

DESCRIPTION OF THE IMMATURE AND ADULT STAGES OF *AMBLYSEIUS COLIMENSIS* N. SP. (ACARI : PHYTOSEIIDAE) FROM MEXICO

BY ORLANDO R. APONTE * & J. A. McMURTRY **

TAXONOMY
AND
DEVELOPMENT
STAGE
BY STAGE

TAXONOMIE
ET
DÉVELOPPEMENT
STASE
PAR STASE

ABSTRACT : Studies of the general morphology and ontogeny of body setation and porotaxy were conducted on *Amblyseius colimensis* n. sp. Stages are taxonomically described and figured.

RÉSUMÉ : Des études de morphologie générale et d'ontogenèse de la pilosité et de la porotaxie du corps ont été conduites sur *Amblyseius colimensis* n. sp. Les stases sont décrites et figurées taxonomiquement.

INTRODUCTION

Description of species in the family Phytoseiidae are based on adult females and infrequently on both sexes. Immature stages are not considered as tools for the classification within the family and only a few descriptions of them have been made (CHANT, 1957, 1958, WESTERBÖER, & BERNHARD, 1963, SCHUSTER, 1966, VAN DER MERWE, 1968, KARG, 1971, SWIRSKI *et al.*, 1973, SCHICHA, 1977).

CHANT (1958) studied the homology of setae on the dorsal shield of the different stages of mites of the family Phytoseiidae. ARUTUNIAN (1972) discussed the ontogenetic development of shields and setae in the family Phytoseiidae. ROWELL *et al.* (1978) discussed the setal homologies and setal patterns on the dorsal shield and developed a more complete system of chaetotactic nomenclature for

the family based on similarities between Ascidae and Phytoseiidae. ROWELL and CHANT (1979) presented evidence of homologous setal relationship between the immature and adult stages, based on chaetotaxy of the legs, and ventral and dorsal shields. YOSHIDA-SHAUL and CHANT (1983) showed the ontogenetic development of setae in two species groups in the genus *Typhlodromus* Scheuten.

METHODS

The description of *Amblyseius colimensis* n. sp. is based on 25 females (including 3 specimens from the original shipment) and 10 females taken from the laboratory culture. Descriptions of immature

* Facultad de Agronomía, UCV, Maracay, AR, Venezuela.

** Division of Biological Control, Department of Entomology, University of California, Riverside, CA 92521 USA.

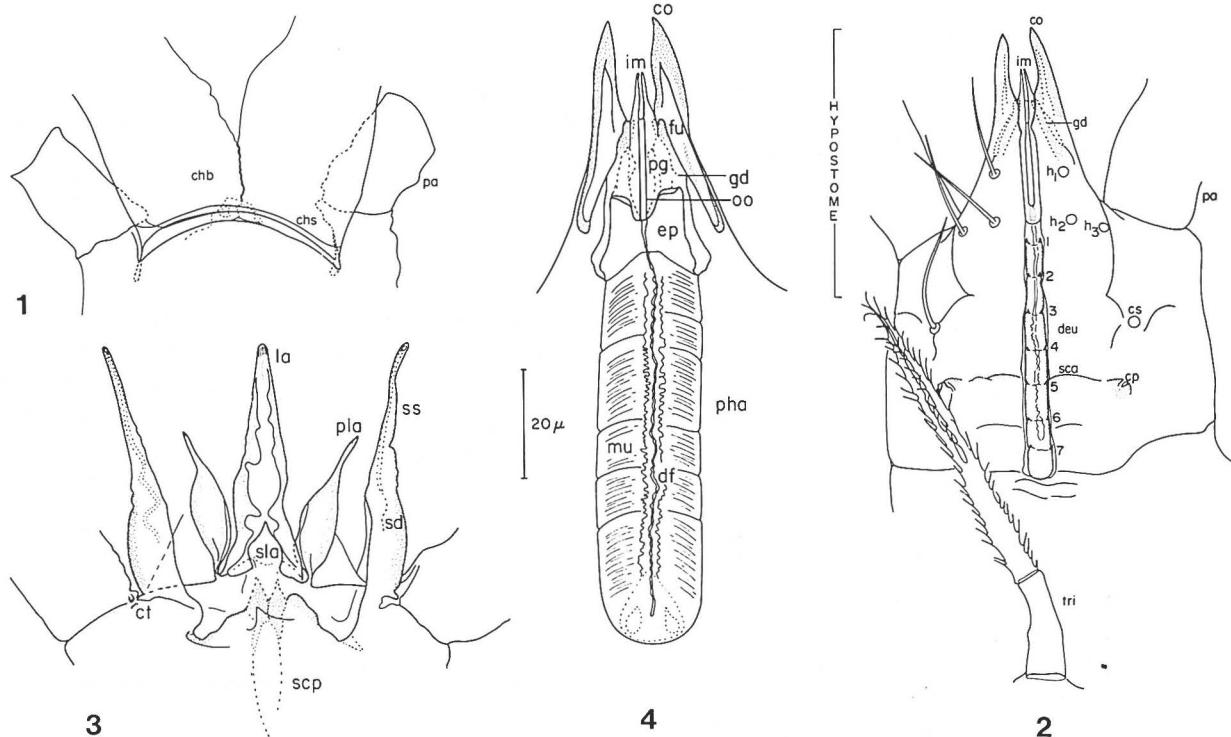
stages are based on 10 individuals, except the male deutonymph which is based on 6 individuals. All the measurements are given in micrometers.

The nomenclature used for the chaetotaxy of the dorsal surface and ventral shields of the opisthosoma is based on the system of LINDQUIST and EVANS (1965) and modified by ATHIAS-HENRIOT (1975b) and ROWELL *et al.* (1978). Nomenclature of the appendage chaetotaxy is based on the system of EVANS (1963, 1965, 1969, 1972). Other terminologies were used as follows : SCHUSTER and SMITH (1960) for the structures of the spermatheca ; DE LEON (1961) for the structures of the spermadactyl ; DE LEON (1966) for the peritremal and stigmal structures ; ATHIAS-HENRIOT (1969a, 1969b, 1970, 1975a, 1975b, 1977) for the organotaxy of the dorsal shield ; NESBITT (1951) and VAN DER HAMMEN (1964, 1966) for the ventral region of the

prosoma ; VAN DER HAMMEN (1964) and EVANS and LOOTS (1975) for the nomenclature of the mouth-parts.

STRUCTURE OF THE GNATHOSOMA

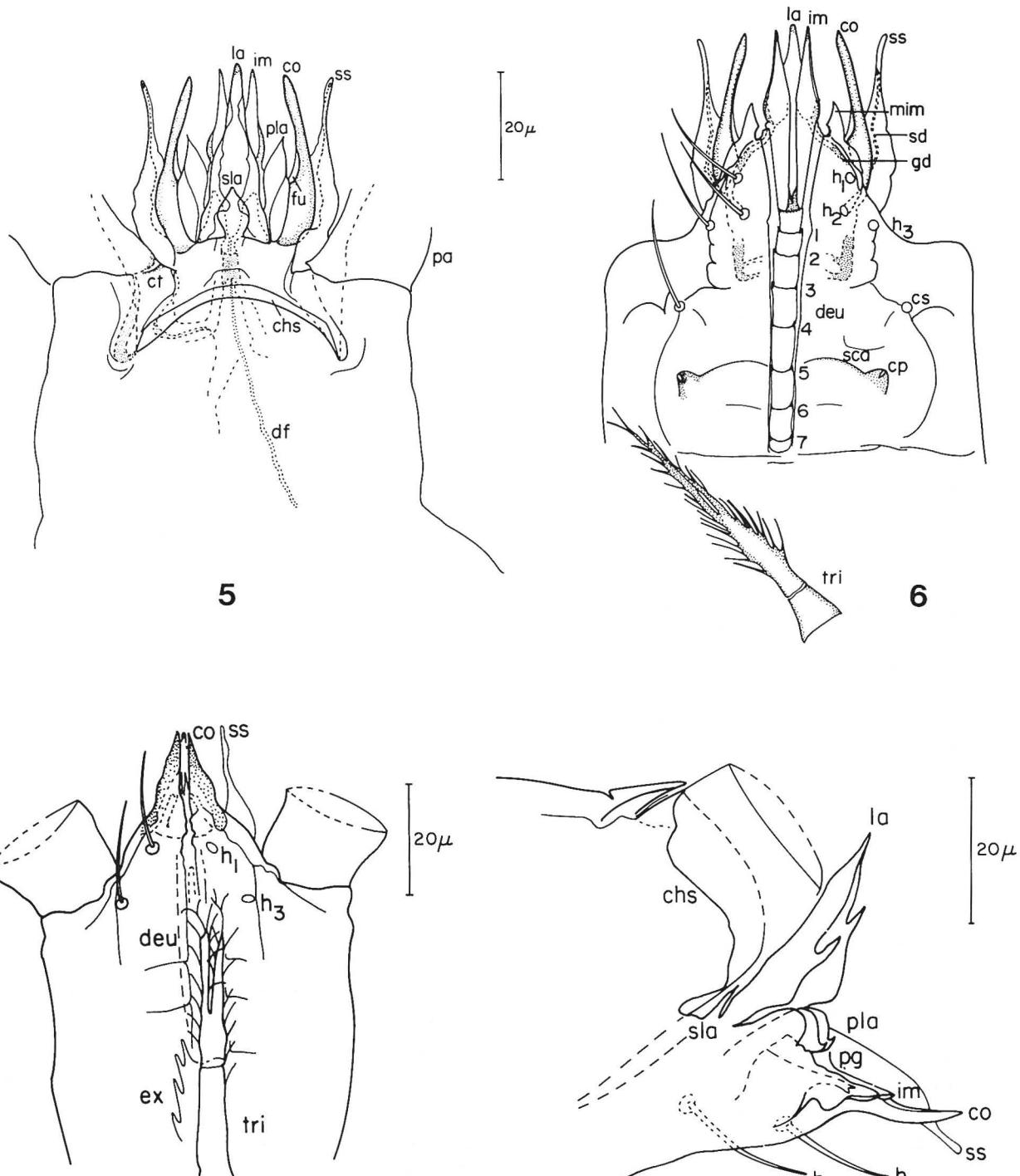
Gnathosomal capsule. The gnathosoma or capitulum resembles the general type for Gamasida. The gnathosoma is lightly sclerotized in the adult stage and in live specimens appears as a prognathus cone-shaped structure. The anterior margin of the epistome (Fig. 1, *eps*) is smooth and rounded. The 3-segmented chelicerae are bounded dorsally and laterally by the cheliceral sheaths (Figs. 1, 5, 8, *chs*), sliding over the subcheliceral plate (Fig. 3, *scp*).



