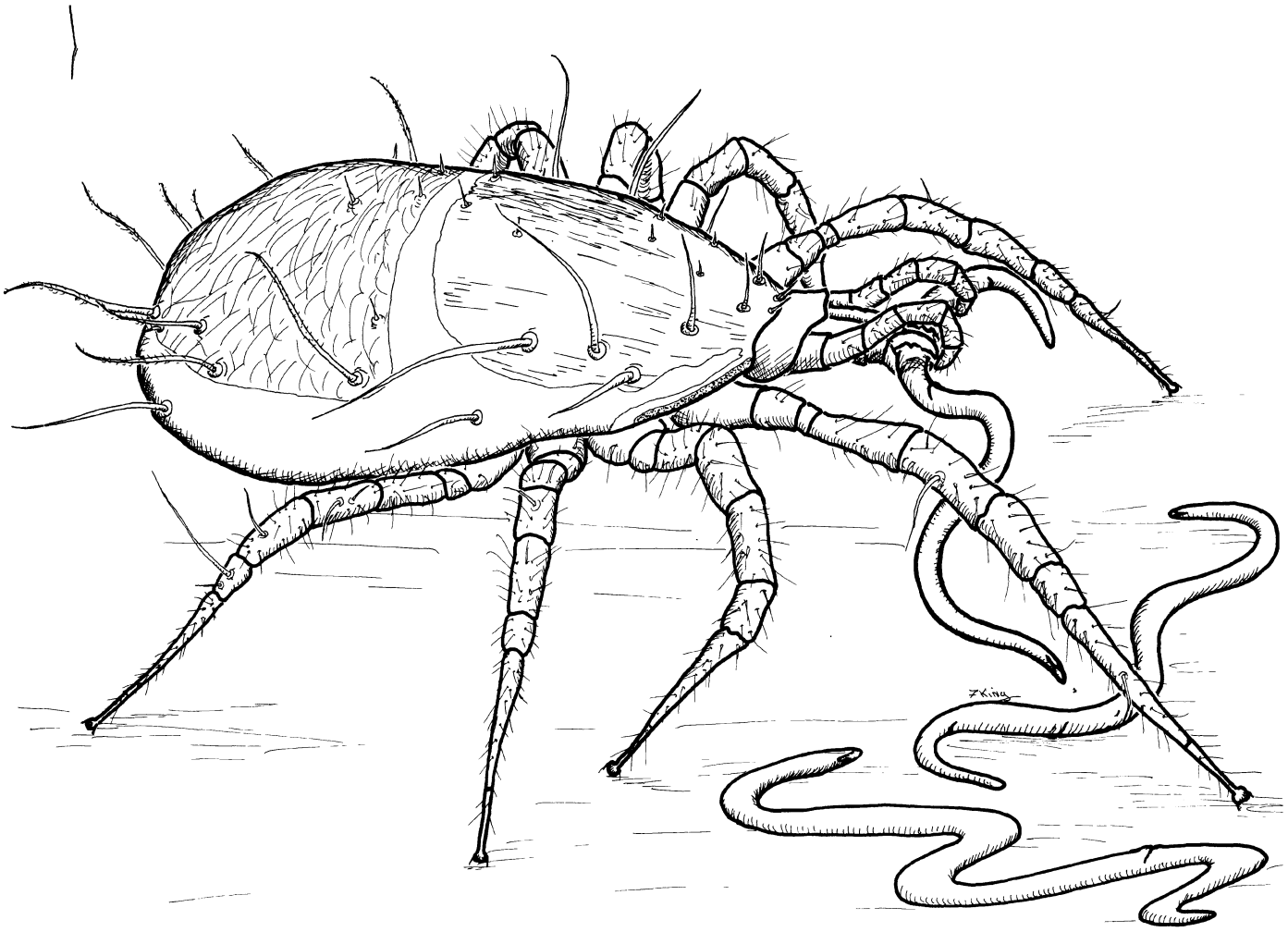
ARTHROPODS OF FLORIDA

AND NEIGHBORING LAND AREAS

VOLUME 6



PHYTOSEIIDAE OF FLORIDA

MARTIN H. MUMA HAROLD A. DENMARK

FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES

DOYLE CONNER, COMMISSIONER

PHYTOSEIIDAE OF FLORIDA

Errata

Title page: Actual release date May 3, 1971.

Page 34: Under Key in first column, 7th line: italicize gracilisetae.

Page 36: Add Fig. 113 to 118 in second column under Proprioseiopsis rotundus (Muma).

Page 62: 4th line under GENUS AMBLYSEIUS BERLESE: Change (Amblyseiulus) to (Amblyseialus).

Page 76: Fundiseius imbricata: Add parenthesis around Muma and Denmark.

Page 78: Second column, 5th line: Remove last "e" from setae.

Page 130: Map title: Change "V" to "C" in Validromus. Also, under County Distribution: Add St. Lucie.

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1970

PHYTOSEIIDAE OF FLORIDA

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FOREWORD

Mites of the family Phytoseiidae are predominately predatory. They are the most important mite predators of plant-feeding mites. They are moderate to large size, flattened-oval to nearly hemispherical in shape and move about readily on strong robust legs. The life cycle from egg to adult is completed in one to three weeks.

Phytoseiids have been collected on all continents and from the arctic to the tropics. They are found in a number of different terrestrial habitats. They are abundant in ground surface litter such as dead and rotting leaves, rotting logs and limbs, sod accumulations, fallen bromeliads, tidal debris and trash. Many species also are common on the trunks, limbs, leaves, flowers, and fruits of plants including trees, shrubs, herbs, grasses, mosses, and fungi. Some species are found in stored plant and animal fibers and food materials. Others are found in mammal and bird burrows, dens and nests, and a few have been taken from the soil.

Although the food habits of phytoseiids have not been studied intensively, published accounts indicate a wide range of foods. Certain genera are known to feed predominately on spider mites, others feed readily on the erineum or rust mites. At least one genus is known to feed exclusively on saprophytic mites, and another feeds and develops readily on nematodes. One genus is believed to feed and reproduce entirely on pollen, and another is known to feed readily on spider mites when pollen is a part of the diet. Several species have been demonstrated to survive for two or more weeks on plant juices obtained from leaf hairs, and one species has survived for three months on water. Tiny soft-bodied insects such as scale insect and whitefly crawlers also serve as survival foods for certain species. The tiny nearly edentate chelicerae of some genera appear to be adapted for mite egg or pollen feeding; the large multidentate chelicerae of other genera indicate larger prey or a broader food range, and the massive chelicerae of one genus could be an adaptation for very large, possibly hard-bodied insects or mites.

The economic importance of Phytoseiidae has, in the past, been the subject of much scientific controversy. Recent carefully conducted observational and experimental research has demonstrated, however, that some species are potentially or actually capable of controlling infestations of injurious mites on economically important agricultural crops. The potential importance of species that inhabit ground surface litter, stored products, and animal nests has not been investigated.

Phytoseiidae of Florida (Acarina: Mesostigmata) is the sixth publication in the series dealing with insects, arachnids and other arthropods in Florida and other land areas in and around the Gulf of Mexico and the Caribbean Sea. The taxonomic, ecologic, biologic, zoogeographic and economic information presented here for the eighty-six species presently known from the state must be considered preliminary. Many additional species will probably be collected from the study area and much additional biologic research is needed.

The senior author, Martin H. Muma, was born in Topeka, Kansas, July 24, 1916. His professional training was obtained at Western Maryland College Extension Night School in 1933-34, Frostburg State Teachers College in 1935-36, and the University of Maryland in 1936-43. He received his B.S. degree in 1939, his M.S. in 1940, and his Ph. D. in 1943. From 1940 to 1945, he served as an Instructor in Entomology and Assistant Entomologist at the University of Maryland; from 1945 to 1951, he was Extension Entomologist and then Associate Entomologist, Associate Professor, and Associate Curator of The Museum at the University of Nebraska.

Since 1951 he has been an Associate Entomologist, Associate Professor, Entomologist, and Professor at the University of Florida Citrus Experiment Station located near Lake Alfred, Florida. His present projects

involve research on the taxonomy, biology, and natural control of citrus mites, the natural and ecological control of injurious citrus insects and the biological control potential for the Caribbean Fruit Fly.

Although Dr. Muma's formal education and official professional experience have been in the field of entomology, his favorite avocational fields are arachnology and speleology. In entomology he has investigated and contributed to the taxonomy, biology, ecology, and control of deciduous fruit insects, field crop insects, livestock parasites, and citrus insects. In arachnology he has studied and contributed to the taxonomy, biology, and ecology of mites, spiders, tarantulas, scorpions, whip-scorpions, and solpugids. In speleology he has examined and contributed to cave biology, cave ecology, and cave terminology. He is the author of a book, "Common Spiders of Maryland," and the author or coauthor of 147 scientific bulletins or papers, 48 in entomology, 66 in arachnology, 21 in extension entomology, and 12 in speleology. His synoptic review of the North American, Central American, and West Indian Solpugida was published earlier in 1970 as Volume 5 of *Arthropods of Florida and Neighboring Land Areas.*

The junior author, Harold A. Denmark, was born in Lamont, Florida, July 3, 1921. He attended public schools in Winter Garden, Florida. In 1941 he joined the United States Navy and served six years, much of this time with the Submarine Service in the Pacific Theatre of Operation, discharged as a Signalman First Class. He received his B.S.A. degree with honors from the University of Florida in 1952. The following year he received his M.S. degree from the same institution. During this period he served as an interim instructor in the Department of Entomology.

In July 1953 he became an Entomologist with the State Plant Board of Florida (which, in 1961, became the Division of Plant Industry of the Florida Department of Agriculture). In July 1958 he became Chief Entomologist.

He is the author of 51 arthropod publications, 29 pertaining to mites.

Howard V. Weems, Jr.
Editor

Bureau of Entomology
Division of Plant Industry
Florida Department of Agriculture and
Consumer Services

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Martin H. Muma,[3] Harold A. Denmark,[4]
and Donald De Leon[5]

Introduction

Mites of the family Phytoseiidae have been the subject of intense taxonomic, biological, and ecological study since Nesbitt's (1951) review of the group. At that time less than 30 species were recognized, and little was known concerning their biology and ecology. Today more than 600 species have been described; several reviews and systematic studies have been published; numerous reports have been made on food habits, life cycles, ecological requirements, and economic potentials.

Florida species have been described by Chant, De Leon, Denmark, Garman, and Muma in a series of recent taxonomic studies. The systematic problem of intraspecific variation has been discussed by Muma and Denmark (1962). Biological and ecological notes on Florida species have been published by Muma (1961, 1964a, and 1964b) and Muma, et al (1961). The economic potential of several Florida phytoseiids has been evaluated and/or discussed by Muma (1955b, 1958, and 1964), and McMurtry and Scriven (1965, 1966a, and 1966b).

Chant (1959) listed 22 species of phytoseiids from Florida. In the present paper, the authors propose to draw together in a single publication all of the information presently available on the species of Phytoseiidae known to occur in Florida. Eighty-six phytoseiids now are known from the state. So, to conserve space, the data for each species have been organized in concise paragraphs which present diagnoses, type data, habitats, biology, and distribution. Diagnostic keys and distributional maps also are included. The habitat includes those plants and litter that mites have been taken from and in most cases does not serve as a host. Such areas as litter, Spanish moss, and other plants most often serve as a host or hiding place for the small arthropods on which the phytoseiids prey.

This study presents more on the taxonomy than on the distribution and biological data. Our present knowledge of the state and world distribution of phytoseiids is so incomplete that detailed distribution records and zoogeographic discussions would be meaningless. Distribution maps have counties blocked in rather than individual collecting sites because many species seldom can be collected from the same locality over a period of time. Species collected in one county sometimes may be collected in another county more easily than by going back to the original habitat. The opposite is true of a few ubiquitous species such as *Typhlodromalus peregrinus* (Muma), *Proprioseiopsis mexicanus* (Garman), and *Euseius hibisci* (Chant). Further, the restriction to Florida of certain species and the absence from Florida of other species may be more apparent than real. In the past ten years 64 species have been added to the list in Florida. It may be conservative to estimate that this list represents approxi-

[1]Florida Agricultural Experiment Stations Journal Series No. 3236.

[2]Contribution No. 148, Bureau of Entomology, Division of Plant Industry, Florida Department of Agriculture and Consumer Services.

[3]Entomologist, University of Florida Citrus Experiment Station, Lake Alfred, 33850.

[4]Chief Entomologist, Division of Plant Industry, Florida Department of Agriculture and Consumer Services, Gainesville 32601.

[5]Entomologist, Erwin, Tennessee (deceased June 8, 1966).

Table. 1. Type depositories and curators of North American solpugids. Code letters only are used in text.

Code Letters	*Institutions and curators*
AMNH	American Museum of National History, New York, New York, USA, Dr. W. J. Gertsch (retired).
ANS	Academy of Natural Sciences, Philadelphia, Pennsylvania, USA, H. J. Grant (deceased).
BMNH	British Museum (Natural History), London, England, Mr. D. J. Clark.
BNHM	Boston Society of Natural History Museum, Boston, Massachusetts, USA.
CUM	Cornell University Museum, Ithaca, New York, USA.
DZUU	Department of Zoology, University of Utah, Salt Lake City, Utah, USA, Wilton Ivie (deceased).
IZUF	Instituto de Zoologia dell'Universita, Firenze, Italy, Dr. Laura Delle Cave.
MCZ	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA, Dr. H. W. Levi.
MNHN	Museum National d'Histoire Naturelle, Paris, France, Prof. M. Vachon.
NMWA	Naturhistorisches Museum, Wien, Austria, Dr. E. Kritscher.
SMF	Natur-Museum und Forschungs-Institut Senchenberg, Frankfurt am Main, West Germany, Dr. O. Kraus (presently director ZSM).
UCBC	University of California, Berkeley, California, USA, Dr. P. D. Hurd (not presently curator).
USNM	United States National Museum, Washington, D. C., USA, Dr. R. Crabill.
ZMHU	Zoologisches Museum der Humboldt Universität, East Berlin, East Germany.
ZSM	Zoologisches Staatsinstitut ad Museum, Hamburg, West Germany, Dr. Gisela Rack.

Table 2. Species, the types of which were not seen during this study.

Ammotrecha picta Pocock, ♂ and ♀ types from Guatemala. Location of types not known.

Ammotrechella bolivari Mello-Leitão, ♀ from La Esperanza, Chiapas, Mexico, by Candido Bolivar. Type may be in La Plata, Rio de Janeiro, or São Paulo.

Ammotrechesta schlueteri Roewer, type from Honduras, supposed to be but not in ZSM.

Ammotrechula boneti Mello-Leitão, ♂ from Mazatlán, Sinaloa, Mexico, by D. Pelaez. Type may be in La Plata, Rio de Janeiro, or São Paulo.

Eremobates audax Hirst, ♂ type from Mexico. Location of type not known.

Eremobates durangonus Roewer, ♀'s from Dinamita, Durango, Mexico. Supposed to be but not in MNHN.

Eremoperna hystrix Mello-Leitão, ♂ from Mexico, D. F., by F. Bonet. Type may be in La Plata, Rio de Janeiro, or São Paulo.

Eremoperna ingens Mello-Leitão, ♀ from Villa Obregón, Mexico, D. F., by Candido Bolivar y Pieltain. Type may be in La Plata, Rio de Janeiro, or São Paulo.

Galeodes limbatus Lucas, lectotype from Guatemala, supposed to be but not in ZSM.

Gluvia elongatas C. L. Koch, ♂ from Mexico. Location of type not known.

Gluvia geniculata C. L. Koch, lectotype from Bahamas, supposed to be but not in ZSM.

Gluvia praecox C. L. Koch, ♂ type from Mexico. Location of type not known.

Gluvia tolteca Pocock, ♂ from Mexico. Supposed to be but not in BMNH.

Solpuga gryllipes Gervais, lectotype from Jamaica, supposed to be but not in ZSM.

Fig. 7-12. Phytoseiinae.
7. Dorsal and leg structure and setation ♀.
8. Ventral and setation ♀.
9. Posterior peritremal and stigmatal development ♀.
10. Cheliceral dentition ♀.
11. Spermathecal structure ♀.
12. Spermatodactyl structure ♂.

KEY TO ABBREVIATIONS

Ap—apotele
At—atrium
Cl—clunal setae
Cs—caudal setae
Cx—cervix
D_1-D_4—dorsal setae
Dn—denticule
Ds—dorsal scutum
Exs—leg IV exopodal scutum
Ff—fixed finger
Ft—foot
Gs—genital scutum
H—heel
L_1-L_{10}—lateral setae
Lp—lateral process
M_1-M_3—median setae
Ma—major duct
Mf—movable finger
Mi—minor duct
Mp—metapodal scutum
Ms—metasternal scutum
P—peritreme
Pd—*pilus dentilis*
Pp—preanal pore
Ps—peritremal scutum
S_1-S_2—sublateral setae
S—stigmata
Sge I-IV—genual macrosetae
Sh—shank
Sp—secondary pore
Ss—stigmatal scutum
St I-IV—tarsal macrosetae
Sti III-IV—tibial macrosetae
Sts—sternal scutum
T—toe
V—vertical setae
VI—ventro-lateral setae
Vs—ventrianal scutum

SETAL, SPERMATHECAL, AND SPECIAL CHARACTERS IN FIG. 13-47.

Fig. 13-22. Setal characters.
13. Hooked—hamate.
14. Rod-like—bacillate.
15. Feathered—plumose.
16. Flattened—spatulate.
17. Clubbed—clavate.
18. Toothed—serrate.
19. Paddle-like—oblanceolate.
20. Hair-like knobbed—knobbed setaceous.
21. Rod-like knobbed—knobbed bacillate.
22. Hair-like—setaceous.
Fig. 23-30. Spermathecal characters.
23 and 24. Cup or bowl-shaped cervix—poculiform.
25. Horn-like cervix—corniform.
26. Bladder-like cervix—vesicular.
27. Sack-like cervix—saccular
28. Tube-like cervix—tubular.
29. Funnel-like cervix—fundibuliform.
30. Funnel-like cervix, knot-like atrium—fundibuliform, nodular.
Fig. 31-36. Sternum.
31. Concave posteriorly.
32. Flat posteriorly.
33. Lobate posteriorly.
34. Excavated posteriorly.
35. Obscure posteriorly.
36. Produced posteriorly.
Fig. 37-42. Ventrianal scutum.
37. Pentagonal.
38. Shield-shaped.
39. Quadrate.
40. Vase-shaped.
41. Ovate.
42. Massive.
Fig. 43-47. Scutal ornamentation.
43. Reticulate.
44. Imbricate.
45. Rugose.
46. Creased.
47. Punctate.

Leg chaetotaxy has been thoroughly studied by Evans (1963) who developed a terminology for setal patterns. The setal patterns for the 6 segments of the 4 legs are basically similar throughout the Phytoseiidae, but variations seem to be both intra- and intergeneric and intra- and interspecific (Table 1) which reduces the usefulness of leg chaetotaxy below the family or subfamily level. Leg chaetotaxy, except as it applies to macrosetae, is not utilized here. The macrosetal terminology in Fig. 1 and 7 is that proposed by Athias-Henriot (1957). Setae are considered to be macrosetae if they occur in the positions indicated in Fig. 1 and 7 and if they are noticeably thickened or their lengths are more than half the length of the segment on which they occur. Other enlarged or modified setae are not considered macrosetae.

The terminology concerning the parts of the spermatheca in Fig. 5 and 11 is that of Schuster and Smith (1960) which was modified from that of Dosse (1958). The cervices

and atria are defined with the following terms: corniform (horn-like), fundibuliform (funnel-like), poculiform (cup-like, wider than long), saccular (sack-like, 1 to 4 times longer than wide), tubular (tube-like more than 4 times longer than wide), vesicular (bladder-like), nodular (node or nut-like), ovate (egg-like), and undifferentiated. These terms are pictorially defined in Fig. 23-30.

Systematics

Within the last 20 years, several workers have published reviews and revisions of the family Phytoseiidae. Most important are those of Garman (1948), Nesbitt (1951), Womersley (1954), Athias-Henriot (1957, 1958, and 1960), Chant (1959), Muma (1961), Wainstein (1962), Hirschmann (1962), Pritchard and Baker (1962), Schuster and Pritchard (1963), and Chant (1965). Garman, Nesbitt, Womersley, Athias-Henriot, Chant, and Hirschmann were conservative in their approach and recognized a few broadly conceived genera and subgenera. Hirschmann (1962) most conservatively recognized all species in the genus *Typhlodromus* Scheuten. Muma, Wainstein, Pritchard and Baker, and Schuster and Pritchard on the other hand recognized many narrowly-restricted, sharply-defined genera and sub-genera. Muma (1961), in extreme, recognized 43 genera. This extreme divergence of opinions indicates that systematics and nomenclature within the family may be in a state of flux for several years. It seems propitious, therefore, that our generic concepts be discussed.

The subfamily and generic concepts proposed by Chant (1965) do not seem to be realistic. The combination of the Otopheidomenidae, a family of semiparasitic to parasitic mites with incomplete chelicerae, fragmented and poorly-defined dorsal and ventral scuta, anteriorly located paraanal setae, and a terminal anus with the Phytoseiidae, a family of semipredaceous to predaceous mites with complete chelicerae, well-defined dorsal and ventral scuta, laterally located paraanal setae, and a ventral anus seems to be unwarranted. Further, Chant's recognition, within the Phytoseiinae, of 5 monotypic narrowly-defined genera and 5 polytypic broadly-defined genera does not take into consideration the wealth of morphological, biological, and ecological data that have been accumulated in the last 10 years. For example, the combination of *Anthoseius* De Leon and *Galendromus* Muma as junior synonyms of *Typhlodromus* Scheuten, buries distinctly different groups of species in a single genus. *Anthoseius* are flower-inhabiting, pollen-feeding mites with short stocky legs, 2 pairs of sublateral setae, and long slender undifferentiated spermatodactyls. *Galendromus*, obligate predators associated primarily with Tetranychidae, have short slender legs, only 1 pair of sublateral setae, and L-shaped spermatodactyls with a typical shank, heel, foot, toe, and lateral process. *Typhlodromus*, facultative predators with an apparent preference for Eriophyidae, have long legs, 2 pairs of sublateral setae, and L-shaped, typically differentiated spermatodactyls. Cheliceral, spermathecal, and peritremal characters also serve to distinguish these genera. A similar combination of dissimilar groups of species occurs when *Phytoscutus* Muma and *Proprioseiopsis* Muma are made junior synonyms of *Amblyseius* Berlese. Cheliceral dentition, dorsal scutal setation, peritremal scutal development, macrosetal development, ecological niches, and feeding habits all serve to distinguish species assigned to these 3 genera.

Although the generic assignments and arrangement proposed by Muma (1961) are extreme and in need of modifications beyond those already indicated by Lindquist and Chant (1964), De Leon (1965 and 1966), Muma (1967), and Muma and Denmark (1968), it results in a grouping of similar species into well-defined genera which frequently include recognizable species-groups. Where definition of genera is still obscure and further partitioning or combining is indicated, such is discussed in the generic paragraphs below. Otherwise, Muma's (1961) system of subfamial and generic classification is utilized here and is characterized in Tables 2, 3, 4, 5, 6, 7, 8, 9, and 10.

Table 1. Variations of leg setal formulae in Phytoseiidae[1]

Genera and species	Genu II	Genu III
Macroseius biscutatus Chant, Denmark, and Baker	$2-\frac{2,\ 2}{1,\ 0}-1$	$1-\frac{2,\ 2}{1,\ 0}-1$
Phytoseiulus macropilis (Banks)	$2-\frac{2,\ 2}{1,\ 0}-1$	$1-\frac{2,\ 2}{1}-1$
Phytoscutus sexpilis Muma	$2-\frac{2,\ 2}{0,\ 0}-1$	$1-\frac{2,\ 2}{1,\ 0}-1$
Proprioseius meridionalis Chant	$2-\frac{2,\ 2}{1}-1$	$1-\frac{2,\ 2}{1,\ 0}-1$
Proprioseius anthurus Denmark and Muma	$2-\frac{2,\ 2}{1}-1$	$1-\frac{2,\ 2}{1,\ 0}-1$
Proprioseiulus paxi (Muma)	$2-\frac{2,\ 2}{1,\ 0}-1$	$1-\frac{2,\ 2}{1,\ 0}-1$
Proprioseiopsis detritus (Muma)	$2-\frac{2,\ 2}{0,\ 0}-1$	$1-\frac{2,\ 2}{1,\ 0}-1$
Proprioseiopsis citri (Muma)	$2-\frac{2,\ 2}{0,\ 0}-1$	$1-\frac{2,\ 2}{1}-1$
Proprioseiopsis tubulus (Muma)	$2-\frac{2,\ 2}{1,\ 0}-1$	$1-\frac{2,\ 2}{1}-1$
Proprioseiopsis sarraceniae (Muma)	$2-\frac{2,\ 2}{1,\ 0}-1$	$1-\frac{2,\ 2}{1,\ 0}-1$
Proprioseiopsis macrosetae (Muma)	$2-\frac{2,\ 2}{0,\ 1}-1$	$1-\frac{2,\ 2}{0,\ 1}-1$
Proprioseiopsis cannaensis (Muma)	$2-\frac{2,\ 2}{0,\ 0}-1$	$1-\frac{2,\ 2}{0,\ 1}-1$
Proprioseiopsis rotundus (Muma)	$2-\frac{2,\ 2}{0,\ 0}-1$	$1-\frac{2,\ 2}{1,\ 0}-1$
Proprioseiopsis dorsatus (Muma)	$2-\frac{2,\ 2}{0,\ 0}-1$	$1-\frac{2,\ 2}{0,\ 1}-1$
Proprioseiopsis gracilisetae (Muma)	$2-\frac{2,\ 2}{0,\ 0}-1$	$1-\frac{2,\ 2}{0,\ 1}-1$
Proprioseiopsis clausae (Muma)	$2-\frac{2,\ 2}{1/2}-1$	$1-\frac{2,\ 2}{1}-1$
Noeledius iphiformis (Muma)	$2-\frac{2,\ 2}{0,\ 0}-1$	$1-\frac{2,\ 2}{1,\ 0}-1$
Amblyseiella setosa Muma	$2-\frac{2,\ 2}{1}-1$	$1-\frac{2,\ 2}{1}-1$
Platyseiella platypilis (Chant)	$2-\frac{2,\ 2}{0,\ 0}-1$	$1-\frac{2,\ 2}{0,\ 0}-1$
Galendromimus alveolaris (De Leon)	$2-\frac{2,\ 2}{0,\ 0}-1$	$1-\frac{2,\ 2}{1,\ 0}-1$

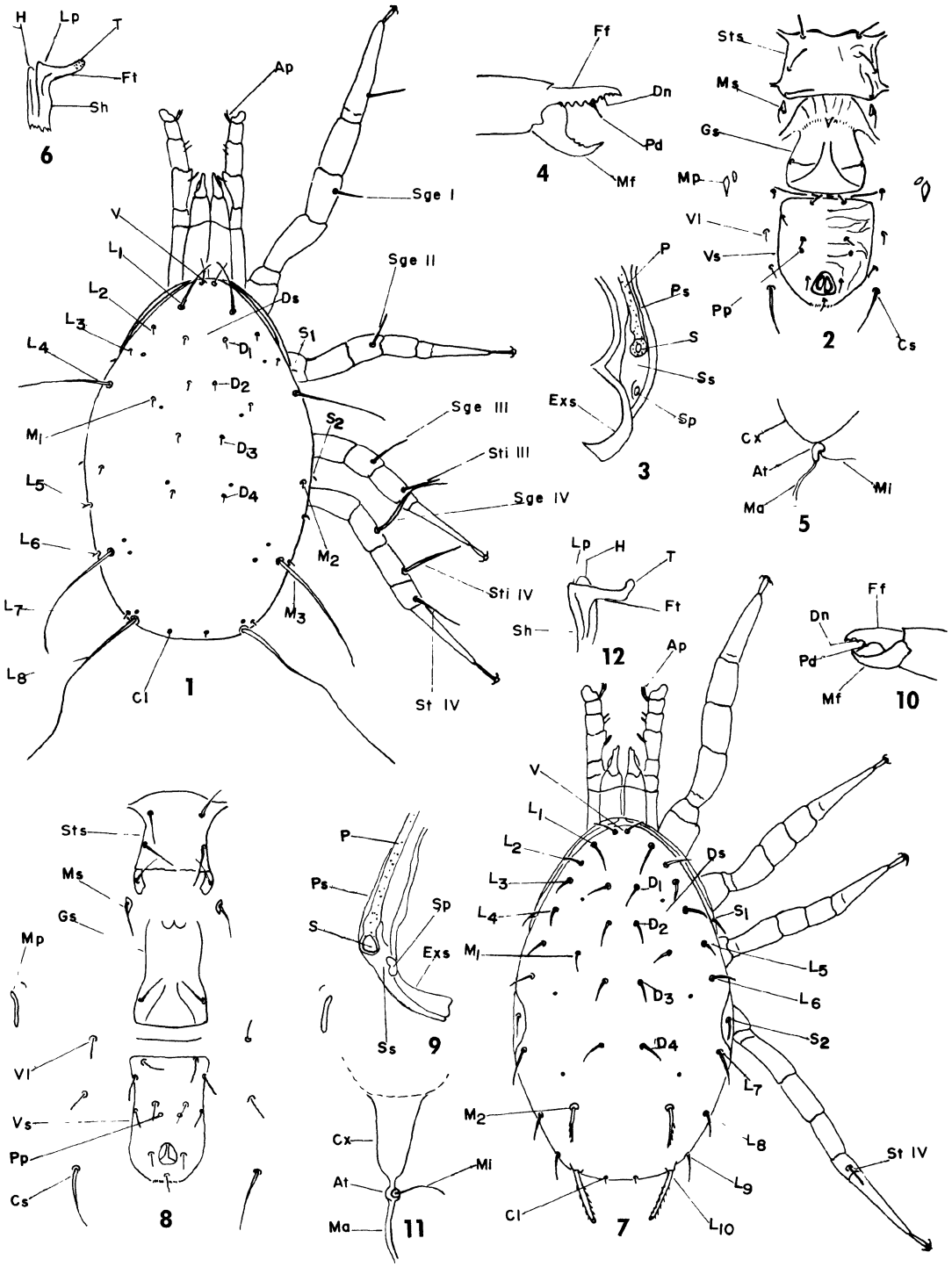
[1]See discussion on leg chaetotaxy (p. 3).

Table 1. Continued

Genera and species	Genu II	Genu III
Chelaseius vicinus (Muma)	2-$\frac{2,\ 2}{0,\ 0}$-1	1-$\frac{2,\ 2}{1,\ 0}$-1
Chelaseius floridanus (Muma)	2-$\frac{2,\ 2}{0,\ 0}$-1	1-$\frac{2,\ 2}{1}$-1
Iphiseiodes quadripilis (Banks)	2-$\frac{2,\ 2}{0,\ 0}$-1	1-$\frac{2,\ 2}{1,\ 0}$-1
Amblyseius curiosus (Chant and Baker)	2-$\frac{2,\ 2}{0,\ 0}$-1	1-$\frac{2,\ 2}{1}$-1
Amblyseius rhabdus Denmark	2-$\frac{2,\ 2}{0,\ 0}$-1	1-$\frac{2,\ 2}{1}$-1
Fundiseius cesi (Muma)	2-$\frac{2,\ 2}{0,\ 0}$-1	1-$\frac{2,\ 2}{1,\ 0}$-1
Fundiseius arenicola (Muma)	2-$\frac{2,\ 2}{0,\ 0}$-1	1-$\frac{2,\ 2}{1,\ 0}$-1
Typhlodromips simplicissimus (De Leon)	2-$\frac{2,\ 2}{0,\ 0}$-1	1-$\frac{2,\ 2}{1,\ 0}$-1
Typhlodromips arenillus Denmark & Muma	2-$\frac{2,\ 2}{1,\ 0}$-1	1-$\frac{2,\ 2}{1,\ 0}$-1
Typhlodromips hellougreus Denmark & Muma	2-$\frac{2,\ 2}{0,\ 0}$-1	1-$\frac{2,\ 2}{1,\ 0}$-1
Typhlodromips mastus Denmark & Muma	2-$\frac{2,\ 2}{0,\ 0}$-1	1-$\frac{2,\ 2}{1}$-1
Typhlodromalus peregrinus (Muma)	2-$\frac{2,\ 2}{0,\ 0}$-1	1-$\frac{2,\ 2}{0,\ 1}$-1
Typhlodromalus limonicus (Garman & McGregor)	2-$\frac{2,\ 2}{1}$-1	2-$\frac{2,\ 2}{0,\ 1}$-1
Euseius hibisci (Chant)	2-$\frac{2,\ 2}{0,\ 0}$-1	1-$\frac{2,\ 2}{0,\ 1}$-1
Neoseiulus kerri Muma	2-$\frac{2,\ 2}{0,\ 0}$-1	1-$\frac{2,\ 2}{0,\ 0}$-1
Neoseiulus umbraticus (Chant)	2-$\frac{2,\ 2}{1}$-1	1-$\frac{2,\ 2}{1}$-1
Neoseiulus gracilis (Muma)	2-$\frac{2,\ 2}{0,\ 0}$-1	1-$\frac{2,\ 2}{1,\ 0}$-1
Neoseiulus interfolius (De Leon)	2-$\frac{2,\ 2}{0,\ 0}$-1	1-$\frac{2,\ 2}{1}$-1
Neoseiulus marinellus (Muma)	2-$\frac{2,\ 2}{0,\ 0}$-1	1-$\frac{2,\ 2}{1,\ 0}$-1
Neoseiulus planatus (Muma)	2-$\frac{2,\ 2}{0,\ 0}$-1	1-$\frac{2,\ 2}{1,\ 0}$-1

Table 1. Continued

Genera and species	Genu II	Genu III
Paraamblyseius lunatus Muma	$2-\frac{2,\ 2}{0,\ 0}-1$	$1-\frac{2,\ 2}{0,\ 0}-1$
Phyllodromus leiodis De Leon	$2-\frac{2,\ 2}{2}-1$	$1-\frac{2,\ 2}{1}-1$
Phytoseius bakeri Chant	$2-\frac{2,\ 2}{0,\ 0}-1$	$1-\frac{2,\ 2}{0,\ 0}-1$
Phytoseius betulae Denmark	$2-\frac{2,\ 2}{0,\ 0}-1$	$1-\frac{2,\ 2}{0,\ 0}-1$
Phytoseius mexicanus De Leon	$2-\frac{2,\ 2}{0,\ 0}-1$	$1-\frac{2,\ 2}{0,\ 0}-1$
Paraseiulella elliptica (De Leon)	$2-\frac{2,\ 1}{1}-1$	$1-\frac{2,\ 2}{1}-1$
Clavidromus transvaalensis (Nesbitt)	$2-\frac{2,\ 2}{1,\ 0}-1$	$1-\frac{2,\ 2}{1,\ 0}-1$
Typhlodromina subtropica Muma & Denmark	$2-\frac{2,\ 2}{0,\ 0}-1$	$1-\frac{2,\ 2}{1,\ 0}-1$
Galendromus (*Galendromus*) *floridanus* (Muma)	$2-\frac{2,\ 2}{0,\ 0}-1$	$1-\frac{2,\ 2}{1,\ 0}-1$
Galendromus (*G.*) *gratus* (Chant)	$2-\frac{2,\ 2}{0,\ 0}-1$	$1-\frac{2,\ 2}{1,\ 0}-1$
Galendromus (*Menaseius*) *mcgregori* (Chant)	$2-\frac{2,\ 2}{1,\ 0}-1$	$1-\frac{2,\ 2}{1,\ 1}-1$
Galendromus (*M.*) *loculus* Denmark & Muma	$2-\frac{2,\ 2}{1,\ 0}-1$	$1-\frac{2,\ 2}{1,\ 0}-1$
Anthoseius hebetis De Leon	$2-\frac{2,\ 2}{1,\ 0}-1$	$1-\frac{2,\ 2}{1,\ 0}-1$
Orientiseius rickeri (Chant)	$2-\frac{2,\ 2}{0,\ 0}-1$	$1-\frac{2,\ 2}{1,\ 0}-1$
Paraseiulus ecclesiasticus (De Leon)	$1-\frac{2,\ 2}{0,\ 0}-1$	$1-\frac{2,\ 2}{0,\ 0}-1$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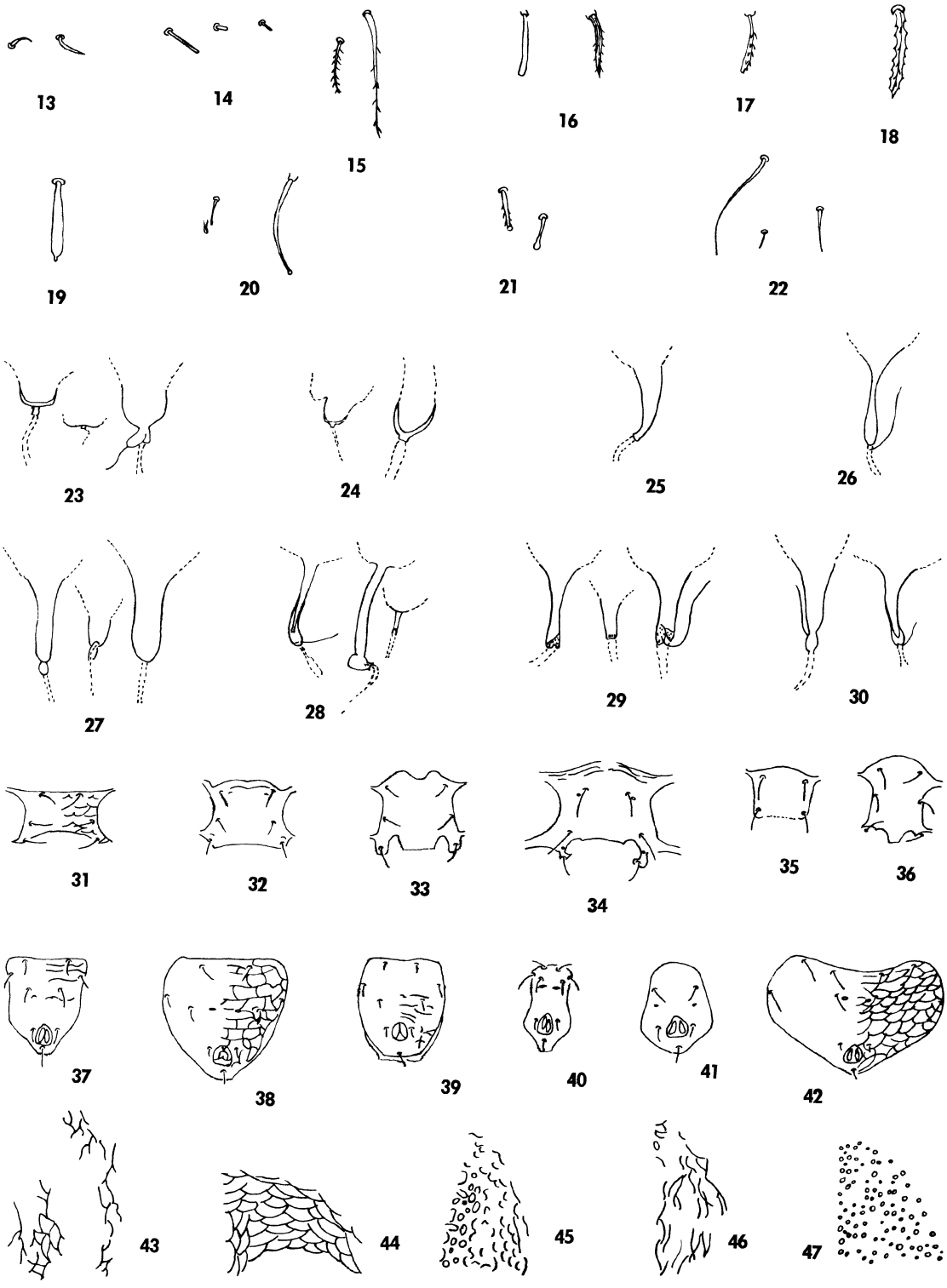
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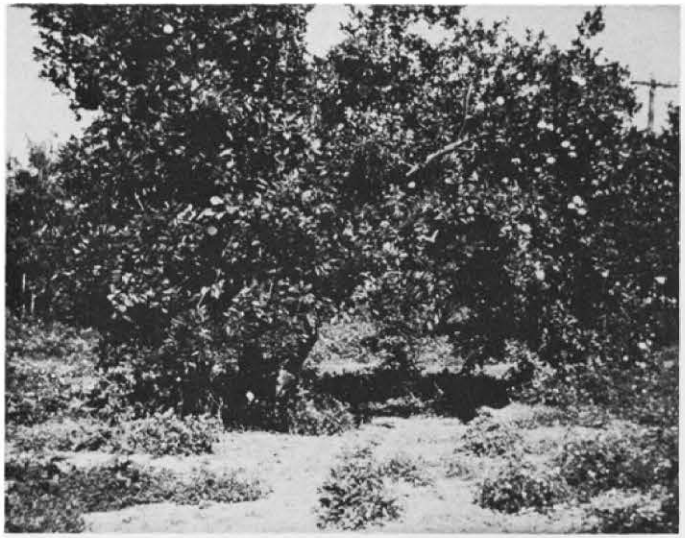


Citrus sinensis, orange trees

Pinus clausa, sand pines

Sarracenia minor, pitcher plants

Serenoa repens, saw palmetto

Some Selected Habitats of Phytoseiidae in Florida

Family Phytoseiidae

Mesostigmatid mites of the monogynaspid family Phytoseiidae are characterized by a two-tined palpal apotele, chelate chelicerae, undifferentiated hypostomal setae, a smooth or indistinctly serrate epistome (tectum of authors), a quadrate sternum with 2 to 5 pairs of lateral setae and 1 to 3 pairs of lateral pores, an entire or transversely divided dorsal scutum provided with less than 24 pairs of setae, 1 to 3 pairs of sublateral setae, peritremes extending anteriorly from the mesolateral stigmata, a ventral anus, and cursorial type legs provided with pretarsi and ambulacra. Females have the genital pore protected by an anterior membrane of the genital scutum, the genital scutum with one pair of lateral setae and more or less truncate posteriorly, a pair of spermathecae that open between the coxae of legs III and IV, a quadrate, elongate, or pentagonal ventrianal scutum provided with 1 to 5 pairs of preanal setae in addition to the paraanals and postanal, 1 to 5 pairs of ventrolateral setae and a pair of caudal setae. Males have cheliceral spermatodactyls, the genital pore protected by the anterior margin of the sternal scutum, a shield-shaped ventrianal scutum provided with 3 to 6 pairs of preanal setae and one pair of caudal setae.

KEY TO SUBFAMILIES (3) AND GENERA (28) OF PHYTOSEIIDAE IN FLORIDA

(Females)

1a Dorsal scutum divided; 5 pairs of dorsal setae; large phytoseiids (body length 470μ to 580μ, mean 540μ) that feed on nematodes in leaf-cups of *Sarracenia* ..... Macroseiinae, *Macroseius* Chant, Denmark, and Baker (p. 21)

1b Dorsal scutum entire; 2 to 5 pairs of dorsal setae, small to medium-sized phytoseiids (body length 200μ to 460μ) 2

2a(1b) 4 pairs of lateral setae well anterior to D_3; medium-sized phytoseiids (body length 260μ to 460μ, mean 340μ) that feed on insects, mites, and pollen, in ground surface litter, in and on stored products, and on plants ..... Amblyseiinae, 3

2b 5 pairs of lateral setae well anterior to D_3; small phytoseiids (body length 200μ to 370μ, mean 310μ) that feed on mites, pollen, and leaf-hairs on plants ..... Phytoseiinae 21

3a(2a) 2 pairs of dorsal setae; macroseta on basitarsus IV short, thick, and hamate; exopodal scutum of coxa IV, peritremal scutum, and stigmatal scutum greatly enlarged and complex ..... *Phytoscutus* Muma (p. 24)

3b 3 or 4 pairs of dorsal setae, macroseta on basitarsus IV, when present, slender and elongate; exopodal scutum of coxa IV, peritremal scutum, and stigmatal scutum small and simple 4

4a(3b) 3 pairs of dorsal setae 5

4b 4 pairs of dorsal setae 9

5a(4a) Leg I shorter than or only slightly longer than other legs; 1 or 3 pairs of median setae 6

5b Leg I twice as long as other legs; 2 pairs of median setae .... *Proprioseiulus* Muma and Denmark ..... (p. 26)

6a(5a) 1 pair of median setae 8

6b 3 pairs of median setae; leg I slightly longer than leg IV 7

7a(6b) S_2 on interscutal membrane; genital scutum as wide as ventrianal scutum; minor metapodal scutum mesad of major metapodal scutum ..... *Proprioseiopsis* Muma (p. 32)

7b S_2 on dorsal scutum; genital scutum much wider than ventrianal scutum;

minor metapodal scutum ectad of major metapodal scutum ..... *Noeledius* Muma and Denmark ..... (p. 52)

8a(6a) No or 1 pair of preanal setae on the female ventrianal scutum; 2 to 3 macrosetae on leg IV; D_3 elongate; leg I shorter than leg IV ..... *Phytoseiulus* Evans (p. 28)

8b 3 pairs of preanal setae on the female ventrianal scutum; no macroseta on leg IV; D_3 short; leg I about as long as leg IV ..... *Proprioseius* Chant (p. 24)

9a(4b) 1 pair of median setae; 1 pair of sublateral setae 10

9b 3 pairs of median setae; 2 pairs of sublateral setae 11

10a(9a) 7 pairs of lateral setae; S_1 on dorsal scutum; peritreme long ..... *Platyseiella* Muma (p. 56)

10b 9 pairs of lateral setae; S_1 on interscutal membrane; peritreme short ..... *Galendromimus* Muma (p. 58)

11a(9b) Macrosetae[1] usually present on genu, tibia, and tarsus of leg IV; medium-sized species 12

11b No macrosetae or macrosetae only on tarsus of leg IV; small species 20

12a(11a) 7 pairs of lateral setae; 1 or 2 pairs of preanal setae on female ventrianal scutum ..... *Amblyseiella* Muma (p. 54)

12b 8 pairs of lateral setae; 3 pairs of preanal setae on female ventrianal scutum 13

13a(12b) L_8 and sometimes L_4 and/or M_3 long and whip-like, longer than distance between their bases; leg I with macroseta on genu and erect seta on tarsus 14

13b L_8 usually shorter than, at most as long as, distance between their bases; L_4 and M_3 always shorter than distance between their bases; leg I with no macroseta or only 1 on genu, no erect seta on tarsus 15

14a(13a) Chelicerae normal, *pilus dentilis* medial, spermatodactyl with heel terminal *Amblyseius* Berlese ..... (p. 62)

14b Chelicerae large, *pilus dentilis* basal, spermatodactyl with foot terminal ..... *Chelaseius* Muma and Denmark (p. 59)

15a(13b) Peritremal scutum distinct and extending to or along leg IV exopodal scutum; usually well sclerotized, brown or red-brown species 16

15b Peritremal scutum indistinct or missing; usually lightly sclerotized yellow or white species 17

16a(15a) Peritremal scutum extending to leg IV exopodal scutum, legs II and III with macrosetae, chelicerae multidentate ..... *Iphiseiodes* De Leon (p. 70)

16b Peritremal scutum along leg IV exopodal scutum, legs II and III without macrosetae, chelicerae with few (2 to 4) denticules ..... *Fundiseius* Muma and Denmark ..... (p. 71)

17a(15b) Sternal scutum distinct and straight or concave posteriorly; ventrianal scutum approximately shield-shaped or pentagonal .. 18

17b Sternal scutum indistinct but trilobate posteriorly; ventrianal scutum elongate, vase-shaped or concave laterally 19

18a(17a) M_3 and L_8 distinctly serrate; sternum as wide or wider than long; leg I macroseta when present on genu, macrosetae also usually present on genu II and genu III ..... *Typhlodromips* De Leon (p. 78)

18b M_3 and L_8 not or indistinctly serrate; sternum longer than wide; genu I, genu II, and genu III without macrosetae ..... *Neoseiulus* Hughes (p. 100)

19a(17b) Peritreme usually extends forward to L_1; anterior pair of preanal setae adjacent to anterior margin of ventrianal scutum; chelicerae normal and multidentate .... *Typhlodromalus* Muma (p. 86)

19b Peritreme not extending forward

to L_1; anterior pair preanal setae removed from anterior margin of ventrianal scutum; chelicerae tiny with 0 to 4 denticules ..... *Euseius* Wainstein (p. 92)

20a(11b) Lateral setae setaceous; 4 pairs of preanal setae on female ventrianal scutum; massive metapodal scuta; small round species ..... *Paraamblyseius* Muma (p. 112)

20b Lateral setae spatulate and oblanceolate; 2 pairs of preanal setae on female ventrianal scutum; small metapodal scuta; small slender species ..... *Phyllodromus* De Leon (p. 114)

21a(2b) 1 pair of median setae; some lateral setae thickened and serrate or plumose ..... *Phytoseius* Ribaga (p. 115)

21b 2 or 3 pairs of median setae; lateral setae setaceous although sometimes plumose or apically knobbed 22

22a(21b) With 9 pairs of lateral setae; 1 pair of sublateral setae; 4 (sometimes 3) pairs of preanal setae on females ..... *Galendromus* Muma (p. 134)

22b With 8 to 10 pairs of lateral setae; 2 pairs of sublateral setae; 3 or 4 pairs of preanal setae on females 23

23a(22b) Leg IV with 3 macrosetae 24

23b Leg IV with 0 to 1 macrosetae 25

24a(23a) 9 pairs of lateral setae; 2 pairs of sternal setae; 3 pairs of preanal setae; most dorsal scutal setae knobbed ..... *Clavidromus* Muma (p. 128)

24b 10 pairs of lateral setae; 3 pairs of sternal setae; 4 pairs of preanal setae; dorsal scutal setae pointed ..... *Orientiseius* Muma and Denmark (p. 141)

25a(23b) 8 pairs of lateral setae; 2 to 3 pairs of sternal setae 26

25b 10 pairs of lateral setae; 2 pairs of sternal setae 27

26a(25a) Most lateral setae slender and smooth or weakly plumose ..... *Typhlodromina* Muma (p. 130)

26b Most lateral setae flattened ..... *Paraseiulella* Muma (p. 124)

27a(25b) 2 pairs of median setae; 3 pairs of preanal setae ..... *Anthoseius* De Leon (p. 140)

27b 3 pairs of median setae; 4 pairs of preanal setae ..... *Paraseiulus* Muma (p. 142)

Table 2. Setal characters among genera of Phytoseiidae found in Florida

Generic name	Number of Setae						
	Dorsal	Median	Lateral	Sub-lateral*	Sternal	Ventri-anal	Ventro-lateral
Macroseiinae Chant, Denmark, and Baker							
Macroseius Chant, Denmark, and Baker	5	3	8	(1)2	3	1	3
Amblyseiinae Muma							
Phytoscutus Muma	2	2	8	2	3	3	3
Proprioseius Chant	3	1	8	2	3	3	3
Proprioseiulus Muma and Denmark	3	2	8	2	3	3	3
Phytoseiulus Evans	3	1	8	2	3	0-1	3
Proprioseiopsis Muma	3	3	8	2	3	3	3
Noeledius Muma and Denmark	4	3	8	(2)2	3	3	3
Amblyseiella Muma	4	3	8	2	3	1-2	4-5
Platyseiella Muma	4	1	7	(1)1	3	2	2
Galendromimus Muma	4	1	9	1	2	4	1
Chelaseius Muma and Denmark	4	3	8	2	3	3	3
Amblyseius Berlese	4	3	8	2	3	3	3
Iphiseiodes De Leon	4	3	8	2	3	3	3
Fundiseius Muma and Denmark	4	3	8	2	3	3	3
Typhlodromips De Leon	4	3	8	2	3	3	3
Typhlodromalus Muma	4	3	8	2	3	3	3
Euseius Wainstein	4	3	8	2	3	3	3
Neoseiulus Hughes	4	3	8	2	3	3	3
Paraamblyseius Muma	4	3	8	2	3	4	1
Phyllodromus De Leon	4	3	8	2	3	2	4
Phytoseiinae Berlese							
Phytoseius Ribaga	3-4	2	8	(1)1-2	2-3	1-3	2-4
Paraseiulella Muma	4	2	8	2	2	4	2
Clavidromus Muma	4	2	10	2	2	3	3
Typhlodromina Muma	4	2	8	2	2	4	2
Galendromus Muma	4	2	9	1	2	4	1-2
Anthoseius De Leon	4	2	10	2	2	3	4
Orientiseius Muma and Denmark	4	3	10	2	3	4	3
Paraseiulus Muma	4	3	10	2	2	2-4	2

*(1)=S_1 on dorsal scutum in females.
(2)=S_2 on dorsal scutum in females.

Table 3. Scutal characters among genera of Phytoseiidae found in Florida

Generic name	Number dorsal scuta	Sternal scutum		Ventrianal scutum		Size and form	
		L/W	Post. margin	Form	Size	Major	Metapodals
Macroseiinae Chant, Denmark, and Baker							
Macroseius Chant, Denmark, and Baker	2	L > W	Concave	Quadrate	< genital	Normal	Elongate
Amblyseiinae Muma							
Phytoscutus Muma	1	L < W	Concave	Pentagonal	> genital	Normal	Ovate
Proprioseius Chant	1	L > W	Concave	Elongate	= genital	Normal	Elongate
Proprioseiulus Muma and Denmark	1	L < W	Concave	Pentagonal	= genital	Normal	Ovate
Phytoseiulus Evans	1	L < W	Concave	Quadrate	< genital	Normal	Elongate
Proprioseiopsis Muma	1	L = or < W	Concave	Pentagonal	genital	Normal	Ovate to Elongate
Noeledius Muma and Denmark	1	L < W	Concave	Pentagonal	< genital	Smaller than Minor	Elongate
Amblyseiella Muma	1	L = W	Concave	Quadrate	< genital	Normal	Elongate
Platyseiella Muma	1	L = W	Not Visible	Elongate	= genital	Small	Elongate
Galendromimus Muma	1	L = W	Not Visible	Pentagonal	= genital	Normal	Elongate
Chelaseius Muma and Denmark	1	L < W	Concave	Pentagonal	> genital	Normal	Ovate

Table 3 (cont.)

Amblyseius Berlese	1	L = or > W	Concave	Variable =	genital	Normal	Ovate
Iphiseiodes De Leon	1	L < W	Concave	Shield =	genital	Normal	Elongate
Fundiseius Muma and Denmark	1	L < W	Concave	Pentagonal =/>	genital	Normal	Elongate
Typhlodromips De Leon	1	L = or < W	Concave	Pentagonal =/>	genital	Normal	Ovate
Typhlodromalus Muma	1	L > W	Lobate	Elongate <	genital	Normal	Ovate
Euseius Wainstein	1	L > W	Lobate	Elongate <	genital	Normal	Ovate
Neoseiulus Hughes	1	L = or > W	Concave	Variable =/>	genital	Normal	Ovate to Elongate
Paraamblyseius Muma	1	L < W	Concave	Shield >	genital	Large	Triangular
Phyllodromus De Leon	1	L < W	Concave	Quadrate =	genital	Normal	Elongate
Phytoseiinae Berlese							
Phytoseius Ribaga	1	L = W L < W	Concave Truncate or Lobate	Variable =/<	genital	Normal	Elongate
Paraseiulella Muma	1	L = W	Truncate	Pentagonal =	genital	Normal	Elongate
Clavidromus Muma	1	L > W	Lobate	Pentagonal =	genital	Normal	Elongate
Typhlodromina Muma	1	L = W	Truncate	Pentagonal =	genital	Normal	Elongate
Galendromus Muma	1	L = W	Truncate or Concave	Pentagonal =	genital	Normal	Elongate
Anthoseius De Leon	1	L < W	Not Visible	Pentagonal <	genital	Normal	Elongate
Orientiseius Muma and Denmark	1	L = W	Concave	Pentagonal <	genital	Normal	Elongate
Paraseiulus Muma	1	L = W	Concave	Pentagonal =	genital	Normal	Ovate

Table 4. Peritremal and stigmatal characters among genera of Phytoseiidae found in Florida.

Generic name	Peritreme extending forward	Peritremal & stigmatal scuta: Fused	Separated	Complex	Special characters
Macroseiinae Chant, Denmark, and Baker					
Macroseius Chant, Denmark, and Baker	Beyond L_1	X			
Amblyseiinae Muma					
Phytoscutus Muma	To vertical setae			X	Secondary pore on peritreme-like plate.
Proprioseius Chant	To vertical setae	X			Scuta parallel leg IV exopodal
Proprioseiulus Muma and Denmark	Between vertical setae	X			
Phytoseiulus Evans	Beyond L_1		X		Peritremal scuta parallel leg IV exopodal
Proprioseiopsis Muma	To or between vertical setae		X		
Noeledius Muma and Denmark	Between vertical setae		X		
Amblyseiella Muma	To vertical setae	X			
Platyseiella Muma	To vertical setae	X			Enlarged secondary pore
Galendromimus Muma	Beyond L_4	X			Enlarged secondary pore
Chelaseius Muma and Denmark	Between vertical setae	X			Reinforced secondary pore
Amblyseius Berlese	Between vertical setae	X			Reinforced secondary pore
Iphiseiodes De Leon	Beyond L_1		X		Peritremal scuta to leg IV exopodal
Fundiseius Muma and Denmark	To or between vertical setae		X		Peritremal scuta surround leg IV exopodal
Typhlodromips De Leon	To or between vertical setae	X[1]			
Typhlodromalus Muma	To vertical setae	X			
Euseius Wainstein	To L_4 to L_1	X			
Neoseiulus Hughes	To vertical setae at least beyond L_1	X			
Paraamblyseius Muma	To vertical setae			X	Extra division near leg IV exopodal
Phyllodromus De Leon	Beyond L_1	X			Peritreme very wide
Phytoseiinae Berlese					
Phytoseius Ribaga	Beyond L_1	X			
Paraseiulella Muma	Beyond L_1	X			Reinforced secondary pore
Clavidromus Muma	To L_2	X			Triangular secondary pore
Typhlodromina Muma	Between verticals or beyond L_1	X			Enlarged secondary pore
Galendromus Muma	A variable distance	X			Kidney shaped secondary pore
Anthoseius De Leon	To L_1	X			One very small round and one kidney shaped secondary pore
Orientiseius Muma and Denmark	Beyond L_2	X			Long and thin secondary pore
Paraseiulus Muma	Beyond L_1	X			Kidney shaped secondary pore

[1] *T. simplicissimus*, the type, has separated scuta.

Table 5. Spermathecal and spermatodactyl characters among genera of Phytoseiidae found in Florida.

Generic name	Spermathecal form		Spermatodactyl form
	Cervix	Atrium	
Macroseiinae Chant, Denmark, and Baker			
Macroseius Chant, Denmark, and Baker	Saccular	Nodular	Heel terminal, lateral process small to obscure
Amblyseiinae Muma			
Phytoscutus Muma	Corniform	Nodular	Foot terminal, lateral process and toe modified into crescent
Proprioseius Chant	Poculiform	Nodular	Heel terminal, lateral process large and usually distinct
Proprioseiulus Muma and Denmark	Tubular	Undiff.	
Phytoseiulus Evans	Vesicular Flared	Undiff. Value indistinct	Foot terminal, heel obscure, lateral process small, toe large and spatulate
Proprioseiopsis Muma	Fundibuliform Saccular Poculiform	Undiff. and Nodular	Foot terminal or subterminal, heel and lateral process obscure to distinct
Noeledius Muma and Denmark	Saccular	Ovate	Not known
Amblyseiella Muma	Fundibuliform	Slender, Ovate	Heel terminal, lateral process obscure or absent
Platyseiella Muma	Poculiform	Nodular	Foot terminal, heel and lateral process subequal and distinct crest present
Galendromimus Muma	Vesicular	Undiff.	Male unknown (De Leon, 1967, shows foot terminal and lateral process distinct)
Chelaseius Muma and Denmark	Saccular	Undiff. to Nodular	Foot terminal, heel obscure, lateral process distinct
Amblyseius Berlese	Fundibuliform Saccular Poculiform	Undiff. Nodular	Heel terminal, lateral process obscure to distinct
Iphiseiodes De Leon	Tubular and Fundibuliform	Undiff.	Foot terminal, heel obscure, lateral process distinct
Fundiseius Muma and Denmark	Fundibuliform	Ovate	Foot terminal, heel obscure, lateral process distinct
Typhlodromips De Leon	Fundibuliform and Tubular	Undiff. and Nodular	Foot terminal, heel distinct, lateral process distinct to obscure
Typhlodromalus Muma	Tubular	Undiff. and Nodular	Foot terminal, heel and lateral process distinct, toe broad and flat
Euseius Wainstein	Tubular	Undiff.	Foot terminal, heel and lateral process distinct
Neoseiulus Hughes	Fundibuliform Tubular Saccular	Nodular	Heel or foot terminal, lateral process distinct to obscure

Paraamblyseius Muma	Saccular	Slender, Ovate	Foot terminal, heel and lateral process distinct
Phyllodromus De Leon	Saccular	Undiff. Valve	Foot terminal, heel and lateral process subequal and distinct
Phytoseiinae Berlese			
Phytoseius Ribaga	Saccular and Fundibuliform	Slender, Ovate Undiff. and Nodular	Foot usually terminal, heel and lateral process subequal and distinct
Paraseiulella Muma	Tubular to Fundibuliform	Nodular	Foot terminal, heel and lateral process distinct
Clavidromus Muma	Fundibuliform	Hooked	Male unknown
Typhlodromina Muma	Tubular	Undiff.	Foot terminal, lateral process distinct
Galendromus Muma	Tubular Vesicular	Nodular Undiff.	Foot terminal, heel terminal or heel and lateral process subequal and distinct
Anthoseius De Leon	Fundibuliform	Undiff.	Foot terminal, heel and lateral process indistinct
Orientiseius Muma and Denmark	Saccular	Nodular	Heel terminal, lateral process small to obscure
Paraseiulus Muma	Fundibuliform	Undiff.	Male unknown

Table 6. Cheliceral and leg characters among genera of Phytoseiidae found in Florida.

Generic name	Chelicerae: Fixed finger Length$_\mu$	Chelicerae: Denticules movable finger	Chelicerae: Denticules fixed finger	Leg formula	Number of Macrosetae[1]: I	II	III	IV
Macroseiinae Chant, Denmark, and Baker								
Macroseius Chant, Denmark, and Baker	50–56	3–4	10–12	4132	1	2	2	3
Amblyseiinae Chant, Denmark and Baker								
Phytoscutus Muma	16–24	0–3	0–6	4123	0	0	0	2
Proprioseius Chant	20–32	1–3	6–8	4123	0	0	0	0
Proprioseiulus Muma and Denmark	40	1–	10–	1423[2]	1	1	2	3
Phytoseiulus Evans	24–26	3	8–	4123	0	0	0	2
Proprioseiopsis Muma	24–48	0–3	3–12	1423	0	0–1	0–2	3
Noeledius Muma and Denmark	48	0	3	1423	0	0	0	3
Amblyseiella Muma	24–36	0–1	1–3	4123	1	1	1	3
Platyseiella Muma	20–24	1	2–3	4123	0	0	0	3
Galendromimus Muma	20–22	2	1	4123	1	1	1	3
Chelaseius Muma and Denmark	56–80	0	2–4	1423	1	1	2	3
Amblyseius Berlese	24–40	0–4	8–12	1423	1	1	2	3
Iphiseiodes De Leon	28–36	2–3	9–10	4132	1	1	1	3
Fundiseius Muma and Denmark	28–40	0	2–4	1432 1423	0	0	0	3
Typhlodromips De Leon	24–36	0–3	4–9	4123 4132	0–3	0–3	0–3	2–3
Typhlodromalus Muma	28–40	1–3	8–9	4123	0–3	0–3	0–3	2–3
Euseius Wainstein	20–28	0–1	1–4	1423 4123	0–3	0–3	0–3	2–3
Neoseiulus Hughes	20–36	0–2	4–6	4123 1423	0	0	0	0–3
Paraamblyseius Muma	16–20	1–2	5–7	4123	0	0	0	0
Phyllodromus De Leon	18–24	2	5–6	4132	0	0	0	0
Phytoseiinae Berlese								
Phytoseius Ribaga	21–23	0–2	2–3	4123	0	0	0	1–3
Paraseiulella Muma	20–26	0–1	2–3	1423	0	0–1	0	3
Clavidromus Muma	28–33	0–1	1	4123	0	0	0	3
Typhlodromina Muma	27–29	0–1	2–4	4123	0	0	0	1
Galendromus Muma	25–27	0–1	1–3	4132	0	0	0	0–1
Anthoseius De Leon	20–22	3	1	4123	0	0	0	0
Orientiseius Muma and Denmark	28–30	1	1–2	4123	0	0	0	3
Paraseiulus Muma	20–22	1	4	4123	0	0	0	0

[1]See identification of macrosetae (p. 3).
[2]Leg I much longer than other legs.

SUBFAMILY MACROSEIINAE CHANT, DENMARK, AND BAKER

Macroseiinae Chant, Denmark, and Baker, 1959: 808
Phytoseiinae Berlese, Chant, 1965: 359 (in part).

Large Phytoseiidae with a divided dorsal scutum, 5 pairs of dorsal setae, 3 pairs of median setae, 4 pairs of anterior lateral setae; 2 pairs of sublateral setae with S_1 on anterior dorsal scutum in females. Males with partly to completely fragmented ventrianal scutum and both sublateral setae on anterior dorsal scutum.

TYPE GENUS: *Macroseius* Chant, Denmark, and Baker, 1959.

DIAGNOSIS: Large phytoseiids with divided dorsal scutum and 4 pairs of anterior lateral setae well anterior to D_3.

DISCUSSION: Sternal and dorsal scutal pores are not illustrated for this subfamily which is presently known from only one species.

GENUS *MACROSEIUS* CHANT, DENMARK, AND BAKER

Macroseius Chant, Denmark, and Baker, 1959: 808.

DIAGNOSIS: Females are usually large and distinguished by 8 pairs of lateral setae, some elongate and serrate; 3 pairs of sternal setae; 1 pair of preanal setae.

Dorsal scutum imbricate and transversely divided just posterior to D_3. Sternum longer than wide. Preanal, ventrianal setae on anterior margin of scutum which is ovate. There are 4 pairs of ventrolateral setae excluding the caudal setae. Peritreme long but extending forward just beyond L_1. The peritremal and stigmatal scuta are fused but distinguishable posteriorly. The chelicerae are normal in proportion to body size with both fingers multidentate. Macrosetae[1] are present on the genu of all legs, Sti IV, and St IV. There is also an erect seta on tarsus 1, St I. Leg formula 4132.

Males are distinctly smaller than but otherwise similar to females. The spermatodactyl is well developed with an elongate shank and a distinct terminal heel and a small to obscure lateral process on the foot. The fragmented ventrianal scutum has 4 pairs of preanal setae.

TYPE SPECIES: *Macroseius biscutatus* Chant, Denmark, and Baker, 1959, by designation.

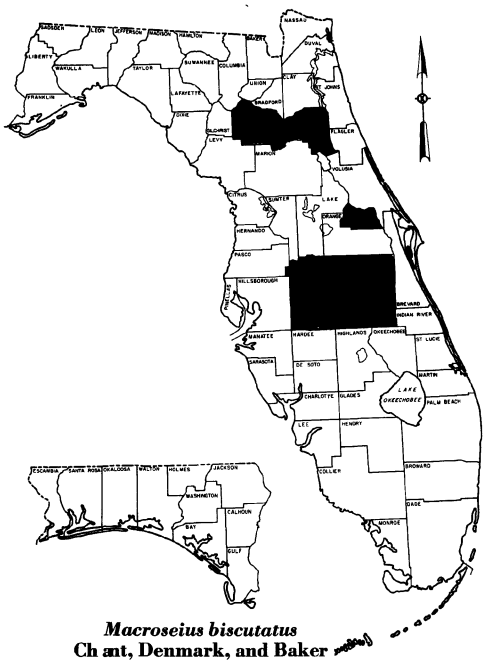
DISCUSSION: The genus is monotypic. The type species feeds primarily on nematodes. It is known only from Florida, Georgia and North Carolina.

