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**SUBFAMILIES, GENERA, AND SPECIES OF
PHYTOSEIIDAE (ACARINA: MESOSTIGMATA)**

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SUBFAMILIES, GENERA, AND SPECIES OF PHYTOSEIIDAE (ACARINA: MESOSTIGMATA)

MARTIN H. MUMA¹

SYNOPSIS: The subfamilies and genera of Phytoseiidae are re-evaluated on the basis of combined stable criteria of dorsal scutal form, dorsal scutal setation, scapular setation, sternal form, sternal setation and the macrosetae of leg IV. Four subfamilies are recognized, two of them new. Of the 43 genera diagnosed, 10 were previously recognized, 3 previously synonymized, 1 is elevated from a subgenus, and 29 are new. Nine new species are described and figured. Altogether 187 species are cited.

Many systematic studies have been conducted on this important family of predatory mites during the past 10 years. More than 180 species are now known, and the present high rate of species discovery indicates that this number may be doubled during the next decade.

Two important recent reviews have been published (Nesbitt, 1951 and Chant, 1959). Several generic and local faunal studies have also appeared. Notable among these are Evans (1958), Chant (1955-1957), Athias-Henriot (1957-1958), Womersley (1954), Garman (1958), Cunniffe and Baker (1953), Wainstein (1958-1959), DeLeon (1957-1959), McGregor (1956), Kennett (1958), and Muma (1955).

Recent opinions differ on the supraspecific classification of these mites. Chant (1959) used setal form and ornamentation for generic separation, recognized the subfamilial importance of a divided dorsal scutum, and agreed with Evans (1954) on the generic criteria of a sclerotized interscutal membrane and a fragmented ventrianal scutum. Athias-Henriot (1957-1958) placed great value in the generic significance of setal number and position on the dorsal scutum and developed a rather complex system of setal citation. Garman (1958) used sternal and ventrianal proportions and ornamentation as generic criteria. DeLeon based a genus (1959c) on an incomplete ventrianal scutum, and genera and subgenera (1959a, 1959d) on the length and ornamentation of dorsal scutal setae. Muma (1955) also based genera on the length of dorsal scutal setae and on the proportions and setation of the ventrianal scutum.

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As a result the subfamilial, generic, and subgeneric classification of the family is confused, and species placement is difficult. Inadequate descriptions and incorrect placements occur in almost every taxonomic paper published in the last 10 years.

The subfamilial and generic classification proposed below is based on a careful re-examination of many characters, some previously used, others recently recognized. The author realizes that the erection of numerous monotypic and small genera, foreseen by Chant (1959), will arouse indignation and consternation. Yet the splitting of large, unwieldy, loosely conceived genera often furthers rather than defeats the purpose of systematics.

Morphologic, supraspecific classification is dependent on the interspecific stability of the structures it is based on. In the Phytoseiidae, such stability occurs in the form and setation of the dorsal scutum, in the number and position of setae in the scapular region, in the form and setation of the sternum, and in the development of elongate or otherwise modified setae on the genu, tibia, and tarsus of the 4th leg.

Form of the dorsal scutum is almost fixed. With a single exception it is entire or undivided and varies only in proportionate length to width from elongate oval to obovate. Chant, Denmark, and Baker (1959) recognized this stability and established the subfamily Macroseiinae for a species with a divided dorsal scutum.

Setation of the dorsal scutum is somewhat more variable, but still remarkably constant. Most phytoseiids have 6 pairs of setae in the so-called dorsal (D) series. Scarcely two dozen species possess only 5 pairs (*Amblyseiulus*², *Amblyseiulella*, *Phytoseiulus*, *Phytoseiulella*, *Proprioseiopsis*, *Proprioseius*, *Asperoseius*), two have 4 pairs (*Phytoscutus*, *Phytoscutella*) and only one has 7 (*Macroseius*). Variation in the number of dorsal setae has been used to separate and to associate species, but has not been recognized as a stable, generically significant character. Median setae exhibit the same order of stability as dorsal setae. Most phytoseiids possess 2 distinguishable pairs of median (M) setae (e.g., *Typhlodromus* in the broad sense, *Typhloseiopsis*, *Asperoseius*, *Proprioseius*, *Anthoseius*) or 3 distinguishable pairs (e.g., *Amblyseius*, *Amblyseiella*, *Phyllodromus*). Nine species (*Phytoseius*, *Dubininellus*, *Phytoseiulus*, *Platyseiella*, and *Aceodromus*) have 1 pair of distinguishable median setae and two species (*Typhloseius*, *Typhloseiella*) have 4 pairs. Lateral (L) setae on the dorsal scutum are variable, but also exhibit numerical stability in certain aspects.

² Authorities for, or status of all subfamilies and genera of Phytoseiidae are given in table 1.

Chant (1957a) noted stability of the so-called anterior lateral setae in *Typhlodromus*, in the broad sense, and proposed the subgenus *Typhlodromus* for those species with more than 4 anterior laterals and the subgenus *Amblyseius* for those with 4 anterior laterals. No particular generic significance has been placed on the fact that all except 11 known phytoseiids (11 *Typhlodromus*, in the broad sense, have 6) have 4 or 5 pairs of lateral setae anterior to the 4th pair of dorsal setae, and that many closely related species share a uniform number and distribution of lateral setae posterior to D_4 . Variations in setation of the dorsal scutum are believed significant at the generic level.

The number of scapular (S) setae is almost as stable as the form of the dorsal scutum. With a single exception all phytoseiids have 1 or 2 pairs of scapular setae. The generic significance of this stability has been largely overlooked except by Wainstein (1959) in establishing his subgenus *Dubinellus*. A new subfamily Aceodrominae and genus *Aceodromus* are described below for a species with 8 pairs of scapular setae. A normal number of scapular setae (1 or 2) and position of S_1 are also considered generically diagnostic.

Acarologists have recognized the sternum as fundamental and stable enough for the establishment of several families of mesostigmatid mites. Within the family Phytoseiidae, however, only one or two workers have considered sternal variation to be of more than specific importance. Only three variations of phytoseiid sterna are known, the proportion of length to width, the occurrence of 2 or 3 pairs of sternal setae, and the presence or absence of sculpturing or reticulate markings. These variations are certainly significant at the generic and subgeneric level.

Finally the number and form of the so-called macrosetae on the dorsal surface of the genu, tibia, and tarsus of the 4th leg exhibit some degree of stability. For example, species of *Amblyseius* always have a distinguishable elongate macroseta on each of the named segments, whereas species of *Neoseiulus* have none. Macrosetal variability is, however, too great for reliability on this character alone. Several genera (*Cydnodromus*, *Galendromus*, and *Typhlodromina*) have a single fine macroseta on the basitarsus of the 4th leg of some species, and no distinguishable macroseta on other closely related species. Short hooked "macrosetae" are present in some genera (*Phytoscutus*, *Clavidromina*), whereas others (*Amblyseius*, *Clavidromus*) have the macrosetae knobbed on certain species.

In the following keys and diagnoses, combinations of these stable fundamental characters are used to recognize, segregate, and associate the several subfamilies and genera. Form and ornamentation of the

setae on the dorsal scutum, with the exception of the posterior medians and laterals, and form and setation of the ventrianal scutum are used only as supporting or subgeneric characters, owing to their extreme variability.

The modified Garman system of setal designation used by most workers is followed, except in the case of median setae. In this study, save for M_1 , that pair of setae forming the ectal angles of the so-called "dorsal hexagonal area," no number is assigned to median setae. If a pair of setae on the posterior third of the body, M_2 of authors, lies mesad to marginal lateral setae, it is considered median; if marginal lateral setae are not present (*Asperoseius*, *Phytoseius*, *Dubininellus*, *Phytoseiulus*) it is considered lateral. If a pair of setae on the middle third of the dorsal scutum, L_5 of authors, lies distinctly mesad to a pair of marginal lateral setae, it is considered median; if only one pair of setae is present or it is not distinctly mesad it is considered lateral. All characters cited in this study refer to the female; data on males are incomplete for many species.

Except for the necessary literature citations dealing directly with subfamily, genus, or generotype descriptions, the usual systematic citations of species descriptions are omitted. Chant's (1959) excellent review of the family cites most of the historic literature and gives adequate descriptions, illustrations, and literature citations for most species through 1959. One or two recent papers not discussed by Chant are cited here.

TABLE 1

SUBFAMILIES AND GENERA OF PHYTOSEIIDAE WITH DIAGNOSTIC FORMULAE

	Diagnostic formula*						
	D	M	L	S	St	Pa	Mac
Macroseinae Chant, Denmark, Baker							
<i>Macroseius</i> Chant, Denmark, Baker	7	3	8	2	3	1	3
Aceodrominae new subfamily							
<i>Aceodromus</i> new genus	5	1	11	8	3	3	6
Amblyseiinae new subfamily							
<i>Phytoscutus</i> new genus	4	2	8	2	3	3	3
<i>Phytoscutella</i> new genus	4	3	8	2	3	3	3
<i>Phytoseiulus</i> Evans	5	1	8	2	3	0-1	1-2
<i>Proprioseius</i> Chant	5	1	8	2	3	3	0-1
<i>Phytoseiulella</i> new genus	5	2	7	2	3	3	3
<i>Amblyseiulella</i> new genus	5	2	7	2	3	3	3
<i>Proprioseiopsis</i> new genus	5	2	8	2	3	3	3

[Continued]

TABLE 1 (Continued)

