

The Phytoseiidae (Acarina: Mesostigmata) of Puerto Rico^{1,2}

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ABSTRACT

This is a faunal summary of the phytoseiids of Puerto Rico in which three new species are described: *Typhlodromips plumosus*, *Typhlodromalus higuilloae*, and *Amblydromella deleoni*. Fourteen other species are recorded from the island for the first time, bringing the total to 48 species.

INTRODUCTION

Several workers (23, 5, 14) have previously described or recorded Phytoseiidae from Puerto Rico and the species recorded here for the first time are collated with earlier records in table 1. Fox (23) was concerned only with possible rat parasites in his study and described three new species. Chant (5) merely recorded two species from material deposited in the U. S. National Museum. However, De Leon (14), who spent two weeks on the island in 1963 specifically collecting plant-inhabiting mites, recorded 24 species, 14 of which he described as new. Muma collected phytoseiids in Puerto Rico for two weeks in 1968 and 1969, and recorded 13 species, three of which are described here. A total of 48 species of phytoseiids are now known to occur on the island.

De Leon collected 16 species not collected by Muma who collected 11 species not collected by De Leon. This suggests that phytoseiid populations are extremely unstable, as indicated by Muma, et al. (47), and that additional plant inhabiting species will be found on the island. Further, neither De Leon nor Muma collected extensively on grasses and related plants or from ground surface litter, thus many species restricted to these strata were missed.

The predatory nature of most phytoseiids is well known, and their food habits were summarized by Muma (43). Although biological and ecological

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studies have not been conducted on most phytoseiids found in Puerto Rico, certain species have been studied in other areas. Such studies are cited in the specific discussions below.

Fox's type material is deposited in the collections of the School of Tropical Medicine in San Juan, Puerto Rico (STM). De Leon's holotypes are deposited in the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts (MCZ) and the U. S. National Museum of Natural History, Washington, D. C. (NMNH). The types of the species described here are deposited in the Florida State Collection of Arthropods, Gainesville, Florida (FSCA).

Our systematics and terminology are those utilized by Muma, et al. (47) and Tuttle and Muma (55). Mites were mounted in a modified Hoyer's solution and examined at magnifications varying from 500X to 1000X.

AMBLYSEIINAE Muma

Genus *Phytoseiulus* Evans

Phytoseiulus Evans, 1952:397 (22). Type: *Laelaps macropilis* Banks 1905 (2), by designation, Evans (22).

This genus of six species probably is world-wide in distribution and common in the Caribbean area. Only the type species is known from Puerto Rico.

Phytoseiulus macropilis (Banks)

Laelaps macropilis Banks 1905:139 (2).

Hypoaspis macropilis, Banks 1915:85 (3).

Phytoseiulus speyeri Evans, 1952:398 (22).

Phytoseiulus macropilis, Cunliffe and Baker 1953:23 (6).

DIAGNOSIS: Females of *P. macropilis* can be separated from *persimilis* Athias-Henriot by the presence of one pair of preanal setae and *macroseta* Sti IV weakly plumose.

DISCUSSION: Smith and Summers (53), Prasad (49), and Muma (44) have discussed the food habits and biological control potential of this species. It was collected in Puerto Rico by De Leon at Santurce on *Desmodium purpureum*. Muma took it in Puerto Rico: 3 females, 1 male, Río Piedras, Agr. Exp. Sta. greenhouse, 28-VIII-1968, on *Cedrela odorata* feeding on *T. tumidus*; 2 females, 1 nymph, Naranjito, Barranquitas Rd., Km 15, 29-VIII-1968, on *Ipomoea rubra*; 6 females, 1 male, 12 nymphs, Ponce, Adjuntas Rd., Km 28.6, 4-IX-1968, on *Ipomoea* sp.; 2 nymphs, Río Piedras, Agr. Exp. Sta., 28-VIII-1968, on unknown host; 3 females, 2 males, Mameyes to El Yunque, Rd. 191, 1-IX-1968, on *Ipomoea* sp.; 1 female, Doña Juana Forest, recreation area entrance, 29-VIII-1968, on *Elephantopus mollis*; 2

TABLE 1.—Phytoseiidae known to occur in Puerto Rico

Genera and Species	Species collected by different workers			
	Fox (1946-49)	Chant (1959)	De Leon (1965)	Denmark and Muma (1975)
AMBLYSEIINAE Muma				
<i>Phytoseiulus macropilis</i> (Banks)		x	x	x
<i>Proprioseiopsis inflatus</i> (De Leon)			x	x
<i>ovatus</i> (Garman)				x
<i>sexsetosus</i> (Fox)	x			
<i>Fundiseius coronatus</i> (Fox)	x			
<i>Paraphytoseius santurcensis</i> De Leon			x	x
<i>Ricoseius loxocheles</i> (De Leon)			x	
<i>Nothoseius borinquensis</i> De Leon			x	
<i>Amblyseius largoensis</i> (Muma)			x	x
<i>herbicolus</i> (Chant)			x	
<i>chiapensis</i> De Leon				x
<i>martus</i> De Leon				x
<i>Iphiseiodes quadripilis</i> (Banks)			x	
<i>zuluagi</i> Denmark & Muma				x
<i>Typhlodromips dentilis</i> (De Leon)			x	
<i>caobae</i> (De Leon)			x	
<i>caribbeanus</i> (De Leon)			x	
<i>plumosus</i> Denmark & Muma				x
<i>mangleae</i> De Leon				x
<i>Typhlodromalus yunquensis</i> (De Leon)			x	
<i>congeae</i> (De Leon)			x	
<i>rapax</i> (De Leon)			x	
<i>peregrinus</i> (Muma)		x		
<i>limonicus</i> (Garman & McGregor)				x
<i>higuilloae</i> Denmark & Muma				x
<i>Euseius ho</i> (De Leon)			x	
<i>sibelius</i> (De Leon)			x	
<i>hibisci</i> (Chant)				x
<i>Neoseiulus setulus</i> (Fox)	x			
PHYTOSEIINAE Berlese				
<i>Phytoseius woodburyi</i> De Leon			x	x
<i>rex</i> De Leon				x
<i>bennetti</i> De Leon			x	
<i>Diadromus regularis</i> De Leon			x	
<i>Typhlodromina conspicua</i> (Garman)			x	
<i>adjacentis</i> (De Leon)			x	
<i>Galendromus annectens</i> (De Leon)			x	x
<i>luculentis</i> (De Leon)				x
<i>Amblydromella deleoni</i> Denmark & Muma				x
Totals	3	2	23	20
Accumulated Totals		5	28	48

females, Hato Rey, 24-VIII-1968, on *Convolvulus* sp.; 1 nymph, Mayagüez, 26-V-1969, on unknown host; 1 female, El Yunque, 7-V-1969, on wild sweet potato vine; 2 females, southwest of Naval Station along Rd. 973, off Rd. 3, 31-VIII-1968, on *Ipomoea rubra*.

Genus *Proprioseiopsis* Muma

Proprioseiopsis Muma, 1961:277 (38) (type only); Muma and Denmark, 1968:231 (45). Type: *Typhlodromus (Amblyseius) terrestris* (Chant), 1959, by designation, Muma (39).

Amblyseiulus Muma, 1961:278 (40); De Leon, 1966:83 (17).

Amblyseius Berlese, Schuster, and Pritchard, 1963:255 (52) (in part).

This genus is world-wide in distribution and common in the Caribbean area. There are approximately 40 species in this genus, most of which can be grouped by spermathecal shape.

Proprioseiopsis inflatus (De Leon), new combination

Amblyseius inflatus De Leon, 1965:131 (14).

DIAGNOSIS: This species resembles *P. tubulus* Muma, but L_4 , L_3 and M_2 are longer and L_3 is much shorter than in *tubulus*.

TYPE FEMALE: Sabana Grande, Puerto Rico, 30-VIII-1963, D. De Leon, on *Clidemia strigillosa*; (MCZ).

DISCUSSION: Female paratypes were taken with the holotype. We have one additional record: 1 female, Río Piedras, 21-VIII-1968, on *Aneilema* sp. leaf.

Proprioseiopsis sexsetosus (Fox), new combination

Borinquolaelaps sexsetosus Fox, 1949:39 (25).

Typhlodromus (Amblyseius) sexsetosus, Chant, 1959:103 (5) (dubious species).

DIAGNOSIS: The type of this species is obviously a *Proprioseiopsis* but needs clearing and remounting. Fox's illustration resembles *P. tubulus* Muma, of which it may be a synonym. It is maintained separately until the type can be studied adequately.

