

# FAUNA OF INDIA

ACARI : MESOSTIGMATA

FAMILY : PHYTOSEIIDAE

*By*

**S. K. GUPTA**

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## EDITOR'S PREFACE

Among the predatory plant mites, members of the family Phytoseiidae are probably the most important ones as they have often been found to feed voraciously not only on the phytophagous mites like tetranychids, tenuipalpids and eriophyids but also on small phytophagous insects like aphids, thrips, coccids, etc. and thereby contribute towards effective and profitable biological control of pest population in the field. Due to this importance, the phytoseiid mites have received worldwide attention necessitating the exploration of phytoseiid fauna and utilising the potentially important species in the biological control programme.

The knowledge about phytoseiid mites of India was meagre when the author of this volume, Dr. S. K. Gupta, initiated this work in 1975 and about 50 species in 5 genera under 2 subfamilies were on record at that time. Barring some parts of northern, southern and eastern India, the phytoseiid fauna was unknown from the major states of the Indian Union. Therefore, by undertaking extensive and intensive surveys throughout the length and breadth of the country during all these years, Dr. Gupta has been able to present a reasonably good faunal picture of this economically important group from India. The present volume gives a summarised account of Indian phytoseiid fauna after critical evaluation of the existing knowledge. While little over 1,000 species under 4 subfamilies are known from the world, the Indian fauna is represented by 139 species in 10 genera under 3 subfamilies. Dr. Gupta, an eminent acarologist of our country, has dealt with all the species giving their full descriptions, illustrations, synonymy, habitat records, data pertaining to type material, distribution in India and abroad and keys to the identification of various taxa known from India. The biological information, wherever known, of the economically important species have also been incorporated. This Fauna volume is the first of its kind on Indian mites and I hope this will be immensely useful for all those interested in the study of mites and inspire them to take up further investigations on this important group. I am sure, this volume will serve as an useful tool not only to the taxonomists in the group but also to the agricultural entomologists who often encounter these beneficial mites in the field. Dr. Gupta deserves hearty congratulations for this useful and valuable contribution.

Calcutta  
the 12th May 1986

DR. B. K. TIKADER  
Director  
*Zoological Survey of India*  
Calcutta

## AUTHOR'S PREFACE

The mites of the family Phytoseiidae have been proved beyond doubt as efficient predators of a large number of phytophagous mites belonging to the families Tetranychidae, Tenuipalpidae and Eriophyidae and also of quite a good number of phytophagous insects like crawlers of scale insects, aphids, thrips, white flies, etc. These mites are abundantly available on various types of crops, fruit trees, vegetables, ornamental plants and forest trees. Because of their immense economic importance and since they are abundantly available, these mites have received attention of the acarologists and agricultural entomologists and a fairly good amount of work has been done specially on their taxonomy and to some extent on their bionomics and predator-prey interactions. Though the Indian phytoseiid fauna is by and large well explored, but all the information is scattered. Besides, a good deal of confusion also exists regarding the taxonomic position of some species and validity of some records.

The objective of this fauna volume is to bring together all the taxonomic information under one cover, to clear the confusion regarding identities of the doubtful records, to verify the present status of all the species known from India, to provide re-descriptions and illustrations of the inadequately known species and to provide keys to all the taxonomic categories.

In order to fulfil this objective, all the records from India were re-checked, types of all the described species were re-examined as far as possible taking loans from various individuals and institutions, explorations were undertaken to discover undescribed species, if any, and all the valid species were re-described and illustrated in the light of modern taxonomic concepts.

In this work, a total of 139 species from India belonging to 10 genera under 3 subfamilies are dealt with. Full descriptions and illustrations of all the species, habitats, information regarding type localities and type repositories and detail distribution in India and abroad are given. All the subfamilies, genera and subgenera are diagnosed and keys to all taxonomic categories are provided. In addition, a general discussion has been made on habitats and food, methods for collection, preservation, mounting and rearing of Phytoseiidae, general morphology having bearing on taxonomy of the group, economic importance, biology, classification, interrelationship with

other related families and its phylogeny. This volume gives a complete taxonomic account of Indian Phytoseiidae which, it is hoped, will serve as a handy tool to the taxonomists of this important group in India and abroad and at the same time will help the general entomologists in identifying the phytoseiid species which they might often come across in the field as predators of mites and insect pests.

While preparing this volume, various scientists, *viz.* Dr. H. A. Denmark and Dr. M. H. Muma of the Florida Department of Agriculture ; Dr. D. A. Chant and Dr. E. Shaul of the University of Toronto, Canada ; Dr. E. W. Baker of U. S. D. A., Washington ; Dr. S. Ehara of Tottori University, Japan, Dr. E. Swirski, Agriculture Research Organisation, Bet Dagen, Israel and Dr. (Miss) Swaraj Ghai, I. A. R. I., New Delhi, helped me either by loaning their types/authentically identified specimens or by offering valuable suggestions or by making reprints of their publications available to me and to all of them I offer my grateful thanks. Various scientists from all over the world, the list of which will be of several pages, helped me by sending reprints/xerox copies of their papers, which were otherwise not available in India and without which this work would have been impossible, and, for all of them I record my very sincere gratitude.

Thanks are also due to Drs. S. K. Bhattacharyya and Y. N. Gupta both of the Zoological Survey of India ; Dr. (Mrs.) S. Ray, M. B. B. College, Agartala ; Dr. M. S. Dhooria of Punjab Agriculture University, Ludhiana and Dr. G. P. ChannaBasavanna, University of Agricultural Sciences, Bangalore, for placing their collection of Phytoseiidae at my disposal for study. Several acarologists and entomologists from this country also sent their collection of Phytoseiidae to me for identification and this, in turn, helped in broadening the knowledge of the taxa. To each of them I offer my grateful thanks.

I am highly indebted to Dr. B. K. Tikader, Director, Zoological Survey : of India, for his keen interest in this work, constant encouragements and for providing the necessary facilities to complete this work. Dr. A. K. Ghosh, Deputy Director, Z. S. I., was kind enough to spare the artist for preparing some of the illustrations and I take this opportunity to offer my sincerest thanks to him.

Dr. G. P. ChannaBasavanna took the pains to go through the entire manuscript and offer valuable suggestions for its improvements and for that I am highly grateful to him.

I shall be failing in my duty if I do not acknowledge the help I have

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Dr. V. K. Gupta, Chief Editor, Oriental Insects, kindly permitted me to reproduce some of the figures earlier published in that journal and for that I am highly indebted to him. Lastly, my wife Smt. Reba Gupta and daughter Km. Nilanjana Gupta helped me in preparing the index and to both of them I offer my sincere thanks.

Calcutta.  
the 5th May 1986

S. K. GUPTA

DEDICATED TO  
My respected teacher  
LATE DR. D. N. RAYCHAUDHRI  
*Formerly Professor of Zoology,  
Calcutta University*

## NOTE

I. The undermentioned species which have been dealt with in the text are to be treated as new species (also refer to ERRATA given at the end).

Species No.	Name of species	Page No.
4	<i>Amblyseius (Amblyseius) hapoliensis</i> sp. nov.	43
25	<i>Amblyseius (Euseius) macrospatulatus</i> sp. nov.	89
45	<i>Amblyseius (Proprioseiopsis) arunachalensis</i> sp. nov.	132
55	<i>Amblyseius (Typhlodromalus) laaensis</i> sp. nov.	152
66	<i>Amblyseius (Typhlodromips) neoghani</i> sp. nov.	174
71	<i>Amblyseius (Typhlodromips) sijiensis</i> sp. nov.	183
83	<i>Okiseius himalayana</i> sp. nov.	211
84	<i>Okiseius sikkimensis</i> sp. nov.	213
118	<i>Typhlodromus (Amblydromella) nilgiriensis</i> sp. nov.	283
122	<i>Typhlodromus (Anthoseius) majumderi</i> sp. nov.	291

II. By the time the printing of the entire text was over, another three species were added to Indian phytoseiid fauna raising the total number of species from 139 to 142. The species are :

- (i) *Phytoseius (Phytoseius) domesticus* Rather, 1985, *Acarologia* 26(1) : 13-16.
- (ii) *Phytoseius (Phytoseius) nipponicus* Ehara, Rather, 1985, *ibid.* 26(1) : 13-16.
- (iii) *Typhlodromus (Typhloctonus) prunus* (Denmark & Rather, 1984), *Internat J. Acarol.*, 10(3) ; 163-177.

III. The records of the following species from India are doubtful :

- (i) *Amblyseius (Typhlodromalus) havu* : Ghai & Menon, 1967.
- (ii) *A. (Typhlodromips) asiaticus* : Narayanan *et al.*, 1960 ; Gupta, 1970, 1975.
- (iii) *A. (Neoseiulus) cucumeris* : Narayanan & Khot, 1959 ; Gupta *et al.* 1971.
- (iv) *Phytoseius (Phytoseius) coheni* : Gupta, 1970 ; 1971.
- (v) *Typhlodromus (Amblydromella) bakeri* : Narayanan *et al.* (1960).

# CONTENTS

	<i>Page</i>
INTRODUCTION	1
HABITATS AND FOOD	2
COLLECTION, PRESERVATION, MOUNTING AND REARING	3
GENERAL MORPHOLOGY	5
BIOLOGY	21
ECONOMIC IMPORTANCE	23
CLASSIFICATION	24
INTERRELATIONSHIP OF PHYTOSEIIDAE WITH OTHER RELATED FAMILIES	28
PHYLOGENY	30
SYSTEMATIC ACCOUNT	31
Family PHYTOSEIIDAE Berlese	31
Key to the subfamilies of Phytoseiidae	32
Subfamily AMBLYSEIINAE Muma	32
Key to the genera of Ambyseiinae	32
Genus AMBLYSEIUS Berlese	33
Key to the subgenera of <i>Amblyseius</i>	34
Subgenus AMBLYSEIUS Berlese	35
Key to the species of <i>Amblyseius</i>	36
1. <i>Amblyseius (Amblyseius) adhatodae</i> Muma	37
2. <i>A. (A.) aeralis</i> (Muma)	39
3. <i>A. (A.) channabasavannai</i> Gupta and Daniel	41
4. <i>A. (A.) hapoliensis</i> Gupta	43
5. <i>A. (A.) herbicolus</i> (Chant)	45
6. <i>A. (A.) indirae</i> Gupta	47
7. <i>A. (A.) kulini</i> Gupta	50
8. <i>A. (A.) largoensis</i> (Muma)	51
9. <i>A. (A.) mcmurtryi</i> Muma	55
10. <i>A. (A.) muraleedharani</i> Gupta	57
11. <i>A. (A.) neorykei</i> Gupta	59
12. <i>A. (A.) orientalis</i> Ehara	61
13. <i>A. (A.) paraaerialis</i> Muma	63
14. <i>A. (A.) shoreae</i> Gupta	65
Subgenus ASPEROSEIUS Chant	67

Key to the species of <i>Asperoseius</i>	...	67
15. <i>A. (Asperoseius) heveae</i> (Oudemans)	...	67
16. <i>A. (A.) hyauliangensis</i> Gupta	...	69
17. <i>A. (A.) nucifera</i> (Gupta)	...	71
Subgenus EUSEIUS Wainstein	...	73
Key to the species of <i>Euseius</i>	...	73
18. <i>A. (Euseius) alstoniae</i> Gupta	...	74
19. <i>A. (E.) bambusae</i> Ghai and Menon	...	76
20. <i>A. (E.) coccineae</i> Gupta	...	78
21. <i>A. (E.) coccosocius</i> Ghai and Menon	...	80
22. <i>A. (E.) delhiensis</i> (Narayanan and Kaur)	...	82
23. <i>A. (E.) eucalypti</i> Ghai and Menon	...	84
24. <i>A. (E.) finlandicus</i> (Oudemans)	...	86
25. <i>A. (E.) macrospatulatus</i> Gupta	...	89
26. <i>A. (E.) neococēneae</i> Gupta	...	90
27. <i>A. (E.) ovalis</i> (Evans)	...	92
28. <i>A. (E.) pruni</i> Gupta	...	94
29. <i>A. (E.) rhododendronis</i> Gupta	...	96
30. <i>A. (E.) sacchari</i> Ghai and Menon	...	98
Subgenus NEOSEIULUS Hughes	...	100
Key to the species of <i>Neoseiulus</i>	...	101
31. <i>A. (Neoseiulus) aceriae</i> Gupta	...	102
32. <i>A. (N.) assamensis</i> (Chant)	...	104
33. <i>A. (N.) baraki</i> Athias-Henriot	...	105
34. <i>A. (N.) cynodonae</i> Gupta	...	107
35. <i>A. (N.) fallacis</i> (Garman)	...	109
36. <i>A. (N.) fraterculus</i> Berlese	...	111
37. <i>A. (N.) indicus</i> (Narayanan and Kaur)	...	112
38. <i>A. (N.) imbricatus</i> Corpuz and Rimando	...	114
39. <i>A. (N.) longispinosus</i> (Evans)	...	116
40. <i>A. (N.) paspalivorus</i> (DeLeon)	...	119
41. <i>A. (N.) rangatensis</i> Gupta	...	121
Subgenus PARAPHYTOSEIUS Swirski and Shechter	...	122
Key to the species of <i>Paraphytoseius</i>	...	123
42. <i>A. (Paraphytoseius) multidentatus</i> (Swirski and Shechter)	...	123
43. <i>A. (P.) scleroticus</i> Gupta and Ray	...	126
Subgenus PHYTOSCUTELLA Muma	...	128
44. <i>A. (Phytoscutella) salebrosus</i> (Chant)	...	128

Subgenus PROPRIOSEIOPSIS Muma	...	131
Key to the species of <i>Proprioseiopsis</i>	...	131
45. <i>A. (Proprioseiopsis) arunachalensis</i>		
	Gupta	...
		132
46. <i>A. (P.) peltatus</i> Van der Merwe	...	134
47. <i>A. (P.) synachattiensis</i> Gupta	...	136
Subgenus PROPRIOSEIUS Chant	...	138
48. <i>A. (Proprioseius) kumaonensis</i> (Gupta)	...	138
Subgenus TYPHLODROMALUS Muma	...	140
Key to the species of <i>Typhlodromalus</i>	...	141
49. <i>A. (Typhlodromalus) chikmagalurensis</i>		
	Gupta	...
		141
50. <i>A. (T.) chitradurgae</i> Gupta	...	143
51. <i>A. (T.) eucalypticus</i> (Gupta)	...	144
52. <i>A. (T.) ficusi</i> Gupta	...	146
53. <i>A. (T.) jarooa</i> Gupta	...	148
54. <i>A. (T.) kalimpongensis</i> Gupta	...	150
55. <i>A. (T.) laaensis</i> Gupta	...	152
56. <i>A. (T.) lablabi</i> Ghai and Menon	...	154
57. <i>A. (T.) manipurensis</i> Gupta	...	156
58. <i>A. (T.) sorghumae</i> Gupta	...	157
Subgenus TYPHLODROMIPS DE LEON	...	159
Key to the species of <i>Typhlodromips</i>	...	159
59. <i>A. (Typhlodromips) arecae</i> Gupta	...	160
60. <i>A. (T.) crotalariae</i> Gupta	...	162
61. <i>A. (T.) eujeniae</i> Gupta	...	164
62. <i>A. (T.) guajavae</i> Gupta	...	166
63. <i>A. (T.) mangiferae</i> Ghai and Menon	...	168
64. <i>A. (T.) meghalayensis</i> Gupta	...	170
65. <i>A. (T.) neocrotalariae</i> Gupta	...	172
66. <i>A. (T.) neoghonii</i> Gupta	...	174
67. <i>A. (T.) officinaria</i> Gupta	...	176
68. <i>A. (T.) polyanthae</i> Gupta	...	178
69. <i>A. (T.) potentillae</i> (Garman)	...	180
70. <i>A. (T.) sapienticola</i> Gupta	...	182
71. <i>A. (T.) sijiensis</i> Gupta	...	183
72. <i>A. (T.) suknaensis</i> Gupta	...	185
73. <i>A. (T.) syzygii</i> Gupta	...	188
74. <i>A. (T.) tetranychivorus</i> (Gupta)	...	190



92.	<i>P. (P.) crinitus</i> Swirski and Shechter	...	232
93.	<i>P. (P.) indicus</i> Bhattacharyya	...	234
94.	<i>P. (P.) intermedius</i> Evans and Macfarlane...		236
95.	<i>P. (P.) jujuba</i> Gupta	...	238
96.	<i>P. (P.) macropilis</i> (Banks)	...	240
97.	<i>P. (P.) macrosetosus</i> Gupta	...	242
98.	<i>P. (P.) meyeræ</i> Gupta	...	244
99.	<i>P. (P.) mixtus</i> Chaudhuri	...	246
100.	<i>P. (P.) neocorniger</i> Gupta	...	248
101.	<i>P. (P.) neoferox</i> Ehara and Bhandhufalck...		250
102.	<i>P. (P.) punjabensis</i> Gupta	...	252
103.	<i>P. (P.) rachelæ</i> Swirski and Shechter	...	253
104.	<i>P. (P.) roseus</i> Gupta	...	255
105.	<i>P. (P.) rugosus</i> Denmark	...	257
106.	<i>P. (P.) swirskii</i> Gupta	...	259
107.	<i>P. (P.) wainsteini</i> Gupta	...	260
Genus TYPHLODROMUS Scheuten			262
Key to the subgenera of <i>Typhlodromus</i>			263
Subgenus AMBLYDROMELLA Muma			263
Key to the species of <i>Amblydromella</i>			264
108.	<i>T. (Amblydromella) arunachalensis</i> Gupta	...	265
109.	<i>T. (A.) bambusicolus</i> Gupta	...	267
110.	<i>T. (A.) chrysanthemi</i> Gupta	...	269
111.	<i>T. (A.) darjeelingensis</i> Gupta	...	270
112.	<i>T. (A.) fleschneri</i> Chant	...	272
113.	<i>T. (A.) gopali</i> Gupta	...	274
114.	<i>T. (A.) himalayensis</i> Gupta	...	276
115.	<i>T. (A.) homalii</i> Gupta	...	278
116.	<i>T. (A.) kodaikanalensis</i>	...	280
117.	<i>T. (A.) mori</i> Gupta	...	282
118.	<i>T. (A.) nilgiriensis</i> Gupta	...	283
119.	<i>T. (A.) rhenanus</i> ( Oudemans )	...	285
120.	<i>T. (A.) rhododendroni</i> Gupta	...	287
121.	<i>T. (A.) sonprayagensis</i> Gupta	...	289
Subgenus ANTHOSEIUS De Leon			289
122.	<i>T. (Anthoseius) majumderi</i> Gupta	...	291
Subgenus BRETHRIA Tuttle and Baker			291
Key to the species of <i>Brethria</i>			293
123.	<i>T. (B.) confusus</i> Narayanan, Kaur & Ghai...		293
124.	<i>T. (B.) roshanlali</i> Narayanan and Ghai	...	294

Subgenus CLAVIDROMUS Muma	...	296
125. <i>T. (Clavidromus) neotransvaalensis</i> Gupta	...	296
Subgenus ORIENTISEIUS Muma and Denmark	...	298
Key to the species of <i>Orientiseius</i>	...	298
126. <i>T. (Orientiseius) channabasavannai</i> Gupta	...	298
127. <i>T. (O.) hadii</i> Chaudhri	...	300
128. <i>T. (O.) manipurensis</i> Gupta	...	302
129. <i>T. (O.) orissaensis</i> Gupta	...	304
130. <i>T. (O.) pruni</i> Gupta	...	305
131. <i>T. (O.) rickeri</i> Chant	...	307
Subgenus PARASEIULUS Muma	...	310
132. <i>T. (Paraseiulus) neosoleiger</i> Gupta	...	310
Subgenus TYPHLOCTOMUS Muma	...	312
Key to the species of <i>Typhloctomus</i>	...	312
133. <i>T. (Typhloctomus) nesbitti</i> Womersley	...	312
134. <i>T. (T.) transitans</i> Gupta	...	314
Subgenus TYPHLODROMUS Scheuten	...	315
Key to the species of <i>Typhlodromus</i>	...	316
135. <i>T. (Typhlodromus) communis</i> Gupta	...	316
136. <i>T. (T.) garhwalicus</i> Gupta	...	318
137. <i>T. (T.) neorhenanus</i> Gupta	...	320
138. <i>T. (T.) sijiensis</i> Gupta	...	321
Subfamily GNORIMINAE Chaudhri	...	323
Genus GARHWALICUS Gupta and Ray	...	323
139. <i>Garhwalicus himalayensis</i> Gupta and Ray	...	323
REFERENCES	...	326
INDEX	...	346

## INTRODUCTION

Mites of the family Phytoseiidae have been recognised since the beginning of this century as predators of phytophagous mites (Parrott *et al.*, 1906). They are worldwide in distribution from arctic to tropics and feed specially on mites of the families Tetranychidae, Eriophyidae, Tarsonemidae and Tenuipalpidae. In addition, reports are also available on their feeding upon small phytophagous insects like aphids, coccids, thrips etc. (Ehara, 1966 ; McMurtry *et al.*, 1970). In view of this economic importance, it is thought that this group may play an important role in achieving biological control programme and, thus, has drawn the attention of the economic entomologists and acarologists all over the world. This has encouraged in undertaking intensive and extensive faunistic exploratory studies resulting in the discoveries of a large number of species in the recent years bringing the total world species from 19 (Nesbitt, 1951) to well over 800 (Chant *et al.*, 1978). Besides exploring the fauna, important and useful contributions have also been made on bionomics, predator-prey interactions, etc.

In India, the earliest record of this mite dates back to 1953 when Evans reported the occurrence of *Amblyseius (Neoseiulus) longispinosus* in association with paddy mite from Coimbatore, Tamil Nadu. Subsequently, through the works of Narayanan & Khot (1959), Chant (1960), Narayanan & Kaur (1960), Narayanan *et al.* (1960), Narayanan & Ghai (1964), Ghai (1964), Rao & Rao (1964), Ghai & Menon (1967, 1969), Muma (1967) and Bhattacharyya (1969), our knowledge on Indian phytoseiid taxonomy advanced considerably recording 33 valid species from India. Later, Gupta through series of papers (Gupta, 1969 ; 1969a ; 1969b ; 1970 ; 1970a ; 1974 ; 1975 ; 1977 ; 1977a ; 1977b ; 1977c ; 1977d ; 1978 ; 1978a ; 1978b ; 1979 ; 1980 ; 1980a ; 1980b ; 1980c ; 1981 ; 1981a ; 1982 ; 1982a ; Gupta & Dhooria, 1972 ; 1974 ; Gupta *et al.*, 1971 ; Gupta & Nahar, 1981 ; Gupta & Ray, 1981 ; 1981a ; Ray & Gupta, 1981, 1983), contributed further in this field bringing the total number of species to 139. However, most of the information is scattered and no consolidated work is available which will be useful to taxonomists and applied entomologists for identifying their material.

In this work, 139 species from India are included giving their full synonymy, descriptions from modern taxonomic concept, detail illustrations, habitat records (pertaining to Indian records), type

localities, repositories and distribution in India and abroad. Several new synonymies are proposed. Wherever known, information on economic importance of the species is given.

There are divergent opinions about classification and generic concept of Phytoseiidae. However, the present author has followed the family concept of Muma & Denmark (1970) and generic concept primarily of Chant (1965). A subgeneric concept has also been introduced as has been done by some of the previous workers (a detail discussion is made under classification). All the measurements given in the text are in microns. In majority of the cases, the measurements given in the text are based on several specimens.

#### HABITATS AND FOOD

Phytoseiids inhabit a wide range of terrestrial habitats and have been collected in all continents from arctic to tropics. They are found in large numbers on herbs, shrubs, trees as well as on grasses, fungi and mosses. They normally inhabit the undersurface of the leaves specially near the angles formed by the midveins with the leaf lamina. But when the food in the lower surface becomes scarce, they may migrate to the upper surface of the leaf as well. They also inhabit flowers, area under bark and also on fruits. A large number of species also occur in litter of dead and rotting leaves, logs, sod accumulation, etc. (Muma & Denmark, 1970). Reports are also available of their occurrence in bird nests, mammal burrows, in stored products and in soil.

Phytoseiid mites show a wide range of food habits from carnivorous to non-animal food as pollen, honey dew, nectar, etc. Some phytoseiids prefer to feed only on certain species of mite and sometimes on a particular stage of that mite and do not feed or develop on others. The average number of prey taken by a single female per day is variable but the average is 20 even though the reports are available which may be as high as 114-119. Some phytoseiids feed and reproduce upon eriophyid mites specially the rust mites but there are some e.g., *Amblyseius rubini* Swirski & Amitai which may feed on eriophyids but do not reproduce without other food. On the contrary, *Typhlodromus (Orientiseius) rickeri* Chant, reproduces equally well on eriophyids. The other mites used as food are : tenuipalpids (e.g., *Amblyseius (Neoseiulus) cucumeris* (Oud.), tarsonemids (*Typhlodromus occidentalis* Nesbitt), tydeids (*T. (P.) soleiger* (Ribaga), acarids (*A. (N.) cucumeris* (Oud.), etc.

Reports are available regarding feeding of these mites on crawlers of scale insects, eggs of certain species of moth, white flies, thrips, aphids, etc. Other phytoseiids prefer pollen as a source of food. Sometimes pollen induces high rate of reproduction than spider mites. Various kinds of fungi may also serve as food. *Amblyseius umbraticus* (Chant) and *A. aberrans* (Oud.) are able to complete development on apple powdery mildew (Chant, 1959). Plant nectar and honey dew from aphids, soft scales, white flies and mealy bugs are also consumed by species like *Amblyseius hibisci* (Chant) when their preferred host is unavailable but with little reproduction. Some like *A. hibisci* may also develop on artificial food as yeast, carbohydrate, etc. At least mites of one genus, viz. *Macroseius* are known to feed upon nematodes. Some are known to suck plant juice as in case of *Typhlodromus* (*Amblydromella*) *rhenanus* (Oud.) (Chant, 1959). Because of this wide range of food habits, these mites are better adapted to survive when their preferred food is not available and therefore are more effective and efficient as predators.

#### COLLECTION, PRESERVATION, MOUNTING AND REARING

*Collection* : Serval methods are known for collection of phytoseiid mites. The hand picking of mites directly from the habitats with the help of a fine sable hair brush moistened with alcohol is perhaps the most tedious one though it may be most informative. A greater number of specimens can be collected by processing the vegetation, twigs etc. under the Berlese funnel. The Berlese type funnel, as modified by Newell (1955), may serve as most profitable one. Samples of soil, vegetation, etc. are collected in the field in polythene bags and are then brought to the laboratory after tightly fastening the mouth with rubber band. In case the samples can not be processed immediately, those can be stored in a refrigerator at a temperature of 5-15°C even for a week or so. A heat source from an electric bulb (40-60 Wts.) may extract the fauna from moderately dry samples in about 2 days time. If the habitat is very wet, the time of extraction may be prolonged. A good number of phytoseiids can be collected by beating method. This is done by beating the plant material over the screened funnel to the bottom of which is attached a collecting jar filled with alcohol.

The proper identification of plant is essential in the case of specimens collected on plants. The collection is properly labelled giving details of habitat, locality, date of collection and name of collector.

*Preservation* : Preservation is best done in 70% ethyl alcohol with a few drops of lactic acid or glycerol to avoid drying of specimens. Specimens may also be preserved in Oudemans' fluid which is made with the following ingredients : alcohol-87 parts, glycerol-5 parts and glacial acetic acid-8 parts. In this preservative, mites are preserved with stretched appendages and thus help in better orientation of specimens while mounting. However, where mites are treated with lactic acid prior to mounting for proper stretching and clearing of specimens, this preservative may be avoided.

*Mounting* : There are several mounting media known for mounting of mites. The most widely used one is the Hoyer's medium which is made with the following ingredients when mixed in the order as listed :

Dist. water.....50 gms  
 Gum arabic.....30 gms  
 Chloral hydrate.....200 gms  
 Glycerol..... 20 gms

Phytoseiids, both in preserved condition or live specimens, can be mounted directly in this medium without going through any pre-mounting processing. Another fairly good mounting medium is the one proposed by Schuster & Pritchard (1963) which is made of the following ingredients :

Dist. water.....50 cc  
 Gum arabic..... 30 gms  
 Chloral hydrate..... 200 gms  
 Glycerol.....20 gms  
 Potassium iodide..... 1 gm  
 Iodine..... 2 gms

After mounting in this medium, the slide is gently warmed over a hot plate which will stretch the specimens properly making it suitable for taxonomic studies. Recently, another mounting medium, Heinze's medium (Evans & Till, 1979), is also used and that is made with the following ingredients :

Polyvinyl alcohol.....10 gms  
 Dist. water.....40-60 cc  
 Lactic acid..... 35 ml.  
 Glycerol..... 10 ml.  
 Phenol 1% aqueous soln... 25 ml.  
 Chloral hydrate.....100 gms

Both living as well as preserved specimens can be mounted directly and, if required, can be remounted by removing the coverslips after immersing the slide in water overnight.

Before going in for permanent mounting, it is advisable to put the specimen in a drop of lactic acid on a slide and warm it gently on an electric lamp (40 Wts.) after putting a broken piece of coverslip on the specimen. This will clean the specimen and make it well stretched.

The mounted slide should be ringed with a good quality nail polish to avoid shrinkage of specimens. All mounted slides should be kept in a cool place preferably in a refrigerator which will keep the slides in better condition for a longer period. All the slides should be labelled giving identity label on the left side and label bearing collection data on the right side. For studying chelicera, spermatheca and spermatophoral process, the specimen should be dissected. For better view of the spermatheca, the specimen is to be mounted laterally. Preferably, all observations are to be taken under a good compound microscope at sufficiently high magnification.

*Rearing* : The commonest method of rearing phytoseiid mites is the one adopted by Swirski *et al.* (1970). The mites are reared in plastic cages with a leaf on a black plastic plate and the water is supplied by an absorbent cotton wick. Canada balsam and castor oil are placed in a groove around the plate's periphery to serve as a repellent. The cages are placed in plastic bowl containing water and partly covered by a glass lid, one edge of which is kept open. Mass breeding is done in relatively large plastic plates.

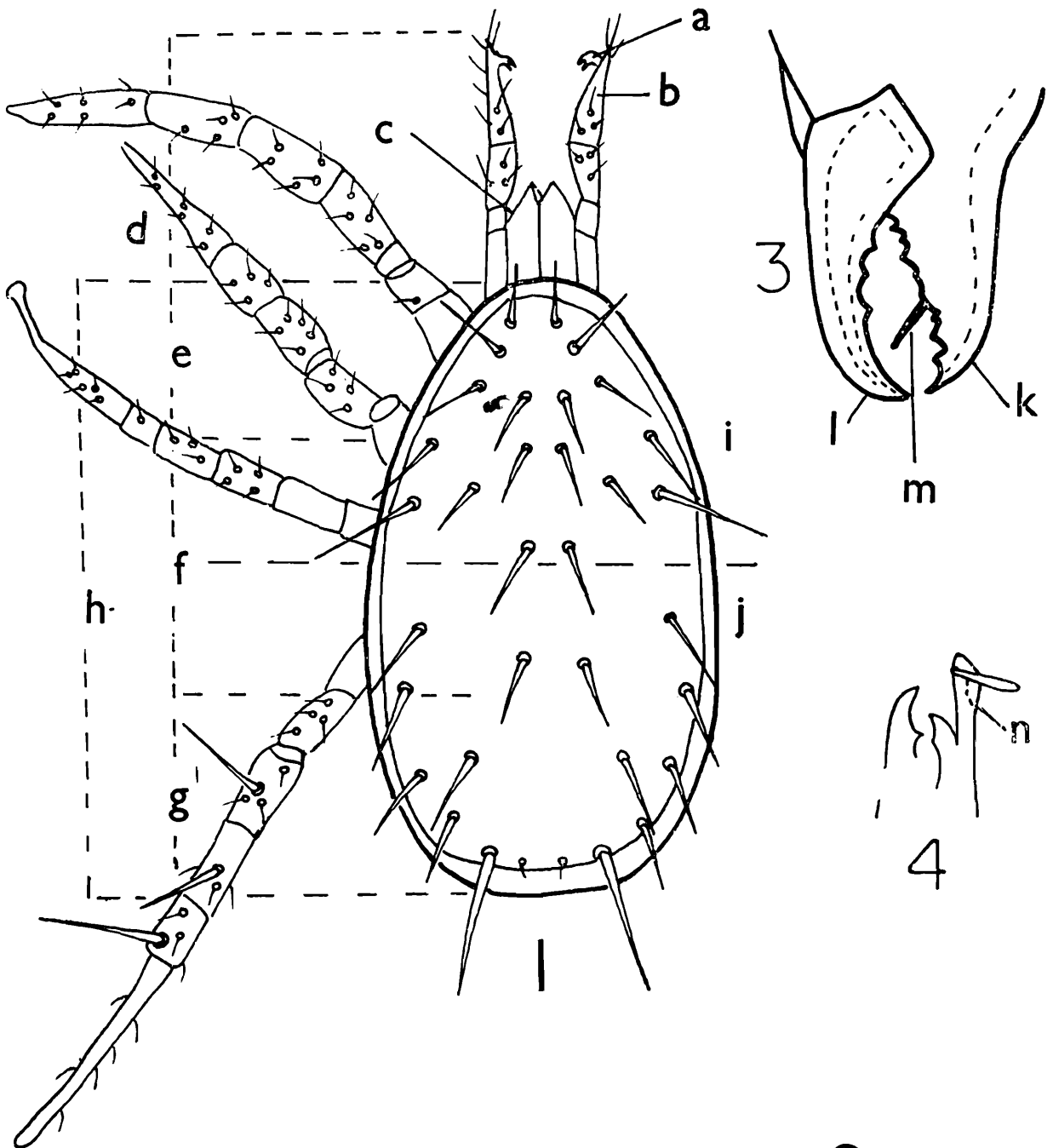
#### GENERAL MORPHOLOGY

Like other members of Acarina, the body of phytoseiid mite is divided into *Gnathosoma* and *Idiosoma*.

**Gnathosoma** : It bears the mouthparts, consisting of a pair of chelicerae and a pair of pedipalpi (Fig. 1). Dorsally the gnathosoma is covered by a thin shield called Tectum (Fig. 2). Tectum is smooth in Phytoseiidae or may be minutely denticulate but never with any process. Hypostome with undifferentiated setae with a series of 6-13 rows of often poorly sclerotized hypostomal teeth. In the median of gnathosoma, there is usually a groove ; lateral to the gnathosomal groove are the two main sections of the ventral wall of gnathosoma. Anteriorly, these are differentiated into a median hypostome, lateral

cornua and more median paralabra. Mouth lies between and below the chelicerae, ventral to labrum and dorsal to hypostome.

*Chelicera* : Chelicerae are the first pair of appendages and are of chelate type. Each chelicera terminates in a chela, which consists of two digits (Fig. 3), the dorsal one is the fixed digit and the ventral one



2

Figs. 1-4. Phytoseiidae showing morphological parts of taxonomic importance :

1. Dorsal surface of a phytoseiid mite showing body regions :
  - a. 2-tined apotele, b. Pedipalp, c. Chelicera, d. Gnathosoma,
  - e. Propodosoma, f. Metapodosoma, g. Opisthosoma, h. Idiosoma,
  - i. Proscutum (=Podonotum), j. Opisthoscutum (=Opisthonotum)
2. Tectum
3. Chelicera (Female) : k. Fixed digit, l. Movable digit, m. *Pilus dentilis*.
4. Spermatophoral process : n. Foot

is the movable digit. Chelicera consists of 3 segments but segmentation is obscure. In the male, the movable digit is modified into a copulatory organ known as spermatophoral process (Fig. 4). This process is highly variable and serves as a good tool for separation of species. In female, the movable digit bears 0-4 teeth and often a distinguishable *pilus dentilis*, the fixed digit is often multidentate. The dentition of chelicera provides aid for separation of species and genera. In *Amblyseius* Berlese, the fixed digit is uni, bi- or multidentate, in *Gigagnathus* Chant, the chelicera is greatly elongate having unidentate fixed digit and edentate movable digit. In *Macroseius* Chant, Denmark and Baker, the fixed digit is with 10-12 small teeth with a *pilus dentilis* and the movable digit with 3-4 large teeth. In *Chantia* Pritchard & Baker, chelicera is with a few teeth. In *Phytoseiulus* Evans, fixed digit is with 7-8 teeth, movable digit with 3 teeth. In *Phytoseius* Ribaga, fixed digit is with 2-3 teeth, movable digit with 0-2 teeth. In *Indoseiulus* Ehara, the fixed digit is multidentate, movable digit 2-dentate. In *Indodromus* Ghai & Menon, fixed digit is 3-dentate, placed in different planes, movable digit edentate. In *Typhlodromus* Scheuten, the fixed digit is with variable number of teeth, movable digit with 0-3 teeth. In *Platyseiella* Muma, fixed digit is with 2-3 teeth, movable digit with 1 tooth. In *Paraamblyseius* Muma, the fixed digit is with 5-7 teeth, movable digit with 1-2 teeth. In *Iphiseius* Berlese, fixed digit is with 9-10 teeth, movable digit with 2-3 teeth and in *Okiseius* Ehara, fixed digit is with 2-3 teeth and movable digit with 1 tooth.

**Pedipalpi** (Fig. 1) : These are the second pair of appendages. These originate laterally from palp coxae, which are probably homologous with the fused basal segments of primitive biramous appendages (Baker & Wharton, 1952). Pedipalp is never more than 6 segmented and the segments are coxa, trochanter, femur, genu, tibia and tarsus. Specialised seta on palptarsus is with 2 tines. Palpi are never modified. In *Gigagnathus* Chant, the palpi are greatly elongate and extend almost upto the end of tarsus I. In all other genera, the palpi are normal.

**Idiosoma** (Fig. 1) : It is the portion of the body posterior to gnathosoma. This, in turn, includes propodosoma, metapodosoma and opisthosoma (Fig. 1). Dorsally it is covered completely by dorsal shield excepting in *Phytoseiulus* Evans, where the dorsum is partly covered. The dorsal shield may be entire as in *Amblyseius* Berlese, laterally incised as in many *Typhlodromus* Scheuten and in some *Okiseius* Ehara, or subdivided into anterior and posterior shields as in *Macroseius* Chant *et al.* The sclerotization of dorsal shield is variable and helps

in separation of genera. It may be slightly sclerotized as in many *Amblyseius* or highly sclerotized and sculptured as in *Phytoseius* Ribaga or *Okiseius* Ehara or coarsely punctate as in *Paraamblyseius* Muma or smooth as in *Platyseiella* Muma. Sometimes dorsal shield is differentiated into two regions as podonotum and opisthonotum (Chant, 1965) or proscutum and postscutum (Schuster & Pritchard, 1963) (Fig. 1). Dorsal shield may be variously reticulated. Its shape is also often variable as round, oval, etc.

Dorsal shield is furnished with a variable number of setae, their arrangement, number, nature and relative position are of extreme value for generic and specific separation.

The setae may be fine and simple as in many *Amblyseius*, whip-like as in *Amblyseius* (*Amblyseius*), weakly serrate as in *Typhlodromus* Scheuten, may be thick, long and serrate as in *Phytoseius* Ribaga, *Platyseiella* Muma, *Okiseius* Ehara, spatulate as in *Chantia* Pritchard & Baker or capitate as in *Ricoseius* De Leon.

The setae on the dorsal shield are arranged in definite rows as dorso-central, median, lateral and sublateral (Fig. 5). In most of the genera, the number of setae on dorsal shield is fixed but their length, nature, etc. may vary and thus it helps in the determination of species within a genus. The arrangement of setae in different rows in different genera and subgenera is given in Table—1.

Lateral to the dorsal shield lies on either side (Fig. 5) the lateral integument which normally possesses 2 pairs of sublateral setae ( $r_3$ ,  $R_1$ ). Sometimes sublateral setae may also lie on dorsal shield as in *Phytoseius* where  $r_3$  lies on dorsal shield; in *Chantia* both  $r_3$ ,  $R_1$ , in *Macroseius* only  $r_3$  and in *Indodromus* both  $r_3$  and  $R_1$  lie on dorsal shield.

Difference of opinion exists as regards naming of setae. Garman (1948) proposed a system of setal nomenclature in consecutive number in the longitudinal row (L-series), dorsocentral row (D-series), median row (M-series) and sublateral row (S-series). His system was followed by subsequent American workers as well as by Womersley (1954) in Australia, Evans (1952) in England and Ehara (1958, 1959) in Japan, except that Chant (1959) modified it in *Amblyseius* where lateral setae were numbered according to the homologies within the numbers of 1-9 in this group. Athias-Henriot (1957, 1958) modified Garman system by attempting to numbering setae showing homologies with the more numerous setae in the basic pattern of blattisocids. She considered the M series to begin with anterolateral seta that Garman

considered the first of L series. Later, she adapted Hirschmann's (1957) letter number system, that was proposed for parasitid form of mites in general. Wainstein (1958, 1959) devised a different letter

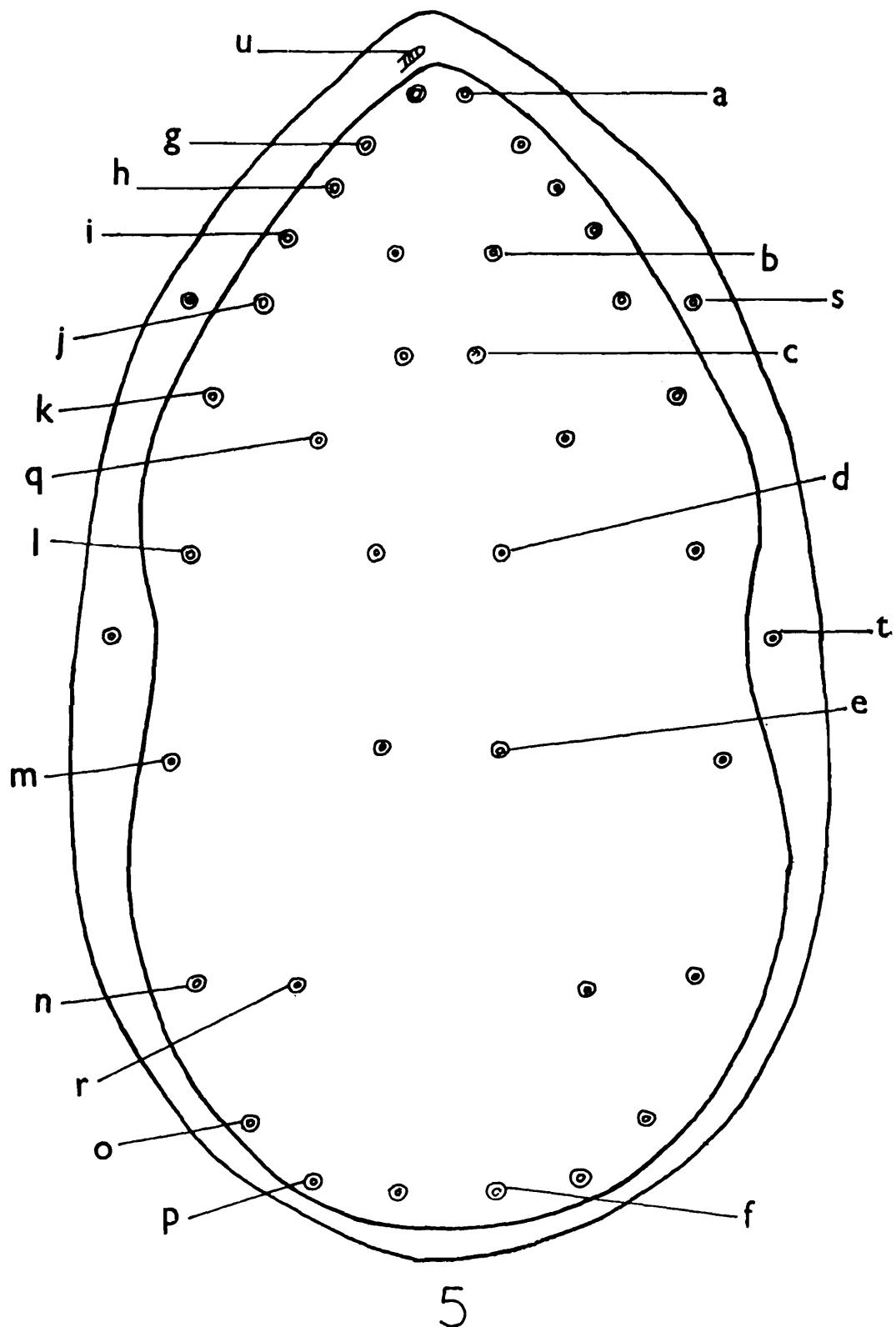
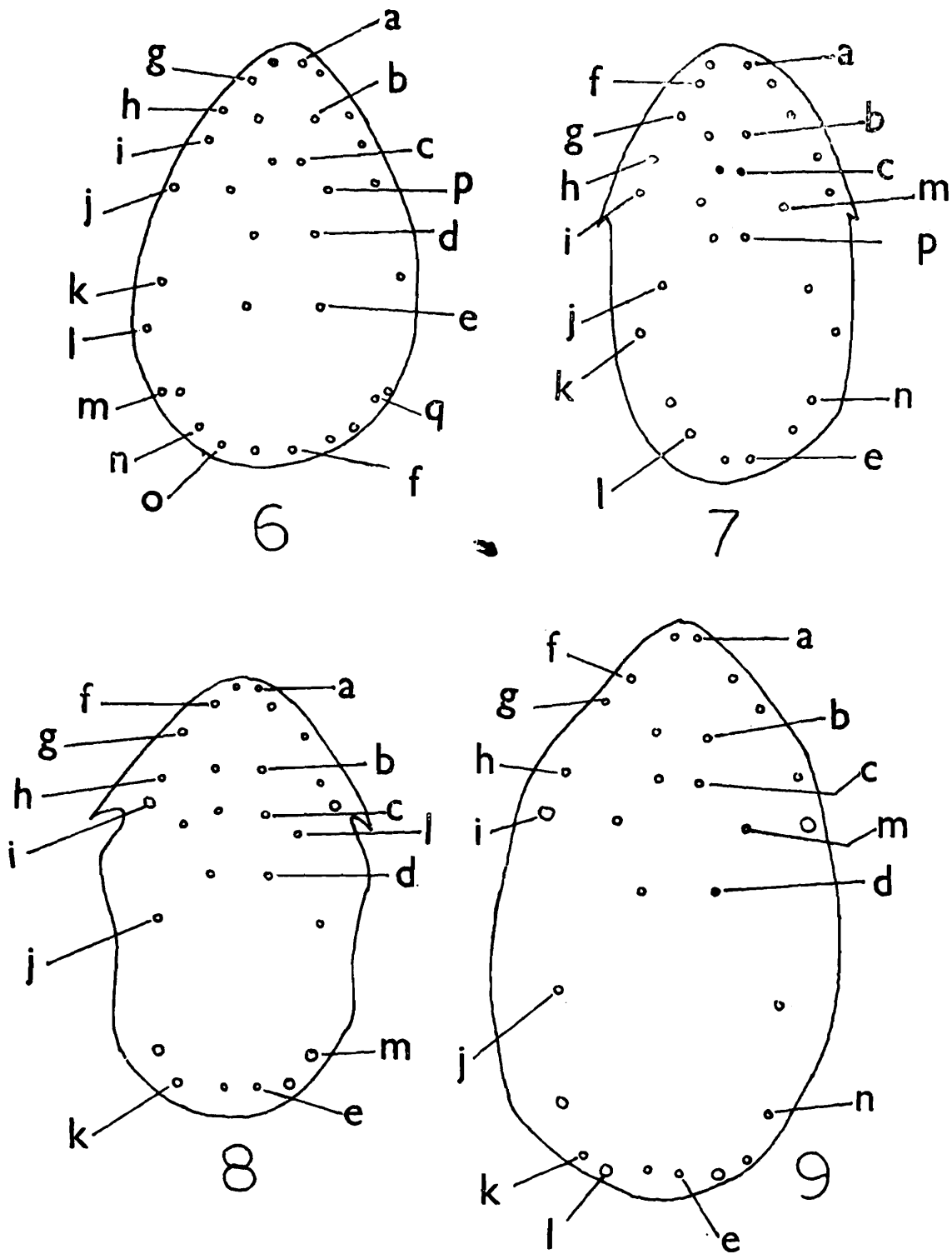


Fig. 5. Dorsal shield of a phytoseiid mite showing locations and nomenclature of setae :

a.  $j_1$ , b.  $j_4$ , c.  $j_5$ , d.  $j_6$ , e.  $J_2$ , f.  $J_5$ , g.  $j_3$ , h.  $z_2$ , i.  $z_3$ , j.  $z_4$ ,  
 k.  $s_4$ , l.  $s_6$ , m.  $S_2$ , n.  $S_4$ , o.  $S_5$ , p.  $Z_5$ , q.  $z_5$ , r.  $Z_4$ , s.  $r_3$ ,  
 t.  $R_1$ , u. Tip of peritreme

number system for the dorsal setae on idiosoma. Pritchard & Baker (1962) followed Garman's system of nomenclature with certain modifications to show homologies with basic setal pattern yet allowing certain flexibility if additional setae were found to exist or if exact homologies were not apparent. Schuster & Pritchard (1963) proposed setal nomenclature as dorsocentral, mediolateral and lateral, in addition to verticals and clunals. Among the two mediolaterals, the one on proscutum was called promediolateral and the other one on postscutum as postmediolateral. The lateral setae on pro and postscutum were consecutively numbered as prolateral I-IV and postlateral I-V. Muma & Denmark (1970) considered 3 series of setae on dorsal shield as dorsal (D), lateral (L), median (M), besides verticals ( $=D_1$ ) and clunals ( $=D_6$ ). They considered the anteriormost of seta on dorsal shield as vertical and the posteriormost one as clunal and the remaining setae in D series as  $D_1, D_2, D_3, D_4$  etc., in the median series (M) as  $M_1, M_2, M_3$ , etc. and in lateral series as  $L_1, L_2, L_3$ , etc. They made a deviation from Garman system by naming  $L_6$  as  $M_2$  when  $L_5$  is distinctly mesad of  $L_6$  and naming  $M_2$  of Garman as  $M_3$  when  $M_2$  ( $=L_6$  of Garman) is distinguishable but neither  $M_2$  nor  $M_3$  is recognised as such unless associated with obvious lateral setae. They tried to distinguish the setal homologies. Chant (1965) considered Garman system of setal nomenclature as artificial system with many weaknesses. Therefore, he advised the use of Hirschmann's (1957) system. Rowell *et al.* (1978) adapted the setal nomenclature as proposed by Lindquist & Evans (1965) for Gamasina using Ascidae as exemplar and determined the setal homologies by examining and comparing their ontogenic relationships in both the Phytoseiidae and Ascidae. The system is based on the definition of three series of longitudinal rows of setae on the dorsal shield. Each row is divided into an anterior subseries on the podonotum ( $=$ proscutum) and a posterior subseries on the opisthonotum ( $=$ opisthoscutum). The relative position of the longitudinal rows were maintained on both anterior and posterior positions of the shield in that the mediolateral (z-Z) series lies intermediate between dorsocentral (j-J) series and lateral (s-S). Two additional setae ( $r_3$  and  $R_1$ ) of marginal longitudinal row of setae occur on the sublateral integument or lateral integument. According to them the lateral series consists of setae  $j_3, z_2, z_3$ , the s-S setae and  $Z_5$ . The mediolateral series consists of setae  $z_5, z_6$  (when present as in *Typhlodromus* (*Paraseiulus*)) and  $Z_4$ . The dorsocentral series consists of setae  $j_1$ -J series, except seta  $j_3$  which is considered in lateral series. The setae on sublateral series are called  $r_3$  and  $R_1$ . In males,  $r_3$  is

present on dorsal shield. The different arrangement of setae with

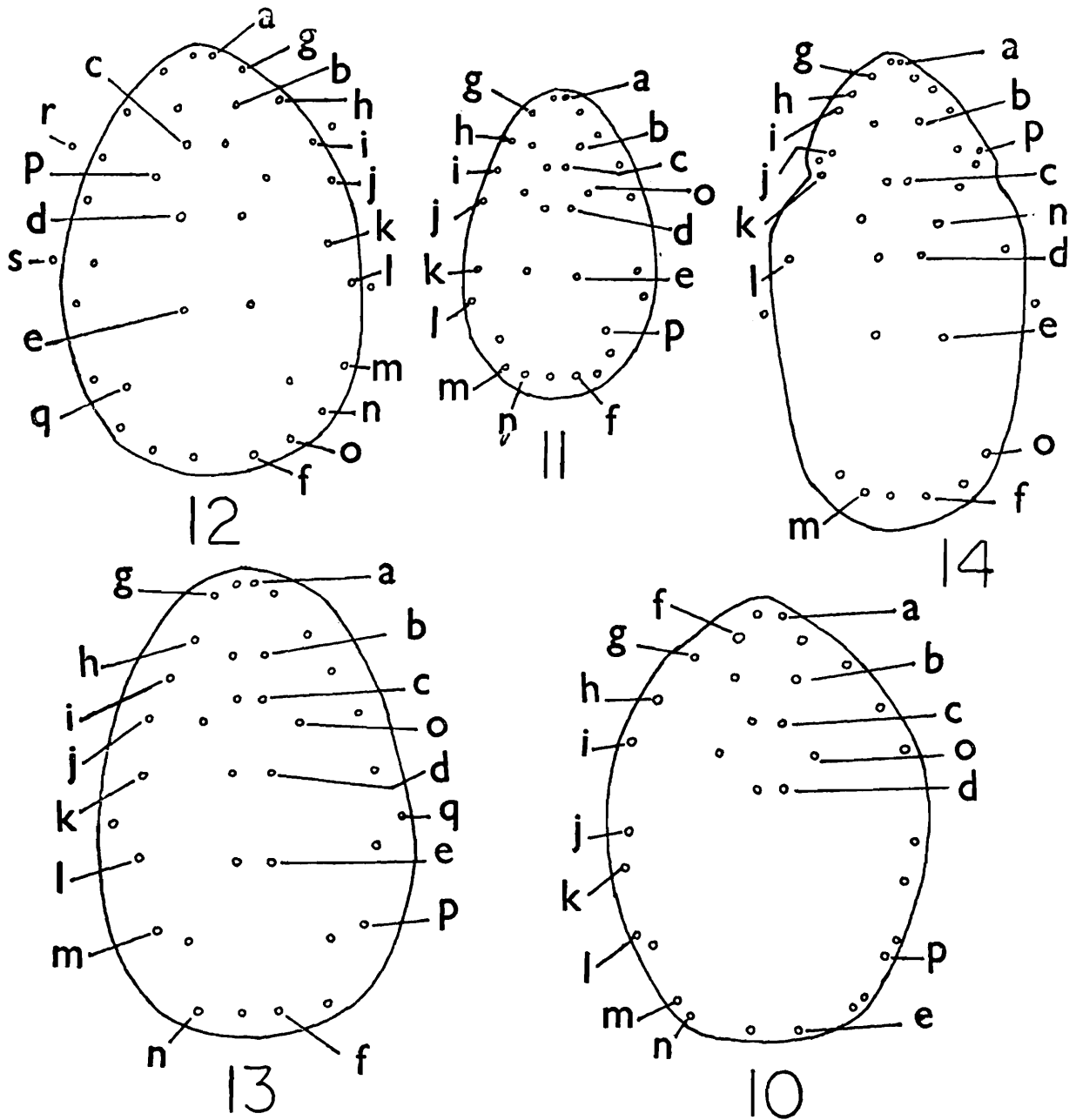


Figs. 6-9. Nomenclature of dorsal setae in different genera and subgenera in Phytoseiidae

6. *Amblyseius (Amblyseius)* : a.  $j_1$ , b.  $j_4$ , c.  $j_5$ , d.  $j_6$ , e.  $J_2$ , f.  $J_5$ , g.  $j_3$ , h.  $z_2$ , i.  $z_4$ , j.  $s_4$ , k.  $Z_1$ , l.  $S_2$ , m.  $S_4$ , n.  $S_5$ , o.  $Z_5$ , p.  $z_5$ , q.  $Z_4$ .
7. *Amblyseius (Asperoseius)* : a.  $j_1$ , b.  $j_4$ , c.  $j_5$ , p.  $j_6$ , e.  $J_5$ , f.  $j_3$ , g.  $z_2$ , h.  $z_4$ , i.  $s_4$ , j.  $Z_1$ , k.  $S_2$ , l.  $Z_5$ , m.  $z_5$ , n.  $Z_4$ .
8. *Amblyseius (Paraphytoseius)* : a.  $j_1$ , b.  $j_4$ , c.  $j_5$ , d.  $j_6$ , e.  $J_5$ , f.  $j_3$ , g.  $z_2$ , h.  $z_4$ , i.  $s_4$ , j.  $Z_1$ , k.  $nZ_4$ , l.  $Z_5$ , m.  $z_4$ .
9. *Amblyseius (Proprioseius)* : a.  $j_1$ , b.  $j_4$ , c.  $j_5$ , d.  $j_6$ , e.  $J_5$ , f.  $j_3$ , g.  $z_2$ , h.  $z_4$ , i.  $s_4$ , j.  $Z_1$ , k.  $S_5$ , l.  $Z_5$ , m.  $z_5$ , n.  $Z_4$ .

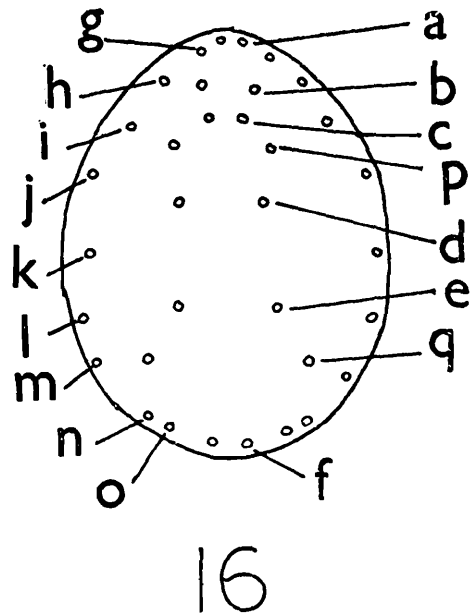
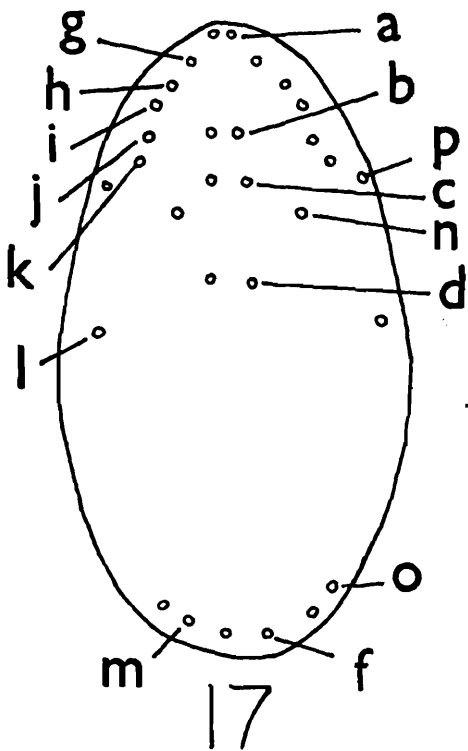
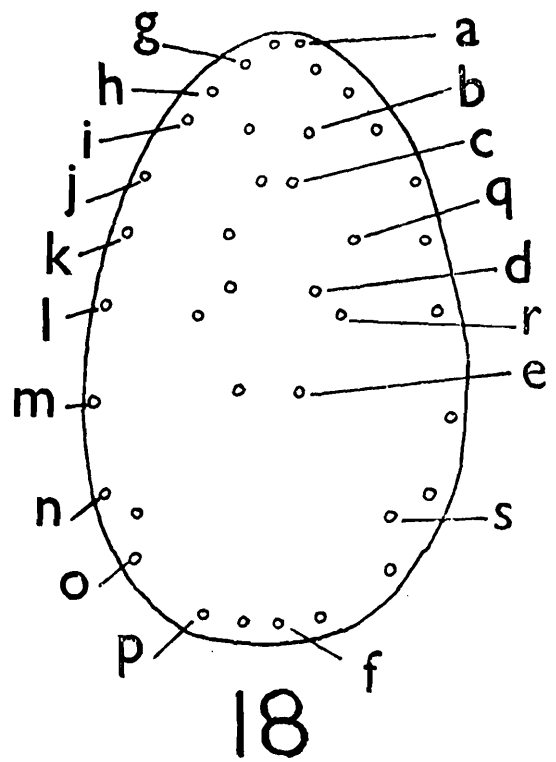
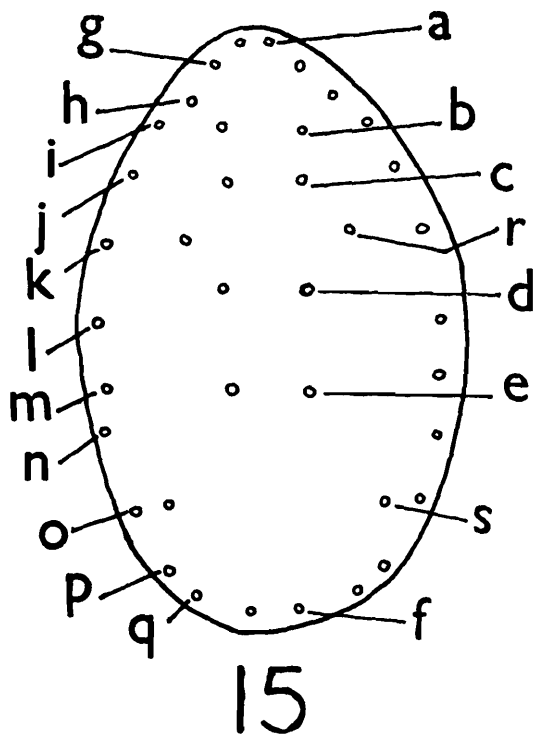
their nomenclature in different genera and subgenera are represented in figures (6-21).

*Venter*: Like other mesostigmatid mites, there is tritosternum (Fig. 22) on the ventral side just posterior to gnathosoma. This



Figs. 10-14. Nomenclature of dorsal setae in different genera and subgenera in Phytoseiidae

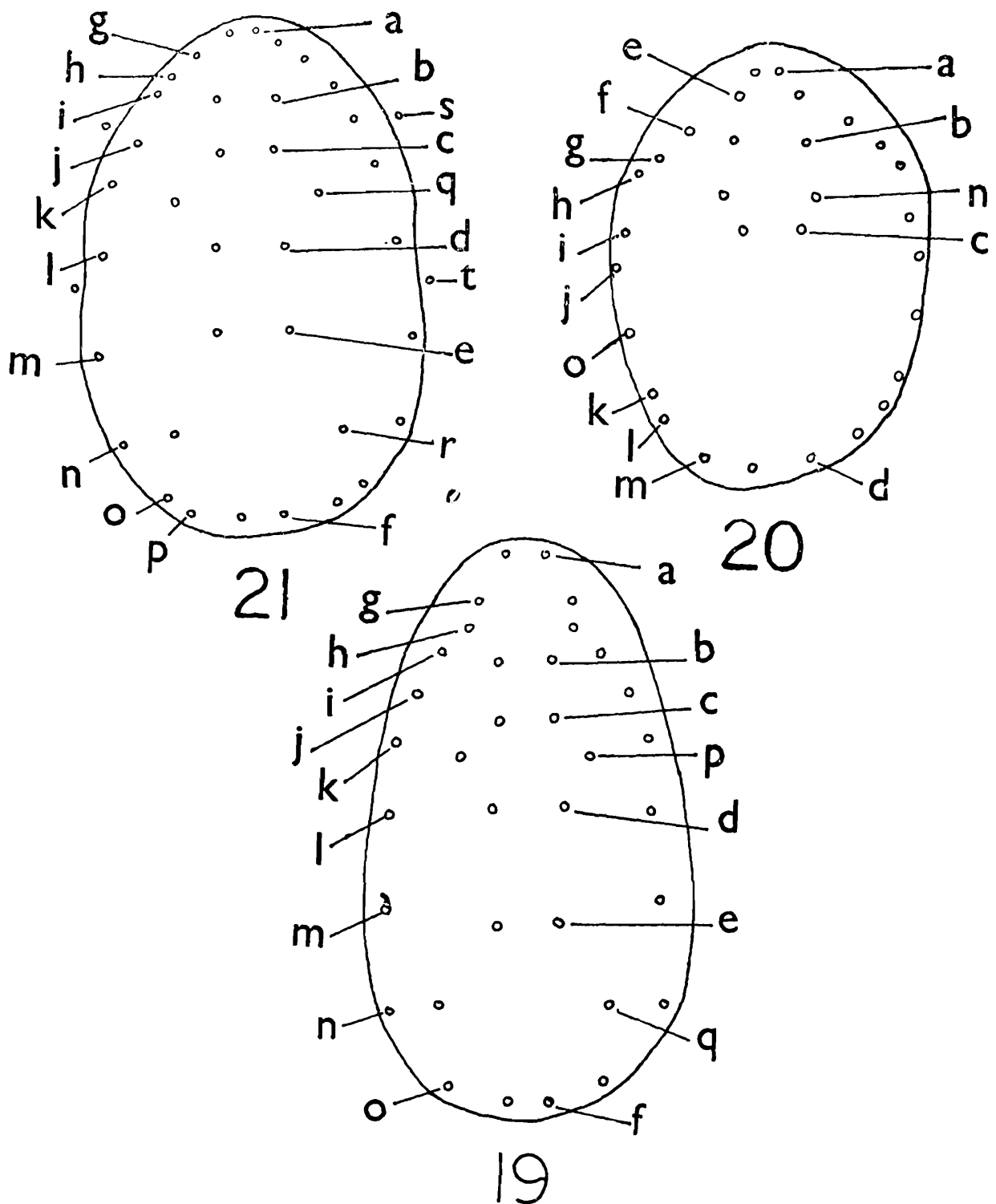
10. *Amblyseius (Proprioseiopsis)*: a.  $j_1$ , b.  $j_4$ , c.  $j_5$ , d.  $j_6$ , e.  $J_5$ , f.  $j_3$ , g.  $z_2$ , h.  $z_4$ , i.  $s_4$ , j.  $Z_1$ , k.  $S_2$ , l.  $S_4$ , m.  $S_5$ , n.  $Z_5$ , o.  $z_5$ , p.  $Z_4$ .
11. *Indoseiulus*: a.  $j_1$ , b.  $j_4$ , c.  $j_5$ , d.  $j_6$ , e.  $J_2$ , f.  $J_5$ , g.  $j_3$ , h.  $z_2$ , i.  $z_4$ , j.  $s_4$ , k.  $Z_1$ , l.  $S_2$ , m.  $S_5$ , n.  $Z_5$ , o.  $z_5$ , p.  $Z_4$ .
12. *Paraamblyseius*: a.  $j_1$ , b.  $j_4$ , c.  $j_5$ , d.  $J_6$ , e.  $j_2$ , f.  $J_5$ , g.  $j_3$ , h.  $z_2$ , i.  $z_4$ , j.  $s_4$ , k.  $Z_1$ , l.  $S_2$ , m.  $S_4$ , n.  $S_5$ , o.  $Z_5$ , p.  $z_5$ , q.  $Z_4$ .
13. *Okiseius*: a.  $j_1$ , b.  $j_4$ , c.  $j_5$ , d.  $j_6$ , e.  $J_2$ , f.  $J_5$ , g.  $j_3$ , h.  $z_2$ , i.  $z_4$ , j.  $s_4$ , k.  $Z_1$ , l.  $S_2$ , m.  $S_5$ , n.  $Z_5$ , o.  $z_5$ , p.  $Z_4$ .
14. *Phytoseius (Pennaseius)*: a.  $j_1$ , b.  $j_4$ , c.  $j_5$ , d.  $j_6$ , e.  $J_2$ , f.  $J_5$ , g.  $j_3$ , h.  $z_2$ , i.  $z_3$ , j.  $z_4$ , k.  $s_4$ , l.  $s_6$ , m.  $Z_5$ , n.  $z_5$ , o.  $Z_4$ , p.  $r_3$ .



Figs. 15-18. Nomenclature of dorsal setae in different genera and subgenera in Phytoseiidae

15. *Typhlodromus* (*Typhloctonus*): a.  $j_1$ , b.  $j_4$ , c.  $j_5$ , d.  $j_6$ , e.  $J_2$ , f.  $J_5$ , g.  $j_3$ , h.  $Z_2$ , i.  $Z_3$ , j.  $Z_4$ , k.  $s_4$ , l.  $s_6$ , m.  $Z_1$ , n.  $S_2$ , o.  $S_4$ , p.  $S_6$ , q.  $Z_5$ , r.  $Z_5$ , s.  $Z_4$ .
16. *Iphiseius*: a.  $j_1$ , b.  $j_4$ , c.  $j_5$ , d.  $j_6$ , e.  $J_2$ , f.  $J_5$ , g.  $j_3$ , h.  $Z_2$ , i.  $Z_4$ , j.  $s_4$ , k.  $Z_1$ , l.  $S_2$ , m.  $S_4$ , n.  $S_5$ , o.  $Z_6$ , p.  $Z_6$ , q.  $Z_4$ .
17. *Phytoseius* (*Phytoseius*): a.  $j_1$ , b.  $j_4$ , c.  $j_5$ , d.  $j_6$ , f.  $J_5$ , g.  $j_3$ , h.  $Z_2$ , i.  $Z_3$ , j.  $Z_4$ , k.  $s_4$ , l.  $s_6$ , m.  $Z_5$ , n.  $Z_5$ , o.  $Z_4$ .
18. *Typhlodromus* (*Paraseiulus*): a.  $j_1$ , b.  $j_4$ , c.  $j_5$ , d.  $j_6$ , e.  $J_2$ , f.  $J_5$ , g.  $j_3$ , h.  $Z_2$ , i.  $Z_3$ , j.  $Z_4$ , k.  $s_4$ , l.  $s_6$ , m.  $S_2$ , n.  $S_4$ , o.  $S_5$ , p.  $Z_5$ , q.  $Z_5$ , r.  $Z_6$ , s.  $Z_4$ .

consists of a basal portion and two setiform distal processes. The tritosternum is the modified remnant of the sternal plates of the third



Figs. 19-21. Nomenclature of dorsal setae in different genera and subgenera in Phytoseiidae

19. *Typhlodromus (Brethria)*: a.  $j_1$ , b.  $j_4$ , c.  $j_5$ , d.  $j_6$ , e.  $J_2$ , f.  $J_5$ , g.  $j_3$ , h.  $z_2$ , i.  $z_3$ , j.  $z_4$ , k.  $s_4$ , l.  $s_6$ , m.  $S_2$ , n.  $S_4$ , o.  $Z_5$ , p.  $z_5$ , q.  $Z_4$ .
20. *Amblyseius (Phytoscutella)*: a.  $j_1$ , b.  $j_4$ , c.  $j_5$ , d.  $J_5$ , e.  $j_3$ , f.  $z_2$ , g.  $z_4$ , h.  $s_4$ , i.  $Z_1$ , j.  $S_2$ , k.  $S_4$ , l.  $S_5$ , m.  $Z_5$ , n.  $z_5$ , o.  $Z_4$ .
21. *Typhlodromus (Typhlodromus)*: a.  $j_1$ , b.  $j_4$ , c.  $j_5$ , d.  $j_6$ , e.  $J_2$ , f.  $J_5$ , g.  $j_3$ , h.  $z_2$ , i.  $z_3$ , j.  $z_4$ , k.  $s_4$ , l.  $s_6$ , m.  $S_2$ , n.  $S_4$ , o.  $S_5$ , p.  $Z_5$ , q.  $z_5$ , r.  $Z_4$ .

segment and is the only relic of the primary sclerites (Baker & Wharton, 1952). Though tritosternum serves as an important character in separating genera of Otopheidomenidae but in Phytoseiidae it is of not much taxonomic importance.

Posterior to tritosternum lies the sternal shield (Fig. 22). This is thought to have been formed by fusion of coxal plates with the ventral body wall. The sternal shield may be smooth, reticulate and variously sclerotized in different genera (strongly sclerotized in *Paraamblyseius*, well sclerotized in *Typhlodromus*, lightly or weakly sclerotized in *Phytoseius*, *Giagnathus* etc.) The relative length and width of sternal shield as well as the presence and absence of sculpturing are often used for generic separation (Merwe & Ryke, 1963). But Chant (1965) considered this character as of little significance. The number of setae present on sternal shield in different genera is given in Table-I. Normally 3 pairs are present on sternal shield, the 4th pair lies either on metasternal plates or are free on integument. But sometimes the 3rd pair instead of being on sternal shield is present on interscutal membrane as in *Gigagnathus* Chant ; 3rd and 4th pairs are both present on interscutal membrane as in *Chantia* Pritchard & Baker or 3rd on small platelet and 4th on metasternal plate as in *Typhlodromus* (*Para-seiulus*). Metasternal plates may be small as in many *Amblyseius* and *Typhlodromus* or may be massive as in *Paraamblyseius*. In males, the sternal and genital shields are fused to form sterniti-genital shield bearing 5 pairs of setae (Fig. 23).

Posterior to the sternal shield is the genital shield (Fig. 22). This, in fact, guards the female genital pore which lies posterior to sternal shield and between the metasternal plates (Baker & Wharton, 1952). Genital shield is normally truncated posteriorly and may have anterior extension as in *Chantia* Pritchard & Baker. Genital shield usually possesses a pair of setae.

Genital shield is followed posteriorly by ventrianal shield (Fig. 22) bearing 1-4 pairs of setae. This shield shows extreme variation from entire to fragmented. Ventrianal shield is sometimes absent and its position is represented only by pre and postanal setae (e.g. *Indoseiulus* Ehara). The shape of ventrianal shield varies. The number of setae present on it in different genera and subgenera of Phytoseiidae is given in Table-I. The ventrianal shield often bears a pair of conspicuous preanal pores (Fig. 22), but sometimes they may be absent as in *Gigagnathus*. Unlike the female, the ventrianal shield of male shows little

variation between species and thus, they are of little taxonomic value. The ventrianal shields of all males are of same shape and possess 4-5 pairs of setae (Chant, 1959). The ventrianal shield is either entire or fragmented, sometimes fused lightly with sternitigenital shield but line of fusion is clear.

The posteroventral surface of body is with variable number of setae. The number of posteroventral setae in different genera and subgenera is given in Table-I. For nomenclature of these setae, Rowell *et al.* (1978) has been followed and explained in fig.-22. Among the setae on the posteroventral surface, the shape and length of the posteriormost median ventral setae (JV5) is of taxonomic importance.

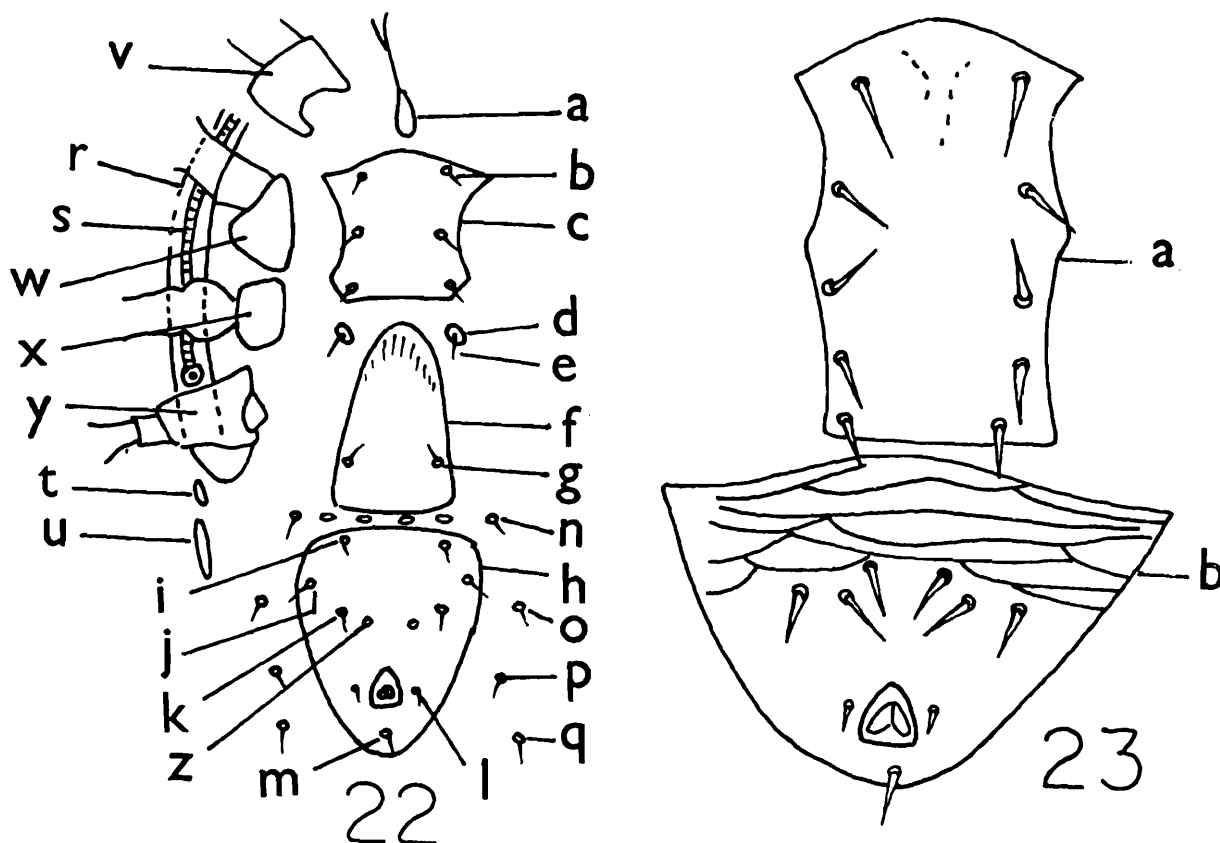


Fig. 22. Ventral surface of a phytoseiid mite (Female) showing ventral plates and setae :

a. Tritosternum, b. Sternal seta, c. Sternal shield, d. Metasternal plate, e. Metasternal seta, f. Genital shield, g. Genital seta, h. Ventrional shield, i. Preanal seta (JV<sub>1</sub>), j. ZV<sub>2</sub>, k. JV<sub>2</sub>, l. Paraanal seta, m. Postanal seta, n. ZV<sub>1</sub>, o. ZV<sub>3</sub>, p. JV<sub>4</sub>, q. JV<sub>5</sub>, r. Peritrematal plate, s. Peritreme, t. and u. Metapodal plates, v. Coxa I, w. Coxa II, x. Coxa III, y. Coxa IV, z. Preanal pore.

Fig. 23. Ventral surface of a phytoseiid mite (Male) showing ventral plates :  
a. Sternitigenital shield, b. Ventrional shield.

Behind coxae IV are present one or two pairs of metapodal plates (Fig. 22) which may be round, oval, triangular, etc. and serve as important character for recognition of genera and species. In *Paraamblyseius*, the metapodal plates are massive.

Besides the metapodal plates, small platelets are often present between the genital and ventrianal shields and also on the membrane around ventrianal shield (Fig. 22).

A pair of spermatheca is always present in Phytoseiidae in contrast to Blattisocidae where it is not always present. This organ was previously neglected by several workers because of its unknown function. Dosse (1958) showed that actual function of this organ was

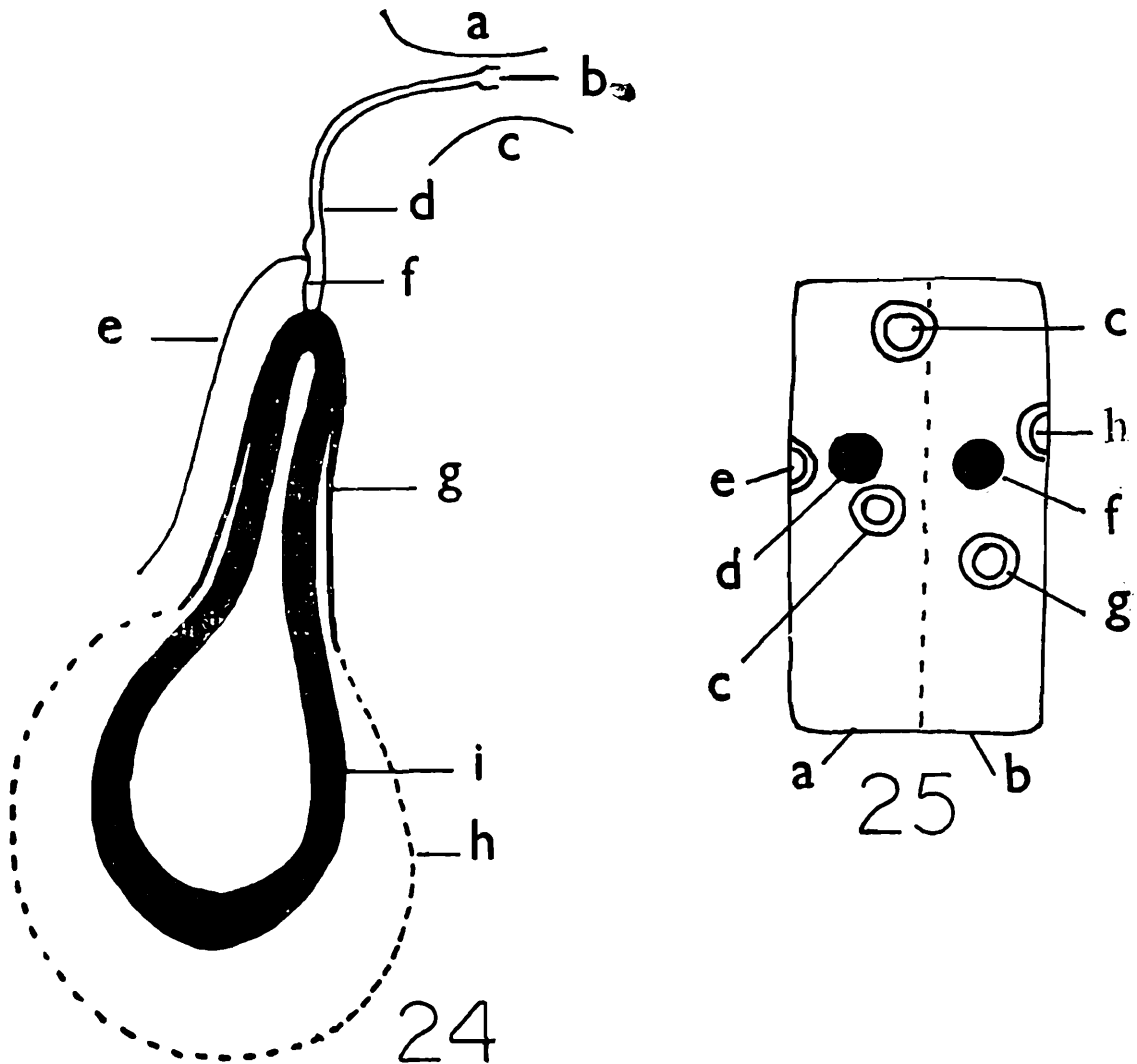


Fig. 24. Spermatheca showing detail structures :

a. Coxa III, b. Receptacle, c. Coxa IV, d. Major duct, e. Minor duct, f. Atrium, g. Cervix, h. Vesicle, i. Spermatophore.

Fig. 25. Diagrammatic representation of genu III showing locations of dorsal and ventral setae for deducing setal formula :

a. Anterior, b. Posterior, c. Anterodorsal, d. Anteroventral, e. Anterolateral, f. Posteroventral, g. Posterodorsal, h. Posterolateral.

reception of spermatophores and since then a lot of importance was laid on the structure of this organ. It is presently believed to be of great importance in separation of the species. Often the species with identical characters are separated with the help of spermatheca alone. Each spermatheca has its external orifice on the venter between coxae III-IV. A lateral view must be obtained in order to examine the structure of spermatheca in detail. The terminology of Schuster & Smith (1960) (Fig. 24) has been followed as done by most of the recent workers. The spermatophores are collected in a membranous vesicle with a sclerotized portion called cervix which leads into a chamber, the atrium. The cervix and atrium are sclerotized and are quite consistent in shape. A narrow duct arises from atrium for passage of spermatozoa to ova and a major duct is there through which the spermatophores are received and open between coxae III and IV. The spermatophores are formed in the spermatheca (Dosse, 1958). Older spermatophores are replaced further into the vesicle. More than one spermatophore is frequently seen to be connected to the atrium (Schuster & Smith, 1960). The spermatheca appears in the deutonymph prior to the final moult and its reaction to stains indicates that it is endodermal in origin (Schuster & Smith, 1960). Spermatheca was earlier called Coxal glands or Vesicles and was recognised by Nesbitt (1951), Smith & Summers (1949) and Womersley (1954). Schuster (1957, 1959) and Schuster & Smith (1960) illustrated this structure for some of the species.

The stigmata and peritreme are on peritrematal shield (Fig. 22). Length of peritreme has recently been looked upon as of great taxonomic value. Often the peritrematal shield may be fused anteriorly with dorsal shield (e.g. *Phytoseius* Ribaga, *Gigagnathus* Chant, *Paraamblyseius* Muma and *Macroseius* Chant *et al.*) and posteriorly curves around coxae IV.

The chaetotaxy of legs is of great value for generic and specific determination. Evans (1963) in his excellent work showed that all phytoseiids have standard chaetotaxy of legs II and III. In *Macroseius* Chant *et al.*, 8 setae on genu II, 7 setae on genu III; in *Typhlodromus* Scheuten, 7 or 8 setae on genu II and 7 setae on genu III; in *Chantia* Pritchard & Baker, 7 setae on each of genu II and III and tibia II and III; in *Platysiella* Muma and *Phytoseius* Ribaga, 7-6-7 setae on genu II, III and IV, respectively but genu III of *Phytoseius* also possesses 7 setae in some of the species. *Iphiseius* Berlese and *Amblyseius* Berlese possess

7-7-7 setae on genu II, III and IV, respectively and 6-7, 6-7 and 6 setae on tibia II, III and IV, respectively. *Paraamblyseius* Muma has 7 setae on genu II and 6 setae on genu III; *Phytoseiulus* Evans has 7, 8 or 9 setae on genu II and 7 setae on genu III; *Okiseius* Ehara has 6 setae on genu II, 7 setae each on genu III and IV. The leg chaetotaxy specially of genu II and III and tibia II and III are represented by leg chaetotactic formula as genu  $2 \frac{2}{o} \frac{2}{o} 1$  or  $2al \frac{2ad}{oav} \frac{2pd}{opv} 1pl$  (Fig. 25)

al = anterolateral  
 ad = anterodorsal  
 av = anteroventral  
 pd = posterodorsal  
 pv = posteropventral  
 pl = posterolateral

Often genu, tibia and basitarsus of leg IV and sometimes genu and tibia of leg II and III bear macrosetae, the relative length of which are of taxonomic value for separation of species. Macroseta may be simple, knobbed, spatulate or otherwise shaped.

TABLE—1. Showing disposition of setae on dorsal shield and ventral surface in various genera and subgenera of Phytoseiidae.

Genera/Subgenera	Dorso-central	Median	Lateral	Sub-lateral	Ster-nal	Ventria-nal	Ventro-lateral
<i>Amblyseius</i> ( <i>Amblyseius</i> )	6	2	9	2	3	3	4
<i>Amblyseius</i> ( <i>Euseius</i> )	6	2	9	2	3	3	4
<i>Amblyseius</i> ( <i>Asperoseius</i> )	5	2	7	2	3	3	4
<i>Amblyseius</i> ( <i>Paraphytoseius</i> )	5	2	6-7	2	3	3	4
<i>Amblyseius</i>							
( <i>Typhlodromalus</i> )	6	2	9	2	3	3	4
<i>Amblyseius</i> ( <i>Typhlodromips</i> )	6	2	9	2	3	3	4
<i>Amblyseius</i> ( <i>Proprioseiopsis</i> )	5	2	9	2	3	3	4
<i>Amblyseius</i> ( <i>Proprioseius</i> )	5	2	7	1	3	3	4
				(R <sub>1</sub> absent)			
<i>Amblyseius</i> ( <i>Phytoscutella</i> )	4	2	9	2	3	3	3
<i>Amblyseius</i> ( <i>Neoseiulus</i> )	6	2	9	2	3	3	4
<i>Iphiseius</i>	4-6	2	7-9	2	3	3-4	3-4
<i>Paraamblyseius</i>	6	2	9	2	3	3	3
<i>Indoseiulus</i>	6	2	8	2	3	3	4
<i>Okiseius</i>	5	2	8	2	3	3	4
				(R <sub>1</sub> on dorsal shield)			

TABLE—1 (Continued). Showing disposition of setae on dorsal shield and ventral surface in various genera and subgenera of Phytoseiidae.

Genera/Subgenera	Dorso-central	Median	Lateral	Sub-lateral	Ster-nal	Ventria-nal	Ventro-lateral	
<i>Platyseieha</i>	5	2	6	1	3	3	4	
			(r <sub>3</sub> on dorsal shield, R <sub>1</sub> absent)					
<i>Typhlodromus</i>								
( <i>Amblydromella</i> )	6	2	10	2	3	4	4	
<i>Typhlodromus</i> ( <i>Anthoseius</i> )	6	2	10	2	3	3	4	
<i>Typhlodromus</i> ( <i>Brethria</i> )	6	2	9	2	3	4	4	
<i>Typhlodromus</i> ( <i>Orientiseius</i> )	6	2	10	2	3	4	4	
<i>Typhlodromus</i> ( <i>Paraseiulus</i> )	6	3	10	2	2	4	4	
<i>Typhlodromus</i> ( <i>Clavidromus</i> )	6	2	10	2	3	4	4	
<i>Typhlodromus</i> ( <i>Typhloctomus</i> )	6	2	11	2	3	4	4	
<i>Typhlodromus</i>								
( <i>Typhlodromus</i> )	6	2	10	2	3	4	4	
<i>Phytoseius</i> ( <i>Pennaseius</i> )	6	2	7	2	3	3	3	
			(r <sub>3</sub> on dorsal shield, R <sub>1</sub> on lateral integument)					
<i>Phytoseius</i> ( <i>Phytoseius</i> )	5	2	7	1	3	1-3	3	
			(r <sub>3</sub> on dorsal shield, R <sub>1</sub> absent)					
<i>Gigagnathus</i>	6	2	9	1	2	3	3	
			(R <sub>1</sub> absent)					
<i>Chantia</i>	5	2	6	2	2	3	3	
			(r <sub>3</sub> , R <sub>1</sub> on dorsal shield)					
<i>Chelaseius</i>	6	2	9	2	3	3	4	
<i>Phytoseiulus</i>	5	2	7	2	3	1	4	
<i>Ir.dodromus</i>	6	2	10	2	2	4	4	
			(r <sub>3</sub> , R <sub>1</sub> both on dorsal shield)					
<i>Macroseius</i>	7	2	9	2	3	1	6	
			(r <sub>3</sub> on dorsal shield, R <sub>1</sub> on lateral integument)					
<i>Gnorimus</i>	7	3	12	3	3	6	2	
<i>Garhwalicus</i>	6	2	12	3	2	7	1	

## BIOLOGY

The phytoseiid mites pass through 4 developmental stages, viz. egg, larva, protonymph and deutonymph. The larva has 3 pairs of legs and all postlarval stages have 4 pairs of legs. In some species, males may not exhibit deutonymphal stages as is seen in *Amblyseius finlandicus* (Oud.) (Ballard, 1954). In between two stages there is a brief resting period called quiescent stage. The life cycle in Phytoseiidae is normally brief in comparison to tetranychid mites under identical conditions and takes 6-7 days and species of *Phytoseiulus* Evans takes still lesser time. However, if the temperature is very low, the developmental period may be prolonged. On the other hand, high temperature may be detrimental for development. Besides temperature, the quantity and quality of food also influence the developmental period. Some are known to develop only on tetranychid food, some on a combination of tetranychids and eriophyids, some on mites and pollen and a few develop on pollen alone. Larvae mostly need food to transform into next stage but reports are available when larvae do not need any food and develop on leaf alone (e.g. *Amblyseius rubini* Swirski & Amitai (Swirski *et al.*, 1967). Since a 4 legged protonymph has a better searching ability than a 3 legged larva, it may be advantageous for larva if it has not to depend upon prey for development.

The reproduction in phytoseiid mites is through arrhenotoky. The oviposition starts only after mating and sometimes frequent mating is needed for continuous oviposition. The sex is determined by haploid-diploid mechanism. Oogenesis requires some stimulus associated with mating and presence of sperms in arrhenotokous forms, even though the developing unfertilized ova produce males. Otherwise female will produce males (haploid) after the sperms were exhausted. According to Dosse (1959), the males use their chelicerae to place the spermatophoras into spermatheca which opens between coxae III and IV of females. Dosse also claimed that the number of successful copulations could be determined by the number of spermatophores in the spermatheca. Studies on sex ratio in case of *Typhlodromus occidentalis* was 15% males, which in case of *T. (O.) rickeri* Chant was 2 females : 1 male.

The preoviposition period in most phytoseiids is very low (24-30 hrs.) but under optimum condition it requires 3-5 days. Putman (1962) obtained a mean pre-oviposition period for *T. (A.) caudiglans* Schuster 9.2 and 16.3 days at 16°C and 14°C., respectively, while Dosse (1957)

reported 15 days as mean preoviposition period for females of *T. pyri* when held at 25-26°C after being collected in the field in March. Regarding oviposition, in most of the species, the maximum production is 2.5 eggs/day at winter temperature with abundant food. The mean total eggs/female depended on the species and testing conditions and the average lies between 30-50. The egg production is more during early part of adult life and gradually declines thereafter. The rate of egg production is influenced on the prey density.

Phytoseiidae also undergoes diapause. Diapause has been defined as a physiological state of arrested development that enables an organism to survive more easily a period of unfavourable condition (Dickson, 1949). Once the organism has entered into diapause, it will remain in that state for certain period regardless of the condition of the environment. When the species finds high temperature to be unfavourable for its survival, it enters into summer diapause (oversummering), which, however, is quite uncommon in Phytoseiidae. Similarly, when the species finds extreme low temperature to be unfavourable for its survival, it undergoes winter diapause (overwintering). Absence of reproduction under otherwise favourable condition is apparently the only reliable criterion for detecting diapause. The winter diapause in Phytoseiidae usually occurs in adult female stage though in other groups it may be in egg stage. Among the important factors responsible for inducing diapause, viz. photoperiod, temperature and nutrition, the photoperiod is the most important one as in *Typhlodromus (Amblydromella) caudiglans* (Putman, 1962). The arboreal species of Phytoseiidae enters into winter diapause by overwintering into protected places like deep crevices, canker wounds, beneath leaf and bud scales and bark. At extremely low temperature like -20 to -24°C, the body fluid freezes (Macphee, 1963) and under severe cold condition 80% of overwintering females suffer mortality. However, if sufficient sheltering places are available, the rate of winter mortality is reduced. The high rate of mortality of overwintering females often reduces the effectiveness of the predatory species. Winter mortality is usually rated by comparing the number of adult females with the number found in next spring. Since emergence of the adult overwintered females takes place through a considerably long period and often they remain on twigs and branches rather than coming on the leaves, the population count should be made more judiciously and population count should not be restricted to leaf population alone. In warm climate, the phytoseiids

may be found in the field throughout the year on evergreen trees and shrubs. Overwintering females have been noticed to feed during warmer winter days (Dosse, 1957). Photoperiod of 9-11 hours induced diapause in *A similis* while none entered diapause at photoperiod of 15-24 hours. The critical photoperiod at which 50% of the population entered into diapause was 11.5 hours. None entered diapause at 25°C irrespective of the photoperiod. Often interesting case of seasonal synchrony has been noticed in Phytoseiidae as the prey and the predator entered diapause simultaneously and often at the same place and emerged from diapause simultaneously.

#### ECONOMIC IMPORTANCE

As has already been mentioned, phytoseiid mites are probably one of the most effective and wide spread predators of injurious plant feeding mites of the families Tetranychidae, Eriophyidae, Tenuipalpidae and Tarsonemidae. This fact was first established by Parrott, Hodgkiss & Schoene (1906) who noted *Seius pomi* (Parrott) preying upon blister mite, *Eriophyes pyri* (Pgst.). Since then several reports are available highlighting the value of phytoseiid mites in regulating the population of plant mites. Quayle (1912), Ewing (1914), Gilliatt (1935), Garman & Townsend (1938), Garman (1948) and Nesbitt (1951) were among the earlier workers who considered this group to be of potential importance in controlling spider mites. Later, several workers from different parts of the world corroborated this fact and a good deal of work was carried out in this direction. These reports were excellently reviewed by Huffaker *et al.* (1969, 1970), and McMurtry *et al.* (1970). Recent studies on predator-prey interaction (McMurtry & Scriven 1971 ; Mori & Moriyama, 1970 ; Takafuji & Chant, 1976, Eveleigh & Chant, 1981, 1981a, 1981b, 1982, 1982a, 1982b, 1982c) further focused the importance of this group as biocontrolling agents. The reports on the functional response of the phytoseiid mites to the density of tetranychid mites and also on the aspects of their numerical response were conducted by various workers to evaluate the efficiency of these mites as potential predator (Chant, 1961 ; Mori & Chant, 1966 ; McMurtry & Scriven, 1966).

From India too, several reports are available on predatory behaviour of these mites upon phytophagous mites ( Narayanan & Khot, 1959 ; Kamath, 1968 ; Daniel, 1981 ; Somchoudhury, 1979 ; Puttaswamy & ChannaBasavana, 1979 ; Puttaswamy & ChannaBasavanna 1979a

Puttaswamy, 1978 ; ChannaBasavanna, 1981 ; Rao, & Rao, 1964 ; Gupta, 1970 ; 1970a ; Gupta, Dhooria & Sidhu, 1971 ; Gupta, 1977a, 1978a ; Muraleedharan & Chandrasekharan, 1981 ; Dhooria, 1981 ; Dhooria & Gupta, 1975 ; Gupta, 1976 ; Sandhu *et al.*, 1973 ; Rao *et al.*, 1969 ; Narayanan & Kaur, 1960 ; Mallick, 1974 ; Putatunda *et al.*, 1975). All these reports give enough indications that these mites are of extreme value as biocontrolling agents and these, if properly and judiciously utilised, can bring about effective and profitable biological control of injurious phytophagous mites and insects. It is heartening to note that considerable amount of work in this direction has already been started in India and some of the results that have emerged recognise a few very useful species as predators.

#### CLASSIFICATION

There has always been some confusion and difference of opinion in generic and suprageneric concepts of Phytoseiidae. Berlese (1916) proposed the subfamily Phytoseiinae under family Laelaptidae including genera : *Podocinum* Berlese, *Ameroseius* Berlese, *Epicroseiopsis* Berlese, *Amblyseius* Berlese and *Iphidozercon* Berlese. Vitzthum (1941) also recognised it as subfamily under Laelaptidae and included under it 7 genera (*viz.* *Typhlodromus* Scheuten, *Seiulus* Berlese, *Phytoseius* Ribaga, *Amblyseius* Berlese, *Iphidulus* Ribaga, *Seiopsis* Berlese and *Klemania* Oudemans. But none of them provided the diagnosis of the family which was first done by Garman (1948) on the basis of type, number and distribution of setae on dorsal shield and by shape and size of anal plate of female. He included 9 genera in this subfamily. Nesbitt (1951) made the first critical review of this subfamily which he included under family Laelaptidae. He recognised genera *Amblyseius* Berlese, *Typhlodromus* Scheuten, *Blattisocius* Keegan, *Klemania* Oudemans, *Phytoseius* Ribaga, *Kampimodromus* Nesbitt and *Garmania* Nesbitt under it. Baker & Wharton (1952) after giving this group the family status for the first time divided it into two subfamilies, subfamily I. Phytoseiinae including 12 genera and subfamily II. Podocinae comprising of 10 genera. In spite of the fact that family status was given, Womersley (1954) considered it as subfamily Phytoseiinae under family Laelaptidae. Chant *et al.* (1959) proposed a new subfamily Macroseiinae to accommodate one atypical genus *Macroseius* Chant *et al.* Chant (1959) made a conservative approach in classifying Phytoseiidae and recognised two subfamilies, *viz.* *Macroseiinae* with one genus

*Macroseius* and Phytoseiinae with 8 genera : *Typhlodromus* Scheuten, *Phytoseius* Ribaga, *Phytoseiulus* Evans, *Iphiseius* Berlese, *Asperoseius* Chant, *Proprioseius* Chant, *Seiulus* Berlese and *Typhloseiopsis* De Leon. He used chaetotaxy of dorsal shield, and chaetotaxy and shape of ventrianal shield of adult, female chelicera and chaetotaxy of membrane around ventrianal shield as important characters for classification. He considered a large number of species groups at subgeneric levels. His study stimulated the future workers and within two years a number of major studies followed. Karg (1961) gave family status to one genus *Typhlodromus* Scheuten. Additional genera were proposed by Athias-Henriot (1960) and Swirski & Shechter (1961). Muma (1961) after making extensive studies re-evaluated the subfamilies, genera and species on the basis of dorsal scutal form, dorsal setal pattern, scapular setae, sternal setation and leg IV macrosetae. He recognised 4 subfamilies and 43 genera, of these, 29 genera and 2 subfamilies were proposed as new. Additional genera were proposed by Gonzalez & Schuster (1962) and Muma (1962). Hirschmann (1962) proposed a very conservative system of classification and put all the species presently considered in Phytoseiidae under one genus which was included in the family Gamasidae newly revised by him. Westerboer & Bernhard (1963) though retained the family Phytoseiidae but included divergent genera presently considered to belong to different families. Wainstein (1962) apparently being unaware of Muma (1961) and Karg (1961) proposed dividing the family into 2 subfamilies, 3 tribes, 7 genera, 22 subgenera and 20 sections. However majority were synonyms. Pritchard & Baker (1962) followed a somewhat conservative system of classification recognising 6 tribes each consisting of a genus, of which one was proposed as new and included 16 subgenera of which two were new. Schuster & Pritchard (1963) divided the family into 6 tribes with 17 genera under it. Lindquist & Chant (1964) transferred *Aceodromus* Muma to subfamily Blattisocinae under Aceosejidae. Chant (1965) made an attempt to stabilise generic concept of Phytoseiidae by making some radical changes. He brought 4 genera of otopheidomenid mites as a subfamily Otopheidomeninae under family Phytoseiidae while his other subfamily Phytoseiinae comprised of 9 known genera and 1 new genus. He did not recognise a separate subfamily Macroseiinae to embrace *Macroseius* Chant *et al.* and considered it simply as a genus under Phytoseiinae. He synonymised 4 of the genera proposed by Cnant (1959) and 35 of the genera proposed by Muma (1961). His basis of classification was (1) whether or not there is addition of prolateral

setae in the deutonymph and adult on dorsal shield in second moult and hence whether there are 4 or more prolateral setae in deutonymph and adult, (2) the placement of sublateral setae  $r_3$  and  $R_1$  (3) the degree of sclerotization of lateral integument, (4) the shape of body and the degree to which it is covered dorsally by dorsal shield and (5) the chaetotaxy of leg and macrosetae. Addition and reallocation of genera were proposed by De Leon (1965, 1965a, 1966) and Ehara (1967). Muma (1963b), Denmark (1966) and Denmark & Muma (1966) revised the genera *Galendromus* Muma, *Phytoseius* Ribaga and *Proprioseius* Chant, respectively. Muma & Denmark (1961) criticised Chant (1965) for the generic concept proposed by him and delineated 5 new genera and synonymised 4 genera. Muma & Denmark (1970) further criticised Chant's generic concept as he included otopheidomenid mites under Phytoseiidae. According to them, this inclusion was without any basis and unwarranted, because the otopheidomenids are parasitic or semiparasitic mites with incomplete chelicerae and fragmented or poorly defined dorsal shield and ventral anus while the phytoseiids are semipredaceous or predaceous with complete chelicerae, well defined dorsal shield and ventral anus. Further, they also did not favour the inclusion of species with divergent habitat and food habits under one genus as was done by Chant (1965) specially in case of heterogeneous genera like *Amblyseius* and *Typhlodromus*. They recognised 3 subfamilies, viz. Amblyseiinae, Phytoseiinae and Macroseiinae with a total of 28 genera under these subfamilies from Florida. They excluded otopheidomenid mites altogether from Phytoseiidae. Even after that work a big question baffled taxonomists whether to include otopheidomenid mites under Phytoseiidae or to treat it as a separate family. Krantz & Khot (1962), Evans (1963), Chant (1965), Treat (1965, 1975), Costa (1968), Prasad (1963, 1970, 1970a), Wainstein (1972) and Ramsey (1973) studied the systematics of this group and most of them gave a separate family status to Otopheidomenidae. Wainstein regarded a part of it under the family Otopheidomenidae and the remainder as a subfamily Treatinae under family Phytoseiidae. Chant (1965), of course, included whole of it under Phytoseiidae in a separate subfamily Otopheidomeninae. In order to throw further light on this subject, Chant *et al.* (1978) made critical study of this family using numerical taxonomy and a new classification was proposed which recognised 2 subfamilies, viz. A. Otopheidomeninae having 4 genera under it (*Otopheidomenis* Treat, *Treatia* Krantz & Khot, *Hemipteroseius* Evans and *Entomoseius* Chant) and B. Phytoseiinae having 5 tribes as I. Phytoseiini Berlese

(including genera *Phytoseius* Ribaga and *Platyseiella* Muma, II. *Typhlodromini* Scheuten (including genera *Typhlodromus* Scheuten and *Gigagnathus* Chant, III. Amblyseiini Berlese (including genera *Amblyseius* Berlese, *Phytoseiulus* Evans, *Proprioseius* Chant, *Paraamblyseius* Muma, *Asperoseius* Chant, IV. Macroseiini Chant *et al.* (including genus *Macroseius* Chant *et al.*) and Chantiini Pritchard & Baker (including *Chantia* Pritchard & Baker). This classification more or less resembles the system as proposed by Schuster & Pritchard (1963) in which they recognised 6 tribes within the family Phytoseiidae. Regarding the inclusion of otopheidomenid mites in Phytoseiidae, Chant *et al.*, (1978) left it to the subjective opinions of various reviewers though they themselves strongly argued in favour of its inclusion in Phytoseiidae. However, in the absence of such study taking all the genera together, it will be improper to strictly follow their generic concept.

The present author believes that because of the different ecological habitat of otopheidomenid mites having different morphological characters to fit with the typical habitat, it will be proper if the otopheidomenid mites are kept separately from the phytoseiid mites in a separate family, Otopheidomenidae. Hence, the concept of the family Phytoseiidae which the present author has followed in this work is the Phytoseiinae of Chant (1965) and Chant *et al.* (1978) and Phytoseiidae of Muma & Denmark (1970) recognising 4 subfamilies under it, viz. I. Macroseiinae including *Macroseius* Chant *et al.* (not represented in India), II. Phytoseiinae (including genera : *Phytoseius* Ribaga, *Indodromus* Ghai & Menon, *Typhlodromus* Scheuten, *Gigagnathus* Chant (not represented in India) and *Chantia* Pritchard & Baker (not represented in India) III. Amblyseiinae (including genera : *Amblyseius* Berlese, *Platyseiella* Muma, *Iphiseius* Berlese, *Paraamblyseius* Muma, *Phytoseiulus* Evans (not represented in India), *Indoseiulus* Ehara and IV. Gnoriminae Chaudhri (including genera *Garhwalicus* Gupta & Ray, *Gnorimus* Chaudhri (not represented in India).

There are two schools of thought regarding generic concept of Phytoseiidae. One school considers Phytoseiidae to be of remarkable generalized form and show little variation in morphological character. With this idea they consider a few basic forms or genera. The other school considers the basic forms to be suprageneric categories and on the basis of many minor morphological characters erected a complex of genera which the former group considers at best of subgeneric signi-

ficance. So the present author feels that a somewhat conservative generic concept as of Chant (1965) and Chant *et al.* (1978) (in part) will be a better approach. Again if Chant's (1965) concept is strictly followed, there is likely to be a problem in handling numerous species under some genera like *Amblyseius*, *Typhlodromus*, *Phytoseius*, etc. specially to key out the species, So to solve that problem it is proposed here to recognise a subgeneric concept and for such purpose the characters chosen by Muma and Denmark (1970) and Tuttle (1973) for generic separation can by and large be utilised with slight modifications. To some extent this concept has been followed by some of the recent workers (Ehara & Bhandhufalck, 1977 ; Blommers, 1976, etc.).

#### INTERRELATIONSHIP OF PHYTOSEIIDAE WITH OTHER RELATED FAMILIES

Phytoseiidae is very close to Otopheidomenidae on one hand and Blattisocidae on the other. Treat (1955), Baker & Johnston (1959) Krantz & Khot (1962), and Evans (1963) have shown close relationship of Otopheidomenidae with Phytoseiidae. Evans (1963) also went to the extent of mentioning that the relationship of Otopheidomenidae with Phytoseiidae is the true one and not due to convergence. According to them, the major difference were the tendency to retain the reduced number of larval setae on the adult appendages in Otopheidomenidae, the terminal position of anus, reduced chelicera and difference in ontogeny of the idiosomal chaetotaxy. The terminal position of anus and reduced chelicera are the unique characters and not met within Phytoseiidae. Now regarding the reduced setae on appendages in otopheidomenids, the phytoseiid mites show variation in this regard and probably the otopheidomenid mites show one of the extremes. Chant (1965) stated that variation in development in the idiosomal chaetotaxy as pointed out by Evans (1963), the otopheidomenids and phytoseiids are not as marked as recorded by Evans. The larvae of Phytoseiidae and Otopheidomenidae have 9 pairs of setae on podonotal region (except in *O. zalelestes* Treat where seta  $j_3$  is absent in all stages). Evans (1963) pointed out that only 1 or 2 setae,  $r_3$  and  $s_7$  are added in the protonymph and that pattern is retained by the deutonymph and adult. But actually in *Typhlodromus soleiger* (Ribaga) 3 setae,  $r_5$ ,  $s_7$  and  $z_5$  are added in the protonymph and in all species of the genera *Typhlodromus* Scheuten and *Phytoseius*

Ribaga, an additional prolateral seta is added to the podonotal region in the deutonymph and retained in adult. In *Hemipteroseius*, one seta is added to the podonotal region in protonymph,  $r_5$ . Evans further stated that larvae of Otopheidomenidae resemble those of Phytoseiidae in having only one pair of setae on the opisthosomal region. But many phytoseiids have 2-3 setae in this region. In *Treatia* Krantz & Khot and *Entomoseius* Chant, 4 setae ( $J_2$ ,  $J_3$ ,  $S_5$  and  $R_1$ ), in protonymph of *Hemipteroseius* 5 setae ( $J_1$  in addition to above 4) and in *Otopheidomenis zalelestes* 4 or 5 setae are added. All retain the protonymphal compliment in the deutonymph and adult. However, in Phytoseiidae, 2-9 setae may be added in protonymph and this is retained in the subsequent stages. All these indicate that the number of setae in opisthosomal region of the adult is reduced in Otopheidomenidae as compared to Phytoseiidae. The divided dorsal shield of the adult in some otopheidomenid mites, according to Chant (1965), is also not unique as similar character is seen in the genus *Macroseius* under Phytoseiidae. He believed that most of the differences that exist between Phytoseiidae and Otopheidomenidae are because of the different habitats in these two groups, as entomogenous in otopheidomenidae and free living in Phytoseiidae. On the basis of this, Chant (1965) went to the extent to include otopheidomenid mites as a subfamily under family Phytoseiidae. In the later reports (Chant *et al.*, 1978), they still continued to have this concept and retained it under Phytoseiidae as subfamily. But most of the workers including the present one do not subscribe to this view and prefer to keep these mites separately from Phytoseiidae as an independent family, Otopheidomenidae.

Phytoseiidae has affinity with Blattisocidae having truncate genital shield and palptarsus with 2 tined seta. Many species also have identical feeding habits. But the former can be easily separated from the latter in having (1) dorsum with 20 or fewer pairs of setae (except in Gnoriminae which has 25 pairs of setae) but Blattisocidae has always more than 20 pairs, (2) sometimes dorsum of Phytoseiidae may be divided as in *Macroseius* but it is always complete in Blattisocidae, (3) never more than 2 pairs of sublateral setae (except in Gnoriminae which has 3 pairs) but Blattisocidae has always more than 2 pairs, (4) tectum never with process in Phytoseiidae but process may be present in Blattisocidae and (5) posteroventral surface of Phytoseiidae has 7 pairs of setae but more in Blattisocidae.

## PHYLOGENY

Most taxonomists have assumed that Phytoseiidae has evolved from blattisocid type ancestor which possessed numerous setae. Athias-Henriot (1957, 58) and Hirschmann (1957) basing on this theoretical concept developed a system of setal nomenclature. Chant (1959a) also corroborated this idea and evolved a prototype. On the basis of reduction of dorsal scutal setae, increase in ventral sclerotization and variation in the type of setae on the dorsal scutum, he developed a chart utilising a prototype. However, Muma (1961) and Wainstein (1962) inferred a different view point. Muma (1963a) proposed an altogether different ancestral prototype which was diametrically opposite to the views of Chant. According to him, the ancestor phytoseiid had a few long whip-like setae on the dorsal scutum, large discrete sclerites on the ventral surface and large tactile setae on legs. From this prototype evolution might have followed in (1) increase in setal number and decrease in setal length, (2) decrease in size and discreteness of ventral scuta and (3) decrease in length and loss of tactile setae on legs. In support of his theory he mentioned that immatures in phytoseiid mites possessed 10-12 pairs of setae on split dorsum of which 2 pairs being always long and whip—like, despite the fact that adults normally have 16-20 pairs of much longer setae. Had the phytoseiids descended from ancestors having numerous shorter setae, then it is logical that the immediately preceding nonfeeding stage of these mites would carry a greater number of setae and shorter setae than adult. He further stressed upon the fact that phytoseiids were found not only on plants but also in organic debris, litter, rotten organic matter and leaf mould. The litter inhabiting forms are invariably Amblyseiinae having long whip—like dorsal scutal setae. It is more probable that the organisms living in tropics in plant litter where almost uniform condition of light, temperature and moisture prevail would retain more primitive characters than organisms living on aerial parts which are more exposed to rigors of nature. He tried to get support for his theory from food habits also as species with longer dorsal setae are either general predators or omnivorous whereas those with shorter dorsal setae have limited food habits. He thought Aceodrominae (Fam. Blattisocidae) is a primitive phytoseiid while Macroseiinae (Fam. Phytoseiidae) serves as a primitive link between Digamasellidae and Phytoseiidae. Basing on this concept Muma (1963 a) arranged the phytoseiid genera (following generic concept of Muma, 1961) into a dichotomous tree showing difference and relation-

ship among the various genera. Excepting *Macroseius* Chant *et al.*, and *Aceodromus* Muma, which he included previously provisionally, all other phytoseiid genera belonged to 2 basic types as shown in two branches of the tree, one representing subfamily Phytoseiinae Muma having 4 pairs of anterior lateral setae and inhabiting litter, herbs, grasses and the other branch representing subfamily Phytoseiinae Berlese having 5-6 pairs of prolateral setae and mainly with arboreal habitat. He also grouped or segregated the genera according to relative importance of setae or scutal characteristics within each subfamily. Primitive forms with fewer and longer setae were put basally while specialised forms with more and shorter setae were apically placed.

Chant *et al.* (1978), while studying the aspects of numerical taxonomy in Phytoseiidae, contradicted Muma's contention regarding phylogeny of Phytoseiidae and stated that *Amblyseius* with fewer setae than *Typhlodromus* seem to demonstrate a wider variety of specialisation as if they have evolved further from some ancestral type. *Typhlodromus contiguous* Chant shows a number of *Amblyseius* characteristics and can be inferred that *Amblyseius* species could have evolved from species of this nature through progressive loss of setae. However, till now there is no theory to explain phylogeny acceptable to everybody in the absence of fossil records and, therefore, this aspect needs further study.

#### SYSTEMATIC ACCOUNT

##### Family PHYTOSEIIDAE Berlese

- 1952. Phytoseiidae Baker & Wharton : 87.
- 1959. Phytoseiidae : Chant, *Can. Ent.*, **91** (suppl. 12) : 48.
- 1961. Phytoseiidae : Muma, *Bull. Fla. St. Mus.*, **5**(7) : 270.
- 1962. Phytoseiidae : Pritchard & Baker, *Hilgardia*, **33** : 207.
- 1963. Phytoseiidae : Schuster & Pritchard, *Hilgardia*, **34** : 199.
- 1965. Phytoseiidae : Chant, *Can. Ent.*, **97** : 353.
- 1966. Phytoseiidae : Ehara, *Mushi*, **39** : 16.
- 1970. Phytoseiidae : Muma & Denmark, *Arthropods of Florida*, **6** : 11.
- 1973. Phytoseiidae : Tuttle & Muma, *Tech. Bull. Agr. Exp. Sta. Univ. Arizona*, **208** : 5.
- 1974. Phytoseiidae : Chaudhri, *Univ. Agr. Lyallpur*, : p. 204.
- 1978. Phytoseiidae : Chant *et al.*, *Can. J. Zool.*, **56**(6) : 1330.

*Diagnosis* : Palptarsus with 2-tined apotele, chelicerae chelate, undifferentiated hypostomal setae, a smooth or indistinctly serrate tectum, an entire or transversely divided dorsal shield with less than 25 pairs of setae, 1-3 pairs of sublateral setae, peritreme extends anteriorly from mesolateral stigmata, anus ventral, legs with pretarsi

and ambulacra. Genital shield truncate posteriorly with a pair of setae, a pair of spermatheca open between coxae III and IV ; a quadrate, elongate or pentagonal ventrianal shield with 1-7 pairs of preanal setae in addition to paraanals and postanals. Males with spermatophoral process on the movable digit of chelicera, genital aperture placed anteriorly on the sternitigenital shield, ventrianal shield with 2-7 pairs of preanal setae and a pair of caudal setae.

Type genus **Phytoseius** Ribaga, 1904

*Key to the subfamilies of Phytoseiidae*

- |   |     |              |
|---|-----|--------------|
| 1. Dorsal shield divided  | ... | MACROSEIINAE |
| — Dorsal shield not divided   | ... | 2            |
| 2. Prolateral setae 4 pairs, in all 6-9 pairs of lateral setae, preanal setae 3 pairs         | ... | AMBLYSEIINAE |
| — Preanal setae 5 or more pairs, in all 9-12 pairs of lateral setae ; preanal setae 3-7 pairs |     | 3            |
| 3. Sublateral setae 3 pairs, lateral setae 12 pairs, preanal setae 6-7 pairs                  | ... | GNORIMINAE   |
| — Sublateral setae 1-2 pairs, lateral setae 8-11 pairs, preanal setae 2-4 pairs               | ... | PHYTOSEIINAE |

Subfamily AMBLYSEIINAE Muma

1961. Amblyseiinae Muma, *Bull. Fla. St. Mus.*, 5(7) : 273.  
 1963. Amblyseiini : Schuster & Pritchard, *Hilgardia*, 34(7) : 225.  
 1965. Phytoseiinae : Chant, *Can. Ent.*, 97(4) : 359 (in part).  
 1970. Amblyseiinae : Muma & Denmark, *Arthropods of Florida*, 6 : 22.  
 1973. Amblyseiinae : Tuttle & Muma, *Tech. Bull. Agr. Exp. Sta. Univ. Arizona*, 208 : 6.  
 1978. Phytoseiinae : Chant *et al.*, *Can. J. Zool.*, 56(6) : 1344.

*Diagnosis* : Dorsal shield undivided with 4-6 pairs of setae on dorsocentral series, 1-2 pairs of median setae, 6-9 pairs of lateral setae (4 of these are prolateral), 1-2 pairs of sublateral setae, 1-3 pairs of preanal setae on ventrianal shield, 1-3 macrosetae on leg IV ; males with fragmented or entire ventrianal shield with 3-4 pairs of preanal setae, 2 pairs of sublateral setae both placed on dorsal shield.

Type Genus **Amblyseius** Berlese, 1915

*Key to the genera of Amblyseiinae in India*

- |   |     |             |
|---|-----|-------------|
| 1. Ventrianal shield absent or indistinctly demarcated, only preanal setae distinctly present | ... | INDOSEIULUS |
| — Ventrianal shield distinctly present  | ... | 2           |

2. Sublateral seta II ( $R_1$ ) absent	...	PLATYSEIELLA
— Sublateral seta II ( $R_1$ ) present	...	3
3. $R_1$ on dorsal shield	...	OKISEIUS
— $R_1$ on lateral integument	...	4
4. Lateral integument sclerotized so that $r_3$ and $R_1$ though on usual lateral position appear to be on lateroventral extension of dorsal shield	...	IPHISEIUS
— Lateral integument not sclerotized as above	...	5
5. Metapodal plates large, single paired, triangular, genital shield very broad and punctate, ventrianal shield massive, genu III with 6 setae	...	PARAAMBLYSEIUS
— Metapodal plates 2 paired, slender, elongate, genital and ventrianal shields usually narrow, genu III with 7 setae	...	AMBLYSEIUS

### Genus *Amblyseius* Berlese

1914. *Amblyseius* Berlese, *Redia*, 10 : 143.
1923. *Amblyseius* (*Seiopsis*) Berlese, *Redia*, 15 : 255.
1948. *Amblyseius* (*Amblyseiopsis*) Garman, *Bull. Conn. Agr. Exp. Stn.*, 520 : 17.
1951. *Kampimodromus* Nesbitt, *Zool. Verh.*, 12 : 52.
1955. *Amblyseiopsis* Muma, *Ann. ent. Soc. Amer.*, 48 : 264.
1955. *Amblyseiella* Muma, *Ann. ent. Soc. Amer.*, 48 : 266.
1957. *Proprioseius* Chant, *Can. Ent.*, 89 : 357-358.
1957. *Asperoseius* Chant, *Can. Ent.*, 89 : 360-362.
1957. *Typhlodromus* (*Amblyseius*) Chant, *Can. Ent.*, 89 : 528-532.
1959. *Phyllodromus* De Leon, *Ent. News*, 70 : 260.
1959. *Typhlodromus* (*Typhlodromopsis*) De Leon, *Fla. Ent.*, 42 : 113.
1961. *Phytoscutus* Muma, *Bull. Fla. St. Mus.*, 5(7) : 275.
1961. *Phytoscutella* Muma, *Bull. Fla. St. Mus.*, 5(7) : 275.
1961. *Amblyseiulella* Muma, *Bull. Fla. St. Mus.*, 5(7) : 276.
1961. *Proprioseiopsis* Muma, *Bull. Fla. St. Mus.*, 5(7) : 277.
1961. *Amblyseiulus*, Muma, *Bull. Fla. St. Mus.*, 5(7) : 278.
1961. *Amblyscutus* Muma, *Bull. Fla. St. Mus.*, 5(7) : 286.
1961. *Paradromus* Muma, *Bull. Fla. St. Mus.*, 5(7) : 286.
1961. *Cydnodromus* Muma, *Bull. Fla. St. Mus.*, 5(7) : 290.
1961. *Phytodromus* Muma, *Bull. Fla. St. Mus.*, 5(7) : 291.
1961. *Typhloseiella* Muma, *Bull. Fla. St. Mus.*, 5(7) : 291.
1961. *Typhloseius* Muma, *Bull. Fla. St. Mus.*, 5(7) : 291.
1961. *Paraphytoseius* Swirski & Shechter, *Israel J. agric. Res.*, 11 : 113-114.
1962. *Athiaseius* Wainstein, *Acarologia*, 4 : 17.
1962. *Amblyseius* (*Ptenoseius*) Pritchard & Baker, *Hilgardia*, 33 : 295.
1966. *Typhlodromips* De Leon, *In Studies on the Fauna of Suriname and other Guyanas*, 8 : 93 (new synonymy).
1966. *Typhlodromalus* De Leon, *Ibid.*, 8 : 87 (new synonymy).

1966. *Euseius* De Leon, *Ibid.*, 8 : 86 (new synonymy).  
 1968. *Chelaseius* Muma & Denmark, *Fla. Ent.*, 61 : 232 (new synonymy).  
 1968. *Proprioseiulus* Muma & Denmark, *Fla. Ent.*, 52 : 231 (new synonymy).  
 1970. *Neoledus* Muma & Denmark, *Fla. Ent.*, 51 : 232 (new synonymy).  
 1970. *Fundiseius* Muma & Denmark, *Arthropods of Florida*, 6 : 71 (new synonymy).  
 1970. *Neoseiulus* Muma & Denmark, *Arthropods of Florida*, 6 : 100 (new synonymy).  
 1973. *Ehareius* Tuttle & Muma, *Tech. Bull. Agr. Exp. Sta. Univ. Arizona, Tucson*, 208 : 14 (new synonymy).  
 1982. *Quadromalus* Moraes *et al.*, *Internat. J. Acarol.*, 8(1) : 15-17 (new synonymy).

*Diagnosis* : Dorsal shield with 13-17 pairs of setae, of which, 4 pairs always present on prolateral series ; setae variable in length. Sublateral setae on lateral integument. Sternal shield with 3 pairs of sternal setae, 4th pair either free on integument or on metasternal plates. Genital shield truncate posteriorly with a pair of setae. Ventrianal shield entire or fragmented, of variable shape, with 3 pairs of preanal setae ; 4 pairs of setae present on the membrane around ventrianal shield ; 1-2 pairs of elongate metapodal plates. Peritrematal plate fused anteriorly with dorsal shield. Chelicera uni-bi-or multidentate.

Type species : **Zercon obtusus** Koch, 1839

(by original designation).

*Key to the subgenera of Amblyseius* Berlese

- |   |     |                 |
|---|-----|-----------------|
| 1. Dorsal shield with 5 pairs of postlateral setae  | ... | 4               |
| — Dorsal shield with less than 5 pairs of post-lateral setae  | ... | 2               |
| 2. Seta Z <sub>1</sub> present  | ... | 3               |
| — Seta Z <sub>1</sub> absent  | ... | PROPRIOSEIUS    |
| 3. Seta S <sub>2</sub> present  | ... | ASPEROSEIUS     |
| — Seta S <sub>2</sub> absent  | ... | PARAPHYTOSEIUS  |
| 4. Ventrianal shield massive covering major portion of posteroventral portion   | ... | 5               |
| — Ventrianal shield not like above  | ... | 6               |
| 5. Seta J <sub>3</sub> present  | ... | PROPRIOSEIOPSIS |
| — Seta J <sub>3</sub> absent  | ... | PHYTOSCUTELLA   |
| 6. Seta Z <sub>5</sub> , s <sub>4</sub> and Z <sub>4</sub> long and whip-like, longer than distance between their bases ; leg IV with macrosetae on genu and erect seta on tarsus | ... | AMBLYSEIUS      |
| — Setae Z <sub>5</sub> shorter, at most as long as distance between their bases ; leg I with no macroseta or only one on genu, no erect seta on tarsus                            | ... | 7               |

- |  |     |                |
|--|-----|----------------|
| 7. Sternal shield distinct and straight or concave posteriorly, ventrianal shield approximately shield-shaped or pentagonal                            | ... | 8              |
| — Sternal shield indistinct, may be trilobate posteriorly, ventrianal shield elongate, vase-shaped or concave laterally                                | ... | 9              |
| 8. $Z_5$ and $Z_4$ distinctly serrate, sternal shield as wide as or wider than long, macroseta may be present on genu I and present on genu II and III | ... | TYPHLODROMIPS  |
| — $Z_5$ and $Z_4$ mostly smooth, sternal shield longer than wide, genu I, II, III without macrosetae   | ... | NEOSEIULUS     |
| 9. Peritreme extends anteriorly upto $j_3$ ; anterior pair of preanal setae adjacent to anterior margin of ventrianal shield                           | ... | TYPHLODROMALUS |
| — Peritreme not extends upto $j_3$ ; anterior pair of preanal setae removed from anterior margin of ventrianal shield                                  | ... | EUSEIUS        |

### Subgenus *Amblyseius* Berlese

1914. *Amblyseius* Berlese, *Redia*, 10 : 143.
1961. *Amblyseius* (*Amblyseius*) : Muma, *Bull. Fla. St. Mus.*, 5(7) : 287.
1961. *Amblyseius* (*Amblyseiulus*) : Muma, *Bull. Fla. St. Mus.*, 5(7) : 287.
1966. *Amblyseius* : De Leon, *In Studies on the fauna of Suriname and other Guyanas*, 8 : 88.
1967. *Amblyseius* : Denmark & Muma, *Fla. Ent.*, 50(3) : 169.
1970. *Amblyseius* : Muma & Denmark, *Arthropods of Florida*, 6 : 62.
1972. *Amblyseius* : Denmark & Muma, *Fla. Ent.*, 55(1) : 19.
1973. *Amblyseius* : Denmark & Muma, *Rev. Brazil. Biol.*, 33(2) : 238.
1974. *Amblyseius* : Denmark, *Fla. Ent.*, 57(2) : 146.
1974. *Amblyseius* (*Amblyseius*) : Blommers, *Bull. Zool. Mus. Univ. Amsterdam*, 3(19) : 144.
1975. *Amblyseius* : Denmark & Muma, *J. Agr. Univ. Puerto Rico*, 59(4) : 285.
1976. *Amblyseius* (*Amblyseius*) : Blommers, *Bijdragen tot de Dierkunde*, 46(1) : 93 (in part).
1977. *Amblyseius* (*Amblyseius*) : Ehara & Bhandhufalck, *J. Fac. ed. Tottori. Univ.*, 27(2) : 75 (in part).
1978. *Amblyseius* : Knisley & Denmark, *Fla. Ent.*, 61(1) : 8.
1978. *Amblyseius* : Denmark & Muma, *Internat. J. Acarol.*, 4(1) : 3.
1981. *Amblyseius* : Denmark & Andrews, *Fla. Ent.*, 64(1) : 148.
1981. *Amblyseius* : Matthyse & Denmark, *Fla. Ent.*, 64(2) : 342.
1982. *Amblyseius* : Daneshvar & Denmark, *Internat. J. Acarol.*, 8(1) : 5.