	Diagnostic formula*						
	D	M	L	S	St	Pa	Mac
<i>Asperoseius</i> Chant	5	2	7	2	3	3	0
<i>Amblyseiulus</i> new genus	5	3	8	2	3	3	3
<i>Platyseiella</i> new genus	6	1	7	1	3	2	3
<i>Amblyscutus</i> new genus	6	2	7	1	3	3	3
<i>Cydnodromella</i> new genus	6	2	8	1	3	4	0
<i>Paradromus</i> new genus	6	3	7	1	3	3	0
<i>Amblyseiella</i> Muma	6	3	7	2	3	1-2	3
<i>Amblyseiulus</i> Berlese	6	3	8	2	3	2-3	3
<i>Cydnodromus</i> new genus	6	3	8	2	3	3	0-1
<i>Phyllodromus</i> DeLeon	6	3	8	2	3	2	0
<i>Phytodromus</i> new genus	6	3	8	2	2	3	1
<i>Typhloseiella</i> new genus	6	4	7	2	2	3	0
<i>Typhloseius</i> new genus	6	4	8	2	3	3	2
Phytoseiinae Berlese							
<i>Dubininellus</i> Wainstein	5	1	8	1	2	1-2	1-3
<i>Phytoseius</i> Ribaga	6	1	8	2	3	3	1-3
<i>Typhloseiopsis</i> DeLeon	6	2	8	2	3	4	3
<i>Paraseiulella</i> new genus	6	2	8	2	3	4	0
<i>Metaseiulus</i> new genus	6	2	9	1	3	3	0-1
<i>Neoseiulus</i> Hughes	6	2	10	2	3	3	0
<i>Amblydromella</i> new genus	6	2	10	2	3	3-4	3
<i>Neoseiulella</i> new genus	6	2	11	2	3	3	1
<i>Australiseiulus</i> new genus	6	3	11	2	3	4	0
<i>Clavidromus</i> new genus	6	2	10	2	2	3	3
<i>Anthoseius</i> DeLeon	6	2	10	2	2	3	0
<i>Clavidromina</i> new genus	6	2	8	2	2	4	3
<i>Amblydromus</i> new genus	6	2	8	2	2	2	2
<i>Typhlodromina</i> new genus	6	2	8	2	2	4	0-1
<i>Galendromimus</i> new genus	6	2	8	1	2	4	0
<i>Galendromus</i> new genus	6	2	9	1	2	4	0-1
<i>Typhlodromus</i> Scheuten	6	2	9	2	2	4	1
<i>Typhlodromella</i> new genus	6	2	10	2	2	4	0-1
<i>Typhloctonus</i> new genus	6	2	11	2	2	4	0
<i>Seiulus</i> Berlese	6	2	11	2	2	1	0
<i>Paraseiulus</i> new genus	6	3	10	2	2	2-4	0

* Number in formula are numbers of (D) dorsal, (M) median, (L) lateral, (S) scapular, (St) sternal, and (Pa) preanal setae, and (Mac) macrosetae on 4th leg.

Several undescribed species of Phytoseiidae were found during the preparation of this paper. They are described under their designated genera. In the diagnoses of new species, subfamily and generic characters are omitted unless they represent a variation from the

normal. Dorsal scutum measurements are of the female holotype or the average of measurements of holotype and paratypes.

Holotypes are deposited in the United States National Museum (USNM), Washington, D. C. Paratypes are deposited in the University of Florida Collections, Gainesville, Florida.

Key to the Subfamilies of Phytoseiidae

1. Dorsal scutum divided, 7 pairs of dorsal setae (fig. 1) *Macroseiinae*
Dorsal scutum entire, 4 to 6 pairs of dorsal setae (figs. 2 to 10) 2
2. Eight pairs of scapular setae (fig. 3), 4th leg with
many macrosetae *Aceodrominae*
One or 2 pairs of scapular setae, (figs. 2, 4, 10), 4th leg
with 0 to 3 macrosetae 3
3. Four pairs of anterior lateral setae (figs. 2, 4, 5, and 6), 6 to 8 pairs
of lateral setae, and usually 3 pairs of distinguishable median
setae, 3 macrosetae on 4th leg and 3 pairs of preanal setae . . . *Amblyseiinae*
Five or more pairs of anterior lateral setae (figs. 7 to 10), 8 to 11
pairs of lateral setae and usually 2 pairs of distinguishable
median setae, 0 or 1 macroseta on 4th leg and 4 pairs of
preanal setae *Phytoseiinae*

SUBFAMILY MACROSEIINAE CHANT, DENMARK, AND BAKER

Macroseiinae Chant, Denmark and Baker, 1959.

DIAGNOSIS. Characterized by a divided dorsal scutum, 7 pairs of dorsal setae, 3 pairs of distinguishable median setae, 4 pairs of anterior lateral setae and 2 pairs of scapular setae with S_1 on anterior dorsal scutum.

TYPE GENUS. *Macroseius* Chant, Denmark, and Baker (by monotypy).

GENUS *Macroseius* CHANT, DENMARK, AND BAKER

Macroseius Chant, Denmark, and Baker, 1959

DIAGNOSIS. Eight pairs of lateral setae, some long and plumose; 3 pairs of sternal setae and 1 pair of preanal setae; 4th leg with 3 elongate macrosetae (figs. 1, 11, and 16.)

TYPE SPECIES. *Macroseius biscutatus* Chant, Denmark, and Baker, 1959. Monotypic.

DISCUSSION. As Chant, *et al.* (1959) pointed out, this genus resembles the Digamasellidae in having a divided dorsal scutum. These mites have 7 pairs of setae in the dorsal series, an unusual number for Phytoseiidae.

SUBFAMILY ACEODROMINAE, NEW SUBFAMILY

DIAGNOSIS. Characterized by an entire dorsal scutum, 5 pairs of dorsal setae, 1 pair of distinguishable median setae, 4 pairs of anterior lateral setae, and 8 pairs of scapular setae with S_1 on dorsal scutum.

TYPE GENUS. *Aceodromus* new genus.

GENUS *Aceodromus*, NEW GENUS

DIAGNOSIS. Eleven pairs of lateral setae, some elongate and plumose; 3 pairs of sternal setae and 3 pairs of preanal setae; 4th leg with at least 6 elongate macrosetae (figs. 3, 11, and 24.)

TYPE SPECIES. *Aceodromus convolvuli* new species. Monotypic.

DISCUSSION. The characters of this genus, though primarily those of the Phytoseiidae, resemble those of the Aceosejidae in additional scapular setae and macrosetae on the 4th leg. Of the median setae, only M_1 are distinguishable.

Because of the obvious close relationship of *Macroseius* with the Digamasellidae and of *Aceodromus* with the Aceosejidae, a recombination of the three families may eventually become necessary.

Aceodromus convolvuli, new species

Figures 21 to 24.

DIAGNOSIS. Dorsal scutum 0.40 mm. long and 0.21 mm. wide. Dorsal setae small to minute and simple except for D_2 which is elongate and plumose; M_1 minute; lateral setae small to minute and simple except for L_4 , L_7 , L_9 , L_{10} and L_{11} , which are elongate and plumose; scapular setae elongate with S_1 on dorsal scutum; sternal scutum longer than wide and produced anteriorly; ventrianal scutum subtriangular, longer than wide and without preanal pores; 4th leg with 6 distinguishable macrosetae, 4 on tarsus, 1 on tibia and 1 on genu.

MATERIAL. Female holotype, USNM 2757, and nymphs from *Convolvulus* sp. leaves at Weirsdale, Florida, 20 August 1959, by Martin H. Muma and Helen Louise Greene.

SUBFAMILY AMBLYSEIINAE, NEW SUBFAMILY

DIAGNOSIS. Characterized by an undivided dorsal scutum, usually 3 pairs of distinguishable median setae, 4 pairs of lateral setae anterior to D_4 , 6 to 8 pairs total, and 1 or 2 pairs of scapular setae; ventrianal scutum usually with 3 pairs of preanal setae; 4th leg usually with 3 macrosetae.

TYPE GENUS. *Amblyseius* Berlese.

Key to Genera of Amblyseiinae

1. Six pairs of dorsal setae (fig. 6) 9
 Five pairs of dorsal setae (figs. 4 and 5) 3
 Four pairs of dorsal setae (fig. 2) 2
2. Two distinct pairs of median setae *Phytoscutus*
 Three distinct pairs of median setae *Phytoscutella*
3. Posterior lateral setae linear, at most weakly plumose 4
 Posterior lateral setae thickened, serrate, clavate or spatulate 7
4. Two distinct pairs of median setae 5
 Three distinct pairs of median setae *Amblyseiulus*
5. Seven pairs of lateral setae 6
 Eight pairs of lateral setae *Proprioseiopsis*
6. Lateral setae L_5 missing *Phytoseiulella*
 Lateral setae L_7 missing *Amblyseiulella*
7. One distinct pair of median setae 8
 Two distinct pairs of median setae *Asperoseiuis*
8. D_4 modified similarly to posterior laterals, 0 or 1
 pair of preanal setae *Phytoseiulus*
 D_4 simple, not like posterior laterals, 3 pairs of preanal setae *Proprioseiuis*
9. Posterior lateral setae linear and at most plumose 11
 Posterior lateral setae, flattened and spatulate or lanceolate 10
10. Lateral setae elongate, spatulate and serrate, 1 pair
 of scapular setae *Platyseiella*
 Lateral setae short, oblanceolate and smooth, 2 pairs of
 scapular setae *Phyllodromus*
11. Two or 3 distinct pairs of median setae 13
 Four distinct pairs of median setae 12
12. Two pairs of sternal setae, 4th leg without macrosetae *Typhloseiella*
 Three pairs of sternal setae, 4th leg with 2 macrosetae *Typhloseiuis*
13. Fourth leg with 3 macrosetae 14
 Fourth leg with 0 or 1 macrosetae 16
14. Two pairs of scapular setae, 3 pairs of median setae 15
 One pair of scapular setae, 2 pairs of median setae *Amblyscutus*
15. Seven pairs of lateral setae, 1 or 2 pairs of preanal setae *Amblyseiella*
 Eight pairs of lateral setae, 2 or 3 pairs of preanal setae *Amblyseiuis*
16. Two pairs of scapular setae, 3 pairs of preanal setae 17
 One pair of scapular setae, 4 pairs of preanal setae *Cydnodromella*
17. Three pairs of sternal setae 18
 Two pairs of sternal setae *Phytodromus*
18. Seven pairs of lateral setae *Paradromus*
 Eight pairs of lateral setae *Cydnodromus*

GENUS *Phytoscutus* NEW GENUS

DIAGNOSIS. Four pairs of dorsal setae, 2 pairs of distinguishable median setae, 8 pairs of lateral setae, some elongate and weakly plumose, 2 pairs of scapular setae, 3 pairs of sternal setae and 3 pairs of preanal setae on a massive ventrianal scutum; 4th leg with 3 macrosetae, 2 elongate and 1 short and hooked (figs. 2, 13, 27 and 28.)

TYPE SPECIES. *Phytoscutus sexpilis* new species. Monotypic.

DISCUSSION. See the discussion under *Phytoscutella*. This genus lacks the median setae usually associated with L_5 .