TYPE FEMALE: San Juan (Santurce), 17-IX-1946, on *Rattus norvegicus*; (STM).

DISCUSSION: Known only from the type specimen.

Proprioseiopsis ovatus (Garman)

Amblyseiopsis ovatus Garman, 1958:78 (27).

Amblyseius ovatus, Chant, 1959:90 (5).

Proprioseiopsis ovatus, Tuttle and Muma, 1973:11 (55).

TYPE FEMALE: Grants Pass, Oregon, 22-X-1952, on ladino clover; (NMNH Slide No. 7, Lot 52-12630).

DISCUSSION: Recorded from Puerto Rico for the first time: 3 females, southwest of Naval Station along Rd. 973, off Rd. 3, 31-VIII-1968, on *Ipomoea rubra*.

Genus *Fundiseius* Muma and Denmark

Athiasia Muma and Denmark, 1968:233 (45) (Preoccupied by *Athiaseius* Wainstein, 1962:17 (57).)

Fundiseius Muma, Denmark, and De Leon, 1970:71 (47). Type: *Typhlodromips cesi* Muma 1965 (41), by designation, Muma and Denmark, 1968 (45).

There are presently six species in this genus: four in Florida, one in Puerto Rico, and one in Argentina.

Fundiseius coronatus (Fox), new combination

Borinquolaelaps coronatus Fox, 1946:450 (23).

Typhlodromus (*Amblyseius*) *coronatus*, Chant, 1959:103 (5) (dubious species).

DIAGNOSIS: *F. coronatus* is similar to *hystrix* (Muma) but differs by the reticulated dorsal scutum and the shorter L₁ and leg IV macrosetae.

TYPE FEMALE: Camp O'Reilly, Gurabo, Puerto Rico, 31-I-1946, Irving Fox, from *Rattus norvegicus*; (STM).

DISCUSSION: Our records include: 3 females, 2 males, El Yunque, Rd. Luquillo-Caribbean National Forest, Km 5.5, 26-VIII-1968, on turk's cap; 1 male, El Yunque, Km 11.0 from Palmer, 10-V-1969, on hibiscus leaves; 1 female, El Yunque, Km 6.6 from Palmer, 10-V-1969, on unknown host.

Genus *Paraphytoseius* Swirski and Shechter

Paraphytoseius Swirski and Shechter, 1961:113 (54). Type: *Paraphytoseius multidentatus* Swirski and Shechter, by original designation and monotypy.

Ptenoseius Pritchard and Baker, 1962:295 (50); Shuster and Pritchard, 1963:198 (52). (Type: *Amblyseius* (*Ptenoseius*) *horrifera* Pritchard and Baker by original designation and monotypy, De Leon, 1965:130 (14).)

Paraphytoseius multidentatus Swirski and Shechter has been taken in Hong Kong and Africa, and *P. santurcensis* in Puerto Rico and Trinidad.

Paraphytoseius santurcensis De Leon

Paraphytoseius santurcensis De Leon, 1965:130 (14).

DIAGNOSIS: *P. santurcensis* is similar to *multidentatus* Swirski and Shechter but differs by having 10 pairs of small pores on the dorsal scutum

and the margin, notched near L_4 . L_1 , L_4 , L_6 , and M_2 are longer and genu IV with two short rod-shaped setae in *santurcensis*.

TYPE FEMALE: Santurce, 5-IX-1963, D. De Leon, on *Hibiscus tiliaceus*; (MCZ).

DISCUSSION: De Leon collected three males and six females with the holotype and one female on *Hura crepitans*. He reported it common on *Hibiscus tiliaceus* with 10 or more per leaf. The male was observed mating on the back of the female, whereas other species of phytoseiids mate with the male beneath the female and ventral side up. We have one additional record: 1 female, 1 nymph, San Sebastian, Rd. 112, Km 7.0, 15-V-1969, on "higuillo" leaves.

Genus *Ricoseius* De Leon

Amblyseius (Ricoseius) De Leon, 1965:128 (14).

Ricoseius, Muma and Denmark, 1968:233 (45). Type: *Amblyseius (Ricoseius) loxocheles* De Leon, by monotypy.

This species has been taken in Puerto Rico, Brazil, and Florida. The Florida specimens were feeding on rust-infected seagrape leaves, *Uredo coccolobae*.

Ricoseius loxocheles (De Leon)

Amblyseius (Ricoseius) loxocheles De Leon, 1965:128 (14).

Ricoseius loxocheles, Denmark and Muma, 1970:119 (20).

DIAGNOSIS: *R. loxocheles* differs from all other known phytoseiids by having elongate whip-like capitate dorsal scutal setae, three pairs of sub-lateral setae, large multidentate chelicerae, four pairs of ventrolateral setae and a curious combination of capitate and setiform macrosetae on leg IV.

TYPE FEMALE: Cayey Mountain, 28-VIII-1963, D. De Leon, on *Cordia alliodora*; (MCZ).

Genus *Nothoseius* De Leon

Nothoseius De Leon, 1965:127 (14). Type: *Nothoseius borinquensis* De Leon, 1965: 127 (14), by original designation.

This species has been collected in Puerto Rico and Jamaica.

Nothoseius borinquensis De Leon

Nothoseius borinquensis De Leon, 1965:128 (14).

DIAGNOSIS: The females have a transparent crescent-shaped body attached by anterior and posterior ends at mid-line or dorsal scutum. No other known phytoseiid has this unique structure. Ventral surface with usual family characteristics.

TYPE FEMALE: Salinas, 28-VIII-1963, D. De Leon, on *Rhynchosia reticulata*; (MCZ).

DISCUSSION: Additional records: Cayey Mountain on *Cordia sulcata* and De Leon (1965) collected a female with an egg containing an almost fully developed larva.

Genus *Amblyseius* Berlese

Amblyseius Berlese, 1914:143 (4); Muma, 1961:287 (39); De Leon, 1966:88 (17). Type: *Zercon obtusus* Koch, 1839 (31), by indication of Berlese (1914).

Amblyseius largoensis (Muma)

Amblyseiopsis largoensis Muma, 1955:266 (38).

Amblyseius neolargoensis van der Merwe, 1965:59 (37).

Amblyseius largoensis, Muma, Denmark, and De Leon, 1970:69 (47).

DIAGNOSIS: *A. largoensis* resembles *deleoni* Muma and Denmark from which it is distinguished by the parallel-sided spermathecal cervix and slight difference in the spermatodactyl.

TYPE FEMALE: Key Largo, Florida, XII-1952, M. H. Muma, from key lime leaves; (NMNH).

DISCUSSION: This species was taken by De Leon at Santurce on *Cocos nucifera*, *Mangifera indica*, *Calophyllum calaba*, and *Hura crepitans*; at Ponce on *Spondias dulcis*; at Salinas on *Cordia sebestena*. Our records include: 1 male, Isabela, Exp. Sub-sta., 19-V-1969, on mango leaves; 2 females, Isabela Agr. Exp. Sub-sta., 18-V-1969, on *Hibiscus* sp.; 4 females, Isabela, Exp. Sub-sta., 18-V-1969, on mango; 1 female, Isabela Agr. Exp. Sub-sta., 18-V-1969, on tropical almond; 1 male, El Collao, Cayey-Salinas Rd., Km 71.0, 27-VIII-1968, on turk's cap; 3 females, Hato Rey, 24-VIII-1968, on *Convolvulus* sp.; 4 males, Hato Rey, 24-VIII-1968, on *Hibiscus* sp.; 3 females, 2 males, Hato Rey, 25-VIII-1968, on unknown host; 2 females, 2 males, Bayamon Cruce Dávila, Km 52 San Juan Rd. 2, 13-V-1969, on unknown host; 1 male, Río Piedras, Agr. Exp. Sta., 23-VIII-1968, on unknown host; 1 female, 1 male, Río Piedras, Agr. Exp. Sta., 30-VIII-1968, on croton leaf; 7 females, 6 males, 2 nymphs, Fortuna Agr. Exp. Sub-sta. 27-VIII-1968, on mango.

Amblyseius herbicolus (Chant)

Typhlodromus (Amblyseius) herbicolus Chant, 1959:84 (5).

DIAGNOSIS: *A. herbicolus* is near *perlongisetus* (Berlese) but differs by having a pair of elliptical pores on the ventrianal scutum and the overall shape of the ventrianal scutum.

TYPE FEMALE: Portugal (taken at Boston), 13-VIII-1955, J. D. Crump, on bromeliad; (NMNH).

