

A WORLD REVIEW OF THE GENUS *PHYTOSCUTUS* MUMA (PHYTOSEIIDAE: ACARI)

BY E. YOSHIDA-SHAUL* and D. A. CHANT*

PHYTOSCUTUS
TAXONOMY
BIOGEOGRAPHY

SUMMARY: Eleven species in the subfamily Amblyseiinae Muma share a set of characters that sets them apart as a group from other species in the subfamily. Though no single character is unique only to this group, the combination of these uncommon, apomorphic characters shared by all 11 species provides a reasonable ground for inferring the monophyly of the group within the family Phytoseiidae Berlese. The 11 species are: *P. acaridophagus* (Collyer); *P. bakeri* (Gupta); *P. eugenus* (Ueckermann and Loots); *P. glomus* (Pritchard and Baker); *P. gongylus* (Pritchard and Baker); *P. reunionensis* (Ueckermann and Loots); *P. salebrosus* (Chant); *P. sexpilis* Muma; *P. vaughni* (Chant and Baker); *P. wiesei* (Ueckermann and Loots); and *P. wongsirii* (Ehara and Bhandhufalck).

This group of 11 species is now recognized as the genus *Phytoscutus* Muma with *Phytoscutus sexpilis* Muma as the type species. Differences in some external morphological characters seem to coincide with geographical distribution. Brief historical accounts of the 11 species and descriptions of each are provided.

PHYTOSCUTUS
TAXONOMIE
BIOGÉOGRAPHIE

RÉSUMÉ : Onze espèces de la sous-famille des Amblyseiinae Muma ont en commun plusieurs caractères qui les différencient des autres espèces de cette sous-famille. Bien qu'aucun caractère ne soit unique pour les membres de ce groupe, les 11 espèces partagent plusieurs caractères peu communs et apomorphes, ce qui nous amène à inférer la monophylie du groupe dans la famille des Phytoseiidae Berlese. Les 11 espèces sont : *P. acaridophagus* (Collyer); *P. bakeri* (Gupta); *P. eugenus* (Ueckermann and Loots); *P. glomus* (Pritchard and Baker); *P. gongylus* (Pritchard and Baker); *P. reunionensis* (Ueckermann and Loots); *P. salebrosus* (Chant); *P. sexpilis* Muma; *P. vaughni* (Chant and Baker); *P. wiesei* (Ueckermann and Loots); and *P. wongsirii* (Ehara and Bhandhufalck).

Ces 11 espèces forment le genre *Phytoscutus* Muma avec *Phytoscutus sexpilis* Muma comme espèce-type. Certaines différences morphologiques externes semblent coïncider avec leur distribution géographique. Nous décrivons brièvement chacune de ces espèces.

Introduction

A group of 11 species in the subfamily Amblyseiinae Muma of the family Phytoseiidae Berlese can be readily distinguished because of a number of promi-

nent characters that they share. These characters are: the absence of seta j5 on the podosoma; the strongly sclerotized, globular dorsal shield; the large, strongly reticulated as well as strongly sclerotized ventrianal shield; and the large, robust peritremal shield. The 11 species are: *Iphiseius acaridophagus* Collyer; *I.*

* University of Toronto, Department of Zoology, Toronto, Ontario, Canada M5S 1A1A.

bakeri Gupta; *Amblyseius* (*Trochoseius*) *eugenus* Ueckermann and Loots; *I.* (*Trochoseius*) *glomus* Pritchard and Baker; *I.* (*Trochoseius*) *gongylus* Pritchard and Baker; *A.* (*Trochoseius*) *reunionensis* Ueckermann and Loots; *Typhlodromus* (*Amblyseius*) *salebrosus* Chant; *Phytoscutus* *sexpilis* Muma; *A. vaughni* Chant and Baker; *A.* (*Trochoseius*) *wiesei* Ueckermann and Loots; and *A.* (*Phytoscutella*) *wongsirii* Ehara and Bhandhufalck.

Other authors considered some of the above characters sufficiently unique to warrant separate generic or subgeneric status for some of the species. MUMA (1961) was the first to propose genera, both monotypic, for two of the 11 species in his review of the family Phytoseiidae: *Phytoscutus* with *sexpilis* and *Phytoscutella* with *salebrosus* as the type species respectively. Although both genera were characterized by “four pairs of dorsal setae”, they were distinguished by the number of “median” setae and differences in the macrosetae on leg IV. However, at the same time, he noted the possibility of combining these two genera.

PRITCHARD & BAKER (1962) proposed the subgenus *Trochoseius* for the species in which the “first pair of dorsocentral setae” (i.e. j5) is absent when they described *I.* (*Trochoseius*) *gongylus* and *I.* (*Trochoseius*) *glomus*. They placed this subgenus in the genus *Iphiseius* Berlese, which was defined as having the dorsal shield “strongly sclerotized, globular” and the “lateral membrane in both sexes sclerotized and united with dorsal shield.”

COLLYER (1964), following PRITCHARD & BAKER’s classification system, placed a new species, *acaridophagus*, in the genus *Iphiseius*. The genus was defined by the “strongly sclerotised” dorsal shield, the sclerotized lateral membrane united with the dorsal shield, the four pairs of “anterior lateral setae” and the insertion of both pairs of sublateral setae on the lateral integument. The absence of seta j5 was not considered in her classification.

When CHANT & BAKER (1965) described *A. vaughni* in their review of the Phytoseiidae of Central America the absence of j5 also was not included in the description of this species.

EHARA (1966) initially placed *salebrosus* in the subgenus *Amblyseius* of the genus *Amblyseius* Berlese, but later transferred this species to the subgenus *Phytoscutella* when EHARA & BHANDHUFALCK (1977) des-

cribed a new species, *wongsirii*. They distinguished this subgenus from other subgenera by the absence of seta “D3” (= j5).

In their review of the species in the genus *Amblyseius* from the African continent, UECKERMANN & LOOTS (1985) revised the definition of the subgenus *Trochoseius*. Because the “interscutal membrane” was not necessarily sclerotized and united with the dorsal shield in the three new species they described (*eugenus*, *reunionensis* and *wiesei*), they deleted this character from their definition of the subgenus *Trochoseius*. Instead, they defined it by the absence of setae j5, J2, S2 and S5, and in turn placed it in the genus *Amblyseius* because of the presence of setae j3, z2, z4 and s4 on the lateral areas of the podoscutum.

The eleventh species, *I. bakeri* described by GUPTA (1980), is based on a male specimen. Though the available information indicates that this species probably belongs to the genus *Phytoscutus*, the cursory description and illustrations do not provide a clear picture of the species. It is included in the present paper on the assumption that it shares the same characters as the other 10 species but we treat it as a *species inquirenda* at this time.

MONOPHYLY OF THE GROUP

To establish the monophyly of the group of 11 species in the present study, it is necessary to determine whether the characters that are shared among them and distinguish them from other phytoseiids are apomorphic or not. The study by TAKAHASHI & CHANT (1993) was the first in which monophyly of a group was established in the family Phytoseiidae: they established monophyly for the genus *Phytoseiulus* Evans. In this study they noted that monophyly had not been established for any phytoseiid groups and that there was no comprehensive database that permitted specifying groups for determining the polarization of character states. They, therefore, made the assumption that the species in *Phytoseiulus* are more closely related to other phytoseiids than to groups of mites such as the Ascidae Voights and Oudemans or the Otopheidomenidae Treat. Based on this, they applied the “criterion of outgroup commo-

nality” and performed outgroup comparisons with all other groups in the Phytoseiidae. We adopted this method in the present study: we examined the extent to which the alternate homologues of character states observed for the 11 species in *Phytoscutus* are common among other phytoseiids.

A pair of j5 setae is present in more than 99 per cent of the Phytoseiidae. This pair is absent (Fig. 4) in only 14 species: the 11 species in the present group and three others. The other three species with j5 absent are *Phytoseiulus longipes* Evans, *Amblyseius euflagellatus* (Karg) and *Amblyseius robertsi* (Baker). Of these three species, *P. longipes* is considered to be a member of the genus *Phytoseiulus* Evans, whose monophyly has been established (TAKAHASHI & CHANT, 1993), and in which the absence of j5 is considered to be autapomorphic.

Although j5 setae are absent in both *A. euflagellatus* and *A. robertsi*, with these two species all of the other character states which are discussed below and which are considered apomorphic among the 11 species are plesiomorphic. It is unlikely that these two species are closely related to the members of the present group. The absence of j5 among the 11 species, therefore, is considered a synapomorphy for the group.

More than 99 per cent of phytoseiids have peritremal plates that are more slender and less exaggerated (Fig. 1a, b) than the extremely robust plates (Fig. 1c, d) of the 11 species. Similarly, more than 90 per cent of adult females in the Phytoseiidae do not have the dorsal shield globular (Fig. 8) or the ventrianal shield large and strongly reticulated (Fig. 5) as observed in the 11 species. These character states, therefore, are also considered synapomorphies. Other authors (BLOMMERS, 1976; MUMA, 1964; LO, 1970; MATTHYSSE & DENMARK, 1981) reported that live specimens of some species in this genus are colored various shades of red, an uncommon coloration in the Phytoseiidae which are reported to be either off white or pale yellowish (TAKAHASHI & CHANT, 1993). This character state may be another synapomorphy for the group, but because this character has not been reported for all species in the genus, it was not included in this study.

Although the 11 species in the group share a combination of character states that readily distinguish

them from the other Phytoseiidae, none of these characters is unique only to them. Nevertheless, the above analysis shows that all these character states are synapomorphic. If so, then it is more probable that these 11 species evolved from a recent ancestor common only to them than that they evolved from more distant ancestors that are common to some other phytoseiids as well: the 11 species probably are more closely related to each other than to any other species in the family. We, therefore, consider the group represented by the 11 species to be monophyletic and assign it generic status, recognizing the genus *Phytoscutus* with *sempilis* as the type species. Although a monotypic genus *Phytoscutella* was also proposed for *salebrosus* in the same publication (Muma, 1961), the name *Phytoscutus* has page priority.