FIGS. 1-4 : *Amblyseius colimensis* n. sp. Female.
1. — Epistome. 2. — Subcapitulum. 3. — Hypostome, dorsal region. 4. — Hypostome, medial region.

As with other mites, the lateral walls of the gnathosoma are formed by expansion of the coxal palpi ; ventrally the palpal coxae form the subcapitulum (Fig. 2) which is about as wide as long and

bears the medial deutosternal groove (*deu*). This groove bears excrescences in the larva (Fig. 7, *ex*), and transverse lines with denticles in the later stages. The tritosternum (Figs. 2, 6, 7, *tri*) normally



Figs. 5-8. *Amblyseius colimensis* n. sp.

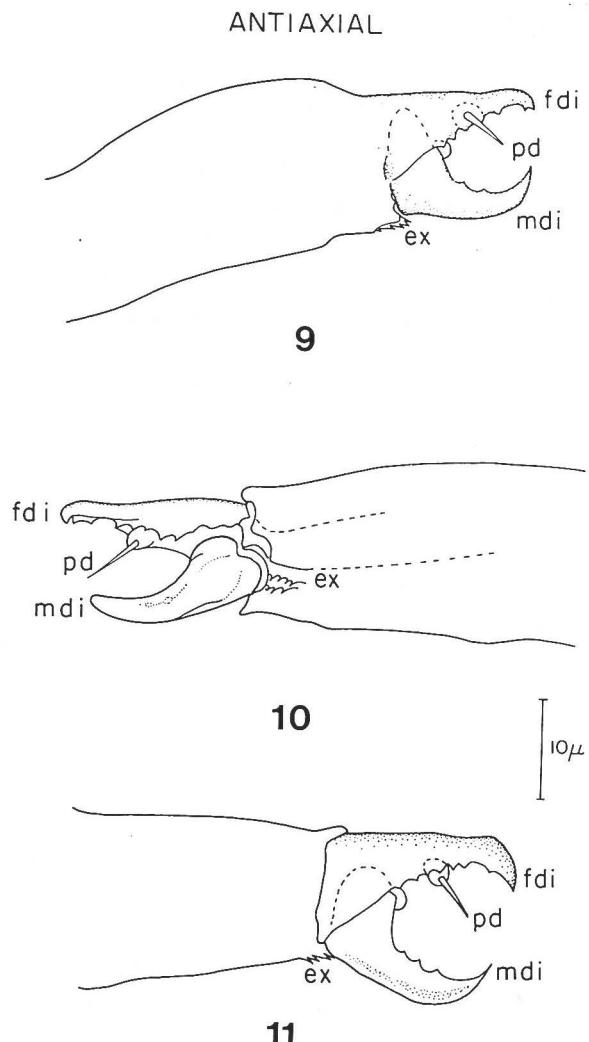
Male. 5. — Hypostome, dorsal region. 6. — Subcapitulum, hypostome.
Larva. 7. — Subcapitulum. 8. — Hypostome, lateral aspect.

rests in the deutosternal groove. Its base originates on the idiosoma and it bifurcates into 2 laciniae. The function of the tritosternum in certain Gamasida is described by WERNZ and KRANTZ (1976).

The subcapitulum of the larva bears 2 pairs of hypostomal setae (Fig. 7, h_1, h_3) ; and the later stages have 3 pairs of hypostomal setae (Figs. 2, 6, h_1, h_2, h_3) and 1 pair of coxal or subcapitular setae (cs). The adult also shows scars, which probably represent points of internal muscle insertions (Fig. 2, sca), and 1 pair of longitudinal cuticular pore-like structures (cp) behind the capitular setae. The hypostome is formed by the anterior extension of the subcapitulum (coxal endites) and the lateroventral extension of the pharyngeal walls (EVANS & LOOTS, 1975, KRANTZ, 1978). The corniculi or external malae (Figs. 2, 4, 5, 6, 7, 8, co) arise from the anterior portion of the hypostome and possess a furrow (Figs. 4, 5, fu) dorsally, which widens posteriorly. A bilobed structure, the minor internal mala and the internal mala (Fig. 6, mim, im) arises from the lateral bases of the corniculi. The salivary styli (siphunculus of VAN DER HAMMEN, 1964) (Figs. 3, 5, 6, 7, 8, ss) are located lateral to the corniculi. These structures are tapered and internally bear a secretory duct (Figs. 3, 6, sd). Dorsally and laterally the corniculi and internal malae form the preoral groove (Figs. 4, 8, pg) (EVANS & LOOTS, 1975) and behind this is the oral opening (oo) which laterodorsally is surrounded by the following organs : an arrowhead shaped structure, the supralabrum (Figs. 3, 5, sla), which is located anteriorly at the end of the subcheliceral plate ; a tapering structure with the ridges folded upward, the labrum (la) (Figs. 3, 5, 6, 8) just below the supralabrum ; a pair of processes, the paralabra (pla), laterally and partially under the labrum.

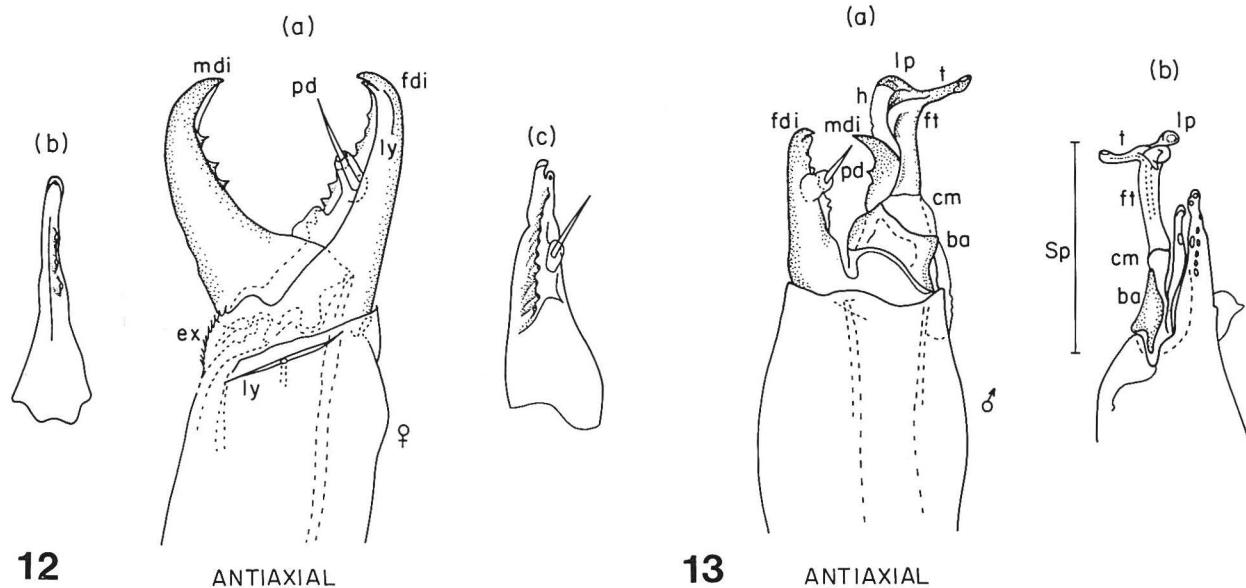
The epipharynx and the pharynx (Fig. 4, ep, pha), which have a large fissure (df) along their dorsal surface, are located behind the oral opening. The pharyngeal muscle surrounds the pharynx to form a cylindrical structure (mu).

■ Chelicera. The chelicerae (Figs. 9, 10, 11, 12, 13) in immature and adult stages bear the *pilus dentilis* (pd) on the fixed digit (fdi), the terminal hook on both digits, ventral excrescences (ex)



Figs. 9-11. *Amblyseius colimensis* n. sp. chelicera.
9. — Larva. 10. — Protonymph. 11. — Deutonymph.

behind the movable digit (mdi), and several teeth which increase in number during ontogeny. Larva (Fig. 9) : length of the fixed digit 17 (15-18), with 6 teeth ; movable digit with 2 teeth. Protonymph (Fig. 10) : length of the fixed digit 20 (19-22), with 6-7 teeth ; movable digit with 2 teeth. Deutonymph (Fig. 11). Female : length of the fixed digit 27 (26-28) ; Male : length of the fixed digit 21 (21-22) ; both sexes : fixed digit with 7-8 teeth ; movable digit with 3 teeth. Adult. Female (Fig. 12, a, b, c) : length of the fixed digit 37 (35-38), with 9 teeth ; movable digit with 3 teeth, and 2 lyrifissures (ly)



Figs. 12-13. *Amblyseius colimensis* n. sp. chelicera.

12. — Female. (a) antiaxial, (b) movable digit, ventral view, (c) fixed digit, ventral view. 13. — Male. (a) antiaxial, (b) dorsal view.

present on the antiaxial region. Male (Fig. 13, a, b) with spermadactyl which bears the following structures : base (*ba*), connective membrane (*cm*), foot (*ft*), heel (*h*), lateral process (*lp*), shank (*sh*), and toe (*t*). Length of the fixed digit 25 (24-26), with 6-9 teeth ; movable digit with 1 tooth.

■ *Palp*. Little is known about palpal chaetotaxy for phytoseiid mites. EVANS (1963) figured the palps of several phytoseiid species. JACKSON (1974) discussed in detail the morphology and possible function of the palpal tarsus for *Phytoseiulus persimilis* ATHIAS-HENRIOT.

The palp shows the following condylic joints : on the paraxial surface, the coxotrochanteral (Fig. 14, *ct*), and dorsally the genotibial (Figs. 14, 15, 16, *gt*). A third joint, the femorogenual (Fig. 15, *fg*), appears in the protonymph. The apotele (palptarsal claw) is 2-tined (Figs. 14, 15, 16, *pc*) ; paraxial setae of femur and genu are specialized, broadened at the tip. The chaetotaxy of the segments is shown in Table 3. The palp in the deutonymph bears the same chaetotaxy as that of the adult stage.

