

**PHYTOSEIID MITES FROM GUATEMALA,  
WITH DESCRIPTIONS OF TWO NEW SPECIES AND  
REDEFINITIONS OF THE GENERA *EUSEIUS*,  
*TYPHLOSEIOPSIS*, AND THE *TYPHLODROMUS*  
*OCCIDENTALIS* SPECIES-GROUP  
(ACARI: MESOSTIGMATA)**

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*Abstract.* Collection records and species diagnoses are given for 22 species of Phytoseiidae from Guatemala, including 2 new species, *Typhlodromus porresi* and *Typhloseiopsis maryae*, which are described. The genera *Euseius* and *Typhloseiopsis* and the *occidentalis* species-group of *Typhlodromus* are redefined.

The family Phytoseiidae contains species that are important predators of phytophagous mites (McMurtry et al. 1970). The number of described species exceeds 800 (Chant & Yoshida Shaul 1980). Although extensive collecting of Phytoseiidae has been done in Mexico (DeLeon 1959a, 1959b, 1959c, 1961, 1965b), Costa Rica, El Salvador, and Honduras (Chant & Baker 1965), there are few records from Guatemala. The majority of the material included in this paper was collected by me with M.A. Porres (Plantadores Ornamentales Unidos, S.A., Apdo. 53, Guatemala) and E.R. Oatman (University of California, Riverside) during a survey from February 14-25, 1977 for natural enemies of mites on avocado. Some of the mites collected were shipped alive to the quarantine facility at the University of California, Riverside, for propagation and field release (in California) for attempted establishment as predators of the avocado brown mite, *Oligonychus punicae* (Hirst). Some specimens, where indicated, were collected by C.A. Fleschner (Emeritus, University of California, Riverside) during earlier visits to Guatemala.

The generic placement of species generally follows the concepts of Chant (1965). For the present, the only additional genera recognized are *Euseius* Wainstein and *Typhloseiopsis* DeLeon, which are easily distinguishable from all species-groups in *Amblyseius* Berlese and *Typhlodromus* Scheuten, respectively. I anticipate recognition of more genera when other groups can be better defined by a combination of characters.

The following abbreviations are used for museums or collections: NMNH, U.S. National Museum of Natural History, Washington, D.C.; MCZ, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts; FSCA, Florida

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State Collection of Arthropods, Gainesville, Florida; UCR, Division of Biological Control, University of California, Riverside, California (author's collection).

All measurements are in micrometres. The setal nomenclature follows that of Rowell et al. (1978).

### Genus *Amblyseius* Berlese

*Amblyseius* Berlese, 1914: 143.

#### *Amblyseius corderoi* Chant & Baker

Fig. 1

*Amblyseius corderoi* Chant & Baker, 1965: 19–20.

*Diagnosis.* This species is characterized among *Amblyseius* with long (ca. 250  $\mu\text{m}$ ) Z5 setae, by large (48  $\mu\text{m}$ ), heavily sclerotized chelicerae with 15–16 teeth on the fixed digit and 5–6 teeth on the movable digit, and by the long (ca. 54  $\mu\text{m}$ ), slender, tubular cervix of the spermatheca (Fig. 1).

*Previous records.* Holotype ♀ (NMNH), HONDURAS: Copan, 28.II.1959. Other specimens from HONDURAS and COSTA RICA (Chant & Baker 1965).

*Guatemalan records.* 2♀, Tikal, on citrus leaves.

*Supplementary description.* Holotype ♀. *Dorsal shield* smooth, 408  $\mu\text{m}$  long, 288 wide at level of s4, 307 wide at level of S2. Dorsal setae measurements: j1 44, j3 55, j4 6, j5 7, j6 8, J2 7, J5 7, z2 14, z4 11, z5 4, Z1 7, Z4 139, Z5 264, s4 133, S2 12, S4 11, S5 10. Setae r3 20, R1 11, both on membranous cuticle. Peritrematal shield relatively wide (22) at level between j1 and j3. *Sternal shield* length 84 at midline, width 86 between sternal setae II, 92 between sternal setae III. Posterior margin of shield straight except for slight lateral protrusions. Sternal setae IV on platelets. Genital shield 96 wide, ventrianal shield 149 long, 84 wide, bearing 3 pairs of preanal setae and a pair of prominent preanal pores. Anal orifice relatively large, 38 long; 29 wide near posterior margin. Setae JV5 (ventrocaudals) 84. *Chelicera.* Fixed digit 54, bearing 14–16 teeth, movable digit 54 with 5 or 6 teeth. *Spermatheca* with long, tubular cervix, length of cervix plus atrium 46. *Legs.* Macrosetae: SgeI 53, SgeII 46, SgeIII 62, SgeIV 120, StilV (broken), StaIV 88. Seven setae each on gell, III, IV.

*Remarks.* Measurements of the 2 Guatemalan specimens are similar to those of the holotype.

#### *Amblyseius chiapensis* DeLeon

Fig. 2

*Amblyseius chiapensis* DeLeon, 1961: 85, 87.

*Diagnosis.* This species is characterized by long Z5 setae (205–240  $\mu\text{m}$ ), the shape of the spermatheca (Fig. 2), the shape of the ventrianal shield (length : width ratio ca. 1.55:1), and the large pores on the ventrianal shield (DeLeon 1961).

*Previous records.* Holotype ♀ (MCZ), paratypes, MEXICO: Chiapas: Tuxtla Gutierrez, 18.I.1957. Also recorded from PUERTO RICO (Denmark & Muma 1975); BRAZIL (Denmark & Muma 1973); COLOMBIA (Moraes et al. 1982); COSTA RICA: Esparta, 19.II.1968, on unidentified tree (UCR); and EL SALVADOR: San Salvador, 23.III.1970, on citrus (UCR).

*Guatemalan records.* 5♀, 2♂, Esquintla, on citrus; 2♀, Suchitepéquez: Tiquisate, on *Terminalia catappa*; 1♀, Cuyotenango, on citrus.

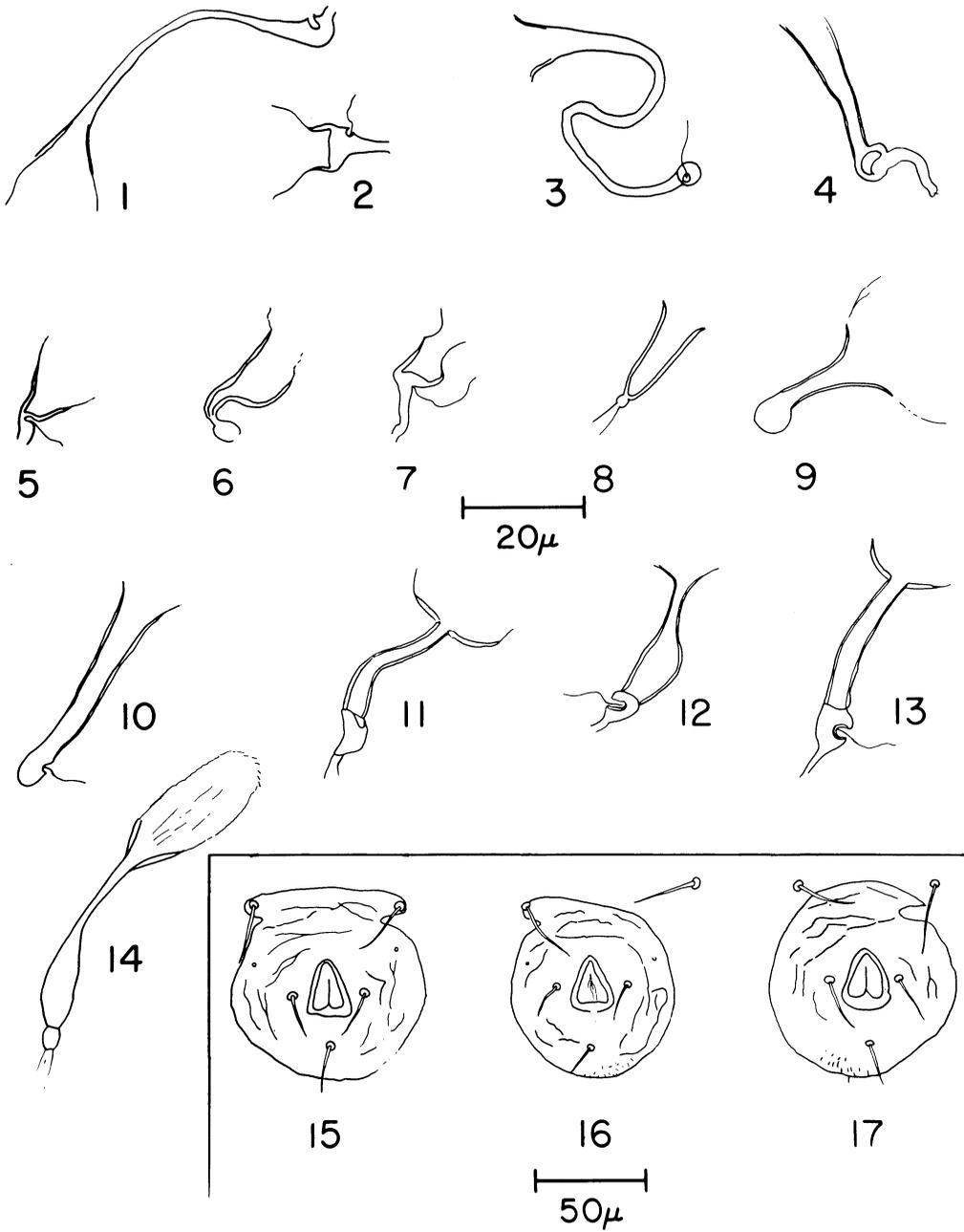


FIG. 1-17. 1-14, spermathecae: 1, *Amblyseius corderoi*; 2, *A. chiapensis*; 3, *A. segregans*; 4, *A. herbicolus*; 5, *A. elongatus*; 6, *A. spinigerus*; 7, *A. quercicolus*; 8, *A. anonymus*; 9, *A. peregrinus*; 10, *A. limonicus*; 11, *Euseius hibisci*; 12, *E. naindaime*; 13, *E. concordis*; 14, *Phytoseiulus macropilis*. 15-17, ventral shields of *P. macropilis*.