*Diagnosis* : Dorsal shield smooth, well sclerotized, with 17 pairs of setae, of those, 6 pairs of dorsocentral, 2 pairs of median and 9

pairs of laterals. Setae  $Z_5$ ,  $s_4$  and  $Z_4$  being long and whip-like and may be serrate minutely ;  $j_1$  and  $j_3$  also long. Sternal shield smooth, as wide as or wider than long with 3 pairs of sternal setae. Ventrianal shield pentagonal or vase-shaped with 3 pairs of preanal setae. Peritreme extends anteriorly upto  $j_1$ . Fixed digit of chelicera multi-dentate with a strong *pilus dentilis*, movable digit with 1-4 teeth. Genu of leg I, II, III also tibia II, III often possess macroseta. Leg IV with macroseta on genu, tibia and basitarsus, that on genu IV being longest.

Type : *Zercon obtusus* Koch 1839 (by indication)

Key to the species of subgenus *Amblyseius* Berlese

1. Ventrianal shield vase-shaped with lateral margins concave	...	2
— Ventrianal shield pentagonal or squarish	...	5
2. Spermatheca saucer-shaped or cup-shaped	...	3
— Spermatheca elongate or fundibuliform	...	4
3. Cervix of spermatheca saucer-shaped	...	<i>hapoliensis</i>
— Cervix of spermatheca cup-shaped	...	<i>indirae</i>
4. Cervix of spermatheca elongated and of parallel diameter	...	<i>largoensis</i>
— Cervix of spermatheca fundibuliform	...	<i>herbicolus</i>
5. $Z_5$ over 200 microns in length	...	8
— $Z_5$ much less than 200 microns in length	...	6
6. $s_4$ and $Z_4$ of same length	...	7
— $s_4$ longer than $Z_4$	...	<i>neorykzi</i>
7. Spermatheca elongated, tubular	...	<i>mcmurtryi</i>
— Spermatheca cup-shaped	...	<i>shoreae</i>
8. $z_2$ and $z_4$ equal	...	10
— $z_2$ and $z_4$ unequal	...	9
9. $z_2$ longer than $z_4$	...	<i>aerialis</i>
— $z_2$ shorter than $z_4$	...	<i>orientalis</i>
10. Cervix of spermatheca looped	...	<i>paraaerialis</i>
— Cervix of spermatheca not like above	...	11
11. Macroseta on tibia and basitarsus IV almost equal	...	<i>kulini</i>
— Macroseta on tibia and basitarsus IV unequal	...	12
12. Ventrianal shield reticulate	...	<i>muraleedharani</i>
— Ventrianal shield smooth	...	13
13. Ventrianal shield almost triangular, macroseta on basitarsus IV longer than that on tibia IV	...	<i>adhatodae</i>

- Ventrianal shield almost pentagonal, macroseta on basitarsus IV shorter than that on tibia IV

... *channabasavannai*

### 1. *Amblyseius (Amblyseius) adhatodae* Muma

(Figs. 26-29)

1967. *Amblyseius adhatodae* Muma, *Fla. Ent.*, 50 : 268-270.  
 1967. *Amblyseius ipomoeae* : Ghai & Menon, *Oriental Ins.*, 1 : 71-72 (new synonymy).  
 1974. *Amblyseius ipomoeae* : Prasad, A catalogue of mites of India, p. 166.  
 1975. *Amblyseius adhatodae* : Gupta, *Internat. J. Acarol.*, 1(2) : 31.  
 1975. *Amblyseius ipomoeae* : Gupta, *Internat. J. Acarol.*, 1(2) : 37.

*Female* : Dorsal shield 375 long, 275 wide, with 17 pairs of setae, dorsal shield lightly sclerotized with indistinct dark roughly circular less sclerotized areas. Setae  $j_1$ ,  $j_3$ ,  $s_4$ ,  $Z_4$  and  $Z_5$  long and the latter two being whip-like and weakly serrate, the other setae ( $j_1$ ,  $j_3$ ,  $s_4$ ) also being long. Measurements of setae  $j_1$ -42,  $j_3$ -56,  $s_4$ -127,  $Z_5$ -306,  $Z_4$ -153 ; other setae minute. Sternal shield 68 long, 80 wide, with 3 pairs of sternal setae, metasternal plates with setae present. Genital shield normal, 85 wide with a pair of setae. Ventrianal shield 134 long, 103 wide, lateral margins almost straight with 3 pairs of preanal setae, 4 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -96 long, 2 pairs of metapodal plates present, primary one-22 long, accessory one-10 long. Fixed digit of chelicera with 10-11 teeth, movable digit with one tooth. Spermatheca with slender elongate cervix. Peritreme extends anteriorly beyond  $j_1$ . Peritrematal shield with a thin ectal strip which extends behind stigmata. Macrosetae on leg IV : genu-100, tibia-76 and basitarsus-89. Other macrosetae : genu III-56, tibia III-33, genu II-33, genu I-44. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ .

*Male* : Dorsal chaetotaxy similar as in female. Spermatophoral process as illustrated.

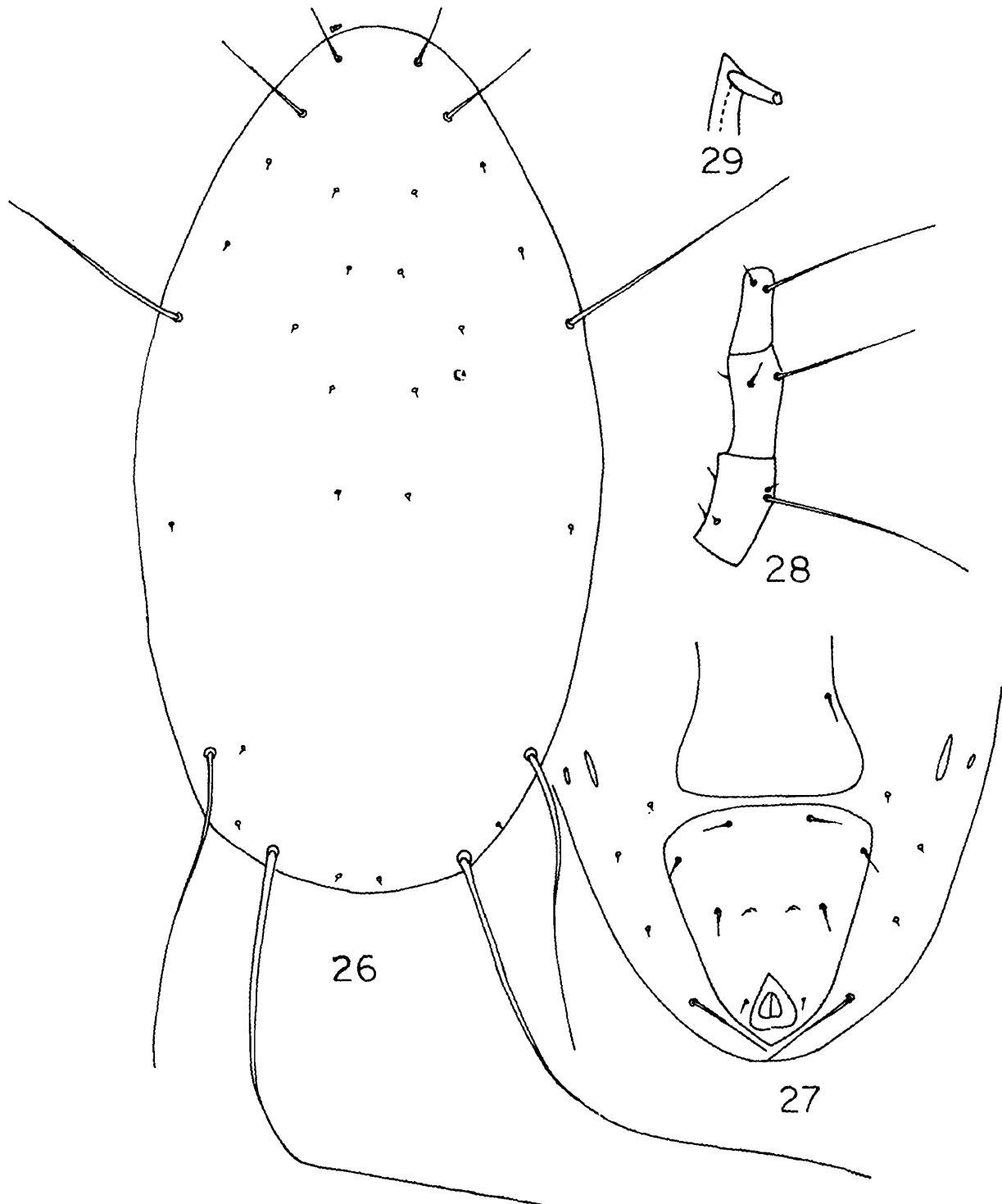
*Habitat* : *Adhatoda vasica*, *Ipomoea* sp.

*Type locality and repository* : Holotype ♀, Pakistan, Karachi, on *Adhatoda vasica*, deposited in USNM. Paratypes ♂ and larva, same data as for holotype ; 1 ♀, India, Maharashtra, on *Ipomoea* sp., repository not mentioned.

*Distribution* : India : Maharashtra ; outside India : Pakistan.

*Remarks* : Ghai & Menon (1967) described *Amblyseius ipomoeae* on the basis of a female collected on *Ipomoea* sp. Muma (1967) based

his description of *A. adhatodae* on a holotype from Karachi collected on *Adhatoda vasica* and paratype from Bombay collected on *Ipomoea* sp. which was sent to him by S. Ghai. The author examined the holotype of *A. ipomoeae* at I.A.R.I., New Delhi, and measurements of different setae were found as :  $j_1$ -30,  $j_3$ -48,  $Z_5$ -225,  $Z_4$ -105,  $s_4$ -90,  $JV_5$ -78.



Figs. 26-29. *Amblyseius (Amblyseius) adhatodae* Muma  
 26. Dorsal shield  
 27. Posterior ventral surface  
 28. Genu, tibia and basitarsus of leg IV  
 29. Spermatophoral process

Ventrianal shield 120 long, 90 wide, macrosetae on leg IV : genu-40, tibia-75, basitarsus-84. The author also examined a paratype slide bearing data, *A. adhatodae* Muma ♀ and *A. ipomoeae* Ghai ♀ ♀, ♂ ♂, Bombay, India, S. Ghai on *Ipomoea* sp., 6.v.1965, borrowed from Dr. H. A. Denmark, Florida Dept. of Agriculture, and the measurements of different setae has been given in the present text. Both the authors refer to the same species and, therefore, the species *A. (A.) ipomoeae* is treated here as synonym for *A. (A.) adhatodae* because of priority.

## 2. *Amblyseius (Amblyseius) aerialis* (Muma)

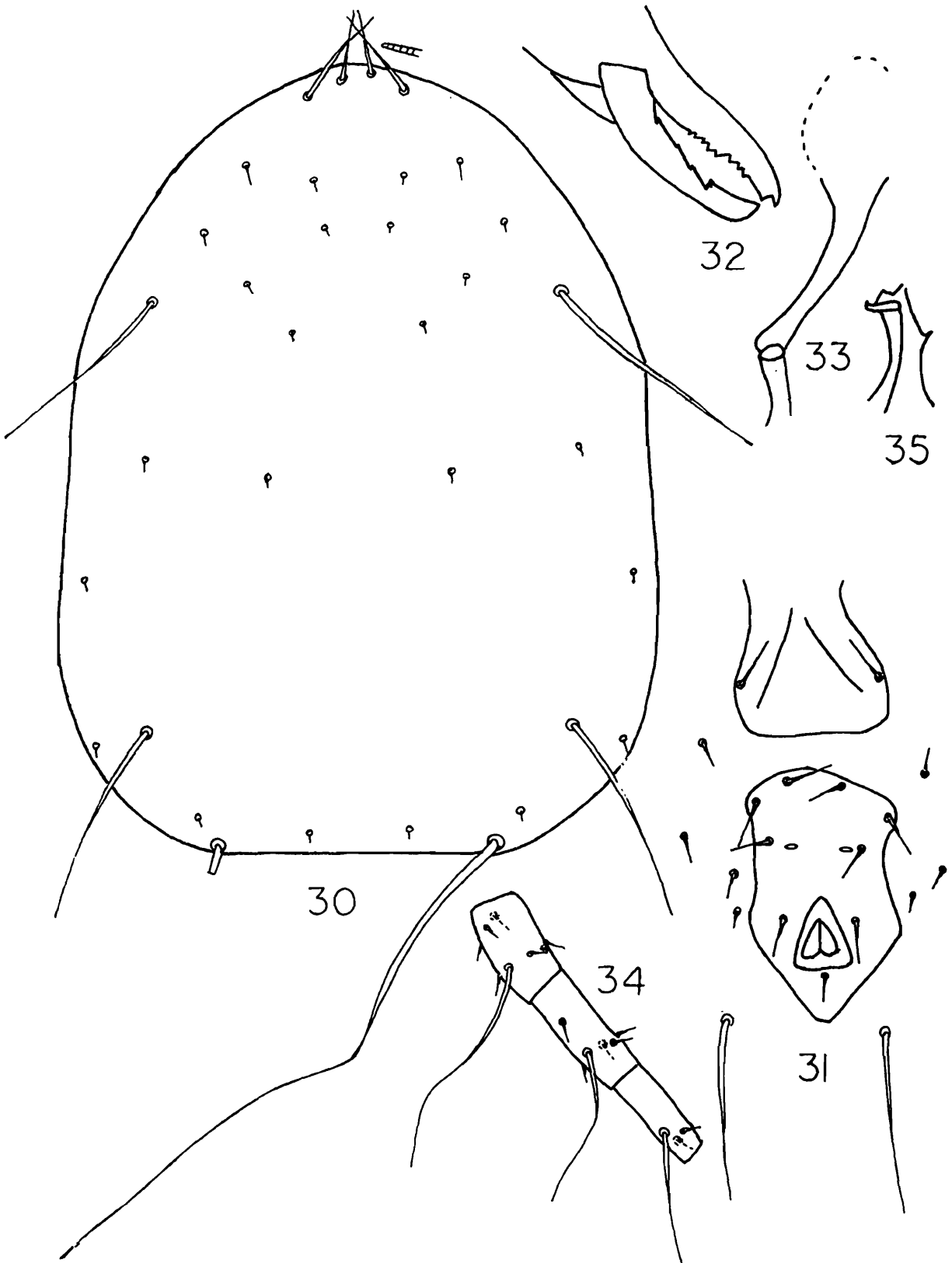
(Figs. 30-35)

1955. *Amblyseius aerialis* Muma, *Ann. ent. Soc. Amer.*, 48 : 264-266.  
 1957. *Amblyseius aerialis* : Athias-Henriot, *Bull. Soc. Hist. Nat. Afr. Nord.*, 48 : 338-339.  
 1958. *Amblyseius aerialis* : Garman, *Ann. ent. Soc. Amer.*, 51 : 75.  
 1958. *Amblyseius aerialis* : Athias-Henriot, *Bull. Soc. Hist. Nat. Afr. Nord.*, 49 : 34.  
 1964. *Amblyseius aerialis* : Rao & Rao, *Comm. Inst. Biol. Contr. Tech. Bull.*, 4 : 38-39.  
 1974. *Amblyseius aerialis* : Prasad, A catalogue of mites of India, p. 160-161.  
 1975. *Amblyseius aerialis* : Gupta, *Internat. J. Acarol.*, 1(2) : 31.  
 1981. *Amblyseius aerialis* : Gupta & Nahar, *In Contrib. to Acar. in India* : p. 9.

*Female* : Dorsal shield 360 long, 140 wide, smooth with 17 pairs of setae, of those,  $j_1$ ,  $j_3$ ,  $s_4$ ,  $Z_5$  and  $Z_4$  being long and  $Z_5$  whip-like ;  $z_2$  longer than  $z_4$ , other setae small and almost equal ; sublateral setae lie on interscutal membrane. Measurements of setae :  $j_1$ -34-36,  $j_3$ -51-55,  $s_4$ -120-125,  $Z_5$ -290-330,  $Z_4$ -150-170 ; remaining setae 5-10 long. Sternal shield smooth with 3 pairs of sternal setae. Genital shield normal, about 85 wide with a pair of setae. Ventrianal shield 115-122 long, 80-95 wide, with 3 pairs of preanal setae and a pair of elliptical pores ; 4 pairs of setae present around ventrianal shield ;  $JV_5$ -84 long ; 2 pairs of metapodal plates present, primary one about 22 long, accessory one—12 long. Fixed digit of chelicera multidentate, movable digit with 4 teeth. Spermatheca with tubular cervix and swollen atrium. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{2}{1} \frac{1}{1} 1$ . Macrosetae on leg IV : genu-135-150, tibia-100-105, basitarsus 75-76 ; genu I-III and tibia III also with macroseta.

*Male* : Chaetotaxy of dorsal shield similar to that of female. Spermatophoral process as figured.

*Habitat* : Citrus.



Figs. 30-35. *Amblyseius (Amblyseius) aerialis* (Muma)  
 30. Dorsal shield  
 31. Posterior ventral surface  
 32. Chelicera (female)  
 33. Spermatheca  
 34. Genu, tibia and basitarsus of leg IV  
 35. Spermatophoral process

*Type locality and repository* : Holotype ♀, Lucern Park, Florida, U.S.A., on citrus, deposited in U S N M.

*Distribution* : India : Karnataka, Bihar ; outside India : Mexico, U.S.A., Bermuda, Galapagos Isl., Jamaica, Puerto Rico, Brazil.

*Remarks* : This species is often found associated with tenuipalpid mites and readily feeds on it. It is weakly sclerotized and pale brown or yellow in colour. Garman (1958) reported it feeding on *Eotetranychus sexmaculatus* Riley. Comparing with the re-description of Schuster & Pritchard (1963) basing on Californian specimens, the Indian specimens have  $Z_5$ ,  $Z_4$  as well as the macroseta on genu IV shorter.

### 3. *Amblyseius (Amblyseius) channabasavannai*\* Gupta & Daniel

( Figs. 36-42 )

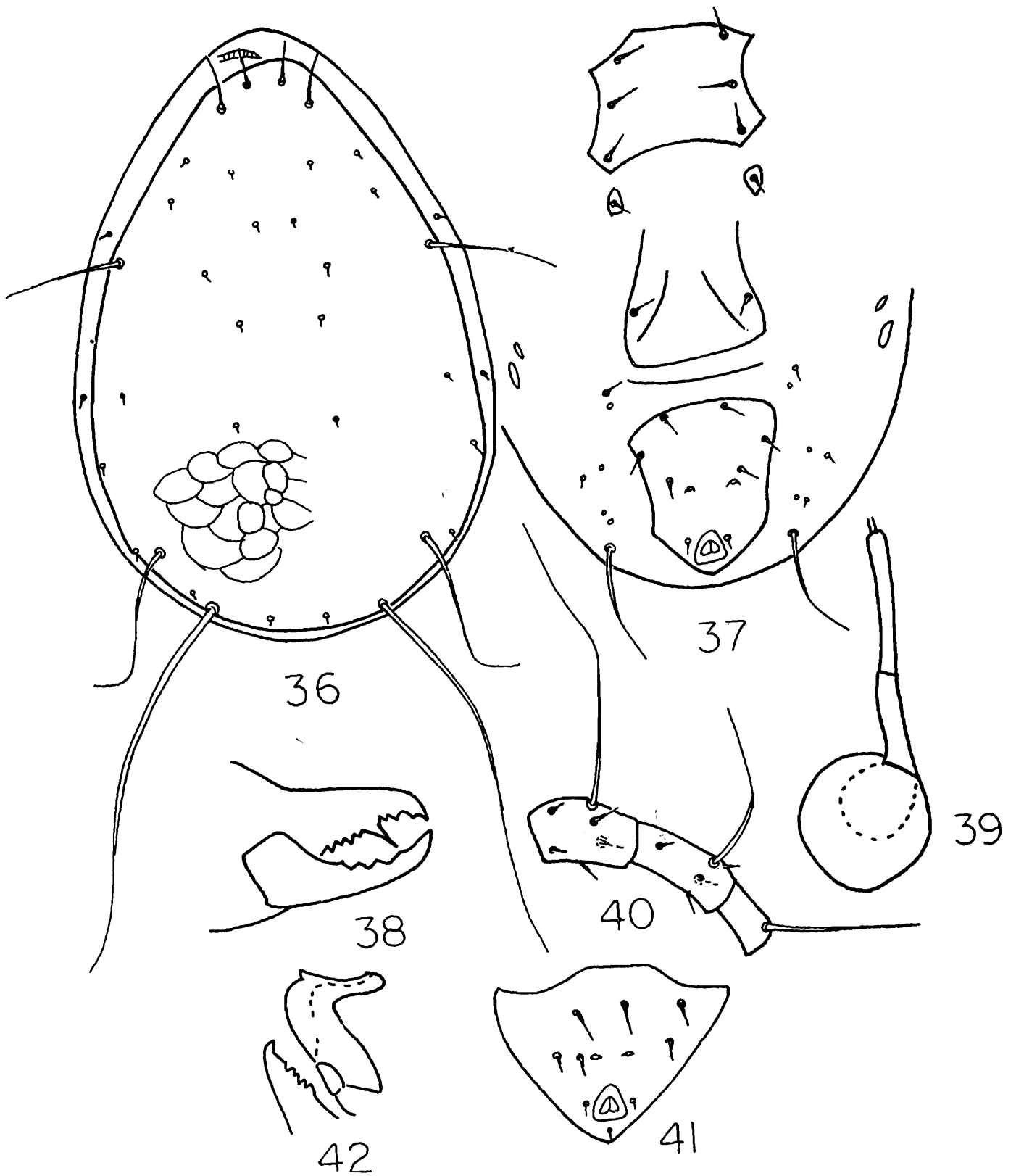
1978. *Amblyseius channabasavanni* Gupta & Daniel, *Oriental Ins.*, 12 : 328-329.

1979. *Amblyseius channabasavanni* : Daniel, First All India Symp. Acar. : p. 49.

1981. *Amblyseius channabasavanni* : Daniel, *In Contrib. to Acar. in India* : p. 167.

*Female* : Dorsal shield smooth anteriorly, rugose posteriorly, 320-350 long, 210-230 wide, with 17 pairs of setae ;  $j_1$ ,  $j_3$ ,  $s_4$ ,  $Z_5$  and  $Z_4$  long or very long, other setae minute,  $Z_5$  being longest. Measurements of setae :  $Z_5$ - 212-250,  $Z_4$  -76-110,  $s_4$ - 72-82,  $j_1$ - 27-28,  $j_3$ - 36-48 ; other setae being minute. Sternal shield weakly sclerotized, 80-84 long, 70-75 wide, with 3 pairs of sternal setae, 4th pair lie on metasternal plates. Genital shield 76-80 wide, with a pair of setae. Ventrianal shield 110-120 long, 80-90 wide, with 3 pairs of preanal setae and a pair of elliptical preanal pores, 4 pairs of setae present around ventrianal shield,  $JV_5$ -67-72 long ; 2 pairs of metapodal plates present, primary one 16-20 long. Fixed digit of chelicera multidentate, with a strong *pilus dentilis*, movable digit with 4 teeth. Spermatheca as illustrated. Macrosetae on leg IV : genu-80-95, tibia-60-64, basitarsus-52-60, genu I-36-40, genu II-27-32, genu III 32-48, tibia III 43-44. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Peritreme extends anteriorly upto  $j_1$  and slightly curves inwards.

\* This species was named after Prof. G. P. ChannaBasavanna, the noted Acarologist of India but. while latinizing, a mistake arose and instead of *channabasavannai*, the species was published under the name *channabasavanni*. Therefore, the necessary rectification is being done here in the name of the species.



Figs. 36-42. *Amblyseius (Amblyseius) channabasavannai* Gupta and Daniel  
 36. Dorsal shield  
 37. Ventral surface  
 38. Chelicera (female)  
 39. Spermatheca  
 40. Genu, tibia and basitarsus of leg IV  
 41. Ventrianal shield (male)  
 42. Spermatophoral process

**Male :** Dorsal chaetotaxy similar to that of female. Spermatophoral process and ventrianal shield as illustrated.

**Habitat :** Chrysanthemum, dahlia, palm.

**Type locality and repository :** Holotype ♀, India : Kerala, Trivendrum on *Chrysanthemum* sp. deposited in ZSI, Calcutta, Reg. No. 3345/17. Paratype 1 ♀, 1 ♂, Tamil Nadu, Oothu, on Dahlia, Reg. No. 3346/17.

**Distribution :** India : Kerala, Tamil Nadu, Arunachal Pradesh.

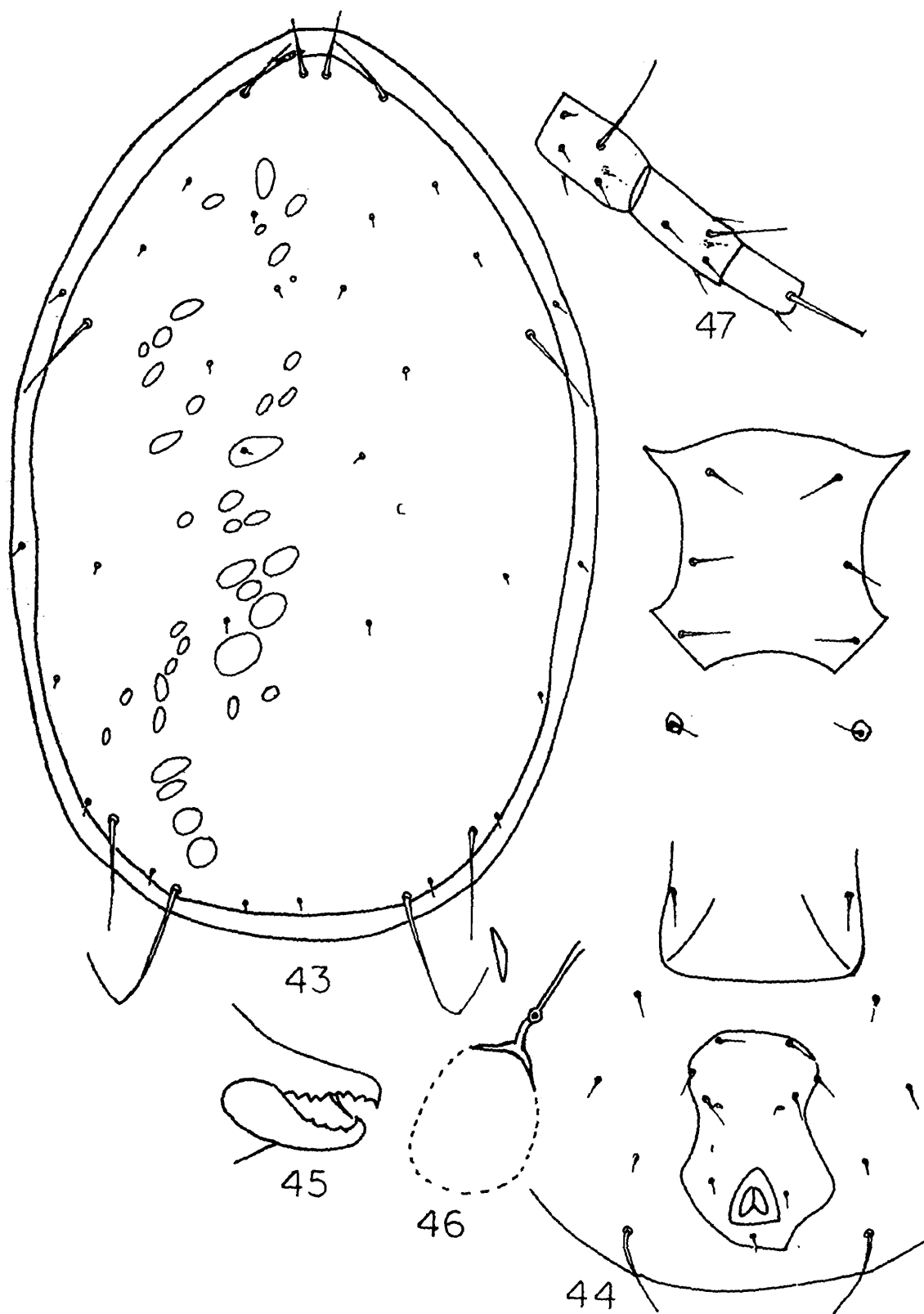
**Remarks :** Daniel (1981) reported this mite feeding on *Raoiella indica* Hirst. She studied its life cycle in the laboratory and reported the duration of different stages as : larva-22.2 hrs. (♂) 21.9 hrs. (♀), deutonymph 23.8 hrs. (♂) and 23.4 hrs. (♀). The developmental period varied from 84-113 hrs. (♀), 85-107 hrs. (♂) and 15-38 eggs of *R. indica* were consumed by female and 14-19 eggs by males, respectively during this period. Incubation period was 32.3 hrs. (♀) and 30.2 hrs. (♂). Ovipositing females consumed 11-40 host eggs or on 6-13 female host mites/day and laid 1-5 eggs/day. All stages of prey were attacked by this mite. Among the alternate hosts, *Tetranychus fijiensis* Hirst, eggs and crawlers of scale insects and mealy bugs infesting arecanut leaves were important. The field population of the predator was maximum during May-June when the prey was also at its peak.

#### 4. *Amblyseius (Amblyseius) hapoliensis* Gupta

(Figs. 43-47)

*Amblyseius hapoliensis* Gupta, *Indian J. Acar.* (In press)

**Female :** Dorsal shield rugose, 342 long, 268 wide, with 17 pairs of setae.  $j_3 > j_1$ ,  $Z_4 > s_4 = j_3$ ,  $r_3 > R_1$ ,  $S_4 = S_5 < Z_1 = S_2$ . Measurements of setae  $j_1$ -34,  $j_3$ -43,  $s_4$ -44,  $Z_5$ -112,  $Z_4$ -60,  $r_3$ -16,  $R_1$ -14, other setae small. Sternal shield as illustrated, 78 wide, 94 long, with 3 pairs of sternal setae, metasternal plates with setae conspicuous. Genital shield vase-shaped, lateral margins concave, 112 long, 68 wide, with 3 pairs of preanal setae and a pair of crescent shaped preanal pores, 4 pairs of setae present around ventrianal shield, 2 pairs of metapodal plates present, primary one, large. Spermatheca as figured, Fixed digit of chelicera with 3 teeth anterior to *pilus dentilis*, 3 teeth posterior to it ; *pilus dentilis* large, movable digit with 3 small teeth. Macrosetae on leg IV : genu-80, tibia-62, basitarsus-63 ; other macrosetae : genu I-40, genu II-42, genu III-45. Leg chaetotactic formula : genu



Figs. 43-47. *Amblyseius (Amblyseius) hapoliensis* Gupta

43. Dorsal shield

44. Ventral surface

45. Chelicera (female)

46. Spermatheca

47. Genu, tibia and basitarsus of leg IV

II 2  $\frac{2}{1}$   $\frac{2}{1}$  1, tibia II 1  $\frac{1}{1}$   $\frac{2}{1}$  1, genu III 1  $\frac{2}{1}$   $\frac{2}{1}$  1, tibia III 1  $\frac{1}{1}$   $\frac{2}{1}$  1. Peritreme extends anteriorly upto  $j_1$ .

*Male* : Unknown.

*Type locality and repository* : **Holotype** ♀, INDIA : Arunachal Pradesh : Hapoli, on apple, 28.x.1981, Coll. S. K. Gupta, deposited in ZSI, Calcutta, Reg. No, 3347/17. Paratypes 3 ♀ ♀, same data as for holotype, Reg. No. 3348-50/17.

*Remarks* : This species resembles *A. (A.) herbicolus* (Chant, 1959) but differs in shape of spermatheca as well as in relative length of  $s_4$ ,  $Z_5$  and  $Z_4$  which are shorter here.

### 5. *Amblyseius (Amblyseius) herbicolus* (Chant)

(Figs. 48-56)

1959. *Typhlodromus (Amblyseius) herbicolus* Chant, *Can. Ent.*, 91 : 84-85.

1961. *Amblyseius (Amblyseiulus) largoensis* Muma, *Bull. Fla. St. Mus.*, 5(7) : 287 (not *largoensis* Muma, 1955)

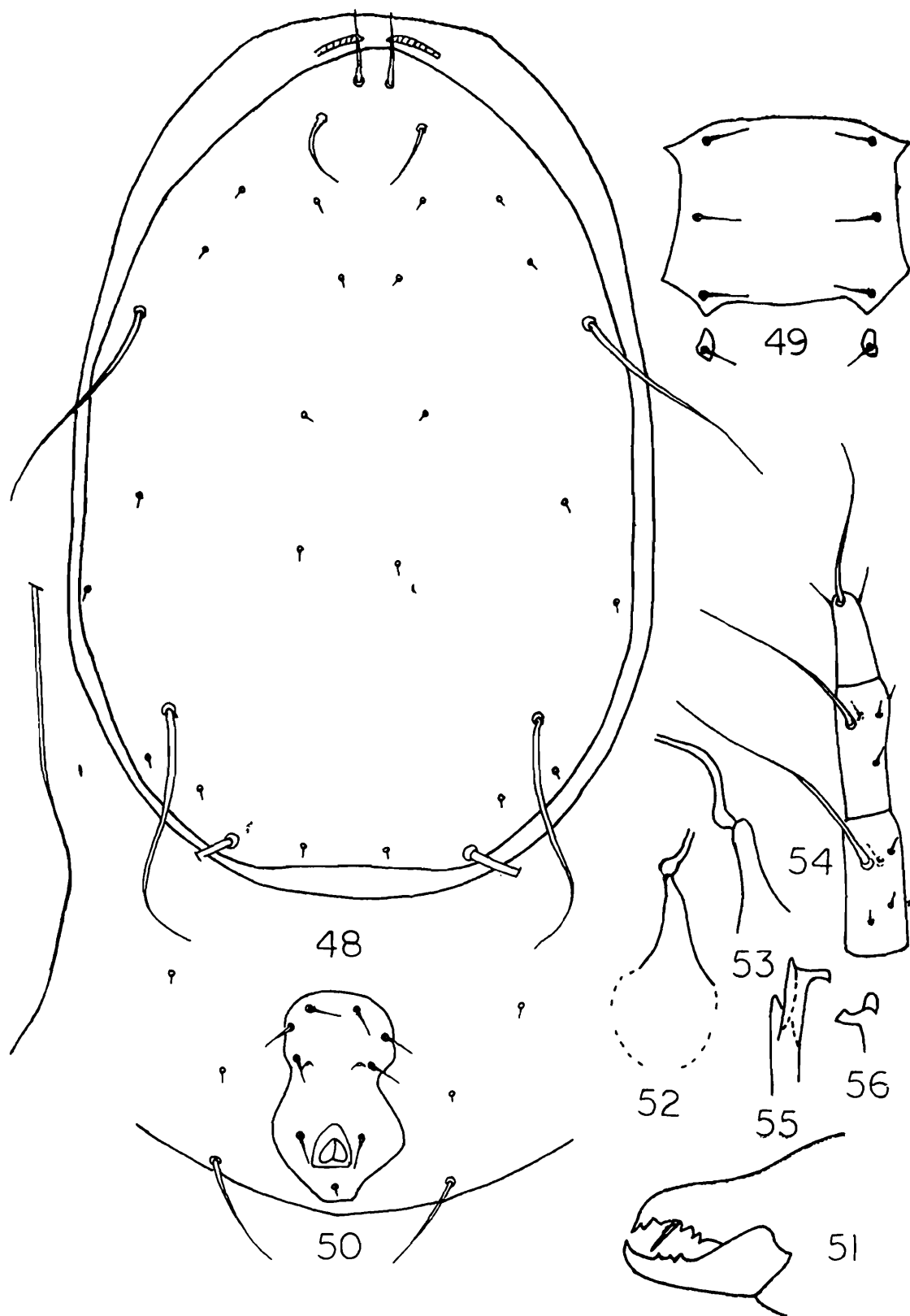
1970. *Amblyseius deleoni* Muma & Denmark, *Arthropods of Florida*, 6 : 68-69.

1981. *Amblyseius giganticus* Gupta, *Indian J. Acar.*, 5 : 33-35. (new synonymy)

1982. *Amblyseius herbicolus* : Daneshvar & Denmark, *Internat. J. Acarol.*, 1(1) : 5.

1983. *Amblyseius deleoni* : Gupta & Ray, *Rec. zool. Surv. India*, 8(3-4) : 305-306.

*Female* : Dorsal shield slightly rugose, 357 long, 255 wide, with 17 pairs of setae, of those,  $j_1$ ,  $j_3$ ,  $s_4$ ,  $Z_5$  and  $Z_4$  being long, others being small ;  $j_3 > j_1$ ,  $Z_4 > s_4$ ,  $r_3 > R_1$ ,  $S_2 > S_4$ . Measurements of setae :  $j_1$ -25,  $j_4$ - $j_6$ ,  $J_2$ ,  $J_5$ -4-5 each,  $j_3$ -33,  $z_2$ -9,  $z_4$ -11,  $s_4$ -107,  $Z_1$ -9,  $S_2$ -13,  $S_4$ -9,  $S_5$ -13,  $Z_5$ -205,  $z_5$ -6,  $Z_4$ -125,  $r_3$ -11,  $R_1$ -7. Sternal shield slightly shorter (81) than wide (94) with 3 pairs of sternal setae, metasternal plate with seta distinct. Genital shield 78 wide with a pair of genital setae. Ventrianal shield 116-120 long, 70-80 wide, elongate, lateral margins concave slightly below the level of 3rd pair of preanal setae ; transverse striation present between genital and ventrianal shields ; 3 pairs of preanal setae present, a pair of preanal pores present little below the level of 3rd pair of preanal seta, 4 pairs of setae present around ventrianal shield,  $JV_5$ -67 long, 2 pairs of metapodal plates present, primary one-21 long, accessory one-14 long. Fixed digit of chelicera with 2 teeth anterior to *pilus dentilis* and 3 teeth posterior to it, movable digit with 3 teeth. Macrosetae on leg IV : genu-129, tibia-90, basitarsus-70, genu I-56, genu II-35, genu III-51, tibia III-40. Leg chaetotactic formula : genu II 2  $\frac{2}{1}$   $\frac{2}{1}$  1, tibia II 1  $\frac{1}{1}$   $\frac{2}{1}$  1, genu III 1  $\frac{2}{1}$   $\frac{2}{1}$  1, tibia III 1  $\frac{1}{1}$   $\frac{2}{1}$  1. Spermatheca with fundibuliform cervix and swollen atrium. Peritreme extends anteriorly upto  $j_1$ .



Figs. 48-56. *Amblyseius (Amblyseius) herbicolus* (Chant)

- 48. Dorsal shield
- 49. Sternal shield
- 50. Posterior ventral surface
- 51. Chelicera (female)
- 52., 53. Spermathecae
- 54. Genu, tibia and basitarsus of leg IV
- 55., 56. Spermatophoral processes

**Male :** Chaetotaxy of dorsal shield similar as in female. Spermatophoral process as illustrated. Macrosetae on leg IV : genu-63, tibia-47, basitarsus-26.

**Habitat :** *Aegle marmelos*, citrus.

**Type locality and repository :** Holotype ♀, Florida, on citrus, from bromeliad imported from Portugal at Boston, Massachusetts, deposited in USNM. Paratype 1 ♀, British West Indies on grass, deposited in Canadian National Collection.

**Distribution :** India : Tripura, Arunachal Pradesh ; outside India : Portugal, North America, South America, Mexico, Philippines, British West Indies, Taiwan, Thailand, Madagascar, Brazil, Japan (Shikoku, Houshu, Kyushu, Okinawa Isl.).

**Remarks :** The name *Amblyseius largoensis* was used for two different species since Muma (1961) and *A. largoensis* Muma, 1961 was consequently renamed as *A. deleoni* by Muma & Denmark (1970). But Daneshvar & Denmark (1982) considered *A. deleoni* Muma & Denmark and *A. herbicolus* Chant to be conspecific and, hence, *A. herbicolus* became the valid name because of priority. This species is distinguished from another closely related species, *A. largoensis* (Muma) by spermathecal character as the former has fundibuliform cervix and the latter has tubular cervix.

## 6. *Amblyseius (Amblyseius) indirae* Gupta

(Figs. 57-63)

*Amblyseius (Amblyseius) indirae* Gupta, *Entomon* (In press)

**Female :** Dorsal shield smooth, 358 long, 224 wide, with 17 pairs of setae, all the setae small except  $j_1$ ,  $j_3$ ,  $s_4$ ,  $Z_5$  and  $Z_4$  which are longer.  $j_1$  slightly shorter than  $j_3$ ,  $z_2 = z_4$ ,  $s_4 \geq Z_4$ . Measurements of setae  $j_1$ -33,  $j_4$ - $j_6$ ,  $J_2$ - $J_5$  extremely small,  $j_3$ -36,  $z_2$ ,  $z_4$ -6 each,  $s_4$ -105,  $Z_1$ ,  $S_2$ - $S_5$ -5-6 each,  $Z_5$ -235,  $z_5$ -5,  $Z_4$ -100,  $r_3$ ,  $R_1$ -10 each. Sternal shield as long (90) as broad, with 3 pairs of sternal setae, metasternal plates conspicuous with seta. Genital shield 67 wide, with a pair of setae. Ventrianal shield longer (100) than broad (67), lateral margins concave with 3 pairs of preanal setae ; a pair of crescent shaped preanal pores presentslightly below the level of 3rd pair of preanal setae ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -56 long, 2 pairs of metapodal plates present, primary one-25 long, accessory one-9 long. Spermatheca as figured with long duct. Fixed digit of chelicera with 4 teeth anterior to *pilus*

*dentilis*, 4-5 teeth posterior to it, *pilus dentilis* strong, movable digit toothless. Macrosetae on leg IV : genu-117, tibia-94, basitarsus-71, genu II-22, genu III-34. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia-II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ , Peritreme extends anteriorly upto  $j_1$ .

*Male* : Dorsal chaetotaxy similar as in female. Spermatophoral process and ventrianal shield as illustrated.

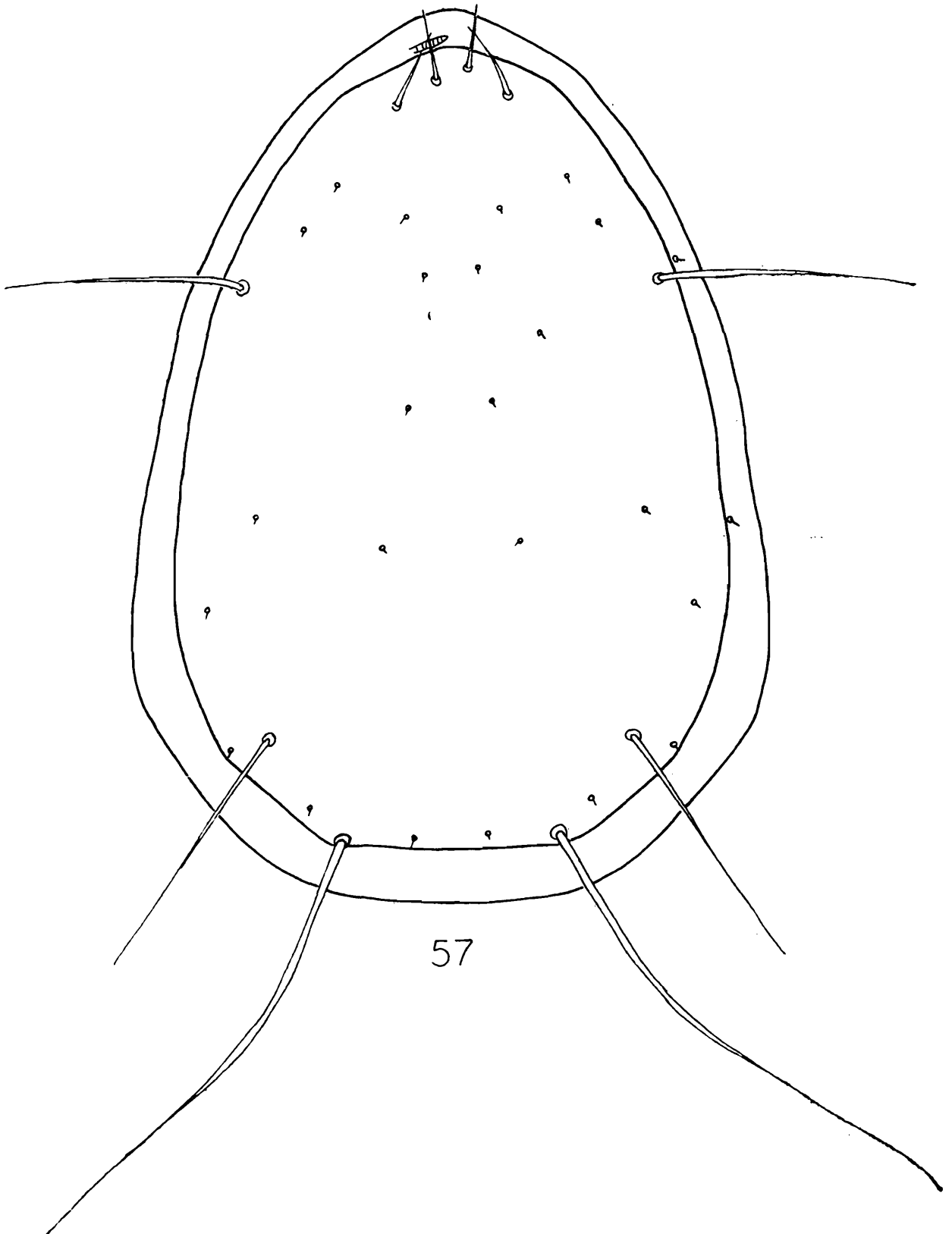
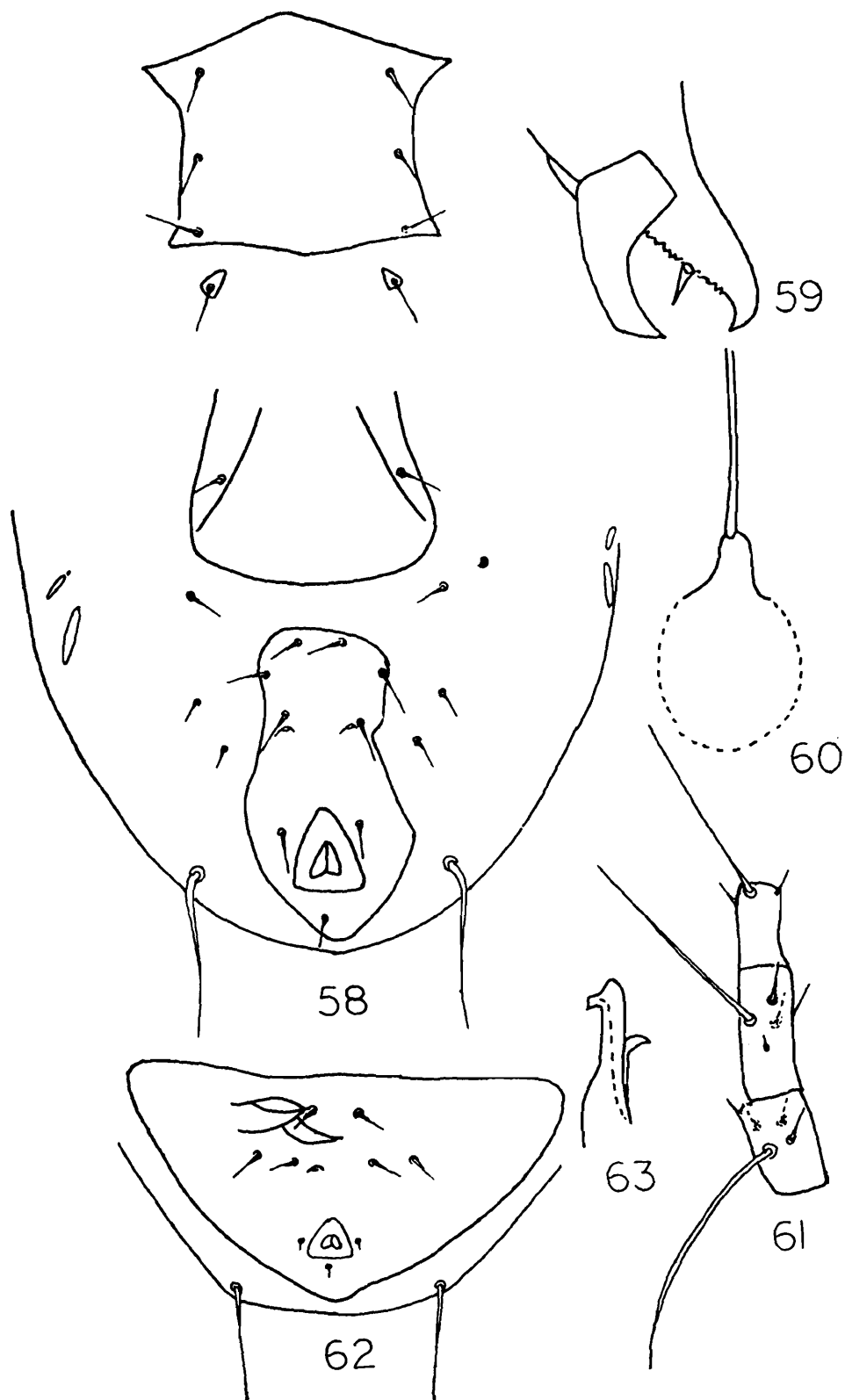


Fig. 57. *Amblyseius (Amblyseius) indirae* Gupta—Dorsal shield



Figs. 58-63. *Amblyseius (Amblyseius) indirae* Gupta  
 58. Ventral surface  
 59. Chelicera (female)  
 60. Spermatheca  
 61. Genu, tibia and basitarsus of leg IV  
 62. Ventrianal shield (male)  
 63. Spermatophoral process

*Type locality and repository* : Holotype ♀, India : Karnataka, Chikmagalur, Mudigere, on an undetermined plant, 30.xii.1980, Coll. S. K. Gupta, deposited in ZSI, Calcutta, Reg. No. 3351/17 Paratypes : 2 ♀ ♀, 1 ♂, data same as for holotype, Reg. No. 3352-53/17.

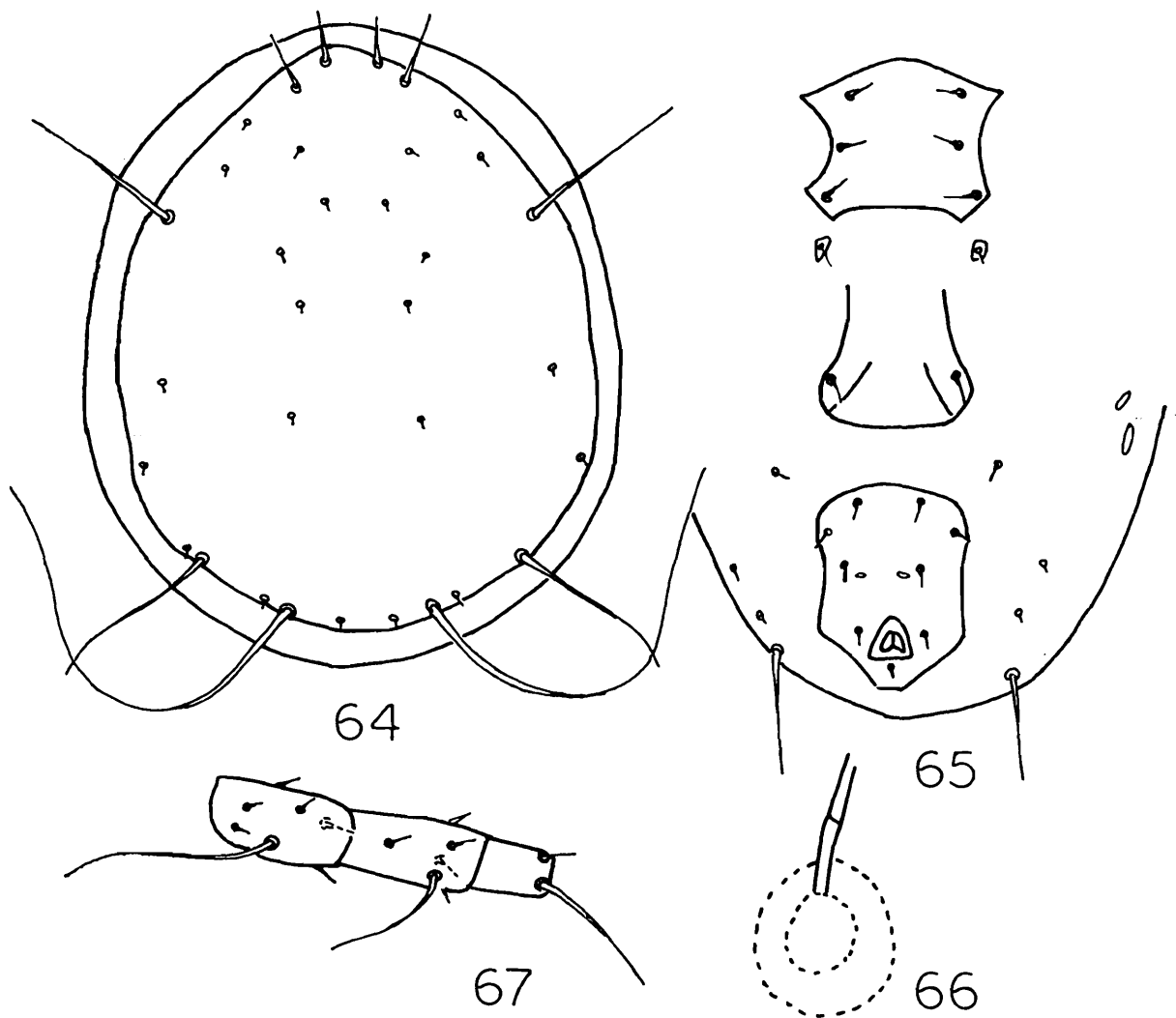
*Remarks* : This species differs from *Amblyseius shiganus* Ehara (1972) in having vase-shaped ventrianal shield and in having comparatively shorter setae on dorsal shield. From *A. largoensis* (Muma, 1955) it differs in shape of spermatheca.

### 7. *Amblyseius (Amblyseius) kulini* Gupta

(Figs. 64-67)

1978. *Amblyseius kulini* Gupta, *Indian J. Acar.*, 2(2) : 63-65.

*Female* : Dorsal shield smooth, 300 long, 220 wide, with 17 pairs



Figs. 64-67. *Amblyseius (Amblyseius) kulini* Gupta

64. Dorsal shield

65. Ventral surface

66. Spermatheca

67. Genu, tibia and basitarsus of leg IV

of setae ;  $j_1$ ,  $j_3$ ,  $s_4$ ,  $Z_5$  and  $Z_4$  being long and measure 28, 44, 80, 200 and 84, respectively ; other setae minute measuring 6-8 long ; sublatetal setae lie on lateral integument. Sternal shield smooth, shorter (72) than wide, with 3 pairs of sternal setae, 4th pair lie on metasternal plates. Genital shield 80 wide with a pair of setae, a fold present between genital and ventrianal shields. Ventrianal shield pentagonal, 104 long, 72 wide, with 3 pairs of preanal setae, and a pair of preanal pores, 4 pairs of setae present around ventrianal shield ; 2 pairs of metapodal plates present. Spermatheca as illustrated. Macrosetae on leg IV : genu-80, tibia-64, basitarsus-62, genu I-37, genu III-56, tibia-III-36. Peritreme extends anteriorly upto  $j_1$ .

*Male* : Unknown.

*Habitat* : *Bambusa* sp.

*Type locality and repository* : Holotype ♀, India : Assam, Gossaingaon on *Bambusa* sp., deposited in ZSI, Calcutta, Reg. No. 3354/17.

*Distribution* : India : Assam.

*Remarks* : The species is known only from its type.

### 8. *Amblyseius (Amblyseius) largoensis* (Muma)

(Figs. 68-76)

1955. *Amblyseiopsis largoensis* Muma, *Ann. ent. Soc. Amer.*, 48 : 266.  
 1959. *Amblyseius largoensis* : Ehara, *Acarologia*, 1 : 293-294.  
 1964. *Amblyseius largoensis* : Rao & Rao, *Comm. Inst. Biol. Contr. Tech. Bull.*, 4 : 38-39.  
 1969. *Amblyseius amitai* Bhattacharyya, *J. Bomb. Nat. Hist. Soc.*, 65(3) : 677-679. (new synonymy)  
 1970. *Amblyseius largoensis* : Gupta, *Sci. & Cult.*, 36 : 298.  
 1971. *Amblyseius largoensis* : Gupta *et. al.*, *Sci. & Cult.*, 37 : 98.  
 1974. *Amblyseius largoensis* : Prasad, A catalogue of mites of India, p. 166-167.  
 1974. *Amblyseius largoensis* : Gupta, *Ent. Rec.*, 86 : 143.  
 1974. *Amblyseius amitai* : A catalogue of mites of India, p. 312.  
 1975. *Amblyseius largoensis* : Gupta, *Internat. J. Acarol.*, 1(2) : 38.  
 1977. *Amblyseius largoensis* : Gupta, *Indian J. Acar.*, 1 : 33.  
 1977. *Amblyseius amtalaensis* : Gupta, *Entomologists' mon. Mag.*, 112 : 53 (new synonymy)  
 1977. *Amblyseius largoensis* : Gupta, *Oriental Ins.*, 11 : 629-631.  
 1978. *Amblyseius largoensis* : Gupta, *Indian J. Acar.*, 2(2) : 65-66.  
 1979. *Amblyseius largoensis* : Gupta & Nahar, First All India Symp. Acar. (Abstract), p. 3.  
 1981. *Amblyseius largoensis* : Gupta & Nahar, *In. Contrib. to Acar. in India*, p. 9.  
 1982. *Amblyseius largoensis* : Gupta, *Indian J. Acar.*, 6 : 25.

*Female* : Dorsal shield smooth, 370-380 long, 260-275 wide, with

3-4 pairs of small pores and 17 pairs of setae. Setae  $j_1, j_3, s_4, Z_4$  and  $Z_5$  long and the last two being whip-like.  $s_4 \approx Z_4, j_3 > j_1$ . Measurements of setae ;  $j_1$ -30-36,  $j_4-j_6, J_2-J_5$ -5-7 each,  $j_3$ -45-49,  $z_2, z_4$ -7-9 each,  $s_4$ -90-100,  $Z_1, S_2, S_5$ -7-9 each,  $Z_5$ -247-268,  $z_5$ -5,  $Z_4$ -95-105,  $r_3, R_1$ -9 each, both on the lateral integument. Sternal shield longer (85) than broad (74) with 3 pairs of sternal setae ; metasternal plates

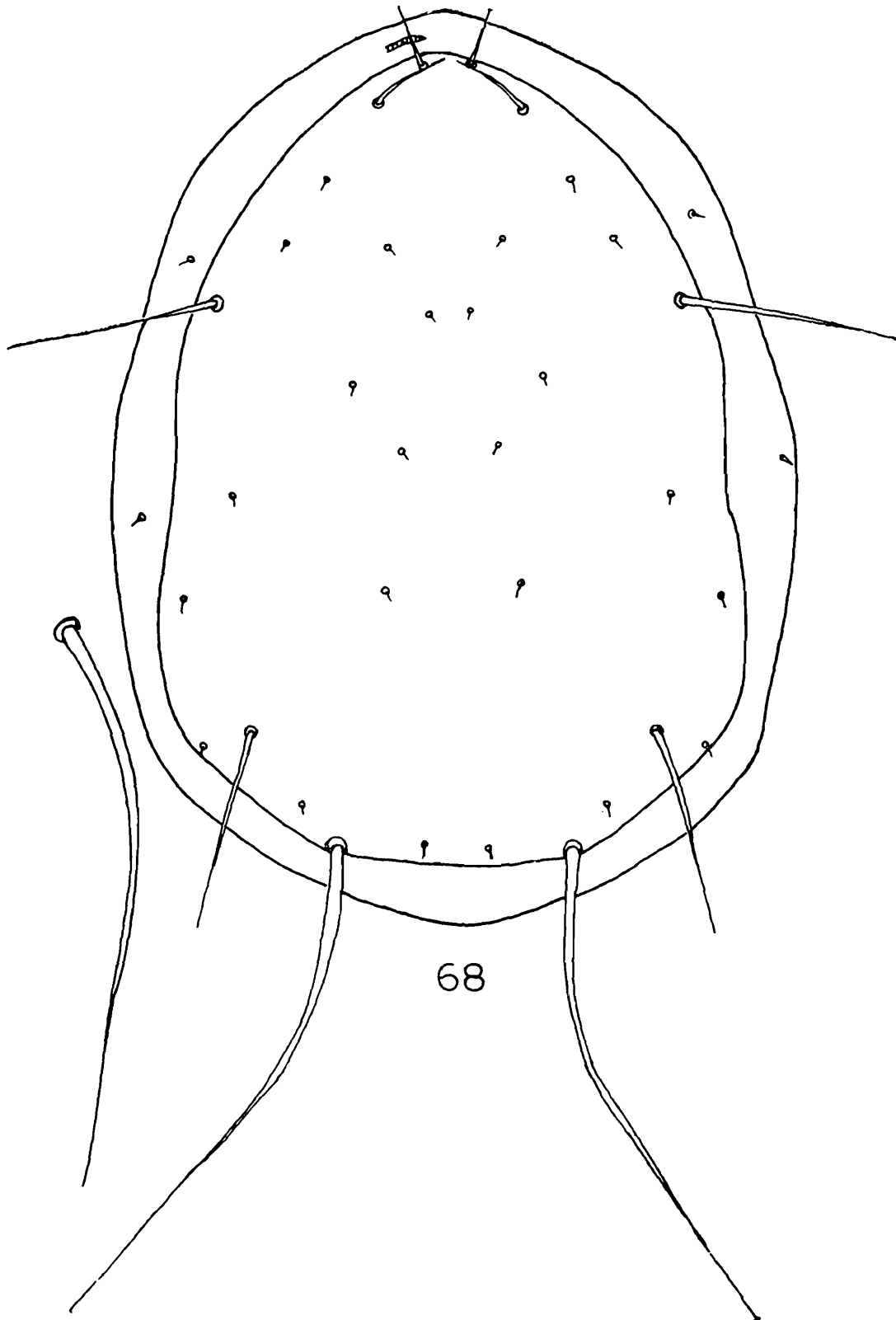
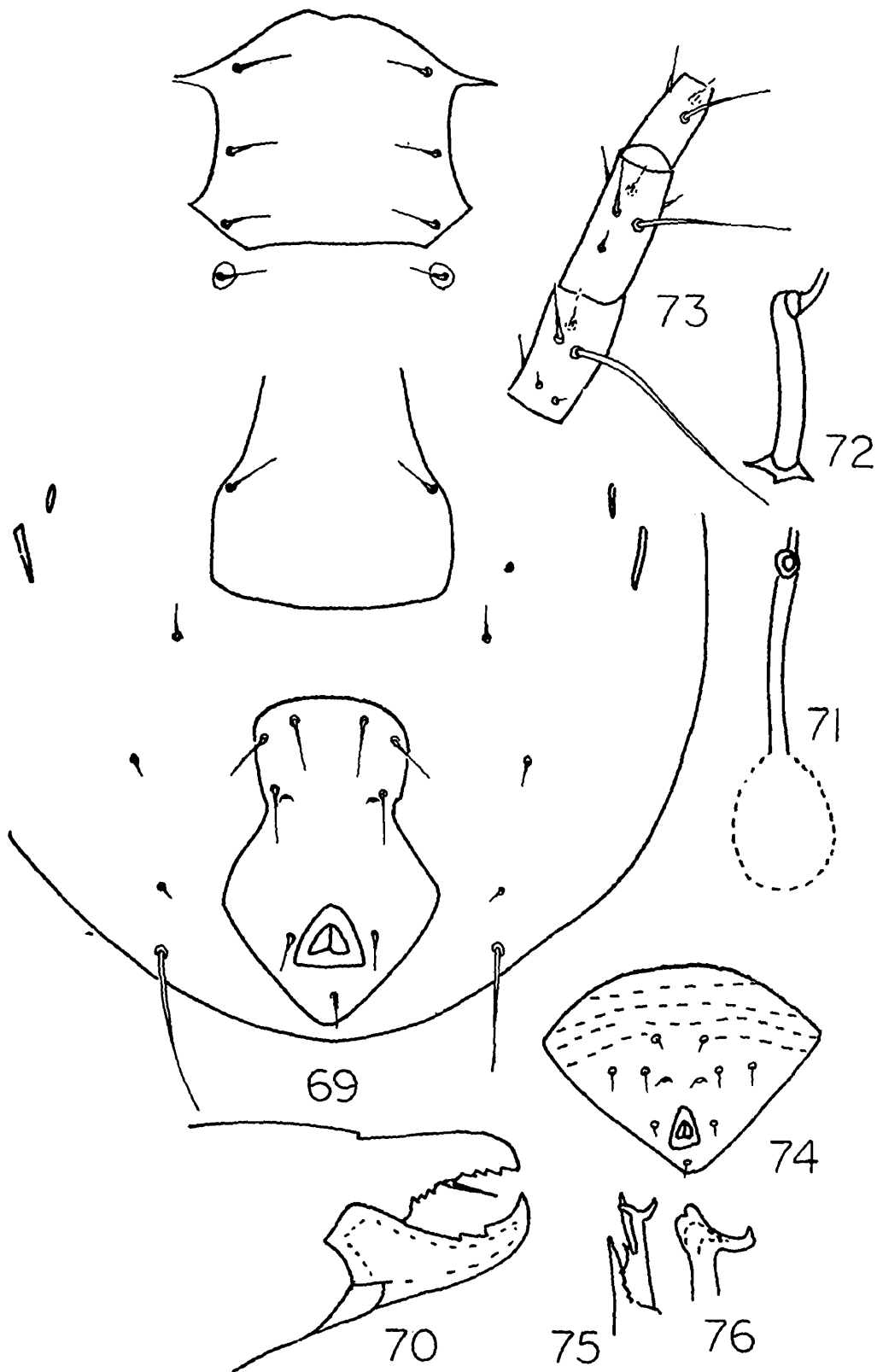


Fig. 68. *Amblyseius (Amblyseius) largoensis* (Muma)—Dorsal shield



Figs. 69-76. *Amblyseius (Amblyseius) largoensis* (Muma)  
 69. Ventral surface  
 70. Chelicera (female)  
 71., 72. Spermathecae  
 73. Genu, tibia and basitarsus of leg IV  
 74. Ventrianal shield (male)  
 75., 76. Spermatophoral processes

with setae distinct. Genital shield 85 wide with a pair of setae. Ventrianal shield longer (105-110) than wide (70-75), vase-shaped, lateral margins concave with 3 pairs of preanal setae and a pair of semilunar pores little posterior to 3rd pair of preanal setae, 4 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -55-60 long; 2 pairs of metapodal plates present, primary one 20-29 long accessory one 5-8 long. Fixed digit of chelicera with 3-4 teeth anterior to *pilus dentilis* and 3 teeth posterior to it, movable digit with 2 sharp teeth. Spermatheca with tubular cervix, walls parallel. Peritreme extends anteriorly beyond  $j_1$ . Macrosetae on leg IV: genu 95-105, tibia 67-76, basitarsus 40-54; genu II-32, genu III-34, tibia III-43. Leg chaetotactic formula: genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male*: Dorsal chaetotaxy similar as in female. Spermatophoral process and ventrianal shield 'as illustrated. Macrosetae on leg IV: genu-58-71, tibia-34-58, basitarsus-44-52.

*Habitat*: Mango, *Callophyllum inophyllum*, *Musandra corymbosa*, *Tabernaemontana coronaria*, castor, banana, citrus, coconut, pomegranate, *Dalbergia*, eucalyptus, *Tectona grandis*, black-berry, sugarcane, rose, *Cassia*, cashewnut, bamboo, arecanut, *Eugenia*, fig, guava, pepper, *Nerium*, litchi, plum, *Manglietia insignis*, chilli, *Shorea* sp., papaya, *Musa*, *Bauhinia acuminata*, poppy, pine-cone, grass, dahlia, "Kanku", peach, *Cassia fistula*, *Citrus medica*.

*Type locality and repository*: Holotype ♀, U. S. A., Florida, Key largo, on lime leaves, deposited in USNM.

*Distribution*: India: West Bengal, Bihar, Manipur, Tripura, Nagaland, Arunachal Pradesh, Assam, Meghalaya. Orissa, Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Pondicherry, Uttar Pradesh, Punjab, Himachal Pradesh, Gujarat and Andaman Nicobar Isls.; outside India: Japan (Honshu, Shikoku, Kyushu, Okinawa Isl.)' Guatemala, Honduras, Puerto Rico, Brazil, Costa Rica, New Zealand, Mexico, Jamaica, Trinidad, S. Africa, Kenya, California, Florida, Hawaii, Israel, Western & Northern Iran, Hong Kong, Philippines, Taiwan, Thailand.

*Remarks*: Gupta & Nahar (1981) and Rao & Rao (1964) reported this mite feeding efficiently on *Oligonychus mangiferus* (Rahman & Sapra) and citrus mite, respectively. Often this mite is seen associated with a number of species of tetranychid and tenuipalpid mites. Denmark & Muma (1973) reported that the Brazilian species

has  $s_4$  shorter than macroseta on genu IV, but in Indian specimens both are almost equal.

### 9. *Amblyseius (Amblyseius) mcmurtryi* Muma

(Figs. 77-82)

1967. *Amblyseius mcmurtryi* Muma, *Fla. Ent.*, 50 : 270.

1974. *Amblyseius mcmurtryi* : Prasad, A catalogue of mites of India, p. 167-168.

1975. *Amblyseius mcmurtryi* : Gupta, *Internat. J. Acarol.*, 1(2) : 39.

1978. *Amblyseius mcmurtryi* : Gupta, *Indian J. Acar.*, 2(2) : 67.

*Female* : Dorsal shield lightly sclerotized, 330-360 long, 200-210 wide, with 17 pairs of setae, of those  $j_1$ ,  $j_3$ ,  $s_4$ ,  $Z_4$  and  $Z_5$  being long and measure 25, 36, 58, 60 and 140, respectively ; length of other setae vary between 6-8. Sternal shield as long as wide or slightly longer with 3 pairs of sternal setae, 4th pair of setae, lie on interscutal membrane. Genital shield 85 wide with a pair of genital setae. Ventrianal shield almost pentagonal, lateral margins gently concave below the level of 2nd pair of preanal setae, 108 long, 80 wide, with 3 pairs of preanal setae and a pair of preanal pores ; 2 pairs of metapodal plates present, 4 pairs of setae present on membrane around ventrianal shield,  $JV_5$ -67 long. Spermatheca short with tubular cervix. Fixed digit of chelicera with 8-9 teeth, movable digit with 3 teeth. Macrosetae on leg IV : genu—50, tibia—40, basitarsus—46, genu I—35, genu II—35. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ . Peritreme extends anteriorly upto  $j_1$ .

*Male* : Unknown.

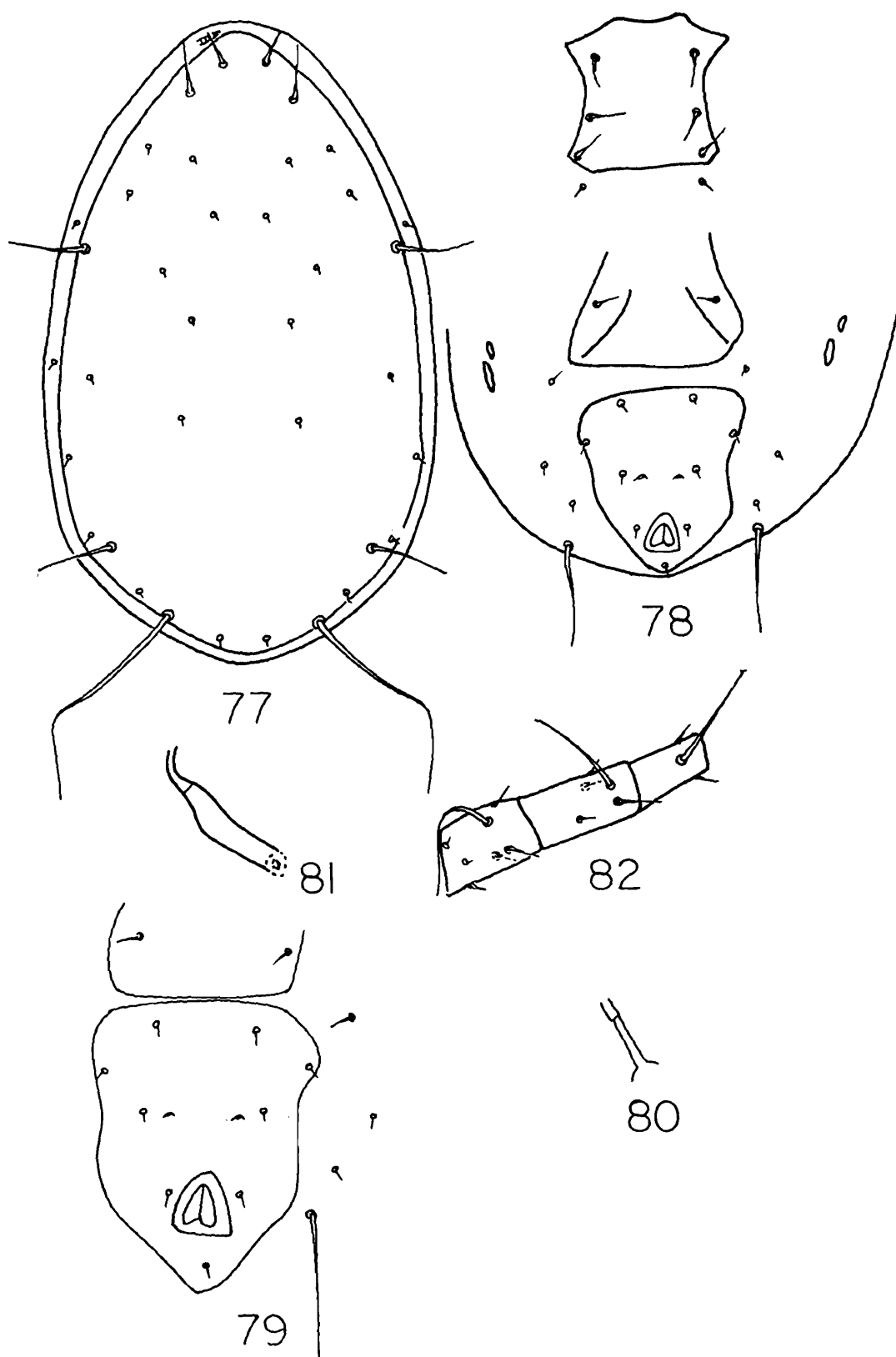
*Habitat* : Citrus, guava.

*Type locality and repository* : Holotype ♀, India : Assam, on citrus, deposited in USNM.

*Distribution* : India : Assam, Meghalaya ; outside India : Northern and Western Iran.

*Remarks* : Muma (1967) mentioned the presence of creases in sternal and ventrianal shields but those are lacking in the specimens examined by the author from Meghalaya and Assam. Though the spermatheca has short, tubular cervix but differs slightly from original description as well as from the paratype specimen which was examined taking loan from Dr. H. A. Denmark. The specimen was in bad condition and many of the setae were broken. However, in overall

characters the specimen resembled the original description and the paratype.



Figs. 77-82. *Amblyseius (Amblyseius) mcMurtryi* Muma  
 77. Dorsal shield  
 78. Ventral surface  
 79. Posterior ventral surface  
 80., 81. Spermathecae  
 82. Genu, tibia and basitarsus of leg IV

10. *Amblyseius (Amblyseius) muraleedharani* Gupta  
(Figs. 83-87)

1981. *Amblyseius rhabdus*: Muraleedharan & Chandrasekharan, *Pestology*, 5: 13  
(misidentification)

1983. *Amblyseius (Amblyseius) rhabdus*: Ray & Gupta, *Rec. zool. Surv. India*, 80:  
304-305 (misidentification)

*Amblyseius (Amblyseius) muraleedharani* Gupta, *Env. & Ecol.* (In press)

*Female*: Dorsal shield smooth, with 17 pairs of setae, 403 long,

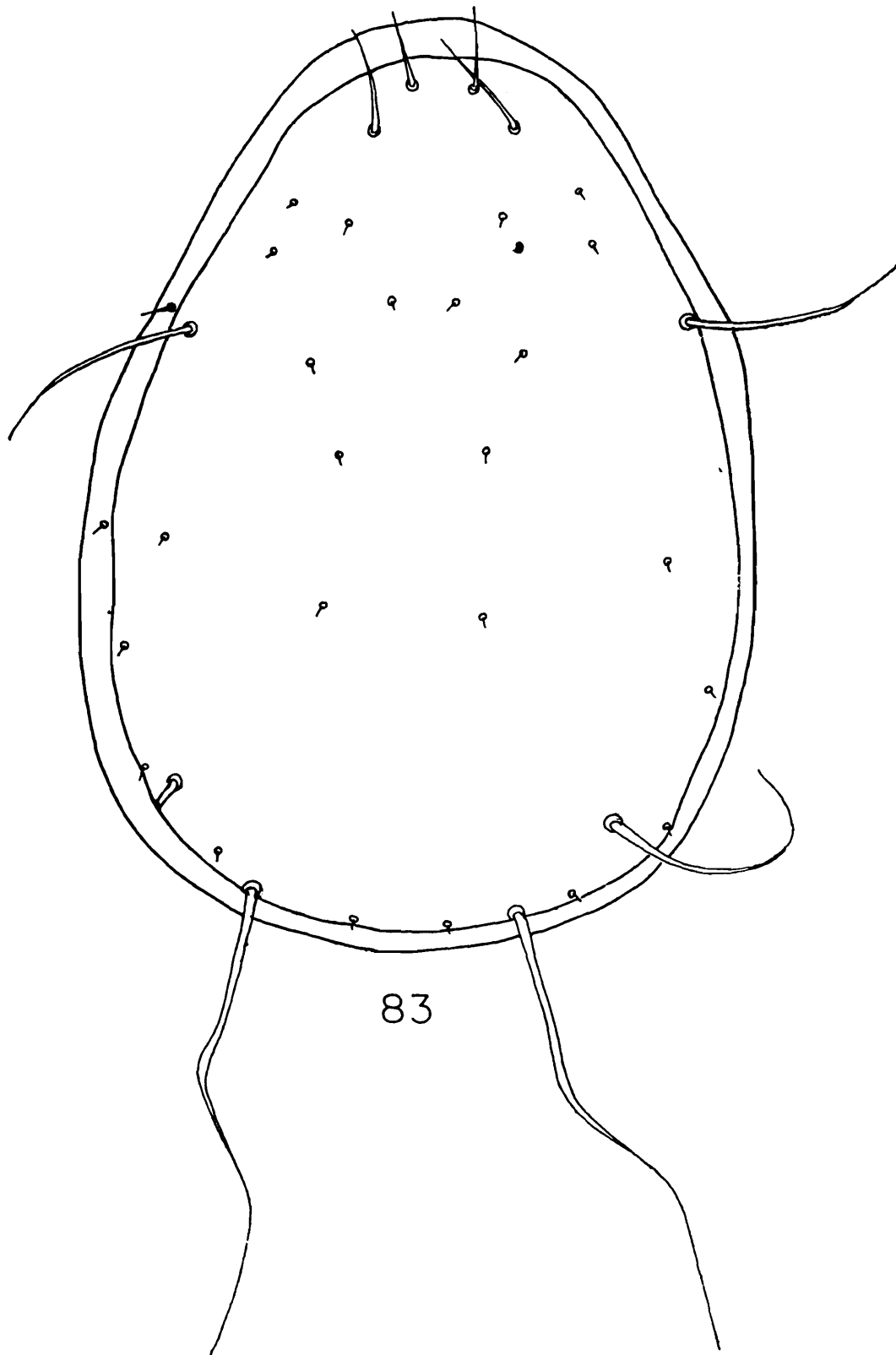
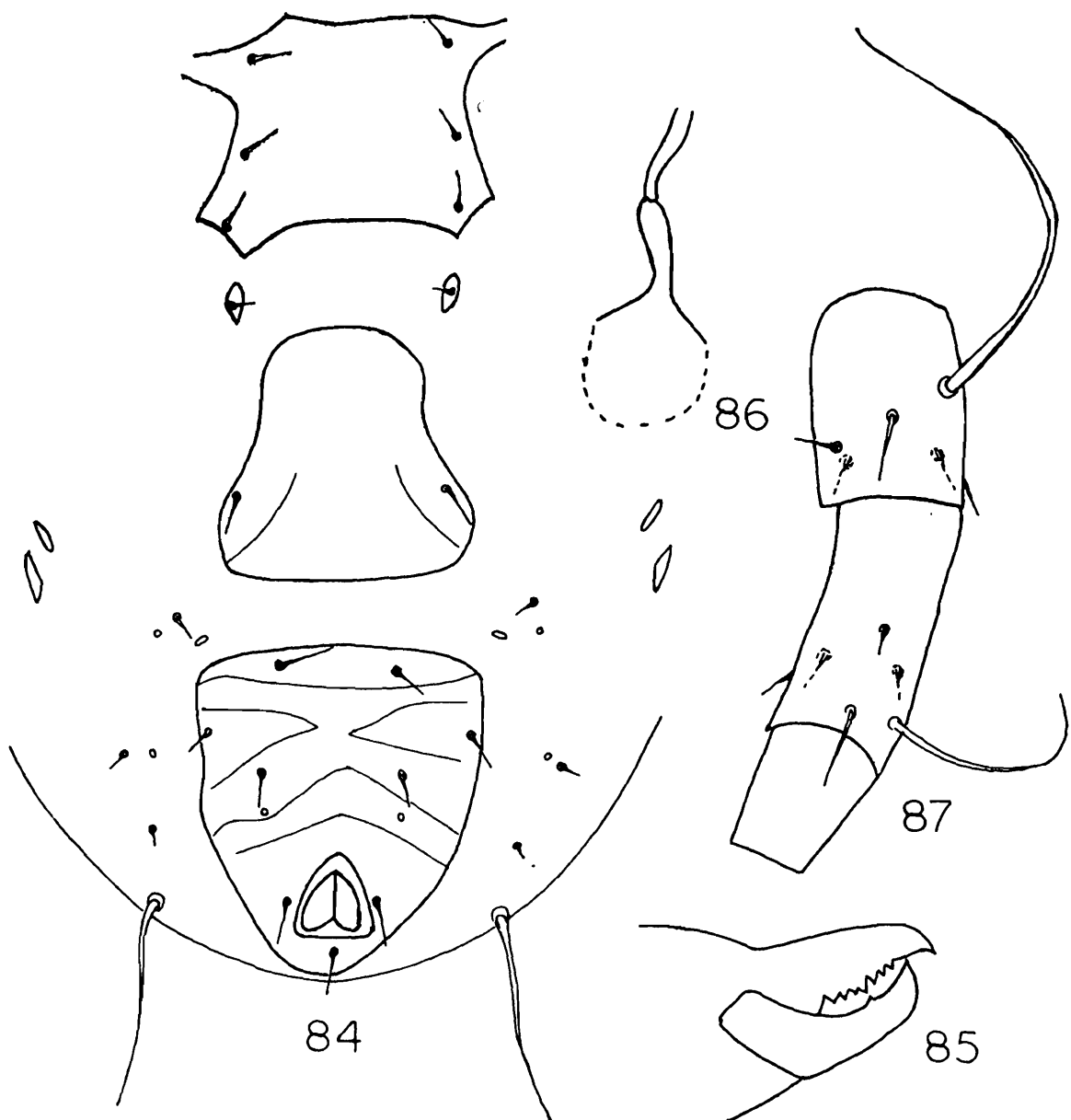


Fig. 83. *Amblyseius (Amblyseius) muraleedharani* Gupta—Dorsal shield

247 wide. Besides setae  $j_1$ ,  $j_3$ ,  $s_4$ ,  $Z_5$  and  $Z_4$  which are long and measure 27, 47, 103, 319 and 156, respectively, the other setae small. Sternal shield 78 long, 112 wide, with 3 pairs of sternal setae, 4th pair lie on oval-shaped metasternal plates. Genital shield normal, 101 wide, with a pair of genital setae. A fold present between genital and ventrianal shields. Ventrianal shield reticulate, 134 long, 125 wide, shaped as figured, with 3 pairs of preanal setae; 4 pairs of setae and 2 pairs of platelets present around ventrianal shield; 2 pairs of metapodal plates present, primary one triangular. Fixed digit of chelicera multidentate, movable digit with one tooth. Spermatheca



Figs. 84-87. *Amblyseius (Amblyseius) muraleedharani* Gupta

84. Ventral surface

85. Chelicera (female)

86. Spermatheca

87. Genu, tibia and basitarsus of leg IV

as figured. Macrosetae on leg IV : genu—112, tibia—94, basitarsus—74, genu III—62, genu II—47, genu I—44, tibia III—54.

*Male* : Unknown.

*Type locality and repository* : Holotype ♀, India : Tamil Nadu, on tea, Coll. N. Muraleedharan, deposited in ZSI, Calcutta, Reg. No. 3180/17.

*Remarks* : This species is quite close to *A. (A.) rhabdus* Denmark (1965) but differs in shape of spermatheca. Earlier, this species was wrongly identified as *rhabdus* but when the spermathecae of the two species were re-examined in detail it became evident that there exists a marked difference in this structure and, therefore, it was described as a new species.

### 11. *Amblyseius (Amblyseius) neorykei* Gupta

(Figs. 88-92)

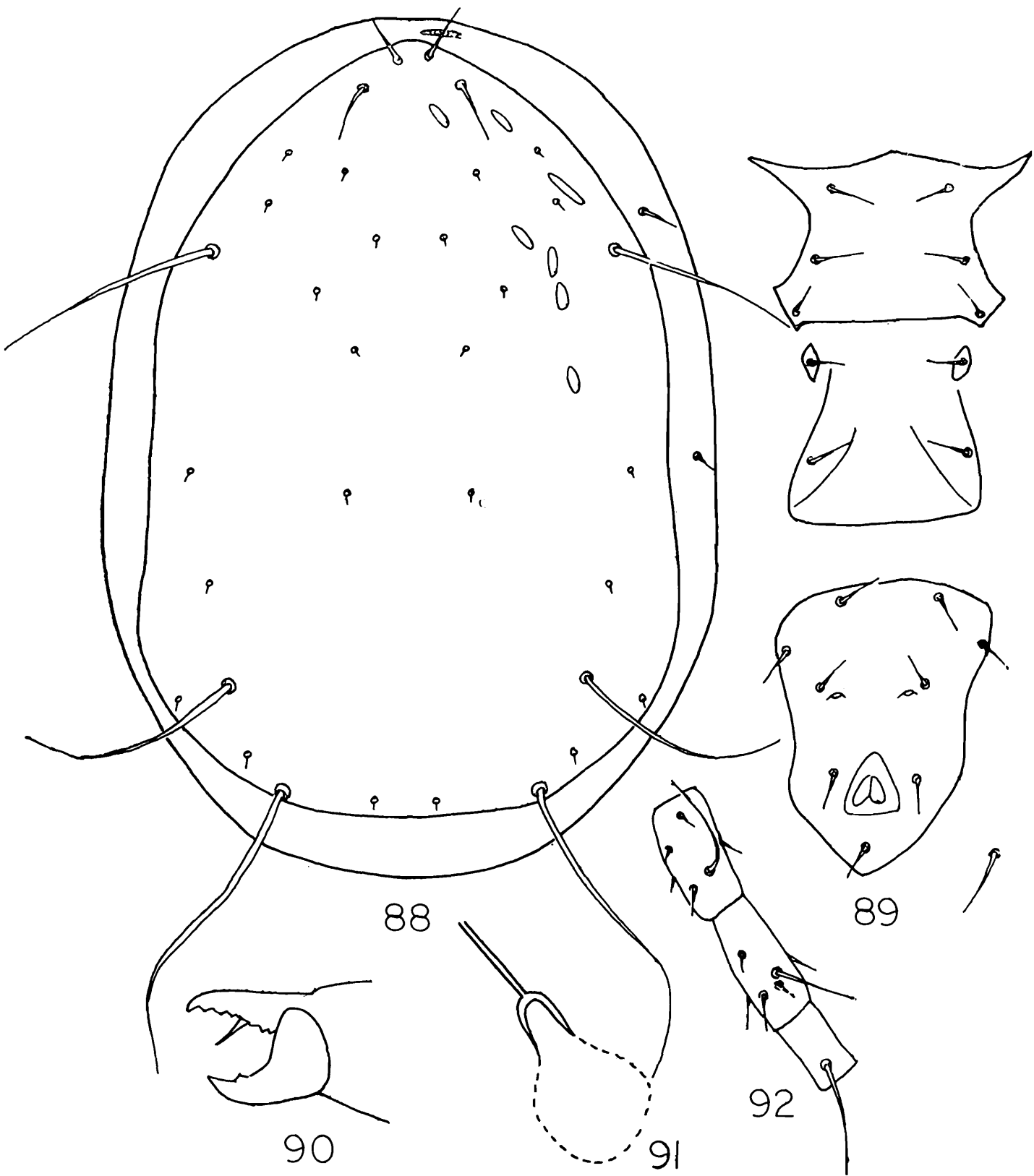
1977. *Amblyseius neorykei* Gupta, *Entomologists' mon. Mag.*, 112 : 56-57.

1982. *Amblyseius neorykei* : Gupta, *Indian J. Acar.*, 6 : 27.

*Female* : Dorsal shield 325-340 long, 210-215 wide, gently rugose, with 17 pairs of setae and 6 pairs of pores (not shown in figure),  $s_4 > Z_4$ . Measurements of setae :  $j_1$ -27-29,  $j_4$ - $j_6$ ,  $J_2$ -5,  $z_5$ ,  $z_2$ - $z_4$ ,  $Z_1$ ,  $S_2$ - $S_5$ -5-6 each,  $j_3$ -46,  $s_4$ -90-92,  $Z_5$ -134-135,  $Z_4$ -83-85,  $r_3$ -20,  $R_1$ -17 both on lateral integument. Sternal shield almost as long as broad or slightly broader than long, with postlateral angulation and 3 pairs of sternal setae, metasternal plate triangular with a seta. Genital shield 85 wide with a pair of genital setae. Ventrianal shield 110-120 long, 85-90 wide, with 3 pairs of preanal setae and a pair of elliptical preanal pores little below the level of 3rd pair of preanal setae ; 2 pairs of metapodal plates present ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -39-40 long. Fixed digit of chelicera with 3 teeth anterior to *pilus dentilis*, 2 teeth posterior to it, movable digit with one tooth. Peritreme extends anteriorly upto  $j_1$ . Spermatheca as illustrated. Macrosetae on leg IV : genu-70, tibia-50, basitarsus-72 ; genu II-33, genu III-38, genu I-33. Leg chaetotactic formula : genu II  $2\frac{2}{0}\frac{2}{0}1$ , tibia II  $1\frac{1}{1}\frac{2}{1}1$ , genu III  $1\frac{1}{1}\frac{2}{1}1$ , tibia III  $1\frac{1}{1}\frac{2}{1}1$ .

*Male* : Unknown.

*Habitat* : Chrysanthemum.



Figs. 88-92. *Amblyseius (Amblyseius) neorykei* Gupta

88. Dorsal shield

89. Ventral surface

90. Chelicera (female)

91. Spermatheca

92. Genu, tibia and basitarsus of leg IV

*Type locality and repository* : Holotype ♀, India : West Bengal, Darjeeling Dist., Sukna, on chrysanthemum, deposited in ZSI, Calcutta, Reg. No. 3355/17.

*Distribution* : India : West Bengal, Arunachal Pradesh.

## 12. *Amblyseius (Amblyseius) orientalis* Ehara

(Figs. 93-97)

1957. *Amblyseius* sp. Ehara, *Annotes. Zool. Jap.*, 31(1) : 55.

1959. *Amblyseius orientalis* Ehara, *Acarologia*, 1 : 291-293.

1978. *Amblyseius orientalis* : Gupta, *Indian J. Acar.*, 2(2) : 69-71.

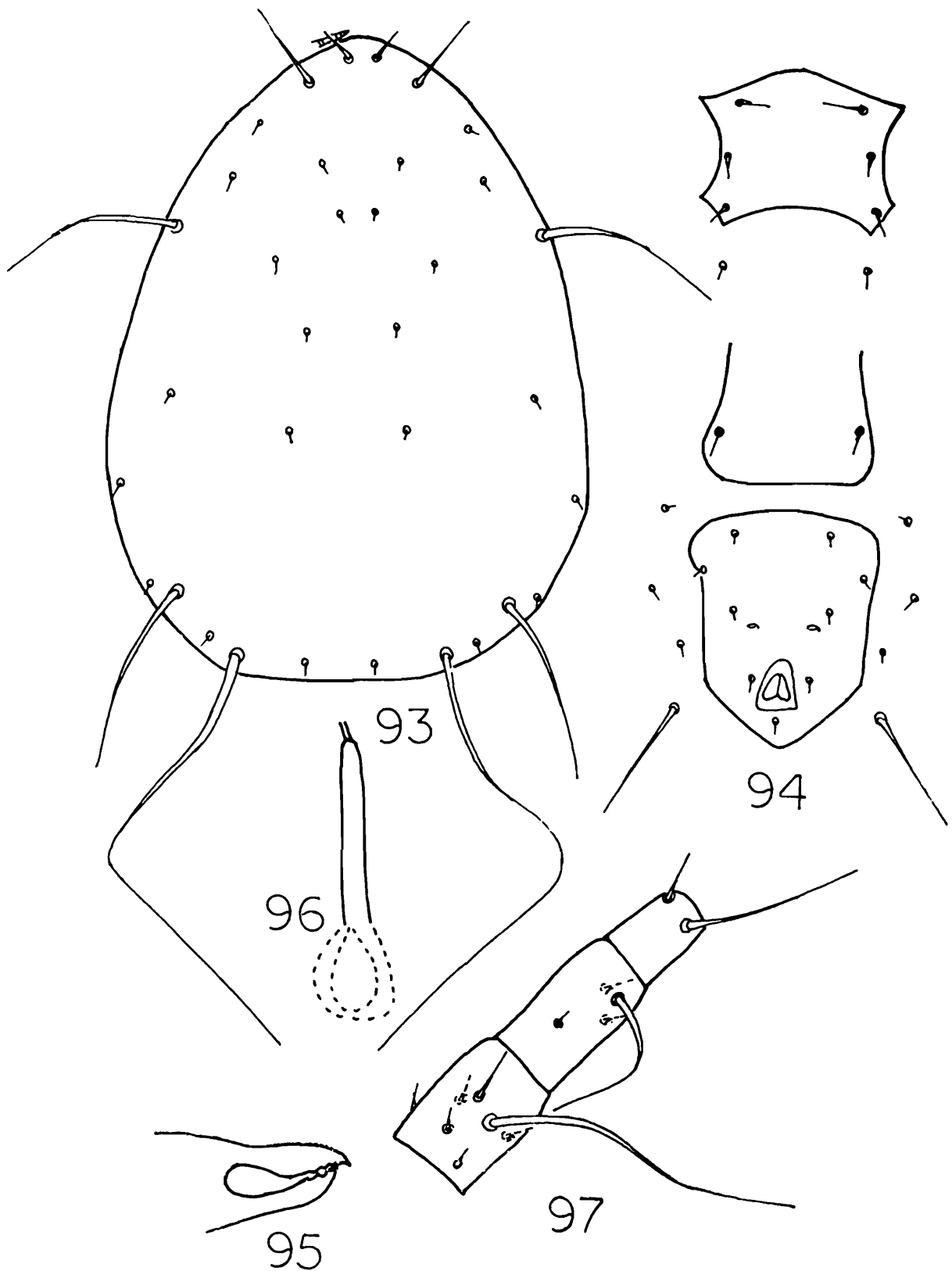
*Female* : Dorsal shield 340 long, 245 wide, with 17 pairs of setae, of those,  $j_1$ ,  $j_3$ ,  $s_4$ ,  $Z_5$  and  $Z_4$  being long while others are minute. Seta  $j_3 > j_1$ ,  $z_4$  slightly longer than  $z_2$ ,  $Z_4$  closer to  $S_4$  than to  $S_5$ . Measurements of setae :  $j_1$ -28,  $j_3$ -56,  $s_4$ -95-100,  $Z_5$ -250-280,  $Z_4$ -110-115,  $r_3$  and  $R_1$  on lateral integument. Sternal shield wider than long, with 3 pairs of sternal setae. Ventrianal shield 124 long, 80 wide, almost as wide as or wider than genital shield, with 3 pairs of preanal setae and a pair of elliptical preanal pores little posterior to 3rd pair of preanal setae, 4 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -80 long, Fixed digit of chelicera with at least 8-10 teeth, movable digit with 3-4 teeth. Peritreme extends anteriorly beyond  $j_1$ . Spermatheca as illustrated. Macrosetae on leg IV : genu-112, tibia-64, basitarsus-72.

*Male* : Dorsal chaetotaxy similar as in female. Ventrianal shield triangular. Spermatophoral process slightly bifurcate at distal end.

*Habitat* : Collected on an undetermined plant.

*Type locality and repository* : Holotype ♀, Japan, Sapporo, Hokkaido, on *Quercus crispula*, deposited in Zoological Institute, Faculty of Science, Hokkaido University, Japan. Paratypes 2 ♂♂, 15 ♀♀, same data and repository as for holotype.

*Distribution* : India : Assam, outside India : Japan (Hokkaido, Honshu, Shikoku).



Figs. 93-97. *Amblyseius (Amblyseius) orientalis* Ehara

93. Dorsal shield

94. Ventral surface

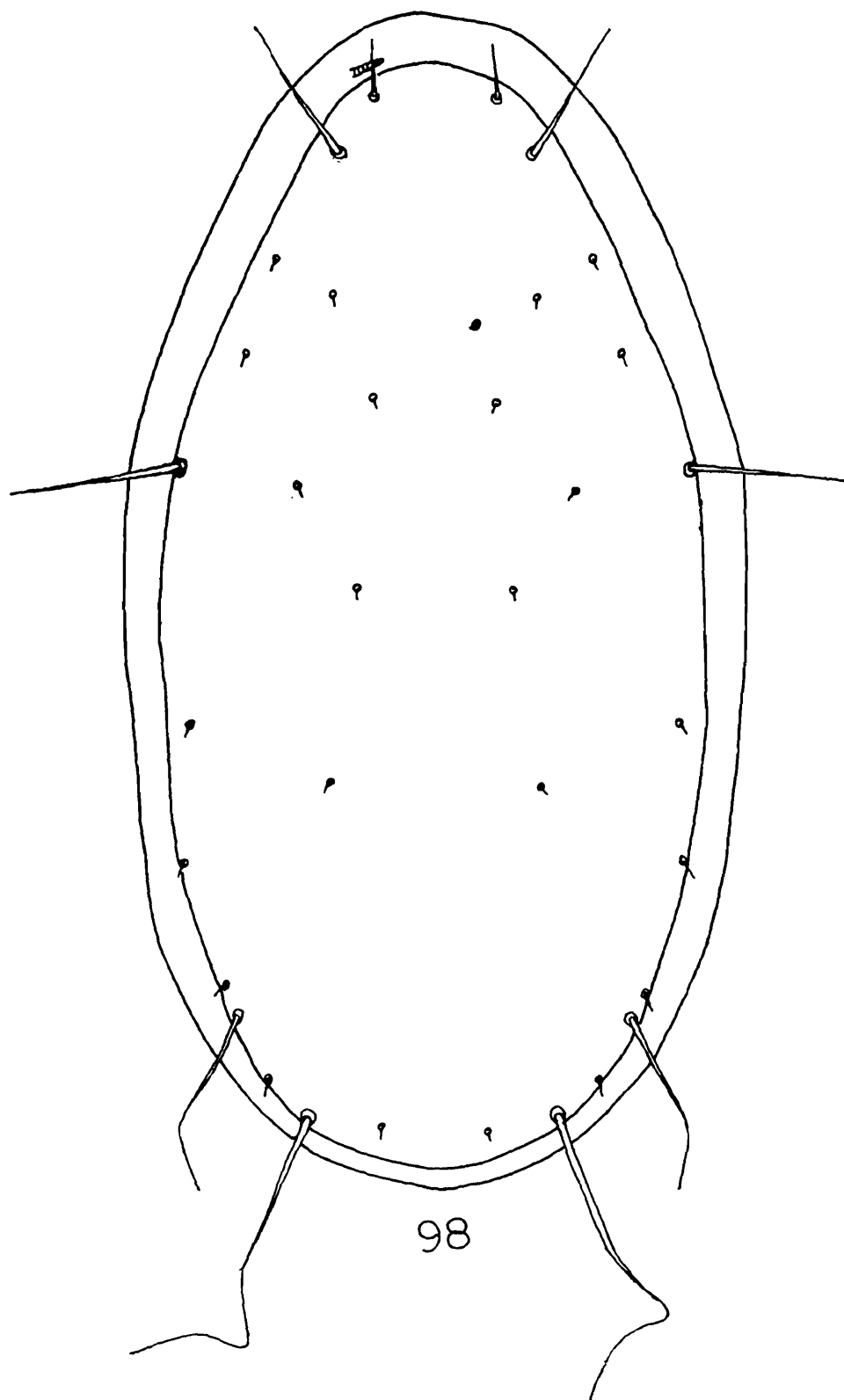
95. Chelicera (female)

96. Spermatheca

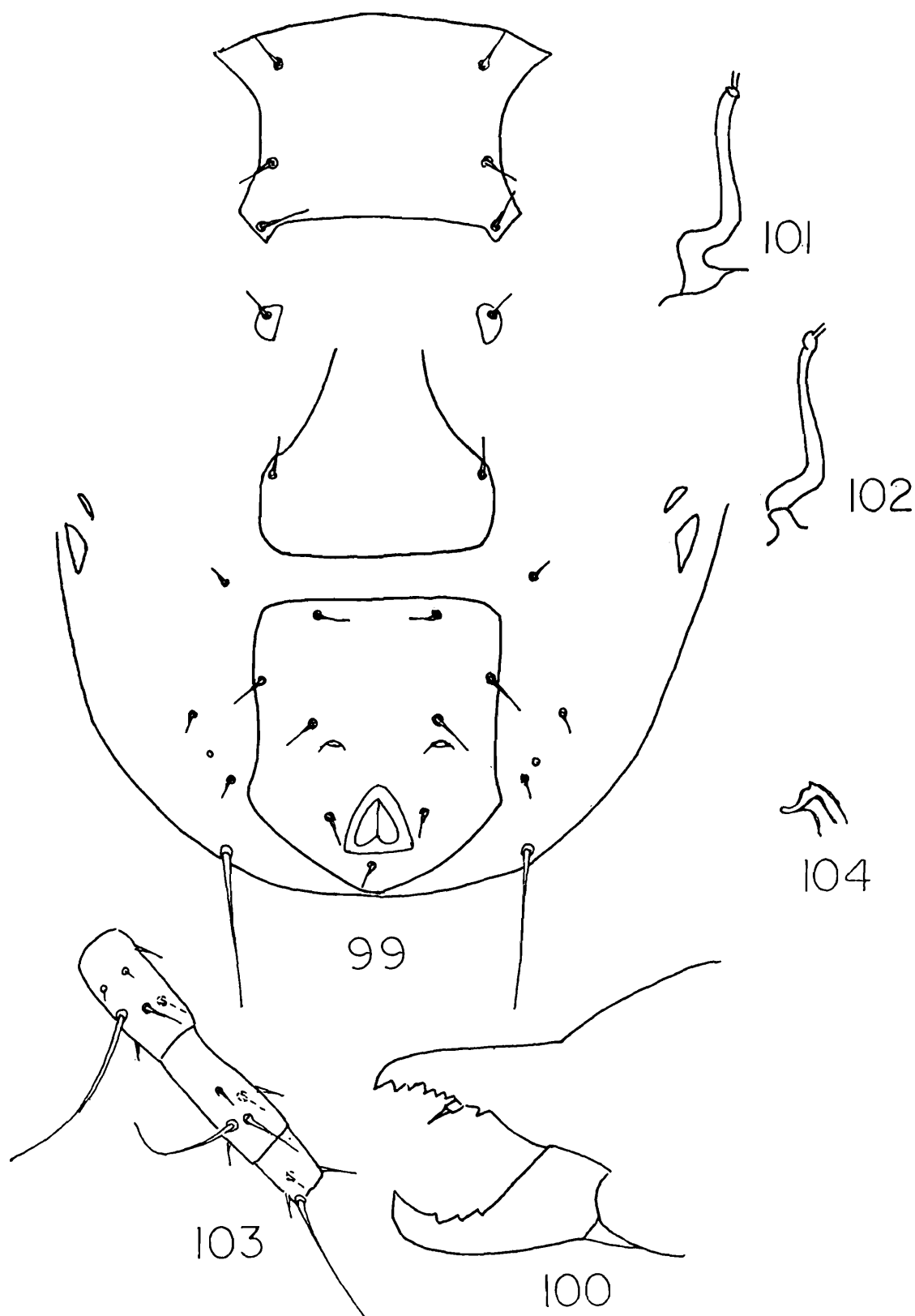
97. Genu, tibia and basitarsus of leg IV

13. *Amblyseius (Amblyseius) paraaerialis* Muma

( Figs. 98-104 )

1967. *Amblyseius paraaerialis* Muma, *Fla. Ent.*, 50 : 270-271.1974. *Amblyseius paraaerialis* : Prasad, A catalogue of mites of India, p. 168-169.1975. *Amblyseius paraaerialis* : Gupta, *Internat. J. Acarol.*, 1(2) : 40.1978. *Amblyseius paraaerialis* : Gupta, *Indian J. Acar.*, 2(2) : 71-72.Fig. 98. *Amblyseius (Amblyseius) paraaerialis* Muma—Dorsal shield.

*Female* : Dorsal shield 350 long, 255 wide, smooth with 17 pairs of setae, mostly small except  $j_1$ ,  $j_3$ ,  $s_4$ ,  $Z_5$  and  $Z_4$  which are long.



Figs. 99-104. *Amblyseius (Amblyseius) paraacrialis* Muma  
 99. Ventral surface  
 100. Chelicera (female)  
 101, 102. Spermathecae  
 103. Genu, tibia and basitarsus of leg IV  
 104. Spermatophoral process

Measurements of setae :  $j_1$ -27,  $j_4$ - $j_6$ ,  $J_2$ - $J_5$ -7-8 each,  $j_3$ -50,  $z_2$ - $z_4$ -10 each,  $s_4$ -72,  $Z_1$ - $S_2$ - $S_5$ -7-9 each,  $Z_5$ -161,  $z_5$ -7,  $Z_4$ -89,  $r_3$ -16,  $R_1$ -9, the latter two lie on lateral integument. Sternal shield smooth, with 3 pairs of sternal setae, metasternal plate conspicuous with seta. Genital shield 90 wide with a pair of genital setae. Ventrianal shield pentagonal, 128 long, 101 wide, smooth with 3 pairs of preanal setae and a pair of large elliptical preanal pores little below the level of 3rd pair of preanal setae, 4 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -67 long; 2 pairs of large conspicuous metapodal plates present. Peritreme extends anteriorly upto  $j_1$ . Fixed digit of chelicera at least with 4-5 teeth anterior to strong *pilus dentilis*, 1-2 teeth posterior to it, movable digit with 3 teeth. Spermatheca with tubular looped cervix. Macrosetae on leg IV : genu-73, tibia-46, basitarsus-56, genu III-41, genu-II-35, genu I-35. Leg chaetotactic formula : genu II  $2\frac{2}{0}$   $\frac{2}{0}$  1, tibia II  $1\frac{1}{1}$   $\frac{2}{1}$  1, genu III  $1\frac{2}{0}$   $\frac{2}{1}$  1.

*Male* : Dorsal chaetotaxy similar to that of female. Spermatophoral process as illustrated.

*Habitat* : Citrus and on one undetermined plant.

*Type locality and repository* : Holotype ♀, India : Kerala, Palghat, on citrus, deposited in USNM. Paratypes 3 ♀ ♀, Assam, on citrus, also in USNM.

*Distribution* : India : Assam, Meghalaya, Kerala, Arunachal Pradesh ; outside India : Thailand.

#### 14. *Amblyseius (Amblyseius) shoreae* Gupta

( Figs. 105-103 )

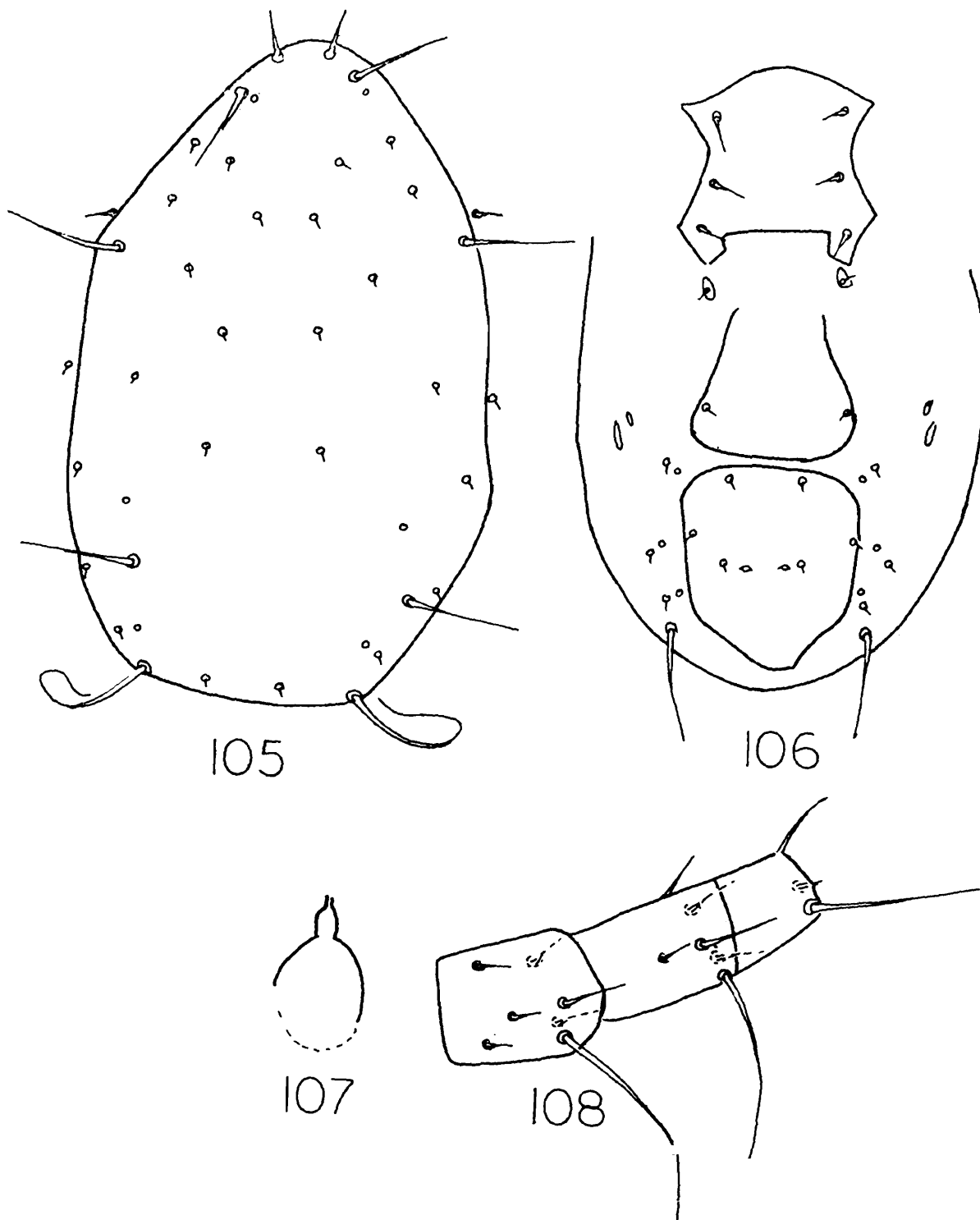
1977. *Amblyseius shoreae* Gupta, *Entomologists' mon. Mag.*, 112 : 57.

*Female* : Dorsal shield 335 long, 205 wide, lateral margins slightly sclerotized, with 17 pairs of setae. All setae minute except  $j_1$ ,  $j_3$ ,  $s_4$ ,  $Z_5$  and  $Z_4$  which are longer. Measurements of setae  $j_1$ -27,  $j_4$ - $j_6$ ,  $J_2$ - $J_5$ -minute,  $j_3$ -50,  $z_2$ ,  $z_4$ -5 each,  $s_4$ -60,  $Z_1$ -5,  $S_2$ - $S_5$ -5-7 each,  $Z_5$ -96,  $z_5$ -minute,  $Z_4$ -60,  $r_3$ -12,  $R_1$ -5, both on lateral integument. Sternal shield almost as long as broad with 3 pairs of sternal setae and post lateral angulation, metasternal plate conspicuous with seta. Ventrianal shield 100 long, 84 wide, with 3 pairs of preanal setae and a pair of round preanal pores little below the level of 3rd pair of preanal setae; 4 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -58 long, 2 pairs of metapodal plates present; primary one—22

long, accessory one smaller. Spermatheca as figured. Macrosetae on leg IV : genu-73, tibia-44, basitarsus-56 ; genu I-III each with a macroseta. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{2}{0} \frac{2}{1} 1$ , genu III  $1 \frac{1}{1} \frac{2}{1} 1$ . Peritreme extends anteriorly upto  $j_1$ .

*Male* : Unknown.

*Habitat* : *Shorea robusta*.



Figs. 105-108. *Amblyseius (Amblyseius) shoreae* Gupta

105. Dorsal shield

106. Ventral surface

107. Spermatheca

108. Genu, tibia and basitarsus of leg IV

*Type locality and repository* : Holotype ♀, India : West Bengal, Midnapur Dist., Jhargram, on *Shorea robusta*, deposited in ZSI, Calcutta, Reg. No. 3356/17.

*Distribution* : India : West Bengal.

*Remarks* : It is known only from its type. The measurement of genu IV macroseta was mentioned in the original description as 56 but on re-examination of the holotype it was found to be 73.

### Subgenus *Asperoseius* Chant

1957. *Asperoseius* Chant, *Can. Ent.*, 89 : 360.  
 1962. *Amblyseius (Asperoseius)* : Pritchard & Baker, *Hilgardia*, 33 : 295.  
 1977. *Amblyseius (Asperoseius)* : Ehara & Bhandhufalck, *J. Fac. ed. Tottori, Univ.*, 27(2) : 75.  
 1978. *Asperoseius* : Chant *et al.*, *Can. J. Zool.*, 56(6) : 1344.  
 1979. *Tropicoseius* Gupta, *Bull. Zool. Surv. India*, 2(1) : 80.  
 1981. *Amblyseius (Asperoseius)* : Gupta & Ray, *Bull. Zool. Surv. India*, 4(1) : 46.

*Diagnosis* : Dorsal shield moderately sclerotized, with 5 pairs of dorsocentral, 2 pairs of median, 7 pairs of lateral and 2 pairs of sublateral setae, the latter to are on lateral integument, J<sub>2</sub> absent. Setae j<sub>1</sub>, j<sub>3</sub>, s<sub>4</sub>, Z<sub>5</sub>, Z<sub>4</sub>, r<sub>3</sub> and R<sub>1</sub> being long, thick and serrate, sometimes z<sub>2</sub>, z<sub>4</sub> and S<sub>2</sub> also serrate. Sternal shield with 3 pairs of sternal setae, ventrianal shield with 3 pairs of preanal setae. Leg IV macrosetae on genu, tibia and basitarsus, mostly spatulate or knobbed.

Type : *Asperoseius africanus* Chant, 1957a.

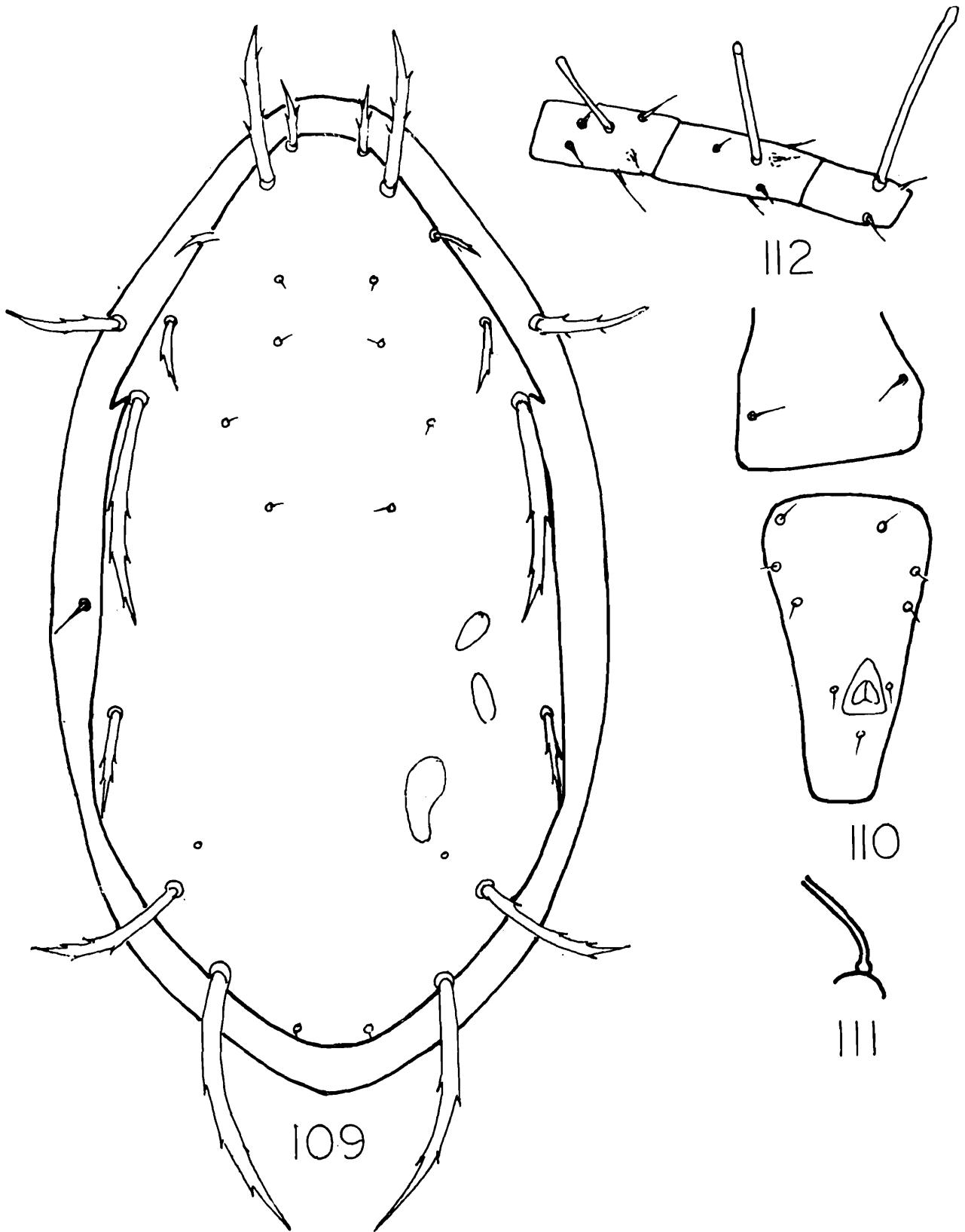
### Key to the species of *Asperoseius*

- |  |     |                       |
|--|-----|-----------------------|
| 1. Seta S <sub>5</sub> present   | ... | <i>hyauliangensis</i> |
| — Seta S <sub>5</sub> absent   | ... | 2                     |
| 2. Macrosetae on genu IV and tibia IV equal, all macrosetae subcapitate ; ventrianal shield much longer than wide          | ... | <i>heveae</i>         |
| — Macrosetae on genu IV longer than that on tibia IV, macrosetae knobbed, ventrianal shield only slightly longer than wide | ... | <i>nucifera</i>       |

### 15. *Amblyseius (Asperoseius) heveae* (Oudemans) (Figs. 109-112)

1930. *Typhlodromus heveae* Oudemans, *Ent. Ber.*, 8 : 97.  
 1951. *Kampimodromus heveae* : Nesbitt, *Zool. Verh.*, 12 : 54.  
 1959. *Typhlodromus (Amblyseius) heveae* : Chant, *Can. Ent.*, 91 : 101.  
 1962. *Amblyseius (Asperoseius) heveae* : Pritchard & Baker, *Hilgardia*, 33 : 295.  
 1977. *Amblyseius (Asperoseius) heveae*, Ehara & Bhandhufalck, *J. Fac. ed. Tottori, Univ.*, 27(2) : 76-78.

*Diagnosis*: Dorsal shield rugose, notched at the level of  $s_4$ , 314 long, 173 wide. Setae  $j_1, j_3, z_2, z_4, s_4, S_2, Z_5, Z_4, r_3$  being long, thick and serrate, other setae small. Measurements of setae:  $j_1-31$ ,



Figs. 109-112. *Amblyseius (Asperoseius) heveae* (Oudemans)  
 109. Dorsal shield  
 110. Posterior ventral surface  
 111. Spermatheca  
 112. Genu, tibia and basitarsus of leg IV

$j_4$ - $j_5$ -6 each,  $j_6$ -12,  $J_5$ -6,  $j_3$ -63,  $z_2$ -18,  $z_4$ -34,  $s_4$ -90,  $Z_1$ -9,  $S_2$ -40,  $Z_5$ -71,  $z_5$ -6,  $Z_4$ -60,  $r_3$ -47,  $R_1$ -23. Sternal shield longer than wide, with 3 pairs of sternal setae, 4th pair of sternal setae on triangular metasternal plates. Genital shield normal with a pair of genital setae. Ventrianal shield elongate, posteriorly narrowed, with 3 pairs of preanal setae, 4 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -45 long. Metapodal plates indistinct. Spermatheca as figured. Macrosetae on leg IV : genu-44, tibia-43, basitarsus-80, distitarsus-42.

*Male* : Unknown.

*Habitat* : Collected on an undetermined plant.

*Type locality and repository* : Holotype ♀, Indonesia, Sumatra, Medan, on *Hevea* sp., deposited in Rijksmuseum van Natuurlijke Historie, Leiden.

*Distribution* : India : Arunachal Pradesh ; outside India : Sumatra, Thailand.

*Remarks* : It is the first report of this species from India. The specimens examined in the present study perfectly tallied with the re-description of Ehara & Bhandhufalck (1977).

## 16. *Amblyseius (Asperoseius) hyauliangensis* Gupta (Figs. 113-117)

*Amblyseius (Asperoseius) hyauliangensis* Gupta, *Oriental Ins.* (In press)

*Female* : Dorsal shield 336 long, 150 wide, smooth with 15 pairs of setae and 6 pairs of fairly large pores. Setae  $j_4$ ,  $j_5$ ,  $j_6$ ,  $J_2$ ,  $Z_1$ , small, minute and smooth, other setae being long, thick and serrate.  $z_4 > z_2$ ,  $Z_4 > S_2$ ,  $s_4 > Z_5 > Z_4 > j_3$ . Measurements of setae :  $j_1$ -36,  $j_4$ ,  $j_5$ -minute,  $j_6$ -16,  $J_5$ -minute,  $j_3$ -84-88,  $z_2$ -24,  $z_4$ -40,  $s_4$ -133,  $Z_1$ -13,  $S_2$ -80,  $S_5$ -30,  $Z_5$ -105,  $z_5$ -minute,  $Z_4$ -100,  $r_3$ -56,  $R_1$ -33. Sternal shield 89 long, 78 wide, with 3 pairs of sternal setae, 4th pair of setae on metasternal plates. Genital shield 78 wide with a pair of setae, a fold present between genital and ventrianal shields. Ventrianal shield 100 long, 56 wide, lateral margins more or less straight with 3 pairs of preanal setae in addition to para and postanals : 4 pairs of setae present around ventrianal shield,  $JV_5$ -62 long. Fixed digit of chelicera with 3 teeth placed anteriorly, 1-2 teeth placed posteriorly ; movable digit with 2 teeth. Spermatheca as illustrated. Macrosetae on leg IV : genu-26, tibia-49, basitarsus-89, all being knobbed ; genu

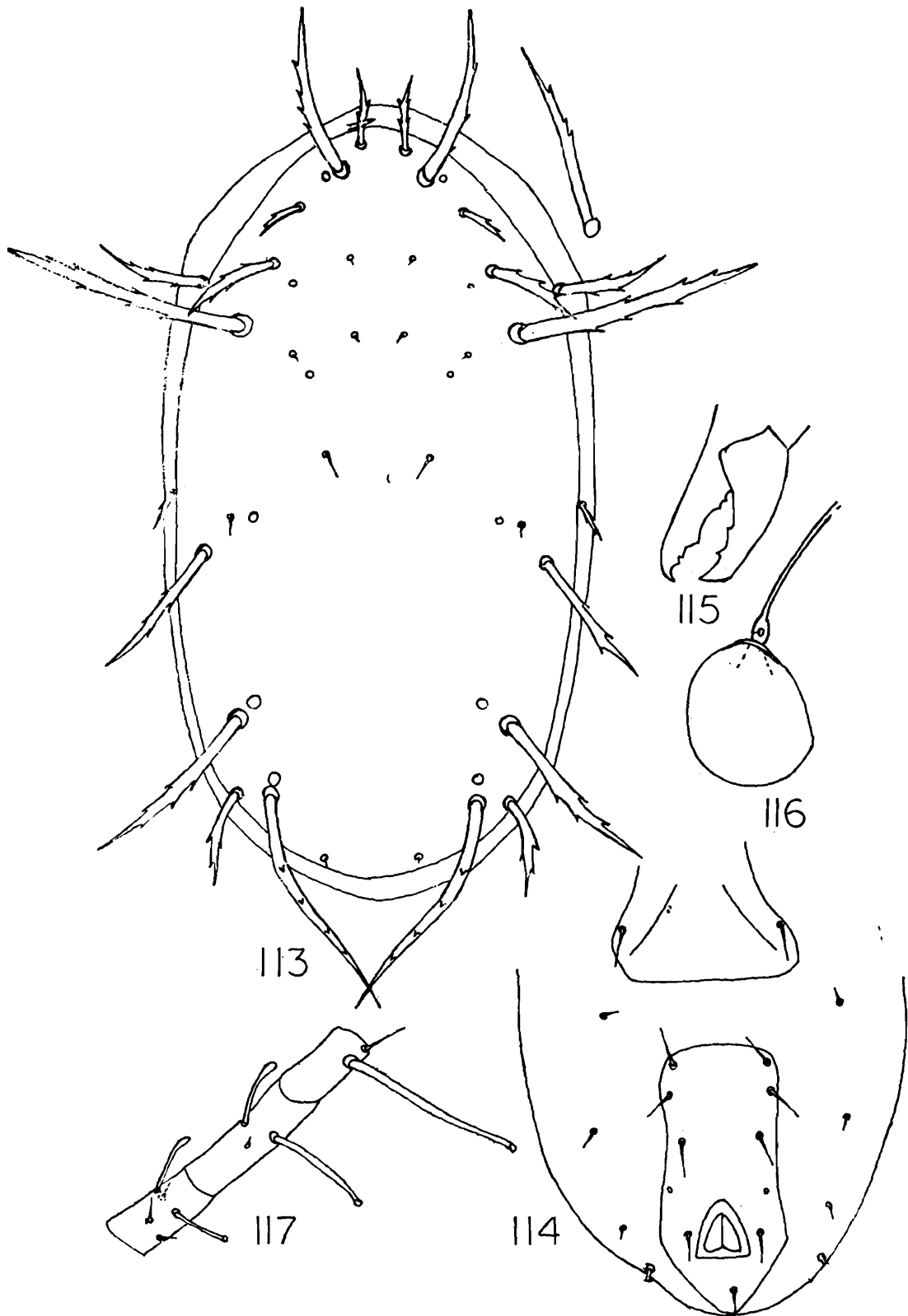


Fig. 113-117. *Amblyseius (Asperoseius) hyauliangensis* Gupta

113. Dorsal shield

114. Posterior ventral surface

115. Chelicera (female)

116. Spermatheca

117. Genu, tibia and basitarsus of leg IV

I and II also with knobbed macrosetae. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Peritreme extends anteriorly beyond the base of  $j_1$ .