DISCUSSION: This species was taken in Puerto Rico by De Leon at Santurce on *Tabebuia* sp.; Río Piedras on *Faramea occidentalis*, *Lagerstroemia speciosa*, *Lantana involucrata*, *Psidium guajava*, and *Palicourea crocea*; at Sabana on *Andria inermis*.

Amblyseius chiapensis De Leon

Amblyseius chiapensis De Leon, 1961:86 (12).

DIAGNOSIS: *A. chiapensis* resembles *tripolaris* De Leon, but differs in having one denticule instead of three on the movable digit and in the shape of the spermatodactyl.

TYPE FEMALE: Tuxtla Gutiérrez, Chiapas, Mexico, 18-I-1957, De Leon, on *Ceiba pentandra*; (MCZ).

DISCUSSION: Our records include the following: 1 female, Mayagüez-Maricao, Rd. 105, Km 12.7, 3-IX-1968, on unknown host; 1 female, Mayagüez, 29-V-1969, on *Muntingia calabura* leaves.

Amblyseius martus De Leon

Amblyseius martus De Leon, 1966:92 (17).

DIAGNOSIS: *A. martus* is similar to *aerialis* (Muma) but differs in having L_1 , M_2 , macrosetae on leg IV, and cervix shorter. *A. martus* also has multiple spermathecae on both sides.

TYPE FEMALE: Natural Reserve, Bartica, Guyana (British Guiana), 28-X-1963, D. De Leon, on *Swartzia leiocalycina*; (MCZ).

DISCUSSION: Our records include the following: 1 female, 1 male, El Yunque, 7-V-1967, on roseapple leaves; 1 female, El Yunque, Km 5.3 from Palmer, 10-V-1969, on taro leaves; 2 males, Río Piedras, 9-V-1969, on *Calophyllum brasiliense* var. *antillanum*; 1 nymph, Río Piedras, 8-V-1969, on hibiscus leaves; 2 females, Río Piedras, Agr. Exp. Sta., 23-VIII-1968, on *Philodendron* sp.; 2 females, Río Piedras, Agr. Exp. Sta., 7-V-1969, on unknown host; 5 females, Río Piedras, Agr. Exp. Sta., 23-VIII-1968, on unknown host; 1 female, Rd. 185, Km 2.6 north of Rd. 3, 1-IX-1968, on *Lantana* sp.; 1 female, 1 male, Utuado-Arecibo, Km 63.4, 4-IX-1968, on unknown host; 2 females, 1 male, Trujillo Alto, 5-IX-1969, on *Passiflora* sp.; 1 female Mayagüez, 26-V-1969, on unknown host; 1 female, El Collao, Cayey-Salinas Rd. Km 71.0, 27-VIII-1968, on turk's cap; 1 female, southwest of Naval Station, Rd. 973 off Rd. 3, 31-IX-1968, on castor bean; 1 female, 1 male, Sabana Grande on Rd. 120, Km 18.0, 17-V-1969, on *Citrus* sp.; 1 female, 1 male, Ponce-Adjuntas Rd. Km 17.3, 4-IX-1968, on *Cissus* sp.; 1 female, 2 males, 1 nymph, Caguas-Cidra, Rd. 172, 22-VIII, 1968, on *Hibiscus* sp.; 3 females, 1 male, Isabela, 15-V-1969, on mango leaves.

Genus *Iphiseiodes* De Leon

Iphiseiodes De Leon, 1966:84 (17); Muma, Denmark, and De Leon, 1970:70 (47); Denmark and Muma, 1972:22 (20). Type: *Sejus quadripilis* Banks, by designation of De Leon, 1966.

There are four described and one undescribed species in this genus. The genus has been reported in Costa Rica, Florida, Honduras, Jamaica, Mexico, Puerto Rico and Trinidad.

Iphiseiodes quadripilis (Banks)

Sejus quadripilis Banks 1905:138 (2).

Iphiseiodes quadripilis, De Leon, 1966:84 (17).

DIAGNOSIS: *I. quadripilis* is near *zuluagi* Denmark and Muma, but the spermathecal atrium is not enlarged, M_3 is minute and macrosetae of leg IV and L_3 are spatulate and not knobbed as in *zuluagi*.

FEMALE HOLOTYPE: Eustis, Florida on *Citrus sinensis* leaves; (NMNH).

DISCUSSION: De Leon collected this species at Santurce on *Laguncularia racemosa* and at Río Piedras on a meliaceous tree.

Iphiseiodes zuluagi Denmark and Muma

Iphiseiodes zuluagi Denmark and Muma, 1972:23 (19).

DIAGNOSIS: *I. zuluagi* is near *quadripilis* (Banks) but L_3 and macrosetae of leg IV are distinctly knobbed in *zuluagi*. The spermathecal atrium is enlarged in *zuluagi*.

FEMALE HOLOTYPE: Palmira, Colombia, 20-V-1969, Ivan Zuluaga, on *Citrus sinensis*; (FSCA).

DISCUSSION: Our records include the following: 1 female, Lajas-San Germán, Rd. 101, Km 26.9, 3-IV-1968, on "espino" tree; 1 female, Río Piedras, Agr. Exp. Sta., 30-VIII-1968, on croton leaf; 3 females, 1 male, Isabela, 19-V-1969, on mango leaves; 1 female, Mayagüez, Rd. 106, Km 5.3, 27-V-1969, on coffee leaves; 2 females, 1 male, Río Piedras, 9-V-1969, on *Calophyllum brasiliense* var. *antillanum*; 1 female, El Yunque Km 5.5 from Palmer, 10-V-1969, on taro leaves; 2 females, Río Piedras, 9-V-1969, on *Crescentia* sp., calabash-tree; 3 females, 1 male, Trujillo Alto, 9-V-1969 on *Passiflora* sp.; 1 female, 1 nymph, Gurabo, 7-V-1969, on leaves of *Pterocarpus indicus*; 1 nymph, Río Piedras, 8-V-1969, on croton leaves; 1 female, El Yunque, 7-V-1969, on wild sweet potato vine; 2 females, Río Piedras, 8-V-1969, on leaves of hibiscus; 9 females, 1 male, Río Piedras, 8-V-1969, on *Malphigia puniceifolia* and *Malphigia glabra*.

Genus *Typhlodromips* De Leon

Typhlodromopsis De Leon, 1959:113 (9) (in part, not typical species).

Typhlodromips De Leon, 1965:23 (16). Type: *Typhlodromopsis simplicissimus* De Leon, 1965, by original designation.

Typhlodromips dentilis (De Leon)

Typhlodromus dentilis De Leon 1959:105 (8).

Amblyseius (*Typhlodromopsis*) *dentilis*, Muma, 1961:287 (39).

Typhlodromips dentilis, Muma, Denmark, and De Leon, 1970:82 (47).

DIAGNOSIS: *T. dentilis* is closely related to *arenillus* Denmark and Muma but has the spermathecal cervix 20 times longer than wide and about 10 times longer than wide in *arenillus*. *T. dentilis* has the spermatodactyl foot slender and toe nodular, whereas these structures are massive and ovate in *arenillus*.

TYPE MALE: Miami, Florida, 24-V-1956, D. De Leon, on *Rhus copallina*; (MCZ).

DISCUSSION: This species was collected by De Leon at Santurce on *Merremia umbellata*.

Typhlodromips caobae (De Leon), **new combination**

Amblyseius (*Typhlodromips*) *caobae* De Leon, 1965:124 (14).

DIAGNOSIS: *T. caobae* resembles *tennesseensis* (De Leon) in having a poculiform cervix but differs in longer dorsal and L_3 setae and shorter L_1 and L_4 .

TYPE FEMALE: Río Piedras, 24-VIII-1963, D. De Leon, on *Swietenia mahagoni*; (MCZ).

DISCUSSION: Known only from the holotype.

Typhlodromips caribbeanus (De Leon)

Amblyseius (*Typhlodromips*) *caribbeanus* De Leon, 1965:124 (14).

DIAGNOSIS: *T. caribbeanus* is distinct from other species of *Typhlodromips* in having Sge IV shorter than Sti IV.

TYPE FEMALE: El Yunque (elevation about 2500 ft.), 26-VIII-1963, D. De Leon, on *Psychotria berteriana*; (MCZ).

DISCUSSION: This species was also taken in Puerto Rico at Las Croabas by De Leon.