Macroseius biscutatus Chant, Denmark, and Baker

Fig. 48 to 55

Macroseius biscutatus Chant, Denmark, and Baker, 1959: 808.

DIAGNOSIS: This species is easily recognized by the generic characters. Instability of normally stable characters is confusing,



Macroseius biscutatus
Chant, Denmark, and Baker

[1]See definition of macrosetae (p. 3).

Muma and Denmark (1962), but it is morphologically, biologically, and ecologically unique, Muma and Denmark (1967). The body is about 450μ long.

TYPE: The female holotype from pitcher-plant leaf, Alachua County, Florida, June 23, 1958, by H. A. Denmark, is in the USNM, Washington, D. C.

HABITAT: This unusual, large phytoseiid is, at the present time, known only from Florida, Georgia and North Carolina where it is found in the leaf cups of pitcher-plants, *Sarracenia* spp. (p. 10).

COUNTY DISTRIBUTION: Alachua, Osceola, Polk, Putnam, and Seminole.

BIOLOGY: Living specimens are milk-white to pale yellow in color, occasionally marked with dark green to black gut contents.

Over-wintering mites have been kept alive on water for 3 months but summer mites seem to live a much shorter time. The species feeds primarily on nematodes of the genus *Panagrolaimus* that occur in the liquid of *Sarracenia* leaf cups. It can, however, survive on other foods including Collembola and anoetids, Muma and Denmark (1967). The life cycle is completed in 9 to 12 days.

This species has been collected year around except for August (Muma and Denmark, 1967).

SUBFAMILY AMBLYSEIINAE MUMA

Amblyseiinae Muma, 1961: 273

Amblyseiini Muma, Schuster and Pritchard, 1963: 225.

Phytoseiinae Berlese, Chant, 1965: 359 (in part).

Phytoseiidae with an undivided dorsal scutum, 2 to 5 pairs of dorsal setae, 1 to 3 pairs of median setae, 4 pairs of lateral setae well anterior to D_3, normally 7 or 8 total; 1 to 3 pairs of sublateral setae on females; 1 to 3 pairs of preanal ventrianal setae; 1 to 3 macrosetae[1] on leg IV. Males have a fragmented or entire ventrianal scutum with 3 or 4 pairs of ventrianal setae, and usually 2 pairs of sublateral setae with both on the dorsal scutum.

TYPE GENUS: *Amblyseius* Berlese, 1915.

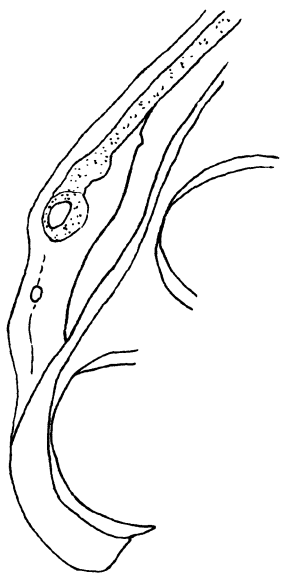
DIAGNOSIS: Medium sized phytoseiids with undivided dorsal scutum and 3 or 4 pairs of anterior lateral setae well anterior to D_3.

DISCUSSION: In this subfamily the sternal scuta have 2 pairs of laterally located, distinctively reinforced pores. Since they are always present these pores have been omitted from the illustrations of species of this subfamily.

Dorsal scutal pores also have been largely omitted from Amblyseiinae illustrations. A few unusually large or otherwise distinctive pores have been indicated, but small or indistinct pores have been omitted purposely to avoid errors. We believe that many, if not all, dorsal scutal setae on Amblyseiinae have associated pores, but that they are indistinct or invisible on certain specimens at presently obtainable magnifications.

[1]See definition of macrosetae (p. 3).

Fig. 48 to 55. *Macroseius biscutatus* Chant, Denmark, and Baker. 48. Dorsal and leg structure and setation ♀. 49. Ventral scuta and setation ♀. 50. Metapodal scuta ♀. 51. Posterior peritremal and stigmatal development ♀. 52 and 53. Positional variations of spermathecal structure ♀. 54. Spermatodactyl structure ♂. 55. Ventrianal scutum ♂.



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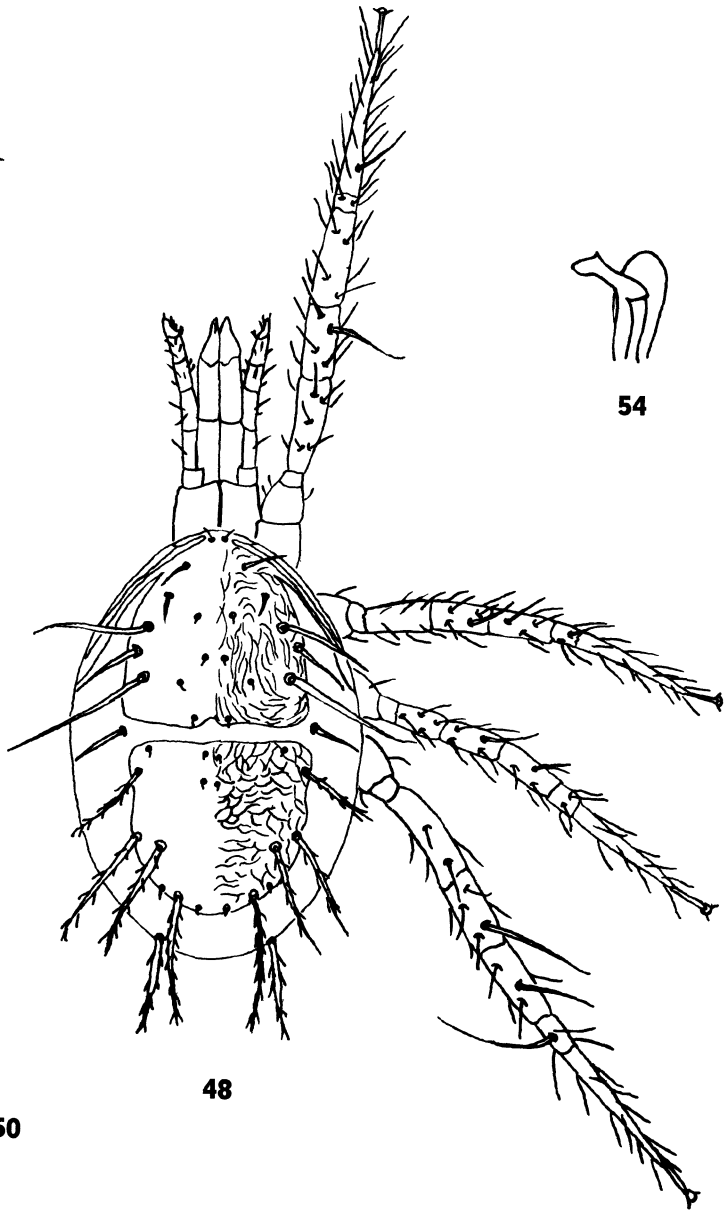

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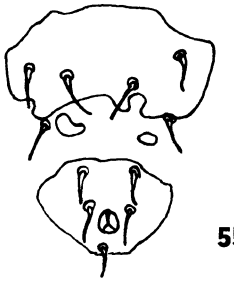

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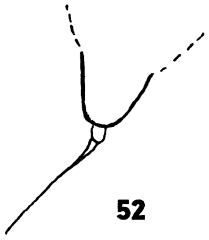

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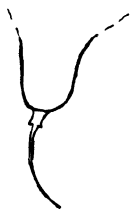

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GENUS *PHYTOSCUTUS* MUMA

Phytoscutus Muma, 1961: 275.
Amblyseius Berlese, Chant, 1965: 371 (in part).

DIAGNOSIS: Females are characterized by 2 pairs of dorsal setae, 2 pairs of median setae, 8 pairs of lateral setae, some elongate and weakly plumose; 2 pairs of sublateral setae on the interscutal membrane; 3 pairs of sternal setae; 3 pairs of preanal setae on a massive shield-shaped ventrianal scutum.

Dorsal scutum well sclerotized and provided with numerous tiny pits. Sternum much wider than long with a concave posterior margin. There are 3 pairs of ventrolateral setae excluding the caudal setae. Peritreme long, extending forward to vertical setae. Peritremal and stigmatal scuta divided into 3 sections posterior to the secondary pore which is situated on a peritreme-like plate. Chelicerae small in proportion to body size. Macrosetae present only on leg IV, Sge IV and Sti IV elongate, St IV short and hamate. Leg formula 4123.

Males smaller than females, but otherwise similar. Spermatodactyl with an elongate shank terminating in a crescent-like structure instead of the usual foot. Ventrianal scutum with 3 pairs of preanal setae.

TYPE SPECIES: *Phytoscutus sexpilis* Muma, 1961, by designation.

DISCUSSION: This distinctive genus is represented by 2 species, the type and *Phytoscutus vaughni* (Chant and Baker). The latter is distinguished by having L_4, M_2, and L_8 much longer and whip-like and by having edentate chelicerae.

The genus is known only from the Caribbean area. One species is known from Florida.

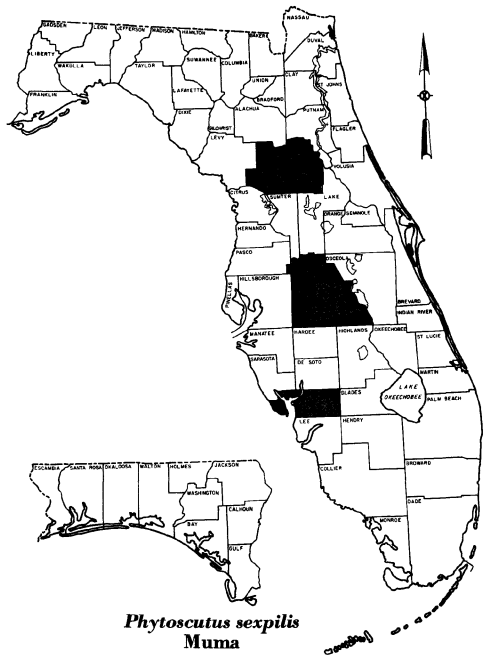
Phytoscutus sexpilis Muma

Fig. 56 to 63

Phytoscutus sexpilis Muma, 1961: 275.

DIAGNOSIS: This species is easily distinguished by the generic characters, by having L_4, M_2, and L_8 elongate but not whip-like, and by having 5 to 6 denticules on the fixed finger and 3 on the movable finger of the chelicerae. The body is about 350μ long.

TYPE: The female holotype, male allotype, and paratypes feeding on acarids on grapefruit leaves at Polk City, Florida, May



Phytoscutus sexpilis
Muma

22, 1954, by M. H. Muma, are in the USNM, Washington, D. C.

HABITAT: Host plants include *Citrus* spp., *Eriobotrya japonica, Feijoa sellowiana,* and *Psidium* sp.

COUNTY DISTRIBUTION: Charlotte, Marion, and Polk.

BIOLOGY: Living specimens are rose-red in color and invariably are associated with and feed upon colonies of *Tropacarus mumai* Cunliffe on trees and shrubs. It is known locally as the velvet button mite.

This species has been collected in March, April, May, and July.

GENUS *PROPRIOSEIUS* CHANT

Proprioseius Chant, 1957: 357.
Amblyseius Berlese, Chant, 1965: 371 (in part).
Proprioseius Chant, Denmark and Muma, 1966: 253.

DIAGNOSIS: Females are characterized by 3 pairs of dorsal setae, 1 pair of median setae, 8 pairs of lateral setae, some distinctly clavate and serrate; 2 pairs of scapular setae on the interscutal membrane; 3 pairs of sternal setae; 3 pairs of preanal, ventrianal setae.

Dorsal scutum partly to completely creased and rugose. Sternum slightly longer than wide. Ventrianal scutum elongate with concave lateral margins; preanal setae arranged in parenthesis-like longitudinal rows; preanal pores, if present, very small and obscure. Peritreme long, extending forward to vertical setae. Peritremal and stigmatal scuta indistinguishably fused and projected behind coxae IV. Chelicerae normal but with 6 to 8 denticules on the fixed finger and 1 to 3 on the movable finger. Legs without macrosetae. Leg formula 4123.

Males smaller than females but otherwise similar. Spermatodactyl with heel terminal and lateral process large and usually distinct. Ventrianal scutum with 4 pairs of preanal setae; the extra pair is situated near the lateral margin and is nearly aligned with the paraanals.

TYPE SPECIES: *Proprioseius meridionalis* Chant, 1957, by designation.

DISCUSSION: This genus is known only from North America and Central America. It is represented by 5 species, 2 of which occur in Florida.

Denmark and Muma (1966) erroneously reported 7 lateral setae, 2 median setae, and only 1 pair of metapodal scuta. The genus actually possesses 8 pairs of lateral setae, 1 pair of distinguishable median setae, and 2 pairs of metapodal scuta.

Key to *Proprioseius* Chant in Florida

(Females)

1a L_4 about 1/3 scutal width; L_6 slightly shorter than L_8 ..... *meridionalis* Chant (p. 23)

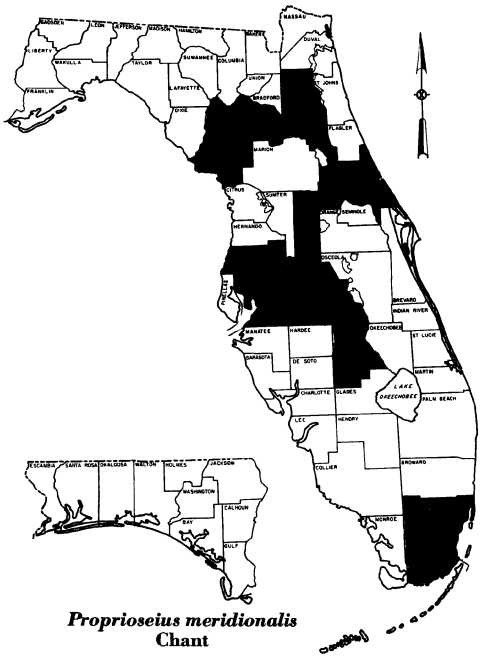
1b L_4 less than 1/4 scutal width; L_6 much shorter than L_8 ..... *anthurus* Denmark and Muma (p. 24)

Proprioseius meridionalis Chant

Fig. 64 to 69

Proprioseius meridionalis Chant, 1957: 358.
Phytoseiulus (*Proprioseius*) *meridionalis* Chant, Wainstein, 1962: 17.
Amblyseius (*Proprioseius*) *meridionalis* Chant, Pritchard and Baker, 1962: 294.
Proprioseius meridionalis Chant, Denmark and Muma, 1966: 259.

DIAGNOSIS: This species differs from the 4 other known species of the genus by the comparative lengths and forms of L_2, L_3, L_4, and L_8. There are also minor differences in the spermathecae and spermatodactyls. The body is about 280μ long.



Proprioseius meridionalis Chant

TYPE: The female holotype from *Psychotria bahamensis*, Homestead, Florida, October 20, 1948, by O. D. Link, is in the USNM, Washington, D. C.

HABITAT: It is found on a wide range of host plants including *Abutilon* sp., *Callicarpa americana*, *Chrysanthemum* sp., cover crops, *Croton* sp., *Erigernon* sp., *Eriobotrya japonica*, *Malva* sp., *Parathenocissus quinquefolia*, *Psychotria* sp., *Quercus prinus*, *Quercus*

sp., *Rhododendron* sp., *Rubus* sp., *Sarracenia* sp., *Vitis* sp., and weeds.

COUNTY DISTRIBUTION: Alachua, Clay, Dade, Gilchrist, Highlands, Hillsborough, Lake, Levy, Pasco, Polk, Putnam, and Volusia.

BIOLOGY: Living specimens of this small species are off-white to pale yellow in color. Food habits are unknown.

This species has been collected in every month except January.

Proprioseius anthurus Denmark and Muma

Fig. 70 to 75

Proprioseius anthurus Denmark and Muma, 1966: 261.

DIAGNOSIS: *Proprioseius anthurus* differs from the closely-related *P. meridionalis* Chant in the shorter lengths of L_4 and L_6. It differs from *P. clancyi* Chant in having L_1 and L_2 subequal and L_6 much shorter than L_8. The body is about 290μ long.

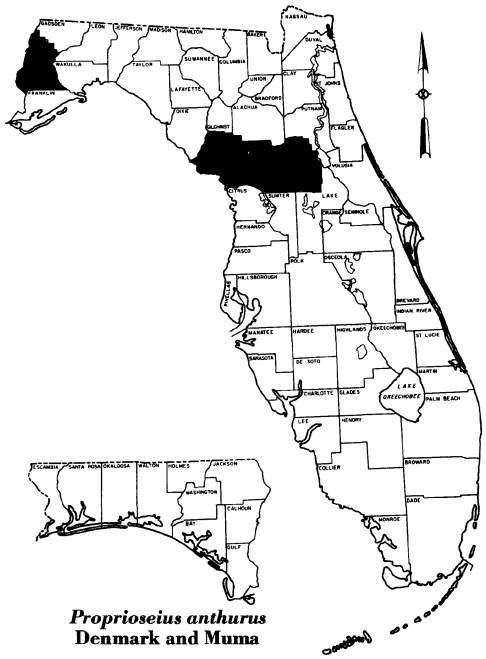
TYPE: The female holotype from Levy County, Florida (2 miles south of junction US 19 and State 121, April 30, 1965, by H. A. Denmark, on *Quercus stellata*, is in the USNM, Washington, D. C.

HABITAT: This species has been taken from *Quercus stellata* and *Quercus stellata margaretta*.

COUNTY DISTRIBUTION: Levy, Liberty and Marion.

BIOLOGY: This species is an off-white in life and has been found along the underside of the leaf associated with the midrib in the absence of any other arthropod.

This species has been collected in May, June, and October.



Proprioseius anthurus
Denmark and Muma

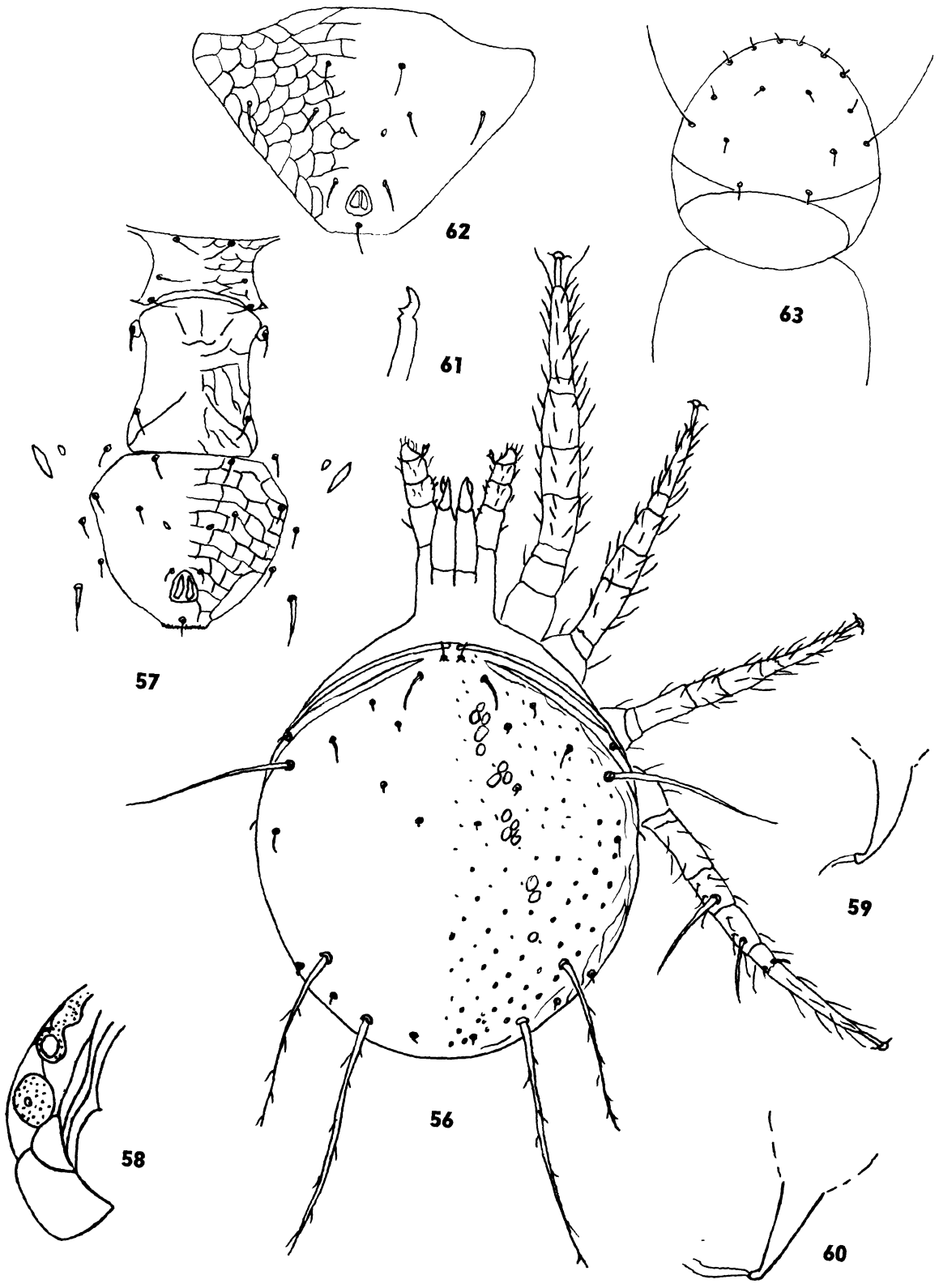
GENUS *PROPRIOSEIULUS* MUMA AND DENMARK

Proprioseiulus Muma and Denmark, 1968: 231 (new name for *Proprioseiopsis* Muma, 1961, not type).

DIAGNOSIS: Females are characterized by 3 pairs of dorsal setae, 2 pairs of median setae, 8 pairs of lateral setae with some elongate and weakly plumose but only 3 pairs well anterior to D_3; 2 pairs of scapular setae on interscutal membrane; 3 pairs of sternal setae; 3 pairs of preanal setae.

Dorsal scutum well sclerotized but not ornamented. Sternal scutum as wide as long and deeply notched anteriorly. Ventrianal scutum shield-shaped. Peritreme long, extending forward between vertical setae. Peritremal and stigmatal scuta indistinguishably fused and projected only to leg IV exopodal scutum. Chelicerae normal in size with 10+ denticules on fixed finger and 1 or more denticules on movable finger. Macro-

Fig. 56 to 63. *Phytoscutus sexpilis* Muma. 56. Dorsal and leg structure and setation ♀. 57. Ventral scuta and setation ♀. 58. Posterior peritremal and stigmatal development ♀. 59 and 60. Positional variations of spermathecal structure. 61. Spermatodactyl structure. 62. Male ventrianal scutum. 63. Larval dorsal setation.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setae present on genu of leg I, Sge II, Sge III, Sti III, Sge IV, Sti IV, and St IV. Leg formula 1423 with leg I nearly twice as long as other legs.

Special setal characters include only 3 pairs of lateral setae obviously anterior to D_3; L_2 and L_3 are more than twice as far from L_1 and L_4 as they are from each other; there is no median seta associated with L_5.

Males are similar to females except S_1 and S_2 are located on the dorsal scutum. Spermatodactyl with typical terminal foot, distinct heel and lateral process, and spatulate toe.

TYPE SPECIES: *Proprioseiopsis paxi* Muma, 1965, by designation, Muma and Denmark (1968).

DISCUSSION: The genus is known only from southeastern United States. One species is known from Florida.

Proprioseiulus paxi (Muma)

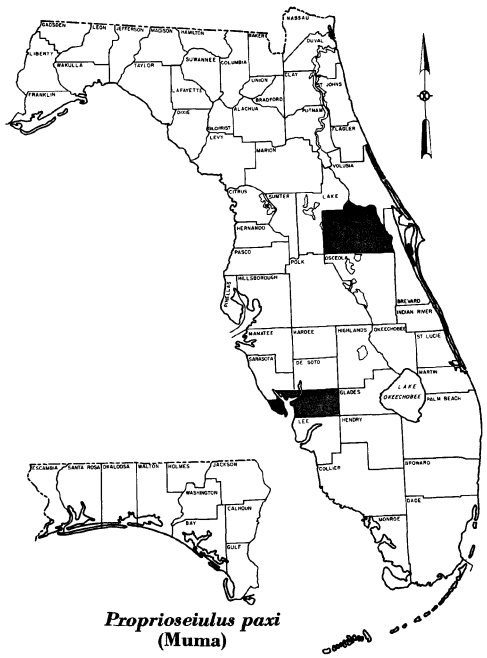
Fig. 76 to 82

Proprioseiopsis paxi Muma, 1965a: 245.
Proprioseiulus paxi (Muma), Muma and Denmark, 1968: 231.

DIAGNOSIS: The large size, the length of leg I, the distinctive elongate setae on leg I, the extreme length of L_8, and the location of the pores on the ventrianal scutum serve to distinguish this species. The body is about 390μ long.

TYPE: The female holotype from citrus litter, Cleveland, Florida, January 22, 1962, by Judith A. Murrell, is in the USNM, Washington, D. C.

HABITAT: The holotype of this species was collected from citrus litter and the paratype from sand pine litter. It also has been collected from litter in Georgia.



Proprioseiulus paxi (Muma)

COUNTY DISTRIBUTION: Charlotte, Orange, and Seminole.

BIOLOGY: Nothing is known about the biology of this species.

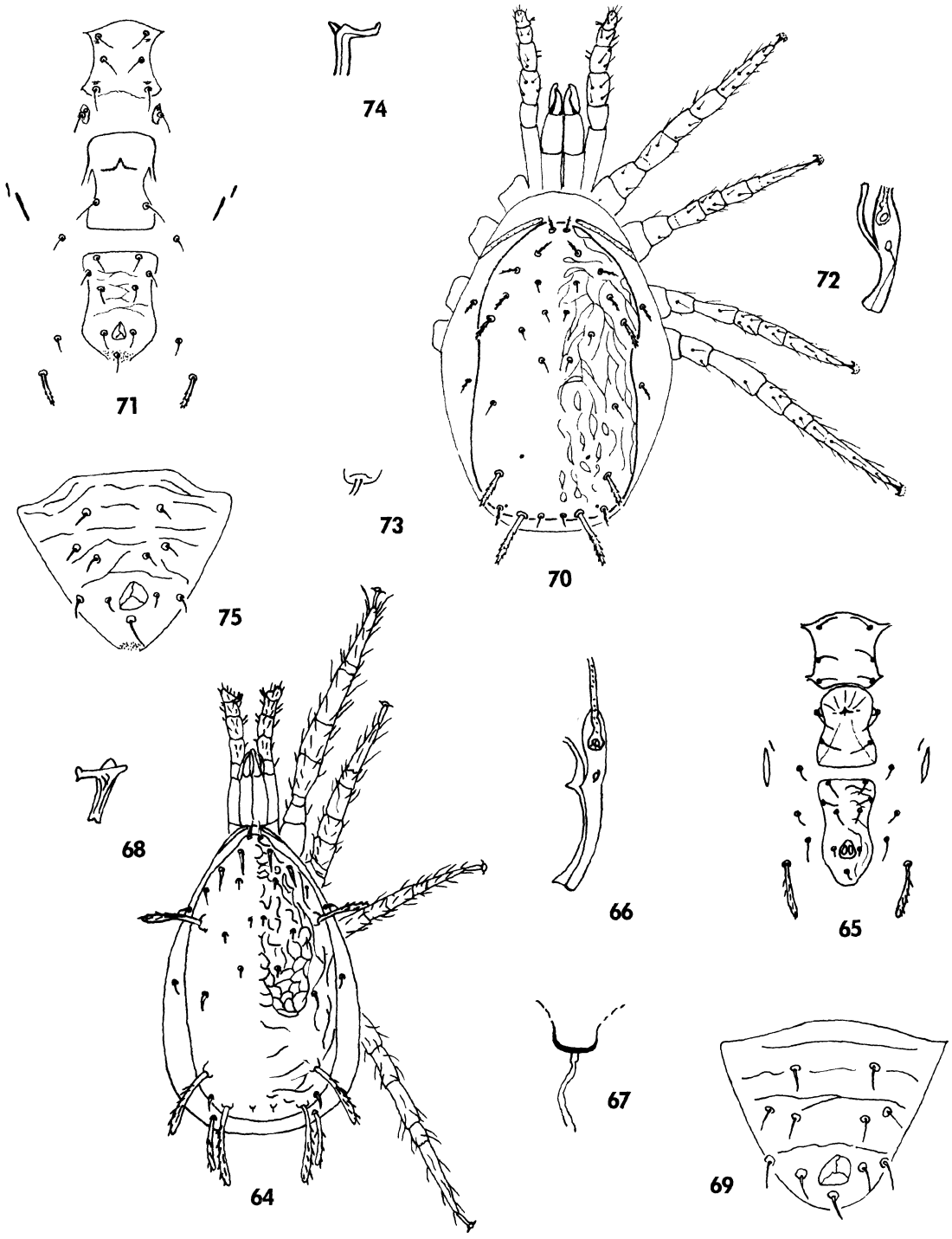
GENUS *PHYTOSEIULUS* EVANS

Phytoseiulus Evans, 1952: 397.

DIAGNOSIS: Females are characterized by 3 pairs of dorsal setae which are elongate and plumose, 1 pair of median setae, 8 pairs of lateral setae some elongate and distinctly plumose; 2 pairs of scapular setae on interscutal membrane; 3 pairs of sternal setae; no or 1 pair of preanal setae.

Fig. 64 to 69. *Proprioseius meridionalis* Chant. 64. Dorsal and leg structure and setation ♀. 65. Ventral scuta and setation ♀. 66. Posterior peritremal and stigmatal development ♀. 67. Spermathecal structure ♀. 68. Spermatodactyl structure ♂. 69. Ventrianal scutum ♂.

Fig. 70 to 75. *Proprioseius anthurus* Denmark and Muma. 70. Dorsal and leg structure and setation ♀. 71. Ventral scuta and setation ♀. 72. Posterior peritremal and stigmatal development ♀. 73. Spermathecal structure ♀. 74. Spermatodactyl structure ♂. 75. Ventrianal scutum ♂.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Dorsal scutum lightly to moderately sclerotized and creased or imbricate, the latter more distinct laterally than medially. Sternum much wider than long and creased. Genital scutum creased. Ventrianal scutum reduced in size, creased and with no or only 1 pair of preanal setae. Peritremes short extending forward to the area between L_4 and L_1. Peritremal scutum extends to and beside leg IV exopodal scutum, stigmatal scutum with 2 distinguishable secondary pores. Chelicerae small, fixed fingers with 8 or more denticules, movable fingers with 3 denticules. Distinguishable macrosetae usually present only as Sge IV and St IV. Leg formula 4132 with all legs longer than usual.

Males smaller than females but otherwise similar. Spermatodactyl of typical form, foot terminal, heel obscure, and lateral process small, but with toe large and spatulate. Ventrianal scutum with 3 pairs of preanal setae.

TYPE SPECIES: *Laelaps macropilis* Banks, 1905, by designation, Evans (1952).

DISCUSSION: Six species have been described in this genus, but Chant (1960) synonymized *P. speyeri* Evans with *P. macropilis* (Banks) and *P. riegeli* Dosse with *P. persimilis* Athias-Henriot. Gonzales and Schuster (1962) redistinguished *P. riegeli*. Therefore, at the present time, only *P. macropilis*, *P. persimilis*, *P. riegeli*, *P. tardi* (Lombardina), and *P. chanti* Ehara are recognized. However, because of inadequacies and inaccuracies in earlier descriptions and diagnoses, the types of all described species probably should be reexamined and reevaluated.

Several workers have studied the biologies and biological control potentials of species of this genus. They are effective predators of spider mites on low growing shrubs and herbs.

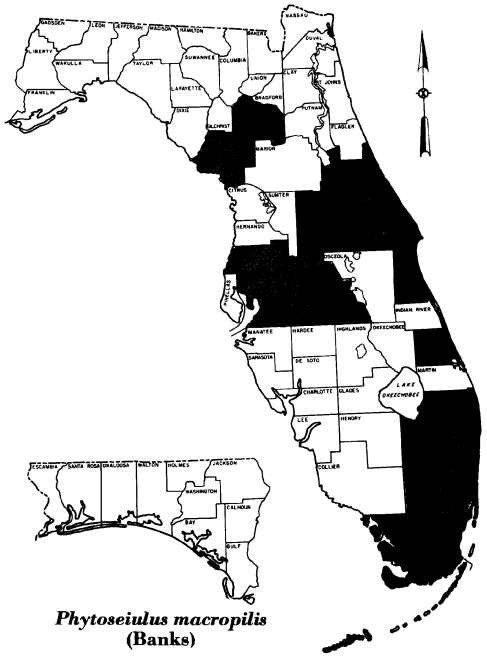
This genus probably is world wide in distribution. It is common in the Caribbean area. Only the type species is known from Florida.

Phytoseiulus macropilis (Banks)

Fig. 83 to 91

Laelaps macropilis Banks, 1905: 139.
Hypoaspis macropilis (Banks), Banks, 1915: 85.
Phytoseiulus speyeri Evans, 1952: 398.
Phytoseiulus macropilis (Banks), Cunliffe and Baker, 1953: 23.

DIAGNOSIS: Females of this species are readily distinguished from *P. persimilis*

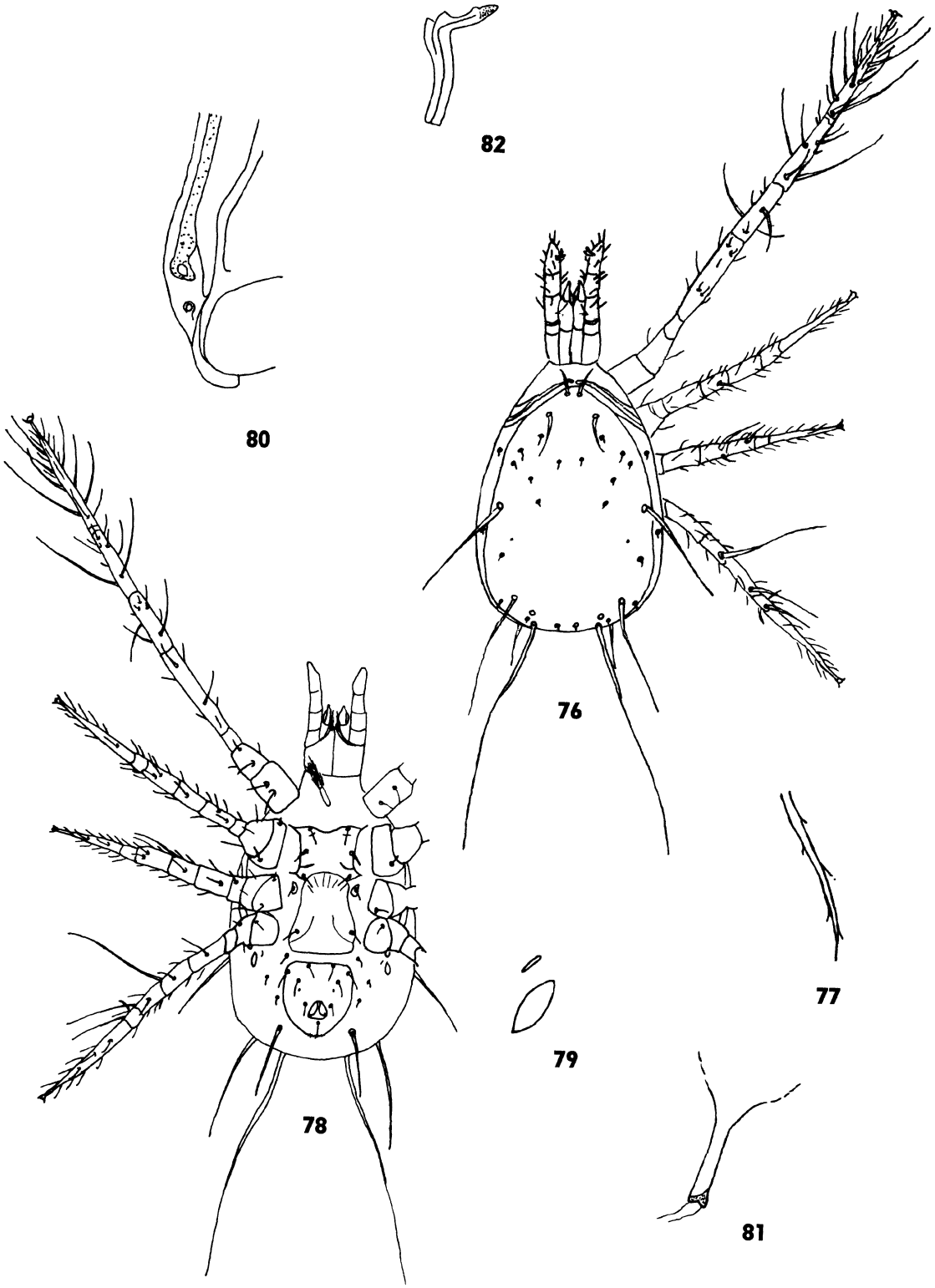


Phytoseiulus macropilis (Banks)

Athias-Henriot by the presence of 1 pair of preanal setae and in having macroseta Sti IV weakly plumose. Males of the two species are practically indistinguishable. The body is about 340μ long.

TYPE: The female holotype from water

Fig. 76 to 82. *Proprioseiulus paxi* (Muma). 76. Dorsal and leg structure and setation ♀. 77. Tip of weakly plumose L_8 ♀. 78. Ventral and leg structure and setation ♀. 79. Metapodal scuta ♀. 80. Posterior peritremal and stigmatal development ♀. 81. Spermatheca structure ♂. 82. Spermatodactyl structure ♂.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hyacinth, Eustis, Florida, is in the USNM, Washington, D. C.

HABITAT: Recorded host plants include *Amaranthus tricolor, Antirrhinum* sp., *Bidens pilosa, Chenopodium ambrosiodes, Citrus* spp., *Cocos nucifera, Crotalaria* sp., *Eichhornia crassipes, Euphorbia pulcherrima, Fragaria* sp., *Hieracium venosum, Hydrangea* sp., *Indigofera* sp., *Ipomoea cairica, Ipomoea leptophylla, Lathyrus odoratus, Lippia nodiflora, Magnolia grandiflora, Passiflora* sp., *Pittosporum* sp., *Pontederia* sp., *Ricinus communis, Quercus stellata, Rhododendron indicum, Rubus* spp., *Taxodium* sp., *Tradescantia* sp., *Ulmus parvifolia, Viburnum* sp., *Viola* sp., *Zea mays* 'Rugosa', and weeds.

COUNTY DISTRIBUTION: Alachua, Brevard, Broward, Dade, Hillsborough, Lake, Levy, Monroe, Orange, Pasco, Palm Beach, Polk, St. Lucie, Seminole, and Volusia.

BIOLOGY: Living specimens are pink to red in color with a milk-white spot over the posterior part of the dorsum. Although its host range includes trees, it is found most commonly on low-growing shrubs, herbs, and vines where it is usually associated with colonial tetranychids. It has been referred to locally as the long-legged mite but might be more properly called the long-legged phytoseiid.

The biology of this species was studied by Smith and Summers (1949) who found that the life cycle was completed in about 5 days and that adults lived about 4 weeks. Evaluation studies inferred a biological control potential, but more quantitative data are needed.

This species has been collected in every month except January, June, and October.

GENUS *PROPRIOSEIOPSIS* MUMA

Proprioseiopsis Muma, 1961: 277 (type only).
Amblyseiulus Muma, 1961: 278.
Amblyseius Berlese, Schuster and Pritchard, 1963: 255 (in part).
Amblyseius Berlese, Chant, 1965: 371 (in part).
Amblyseiulus Muma, De Leon, 1966:83.
Proprioseiopsis Muma, Muma and Denmark, 1968: 231.

DIAGNOSIS: Females are characterized by 3 pairs of dorsal setae, 3 pairs of median setae, 8 pairs of lateral setae, some elongate and weakly plumose; 2 pairs of sublateral setae on the interscutal membrane; 3 pairs of sternal setae; 3 pairs of preanal setae.

Dorsal scutum well sclerotized and smooth except for indistinct lunate areas on most species. Sternal scutum as wide or wider than long with straight or concave posterior margin; most species have the sternum creased to reticulate. Ventrianal scutum shield-shaped to pentagonal and creased or reticulate with preanal pores. Peritreme long, extending forward to or between vertical setae. Peritremal scutum with an ectal strip that extends posteriorly to leg IV exopodal scutum. Chelicerae normal with the fixed fingers provided with 6 to 14 denticules and the movable fingers with 0 to 4 denticules. Leg formula usually 1423 with leg I slightly to distinctly longer but without macrosetae, except on *P. macrosetae* (Muma) and *P. gracilisetae* (Muma). Sge II and Sge III present on some species. All species have Sge IV, Sti IV, and St IV.

Males smaller than females but otherwise similar. Spermatodactyl of usual form with foot terminal and heel and lateral process obscure to distinct; the lateral process is fre-

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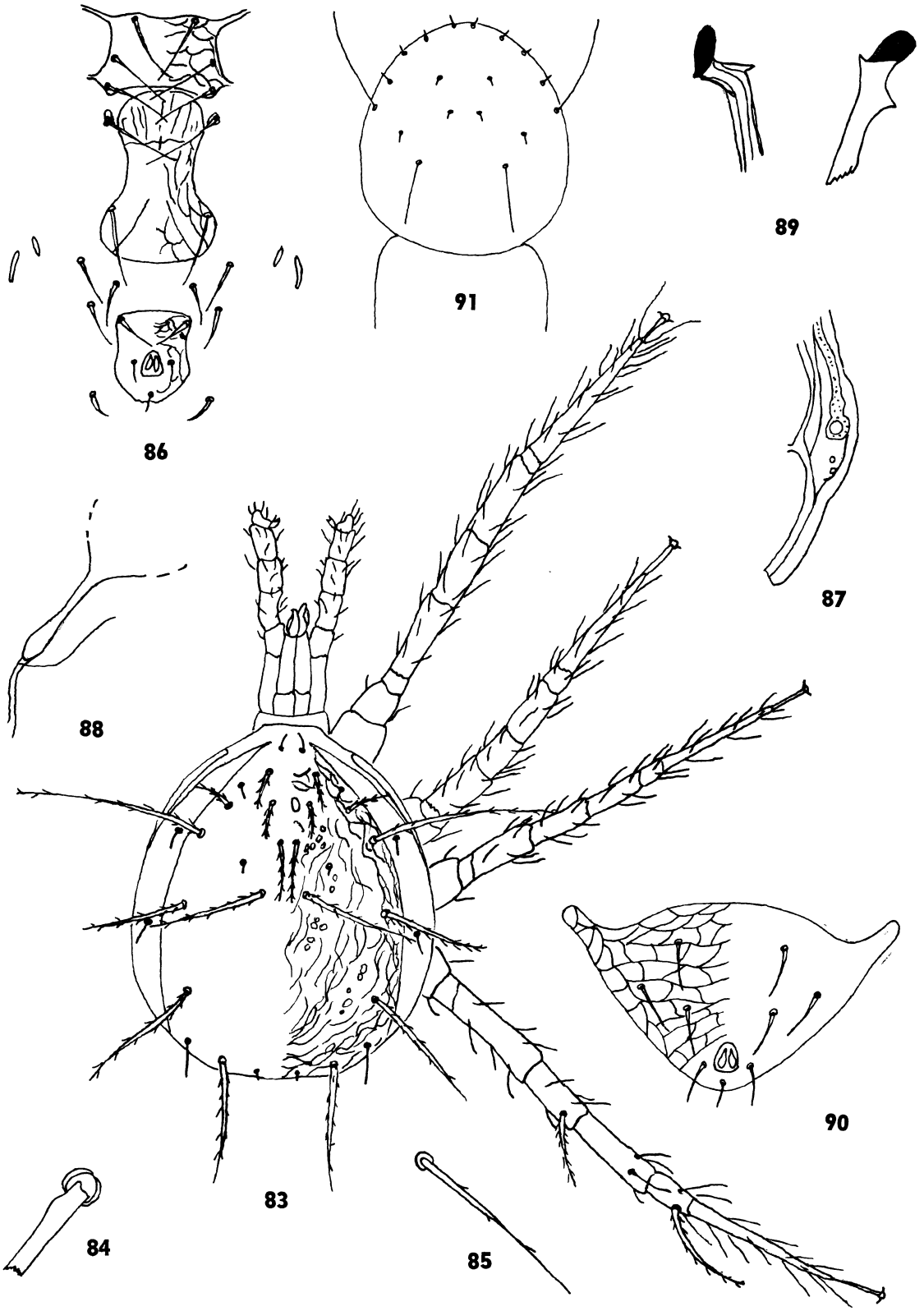
Fig. 83 to 91. *Phytoseiulus macropilis* (Banks). 83. Dorsal and leg structure and setation ♀. 84. Articulation of L_6 ♀. 85. Weakly plumose Sti IV ♀. 86. Ventral scuta and setation ♀. 87. Posterior peritremal and stigmatal development ♀. 88. Spermathecal structure ♀. 89. Positional variations of spermatodactyl structure ♂. 90. Ventrianal scutum. 91. Larval dorsal setation.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quently elongate. Ventrianal scutum with 3 or 4 pairs of preanal setae and a pair of preanal pores.

TYPE SPECIES: *Typhlodromus* (*Amblyseius*) *terrestris* Chant, 1959, by designation, Muma (1961).

DISCUSSION: This genus includes at least 40 known species, most of which are readily grouped by spermathecal shape. Two unusual species are recognized: *P. macrosetae* (Muma) lacks the ectal peritremal scutal strip, has a unique spermatheca, and leg I is much longer than usual; *P. gracilisetae* (Muma) has elongate macrosetae on all legs and an unusual poculiform spermatheca.

Most species of *Proprioseiopsis* are found in ground surface litter or on grass, herbs, or vines; but the *dorsatus* group, which includes 5 species with several *Amblyseius*-like characters, are arboreal.

This genus is world wide in distribution. It is common in the Caribbean area. Sixteen species have been collected in Florida. *P. tropicanus* (Garman) is not included in the key.

Key to *Proprioseiopsis* Muma in Florida

(Females)

1a Leg I without distinguishable macrosetae 3

1b Leg I with macrosetae, leg IV macrosetae long 2

2a(1b) Leg I with 5 or 6 elongate setae; L_8 much longer than M_3 ..... gracilisetae (Muma) (p. 48)

2b Leg I with at least 8 elongate setae; M_3 longer than L_8 ..... *macrosetae* (Muma) (p. 35)

3a(1a) Spermathecae elongate and saccular or long and fundibuliform 10

3b Spermathecae short and poculiform or short and fundibuliform 4

4a(3b) Spermathecae poculiform with short atria—*clausae* group 6

4b Spermathecae short fundibuliform with long atria—*dorsatus* group....5

5a(4b) Ventrianal pores between posterior preanal setae ..... *dorsatus* (Muma) (p. 49)

5b Ventrianal pores behind posterior preanal setae ..... *solens* (De Leon) (p. 49)

6a(4a) Ventrianal pores between posterior preanal setae; $M_3 < L_8$ 7

6b Ventrianal pores behind posterior preanal setae; $M_3 = > L_8$ ..... *clausae* (Muma) (p. 42)

7a(6a) Preanal pores large and elliptical; L_2 distinctly $> L_3$ 8

7b Preanal pores minute and punctate; L_2 and L_3 subequal ..... *asetus* (Chant) (p. 44)

8a(7a) L_2 at least twice as long as L_3; dorsal scutum smooth except for lunate areas 9

8b L_2 only 1/3 longer than L_3; dorsal scutum creased and imbricate ..... *lepidus* (Chant) p. 46)

9a(8a) Preanale pores closer to posterior preanal setae ..... *temperellus* Denmark and Muma (p. 44)

9b Posterior pores closer to each other ..... *mexicanus* (Garman) (p. 48)

10a(3a) Spermathecae saccular; well-sclerotized species—*rotundus* group 12

10b Spermathecae elongate fundibuliform; lightly-sclerotized species—*detritus* group 11

11a(10b) Spermathecal atrium large and peanut-shaped; most setae short..... *detritus* (Muma) (p. 35)

11b Spermathecal atrium small and nodular; L_4, M_3, and L_8 long ..... *citri* (Muma) (p. 36)

12a(10a) Preanal pores between posterior preanal setae; $L_3 >$ dorsal setae 14

12b Preanal pores behind posterior preanal setae; L_3 = dorsal setae..13

13a(12b) L_2 slightly longer than L_3; cervix only twice as long as wide ..... *tubulus* (Muma) p. 40)

13b L_2 much longer than L_3; cervix nearly 4 times longer than wide .... *sarraceniae* (Muma) (p. 40)

14a(12a) Cervix only twice as long as wide ..... *cannaensis* (Muma) (p. 38)

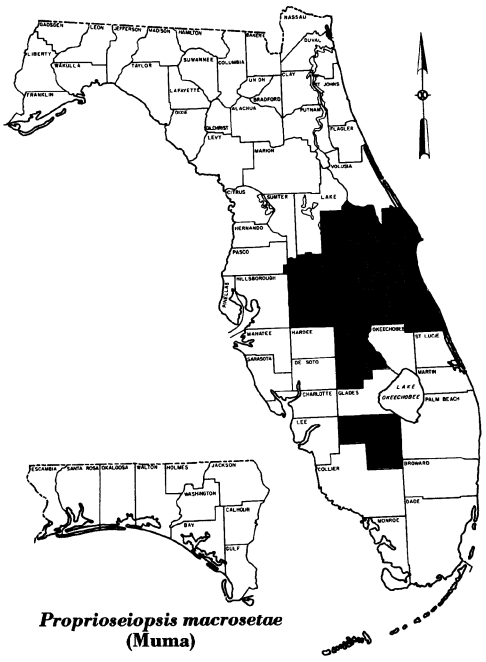
14b Cervix nearly 5 times longer than wide ..... *rotundus* (Muma) (p. 36)

Proprioseiopsis macrosetae (Muma), new combination

Fig. 92 to 98

Amblyseiulus macrosetae Muma, 1962: 3.

DIAGNOSIS: The slender tubular spermatheca, the spatulate toe of the spermatodactyl, the presence of macrosetae on legs I, II, and III, and additional elongate setae on leg I serve to distinguish this species. It does not have the peritremal scutum extending to leg IV exopodal scutum as on most *Proprioseiopsis*. In general facies, it closely resembles *Proprioseiulus paxi* (Muma). The body is about 360μ long.



Proprioseiopsis macrosetae (Muma)

TYPE: Female holotype, female paratype, and male allotype from citrus litter, Malabar, Florida, January 25, 1960, by Judith A. Murrell, are in the USNM, Washington, D. C.

HABITAT: Specimens have been collected from *Casuarina* sp., *Citrus* sp. litter and *Pinus clausa* litter.

COUNTY DISTRIBUTION: Brevard, Hendry, Highlands, Indian River, Orange, Osceola, Polk, and Seminole.

BIOLOGY: Living specimens have not been seen. The biology is unknown.

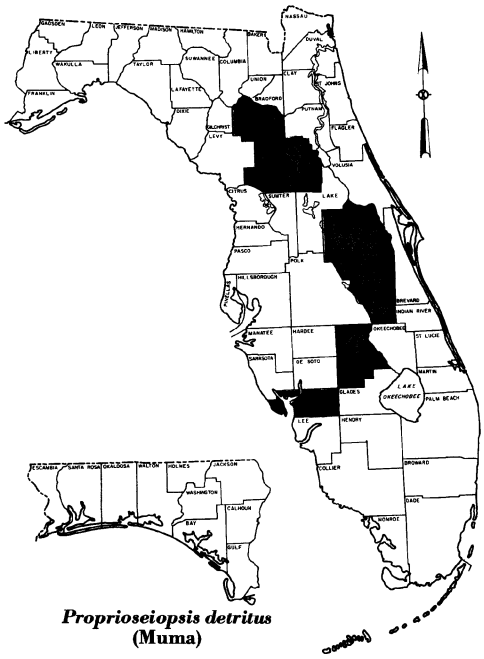
This species has been collected in January, February, March, April, May, June, July, September, and December.

Proprioseiopsis detritus (Muma), new combination

Fig. 99 to 106

Amblyseiulus detritus Muma, 1961: 280.

DIAGNOSIS: This species is distinguished from the closely-related *Proprioseiopsis citri* Muma by the creased dorsal scutum, proportions of setal lengths on the dorsal scutum, and differences in the spermatheca and spermatodactyl. The allotype, collected from citrus litter, is a misidentified male of *Proprioseiopsis mexicanus* (Garman). The spermatodactyl and ventrianal scutum of the true male of this species are illustrated here (Fig. 105, 106). The preanal pores vary considerably in position, frequently exhibiting asymmetry. The body is about 310μ long.



Proprioseiopsis detritus (Muma)

TYPE: The female holotype from pine and hardwood litter, Moss Bluff, Florida, May 22, 1958, by H. L. Greene and Martin H.

Muma, is in the USNM, Washington, D. C.

HABITAT: To date, this species is known only from litter of pines and hardwood trees.

COUNTY DISTRIBUTION: Alachua, Charlotte, Marion, Highlands, Osceola, Orange, and Seminole.

BIOLOGY: Nothing is known about the biology of this species.

This species has been collected in January, March, April, May, November, and December.

Proprioseiopsis citri (Muma), new combination

Fig. 107 to 112

Amblyseiulus citri Muma, 1962: 1.

DIAGNOSIS: This species is readily distinguished from *P. detritus* by the relatively smooth dorsal scutum, longer M_3, L_1, L_4, and L_8, a small but distinctly swollen spermathecal atrium, and a differently shaped spermathecal cervix. The body is about 330μ long.

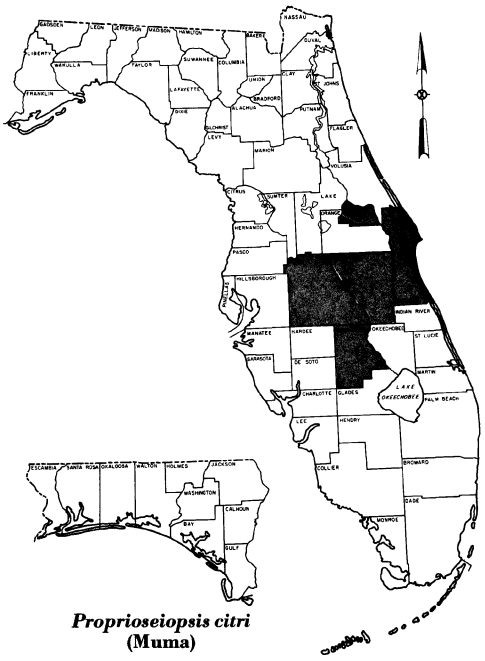
TYPE: The female holotype, allotype, and paratypes from citrus litter, Sebring, Florida, July 18, 1960, by M. H. Muma, are in the USNM, Washington, D. C.

HABITAT: To date, this species has been found only on the bark or in the litter beneath citrus trees (p. 10).

COUNTY DISTRIBUTION: Brevard, Highlands, Polk, Osceola, and Seminole.

BIOLOGY: Living specimens have not been seen.

This species has been collected in January and April.



Proprioseiopsis citri (Muma)

Proprioseiopsis rotundus (Muma), new combination

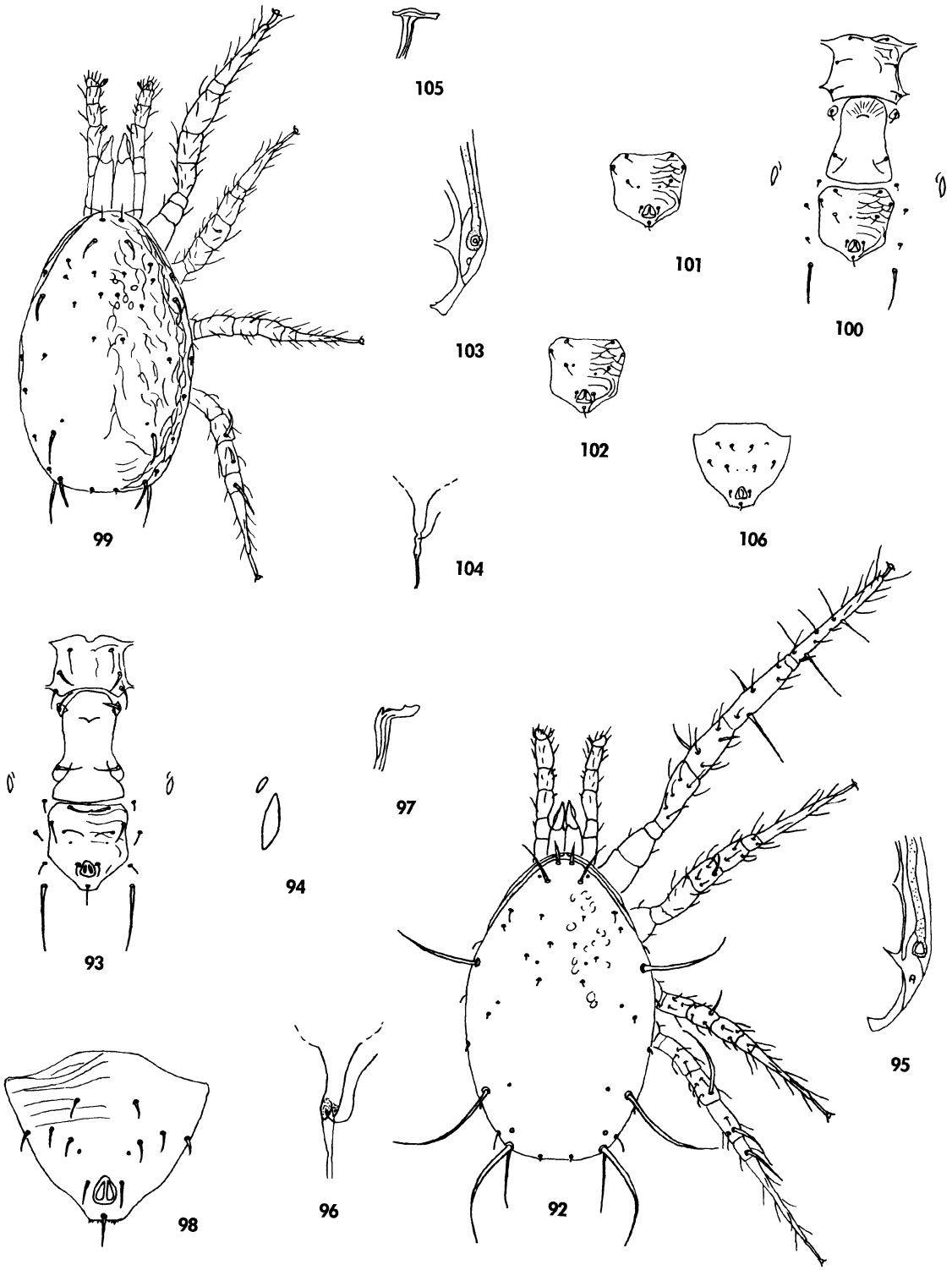
Amblyseiulus rotundus Muma, 1961 : 279.

DIAGNOSIS: The species is distinguished from the closely-related *Proprioseiopsis cannaensis* (Muma) by the longer and more slender spermatheca and the comparatively longer lateral process of the spermatodactyl. Other closely-related species have different proportional lengths of the lateral setae. The body is about 360μ long.

TYPE: The female holotype and paratype from fescue, Spring Water, Oregon, April 16, 1958, by G. W. Krantz, are in the USNM, Washington, D. C.

Fig. 92 to 98. *Proprioseiopsis macrosetae* (Muma). 92. Dorsal and leg structure and setation ♀. 93. Ventral scuta and setation ♀. 94. Metapodal scuta ♀. 95. Posterior peritremal and stigmatal development ♀. 96. Spermathecal structure ♀. 97. Spermatodactyl structure ♂. 98. Ventrianal scutum ♂.

Fig. 99 to 106. *Proprioseiopsis detritus* (Muma). 99. Dorsal and leg structure and setation ♀. 100. Ventral scuta and setation ♀. 101 and 102. Variations in position of preanal pores ♀. 103. Posterior peritremal and stigmatal development ♀. 104. Spermathecal structure ♀. 105. Spermatodactyl structure ♂. 106. Ventrianal scutum ♂.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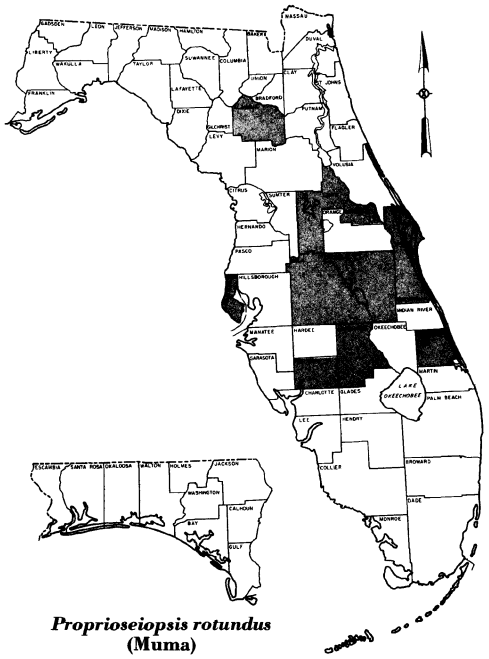
HABITAT: Most specimens have been collected from citrus litter; 1 specimen was taken from citrus bark. It has also been taken from can traps, *Conocarpus erecta*, *Digitaria decumbens*, *Gordonia lasianthus*, *Paspalum notatum*, and *Tillandsia usneoides*.



Proprioseiopsis rotundus (Muma)

COUNTY DISTRIBUTION: Alachua, Brevard, De Soto, Highlands, Lake, Osceola, Pinellas, Polk, St. Lucie, and Seminole.

BIOLOGY: Nothing is known about living specimens.

This species has been collected in January, February, April, and June.

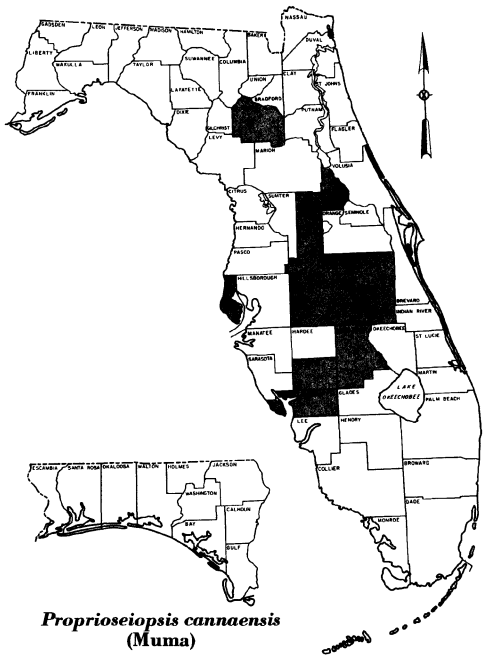
Proprioseiopsis cannaensis (Muma), new combination

Fig. 119 to 125

Amblyseiulus cannaensis Muma, 1962: 4.

DIAGNOSIS: This mahogany red-brown species is distinguished from the closely-related *Proprioseiopsis rotundus* (Muma) by its shorter, wider spermatheca and comparatively shorter lateral process of the spermatodactyl. Comparative lengths of median and lateral setae on the dorsal scutum serve to separate it from *P. lindquisti* (Schuster and Pritchard), *P. ovatus* (Garman), *P. fragariae* (Kennett), and *P. exopodalis* (Kennett). The body is about 330μ long.

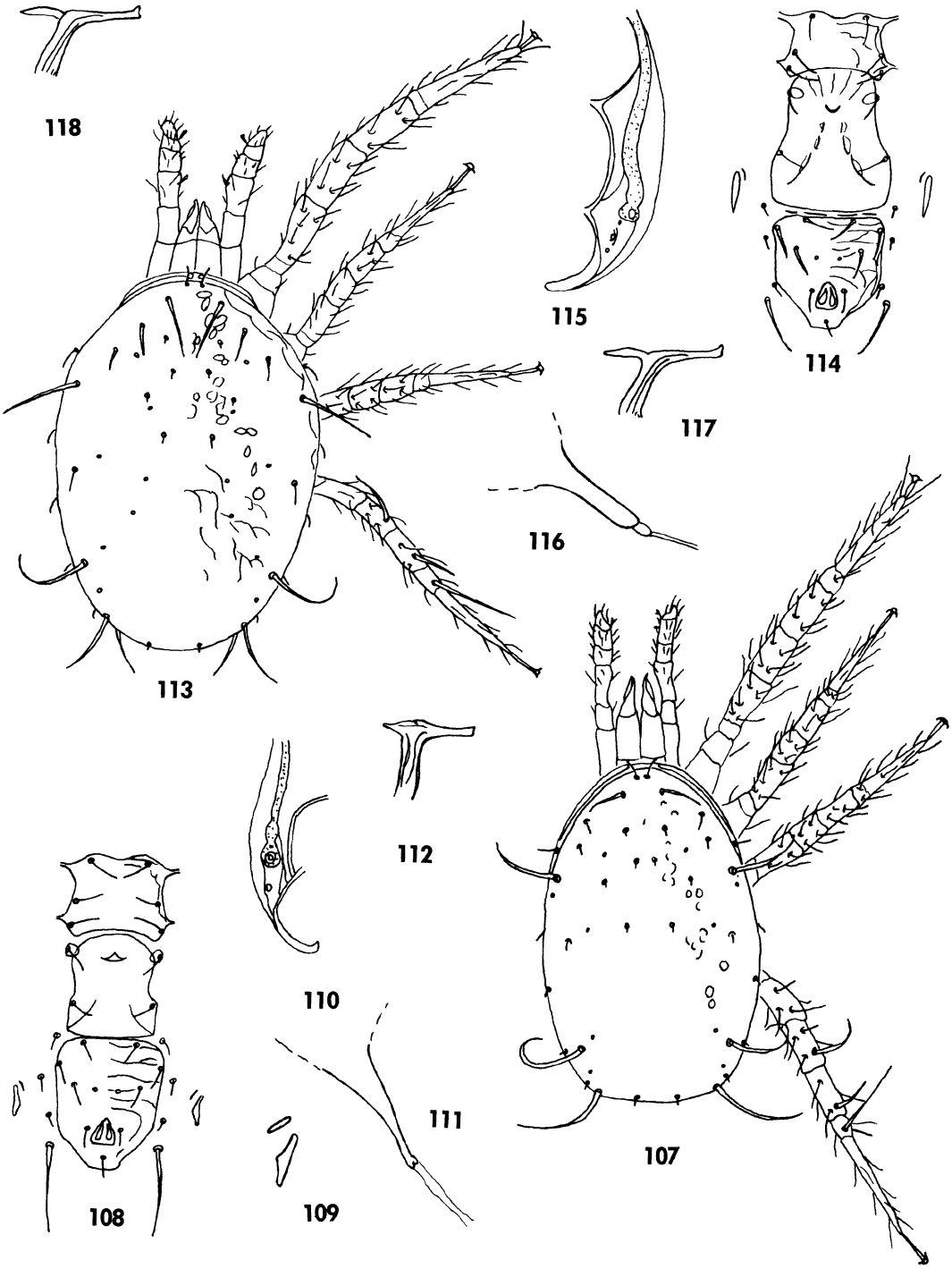
TYPE: The female holotype from canna



Proprioseiopsis cannaensis (Muma)

Fig. 107 to 112. *Proprioseiopsis citri* (Muma). 107. Dorsal and leg structure and setation ♀. 108. Ventral scuta and setation ♀. 109. Metapodal scuta ♀. 110. Posterior peritremal and stigmatal development ♀. 111. Spermathecal structure ♀. 112. Spermatodactyl structure ♂.

Fig. 113 to 118. *Proprioseiopsis rotundus* (Muma). 113. Dorsal and leg structure and setation ♀. 114. Ventral scuta and setation ♀. 115. Posterior peritremal and stigmatal development ♀. 116. Spermathecal structure ♀. 117 and 118. Positional variations of spermatodactyl structure ♂.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leaf, Winter Haven, Florida, July 24, 1960, by M. H. Muma, is in the USNM, Washington, D. C.

HABITAT: Specimens have been collected from *Canna* leaves, *Ipomoea* leaves, *Citrus* litter, and *Pinus clausa* litter.