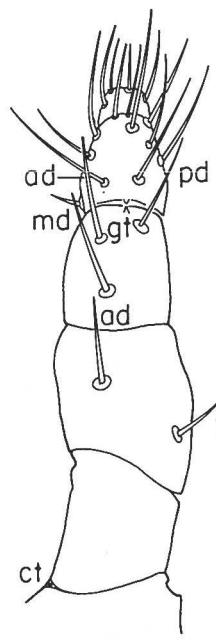
DESCRIPTION OF STAGES

LARVA

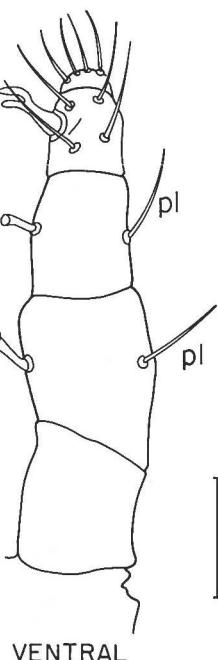
DORSUM (Fig. 17). Two weakly sclerotized shields are present, with 1 pair of setal nubs (*SN*) on the membrane. Podonotal shield (*PS*) smooth over entire surface, distance from the base of j_1 to the base of j_6 129 (123-136) ; distance between the bases of setae s_4 108 (106-111) ; with 9 pairs of setae ($j_1, j_3, j_4, j_5, j_6, z_2, z_4, z_5, s_4$). Opisthonotal shield (*OS*) with 3 pairs of setae (Z_4, Z_5, S_5). Setal measurements : j_1 31 (30-34), J_3 20 (19-22), j_4 12 (11-12), j_5 8 (8-9), j_6 29 (27-34), z_2 10 (9-11), z_4 13 (12-15), z_5 8 (8-9), Z_4 150 (143-151), Z_5 7 (7-8), s_4 66 (63-68), S_5 7 (6-7).

VENTER (Fig. 18). Shields absent or weakly sclerotized ; sternogenital region with 3 pairs of setae (S_1, S_2, S_3) ; ventrianal region with anal shield (*AN*) bearing the anal setae (a_1, a_2, a_3), 4 pairs of preanal setae (JV_1, JV_2, JV_5, ZV_2), and 2 pairs of cuticular pores (*p*). Stigmata and peritremes absent.

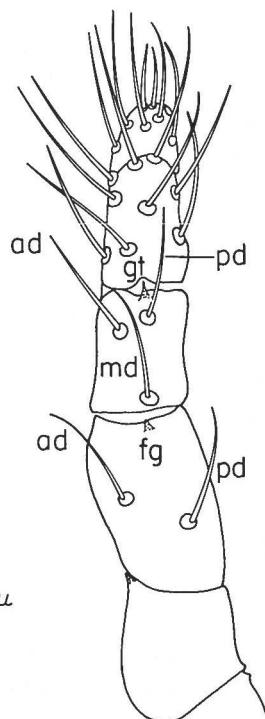
LEGS. Chaetotaxy as shown in Table 3. Dorsal field (JACKSON, 1974) bears a set of 9 short pegs or spur-



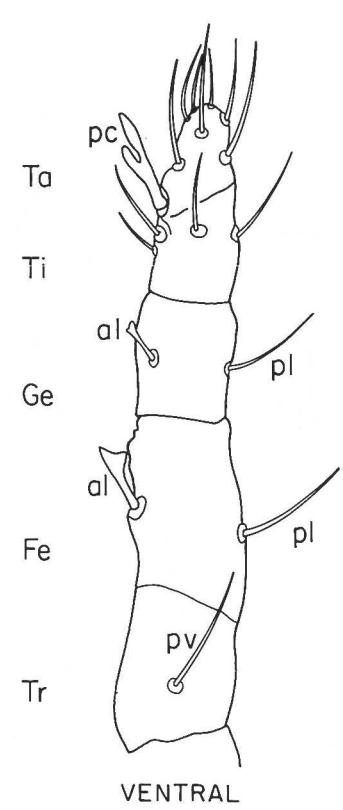
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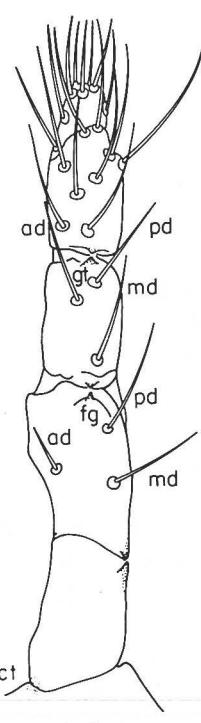
VENTRAL



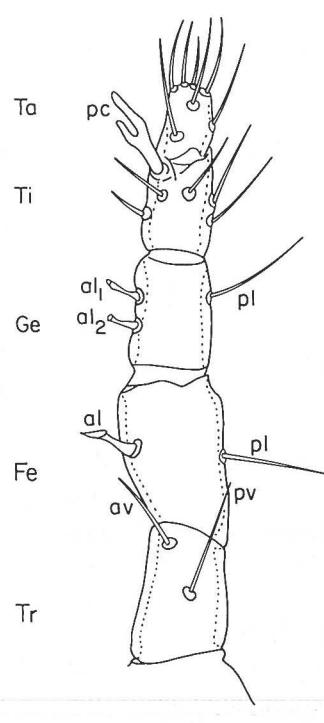
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VENTRAL



DORSAL

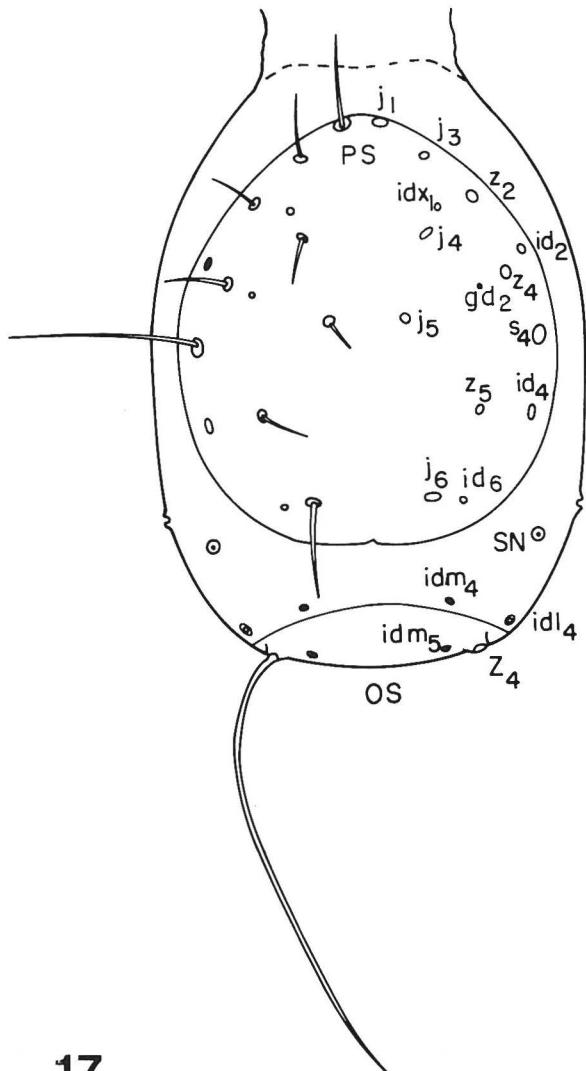


VENTRAL

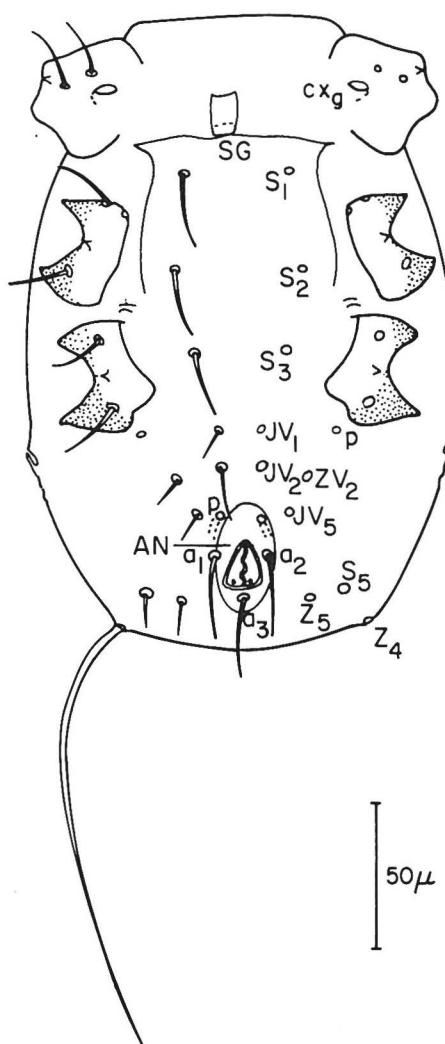
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Figs. 14-16. *Amblyseius colimensis* n. sp. palp.

14. — Larva. 15. — Protonymph. 16. — Adult. Tr = trochanter; Fe = femur; Ge = genu; Ti = tibia; Ta = tarsus.



17



18

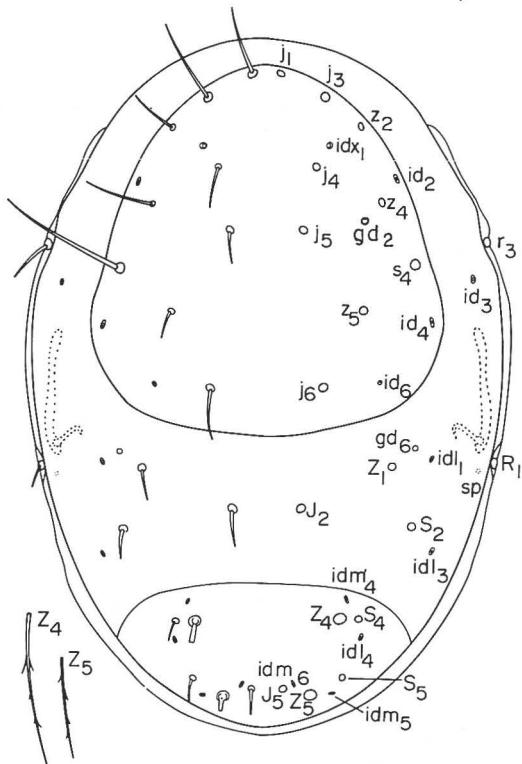
FIGS. 17-18. *Amblyseius colimensis* n. sp. idiosoma. Larva. 17. — Dorsum. 18. — Venter.

like setae. Coxa I has 1 gland (Fig. 18, *cxg*) (FAIN, 1966, SWIRSKI *et al.*, 1973) with a single glandular opening.

