

## SOME PHYTOSEIID MITES FROM THE SOUTH PACIFIC, WITH DESCRIPTIONS OF NEW SPECIES AND A DEFINITION OF THE *AMBLYSEIUS LARGOENSIS* SPECIES GROUP

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**ABSTRACT**—Species of Phytoseiidae collected in Fiji, Vanuatu (New Hebrides) and New Caledonia in 1979 and Cook Islands in 1981 are listed. *Amblyseius fijiensis* n. sp. and *A. herbicoloides* n. sp. belong to the *largoensis* species group, which, as defined, comprises 9 species, 7 of which are known only from the Southern Hemisphere. *Amblyseius (Indoseiulus) hebridensis* n. sp. is also described.

### INTRODUCTION

Previous knowledge of the Phytoseiidae from South Pacific islands is based on records of Schicha (1979, 1981a, 1981b) and Collyer (1980). The present paper reports on studies of material collected by the senior author in Fiji, Vanuatu (New Hebrides) and New Caledonia in 1979 and the Cook Islands in 1981. Among phytoseiids most frequently collected were species in the *Amblyseius largoensis* group as defined herein. Examination of various series of specimens confirmed that this group contains a complex of at least 9 species.

All measurements are given in micra. The setal nomenclature follows that of Rowell et al. (1978). Holotypes and some paratypes of new species are deposited in the U.S. National Museum of Natural History (NMNH), and other paratypes are deposited in the Division of Biological Control, University of California, Riverside (UCR).

#### Genus *Phytoseiulus* Evans

*Phytoseiulus* Evans, 1952:397; Denmark & Schicha, 1983:27.

#### *Phytoseiulus macropilis* (Banks)

*Laelaps macropilis* Banks, 1905:139.

*Hypoaspis macropilis*, Banks, 1915:85; Smith and Summers, 1949:209.

*Phytoseiulus speyeri* Evans, 1952:398.

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

*Phytoseiulus chanti* Ehara, 1966:135.

**SPECIMENS EXAMINED**—*Cook Islands*: Rarotonga, 31-VII-81, 1 female, Ex: unknown tree; *New Caledonia*: Noumea, 12-III-79, 1 female, Ex: *Manihot* sp.

**REMARKS**—In the Cook Islands, all stages of *P. macropilis* were found in colonies of *Oligonychus* species (Tetranychidae) on the upper leaf surfaces of a tree. This species was previously reported from Cook Islands on *Hibiscus tiliaceus* (Collyer 1980).

The distribution of *P. macropilis* is widespread. Records include USA - California, Florida, The Caribbean area, Central America, Brazil, and Hawaii. Crossing experiments were conducted between Cook Islands and California cultures by the methods of McMurtry (1980). Reciprocal crosses resulted in production of fertile progeny at a rate similar to that of control crosses (McMurtry and Badii, unpublished data).

#### Genus *Paraphytoseius* Swirski and Shechter

*Paraphytoseius* Swirski and Shechter, 1961:114; Blommers, 1976:87; Matthyse and Denmark, 1981:342.

*Amblyseius (Paraphytoseius)*, Ehara, 1967:77.

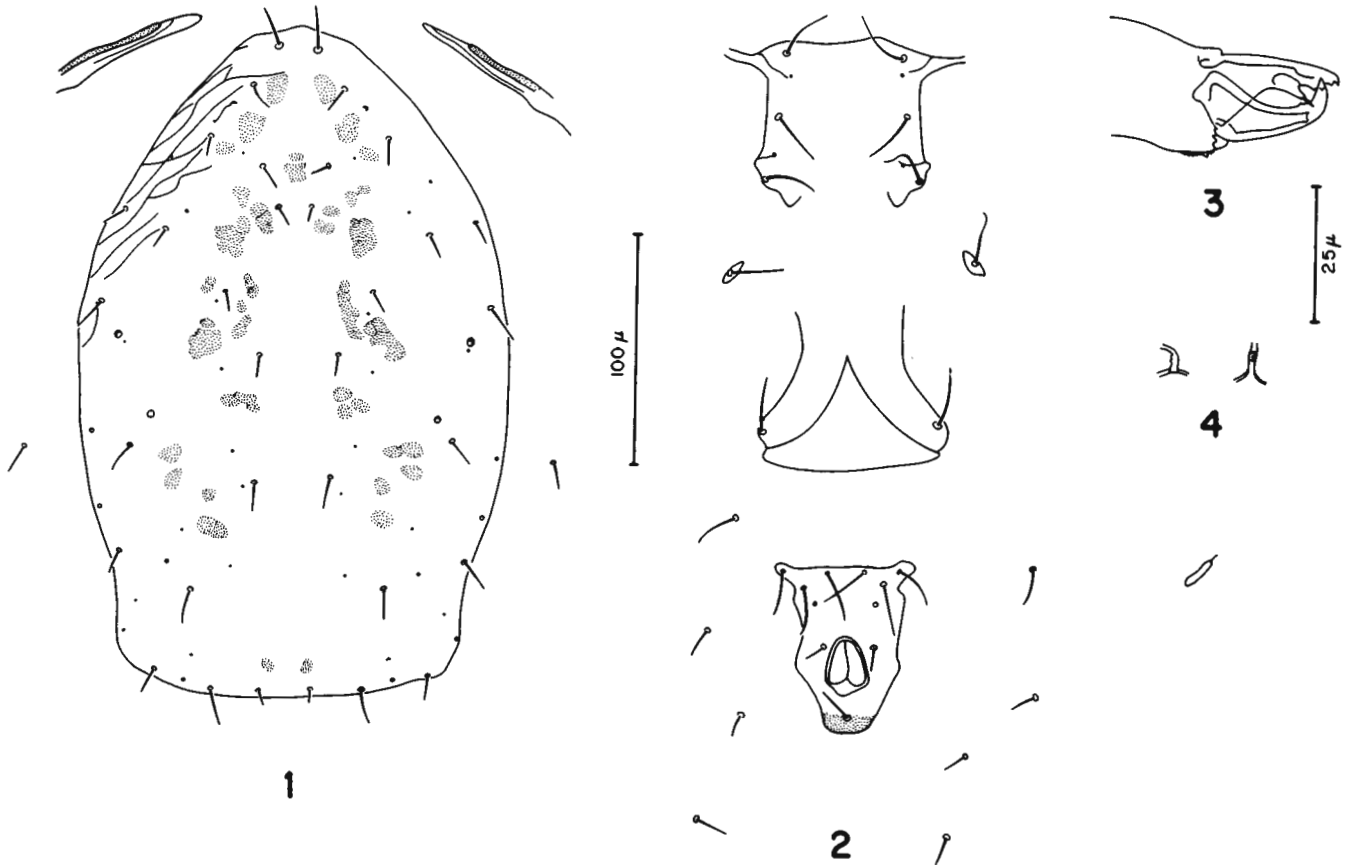
#### *Paraphytoseius multidentatus* Swirski and Shechter