*Remarks.* Setal lengths of Guatemalan specimens are close to those given in the original description (DeLeon 1961). Guatemalan specimens have 2 teeth on the movable cheliceral digit, although DeLeon indicates only 1. The movable digit has 10–12 teeth; digits are 33–35 long. *A. chiapensis* was introduced to southern California from Costa Rica and El Salvador. It was released on citrus and avocado trees but apparently did not become established.

### **Amblyseius segregans** DeLeon

Fig. 3

*Amblyseius segregans* DeLeon, 1966: 90.

*Diagnosis.* A species with long Z5 setae (200  $\mu\text{m}$  or more), *A. segregans* can be distinguished by the combination of a divided ventrianal shield and a very long, thin, tubular cervix of the spermatheca (Fig. 3). *Amblyseius perditus* Chant & Baker also has a divided ventrianal shield, but the cervix is considerably shorter than that of *A. segregans*.

*Previous records.* Holotype ♀ (mcz), 1♀ paratype, BRITISH GUIANA: Bartica Nature Reserve, 26.X.1963.

*Guatemalan records.* 2♀, San Jose Pinula (40 km SE of Guatemala City), on citrus.

*Comparative measurements.* The Guatemalan specimens are generally larger, having larger dorsal shields and longer macrosetae on the legs, than those of the holotype. Some measurements in the Guatemalan specimens, in comparison with measurements of the holotype (shown in parentheses) are as follows: dorsal shield length 384–398 (320), width 254–262 (208), genital shield width 98–103 (79), ventral shield width 78–80 (60), anal shield width 84–88 (68), j3 52–54 (36), s4 88–96 (70), Z4 88 (68), Z5 250 (199), SgeI 48–50 (48), SgeII 44–46 (42), SgeIII 54–61 (43), StiIII 48 (36), SgeIV 120 (87), StiIV 101–105 (63), StaIV 74–80 (72). Cervix of spermatheca ca. 54 (36). Fixed digit of chelicera 36  $\mu\text{m}$  long (holotype 31), with 9–10 teeth plus 2 subapical teeth; movable digit 36 long (holotype 32) and with 3 teeth.

*Remarks.* Most of the shield and setal measurements for the Guatemalan specimens are ca. 20% greater than those of the holotype but are very similar to those on a specimen from Honduras.

### **Amblyseius herbicolus** Chant

Fig. 4

*Typhlodromus (Amblyseius) herbicolus* Chant, 1959: 84–85.

*Amblyseius herbicolus*: Daneshvar & Denmark, 1982: 5.

*Amblyseius largoensis* Muma, 1961: 287.—Schuster & Pritchard, 1963: 237.—Chant & Baker, 1965: 18.—van der Merwe, 1968: 135.

*Amblyseius deleari* Muma & Denmark, 1970: 68.

*Diagnosis.* This species, with long Z5 setae (250–270  $\mu\text{m}$ ) and multidentate (ca. 12 teeth) fixed digit of chelicera, can be distinguished by a vase-shaped ventrianal shield and an elongated, fundibuliform cervix of the spermatheca (Fig. 4) that is narrow where it joins the enlarged atrium, widening distally. The closely related *A. largoensis* has a parallel-sided, tubular cervix. *Amblyseius eharai* Amitai & Swirski differs

from *A. herbicolus* by having a lobed rather than straight posterior margin of the sternal shield (Amitai & Swirski 1981).

*Previous records.* Holotype ♀ (NMNH), PORTUGAL, from bromeliad imported at Boston, Massachusetts 13.VIII.1955. This species appears to be distributed worldwide in tropical and subtropical areas. Other records include USA: CALIFORNIA (Schuster & Pritchard 1963), FLORIDA (Muma & Denmark 1970); CENTRAL AMERICA (Chant & Baker 1965); SOUTH AFRICA (van der Merwe 1968); BRAZIL (Denmark & Muma 1973); COLOMBIA (Denmark & Muma 1972); MADAGASCAR (Blommers 1976); THAILAND (Ehara & Bhandhufalck 1977); TAIWAN (Tseng 1976); AUSTRALIA (Schicha 1981); and IRAN (Daneshvar & Denmark 1982).

*Guatemalan record.* 1♀, Guatemala City, 3.I.1954, on orange leaf (C.A. Fleschner).

*Remarks.* Muma & Denmark (1970) pointed out that the name *A. largoensis* Muma had been used for 2 different species; consequently, they named the species with the fundibuliform cervix of the spermatheca *A. deleoni* Muma & Denmark and retained the name *A. largoensis* for the species with the parallel-sided, tubular cervix. Daneshvar & Denmark (1982) synonymized *A. deleoni* under *herbicolus*. Probably many records of *A. largoensis* actually refer to *A. herbicolus*. Both species were redescribed by Schicha (1981).

### **Amblyseius elongatus** (Garman)

Fig. 5

*Amblyseius elongatus* Garman, 1958: 79.

*Amblyseius elongatus*: Kennett, 1958: 476.—Schuster & Pritchard, 1963: 234.—Chant & Baker, 1965: 17.

*Amblyseius elongatus*: Muma, 1961: 278.

*Diagnosis.* A species with long setae Z5 (over 250 µm) and s4 (125 µm) and multidentate (12–14) fixed digit of the chelicera, *Amblyseius elongatus* can be distinguished from similar species by the absence of seta J2, the characteristic shape of the spermatheca (Fig. 5), the shape of the ventrianal shield and locations of the preanal setae (see Chant & Baker 1965, Schuster & Pritchard 1963), and preanal pores are directly posterior to setae JV2.

*Previous records.* Holotype ♀ (NMNH), GUATEMALA, from orchid plant intercepted at Brownsville, Texas. Other records are USA: NEW JERSEY (Specht 1968), CALIFORNIA (Kennett 1958); GUATEMALA: NICARAGUA; and COSTA RICA (Chant & Baker 1965).

*Additional Guatemalan records.* 1♀, 1♂, Guatemala City, 3.I.1954, on orange (C.A. Fleschner); 1♀, Antigua Guatemala, 5.XII.1953, on avocado (Fleschner); 2♀, Suchitepéquez: San Bernardino, on cacao.

*Remarks.* Muma & Denmark (1970) and Tuttle & Muma (1973) pointed out that the species *A. dorsatus* (Muma) and *A. solens* (DeLeon) may prove to be synonyms of *A. elongatus*.

The holotype of *A. elongatus* was not available for study. Measurements of setae and shields of the 4 specimens considered here were almost identical to those given for the species by Schuster & Pritchard (1963).

**Amblyseius spinigerus** Chant & Baker

Fig. 6

*Amblyseius spinigerus* Chant & Baker, 1965: 20.

*Diagnosis.* This species can be distinguished by the following combination of characters: all setae on dorsal shield except J5 relatively long, macrosetae on genua of all legs (SgeIV barely discernible); dorsal shield lightly imbricate on posterior  $\frac{1}{2}$ , smooth on anterior  $\frac{1}{2}$ ; and the shape of the spermatheca (Fig. 6). Chant & Baker's (1965) illustration is also diagnostic. Measurements of the holotype are given by Schicha & Elshafie (1980). *Amblyseius spinigerus* is very close to *Typhlodromips benavidesi* Denmark & Andrews (1981) from El Salvador, which has knobbed rather than sharp-pointed macrosetae.

*Measurements.* Setal measurements of the Guatemalan specimen are as follows: j1 30, j3 47, j4 38, j5 46, j6 56, J2 65, J5 11, z2 40, z4 56, z5 24, Z1 68, Z4 71, Z5 110, s4 72, S2 72, S4 60, S5 43, r3 34, R1 36, SgeI and II 31, SgeIII 35, SgeIV 47, StiIV 41, StaIV 90. Fixed digit of chelicera 33 long, bearing 2 subapical plus 7 additional small teeth. Movable digit 33 long, dentition not visible. Lengths of some setae longer than those of holotype as given by Schicha & Elshafie (1980).

*Previous records.* Holotype ♀ (NMNH), COSTA RICA: San Jose, 4.IV.1959.

*Guatemalan record.* 1♀, Sololá: San Lucas, from avocado leaf.