PROTONYMPH

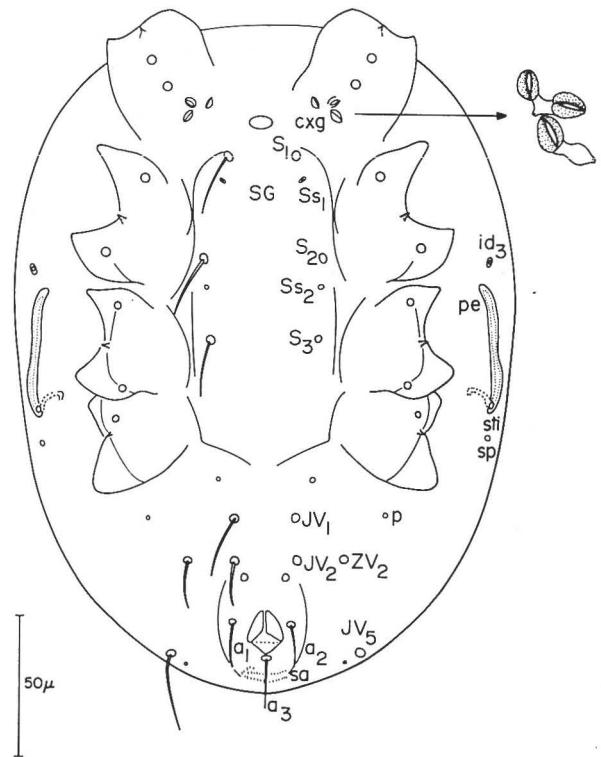
DORSUM (Fig. 19). Podonotal and opisthonotal shields widely separated by interscutal membrane,

which bears 5 pairs of setae (J_2 , Z_1 , S_2 , r_3 , R_1). Dorsal surface : length (distance from j_1 to J_5) 212 (201-223); width (distance between bases of s_4) 108 (105-111). Podonotal shield with 9 pairs of setae (j_1 , j_3 , j_4 , j_5 , j_6 , z_2 , z_4 , z_5 , s_4). Opisthonotal shield with 5 pairs of setae (J_5 , Z_4 , Z_5 , S_4 , S_5). Setal measurements : j_1 22 (19-24), j_3 31 (28-34), j_4 (13-15), j_5 8 (8-9), j_6 18 (17-22), J_2 14 (13-15), J_5 7 (6-7), z_2 10 (9-11), z_4 13 (12-15), z_5 8 (8-9), Z_1 12 (12-14), Z_4 barbed, 147 (143-151), Z_5 barbed, 38 (35-42), s_4 66



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FIGS. 19-20. *Amblyseius colimensis* n. sp. idiosoma. Protonymph.
19. — Dorsum. 20. — Venter.



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(63-68), S_2 11 (10-12), S_4 6 (5-6), S_5 6 (6-7), r_3 18 17-19), R_1 7 (6-7).

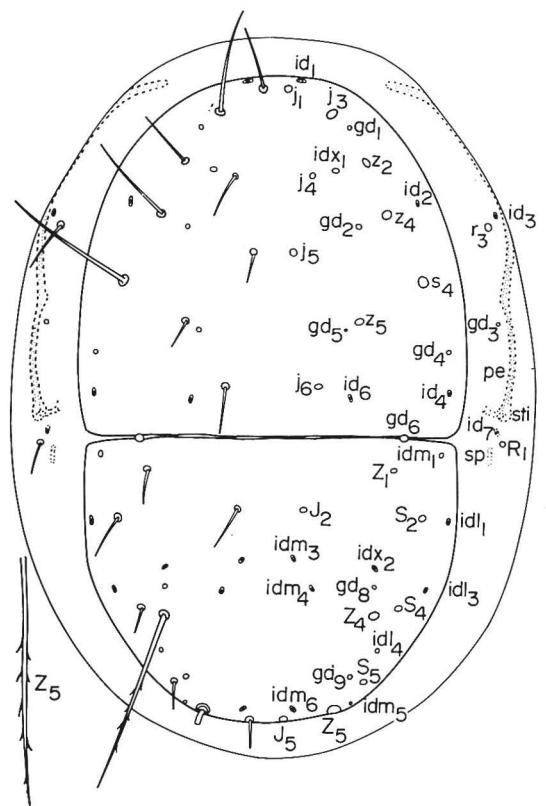
VENTER (Fig. 20). Shields weakly sclerotized. Sternogenital shield (SG) bears 3 pairs of setae (S_1 , S_2 , S_3), and 2 pairs of sensillae (Ss_1 , Ss_2). Ventrianal region with anal shield bearing three anal setae (a_1 , a_2 , a_3), and setose process (sa) at posterior end of anal shield, with 4 pairs of preanal setae (JV_1 , JV_2 , JV_5 , ZV_2), and 4 pairs of cuticular pores (p) (anterior to JV_1 , lateral to JV_1 , posterior to JV_2 , medial to JV_5).

Stigmal opening (sti) and secondary pore (sp) located ventro-laterally between coxae III and IV; peritreme extends from the stigma to the level of anterior margin of coxa III, and bears small tubercular processes along its length.

LEGS. Chaetotaxy as shown in Table 3. Dorsal field with 11 short pegs or spur-like setae. Coxa I (Fig. 20) with 2 glands with 1 and 2 glandular openings, respectively. Macroseta (pd) basitarsus IV : 71 (68-74).

DEUTONYMPH

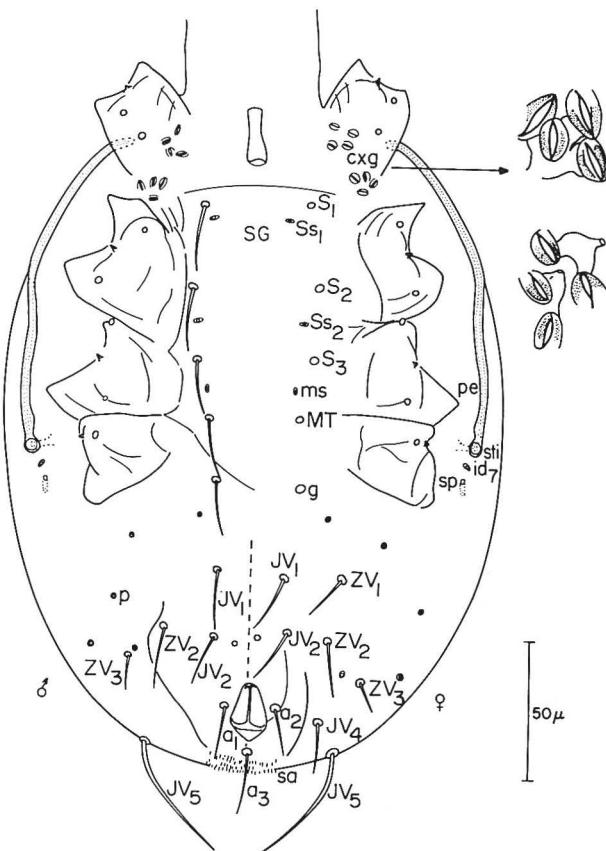
DORSUM (Fig. 21). Interscutal membrane with 2 pairs of setae (r_3 , R_1). Podonotal and opisthonotal shields partially fused. Length (from bases of setae j_1 to J_5) : female 246 (246-262), male 232 (231-236); width between bases of s_4 : female 123 (120-126), male 113 (108-116). Podonotal shield with 9 pair of



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FIGS. 21-22. *Amblyseius colimensis* n. sp. idiosoma. Deutonymph.

21. — Dorsum. 22. — Venter.



22

setae ($j_1, j_3, j_4, j_5, j_6, z_2, z_4, z_5, s_4$). Opisthonal shield width 8 pairs of setae ($J_2, J_5, Z_1, Z_4, Z_5, S_2, S_4, S_5$). Setal measurements. Female : j_1 27 (25-29), j_3 46 (45-49), j_4 14 (13-15), j_5 8 (8-9), j_6 16 (14-19), J_2 15 (14-17), J_5 9 (9-10), z_2 24 (23-26), z_4 36 (32-40), z_5 8 (8-9), Z_1 15 (13-17), Z_4 barbed, 70 (66-72), Z_5 barbed, 103 (99-108), s_4 63 (62-65), S_2 17 (15-19), S_4 9 (8-9), S_5 8 (8-9), r_3 21 (20-22), R_1 11 (10-12). Male : j_1 24 (23-25), j_3 43 (40-45), j_4 14 (14-15), j_5 9 (9-10), j_6 17 (16-19), J_2 14 (12-15), J_5 9 (9-10), z_2 20 (19-22), z_4 33 (30-35), z_5 8 (8-9), Z_1 14 (13-15), Z_4 barbed, 61 (55-63), Z_5 barbed, 78 (74-80), s_4 54 (51-55), S_2 17 (15-19), S_4 9 (8-9), S_5 9 (8-9), r_3 19 (19-20), R_1 12 (10-13).

VENTER (Fig. 22). Shields weakly sclerotized. Sternogenital shield bears 5 pairs of setae ($S_1, 2_2, S_3, MT, g$), and 3 pairs of sensillae (Ss_1, Ss_2, ms). Sexual dimorphism is evident in the ventrianal region. Female : with 6 pairs of preanal setae ($JV_1, JV_2, JV_4, ZV_1, ZV_2, ZV_3$). Male : with 4 pairs of preanal setae (JV_1, JV_2, ZV_2, ZV_3). Both sexes with 3 anal setae (a_1, a_2, a_3), and 1 pair of postanal setae (JV_5). The membranous area lateral of the preanal setae has 4 cuticular pores ; an additional pair of prominent pores are situated mediad to setae JV_2 . Setose processes present at posterior end of anal shield.

Peritremes (pe) extended anteriorly to level of

setae j_1 , with the tubercular processes, stigmal opening and secondary pore located ventrolaterally between coxae III and IV.