Phytoscutus sexpilis new species

Figures 25 to 28

DIAGNOSIS. Dorsal scutum 0.35 mm. long and 0.32 mm. wide. Dorsal setae small and simple; M_1 small and simple, M_2 elongate and weakly plumose; lateral setae small and simple except for L_4 and L_8 which are elongate with L_8 weakly plumose; scapular setae minute; sternal scutum much wider than long and reticulate; ventrianal scutum exceptionally large and reticulate, with an elliptical pair of preanal pores; 4th leg with an elongate macroseta on the genu and tibia and a short hooked macroseta on the tarsus.

MATERIAL. Female holotype, USNM 2758, male allotype and paratypes feeding on acarids on grapefruit leaf at Polk City, Florida, 22 May 1954, by Martin H. Muma. Male and female paratypes on grapefruit leaves at Lake Alfred, Florida, 7 May 1954, by H. L. Greene. Male and female paratypes on fungus feeding acarid at Lake Alfred, Florida, 17 March 1955, by H. L. Greene.

DISCUSSION. This species feeds commonly on acarids on citrus. It may be distinguished from *P. salebrosa* (Chant) by the apparent lack of L_5 , by the ridged and pitted dorsal scutum, and by the different macroseta on the 4th leg. The spermatophore bearer of the male is bladeliike, tapered apically, and hooked dorsally at the tip.

GENUS *Phytoscutella* NEW GENUS

DIAGNOSIS. Four pairs of dorsal setae, 3 pairs of distinguishable median setae, 8 pairs of lateral setae, some elongate and weakly plumose, 2 pairs of scapular setae, 3 pairs of sternal setae, and 3 pairs of preanal setae on a massive ventrianal scutum; 4th leg with 3 short macrosetae (figs. 11 and 16.)

TYPE SPECIES. *Typhlodromus salebrosus* Chant, 1960. Monotypic.

DISCUSSION. This genus and *Phytoscutus* may be eventually combined. They are presently distinguished by differences in the number of median setae and in the macrosetae of the 4th leg.

GENUS *Phytoseiulus* EVANS

Phytoseiulus Evans, 1952.

DIAGNOSIS. Five pairs of dorsal setae, some elongate and plumose, 1 pair of median setae, 7 pairs of lateral setae, some elongate and distinctly plumose, 2 pairs of scapular setae on interscutal membrane, 3 pairs of sternal setae, and 0 or 1 pair of preanal setae. Fourth leg with 1 or 2 elongate plumose macrosetae (fig. 13.)

TYPE SPECIES. *Laelaps macropilis* Banks, 1905 (by monotypy).

KNOWN SPECIES. *P. macropilis* (Banks), *P. persimilis* Athias-Henriot.

DISCUSSION. This genus lacks lateral setae in the position normally occupied by L_6 , and of the median setae only M_1 are distinguishable.

GENUS *Phytoseiulella* NEW GENUS

DIAGNOSIS. Five pairs of dorsal setae, 2 pairs of median setae, 7 pairs of lateral setae, some elongate and weakly plumose, 2 pairs of scapular setae on interscutal membrane, 3 pairs of sternal setae, and 3 pairs of preanal setae; 4th leg with 3 elongate macrosetae (figs. 13 and 16.)

TYPE SPECIES. *Iphiseius grovesae* Chant, 1959. Monotypic.

DISCUSSION. This genus is closely related to *Proprioiseiopsis*, but lacks a pair of lateral and median setae between the anterior laterals and posterior laterals. Because these are the only known distinguishing features, the two genera may have to be combined if study of the types reveal no sternal or macrosetal differences.

Chant described this species in *Iphiseius* because of a lightly sclerotized interscutal membrane. Sclerotization varies from species to species and even specimen to specimen within the genera *Amblyseius* and *Amblyseiulus* and cannot therefore be considered to be of generic importance.

GENUS *Amblyseiulella* NEW GENUS

DIAGNOSIS. Five pairs of dorsal setae, 2 pairs of median setae, 7 pairs of lateral setae, most of them elongate and plumose, 2 pairs of scapular setae on interscutal membrane, 3 pairs of sternal setae, and 3 pairs of preanal setae; 4th leg with 3 elongate macrosetae (figs. 11 and 16.)

TYPE SPECIES. *Typhlodromus heveae* Oudemans, 1930. Monotypic.

DISCUSSION. This genus lacks lateral setae in the position normally occupied by L₇. The posterior median setae are not distinguishable.

GENUS *Proprioseius* CHANT

Proprioseius Chant, 1957c.

DIAGNOSIS. Five 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 interscutal membrane, 3 pairs of sternal setae, and 3 pairs of preanal setae; 4th leg with 0 or 1 macroseta (figs. 11, 19 and 20.)

TYPE SPECIES. *Proprioseius meridionalis* Chant, 1957c (by designation).

KNOWN SPECIES. *P. meridionalis* Chant, *P. clancyi* Chant, *P. oudemansi* (Chant), *P. mirandai* DeLeon.

DISCUSSION. Although Chant described *P. oudemansi* in his subgenus *Amblyseius* of *Typhlodromus* in the broad sense, it is a typical *Proprioseius* Chant in all setal and scutal characters both dorsal and ventral.

In this genus only M₁ are distinguishable. The genus is most closely related to *Phytoseiulus*.

GENUS *Proprioseiopsis* NEW GENUS

DIAGNOSIS. Five pairs of dorsal setae, 2 pairs of median setae, 8 pairs of lateral setae, some elongate and weakly plumose, 2 pairs of scapular setae on interscutal membrane, 3 pairs of sternal setae, and 3 pairs of preanal setae; 4th leg with 3 elongate macrosetae (figs. 11 and 16.)

TYPE SPECIES. *Typhlodromus terrestris* Chant, 1959.

KNOWN SPECIES. *P. terrestris* (Chant), *P. sandersi* (Chant).

DISCUSSION. This genus is discussed under *Phytoseiulella*. The median setae usually associated with L₅ are absent.

GENUS *Asperoseius* CHANT

Asperoseius Chant, 1957c.

DIAGNOSIS. Five pairs of dorsal setae with D₄ flattened and serrate, 2 pairs of median setae, 7 pairs of lateral setae, most of them strongly flattened and serrate, 2 pairs of scapular setae on interscutal

membrane, 3 pairs of sternal setae and 3 pairs of preanal setae; 4th leg without macrosetae (figs. 11 and 20.)

TYPE SPECIES. *Asperoseius africanus* Chant, 1957c. Monotypic.

DISCUSSION. Species of this genus lack a pair of lateral setae in the position normally occupied by L_7 . The posterior median setae are not distinguishable.

GENUS *Amblyseiulus* NEW GENUS

DIAGNOSIS. Five pairs of dorsal setae, 3 pairs of median setae, 8 pairs of lateral setae, some elongate and weakly plumose, 2 pairs of scapular setae on interscutal membrane, 3 pairs of sternal setae, and 3 pairs of preanal setae; 4th leg with 3 elongate macrosetae (figs. 4, 13, and 16).

TYPE SPECIES. *Typhlodromus okanagensis* Chant, 1957a.

KNOWN SPECIES. *A. okanagensis* (Chant), *A. asetus* (Chant), *A. lepidus* (Chant), *A. lichenis* (Chant), *A. ovatus* (Garman), *A. oregonensis* (Garman), *A. putnami* (Chant), *A. fragariae* (Kennett), *A. reticulatus* (Garman), *A. mexicanus* (Garman), *A. septus* (Garman), *A. tropicanus* Garman, *A. elongatus* (Garman), *A. rosellus* (Chant), *A. detritus* new species, *A. dorsatus* new species, *A. oblatulus* new species, *A. rotundus* new species.

DISCUSSION. Most species of this genus have the sternal and ventrianal scuta reticulate, only three do not.

This genus superficially resembles *Amblyseiulus* but is easily recognized by the presence of only 5 pairs of dorsal setae.

Amblyseiulus dorsatus new species

Figures 29 to 32

DIAGNOSIS. Dorsal scutum 0.38 mm. long and 0.27 mm. wide. Dorsal setae small and simple with D_2 distinctly further apart than other dorsals; M_1 and M_2 small, M_3 elongate and weakly plumose; lateral setae L_1 , L_4 , and L_8 weakly plumose, L_2 , L_3 , L_5 , L_6 , and L_7 small with L_2 and L_3 not aligned with L_1 and L_4 ; scapular setae small; sternal scutum slightly wider than long and smooth; ventrianal scutum pentagonal, longer than wide, smooth and with small round preanal pores that are nearly aligned with posterior preanals; macrosetae of 4th leg progressively shorter distally.

MATERIAL. Female holotype, USNM 2759, male allotype and female paratypes from citrus at Magnolia, Louisiana, 18 November 1958, by D. W. Clancy and A. Selhime. Female paratypes from scaly

orange leaf at DeLand, Florida, 3 February 1959, by D. W. Clancy. Female paratype from Bluefields, Florida, 15 April 1959, by H. L. Greene.

DISCUSSION. This species is closely related to *A. elongatus* (Garman) from which it may be distinguished by having D_4 widely separated, L_2 and L_3 not aligned with L_1 and L_4 , and the preanal pores nearly aligned with the posterior preanals.

A. dorsatus, *A. elongatus* (Garman) and *A. tropicanus* (Garman) are the only species of *Amblyseiulus* without reticulate ventrianal scuta.

*Amblyseiulus oblatu*s new species

Figures 41 to 44

DIAGNOSIS. Dorsal scutum 0.40 mm. long and 0.31 mm. wide. Dorsal setae small to tiny and simple; M_1 and M_2 small and simple, M_3 elongate and weakly plumose; L_1 and L_2 subequal, L_3 one half length of L_1 , L_4 two to three times length of L_1 , and L_5 , L_6 , and L_7 slightly smaller than L_1 , L_8 elongate, weakly plumose, and longer than L_4 and M_3 which are subequal; S_1 and S_2 small with S_1 slightly larger; sternal scutum much longer than wide and reticulate; ventrianal scutum subtriangular with rounded lateral margins, reticulate and lacking preanal pores; macrosetae on 4th leg longest on tarsus and shortest on tibia.

MATERIAL. Female holotype, USNM 2760, from [?] C. P., Oregon, 1 April 1958, by C. Krantz.

DISCUSSION. The setation of the dorsal scutum of this species is almost identical with that of *A. tropicanus* (Garman) but the ventrianal scutum is differently shaped and ornamented and lacks preanal pores. It has closer affinities with *A. fragariae* (Kennett) and *A. reticulatus* (Garman).