**Amblyseius quercicolus** DeLeon

Fig. 7

*Amblyseius (Typhlodromopsis) quercicolus* DeLeon, 1959a: 116.

*Diagnosis.* The nearly triangular ventrianal shield (DeLeon 1959a), the shape of the spermatheca (Fig. 7), the relatively long setae j3, z4, s4, Z1, Z4, Z5, S2, S4, and the short setae j4–j6, distinguish this species. The fixed digit of the chelicera (34 long) bears 2 large subapical teeth, plus 6 or 7 smaller teeth. The movable digit is 36 long, with 3 teeth.

*Previous records.* Holotype and 1♀ paratype (MCZ), MEXICO: Michoacán: Quiroga, 11.III.1957; 1♀, San Luis Potosi: Ciudad del Maiz, 11.VI.1957.

*Guatemalan records.* 4♀, 1♂, Quiché: Chichicastenango, on avocado.

*Remarks.* The Guatemalan specimens closely resemble the holotype. All measurements of setal lengths fall within the ranges given by DeLeon (1959a).

**Amblyseius anonymus** Chant & Baker

Fig. 8

*Amblyseius anonymus* Chant & Baker, 1965: 21.*Neoseiulus anonymus*: Denmark & Muma, 1972: 27.

*Diagnosis.* *Amblyseius anonymus* is similar to *A. fallacis* (Garman) and *A. idaeus* (Denmark & Muma), but can be distinguished from these species by the number of teeth on the fixed digit of the chelicera (7–8 in *A. anonymus*, 5 in *A. idaeus* and *A. fallacis*),

and by the cervix of the spermatheca (Fig. 8) being more slender and elongate than that of either *A. fallacis* or *A. idaeus*.

*Previous records.* Holotype ♀ (NMNH), HONDURAS: La Lima, 28.X.1958. Also collected in COLOMBIA (Denmark & Muma 1972); BRAZIL (Denmark & Muma 1973); and COSTA RICA (McMurtry, unpubl.).

*Guatemalan records.* 10♀, Sacatepéquez: Santiago, 13.V. 1964, on tomato leaves (C.A. Fleschner).

*Remarks.* Schicha & Elshafie (1980) give measurements and other details not included in the original description of *A. anonymus*.

### **Amblyseius peregrinus** (Muma)

Fig. 9

*Typhlodromus peregrinus* Muma, 1955: 270.

*Typhlodromus (Amblyseius) peregrinus*: Chant, 1959: 97.

*Amblyseius (Typhlodromalus) peregrinus*: Muma, 1961: 288.

*Typhlodromalus peregrinus*: Muma & Denmark, 1970: 88, 90.

*Diagnosis.* The shape of the cervix of the spermatheca (Fig. 9), the shape of the ventrianal shield (Muma 1955), the rugose dorsal shield, and the relatively long setae S2 (28–44 µm), Z4 (42–55), and Z5 (66–80) characterize this species. It is very close to *A. aripo* (DeLeon 1967) from Trinidad, and *A. clavicus* (Denmark & Muma 1973) from Brazil. Detailed comparative studies are needed to determine whether these are valid species.

*Previous records.* Holotype ♀ (NMNH), USA: FLORIDA: Minneola, 24.I.1952, from scaly orange leaves. Collected on a wide variety of plants in FLORIDA (Muma et al. 1970). Also recorded from HAWAII (Prasad 1968b); MEXICO (DeLeon 1959a); HONDURAS; COSTA RICA; NICARAGUA (Chant & Baker 1965); PUERTO RICO (Denmark & Muma 1975); COLOMBIA (Denmark & Muma 1972); and EL SALVADOR (McMurtry, unpubl.).

*Guatemalan records.* 5♀, Sacatepéquez: Santiago, 13.V.1974, on tomato (C.A. Fleschner).

*Comparative measurements.* Measurements of setal lengths for 5 specimens from Guatemala are compared with those of 2 specimens from the type slide (in parentheses): j1 25–30 (29–31), j3 38–40 (35–36), j4 13–14 (12), j5 13–16 (11), j6 16–19 (13), J2 15–18 (14), J5 10–11 (8), z2 24–26 (22–24), z4 31–36 (23–24), z5 15 (11), Z1 19–20 (16–17), Z4 48–54 (42–43), Z5 66–70 (73–79), s4 48–50 (38–40), S2 41–44 (28), S4 26–30 (19), S5 15–19 (14), r3 24–26 (19), R1 17–19 (17–18), SgeI 20–21 (19–28), SgeII 22–23 (19–23), SgeIII 28–30 (28–29), SgeIV 46–48 (46–50), StiIV 24–26 (26), StaIV 77–78 (78). For Guatemalan and type specimens, fixed digit of chelicera 31–35 with 2 subapical and 8 additional teeth, movable digit 33–34 with 3 teeth.

*Remarks.* The specimens from Guatemala, and also specimens from California and El Salvador in my collection, have most dorsal setae longer than the type specimens from Florida, especially setae z4, Z4, s4 and S2.

Muma & Denmark (1962) concluded that *A. peregrinus* is a highly variable species in relation to lengths of the setae, the ratios of the lengths between certain pairs of setae, and the shape of the ventrianal shield and leg macrosetae, and they suggested

TABLE 1. Lengths of certain setae in specimens of *Amblyseius limonicus* from different localities.

	MEAN (RANGE) LENGTHS OF SETAE IN $\mu\text{m}$		
	j3	s4	Z5
Chapol ( $n = 8$ )	33.1 (30–36)	38.9 (36–43)	41.1 (38–47)
San Juan Sacatepéquez ( $n = 8$ )	48.0 (46–51)	68.5 (66–76)	57.1 (54–61)
Chimaltenango ( $n = 4$ )	49.5 (49–50)	70.3 (68–75)	58.5 (56–60)
Chicacao ( $n = 1$ )	32	35	59
California ( $n = 6$ )	58.8 (50–56)	73.8 (72–77)	63.0 (60–66)

that several species may be synonyms of *A. peregrinus*. Muma (1964) synonymized *A. robiniae*, *A. evansi*, and *A. primulae*, all described by Chant (1959), under *A. peregrinus*. Although critical study may reveal the presence of more than 1 species, the opinion of Muma & Denmark (1962, 1970) that this is a single, variable species, is followed here.

### ***Amblyseius limonicus* Garman & McGregor**

Fig. 10

*Amblyseius limonicus* Garman & McGregor, 1956: 11–13.

*Typhlodromus (Amblyseius) limonicus*: Chant, 1959: 96.

*Amblyseius (Typhlodromalus) limonicus*: Muma, 1961: 288.

*Typhlodromalus limonicus*: DeLeon, 1967: 22.—Muma & Denmark, 1970: 90–92.

*Diagnosis.* *Amblyseius limonicus* can be distinguished from other species in this group (*Typhlodromalus* of Muma & Denmark 1970) by the following combination of characters: all setae on dorsal shield minute (less than 15  $\mu\text{m}$ ) except j1, j3, s4, and Z5; relatively long (30–36  $\mu\text{m}$ ) tubular cervix of the spermatheca (Fig. 10); long macrosetae on leg IV ( $ge > 80$ ,  $ta > 100$ ); and a smooth dorsal shield.

*Previous records.* Holotype ♀ (NMNH), [USA] CALIFORNIA: Santa Ana, 20.IX.1940. Also collected in USA: FLORIDA (Muma & Denmark 1970), GEORGIA (DeLeon 1961), various parts of CALIFORNIA (Schuster & Pritchard 1963); NICARAGUA and HONDURAS (Chant & Baker 1965); PUERTO RICO (Denmark & Muma 1975); JAMAICA (Denmark & Muma 1978); HAWAIIAN IS (Prasad 1968b); NEW ZEALAND (Collyer 1964); BRAZIL (Farias et al. 1981); and COLOMBIA (Moraes et al. 1982).

*Guatemalan records.* 8♀, 1♂, Chapol (nr Sololá), on avocado; 14♀, San Juan Sacatepéquez, on *Ricinus communis*; 4♀, 1♂, nr Chimaltenango, on *Zea mays*; 1♀, 1♂, Suchitepéquez: Chicacao, on sugar cane.

*Remarks.* The chelicerae of the Guatemala specimens bear 9–11 teeth on the fixed digit (34 long) and 3 teeth on the movable digit (34 long). Specimens from Chapol have consistently shorter setae j3, s4 and Z5 than those from San Juan Sacatepéquez, Chimaltenango, and California (Table 1). The 1 specimen from Chicacao has j3 and s4 similar in length to those from Chapol, but the length of Z5 is similar to that in specimens from the other locations. The ventrianal and especially the sternal shields of the Chapol specimens seem more lightly sclerotized and ill-defined than specimens from the other locations. Although it is possible that the Chapol specimens represent

a new species, no other morphological differences are detected. As H.A. Denmark (pers. commun.) identified these as *A. limonicus*, and he also considers 3 other species with short j3, s4, and Z5 setae (*A. rapax* DeLeon, *A. arawak* DeLeon, and *A. horatii* DeLeon) to be possible synonyms of *A. limonicus*, the Guatemalan material is all treated as *A. limonicus*, pending study of additional material and/or crossbreeding experiments.

### Genus **Euseius** Wainstein

*Amblyseius* (*Amblyseius*) section *Euseius* Wainstein, 1962: 15.