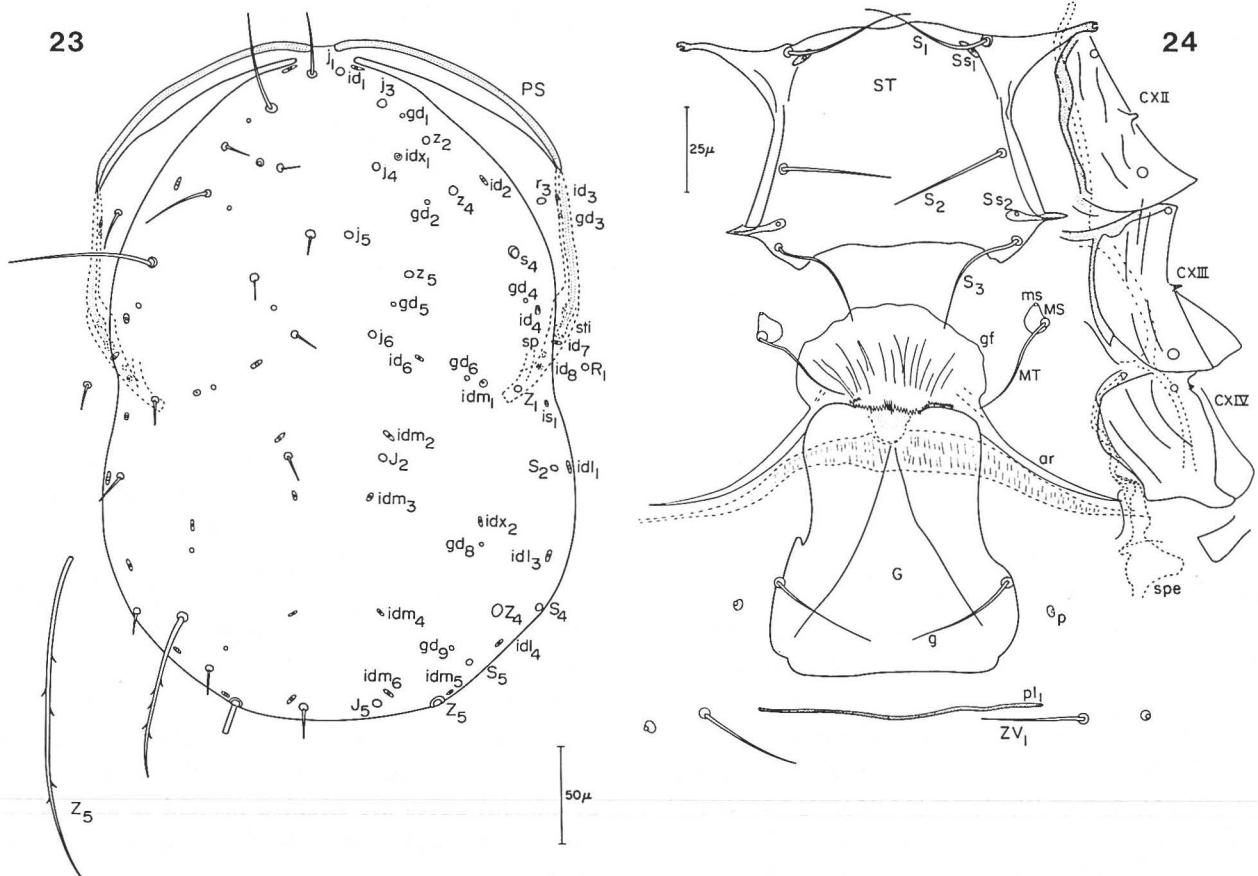
LEGS. The legs of both sexes show the same chaetotaxy as the adults (Table 3). Coxa I (Fig. 22) with 3 glands (cxg), 2 of which have 2 glandular openings and the third with 4 glandular openings. Macroseta (pd) on basitarsus IV : female 74 (71-79), Male 68 (65-69).

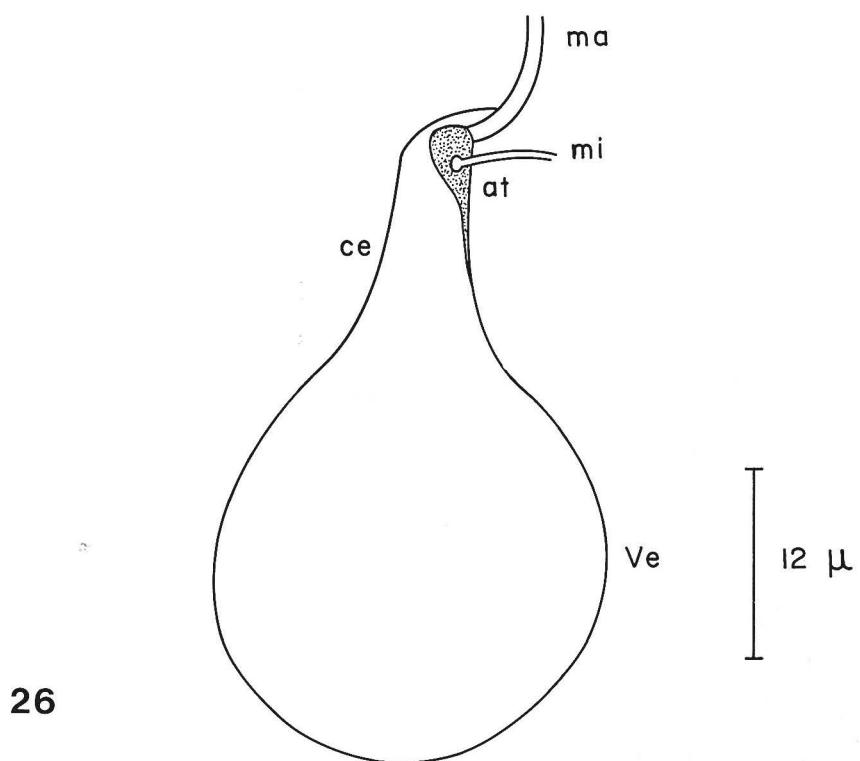
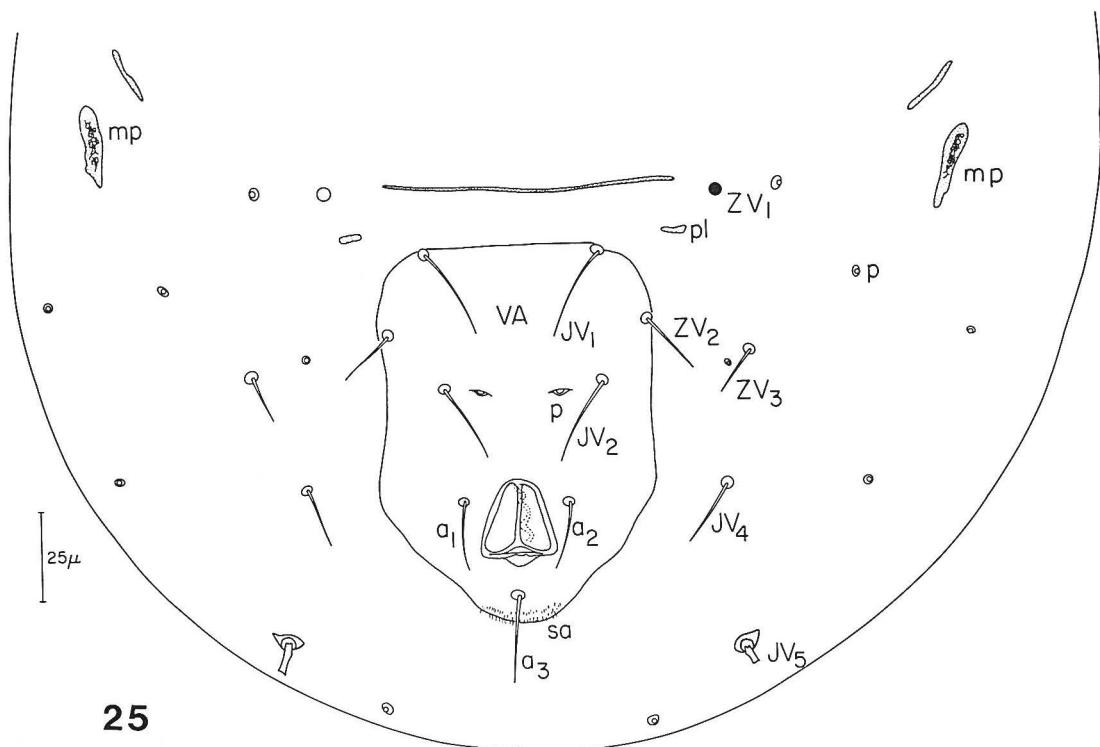
ADULT

DORSUM (Figs. 23, 27). Podonotal and opisthonal shields fused, forming a complete dorsal shield, which is smooth over the entire surface. Female (Fig. 23) : length (between bases of j_1 and j_5) 344 (324-360), width of the dorsal shield at the

constricted point (R_1 level) 218 (209-222). Dorsal shield with 17 pairs of setae : j_1 29 (26-31), j_3 50 (46-52), j_4 7 (6-7), j_5 6 (5-7), j_6 7 (6-8), J_2 7 (6-7), J_5 10 (9-11), z_2 12 (9-14), z_4 27 (23-32), z_5 5 (5-7), Z_1 7 (6-8), Z_4 barbed, 85 (82-90), Z_5 barbed, 188 (182-193), s_4 69 (65-74), S_2 12 (10-13), S_4 8 (8-9), S_5 8 (8-9), r_3 on membrane, 18 (17-20), R_1 on membrane, 10 (9-12). Male (Fig. 27) : length (between bases of j_1 and J_5) 274 (259-293), width of dorsal shield at level of R_1 196 (188-199). Dorsal shield with 19 pairs of setae : j_1 25 (22-28), j_3 45 (42-49), j_4 7 (6-8), j_5 6 (5-7), j_6 8 (6-9), J_2 7 (6-9), J_5 9 (9-10), z_2 17 (15-20), z_4 30 (25-34), z_5 6 (5-6), Z_1 7 (7-8), Z_4 barbed, 64 (60-65), Z_5 barbed, 117 (116-120), s_4 56 (52-59), S_2 14 (12-15), S_4 9 (8-10), S_5 9 (8-9), r_3 18 (17-20), R_1 10 (9-11).

VENTER (Figs. 24, 25, 28). Ventral shields well defined. Female (Figs. 24, 25) : sternal shield (ST) with 3 pairs of sternal setae (S_1 , S_2 , S_3), and 2 pairs





FIGS. 25-26. *Amblyseius colimensis* n. sp. Female. 25. — Ventri-anal area. 26. — Spermatheca.