Typhlodromips plumosus Denmark and Muma, **new species**

Plate I, Figs. 1-5

DIAGNOSIS: *T. plumosus* is similar to *tunus*: De Leon as both have plumose lateral setae and poculiform spermathecal cervices. *T. plumosus* has L_1 about two-thirds as long, L_5 is about twice as long, M_3 is about one-third longer, and L_9 is about one-fifth longer than *tunus*.

FEMALE: Length 270 μ ; width at L_4 165 μ . Dorsal scutum reticulated with 15 pairs of setae. (Plate I, fig. 1). Measurements of setae: verticals 19 μ ; D_1 11 μ , D_2 13 μ , D_3 16 μ , D_4 17 μ ; clunals 6 μ ; M_1 13 μ , M_2 25 μ , M_3 40 μ ; L_1 20 μ ,

L_2 16μ , L_3 27μ , L_4 35μ , L_5 30μ , L_6 17μ , L_7 10μ , L_8 60μ ; anterior sublateral setae 20μ . Posterior sublateral 14μ . Sternal scutum smooth with three pairs of setae (Plate I, fig. 2). Ventrianal scutum smooth with a pair of pores and three pairs of preanal ventrianal setae (Plate I, fig. 2). Peritreme (Plate I, fig. 3) extending forward to the verticals. Chelicerae (Plate I, fig. 5) normal in size, fixed finger with two denticules. Leg formulae 1423. Macrosetae on

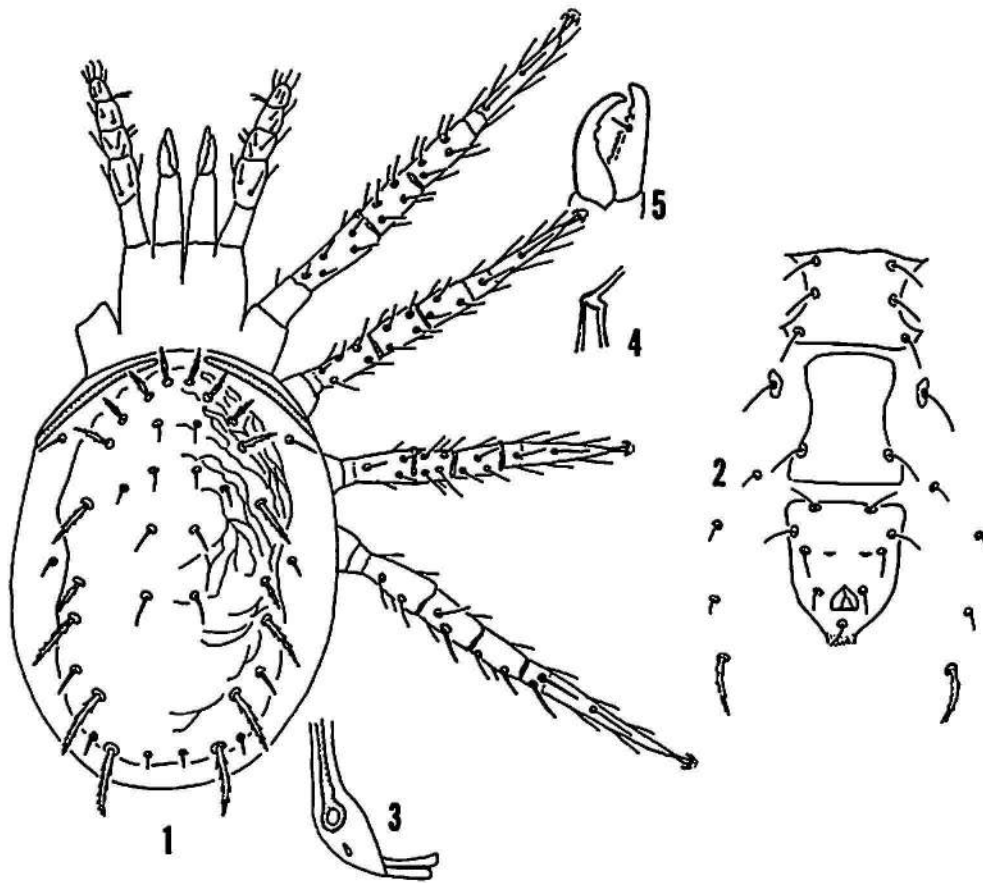


PLATE I. Female *Typhlodromips plumosus* Denmark and Muma, n. sp. Fig. 1. Dorsal and leg structure and setation. Fig. 2. Ventral scuta and setation. Fig. 3. Posterior peritremal and stigmatal development. Fig. 4. Spermathecal structure. Fig. 5. Chelicera.

leg IV as follows: Sge 20μ , Sti 14μ , St 30μ . Genu II $2, \frac{2,2}{1}, 1$; genu III $1, \frac{2,2}{1},$

1. Spermatheca poculiform (Plate I, fig. 4).

MALE: Unknown.

TYPE FEMALE: El Yunque, Puerto Rico, 10-V-1969, M. H. Muma, on four-o'clock-like plant; (FSCA).

DISCUSSION: In addition to the holotype, the following paratypes were collected: 1 female, Mameyes-El Yunque, Rd. 1913, Km 11.6, 1-IX-1968, on *Elephantopus* sp.; 6 females, Barranquitas-Dofia Juana Forest, Rd. 140,

Km 54.5, 29-VIII-1968, on "higuillo"; 1 female with the holotype, El Yunque, Km 6.6 from Palmer, 10-V-1969, on four-o'clock-like plant.

Typhlodromips mangleae De Leon

Typhlodromips mangleae De Leon, 1967:28 (18).

DIAGNOSIS: *T. mangleae* is similar to *caobae* De Leon, but has M_3 approximately half as long as L_8 . *T. caobae* has M_2 equal to L_8 and dorsal setae longer than *mangleae*.

TYPE FEMALE: Near College Experiment Station Farm, St. Augustine, Trinidad, 23-IX-1963, D. De Leon, on *Rhizophora mangle*; (MCZ).

DISCUSSION: We have one additional record: 1 female, Mayagüez, 26-V-1969, on unknown host.

Genus *Typhlodromalus* Muma

Amblyseius (Typhlodromalus) Muma, 1961:288 (39).

Typhlodromalus, De Leon, 1961:87 (12). Type: *Amblyseius peregrinus* Muma, 1955, by designation of Muma, 1961.

There are about 15 species in this genus that are widely distributed and especially common in the Caribbean area.

Typhlodromalus yunquensis (De Leon)

Amblyseius (Typhlodromalus) yunquensis De Leon, 1965:124 (14).

DIAGNOSIS: *T. yunquensis* resembles *congeae* De Leon but is separated from it by the overall smaller measurements in size and lengths of setae. M_3 is approximately one half as long as L_8 in *yunquensis* and approximately three-fourths as long as L_8 in *congeae*.

TYPE FEMALE: El Yunque, 26-VIII-1963, D. De Leon, on *Clibadium erosum*; (MCZ).

Typhlodromalus congeae De Leon

Amblyseius (Typhlodromalus) congeae De Leon, 1965:125 (14).

DIAGNOSIS: *T. congeae* resembles *yunquensis* De Leon but is generally a larger species with longer setae. M_3 is approximately three-fourths as long as L_8 in *congeae* and approximately one half as long as L_8 in *yunquensis*.

TYPE FEMALE: Río Piedras, 24-VIII-1963, D. De Leon, on *Congea tomentosa*; (MCZ). De Leon also collected two female paratypes from Río Piedras, 3-IX-1963, on *Clerodendron* sp.

Typhlodromalus rapax De Leon, new combination

Amblyseius (Typhlodromalus) rapax De Leon, 1965:125 (14).

DIAGNOSIS: *T. rapax* closely resembles *limonicus* (Garman and McGregor) but differs in size, in the relative lengths of the setae of the dorsal

scutum, in having a pore near M_1 , in dentition of chelicerae, and in size of the spermatheca.

TYPE FEMALE: Río Piedras, 24-VIII-1963, D. De Leon, on *Lantana involucrata*; (MCZ). De Leon also collected two female paratypes from Cayey Mountain, 28-VIII-1963, on *Cordia alliodora*.

Typhlodromalus peregrinus (Muma)

Typhlodromus peregrinus Muma, 1955:270 (38); Chant, 1959:97 (5).

Typhlodromus (*Amblyseius*) *robiniae* Chant, 1959:98 (5).

Typhlodromus (*Amblyseius*) *primulae* Chant, 1959:99 (5).

Amblyseius (*Typhlodromalus*) *peregrinus*, Muma, 1961:288 (39).

