A TAXONOMIC STUDY OF THE GENUS AMBLYSEIUS BERLESE (ACARINA: PHYTOSEIIDAE) IN SOUTH AFRICA

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C O N T E N T S.

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ABSTRACT

This taxonomic study comprises the description of ten new South African species of the common predacious mite genus *Amblyseius*. A cursory survey of the literature pertaining to the predacious relationships existing between the phytoseiids and phytophagous mites is given. The general morphology of the Phytoseiidae is described and the characteristics of the subfamilies and genera belonging to this family are discussed.

A key to the subfamilies of the family Phytoseiidae as well as a key to the genera of the subfamily Amblyseiinae is given. The genus *Amblyseius* is defined and discussed and a proposed key to separate the subgenera is submitted.

The new species described are: *Amblyseius (Typhlodromalus) grabouwi*, *A.(T.) rubicolus*, *A.(T.) anneckei*, *A.(T.) raptor*, *A.(T.) citri*, *A.(T.) addoi*, *A. (T.) capensis*, *A. (T.) erugatus*, *A.(T.) transvaalensis*.

A key for their identification and a list of the localities and plants from which they were collected are furnished.

1. INTRODUCTION.

The Phytoseiidae are usually lightly sclerotised, relatively fast-moving mites found in association with Tetranychidae, Tenuipalpidae, Eriophyidae and other phytophagous mites. They are predators on the eggs, larval stages and adults of these injurious mites, some of which have become major pests in orchards all over the world. During recent years the Phytoseiidae have received attention in field studies after their taxonomy had been unravelled by Garman (1948), Nesbitt (1951), Evans (1953, 1954), Chant (1955, 1956, etc.), Athias-Henriot (1957, 1958, etc.), Ehara (1958, 1959), Muma (1961) and others. The field studies were largely made on the ecology of these mites; their possible use in biological control of those forms injurious to plants also received attention.

Nesbitt (1951) gives a survey of the literature pertaining to the predacious relationships existing between the Phytoseiidae and the phytophagous Tetranychidae prior to this date and the reader is referred to this paper. A survey of the more recent literature dealing with the biological control of plant parasitic mites by means of predacious mites reveals that these investigations are being carried out in different parts of the world, especially the U.S.A., Canada, England, Germany and Japan.

It is now generally accepted that the application of insecticides and fungicides has made orchards highly acceptable to certain mite and insect pests Garman (1961). The abundant increase in phytophagous mite populations

and their/.....

and their expensive control by acaricides has initiated and stimulated research on the biological control of these pests. One of the first reports on predacious mite investigations in orchards was that of Herbert (1953) who conducted studies in Nova Scotia, Canada. Because of the important role played by phytoseiids in the control of phytophagous mites she undertook studies of the life-histories, behaviour, distribution, and relative abundance of these predators. Herbert came to the conclusion that the change in status from minor to major pests is evidently associated with the destructive action of certain sprays on their predators. This had also previously been observed by Lord (1949) who noticed that red mite populations increased rapidly when the predators were destroyed by certain sprays. This view was also substantiated by Hantsbarger & O'Neill (1954) who collected predacious phytoseiids in the orchards of North-Central Washington and Fleschner & Ricker (1954) who studied those on citrus and ovocado trees in southern California.

Huffaker & Kennett (1953 a & b, 1956) investigated the possibility of biological control of the cyclamen mite, Tarsonemus pallidus Banks, on strawberries in California. The results of their research showed that the yield from strawberry plants in plots where the predators of the cyclamen mite were present, was seven times higher than those from plants in predator-free plots. The purpose of their extensive population studies was to appraise the degree and consistency of any controlling action under a variety of conditions and to evaluate the possibilities and determine the means of utilizing natural enemies to better advantage. They showed conclusively that predators exert very effective control of the cyclamen

mite/.....

mite when their activities are not inhibited by detrimental chemical treatments used for the control of other pests. Malcolm (1955), in his study on the timothy mite, Paratetranychus pratensis (Banks), an important pest of grasses in the western United States, states that it was not unusual to find whole colonies of timothy mites decimated by the phytoseiids Typhlodromus fallacis Garman and T. cucumeris Oudms. Similar results were obtained by Berker (1955, 1958) who found that eight species of the family Phytoseiidae are important predators of the spider mite Metatetranychus ulmi (Koch). Anderson and Morgan (1956), however, came to the conclusion that T. rhenanus (Oudms.) and T. occidentalis Nesbitt are not efficient predators of M. ulmi due to their distribution on the leaves and their incapability of producing populations of the same magnitude as the phytophagous mites. This statement was substantiated by Chant (1958a), and Chant and Fleschner (1960).

Only the females of the phytoseiids overwinter and males appear amongst the first generation (Dosse, 1955a, b). Unfertilized overwintering females do not lay eggs. According to Dosse (1957, 1958a) insufficient numbers of the predators are due to (1) higher mortality during winter than amongst the phytophagous mites, (2) the overwintering females feeding for a few weeks before they begin to lay eggs, (3) the males being rapidly reduced in numbers during late summer and (4) the fact that fewer eggs are laid and development is slower at low temperatures, such as may occur with a delayed summer. Predators can thus be of value if the physiological and climatic factors are not in favour of the phytophagous

mites/.....

mites (Mathys, 1955, 1957; Herbert, 1956). Chant (1959, 1961), however, stressed the point that it is absolutely necessary to study each species in detail to be able to evaluate the capabilities of the phytoseiids as predators of phytophagous mites.

The solution of problems in the taxonomy of the Phytoseiidae is, however, a necessary precursor and adjunct to studies on their ecology. The present study attempts a survey of the distribution, classification and external morphology of the members of the most common genus, Amblyseius Berlese, in South Africa. The author hopes that this may furnish a sound basis for subsequent research work on the ecology and possible utilization of these mites in the biological control of phytophagous Acarina.

II. MATERIALS AND TECHNIQUE.

The material investigated in this study was collected by P.A.J. Ryke, M.K.P. Meyer and the author. The specimens were collected with a small brush and transferred to a vial containing 70% alcohol. A number of these were mounted on slides by Ryke. These were, however, not used as type specimens. The type specimens which are in alcohol, are deposited in the collection of the Institute for Zoological Research, Department of Zoology, Potchefstroom University.

The type specimens were treated with approximately 50% lactic acid at room temperature. Adequate clearing was achieved in a day to a week or more, depending on

the contents of the gut and period stored in the alcohol. Freshly collected specimens, killed in 70% alcohol, cleared quickly and had to be handled more carefully since they were liable to disintegrate.

Several permanent slides were made using polyvinyl alcohol (Turtox C.M.C. 10) or Berlese's Fluid. This treatment, however, proved unsatisfactory since only one side of the specimen was rendered clearly visible. Moreover, the setae were not in a horizontal plane, resulting in incorrect measurements. Temporary slides were therefore made, using hollow-ground slides, each with a single cavity. These slides proved to be satisfactory as all the specimens studied fall in the range of 250-1000 μ in length (cf. Evans and Browning, 1955).

The depression in the slide is filled with lactic acid of the same concentration as that in which the specimens were cleared. This is important since specimens transferred from a higher to a lower concentration (especially freshly caught specimens) often burst open, or otherwise the specimens collapse and require some time to recover their normal body-shape. The coverslip is then placed over the depression, covering approximately three quarters of it. The specimen is now placed in the space left uncovered by the coverslip; it is orientated and pushed underneath the coverslip with the aid of a very fine needle or wire. The specimen can thus be orientated, or removed from the slide at will. All the morphological characters, especially the lengths of the setae on the dorsum and the details of the chelicerae can in most cases be studied in the same specimen. To get a clear view of the posterior margin

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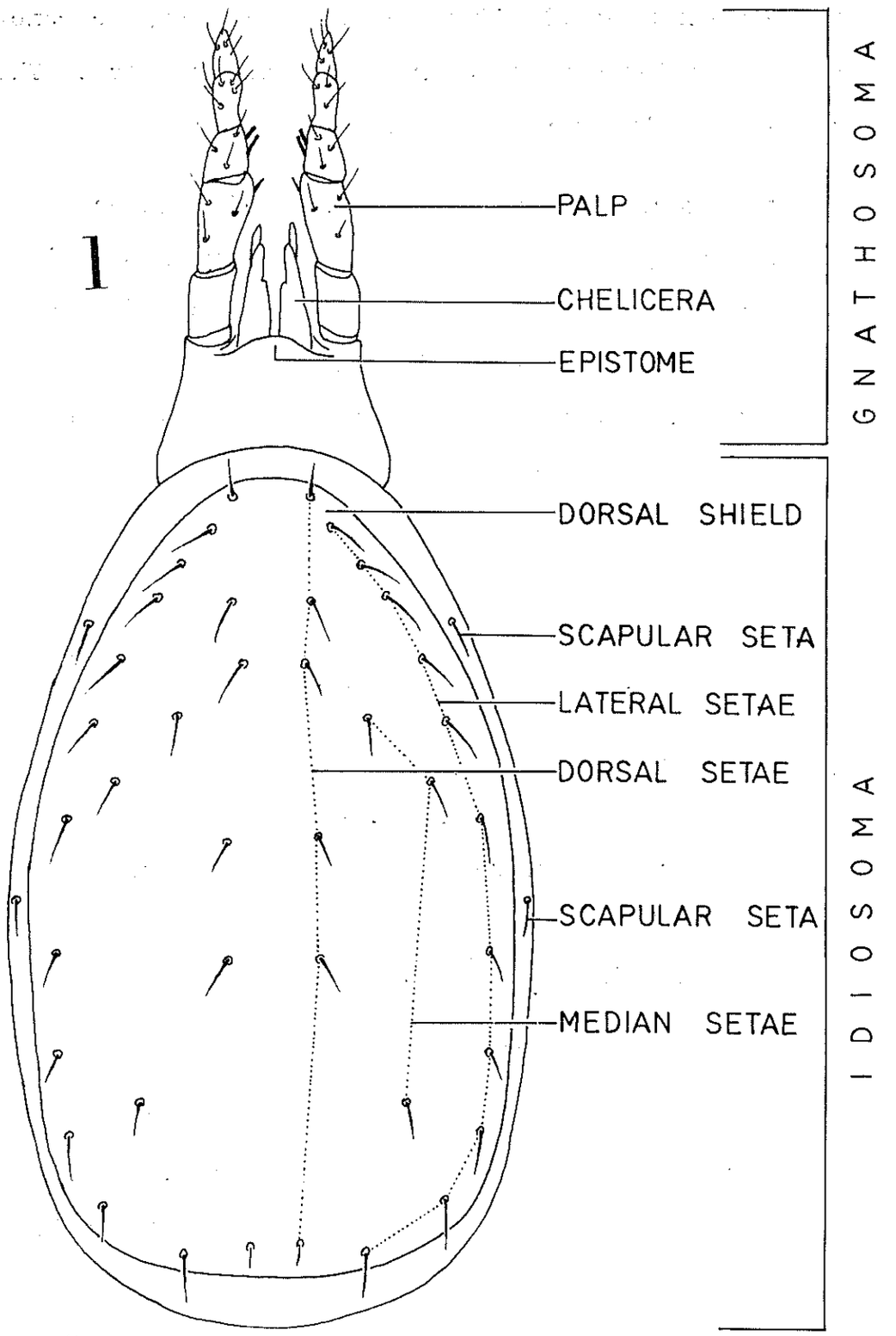

FIG.1. Diagrammatic sketch of the dorsum of a hypothetical phytoseiid mite

of the sternal shield it is usually necessary to remove the body contents which emerge through the vulva. This is best done by means of a fine needle.

The material is stored in small corked tubes containing 70% alcohol. This is then put into a larger specimen bottle containing 70% alcohol plus 5% glycerine together with the name and data of the species. Specimens thus preserved can easily be recovered and temporary slides made as described above.

III. FAMILY PHYTOSEIIDAE.

Phytoseiidae, Berlese, A., 1916, Redia, 12, 33.

Phytoseiinae, Vitzthum, Graf H. von, 1941, Acarina in Bronns Klassen und Ordnungen des Tierreichs 5 (iv): 767.

Phytoseiinae, Garman, P., 1948, Bull. Connecticut Agr. Expt. Sta. 520: 10.

Phytoseiinae, Nesbitt, H.H.J., 1951, Zool. Verh. 12.

Phytoseiidae, Baker, E.W., and G.W. Wharton, 1952, An Introduction of Acarology. The Macmillan Co., p. 465.

Phytoseiinae, Womersley, H., 1954, Australian J. Zool. 2: 169.

Phytoseiidae, Chant, D.A., 1959, Canadian Ent., Vol. 91, suppl. 12.

The phytoseiids are small, 300 to 600 μμ in length, whitish to light brown in colour. The gnathosoma (figs. 1 and 2) comprises two portions: the distal part

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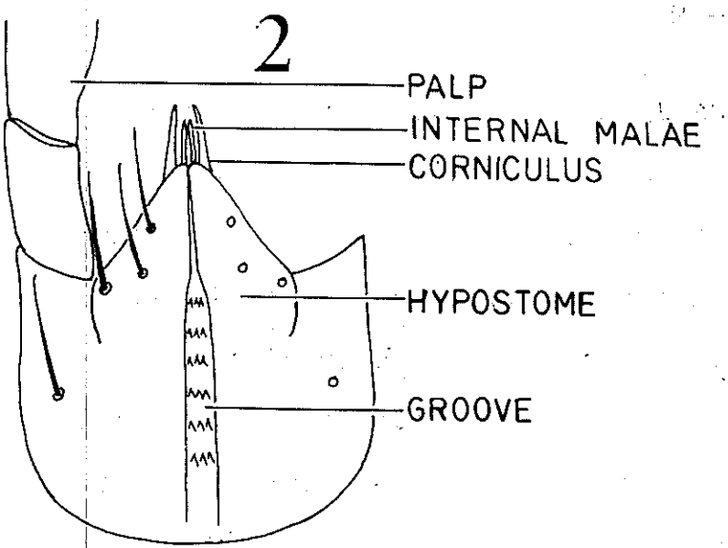
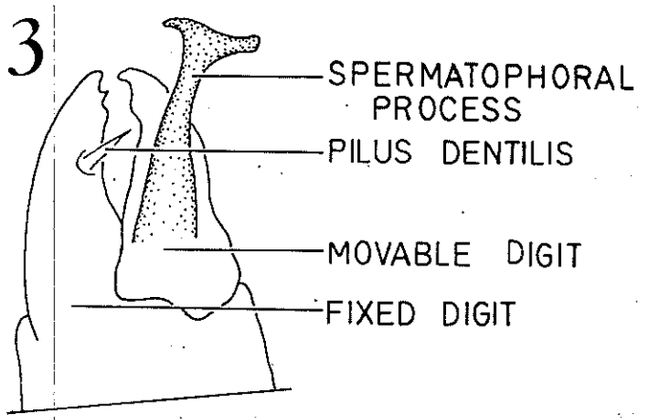
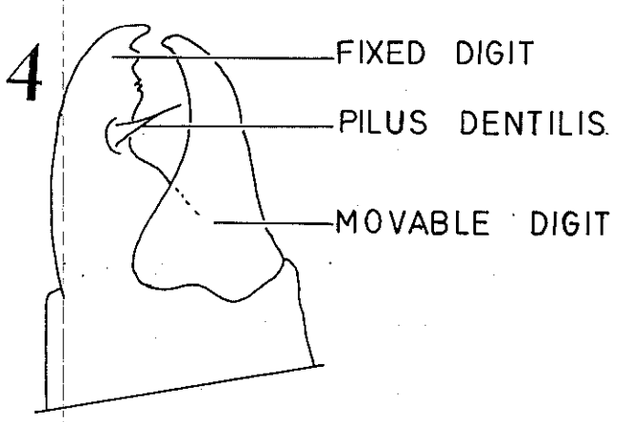
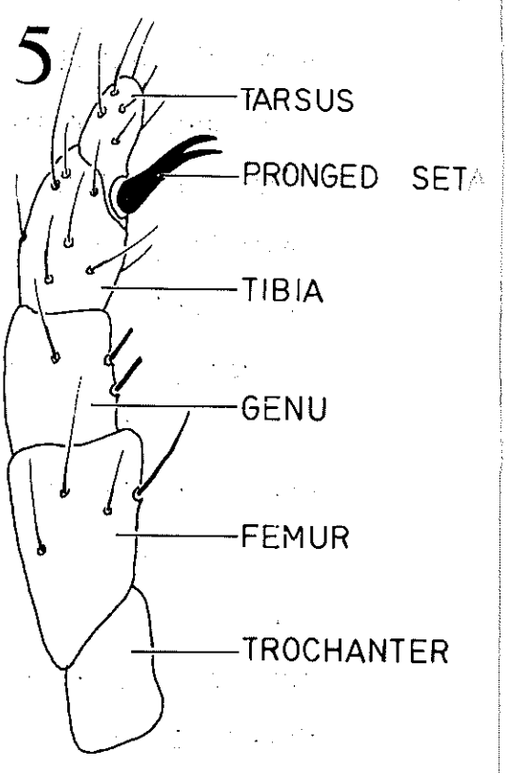
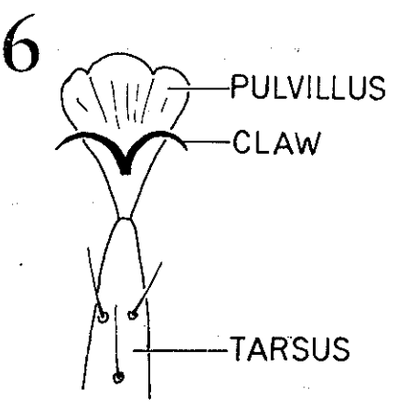










FIGS.2-6. Diagrammatic sketches of a hypothetical phytoseiid mite.