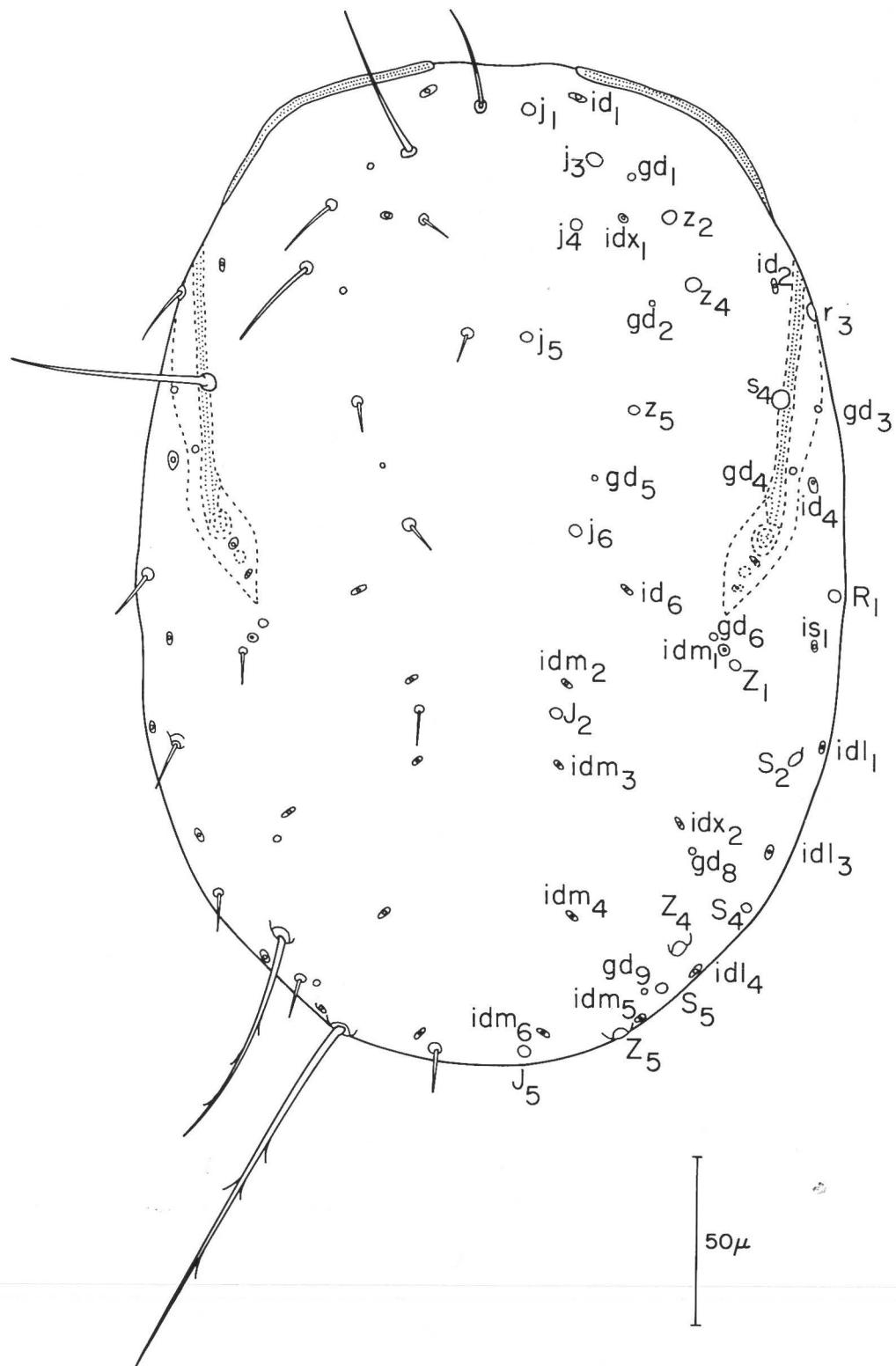
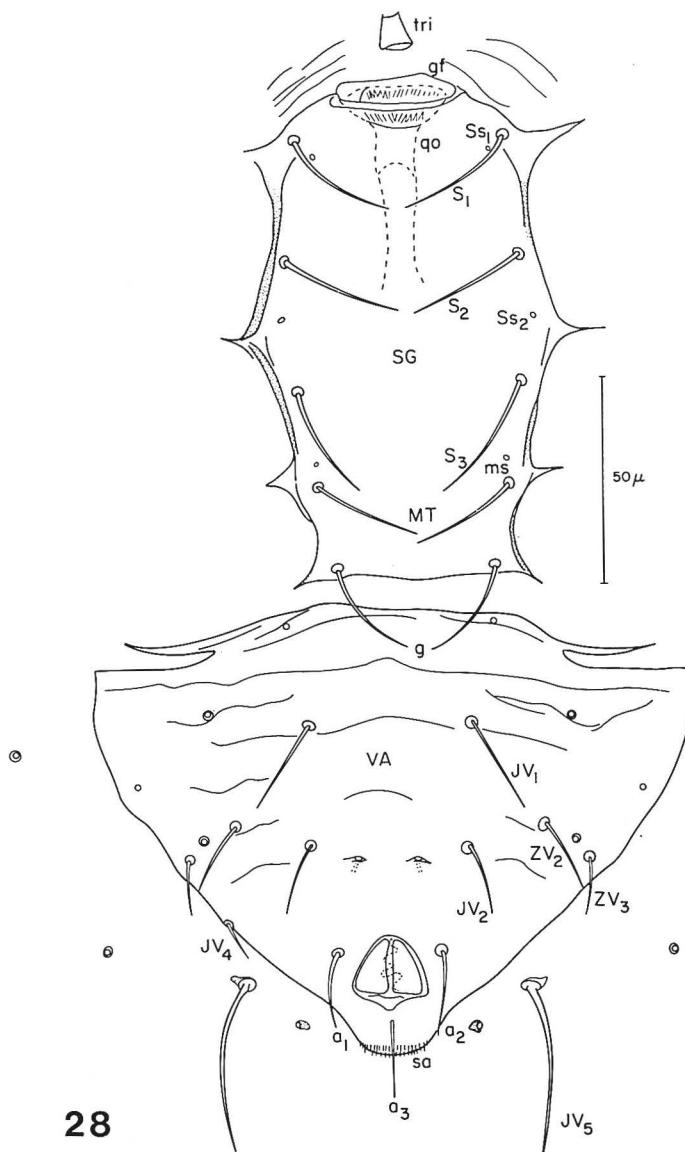
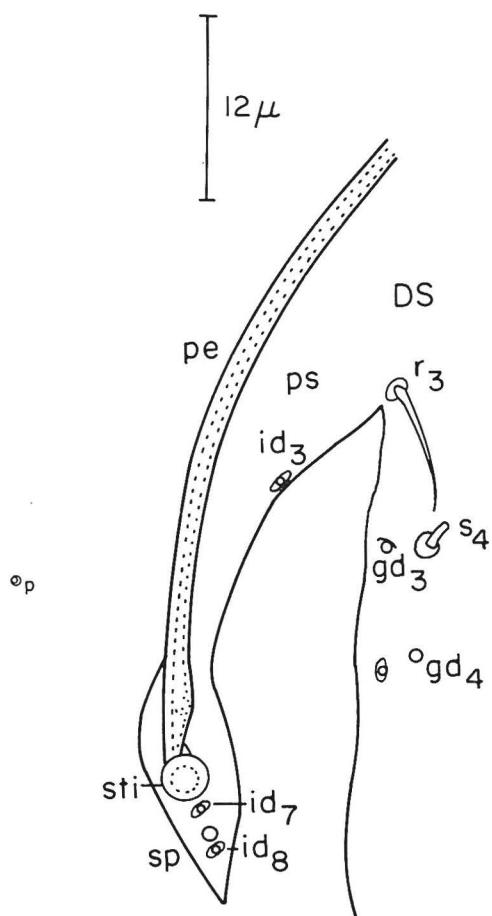


FIG. 27. *Amblyseius colimensis* n. sp. Male. Dorsum.



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29

FIGS. 28-29. *Amblyseius colimensis* n. sp. Male. 28. — Venter. 29. — Fused dorsal and peritremal shield.

of sensillae (Ss_1 , Ss_2) near bases of S_1 and S_3 ; length at the medial section 64 (62-66). Sternal shield with anterior lateral projection reaching the anterior region of coxa II and with a pore-like structure at the end of each of these projections; posterior margin of the shield with lateral truncated lobes. Metasternal setae (MT) on platelet (MS) with sensillae (ms). Length of genital shield (G) at the medial region, not including genital flap (gf), 84

(79-89); maximum width 77 (69-86); genital flap semicircular with scalloped margin and lateral arms reaching coxae IV; a pair of pores present on the surrounding membrane posterolaterally to genital setae (g), and a thin, transverse platelet (pl) behind genital shield. Ventrianal shield (Fig. 25, VA) rounded at the anterior corners, length at the medial region 112 (103-119), width at level of seta ZV_2 84 (77-90), with 3 pairs of preanal setae (JV_1 ,

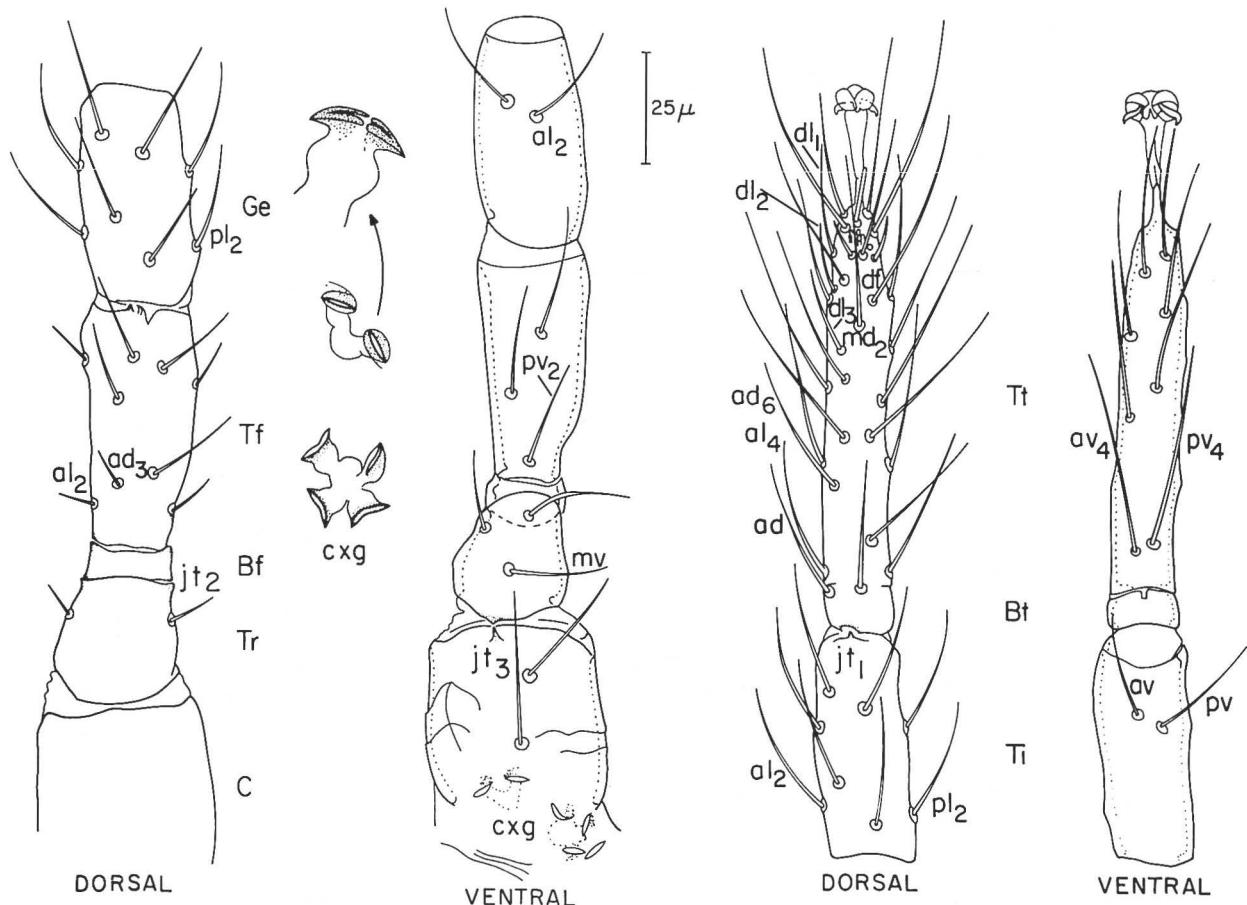


FIG. 30. Leg I of *Amblyseius colimensis* n. sp. Female. C = coxa; Tr = trochanter; Bf = basifemur; Tf = telofemur; Ge = genu; Ti = tibia; Bt = basitarsus; Tt = telotarsus.