COUNTY DISTRIBUTION: Alachua, Charlotte, De Soto, Highlands, Lake, Osceola, Pinellas, and Polk.

BIOLOGY: All living specimens collected have been associated with *Brevipalpus* spp. infestations.

This species has been collected in January, April, July, August, September, October, and December.

Proprioseiopsis tubulus (Muma), new combination

Fig. 126 to 133

Amblyseiulus tubulus Muma, 1965a: 247.

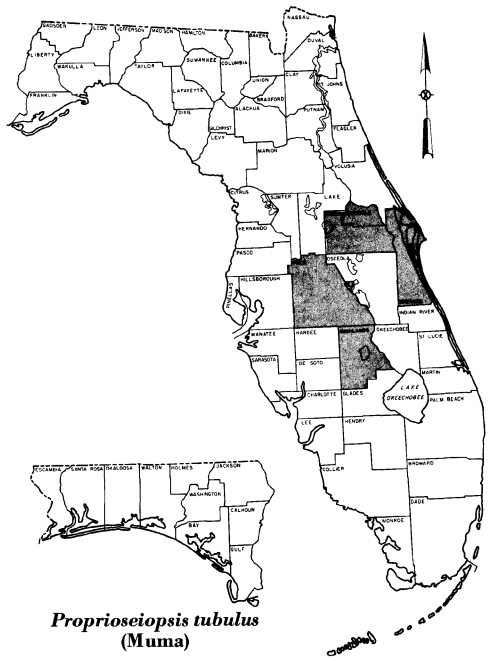
DIAGNOSIS: The combination of the saccular spermatheca, short L_2 and L_3, and the location of the preanal pores distinguish this species from closely-related forms. The lateral process of the spermatodactyl is very short. A female of this species was misidentified as *P. clausae* (Muma) and designated as a paratype, Muma (1962). The body is about 360μ long.

TYPE: The female holotype from sand pine litter, Oviedo, Florida, November 15, 1961, by Judith A. Murrell and M. H. Muma is in the USNM, Washington, D. C.

HABITAT: This species has been found in can traps, *Citrus* sp., *Pinus clausa* litter, and on lake shore.

COUNTY DISTRIBUTION: Brevard, Highlands, Orange, Polk, and Seminole.

BIOLOGY: Nothing is known of the biology.



Proprioseiopsis tubulus (Muma)

This species has been collected in February, March, June, July, August, and September.

Proprioseiopsis sarraceniae (Muma), new combination

Fig. 134 to 140

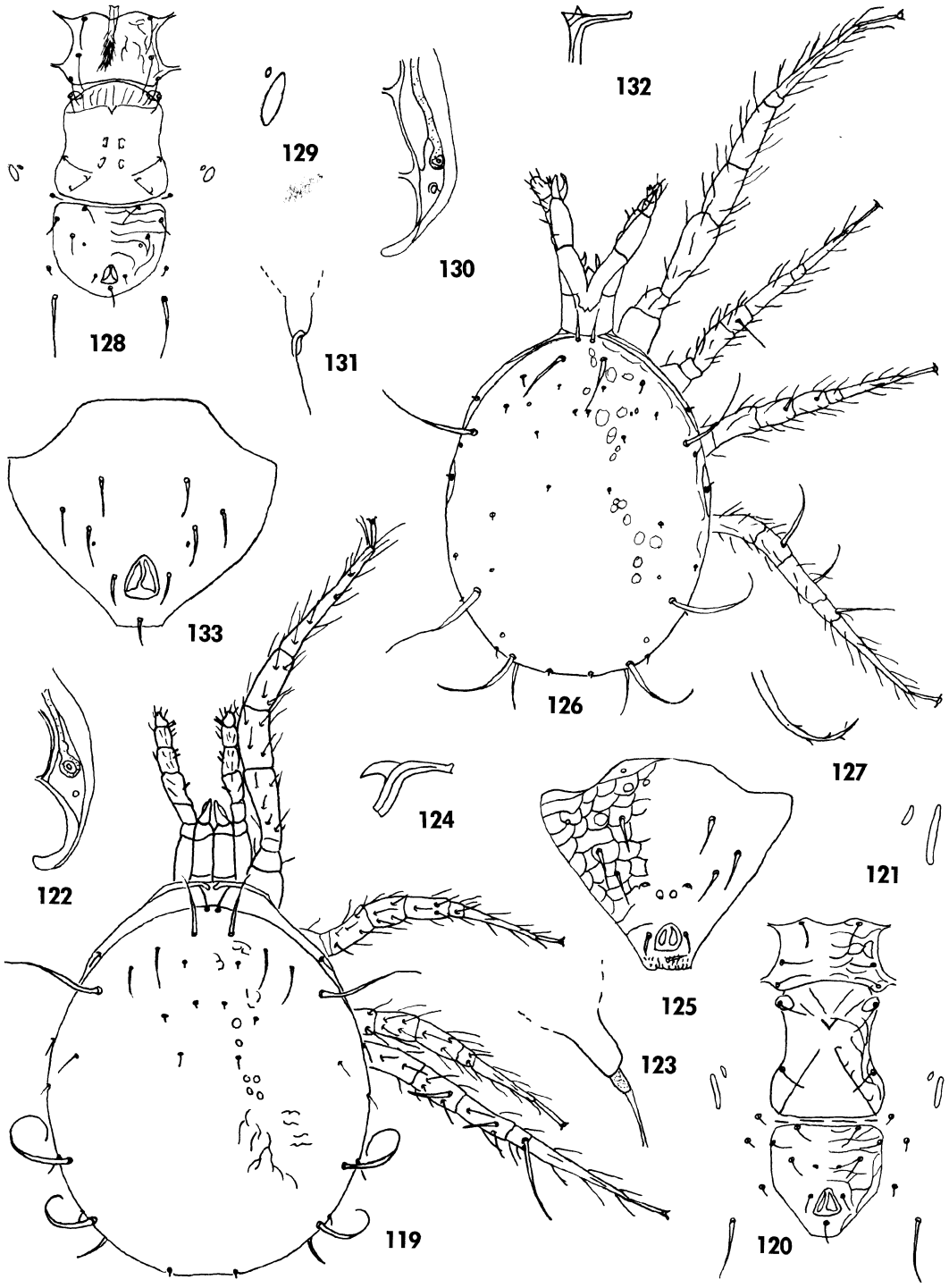
Amblyseiulus sarraceniae Muma, 1965a: 247.

DIAGNOSIS: This species differs from other *Proprioseiopsis* with saccular spermathecae in having L_3 much smaller than L_2, and M_3 distinctly shorter than L_8. It also has 6 to 8 teeth on the fixed finger of the chelicerae. The body is about 350μ long.

TYPE: The female holotype in pitcher

Fig. 119 to 125. *Proprioseiopsis cannaensis* (Muma). 119. Dorsal and leg structure and setation ♀. 120. Ventral scuta and setation ♀. 121. Metapodal scuta ♀. 122. Posterior peritremal and stigmatal development ♀. 123. Spermathecal structure ♀. 124. Spermatodactyl structure ♂. 125. Ventrianal scutum ♂.

Fig. 126 to 133. *Proprioseiopsis tubulus* (Muma). 126. Dorsal and leg structure and setation ♀. 127. Tip of weakly plumose L_8 ♀. 128. Ventral scuta and setation ♀. 129. Metapodal scuta ♀. 130. Posterior peritremal and stigmatal development ♀. 131. Spermathecal structure ♀. 132. Spermatodactyl structure ♂. 133. Ventrianal scutum ♂.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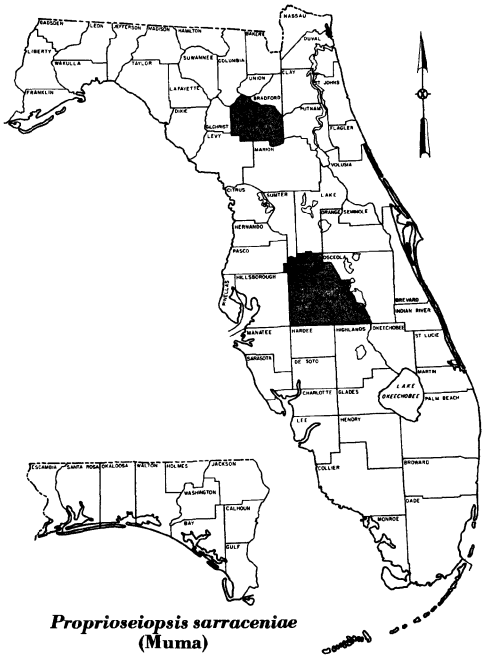


Proprioseiopsis sarraceniae (Muma)

plant leaf cup, Polk City, Florida, January 25, 1965, by M. H. Muma and H. L. Greene, is in the USNM, Washington, D. C.

HABITAT: Known only from *Sarracenia* leaf cups.

COUNTY DISTRIBUTION: Alachua and Polk.

BIOLOGY: Nothing is known about the food habits.

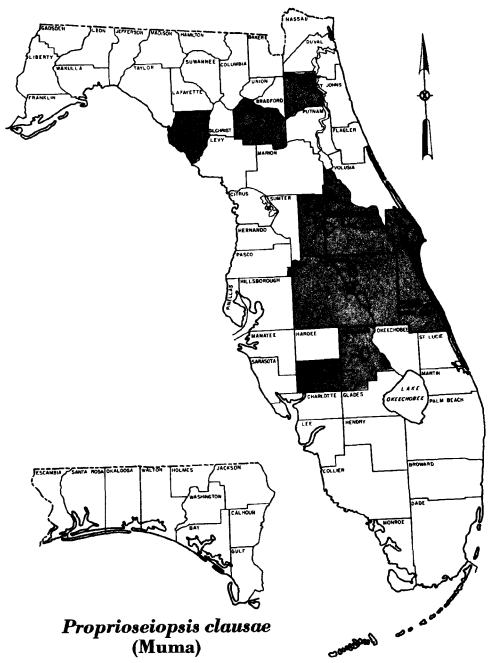
This species has been collected in January, April, and December.

Proprioseiopsis clausae (Muma), new combination

Fig. 141 to 146

Amblyseiulus clausae Muma, 1962: 1.

DIAGNOSIS: This light brown species is distinguished from closely related species with poculiform spermathecae by shorter L_1, L_4, and L_8, widely-separated preanal pores and minor differences in the spermatodactyl. This species has the pores associated with L_3, M_3, and L_7 much larger than usual. A



Proprioseiopsis clausae (Muma)

paratype from Titusville, cited at the time of the original description, was a misidentified specimen of *P. tubulus* (Muma). The body is about 300μ long.

TYPE: The female holotype and male allotype from *Pinus clausa* litter, St. Cloud, Florida, March 18, 1959, by M. H. Muma, are in the USNM, Washington, D. C.

HABITAT: Most specimens have been collected from *Lycopodium* on palm trunks, litter of *Pinus clausa* (p. 10), litter of *Sabal*

Fig. 134 to 140. *Proprioseiopsis sarraceniae* (Muma). 134. Dorsal and leg structure and setation ♀. 135. Tip of weakly plumose L_8 ♀. 136. Ventral scuta and setation ♀. 137. Metapodal scuta ♀. 138. Posterior peritremal and stigmatal development ♀. 139 and 140. Positional variations of spermathecal structure ♀.

Fig. 141 to 146. *Proprioseiopsis clausae* (Muma). 141. Dorsal and leg structure and setation ♀. 142. Ventral scuta and setation ♀. 143. Posterior peritremal and stigmatal development ♀. 144. Spermathecal structure ♀. 145. Spermatodactyl structure ♂. 146. Ventrianal scutum ♂.

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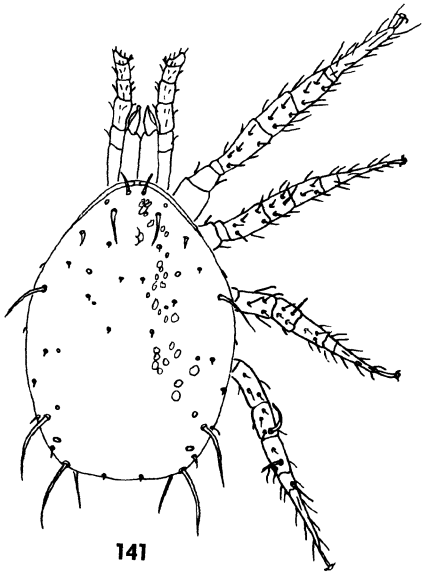

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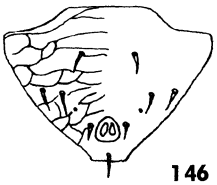

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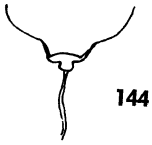

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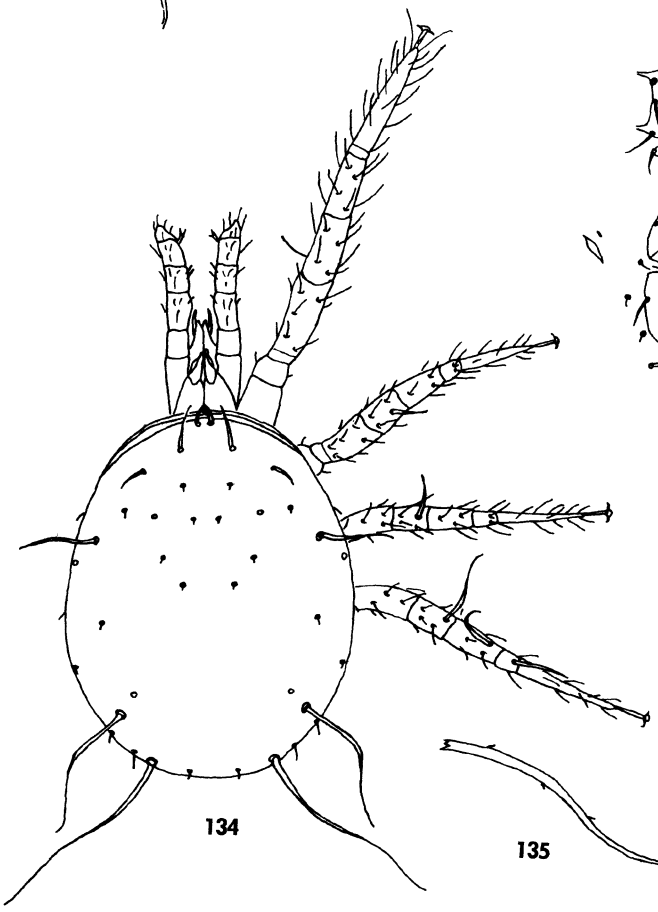

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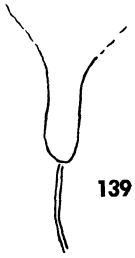

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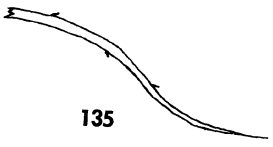

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palmetto, Stenotaphrum secundatum, and *Tillandsia usneoides.*

COUNTY DISTRIBUTION: Alachua, Brevard, Clay, De Soto, Dixie, Highlands, Indian River, Lake, Orange, Osceola, Polk, and Seminole.

BIOLOGY: The food habits are unknown.

This species has been collected in every month except July.

Proprioseiopsis temperellus (Denmark and Muma), new combination

Fig. 147 to 150

Amblyseiulus temperellus Denmark and Muma, 1967: 171.

DIAGNOSIS: This species is distinguished from related species with poculiform spermathecae by the lack of dorsal scutal imbrication, proportionately shorter dorsal scutal setae, widely-spaced preanal pores, and differently proportioned macrosetae on leg IV. It is most closely related to *P. clausae* (Muma). The body is about 260μ long.

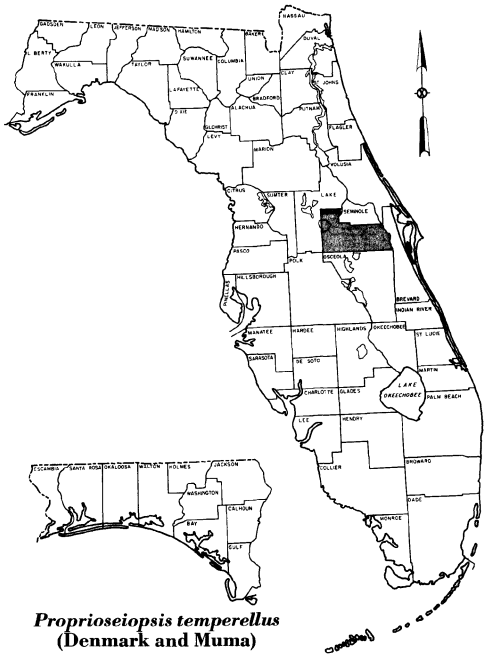
TYPE: The female holotype from *Pinus clausa* litter, Vineland, Orange County, Florida, January 16, 1965, M. H. Muma and H. L. Greene, is in the USNM, Washington, D. C.

HABITAT: *Pinus clausa* litter.

COUNTY DISTRIBUTION: Orange.

BIOLOGY: Nothing is known about the biology.

This species has been collected only in the month of January.



Proprioseiopsis temperellus **(Denmark and Muma)**

Proprioseiopsis asetus (Chant), new combination

Fig. 151 to 157

Typhlodromus (*Amblyseius*) *asetus* Chant, 1959: 80.

Amblyseiulus asetus (Chant), Muma, 1961: 278.

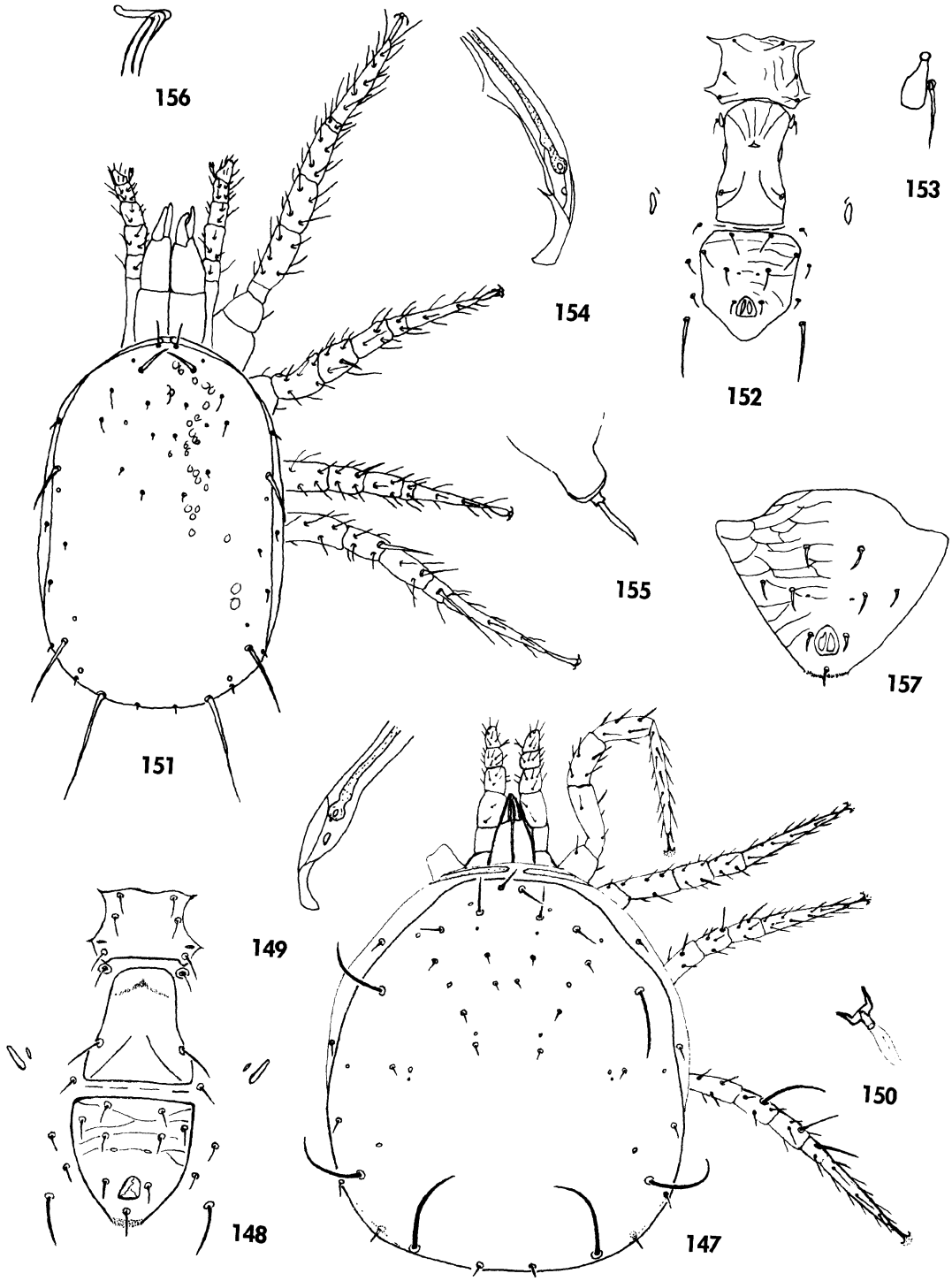
Amblyseiulus putnami (Chant), Muma, 1964: 16 (misidentification).

DIAGNOSIS: This species, moderately sclerotized and pale brown, is distinguished from the related *P. clausae* (Muma) and *P. mexicanus* (Garman) by having the preanal pores round and closer to each other than to the posterior preanal setae, and the spermatodactyl L-shaped with the lateral process near the heel. The body is about 340μ long.

TYPE: The female holotype from unsprayed apple leaves, Kearneysville, West Virginia, July 1953, by D. W. Clancy, is in the USNM, Washington, D. C.

Fig. 147 to 150. *Proprioseiopsis temperellus* (Denmark and Muma). 147. Dorsal and leg structure and setation ♀. 148. Ventral scuta and setation ♀. 149. Posterior peritremal and stigmatal development ♀. 150. Spermathecal structure ♀.

Fig. 151 to 157. *Proprioseiopsis asetus* (Chant). 151. Dorsal and leg structure and setation ♀. 152. Ventral scuta and setation ♀. 153. Metasternal scutum ♀. 154. Posterior peritremal and stigmatal development ♀. 155. Spermatodactyl structure ♀. 156. Spermatodactyl structure ♂. 157. Ventrianal scutum ♂.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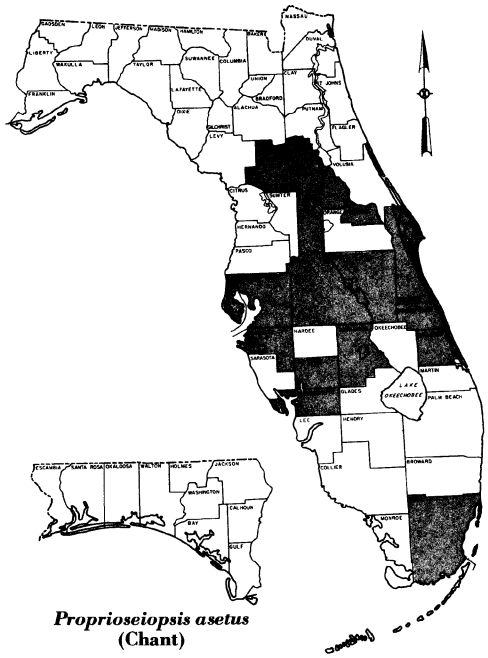


Proprioseiopsis asetus
(Chant)

HABITAT: The species has been taken only from the leaves, fruit, and litter of *Citrus* sp., *Pinus clausa*, *Senecio confusus*, and *Tillandsia usneoides*.

COUNTY DISTRIBUTION: Brevard, Charlotte, Dade, De Soto, Highlands, Hillsborough, Indian River, Lake, Manatee, Marion, Osceola, Pinellas, Polk, St. Lucie. and Seminole.

BIOLOGY: The food habits are not known.

This species has been collected in every month except May and November.

Proprioseiopsis lepidus (Chant), new combination

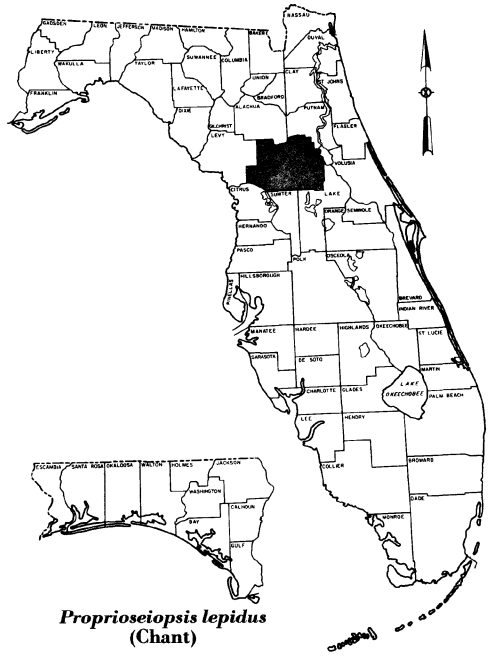
Fig. 158 to 160

Typhlodromus (*Amblyseius*) *lepidus* Chant, 1959: 82.

Amblyseiulus lepidus (Chant), Muma, 1961: 278.

DIAGNOSIS: This species is distinguished from other species with poculiform spermathecae by the weakly-imbricate dorsal scutum and the longer, thicker L_2 and L_3. The body is about 330μ long.

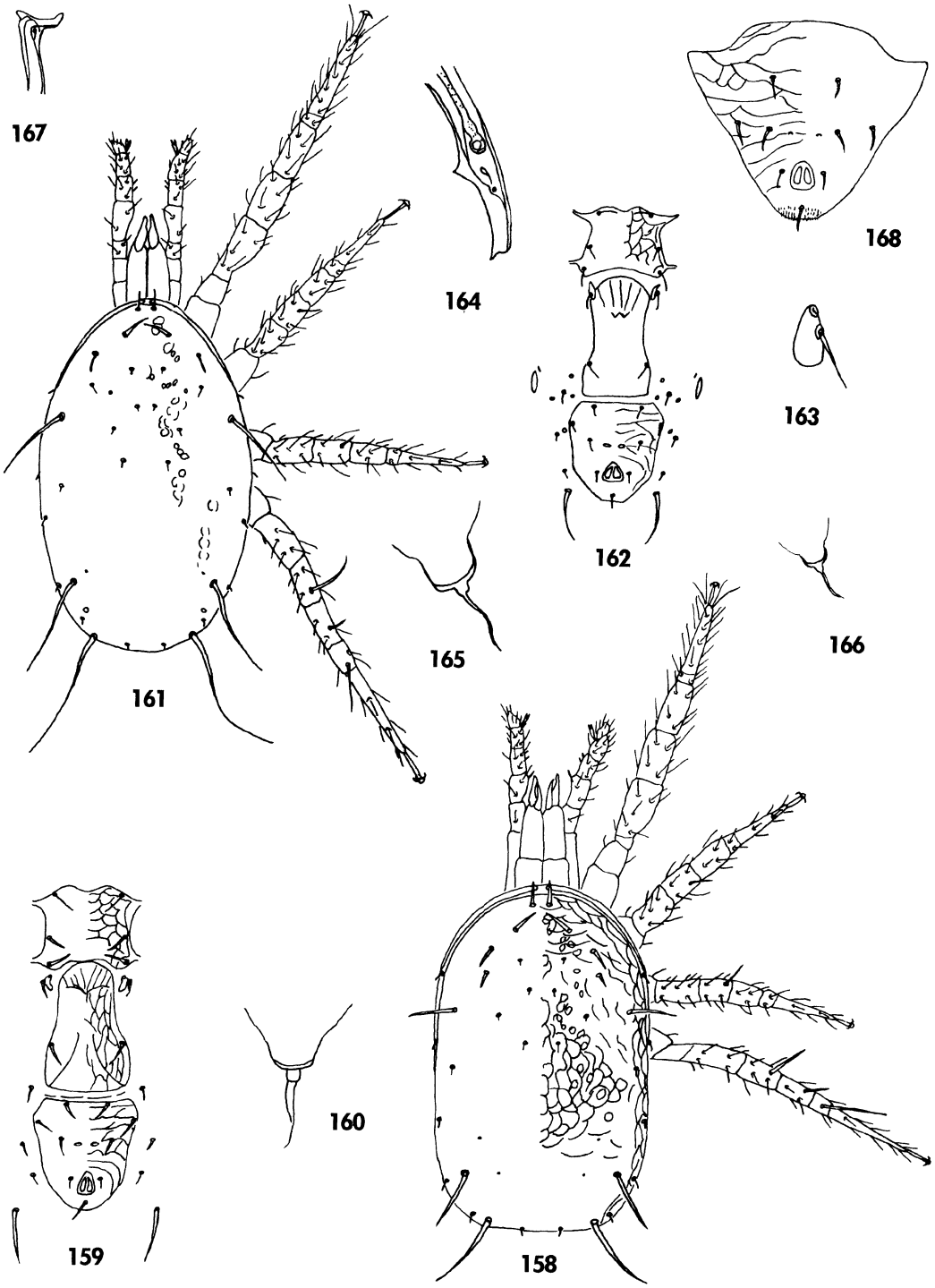
TYPE: The female holotype from strawberry, Baton Rouge, Louisiana, March 29, 1951, by J. S. Roussel, is in the USNM, Washington, D. C.



Proprioseiopsis lepidus
(Chant)

Fig. 158 to 160. *Proprioseiopsis lepidus* (Chant). 158. Dorsal and leg structure and setation ♀. 159. Ventral scuta and setation ♀. 160. Spermathecal structure ♀.

Fig. 161 to 168. *Proprioseiopsis mexicanus* (Garman). 161. Dorsal and leg structure and setation ♀. 162. Ventral scuta and setation ♀. 163. Metasternal scutum ♀. 164. Posterior peritremal and stigmatal development ♀. 165. Spermathecal structure ♀. 166. Small variation of spermatheca ♀. 167. Spermatodactyl structure ♂. 168. Ventrianal scutum ♂.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HABITAT: *Citrus* litter.

COUNTY DISTRIBUTION: Marion.

BIOLOGY: Nothing is known about the food habits or life cycle.

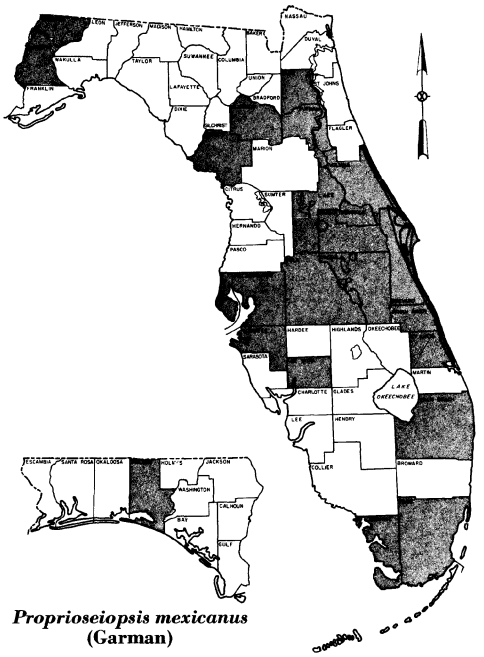
This species has been collected in April.

Proprioseiopsis mexicanus (Garman), new combination

Fig. 161 to 168

Amblyseiopsis mexicanus Garman, 1958: 75.
Typhlodromus (*Amblyseius*) *mexicanus* (Garman), Chant, 1959: 92.
Amblyseiulus mexicanus (Garman), Muma, 1961: 278.
Amblyseiulus lepidus (Chant), Muma, 1964: 15 (misidentification).

DIAGNOSIS: This moderately sclerotized



Proprioseiopsis mexicanus (Garman)

and pale brown species is distinguished by having L_4, M_3, and L_8 proportionately longer, the preanal pores elliptical and closer to each other than posterior preanal setae, and the spermatodactyl has a lateral process near the heel of the foot. The body is about 380μ long.

TYPE: The female holotype from *Zinnia*, from Mexico near Brownsville, Texas, June 27, 1937, by G. E. Callaghan is in the USNM, Washington, D. C.

HABITAT: This species has been taken principally from *Citrus* litter and *Pinus clausa* litter. Specimens are, however, occasionally found on *Beta vulgaris*, *Casuarina*, *Conocarpus erectus* litter, *Cynodon dactylon* debris, *Digitaria decumbens*, *Eremochloa ophiuroides*, *Fraxinus profunda*, *Gordonia lasianthus*, *Lyonia ferruginea*, *Magnolia* sp., *Pisum* sp., *Quercus incana*, *Quercus stellata*, *Quercus stellata garetta*, *Quercus virginiana*, *Rhus copallina leucantha*, *Stenotaphrum secundatum* sod, *Vitis* sp., and in can traps.

COUNTY DISTRIBUTION: Alachua Brevard, Clay, Dade, De Soto, Gadsden, Hillsborough, Indian River, Lake, Levy, Liberty, Manatee, Monroe, Orange, Osceola, Palm Beach, Pinellas, Polk, Putnam, St. Lucie, Seminole, Volusia, and Walton.

BIOLOGY: The food habits of this species are not known.

This species has been collected in every month except October.

Proprioseiopsis gracilisetae (Muma), new combination

Fig. 169 to 174

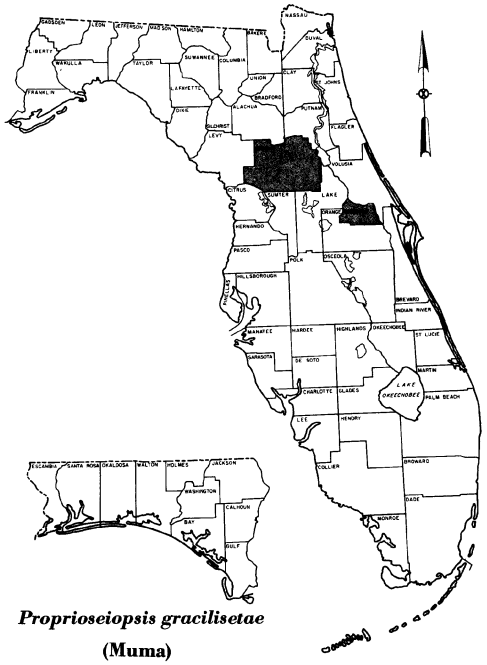
Amblyseiulus gracilisetae Muma, 1962: 4.

DIAGNOSIS: This species is distinguished from other species with poculiform spermathecae by the presence of macrosetae on leg I, elongate setae on leg I, the extreme lengths of L_4, M_3, and L_8, and the presence of 2 distinct pores on the stigmatal scutum. The cheliceral fixed finger has 8 to 14 denticules, the movable finger 3 to 4. The body is about 390μ long.

TYPE: The female holotype from mixed hardwood litter, Moss Bluff, Florida, May 22, 1958, by Judith A. Murrell, is in the USNM, Washington, D. C.

HABITAT: This species is known only from the female holotype from hardwood litter and a series of specimens from *Pinus clausa* litter.

COUNTY DISTRIBUTION: Marion and Seminole.



Proprioseiopsis gracilisetae
(Muma)

BIOLOGY: Nothing is known on the biology.

This species has been collected in April and August.

Proprioseiopsis dorsatus (Muma), new combination

Fig. 175 to 181

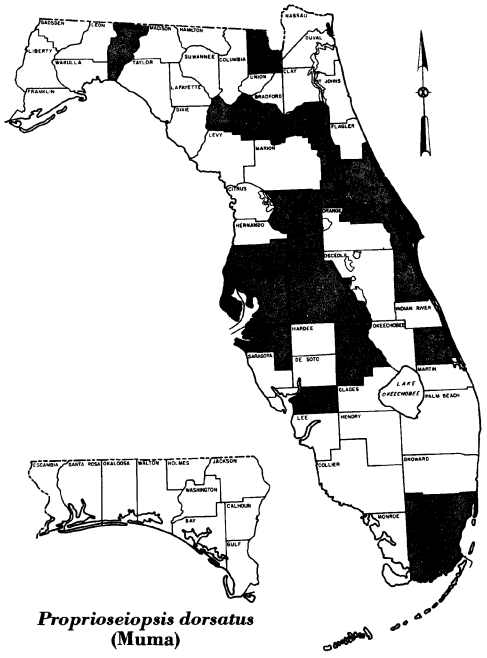
Amblyseiulus dorsatus Muma, 1961: 278.

DIAGNOSIS: This lightly sclerotized and pale colored species and *P. solens* (De Leon) are closely related but separable by the preanal pores which are located between, but slightly behind, the posterior preanal setae and minor differences in the setation of the dorsal scutum. This species or *P. solens* may later prove to be a synonym of *P. elongatus* (Garman). The body is about 380μ long.

TYPE: The female holotype, male allotype, and paratypes from citrus, Magnolia, Louisiana, November 18, 1958, by D. W. Clancy and A. Selhime, are in the USNM, Washington, D. C.

HABITAT: It has been collected from *Camellia* sp., *Camphora* sp., *Casuarina* sp., *Cattleya* sp., leaves, bark end litter of *Citrus* sp., *Fraxinus profunda, Ligustrum* sp., *Lyonia lucida, Lyonia ferruginea, Photenia serrulata, Pinus,* sp., *Platanus occidentalis, Prunus* sp., *Quercus nigra, Rubus* sp., *Sabal* sp., *Serenoa repens, Tillandsia usneoides* and *Viburnum suspensum.*

COUNTY DISTRIBUTION: Alachua, Baker, Brevard, Charlotte, Dade, Gilchrist, Highlands, Hillsborough, Jefferson, Lake,



Proprioseiopsis dorsatus
(Muma)

Levy, Manatee, Pasco, Pinellas, Polk, Putnam, Seminole, St. Lucie, Sumter, and Volusia.

BIOLOGY: The food habits are not known.

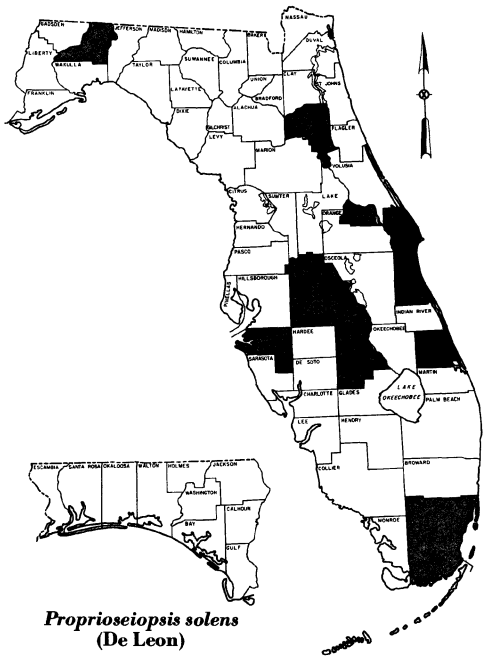
This species has been collected in January, February, March, April, May, June, and July.

Proprioseiopsis solens (De Leon), new combination

Fig. 182 to 186

Amblyseiulus solens De Leon, 1962: 17.
Amblyseiulus solens De Leon, Muma, 1964: 18.

DIAGNOSIS: Distinguishing characters



Proprioseiopsis solens
(De Leon)

include the preanal pores located behind the posterior preanal setae and proportional lengths of the setae on the dorsal scutum of this lightly sclerotized and pale colored species. The body is about 370μ long.

TYPE: The female holotype from *Sideroxylon foetidissimum*, Coral Gables, Florida, January 10, 1956, by D. De Leon, is in the MCZ collection, Harvard University, Cambridge, Mass.

HABITAT: It has been collected from *Callicarpa americana*, *Carya* sp., *Citrus* leaves and litter, *Cocos nucifera*, *Conocarpus erecta*, *Cornus* sp., *Ixora coccinea*, *Quercus* sp., *Sabal palmetto* litter, *Sideroxylon foetidissimum*, *Tillandsia usneoides*, miscellaneous shrubs in *Pinus clausa* scrub, and in can trap.

COUNTY DISTRIBUTION: Brevard, Dade, Highlands, Leon, Manatee, Polk, Putnam, St. Lucie, and Seminole.

BIOLOGY: The food habits are not known.

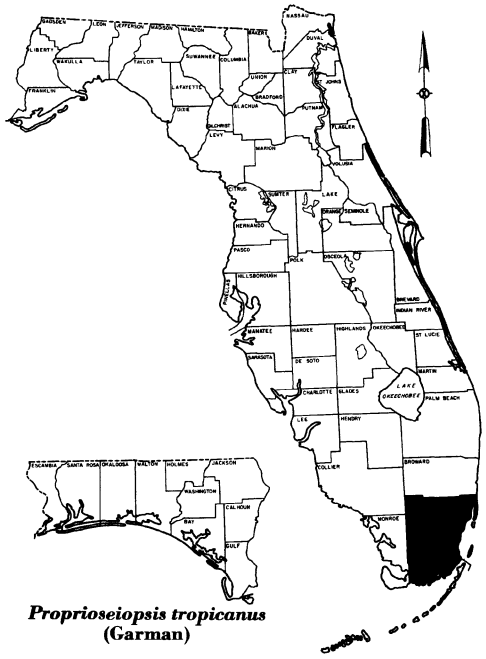
This species has been collected in February, March, April, May, August, September, and October.

Proprioseiopsis tropicanus (Garman), new combination

Amblyseiopsis tropicanus Garman, 1958: 77.
Typhlodromus (*Amblyseius*) *tropicanus* (Garman), Chant, 1959: 91.

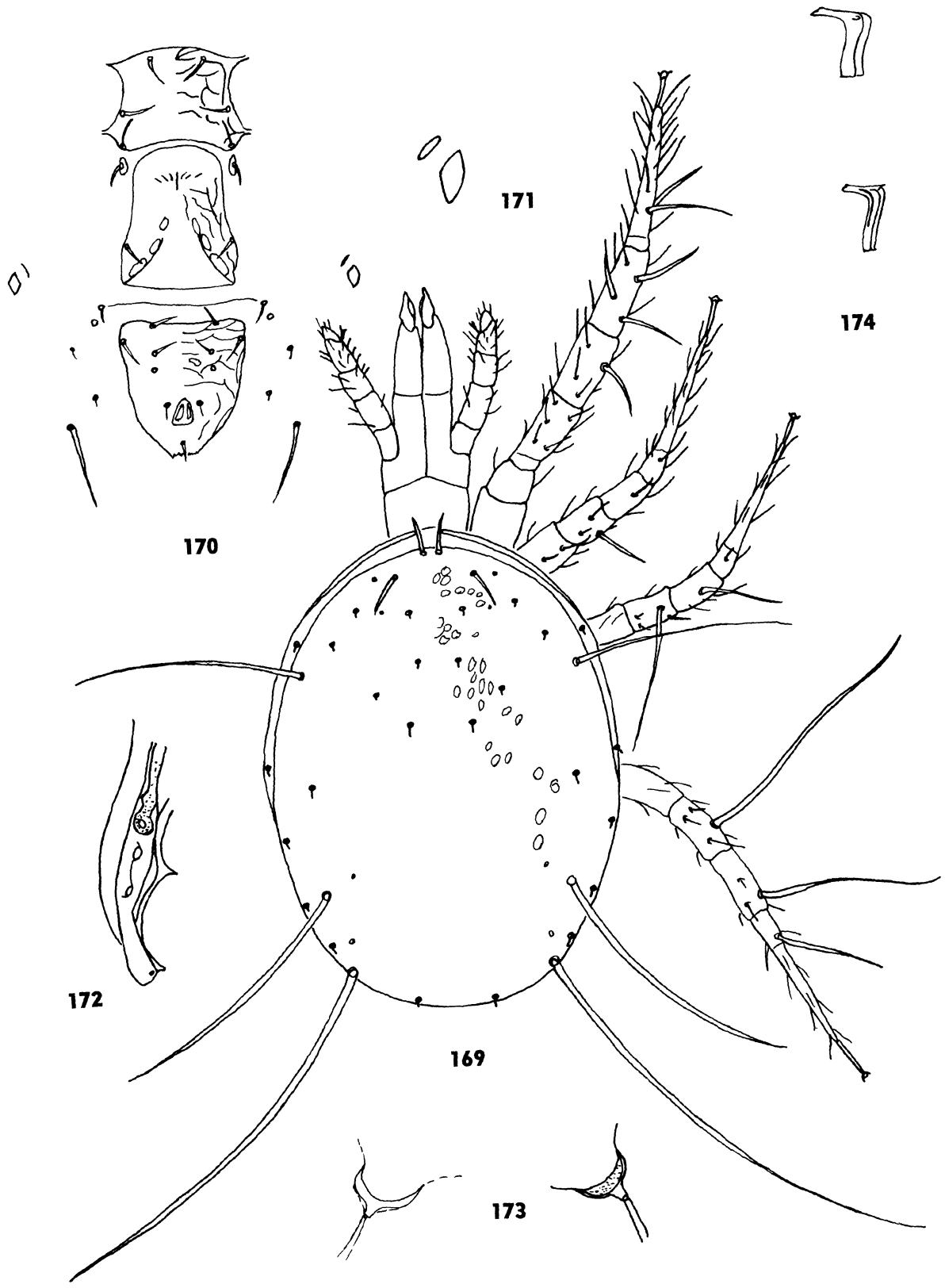
DIAGNOSIS: On this species, L_2 is larger than L_3, the preanal pores are between and closer to the posterior preanal setae than to each other. Spermatheca not observed. Male not known.

Our notes and sketches agree with the description and illustrations given by Chant (1959). Since the type cannot be located presently the species is not illustrated here.



Proprioseiopsis tropicanus
(Garman)

Fig. 169 to 174. *Proprioseiopsis gracilisetae* (Muma). 169. Dorsal and leg structure and setation ♀. 170. Ventral scuta and setation ♀. 171. Metapodal scuta ♀. 172. Posterior peritremal and stigmatal development ♀. 173. Variations of spermathecal structure apparently caused by preservative ♀. 174. Positional variations of spermatodactyl ♂.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TYPE: The female holotype from *Cynodon dactylon,* Homestead, Florida, July 12, 1954, by O. D. Link, is in the USNM, Washington, D. C.

HABITAT: Recorded only from *Cynodon dactylon* in Florida.

COUNTY DISTRIBUTION: Dade.

BIOLOGY: In Florida, this species is known only from the type. The biology is not known.

This species has been collected in July.

GENUS *NOELEDIUS* MUMA AND DENMARK

Noeledius Muma and Denmark, 1968: 232.

DIAGNOSIS: Females are characterized by 3 pairs of dorsal setae, 3 pairs of median setae, 8 pairs of lateral setae of which some are elongate; 2 pairs of sublateral setae of which S_2 are on the dorsal scutum; 3 pairs of sternal setae; 3 pairs of preanal ventrianal setae.

Dorsal scutum well sclerotized and distinctly imbricate. Sternum creased and wider than long. Ventrianal scutum pentagonal and imbricate. Metapodal scuta with minor scutum ectad of major scutum. Peritreme long, extending forward to between vertical setae. Peritremal scutum with ectal strip that extends posteriorly to leg IV exopodal scutum. Chelicerae normal in size but with only 3 denticules on the fixed finger and none on the movable finger. Leg formula 1423. There are no macrosetae on Legs I, II, and III; but Sge IV, Sti IV, and St IV are present.

Males are unknown.

TYPE SPECIES: *Amblyseiulus iphiformis* Muma, 1962, by designation, Muma and Denmark (1968).

DISCUSSION: Although this genus has the general facies of *Proprioseiopsis* Muma, it is readily distinguished by the location of S_1 and S_2, the sizes of the metapodal scuta, the reduced cheliceral dentition, and the distinctive dorsal scutal imbrication.

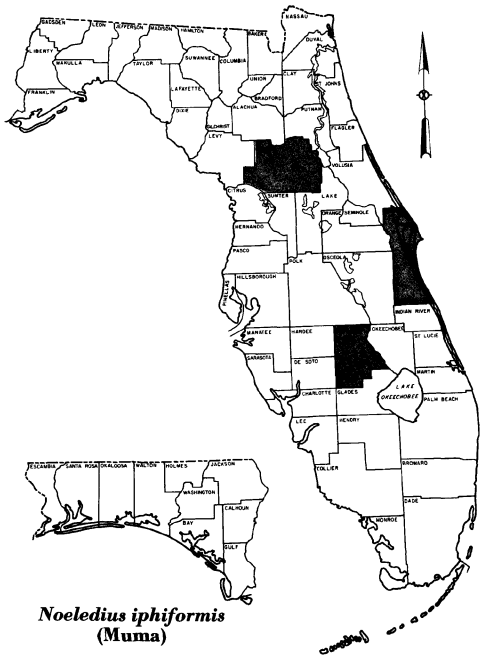
The genus is monotypic. It has been found only in Florida.

Noeledius iphiformis (Muma)

Fig. 187 to 191

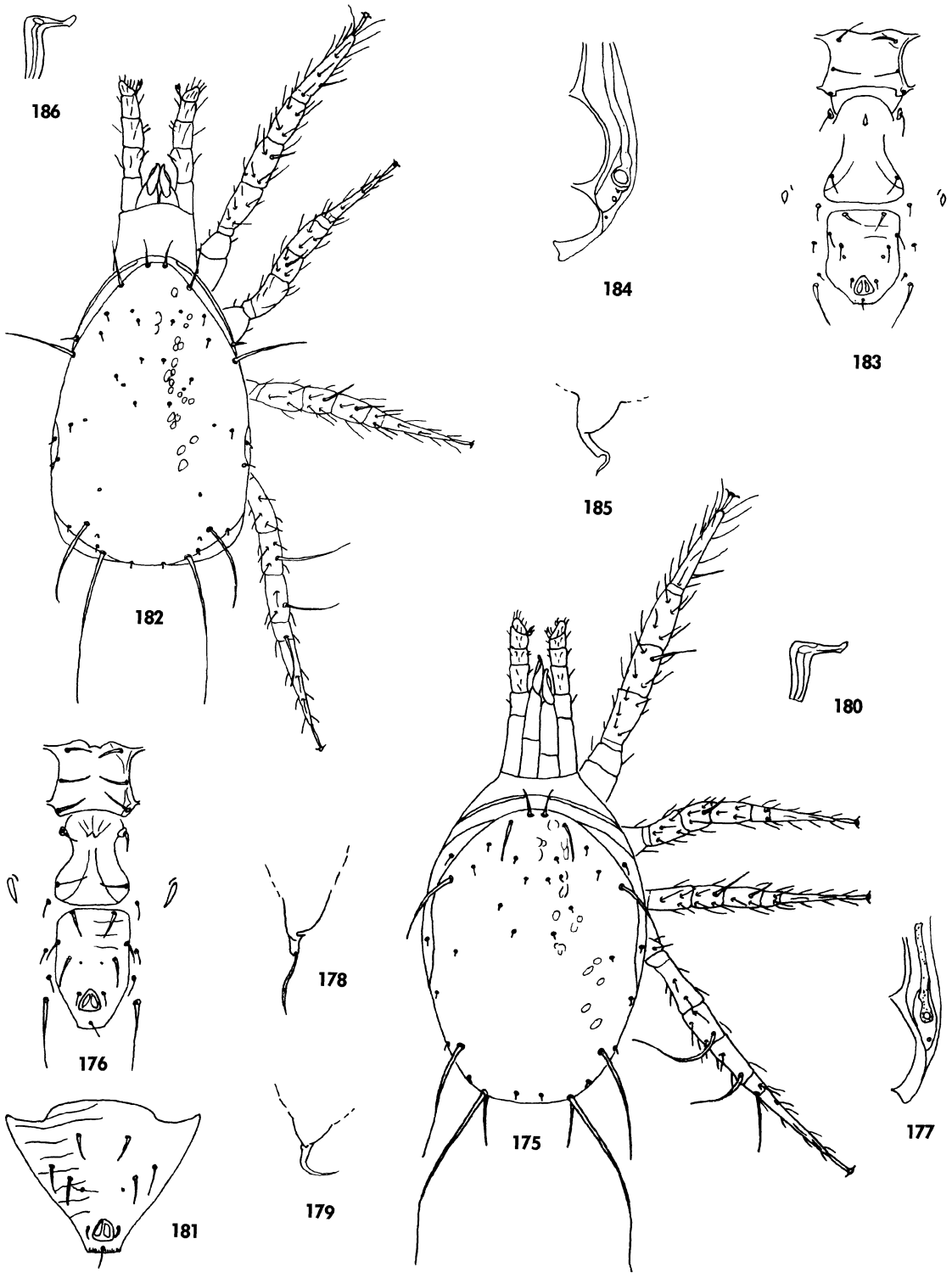
Amblyseiulus iphiformis Muma, 1962: 6.
Noeledius iphiformis (Muma), Muma and Denmark, 1968: 232.

DIAGNOSIS: This heavily-sclerotized species is readily distinguished by the nearly equal-sized metapodal scuta and a



Noeledius iphiformis **(Muma)**

Fig. 175 to 181. *Proprioseiopsis dorsatus* (Muma). 175. Dorsal and leg structure and setation ♀. 176. Ventral scuta and setation ♀. 177. Posterior peritremal and stigmatal development ♀. 178 and 179. Positional variation of spermathecal structure ♀. 180. Spermatodactyl structure ♂. 181. Ventrianal scutum ♂. Fig. 182 to 186. *Proprioseiopsis solens* (De Leon). 182. Dorsal and leg structure setation ♀. 183. Ventral scuta and setation ♀. 184. Posterior peritremal and stigmatal development ♀. 185. Spermathecal structure ♀. 186. Spermatodactyl structure ♂.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distinctive spermatheca. Males are unknown. The body is about 450μ long.

TYPE: The female holotype from citrus litter, Turnbull Hammock, north of Mims, Florida, January 19, 1960, by Judith A. Murrell, is in the USNM, Washington, D.C.

HABITAT: The species has been collected from the leaves, bark, and litter of *Citrus* and from *Quercus* and *Sabal* leaves.

COUNTY DISTRIBUTION: Brevard, Highlands, and Marion.

BIOLOGY: Living specimens have not been observed. The biology is unknown.

This species has been collected in January, February, and August.

GENUS *AMBLYSEIELLA* MUMA

Amblyseiella Muma, 1955a: 266.

DIAGNOSIS: Females are characterized by 4 pairs of dorsal setae, 3 pairs of median setae, 7 pairs of lateral setae, most elongate and some weakly plumose; 2 pairs of sublateral setae on the interscutal membrane; 3 pairs of sternal setae; 1 or 2 pairs of preanal ventrianal setae.

Dorsal scutum lightly sclerotized and smooth except for indistinct thin lunate areas. Sternum smooth and about as wide as long. Ventrianal scutum reduced, ovate, and smooth except for preanal pores. Peritreme long, extending forward to vertical setae. Peritremal, stigmatal, and leg IV exopodal scuta indistinguishably fused. Chelicerae normal; fixed finger with 1 to 3 denticules, movable finger with 0 to 1 denticule. Leg formula 4123. Macrosetae occur on the genu of legs I, II, and III; and Sge IV, Sti IV, and St IV are always present.

Males are smaller than females but otherwise similar. The ventrianal scutum is typically shield-shaped with 3 pairs of preanal setae. The spermatodactyl is of the usual form with a well-developed terminal heel but no visible lateral process.

TYPE SPECIES: *Amblyseiella setosa* Muma, 1955, by designation.

DISCUSSION: Five species are recognized in this genus at the present time. *A. rusticanus* (Athias-Henriot) is quite closely related to the type species and may be a synonym. A. *irregularis* (Evans) and 2 undescribed species from Asia are closely related to each other but are readily distinguished from *A. setosa* by the possession of 2 pairs of ventrianal setae and the different position of L_6.

The genus is world wide in distribution. Only one species, *A. setosa* has been found in Florida and in the Caribbean area.

Amblyseiella setosa Muma

Fig. 192 to 197

Amblyseiella setosa Muma, 1955a: 266.

Phytoseiulus setosa (Muma), Garman, 1958: 71.

Typhlodromus (*Amblyseius*) *setosus* (Muma) Chant, 1959: 70.

Amblyseiella setosa Muma, Muma, 1961: 286.

DIAGNOSIS: This moderately large, weakly-sclerotized, pale-colored species is readily identified by the generic characters and those illustrated. The body is about 450μ long.

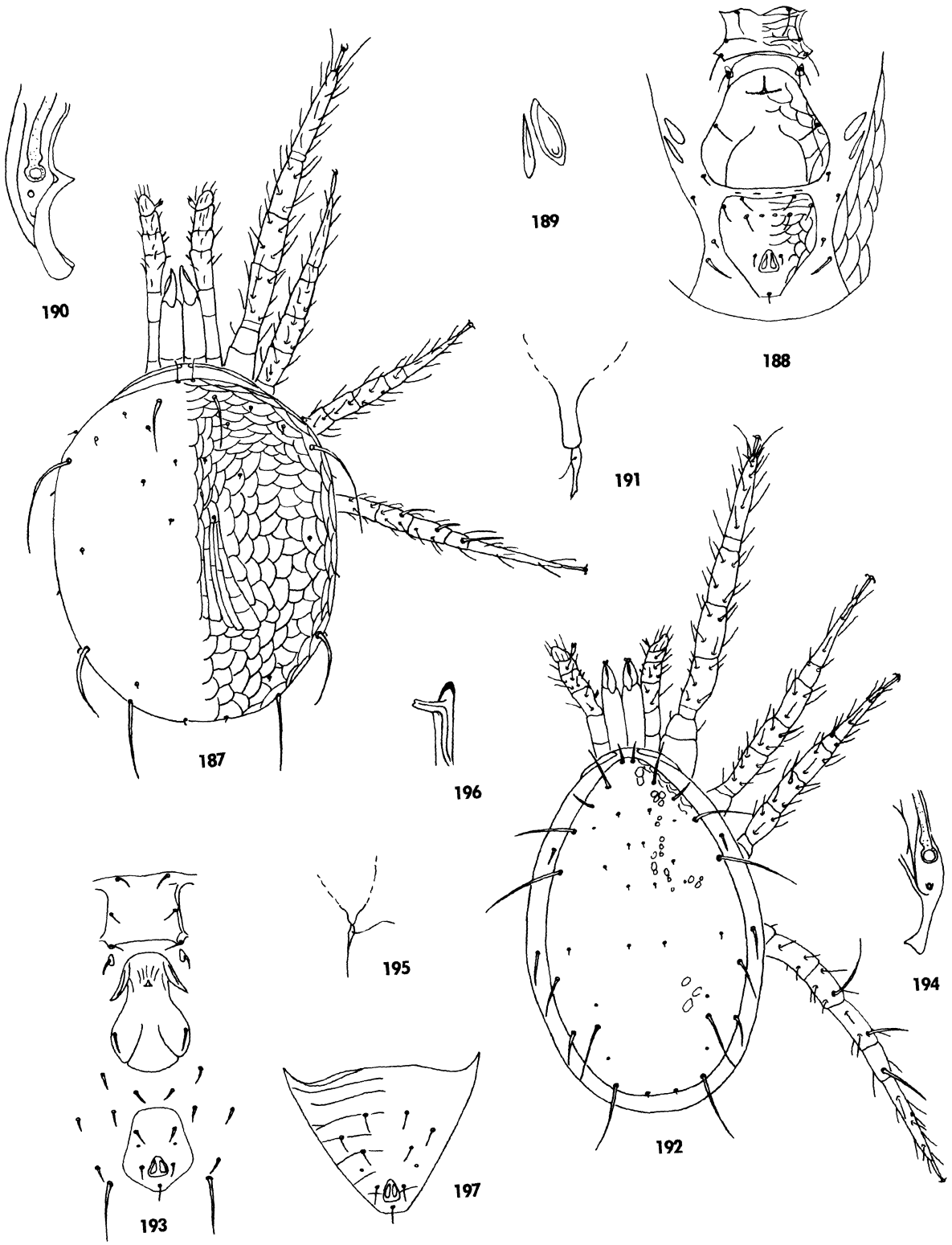
TYPE: The female holotype from scaly orange leaves, Tampa, Florida, May 27, 1952, by M. H. Muma, is in the USNM, Washington, D. C.

HABITAT: Citrus leaves, bark, and litter are the only known habitats.

COUNTY DISTRIBUTION: Brevard,

Fig. 187 to 191. *Noeledius iphiformis* (Muma). 187. Dorsal and leg structure and setae ♀. 188. Ventral scuta and setation ♀. 189. Metapodal scuta ♀. 190. Posterior peritremal and stigmatal development ♀. 191. Spermathecal structure ♀.

Fig. 192 to 197. *Amblyseiella setosa* Muma. 192. Dorsal and leg structure and setation ♀. 193. Ventral scuta and setation ♀. 194. Posterior peritremal and stigmatal development ♀. 195. Spermathecal structure ♀. 196. Spermatodactyl structure ♂. 197. Ventrianal scutum ♂.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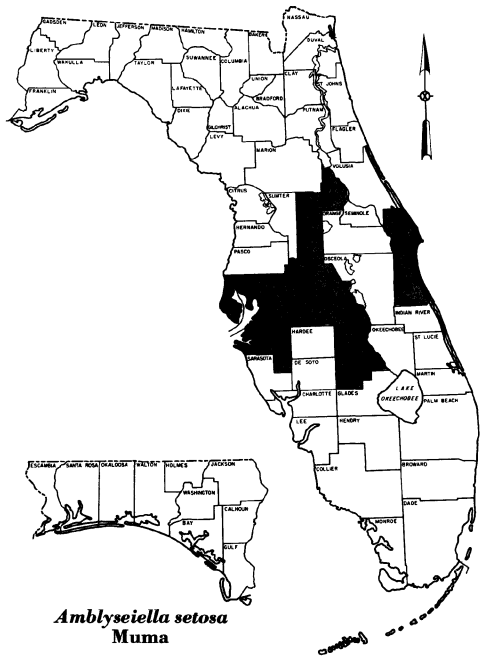
Highlands, Hillsborough, Lake, Manatee, Pinellas, and Polk.

BIOLOGY: It is found frequently in association with six-spotted mites on citrus leaves, but has also been taken in numbers from the litter. In Florida, the species is known as the crowned mite. Some biological and ecological data were published by Muma (1964a), but the life cycle and food habits are not known.



Amblyseiella setosa
Muma

This species has been collected in January, April, May, and June.

GENUS *PLATYSEIELLA* MUMA

Platyseiella Muma, 1961: 280.
Platyseiella Muma, Chant, 1965: 370.

DIAGNOSIS: Females are distinguished by 4 pairs of dorsal setae, 1 pair of median setae, 7 pairs of lateral setae, most of them elongate, flattened and serrate; 1 pair of sublateral setae on dorsal scutum; 2 pairs of sternal setae; and 2 pairs of preanal setae.

Dorsal scutum lightly sclerotized but rugose. Sternal scutum smooth and about as long as wide. Ventrianal scutum smooth, elongate, and vase-shaped. Peritreme long, extending forward to vertical setae. Peritremal scutum and stigmatal scutum indistinguishably fused. Chelicerae normal; fixed finger with 2 tiny denticules; movable finger with 1 tiny denticule. Leg formula 4123 with leg IV distinctly longer. Distinctly elongate macrosetae present only on tibia of leg III and genu, tibia, and basitarsus of leg IV; but clavate bacillate, spatulate, or otherwise modified setae occur on several segments of legs I, III, and IV.

We have seen 1 male; it has a typical spermatodactyl with a terminal foot, distinct subequal heel and lateral process, and a distinct crest.

TYPE SPECIES: *Phytoseius platypilis* Chant, 1959, by designation, Muma (1961).

DISCUSSION: The genus is monotypic. It has been found only in Florida.

Platyseiella platypilis (Chant)

Fig. 198 to 204

Phytoseius platypilis Chant, 1959: 107.
Platyseiella platypilis (Chant), Muma, 1961: 280.

DIAGNOSIS: This species is distinguished by the generic characters, since it is monotypic. Many specimens such as the one figured lack D_4, but are otherwise typical. The body is about 260μ long.

TYPE: The female holotype from lan-

Fig. 198. to 204. *Platyseiella platypilis* (Chant). 198. Dorsal and leg structure and setation ♀. 199. Tip of Sti IV ♀. 200. Ventral scuta and setation ♀. 201. Posterior peritremal and stigmatal development ♀. 202. Spermathecal structure ♀. 203. Cheliceral and spermatodactyl structure ♂. 204. Ventrianal scutum ♂.

Fig. 205 to 209. *Galendromimus alveolaris* (De Leon). 205. Dorsal and leg structure and setation ♀. 206. Ventral scuta and setation ♀. 207. Posterior peritremal and stigmatal development ♀. 208. Cheliceral structure ♀. 209. Spermathecal structure ♀.

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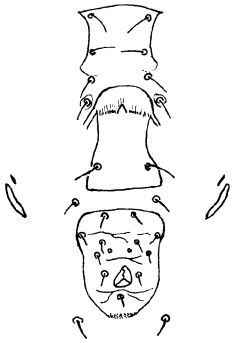

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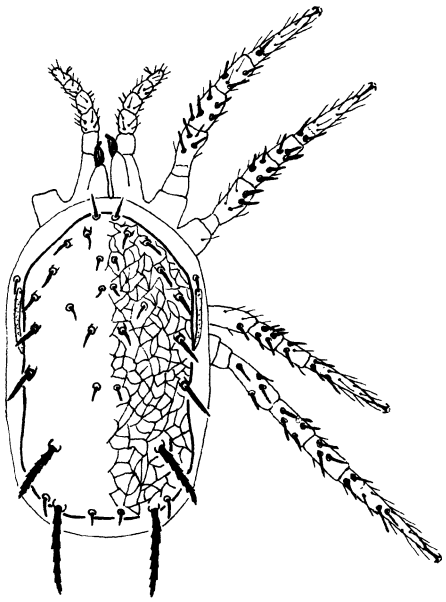

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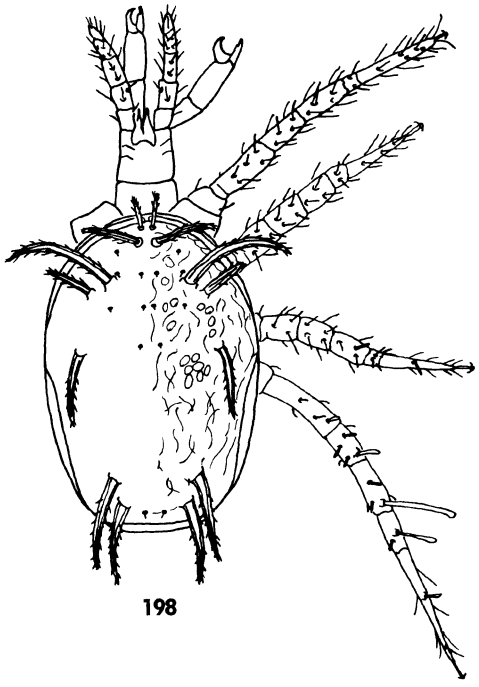

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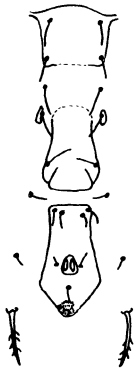

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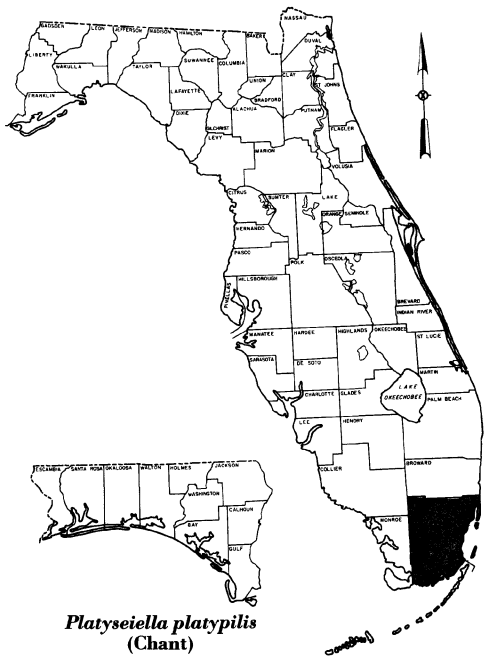


Platyseiella platypilis (Chant)

tana at Coral Gables, Florida, February 17, 1953, by O. D. Link, is in the USNM, Washington, D. C.

HABITAT: Known only from *Lantana* sp. and *Persea* sp.

COUNTY DISTRIBUTION: Dade.

BIOLOGY: Nothing is known about the biology.

This species has been collected in February and June.