Typhlodromalus peregrinus, Muma, Denmark, and De Leon, 1970:88 (47).

DIAGNOSIS: This species is closely related to *T. planetarius* (De Leon) from Mexico and *T. olombo* (Pritchard and Baker) from Africa. The genitalic details and the relative lengths of setae on the dorsal scutum separate *T. peregrinus* from the above species.

TYPE FEMALE: Minneola, Florida, 24-I-1952, M. H. Muma, on scaly citrus leaves; (NMNH).

DISCUSSION: Muma (43) evaluated this species as a predator on citrus insects and mites in Florida. Martorell took specimens of this species at Isabela, Puerto Rico, 5-I-1951, on pepper; it was described as *Typhlodromus* (*Amblyseius*) *evansi* by Chant (5) and synonymized by Muma, Denmark, and De Leon (47).

Typhlodromalus limonicus (Garman and McGregor)

Amblyseius limonicus Garman and McGregor, 1956:11 (28).

Typhlodromus (*Amblyseius*) *limonicus*, Chant, 1959:96 (5).

Typhlodromalus limonicus, De Leon, 1967:22 (18).

DIAGNOSIS: This species is closely related to *T. horatii* De Leon. L_1 is approximately half the length of L_4 in *limonicus* while L_1 is approximately the same length in *horatii*.

TYPE: The female from Santa Ana, California is in the Connecticut Agricultural Experiment Station collection, New Haven, Connecticut.

DISCUSSION: The biology and food habits of this species were discussed by McMurtry and Scriven (32). Our Puerto Rico records include: 1 female, 1 nymph, Mameyes-El Yunque, Rd. 191, Km 11.6, 1-IX-1968, on unknown host; 2 females, 1 male, Mameyes-El Yunque, Rd. 191, Km 10.4, 1-IX-1968, on "higuillo"; 1 female, Mameyes-El Yunque, Rd. 191, 1-IX-1968, on *Ipomoea* sp.; 2 males, El Yunque, Rd. 191, Km 10.4, 25-V-1969, on unknown host; 1 male, El Yunque, Rd. 191, Km 10.4, 22-V-1969, on unknown host; 1 female, El Yunque, Km 13.4, from Mameyes (Palmer), 10-V-1969, on unknown host; 4 females, 1 male, El Yunque, Km 2.9 toward Luquillo

through Bo. Sabana on Rd. 191, 25-V-1969, on "higuillo"; 1 female, 1 male, Utuado-Arecibo, Km 63.4, 4-IX-1968, on unknown host; 1 male, Mayagüez, Rd. 106, Km 5.3, 27-V-1969, on coffee leaves.

Typhlodromalus higuilloae Denmark and Muma, new species

Plate II, Figs. 6-12

DIAGNOSIS: *T. higuilloae* is distinguished from the closely related *pregrinus* (Muma) in having L_4 and L_8 , genu I with macrosetae, and M_3 and L_8 not as thick or serrated as in *peregrinus*.

FEMALE: Length 268μ ; width at L_4 151μ . Dorsal scutum smooth with slight creases along the anterior border and 17 pairs of setae (Plate II, fig. 6). Measurements of setae: verticals 27μ ; D_1 9μ , D_2 8μ , D_3 9μ , D_4 10μ ; M_1 7μ , M_2 9μ , M_3 39μ ; clunals 6μ ; L_1 39μ , L_2 13μ , L_3 20μ , L_4 58μ , L_5 16μ , L_7 6μ , L_8 59μ ; anterior sublaterals 25μ ; posterior sublaterals 8μ . Sternal scutum

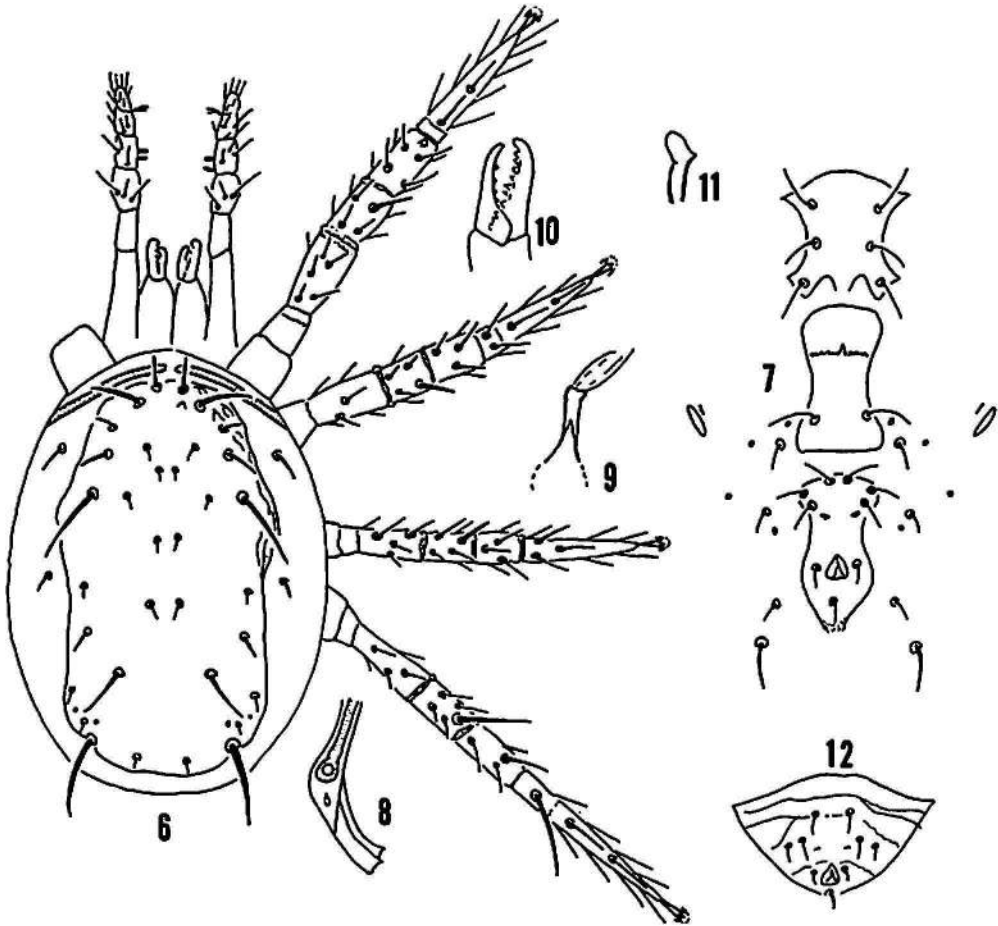


PLATE II. Female *Typhlodromalus higuilloae* Denmark and Muma, n. sp. Fig. 6. Dorsal and leg structure and setation. Fig. 7. Ventral scuta and setation. Fig. 8. Posterior peritremal and stigmatal development. Fig. 9. Spermathecal structure. Fig. 10. Chelicera. Fig. 11. Male spermatodactyl structure. Fig. 12. Male ventrianal scutum.

(Plate II, fig. 7) smooth with three pairs of setae; the ventrianal scutum (Plate II, fig. 7) smooth with one pair of pores, and three pairs of preanal ventrianal setae. Peritreme (Plate II, fig. 8) extending forward to the verticals. Chelicerae (Plate II, fig. 10) normal fixed finger with 11 to 12 denticules and the movable finger with three to four denticules. Leg formulae 4123. Macrosetae on genu I, II, III. Macrosetae of leg IV as follows: Sge 55μ , Sti 32μ , and St 60μ . Genu I 1, $\frac{2,2}{1}$, 2; genu III 1, $\frac{2,2}{1}$, 1. Spermatheca tubular undifferentiated (Plate II, fig. 9).

MALE: The male is smaller than the female. The ventrianal scutum (Plate II, fig. 12) with three pairs of preanal setae. The spermatodactyl (Plate II, fig. 11) with foot terminal, heel and lateral process distinct, toe broad and flat.

TYPE FEMALE: El Yunque, Km 13.4 from Palmer, Puerto Rico, 10-V-1969, M. H. Muma, on leaves of "higuillo"; (FSCA).

DISCUSSION: One female paratype was collected with the holotype; the allotype male was taken 3 miles southwest of Naval Station on Rd. 973, 31-VIII-1968, on castor bean; three female paratypes were collected at El Yunque, Km 11.0 from Palmer, 10-V-1969, on leaves of "higuillo".

Genus *Euseius* Wainstein

Amblyseius (*Amblyseius*) section *Euseius* Wainstein, 1962:15 (58).