*Amblyseius* (*Euseius*), DeLeon, 1965a: 125.

*Euseius*: DeLeon, 1966: 86.—Muma & Denmark, 1970.

*Type-species.* *Seiulus finlandicus* Oudemans, 1915, by original designation (Wainstein 1962).

Females with dorsal shield smooth to moderately reticulated and with setae j1, j3–j6, J2, J5, z2, z4, z5, Z1, Z4, Z5, s4 and S2, S4, S5 on dorsal shield. Setae r3 or both r3 and R1 present on shield rather than on interscutal membrane in a few species. Posterior margin of sternal shield usually with median lobe, which may be difficult to discern in weakly sclerotized shields. Genital shield distinctly wider than ventrianal shield, which is usually vase-shaped and widest at level of anal opening. Three pairs of preanal setae on ventrianal shield, arranged in a semi-transverse row with seta JV1 inserted well behind anterior margin of shield. Peritremes relatively short, rarely extending to level of setae j3. Cheliceral digits ca. 25  $\mu\text{m}$  long, fixed digit with 2–7 small to minute teeth, all on distal portion, inner surface of digit concave (in lateral aspect) proximal to teeth (see Schicha 1977 for illustrations); movable digit with 1 small tooth, inner surface concave in lateral aspect. Macrosetae usually present on geIV, tiIV and taIV, and sometimes also on geII and geIII.

*Remarks.* This is a large (60+ species), relatively uniform group both morphologically and biologically. The cheliceral morphology and placement of setae on the ventrianal shield appear to be unique in the Phytoseiidae, and the combination of these features with other character states results in a well-defined genus. All species studied are general feeders which seem to reproduce more rapidly on pollen than on mite prey (Muma & Denmark 1970, McMurtry 1977, 1980). *Euseius* is a cosmopolitan genus, but most species occur in tropical and subtropical regions with only a few widespread species known from temperate climates.

### **Euseius hibisci** (Chant)

*Typhlodromus* (*Amblyseius*) *hibisci* Chant, 1959: 68.

*Amblyseius hibisci*: Schuster & Pritchard, 1963: 228–230.

*Euseius hibisci*: Muma & Denmark, 1970: 94–95.

*Diagnosis.* *E. hibisci* is similar to *E. vivax* Chant & Baker but can be distinguished from *E. vivax* by having longer setae J2 16–24 (12–14 for *E. vivax*), Z1 16–21 (12–15), Z4 19–21 (12–18), and S5 31–45 (23–31).

*Previous records.* Holotype ♀ (NMNH), MEXICO: Sonora: Alamos, 6.III.1951. Also recorded from USA: FLORIDA (Muma & Denmark 1970), CALIFORNIA (Schuster & Pritchard 1963); PUERTO RICO (Denmark & Muma 1975); and JAMAICA (Denmark & Muma 1978).

*Guatemalan records.* Collected from avocado leaves at the following localities: Jocotenango (nr Antigua Guatemala); Chimaltenango: Patzicia; San Juan Sacatepéquez; Quiché: Chichicastenango; Sololá: Godinez; Guatemala: Mixco; and Sacatepéquez: Mixco Viejo. Other collections from *Bauhinia* sp., Guatemala City, and *Ricinus communis*, San Juan Sacatepéquez.

*Remarks.* For the present, this material is treated as *E. hibisci*. Biosystematic studies in progress on material from other parts of Central America and from Mexico suggest the existence of a species complex.

This species was the most common phytoseiid on avocado in Guatemala. It was sometimes found in association with *Oligonychus* species and showed a brown coloration in the gut, indicative of feeding on the brown-colored spider mites. However, it was also frequently collected from trees on which few or no spider mites were present.

### ***Euseius naindaime*** (Chant & Baker)

Fig. 12

*Amblyseius naindaime* Chant & Baker, 1965: 22–23.

*Euseius naindaime*: Denmark & Muma, 1972: 21–22.

*Diagnosis.* This species can be distinguished from closely related species by the shape of the cervix of the spermatheca (Fig. 12), and by its having a concave rather than lobed posterior margin of the sternal shield, short (<25 μm) seta s4, and blunt-tipped macrosetae on leg IV.

*Previous records.* Holotype ♀ (NMNH), HONDURAS: La Lima, 19.IX.1958. Also collected in NICARAGUA (Chant & Baker 1965), and COLOMBIA (Denmark & Muma 1972).

*Guatemalan records.* ♀♀, Suchetepéquez: Cocales, on mango leaves (with *Typhloseiopsis maryae*, n. sp.).

*Remarks.* The Guatemalan specimens conform to Denmark & Muma's (1972) re-description of *E. naindaime*, although some of the setae on the dorsal shield are somewhat longer than the measurements given by Denmark & Muma for the holotype. The ranges in lengths of some setae, based on 5 specimens, are as follows (Denmark & Muma's measurements in parentheses): j3 21–26 (18), Z4 9–11 (6), s4 20–24 (17), S2 12–17 (11), S5 13–17 (11). Measurements of other setae are very close to those given by Denmark & Muma for the holotype.

### ***Euseius concordis*** (Chant)

Fig. 13

*Typhlodromus (Amblyseius) concordis* Chant, 1959: 69–70.

*Amblyseius concordis*: Chant & Baker, 1965: 22.

*Euseius concordis*: Denmark & Muma, 1973: 264.

*Euseius flechtmanni* Denmark & Muma, 1970: 223. **New synonymy.**

*Diagnosis.* *Euseius concordis* is similar to *E. hibisci* and *E. vivax*. The combination of knobbed macrosetae on leg IV, the short lengths of setae Z1 (10–12 μm) and S2

(11–16), and the absence of imbrications on the dorsal shield distinguish *E. concordis* from these 2 species and other closely related *Euseius*. It is distinguished from *E. naindaimeii* by the shape of the cervix of the spermatheca (Fig. 13).

*Previous records.* Holotype ARGENTINA: Entre Rios, on citrus. Also reported from EL SALVADOR and NICARAGUA (Chant & Baker 1965, Denmark & Andrews 1981); BRAZIL (Denmark & Muma 1973); PARAGUAY (cited as *E. flechtmani*, Denmark & Muma 1970); COLOMBIA (Moraes et al. 1982); and COSTA RICA, on *Terminalia catappa* and *Ricinus communis* (McMurtry, unpubl.).

*Guatemalan records.* 3♀, nr Esquintla, on citrus; 2♀, nr El Progreso, on *Acra* species.

*Comparative measurements.* Ranges in measurements from 5 Guatemalan specimens are compared with measurements of the holotype (in parentheses): dorsal shield 297–312 (317) long, 216 (230) wide, j1 23–36 (30), j3 32–36 (37), j4 8–9 (10), j5 8 (9), j6 9–10 (13), J2 9–10 (broken), J5 5 (broken), z2 15–17 (17), z4 19–24 (29), z5 8 (9), Z1 10–11 (11), Z4 10–13 (11), Z5 56–60 (64), s4 29–47 (52), S2 11–14 (14), S4 12–18 (16), S5 13–16 (18), r3 14–16 (16), R1 9–10 (missing). Genital shield 77–85 (84) wide. Macrosetae on leg IV all with bulbous tips. SgeII 24–27 (24), SgeIII 25–29 (29), SgeIV 33–40 (41), StiIV 25–31 (27), StaIV 42–50 (48).

*Remarks.* Macrosetae, as defined by Muma & Denmark (1970), are present on geII and geIII of Guatemalan specimens as well as those from Costa Rica. The statement of Chant & Baker (1965) that there are no macrosetae on legs I–III probably is based on a different interpretation of relatively short but thickened setae.

## Genus *Phytoseiulus* Evans

*Phytoseiulus* Evans, 1952: 397.

### *Phytoseiulus macropilis* (Banks)

Fig. 14–17

*Laelaps macropilis* Banks, 1905: 139.

*Hypoaspis macropilis*: Banks, 1915: 85.—Smith & Summers, 1949: 209–218.

*Phytoseiulus speyeri* Evans, 1952: 398.

*Phytoseiulus macropilis*: Cunliffe & Baker, 1953: 23.

*Phytoseiulus chanti* Ehara, 1966: 135–136.

*Diagnosis.* *P. macropilis* usually can be distinguished from *P. persimilis* by a pair of preanal setae (sometimes only 1 seta) on the ventrianal shield.

*Previous records.* Type ♀ (NMNH), [USA] FLORIDA: Eustis, on water hyacinth. Other records include USA: FLORIDA (Muma & Denmark 1970), CALIFORNIA (Schuster & Pritchard 1963); HAWAIIAN IS (Prasad 1968a); COOK IS (Collyer 1980); PANAMA (Chant & Baker 1965); BRAZIL (Denmark & Muma 1973); PUERTO RICO (Denmark & Muma 1975); JAMAICA (Denmark & Muma 1978); PORTUGAL (Carmona 1966); and CANARY IS (Evans 1952).

*Guatemalan records.* 13♀, San Juan Sacatepéquez, on *Malva*; 1♀, from “elephant ear”; 3♀ from *Greyina robusta*, Panajachel, 19.V.1964, (C.A. Fleschner).