*Amblyseiulus rotundu*s new species

Figures 37 to 40

DIAGNOSIS. Dorsal scutum 0.36 mm. long and 0.31 mm. wide. Dorsal setae except for D_1 minute; M_1 minute, M_2 small but larger than L_5 , and M_3 elongate, longer than any of the laterals, and smooth; L_4 and L_8 elongate and subequal, L_1 shorter than L_4 , L_2 shorter than L_1 , L_3 one half length of L_2 , and L_5 , L_6 , and L_7 progressively smaller than L_3 ; scapular setae small; sternal scutum wider than long and reticulate; ventrianal scutum pentagonal, reticulate, and with a pair of tiny preanal pores; macrosetae of 4th leg longer on distal segments:

MATERIAL. Female holotype, USNM 2761, and female paratype from fescue at Spring Water, Oregon, 16 April 1958, by G. W. Krantz.

DISCUSSION. The dorsal scutum of this species is more nearly round than on any other species of the genus. This species has its closest affinities with *A. ovatus* (Garman) and *A. oregonensis* (Garman) from which it differs in the length of M_2 and the size and position of the preanal pores.

Amblyseiulus detritus new species

Figures 33 to 36

DIAGNOSIS. Dorsal scutum 0.31 mm. long and 0.21 mm. wide. Dorsal setae, except for D_1 , small and simple; M_1 and M_2 small, but M_3 is elongate and weakly plumose; lateral setae L_1 , L_4 and L_8 elongate with L_8 weakly plumose, L_2 , L_3 , L_5 , L_6 and L_7 small with L_2 and L_3 not aligned with L_1 and L_4 , and L_2 slightly larger than L_3 ; scapular setae small; sternal scutum slightly wider than long and faintly lined; ventrianal scutum pentagonal, longer than wide, reticulate and with tiny, widely separated preanal pores lying just behind the posterior preanals. Macrosetae on 4th leg longest on tarsus and shortest on tibia.

MATERIAL. Female holotype, USNM 2762, from pine and hardwood litter at Moss Bluff, Florida, 22 May 1958, by H. L. Greene and Martin H. Muma. Male allotype from citrus litter at Avon Park, Florida, 7 December 1959, by H. L. Greene and Martin H. Muma.

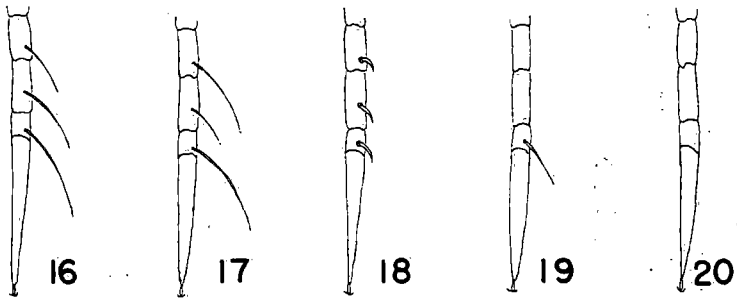
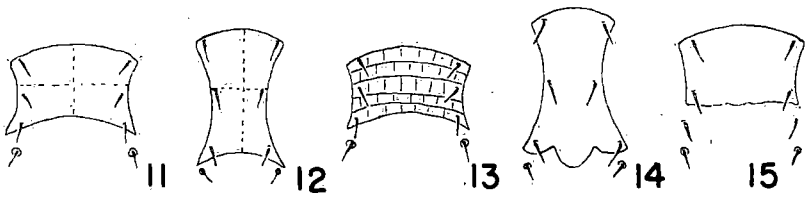
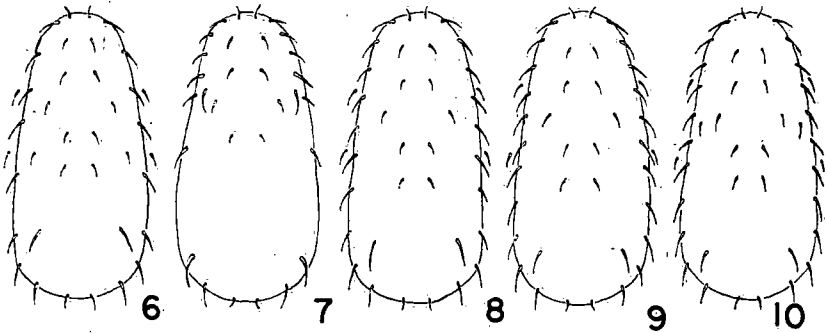
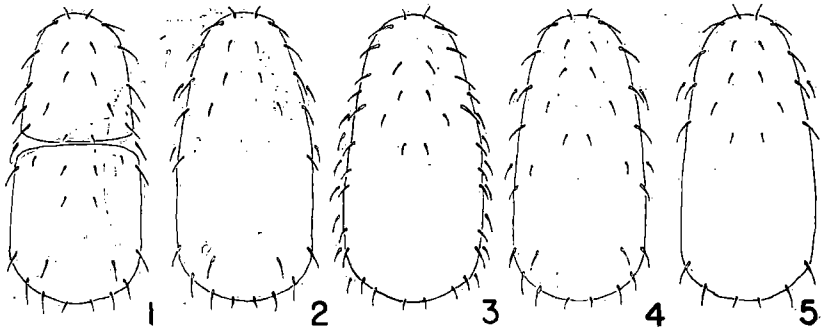
DISCUSSION. This species is closely related to *A. putnami* (Chant) from which it differs in the comparative size and position of L_2 and L_3 and the position of M_3 .

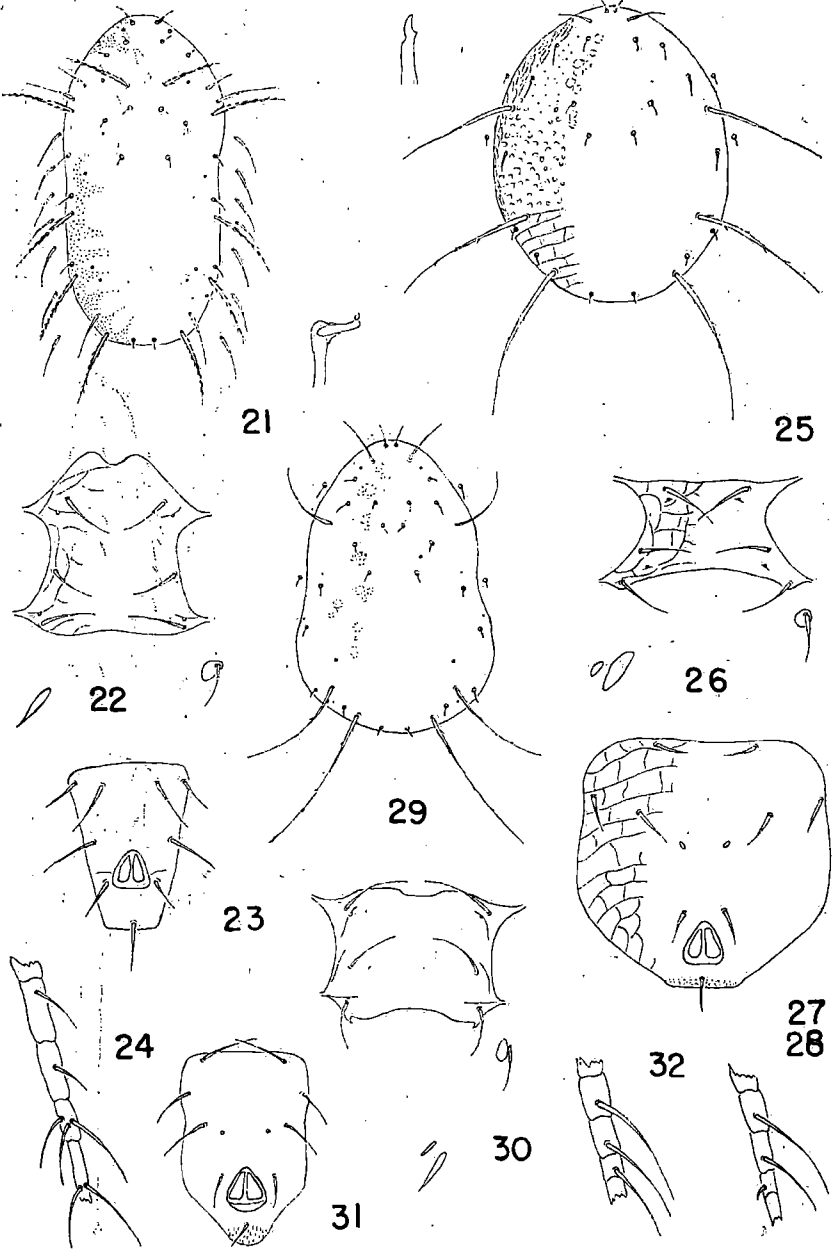
GENUS *Platyseiella* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 1 pair of median setae, 7 pairs of lateral setae, most of them elongate, flattened and serrate, 1 pair of scapular setae, S_1 , on dorsal scutum, 3 pairs of sternal setae, and 2 pairs of preanal setae; 4th leg with 3 elongate knobbed macrosetae.

TYPE SPECIES. *Phytoseiella platypilis* Chant, 1959. Monotypic.

DISCUSSION. This is a unique genus of the Amblyseiinae, not only in the possession of flattened, serrate setae but in the position of S_1 on the dorsal scutum. Of the median setae, only M_1 are distinguishable.





Figures 1 to 20. 1. Divided dorsal scutum, 7 dorsals, 3 medians, 8 laterals, 2 scapulars. 2. Entire dorsal scutum, 4 dorsals, 2 medians, 7 laterals (4 anterior), 2 scapulars. 3. Entire dorsal scutum, 5 dorsals, 1 median, 10 laterals (4 anterior), 8 scapulars. 4. Entire dorsal scutum, 5 dorsals, 3 medians, 8 laterals (4 anterior), 2 scapulars. 5. Entire dorsal scutum, 5 dorsals, 1 median, 6 laterals (4 anterior), 1 scapular. 6. Entire dorsal scutum, 6 dorsals, 3 medians, 8 laterals (4 anterior), 2 scapulars. 7. Entire dorsal scutum, 5 dorsals, 1 median, 8 laterals (5 anterior), 1 scapular on scutum. 8. Entire dorsal scutum, 6 dorsals, 2 medians, 10 laterals (5 anterior), 2 scapulars. 9. Entire dorsal scutum, 6 dorsals, 2 medians, 10 laterals (6 anterior), 2 scapulars. 10. Entire dorsal scutum, 6 dorsals, 3 medians, 11 laterals (6 anterior), 2 scapulars. 11. Sternal scutum wider than long and with three pairs of setae. 12. Sternal scutum longer than wide and with three pairs of setae. 13. Sternal scutum reticulate. 14. Sternal scutum lobate posteriorly. 15. Sternal scutum with two pairs of setae. 16. Fourth leg with three elongate macrosetae, that on genu shortest, that on tarsus longest. 17. Fourth leg with three elongate macrosetae, that on tibia shortest, that on tarsus longest. 18. Fourth leg with three short hooked macrosetae. 19. Fourth leg with one macroseta. 20. Fourth leg without macrosetae. All figures schematic.