Euseius, De Leon, 1966:86 (17). Type: *Seiulus finlandicus* Oudemans, 1915, by designation of Wainstein, 1962 (58).

There are over 40 known species and the genus is world-wide in distribution. It is common on the mainland of North America and in the Caribbean area.

Euseius ho (De Leon), new combination

Amblyseius (*Euseius*) *ho* De Leon, 1965:125 (14).

DIAGNOSIS: *E. ho* closely resembles *hum* Pritchard and Baker, but differs in having longer anterolateral setae and shorter caudal setae.

TYPE FEMALE: Coamo, Puerto Rico, 28-VIII-1963, D. De Leon, on *Colubrina reclinata*; (MCZ).

DISCUSSION: De Leon took one female and two males with the holotype. He also took a female on *Tetrazygia elaeagnoides* and a male on *Eupatorium odoratum* on the same date and location as the holotype. Our records include the following: 4 females, Mayagüez, Rd. 106, Km 5.3, 27-V-1969, on coffee leaves; 1 female, 1 male, Isabela Agr. Exp. Sub-sta., 18-V-1969, on tropical almond; 4 females, 2 males, Mayagüez-Maricao, Rd. 105, Km 12.7, 3-IX-1968, on unknown host.

Euseius sibelius (De Leon)

Amblyseius (*Typhlodromalus*) *sibelius* De Leon, 1962:21 (13).

Amblyseius (*Euseius*) *subalatus* De Leon, 1965:127 (14).

Euseius sibelius, Muma, Denmark, and De Leon, 1970:98 (47).

DIAGNOSIS: *E. sibelius* is similar to *scutalis* (Athias-Henriot) but has L₁, L₂, L₄, and L₈ much shorter, and has knobbed macrosetae on leg IV.

TYPE FEMALE: Coral Gables, Florida, 3-VI-1956, D. De Leon, on *Clerodendron* sp.; (MCZ).

DISCUSSION: De Leon collected this species at Juana Díaz, 28-VIII-1963, on *Citharexylum fruticosum*.

Euseius hibisci (Chant)

Typhlodromus (*Amblyseius*) *hibisci* Chant, 1959:68 (5).

Amblyseius (*Typhlodromalus*) *hibisci*, Muma, 1961:288 (39).

Euseius hibisci, Muma, Denmark, and De Leon, 1970:94 (47).

DIAGNOSIS: This species is distinguished from *sibelius* by having verticals equal L₄ in length while the verticals are shorter than L₄ in *sibelius*. L₈ is 3 times longer than M₃ in *hibisci* while L₈ is twice as long as M₃ in *sibelius*.

TYPE FEMALE: Alamos, Sonora, Mexico, 6-III-1961, Mr. Crow, on hibiscus leaves; (NMNH).

DISCUSSION: McMurtry and Scriven (32, 33, 34, 35, 36) indicated that this is a pollen feeder that can facultatively feed on a wide range of insects and mites. Our Puerto Rican records include: 2 males, Mayagüez, Rd. 106, Km 5.3, 27-V-1969, on coffee leaves; 1 female, Hato Rey, 25-VIII-1969, on coffee leaves; 1 female, Hato Rey, 25-VIII-1968, on grape; 1 female, Hato Rey, 24-VIII-1968, on hibiscus.

Genus *Neoseiulus* Hughes

Neoseiulus Hughes, 1948:141 (29); De Leon, 1965:23 (16); Muma and Denmark, 1968:235 (45). Type: *Neoseiulus barkeri* Hughes, 1948 (29) by original designation.

Typhlodromus (*Typhlodromopsis*) De Leon, 1959:113 (9) (in part).

Cydnodromus Muma, 1961:290 (39); Muma, 1967:273 (42).

There are about 40 known species in this genus that have considerable range in their habitat preference. The genus is common in the Caribbean area, although only a single species has been taken in Puerto Rico.

Neoseiulus setulus (Fox), new combination

Borinquolaelaps setulus Fox, 1947:599 (24).

DIAGNOSIS: Distinguishing characters of this species include a nearly smooth dorsal scutum, subequal dorsal scutal setae and a slender and in-

distinct but elongate St IV. *N. setulus* is closely related to *N. marinellus* (Muma) but the latter lacks macrosetae on leg IV.

TYPE FEMALE: San Juan (Santurce), Puerto Rico, 4-XI-1946, I. Fox, on *Rattus norvegicus*; (STM). This species is known only from the type.

PHYTOSEIINAE Berlese

Genus *Phytoseius* Ribaga

Phytoseius Ribaga, 1904:177 (51); Muma and Denmark, 1968:229 (45).

Type: *Phytoseius plumifer* (C. and F.), 1876, by subsequent designation of Vitzthum, 1914 (56), based on Ribaga's 1914 (51) description.

Dubininellus Wainstein, 1959:1365 (57).

Pennaseius Pritchard and Baker, 1962:223 (50).

Two subgenera are recognized: *Phytoseius* Ribaga and *Pennaseius* Pritchard and Baker. S_2 is missing in the subgenus *Phytoseius*.

Phytoseius (Phytoseius) woodburyi De Leon

Phytoseius (Phytoseius) woodburyi De Leon, 1965:130 (14).

DIAGNOSIS: *P. woodburyi* is similar to *rachelae* Swirski and Shechter, but differs in having L_3 serrate and dorsal scutum rugose.

TYPE FEMALE: North of Coamo, 28-VIII-1963, D. De Leon, on *Licaria salicifolia*; (MCZ).

DISCUSSION: This species originally was known only from the holotype. De Leon (unpublished) collected it in Trinidad and Jamaica. Muma collected it in Puerto Rico: 5 females, east of San Juan along Rd. 3, Km 43.2, 31-VIII-1968, on unknown host; 2 females, Río Piedras, Agr. Exp. Sta., 23-VIII-1968, on star jessamine.

Phytoseius (Phytoseius) rex De Leon

Plate III, figs. 13-19

Phytoseius (Phytoseius) rex De Leon, 1967:12 (18).

DIAGNOSIS: *P. rex* is similar to *woodburyi* De Leon but has an elongate cervix, macrosetae on the genu and the basitarsus longer and L_3 and L_5 are shorter. The female is redescribed below and the male is described for the first time.

FEMALE: Length 264 μ ; width at L_5 137 μ . Dorsal scutum rugose with 15 pairs of setae (Plate III, fig. 13). Measurements of setae: verticals 27 μ ; D_1 , D_2 , D_3 , and M_1 4 μ ; clunals 5 μ ; L_1 41 μ , L_2 11 μ , L_3 20 μ , L_4 7 μ , L_5 105 μ , L_6 75 μ , L_7 71 μ , L_8 71 μ ; anterior sublateral setae 36 μ . Sternal scutum (Plate III, fig. 14) smooth with 2 pairs of setae. Ventrianal scutum smooth with 3 pairs of preanal ventrianal setae (Plate III, fig. 14). Peritreme (Plate III, fig. 15)

extending forward to the verticals. Chelicerae (Plate III, fig. 17) small, fixed finger of chelicerae with 2 denticules and the movable finger with 1 small denticule. Leg formula 4123. Macrosetae on leg IV as follows: Sge IV 20μ , Sti IV 46μ , and St IV 37μ . Genu II 2, $\frac{2,2}{0}$, 1; genu III 1, $\frac{2,2}{0}$, 1. Spermatheca (Plate III, fig. 16) fundibuliform nodular.