GENUS *Phytoscutus* Muma

The genera and subgenera in which the 11 species in the genus *Phytoscutus* have been included by other authors are as follows:

- Amblyseius* BERLESE, 1914, pp. 143-144. Type species: *Zercon obtusus* Koch, 1839, by original designation.
Iphiseius BERLESE, 1921, p. 95. Type species: *Seius degenerans* Berlese, 1889, by monotypy.
Phytoscutus MUMA, 1961, p. 275. Type species: *Phytoscutus sempilis* Muma, 1961, by original designation.
Phytoscutella MUMA, 1961, p. 275. Type species: *Typhlodromus salebrosus* Chant, 1960, by original designation.
Iphiseius (Trochoseius) PRITCHARD & BAKER, 1962. Type species: *Iphiseius (Trochoseius) gongylus* Pritchard and Baker, 1962, by original designation.
Amblyseius (Amblyseius) EHARA, 1966, p. 23.
Amblyseius (Phytoscutella) EHARA & BHANDHUFALCK, 1977, p. 73.
Trochoseius Pritchard and Baker, MATTHYSSE & DENMARK, 1981. Type species: *Trochoseius gongylus* Pritchard and Baker, 1962.
Amblyseius (Trochoseius) UECKERMANN & LOOTS, 1985, p. 129. Type species: *Iphiseius (Trochoseius) gongylus* Pritchard and Baker, 1962.

TYPE SPECIES: *Phytoscutus sempilis* Muma, 1961, p. 275, by original designation.

The 11 species in the genus *Phytoscutus* have been recorded from the Ethiopian, Oriental, Australian and Neotropical biogeographical regions as defined

by DARLINGTON (1957). The localities from where they were collected within these are all in the “warmer humid” or “tropical humid” climate zones (The Times Atlas of the World, 1973).

The dorsal and ventral setal patterns of the species from these biogeographical groups are different for each subgroup but consistent within them. The setae responsible for these differences are J2, S2 and S4 on the dorsum and ZV3 on the venter. Table 1 lists the presence and absence of these setae for each species. All of these setae are present in *acaridophagus* from the Australian region (Fig. 4), whereas all are absent in the five species from the Ethiopian region (Fig. 18). Also, while setae S2 and S4 are present in the three species from the Oriental region (Fig. 8), only S4 is present in the two species from the Neotropical region (Fig. 39). The only variable caudoventral seta, ZV3, is absent in all but the two species from the Neotropical region (Figs. 40, 41).

SPECIES	J2	S2	S4	ZV3	COUNTRY
<i>acaridophagus</i>	P	P	P	A	New Zealand; Australia
<i>bakeri</i> (♂)	A	P	P	?	India (Middle Andamans)
<i>salebrosus</i>	A	P	P	A	Thailand; Taiwan; India; Philippines
<i>wongsirii</i>	A	P	P	A	Thailand
<i>sexpilis</i>	A	A	P	P	U.S.A. (Florida)
<i>vaughni</i>	A	A	P	P	Honduras; Mexico
<i>eugenus*</i>	A	A	A	A	Angola
<i>glomus</i>	A	A	A	A	Zaire; Kenya
<i>gongylus</i>	A	A	A	A	Zaire; Kenya; Nigeria; Madagascar
<i>reunionensis</i>	A	A	A	A	Reunion Island
<i>wieseri*</i>	A	A	A	A	Angola; Liberia

P – Present; A – Absent; * – Collected together

TABLE 1: Comparative table showing the presence and absence of setae that are variable among the 11 species in the genus *Phytoscutus* and the countries from where they are recorded.

Other differences between the two species from the Neotropical region and the others are the positions of some of the dorsal setae. Whereas the insertion of seta Z1 in *sexpilis* and *vaughni* is at about the mid level of the dorsal shield (Fig. 39), in others this seta is distinctly anterior to the middle of the shield (Figs. 4, 27). Consequently, the podoscuta of the latter species are much shorter than the opisthoscuta.

There also seems to be a difference in the nature of the dorsal shield among the species from different biogeographical regions. The dorsal shield of *acaridophagus* from the Australian region has a distinct

“jigsaw”-like pattern of reticulation (Fig. 4) whereas those of most species from the Oriental and Ethiopian regions have less strong but nevertheless distinct “wave”-like patterns (Fig. 13). In contrast to these species, the dorsal shields of the two species from the Neotropical region have a punctate appearance (Fig. 39).

Further study of these biogeographical differences may shed light on phylogenetic relationships among the members of the genus *Phytoscutus*.

Nomenclature used in this paper follows ROWELL *et al.* (1978) for the idiosomal setae, CHANT & YOSHIDA-SHAUL (1989) for the dorsal setal patterns, CHANT & YOSHIDA-SHAUL (1991) for the ventral setal patterns and EVANS (1963) for the setal patterns of the legs. Illustrations were made using a camera lucida attached to a Leitz phase-contrast microscope; detailed examination of characters was made with a Reichert interference phase-contrast microscope. All measurements are in micrometres.

DIAGNOSIS: *Adult female* – One podosomal setal pattern occurring in the genus: P-9A, with j1, j3, j4, j6, z2, z4, z5, s4 and r3 (Fig. 4). Setae Z1, Z4, Z5, J5, S5 and R1 always present and J2, S2 and S4 present or absent on the opisthosoma. There are four opisthosomal setal patterns: O-6E with J5, Z1, Z4, Z5, S5 and R1 present (Fig. 18); O-7D with J5, Z1, Z4, Z5, S4, S5 and R1 present (Fig. 39); O-8E with J5, Z1, Z4, Z5, S2, S4, S5 and R1 present (Fig. 8); and O-9B with J2, J5, Z1, Z4, Z5, S2, S4, S5 and R1 present (Fig. 4). Altogether four dorsal setal patterns (CHANT & YOSHIDA-SHAUL, 1989) occur in the genus: 9A:6E with five species; 9A:7D with two species; 9A:8E with three species (assuming seta R1 is present in *bakeri*); and 9A:9B with one species.

Dorsal shield well sclerotized, globular; with or without reticulation. Seta j5 absent. Sublateral setae r3 and R1 always present; the former inserted on the lateral integument and the latter inserted on or off the opisthoscutum. Dorsal setae in the dorsocentral area of the shield always short, whereas setae s4, Z4 and Z5 always long; remaining setae short to medium in length. Solenostomes appear in pairs on the dorsal shield of some species (Figs. 13, 31). Sternal shield wider than long, with or without reticulation; always with three pairs of setae, except *acaridophagus*, and two pairs of pores (Fig. 9). A pair of metasternal setae

always on platelets, each accompanied by a pore. Genital shield lightly reticulated, always with a pair of setae. Ventrianal shield large, strongly reticulated throughout; with a pair of prominent solenostomes.

Two caudoventral setal patterns occur in the genus: 7:JV-3:ZV, with JV1, JV2, JV4, JV5, ZV1, ZV2 and ZV3 present (Fig. 40), in two species; 6:JV-3:ZV-3, with JV1, JV2, JV4, JV5, ZV1 and ZV2 present (Fig. 5), in eight species. (The description of *A. bakeri* is based on a male specimen.). Setae JV1, JV2, JV4, JV5, ZV1 and ZV2 always present; JV3 always absent; and ZV3 present or absent. Setae JV1, JV2 and ZV2 always inserted on ventrianal shield; setae ZV1, JV4 and JV5 inserted on or off the shield; and ZV3, when present, always inserted off the shield.

A pair of primary metapodal plates always present; secondary metapodal plates present or absent. Nature and size of the metapodal plates variable. Peritremal shield large, robust (Fig. 1c, 1d). Peritreme extending anteriorly to level of seta j1 (Fig. 4).

Shape of cervix of spermatheca variable. Fixed digit of chelicera, when discernible, multidentate with pilus dentilis present or absent, shorter than movable digit; movable digit with three or four teeth. Chaetotactic formulae of leg segments the same for all species, except femora I and II of *P. sexpilis*: femur I 2-5/3-2 or 2-4/3-2 (*sexpilis*); femur II 2-5/2-1 or 2-4/2-1 (*sexpilis*); femur III 1-3/1-1; femur IV 1-3/1-1; genu I 2-2/1, 2/1-2; genu II 2-2/0, 2/0-1; genu III 1-2/1, 2/0-1; genu IV 1-2/1, 2/0-1; tibia I 2-2/1, 2/1-2; tibia II 1-1/1, 2/1-1; tibia III 1-1/1, 2/1-1; tibia IV 1-1/1, 2/0-1. Legs II and III always shorter than, leg I subequal to or shorter than and leg IV variable to dorsal shield length. Legs with macrosetae.

Adult male – Nature of dorsal shield and dorsal setal pattern same as adult females. Sublateral setae r3 and R1 inserted on the dorsal shield, except for *P. acaridophagus*, in which setae R1 inserted off the shield.

All known males with sternogenital shield distinctly reticulated throughout, always with five pairs of setae and three pairs of pores. Ventrianal shield strongly reticulated throughout, not connected to the posterior extremities of the peritremal shields; with a pair of prominent solenostomes (Fig. 2). Caudoventral setal pattern same for all known males: 4:JV-3,4:ZV-1,3, with JV1, JV2, JV5 and ZV2 present.

Setae JV5 on integument surrounding ventrianal shield. Peritreme extending anteriorly to level of j1. Peritremal shield robust as with females.

Spermatodactyl without a small “heel” (Fig. 3). Fixed digit of chelicera with three or four teeth and pilus dentilis; movable digit unidentate. Chaetotactic formulae of leg segments as with females. Legs with macrosetae.