Figures 21 to 24. *Aceodromus convolvuli* new species. 21. Dorsal scutum. 22. Sternal, metasternal, and metapodal scuta. 23. Ventrianal scutum. 24. Genu, tibia, and basitarsus of 4th leg.

Figures 25 to 28. *Phytoscutus sexpilis* new species. 25. Dorsal scutum and tip of spermatophore bearer. 26. Sternal, metasternal, and metapodal scuta. 27. Ventrianal scutum. 28. Genu, tibia, and basitarsus of 4th leg.

Figures 29 to 32. *Amblyseiulus dorsatus* new species. 29. Dorsal scutum and tip of spermatophore bearer. 30. Sternal, metasternal, and metapodal scuta. 31. Ventrianal scutum. 32. Genu, tibia, and basitarsus of 4th leg.

Figures 33 to 36. *Amblyseiulus detritus* new species. 33. Dorsal scutum and tip of spermatophore bearer. 34. Sternal, metasternal, and metapodal scuta. 35. Ventrianal scutum. 36. Genu, tibia, and basitarsus of 4th leg.

Figures 37 to 40. *Amblyseiulus rotundus* new species. 37. Dorsal scutum. 38. Sternal, metasternal, and metapodal scuta. 39. Ventrianal scutum. 40. Genu, tibia, and basitarsus of 4th leg.

Figures 41 to 44. *Amblyseiulus oblatu*s new species. 41. Dorsal scutum. 42. Sternal, metasternal, and metapodal scuta. 43. Ventrianal scutum. 44. Genu, tibia, and basitarsus of 4th leg.

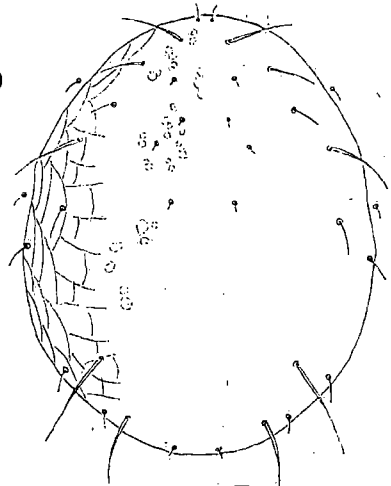
Figures 45 to 48. *Amblyseius microsetae* new species. 45. Dorsal scutum. 46. Sternal, metasternal, and metapodal scuta. 47. Ventrianal scutum. 48. Genu, tibia, and basitarsus of 4th leg.

Figures 49 to 52. *Amblyseius magnoliae* new species. 49. Dorsal scutum and tip of spermatophore bearer. 50. Sternal, metasternal, and metapodal scuta. 51. Ventrianal scutum. 52. Genu, tibia, and basitarsus of 4th leg.

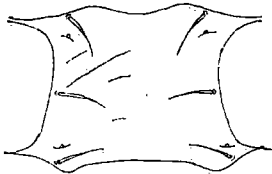
Figures 53 to 56. *Amblyseius cotoensis* new species. 53. Dorsal scutum. 54. Sternal, metasternal, and metapodal scuta. 55. Ventrianal scutum. 56. Genu, tibia, and basitarsus of 4th leg.



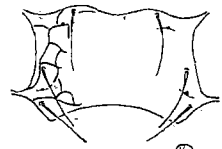
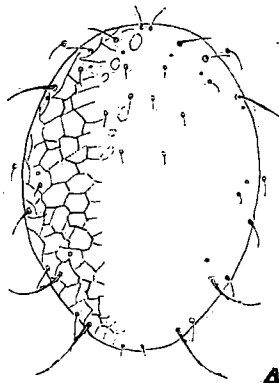
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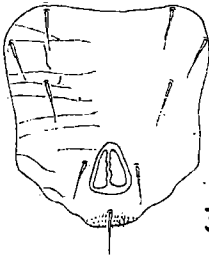
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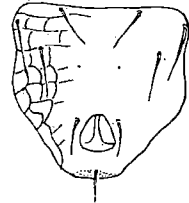
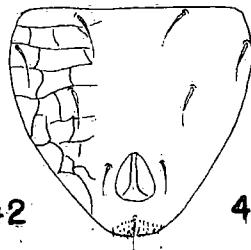
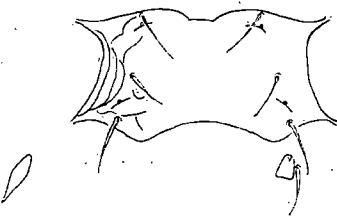
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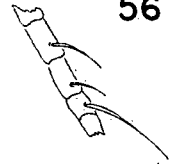
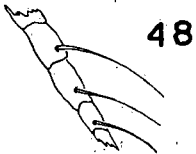
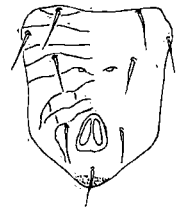
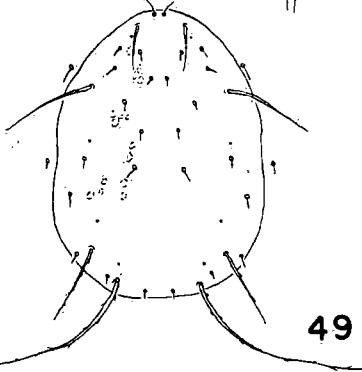
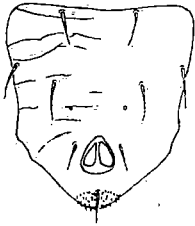
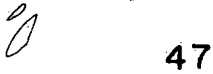
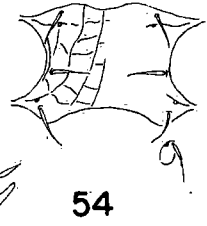
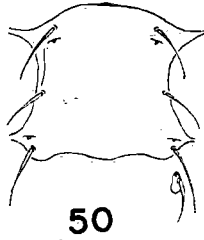
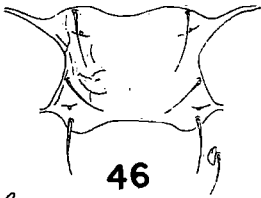
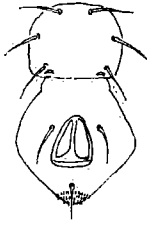
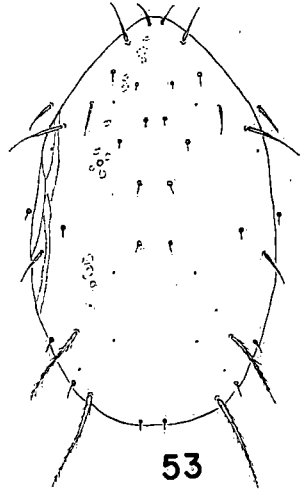
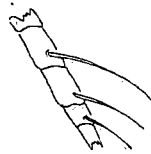
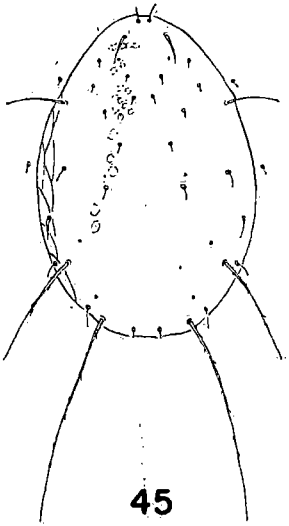


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GENUS *Amblyscutus* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 2 pairs of median setae, 7 pairs of lateral setae, some elongate and weakly plumose, 1 pair of scapular setae on interscutal membrane, 3 pairs of sternal setae, and 3 pairs of preanal setae; 4th leg with 3 elongate macrosetae (figs. 11 and 16.)

TYPE SPECIES. *Amblyseius grandis* Berlese, 1914. Monotypic.

DISCUSSION. Species of this genus lack lateral setae in the position normally occupied by L_7 . The posterior median setae are not distinguishable.

GENUS *Cydnodromella* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 2 pairs of median setae, 8 pairs of lateral setae, most of them elongate and slender, 1 pair of scapular setae on interscutal membrane, 3 pairs of sternal setae, and 4 pairs of preanal setae; 4th leg without macrosetae (figs. 11 and 20.)

TYPE SPECIES. *Typhlodromus pilosus* Chant, 1959. Monotypic.

DISCUSSION. Chant overlooked the presence of 4 pairs of lateral setae anterior to D_4 when he placed this species in his subgenus *Typhlodromus*. It is a typical Amblyseiinae except in the number of median and preanal setae and macrosetae on the 4th leg. The median setae usually associated with L_5 are absent.

GENUS *Paradromus* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 3 pairs of median setae, 7 pairs of lateral setae, most of them short and simple, or weakly plumose, 1 pair of scapular setae on interscutal membrane, 3 pairs of sternal setae, and 3 pairs of preanal setae; 4th leg without macrosetae (figs. 11 and 20.)

TYPE SPECIES. *Typhlodromus aberrans* Oudemans, 1930. Monotypic.

DISCUSSION. Species of this genus lack a lateral seta in the position normally occupied by L_7 .

GENUS *Amblyseiella* MUMA

Amblyseiella Muma, 1955.

DIAGNOSIS. Six pairs of dorsal setae, 3 pairs of median setae, 7 pairs of lateral setae, some elongate and weakly plumose, 2 pairs of scapular setae on interscutal membrane, 3 pairs of sternal setae, and

1 or 2 pairs of preanal setae; 4th leg with 3 elongate macrosetae (figs. 11 and 16.)

TYPE SPECIES. *Amblyseiella setosa* Muma, 1955 (by designation).

KNOWN SPECIES. *A. setosa* Muma, *A. irregularis* (Evans).

DISCUSSION. Although the two species placed in this genus seem to be closely related, the different positions of M_1 , the lack of apparently different (L_6 or L_7) posterior lateral setae, and the form and setation of the ventrianal scuta may, when additional species have been collected, prove to be of generic importance.

GENUS *Amblyseius* BERLESE³

Amblyseius Berlese, 1914.