Fig.2, venter of gnathosoma; fig.3, male chelicera; fig.4, female chelicera; fig.5, palp; fig.6, tarsus.

with the epistome dorsally and the two halves of the hypostome ventrally; and the proximal part, which is confluent with the body proper, bearing the palps. Each palp is provided with a two-tined, pronged seta (fig. 5). The margin of the epistome may be smooth or slightly serrate, sometimes giving the impression of bearing small sharp teeth. Each half of the hypostome bears four setae and distally the internal malae and corniculus (fig. 2) can be seen. The groove dividing the hypostome bears transverse rows of teeth internally. Above these lie the chelate chelicerae, comprising one movable and one fixed digit (fig. 3 and 4). The inner margins of the digits may be smooth or denticulate and the fixed digit bears a modified seta, the pilus dentilis, about one-third of its length from the tip. In the male the movable digit (fig. 3) bears a copulatory structure, the spermatophoral process, often twice the length of the digit itself.

With one exception, the idiosoma of the adult (fig. 1) is covered dorsally by a single shield provided with a variable number of paired setae, four to seven in the dorsal series, one to four in the median series and seven to 11 in the lateral series. (The system of setal designation as initiated by Garman (1948) and modified by several authors, lastly by Muma (1961), is used in this paper). The number, position and relative lengths of these setae are of generic and specific value. The membrane surrounding the dorsal shield bears 1 to 8 pairs of scapular setae although usually only two pairs are present.

The venter of the idiosoma (fig. 7) is covered by a

series/.....

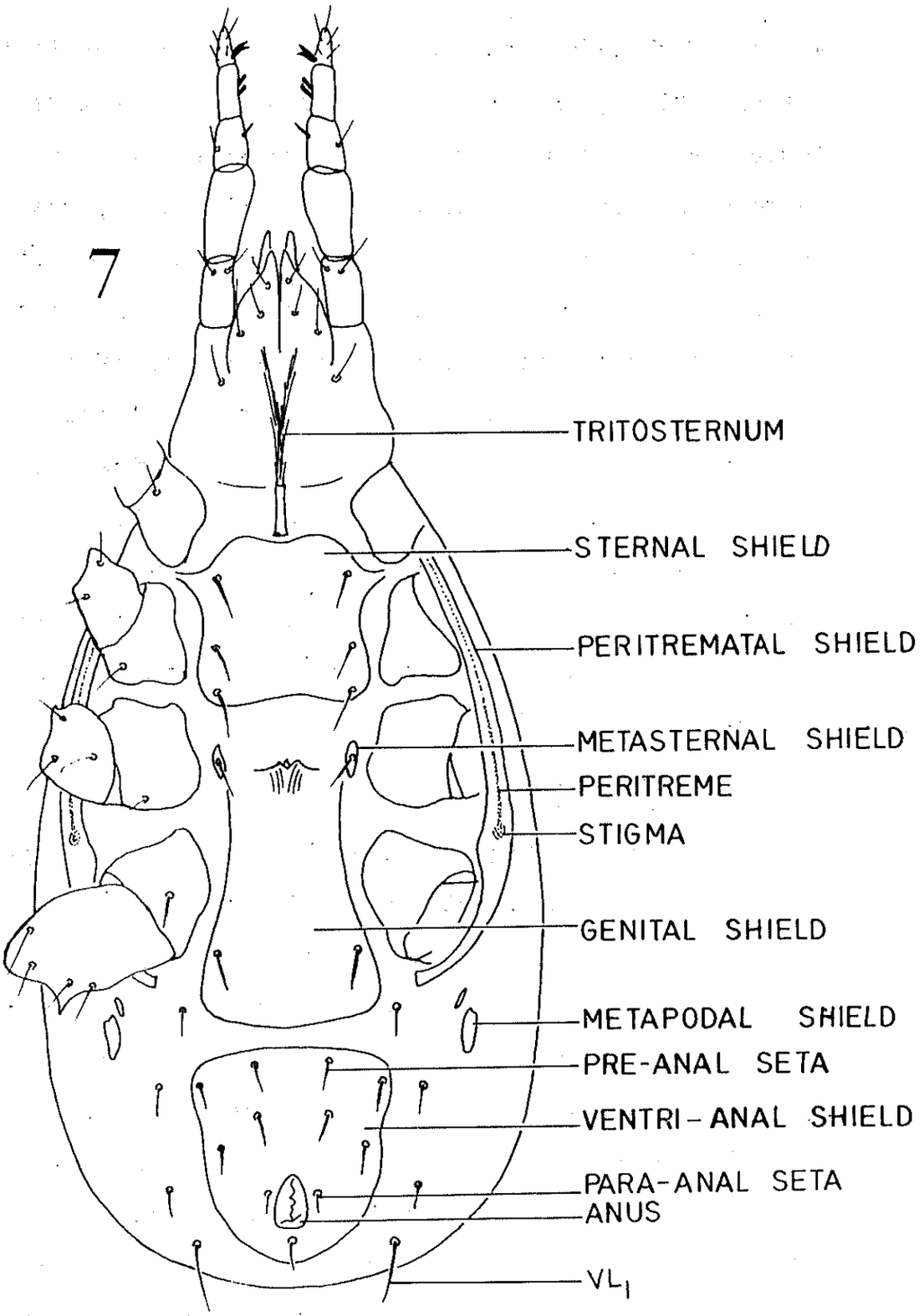


FIG.7. Diagrammatic sketch of the venter of a hypothetical phytoseiid female mite.

series of shields, bears a tritosternum anterior to the sternal shield, and the coxae of four pairs of legs laterally. In the female the most anterior shield between the legs represents the sternal shield, the proportion of its length to width, the occurrence of two or three pairs of sternal setae and the presence or absence of sculpturing or markings being significant at generic and subgeneric levels. Posterior to this shield lie two small metasternal shields, each provided with a seta. Between and a little posterior to the metasternal shields lies the vulva from which the genital shield extends caudad; the latter shield is provided with a pair of setae, and has a truncate or concave posterior margin.

The posterior shield in the series is the ventri-anal shield comprising the anal shield, with three para-anal setae, and an anterior extension bearing from nil to four pairs of pre-anal setae which may sometimes be associated with a pair of pores. In a few species the anterior extension is separated from the anal shield and in a few others only the anal shield is present. Posterior to coxae IV are one or two pairs of metapodal shields, which may be absent in some species. The remainder of the venter is covered by an interscutal membrane provided with a variable number of paired setae.

The venter of the male (fig. 8) differs radically from that of the female in that it is covered by only two shields; an elongated sternal shield with the genital opening at the anterior margin and a broad, roughly triangular ventri-anal shield. In a few species the anal portion is separated from the anterior part.

Laterally,/.....

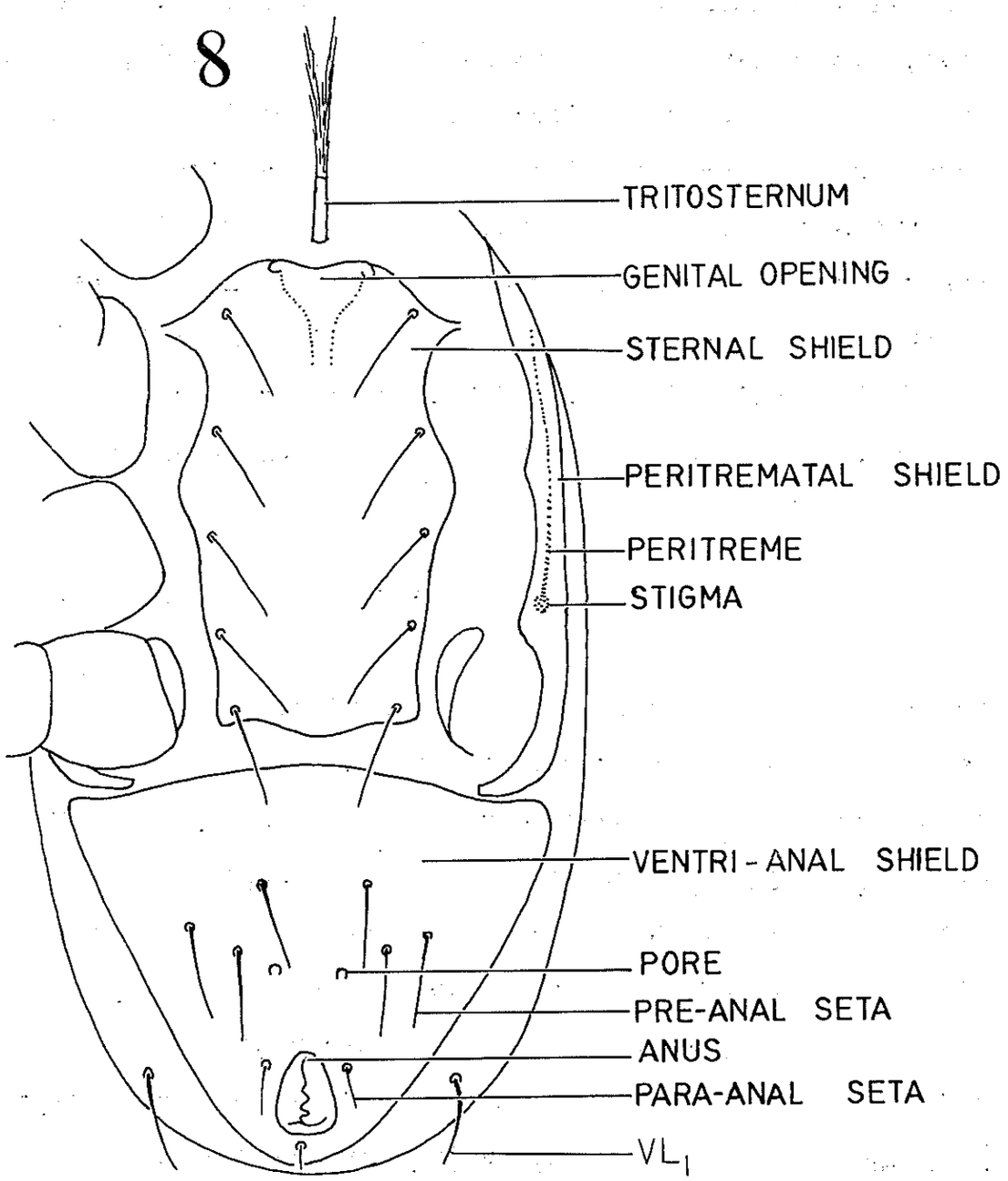


FIG.8. Diagrammatic sketch of the venter of a hypothetical phytoseiid male mite.

Laterally, and in some species somewhat posterior to coxa IV, lies the peritrematal shield bearing the stigmata. The stigma continues anteriorly as the peritreme. The legs, terminating in a pulvillus and claw (fig. 6), are of no taxonomic significance except leg IV which in some genera bears modified or elongated macrosetae. The spermathecae (coxal glands of authors) are distinct organs attached between coxae III and IV, hanging free in the body. They have a characteristic form and are of specific value (Dosse, 1958b). Some species can, however, not be separated on this character (Chant and Athias-Henriot, 1960).

The family Phytoseiidae was first reviewed by Nesbitt (1951) who found it to contain a number of confused, poorly defined genera. Species descriptions in the early literature were vague, drawings, when given, lacked detail and type specimens were not available. The genera Typhlodromus Scheuten, 1857 and Seiulus Berlese, 1887 were resurrected by Oudemans (1929) on the nature of the dorsal setae, which are smooth in Typhlodromus and rough in Seiulus. As such Typhlodromus was a composite group in which Garman (1948) recognized Seiulus, Seiopsis Berlese, 1923, Amblyseius Berlese, 1914, Lasioseius Berlese, 1916, Typholodromus and Iphidulus Ribaga, 1902, as genera of the Phytoseiinae. He characterised these genera by such characters as dorsal and leg setae, ventri-anal shield of the female and peritrematal shields.

The genus Iphidulus was listed as a nomen dubium by Nesbitt (1951) who included, as valid genera, Amblyseius, Typhlodromus, Garmania gen. nov., Blattisocious Keegan,

1944, Kampimodromus, gen. nov., Phytoseius Ribaga, 1902, and Kleemannia Oudemans, 1930, distinguishing them on such characters as dorsal setae, ventri-anal shield of the female and the chelicerae.

Chant (1959) reviewed the family Phytoseiidae and recognized two subfamilies, viz. Macroseiinae Chant, Denmark and Baker, 1959, and Phytoseiinae. The latter included the following valid genera, Iphiseius, Typhloseiopsis De Leon, 1959, Proprioseius Chant, 1957, Asperoseius Chant, 1957, Phytoseius, Phytoseiulus Evans, 1952, Seiulus and Typhlodromus. For the designation of these genera he used such characters as dorsal setae, ventri-anal shield and interscutal membrane.

Muma re-evaluated the subfamilies and genera of the Phytoseiidae in 1961 and his classification is largely followed in this paper.

Key to the Subfamilies of Phytoseiidae (adapted from Muma, 1961).

1. Dorsal shield divided, seven pairs of dorsal setae ..... Macroseiinae Chant, Denmark and Baker.

\- Dorsal shield entire, four to six pairs of dorsal setae ..... 2.

2. Eight pairs of scapular setae, leg IV with many macrosetae ..... Aceodrominae Muma

\- One or two pairs of scapular setae, leg IV with nil to three macrosetae ..... 3.

3. Four pairs of anterior lateral setae, six to eight pairs of lateral setae, usually three pairs of distinguishable median setae,

three/.....

three macrosetae on leg IV and three pairs of pre-anal setae ..... Amblyseiinae Muma

-- Five or more pairs of anterior lateral setae, eight to 11 pairs of lateral setae, usually two pairs of distinguishable median setae, nil or one macroseta on leg IV and four pairs of pre-anal setae .... Phytoseiinae Berlese

SUBFAMILY AMBLYSEIINAE MUMA.

Dorsal shield undivided with usually three pairs of median setae, six to eight pairs of lateral setae with four pairs anterior to D_4 and one or two pairs of scapular setae. The ventri-anal shield is usually provided with three pairs of pre-anal setae and the fourth leg usually with three macrosetae.

Key to the Genera of Amblyseiinae (adapted from Muma, 1961).

1. Six pairs of dorsal setae ..... 9.

-- Five pairs of dorsal setae ..... 3.

-- Four pairs of dorsal setae ..... 2.

2. Two distinct pairs of median setae .....
..... Phytoscutus Muma
-- Three distinct pairs of median setae .....
..... Phytoscutella Muma

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 Muma

5. Seven pairs of lateral setae 6
-- Eight pairs of lateral setae .....
..... Proprioseiopsis Muma

6. Lateral setae L_5 missing .... Phytoseiulella Muma
-- Lateral setae L_7 missing .... Amblyseiulella Muma

7. One distinct pair of median setae 8
-- Two distinct pairs of median setae .....
..... Asperoseius Chant

8. D_4 modified similarly to posterior laterals, nil or one pair of pre-anal setae .....
..... Phytoseiulus Evans
-- D_4 simple, not like posterior laterals, three pairs of pre-anal setae .....
..... Proprioseius Chant

9. Posterior lateral setae linear or at most plumose 11
-- Posterior lateral setae flattened and spatulate or lanceolate 10

10. Lateral/.....

10. Lateral setae elongate, spatulate and serrate, 1 pair of scapular setae .... Platyseiella Muma

-- Lateral setae short, oblanceolate and smooth, two pairs of scapular setae .... Phyllodromus De Leon

11. Two or three distinct pairs of median setae ... 13.

-- Four distinct pairs of median setae 12

12. Two pairs of sternal setae, leg IV without macrosetae ..... Typhloseiella Muma

-- Three pairs of sternal setae, leg IV with macrosetae ..... Typhloseius Muma

13. Fourth leg with three macrosetae 14

-- Fourth leg with nil or one macroseta 16

14. Two pairs of scapular setae, three pairs of median setae 15

-- One pair of scapular setae, two pairs of median setae ..... Amblyscutus Muma

15. Seven pairs of lateral setae, one or two pairs of pre-anal setae ..... Amblyseiella Muma

-- Eight pairs of lateral setae, two or three pairs of pre-anal setae ..... Amblyseius Berlese

16. Two pairs of scapular setae, three pairs of pre-anal setae 17

-- One pair of scapular setae, four pairs of pre-anal setae ..... Cydnodromella Muma

17. Three pairs of sternal setae 18

-- Two pairs of sternal setae ..... Phytodromus Muma

18. Seven/.....

18. Seven pairs of lateral setae ..... Paradromus Muma

-- Eight pairs of lateral setae .... Cydnodromus Muma

IV. GENUS AMBLYSEIUS.

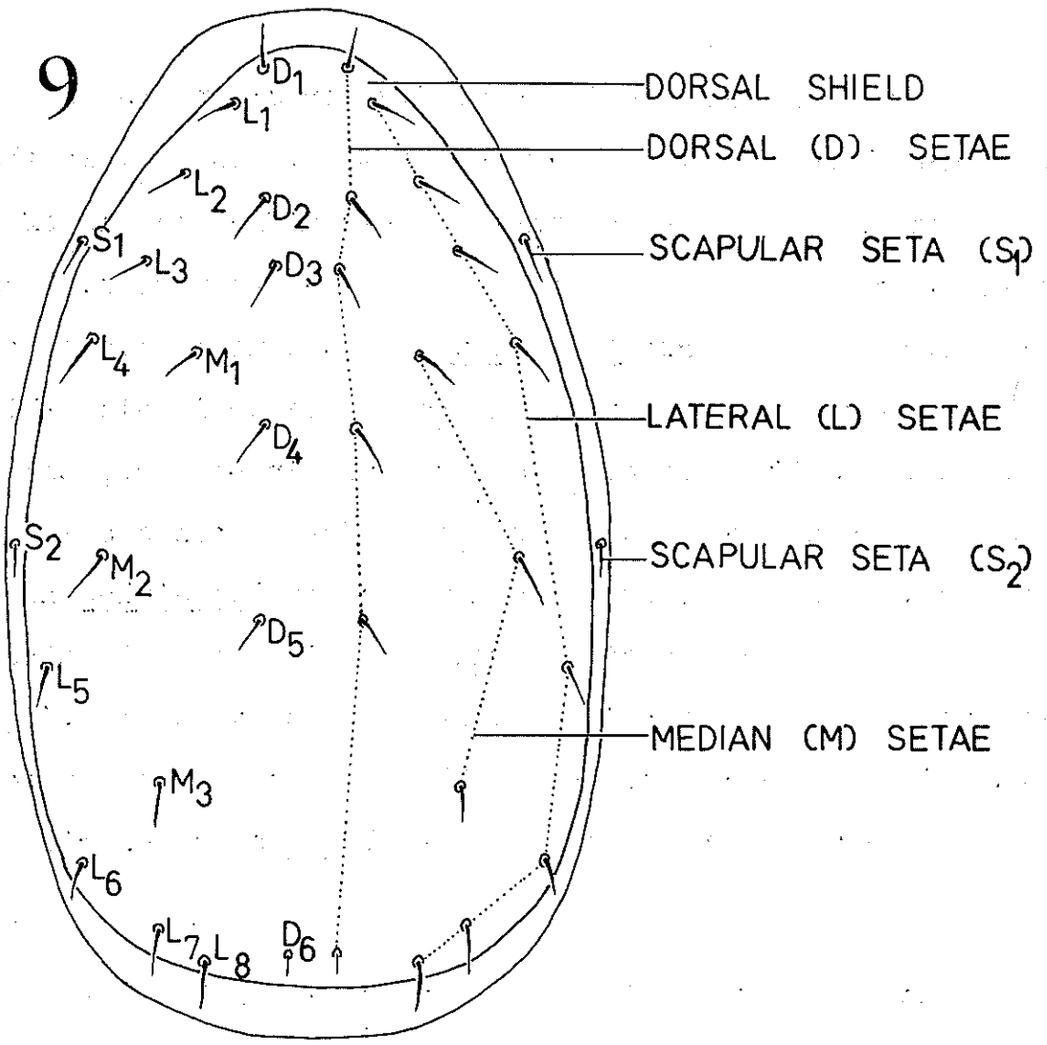
Amblyseius, Berlese, A., 1914, Redia 10: 143.