KEY TO ADULT FEMALES IN THE GENUS *Phytoscutus*

- (1) – Seta J2 present on opisthoscutum (Fig. 4) *acaridophagus*
 – Seta J2 absent on opisthoscutum (Fig. 8)..... (2)
- (2) – Setae S2, S4 and S5 of S-series present on opisthoscutum (Fig. 8) (3)
 – Seta S2 of S-series absent, S4 absent or present, S5 present on opisthoscutum..... (4)
- (3) – Seta z2 as long as j3, longer than z4 (Fig. 8); seta S2 long, extending beyond the insertion of S5; setae JV4 and JV5 inserted on ventrianal shield (Fig. 9) *wongsirii*
 – Seta z2 shorter than j3 and z4 (Fig. 13); seta S2 shorter, extending to the insertion of S4; setae JV4 and JV5 inserted on integument surrounding ventrianal shield (Fig. 14)..... *salebrosus*
- (4) – Seta S4 absent on opisthoscutum; insertion of seta s4 anterior to level of z5, proximal to z4 (Fig. 18). (5)
 – Seta S4 present on opisthoscutum; insertion of s4 posterior to level of z5, not as close to z4 as above (Fig. 44). (9)
- (5) – Seta Z1 long, extending beyond insertion of Z4 (Fig. 18); ventrianal shield enormous, covering the entire caudoventral area (Fig. 19) *wieseii*
 – Seta Z1 short (Fig. 23); ventrianal shield not as large (Fig. 28). (6)
- (6) – Seta z2 longer than j3 (Fig. 23); seta JV5 long, greater than 100 µm (Fig. 24); macrosetae on leg IV greater than 80 µm. *eugenus*
 – Seta z2 conspicuously shorter than j3 (Fig. 27); seta JV5 40 µm at most; macrosetae on leg IV 65 µm at most. (7)
- (7) – Ventrianal shield wider than long, with setae ZV1 and JV4 inserted on the shield (Fig. 28); seta s4 extending beyond insertion of Z4 (Fig. 27). *gongylus*
 – Ventrianal shield quadrate, with setae ZV1 and JV4 inserted on integument surrounding the shield (Fig. 32); seta s4 shorter, not extending beyond insertion of Z4 (Fig. 31)..... (8)

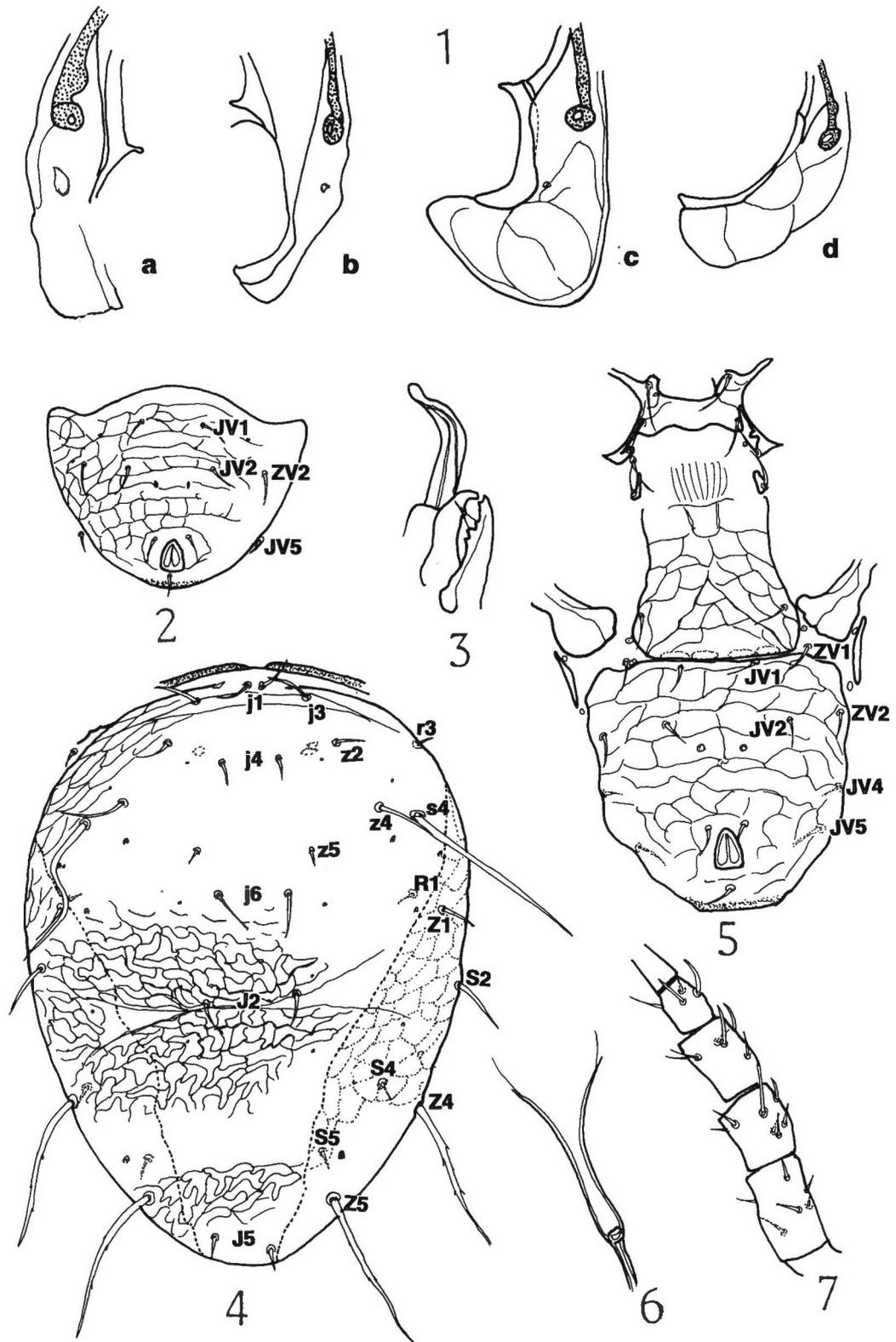


FIG. 1: Examples of peritremal shields.

a, b. — Peritremal shields of other phytoseiid species; (c, d). — Peritremal shields of species in the genus *Phytoscutus*.

FIG. 2: Male ventrianal shield of species in the genus *Phytoscutus*.

FIG. 3: Spermatodactyl of species in the genus *Phytoscutus*.

Figs. 4-7: *Amblyseius acaridophagus*, adult female.

4. — Dorsal view. 5. — Ventral view. 6. — Spermatheca. 7. — Genu, tibia and basitarsus of leg IV.

- (8) – Secondary metapodal plates absent (Fig. 32); seta s4 longer than half the distance between its insertion and that of Z4 (Fig. 31); setae z2 and z4 equal in length *glomus*
 – Secondary metapodal plates present (Fig. 36); seta s4 half as long as the distance between its insertion and that of Z4 (Fig. 35); seta z2 longer than z4 *reunionensis*
- (9) – Femur I with 11 setae (2-4/3-2), femur II with 10 setae (2-4/3-1); ventrianal shield as long as wide (Fig. 40); seta R1 inserted on dorsal shield (Fig. 39); lateral integument strongly sclerotized *sexpilis*
 – Femur I with 12 setae (2-5/3-2), femur II with 11 setae (2-5/3-1); ventrianal shield wider than long (Fig. 45); seta R1 inserted on lateral integument (Fig. 44); lateral integument not strongly sclerotized ... *vaughni*

SPECIES DESCRIPTIONS

Phytoscutus acaridophagus (Collyer) comb. nov.

(Figs. 4-7)

Iphiseius acaridophagus COLLYER, 1964, pp. 644-645, Fig. 8; COLLYER, 1967, pp. 11-13, Fig. 1.

Adult female (based on a paratype specimen) – Dorsal shield with unique jigsaw-like reticulation throughout except on dorsocentral area of podoscutum (Fig. 4); length 437, width 386. Dorsal setal pattern 9A:9B. Six pairs of solenostomes on dorsal shield: one pair posterior to z4; two pairs posterolaterad to s4; one pair mediad to Z1; and one pair each anterior to Z4 and Z5. All dorsal and sublateral setae smooth, except Z4 and Z5 which are sparsely serrated. Sublateral seta R1 on lateral integument (R1 folded under the dorsal shield of the specimen examined). Measurements of dorsal and sublateral setae as follows: j1 27; j3 31; j4 15; j6 37; J2 23; J5 13; z2 24; z4 48; z5 10; Z1 25; Z4 116; Z5 115; s4 130; S2 43; S4 19; S5 13; r3 8; R1 13.

Sternal shield lightly reticulated laterally, with hook-shaped extensions; length 20, width 76. One of the third pair of sternal setae inserted on and the other off the extensions of the specimen examined (Fig. 5). Genital shield distinctly reticulated throughout, width 128. Four elongate plates between genital and ventrianal shields (folded under the genital shield on the specimen examined). Ventrianal shield

subquadrate, distinctly reticulated throughout; with setae JV1, JV2 and ZV2 and a pair of circular solenostomes posteromedial to JV2. Length of ventrianal shield 190; width 194. Setae ZV1, JV4 and JV5 on integument surrounding ventrianal shield (JV4 and JV5 folded under the ventrianal shield on the specimen examined). Seta JV5 smooth, 20. Caudoventral setal pattern: 6:JV-3:ZV-3. Length of primary metapodal plate 48, width 6. A pair of small secondary metapodal plates present.

Cervix of spermatheca elongate (Fig. 6), 25. Dentition of chelicera not discernible; movable digit 22. Measurements of legs and palp as follows: leg I 429; leg II 369; leg III 378; leg IV 475; palp 178. Leg I subequal to and leg IV slightly longer than dorsal shield length. Legs I, III and IV with macrosetae (Fig. 7): genu I 42; genu III 25; genu IV 28; tibia III 24; tibia IV 28.