DIAGNOSIS. Six pairs of dorsal setae, 3 pairs of median setae, 8 pairs of lateral setae, some elongate and weakly plumose, 2 pairs of scapular setae on interscutal membrane, 3 pairs of sternal setae, and 2 or 3 pairs of preanal setae; 4th leg with 3 macrosetae, some long and some short (figs. 6, 11, 17, and 48.)

TYPE SPECIES. *Zercon obtusus* Koch, 1839 (by designation).

KNOWN SPECIES. Subgenus *Amblyseius* Berlese³: *A. obtusus* (Koch), *A. krantzi* (Chant), *A. multidentatus* (Chant), *A. perlongisetus* Berlese, *A. herbicolus* (Chant), *A. floridanus* (Muma), *A. caudatus* Berlese, *A. aerialis* (Muma), *A. schusteri* (Chant), *A. foenalis* Berlese, *A. andersoni* (Chant), *A. americanus* Garman, *A. sylvaticus* (Chant), *A. gracilis* (Garman), *A. meridionalis*, Berlese, *A. microsetae* new species.

Subgenus *Amblyseialus* new subgenus: *A. largoensis* (Muma), *A. caudatus* Berlese, *A. magnoliae* new species, *A. italicus* (Chant).

Subgenus *Typhlodromopsis* DeLeon: *A. cucumeris* (Oudemans), *A. rademacheri* (Dosse), *A. graminis* (Chant), *A. brittanicus* (Chant), *A. fraterculus* Berlese, *A. potentillae* (Garman), *A. similis* (Koch), *A. jucundus* (Chant), *A. robiniae* (Chant), *A. evansi* (Chant), *A. japonicus* (Ehara), *A. longispinosus* (Evans), *A. fallacis* (Garman), *A. massëei* (Nesbitt), *A. umbraticus* (Chant), *A. asiaticus* (Evans), *A. callunae* Willmann, *A. garmani* Willmann, *A. aequipilis* Berlese, *A. longulus* Berlese, *A. morgani* (Chant), *A. collyerae* (Chant), *A. exopodalis* (Kennett), *A. quercicolus* (DeLeon), *A. dentilis* (DeLeon), *A. dillus* (DeLeon), *A. similoides* Buchelos and Pritchard, *A. fordycei* (DeLeon), *A. simplicissimus* (DeLeon), *A. sabali* (DeLeon), *A. confertus* (DeLeon), *A. cotoensis* new species, *A. tsugawai* (Ehara).

³ See discussion for diagnoses of subgenera.

Subgenus *Typhlodromalus* new subgenus: *A. peregrinus* (Muma), *A. finlandicus* (Oudemans), *A. newsami* (Evans), *A. africanus* (Evans), *A. limonicus* Garman and McGregor, *A. primulae* (Chant), *A. ovalis* (Evans), *A. victoriensis* (Womersley), *A. hibisci* (Chant); *A. mesembrinus* (Déan), *A. scutalis* (Athias-Henriot), *A. planetarius* (DeLeon).

Subgenus *Iphiseius* Berlese: *A. degenerans* (Berlese), *A. quadripilis* (Banks), *A. assamensis* (Chant).

Questionable Species: *A. aferulus* (Chant), *A. concordis* (Chant).

DISCUSSION. This large genus may be separated into subgenera as indicated below. Those species like *A. obtusus* (Koch) with L_8 long and whiplike, much longer than the distance between their bases, with long whiplike macrosetae on the 4th leg of which that on the genu is longest, with the sternal scutum wider than long and with a shield-shaped ventrianal scutum would comprise the typical subgenus, *Amblyseius*. Those species similar to typical *Amblyseius* but with the sternal scutum longer than wide and an elongate constricted ventrianal scutum, as in *A. largoensis* (Muma), would comprise a second subgenus, *Amblyseialus*. Those species, like *A. cucumeris* (Oudemans), with L_8 shorter, at most only slightly longer than the distance between their bases, with short macrosetae on the 4th leg of which that on tarsus is longest, with sternal scutum as wide or wider than long and posteriorly straight or at most undulate and with a shield-shaped ventrianal scutum, would make up the subgenus *Typhlodromopsis*. Those species, such as *A. degenerans* (Berlese), similar to *Typhlodromopsis* but with the sternal scutum much wider than long and with the macrosetae on the 4th leg longest on the genu would make up the subgenus *Iphiseius*. Those similar to *Typhlodromopsis* but with the sternal scutum longer than wide and posteriorly lobate, and with the ventrianal scutum elongate and constricted, as in *A. peregrinus* (Muma), would make up the fourth subgenus *Typhlodromalus*.

A. aferulus (Chant) and *A. concordis* (Chant) are included doubtfully in this genus; they reportedly lack S_1 and S_2 respectively. As Chant (1959) erroneously omitted scapular setae in several descriptions and illustrations, their assignment here must be considered doubtful until the types have been examined. It should be noted that the genera *Amblyseiopsis* Garman and *Iphiseius* are synonymized here. Garman's *A. americanus* does not differ generically from *A. obtusus* (Koch). The fragmented ventrianal scutum and degree of sclerotization of Berlese's *degenerans* are not considered generically important. Chant overlooked D_5 on *A. quadripilis* Banks, which is a typical though highly sclerotized *Amblyseius*.

Amblyseius microsetae new species

Figures 45 to 48

DIAGNOSIS. Dorsal scutum 0.36 mm. wide and 0.29 mm. long. Dorsal setae all minute and simple; M_1 minute, M_2 small, M_3 elongate and weakly plumose; L_2 , L_3 , L_6 and L_7 minute, L_1 and L_5 small, L_4 elongate, and L_8 very long and weakly plumose; scapular setae minute; sternal scutum nearly as long as wide and smooth; ventrianal scutum pentagonal, reticulate, and with small round preanal pores nearly as widely separated as posterior preanal setae; macrosetae of 4th leg shorter distally.

MATERIAL. Female holotype, USNM 2763, from rotting fir bark at Corvallis, Oregon, 7 December 1955, by E. C. Burts.

DISCUSSION. This species is closely related to *A. multidentatus* (Chant) from which it may be distinguished by the relative lengths of M_2 and L_5 and the presence of reticulation and preanal pores on the ventrianal scutum.

Amblyseius magnoliae new species

Figures 49 to 52

DIAGNOSIS. Dorsal scutum 0.36 mm. long and 0.26 mm. wide. Dorsal setae small to minute and simple; M_1 and M_2 small, M_3 elongate and weakly plumose; L_2 , L_3 , L_5 , L_6 and L_7 small, L_1 elongate, L_4 twice as long as L_1 , and L_8 twice as long as L_4 and weakly plumose; scapular setae small to minute; sternal scutum nearly as long as wide and smooth; ventrianal scutum vase-shaped, abruptly constricted behind the posterior preanal setae and provided with crescentic preanal pores adjacent to the posterior preanal setae, macrosetae on 4th leg shorter distally.

MATERIAL. Female holotype, USNM 2764, male allotype, and female paratype from citrus leaves at Magnolia, Louisiana, 18 November 1958, by D. W. Clancy and A. Selhime.

DISCUSSION. This species is closely related to *A. largoensis* (Muma) from which it may be distinguished by proportionately longer L_1 and the distinctive ventrianal scutum.

Amblyseius cotoensis new species

Figures 53 to 56

DIAGNOSIS. Dorsal scutum 0.31 mm. long and 0.21 mm. wide. Dorsal setae, except for D_1 small and simple; M_1 and M_2 small, but

M₃ elongate and plumose; lateral setae L₁, L₃, L₄, L₅, and L₈ elongate, with L₁, L₃, and L₅ subequal, L₈ longer than L₄ and plumose, and L₂, L₆, and L₇ small; S₁ elongate, S₂ small; sternal scutum wider than long and reticulate; ventrianal scutum pentagonal, longer than wide, reticulate and with elliptical preanal pores equally spaced between and just behind the posterior preanals, macrosetae on 4th leg longest on tarsus and shortest on tibia.

MATERIAL. Female holotype, USNM 2765, taken while panning kudzu [a method of collecting collembola by sliding a pan through low foliage] at Coto, Costa Rica, 25 October 1957, by E. Dixon.

DISCUSSION. Most closely related to *A. potentillae* (Garman) and *A. similis* (Koch), this species differs in the lengths of L₅ and S₁ and the reticulation of the ventrianal scutum.

GENUS *Cydnodromus* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 3 pairs of median setae, 8 pairs of lateral setae, most of them short and simple, 2 pairs of scapular setae on interscutal membrane, 3 pairs of sternal setae, and 3 pairs of preanal setae; 4th leg with 0 or 1 slender, elongate macroseta (figs. 6, 12, 19 and 20.)

TYPE SPECIES. *Lasioseius marinus* Willmann, 1952.

KNOWN SPECIES. *C. marinus* (Willmann), *C. longispinosus* (Evans), *C. reticulatus* (Oudemans), *C. brevispinus* (Kennett), *C. zwoelferi* (Dosse), *C. cucumeroides* (DeLeon), *C. paspalivorus* (DeLeon), *C. desertus* (Chant), *C. scoticus* (Collyer), *C. novaescotiae* (Chant), *C. ornatus* (Athias-Henriot), *C. longilaterus* (Athias-Henriot), *C. bellinus* (Womersley), *C. amicus* (Chant).

DISCUSSION. This genus, because of its heterogeneous nature, may be divisible into species groups in recognition of the slender dorsal scuta of such species as *C. desertus* (Chant), *C. paspalivorus* (DeLeon) and *C. marinus* (Willmann), but these species are not well enough known at present. Several apparently closely related species have no macrosetae; others possess a distinct macroseta on the tarsus of the 4th leg.

GENUS *Phyllodromus* DELEON

Phyllodromus DeLeon, 1959d.

DIAGNOSIS. Six pairs of dorsal setae, 3 pairs of median setae, 8 pairs of lateral setae, mostly flattened and lanceolate, 2 pairs of scap-

ular setae on interscutal membrane, 3 pairs of sternal setae, and 2 pairs of preanal setae; 4th leg without macrosetae (figs. 6, 11 and 20.)

TYPE SPECIES. *Phyllostromus leiodis* DeLeon, 1959d (by monotypy).

DISCUSSION. This is a typical Amblyseiinae except in the number of preanal setae and macrosetae; it seems most closely related to *Platyseiella*.