*Male* : Unknown.

*Type locality and repository* : Holotype ♀, India : Arunachal Pradesh, Hyauliang, on an undetermined plant, 26.i.1983, Coll. S. K. Gupta, deposited in ZSI, Calcutta, Reg. No. 3516/17. Paratype 1 ♀, same data as for holotype, Reg. No. 3517/17

*Remarks* : This species is very interesting and so far in the knowledge of the author, no species akin to it is known. The nearest species with which it bears some similarities is *A. (Asperoseius) heveae* (Oudemans, 1930) but differs distinctly from it in having seta  $S_5$  which is fairly long and serrate and the same is lacking in *heveae*.

### 17. *Amblyseius (Asperoseius) nucifera* (Gupta)

(Figs. 118-121)

1979. *Paraphytoseius (Tropicoseius) nucifera* Gupta, *Bull. Zool. Surv. India*, 2(1) : 80-81.

*Female* : Body elongated oval. Peritreme extends anteriorly upto  $j_1$  and posteriorly narrowed and curves around coxae IV. Dorsal shield 305 long, 165 wide, deeply notched at the level of  $s_4$ . Setae  $j_1, j_3, z_2, z_4, s_4, S_2, Z_5, Z_4, r_3$  all being long, thick and serrate, others very small. Measurements of setae :  $j_1$ -28,  $j_4$ - $j_6$ -4 each,  $J_5$ -4,  $j_3$ -68,  $z_2$ -16,  $z_4$ -32,  $s_4$ -80,  $Z_1$ -4,  $S_2$ -40,  $Z_5$ -76,  $z_5$ -4,  $Z_4$ -68,  $r_3$ -56,  $R_1$ -28. Sternal shield weakly sclerotized, as long (80) as wide, with 3 pairs of sternal setae, metasternal plates triangular with seta. Genital shield wider (80) than greatest width of ventrianal shield, with a pair of setae. Ventrianal shield smooth, 80 long, 60 wide, with 3 pairs of preanal setae ; 3 pairs of setae present around ventrianal shield,  $JV_5$ -28 long, 2 pairs of metapodal plates present. Fixed digit of chelicera multidentate, tooth on movable digit not discernible. Spermatheca with bell-shaped cervix as figured. Macrosetae on leg IV : genu-44, tibia-36, basitarsus-64, distritarsus-40, all with knobbed tip. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{2}{1} \frac{1}{1} 1$ .

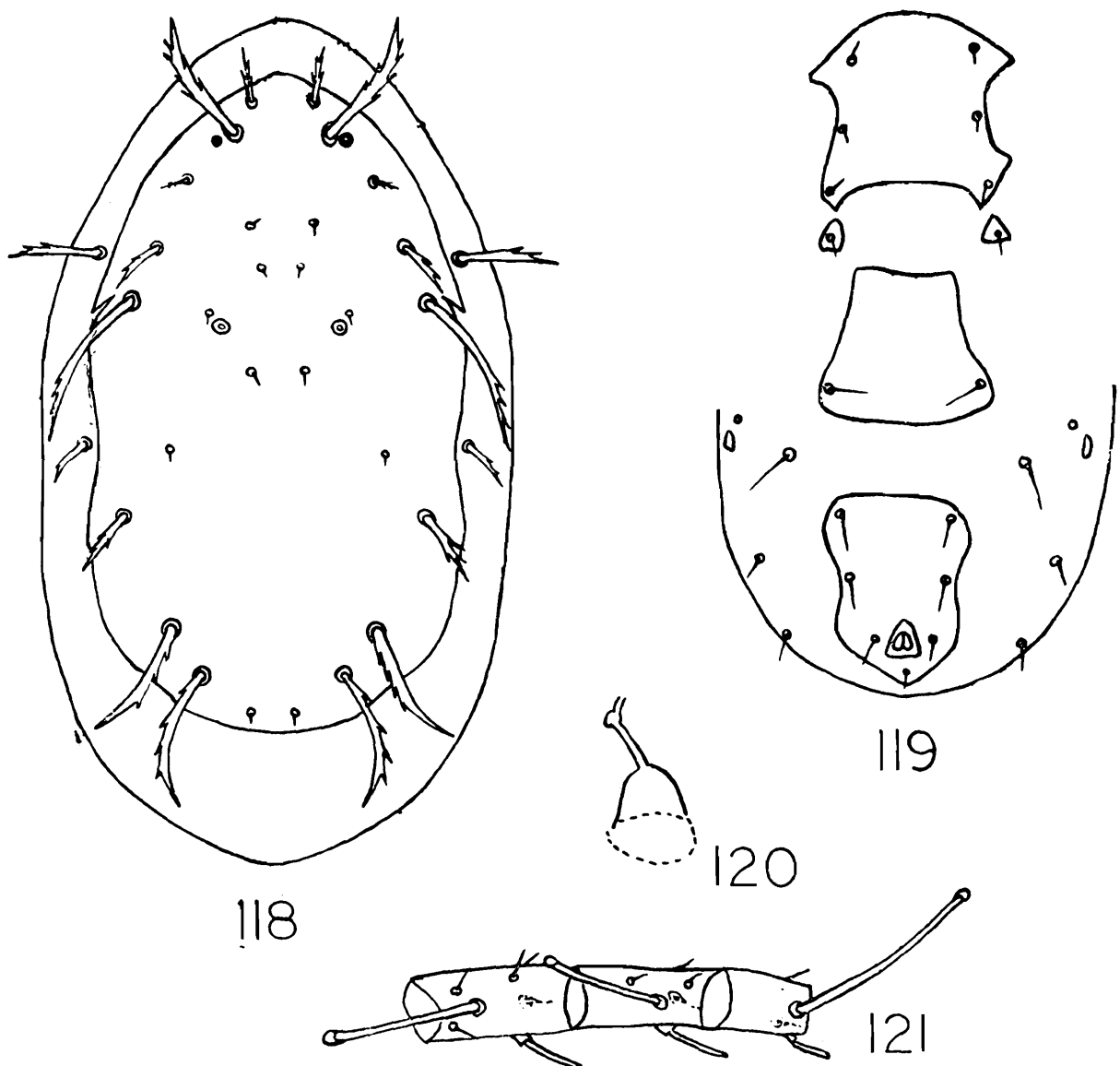
*Male* : Unknown.

*Habitat* : *Cocos nucifera*, Jute.

*Type locality and repository* : Holotype ♀, India : Kerala, Trivendrum, Neyer dam area, on *Cocos nucifera*, deposited in ZSI, Calcutta, Reg. No. 3057/17.

*Distribution* : India : Kerala, West Bengal.

*Remarks* : After the description of the species from Kerala, another female was collected from West Bengal on jute,



Figs. 118-121. *Amblyseius (Asperoseius) nucifera* (Gupta)

118. Dorsal shield

119. Ventral surface

120. Spermatheca

121. Genu, tibia and basitarsus of leg IV

*Subgenus Euseius* Wainstein

1962. *Amblyseius* (*Amblyseius*) Section *Euseius* Wainstein, *Acarologia*, 4 : 15.  
 1966. *Euseius* : De Leon : *In Studies on the fauna of Suriname and other Guyanas*, p. 86.  
 1967. *Euseius* : De Leon : Allen Press Inc. Kansas, U. S. A. : p. 18.  
 1970. *Euseius* : Muma & Denmark, *Arthropods of Florida*, 6 : 92.  
 1972. *Euseius* : Denmark & Muma, *Fla. Ent.*, 55(1) : 20.  
 1973. *Euseius* : Denmark & Muma, *Rev. Brazil. Biol.*, 33(2) : 260.  
 1975. *Euseius* : Denmark & Muma, *J. Agr. Univ. Puerto Rico.*, 59 : 203.  
 1978. *Euseius* : Denmark & Muma, *Internat. J. Acarol.*, 4(1) : 11.  
 1981. *Euseius* : Matthyse & Denmark, *Fla. Ent.*, 64(2) : 348.  
 1981. *Euseius* : Denmark & Andrews, *Fla. Ent.*, 64(1) : 151.  
 1982. *Euseius* : Moraes *et al.*, *Internat. J. Acarol.*, 8(1) : 18.

*Diagnosis* : Dorsal shield with 6 pairs of dorsocentral setae, 9 pairs of laterals and 2 pairs of median setae ;  $Z_5$  longest. Chelicera small, fixed digit with 0-2 teeth distal to the medially located *pilus dentilis*. Sternal shield longer than wide, may be indistinctly lobate posteriorly. Peritreme extends anteriorly upto  $j_1$ . Ventrianal shield elongate, frequently vase-shaped, preanal setae more or less arranged in two transverse curved rows. Macrosetae may sometimes occur on genu of legs II and III ; genu, tibia and basitarsus of leg IV always with macrosetae, with the latter usually longest.

Type : *Seiulus finlandicus* Oudemans, 1915  
 (by designation, Wainstein, 1962)

*Key to the species of subgenus Euseius*

- |   |     |                        |
|---|-----|------------------------|
| 1. All setae on dorsal shield minute except $j_1$ and $Z_5$ | ... | 2                      |
| — Besides $Z_5$ and $j_1$ , some other setae also long      | ... | 5                      |
| 2. $S_2$ — $S_5$ equal                                      | ... | 3                      |
| — $S_2$ — $S_5$ unequal                                     | ... | 4                      |
| 3. Macrosetae on leg IV knobbed                             | ... | <i>macrospatulatus</i> |
| — Macrosetae on leg IV simple                               | ... | <i>ovalis</i>          |
| 4. $S_4$ longer than $S_2$ and $S_5$ which two are equal    | ... | <i>rhododendronis</i>  |
| — $S_4$ and $S_5$ equal and longer than $S_2$               | ... | <i>sacchari</i>        |
| 5. $j_1$ and $j_3$ either equal or $j_3$ longer than $j_1$  | ... | 6                      |
| — $j_1$ longer than $j_3$                                   | ... | 10                     |
| 6. $j_3$ longer than $j_1$                                  | ... | 7                      |
| — $j_3$ as long as $j_1$                                    | ... | 8                      |

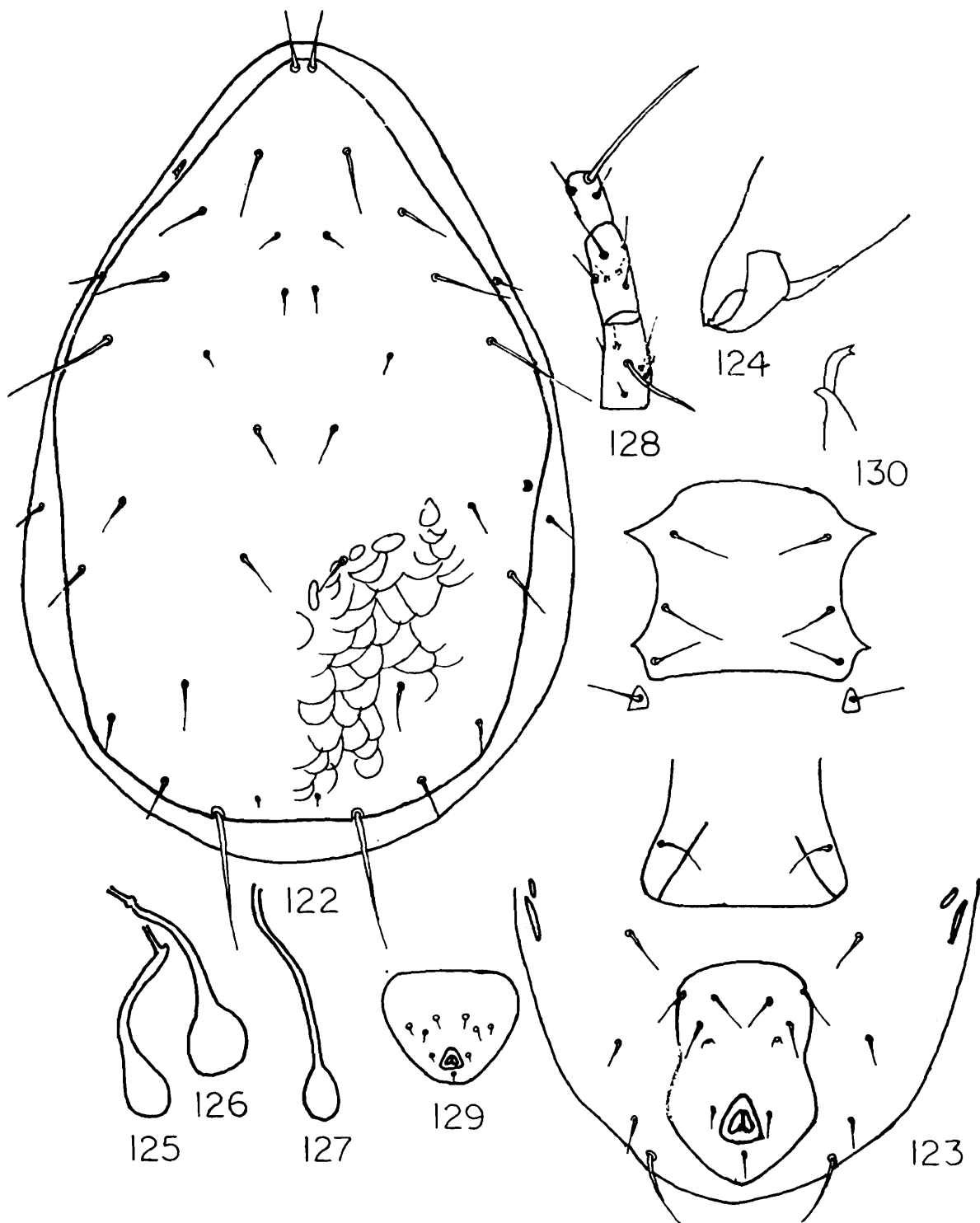
7. $S_2$ noticeably longer than $Z_1$	...	<i>alstoniae</i>
— $S_2$ and $Z_1$ almost equal	...	<i>delhiensis</i>
8. Macrosetae on leg IV acuminate	...	<i>eucalypti</i>
— Macrosetae on leg IV capitate	...	9
9. Spermatheca as in fig 142	...	<i>coccineae</i>
— Spermatheca as in fig 148	...	<i>coccosocius</i>
10. $j_3$ and $z_2$ almost equal	...	<i>neococcineae</i>
— $j_3$ noticeably longer than $z_2$	...	11
11. $S_5$ longer than $S_4$	...	12
— $S_5$ as long as or shorter than $S_4$	...	<i>bambusae</i>
12. Spermatheca and spermatophoral process as in figs 192 and 195	...	<i>pruni</i>
— Spermatheca and spermatophoral process as in figs. 167, 168 and 170	...	<i>finlandicus</i>

### 18. *Amblyseius* (*Euseius*) *alstoniae* Gupta

(Figs. 122-130)

1975. *Amblyseius alstoniae* Gupta, *Internat. J. Acarol.*, 1(2) : 31-32.  
 1977. *Amblyseius alstoniae* : Gupta, *Indian J. Acar.*, 1 : 29.  
 1978. *Euseius alstoniae* : Gupta, *Oriental Ins.*, 12(3) : 327.  
 1978. *Amblyseius alstoniae* : Gupta, *Indian J. Acar.*, 2(2) : 61.  
 1980. *Amblyseius alstoniae* : Dhooria, *Acar. Newsl.*, 10 : 5.  
 1981. *Amblyseius alstoniae*, Gupta & Nahar : *In Contrib to. Acar. in India*, p. 9.  
 1982. *Amblyseius alstoniae* : Gupta, *Indian J. Acar.*, 5(1-2) : 47.  
 1982. *Amblyseius alstoniae* : Gupta, *Rec. zool. Surv. India*, 79(3-4) : 369-370.

*Female* : Dorsal shield smooth anteriorly, rugose posteriorly with 17 pairs of setae and 4 pairs of pores.  $j_1 = j_6$ ,  $j_4 = j_5$ ,  $j_3 \geq j_1$ ,  $S_2 > Z_1$ ,  $S_5 > S_4$ ,  $j_3 > Z_4$ ,  $r_3 > R_1$ . Measurements of setae :  $j_1$ -25-28,  $j_4$ ,  $j_5$ -8-13,  $j_6$ -26-31,  $J_2$ -26-31,  $J_5$ -5-6,  $j_3$ -28-33,  $z_2$ -26-28,  $z_4$ -31-38,  $s_4$ -48-56,  $Z_1$ -20-22,  $S_2$ -26-31,  $S_4$ -18-22,  $S_5$ -28-34,  $Z_5$ -56-63, (weakly serrate),  $z_5$ -18-19,  $Z_4$ -27-29,  $r_3$ -15-18,  $R_1$ -15-18, sublateral setae on lateral integument. Sternal shield almost as long as wide with 3 pairs of sternal setae, 4th pair of setae present on triangular metasternal plates. Genital shield almost as wide as the greatest width of the ventrianal shield. Ventrianal shield longer (90) than broad (78) with 3 pairs of preanal pores little below the level of 3rd pair of preanal setae ; 4 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -44 long, 2 pairs of metapodal plates present. Spermatheca as figured. Chelicera with 2-3 minute denticles on the fixed digit, movable digit with no tooth. Macrosetae on leg IV : genu 48-52, tibia-32-36, basitarsus



**Figs. 122-130.** *Amblyseius (Euseius) alstoniae* Gupta  
 122. Dorsal shield  
 123. Ventral surface  
 124. Chelicera (female)  
 125-127. Spermathecae  
 128. Genu, tibia and basitarsus of leg IV  
 129. Ventrianal shield (male)  
 130. Spermatophoral process

67-76. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Peritreme extends anteriorly upto  $z_2$ .

*Male* : Dorsal chaetotaxy similar to that of female. Spermatophoral process and ventrianal shield as illustrated. Macrosetae on leg IV : genu-18-21, tibia-18-34, basitarsus-22-50.

*Habitat* : *Alstonia scholaris*, *Zinia* sp., sapota, chilli, cotton, *Acacia*, date palm, *Nerium indicum*, cucurbits, pomegranate, *Tabernaemontana coronaria*, palm, maize, pear, sugarcane, *Dalbergia sissoo*, *Butea monosperma*, grass, rose, *Nyctanthes arbortristis*, guava, *Ficus*, citrus, ornamental plant, vines, beans, mulberry, sunflower.

*Type locality and repository* : Holotype ♀, India : West Bengal, Howrah, Shibpur Botanical garden on *Alstonia scholaris*, deposited in ZSI, Calcutta, Reg. No. 3359/17. Paratypes 1 ♀, same data as for holotype, Reg. No. 3360/17 ; 2 ♀ ♀, Hooghly on undet. plant, Reg. No. 3361-62/17.

*Distribution* : India : West Bengal, Orissa, Bihar, Tamil Nadu, Rajasthan, Gujarat, Punjab, Uttar Pradesh, Madhya Pradesh, Jammu & Kashmir.

*Remarks* : This species is fairly wide spread in India. This mite was often found in the field associated with tetranychid species and devouring upon them.

### 19. *Amblyseius* (*Euseius*) *bambusae* Ghai & Menon

( Figs. 131-138 )

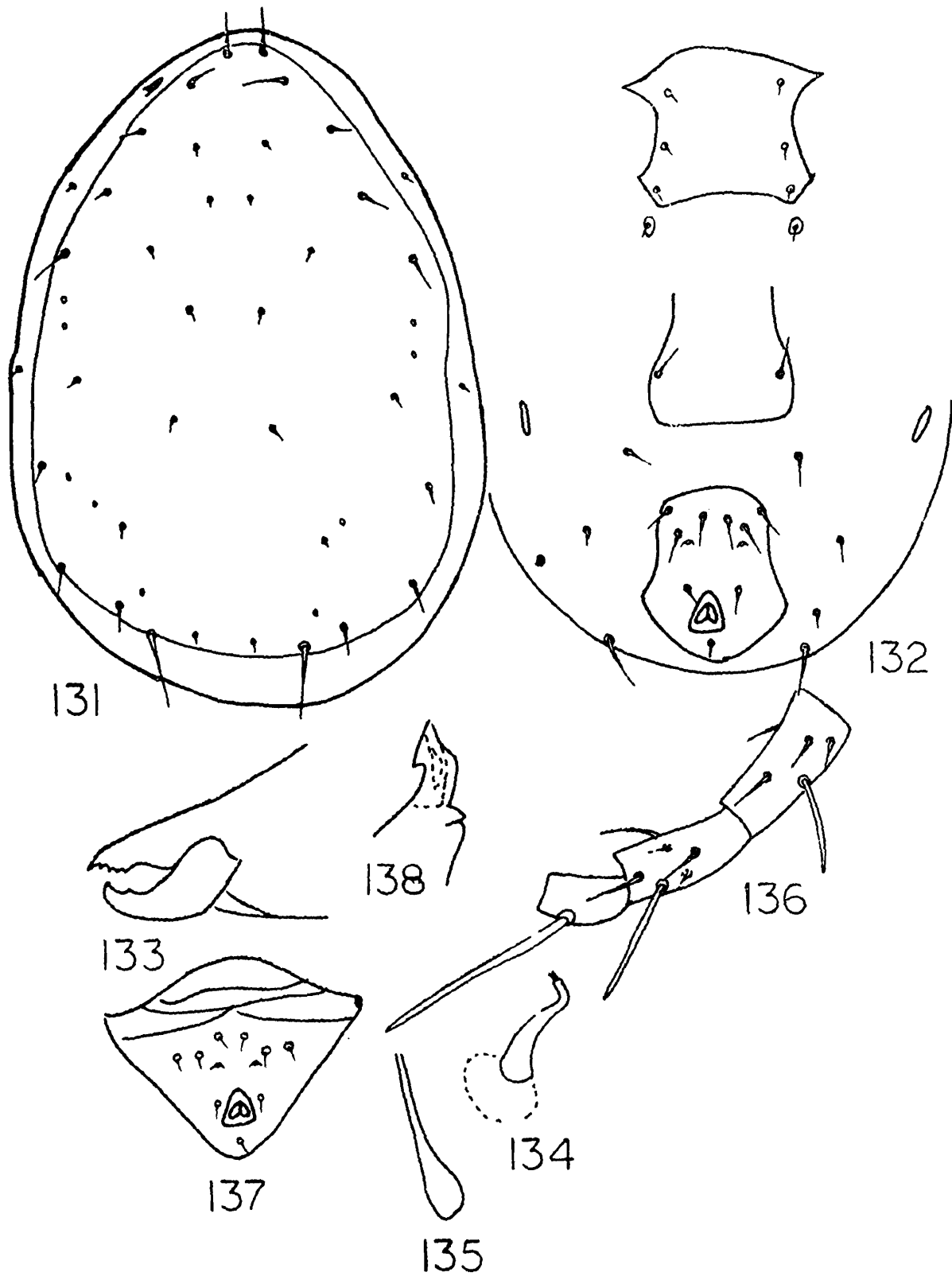
1967. *Amblyseius bambusae* Ghai & Menon, *Oriental Ins.*, 1 : 66-67.

1974. *Amblyseius bambusae* : Prasad, A catalogue of mites of India, p. 161.

1975. *Amblyseius bambusae* : Gupta, *Internat. J. Acarol.*, 1(2) : 33.

1978. *Amblyseius bambusae* : Gupta, *Oriental Ins.*, 12(3) : 327-328.

*Female* : Dorsal shield gently reticulate, 360 long, 260 wide, smooth with 17 pairs of setae and 5 pairs of pores.  $Z_5$  being the longest.  $j_1 > j_3$ ,  $z_2 = z_4$ ,  $S_4 > S_2 = S_5$ . Measurements of setae :  $j_1$ -32,  $j_4$ ,  $j_5$ -5 each,  $j_6$ ,  $J_2$ -11 each,  $J_5$ -4,  $j_3$ -24,  $z_2$ -20,  $z_4$ -20,  $s_4$ -28,  $Z_1$ -12,  $S_2$ -16,  $S_4$ -20,  $S_5$ -17,  $Z_5$ -50,  $z_5$ -4,  $Z_4$ -12,  $r_3$ -9,  $R_1$ -12. Sternal shield slightly longer (86) than wide with 3 pairs of sternal setae, metasternal plate round with seta. Genital shield almost as wide as the greatest width of ventrianal shield with a pair of setae. Ventrianal shield 100 long, 76 wide, lateral margins concave, with 3 pairs of preanal setae and a pair



Figs. 131-138. *Amblyseius (Euseius) bambusae* Ghai and Menon

- 131. Dorsal shield
- 132. Ventral surface
- 133. Chelicera (female)
- 134-135. Spermathecae
- 136. Genu, tibia and basitarsus of leg IV
- 137. Ventrianal shield (male)
- 138. Spermatophoral process

of preanal pores below the level of 3rd pair of preanal setae ; a pair of metapodal plates present ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -38 long. Fixed digit of chelicera with 3-4 apical teeth, movable digit with one tooth. Spermatheca as illustrated. Macrosetae on leg IV : genu-52-56, tibia-44-45, basitarsus—68-72. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{1}{1} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Peritreme terminates anteriorly between  $z_2$  and  $j_3$ .

*Male* : Dorsal chaetotaxy similar to that of female. Spermatophoral process and ventrianal shield as illustrated.

*Habitat* : Bamboo, *Pyrus communis*, *Butea monosperma*, *Dalbergia* sp., *Ficus religiosa*, *Coffea arabica*.

*Type locality and repository* : Holotype ♀, India : Karnataka, Bangalore, on *Bambusa* sp., along with eriophyid mites, deposited in NPC, I.A.R.I., New Delhi. Paratypes 1 ♂ and 5 others (sex not mentioned), same data as for holotype.

*Distribution* : India : Karnataka, Tamil Nadu, Kerala, Andhra Pradesh.

*Remarks* : This mite appears to be common in South India. So far, no report of it is available from any region besides South India.

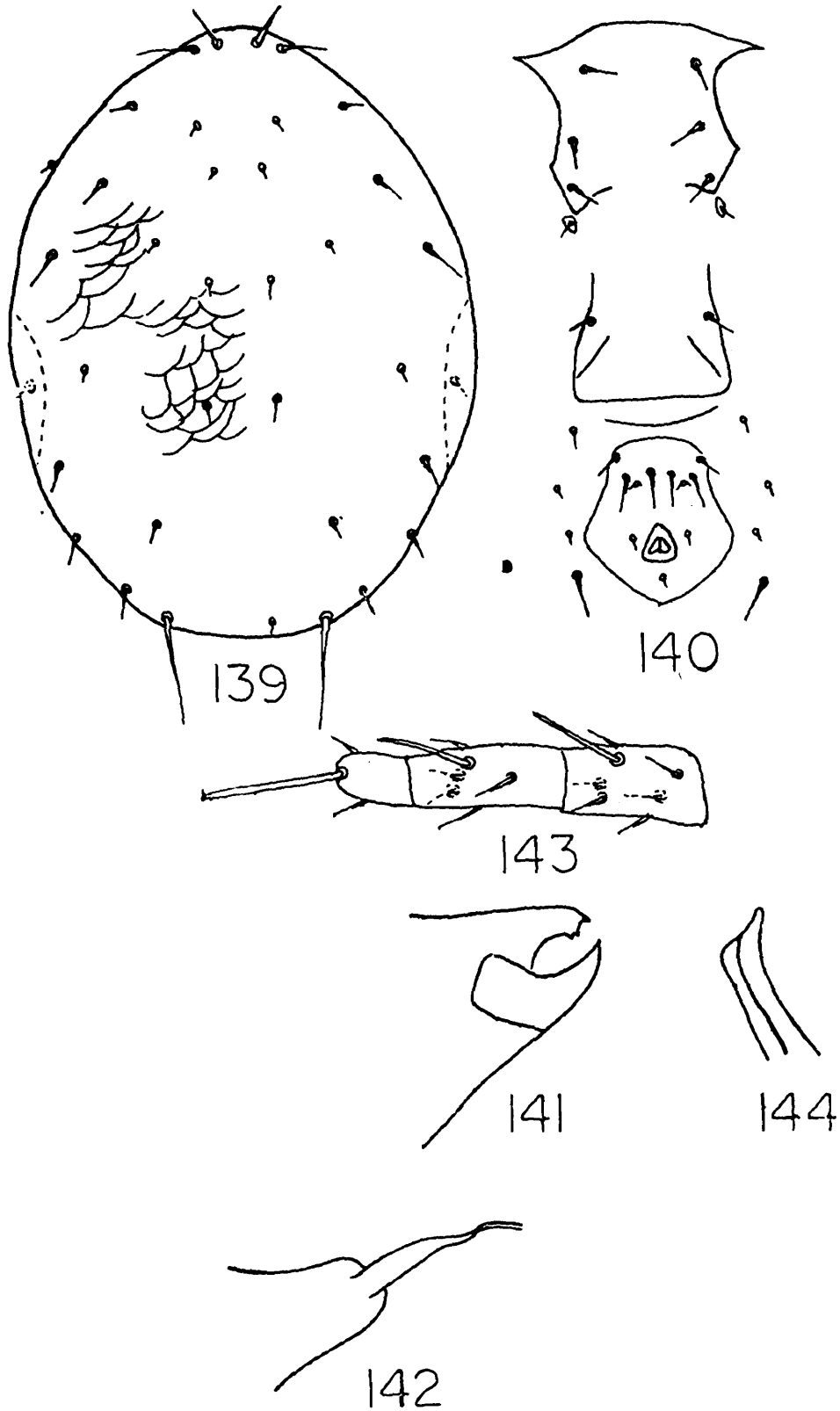
The holotype material was examined at I.A.R.I. but most of the characters were not discernible because of shrinkage of specimen. The measurements given here are based on additional material collected by the present author which agreed with the original description.

## 20. *Amblyseius (Euseius) coccineae* Gupta

(Figs. 139-144)

1975. *Amblyseius coccineae*, Gupta, *Internat. J. Acarol.*, 1(2) : 33.  
 1977. *Amblyseius coccineae* : Gupta, *Indian J. Acar.*, 1 : 30.  
 1978. *Euseius coccineae* : Gupta, *Oriental Ins.*, 12 : 329.  
 1978. *Amblyseius coccineae* : Gupta, *Indian J. Acar.*, 2(2) : 61.  
 1981. *Amblyseius coccineae*, Gupta, *Indian J. Acar.*, 5(1-2) : 46.  
 1981. *Amblyseius coccineae* : Ray & Gupta, *Bull. Zool. Surv. India*, 4(3) : 279.  
 1982. *Amblyseius coccineae* : Gupta, *Rec. zool. Surv. India*, 79(3-4) : 370.  
 1982. *Amblyseius coccineae* : Gupta, *Indian J. Acar.*, 6 : 26.

*Female* : Dorsal shield 303 long, 210 wide, reticulate with 17 pairs of setae. Measurements of setae :  $j_1$ -25-27,  $j_4$ - $j_6$ -10-12 each,  $J_2$ -15,



Figs. 139-144. *Amblyseius (Euseius) coccineae* Gupta  
 139. Dorsal shield  
 140. Ventral surface  
 141. Chelicera (female)  
 142. Spermatheca  
 143. Genu, tibia and basitarsus of leg IV  
 144. Spermatophoral process

$J_5$ -6,  $j_3$ -27-30,  $z_2$ -19-20,  $z_4$ -20-21,  $s_4$ -31-36,  $Z_1$ -11-14,  $S_2$ -21-23,  $S_4$ -19-24,  $S_5$ -22-28,  $Z_5$ -58-60,  $z_5$ -9-10,  $Z_4$ -13-15,  $r_3$ ,  $R_1$ -12-13 each, both on lateral integument. Peritreme extends anteriorly upto base of  $z_4$ . Sternal shield 76 long, 81 wide, posterior margin not clear, with 3 pairs of sternal setae, 4th pair lie on metasternal plates. Genital shield 84 wide, with a pair of genital setae. Ventrianal shield 85 long, 76 wide, lateral margins deeply concave with 3 pairs of preanal setae and a pair of semilunar preanal pores; 4 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -36 long; one pair of metapodal plates present. Chelicera with 2 teeth on the fixed digit and none on the movable digit. Spermatheca as figured. Macrosetae on leg IV: genu 37-47, tibia 32-37, basitarsus 48-56, all with thickened tip. Leg chaetotactic formula: genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{2}{1} \frac{1}{1} 1$ .

*Male*: Dorsal chaetotaxy similar as in female. Spermatophoral process as figured. Macrosetae on leg IV: genu-27, tibia-22, basitarsus—31.

*Habitat*: *Coccinea indica*, citrus, marigold, *Tabernaemontana coronaria*, cashewnut, mango, castor, jackfruit, bamboo, *Terminalia arjuna*, *Eugenia* sp., arum, *Ficus*, *Polianthes tuberosa*, *Shorea rubusta*, *Eucalyptus* sp., Fig, guava, *Bougainvillea* sp., pear, mulberry, papaya, *Schima wallachi*, sugarcane.

*Type locality and repository*: Holotype ♀, India: West Bengal, Darjeeling Dist., Sevak, on *Coccinea indica*, deposited in ZSI, Calcutta, Reg. No. 3363/17. Paratypes 2 ♀ ♀, same data as for holotype, Reg. No. 3364-65/17; 1 ♀, Kalimpong, on citrus, in ZSI, Calcutta, Reg. No. 3366/17.

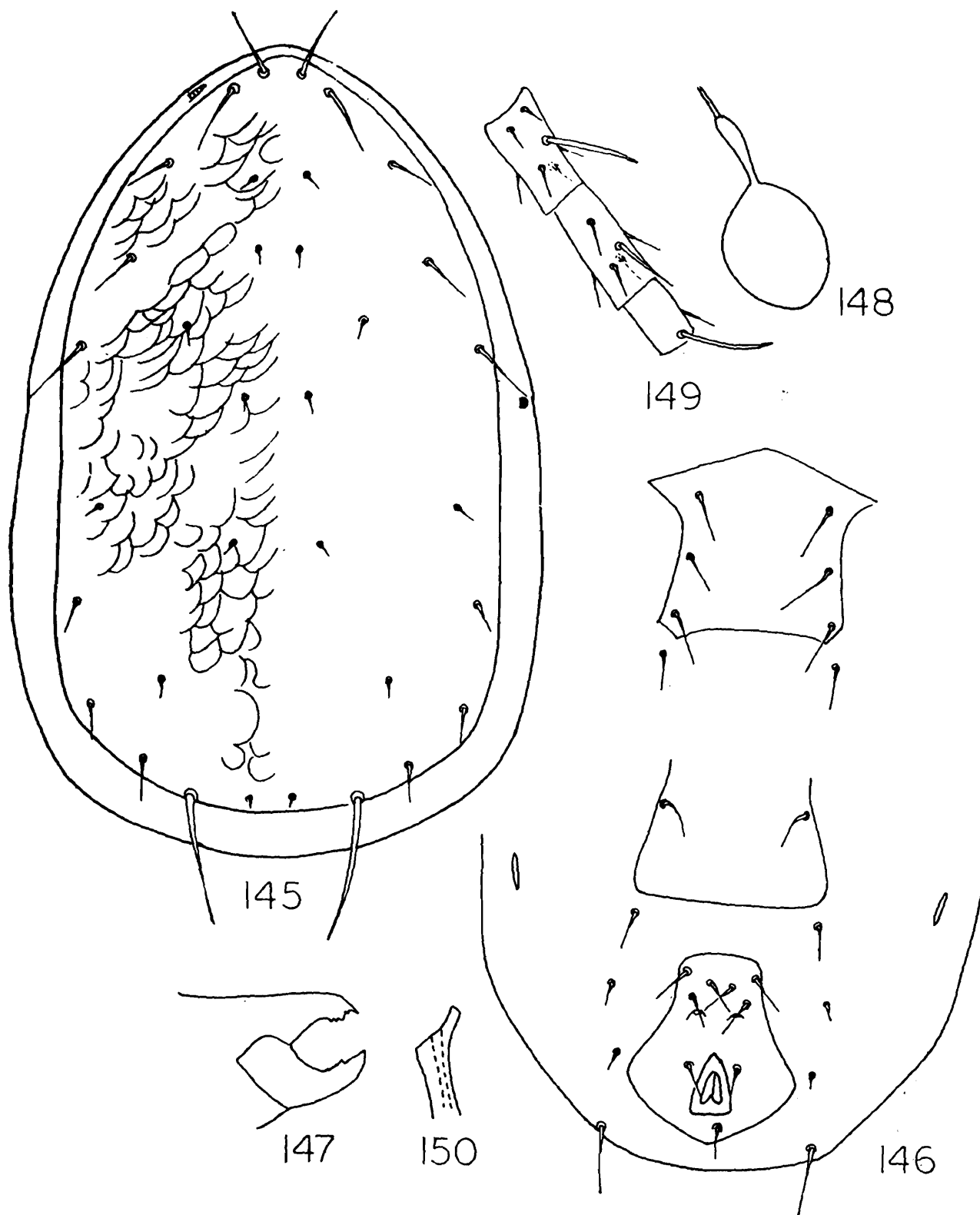
*Distribution*: India: West Bengal, Orissa. Meghalaya, Bihar, Tripura, Pondicherry, Tamil Nadu, Andhra Pradesh, Gujarat, Madhya Pradesh, Jammu & Kashmir, U. P.

*Remarks*: This has been seen to feed upon citrus mite *Eutetranychus orientalis* (Klein).

## 21. *Amblyseius* (*Euseius*) *coccosocius* Ghai & Menon (Figs. 145-150)

1967. *Amblyseius coccosocius* Ghai & Memon, *Oriental Ins.*, 1: 67-68.  
 1970. *Amblyseius coccosocius*: Gupta, *Sci. & Cult.*, 36: 98.  
 1974. *Amblyseius coccosocius*: Prasad, A catalogue of mites of India, p. 162.  
 1975. *Amblyseius coccosocius*: Gupta, *Internat. J. Acarol.*, 1(2): 33-34.  
 1977. *Amblyseius coccosocius*: Gupta, *Indian J. Acar.*, 1: 29-30.  
 1978. *Euseius coccosocius*: Gupta, *Oriental Ins.*, 12: 329.

*Female* : Dorsal shield reticulate, 320 long, 200 wide, with 17 pairs of setae.  $Z_5 > j_1 \geq j_3 = s_4$  ;  $S_5 > S_4 > S_2 > Z_1$  ;  $r_3 = R_1$ . Measurements of setae :  $j_1$ -32-35,  $j_4$ -9,  $j_5$ -11,  $j_6$ -13,  $J_2$ -13,  $J_5$ -7,  $j_3$ -32,  $z_2$ -18,  $z_4$ -25,  $s_4$ -31,  $Z_1$ -13,  $S_2$ -20,  $S_4$ -22,  $S_5$ -29,  $Z_5$ -56,  $r_3$ ,  $R_1$ -14 each, both on



Figs. 145-150. *Amblyseius (Euseius) coccosocius* Ghai and Menon

- 145. Dorsal shield
- 146. Ventral surface
- 147. Chelicera (female)
- 148. Spermatheca
- 149. Genu, tibia and basitarsus of leg IV
- 150. Spermatophoral process

lateral integument. Sternal shield almost as long as broad, posterior margin straight, with 3 pairs of sternal setae, 4th pair lie on interscutal membrane, metasternal plate apparently appear to be absent. Genital shield wider than the greatest width of ventrianal shield with a pair of genital setae. Ventrianal shield 80 long, 76 wide, smooth, with 3 pairs of preanal setae and a pair of semilunar preanal pores ; 4 pairs of setae present on membrane around ventrianal shield ; metapodal plates single paired. Chelicera with fixed digit having at least 3 apical teeth, movable digit with one small tooth. Spermatheca as figured. Macrosetae on leg IV : genu-44, tibia-30, basitarsus-48, all with broad tip. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Peritreme extends anteriorly upto  $z_2$ .

*Male* : Dorsal chaetotaxy similar as in female. Spermatophoral process as figured.

*Habitat* : Mango, papaya, guava, *Alstonia scholaris*.

*Type locality and repository* : Holotype ♀, India : Karnataka, Bangalore, on mango leaves with scale insects, deposited at NPC, IARI, New Delhi. Paratypes 8 ♀ ♀, same data as for holotype, also at IARI.

*Distribution* : India : Karnataka, Pondicherry, Tamil Nadu, Kerala, Andhra Pradesh, Punjab, West Bengal.

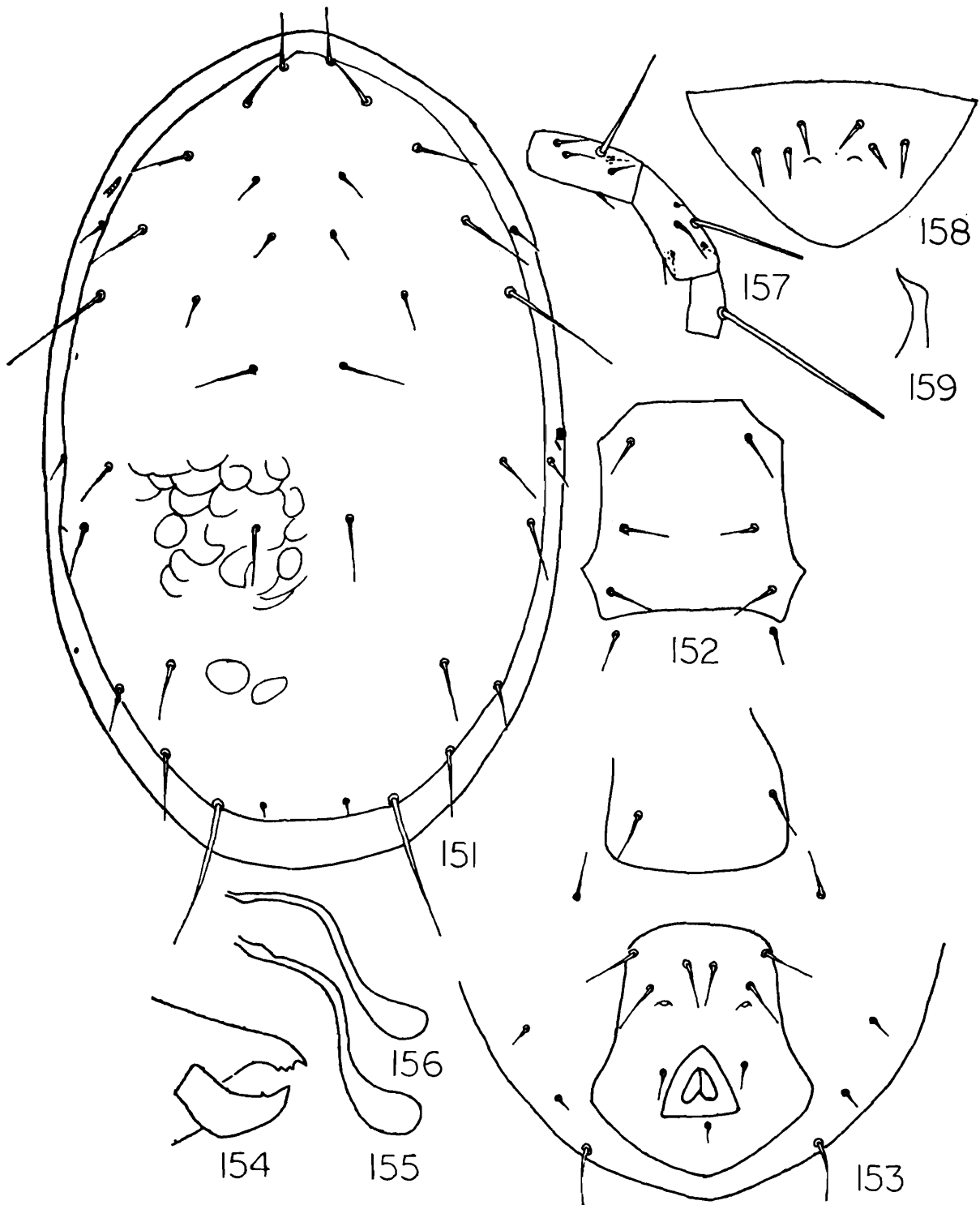
*Remarks* : The holotype material was examined at I.A.R.I. but because of shrinkage, the specimen was in bad condition and it was impossible to examine in detail. However, it was found that the macrosetae was uniformly rounded rather than abruptly rounded as figured.

## 22. *Amblyseius (Euseius) delhiensis* (Narayanan & Kaur)

(Figs. 151-159)

1960. *Tyohlodromus (Amblyseius) delhiensis* Narayanan & Kaur, *Proc. Indian Acad. Sci.*, **51** : 5-7.
1970. *Amblyseius delhiensis* : Gupta, *Sci. & Cult.*, **36** : 98.
1971. *Amblyseius delhiensis* : Gupta *et al.*, *Sci. & Cult.*, **37** : 298.
1971. *Amblyseius delhiensis* : Gupta *et al.*, *Sci. & Cult.*, **37** : 484.
1972. *Amblyseius delhiensis* : Gupta & Dhooria, *Curr. Sci.*, **41** : 824-825.
1973. *Amblyseius delhiensis* : Sandhu *et al.*, *Sci. & Cult.*, **39** : 226-227.
1974. *Amblyseius delhiensis* : Prasad, A catalogue of mites of India, p. 162-163.
1975. *Amblyseius delhiensis* : Gupta, *Internat. J. Acarol.*, **1**(2) : 36.
1977. *Amblyseius delhiensis* : Gupta, *Indian J. Acar.*, **1** : 30.
1978. *Amblyseius delhiensis* : Gupta, *Indian J. Acar.*, **2**(2) : 62.
1979. *Amblyseius delhiensis* : Somchoudhury, First All India Symp. Acar., pp. 50-51.
1981. *Amblyseius delhiensis* : Somchoudhury, *In. Contrib. to Acar. in India*, p. 179.
1982. *Amblyseius delhiensis* : Gupta, *Indian J. Acar.*, **6** : 27.

*Female* : Dorsal shield with 17 pairs of setae.  $j_1 = j_6 = J_2 > j_4 = j_5$  ;  $j_3 > j_1$ ,  $z_4 > z_2$ ,  $s_4 > j_3$ ,  $S_5 > S_2 > S_4$ . Measurements of setae :  $j_1$ -34-38,  $j_4$ -18-22,  $j_5$ -22,  $j_6$ -34,  $J_2$ -34,  $J_5$ -7,  $j_3$ -40-45,  $z_2$ -35-40,  $z_4$ -45-51,  $s_4$ -60-65,



Figs. 151-159. *Amblyseius (Euseius) delhiensis* (Narayanan and Kaur)

- 151. Dorsal shield
- 152. Sternal shield
- 153. Posterior ventral surface
- 154. Chelicera (female)
- 155., 156. Spermathecae
- 157. Genu, tibia and basitarsus of leg IV
- 158. Ventrianal shield (male)
- 159. Spermatophoral process

$Z_1$ -31,  $S_2$ -35,  $S_4$ -27-29,  $S_5$ -36-40,  $Z_5$ -67-72,  $z_5$ -18,  $Z_4$ -31-34,  $r_3$ -22,  $R_1$ -14. Sternal shield as long (67) as or longer than broad, with 3 pairs of sternal setae, 4th pair of setae lie on interscutal membrane. Genital shield 90 wide with a pair of setae. Ventrianal shield 100 long, 73 wide, with 3 pairs of preanal setae and a pair of crescent-shaped preanal pores, 4 pairs of setae present around ventrianal-shield,  $JV_5$ -34 long, one pair of metapodal plates present, 29 long. Fixed digit of chelicera with 3 apical teeth, movable digit with one tooth. Spermatheca as figured. Peritreme terminates anteriorly between  $z_2$  and  $z_4$ . Macrosetae on leg IV : genu 52-57, tibia 35-45, basitarsus 72-76. Leg chaetotactic formula : genu II 2  $\frac{2}{0}$   $\frac{2}{0}$  1, tibia II 1  $\frac{1}{1}$   $\frac{2}{1}$  1, genu III 1  $\frac{2}{1}$   $\frac{2}{0}$  1, tibia III 1  $\frac{1}{1}$   $\frac{2}{1}$  1.

*Male* : Dorsal chaetotaxy similar as in female. Spermatophoral process and ventrianal shield as figured.

*Habitat* : *Hibiscus esculentus*, *Gossypium* sp., *Hibiscus rosa-sinensis*, grapevines, guava, maize, *Syzygium javanicum*, citrus, maize, *Bougainvillea* sp., beans.

*Type locality and repository* : Holotype ♀, India : New Delhi on *Hibiscus esculentus* and *Gossypium* sp., infested with tetranychid mites, deposited at NPC, IARI., New Delhi. Paratypes 9 ♀♀, 5 ♂♂, same data as for holotype, also at NPC, IARI.

*Distribution* : India : Delhi, U. P., West Bengal.

*Remarks* : This species is often confused with the other related Indian species, *A. (E) alstoniae* Gupta, but can be distinguished by the relative length of  $Z_1$  and  $S_2$  and by shape of spermatheca. Its predatory importance has been focused by Gupta *et al.* (1971), Gupta & Dhooria (1972) and Somchoudhury (1979). The latter author during his investigations from 1973-1975 found this mite feeding upon the eggs of cotton jassid. He observed that population of this mite increased from September and reached maximum during November. Its activity was adversely affected by extremes of temperature (max. 36-45°C, min. 0.5-12°C). The optimal conditions for development were 20-30°C and 50-70% RH. He further observed that endosulfan was relatively non-toxic to this mite.

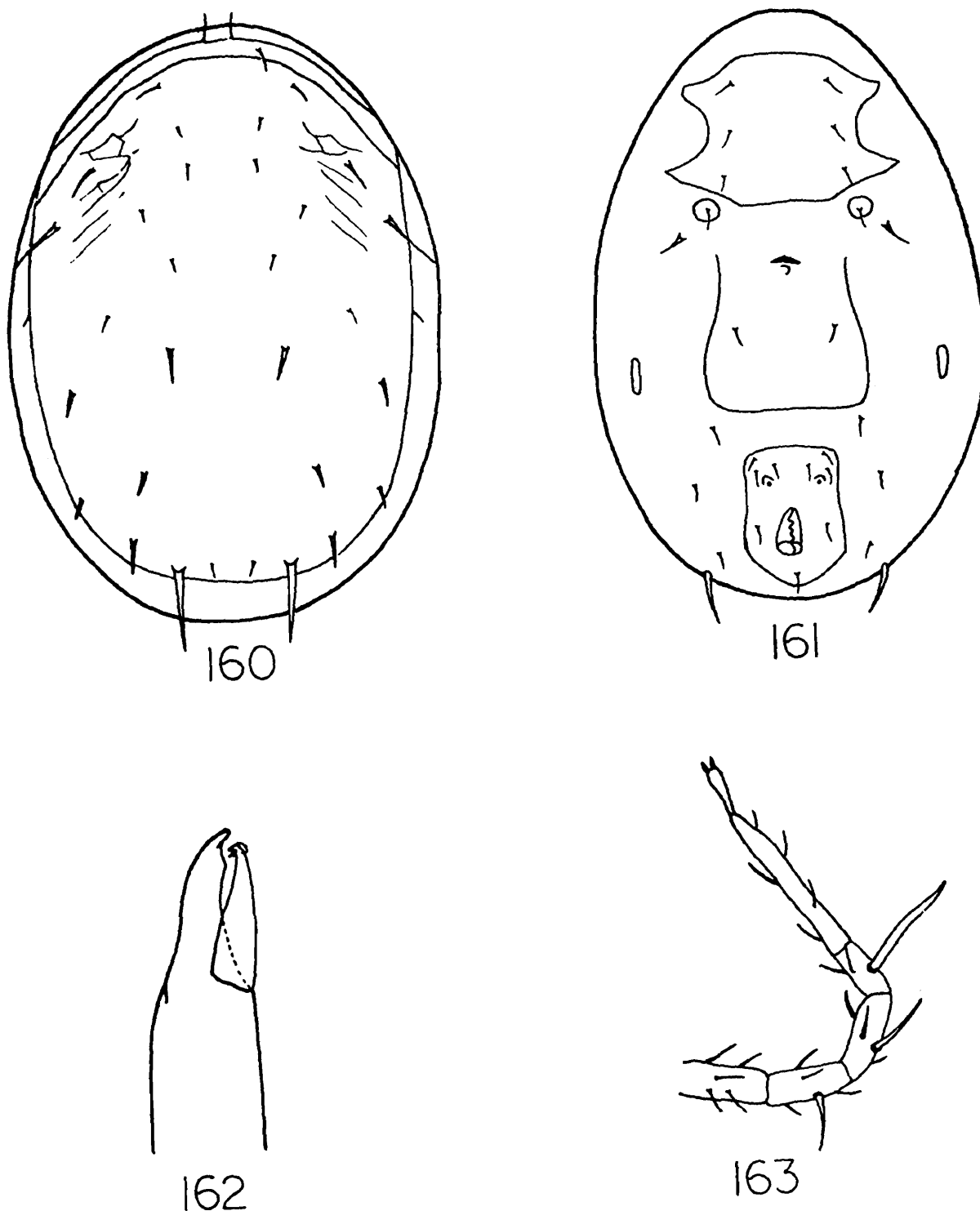
### 23. *Amblyseius (Euseius) eucalypti* Ghai & Menon (Figs. 160-163)

1967. *Amblyseius eucalypti* Ghai & Menon, *Oriental Ins.*, 1 : 69-70.

1974. *Amblyseius eucalypti* : Prasad, A catalogue of mites of India, p. 163.

1975. *Amblyseius eucalypti* : Gupta, *Internat. J. Acarol.*, 1(2) : 36.

*Female*: Dorsal shield faintly reticulate, with 17 pairs of setae.  $s_4 > j_1 = j_3 = z_2 = z_4$ ,  $j_4$ ,  $J_5$ ,  $z_5$  and  $Z_4$  short,  $Z_1 = S_2 = S_4$ ,  $Z_5$  longest,  $r_3$ ,  $R_1$  on lateral integument. Sternal shield as broad as long with



Figs. 160-163. *Amblyseius (Euseius) eucalypti* Ghai and Menon  
(after Ghai & Menon, 1967)

- 160. Dorsal shield
- 161. Ventral surface
- 162. Chelicera (female)
- 163. Leg IV

3 pairs of sternal setae, 4th pair lie on metasternal plates. Genital shield much wider than greatest width of ventrianal shield, with a pair of setae. Ventrianal shield 80 long, 60 wide, with 3 pairs of preanal setae and a pair of elliptical preanal pores, 4 pairs of setae present on the membrane around ventrianal shield, one pair of metapodal plates present. Peritreme terminates anteriorly near coxae II. Fixed digit of chelicera dentate. Leg IV with pointed macroseta on each of genu, tibia and basitarsus.

*Male* : Unknown.

*Habitat* : *Eucalyptus* sp.

*Type locality and repository* : Holotype ♀, India : Karnataka, Bangalore, on *Eucalyptus* sp., deposited at NPC, IARI, New Delhi. Paratypes 8 ♀ ♀, same data as for holotype, deposited at IARI.

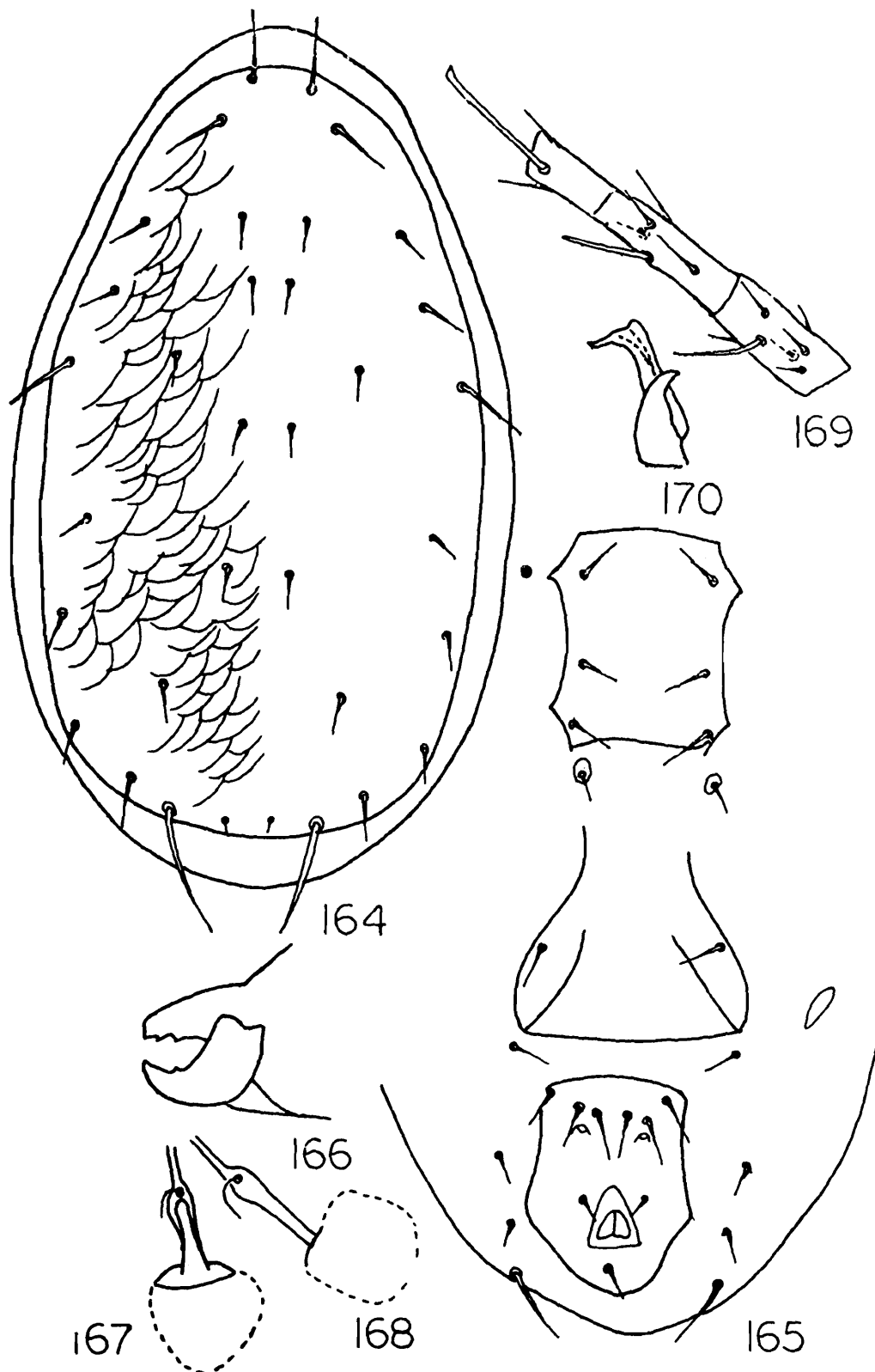
*Distribution* : India : Karnataka.

*Remarks* : This species is known from its type material only. The holotype slide was examined but the specimen and the mounting medium suffered so much of shrinkage that it was impossible to take measurements of setae and other body parts in detail.

#### 24. *Amblyseius (Euseius) finlandicus* (Oudemans)

(Figs. 164-170)

1915. *Seiulus finlandicus* Oudemans, *Ent. Ber.*, 4 : 183.  
 1958. *Amblyseius finlandicus* : Athias-Henriot, *Bull. Soc. Hist. Nat. Afr. Nord.*, 49 : 34-36.  
 1967. *Amblyseius finlandicus* : Ghai and Menon, *Oriental Ins.*, 1 : 70.  
 1970. *Amblyseius finlandicus* : Gupta, *Sci. & Cult.*, 36 : 98.  
 1970. *Amblyseius hibisci* : Gupta, *Sci. & Cult.*, 36 : 298. (misidentification).  
 1971. *Amblyseius finlandicus* : Gupta *et al.*, *Sci. & Cult.*, 37 : 98.  
 1971. *Amblyseius hibisci* : Gupta *et al.*, *Sci. & Cult.*, 37 : 298 (misidentification).  
 1973. *Amblyseius finlandicus* : Sandhu *et al.*, *Sci. & Cult.*, 39 : 226-227.  
 1974. *Amblyseius finlandicus* : Prasad, A catalogue of mites of India, p. 164,  
 1974. *Amblyseius finlandicus* : Gupta, *Ent. Rec.*, 86 : 143.  
 1974. *Amblyseius hibisci* : Prasad, A catalogue of mites of India, p. 165.  
 1975. *Amblyseius finlandicus* : Gupta, *Internat. J. Acarol.*, 1(2) : 36.  
 1975. *Amblyseius hibisci* : Gupta, *Internat. J. Acarol.*, 1(2) : 37. (misidentification).  
 1977. *Amblyseius finlandicus* : Gupta, *Indian J. Acar.*, 1 : 32.  
 1981. *Amblyseius finlandicus* : Gupta, *Indian J. Acar.*, 5(1-2) : 35.  
 1981. *Amblyseius finlandicus* : Gupta, *Indian J. Acar.*, 5(1-2) : 46.  
 1981. *Amblyseius finlandicus* : Gupta & Nahar, *In Contrib. to Acar. in India* : p. 9.  
 1982. *Amblyseius finlandicus* : Gupta, *Indian J. Acar.*, 6 : 24.



Figs. 164-170. *Amblyseius (Euseius) finlandicus* (Oudemans)

- 164. Dorsal shield
- 165. Posterior ventral surface
- 166. Chelicera (female)
- 167., 168. Spermathecae
- 169. Genu, tibia and basitarsus of leg IV
- 170. Spermatophoral process

*Female* : Dorsal shield 308 long, 200 wide, with 17 pairs of setae and 4 pairs of pores (not shown in figure). Measurements of setae :  $j_1$ -28,  $j_4$ ,  $j_6$ ,  $J_2$ -10-13 each,  $J_5$ -6,  $j_3$ -24,  $z_2$ -16,  $z_4$ -16,  $s_4$ -28,  $Z_1$ -12-16,  $S_2$ -18-22,  $S_4$ -20-26,  $S_5$ -25-31,  $Z_5$ -54-56,  $z_5$ -10-13,  $Z_4$ -16-20. Sternal shield longer (74) than wide with 3 pairs of sternal setae, 4th pair lie on metasternal plates. Genital shield 80-86 wide, with a pair of genital setae. Ventrianal shield 84-90 long, 68-74 wide, with 3 pairs of preanal setae and a pair of preanal pores much below the level of 3rd pair of preanal setae ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -37-40 long ; metapodal plates single paired. Chelicera with 2 teeth on the fixed digit and one on the movable digit. Spermatheca as illustrated. Macrosetae on leg IV : genu 30-40, tibia 27-30, basitarsus 47-50, all with broadened tip. Leg chaetotactic formula : genu II  $2 \frac{2}{6} \frac{2}{6} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{1}{1} \frac{2}{1} 1$ , tibia III  $1 \frac{2}{1} \frac{1}{1} 1$ . Peritreme extends anteriorly upto coxae II.

*Male* : Dorsal chaetotaxy similar to that of female. Spermatophoral process as illustrated.

*Habitat* : Hedge plant, guava, *Pyrus communis*, maize, chiner, grape vines, tea, peach, pine, cucurbitaceous plant, dahlia, chrysanthemum, citrus, apple, wood-apple, castor, bamboo, *Nerium indicum*, cotton, arum, cashewnut.

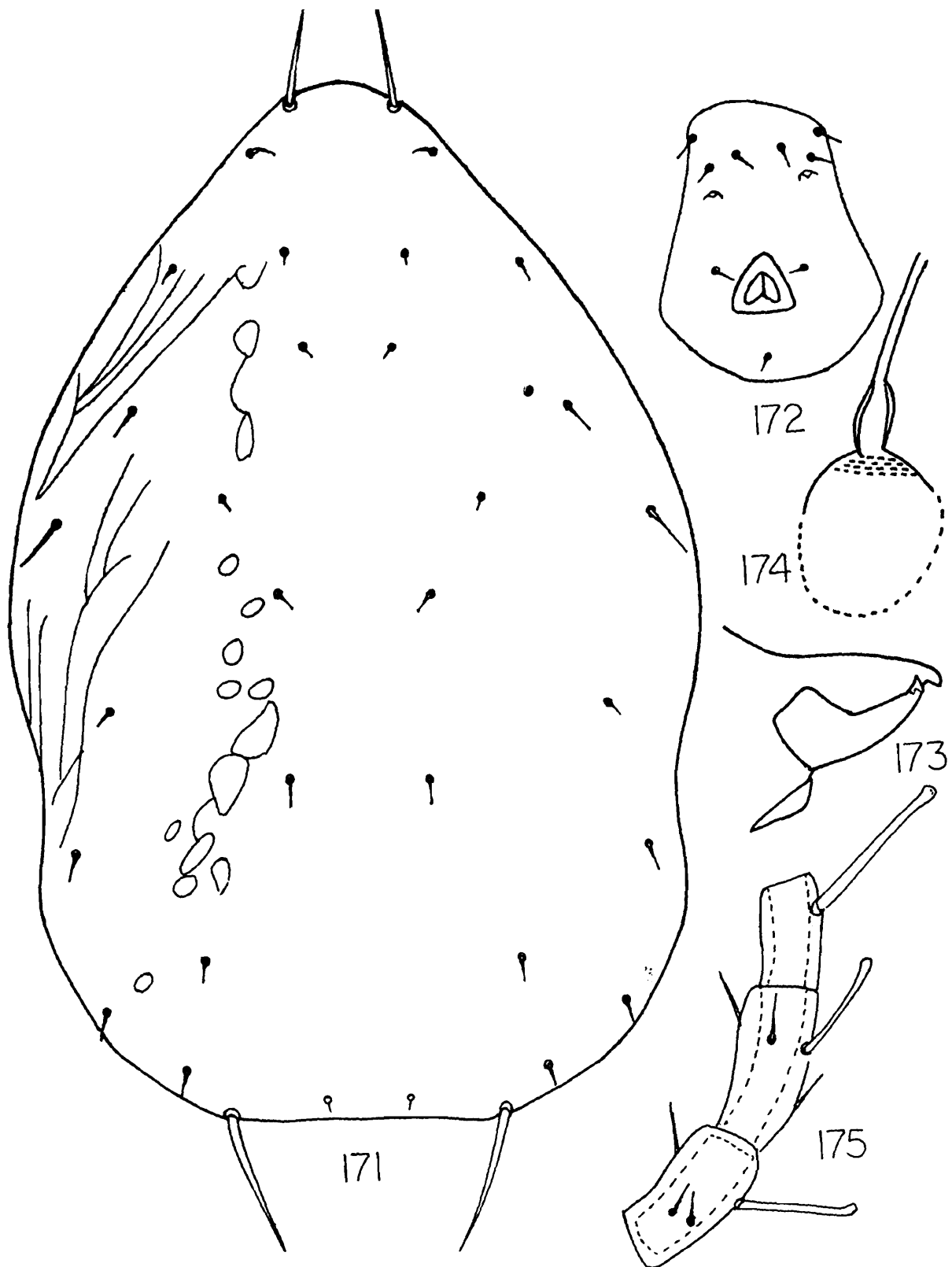
*Type locality and repository* : Finland (Abo) on *Salix caprea*, deposited in Rijksmuseum van Natuurlijke Historie, Leiden.

*Distribution* : India : Karnataka, West Bengal, Bihar, Punjab, Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh ; outside India : Pakistan, Europe (England, Algeria, Western & Northern Iran, Israel, Greece, Italy, Netherlands, Scandinavian areas), Canada (British Columbia, Nova Scotia, Ontario), Mexico, Hawaii, Japan (Hokkaido, Honshu), USSR, Africa, North America, South America.

*Remarks* : This species is wide spread in its distribution, cosmopolitan in its choice of food plants and exhibits a lack of specificity in its food habits. It is more common in north temperate region (Nesbitt, 1951). It has been seen associated with tetranychid mites and often found feeding on it. Not much of variation in setal length was observed in Indian specimens as compared to those from other regions as evidenced from literature.

25. *Amblyseius (Euseius) macrospatulatus* Gupta  
(Figs. 171-175)

*Amblyseius macrospatulatus* Gupta, *Indian J. Acar.* (In press)



Figs. 171-175. *Amblyseius (Euseius) macrospatulatus* Gupta  
171. Dorsal shield  
172. Ventrianal shield  
173. Chelicera (female)  
174. Spermatheca  
175. Genu, tibia and basitarsus of leg IV

*Female* : Dorsal shield 414 long, 291 wide, gently imbricate laterally, with 17 pairs of setae. Measurements of setae :  $j_1$ -51,  $j_4$ -7,  $j_5$ -9,  $j_6$ -11,  $J_2$ -15,  $J_5$ -5,  $j_3$ -12,  $z_2$ -13,  $z_4$ -17,  $s_4$ -29,  $Z_1$ -15,  $S_2$ -17,  $S_4$ -17,  $S_5$ -17,  $Z_5$ -68,  $z_5$ -9,  $Z_4$ -16,  $r_3$ -12,  $R_1$ -12, (both on lateral integument). Sternal shield margins indistinct, 3 pairs of sternal setae present, 4th pair lie on lateral integument. Genital shield with a pair of genital setae. Ventrianal shield oval, 123 long, 100 wide, with 3 pairs of preanal setae and a pair of crescent-shaped preanal pores, 4 pairs of setae present around ventrianal shield, one pair of metapodal plates present, 22 long,  $JV_5$ -30 long. Dentition of chelicera not clearly visible. Spermatheca as figured. Macrosetae on leg IV : genu-47, tibia-45, basitarsus-69, all with spatulate tip ; genu II-16, genu III-43, tibia III-33. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Unknown.

*Type locality and repository* : Holotype ♀, India : Arunachal Pradesh, Likabali, on an undetermined plant, 14.x.1981, Coll. S. K. Gupta, deposited in ZSI, Calcutta, Reg. No. 3369/17.

*Remarks* : This species resembles *A. (Euseius) ricinus* (Moraes, Denmark & Guerrero, 1982) but differs in structure of spermatheca.

## 26. *Amblyseius (Euseius) neococcineae* Gupta

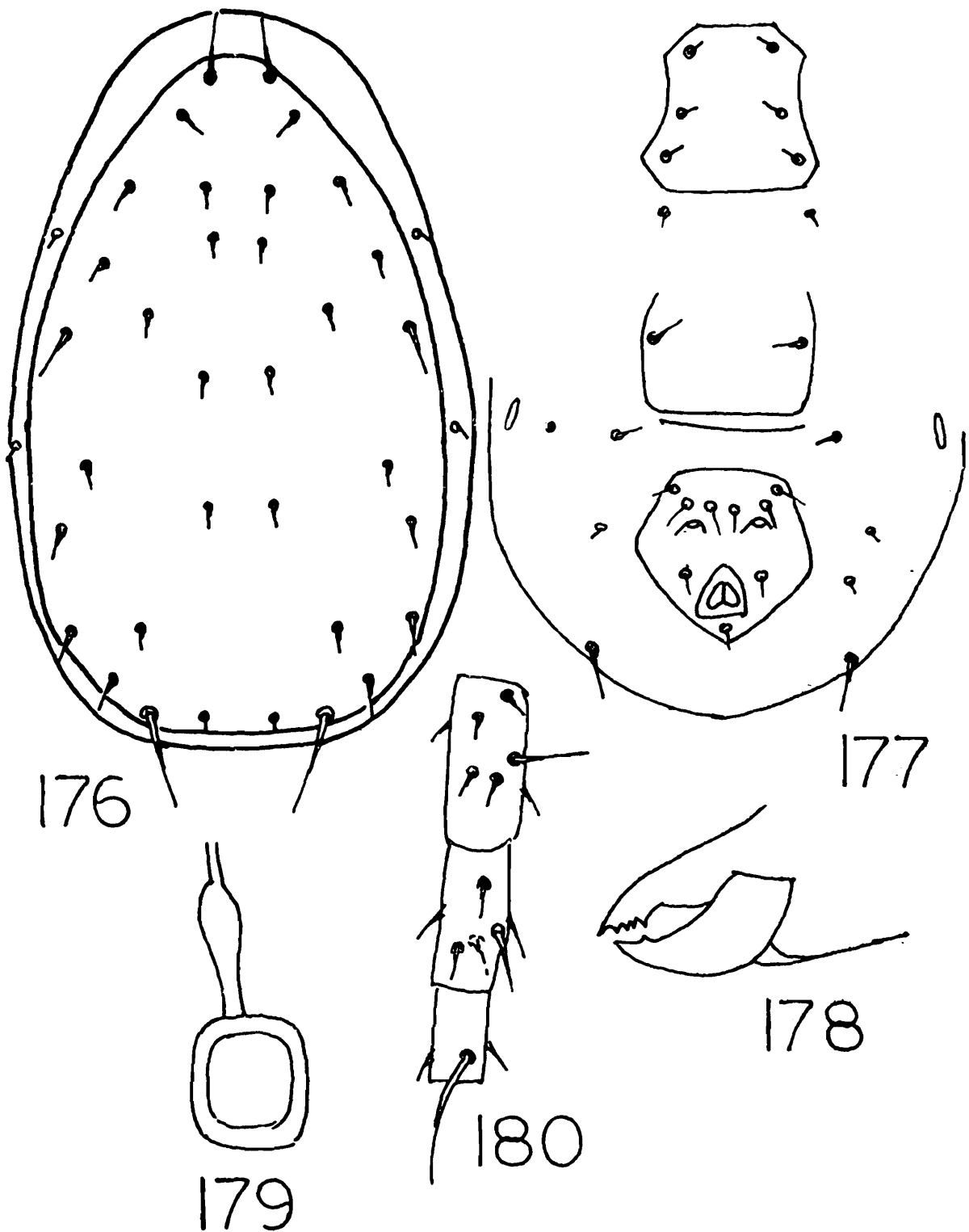
(Figs. 176-180)

1978. *Amblyseius neococcineae* Gupta, *Indian J. Acar.*, 2(2) : 69.

*Female* : Dorsal shield 265 long, 145 wide, weakly sclerotized, with 17 pairs of setae. Measurements of setae :  $j_1$ -26,  $j_4$ - $j_5$ -8 each,  $j_6$ ,  $J_2$ -12 each,  $J_5$ -5,  $j_3$ ,  $z_2$ -12 each,  $z_4$ -16,  $s_4$ -24,  $Z_1$ -12,  $S_2$ -16,  $S_4$ -16,  $S_5$ -18,  $Z_5$ -45,  $z_5$ -12,  $Z_4$ -16,  $r_3$ -16,  $R_1$ -12. Sternal shield with 3 pairs of sternal setae, posterior margin almost straight, 4th pair of sternal setae on interscutal membrane. Genital shield almost as wide as the greatest width of ventrianal shield, with a pair of setae. Ventrianal shield 60 long, 40 wide, lateral margins convex, with 3 pairs of preanal setae and a pair of crescent-shaped preanal pores, 4 pairs of setae present around ventrianal shield ;  $JV_5$ -24 long ; one pair of metapodal plates present. Fixed digit of chelicera with 3 teeth and *pilus dentilis*, movable digit with one tooth. Spermatheca as figured. Macrosetae on leg IV : genu-29, tibia-24, basitarsus-47, all with flattened tip.

*Male* : Unknown.

*Habitat* : *Syzygium cumini*.



Figs. 176-180. *Amblyseius (Euseius) neococcineae* Gupta

176. Dorsal shield

177. Ventral surface

178. Chelicera (female)

179. Spermatheca

180. Genu, tibia and basitarsus of leg IV

*Type locality and repository* : Holotype ♀, India : Meghalaya, Tura, on *Syzygium cumini*, deposited in ZSI, Calcutta, Reg. No. 3370/17. Paratype 1 ♀, same data as for holotype, deposited in ZSI, Calcutta, Reg. No. 3371/17.

*Distribution* : India : Meghalaya.

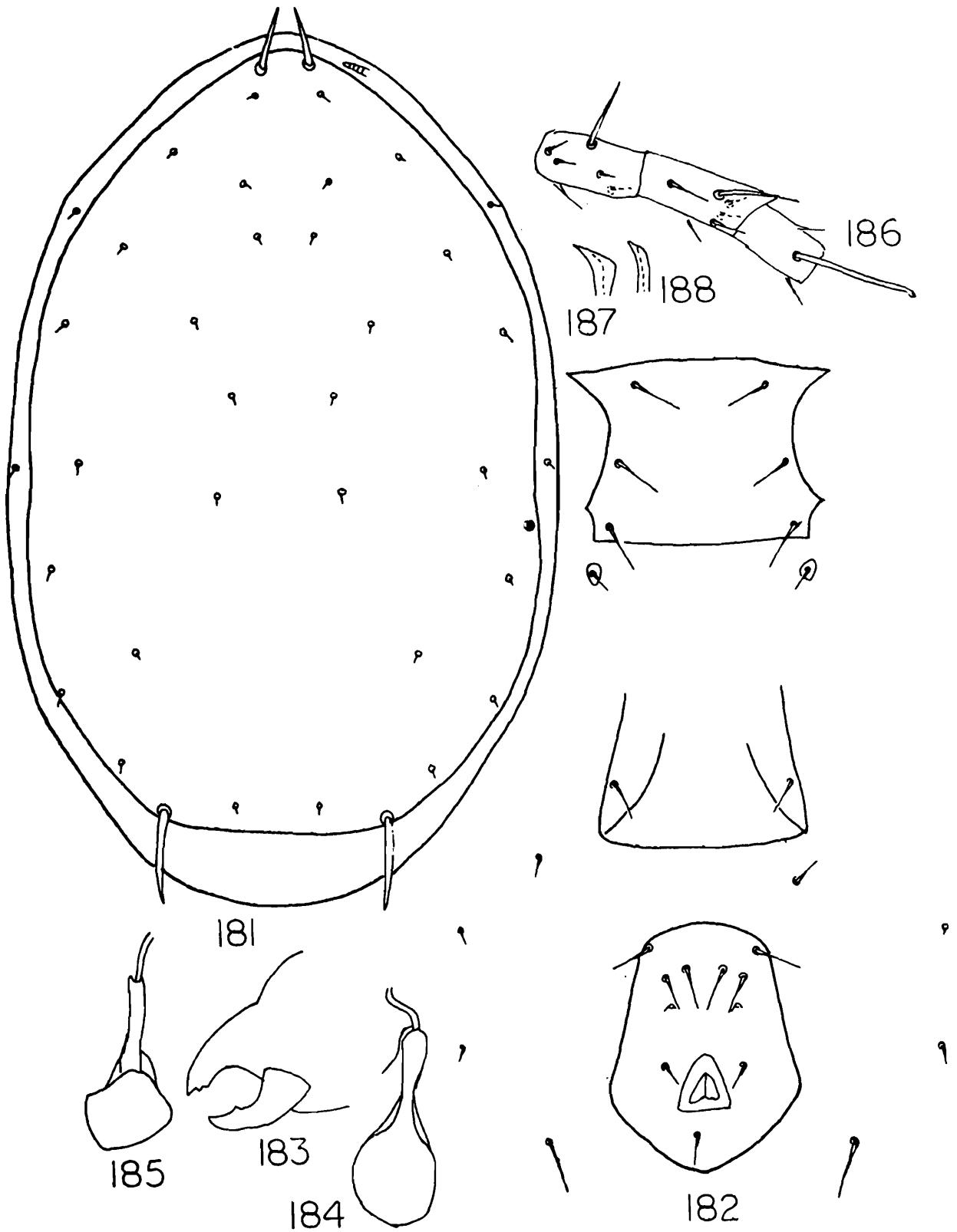
## 27. *Amblyseius (Euseius) ovalis* (Evans)

(Figs. 181-188)

1953. *Typhlodromus ovalis* Evans, *Ann. Mag. Nat. Hist.*, 6 : 458-461.  
 1960. *Typhlodromus (Amblyseius) ovalis* : Narayanan *et al.*, *Proc. Nat. Inst. Sci.*, 26 B (6) : 388-389.  
 1970. *Amblyseius ovalis* : Gupta, *Sci. & Cult.*, 36 : 98.  
 1974. *Amblyseius ovalis* : Prasad, A catalogue of mites of India, p. 168.  
 1974. *Amblyseius ovalis* : Gupta, *Ent. Rec.*, 86 : 143.  
 1975. *Amblyseius ovalis* : Gupta, *Internat. J. Acarol.*, 1(2) : 39-40.  
 1977. *Amblyseius ovalis* : Gupta, *Oriental Ins.*, 11 : 632.  
 1977. *Amblyseius ovalis* : Gupta, *Indian J. Acar.*, 1 : 34.  
 1978. *Amblyseius ovalis* : Gupta, *Indian J. Acar.*, 2(2) : 71.  
 1978. *Euseius ovalis* : Gupta, *Oriental Ins.*, 12 : 335-336.  
 1981. *Amblyseius ovalis* : Ray & Gupta, *Bull. Zool. Surv. India*, 4 : 279.

*Female* : Dorsal shield 340-360 long, 230-240 wide, smooth, with 17 pairs of setae, all being very small except  $Z_5$  and  $j_1$  which are longer. Measurements of setae :  $j_1$ -29-31,  $j_4$ - $j_6$ ,  $J_2$ - $J_5$ -4-5 each,  $j_3$ -6,  $z_2$ -6,  $z_4$ -6-7,  $s_4$ -9-12,  $Z_1$ -6,  $S_2$ - $S_5$ , -5-6 each,  $Z_5$ -40-55,  $z_5$ -4,  $Z_4$ -7-8. Sternal shield almost as long (75) as wide, smooth, with 3 pairs of sternal setae, metasternal plate oval with a seta. Genital shield (90) wide, with a pair of genital setae. Ventrianal shield oval, 84-90 long, 72-78 wide, with 3 pairs of preanal setae and a pair of preanal pores below the level of 3rd pair of preanal setae, 4 pairs of setae present around ventrianal shield,  $JV_5$ -25 long ; 2 pairs of metapodal plates present, primary one 27 long. Chelicera with 2 teeth on the fixed digit, movable digit with a small tooth. Spermatheca with funnel-shaped cervix. Macrosetae on leg IV : genu 32-37, tibia 25-37, basitarsus-44-56, all with broadened tip. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Peritreme extends anteriorly little before  $j_1$ .

*Male* : Dorsal chaetotaxy similar as in female. Spermatophoral process as illustrated. Macrosetae on leg IV : genu-24, tibia-21, basitarsus-42.



Figs. 181-188. *Amblyseius (Euseius) ovalis* (Evans)

181. Dorsal shield

182. Ventral surface

183. Chelicera (female)

184, 185. Spermathecae

186. Genu, tibia and basitarsus of leg IV

187, 188. Spermatophoral processes

*Habitat* : *Ficus*, *Terminalia arjuna*, banana, *Vitex pubescens*, napier grass, castor, *Nerium* sp., mango, coconut, oilseed plant, *Bauhinia* sp., papaya, pomegranate, rose, chrysanthemum, coffee, *Bauhinia purpuria*, paddy, sugarcane, cashewnut, *Tabernaemontana* sp., beans, *Bougainvillea*, grass, *Bougainvillea spectabilis*, *Holarrhena antidysenterica*, jackfruit, *Cassia fistula*, *Macrocos paniculatus*, bamboo.

*Type locality and repository* : Holotype ♀, Malaya, Kuala Lumpur, on rubber tree, deposited in BM (NH), London.

*Distribution* : India : Maharashtra, Gujarat, Karnataka, Tamil Nadu, Pondicherry, Kerala, Andaman Isl., West Bengal, Meghalaya, Tripura, Manipur, Bihar ; outside India : Philippines, Taiwan, Hawaii, Mauritius, Mexico, Malaya, Hong Kong, Okinawa Isl., Indonesia, New Zealand.

*Remarks* : The Indian material shows no variation from the descriptions available from other parts of the world. Predatory behaviour of this species was reported from India by Rao *et al.* (1969) and Gupta (1977). Very often this species was collected in the field in fully engorged condition after feeding on tetranychid mites and assuming reddish colour, i.e. the colour of the prey on which it fed. It is strongly believed that this species will prove to be a profitable bio-controlling agent, if judiciously used.

## 28. *Amblyseius (Euseius) pruni* Gupta

(Figs. 189-195)

1970. *Amblyseius sojaensis*, Gupta, *Sci. & Cult.*, 36 : 98 (misidentification).  
 1974. *Amblyseius sojaensis* : Prasad, A catalogue of mites of India, p. 170.  
 1975. *Amblyseius sojaensis* : Gupta, *Internat. J. Acarol.*, 1(2) : 43-44.  
 1975. *Amblyseius pruni* Gupta, *Internat. J. Acarol.*, 1(2) : 40-42.  
 1978. *Amblyseius pruni* : Gupta, *Indian J. Acarol.*, 2(2) : 73.  
 1981. *Amblyseius pruni* : Gupta, *Indian J. Acarol.*, 5(1-2) : 35.  
 1981. *Amblyseius pruni* : Gupta, *Indian J. Acarol.*, 5(1-2) : 46.  
 1982. *Amblyseius pruni* : Ray & Gupta, *Bull. Zool. Surv. India*, 4 : 280.

*Female* : Dorsal shield reticulate, 315 long, 230 wide, with 17 pairs of setae and 4 pairs of pores (not shown in figure).  $Z_5 > j_1 = s_4$ ,  $S_5 > S_4$ . Measurements of setae :  $j_1$ -31-36,  $j_4$ - $j_6$ ,  $J_2$ -13-15 each,  $J_5$ -6,  $j_3$ -27,  $z_2$ - $z_4$ -20-22 each,  $s_4$ -33-34,  $Z_1$ -13-15,  $S_2$ -20-24,  $S_4$ -20-24,  $S_5$ -23-28,  $Z_5$ -60-65 (weakly serrate),  $z_5$ -12,  $Z_4$ -14. Sternal shield slightly longer than wide with 3 pairs of sternal setae, metasternal plate oval with a seta. Genital shield almost as wide as the greatest width of ventrianal shield, with a pair of genital setae. Ventrianal shield 90

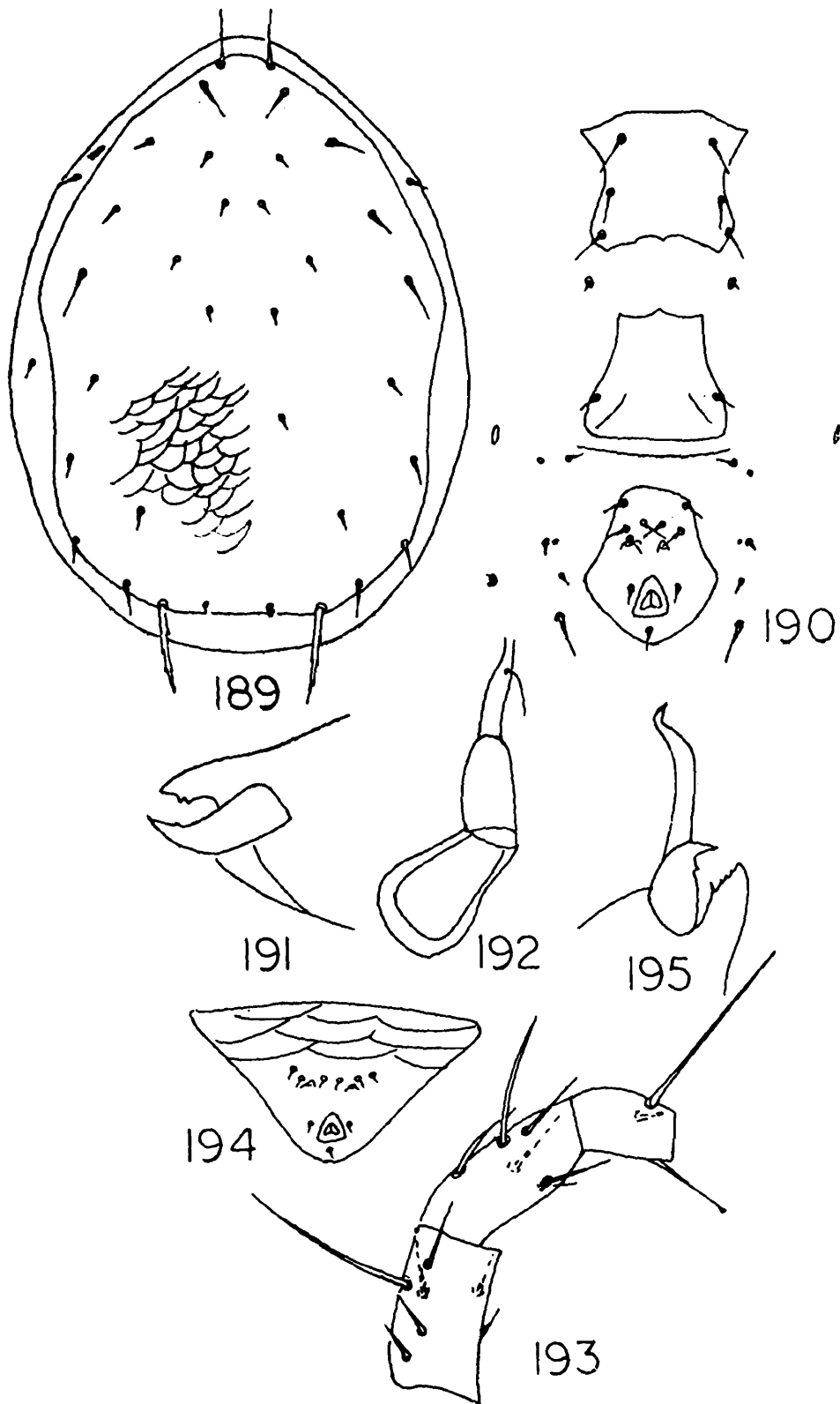


Fig. 189-195. *Amblyseius (Euseius) pruni* Gupta  
 189. Dorsal shield  
 190. Ventral surface  
 191. Chelicera (female)  
 192. Spermatheca  
 193. Genu, tibia and basitarsus of leg IV  
 194. Ventrianal shield (male)  
 195. Chelicera (male) with spermatophoral process

long, 80 wide, with 3 pairs of preanal setae and a pair of semilunar preanal pores; 4 pairs of setae and a few small platelets present around ventrianal shield,  $JV_5$ -33 long, one pair of metapodal plates present. Spermatheca as illustrated. Chelicera with 1 or 2 big teeth followed by 2-3 minute teeth on fixed digit, movable digit with one tooth. Peritreme terminates anteriorly between  $z_2$  and  $z_4$ . Macrosetae on leg IV : genu-40, tibia-36, basitarsus-58. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{2}{1} \frac{1}{1} 1$ .

*Male* : Dorsal chaetotaxy similar to that of female. Ventrianal shield and spermatophoral process as illustrated. Macrosetae on leg IV : genu-21-24, tibia-21, basitarsus-37

*Habitat* : *Prunus persica*, pear, *Bauhinia acuminata*, apple, chryanthemum, apricot, white lilly, cherry, beans, peach, *Erythrina ovalifolia*, jute, *Anthocephalus cadamba*, *Bignonia* sp., *Mangifera indica*.

*Type locality and repository* : Holotype ♀, India : West Bengal, Darjeeling Dist., Kalimpong, on *Prunus persica*, deposited in ZSI, Calcutta, Reg. No. 3372/17. Paratypes 2 ♀ ♀, 1 ♂ same data as for holotype, Reg. No. 3373-75/17.

*Distribution* : India : West Bengal, Meghalaya, Assam, Tripura, Jammu & Kashmir, Himachal Pradesh.

*Remarks* : Earlier, this species was misidentified as *A. sojaensis* Ehara which was originally described from Japan but later it was found to be a separate species differing from *sojaensis* in spermathecal character.

## 29. *Amblyseius (Euseius) rhododendronis* Gupta

( Figs. 196-201 )

1970. *Amblyseius rhododendronis* Gupta, *Oriental Ins.*, 4 : 187-188.

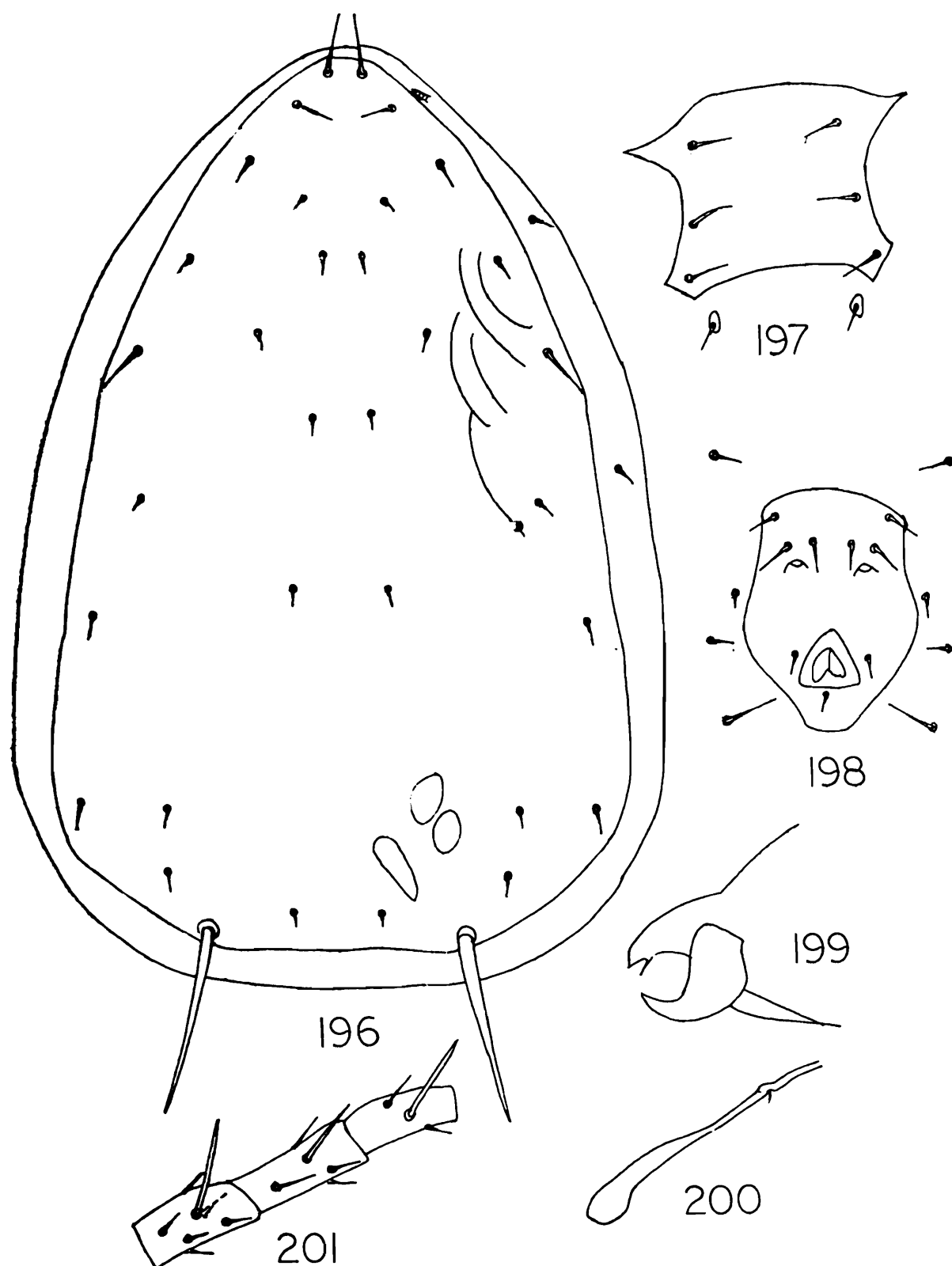
1974. *Amblyseius rhododendronis* : Prasad, A catalogue of mites of India, p. 169.

1975. *Amblyseius rhododendronis* : Gupta, *Internat. J. Acarol.*, 1(2) : 43.

1978. *Euseius kodaikanalensis* Gupta, *Oriental Ins.*, 12 : 331-333. (new synonymy).

1981. *Amblyseius rhododendronis* : Ray & Gupta, *Bull. Zool. Surv. India*, 4(3) : 280.

*Female* : Dorsal shield 325-330 long, 220-230 wide, faintly reticulate laterally, with 17 pairs of setae and 5 pairs of pores, all the setae small besides  $j_1$  and  $Z_5$  which are longer and thicker.  $S_4 > S_2 = S_5$ ,  $s_4 > z_2 = z_4$ ,  $Z_5 > j_1$ . Measurements of setae :  $j_1$ -27,  $j_4$ - $j_5$ -8-9 each,  $j_6$ - $J_2$ -10-11 each,  $J_5$ -4,  $j_3$ -16-18,  $z_2$ - $z_4$ -10-12 each,  $s_4$ -20-25,  $Z_1$ -8,  $S_2$ -11-12,  $S_4$ -17,  $S_5$ -10-12,  $Z_5$ -55-60,  $z_5$ -6,  $Z_4$ -9-10,  $r_3$ ,  $R_1$ -9 each, both on lateral integument. Sternal shield as long as broad, with 3 pairs of



Figs. 196-201. *Amblyseius (Euseius) rhododendronis* Gupta

196. Dorsal shield

197. Sternal shield

198. Ventrianal shield

199. Chelicera (female)

200. Spermatheca

201. Genu, tibia and basitarsus of leg IV

sternal setae, 4th pair lie on metasternal plates. Genital shield 80-85 wide, with a pair of setae. Ventrianal shield 95-100 long, 72-78 wide, with 3 pairs of preanal setae and a pair of preanal pores, 4 pairs of setae present around ventrianal shield,  $JV_5$  35-40 long. Peritreme terminates anteriorly at the base of  $j_3$ . Fixed digit of chelicera with 2 teeth, and movable digit toothless. Spermatheca with elongated cervix as illustrated. Macrosetae on leg IV : genu—35-40, tibia-22-30, basitarsus 40-42, all with rounded tips. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{2}{1} \frac{2}{0} 1$ , genu III  $1 \frac{1}{1} \frac{2}{1} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Unknown.

*Habitat* : *Rhododendron* sp., *Shorea robusta*, litchi.

*Type locality and repository* : Holotype ♀, India : West Bengal, Darjeeling Dist., Sukna, on *Rhododendron* sp., deposited in ZSI, Calcutta, Reg. No. 3376/17. Paratypes 2 ♀ ♀, same data as for holotype, in ZSI, Reg. No. 3377-78/17 ; 1 ♀, Lataguri, on undet. plant, Reg. No. 3379/17 ; 1 ♀, Sevak, on *Shorea robusta*, in ZSI, Reg. No. 3380/17.

*Distribution* : India : West Bengal, Tripura.

*Remarks* : This species is quite close to *A. (E.) ovalis* (Evans) but differs in structure of spermatheca. *A. (E.) kodaikanalensis* Gupta, is treated here as synonym for *A. (E.) rhododendronis* Gupta, because of striking similarities noticed after re-examining types of those two species and that led to conclusion that these two are conspecific.

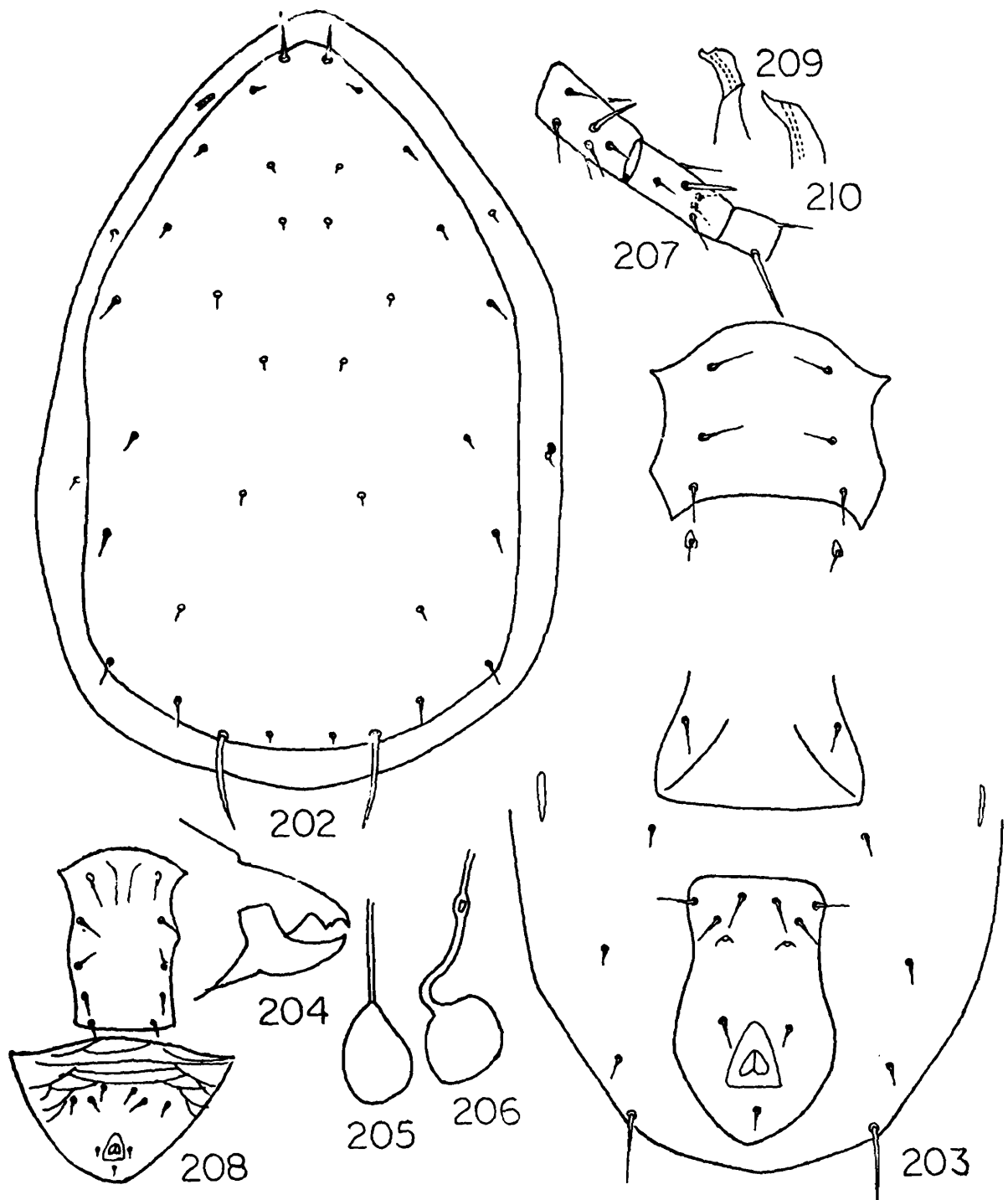
### 30. *Amblyseius (Euseius) sacchari* Ghai & Menon

( Figs. 202-210 )

1967. *Amblyseius sacchari* Ghai & Menon, *Oriental Ins.*, 1 : 75-76.  
 1970. *Amblyseius sacchari* : Gupta, *Sci. & Cult.*, 36 : 98.  
 1974. *Amblyseius sacchari* : Prasad, A catalogue of mites of India, p. 169.  
 1974. *Amblyseius sacchari* : Gupta & Dhooria, *Proc. Indian Sci. Cong.*, 1974 : 69.  
 1975. *Amblyseius sacchari* : Gupta, *Internat. J. Acarol.*, 1(2) : 43.  
 1977. *Amblyseius sacchari* : Gupta, *Indian J. Acar.*, 1 : 33-34.  
 1978. *Euseius sacchari* : Gupta, *Oriental Ins.*, 12 : 337.  
 1981. *Amblyseius sacchari* : Gupta & Nahar, *In Contrib. to Acar. in India* : p. 9.

*Female* : Dorsal shield 350-360 long, 230-250 wide, with 17 pairs of setae.  $S_5 = S_4 > S_2 > Z_1$ ,  $s_4 > z_2 = z_4$  ;  $Z_5 > j_1$ . Measurements of setae :  $j_1$ -33,  $j_4$ - $j_5$ -5-6 each,  $j_6$ ,  $J_2$ -10 each,  $J_5$ -5,  $j_3$ -8,  $z_2$ -8,  $z_4$ -8,  $s_4$ -15,  $Z_1$ -12,  $S_2$ -15,  $S_4$ -16-18,  $S_5$ -16-18,  $Z_5$ -40-45,  $z_5$ -7,  $Z_4$ -11,  $r_3$ ,  $R_1$ -11 each on lateral integument. Sternal shield 92 long, 82 wide, with 3 pairs of sternal setae, 4th pair lie on metasternal plates. Genital shield 90-95

wide, with a pair of setae. Ventrianal shield 90-100 long, 70-80 wide, lateral margins concave, with 3 pairs of preanal setae and a pair of crescent-shaped preanal pores below the level of 3rd pair of



Figs. 202-210. *Amblyseius (Euseius) sacchari* Ghai and Menon

202. Dorsal shield

203. Ventral surface

204. Chelicera (female)

205, 206. Spermathecae

207. Genu, tibia and basitarsus of leg IV

208. Ventral surface (male)

209, 210. Spermatophoral processes

preanal setae, 4 pairs of setae present around ventrianal shield, JV-29 long; one pair of metapodal plates present, 14 long. Chelicera with 2 teeth on the fixed digit, none on movable digit. Spermatheca as figured. Macrosetae on leg IV : genu 25-30, tibia 30-35, basitarsus 45-60. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Peritreme terminates anteriorly between  $j_3$  and  $z_2$ .

*Male* : Dorsal chaetotaxy similar to that of female. Ventrianal shield and spermatophoral process as figured.

*Habitat* : Sugarcane.

*Type locality and repository* : Holotype ♂, India : Karnataka, Bangalore, on sugarcane leaves associated with eriophyid mites, deposited at NPC, IARI, New Delhi. Paratypes ♀, 7 others (sex not mentioned), all at IARI, New Delhi.

*Distribution* : India : Karnataka, Tamil Nadu, Gujarat, Punjab, Himachal Pradesh and West Bengal.

*Remarks* : This mite is quite common on sugarcane in India and is distinguished from *A. (E.) ovalis* (Evans) by spermathecal character. No direct feeding on eriophyid mites by this species has been noticed in the field though it has often been seen associated with eriophyids.

The holotype material was examined at I.A.R.I. but due to shrinkage of the specimen, most of the structures were not discernible. However, the measurements of the setae were clearly visible and that agreed with those mentioned in the original description.

#### Subgenus *Neoseiulus* Hughes

- 1948. *Neoseiulus* Hughes, p. 141.
- 1959. *Typhlodromus (Typhlodromopsis)* De Leon, *Ent. News*, 70 : 133 (in part).
- 1961. *Cydnodromus* Muma, *Bull. Fla. St. Mus.*, 5(7) : 290.
- 1965. *Neoseiulus* : De Leon, *Proc. Ent. Soc. Wash.*, 67(1) : 23.
- 1967. *Cydnodromus* : Muma, *Fla. Ent.*, 50(4) : 273.
- 1968. *Neoseiulus* : Muma & Denmark, *Fla. Ent.*, 51 : 235.
- 1970. *Neoseiulus* : Muma & Denmark, *Arthropods of Florida*, 6 : 100.
- 1972. *Neoseiulus* : Denmark & Muma, *Fla. Ent.*, 55(1) : 26.
- 1973. *Neoseiulus* : Tuttle & Muma, *Tech. Bull. Agr. Exp. St. Univ. Arizona*, 208 : 18.
- 1973. *Neoseiulus* : Denmark & Muma, *Rev. Brazil. Biol.*, 33(2) : 26<sup>1</sup>.
- 1975. *Neoseiulus* : Denmark & Muma, *J. Agr. Univ. Puerto. Rico*, 59(4) : 294.
- 1978. *Neoseiulus* : Denmark & Muma, *Internat. J. Acarol.*, 4(1) : 12.
- 1978. *Neoseiulus*, Knisley & Denmark, *Fla. Ent.*, 61(1) : 11.
- 1982. *Neoseiulus* : Moraes *et al.*, *Internat. J. Acarol.*, 8(1) : 19.

**Diagnosis :** Dorsal shield well sclerotized, smooth or reticulate, with 17 pairs of setae (6 pairs of dorsocentral, 2 pairs of median, 9 pairs of lateral). Chelicera with 4-8 teeth on fixed digit. Sternal shield as long as or longer than wide with straight or concave posterior margin with 3 pairs of sternal setae. Peritreme extends anteriorly upto  $j_1$ . Ventrianal shield elongate, pentagonal, shield-shaped or nearly quadrate with 3 pairs of preanal setae. No distinguishable macrosetae on leg I, II, III but it is always present on basitarsus IV and in some species it is also present on genu IV and tibia IV.

**Type :** *Neoseiulus barkeri* Huges, 1948, by designation.

*Key to the species of subgenus Neoseiulus*

- |   |     |                      |
|---|-----|----------------------|
| 1. All setae on dorsal shield very small except $Z_5$                                       | ... | <i>assamensis</i>    |
| — Setae on dorsal shield of diverse length  | ... | 2                    |
| 2. Setae on dorsal shield of same length or uniformly long, none greatly longer than others | ... | 3                    |
| — Some setae on dorsal shield appreciably longer, others being small or very small          | ... | 5                    |
| 3. All setae very long, except $S_5$ which is minute  | ... | <i>longispinosus</i> |
| — All setae of uniform length   | ... | 4                    |
| 4. Setae on dorsal hexagonal area longer than interval between their bases                  | ... | <i>fallacis</i>      |
| — Setae on dorsal hexagonal area shorter than interval between their bases                  | ... | <i>imbricatus</i>    |
| 5. Dorsal shield narrower, much longer than wide  | ... | 9                    |
| — Dorsal shield oval  | ... | 6                    |
| 6. Only setae $Z_5$ and $Z_4$ long, other setae almost of same length                       | ... | <i>indicus</i>       |
| — Besides $Z_5$ and $Z_4$ there are also other longer setae on dorsal shield                | ... | 7                    |
| 7. Setae $j_1$ , $s_4$ , $Z_5$ and $Z_4$ longer than other dorsal setae                     | ... | <i>fraterculus</i>   |
| — Only setae $s_4$ , $Z_5$ and $Z_4$ longer than other dorsal setae                         | ... | 8                    |
| 8. Ventrianal shield pentagonal, spermatheca as in fig. 231                                 | ... | <i>cynodonae</i>     |
| — Ventrianal shield triangular, spermatheca as in fig. 266                                  | ... | <i>rangatensis</i>   |

9. Sternal shield with postlateral angulation	...	<i>paspalivorus</i>
— Sternal shield without postlateral angulation	...	10
10. Spermatophoral process as in figs. 224, 225	...	<i>baraki</i>
— Spermatophoral process as in fig. 214	...	<i>aceriae</i>

### 31. *Amblyseius* (*Neoseiulus*) *aceriae* Gupta

( Figs. 211-216 )

1975. *Amblyseius aceriae* Gupta, *Internat. J. Acarol.*, 1(2) : 30-31.

1977. *Amblyseius aceriae*, Gupta, *Indian J. Acar.*, 1 : 28-29.

*Female* : Dorsal shield imbricate, slender, elongate, 340 long, 170 wide, with 17 pairs of setae.  $\zeta_5$  longest and serrate, other setae small. Measurements of setae :  $j_1$ -8-10,  $j_4$ - $j_6$ ,  $J_2$ - $J_5$ -8-10 each,  $j_3$ -10,  $z_2$ - $z_4$ ,  $s_4$ ,  $Z_1$ ,  $S_2$ -8-10 each,  $S_4$ - $S_5$ -12-15 each,  $Z_5$ -68,  $z_5$ -8,  $Z_4$ -16,  $r_3$ ,  $R_1$ -8-10 each. Sternal shield 80 long, 72 wide, with 3 pairs of sternal setae, posterior margin almost straight, 4th pair of sternal setae lie on metasternal plates. Genital shield normal with a pair of setae. Ventrianal shield shaped as figured 87-100 long, 76-80 wide, slightly reticulate, with 3 pairs of preanal setae ; 4 pairs of setae present around ventrianal shield, one pair of large metapodal plates present. Spermatheca as figured. Fixed digit of chelicera multidentate, movable digit with 2 teeth. Peritreme terminates anteriorly between  $j_1$  and  $j_3$ . Macroseta on leg IV : basitarsus-20. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

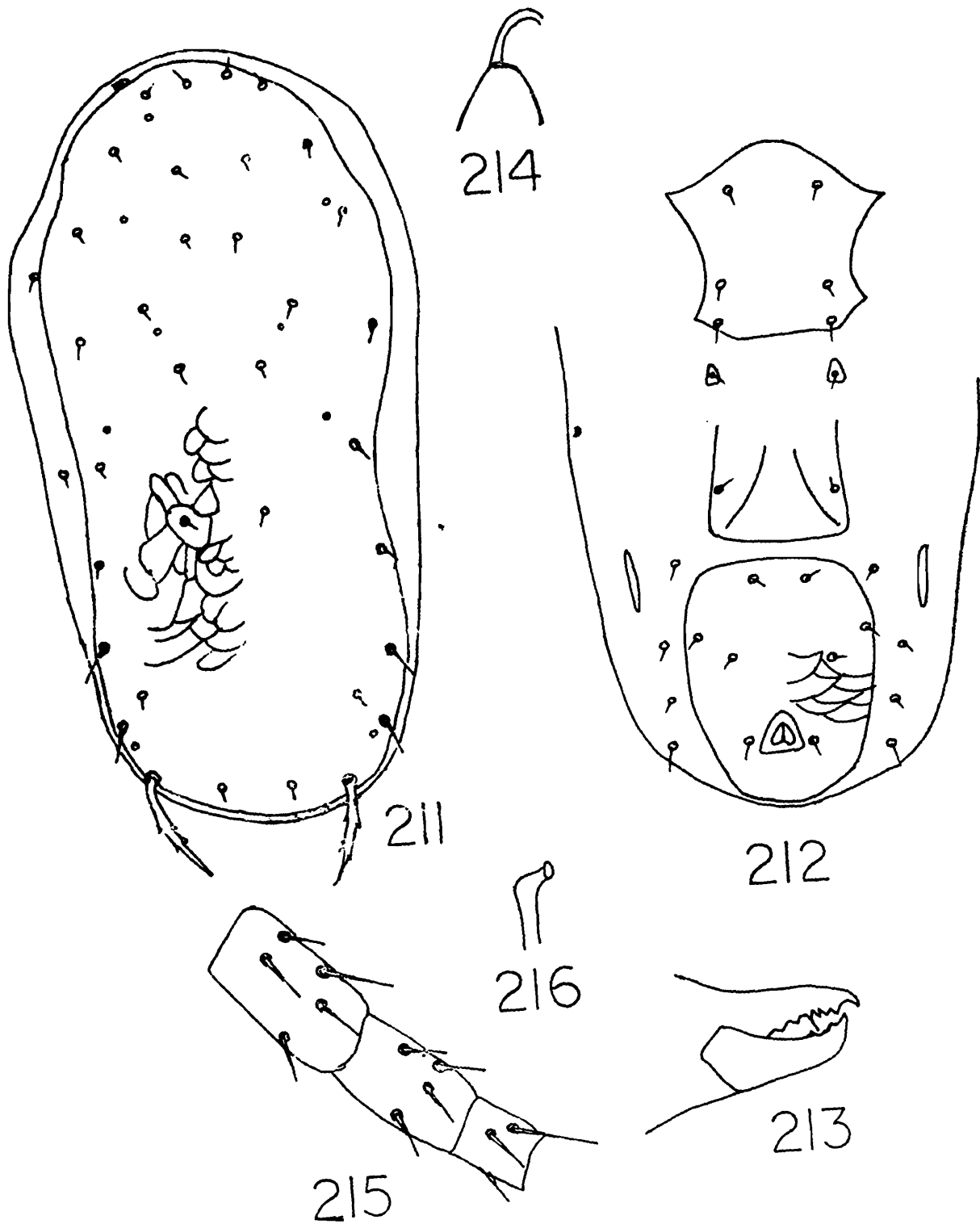
*Male* : Spermatophoral process as figured. Dorsal chaetotaxy similar to that of female.

*Habitat* : *Mangifera indica*.

*Type locality and repository* : Holotype ♀, India : West Bengal, Malda, on *Mangifera indica*, associated with mango bud mite, deposited in ZSI, Calcutta, Reg. No. 3381/17.

*Distribution* : India : West Bengal, Gujarat.

*Remarks* : This species is very similar to *A. (N.) baraki* Athias-Henriot (1966) but differs in shape of spermatheca and spermatophoral process.



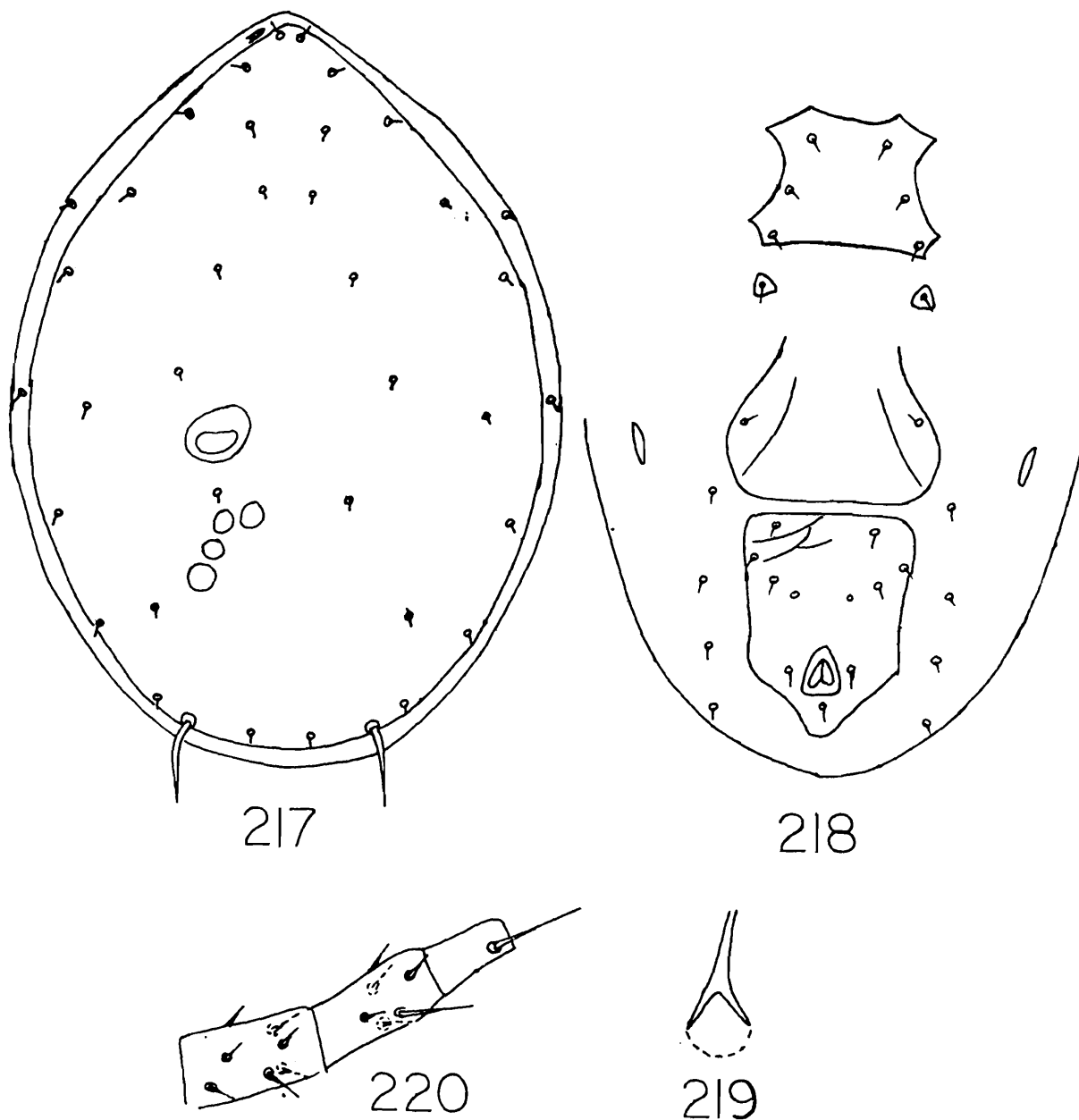
Figs. 211-216. *Amblyseius (Neoseiulus) aceriae* Gupta  
 211. Dorsal shield  
 212. Ventral surface  
 213. Chelicera (female)  
 214. Spermatheca  
 215. Genu, tibia and basitarsus of leg IV  
 216. Spermatophoral process

32. *Amblyseius (Neoseiulus) assamensis* (Chant)

(Figs. 217-220)

1960. *Typhlodromus (Amblyseius) assamensis* Chant, *Can. Ent.*, 92 : 60.1974. *Amblyseius assamensis* : Prasad, A catalogue of mites of India, p. 161.1975. *Amblyseius assamensis* : Gupta, *Internat. J. Acarol.*, 1(2) : 32-33.

*Female* : Dorsal shield 360 long, 260 wide, rugose, roundish, with 17 pairs of setae, mostly small except  $Z_5$  which is longer. Measurements of setae :  $j_1$ -8,  $j_3$ -12,  $Z_5$ -40, other setae minute. Sternal shield longer than wide with 3 pairs of sternal setae, 4th pair of sternal setae

Figs. 217-200. *Amblyseius (Neoseiulus) assamensis* (Chant)

217. Dorsal shield

218. Ventral surface

219. Spermatheca

220. Genu, tibia and basitarsus of leg IV

on triangular metasternal plates. Genital shield slightly wider than greatest width of ventrianal shield, with a pair of setae. Ventrianal shield 104 long, 76 wide, pentagonal, lateral margins slightly concave, with 3 pairs of preanal setae and a pair of preanal pores, 4 pairs of setae present around ventrianal shield, 1 pair of metapodal plates present. Spermatheca as figured. Chelicera with fixed digit multi-dentate, movable digit apparently toothless. Peritreme extends anteriorly upto  $j_1$ . Macrosetae on leg IV : genu-12, tibia-20, basitarsus-32.

*Male* : Unknown.

*Habitat* : Citrus.

*Type locality and repository* : Holotype ♀, India : Assam, Jorhat, on citrus, deposited in Citrus Experimental Station, Riverside, California.

*Distribution* : India : Assam.

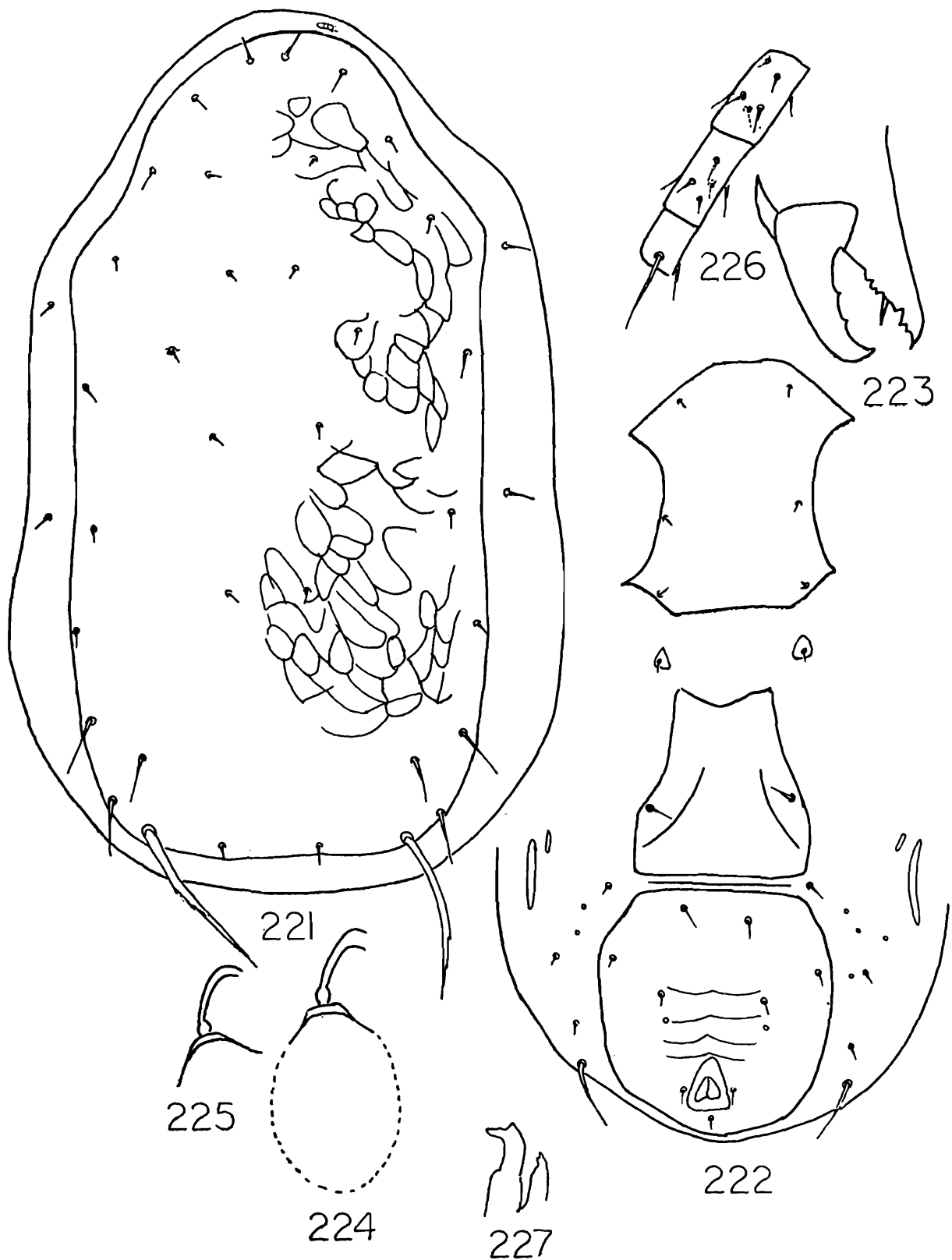
### 33. *Amblyseius (Neoseiulus) baraki* Athias-Henriot

(Figs. 221-227)

1966. *Amblyseius baraki* Athias-Henriot, *Sci. d. Bourgogne*, 24 : 211-212.

1977. *Amblyseius dhooriai* Gupta, *Indian J. Acar.*, 1 : 30-31 (new synonymy).

*Female* : Dorsal shield reticulate, 408 long, 172 wide, with 17 pairs of setae :  $j_4 \leq j_5 = j_6 = J_2$ ,  $j_3 \geq z_2 = z_4$ . Measurements of setae :  $j_1$ -13-17,  $j_4$ -10-12,  $j_5$ -12-14,  $j_6$ -13-14,  $J_2$ -12-14,  $J_5$ -12,  $j_3$ -12-15,  $z_2$ ,  $z_4$ -10-13 each,  $s_4$ -12-16,  $Z_1$ -12,  $S_2$ -12,  $S_4$ -24-29,  $S_5$ -24-29,  $Z_5$ -75-82,  $z_5$ -10,  $Z_4$ -37,  $r_3$ ,  $R_1$ -14 each. Sternal shield reticulate, much longer (96-110) than wide (60-75) with 3 pairs of sternal setae, 4th pair of setae lie on triangular metasternal plates. Genital shield 64-74 wide, narrower than the greatest width of ventrianal shield with a pair of setae. Ventrianal shield reticulate, 110-120 long, 98-102 wide, with 3 pairs of preanal setae and a pair of round preanal pores below the level of 3rd pair of preanal setae, 4 pairs of setae present around ventrianal shield,  $JV_5$ -26-30 long, 2 pairs of metapodal plates present, primary one 41 long, accessory one 9 long. Fixed digit of chelicera with 3 sharp teeth anterior to strong *pilus dentilis*, 3 teeth posterior to it, movable digit with 2 teeth. Spermatheca as figured. Macroseta on basitarsus IV-48 long. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Peritreme extends anteriorly upto  $j_1$ .