*Paraphytoseius multidentatus* Swirski and Shechter, 1961:114; Matthyse and Denmark, 1981:342; Blommers, 1976:87.

*Amblyseius (Paraphytoseius) multidentatus*, Ehara, 1967:77; Ehara and Lee, 1971:69; Ehara and Bhandhufalck, 1977:79.

**SPECIMENS EXAMINED**—*New Caledonia*: nr. Noumea, 9-III-79, 3 female, Ex: *Hibiscus* sp.

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Figs. 1-4. *Amblyseius (Indoseiulus) hebridensis* n. sp. Female: 1. dorsal shield; 2. ventral surface; 3. chelicera; 4. spermatheca.

**REMARKS**—Mean setal lengths of 3 specimens: j1 35, j3 84, j4, 5, 6 5, J5 4, z2, z4 8, z5 6, Z1 7, Z4 63, Z5 99, s4 126, r3 47, R1 29, SgeI 6, SgeII, SgeIII 10, SgeIV 17, StiIV 29, StIV 41. Additional blunt macroseta present on distitarsus IV. Other 3 macrosetae on leg IV strongly spatulate with hyaline tips. Additional smaller rod-shaped setae on genu and tibia of legs I-III. Setae S4 are absent on these specimens, although the sockets are visible. Setal measurements and other features generally agree with the descriptions of Swirski and Shechter (1961) and Blommers (1976) for this species. We have specimens from Papua, New Guinea, on which S5 is present, StIV is not strongly spatulate, and none of the smaller setae on the legs are rod-shaped. Matthyse and Denmark (1981) recognize only one species of *Paraphytoseius*.

#### Genus *Euseius* Wainstein

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

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

*Euseius*, DeLeon, 1966:86; Muma, Denmark and DeLeon, 1970:92; McMurtry 1983.

#### *Euseius noumeae* (Schicha)

*Amblyseius noumeae* Schicha, 1979:42.

**SPECIMENS EXAMINED**—Cook Islands: Rarotonga, 1-III-81, 3 females, Ex: *Persea americana*; New Caledonia: Noumea, 10-III-79, 2 females, 1 male, Ex: *Mangifera indica*; 3 females, Ex: *Manihot* sp.; 12 females, Ex: *Spathodea campanulata*; 7 females, Ex: *Hernandia ovigera*; 5 females, Ex: *Croton* sp.; 7 females, Ex: *Hibiscus* sp.

**REMARKS**—The specimens collected in Cook Islands are considered conspecific with *E. noumeae*, regardless of variation observed in the lengths of some setae. Measurements of some setae on our specimens as compared to those given in the original description (in parentheses) are as follows: s4 10-13 (8-9), S2 12 (5-7), S4 12-13 (7-8), S5 8-12 (7-8), SgeII 14-17 (19-21), SgeIII 24 (27-28), StiIII 19-22 (25), SgeIV 30-31 (36-39), StiIV 28-30 (35-36), StIV 41-42 (50-51). In one of the Cook Islands specimens, r3, on one side, was on the dorsal shield. The measurements of our specimens from New Caledonia agree exactly with the original description.

Genus *Amblyseius* Berlese*Amblyseius* Berlese, 1914:143.*Amblyseius cannaensis* (Muma)*Amblyseiulus cannaensis* Muma, 1962:4.*Proprioseiopsis cannaensis*, Muma, Denmark and DeLeon, 1970:38; Denmark and Andrews, 1981:148.SPECIMEN EXAMINED — *New Caledonia*: Mont Dore, 7-III-79, 1 female, *Citrus paradisi*.

REMARKS—This specimen was compared with the holotype and it appeared identical except for slight differences in lengths of some setae. The only other records for this species are USA (Florida), El Salvador and Brazil (Moraes and McMurtry 1983).

*Amblyseius (Indoseiulus) hebridensis*

McMurtry and Moraes, n. sp.

