4F)..... 2
- Medial margins of latigynial shields straight or pointed, never wavy..... 4

2. Sternal and latigynial setae barbed (Fig. 8F) ....  
..... scotti n. sp.  
Sternal and latigynial setae smooth ..... 3
3. Sternal setae 1 longer than other sternal setae, setae 3  
longer than 4 (Fig. 4F) ..... victoriae n. sp.  
All sternal setae of equal length (Fig. 5F) ....  
..... simplisetosa n. sp.
4. Sternal setae 1 barbed ..... 5  
Sternal setae 1 smooth ..... 8
5. Sternal setae 2 barbed (Fig. 3F) ....  
..... candidoi n. sp.  
Sternal setae 2 smooth ..... 6
6. Mesogynial shield rounded anteriorly (Fig. 9F) ....  
..... atramaculata n. sp.  
Mesogynial shield pointed anteriorly ..... 7
7. Medial margins of latigynial shields pointed .....  
..... tapachulensis Chernoff and Pope  
Medial margins of latigynial shields truncate (Fig. 6F).  
..... schusteri n. sp.
8. Two pairs of setae on latigynial shield ; sternal setae 2  
shorter than 3 and 4 .....  
..... trädärdhi Baker and Warton  
More than 2 pairs of setae on latigynial shields... 9
9. Posterior margin of ventral shield concave .....  
..... concava Hunter and Butler  
Posterior margin of ventral shield truncate  
(Fig. 7A) ..... 10
10. Mesogynial shield extending anteriorly to sternogynial  
shield ; medial margins of latigynial shields  
pointed (Fig. 7G) ..... 11  
Mesogynial shield not extending to sternogynial  
shield ; medial margins of latigynial shields truncated  
(Fig. 2F) ..... 12
11. Lateral margins of mesogynial shield concave ; all  
sternal setae of equal length (Fig. 7G) ....  
..... multisetillosa n. sp.  
Lateral margins of mesogynial shield straight ; sternal  
setae 1 longer than other sternal setae (Fig. 1F).  
..... starri n. sp.
12. Lateral margins of mesogynial shield concave ; 5 or  
6 pairs of setae on latigynial shields .....  
..... grabowskii Chernoff and Pope  
Lateral margins of mesogynial shield straight ; 3 or 4  
pairs of setae on latigynial shields ..... 13
13. Sternal setae 2 shorter than setae 3 and 4 ; 3 pairs of  
setae on latigynial shields (Fig. 2F) ....  
..... reyesi n. sp.

Sternal setae 2 longer than setae 3 and 4 ; 4 pairs of  
setae on latigynial shields .....  
..... truncata Hunter and Butler

#### ACKNOWLEDGEMENTS

We extend appreciations to the following persons : Drs. Anita HOFFMANN, Universidad Nacional Autonoma de Mexico, Mexico, Carlos W. FLECHTMANN Zoologia, Escola Superior de Agricultura, Universidad de Sao Paulo, Brazil and Stuart B. HILL, Department of Entomology, Macdonald College, McGill University, Canada, for the loan of specimens ; the various collectors for making specimens available for study.

#### REFERENCES

- BAKER (E. W.) and WHARTON (G.), 1952. — An Introduction to Acarology. — MacMillan CO., New York : 465 + XIII pp.
- CAMIN (J. H.) and GORIROSSI (F. E.), 1955. — A revision of the suborder Mesostigmata (Acarina), based on new interpretations of comparative morphological data.-Spec. Publs Chicago Acad. Sci. no. 11 : 1-70.
- CHERNOFF (N.) and POPE (R.), 1970. — Two new mites of the genus *Klinckowstroemia* from Mexico (Acarina : Klinckowstroemidae). — Proc. Biol. Soc. Wash. 83 (12) : 145-154.
- EVANS (G. O.), 1963. — Observations on the chaetotaxy of the legs in the free-living Gamasina (Acana : Mesostigmata). — Bull. Br. Mus. (Nat. Hist.) Zool. 10 (5) : 277-303.
- HUNTER (P. E.) and BUTLER (L.), 1966. — New *Klinckowstroemia* mites from Costa Rican passalid beetles (Acarina : Klinckowstroemidae). — J. Ga. Ent. Soc. 1 (4) : 24-30.
- KETHLEY (J. B.), 1977. — A review of the higher categories of Trigynaspida (Acari : Parasitiformes). — Int. J. Acarology 3 (2) : 129-149.
- ROSARIO (R. M. T.) and HUNTER (P. E.), 1987. — The family Klinckowstroemidae Trägårdh with descriptions of two new species of *Klinckowstroemiella* (Acarina : Mesostigmata : Trigynaspida). — Acarologia 28 (4) : 307-319.
- TRÄGÅRDH (I.). 1937. — Zur systematik der Mesostigmata. — Ark. Zool. 29 B (11) : 1-8.
- TRÄGÅRDH (I.). 1938. — Further contributions towards the comparative morphology and classification of the Mesostigmata. — Ent. Tidskr. 59 (3-4) : 123-158.