GENUS *GALENDROMIMUS* MUMA

Galendromimus Muma, 1961: 141, figs. 1-3.
Chanteius Wainstein, 1962: 19.

DIAGNOSIS: Females are distinguished by 4 pairs of dorsal setae, 1 pair of median setae, 8 pairs of lateral setae most of which are thickened and serrate; 1 pair of sublateral setae on the interscutal membrane; 2 pairs of sternal setae; 4 pairs of ventrianal setae; 1 pair of ventrolateral setae.

Dorsal scutum lightly sclerotized but rugose to alveolate. Sternal scutum smooth and indistinct. Ventrianal scutum smooth and pentagonal. Peritreme long, extending forward to L_1; peritremal and stigmatal scuta fused. Chelicerae small in relation to the body size; fixed finger with 1 denticule; movable finger with 2. Leg formula 4123. All legs with many thickened bacillate or clavate setae. Macrosetae Sge I-IV, Sti II and IV, and St IV are present as thickened setae.

Males are unknown in Florida. De Leon (1967) reported a male from Trinidad.

TYPE SPECIES: *Typhlodromus alveolaris* De Leon, 1957, by designation, Muma (1961).

DISCUSSION: This genus was originally thought to be closely related to *Galendromus* Muma, but *Galendromimus* has only seven or eight pairs of lateral setae (De Leon, 1967), (if *sanctus* De Leon belongs in *Galendromimus*) and all lateral setae except L_7 tend to be spatulate and may be serrate. There are also several modified thickened setae on all legs. Since our interpretation of the Phytoseiinae is 5 or 6 lateral setae well in advance of D_3, we are placing *Galendromimus* in the Amblyseiinae as it has only 4 lateral setae well in advance of D_3. This genus is found in south Florida, Mexico, Jamaica, and Trinidad. Chant and Baker (1965) reported *G. alveolaris* (De Leon) from Costa Rica. However, their illustration differs from Florida specimens and may represent another species.

Galendromimus alveolaris (De Leon)

Fig. 205 to 209

Typhlodromus alveolaris De Leon, 1957: 141.
Galendromimus alveolaris (De Leon), Muma, 1961: 298.
Chanteius alveolaris (De Leon), Wainstein, 1962: 19.
Typhlodromus alveolaris De Leon, Chant and Baker, 1965: 7.
Galendromimus alveolaris (De Leon), De Leon, 1967: 13.

DIAGNOSIS: This species is readily distinguished in Florida by the generic characters. It can be separated from *G. tunapunensis* De Leon from Trinidad by having only M_2 and L_8 serrated.

The body is about 290μ long.

TYPE: The female holotype from *Cassia* sp., Coral Gables, Florida, October 20, 1955,

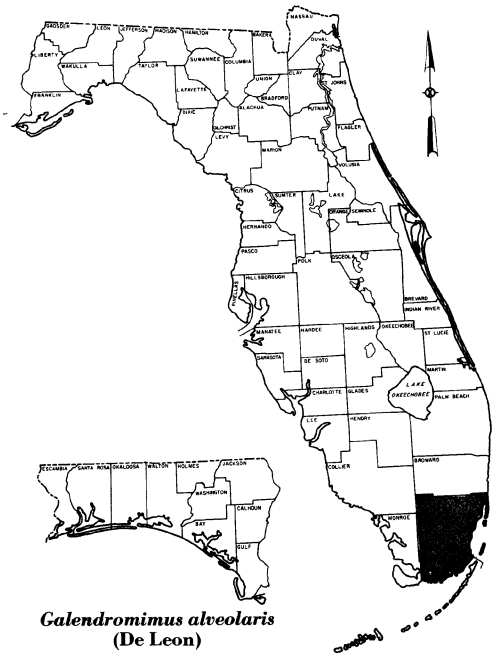
by D. De Leon, is in the MCZ, Harvard University, Cambridge, Mass.

HABITAT: Known only from *Cassia* sp. in Florida.

COUNTY DISTRIBUTION: Dade.

BIOLOGY: Nothing is known about the biology of the species. The type was taken from *Cassia* leaves infested with *Brevipalpus phoenicis* (Geijskes) and a large number of *Tarsonemus* sp. according to De Leon (1957).

This species has been collected in March and October.



Galendromimus alveolaris (De Leon)

GENUS *CHELASEIUS* MUMA AND DENMARK

Chelaseius Muma and Denmark, 1968: 232.

DIAGNOSIS: Females of this genus are characterized by 4 pairs of dorsal setae, 3 pairs of median setae, 8 pairs of lateral setae with some elongate; 2 pairs of sublateral setae on the interscutal membrane; 3 pairs of sternal setae; 3 pairs of preanal ventrianal setae.

The dorsal scutum is lightly to moderately sclerotized and smooth except for indistinct lunate areas. Sternal scutum smooth except for lateral creases and wider than long. Ventrianal scutum pentagonal. Peritreme long, extending forward to between vertical setae. Peritremal and stigmatal scuta indistinguishable. Chelicerae very large in proportion to the body size; fixed finger with 2 to 4 denticules, and a basal *pilus dentilis*; movable finger with no denticules. Leg formula 1423; legs I, II, and III with macroseta on genu, leg I with an erect seta on tarsus, and leg IV with Sge IV, Sti IV, and St IV with Sge IV always longest.

Males are smaller than females, but similar. Spermatodactyl with terminal foot, obscure heel, and distinct lateral process; the tip of the toe is brightly lighted under phase microscopy. Ventrianal scutum with 3 pairs of preanal ventrianal setae and a pair of pores. Both pairs of sublateral setae on the dorsal scutum.

TYPE SPECIES: *Amblyseiopsis floridanus* Muma, 1955, by designation, Muma and Denmark (1968).

DISCUSSION: This genus presently contains 5 species *C. floridanus* (Muma), *C. vicinus* (Muma), *C. austrellus* (Athias-Henriot), *C. schusterellus* (Athias-Henriot), and an undescribed species from forest litter in South Carolina.

This genus is world wide in distribution. It is recorded from only one locality in the Caribbean area, Florida. Only 2 species are known from Florida.

All species have been collected primarily from forest floor litter, so the food habits are unknown.

Chelaseius floridanus (Muma)

Fig. 210 to 216

Amblyseiopsis floridanus Muma, 1955a: 264.

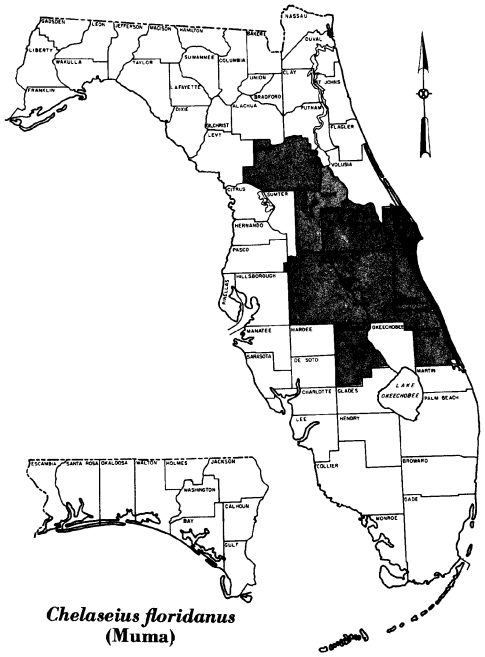
Amblyseius floridanus (Muma), Athias-Henriot, 1958: 33.

Typhlodromus (*Amblyseius*) *floridanus* (Muma), Chant, 1959: 85.

Amblyseius (*Amblyseius*) *floridanus* (Muma), Muma, 1961: 287.

Chelaseius floridanus (Muma), Muma and Denmark, 1968: 233.

DIAGNOSIS: This moderately-sclerotized, pale brown species resembles *C.*



Chelaseius floridanus
(Muma)

vicinus, but is larger, has longer M_3 and L_8, and has a slightly different spermatheca and spermatodactyl. The body is about 370μ long.

TYPE: The female holotype from litter under citrus trees, Lake Weir, Florida, January 15, 1953, by M. H. Muma, is in the USNM, Washington, D.C.

HABITAT: It has been taken from *Citrus* leaves and bark, *Pinus clausa* litter, under *Quercus virginiana*, *Quercus* leaf mold, and oak-pine-bay litter.

COUNTY DISTRIBUTION: Brevard, Highlands, Indian River, Lake, Marion, Orange, Osceola, Polk, St. Lucie, and Seminole.

BIOLOGY: We have not seen this mite in the living condition. The food habits are not known.

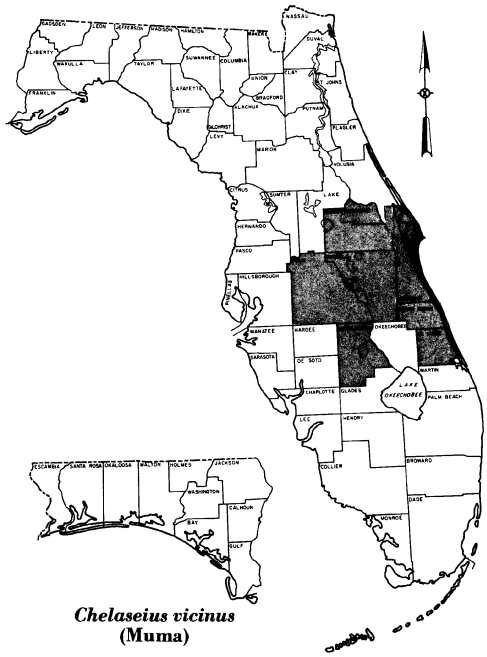
This species has been collected in every month except March, July, and August.

Chelaseius vicinus (Muma)

Fig. 217 to 222

Typhlodromips vicinus Muma, 1965a: 250.
Chelaseius vicinus (Muma), Muma and Denmark, 1968: 233.

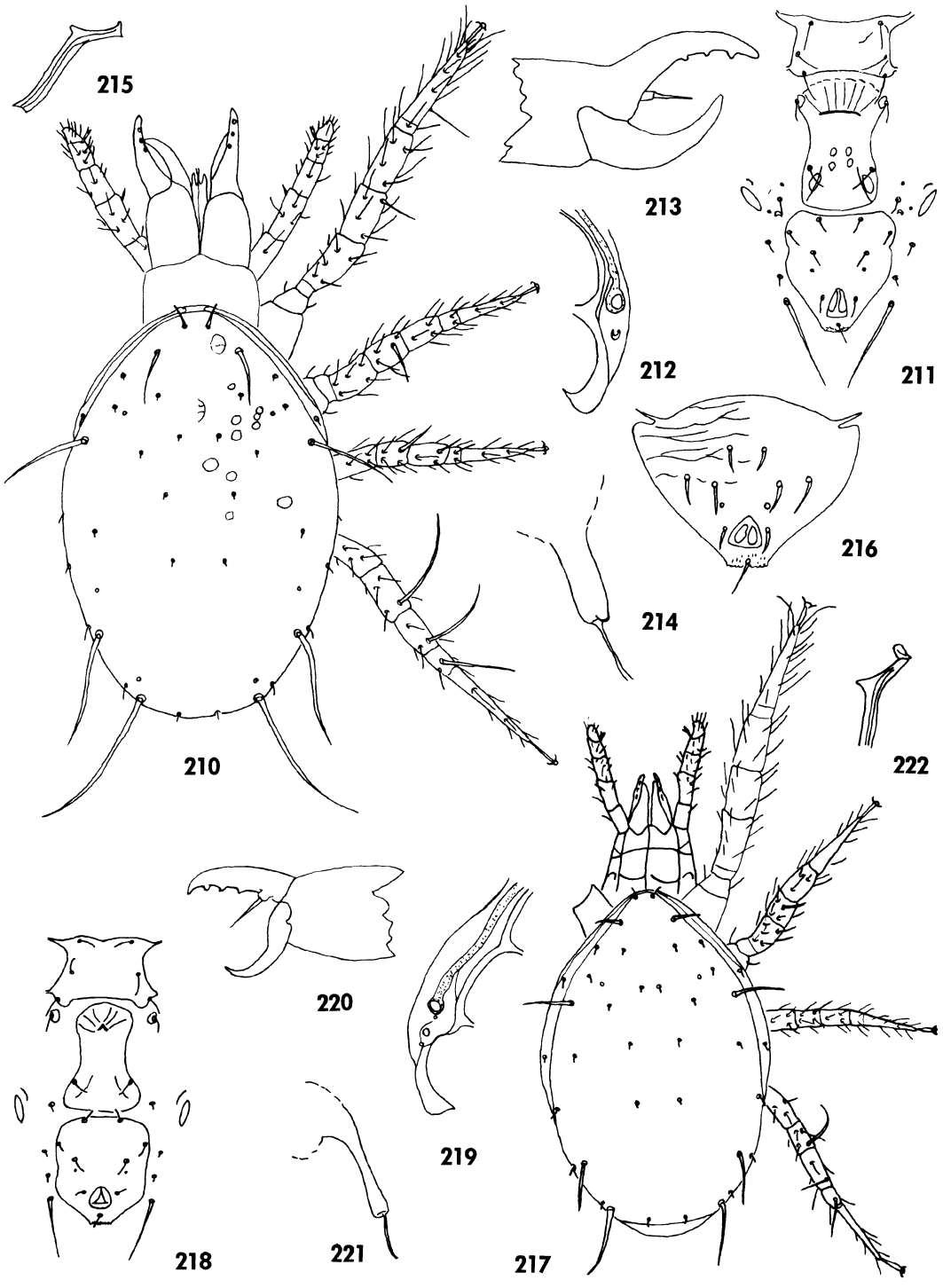
DIAGNOSIS: This lightly-sclerotized, pale-colored species is readily distinguished from its counterpart, *C. floridanus* (Muma) by the much shorter L_1, L_4, L_8, and



Chelaseius vicinus
(Muma)

Fig. 210 to 216. *Chelaseius floridanus* (Muma). 210. Dorsal and leg structure and setation ♀. 211. Ventral scuta and setation ♀. 212. Posterior peritremal and stigmatal development ♀. 213. Cheliceral structure ♀. 214. Spermathecal structure ♀. 215. Spermatodactyl structure ♂. 216. Ventrianal scutum ♂.

Fig. 217 to 222. *Chelaseius vicinus* (Muma). 217. Dorsal and leg structure and setation ♀. 218. Ventral scuta and setation ♀. 219. Posterior peritremal and stigmatal development ♀. 220. Cheliceral structure ♀. 221. Spermathecal structure ♀. 222. Spermatodactyl structure ♂.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M_3, the longer more slender spermatheca, more greatly expanded toe of the spermatodactyl and slightly smaller chelicerae. The body is about 350μ long.

TYPE: The female holotype from *Pinus clausa* litter, Oviedo, Florida, January 11, 1962, by M. H. Muma, is the USNM, Washington, D. C.

HABITAT: In Florida, it has been taken only from *Pinus clausa* litter where it is common.

COUNTY DISTRIBUTION: Brevard, Highlands, Indian River, Orange, Osceola, Polk, St. Lucie, and Seminole.

BIOLOGY: Its food habits and life history are unknown.

This species has been collected in every month except June and October.

GENUS *AMBLYSEIUS* BERLESE

Amblyseius Berlese, 1914: 143.
Amblyseius (*Amblyseius*) Berlese, Muma, 1961: 287.
Amblyseius (*Amblyseiulus*) Muma, 1961: 287.
Amblyseius Berlese, De Leon, 1966: 88.

DIAGNOSIS: Females of this genus as restricted by Muma (1961), De Leon (1966), and here are distinguished by 4 pairs of dorsal setae, 3 pairs of median setae of which M_3 is elongate, whip-like and indistinctly plumose, 8 pairs of lateral setae, some elongate, whip-like and weakly plumose; 2 pairs of sublateral setae on the interscutal membrane; 3 pairs of sternal setae; 3 pairs of preanal ventrianal setae.

Dorsal scutum lightly to well sclerotized and smooth except for indistinct, thin lunate areas. Sternal scutum smooth except for lateral creases and as wide or wider than long. Ventrianal scutum pentagonal to vase-shaped and smooth or lightly creased. Peritreme long, extending forward to between the vertical setae. Peritremal scutum without distinguishable ectal strip extending to leg IV exopodal scutum. Chelicerae normal in relation to the body size; fixed finger bearing 8 or more denticules of which several lie proximal to *pilus dentilis*; movable finger with 1 to 4 denticules. Leg formula 1423; leg III with macrosetae Sge III and Sti III, leg II with macroseta Sge II, leg I with macroseta Sge I, and an erect seta on tarsus I, and leg IV with macrosetae Sge IV, Sti IV, and St IV of which Sge IV is the longest.

Males are smaller than females; but otherwise similar. Spermatodactyl of typical form with a terminal heel and an obscure to distinct lateral process. Ventrianal scutum with 3 pairs of preanal setae and a pair of preanal pores. Both pairs of sublateral setae on dorsal scutum.

TYPE SPECIES: *Zercon obtusus* Koch, 1839, by indication, Berlese (1914).

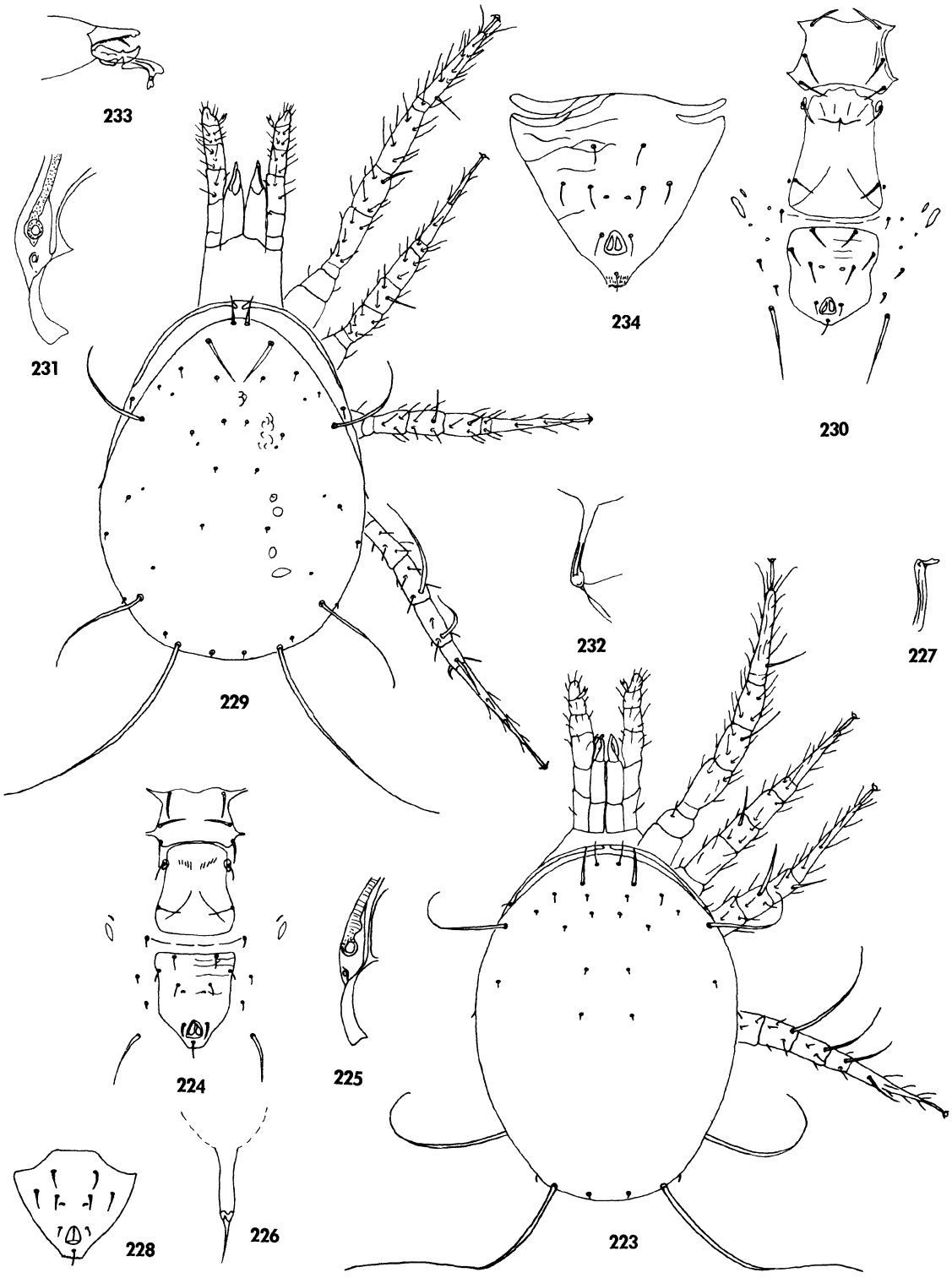
DISCUSSION: More than 60 known species can be assigned to this genus. Most are lightly-colored, weakly-sclerotized species that are found on the foliage of various plants. A few are red or brown, heavily-sclerotized species that are found in ground surface leaf litter.

This genus is world wide in distribution. It is common throughout the Caribbean area. Six species of the genus are known from Florida.

Biological studies on species of *Amblyseius* indicate that they are predators on other mites, but the information is too fragmentary to permit generic generalizations.

Fig. 223 to 228. *Amblyseius curiosus* (Chant and Baker). 223. Dorsal and leg structure and setation ♀. 224. Ventral scuta and setation ♀. 225. Posterior peritremal and stigmatal development ♀. 226. Spermathecal structure ♀. 227. Spermatodactyl structure ♂. 228. Ventrianal scutum ♂.

Fig. 229 to 234. *Amblyseius aerialis* (Muma). 229. Dorsal and leg structure and setation ♀. 230. Ventral scuta and setation ♀. 231. Posterior peritremal and stigmatal development ♀. 232. Spermathecal structure ♀. 233. Spermatodactyl structure ♂. 234. Ventrianal scutum ♂.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Key to *Amblyseius* Berlese in Florida

(Females)

1a Sternum as long as wide; ventrianal scutum vase-shaped, or elongated with concave lateral margins 2

1b Sternum wider than long; ventrianal scutum shield-shaped, or nearly pentagonal 3

2a(1a) Cervix of spermathecum wider internally than at atrium .... *deleoni*, new name (p.68)

2b Cervix of spermathecum parallel-sided .... *largoensis* (Muma) (p. 69)

3a(1b) L_2 distinctly longer than L_3; preanal pores elliptical 4

3b L_2 subequal with L_3; preanal pores punctate 5

4a(3a) Preanal pores much closer together than posterior preanal setae; atrium of spermatheca swollen .... *aerialis* (Muma) (p. 66)

4b Preanal pores almost as widely separated as posterior preanal seta; atrium of spermatheca not swollen .. *curiosus* (Chant and Baker) (p. 64)

5a(3b) Preanal pores much closer together than posterior preanal setae; spermathecal cervix saccular .... *multidentatus* (Chant) (p. 66)

5b Preanal pores almost as widely separated as posterior preanal setae; spermathecal cervix rod-like .... *rhabdus* Denmark (p. 68)

Amblyseius curiosus (Chant and Baker)

Fig. 223 to 228

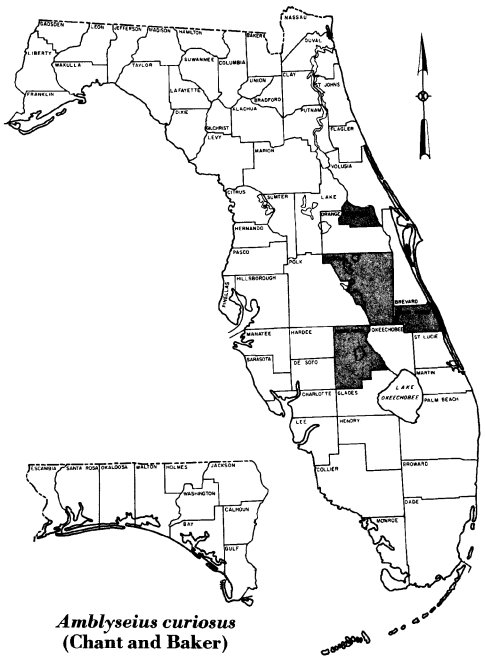
Iphiseius curiosus Chant and Baker, 1965: 11.

Amblyseius arenus Muma, 1965: 250 (new synonymy).

DIAGNOSIS: This moderately-sclerotized, brown species is distinguished from the apparently closely-related *A. aerialis* Muma by the spermathecal form, and placement of the preanal pores. The body is about 380μ long.

TYPE: The female holotype and paratype on shrub leaves, Turrialba, Costa Rica, April 3, 1959, by E. W. Baker, are in the USNM, Washington, D. C.

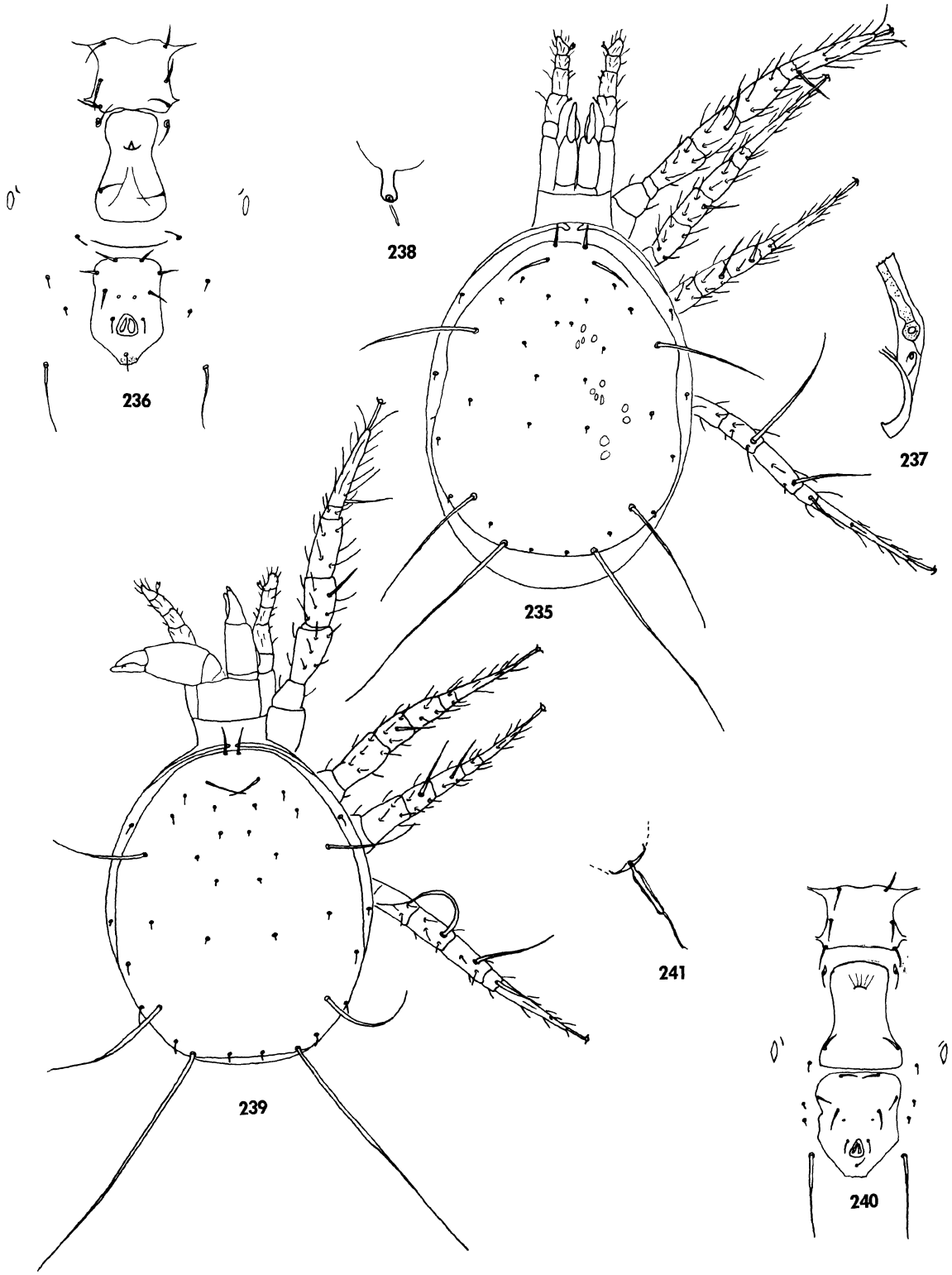
HABITAT: This species is known from a pair taken in *Pinus clausa* litter, a fe-



Amblyseius curiosus
(Chant and Baker)

Fig. 235 to 238. *Amblyseius multidentatus* (Chant). 235. Dorsal and leg structure and setation ♀. 236. Ventral scuta and setation ♀. 237. Posterior peritremal and stigmatal development ♀. 238. Spermathecal structure ♀.

Fig. 239 to 241. *Amblyseius rhabdus* Denmark. 239. Dorsal and leg structure and setation ♀. 240. Ventral scuta and setation ♀. 241. Spermathecal structure ♀.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male from fern litter, and series taken from oak-bay-sweet gum litter, oak-hickory-ironwood litter, and oak-pine-bay litter.

COUNTY DISTRIBUTION: Highlands, Indian River, Osceola, and Seminole.

BIOLOGY: Nothing is known about the biology of this mite.

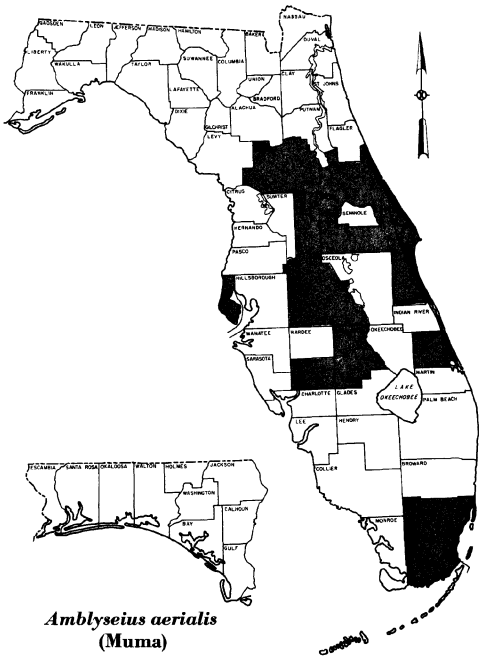
This species has been collected in April.

Amblyseius aerialis (Muma)

Fig. 229 to 234

Amblyseiopsis aerialis Muma, 1955a: 264.

Amblyseius aerialis (Muma), Athias-Henriot, 1957: 338.



Amblyseius aerialis (Muma)

Typhlodromus (*Amblyseius*) *aerialis* (Muma), Chant, 1959: 88.

Amblyseius (*Amblyseius*) *aerialis* (Muma), Muma, 1961: 287.

DIAGNOSIS: Distinguishing characters of this species include elliptical preanal pores located between and behind the posterior preanal setae, spermathecal cervix tubular and much smaller than swollen atrium, and spermatodactyl with small lateral process, lobate heel and short club-shaped foot. The body is about 400μ long.

TYPE: The female holotype from citrus leaf, Lucerne Park, Florida, May 22, 1952, by M. H. Muma and W. L. Thompson, is in the USNM, Washington, D.C.

HABITAT: This species has been collected from *Citrus* bark, leaves, fruit, twigs and litter, and *Tillandsia usneoides*.

COUNTY DISTRIBUTION: Brevard, Dade, De Soto, Highlands, Lake, Marion, Orange, Pinellas, Polk, St. Lucie and Volusia.

BIOLOGY: This is a pale lightly-sclerotized species that is fairly common on *Citrus* leaves, Muma (1964a). It is frequently associated with and feeds on infestations of *Brevipalpus* sp. In Florida, it is known as the long-haired mite.

This species has been collected in January, February, March, April, May, June, August, November, and December.

Amblyseius multidentatus (Chant), new combination

Fig. 235 to 238

Typhlodromus multidentatus Chant, 1959: 84.

DIAGNOSIS: The short saccular spermatheca and the round mesally located

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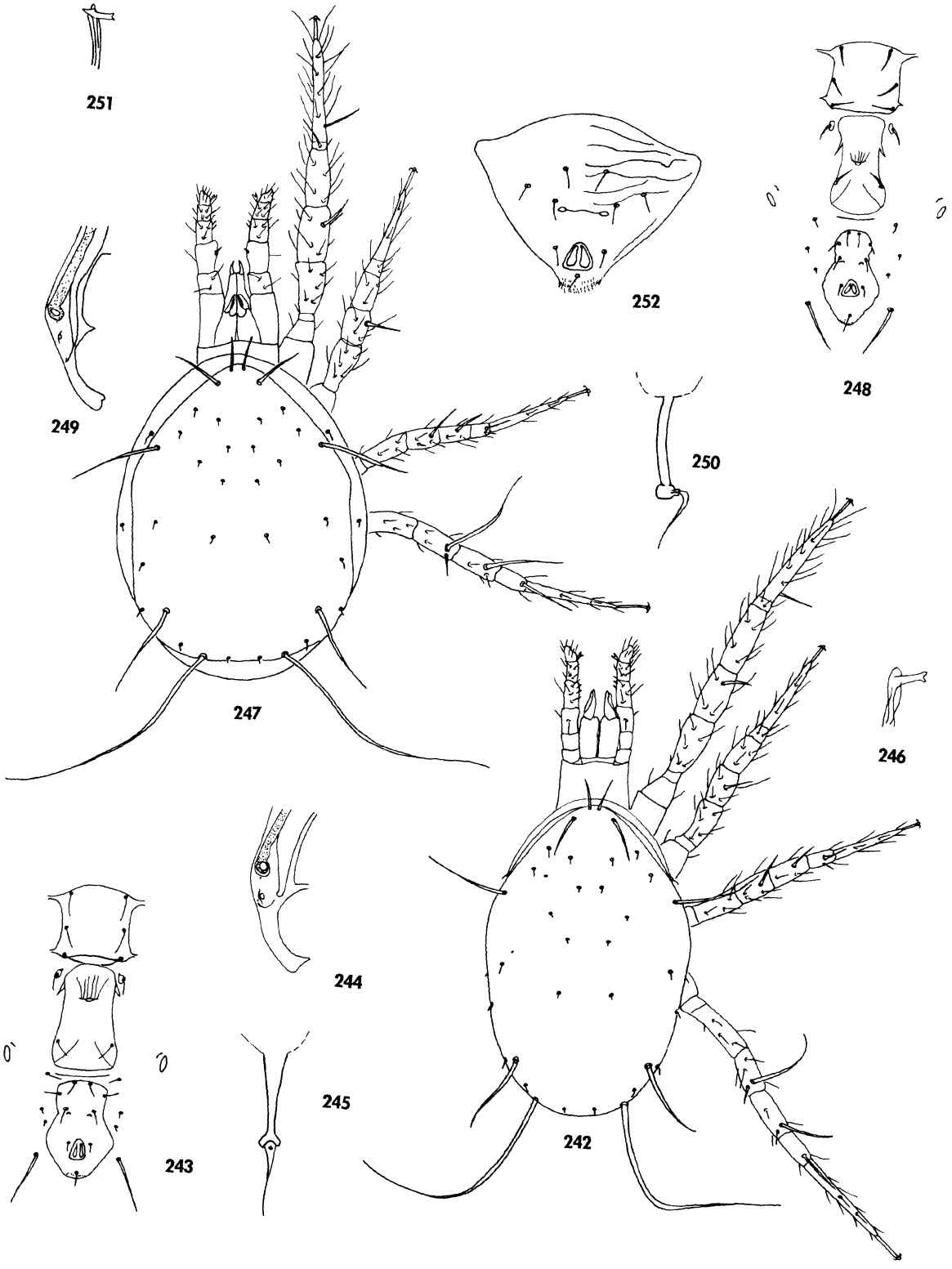
Fig. 242 to 246. *Amblyseius deleoni* Muma and Denmark. 242. Dorsal and leg structure and setation ♀. 243. Ventral scuta and setation ♀. 244. Posterior peritremal and stigmatal development ♀. 245. Spermathecal structure ♀. 246. Spermatodactyl structure ♂.

Fig. 247 to 252. *Amblyseius largoensis* (Muma). 247. Dorsal and leg structure and setation ♀. 248. Ventral scuta and setation ♀. 249. Posterior peritremal and stigmatal development ♀. 250. Spermathecal structure ♀. 251. Spermatodactyl structure ♂. 252. Ventrianal scutum ♂.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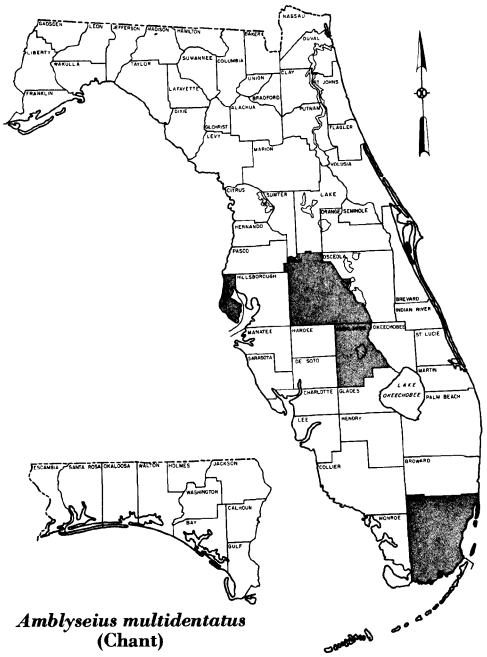


Amblyseius multidentatus
(Chant)

preanal, ventrianal pores distinguish this species. The body is about 340μ long.

TYPE: The female holotype and paratype from sabal palm, St. Petersburg, Florida, July 11, 1952, by E. W. Baker, are in the USNM, Washington, D. C. The 3 males on the type slide are indistinguishable from *A. aerialis* (Muma), and there is also a female of *T. dentilis* (De Leon).

HABITAT: This species has been recorded from *Cupressus* sp., *Sabal palmetto, Senecio confusus, Tillandsia usneoides,* and palm sheath debris.

COUNTY DISTRIBUTION: Dade, Highlands, Pinellas, and Polk.

BIOLOGY: Nothing is known of the food habits or life cycle.

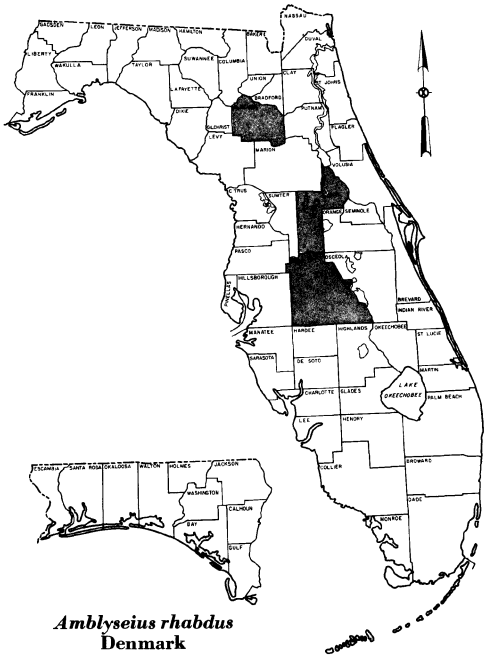
This species has been collected in March, April, July, and September.

Amblyseius rhabdus Denmark

Fig. 239 to 241

Amblyseius rhabdus Denmark, 1965: 95.

DIAGNOSIS: This species is readily identified by the distinctive spermatheca. It is similar to *A. aerialis* Muma, but dorsal setation and ventrianal pores different. Chelicerae slightly larger than usual with 7 to 8 denticules on the fixed finger and none on the movable finger. The body is about 370μ long.



Amblyseius rhabdus
Denmark

TYPE: The female holotype in sod of St. Augustine grass, *Stenotaphrum secundatum,* Gainesville, Florida, October 1, 1964, by H. A. Denmark, USNM Type No. 3113, is in the USNM, Washington, D.C.

HABITAT: *Stenotaphrum secundatum, Sarracenia* sp., *Tillandsia usneoides* on ground, and in can trap at lake shore and residential areas.

COUNTY DISTRIBUTION: Alachua, Lake, and Polk.

BIOLOGY: Nothing is known about the food habits or life cycle.

Amblyseius deleoni Muma and Denmark, new name

Fig. 242 to 246

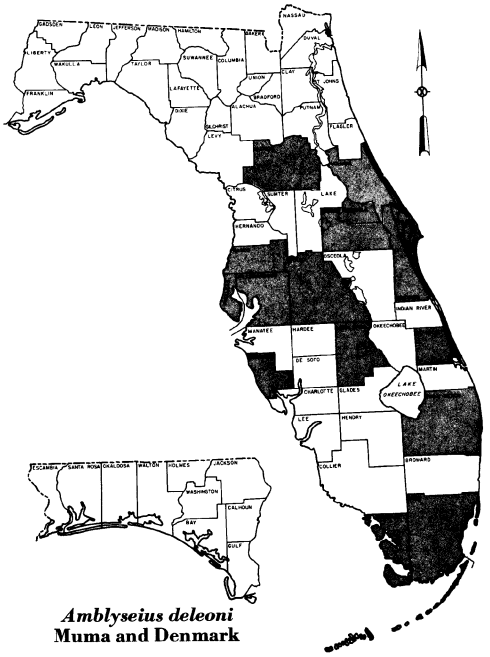
Amblyseius (*Amblyseialus*) *largoensis* Muma, Muma, 1961: 287 (not *largoensis* Muma, 1955).

Amblyseius largoensis Muma, Schuster and Pritchard, 1963: 237.

Amblyseius (*Amblyseialus*) *largoensis* Muma, Muma, 1964: 22.

DIAGNOSIS: This species has been mixed and confused with *A. largoensis* since Muma 1961. De Leon (1966) first noted the error. A type has been selected for the species which is here dedicated to the late Dr. Donald De Leon by the two senior authors.

Distinguishing characters of the species include an elongate and vase-shaped ventrianal scutum, an elongate fundibuliform



Amblyseius deleoni
Muma and Denmark

spermathecal cervix with a greatly swollen atrium and an L-shaped spermatodactyl with a weakly-bifurcate toe on the foot. The body is about 420μ long.

TYPE: The female holotype from citrus leaves, at Ft. Pierce, Florida, March 20, 1959, by Helen Louise Greene, is in the USNM, Washington, D.C.

HABITAT: This species, which has been collected under a wide variety of conditions, has been taken from *Amaranthus tricolor*, fruit, leaves, bark, and litter of *Citrus* sp., *Podocarpus, Quercus* hammock litter, *Rubus* sp., *Sabal palmetto* litter, *Tillandsia usneoides*, and several ornamental shrubs.

COUNTY DISTRIBUTION: Brevard, Dade, Highlands, Hillsborough, Marion, Monroe, Orange, Palm Beach, Pasco, Pinellas, Polk, St. Lucie, Sarasota, Seminole, and Volusia.

BIOLOGY: This is a weakly-sclerotized species that is pale colored in life. Specimens feeding on dark hosts have typical gut markings. The species is relatively common in spider mite and *Brevipalpus* spp. infestations. Living specimens are indistinguishable from *A. aerialis* and are also referred to as long-haired mites.

This species has been collected in every month, except January, August, and November.

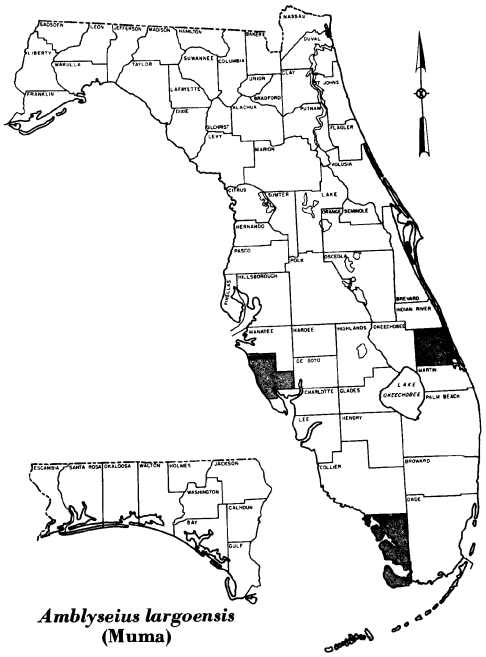
Amblyseius largoensis (Muma)

Fig. 247 to 252

Amblyseiopsis largoensis Muma, 1955a: 266.

Amblyseius largoensis (Muma, Ehara, 1959: 293.

Typhlodromus (*Amblyseius*) *largoensis* (Muma), Chant, 1959: 96.



Amblyseius largoensis
(Muma)

Amblyseius neolargoensis van der Merwe, 1965: 59 (new synonymy).
Amblyseius largoensis (Muma), De Leon, 1966: 90.

DIAGNOSIS: This species resembles *A. deleoni* from which it is distinguished by the parallel-sided spermathecal cervix and slight differences in the spermatodactyl. The body is about 400μ long.

TYPE: The female holotype from key lime leaves, Key Largo, Florida, December 1952, by M. H. Muma, is in the USNM, Washington, D. C.

HABITAT: In Florida, this species has been collected only from *Citrus* sp. and *Caryota* sp.

COUNTY DISTRIBUTION: Monroe, St. Lucie, and Sarasota.

BIOLOGY: Nothing is known about the food habits or life cycle. Our Sarasota specimens were collected from leaves infested with six-spotted mites.

This species has been collected in February, March, April, May, July, August, and December.

GENUS *IPHISEIODES* DE LEON

Iphiseiodes De Leon, 1966: 84, fig. 104-105.
Iphiseiodes De Leon, De Leon, 1967: 18.

DIAGNOSIS: Females of this genus are distinguished by 4 pairs of dorsal setae, 3 pairs of median setae, 8 pairs of lateral setae with L_4 and/or L_8 much longer than others; 2 pairs of sublateral setae on the interscutal membrane; 3 pairs of sternal setae; 3 pairs of preanal ventrianal setae.

All scuta are heavily sclerotized and distinct. The sternum is much wider than long and concave posteriorly. The preanal ventrianal setae are much closer to the anterior margin of the ventrianal scutum than to the anus. Peritreme variable but extending forward to L_1. The peritremal scutum extends posteriorly to leg IV exopodal scutum. The chelicerae are small; fixed finger with 9 to 10 denticules, movable with 2 to 3. Macrosetae are usually present on the genu of all legs and Sge IV, Sti IV, and St IV are present. Leg formula 4132.

Male spermatodactyls have the foot terminal, heel obscure, and lateral process distinct.

TYPE SPECIES: *Sejus quadripilis* Banks, 1905, by designation, De Leon (1966).

DISCUSSION: Three species are presently recognized in this genus: *I. quadripilis* (Banks), *I. nobilis* (Chant and Baker), and *I. kamahorae* De Leon. They are closely related and obviously congeneric, but are readily distinguished by striking differences in dorsal setal lengths.

De Leon (1966) obviously intended that De Leon (1967) be published first since the 1966 paper only gives an indication of the genus and refers to the 1967 paper which contains a complete description. Owing to Dr. De Leon's untimely death the 1966 paper predates the 1967 paper which is even differently titled from that indicated by De Leon (1966). Since the 1966 paper contains a generic indication this publication is cited in accordance with the International Code of Zoological Nomenclature.

This genus has been recorded from several localities in the Caribbean area, Costa Rica, Florida, Honduras, Mexico, Puerto Rico and Trinidad. One species of the genus has been found in Florida.

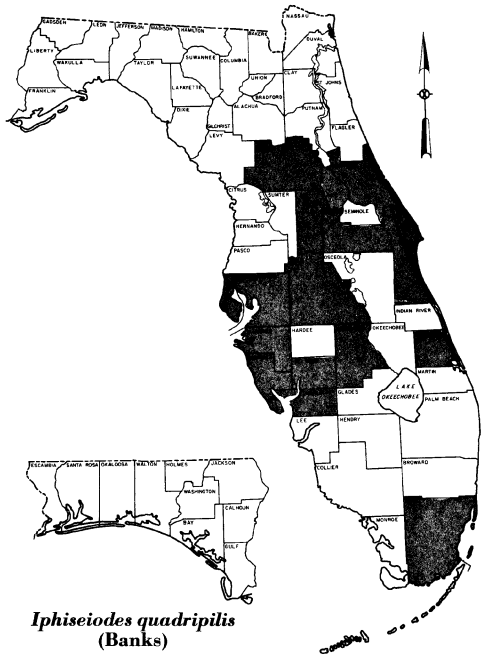
Iphiseiodes quadripilis (Banks)

Fig. 253 to 259

Seius quadripilis Banks, 1905: 138.
Amblyseius quadripilis (Banks), Cunliffe and Baker, 1953: 26.
Iphiseius quadripilis (Banks), Chant, 1959: 110.
Amblyseius (*Iphiseius*) *quadripilis* (Banks), Muma, 1961: 288.
Iphiseiodes quadripilis (Banks), De Leon, 1966: 84.

DIAGNOSIS: This, the typical species, is easily distinguished by the minute M_3, and the broadly-knobbed macrosetae on leg IV. The body is about 450μ long.

As discussed in Muma (1964), this species differs somewhat from the mite originally described by Banks (1905).



Iphiseiodes quadripilis (Banks)

TYPE: The female holotype from *Citrus sinensis* leaves, Eustis, Florida, is in the USNM, Washington, D. C.

HABITAT: It is common on *Citrus* leaves and fruit and occurs on the bark and in the litter. Other recorded host plants are *Hibiscus* sp., *Myrica cerifera, Persea americana, Quercus falcata, Quercus laurifolia, Quercus* sp., and *Serenoa repens.*

COUNTY DISTRIBUTION: Brevard, Charlotte, Dade, De Soto, Highlands, Hillsborough, Lake, Manatee, Marion, Orange, Pinellas, Polk, St. Luice, Sarasota, and Volusia.

BIOLOGY: This is a hemispherical, heavily-sclerotized species that is deep red-brown in color, both living and preserved.

Biological studies have not as yet revealed the primary food of this species. It is known, however, to be nocturnal (Muma, 1955). Additional biological notes were published by Muma (1964a).

This species has been collected throughout the year.

GENUS *FUNDISEIUS* MUMA AND DENMARK, new name

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

DIAGNOSIS: Females of this genus are distinguished by 4 pairs of dorsal setae, 3 pairs of median setae, 8 pairs of lateral setae with some much longer than others; 2 pairs of sublateral setae on the interscutal membrane; 3 pairs of sternal setae; 3 pairs of preanal ventrianal setae.

All scuta are well sclerotized and distinct. The sternal scutum is wider than long and creased. Ventrianal scutum imbricate. Peritreme extending forward to or between vertical setae. Peritremal scutum with ectal strip that extends along and around leg IV exopodal scutum. Chelicerae normal in proportion to the body size; fixed finger with 2 to 4 denticules, movable finger with none. Macrosetae are absent from legs I, II, and III but Sge IV, Sti IV, and St IV are present with St IV longest. Leg formula 1423 or 1432.

Males are smaller than females, but otherwise similar. The spermatodactyl may have either the heel or foot terminal but the lateral process is always distinct. Ventrianal scutum very large, shield-shaped, and with 3 pairs of preanal, ventrianal setae.

TYPE SPECIES: *Typhlodromips cesi* Muma, 1965, by designation, Muma and Denmark (1968).

DISCUSSION: This genus may be distinguished from the closely-related *Iphiseiodes* De Leon by the reduced dentition, the large ventrianal scuta, the extended ectal strip of the peritremal scutum, and the lack of macrosetae on legs I, II, and III.

In addition to the 4 species known from Florida, *Amblyseius gonzalezi* Athias-Henriot belongs here. To date this genus is known only from the southeastern United States and South America.

Key to *Fundiseius* Muma and Denmark in Florida

(Females)

1a L_2 distinctly longer than L_3; ventri-anal scutum only as wide as genital scutum 2

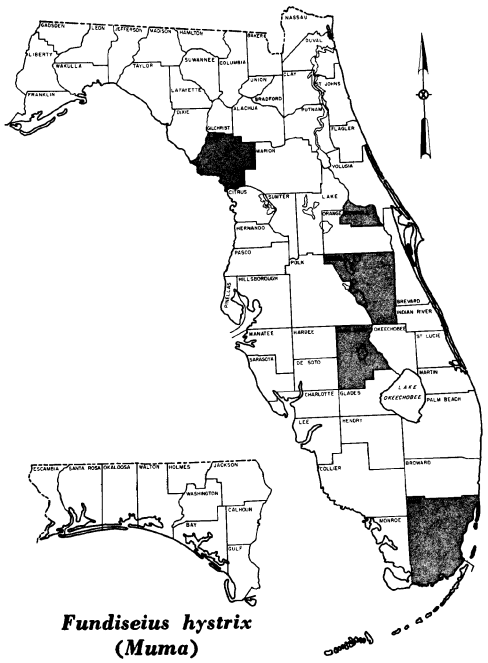
1b L_2 and L_3 subequal in length; ventri-anal scutum much wider than genital scutum 3

2a(1a) Small species, 325μ long; dorsal scutum faintly creased at margins but otherwise smooth .... *arenicola* (Muma) (p. 74)

2b Large species, 405μ long; dorsal scutum distinctly imbricate marginally and posteriorly ..... *imbricata* Muma and Denmark (p. 76)

3a(1b) Round species; dorsal scutum creased laterally but smooth centrally ..... *hystrix* (Muma) (p. 72)

3b Elongate species; dorsal scutum distinctly imbricate and punctate centrally ..... *cesi* (Muma) (p. 74)



***Fundiseius hystrix* (*Muma*)**

Fundiseius hystrix (Muma)

Fig. 260 to 264

Amblyseius (*Amblyseius*) *hystrix* Muma, 1962: 6.

Iphiseiodes hystrix (Muma), Muma, *et al* 1967: 204.

Athiasia hystrix (Muma), Muma and Denmark, 1968: 234.

DIAGNOSIS: This heavily-sclerotized, hemispherical deep red-brown species is distinguished by an elongate M_3 and details of the spermatheca and spermatodactyl. Other characters of value in separating this from related species are the nearly round, large metasternal scuta, the medially-located elliptical preanal pores, and the circular form of the secondary metapodal scutum. The spermatodactyl is not distinctive. The body is about 420μ long.

The strikingly developed ectal strip of the peritremal scutum is somewhat atypical of the genus.

TYPE: The female holotype and paratypes from palmetto leaves, Highlands Hammock State Park, near Sebring, Florida, January 29, 1961, by M. H. Muma, are in the USNM, Washington, D. C.

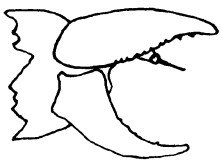
HABITAT: It has been collected from *Citrus* litter and the leaves of *Sabal palmetto* and *Serenoa repens*.

COUNTY DISTRIBUTION: Dade, Highlands, Levy, Osceola, and Seminole.

BIOLOGY: Its food habits are not known.

This species has been collected in January, February, March, April, and June.

Fig. 253 to 259. *Iphiseiodes quadripilis* (Banks). 253. Dorsal and leg structure and setation ♀. 254. Ventral scuta and setation ♀. 255. Posterior peritremal and stigmatal development ♀. 256. Cheliceral structure ♀. 257. Spermathecal structure ♀. 258. Cheliceral and spermatodactyl structure ♂. 259. Positional variation of spermatodactyl ♂.



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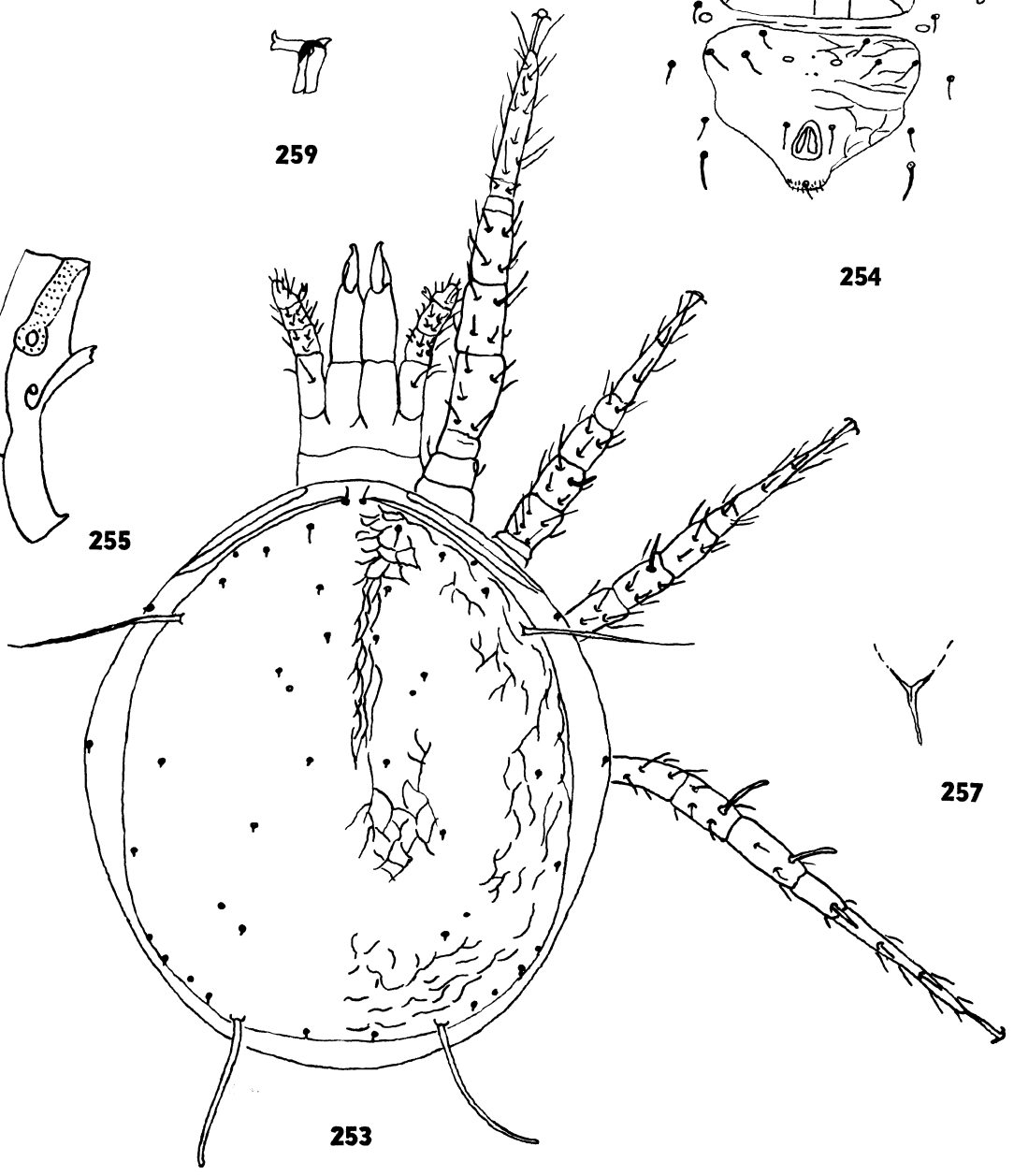

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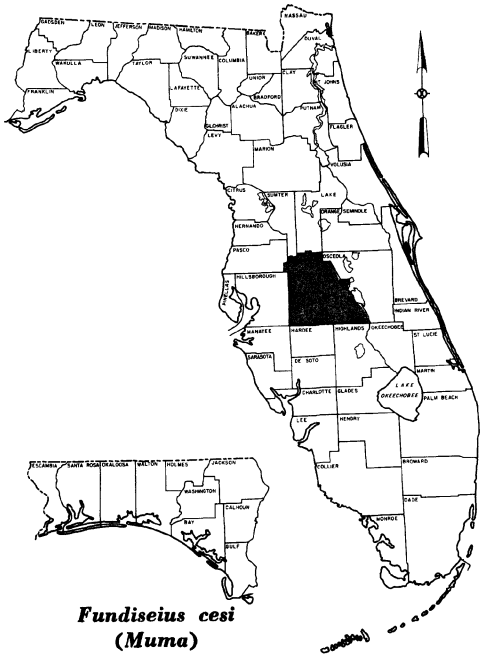
Fundiseius cesi (Muma)

Fig. 265 to 269

Typhlodromips cesi Muma, 1965a: 254.
Athiasia cesi (Muma), Muma and Denmark, 1968: 234.

DIAGNOSIS: This distinctive moderately-sclerotized, brown species has a unique dorsal imbrication which separates it from all other related species. The large primary metapodals, the wide separation of the preanal pores, and the short macroseta, Sti IV, are also diagnostic. Male unknown. The body is about 460μ long.

The lack of macrosetae on legs I, II, III, the thin ectal strip of the peritremal scutum,



Fundiseius cesi (*Muma*)

and the presence of only 6 denticules on the cheliceral fixed finger are typical of this genus.

TYPE: The female holotype and paratypes from grapefruit leaves, Lake Alfred, Florida, April 16, 1964, by H. L. Greene, are in the USNM, Washington, D. C.

HABITAT: This species has been taken from *Citrus* spp., *Juniperus* sp., and an unidentified weed.

COUNTY DISTRIBUTION: Polk.

BIOLOGY: Feeding and limited reproduction of the species has been obtained using six-spotted mites as a host.

This species has been collected in March and April.

Fundiseius arenicola (Muma)

Fig. 270 to 275

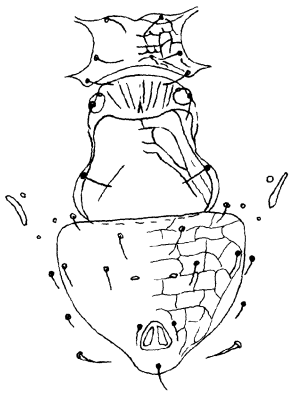
Amblyseius (*Iphiseius*) *arenicolus* Muma, 1965a: 247.
Iphiseiodes arenicolus (Muma), Muma, *et al* 1967: 203.
Athiasia arenicola (Muma), Muma and Denmark, 1968: 234.

DIAGNOSIS: Distinguishing characters of this highly-arched, moderately-sclerotized, pale brown species are the generally larger size of the dorsal setae, M_3 as long or longer than L_8, and details of the spermatheca and spermatodactyl. The species is more lightly sclerotized than is normal for the genus, and S_1 and S_2 are not normally visible from above. The thin ectal strip of the peritremal scutum, the reduced number, 4 to 5, of denticules on the cheliceral fixed finger, and the lack of macroseta on legs I, II, and III are typical. The body is about 330μ long.

TYPE: The female holotype and 2 paratypes from sand pine litter, east of Fern Park, Florida, November 15, 1965, by M. H. Muma. The holotype is in the USNM, Washington, D. C.

Fig. 260 to 264. *Fundiseius hystrix* (Muma). 260. Dorsal and leg structure and setation ♀. 261. Ventral scuta and setation ♀. 262. Posterior peritremal and stigmatal development ♀. 263. Spermathecal structure ♀. 264. Spermatodactyl structure ♂.

Fig. 265 to 269. *Fundiseius cesi* (Muma). 265. Dorsal and leg structure and setation ♀. 266. Detail of dorsal scutal ornamentation ♀. 267. Ventral scuta and setation ♀. 268. Posterior peritremal and stigmatal development ♀. 269. Spermathecal structure ♀.



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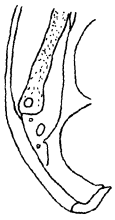

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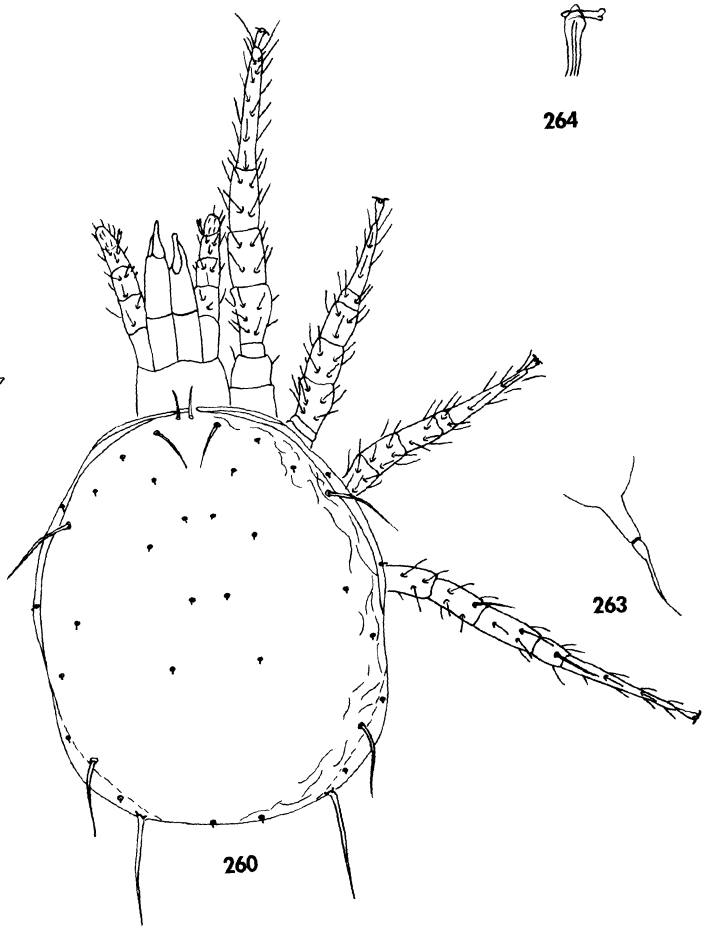

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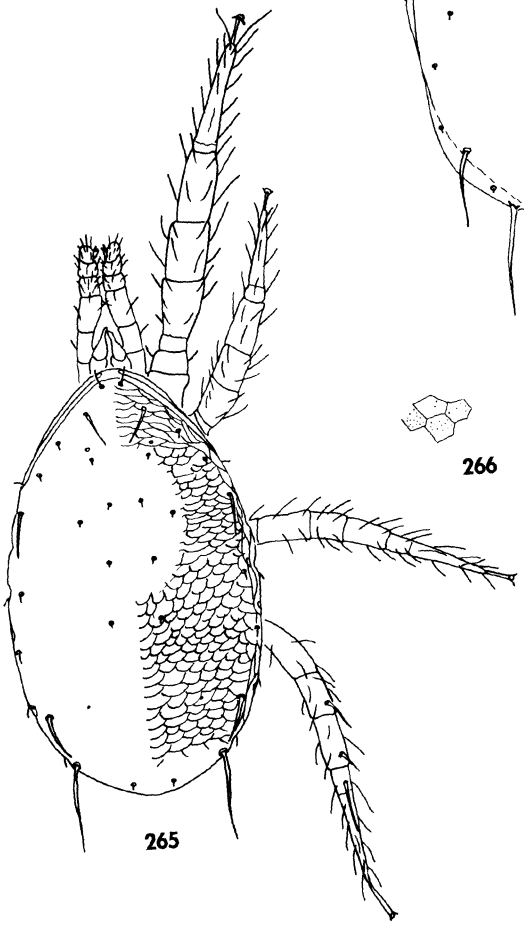

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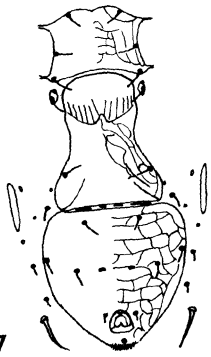

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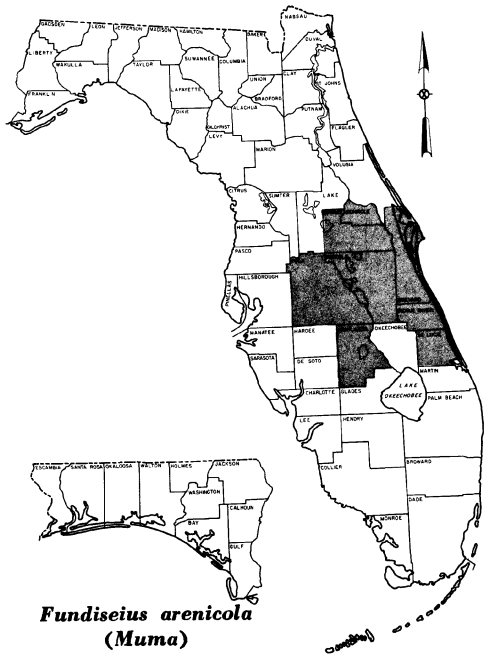


***Fundiseius arenicola* (Muma)**

HABITAT: It has been collected only in the litter of *Pinus clausa.*

COUNTY DISTRIBUTION: Brevard, Highlands, Indian River, Orange, Osceola, Polk, Seminole, and St. Lucie.