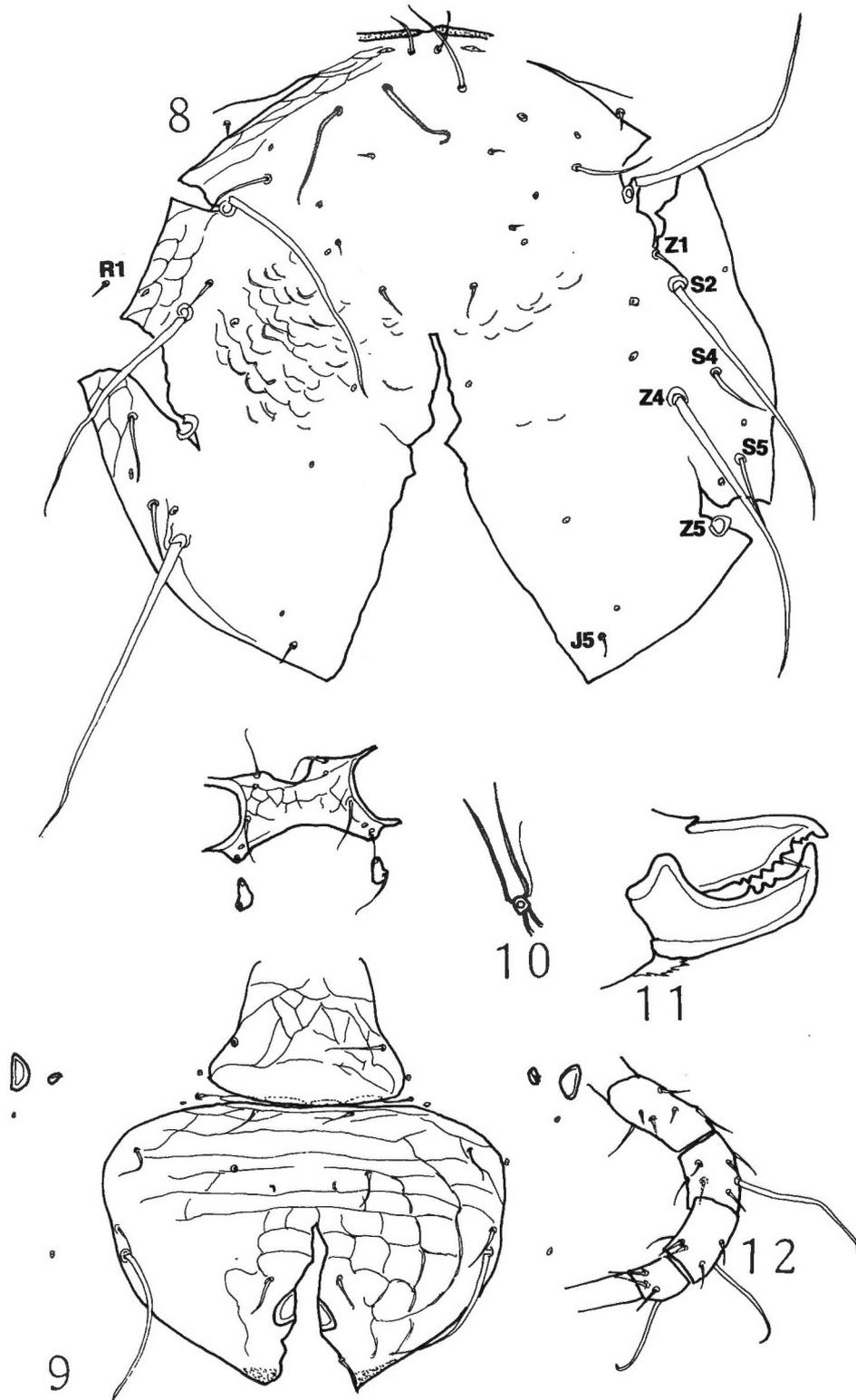
Adult male – Described by COLLYER (1964).

Type – The male holotype was collected from bush lawyer (*Rubus* sp.), Te Morepu, near Auckland, New Zealand. The allotype female was collected from a leaf of *Ixerba brexioides*, above Lake Waikaremoana, North Island, New Zealand, April 23, 1965. Paratypes: two female and one male from *Rubus* sp., Lake Waikaremoana, North Island, April 20, 1965; one female from *Nothofagus menziesii*, Lake Rotorua, Nelson Province, January 2, 1965; one female from *Phymatodes scandens*, Abel Tasman National Park, Nelson Province, July 14, 1966; one male and one nymph from *Melicytus ramiflorus*, Stephens Bay, Nelson Province, January 13, 1965; one female and immatures from *Rhipogonum scandens*, Kaihoka Lake, Nelson Province, October 3, 1965; and one female from *Metrosideros perforata*, Abel Tasman National Park, Nelson Province, July 11, 1966.

The holotype is deposited in the British Museum (Natural History), London, England. The allotype and the first three paratypes are deposited in the Entomology Division, Nelson, New Zealand.

REMARKS – Unlike most of the males of phytoseiid species, sublateral setae R1 on the male of *P. acaridophagus* are inserted on the lateral integument instead of on the dorsal shield.

Although, as noted above, only one of the third pair of sternal setae of the specimen examined is inserted off the shield (Fig. 5), COLLYER's (1967) des-



FIGS. 8-12: *Amblyseius wongsirii*, adult female.

8. — Dorsal view. 9. — Ventral view. 10. — Spermatheca. 11. — Chelicera. 12. — Genu, tibia and basitarsus of leg IV.

cription of this species indicates both setae as inserted off the shield.

An additional adult female specimen was collected from shrubs and plants, 20 km north of Sydney, Australia, November 25, 1990, by D. A. CHANT. Measurements of many of the characters of this specimen tend to be smaller than those of the allotype.

Phytoscutus wongsirii (Ehara and Bhandhufalck)

(Figs. 8-12)

Amblyseius (Phytoscutella) wongsirii EHARA & BHANDHUFALCK, 1977, p. 74, Figs. 119-124.

Adult female (based on two specimens on the type slide) – Dorsal shield with distinct reticulation on lateral areas and with wave-like reticulation on dorsocentral area (Fig. 8); length 480, width 482 (shield of other specimen not measurable). Dorsal setal pattern 9A:8E. Four pairs of distinct solenostomes on dorsal shield: mediad to each of z4 and Z1; posterior to z5; and posteromedial to S5. All dorsal and sublateral setae smooth. Sublateral seta R1 on lateral integument. Measurements of dorsal and sublateral setae as follows: j1 30, 30; j3 61, 60; j4 9, 10; j6 22, 25; J5 11, 13; z2 66, 61; z4 53, 55; z5 14, 11; Z1 23, 25; Z4 190, 184; Z5 238, 212; s4 160, 170; S2 178, 168; S4 50, 46; S5 45, 46; r3 6, 7; R1 8, 9.

Sternal shield lightly reticulated throughout: length 42, 50; width 76, 86. Genital shield lightly reticulated anteriorly; width 142, 146. Four elongate plates between genital and ventrianal shields (folded under the genital shield in the specimen illustrated). Ventrianal shield extremely large, distinctly reticulated throughout; with setae JV1, JV2, JV4, JV5 and ZV2 and a pair of crescentic solenostomes posteromedial to JV2 (Fig. 9). Length of ventrianal shield 200, 208; width 290, 286. Only seta ZV1 on integument surrounding ventrianal shield. Seta JV5 smooth; 114, 100. Caudoventral setal pattern: 6:JV-3:ZV-3. Length of primary metapodal plate 27, 24; width 13, 13. A pair of secondary metapodal plates present. Margins of both primary and secondary plates ridged.

Cervix of spermatheca elongate (Fig. 10); 20, 19. Fixed digit of chelicera with seven teeth and pilus

dentilis; movable digit tridentate (Fig. 11); 25 (movable digit of other specimen not measurable). Measurements of legs and palp as follows (legs I, II, III and palp of other specimen not measurable): leg I 426; leg II 356; leg III 340; leg IV 438, 440; palp 160. Legs I and IV shorter than dorsal shield length. Legs I, III and IV with macrosetae (Fig. 12): genu I 53, 51; genu III 52, 48; genu IV 98, 100; tibia III 44, 43; tibia IV 70, 70; basitarsus IV 58, 56.

Adult male – Unknown.

Type – Two female specimens, mounted on the same slide, were collected from citrus, Prew, Thailand, November 17, 1970, by S. EHARA. The type slide is deposited in the Biological Institute, Faculty of Education, Tottori University, Tottori-ken, Japan.

REMARKS – Because of its large size, seta JV5 as well as JV4 are inserted on the ventrianal shield of the adult females of this species (Fig. 9); the only known species in the Phytoseiidae with this condition.

No additional collections have been recorded.

Phytoscutus salebrosus (Chant)

(Figs. 13-17)

Typhlodromus (Amblyseius) salebrosus CHANT, 1960, pp. 58-65, Figs. 1-4.

Phytoscutella salebrosus (Chant), MUMA, 1961, p. 275.

Typhlodromus salebrosus Chant, HIRSCHMANN, 1962, p. 17, Fig. 80.

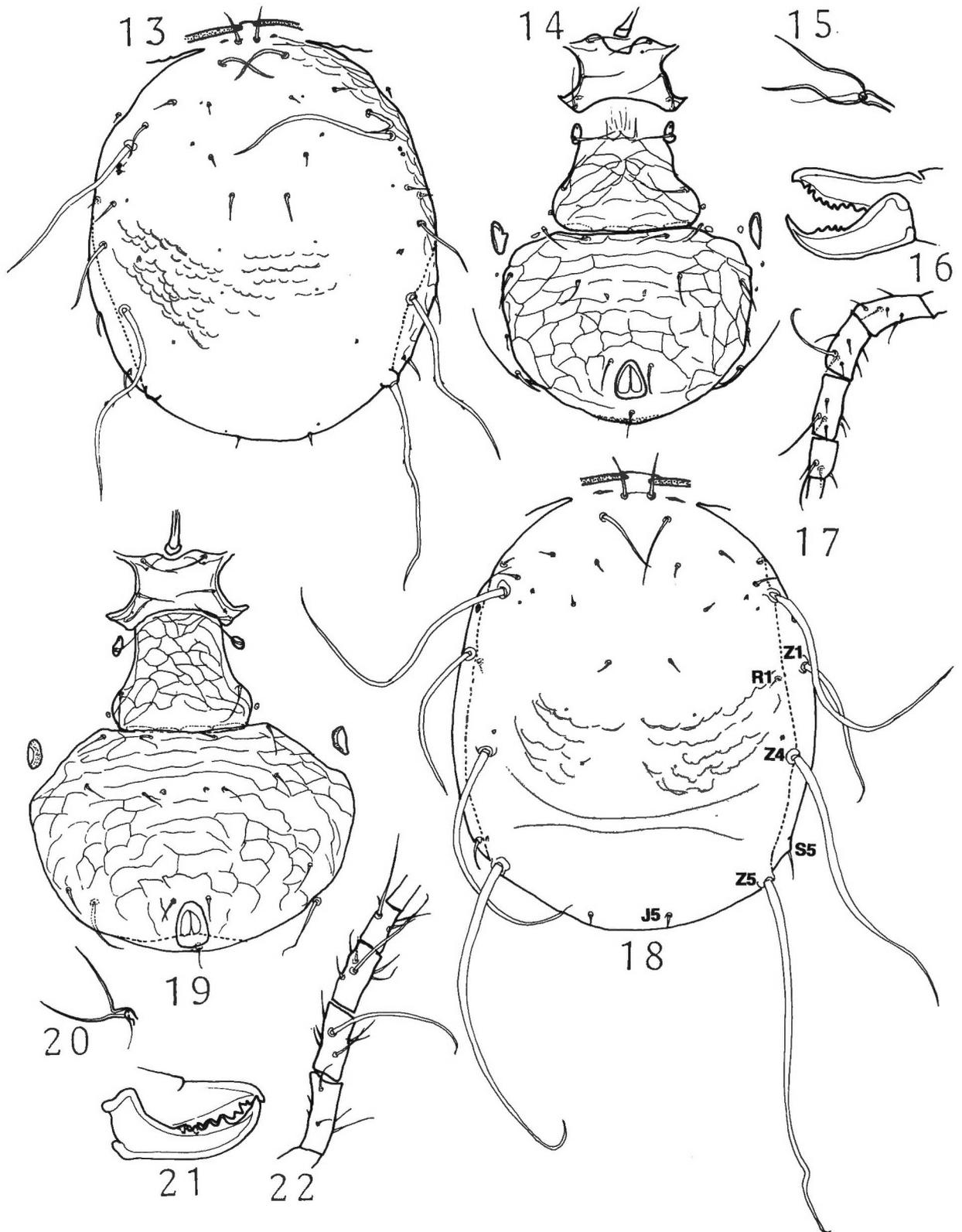
Amblyseius (Amblyseius) salebrosus (Chant), EHARA, 1966, p. 23.