Figs. 221-227. *Amblyseius (Neoseiulus) baraki* Athias-Henriot

221. Dorsal shield

222. Ventral surface

223. Chelicera (female)

224, 225. Spermathecae

226. Genu, tibia and basitarsus of leg IV

227. Spermatophoral process

*Male* : Dorsal chaetotaxy similar to that of female. Spermatophoral process as figured.

*Habitat* : Sugarcane.

*Type locality and repository* : Holotype ♀, D. Z. Baraki, on *Phalaris* sp. (Dijon B 59), repository unknown.

*Distribution* : India : Punjab ; outside India : Algeria, Thailand.

*Remarks* : The present author described *A. (N.) dhooriai* from Punjab but on examination of the type and comparing it with the original description of *A. (N.) baraki* Athias-Henriot and subsequent re-description of Ehara & Bhandhufalck (1977), the present author was inclined to believe that both the species are conspecific and, therefore, the former is treated here as the synonym for the latter. Not much variation was observed from Thailand specimens as described by Ehara & Bhandhufalck (1977).

#### 34. *Amblyseius (Neoseiulus) cynodonae* Gupta

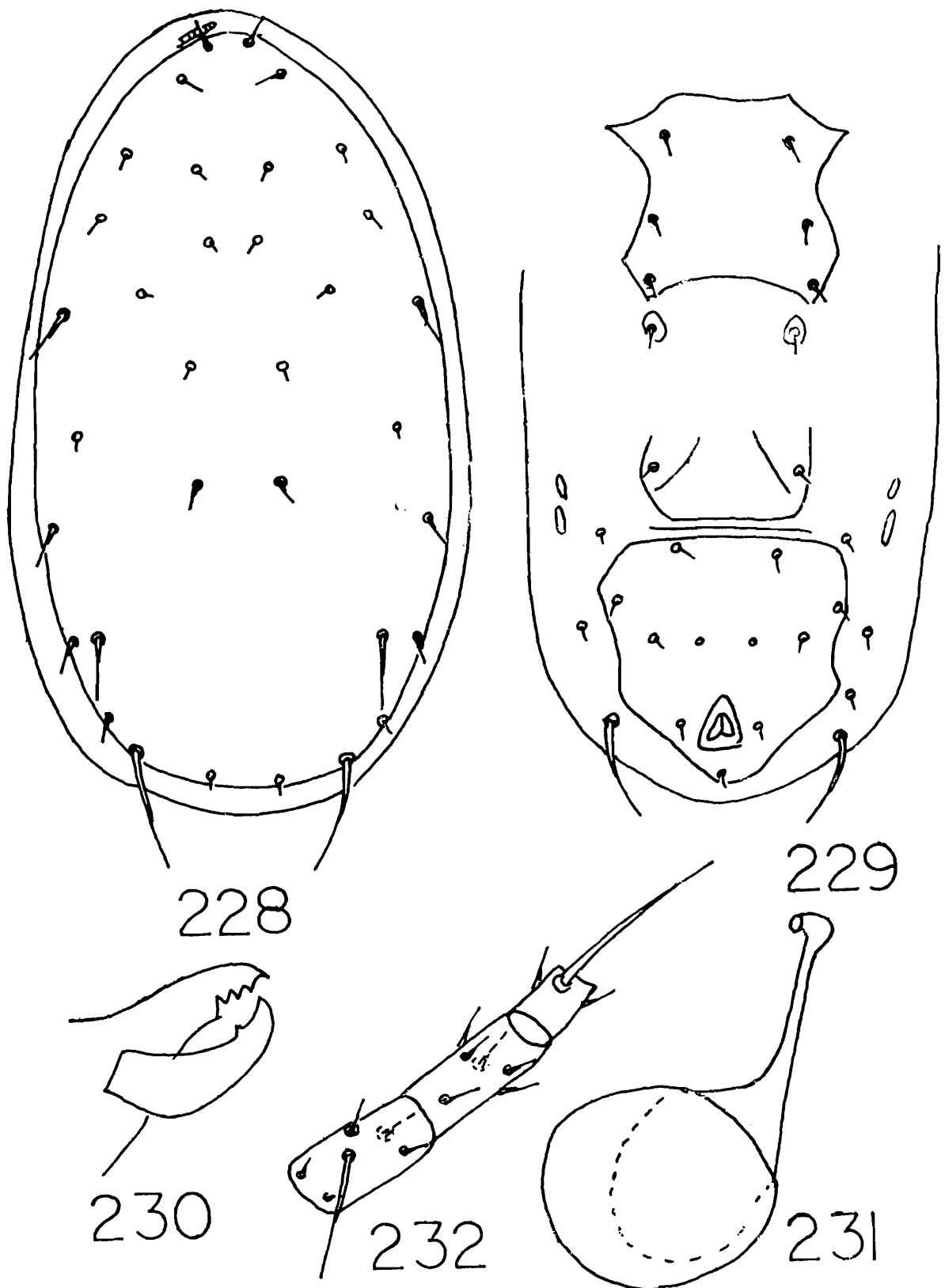
(Figs. 228-232)

1977. *Amblyseius cynodonae* Gupta, *Oriental Ins.*, 11 : 626-627.

*Female* : Dorsal shield 325 long, 180 wide. Peritreme extends anteriorly upto  $j_1$ . Dorsal setae short except  $Z_4$ ,  $Z_5$  and  $s_4$  which are longer, other setae short and pointed,  $Z_5$  shorter than distance between their bases,  $Z_4 > s_4 > j_3$ ,  $S_2 > S_4 > S_5$ . Measurements of setae :  $j_1$ -17,  $j_4$ - $j_6$ ,  $J_5$ -5 each,  $J_2$ -10,  $j_3$ -12,  $z_2$ ,  $z_4$ -10 each,  $s_4$ -25,  $Z_1$ -10,  $S_2$ -16,  $S_4$ -12,  $S_5$ -10,  $Z_5$ -67,  $z_5$ -7,  $Z_4$ -36,  $r_3$  and  $R_1$  on lateral integument. Sternal shield reticulate anteriorly with 3 pairs of sternal setae, 4th pair lie on distinct metasternal plates. Genital shield narrower than anterior width of ventrianal shield with a pair of setae. Ventrianal shield well sclerotized, weakly reticulate, as long (92) as wide, with 3 pairs of preanal setae and a pair of preanal pores, 4 pairs of setae present around ventrianal shield,  $JV_5$ -40 long, 2 pairs of metapodal plates present, primary one 25 long, a fold present between genital and ventrianal shields. Fixed digit of chelicera with 3 teeth anterior to *pilus dentilis*, movable digit with one tooth. Spermatheca as figured. Macrosetae on leg IV : genu-40, tibia-18, basitarsus-55. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Unknown.

*Habitat* : *Cynodon dactylon*.



Figs. 228-232. *Amblyseius (Neoseiulus) cynodonae* Gupta  
 228. Dorsal shield  
 229. Ventral surface  
 230. Chelicera (female)  
 231. Spermatheca  
 232. Genu, tibia and basitarsus of leg IV

*Type locality and repository* : Holotype ♀, India : Andaman Isl., Port Blair, South Point, on *Cynodon dactylon*, deposited in ZSI, Calcutta, Reg. No. 3384/17. Paratypes 3 ♀♀, same data as for holotype, Reg. No. 3385/17.

*Distribution* : India : Andaman Isl.

*Remarks* : This species is known only from its type. It differs from *A. (N.) ainu* Ehara (1967) in shape of spermatheca.

### 35. *Amblyseius (Neoseiulus) fallacis* (Garman)

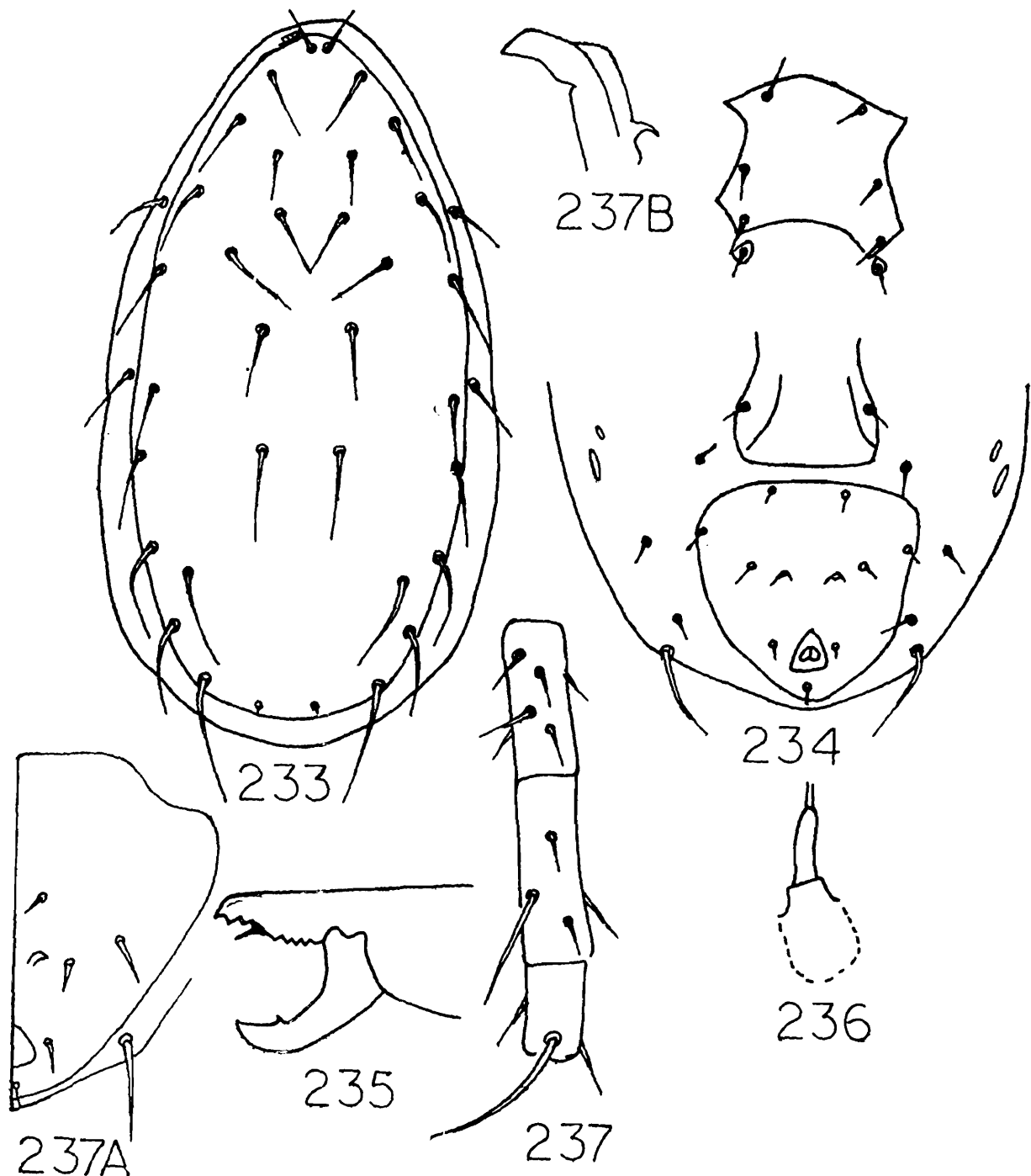
( Figs. 233-237, 237A, 237B)

1948. *Iphidulus fallacis* Garman, *Bull. Conn. Agr. Expt. Sta.*, 520 : 13.  
 1958. *Amblyseius fallacis* : Athias-Henriot, *Bull. Soc. Hist. Nat. Afr. Nord.*, 49 : 34.  
 1960. *Typhlodromus (Amblyseius) fallacis* : Narayanan, Kaur & Ghai, *Proc. Nat. Inst. Sci.*, 26 B(6) : 387-388.  
 1970. *Amblyseius fallacis* : Gupta, *Sci. & Cult.*, 36 : 98.  
 1971. *Amblyseius fallacis* : Gupta *et. al.*, *Sci. & Cult.*, 37 : 298.  
 1974. *Amblyseius fallacis* : Prasad, A catalogue of mites of India, p. 163-164.  
 1974. *Amblyseius fallacis* : Gupta, *Ent. Rec.*, 86 : 143.  
 1975. *Amblyseius fallacis* : Gupta, *Internat. J. Acarol.*, 1(2) : 36.  
 1977. *Amblyseius fallacis* : Gupta, *Oriental Ins.*, 11 : 629.  
 1977. *Amblyseius fallacis* : Gupta, *Indian J. Acar.*, 1 : 31-32.  
 1978. *Amblyseius fallacis* : Gupta, *Indian J. Acar.*, 2(2) : 62.  
 1978. *Neoseiulus fallacis* : Gupta, *Oriental Ins.*, 12 : 331.  
 1981. *Amblyseius fallacis* : Gupta & Nahar : *In Contrib. to Acar. in India*, p. 9.

*Female* : Dorsal shield 362 long, 163 wide, with 17 pairs of setae, mostly long ; setae on dorsal hexagonal area longer than the distance between their bases. Measurements of setae :  $j_1$ -23-24,  $j_4$ -40,  $j_5$ -40,  $j_6$ -40,  $J_2$ -45-50,  $J_5$ -11,  $j_3$ -40-60,  $z_2$ -35-45,  $z_4$ -35-45,  $s_4$ -45-55,  $Z_1$ -45-50,  $S_2$ -45-55,  $S_4$ -50-51,  $S_5$ -40-48,  $Z_5$ -68-76,  $z_5$ -23-29,  $Z_4$ -60-66,  $r_3$ -30-40,  $R_1$ -35-40 ; the latter two lie on lateral integument. Sternal shield smooth, posterior margin slightly concave, with 3 pairs of sternal setae, 4th pair lie on triangular metasternal plates. Genital shield normal, 70 wide, with a pair of setae. Ventrianal shield pentagonal, 120 long, 110 wide, with 3 pairs of preanal setae and a pair of crescentic pores, 4 pairs of setae present around ventrianal shield ; 2 pairs of metapodal plates present, primary one 18 long, accessory one 12 long. Fixed digit of chelicera multidentate with strong *pilus dentilis*, movable digit with one tooth. Spermatheca as illustrated. Peritreme extends anteriorly upto  $j_1$ . Macrosetae on leg IV : genu—17, tibia—32, basitarsus—50. Leg chaetotactic

formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{2}{1} \frac{1}{1} 1$ , genu III  $1 \frac{1}{1} \frac{2}{1} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Dorsal chaetotaxy as in female. Spermatophoral process as illustrated. Macroseta on basitarsus IV—58.



Figs. 233-237, 237A, 237B. *Amblyseius (Neoseiulus) fallacis* (Garman)

233. Dorsal shield

234. Ventral surface

235. Chelicera (female)

236. Spermatheca

237. Genu, tibia and basitarsus of leg IV

237A. Ventrianal shield (male)

237B. Spermatophoral process

*Habitat* : Seeds of sowank (*Echinichloa crusgalli*), grass, paddy, sarian tape, carrot, arum, *Musa*.

*Type locality and repository* : Holotype ♀, U. S. A., Connecticut, Brandford, on apple, deposited in connecticut Agr. Expt. Station, New Haven.

*Distribution* : India : Tamil Nadu, Punjab, Haryana, Assam, Tripura, West Bengal, Bihar ; outside India : Arizona, California, Caribbean Isl., North and Central America, Eastern Canada, Gulph, Ontario, British Columbia, Quebec, Montreal, Nova Scotia, Australia, Algeria.

*Remarks* : This species is wide spread and common on herbs, shrubs and trees as well as on soil surface. The Indian specimens have slightly shorter setae in comparison to the Californian ones. Though several authors as Herbert (1959), Schuster & Pritchard (1963), Burrell & McCormick (1964) and Poe & Enns (1969) conducted studies on biological and ecological aspects of this mite but their results are mostly incomplete (Tuttle & Muma, 1973). It is potentially important in this country as an effective predator and may prove useful if properly utilised.

### 36. *Amblyseius* (*Neoseiulus*) *fraterculus* Berlese

( Figs. 238-239 )

1917. *Amblyseius fraterculus* Berlese, *Redia*, 12 : 172.

1967. *Amblyseius fraterculus* : Ghai & Menon, *Oriental Ins.*, 1 : 70.

1974. *Amblyseius fraterculus* : Prasad, A catalogue of mites of India, p. 164.

1975. *Amblyseius fraterculus* : Gupta, *Internat. J. Acarol.*, 1(2) : 36-37.

*Female* : Dorsal shield with 17 pairs of setae.  $z_4 > z_2$ ,  $Z_5 > Z_4 > s_4$ ,  $Z_1 = S_2$ ,  $S_4 = S_5$ ,  $j_4-j_6$ ,  $J_2-J_5$ —very small. Sternal shield with 3 pairs of sternal setae, 4th pair on metasternal plate. Genital shield narrower than greatest width of ventrianal shield with a pair of setae. Ventrianal shield almost as long as broad, with 3 pairs of preanal setae and a pair of preanal pores little below the level of 3rd pair of preanal setae ; 4 pairs of setae present around ventrianal shield ; 1 pair of metapodal plates present. Macrosetae on leg IV present on genu, tibia and basitarsus.

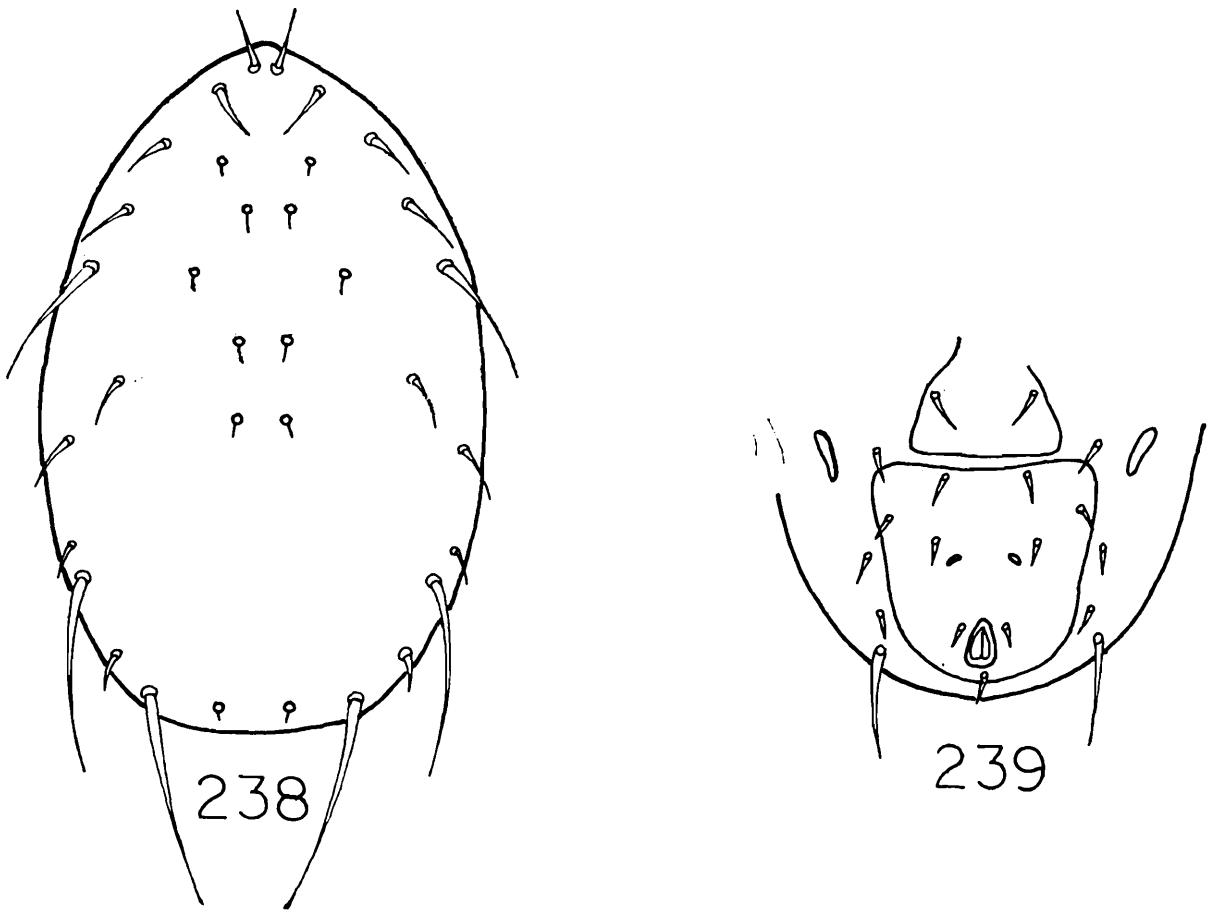
*Male* : Unknown.

*Habitat* : Red gram.

*Type locality and repository* : Holotype ♀, Argentina; La Plata, deposited in Berlese's Collection, Florence, (No. 8/36).

*Distribution* : India : Tamil Nadu ; outside India : Argentina.

*Remarks* : Ghai & Menon (1967) reported this species from Tamil Nadu. However, it was not available to the author for re-examination.



Figs. 238-239. *Amblyseius (Neoseiulus) fraterculus* Berlese (based on Chant, 1959)

238. Dorsal shield

239. Posterior ventral surface

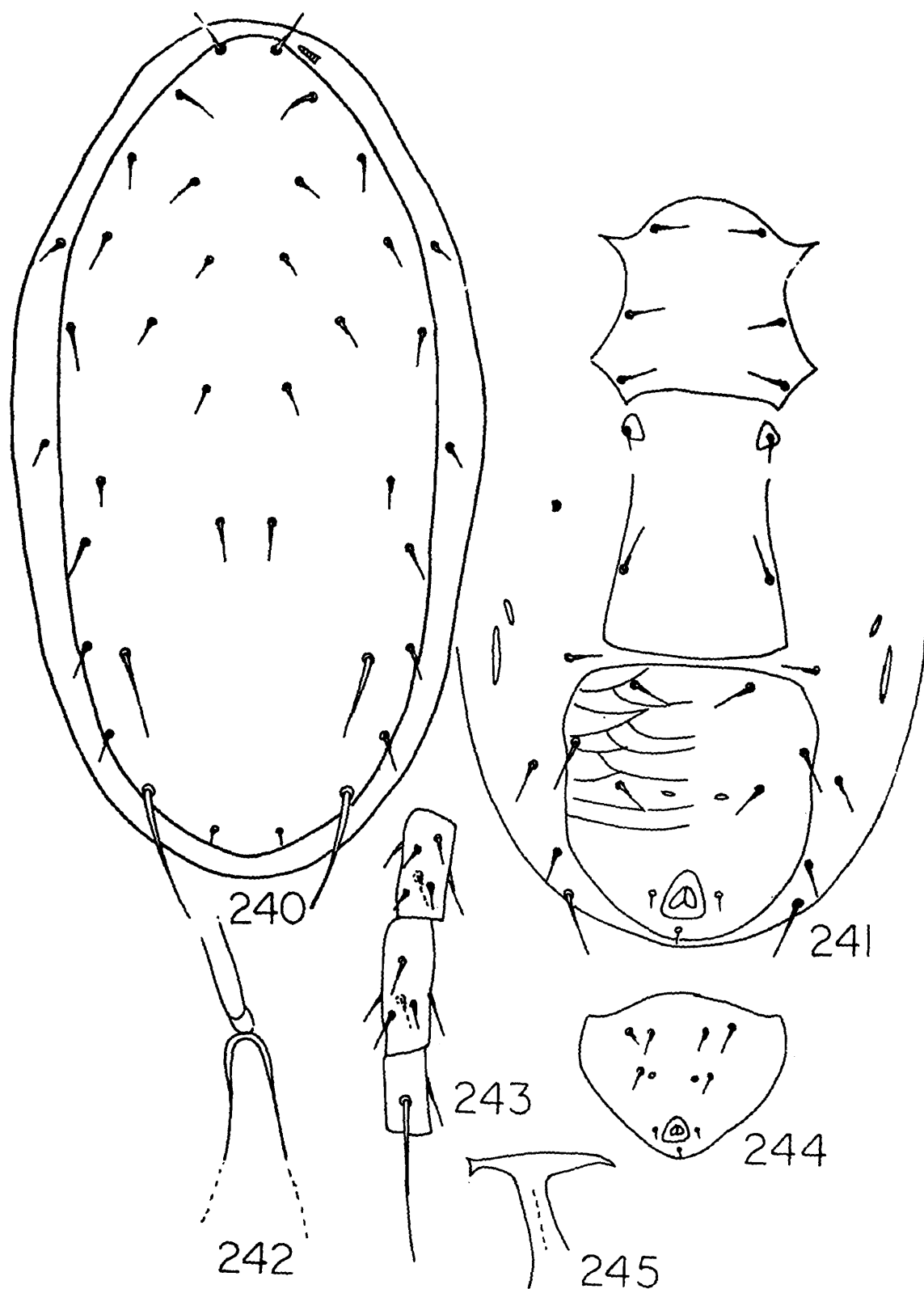
It is assumed that the identification of Ghai & Menon (1967) was correct and basing on that this species is included here. This identity needs re-checking as the occurrence of this species in India appears to be doubtful.

### 37 *Amblyseius (Neoseiulus) indicus* (Narayanan & Kaur)

( Figs. 240-245 )

1960. *Typhlodromus (Amblyseius) indicus* Narayanan & Kaur, *Proc. Indian Acad. Sci.*, 51 (B) : 2-5.
1970. *Amblyseius indicus* : Gupta, *Sci. & Cult.*, 36 : 98.
1973. *Amblyseius indicus* : Sandhu, Kaushal & Gupta, *Sci. & Cult.*, 39 : 226-227.
1974. *Amblyseius indicus* : Prasad, A catalogue of mites of India, p. 165-166.
1975. *Amblyseius indicus* : Gupta, *Internat. J. Acarol.*, 1(2) : 37.
1977. *Amblyseius indicus* : Gupta, *Indian J. Acar.*, 1 : 32.
1977. *Amblyseius bindrai* Gupta, *Indian J. Acar.*, 1 : 34-35. (new synonymy).

*Female* : Dorsal shield 324 long, 168 wide, with 17 pairs of setae,



Figs. 240-245. *Amblyseius (Neoseiulus) indicus* (Narayanan and Kaur)

- 240. Dorsal shield
- 241. Ventral surface
- 242. Spermatheca
- 243. Genu, tibia and basitarsus of leg IV
- 244. Ventrianal shield (male)
- 245. Spermatophoral process

Measurements of setae :  $j_1$ -18,  $j_4$ - $j_5$ -15-16 each,  $j_6$ ,  $J_2$ -21 each,  $J_5$ -11,  $j_3$ -22,  $z_2$ -16-20,  $z_4$ -16-20,  $s_4$ -20-22,  $Z_1$ -13-16,  $S_2$ -20-24,  $S_4$ -20-22,  $S_5$ -18-22,  $Z_5$ -48-56,  $z_5$ -16-18,  $Z_4$ -36-40,  $r_3$ ,  $R_1$ -14-16 each, the latter two lie on lateral integument. Sternal shield 85 long, 82 wide, with 3 pairs of sternal setae, metasternal plate with seta conspicuous. Genital shield 72 wide with a pair of setae. Ventrianal shield shaped as figured, reticulate, 115-120 long, 95-105 wide, with 3 pairs of preanal setae and a pair of preanal pores ; 4 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -40 long, 2 pairs of metapodal plates present, primary one 22-25 long. Fixed digit of chelicera tridentate with strong *pilus dentilis*, movable digit unidentate. Peritreme terminates little before  $j_1$ . Spermatheca as figured. Macroseta on basitarsus IV-60-66 long. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Dorsal chaetotaxy similar to that of female. Spermatophoral process and ventrianal shield as figured.

*Habitat* : *Gnorimoschema operculella* infested potato, *Zea mays*, wheat, carrot, brinjal.

*Type locality and repository* : Holotype ♀, India, New Delhi, from *Gnorimoschema operculella* infested potato feeding on *Tyrophagus putrescentiae*, deposited in NPC, IARI, New Delhi. Paratypes 11 ♀ ♀, 4 ♂ ♂, same data as for holotype, deposited in NPC, IARI.

*Distribution* : India : New Delhi, West Bengal, Punjab.

*Remarks* : The types of *A. (N.) bindrai* Gupta and *A. (N.) indicus* (Narayanan & Kaur) were re-examined and the author was more than convinced that both are the same species and, hence, the former is treated here as synonym for the latter. Though the dorsal setae of *A. (N.) bindrai* are relatively shorter but the spermatheca of both the species bear marked similarities and, therefore, the difference in relative length of dorsal chaetotaxy is overlooked considering it as a case of variation.

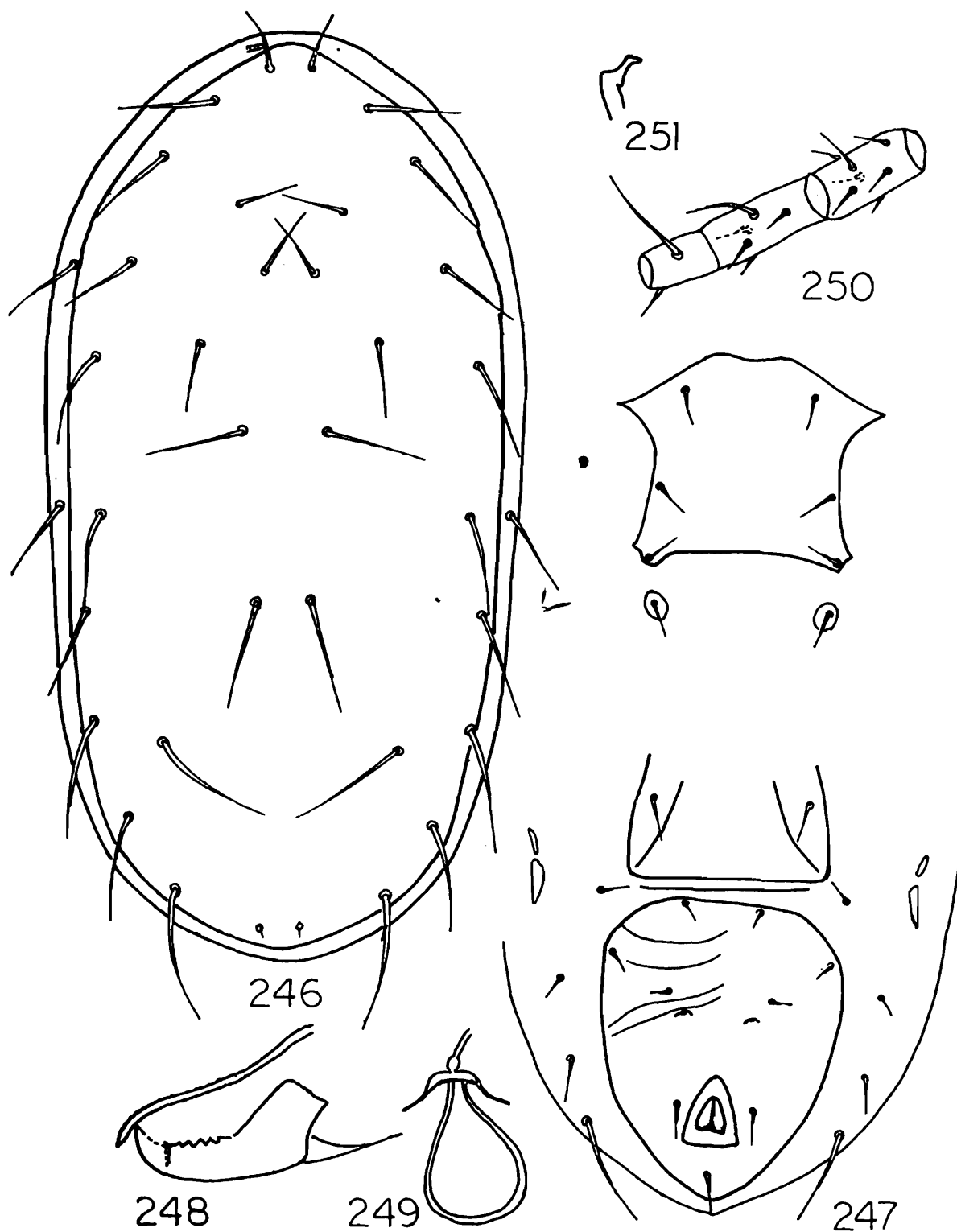
### 38. *Amblyseius (Neoseiulus) imbricatus* Corpuz & Rimando

(Figs. 246-251)

1966. *Amblyseius imbricatus* Corpuz & Rimando, *Philipp. Agr.*, 50 : 127.

*Female* : Dorsal shield smooth, 292 long, 210 wide, with 17 pairs of setae. Measurements of setae :  $j_1$ -33,  $j_4$ -31,  $j_5$ -33,  $j_6$ -44,  $J_2$ -59,  $J_5$ -13,  $j_3$ -51,  $z_2$ -49,  $z_4$ -49,  $s_4$ -56,  $Z_1$ -56,  $S_2$ -58,  $S_4$ -60,  $S_5$ -60,  $Z_5$ -80,  $z_5$ -35,  $Z_4$ -47,  $r_3$ -47,  $R_1$ -49, the latter two lie on lateral integument.

Sternal shield 89 long, 72 wide, postlateral angulation present, with 3 pairs of sternal setae, roundish metasternal plates with seta present.



Figs. 246-251. *Amblyseius (Neoseiulus) imbricatus* Corpuz and Rimando  
 246. Dorsal shield  
 247. Ventral surface  
 248. Chelicera (female)  
 249. Spermatheca  
 250. Genu, tibia and basitarsus of leg IV  
 251. Spermatophoral process

Genital shield 92 wide with a pair of setae. Ventrianal shield shaped as figured, reticulate, 132 long, 100 wide, with 3 pairs of preanal setae and a pair of crescentic pores, 4 pairs of setae present around ventrianal shield,  $JV_5$ -60 long, 2 pairs of metapodal plates present, primary one 22 long, accessory one 13 long. Fixed digit of chelicera with 3-4 teeth anterior to strong *pilus dentilis*, 3-4 teeth posterior to it, dentition on movable digit probably two. Spermatheca as figured. Peritreme extends anteriorly upto  $j_1$ . Macrosetae on leg IV : genu-38, tibia-40, basitarsus-67

*Male* : Dorsal chaetotaxy similar to that of female. Ventrianal shield imbricate. Spermatophoral process as figured.

*Habitat* : Paddy.

*Type locality and repository* : Holotype ♀, Philippines, Los Banos, Laguna, on *Oryza sativa*, deposited in Dept. of Entomology, University of Philippines. Paratypes 5 ♀ ♀, same data and repository as for holotype ; 1 ♀, Laguna, on *Asparagus plumosus* ; 1 ♀ *Tuguegarao*, on paddy, all in Dept. of Ento., Univ. Philippines.

*Distribution* : India : Karnataka ; outside India : Philippines, Thailand.

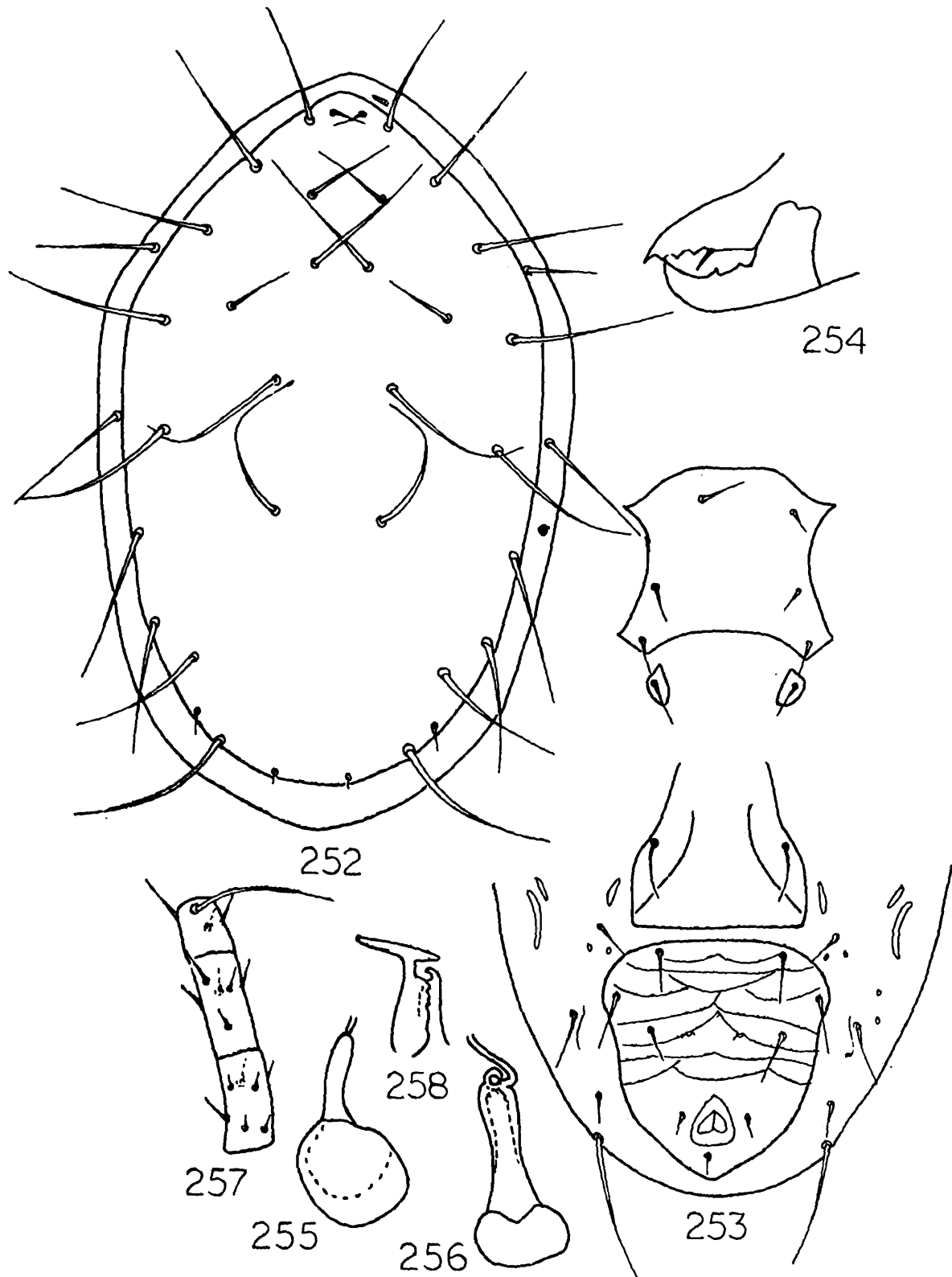
*Remarks* : Earlier, this species was known from Philippines and Thailand and from India this is the first record. Indian specimens showed no marked variation from Philippines and Thailand material.

### 39. *Amblyseius (Neoseiulus) longispinosus* (Evans)

( Figs. 252-258 )

1952. *Typhlodromus longispinosus* Evans, *Ann. Mag. Nat. Hist.*, (12) 5 : 413-416.  
 1953. *Typhlodromus longispinosus* : Evans, *Ann. Mag. Nat. Hist.*, (12)6 : 449.  
 1970. *Amblyseius longispinosus* : Gupta, *Sci. & Cult.*, 36 : 98.  
 1974. *Amblyseius longispinosus* : Prasad, A catalogue of mites of India, p. 167.  
 1975. *Amblyseius longispinosus* : Gupta, *Internat. J. Acarol.*, 1(2) : 38.  
 1977. *Amblyseius longispinosus* : Gupta, *Oriental Ins.*, 11 : 631.  
 1978. *Neoseiulus longispinosus* : Gupta, *Oriental Ins.*, 12 : 334-335.  
 1978. *Amblyseius longispinosus* : Gupta, *Indian J. Acar.*, 2(2) : 66.  
 1979. *Amblyseius longispinosus* : Gupta, First All India Symp. Acar., p. 6.  
 1981. *Amblyseius longispinosus* : Gupta & Nahar : *In Contrib. to Acar. in India* : p. 9.  
 1982. *Amblyseius longispinosus* : Gupta, *Indian J. Acar.*, 6: 25.

*Female* : Dorsal shield 325 long, 180 wide, smooth, with 17 pairs of setae mostly long except  $j_1$ ,  $J_5$  and  $S_5$  which are smaller. Measurements of setae :  $j_1$ -16-20,  $j_4$ -54-62,  $j_5$ -67-72,  $j_6$ -72,  $J_2$ -71-81,



Figs- 252-258. *Amblyseius (Neoseiulus) longispinosus* (Evans)  
 252. Dorsal shield  
 253. Ventral surface  
 254. Chelicera (female)  
 255, 256. Spermathecae  
 257. Genu, tibia and basitarsus of leg IV  
 258. Spermatophoral process

$J_5$ -7-10,  $j_3$ -50-60,  $z_2$ -69,  $z_4$ -70-76,  $s_4$ -80-82,  $Z_1$ -73-76,  $S_2$ -76-78,  $S_4$ -59-61,  $S_5$ -18,  $Z_5$ -78-80,  $z_5$ -31-36,  $Z_4$ -63-69,  $r_3$ -58,  $R_1$ -67. Sternal shield 78 long, 67 wide, smooth, with 3 pairs of sternal setae, posterior margin gently concave, 4th pair of sternal setae lie on large metasternal plates. Genital shield 72 wide, with a pair of long setae. Ventrianal shield triangular, 107-116 long, 90-95 wide, reticulate, with 3 pairs of long preanal setae and a pair of semilunar preanal pores, 4 pairs of setae present around ventrianal shield,  $JV_5$ -67 long, 2 pairs of metapodal plates present, primary one 22 long, accessory one 9 long, small platelets also present around ventrianal shield. Spermatheca as figured. Fixed digit of chelicera with 3 teeth anterior to *pilus dentilis*, movable digit with 2 sharp teeth. Peritreme extends anteriorly upto  $j_1$ . Macrosetae on leg IV : basitarsus-60-70 long. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{2}{1} \frac{1}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Dorsal chaetotaxy similar to that of female. Spermatophoral process as figured. Macroseta on basitarsus IV-56.

*Habitat* : *Datura* sp. feeding on *Tetranychus* sp.

*Tabernaemontana coronaria*, *Bauhinia purpuria*, castor, *Zinia* sp., lady's finger, paddy, guava, rose, *Datura metel*.

*Type locality and repository* : Holotype ♀, Indonesia on *Manihot untillisima*, deposited in BM (NH).

*Distribution* : India : West Bengal, Orissa, Bihar, Tamil Nadu, Pondicherry, Andaman Nicobar Isl., Uttar Pradesh ; outside India : Philippines, Taiwan, Indonesia, South America, Tasmania, Malayasia, Japan (Hokkaido, Honshu, Shikoku, Kyushu, Amumi-Oshima Isl., Okinawa Isl.), Hong Kong, Malaya, Hawaii, New Zealand, Jamaica.

*Remarks* : This species is fairly wide spread in distribution. Not much of variation is seen either in dorsal setal length or in shape of spermatheca. This is rated as one of the most efficient predators of tetranychid mites. Often fully fed females assume reddish colour. Mallik (1974) worked on the predatory efficiency of this mite on *Tetranychus ludeni* Zacher. Mallik & ChannaBasavanna (1983) studied the life table of this mite recording the following data : intrinsic rate of natural increase—0.41, rate of multiplication—53.27, mean generation time—9.69 and finite rate of increase—1.51.

40. *Amblyseius (Neoseiulus) paspalivorus* (De Leon)

( Figs. 259-263 )

1957. *Typhlodromus paspalivorus* De Leon, *Fla. Ent.*, 40 : 143-144.  
 1970. *Amblyseius lula* : Gupta, *Sci. & Cult.*, 36 : 98. (misidentification).  
 1974. *Amblyseius lula* : Prasad, A catalogue of mites of India, p. 167.  
 1984. *Amblyseius (Neoseiulus) paspalivorus* : Ghai & Gupta, *Bull. Zool. Surv. India*, 6 (1-3) : 173-174.

*Female* : Dorsal shield elongated, narrow, faintly imbricate, 408 long, 193 wide, with 17 pairs of setae ;  $j_1 = j_3^9 > z_2 > z_4$ ,  $s_4 > j_3$ ,  $S_4 > S_5$ ,  $S_2 > Z_1$ . Measurements of setae :  $j_1$ -11,  $j_4$ -11,  $j_5$ -12,  $j_6$ -11,  $J_2$ -8-12,  $J_5$ -7-10,  $j_3$ -11.12,  $z_2$ -10-11,  $z_4$ -11,  $s_4$ -11-15,  $Z_1$ -11-13,  $S_2$ -12-16,  $S_4$ -20-30,  $S_5$ -20-30,  $Z_5$ -60-80,  $z_5$ -11,  $Z_4$ -20-25,  $r_3$ -9 ;  $r_3$  and  $R_1$  on lateral integument. Sternal shield 100-107 long, 67-74 wide, with 3 pairs of sternal setae, postlateral angulation present, 4th pair of sternal setae lie on metasternal plates. Genital shield 72-78 wide, with a pair of genital setae. Ventrianal shield 123-134 long, 90-110 wide, imbricate, with 3 pairs of small preanal setae and a pair of round preanal pores below the level of 3rd pair of preanal setae ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -25-29 long ; 2 pairs of metapodal plates present, primary one 33 long. Peritreme extends anteriorly upto  $j_1$ . Fixed digit of chelicera with 3 teeth anterior to *pilus dentilis* and one tooth posterior to it, movable digit without sharp tooth. Spermatheca as figured. Macroseta on basitarsus IV : 35-44 long. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

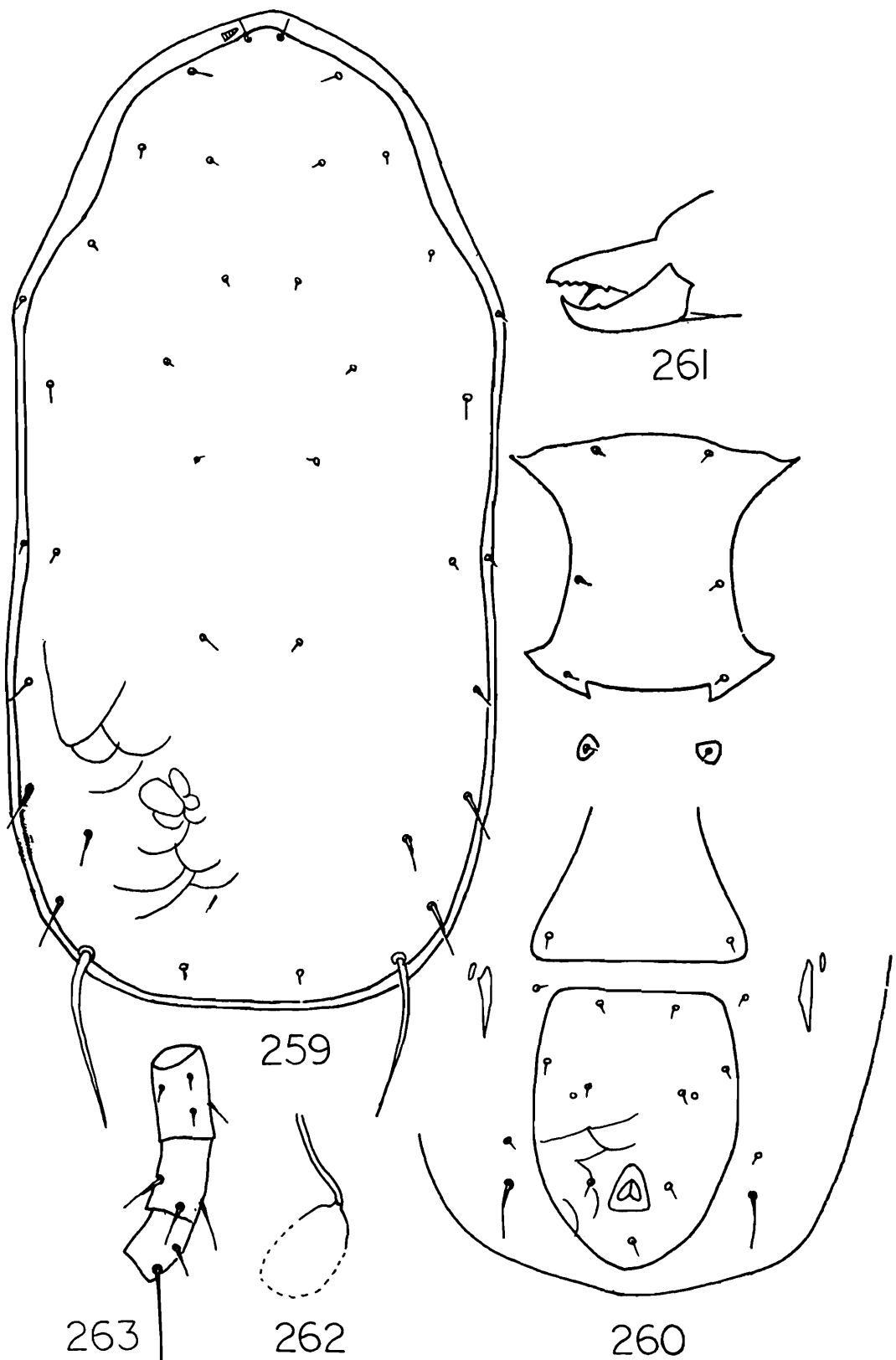
*Male* : Unknown.

*Habitat in India* : *Salix elegans*, malformed mango inflorescence, paddy.

*Type locality and repository* : Holotype ♀, U. S. A. : Florida, Coral Gables, on *Paspalum* sp., deposited in Museum of Comparative Zoology, Harvard University, Massachusetts. Paratypes ♀ ♀, same data as for holotype, deposited in University of Florida, Gainesville.

*Distribution* : India : West Bengal, Rajasthan, Andhra Pradesh. outside India : Florida, Jamaica, Philippines.

*Remarks* : Two specimens, one collected from Andhra Pradesh and the other from Rajasthan, were examined but dorsal setae specially  $S_4$  and  $S_5$  and basitarsal macroseta showed a marked variation from the type material as to their lengths.



Figs. 259-263. *Amblyseius (Neoseiulus) paspalivorus* (DeLeon)

259. Dorsal shield

260. Ventral surface

261. Chelicera (female)

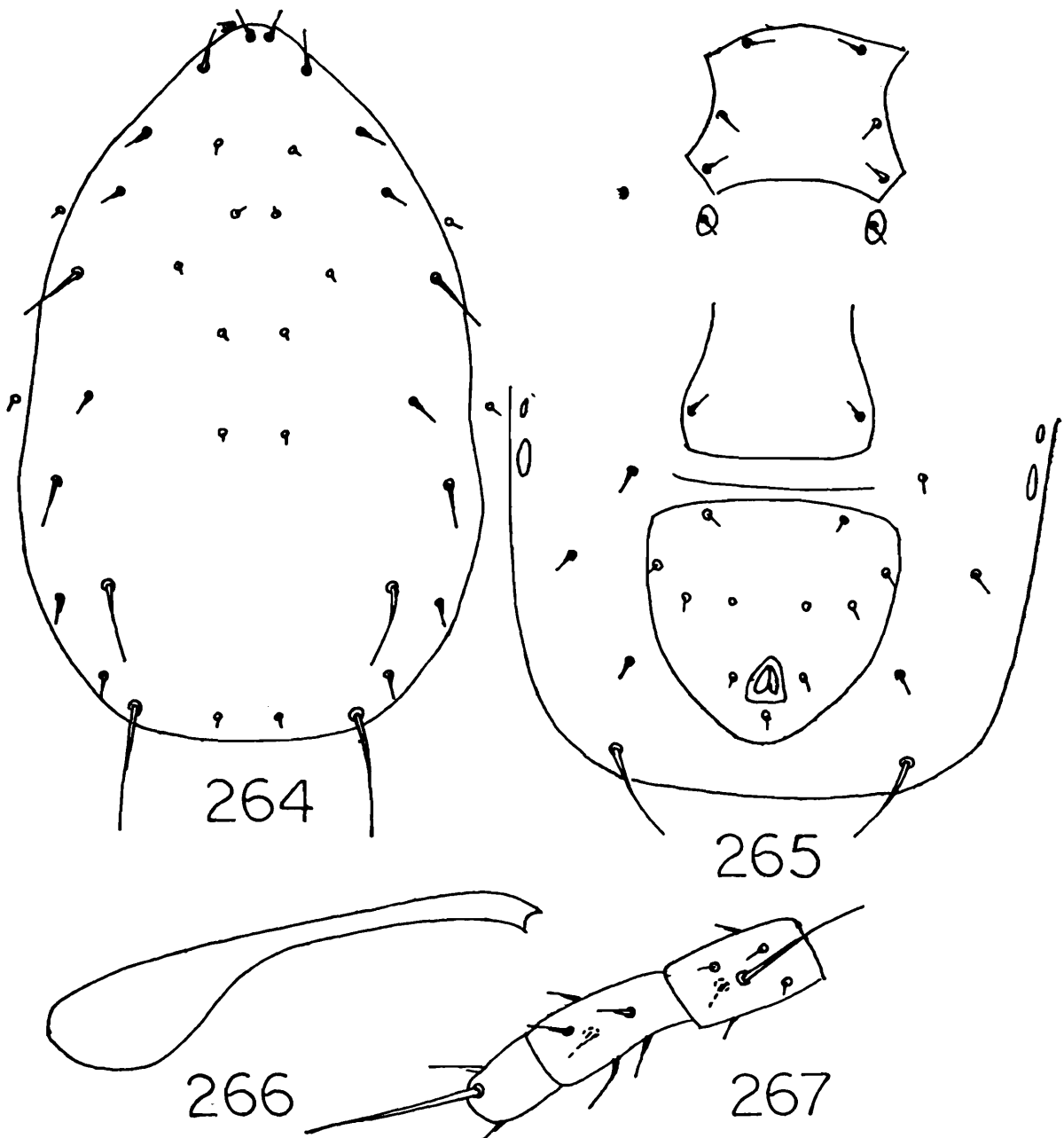
262. Spermatheca

263. Genu, tibia and basitarsus of leg IV

41. *Amblyseius (Neoseiulus) rangatensis* Gupta  
( Figs. 264-267 )

1977. *Amblyseius rangatensis* Gupta, *Oriental Ins.*, 11 : 632-633.

*Female* : Dorsal shield 316 long, 200 wide, smooth, with 17 pairs of setae, mostly short, except  $s_4$ ,  $Z_4$ ,  $Z_5$  which are longer. Measurements of setae :  $j_1$ -16,  $j_4$ - $j_6$ ,  $J_2$ -7 each,  $j_3$ -20,  $z_2$ ,  $z_4$ -16 each,  $s_4$ -32,  $Z_1$ ,  $S_4$ ,  $S_5$ -10-12 each,  $S_2$ -24,  $Z_5$ -60 (weakly serrate),  $Z_4$ -40 (smooth),  $r_3$ ,  $R_1$ -10-12 each, both on lateral integument. Sternal shield 80 long,



Figs. 264-267. *Amblyseius (Neoseiulus) rangatensis* Gupta  
264. Dorsal shield  
265. Ventral surface  
266. Spermatheca  
267. Genu, tibia and basitarsus of leg IV

60 wide, well sclerotized, with 3 pairs of sternal setae, metasternal plates with seta distinct. Genital shield 72 wide with a pair of setae. Ventrianal shield triangular, 100 long, 92 wide, with 3 pairs of preanal setae, a pair of round preanal pores present almost at the level of 3rd pair of preanal setae ; 4 pairs of setae present around ventrianal shield,  $JV_5-44$  long ; 2 pairs of metapodal plates present. Fixed digit of chelicera with 2 teeth, movable digit with one tooth. Peritreme extends anteriorly beyond  $j_1$ . Macrosetae on leg IV : genu-51, tibia-nil, basitarsus-67. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Unknown.

*Habitat* : Brinjal.

*Type locality and repository* : Holotype ♀, India : Andaman Isls., Yerata, on brinjal, deposited in ZSI, Calcutta, Reg. No. 3387/17. Paratype 1 ♀, same data as for holotype.

*Distribution* : India : Andaman Isl.

*Remarks* : This species is known only from its types.

#### Subgenus *Paraphytoseius* Swirski & Shechter

1961. *Paraphytoseius* Swirski & Shechter, *Israel J. agric. Res.*, 11 : 113.  
 1962. *Amblyseius (Ptenoseius)* Pritchard & Baker, *Hilgardia*, 33 : 295.  
 1963. *Ptenoseius* : Schuster & Pritchard, *Hilgardia*, 34(7) : 198.  
 1965. *Paraphytoseius* : De Leon, *Fla. Ent.*, 48(2) : 130.  
 1966. *Ptenoseius* : Corpuz & Rimando, *Philip Agr.*, 50 : 115.  
 1966. *Paraphytoseius* : De Leon : Allen Press Inc, Kansas, p. 17.  
 1975. *Paraphytoseius* : Denmark & Muma, *J. Agr. Univ. Puerto Rico*, 59(4) : 283.  
 1976. *Paraphytoseius* : Blommers, *Bijdragen Tot de Dierkunde*, 46(1) : 87.  
 1977. *Amblyseius (Paraphytoseius)* : Ehara & Bhandhufalck, *J. Fac. ed. Tottori. Univ.*, 27(2) : 78.  
 1981. *Paraphytoseius* : Matthyse & Denmark, *Fla. Ent.*, 64(2) : 342.

*Diagnosis* : Dorsal shield smooth, moderately sclerotized with 5 pairs of setae on dorsocentral series, 2 pairs of median and 6-7 pairs of lateral ; 2 pairs of sublateral setae present on lateral integument. Setae  $j_1$ ,  $j_3$ ,  $s_4$ ,  $Z_5$ ,  $Z_4$ ,  $r_3$  and  $R_1$  being long, thick and serrate. Sternal shield with 3 pairs of sternal setae. Ventrianal shield with 3 pairs of preanal setae. Leg IV macrosetae on genu, tibia and basitarsus, mostly spatulate or knobbed.

*Type* : *Paraphytoseius multidentatus* Swirski & Shechter, 1961 (by designation ).

*Key to the species of subgenus Paraphytoseius*

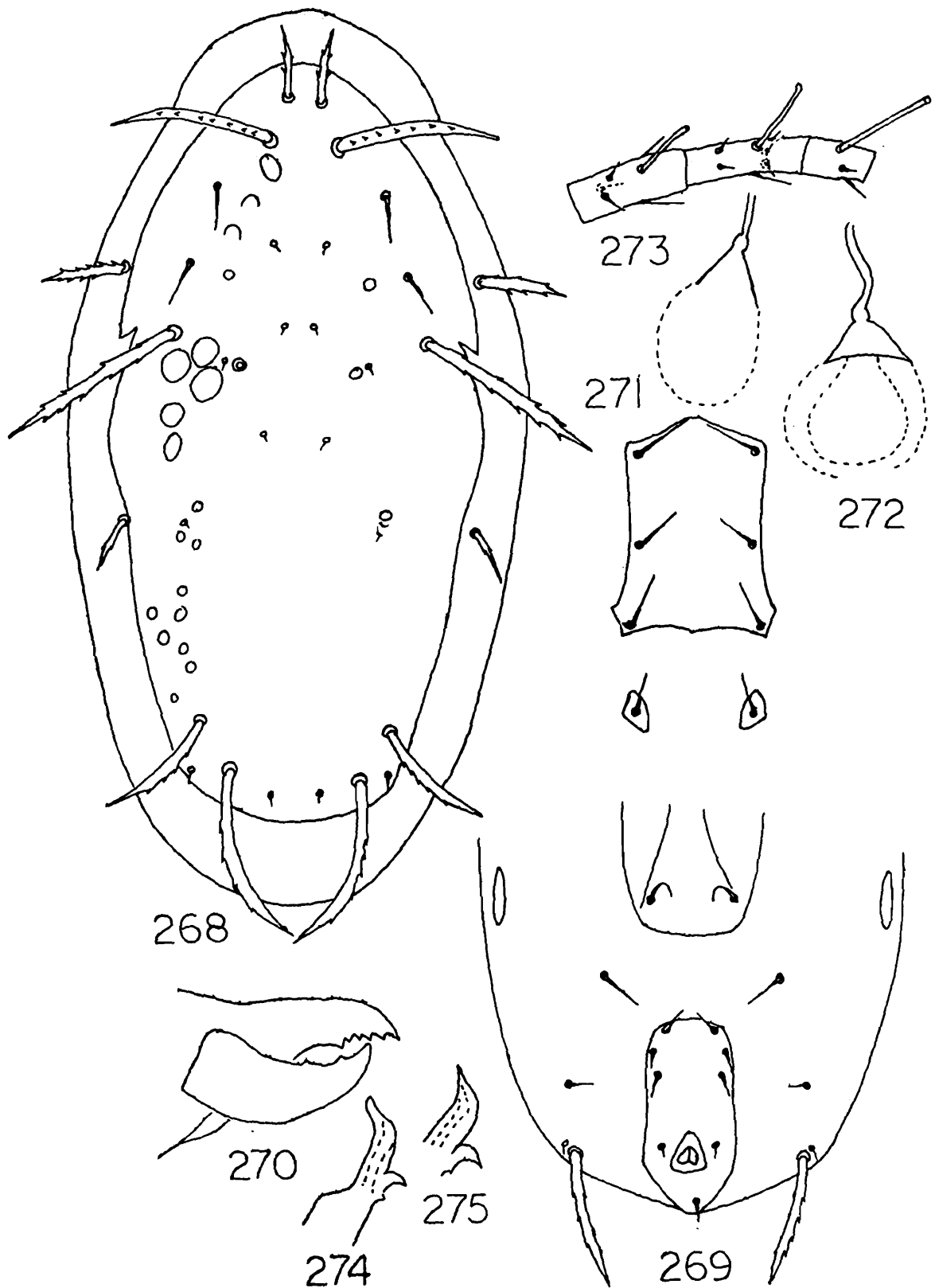
- |  |     |     |                      |
|--|-----|-----|----------------------|
| 1. z <sub>2</sub> and z <sub>4</sub> serrate | ... | ... | <i>scleroticus</i>   |
| — z <sub>2</sub> and z <sub>4</sub> smooth   | ... | ... | <i>multidentatus</i> |

**42. *Amblyseius (Paraphytoseius) multidentatus* (Swirski & Shechter)**

( Figs. 268-275 )

1960. *Typhlodromus (Amblyseius) orientalis* Narayanan, Kaur & Ghai, *Proc. Nat. Inst. Sci.*, 26 B : 394. [Preoccupied by *Amblyseius (Amblyseius) orientalis* Ehara.]
1961. *Paraphytoseius multidentatus* Swirski & Shechter, *Israel J. agric. Res.*, 11 (2) : 114-116.
1967. *Amblyseius (Paraphytoseius) narayanani* Ehara & Ghai, *Mushi*, 40 (6) : 77.
1969. *Amblyseius bhadarakaliensis* Gupta, *Bull. Ent., Ent. Soc. India*, 10 : 127-128.
1970. *Amblyseius horrififer* : Gupta, *Sci. & Cult.*, 36 : 98 (misidentification).
1974. *Amblyseius bhadrakaliensis* : Prasad, A catalogue of mites of India, p. 161-162.
1974. *Amblyseius horrififer* : Prasad : A catalogue of mites of India : p. 165.
1974. *Amblyseius narayanani* : Prasad : A catalogue of mites of India : p. 168.
1975. *Amblyseius bhadrakaliensis* : Gupta, *Internat. J. Acarol.*, 1(2) : 37.
1975. *Amblyseius horrififer* : Gupta, *Internat. J. Acarol.*, 1(2) : 37.
1975. *Amblyseius narayanani* : Gupta, *Internat. J. Acarol.*, 1(2) : 39.
1977. *Amblyseius nicobarensis* Gupta, *Oriental Ins.*, 11 : 631-632.
1977. *Amblyseius bhadrakaliensis* : Gupta, *Oriental Ins.*, 11 : 626.
1978. *Amblyseius bhadrakaliensis* : Gupta, *Indian J. Acar.*, 2(2) : 61.
1979. *Paraphytoseius (Paraphytoseius) bhadrakaliensis* : Gupta, *Bull. Zool. Surv. India*, 2(1) : 81-82.
1979. *Paraphytoseius multidentatus* : Gupta, *Bull. Zool. Surv. India*, 2(1) : 80.
1981. *Amblyseius (Paraphytoseius) bhadrakaliensis* : Gupta & Ray, *Bull. Zool. Surv. India*, 4 : 45.
1981. *Amblyseius (Paraphytoseius) nicobarensis* : Gupta & Ray, *Bull. Zool. Surv. India*, 4 : 45-46.
1981. *Amblyseius (Paraphytoseius) multidentatus* : Gupta & Ray, *Bull. Zool. Surv. India*, 4(3) : 43-44.
1981. *Amblyseius (Paraphytoseius) bhadrakaliensis* : Gupta & Nahar, *In Contrib. to Acar. in India*, p. 10.
1981. *Paraphytoseius bhadrakaliensis* : Gupta, *Indian J. Acar.*, 5(1-2) : 47.
1981. *Paraphytoseius bhadrakaliensis* : Matthyse & Denmark, *Fla. Ent.*, 64(2) : 342.
1981. *Amblyseius (Paraphytoseius) bhadrakaliensis* : Gupta & Ray, *Bull. Zool. Surv. India*, 4(3) : 279.
1981. *Amblyseius (Paraphytoseius) narayanani* : Gupta & Ray, *Bull. Zool. Surv. India*, 4 : 279.
1982. *Amblyseius bhadrakaliensis* : Gupta, *Rec. zool. Surv. India*, 79 (3-4) : 370.
1982. *Paraphytoseius horrififer* : Gupta, *Indian J. Acar.*, 6 : 27.

*Female* : Dorsal shield rugose, somewhat elongate, incised at the level of s<sub>4</sub> ( in some specimens incision not apparent ), 285-300 long, 150-160 wide, with 13-14 pairs of setae ( S<sub>5</sub>-a fine seta associated with Z<sub>5</sub> may be present or absent ); setae j<sub>1</sub>, j<sub>3</sub>, s<sub>4</sub>, Z<sub>5</sub>,



Figs. 268-275. *Amblyseius (Paraphytoseius) multidentatus* (Swirski and Shechter)  
 268. Dorsal shield  
 269. Ventral surface  
 270. Chelicera (female)  
 271, 272. Spermathecae  
 273. Genu, tibia and basitarsus of leg IV  
 274, 275. Spermatophoral processes

$Z_4$  being long, thick and serrate measuring respectively, 30-36, 78-88, 115-120, 85-100, 70-82 ; other setae measure between 6-9 each,  $r_3$ -42-49,  $R_1$ -27-40. Sternal shield 90 long, 78 wide, with 3 pairs of sternal setae ; 4th pair lie on metasternal plates. Genital shield 78-80 wide with a pair of setae. Ventrianal shield 80-92 long, 60-70 wide, with 3 pairs of preanal setae ; 3 pairs of setae present around ventrianal shield,  $JV_5$ -65-75 long, serrate ; a pair of large metapodal plates present. Fixed digit of chelicera multidentate, movable digit with 2 teeth. Spermatheca as figured. Peritreme extends anteriorly upto  $j_3$ . Macrosetae on leg IV : genu-25-31, tibia-35-40, basitarsus-40-49, distitarsus-40-48, all with knobbed tip. Leg chaetotactic formula : genu II 2  $\frac{2}{0}$   $\frac{2}{0}$  1, tibia II 1  $\frac{1}{1}$   $\frac{2}{1}$  1, genu III 1  $\frac{2}{1}$   $\frac{2}{0}$  1, tibia III 1  $\frac{1}{1}$   $\frac{2}{1}$  1.

*Male* : Dorsal chaetotaxy similar to that of female. Spermatophoral process as figured. Macrosetae on leg IV : genu-11-13, tibia 15-24, basitarsus 23-31, distitarsus-21-24.

*Type locality and repository* : Holotype ♀, Hong Kong, on *Bambusa* sp., deposited in Dept. of Entomology, National Institute of Agriculture, Rehovot, Israel. Paratypes 2 ♀ ♀, Hong Kong, on *Jasminum* sp. ; 1 ♀, on Pomelo ; 1 ♀, on *Ageratum houstonianum* ; 1 ♀, on *Urena lobata* ; 1 ♀, on *Cyclosorus subtescens*, all in Dept. of Entomology, National University Institute of Agriculture, Israel.

*Habitat* : *Datura metel*, paddy, *Cajanus cajan*, *Rubus* sp., brinjal, banana, pear, beans, rose, tea eucalyptus, sunflower, cashewnut, brinjal, fern, *Shorea robusta*, *Albizia lucida*, *Ipomoea*, cotton, *Eupatorium odoratum*, *Polygonum* sp., *Hibiscus mutabilis*.

*Distribution* : India : Tripura, Maharashtra, West Bengal, Andaman and Nicobar Isl., Bihar, Meghalaya, Assam, Tamil Nadu, Karnataka, Andhra Pradesh, Uttar Pradesh ; outside India : Hong Kong, Thailand, Malagassy, Nigeria, Madagascar.

*Remarks* : According to Matthyse & Denmark (1981), this subgenus is monotypic and they synonymised with *multidentatus* all the ten species known till then, viz. *horrifer* Pritchard & Baker, 1962 ; *santurcensis* DeLeon, 1967 ; *narayanani* Ehara & Ghai (in Ehara, 1967a) ; *parabilis* Chaudhri, 1967 ; *urumanus* Ehara, 1967a ; *bhadrakaliensis* Gupta, 1969b, *subtropicus* Tseng, 1972 ; *hyalinus* Tseng, 1973 ; *cracentis* Corpuz & Rimando, 1966 and *nicobarensis* Gupta, 1977c. Some characters as the presence and absence of a fine pair of setae ( $S_5$  of author) and presence and absence of notch associated with  $s_4$  confused the taxonomists and on the basis of presence and

absence of these characters they described several species. However, Matthyse & Denmark (1981) stated that these two characters are highly variable and notch associated with  $s_4$  may be present on one side and absent on the other. Therefore, they considered these characters as variable characters. The present author also subscribes to this view and treats *bhadrakaliensis*, *horrifer*, *narayanani* and *nicobarensis* reported from India under this subgenus as synonyms for *multidentatus*. However, the other known species under this subgenus, viz. *scleroticus* Gupta & Ray, which was not considered for establishing synonymy by Matthyse & Denmark (1981), is a distinct valid species differing from *multidentatus* in having serrated  $z_2$  and  $z_4$ , in relative length of  $Z_5$  and  $Z_4$  and in shape of ventrianal shield and spermatheca.

#### 43. *Amblyseius* (*Paraphytoseius*) *scleroticus* Gupta & Ray

( Figs. 276-279 )

1981. *Amblyseius* (*Paraphytoseius*) *scleroticus* Gupta & Ray, *Bull. Zool. Surv. India*, 4 : 42-43.

*Female* : Dorsal shield reticulate, 260 long, 135 wide, with 14 pairs of setae ;  $j_1$ ,  $j_3$ ,  $s_4$ ,  $z_2$ ,  $Z_5$ ,  $z_4$ ,  $S_4$  and  $r_3$  being long, thick and serrate ;  $R_1$  also serrate, 4 pairs of pores present on dorsal shield, the pair associated with  $z_5$  largest. Dorsal shield incised at the level of  $s_4$ . Measurements of setae :  $j_1$ -25,  $j_4$ - $j_6$ -8 each,  $J_5$ -4,  $j_3$ -56,  $z_2$ -11,  $z_4$ -20,  $s_4$ -69,  $Z_1$ -9,  $S_5$ -11,  $Z_5$ -77,  $z_5$ -7,  $Z_4$ -53,  $r_3$ -25,  $R_1$ -16. Sternal shield smooth, 90 long, 72 wide, posterior margin concave, with 3 pairs of sternal setae, 4th pair of setae lie on metasternal plates. Genital shield 69 wide with a pair of setae. Ventrianal shield 90 long, 50 wide, lateral margins concave, anterior margin rounded with 3 setae on one side and 2 setae on the other side ; 4 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -56 long, (serrate), one pair of metapodal plates also present. Spermatheca as figured. Peritreme terminates little before  $j_3$ . Macrosetae on leg IV : genu-27, tibia-33, basitarsus-42, distitarsus-44, all with knobbed tip.

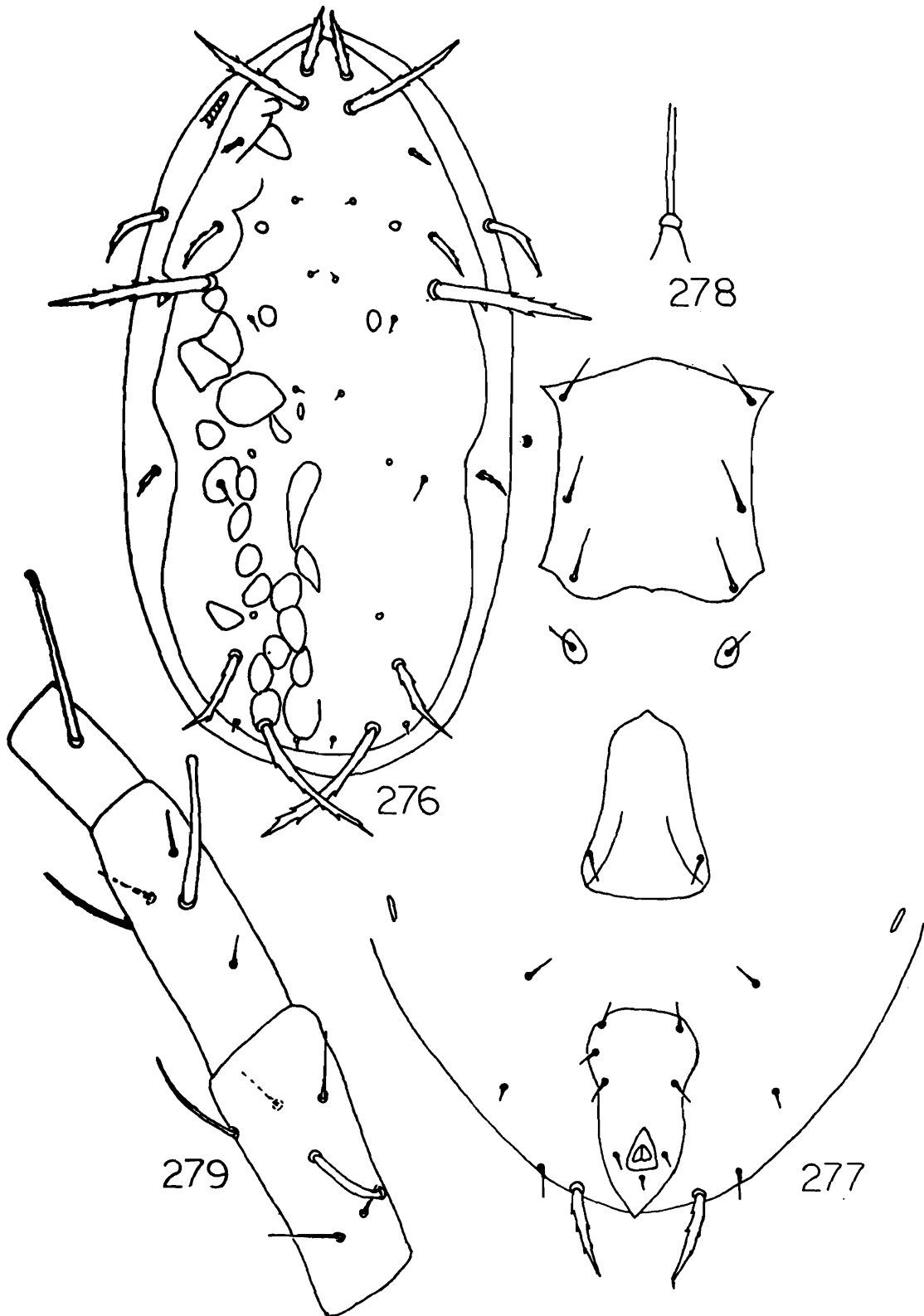
*Male* : Unknown.

*Habitat* : Collected on an undetermined plant.

*Type locality and repository* : Holotype ♀, India : Uttar Pradesh, Garhwal region, Barkot, on an undetermined plant, deposited in ZSI, Calcutta, Reg. No. 3176/17

*Distribution* : India : Uttar Pradesh.

*Remarks* : This species can be differentiated from *A. (P.) multidentatus*, by  $z_2$  and  $z_4$  being serrate, by relative length of  $Z_5$  and  $Z_4$  and also by shape of spermatheca.



**Figs. 276-279.** *Amblyseius (Paraphytoseius) scleroticus* Gupta and Ray  
 276. Dorsal shield  
 277. Posterior ventral surface  
 278. Spermatheca  
 279. Genu, tibia and basitarsus of leg IV

Subgenus **Phytoscutella** Muma

1961. *Phytoscutella* Muma, *Bull. Fla. St. Mus.*, 5(7) : 475.

1970. *Phytoscutus* : Tseng, *Bull. Sun Yat Sen Cult. Found.*, 5 : 49.

1977. *Phytoscutella* : Ehara & Bhandhufalck, *J. Fac. ed. Tottori. Univ.*, 27(2) : 73.

**Diagnosis** : Dorsal shield highly sclerotized, somewhat oval with 9 pairs of lateral setae, 2 pairs of median setae, 4 pairs of dorsocentral setae ; 2 pairs of sublateral setae present on interscutal membrane.  $J_5$  and  $J_2$  absent ; Setae  $j_3$ ,  $s_4$ ,  $Z_5$ , and  $Z_4$  often considerably long. Sternal shield highly sclerotized, much wider than long, with 3 pairs of sternal setae. Ventrianal shield robust, reticulate, highly sclerotized, with 3 pairs of preanal setae, a pair of large metapodal plates present. Macrosetae on leg IV present on genu, tibia and basitarsus.

Type : *Typhlodromus* ( *Amblyseius* ) *salebrosus* Chant (1960)

So far only 2 species from the world are known in this subgenus, one from India, *salebrosus* (Chant, 1960) and the other one, *wongsirii* (Ehara & Bhandhufalck, 1977) from Thailand.

44. **Amblyseius** (**Phytoscutella**) **salebrosus** (Chant)

( Figs. 280-285 )

1960. *Typhlodromus* (*Amblyseius*) *salebrosus* Chant, *Can. Ent.*, 92 : 58-60.

1974. *Amblyseius salebrosus* : Prasad, *A catalogue of mites of India*, p. 169-170.

1975. *Amblyseius salebrosus* : Gupta, *Internat. J. Acarol.*, 1(2) : 43.

**Female** : Dorsal shield 358 long, 280 wide, highly sclerotized, rugose, marginal portion curving ventrally, prominent medially, with 15 pairs of setae and 3 pairs of pores. Setae  $j_5$  and  $J_2$  absent ;  $Z_4$ ,  $Z_5$ ,  $j_3$ ,  $s_4$  very long,  $S_2$ ,  $j_1$  also long ; other setae relatively shorter, all setae smooth except  $Z_4$  which appear to be weakly serrate.  $Z_5 > Z_4 > s_4 > S_2 > j_3 > j_1$  ;  $S_4 = S_5$ . Measurements of setae  $j_1$ -22,  $j_4$ ,  $j_6$ ,  $J_5$ -5-8 long each,  $j_3$ -54,  $z_2$ -9,  $z_4$ -14,  $s_4$ -140-150,  $Z_1$ -6,  $S_2$ -52-56,  $S_4$ -16-20,  $S_5$ -16-20,  $Z_5$ -202,  $z_5$ -5,  $Z_4$ -157-170,  $r_3$ -9,  $R_3$ -11, both on lateral integument. Sternal shield 56 long, 96 wide, anterior and posterior margins concave, with 3 pairs of sternal setae, metasternal plate triangular with seta. Genital shield highly sclerotized, 146 wide, reticulate with a pair of setae, shield almost touches ventrianal shield. Ventrianal shield robust, reticulate, 146 long, 224 wide, with 3 pairs of preanal setae and a pair of round preanal pores, 3 pairs of setae present around ventrianal shield,  $JV_5$ -34 long ; 1 pair of large triangular metapodal plates present, 29 long. Peritreme extends anteriorly beyond  $j_1$ . Chelicera with 4-5 teeth anterior to strong *pilus dentilis*, 3-4

teeth posterior to it, movable digit with 3 strong teeth. Spermatheca as figured. Macrosetae on leg IV : genu-34, tibia-45, basitarsus-24. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Dorsal chaetotaxy similar to that of female. Spermatophoral process as figured. Macrosetae on leg IV : genu-53, tibia-43, basitarsus-29.

*Habitat* : Citrus.

*Type locality and repository* : Holotype ♀, India : Assam, Jorhat, on Citrus, deposited in Canadian National Collection. Paratypes 2 ♀ ♀, 2 ♂ ♂, same data as for holotype, in Canadian National Collection ; 1 ♀, above data, in Citrus Expt. Sta., Riverside, California.

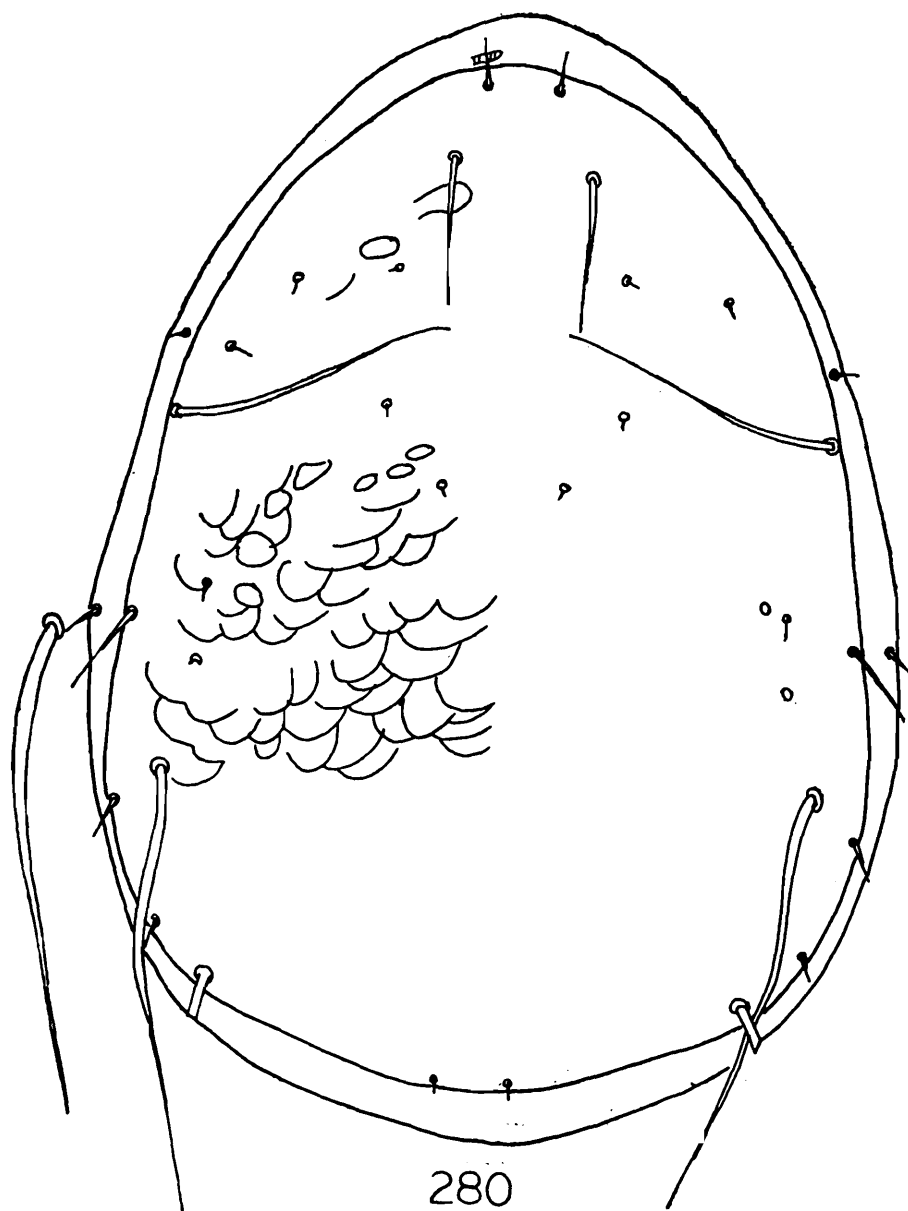
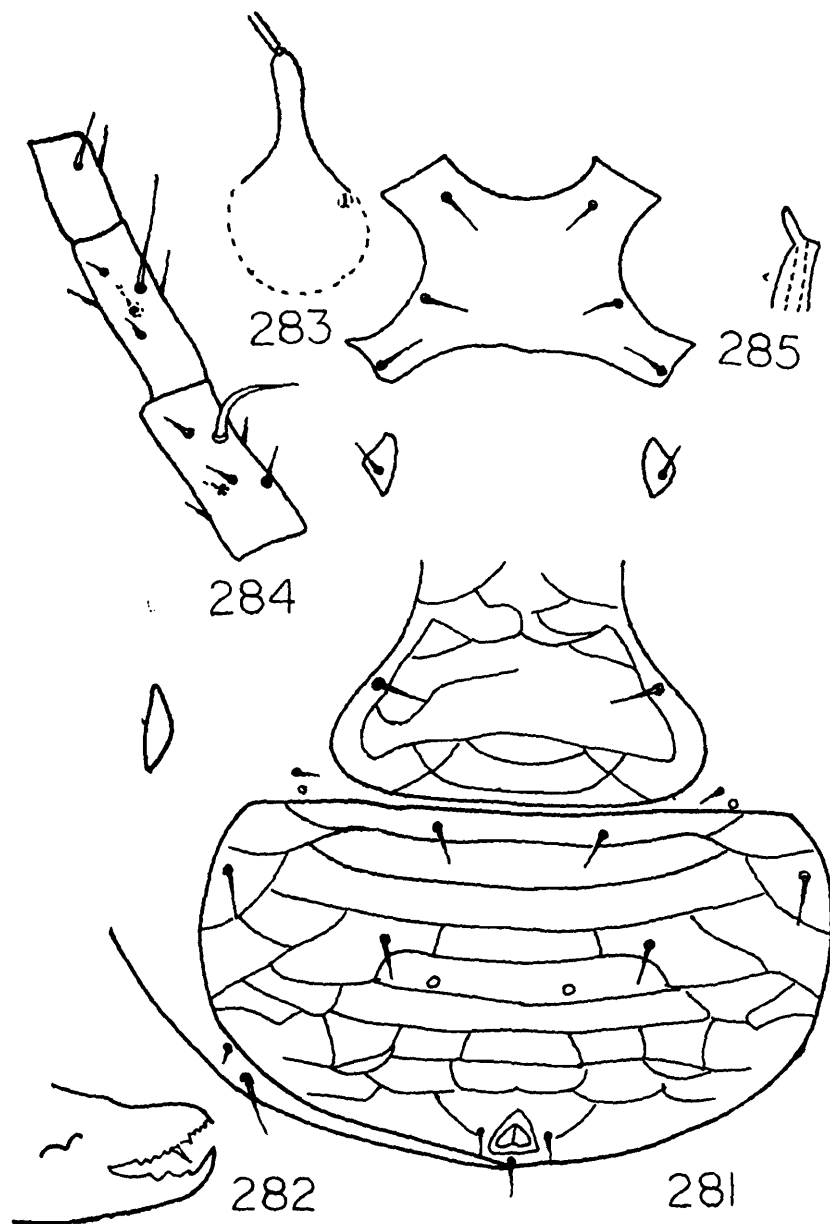


Fig. 280. *Amblyseius (Phytoscutella) salebrovus* (Chant) : Dorsal shield

*Distribution* : India : Assam ; outside India : Taiwan, Thailand.

*Remarks* : Subsequent to the description of this species the present author collected some more specimens from the type locality as well as from Arunachal Pradesh which had shown some variation in setal lengths from the holotype which was examined after borrowing it from Dr. D. A. Chant, University of Toronto, Canada.



Figs. 281-285. *Amblyseius (Phytoscutella) salebrosus* (Chant)

281. Ventral surface

282. Chelicera (female)

283. Spermatheca

284. Genu, tibia and basitarsus of leg IV

285. Spermatophoral process

*Subgenus Proprioseiopsis* Muma

1961. *Proprioseiopsis* Muma, *Bull. Fla. St. Mus.*, 5(7) : 277 (Type only).  
 1961. *Amblyseiulus* Muma, *Bull. Fla. St. Mus.*, 5(7) : 278.  
 1963. *Amblyseius* : Schuster & Pritchard, *Hilgardia*, 34 : 255 (in part).  
 1965. *Amblyseius* : Chant, *Can. Ent.*, 97(4) : 371 (in part).  
 1966. *Amblyseiulus* : De Leon : *In Studies on the fauna of Suriname and other Guyanas*, 83.  
 1968. *Proprioseiopsis* : Muma & Denmark, *Fla. Ent.*, 51 : 231.  
 1970. *Proprioseiopsis* : Muma & Denmark, *Arthropods of Florida*, 6 : 32.  
 1970. *Proprioseiopsis* : Denmark & Muma, *Fla. Ent.*, 53(4) : 220.  
 1973. *Proprioseiopsis* : Tuttle & Muma, *Tech. Bull. Agr. Exp. Sta. Univ. Arizona*, 208 : 7.  
 1973. *Proprioseiopsis* : Denmark & Muma, *Rev. Barazil Biol.*, 33(2) : 236.  
 1974. *Proprioseiopsis* : Denmark, *Fla. Ent.*, 57(2) : 145.  
 1975. *Proprioseiopsis* : Denmark & Muma, *J. Agr. Univ. Puerto Rico*, 59(4) : 282.  
 1975. *Proprioseiopsis* : Denmark & Muma, *Internat. J. Acarol.*, 4(1) : 3.  
 1976. *Amblyseius (Proprioseiopsis)* : Blommers, *Bijdragen Tot de Dierkunde*, 46(1) : 99.  
 1977. *Proprioseiopsis* : Ehara & Bhandhufalck, *Ź. Fac. ed. Tottori Univ.*, 27(2) : 71.  
 1978. *Proprioseiopsis* : Knisley & Denmark, *Fla. Ent.*, 61(1) : 6.  
 1981. *Proprioseiopsis* : Denmark & Andrews, *Fla. Ent.*, 64(1) : 147.

*Diagnosis* : Dorsal shield with 5 pairs of dorsocentral, 2 pairs of median and 9 pairs of lateral setae. Dorsal shield well sclerotized, smooth. Sternal shield as wide as or wider than long with straight or concave posterior margins ; sternal shield reticulate. Ventrianal shield shield-shaped or pentagonal, reticulate with 3 pairs of preanal setae and a pair of preanal pores. Peritreme extends anteriorly upto J<sub>1</sub>. Fixed digit of chelicera with 6-14 teeth, movable digit with 0-4 teeth. Genu II and III may have macrosetae in some species ; genu tibia and basitarsus of leg IV with macrosetae.

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

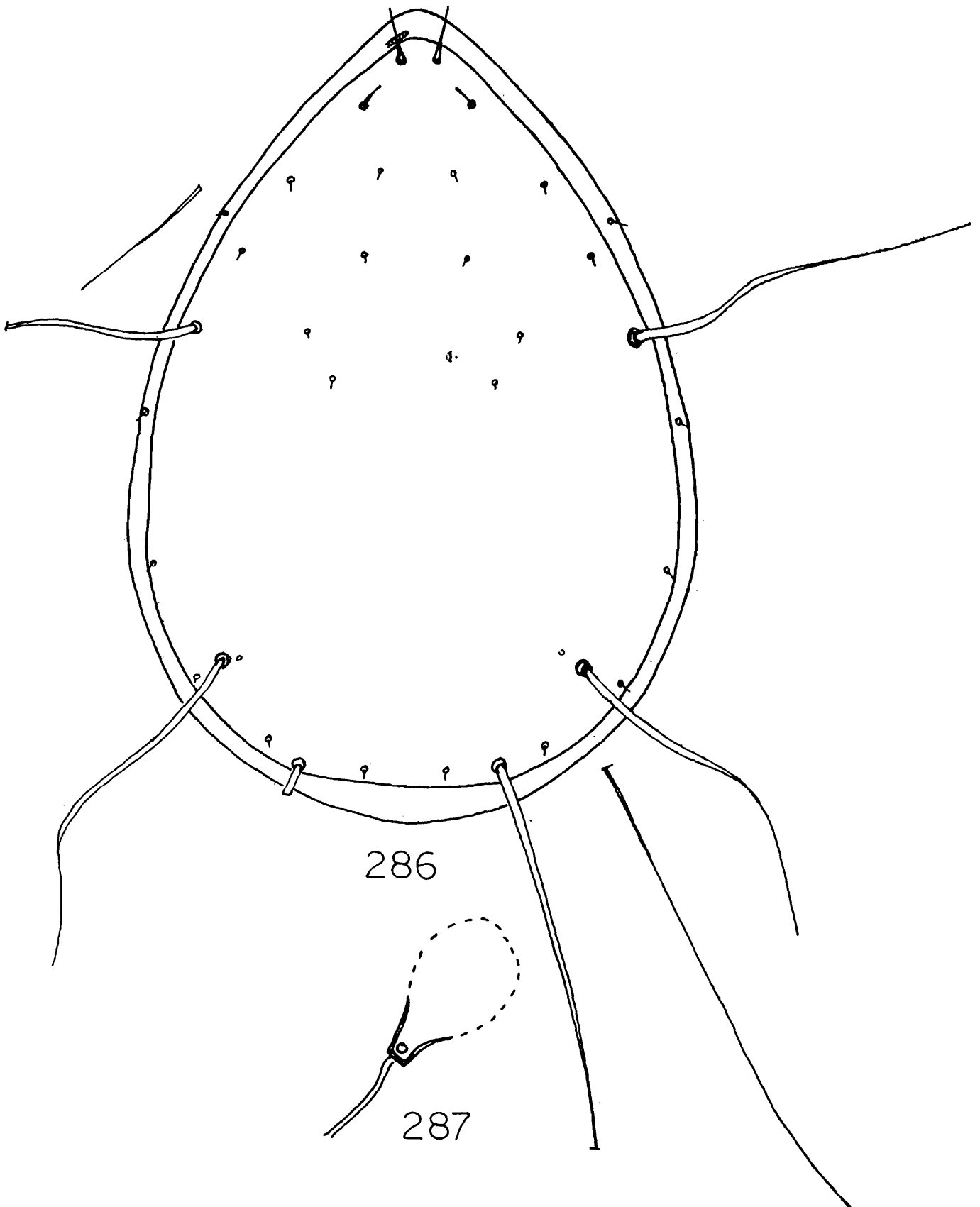
*Key to the species of subgenus Proprioseiopsis*

- |   |     |     |                        |
|---|-----|-----|------------------------|
| 1. Seta Z <sub>5</sub> very long (more than 200 microns)                          | ... | ... | <i>arunachalensis</i>  |
| — Seta Z <sub>5</sub> comparatively shorter (much less than 200 microns)          | ... | ... | 2                      |
| 2. Z <sub>4</sub> shorter than Z <sub>5</sub> , cervix of spermatheca cup-shaped  | ... | ... | <i>synachattiensis</i> |
| — Z <sub>4</sub> longer than Z <sub>5</sub> , cervix of spermatheca funnel-shaped | ... | ... | <i>peltatus</i>        |

45. **Amblyseius (Proprioseiopsis) arunachalensis** Gupta  
(Figs. 286-289)

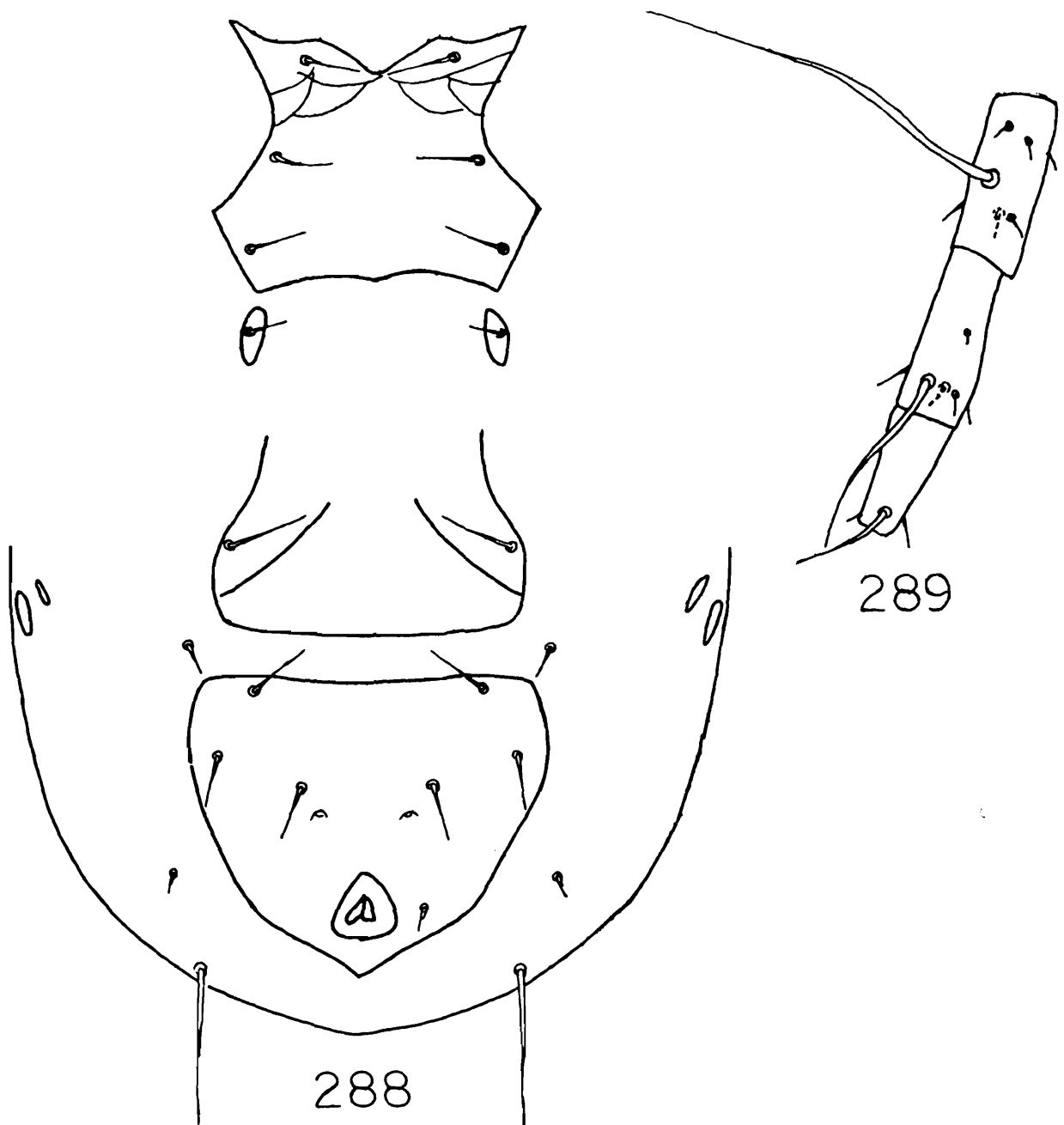
*Amblyseius arunachalensis* Gupta, *Indian J. Acar.* (In press).

*Female* : Dorsal shield 336 long, 245 wide, smooth, sclerotized



Figs. 286-287. *Amblyseius (Proprioseiopsis) arunachalensis* Gupta  
286. Dorsal shield  
287. Spermatheca

towards margins with 17 pairs of setae :  $j_1 > j_3 > z_2 > z_4$ ,  $s_4 = Z_4$ ,  $Z_5$ -longest,  $Z_1$ -absent,  $J_2$ -absent. Measurements of setae :  $j_1$ -24,  $j_4$ - $j_6$ , minute,  $j_3$ -15 (thick),  $z_2$ -8,  $z_4$ -8,  $s_4$ -201,  $S_2$ - $S_5$ -minute,  $Z_5$ -400,  $z_5$ -minute  $Z_4$ -194,  $r_3$ ,  $R_1$ -13 each, both on lateral integument. Sternal shield smooth, 67 long, 100 wide, 3 pairs of sternal setae, metasternal plate triangular with a seta. Genital shield 100 wide with a pair of setae, a fold present between genital and ventrianal shields. Ventrianal shield large, shaped as figured, 112 long, 120 wide, with 3 pairs of preanal setae and a pair of preanal pores little below the level of 3rd pair of preanal setae, 3 pairs of setae present around



Figs. 288-289. *Amblyseius (Proprioseiopsis) arumachalensis* Gupta  
 288. Ventral surface  
 289. Genu, tibia and basitarsus of leg IV

ventrianal shield,  $JV_5$ -77 long. 2 pairs of metapodal plates present, primary one 15 long. Spermatheca as figured with long duct. Fixed digit of chelicera multidentate, dentition on movable digit not discernible. Macrosetae on leg IV : genu-138, tibia-67, basitarsus-30, genu II-40, genu III-69, tibia III-49. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{1}{1} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Peritreme extends anteriorly beyond  $j_1$ .

*Male* : Unknown.

*Type locality and repository* : Holotype, ♀ India : Arunachal Pradesh, Likabali, Garu, on an undetermined plant, 16.xi.1981, deposited in ZSI, Calcutta, Reg. No. 3344/17

*Remarks* : This species differs from *A. (A.) ishizuchiensis* Ehara (1972) in having cervix of spermatheca longer than wide. Besides,  $Z_5$  in this species is also longer. From *A. (A.) longulus* Berlese (1914) it differs in having  $j_3$  very small (15) and in lacking  $J_2$ . Lastly, from *A. (A.) lindquisti* Schuster & Pritchard (1963) it differs in relative length of  $j_1$ ,  $z_2$  and  $s_4$ .

#### 46. *Amblyseius (Proprioseiopsis) peltatus* Van der Merwe

(Figs 290-293)

1968. *Amblyseius (Amblyseius) peltatus* Van der Merwe, *Ent. Mem. Dept. Agr. Tech. Serv. Rep. S. Afr.*, 18 : 119.  
 1970. *Amblyseius rosellus* : Gupta, *Sci. & Cult.*, 36 : 98. (misidentification).  
 1974. *Amblyseius rosellus* : Prasad, A catalogue of mites of India, p. 169.  
 1980. *Iphiseius punicae* Gupta, *Entomologists' mon. Mag.*, 115 : 213 (new synonymy).

*Female* : Dorsal shield highly sclerotized, 315 long, 232 wide, lateral margins highly sclerotized with 16 pairs of setae.  $Z_4 = s_4 > Z_5 > j_3 > z_2$ ,  $j_1 > z_4 > Z_1$ . Measurements of setae :  $j_1$ -27,  $j_4$ - $j_6$ ,  $J_2$ -4-5 each,  $j_3$ -54,  $z_2$ -31,  $z_4$ -22,  $s_4$ -93,  $Z_1$ -18,  $S_2$ -22,  $S_4$ -10,  $S_5$ -8,  $Z_5$ -80,  $z_5$ -5,  $Z_4$ -93,  $r_3$  and  $R_1$  on lateral integument. Sternal shield reticulate, 45 long, 95 wide, with 3 pairs of sternal setae ; metasternal plate conspicuous with seta. Genital shield 103 wide almost touching ventrianal shield, with a pair of setae. Ventrianal shield highly sclerotized, reticulate, 90 long, 108 wide, with 3 pairs of fairly long preanal setae and a pair of preanal pores ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -67 long ; 2 pairs of metapodal plates present. Spermatheca as figured. Peritreme extends anteriorly upto  $j_1$ . Fixed digit of chelicera with 4-5 teeth, movable digit with 1 tooth, *pilus dentilis* on fixed digit strong. Macrosetae on leg IV : genu-63,

tibia-37, basitarsus-76. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{1}{1} 1$ , tibia III  $1 \frac{2}{1} \frac{1}{1} 1$ .

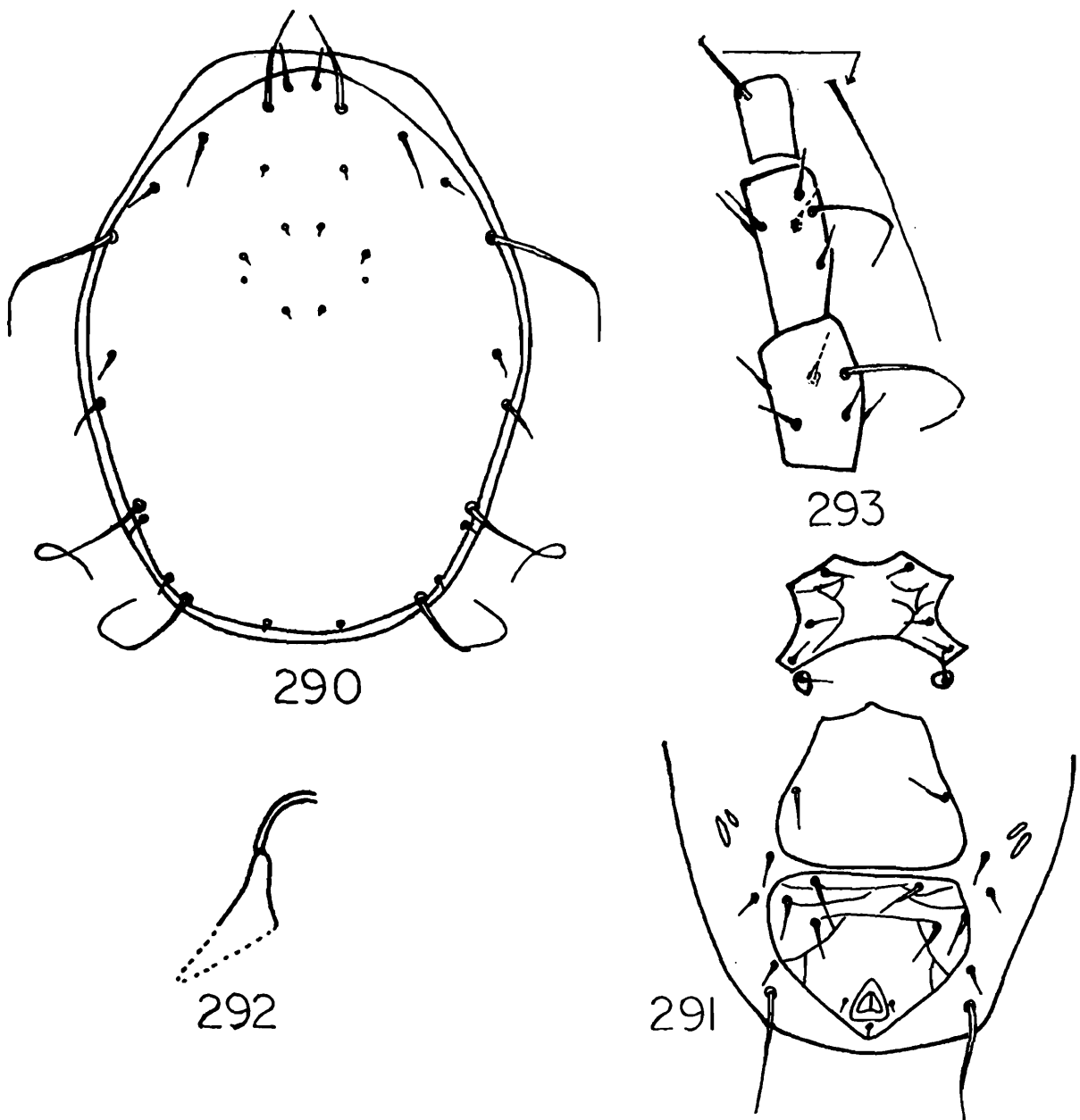
*Male* : Unknown.

*Habitat* : *Punica granatum*.

*Type locality* : South Africa.

*Distribution* : India : West Bengal ; outside India : Thailand, S. Africa, Madagascar.

*Remarks* : The author misunderstood this species and tentatively identified it as *A. rosellus*. Later, he thought this species to belong to



Figs. 290-293. *Amblyseius (Proprioseiopsis) peltatus* Van der Merwe  
 290. Dorsal shield  
 291. Ventral surface  
 292. Spermatheca  
 293. Genu, tibia and basitarsus of leg IV

*Iphiseius* because of the fairly well sclerotized lateral integument and described it as a new species under *Iphiseius*. But after the publication of the re-description of this species from Thailand by Ehara & Bhandhufalck (1977) it became evident to the author that *I. punicae*, which he described as new, is the same as *A. (P.) peltatus* and, hence, *I. punicae* is treated here as synonym for *A. (P.) peltatus*. The type of *Iphiseius punicae* was re-examined and that fully conformed with the re-description of Ehara & Bhandhufalck (1977).

47 **Amblyseius (*Proprioseiopsis*) synachattiensis** Gupta  
(Figs. 294-297)

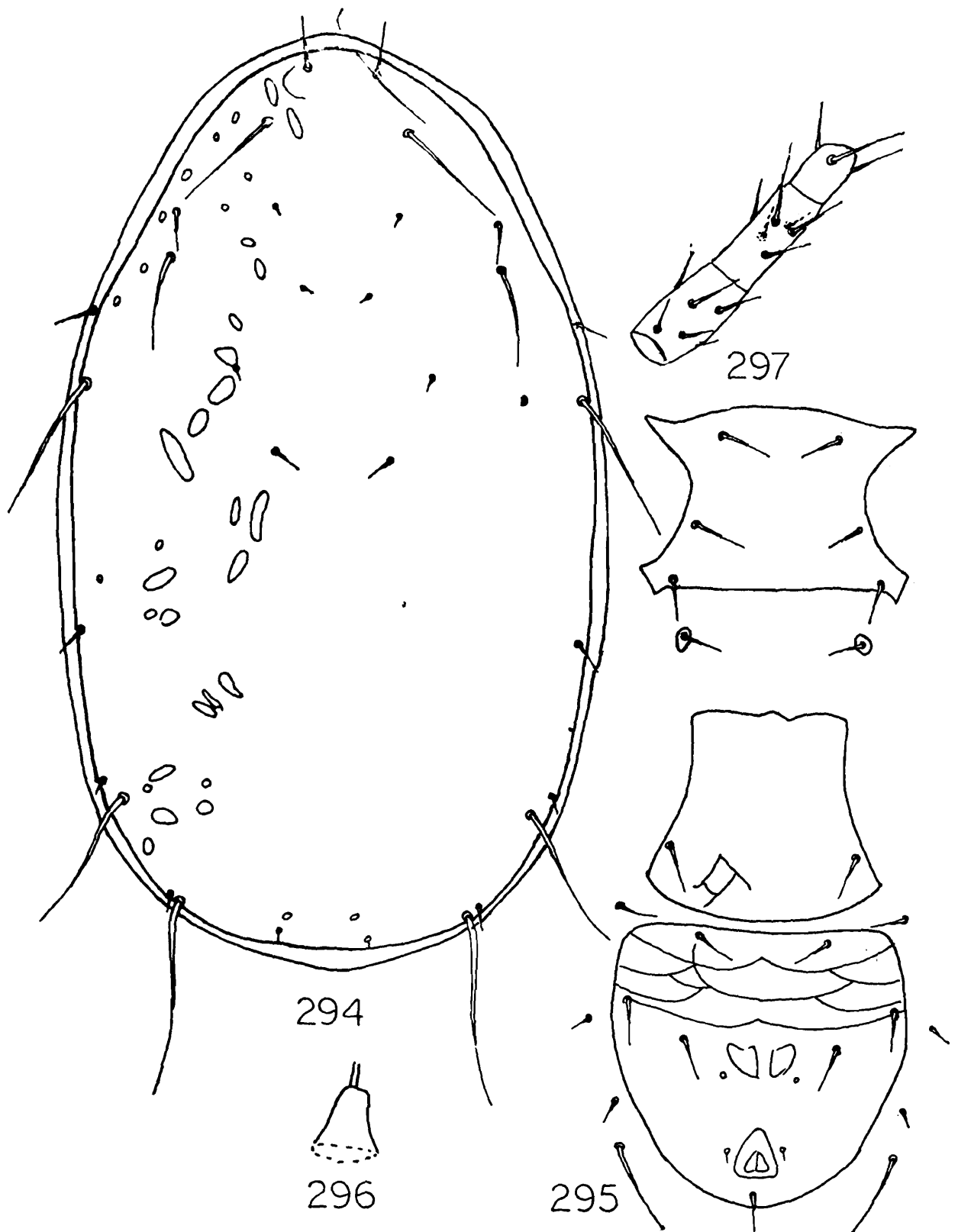
*Amblyseius (Proprioseiopsis) synachattiensis* Gupta, *Entomon* (In press).

*Female* : Dorsal shield 504 long, 292 wide, rugose, with at least 8 pairs of pores and 15 pairs of setae,  $J_2$  absent. Measurements of setae :  $j_1$ -34,  $j_4$ -5,  $j_5$ -6,  $j_6$ -20,  $j_3$ -54,  $z_2$ -36,  $z_4$ -52,  $s_4$ -90,  $Z_1$ -25,  $S_2$ -18,  $S_4$ -13,  $S_5$ -16,  $Z_5$ -121,  $z_5$ -8,  $Z_4$ -90,  $r_3$ .31,  $R_1$ -18, all setae smooth. Sternal shield wider than long with 3 pairs of sternal setae, metasternal plates round with setae. Genital shield 125 wide, rugose, with a pair of setae. Ventrianal shield triangular, reticulate anteriorly, 157 long, 157 wide, with 3 pairs of preanal setae and a pair of round preanal pores ; 4 pairs of setae and a pair of platelets present around ventrianal shield,  $JV_5$ -26 long (smooth). Fixed digit of chelicera multidentate, movable digit with at least 3 teeth. Spermatheca with bell-shaped cervix as figured. Macrosetae on leg IV : genu-20; tibia-40, basitarsus-34, all pointed ; genu II and III also with macroseta. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Unknown.

*Type locality and repository* : Holotype ♀, India : Uttar Pradesh, Garhwal region, Synachatti, on grass, 31.viii.1979, Coll. S. K. Gupta, deposited in ZSI, Calcutta, Reg. No. 3390/17.

*Remarks* : This species is very close to *Amblyseius (Proprioseiopsis) rotundus* (Muma, 1961) but differs in shape of spermatheca and in relative lengths of  $z_2$  and  $z_4$ . It is also close to *A. (P.) alpicola* Ehara (1982) but differs in shape of ventrianal shield and in relative lengths of dorsal idiosomal setae. Further  $Z_1 > S_2$  in this species while in *alpicola*  $Z_1 < S_2$ . Lastly, it also differs from *A. (P.) kogi* Chant & Hansell (1971) but differs in relative lengths of  $z_2$  and  $z_4$  and



Figs. 294-297. *Amblyseius (Proprioseiopsis) synachattiensis* Gupta

294. Dorsal shield

295. Ventral surface

296. Spermatheca

297. Genu, tibia and basitarsus of leg IV

in shape of spermatheca and from *A. (P.) gracilis* (Garman, 1958), in relative lengths of  $z_2$  and  $z_4$ , and in shape of ventrianal shield.

### *Subgenus Proprioseius* Chant

1957. *Proprioseius* Chant, *Can. Ent.*, 89 : 357.  
 1965. *Amblyseius* : Chant, *Can. Ent.*, 97(4) : 371 (in part).  
 1966. *Proprioseius* : Denmark & Muma, *Fla. Ent.*, 49(4) : 253.  
 1970. *Proprioseius* : Muma & Denmark, *Arthropods of Florida*, 6 : 24.  
 1978. *Proprioseius*, Chant *et al.*, *Can. J. Zool.*, 56(6) : 1344.  
 1982. *Proprioseius* : Gupta, *Indian J. Acar.*, 6 : 28.

*Diagnosis* : Dorsal shield rugose with 5 pairs of dorsocentral, 2 pairs of median and 7 pairs of lateral setae : some setae distinctly clavate and serrate or weakly plumose. Sternal shield longer than wide with 3 pairs of sternal setae. Peritreme extends anteriorly upto  $j_1$ . Macrosetae on leg IV present on genu, tibia and basitarsus. Ventrianal shield elongate with concave lateral margins and 3 pairs of preanal setae, preanal pores obscure. Chelicera with 4-8 teeth on the fixed digit and 1-3 teeth on the movable digit. Legs with or without macroseta.

Type : *Proprioseius meridionalis* Chant, 1957 by designation.

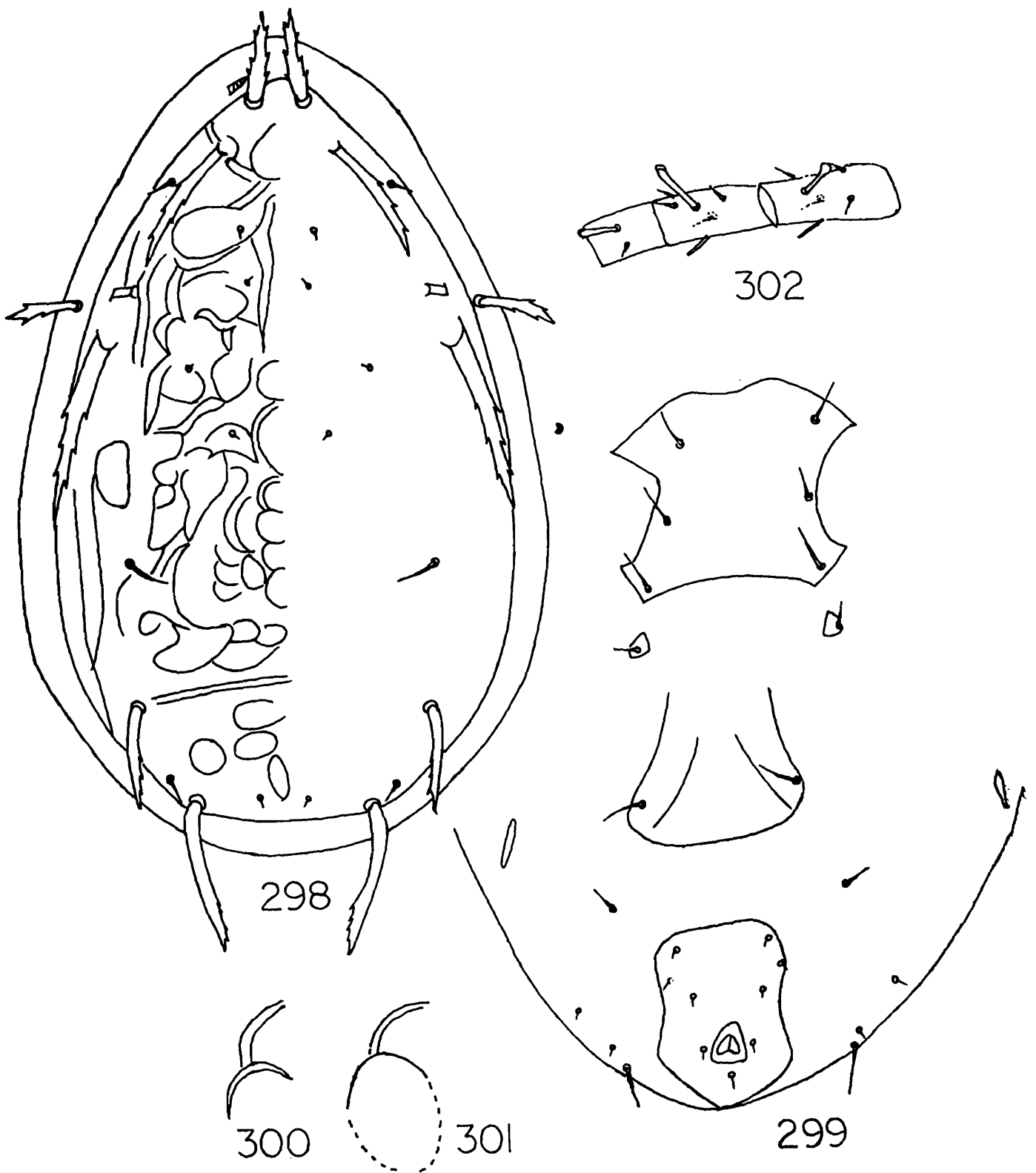
Denmark & Muma (1966), while revising this genus, mentioned that the macrosetae are lacking on leg IV but in the Indian material the macrosetae are clearly present.

### 48. *Amblyseius ( Proprioseius ) kumaonensis* (Gupta)

( Figs. 298-302 )

1982. *Proprioseius kumaonensis* Gupta, *Indian J. Acar.*, 6 : 28-29.

*Female* : Dorsal shield 312 long, 252 wide, highly rugose, well sclerotized with 14 pairs of setae. Setae  $j_1$ ,  $j_3$ ,  $z_4$ ,  $s_4$ ,  $r_3$ ,  $Z_4$  and  $Z_5$  being thick, long and serrate,  $z_2$ ,  $S_2$  and  $S_5$  thick and stout.  $j_4$ - $j_5$  short and simple. Measurements of setae :  $j_1$ -36,  $j_4$ -5,  $j_5$ -5,  $j_6$ -7,  $J_5$ -4,  $j_3$ -53,  $z_2$ -15,  $z_4$ -27,  $s_4$ -87,  $S_2$ -17,  $S_5$ -12,  $Z_5$ -72,  $z_5$ -5,  $Z_4$ -50,  $r_3$ -20,  $R_1$  absent. Sternal shield with 3 pairs of setae, 4th pairs on metasternal plates. Genital shield 72 wide with a pair of genital setae. Ventrianal shield 96 long, 60 wide, lateral margins concave with 3 pairs of preanal setae ; 4 pairs of setae present around ventrianal shield, one pair of elongate metapodal plates present. Peritreme extends anteriorly upto  $j_1$ . Fixed digit of chelicera with at least 1 tooth,



Figs. 298-302. *Amblyseius (Proprioseius) kumaonensis* (Gupta)

298. Dorsal shield

299. Ventral surface

300, 301. Spermathecae

302. Genu, tibia and basitarsus of leg IV

tooth on movable digit not discernible. Spermatheca as illustrated. Macrosetae on leg IV : genu-24, tibia-27, basitarsus-19, all spatulate. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{2}{1} \frac{1}{1} 1$ , genu III  $1 \frac{1}{1} \frac{2}{0} 2$ , tibia III  $1 \frac{1}{1} \frac{1}{1} 2$ .

*Male* : Unknown.

*Habitat* : Collected on an undetermined plant.

*Type locality and repository* : Holotype ♀, India : Uttar Pradesh, Naini Tal, Kaladungi, on an undetermined plant, deposited in ZSI, Calcutta, Reg. No. 3125/17. Paratype 1 ♀, same data as for holotype, in ZSI, Reg. No. 3126/17.

*Distribution* : India : Uttar Pradesh.

*Remarks* : This is the only species of the subgenus known from India.

#### **Subgenus *Typhlodromalus* Muma**

1961. *Amblyseius (Typhlodromalus)* Muma, *Bull. Fla. St. Mus.*, 5(7) : 288.  
 1964. *Amblyseius (Typhlodromalus)* : Merwe & Ryke, *J. Ent. Soc. S. Afr.*, 26(2) : 263.  
 1966. *Typhlodromalus* : De Leon : *In Studies on the fauna of Suriname and other Guyanas*, p. 87.  
 1967. *Typhlodromalus* : De Leon : Allen Press Inc., Kansas, p. 21.  
 1970. *Typhlodromalus* : Muma & Denmark, *Arthropods of Florida*, 6 : 86.  
 1972. *Typhlodromalus* : Denmark, *Fla. Ent.*, 55(1) : 25.  
 1973. *Typhlodromalus* : Denmark & Muma, *Rev. Brazil Biol.*, 33(2) : 257.  
 1975. *Typhlodromalus* : Denmark & Muma, *Internat. J. Acarol.*, 4(1) : 8.  
 1981. *Typhlodromalus* : Denmark & Andrews, *Fla. Ent.*, 64(1) : 153.  
 1982. *Typhlodromalus* : Moraes *et al.*, *Internat. J. Acarol.*, 8 : 18.

*Diagnosis* : Dorsal shield with 6 pairs of dorsocentral, 2 pairs of median and 8-9 pairs of laterals, of those,  $Z_5$  being mostly longest. Fixed digit of chelicera multidentate, half of which proximal to *pilus dentilis*. Sternal shield longer than wide, mostly lobate posteriorly. Peritreme extends anteriorly upto  $j_1$ . Ventrianal shield elongate, mostly vase-shaped, with 3 pairs of preanal setae, anterior pair mostly adjacent to anterior margin of the shield. Macrosetae usually present on genu I, II and III and also present on genu, tibia and basitarsus of leg IV, that on basitarsus being longest.

*Type* : *Typhlodromalus peregrinus* Muma, 1955 by designation Muma (1961).

*Key to the species of Typhlodromalus*

1. Ventrianal shield vase-shaped	...	...	2
— Ventrianal shield squarish or pentagonal	...	...	5
2. $s_4$ noticeably longer, nearly 2 times the length of $z_4$	...	...	3
— $s_4$ and $z_4$ almost of similar length or the latter slightly smaller	...	...	4
3. $s_4$ over 3 times the length of $z_4$	...	...	<i>jarooa</i>
— $s_4$ only 2 times the length of $z_4$	...	...	<i>sorghumae</i>
4. Spermatheca as in fig. 305	...	...	<i>chikmagalurensis</i>
— Spermatheca as in figs. 310, 311	...	...	<i>chitradurgae</i>
— Spermatheca as in fig. 333	...	...	<i>kalimpongensis</i>
5. $z_2$ and $z_4$ equal	...	...	6
— $z_2$ and $z_4$ unequal	...	...	7
6. $Z_5$ and $Z_4$ equal	...	...	<i>lablabi</i>
— $Z_5$ and $Z_4$ unequal	...	...	<i>eucalypticus</i>
7. $S_2$ 2 times the length of $Z_1$	...	...	<i>laaensis</i>
— $S_2$ almost as long as $Z_1$	...	...	8
8. $z_4$ $2\frac{1}{4}$ —3 times as long as $z_2$	...	...	<i>manipurensis</i>
— $z_4$ only about 2 times of $z_2$	...	...	<i>ficusi</i>

49. *Amblyseius* (*Typhlodromalus*) *chikmagalurensis* Gupta

( Figs. 303-306 )

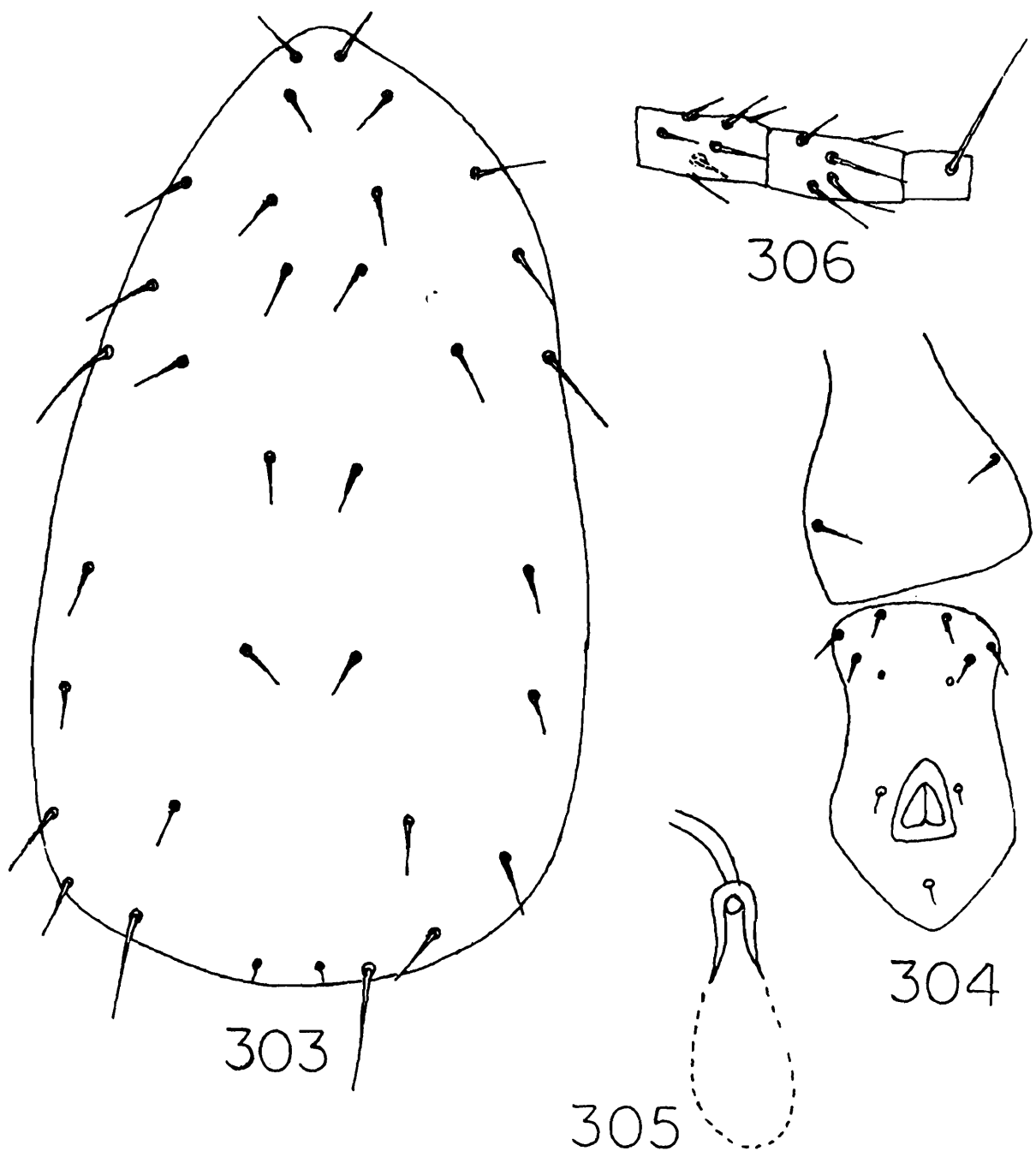
*Amblyseius* (*Typhlodromalus*) *chikmagalurensis* Gupta, *Env. Ecol.* (In press).