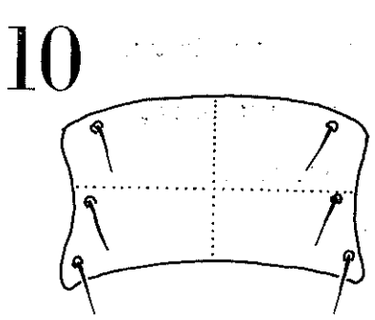
A. TAXONOMIC STATUS.

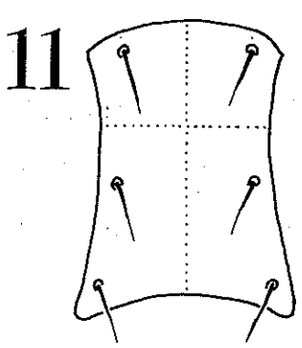
The genus Amblyseius, type Seius obtusus Berlese 1889, was defined by Garman (1948) under the subfamily Phytoseiinae as follows: Dorsum smooth with 6 dorsal, 1 median, 8 lateral (15 pairs) setae of which at least four pairs are very long; fourth leg with three macrosetae; peritrematal shields blunt or truncate posteriorly; sternal shield with three pairs of setae; teeth of chelicerae not confined to tip; anal plate broader than genital with three pairs of pre-anal setae besides the para-anals, with its anterior margin in contact with the genital shield.

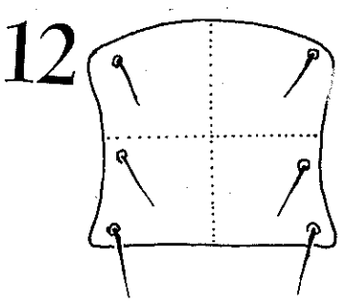
Chant (1957b) objected to the generic status of Amblyseius. He regarded the morphological distinctions between the genera Typhlodromus and Amblyseius as artificial, since their chaetotaxy is the same, aside from relative lengths. The anteriorly-grouped first four lateral setae in Amblyseius are, according to Chant, not of generic significance, since it was shown by him (1958b) that the immature stages bear different setal patterns. The species with four pairs of antero-lateral setae in the adult bear the same number in the nymphal stages, but

those/.....









FIGS.9-12. Diagrammatic sketches of a hypothetical Amblyseius mite.

Fig.9, dorsum; fig.10, sternal shield wider than long; fig. 11, sternal shield longer than wide; fig. 12, sternal shield as wide or wider than long and the posterior margin straight.

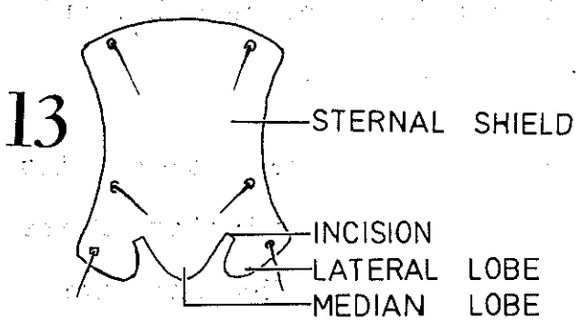
those species, whose adults have five or six pairs of anterior lateral setae, lack one of them, viz. L_3, in the protonymph. He doubted whether this difference is of generic value and used it for subgeneric separation. He thus reduced the genus Amblyseius to subgeneric level and placed no restriction on the number of lateral setae which characterise it, provided that they are in one row, and not more than three median and eight dorsal pairs are present. However, in his discussion of Neoseiulus Hughes, in the same paper, he states that "species with 10 pairs of lateral setae are not necessarily closely related," (p. 531). Athias-Henriot (1958), however, objected to this downgrading and re-elevated Amblyseius to generic level.

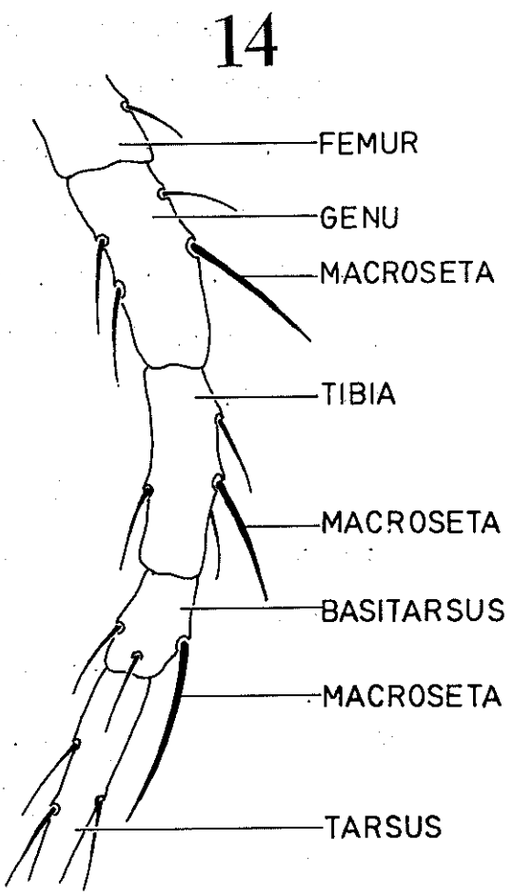
Muma (1961) emphasizes the fact that all but eleven known species of Phytoseiidae have four or five pairs of lateral setae anterior to the fourth pair of dorsal setae and regards differences in the dorsal chaetotaxy as significant at the generic level. This author also draws attention to the stability and usefulness of the sternum, the scapular setae and the macrosetae on the fourth leg, using them to segregate the genera of the family Phytoseiidae.

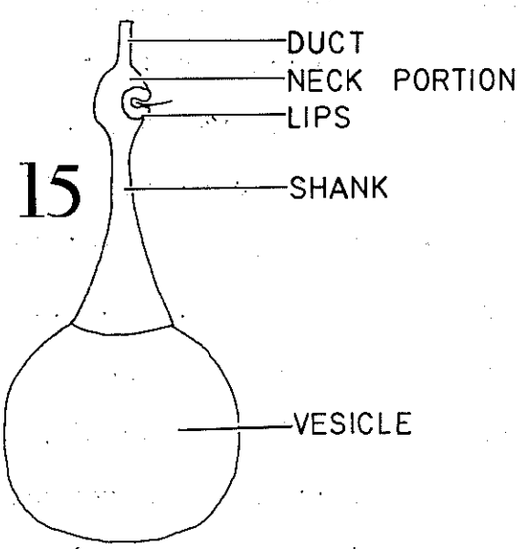
B. MORPHOLOGY.

The genus Amblyseius, as defined by Muma (1961), exhibits the following characteristics: The entire dorsal shield may be smooth, imbricate or sclerotized and is provided with seventeen pairs of setae; six pairs in the dorsal (D), three pairs in the median (M) and eight pairs in the lateral (L) series (fig. 9). Some of

these are/.....







FIGS.13-15. Diagrammatic sketches of a hypothetical Amblyseius mite.

Fig. 13, sternal shield longer than wide and the posterior margin lobate; fig.14, fourth leg with three macrosetae; fig.15, spermatheca.

these are elongate, weakly pectinate or plumose. The dorsal interscutal membrane bears two pairs of scapular setae; S_1 at approximately the level of seta L_3, and S_2 at approximately the level of seta M_2.

The sternal shield bears three pairs of setae; its length relative to its width and the irregularity of the posterior margin are useful characters. The ~~anterior~~ posterior margin in the subgenus Typhlodromalus Muma exhibits a characteristic form, comprising a median and two lateral lobes with an incision between the lateral and median lobes (fig. 13).

The ventri-anal shield bears two or three pairs of pre-anal setae and a pair of pores in addition to the para-anal setae. The form of the ventri-anal shield varies from shield-shaped to elongate and constricted, and is less broad than the genital shield. The shield is fragmented in A. (I). degenerans (Berlese). One or two pairs of metapodal shields are present and the peritrematal shields curve around coxae IV and usually end bluntly. The interscutal membrane flanking the ventri-anal shield in provided with four pairs of setae, three of which are of moderate length and one (VL_1) which is much longer and sometimes curved.

The fourth leg bears three macrosetae on the genu, tibia and basitarsus, some being long and some short (fig. 14). The fixed digit of the chelicerae bears a few teeth on the last one-fourth to one-third of its length in addition to the pilus dentilis. In this study the tip of the fixed digit is not counted as one of the teeth. The movable digit is usually devoid of teeth

or only/.....

or only slightly denticulate. The spermatophoral process on the male movable digit is usually foot-shaped. The spermatheca is strongly developed and its different components can easily be distinguished (fig. 15). The duct is prominent and of moderate length, though slender in some species; the neck portion is usually bulbous, the lips more or less prominent and the shank is bell or trumpet-shaped. The vesicle has no definite form.

Key to the Subgenera of Amblyseius Berlese

1. L_8 long and whiplike 2
-- L_8 short, at most only slightly longer than the distance between their bases 3

2. Sternal shield wider than long (fig. 10) .... Amblyseius Berlese
-- Sternal shield longer than wide (fig. 11) .... Amblyseialus Muma

3. Sternal shield as wide or wider than long and posterior margin straight (fig. 12) or somewhat undulate, ventri-anal shield shield-shaped ..... Typhlodromopsis De Leon
-- Sternal shield much wider than long, macrosetae on leg IV longest on genu .... Iphiseius Berlese
-- Sternal shield longer than wide and posteriorly lobate (fig. 13), ventri-anal shield elongate and constricted .... Typhlodromalus Muma

C. SOUTH/.....

C. SOUTH AFRICAN SPECIES.

The species examined during this study appear to be restricted to the subgenus Typhlodromalus.

Key to the females of South African species of A. (Typhlodromalus) Muma.

1. Seta L_4 shorter than seta L_8 2
-- Seta L_4 longer than seta L_8 5

2. Seta L_8 longest seta on dorsal shield 3
-- Seta D_1 longest seta on dorsal shield .....
..... A. (T.) grabouwi, spec. nov.

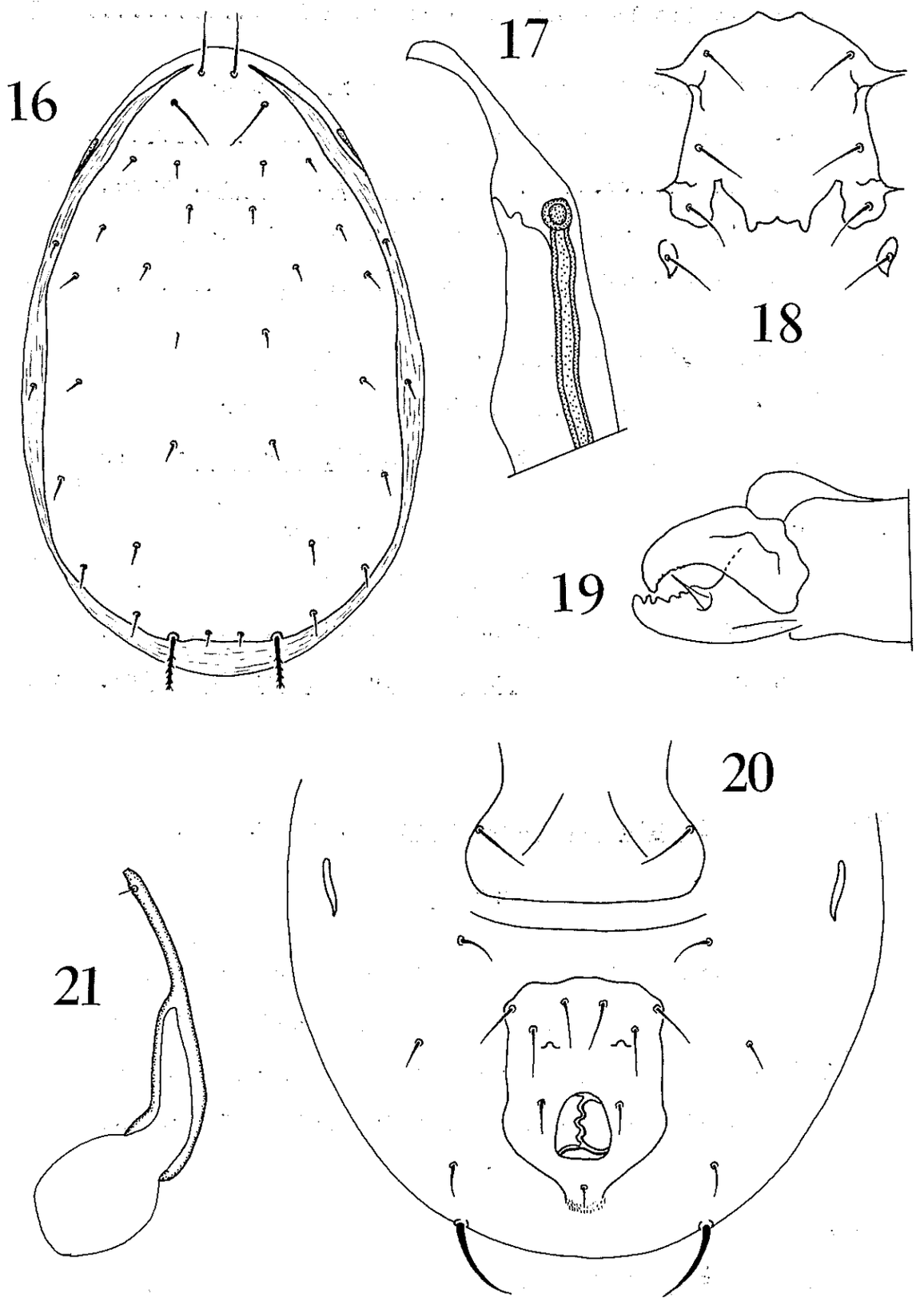
3. Setae L_1 and D_1 equal in length 4
-- Seta L_1 shorter than seta D_1 .....
..... A. (T.) rubicolus, spec. nov.

4. Seta D_1 shorter than seta L_4 .....
..... A. (T.) anneckei, spec. nov.
-- Setae D_1 and L_4 equal in length .....
..... A. (T.) raptor, spec. nov.

5. Seta D_1 shorter than seta L_1 6
-- Setae D_1 and L_1 equal in length .....
..... A. (T.) citri, spec. nov.

6. Seta L_3 shorter than the distance between its base and that of seta L_4, posterior margin of lateral lobe of sternal shield smooth .... A. (T.) addoi, spec. nov.
-- Seta L_3 in length equals the distance between its base and that of seta L4, posterior margin of lateral lobe of sternal shield undulate ..... A.(T.) undulatus, spec. nov.

Seta/.....



FIGS.16-21. Amblyseius (Typhlodromalus) grabouwi, spec. nov., female

Fig.16, dorsum; fig.17, peritrematal shield; fig.18, sternal shield; fig.19, chelicera; fig.20, posterior ventral surface; fig.21; spermatheca.

-- Seta L_3 greater in length than the distance between its base and that of seta L_4 7

7. Seta L_2 shorter than the distance between its base and that of seta L_3 .... A. (T.) capensis, spec. nov.

-- Seta L_2 greater in length than the distance between its base and that of seta L_3 8

8. Dorsal (D) setae relatively short, seta D_2 shorter than the distance between its base and that of seta D_3 ...A.(T.) erugatus, spec. nov.

-- Dorsal (D) setae relatively long, seta D_2 greater in length than the distance between its base and that of seta D_3 .... A.(T.) transvaalensis, spec. nov.

Amblyseius (Typhlodromalus) grabouwi, spec. nov.

(Figs. 16-21).

This species differs from other members of the genus in that D_1 is the longest seta on the dorsum and seta L_8 is longer than L_4. Posteriorly the median lobe of the sternal shield has two prominent lateral projections.