Amblyseius salebrosus (Chant), PRASAD, 1974, pp. 169-170; GUPTA, 1975, p. 43.

Amblyseius (Phytoscutella) salebrosus (Chant), EHARA & BHANDHUFALCK, 1977, pp. 73-75, Figs. 113-118.

Phytoscutus taoi LO, 1970, pp. 49-52, Figs. 2-9. (Type: Taiwan Agricultural Research Institute, Taipei, Taiwan.)

Adult female (based on one of the three specimens on the type slide; when measurements not available those of the holotype of *A. taoi* are used in brackets) – Dorsal shield strongly reticulated laterally, opisthoscutum with light wave-like reticulation (Fig. 13): length 374; width 335. Dorsal setal pattern: 9A:8E. Five pairs of solenostomes on dorsal shield: one pair anterolaterad to z5; two pairs posterolaterad to s4; one pair anterior to Z4; and one pair anterolaterad to Z5. All dorsal and sublateral setae smooth except Z4



FIGS. 13-17: *Amblyseius salebrosus*, adult female.

13. — Dorsal view. 14. — Ventral view. 15. — Spermatheca. 16. — Chelicera. 17. — Genu, tibia and basitarsus of leg IV.

FIGS. 18-22: *Amblyseius wiesei*, adult female.

18. — Dorsal view. 19. — Ventral view. 20. — Spermatheca. 21. — Chelicera. 22. — Genu, tibia and basitarsus of leg IV.

and Z5, which are sparsely serrated. Sublateral seta R1 on lateral integument. Measurements of dorsal and sublateral setae as follows: j1 30; j3 52; j4 9; j6 20; J5 10; z2 20; z4 30; z5 10; Z1 19; Z4 171; Z5 194; s4 156; S2 62; S4 22; S5 24; r3 7; R1 7.

Sternal shield smooth; length 55, width 72. Genital shield lightly reticulated throughout, width 131. Four elongate plates between genital and ventrianal shields. Ventrianal shield quadrate, distinctly reticulated throughout; with setae JV1, JV2 and ZV2 and a pair of elliptic solenostomes posteromedial to JV2 (Fig. 14). Length of ventrianal shield 173, width 222. Setae ZV1, JV4 and JV5 on lateral integument surrounding ventrianal shield. Seta JV5 smooth, 27. Caudoventral setal pattern: 6:JV-3:ZV-3. Length of primary metapodal plate 29, width 9; with margin of plate ridged. A pair of small secondary metapodal plates present.

Cervix of spermatheca elongate, wider towards the vesicle (Fig. 15); (18). Fixed digit of chelicera with eight teeth; movable digit with four teeth, (23) (Fig. 16). Measurements of legs and palp as follows: leg I 369; leg II 340; leg III 332; leg IV 433; palp (136). Leg I subequal to and leg IV longer than dorsal shield length. Legs III and IV with macrosetae (Fig. 17); genu III 36; genu IV 65; tibia III 31; tibia IV 49; basitarsus IV 44.

Adult male – Described by CHANT (1960) and LO (1970).

Type – Three female and two male specimens, mounted on the same slide, were collected from citrus, Jarhat, Assam, India, March 1, 1959, by C. A. FLESHNER. The type slide is deposited in the Canadian National Collection (No. 7004).

REMARKS – Two of the three specimens on the type slide are in poor condition and were not used for the present redescription.

EHARA & BHANDHUFALCK (1977) designated *P. taoi* Lo as a junior synonym of *salebrosus*. On the basis of our examination of the type material of both species, we concur with this conclusion.

Additional specimens have been recorded from Thailand and Taiwan. A previously unidentified specimen in our collection (from *Citrus maxima*, collected at Laguna, the Philippine Islands, on July 21, 1955 by L. RIMANDO) has now been identified as *P. salebrosus*. Other host plants are sugar cane and *Hibiscus* sp.

Phytoscutus wiesei (Ueckermann and Loots)

(Figs. 18-22)

Amblyseius (Trochoseius) wiesei UECKERMANN & LOOTS, 1985, pp. 133-136, Figs. 13-18.

Adult female (based on the holotype specimen) –

Dorsal shield smooth except for wave-like reticulation on dorsocentral area of opisthoscutum (Fig. 18); length 397, width 334. Dorsal setal pattern: 9A:6E. Six pairs of distinct solenostomes on dorsal shield: two pairs medial to s4; two posterolaterad to s4; one anterior to Z4; and one anterolaterad to Z5. Sublateral seta R1 on lateral integument (R1 folded under the dorsal shield of the specimen examined). All dorsal and sublateral setae smooth. Measurements of dorsal and sublateral setae as follows: j1 31; j3 63; j4 8; j6 14; J5 10; z2 11; z4 16; z5 6; Z1 132; Z4 248; Z5 299; s4 236; S5 29; r3 8; R1 9.

Sternal shield smooth; length 54, width 74. Genital shield lightly reticulated throughout, width 130. Four plates, joined into two, between genital and ventrianal shields (folded under the shields in the specimen examined). Ventrianal shield distinctly reticulated throughout, covering the entire caudoventral area; with setae JV1, JV2, ZV1 and ZV2 inserted on anterior third, JV4 inserted posterolaterally and with a pair of crescentic solenostomes medial to JV2 (Fig. 19). Length of ventrianal shield 188, width 295. Only seta JV5 inserted on integument surrounding ventrianal shield, 53. Caudoventral setal pattern: 6:JV-3:ZV-3. Length of primary metapodal plate 25, width 8.5; with strong crescentic ridge. Secondary metapodal plates absent.

Cervix of spermatheca cup-shaped (Fig. 20); 14. Fixed digit of chelicera with 8 teeth; movable digit with 4 teeth, 27 (Fig. 21). Measurements of legs as follows (palp not measurable): leg I 442; leg II 375; leg III 397; leg IV 529. Leg I longer and leg IV conspicuously longer than dorsal shield length. Legs I, III and IV with macrosetae (Fig. 22): femur III 30; genu I 57 (dorsum), 43 (venter); genu III 77; genu IV 124; tibia III 48; tibia IV 94; basitarsus IV 74.

Adult male – Unknown.

Type – The female holotype was collected from *Eugenia uniflora*, Salazar, Angola, April 18, 1972, by



Figs. 23-26: *Amblyseius eugenus*, adult female.

23. — Dorsal view. 24. — Ventral view. 25. — Spermatheca. 26. — Genu, tibia and basitarsus of leg IV.

FIGS. 27-30: *Amblyseius gongylus*, adult female.

27. — Dorsal view. 28. — Ventral view. 29. — Spermatheca. 30. — Genu, tibia and basitarsus of leg IV.

M. K. P. SMITH-MEYER. The holotype is deposited in the National Collection of Acari, Plant Protection Research Institute, Pretoria, South Africa.

REMARKS – According to UECKERMANN & LOOTS (1985), there is “a small dorsal seta” present at the base of the fixed digit of this specie We might have overlooked this when we examined the holotype of this species. Examination of an additional specimen of this species and of other species in the genus *Phytoscutus* for this seta proved to be difficult either because of the angle of the chelicera or a lack of clarity in the area where the seta is presumably located: some seem to have a pit-like depression in this area.

*Phytoscutus wiese*i was collected with *P. eugenus*. A new record of this species is from Krahn Bassa National Forest, near Pyne Town, Grand Gedeh County, Liberia, March, 1989, by Dr Mark TAYLOR.

Phytoscutus eugenus (Ueckermann and Loots)

(Figs. 23-26)

Amblyseius (Trochoseius) eugenus UECKERMANN & LOOTS, 1985, pp. 130-131, Figs. 1-5.

Adult female (based on the holotype specimen) – Dorsal shield smooth (Fig. 23); length 448, width 355. Dorsal setal pattern: 9A:6E. Four pairs of solenostomes on dorsal shield: one mediad to z4; two posterior to s4; and one immediately mediad to S5. Sublateral seta R1 on lateral integument (R1 folded under the dorsal shield of the specimen examined). All dorsal and sublateral setae smooth. Measurements of dorsal and sublateral setae as follows: j1 34; j3 74; j4 9; j6 14; J5 10; z2 78; z4 25; z5 7; Z1 19; Z4 188; Z5 230; s4 166; S5 10; r3 7; R1 not measurable.

Sternal shield smooth; length 59, width 74. Genital shield lightly reticulated anteriorly and laterally, width 123. Ventrianal shield distinctly reticulated throughout; with setae JV1, JV2 and ZV2 and a pair of crescentic solenostomes posteromedial to JV2 (one JV4 is inserted on the shield in the specimen examined) (Fig. 24). Length of ventrianal shield 186, width 187. Setae ZV1 and JV5 on integument surrounding ventrianal shield. Seta JV5 smooth, 116.

Caudoventral setal pattern: 5:JV-3,4:ZV-3. Length of primary metapodal plate 37, width 7; with margin of plate strongly ridged. Secondary metapodal plates absent.

Cervix of spermatheca elongate (Fig. 25), 16. Dentition of chelicera not discernible because of the angle of the specimen. Measurements of legs and palp as follows: leg I 382; leg II 351; leg III 347; leg IV 459; palp 137. Leg I shorter than and leg IV subequal to dorsal shield length. Legs I and IV with macrosetae (Fig. 26): genu I 51 (dorsum), 39 (venter); genu IV 100; tibia IV 88; basitarsus IV 92.

Adult male – Unknown.

Type – The monobasic female holotype was collected from *Eugenia uniflora*, Salazar, Angola, April 18, 1972, by M. K. P. SMITH-MEYER. The type slide (AcY 72/200) is deposited in the National Collection of Acari, Plant Protection Research Institute, Pretoria, South Africa.