JV_2 , ZV_2), and 1 pair of pores mediad and slightly posterior to JV_2 ; 3 anal setae (a_1 , a_2 , a_3) and setose processes present; surrounding membrane with 4 pairs of setae (JV_4 , JV_5 , ZV_1 , ZV_3), and 6 pairs of pores; 2 pairs of metapodal platelets (mp) with pebbled surface, 1 pair of small platelets (pl) behind ZV_1 .

Endopodal and parapodal shields present. Spermatheca (Fig. 26) pyriform when vesicle (Ve) expanded; cervix (ce) and atrium (at) forming an angular tube, cervix length 12 (11-13), major duct (ma) and minor duct (mi) well defined.

Peritremal shield (Fig. 23, ps) extensions fused anteriorly with dorsal shield at the level of id_1 sensillae. Stigma (sti), secondary pore (sp), and

peritreme (pe) on peritremal shield, which also bears 3 pairs of sensillae (id_3 , id_7 , id_8) and 1 pair of cuticular openings (gd_3). Peritreme extending to level of j_1 seta.

Male (Fig. 28). Ventral shields well sclerotized. Sternogenital shield (SG) length at the medial section 116 (114-120) with 5 pairs of setae (S_1 , S_2 , S_3 , MT , g), and 3 pairs of sensillae (Ss_1 , Ss_2 , ms). Genital opening at anterior margin of sternogenital shield, with internal chitinous organ (qo) and genital flap (gf) which are protruded during mating. Ventrianal shield (VA) with a few striations, length at the medial section 117 (108-122), maximum width 147 (145-150), with 4 pairs of preanal setae (JV_1 , JV_2 , ZV_2 , ZV_3) (some specimens also have 1

or 2 JV_4 setae), and 5 pairs of cuticular pores ; surrounding membrane with 1 pair of setae (JV_5) and 3 pairs of cuticular pores.

Peritremal shield (Fig. 29, *ps*) fused with dorsal shield at level r_3 setae. Stigma (*sti*), secondary pore (*sp*) and peritreme on peritremal shield, which also bears 3 pairs of sensillae (id_3 , id_7 , id_8). Peritreme extending to level of id_1 sensillae.

LEGS. The legs have the same chaetotaxy in both sexes (Table 3). All legs with 1 dorsal tibiotarsal (jt_1), 2 lateral trochanterofemoral (jt_2), and ventral coxotrochanteral joints (jt_3) (Fig. 30). Coxa I with 2 prominent glands (*csg*) with 2 and 4 openings, respectively. Pretarsus (Fig. 31) with 2 claws and pad-like empodium. Dorsal field (Fig. 32) with 11 short pegs or spur-like setae. Leg IV (Fig. 33) with dorsal coxotrochanteral joint (jt_4) as well as 2 lateral trochanteral and 1 ventral coxotrochanteral joints. Macroseta (*pd*) on basitarsus IV : female 73 (69-82), male 57 (56-60). Macrosetae also present on genu and tibia IV and genua of legs I, II, III in both sexes.

ONTOGENETIC DEVELOPMENT OF ORGANOTAXY OF DORSUM AND APPENDAGES

Setae, sensillae and glandular openings are considered in the ontogeny of the organotaxy of the

dorsum, while only the setal ontogeny is considered in relation to the appendages.

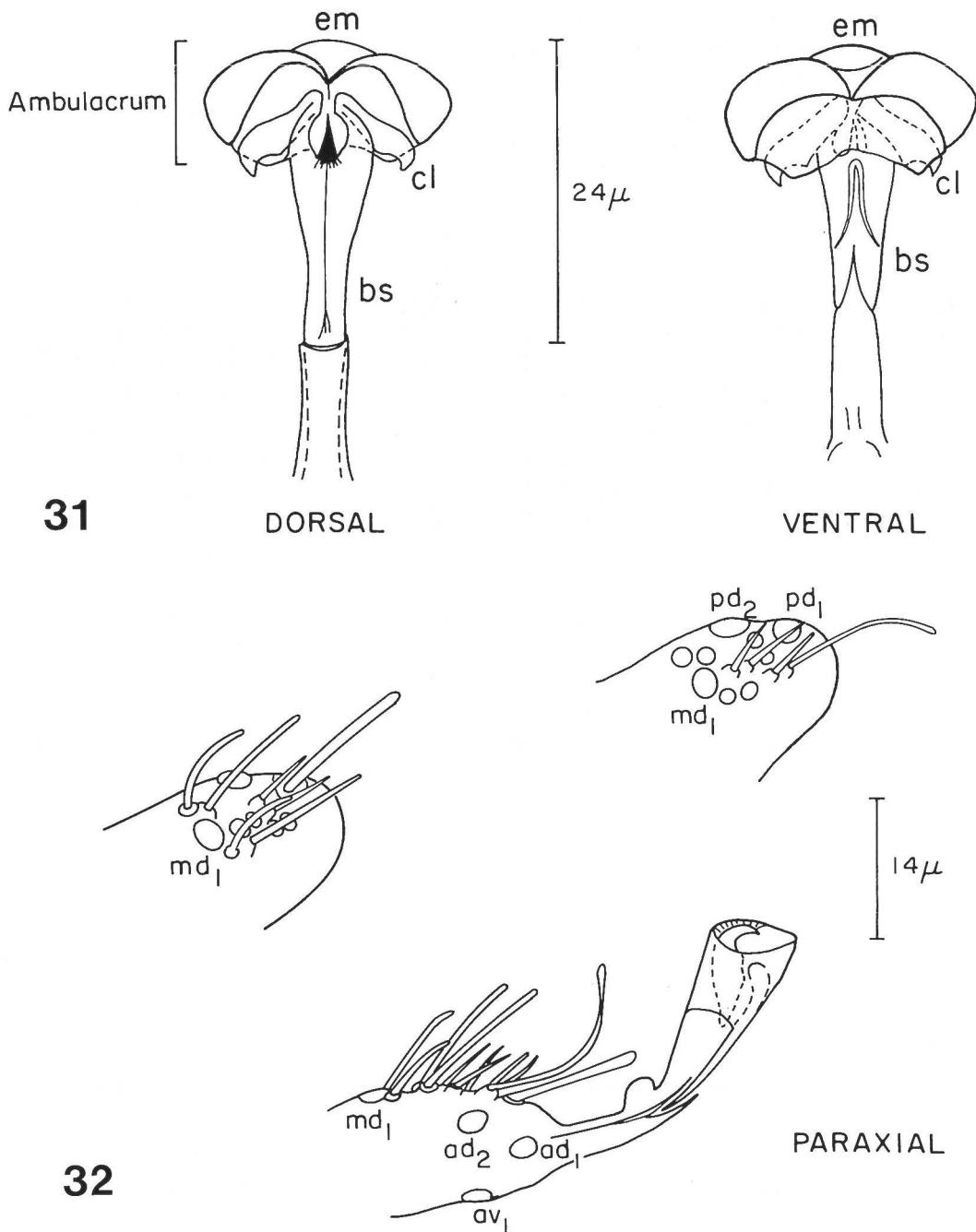
IDIOSOMA

SETAE. ARUTUNIAN (1972) stated that for some *Amblyseius*, the number and arrangement of setae in the dorsal region is the same in the protonymph and deutonymph stages, and changes occur during the molt to protonymph. Definitive dorsal setation in *Amblyseius colimensis* n. sp. is present in the protonymph stage and complete idiosomal chaetotaxy is definitive in the deutonymph stage, as also shown for other phytoseiid mites (CHANT 1958, ARUTUNIAN 1972, SWIRSKI *et al.* 1973, ROWELL *et al.* 1978, 1979). The chaetotaxy for each stage is shown in Table 1. During the molt to protonymph r_3 , R_1 , Z_1 , S_2 and S_4 are added. No changes occur in the body venter except that JV_5 is posteriorly displaced. During the molt to deutonymph, the chaetotaxy of the dorsal surface remains the same. On the ventral surface, metasternal setae (*MT*) and genital (*g*) setae are added in the sternogenital region ; seta ZV_3 is added in the male and ZV_1 , ZV_3 and JV_4 are added in the female. Seta JV_5 is completely displaced posteriorly. During the molt to adult, no setae are added. However, exceptions

TABLE 1 : Ontogenetic development of the idiosomal chaetotaxy in *Amblyseius colimensis* n. sp. (Acarina : Phytoseiidae).

DORSUM					
Stage	Central	Medio lateral	Lateral	Marginal	
Larva	$j_1 j_3 j_4 j_5 j_6$	$z_2 z_4 z_5$	$Z_4 Z_5$	s_4	S_5
Protonymph	$j_1 j_3 j_4 j_5 j_6 J_2 J_5$	$z_2 z_4 z_5 Z_1 Z_4 Z_5$		$s_4 S_2 S_4 S_5$	$r_3 R_1$
Deutonymph	$j_1 j_3 j_4 j_5 j_6 J_2 J_5$	$z_2 z_4 z_5 Z_1 Z_4 Z_5$		$s_4 S_2 S_4 S_5$	$r_3 R_1$

VENTER					
	sternogenital		Medio lateral		Anal
Larva	$S_1 S_2 S_3$	$JV_1 JV_2$	JV_5	ZV_2	$a_1 a_2 a_3$
Protonymph	$S_1 S_2 S_3$	$JV_1 JV_2$	JV_5	ZV_2	$a_1 a_2 a_3$
Deutonymph	$S_1 S_2 S_3 MT g$	$\delta JV_1 JV_2$	JV_5	$ZV_2 ZV_3$	$a_1 a_2 a_3$
		$\varphi JV_1 JV_2 JV_4 JV_5$		$ZV_1 ZV_2 ZV_3$	$a_1 a_2 a_3$



FIGS. 31-32. *Amblyseius colimensis* n. sp. Female. Leg I. 31. — Pretarsus. em = empodium; cl = claw; bs = base. 32. — Dorsal field.