Female:

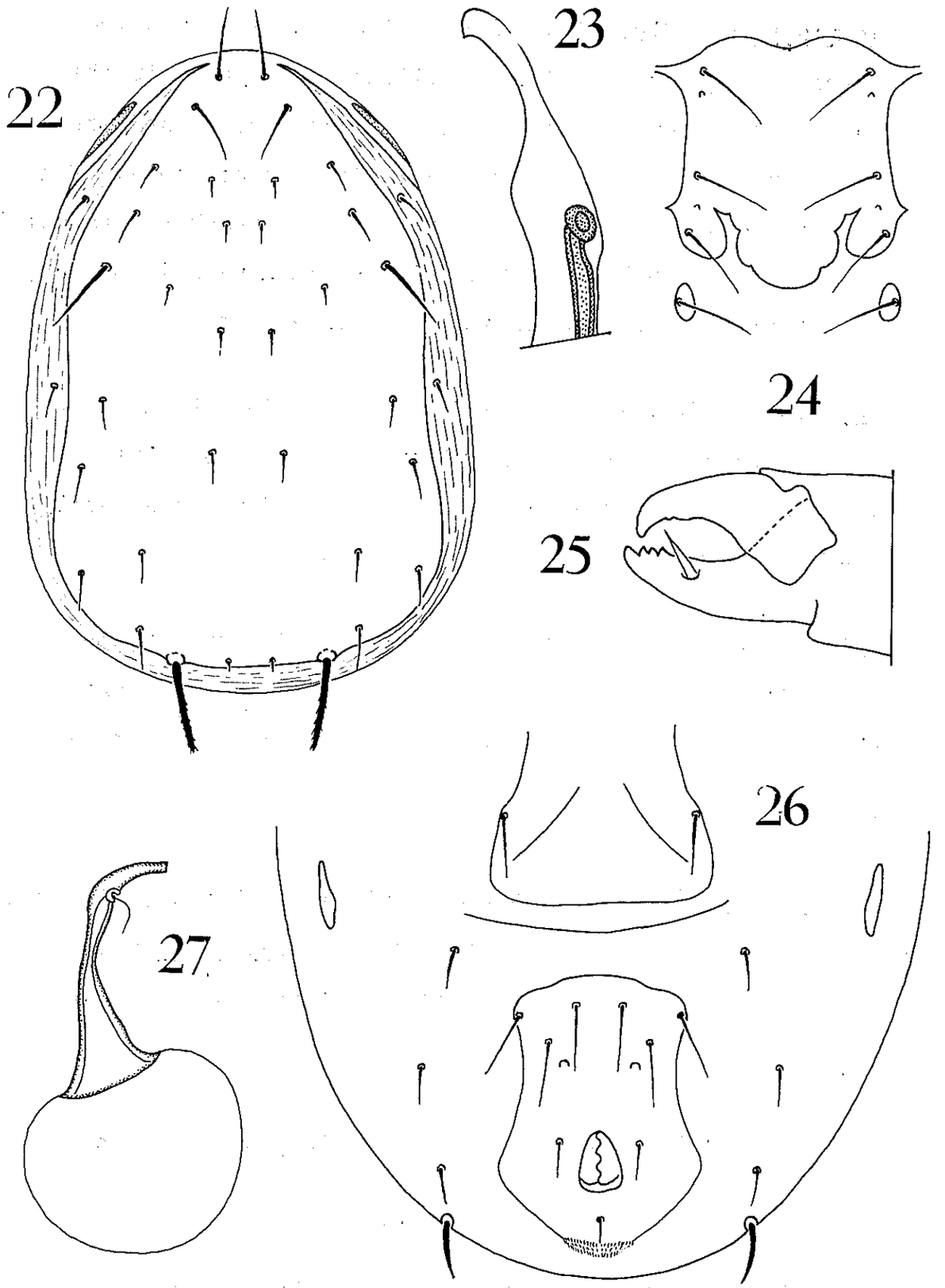
Dorsum (fig. 16): The smooth shield (length, 346-350 µ; breadth, 210-222 µ) is provided with 17 pairs of setae, six pairs of which are placed in the dorsal (D), three in the median (M) and eight in the lateral (L) series. The length of these setae are as follows: D_1, 34-36 µ; D_2, 8 µ; D_3, 8 µ; M_3 10-12 µ; L_1, 31-32 µ;/.....

L_1, 31-32 μ; L_2, 8 μ; L_3, 8 μ; L_4, 10-11 μ; L_5, 11-12 μ; L_6, 11-12 μ; L_7, 11-12 μ; L_8, 28-30 μ. Only setae D_1, L_1 and L_8 are therefore of moderate length. All of them, however, are shorter than the intervals between those in the same series. The distal third of the stout seta L_8 is strongly pectinate. Setae S_1 and S_2 are placed on the interscutal membrane with S_2 at the same level as M_2.

Venter: The sternal shield (fig. 18) is longer (78-80 μ) than broad (63-68 μ) and bears three pairs of setae. Posteriorly the median lobe has laterally two prominent projections. The lateral lobe has a pseudolobe and the incision narrows, ending angularly. The fourth pair of sternal setae are placed on oval, posteriorly pointed metasternal shields. The genital shield (fig. 20) is normal (width, 92-94 μ) and provided with a pair of setae. The ventri-anal shield (fig. 20) (length, 92-97 μ; breadth, 66-69 μ) has a sinuate anterior margin and parallel lateral margins. The shield, bearing three pairs of pre-anal setae and a pair of pores, bulges slightly across the lateral anterior pre-anal setae and the anus. It tapers to the level of the postanal seta. The para-anal setae are normal.

The ventral interscutal membrane flanking the ventri-anal shield bears a pair of slender metapodal shields and four pairs of setae, one pair (VL_1) being long (40 μ) and curved. The peritrematal shields fuse antero-dorsally with the dorsal shield (fig. 16) and curve posteriorly around coxae IV, ending in a sharp point (fig. 17). The peritreme reaches antero-dorsally to a position near the level of seta L_2.

Spermathecae/.....



FIGS.22-27. Amblyseius (Typhlodromalus) rubicolus, spec. nov., female

Fig.22, dorsum; fig.23, peritrematal shield; fig.24, sternal shield; fig.25, chelicera; fig.26, posterior ventral surface; fig.27, spermatheca.

Spermathecae (fig. 21): Due to its unusual shape the spermatheca (length, 44 μ) is difficult to trace in the unflattened body. The duct is extremely short and the neck portion, with the very small lips, is scarcely, if at all, bulged. The lateral margins of the shank run parallel for nearly one-half of its length and then seem to branch, thus forming a peculiarly shaped, elongate bell.

Chelicerae (fig. 19): The fixed digit (length, 25 μ) of the chelicera bears five prominent teeth and a pilus dentilis. The movable digit (length, 27 μ) is slightly denticulate at the inner distal third.

Legs: Leg IV bears three macrosetae, the one on the genu being 38-39 μ in length, on the tibia 35-36 μ and on the basitarsus, 45-46 μ. The other legs are normal.

Male: Unknown.

Material studied: Holotype female (serial no. 33/13/58/1) and one paratype female from leaves of Passiflora sp., Grabouw, 17 November 1953; collected by P.A.J. Ryke.

Amblyseius (Typhlodromalus) rubicolus, spec. nov.

(Figs. 22-27)

This species differs from other members of the genus in that L_8, the longest seta on the dorsum, is longer than seta L_4 and seta D_1 is longer than L_1. The median lobe of the sternal shield is scalloped whereas the lateral lobes are smooth.

Female/.....

Female:

Dorsum (fig. 22). The mildly imbricate shield (length, 375 μ; breadth, 233-240 μ) is provided with 17 pairs of setae, six pairs of which are placed in the dorsal (D), three in the median (M) and eight in the lateral (L) series. The lengths of these setae are as follows: D_1, 39-41 μ; D_2, 9-10 μ; D_3, 9-10 μ; D_4, 13-14 μ; D_5, 15-16 μ; D_6, 6-7 μ; M_1, 9-10 μ; M_2, 15-16 μ; M_3, 15-16 μ; L_1, 34-36 μ; L_2, 13-14 μ; L_3, 19-20 μ; L_4, 44-45 μ; L_5, 19-20 μ; L_6, 20-21 μ; L_7, 22-23 μ; L_8, 52-55 μ. Setae D_4 and L_2 are of equal length and slightly shorter than D_5, M_2 and M_3. Setae L_3 and L_5 are of equal length and a little shorter than L_6, whilst L_6 is a little shorter than L_7. Setae L_4 and L_7 are longer than the distance between bases L_4 & L_3 and L_7 & L_8 repsectively. L_1, L_2 and L_3 are shorter than the distances to the bases of the setae next following in the series. The stout and faintly pectinate setae L_8 are much shorter than the distance between their bases. Setae S_1 and S_2 are placed on the interscutal membrane. Seta S_2 lies a little anterior to M_2.

Venter: The sternal shield (fig. 24) (length, 85-90 μ; breadth, 72-74 μ) bears three pairs of setae. The median lobe is scalloped and the lateral lobes are smooth. The incision cuts into the lateral lobe with a sharp angle. Sternal setae IV are situated on oval metasternal shields. The genital shield (fig. 26) is normal (width, 93-95 μ) and provided with a pair of setae. The ventri-anal shield (fig. 26) is longer (112-115 μ) than broad (76-80 μ) with its anterior margin curved and recurved anteriorly. The lateral margins are gently constricted leaving the broadest

part of/.....

part of the shield across the anus. Three pairs of pre-anal setae and a pair of pores are grouped anteriorly on the shield. The normal para-anal setae are present. The ventral interscutal membrane, flanking the ventri-anal shield, is provided with four pairs of setae, one pair (VL_1) being long (34 μ) and slightly curved. One pair of metapodal shields is present. The peritrematal shields fuse antero-dorsally with the dorsal shield (fig. 22) and curve posteriorly around coxae IV, ending bluntly (fig. 23). The peritreme reaches antero-dorsally nearly to the level of seta L_1.

Spermathecae (fig. 27): The spermatheca (length, 30 μ) has a stout duct fusing at an angle onto the neck portion. The slightly bulged neck portion, with the lips in its centre, continues smoothly into the narrowed shank which, after a slight bend, diverges to form a trumpet.

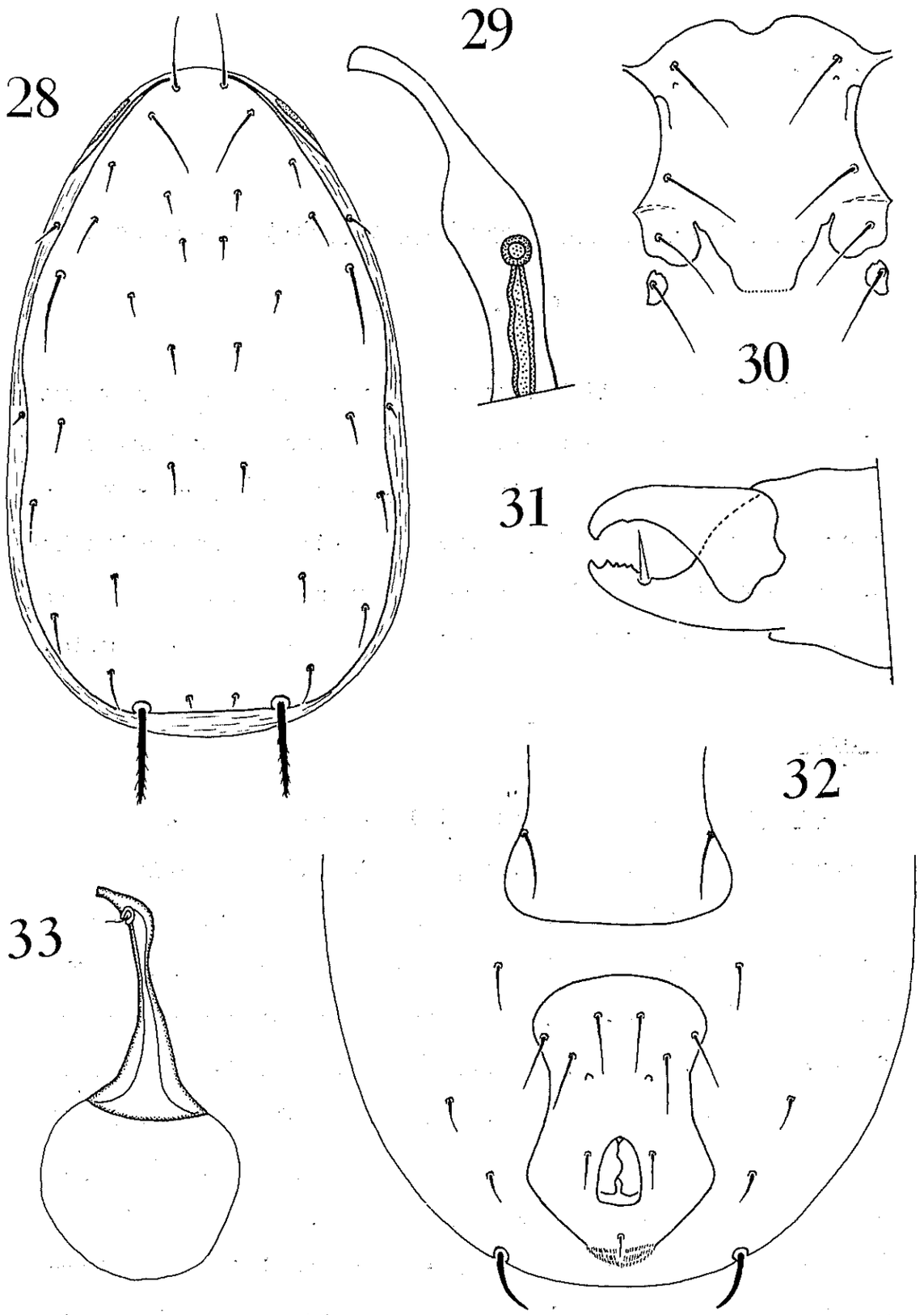
Chelicerae (fig. 25): The fixed digit (length, 28 μ) of the chelicerae has three teeth and a pilus dentilis. The movable digit (length, 26 μ) bears one to two denticles.

Legs: Leg IV bears three macrosetae, the length of the one on the genu being 42-44 μ, on the tibia 38-40 μ and on the basitarsus 55-58 μ. The other legs are normal.

Male: Unknown.

Material studied: Holotype female (serial no. 38/8/58/1) and two paratype females from leaves of Rubus sp., Grabouw, C.P., 2 January 1955: collected by

P.A.J. Ryke/.....



FIGS.28-33. Amblyseius (Typhlodromalus) anneckei, spec. nov., female

Fig.28, dorsum; fig.29, peritrematal shield; fig.30, sternal shield; fig.31, chelicera; fig.32, posterior ventral surface; fig.33, spermatheca.

P.A.J. Ryke.

Amblyseius (Typhlodromalus) anneckei, spec. nov.

(Figs. 28-33).

This species differs from other species of the genus in that L_8, the longest seta on the dorsum, is longer than L_4 and seta L_1 equals D_1 in length while seta D_1 is shorter than L_4. The posterior margin of the median lobe of the sternal shield is probably straight and the lateral lobe is slightly bulged opposite the third sternal seta.

Female:

Dorsum (fig. 28): The mildly imbricate shield (length, 368-373 μ; breadth, 221-224 μ) is provided with 17 pairs of setae, six pairs of which are placed in the dorsal (D), three in the median (M) and eight in the lateral (L) series. The lengths of these setae are as follows: D_1, 36-39 μ; D_2, 9-10 μ; D_3, 9-10 μ; D_4, 13-14 μ; D_5, 15-16 μ; D_6, 8 μ; M_1, 9-10 μ; M_2, 16-17 μ; M_3, 15-17 μ; L_1, 36-39 μ; L_2, 13-14 μ; L_3, 20-21 μ; L_4, 41-45 μ; L_5, 19-21 μ; L_6, 19-21 μ; L_7, 19-21 μ; L_8 52-55 μ. Setae D_1 and L_1 are of equal length. Setae D_2, D_3 and M_1 are equal in length. Setae D_4 and L_2 are equal in length and so are D_5, M_2 and M_3 and also L_3, L_5, L_6 and L_7. Setae L_1 and L_4 are longer than the distances between L_1 & L_2 and L_4 & L_3 respectively. Seta L_7 is slightly shorter than the distance between L_7 & L_8 but setae L_2 and L_3 are much shorter than the distances between L_2 & L_3 and L_3 & L_4 respectively.

The stout/.....

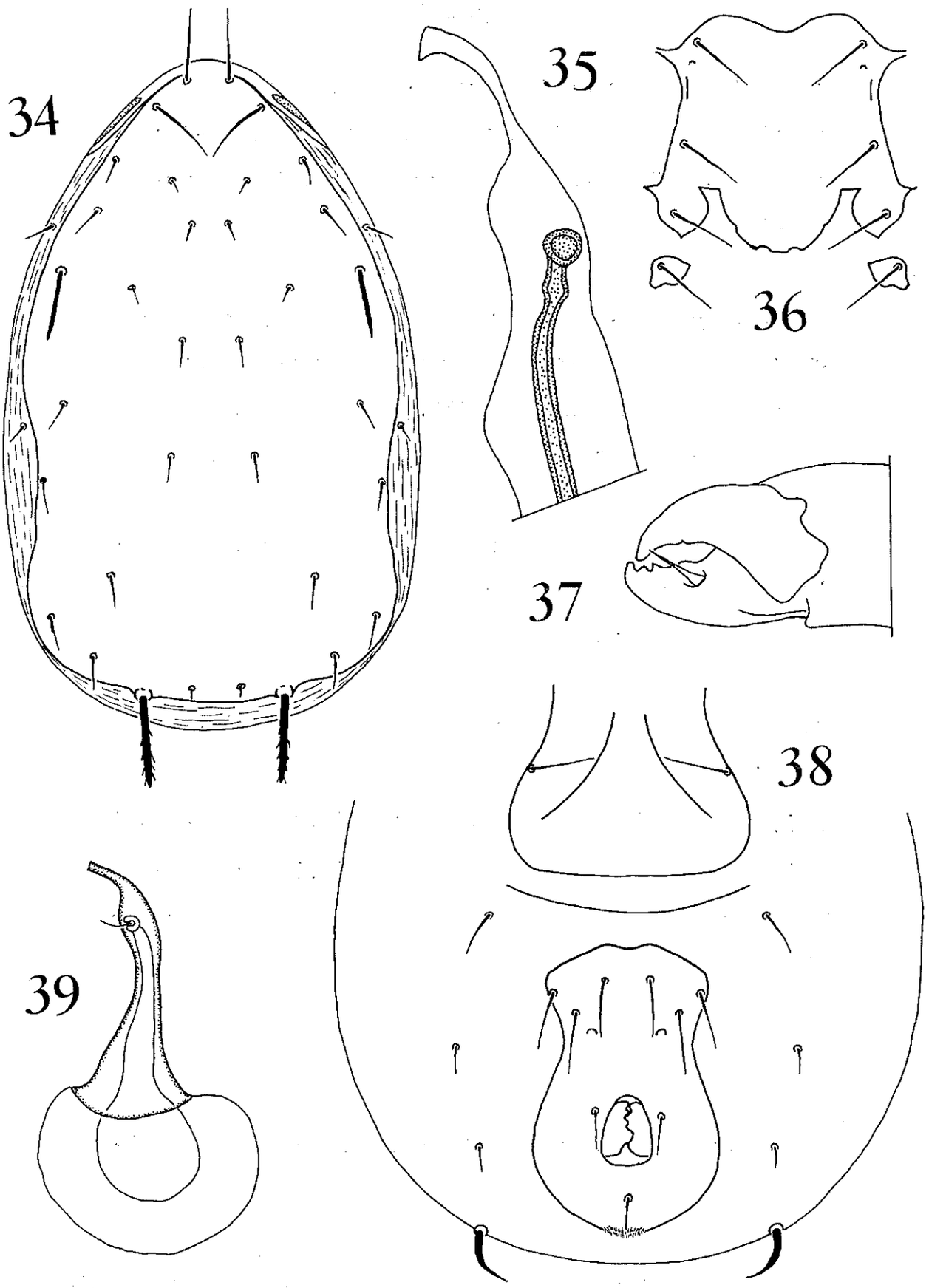
The stout and slightly pectinate setae L_8 are much shorter than the distance between their bases. Setae S_1 and S_2 are placed on the interscutal membrane. Seta S_2 lies slightly anterior to M_2.