REMARKS – Because one of the pair of setae JV4 is present on the type of *P. eugenus*, we consider this pair of setae to be present at this point. However, whether the pair indeed is inserted on the ventrianal shield is not certain because this species is monobasic. This species was collected with *P. wiese*i.

Phytoscutus gongylus (Pritchard and Baker)

(Figs. 27-30)

Iphiseius (Trochoseius) gongylus PRITCHARD & BAKER, 1962, p. 304, Figs. 69-70; BLOMMERS, 1976, pp. 85, 87, Figs. 10-13.

Iphiseius gongylus Pritchard and Baker, SWIRSKI & RAGUSA, 1978, p. 408.

Trochoseius gongylus (Pritchard and Baker), MATTHYSSE & DENMARK, 1981, pp. 341-342.

Amblyseius (Trochoseius) gongylus (Pritchard and Baker), UECKERMANN & LOOTS, 1985, p. 133.

Adult female (based on the holotype specimen) – Dorsal shield smooth except for wave-like reticulations on dorsocentral area of opisthoscutum (Fig. 27); length 351, width 338. Dorsal setal pattern: 9A:6E. Four pairs of solenostomes on dorsal shield: two pairs mediad to s4; one pair posterolaterad to s4; and one pair anterior to Z4. Sublateral seta R1 on

lateral integument (R1 folded under the dorsal shield of the specimen examined). All dorsal and sublateral setae smooth. Measurements of dorsal and sublateral setae as follows: j1 28; j3 57; j4 6; j6 19; J5 11; z2 9; z4 18; z5 7; Z1 29; Z4 168; Z5 192; s4 179; S5 13; r3 9; R1 6.

Sternal shield smooth; length 43, width 65. Genital shield reticulated anteriorly and laterally, width 118. Ventrianal shield distinctly reticulated throughout; with setae JV1, JV2, JV4, ZV1 and ZV2 and a pair of crescentic solenostomes mediad to JV2 (Fig. 28). Only seta JV5 on integument surrounding ventrianal shield, 27. Caudovernal setal pattern: 6:JV-3:ZV-3. Length of primary metapodal plate 22, width 9; with margin of plate ridged. Secondary metapodal plates absent.

Cervix of spermatheca bell-shaped (Fig. 29), 12. Dentition of chelicera not discernible in the specimen examined; movable digit 25. (According to BLOMMERS (1976), fixed digit with 8 teeth and pilus dentilis, movable digit with 3 teeth.). Measurements of legs and palp as follows: leg I 349; leg II 320; leg III 318; leg IV 440; palp 136. Leg I subequal to and leg IV longer than dorsal shield length. Legs III and IV with macrosetae (Fig. 30): genu III 33; genu IV 60; tibia IV 50; basitarsus IV 49.

Adult male – Described by BLOMMERS (1976).

Type – The female holotype was collected from *Vitex congolensis*, Stanleyville, Zaire (former Belgian Congo), April 18, 1955, by E. W. BAKER. Paratypes were all collected in Zaire by E. W. BAKER: 1 each of male and female from frangipani, Lwiro, May 17, 1955; 1 female from peach, Mulunga, May 18, 1955; 3 females from frangipani, Stanleyville, April 18, 1955; 1 female from *Berlinia* sp., May 17, 1955; and 1 female from *Jatropha* sp., April 20, 1955. The holotype slide (No. 2727) is deposited in the United States National Museum, Washington DC, U. S. A.

REMARKS – Additional specimens have been recorded from Kenya, Nigeria and Madagascar. Other host plants are: *Citrus limon*, *Citrus histrix* and *Telfairia occidentalis*. *Phytoscutus gongylus* has been collected with *Tetranychus neocaledonicus* André, *Brevipalpus phoenicis* (Geijskes), Tarsoneimidae, Czenspinksakiiidae, Tydeidae, Oribatei and Cryptostigmata.

Phytoscutus glomus (Pritchard and Baker)

(Figs. 31-34)

Iphiseius (Trochoseius) glomus PRITCHARD & BAKER, 1962, pp. 299, 304, Figs. 67-68.

Amblyseius (Trochoseius) glomus (Pritchard and Baker), UECKERMANN & LOOTS, 1985, p. 131.

Adult female (based on the holotype specimen) – Dorsal shield smooth (Fig. 31); length 458, width 412. Dorsal setal pattern: 9A:6E. Three pairs of distinct solenostomes on dorsal shield: two pairs posterior to s4 and one pair anterior to Z4. Sublateral seta R1 on lateral integument (R1 folded under the dorsal shield of the specimen examined). All dorsal and sublateral setae smooth. Measurements of dorsal and sublateral setae as follows: j1 33; j3 68; j4 9; j6 18; J5 not measurable; z2 24; z4 24; z5 7; Z1 38; Z4 142; Z5 131; s4 148; S5 8; r3 12; R1 8.

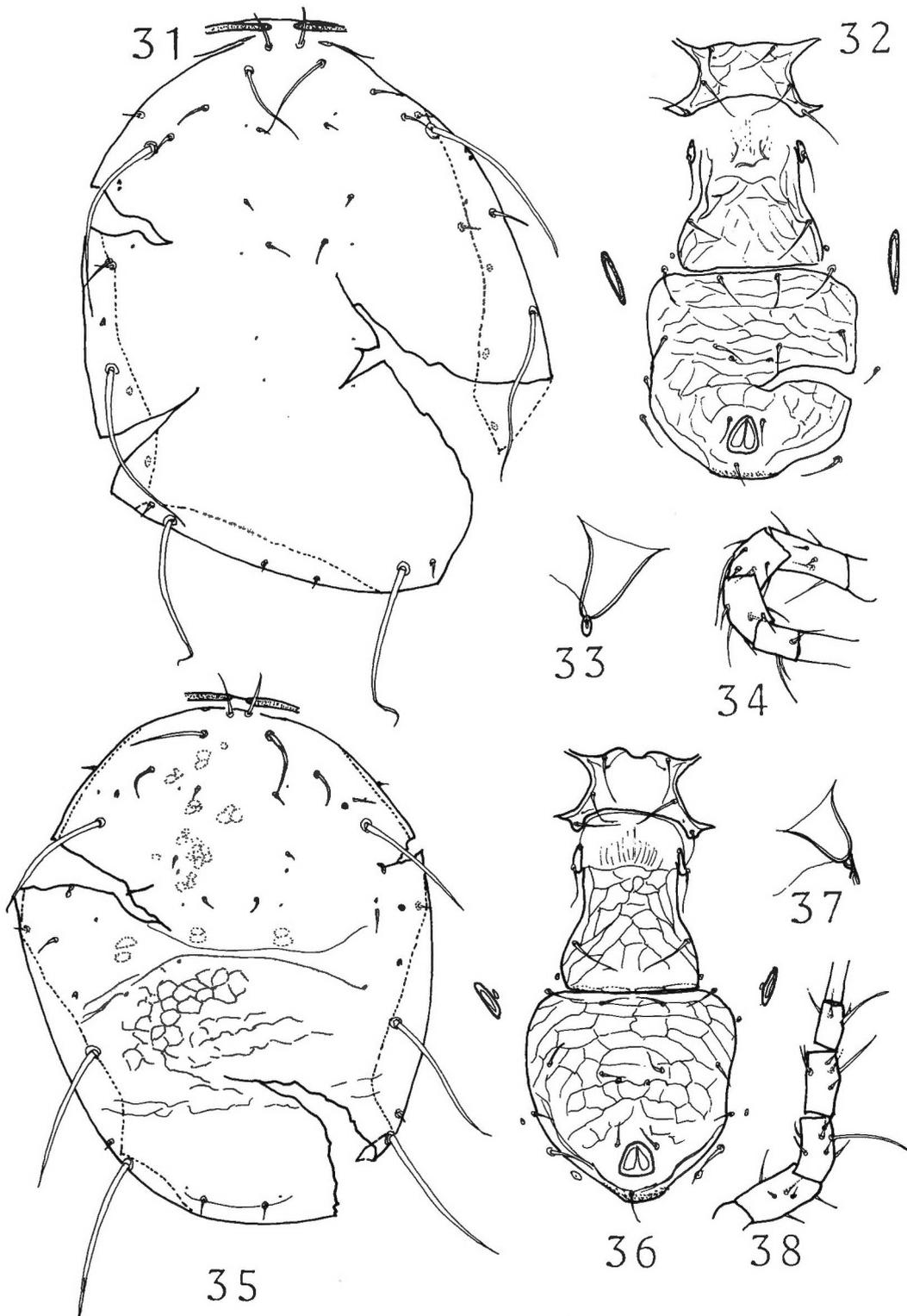
Sternal shield lightly reticulated laterally; length 42, width 74. Genital shield lightly reticulated throughout, width 120. Ventrianal shield distinctly reticulated throughout, with setae JV1, JV2 and ZV2 and a pair of crescentic solenostomes posteromedial to JV2 (Fig. 32). Length of ventrianal shield 169, width 175. Setae ZV1, JV4 and JV5 on integument surrounding ventrianal shield. Seta JV5 smooth, 19. Caudovernal setal pattern: 6:JV-3:ZV-3. Length of primary metapodal plate 44, width 3. Secondary metapodal plates absent.

Cervix of spermatheca bell-shaped, flaring towards vesicle (Fig. 33), 16. Dentition of chelicera not discernible on the specimen examined. Measurements of legs and palp as follows: leg I 366; leg II 326; leg III 310; leg IV 422; palp 173. Legs I and IV shorter than dorsal shield length. Legs III and IV with macrosetae (Fig. 34): genu III 39; genu IV 58; tibia IV 45; basitarsus IV 51.

Adult male – Unknown.

Type – The female holotype was collected from an ornamental tree, Lwiro, Zaire (former Belgian Congo), May 18, 1955, by E. W. BAKER. The type slide (No. 2726) is deposited in the United States National Museum of Natural History, Washington DC, U. S. A.

REMARKS – An additional adult female specimen was recorded from a tree, Bantu Lodge (7000'),



FIGS: 31-34. *Amblyseius glomus*, adult female.

31. — Dorsal view. 32. — Ventral view. 33. — Spermatheca. 34. — Genu, tibia and basitarsus of leg IV.

FIGS. 35-38. *Amblyseius reunionensis*, adult female.

35. — Dorsal view. 36. — Ventral view. 37. — Spermatheca. 38. — Genu, tibia and basitarsus of leg IV.