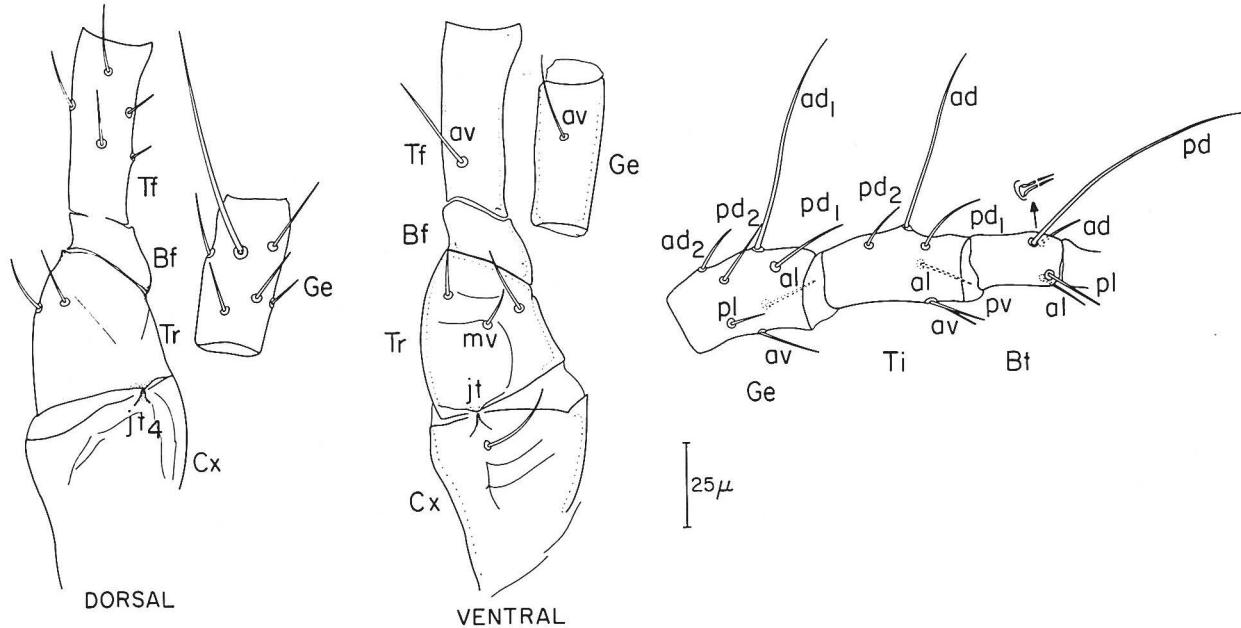


FIG. 33. *Amblyseius colimensis* n. sp. Female. Leg IV.

may occur in some males where 1 or 2 JV_4 setae may be added.

SENSILLAE (Figs. 17, 19, 21, 23, 27, and Table 2). Larva. This stage shows 7 pairs of sensillae. Protonymph. This stage shows the beginning of sclerotization of the interscutal membrane between shields. The sensillae id_3 , idl_1 and idl_3 are added; podonotal shield with the same sensillae as larva; idm_4 and idl_4 incorporated in the opisthonotal shield; idm_6 also added to this shield. Deutonymph. The shields are partially formed and fused. The

sensillae idl_7 is added to the membrane; podonotal shield adds id_1 . Sensillae idl_2 and idl_3 incorporated on the opisthonotal shield from the membrane. This shield also adds idm_1 , idm_3 and idx_2 . Adult. The dorsal shield is completely developed. All the sensillae are located on it; the dorsum adds idm_2 and is_1 . Peritremal shield bears $id_{3=}$, id_7 and id_8 .

GLANDULAR OPENINGS (Figs. 17, 19, 21, 23, 27 and Table 2). The full complement of glandular openings appears in the deutonymph stage. Larva. The podonotal shield bears gd_2 . Protonymph. This

TABLE 2. Sensillae and glandular openings of the dorsum in *Amblyseius colimensis* n. sp.

Stage	Surrounding membrane	Podonotal shield	Opisthonotal shield
Larva	idl_4 idm_4	idx_1 id_2 id_3 id_6 gd_2	idm_5
Protonymph	idl_1 idl_3 idl_4 idm_4 id_3 gd_6	idx_1 id_2 id_3 id_6 gd_2	idm_4 idm_5 idm_6 idl_4
Deutonymph	idl_1 idl_3 idl_4 idl_7 idm_4 id_3 gd_3 gd_6	idx_1 id_1 id_2 id_4 id_6 gd_1 gd_2 gd_4 gd_5	idm_1 idm_3 idm_4 idm_5 idm_6 idl_1 idl_3 idl_4 idx_2 gd_8 gd_9

stage adds gd_6 to the surrounding membrane, no changes occur on the podonotal and opisthonal shields. Deutonymph. The membrane adds gd_3 ; podonotal shield bears gd_1 , gd_4 and gd_5 ; opisthonal shield bears gd_8 and gd_9 . Adult. All the glandular openings are located on the dorsal shield, except gd_3 which appears in the female on the peritremal shield.

APPENDAGES

As in the idiosoma, palp and leg chaetotaxy reaches its full complement in the deutonymph stage (Table 3). Only a few setae are added during the ontogenetic development of the palps. In the legs, the major addition of setae occur in the molt from protonymph to deutonymph.

REMARKS. *Amblyseius colimensis* n. sp. was present in a consignment of citrus leaf pieces, containing parasitized woolly whitefly *Aleurocanthus floccosus* (Maskell) from Manzanillo, Colima State, Mexico. The material was shipped by B. DEBACH and M. ROSE¹ to the quarantine facility of the University of California, Riverside. From those

mites, an insectary culture was established and studies were conducted on their progeny.

The adult females of *Amblyseius colimensis* n. sp. resemble *Amblyseius divisus* De Leon, 1961; *Amblyseius sinuatus* De Leon, 1961; *Amblyseius potentillae* (Garman, 1958), and *Amblyseius andersoni* (Chant, 1957). *A. colimensis* can be distinguished from *A. divisus* by the shape of the spermatheca, lengths of the dorsal setae Z_4 and Z_5 , and the length and width of the dorsal shield; from *A. sinuatus* by differences in lengths of the setae j_3 , z_2 , z_4 , S_2 , Z_4 and Z_5 , and the constriction in the middle region of the ventrianal shield in *A. sinuatus*; from *A. andersoni* by the shape of the spermatheca and differences in lengths of setae j_3 , s_4 , 4_4 and Z_5 ; and from *A. potentillae* by differences in shape of the spermatheca; no differences were considered on the dorsal setae between the two species because the measurements were not given in the original description of *A. potentillae*.

TYPE SERIES. Holotype : ♀ original sample. Allotype : ♂ from laboratory culture. Paratypes : 2 ♀♀ from original sample. 22 ♀♀ and 9 ♂♂ from laboratory culture. The holotype and allotype are deposited in the U.S. National Museum of Natural

TABLE 3 : Ontogenetic development of the appendage chaetotaxy in *Amblyseius colimensis* n. sp. (Acarina : Phytoseiidae).

Stage	Appendages	Coxa	Trochanter	Femur		Genu	Tibia	Tarsus	
				Basifemur	Telofemur			Basi-tarsus	Telotarsus
Larva	Palp	2	0		1-1-1-1	1-1-1-1-1	13		10
	Leg I	0/2	1-0/1-0/1-1	0	2-2/1-2/1-2	1-2/1-2/1-1	1-2/1-2/1-1	1	3-4/4-1-4/3-3
	II	1/2	1-0/1-0/1-1	0	1-2/1-2-1	1-2-2-1	1-1/1-2/1-1	1-1-1-1	2-2/2-2/2-2
	III	0/2	1-1/1-0/1-0	0/1	1-2-1-0	1-2-2-1	1-1/1-2/1-1	1-1-1-1	2-2/2-2/2-2
Protonymph	Palp	4	0/1		1-1-1-1	1-1-1-1-1	13		14
	Leg I	0/2	1-0/1-0/1-1	0	2-2/1-2/1-2	1-2/1-2/1-1	1-2/1-2/1-1	1	3-5/4-2-5/4-3
	II	0/2	1-0/1-0/1-1	0	1-2/1-2-1	1-2-2-1	1-1/1-2/1-1	1-1-1-1	2-2/2-1-2/2-2
	III	0/2	1-1/1-0/1-0	0/1	1-2/1-2-1	1-2-2-1	1-1/1-2/1-1	1-1-1-1	2-2/2-1-2/2-2
	IV	0/1	1-1/1-0/1-0	0	1-2-1-0	1-2-2-0	1-1/1-2/1-0	1-1-1-1	2-2/2-1-2/2-2
Deutonymph and Adult	Palp	4	0-0/1-0/1-0		1-1-1-1	2-1-1-1-1	14		15
	Leg I	0/2	1-0/1-0/1-1/1-1	0	2-3/1-2/2-2	2-2/1-2/1-2	2-2/1-2/1-2	0-1-1-0	4-6/4-2-6/4-4+3
	II	0/2	1-0/1-0/1-1/1-1	1	1-3/1-2/1-1	2-2-2-1	1-1/1-2/1-1	1-1-1-1	2-2/2-1-2/2-2
	III	0/2	1-1/1-0/1-0/1-0	0/1	1-2-1-1	1-2/1-2-1	1-2/1-2/1-1	1-1-1-1	2-2/2-1-2/2-2
	IV	0/1	1-1/1-0/1-0/1-0	0	1-2/1-1-1	1-2/1-2-1	1-1/1-2/1-0	1-1-1-1	2-2/2-1-2/2-2

1. University of California, Riverside, U.S.A.

History (Washington, D.C.); 14 paratypes are deposited in the Florida State Collection of Arthropods (FSCA), Gainesville, Florida. Nineteen paratypes (14 ♀♀ and 5 ♂♂) and the immature stages are deposited in the Division of Biological Control, Department of Entomology, University of California, Riverside, CA.

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