Venter: The sternal shield (fig. 30) (length, 86-90 μ; breadth, 72-74 μ) bears three pairs of setae. The posterior margin of the median lobe is probably straight. The lateral lobe is slightly bulged opposite the third sternal seta. The end of the incision is very narrow. Sternal setae IV are situated on irregular oval metasternal shields. The genital shield (fig. 32) is normal (width, 92-95 μ) and provided with a pair of setae. The ventri-anal shield (fig. 32), which is much longer than broad (112-114 μ by 78-80 μ) has a smooth rounded anterior margin and constricted lateral margins, leaving the broadest part of the shield across the anus. Three pairs of pre-anal setae and a pair of pores are grouped anteriorly on the shield. The anal portion bears three para-anal setae.

The ventral interscutal membrane, flanking the ventri-anal shield, is provided with four pairs of setae, one pair (VL_1) being long (28-32 μ) and curved. Metapodal shields are absent. The peritrematal shields fuse antero-dorsally with the dorsal shield (fig. 28) and curve posteriorly around coxae IV, ending bluntly (fig. 29). Antero-dorsally the peritreme reaches position approximately at the level of seta L_1.

Spermathecae (fig. 33): The spermatheca measures 35 μ in length. The relatively short straight duct continues

smoothly/.....



FIGS.34-39. Amblyseius (Typhlodromalus) raptor, spec. nov., female

Fig.34, dorsum; fig.35, peritrematal shield; fig.36, sternal shield; fig.37, chelicera; fig.38, posterior ventral surface; fig.39; spermatheca.

smoothly with an angle into the evenly bulged neck portion. The small lips are close to the position of the duct. The shank is constricted and its outer margins diverge moderately to form a trumpet.

Chelicerae (fig. 31): The fixed digit (length, 32 µ) of the chelicera bear one prominent tooth, three denticles and a pilus dentilis. The movable digit (length, 32 µ) is provided with one denticle.

Legs: Leg IV bears three macrosetae, the length of the one on the genu measuring 42 µ, on the tibia 36-39 µ and on the basitarsus 53-58 µ.

Male: Unknown.

Material: Holotype female (serial no. 1/1/62) and four female paratypes from leaves of Quercus sp., Grabouw, C.P., 2 January 1955; collected by P.A.J. Ryke.

Amblyseius (Typhlodromalus) raptor, spec. nov.

(Figs. 34 - 39)

This species differs from other members of the genus in that seta L_8, the longest seta on the dorsum, is longer than setae L_4, D_1 and L_1, which are equal in length. The posterior margin of the median lobe of the sternal shield has an irregular outline and the lateral lobe has a sharp projection posteriorly.

Female:/.....

Female:

Dorsum (fig. 34). The mildly imbricate shield (Length, 368-388 μ; breadth, 216-228 μ) is provided with 17 pairs of setae, six pairs of which are placed in the dorsal (D), three in the median (M) and eight in the lateral (L) series. The lengths of these setae are as follows: D_1, 39-41 μ; D_2, 9-10 μ; D_3, 9-10 μ; D_4, 14-16 μ; D_5, 14-16 μ; D_6, 6-8 μ; M_1, 9-10 μ; M_2, 14-16 μ; M_3, 16-19 μ; L_1, 39-41 μ; L_2, 13-14 μ; L_3, 18-20 μ; L_4, 39-41 μ; L_5, 16-19 μ; L_6, 16-19 μ; L_7, 16-19 μ; L_8, 55-58 μ. Seta L_1 is as long as the distance between its base and that of L_2. The stout seta L_4 is nearly as long as the distance between the bases of setae L_4 & L_3. Setae L_2, L_3 and L_7 are much shorter than the distance between L_2 & L_3, L_3 & L_4 and L_7 & L_8 respectively. Setae D_1, L_1 and L_4 are equal in length. Setae D_2, D_3 and M_1 are equal in length. Setae D_4, D_5 and M_2 are equal in length and so are M_3, L_5, L_6 and L_7. The stout and slightly pectinate setae L_8 are shorter than the distance between their bases. Setae S_1 and S_2 are placed on the interscutal membrane. Seta S_2 lies posterior to M_2.

Venter: The sternal shield (fig. 36) (length, 80-86 μ; breadth, 73-76 μ) bears three pairs of setae. The posterior margin of the median lobe has an irregular outline. The lateral lobe has a sharp projection posteriorly. The incision cuts in on the lateral lobe at a sharp angle. Sternal setae IV are situated on irregularly shaped metasternal shields. The genital shield (fig. 38) is normal (width, 94-98 μ) and provided with a pair of setae.

The ventri-anal/.....

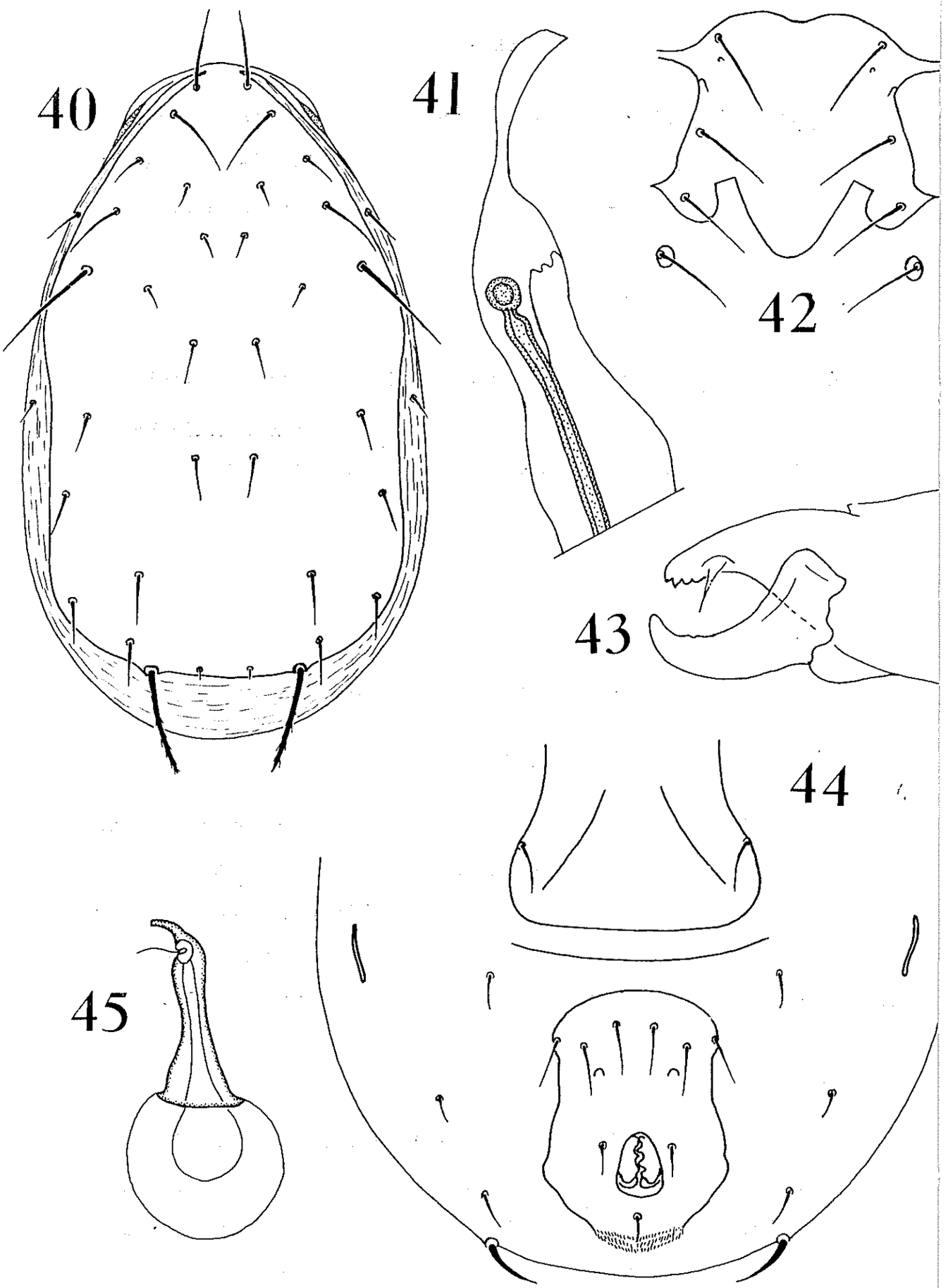
The ventri-anal shield (fig. 38) which is much longer (109-114 μ) than broad (77-83 μ) has a rounded anterior margin, with a median anterior indentation. The lateral margins are constricted, leaving the broadest part across the anus. The posterior margin is smoothly rounded. The three pairs of pre-anal setae are anteriorly grouped with a pair of pores. The normal three para-anal setae are present.

The ventral interscutal membrane flanking the ventri-anal shield is provided with four pairs of setae, one pair (VL_1) being long (30-34 μ) and curved. Metapodal shields are probably absent. The peritrematal shields fuse antero-dorsally with the dorsal shield (fig. 34) and curve posteriorly around coxae IV (fig. 35), with broad blunt ends. Antero-dorsally the peritremes reach to a position near the level of setae L_1.

Spermathecae (fig. 39): The spermatheca is of moderate length (38 μ) and rather stout. The straight duct forms a blunt angle where it meets the bulged elongated oval neck portion. The small lips are situated in the centre of the neck portion. The shank is slightly constricted and its lateral margins diverge gradually to form a somewhat flared trumpet.

Chelicerae (fig. 37): The fixed digit (length, 26 μ) of the chelicera is provided with two prominent teeth and one to two small denticles, and a pilus dentilus. The movable digit (length, 26 μ) bears two barely detectable denticles.

Legs/.....



FIGS.40-45 Amblyseius (Typhlodromalus) citri, spec. nov., female

Fig.40, dorsum; fig.41, peritrematal shield; fig.42, sternal shield; fig.43, chelicera; fig.44, posterior ventral surface; fig.45, spermatheca.

Legs: Leg IV bears three macrosetae, the one on the genu being 43-46 μ in length, on the tibia 36-39 μ and on the basitarsus 55-58 μ. The other legs are normal.

Male: Unknown.

Material studied: Holotype female (serial no. 33/13/58/1 and four female paratypes from leaves of Passiflora sp., Grabouw, C.P., 17 November 1953; collected by P.A.J. Ryke.

Amblyseius (Typhlodromalus) citri spec. nov.

(Figs. 40-45)

This species differs from other members of the genus in that seta L_4 is longer than L_8 and setae D_1 and L_1 are equal in length. The posterior outlines of the posterior margins of the median and lateral lobes of the sternal shield are smooth and the incisions are rather wide.

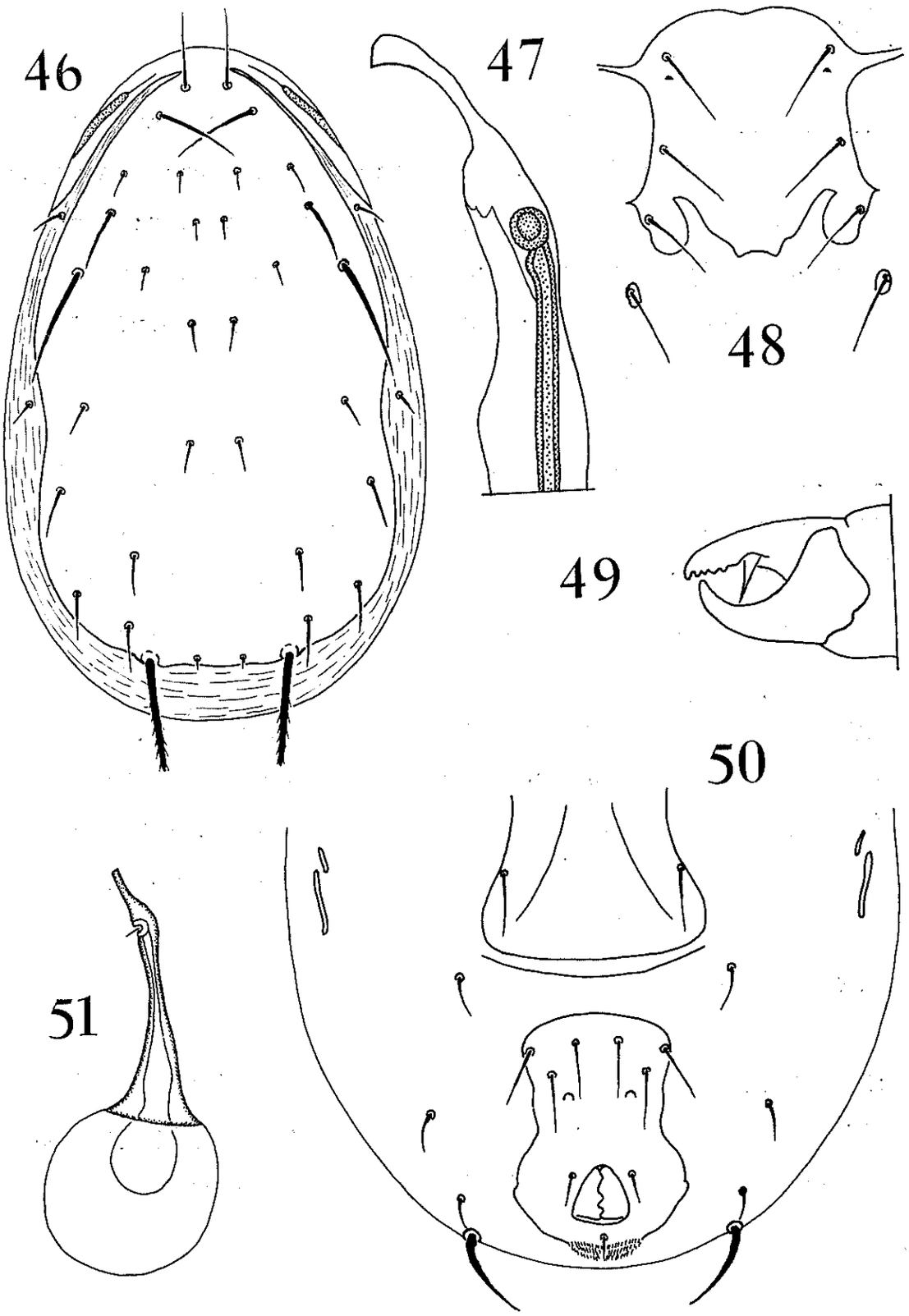
Female:

Dorsum (fig. 40): The mildly imbricate shield (length, 348-354 μ; breadth, 214-220 μ) is provided with 17 pairs of setae, six pairs of which are placed in the dorsal (D), three in the median (M) and eight in the lateral (L) series. The lengths of these setae are as follows: D_1, 40-42 μ; D_2, 10-13 μ; D_3, 10-13 μ; D_4, 20-23 μ; D_5, 20-23 μ; D_6, 9 μ; M_1, 10-13 μ; M_2, 20-22 μ; M_3, 26-28 μ; L_1, 39-41 μ; L_2, 18-20 μ; L_3, 33-36 μ; L_4, 62-66 μ; L_5, 23-25 μ; L_6, 23-25 μ; L_7, 23-25 μ;/.....

L_7, 23-25 μ; L_8, 58-60 μ. Setae L_1, L_4 and L_7 are distinctly longer than the distance between the bases of L_1 & L_2, L_4 & L_3 and L_7 & L_8 respectively. L_3 are nearly as long as the distance between L_3 & L_4. Setae D_1 and L_1 are of approximately equal length. Setae D_2, D_3 and M_1 are equal in length. Setae D_4, D_5 and M_2 are also equal in length, as well as L_5 and L_7. The stout setae L_8 are slightly pectinate and much shorter than the distance between their bases. Setae S_1 and S_2 are placed on the interscutal membrane. Seta S_2 lies a little anterior to M_2.

Venter: The sternal shield (fig. 42) (length, 80-85 μ; breadth, 72-77 μ) bears three pairs of setae. Posteriorly the median and lateral lobes are smooth and the incisions are rather wide and angular. Sternal setae IV are situated on small round metasternal shields. The genital shield (fig. 44) is normal (width, 96-100 μ) and provided with one pair of setae. The ventri-anal shield (fig. 44) which is much longer (105-114 μ) than broad (70-74 μ) has a rounded anterior margin; the lateral margins run parallel posteriorly for a short distance and then diverge to the broadest region across the anus. The shield bears three pairs of pre-anal setae and a pair of pores. The normal three para-anal setae are present. The ventral interscutal membrane flanking the ventri-anal shield is provided with four pairs of setae, one pair (VL_1) being long (33-35 μ) and curved. One pair of slender metapodal shields is present. The peritrematal shields fuse antero-dorsally with the dorsal shield (fig. 40) and curve posteriorly around coxae IV (fig. 41), ending in a sharp point. The peritremes

reach/.....