(Figs. 1-4)

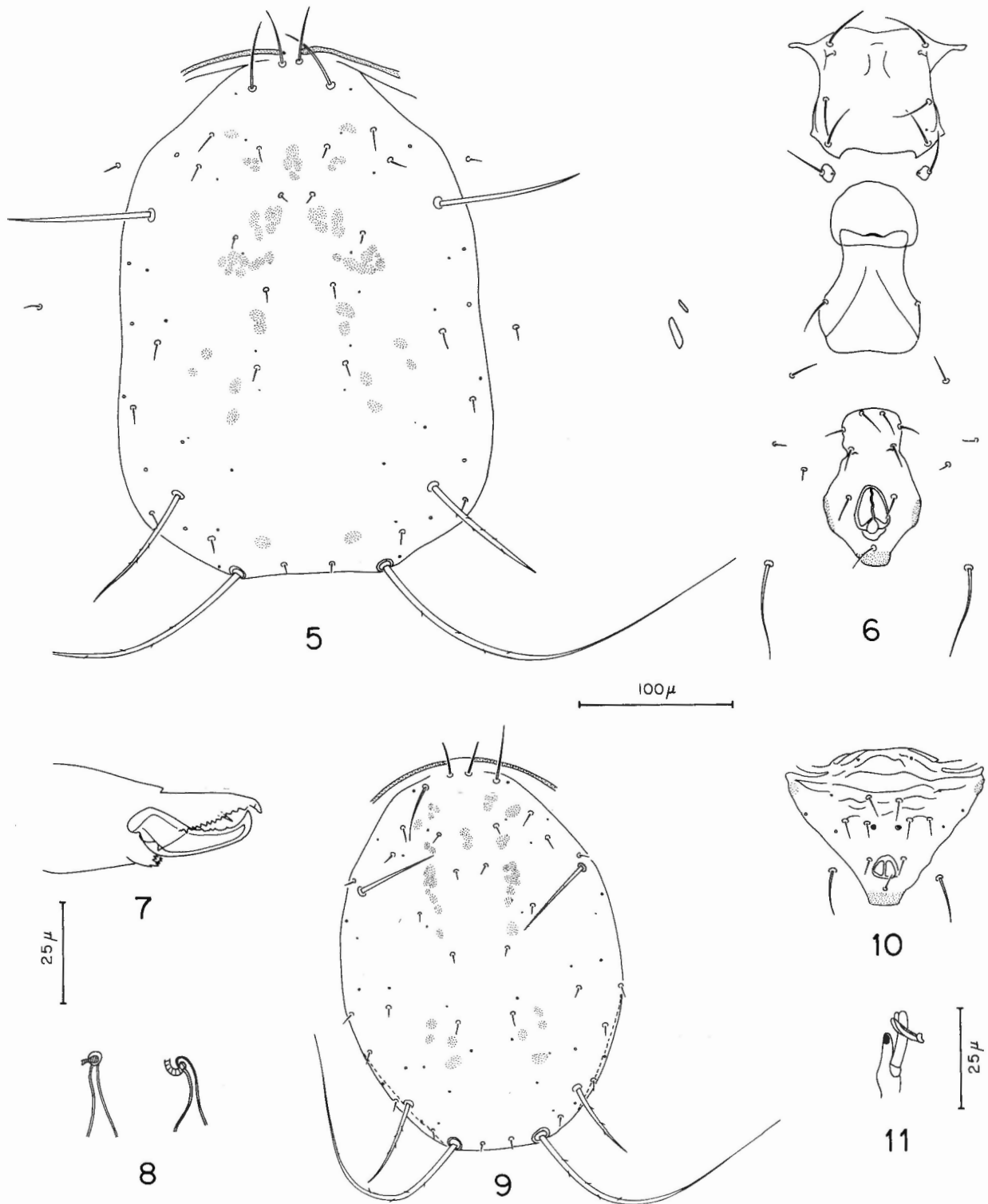
DIAGNOSIS—This species is very similar to *A. irregularis* (Evans), but differs from this species by its smaller size and shorter leg macrosetae. It is also similar to *A. christinae* (Schicha) but differs by its longer peritreme and by having a tooth on the movable digit of the chelicera. *A. hebridensis* differs from both species by having r3 on the dorsal shield and by the shape of the spermatheca.

FEMALE—(Figs. 1-4) (4 specimens measured).

*Dorsum*—Dorsal shield smooth, except for some striae on the sides of the proscutum, with 20 pairs of pores, 293 (278-314) long and 197 (190-206) wide at widest level of proscutum. Setae j1 20 (19-22), j3 14 (13-14), j4 8 (7-10), j5 8 (7-8), j6 9 (8-10), J2 13 (12-14), J5 7 (6-7), z2 13 (12-14), z4 12 (11-13), z5 10 (8-11), Z1 14 (13-16), Z4 15 (13-16), Z5 17 (16-18), s4 18 (17-20), S2 16 (14-16), S5 13 (12-14), r3 11 (11-12) and R1 13 (12-14). All setae smooth. Setae r3 on dorsal shield.*Peritreme*—Extending forward nearly to level of j3.*Venter*—All shields very lightly sclerotized. Sternal shield with 3 pairs of setae and with ill defined posterior margin. Distances between sternal setae ST1-ST3 53 (53-54), ST2-ST3 53 (53-54) and genital setae G-G 72 (71-72). Ventrianal shield with the 3 pairs of preanal setae more or less in line, length of shield 74 (72-78), width 60 at widest level of anterior half and 47 (46-48) at anus level. The anterior half of this shield is defined mainly as an area devoid of the typical striation of the ventral membrane.*Chelicera*—Movable and fixed digits 23 long. Movable digit with a short subapical tooth and fixed digit with 3 subapical teeth, all distal to pilus dentilis.*Spermatheca*—Distal portion of cervix disc-like, connected to atrium by a short duct about 2  $\mu$  long.*Legs*—Macrosetae blunt, except for StiII, which is setaceous. SgeII 17 (16-17), StiII 17 (16-17), SgeIII 21 (20-22), StiIII 18 (17-19), SgeIV 28 (26-29), StiIV 30 (28-32), StIV 18 (18-19). Chaetotaxy of GeII 2- $\frac{2-2}{0}$ -1; GeIII 1- $\frac{2}{1}$ - $\frac{2}{0}$ -1.