Kenya, February 20, 1987, by M. MYCHAJLOWYCZ and S. POKORNY.

Phytoscutus reunionensis (Ueckermann and Loots)
(Figs. 35-38)

Amblyseius (Trochoseius) reunionensis UECKERMANN & LOOTS, 1985, pp. 132-133, Figs. 6-11.

Adult female (based on the holotype specimen) – Dorsal shield smooth except for faint reticulation on the dorsocentral area of the opisthoscutum (Fig. 35); length 424, width 345. Dorsal setal pattern 9A:6E. Four pairs of solenostomes on dorsal shield: two pairs posterior to s₄; one pair anterior to Z₄; and one pair anterolaterad to Z₅. Sublateral seta R₁ on lateral integument (R₁ folded under the dorsal shield of the specimen examined). All dorsal and sublateral setae smooth. Measurements of dorsal and sublateral setae as follows: j₁ 32; j₃ 55; j₄ 11; j₆ 14; J₅ 12; z₂ 33; z₄ 23; z₅ 9; Z₁ 22; Z₄ 121; Z₅ 130; s₄ 107; S₅ 6; r₃ 9; R₁ 10.

Sternal shield smooth; length 47, width 69. Genital shield lightly reticulated anteriorly and laterally, width 114. Four plates between genital and ventrianal shields. Ventrianal shield distinctly reticulated throughout; with setae JV₁, JV₂ and ZV₂ and a pair of crescentic solenostomes posteromedial to JV₂ (Fig. 36). Length of ventrianal shield 162, width 168. Setae ZV₁, JV₄ and JV₅ on integument surrounding ventrianal shield. Seta JV₅ smooth, 31. Caudoventral setal pattern: 6:JV-3:ZV-3. Length of primary metapodal plate 31; width 7; with margin of plate ridged. A pair of secondary metapodal plates present.

Cervix of spermatheca bell-shaped (Fig. 37), 13. Dentition of chelicera not discernible in the specimen examined. Measurements of legs and palp as follows: leg I 401; leg II 352; leg III 352; leg IV 436; palp 158. Legs I and IV subequal to dorsal shield length. Legs I, III and IV with macrosetae (Fig. 38): genu I 29 (dorsum), 34 (venter); genu III 32; genu IV 60; tibia IV 46; basitarsus IV 45.

Adult male – Unknown.

Type – The monobasic female holotype was collected from *Prunus persica*, Paine des Cafrés, Reu-

nion, April 13, 1983, by J. QUILICI. The type slide is deposited in the National Collection of Acari, Plant Protection Research Institute, Pretoria, South Africa.

No additional specimens have been recorded.

Phytoscutus sexpilis Muma
(Figs. 39-43)

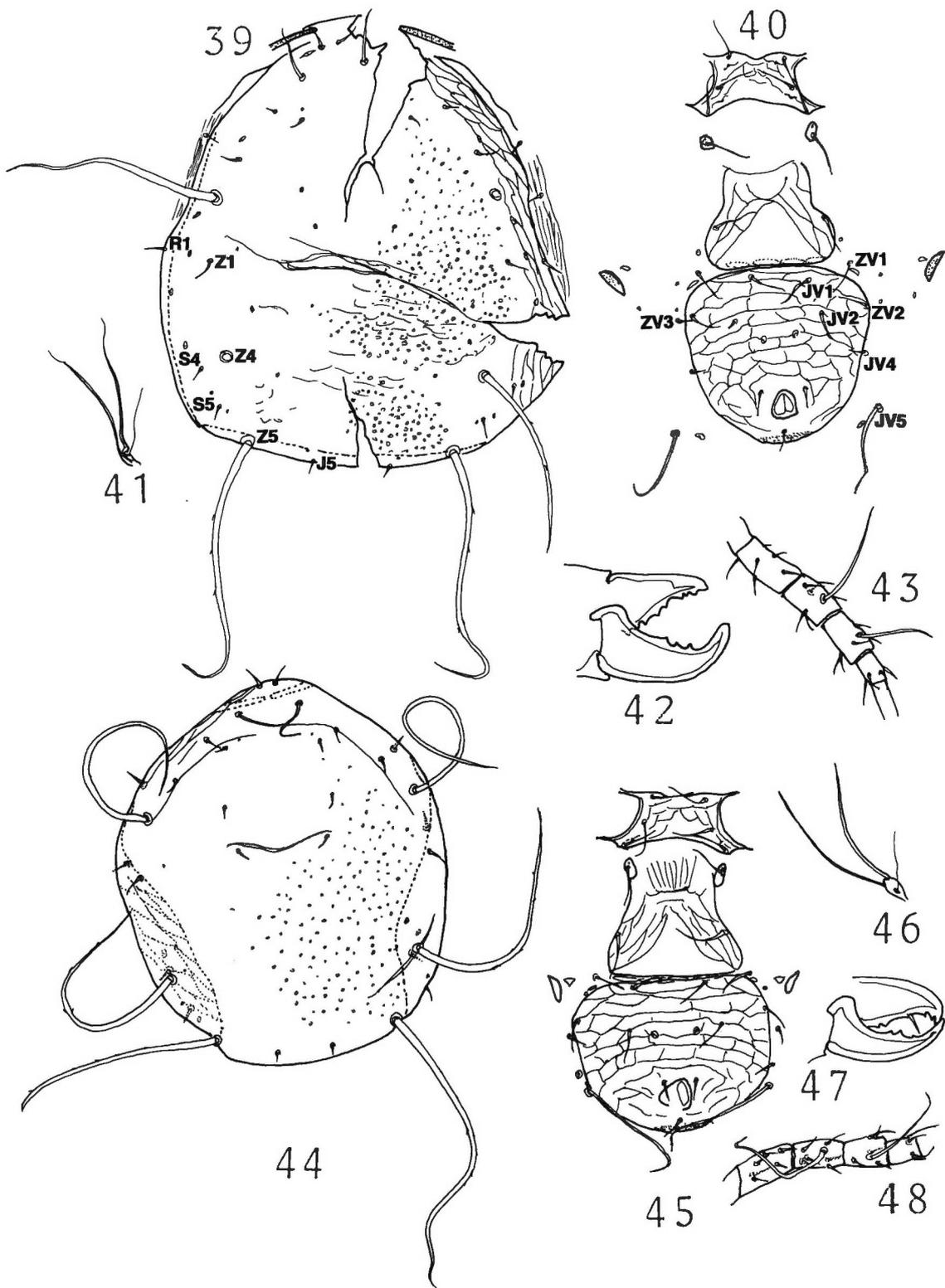
Phytoscutus sexpilis MUMA, 1961, p. 275, Figs. 25-28; MUMA, 1964, p. 7; DE LEON, 1967, p. 17, Fig. 21; MUMA & DENMARK, 1970, p. 24, Figs. 56-63.

Typhlodromus sexpilis (Muma), HIRSCHMANN, 1962, p. 17, Fig. 79.

Amblyseius (Phytoscutus) sexpilis (Muma), VAN DER MERWE, 1968, pp. 161-162.

Adult female (based on the holotype specimen) – Dorsal shield punctate with distinct reticulation on lateral margins (Fig. 39); length 420, width 380. Dorsal setal pattern: 9A:7D. Solenostomes on dorsal shield not easily discernible: three pairs of small solenostomes; anteromedial to each of Z₁ and Z₄ and anteromedial to S₅. Sublateral seta R₁ on dorsal shield; an extra seta in r-series present on one side of the specimen examined. All dorsal setae smooth except Z₄ and Z₅ which are sparsely serrated. Measurements of dorsal and sublateral setae as follows: j₁ 21; j₃ 38; j₄ 9; j₆ 11; J₅ 13; z₂ 11; z₄ 22; z₅ broken; Z₁ 26; Z₄ 170; Z₅ 242; s₄ 182; S₄ 13; S₅ 14; r₃ 10; R₁ 18.

Sternal shield lightly reticulated anteriorly; length 44, width 74. Genital shield lightly reticulated from anterior half to posterolateral areas, width 120. Four elongate plates between genital and ventrianal shields (folded under the genital shield in the specimen examined). Ventrianal shield quadrate, distinctly reticulated throughout; with setae JV₁, JV₂ and ZV₂ and a pair of crescentic solenostomes posteromedial to JV₂ (Fig. 40). Length of ventrianal shield 162, width 172. Setae ZV₁, ZV₃ (one of the pair absent in the specimen illustrated; this pair of setae is present in all other specimens examined), JV₄ and JV₅ on integument surrounding ventrianal shield. Seta JV₅ smooth, 75. Caudoventral setal pattern: 7:JV-3:ZV. Length of primary metapodal plate 29, width 8. A pair of secondary metapodal plates present.



FIGS. 39-43. *Amblyseius sexpilis*, adult female.

39. — Dorsal view. 40. — Ventral view. 41. — Spermatheca. 42. — Chelicera. 43. — Genu, tibia and basitarsus of leg IV.

FIGS. 44-48: *Amblyseius vaughni*, adult female.

44. — Dorsal view. 45. — Ventral view. 46. — Spermatheca. 47. — Chelicera. 48. — Genu, tibia and basitarsus of leg IV.

Cervix of spermatheca elongate, flaring towards vesicle (Fig. 41); 20. Fixed digit of chelicera with eight teeth; movable digit tridentate (Fig. 42), 22. Measurements of legs and palp as follows: leg I 360; leg II 320; leg III 334; leg IV 416; palp 148. Legs I and IV shorter than dorsal shield length. Leg IV with macrosetae (Fig. 43): genu 90, tibia 65.

Adult male – Described by MUMA (1964) and MUMA & DENMARK (1970).

Type – The female holotype (No. 2758), male allotype and paratypes were collected from a grapefruit leaf, Polk City, Florida, U. S. A., May 22, 1955, by M. H. MUMA. These specimens are deposited in the United States National Museum of Natural History, Washington DC, U. S. A. Male and female paratypes were collected from grapefruit at Lake Alfred, Florida, U. S. A., May 7, 1954, by H. L. GREENE; and male and female paratypes from “fungus feeding acarid” at Lake Alfred, Florida, U. S. A., March 17, 1955, by H. L. GREENE.

REMARKS – The chaetotactic formulae of femora I (2-4/3-2) and II (2-4/2-1) of *P. sexpilis* are rare in the family.

Additional specimens have all been collected from Florida on orange, *Eriobotrya japonica*, *Feijoa selowiana* and *Psidium* sp. This species has been collected with acarids and *Tropacarus mumai* Cunliffe.