FIGS.46-51. Amblyseius (Typhlodromalus) addoi, spec. nov., female

Fig.46, dorsum; fig.47, peritrematal shield; fig.48, sternal shield; fig.49, chelicera; fig.50, posterior ventral surface; fig.51, spermatheca.

reach dorsally to a position close to the level of setae L_1.

Spermathecae (fig. 45): The stout, short spermatheca measures 30 µ in length. The curved duct forms an angle with the slightly and evenly bulged neck portion; the prominent lips are placed almost where the duct meets the neck portion. The shank diverges slightly towards its flared distal end.

Chelicerae (fig. 43): The fixed digit (length, 29 µ) of the chelicera bears one to two prominent teeth, one to two smaller ones and a pilus dentilus. The movable digit (length, 29 µ) bears one or two denticles.

Legs: Leg IV is provided with three macrosetae, the length of the one on the genu being 52-58 µ, on the tibia 38-43 µ and on the basi-tarsus 52-58 µ. The seta on the tibia is blunt. The other legs are normal.

Male: Unknown.

Material studied: Holotype female (serial no. 2/1/62) and four paratype females from the leaves of Citrus sp., Rustenburg, 29 November 1961; collected by the author.

Amblyseius (Typhlodromalus) addoi, spec. nov.

(Figs. 46-54)

This species differs from other members of the genus in that seta L_4 is longer than L_8 and seta D_1 is shorter than L_1,/.....

L_1, while seta L_3 is shorter than the distance between its base and that of L_4. The posterior margin of the lateral lobe of the sternal shield is smooth.

Female:

Dorsum (fig. 46): The mildly imbricate shield (length, 355-375 μ; breadth, 220-228 μ) is provided with 17 pairs of setae, six of which are placed in the dorsal (D), three in the median (M) and eight in the lateral (L) series. The lengths of these setae are as follows: D_1, 39-42 μ; D_2, 9-10 μ; D_3, 9-10 μ; D_4, 16-17 μ; D_5, 16-18 μ; D_6, 6-8 μ; M_1, 9-10 μ; M_2, 16-12 μ; M_3, 19-20 μ; L_1, 47-49 μ; L_2, 14-15 μ; L_3, 32-35 μ; L_4, 65-68 μ; L_5, 24-26 μ; L_6, 24-26 μ; L_7, 24-27 μ; L_8, 63-65 μ. Setae D_2, D_3, M_1 are equal in length. D_4, D_5 and M_2 are equal in length and so are L_5, L_6 and L_7. Setae L_1, L_4 and L_7 are longer than the distances between the bases of L_1 & L_2, L_4 & L_3 and L_7 & L_8 respectively. Seta L_3 is not much shorter than the distance between its base and that of L_4. The stout and faintly pectinate setae L_8 are shorter than the distance between their bases. Setae S_1 and S_2 are placed on the interscutal membrane. Seta S_2 lies lateral to M_2, at the same level.

Venter: The sternal shield (fig. 48) (length, 82-88 μ; breadth, 74-76 μ) bears three pairs of setae. Posteriorly the median lobe has two slight protuberances; the lateral lobes are smooth and prominent. The incision has a sharp point towards the lateral lobe. The pair of small oval metasternal shields bears a pair of setae. The genital shield (fig. 50) is normal (width 88-92 μ)

and provided/.....

and provided with a pair of setae.

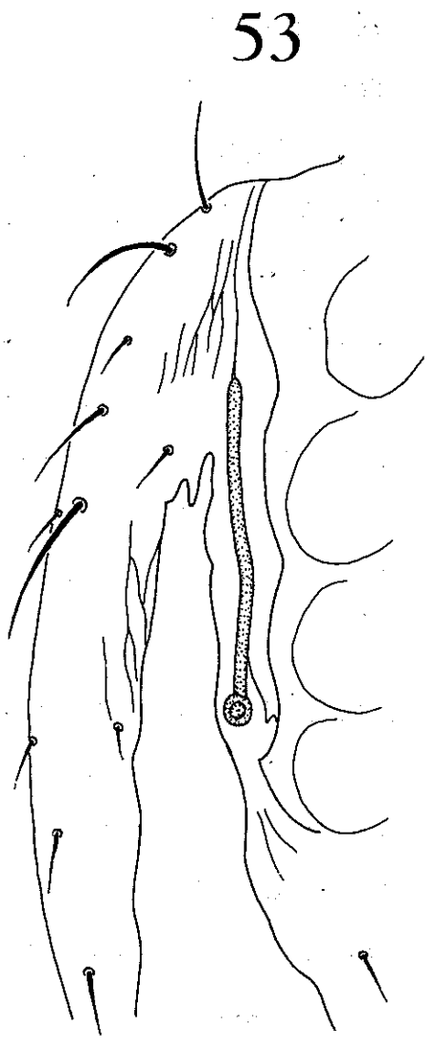
The ventri-anal shield (fig. 50) which is much longer (114-120 μ) than broad (72-76 μ) has a smooth anterior margin. The lateral margins are slightly irregularly constricted, diverging suddenly to the broadest part across the anus. The posterior margin is also slightly irregular. Three pairs of pre-anal setae and a pair of pores are anteriorly grouped. The normal three para-anal setae are present.

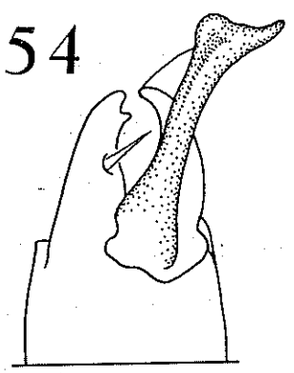
The ventral interscutal membrane flanking the ventri-anal shield is provided with four pairs of setae, one pair (VL_1) being long (40-45 μ) and slightly curved. The membrane is also provided with two pairs of metapodal plates, the primary one being long and slender. The peritrematal shields fuse antero-dorsally with the dorsal shield (fig. 46) and curve posteriorly around coxae IV (fig. 47), each ending in an obtuse angle. The peritreme reaches anterodorsally to a position at the level of seta L_1.

Spermathecae (fig. 51): The slender spermatheca measures 38 μ in length and has a straight duct. It runs straight into the neck portion. The lips are positioned in the centre of the neck protion which is only slightly bulged opposite the lips, The lateral margins of the shank run nearly parallel, diverging slowly to form a narrow trumpet.

Chelicerae (fig. 49): The fixed digit (length, 22 μ) of the chelicera bears four teeth and one or two small denticles and a pilus dentilus. The movable digit

(length, 22 μ)/.....





FIGS.52-54. Amblyseius (Typhlodromalus) addoi, spec. nov., male

Fig.52, venter; fig.53, lateral; fig.54, chelicera.

(length, 22 μ) is devoid of teeth.

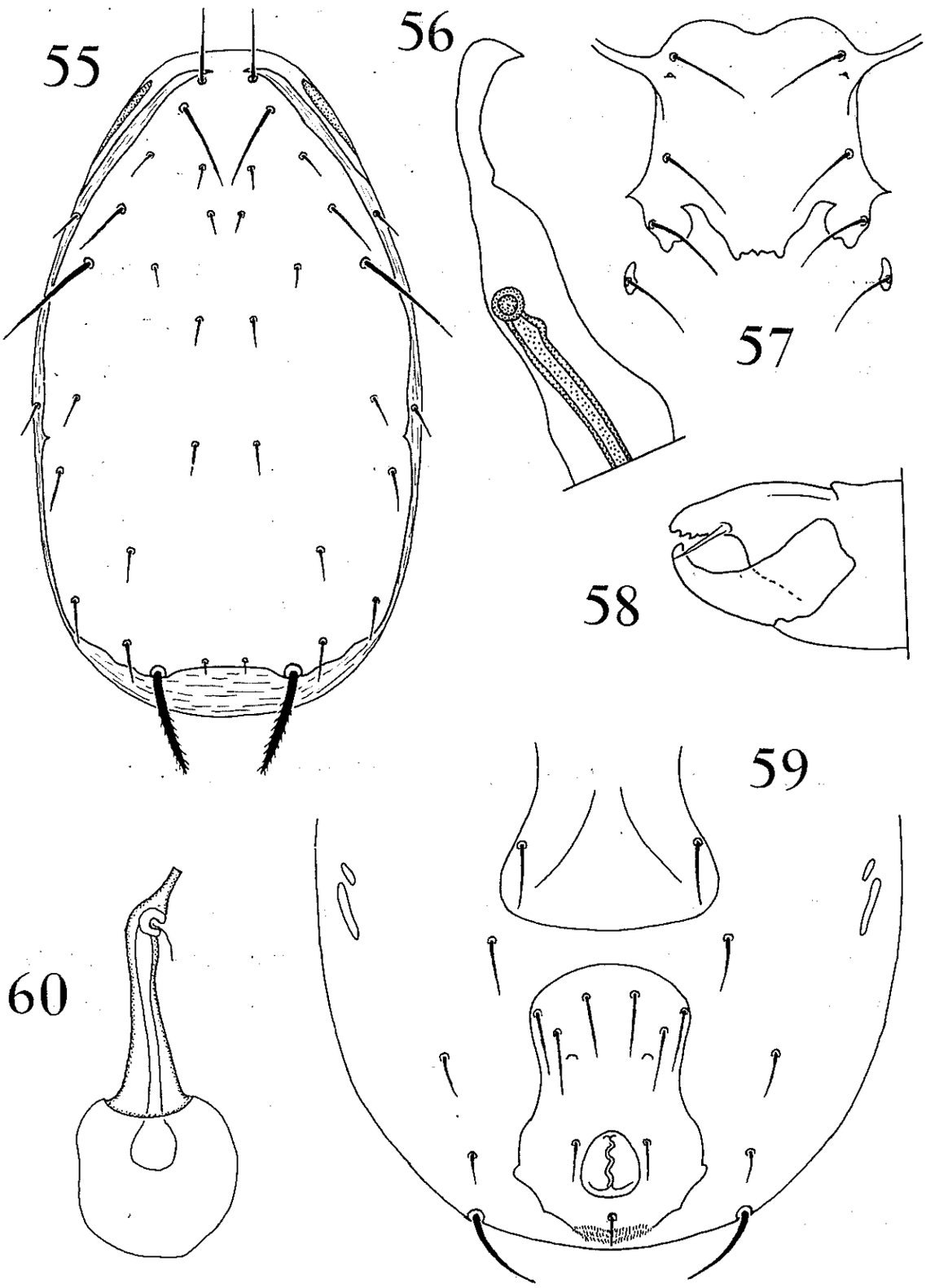
Legs: Leg IV is provided with three macrosetae, the length of the one on the genu being 55-58 μ, on the tibia 42-45μ and on the basitarsus 62-66 μ. The other legs are normal.

Male:

Dorsum: The mildly imbricate shield measures 274-284 μ by 172-178 μ and the chaetotaxy resembles that of the female. The lengths of the setae are as follows: D_1, 36-38 μ; D_2, 9-10 μ; D_3, 9-10 μ; D_4, 14-15 μ; D_5, 16-17 μ; D_6, 6 μ; M_1, 9-10 μ; M_2, 16-17 μ; M_3, 18-19 μ; L_1, 43-45 μ; L_2, 16-17 μ; L_3, 31-32 μ; L_4, 51-53 μ; L_5, 21-23 μ; L_6, 21-23 μ; L_7, 21-23 μ; L_8, 48-50 μ. The relative lengths of the setae differ from those of the female in that seta L_3 is longer than the distance between its base and that of L_4. Setae S_1 and S_2 are placed on the dorsal shield (fig. 53).

Venter: The sternal shield (fig. 52) is longer than wide and bears five pairs of setae, with the genital opening on its anterior margin. The ventri-anal shield, provided with three pairs of pre-anal setae and a pair of pores, fuses laterally with the peritrematal shields. The para-anal setae are normal. The ventral interscutal membrane bears only one pair of setae (VL_1). The peritrematal shields (fig. 53) are fused antero-dorsally with the dorsal shield at a position near the level of S_1. The peritreme reaches anteriorly to a position between the levels of setae L_2 and L_3.

Chelicerae/.....



FIGS.55-60. Amblyseius (Typhlodromalus) undulatus, spec. nov., female

Fig.55, dorsum; fig.56, peritrematal shield; fig.57, sternal shield; fig.58, chelicera; fig.59, posterior ventral surface; fig.60, spermatheca.

Chelicerae (fig. 54): The fixed digit of the chelicera bears one prominent tooth and a pilus dentilis. The movable digit is devoid of teeth and bears a well developed, foot-shaped, spermatophoral process.

Legs: Leg IV is provided with three macrosetae, the one on the genus being 39-43 μ long, on the tibia 33-37 μ and on the basitarsus 48-52 μ. The other legs are normal.

Material studied: Holotype female (serial no. 3/1/62), six female paratypes and two male allotypes from leaves of Vitis sp., Addo, 20 March 1961; collected by the author.

Amblyseius (Typhlodromalus) undulatus, spec. nov.

(Figs. 55-63)

This species differs from other members of the genus in that seta L_4 is longer than L_8 and seta D_1 shorter than L_1, while seta L_3 is as long as the distance between its base and that of seta L_4. The posterior margin of the lateral lobe of the sternal shield is undulate.

Female:

Dorsum (fig. 55): The mildly imbricate shield (length, 350-362 μ; breadth 215-228 μ) is provided with 17 pairs of setae, six pairs of which are placed in the dorsal (D), three in the median (M) and eight in the lateral (L) series. The lengths of these setae are as follows: D_1, 37-39 μ; D_2, 9-11 μ; D_3, 9-11 μ; D_4, 14-15 μ; D_5, 16-17 μ; D_6, 6 μ; M_1, 9-11 μ; M_2, 16-17 μ/.....

M_2, 16-17 μ; M_3, 18-20 μ; L_1, 45-48 μ; L_2, 14-15 μ; L_3, 32-34 μ; L_4, 61-64 μ; L_5, 21-23 μ; L_6, 22-24 μ; L_7, 21-23 μ; L_8, 55-58 μ. Setae D_2, D_3 and M_1 are equal in length. Setae D_4 and L_2 are equal in length and so are setae D_5 and M_2. Setae L_5, L_6 and L_7 are approximately equal in length and a little longer than seta M_3. Setae L_1, L_4 and L_7 are longer than the distances between the bases of setae L_1 & L_2, L_4 & L_3 and L_7 & L_8 respectively. Seta L_3 is as long or nearly as long, as the distance between the bases of setae L_3 & L_4, but seta L_2 is much shorter than the distance between the bases of setae L_2 & L_3. The stout and slightly pectinate setae L_8 are shorter than the distance between their bases. Setae S_1 & S_2 are placed on the interscutal membrane, with seta S_2 slightly posterior to the level of seta M_2.

Venter: The sternal shield (fig. 57) (length, 80-84 μ; breadth, 73-76 μ) bears three pairs of setae. The posterior margin of the median lobe is irregular with two projections laterally. The lateral lobe is undulate posteriorly and the incision has a sharp point towards the lateral lobe. Sternal setae IV are situated on semicircular metasternal shields. The genital shield (fig. 59) is normal (width, 88-92 μ) and provided with a pair of setae.

The ventri-anal shield (fig. 59), which is much longer (103-109 μ) than broad (66-69 μ), has a rounded anterior margin and slightly constricted lateral margins, which diverge suddenly towards the broadest part across the anus. The posterior margin is round and slightly irregular. The three pairs of pre-anal setae and a pair of pores are anteriorly grouped on the shield. The three para-anal

setae/.....

setae are normal.

The ventral interscutal membrane flanking the ventri-anal shield is provided with four pairs of setae, one pair (VL_1) being long (35-40 μ) and slightly curved. Two pairs of metapodal shields are present, the primary ones being slender and approximately three times the length of the smaller anterior ones. The peritrematal shields fuse antero-dorsally with the dorsal shield (fig. 55) and curve posteriorly around coxae IV (fig. 56), ending broadly with a sharp point medially. The peritreme reaches antero-dorsally beyond the level of seta L_1.

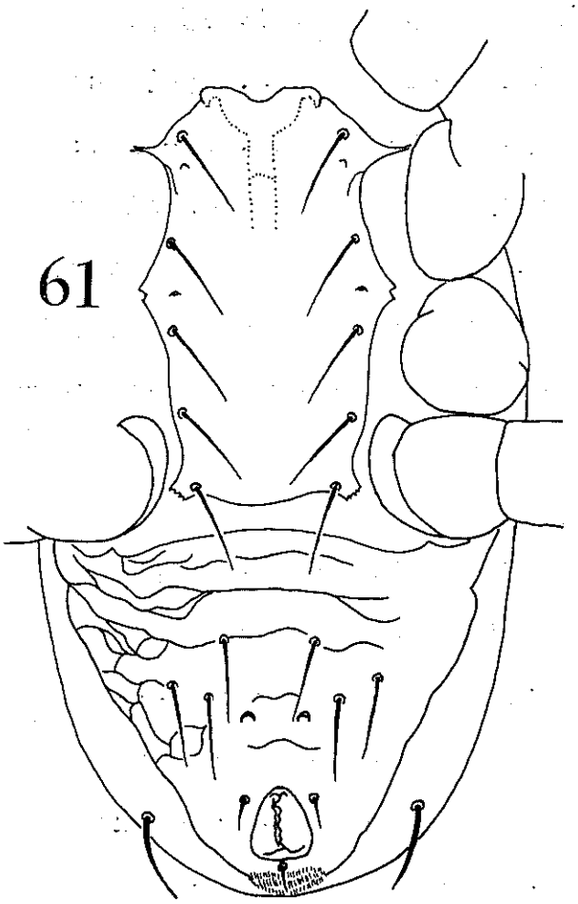
Spermathecae (fig. 60): The rather stout spermatheca measures 36 μ in length. The straight prominent duct continues into a smoothly bulged neck portion. The big lips lie a short distance from the centre of the neck portion towards the position of the duct. The shank is very slightly constricted, its outer margins running more or less parallel to the distal end where it is slightly flared.