MALE—Unknown.

LOCALITY AND TYPE MATERIAL—Holotype female (NMNH) and 3 female paratypes (UCR) from *Hibiscus* sp., Port Vila, Vanuatu (New Hebrides), 9-VIII-79 (J. A. McMurtry).REMARKS—We here follow Ehara's (1982) definition of the subgenus *Indoseiulus* as this encompasses a well defined assemblage of species. The subgenus includes *irregularis* (Evans, 1953), *ricini* (Ghai and Menon, 1969), *christinae* (Schicha, 1981b), *liturivorus* (Ehara, 1981) and the new species described here. With the exception of *liturivorus*, the chelicerae of these species closely resemble those of species in the genus *Euseius* in that the digits are short (ca. 25  $\mu$ ), the inner surfaces of both digits are concave, there are a few small teeth, all near the distal end of the fixed digit, and usually there is one small tooth on the movable digit. The chelicerae of *A. liturivorus* resemble those of *Amblyseius* s.s., i.e., multidentate fixed digit and 3-4 teeth on movable digit. Other characteristics that species in the subgenus *Indoseiulus* have in common with *Euseius* species include a wide genital shield in relation to the ventrianal shield and the three pairs of preanal setae in a nearly transverse row. The subgenus *Indoseiulus* is unique in having the following combination of characters: peritremal shields not fused anteriorly to the dorsal shield; setae S4 absent; and ventrianal shield weakly sclerotized with ill-defined margins.*Amblyseius largoensis* GroupDIAGNOSIS—Species in the genus *Amblyseius* (as defined in the diagnosis of Muma et al., 1970) with the following combination of characters in the female:*Dorsum*—Dorsal shield lightly sclerotized, smooth. All setae on shield minute except j1, j3, s4, Z4, Z5, which are usually of progressively increasing lengths (s4 sometimes longer than Z4); Z5 whiplike, 200-400 +  $\mu$ .*Venter*—Posterior margin of sternal shield in most species straight or slightly undulating, protruding medially in one species; and with truncate median projection in one species. Ventrianal shield vase-shaped, lateral margins constricted near level of preanal pores; anterior portion of shield narrower than posterior portion.*Chelicerae*—9 to 13 teeth on fixed digit, 3 to 5 on movable digit.*Spermatheca*—Cervix long (usually > 20; up to 35  $\mu$ ), tubular, sides parallel or flaring distally, atrium



Figs. 5-11. *Amblyseius fijiensis* n. sp.: 5. Female dorsal shield; 6. female ventral surface; 7. female, chelicera; 8. spermatheca; 9. male, dorsal shield; 10. ventrianal shield; 11. spermatodactyl.

Table I. Tabular key to females of species in the *Amblyseius largoensis* group.

## Statement of characters

1. Shape of cervix of spermatheca
    - short-flar. = short (18-24  $\mu$ ), flaring distally to 2-3 times narrowest diameter (Figs. 22, 23)
    - short, abr. flar. = narrow at basal portion, flaring abruptly to 4 or more times narrowest width (Figs. 8, 15)
    - long, grad.-flar. = long (23-29, usually v 25), distal two-thirds gradually flaring to 2-2.5 times basal diameter (Fig. 24)
    - long, par. flar. = parallel sides, very narrow diameter for two-thirds of length, flaring distally (Fig. 25)
    - par. = sides parallel for entire length (Fig. 26)
  2. Sternal shield posterior margin
    - trunc. proj. = truncate median projection (Fig. 19)
    - rnd. protr. = rounded median protrusion (Fig. 13)
    - str. = straight (sometimes slightly undulating) (Figs. 6, 20, 21)
    - ill-def. = ill-defined, very lightly sclerotized
- 3-5. Lengths of setae in micra

Key						
1	2	3	4	5		
Cervix shape	st. sh. post. margin	Length s4	Length SgeIV	Length Z5	Distribution	Species
short, flar.	trunc.-proj.	86-116	111-163	227-320	E. Asia	<i>eharai</i>
short, flar.	str.	128-133	203-211	305-348	Australia	<i>nambourensis</i>
short, abr. flar.	rnd.-protr.	68-72	126-142	280-298	S. Pacific	<i>herbicoloides</i>
short, abr. flar.	str.	82-96	126-154	240-296	S. Pacific	<i>fijiensis</i>
long, grad. flar.	str.	92-100	101-117	231-272	Cosmopolitan	<i>herbicolus</i>
long, par. flar.	ill-def.	99-104	158-173	318-342	Australia	<i>phillipsi</i>
par.	str.	88-108	105-107	266-299	Cosmopolitan	<i>largoensis</i>
par.	str.	104	128	264	Madagascar	<i>sakalava</i>
par.	str.	140-148	170-186	355-374	S. Africa	<i>neolargoensis</i>

distinct; major duct usually joining atrium laterally rather than distally.

*Legs*—Genua of all legs with prominent macrosetae; macroseta on geIV longest, whiplike, usually over 100  $\mu$ ; macroseta of tiIV also whiplike, somewhat shorter than that of geIV.

Table I shows a tabular key (Newell 1970, 1972) to the species in this group.

*Amblyseius fijiensis*

McMurtry and Moraes, n. sp.