BIOLOGY: This species has been collected in all months except February and May.

Fundiseius imbricata Muma and Denmark

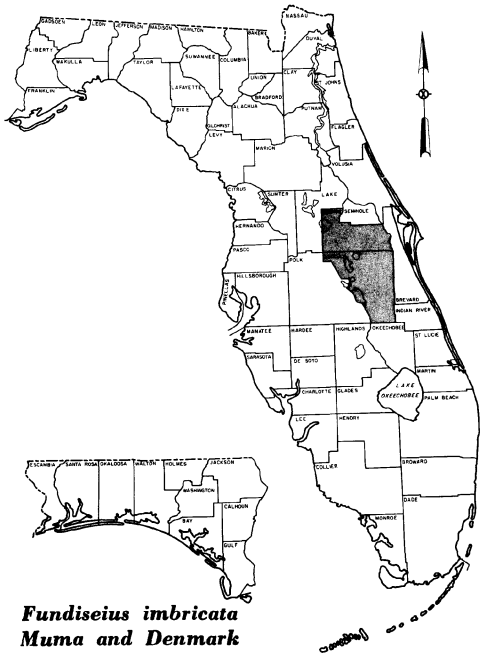
Fig. 276 to 279

Athiasia imbricata Muma and Denmark, 1969: 233.

DIAGNOSIS: This species may be distinguished from the closely allied *A. arenicola* by its larger average dorsal scutal size, 405μ long as opposed to 325μ, by its laterally and posteriorly imbricate dorsal scutum (that on *arenicola* is smooth), and by having the vertical setae 2/3 rather than 1/2 the length of L_1.

TYPE: The female holotype and female paratype collected from moist *Pinus clausa* litter, St. Cloud, Florida, September 21, 1965, by M. H. Muma and H. L. Greene, are in the USNM, Washington, D.C.

HABITAT: *Pinus clausa* litter.



***Fundiseius imbricata* Muma and Denmark**

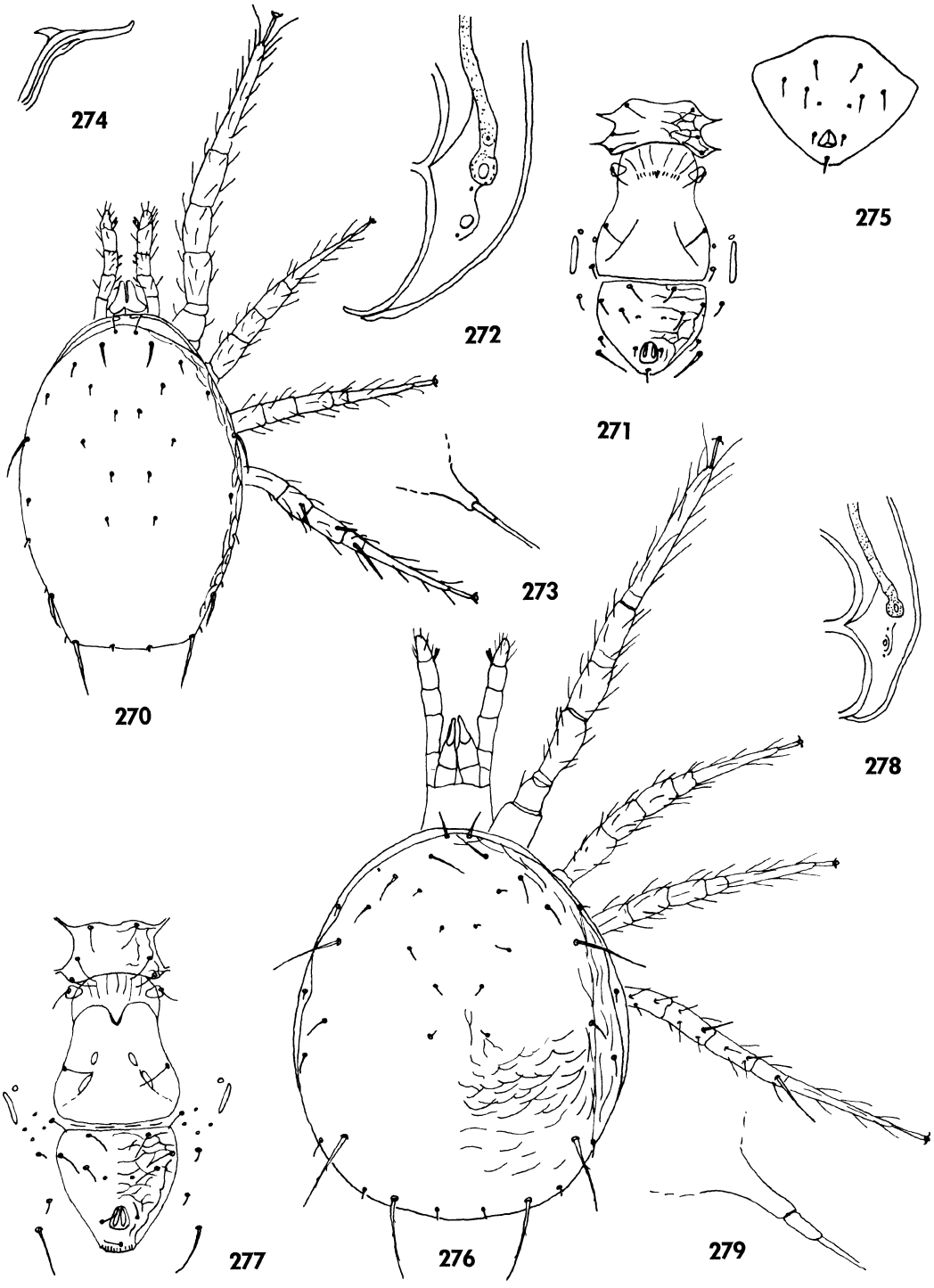
COUNTY DISTRIBUTION: Orange and Osceola.

BIOLOGY: Nothing is known about the biology of the species.

This species has been collected in September and December.

Fig. 270 to 275. *Fundiseius arenicola* (Muma). 270. Dorsal and leg structure and setation ♀. 271. Ventral scuta and setation ♀. 272. Posterior peritremal and stigmatal development ♀. 273. Spermathecal structure ♀. 274. Spermatodactyl structure ♂. 275. Ventrianal scutum ♂.

Fig. 276 to 279. *Fundiseius imbricata* Muma and Denmark. 276. Dorsal and leg structure and setation ♀. 277. Ventral scuta and setation ♀. 278. Posterior peritremal and stigmatal development ♀. 279. Spermathecal structure ♀.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GENUS *TYPHLODROMIPS* DE LEON

Typhlodromopsis De Leon, 1959a: 133 (in part, not typical species).
Typhlodromips De Leon, 1965: 23.
Typhlodromips De Leon, Muma, 1965: 250.
Typhlodromips De Leon, 1966: 93.

DIAGNOSIS: Females are characterized by 4 pairs of dorsal setae, 3 pairs of median setae with M_3 stout and serrate or plumose, 8 pairs of lateral setae with L_8 usually longer than others, stout and serrate or plumose; 2 pairs of sub-lateral setae on the interscutal membrane; 3 pairs of sternal setae; 3 pairs of preanal, ventrianal setae.

Chelicerae normal in size in proportion to the body. Fixed finger of chelicerae usually with 8 or more denticules, several of which lie proximal to the *pilus dentilis*. Sternum as wide or wider than long and with a straight or concave posterior margin. Peritreme long, extending forward to or between the ventrical setae. Peritremal scutum almost indistinguishable or indistinguishably fused to stigmatal scutum and leg IV exopodal scutum. Ventrianal scutum pentagonal to shield-shaped. Macrosetae are usually present on the genu and occasionally on the tibia of legs I, II, and III; leg IV has Sge IV, Sti IV, and St IV, with the latter usually longest. Additional elongate, thickened or otherwise modified setae occur on some species. Leg formula 1423 to 1432.

Males are smaller than but similar to females, except that the sublateral setae are on the dorsal scutum. Ventrianal scutum with 3 or 4 pairs of preanal setae. Spermatodactyl with typical terminal foot, distinct heel, and distinct to obscure lateral process.

TYPE SPECIES: *Typhlodromopsis simplicissimus* De Leon, 1959, by designation, De Leon (1965).

DISCUSSION: This is a large genus represented by at least 50 known species.

Typhlodromips is most readily distinguished from *Neoseiulus* Hughes by proportions of the sternum, greater number of cheliceral denticules, and presence of macrosetae on legs I, II, and III. It differs from *Typhlodromalus* Muma in the form of sternal and ventrianal scuta and in the development of the spermatodactyl.

There is some variation among the species of this genus in peritremal cheliceral, and leg setae characters. It is possible that further study will indicate a complex of genera.

This genus is world wide in distribution. It is common in the Caribbean area. Nine species are recorded from Florida.

Key to *Typhlodromips* De Leon in Florida
(Females)

1a	M_3 subequal with, or only slightly longer than L_4; leg IV macrosetae pointed 2
1b	M_3 much longer than L_4; leg IV macrosetae knobbed 4
2a(1a)	L_5 more than twice as long as M_2; spermatheca saccular ..... *mastus* Denmark and Muma (p. 80)
2b	L_5 only slightly longer than M_2; spermatheca fundibuliform 3
3a(2b)	Spermatheca less than twice as long as wide; spermatodactyl toe straight ..... *deleoni* (Muma) (p. 79)
3b	Spermatheca more than twice as long as wide; spermatodactyl toe bent forward ..... *simplicissimus* (De Leon) (p. 79)
4a(1b)	M_2 subequal with, or longer than L_5 5
4b	M_2 distinctly shorter than L_5 7
5a(4a)	M_2 longer than L_5; spermatheca fundibuliform; spermatodactyl foot short ..... *dillus* (De Leon) (p. 80)
5b	M_2 subequal with L_5; spermatheca tubular; spermatodactyl foot long..... 6
6a(5b)	Spermatodactyl foot slender, toe nodular; spermathecal cervix 20 times longer than wide ..... *dentilis* (De Leon) (p. 82)
6b	Spermatodactyl foot massive, toe ovate; spermathecal cervix 10 times longer than wide ..... *arenillus* Denmark and Muma (p. 83)
7a(4b)	M_3 about 1/3 the length of L_8 .... *hellougreus* Denmark and Muma (p. 84)
7b	M_3 about 1/2 the length of L_8 8

8a(7b) Spermathecal cervix long and slender, about 40μ long ..... *dimidiatus* (De Leon) (p. 83)

8b Spermathecal cervix short and broad, about 25μ long ..... *digitulus* Denmark (p. 86)

Typhlodromips simplicissimus (De Leon)

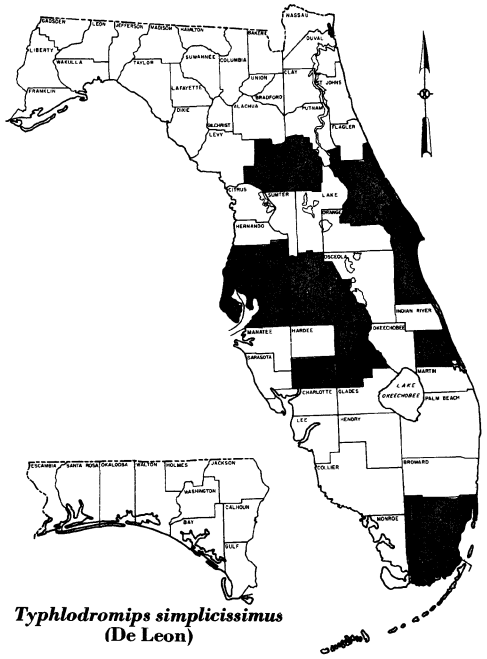
Fig. 280 to 288

Typhlodromus (*Typhlodromopsis*) *simplicissimus* De Leon, 1959b: 117.

Amblyseius (*Typhlodromopsis*) *simplicissimus* (De Leon) Muma, 1961: 287.

Typhlodromips simplicissimus (De Leon), De Leon, 1965: 23.

DIAGNOSIS: The location of the posterior preanal setae and preanal pores distinguish this species from most other *Typhlodromips*. *T. deleoni* (Muma) is closely related, but the bent transverse arm of the spermatodactyl serves to separate this mite. This is the only species of the genus in which an ectal strip of the peritremal scutum extends to leg IV exopodal scutum. The body of this common, pale-colored, lightly-sclerotized species is about 320μ long.



Typhlodromips simplicissimus (De Leon)

TYPE: The female holotype from *Eugenia jambos*, Cordoba, Veracruz, Mexico, February 4, 1957, by D. De Leon, is in the MCZ, Harvard University, Cambridge, Mass.

HABITAT: It has been collected from *Amelanchier arborea*, *Ardisia* sp., leaves, fruit, twigs and litter of *Citrus*, *Magnolia*, *Parthenocissus quinquefolia*, *Persea borbonia*, *Quercus* sp., *Ricinus communis*, *Serenoa repens*, *Thea* sp., and fern.

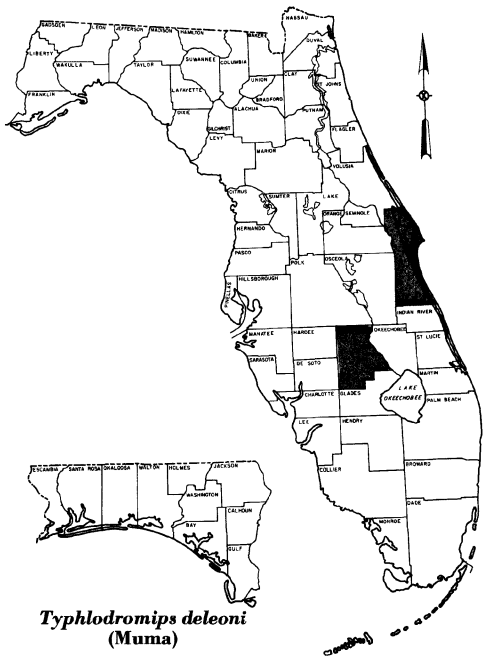
COUNTY DISTRIBUTION: Brevard, Dade, Highlands, Hillsborough, Marion, Pasco, Polk, Seminole, St. Lucie, De Soto, Pinellas, and Volusia.

BIOLOGY: Nothing is known of its food habits.

This species has been collected in January, February, March, April, July, September, October, and November.

Typhlodromips deleoni (Muma), new combination

Fig. 289 to 292



Typhlodromips deleoni (Muma)

Amblyseius (*Typhlodromopsis*) *deleoni* Muma, 1962: 7.
Typhlodromus simplicissimus De Leon, Hirschmann, 1962: 6.
Amblyseius (*Typhlodromopsis*) *deleoni* Muma, Muma, 1964: 24.

DIAGNOSIS: Males of this lightly-sclerotized, pale-colored species are distinguished from males of *A. simplicissimus* (De Leon) by the broad, spatulate, unflexed toe of the spermatodactyl. Females of the two species are either indistinguishable, except for spermathecal length, or females of this species are as yet unknown. The body is about 300μ long.

TYPE: The male holotype from citrus leaf, Turnbull Hammock, north of Mims, Florida, January 16, 1969, by Judith A. Murrell, is in the USNM, Washington, D. C.

HABITAT: This species has been collected only from the leaves of citrus.

COUNTY DISTRIBUTION: Brevard and Highlands.

BIOLOGY: The food habits are unknown.

This species has been collected in February and November.

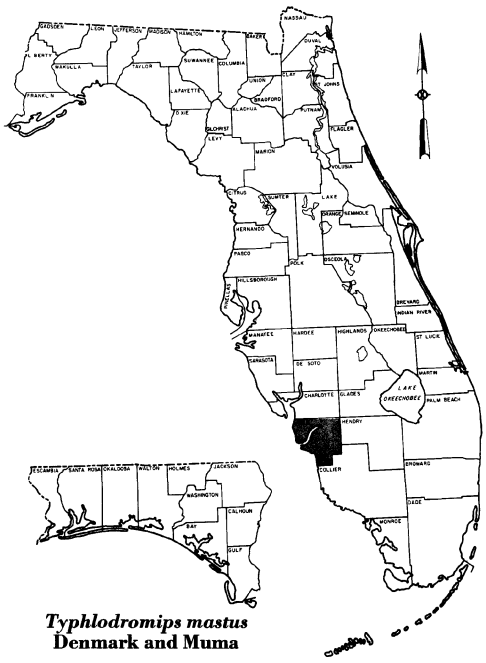
Typhlodromips mastus Denmark and Muma

Fig. 293 to 298

Typhlodromips mastus Denmark and Muma, 1967: 175.

DIAGNOSIS: *T. mastus* is distinguished from a closely related Mexican species, *T. sanblasensis* (De Leon), by shorter dorsal scutal setae, a shorter, narrower saccular spermatheca with a large atrium, and details of the ventrianal scutum. Also, there are only 6 to 7 denticules on the cheliceral fixed finger. The body is about 310μ long.

TYPE: The female holotype from goldenrod, *Solidago* sp., Alva, Florida, June 10, 1965, by W. T. Walsh, is in the USNM, Washington, D. C.



Typhlodromips mastus
Denmark and Muma

HABITAT: *Solidago* sp.

COUNTY DISTRIBUTION: Lee.

BIOLOGY: Nothing is known about the biology.

This species has been collected in June.

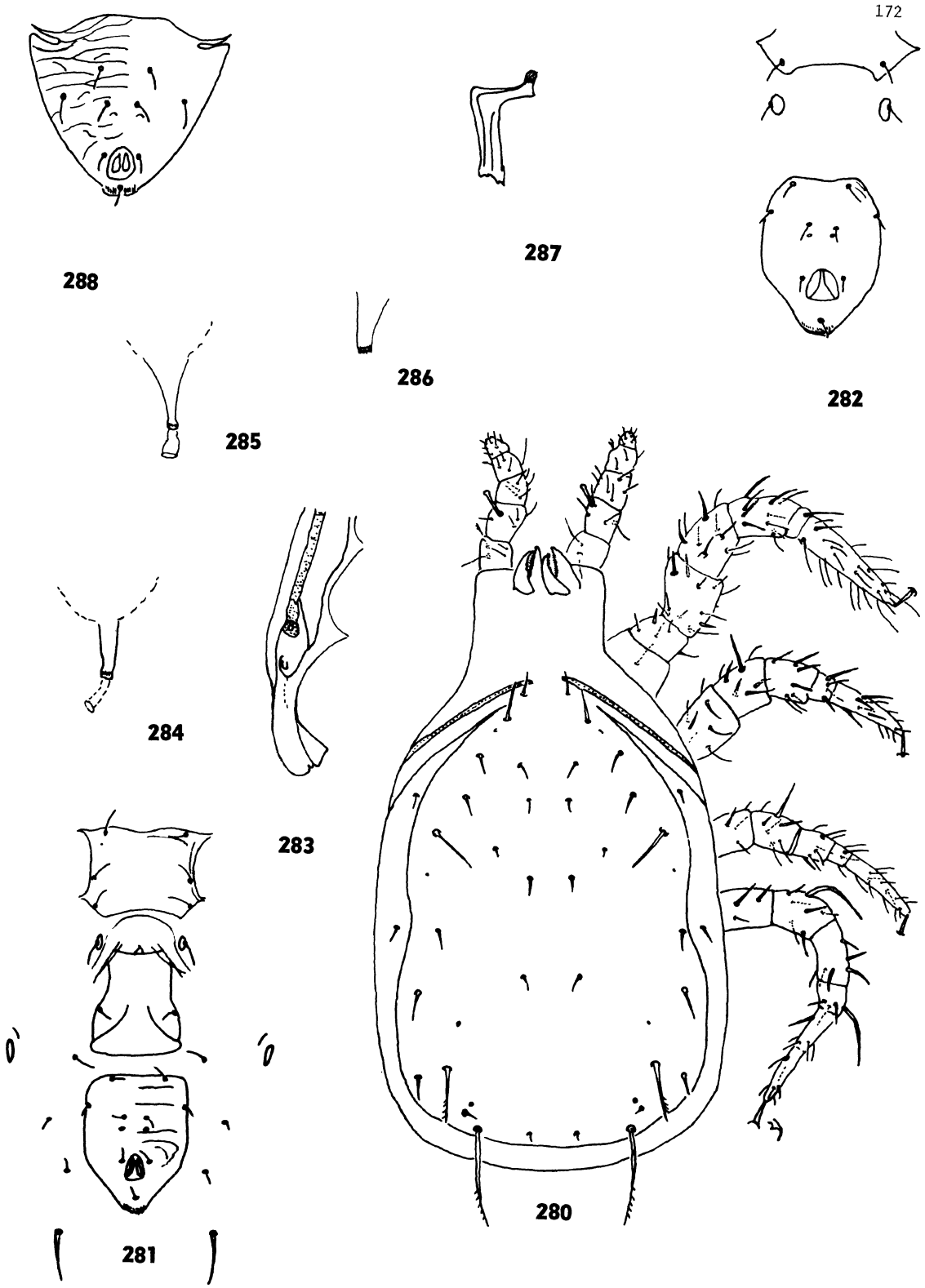
Typhlodromips dillus (De Leon), new combination

Fig. 299 to 307

Typhlodromus dillus De Leon, 1960: 106.
Amblyseius (*Typhlodromopsis*) *dillus* (De Leon), Muma, 1961: 287.

DIAGNOSIS: This species is closely related to *T. dimidiatus* (De Leon) from which it is distinguished by differently proportioned M_2 and L_5, the shorter spermatheca, and the presence of 4 pairs of preanal setae

Fig. 280 to 288. *Typhlodromips simplicissimus* (De Leon). 280. Dorsal and leg structure and setation ♀. 281 and 282. Ventral scuta and setation ♀. 283. Posterior peritremal and stigmatal development ♀. 284, 285, and 286. Positional variations of spermathecal structure ♀. 287. Spermatodactyl structure ♂. 288. Ventrianal scutum ♂.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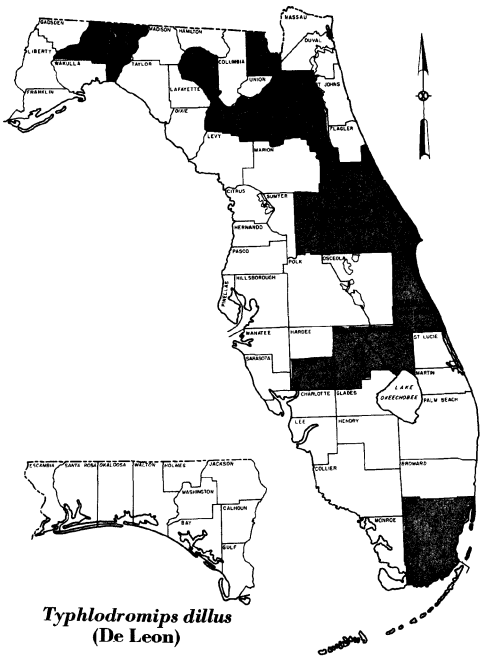


Typhlodromips dillus
(De Leon)

on the male ventrianal scutum. Although the dorsal scutum is heavily imbricate, the species is lightly sclerotized and pale in color. The body is about 300μ long.

TYPE: The male holotype from *Hicoria* sp., Barwell, Florida, September 1, 1956, by D. De Leon, is in the MCZ, Harvard University, Cambridge, Mass.

HABITAT: It has been collected from *Amelanchier arborea, Citrus* sp., *Cornus* sp., *Cupressus* sp., *Cyperus papyrus, Diospyros* sp., *Eriobotrya japonica, Fraxinus caroliniana, Geranium* sp., *Gordonia lasianthus, Hibiscus tiliaceus, Ilex* sp., *Juniperus virginiana, Magnolia grandiflora, Phytolacca americana, Pinus clausa, Pinus palustris, Pinus taeda, Pittosporum tobira, Polystichum adiantiforme, Quercus laevis, Quercus prinus, Quercus virginiana, Rhododendron* sp., *Rubus* sp., *Styrax americana, Thea* sp., *Viburnum suspensum,* and *Vitis* sp.

COUNTY DISTRIBUTION: Alachua, Baker, Bradford, Brevard, Clay, Dade, De Soto, Gilchrist, Highlands, Indian River, Jefferson, Lake, Leon, Okeechobee, Orange, Putnam, Suwannee, Seminole, and Volusia.

BIOLOGY: Its food habits are unknown. This species has been collected in every month except June and August.

Typhlodromips dentilis (De Leon), new combination

Fig. 308 to 317

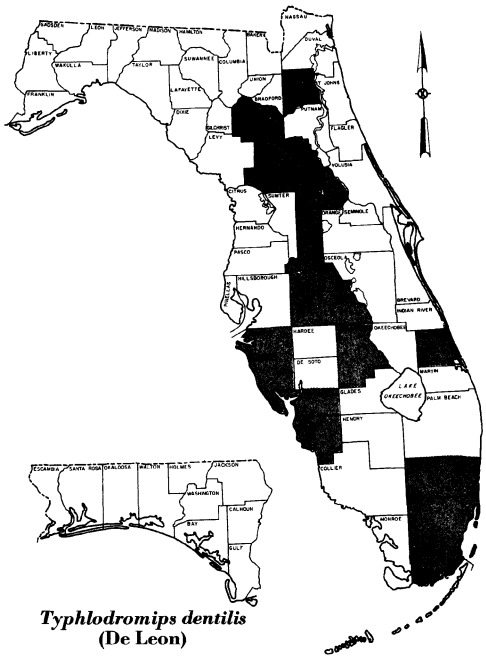
Typhlodromus dentilis De Leon, 1960: 105.
Amblyseius (*Typhlodromopsis*) *dentilis* (De Leon), Muma, 1961: 287.

DIAGNOSIS: Details of the spermatheca and spermatodactyl distinguish this species from closely related forms. Knobbed macrosetae on leg IV are also usable characters. The body is about 310μ long.

This species seems to be more closely related to *T. arenillus* Denmark and Muma than to *T. dillus* (De Leon) or *T. sabali* (De Leon) as originally distinguished.

TYPE: The male holotype from *Rhus copallina* at Miami, Florida, May 24, 1956, by D. De Leon, is in the MCZ, Harvard University, Cambridge, Mass.

HABITAT: Collected from *Acalypha wil-*



Typhlodromips dentilis
(De Leon)

kesiana, Acer negundo, Arecastrum romanzoffianum, Bidens pilosa, Casimiora sp., *Castanea* sp., *Citrus limon, Citrus* leaves and litter, *Erigeron* sp., *Eriobotrya japonica, Euphorbia pulcherrima, Gardenia* sp., *Juniperus chinensis* 'Hetzii', *Juniperus sylvestris, Juniperus* sp., *Litchi chinensis, Magnolia virginiana australis, Malva* sp., *Petrea volubilis, Pinus clausa* litter, *Pinus* sp., *Psidium* sp., *Quercus incana, Rhus copallina, Rhus copallina leucantha, Solidago* sp., *Tillandsia usneoides* in swamp, and feed bin litter.

COUNTY DISTRIBUTION: Alachua, Broward, Charlotte, Clay, Dade, Highlands, Lake, Lee, Manatee, Marion, Polk, Sarasota, and St. Lucie.

BIOLOGY: Nothing is known about the biology of this species.

This species has been collected in every month, except August.

Typhlodromips arenillus Denmark and Muma

Fig. 318 to 324

Typhlodromips arenillus Denmark and Muma, 1967: 172.

DIAGNOSIS: *T. arenillus* seems to be most closely related to *T. dentilis* (De Leon) from which it is distinguished by proportional lengths of dorsal scutal setae, larger pores on the ventrianal scutum, a shorter, wider spermatheca, and a larger spermatodactyl with a bent toe. The body is about 290μ long.

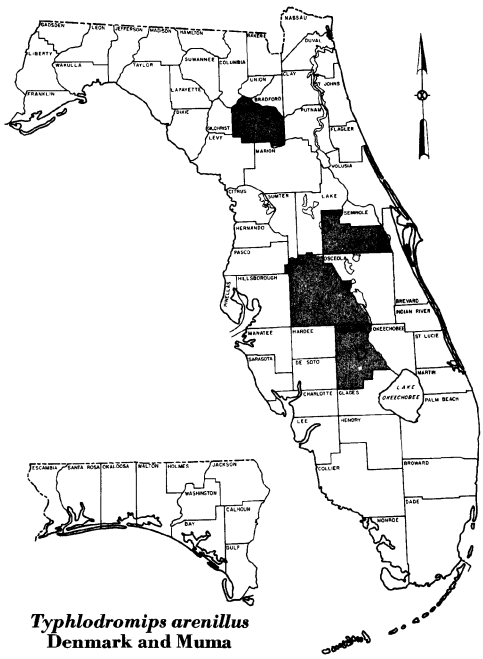
TYPE: The female holotype from Lake Placid, Florida, August 23, 1965, by M. H. Muma and H. L. Greene, on pea vine in sand dune, is in the USNM, Washington, D. C.

HABITAT: This species has been found on *Carya* sp., *Geobalanus* sp., *Quercus* sp., *Serenoa repens, Vaccinium* sp., *Vicia* sp., and an unidentified plant on *Pinus clausa* sand dunes.

COUNTY DISTRIBUTION: Alachua, Highlands, Orange, and Polk.

BIOLOGY: Nothing is known about the food habits or life cycle of this species.

This species has been collected in March, April, and August.



Typhlodromips arenillus
Denmark and Muma

Typhlodromips dimidiatus (De Leon), new combination

Fig. 325 to 330

Amblyseius (*Typhlodromopsis*) *dimidiatus* De Leon, 1962: 25.

DIAGNOSIS: A combination of dorsal setal, spermathecal, spermatodactyl, macrosetal, and ventrianal scutal characters is required to distinguish this species from others of the complex. *T. dillus* is the most closely related species, but has more distinct imbrication, and shorter spermatheca. The body is about 320μ long. The male is unknown.

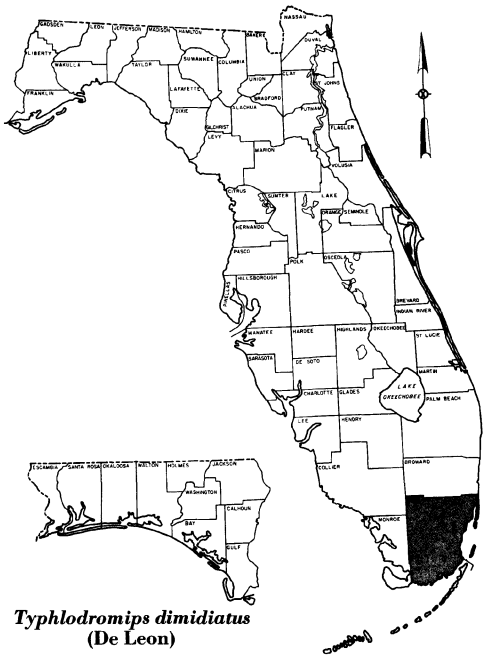
TYPE: The female holotype from *Ilex* sp., Florida City, Florida, March 19, 1959, by D. De Leon is in the MCZ, Harvard University, Cambridge, Mass.

HABITAT: *Ilex* sp.

COUNTY DISTRIBUTION: Dade.

BIOLOGY: Nothing is known of the food habits.

This species has been collected in March.



Typhlodromips dimidiatus
(De Leon)

Typhlodromips hellougreus Denmark and Muma

Fig. 331 to 337

Typhlodromips hellougreus Denmark and Muma, 1967: 173.

DIAGNOSIS: *T. hellougreus* is closely related in some respects to *T. simplicissimus* (De Leon) and in others to *T. auratus* (De Leon). It is distinguished from the former by the reticulated dorsal scutum, shorter dorsal scutal setae, and differently positioned preanal pores; from the latter by having M_3 much shorter than L_8, and much narrower spermatheca. The body is about 340μ long.

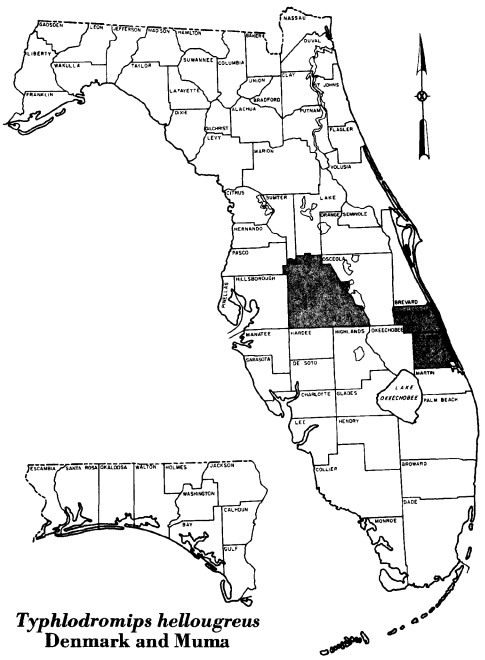
TYPE: The female holotype from Sebastian, Florida, February 25, 1966, by M. H. Muma, on sand pine, *Pinus clausa*, is in the USNM, Washington, D. C.

HABITAT: This species has been found only on *Pinus clausa* and an unidentified plant in sand dune.

COUNTY DISTRIBUTION: Indian River, Polk, and St. Lucie.

BIOLOGY: The food habits are not known.

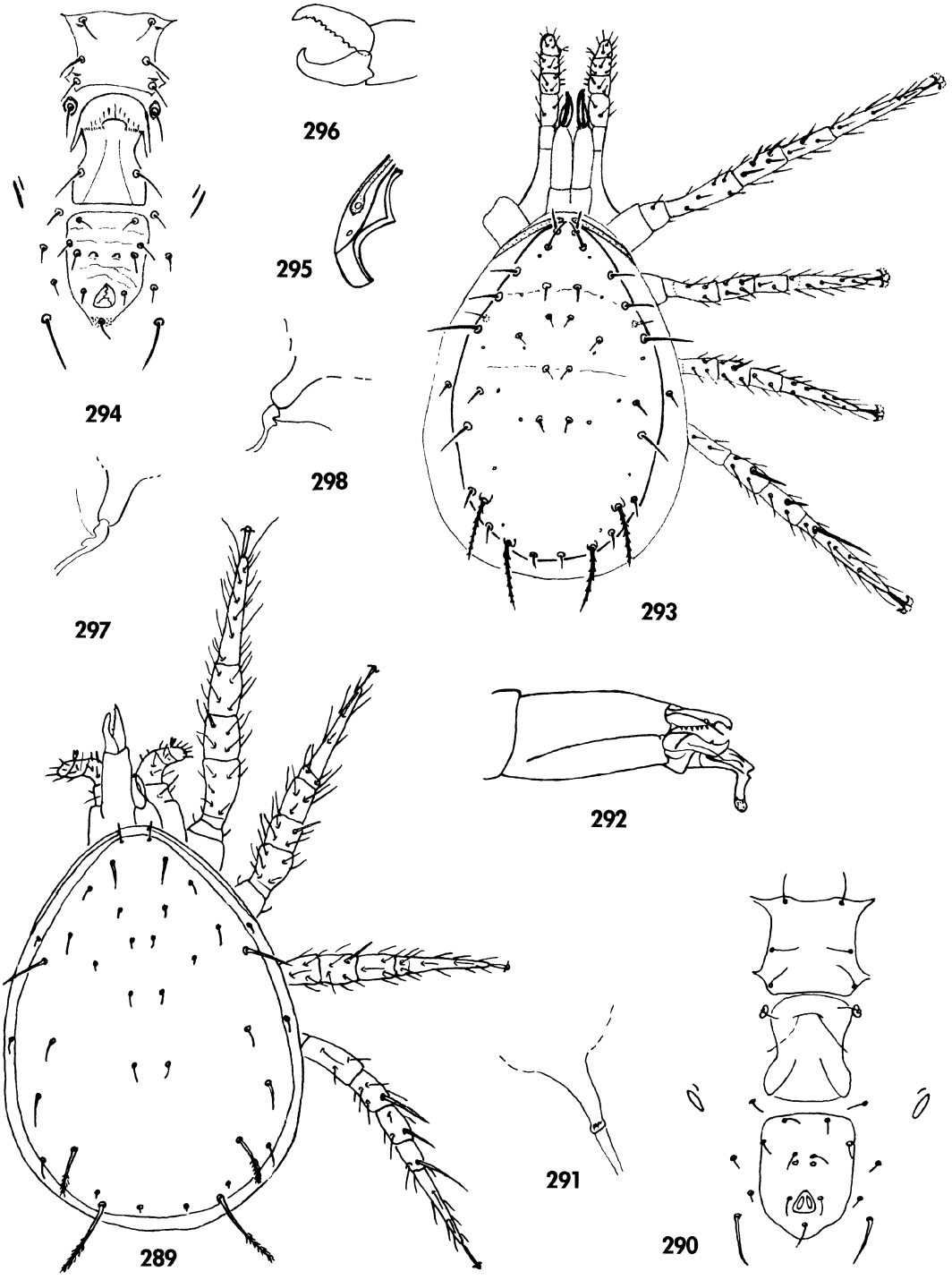
This species has been collected in February and March.



Typhlodromips hellougreus
Denmark and Muma

Fig. 289 to 292. *Typhlodromips deleoni* (Muma). 289. Dorsal and leg structure and setation ♀. 290. Ventral scuta and setation ♀. 291. Spermathecal structure ♀. 292. Cheliceral and spermatodactyl structure ♂.

Fig. 293 to 298. *Typhlodromips mastus* Denmark and Muma. 293. Dorsal and leg structure and setation ♀. 294. Ventral scuta and setation ♀. 295. Posterior peritremal and stigmatal development ♀. 296. Cheliceral structure ♀. 297 and 298. Positional variations of spermathecal structure ♀.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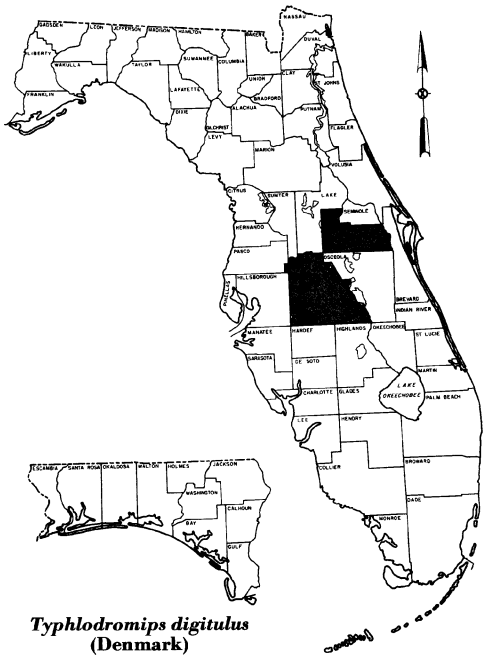
Typhlodromips digitulus (Denmark), new combination

Fig. 338 to 344

Amblyseius digitulus Denmark, 1965: 91.

DIAGNOSIS: *Typhlodromips digitulus* is



Typhlodromips digitulus (Denmark)

closely related to *T. dimidiatus* (De Leon), and *T. dillus* (De Leon), but differs in that M_2 is much smaller than L_5, L_8 and M_3 are longer and only slightly serrate, and the spermatheca is distinct in having a cleft atrium. This species is weakly sclerotized and is pale white in life. The body is about 330μ long.

TYPE: The female holotype from 2 miles south of Winter Garden, Florida, April 2, 1963, by H. A. Denmark, on Bermuda grass, *Cynodon dactylon*, is in the USNM, Washington, D. C.

HABITAT: *Cynodon dactylon, Paspalum notatum,* and *Tillandsia usneoides* in swamp.

COUNTY DISTRIBUTION: Orange and Polk.

BIOLOGY: Nothing is known of its life history or food habits.

This species has been collected in March, April, and May.

GENUS *TYPHLODROMALUS* MUMA

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

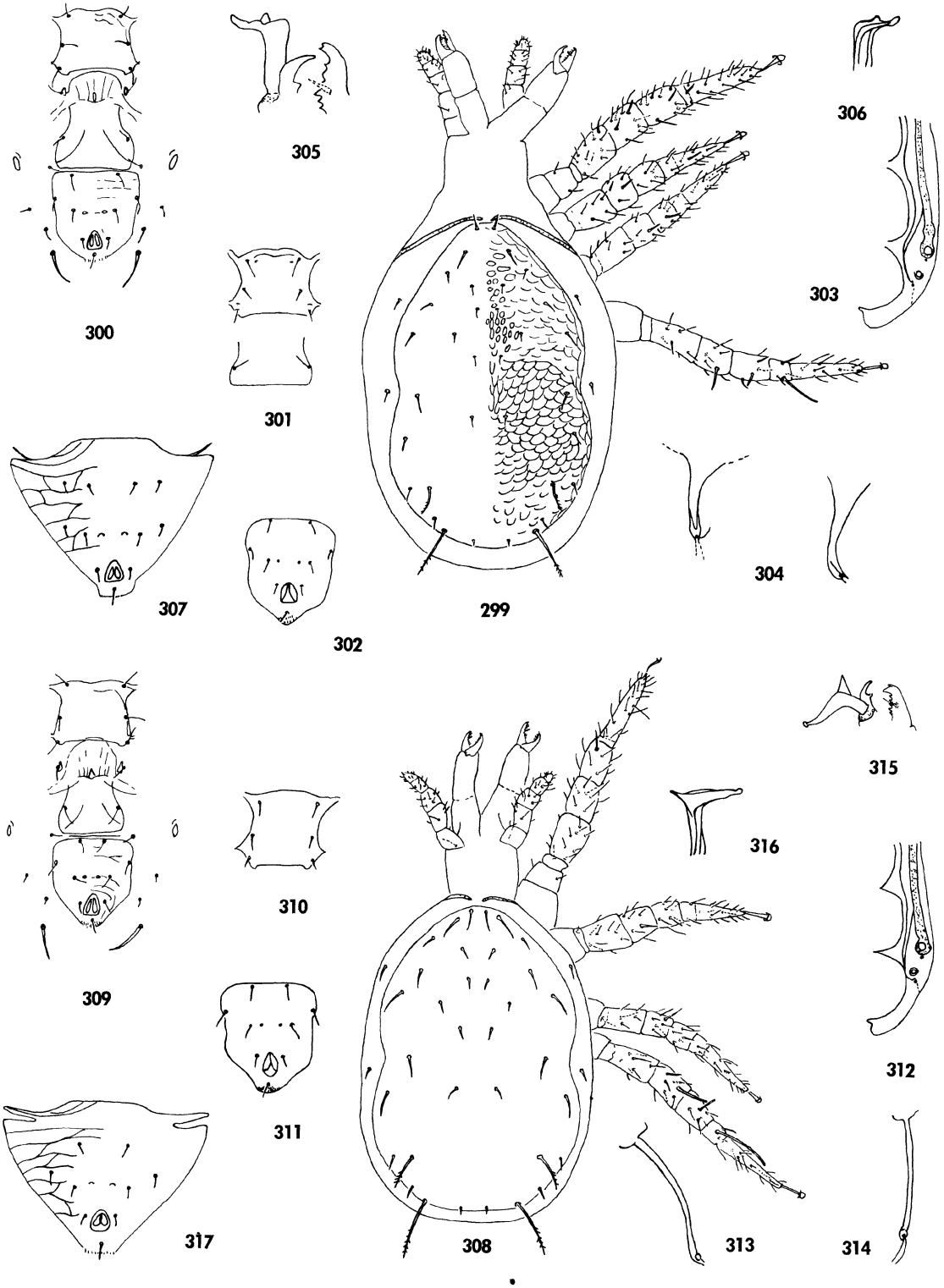
Typhlodromalus Muma, De Leon, 1966: 87.

DIAGNOSIS: Females are characterized by 4 pairs of dorsal setae, 3 pairs of median setae, 8 pairs of lateral setae of which L_1, L_4, and L_8 are longer and stouter and L_8 is usually serrate; 2 pairs of sublateral setae on the interscutal membrane; 3 pairs of sternal setae; 3 pairs of preanal ventrianal setae.

Chelicerae normal in size in relation to the body. Fixed finger of chelicerae with 8 or more denticules about half of which lie proximal to the *pilus dentilis*. Sternal scutum longer than wide and lobate posteriorly. Peritreme long, extending forward to or between vertical setae. Peritremal scutum indistinguishably fused with stigmatal scutum and leg IV exopodal scutum. Ventrianal scutum elongate, frequently vase-shaped with the preanal setae forming 2 triangles. Macrosetae are usually present on the genu and occasionally on the tibia of legs I, II, and III, and leg IV has Sge IV, Sti IV, and St IV with the latter usually longest. Leg formula 4123.

Fig. 299 to 307. *Typlodromips dillus* (De Leon). 299. Dorsal and leg structure and setation ♀. 300, 301 and 302. Ventral scuta and setation ♀. 303. Posterior peritremal and stigmatal developement ♀. 304. Positional variations of spermathecal structure ♀. 305 and 306. Cheliceral and spermatodactyl structure ♂. 307. Ventrianal scutum ♂.

Fig. 308 to 317. *Typhlodromips dentilis* (De Leon). 308. Dorsal and leg structure and setation ♀. 309, 310 and 311. Ventral scuta and setation ♀. 312. Posterior peritremal and stigmatal development ♀. 313 and 314. Positional variations of spermathecal structure ♀. 315 and 316. Cheliceral and spermatodactyl structure ♂. 317. Ventrianal scutum ♂.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Males are smaller than, but similar to, females except that the sublateral setae are on the dorsal scutum. Ventrianal scutum with 3 pairs of preanal setae. Spermatodactyl with an elongate shank, a broad spatulate foot, and a smaller but distinct heel and lateral process.

TYPE SPECIES: *Typhlodromus peregrinus* Muma, 1955, by designation, Muma (1961).

DISCUSSION: The species of this genus have been confused with those of *Euseius* Wainstein. They may be distinguished by the large multidentate chelicerae, the position of the preanal ventrianal setae and the form of the spermatodactyl.

About 12 species can presently be assigned to this genus. All of them live on shrubs and trees. The food habits are known only for *T. peregrinus* (Muma), which seems to be an omnivorous predator (Muma, 1969). In California, Chant and Fleschner (1960) and McMurtry and Scriven (1965) have found that *T. limonicus* (Garman and McGregor) will feed on both pollen and tetranychids, but other food hosts have not been tested.

This genus is widely distributed. It is common in the Caribbean area. Two species are known from Florida.

Key to *Typhlodromalus* Muma in Florida

(Females)

1a M_3 much larger than L_6 and plumose; dorsal scutum rugose .... *peregrinus* (Muma) (p. 88)

1b M_3 subequal with L_6 and setiform; dorsal scutum smooth ..... *limonicus* (Garman and McGregor) (p. 90)

Typhlodromalus peregrinus (Muma), new combination

Fig. 345 to 362

Typhlodromus peregrinus Muma, 1955a: 270.

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

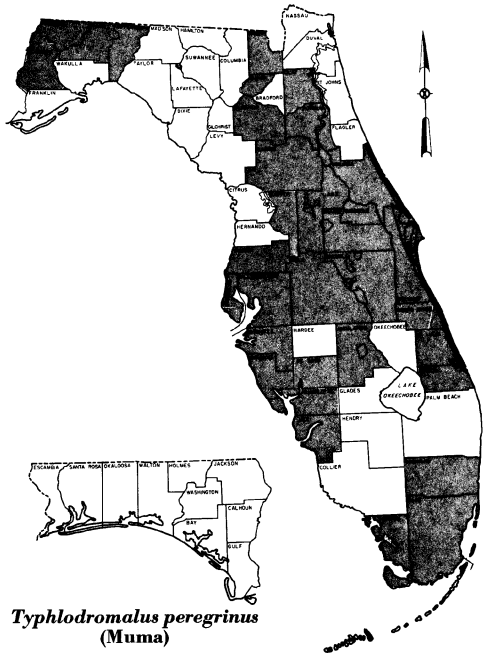
Typhlodromus (*Amblyseius*) *robiniae* Chant, 1959: 98.

Typhlodromus (*Amblyseius*) *evansi* Chant, 1959: 99.

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

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

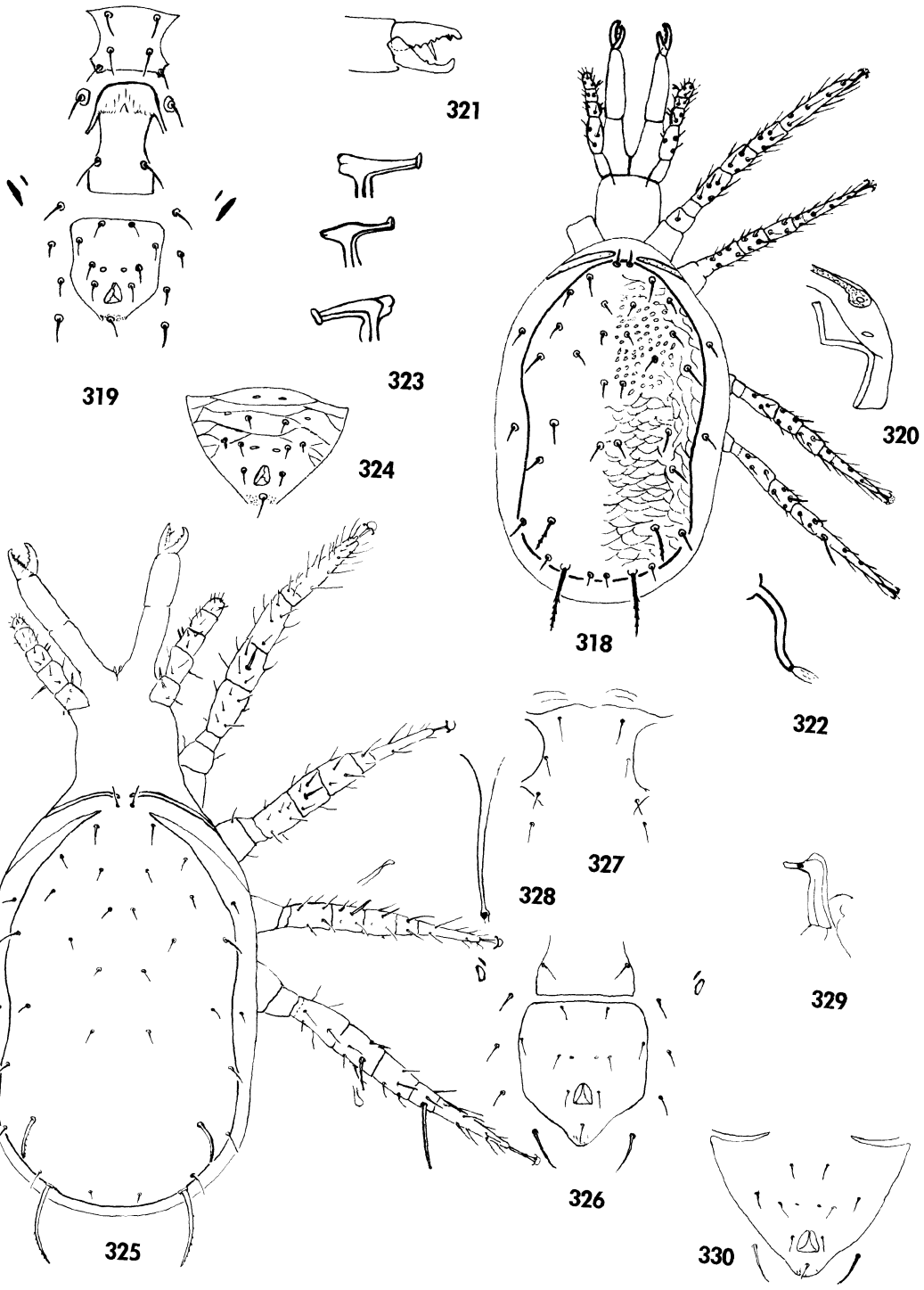
DIAGNOSIS: This species is closely re-



Typhlodromalus peregrinus (Muma)

Fig. 318 to 324. *Typhlodromips arenillus* Denmark and Muma. 318. Dorsal and leg structure and setation ♀. 319. Ventral scuta and setation ♀. 320. Posterior peritremal and stigmatal development ♀. 321. Cheliceral structure ♀. 322. Spermathecal structure ♀. 323. Positional variations of spermatodactyl structure ♂. 324. Ventrianal scutum ♂.

Fig. 325 to 330. *Typhlodromips dimidiatus* (De Leon). 325. Dorsal and leg structure and setation ♀. 326 and 327. Ventral scuta and setation ♀. 328. Spermathecal structure ♀. 329. Spermatodactyl structure ♂. 330. Ventrianal scutum ♂.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lated to *T. planetarius* (De Leon) from Mexico and *T. olombo* (Pritchard and Baker) from Africa. Proportions of setae on the dorsal scutum and genitalic details separate it from these species. The body is about 380μ long.

Muma and Denmark (1962) have shown that this species is highly variable and includes the synonyms cited above.

TYPE: The female holotype from scaly orange leaves, Minneola, Florida, January 24, 1952, by M. H. Muma, is in the USNM, Washington, D. C.

HABITAT: As the name implies, this species wanders over a large number of plant hosts including *Acera* sp., *Acer negundo, Arecastrum romanzoffianum, Asparagus plumosus, Bambusa* sp., *Begonia* sp., *Bucida buceras, Buxus microphylla* 'Japonica', *Buxus* sp., *Callistemon salignus, Carya illinoensis, Citrus mitis, Citrus nobilis, Citrus sinensis, Citrus* sp. bark, fruit and litter, *Coffea arabica, Cornus floridanus, Diospyros* sp., *Erigeron* sp., *Euphorbia* sp., *Gardenia* sp., *Gordonia lasianthus, Ilex glabra, Ilex opaca, Ipomoea purpurea, Juniperus conferta, Lantana* sp., *Ligustrum* sp., *Litchi chinensis, Melanthera deltoidea, Nyssa sylvatica, Passiflora* sp., *Phoenix* sp., *Pinus elliottii, Pinus* sp., *Pittosporum tobira, Pityothamnus* (=*Asimina*) *pygamea, Platanus occidentalis, Plumeria* sp., Primrose family, *Prunus caroliniana, Prunus laurocerasus, Prunus* sp., *Psidium guajava, Psidium* sp., *Quercus falcata, Quercus hemisphaerica, Quercus laurifolia, Quercus nigra, Quercus virginiana, Quercus* sp., *Rhododendron* sp., *Rhus* sp., *Ricinus communis, Rosa* sp., *Rubus* sp., *Salix caroliniana, Sambucus* sp., *Schefflera* sp., *Schinus terebinthifolius, Serenoa repens, Solanum* sp., *Solidago* sp., *Stokesia laevis, Thespesia populnea, Thuja* sp., *Tillandsia usneoides* in swamp and under *Quercus* sp., *Vaccinium* sp., *Viburnum odoratissimum, Vitis* sp., *Zamia* sp., and unidentified weeds and cover crops.

COUNTY DISTRIBUTION: Alachua, Baker, Brevard, Broward, Charlotte, Clay, Dade, De Soto, Gadsden, Highlands, Hillsborough, Indian River, Jefferson, Lake, Lee, Leon, Liberty, Manatee, Marion, Martin, Monroe, Orange, Osceola, Pasco, Pinellas, Polk, Putnam, St. Lucie, Sarasota, Seminole, Sumter, Union, and Volusia.

BIOLOGY: This species is known locally as the yellow mite because it is most frequently colored a milk-white to pale yellow. Dark gut markings are infrequent under field conditions. Laboratory studies indicate a wide host food range.

This is the most common phytoseiid on Florida citrus; it has been discussed in a number of reports including Muma (1961, 1964, 1964a, 1965a, and 1970) and Muma, *et al* (1961).

This species has been collected in every month of the year.

Typhlodromalus limonicus (Garman and McGregor)

Fig. 363 to 368

Amblyseius limonicus Garman and McGregor, 1956: 11.

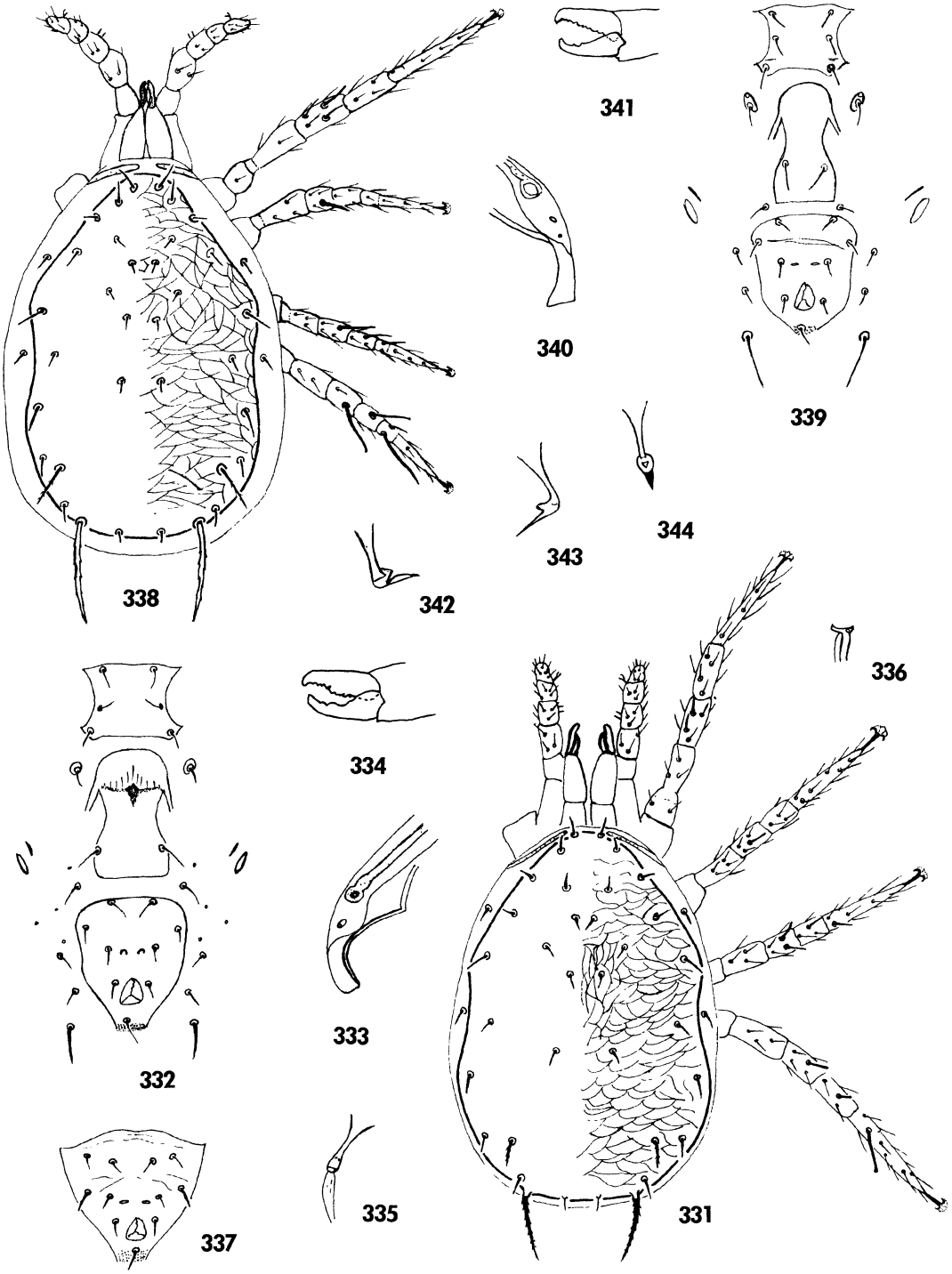
Typhlodromus (*Amblyseius*) *limonicus* (Garman and McGregor), Chant, 1959: 96.

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

Typhlodromalus limonicus (Garman and McGregor), De Leon, 1967: 22.

Fig. 331 to 337. *Typhlodromips hellougreus* Denmark and Muma. 331. Dorsal and leg structure and setation ♀. 332. Ventral scuta and setation ♀. 333. Posterior peritremal and stigmatal development ♀. 334. Cheliceral structure ♀. 335. Spermathecal structure ♀. 336. Spermatodactyl structure ♂. 337. Ventrianal scutum ♂.

Fig. 338 to 344. *Typhlodromips digitulus* (Denmark). 338. Dorsal and leg structure and setation ♀. 339. Ventral scuta and setation ♀. 340. Posterior peritremal and stigmatal development ♀. 341. Cheliceral structure ♀. 342, 343, and 344. Positional variation of spermathecal structure ♀.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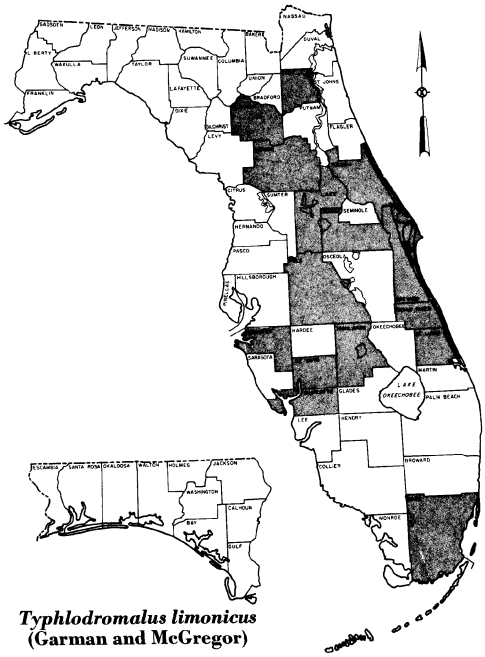


Typhlodromalus limonicus
(Garman and McGregor)

DIAGNOSIS: The closely related *T. hum* Pritchard and Baker and *T. swaga* Pritchard and Baker of Africa can be distinguished only by details of the genitalia, female ventrianal scuta and macrosetae of leg IV. Our specimens have a short spermatheca, not as long as that figured by Schuster and Pritchard (1963). The spermatodactyl is reminiscent of that of *T. peregrinus,* but is bent at more of a right angle apically. The body of this lightly-sclerotized, pale species is about 370μ long.

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

HABITAT: This species has been collected from *Camellia* sp., *Citrus* sp., *Delonix regia, Erigeron* sp., *Ipomoea purpurea, Passiflora* sp., *Salix* sp., *Simaruba glauca, Solidago* sp., and *Tradescantia* sp.

COUNTY DISTRIBUTION: Alachua, Brevard, Charlotte, Clay, Dade, De Soto, Highlands, Indian River, Lake, Manatee, Marion, Orange, Polk, St. Lucie, and Volusia.

BIOLOGY: This species seems to prefer vines, but is also found on various shrubs and trees.

The food habits and biology of this species have been discussed in several papers including Fleschner and Ricker (1954), Chant and Fleschner (1960), and McMurtry and Scriven (1965a).

This species has been collected in January, February, March, April, May, July, and September.

GENUS *EUSEIUS* WAINSTEIN

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

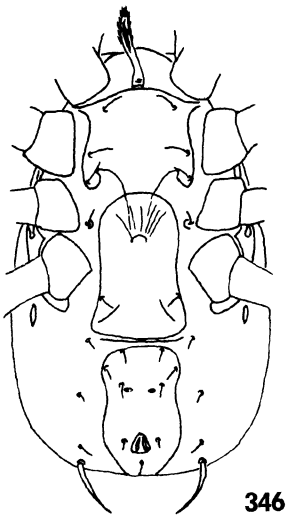
Euseius Wainstein, De Leon, 1966: 86.

DIAGNOSIS: Females are characterized by 4 pairs of dorsal setae, 3 pairs of median setae of which M_3 usually is setiform and scarcely if any larger than M_1 and M_2, 8 pairs of lateral setae which are usually setiform except for L_8 which sometimes is weakly plumose; 2 pairs of sublateral setae on the interscutal membrane; 3 pairs of sternal setae; 3 pairs of preanal ventrianal setae.

Chelicerae small in proportion to the body size with fixed finger edentate or with only 1 or 2 denticules usually distal to the medially located *pilus dentilis.* Sternum longer than wide and indistinctly lobate[1] posteriorly. Peritreme short, extending forward, at most, to the level of L_1. Peritremal scutum indistinguishably fused with stigmatal scutum and leg IV exopodal scutum. Ventrianal scutum elongate, frequently vase-

[1]Lobate condition difficult to distinguish on old slides.

Fig. 345 to 353. *Typhlodromalus peregrinus* (Muma). 345. Dorsal and leg structure and setation ♀. 346. Ventral scuta and setation ♀. 347 and 348. Positional variations of posterior peritremal and stigmatal development ♀. 349. Cheliceral structure ♀. 350. Spermathecal structure ♀. 351. Dorsal and leg structure and setation ♂. 352. Ventral scuta and setation ♂. 353. Cheliceral and spermatodactyl structure ♂.



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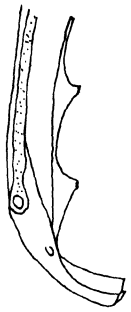

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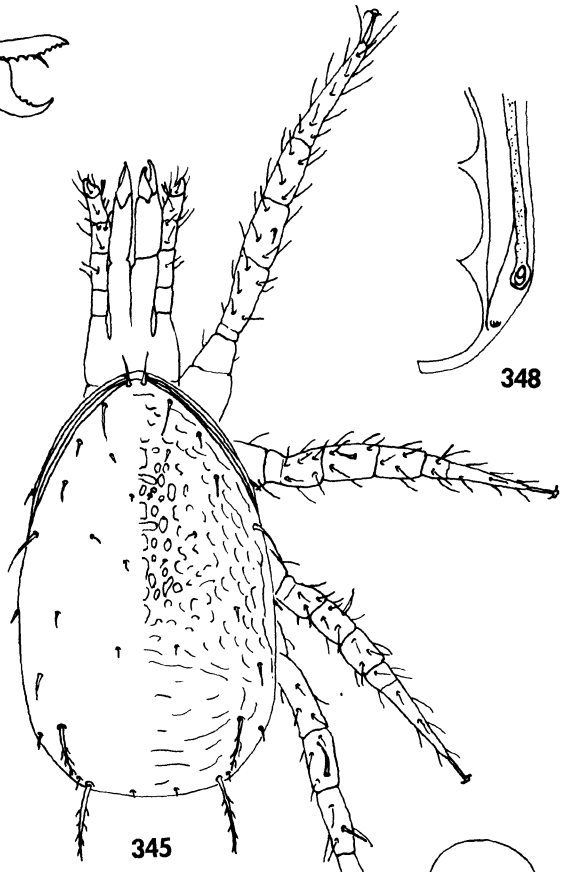

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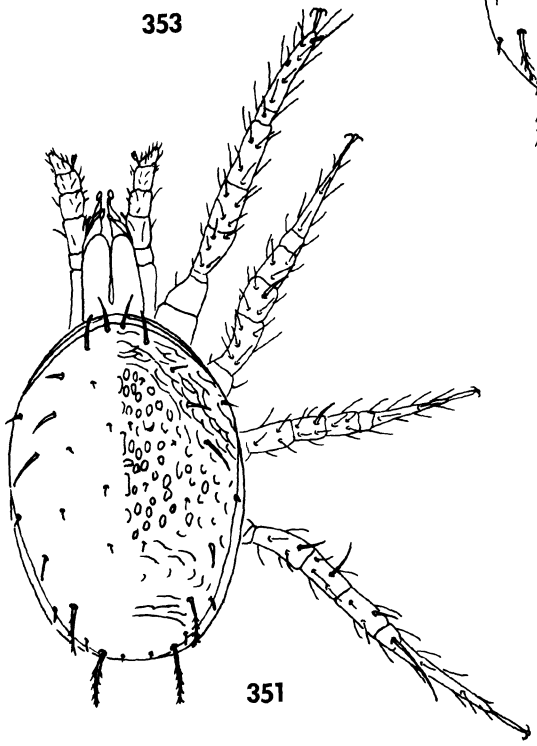

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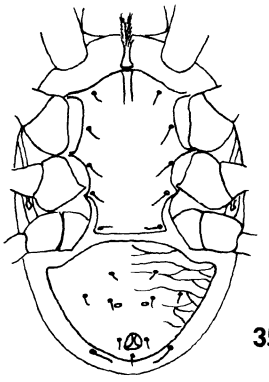

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shaped; the preanal setae more or less aligned in 2 transverse curved rows with no setae on anterior margin of scutum. Macrosetae sometimes occur on the genu of legs II and III, and Sge IV, Sti IV, and St IV are always present with the latter usually longest.