*Remarks.* The number of preanal setae on the ventrianal shield and the shape of the shield show some variation in the Guatemalan material. Of 17 specimens, 13 have 1 pair of preanal setae on the shield, although there is considerable variation in the shape of the shield. The shields in some specimens have constrictions behind the

setae (Fig. 15), while those of other specimens have straight lateral edges. Three specimens have only a single preanal seta on the shield (Fig. 16) and 1 has no preanal setae on a rounded ventrianal shield (Fig. 17), resembling that of *P. persimilis*. Apparently, when the shield has 1 anterior lateral edge or both edges rounded, 1 or both setae are on the membranous cuticle rather than on the shield. Some Californian specimens of *P. macropilis* show a single preanal seta on the shield, but most have a seta on each side. In 25 specimens from Costa Rica, 12 have no preanal setae on the shield, 7 have 1 seta and 6 have 2 setae. Thus, the character of 1 pair or no preanal setae on the ventrianal shield cannot always be used to distinguish *P. macropilis* from *P. persimilis*.

### Genus *Typhlodromus* Scheuten

*Typhlodromus* Scheuten, 1857: 104.

Division of the Typhlodromini into genera or subgenera has been based largely on the number of "postlateral" setae, namely those in the S series, on the dorsal shield (Muma 1961, Schuster & Pritchard 1963, van der Merwe 1968, Wainstein 1962). This has in some instances resulted in closely related species being placed in different genera or unrelated species becoming congeners. For example, the genus *Galendromus*, as interpreted by Muma (1963), or *Metaseiulus*, as interpreted by Schuster & Pritchard (1963), based mainly on the absence of seta S4, includes not only the *occidentalis* group (Chant 1959), redefined below, but also such species as *T. pomi* (Parrott), *T. pomoides* (Schuster & Pritchard) and *T. mcgregori* Chant (subgenus *Menaseius* of Muma 1963), which seem more closely related to the *pini* group (part of *Typhlodromina* sensu Muma or *Typhloseiopsis* sensu Schuster & Pritchard), whose members lack seta S2 as well as S4 (R1 is present) (Mahr & McMurtry 1980). As many of these problems are unresolved in the above-mentioned systems of generic classification and various modifications of them, the system of Chant (1965) is followed here.

#### **occidentalis** group

Females with dorsal shield faintly to strongly imbricate. Setae S4, R1 and sometimes z3 (in *T. pilosus* Chant) absent; most setae on dorsal shield long and serrated, some extending well beyond the bases of the following setae; setae j3 nearly as far anterior as j1. Base of S5 relatively far from margin of dorsal shield, closer to base of Z4 than to that of Z5. Cervix of spermatheca tubular, often very long and slender. Sternal setae I and II on sternal shield. Ventrianal shield somewhat constricted near middle of its length, width of shield greatest near level of anus; normally 4 pairs of setae on shield (aberrations occur in some species); setae ZV1 and usually ZV3 present on membrane. Fixed digit of chelicera with 3 subapical teeth near distal end, movable digit with 1 or 2 teeth. No macrosetae present on legs.

Chant's (1959) diagnosis did not specify which dorsal shield setae were present or absent. The *occidentalis* group as here described includes all species in *Galendromus* (*Galendromus*) Muma and *T. pilosus*.

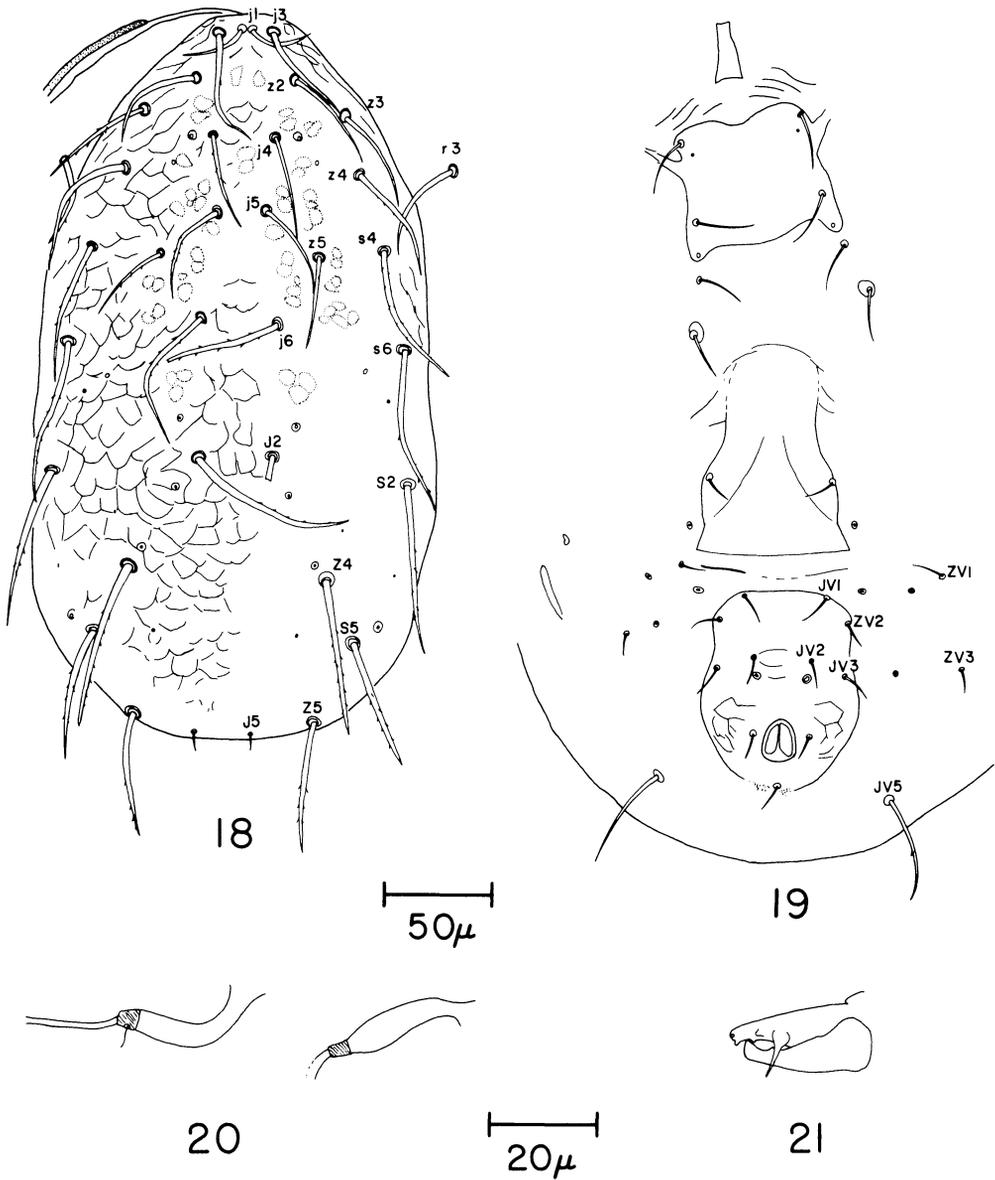


FIG. 18-21. *Typhlodromus porresi*, ♀; 18, dorsal shield; 19, ventral surface; 20, spermathecae; 21, chelicera.

***Typhlodromus porresi* McMurtry, new species**

Fig. 18-21

*Diagnosis.* *T. porresi* can be distinguished from other species of the *occidentalis* group by: shape of spermatheca, medium length of dorsal shield, and long peritreme (extending beyond level of base of seta z2). It is similar to *T. helveolus* Chant but can

be distinguished from it by: smaller size (dorsal shield 328  $\mu\text{m}$  compared to 340–400  $\mu\text{m}$  for *T. helveolus*) (Muma 1963); shorter and broader cervix of the spermatheca; less pronounced reticulation medially between setae j4 and j5, and seta z5 being subequal to j5, rather than considerably shorter than j5. The new species also resembles *T. annectens* DeLeon but *T. annectens* is smaller: the length of the dorsal shield of the holotype is 250 (260 according to DeLeon's original description), has a longer and more slender cervix of the spermatheca, and has 8 setae on geII (7 for *T. porresi*).

♀. *Dorsum*. Dorsal shield 328 long, with prominent reticulation except on anteromedial area of shield. Prominent solenostomes and poroids (Athias-Henriot 1969, 1975) as shown in Fig. 18. Dorsal setae and their measurements as follows: j1 32–34, j3 52–58, j4 44–48, j5 47–48, j6 72, J2 80–83, J5 9, z2 51–52, z3 52–54, z4 60–66, z5 44–46, Z4 71–78, Z5 62–68, s4 68–74, s6 76–80, S2 79–82, S5 60–66; barbs present on most setae. Seta r3 (53–54) located on membranous cuticle; R1 absent. Peritreme extending anteriorly to level between setae j3 and z2. *Venter*. Sternal shield (Fig. 19) length at midline 52, width between bases of sternal setae II 55, bearing 2 pairs of setae and a pair of poroids posterior to base of each pair of setae. Anterior margin of shield medially concave, posterior margin straight or slightly convex with small lateral lobes. Sternal setae III on membrane behind shield; metasternal setae on small platelets. Genital shield width 62 at level of genital setae, 72 at posterior margin; a pair of small platelets situated on membrane posterolaterally to shield. Ventrianal shield shaped as in Fig. 19, bearing 4 pairs of preanal setae (JV1–3, ZV2) and a pair of prominent solenostomes, situated directly posterior to setae JV2. Three pairs of setae (ZV1, ZV3, JV5) and 3 pairs of platelets on membrane around ventrianal shield. Seta JV5 51 long. Two pairs of metapodal platelets, 1 long (26–30), slender, the other small, crescent-shaped. *Chelicera*. Fixed digit (Fig. 21) 24 long, with 3 subapical teeth plus *pilus dentilis*; movable digit 25 long, unidentate. *Spermatheca* (Fig. 20) with distinct atrium; cervix tubular, 24–28 long, narrower near distal end than near base, flared distally. *Legs*. Chaetotactic formula of genu II 2-2/0,2/0-1; genu III 1-2/1,2/0-1; genu IV 1-2/1,2/0-1. No macrosetae on legs.