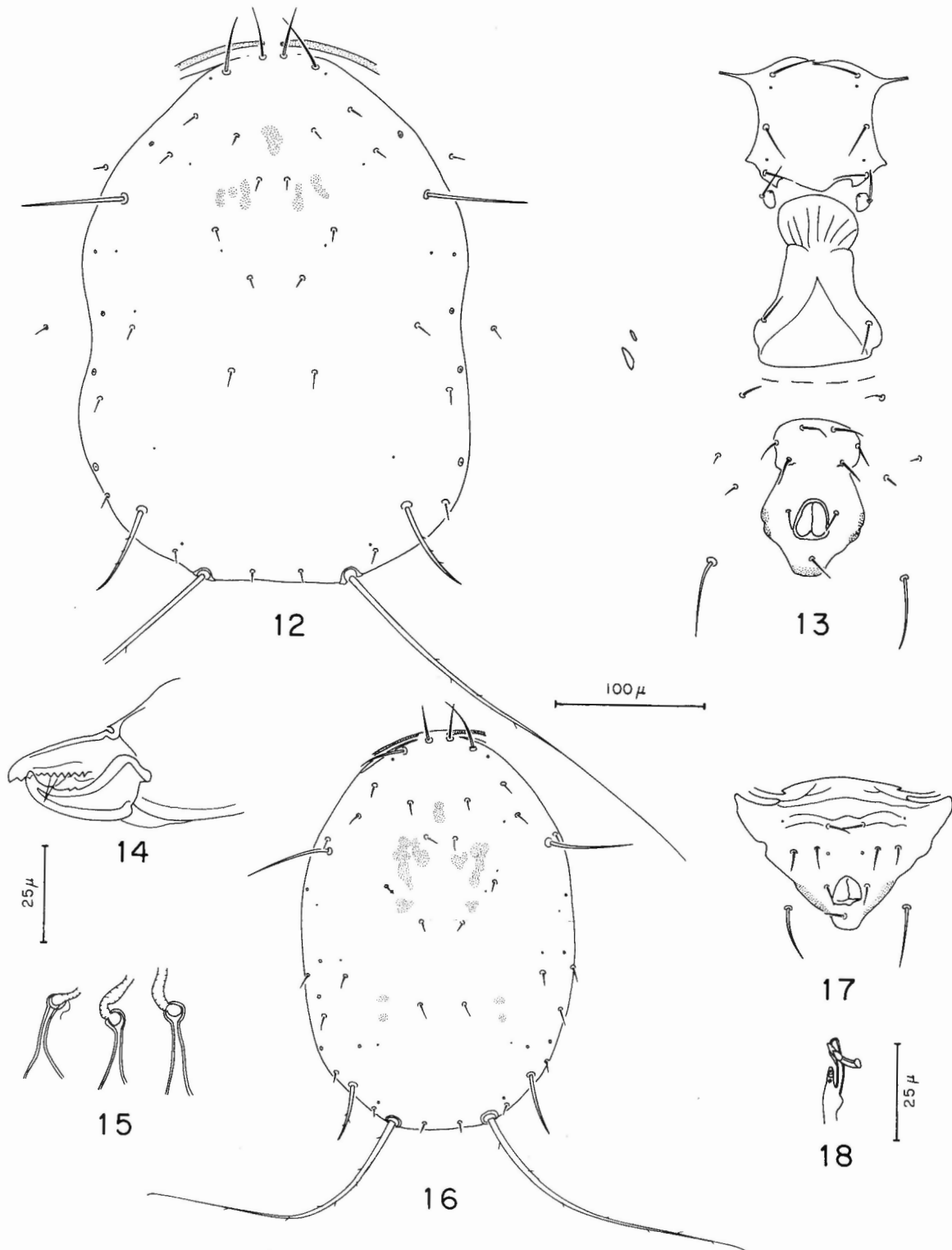
(Figs. 5-11)

**DIAGNOSIS**—This species of the *largoensis* group differs from *Amblyseius phillipsi* McMurtry &

Schicha, and *Amblyseius herbicolus* (Chant) by the shape of the spermatheca, which flares more strongly at the distal end. *A. fijiensis* differs from *Amblyseius herbicoloides* n. sp. by having 3 instead of 4 teeth on the movable digit of the chelicera and by its longer setae Z4 and s4. It is also very similar to *Amblyseius eharai* Amitai & Swirski, but differs from it by having the posterior margin of the sternal shield straight or slightly convex rather than having a median protrusion.

**FEMALE**—(Figs. 5-8) (20 specimens measured).

**Dorsum**—Dorsal shield smooth, with 20 pairs of well defined pores, 339 (317-365) long and 232 (215-247) wide at widest level of proscutum. Setae j1 32 (30-36), j3 42 (35-47), j4 7 (5-8), j5 6 (5-7), j6 8



Figs. 12-18. *Amblyseius herbicoloides* n. sp. 12. Female, dorsal shield; 13. ventral surface; 14. chelicera; 15. spermatheca; 16. male, dorsal shield; 17. ventrianal shield; 18. spermadactyl.

(6-10), J2 9 (8-11), J5 7 (6-8), z2 13 (10-16), z4 10 (7-12), z5 6 (5-7), Z1 10 (8-12), Z4 87 (76-96), Z5 275 (240-296), s4 89 (82-96), S2 11 (10-14), S4 11 (10-12), S5 8 (7-10), r3 9 (7-11), R1 9 (7-11). All setae smooth, except for Z4 and Z5 which are slightly barbed.

*Peritreme*—Extending forward to level of j1.