Males are smaller than but similar to females except the sublateral setae are on the dorsal scutum. Ventrianal scutum with 3 pairs of preanal setae. Spermatodactyl of usual form with terminal foot and distinct heel, and lateral process; the toe is frequently bent forward.

TYPE SPECIES: *Seiulus finlandicus* Oudemans, 1915 by designation, Wainstein (1962).

DISCUSSION: This is a large genus comprised of at least 40 known species. They are readily recognized by their small chelicerae, lobate sterna, and position of the preanal ventrianal setae.

The genus is world wide in distribution. It is common on both the mainland of North America and islands of the Caribbean area. Three species are known from Florida.

All of the species inhabit trees or shrubs. Food habit studies indicate that the species are partly predatory but primarily pollenophagus. Many populations are pale green or pale yellow in color apparently because the individuals are feeding on pollen. Large populations of *E. hibisci* (Chant) frequently are found on turks cap and hibiscus which produce flowers continuously throughout the year.

Key to *Euseius* Wainstein in Florida

(Females)

1a	Peritreme extending forward to L_2; preanal setae situated in broad triangles; macrosetae on leg IV distinctly knobbed ..... *sibelius* (De Leon) (p. 98)
1b	Peritreme extending forward to L_1; preanal setae near aligned; macrosetae on leg IV pointed 2
2a(1b)	M_2 distinctly shorter than L_5; L_2, and L_3 more than twice as long as M_1 ..... *hibisci* (Chant) (p. 94)
2b	M_2 subequal with L_5, L_2; and L_3 subequal with M_1 ..... *urceus* (De Leon) (p. 96)

Euseius hibisci (Chant), new combination

Fig. 369 to 375

Typhlodromus finlandicus (Oudemans), Muma, 1955a:268 (misidentification).

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

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

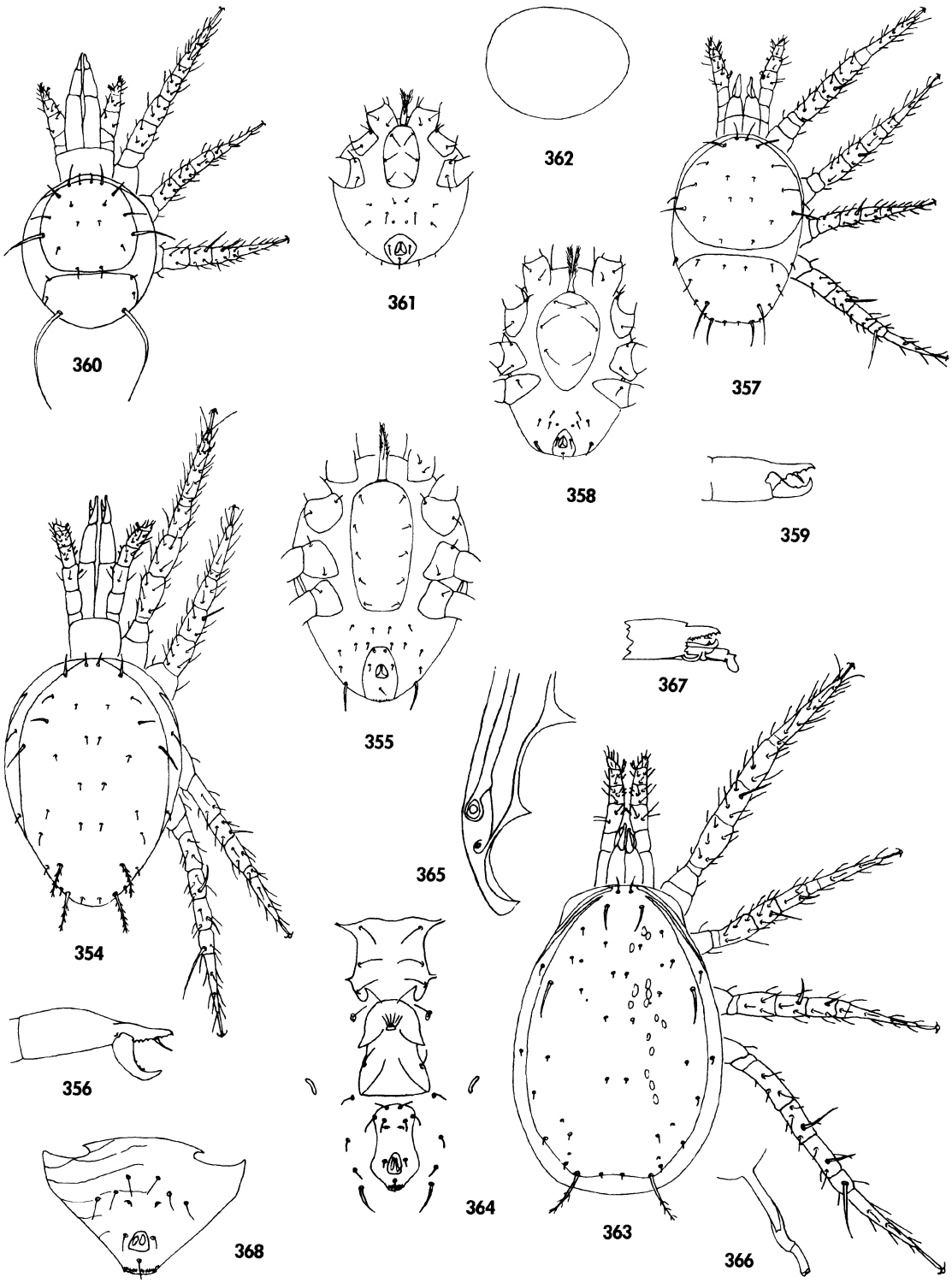
Amblyseius hibisci (Chant), Schuster and Pritchard, 1963: 228.

DIAGNOSIS: This lightly-sclerotized, pale-colored species is distinguished from closely related forms by the relative lengths of the dorsal, median, and lateral setae. Minor differences are also exhibited by the spermatheca and spermatodactyl. The body is about 330μ long.

TYPE: The female holotype from *Hibis-*

Fig. 354 to 362. *Typhlodromalus peregrinus* (Muma). 354. Deutonymph and dorsal and leg structure and setation. 355. Deutonymph ventral scuta and setation. 356. Deutonymph cheliceral structure. 357. Protonymph dorsal and leg structure and setation. 358. Protonymph ventral scuta and setation. 359. Protonymph cheliceral structure. 360. Larval dorsal and leg structure and setation. 361. Larval ventral scuta and setation. 362. Egg.

Fig. 363 to 368. *Typhlodromalus limonicus* (Garman and McGregor). 363. Dorsal and leg structure and setation ♀. 364. Ventral scuta and setation ♀. 365. Posterior peritremal and stigmatal development ♀. 366. Spermathecal structure ♀. 367. Cheliceral and spermatodactyl structure ♂. 368. Ventrianal scutum ♂.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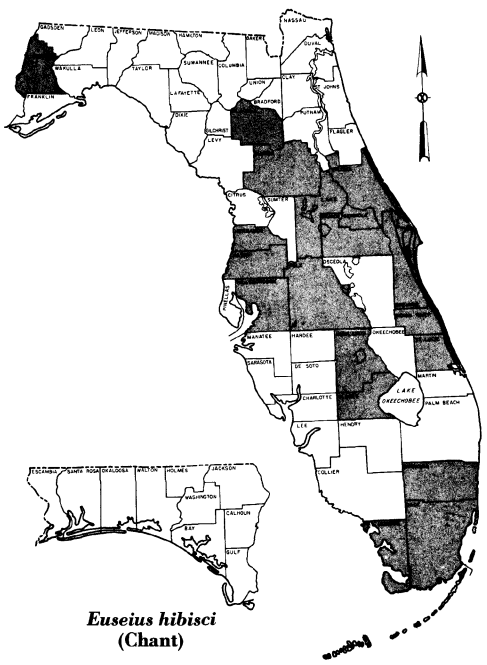

Euseius hibisci
(Chant)

cus sp. leaves, Alamos, Sonora, Mexico, March 6, 1961, by Mr. Crow, is in the USNM, Washington, D. C.

HABITAT: This species is found on a wide variety of plants including *Albizzia* sp., *Antidesmia* sp., *Bauhinia* sp., *Barringtonia speciosa, Bidens bipinnata, Bucida buceras, Calonyction* sp., *Caryota urens, Casuarina* sp., *Cassia antillanum, Citrus aurantifolia, Citrus* sp., *Coccoloba uvifera, Cocos nucifera, Cordia* sp., *Croton* sp., *Erythrina* sp., *Exothea paniculata, Ficus retusa, Fraxinus profunda, Ipomoea batatas, Ipomoea purpurea, Iris* sp., *Ligustrum* spp., *Lucuma* sp., *Magnolia* sp., *Malvaviscus penduliflorus* (= *grandiflorus*), *Persea americana, Photinia* sp., *Pongamia pinnata, Prunus laurocerasus, Psidium* sp., *Quercus stellata* near *garetta, Quercus virginiana, Rhododendron* sp., *Ricinus communis, Schinus terebinthifolia, Senecio confusus, Simarouba glauca, Swietenia* sp., *Syzygium cuminii, Tecoma gaudichaudii, Terminalia arjuna, Terminalia catappa, Thrinax parvifora, Tillandsia usneoides, Viburnum odoratissimum,* and *Vitis* sp.

COUNTY DISTRIBUTION: Alachua, Brevard, Broward, Dade, Glades, Hernando, Highlands, Hillsborough, Indian River, Lake, Liberty, Marion, Monroe, Orange, Pasco, Polk, Seminole, St. Lucie, and Volusia.

BIOLOGY: This is a lightly-sclerotized, pale-colored species. It is found primarily on trees, shrubs, and vertically growing vines. Locally, it is known as the hibiscus mite. Specimens are frequently taken in colonies of spider mites, but food habit studies by McMurtry and Scriven (1965) indicate that pollen is a necessary part of its diet. Individuals run very rapidly when disturbed.

The biology of this species has been discussed in a number of papers, including Fleschner and Ricker (1954), Chant and Fleschner (1960), Bartlett (1964), Muma (1961 and 1964), and McMurtry and Scriven (1964, 1965, 1965a, 1966, and 1966a).

This species has been collected in every month of the year.

Euseius urceus (De Leon), new combination

Fig. 376 to 379

Amblyseius (*Typhlodromalus*) *urceus* De Leon, 1962: 22.

DIAGNOSIS: Dorsal setal lengths, macrosetal proportions and apices, and details of the genitalia serve to distinguish this species from closely related forms. The male is unknown. The ventral scuta on the type cannot be defined. The body is about 280μ long.

TYPE: The female holotype from *Lysiloma bahamensis,* Key Largo, Florida, June 7, 1956, by D. De Leon, is in the MCZ, Harvard University, Cambridge, Mass.

Fig. 369 to 375. *Euseius hibisci* (Chant). 369. Dorsal and leg structure and setation ♀. 370. Ventral scuta and setation ♀. 371. Posterior peritremal and stigmatal development ♀. 372. Cheliceral structure ♀. 373. Spermathecal structure ♀. 374. Positional variations of spermatodactyl structure ♂. 375. Ventrianal scutum. ♂.

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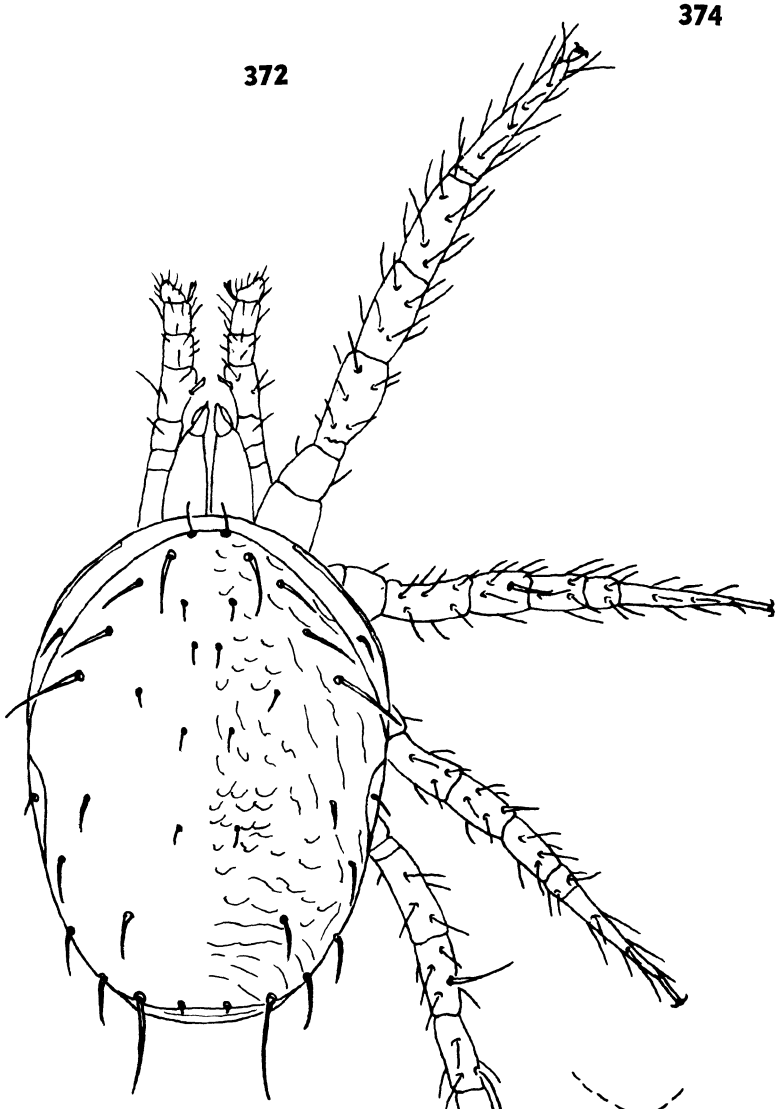

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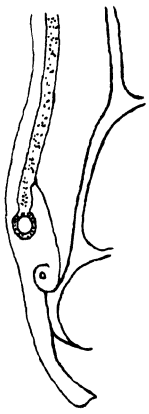

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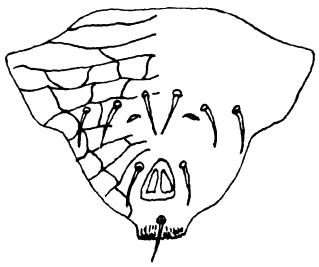

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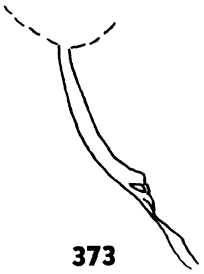

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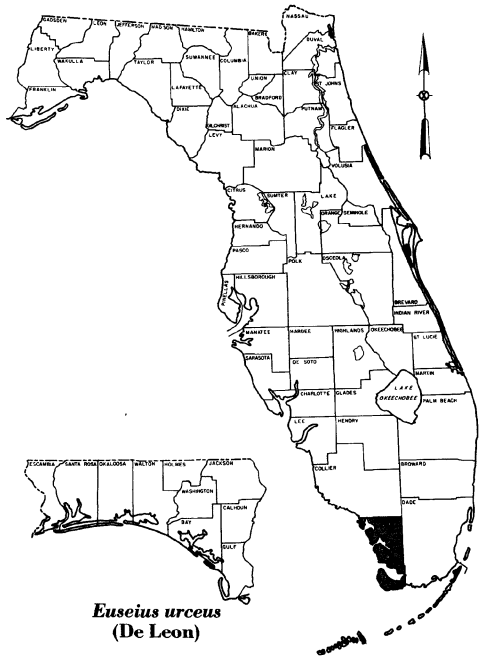


Euseius urceus
(De Leon)

HABITAT: Known only from the holotype.

COUNTY DISTRIBUTION: Monroe.

BIOLOGY: Nothing is known about its biology.

This species has been collected in June.

Euseius sibelius (De Leon)

Fig. 380 to 383

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

Euseius subalatus De Leon, 1965: 127 (new synonymy).

DIAGNOSIS: Relative lengths of dorsal setae, position of preanal setae, and knobbed macrosetae separate this species from *A. scutalis* (Athias-Henriot) and *A. hutu* Pritchard and Baker. The sublateral setae of the females are situated on the dorsal scutum which is atypical for the genus. As with *E. urceus* the ventral scuta on the type are too well cleared to define. The body is about 260μ long.

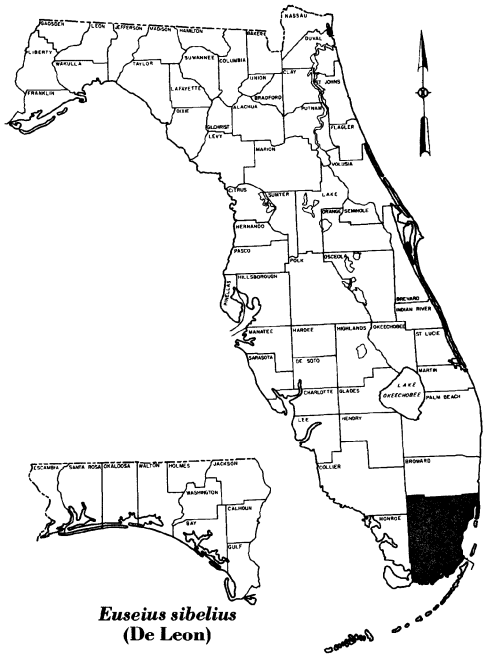
TYPE: The female holotype from *Clerodendrum* sp., Coral Gables, Florida, June 3, 1956, by D. De Leon, is in the MCZ, Harvard University, Cambridge, Mass.

HABITAT: The species is known from *Clerodendrum* sp. and *Terminalia catappa*.

COUNTY DISTRIBUTION: Dade.

BIOLOGY: Nothing is known about the biology.

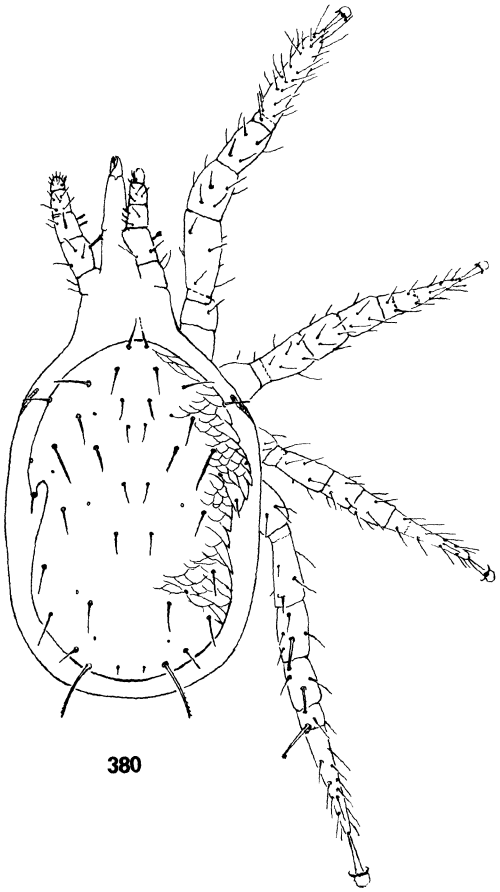
This species has been collected in June.



Euseius sibelius
(De Leon)

Fig. 376 to 379. *Euseius urceus* (De Leon). 376. Dorsal and leg structure and setation ♀. 377. Cheliceral structure ♀. 378. Ventrianal scutum ♀. 379. Spermathecal structure ♀.

Fig. 380 to 383. *Euseius sibelius* (De Leon). 380. Dorsal and leg structure and setation ♀. 381. Cheliceral structure ♀. 382. Ventrianal scutum ♀. 383. Spermathecal structure ♀.



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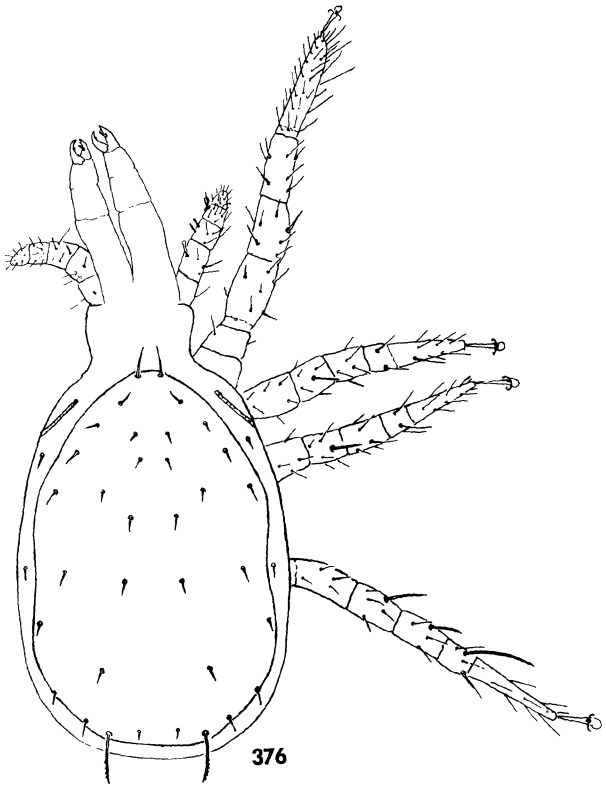

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GENUS *NEOSEIULUS* HUGHES

Neoseiulus Hughes, 1948: 141.
Typhlodromus (*Typhlodromopsis*) De Leon, 1959a: 133 (in part).
Cydnodromus Muma, 1961: 290.
Neoseiulus Hughes, De Leon, 1965: 23.
Cydnodromus Muma, Muma, 1967: 273.
Neoseiulus Hughes, Muma and Denmark, 1968: 235.

DIAGNOSIS: Females are characterized by 4 pairs of dorsal setae, 3 pairs of median setae, 8 pairs of lateral setae that are subequal in length or slightly longer posteriorly; 2 pairs of sublateral setae on the interscutal membrane; 3 pairs of sternal setae; 3 pairs of preanal ventrianal setae.

Chelicerae small in proportion to the body size, fixed finger with 4 to 8 denticules. Sternal scutum as long as or longer than wide with a straight or concave posterior margin. Peritreme long, extending forward to vertical setae. Peritremal scutum indistinguishably fused with stigmatal scutum, but sometimes separated from the exopodal scutum by a faint suture. Ventrianal scutum elongate pentagonal or shield-shaped to nearly quadrate. There are no distinguishable macrosetae on legs I, II, and III, but St IV is nearly always present and Sti IV and Sge IV are present on some species.

Males are smaller than, but similar to, females except that the sublateral setae are on the dorsal scutum. Ventrianal scutum with 3 pairs of preanal setae. Spermatodactyl of usual type with a short broad shank, terminal heel or foot, and distinct to obscure lateral process. The males of some species-groups have the dorsal scutal pore behind L_4 enlarged.

TYPE SPECIES: *Neoseiulus barkeri* Hughes, 1948, by designation.

DISCUSSION: This genus, as recognized here, agrees in most respects with the interpretations of Athias-Henriot (1957) and De Leon (1965). Nesbitt (1951) and Chant (1959 and 1965) define the genus differently, and their interpretation is not recognized here. Muma (1967) and Muma and Denmark (1968) have discussed this problem.

This genus is represented in Florida by several rather distinct species-groups. A group of semi-arboreal species, including *Neoseiulus fallacis* (Garman), *umbraticus* (Chant), and *cucumeris* (Oudemans) have 3 macrosetae on leg IV, sterna as wide as long, and shield-shaped ventrianal scuta. Most species have no or 1 macroseta on leg IV, sterna distinctly longer than wide and pentagonal ventrianal scuta. A group of palm and grass inhabiting species, including *Neoseiulus paspalivorus* (De Leon) and *mumai* (Denmark) have 1 macroseta on leg IV (St IV), sterna much longer than wide, and quadrate ventrianal scuta. One unique species, *Neoseiulus interfolius* (De Leon), also has additional, thickened, elongate setae on the tibia and tarsus. Other species-groups are known throughout the world, but they do not occur in Florida.

This genus includes at least 36 known species. The genus is common in the Caribbean area. Some live on trees and shrubs, others on vines and herbs, and still others in stored products or in ground surface litter. Ten species are found in Florida. Nothing is known of the food habits of most species but studies by Huffaker and Kennett (1956) show that two species feed readily on Tarsonemidae.

Key to *Neoseiulus* Hughes in Florida

(Females)

1a	Leg IV with 3 macrosetae, sternum as wide as long ..... *umbraticus* (Chant) (p. 101)
1b	Leg IV with no or 1 macroseta (see *interfolius*), sternum longer than wide 2
2a(1b)	Dorsal scutum not or only faintly imbricate 3
2b	Dorsal scutum distinctly to strongly imbricate 7
3a	Spermathecae with distinct atria 4
3b	Spermatheca without distinct atria ..... *interfolius* (De Leon) (p. 106)
4a(3a)	Females with elongate cervices .. 5
4b	Females with poculiform crevices ....

..... *gracilis* (Muma) (p. 104)

5a(4a) Cervix abruptly constricted at atrium .... *planatus* (Muma) (p. 104)

5b Cervix not separated from atrium by a constriction 6

6a(5b) St IV very indistinct or absent .... *marinellus* (Muma) (p. 101)

6b St IV present and distinct ....*vagus* (Denmark) (p. 102)

7a(2b) Imbrication between dorsal setae short and broad 8

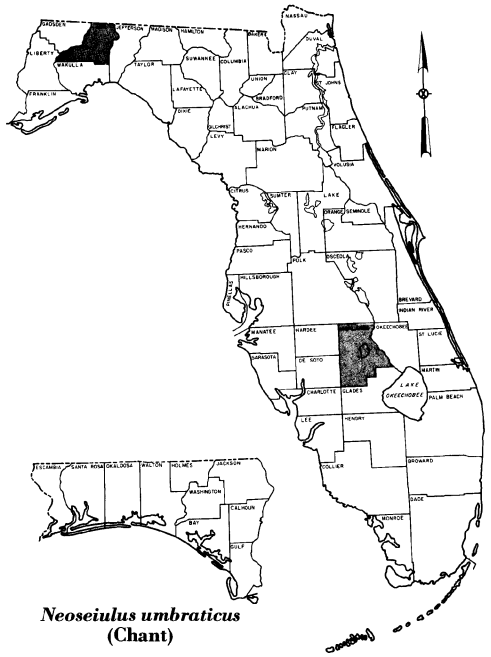
7b Imbrication between dorsal setae long and slender 9

8a(7a) Cervix with a tiny atrium .... *comitatus* (De Leon) (p. 108)

8b Cervix with a large, elongate atrium ..... *kerri* Muma (p. 108)

9a(7b) M_3 only half as long as L_7 and shorter than L_6 .... *mumai* (Denmark) (p. 110)

9b M_3 nearly as long as L_7 and longer than L_6 .... *paspalivorus* (De Leon) (p. 110)



Neoseiulus umbraticus (Chant)

Neoseiulus umbraticus (Chant), new combination

Fig. 384 to 390

Typhlodromus umbraticus Chant, 1956: 26.
Typhlodromus (*Amblyseius*) *umbraticus* Chant, Chant, 1959: 75.
Amblyseius (*Typhlodromopsis*) *umbraticus* (Chant), Muma, 1961: 287.

DIAGNOSIS: This lightly-sclerotized, pale-colored species is distinguished from related species by the presence of large, medially-located, elliptical preanal pores, comparative lengths of dorsal, median and lateral setae, and relative lengths of lateral setae. There are also minor differences in the spermatheca and spermatodactyl, but these require direct comparison. The body is about 330μ long.

TYPE: The female holotype from leaves of *Rubus fruticosus*, Newgate Shaw, East Malling Research Station, Kent, England, October 1964, by D. A. Chant, is in the British Museum (Natural History), London.

HABITAT: Although the species is essentially northern in distribution, several specimens have been taken from *Cornus* sp. leaves in North Florida, and one female from *Quercus* sp. in central Florida.

COUNTY DISTRIBUTION: Highlands, Leon.

BIOLOGY: The biology of this species in Florida is not known.

This species has been collected in August and October.

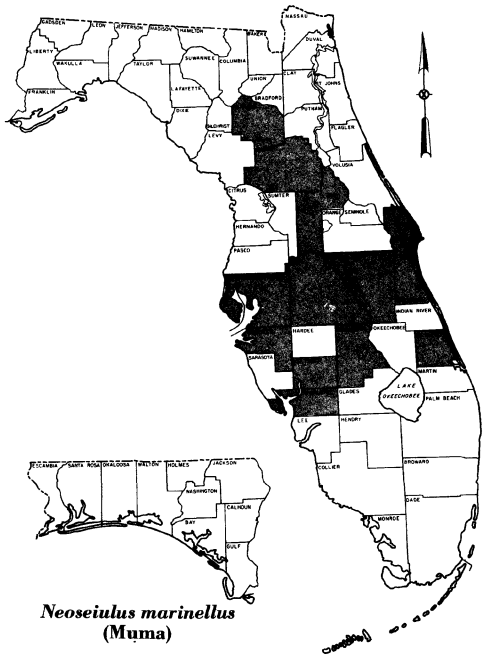
Neoseiulus marinellus (Muma), new combination

Fig. 391 to 398

Cydnodromus marinellus Muma, 1962: 8.

DIAGNOSIS: The lack of a macroseta on the basitarsus of leg IV and details of the spermatheca and spermatodactyl distinguish this species from closely related species such as *N. vagus* (Denmark), *N. brevispinus* (Kennett), and *N. huffakeri* (Schuster and Pritchard). The body is about 270μ long.

TYPE: The female holotype from citrus litter, Minneola, Florida, April 6, 1960, by Judith A. Murrell, is in the USNM, Washington, D. C.



Neoseiulus marinellus
(Muma)

HABITAT: This species has been collected from citrus fruit, bark, and litter, from *Cynodon dactylon, Ipomoea purpurea* leaves, *Paspalum notatum,* under *Quercus* sp., and in can traps in flat pine land. It is much more common in litter.

COUNTY DISTRIBUTION: Alachua, Brevard, Charlotte, De Soto, Highlands, Hillsborough, Lake, Manatee, Marion, Osceola, Pinellas, Polk, and St. Lucie.

BIOLOGY: Nothing is known of the food habits. The species is weakly sclerotized and pale yellow in color. This is the most common member of the genus in citrus litter.

This species has been collected in January, February, April, May, July, October, and December.

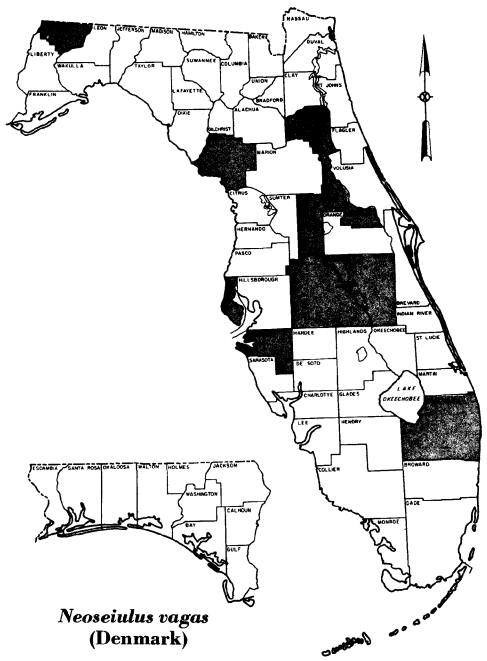
Neoseiulus vagus (Denmark), new combination

Fig. 399 to 405

Cydnodromus vagus Denmark, 1965: 89.

DIAGNOSIS: *Neoseiulus vagus* is similar to *N. gracilis* (Muma), but differs in the shape of the spermatheca and spermatodactyl. This off-white and weakly-sclerotized species is distinguished from *C. marinellus* by a distinct macroseta on leg IV. The body is about 320μ long.

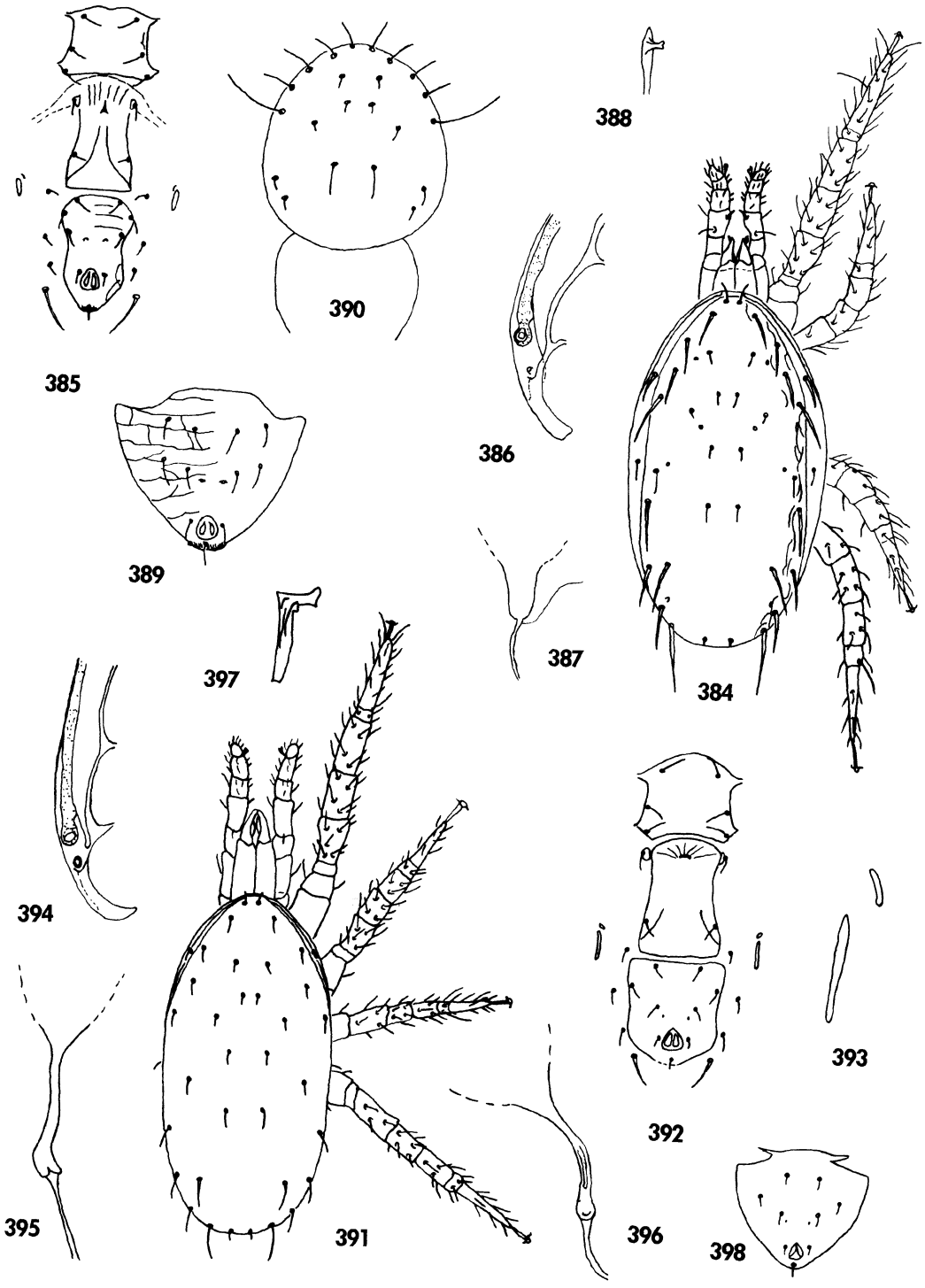
TYPE: The female holotype from Welaka, Florida, April 8, 1964, by H. A. Denmark, on *Lyonia ferruginea,* is in the



Neoseiulus vagas
(Denmark)

Fig. 384 to 390. *Neoseiulus umbracticus* (Chant). 384. Dorsal and leg structure and setation ♀. 385. Ventral scuta and setation ♀. 386. Posterior peritremal and stigmatal development ♀. 387. Spermathecal structure ♀. 388. Spermatodactyl structure ♂. 389. Ventrianal scutum ♂. 390. Larval dorsal setation.

Fig. 391 to 398. *Neoseiulus marinellus* (Muma). 391. Dorsal and leg structure and setation ♀. 392. Ventral scuta and setation ♀. 393. Metapodal scuta ♀. 394. Posterior peritremal and stigmatal development ♀. 395 and 396. Positional variations of spermathecal structure ♀. 397. Spermatodactyl structure ♂. 398. Ventrianal scutum ♂.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USNM, Washington, D. C.

HABITAT: This species has been collected on *Cynodon dactylon, Fragaria* sp., *Gordonia lasianthus, Lyonia ferruginea, Paspalum notatum, Quercus stellata,* and litter.

COUNTY DISTRIBUTION: Gadsden, Lake, Levy, Manatee, Osceola, Palm Beach, Pinellas, Polk, Putnam, and Seminole.

BIOLOGY: The food habits and life history are unknown.

This species has been collected in April, May, June, and August.

Neoseiulus planatus (Muma), new combination

Fig. 406 to 410

Cydnodromus planatus Muma, 1962: 9.

DIAGNOSIS: Details of the genitalia serve to distinguish this weakly-sclerotized and pale-yellow species from all described species except *N. calorai* (Corpuz and Rimando) from the Philippine Islands which also exhibits a constriction of the spermathecal cervix mesad of the atrium. *N. calorai* differs by having L_8 serrate. The spermatodactyl is similar to that of *N. marinellus*. The body is about 340μ long.

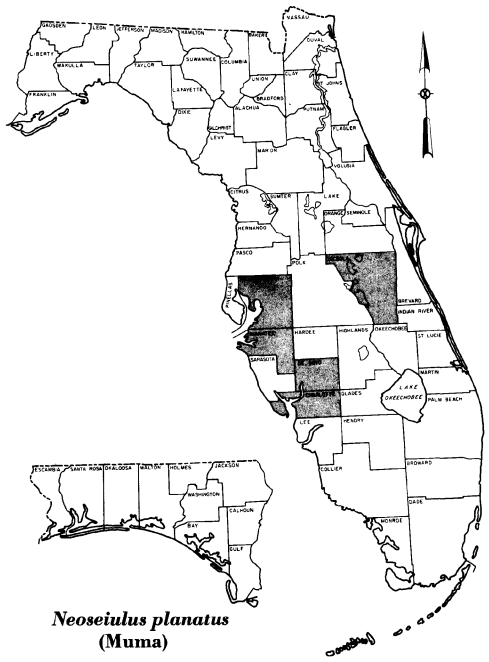
TYPE: The female holotype from citrus litter, Avon Park, Florida, December 7, 1959, by Helen Louise Greene and M. H. Muma, is in the USNM, Washington, D. C.

HABITAT: Citrus fruit and bark, *Pisum* sp., and unidentified litter.

COUNTY DISTRIBUTION: Charlotte, De Soto, Hillsborough, Manatee, and Osceola.

BIOLOGY: Its food habits are unknown.

This species has been collected in January, February, April, and May.



Neoseiulus planatus (Muma)

Neoseiulus gracilis (Muma), new combination

Fig. 411 to 417

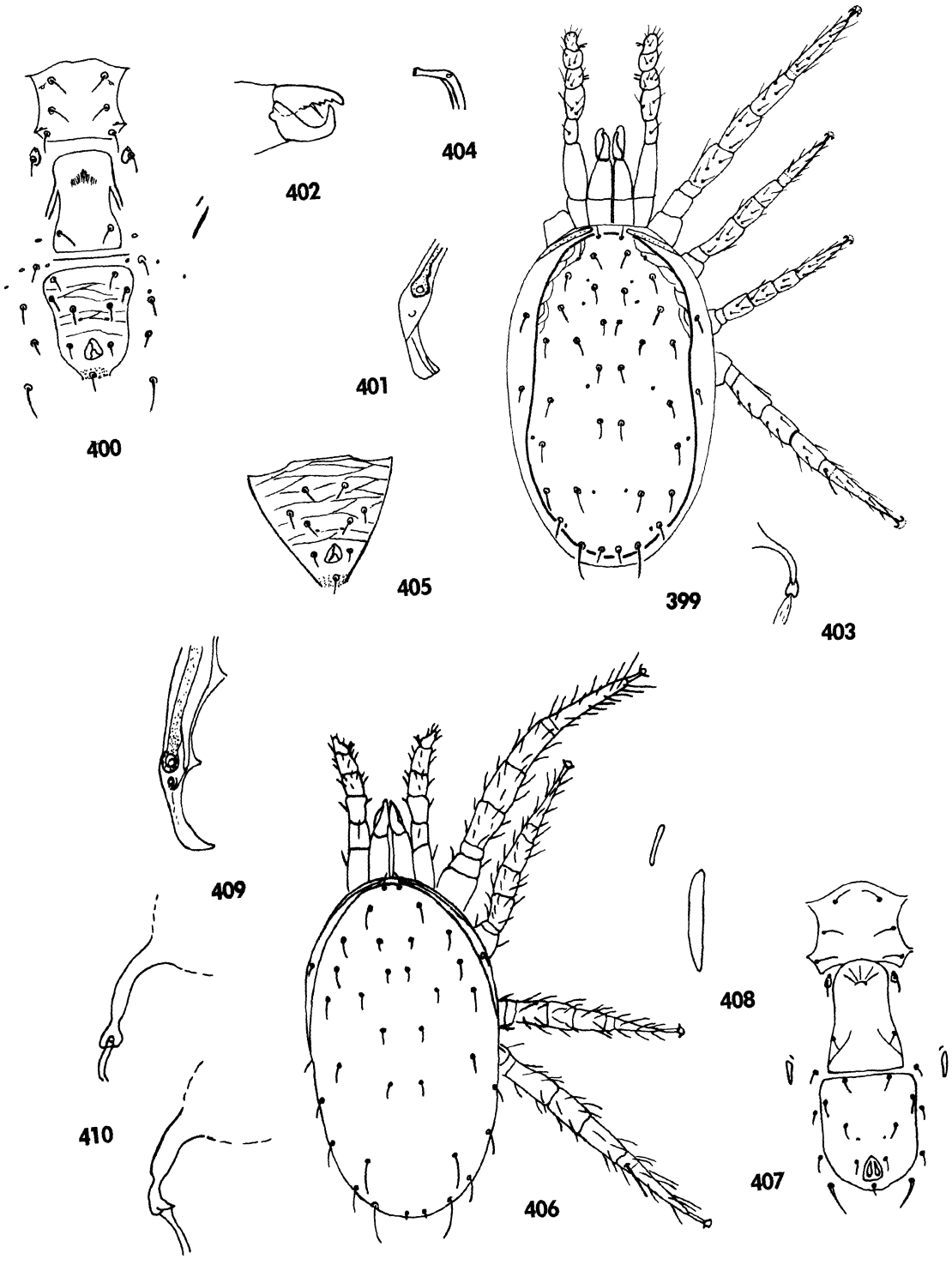
Cydnodromus gracilis Muma, 1962:9.

DIAGNOSIS: The closest relative of this pale-yellow species is *N. vallis* (Schuster and Pritchard) from California. Details of the genitalia and comparative length of the macroseta on the basitarsus of leg IV separate the species. The body is about 330μ long.

TYPE: The female holotype from citrus litter, Sebring, Florida, April 11, 1960, by Judith A. Murrell, is in the USNM, Washington, D. C.

Fig. 399 to 405. *Neoseiulus vagus* (Denmark). 399. Dorsal and leg structure and setation ♀. 400. Ventral scuta and setation ♀. 401. Posterior peritremal and stigmatal development ♀. 402. Cheliceral structure ♀. 403. Spermathecal structure ♀. 404. Spermatodactyl structure ♂. 405. Ventrianal scutum ♂.

Fig. 406 to 410. *Neoseiulus planatus* (Muma). 406. Dorsal and leg structure and setation ♀. 407. Ventral scuta and setation ♀. 408. Metapodal scuta ♀. 409. Posterior peritremal and stigmatal development ♀. 410. Positional variations of spermathecal structure ♀.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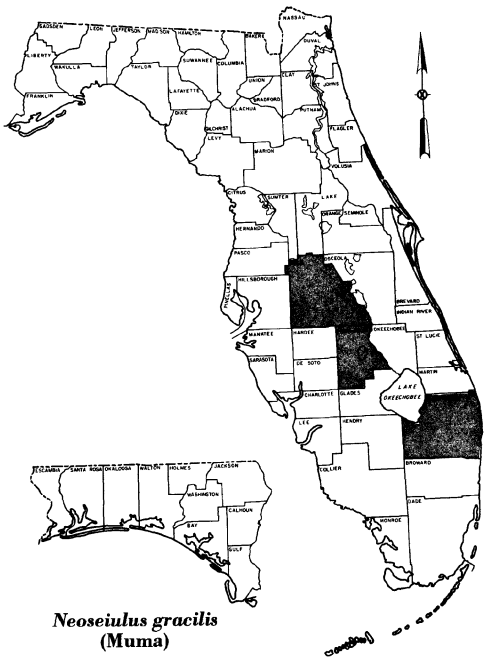


Neoseiulus gracilis
(Muma)

HABITAT: Two females were collected from *Olla abdominalis* 'Plagiata'; other specimens have been taken from citrus litter and *Cynodon dactylon.*

COUNTY DISTRIBUTION: Highlands, Palm Beach, and Polk.

BIOLOGY: The food habits are unknown.

This species has been collected in April, May, and July.

Neoseiulus interfolius (De Leon), new combination

Fig. 418 to 425

Cydnodromus interfolius De Leon, 1962: 16.

DIAGNOSIS: This species is distinguished by the lack of preanal pores, the weakly-sclerotized, poculiform spermatheca (Fig. 423 and 424) and extra macrosetae on leg IV. The male is unknown. The body is about 330μ long.

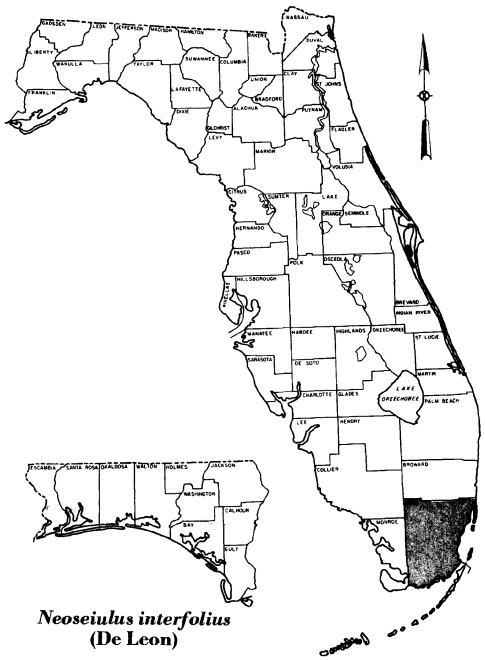
TYPE: The female holotype from folded leaflets of *Sabal palmetto,* Florida City, Florida, March 7, 1959, by D. De Leon, is in the MCZ, Harvard University, Cambridge, Mass.

HABITAT: Known only from the holotype.

COUNTY DISTRIBUTION: Dade.

BIOLOGY: Food habits and biology are unknown.

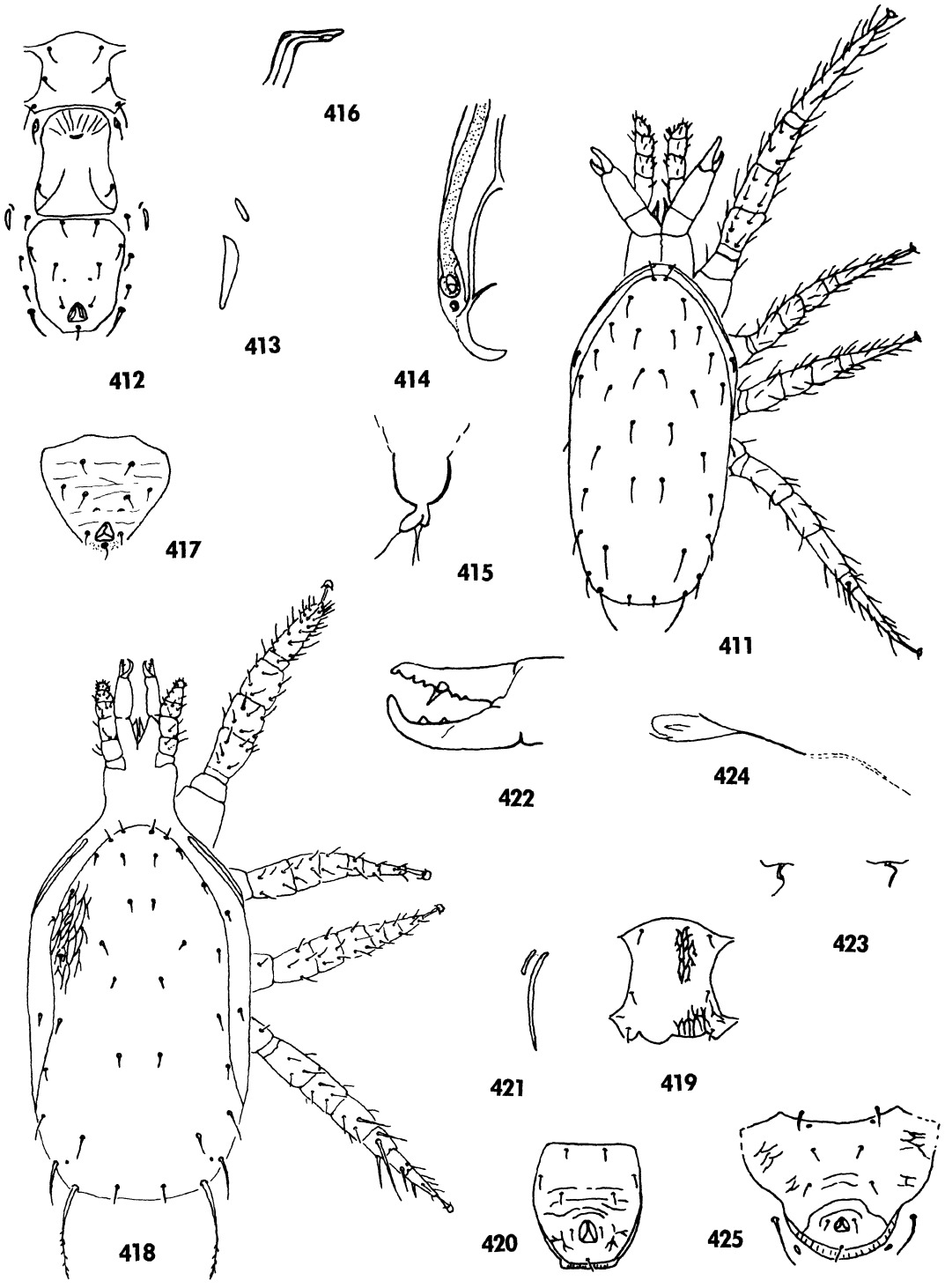
This species has been collected in March.



Neoseiulus interfolius
(De Leon)

Fig. 411 to 417. *Neoseiulus gracilis* (Muma). 411. Dorsal and leg structure and setation ♀. 412. Ventral scuta and setation ♀. 413. Metapodal scuta ♀. 414. Posterior peritremal and stigmatal development ♀. 415. Spermathecal structure ♀. 416. Spermatodactyl structure ♂. 417. Ventrianal scutum ♂.

Fig. 418 to 425. *Neoseiulus interfolius* (De Leon). 418. Dorsal and leg structure and setation ♀. 419. Sternum ♀. 420. Ventrianal scutum ♀. 421. Metapodal scuta ♀. 422. Cheliceral structure ♀. 423. Spermathecal structure (according to Muma) ♀. 424. Spermathecal structure (according to De Leon) ♀. 425. Ventrianal scutum ♂.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Neoseiulus comitatus (De Leon), new combination

Fig. 426 to 430

Cydnodromus comitatus De Leon, 1962: 17.

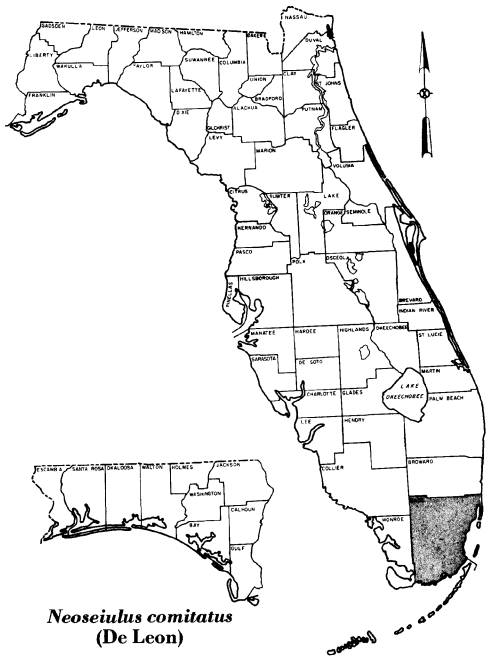
DIAGNOSIS: The broad poculiform spermatheca with a tiny atrium and weakly serrate M_3, L_7, and L_8 distinguish this species. The body is about 410μ long.

TYPE: The female holotype, 2 female paratypes, and 1 male paratype from *Andropogon glomeratus*, South Miami, Florida, October 5, 1955, by D. De Leon, are in the MCZ, Harvard University, Cambridge, Mass.

HABITAT: Known only from the type locality.

COUNTY DISTRIBUTION: Dade.

BIOLOGY: Nothing is known about the food habits.



Neoseiulus comitatus (De Leon)

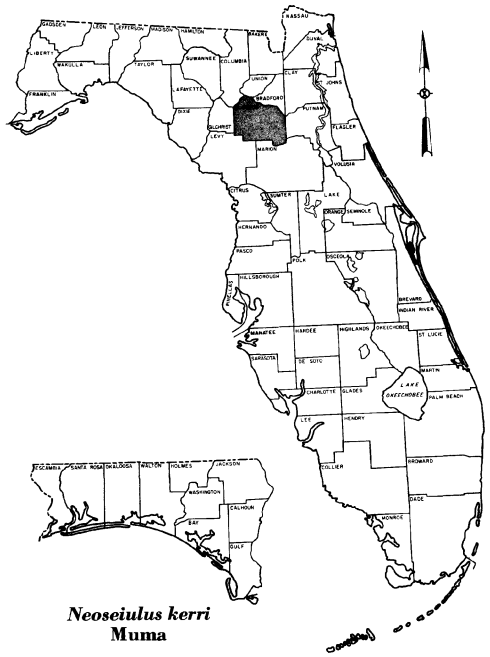
This species has been collected in October.

Neoseiulus kerri Muma

Fig. 431 to 433

Neoseiulus kerri Muma 1965a: 254.

DIAGNOSIS: The extreme length of the dorsal, median and lateral setae, and the form of the spermatheca distinguish this species from other distinctly imbricated species of the genus. No males are known. The body is about 370μ long.



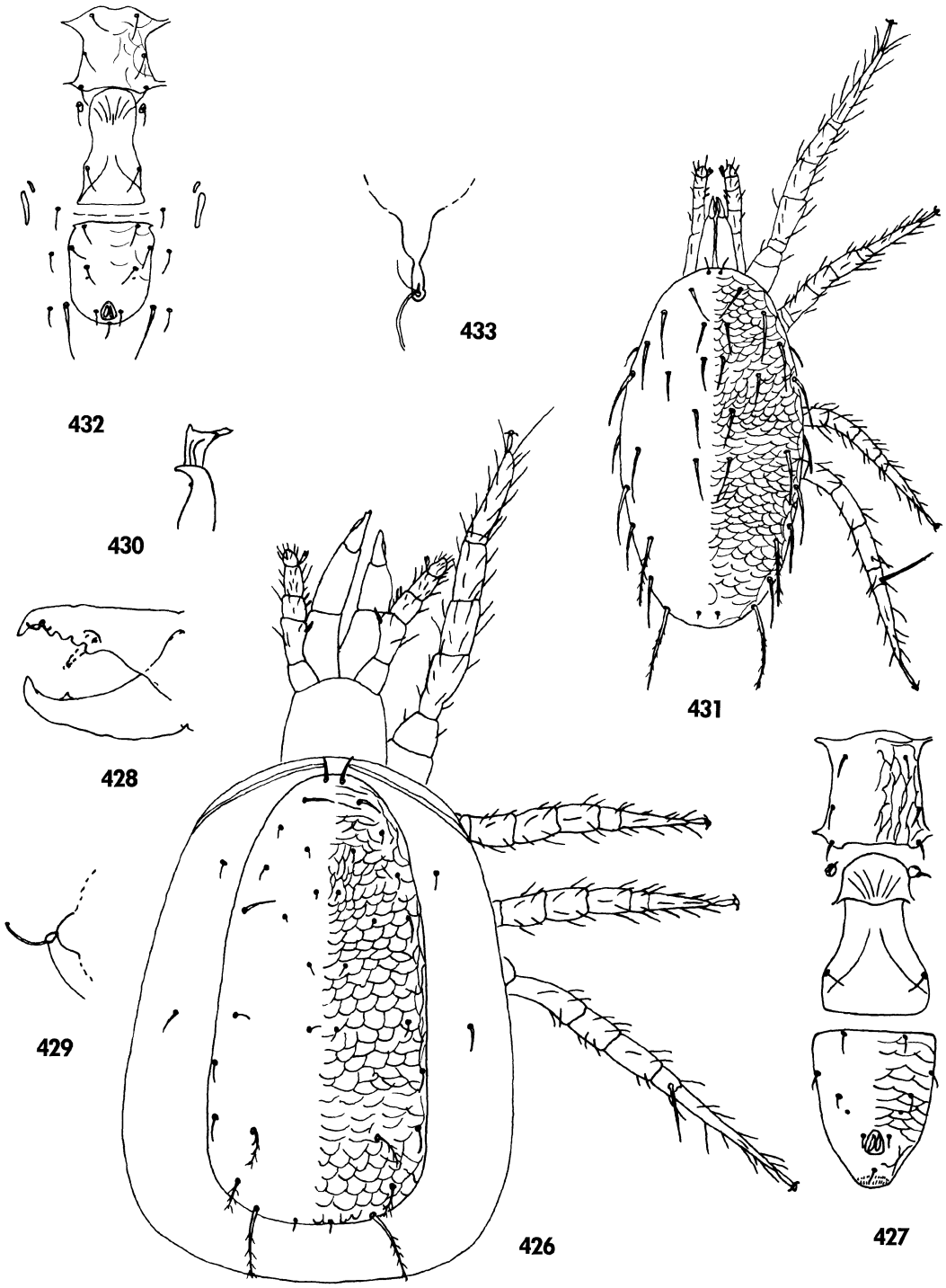
Neoseiulus kerri Muma

TYPE: The female holotype and paratype from *Paspalum notatum*, Gainesville, Florida, June 1962, by S. H. Kerr, are in the USNM, Washington, D. C.

HABITAT: Known only from type and paratype.

Fig. 426 to 430. *Neoseiulus comitatus* (De Leon). 426. Dorsal and leg structure and setation ♀. 427. Ventral scuta and setation ♀. 428. Cheliceral structure ♀. 429. Spermathecal structure ♀. 430. Spermatodactyl structure ♂.

Fig. 431 to 433. *Neoseiulus kerri* Muma. 431. Dorsal and leg structure and setation ♀. 432. Ventral scuta and setation ♀. 433. Spermathecal structure ♀.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COUNTY DISTRIBUTION: Alachua.

BIOLOGY: Food habits and biology are unknown.

This species has been collected in June.

Neoseiulus paspalivorus (De Leon), new combination

Fig. 434 to 439

Typhlodromus paspalivorus De Leon, 1957: 143.

Typhlodromus (*Amblyseius*) *paspalivorus* De Leon, Chant, 1959: 79.

Cydnodromus paspalivorus (De Leon), Muma, 1961: 290.

DIAGNOSIS: This species is distinguished from *N. mumai* (Denmark) by the position of the preanal setae and pores, a shorter macroseta on leg IV, and shorter posterior lateral setae. The body is about 340μ long.

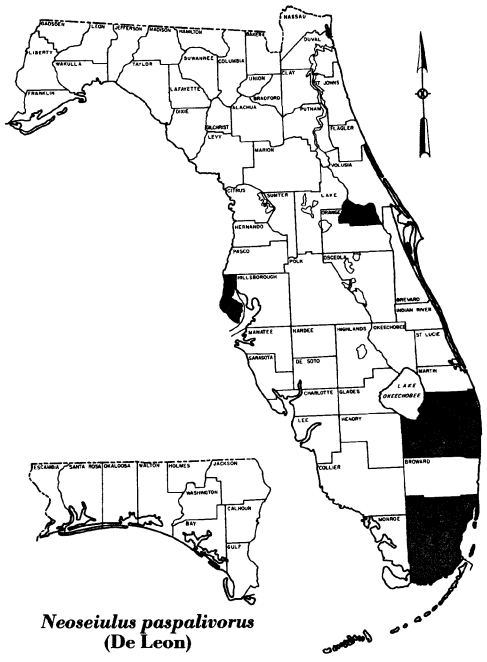
TYPE: The female holotype from under leaf sheath of *Paspalum* sp., Coral Gables, Florida, May 29, 1956, by D. De Leon, is in the MCZ, Harvard University, Cambridge, Mass.

HABITAT: *Cynodon dactylon* and *Paspalum* sp.

COUNTY DISTRIBUTION: Dade, Palm Beach, Pinellas, and Seminole.

BIOLOGY: Food habits and biology are unknown.

This species has been collected in February, May, August, and October.



Neoseiulus paspalivorus (De Leon)

Neoseiulus mumai (Denmark), new combination

Fig. 440 to 446

Cydnodromus mumai Denmark, 1965: 91.

DIAGNOSIS: *Neoseiulus mumai* is a weakly-sclerotized, pale-white species closely related to *N. paspalivorus* (De Leon) from which it may be distinguished by the proportionately longer L_1, L_2, L_3, L_7, L_8, M_3, and the longer macroseta on basitarsus IV. The body is about 340μ long.

TYPE: The female holotype from St. Petersburg, Florida, November 17, 1958, by C. E. Bingaman, on *Arecastrum romanzoffianum* fronds, is in the USNM, Washington, D. C.

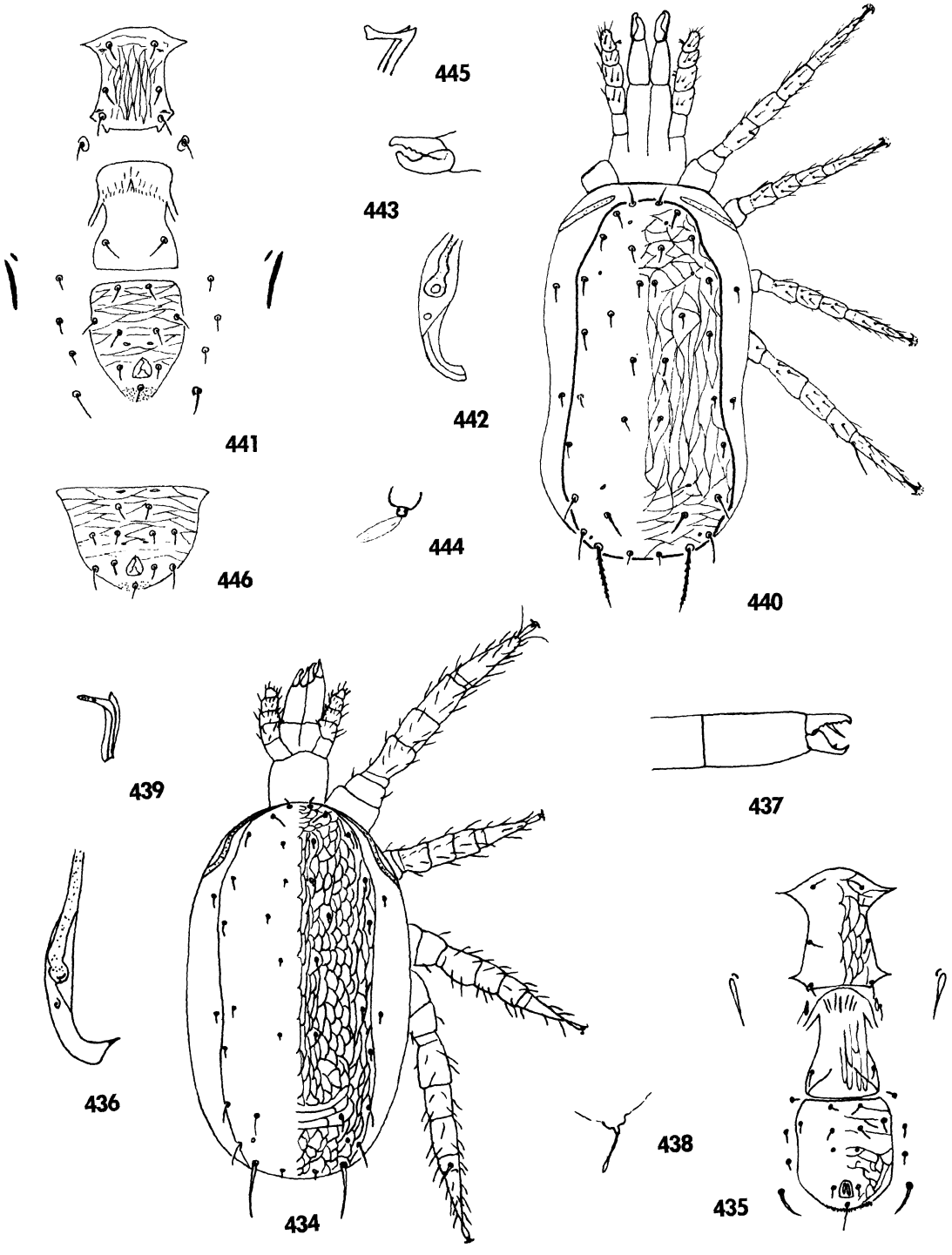
HABITAT: This species has been found only on *Arecastrum romanzoffianum*.

COUNTY DISTRIBUTION: De Soto, Hardee, and Pinellas.

BIOLOGY: Nothing is known of its food habits or life cycle.

Fig. 434 to 439. *Neoseiulus paspalivorus* (De Leon). 434. Dorsal and leg structure and setation ♀. 435. Ventral scuta and setation ♀. 436. Posterior peritremal and stigmatal development ♀. 437. Cheliceral structure ♀. 438. Spermathecal structure ♀. 439. Spermatodactyl structure ♂.

Fig. 440 to 446. *Neoseiulus mumai* (Denmark). 440. Dorsal and leg structure and setation ♀. 441. Ventral scuta and setation ♀. 442. Posterior peritremal and stigmatal development ♀. 443. Cheliceral structure ♀. 444. Spermathecal structure ♀. 445. Spermatodactyl structure ♂. 446. Ventrianal scutum ♂.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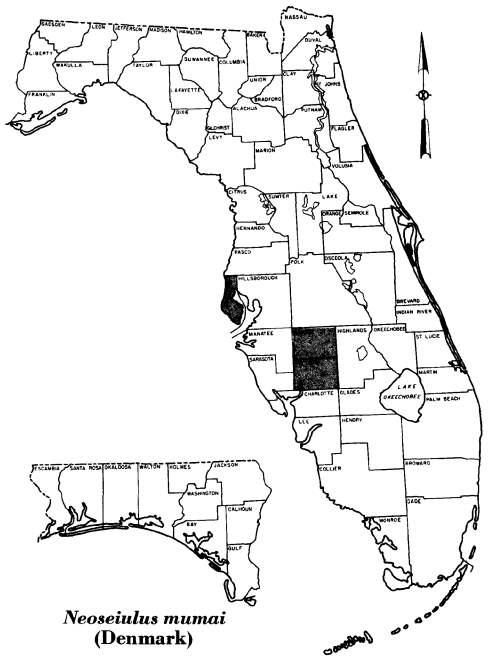
This species has been collected in August and November.



Neoseiulus mumai
(Denmark)

GENUS *PARAAMBLYSEIUS* MUMA

Paraamblyseius Muma, 1962: 8.
Paraamblyseius Muma, Chant and Baker, 1965: 12.
Paraamblyseius Muma, De Leon, 1966: 86.

DIAGNOSIS: Females are characterized by 4 pairs of dorsal setae, 3 pairs of median setae, 8 pairs of lateral setae all short and simple; 2 pairs of sublateral setae on interscutal membrane; 3 pairs of sternal setae; 4 pairs of preanal setae on a massive ventrianal scutum and massive metapodal scuta.