Phytoscutus vaughni (Chant and Baker)
(Figs. 44-48)

Amblyseius vaughni CHANT & BAKER, 1965, pp. 16-17, Figs. 80-84.

Adult female (based on the holotype specimen) – Dorsal shield punctate, with light reticulation on lateral margins (Fig. 44); length 321, width 300. Dorsal setal pattern: 9A:7D. Solenostomes not discernible on dorsal shield. Sublateral seta R1 on lateral integument (R1 folded under the dorsal shield of the specimen examined). All dorsal and sublateral setae smooth except Z4 and Z5, which are sparsely serrated. Measurements of dorsal and sublateral setae as follows: j1 17; j3 36; j4 11; j6 12; J5 8; z2 10; z4 13; z5 11; Z1 18; Z4 209; Z5 278; s4 202; S4 12; S5 13; r3 13; R1 11.

Sternal shield lightly reticulated throughout; length 46, width 70. Genital shield lightly reticulated laterally, width 120. Four elongate plates between genital and ventrianal shields. Ventrianal shield semi-quadrangle, distinctly reticulated throughout; with setae JV1, JV2 and ZV2 and a pair of large, crescentic solenostomes mediad to JV2 (Fig. 45). Length of ventrianal shield 139, width 175. Setae ZV1, ZV3, JV4 and JV5 on integument surrounding ventrianal shield. Setae JV5 smooth, 121. Caudovernal setal pattern: 7:JV-3:ZV. Length of primary metapodal plate 23, width 8. A pair of secondary metapodal plates present.

Cervix of spermatheca elongate, flaring towards vesicle (Fig. 46); 28. Details of fixed digit of chelicera not clearly discernible because of an air pocket on slide (possibly three small teeth distally and two proximally with pilus dentilis in between); movable digit tridentate (Fig. 47), 22. Measurements of legs and palp as follows: leg I 312; leg II 280; leg III 278; leg IV 355; palp 115. Leg I shorter than and leg IV slightly longer than dorsal shield length. Leg IV with macrosetae (Fig. 48): genu 89; tibia 74.

Adult male – Described by CHANT & BAKER (1965).

Type – The holotype female was collected on a “leaf,” Lancetilla, Honduras, March 13, 1959, by J. G. MATTHYSSE. The type slide (No. 2997) is deposited in the United States National Museum of Natural History, Washington, DC, U. S. A.

REMARKS – Additional specimens were recorded from Mexico, on *Hibiscus* and orange.

SPECIES INQUIRENDA

Phytoscutus bakeri (Gupta) comb. nov.

Iphiseius bakeri GUPTA, 1980, pp. 214-215, Figs. 12-14.

The description of this species is based on a single male specimen collected from areca nut in Port Blair, Middle Andamans, India. Based on the original illustration, the dorsal setal pattern appears to be 9A:8E (sublateral setae R1 are not shown in the drawing) and the ventrianal shield bears setae JV1, JV2 and

ZV2. We were not able to borrow the holotype of this species for examination.

ACKNOWLEDGEMENTS

We wish to thank the following for their generous assistance in loaning us the specimens for this study: Dr H. A. DENMARK (Florida Department of Agriculture and Consumer Services, Gainesville, Florida, U. S. A.); Dr S. EHARA (Biology Institute, Faculty of Education, Tottori University, Tottori, Japan); Dr E. A. UECKERMANN (Plant Protection Research Institute, Pretoria, South Africa); Entomology Division, Department of Scientific and Industrial Research, Nelson, New Zealand; and the United States National Museum of Natural History, Washington DC, U. S. A. We also thank Dr Mark E. TAYLOR (Geomatics International Inc., Burlington, Ontario, Canada) and Ms M. MYCHAJLOWYCZ for collecting specimens for us.

The research on which this paper is based was supported by a grant from the Natural Sciences and Engineering Research Council of Canada to the junior author.

REFERENCES

- BERLESE (A.), 1889. — Acari Myriopoda et Scorpiones hucusque in Italia Reperta. Ordo Mesostigmata (Gamasidae). — Fasc. 54, No. 7.
- BERLESE (A.), 1914. — Acari Nuovi. Manipulus IX. — Redia, **10**: 113-150.
- BERLESE (A.), 1921. — Acari, Myriopoda et Pseudoscorpiones hucusque in Italia reperta. — Redia, **14**: 78-105.
- BLOMMERS (L.), 1976. — Some Phytoseiidae (Acarina: Mesostigmata) from Madagascar, with descriptions of eight new species and notes on their biology. — Bijdragen Tot de Dierkunde, **46** (1): 80-106.
- CHANT (D. A.), 1960. — Descriptions of five new species of mites from India (Acarina: Phytoseiidae, Aceosejidae). — Can. Entomol., **92**: 58-65.
- CHANT (D. A.) & Baker (E. W.), 1965. — The Phytoseiidae (Acarina) of Central America. — Mem. Entomol. Soc. Can., No. 41.
- CHANT (D. A.) & YOSHIDA-SHAUL (E.), 1989. — Adult dorsal setal patterns in the family Phytoseiidae (Acari: Gamasina). — Int. J. Acarol., **15** (4): 219-233.
- CHANT (D. A.) & YOSHIDA-SHAUL (E.), 1991. — Adult ventral setal patterns in the family Phytoseiidae (Acari: Gamasina). — Int. J. Acarol., **17** (3): 187-199.
- COLLYER (E.), 1964. — The occurrence of some mites of the family Phytoseiidae in New Zealand, and descriptions of seven new species. — Acarologia, **6** (4): 632-646.
- COLLYER (E.), 1967. — A description of the female *Iphiseius acaridophagus* Collyer (Acarina: Phytoseiidae) and of *Tropacarus bakeri* n. sp. (Acaridae) and their association together. — New Zealand Entomol., **3** (5): 11-16.
- DARLINGTON (P. J.), 1957. — Zoogeography: the geographical distribution of animals. — John Wiley & Sons, Inc., New York.
- DE LEON (D.), 1967. — Some mites of the Caribbean area: Part I. Acarina on plants in Trinidad, West Indies. — Allen Press Inc., Lawrence, Kansas.
- EHARA (S.), 1966. — A tentative catalogue of predatory mites of Phytoseiidae known from Asia, with descriptions of five new species from Japan. — Mushi, **39** (2): 9-30.
- EHARA (S.) & BHANDHUFALCK (A.), 1977. — Phytoseiid mites of Thailand (Acarina: Mesostigmata). — J. Fac. Educ., Tottori Univ. (Nat. Sci.), **27** (2): 43-82.
- EVANS (G. O.), 1963. — Observations on the chaetotaxy of the legs in the free-living Gamasina (Acari: Mesostigmata). — Bull. Brit. Mus. (Nat. Hist.), Zool., **10** (5): 277-303.
- GUPTA (S. K.), 1975. — Mites of the genus *Amblyseius* (Acarina: Phytoseiidae) from India with descriptions of eight new species. — Int. J. Acarol., **1** (2): 26-45.
- GUPTA (S. K.), 1980. — New species of *Iphiseius* Berlese and *Paraamblyseius* Muma from India (Acarina, Phytoseiidae). — Entomol. Monthly Mag., **115**: 213-218.
- HIRSCHMANN (W.), 1962. — Acarologie. Gangsystematik der Parasitiformes. Teil 5. — Gamasiden-Schriftenreihe vergl. Milbenkd. Fürth/Bayern, Folge 5: 1-56.
- KOCH (C. L.), 1839. — Deutschlands Crustaceen, Myriopoden, und Arachniden. — Regensburg, Vol. 6.
- LO (P. K. C.), 1970. — Phytoseiid mites from Taiwan (I) (Acari: Mesostigmata). — Bull. Sun Yat-sen Cult. Found., No. 5: 47-62.
- MATTHYSSE (J. G.) & DENMARK (H. A.), 1981. — Some phytoseiids of Nigeria (Acarina: Mesostigmata). — Fla. Entomol., **64** (2): 340-357.
- MUMA (M. H.), 1961. — Subfamilies, genera, and species of Phytoseiidae (Acarina: Mesostigmata). — Bull. Fla. State Univ., Biol. Sci., **5**: 267-302.
- MUMA (M. H.), 1964. — Annotated list and keys to Phytoseiidae (Acarina: Mesostigmata) associated with Florida citrus. — Fla. Agr. Exp. Stn. Tech. Bull., 685.
- MUMA (M. H.) & DENMARK (H. A.), 1970. — Phytoseiidae of Florida. Arthropods of Florida and neighboring land

- areas. Vol. 6. — Fla. Dept. Agr. Consum. Serv., Div. of Plant Industry, Gainesville.
- PRASAD (V.), 1974. — A catalogue of mites of India. — Indira Acarology Publication House, Ludhiana, Punjab, India.
- PRITCHARD (A. E.) & BAKER (E. W.), 1962. — Mites of the family Phytoseiidae from Central Africa, with remarks on the genera of the world. — *Hilgardia*, **33** (7): 205-309.
- ROWELL (H. J.), CHANT (D. A.) & HANSELL (R. I. C.), 1978. — The determination of setal homologies and setal patterns on the dorsal shield in the family Phytoseiidae (Acarina: Mesostigmata). — *Can. Entomol.*, **110**: 859-876.
- SWIRSKI (E.) & RAGUSA (S.), 1978. — Three new species of phytoseiid mites from Kenya (Mesostigmata: Phytoseiidae). — *Zool. J. Linnean Soc.*, **63**: 397-409.
- TAKAHASHI (F.) & CHANT (D. A.), 1993. — Phylogenetic relations in the genus *Phytoseiulus* Evans (Acari: Phytoseiidae). III. Cladistic analysis. — *Int. J. Acarol.*, **19** (3): 233-241.
- THE TIMES ATLAS OF THE WORLD. Comprehensive edition, 1973. — Times Newspapers Ltd., London, England.
- UECKERMANN (E. A.) & LOOTS (G. C.), 1985. — *Trochoseius* Pritchard and Baker, a new subgenus of *Amblyseius* Berlese with notes on its former genus *Iphiseius* Berlese (Acari: Phytoseiidae). — *Phytophylactica*, **17**: 129-137.
- VAN DER MERWE (G. G.), 1968. — A taxonomic study of the family Phytoseiidae (Acari) in South Africa with contributions to the biology of two species. — *S. Afr. Entomol. Mem. (Dept. Agr. Tech. Serv.)*, No. 18.