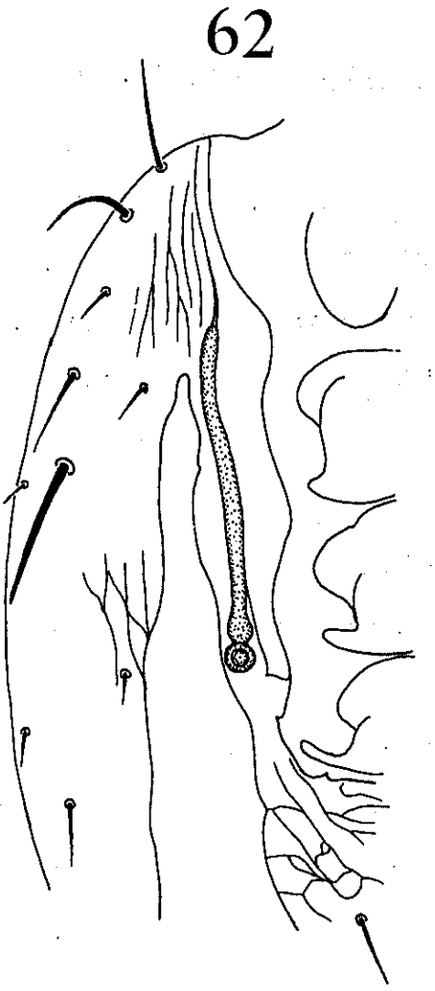
Chelicerae (fig. 58): The fixed digit (length, 26 μ) of the chelicera is provided with two to three teeth and a pilus dentilis. The movable digit (length, 26 μ) is devoid of teeth.

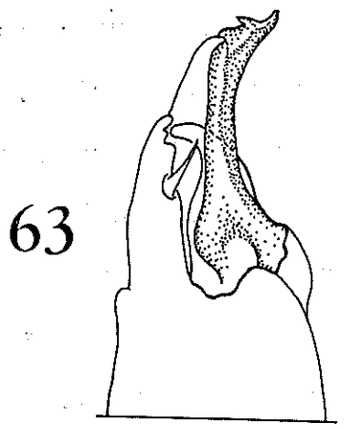
Legs: Leg IV bears three macrosetae, the length of the one on the genu being 52-55 μ, on the tibia 38-40 μ and on the basitarsus 58-62 μ. The other legs are normal.

Male:

Dorsum: The imbricate dorsal shield measures







FIGS.61-63. Amblyseius (Typhlodromalus) undulatus, spec. nov., male

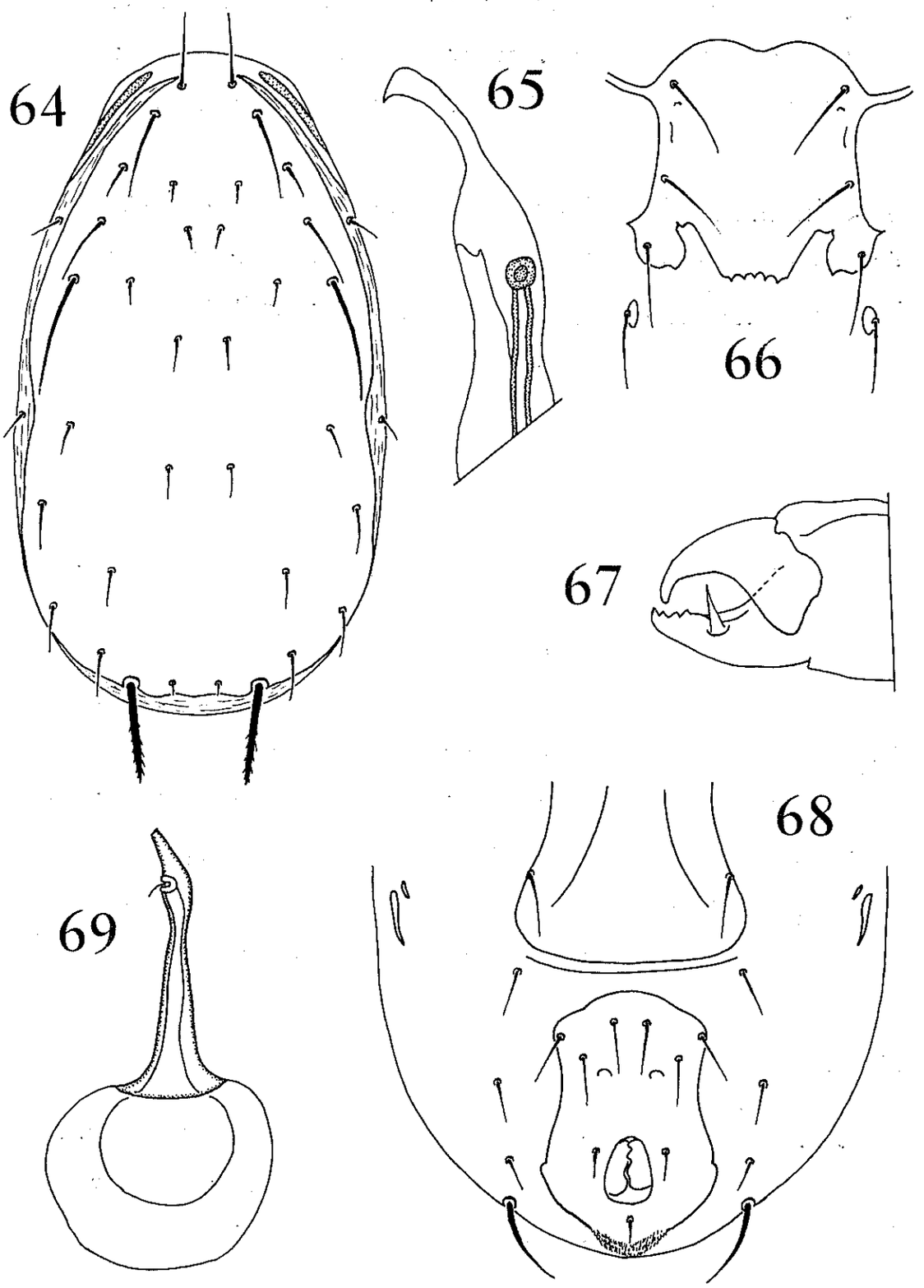
Fig.61, venter; fig.62, lateral; fig.63, chelicera.

273-282 μ by 155-161 μ and the chaetotaxy resembles that of the female. The lengths of the setae are as follows: D_1, 33-35 μ; D_2, 9-10 μ; D_3, 9-10 μ; D_4, 14-15 μ; D_5, 15-16 μ; D_6, 6-7 μ; M_1, 9-10 μ; M_2, 14-15 μ; M_3, 17-18 μ; L_1, 36-39 μ; L_2, 15-16 μ; L_3, 29-32 μ; L_4, 46-49 μ; L_5, 21-22 μ; L_6, 22-23 μ; L_7, 22-23 μ; L_8, 46-49 μ; The relative lengths of the setae differ from those of the female in that setae L_4 and L_8 are of equal length. Setae S_1 and S_2 are placed on the dorsal shield (fig. 62) with S_1 on the same level as L_3 and seta S_2 decidedly anterior to M_2.

Venter: The sternal shield (fig. 61) is much longer than wide and bears five pairs of setae with the genital opening on the anterior margin. The imbricate ventri-anal shield (fig. 61), provided with three pairs of pre-anal setae and a pair of pores, fuses antero-laterally with the peritrematal shields. The anterior margin of the ventri-anal shield is slightly convex but for a sharp projection where it fuses laterally with the peritrematal shield. The tapering lateral margins are irregular. The para-anal setae are normal. The ventral interscutal membrane flanking the ventri-anal shield bears only one pair of setae (VL_1). The peritremental shields (fig. 62) are fused with the dorsal shield. The peritreme reaches anteriorly to a position near the level of seta L_2.

Chelicerae (fig. 63): The fixed digit (length, 21 μ) of the chelicera bears two teeth and a pilus dentilis. The movable digit (length, 21 μ) is devoid of teeth and bears the spermatophoral process (length, 32 μ) which has two hooks on its distal margin.

Legs/.....



FIGS.64-69. Amblyseius (Typhlodromalus) capensis, spec. nov., female

Fig.64, dorsum; fig.65, peritrematal shield; fig.66, sternal shield; fig.67, chelicera; fig.68, posterior ventral surface; fig.69, spermatheca.

Legs: Leg IV bears three macrosetae, the one on the genu being 40-43 μ long, on the tibia 35-37 μ and on the basitarsus 49-52 μ. The other legs are normal.

Material studied: Holotype female (serial no. 4/1/62), four female paratypes and two male allotypes from the leaves of Quercus sp. Addo, C.P., 20 March 1961; collected by the author.

Amblyseius (Typhlodromalus) capensis, spec. nov.

(Figs. 64-69)

This species differs from other members of the genus in that seta L_4 is longer than L_8 and seta D_1 shorter than L_1, while seta L_3 is greater in length and seta L_2 shorter than the distance between the bases of setae L_3 & L_4 and L_2 & L_3 respectively. The posterior margin of the median lobe of the sternal shield is serrated.

Female:

Dorsum (fig. 64): The mildly imbricate dorsal shield (length, 362-375 μ; breadth 209-220 μ) is provided with 17 pairs of setae, six in the dorsal (D), three in the median (M) and eight in the lateral (L) series. The lengths of these setae are as follows: D_1, 38-40 μ; D_2, 9-11 μ; D_3, 9-11 μ; D_4, 16-17 μ; D_5, 16-17 μ; D_6, 6-8 μ; M_1, 9-11 μ; M_2, 16-17 μ; M_3, 19-20 μ; L_1, 47-51 μ; L_2, 16-18 μ; L_3, 37-40 μ; L_4, 65-68 μ; L_5, 23-24 μ; L_6, 23-24 μ; L_7, 23-24 μ; L_8, 58-61 μ. Setae D_1 and L_3 are approximately equal in length. Setae

D_2, D_3 /.....

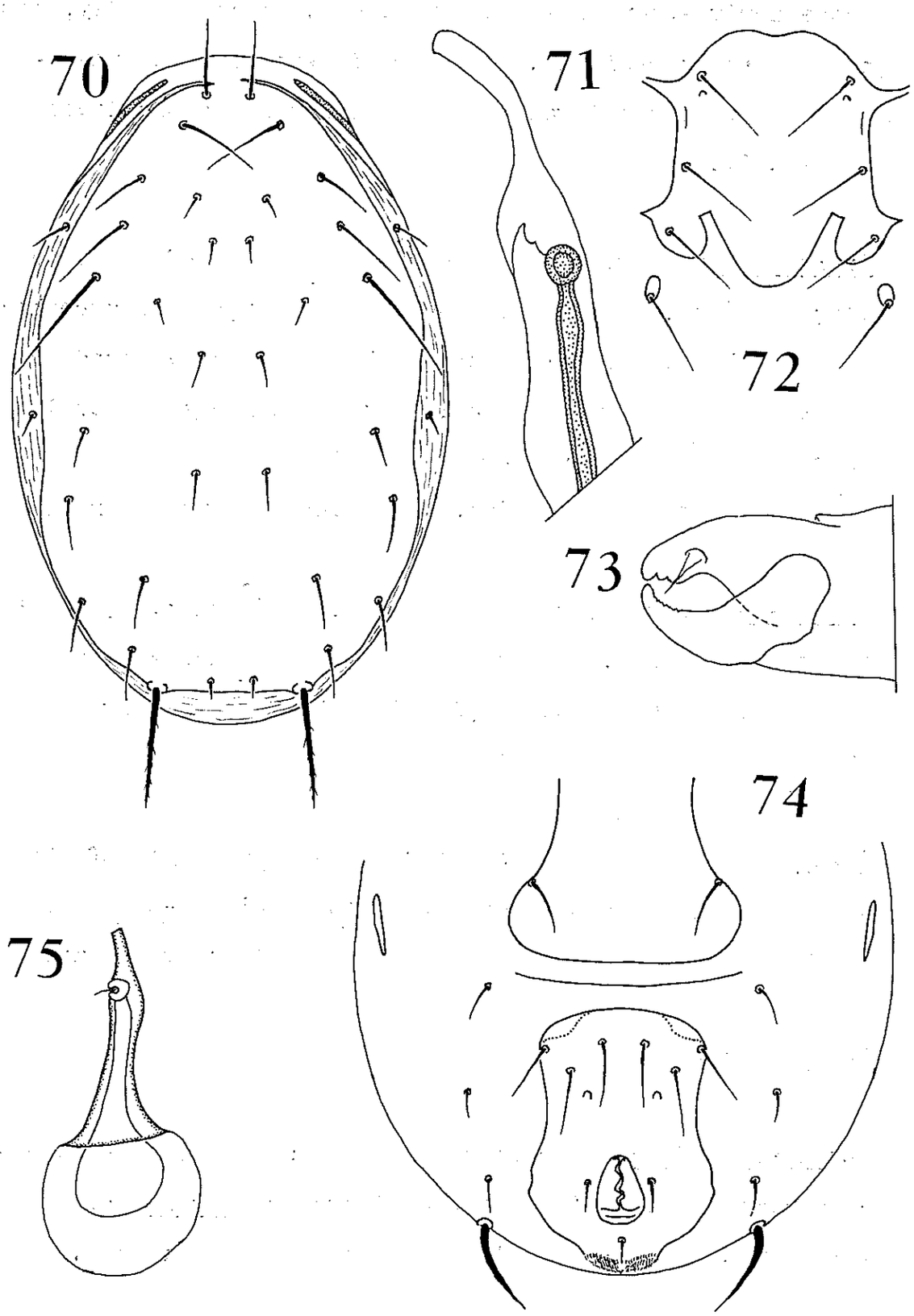
D_2, D_3 and M_1 are of equal length. Setae D_4, D_5, M_2 and L_2 are of equal length and so are L_5, L_6 and L_7. Setae L_1, L_3, L_4 and L_7 are longer than the distances between setae L_1 & L_2, L_3 & L_4, L_4 & L_3 and L_7 & L_8 respectively. The stout and faintly pectinate setae L_8 are shorter than the distance between their bases. Setae S_1 and S_2 are placed on the interscutal membrane.

Venter: The sternal shield (fig. 66) (length, 85-87 μ breadth, 71-74 μ) bears three pairs of setae. The posterior margin of the median lobe is serrated and the lateral lobe is slightly irregular. The incision is broad and angular, having another much smaller incision near the lateral corner. Sternal setae IV are situated on small oval metasternal shields. The genital shield (fig. 68) is normal (width, 88-95 μ) and provided with a pair of setae.

The ventri-anal shield (fig. 68) which is much longer (108-114 μ) than broad (71-77 μ) has a rounded anterior margin with two slight depressions laterally. The lateral margins are slightly constricted and diverge gradually to the broadest part of the shield across the anus. Anteriorly the ventri-anal shield bears three pairs of pre-anal setae and a pair of pores. The normal para-anal setae are present.

The ventral interscutal membrane, flanking the ventri-anal shield, is provided with four pairs of setae, one pair (VL_1) being long (40-42 μ) and slightly curved. Two pairs of metapodal plates are present, the primary ones being long and slender. The peritrematal shields fuse antero-dorsally with the dorsal shield (fig. 64) and curve

posteriorly/.....



FIGS.70-75. Amblyseius (Typhlodromalus) erugatus, spec. nov., female

Fig.70, dorsum; fig.71, peritrematal shield; fig.72, sternal shield; fig.73, chelicera; fig.74, posterior ventral surface; fig.75; spermatheca.

posteriorly around coxae IV (fig. 65), ending broadly, with a sharp point medially. The peritreme reaches antero-dorsally past the level of seta L_1, nearly to the level of seta D_1.

Spermathecae (fig. 69): The spermatheca is of moderate length (36 μ). The stout duct runs straight and smoothly into the bulged neck portion. The lips are situated in a position close to the duct. The constricted lateral margins of the shank diverge slightly towards the distal end where it is flared, dorming a narrow trumpet.

Chelicerae (fig. 67): The fixed digit (length, 23 μ) of the chelicera is provided with three teeth and a pilus dentilis. The movable digit (length, 23 μ) is devoid of teeth.

Legs: Leg IV bears three macrosetae, the length of the one on the genu being 55-56 μ, on the tibia 42-43 μ and on the basitarsus 61-63 μ. The other legs are normal.

Male: Unknown.

Material studied: Holotype female (serial no. 5/1/62) and three paratype females from leaves of Betula sp., Addo, C.P. 20 March 1961; collected by the author.

Amblyseius (Typhlodromalus) erugatus, spec. nov.

(Figs. 70-78)

This species differs from other members of the genus

in that/.....

in that seta L_4 is longer than L_8 and seta D_1 is shorter than L_1. Setae L_3 and L_2 are greater in length, and seta D_2 shorter, than the distances between bases L_3 & L_4; L_2 & L_3 and D_2 & D_3 respectively. The median and lateral lobes of the sternal shield are smoothly rounded.

Female:

Dorsum (fig. 70). The mildly imbricate shield (length, 375-388 μ; breadth, 214-220 μ) is provided with 17 pairs of setae, six in the dorsal (D), three in the median (M) and eight in the lateral (L) series. The lengths of these setae are as follows: D_1, 42-45 μ; D_2, 13-14 μ; D_3, 13-14 μ; D_4, 19-21 μ; D_5, 22-23 μ; D_6, 7-9 μ; M_1, 13-14 μ; M_2, 22-23 μ; M_3, 26-29 μ; L_1, 46-49 μ; L_2, 33-36 μ; L_3, 51-55 μ; L_4, 69-72 μ; L_5, 26-29 μ; L_6, 26-29 μ; L_7, 26-29 μ; L_8, 65-68 μ. Setae D_2, D_3, and M_1 are equal in length, as are setae D_5 and M_2 and setae M_3, L_5, L_6 and L_7. Setae D_4 are slightly shorter than D_5 and M_2. Setae L_1, L_2 and L_7 are each longer than the distance between their bases and the bases of the next setae in the lateral series. Seta L_4 is longer than the distance between the bases of L_4 & L_3 and even longer than that between the bases of L_4 & L_2. The stout needle-shaped (not blunt) setae L_8 are very faintly and sparsely spectinate. Setae S_1 and S_2 are placed on the interscutal membrane. Seta S_2 lies anterior to the level of seta M_2.