The dorsal scutum is well sclerotized and ornamented with what appear to be lunate pits. Chelicerae small in proportion to the body size. There is 1 pair of ventrolateral setae, excluding caudals. Ventral scuta well sclerotized; sternal and ventrianal scuta imbricate; genital, ventrianal, and metapodal scuta with lunate pits. Peritreme long, extending forward to vertical setae. Peritremal, stigmatal, and leg IV exopodal scuta easily distinguished by line-like sutures; the peritremal scutum does not extend to the exopodal scutum. No macrosetae are present on any legs. Genu III lacks a ventral seta.

Males are similar to, but smaller than females. The male spermatodactyl is typical according to Chant and Baker, 1965.

TYPE SPECIES: *Paraamblyseius lunatus* Muma, 1962, by designation.

DISCUSSION: This genus is presently represented by 2 species, the type and *P. ogdeni* De Leon. It is known only from the Caribbean area. Only the genotype is known from Florida.

The genus has been taken only from shrubs and trees. The food habits are unknown.

Paraamblyseius lunatus Muma

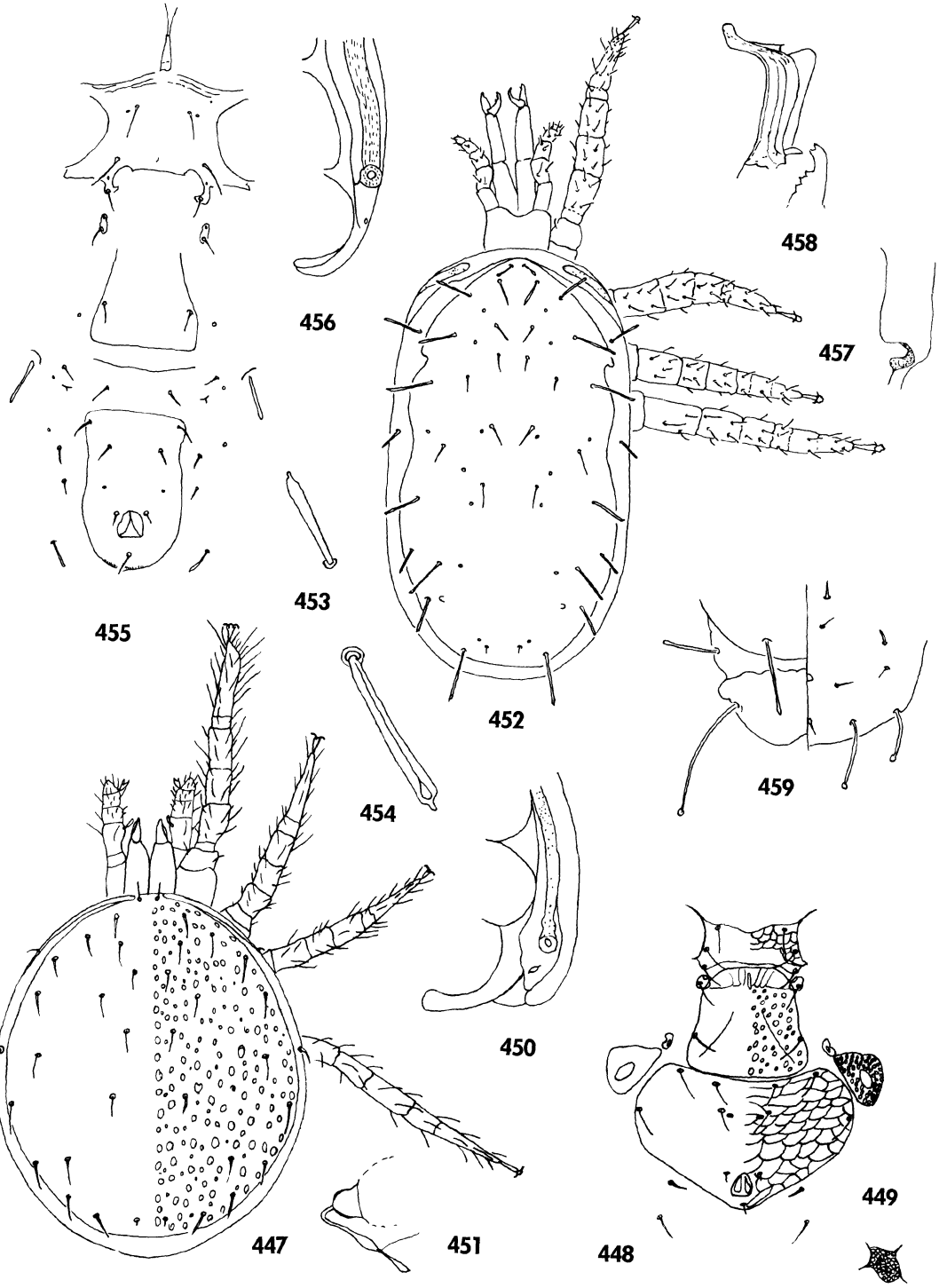
Fig. 447 to 451

Paraamblyseius lunatus Muma, 1962: 8.
Paraamblyseius lunatus Muma, Chant and Baker, 1965: 12.

DIAGNOSIS: The generic characters and its small size serve to distinguish this species from other Amblyseiines. The body is about 290μ long.

Fig. 447 to 451. *Paraamblyseius lunatus* Muma. 447. Dorsal and leg structure and setation ♀. 448. Ventral scuta and setation ♀. 449. Detail of ventrianal scutum ornamentation ♀. 450. Posterior peritremal and stigmatal development ♀. 451. Spermathecal structure ♀.

Fig. 452 to 459. *Phyllodromus leiodis* De Leon. 452. Dorsal and leg structure and setation ♀. 453 and 454. Details of L_5 structure ♀. 455. Ventral scuta and setation ♀. 456. Posterior peritremal and stigmatal development ♀. 457. Spermathecal structure ♀. 458. Spermatodactyl and cheliceral structure ♂. 459. Posterior hysterosoma of larva (dorsal left, ventral right).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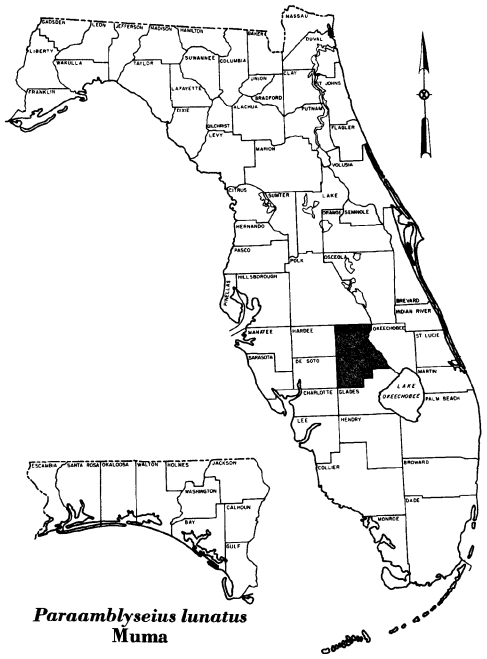


Paraamblyseius lunatus
Muma

TYPE: The female holotype from *Serenoa repens* leaf, Highlands Hammock State Park, southwest of Sebring, Florida, January 23, 1961, by M. H. Muma, is in the USNM, Washington, D. C.

HABITAT: Known only from *Serenoa repens.*

COUNTY DISTRIBUTION: Highlands.

BIOLOGY: This species is heavily sclerotized and dark red-brown in color. It has been found also in Central America. Nothing is known about its food habits.

This species has been collected in January and February.

GENUS *PHYLLODROMUS* DE LEON

Phyllodromus De Leon, 1959c:260.

DIAGNOSIS: Females are characterized by 4 pairs of dorsal setae, 3 pairs of median setae, 8 pairs of lateral setae most of them flattened and oblanceolate; 2 pairs of sublateral setae on the interscutal membrane; 3 pairs of sternal setae; and 2 pairs of preanal setae.

The chelicerae are small in porportion to the body size, fixed fingers with 5 or 6 denticules; movable finger with 2. Sternal scutum is wider than long with a concave posterior margin. Ventrianal scutum elongate and shield-shaped. Peritreme wide and long, extending forward to L_1. Peritremal scutum indistinguishably fused to stigmatal and exopodal scuta. Peritreme much wider than usual for the family. Legs I, II, and III without macrosetae; Sge IV, Sti IV, and St IV also are absent. Leg formula 4123 with all legs short and stocky.

The male spermatodactyl has a terminal foot, distinct heel, distinct lateral process, and a distinct crest.

TYPE SPECIES: *Phyllodromus leiodis* De Leon, 1959, by designation.

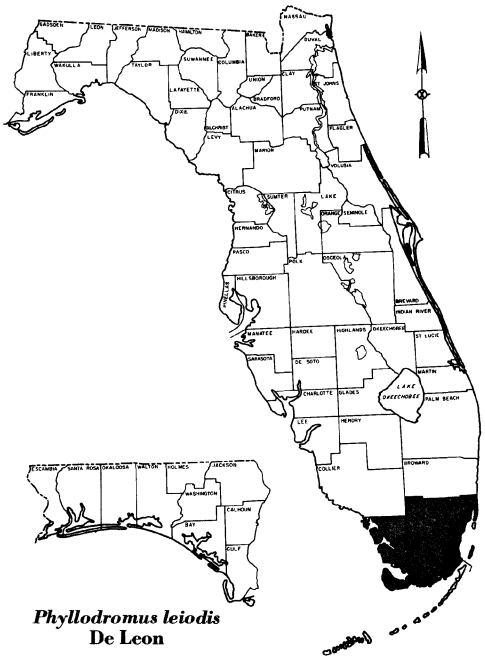
DISCUSSION: This is a monotypic genus. It is known only from Florida.

Phyllodromus leiodis De Leon

Fig. 452 to 459

Phyllodromus leiodis De Leon, 1959c: 260.

DIAGNOSIS: The generic characters serve to distinguish this unique species. The striking form of the lateral, especial-



Phyllodromus leiodis
De Leon

ly posterior lateral setae, and M_3 are not found on any other phytoseiid. The body is about 350μ long.

TYPE: The female holotype from *Waltheria americana,* Miami, Florida, September 20, 1958, by D. De Leon is in the MCZ, Harvard University, Cambridge, Mass.

HABITAT: Found only between the flower heads of *Waltheria americana.*

COUNTY DISTRIBUTION: Dade and Monroe.

BIOLOGY: The food habits and biology are unknown.

This species has been collected in March and September.

SUBFAMILY PHYTOSEIINAE

Phytoseiinae Berlese, 1916: 11.
Phytoseiinae Berlese, Muma, 1961: 292.

Phytoseiidae with an undivided dorsal scutum with 3 to 4 pairs of dorsal setae; 1 to 3 pairs of median setae; 8 to 11 pairs of lateral setae with 5 or more well anterior to D_3; 1 or 2 pairs of sublateral setae on females; ventrianal scutum with 1 to 4 pairs of preanal setae; no to 3 macrosetae on leg IV. Males have an entire shield-shaped ventrianal scutum with 3 or 4 pairs of ventrianal setae and usually 2 pairs of sublateral setae located on the dorsal scutum.

TYPE GENUS: *Phytoseius* Ribaga, 1904, by indication, Berlese (1916).

DIAGNOSIS: Small phytoseiids with undivided dorsal scutum and 5 pairs of anterior lateral setae well anterior to D_3.

DISCUSSION: In the illustrations of species of this subfamily the omission of sternal and dorsal scutal pores does not infer pore absence; see discussion under Amblyseiinae.

GENUS *PHYTOSEIUS* RIBAGA

Phytoseius Ribaga, 1904: 177.
Dubininellus Wainstein, 1959: 1365.
Phytoseius Ribaga, Chant and Athias-Henriot, 1960: 213.
Pennaseius Pritchard and Baker, 1962: 223.
Phytoseius Ribaga, Denmark, 1966: 11.
Phytoseius Ribaga, Muma and Denmark, 1968: 229.

DIAGNOSIS: Females of the genus *Phytoseius* have the dorsal shield entire, smooth or rugose, 3 or 4 pairs of dorsal setae, 1 pair of median setae; 8 pairs of lateral setae, some thickened and serrate; 1 or 2 pairs of sublateral setae, with anterior pair on the dorsal shield; a pair of verticals, and a pair of clunals. Ventrianal scutum with 1 to 3 pairs of preanal setae.

TYPE SPECIES: *Gamasus plumifer* Canestrini and Fanzago, 1876, by subsequent designation, Vitzthum (1941), based on Ribaga's (1904) description.

DISCUSSION: This genus is world wide in distribution; more than 40 species are known at the present time (Denmark 1966). They are recognized here as representing 2 subgenera, *Phytoseius* Ribaga and *Pennaseius* Pritchard and Baker. Seven species are known from Florida.

Key to Subgenera *Phytoseius* Ribaga in Florida

1a Posterior sublateral setae (S_2 of authors) present ..... *Pennaseius* (p. 120)
1b Posterior sublateral setae absent ..... *Phytoseius* (p. 115)

Subgenus *Phytoseius* Ribaga

Phytoseius Ribaga, 1904: 175.
Dubininellus Wainstein, 1959: 1361.
Phytoseius Ribaga, Muma and Denmark, 1968: 236.

DIAGNOSIS: Females of this subgenus are characterized by a rugose dorsal scutum with 3 pairs of dorsal setae; 1 pair of median

setae; 8 pairs of lateral setae with some unusually thick and serrate; only 1 pair (S_1) of sublateral setae located on the dorsal scutum; 1 to 3 pairs of preanal setae on the ventrianal scutum; 2 to 4 pairs of ventrolateral setae and a pair of caudal setae; no to 3 macrosetae on leg IV that are usually thicker and longer than in *Pennaseius*; when present, macrosetae Sti IV longest; no macrosetae or modified setae except on leg IV; leg formulae 4123; peritreme extending to verticals; peritremal and stigmatal scuta indistinguishably fused and extending parallel to leg IV exopodal scutum; spermatheca has a saccular cervix and nodular atrium; chelicerae small in proportion to the body size, movable cheliceral finger with no or 1 denticule; fixed finger with 2 to 4 denticules.

Males are distinctly smaller than, but otherwise similar to females. The spermatodactyl has foot usually terminal with heel and lateral process subequal and distinct. A crest may or may not be present on the shank. The ventrianal scutum has three pairs of preanal setae.

TYPE SPECIES: *Gamasus plumifer* Canestrini and Fanzago, 1876, by subsequent designation, Vitzthum, 1941, based on Ribaga's (1904) description.

DISCUSSION: This subgenus is distinguished from *Pennaseius* Pritchard and Baker by having L_7 and L_8 separated by less than 2 diameters of a setal socket, only 1 sublateral seta which is on the dorsal scutum, only 3 pairs of dorsal setae, and leg IV with the longest macroseta Sti IV. This subgenus is usually found on trees or understory plants. Very little is known about the food habits. *P. macropilis* (Banks) was associated originally with an eriophyid mite. *P. betulae* Denmark also has been associated with *Aceria* sp., but was not observed feeding.

Key to Species of Subgenus *Phytoseius* Ribaga in Florida

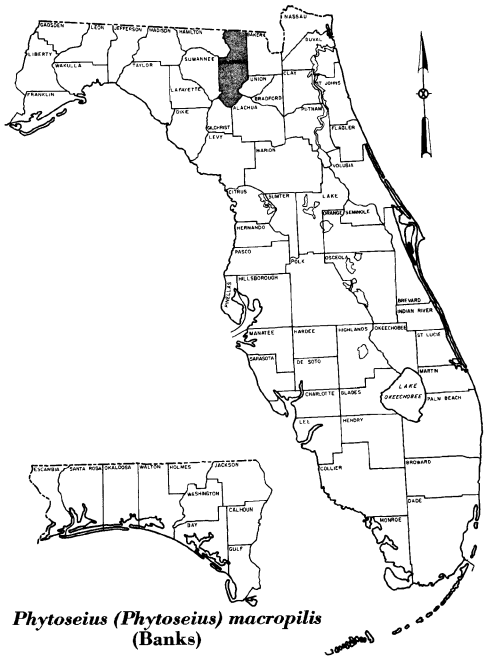
(Females)

1a	One pair of preanal setae	2
1b	Two pairs of preanal setae	3
2a(1a)	Macroseta present on genu of leg IV, 3 pairs of setae surround the ventrianal scuta .. *bakeri* Chant (p 117)	
2b	Macroseta absent on genu of leg IV, 4 pairs of setae surround the ventrianal scuta *deleoni* Denmark (p. 120)	
3a(1b)	L_5 and L_6 approximal lengths, clunals ..... *betulae* Denmark (p. 117)	
3b	L_5 longer than L_6	4
4a(3b)	L_1 longer than verticals .... *chanti* Denmark (p. 118)	
4b	L_1 and verticals approximal lengths ..... *macropilis* (Banks) (p. 116)	

Phytoseius (Phytoseius) macropilis (Banks)

Fig. 460 to 466

Sejus macropilis Banks, 1909: 135.
Seiulus spoofi Oudemans, 1915a: 184.
Typhlodromus spoofi (Oudemans), Oudemans, 1930: 98.



Phytoseius (Phytoseius) macropilis (Banks)

Phytoseius spoofi (Oudemans), Nesbitt, 1951: 57.

Phytoseius macropilis (Banks), Cunliffe and Baker, 1953: 22.

Phytoseius (Dubininellus) macropilis (Banks), Wainstein, 1959: 1365.

Phytoseius macropilis (Banks), De Leon, 1959: 149.

DIAGNOSIS: *P. macropilis* is similar to *P. chanti* Denmark and *P. betulae* Denmark. Seta L_1 is much shorter in *P. macropilis* and the clunals are short and serrate. The body is about 270μ long.

TYPE: The female holotype from Guelph, Ontario, Canada, July 27, 1909, attacking *Eriophyes* on large-tooth aspen, is in the MCZ, Harvard University, Cambridge, Mass.

HABITAT: Only one valid record from Florida—O'Leno State Park, September 17, 1962, by H. A. Denmark, on *Styrax americana.*

COUNTY DISTRIBUTION: Columbia.

BIOLOGY: Living specimens are usually found on the underside of leaves. Banks reported *P. macropilis* associated with *Eriophyes.* No definite food habits have been determined for this mite. It has been collected in September.

Phytoseius (Phytoseius) betulae Denmark

Fig. 467 to 473

Phytoseius (Dubininellus) betulae Denmark, 1966: 60.

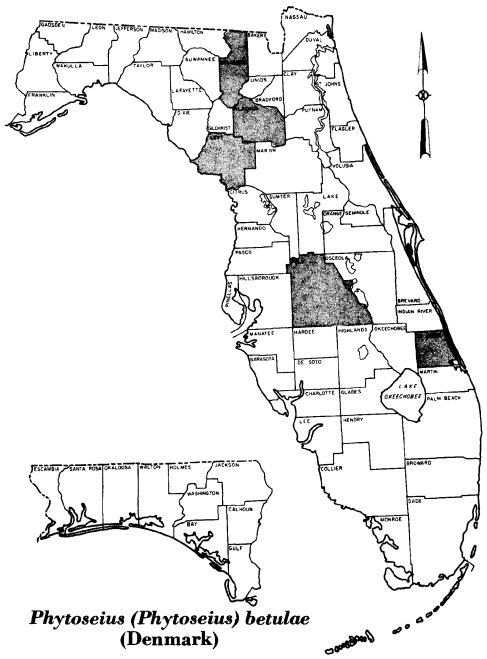
DIAGNOSIS: *P. betulae* is closely related to *P. chanti* Denmark, but differs by having the clunals longer and serrate. The body is about 250μ long.

TYPE: The female holotype from O'Leno State Park, Columbia County, July 19, 1961, by G. W. Dekle, on *Betula nigra,* is in the USNM, Washington, D. C.

HABITAT: The species has been taken on *Betula nigra, Cephalanthus occidentalis,* and *Quercus stellata.*

COUNTY DISTRIBUTION: Alachua, Columbia, Levy, Polk, and St. Lucie.

BIOLOGY: This mite was collected first on river birch and was associated with a high population of eriophyid mites. It was taken later on button bush and post oak, and no eriophyids were observed to be present. A tetranychid mite was present in small numbers on post oak, but the food habits are unknown. Nymphs, males, and females have been taken.



Phytoseius (Phytoseius) betulae (Denmark)

This species has been collected in April, July, and August.

Phytoseius (Phytoseius) bakeri Chant

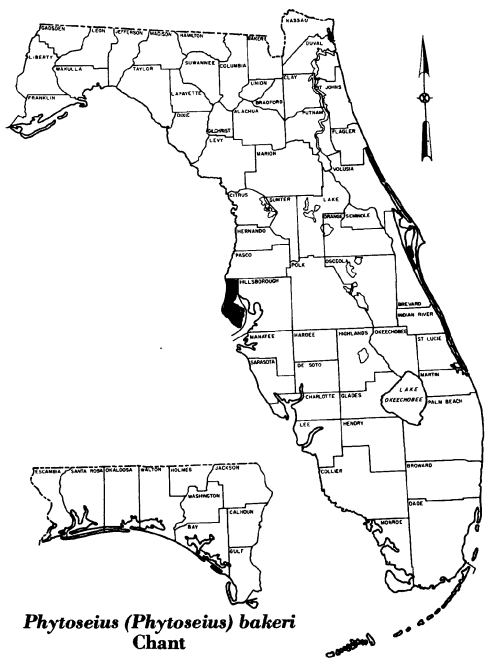
Fig. 474 to 480

Phytoseius (Dubininellus) bakeri Chant, 1959: 108.

DIAGNOSIS: *P. bakeri* is similar to *P. deleoni* Denmark, but has short, smooth clunals and Sge IV. The body is about 280μ long.

TYPE: The female holotype from St. Petersburg, Florida, July 11, 1952, by E. W. Baker, on "plant XY", is in the USNM, Washington, D. C.

HABITAT: Recorded host plants are *Salix* sp. and "plant XY".



Phytoseius (Phytoseius) bakeri
Chant

COUNTY DISTRIBUTION: Pinellas.

BIOLOGY: Thirty females and three males were collected on "plant XY". This is the only Florida record, and nothing is known about its food habits. It seems to be a more northerly form, as it has been collected several times in Ohio.

This species has been collected in July.

Phytoseius (Phytoseius) chanti Denmark

Fig. 481 to 487

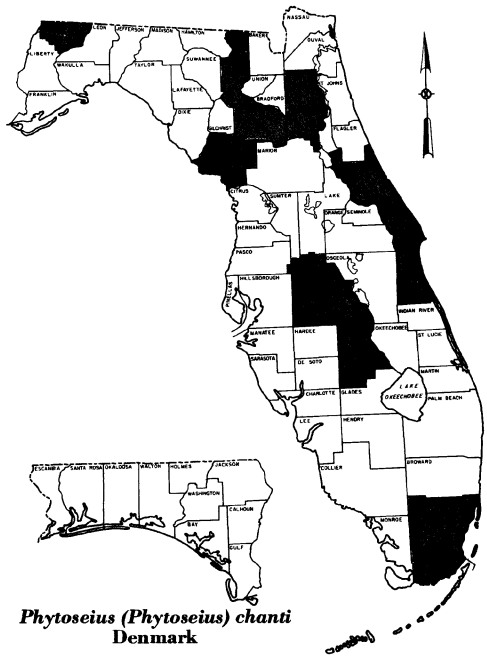
Phytoseius (*Dubininellus*) *chanti* Denmark, 1966: 58.

DIAGNOSIS: *P. chanti* Denmark is similar to *P. betulae* Denmark, but has St IV longer than in *betulae*, and the clunals tiny and setiform. The body is about 270μ long.

TYPE: The female holotype from the University of Florida Conservation Reserve, Welaka, Florida, April 8, 1965, by H. A. Denmark, on *Quercus virginiana*, is in the USNM, Washington, D.C.

HABITAT: Recorded host plants are *Calocarpum sapota, Cynodon dactylon, Diospyros* sp., *Pisium* sp., *Quercus durandii, Quercus stellata, Quercus virginiana, Quercus* sp., *Rhus copallina leucantha, Styrax americana, Vitis* sp., and can trap in relict sand dune.

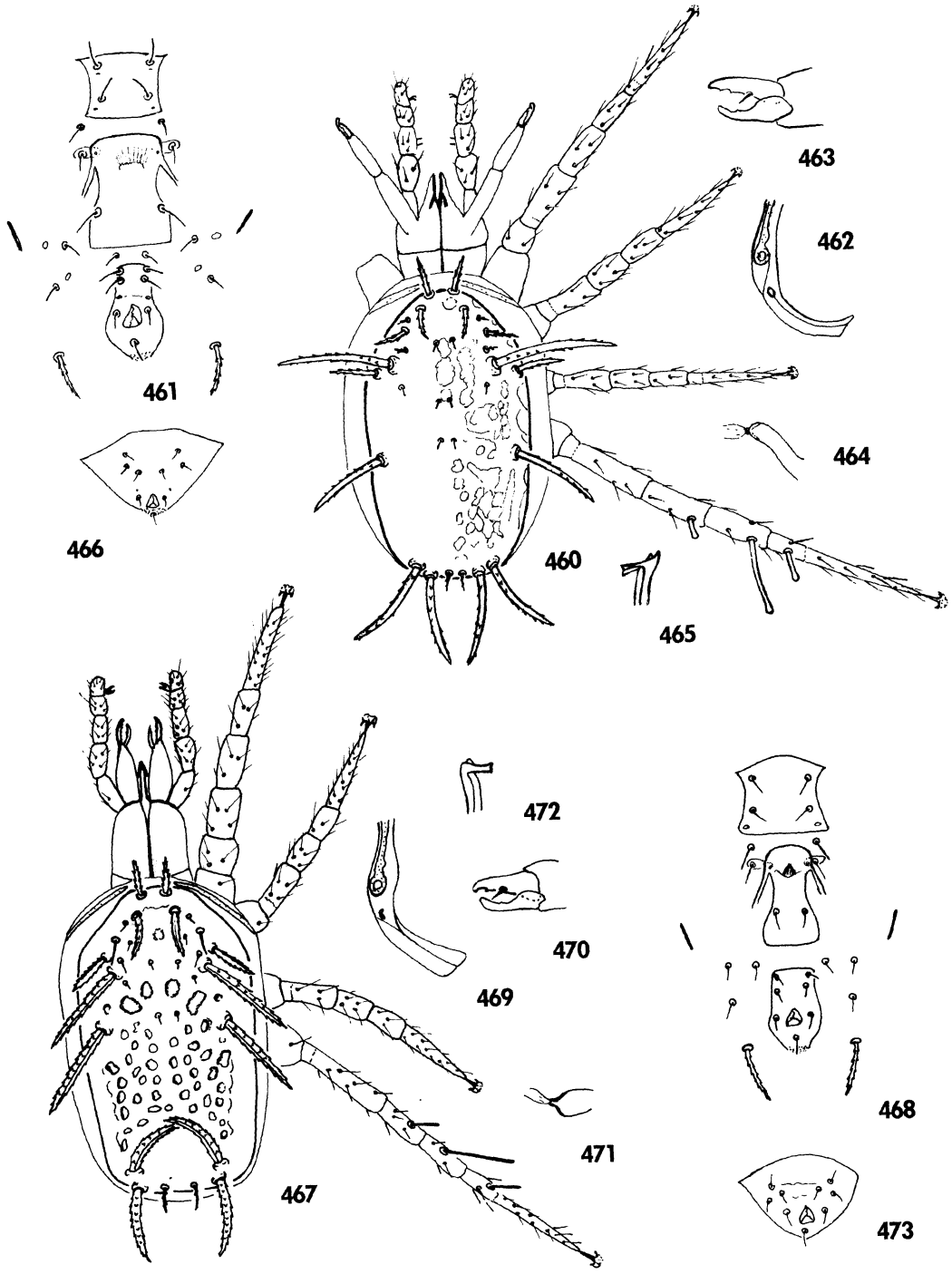
COUNTY DISTRIBUTION: Alachua, Brevard, Clay, Columbia, Dade, Gadsden, Highlands, Levy, Polk, Putnam, and Volusia.



Phytoseius (Phytoseius) chanti
Denmark

Fig. 460 to 466. *Phytoseius macropilis* (Banks). 460. Dorsal and leg structure and setation ♀. 461. Ventral scuta and setation ♀. 462. Posterior peritremal and stigmatal development ♀. 463. Cheliceral structure ♀. 464. Spermathecal structure ♀. 465. Spermatodactyl structure ♂. 466. Ventrianal scutum ♂.

Fig. 467 to 473. *Phytoseius betulae* Denmark. 467. Dorsal and leg structure and setation ♀. 468. Ventral scuta and setation ♀. 469. Posterior peritremal and stigmatal development ♀. 470. Cheliceral structure ♀. 471. Spermathecal structure ♀. 472. Spermatodactyl structure ♂. 473 . Ventrianal scutum ♂.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BIOLOGY: It is usually found in trees, but has been found on low growing plants and in one case on bermudagrass. It is a medium-sized mite and usually is not found associated with other arthropods.

This species has been collected in every month except January and December.

Phytoseius (Phytoseius) deleoni Denmark

Fig. 488 to 492

Phytoseius (*Dubininellus*) *deleoni* Denmark, 1966: 92.

DIAGNOSIS: *P. deleoni* is related to *P. taiyushani* Swirski & Shechter and *P. nipponicus* Ehara, but differs by having only one pair of preanal setae and serrated clunals. The body is about 300μ long.

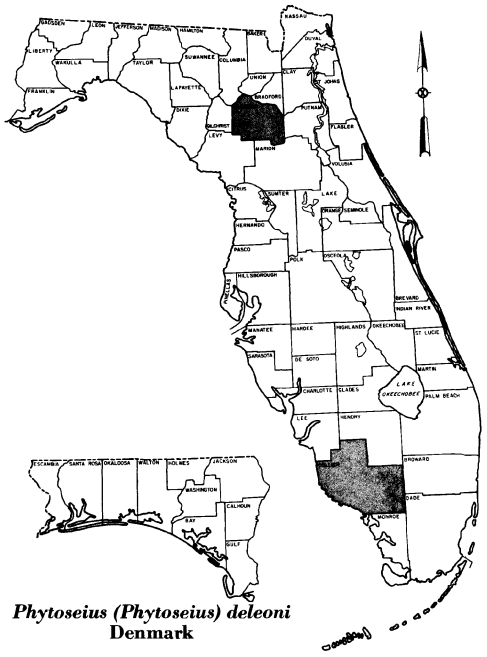
TYPE: The female holotype from Wooster, Ohio, July 3, 1964, by E. W. Baker, on *Vitis* sp., is in the USNM, Washington, D. C.

HABITAT: Recorded from *Vitis* sp.

COUNTY DISTRIBUTION: Collier and Alachua.

BIOLOGY: The 3 known females of this species have been collected from widely separated areas on wild grape vine. It is a white, medium-sized mite. Nothing is known about its food habits.

This species has been collected in June and July.



Phytoseius (Phytoseius) deleoni Denmark

Subgenus *Pennaseius* Pritchard and Baker

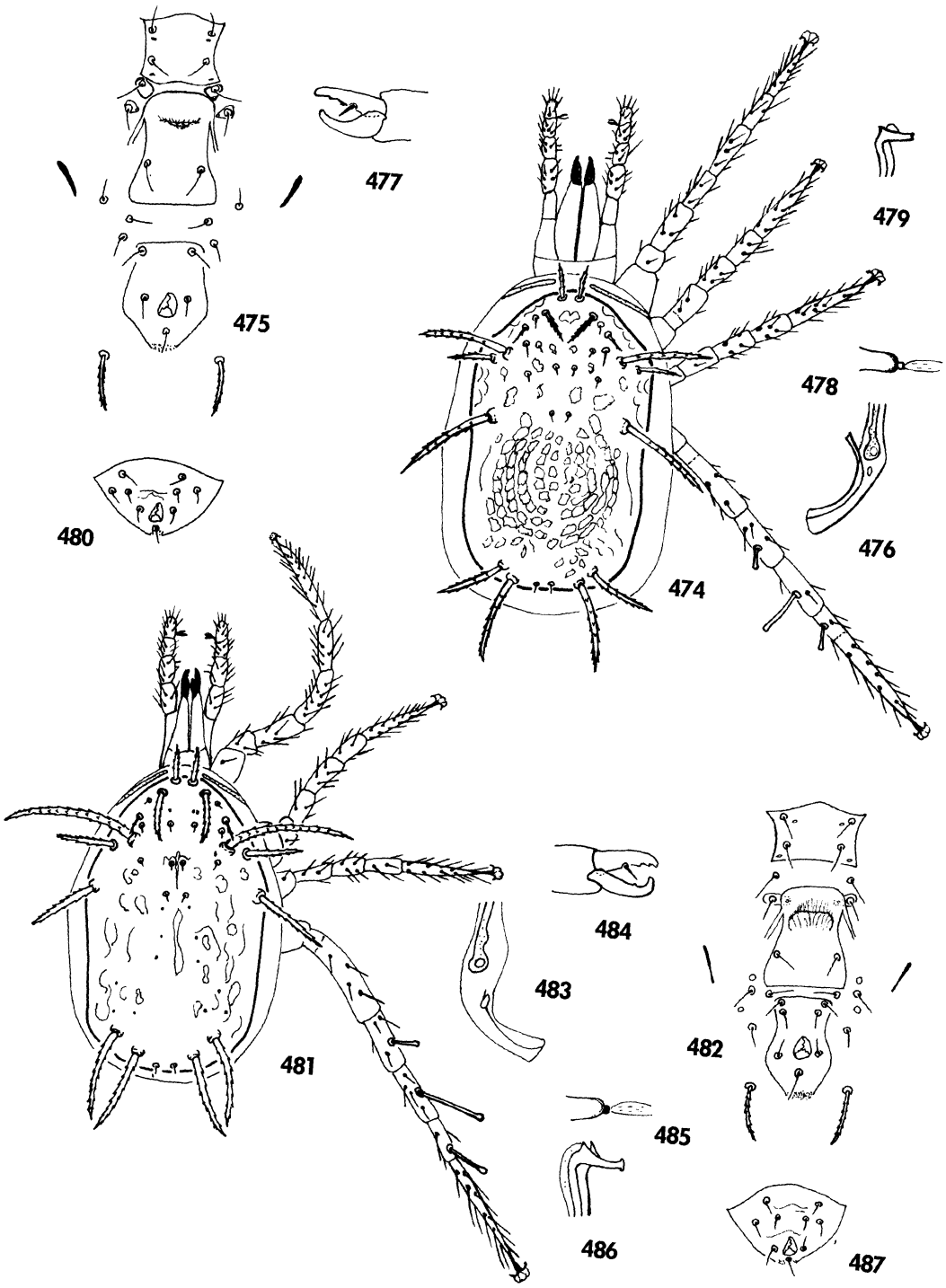
Phytoseius Ribaga, 1904: 175 (and most recent authors).

Pennaseius Pritchard and Baker, 1962: 223.

DIAGNOSIS: Females of the subgenus are characterized by a smooth to weakly reticulated dorsal scutum, with 3 or 4 pairs of dorsal setae; 1 pair of median setae; 8 pairs of lateral setae with some large and strongly serrate; 2 pairs of sublateral setae, the anterior pair on the dorsal scutum and the posterior pair on the interscutal membrane; 2 or 3 pairs of sternal setae; 2 or 3 pairs of preanal setae on the ventrianal scutum; 2 or 3 pairs of ventrolateral setae and a pair of caudal setae; 1 to 3 flattened and spatulate macrosetae on leg IV; with St IV usually longest; macrosetae only on leg IV; leg formulae 4123 or 4132; peritremal and stigmatal scuta indistinguishably fused and extending parallel to leg IV exopodal scutum; spermatheca with saccular cervix and nodular atrium; chelicerae small in proportion to

Fig. 474 to 480. *Phytoseius bakeri* Chant. 474. Dorsal and leg structure and setation ♀. 475. Ventral scuta and setation ♀. 476. Posterior peritremal and stigmatal development ♀. 477. Cheliceral structure ♀. 478. Spermathecal structure ♀. 479. Spermatodactyl structure ♂. 480. Ventrianal scutum ♂.

Fig. 481 to 487. *Phytoseius chanti* Denmark. 481. Dorsal and leg structure and setation ♀. 482. Ventral scuta and setation ♀. 483. Posterior peritremal and stigmatal development ♀. 484. Cheliceral structure ♀. 485. Spermathecal structure ♀. 486. Spermatodactyl structure ♂. 487. Ventrianal scutum ♂.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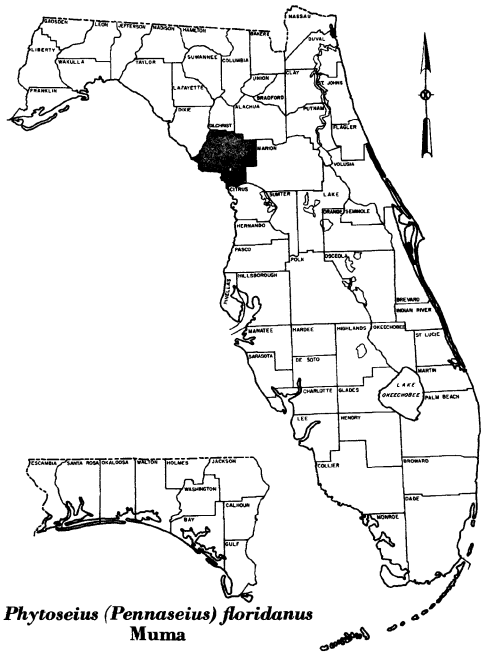
the body size; the fixed cheliceral finger usually has 1 denticule, and the movable cheliceral finger has 2 or more denticules.

The male is smaller than the female, but otherwise similar; spermatodactyl with foot terminal, heel and lateral process subequal and distinct. A crest may or may not be present on the shank.

TYPE SPECIES: *Phytoseius (Pennaseius) amba* Pritchard and Baker, 1962, by designation.

DISCUSSION: This subgenus is distinguished from *Phytoseius* Ribaga by having L_7 and L_8 separated by 2 or more setal socket diameters, 2 pairs of sublateral setae with S_1 on dorsal scutum, usually 3 pairs of sternal setae, and leg IV with the longest macroseta on the genu or tarsus. This subgenus is represented in Florida by two species: *P. mexicanus* De Leon and *P. floridanus* Muma. Nothing is known about the food habits of these two mites.



Phytoseius (Pennaseius) floridanus Muma

Key to Species of Subgenus *Pennaseius* Pritchard and Baker in Florida

(Females)

1a L_1 smooth, notocephalic pore caudad to M_1 present .... *floridanus* Muma (p. 122)

1b L_1 serrate, notocephalic pore caudad to M_1 absent....*mexicanus* De Leon (p. 122)

Phytoseius (Pennaseius) floridanus Muma

Fig. 493 to 495

Phytoseius floridanus Muma, 1962: 9.

Phytoseius (Phytoseius) floridanus Muma, Denmark, 1966: 42.

DIAGNOSIS: *P. floridanus* is similar to *P. scrobis* Denmark, but *floridanus* has L_1 smooth and much shorter than in *scrobis*. The body is about 200μ long.

TYPE: The male holotype from two miles south of Otter Creek, Levy County, Florida, August 3, 1960, by M. H. Muma, on *Quercus michauxii*, is in the USNM, Washington, D. C.

HABITAT: Recorded only from *Quercus michauxii*.

COUNTY DISTRIBUTION: Levy.

BIOLOGY: Only the male is known for this species. It is small to medium sized and off-white in color. This mite was found on the leaves of chesnut oak associated with *Tydeus* sp. and tetranychids.

This species has been collected in August.

Phytoseius (Pennaseius) mexicanus De Leon

Fig. 496 to 502

Phytoseius mexicanus De Leon, 1960: 269.

Phytoseius (Pennaseius) mexicanus De Leon, 1965: 20.

Phytoseius (Phytoseius) mexicanus De Leon, Denmark, 1966: 19.

Fig. 488 to 492. *Phytoseius deleoni* Denmark. 488. Dorsal and leg structure and setation ♀. 489. Ventral scuta and setation ♀. 490. Cheliceral structure ♀. 491. Posterior peritremal and stigmatal development ♀. 492. Spermathecal structure ♀.

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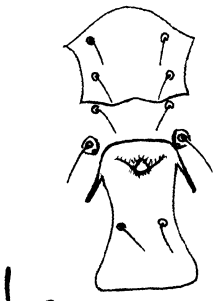

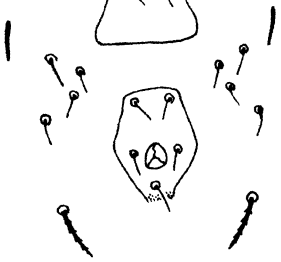

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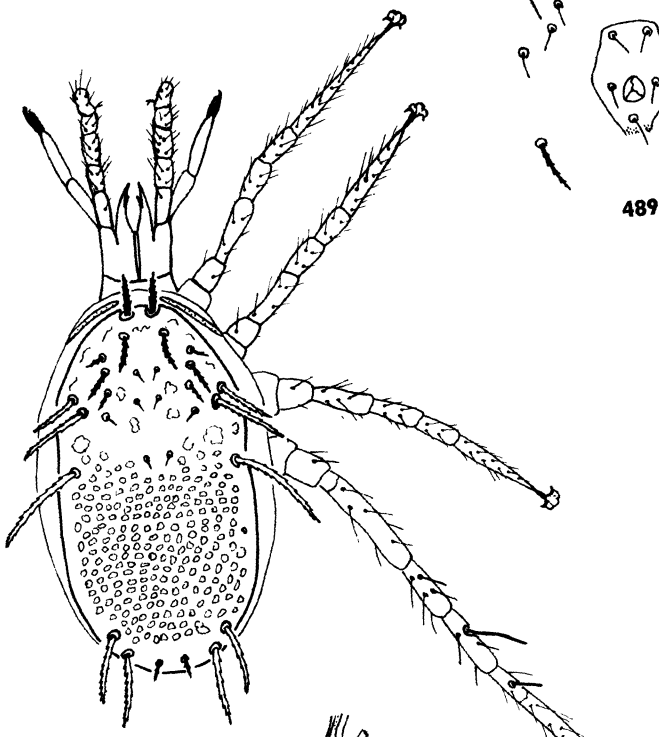

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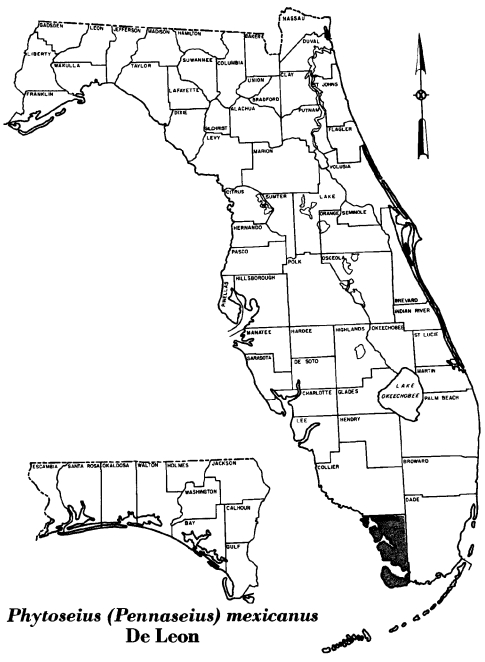
DIAGNOSIS: *Phytoseius mexicanus* De Leon is distinct from other species that occur in Florida. It is similar to *Phytoseius finitimus* Ribaga, which does not occur in Florida, but *mexicanus* has smooth verticals and a shorter St IV. The body is about 260μ long.

TYPE: The female holotype from Tuxtula Gutierrez, Chiapas, Mexico, January 15, 1957, by D. De Leon, on *Cecropia peltata*, is in the MCZ, Harvard University, Cambridge, Mass.

HABITAT: In Florida it has been found on *Callicarpa americana, Cordia sebestena, Guettarda scabra,* and *Tournefortia gnaphalodes.*



Phytoseius (Pennaseius) mexicanus De Leon

COUNTY DISTRIBUTION: Monroe.

BIOLOGY: Living mites are white to off-white in color. This species is medium sized. It has not been associated with any other mites. The feeding habits are unknown.

This species has been collected in January and June.

GENUS *PARASEIULELLA* MUMA

Clavidromina Muma, 1961: 296.
Paraseiulella Muma, Muma and Denmark, 1968: 237.

DIAGNOSIS: Females of this genus are characterized by a smooth or reticulated dorsal scutum with 4 pairs of dorsal setae; 2 pairs of median setae; 8 pairs of lateral setae that may be smooth or plumose and flattened; 2 pairs of sublateral setae with the anterior pair on the interscutal membrane, the posterior pair on the interscutal membrane or on the dorsal scutum, and S_2 longer than S_1; 1 pair of vertical and 1 pair of clunal seta; 2 pairs of sternal setae; 3 or 4 pairs of preanal setae on the ventrianal scutum; 2 pairs of ventrolateral setae and a pair of caudal seta; 3 hamate macrosetae on leg IV, Sge, Sti, and St; leg formulae 1423; peritreme extending to the verticals; peritremal and stigmatal scuta partially divided either anteriorly or posteriorly to the secondary pore; spermatheca with fundibuliform cervix and nodular atrium; chelicerae normal in proportion to the body size; movable cheliceral finger with no or 1 denticule and fixed finger with 2 or 3 denticules.

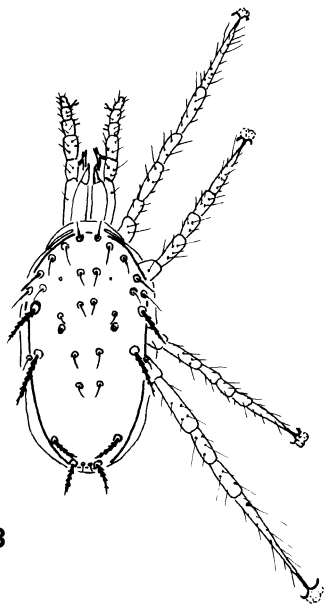
Males are smaller, but otherwise similar to females; spermatodactyl with or without crest.

TYPE SPECIES: *Typhlodromus ellipticus* De Leon, 1958, by designation, Muma (1961).

DISCUSSION: This genus is found on shrubs and trees. In the southern half of Florida where representatives of this genus

Fig. 493 to 495. *Phytoseius floridanus* Muma. 493. Dorsal and leg structure and setation ♂. 494. Ventral scuta and setation ♂. 495. Spermatodactyl structure ♂.

Fig. 496 to 502. *Phytoseius mexicanus* De Leon. 496. Dorsal and leg structure and setation ♀. 497. Ventral scuta and setation ♀. 498. Posterior peritremal and stigmatal development ♀. 499. Cheliceral structure ♀. 500. Spermathecal structure ♀. 501. Spermathodactyl structure ♂. 502. Ventrianal scutum ♂.



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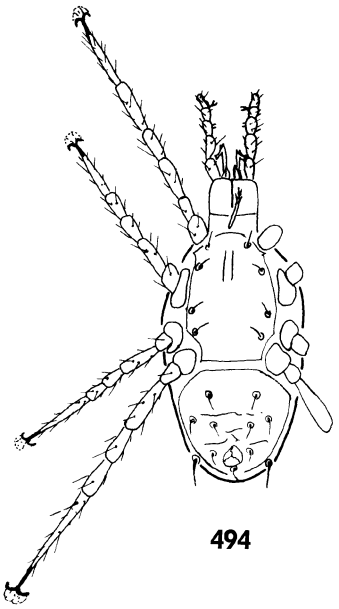

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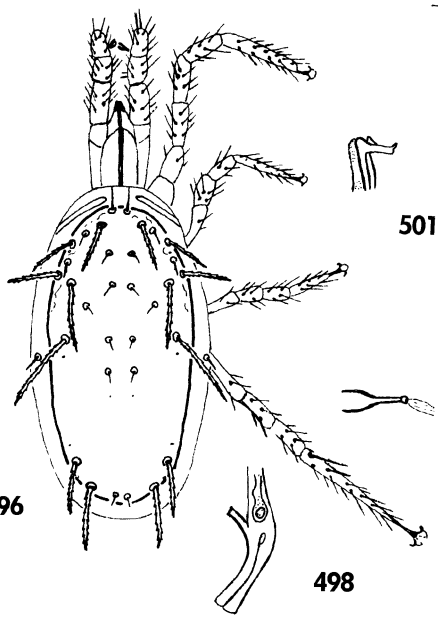

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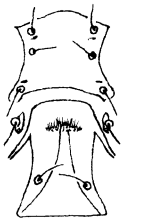

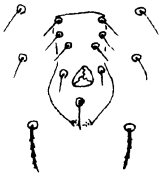

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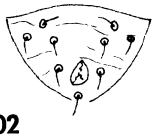

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are common, they are sometimes associated with eriophyid mites and sometimes with tenuipalpid mites. *P. corna* (De Leon) and *P. elliptica* (De Leon) have been reported from Costa Rica and Mexico by D. De Leon (1959a), and by Chant and Baker (1965).

The location of S_2 is inconsistent in species of this genus. De Leon (1957 and 1958) noted this inconsistency in describing *P. corna* and *P. elliptica*; he discussed the problem further for *P. corna* in De Leon (1959a).

The genus is known only from the southeastern United States and the Caribbean area. Three species are known from Florida.

Key to *Paraseiulella* Muma in Florida

(Females)

1a Dorsal setae smooth 2

1b Dorsal setae serrate ..... *elliptica* (De Leon) (p. 126)

2a Dorsal setae less than one-half as long as distance to succeeding setae, D_4 shorter than M_2; dorsal scutum reticulated ..... *corna* (De Leon) (p. 126)

2b Dorsal setae more than one-half as long as distance to succeeding setae, D_4 approximates M_2; dorsal scutum smooth .... *greeneae* (Denmark and Muma) (p. 127)

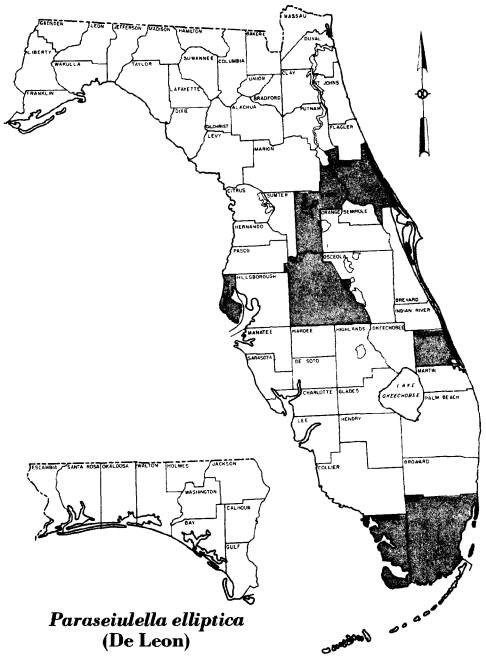
Paraseiulella elliptica (De Leon)

Fig. 503 to 510

Typhlodromus ellipticus De Leon, 1958: 73.
Typhlodromus burrelli Chant, 1959: 51.
Typhlodromus perplexus (Chant), 1959: 51.
Clavidromina ellipticus (De Leon), Muma, 1961: 297.
Paraseiulella elliptica (De Leon), Muma and Denmark, 1968: 237.

DIAGNOSIS: *P. elliptica* differs from *P. corna* (De Leon) by having L_7 serrate and one-third as long as L_8, and the spermatodactyl is much longer than in *P. corna*. The body is about 300μ long.

TYPE: The female holotype from Coral Gables, Florida, October 23, 1956, by D. De Leon, on *Conocarpus erecta*, is in the MCZ, Harvard University, Cambridge, Massachusetts.



Paraseiulella elliptica (De Leon)

HABITAT: The species is found in peninsular Florida on *Achras zapota*, *Citrus* sp., *Conocarpus erecta*, *Hibiscus* sp., *Ligustrum* sp., *Magnolia grandiflora*, *Malvaviscus* sp., *Persea americana*, *Prunus laurocerasus*, *Quercus nigra*, *Quercus* sp., and *Rhododendron* sp.

COUNTY DISTRIBUTION: Dade, Lake, Monroe, Pinellas, Polk, St. Lucie, and Volusia.

BIOLOGY: Nothing is known about the biology of this species.

This species has been collected in March, April, May, June, July, October, and November.

Paraseiulella corna (De Leon)

Fig. 511 to 517

Typhlodromus cornus De Leon, 1957: 142.
Clavidromina corna (De Leon), Muma, 1961: 297.
Paraseiulella corna (De Leon), Muma and Denmark, 1968: 237.

DIAGNOSIS: *P. corna* differs from *P.*

elliptica (De Leon) by having L_7 minute and setiform, and the spermatodactyl foot much shorter than on *P. elliptica* with the lateral process obscure. The body is about 290μ long.

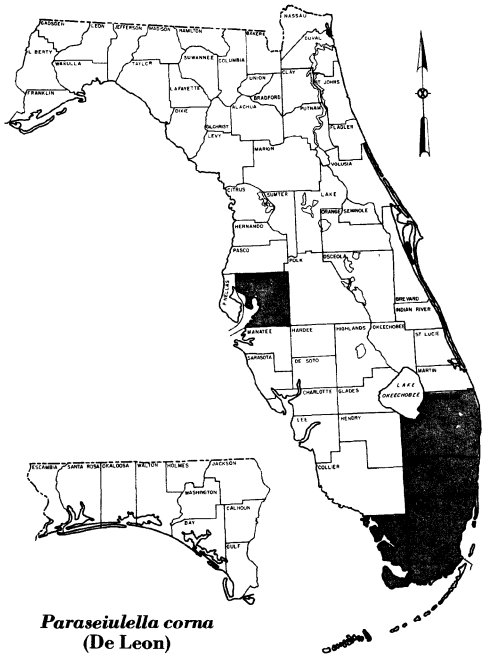
TYPE: The female holotype from Coral Gables, Florida, June 4, 1956, by D. De Leon, on *Callicarpa americana,* is in the MCZ, Harvard University, Cambridge, Mass.

HABITAT: This species is found in south Florida on *Bucida buceras, Callicarpa americana, Canavalia obtusifolia, Citrus mitis, Citrus* sp., *Conocarpus erecta, Guettarda elliptica, Quercus virginiana, Solanum bahamense,* and *Waltheria americana.* It is often associated with *Eriophyes buceras* on *Bucida buceras.*

COUNTY DISTRIBUTION: Broward, Dade, Hillsborough, Monroe, and Palm Beach.

BIOLOGY: Nothing is known about the biology of this species.

This species has been collected in January, February, May, June, October, November, and December.



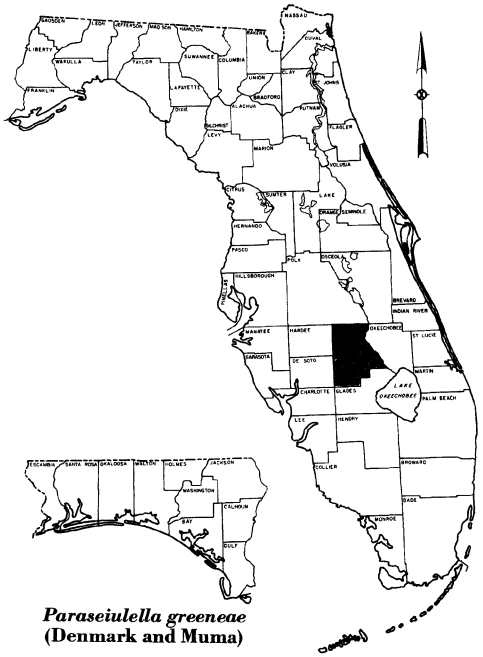
Paraseiulella corna
(De Leon)

Paraseiulella greeneae (Denmark and Muma), new combination

Fig. 518 to 525

Typhlodromina greeneae Denmark and Muma, 1967: 177.

DIAGNOSIS: *P. greeneae* is not closely related to the other species of the genus. It is distinguished from all species by the extreme length of dorsal setae, extreme length of S_2, shortness of the spermatheca, and position of the preanal ventrianal pores. The body is about 330μ long.



Paraseiulella greeneae
(Denmark and Muma)

TYPE: The female holotype from Highlands Hammock State Park, Highlands County, Florida, March 3, 1966, by H. L. Greene, on *Serenoa repens,* is in the USNM, Washington, D. C.

HABITAT: This species has been found only on *Serenoa repens* (p. 10).

COUNTY DISTRIBUTION: Highlands.

BIOLOGY: Nothing is known about the biology of the species.

This species has been collected in March.

GENUS *CLAVIDROMUS* MUMA

Clavidromus Muma, 1961: 296.

DIAGNOSIS: Females are characterized by the dorsal scutum lightly reticulated with 4 pairs of dorsal setae; 2 pairs of median setae; 10 pairs of lateral setae; 2 pairs of plumose, knobbed, sublateral setae located on the interscutal membrane; all setae located on the dorsal scutum and the sublateral setae are plumose and usually knobbed except L_9 and the clunals which are short and smooth; 2 or 3 pairs of sternal setae; 3 pairs of preanal ventrianal setae; 3 pairs of ventrolateral setae and a pair of plumose caudal setae; 3 knobbed macrosetae on leg IV, Sge, Sti and St; legs I, II, and III without macrosetae; leg formula 4123; peritreme extending to L_1 or L_2; peritremal and stigmatal scuta indistinguishably fused and surrounding leg IV exopodal scutum; spermatheca has a partially sclerotized fundibuliform cervix and nodular atrium; chelicerae normal in size in proportion to the body; movable cheliceral finger with no to 1 denticule and the fixed cheliceral finger with 1 or 2 denticules.

Males are unknown.

TYPE SPECIES: *Kampimodromus transvaalensis* Nesbitt, 1951, by designation, Muma (1961).

DISCUSSION: This genus is unusual in that it has been found in litter, on bushes, in trees, on rats, and in human hair. Nothing is known about the food habits.

This genus probably is world wide in distribution. It has been collected at 2 localities in the Caribbean area. One species has been found in Florida.

Clavidromus transvaalensis (Nesbitt)

Fig. 526 to 531

Kampimodromus transvaalensis Nesbitt, 1951: 55.

Typhlodromus jackmickleyi De Leon, 1958: 75.

Typhlodromus pectinatus Athias-Henriot, 1958: 179.

Neoseiulus transvaalensis (Nesbitt), Muma, 1961: 295.

Clavidromus jackmickleyi (De Leon), Muma, 1961: 296.

Clavidromus transvaalensis (Nesbitt), Muma and Denmark, 1968: 238.

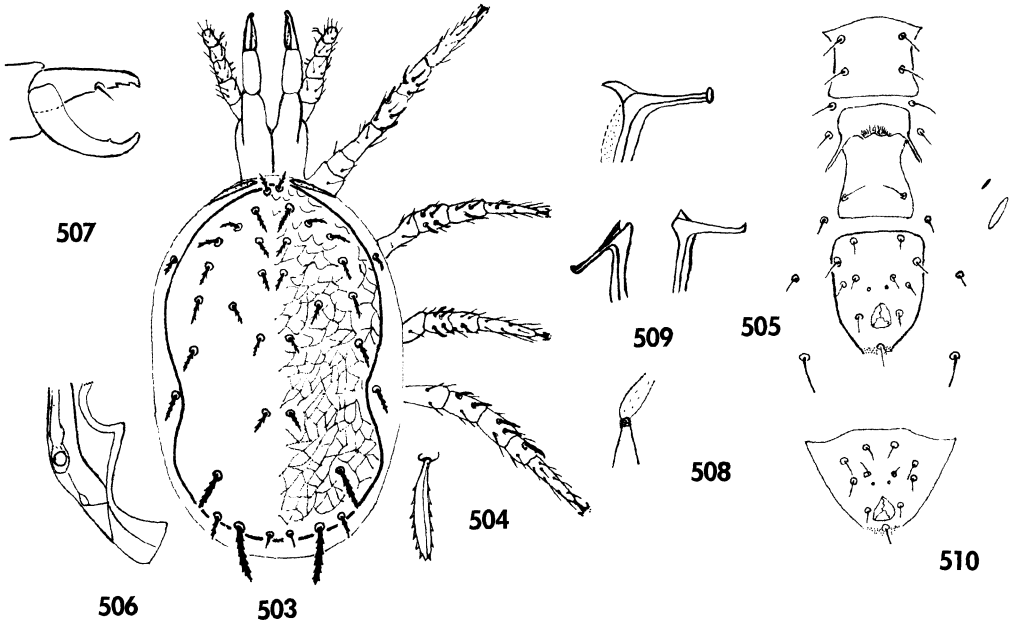
DIAGNOSIS: *Clavidromus transvaalensis* differs from *C. hartlandrowei* (Evans) in that each pair of dorsal setae is shorter than the distance to the succeeding pair of dorsal setae. *C. transvaalensis* has two pairs of sternal setae, whereas *C. hartlandrowei* has three pairs of sternal setae. The body is about 340μ long.

TYPE: The female holotype from Nylstroom, Transvaal, February 1947, feeding on small acari on ground peanuts, by R. F. Lawrence, is in the Canadian National Collection, Ottawa, Canada.

HABITAT: This species is unusual in that it is wide spread geographically and can be found on the ground in litter, above ground on shrubs and trees, and occasionally on mammals. Some of the plants are: *Beta vulgaris, Callicarpa americana, Chionanthus virginica, Citrus mitis, Cornus florida, Cynodon dactylon, Daucus carota* 'Sativa', *Fraxinus profunda, Gardenia* sp., *Gnorimoschema operculla, Guettarde elliptica, Ligustrum sp., Lippia* sp., *Pinus clausa, Pinus taeda, Pinus* sp., *Pithecellobium unguis-cati, Platanus* sp., *Podocarpus* sp., *Mor-*

Fig. 503 to 510. *Paraseiulella elliptica* (De Leon). 503. Dorsal and leg structure and setation ♀. 504. L_8 enlarged ♀. 505. Ventral scuta and setation ♀. 506. Posterior peritremal and stigmatal development ♀. 507. Cheliceral structure ♀. 508. Spermathecal structure ♀. 509. Two views of spermatodactyl structure ♂. 510. Ventrianal scutum ♂.

Fig. 511 to 517. *Paraseiulella corna* (De Leon). 511. Dorsal and leg structure and setation ♀. 512. Ventral scuta and setation ♀. 513. Posterior peritremal and stigmatal development ♀. 514. Cheliceral development ♀. 515. Spermathecal structure ♀. 516. Spermatodactyl structure ♂. 517. Ventrianal scutum ♂.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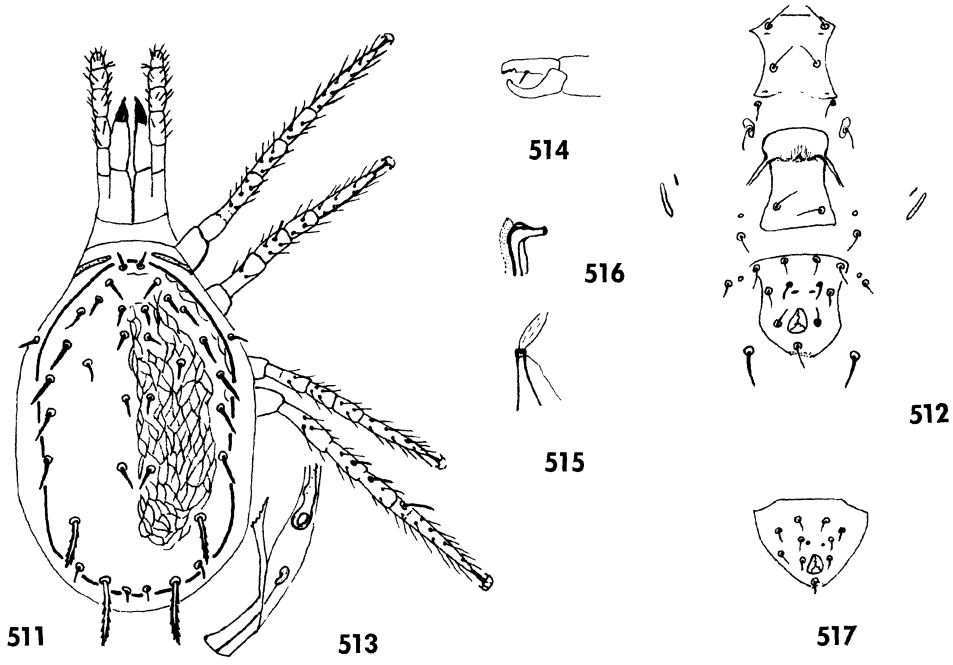
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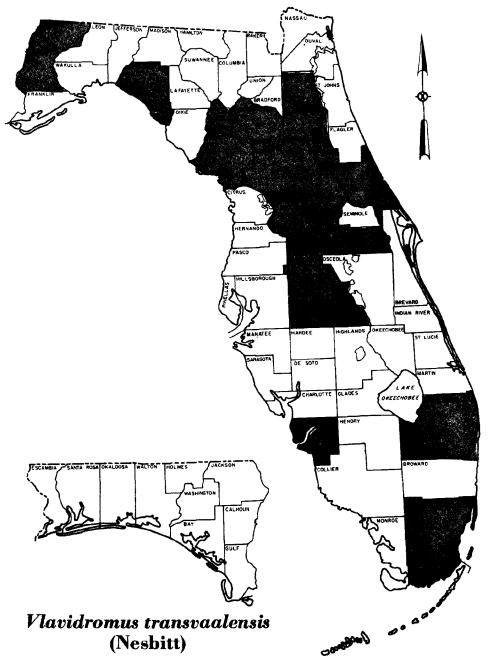


Vlavidromus transvaalensis (Nesbitt)

us sp., *Quercus incana, Quercus laevis, Quercus stellata, Quercus stellata* near *garetta, Quercus virginiana, Raphanus sativus, Rhus copallina leucantha, Solidago* sp., *Stenotaphrum secundatum, Tillandsia usneoides,* and *Vitis* sp.

COUNTY DISTRIBUTION: Alachua, Clay, Dade, Gadsden, Gilchrist, Lake, Lee, Levy, Liberty, Marion, Orange, Palm Beach, Polk, Putnam, Sumter, Taylor, and Volusia.

BIOLOGY: This is a large off-white mite and tends to prefer habitats with decaying organic matter. Nothing is known about its food habits.

This species has been collected in every month of the year except February.

GENUS *TYPHLODROMINA* MUMA

Typhlodromina Muma, 1961: 297.

DIAGNOSIS: Females are characterized by a smooth to reticulated dorsal scutum with 4 pairs of dorsal setae; 2 pairs of median setae; 8 pairs of lateral setae; 2 pairs of sublateral setae; 2 pairs of sternal setae, 2 pairs of metasternal setae; 4 pairs of preanal setae, and a pair of preanal pores on the ventrianal scutum; 1 pair of ventrolateral setae and a pair of caudal setae; no or 1 macroseta on basitarsus of leg IV, Sti IV; legs I, II and III without macrosetae; leg formulae 4123 or 4132; peritremes extend to verticals; peritremal and stigmatal scuta indistinguishably fused and extending along leg IV exopodal scutum; spermatheca with a saccular or fundibuliform cervix and an undifferentiated atrium; chelicerae small to normal in size in proportion to the body; movable cheliceral finger with no or 1 denticle and fixed cheliceral finger 2 to 4 denticules.

Males are similar to females but smaller. The spermatodactyl has the foot terminal and lateral process distinct. The ventrianal scutum has 4 or more pairs of preanal setae.

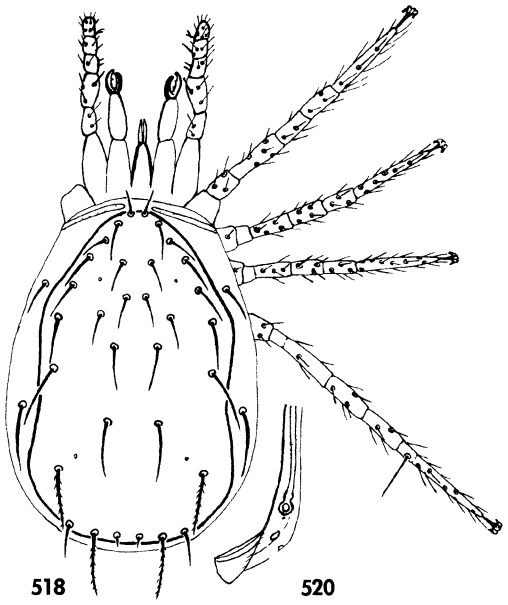
TYPE SPECIES: *Iphidulus conspicuus* Garman, 1948, by designation, Muma (1961).