*Female* : Dorsal shield 274 long, 150 wide, smooth, with 17 pairs of setae. Measurements of setae :  $j_1$ -22,  $j_4$ -22,  $j_6$ -18,  $J_2$ -16,  $J_5$ -8,  $j_3$ -22,  $z_2$ -25,  $z_4$ -29,  $s_4$  37,  $Z_1$ -16,  $S_2$ -13,  $S_4$ -22,  $S_5$ -18,  $Z_5$ -45,  $z_5$ -21,  $Z_4$ -18 ; sublateral setae on lateral integument. Margins of sternal shield indistinct, with 3 pairs of sternal setae, metasternal plates indistinct, 4th pair of sternal setae appear to be on interscutal membrane. Genital shield normal with a pair of genital setae, Ventrianal shield 78 long, 50 wide, with 3 pairs of preanal setae and a pair of preanal pores ; 4 pairs of setae present on the membrane around ventrianal shield ; metapodal plates single paired. Fixed digit of chelicera with 2 teeth, movable digit without tooth. Spermatheca as figured. Macrosetae on leg IV : basitarsus-49. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Unknown.

*Type locality and repository* : Holotype ♀, India : Karnataka : Chikmagalur, on an undetermined plant, 30.xii.1980, Coll. S. K. Gupta, deposited in ZSI, Calcutta, Reg. No. 3391/17.

*Remarks* : This species is quite close to *Amblyseius (Typhlodromalus) anneckei* Merwe & Ryke (1964) but differs in shape of spermatheca besides differing in relative lengths of  $Z_4$ ,  $S_4$  and  $S_5$ . Further  $j_3$  is shorter than the distance between its base and that of  $z_2$ . From *A. (T.) havu* Pritchard & Baker (1962) it differs in shape of spermatheca.



Figs. 303-306. *Amblyseius (Typhlodromalus) chikmagalurensis* Gupta

303. Dorsal shield

304. Posterior ventral surface

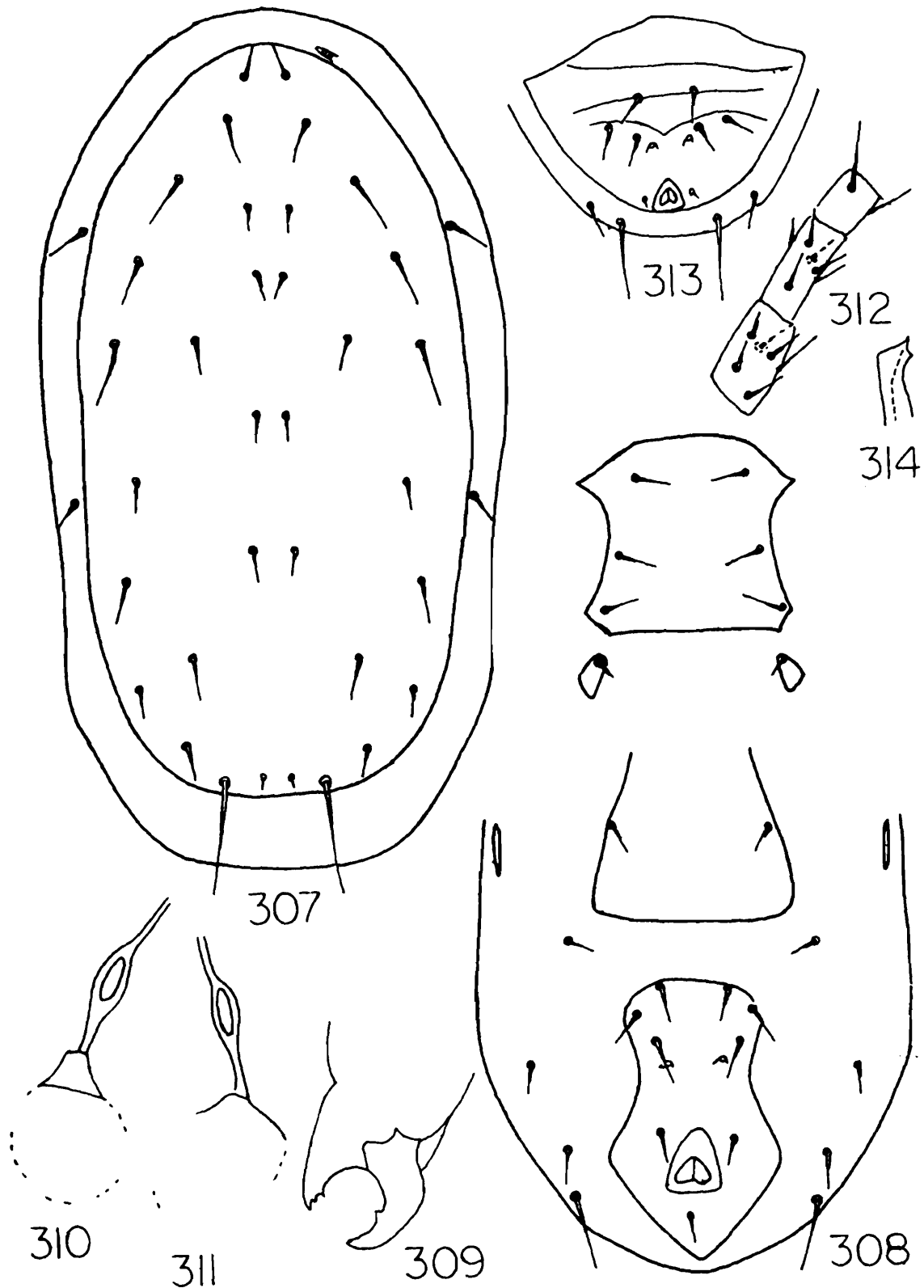
305. Spermatheca

306. Genu, tibia and basitarsus of leg IV

50. *Amblyseius (Typhlodromalus) chitradurgae* Gupta  
( Figs. 307-314 )

*Amblyseius (Typhlodromalus) chitradurgae* Gupta, *Env. Ecol.* (In press).

Female : Dorsal shield 292 long, 146 wide, rugose, with 17 pairs



Figs. 307-314. *Amblyseius (Typhlodromalus) chitradurgae* Gupta  
 307. Dorsal shield  
 308. Ventral surface  
 309. Chelicera (female)  
 310, 311. Spermathecae  
 312. Genu, tibia and basitarsus of leg IV  
 313. Ventrianal shield (male)  
 314. Spermatophoral process

of setae.  $j_3 > j_1$ ,  $z_2 = z_4 > J_2$ ,  $j_3 = z_2 = z_4$ ,  $s_4 > Z_4$ ,  $S_2 > S_5$ ,  $r_3 > R_1$ . Measurements of setae :  $j_1$ -20,  $j_4$ -16,  $j_5$ -16,  $j_6$ -16,  $J_2$ -18,  $J_5$ -5,  $j_3$ -27,  $z_2$ -27,  $z_4$ -29,  $s_4$ -33,  $Z_1$ -18,  $S_2$ -25,  $S_4$ -20,  $S_5$ -22,  $Z_5$ -44,  $z_5$ -20,  $Z_4$ -22,  $r_3$ -25,  $R_1$ -16 ; the latter two lie on lateral integument. Sternal shield slightly longer than wide with 3 pairs of sternal setae, 4th pair lie on triangular metasternal plates. Genital shield 62 wide, with a pair of setae. Ventrianal shield 78 long, 56 wide, lateral margins concave with 3 pairs of preanal setae and a pair of crescent-shaped preanal pores ; 4 pairs of setae present around ventrianal shield ; metapodal plates single paired, 22 long,  $JV_5$ -22 long. Fixed digit of chelicera with 2 apical teeth ; movable digit with 1 tooth. Spermatheca as figured. Macrosetae on leg IV : basitarsus-31. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Dorsal chaetotaxy similar to that of female. Ventrianal shield and spermatophoral process as illustrated.

*Type locality and repository* : Holotype ♀ India : Karnataka, Chitradurga, on chrysanthemum, 23.xii.1980, Coll. S. K. Gupta, deposited in ZSI, Calcutta, Reg. No. 3392/17. Paratypes 11 ♀ ♀, 1 ♂, data same as for holotype, Reg. No. 3393-95/17.

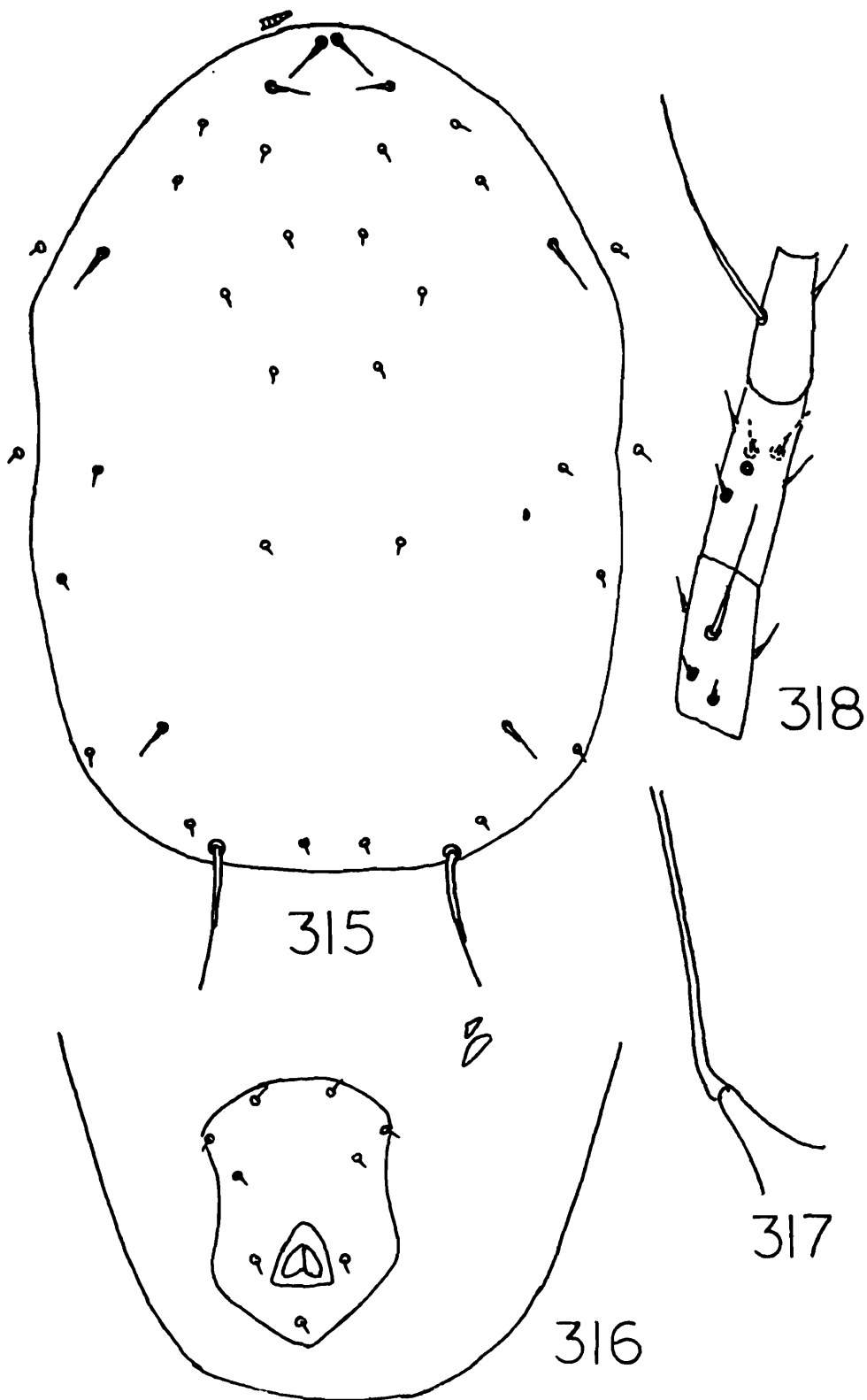
*Remarks* : This species is quite close to *A. (T.) kalimpongensis* Gupta (1969b) and *A. (T.) hima* Pritchard & Baker (1962) but differs from both of them in shape of spermatheca. From *A. (T.) addoensis* Merwe & Ryke (1964) it differs in shape of spermatheca and in lacking prominent lobes on sternal shield. Besides,  $j_3$ ,  $z_4$  are relatively shorter and  $S_2$  longer than  $S_4$ .

### 51. *Amblyseius (Typhlodromalus) eucalypticus* (Gupta)

(Figs. 315-318)

1978. *Typhlodromalus eucalypticus*, Gupta, *Oriental Ins.*, 12 : 330-331.

*Female* : Dorsal shield 350 long, 240 wide, anterior lateral margins weakly imbricate with 17 pairs of setae, all being smooth and pointed,  $Z_5$  being longest and thickest. Measurements of setae :  $j_1$ -24,  $j_3$ -20,  $s_4$ -28,  $Z_5$ -64,  $Z_4$ -24, other setae between 5-6 long. Sternal shield with 3 pairs of sternal setae. Genital shield as wide as greatest width of ventrianal shield, with a pair of setae. Ventrianal shield 96 long, 75 wide, lateral margins concave, with 3 pairs of preanal setae ; 4 pairs of setae present around ventrianal shield ; 2 pairs of metapodal plates present, primary one 20 long, accessory one 8 long,  $JV_5$ -29



Figs. 315-318. *Amblyseius (Typhlodromalus) eucalypticus* (Gupta)  
 315. Dorsal shield  
 316. Posterior ventral surface  
 317. Spermatheca  
 318. Genu, tibia and basitarsus of leg IV

long. Fixed digit of chelicera multidentate, movable digit with 2 teeth. Spermatheca as figured. Peritreme extends anteriorly upto base of  $j_1$ , posteriorly extends upto coxae IV and slightly curves around it. Macrosetae on leg IV : genu-62, tibia-broken, basitarsus-69, genu III-38, genu II-32, all macrosetae pointed. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ .

*Male* : Unknown.

*Habitat* : *Eucalyptus* sp.

*Type locality and repository* : Holotype ♀, India : Karnataka, Bandipur sanctuary, on *Eucalyptus* sp., deposited in ZSI, Calcutta, Reg. No. 3396/17.

*Distribution* : India : Karnataka.

*Remarks* : This species is known only from its type.

## 52. *Amblyseius (Typhlodromalus) ficusi* Gupta

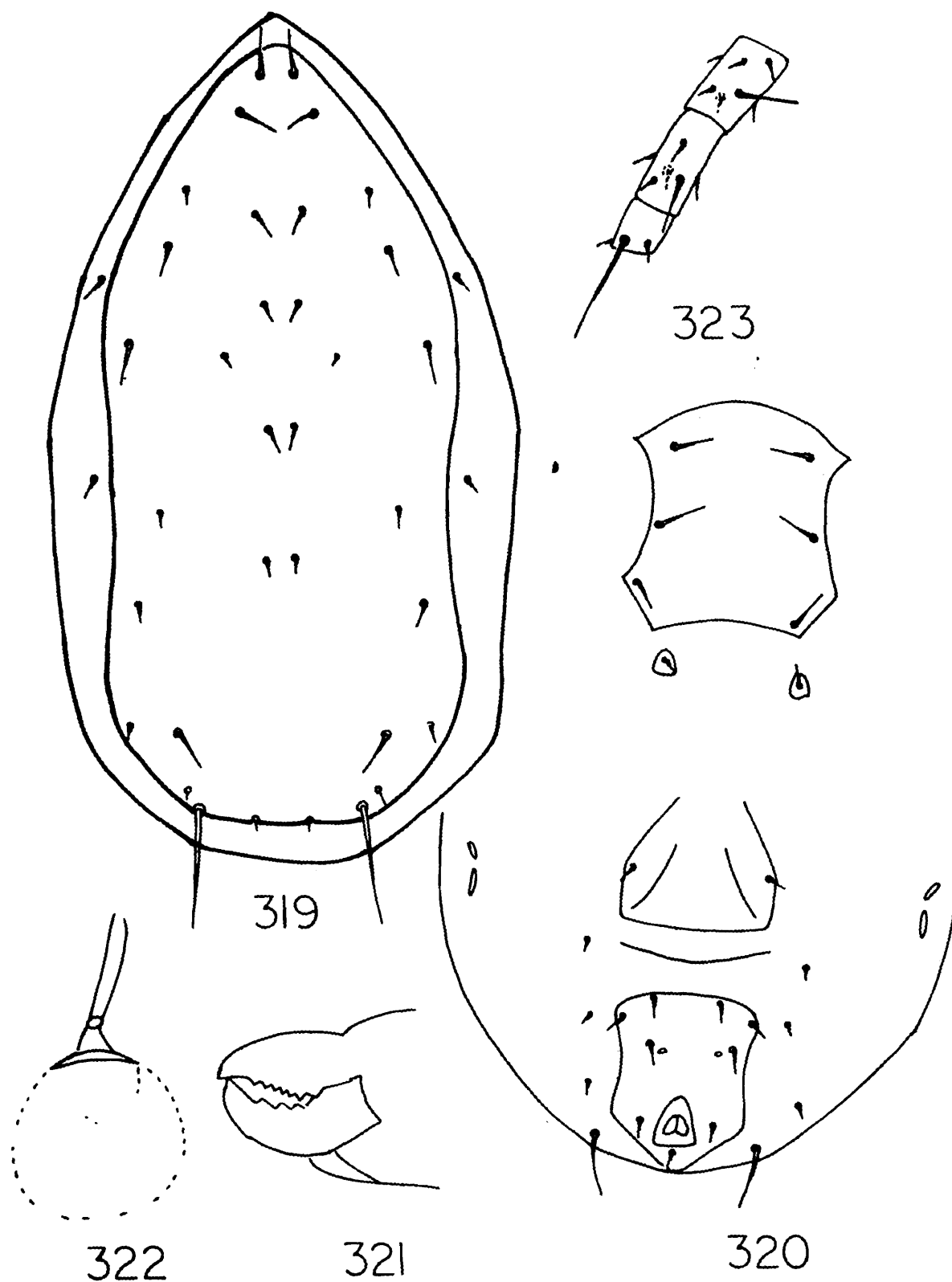
(Figs. 319-323)

*Amblyseius (Typhlodromalus) ficusi* Gupta, *Oriental Ins.* (In press).

*Female* : Dorsal shield smooth, 292 long, 157 wide, slightly concave at the level of  $R_1$ , with 17 pairs of setae. Measurements of setae :  $j_1$ -13,  $j_4$ -13,  $j_5$ -11,  $j_6$ -13,  $J_2$ -10,  $J_5$ -5,  $j_3$ -16,  $z_2$ -11,  $z_4$ -20,  $s_4$ -25,  $Z_1$ -11,  $S_2$ -13,  $S_4$ -9,  $S_5$ -9,  $Z_5$ -49,  $z_5$ -9,  $Z_4$ -22,  $r_3$ -13,  $R_1$ -10, the latter two lie on latetal integument. Sternal shield smooth, as long (74) as or slightly longer than broad, posterior margin almost straight with 3 pairs of sternal setae, metasternal plate conspicuous with seta. Genital shield normal, 69 wide, with a pair of setae. Ventrianal shield 78 long, 50 wide, with 3 pairs of preanal setae and a pair of crescent-shaped preanal pores ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -29 long ; 2 pairs of metapodal plates present, primary one-29 long. Spermatheca as figured. Macrosetae on leg IV : genu-25, tibia-25, basitarsus-47. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Fixed digit of chelicera multidentate with strong *pilus dentilis*. movable digit with 2 teeth.

*Male* : Unknown.

*Type locality and repository* : Holotype ♀, India : Arunachal Pradesh, Kambang, on *Ficus* sp., 20.x.1981, Coll. S. K. Gupta, deposited in ZSI, Calcutta, Reg. No. 3397/17. Paratypes 3 ♀ ♀, data same as for holotype, Reg. Nos. 3398-99/17.



Figs. 319-323. *Amblyseius (Typhlodromalus) ficusi* Gupta  
 319. Dorsal shield  
 320. Ventral surface  
 321. Chelicera (female)  
 322. Spermatheca  
 323. Genu, tibia and basitarsus of leg IV

*Remarks* : This species is quite close to *A. (T.) aripo* (DeLeon, 1967) and *A. (T.) manipurensis* Gupta (1978b) but differs in having cervix of spermatheca shorter and  $z_4$  not 2 times as long as  $z_2$ . From *A. (T.) maindaimi* Chant & Baker (1965) it differs in having  $Z_4$  much longer than  $S_4$  and also in shape of spermatheca. Further, it differs from *A. (T.) havu* Pritchard & Baker (1962) in relative length of dorsal idiosomal setae and in shape of spermatheca.

53. *Amblyseius (Typhlodromalus) jarooa* Gupta  
(Figs. 324-329)

1977. *Amblyseius jarooa* Gupta, *Oriental Ins.*, 11 : 629.

1978. *Amblyseius (Amblyseius) swaga* : Gupta, *Indian J. Acar.*, 2(2) : 73 (misidentification).

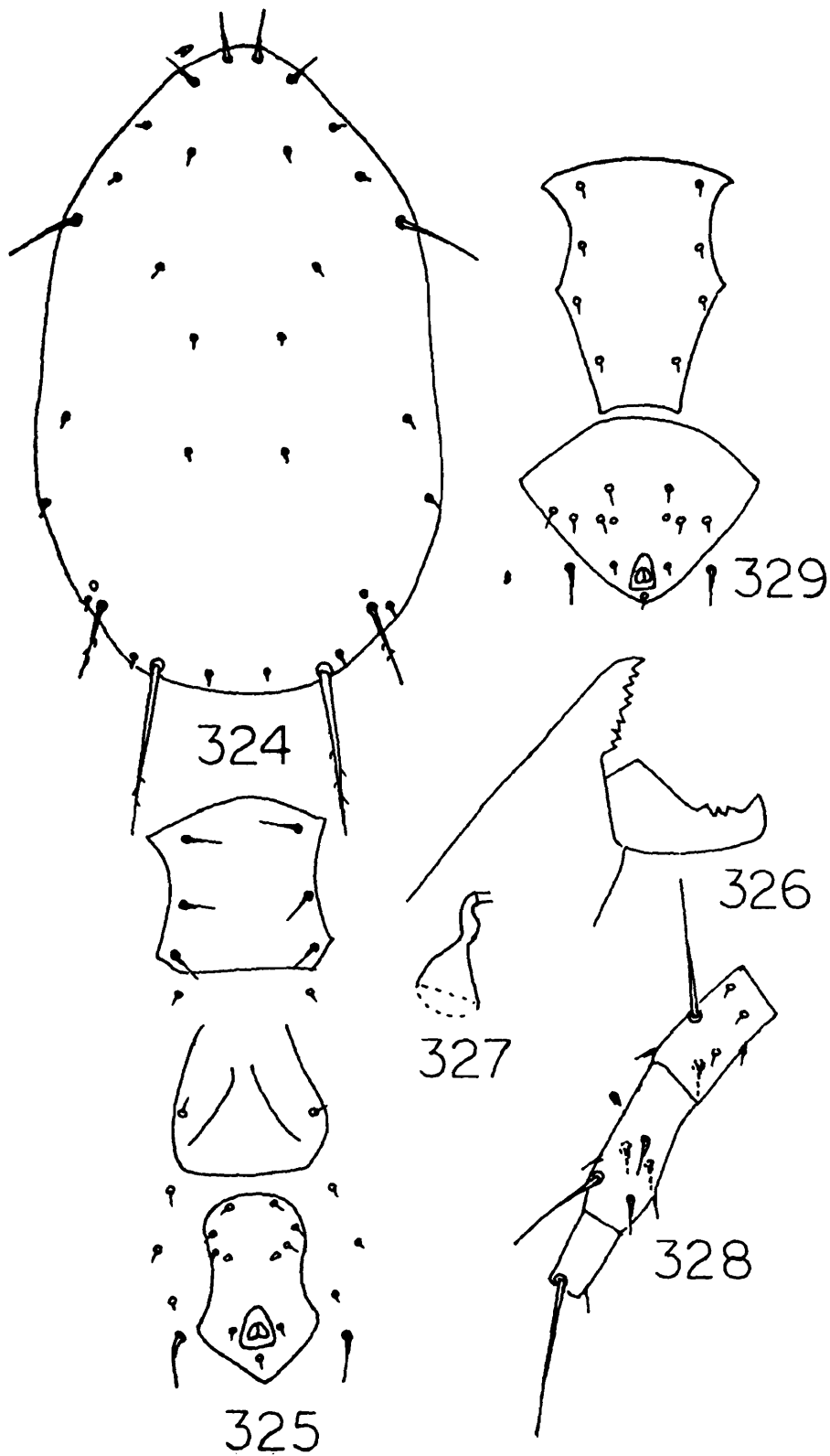
*Female* : Body elongated oval. Dorsal shield 320 long, 180 wide, smooth, lightly sclerotized with 17 pairs of setae and one pair of pores above  $Z_4$  level. Dorsal setae mostly small, thin and smooth except  $j_1$ ,  $j_3$ ,  $s_4$ ,  $Z_4$  and  $Z_5$  which are longer, latter two gently serrate. Measurements of setae :  $j_1$ -24,  $j_4$ - $j_6$ ,  $J_2$ - $J_5$ -5-6 each,  $j_3$ -20,  $z_2$ - $z_4$ -8 each,  $s_4$ -40-44,  $Z_1$ -10-12,  $S_2$ -10-12,  $S_4$ ,  $S_5$ ,  $z_5$ -5 each,  $Z_5$ -90-107,  $Z_4$ -48-56, sublateral setae on lateral integument. Sternal shield 80 long, 72 wide, weakly sclerotized, with 3 pairs of sternal setae, 4th pair of setae present on interscutal membrane. Genital shield 80 wide, with a pair of setae. Ventrianal shield 90-100 long, 50-60 wide, lateral margins deeply concave, with 3 pairs of preanal setae and a pair of crescent-shaped pores ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -32 long, 2 pairs of metapodal plates present. Spermatheca as illustrated. Fixed digit of chelicera multidentate, movable digit with 3 teeth. Peritreme terminates anteriorly between  $j_3$  and  $j_1$ . Macrosetae on leg IV : genu-50-60, tibia-35-44, basitarsus-53-60. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Dorsal chaetotaxy similar as in female. Ventrianal shield as figured.

*Habitat* : Collected on an undetermined plant and also on *Tectona grandis*.

*Type locality and repository* : Holotype ♀, India : Andaman Isl., Wandrau, on an undetermined plant, deposited in ZSI, Calcutta, Reg. No. 3400/17. Paratype 1 ♀, Ferrargunj, on undet. plant, in ZSI, Calcutta, Reg. No. 3401/17.

*Distribution* : India : Andaman Isl., Assam.



Figs. 324-329. *Amblyseius (Typhlodromalus) jarooa* Gupta  
 324. Dorsal shield  
 325. Ventral surface  
 326. Chelicera  
 327. Spermatheca  
 328. Genu, tibia and basitarsus of leg IV  
 329. Ventral surface (male)

*Remarks* : The author re-examined the type of *A. (T.) jarooa* and compared it with *A. (T.) swaga* as identified by Gupta (1978b) and found that the latter referred to the former species and not to *A. (T.) swaga* as described by Pritchard & Baker (1962).

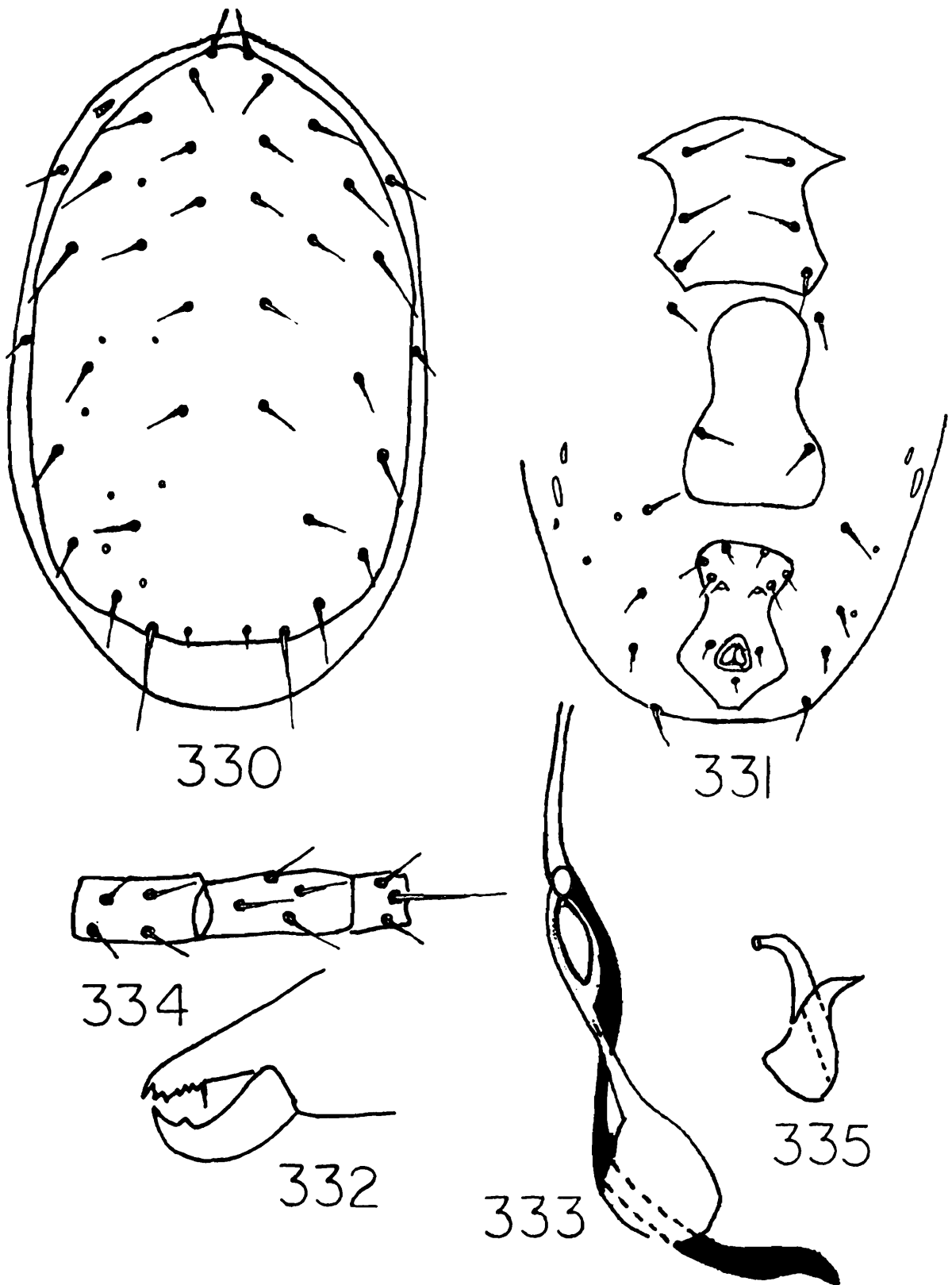
#### 54. *Amblyseius (Typhlodromalus) kalimpongensis* Gupta

(Figs. 330-335)

1969. *Amblyseius kalimpongensis* Gupta, *Bull. Ent., Ent. Soc. India*, **10** : 128-129.  
 1970. *Amblyseius hima* : Gupta, *Sci. & Cult.*, **36** : 98. (misidentification).  
 1974. *Amblyseius hima* : Prasad, A catalogue of mites of India, p. 165.  
 1974. *Amblyseius kalimpongensis* : Prasad, A catalogue of mites of India, p. 166.  
 1975. *Amblyseius kalimpongensis* : Gupta, *Internat. J. Acarol.*, **1(2)** : 37.  
 1975. *Amblyseius hima* : Gupta, *Internat. J. Acarol.*, **1(2)** : 37.  
 1977. *Amblyseius kalimpongensis* : Gupta, *Indian J. Acar.*, **1** : 32.  
 1978. *Typhlodromalus kalimpongensis* : Gupta, *Oriental Ins.*, **12** : 331.  
 1978. *Typhlodromalus hima* : Gupta, *Oriental Ins.*, **12** : 331 (misidentification).  
 1978. *Amblyseius kalimpongensis* : Gupta, *Indian J. Acar.*, **2(2)** : 63.  
 1981. *Amblyseius kalimpongensis* : Gupta, *Indian J. Acar.*, **5(1-2)** : 35.  
 1981. *Amblyseius kalimpongensis* : Gupta, *Indian J. Acar.*, **5(1-2)** : 47.  
 1982. *Amblyseius kalimpongensis* : Gupta, *Rec. zool. Surv. India*, **79(3-4)** : 370-371.  
 1982. *Amblyseius kalimpongensis* : Gupta, *Indian J. Acar.*, **6** : 26-27.

*Female* : Dorsal shield reticulate, 275-280 long, 160-170 wide, with 17 pairs of setae and 6-8 pairs of pores,  $j_3 > j_1 > j_4 = j_5$ ,  $Z_5 > Z_4 = S_2$ . Measurements of setae :  $j_1$ -19-22,  $j_4$ -18,  $j_5$ -18,  $j_6$ -18,  $J_2$ -18,  $J_5$ -6,  $j_3$ -27,  $z_2$ -24-27,  $z_4$ -22-27,  $s_4$ -30-32,  $Z_1$ -17-18,  $S_2$ -20-25,  $S_4$ -18-20,  $S_5$ -22-26,  $Z_5$ -40-47,  $z_5$ -16-18,  $Z_4$ -20-30,  $r_3$ -18,  $R_1$ -13. Sternal shield longer than wide with 3 pairs of sternal setae, metasternal plates lacking, 4th pair lie on interscutal membrane. Genital shield 58-67 wide with a pair of setae. Ventrianal shield 80 long, 45 wide, lateral margins strongly concave, with 3 pairs of preanal setae and a pair of crescent-shaped pores ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -32 long ; 2 pairs of metapodal plates present, primary one 18 long. Spermatheca as illustrated. Fixed digit of chelicera with 2 apical teeth, followed by minute denticles and *pilus dentilis* ; movable digit unidentate. Peritreme extends anteriorly upto  $z_2$ . Macrosetae present only on basitarsus IV-31-34 long. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Dorsal chaetotaxy similar as in female. Spermatophoral process as illustrated.



Figs. 330-335. *Amblyseius (Typhlodromalus) kalimpongensis* Gupta

- 330. Dorsal shield
- 331. Posterior ventral surface
- 332. Chelicera (female)
- 333. Spermatheca
- 334. Genu, tibia and basitarsus of leg IV
- 335. Spermatophoral process

*Habitat* : *Citrus reticulata*, banana, brinjal, dahila, guava, *Shorea* sp., cashewnut, citrus.

*Type locality and repository* : Holotype ♀, India : West Bengal : Kalimpong on *Citrus reticulata*, deposited in ZSI, Calcutta, Reg. No. 3402/17. Paratypes 1 ♀, 1 ♂, same data as for holotype, in ZSI, Reg. No. 3403/17 and 3404/17.

*Distribution* : India : West Bengal, Bihar, Assam, Orissa, Tamil Nadu, Karnataka, Andhra Pradesh, Gujarat, Uttar Pradesh.

*Remarks* : This appears to be a widely distributed species in India.

55. *Amblyseius* (*Typhlodromalus*) *laaensis* Gupta  
(Figs. 336-341)

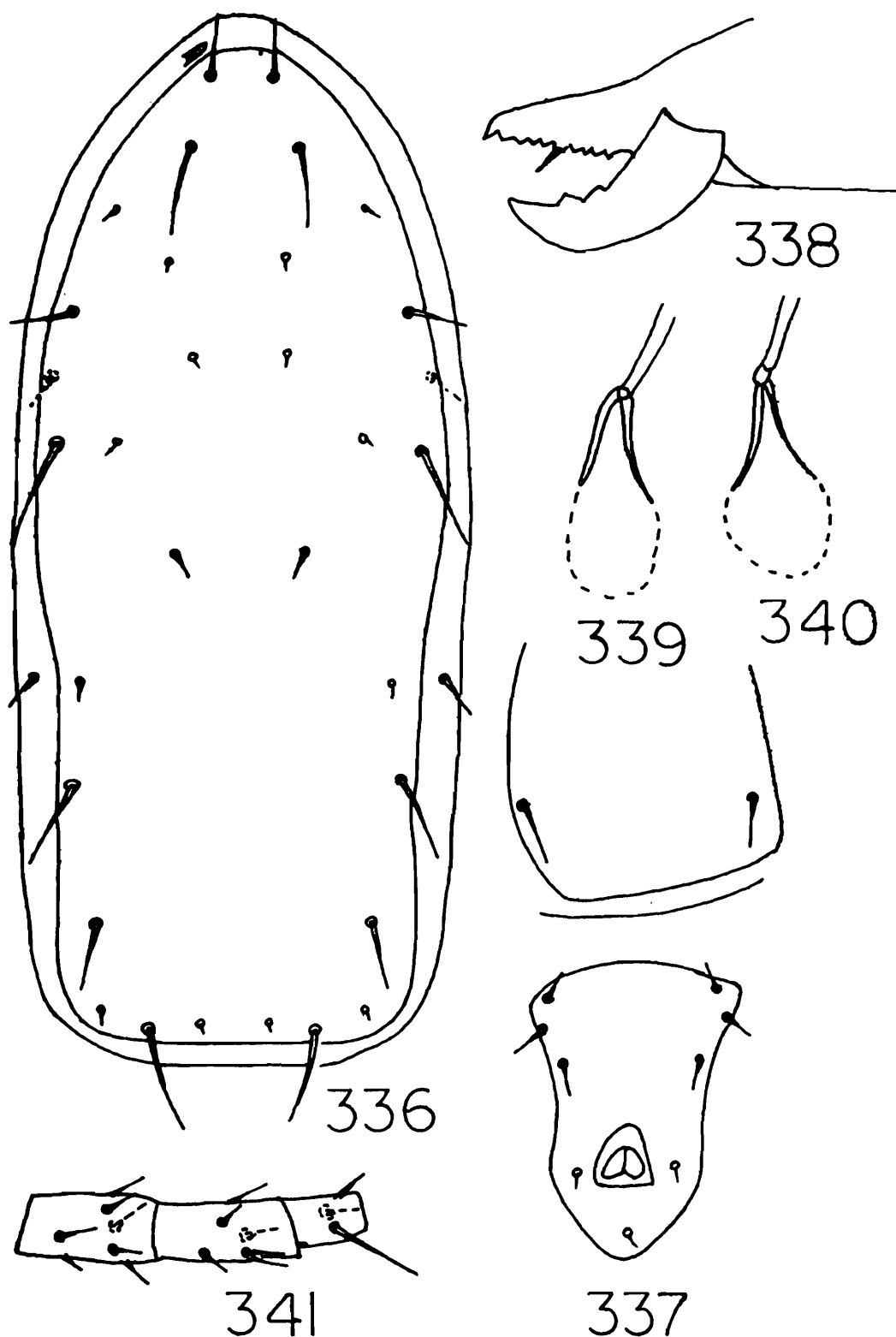
*Amblyseius laaensis* Gupta, *Indian J. Acar.* (In press).

*Female* : Dorsal shield weakly reticulate anterolaterally, 270 long, 130 wide, with 17 pairs of setae.  $s_4 > j_3 > j_1$ ,  $z_4 > z_2$ ,  $S_2 > Z_1$ ,  $J_2$  and  $S_4$  absent. Measurements of setae :  $j_1$ -16,  $j_4$ - $j_5$ -4-5 each,  $j_6$ -10,  $J_5$ -8,  $j_3$ -29,  $z_2$ -7,  $z_4$ -22,  $s_4$ -40,  $Z_1$ -13,  $S_2$ -27,  $S_5$ -13,  $Z_5$ -40,  $z_5$ -6,  $Z_4$ -25,  $r_3$ -22,  $R_1$ -13, the latter two on lateral integument. Sternal shield indistinct, however, 3 pairs of sternal setae present. Genital shield much wider than greatest width of ventrianal shield, a fold present between genital and ventrianal shields. Ventrianal shield 90 long, 56 wide, with 3 pairs of preanal setae ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -22 long : metapodal plate one paired. Fixed digit of chelicera multidentate, with strong *pilus dentilis*, movable digit with 2 teeth. Spermatheca as figured. Macroseta on basitarsus IV-36. Peritreme extends anteriorly upto  $j_1$ .

*Male* : Unknown.

*Type locality and repository* : Holotype ♀, India : Arunachal Pradesh, Laa, on tea, 26.xii.1981, Coll. S. K. Gupta, deposited in ZSI, Calcutta, Reg. No. 3405/17. Paratype 1 ♀, same data as for holotype, Reg. No. 3406/17.

*Remarks* : This species differs from *A. (T.) eucalypticus* (Gupta, 1978) in having  $j_3$  more than 3 times as long as  $z_2$  and also in the absence of  $J_2$  and  $S_4$ . It is also quite close to *A. (T.) aripo* (De Leon, 1967), from that it differs in relative length of  $S_2$  and  $Z_4$ .



Figs. 336-341. *Amblyseius (Typhlodromalus) laeensis* Gupta  
 336. Dorsal shield  
 337. Ventrianal shield  
 338. Chelicera (female)  
 339., 340. Spermathecae  
 341. Genu, tibia and basitarsus of leg IV

Finally, from *A. (T.) olombo* Pritchard & Baker (1962) it differs in having single macroseta and in lacking  $S_2$ .

56. *Amblyseius (Typhlodromalus) lablabi* Ghai & Menon  
(Figs. 342-346)

1967. *Amblyseius lablabi* Ghai & Menon, *Oriental Ins.*, 1 : 72-73.

1974. *Amblyseius lablabi* : Prasad, A catalogue of mites of India, p. 166.

1975. *Amblyseius lablabi* : Gupta, *Internat. J. Acarol.*, 1(2) : 38.

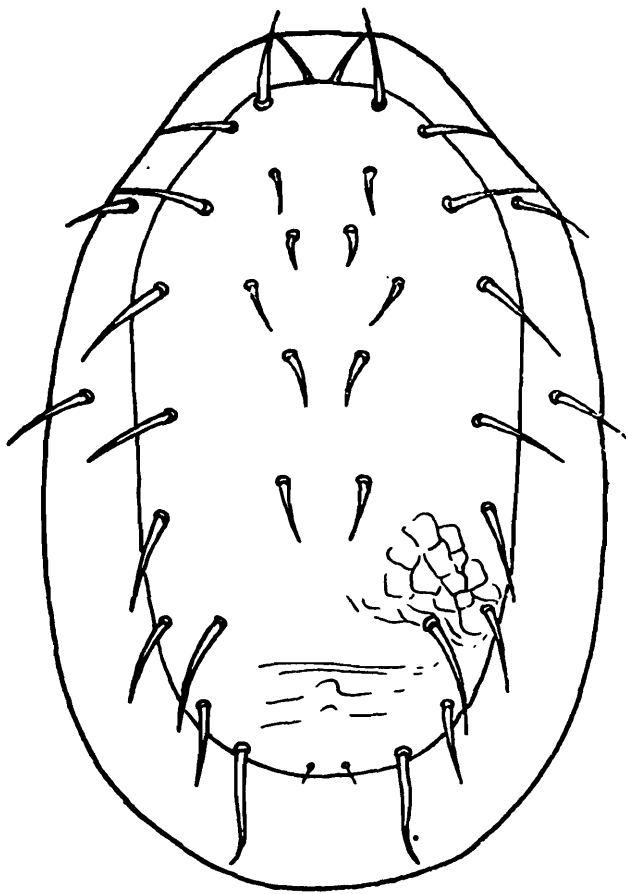
*Female* : Dorsal shield reticulate, with 17 pairs of setae, Measurements of setae :  $j_1$ -33,  $j_4$ -18,  $j_5$ -18,  $j_6$ -30,  $J_2$ -33,  $j_3$ -45,  $z_2$ -33,  $z_4$ -36,  $s_4$ -54,  $Z_1$ -30,  $S_2$ -51,  $S_4$ -48,  $S_5$ -36,  $Z_5$ -60,  $z_5$ -27,  $Z_4$ -60,  $r_3$  and  $R_1$  lie on lateral integument. Sternal shield as long as wide, posterior margin of sternal shield with postlatera<sup>l</sup> angulation, with 3 pairs of sternal setae, 4th pair lie on metasternal plates. Genital shield normal with a pair of setae. Ventrianal shield 140 long, 116 wide, reticulate, with 3 pairs of preanal setae and a pair of preanal pores, anterior margin rounded, lateral margins concave, 4 pairs of setae present around ventrianal shield ; 2 pairs of metapodal plates present. Peritreme extends anteriorly upto  $j_1$ . Fixed digit of chelicera multidentate, movable digit unidentate. Leg IV with macrosetae on genu, tibia and basitarsus, that on tibia being shorter than the other two. Spermatheca as figured.

*Male* : Unknown.

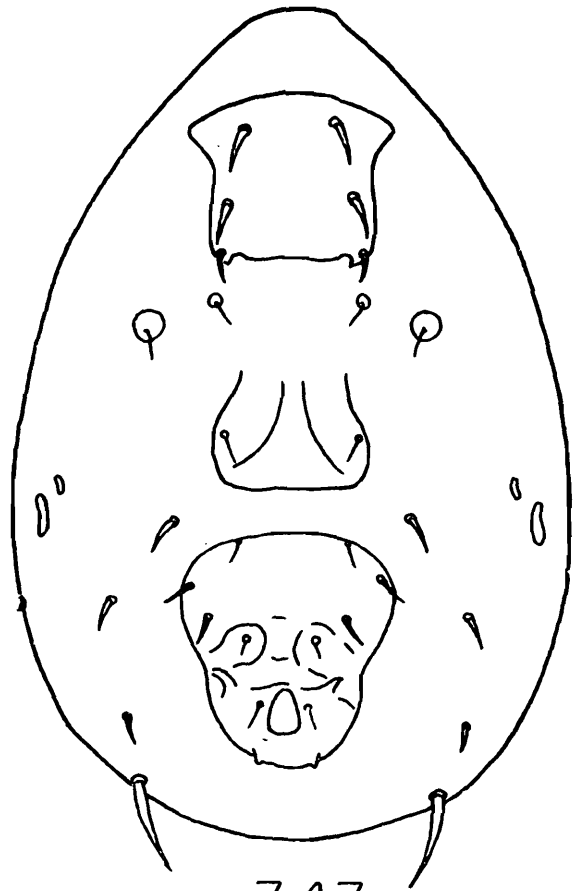
*Habitat* : *Dolichos lablab*.

*Type locality and repository* : Holotype ♀, India : Karnataka, Bangalore, on *Dolichos lablab*, deposited in NPC, I.A.R.I, New Delhi. Paratypes several ♀ ♀, same data as for holotype, in NPC, I.A.R.I.

*Remarks* : This species is known only from its types. The author, while describing the species, did not give the measurements of setae and, therefore, those are given here on the basis of re-examination of the holotype at I.A.R.I, New Delhi. However, the specimen was not in proper condition to allow re-drawing of the spermatheca and, hence, for that the original illustration of the author has been used.



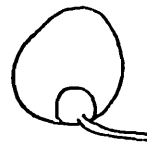
342



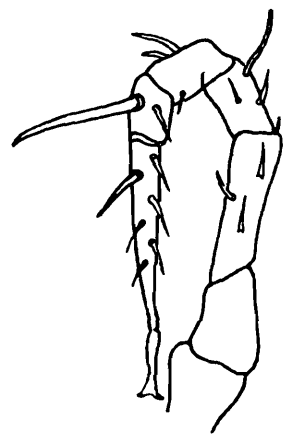
343



344



345



346

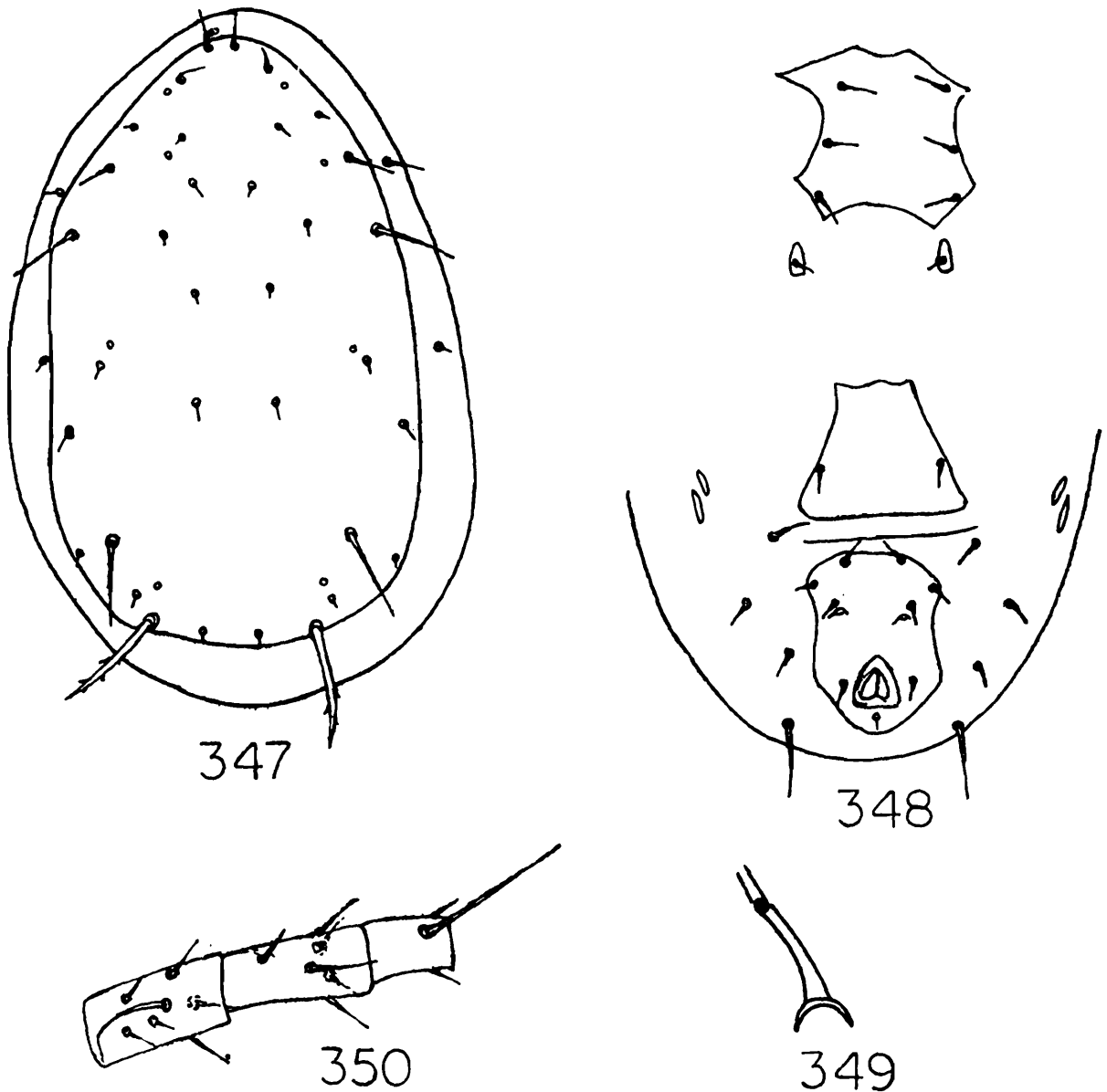
Figs. 342-346. *Amblyseius (Typhlodromalus) lablabi* Ghai and Menon  
(after Ghai & Menon, 1967)

- 342. Dorsal shield
- 343. Ventral surface
- 344. Chelicera (female)
- 345. Spermatheca
- 346. Leg IV

57. *Amblyseius (Typhlodromalus) manipurensis* Gupta  
(Figs. 347-350)

1978. *Amblyseius manipurensis* Gupta, *Indian J. Acar.*, 2(2) : 66-67.

*Female* : Dorsal shield 308 long, 180 wide, smooth, with 17 pairs of setae and 4 pairs of pores. Setae  $j_1 > j_3$ ,  $z_4 > z_2$ ,  $S_2 > S_4 = S_5$ ,  $Z_5 > Z_4$ . Measurements of setae ;  $j_1$ -22,  $j_4$ - $j_5$ -6-8,  $J_2$ -12,  $J_5$ -8,  $j_3$ -12,  $z_2$ -8,  $z_4$ -24,  $s_4$ -40,  $Z_1$ -12,  $S_2$ -16,  $S_4$ -8,  $Z_5$ -68, (faintly serrate),  $z_5$ -8,  $Z_4$ -48 (apparently smooth),  $r_3$ -16,  $R_1$ -9, both on lateral integument, Sternal shield longer (84) than or as long as wide, posterior margin concave with 3 pairs of sternal setae, 4th pair of setae lie on metasternal plates.



Figs. 347-350. *Amblyseius (Typhlodromalus) manipurensis* Gupta

347. Dorsal shield

348. Ventral surface

349. Spermatheca

350. Genu, tibia and basitarsus of leg IV

Genital shield 80 wide with a pair of setae, a fold present between genital and ventrianal shields. Ventrianal shield 92 long, 64 wide, lateral margins gently concave, anterior margin more or less rounded, with 3 pairs of preanal setae and a pair of preanal pores little below the level of 3rd pair of preanal setae, 4 pairs of setae present around ventrianal shield; 2 pairs of metapodal plates present, primary one 16 long, accessory one 12 long. Spermatheca as figured. Macrosetae on leg IV : genu-28, tibia-28, basitarsus-64. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{2}{1} \frac{1}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{2}{1} \frac{1}{1} 1$ .

*Male* : Unknown.

*Habitat* : *Hibiscus esculentus*.

*Type locality & repository* : Holotype ♀ India : Manipur, Ukhrul on *Hibiscus esculentus*, deposited in ZSI, Calcutta, Reg. No. 3407/17 (badly damaged).

*Distribution* : India : Manipur.

*Remarks* : This species is known from its type only.

### 58. *Amblyseius (Typhlodromalus) sorghumae* Gupta

(Figs. 351-354)

1977, *Amblyseius sorghumae* Gupta, *Oriental Ins.*, 11 : 635-636.

*Female* : Dorsal shield 330 long, 225 wide, smooth, gently sclerotized, with 17 pairs of setae, all being smooth and simple. Measurements of setae :  $j_1$ -18,  $j_4$ - $j_6$ ,  $J_2$ - $J_5$ -6-8 each,  $j_3$ -11,  $z_2$ ,  $z_4$ -9 each,  $s_4$ -16,  $Z_1$ ,  $S_2$ - $S_5$ -7 each,  $Z_5$ -72,  $z_5$ -5,  $Z_4$ -17,  $r_3$ ,  $R_1$ -6 each, both on lateral integument;  $j_1$  longer than distance between their bases. Sternal shield lightly sclerotized, wider than long, with 3 pairs of sternal setae, metasternal plates with seta distinct. Genital shield 72 wide, wider than greatest width of ventrianal shield. Ventrianal shield 92 long, 64 wide, constricted at the level of preanal pores, with 3 pairs of preanal setae, 4 pairs of setae and a few small platelets present around ventrianal shield,  $JV_5$ -25 long; 2 pairs of metapodal plates present. Spermatheca as figured. Macrosetae on leg IV : genu-56, tibia-47, basitarsus-40. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{2}{1} \frac{1}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ ; genu II, III, tibia II and III also with a macroseta.

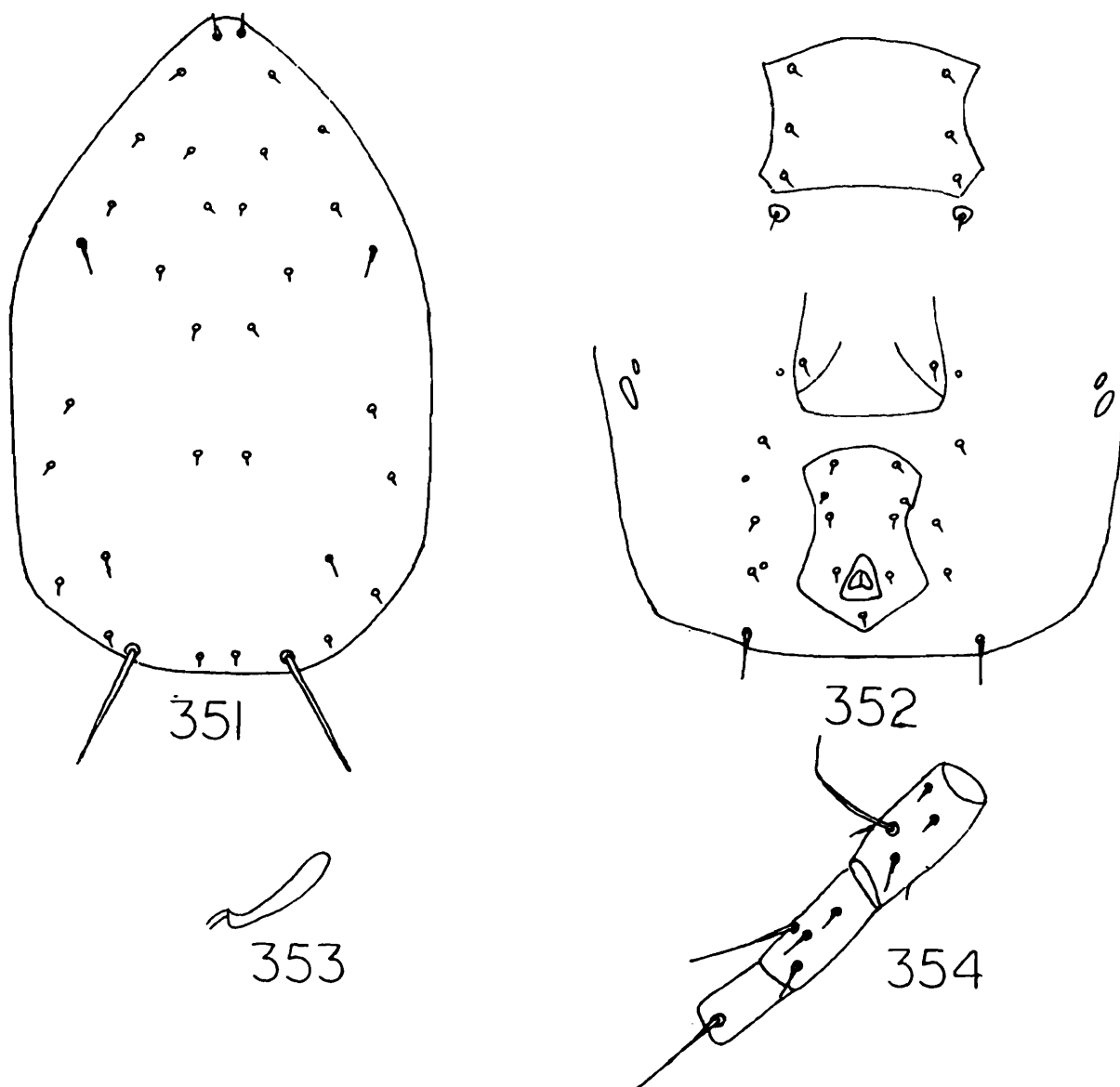
*Male* : Unknown.

*Habitat* : Maize.

*Type locality and repository* : Holotype ♀, India : Car Nicobar Agricultural. Farm, on maize, deposited in ZSI, Calcutta, Reg. No. 3408/17 (mounted on right side of slide). Paratypes 2 ♀ ♀, same data as for holotype, in ZSI, Reg. No. 3409/17.

*Distribution* : India : Car Nicobar Isl.

*Remarks* : This species is known from its type.



Figs. 351-354. *Amblyseius (Typhlodromalus) sorghumae* Gupta  
 351. Dorsal shield  
 352. Ventral surface  
 353. Spermatheca  
 354. Genu, tibia and basitarsus of leg IV

**Subgenus Typhlodromips De Leon**

1959. *Typhlodromopsis* De Leon, *Ent. News*, 70 : 133 (in part, not typical species).  
 1965. *Typhlodromips* De Leon, *Proc. ent. Soc. Wash.*, 67(1) : 23.  
 1965. *Typhlodromips* : Muma, *Fla. Ent.*, 48 (4) : 250.  
 1965. *Amblyseius* : Chant, *Can. Ent.*, 97 : 371 (in part).  
 1966. *Typhlodromips* : De Leon, : *In Studies on the fauna of Suriname and other Guyanas*, p. 93.  
 1967. *Typhlodromips* : De Leon, Allen Press Inc., : p. 26.  
 1967. *Typhlodromips* : Denmark & Muma, *Fla. Ent.*, 50(3) : 171.  
 1970. *Typhlodromips* : Muma & Denmark, *Arthropods of Florida*, 6 : 78.  
 1972. *Typhlodromips* : Denmark & Muma, *Fla. Ent.*, 55(1) : 24.  
 1973. *Typhlodromips* : *Tech. Bull. Agr. Expt. Sta. Univ. Arizona*, 208 : 16.  
 1973. *Typhlodromips* : Denmark & Muma, *Rev. Brazil. Biol.*, 33(2) : 251.  
 1975. *Typhlodromips* : Denmark & Muma, *J. Agr. Univ. Puerto Rico.*, 59(4) : 287.  
 1975. *Typhlodromips*, Denmark & Muma, *Internat. J. Acarol.*, 4(1) : 7-8.  
 1978. *Typhlodromips* : Knisley & Denmark, *Fla. Ent.*, 61(1) : 10.  
 1981, *Typhlodromips* : Denmark & Andrews, *Fla. Ent.*, 64(1) : 149.  
 1981. *Typhlodromips* : Matthyse & Denmark, *Fla. Ent.*, 64(2) : 346.  
 1982. *Typhlodromips* : Moraes *et al.*, *Internat. J. Acarol.*, 8(1) : 5.

*Diagnosis* : Dorsal shield with 6 pairs of setae on dorsocentral series, 2 pairs of median and 9 pairs of laterals,  $Z_5$  and  $Z_4$  serrate or plumose. Fixed digit of chelicera mostly multidentate, several lie proximal to *pilus dentilis*. Sternal shield as wide as or wider than long, with straight or concave posterior margin. Peritreme extends anteriorly upto  $j_1$ . Ventrianal shield pentagonal or shield-shaped. Macrosetae usually present on genu and occasionally on tibia of legs I, II and III. Leg IV macroseta on genu, tibia and basitarsus, the latter usually longest.

Type : *Typhlodromopsis simplicissimus* De Leon, 1965, by original designation.

**Key to the species of Typhlodromips**

- |  |     |                   |
|--|-----|-------------------|
| 1. Besides $Z_5$ and $Z_4$ other setae being subequal          | ... | 2                 |
| — Besides $Z_5$ and $Z_4$ there are other long setae           | ... | 9                 |
| 2. $Z_4$ quite long at least 3 times the length of $S_4$       | ... | 3                 |
| — $Z_4$ not so long  | ... | 6                 |
| 3. $Z_4$ distinctly serrate or weakly serrate                  | ... | 4                 |
| — $Z_4$ smooth   | ... | 5                 |
| 4. Cervix of spermatheca saucer-shaped                         | ... | <i>syzygii</i>    |
| — Cervix of spermatheca elongated flask-shaped                 | ... | <i>suknaensis</i> |
| 5. Spermatheca and spermatophoral process as in figs. 358, 361 | ... | <i>arecae</i>     |

— Spermatheca and spermatophoral process as in figs. 389, 391	...	<i>meghalayensis</i>
6. Ventrianal shield as long as wide	...	<i>sapienticola</i>
— Ventrianal shield longer than wide	...	7
7. $Z_5$ almost as long as the distance between its bases	...	<i>neoghanii</i>
— $Z_5$ not so long	...	8
8. Spermatheca as in fig. 405	...	<i>officinaria</i>
— Spermatheca as in figs 409, 410	...	<i>polyantheae</i>
9. $z_2$ and $z_4$ unequal	...	10
— $z_2$ and $z_4$ equal	...	12
10. $S_2$ more than 4 times as long as $Z_1$	...	<i>tetranychivorus</i>
— $S_2$ only slightly longer than $Z_1$	...	11
11. Macrosetae on genu IV and tibia IV almost equal	...	<i>potentillae</i>
— Macrosetae on genu IV longer than that on tibia IV	...	<i>mangiferae</i>
12. $Z_4$ reaches almost upto base of $Z_5$	...	13
— $Z_4$ much shorter than the distance between its base and that of $Z_5$	...	<i>neocrotalariae</i>
13. Lateral margins of ventrianal shield concave	...	14
— Lateral margins of ventrianal shield almost straight	...	15
14. Spermatheca with bowl-shaped cervix ; small platelets absent around ventrianal shield	...	<i>sijiensis</i>
— Spermatheca with flask-shaped cervix ; small platelets present around ventrianal shield	...	<i>crotalariae</i>
15. Spermatheca as in fig. 379	...	<i>guajavae</i>
— Spermatheca as in fig. 374	...	<i>eujeniae</i>

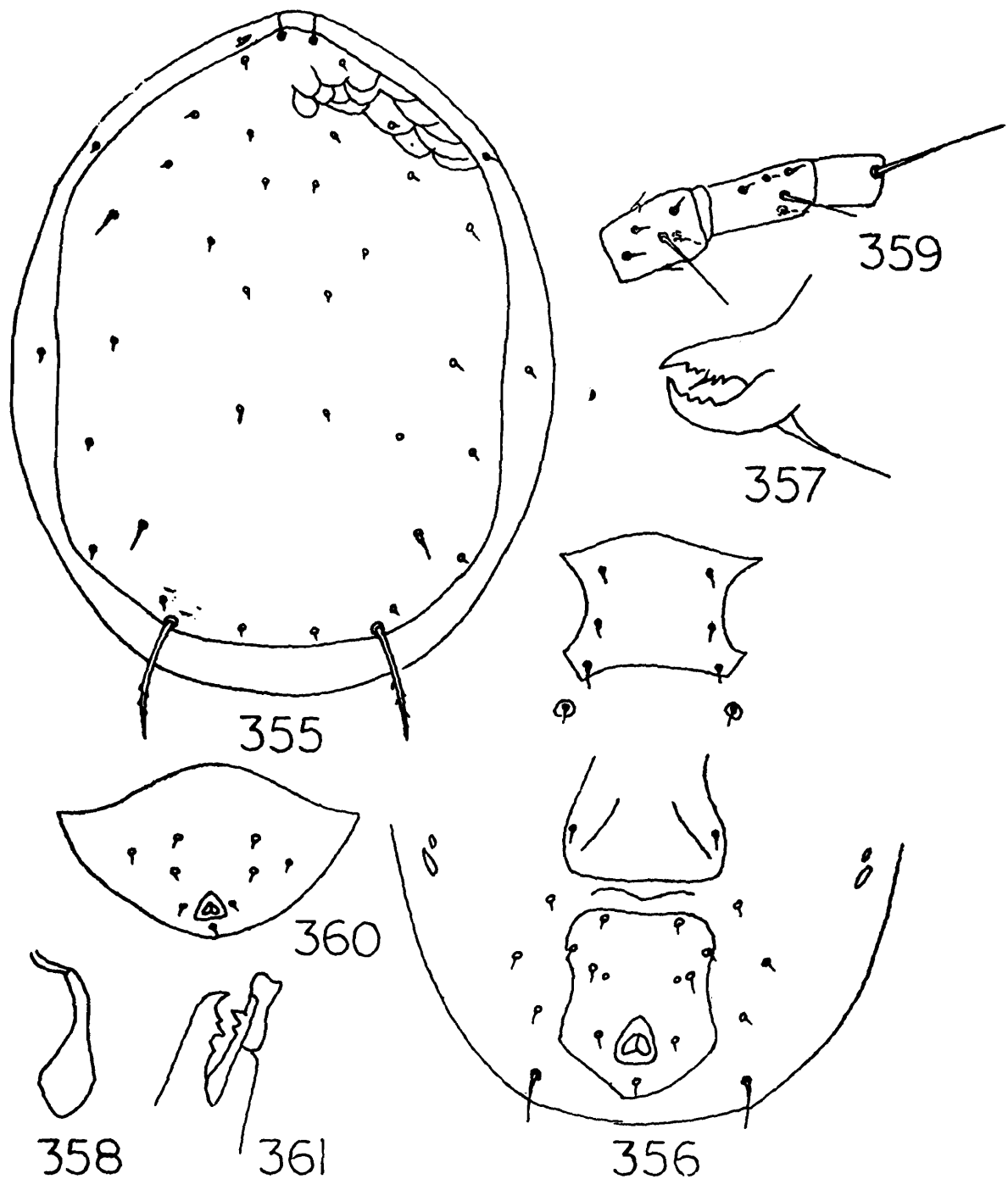
### 59. *Amblyseius* (*Typhlodromips*) *arecae* Gupta

(Figs. 355-361)

1977. *Amblyseius arecae* Gupta, *Oriental Ins.*, 11 : 624-626.

*Female* : Dorsal shield 308 long, 208 wide, fairly well sclerotized with 17 pairs of setae, mostly small except  $Z_5$  and  $Z_4$  which are thicker and longer and the former gently serrate ;  $s_4 = J_1$ . Measurements of setae :  $j_1$ -16,  $j_4$ - $j_6$ ,  $J_2$ - $J_5$ -8-10 each,  $j_3$ -12,  $z_2$ ,  $z_4$ -8 each,  $s_4$ -16,  $Z_1$ -8,  $S_2$ - $S_5$ -8 each,  $Z_5$ -71,  $Z_4$ -26. Sternal shield as long (60) as wide, smooth with 3 pairs of sternal setae, 4th pair of setae lie on metasternal plates. Genital shield 63 wide, wider than maximum width of ventrianal shield,

with a pair of setae. Ventrianal shield 96 long. 56 wide, smooth, lateral margins concave, with 3 pairs of preanal setae and a pair of round preanal pores almost at the level of 3rd pair of preanal setae, 4 pairs of setae present around ventrianal shield,  $JV_5-28$  long, 2 pairs



Figs. 355-361. *Amblyseius (Typhlodromips) arecae* Gupta

- 355. Dorsal shield
- 356. Ventral surface
- 357. Chelicera (female)
- 358. Spermatheca
- 359. Genu, tibia and basitarsus of leg IV
- 360. Ventrianal shield (male)
- 361. Chelicera (male) with spermatophoral process

of metapodal plates present. Spermatheca as figured. Fixed digit of chelicera multidentate with strong *pilus dentilis*, movable digit 3 dentate. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{2}{1} \frac{1}{1} 1$ . Macrosetae on leg IV : genu-40, tibia-29, basitarsus-44, genu III-29, genu II-17. Peritreme extends anteriorly upto  $j_3$ .

*Male* : Dorsal chaetotaxy as in female. Spermatophoral process as figured.

*Habitat* : *Areca catechu*.

*Type locality and repository* : Holotype ♀, India : Andaman Isl., Anikhet, on arecanut, deposited in ZSI, Calcutta, Reg. No. 3211/17. Paratypes 5 ♀ ♀, 1 ♂, same data as for holotype, in ZSI, Reg. No. 3212/17 and 3410 & 3411/17.

*Distribution* : INDIA : Andaman Isl.

*Remarks* : This species is known from its types only.

#### 60. *Amblyseius (Typhlodromips) crotalariae* Gupta

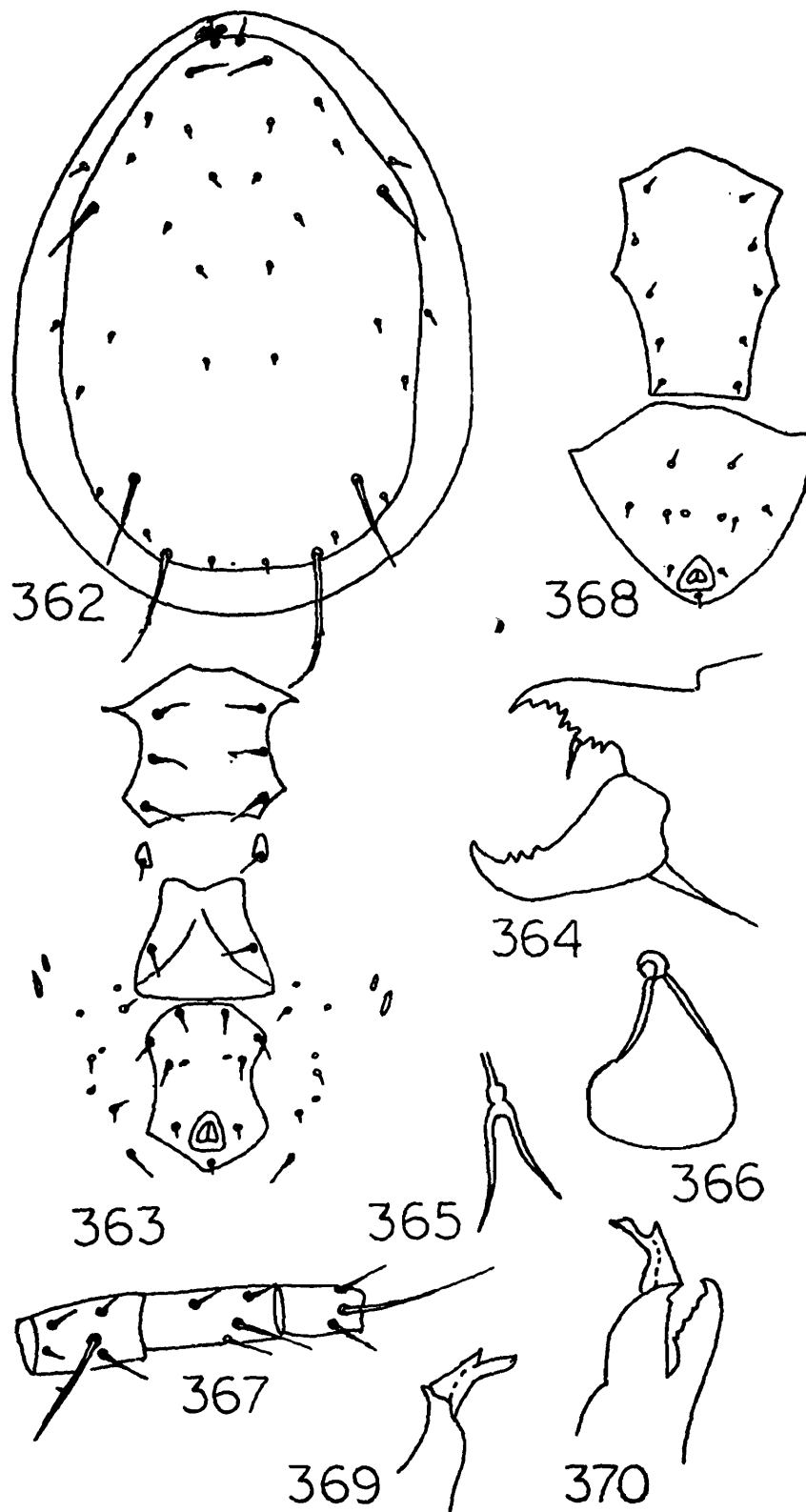
(Figs. 362-370)

1977. *Amblyseius crotalariae* Gupta, *Entomologists' mon. Mag.*, **112** : 53-55.

1978. *Amblyseius crotalariae* : Gupta, *Indian J. Acar.*, **2**(2) : 61-62.

*Female* : Dorsal shield 300 long, 200 wide, smooth with 17 pairs of setae and 5 pairs of pores.  $Z_5$  weakly serrate, other setae smooth. Measurements of setae :  $j_1$ -18-22,  $j_4$ - $j_6$ ,  $J_2$ -6-9 each,  $J_5$ -5,  $j_3$ -22,  $z_2$ -9,  $z_4$ -10,  $s_4$ -40-45,  $Z_1$ -10,  $S_2$ -10,  $S_4$ -10,  $S_5$ -10,  $Z_5$ -65-74,  $z_5$ -5,  $Z_4$ -45-52,  $r_3$ -10,  $R_1$ -9, both on lateral integument. Sternal shield 90 long, 80 wide, with 3 pairs of sternal setae, 4th pair of setae on metasternal plates. Genital shield 80 wide with a pair of setae. Ventrianal shield 90 long, 78 wide, lateral margins concave, with 3 pairs of preanal setae and a pair of crescent-shaped preanal pores ; 4 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -36 long ; 2 pairs of metapodal plates present, primary one 14 long, accessory one 10 long. Fixed digit of chelicera with at least 4 teeth anterior to *pilus dentilis*, 2 teeth posterior to it, *pilus dentilis* strong, movable digit with 2-3 teeth. Spermatheca as figured. Peritreme extends anteriorly beyond  $j_1$ . Macrosetae on leg IV : genu-46-55, tibia 36-43, basitarsus-55-65, genu I-31, genu II-27, genu III-22. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Dorsal chaetotaxy similar as in female. Spermatophoral process and ventrianal shield as figured.



Figs. 362-370. *Amblyseius (Typhlodromips) crotalariae* Gupta  
 362. Dorsal shield  
 363. Ventral surface  
 364. Chelicera (female)  
 365, 366. Spermathecae  
 367. Genu, tibia and basitarsus of leg IV  
 368. Ventral surface (male)  
 369, 370. Spermatophoral processes

*Habitat* : *Crotalaria* sp., fern, *Nyctanthes arbortritis*.

*Type locality and repository* : Holotype ♀, India : West Bengal, Darjeeling Dist., Sukna, on *Crotalaria* sp., deposited in ZSI, Calcutta, Reg. No. 3412/17.

*Distribution* : INDIA : West Bengal, Tripura, Assam.

*Remarks* : The distribution of this species appears to be confined to east and northeast India.

61. *Amblyseius* (*Typhlodromips*) *eujeniae* Gupta  
(Figs. 371-375)

1977. *Amblyseius eujeniae* Gupta, *Oriental Ins.*, 11 : 627-629.

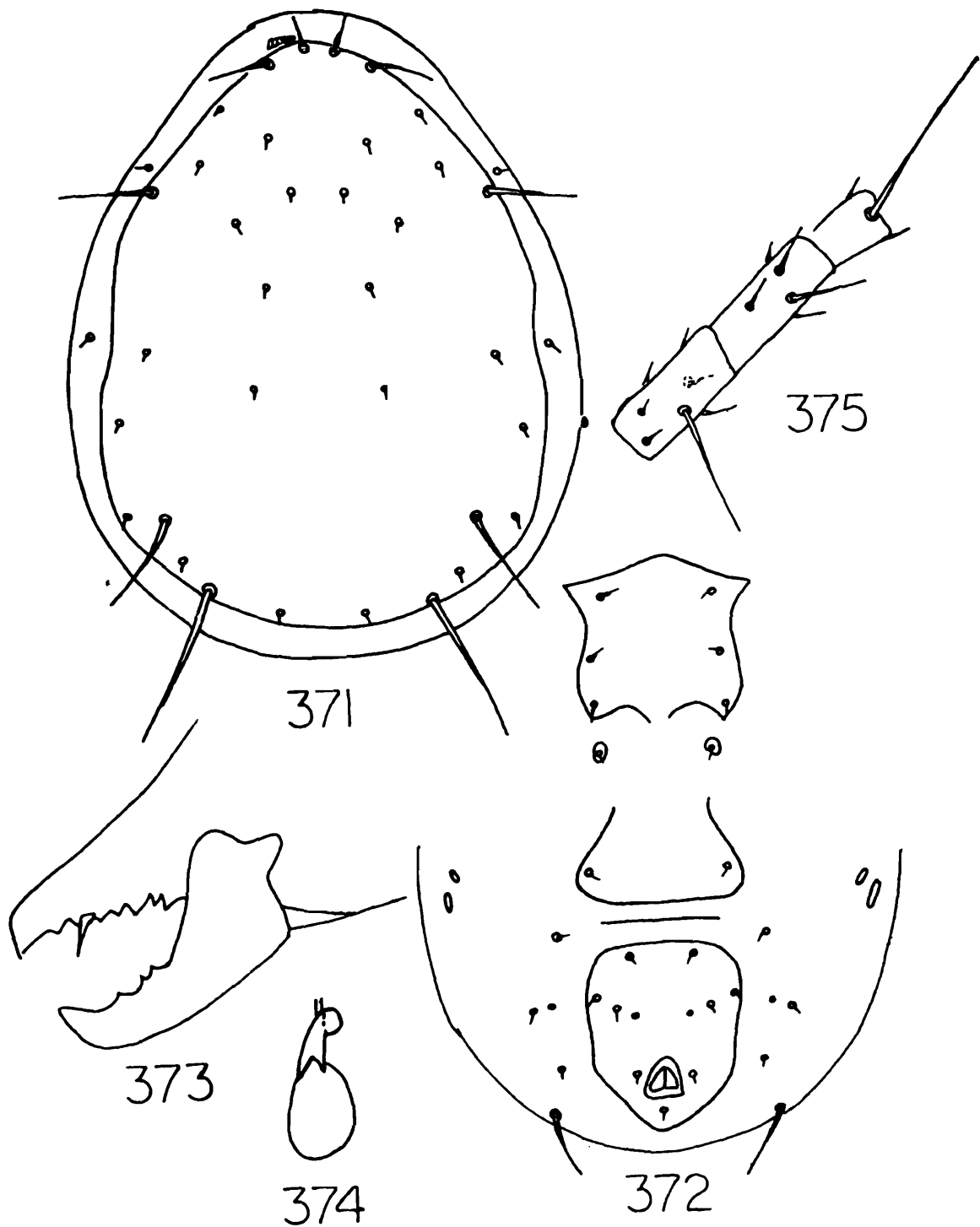
*Female* : Dorsal shield 300-320 long, 190-200 wide, reticulate, with 17 pairs of setae. Besides  $j_1$ ,  $j_3$ ,  $s_4$ ,  $Z_5$  and  $Z_4$  which are long and the latter two weakly serrate, others are small, smooth and pointed. Measurements of setae :  $j_1$ -20,  $j_4$ - $j_6$ -5 each,  $J_2$ -10,  $J_5$ -5,  $j_3$ -37,  $z_2$ -8,  $z_4$ -8,  $s_4$ -66,  $Z_1$ ,  $S_2$ - $S_5$ -8 each,  $Z_5$ -92 (weakly serrate),  $z_5$ -8,  $Z_4$ -66. Sternal shield sclerotized, as long (80) as wide, with 3 pairs of sternal setae ; 4th pair of setae on metasternal plates. Genital shield 78 wide with a pair of setae. Ventrianal shield 96-112 long, 72-78 wide, lateral margins straight, with 3 pairs of preanal setae, preanal pores present at the level of 3rd pair of preanal setae ; 4 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -25 long, metapodal plates 2 paired, primary one 20 long. Spermatheca as figured. Fixed digit of chelicera with 2 teeth anterior to strong *pilus dentilis*, 4-5 teeth posterior to it ; movable digit with 2-3 teeth. Peritreme extends anteriorly upto  $j_1$ . Macrosetae on leg IV : genu-56, tibia-29, basitarsus-72. Genu I-26, genu II-33, genu III-41. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Unknown.

*Habitat* : *Eujenia jambolana*, banana.

*Type locality and repository* : Holotype ♀, India : Andaman Isl., Ferrargunj, on *Eujenia jambolana*, deposited in ZSI, Calcutta, Reg. No. 3413/17. Paratype 1 ♀, Ferrargunj. on banana.

*Distribution* : India : Andaman Isls.



Figs. 371-375. *Amblyseius (Typhlodromips) eujeniae* Gupta

- 371. Dorsal shield
- 372. Ventral surface
- 373. Chelicera (female)
- 374. Spermatheca
- 375. Genu, tibia and basitarsus of leg IV

62. *Amblyseius (Typhlodromips) guajavae* Gupta  
(Figs. 376-380)

1978. *Amblyseius guajavae* Gupta, *Indian J. Acar.*, 2(2) : 63.

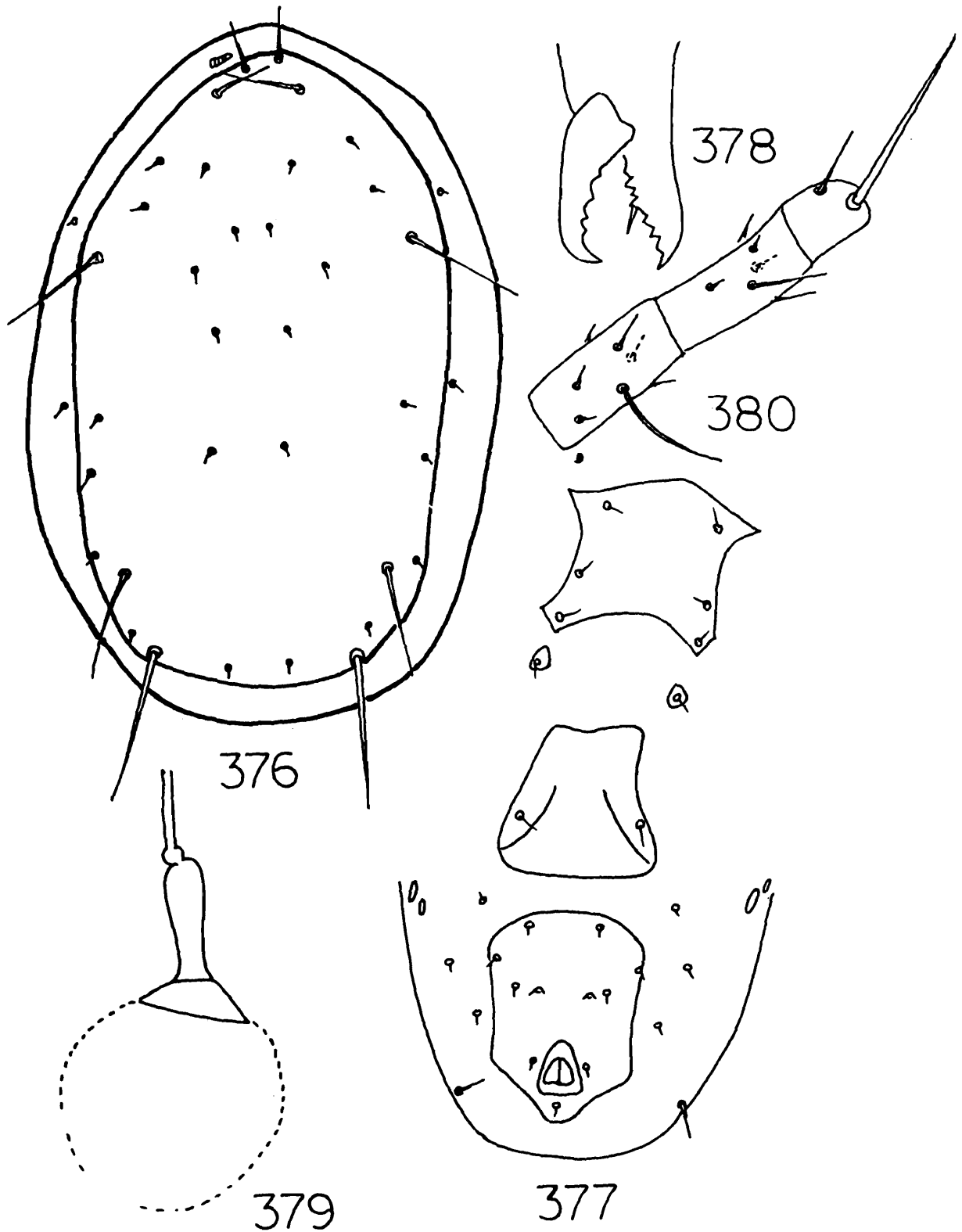
*Female* : Dorsal shield 315-325 long, 215-224 wide, smooth, with 17 pairs of setae. Setae  $j_1$ ,  $j_3$ ,  $s_4$ ,  $Z_5$  and  $Z_4$  long, other setae minute. Measurements of setae :  $j_1$ -22-28,  $j_4$ - $j_6$ ,  $J_2$ - $J_5$ -6-8 long,  $j_3$ -40,  $z_2$ - $z_4$ -6-8,  $s_4$ -67,  $Z_1$ ,  $S_2$ - $S_5$ -6-8,  $Z_5$ -90-98,  $z_5$ -6,  $Z_4$ -68-71. Sternal shield smooth, 82 long, 80 wide, with 3 pairs of sternal setae, metasternal plate triangular with seta. Genital shield 82-85 wide, with a pair of setae. Ventrianal shield 108-112 long, 76-85 wide, pentagonal, lateral margins concave, with 3 pairs of preanal setae and a pair of preanal pores at the level of 3rd pair of preanal setae, 4 pairs of setae present around ventrianal shield, 2 pairs of metapodal plates present. Peritreme extends anteriorly upto  $j_1$ . Spermatheca as figured. Fixed digit of chelicera with 4 teeth anterior to *pilus dentilis* and 3 teeth posterior to it, movable digit with at least 3 teeth. Macrosetae on leg IV : genu 58-62, tibia 35-40, basitarsus 76-78, genu I-35, genu II-27, genu III-40. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Unknown.

*Type locality and repository* : Holotype ♀, India : Meghalaya, Dalu, on *Psidium guajava*, deposited in ZSI, Calcutta, Reg. No. 3414/17 (Holotype-damaged). Paratypes 3 ♀ ♀, same data as for holotype, in ZSI, Reg. No. 3415-17/17.

*Distribution* : India : Meghalaya, Arunachal Pradesh, Karnataka.

*Remarks* : Since the publication of its description basing on Meghalayan material, this species was also collected from Karnataka and Arunachal Pradesh and the measurements given above are also based upon those material.



Figs. 376-380. *Amblyseius (Typhlodromips) guajavae* Gupta

376. Dorsal shield

377. Ventral surface

378. Chelicera (female)

379. Spermatheca

380. Genu, tibia and basitarsus of leg IV

63. *Amblyseius (Typhlodromips) mangiferae* Ghai & Menon.

( Figs. 381-385 )

1967. *Amblyseius mangiferae* Ghai & Menon, *Oriental Ins.*, 1 : 74-75.1974. *Amblyseius mangiferae* : Prasad, A catalogue of mites of India, p. 167.1975. *Amblyseius mangiferae*, Gupta, *Internat. J. Acarol.*, 1(2) : 38.

*Female* : Dorsal shield smooth with 17 pairs of setae,  $Z_5$  being longest and thickest ;  $j_1$ ,  $j_3$ ,  $z_2$ ,  $z_4$ ,  $s_4$ ,  $J_2$  long, others being small ; setae  $j_3$ ,  $z_2$ - $z_4$  shorter than the distance between their bases. Measurements of setae :  $Z_5$ -54,  $S_5$ -24,  $S_4$ -18,  $j_3$ -21,  $s_4$ -50,  $Z_4$ -30,  $z_2$ -21. Sternal shield much longer than broad, with 3 pairs of sternal setae, metasternal plate indistinct. Genital shield wider than greatest width of ventrianal shield, with a pair of setae. Ventrianal shield longer (70) than broad (62), with 3 pairs of preanal setae and a pair of preanal pores. Leg IV macrosetae on genu-48, tibia-33 and basitarsus-60. Fixed digit of chelicera with 3 apical teeth and one subapical tooth, movable digit apparently toothless.

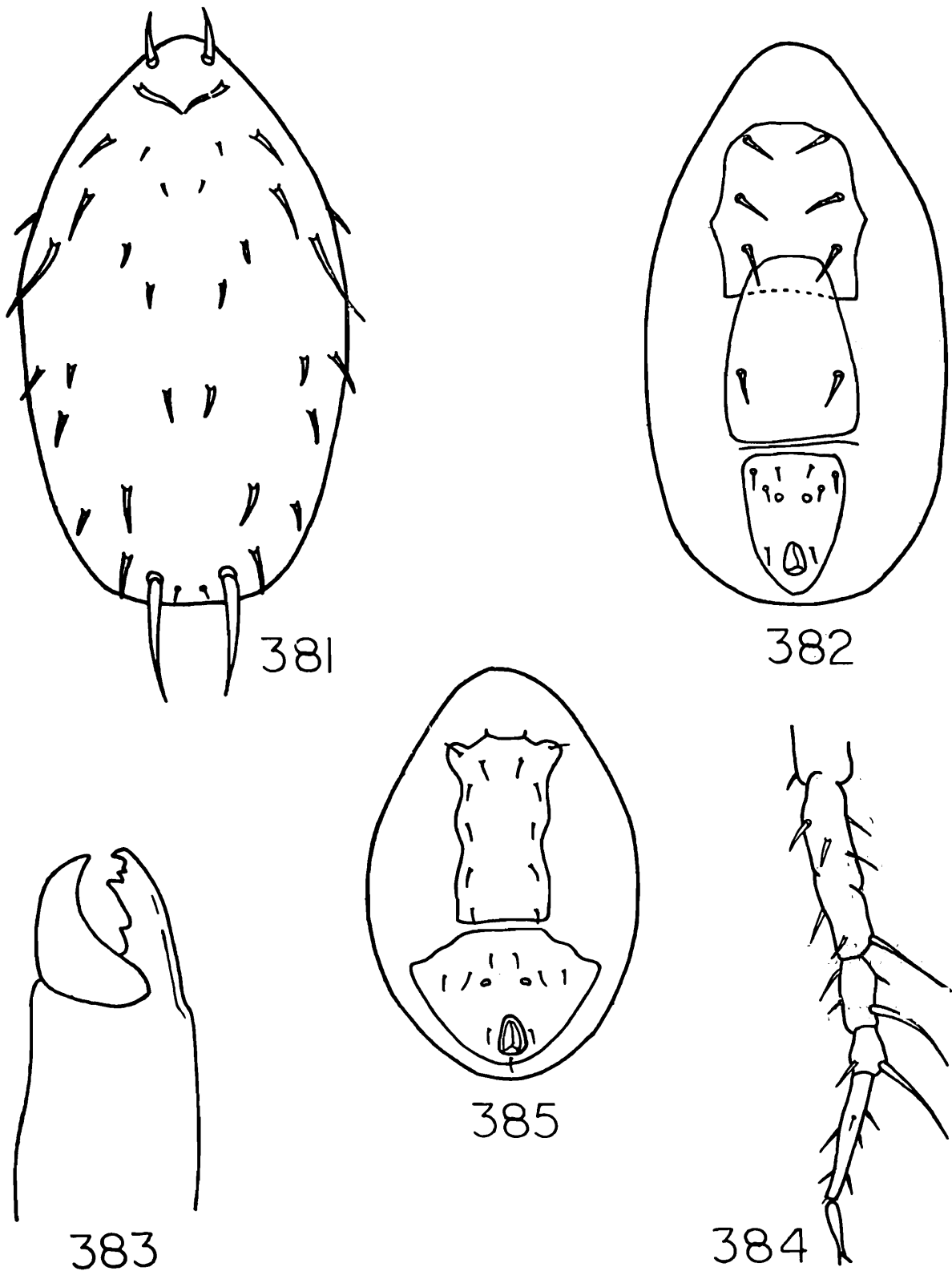
*Male* : Dorsal chaetotaxy similar to that of female. Ventrianal shield as figured.

*Habitat* : Malformed mango.

*Type locality and repository* : Holotype ♂, India : Delhi on malformed mango panicles along with mango-bud mite, deposited in NPC, I.A.R.I, New Delhi. Paratypes ♀ + 2 other specimens ( sex not specified ), same data as for holotype, in NPC, I.A.R.I.

*Distribution* : India : New Delhi.

*Remarks* : This species is known only from its types. The authors of this species, while describing it, did not give the measurements of setae which are provided here after re-examing the holotype. Since the slide was in bad condition, the measurements of all the dorsal setae and ventral shields could not be given here in detail.



Figs. 381-385. *Amblyseius (Typhlodromips) mangiferae* Ghai and Menon (after Ghai & Menon, 1967)

- 381. Dorsal shield
- 382. Ventral surface
- 383. Chelicera (female)
- 384. Leg IV
- 385. Ventral surface (male)

64. *Amblyseius (Typhlodromips) meghalayensis* Gupta  
(Figs. 386-391)

1978. *Amblyseius meghalayensis* Gupta, *Indian J. Acar.*, 2(2) : 67-69.

*Female* : Dorsal shield 300 long, 162 wide, lateral margins imbricate with 17 pairs of setae. Measurements of setae :  $j_1$ -20,  $j_4$ - $j_5$ -8 each.  $j_6$ -10,  $J_2$ -10,  $J_5$ -6,  $j_3$ -15,  $z_2$ -10,  $z_4$ -16,  $s_4$ -24,  $Z_1$ -12,  $S_2$ -17,  $S_4$ -16,  $S_5$ -16,  $Z_5$ -75,  $z_5$ -8,  $Z_4$ -56,  $r_3$ -16,  $R_1$ -12. Sternal shield as long (68) as wide, with 3 pairs of sternal setae, 4th pair lie on metasternal plates. Genital shield narrower (60) than greatest width of ventrianal shield, with a pair of setae. Ventrianal shield 88 long, 72 wide, lateral margins concave at the level of 3rd pair of preanal setae with 3 pairs of preanal setae and a pair of preanal pores, 4 pairs of setae present around ventrianal shield ; 2 pairs of metapodal plates present. Fixed digit of chelicera with 4 teeth anterior to *pilus dentilis* and at least 4 teeth posterior to it ; movable digit with 3 teeth. Spermatheca as figured. Macrosetae on leg IV : genu-44, tibia-35, basitarsus-48 ; genu I-24, genu II-29.

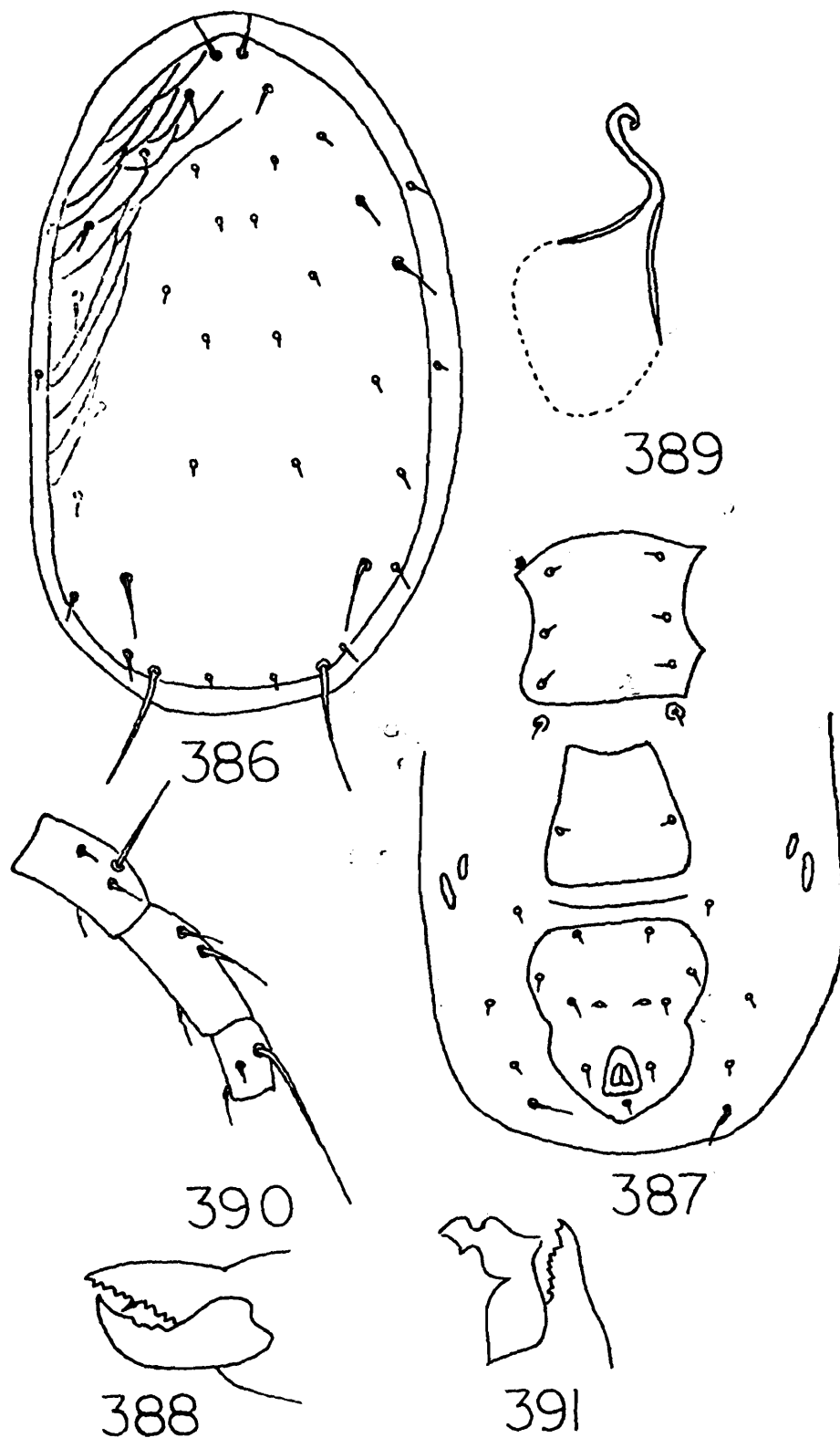
*Male* : Dorsal chaetotaxy similar as in female. Spermatophoral process as figured.

*Habitat* : Guava.

*Type locality and repository* : Holotype ♀, India : Meghalaya, Dalu, on guava, deposited in ZSI, Calcutta, Reg. No. 3418/17. Paratypes 2 ♀ ♀, same data as for holotype, in ZSI, Reg. No. 3419-20/17, 1 ♂, Assam, Dhubri, on undet. plant.

*Distribution* : India : Meghalaya and Assam.

*Remarks* : This species is known only from its types.



Figs. 386-391. *Amblyseius (Typhlodromips) meghalayensis* Gupta  
 386. Dorsal shield  
 387. Ventral surface  
 388. Chelicera (female)  
 389. Spermatheca  
 390. Genu, tibia and basitarsus of leg IV  
 391. Chelicera (male) with spermatophoral process

65. *Amblyseius (Typhlodromips) neocrotalariae* (Gupta)

(Figs. 392-397)

1978. *Typhlodromips neocrotalariae* Gupta, *Oriental Ins.*, 12 : 335.

*Female* : Dorsal shield 324 long, 212 wide, less sclerotized, reticulate, with 17 pairs of setae, all being smooth except  $Z_5$  which is weakly serrate. Peritreme extends anteriorly upto  $j_1$  and posteriorly curves around coxae IV.  $Z_5$  being longest ;  $j_3 > j_1$ ,  $s_4 > j_3$ . Measurements of setae :  $j_1$ -20,  $j_4$ - $j_5$ -8 each,  $j_6$ - $J_2$ -12 each,  $J_5$ -8,  $j_3$ -28,  $z_2$ - $z_4$ -9 each,  $s_4$ -30-35,  $Z_1$ -12,  $S_2$ -12,  $S_4$ -8,  $S_5$ -8,  $Z_5$ -68,  $z_5$ -8,  $Z_4$ -36-40,  $r_3$ -20,  $R_1$ -10. Sternal shield smooth with 3 pairs of sternal setae, 4th pair of sternal setae on triangular metasternal plates. Genital shield as wide as the greatest width of ventrianal shield, with a pair of setae. Ventrianal shield 108 long, 80 wide, lateral margins gently concave with 3 pairs of preanal setae and a pair of preanal pores at the level of 3rd pair of preanal setae, 4 pairs of setae present around ventrianal shield,  $JV_5$ -32 long ; 2 pairs of metapodal plates present, primary one 16 long, accessory one-8 long. Fixed digit of chelicera with at least 3 teeth anterior to *pilus dentilis* and 3 teeth posterior to it, movable digit with 3 teeth. Spermatheca as figured. Macrosetae on leg IV : genu-52, tibia-40, basitarsus-60, genu II-20, genu III-32. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

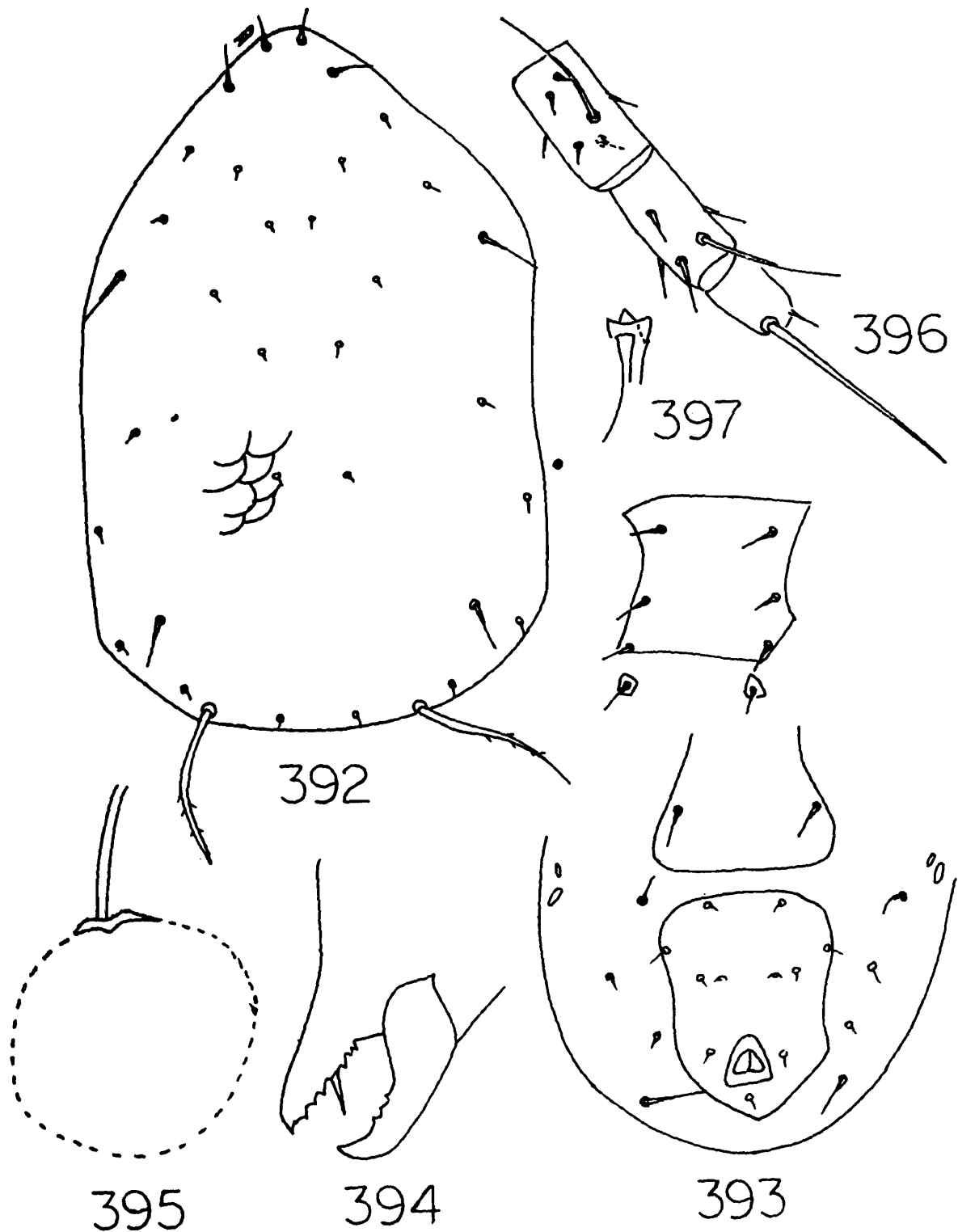
*Male* : Dorsal chaetotaxy similar as in female. Spermatophoral process as figured.

*Habitat* : *Datura* sp.

*Type locality and repository* : Holotype ♀, India : Tamil Nadu, Kodaikanal, Oothu, on *Datura* sp., deposited in ZSI, Calcutta, Reg. No. 3421/17. Paratypes 2 ♀ ♀, 1 ♂, same data as for holotype, in ZSI, Reg. No. 3422/17.

*Distribution* : India : Tamil Nadu.

*Remarks* : This species is known only from its types.



Figs. 392-397. *Amblyseius (Typhlodromips) neocrotalariae* (Gupta)

392. Dorsal shield

393. Ventral surface

394. Chelicera (female)

395. Spermatheca

396. Genu, tibia and basitarsus of leg IV

397. Spermatophoral process

66. *Amblyseius (Typhlodromips) neoghanii* Gupta

(Figs. 398-401)

*Amblyseius neoghanii* Gupta, *Indian J. Acar.* (In press).

*Female* : Dorsal shield reticulate, 358 long, 250 wide, with 17 pairs of setae. Measurements of setae :  $j_1$ -18,  $j_4$ -9,  $j_5$ -10,  $j_8$ -12,  $J_2$ -14,  $J_5$ -10,  $j_3$ -11,  $z_2$ -7,  $z_4$ -7,  $s_4$ -16,  $Z_1$ -11,  $S_2$ -11,  $S_4$ -11,  $S_5$ -9,  $Z_5$ -95,  $z_5$ -9,  $Z_4$ -22,  $r_3$ ,  $R_1$ -9 each. Sternal shield 67 long, 86 wide, with 3 pairs of sternal setae ; metasternal plate with seta distinct. Genital shield 56 wide with a pair of setae. Ventrianal shield 134 long, 118 wide, with 3 pairs of preanal setae and a pair of preanal pores at the level of 3rd pair of preanal setae ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -27 long ; 2 pairs of metapodal plates present, primary one 25 long. Peritreme extends anteriorly upto  $j_1$ . Spermatheca as figured. Macrosetae on leg IV : genu-31, tibia-40, basitarsus-52. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Unknown.

*Type locality and repository* : Holotype ♀, India : Arunachal Pradesh, Ziro, Yazuli, 30. x. 1981, Coll. S. K. Gupta, deposited in ZSI, Calcutta, Reg. No. 3423/17.

*Remarks* : This species differs from *Amblyseius ghanii* (Muma, 1967) in having  $Z_4$  much shorter than the distance between its base and that of  $S_5$  (in *ghanii* it almost touches the base of  $S_5$ ). From *A. (T.) simplex* (Knisley & Denmark, 1978) and *A. (T.) sapienticola* Gupta (1977) it differs in shape of ventrianal shield. Further, it also differs from *A. (T.) johoreae* (Muma, 1967) and *A. (T.) officinaria* Gupta (1975) in relative length and width of ventrianal shield and in shape of spermatheca.

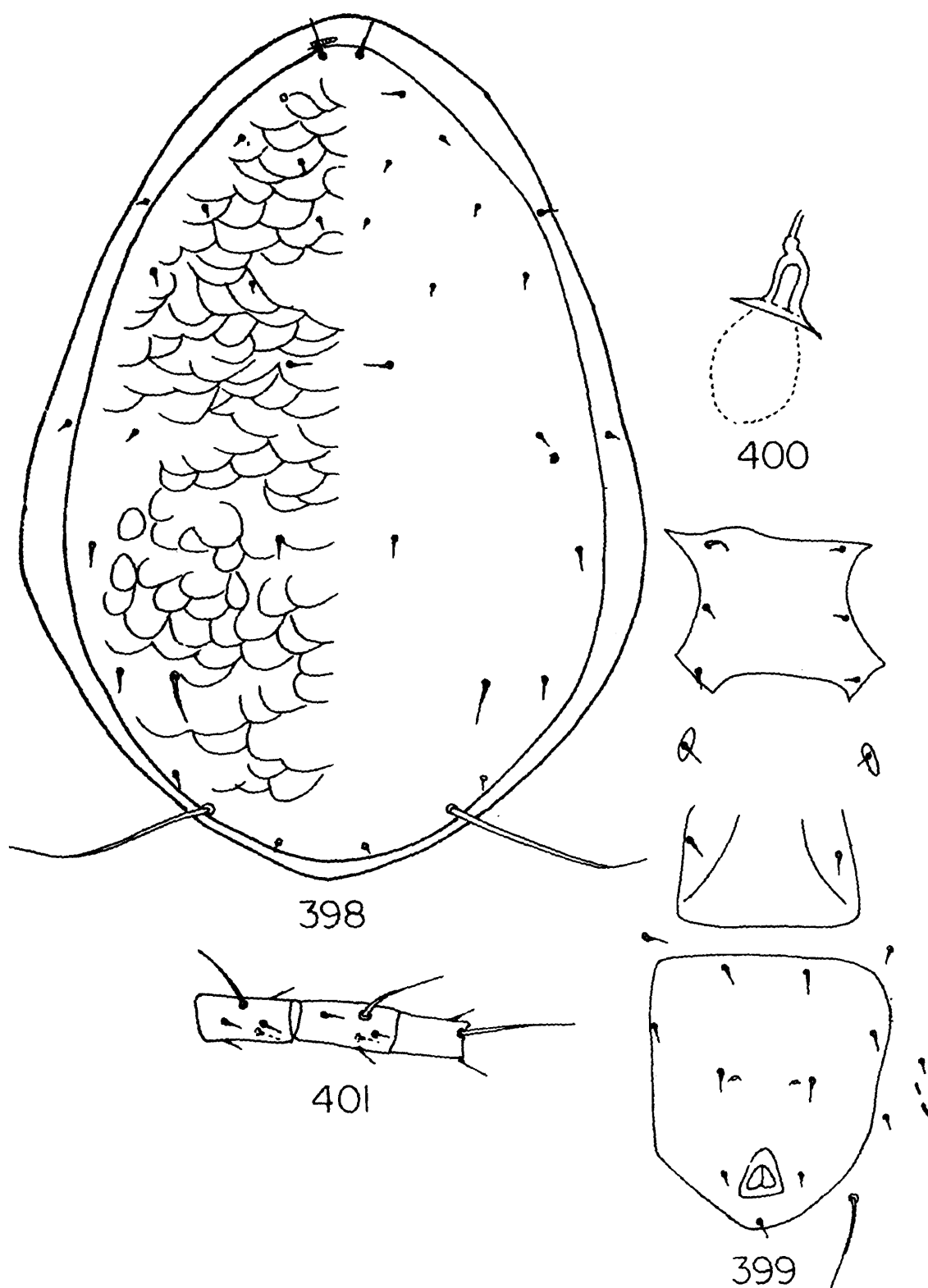


Fig. 398-401. *Amblyseius (Typhlodromips) neoghani* Gupta  
 398. Dorsal shield  
 399. Ventral surface  
 400. Spermatheca  
 401. Genu, tibia and basitarsus of leg IV

67. *Amblyseius (Typhlodromips) officinaria* Gupta  
(Figs. 402-406)

1975. *Amblyseius officinaria* Gupta, *Internat. J. Acarol.*, 1(2) : 39.

*Female* : Dorsal shield 310 long, 200 wide, reticulate with 17 pairs of setae and 6 pairs of pores. Measurements of setae :  $j_1$ -18,  $j_4$ - $j_5$ -5-6 each,  $j_6$ ,  $J_2$ -11-12 each,  $J_5$ -6,  $z_2$ ,  $z_4$ -4-5 each,  $s_4$ -16-18,  $Z_1$ -4-10,  $S_2$ -11-13,  $S_4$ -11-13,  $S_5$ -11-13,  $Z_5$ -85,  $z_5$ -8,  $Z_4$ -30,  $r_3$ ,  $R_1$ -10-11 each. Sternal shield 74 long, 78 wide, posterior margin straight, with 3 pairs of sternal setae, metasternal plate triangular with seta. Genital shield 83 wide with a pair of setae. Ventrianal shield pentagonal, 105-112 long, 74-85 wide, lateral margins gently concave, with 3 pairs of preanal setae and a pair of semilunar preanal pores ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -22 long ; 2 pairs of metapodal plates present, primary one 10 long. Fixed digit of chelicera with 2 teeth anterior to strong *pilus dentium*, 3 teeth posterior to it, movable digit with 3 teeth. Spermatheca as figured. Peritreme extends anteriorly upto the base of  $j_1$ . Macrosetae on leg IV : genu-36, tibia-28-29, basitarsus-35-44, genu III-24. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

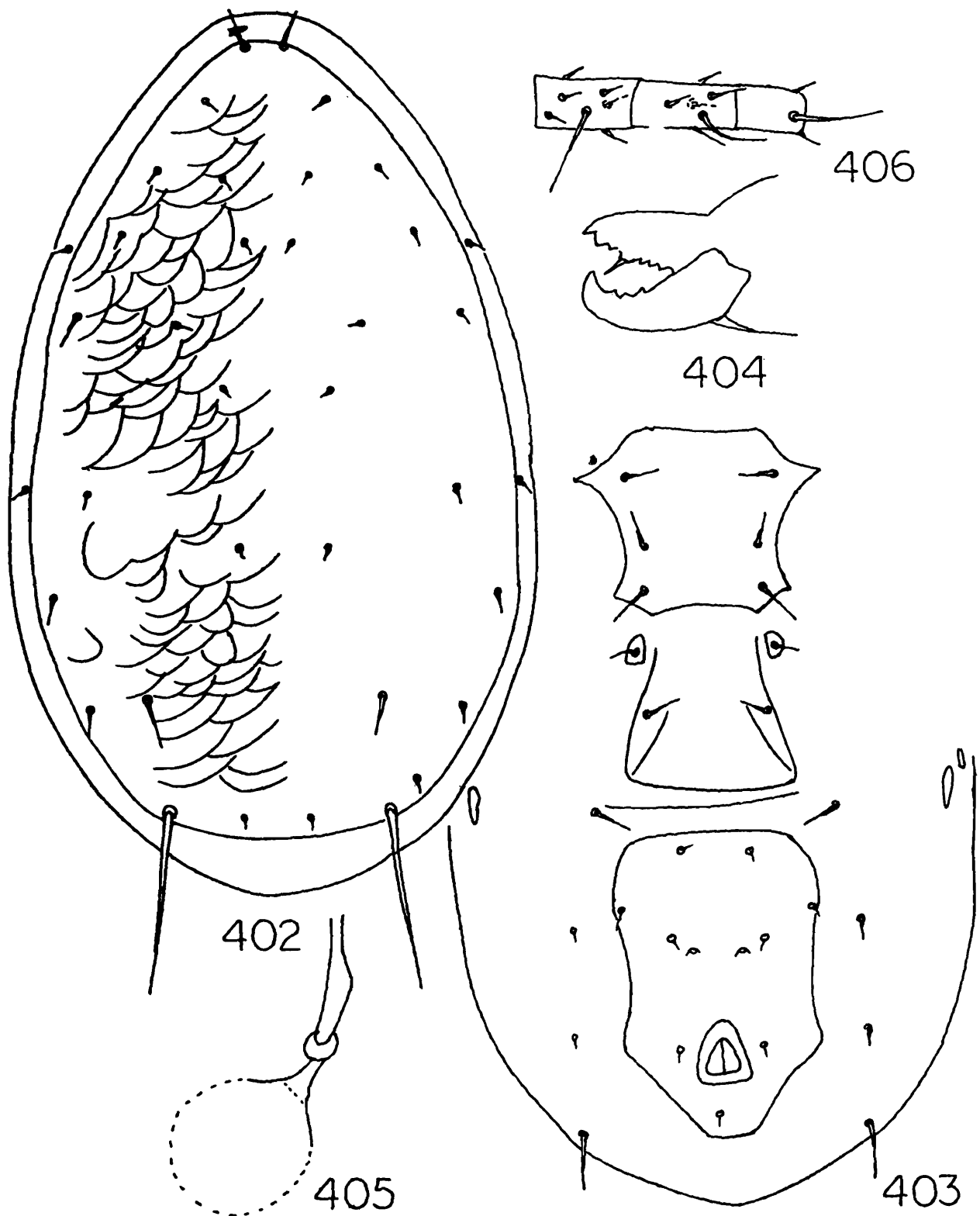
*Male* : Unknown.

*Habitat* : *Saccharum officinarum*.

*Type locality and repository* : Holotype ♀, India : West Bengal, Hooghly Dist., Chinsurah, on *Saccharum officinarum*, deposited in ZSI, Calcutta, Reg. No. 3424/17. Paratypes 4 ♀ ♀, 1 ♂, same data as for holotype, in ZSI, Reg. No. 3425-28/17.

*Distribution* : India : West Bengal.

*Remarks* : This species is known only from its type. It has many similarities with *A. (T.) labis* Corpuz and Rimando (1966) specially in dorsal chaetotaxy but by the macrosetal character this species can be separated as the macrosetae of *labis* are lobed but simple in *officinaria*.



Figs. 402-406. *Amblyseius (Typhlodromips) officinaria* Gupta

402. Dorsal shield

403. Ventral surface

404. Chelicera (female)

405. Spermatheca

406. Genu, tibia and basitarsus of leg IV

68. *Amblyseius (Typhlodromips) polyantheae* Gupta  
( Figs. 407-411 )

1975. *Amblyseius polyantheae* Gupta, *Internat. J. Acarol.*, 1(2) : 42-43.

*Female* : Dorsal shield 325 long, 250 wide, with 17 pairs of setae, all being smooth. Measurements of setae :  $j_1$ -18,  $j_4$ - $j_6$ -6-8 each,  $J_2$ -9,  $J_5$ -5,  $j_3$ -14,  $z_2$ -12,  $z_4$ -8,  $s_4$ -27,  $Z_1$ -8,  $S_2$ -14,  $S_4$ -14,  $S_5$ -9,  $Z_5$ -58, (smooth),  $z_5$ -6,  $Z_4$ -27,  $r_3$ ,  $R_1$ -9 each, both on lateral integument. Sternal shield as figured, 76 long, 77 wide, with 3 pairs of sternal setae, metasternal plates conspicuous with seta. Genital shield 82 wide, with a pair of genital setae. Ventrianal shield longer (104) than broad (81) with 3 pairs of preanal setae and a pair of preanal pores,  $JV_5$ -20 long, 4 pairs of setae and a number of small platelets present around ventrianal shield ; 2 pairs of metapodal plates present, primary one-24 long, 5 wide, accessory one-9 long ; a fold present between genital and ventrianal shields. Spermatheca as illustrated. Dentition of chelicera not discernible. Peritreme extends anteriorly upto  $j_1$ . Macrosetae on leg IV : genu-27, tibia-31, basitarsus-36, genu I-23, genu III-24, tibia III-20.

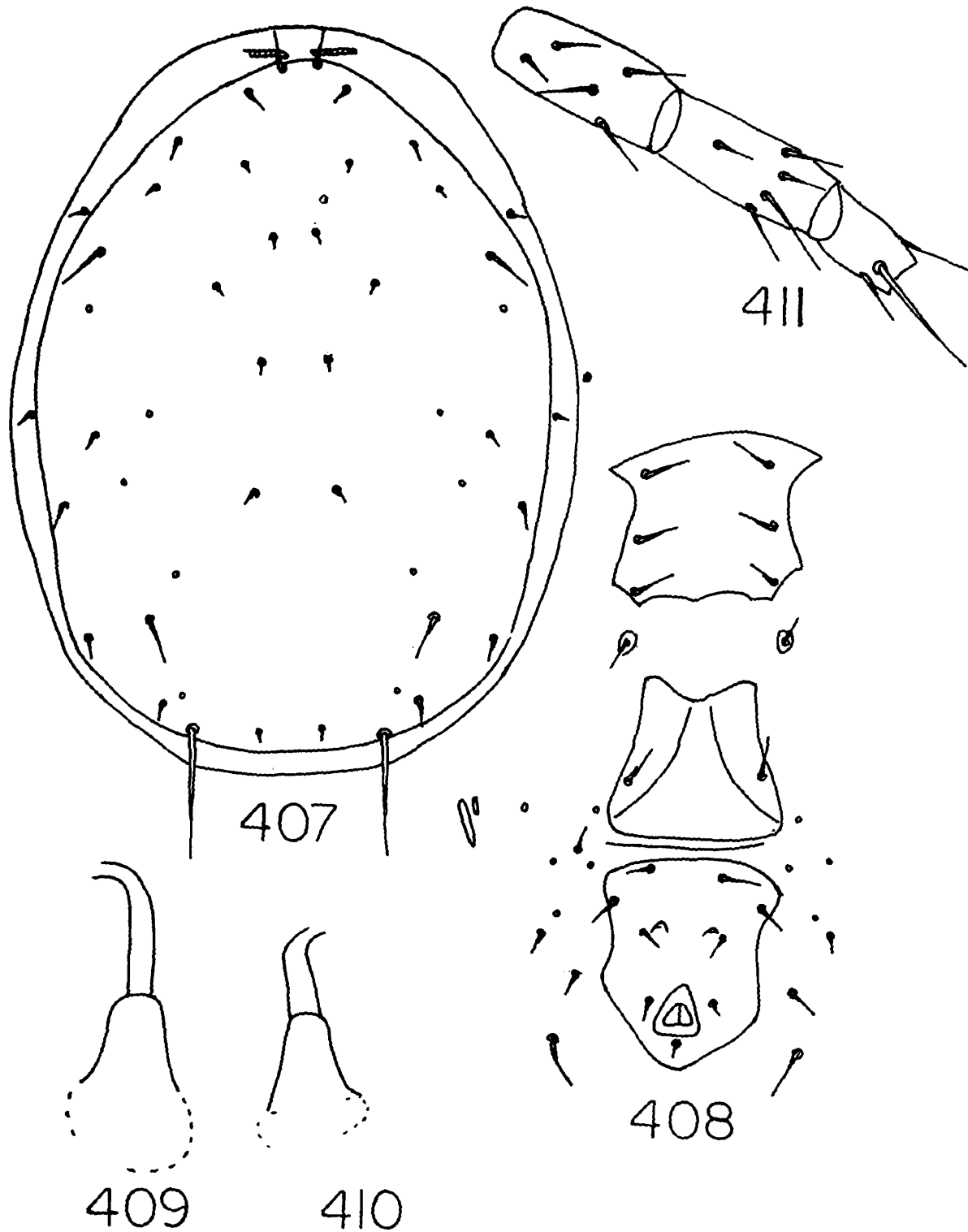
*Male* : Unknown.

*Habitat* : *Polyanthea tuberosa*.

*Type locality and repository* : Holotype ♀, India : West Bengal, Darjeeling Botanical Garden, on *Polyanthea tuberosa*, deposited in ZSI, Calcutta, Regd. No. 3429/17.

*Distribution* : India : West Bengal.

*Remarks* : This species is known from its type only.



Figs. 407-411. *Amblyseius (Typhlodromips) polyanthae* Gupta  
 407. Dorsal shield  
 408. Ventral surface  
 409, 410. Spermathecae  
 411. Genu, tibia and basitarsus of leg IV

69. *Amblyseius (Typhlodromips) potentillae* (Garman)

(Figs. 412-416)

1958. *Amblyseiopsis potentillae* Garman, *Ann. ent. Soc. Amer.*, 51 : 76-77.  
 1969. *Amblyseius charui* Gupta, *Bull. Ent., Ent. Soc. India*, 10 : 126-127 (new synonymy).  
 1970. *Amblyseius rykei* : Gupta, *Sci. & Cult.*, 36 : 98 (misidentification).  
 1974. *Amblyseius charui* : Prasad, A catalogue of mites of India, p. 162.  
 1974. *Amblyseius rykei* : Prasad, A catalogue of mites of India, p. 169.  
 1975. *Amblyseius charui* : Gupta, *Internat. J. Acarol.*, 1(2) : 33.  
 1975. *Amblyseius rykei* : Gupta, *Internat. J. Acarol.*, 1(2) : 43.  
 1981. *Amblyseius potentillae* : Gupta, *Indian J. Acar.*, 5(1-2) : 47.  
 1982. *Amblyseius charui* : Gupta, *Indian J. Acar.*, 6 : 26.