♂. Unknown.

*Type material*. Holotype ♀, GUATEMALA: Chimaltenango: Patzicia, 18.II.1977, on avocado leaf (NMNH); 1 paratype, Mixco, 17.II.1977, on avocado leaf (author's collection, UCR).

## **Typhlodromus helveolus** Chant

Fig. 22

*Typhlodromus floridanus* Muma, 1955: 269.

*Typhlodromus* (*Typhlodromus*) *helveolus* Chant, 1959: 58.

*Galendromus floridanus*: Muma, 1961: 298.

*Galendromus* (*Galendromus*) *floridanus*: Muma, 1963: 18.

*Galendromus helveolus*: Denmark, 1977: 171.

*Diagnosis*. *T. helveolus* can be distinguished from other species in the *occidentalis* group by the following combination of characters: a long peritreme, extending to seta j3; short setae z5 (30–40) in relation to j5; a long, tubular cervix of the spermatheca (Fig. 22); and seta j6 as long as or longer than distance to base of J2 (Muma 1963).

*Previous collections*. Holotype ♀ (NMNH), [USA] FLORIDA: Lake Alfred, 6.III.1952, on citrus seedlings. Also known from USA: TEXAS (Chant 1959); various parts of MEXICO (DeLeon 1959b); JAMAICA (Denmark & Muma 1978); COSTA RICA and NICARAGUA (Chant & Baker 1965).

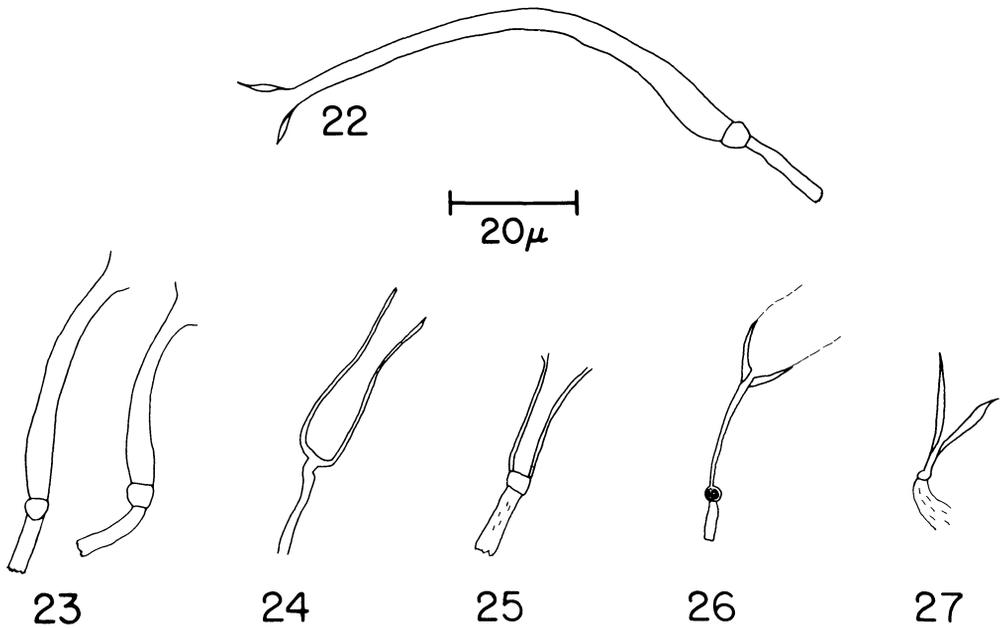


FIG. 22–27. Spermathecae: 22, *Typhlodromus helveolus*; 23, *T. pilosus*; 24, *T. conspicuus*; 25, *T. johnsoni*; 26, *Phytoseius mexicanus*; 27, *P. montanus*.

*Guatemalan records.* 12♀, 1♂, Sacatepéquez: Mixco Viejo, on *Ricinus communis* with heavy infestation of *Eutetranychus banksi* (McGregor); 3♀, Suchitepéquez: Cocal, on *Bixa* sp.; 2♀, Guatemala: Amatitlán; 1♀, Sololá: Panajachel, on *R. communis*.

*Remarks.* Muma (1970) concluded that *T. helveolus* in many instances is responsible for control of the 6-spotted mite, *E. sexmaculatus*, on Florida citrus. He also concluded that it is not an important predator of the citrus red mite, *Panonychus citri* (McGregor), or the Texas citrus mite, *Eutetranychus banksi* (McGregor), because it seems to require highly localized dense colonies of spider mites for population increase.

### ***Typhlodromus pilosus* Chant**

Fig. 23

*Typhlodromus (Typhlodromus) pilosus* Chant, 1959: 53–54.

*Cydnodromella pilosus*: Muma, 1961: 286.

*Chanteius (Allodromus) pilosus*: Wainstein, 1962: 19.

*Typhlodromus pilosus*: Chant & Baker, 1965: 6–7.

*Diagnosis.* *Typhlodromus pilosus* can be separated from other species in the *occidentalis* group by the absence of seta z3; thus there are 5 rather than 6 pairs of “anterior lateral” setae.

*Previous records.* Holotype ♀ (NMNH), NICARAGUA: Chinandega, 11.II.1952. Also collected from EL SALVADOR, HONDURAS, and COSTA RICA (Chant & Baker 1965, Denmark & Andrews 1981).

Collected on cotton leaves with *Tetranychus* sp. and *Typhlodromus floridanus* in COSTA RICA: Liberia in 1967 (McMurtry & E.R. Oatman, unpubl.).

*Guatemalan records.* 12♀, Esquintla: Santa Lucia Cotzumalguapa on croton infested with *Tetranychus* sp.; 6♀, Suchitepéquez: Cuyotenango, from *Bixa* sp. infested with *Tetranychus* sp.; 1♀, Esquintla, from citrus infested with *Tetranychus* sp.

*Remarks.* Although *T. pilosus* lacks seta z3 and has been placed in other genera by some authors (Muma 1961, Wainstein 1962), it is here placed in the *occidentalis* group of *Typhlodromus*. It resembles other species in this group in the general shape and lengths of setae on the dorsal shield, the type of reticulation of the dorsal shield, absence of seta R1, the anterior position of j3 (located laterad of and at about the same level as j1), the relatively long, tubular cervix of the spermatheca (Fig. 23), and the general shape of the ventrianal shield.

Besides having seta z3 absent, *T. pilosus* also differs from other species in the *occidentalis* group in having the base of seta j5 more anterior and closer to j4, so that a different type of hexagon is formed when drawing lines between bases of j5, z5, and j6. Another difference, shared also by *T. ferrugineus* (DeLeon), is the absence of seta ZV3. In some specimens, however, ZV2 may be on the membrane rather than on the ventrianal shield so that it would appear to have ZV3 present on one side.

*Typhlodromus pilosus* also shows ecological similarities to other species in the *occidentalis* group, in that it is typically associated with *Tetranychus* species that form densely populated colonies with copious webbing (personal observations).

### conspicuous group

#### ***Typhlodromus conspicuus* (Garman)**

Fig. 24

*Iphidulus conspicuus* Garman, 1948: 14.

*Typhlodromus conspicuus*: Nesbitt, 1951: 22.

*Typhlodromus (Typhlodromus) conspicuus*: Chant, 1959: 55.

*Typhlodromina conspicua*: Muma, 1961: 297.—Muma & Denmark, 1969: 407–408.

*Diagnosis.* This species is in the *conspicuus* (= *conspicua*) group as defined by Muma & Denmark (1969). It is distinguished from *T. eharai* (Muma & Denmark) by the longer cervix of the spermatheca (about 3× longer than wide) (Fig. 24); from *T. tropicus* Chant by the shorter cervix (3 compared to 4× longer than wide), and by the shorter j1 setae in relation to j3 (about 1/3 as long as j3, compared to being subequal to j3 in *T. tropica*); and from *T. subtropicus* (Muma & Denmark) by the larger dorsal shield (375 ± 12 long compared to 335 ± 17) and by shorter J2 setae (only 1/2–2/3 the length of s4; nearly equal to s4 in *T. subtropicus*) (Muma & Denmark 1969).

*Previous records.* Holotype ♀, [USA] CONNECTICUT: Hamden (Connecticut Agricultural Experiment Station, New Haven). Collected in eastern UNITED STATES, CANADA, MEXICO (Muma & Denmark 1969); and PUERTO RICO (Denmark & Muma 1975).