*Venter*—Sternal shield lightly sclerotized, with straight or slightly convex posterior margin. Distances between bases of setae ST1-ST3 64 (60-68), ST2-ST2 66 (62-68) and G-G 63 (56-66). Ventrianal shield vase shaped, constricted posteriorly to JV<sub>2</sub>, 100 (93-107) long, 43 (39-49 wide at level of ZV<sub>2</sub> and 64 (60-66) wide at level of anus.

*Chelicera*—Movable digit 33 (32-34), with 4 teeth; fixed digit 29 (28-30), with 13 teeth.

*Spermatheca*—Cervix flared, 19 (18-22) long. Atrium only slightly wider than proximal section of cervix.

*Legs*—Setaceous macrosetae, of the following lengths: SgeI 45 (41-48), SgeII 35 (30-38), SgeIII 45 (41-48), StiIII 39 (35-44), StiIII 28 (22-32), SgeIV 137 (126-154), StiIV 98 (84-112), StiIV 48 (38-54). Chaetotaxy of GeII  $2-\frac{2,2}{0}-1$ ; GeIII  $1-\frac{2}{1}, \frac{2}{0}-1$ .

MALE—(Figs. 9-11) (7 specimens measured).

*Dorsum*—Dorsal shield smooth, with 17 pairs of well defined pores, 261 (257-269) long, 182 (170-190) wide. Setae j1 26 (25-28), j3 40 (37-42), j4 6 (6-8), j5 6 (5-7), j6 7 (6-8), J2 8 (7-8), J5 6 (5-7), z2 11 (10-12), z4 9 (8-10), z5 6 (5-7), Z1 10 (8-11), Z4 63 (60-66), Z5 193 (180-198), s4 64 (60-68), S2 10 (8-11), S4 8 (7-8), S5 6 (5-7), r3 10, R1 8 (7-10). All setae smooth, except for Z4 and Z5 which are slightly barbed.

*Peritreme*—Extending to level of j1.

*Venter*—Ventrianal shield creased on the anterior half, 105 (102-108) long and 135 (127-143) wide at its widest level, with a pair of large and 4 pairs of small preanal pores.

*Spermatodactyl*—Shaft 16 (16-17) long.

*Legs*—Setaceous macrosetae, of following lengths: SgeI 35 (30-37), SgeII 30 (28-32), SgeIII 33 (30-36), StiIII 30 (28-32), StiIII 24 (23-26), SgeIV 82 (67-92), StiIV 66 (58-76), StiIV 43 (38-48).

LOCALITY AND TYPE MATERIAL—Holotype female, 3 female and 1 male paratypes from *Citrus sinensis*, Savusavu (Vanua Levu), Fiji, 30-VIII-79, in NMNH. Six female paratypes and 1 male paratype, same data as holotype; 11 females, male allotype, 5 male paratypes from *Artocarpus altilis* ("Breadfruit"), 23-VIII-79, same location; 2 female paratypes from unknown tree, Rarotonga, Cook Islands, 31-VII-81; 4 female paratypes from *Terminalia* sp., Rarotonga, Cook Islands, 1-VIII-81; (J. A. McMurtry); all in UCR.

### *Amblyseius herbicoloides*

McMurtry and Moraes, n. sp.

(Figs. 12-18)

DIAGNOSIS—This species most closely resembles *Amblyseius herbicolus* (Chant, 1959) and *Amblyseius fijiensis* McMurtry and Moraes, n. sp. However, *A. herbicoloides* differs from both species by having the posterior margin of the sternal shield with a rounded median protrusion instead of a straight margin, 3 instead of 4 teeth on the movable digit of the chelicera and shorter setae s4, Z4 and StiIV. It further differs from *A. herbicolus* by the shorter and more flared spermathecal cervix and longer SgeIV and StiIV. The width of the ventrianal shield at the level of ZV<sub>2</sub> is only slightly less than at the level of the anus in *A. herbicoloides*, whereas in *A. fijiensis* the width is much narrower at the level of ZV<sub>2</sub> compared to the width at the anus. *A. herbicoloides* also closely resembles *Amblyseius eharai* Amitai & Swirski, 1981, but differs from it by the shorter s4, Z4 and StiIV, and by having the atrium more distinct, rounded, and about 3 times as wide as the proximal section of the cervix (it is about 2 times as wide as proximal section of cervix in *A. eharai*).

FEMALE—(Figs. 12-15) (4 specimens measured).

*Dorsum*—Dorsal shield smooth, with 12 pairs of clearly visible pores, 357 (348-365) long and 244 (230-257) wide at widest level of proscutum. Setae j1 35 (32-37), j3 42 (41-43), j4 7 (6-8), j5 7 (6-8), j6 8 (7-10), J2 10 (10-11), J5 (6-7), z2 10 (10-12), z4 9 (8-10), z5 7 (6-8), Z1 10 (10-11), Z4 63 (59-67), Z5 291 (280-298), s4 70 (68-72), S2 10 (10-11) S4 9 (8-10), S5 8 (7-8), r3 8 and R1 10 (8-11). All setae smooth, except for Z4 and Z5 which are slightly barbed.