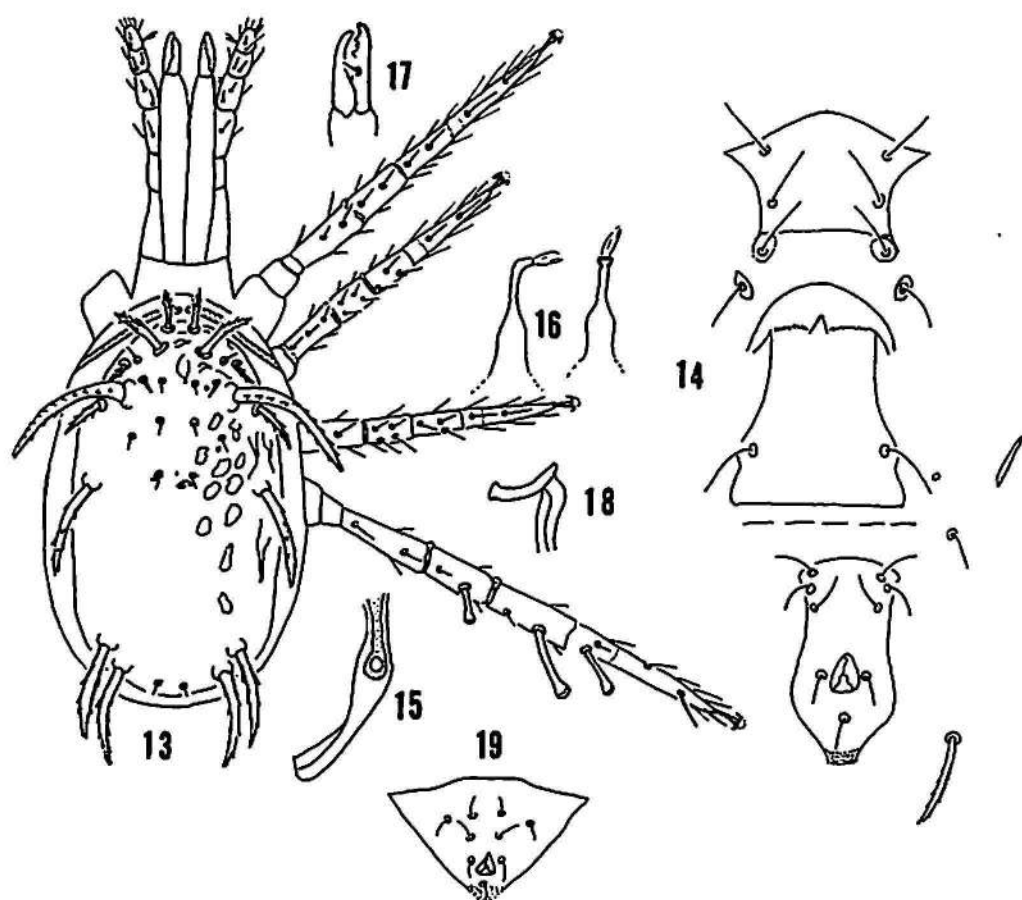


PLATE III. Female *Phytoseius rex* De Leon. Fig. 13. Dorsal and leg structure and setation. Fig. 14. Ventral scuta and setation. Fig. 15. Posterior peritremal and stigmatal development. Fig. 16. Spermathecal structures (two views). Fig. 17. Chelicera. Fig. 18. Male spermatodactyl structure. Fig. 19. Male ventrianal scutum.

MALE: The male is smaller than the female. The ventrianal scutum (Plate III, fig. 19) with 3 pairs of preanal setae. The spermatodactyl (Plate III, fig. 18) has foot terminal.

TYPE FEMALE: Curepe, Trinidad, 23-IX-1963, D. De Leon, on *Phaseolus lunatus*; (MCZ).

DISCUSSION: Our Puerto Rican records include: 2 females, Río Piedras, Agr. Exp. Sta., 23-VIII-1968, on star jessamine; 2 females, 1 nymph, Hato Rey, 24-VIII-1968, on unknown host; 2 females, 1 nymph, east of San Juan along Rd. 3, Km 55, 31-VIII-1968, on unknown host; 1 male, Sabana Grande-Yauco, Km 225.6, 3-IX-1968, on *Rivina humilis*.

Phytoseius (Pennaseius) bennetti De Leon

Phytoseius (Pennaseius) bennetti De Leon, 1965:14 (15); Denmark, 1966:36 (19).

DIAGNOSIS: *P. bennetti* is similar to *averrhoae* De Leon, but *bennetti* has pores between D₃ and D₄, clunals and L₃, and L₇ and L₈; spermathecal atrium only slightly nodular.

TYPE FEMALE: Manzanilla Bay, Trinidad, 3-X-1963, F. D. Bennett, on *Hibiscus tiliaceus*; (MCZ).

DISCUSSION: De Leon collected it in Puerto Rico at Río Piedras, 23-X-1963, on *Congea tomentosa*, and Cayey Mountain on *Eupatorium odoratum*.

Genus *Typhloseiopsis* De Leon

Typhloseiopsis De Leon, 1959:150 (11); Chant 1959:113 (5); Muma 1961:294 (39); Pritchard and Baker 1962:222 (50); Schuster and Pritchard 1963:205 (52). Type: *Typhloseiopsis theodoliticus* De Leon, 1959, by original designation.

There are three known species in this genus and these are restricted to Mexico and Puerto Rico.

Typhloseiopsis funiculatus De Leon

Typhloseiopsis funiculatus De Leon, 1965:122 (14).

DIAGNOSIS: *T. funiculatus* is similar to *theodoliticus* De Leon but has ventrianal scutum fully developed and L₂, L₃ and L₄ minute.

TYPE FEMALE: Coamo, Puerto Rico, 28-VIII-1963, D. De Leon on *Gymnanthes lucida*; (MCZ).

DISCUSSION: This species is known only from the female holotype.

Genus *Diadromus* Athias-Henriot

Diadromus Athias-Henriot, 1960:67 (1); De Leon, 1966:100 (17); Muma, 1961:294 (39); Denmark and Muma, 1972:27 (21). Type: *Typhlodromus contiguus* Chant, 1959, by original designation.

Typhloseiopsis De Leon; Muma, 1961 (39) (in part, not type).

Chanteius Wainstein, 1962:11 (58); De Leon, 1967:16 (18).

There are two species in this genus. *D. contiguus* (Chant) has been reported from Hong Kong and *regularis* is reported from Guyana (formerly British Guiana), Puerto Rico, Trinidad, and Colombia, South America.

Diadromus regularis (De Leon)

Typhloseiopsis regularis De Leon, 1965:122 (14).

Diadromus regularis, De Leon, 1966:100 (17); Denmark and Muma, 1972:27 (21).

Chanteius regularis, De Leon, 1967:16 (18).

DIAGNOSIS: We question whether *regularis* is congeneric with the genus *Diadromus*. If it does belong in this genus, it can be separated from *D. contiguus* by the fundibular spermatheca and a deep notch in the dorsal scutum.

TYPE FEMALE: Cayey Mountain, Puerto Rico, 28-VIII-1963, D. De Leon, on *Mangifera indica*; (MCZ).

DISCUSSION: De Leon collected 1 female and 2 nymphs with the holo type. Our Puerto Rican records include: 1 female, El Yunque, 7-V-1969, on roseapple leaves; 1 female, Rd. 119, Km 9.0, near intersection 113, 2-IX-1968, on unknown host.

Genus *Typhlodromina* Muma

Typhlodromina Muma, 1961:297 (39). Type: *Iphidulus conspicuus* Garman, 1948, by designation of Muma (39).

Muma and Denmark (46) gave a detailed account of the *T. conspicua* species-group which included *conspicua* (Garman), *subtropica* Muma and Denmark, *eharai* Muma and Denmark, and *tropica* (Chant). The *pini* group and *adjacentis* group were also delineated in this report.

Typhlodromina conspicua (Garman)

Iphidulus conspicuus Garman, 1948:14 (26).

Typhlodromus conspicuus, Nesbitt, 1951:22 (48); Chant, 1959:55 (5).

Typhlodromina conspicua, Muma, 1961:297 (39); Muma and Denmark, 1969:407 (46).

DIAGNOSIS: *T. conspicua* can be separated from the closely related *eharai* by having the spermathecal cervix 2.5 to 3.5 times longer than wide and ventrianal pores circular and distinct whereas *eharai* has the spermathecal cervix 2 times longer than wide and the ventrianal pores punctate and indistinct.

TYPE FEMALE: Hamden, Connecticut, 1937, from apple bark, in the Connecticut Agricultural Experiment Station collection at New Haven.

DISCUSSION: This species was taken in Puerto Rico by De Leon at Coamo, 23-VIII-1963, on *Sterculia apetala* and *Tetrazygia elaeagnoides*; at Juana Díaz, 23-VIII-1963, on *Hura crepitans*; at Cayey Mountain (elevation about 1800 ft.), 23-VIII-1963, on *Cordia sulcata*.

Typhlodromina adjacentis (De Leon)

Typhlodromus adjacentis De Leon, 1959:124 (10).

Typhlodromina adjacentis, De Leon, 1965:121 (14); De Leon 1967:16 (18).

DIAGNOSIS: *T. adjacentis* is readily distinguished from other species by the short dorsal setae, the serrate-oblongate M_2 and L_8 setae, and the strongly cleft dorsal scutum.

TYPE FEMALE: Aticama, Nay, Mexico, 8-IV-1957, D. De Leon on *Randia* sp.; (MCZ).