*Female* : Dorsal shield 300 long, 172 wide, posteriorly gently reticulate with 17 pairs of setae and a few pairs of pores.  $j_3 > j_1$ ,  $s_4 = Z_5 > Z_4$ ,  $z_4 > z_2$ ,  $S_2 > S_4 = S_5$ . Measurements of setae :  $j_1$ -20,  $j_4$ - $j_8$ ,  $J_2$ - $J_5$ -6 each,  $j_3$ -44,  $z_2$ -8,  $z_4$ -28,  $s_4$ -82,  $Z_1$ -5,  $S_2$ -11,  $S_4$ -8,  $S_5$ -8,  $Z_5$ -84,  $z_5$ -4,  $Z_4$ -60,  $r_3$ -20,  $R_1$ -15 ; sublateral setae lie on lateral integument. Sternal shield smooth, 80 long, 72 wide, with postlateral angulation, and 3 pairs of sternal setae, metasternal plates triangular with seta. Genital shield normal, 68 wide, with a pair of setae. Ventrianal shield smooth, 100 long, 80 wide, anterior margin rounded, lateral margins slightly concave, with 3 pairs of preanal setae, a pair of preanal pores present at the level of 3rd pair of preanal setae ; 4 pairs of setae and a pair of platelets present around ventrianal shield ; 2 pairs of metapodal plates present, primary one 20 long, accessory one 12 long. Spermatheca as figured. Macrosetae on leg IV : genu-40, tibia-40, basitarsus-60, genu II and III also with a macroseta. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{2}{1} \frac{1}{1} 1$ .

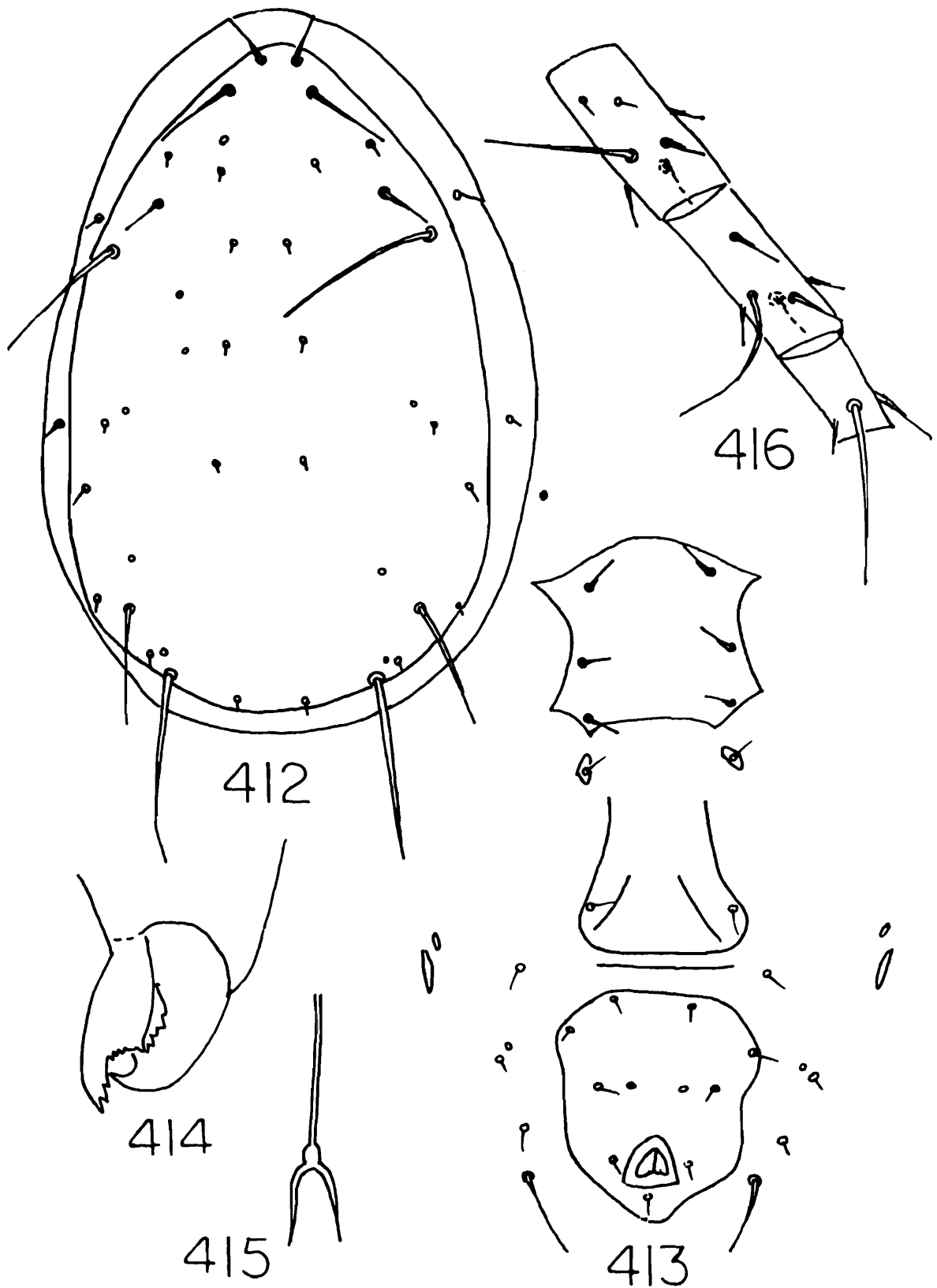
*Male* : Not available.

*Habitat* : Cucurbitaceous plant.

*Type locality and repository* : Holotype ♀, Holland : Hoboken, on *Potentilla* sp., deposited in USNM, Washington.

*Distribution* : India : Jammu & Kashmir ; outside India : Holland, New Jersey, Greece, Italy, Netherlands.

*Remarks* : Gupta (1969) described *A. charui*. The type of that species was re-examined and compared with the original description of *A. potentillae*. The author is inclined to believe now that *A. charui* is same as *A. potentillae* and the minor differences in setal length are the



Figs. 412-416. *Amblyseius (Typhlodromips) potentillae* (Garman)

412. Dorsal shield

413. Ventral surface

414. Chelicera (female)

415. Spermatheca

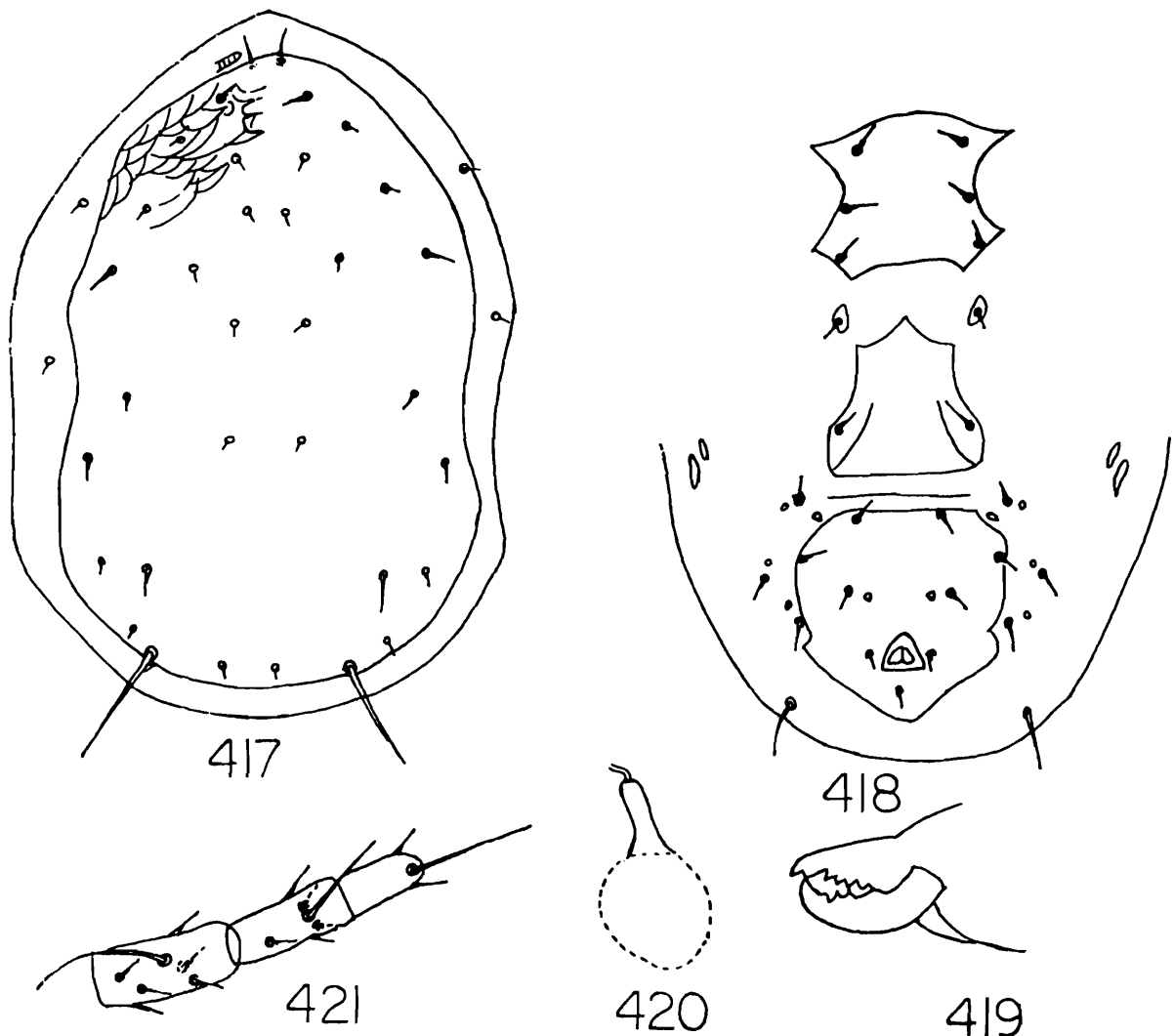
416. Genu, tibia and basitarsus of leg IV

variations. Therefore, *A. charui* is treated here as synonym of *A. potentillae*. Swirski & Ragusa (1977) pointed out that there was no striking difference in length of  $j_4$ ,  $S_2$ ,  $S_4$  and genu IV macroseta though McMurtry (1977) and McMurtry *et al.* (1976) observed biometric difference with regard to these characters.

70. *Amblyseius (Typhlodromips) sapienticola* Gupta  
( Figs. 417-421 )

1977. *Amblyseius sapienticola* Gupta, *Oriental Ins.*, 11 : 633-635.

*Female* : Dorsal shield 308 long, 189 wide, reticulate, well sclerotized, with 17 pairs of setae, mostly small, except  $Z_5$  and  $Z_4$



Figs. 417-421. *Amblyseius (Typhlodromips) sapienticola* Gupta  
417. Dorsal shield  
418. Ventral surface  
419. Chelicera (female)  
420. Spermatheca  
421. Genu, tibia and basitarsus of leg IV

which are longer and the former being thicker than the latter. Measurements of setae :  $j_1$ -16,  $j_4$ - $j_8$ ,  $J_2$ - $J_5$ -8 each,  $j_3$ -12,  $z_2$ ,  $z_4$ -8 each,  $s_4$ -16,  $Z_1$ ,  $S_4$ - $S_5$ -8 each,  $S_2$ -12,  $Z_5$ -64,  $z_5$ -8,  $Z_4$ -18. Sternal shield moderately sclerotized, weakly reticulate, 62 long, 72 wide, with 3 pairs of sternal setae, 4th pair of setae lie on metasternal plate. Genital shield 72 wide, shorter than the greatest width of ventrianal shield, with a pair of setae. Ventrianal shield 100 long, 108 wide, notched below the level of 3rd pair of preanal setae, with 3 pairs of preanal setae and a pair of round preanal pores at the level of 3rd pair of preanal setae ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -32 long, 2 pairs of metapodal plates present, primary one-20 long. Fixed digit of chelicera multidentate, movable digit 3 dentate. Peritreme extends anteriorly upto  $j_1$ . Spermatheca as figured. Macrosetae on leg IV : genu-48, tibia-40, basitarsus-48, genu I-29, genu III-33. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{2}{0} \frac{2}{1} 1$ .

*Male* : Unknown.

*Habitat* : Banana.

*Type locality and repository* : Holotype ♀, India : Andaman Isls, Ferrargunj, on banana, deposited in ZSI, Calcutta, Reg. No. 3430/17. Paratypes 3 ♀ ♀, same data as for holotype, in ZSI, Reg. No. 3431/17 (mounted on same slide).

*Distribution* : India : Andaman Isls.

*Remarks* : This species is known only from its type.

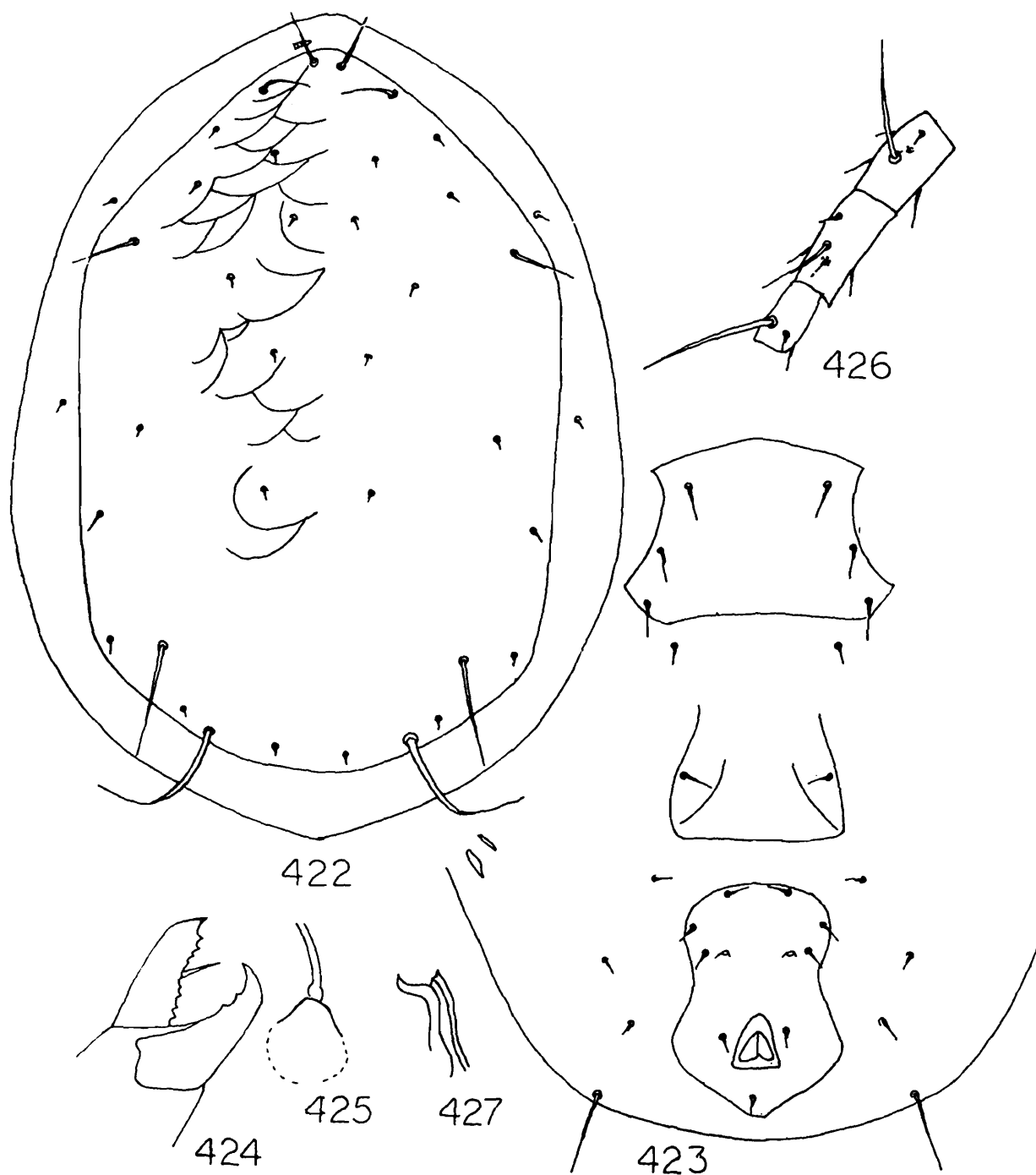
### 71. *Amblyseius* (*Typhlodromips*) *sijiensis* Gupta

(Figs. 422-427)

*Amblyseius sijiensis* Gupta, *Indian J. Acar.* (In press).

*Female* : Dorsal shield 360 long, 235 wide, gently reticulate, with 17 pairs of setae, all smooth except  $Z_5$  which is weakly serrate. Measurements of setae :  $j_1$ -28-30,  $j_4$ - $j_8$ ,  $J_2$ - $J_5$ -6-7 each,  $j_3$ -27,  $z_2$ ,  $z_4$ -8 each,  $s_4$ -35,  $Z_1$ -11,  $S_2$ -12,  $S_4$ ,  $S_5$ -7 each,  $Z_5$ -91,  $z_5$ -6,  $Z_4$ -60,  $r_3$ -13,  $R_1$ -11, the sublateral setae on lateral integument. Sternal shield 78 long, 89 wide, with 3 pairs of sternal setae, metasternal plate apparently absent, 4th pair of setae lie on interscutal membrane. Genital shield 67 wide, with a pair of setae. Ventrianal shield 100 long, 56 wide, lateral margins concave, with 3 pairs of preanal setae and a pair of crescent-shaped preanal proes ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -35 long ; 2 pairs of metapodal plates present,

primary one 14 long. Chelicera with multidentate fixed digit and 2-dentate movable digit. Spermatheca as illustrated. Macrosetae on leg IV : genu-78, tibia-51, basitarsus-60, that on genu thicker ; genu I-33, genu II-35, genu III-44. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Peritreme extends anteriorly upto  $j_1$ ,



Figs. 422-427. *Amblyseius (Typhlodromips) sijiensis* Gupta

- 422. Dorsal shield
- 423. Ventral surface
- 424. Chelicera (female)
- 425. Spermatheca
- 426. Genu, tibia and basitarsus of leg IV
- 427. Spermatophoral process

*Male* : Dorsal chaetotaxy similar to that of female. Spermatophoral process as figured.

*Type locality and repository* : Holotype ♀, India : Arunachal Pradesh, Siji, on an undetermined plant, 15.x.1981, Coll. S. K. Gupta, deposited in ZSI, Calcutta, Reg. No. 3432/17. Paratype 1 ♀, Daporizo, on undet. plant, 26.i.1983, same data as for holotype, Reg. No. 3433/17 ; 1 ♂, Daporizo, on undet. plant.

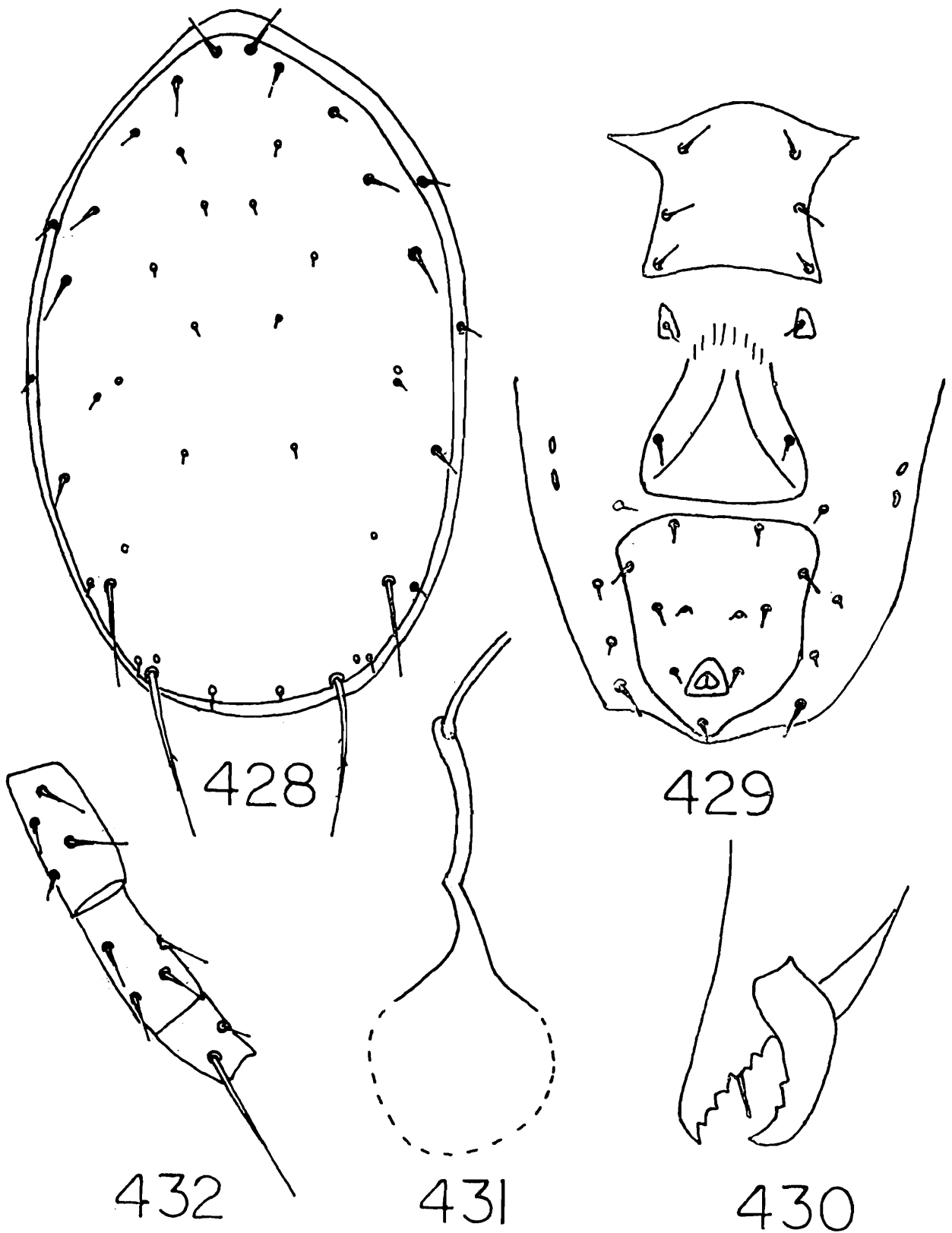
*Remarks* : This species is very close to *A. (T.) crotalariae* Gupta (1975), from which it differs in spermathecal character.

## 72. *Amblyseius* (*Typhlodromips*) *suknaensis* Gupta

(Figs. 428-435)

1970. *Amblyseius suknaensis* Gupta, *Oriental Ins.*, 4 : 185-186.  
 1974. *Amblyseius suknaensis* : Prasad, A catalogue of mites of India, p. 170.  
 1975. *Amblyseius suknaensis* : Gupta, *Internat. J. Acarol.*, 1(2) : 44.  
 1975. *Amblyseius daturae* Gupta, *Internat. J. Acarol.*, 1(2) : 34-36 (new synonymy).  
 1977. *Amblyseius suknaensis* : Gupta, *Oriental Ins.*, 11 : 636.  
 1977. *Amblyseius daturae* : Gupta, *Oriental Ins.*, 11 : 627.  
 1978. *Amblyseius suknaensis* : Gupta, *Oriental Ins.*, 12 : 337.  
 1978. *Typhlodromips daturae* : Gupta, *Oriental Ins.*, 12 : 329.  
 1978. *Amblyseius suknaensis* : Gupta, *Indian J. Acar.*, 2(2) : 73.  
 1978. *Amblyseius daturae* : Gupta, *Indian J. Acar.*, 2(2) : 62.  
 1981. *Amblyseius daturae* : Gupta, *Indian J. Acar.*, 5 : 35.  
 1981. *Amblyseius* (*Typhlodromips*) *suknaensis* : Ray & Gupta, *Bull. Zool. Surv. India*, 4(3) : 280.  
 1982. *Amblyseius suknaensis* : Gupta, *Indian J. Acar.*, 6 : 25-26.

*Female* : Dorsal shield 290-310 long, 170-185 wide, reticulate with 17 pairs of setae and 3 pairs of pores.  $j_1 \geq j_3$ ,  $j_4 = j_5 = j_6 < J_2$ ,  $Z_5 > Z_4$ ,  $s_4 > z_4 > z_2$ ,  $S_4 = S_5$ . Measurements of setae :  $j_1$ -22,  $j_4$ - $j_6$ -7-9 each,  $J_2$ -11,  $J_5$ -6,  $j_3$ -18-21,  $z_2$ -11-12,  $z_4$ -13-16,  $s_4$ -20-22,  $Z_1$ -9-12,  $S_2$ -16,  $S_4$ -16-18,  $S_5$ -16,  $Z_5$ -75-85,  $z_5$ -8,  $Z_4$ -56,  $r_3$ ,  $R_1$ -16 each. Sternal shield 78 long, 74 wide, with 3 pairs of sternal setae, 4th pair of setae on triangular metasternal plates. Genital shield 78 wide, as wide as the greatest width of ventrianal shield, with a pair of setae. Ventrianal shield 103 long, 96 wide, with 3 pairs of preanal setae and a pair of semilunar preanal pores at the level of 3rd pair of preanal setae ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -36 long ; matapodal plates 2 paired, primary one 22 long, accessory one 13 long. Fixed digit of chelicera with 3-4 teeth anterior to *pilus dentilis*, 2-3 teeth



Figs. 428-432. *Amblyseius (Typhlodromips) suknaensis* Gupta

428. Dorsal shield

429. Ventral surface

430. Chelicera (female)

431. Spermatheca

432. Genu, tibia and basitarsus of leg IV

posterior to it ; movable digit with 2 teeth. Spermatheca as figured. Peritreme extends anteriorly upto  $j_1$ . Macrosetae on leg IV : genu-24-30, tibia 20-26, basitarsus 50-66 ; genu III-22. Leg chaetotactic formula : genu II  $2 \frac{\text{♂}}{\text{♀}} 1$ , tibia II  $1 \frac{\text{♂}}{\text{♀}} 1$ , genu III  $1 \frac{\text{♂}}{\text{♀}} 1$ , tibia III  $1 \frac{\text{♂}}{\text{♀}} 1$ . Peritreme extends anteriorly upto  $j_1$ .

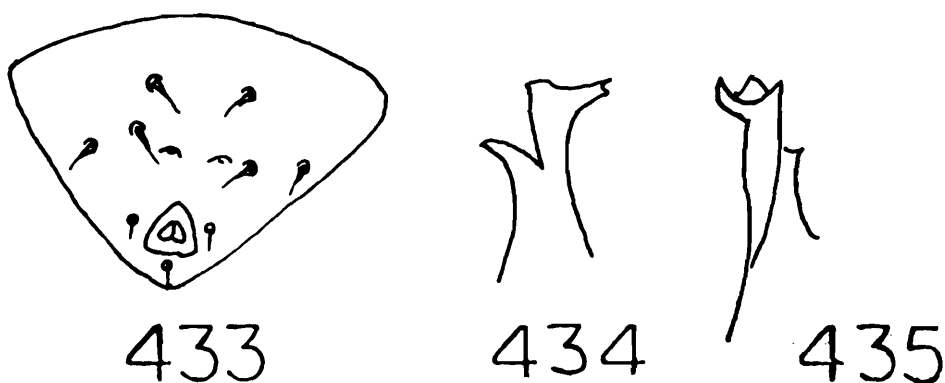
**Male :** Dorsal chaetotaxy similar as in female. Ventrianal shield and spermatophoral process as figured. Macrosetae on leg IV : genu-16, tibia-13, basitarsus-34.

**Habitat :** *Colocasia* sp., rose, *Tectona grandis*, *Shorea robusta*, fern, harsinger, bitter gourd, "Chulai sag", papaya, mulberry, *Eupatorium odoratum*, *Datura metel*, fig.

**Type locality and repository :** Holotype ♀, India : West Bengal, Darjeeling Dist. Sukna, on *Colocasia* sp., deposited in ZSI, Calcutta, Reg. No. 3434/17. Paratypes 3 ♀♀, 2 ♂♂, same data as for holotype, in ZSI, Reg. No. 3435-3439/17.

**Distribution :** India : West Bengal, Orissa, Meghalaya, Assam, Tripura, Andaman & Nicobar Isls., Kerala.

**Remarks :** Until recently *A. (T.) suknaensis* Gupta and *A. (T.) daturae* Gupta were considered to be two separate species and several reports were made on this basis. The types of two species were thoroughly re-examined and found that though there exists some differences in shape of ventrianal shield and spermatheca but basically there are many similarities. Besides the types, several other specimens from different regions were examined and it was found that variations occur as to the shape of ventrianal shield and spermatheca. Therefore, on the basis of these differences as well as on the basis of relative length of  $j_1$  and  $j_3$ , which also vary, it will not be wise to recognise two



Figs. 433-435. *Amblyseius (Typhlodromips) suknaensis* Gupta  
 433. Ventrianal shield (male)  
 434, 435. Spermatophoral processes

species. In view of this, *A. (T.) daturae* Gupta is considered here as a synonym for *A. (T.) suknaensis* Gupta. This species is quite close to *A. (T.) oguroi* Ehara (1964) but differs in having  $Z_5$  shorter and in shape of spermatophoral process. Further, it is distinguished from *A. (T.) lienearis* Corpuz & Rimando (1966) by shape of ventrianal shield.

### 73. *Amblyseius (Typhlodromips) syzygii* Gupta

(Figs. 436-442)

1975. *Amblyseius syzygii* Gupta, *Internat. J. Acarol.*, 1(2) : 44-45.

1978. *Amblyseius syzygii* : Gupta, *Indian J. Acar.*, 2(2) : 74.

1981. *Amblyseius syzygii* : Gupta & Nahar, *In Contrib. to Acar. in India*, p. 8.

1981. *Amblyseius (Typhlodromips) syzygii* : Ray & Gupta, *Bull. Zool. Surv. India*, 4(3) : 280.

1982. *Amblyseius syzygii* : Gupta, *Indian J. Acar.*, 6 : 26.

*Female* : Dorsal shield 335-345 long, 200-210 wide, reticulate, with 17 pairs of setae.  $j_1 \geq j_3$ ,  $Z_5 > Z_4 > s_4$ ,  $j_4 = j_5 < j_6 = J_2$ . Measurements of setae :  $j_1$ -15-18,  $j_4$ - $j_5$ -8-9 each,  $j_6$ - $J_2$ -10-13 each,  $J_5$ -8,  $j_3$ -13-16,  $z_2$ - $z_4$ -11 each,  $s_4$ -20-22,  $Z_1$ -16,  $S_2$ - $S_5$ -11-13,  $Z_5$ -67 (serrate)  $z_5$ -9,  $Z_4$ -31-36,  $r_3$ ,  $R_1$  on lateral integument. Sternal shield slightly longer (75) than wide (70), posterior margin gently concave, with 3 pairs of sternal setae, metasternal plates conspicuous with seta. Genital shield 76 wide, with a pair of setae. Ventrianal shield 100-110 long, 78-85 wide, lateral margins concave, with 3 pairs of preanal setae and a pair of crescent shaped preanal pores ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -31 long ; 2 pairs of matapodal plates present, primary one 20 long, accessory one 11 long. Peritreme terminates anteriorly before  $j_1$ . Spermatheca as figured. Fixed digit of chelicera with 3 teeth anterior to *pilus dentilis*, 3-4 teeth posterior to it ; movable digit with 2-3 teeth. Macrosetae on leg IV : genu-40-45, tibia-27-31, basitarsus-45-49. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

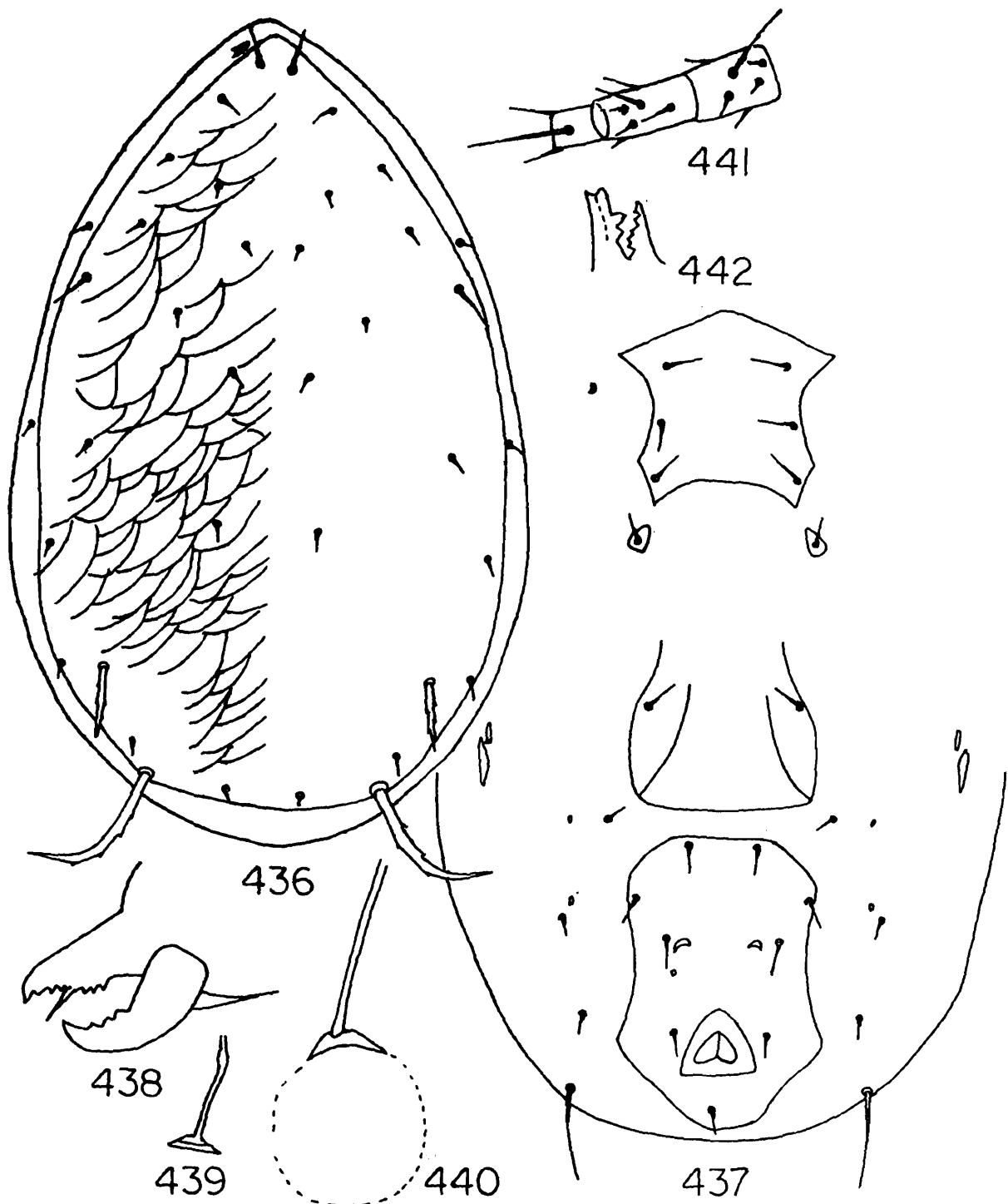
*Male* : Dorsal chaetotaxy similar as in female. Spermatophoral process as figured. Macrosetae on leg IV : genu-36, tibia-27, genu III-27, genu II-27.

*Habitat* : *Syzygium cumini*, leaf litter, guava, jute, maize, beans, sugarcane.

*Type locality and repository* : Holotype ♀, India : West Bengal, 24-Parganas Dist., Naihati, on *Syzygium cumini*, deposited in ZSI, Calcutta, Reg. No. 3440/17.

*Distribution* : India : West Bengal, Orissa, Tripura, Bihar, Uttar Pradesh ; outside India : Thailand.

*Remarks* : Ehara & Bhandhufalck (1977) recorded this species from Thailand and described in detail the male. Gupta & Nahar (1981)



Figs. 436-442. *Amblyseius (Typhlodromips) syzygii* Gupta

436. Dorsal shield

437. Ventral surface

438. Chelicera (female)

439, 440. Spermathecae

441. Genu, tibia and basitarsus of leg IV

442. Chelicera (male) with Spermatophoral process

reported its association with *Tetranychus neocaledonicus* André as feeding on its eggs and nymphs.

74. **Amblyseius (Typhlodromips) tetranychivorus** (Gupta)

(Figs. 443-450)

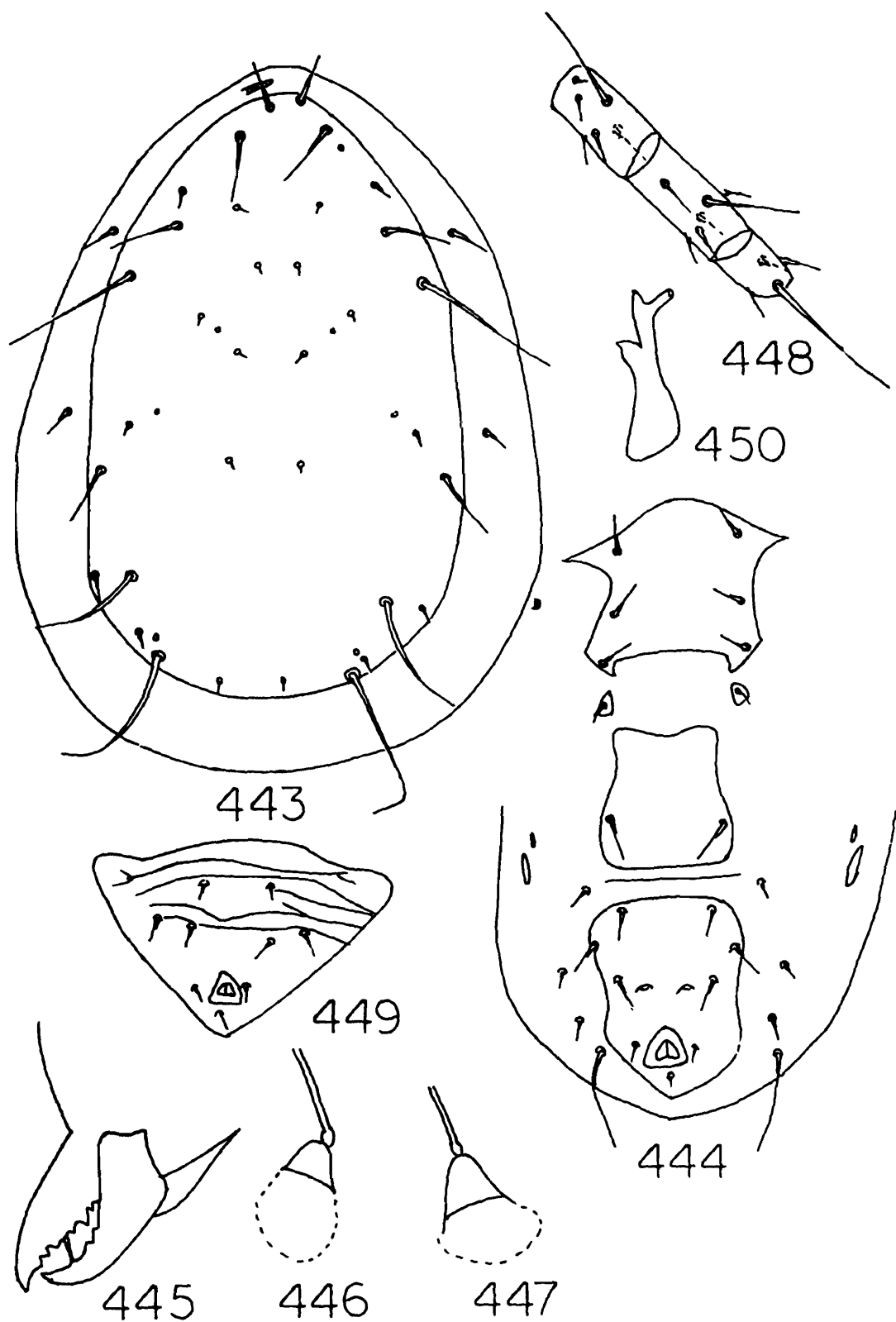
1978. *Typhlodromips tetranychivorus* Gupta, *Oriental Ins.*, 12 : 337-338.  
 1979. *Typhlodromips tetranychivorus* : Jagadish & Nagesha Chandra : First All India Symp. Acar., p. 49-50.  
 1979. *Typhlodromips tetranychivorus* : Puttaswamy & ChannaBasavanna : First All India Symp. Acar., p. 50.  
 1979. *Typhlodromips tetranychivorus* : Puttaswamy & ChannaBasavanna, *Acar. Newsl.*, 8 : 5.  
 1981. *Typhlodromips tetranychivorus* : ChannaBasavanna, *Final Rept. ICAR Research Scheme*, p. 3.  
 1981. *Amblyseius tetranychivorus* : Gupta & Nahar, *In Contrib. to Acar. in India*, p. 9.  
 1982. *Amblyseius tetranychivorus* : Gupta, *Rec. zool. Surv. India*, 79(3-4) : 371.

*Female* : Dorsal shield gently rugose, lateral margins imbricate, 330-350 long, 190-195 wide, with 17 pairs of setae, all being smooth,  $Z_5$  longest ;  $s_4 > z_4$ ,  $S_2 < Z_4$ ,  $S_4 = S_5$ . Measurements of setae :  $j_1$ -25-28,  $j_4$ - $j_6$ ,  $J_2$ -9-13 each,  $J_5$ -9,  $j_3$ -44,  $z_2$ -13-17,  $z_4$ -36,  $s_4$ -76-78,  $Z_1$ -8-11,  $S_2$ -36-43,  $S_4$ -8,  $Z_5$ -76-85,  $z_5$ -8,  $Z_4$ -68,  $r_3$ -22-24,  $R_1$ -10, the sublateral setae on lateral integument. Sternal shield as long (80) as wide with 3 pairs of sternal setae, 4th pair lie on triangular metasternal plate. Genital shield 72 wide, with a pair of setae. Ventrianal shield 110-120 long, 90-95 wide, lateral margins concave, anterior margin rounded, with 3 pairs of preanal setae and a pair of crescentic preanal pores ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -37-40 long ; 2 pairs of metapodal plates present, primary one 22 long, accessory one 9 long. Fixed digit of chelicera with 2-3 teeth anterior to strong *pilus dentilis*, 3 teeth posterior to it, movable digit with 3 teeth. Spermatheca as illustrated. Peritreme extends anteriorly upto  $j_1$ . Macrosetae on leg IV : genu-40-48, tibia-40, basitarsus-68, genu III-24, genu II-24, tibia-III-24, tibia II-20. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Dorsal chaetotaxy as in female. Ventrianal shield and spermatophoral process as illustrated.

*Habitat* : Brinjal, palm, *Hibiscus mutabilis*, citrus.

*Type locality and repository* : Holotype ♀, India : Tamil Nadu, Coimbatore Agril. Univ. Campus, on brinjal infested with *T.*



Figs. 443-450. *Amblyseius (Typhlodromips) tetranychivorus* (Gupta)  
 443. Dorsal shield  
 444. Ventral surface  
 445. Chelicera (female)  
 446, 447. Spermathecae  
 448. Genu, tibia and basitarsus of leg IV  
 449. Ventrianal shield (male)  
 450. Spermatophoral process

*cinnabarinus* (Boisduval), deposited in ZSI, Calcutta, Reg. No. 3441/17. Paratypes 1 ♀, 1 ♂, Kerala, Trivendrum, Nayer dam area, on undet. plant, in ZSI, Reg. No. 3442/17.

*Distribution* : India : Tamil Nadu, Kerala, Bihar, Uttar Pradesh.

*Remarks* : This species was first reported in association with *T. cinnabarinus* (Boisd.) (Gupta, 1978) but its actual importance as predator was brought into light by Puttaswamy (1978) who, after studying its biology and interactions with different levels of prey density, found it to be a potential predator of *T. ludeni* Zacher and could suppress its population. Puttaswamy & ChannaBasavanna (1979) studied its rate of prey consumption in presence of pollen. They (1979a) reported that females and males completed their development in  $140.19 \pm 7.5$  and  $136.21 \pm 6.00$  hrs., respectively at 24-27°C, 62-80% RH. Adult females of *T. ludeni* were preferred to other stages. The average incubation period, larval, protonymphal and deutonymphal periods of females and males when studied on *R. indica* Hirst were respectively, 1.92, 1.06, 1.06, 0.98 and 1.92, 1.14 and 1.14 days, (Jagadish & Nagesha Chandra, 1982). The total developmental period at  $27 \pm 1^\circ\text{C}$  and  $95 \pm 3\%$  RH was  $47.95 \pm 3.60$  hrs, while the same at  $24 \pm 1^\circ\text{C}$  and  $65 \pm 3\%$  RH was 142.28 hrs. At temperature of  $27 \pm 1^\circ\text{C}$  and  $30 \pm 1^\circ\text{C}$  with the humidity range of  $85 \pm 3$  to  $95 \pm 3\%$  RH, the total developmental period decreased, whereas at  $24 \pm 1^\circ\text{C}$  and  $32 \pm 1^\circ\text{C}$ , this period decreased and increased alternatively, for every 10% rise of humidity from  $65 \pm 3\%$  RH to  $85 \pm 3\%$  RH, (ChannaBasavanna, 1981). The application of the pesticides viz. dicofol (0.02-0.01%) and sulphur (0.05-0.015%) could conserve the predator in the field (ChannaBasavanna, 1981).

### Genus *Indoseiulus* Ehara

1969. *Indoseius* Ghai & Menon, *Oriental Ins.*, 3 : 348.  
 1974. *Indoseius* : Gupta & Dhooria, *Proc. Indian Sci. Congr.*, 1974, p. 69.  
 1977. *Indoseius* : Gupta, *Indian J. Acar.*, 1 : 18.  
 1981. *Indoseius* : Gupta & Nahar ; *In Contrib. to Acar. in India*, p. 10.  
 1982. *Indoseius* : Gupta, *Rec. zool. Surv. India*, 79(3-4) : 369.  
 1982. *Indoseiulus* : Ehara, *Appl. Ent. Zool.*, 17(1) : 42.

Since *Indoseius* was a preoccupied name, (*Indoseius* Evans, 1955), Ehara (1982) proposed a new name *Indoseiulus* for this. However, he did not recognise it as a genus rather recognised it as a subgenus under the genus *Amblyseius*. The present author favours retaining it as a genus

because of its unique character of lacking a clearly defined ventrianal shield, the character found no where else in Phytoseiidae.

*Diagnosis* : Dorsal shield smooth, does not cover whole of dorsum with 16 pairs of setae (8 pairs of laterals, 2 pairs of median and 6 pairs of dorsocentrals) all being small, simple and smooth ; 2 pairs of sublateral setae on lateral integument which is very much widened. Sternal shield with 3 pairs of sternal setae. Ventrianal shield poorly defined, however, 3 pairs of preanal setae present ; 3 pairs of setae present around ventrianal shield ; a pair of metapodal plates present. Peritreme extends anteriorly upto  $j_3$  and posteriorly curves around coxae IV. Leg chaetotaxy as in *Amblyseius*. Spermatheca normal.

Type : *Indoseius ricini* Ghai & Menon, 1969, by original designation.

#### Key to the species of *Indoseiulus*

- |                               |     |               |
|-------------------------------|-----|---------------|
| 1. Spermatheca as in fig. 458 | ... | <i>ricini</i> |
| — Spermatheca as in fig. 453  | ... | <i>eharai</i> |

#### 75. *Indoseiulus eharai* Gupta

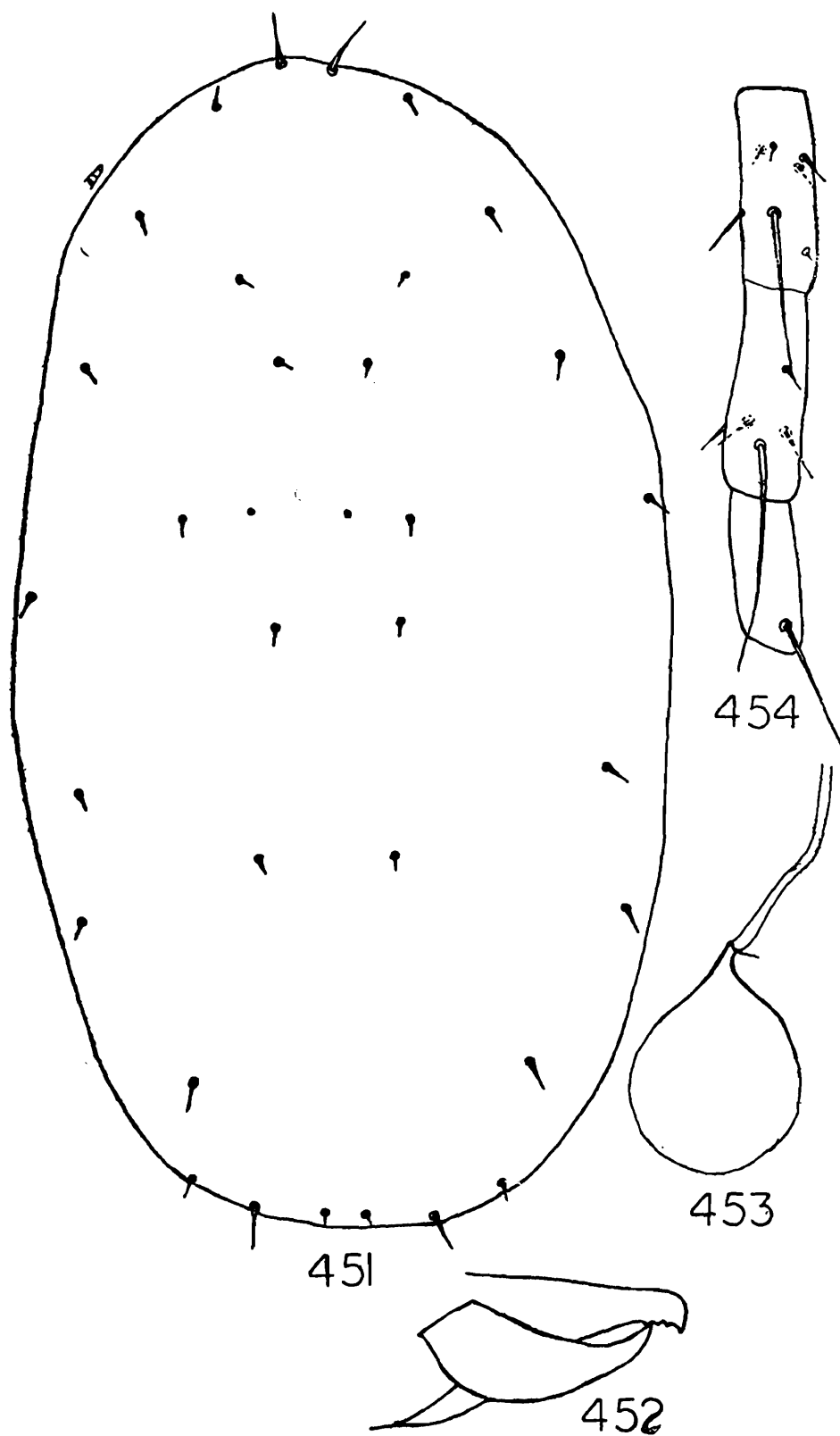
(Figs. 451-454)

*Indoseiulus eharai* Gupta, *Oriental Ins.* (In press).

*Female* : Dorsal shield 425 long, 250 wide, poorly sclerotized and lightly reticulate with 16 pairs of setae and 2-3 pairs of pores. All the setae being small and smooth and measure as :  $j_1$ -26,  $j_4$ -9,  $j_5$ -7,  $j_6$ -11,  $J_2$ -11,  $J_5$ -4,  $j_3$ -7,  $z_2$ -10,  $z_4$ -9,  $s_4$ -13,  $Z_1$ -13,  $S_2$ -13,  $S_5$ -14,  $Z_5$ -22,  $z_5$ -4,  $Z_4$ -15 ; both sublateral setae on lateral integument and measure as  $r_3$ -14,  $R_1$ -12. Margins of sternal shield indistinguishable, with 3 pairs of sternal setae. Genital shield faintly distinguishable, however, a pair of setae present. Ventrianal shield appears to be absent, 3 pairs of preanal setae present. Fixed digit of chelicera with 2 apical teeth followed by 2 minute denticles placed little posteriorly, movable digit appears to be without tooth or with a tiny tooth. Spermatheca as figured. Macrosetae on leg IV, genu-71, tibia-67, basitarsus-56, genu III-44, tibia III-33, genu II-44, genu I with 3 macrosetae 44, 33, 38. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{1}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Peritreme terminates little anterior to  $z_2$ .

*Male* : Unknown.

*Type locality and repository* : Holotype ♀, India, Arunachal Pradesh, Khonsa, on papaya, 6.i.1983, Coll. S. K. Gupta, deposited in ZSI, Calcutta, Reg. No. 3515/17.



Figs. 451-454. *Indoseiulus eharai* Gupta

451. Dorsal shield

452. Chelicera (female)

453. Spermatheca

454. Genu, tibia and basitarsus of leg IV

*Remarks* : This new species differs from *Indoseiulus liturivorus* (Ehara, 1982) in shape of spermatheca and in absence of striation at ventrianal region. From *I. ricini* Ghai & Menon (1969) this species differs in shape of spermatheca and in having light sclerotization on dorsal shield.

### 76. *Indoseiulus ricini* (Ghai and Menon)

(Figs. 455-459)

1969. *Indoseiulus ricini* Ghai & Menon, *Oriental Ins.*, 3 : 348.  
 1974. *Indoseiulus ricini* : Prasad, A catalogue of mites of India, p. 170.  
 1974. *Indoseiulus ricini* : Gupta & Dhooria, *Proc. Indian Sci. Cong.*, p. 69.  
 1977. *Indoseiulus ricini* : Gupta, *Indian J. Acar.*, 1 : 18.  
 1981. *Indoseiulus ricini* : Gupta & Nahar : *In Contrib. to Acar. in India*, p. 10.  
 1982. *Indoseiulus ricini* : Gupta, *Rec. zool. Surv. India*, 79(3-4) : 369.  
 1982. *Indoseiulus ricini* : Gupta, *Indian J. Acar.*, 6 : 27.

*Female* : Dorsal shield well sclerotized, highly concave, slightly reticulate, with 16 pairs of setae,  $S_4$  absent. Measurements of setae :  $j_1$ -21,  $j_4$ - $j_6$ ,  $J_2$ - $J_5$ -8-10 each,  $j_3$ -14,  $z_2$ -10,  $z_4$ -12,  $s_4$ -16,  $Z_T$ -16,  $S_2$ -16,  $S_5$ -16,  $Z_5$ -25-28,  $z_5$ -12,  $Z_4$ -12-16,  $r_3$  and  $R_1$  on lateral integument. Sternal shield with 3 pairs of sternal setae, metasternal plate conspicuous with seta. Genital shield distinct with a pair of setae. Ventrianal shield absent, however, its position is shown by 3 pairs of preanal setae. Fixed digit of chelicera multidentate, movable digit 3-dentate. Spermatheca as figured. Peritreme short. Macrosetae on leg IV : genu-32, tibia-40, basitarsus-36. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{2}{1} \frac{1}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{2}{1} \frac{1}{1} 1$ .

*Male* : Unknown.

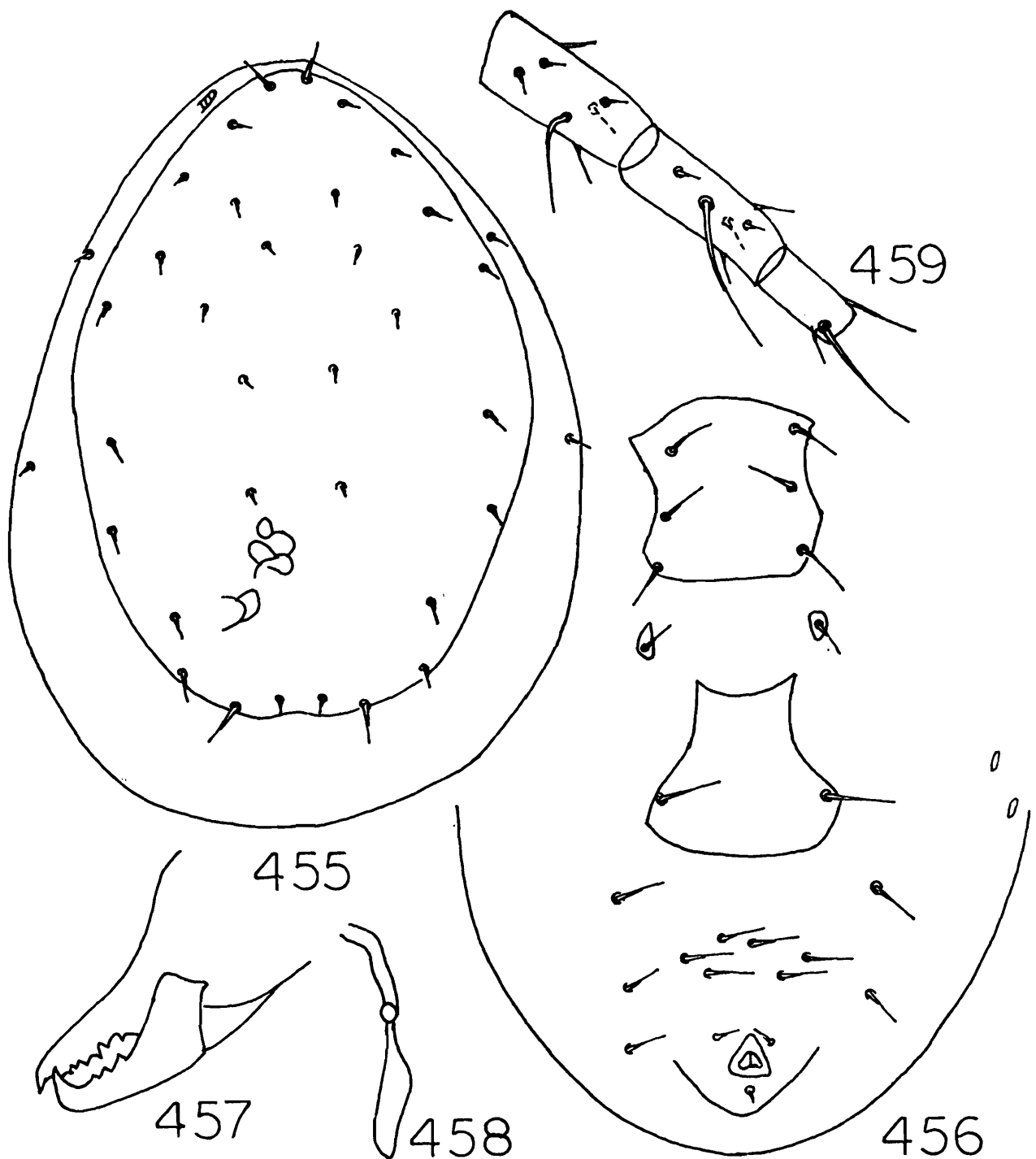
*Habitat* : Castor, guava, *Colocasia* sp.

*Type locality and repository* : Holotype ♀, India : Tamil Nadu, Coimbatore, on castor, deposited in NPC, I.A.R.I, New Delhi. Paratypes 8 ♀ ♀, same data as for holotype, deposited in I.A.R.I, New Delhi.

*Distribution* : India : Tamil Nadu, Gujarat, Uttar Pradesh, Himachal Pradesh, Bihar, Arunachal Pradesh, West Bengal.

*Remarks* : This is a highly predacious species and often it has been encountered in the field in fully engorged condition after feeding on red-spider mites. A fully engorged adult looks highly convex with deep brownish colour and often with few black dots.

The holotype was in bad shape due to shrinkage and, therefore, measurements could not be taken from there. The measurements given here are based upon freshly collected specimens and then comparing those with the original description and also with the holotype.



Figs. 455-459. *Indoseiulus ricini* (Ghai and Menon)

455. Dorsal shield

456. Ventral surface

457. Chelicera (female)

458. Spermatheca

459. Genu, tibia and basitarsus of leg IV

Genus *Iphiseius* Berlese

1916. *Iphiseius* Berlese, *Redia*, 12 : 33.  
 1921. *Iphiseius* : Berlese, *Redia*, 14 : 95.  
 1954. *Iphiseius* : Evans, *Proc. Zool. Soc. Lond.*, 124 : 517-524.  
 1959. *Iphiseius* : Chant, *Can. Ent.*, 91 : 109.  
 1961. *Phytoseiulella* Muma, *Bull. Fla. St. Mus.*, 5(7) : 276.  
 1962. *Iphiseius* (*Iphiseius*) : Pritchard & Baker, *Hilgardia*, 33 : 298.  
 1963. *Iphiseiini* : Schuster & Pritchard, *Hilgardia*, 34 : 198-199.  
 1964. *Iphiseius* : Ehara, *Jap. J. Zool.*, 15(2) : 138.  
 1965. *Iphiseius* : Chant, *Can. Ent.*, 97 : 370.  
 1966. *Iphiseiodes* De Leon, *In Studies on the fauna of Suriname and other Guyanas*, p. 84.  
 1967. *Iphiseiodes* : De Leon : Allen Press Inc., Kansas, USA, p. 18.  
 1968. *Iphiseius* : Prasad, *Ann. ent. Soc. Amer.*, 61(6) : 1459.  
 1970. *Iphiseius* : Ehara, *Mushi*, 43(6) : 59 (misidentification).  
 1970. *Iphiseiodes* : Muma & Denmark, *Arthropods of Florida*, 6 : 70.  
 1972. *Iphiseiodes* : Denmark & Muma, *Fla. Ent.*, 55(1) : 22.  
 1973. *Iphiseiodes* : Denmark & Muma, *Rev. Braz. Biol.*, 33(2) : 250.  
 1975. *Iphiseiodes* : Denmark & Muma, *J. Agr. Univ. Puerto Rico*, 59 : 287.  
 1976. *Iphiseius* (*Iphiseius*) : Blommers, *Bijdragen Tot. de Dierkunde*, 46(1) : 85.  
 1978. *Iphiseiodes* : Denmark & Muma, *Internat. J. Acarol.*, 4(1) : 7.  
 1980. *Iphiseius* : Gupta, *Entomologists' mon. Mag.*, 115 : 213.

*Diagnosis* : Dorsal shield smooth or moderately sclerotized with maximum of 17 pairs of setae (9 pairs of laterals, 2-3 pairs of medians and 4-6 pairs of dorsocentrals) ; all short or some being long. Lateral integument sclerotized to well below the base of  $r_3$  and  $R_1$  but not being fused with dorsal shield and  $r_3$  and  $R_1$  present on lateral integument not dorsolaterally on dorsal shield. Ventrally, female with sternal, genital and either a ventrianal shield or separate ventral and anal shields. Sternal shield with 3 pairs of setae, 4th pair free on integument or on metasternal plate. Ventral or ventrianal shield with 3 pairs of preanal setae ; 4 pairs of setae present around ventrianal shield ; 2 pairs of narrow elongate matapodal plates present. Spermatheca well developed. Peritremetal shield fused anteriorly with dorsal shield. Legs normal with macrosetae on leg IV.

Type : *Sejus degenerans* Berlese (1916), by original designation.

*Key to the subgenera of Iphiseius*

1. Dorsal shield with 6 pairs of dorsocentral setae,  
 postscutum with 5 pairs of lateral setae ... *Iphiseius*
- Dorsal shield with 4 pairs of dorsocentral setae,  
 setae  $j_1$  and  $J_2$  absent ; postscutum with 3-5  
 pairs of lateral setae, setae  $S_2$  and  $S_4$  may be  
 present or absent ... *Trochoseius*

*Subgenus Iphiseius* Berlese

1917. *Iphiseius* : Berlese, *Redia*, 12 : 33.  
 1921. *Iphiseius* : Berlese, *Redia*, 14 : 95.  
 1941. *Iphiseius* : Vitzthum, *Klass Ord. Tier.*, 5 : 764.  
 1954. *Iphiseius* : Evans, *Proc. Zool. Soc. Lond.*, 124 : 517.  
 1957. *Iphiseius* : Athias-Henriot, *Bull. Soc. Hist. Nat. Afr. Nord.*, 48 : 334.  
 1959. *Iphiseius* : Chant., *Can. Ent.*, 91 : 109.  
 1962. *Iphiseius* : Pritchard & Baker, *Hilgardia*, 33 : 298.  
 1976. *Iphiseius (Iphiseius)* : Blommers, *Brijdragen Tot. de Dierkunde*, 46(1) : 85.

*Diagnosis* : Dorsal shield with 6 pairs of dorsocentral setae, postscutum with 5 pairs of lateral setae.

Type : *Sejus degenerans* Berlese (1916)

*Key to the species of subgenus Iphiseius*

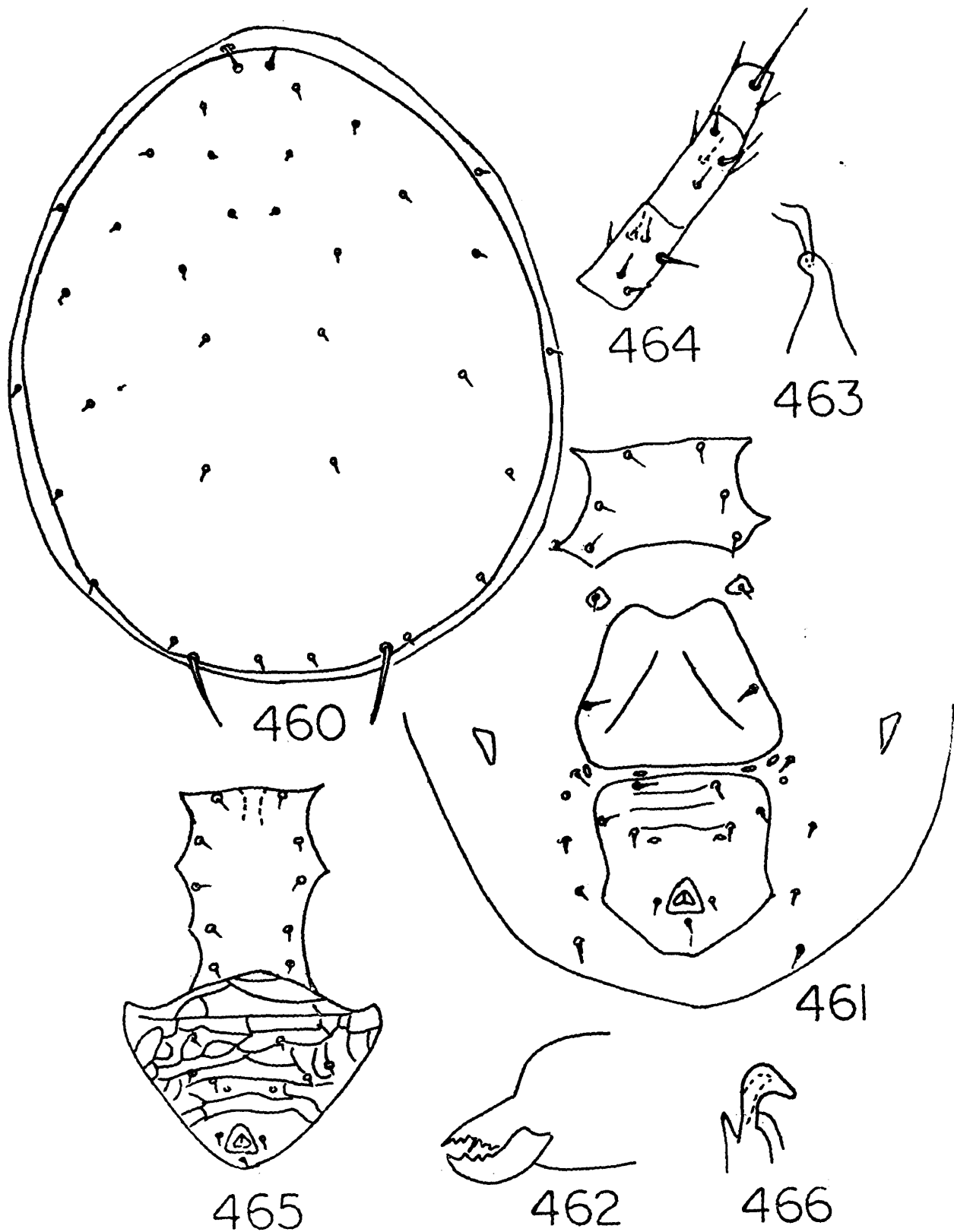
1.  $Z_5$  very long (over 30 microns) and stout ; considerably longer than other setae on dorsal shield ... *andamanicus*  
 —  $Z_5$  short, (much less than 30 microns ; only 12 microns) and almost as long as other setae on dorsal shield ... *hapali*

**77. *Iphiseius (Iphiseius) andamanicus* Gupta**

(Figs. 460-466)

1980. *Iphiseius andamanicus* Gupta, *Entomologists' mon. Mag.*, 115 : 213-214.

*Female* : Dorsal shield 330-350 long, 240-250 wide, well sclerotized with 17 pairs of setae, mostly small or minute (15-18 long) except  $Z_5$  which is long (27-30) ;  $r_3$  and  $R_1$  also small and lie on sclerotized lateral integument. Sternal shield sclerotized, 45 long, 90 wide, with 3 pairs of sternal setae, 4th pair lie on triangular metasternal plates. Genital shield 90 wide with a pair of setae ; genital shield almost adjacent to ventrianal shield. Ventrianal shield 99-108 long, 70-80 wide, with 3 pairs of preanal setae and a pair of preanal pores ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -13 long, 3-4 small platelets present between genital and ventrianal shields, metapodal plates large, triangular and one paired. Fixed digit of chelicera multidentate, movable digit 2 dentate. Spermatheca as figured. Peritreme extends anteriorly beyond  $j_1$ . Macrosetae on leg IV : genu 11-13, tibia 12-14, basitarsus 36-50 long. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .



Figs. 460-466. *Iphiseius (Iphiseius) andamanicus* Gupta  
 460. Dorsal shield  
 461. Ventral surface  
 462. Chelicera (female)  
 463. Spermatheca  
 464. Genu, tibia and basitarsus of leg IV  
 465. Ventral surface (male)  
 466. Spermatophoral process

*Male* : Ventrianal shield and spermatophoral process as figured.

*Habitat* : *Dolichos lablab*.

*Type locality and repository* : Holotype ♀, India : Andaman Isls., on *Dolichos lablab*, deposited in ZSI, Calcutta, Reg. No. 3448/17. Paratypes 9 ♀ ♀, same data as for holotype, Reg. No. 3449-50/17.

*Distribution* : India : Andaman Isls., Karnataka.

*Remarks* : Later to the publication of its description, this species was also collected from Karnataka.

### 78. *Iphiseius (Iphiseius) hapoli* Gupta

(Figs. 467-474)

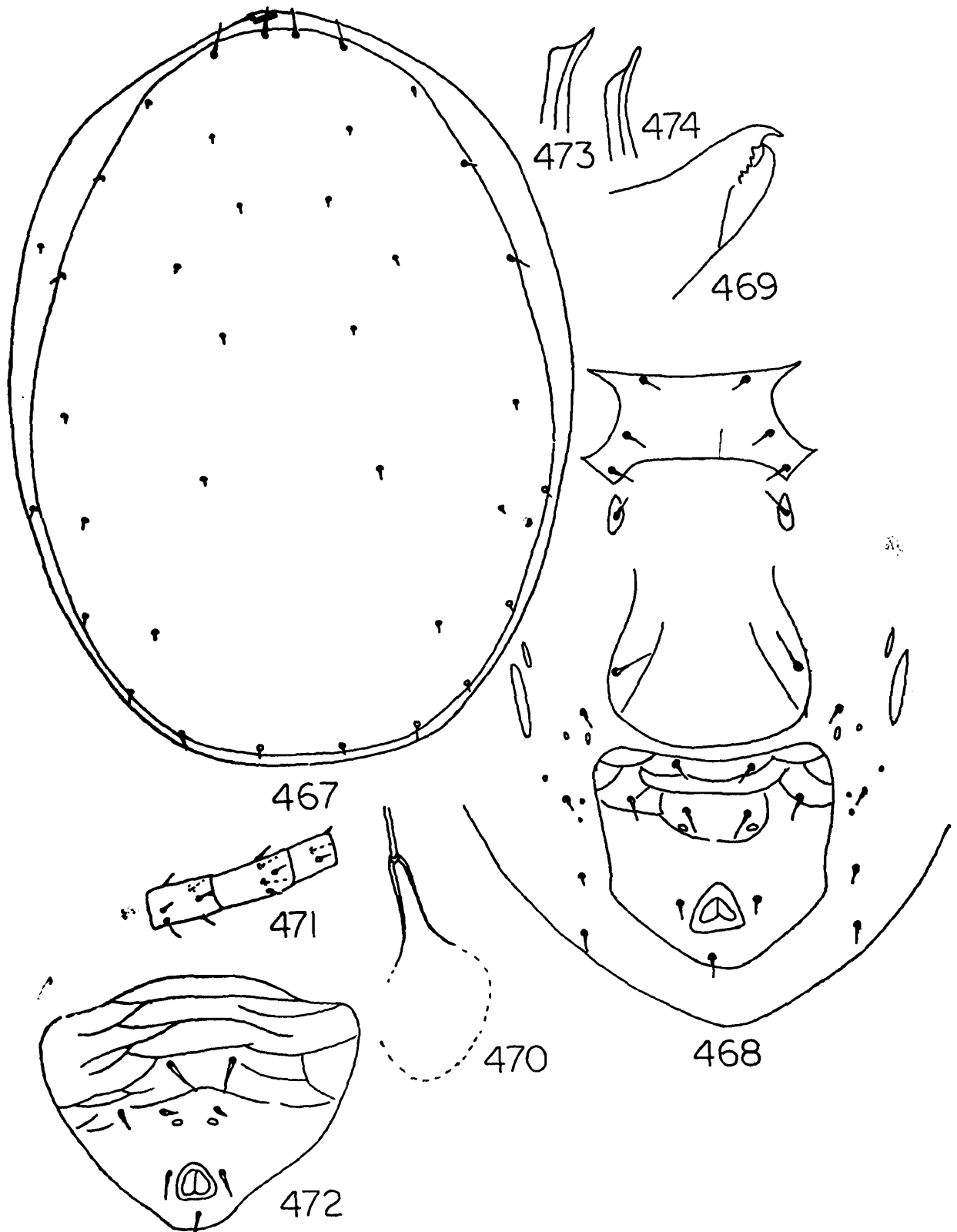
*Iphiseius (Iphiseius) hapoli* Gupta, *Oriental Ins.* (In Press).

*Female* : Dorsal shield highly sclerotized, lateral integument also sclerotized, with 17 pairs of setae, all being very small except  $Z_5$ ,  $j_3$ ,  $j_1$  which are slightly longer and measure 12, 18, 14, respectively; other setae measure between 6-8. Sternal shield 44 long, 95 wide, reticulate with 3 pairs of sternal setae, 4th pair lie on large metasternal plates. Genital shield 94 wide, with a pair of setae. Ventrianal shield reticulate, 100 long, 112 wide, with 3 pairs of preanal setae and a pair of preanal pores; 4 pairs of setae and some small platelets present around ventrianal shield, 2 pairs of large metapodal plates present, primary one 38 long, accessory one 15 long,  $JV_5$ -12 long. Peritreme extends anteriorly beyond  $j_3$ . Chelicera with at least 5-6 teeth on the fixed digit and 2-3 teeth on the movable digit. Spermatheca as figured. Macrosetae absent on leg IV. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Dorsal chaetotaxy as in female. Ventrianal shield and spermatophoral process as figured.

*Type locality and repository* : Holotype : ♀, India : Arunachal Pradesh, Hapoli, on apple, 28.x.1981, Coll. S. K. Gupta, deposited in ZSI, Calcutta, Reg. No. 3451/17.

*Remarks* : This species is very close to *Iphiseius degenerans* (Berlese, 1916) and *I. andamanicus* Gupta (1980) but differs from them in shape of ventrianal shield and in shape of spermatheca.



Figs. 467-474. *Iphiseius (Iphiseius) hapoli* Gupta

- 467. Dorsal shield
- 468. Ventral surface
- 469. Chelicera (female)
- 470. Spermatheca
- 471. Genu, tibia and basitarsus of leg IV
- 472. Ventrianal shield (male)
- 473., 474. Spermatophoral processes

Subgenus **Trochoseius** Pritchard & Baker

1962. *Trochoseius* Pritchard & Baker, *Hilgardia*, 33(7) : 299.  
 1976. *Iphiseius* (*Trochoseius*) : Blommers, *Bijdragen Tot. de Dierkunde*, 46(1) : 85.  
 1981. *Trochoseius* : Matthyse & Denmark, *Fla. Ent.*, 64(2) : 341.

*Diagnosis* : Dorsal shield with 4 pairs of dorsocentral setae, setae  $j_5$  and  $J_2$  absent ; postscutum with 3 pairs of lateral setae ;  $S_2$  and  $S_4$  absent.

Type : *Trochoseius gongylus* Pritchard & Baker, 1962, by designation.

79. **Iphiseius (Trochoseius) bakeri** Gupta

( Figs. 475-477 )

1980. *Iphiseius bakeri* Gupta, *Entomologists' mon. Mag.*, 115 : 214-215.

*Female* : Unknown.

*Male* : Dorsal shield 288 long, 235 wide, highly sclerotized, reticulate with 15 pairs of setae ; lateral margins sclerotized and appear to be fused with dorsal shield. Setae  $j_5$  and  $J_2$  lacking ;  $s_4$ ,  $Z_5$  and  $Z_4$  being long measuring 117, 194 and 145, respectively ; other setae shorter measuring 4-10 ;  $S_2$ -25 ;  $r_3$  and  $R_1$  present on sclerotized lateral integument. Ventrianal shield reticulate, with 3 pairs of preanal setae and a pair of preanal pores. Macrosetae on leg IV : genu-60, tibia-53, basitarsus-33.

*Habitat* : Arecanut.

*Type locality and repository* : Holotype ♀, India : Andaman Isls., Port Blair, on arecanut, deposited in ZSI, Calcutta, Reg. No. 3452/17.

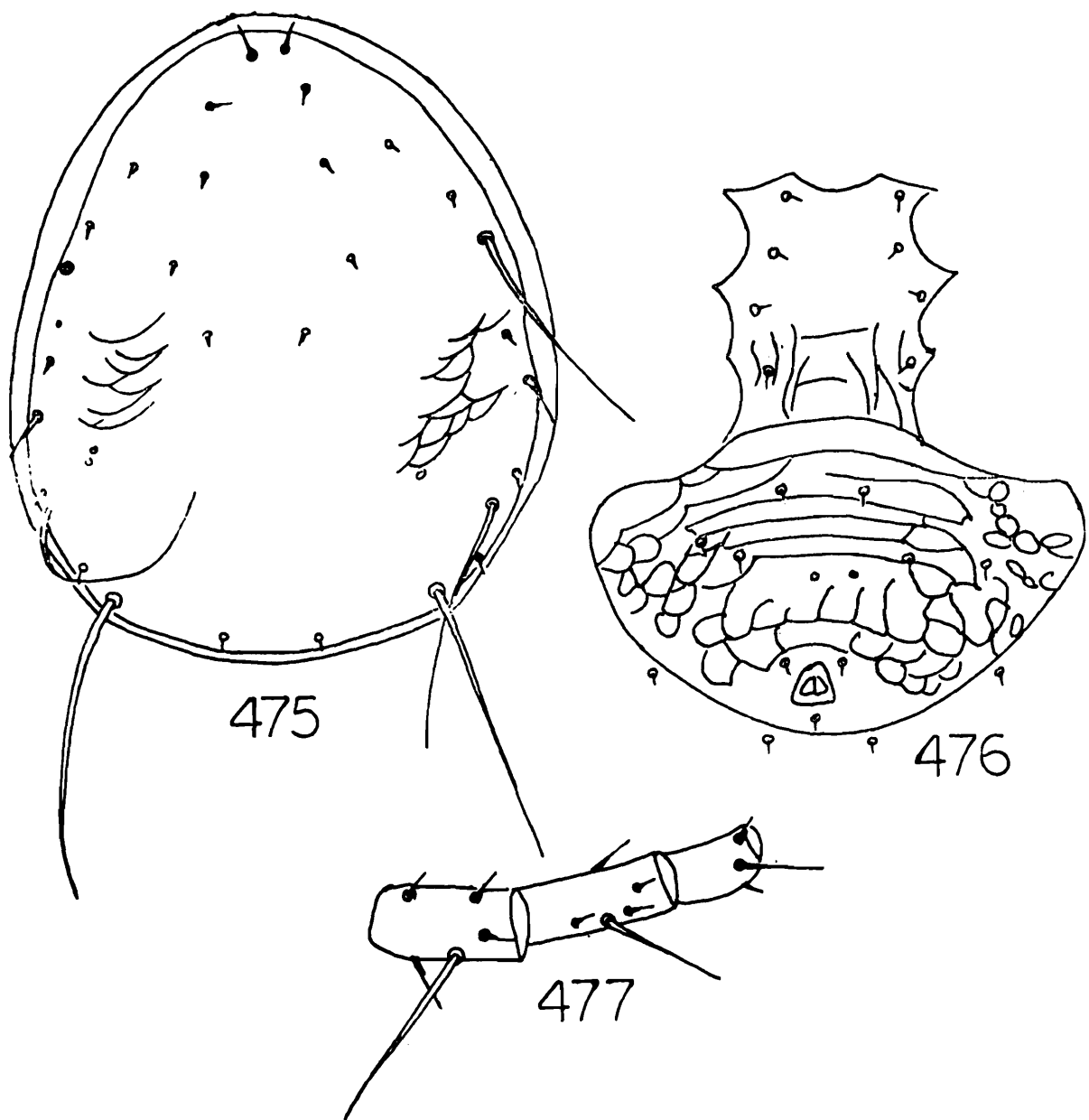
*Distribution* : India : Andaman Isls.

*Remarks* : This species resembles African species *I. (T.) glomus* Pritchard & Baker (1962) and *I. (T.) gongylus* Pritchard & Baker (1962), in lacking setae  $j_5$  and  $J_2$  but from both of them it differs in relative length of  $j_1$  as in this species  $j_1$  is small while in both the African species  $j_1$  is much longer.

Genus **Paraamblyseius** Muma

1962. *Paraamblyseius* Muma, *Fla. Ent.*, 45 : 8.  
 1965. *Paraamblyseius* : Chant, *Can. Ent.*, 97 : 371.  
 1965. *Paraamblyseius* : Chant & Baker, *Mem. Ent. Soc. Can.*, 41 : 12.  
 1970. *Paraamblyseius* : Muma & Denmark, *Arthropods of Florida*, 6 : 112.  
 1978. *Paraamblyseius* : Chant *et al.*, *Can. J. Zool.*, 56(6) : 1344.

**Diagnosis :** Dorsal shield coarsely punctate with 17 pairs of setae, 9 pairs in lateral, 2 pairs in mediolateral and 6 pairs in dorsocentral series, 4 pairs of lateral setae on proscutum ; sublateral setae on lateral integument. Setae short or may be long. Sternal, genital and ventrianal shields well sclerotized ; metasternal plates with seta well developed ; genital shield large, punctate ; ventrianal shield massive, much broader than long, reticulate, almost touching genital shield with 3 pairs of preanal setae ; 2-3 pairs of setae present on the membrane around ventrianal shield, one pair of large, triangular metapodal plates present. Peritrematal shield fused anteriorly with dorsal shield. Genu II



Figs. 475-477. *Iphiseius (Trochoseius) bakeri* Gupta  
 475. Dorsal shield (male)  
 476. Ventral surface (male)  
 477. Genu, tibia and basitarsus of leg IV

with 7 setae, tibia II 7 setae, genu III 6 setae, tibia III 7 setae. Macrosetae absent on leg IV.

Type : *Paraamblyseius lunatus* Muma (1962), by designation

### Key to the species of *Paraamblyseius*

- |  |     |                  |
|--|-----|------------------|
| 1. Metasternal plate round, $J_2$ longer than $Z_1$ .<br>$Z_4$ shorter than the distance between $Z_4$ and<br>$Z_5$ ; reticulation of ventrianal shield as in<br>fig. 491. | ... | <i>mumai</i>     |
| — Metasternal plate kidney shaped, $J_2$ subequal<br>to $Z_1$ . $Z_4$ reaches base of $Z_5$ , reticulation<br>of ventrianal shield as in fig. 480.                         | ... | <i>fragariae</i> |

### 80. *Paraamblyseius fragariae* Gupta

(Figs. 478-488)

1970. *Paraamblyseius* sp., Gupta, *Sci. & Cult.*, 36 : 98.

1980. *Paraamblyseius fragariae* Gupta, *Entomologists' mon. Mag.*, 115 : 215-216.

1980. *Paraamblyseius formosanus* : Gupta, *Entomologists' mon. Mag.*, 116 : 35  
(misidentification).

*Female* : Dorsal shield 320 long, 230 wide, heavily sclerotized, reticulate with 17 pairs of setae. Measurements of setae :  $j_1$ -12-14,  $j_4$ -13-14,  $j_5$ -16,  $j_6$ -25-33,  $J_2$ -38-40,  $J_5$ -10-12,  $j_3$ -16-18,  $z_2$ -22-25,  $z_4$ -22-27,  $s_4$ -33-36,  $Z_1$ -38-40,  $S_2$ -33-36,  $S_4$ -23-29,  $S_5$ -22-27,  $Z_5$ -38-40, (weakly serrate)  $z_5$ -11,  $Z_4$ -45-46,  $r_3$ -13,  $R_1$ -13, the sublateral setae lie on lateral integument. Sternal shield 45 long, 95-110 wide, sculptured, with 3 pairs of seternal setae, 4th pair lie on kidney-shaped metasternal plates. Genital shield very wide, 123-126 wide, punctate, with a pair of genital setae. Ventrianal shield massive, reticulate, 112-123 long; 170-190 wide with 3 pairs of preanal setae and a pair of preanal pores; 3 pairs of setae present around ventrianal shield,  $JV_5$ -43 long, a single pair of large, triangular metapodal plates present, 45 long. Spermatheca as in figure. Macroseta absent on leg IV. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

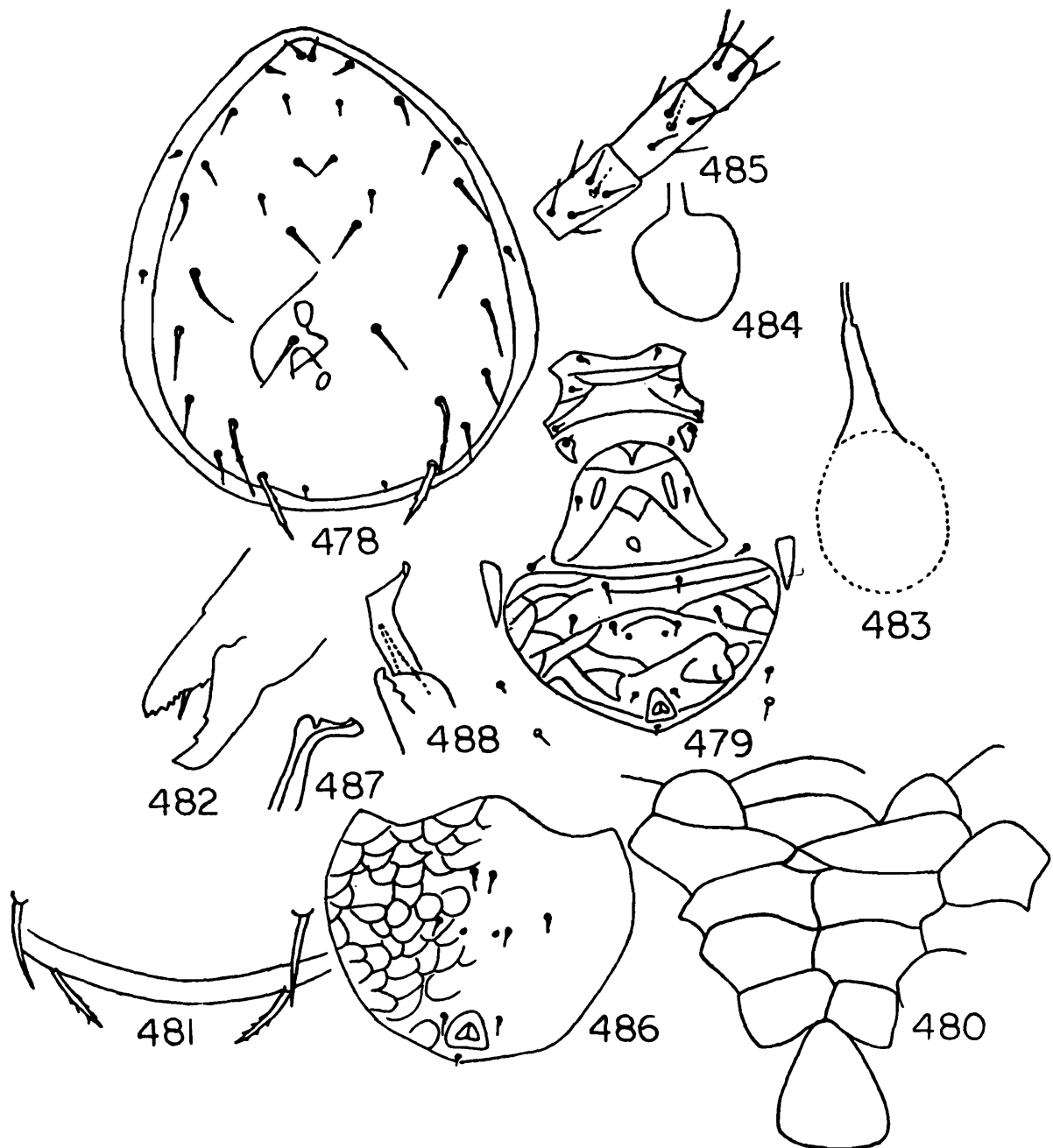
*Male* : Ventrianal shield and spermatophoral process as in figure.

*Habitat* : *Fragaria nilgerrensis*.

*Type locality and repository* : Holotype ♀, India : West Bengal, Kalimpong, on *Fragaria nilgerrensis*, deposited in ZSI, Calcutta, Reg. No. 3455/17.

*Distribution* : India : West Bengal, Arunachal Pradesh.

*Remarks*: *P. formosanus* identified earlier (Gupta, 1980b) was found to be the same as *P. fragariae*. In fact, setae  $j_6$ ,  $J_2$ ,  $Z_4$ , and  $Z_5$  vary considerably in length and this led to the misunderstanding of *formosanus*. However, with the examination of a large number of



Figs. 478-488. *Paraamblyseius fragariae* Gupta

478. Dorsal shield

479. Ventral surface

480. Reticulation pattern of ventrianal shield

481. Posterior dorsal surface

482. Chelicera (female)

483., 484. Spermathecae

485. Genu, tibia and basitarsus of leg IV

486. Ventrianal shield (male)

487., 488. Spermatophoral processes

specimens collected from Arunachal Pradesh it was found that these setae vary in length. The species though close to *formosanus* differs in shape of spermatheca and spermatophoral process. Again from *P. mumai* it differs in reticulation pattern of ventrianal shield as illustrated. Further, setae  $j_6$  and  $J_2$  in *mumai* are longer.

### 81. *Paraamblyseius mumai* Gupta

(Figs. 489-494)

1980. *Paraamblyseius mumai* Gupta, *Entomologists' mon. Mag.*, 116 : 33-34.

*Female* : Dorsal shield 335 long, 225 wide, reticulate, highly sclerotized, with 17 pairs of setae. Measurements of setae :  $j_1$ -16,  $j_4$ -16,  $j_5$ -16,  $j_6$ -40,  $J_2$ -45,  $J_5$ -12,  $j_3$ -14,  $z_2$ -14,  $z_4$ -16,  $s_4$ -24,  $Z_1$ -36,  $S_2$ -28,  $S_4$ -18,  $S_5$ -16,  $Z_5$ -30,  $z_5$ -16,  $Z_4$ -40,  $r_3$ ,  $R_1$ -9 each. Sternal shield reticulate, 44 long, 80 wide, posterior margin concave with 3 pairs of sternal setae, 4th pair lie on rounded metasternal plates. Genital shield 106 wide, reticulate, with a pair of setae. Ventrianal shield massive, 110 long, 168 wide, reticulate, almost touching genital shield with 3 pairs of preanal setae, 3 pairs of setae present around ventrianal shield, a pair of large triangular metapodal plates present, 36 long. Macrosetae absent on leg IV. Fixed digit of chelicera multidentate, dentition on movable digit not discernible. Peritreme extends anteriorly upto  $j_1$ . Spermatheca as figured. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{2}{1} \frac{1}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{0} 1$ .

*Male* : Unknown.

*Habitat* : Collected on an undetermined plant.

*Type locality and repository* : Holotype ♀, India : Meghalaya, Mawphlong, on an undetermined plant, deposited in ZSI, Calcutta, Reg. No. 3456/17.

*Distribution* : India : Meghalaya.

*Remarks* : This species is known only from its type.

### Genus *Platyseiella* Muma

1961. *Platyseiella* Muma, *Bull. Fla. St. Mus.*, 5(7) : 280.

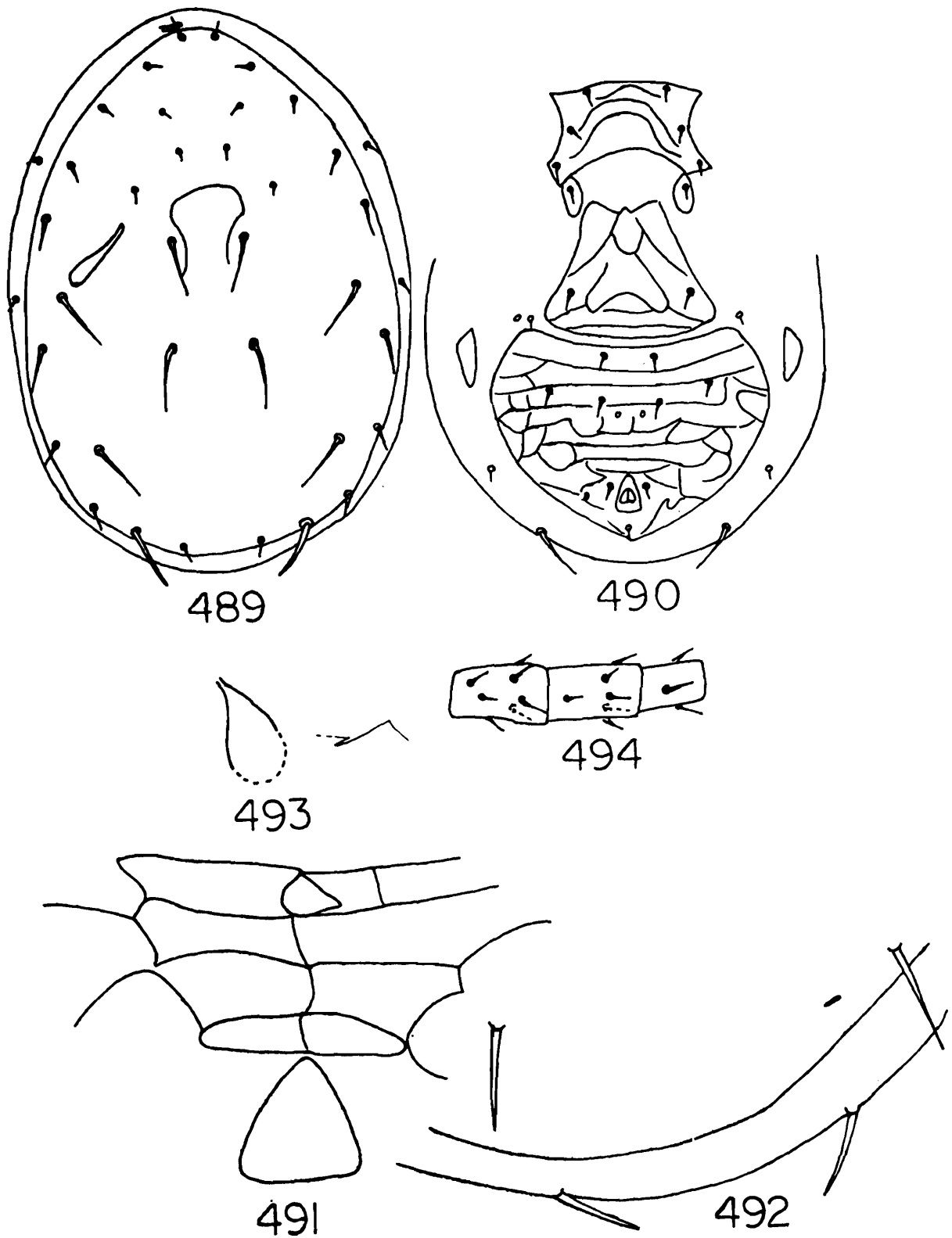
1965. *Platyseiella* : Chant, *Can. Ent.*, 97(4) : 370.

1970. *Platyseiella* : Muma & Denmark, *Arthropods of Florida*, 6 : 56.

1978. *Platyseiella* : Chant *et al.*, *Can. J. Zool.*, 56(6) : 1344.

1981. *Platyseiella* : Ray & Gupta, *Bull. Zool. Surv. India*, 4(3) : 277.

*Diagnosis* : Dorsal shield rugose, lightly sclerotized, with 5 pairs



Figs. 489-494. *Paraamblyseius mumai* Gupta  
 489. Dorsal shield  
 490. Ventral surface  
 491. Reticulation pattern on ventrianal shield  
 492. Posterior dorsal surface  
 493. Spermatheca  
 494. Genu, tibia and basitarsus of leg IV

of dorsocentral, 2 pairs of median and 6 pairs of lateral setae ;  $r_3$  lies on dorsal shield,  $R_1$  absent. Sternal shield smooth, as long as wide, with 3 pairs of sternal setae. Ventrianal shield smooth, elongate, vase-shaped, with 2-3 pairs of preanal setae. Peritreme extends anteriorly upto- $j_1$ . Macrosetae present on genu, tibia and basitarsus of leg IV, may be spatulate.

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

82. *Platyseiella mumai* Ray & Gupta  
( Figs. 495-499, 499A, 499B)

1981. *Platyseiella mumai* Ray & Gupta, *Bull. Zool. Surv. India*, 4(3) : 277-279.

*Female* : Dorsal shield rugose, 285 long, 128 wide, with 14 pairs of setae,  $j_4$ ,  $j_5$ ,  $j_6$ ,  $J_5$  and  $z_5$  small and simple, the others being long, thick and serrate. Measurements of setae :  $j_1$ -25,  $j_4$ -7,  $j_5$ -5,  $j_6$ -5,  $J_5$ -5,  $j_3$ -34,  $z_2$ -11,  $z_4$ -9,  $s_4$ -146,  $Z_1$ -61,  $Z_5$ -85,  $z_5$ -5,  $Z_4$ -90 ( $Z_4$  apparently appear to be slightly longer and thicker than  $Z_5$ ),  $r_3$ -46,  $R_1$  absent. Sternal shield as figured, with 3 pairs of sternal setae, metasternal setae on interscutal membrane. Genital shield narrower than greatest width of ventrianal shield. Ventrianal shield 100 long, 67 wide, with 3 pairs of preanal setae, 4 pairs of setae present on the membrane around ventrianal shield, metapodal plates present, primary one 28 long. Fixed digit of chelicera multidentate, movable digit with 2 teeth. Spermatheca as figured. Macrosetae on leg IV : genu-38, tibia-61, basitarsus-34, distitarsus-33, all being spatulate.

*Male* : Chaetotaxy of dorsal shield as in female. Spermatophoral process as illustrated. Macrosetae on leg IV : genu-27, tibia-34, basitarsus-24.

*Habitat* : Collected on an undetermined plant.

*Type locality and repository* : Holotype ♀ : India : Tripura, Agartala, Amtali, on an undetermined plant, deposited in ZSI, Calcutta, Reg. No. 3137/17. Paratype 1 ♀, same data as for holotype, Reg. No. 3138/17.

*Distribution* : India : Tripura.

*Remarks* : So far this genus was known only from its type, *P. platypilis* Chant, from florida. Therefore, the occurrence of this genus in India is quite interesting,

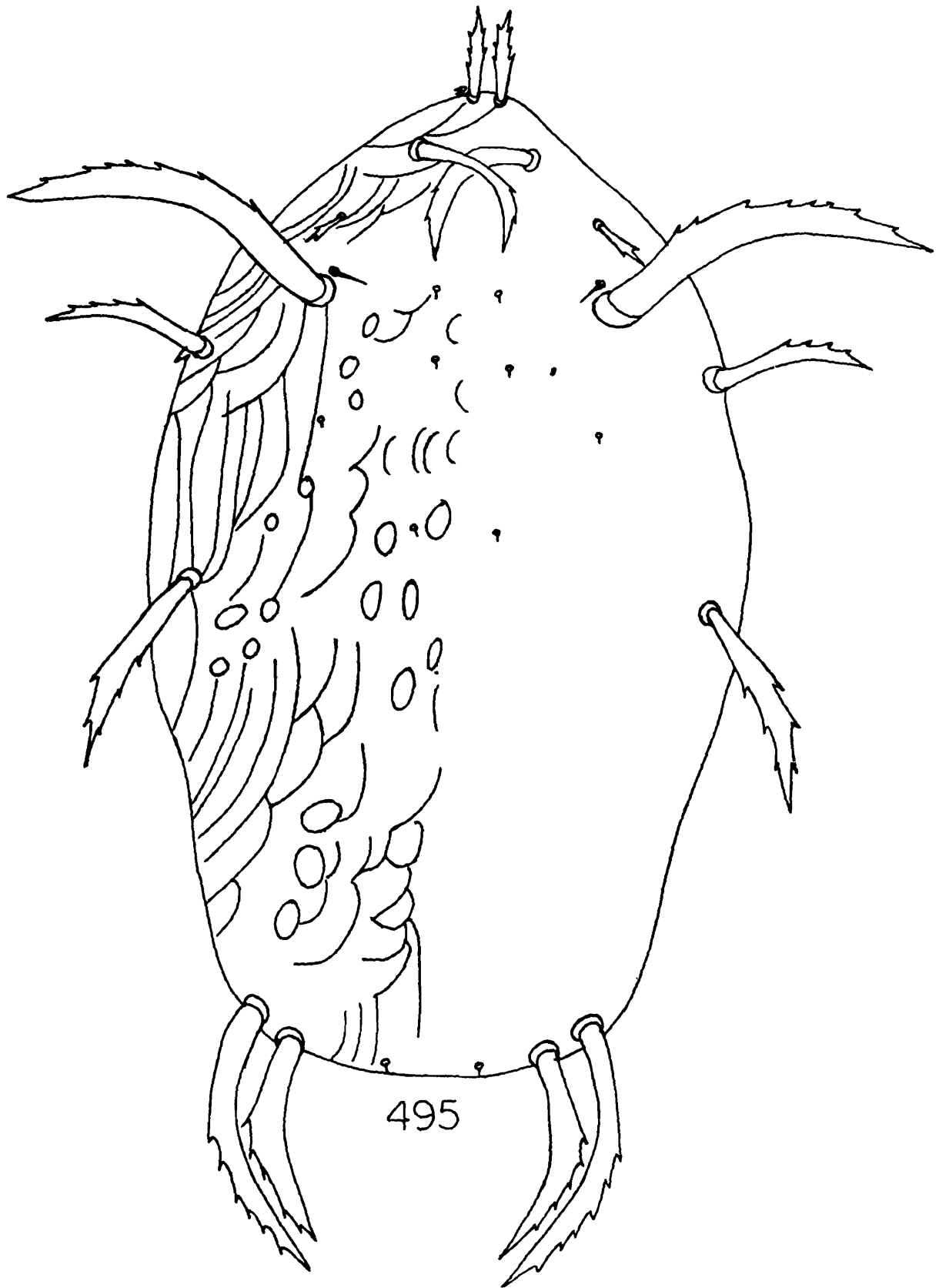
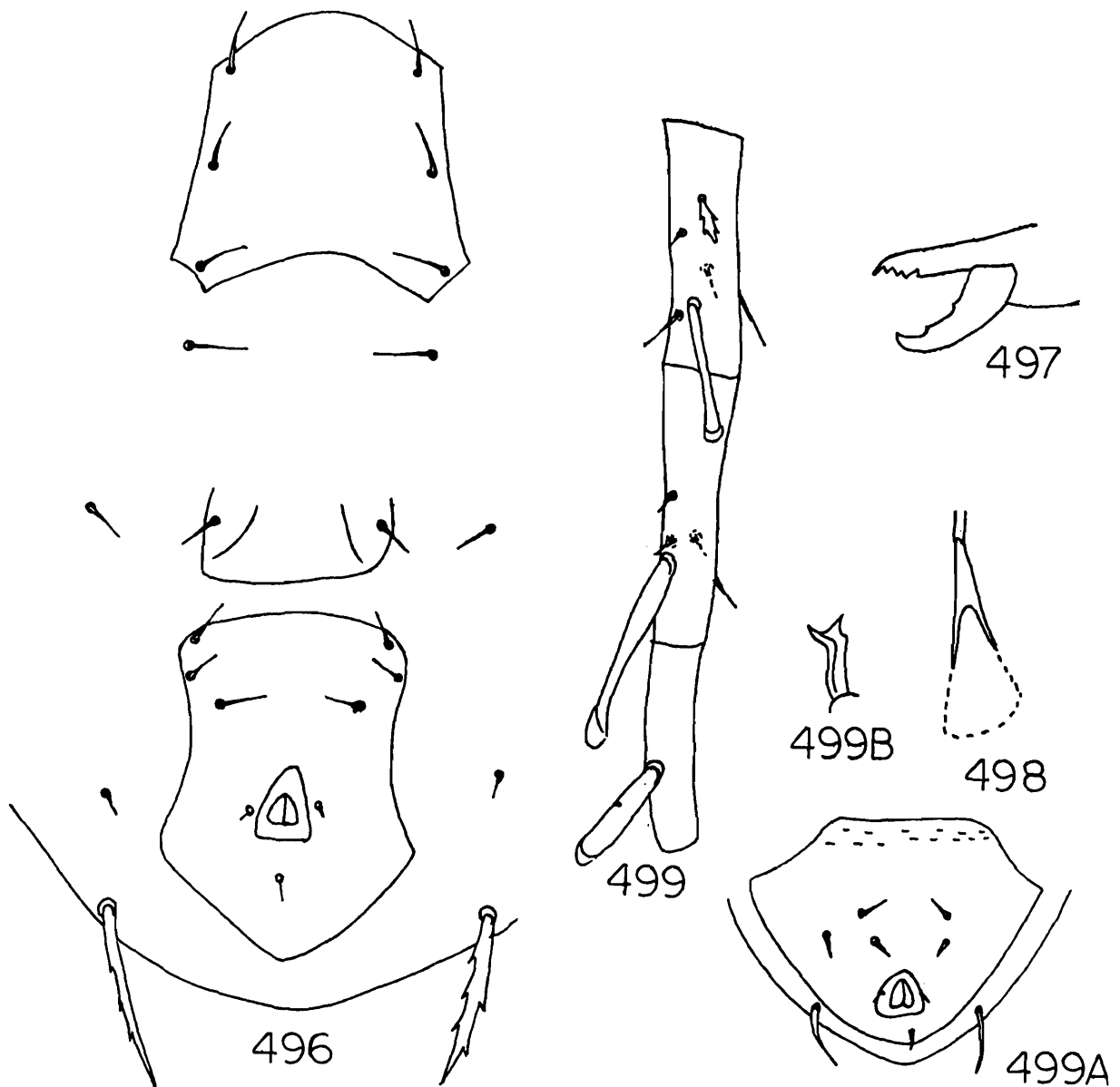


Fig. 495. *Platyseiella mumai* Ray and Gupta : Dorsal shield



Figs. 496-499. *Platyseiella mumai* Ray and Gupta

496. Ventral surface  
 497. Chelicera (female)  
 498. Spermatheca  
 499. Genu, tibia and basitarsus of leg IV  
 499A. Ventrianal shield (male)  
 499B. Spermatophoral process

### Genus *Okiseius* Ehara

1967. *Okiseius* Ehara, *Mushi*, 40(6) : 77.  
 1977. *Okiseius* : Ehara, *Rev. Plant Prot. Res.*, 10 : 38.  
 1980. *Okiseius* : Ehara & Hamaoka, *Acta Arachnologia*, 29(1) : 6.  
 1983. *Okiseius* : Weinan & Xing, *Entomotaxonomia*, 5(1) : 75.

**Diagnosis :** Dorsal shield convex, highly sclerotized, rugose, as in *Phytoseius* with 16 pairs of setae, of these, 8 pairs of laterals, 5 pairs of dorsocentrals and 2 pairs of medians,  $r_3$  on lateral integument,

$R_1$  on dorsal shield. An incision may or may not be present on dorsal shield posterior to  $R_1$ . Setae on the dorsal shield mostly elongate, thick and serrate as in *Phytoseius*. Genu II with 6 setae; genu III and IV each with 7 setae. Macrosetae present on basitarsus and distitarsus IV, genu and tibia of leg IV may or may not possess macroseta; macrosetae when present mostly spatulate. Metapodal plates single paired; spermatheca normal.

Type: *Okiseius subtropicus* Ehara (1967), by original designation.

### Key to the species of *Okiseius*

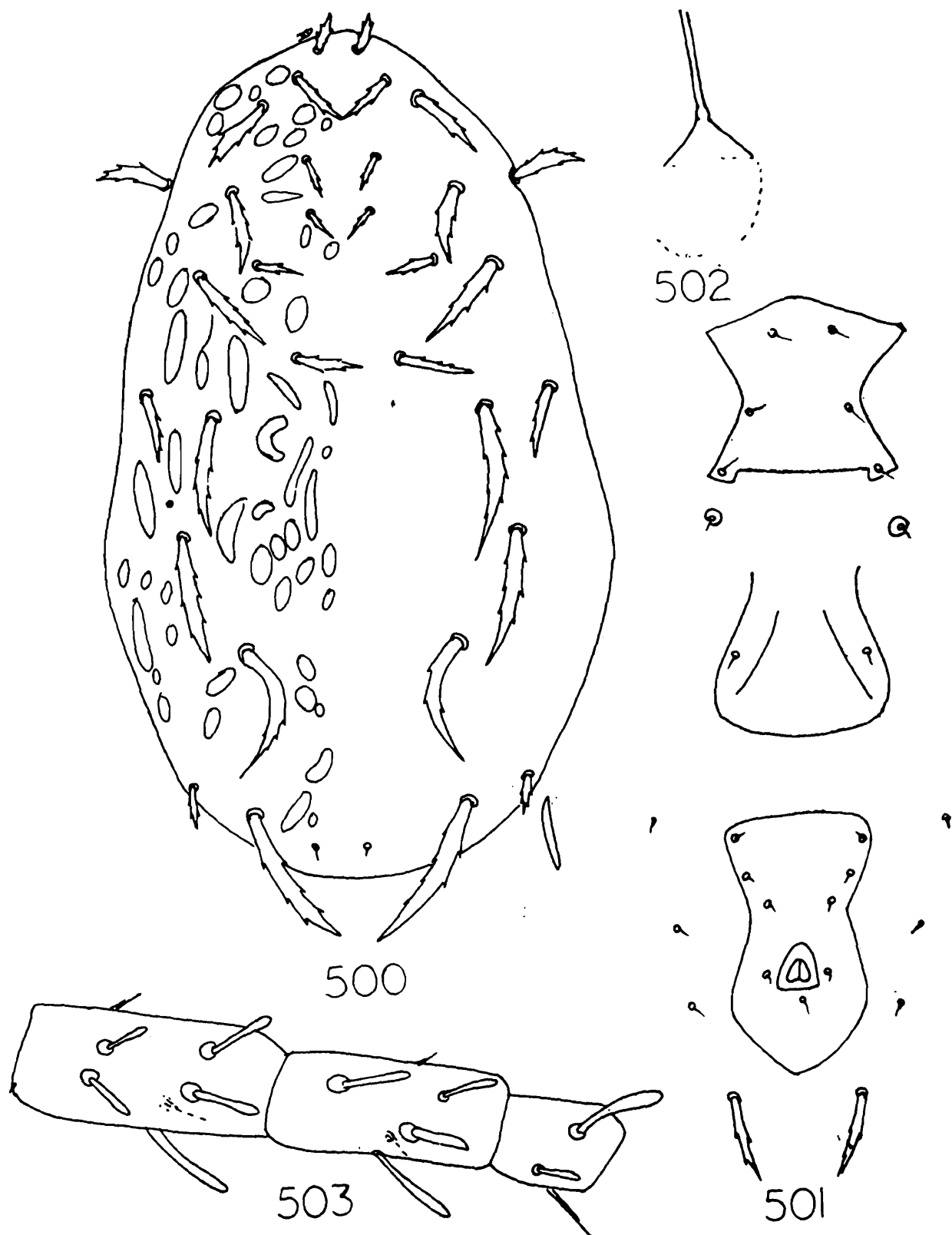
- |   |     |                    |
|---|-----|--------------------|
| 1. Setae $j_4$ and $j_5$ very small (6-12 microns), simple  | ... | 2                  |
| — Setae $j_4$ and $j_5$ longer than above, serrate  | ... | <i>himalayana</i>  |
| 2. Ventrianal shield much more than $1\frac{1}{2}$ times as long as wide, lateral margins distinctly constricted                  | ... | <i>yazuliensis</i> |
| — Ventrianal shield less than $1\frac{1}{2}$ times as long as wide, lateral margins almost straight, or only slightly constricted | ... | <i>sikkimensis</i> |

### 83. *Okiseius himalayana* Gupta

(Figs. 500-503)

*Okiseius himalayana* Gupta, *Indian J. Acar.* (In press).

**Female:** Dorsal shield highly rugose, sclerotized, 315 long, 157 wide, with 16 pairs of setae, all thick and serrate except  $J_5$  which is small. Measurements of setae:  $j_1$ -10,  $j_4$ - $j_5$ -16 each  $j_6$ -33,  $J_5$ -7,  $j_3$ -23,  $z_2$ -27,  $z_4$ -34,  $s_4$ -38,  $Z_1$ -40,  $S_2$ -40,  $S_5$ -16,  $Z_5$ -47,  $z_5$ -20,  $Z_4$ -50;  $r_3$ ,  $R_1$ -27 each. Setae  $J_2$  and  $S_4$  absent. Setae  $j_3$ - $z_4$  shorter or as long as the distance between their bases and those of the next setae. Sternal shield longer than broad with 3 pairs of short sternal setae; metasternal plates with setae distinct. Genital shield normal with a pair of setae. Ventrianal shield about  $1\frac{1}{2}$  times as long as broad with 3 pairs of preanal setae; para and postanal setae present as usual; 4 pairs of setae present around ventrianal shield;  $JV_5$ -29 long, serrate; metapodal plates single paired, elongate. Fixed digit of chelicera with at least 3 teeth, movable digit probably with one tooth. Spermatheca with bowl-shaped cervix and long duct. Leg chaetotactic formula: genu II  $1 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{2}{1} \frac{1}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{2}{1} \frac{1}{1} 1$ . Macrosetae on genu IV and tibia IV indistinguishable from other leg



Figs. 500-503. *Okiseius himalayana* Gupta  
 500. Dorsal shield  
 501. Ventral surface  
 502. Spermatheca  
 503. Genu, tibia and basitarsus of leg IV

setae, that on basitarsus-16, distitarsus-18, both with spatulate tip. Peritreme extends anteriorly upto  $j_1$ .

*Male* : Unknown.

*Type locality and repository* : Holotype ♀, India : Uttar Pradesh, Garhwal, Fata Village, on an undetermined shrub, Coll. S. K. Gupta, deposited in ZSI, Calcutta, Reg. No. 3297/17.

*Remarks* : This species is distinguished from *Okiseius subtropicus* Ehara (1967) by absence of lateral incision posterior to  $R_1$  and in having bowl-shaped cervix.

#### 84. *Okiseius sikkimensis* Gupta

( Figs. 504-507 )

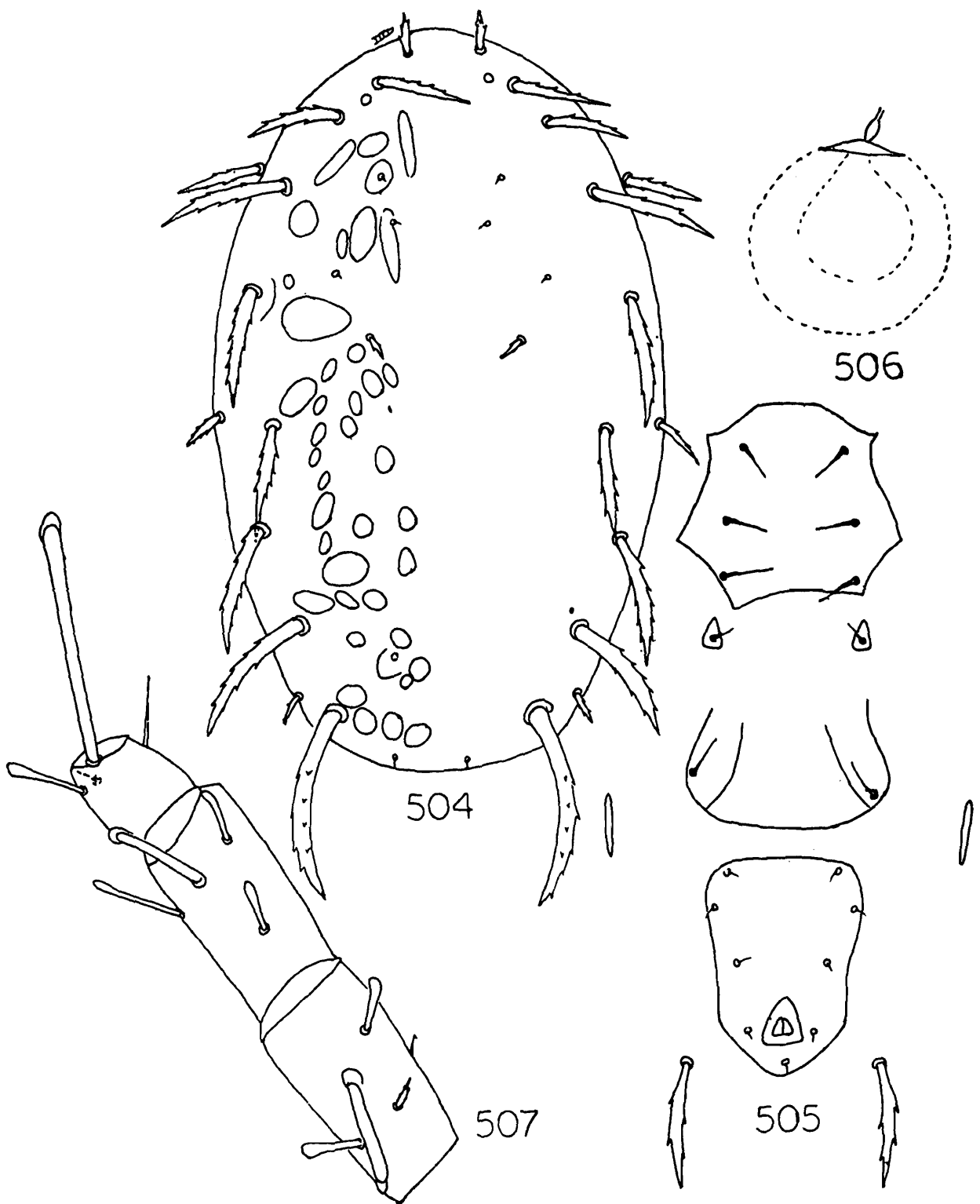
*Okiseius sikkimensis*, Gupta, *Indian J. Acar.* (In press).

*Female* : Dorsal shield highly rugose, sculptured, 333 long, 118 wide, with 16 pairs of setae. Setae  $J_2$  and  $S_4$  absent. Excepting setae  $j_4$ ,  $J_5$ ,  $z_5$  other setae being serrate and thick. Measurements of setae :  $j_1$ -25,  $j_4$ -5,  $j_5$ -5,  $j_6$ -9,  $J_5$ -5,  $j_3$ -45,  $z_2$ -36,  $z_4$ -45,  $s_4$ -45,  $Z_1$ -47,  $S_2$ -56,  $S_5$ -18,  $Z_5$ -83,  $z_5$ -6,  $Z_4$ -65,  $r_3$ -36,  $R_1$ -22. Ventrally, sternal shield smooth, approximately 85 long, 55 wide, with 3 pairs of sternal setae, 4th pair lie on metasternal plates. Genital shield slightly wider than the greatest width of ventrianal shield, with a pair of setae. Ventrianal shield shaped as figured, 105 long, 75 wide, with 3 pairs of preanal setae, para and postanal setae present as usual ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -47 long, serrate ; metapodal plate single paired, elongate. Spermatheca as figured. Leg chaetotactic formula : genu II 1  $\frac{2}{0}$   $\frac{2}{0}$  1, tibia II 1  $\frac{1}{1}$   $\frac{2}{1}$  1, genu III 1  $\frac{2}{1}$   $\frac{2}{0}$  1, tibia III 1  $\frac{1}{1}$   $\frac{2}{1}$  1. Macrosetae, on leg IV : genu-25, tibia-21, basitarsus-45, all with spatulate tip. Peritreme extends anteriorly upto base of  $j_1$ .

*Male* : Unknown.

*Type locality and repository* : Holotype ♀, India : Sikkim, Rangay near Nathula Road, on an undetermined tree, Coll. S. K. Ghosh, deposited in ZSI, Calcutta, Reg. No. 3296/17.

*Remarks* : This species is distinguished from *O. subtropicus* Ehara (1967 a) by lack of incision posterior to  $R_1$  and from *O. yazuliensis* Gupta by relative length of ventrianal shield and by shape of spermatheca.



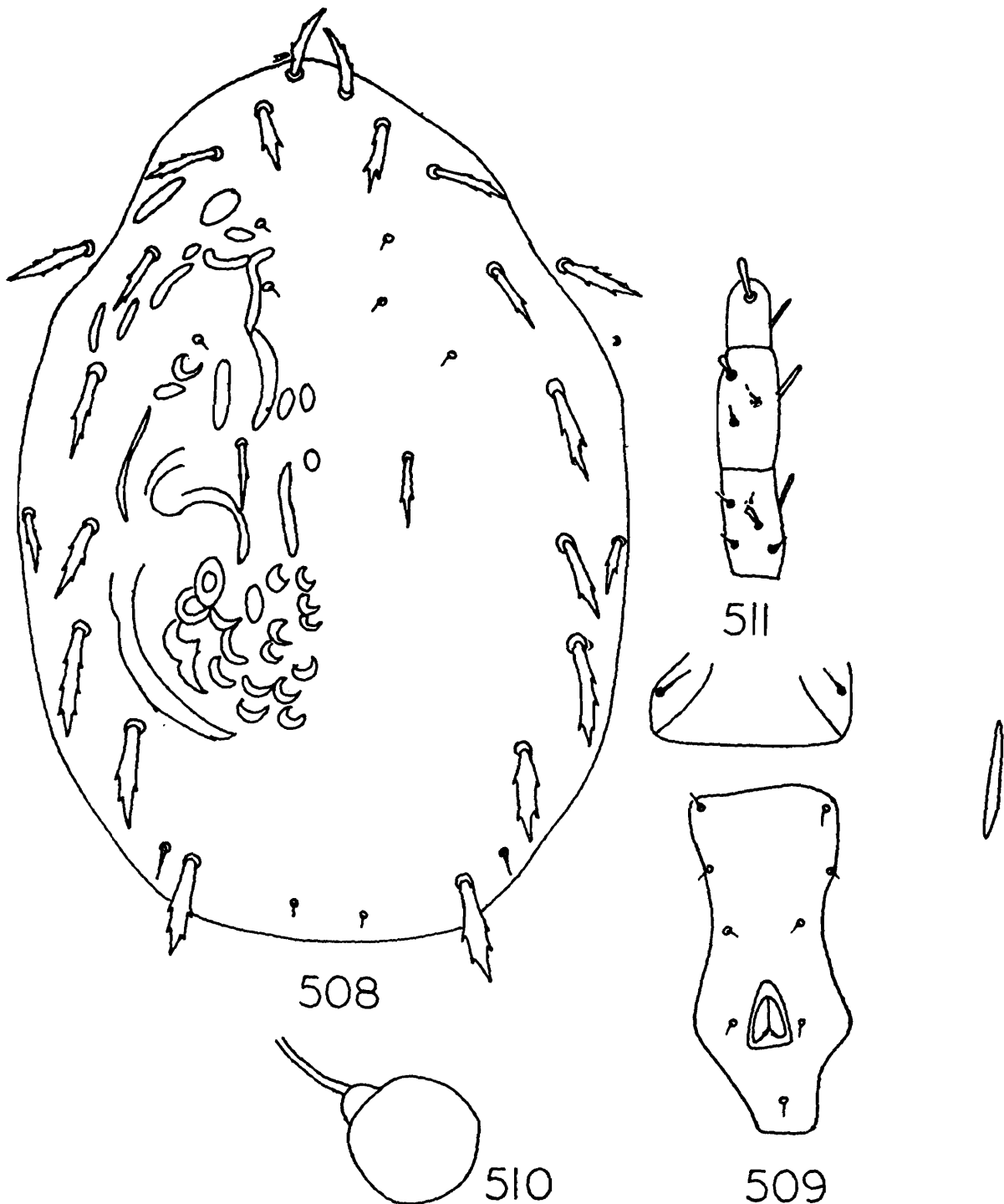
Figs. 504-507. *Okiseius sikkimensis* Gupta  
 504. Dorsal shield  
 505. Ventral surface  
 506. Spermatheca  
 507. Genu, tibia and basitarsus of leg IV

85. *Okiseius yazuliensis* Gupta

(Figs. 508-511)

*Okiseius yazuliensis* Gupta, *Oriental Ins.* (In press).

*Female* : Dorsal shield 358 long, 212 wide, heavily sclerotized, with 16 pairs of setae. Measurements of setae :  $j_1$ -22,  $j_4$ - $j_5$ -11-12 each,

Figs. 508-511. *Okiseius yazuliensis* Gupta

508. Dorsal shield

509. Posterior ventral surface

510. Spermatheca

511. Genu, tibia and basitarsus of leg IV

$j_6$ -23,  $J_5$ -7,  $j_3$ -34,  $z_2$ -29,  $z_4$ -34,  $s_4$ -40,  $Z_1$ -38,  $S_2$ -45,  $S_5$ -16,  $Z_5$ -45,  $z_5$ -14,  $Z_4$ -40,  $r_3$ -33,  $R_1$ -22. Sternal shield indistinct with 3 pairs of sternal setae, metasternal plates indistinct, however, setae present. Genital shield wider than greatest width of ventrianal shield. Ventrianal shield, much longer (112) than broad (60) with 3 pairs of preanal setae, preanal pores apparently absent; 3 pairs of setae present around ventrianal shield, metapodal plates single paired, 56 long. Spermatheca as illustrated. Leg chaetotactic formula: genu II  $1 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Macrosetae on leg IV: genu-7, tibia-7, basitarsus-23, distitarsus-23. Peritreme extends anteriorly upto base of  $j_1$ .

*Male*: Unknown.

*Type locality and repository*: Holotype ♀, India: Arunachal Pradesh, Ziro, Yazuli, on an undetermined shrub, Coll. S. K. Gupta, deposited in ZSI, Calcutta, Reg. No. 3443/17.

#### Subfamily PHYTOSEIINAE Berlese

1916. *Phytoseiinae* Berlese, *Redia*, 12: 11.  
 1961. *Phytoseiinae*: Muma, *Bull. Fla. St. Mus.*, 5(7): 292.  
 1965. *Phytoseiinae*: Chant, *Can. Ent.*, 97: 353 (in part).  
 1970. *Phytoseiinae*: Muma & Denmark, *Arthropods of Florida*, 6: 115.  
 1973. *Phytoseiinae*: Tuttle & Muma, *Tech. Bull. Agr. Exp. Sta. Univ. Arizona*, 208: 27.  
 1978. *Phytoseiinae*: Chant *et al.*, *Can. J. Zool.*, 56(6): 1344. (in part).  
 1978. *Phytoseiinae*: Denmark & Muma, *Internat. J. Acarol.*, 4(1): 14.