*Guatemalan record.* 2♀, Chimaltenango: Patzicia, from avocado leaves.

*Remarks.* The *conspicuous* group of Muma & Denmark (1969) is recognized here as a group in the genus *Typhlodromus* rather than the genus *Typhlodromina*, which I consider as a part of *Typhlodromus* (Mahr & McMurtry 1980).

Both Guatemalan specimens show 3 subapical teeth plus an anteriorly situated pilus dentilis on the fixed digit of the chelicerae, although Muma & Denmark (1969) stated that species in the *conspicuous* group have 1 or 2 subapical teeth.

### pini group

#### ***Typhlodromus johnsoni* Mahr**

Fig. 25

*Typhlodromus johnsoni* Mahr, 1979: 219, 222.

*Diagnosis.* This species belongs to the *pini* species group as defined by Mahr (1979). It is distinguished from *T. arboreus* Chant by the longer, thinner, and more parallel-sided cervix of the spermatheca (Mahr 1979) (Fig. 25).

*Previous records.* Holotype ♀ (NMNH), 4♀, [USA] CALIFORNIA: Riverside County, Eagle Val, E of Corona, 28.V.1974.

*Guatemalan record.* 2♀, from Mixco, 5.III.1955, on avocado (C.A. Fleschner).

*Remarks.* Mahr & McMurtry (1979) concluded, from crossbreeding and morphological studies, that this species was a previously undescribed sibling of *T. arboreus*.

### Genus ***Typhloseiopsis* DeLeon**

*Typhloseiopsis* DeLeon, 1959c: 150.—Chant, 1959: 113.—Muma, 1961: 294.—Schuster & Pritchard, 1963: 199 (part).

*Typhlodromus* (*Typhloseiopsis*): Pritchard & Baker, 1962: 222 (part).—van der Merwe, 1968: 99 (part).

*Chanteius* (*Typhloseiopsis*): Wainstein, 1962: 20.

*Type-species.* *Typhloseiopsis theodoliticus* DeLeon, by original designation.

♀. Dorsal shield smooth, except for a few striae anterolaterally; setae j1, j3, j4, j5, j6, z2, z3, z4, z5 and s4, s6 present on anterior portion of shield; only setae J2, J5, Z4, Z5, and S5 present on posterior portion of shield. Seta z4 directly posterior to or slightly mediad to z3; all setae on dorsal shield minute except j1, j3, s4, Z4, and Z5; s6 small or minute. Macrosetae present on geI–IV, tiIV, and taIV. Sternal shield bearing setae stI, II, and III. May have a ventrianal shield, an anal shield only, or separate ventral and anal shields.

*Remarks.* This genus includes *T. maryae*, n. sp., *T. theodoliticus* DeLeon (1959c), *T. funiculatus* DeLeon (1965a), *T. regularis* DeLeon (1965a), and *T. pritchardi* (Chant & Baker 1965). *Typhloseiopsis pritchardi* was described under *Amblyseius*. Species in this genus have some characters which are more typical of *Amblyseius* species, including minute z and j setae and the presence of macrosetae on all legs. *Typhloseiopsis regularis* is an aberrant species in having setae s4, Z4, and Z5 long and whiplike, a “notched” dorsal shield, multidentate chelicerae, and additional leg macrosetae. The known distribution of the genus is Mexico, the Caribbean, Central and South America.

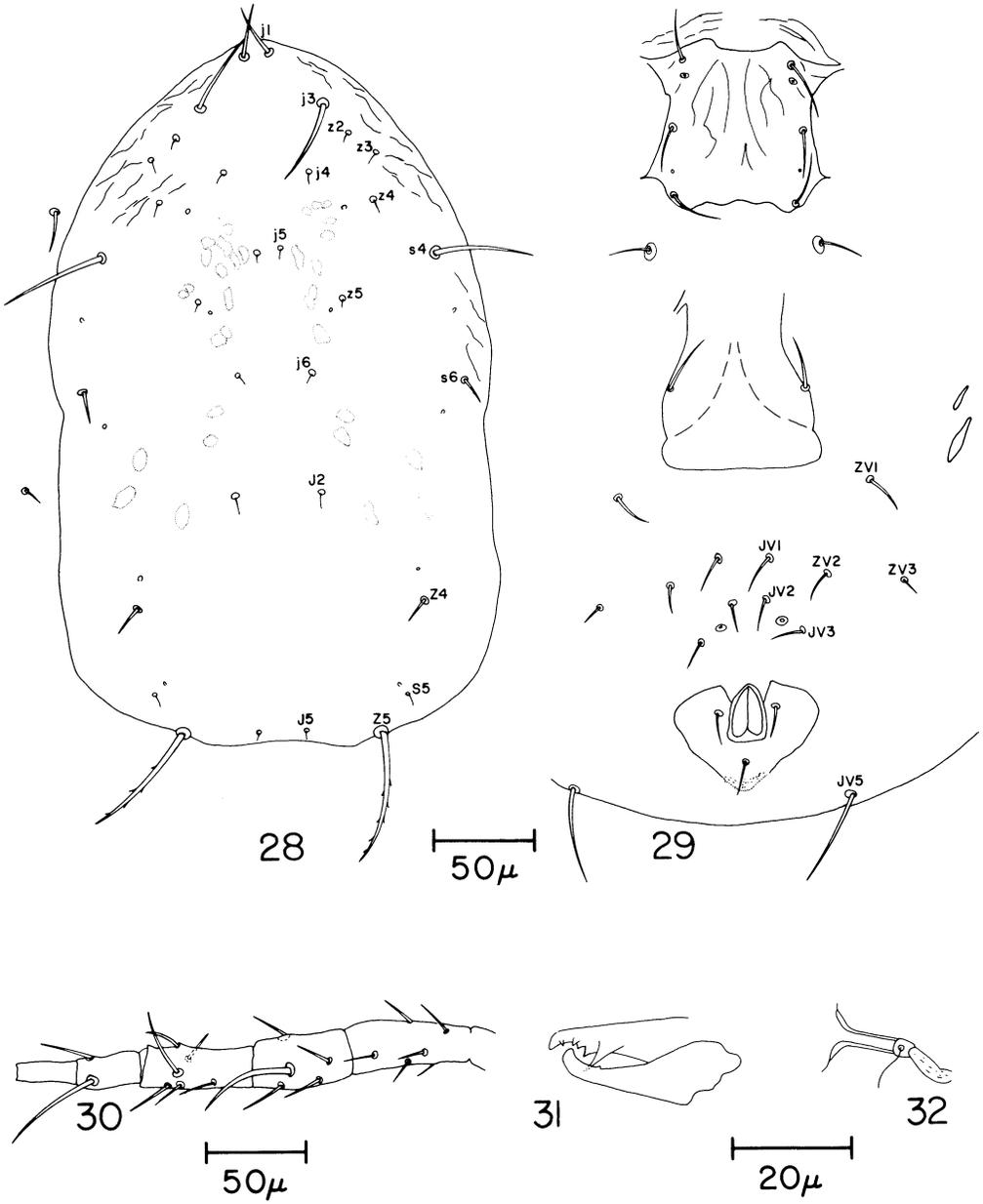


FIG. 28-32. *Typhloseiopsis maryae*, ♀: 28, dorsal shield; 29, ventral surface; 30, leg IV; 31, chelicera; 32, spermatheca.

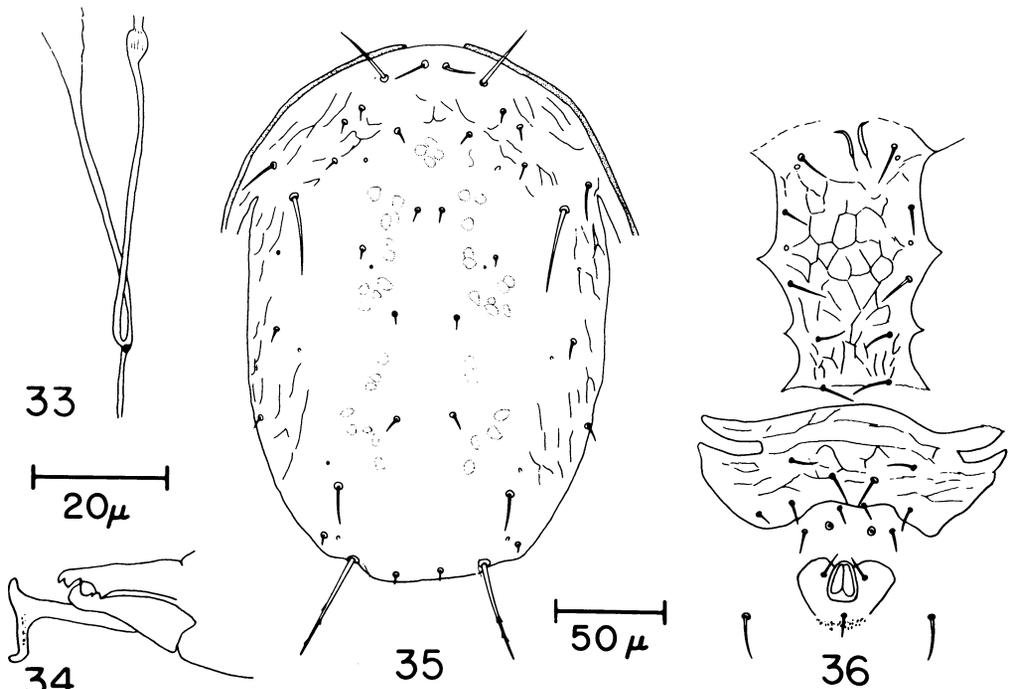


FIG. 33–36. 33, spermatheca of *Typhloseiopsis theodoliticus*. 34–36, *Typhloseiopsis maryae*, ♂: 34, chelicera; 35, dorsal shield; 36, ventral surface.