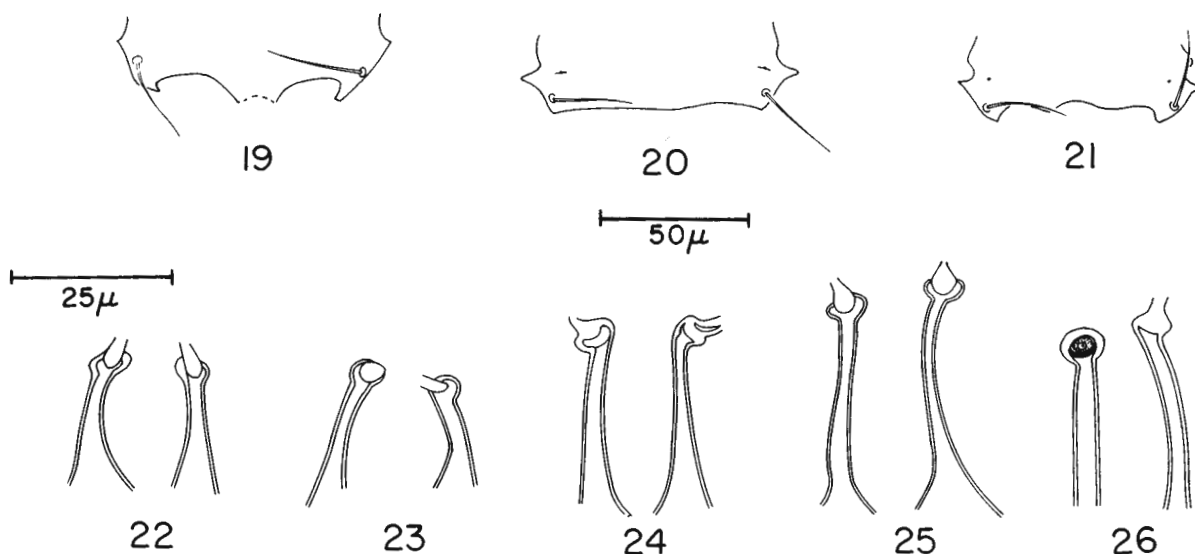
*Peritreme*—Extending forward to level of j1.

*Venter*—Sternal shield lightly sclerotized, with a median rounded protrusion on posterior margin. Distances between bases of setae ST1-ST3 68 (65-70), ST2-ST2 68 (65-70) and G-G 71 (66-72). Ventrianal shield vase shaped, with a strong constriction posterior to JV<sub>2</sub> setae, 105 (98-110) long, 59 (59-60) wide at level of ZV<sub>2</sub> and 70 (68-72) wide at level of anus.

*Chelicera*—Movable digit 31 long, with 3 backwardly pointing teeth; fixed digit 26 long, with 10 teeth.

*Spermatheca*—Cervix flared, 21 (18-24) long. Atrium globate, about 3 times as wide as proximal section of cervix.

*Legs*—Setaceous macrosetae, with the following lengths: SgeI 41, SgeII 36 (35-36), SgeIII 48 (47-49), StiIII 41 (38-42), SgeIV 137 (126-142), StiIV 111 (102-116), StiIV 40 (38-42). Chaetotaxy of GeII  $2-\frac{2,2}{0}-1$ ; GeIII  $1-\frac{2}{1}, \frac{2}{0}-1$ .



Figs. 19-21. Sternal shields (posterior portion) of species in the *Amblyseius largoensis* group: 19. *A. ehari*; 20. *A. largoensis*.

Figs. 22-26. Spermathecae of species in the *Amblyseius largoensis* group: 22. *A. nambourensis*; 23. *A. eharai*; 24. *A. herbicolus*; 25. *A. phillipsi*; 26. *A. largoensis*.

MALE—(Figs. 16-18) (2 specimens measured).

*Dorsum*—Dorsal shield smooth, with 12 pairs of clearly visible pores, 284 (274-295) long, 170 (168-172) wide. Setae j1 28 (25-30), j3 38 (36-40), j4 9 (7-11), j5 7 (6-8), j6 8 (7-8), J2 10 (10-11), J5 6 (6-7), z2 9 (8-10), z4 10 (10-11), z5 6 (6-7), Z1 12 (11-12), Z4 46 (44-47), Z5 217 (210-228), s4 55 (52-58), S2 11, S4 8, S5 6 (6-7). Setae r3 8 (6-10) and R1 8, both on dorsal shield. All setae smooth, except for Z4 and Z5 which are barbed.

*Peritreme*—Extending forward to level of j1.

*Venter*—Ventrional shield creased on the anterior half, 108 (104-112) long and 136 (127-144) wide at its widest level, with a pair of large and a pair of small preanal pores.

*Spermatodactyl*—Shaft 16 long.

*Legs*—Setaceous macrosetae, with the following lengths: SgeI 30 (29-32), SgeII 29 (28-30), SgeIII 38, StiIII 34 (31-36), SgeIV 75 (71-78), StiIV 69 (64-73), StIV 37 (36-37).

LOCALITY AND TYPE MATERIAL—Holotype female, allotype male (NMNH) and 3 paratype females, 1 pharate female, and 1 male (UCR) from unidentified Asteraceae, Luganville, Santo, Vanuatu VIII-13-79 (J. A. McMurtry).

*Amblyseius largoensis* (Muma)

*Amblyseius largoensis* Muma, 1955:266.

*Amblyseius largoensis*, Ehara, 1959:293.

SPECIMENS EXAMINED—*New Caledonia*: Noumea, 12-III-79, 7 females, Ex: *Manihot*; 3

females, Ex: *Mangifera indica*. *Vanuatu*: Port Vila 6-VIII-79, 9 females, 1 male, Ex: *Hibiscus* tree.

REMARKS—Many early records of *A. largoensis* may involve other species in the *largoensis* group. However, it appears to occur in tropical areas in many parts of the world. Based on studies by Amitai and Swirski (1981) and Schicha (1981a), who recognized the existence of a species complex, the distribution of *A. largoensis* can be confirmed to include USA-Florida, Australia, Philippines, and various tropical islands in the Pacific Ocean. The records of Denmark and Muma (1975, 1978) for Puerto Rico and Jamaica, respectively, are probably valid as well, and we have specimens of *A. largoensis* from India, Puerto Rico, Brazil and Mexico.