GENUS *Phytodromus* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 3 pairs of median setae, 8 pairs of lateral setae, all short and simple, 2 pairs of scapular setae, 2 pairs of sternal setae, and 3 pairs of preanal setae; 4th leg with 1 short macroseta on tarsus (figs. 6, 15 and 19.)

TYPE SPECIES. *Amblyseius leucophaeus* Athias-Henriot, 1959. Monotypic.

DISCUSSION. See discussion under *Typhloseiella*.

GENUS *Typhloseiella* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 4 pairs of median setae, 7 pairs of lateral setae some elongate and plumose, 2 pairs of scapular setae on interscutal membrane, 2 pairs of sternal setae, and 2 pairs of preanal setae; 4th leg with no elongate macrosetae (figs. 15 and 20.)

TYPE SPECIES. *Seiulus isotrichus* Athias-Henriot, 1958. Monotypic.

DISCUSSION. This genus and *Phytodromus* are the only genera of Amblyseiinae with only 2 pairs of sternal setae. Otherwise *Typhloseiella* closely resembles *Typhloseius*. This genus lacks a lateral seta in the position normally occupied by L₇. The 4th pair of median setae lies between L₅ and L₆ just anterior to the posterior medians.

GENUS *Typhloseius* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 4 pairs of median setae, 8 pairs of lateral setae, some elongate and plumose, 2 pairs of scapular setae on interscutal membrane, 3 pairs of sternal setae, and 3 pairs of preanal setae; 4th leg with 2 elongate macrosetae (fig. 11.)

TYPE SPECIES. *Amblyseiopsis sextus* Garman, 1958. Monotypic.

DISCUSSION. Only two genera of phytoseiids, this and *Typhloseiella* have 4 pairs of median setae. Multiple scapulars and medians are normal characteristics of Aceosejidae but seldom occur in the Phytoseiidae.

SUBFAMILY PHYTOSEIINAE BERLESE

Phytoseiinae Berlese, 1916.

DIAGNOSIS. Characterized by an undivided dorsal scutum, usually 2 pairs of distinguishable median setae, 5 or more pairs of lateral setae anterior to D_4 , 8 to 11 pairs total, and 1 or 2 pairs of scapular setae, ventrianal scutum usually with 4 pairs of preanal setae; 4th leg usually with 0 or 1 macroseta.

TYPE GENUS. *Phytoseius* Ribaga (by designation).

Key to Genera of Phytoseiinae

1. Six pairs of dorsal setae (figs. 8, 9, and 10), 2 or more pairs of median setae 2
Five pairs of dorsal setae (fig. 7), 1 pair of median setae . . . *Dubininellus*
2. Three pairs of sternal setae (fig. 11) 3
Two pairs of sternal setae (fig. 15) 10
3. Lateral setae unequal in length, 4th leg with 3 macrosetae 4
Lateral setae subequal in length, 4th leg with 0 or 1 macroseta 6
4. Most of the lateral setae thickened and serrate, 3 pairs of preanal setae *Phytoseius*
Most of the lateral setae slender at most weakly plumose, 4 pairs of preanal setae 5
5. Nine pairs of lateral setae, 5 anterior to D_4 *Typhloseiopsis*
Ten pairs of lateral setae, 6 anterior to D_4 *Amblydromella*
6. Three pairs of preanal setae 7
Four pairs of preanal setae 9
7. Nine pairs of lateral setae, 1 pair of scapular setae *Metaseiulus*
Ten or more pairs of lateral setae, 2 pairs of scapular setae 8
8. Ten pairs of lateral setae, no macrosetae on 4th leg *Neoseiulus*
Eleven pairs of lateral setae, 1 macroseta on 4th leg *Neoseiulella*
9. Eight pairs of lateral setae, 2 pairs of median setae *Paraseiulella*
Eleven pairs of lateral setae, 3 pairs of median setae *Australiseiulus*
10. Fourth leg with 3 macrosetae 11
Fourth leg with less than 3 macrosetae 12
11. Eight pairs of lateral setae, macrosetae short and hooked . . . *Clavidromina*
Ten pairs of lateral setae, macrosetae long and linear *Clavidromus*
12. One pair of scapular setae 13
Two pairs of scapular setae 14
13. Eight pairs of lateral setae *Galendromimus*
Nine pairs of lateral setae *Galendromus*
14. Five pairs of anterior lateral setae 16
Six pairs of anterior lateral setae 15

15. Eleven pairs of lateral setae, 4th leg without macrosetae . . . *Typhloctonus*
 Nine pairs of lateral setae, 4th leg with 1 macroseta . . . *Typhlodromus*
16. Eight pairs of lateral setae 17
 Ten or more pairs of lateral setae 18
17. Two pairs of preanal setae, 2 macrosetae on 4th leg . . . *Amblydromus*
 Four pairs of preanal setae, 0 or 1 macroseta on 4th leg . . . *Typhlodromina*
18. Eleven pairs of lateral setae *Seiulus*
 Ten pairs of lateral setae 19
19. Two pairs of median setae 20
 Three pairs of median setae *Paraseiulus*
20. Three pairs of preanal setae, L₁₀ expanded at tips *Anthoseius*
 Four pairs of preanal setae, L₁₀ pointed at tips *Typhlodromella*

GENUS *Dubininellus* WAINSTEIN

Dubininellus Wainstein, 1959.

DIAGNOSIS. Five pairs of dorsal setae, 1 pair of median setae, 8 pairs of lateral setae, mostly thickened elongate and serrate, only S₁ present and it on the dorsal scutum, 2 pairs of sternal setae, and 1 or 2 pairs of preanal setae; 4th leg with 1 to 3 macrosetae, (figs. 7 and 15).

TYPE SPECIES. *Phytoseius corniger* Wainstein, 1959.

KNOWN SPECIES. *D. corniger* (Wainstein), *D. macropilis* (Banks), *D. bakeri* (Chant).

DISCUSSION. Variation in preanal setae and macrosetae of the 4th leg of this and the following genus indicates a species confusion that will have to stand until further analytical work is done. Species of this and the following genus lack lateral setae in the positions normally occupied by L₇ and L₈. Of the median setae, only M₁ are distinguishable in both genera.

GENUS *Phytoseius* RIBAGA

Phytoseius Ribaga, 1902.

DIAGNOSIS. Six pairs of dorsal setae, 1 pair of median setae, 8 pairs of lateral setae, some thickened, elongate, and serrate, 2 pairs of scapular setae with S₁ on dorsal scutum, 3 pairs of sternal setae and 3 pairs of preanal setae; 4th leg with 1 to 3 macrosetae, (figs. 11, 16, and 19).

TYPE SPECIES. *Gamasus plumifer* Canestrini and Fanzago, 1876 (by designation).

KNOWN SPECIES. *P. plumifer* (Can. and Fan.), *P. nauhautlensis* DeLeon.

DISCUSSION. See discussion under *Dubininellus*.

GENUS *Typhloseiopsis* DeLeon

Typhloseiopsis DeLeon, 1959c.

DIAGNOSIS. Six pairs of dorsal setae, 2 pairs of median setae, 8 pairs of lateral setae some long, slender, and weakly plumose, some short and simple, 2 pairs of scapular setae on interscutal membrane, 3 pairs of sternal setae, and 4 pairs of preanal setae; 4th leg with 3 elongate macrosetae (figs. 11 and 16.)

TYPE SPECIES. *Typhloseiopsis theodoliticus* DeLeon, 1959c (by designation).

KNOWN SPECIES. *T. theodoliticus* DeLeon, *T. contiguus* (Chant).

DISCUSSION. This genus and *Amblydromella* have affinities with both Amblyseiinae and Phytoseiinae. They are placed here because of the number of anterior lateral setae, median setae, and preanal setae. Species of this genus lack lateral setae in the positions normally occupied by L₇ and L₈.

GENUS *Amblydromella* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 2 pairs of median setae, 10 pairs of lateral setae, 6 anterior to D₄, most of them short, some plumose, 2 pairs of scapular setae on interscutal membrane, 3 pairs of sternal setae, and 3 or 4 pairs of preanal setae; 4th leg with 3 elongate, sometimes knobbed macrosetae (figs. 11 and 16.)

TYPE SPECIES. *Typhlodromus fleschneri* Chant, 1960.

KNOWN SPECIES. *A. fleschneri* (Chant), *A. rickeri* (Chant), *A. vulgaris* (Ehara), *A. junipera* (Chant.)

DISCUSSION. See discussion under *Typhloseiopsis*.

GENUS *Paraseiulella* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 2 pairs of median setae, 8 pairs of lateral setae, some weakly plumose, 2 pairs of scapular setae on interscutal membrane, 3 pairs of sternal setae, and 4 pairs of preanal setae; 4th leg without macrosetae (figs. 11 and 20.)

TYPE SPECIES. *Typhlodromus burrelli* Chant, 1959.

KNOWN SPECIES. *P. burrelli* (Chant), *P. perplexa* (Chant), *P. tropica* (Chant).

DISCUSSION. This and the following four genera form a distinct group within the Phytoseiinae; all have 3 pairs of sternal setae and subequal dorsal, median, and lateral setae graduated in size caudally.

Were it not for significant differences in the number of median, lateral, scapular, and preanal setae the species might be considered congeneric. This genus lacks lateral setae in the positions normally occupied by L_7 and L_8 .

GENUS *Metaseiulus* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 2 pairs of median setae, 9 pairs of lateral setae, the 6th pair on a level with D_4 , all short and simple, 1 pair of scapular setae on interscutal membrane, 3 pairs of sternal setae, and 3 pairs of preanal setae; 4th leg with no or one macroseta (figs. 11, 19, and 20.)

TYPE SPECIES. *Typhlodromus validus* Chant, 1957a.

KNOWN SPECIES. *M. validus* (Chant), *M. nelsoni* (Chant).

DISCUSSION. Species of this genus lack lateral setae in the position normally occupied by L_8 .

GENUS *Neoseiulus* HUGHES

Neoseiulus Hughes, 1948.

DIAGNOSIS. Six pairs of dorsal setae, 2 pairs of median setae, 10 pairs of lateral setae, some weakly plumose, 2 pairs of scapular setae on interscutal membrane, 3 pairs of sternal setae, and 3 pairs of preanal setae; 4th leg with no macrosetae (figs. 8, 11, and 20.)

TYPE SPECIES. *Neoseiulus barkeri* Hughes, 1948 (by designation).

KNOWN SPECIES. *N. barkeri* Hughes, *N. transvaalensis* (Nesbitt), *N. invectus* (Chant), *N. singularis* (Chant).