### *Typhloseiopsis maryae* McMurtry, new species

Fig. 28–32, 34–36

*Diagnosis.* This species resembles *T. funiculatus* DeLeon, *T. pritchardi* (Chant & Baker), and *T. theodoliticus* DeLeon. It can be distinguished from the first 2 by the presence of only an anal shield (*T. funiculatus* has a ventrianal shield and *T. pritchardi* has separate ventral and anal shields), and from *T. theodoliticus* on the basis of the spermatheca (tubular cervix in the new species and a slender bifurcated structure in *T. theodoliticus*) (Fig. 33, drawn from the holotype), and the length of seta s4, varying from 41–60 μm in the new species, as compared to 11 in *T. theodoliticus*. However, DeLeon (1959c) mentioned that the length of s4 on 1 of his *T. theodoliticus* specimens was 44. As his material came from different localities and host plants in Mexico, it is possible that this specimen was a different species. No spermatheca was illustrated in DeLeon's description of *T. theodoliticus*.

♀ (measurements based on 15 specimens). *Dorsum.* Dorsal shield (Fig. 28) length 328 (309–353), with a few striae near anterolateral margins; otherwise smooth, lightly sclerotized; lateral margins recessed just posterior to seta s6; with 6 pairs of solenostomes: mesad to z4, posteromesad to z5, between s4 and s6, posteromesad to s6, anterior to Z4, and anterior to S5; distribution of muscle marks as shown in Fig. 28. Shield bears 16 pairs of setae with following

lengths: j1 26 (22–29), j3 40 (36–43), j4 6, j5 5, j6 6, J2 7, J5 6; z2 6, z3 7, z4 7, z5 5, Z4 13 (12–15), Z5 62 (58–67); s4 49 (41–60), s6 12 (10–13), S5 6. Seta Z5 bears a few small barbs. Setae r3 18 (16–20) and R1 10 (9–11) located on membranous cuticle. Peritreme extending nearly to level of base of seta j1. *Venter*. Sternal shield (Fig. 29) length 74 (68–78) at midline; width between bases of sternal setae II 66 (65–68); with 3 pairs of setae and 2 pairs of poroids; anterior margin of shield medially concave, sometimes obscure, posterior margin somewhat excavated; several distinct striae on shield. Metasternal setae on platelets, no poroids visible. Genital shield width at widest point (behind genital setae) 72 (70–74). Only an anal shield, bearing 3 setae, present on posteroventral surface (Fig. 29). Seven pairs of setae (JV1, 2, 3; JV1, 2, 3, 5) on membranous cuticle, with a pair of solenostomes between JV2 and JV3. Setae JV5 developed as macrosetae, 43 (39–49) long. Two pairs of metapodal platelets, anterior pair small, narrow, posterior pair larger. *Chelicera*. Fixed digit 26–28 long, with 4 subapical teeth; movable digit 27–28 long, with 1 small tooth (Fig. 31). *Spermatheca*. Cervix tubular, moderately thick-walled, atrium approximately same diameter as cervix, major duct large (Fig. 32). Length of atrium plus cervix 16 (12–18). *Legs*. Macrosetae present on genua of all legs and on ti and ta of leg IV (Fig. 30). Lengths of macrosetae: SgeI 35 (33–37), SgeII 34 (31–38), SgeIII 39 (35–44), SgeIV 58 (55–64), StiIV 36 (30–42), StaIV 58 (52–65). Six cuticular glands present ventrally at base of Coxa I. Chaetotactic formula of geII 2-2/0,2/0-1; geIII 1-2/1,2/0-1; geIV 1-2/1,2/0-1.

♂ (measurements based on 4 specimens). *Dorsum*. Dorsal shield (Fig. 35) length 265 (255–279), with a few striae or reticulations, mainly on lateral margins; otherwise smooth, lightly sclerotized. Shield widest at or near level of setae z5, becoming gradually narrower posteriorly, with 6 pairs of solenostomes in same regions as on ♀ in relation to setal bases. Distribution of muscle marks as in Fig. 35. Eighteen pairs of setae on shield: j1 22, j3 32 (31–33), j4 6, j5 5, j6 7, J2 7, J5 5; z2, z3, z4 7, z5 5, Z4 19 (16–20), Z5 48 (46–52), s4 39 (36–41), s6 9, S5 6, r3 18 (16–19), R1 9. Peritreme extending nearly to level of base of seta j1. *Venter*. Sternogenital shield (Fig. 36) reticulated with posterior margin straight, bearing 5 pairs of setae and 2 discernible pairs of poroids. Ventral shield reticulated. Numbers of setae on ventral shield plus those on membranous cuticle between ventral and anal shields vary from 11 to 14. Two, 3, or 4 of these setae may be on membrane. Anal shield with 3 setae. JV5 developed as macroseta, 22 (21–24) long. *Chelicera*. Fixed digit (Fig. 34) with 1 large and 1 or 2 small subapical teeth; movable digit with 1 tooth plus apical hook. Spermatodactyl as in Fig. 34. *Legs*. Lengths of macrosetae as follows: SgeI 27 (25–29), SgeII 26 (24–28), SgeIII 28 (26–30), SgeIV 40 (38–42), StiIV 31 (29–36), StaIV 43 (41–45). Chaetotaxy of legs same as in ♀.

*Type material*. Holotype ♀, allotype, 5 paratypes, GUATEMALA: Suchitepéquez: Tiquisate, 23.II.1977, on mango (NMNH); 4 paratypes, same data (UCR); 4 paratypes, type-locality, on citrus leaves; 4 paratypes, Suchitepéquez: Cuyotenango, on *Bixa* species; 8 paratypes, Cocales (nr Mazetenango), on mango (UCR).

*Remarks*. Nothing is known about the feeding habits of *Typhloseiopsis* species. *Typhloseiopsis maryae* was abundant on the foliage of mango trees on which *Euseius naindaimi* was also present. As no phytophagous mite species were found, both of these phytoseiids may have been feeding on pollen grains from numerous blossoms present on the trees at that time.

### Genus *Phytoseius* Ribaga

*Phytoseius* Ribaga, 1904: 177.

**Phytoseius (Pennaseius) mexicanus** DeLeon

Fig. 26

*Phytoseius mexicanus* DeLeon, 1960: 269–270.

*Phytoseius (Pennaseius) mexicanus*: DeLeon, 1965b: 20.—Muma & Denmark, 1970: 122, 124.

*Phytoseius (Phytoseius) mexicanus*: Denmark, 1966: 19–21.

*Diagnosis.* Denmark (1966) placed this species in the *finitimus* group. It can be distinguished from other species in the group by the combination of a long, thin cervix of the spermatheca (Fig. 26) and a smooth, rather than serrate, j1.

*Previous records.* Holotype ♀, MEXICO: Chiapas: Tuxtla Gutierrez, 15.I.1957, from *Cecropia peltata*. Also known from other parts of MEXICO (DeLeon 1960); from USA: FLORIDA (DeLeon 1960, Muma & Denmark 1970); and HONDURAS (Chant & Baker 1965).

*Guatemalan record.* 2♀, Sacatepéquez: Mixco Viejo, on *Gossypium* sp.

*Remarks.* The setal measurements of the Guatemalan specimens agree with those given in DeLeon's (1960) original description.

No phytophagous mites were observed on the shrublike *Gossypium* plant from which these mites were collected.

**Phytoseius (Pennaseius) montanus** DeLeon

Fig. 27

*Phytoseius montanus* DeLeon, 1965b: 15.

*Phytoseius (Phytoseius) montanus*: Denmark, 1966: 40–42.

*Diagnosis.* *Phytoseius montanus* is in the *nahautlensis* group and can be distinguished from *nahautlensis* by the macroseta on tarsus IV being filamentous rather than short and blunt or knobbed at the tip (Denmark 1966).

*Previous records.* Holotype ♀ (MCZ), MEXICO: Jalisco: Guadalajara, 22.III.1957, from *Hyptis albida*; paratypes, Jalisco: Jocotepec; and Nayarit: Santa Maria del Oro (DeLeon 1965b).

*Guatemalan record.* 1♀, Mixco Viejo, on *Gossypium* sp., collected with *P. mexicanus*.

*Remarks.* In comparing the Guatemalan specimen with the holotype, it appeared that the latter had somewhat thicker setae (especially s6 and Z4), and a less distinct atrium of the spermatheca (Fig. 27). Setal measurements were similar to those given by DeLeon (1965b) except for s4, Z4, and Z5, which were shorter (42, 30, and 41, respectively) than those of the type (51, 39, and 60, respectively).

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