Schicha (1981a) redescribed *A. largoensis*.

*Amblyseius herbicolus* (Chant)

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

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

*Amblyseius largoensis* Muma, 1961:287.

*Amblyseius deleoni* Muma and Denmark, in Muma, Denmark and DeLeon, 1970:68.

SPECIMENS EXAMINED—*New Caledonia*: Noumea, 9-III-79, 1 female, Ex: *Hibiscus* sp.

REMARKS—Muma et al. (1970) pointed out that the name *largoensis* had been used for 2 different species occurring in Florida and other parts of the world. They retained the name *largoensis* for the



species with the parallel-sided cervix of the spermatheca and named the other species (with fundibuliform or gradually flaring cervix) *deleoni*. Daneshvar and Denmark (1982) synonymized *deleoni* under *herbicolus*.

As with *A. largoensis*, earlier records referring to this species may have involved several species, but the distribution of *A. herbicolus* appears to be worldwide, with confirmed records including USA-Florida, Iran (Daneshvar and Denmark 1982), Australia (Schicha 1981a), Madagascar and South Africa (Blommers 1976), Brazil (Denmark and Muma 1973; Amitai and Swirski 1981), Colombia (Denmark and Muma 1972), and Thailand (Ehara and Bhandhufalck 1977). We have specimens from Central America, New Guinea, India and USA-California. The distributions of *A. herbicolus* and *A. largoensis* may overlap in some regions. McMurtry and Schicha (unpublished) collected both species on subtropical fruit trees in northern Queensland, but they were never found together at the same sites. *A. herbicolus* seems to extend to higher latitudes (e.g., USA-Central California, and Australia-New South Wales) than *A. largoensis*.

A detailed description of *A. herbicolus* is given by Schicha (1981a) (under *A. deleoni*).

Although Muma et al. (1970) reported males of *A. herbicolus* from Florida, there are no records of males from other regions. Van der Merwe (1968) and Sanderson and McMurtry (unpublished) confirmed thelytoky in a population of *A. herbicolus* from South Africa and Australia, respectively, by rearing isolated immatures to adult females and observing reproduction of these females.

*Amblyseius eharai* Amitai and Swirski

*Amblyseius eharai* Amitai and Swirski, 1981:59.

REMARKS—Amitai and Swirski (1981) showed that specimens from Hong Kong and Japan, formerly considered *A. deleoni*, were actually a new species, which they named *A. eharai*. At present, this species is only known from these two locations.

*Amblyseius neolargoensis* van der Merwe

*Amblyseius neolargoensis* van der Merwe, 1965:59.

REMARKS—Muma et al. (1970) treated this species as a junior synonym of *A. largoensis*, but Blommers and Chazeau (1974), Schicha (1981a) and Amitai and Swirski (1981) restored it as a distinct species. The last authors showed that setae s4, Z4 and Z5 of *neolargoensis* were considerably longer than those of *A. largoensis*. *A. neolargoensis* is presently known only from South Africa. The male is unknown.

*Amblyseius sakalava* Blommers

*Amblyseius (Amblyseius) sakalava* Blommers, 1976: 96.

REMARKS—This species can be separated from *A. largoensis* only on the basis of slightly longer SgeIV and shorter Z5. Although its validity is questionable, it is recognized here as a distinct species. Blommers (1976) gives no ranges of setal measurements, although he examined a fairly large series of specimens from Madagascar.

*Amblyseius nambourensis* Schicha

*Amblyseius nambourensis* Schicha, 1981a:102.

REMARKS—This species has the longest SgeIV of any species in the group. The type material is from Nambour, Queensland, on *Macadamia tetraphylla* and we have specimens from Tewantin on palm. It is known only from Queensland, Australia.

*Amblyseius phillipsi* McMurtry and Schicha

*Amblyseius phillipsi* McMurtry and Schicha, 1984.

REMARKS—*A. phillipsi* is known only from mangroves in north Queensland, Australia (McMurtry and Schicha 1984).

#### DISCUSSION OF THE LARGOENSIS GROUP

The *largoensis* group as here defined is made up of closely related species which can be distinguished by slight differences in setal lengths, in shapes of spermathecal cervixes, and sometimes by the contour of the posterior margin of the sternal shield. It is recognized that some species, e.g. *Amblyseius vazimba* Blommers and Chazeau 1974, *A. sundi* Pritchard and Baker 1962, *A. parasundi* Blommers 1974, *A. fletcheri* Schicha 1981, and *A. solus* Denmark and Matthyse 1981, are closely related, but they do not have a vase-shaped ventrianal shield, and therefore, are not included in the *largoensis* group. *Amblyseius passiflorae* Blommers 1974 also resembles species in the *largoensis* group but is excluded on the basis of a different shaped cervix of the spermatheca.

Species of the *largoensis* group occur mainly in the tropics with some species (e.g. *A. herbicolus*) extending into subtropical areas. Except for *A. largoensis* and *A. herbicolus*, which are cosmopolitan, and *A. eharai*, presently known only from East Asia, the species in this group have been found only in the Southern Hemisphere (Australia and South Pacific Islands or Southern Africa - Madagascar). The fact that 6 of the 9 species in the group occur in the Australian biogeographic realm suggests that the *largoensis* group originated in this realm. The wide distribution of *A. largoensis* and *A. herbicolus* suggests that these 2 species have been widely dispersed by man on various types of plant material. Such dispersal seems especially plausible for a thelytokous species such as *A. herbicolus*, as a single individual in any developmental stage represents a potential founder of a new colony.

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