DISCUSSION: This genus lacks lateral setae in the positions normally occupied by L_7 and L_8. Muma (1961) and Muma and Denmark (1969) indicated 2 or 3 species-groups in this genus based on the shape of the sternal and ventrianal scuta, and on the development of M_2 and L_8.

T. arborea (Chant) has been recorded from Florida by Chant (1959); however, we

Fig. 518 to 525. *Paraseiulella greeneae* (Denmark and Muma). 518. Dorsal and leg structure and setation ♀. 519. Ventral scuta and setation ♀. 520. Posterior peritremal and stigmatal development of a paratype. 521. Type ♀. 522. Cheliceral structure ♀. 523. Spermathecal structure ♀. 524. Spermatodactyl structure ♂. 525. Ventrianal scutum ♂.

Fig. 526 to 531. *Clavidromus transvaalensis* (Nesbitt). 526. Dorsal and leg structure and setation ♀. 527. L_{10} enlarged ♀. 528. Ventral scuta and setation ♀. 529. Posterior peritremal and stigmatal development ♀. 530. Cheliceral structure ♀. 531. Spermathecal structure ♀.



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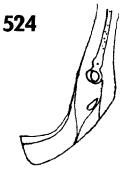

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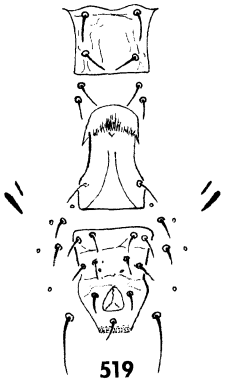

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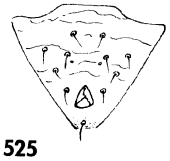

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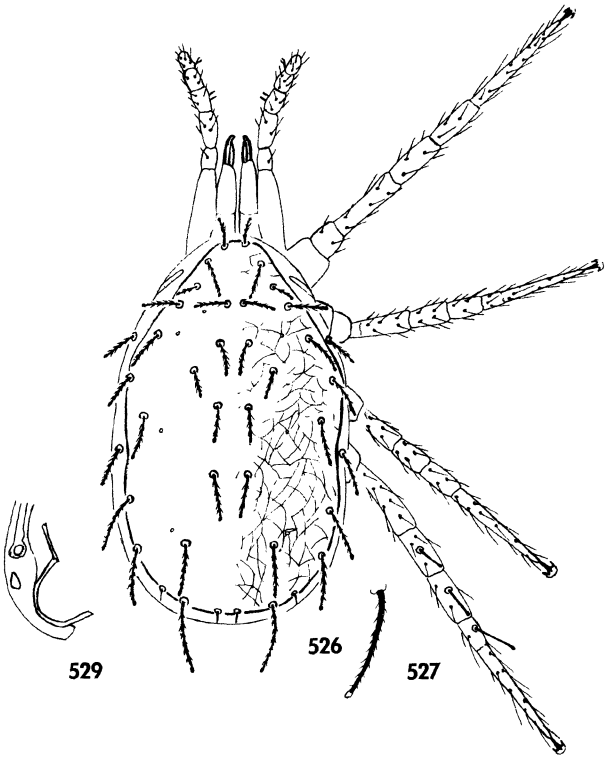

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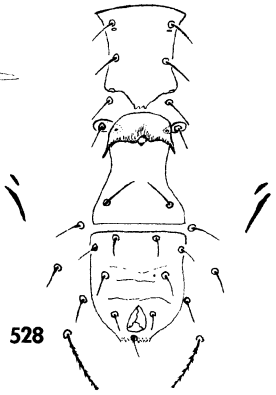

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have not seen this species from Florida and have not examined the type. We have taken only one species, *T. subtropica* Muma and Denmark.

The genus is known from North America, West Indies, and the Galapagos Islands.

Typhlodromina subtropica Muma and Denmark

Fig. 532 to 536

Typhlodromina conspicua (Garman), Muma, 1961: 297 (Not *Iphidulus conspicuus* Garman).

Typhlodromina conspicua (Garman), Muma, 1964: 37.

Typhlodromina subtropica Muma and Denmark, 1969: 412.

DIAGNOSIS: *T. subtropica* is closely related to *T. tropica* (Chant), but has verticals shorter than L_1, and the spermathecal cervix about 3 times longer than wide. The body is about 340μ long.

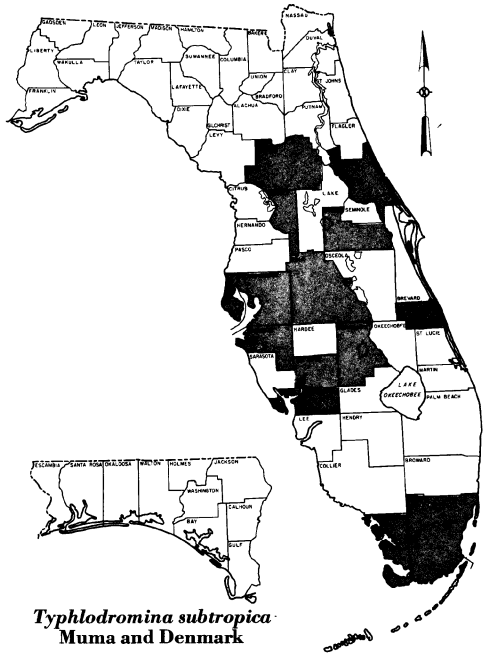
TYPE: The female holotype from Polk City, Florida, July 6, 1964, by H. L. Greene, on citrus, is in the USNM, Washington, D. C.

HABITAT: This Florida species has been taken from *Archontophoenix alexandrae, Arecastrum romanzoffianum, Citrus* spp., *Cocos nucifera, Eriobotrya japonica, Ficus* sp., *Persea borbonia, Psidium* sp., and *Trema lamarckiana.*

COUNTY DISTRIBUTION: Charlotte, Dade, De Soto, Highlands, Hillsborough, Indian River, Manatee, Marion, Monroe, Orange, Pinellas, Polk, Sumter, and Volusia.

BIOLOGY: No males of this species have been recorded, although several hundred specimens have been examined. This situation is discussed in Muma (1964a and 1964b) and Muma and Denmark (1969).

This species has been collected in every month except October.



Typhlodromina subtropica Muma and Denmark

Typhlodromina arborea (Chant)

Typhlodromus arboreus Chant, 1957.

Typhlodromina arborea (Chant), Muma, 1961.

DIAGNOSIS: Chant (1959) distinguished this species by the short anterior lateral setae, 2 pairs of ventrolateral setae, ventrianal scutum elongate and constricted and setaceous M_2 and L_8.

TYPE: The female holotype from apple leaves, 1650 Wesbrook Crescent, Vancouver, British Columbia, Canada, is in the Canadian National Collection, Ottawa, Canada.

HABITAT: Unknown.

COUNTY DISTRIBUTION: No locality records recorded by Chant in his original description or his later papers.

BIOLOGY: We have included this species here because Chant (1959) recorded it from Florida. We have not collected it from the state.

Fig. 532 to 536. *Typhlodromia subtropica* Muma and Denmark. 532. Dorsal and leg structure and setation ♀. 533. Ventral scuta and setation ♀. 534. Posterior peritremal and stigmatal development ♀. 535. Cheliceral structure ♀. 536. Spermathecal structure ♀.

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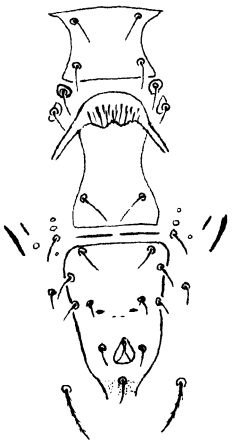

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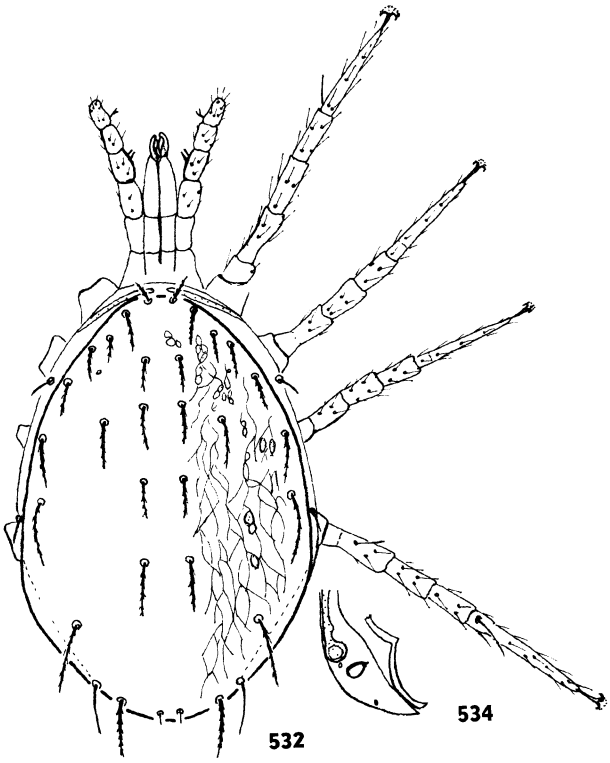

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GENUS *GALENDROMUS* MUMA

Galendromus Muma, 1961: 298.

DIAGNOSIS: Females are characterized by a reticulated dorsal scutum with 4 pairs of dorsal setae; 2 pairs of median setae; 9 pairs of simple or plumose lateral setae; 1 pair of anterior sublateral setae; 2 pairs of sternal setae; 4 pairs of preanal, ventrianal setae; 1 or 2 pairs ventrolateral and a pair of caudal setae; no or 1 macroseta on leg IV, St IV; legs I, II and III without macrosetae or modified setae; leg formula 1423 or 4123; peritreme variable in length from a point between L_3 and L_4 to the verticals, peritremal and stigmatal scuta indistinguishably fused; spermatheca with a tubular or vesicular cervix and a nodular or undifferentiated atrium; chelicerae normal in proportion to the body size; movable cheliceral finger with no to 1 denticule and fixed cheliceral finger with 1 to 3 denticules.

Males are similar to the females, but smaller.

TYPE SPECIES: *Typhlodromus floridanus* Muma, 1955, by designation, Muma (1961).

DISCUSSION: This genus was erected by Muma (1961) and revised by Muma (1963). It is represented over a wide geographical area from Mexico to Canada on trees, shrubs and vines. It also has been recorded from Chile and Puerto Rico.

Key to Subgenera of *Galendromus* Muma in Florida

1a Most dorsal, medium and lateral setae plumose and subequal in length; female spermatheca tubular ..... *Galendromus* Muma (p. 134)

1b Most dorsal setae setaceous and usually smaller than lateral setae; female spermatheca fundibuliform ..... *Menaseius* Wainstein (p. 138)

Key to Species of Subgenus *Galendromus* Muma in Florida

(Females)

1a M_1 distinctly shorter than D_3; dorsal scutum distinctly imbricate; peritreme extending to L_2 or beyond 2

1b M_1 as long or longer than D_3; dorsal scutum not imbricate, ridged and creased; peritreme extending to area of L_3-L_4 ..... *annectens* (De Leon) (p. 135)

2a(1a) D_3 extending to D_4; L_1, L_2, L_3 and L_4 subequal ..... *floridanus* (Muma) (p. 136)

2b D_3 not extending to D_4; L_2 and L_3 shorter than L_1 and L_4 ..... *gratus* (Chant) (p. 135)

Key to Species of Subgenus *Menaseius* Wainstein in Florida

(Females)

1a M_2 as long as, or longer than, distance to L_8; L_8 about as long as distance to L_9 ..... *mcgregori* (Chant) (p. 138)

1b M_2 shorter than distance to L_8; L_8 longer than distance to L_9 ..... *loculus* Denmark and Muma (p. 140)

Subgenus *Galendromus* Muma

Galendromus Muma, 1961: 298.
Trichoseius Wainstein, 1962: 21.
Galendromus (*Galendromus*) Muma, Muma, 1963: 17.

DIAGNOSIS: Females of this subgenus have most of the dorsal and lateral setae plumose. Setae on the dorsal scutum tend to be elongate, extending to or beyond the bases of succeeding setae. Dorsal scutal pores often are difficult to distinguish. Ventrianal scuta elongate and somewhat constricted near middle of length. None of the known species has a macroseta.

Spermatheca with slender tubular cervix that is flared slightly at vesicle and not or scarcely swollen at atrium. Spermatodactyl with typical shank, foot, heel, lateral process, and toe; foot terminal with both heel and lateral process acutely pointed.

TYPE SPECIES: *Typhlodromus floridanus* Muma, 1955, by designation, Muma (1963).

DISCUSSION: Three of the 6 known species of this subgenus have been found in Florida.

Galendromus (Galendromus) annectens (De Leon)

Fig. 537 to 543

Typhlodromus annectens (De Leon), 1958: 75.

Galendromus annectens (De Leon), Muma, 1961: 298.

Galendromus (Galendromus) annectens (De Leon), Muma, 1963: 20.

DIAGNOSIS: This is the smallest known species in the subgenus *Galendromus*. It is distinguished readily by the longer M_1, shorter peritremes, and punctate preanal pores. The body is about 290μ long.

TYPE: The female holotype from Coral Gables, Florida, June 4, 1956, by D. De Leon, on *Trema micrantha*, is in the MCZ, Harvard University, Cambridge, Mass.

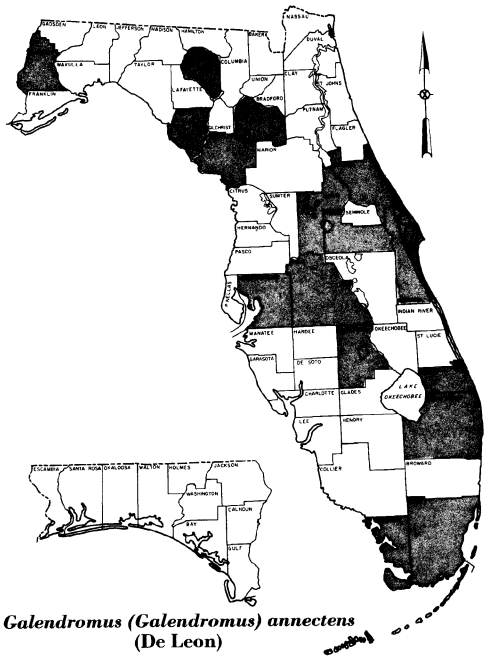
HABITAT: This species is found on *Aster carolinianus, Calliandra* sp., *Callicarpa americana, Camellia japonica, Chrysophyllum olivaeforme, Cornus florida, Eriobotrya japonica, Eriobotrya* sp., *Euphorbia* sp., *Fraxinus americana, Hibiscus tiliaceus, Ipomoea* sp., *Juglans* sp., *Lantana* sp., *Ligustrum sinense, Magnolia grandiflora, Malva* sp., *Malvaviscus* sp., *Persea borbonia, Podocarpus* sp., *Platanus occidentalis, Quamoclit* (=*Ipomoea*) *coccinea, Quercus laurifolia, Quercus stellata, Quercus virginiana, Quercus* sp., *Rhododendron* sp., *Rubus* sp., *Scatelloria* sp., *Sideroxylon foetidissimum, Trema micrantha, Verbensia virginica, Vinca* sp., and *Wisteria* sp.

COUNTY DISTRIBUTION: Alachua, Brevard, Dade, Dixie, Highlands, Hillsborough, Lake, Levy, Liberty, Martin, Monroe, Orange, Palm Beach, Polk, Suwannee, and Volusia.

BIOLOGY: This species seems to be an obligatory predator, as are the other species of the subgenus. It feeds readily on, and is most frequently collected from colonies of webbing tetranychids. The exact life cycle is not known.

Although it is found on trees, this species seems to prefer bushes, vines, and herbs.

This species has been collected in every month of the year.



Galendromus (Galendromus) annectens (De Leon)

Galendromus (Galendromus) gratus (Chant)

Fig. 544 to 548

Typhlodromus gratus Chant, 1959: 58.

Galendromus gratus (Chant), Muma, 1961: 298.

Galendromus (Galendromus) gratus (Chant), Muma, 1963: 20.

DIAGNOSIS: *G. gratus* can be separated from the closely related species, *G. floridanus*, by having shorter D_2 and D_3, and the more widely spaced preanal, ventrianal pores. The body is about 330μ long.

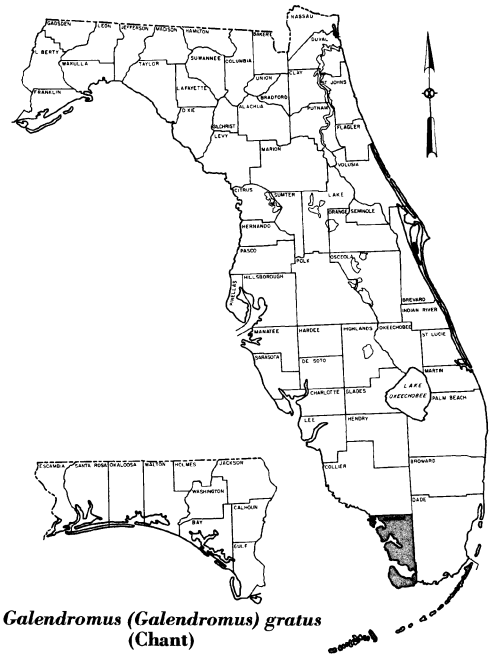
TYPE: The female holotype from Key West, Florida, June 4, 1953, by O. D. Link, on *Thespesia populnea*, is in the USNM, Washington, D. C.

HABITAT: This species is found on *Thespesia populnea*.

COUNTY DISTRIBUTION: Monroe.

BIOLOGY: Nothing is known about the biology of this species.

This species has been collected in June.



Galendromus (Galendromus) gratus (Chant)

TYPE: The female holotype, male allotype, and male and female paratypes from Lake Alfred, Florida, March 6, 1952, by M. H. Muma, feeding on six-spotted mites, *Eotetranychus sexmaculatus* (Riley), on citrus seedlings. is in the USNM, Washington, D. C.

HABITAT: This species is found on *Acer platanoides, Casimiroa edulis, Cedrus* sp., leaves and fruit of *Citrus* spp., *Ipomoea carica, Juniperus conferta,* and *Magnolia grandiflora.*

COUNTY DISTRIBUTION: Alachua, Brevard, Gadsden, Hillsborough, Indian River, Lake, Marion, Orange, Osceola, Pinellas, Polk, Saint Lucie, Sarasota, and Volusia.

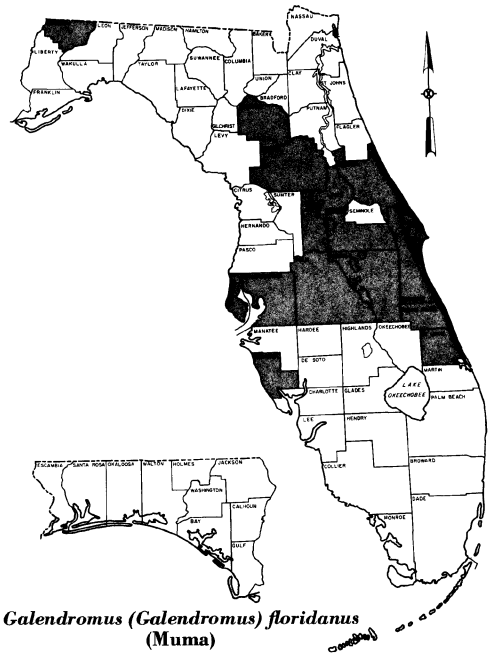
BIOLOGY: This species is regularly associated with six-spotted mites in citrus groves as reported by Muma (1955, 1958,

Galendromus (Galendromus) floridanus (Muma)

Fig. 549 to 555

Typhlodromus floridanus Muma, 1955a: 269.
Typhlodromus helveolus Chant, 1959: 58.
Galendromus floridanus (Muma), Muma, 1961: 298.
Galendromus (Galendromus) floridanus (Muma), Muma, 1963: 18.

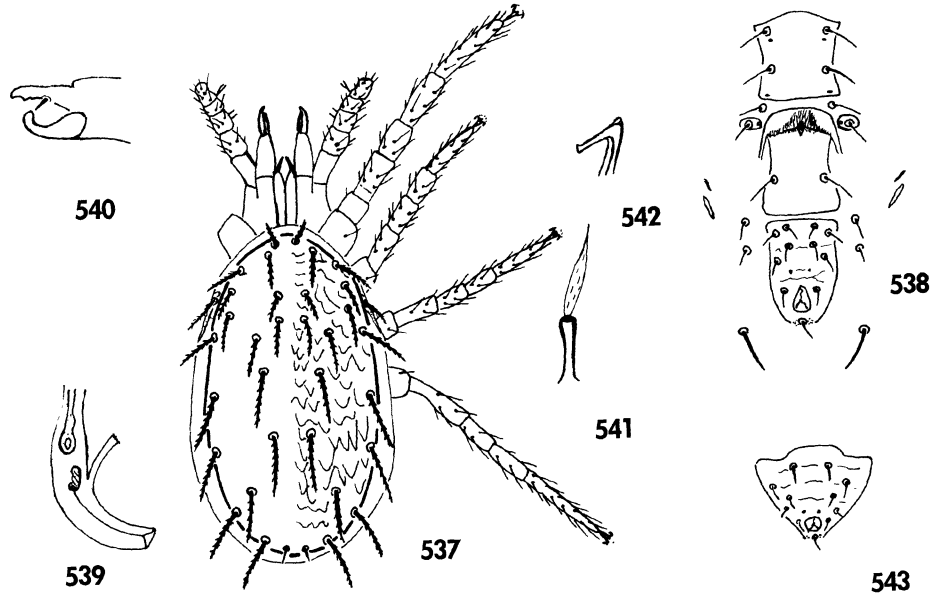
DIAGNOSIS: *G. floridanus* can be separated from most other species of the subgenus *Galendromus* by the short M_1. It can be distinguished from the closely related *G. gratus* (Chant) by the longer D_2, longer L_2 and L_3, and the more closely spaced preanal, ventrianal pores. The body is about 370μ long.



Galendromus (Galendromus) floridanus (Muma)

Fig. 537 to 543. *Galendromus* (*G.*) *annectans* (De Leon). 537. Dorsal and leg structure and setation ♀. 538. Ventral scuta and setation ♀. 539. Posterior peritremal and stigmatal development ♀. 540. Cheliceral structure ♀. 541. Spermathecal structure ♀. 542. Spermatodactyl structure ♂. 543. Ventrianal scutum ♂.

Fig. 544 to 548. *Galendromus* (*G.*) *gratus* (Chant). 544. Dorsal and leg structure and setation ♀. 545. Ventral scuta and setation ♀. 546. Posterior peritremal and stigmatal development ♀. 547. Cheliceral structure ♀. 548. Spermathecal structure ♀.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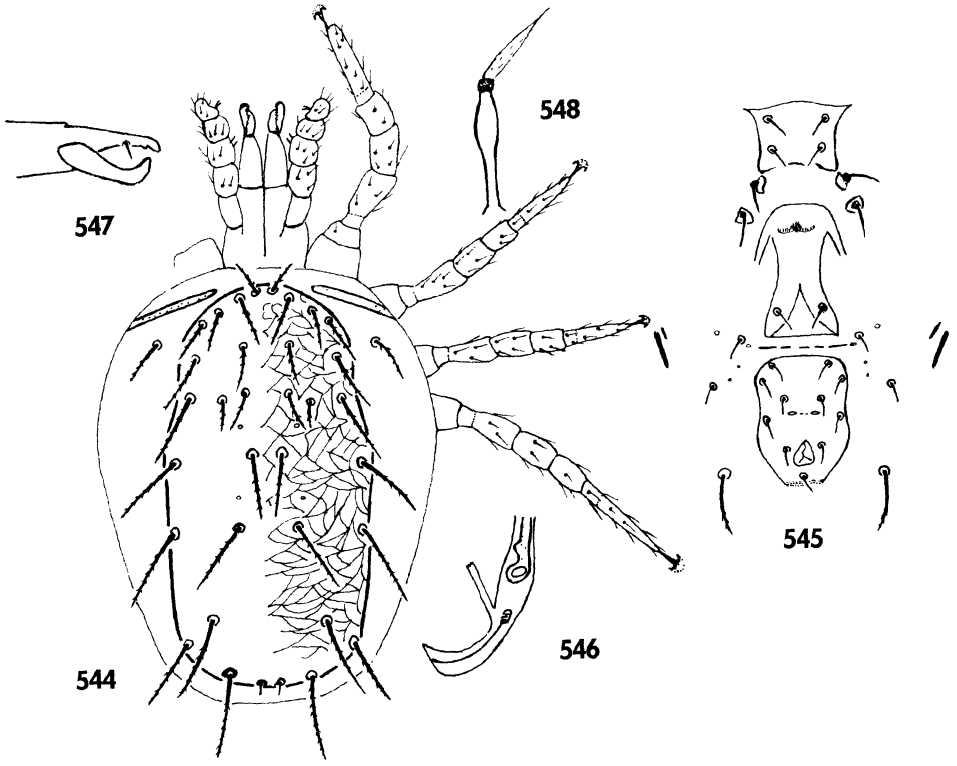
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1964, and 1964a). In the laboratory it also feeds readily on Texas citrus mites and citrus red mites, so, in all probability, it will feed on a number of tetranychids. It completes a life cycle in about 8 days.

The species is found predominately on trees and shrubs.

This species has been collected in every month of the year.

Subgenus *Menaseius* Wainstein

Menaseius Wainstein, 1962: 21.
Lamiaseius Wainstein, 1962: 21.
Galendromus (*Menaseius*) Wainstein, Muma, 1963: 27.

DIAGNOSIS: Females of this subgenus have most of the dorsal and lateral setae simple. Dorsal setae are shorter than the distance to the succeeding setae. Anterior dorsal scutal pores distinct with reticulation radiating from pores. Ventrianal scuta pentagonal, but slightly constricted near middle of length. Most species have leg IV, St IV macroseta present.

Spermatheca with fundibuliform cervix and a highly refractive valve at atrium. Spermatodactyl with typical shank, foot, heel, lateral process, and toe; both heel and lateral process distinct; foot terminal.

TYPE SPECIES: *Seius pomi* Parrott, by designation, Wainstein (1963) and Muma (1963).

DISCUSSION: Two of the 10 known species of the subgenus occur in Florida.

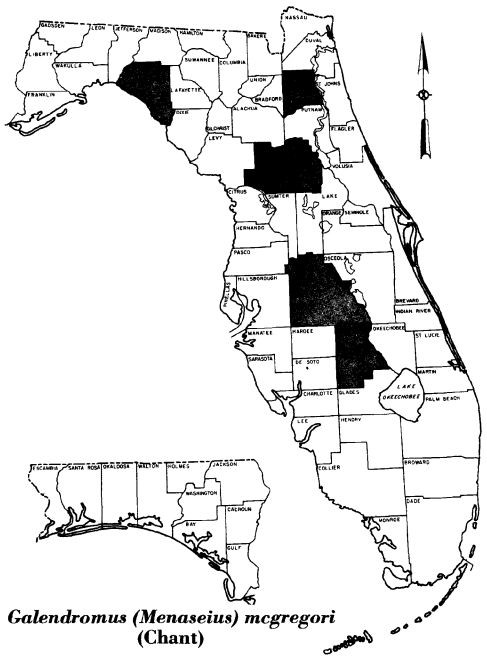
Galendromus (Menaseius) mcgregori (Chant)

Fig. 556 to 562

Typhlodromus mcgregori Chant, 1959: 57.
Metaseiulus mcgregori (Chant), Schuster and Pritchard 1963: 223.
Galendromus (*Menaseius*) *mcgregori* (Chant), Muma, 1963: 33.

DIAGNOSIS: *G. mcgregori* (Chant) is closely related to *G. pomoides* (Schuster and Pritchard), but differs by having no pores on the preanal ventrianal shield and one pair of ventrolateral setae. Florida specimens frequently exhibit 3 pairs of preanal setae rather than the typical 4. The body is about 330μ long.

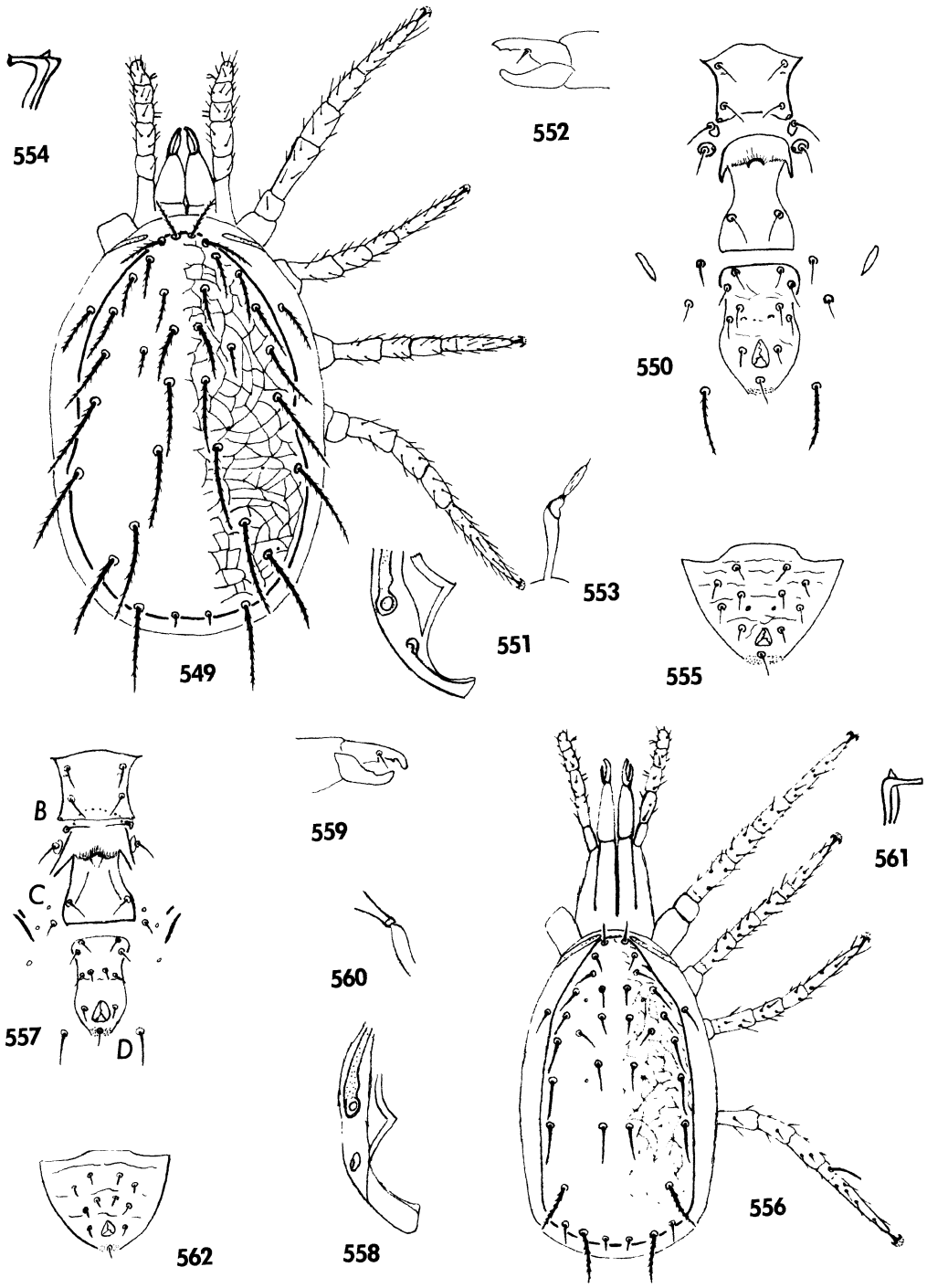
TYPE: The female holotype from Pasco, Washington, May 1953, by E. C. Klostermeyer, on arborvitae is in the Canadian National Collection, Ottawa, Ontario.



Galendromus (Menaseius) mcgregori (Chant)

Fig. 549 to 555. *Galendromus* (*G.*) *floridanus* (Muma). 549. Dorsal and leg structure and setation ♀. 550. Ventral scuta and setation ♀. 551. Posterior peritremal and stigmatal development ♀. 552. Cheliceral structure ♀. 553. Spermathecal structure ♀. 554. Spermatodactyl structure ♂. 555. Ventrianal scutum ♂.

Fig. 556 to 562. *Galendromus* (*M.*) *mcgregori* (Chant). 556. Dorsal and leg structure and setation ♀. 557. Ventral scuta and setation ♀. 558. Posterior peritremal and stigmatal development ♀. 559. Cheliceral structure ♀. 560. Spermathecal structure ♀. 561. Spermatodactyl structure ♂. 562. Ventrianal scutum ♂.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HABITAT: In Florida it has been found on *Malva* sp. and *Tillandsia usneoides.*

COUNTY DISTRIBUTION: Clay, Highlands, Marion, Polk, and Taylor.

BIOLOGY: It's food habits and biology in Florida are not known.

This species has been collected in March, April, June, and November.

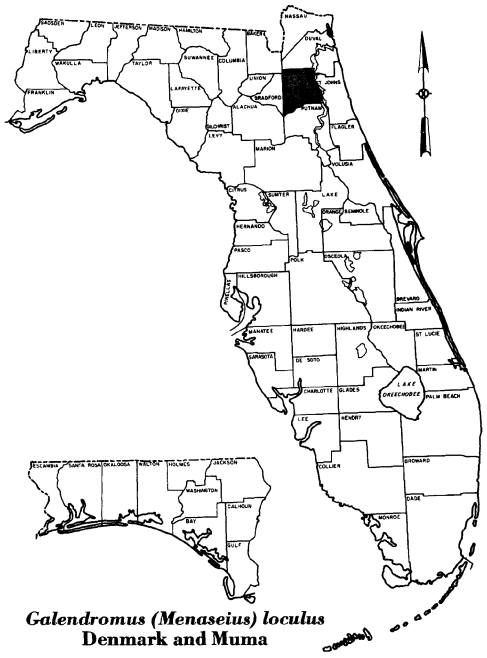
Galendromus (Menaseius) loculus Denmark and Muma

Fig. 563 to 569

Galendromus loculus Denmark and Muma, 1967: 178.

DIAGNOSIS: *G. loculus* is closely related to *G. mcgregori* (Chant), but *loculus* has L_8 longer, a shorter ventrianal scutum, a shorter spermatheca, and a greater distance between D_3 and D_4. The body is about 330μ long.

TYPE: The female holotype from Clay County, Florida, September 6, 1966, by E. M. Collins, Jr., on *Pinus* sp., is in the Florida State Collection of Arthropods, Gainesville.



Galendromus (Menaseius) loculus Denmark and Muma

HABITAT: This species is known only from the type locality. Five females, two males, and one nymph were collected with the holotype, and all were associated with a gall formation on *Pinus* sp.

COUNTY DISTRIBUTION: Clay.

BIOLOGY: Nothing is known about the biology of this species.

This species has been collected in September.

GENUS *ANTHOSEIUS* DE LEON

Anthoseius De Leon, 1959c: 257.
Anthoseius De Leon, Muma, 1961: 296.

DIAGNOSIS: Females are characterized by a reticulated dorsal scutum and having 4 pairs of dorsal setae; 2 pairs of median setae; 10 pairs of lateral setae with 6 pairs anterior to D_3 and L_{10} expanded at tip; 2 pairs of sublateral setae; 2 pairs of sternal setae; 3 pairs of preanal ventrianal setae on the preanal scutum; 4 pairs of ventrolateral setae and a pair of caudal setae; no macrosetae on legs; leg formula 4123 with legs unusually short and stocky; peritremal and stigmatal scuta indistinguishably fused; peritreme extends to L_1; spermatheca has an elongate, fundibuliform cervix with a crescent shaped opening near atrium and an undifferentiated atrium; chelicerae normal in proportion to the body size; movable cheliceral finger with 1 or 2 denticules, fixed finger with 2 denticules.

Males are smaller than, but otherwise similar to females. The spermatodactyl lacks a foot, heel, and lateral process, but the shank is long and slightly curved with a slightly flared and bifurcate tip. The ventrianal scutum has 3 pairs of preanal setae.

TYPE SPECIES: *Anthoseius hebetis* De Leon, 1959, by designation (by monotypy).

DISCUSSION: This genus has been collected only from within the flower of *Heliotropium parviflorum* in Florida. De Leon (1959b and 1966) has stated that the type species is a pollen feeder. The genus is closely related to *Amblydromella* Muma; it is maintained separately, for the present, because of its probable pollen feeding habit,

the short thick legs, the reduced number of preanal setae, and the unusual dorsal setal pattern on the larva.

Anthoseius hebetis De Leon

Fig. 570 to 576

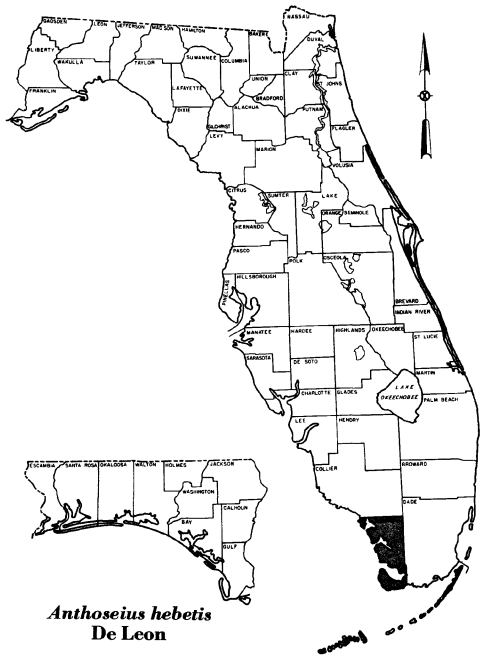
Anthoseius hebetis De Leon, 1959c: 257.
Anthoseius hebetis De Leon, Muma, 1961: 296.

DIAGNOSIS: This species is easily recognized by the generic characters which are closely related to *Amblydromella.* The male has an unusually long distinctive spermatodactyl that is reminiscent of those in the *rhenana* species group of *Amblydromella.* The body is about 330μ long.

TYPE: The female holotype from Key Largo, Florida, December 6, 1958, by De Leon, from *Heliotropium parviflorum,* is in the MCZ, Harvard University, Cambridge, Massachusetts.

HABITAT: This monotypic species has been found only in Florida from within the flowers of *Heliotropium parviflorum.*

COUNTY DISTRIBUTION: Monroe.



Anthoseius hebetis De Leon

BIOLOGY: According to De Leon (1959c and 1966) this mite colonizes a single flower of *Heliotropium parviflorum,* all stages occurring within the throat. He reported taking 35 mites from four flowers. Mites were covered with pollen, and it is quite probable that they feed on the pollen.

This species has been collected in December.

GENUS *ORIENTISEIUS* MUMA AND DENMARK

Amblydromella Muma, 1961: 294 (in part).
Amblydromella Muma, 1962: 278 (in part).
Orientiseius Muma and Denmark, 1968: 238.

DIAGNOSIS: Females are characterized by 4 pairs of dorsal setae; 2 pairs of median setae; 10 pairs of lateral setae with some much shorter than others; 2 pairs of sublateral setae on the inter-scutal membrane; 3 pairs of sternal setae; 4 pairs of ventrianal setae; 3 pairs of ventro-lateral setae excluding caudal setae. Scutal characters are 1 dorsal scutum; sternal scutum longer than wide with posterior margin straight or excavated; ventrianal scutum pentagonal, but elongate and broad anteriorly; and primary metapodal scuta normal in size, elongate and slender. Peritremal, stigmatal, and leg IV exopodal scuta fused, with secondary pore large and kidney-shaped; peritreme extending forward to L_1. Spermathecal cervix saccular; atrium tiny but nodular, with valve indistinct. Chelicerae normal in size in proportion to the body with 1 or 2 denticules on the movable finger and 2 or 3 distad of the medially located *pilus dentilis* on the fixed finger. Legs ranked in size 4123, respectively, with leg IV distinctly longer and no macrosetae on legs I, II, and III, but 3 on leg IV, Sge IV, Sti IV, and St IV.

Males are similar to, but smaller than females, with S_1 and S_2 both on the dorsal scutum. Spermatodactyl with heel terminal and lateral process indistinct.

TYPE SPECIES: *Typhlodromus rickeri* Chant, 1960, by designation, Muma and Denmark (1968).

DISCUSSION: Muma (1967) and Muma

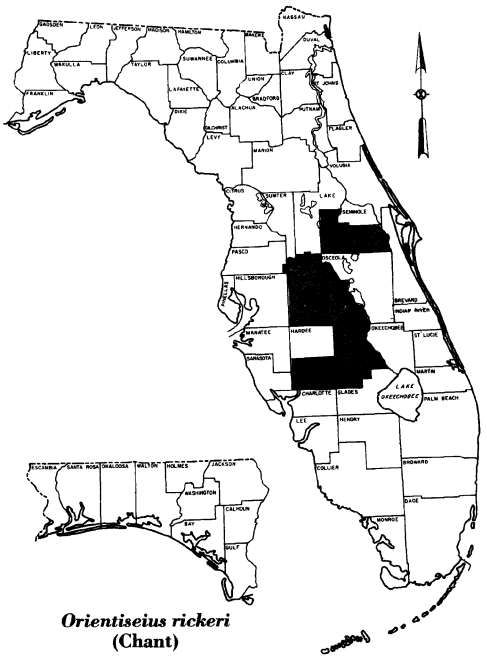
and Denmark (1968) have discussed the erection of this genus. Muma and Denmark (1968) erred in citing 8 pairs of lateral setae; there are 10.

Although *O. rickeri* and *O. hadii* (Chaudri) are known, only the generotype has been introduced into Florida.

Orientiseius rickeri (Chant)

Fig. 577 to 583

Typhlodromus rickeri Chant, 1960: 62.
Amblydromella rickeri (Chant), Muma 1961: 294.
Orientiseius rickeri (Chant), Muma and Denmark, 1968: 238.



Orientiseius rickeri (Chant)

DIAGNOSIS: *O. rickeri* is about 365μ long. It is distinguished from the closely related *O. hadii* by the much longer dorsal setae.

TYPE: The female holotype from Shillong, Assam, India, by D. W. Ricker, found on citrus leaves, is in the Canadian National Collection, Ottawa, Ontario.

HABITAT: It has been introduced into Florida on citrus for the control of rust mites.

COUNTY DISTRIBUTION: De Soto, Highlands, Orange, and Polk.

BIOLOGY: The life cycle and food habits of this species have been investigated by McMurtry and Scriven (1964a).

The establishment of this species in Florida has not been confirmed. We list the species because it has been introduced several times into 4 counties.

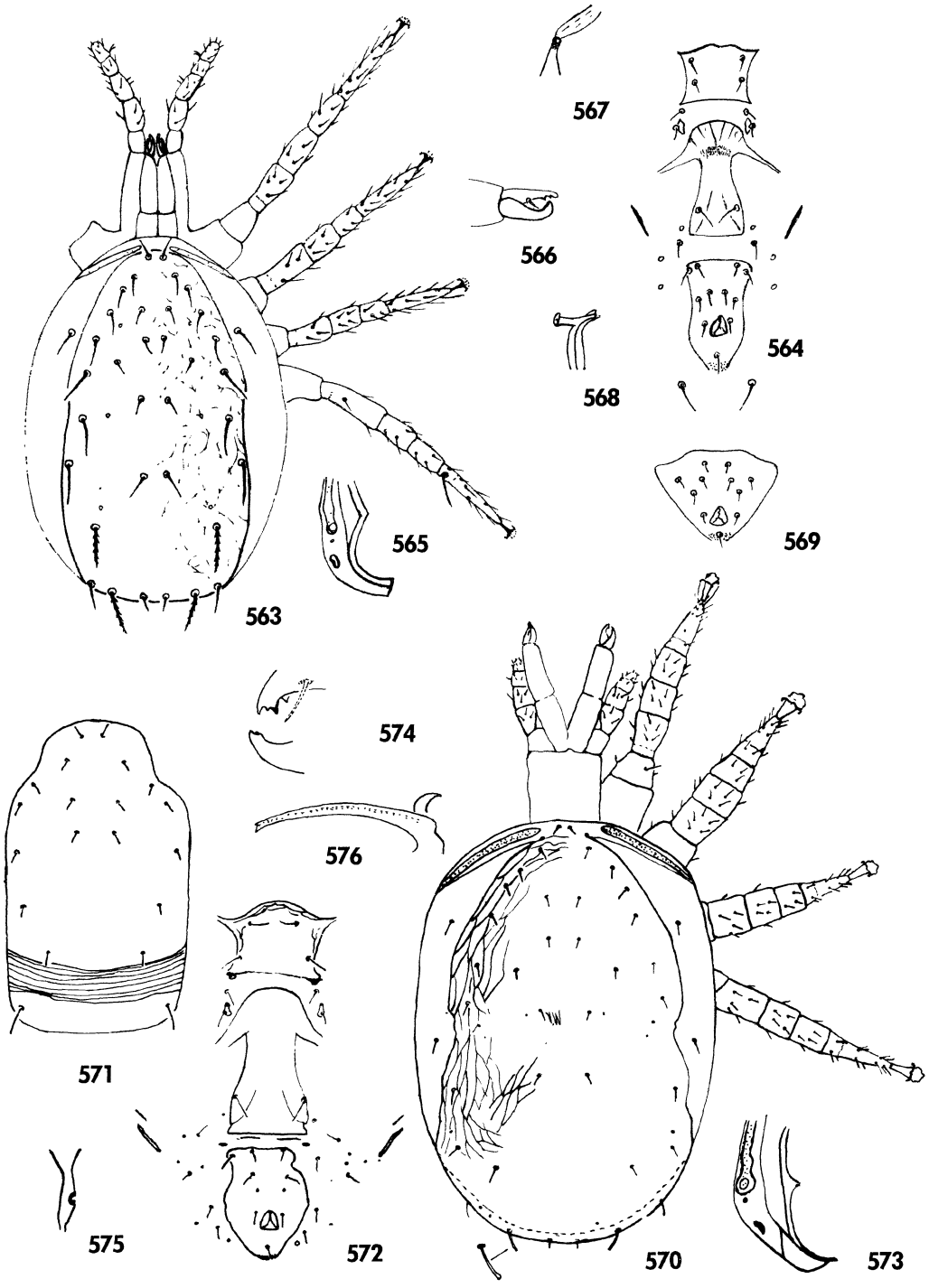
GENUS *PARASEIULUS* MUMA

Paraseiulus Muma, 1961: 299.

DIAGNOSIS: Females of the genus are characterized by having a reticulated dorsal scutum with 4 pairs of dorsal setae; 3 pairs of median setae; 10 pairs of lateral setae; M_3 and L_{10} are serrate; all other setae short and setaceous; 2 pairs of sublateral setae; 2 pairs of sternal setae; 2 to 4 pairs of preanal ventrianal setae on the preanal scutum; 2 or 3 pairs of ventrolateral and a pair of caudal setae; no macrosetae on legs; leg formula 4123; peritreme extends to the verticals; peritremal and stigmatal scuta indistinguishably fused; spermatheca has a tubular cervix and an undifferentiated atrium; chelicerae normal; movable cheliceral finger with 1 denticule, and fixed finger with 2 to 4 denticules.

Fig. 563 to 569. *Galendromus* (*M.*) *loculus* Denmark and Muma. 563. Dorsal and leg structure and setation ♀. 564. Ventral scuta and setation ♀. 565. Posterior peritremal and stigmatal development ♀. 566. Cheliceral structure ♀. 567. Spermathecal structure ♀. 568. Spermatodactyl structure ♂. 569. Ventrianal scutum ♂.

Fig. 570 to 576. *Anthoseius hebetis* De Leon. 570. Dorsal and leg structure and setation ♀. 571. Dorsal scuta and setation of the larva. 572. Ventral scuta and setation ♀. 573. Posterior peritremal and stigmatal development ♀. 574. Cheliceral structure ♀. 575. Spermathecal structure ♀. 576. Spermatodactyl structure ♂.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Males are unknown.

TYPE SPECIES: *Seiulus soleiger* Ribaga, 1902, by designation, Muma (1961).

DISCUSSION: This genus has been collected in Europe, England, Canada, and the United States. *P. ecclesiasticus* (De Leon) is found on the southern tip of Florida.

Paraseiulus ecclesiasticus (De Leon)

Fig. 584 to 588

Typhlodromus ecclesiasticus De Leon, 1958: 73.

Paraseiulus ecclesiasticus (De Leon), Muma, 1961: 300.

DIAGNOSIS: *P. ecclesiasticus* differs from *P. soleiger* Ribaga by having 4 pairs of preanal ventrianal setae on the preanal scutum, while *soleiger* has only 2 pairs. The body is about 300μ long.

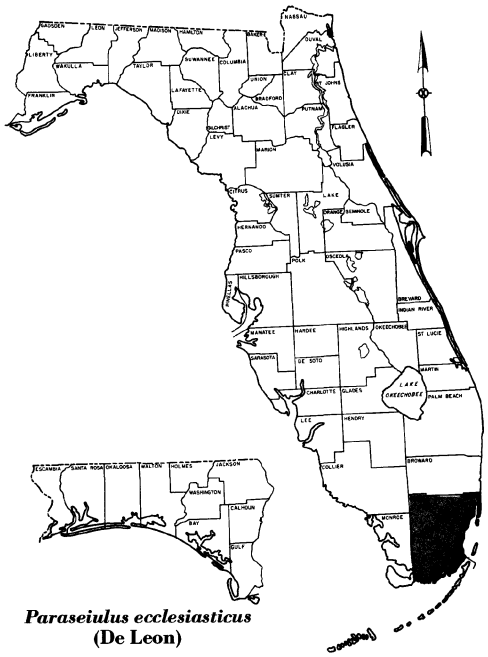
TYPE: The female holotype from Coral Gables, Florida, April 18, 1955, by D. De Leon, on *Laguncularia racemosa,* is in the MCZ, Harvard University, Cambridge, Massachusetts.

HABITAT: This species is found in south Florida on *Laguncularia racemosa* and *Stenolobium* (=*Tecoma*) *stans.*

COUNTY DISTRIBUTION: Dade.

BIOLOGY: Nothing is known about the biology of this species.

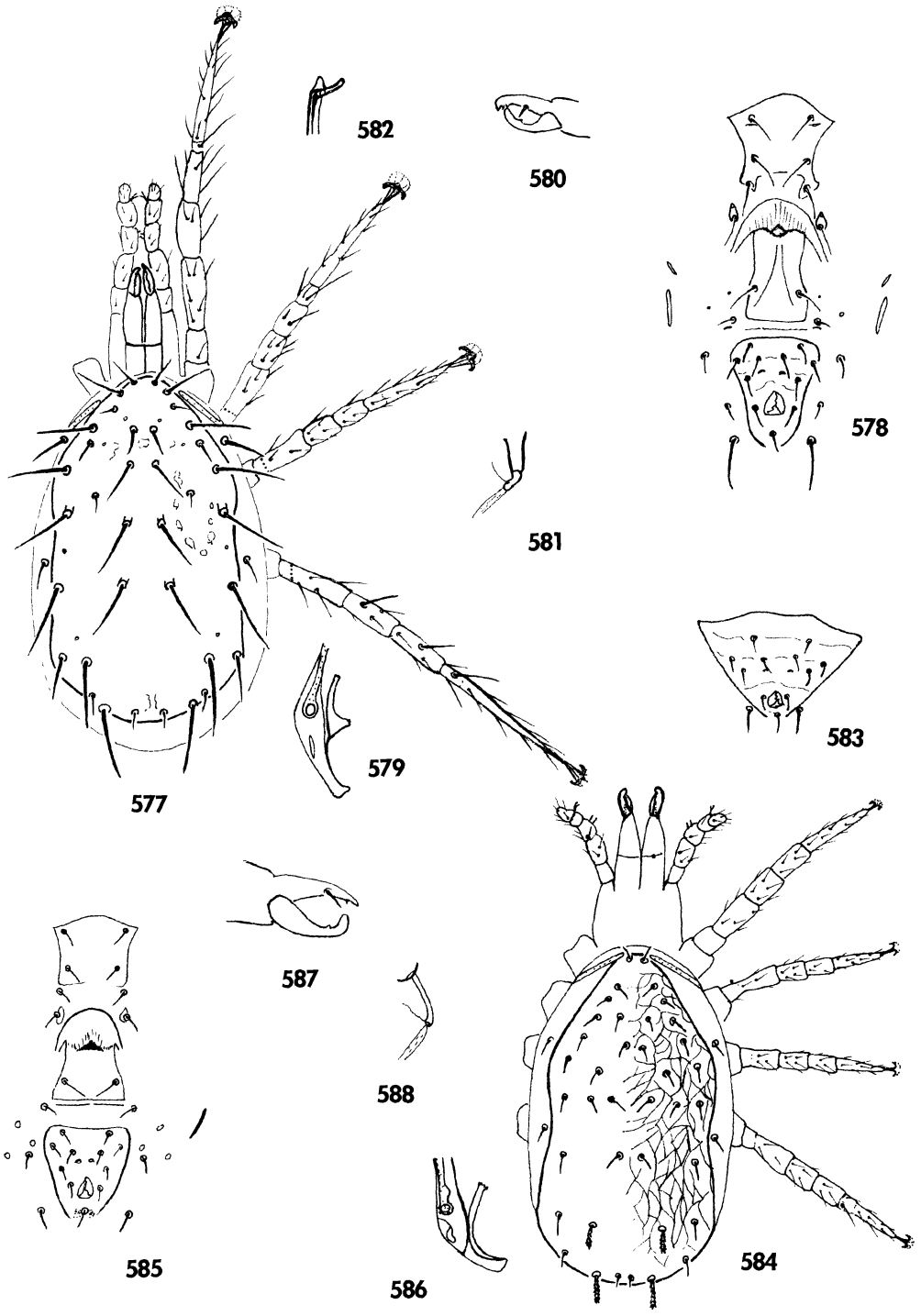
This species has been collected in April and October.



Paraseiulus ecclesiasticus
(De Leon)

Fig. 577 to 583. *Orientiseius rickeri* (Chant). 577. Dorsal and leg structure and setation ♀. 578. Ventral scuta and setation ♀. 579. Posterior peritremal and stigmatal development ♀. 580. Cheliceral structure ♀. 581. Spermathecal structure ♀. 582. Spermatodactyl structure ♂. 583. Ventrianal scutum ♂.

Fig. 584 to 589. *Paraseiulus ecclesiasticus* (De Leon). 584. Dorsal and leg structure and setation ♀. 585. Ventral scuta and setation ♀. 586. Posterior peritremal and stigmatal development ♀. 587. Cheliceral structure ♀. 588. Spermathecal structure ♀.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LITERATURE CITED

Athias-Henriot, C. 1957. Phytoseiidae et Aceosejidae (Acarina: Gamasina) d'Algérie, I Genres *Blattisocius* Keegan, *Iphiseius* Berlese, *Amblyseius* Berlese, *Phytoseius* Ribaga, *Phytoseiulus* Evans. Bull. Soc. Hist. Nat. l'Afrique du Nord 48: 319-352.

Athias-Henriot, C. 1958. Phytoseiidae et Aceosejidae (Acarina: Gamasina) d'Algérie. II Phytoseiidae: clé des genres *Amblyseius* Berlese (suite) et *Seiulus* Berlese. Bull. Soc. Hist. Nat. l'Afrique du Nord 49: 23-43.

Athias-Henriot, C. 1960. Phytoseiidae et Aceosejidae (Acarina: Gamasina) d'Algérie, IV Genre *Typhlodromus* Scheuten, 1857. Bull. Soc. Hist. Nat. l'Afrique du Nord 51: 62-107.

Banks, Nathan. 1905. Descriptions of some new mites. Proc. Ent. Soc. Wash. 7: 133-142.

Banks, Nathan. 1909. New Canadian mites. Proc. Ent. Soc. Wash. 11: 133-143.

Bartlett, Blair. 1964. The toxicity of some pesticide residues to adult *Amblyseius hibisci* with a compilation of the effects of pesticides upon phytoseiid mites. J. Econ. Ent. 57(4): 559-563.

Berlese, A. 1914. Acari nuovi. Redia 10: 113-150.

Berlese, A. 1916. Centuria prima-sesta di Acari nuovi. Redia 12: 19-67.

Chant, D. A. 1956. Some mites of the subfamily Phytoseiinae (Acarina: Laelaptidae) from Southeastern England, with descriptions of new species. Can. Ent. 88: 26-37.

Chant, D. A. 1957. Descriptions of two new phytoseiid genera (Acarina: Phytoseiidae), with a note on the genus *Phytoseius* Ribaga, 1902. Can. Ent. 89: 357-363.

Chant, D. A. 1959. Phytoseiid mites (Acarina: Phytoseiidae). Part I. Bionomics of seven species in southeastern England. Part II. A taxonomic review of the family Phytoseiidae, with descriptions of 38 new species. Can. Ent. 91, Suppl. 12: 1-166.

Chant, D. A. 1960. Descriptions of five new species of mites from India (Acarina: Phytoseiidae, Aceosejidae). Can. Ent. 92: 58-65.

Chant, D. A. 1965. Generic concepts in the family Phytoseiidae (Acarina: Mesostigmata). Can. Ent. 97(4): 352-374.

Chant, D. A., and E. W. Baker. 1965. The Phytoseiidae (Acarina) of Central America. Mems. Ent. Soc. Can. 41: 1-56.

Chant, D. A., H. A. Denmark, and E. W. Baker. 1959. A new Subfamily, Macroseiinae Nov., of the Family Phytoseiidae (Acarina: Gamasina). Can. Ent. 91 (12): 808-811.

Chant, D. A., and C. A. Fleschner. 1960. Some observations on the ecology of phytoseiid mites (Acarina: Phytoseiidae) in California. Entomophaga 5: 132-139.

De Leon, Donald. 1957. Three new *Typhlodromus* from southern Florida. Fla. Ent. 40: 141-144.

De Leon, Donald. 1958. Four new *Typhlodromus* from southern Florida. Fla. Ent. 41: 73-76.

De Leon, Donald. 1959a. A new genus and three new species of phytoseiid mites from Mexico with collection records on *Phytoseius plumifer* (C. & F.) and *P. macropilis* (Banks). Ent. News 70: 147-152.

De Leon, Donald. 1959b. Seven new *Typhlodromus* from Mexico with collection notes on three other species (Acarina: Phytoseiidae). Fla. Ent. 42(3): 113-121.

De Leon, Donald. 1959c. Two new phytoseiid genera (Acarina: Phytoseiidae). Ent. News 70: 257-265.

De Leon, Donald. 1960. An undescribed *Phytoseius* from Florida and Mexico (Acarina: Phytoseiidae). Ent. News 71: 269-270.

De Leon, Donald. 1961. Eight new *Amblyseius* from Mexico. Fla. Ent. 44: 85-91.

De Leon, Donald. 1962. Twenty-three new phytoseiids, mostly from southeastern United States (Acarina: Phytoseiidae). Fla. Ent. 45(1): 11-27.

De Leon, Donald. 1965. A note on *Neoseiulus* Hughes and new synonymy. Proc. Ent. Soc. Wash. 67(1): 23.

De Leon, Donald. 1966. Phytoseiidae of British Guyana with keys to species (Acarina: Mesostigmata). *In* Studies on the Fauna of Suriname and Other Guyanas 8: 81-102.

De Leon, Donald. 1967. Some mites of the Caribbean area; Part I. Acarina on plants in Trinidad, West Indies. Allen Press Incorporated. (posthumous)

Denmark, H. A. 1965. Four new Phytoseiidae (Acari: Mesostigmata) from Florida. Fla. Ent. 48(2): 89-95.

Denmark, H. A. 1966. Revision of the genus *Phytoseius* Ribaga, 1904 (Acarina: Phytoseiidae). Fla. Dept. Agr. Div. Plant Ind. Bull. 6. 105 p.

Denmark, H. A. and M. H. Muma. 1966. Revision of the genus *Proprioseius* Chant (Acarina: Phytoseiidae). Fla. Ent. 49(4): 253-264.

Denmark, H. A., and Martin H. Muma. 1967. Six new Phytoseiidae from Florida (Acarina: Phytoseiidae). Fla. Ent. 50(3): 169-180.

Dosse, Gudo. 1958. Die Spermathecae ein zusätzliches bestimmungsmerkmal bei Raubmilben. Pflanzenshutz-Berichte. 20 (1/2): 1-11.

Evans, G. O. 1952. On a new predatory mite of economic importance. Bull. Ent. Res. 43: 397-401.

Evans, G. O. 1963. Observations on the chaetotaxy of the legs in the free-living Gamasina (Acari: Mesostigmata). Bull. Brit. Mus. (Nat. Hist.) Zool. 10(5): 277-303.

Fleschner, C. A., and D. W. Ricker. 1954. Typhlodromid mites on citrus and avocado trees in southern California. J. Econ. Ent. 47: 356-357.

Garman, P. 1948. Mite species from apple trees in Connecticut. Bull. Conn. Agr. Exp. Sta. 520. 27 p.

Garman, P. 1958. New species belonging to the genera *Amblyseius* and *Amblyseiopsis* with keys to *Amblyseius, Amblyseiopsis,* and *Phytoseiulus.* Ann. Ent. Soc. Amer. 51: 69-79.

Garman, P., and E. A. McGregor. 1956. Four new predaceous mites (Acarina, Phytoseiidae). Bull. So. Calif. Acad. Sci. 55(1): 7-13.

Gonzalez, Roberto H., and Robert O. Schuster. 1962. Species of the family Phytoseiidae in Chile I (Acarina: Mesostigmata). Univ. of Chile Agr. Exp. Sta. Tech. Bull. No. 16. 35 p.

Hirschmann, W. 1957. Gagsystematic der Parasitiformes, 1: Rumpfbeharrung und Ruckenflachen, Schrift. Vergl. Milbenkunde. 20 p.

Hirschmann, W. 1962. Gagsytematic der Parasitiformes, 5(5): Gamasiden, Schrift. Vergl. Milbenkunde. 56 p.

Lindquist, E., and D. A. Chant. 1964. A redescription of *Aceodromus* Muma and its transfer to the Blattisociinae (Acarina: Blattisocidae). Can. Ent. 96: 500-507.

McMurtry, J. A., and G. T. Scriven. 1964a. Studies on the feeding, reproduction, and development of *Amblyseius hibisci* (Acarina: Phytoseiidae) on various food substances. Ann. Ent. Soc. Amer. 57(5): 649-655.

McMurtry, J. A., and G. T. Scriven. 1964b. Biology of the predaceous mite *Typhlodromus rickeri* (Acarina: Phytoseiidae). Ann. Ent. Soc. Amer. 57: 362-367.

McMurtry, J. A., and G. T. Scriven. 1965a. Some factors influencing the abundance of the predaceous mite *Amblyseius hibisci* in southern California (Acarina: Phytoseiidae). Ann. Ent. Soc. Amer. 58(1): 49-56.

McMurtry, J. A., and G. T. Scriven. 1965b. Life-history studies of *Amblyseius limonicus,* with comparative observations of *Amblyseius hibisci* (Acarina: Phytoseiidae). Ann. Ent. Soc. Amer. 58(1): 106-111.

McMurtry, J. A., and G. T. Scriven. 1966a. The influence of pollen and prey density on the number of prey consumed by *Amblyseius hibisci* (Acarina: Phytoseiidae). Ann. Ent. Soc. Amer. 59(1): 147-149.

McMurtry, J. A., and G. T. Scriven. 1966b. Studies on predator-prey interactions between *Amblyseius hibisci* and *Oligonychus punicae* (Acarina: Phytoseiidae, Tetranychidae) under greenhouse conditions. Ann. Ent. Soc. Amer. 59(4): 793-800.

Muma, M. H. 1955a. Phytoseiidae (Acarina) associated with citrus in Florida. Ann. Ent. Soc. Amer. 48(4): 262-272.

Muma, M. H. 1955b. Factors contributing to the natural control of citrus insects and mites in Florida. J. Econ. Ent. 48(4) :432-438.

Muma, M. H. 1958. Predators and parasites of citrus mites in Florida. Proc. 10th Intl. Congr. Ent. 4: 633-647. (1956).

Muma, M. H. 1961. Subfamilies, genera and species of Phytoseiidae (Acarina: Mesostigmata). Bull. Fla. State Mus. 5(7): 267-302.

Muma, M. H. 1961. Mites associated with citrus in Florida. Fla. Agr. Exp. Sta. Tech. Bull. 640: 1-39.

Muma, M. H. 1962. New Phytoseiidae (Acarina: Mesostigmata) from Florida. Fla. Ent. 45(1) : 1-10.

Muma, M. H. 1963. The genus *Galendromus* Muma, 1961. (Acarina: Phytoseiidae) Fla. Ent. Suppl. 1: 15-41.

Muma, M. H. 1964a. Annotated list and keys to Phytoseiidae (Acarina: Mesostigmata) associated with Florida citrus. Fla. Agr. Exp. Sta. Tech. Bull. 685: 1-42.

Muma, M. H. 1964b. The population of Phytoseiidae on Florida citrus. Fla. Ent. 47: 5-11.

Muma, M. H. 1965a. Eight new Phytoseiidae (Acarina: Mesostigmata) from Florida. Fla. Ent. 48(4) : 245-254.

Muma, M. H. 1965b. Populations of common mites in Florida citrus groves. Fla. Ent. 48(1) : 35-46.

Muma, M. H. 1967. New Phytoseiidae (Acarina: Mesostigmata) from southern Asia. Fla. Ent. 50(4) : 267-280.

Muma, M. H. 1970. *Typhlodromalus peregrinus* (Muma) (Acarina: Phytoseiidae) on Florida Citrus. Proceedings of the 2nd Intl. Congr. Acarology, 1967. Akademiai Kiado, Budapest, 652 p.

Muma, M. H., and H. A. Denmark. 1962. Intraspecific variation in Phytoseiidae (Acarina-Mesostigmata). Fla. Ent. 45(2) : 57-65.

Muma, M. H., and H. A. Denmark. 1967. Biological studies on *Macroseius biscutatus* Chant, Denmark, and Baker (Acarina: Phytoseiidae). Fla. Ent. 50: 249-255.

Muma, M. H., and H. A. Denmark. 1968. Some generic descriptions and name changes in the family Phytoseiidae (Acarina: Mesostigmata). Fla. Ent. 51: 229-240.

Muma, M. H., and H. A. Denmark. 1969. The *conspicua* species group of *Typhlodromina* Muma, 1961 (Acarina: Phytoseiidae). Ann. Ent. Soc. Amer. 62(2) : 406-413.

Muma, M. H., A. G. Selhime, and H. A. Denmark. 1961. An annotated list of predators and parasites associated with insects and mites on Florida citrus. Fla. Agr. Exp. Sta. Tech. Bull. 634: 1-39.

Nesbitt, H. H. J. 1951. A taxonomic study of the Phytoseiinae (Family Laelaptidae) predaceous upon Tetranychidae of economic importance. Zoologische Verhandelingen No. 12. 64 p.

Pritchard, A. E., and E. W. Baker. 1962. Mites of the family Phytoseiidae from central Africa, with remarks on the genera of the world. Hilgardia 33(7) : 205-309.

Ribaga, C. 1904. Gamasidi planticoli. Riv. Pat. Veg. 10: 175-178.

Schuster, Robert O., and A. Earl Pritchard. 1963. Phytoseiid mites of California. Hilgardia 34(7) : 19-285.

Schuster, Robert O., and Leslie M. Smith. 1960. The spermathecae as taxonomic features in phytoseiid mites of western North America. Proc. Ent. Soc. Wash. 62(3): 181-187.

Smith, L. M., and F. M. Summers. 1949. The structure and biology of the red spider predator *"Hypoaspis" macropilis* (Banks). Proc. Ent. Soc. Wash. 51: 209-218.

Wainstein, B. A. 1962. Revision du genre *Typhlodromus* Scheuten, 1857 et systematique de la famille des Phytoseiidae (Berlese, 1916) (Acarina: Parasitiformes). Acarologia 4: 5-30.

Womersley, H. 1954. Species of the subfamily Phytoseiinae (Acarina: Laelaptidae) from Australia. Australian J. Zool. 2:169-191.

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