*Diagnosis*: Dorsal shield undivided with 5-6 pairs of dorsocentral setae, 2-3 pairs of median setae and 7-11 pairs of lateral setae, of these, 5 pairs of prolateral, 1-2 pairs of sublateral setae, both may be on interscutal membrane or one or both may be on dorsal shield. Ventrianal shield with 1-4 pairs of preanal setae; 0-3 macrosetae on leg IV. Males with entire shield-shaped ventrianal shield and usually with 2 pairs of sublateral setae located on dorsal shield.

*Type*: *Phytoseius* Ribaga, 1904, by indication Berlese (1916)

#### Key to the genera of subfamily Phytoseiinae

- |   |     |                   |
|---|-----|-------------------|
| 1. Both $r_3$ and $R_1$ on dorsal shield  | ... | <i>Indodromus</i> |
| — $r_3$ may be on dorsal shield, $R_1$ if present, always on lateral integument | ... | 2                 |

2.  $r_3$  on dorsal shield, genu II with 7 setae, genu III with 6 setae ... *Phytoseius*  
 —  $r_3$  on lateral integument, genu II with 7 or 8 setae, genu III with 6 or 7 setae ... *Typhlodromus*

### Genus *Indodromus* Ghai & Menon

1969. *Indodromus* Ghai & Menon *Oriental Ins.*, 3 : 349.

**Diagnosis :** Dorsal shield reticulate with 18 pairs of setae, of those, 5 pairs of prolateral ; posterior lateral setae progressively increasing in length upto  $S_4$ ,  $S_5$  very small,  $Z_5 = S_4$  ; setae  $S_2$ ,  $S_4$ ,  $Z_5$ ,  $Z_4$  being plumose ; both  $r_3$  and  $R_1$  on dorsal shield. Sternal shield with 2 pairs of setae. Ventrianal shield with constricted lateral margins, longer than wide, with 4 pairs of preanal setae, 2 pairs of metapodal plates present. Peritreme extends anteriorly upto  $j_1$ . Leg IV without macroseta.

**Type :** *Indodromus meerutensis* Ghai & Menon, 1969, by original designation.

**Remarks :** This genus is restricted to India. It has resemblance with *Chantia* Pritchard & Baker, in having both  $r_3$  and  $R_1$  on dorsal shield but differs in lacking spatulate dorsal setae. It is also close to *Typhlodromus* in having 5 pairs of prolateral setae but differs in having both  $r_3$  and  $R_1$  on dorsal shield.

### 86. *Indodromus meerutensis* Ghai & Menon

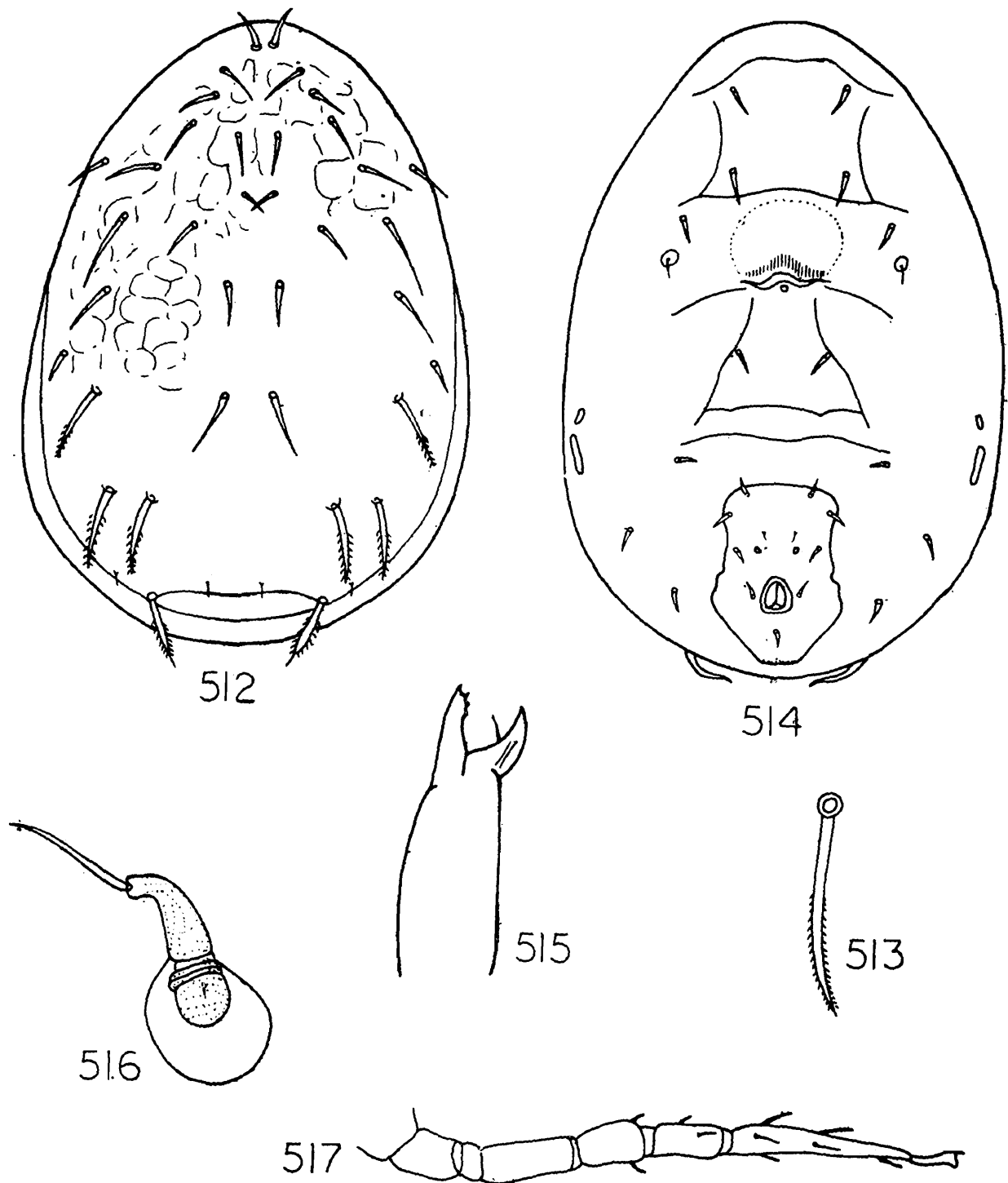
( Figs. 512-517 )

1969. *Indodromus meerutensis* Ghai & Menon, *Oriental Ins.*, 3 : 349.

1974. *Indodromus meerutensis* : Prasad, A catalogue of mites of India, p. 170.

**Female :** Length 338, width 227 ; dorsal shield reticulate with 10 pairs of lateral setae, 2 pairs of median setae, 6 pairs of dorsocentral setae ; 2 pairs of sublateral setae always on dorsal shield, posterior lateral setae progressively longer,  $S_2$ ,  $S_4$ ,  $Z_5$  and  $Z_4$  plumose ;  $S_5$  and  $J_5$  minute. Sternal shield shorter than broad and smooth, metasternal shield conspicuous with seta. Ventrianal shield longer (92) than broad (57) with 4 pairs of preanal setae and a pair of preanal pores, para and postanal setae present as usual. Fixed digit of chelicera

with 3 teeth, movable digit without tooth. Spermatheca as figured. Peritreme extends anteriorly upto  $j_3$ . Macrosetae on leg IV : genu-22 tibia-30, basitarsus-30.



Figs. 512-517. *Indodromus meerutensis* Ghai and Menon  
(after Ghai & Menon, 1969)

- 512. Dorsal shield
- 513. Posterior dorsal seta
- 514. Ventral surface
- 515. Chelicera (female)
- 516. Spermatheca
- 517. Leg IV

*Male* : Unknown.

*Habitat* : Malformed mango.

*Type locality and repository* : Holotype ♀, India : Uttar Pradesh, Meerut, on malformed mango sample, deposited in NPC, I.A.R.I, New Delhi. Paratypes 9 ♀ ♀, same data as for holotype.

*Distribution* : India : Uttar Pradesh.

*Remarks* : This species is so far known only from its types. The measurements of setae in holotype specimen, as examined at I.A.R.I. by the present author, are as :  $j_1$ -26,  $j_4$ -18,  $j_5$ , 21,  $j_6$ , 21,  $J_2$ , 25,  $j_3$ -32,  $z_2$ -30,  $z_4$ -30,  $s_4$ -30,  $Z_5$ -50,  $Z_4$ -50. Ghai & Menon (1969) mentioned that macrosetae were absent but on re-examination these were found to be present.

### Genus *Phytoseius* Ribaga

1904. *Phytoseius* : Ribaga, *Riv. Path. Veg.*, 10 : 177.  
 1951. *Phytoseius* : Nesbitt, *Zool. Verh.*, 12 : 16.  
 1952. *Phytoseius* : Baker & Wharton, : p. 88.  
 1953. *Phytoseius* : Cunliffe & Baker, *Pinn. Biol. Lab. Publ.*, No. 1 : 22.  
 1954. *Phytoseius* : Womersley, *Aust J. Zool.*, 2(1) : 187.  
 1959. *Phytoseius* : Chant, *Can. Ent.*, 91 : 105.  
 1959. *Phytoseius* : Wainstein, *Ent. Rev.*, 38(2) : 1365.  
 1960. *Phytoseius* : Chant & Athias-Henriot, *Entomophaga*, 5 : 213.  
 1961. *Phytoseius* : Muma, *Bull. Fla. St. Mus.*, 5(7) : 293.  
 1962. *Pennaseius* Pritchard & Baker, *Hilgardia*, 33 : 223.  
 1965. *Phytoseius* : Chant & Baker, *Mem. Ent. Soc. Canada*, 41 : 8.  
 1966. *Phytoseius* : Denmark, *Bull. Fla. Dept. Agr.*, 6 : 11.  
 1966. *Phytoseius* : Corpuz, *Philip. Agr.*, 50 : 732.  
 1968. *Phytoseius* : Muma & Denmark, *Fla. Ent.*, 51 : 229.  
 1970. *Phytoseius* : Muma & Denmark, *Arthropods of Florida*, 6 : 115.  
 1970. *Phytoseius* : Lo, *Bull. Sun. Yat. Sen Cult. Foundation*, 5 : 52.  
 1972. *Phytoseius* : Denmark & Muma, *Fla. Ent.*, 55(1) : 28.  
 1973. *Phytoseius* : Denmark & Muma, *Rev. Brazil Biol.*, 33(2) : 269.  
 1975. *Phytoseius* : Denmark & Muma, *J. Agr. Univ. Puerto Rico*, 59(4) : 295.  
 1977. *Phytoseius* : Ehara & Bhandhufalck, *J. Fac. Ed. Tottori Univ.*, 27(2) : 46.  
 1978. *Phytoseius* : Denmark & Muma, *Internat. J. Acarol.*, 4(1) : 14.  
 1981. *Phytoseius* : Denmark & Andrews, *Fla. Ent.*, 64(1) : 153.  
 1982. *Phytoseius* : Daneshvar & Denmark, *Internat. J. Acarol.*, 8 : 6.

*Diagnosis* : Dorsal shield entire, often heavily sclerotized, sculptured, with 15-16 pairs of setae, of those, 5-6 pairs on pro-lateral series, all long setae on dorsal shield heavily serrate ;  $r_3$  on dorsal shield in dorsal position,  $R_1$  either on lateral integument or absent. All known species with 7 pairs of lateral setae, 2 pairs of median setae and 5-6 pairs of dorsocentral setae. Ventrally, female with sternal, genital

and ventrianal shields. Sternal shield with 3 pairs of sternal setae, genital shield with 1 pair of setae, ventrianal shield longer than wide, with a distinct waist and 1-3 pairs of preanal setae, the number may be variable within species and also from one side to another ; 1-2 pairs of narrow elongate metapodal plates present. Macrosetae on leg IV often spatulate club-shaped or thickened. Genu II with 7 setae, genu III-7 setae, tibia II-6-7 setae, tibia III 6 setae.

Type : *Gamasus plumifer* Canestrini & Fanzago, 1876 by subsequent designation (Vitzthum, 1941)

#### Key to the subgenera of *Phytoseius*

- |                       |     |                   |
|-----------------------|-----|-------------------|
| 1. Seta $R_1$ present | ... | <i>Pennaseius</i> |
| — Seta $R_1$ absent   | ... | <i>Phytoseius</i> |

#### Subgenus *Pennaseius* Pritchard & Baker

1904. *Phytoseius* Ribaga, *Riv. Path. Veg.*, 10 : 175. (in part).  
 1962. *Pennaseius* Pritchard & Baker, *Hilgardia*, 33 : 223.  
 1966. *Phytoseius* (*Phytoseius*) : Denmark, *Bull. Fla. Dept. Agr.*, 6 : 11.  
 1966. *Pennaseius* : Schuster, *Pacific Insects*, 8(2) : 339.  
 1966. *Phytoseius* (*Pennaseius*) : Ehara, *Jap. J. Zool.*, 15(2) : 137.  
 1970. *Pennaseius* : Muma & Denmark, *Arthropods of Florida*, 6 : 120.  
 1972. *Phytoseius* (*Pennaseius*) : Denmark & Muma, *Fla. Ent.*, 55(1) : 28.  
 1972. *Phytoseius* (*Pennaseius*) : Ehara, *Mushi*, 46 : 169.  
 1973. *Phytoseius* (*Pennaseius*) : Chaudhri, *Pak. J. Zool.*, 5(1) : 79.  
 1975. *Phytoseius* (*Pennaseius*) : Denmark & Muma, *J. Agr. Univ. Puerto Rico.*, 59(4) : 297.  
 1976. *Phytoseius* (*Pennaseius*), Blommers, *Bijdragen Tot. De Dierkunde*, 46(1) : 84.  
 1977. *Pennaseius* : Ehara & Bhandhufalck, *J. Fac. Ed. Tottori Univ.*, 27(2) : 46.  
 1978. *Phytoseius* (*Pennaseius*) : Ehara, *Proc. Jap. Acad.*, 54(B) : 448.  
 1978. *Pennaseius* : Denmark & Muma, *Internat. J. Acarol.*, 4(1) : 14.  
 1981. *Phytoseius* (*Pennaseius*) : Denmark & Andrews, *Fla. Ent.*, 64(1) : 153.  
 1981. *Pennaseius* : Matthyse & Denmark, *Fla. Ent.*, 64(2) : 352.

**Diagnosis :** Dorsal shield smooth, or weakly sclerotized, with 7 pairs of lateral setae, 2 pairs of median setae and 6 pairs of dorsocentral setae and in addition  $r_3$  also present on shield ;  $R_1$  on lateral integument ; some of the dorsal setae being long, thick and serrate. Sternal shield with 3 pairs of sternal setae ; 2-3 pairs of setae present on the membrane around ventrianal shield. Macrosetae on leg IV present on genu, tibia and basitarsus, all with flattend tip or spatulate.

Type : *Phytoseius* (*Pennaseius*) *amba* pritchard & Baker, 1962, by designation.

*Key to the species of subgenus Pennaseius*

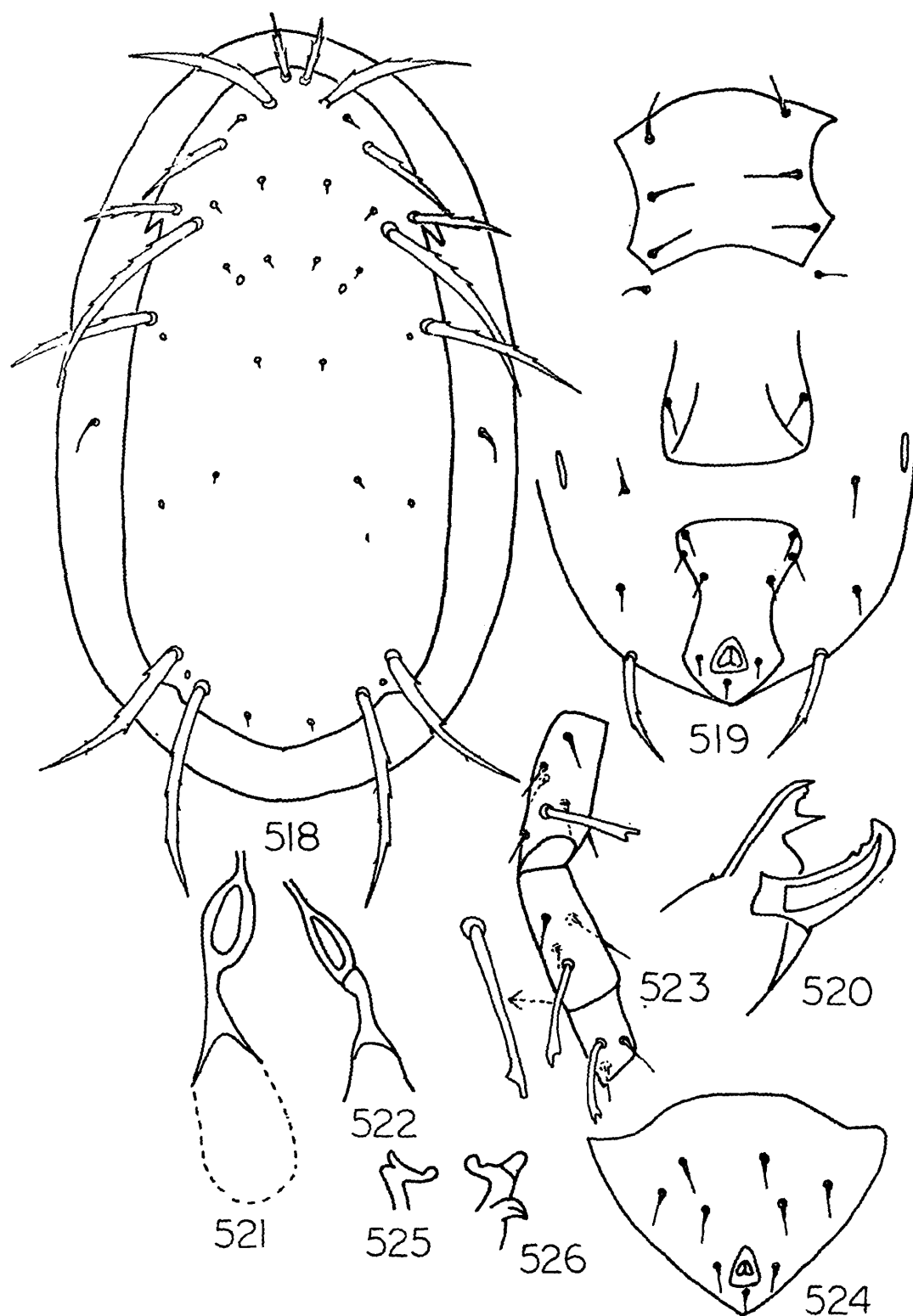
- |  |     |                      |
|--|-----|----------------------|
| 1. Dorsal shield notched at the level $r_3$            | ... | <i>kapuri</i>        |
| — Dorsal shield not notched at the level of $r_3$      | ... | 2                    |
| 2. Macrosetae on leg IV more or less forked at the tip | ... | <i>minutus</i>       |
| — Macrosetae not forked but somewhat knobbed           | ... | <i>namdcphaensis</i> |

87. *Phytoseius (Pennaseius) kapuri* Gupta

(Figs. 518-526)

1969. *Phytoseius (Phytoseius) kapuri* Gupta, *Israel J. agric. Res.*, 19(3) : 115-117.  
 1974. *Phytoseius kapuri* : Prasad, A catalogue of mites of India, p. 171.  
 1977. *Phytoseius (Phytoseius) kapuri* : Gupta, *Indian J. Acar.*, 1 : 12.  
 1977. *Phytoseius (Phytoseius) kapuri* : Gupta, *Oriental Ins.*, 11 : 636.  
 1977. *Phytoseius (Phytoseius) kapuri* : Gupta, *Indian J. Acar.*, 2 : 10.  
 1980. *Phytoseius (Phytoseius) kapuri* : Gupta, *Bull. Zool. Surv. India*, 3(1-2) : 51.  
 1981. *Phytoseius (Phytoseius) kapuri* : Gupta, *Indian J. Acar.*, 5(1-2) : 46.  
 1981. *Phytoseius (Phytoseius) kapuri* : Gupta & Nahar, *In Contrib. to Acar. in India*, p. 10.  
 1982. *Phytoseius (Phytoseius) kapuri* : Gupta, *Rec. zool. Surv. India*, 79(3-4) : 369.  
 1982. *Phytoseius (Phytoseius) kapuri* : Gupta, *Indian J. Acar.*, 6 : 31.

*Female* : Dorsal shield smooth, 265-280 long, 135-160 wide, with 16 pairs of setae and 4-5 pairs of pores. A distinct notch present on the lateral margin of dorsal shield at the level of  $r_3$  and in some species a depression exists at the posterior margin of shield between  $Z_5$  and  $Z_4$ . A pair of pores associated with  $z_5$  being largest, other pairs smaller. Setae  $j_1$ ,  $j_3$ ,  $z_3$ ,  $s_4$ ,  $s_6$ ,  $r_3$ ,  $Z_5$  and  $Z_4$  being long, thick and serrate, other setae small. Measurements of setae :  $j_1$ -26-28,  $j_4$ -3-4,  $j_5$ -4-5,  $j_6$ -4-5,  $J_2$ -5-9,  $J_5$ -4,  $j_3$ -53-63,  $z_2$ -11-16,  $z_3$ -40-48,  $z_4$ -5-9,  $s_4$ -88-96,  $s_6$ -80-86,  $Z_5$ -68-75,  $Z_4$ -72-76,  $z_5$ -5,  $r_3$ -40-45,  $R_1$ -12-14. Sternal shield wider (80-85) than long (70-74), smooth with 3 pairs of sternal setae, 4th pair of setae present, metasternal plate indistinct. Genital shield 70-75 wide, with a pair of setae. Ventrianal shield 75-92 long, 45-60 wide, lateral margins deeply concave with 3 pairs of preanal setae, preanal pores absent ; sometimes a fold present between genital and ventrianal shields ; 3 pairs of setae present around ventrianal shield,  $JV_5$ -49-56 long, serrate, one pair of elongate metapodal plates present. Spermatheca as figured. Fixed digit of chelicera with 3 teeth and movable digit with 2 teeth. Macrosetae, on leg IV : genu 24-29, tibia 29-34, basitarsus 24-27, all characteristically shaped as figured. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Peritreme extends anteriorly almost upto the base of  $j_1$ .



Figs. 518-526. *Phytoseius (Pennaseius) kapuri* Gupta  
 518. Dorsal shield  
 519. Ventral surface  
 520. Chelicera (female)  
 521, 522. Spermathecae  
 523. Genu, tibia and basitarsus of leg IV  
 524. Ventrianal shield (male)  
 525, 526. Spermatophoral processes

*Male* : Dorsal chaetotaxy similar as in female except setae being shorter. Ventrianal shield 86 long, 34 wide, gently reticulate with 3 pairs of preanal setae. Spermatophoral process as in figure.

*Habitat* : *Syzygium cumini*, *Adantheria pavoniana*, brinjal, sugarcane, guava, *Datura*, citrus.

*Type locality and repository* : Holotype ♀, India : West Bengal, Howrah Botanical Garden, on *Syzygium javanica*, deposited in ZSI, Calcutta, Reg. No. 3457/17. Paratypes 2 ♀♀, 1 ♂, same data as for holotype, Reg. No. 3458-60/17.

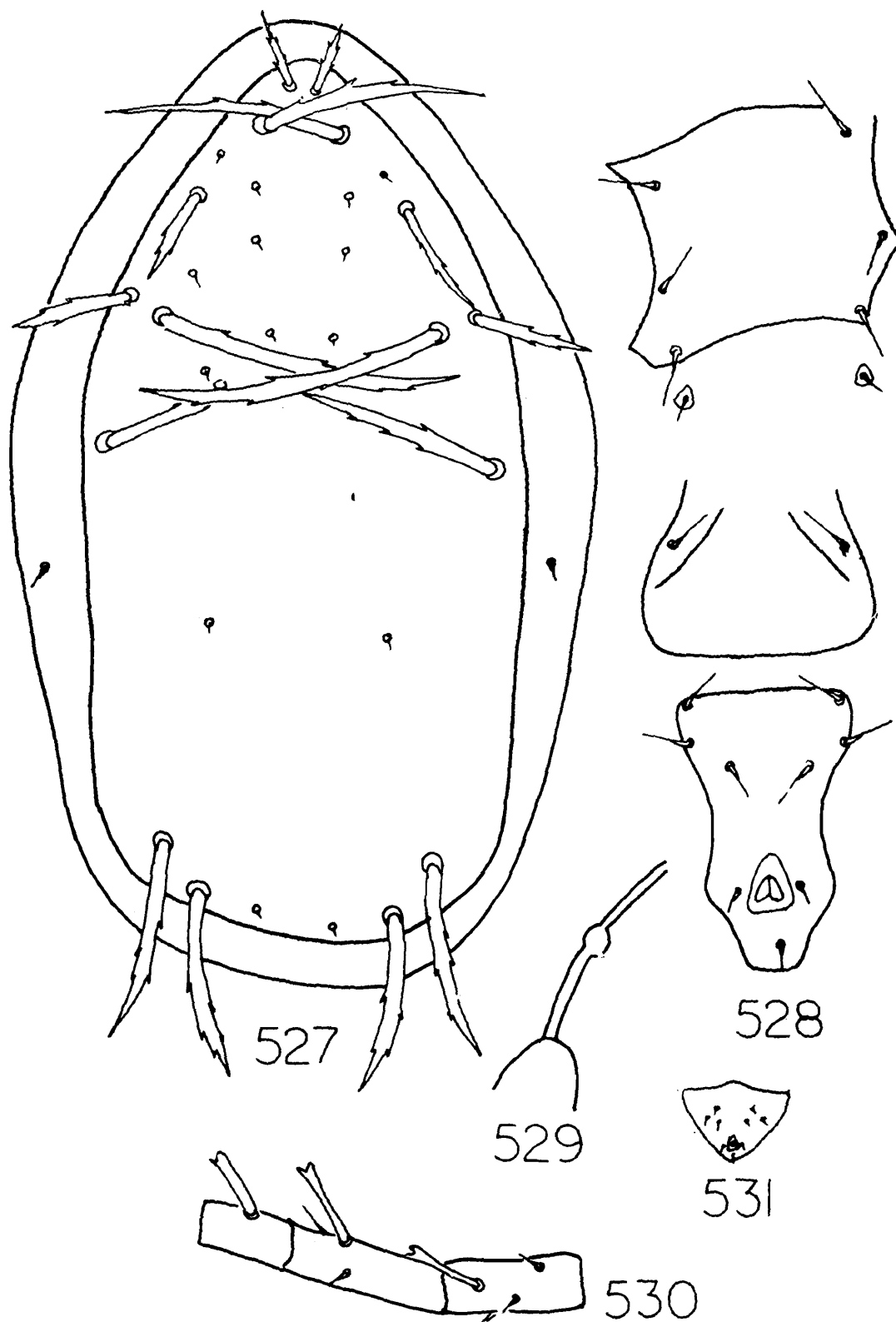
*Remarks* : This species is very close to *P. (P.) hongkongensis* Swirski & Shechter (1961) but is easily separated by  $j_3$  being  $1\frac{1}{2}$  times as long as  $z_3$  while in *hongkongensis*  $j_3$  2 times as long as  $z_3$ . From another Indian species, *P. (P.) minutus* Narayanan, Kaur & Ghai (1960) it differs in lacking the lateral notch on dorsal shield near  $r_3$  in *minutus*. This is a widely spread species in India and occurs on a number of plants. Though so far no observation has been made as to the feeding of this species on tetranychid mites but often it has been seen associated with tetranychid species. A more thorough observation in this regard is needed.

*Distribution* : India : West Bengal, Bihar, Orissa, Pondicherry, Kerala, Tamil Nadu, Andaman Isls., Gujarat, Rajasthan, Punjab, Madhya Pradesh, Jammu & Kashmir, Uttar Pradesh.

### 88. *Phytoseius (Pennaseius) minutus* Narayanan, Kaur & Ghai ( Figs. 527-531 )

1960. *Phytoseius minutus* Narayanan, Kaur & Ghai., *Proc. nat. Inst. Sci.*, 26B(6) : 391-392.  
 1964. *Phytoseius minutus* : Ghai, *In Entomology in India*, p. 390.  
 1966. *Phytoseius (Phytoseius) minutus* : Denmark, *Fla. Dept. Agr. Bull.*, 6 : 48-50.  
 1970. *Phytoseius (Phytoseius) minutus* : Gupta, *Sci. & Cult.*, 36 : 98.  
 1974. *Phytoseius (Dnbininellus) minutus* : Gupta & Dhooria, *Proc. Indian Sci. Congr.*, 61 : 69.  
 1974. *Phytoseius minutus* : Prasad, *A catalogue of mites of India*, p. 171-172.

*Female* : Dorsal shield 275-280 long, 135-140 wide, small with 16 pairs of setae ( including  $r_3$  ) and 4 pairs of pores, of those, the pair associated with  $z_5$  being largest. Setae  $j_1, j_3, z_3, r_3, s_4, s_6, Z_5$ , and  $Z_4$  long, thick and serrate, others small. Measurements of setae :  $j_1$ -25-30,  $j_4$ - $j_6$  3-5 each,  $J_2$ -8-11,  $J_5$ -6,  $j_3$ -67-71,  $z_2$ -7,  $z_3$ -45-52,  $z_4$ -6-7,  $s_4$ -99-105,  $s_6$ -78-86,  $Z_5$ -67-79,  $z_5$ -7,  $Z_4$ -76-83,  $r_3$ -45-49,  $R_1$ -16 ( on



Figs. 527-531. *Phytoseius (Pennaseius) minutus* Narayanan, Kaur and Ghai

527. Dorsal shield

528. Ventral surface

529. Spermatheca

530. Genu, tibia and basitarsus of leg IV

531. Ventrianal shield (male)

lateral integument ). Sternal shield wider than long, with 3 pairs of sternal setae, 4th pair of setae on weakly sclerotized metasternal plates. Genital shield 90 wide with a pair of setae. Ventrianal shield smooth, 96 long, 63 wide, lateral margins concave, with 3 pairs of preanal setae preanal pores absent ; 3 pairs of setae present around ventrianal shield,  $JV_5$ -58 long, serrate ; 2 pairs of small platelets present around ventrianal shield. Spermatheca as figured. Fixed digit of chelicera multidentate. Macrosetae on leg IV : genu 30-36, tibia 28-35, basitarsus 27-30. Peritreme extends anteriorly upto  $j_1$ .

*Male* : Ventrianal shield as figured. Spermatophoral process with shaft  $1\frac{1}{2}$  times as long as foot.

*Habitat* : *Hibiscus esculentus*.

*Type locality and repository* : Holotype ♀ , India : New Delhi, on *Hibiscus esculentus*, infested with tetranychids, deposited in NPC, I.A.R.I. New Delhi. Paratypes 6 ♀ ♀ , 5 ♂ ♂ , same data as for holotype, in NPC, I.A.R.I. New Delhi.

*Distribution* : India : New Delhi, Punjab, Himachal Pradesh.

*Remarks* : This species can be distinguished from a very closely related species, *P. ( P. ) kapuri* Gupta ( 1969 ) by the absence of notch at the level of  $r_3$ .

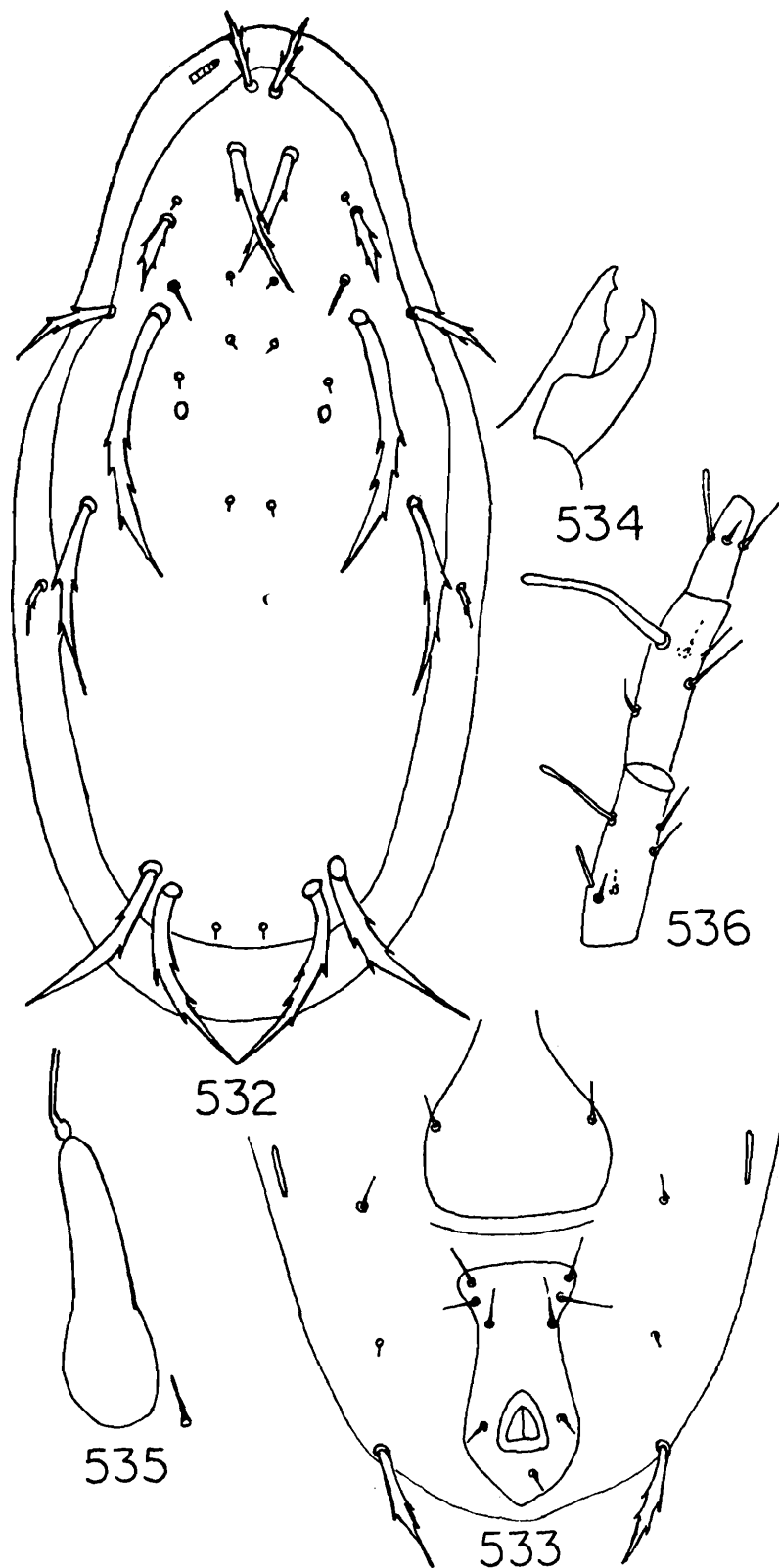
The holotype was re-examined at I. A. R. I. and the measurements which were taken agreed with those given in original description.

### 89. *Phytoseius ( Pennaseius ) namdaphaensis* Gupta

(Figs. 532-536)

*Phytoseius (Pennaseius) namdaphaensis* Gupta, *Oriental Ins.* (In press).

*Female* : Dorsal shield smooth, 302 long, 145 wide, weakly sclerotized with 14 pairs of setae and 5 pairs of pores. Excepting  $j_4$ ,  $j_5$ ,  $j_6$ ,  $J_5$ ,  $z_2$  which are small and smooth, others being long, thick and poorly serrate, sublateral setae  $r_3$  on dorsal shield and  $R_1$  on lateral integument,  $z_2$  does not reach upto the base of  $z_3$  but the latter reaches upto  $s_4$  ;  $j_4$ ,  $j_5$ ,  $z_5$  being small and of same length,  $j_6$  two times as long as  $j_5$ ,  $Z_5$  shorter or as long as  $Z_4$ ,  $j_3 < s_6$ ,  $r_3 > R_1$ . Measurements of setae :  $j_1$ -24,  $j_4$ - $j_6$ ,  $J_5$  very small,  $j_3$ -49,  $z_2$ -9,  $z_3$ -22,  $z_4$ -15,  $s_4$ -95,  $s_6$ -72,  $Z_5$ -71,  $z_5$ -small,  $Z_4$ -80. Sternal shield smooth, as long as broad, with 3 pairs of sternal setae, metasternal plate with seta conspicuous. Genital shield distinct with a pair of setae. Ventrianal shield elongate, 100 long, 56 wide, with 3 pairs of preanal setae and a pair of preanal pores placed



Figs. 532-536. *Phytoseius (Phytoseius) namdaphaensis* Gupta  
 532. Dorsal shield  
 533. Posterior ventral surface  
 534. Chelicera (female)  
 535. Spermatheca  
 536. Genu, tibia and basitarsus of leg IV

laterally, 3 pairs of setae present around ventrianal shield. Metapodal plates not discernible. Macrosetae on leg IV : genu-24, tibia-56, basitarsus-17, all with broad tip ; genu I and II also with more or less spatulate seta. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1, \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Peritreme terminates little before  $j_1$

*Male* : Unknown.

*Type locality and repository* : Holotype ♀, India : Arunachal Pradesh : Namdapha sanctuary area, on an undetermined plant, 11. i. 1983, Coll. S. K. Gupta, deposited in Z. S. I., Calcutta, Reg. No. 3518/17. Paratypes 2 ♀ ♀, data same as for holotype, Reg. No. 3519/17 and 3520/17.

*Remarks* : This species comes closer to *P. (P.) kishii* Ehara (1967) described from Japan but differs from it in relative length of  $j_1$  and  $z_4$  and the cervix of spermatheca being longer in this species. *P. (P.) curvatus*. Chaudhri (1973) described from Pakistan is also related to this species but differs in shape of ventrianal shield and spermatheca. Two more species, viz., *P. (P.) taianensis* Lairong & Lisheng (1981) and *P. (P.) qianshanensis* Lairong & Lisheng (1981) both described from China, also are quite close to this species but from the former it differs in shape of spermatheca and in having 3 macrosetae on leg IV and from the latter in relative length of  $s_4$  and  $s_6$ . Finally, from *P. (P.) improcerus* Corpuz (1966) it differs in relative length of  $s_4$  and  $s_6$  and also in shape of spermatheca.

#### Subgenus *Phytoseius* Ribaga

- 1904. *Phytoseius* Ribaga, *Riv. Path. Veg.*, 10 : 177.
- 1959. *Dubininellus* Wainstein, *Zool. Zhurn.*, 38(2) : 1361.
- 1965. *Phytoseius* : Chant, *Can. Ent.*, 97(4) : 370. (In part).
- 1966. *Phytoseius* (*Dubininellus*) : Denmark, *Fla. Dept. Agr. Bull.*, 6 : 54.
- 1967. *Phytoseius* (*Phytoseius*) : Ehara, *J. Fac. Sci. Hokkaido Univ.*, (6) 16(2) : 227.
- 1968. *Phytoseius* : Muma & Denmark, *Fla. Ent.*, 51 : 236.
- 1970. *Phytoseius* : Muma & Denmark, *Arthropods of Florida*, 6 : 115.
- 1972. *Phytoseius* (*Phytoseius*) : Ehara, *Mushi*, 46(12) : 169.
- 1973. *Phytoseius* (*Phytoseius*) : Chaudhri, *Pak. J. Zool.*, 5(1) : 80.
- 1975. *Phytoseius* (*Phytoseius*) : Denmark & Muma, *J. Agr. Univ. Puerto Rico*, 59(4) : 295.
- 1976. *Phytoseius* (*Phytoseius*) : Blommers, *Bijdragen Tot. Dierkunde*, 46(1) : 82.
- 1977. *Phytoseius* : Ehara & Bhandhufalck, *J. Fac. Ed. Tottori Univ.*, 27(2) : 46.
- 1978. *Phytoseius* : Denmark & Muma, *Internat. J. Acarol.*, 4(1) : 14.

*Key to the species of subgenus Phytoseius ( excluding rugosus )*

1. Macrosetae absent on leg IV	...	<i>intermedius</i>
— Macrosetae present on leg IV	...	2
2. $s_4$ and $Z_4$ flat and divided	...	3
— $s_4$ and $Z_4$ not flat and divided	...	4
3. Macrosetae on genu IV and basitarsus IV almost equal	...	<i>neoferox</i>
— Macrosetae on genu IV shorter than that on basitarsus IV	...	<i>crinitus</i>
4. Genu IV without macroseta	...	5
— Genu IV with macroseta	...	9
5. Macroseta on basitarsus IV subequal to that on tibia IV	...	<i>macrosetosus</i>
— Macroseta on basitarsus IV smaller than that on tibia IV	...	6
6. $z_2$ and $z_4$ distinctly serrate	...	<i>mixtus</i>
— $z_2$ and $z_4$ appear to be smooth	...	7
7. Ventrianal shield nearly 2 times as long as broad	...	<i>roseus</i>
— Ventrianal shield only slightly longer than broad	...	8
8. $j_3$ distinctly longer than $r_3$ , $s_4$ more than $1\frac{1}{2}$ times as long as $s_6$	...	<i>neocorniger</i>
— $j_3$ about as long as $r_3$ , $s_4$ much less than $1\frac{1}{2}$ times as long as $s_6$	...	<i>jujuba</i>
9. $s_4$ longer than $s_6$	...	13
— $s_4$ as long as or shorter than $s_6$	...	10
10. $j_3$ only slightly longer than $z_2$	...	<i>meyerae</i>
— $j_3$ much longer than $z_2$	...	11
11. $Z_5$ longer than $Z_4$	...	12
— $Z_5$ shorter or equal to $Z_4$	...	<i>punjabensis</i>
12. Macrosetae on genu IV and basitarsus IV equal	...	<i>indicus</i>
— Macrosetae on genu IV and basitarsus IV unequal	...	<i>swirskii</i>
13. $z_4$ longer than $z_2$	...	<i>wainsteini</i>
— $z_4$ almost as long as $z_2$	...	14
14. Macrosetae on genu IV rarely distinguishable, it is only slightly longer than other genual setae	...	<i>corniger</i>
— Macrosetae on genu IV distinct and spatulate	...	15
15. Macrosetae on genu IV and basitarsus IV almost equal	...	<i>bandipurensis</i> ]

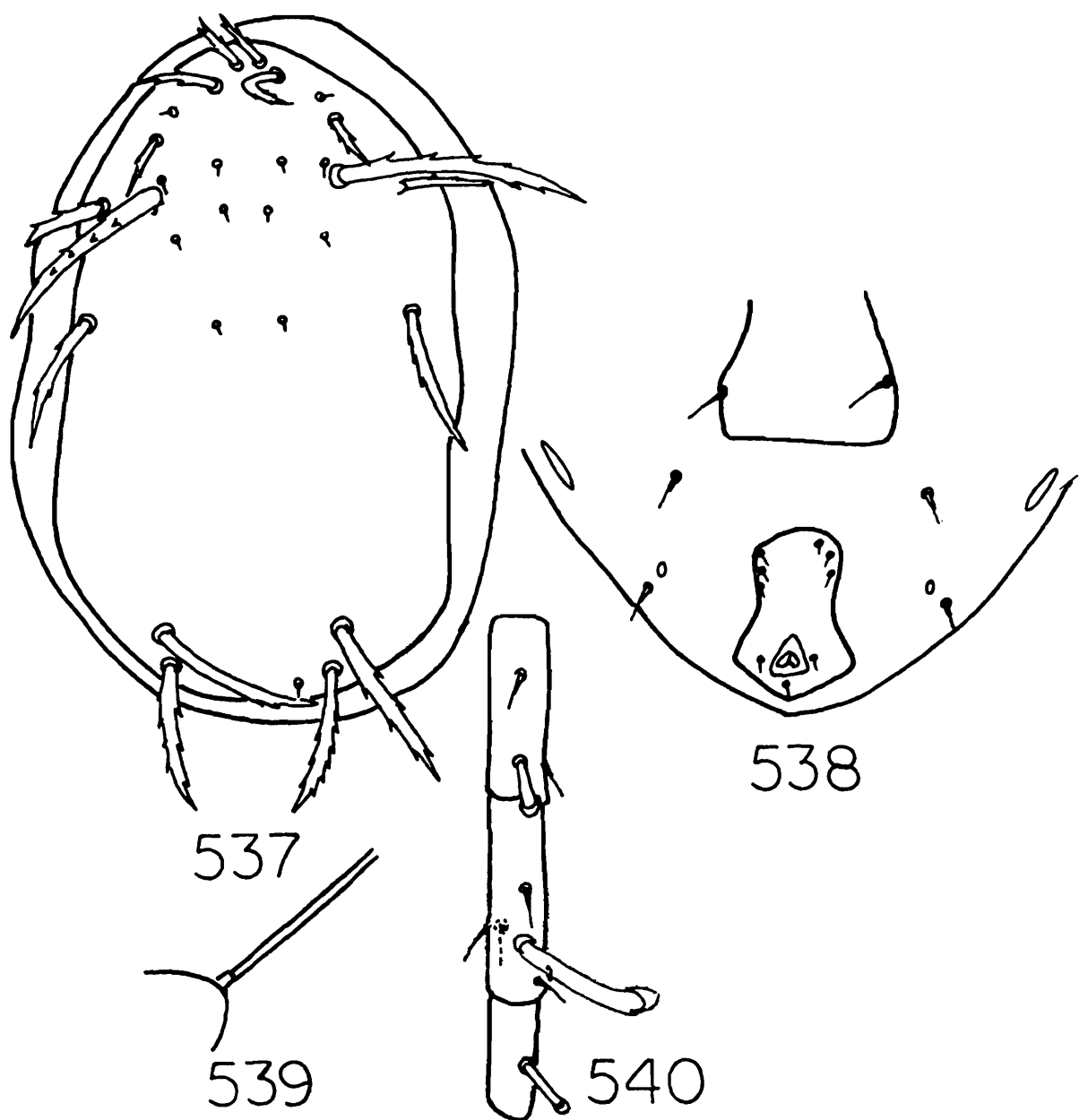
- Macrosetae on genu IV shorter than that on basitarsus IV ... 16
- 16. Seta  $z_3$  shorter than  $j_1$  ... *rachelae*
- Seta  $z_3$  longer or as long as  $j_1$  ... *macropilis*

90. *Phytoseius (Phytoseius) bandipurensis* Gupta

( Figs. 537-540 )

1980. *Phytoseius (Dubininellus) bandipurensis* Gupta, *Bull. Zool. Surv. India.*, 3(1-2) : 53-54.

*Female* : Dorsal shield heavily sclerotized, with 15 pairs of



Figs. 537-540. *Phytoseius (Phytoseius) bandipurensis* Gupta  
 537. Dorsal shield  
 538. Posterior ventral surface  
 539. Spermatheca  
 540. Genu, tibia and basitarsus of leg IV

setae (including  $r_3$ ).  $j_1, j_3, z_3, s_4, s_6, Z_5, Z_4$  and  $r_3$  being long, thick and serrate, all others being small.  $j_1 < j_3 = z_3, z_2 = z_4, s_4 > Z_4 > Z_5, r_3$  thicker than  $z_3$ . Measurements of setae :  $j_1$ -24,  $j_4$ - $j_6, J_5, z_5$  very small,  $j_3$ -28,  $z_2, z_4$ -8 each,  $z_3$ -28,  $s_4$ -100,  $s_6$ -56,  $Z_5$ -69,  $Z_4$ -74,  $r_3$ -36. Sternal shield margins not clearly discernible, however 3 pairs of sternal setae present. Genital shield wider than greatest width of ventrianal shield, with a pair of genital setae. Ventrianal shield shorter, lateral margins deeply concave with 3 pairs of preanal setae ; 3 pairs of setae present around ventrianal shield,  $JV_5$ -40 long (serrate), metapodal plates single paired. Spermatheca shaped as figured. Fixed digit of chelicera with 2 teeth, movable digit with one tooth. Macrosetae on leg IV : genu-18, tibia-40, basitarsus-16, distitarsus-20, all with spatulate tip. Peritreme extends anteriorly upto  $j_1$ . Leg chaetotactic formula : genu II 2  $\frac{2}{0}$   $\frac{2}{0}$  1, tibia II 1  $\frac{1}{1}$   $\frac{2}{1}$  1, genu III 1  $\frac{2}{0}$   $\frac{2}{0}$  1, tibia III 1  $\frac{1}{1}$   $\frac{2}{1}$  1.

*Male* : Unknown.

*Habitat* : Collected on an undetermined plant.

*Type locality and repository* : Holotype ♀, India : Karnataka, Bandipur Sanctuary, on an undetermined plant, deposited in ZSI, Calcutta, Reg. No. 3056/17.

*Distribution* : India : Karnataka.

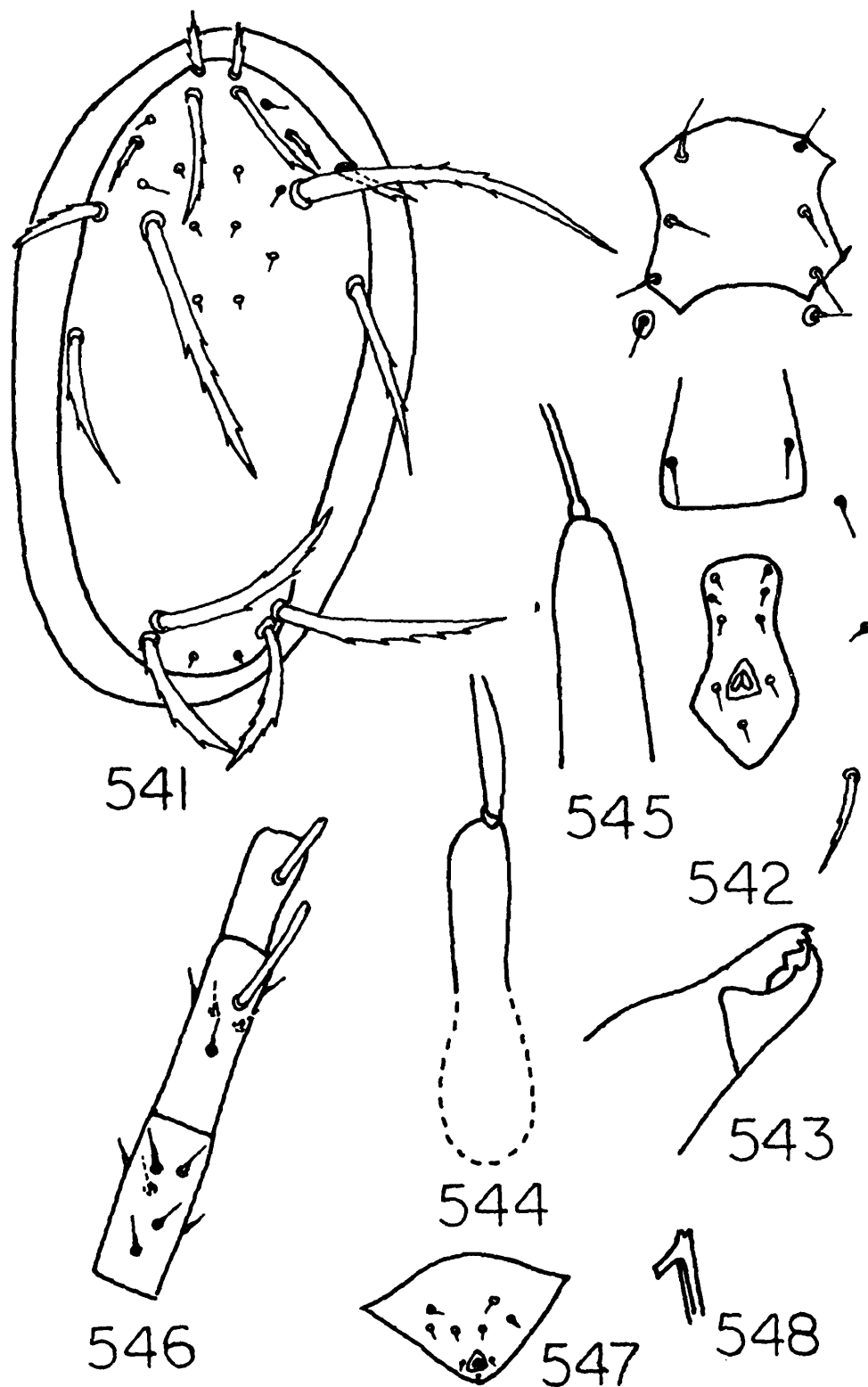
*Remarks* : This species is known from its type only,

### 91. *Phytoseius (Phytoseius) corniger* Wainstein

(Figs. 541-548)

1959. *Phytoseius (Dubininellus) corniger* Wainstein, *Zool. Zhurn.*, 38 : 1362-1364.  
 1966. *Phytoseius (Dubininellus) corniger* : Denmark, *Fla. Dept. Agr. Bull.*, 6 : 85-86.  
 1981. *Phytoseius (Dubininellus) corniger* : Gupta, *Indian J. Acar.*, 5(1-2) : 44-45.  
 1982. *Phytoseius (Dubininellus) corniger* : *Indian J. Acar.*, 6 : 31.

*Female* : Dorsal shield 260-270 long, 135-140 wide, rugose with 15 pairs of setae and 3 pairs of pores. Excepting  $j_4, j_5, j_6, J_5, z_5$  all other setae being long, thick and serrate. Measurements of setae :  $j_1$ -28-31,  $j_4$ - $j_6, J_5, z_5$ -5-6 each,  $j_3$ -48-60,  $z_2$ -12-14,  $z_3$ -29-32,  $z_4$ -11-16,  $s_4$ -129-141,  $s_6$ -72-78,  $Z_5$ -64-80,  $Z_4$ -84-104,  $r_3$ -44-50. Sternal shield wider (78) than long (58) with 3 pairs of sternal setae, metasternal plate lightly sclerotized with a pair of setae. Genital shield 65-75 wide, with a pair of setae. Ventrianal shield longer (78) than wide (56), Lateral margins deeply concave, with 3 pairs of preanal setae, 3 pairs of setae present around ventrianal shield,  $JV_5$ -40 long, serrate, one pair of elongate,



Figs. 541-548. *Phytoseius (Phytoseius) corniger* Wainstein

541. Dorsal shield

542. Ventral surface

543. Chelicera

544, 545. Spermathecae

546. Genu, tibia and basitarsus of leg IV

547. Ventrianal shield (male)

548. Spermatophoral process

metapodal plates present. Fixed digit of chelicera with 3 teeth, movable digit with 1 tooth. Spermatheca as figured. Macrosetae on leg IV : genu-16, tibia-58, basitarsus-31, distitarsus-25-31. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Peritreme extends anteriorly upto base of  $j_1$ .

*Male* : Dorsal chaetotaxy similar as in female. Spermatophoral process and ventrianal shield as figured.

*Habitat* : Guava, chrysanthemum, fig.

*Type locality and repository* : Wainstein (1959) did not give type or type locality but listed the following collection sites : Tadzikistan, S. Kazakhstan, Shelkovitsa, Inzhir, Isblonia, Vinograd and Karagach, repository—not mentioned.

*Distribution* : India : Jammu & Kashmir, Uttar Pradesh ; outside India : Pakistan, Western & Northern Iran, Central Asia, Southern Kazakhstan.

*Remarks* : The majority of characters as examined in the Indian material conform with the re-description of the species by Denmark (1966) except in macrosetal length as in the Indian specimens the macrosetae on tibia and basitarsus IV are much shorter than those mentioned by Denmark from Pakistan. However, these differences are considered here as variations.

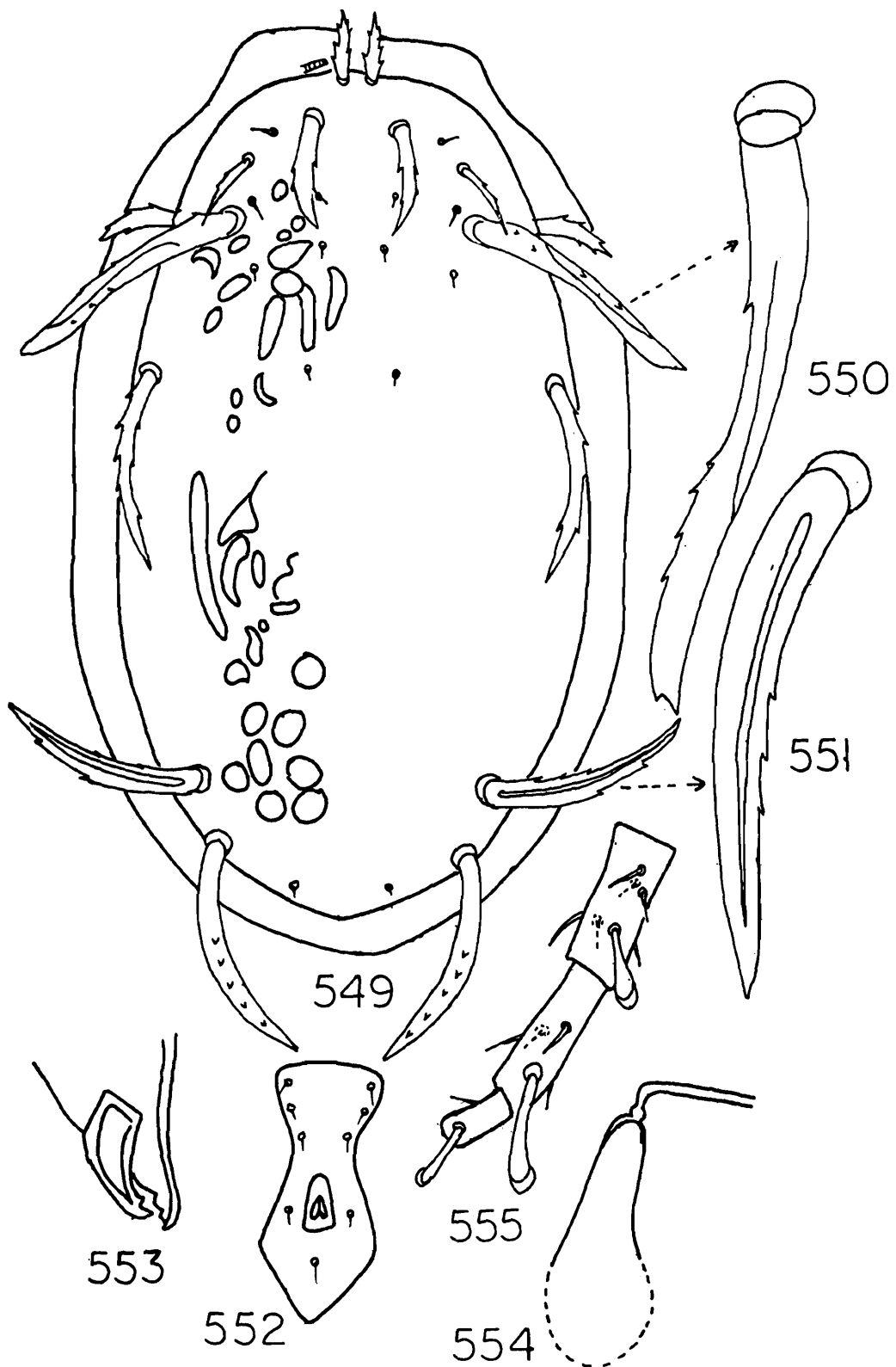
## 92. *Phytoseius (Phytoseius) crinitus* Swirski & Shechter

( Figs. 549-555 )

1961. *Phytoseius (Dubininellus) crinitus* Swirski & Shechter, *Israel J. agric. Res.*, 11(2) : 102-104.

1983. *Phytoseius (Phytoseius) crinitus* : Ray & Gupta, *Rec. zool. Surv. India*, 80 : 303-304.

*Female* : Dorsal shield 280 long, 168 wide, rugose with 15 pairs of setae. Excepting setae  $j_4, j_6, J_5, z_2, z_4$  all other setae being long, thick and serrate,  $s_4$  and  $Z_4$  divided. Measurements of setae :  $j_1$ -33,  $j_4$ - $j_6, J_5, z_5$ -4-6 each,  $j_3$ -44,  $z_2$ -14-18,  $z_3$ -28-33,  $z_4$ -11-12,  $s_4$ -105-110,  $s_6$ -75-85,  $Z_5$ -78,  $Z_4$ -90,  $r_3$ -33-38. Sternal shield wider than long with 3 pairs of sternal setae, 4th pair lie on weakly sclerotized metasternal plates. Genital shield broad with a pair of setae. Ventrianal shield longer (90) than broad (56), lateral margins concave with 3 pairs of preanal setae, preanal pores absent ; 3 pairs of setae present around ventrianal shield,  $JV_5$ -36-42 long ; serrate, one pair of elongate metapodal plates present, Fixed digit of chelicera with 2 teeth and a strong



Figs. 549-555. *Phytoseius (Phytoseius) crinitus* Swirski and Shechter

- 549. Dorsal shield
- 550. Seta  $s_4$  enlarged view
- 551. Seta  $Z_4$  enlarged view
- 552. Ventrianal shield (female)
- 553. Chelicera (female)
- 554. Spermatheca
- 555. Genu, tibia and basitarsus of leg IV

*pilus dentilis* ; movable digit with one tooth. Spermatheca as figured. Macrosetae on leg IV : genu-26, tibia-51, basitarsus-29, distitarsus-29, all spatulate. Peritreme extends anteriorly upto  $j_1$ .

*Male* : Unknown.

*Habitat* : Collected on an undetermined plant.

*Type locality and repository* : Holotype ♀, Hong Kong, Victoria Mt. Forest, on *Homalium conchinchinense*, deposited in Dept. of Entomology, National Institute of Agriculture, Rehovot, Israel. Paratypes 13 ♀ ♀, same data and repository as for holotype.

*Distribution* : India : Assam ; outside India : Hong Kong, Madagascar, Japan (Okinawa Isl.).

*Remarks* : The Indian material differs from the specimens collected from Israel by relative length of macrosetae of genu, tibia and basitarsus of leg IV. Further, Denmark (1966) mentioned genu IV macroseta as 10 while Swirski & Shechter (1961) mentioned it as 8-13 ; likewise in case of tibia IV Denmark (1966) mentioned it as 30 long and Swirski & Shechter mentioned it as 43-51. The Indian material falls within the range of Swirski & Shechter. However, paratype, which Denmark re-described, has smaller macroseta on tibia IV.

### 93. *Phytoseius (Phytoseius) indicus* Bhattacharyya

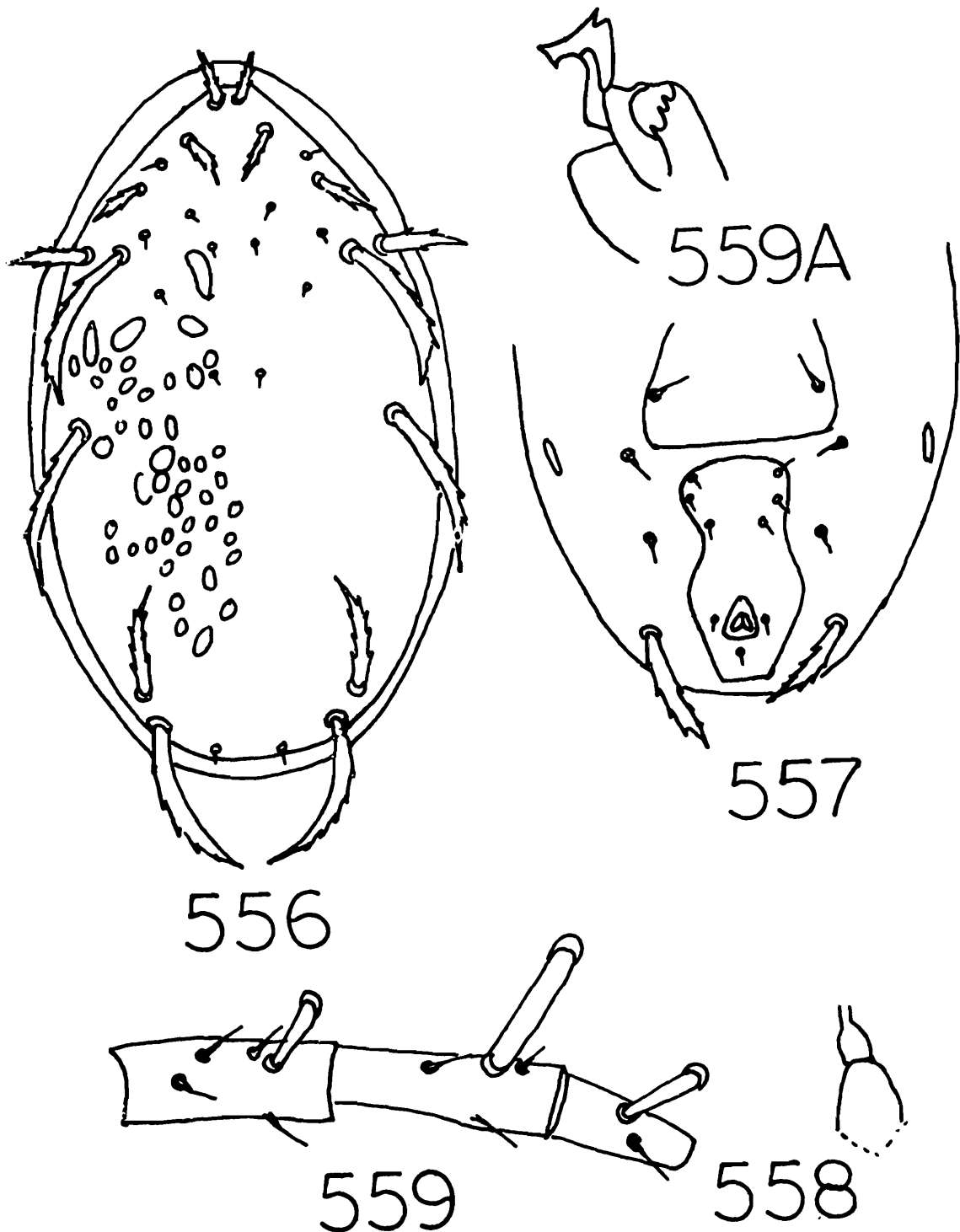
(Figs. 556-559, 559A)

1969. *Phytoseius (Dubininellus) indicus* Bhattacharyya, *J. Bom. Nat. Hist. Soc.*, 65(3) : 679-680.
1969. *Phytoseius (Dubininellus) neglecta* Gupta, *Israel J. agric. Res.*, 19 : 117-119 ( new synonymy ).
1974. *Phytoseius (Dubininellus) neglecta* : Gupta & Dhooria, *Proc. Indian Sci. Congr.*, 61 : 69.
1974. *Phytoseius neglecta* : Prasad, A catalogue of mites of India, p. 172.
1974. *Phytoseius indicus* : Prasad, A catalogue of mites of India, p. 312.

*Female* : Dorsal shield 299 long, 145 wide, with 15 pairs of setae. Measurements of setae :  $j_1$ -27,  $j_4$ - $j_6$ ,  $J_2$ - $z_5$ -8-9 each,  $j_3$ -27,  $z_2$ -10,  $z_3$ -29,  $z_4$ -10,  $s_4$ -72,  $s_6$ -72,  $Z_5$ -65,  $Z_4$ -50,  $r_3$ -36. Sternal shield almost as long (63) as broad with 3 pairs of sternal setae ; metasternal plate with seta distinct. Genital shield 71 wide, wider than greatest width of ventrianal shield. Ventrianal shield 90 long, 45 wide, with 3 pairs of preanal setae, 3 pairs of setae present around ventrianal shield,  $JV_5$ -36 long, serrate ; 1 pair of elongate metapodal plates present. Spermatheca

as figured. Macrosetae on leg IV : genu-18, tibia-40, basitarsus-18, distitarsus-22, the first three being spatulate, the last one simple.

*Male* : Dorsal shield chaetotaxy as in female. Spermatophoral process as illustrated. Macrosetae on leg IV : genu-18, tibia-40, distitarsus-20.



Figs. 556-559, 559A. *Phytoseius (Phytoseius) indicus* Bhattacharyya

- 556. Dorsal shield
- 557. Ventral surface
- 558. Spermatheca
- 559. Genu, tibia and basitarsus of leg IV
- 559A. Chelicera with spermatophoral process

*Habitat* : *Saraca indica*, *Hibiscus* sp.

*Type locality and repository* : India : West Bengal, 24-Parganas, Sonarpur, Sitala, on *Hibiscus* sp., though mentioned to be deposited in ZSI but may be present with author.

*Distribution* : India : West Bengal, Punjab, Himachal Pradesh.

*Remarks* : Bhattacharyya (1969) and Gupta (1969) both described this species independently but as the former publication came out earlier, on question of priority, *P. (P.) neglecta* Gupta is treated here as synonym of *P. (P.) indicus* Bhattacharyya.

#### 94. *Phytoseius (Phytoseius) intermedius* Evans & Macfarlane

(Figs. 560-565)

1962. *Phytoseius (Dubininellus) intermedius* Evans & Macfarlane, *Ann. Mag. Nat. Hist.*, (13)4 : 587-588.  
 1966. *Phytoseius (Dubininellus) intermedius* : Denmark, *Fla. Dep. Agri. Bull.*, 6 : 70.  
 1970. *Phytoseius (Dubininellus) intermedius* : Gupta, *Sci. & Cult.*, 36 : 98.  
 1974. *Phytoseius intermedius* : Prasad, A catalogue of mites of India, p. 171.  
 1977. *Phytoseius (Dubininellus) intermedius* : Gupta, *Oriental Ins.*, 11 : 636-637.  
 1982. *Phytoseius (Dubininellus) intermedius* : Gupta, *Indian J. Acar.*, 6 : 31.

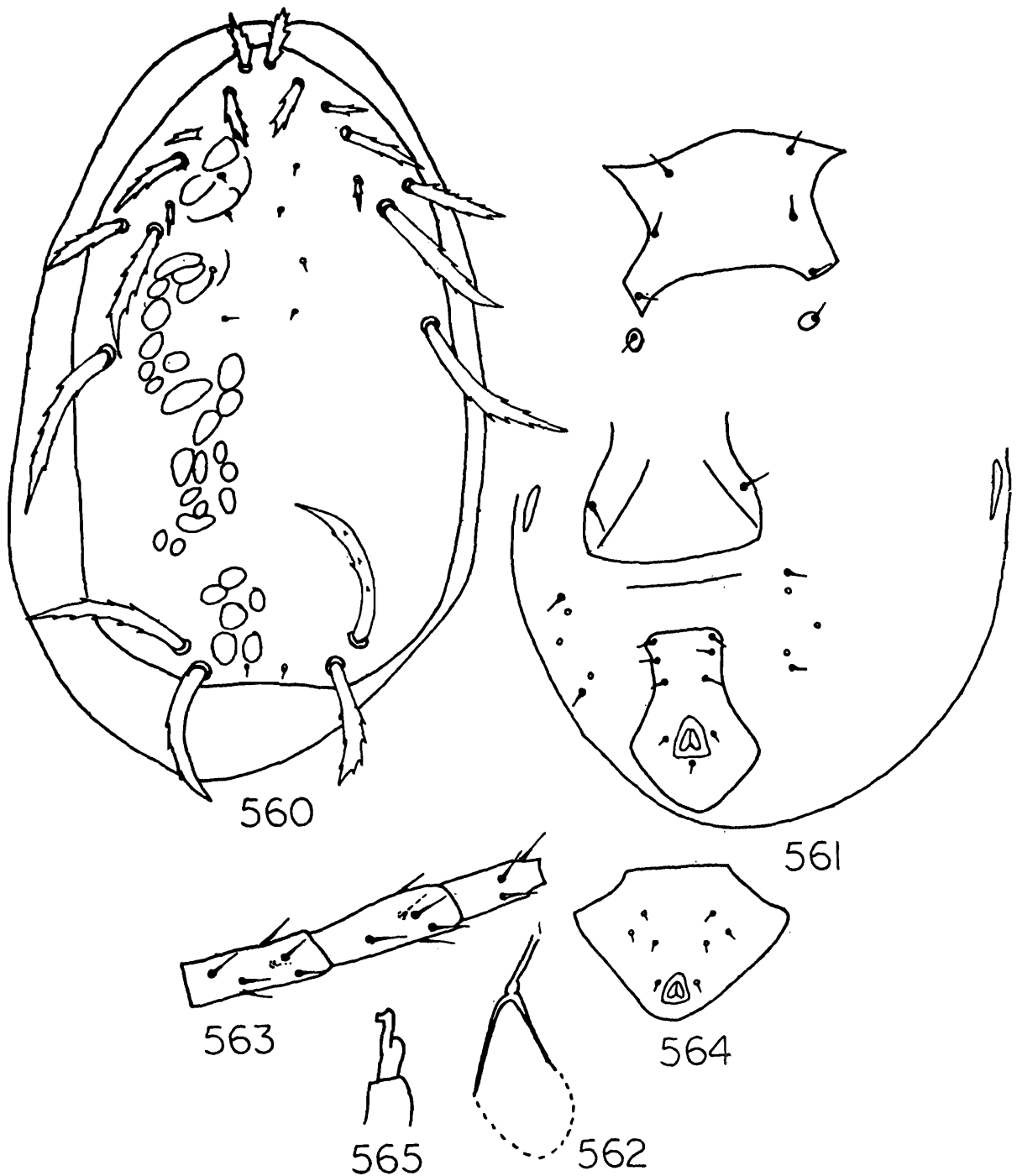
*Female* : Dorsal shield 275 long, 150 wide, rugose, with 15 pairs of setae. All setae long and serrate except  $j_4$ - $j_6$ ,  $J_5$ ,  $z_5$  which are short and simple. Measurements of setae :  $j_1$ -20-22,  $j_4$ - $j_6$ ,  $J_5$ -5-7,  $j_8$ -22,  $z_2$ -18,  $z_3$ -31,  $z_4$ -12-13,  $s_4$ -54-55,  $s_6$ -72-74,  $Z_5$ -54-55,  $Z_4$ -76,  $r_3$ -30-33. Sternal shield wider than long, smooth with 3 pairs of sternal setae, 4th pair lie on weakly sclerotized metasternal plates. Genital shield broad, (67), truncate posteriorly, with a pair of genital setae. Ventrianal shield longer than wide, with 3 pairs of preanal setae and a pair of preanal pores ; 3 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -25-34 long, serrate ; one pair of elongate metapodal plates present. Spermatheca as figured. Leg IV devoid of macrosetae. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male* : Dorsal chaetotaxy similar to that of female. Ventrianal shield and spermatophoral process as figured.

*Habitat* : Brinjal.

*Type locality and repository* : Holotype ♀, Southern Rhodesia, Mazoe, on *Alöe*, associated with *Tyrophagus* sp., deposited in B. M. (N. H.), No. 1961.11.9.1. Paratypes 2 ♀ ♀, same data and repository as for holotype, Nos. 1961.11.9.2-3.

*Distribution* : India : West Bengal, Andaman Isls., Uttar Pradesh ;  
outside India : Pakistan, Central Africa, South Rhodesia, Belgian  
Congo, Madagascar, Japan.



Figs. 560-565. *Phytoseius (Phytoseius) intermedius* Evans and Macfarlane

- 560. Dorsal shield
- 561. Ventral surface
- 562. Spermatheca
- 563. Genu, tibia and basitarsus of leg IV
- 564. Ventrianal shield (male)
- 565. Spermatophoral process

*Remarks* : The specimens from India conformed in all respects with the material available from abroad. This is the only species of *Phytoseius* known so far having no macroseta on leg IV.

95. **Phytoseius (Phytoseius) jujuba** Gupta  
(Figs. 566-571)

1977. *Phytoseius (Phytoseius) jujuba* Gupta, *Indian J. Acar.*, 1 : 13.

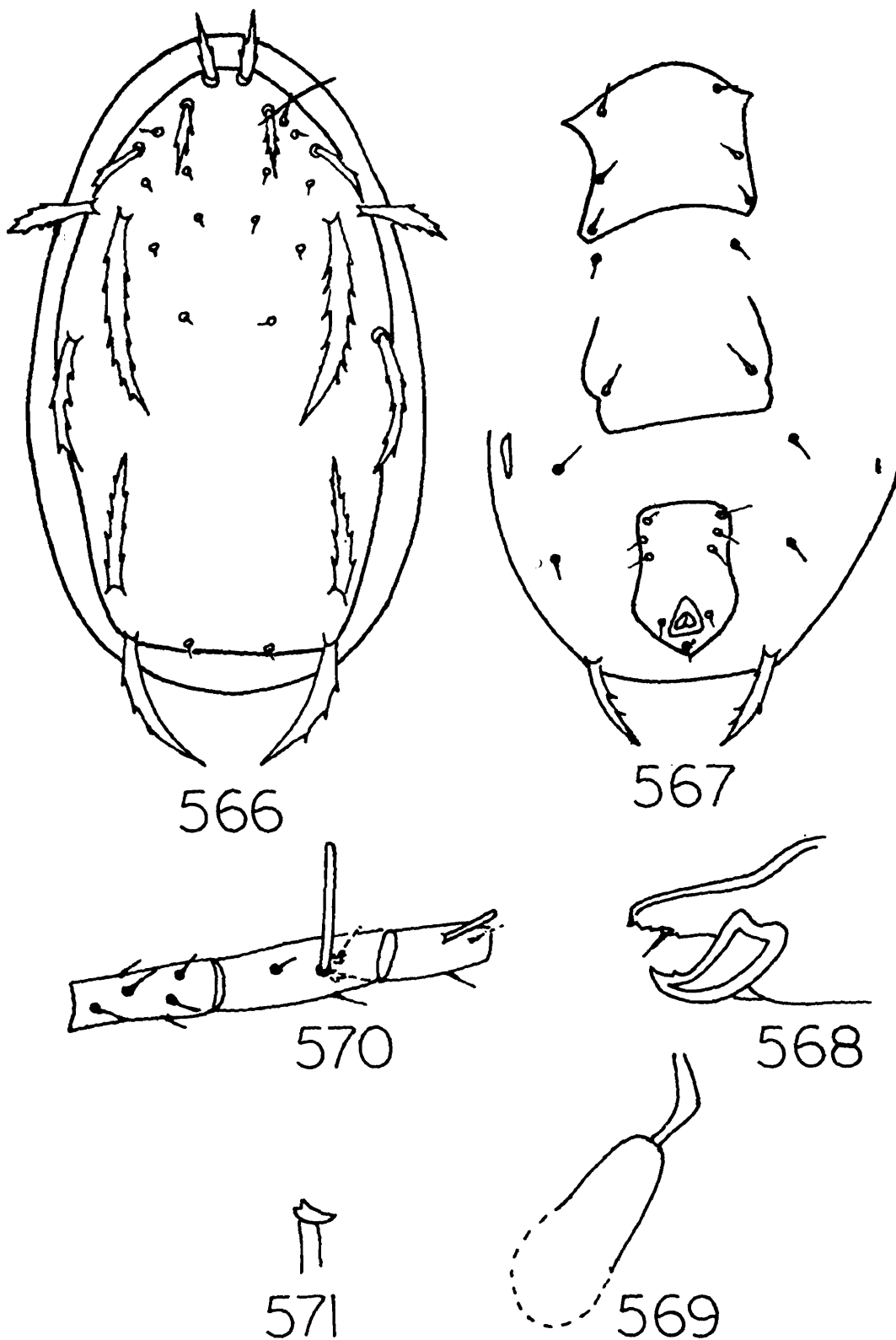
*Female* : Dorsal shield rugose, 270 long, 120-130 wide, with 15 pairs of setae. Except  $j_4$ - $j_6$ ,  $z_5$ ,  $J_5$ ,  $z_2$ ,  $z_4$  which are small, the others are long, thick and serrate. Measurements of setae :  $j_1$ -25-27,  $j_4$ - $j_6$ ,  $z_5$ ,  $J_5$ -4-6 each,  $j_3$ -36-44,  $z_2$ -7-12,  $z_3$ -31-34,  $z_4$ -6,  $s_4$ -95-96,  $s_6$ -66-69,  $Z_5$ -78,  $Z_4$ -78,  $r_3$ -40 ;  $Z_4$  thicker than  $Z_5$ . Sternal shield wider than long with 3 pairs of sternal setae ; 4th pair lie on interscutal membrane. Genital shield 72 wide with a pair of setae, lateral margins having gentle cleft. Ventrianal shield longer (68) than broad (45) with 3 pairs of preanal setae, 3 pairs of setae present around ventrianal shield ; 1 pair of elongate metapodal plates present. Spermatheca as figured. Chelicera with 3-4 teeth and a strong *pilus dentilis* on the fixed digit, movable digit with one tooth. Macroseta on leg IV : genu-nil, tibia-35-40, basitarsus-20-22. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Peritreme extends anteriorly upto  $j_1$ .

*Male* : Dorsal chaetotaxy similar to that of female. Spermatophoral process as figured.

*Habitat* : *Zizyphus jujuba*, guava.

*Type locality and repository* : Holotype ♀, India : Gujarat, Veraval, on *Zizyphus jujuba*, deposited in ZSI, Calcutta, Reg. No. 3461/17. Paratypes 2 ♀ ♀, 1 ♂, same data and repository as for holotype, Reg. No. 3462/17.

*Distribution* : India : Gujarat, Rajasthan.



Figs. 566-571. *Phytoseius (Phytoseius) jujuba* Gupta  
 566. Dorsal shield  
 567. Ventral surface  
 568. Chelicera (female)  
 569. Spermatheca  
 570. Genu, tibia and basitarsus of leg IV  
 571. Spermatophoral process

96. *Phytoseius (Phytoseius) macropilis* (Banks)

( Figs. 572-577 )

1909. *Sejus macropilis* Banks, *Proc. ent. Soc. Wash.*, 11 : 135.  
 1953. *Phytoseius macropilis* : Cunliffe & Baker, *Pinellas Biol., Lab. Pub.*, No. 1 : 22.  
 1960. *Phytoseius macropilis* : Narayanan, Kaur & Ghai, *Proc. nat. Inst. Sci.*, 26B (6) : 386-387.  
 1964. *Phytoseius macropilis* : Ghai, *In Entomology in India*, p. 390.  
 1970. *Phytoseius (Dubininellus) woodburyi* : Gupta, *Sci. & Cult.*, 36 : 98 (misidentification).  
 1974. *Phytoseius (Dubininellus) macropilis* : Gupta, *Ent. Rec.*, 86 : 143.  
 1974. *Phytoseius macropilis* : Prasad, A catalogue of mites of India, p. 171.  
 1974. *Phytoseius woodburyi* : Prasad, *Ibid.*, p. 172.  
 1977. *Phytoseius (Dubininellus) macropilis* : Gupta, *Indian J. Acar.*, 1 : 9.  
 1982. *Phytoseius (Dubininellus) woodburyi* : *Indian J. Acar.*, 6 : 32.

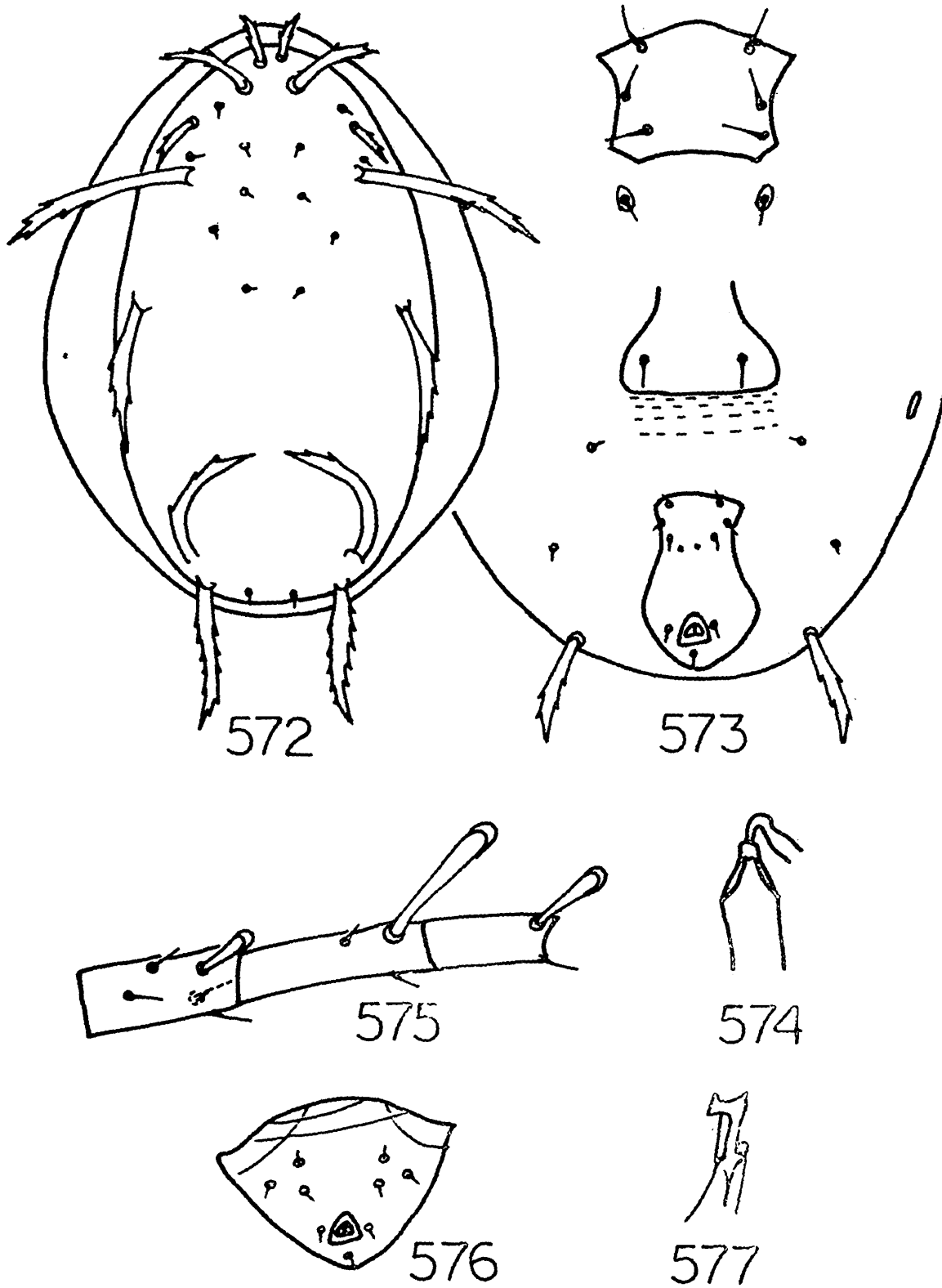
*Female* : Dorsal shield rugose, 280-300 long, 160-180 wide, with 15 pairs of setae and 3 pairs of small pores. Setae  $j_4$ - $j_6$ ,  $z_5$ ,  $J_5$  being short and smooth,  $z_2$  and  $z_4$  weakly serrate, other setae thick and heavily serrate. Measurements of setae :  $j_1$ -27-30,  $j_4$ - $j_6$ ,  $J_5$ ,  $z_5$ -6-12,  $j_3$ -30-40,  $z_2$ -6-10,  $z_3$ -25-32,  $z_4$ -7-10,  $s_4$ -100-120,  $s_6$ -76-78,  $Z_5$ -70-80,  $Z_4$ -70,  $r_3$ -45-51. Sternal shield wider (80) than long (76) with 3 pairs of sternal setae, 4th pair lie on weakly sclerotized mstasternal plates. Genital shield 78 wide with a pair of setae. Ventrianal shield 85-90 long, 45-50 wide, lateral margins concave, with 3 pairs of preanal setae and a pair of preanal pores ; 3 pairs of setae present around ventrianal shield,  $JV_5$ -45-47 long, one pair of elongate metapodal plates present, 25 long. Spermatheca as figured. Macrosetae on leg IV : genu-16-22, tibia 50-60, basitarsus 25-32, distitarsus-22, all with spatulate tip. Leg chaetotactic formula : genu II 2  $\frac{2}{0}$   $\frac{2}{0}$  1, tibia II 1  $\frac{2}{1}$   $\frac{1}{1}$  1, genu III 1  $\frac{2}{0}$   $\frac{2}{0}$  1, tibia III 1  $\frac{1}{1}$   $\frac{2}{1}$  1.

*Male* : Ventrianal shield and spermatophoral process as illustrated. Dorsal chaetotaxy similar as in female.

*Habitat* : *Shorea robusta*, fig, mulberry, Compositae, *Lanata camara*, *Polygonum molle*, wood-apple.

*Type locality and repository* : Holotype ♀, Canada : Ontario, Guelph, on willow, deposited in USNM, Washington.

*Distribution* : India : New Delhi, Orissa, Arunachal Pradesh ; outside India : Caribbean Isl., USA : North Carolina, Hawaii, Florida, all Canadian Provinces, Mexico, England, USSR, British West Indies, Australia, Canary Isl., Panama Canal Zone, New Brunswick,



Figs. 572-577. *Phytoseius (Phytoseius) macropilis* (Banks)

572. Dorsal shield

573. Ventral surface

574. Spermatheca

575. Genu, tibia and basitarsus of leg IV

576. Ventrianal shield (male)

577. Spermatophoral process

*Remarks* : The Indian material has 3 pairs of preanal setae and lack creases against 2 pairs of preanal setae and presence of creases in the material from Columbus as re-described by Denmark (1966). The tibial macroseta on leg IV are also shorter in Indian specimens. However, this species shows a good deal of variation in number of preanal setae on ventrianal shield as well as in macrosetal length of leg IV and because of these reasons, the differences which are seen in Indian material are considered as variations. Often these variations led to misidentification and the same thing happened when Gupta (1970) identified a species as *P. (P.) woodburyi* De Leon (1965). Later, the re-examination of this species proved to be the same as *P. (P.) macropilis*.

### 97. *Phytoseius (Phytoseius) macrosetosus* Gupta

(Figs. 578-582)

1977. *Phytoseius (Dubininellus) macrosetosus* Gupta, *Indian J. Acar.*, 1 : 15-16.

*Female* : Dorsal shield rugose, 265 long, 130 wide, with 15 pairs of setae. Setae  $j_1, j_3, z_3, z_4, s_4, s_6, Z_5, Z_4, r_3$  being serrate and thick, the other setae small.  $z_4 > z_2, s_4 = s_6, j_3 > z_3, Z_5 = Z_4$ . Measurements of setae :  $j_1$ -20,  $j_4$ - $j_6, J_5, z_5$  minute, each 5 long,  $j_3$ -36,  $z_2$ -16,  $z_3$ -32,  $z_4$ -24,  $s_4$ -62,  $s_6$ -64,  $Z_5$ -50,  $Z_4$ -52,  $r_3$ -32. Sternal shield with 3 pairs of sternal setae, posterior margin concave. Genital shield wider than greatest width of ventrianal shield. Ventrianal shield 56 long, 40 wide, concave at the preanal level with 3 pairs of preanal setae. Spermatheca as figured. Fixed digit of chelicera with 3-4 teeth, those on movable digit not discernible. Macrosetae on leg IV : genu-nil, tibia-18, basitarsus-20, both being spatulate. Peritreme extends anteriorly upto  $j_1$ .

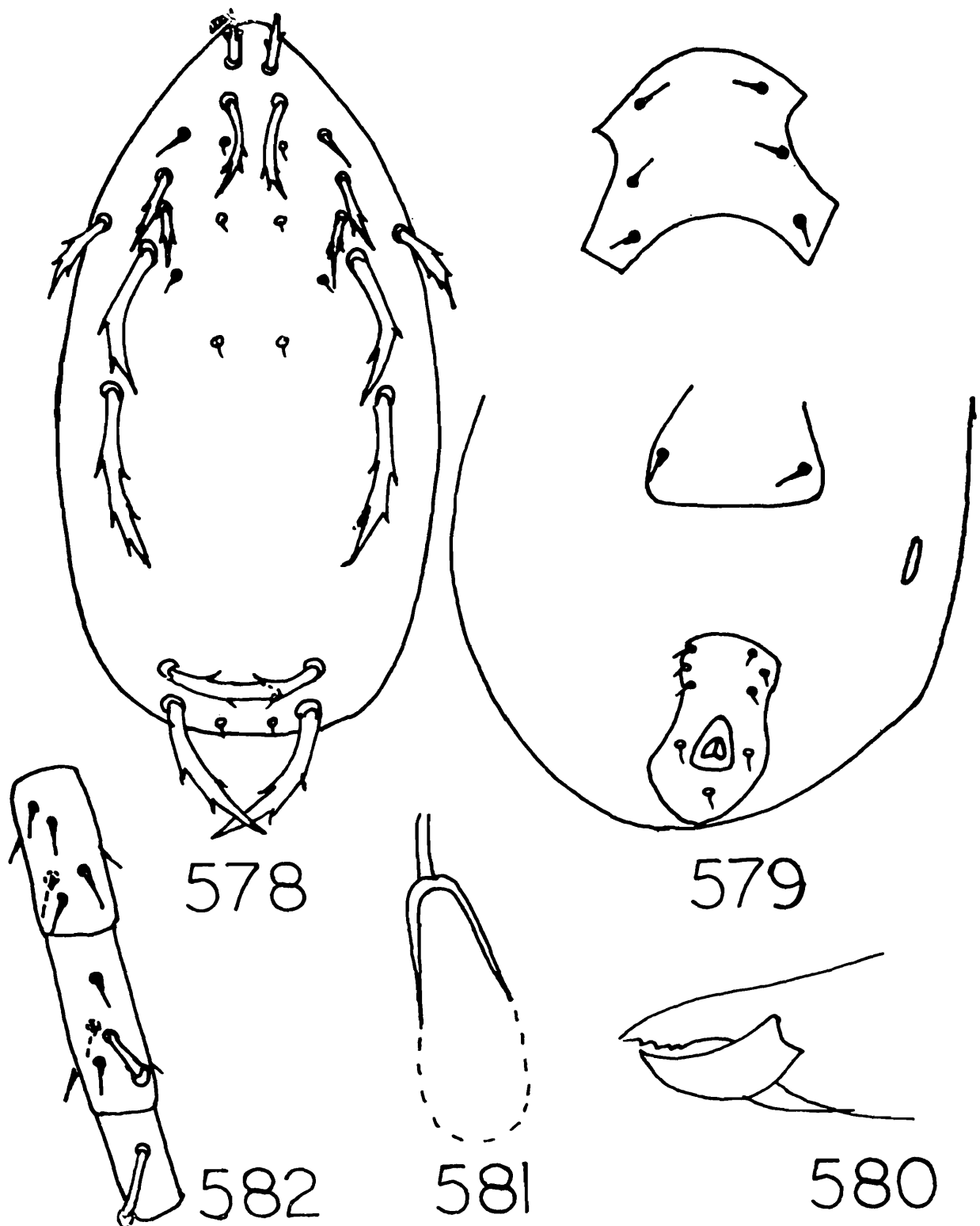
*Male* : Unknown.

*Habitat* : Kendu, rose.

*Type locality and repository* : Holotype ♀, India : Madhya Pradesh, Shivpuri, on Kendu leaf, deposited in ZSI, Calcutta, Reg. No. 3463/17. Paratype 1 ♀, same data and repository as for holotype, Reg. No. 3464/17.

*Distribution* : India : Madhya Pradesh.

*Remarks* : This species is known only from its type.



Figs. 578-582. *Phytoseius (Phytoseius) macrosetosus* Gupta

578. Dorsal shield

579. Ventral surface

580. Chelicera (female)

581. Spermatheca

582. Genu, tibia and basitarsus of leg IV

98. **Phytoseius (Phytoseius) meyeræ** Gupta  
( Figs. 583-587 )

1977. *Phytoseius (Dubininellus) meyeræ* Gupta, *Indian J. Acar.*, 2 : 7.

*Female* : Dorsal shield rugose, 260-280 long, 160-170 wide, with 15 pairs of setae, all long setae gently serrate.  $s_6 > s_4$ ,  $z_3 = z_4$ . Measurements of setae :  $j_1$ -20-25,  $j_4$ - $j_6$ ,  $J_5$ ,  $z_5$ -8-12 each,  $j_3$ -18-20,  $z_2$ -12,  $z_3$ -18-20,  $z_4$ -18-20,  $s_4$ -45,  $s_6$ -60,  $Z_5$ -40-50,  $Z_4$ -44-52,  $r_3$ -28-29. Sternal shield almost as long as broad with 3 pairs of sternal setae, metasternal plate not discernible, 4th pair lie on interscutal membrane. Genital shield normal with a pair of setae. Ventrianal shield 78 long, 50 wide, with 3 pairs of preanal setae and a pair of preanal pores ; 3 pairs of setae present around ventrianal shield,  $JV_5$ -48 long, one pair of metapodal plates present, 18 long. Fixed digit of chelicera with 3 teeth, movable digit with one tooth. Spermatheca as figured. Macrosetae on leg IV : genu-7, tibia-31-36, basitarsus-20-26, distitarsus-18, all with spatulate tip. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Peritreme extends anteriorly upto  $j_1$ .

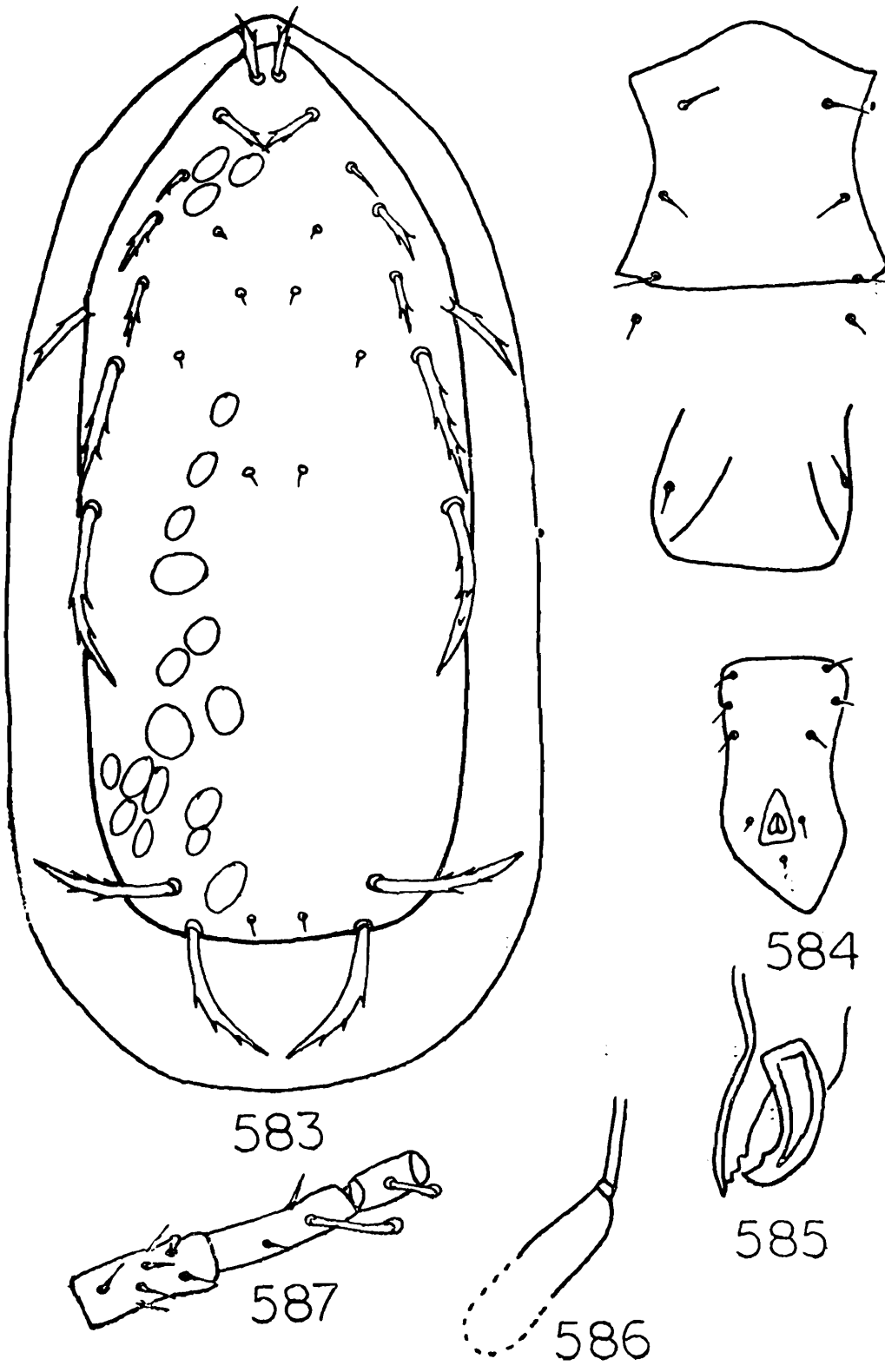
*Male* : Unknown.

*Habitat* : Weeds, banana.

*Type locality and repository* : Holotype ♀, India : Meghalaya, Tura, on a weed, deposited in ZSI, Calcutta, Reg. No. 3465/17. Paratype 1 ♀, Assam, Gossaigaon, on banana, Reg. No. 3466/17.

*Distribution* : India : Meghalaya, Assam.

*Remarks* : This species is known only from its type.



Figs. 583-587. *Phytoseius (Phytoseius) meyeri* Gupta  
 583. Dorsal shield  
 584. Ventral surface  
 585. Chelicera (female)  
 586. Spermatheca  
 587. Genu, tibia and basitarsus of leg IV

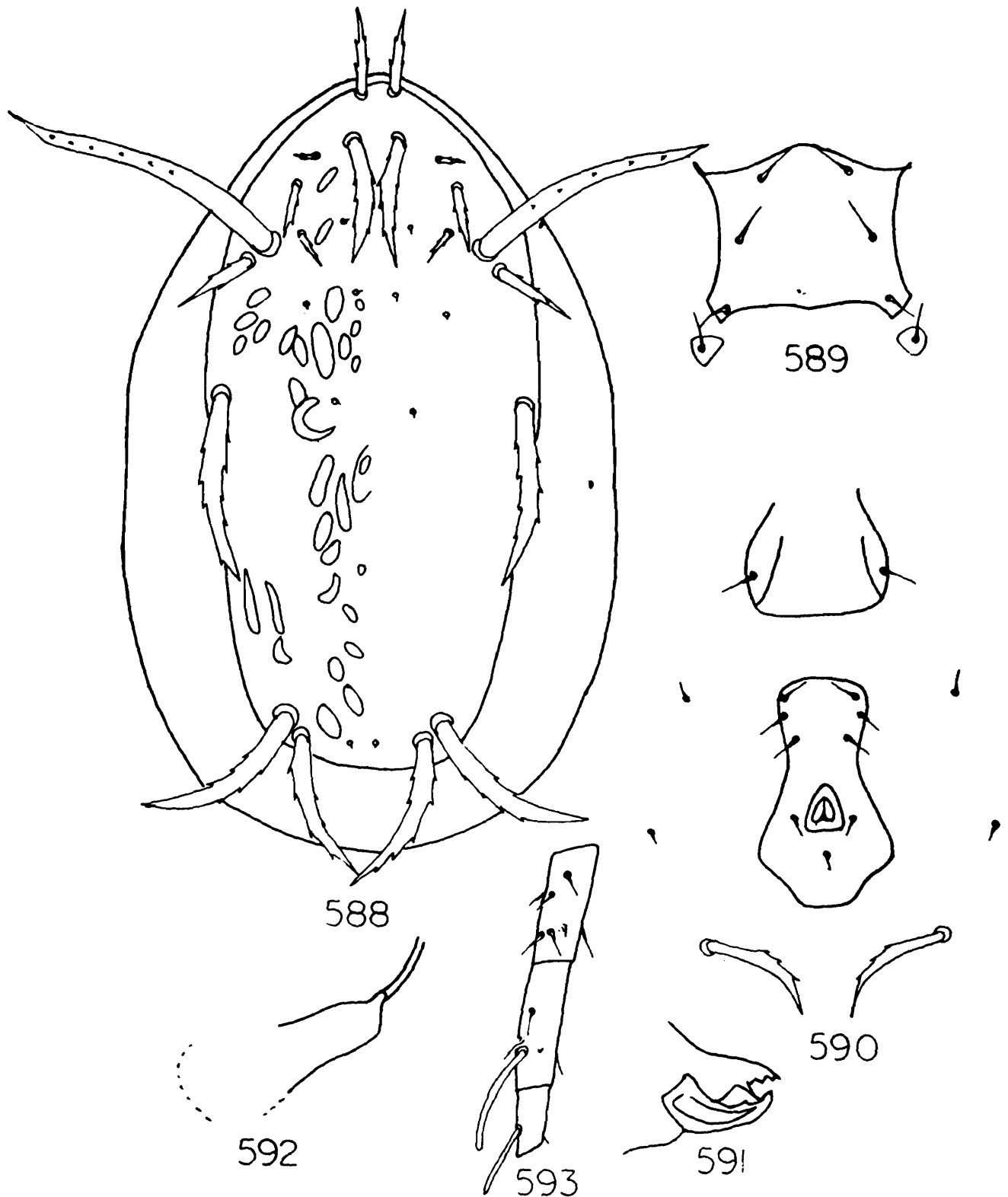
99. *Phytoseius (Phytoseius) mixtus* Chaudhri

( Figs. 588-593 )

1973. *Phytoseius (Phytoseius) mixtus* Chaudhri, *Pak. J. Zool*, 5(1) : 83-85.1983. *Phytoseius (Phytoseius) mixtus* : Ray & Gupta, *Rec. zool. Surv. India*, 80 (3-4) : 301-302.

*Female* : Dorsal shield rugose, 280-290 long, 134-145 wide, with 15 pairs of setae and a few pairs of pores. Excepting setae  $j_4$ - $j_6$ ,  $z_5$ ,  $J_5$  which are small, all other setae being serrate. Measurements of setae :  $j_1$ -29-34,  $j_4$ - $j_6$ ,  $J_5$ ,  $z_5$ -4-5 each,  $j_3$ -56-62,  $z_2$ -16-18,  $z_3$ -36-40,  $z_4$ -16-24,  $s_4$ -130-150,  $s_6$ -80-90,  $Z_5$ -75-89,  $Z_4$ -90-115,  $r_3$ -44-52. Sternal shield wider (85) than long (67) with 3 pairs of moderately long sternal setae, metasternal plate distinct with seta. Genital shield 89 wide with a pair of setae. Ventrianal shield 90-100 long, 45-56 wide, lateral margins concave with 3 pairs of preanal setae, 3 pairs of setae present around ventrianal shield,  $JV_5$ -56-60 long, serrate ; metapodal plates single paired. Chelicera with 2-3 teeth and *pilus dintilis* on the fixed digit, one tooth on the movable digit. Spermatheca as figured. Macrosetae on leg IV : genu-nil, tibia-56, basitarsus-29-31, distitarsus-31 long. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , genu III  $1 \frac{2}{0} \frac{2}{0} 1$ , tibia III  $1 \frac{2}{1} \frac{1}{1} 1$ . Peritreme extends anteriorly upto  $j_1$ .

*Male* : Unknown.*Habitat* : Grass.*Type locality and repository* : Holotype ♀, Pakistan, Haripur, on mulberry, deposited in University of Agriculture, Lyallpur.*Distribution* : India : Uttar Pradesh ; outside India : Pakistan.*Remarks* : In some of the specimens examined from Uttar Pradesh, the length of  $s_4$  was shorter than what was given in the original description from Pakistan. In other essential features, there was no marked variation.



Figs. 588-593. *Phytoseius (Phytoseius) mixtus* Chaudhri

- 588. Dorsal shield
- 589. Sternal shield
- 590. Posterior ventral surface
- 591. Chelicera (female)
- 592. Spermatheca
- 593. Genu, tibia and basitarsus of leg IV

100. **Phytoseius (Phytoseius) neocorniger** Gupta  
(Figs. 594-597)

1977. *Phytoseius (Dubininellus) neocorniger* Gupta, *Indian J. Acar.*, 1 : 13.

*Female* : Dorsal shield highly sclerotized, 284 long, 155 wide, with 15 pairs of setae.  $s_4$  being longest but its length varies ;  $z_5, j_4-j_6$  minute ;  $z_2$  and  $z_4$  small, equal ; other setae being long and serrate. Measurements of setae :  $j_1-28, j_3-50, z_2-12, z_3-33, z_4-12, s_4-110-130, s_6-80, Z_5-65-82, Z_4-70-89, r_3-40$ . Sternal shield normal, wider than long, with 3 pairs of setal setae ; metasternal setae on interscutal membrane. Genital shield wider than greatest width of ventrianal shield, with a pair of setae. Ventrianal shield 60 long, 40 wide, distinctly constricted at preanal level with 3 pairs of preanal setae ; 3 pairs of setae present around ventrianal shield,  $JV_5-47$  long. Spermatheca as figured. Macrosetae on leg IV : genu-nil, tibia-40, basitarsus-26, Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{2}{0} \frac{2}{0} 1$ , genu III  $1 \frac{1}{1} \frac{2}{1} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Peritreme extends anteriorly upto  $j_1$ .

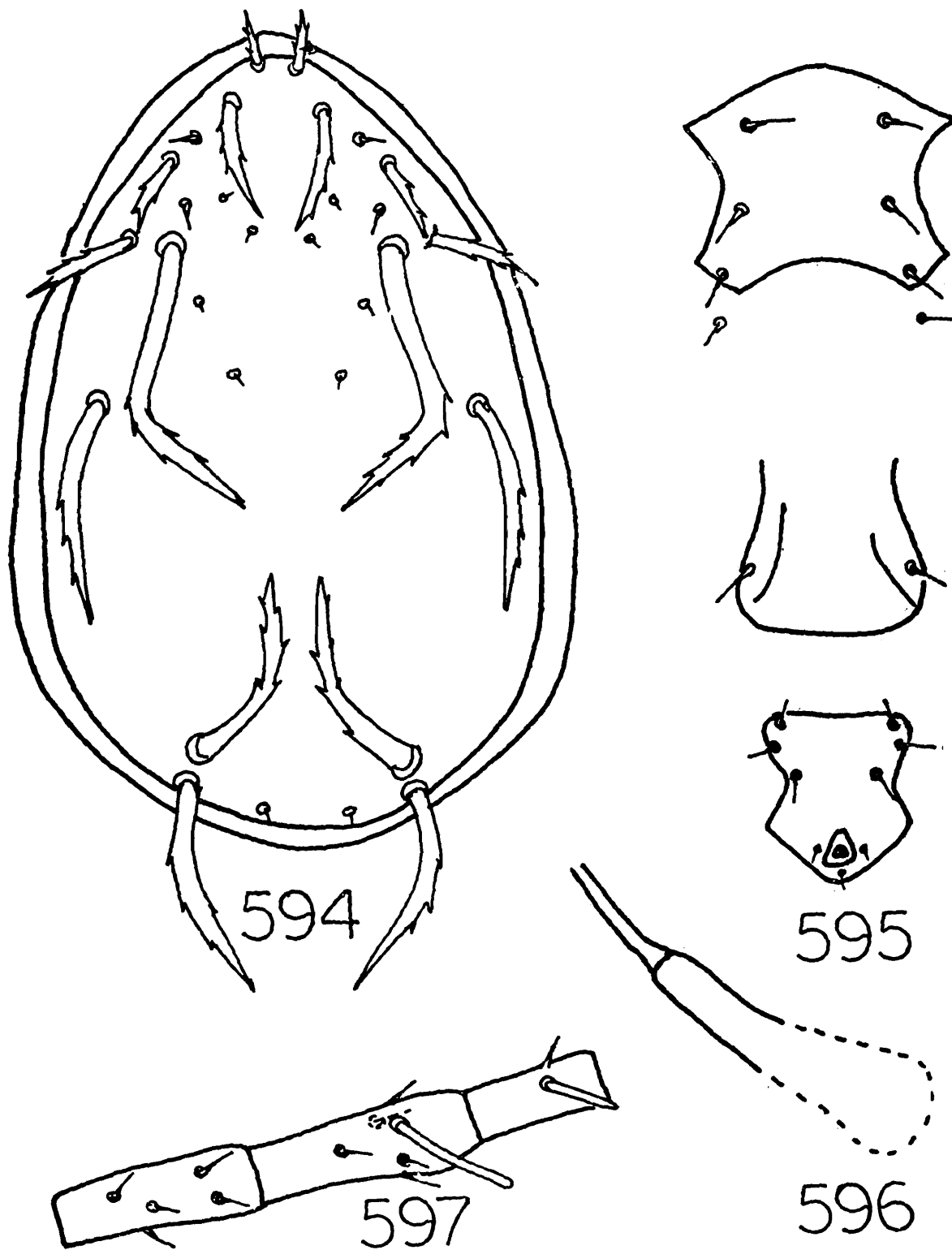
*Male* : Unknown.

*Habitat* : *Lantana* sp.

*Type locality and repository* : Holotype, ♀ India : Rajasthan, Pratapgarh, on *Lantana* sp., deposited in ZSI, Calcutta, Reg. No. 3468/17 Paratypes 2 ♀ ♀, same data as for holotype, Reg. No. 3469/17.

*Distribution* : India : Rajasthan.

*Remarks* : This species is known only from its types.



Figs. 594-597. *Phytoseius (Phytoseius) neocorniger* Gupta  
 594. Dorsal shield  
 595. Ventral surface  
 596. Spermatheca  
 597. Genu, tibia and basitarsus of leg IV

101. *Phytoseius (Phytoseius) neoferox* Ehara & Bhandhufalck  
(Figs. 598-603)

1977. *Phytoseius (Phytoseius) neoferox* Ehara & Bhandhufalck, *J. Fac. ed. Tottori Univ.*, 27(2) : 49-50.

*Female* : Dorsal shield rugose, 251 long, 156 wide, with 15 pairs of setae and 2 pairs of conspicuous pores behind  $z_5$ . Setae  $j_1, j_3, z_3, s_4, s_6, Z_5, Z_4, r_3$  being long, stout and serrate,  $s_4$  and  $Z_4$  divided (according to Ehara & Bhandhufalck, 1977,  $j_3, s_6, Z_5$  and  $r_3$  also divided, besides  $Z_4$  and  $s_4$  but in the material examined from India, these setae did not appear to be divided). Measurements of setae :  $j_1$ -28-31,  $j_4$ - $j_6$ ,  $z_5$ ,  $J_5$ -5-6 each,  $j_3$ -38-47,  $z_2$ -12,  $z_3$ -26,  $z_4$ -9-11,  $s_4$ -93-112,  $s_6$ -82-89,  $Z_5$ -63-71,  $Z_4$ -74-96,  $r_3$ -38-45. Sternal shield wider (94) than long (62) with 3 pairs of sternal setae ; metasternal plates indistinct, however, seta present. Genital shield 71 wide with a pair of setae. Ventrianal shield longer (78) than broad (49), lateral margins concave to form waist with 3 pairs of preanal setae ; 3 pairs of setae present around ventrianal shield,  $JV_5$ -40 long ; area between genital and ventrianal shields transversely striated, one pair of metapodal plates present, 13 long. Spermatheca as figured, Macrosetae on leg IV : genu-24, tibia-51, basitarsus-28, distitarsus-22. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Peritreme extends anteriorly upto  $j_1$ .

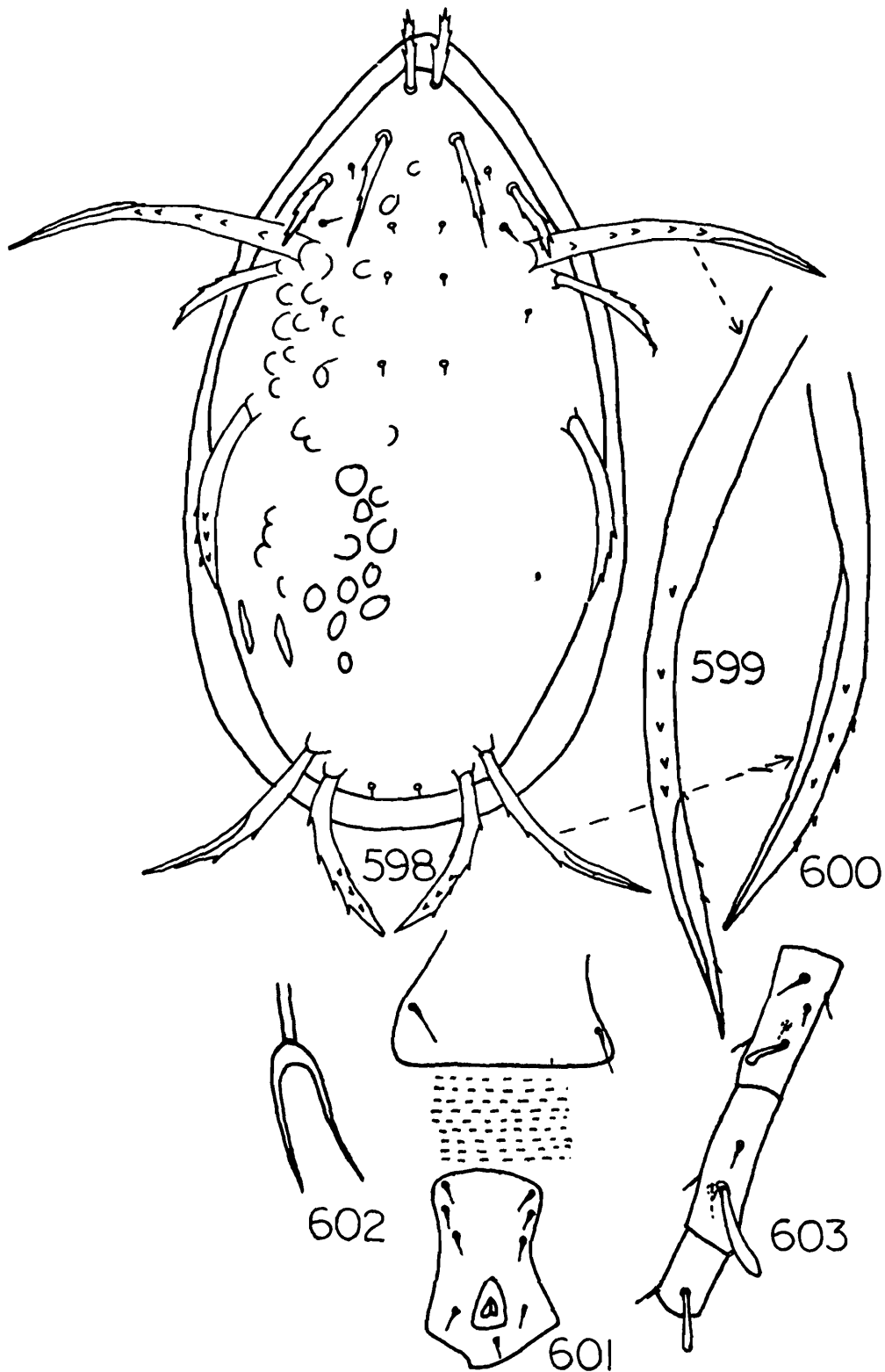
*Male* : Unknown.

*Habitat* : Guava.

*Type locality and repository* : Holotype ♀, Thailand, Fang, on persimmon, deposited in Biological Institute, Faculty of Education, Tottori University, Japan. Paratype 1 ♀, same locality, on coffee, repository not mentioned.

*Distribution* : India : Arunachal Pradesh ; outside India : Thailand.

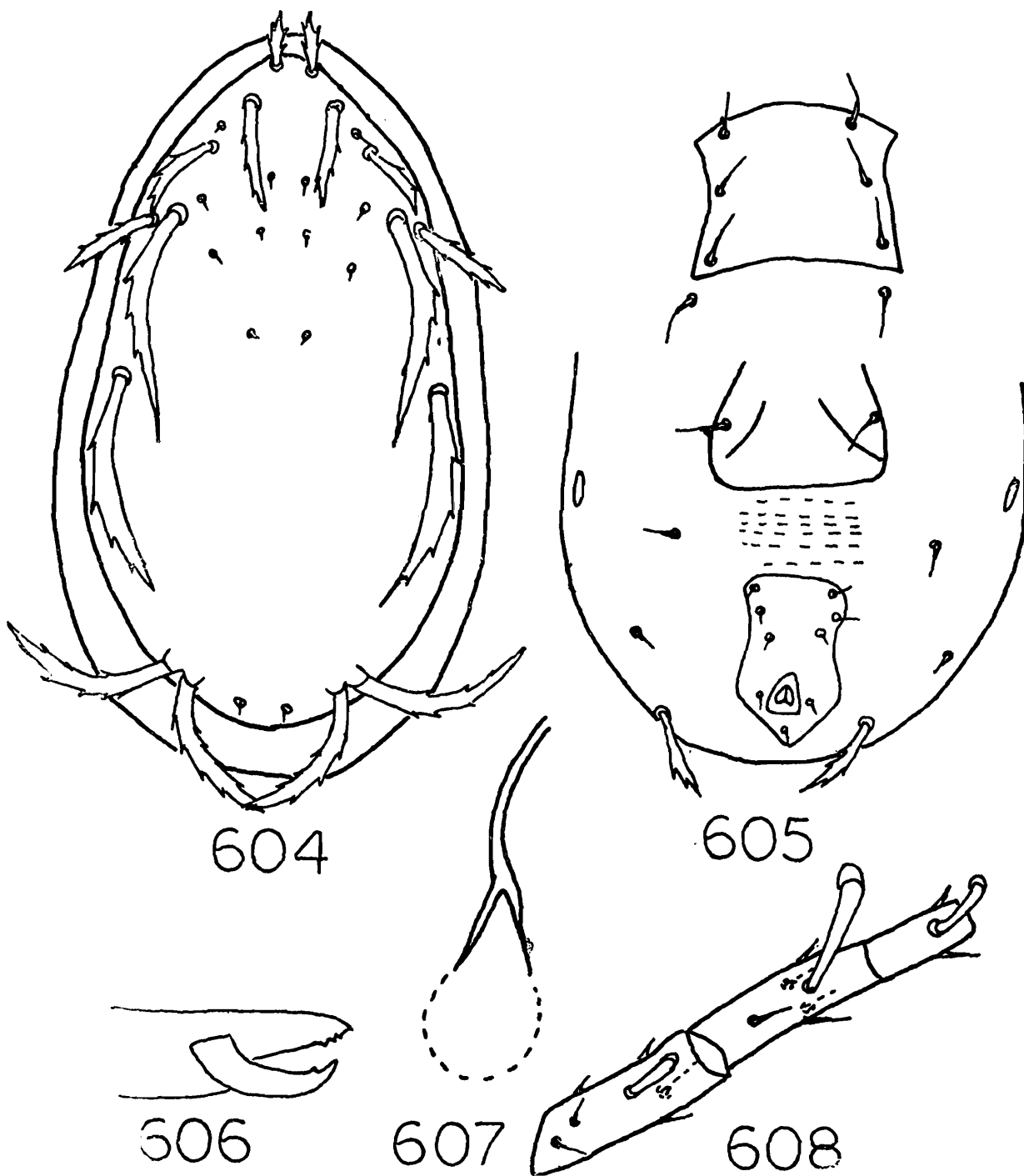
*Remarks* : The Indian material does not show any significant difference from Thailand material except  $j_3, s_6, Z_5$  and  $r_3$  do not appear to be serrate. This is the first report of this species from India.



Figs. 598-603. *Phytoseius (Phytoseius) neoferox* Ehara and Bhandhufalck  
 598. Dorsal shield  
 599. Seta  $s_4$  (enlarged view)  
 600. Seta  $Z_4$  (enlarged view)  
 601. Posterior ventral surface  
 602. Spermatheca  
 603. Genu, tibia and basitarsus of leg IV

102. *Phytoseius (Phytoseius) punjabensis* Gupta

(Figs. 604-608)

1977. *Phytoseius (Dubininellus) punjabensis* Gupta, *Indian J. Acar.*, 1 : 16.1982. *Phytoseius (Phytoseius) jaunpurensis* Gupta, *Rec. zool. Surv. India*, 79(3-4) : 367-368 ( new synonymy ).*Female* : Dorsal shield rugose, 275 long, 140 wide, with 15 pairsFigs. 604-608. *Phytoseius (Phytoseius) punjabensis* Gupta

604. Dorsal shield

605. Ventral surface

606. Chelicera (female)

607. Spermatheca

608. Genu, tibia and basitarsus of leg IV

o. setae. Setae  $j_1$ ,  $z_3$ ,  $s_4$ ,  $s_6$ ,  $Z_5$ ,  $Z_4$  and  $r_3$  long and serrate, while the other setae being short and simple. Setae  $j_3 > z_3$ ,  $s_4 = s_6$ ,  $Z_4 > Z_5$ ,  $j_3$  slightly longer than  $r_3$ . Measurements of setae:  $j_1$ -24,  $j_4$ - $j_6$ ,  $z_5$ ,  $J_5$ -6-8 long,  $j_3$ -48,  $z_3$ -32,  $z_4$ -10,  $s_4$ -97,  $s_6$ -97,  $Z_5$ -64,  $Z_4$ -72,  $r_3$ -44. Sternal shield almost as long as broad with 3 pairs of sternal setae, 4th pair on interscutal membrane. Genital shield wider than greatest width of ventrianal shield. Striation present between genital and ventrianal shields. Ventrianal shield elongate, 76 long, 48 wide, with 3 pairs of preanal setae; 3 pairs of setae present around ventrianal shield,  $JV_5$ -serrate; one pair of elongate metapodal plates present. Spermatheca as figured. Fixed digit of chelicera with 3 teeth on fixed digit and one tooth on movable digit. Macroseta on leg IV: genu-16, tibia-36, basitarsus-24. Leg chaetotactic formula: genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ .

*Male*: Unknown.

*Habitat*: Fig.

*Type locality and repository*: Holotype ♀, India: Punjab, Kapurthala, on fig, deposited in ZSI, Calcutta, Reg. No. 3470/17 (specimen damaged).

*Distribution*: India: Punjab, Uttar Pradesh.

*Remarks*: On re-examination of the type of *P. (P.) jaunpurensis* it appeared that *P. (P.) punjabensis* and *P. (P.) jaunpurensis* are conspecific and, hence, the latter is considered here as synonym for the former.

### 103. *Phytoseius (Phytoseius) rachelae* Swirski & Shechter

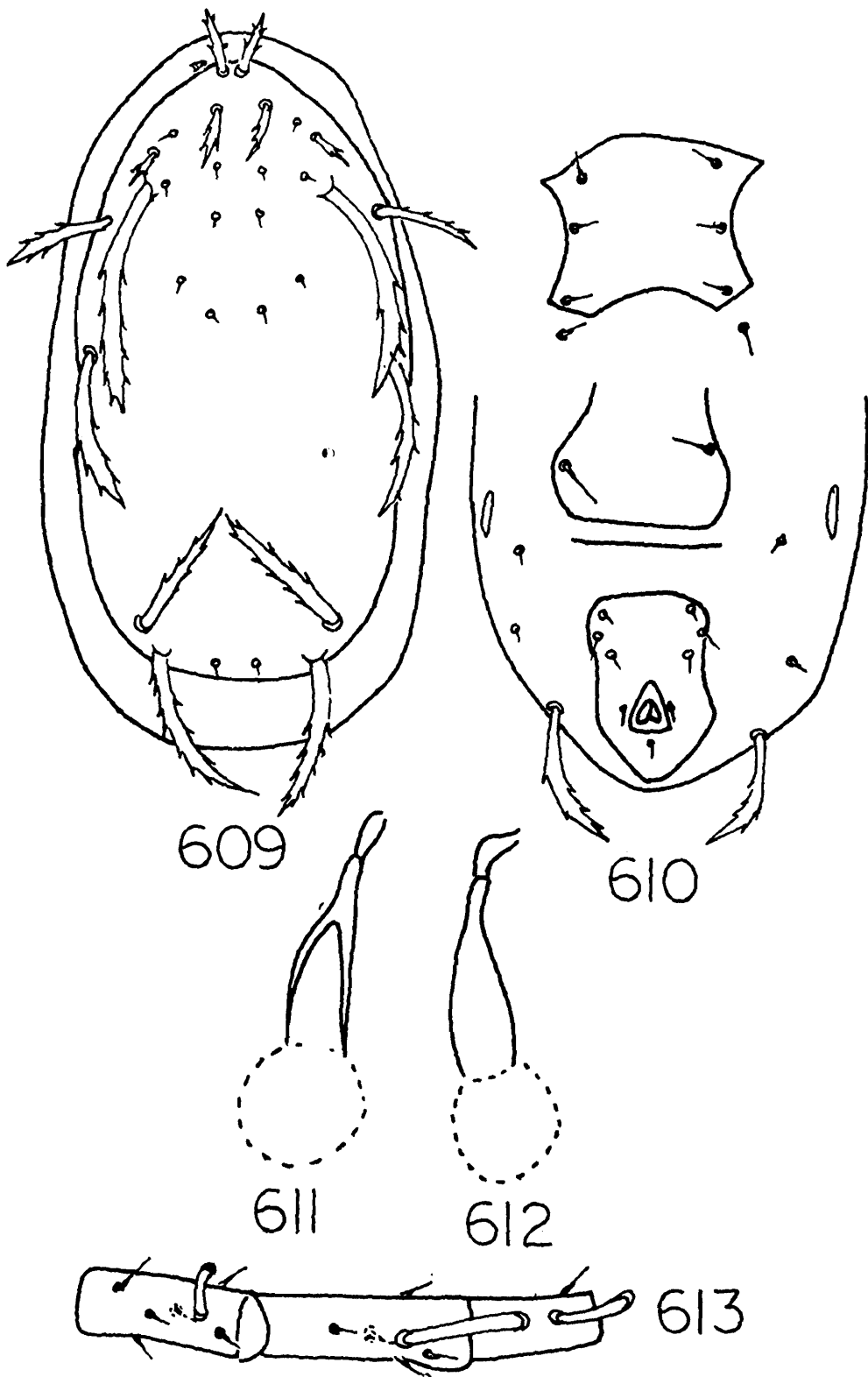
(Figs. 609-613)

1961. *Phytoseius (Dubininellus) rachelae* Swirski & Shechter, *Israel J. agric. Res.*, 11: 108-109.