Venter: The sternal shield (fig. 72) (length, 90-95 μ; breadth, 72-75 μ) bears three pairs of setae. The median and lateral lobes are smoothly rounded and the incision squarely cut. Sternal setae IV are situated on the

posterior/.....

posterior margin of small oval metasternal shields. The genital shield (fig. 74) is normal (width, 95-100 μ) and provided with a pair of setae.

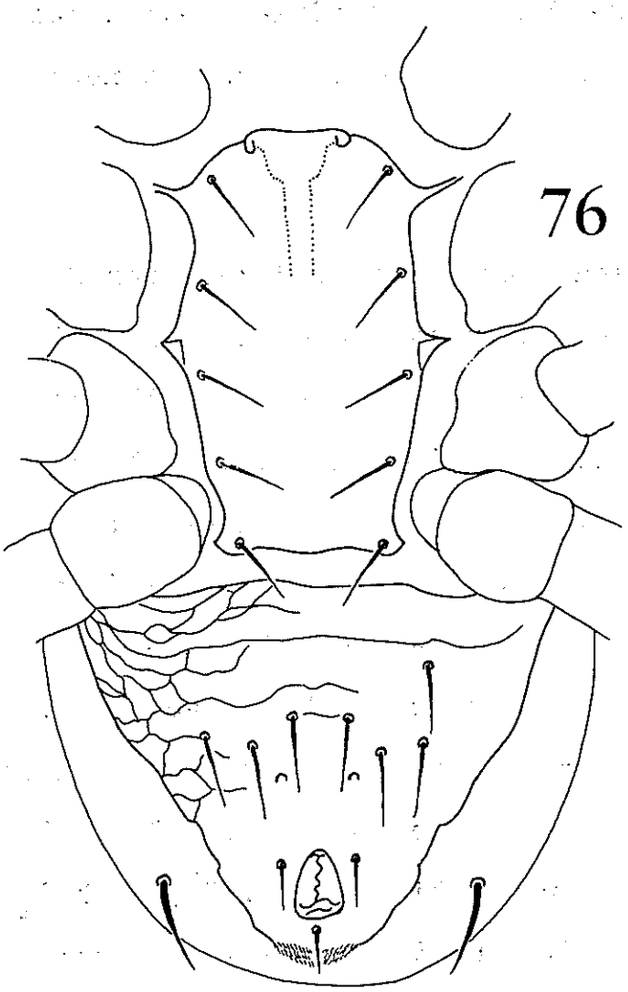
The ventri-anal shield (fig. 74) which is longer (108-114 μ) than broad (75-79 μ) has a flattened round anterior margin (in some specimens the lateral part is depressed) and constricted lateral margins which diverge to the broadest part across the anus. Three pairs of pre-anal setae are anteriorly grouped with a pair of pores . The normal three para-anal setae are present.

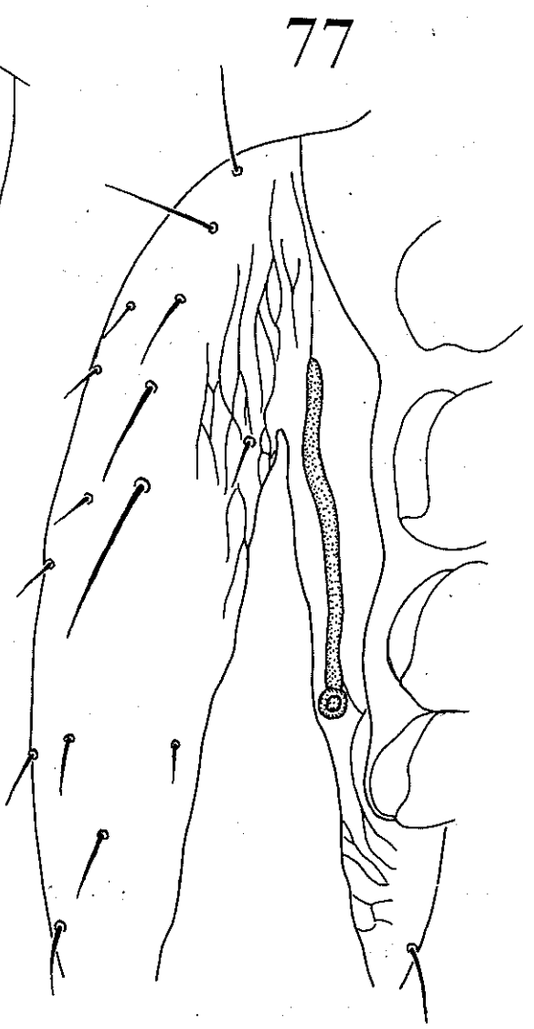
The ventral interscutal membrane flanking the ventri-anal shield is provided with four pairs of setae, one pair (VL_1) being long (44 μ) and curved. A pair of slender metapodal plates is present. The peritrematal shields fuse antero-dorsally with the dorsal shield (fig. 70) and curve posteriorly around coxae IV (fig. 71), ending bluntly. The peritreme reaches antero-dorsally past the level of seta L_1.

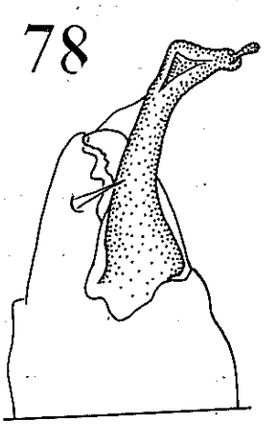
Spermathecae (fig. 75): The stout spermatheca (length 30 μ) has a prominent duct, running straight into the slightly bulged neck portion. The big lips are rather close to the position of the duct. The lateral margins of the shank are slightly constricted, diverging distally to form a trumpet.

Chelicerae (fig. 73): The fixed digit (length, 26 μ) of the chelicera is provided with two prominent blunt teeth and a pilus dentilis. The movable digit (length 26 μ) has a denticulate inner distal margin.

Legs/.....







FIGS.76-78. Amblyseius (Typhlodromalus) erugatus, spec. nov., male

Fig.76, venter; fig.77, lateral; fig.78, chelicera.

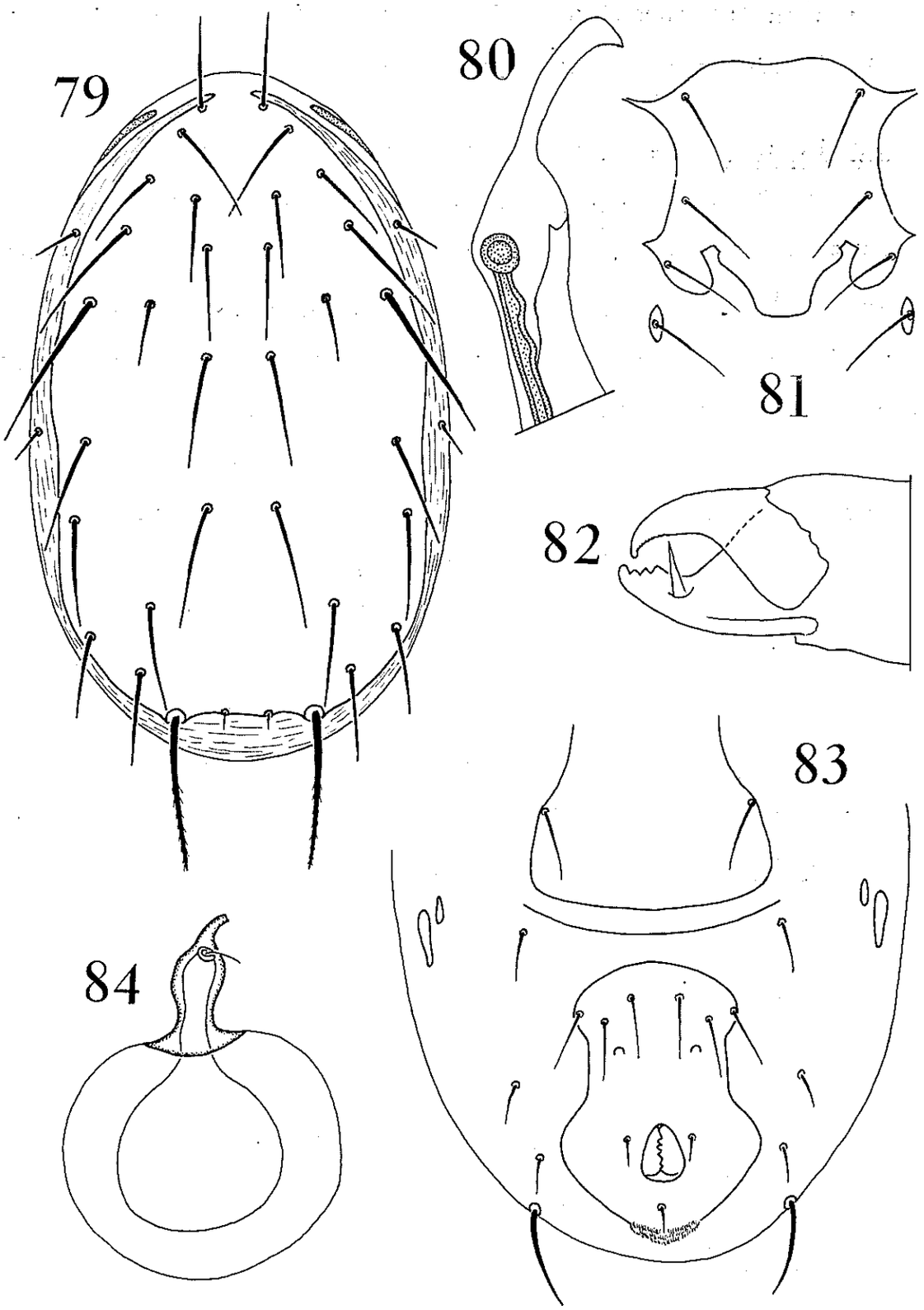
Legs. Leg IV bears three macrosetae, the length of the one on the genu being 58-60 μ, on the tibia 45-48 μ and on the basi-tarsus 67-74 μ. The other legs are normal.

Male:

Dorsum: The imbricate dorsal shield measures 282-294 μ x 174-180 μ and the chaetotaxy resembles that of the female. The lengths of the setae are as follows: D_1, 34-38 μ; D_2, 13-14 μ; D_3, 13-14 μ; D_4, 16-19 μ; D_5, 19-22 μ; D_6, 6-9 μ; M_1, 13-14 μ; M_2, 19-22 μ; M_3, 24-26 μ; L_1, 39-43 μ; L_2, 26-29 μ; L_3, 38-42 μ; L_4, 54-56 μ; L_5, 24-26 μ; L_6, 24-26 μ; L_7, 24-26 μ; L_8, 51-52 μ. The relative lengths of the setae differ from those of the female in that setae L_2 are not as long as the distance between the bases of L_2 & L_3. Setae S_1 and S_2 are placed on the dorsal shield (fig. 77) with S_1 posterior to the level of L_3, and S_2 at the same level as M_2.

Venter: The sternal shield (fig. 76) is much longer than wide and bears five pairs of setae with the genital opening on the anterior margin. The imbricate ventri-anal shield (fig. 76) is provided with three pairs of pre-anal setae (one specimen has an extra pre-anal seta anteriorly) and a pair of pores, and fuses antero-laterally with the peritrematal shields. The anterior margin of the shield is nearly straight. The tapering lateral margins are irregular but have a definite pattern (fig. 76). The para-anal setae are normal. The ventral interscutal membrane, flanking the ventri-anal shield bears only one pair of setae (VL_1). The peritrematal shields (fig. 77) fuse antero-dorsally, at the level of

S_1, with/.....



FIGS.79-84. Amblyseius (Typhlodromalus) transvaalensis, spec. nov., female

Fig.79, dorsum; fig.80, peritrematal shield; fig.81, sternal shield; fig.82, chelicera; fig.83, posterior ventral surface; fig.84, spermatheca.

S_1, with the dorsal shield. The peritreme reaches anteriorly to a position past the level of seta L_3.

Chelicerae: (fig. 78): The fixed digit (length 22 µ) of the chelicera bears two large teeth and a pilus dentilis. The movable digit (length, 22 µ) has one tooth, two or three denticles and a well defined foot-shaped spermatophoral bearer (length, 36 µ) with a small appendix near its extremity.

Legs: Leg IV is provided with three macrosetae, the one on the genu being 32-35 µ long, on the tibia 38-41 µ and on the basitarsus 52-55 µ. The other legs are normal.

Material studied: Holotype female (serial no. 33/13/58/1), seven female paratypes and two male allotypes from leaves of Passiflora sp., Grabouw, C.P., 17 November 1953; collected by P.A.J. Ryke.

Amblyseius (Typhlodromalus) transvaalensis, spec. nov.

(Figs. 79-84)

This species differs from other members of the genus in that seta L_4 is longer than L_8 and seta D_1 shorter than L_1. Setae L_3, L_2 and D_2 are greater in length than the distances between the bases of setae L_3 & L_4, L_2 & L_3 and D_2 & D_3 respectively. The posterior margin of the median lobe of the sternal shield is straight and the lateral lobes are smooth.

Female/.....

Female:

Dorsum (fig. 79): The mildly imbricate dorsal shield (length, 355-370 μ; breadth, 205-220 μ) is provided with 17 pairs of setae, six in the dorsal (D), three in the median (M) and eight in the lateral (L) series. The lengths of these setae are as follows: D_1, 48-52 μ; D_2, 46-50 μ; D_3, 50-53 μ; D_4, 63-65 μ; D_5, 68-70 μ; D_6, 9-12 μ; M_1, 32-35 μ; M_2, 63-65 μ; M_3, 60-63 μ; L_1, 54-57 μ; L_2, 43-46 μ; L_3, 71-74 μ; L_4, 86-90 μ; L_5, 57-60 μ; L_6, 46-48 μ; L_7, 50-52 μ; L_8, 80-86 μ. Setae D_1, D_3 and L_7 are of approximately equal length. Setae D_2 and L_6 are of equal length and slightly longer than seta L_2. Setae D_4 and M_2 are equal in length and slightly longer than seta M_3. Setae D_2, L_1, L_2, L_3, L_4, L_6 and L_7 are longer than the distances between the bases of setae D_2 & D_3, L_1 & L_2, L_2 & L_3, L_3 & L_4, L_4 & L_3, L_6 & L_7 and L_7 & L_8 respectively. Seta M_2 is longer than the distance between its base and that of seta L_5, and the faintly pectinate setae L_8 are slightly longer than the distance between their bases. Setae S_1 and S_2 are placed on the interscutal membrane.

Venter: The sternal shield (fig. 81) (length, 88-95 μ; breadth, 77-80 μ) bears three pairs of setae. The posterior margin of the median lobe is straight and the prominent lateral lobe is smooth. The incision ends angularly, having a smaller incision in the median lobe. Sternal setae IV are situated on oval metasternal shields. The genital shield (fig. 83) is normal (width, 100-106 μ) and provided with a pair of setae.

The ventri-anal shield (fig. 83) is much longer (109-144 μ) than broad (76-79 μ) and has a rounded

anterior/.....

anterior margin and parallel, constricted lateral margins which diverge suddenly posteriorly so that the broadest part of the shield lies across the anus. Three pairs of pre-anal setae and a pair of pores are anteriorly grouped on the shield. The para-anal setae are normal.

The ventral interscutal membrane flanking the ventri-anal shield is provided with four pairs of setae, one pair (VL_1) being long 52-54 μ) and slightly curved. Two pairs of metapodal shields are present, the primary ones being more than twice the length of the smaller ones. The peritrematal shields fuse antero-dorsally with the dorsal shield (fig. 79) and curve posteriorly around coxae IV (fig. 80), ending broadly, with a sharp median point. The peritreme reaches antero-dorsally to a position past the level of seta L_1.

Spermathecae (fig. 84): The short thick spermatheca measures 20 μ in length and has a slightly curved duct. The neck portion is large and greatly bulged with the lips close to the position of the duct. The shank is sharply constricted and flares suddenly towards its end.

Chelicerae (fig. 82): The fixed digit (length, 29 μ) of the chelicera bears three prominent teeth and a pilus dentilis. The movable digit (length, 29 μ) has a denticulate inner distal margin.

Legs: Leg IV is provided with three macrosetae, the length of the one on the genu being 70-74 μ, on the tibia 50-53 μ and on the basitarsus 83-86 μ. The other legs are normal.

Male:/.....

Male: Unknown.

Material studied: Holotype female (serial no. 6/1/62) and four paratype females from leaves of Musa sp., Tzaneen, Transvaal, 7 July 1951; collected by M.K.P. Meyer.

C. DISTRIBUTION OF A. (TYPHLODROMALUS) SPECIES IN SOUTH AFRICA.

1. A. (T.) grabouwi, spec. nov.
   a. Passiflora sp., Grabouw, C.P.
   b. Prunus persica, Grabouw, C.P.

2. A. (T.) rubicolus, spec. nov.
   a. Rubus sp., Grabouw, C.P.
   b. Quercus sp., Grabouw, C.P.
   c. Persea sp., Nelspruit, Tvl.
   d. Pyrus malus, Potchefstroom, Tvl.
   e. Althaea sp., Potchefstroom, Tvl.
   f. Ficus carina, Tamboerskloof, C.P.

3. A.(T.) anneckei, spec. nov.
   a. Quercus sp., Grabouw, C.P.
   b. Citrus sp., Grabouw, C.P.

4. A. (T.) raptor, spec. nov.
   a. Passiflora sp., Grabouw, C.P.

5. A. (T.) citri, spec. nov.
   a. Citrus sp., Rustenburg, Tvl.

6. A. (T.) addoi/....

6. A. (T.) addoi, spec. nov.

   a. Vitis sp., Addo, C.P.

   b. Pyrus communis, Potchefstroom, Tvl.

   c. Pyrus malus, Potchefstroom, Tvl.

7. A. (T.) undulatus, spec. nov.

   a. Quercus sp., Addo, C.P.

   b. Citrus sp., Addo, C.P.

8. A. (T.) capensis, spec. nov.

   a. Betula sp., Addo, C.P.

9. A. (T.) erugatus, spec. nov.

   a. Passiflora sp., Grabouw, C.P.

10. A. (T.) transvaalensis, spec. nov.

   a. Musa sp., Tzaneen, Tvl.

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