DISCUSSION: De Leon collected this species in Puerto Rico at Coamo, 23-VIII-1963, on *Sterculia apetala*; Cayey Mountain, on *Myrcia splendens*, *Cordia alliodora*, and *Polypodium phyllitidis*; El Yunque (elevation about 2500 ft.) on *Myrcia deflexa*.

Genus *Galendromus* Muma

Galendromus Muma, 1961:298 (39). Type: *Typhlodromus floridanus* Muma, 1955 (38), by subsequent designation, Muma, 1961 (39); Muma, 1963:15 (40); Tuttle and Muma, 1973:30 (55).

Muma (40) revised this genus and recognized 17 species in 3 subgenera. The genus is represented over a wide geographical area ranging from Canada to Mexico, Puerto Rico, Chile and Paraguay.

Galendromus annectens (De Leon)

Typhlodromus annectens De Leon, 1958:75 (7).

Galendromus annectens, Muma, 1961:298 (39); Muma, 1963:20 (40); Muma, Denmark, and De Leon, 1970 (47).

DIAGNOSIS: *T. annectens* is the smallest species in the subgenus *Galendromus*. The body is 290 μ long and has punctate preanal pores.

TYPE FEMALE: Coral Gables, Florida, 4-VI-1956, D. De Leon, on *Trema micrantha*; (MCZ).

DISCUSSION: De Leon collected this species in Puerto Rico at Santurce, 23-VIII-1963, on *Hura crepitans*, and at Ponce, 23-VIII-1963, on *Guazuma ulmifolia*. Our Puerto Rican records include: 3 females, Río Piedras, Agr. Exp. Sta. greenhouse, 28-VIII-1968, J. Greene and M. H. Muma, on *Cedrella odorata*, probably feeding on *Tetranychus tumidus* Banks.

Galendromus luculentis (De Leon)

Typhlodromus luculentis De Leon, 1959:126 (10); Herschmann, 1962:14 (30).

Galendromus luculentis, Muma, 1961:298 (39); Muma, 1963:36 (40).

DIAGNOSIS: *G. luculentis* is closely related to *carinulatus* (De Leon), but is separated from it by the subequal, plumose M_2 and L_8 and the absence of preanal pores on the ventrianal scutum.

TYPE FEMALE: Tuxtla Gutiérrez, Chiapas, Mexico, 11-I-1957, D. De Leon on *Guazuma tomentosa*; (MCZ).

DISCUSSION: Our Puerto Rican records include: 1 male, 1 nymph, El Yunque, Luquillo Rd., Caribbean National Forest, Km 5.5, 26-VIII-1968, on turk's cap; 3 females, Mameyes-El Yunque, Rd. 191, Km 11.6, 1-IX-1968, on unknown host; 1 female, 1 male, El Collao, Cayey-Salinas

Rd., Km 71.0, 27-VIII-1968, on turk's cap; 2 females. El Yunque on Rd. 191, Km 10.4, 25-V-1969, on unknown host.

Genus *Amblydromella* Muma

Amblydromella Muma, 1961:294 (39). Type: *Typhlodromus fleschneri* Chant, 1960 by designation of Muma, 1961 (39); Muma, 1967:276 (42).

Typhlodromella Muma, 1961:299 (39).

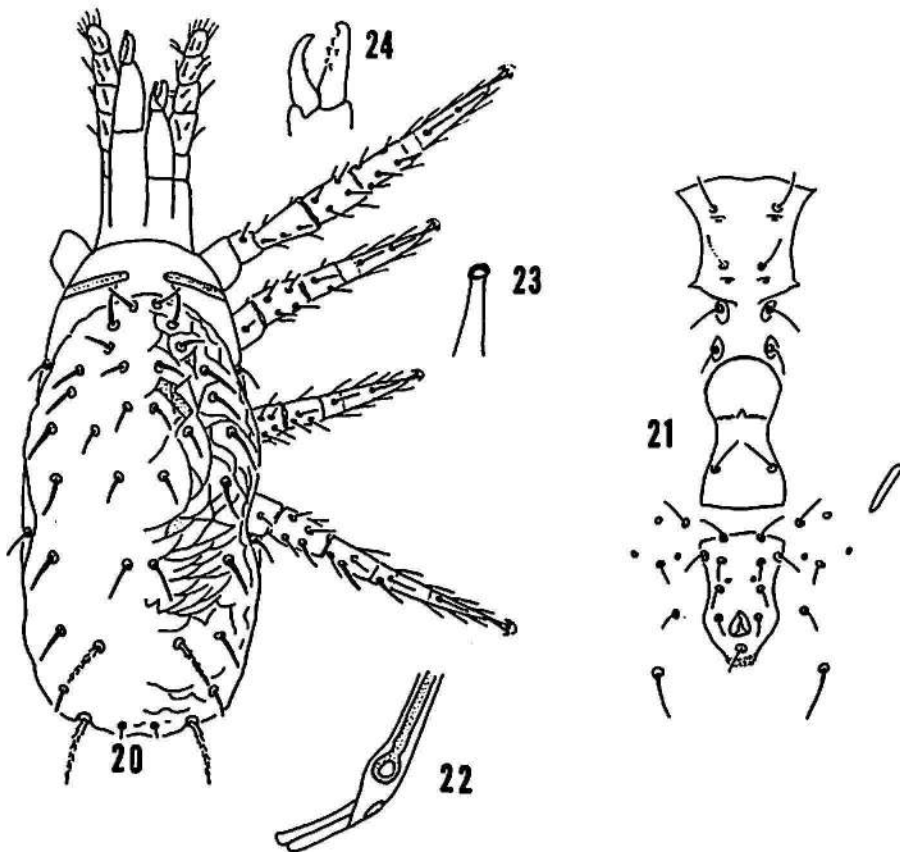


PLATE IV. Female *Amblydromella deleoni* Denmark and Muma, n. sp. Fig. 20. Dorsal and leg structure and setation. Fig. 21. Ventral scuta and setation. Fig. 22. Posterior peritremal and stigmatal development. Fig. 23. Spermathecal structure. Fig. 24. Chelicera.

Muma (42) discussed two groups of species belonging to this genus and cited species to which no group assignment could be made. The new species described in this paper also cannot be assigned to a species group.

Amblydromella deleoni Denmark and Muma, new species

Plate IV, Figs. 20-24

DIAGNOSIS: *A. deleoni* can be separated from *loralaiana* Muma by the small macrosetae on leg IV and longer L_9 .

FEMALE: Length 299 μ ; width at L_5 160 μ . Dorsal scutum reticulated and

18 pairs of setae (Plate IV, fig. 20). Measurements of setae: verticals 19μ ; D_1 and D_2 17μ , D_3 20μ , D_4 25μ ; clunals 8μ ; M_1 17μ , M_2 35μ ; L_1 25μ , L_2 18μ , L_3 22μ , L_4 22μ , L_5 25μ , L_6 28μ , L_7 30μ , L_8 27μ , L_9 17μ , L_{10} 47μ ; anterior sublateral setae 25μ , posterior sublateral setae 23μ . Sternal scutum (Plate IV, fig. 21) smooth, with 2 pairs of pores and 2 pairs of setae. Ventrianal scutum (Plate IV, fig. 21) smooth with a pair of pores and 4 pairs of preanal ventrianal setae. Peritreme (Plate IV, fig. 22) extending forward to the verticals. Chelicerae (Plate IV, fig. 24) normal in size, fixed finger with 5 denticles, movable finger with 2 very small denticles. Leg formulae 1423.

Macrosetae on leg IV: Sge 10μ , Sti 13μ , St 20μ . Genu II 1, $\frac{2,2}{0}$, 1; genu III 1, $\frac{2,2}{0}$, 1. Spermatheca (Plate IV, fig. 23) fundibuliform nodular.

MALE: UNKNOWN.

TYPE FEMALE: Sabana Grande to Yauco Road, Puerto Rico, 3-IX-1968, M. H. Muma, on *Rivina humilis*; (FSCA). One nymph was taken at Río Piedras, Puerto Rico, Agr. Exp. Sta., 23-VIII-1968, M. H. Muma on star jessamine.

RESUMEN

Este artículo es un resumen de los acarinos (Phytoseiidae) de Puerto Rico. En él se describen tres nuevas especies a saber: *Typhlodromips plumosus*, *Typhlodromalus higuilloae* y *Amblydromella deleoni*. Unas catorce especies se informan por primera vez de Puerto Rico, elevando a 48 el número total de especies conocidas.

LITERATURE CITED

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