DISCUSSION. In this genus setae L_6 tend to lie mesad of L_7 but not distinctly enough to be referred to as medians.

GENUS *Neoseiulella* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 2 pairs of median setae, 11 pairs of lateral setae, all short and simple, 2 pairs of scapular setae on interscutal membrane, 3 pairs of sternal setae, and 3 pairs of preanal setae; 4th leg with one macroseta (figs. 9, 11, and 19.)

TYPE SPECIES. *Typhlodromus nesbitti* Womersley, 1954. Monotypic.

DISCUSSION. This and the following genus have an additional pair of lateral setae between the setae normally referred to as L_6 and L_7 . In this genus these setae lie slightly but not distinctly mesad of the associated lateral setae.

GENUS *Australiseiulus* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 3 pairs of median setae, 11 pairs of lateral setae, 6 anterior to D_4 , all short, some weakly plumose, 2 pairs of scapular setae on interscutal membrane, 3 pairs of sternal setae, and 4 pairs of preanal setae; 4th leg with no macrosetae (figs. 10, 11, and 20.)

TYPE SPECIES. *Kampimodromus australicus* Womersley, 1954. Monotypic.

DISCUSSION. See discussion under *Neoseiulella*. The 3rd pair of median setae lie anterior to D_4 and just posterior to M_1 .

GENUS *Clavidromus* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 2 pairs of median setae, 10 pairs of lateral setae, all short, many plumose, 2 pairs of scapular setae on interscutal membrane, 2 pairs of sternal setae, and 3 pairs of preanal setae; 4th leg with 3 elongate macrosetae (figs. 8, 15, and 16.)

TYPE SPECIES. *Typhlodromus jackmickleji* DeLeon, 1958.

KNOWN SPECIES. *C. jackmickleji* (DeLeon), *C. pectinatus* (Athias-Henriot), *C. hartlandrowei* (Evans).

DISCUSSION. See discussion under *Anthoseius*.

GENUS *Anthoseius* DeLeon

Anthoseius DeLeon, 1959d.

DIAGNOSIS. Six pairs of dorsal setae, 2 pairs of median setae, 10 pairs of lateral setae, with L_{10} elongate and expanded at tip, 2 pairs of scapular setae on interscutal membrane, 2 pairs of sternal setae, and 3 pairs of preanal setae; 4th leg without macrosetae (figs. 8, 15, and 20.)

TYPE SPECIES. *Anthoseius hebetis* DeLeon, 1959d (by monotypy).

DISCUSSION. This genus seems closely related to *Clavidromus* and *Clavidromina*, from which it may be distinguished by the lack of macrosetae, the number of preanal setae and the unusual development of L_{10} .

GENUS *Clavidromina* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 2 pairs of median setae, 8 pairs of lateral setae, some flattened, spatulate and plumose, 2 pairs of scapular setae on interscutal membrane, 2 pairs of sternal setae, and 4 pairs of preanal setae; 4th leg with 3 short hooked macrosetae (figs. 15 and 18.)

TYPE SPECIES. *Typhlodromus ellipticus* DeLeon, 1958.

KNOWN SPECIES. *C. elliptica* (DeLeon), *C. corna* (DeLeon).

DISCUSSION. This and the following two genera are closely related; they may be distinguished by differences in the number of preanal setae and in the number and form of the macrosetae of the 4th leg. This genus lacks lateral setae in the positions normally occupied by L_7 and L_8 .

GENUS *Amblydromus* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 2 pairs of median setae, 8 pairs of lateral setae, all simple, 2 pairs of scapular setae on interscutal membrane, 2 pairs of sternal setae, and 2 pairs of preanal setae; 4th leg with 2 elongate macrosetae, both on tarsus (fig. 15.)

TYPE SPECIES. *Typhlodromus smithi* Schuster, 1957. Monotypic.

DISCUSSION. This genus differs from *Typhlodromina* by having 2 macrosetae on the tarsus of the 4th leg and 2 preanal setae. It also lacks lateral setae in the positions normally occupied by L_7 and L_8 .

GENUS *Typhlodromina* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 2 pairs of median setae, 8 pairs of lateral setae, with 2 pairs of scapular setae on interscutal membrane, 2 pairs of sternal setae and 4 pairs of preanal setae; 4th leg with 0 or 1 macroseta (figs. 15, 19, and 20.)

TYPE SPECIES. *Iphidulus conspicuus* Garman, 1948.

KNOWN SPECIES. *T. conspicua* (Garman), *T. pini* (Chant), *T. arboorea* (Chant), *T. adjacentis* (DeLeon), *T. columbiensis* (Chant), *T. anchialis* (Kennett), *T. herbertae* (Chant).

DISCUSSION. Two groups of species can be distinguished within this genus, those with a shield-shaped ventrianal scutum and those with an elongate, sinuous-margined, ventrianal scutum. The striking development of M_2 and L_8 on *T. adjacentis* (DeLeon) may indicate a third group. This genus lacks lateral setae in the positions normally occupied by L_7 and L_8 .

GENUS *Galendromimus* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 2 pairs of median setae, 8 pairs of lateral setae, with L_8 elongate and plumose, 1 pair of scapular setae on interscutal membrane, 2 pairs of sternal setae, and 4 pairs of preanal setae; 4th leg without macrosetae (figs. 15 and 20.)

TYPE SPECIES. *Typhlodromus alveolaris* DeLeon, 1957. Monotypic.

DISCUSSION. This genus is closely related to *Galendromus* from which it may be distinguished by having only 8 pairs of lateral setae, and M_2 and L_8 elongate, clavate, and serrate. It also lacks lateral setae in the positions normally occupied by L_7 and L_8 .

GENUS *Galendromus* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 2 pairs of median setae, 9 pairs of lateral setae, most of them subequal in length and often weakly plumose, 1 pair of scapular setae on interscutal membrane, 2 pairs of sternal setae, and 4 pairs of preanal setae; 4th leg with 0 or 1 slender macroseta (figs. 15, 19, and 20.)

TYPE SPECIES. *Typhlodromus floridanus* Muma, 1955.

KNOWN SPECIES. *G. floridanus* (Muma), *G. gratus* (Chant), *G. annectens* (DeLeon), *G. longipilis* (Nesbitt), *G. occidentalis* (Nesbitt), *G. pomi* (Parrott), *G. flumenis* (Chant), *G. mcgregori* (Chant), *G. juniperi* (DeLeon), *G. carinulatus* (DeLeon), *G. luculentis* (DeLeon).

DISCUSSION. This distinctive genus has three species groups, one with dorsals and laterals plumose and subequal in length, one with simple dorsals distinctly smaller than the simple laterals, and one with dorsals tiny and simple, and the laterals plumose. Species of this genus lack lateral setae in the position normally occupied by L_8 .

GENUS *Typhlodromus* SCHEUTEN

Typhlodromus Scheuten, 1857.

DIAGNOSIS. Six pairs of dorsal setae, 2 pairs of median setae, 9 pairs of lateral setae, 6 anterior to D_4 , all short and simple, 2 pairs of scapular setae on interscutal membrane, 2 pairs of sternal setae, and 4 pairs of preanal setae; 4th leg with one macroseta (figs. 15 and 19.)

TYPE SPECIES. *Typhlodromus pyri* Scheuten, 1857 (by monotypy).

DISCUSSION. It is unfortunate that this well known genus must be restricted to the type species. *Typhlodromus*, *Typhloctonus*, and *Typhlodromella* form a distinct group of genera, all of which have 2 pairs of median setae, the 6th pair of lateral setae on a level with or anterior to D_4 , and 4 pairs of preanal setae. This genus lacks lateral setae in the position normally occupied by L_9 .

GENUS *Typhlodromella* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 2 pairs of median setae, 10 pairs of lateral setae, the 6th pair on a level with D_4 , all short and simple, 2 pairs of scapular setae on interscutal membrane, 2 pairs of sternal setae, and 4 pairs of preanal setae; 4th leg with 0 or 1 macrosetae (figs. 15, 19, and 20.)

TYPE SPECIES. *Seiulus rhenanus* Oudemans, 1905.

KNOWN SPECIES. *T. rhenana* (Oudemans), *T. bakeri* (Garman), *T. recki* (Wainstein), *T. caudiglans* (Schuster).

DISCUSSION. See discussion under *Typhlodromus*.

GENUS *Typhloctonus* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 2 pairs of median setae, 11 pairs of lateral setae, 6 anterior to D_4 , with L_{11} plumose, 2 pairs of scapular setae on interscutal membrane, 2 pairs of sternal setae and 4 pairs of preanal setae; 4th leg without macrosetae (figs. 9, 15, and 20).

TYPE SPECIES. *Typhlodromus tiliarum* Oudemans, 1930.

KNOWN SPECIES. *T. tiliarum* (Oudemans), *T. aceri* (Collyer).

DISCUSSION. See discussion under *Typhlodromus* Scheuten. This genus always has an additional pair of lateral setae between the setae normally referred to as L_6 and L_7 . These setae tend to lie mesad of the associated lateral setae and may, when additional species have been collected, prove to be median setae.

GENUS *Seiulus* BERLESE

Seiulus Berlese, 1887.

DIAGNOSIS. Six pairs of dorsal setae, 2 pairs of median setae, 11 pairs of lateral setae, all short and simple, 2 pairs of scapular setae on interscutal membrane, 2 pairs of sternal setae, and 1 pair of preanal setae; 4th leg without macrosetae (figs. 15 and 20.)

TYPE SPECIES. *Seiulus hirsutigenus* Berlese, 1887 (by monotypy).

KNOWN SPECIES. *S. hirsutigenus* (Berlese), *S. simplex* Chant.

DISCUSSION. Species of the genus possess an additional pair of lateral setae between the setae normally referred to as L_6 and L_7 .

GENUS *Paraseiulus* NEW GENUS

DIAGNOSIS. Six pairs of dorsal setae, 3 pairs of median setae, 10 pairs of lateral setae, all short and simple, 2 pairs of scapular setae on

interscutal membrane, 2 pairs of sternal setae, and 2 to 4 pairs of préanal setae; 4th leg without macrosetae (figs. 15 and 20.)

TYPE SPECIES. *Seiulus soleiger* Ribaga, 1902.

KNOWN SPECIES. *P. soleiger* (Ribaga), *P. ecclesiasticus* (DeLeon).

DISCUSSION. This genus is distinctive in the possession of 3 pairs of median setae with the additional pair located just posterior to D₄.

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