1980. *Phytoseius (Dubininellus) rachelae*: Gupta, *Bull. Zool. Surv. India*, 3(1-2): 52.

*Female*: Dorsal shield 267-282 long, 130-140 wide, rugose with 15 pairs of setae:  $j_1 = j_3$ ,  $s_4$  being longest,  $s_4 > Z_5 = Z_4 > r_3$ . Measurements of setae:  $j_1$ -25-28,  $j_4$ -,  $j_6$ ,  $z_5$ ,  $J_5$ -5-8, each,  $j_3$ -25-28,  $z_2$ -8-9,  $z_3$ -15-20,  $z_4$ -8-10,  $s_4$ -90-100,  $s_6$ -60-70,  $Z_5$ -75,  $Z_4$ -70-76,  $r_3$ -35-40. Sternal shield with 3 pairs of sternal setae 4th pair lie on interscutal membrane. Genital shield wider than greatest width of ventrianal shield with a pair of setae. Ventrianal shield 64 long, 44 wide, with 3 pairs of preanal setae, 3 pairs of setae present around ventrianal shield,  $JV_5$ -40-50 long; metapodal plate single paired.

Fixed digit of chelicera with 2 teeth, and movable digit with 1 tooth. Spermatheca as figured. Macrosetae on leg IV : genu-20, tibia-60, basitarsus-25-35, all with spatulate tip. Peritreme extends anteriorly upto  $j_1$ .



Figs. 609-613. *Phytoseius (Phytoseius) rachelae* Swirski and Shechter  
 609. Dorsal shield  
 610. Ventral surface  
 611, 612. Spermathecae  
 613. Genu, tibia and basitarsus of leg IV

*Male* : Unknown.

*Habitat* : *Hibiscus* sp.

*Type locality and repository* : Holotype ♀, Hong Kong, Sai Kung, on *Rhus chinensis*, deposited in Dept. of Entomology, National and University Institute of Agriculture, Rehovot, Israel. Paratypes 3 ♀ ♀, Hong Kong, on *Glochidion eriocarpum*, same repository as holotype.

*Distribution* : India : Kerala; outside India : Hong Kong.

*Remarks* : The Indian material did not show any significant variation from the original description of Swirski & Shechter (1961).

#### 104. *Phytoseius* (*Phytoseius*) *roseus* Gupta

(Figs. 614-620)

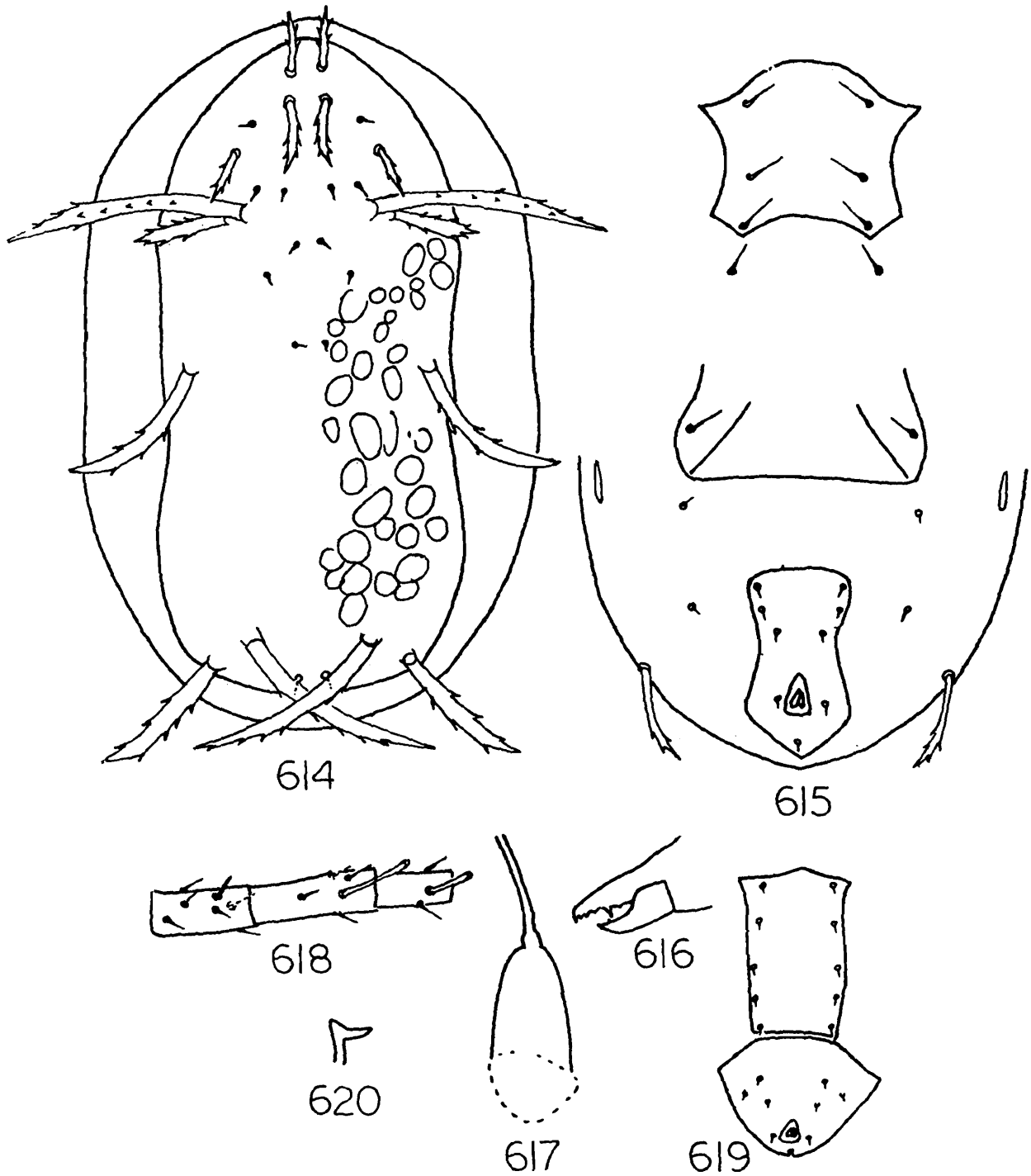
1969. *Phytoseius* (*Dubininellus*) *roseus* Gupta, *Israel J. agric. Res.*, 19 : 119-120.  
 1973. *Phytoseius* (*Phytoseius*) *rugulosus* Chaudhri, *Pak. J. Zool.*, 5(1) : 82-83 (new synonymy).  
 1974. *Phytoseius roseus* : Prasad, A catalogue of mites of India, p. 172.  
 1977. *Phytoseius* (*Dubininellus*) *roseus* Gupta : *Indian J. Acar.* 1 : 16-17.  
 1980. *Phytoseius* (*Dubininellus*) *roseus* : Gupta, *Bull. Zool. Surv. India*, 3(1-2) : 51-52.  
 1981. *Phytoseius* (*Dubininellus*) *roseus* : Gupta, *Indian J. Acar.*, 5(1-2) : 46.  
 1982. *Phytoseius* (*Phytoseius*) *roseus* : Gupta, *Rec. zool. Surv. India*, 79(3-4) : 368.  
 1982. *Phytoseius* (*Dubininellus*) *roseus* : Gupta, *Indian J. Acar.*, 6 : 32.

*Female* : Dorsal shield 280-285 long, 130-145 wide, rugose with 15 pairs of setae. Setae  $z_2$ ,  $z_4$ ,  $z_5$ ,  $j_4$ - $j_6$ ,  $J_5$  small and smooth, others being long, thick and serrate. Measurements of setae :  $j_1$ -25-27,  $j_4$ - $j_6$ ,  $z_5$ ,  $J_5$ -4-6 each,  $j_3$ -31-40,  $z_2$ -8-11,  $z_3$ -29-33,  $z_4$ -8-9,  $s_4$ -99-101,  $s_6$ -64-70,  $Z_5$ -65-75,  $Z_4$ -72-81,  $r_3$ -40-45. Sternal shield slightly wider than long with 3 pairs of sternal setae, 4th pair lie on interscutal membrane. Genital shield much wider (74) than greatest width of ventrianal shield with a pair of setae. Ventrianal shield 70-80 long, 40-50 wide, lateral margins constricted with 3 pairs of preanal setae in addition to para and postanal setae, 3 pairs of setae present around ventrianal shield,  $JV_5$ -48 long ; one pair of elongate metapodal plates present. Chelicera with 3-4 teeth on the fixed digit and *pilus dentilis*, movable digit with one tooth. Spermatheca as figured. Peritreme extends anteriorly upto  $j_1$ . Macrosetae on leg IV : genu-nil, tibia-35-40, basitarsus-20-22, all with broadened tip. Leg chaetotactic formula : genu II 2  $\frac{2}{0}$   $\frac{2}{0}$  1, tibia II 1  $\frac{1}{1}$   $\frac{2}{1}$  1, genu III 1  $\frac{2}{0}$   $\frac{2}{0}$  1, tibia III 1  $\frac{1}{1}$   $\frac{2}{1}$  1.

*Male* : Ventrianal shield and spermatophoral process as figured.

*Habitat* : Rose, papaya, milkweed, *Zizyphus* sp., fig, guava, beans.

*Type locality and repository* : Holotype ♀, India : West Bengal, Howrah Botanical Garden, on rose, deposited in ZSI, Calcutta, Reg. No. 2820/17.



Figs. 614-620. *Phytoseius (Phytoseius) roseus* Gupta  
 614. Dorsal shield  
 615. Ventral surface  
 616. Chelicera (female)  
 617. Spermatheca  
 618. Genu, tibia and basitarsus of leg IV  
 619. Ventral surface (male)  
 620. Spermatophoral process

**Distribution :** India ; West Bengal, Tripura, Punjab, Uttar Pradesh, Jammu & Kashmir, Gujarat, Tamil Nadu ; outside India : Pakistan.

**Remarks :** Chaudhri (1973) described *P. (P.) rugulosus* from Pakistan but that refers to the same species as *P. (P.) roseus* Gupta (1969a) and, therefore, the former is considered here as synonym for *P. (P.) roseus*. This species differs from the related species, *P. (P.) mixtus* Chaudhri, in relative length of  $z_2$  and  $z_4$  which are longer and serrate in *mixtus* and smaller and smooth in *roseus*.

### 105. *Phytoseius (Phytoseius) rugosus* Denmark

(Figs. 621-624)

1966. *Phytoseius (Dubininellus) rugosus* Denmark, *Fla. Dept. Agr. Bull.*, 6 : 100.

1977. *Phytoseius (Dubininellus) rugosus* : Gupta, *Indian J. Acar.*, 2 : 7-8.

**Female :** Unknown.

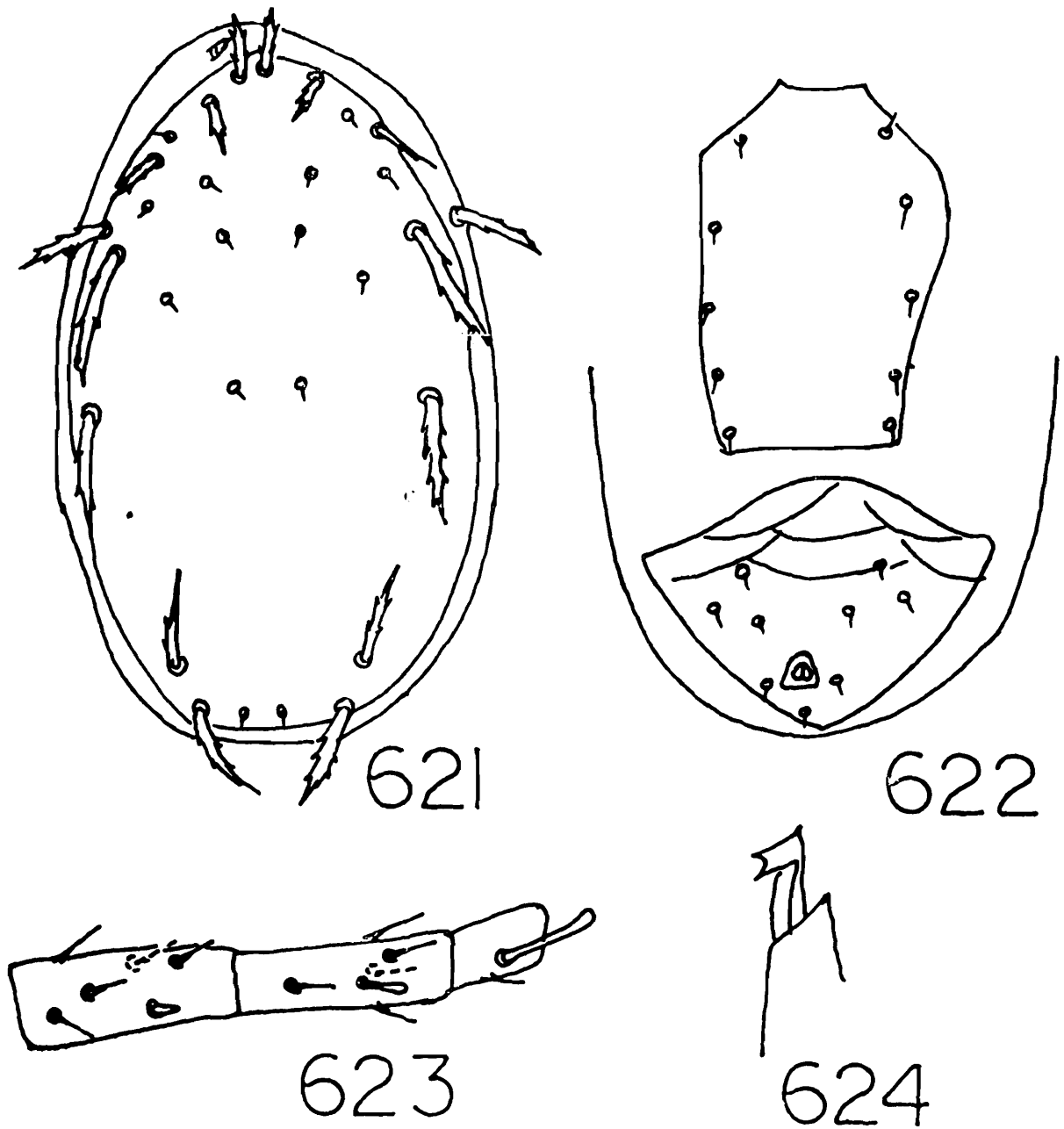
**Male :** Dorsal shield 200 long, 155 wide, with 15 pairs of setae. Except  $z_2$ ,  $z_4$ ,  $j_4$ ,  $j_5$ ,  $j_6$ ,  $J_5$  and  $z_5$  which are small, other setae being long, thick and serrate. Setae  $s_4$  and  $s_6$  almost equal. Measurements of setae  $j_1$ -19,  $j_4$ - $j_6$ ,  $z_5$ ,  $J_5$ -5-6 each,  $j_3$ -20-25,  $z_2$ -9-11,  $z_3$ -24-27,  $z_4$ -11-13,  $s_4$ -50-60,  $s_6$ -50-60,  $Z_5$ -30-35,  $Z_4$ -35-41,  $r_3$ -26-32. Sternitigenital shield normal with 5 pairs of setae. Ventrianal shield with 3 pairs of preanal setae. Spermatophoral process as figured. Peritreme extends anteriorly upto  $j_1$ . Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Macrosetae on leg IV : genu-6 (peg like), tibia-7, basitarsus-20.

**Habitat :** *Terminalia arjuna*, *Zizyphus* sp.

**Type locality and repository :** Holotype ♂, Pakistan, Rawalpindi, on undetermined plant, deposited in U S N M. Paratype 1 nymph, Sialkot, deposited in Florida State collection of Arthropods, Gainesville, Florida.

**Distribution :** India : Orissa ; outside India : Pakistan (Sialkot, Rawalpindi).

**Remarks :** This is one of the very few phytoseiid mites which is known only from male specimen and female is unknown. The Indian material conformed well with the description of Denmark (1966).



Figs. 621-624. *Phytoseius (Phytoseius) rugosus* Denmark

621. Dorsal shield (male)

622. Ventral surface (male)

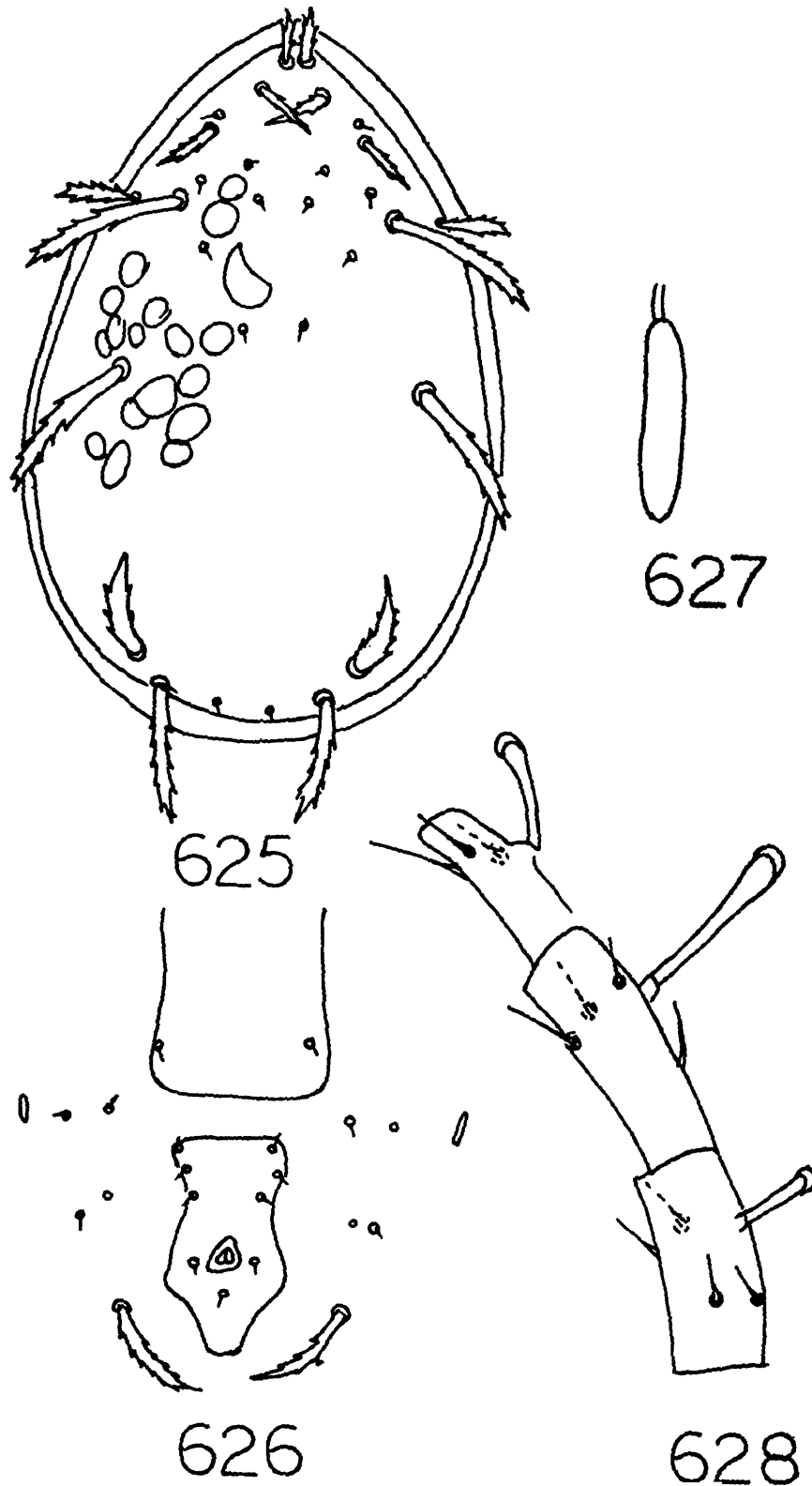
623. Genu, tibia and basitarsus of leg IV

624. Spermatophoral process (male)

106. *Phytoseius (Phytoseius) swirskii* Gupta  
(Figs. 625-628)

1980. *Phytoseius (Dubininellus) swirskii* Gupta, *Entomologists' mon. Mag.*, 115 : 210-212.

*Female* : Dorsal shield rugose, 280 long, 178 wide, with 15 pairs



Figs. 625-628. *Phytoseius (Phytoseius) swirskii* Gupta  
625. Dorsal shield  
626. Posterior ventral surface  
627. Spermatheca  
628. Genu, tibia and basitarsus of leg IV

of setae. Measurements of setae :  $j_1$ -20,  $j_4$ - $j_6$ ,  $J_5$ -7 each,  $j_3$ -25,  $z_2$ -12,  $z_3$ -26,  $z_4$ -12,  $s_4$ -70,  $s_6$ -70,  $Z_5$ -50,  $Z_4$ -60,  $r_3$ -32, all long setae on dorsal shield thick and serrate. Sternal shield with 3 pairs of sternal setae. Genital shield wider than maximum width of ventrianal shield with a pair of setae. Ventrianal shield longer (82) than broad (45) with 3 pairs of preanal setae ; 3 pairs of setae present around ventrianal shield,  $JV_5$ -47 long. One pair of metapodal plates present. Spermatheca as figured. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ . Macrosetae on leg IV : genu-17, tibia-36, basitarsus-21, distitarsus-21, all spatulate.

*Male* : Unknown.

*Habitat* : *Ficus* sp.

*Type locality and repository* : Holotype ♀, India : West Bengal, Burdwan Agriculture Farm, on *Ficus* sp., deposited in ZSI, Calcutta, Reg. No. 3471/17.

*Distribution* : India : West Bengal.

*Remarks* : This species is known only from its type.

### 107. *Phytoseius (Phytoseius) wainsteini* Gupta

(Figs. 629-633)

1981. *Phytoseius (Dubininellus) wainsteini* Gupta, *Indian J. Acar.*, 5(1-2) : 43-44.

1981. *Phytoseius (Dubininellus) wainsteini* : Gupta, *Indian J. Acar.*, 5(1-2) : 35.

*Female* : Dorsal shield 270 long, 147 wide, rugose, with 15 pairs of setae. Setae  $j_1$ ,  $j_3$ ,  $z_3$ ,  $z_4$ ,  $s_4$ ,  $s_6$ ,  $Z_5$ ,  $Z_4$  and  $r_3$  long, thick and serrate, other setae small. Measurements of setae :  $j_1$ -30,  $j_4$ - $j_5$ ,  $J_5$ ,  $z_5$ -minute,  $j_3$ -56,  $z_2$ -16,  $z_3$ -32,  $z_4$ -28,  $s_4$ -124,  $s_6$ -65,  $Z_5$ -68,  $Z_4$ -80,  $r_3$ -36,  $Z_4$  thicker than  $Z_5$ . Sternal shield with 3 pairs of sternal setae, metasternal plates indistinct, 4th pair of sternal setae on interscutal membrane. Genital shield wider (64) than greatest width of ventrianal shield. Ventrianal shield longer (80) than broad (40) with 3 pairs of preanal setae ; 3 pairs of setae present around ventrianal shield,  $JV_5$ -56 long, serrate, one pair of elongate metapodal plates present, 28 long. Peritreme extends anteriorly upto  $j_1$ . Fixed digit of chelicera with 3 teeth, movable digit with one tooth. Spermatheca as figured. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{0} 1$ , tibia III  $1 \frac{2}{1} \frac{1}{1} 1$ . Macrosetae on leg IV : genu 15 (rarely distinguishable from other setae), tibia-67, basitarsus-32. Peritreme extends anteriorly upto  $j_1$ .

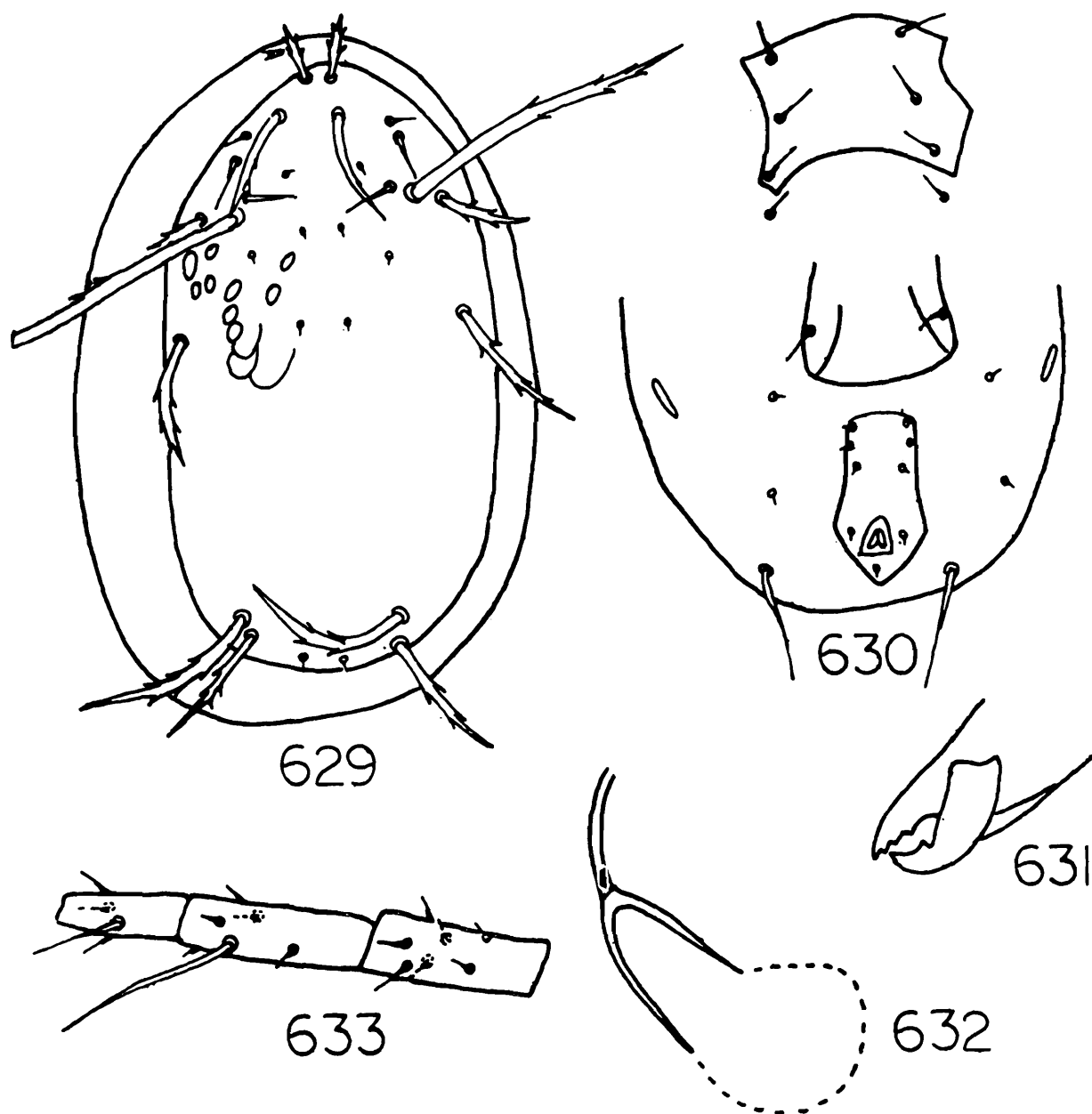
*Male* : Unknown.

*Habitat* : Collected on tea as well as on an undetermined plant.

*Type locality and repository* : Holotype ♀, India : Jammu & Kashmir, Phalgam on an undetermined plant, deposited in ZSI, Calcutta, Reg. No. 3100/17. Paratype 1 ♀, same data and repository as for holotype, Reg. No. 3101/17.

*Distribution* : India : Jammu & Kashmir.

*Remarks* : This species can be distinguished from *P. (P.) corniger* in relative length of  $z_2$  and  $z_4$  as  $z_4$  here is  $1\frac{1}{2}$  times as long as  $z_2$  whereas in latter both are equal,



Figs. 629-633. *Phytoseius (Phytoseius) wainsteini* Gupta  
 629. Dorsal shield  
 630. Ventral surface  
 631. Chelicera (female)  
 632. Spermatheca  
 633. Genu, tibia and basitarsus of leg IV

Genus *Typhlodromus* Scheuten

1857. *Typhlodromus* Scheuten, *Arch. Naturges*, 23 : 111.  
 1887. *Seius* (*Seiulus*) Berlese, *Acari Myriapoda et Scorpionidae, Fasc.*, 41(3) : 3.  
 1902. *Seiulus* Oudemans, *Tij. Ent.*, 45 : 17.  
 1904. *Iphidulus* Ribaga, *Riv. Path. Veg.*, 10 : 176.  
 1904. *Echinoseiulus* Ribaga, *Riv. Path. Veg.*, 10 : 177.  
 1948. *Neoseiulus* Hughes, *In Min. Agr. Fish. Lond., Pub.* 141.  
 1957. *Typhlodromus* (*Typhlodromus*) Chant, *Can. Ent.*, 89 : 529.  
 1959. *Typhloseiopsis* De Leon, *Ent. News*, 70 : 150.  
 1959. *Anthoseiulus* De Leon, *Ent. News*, 70 : 258.  
 1961. Typhlodromidae Karg, *Z. angew Ent.*, 47 : 441.  
 1961. *Cydnodromella* Muma, *Bull. Fla. St. Mus.*, 5(7) : 286.  
 1961. *Amblydromella* Muma, *ibid.*, 294.  
 1961. *Paraseiulella* Muma, *ibid.*, : 294.  
 1961. *Metaseiulus* Muma, *ibid.*, : 295.  
 1961. *Neoseiulella* Muma, *ibid.*, : 295.  
 1961. *Australiseiulus* Muma, *ibid.*, : 296.  
 1961. *Clavidromus* Muma, *ibid.*, : 296.  
 1961. *Clavidromina* Muma, *ibid.*, : 296.  
 1961. *Amblydromus* Muma, *ibid.*, : 297.  
 1961. *Typhlodromina* Muma, *ibid.*, : 297.  
 1961. *Galendrominus* Muma, *ibid.*, : 297.  
 1961. *Galendromus* Muma, *ibid.*, : 298.  
 1961. *Typhlodromella* Muma, *ibid.*, : 299.  
 1961. *Typhloctomus* Muma, *ibid.*, : 299.  
 1961. *Paraseiulus* Muma, *ibid.*, 299-300.  
 1962. Typhlodromini Wainstein, *Acarologia*, 4 : 26.  
 1962. *Chanteius* Wainstein, *Acarologia*, 4 : 19.  
 1962. *Melodromus* Wainstein, *Acarologia*, 4 : 23-24.  
 1962. *Chiliseiulus* Gonzalez & Schuster, *Bull. Univ. Chile Agr. Exp. Sta.*, 16 : 7.  
 1967. *Cydnoseiulus* Muma, *Fla. Ent.*, 50 : 274-276.  
 1982. *Typhlodromus*, Daneshvar & Denmark, *Internat. J. Acarol.*, 8(1) : 6.

*Diagnosis* : Dorsal shield entire with 16-20 pairs of setae, of those, 5-6 pairs on prolateral series. Setae short or long, smooth or serrate ; dorsocentral setae 5-6 pairs and median setae 2-3 pairs, lateral setae 8-12 pairs, sublateral setae on lateral integument. Female with sternal and genital shields and either a ventrianal or separate ventral and anal shields, with 1-4 pairs of preanal setae ; 2 pairs of elongated narrow metapodal plates present. Spermatheca well developed. Peritreme short or long, genu II, III and IV with 6-7 setae each, tibia II and III 6-7 setae each, tibia IV 6 setae.

Type : *Typhlodromus pyri* Scheuten (1857) by subsequent designation (Oudemans, 1929).

*Key to the subgenera of Typhlodromus*

- |  |     |                             |
|--|-----|-----------------------------|
| 1. Dorsal shield with 11 pairs of setae                            | ... | <i>Typhloctomus</i>         |
| — Dorsal shield with less than 11 pairs of setae                   | ... | 2                           |
| 2. Dorsal shield with 10 pairs of setae                            | ... | 4                           |
| — Dorsal shield with less than 10 pairs of setae                   | ... | 3                           |
| 3. Sternal shield entire and distinct                              | ... | <i>Brethria</i>             |
| — Sternal shield not entire and indistinct                         | ... | <i>Metaseiulus</i>          |
| 4. 3 pairs of median setae   | ... | <i>Paraseiulus</i>          |
| — 2 pairs of median setae  | ... | 5                           |
| 5. Ventrianal shield with 3 pairs of preanal setae                 | ... | <i>Anthoseius</i>           |
| — Ventrianal shield with 4 pairs of preanal setae                  | ... | 6                           |
| 6. Most of the lateral setae plumose                               | ... | <i>Clavidromus</i>          |
| — Most of the lateral setae not plumose, only a few may be serrate | ... | 7                           |
| 7. $Z_5$ and $Z_4$ normally serrate and former usually knobbed     | ... | <i>Amblydromella</i>        |
| — $Z_5$ and $Z_4$ never serrate, $Z_5$ always smooth               | ... | 8                           |
| 8. Leg IV with macrosetae, on genu, tibia and basitarsus of leg IV | ... | <i>Orientiseius</i>         |
| — Leg IV with macrosetae on basitarsus IV only                     | ... | <i>Typhlodromus s. str.</i> |

*Subgenus Amblydromella Muma*

1961. *Amblydromella* Muma, *Bull. Fla. St. Mus.*, 5(7) : 294.  
 1961. *Typhlodromella* Muma, *ibid.*, : 299.  
 1967. *Amblydromella* : Muma : *Fla. Ent.*, 50(4) : 276.  
 1972. *Typhlodromus* (*Anthoseius*) : Ehara, *Mushi*, 46(12) : 138.  
 1973. *Amblydromella* : Denmark & Muma, *Rev. Brazil Biol.*, 33(2) : 269.  
 1974. *Amblydromella* : Chaudhri *et al.*, : 208.  
 1975. *Amblydromella* : Denmark & Muma, *J. Agr. Univ. Puerto Rico*, 59(4) : 300.  
 1978. *Typhlodromus* : Ragusa & Swirski, *Internat. J. Acarol.*, 4(3) : 211.  
 1978. *Amblydromella* : Denmark & Muma, *Internat. J. Acarol.*, 4(1) : 18.  
 1978. *Amblydromella* : Knisley & Denmark, *Fla. Ent.*, 61(1) : 14.  
 1981. *Amblydromella* : Matthysse & Denmark, *Fla. Ent.*, 64(2) : 351.  
 1982. *Amblydromella* : Daneshvar & Denmark, *Internat. J. Acarol.*, 8(1) : 7.

*Diagnosis* : Dorsal shield well sclerotized, reticulate with 18 pairs of setae of those 10 pairs of laterals, 2 pairs of median and 6 pairs of dorsocentrals, among them  $Z_5$  and  $Z_4$  often thick and serrate, the former may be knobbed ; 2 pairs of sublateral setae on lateral integu-

ment. Sternal shield with 3 pairs of sternal setae. Ventrianal shield with 4 pairs of preanal setae. Macrosetae present on genu, tibia and basitarsus of leg IV, which may be simple or knobbed.

Type : *Typhlodromus fleschneri* Chant, 1960 by designation Muma, 1961.

*Key to the species of subgenus Amblydromella*

1. Seta $Z_5$ knobbed and serrate	...	2
— Seta $Z_5$ not knobbed, but may be serrate	...	8
2. Macrosetae present only on basitarsus IV	...	3
— Macrosetae present on other leg segments besides basitarsus IV	...	5
3. $Z_4$ almost touches the base of $Z_5$	...	<i>fleschneri</i>
— $Z_4$ much shorter than the distance between its base and that of $Z_5$	...	4
4. Ventrianal shield more than $1\frac{1}{2}$ times as long as wide	...	<i>himalayensis</i>
— Ventrianal shield less than $1\frac{1}{2}$ times as long as wide	...	<i>homalii</i>
5. Macroseta present on genu, tibia and basitarsus of leg IV	...	6
— Macroseta present on genu and basitarsus of leg IV ; absent on tibia IV	...	<i>mori</i>
6. Ventrianal shield almost as long as or only slightly longer than wide, macrosetae on genu IV and tibia IV unequal	...	7
— Ventrianal shield distinctly longer than wide, macroseta on genu IV and tibia IV almost equal	...	<i>sonprayagensis</i>
7. Spermatheca corniform	...	<i>darjeelingensis</i>
— Spermatheca sacculiform	...	<i>bambusicolus</i>
8. Setae comparatively longer, $Z_4$ almost touches the base of $Z_5$	...	9
— Setae comparatively shorter ; $Z_4$ never reaches upto the base of $Z_5$	...	10
9. Macroseta present on genu, tibia and basitarsus of leg IV, all knobbed	...	<i>nilgiriensis</i>
— Macroseta present only on basitarsus IV, simple	...	<i>gopali</i>
10. Macroseta simple	...	11
— Macroseta knobbed	...	13

- |  |                        |
|--|------------------------|
| 11. $z_3$ reaches upto base of $z_2$ ...   | <i>rhenanus</i>        |
| — $z_2$ much shorter than distance between its base and that of $z_3$ ...                | 12                     |
| 12. Setae $j_3, z_3, z_4, s_4$ , small, length vary between 10-15 ; macrosetae blunt ... | <i>arunachalensis</i>  |
| — Setae $j_3, z_3, z_4, s_4$ long, length vary between 15-25 ; macrosetae pointed ...    | <i>rhododendronis</i>  |
| 13. Spermatheca with elongate cervix, movable digit without teeth ...                    | <i>chrysanthemi</i>    |
| — Spermatheca with saccular cervix, movable digit with 2 teeth ...                       | <i>kodaikanalensis</i> |

### 108. *Typhlodromus (Amblydromella) arunachalensis* Gupta

(Figs. 634-640)

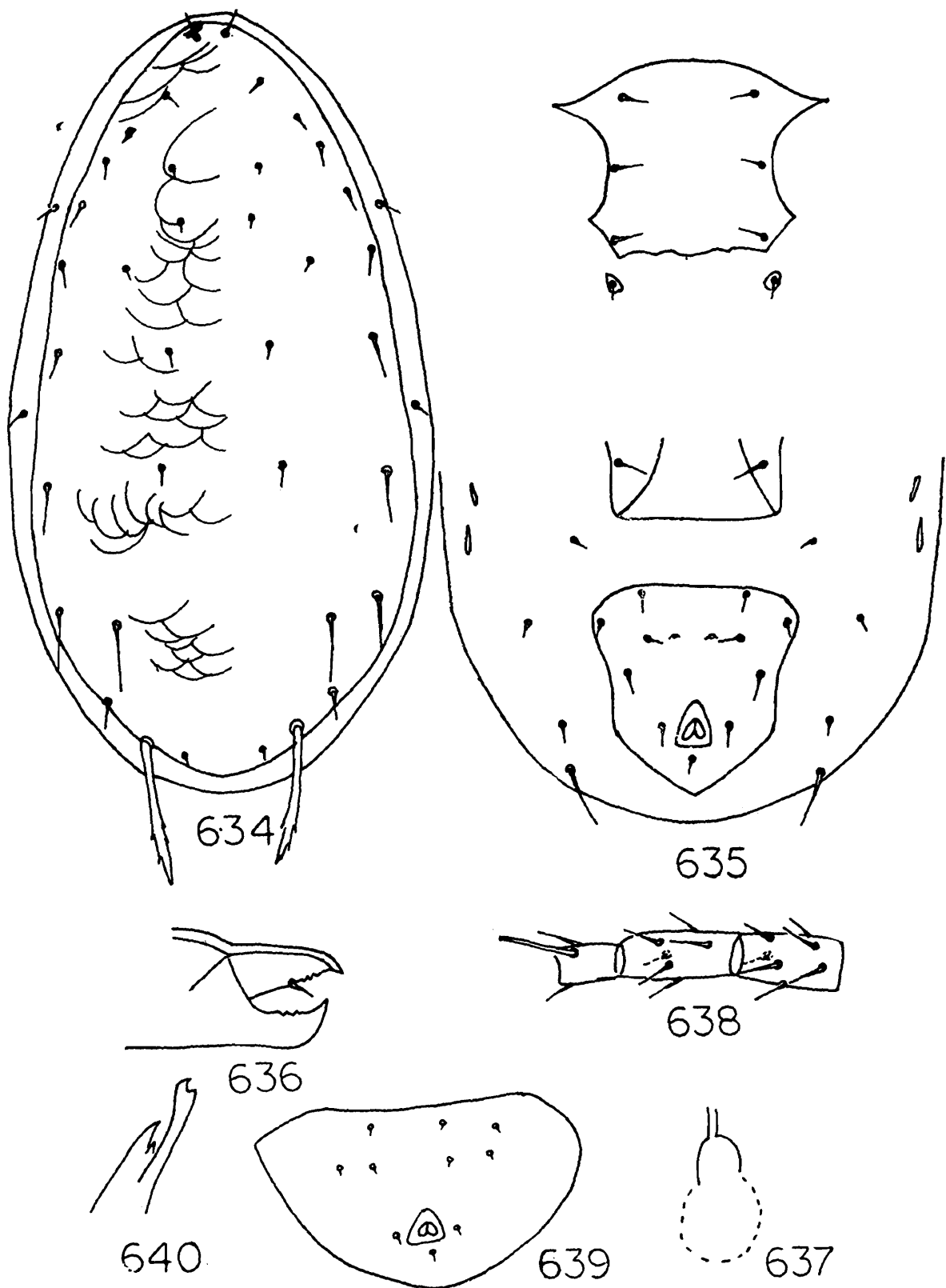
*Typhlodromus (Amblydromella) arunachalensis* Gupta, *Oriental Ins.* (in press).

**Female :** Dorsal shield reticulate, 302 long. 146 wide with 18 pairs of setae,  $Z_5$  being serrate, other setae smooth,  $Z_4$  shorter than the distance between its base and that of  $S_5$  ; anterolateral setae shorter than the distance from their bases and those of following setae. Measurements of setae :  $j_1$ -14,  $j_4$ -9,  $j_5$ -11,  $j_8$ -14,  $J_2$ -15,  $J_5$ -4,  $j_3$ -13,  $z_2$ -10,  $z_3$ -11,  $z_4$ -13,  $s_4$ -15,  $s_8$ -22,  $S_2$ -22,  $S_4$ -24,  $S_5$ -12,  $Z_5$ -47 (weakly serrate and blunt ended),  $z_5$ -13,  $Z_4$ -34,  $r_3$ ,  $R_1$ -13 each, both on lateral integument. Ventrally, sternal shield almost as long (74) as broad with 3 pairs of sternal setae, 4th pair lie on well defined metasternal plates. Genital shield 56 wide with a pair of setae. Ventrianal shield as figured, 78 long, 78 wide, with 4 pairs of preanal setae ; para and postanal setae present as usual ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -29 long ; 2 pairs of metapodal plates present, primary one 16 long. Chelicera with 3 teeth anterior to strong *pilus dentilis*, movable digit with also 2 teeth. Spermatheca as figured. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Macrosetae absent on genu and tibia IV but present on basitarsus IV-35 long (blunt ended). Peritreme extends anteriorly upto  $j_1$ .

**Male :** Ventrianal shield and spermatophoral process as figured.

**Type locality and repository :** Holotype ♀, India : Arunachal Pradesh, Likabali, on fern, 17.xi.1981, Coll. S. K. Gupta, deposited in ZSI, Calcutta, Reg. No. 3472/17. Paratypes 2 ♀♀, 1 ♂, data same as for holotype, Reg. No. 3473-74/17.

**Remarks :** This species is very close to *Typhlodromus (Amblydromella) rhododendronis* Gupta (1978a) but differs in relative



Figs. 634-640. *Typhlodromus (Amblydromella) arunachalensis* Gupta  
 634. Dorsal shield  
 635. Ventral surface  
 636. Chelicera (female)  
 637. Spermatheca  
 638. Genu, tibia and basitarsus of leg IV  
 639. Ventrianal shield (male)  
 640. Spermatophoral processes

length of  $Z_4$ ,  $z_3-z_4$ , in having  $S_5$  shorter and in shape of spermatheca. From *T. (A.) insularis* Ehara (1966) and *T. (A.) octavus* (Chaudhri *et al.*, 1974) it differs in relative length of dorsal idiosomal setae and from *T. balakotiensis* (Chaudhri *et al.*, 1974) it differs in shape of spermatheca.

109. *Typhlodromus (Amblydromella) bambusicolus* Gupta

(Figs. 641-644)

1977. *Typhlodromus bambusicolus* Gupta, *Indian J. Acar.*, 2 : 2-4.

*Female* : Dorsal shield well sclerotized, reticulate, 290 long, 160 wide, with 18 pairs of setae. Except  $Z_5$ , all other setae short and never touch the bases of the following setae. Measurements of setae :  $j_1$ -12,  $j_4$ -10,  $j_5$ -11,  $j_6$ -16,  $J_2$ -20,  $J_5$ -8,  $j_3$ -15,  $z_2$ -12,  $z_3$ -12,  $z_4$ -16,  $s_4$ -16,  $s_6$ -20,  $S_2$ -20,  $S_4$ -22,  $S_5$ -12,  $Z_5$ -44,  $z_5$ -14,  $Z_4$ -24,  $r_3$  and  $R_1$  each 16 long, both on lateral integument,  $Z_4$  and  $Z_5$  serrate, the latter with slightly knobbed tip. Sternal shield well sclerotized, 68 long, 56 wide, with 3 pairs of sternal setae, metasternal plates distinct with seta. Genital shield 60 wide, narrower than greatest width of ventrianal shield with a pair of setae ; a fold present between genital and ventrianal shields. Ventrianal shield as figured, 76 long, 72 wide, with 3 pairs of preanal setae and a pair of preanal pores ; 4 pairs of setae present around ventrianal shield,  $JV_5$ -27 long, blunt ended ; 2 pairs of metapodal plates present, both being short. Fixed digit of chelicera multidentate, teeth on movable digit not discernible. Spermatheca as figured. Leg chaetotactic formula ; genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{2}{1} \frac{1}{1} 1$ . Macrosetae on leg IV : genu-8, tibia-12, basitarsus-20, all with knobbed tip.

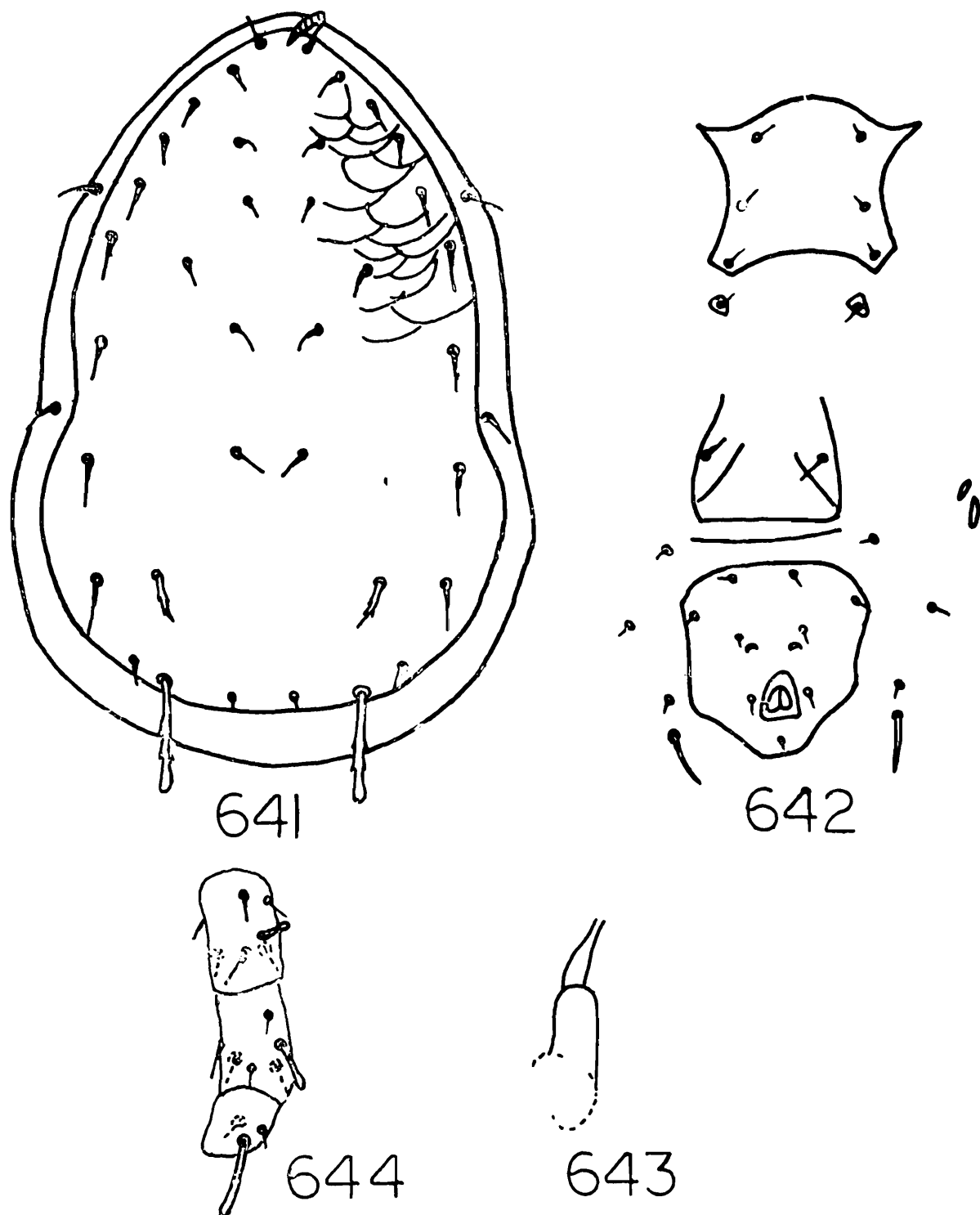
*Male* : Unknown.

*Habitat* : Bamboo, citrus.

*Type locality and repository* : Holotype ♀, India : Assam, Mikir hills, on bamboo, deposited in ZSI, Calcutta, Reg. No. 3475/17. Paratype 1 ♀, Assam, Nowgong, on citrus.

*Distribution* : India: Assam.

*Remarks* : This species is known only from its types.



Figs. 641-644. *Typhlodromus (Amblydromella) bambusicolus* Gupta

641. Dorsal shield

642. Ventral surface

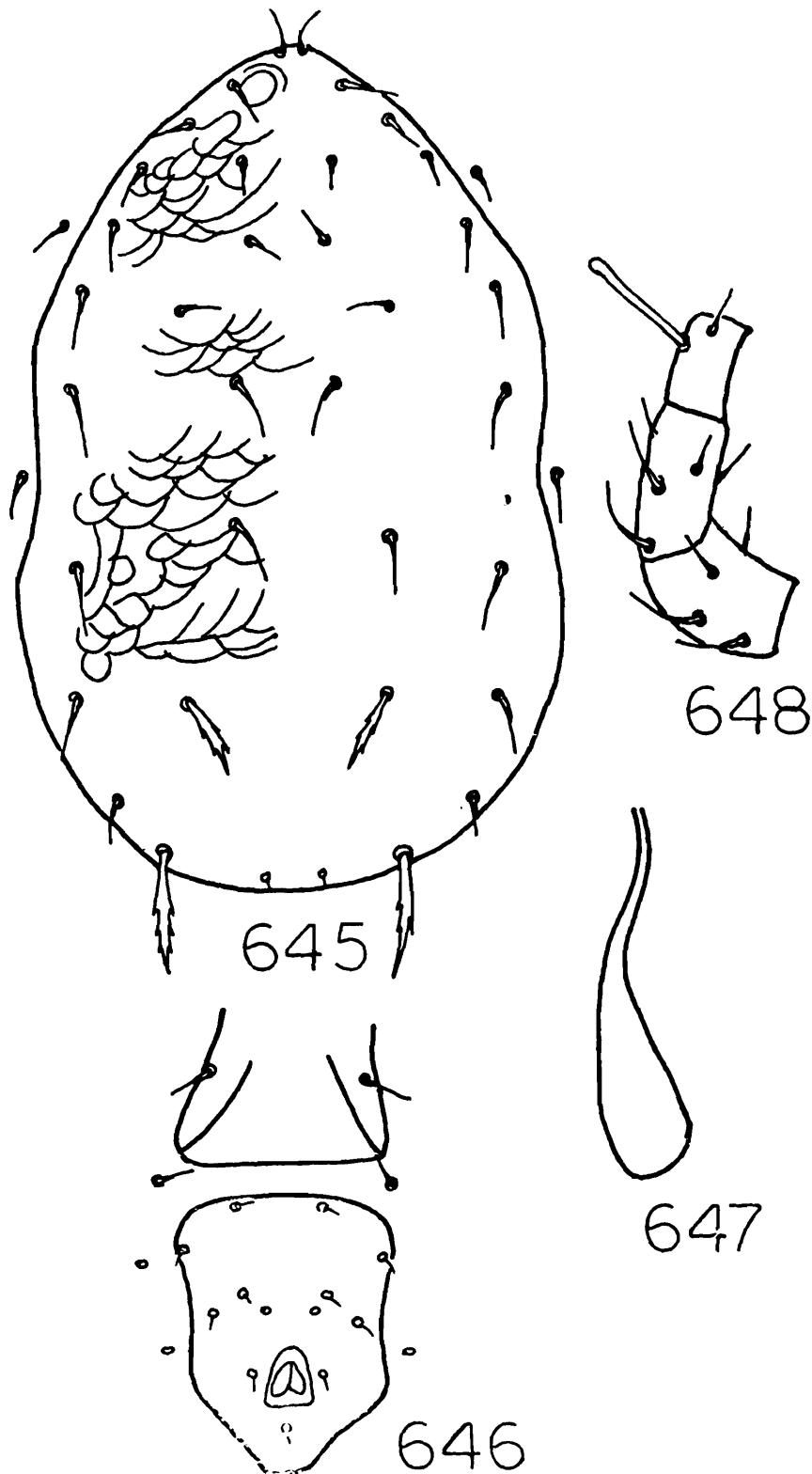
643. Spermatheca

644. Genu, tibia and basitarsus of leg IV

110. *Typhlodromus (Amblydromella) chrysanthemi* Gupta  
(Figs. 645-648)

1977. *Typhlodromus chrysanthemi* Gupta, *Indian J. Acar.*, 1 : 11-12.

*Female* : Dorsal shield well sclerotized, reticulate, 312 long,



Figs. 645-648. *Typhlodromus (Amblydromella) chrysanthemi* Gupta  
 645. Dorsal shield  
 646. Posterior ventral surface  
 647. Spermatheca  
 648. Genu, tibia and basitarsus of leg IV

200 wide, with 18 pairs of setae, mostly thin and small except  $Z_4$  and  $Z_5$  which are thick and serrate. Setae  $j_1, j_4-j_6, z_2, z_3, z_4, z_5$  almost subequal;  $s_6 = S_2, S_4 = Z_4$ . Measurements of setae:  $j_1-21, j_4-20, j_5-20, j_6-20, J_2-25, J_5-8, j_3-18, z_2-20, z_3-20, z_4-22, s_4-26, s_6-28, S_2-29, S_4-32, S_5-18, Z_5-48, z_5-20, Z_4-33, R_1-32$ . Sternal shield margin indistinct with 3 pairs of setae. Genital shield 76 wide with a pair of genital setae. Ventrianal shield 108 long, 80 wide, slightly concave at the preanal region with 4 pairs of preanal setae and a pair of preanal pores present; 4 pairs of setae present around ventrianal shield; 2 pairs of metapodal plates present. Fixed digit of chelicera multidentate, movable digit without tooth. Spermatheca as in figure, Leg IV macroseta only on basitarsus-28 long.

*Male* : Unknown.

*Habitat* : Chrysanthemum.

*Type locality and repository* : Holotype ♀, India : Gujarat, Jamnagar, Jubilee Garden, on chrysanthemum, deposited in ZSI, Calcutta, Reg. No. 3476/17.

*Distribution* : India : Gujarat.

*Remarks* : This species is known only from its type. It is distinguished from *T. (A.) kodaikanalensis* Gupta (1978) by dentition of chelicera as the movable digit is without tooth in *chrysanthemi* and with 2 teeth in *kodaikanalensis*,

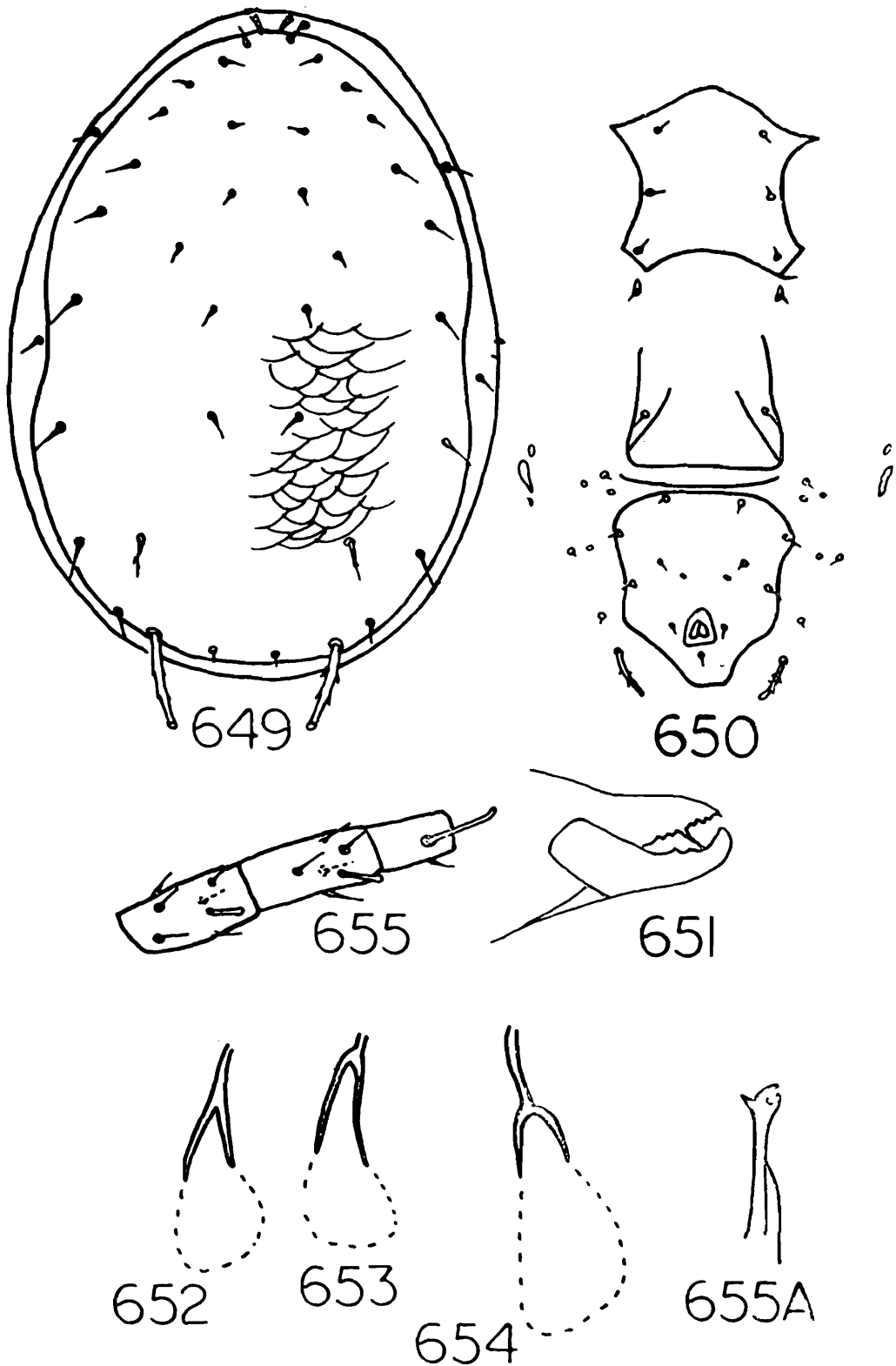
### 111. *Typhlodromus (Amblydromella) darjeelingensis* non. nov.

(Figs. 649-655, 655a)

1970. *Typhlodromus insularis* : Gupta, *Sci. & Cult.*, 36 : 98 (misidentification).  
 1970. *Typhlodromus bakeri* : Gupta, *Sci. & Cult.*, 36 : 98 (misidentification).  
 1971. *Typhlodromus caudiglans* : Gupta *et al.*, *Sci. & Cult.*, 37 : 298 (misidentification).  
 1974. *Typhlodromus caudiglans* : Prasad, A catalogue of mites of India, p. 173.  
 1974. *Typhlodromus insularis* : Prasad, A catalogue of mites of India, p. 174.  
 1974. *Typhlodromus bakeri* : Prasad, A catalogue of mites of India, p. 173.  
 1978. *Typhlodromus eharai* Gupta, *Bull. Zool. Surv. India*, 1 : 54.  
 1980. *Typhlodromus eharai* : Gupta, *Entomologists' mon. Mag.*, 115 : 209-210.  
 1982. *Typhlodromus eharai* : Gupta, *Indian J. Acar.*, 6 : 30.

*Female* : Dorsal shield reticulate, 285-295 long, 170-180 wide, with 18 pairs of setae, all smooth except  $Z_5$  and  $Z_4$  which are serrate, the latter being knobbed distally. Measurements of setae:  $j_1-10, j_4-10-11, j_5-12, j_6-15-16, J_2-16-18, J_5-10-15, j_3-14-16, z_2-10-12, z_3-12-13, z_4-15-16, s_4-17-18, s_6-20, S_2-22-24, S_4-22-24, S_5-12-15, Z_5-40, z_5-12-16, Z_4-21-24, r_3-14-16, R_1-14-16$ . Ventrally, sternal shield longer than wide,

with 3 pairs of sternal setae, metasternal plate conspicuous with seta. Genital shield 55-67 wide, with a pair of setae. Ventrianal shield



Figs. 649-655, 655A. *Typhlodromus (Amblydromella) darjeelingensis* nom. nov.

649. Dorsal shield

650. Ventral surface

651. Chelicera

652-654. Spermathecae

655. Genu, tibia and basitarsus of leg IV

655A. Spermatophoral process

slightly longer (84-88) than wide (72-75) with 4 pairs of preanal setae ; a fold present between genital and ventrianal shields, 4 pairs of setae present around ventrianal shield,  $JV_5-26$  long (knobbed) ; 2 pairs of metapodal plates present. Fixed digit of chelicera with 3-4 teeth anterior to *pilus dentilis*, movable digit with 3 teeth. Spermatheca as illustrated. Leg chaetotactic formula : genu II  $2 \frac{2}{3} \frac{2}{3} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{3} \frac{2}{1} 1$ , tibia III  $1 \frac{2}{1} \frac{1}{1} 1$ . Macrosetae on leg IV : genu 8-9, tibia 15-16, basitarsus-24-29, all with knobbed tip. Peritreme extends anteriorly beyond  $j_1$  and gently curves inwards.

*Male* : Chaetotaxy of dorsal shield as in female. Spermatophoral process as illustrated. Macrosetae on leg IV : genu-8-9, tibia-15-16, basitarsus-24-29.

*Habitat* : *Cassia* sp., coffee, plum, mango, *Syzygium cumini*, also on an undetermined plant.

*Type locality and repository* : Holotype ♀, India : Darjeeling Dist., Lataguri, on an undetermined plant, deposited in ZSI, Calcutta, Reg. No. 3477/17. Paratypes 2 ♀ ♀, same data as for holotype, Reg. No. 3478-79/17.

*Distribution* : India : West Bengal, Tripura, Karnataka, Tamil Nadu, Punjab, Uttar Pradesh.

*Remarks* : Since *T. (A.) eharai* Gupta, 1980 is a preoccupied name, [*Typhlodromus (Amblydromella) eharai* (Muma & Denmark, 1969)], a new name *T. (A.) darjeelingensis* is proposed here. This species resembles *T. (A.) bambusicolus* Gupta (1977b) but in *bambusicolus*, the spermatheca is sacculiform and in the latter the same is corniform. Earlier, this species was confused with *T. (A.) insularis* Ehara and *T. (A.) caudiglans* Schuster, but in the present investigation it was found that both identifications were wrong and both refer to *T. (A.) darjeelingensis* *nom. nov.* This species is fairly common specially in northeast India.

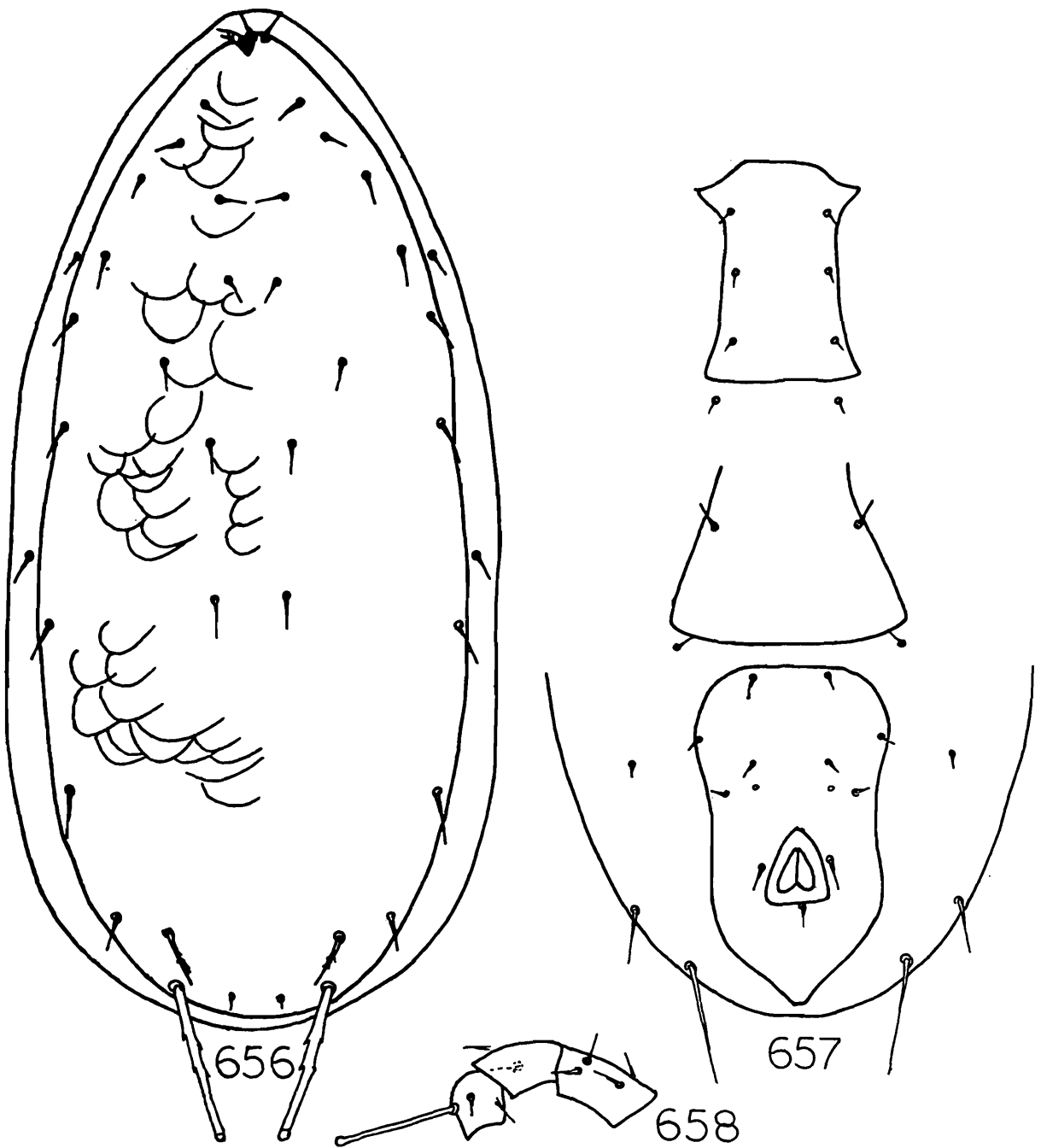
## 112. *Typhlodromus (Amblydromella) fleschneri* Chant

(Figs. 656-658)

1960. *Typhlodromus (Typhlodromus) fleschneri* Chant, *Can. Ent.*, 92 : 60-62.  
 1964. *Typhlodromus fleschneri* : Ghai, *In Entomology in India*, p. 390.  
 1970. *Typhlodromus fleschneri*, Gupta, *Sci. & Cult.*, 36 : 98.  
 1974. *Typhlodromus fleschneri* : Prasad, *A catalogue of mites of India*, p. 173.  
 1977. *Typhlodromus fleschneri*, Gupta, *Indian J. Acar.*, 2 : 6.

*Female* : Dorsal shield reticulate, elongate, 358 long, 177 wide, with 18 pairs of setae ;  $Z_5$  serrate, knobbed at the tip, other setae smooth,

$Z_4$  appears to be weakly serrate, barely touches the base of  $Z_5$ ,  $j_3 > j_1$ ,  $z_2 = z_3$ ,  $z_4 = s_4 = s_6 = S_2 = S_4 > S_5$ ; anterolateral setae shorter than the distance between bases of the following setae. Measurements of setae:  $j_1$ -14,  $j_4$ -16,  $j_5$ -17,  $j_6$ -19,  $J_2$ -20,  $J_5$ -8,  $j_3$ -22,  $z_2$ -20,  $z_3$ -20,  $z_4$ -22,  $s_4$ -23,  $s_6$ -24,  $S_2$ -24,  $S_4$ -24,  $S_5$ -16,  $Z_5$ -45,  $z_5$ -18,  $Z_4$ -31,  $r_3$ -13,  $R_1$ -22; the sublateral setae lie on lateral integument. Sternal shield longer than wide with 3 pairs of sternal setae, metasternal plate indistinct, seta present. Genital shield 89 wide with a pair of setae. Ventrianal



Figs. 656-658. *Typhlodromus (Amblydromella) fleschneri* Chant

656. Dorsal shield

657. Ventral surface

658. Genu, tibia and basitarsus of leg IV

shield 112 long, 80 wide with 4 pairs of preanal setae and a pair of preanal pores present below the level of 3rd pair of preanal setae, 4 pairs of setae present on the membrane around ventrianal shield, 2 pairs of metapodal plates present. Spermatheca not discernible. Macroseta present only on basitarsus IV-45 long (knobbed).

*Male* : Chant (1960) mentioned that dorsal chaetotaxy is similar as in female.

*Habitat* : Orange, lemon, *Gossypium herbaceum*.

*Type locality and repository* : Holotype ♀, India : Karnataka, Mercara, on orange, deposited in Canadian National Collection, No. 7005. Paratypes 2 ♀ ♀, 1 ♂, same data and repository as for holotype ; 3 ♀ ♀, Meghalaya, Shillong, on citrus ; 1 ♀, Assam, Burnihat, on citrus ; 1 ♀, Bangalore, on lemon, all deposited in Citrus Expt. Station, Riverside, California.

*Distribution* : India : Assam, West Bengal, Karnataka, Meghalaya.

*Remarks* : A slide of this species bearing label : "Darjeeling Rd, 3/3/1959, Citrus (A. P.)," borrowed from Dr. D. A. Chant, was examined and the above description is based upon that specimen. This species is distinguished from *T. (A.) umbratus* (Chaudhri *et al.*, 1974) by absence of platelets around ventrianal shield.

### 113. *Typhlodromus (Amblydromella) gopali* Gupta

(Figs 659-663)

1969. *Typhlodromus gopali* Gupta, *Sci. & Cult.*, 35 : 277.

1974. *Typhlodromus gopali* : Gupta & Dhooria, *Proc. Indian Sci. Congr.*, 1974 : 69.

1974. *Typhlodromus gopali* : Prasad, A catalogue of mites of India, p. 174.

1977. *Typhlodromus gopali* : Gupta, *Indian J. Acar.*, 1 : 12.

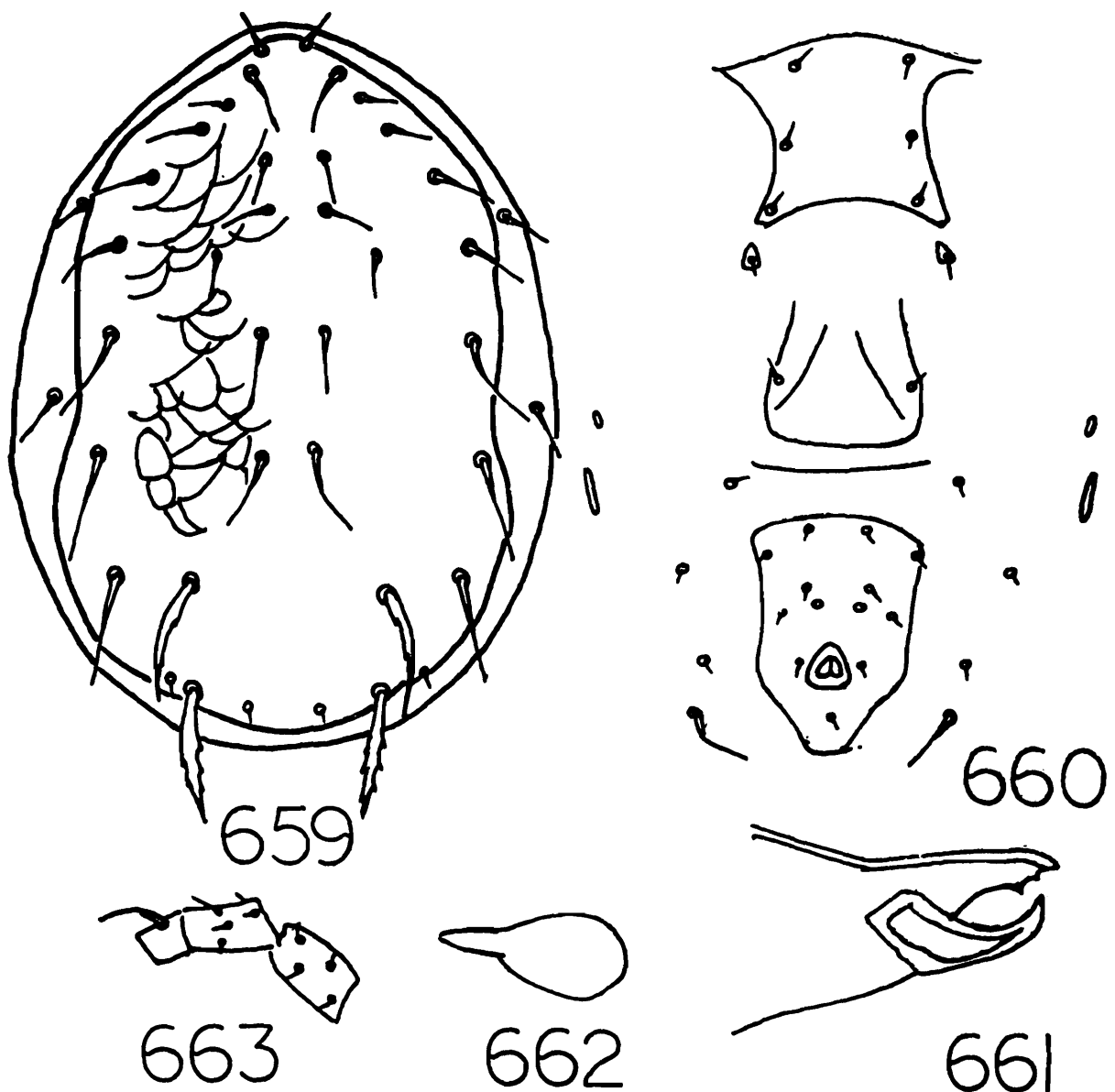
*Female* : Dorsal shield 298 long, 192 wide, reticulate with 18 pairs of setae and 5 pairs of pores, all setae smooth and simple excepting  $Z_5$  and  $Z_4$  which are thick and serrate. Measurements of setae :  $j_1$ -19,  $j_4$ -22,  $j_5$ -22,  $j_6$ -31-34,  $J_2$ -40,  $J_5$ -9,  $j_3$ -27,  $z_2$ -18,  $z_3$ -24,  $z_4$ -27,  $s_4$ -36,  $s_6$ -45,  $S_2$ -52,  $S_4$ -52,  $S_5$ -6,  $Z_5$ -56,  $z_5$ -22,  $Z_4$ -55,  $r_3$ -20,  $R_1$ -27. Sternal shield 67 wide with 3 pairs of sternal setae, 4th pair of sternal setae lie on metasternal plates. Genital shield 67 wide with a pair of genital setae. Ventrianal shield longer (63) than wide, with 4 pairs of preanal setae and a pair of preanal pores ; 4 pairs of setae present around ventrianal shield ;  $JV_5$ -36 long ; 2 pairs of long metapodal plates present, primary one 27 long, accessory one 9 long. Spermatheca as figured. Fixed digit of chelicera with 2 teeth, movable digit with no

tooth. Peritreme extends anteriorly upto  $j_1$ . Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Leg IV with macroseta only on basitarsus IV-27 long,

*Male* : Unknown.

*Habitat* : Palm.

*Type locality and repository* : Holotype ♀, India : West Bengal, Calcutta, Eden garden, on palm tree, deposited in ZSI, Calcutta, Reg. No. 3480/17. Paratypes 3 ♀ ♀, same data and repository as for holotype, Reg. No. 3481-83/17.



Figs. 659-663. *Typhlodromus (Amblydromella) gopali* Gupta

659. Dorsal shield

660. Ventral surface

661. Chelicera (female)

662. Spermatheca

663. Genu, tibia and basitarsus of leg IV

*Distribution* : India : West Bengal, Rajasthan, Punjab, Himachal Pradesh.

*Remarks* : This species is very close to *T. (A.) divergentis* (Chaudhri *et al.*, 1974) from which it differs in shape of spermatheca as spermatheca is funnel shaped in *gopali* and saccular in *divergentis*.

#### 114. *Typhlodromus (Amblydromella) himalayensis* Gupta

( Figs. 664-668 )

1981. *Typhlodromus himalayensis* Gupta, *Indian J. Acar.*, 5(1-2) : 32-33.

1982. *Typhlodromus himalayensis* : Gupta, *Indian J. Acar.*, 6 : 31.

*Female* : Dorsal shield 310 long, 200 wide, well sclerotized, faintly reticulate with 18 pairs of setae. Measurements of setae :  $j_1$ -12,  $j_4$ -10,  $j_5$ -12,  $j_6$ -16,  $J_2$ -16,  $J_5$ -8,  $j_3$ -14,  $z_2$ -18,  $z_3$ -15,  $z_4$ -16,  $s_4$ -20,  $s_6$ -24,  $S_2$ -24,  $S_4$ -25,  $S_5$ -17,  $Z_5$ -40 (serrate, knobbed),  $z_5$ -16,  $Z_4$ -24,  $r_3$ -14,  $R_1$ -16. Sternal shield with 3 pairs of sternal setae, metasternal plate indistinct. Genital shield 69 wide, with a pair of setae. Ventrianal shield 108 long, 68 wide, with 4 pairs of preanal setae and a pair of preanal pores ; 2 pairs of metapodal plates present, primary one 16 long, accessory one 12 long ; 4 pairs of setae present on the membrane around ventrianal shield. Fixed digit of chelicera 3-4 teeth and a strong *pilus dentilis*, movable digit with 2 small teeth. Peritreme extends anteriorly upto  $j_1$  and slightly bends inwards. Spermatheca as figured. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{2}{1} \frac{1}{1} 1$ . Macroseta only on basitarsus IV-36 (knobbed).

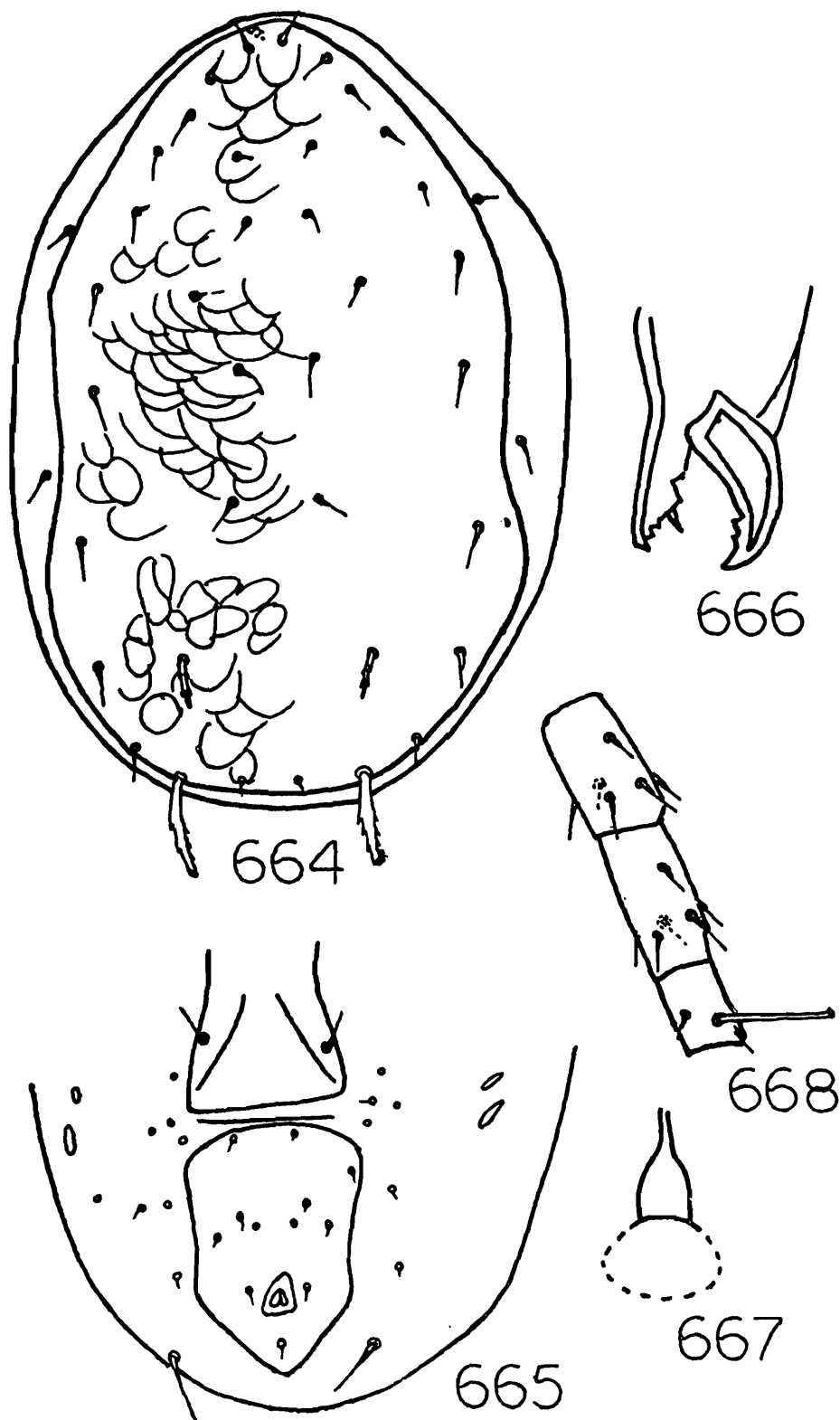
*Male* : Unknown.

*Habitat* : Pear, pine cone.

*Type locality and repository* : Holotype ♀, India : Himachal Pradesh, Kangra, on pear, deposited in ZSI, Calcutta, Reg. No. 3128/17. Paratype 1 ♀, same data and repository as for holotype, Reg. No. 3128/17.

*Distribution* : India : Uttar Pradesh, Himachal Pradesh.

*Remarks* : This species differs from *T. (A.) dactylifera* (Chaudhri *et al.*, 1974) in relative length of  $j_1$ - $j_6$  and  $J_2$  which are comparatively shorter in this species.



Figs. 664-668. *Typhlodromus (Amblydromella) himlayensis* Gupta

- 664. Dorsal shield
- 665. Posterior ventral surface
- 666. Chelicera (female)
- 667. Spermatheca
- 668. Genu, tibia and basitarsus of leg IV

115. *Typhlodromus (Amblydromella) homalii* Gupta  
( Figs. 669-675 )

1970. *Typhlodromus homalii* Gupta, *Oriental Ins.*, 4(2) : 188-189.  
 1974. *Typhlodromus homalii* : Gupta & Dhooria, *Proc. Indian Sci Congr.*, 1974 : 69.  
 1974. *Typhlodromus homalii* : Prasad, A catalogue of mites of India, p. 174.  
 1974. *Amblydromella plebius* Chaudhri, Akbar & Rasool, p. 209-211 (new synonymy).  
 1977. *Typhlodromus homalii* : Gupta, *Indian J. Acar.*, 1 : 12.  
 1977. *Typhlodromus homalii* : Gupta, *Indian J. Acar.*, 2 : 6.  
 1978. *Typhlodromus homalii* : Gupta, *Bull. Zool. Surv. India*, 1 : 52.  
 1981. *Typhlodromus homalii* : Gupta & Nahar, *In Contrib. to Acar in India*, p. 16.  
 1982. *Typhlodromus homalii* : Gupta, *Rec. zool. Surv. India*, 79(3-4) : 369.

*Female* : Dorsal shield 310-320 long, 175-190 wide, reticulate, with 18 pairs of setae, Setae  $Z_4$ ,  $Z_5$  serrate, latter with knobbed tip. Measurements of setae :  $j_1$ -16-18,  $j_4$ -14-18,  $j_5$ -13-20,  $j_6$ -16-20,  $J_2$ -17-22,  $J_5$ -7-9,  $j_3$ -16-20,  $z_2$ -14-17,  $z_3$ -18-20,  $z_4$ -15-18,  $s_4$ -18-19,  $s_6$ -20-25,  $S_2$ -21-27,  $S_4$ -24-28,  $S_5$ -16-18,  $Z_5$ -37-45,  $z_5$ -16-18,  $Z_4$ -24-28,  $r_3$ ,  $R_1$ -16-18 each. Sternal shield normal, posterior margin apparently indistinct, with 3 pairs of sternal setae ; metasternal plate with seta present. Genital shield 72 wide, with a pair of setae. Ventrianal shield 96-103 long, 75 wide, with 3 pairs of preanal setae and a pair of preanal pores, 4 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -31 long ; 2 pairs of metapodal plates present, primary one 18 long, accessory one 8-9 long. Fixed digit of chelicera multidentate, movable digit apparently toothless. Peritreme extends anteriorly upto base of  $j_1$  and then curves inwards. Spermatheca as figured. Leg chaetotactic formula : genu II 2  $\frac{\text{♀}}{\text{♂}}$   $\frac{\text{♀}}{\text{♂}}$  1, tibia II 1  $\frac{\text{♂}}{\text{♀}}$   $\frac{\text{♀}}{\text{♂}}$  1, genu III 1  $\frac{\text{♀}}{\text{♂}}$   $\frac{\text{♀}}{\text{♂}}$  1, tibia III 1  $\frac{\text{♂}}{\text{♀}}$   $\frac{\text{♀}}{\text{♂}}$  1. Macroseta present only on basitarsus IV-15-16 long (knobbed tip.).

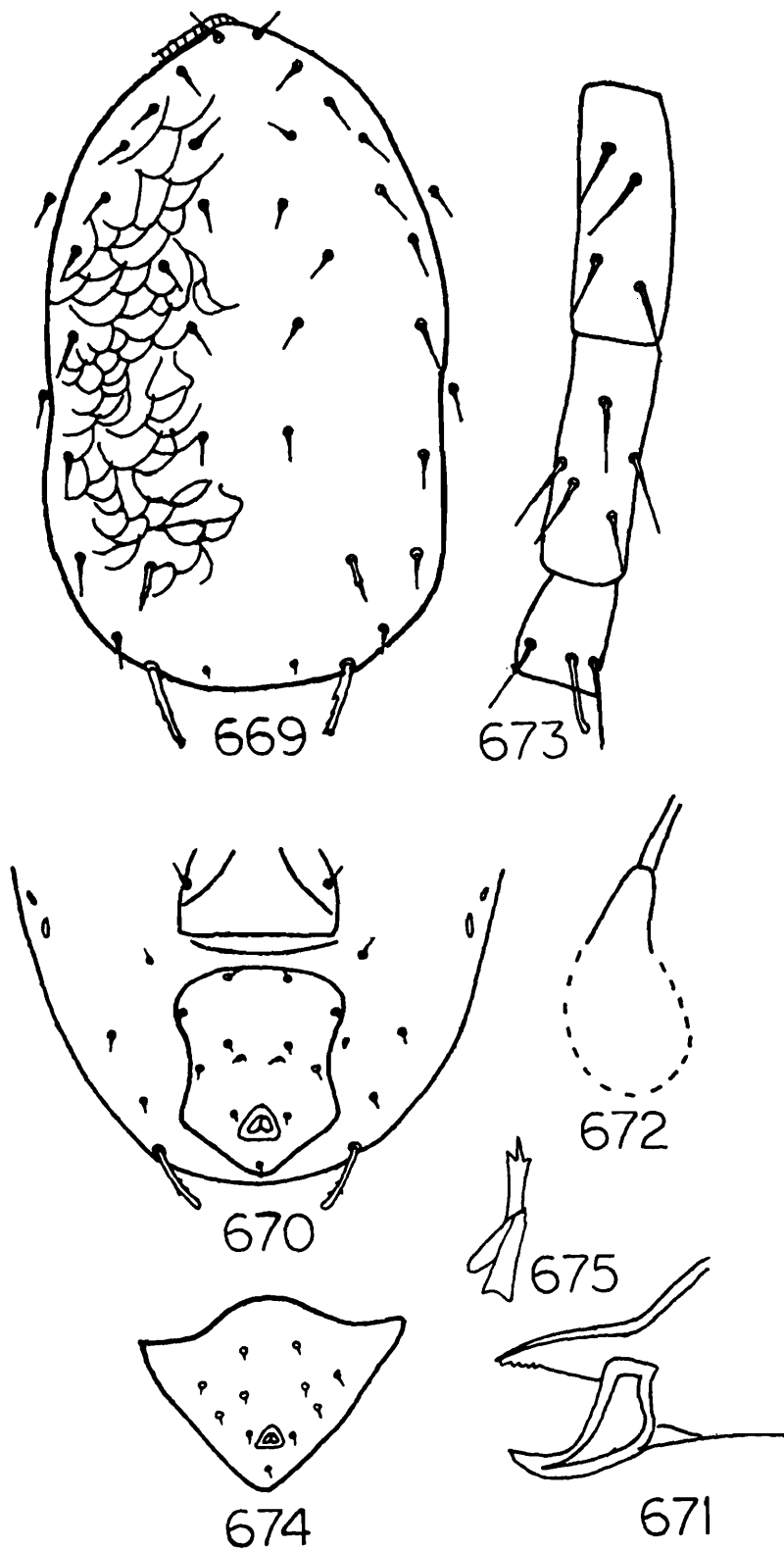
*Male* : Chaetotaxy of dorsal shield similar as in female. Ventrianal shield and spermatophoral process as figured.

*Habitat* : *Homalium tomentosum*, galls of *Zizyphus* sp., *Ficus bengalensis*, arum, citrus, *Zizyphus jujuba*.

*Type locality and repository* : Holotype ♀, India : West Bengal, Howrah, Sibpur Botanical garden, on *Homalium tomentosum*, deposited in ZSI, Calcutta, Reg. No. 3484/17. Paratypes 1 ♀, 1 ♂, same data and repository as for holotype, Reg. No. 3485-86/17.

*Distribution* : India : West Bengal, Bihar, Orissa, Meghalaya, Punjab, Himachal Pradesh, Uttar Pradesh, Kerala, Tamil Nadu.

*Remarks* : This species differs from *T. (A.) bakeri* (Garman, 1948) in relative length of  $Z_5$  and  $Z_4$ . From the original description and



**Figs. 669-675.** *Typhlodromus (Amblydromella) homalii* Gupta  
 669. Dorsal shield  
 670. Posterior ventral surface  
 671. Chelicera (female)  
 672. Spermatheca  
 673. Genu, tibia and basitarsus of leg IV  
 674. Ventrianal shield (male)  
 675. Spermatophoral process

illustration of *Typhlodromus plebius* (Chaudhri *et al.*, 1974) described from Pakistan, it appears that it is same as *T. (A.) homalii* Gupta having hardly any difference among themselves and, hence, *T. (A.) plebius* (Chaudhri *et al.*, 1974) is treated here as synonym for *T. (A.) homalii* Gupta on the basis of priority. This species appears to be fairly common in India in eastern, northern, northeastern and southern India. Often this mite was found associated with tetranychid and eriophyid mites but no feeding on them has ever been observed.

116. *Typhlodromus (Amblydromella) kodaikanalensis* Gupta  
(Figs. 676-680)

1978. *Typhlodromus kodaikanalensis* Gupta, *Bull. Zool. Surv. India*, 1(1) : 47-48.

*Female* : Dorsal shield 300 long, 165 wide, well sclerotized, reticulate, with 18 pairs of setae.  $Z_5$  thickest, all other setae smooth and simple. Except  $j_3$  which touches bases of  $z_2$ , all other setae shorter than the distance between the bases of the succeeding setae :  $s_6 = S_2 = S_4 = Z_4$ . Measurements of setae :  $j_1$ -21,  $j_4$ - $j_6$ -16 each,  $J_2$ -20,  $J_5$ -6,  $j_3$ -20,  $z_2$ -20,  $z_3$ -20,  $z_4$ -20,  $s_4$ -24,  $s_6$ -28,  $S_2$ -28,  $S_4$ -28,  $S_5$ -16,  $Z_5$ -48,  $z_5$ -16,  $Z_4$ -28,  $r_3$ -25,  $R_1$ -24. Sternal shield weakly sclerotized, with 3 pairs of sternal setae, metasternal plates with setae distinct. Genital shield 60 wide, narrower than the greatest width of ventrianal shield, with a pair of setae ; a fold and some platelets present between genital and ventrianal shields. Ventrianal shield 92 long, 76 wide, anterior margin rounded, lateral margins gently concave, with 4 pairs of preanal setae ; 4 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -34 long, 2 pairs of metapodal plates present, primary one 25 long, accessory one 16 long. Fixed digit of chelicera multidentate with *pilus dentilis*, movable digit with 3 teeth. Spermatheca as figured. Macroseta present only on basitarsus IV-40 long. Peritreme extends anteriorly upto base of  $j_1$ .

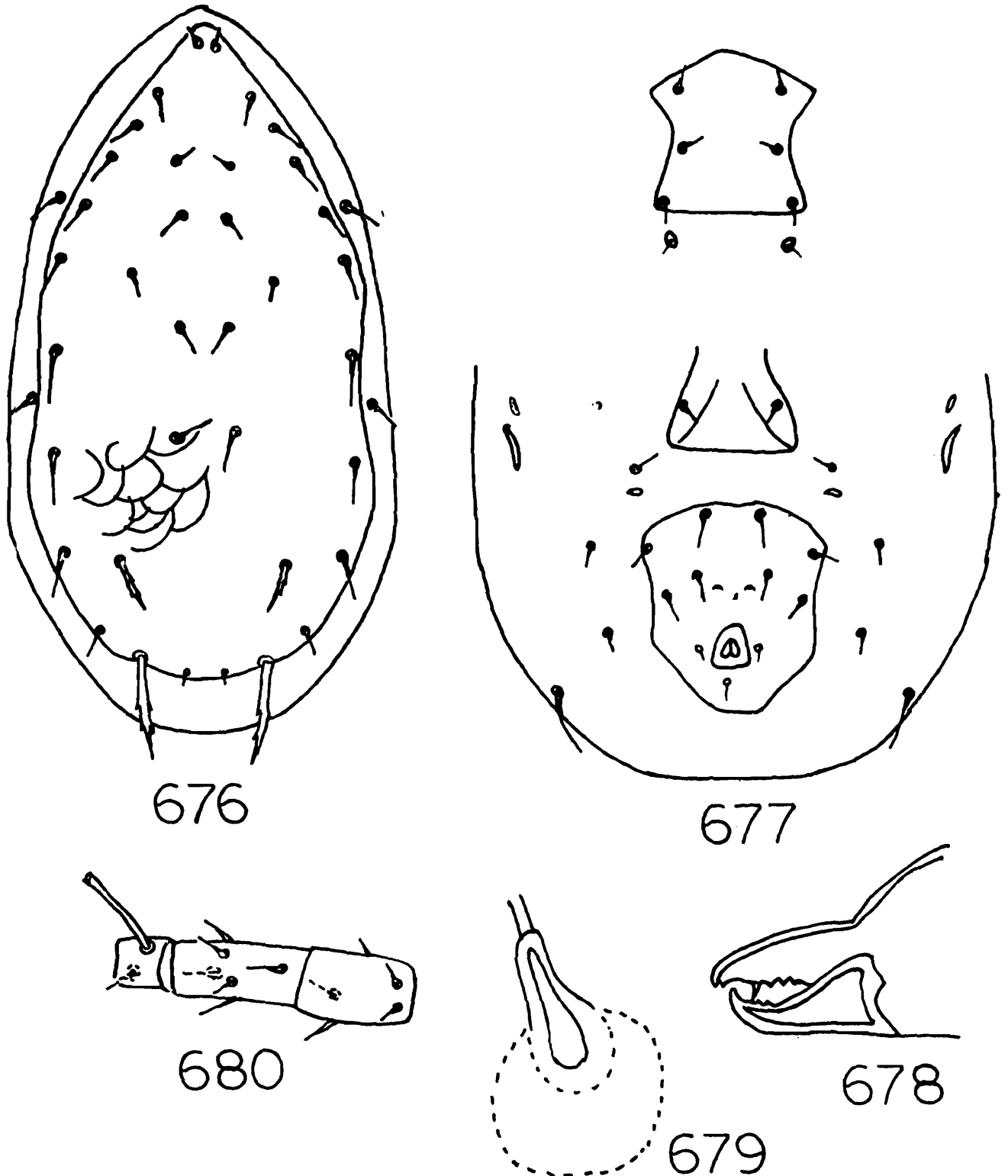
*Male* : Unknown.

*Habitat* : Pear.

*Type locality and repository* : Holotype ♀, India : Tamil Nadu, Kodaikanal, on pear, deposited in ZSI, Calcutta, Reg. No. 3487/17. Paratypes 3 ♀ ♀, same data and repository as for holotype, Reg. No 3488/17.

*Distribution* : India : Tamil Nadu.

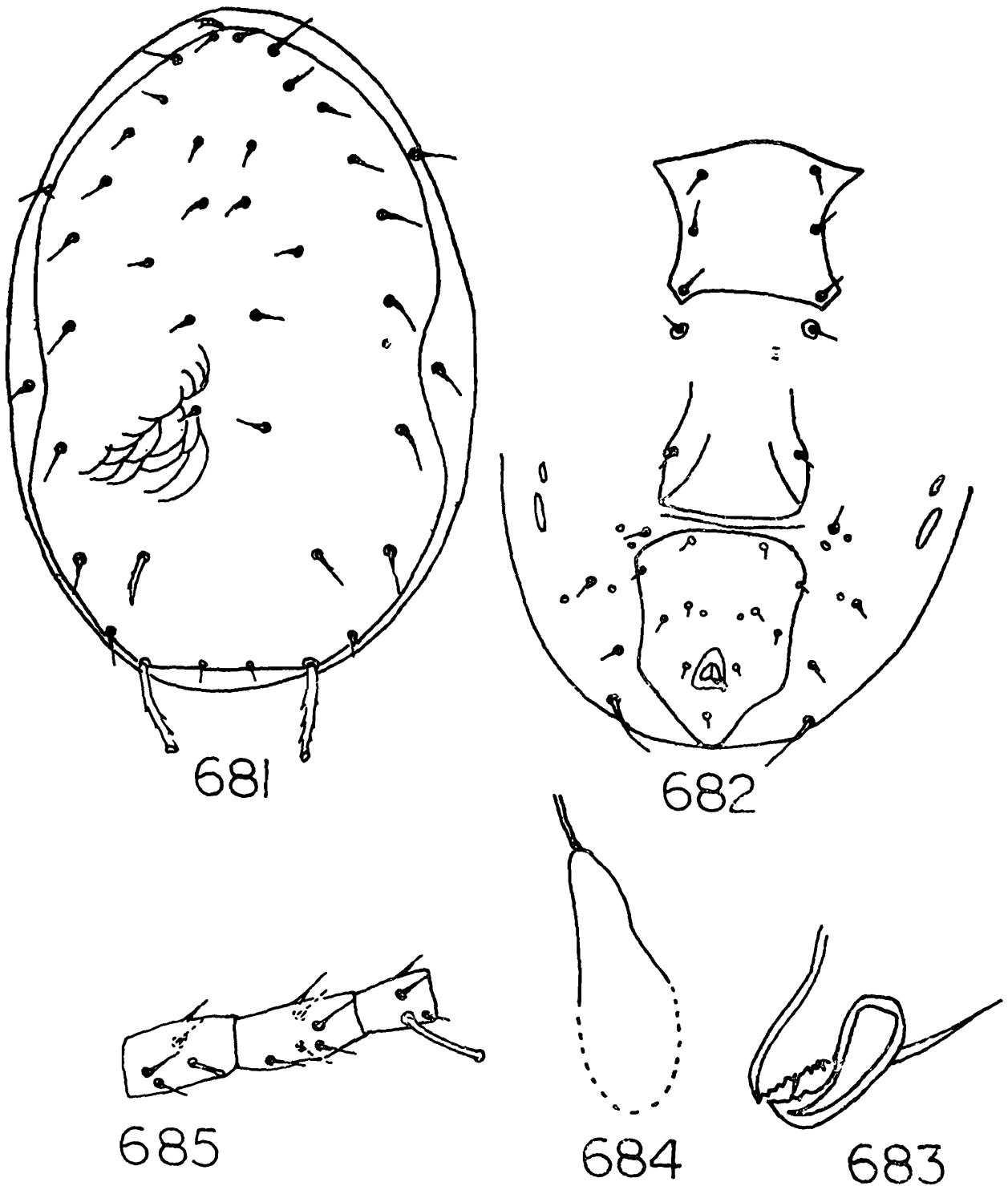
*Remarks* : It is known only from its types. It differs from *T. (A.) chrysanthemi* Gupta (1977) in dentition of chelicera and in shape of spermatheca.



Figs. 676-680. *Typhlodromus (Amblydromella) kodaikanalensis* Gupta  
 676. Dorsal shield  
 677. Ventral surface  
 678. Chelicera (female)  
 679. Spermatheca  
 680. Genu, tibia and basitarsus of leg IV

117. *Typhlodromus (Amblydromella) mori* Gupta

(Figs. 681-685)

1981. *Typhlodromus mori* Gupta, *Indian J. Acar.*, 5 : 39-40.1982. *Typhlodromus mori* : Gupta, *Indian J. Acar.*, 6 : 31.*Female* : Dorsal shield 312 long, 172 wide, well sclerotized,Figs. 681-685. *Typhlodromus (Amblydromella) mori* Gupta

681. Dorsal shield

682. Ventral surface

683. Chelicera (female)

684. Spermatheca

685. Genu, tibia and basitarsus of leg IV

reticulate, with 18 pairs of setae.  $Z_5$  serrate, knobbed,  $Z_4$  serrate, other setae simple, pointed. Measurements of setae :  $j_1$ -12-15,  $j_4$ - $j_6$ -13-16 each,  $J_2$ -20,  $J_5$ -8,  $j_3$ -22-24,  $z_2$ -16,  $z_3$ -20,  $z_4$ -20,  $s_4$ -20-24,  $s_6$ -24-26,  $S_2$ -27,  $S_4$ -27-29,  $S_5$ -20-25,  $Z_5$ -45-53,  $z_5$ -13-16,  $Z_4$ -28-31,  $r_3$ ,  $R_1$ -16 each. Sternal shield as long (75) as broad (77) with 3 pairs of sternal setae, metasternal plates with seta distinct. Genital shield 64-66 wide, with a pair of setae. Ventrianal shield longer (100-110) than wide (80-90) with 4 pairs of preanal setae and a pair of preanal pores, 2 pairs of metapodal plates present, primary one 24 long, accessory one-12 long ; 4 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -32 long, smooth. Peritreme extends anteriorly upto base of  $j_1$  and slightly curves inwards. Fixed digit of chelicera multidentate, *pilus dentilis* strong ; movable digit with 2 sharp teeth. Spermatheca as figured. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III,  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Macrosetae on leg IV : genu-10 (knobbed), tibia-macroseta apparently indistinguishable from other tibial setae, basitarsus-36 (knobbed).

*Male* : Unknown.

*Habitat* : Mulberry, apple, pear.

*Type locality and repository* : Holotype ♀, India : Jammu & Kashmir, Udhampur, on mulberry, deposited in ZSI, Calcutta, Reg. No. 3094/17. Paratypes 2 ♀ ♀, Jammu & Kashmir, Achhabal, on apple, deposited in ZSI, Reg. No. 3095/17.

*Distribution* : India : Jammu & Kashmir.

*Remarks* : In the original description it was pointed out that tibia IV without macroseta. In fact, the setae of tibia being all simple and macroseta as such is indistinguishable in contrast to those on genu and basitarsus IV which are all well differentiated and both being knobbed.

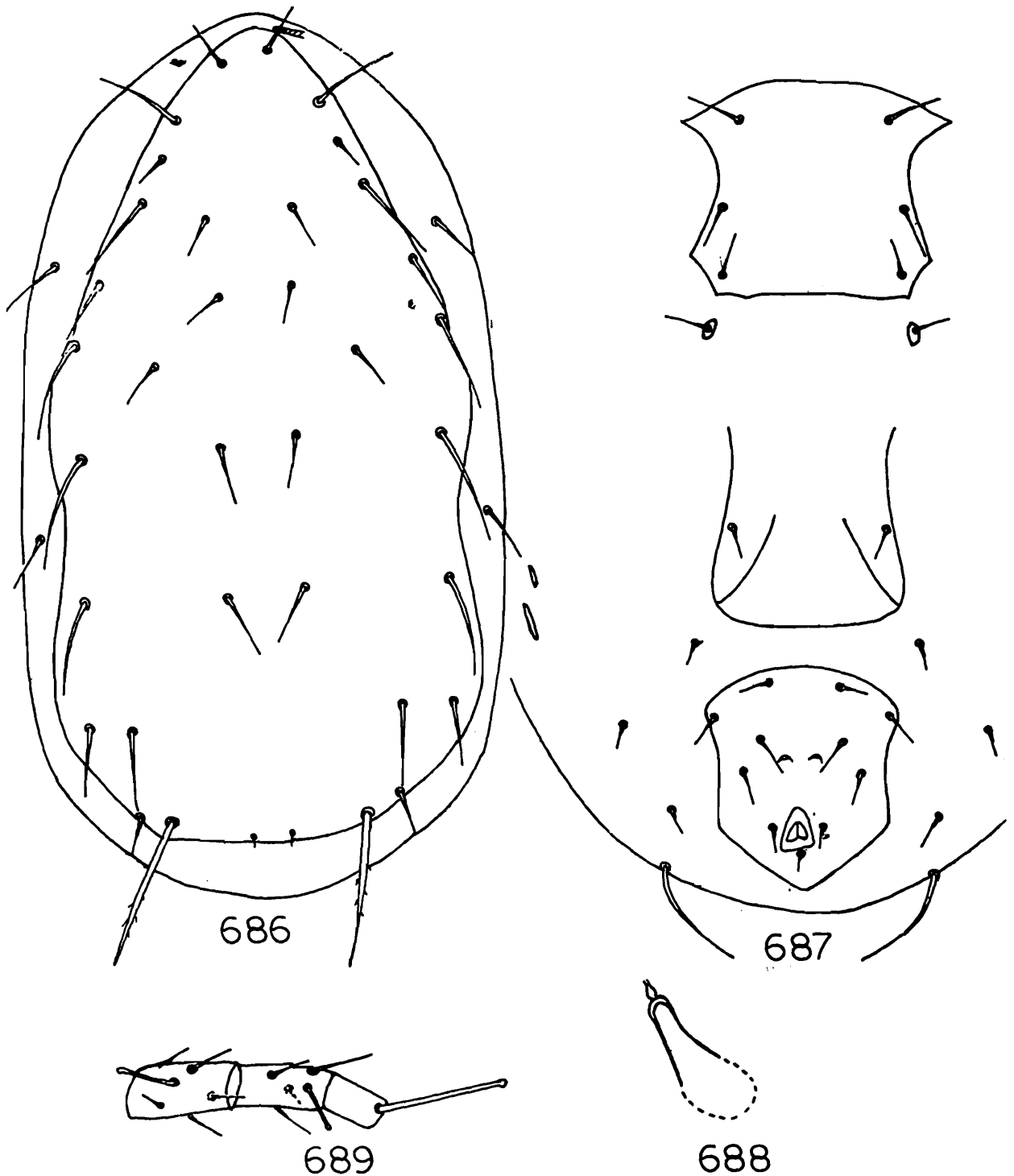
### 118. *Typhlodromus (Amblydromella) nilgiriensis* Gupta

(Figs. 686-689)

*Typhlodromus (Amblydromella) nilgiriensis* Gupta, *Indian J. Acar.* (in press).

*Female* : Dorsal shield 355 long, 212 wide, smooth, well sclerotized, with 18 pairs of setae and 6 pairs of pores ; all setae simple except  $Z_5$  and  $Z_4$  which are weakly serrate. Measurements of setae :  $j_1$ -22,  $j_4$ -22,  $j_5$ -22,  $j_6$ -29,  $J_2$ -40,  $J_5$ -5,  $j_3$ -35,  $z_2$ -11,  $z_3$ -44,  $z_4$ -29,  $s_4$ -49,  $s_6$ -56,  $S_2$ -50,  $S_4$ -33,  $S_5$ -29,  $Z_5$ -78,  $z_5$ -26,  $Z_4$ -49,  $r_3$ ,  $R_1$ -25-26 each. Sternal shield smooth with 3 pairs of sternal setae, 4th pair lie on triangular meta-

sternal plates. Genital shield 100 wide with a pair of genital setae. Ventrianal shield 112 long, 100 wide, shaped as figured, lateral margins concave, with 4 pairs of preanal setae and a pair of preanal pores, 4 pairs of setae present on the membrane around ventrianal shield,  $JV_5-42$  long (smooth, pointed); 2 pairs of metapodal plates present, primary one 22 long, accessory one 6 long. Dentition of chelicera not discernible.



Figs. 686-689. *Typhlodromus (Amblydromella) nilgiriensis* Gupta

686. Dorsal shield

687. Ventral surface

688. Spermatheca

689. Genu, tibia and basitarsus of leg IV

Spermatheca as figured. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Macrosetae on leg IV : genu-39, tibia-33, basitarsus-62, all knobbed. Peritreme extends anteriorly upto base of  $j_1$ .

*Male* : Unknown.

*Type locality and repository* : Holotype ♀, India : Tamil Nadu, Top Slip, 16.ii.1982, on an undetermined tree, Coll. Y. N. Gupta, deposited in Z. S. I., Calcutta, Reg. No. 3489/17.

*Remarks* : This species differs from *T. (A.) rhenanus* (Oudemans, 1905) in relative length of dorsal idiosomal setae and in having knobbed macrosetae on genu, tibia and basitarsus of leg IV. It is also close to *T. (A.) kikuyuensis* Swirski & Ragusa (1978) but differs in shape of sternal shield, in relative length of  $s_4$ ,  $z_2$ ,  $z_3$ ,  $s_6$  and  $Z_4$  and in having macrosetae on genu, tibia and basitarsus of leg IV. It also differs from *T. (A.) invectus* Chant (1959) in having 4 pairs of setae around ventrianal shield and 4 pairs of setae on ventrianal shield instead of 5 pairs around shield and 3 pairs on the shield ; further  $s_4$  is comparatively longer in this species. Lastly, from *T. (A.) bambusae* Ehara (1964) it differs in shape of ventrianal shield.

### 119. *Typhlodromus (Amblydromella) rhenanus* (Oudemans)

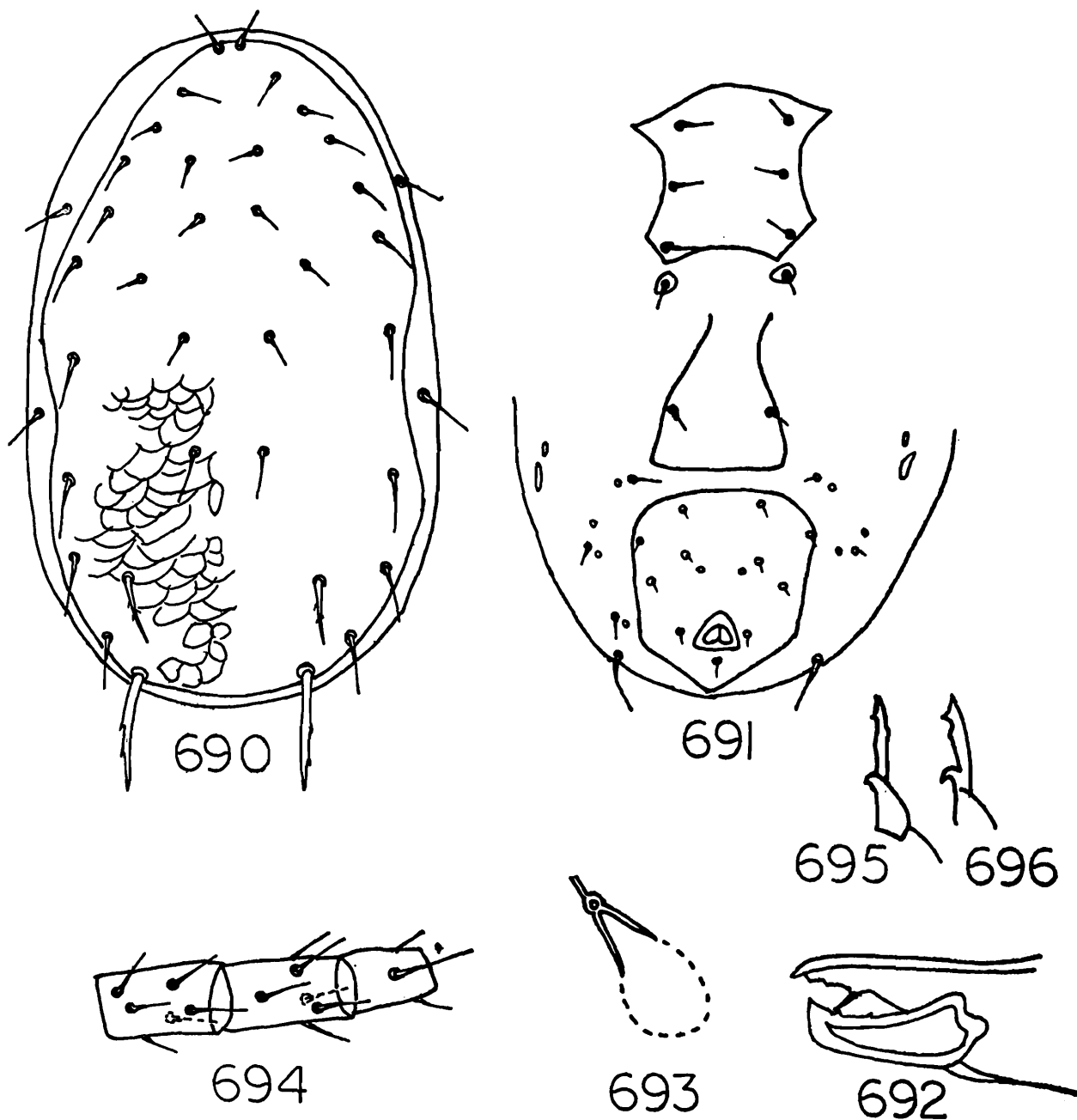
(Figs. 690-696)

1905. *Seiulus rhenanus* Oudemans, *Tij. Ent.*, 48 : 78.  
 1951. *Typhlodromus rhenanus* : Nesbitt, *Zool. Verh.*, 12 : 38-39.  
 1964. *Typhlodromus (Typhlodromus) rhenanus* : Narayanan, Kaur & Ghai, *Proc. Nat. Inst. Sci.*, 29B : 539-541.  
 1964. *Typhlodromus (Typhlodromus) rhenanus* : Ghai, *In Entomology in India*, p. 391.  
 1971. *Typhlodromus rhenanus* : Gupta, Dhooria & Sidhu, *Sci & Cult.*, 37 : 484.  
 1974. *Typhlodromus rhenanus* : Gupta, *Ent. Rec.*, 86 : 143.  
 1974. *Typhlodromus rhenanus* : Prasad, *A catalogue of mites of India*, p. 174-175.  
 1977. *Typhlodromus rhenanus* : Gupta, *Indian J. Acar.*, 1 : 12.  
 1981. *Typhlodromus rhenanus* : Gupta, *Indian J. Acar.*, 5 : 43.

*Female* : Dorsal shield 325 long, 195 wide, reticulate with 18 pairs of setae,  $Z_6$  serrate, other setae smooth. Measurements of setae :  $j_1$ -16,  $j_4$ -16,  $j_5$ -16,  $j_6$ -16,  $J_2$ -20,  $J_5$ -5,  $j_3$ -17,  $z_2$ -14,  $z_3$ -20,  $z_4$ -20,  $s_4$ -25,  $s_6$ -25,  $S_2$ -32,  $S_4$ -32,  $S_5$ -28,  $Z_5$ -56,  $z_5$ -16,  $Z_4$ -36. Sternal shield as long as wide with 3 pairs of sternal setae, 4th pair lie on metasternal plates. Genital shield 68 wide with a pair of genital setae. Ventrianal shield 96 long, 80 wide, with 4 pairs of preanal setae and a pair of preanal pores ; 4 pairs of setae and some small platelets present around ventrianal

shield ;  $JV_5$ -40 long ; 2 pairs of metapodal plates present, primary one 20 long, accessory one-12 long. Fixed digit of chelicera with 2-3 sharp teeth anterior to *pilus dentilis*, movable digit with 2 teeth. Spermatheca as figured. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Macroseta on basitarsus IV only-36 long.

*Male* : Spermatophoral process as figured.



Figs. 690-696. *Typhlodromus (Amblydromella) rhenanus* (Oudemans)

690. Dorsal shield

691. Ventral surface

692. Chelicera (female)

693. Spermatheca

694. Genu, tibia and basitarsus of leg IV

695, 696. Spermatophoral processes

*Habitat* : Mango, pine litter.

*Type locality and repository* : Holotype, ♀ (?), Germany, Bennel, near Bonn, from rotting leaves, deposited in Rijksmuseum van Natuurlijke Historie, Leiden.

*Distribution* : India : Delhi, Punjab, Himachal Pradesh, Jammu & Kashmir ; outside India : USA, USSR, U. K., Canada, Israel, Netherlands, France, Belgium.

*Remarks* : This is a fairly wide spread mite and in India it is restricted to northern India. In other parts of the world, it is quite common on fruit trees. Possibly, it is indigenous to north temperate zone and may be useful in controlling tetranychid mites (Nesbitt, 1951).

## 120. *Typhlodromus (Amblydromella) rhododendroni* Gupta

(Figs. 697-700)

1978. *Typhlodromus rhododendroni* Gupta, *Bull. Zool. Surv. India*, 1(1) : 50.

*Female* : Dorsal shield 272 long, 160 wide, weakly sclerotized, reticulate, with 18 pairs of setae. Excepting  $Z_5$  and  $Z_4$  which are serrate, others are smooth and simple. Measurements of setae :  $j_1$ -16,  $j_4$ -16,  $j_5$ -18,  $j_6$ -20,  $J_2$ -25,  $J_5$ -8,  $j_3$ -25,  $z_2$ -16,  $z_3$ -20,  $z_4$ -20,  $s_4$ -24,  $s_6$ -25,  $S_2$ -26,  $S_4$ -32,  $S_5$ -20,  $Z_5$ -44,  $z_5$ -20,  $Z_4$ -36,  $r_3$ -20,  $R_1$ -18. Sternal shield weakly sclerotized, with 3 pairs of sternal setae, 4th pair lie on metasternal plates. Genital shield narrower (56) than greatest width of ventrianal shield, with a pair of setae. Ventrianal shield 84 long, 60 wide, lateral margins concave with 4 pairs of preanal setae ; 4 pairs of setae and some small platelets present around ventrianal shield,  $JV_5$ -32 long ; 2 pairs of metapodal plates present. Fixed digit of chelicera with 3 teeth placed anteriorly, movable digit with one tooth. Spermatheca as figured. Macroseta on basitarsus IV-25 long.

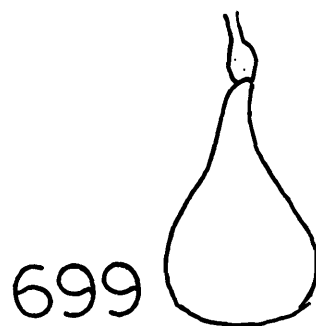
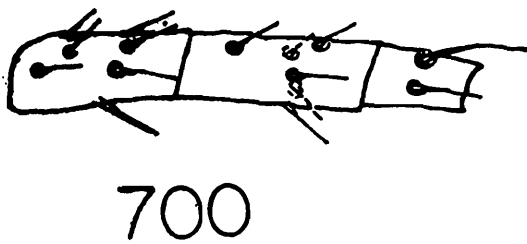
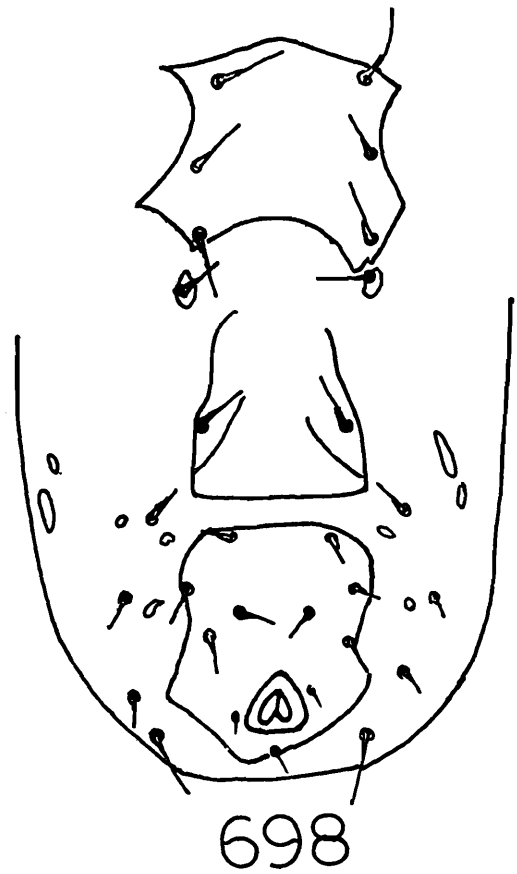
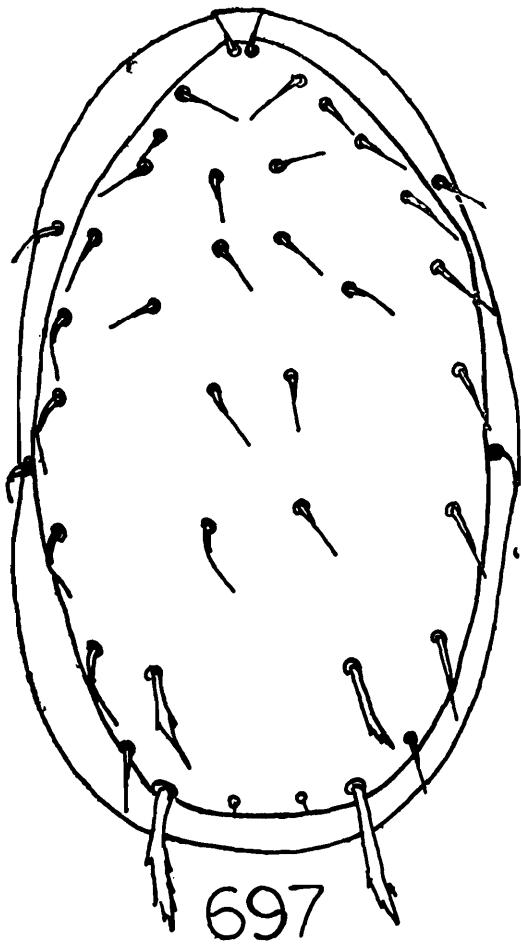
*Male* : Unknown.

*Habitat* : *Rhododendron arboreum*.

*Type locality and repository* : Holotype ♀, India : Karnataka, Gundelpet, on *Rhododendron arboreum*, deposited in ZSI, Calcutta, Reg. No. 3490/17. Paratypes 2 ♀ ♀, same data as for holotype, Reg. No. 3491/17.

*Distribution* : India : Karnataka.

*Remarks* : This species is known from its types only. It differs from *T. (A.) rhenanus* (Oudemans, 1905) in having  $S_2$  shorter than  $S_4$ .



Figs. 697-700. *Typhlodromus (Amblydromella) rhododendroni* Gupta  
 697. Dorsal shield  
 698. Ventral surface  
 699. Spermatheca  
 700. Genu, tibia and basitarsus of leg IV

121. *Typhlodromus* (*Amblydromella*) *sonprayagensis* Gupta  
( Figs. 701-705 )

*Typhlodromus* (*Amblydromella*) *sonprayagensis* Gupta, *Entomon*, 10(3) : 211-213.

*Female* : Dorsal shield reticulate, well sclerotized, 360 long, 213 wide, with 18 pairs of setae. Peritreme extends anteriorly upto  $j_1$  and gently curves inwards,  $Z_4$  about  $\frac{1}{2}$  of the distance between  $Z_4$  and  $S_5$ ;  $Z_5$  serrate, with knobbed tip,  $Z_4$  only weakly serrate at tip. Measurements of setae :  $j_1$ -14,  $j_4$ -14,  $j_5$ -16,  $J_2$ -20,  $J_5$ -6,  $j_3$ -22,  $z_2$ -16,  $z_3$ -20,  $z_4$ -18,  $s_4$ -22,  $s_6$ -22,  $S_2$ -27,  $S_4$ -27,  $S_5$ -20,  $Z_5$ -45,  $z_5$ -16,  $Z_4$ -25,  $r_3$ -23,  $R_1$ -18. Sternal shield margins indistinct however, 3 pairs of sternal setae present. Genital shield 70 wide with a pair of setae, a fold present between genital and ventrianal shields. Ventrianal shield 112 long, 85 wide, with 4 pairs of preanal setae and a pair of preanal pores, 4 pairs of setae and 2 pairs of small platelets present around ventrianal shield,  $JV_5$ -40 long (knobbed); 2 pairs of metapodal plates present, primary one 20 long, accessory one 7 long. Chelicera with 4-5 teeth anterior to strong *pilus dentilis*, movable digit with 3 teeth. Spermatheca as figured. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Macrosetae on leg IV : genu-14, tibia-16, basitarsus-35, all with knobbed tip.

*Male* : Unknown.

*Type locality and repository* : Holotype ♀, India : Uttar Pradesh, Sonprayag, on pear, 11.ix.1979, Coll. S. K. Gupta; deposited in ZSI, Calcutta, Reg. No. 3492/17. Paratype 1 ♀, data same, as for holotype, Reg. No. 3493/17 (Holotype is mounted on left side of slide; paratype-1 ♀, which is badly damaged is on right side of the same slide).

*Remarks* : This species is close to *T. (A.) galummatus* (Chaudhri *et al.*, 1974) but differs in shape of spermatheca.

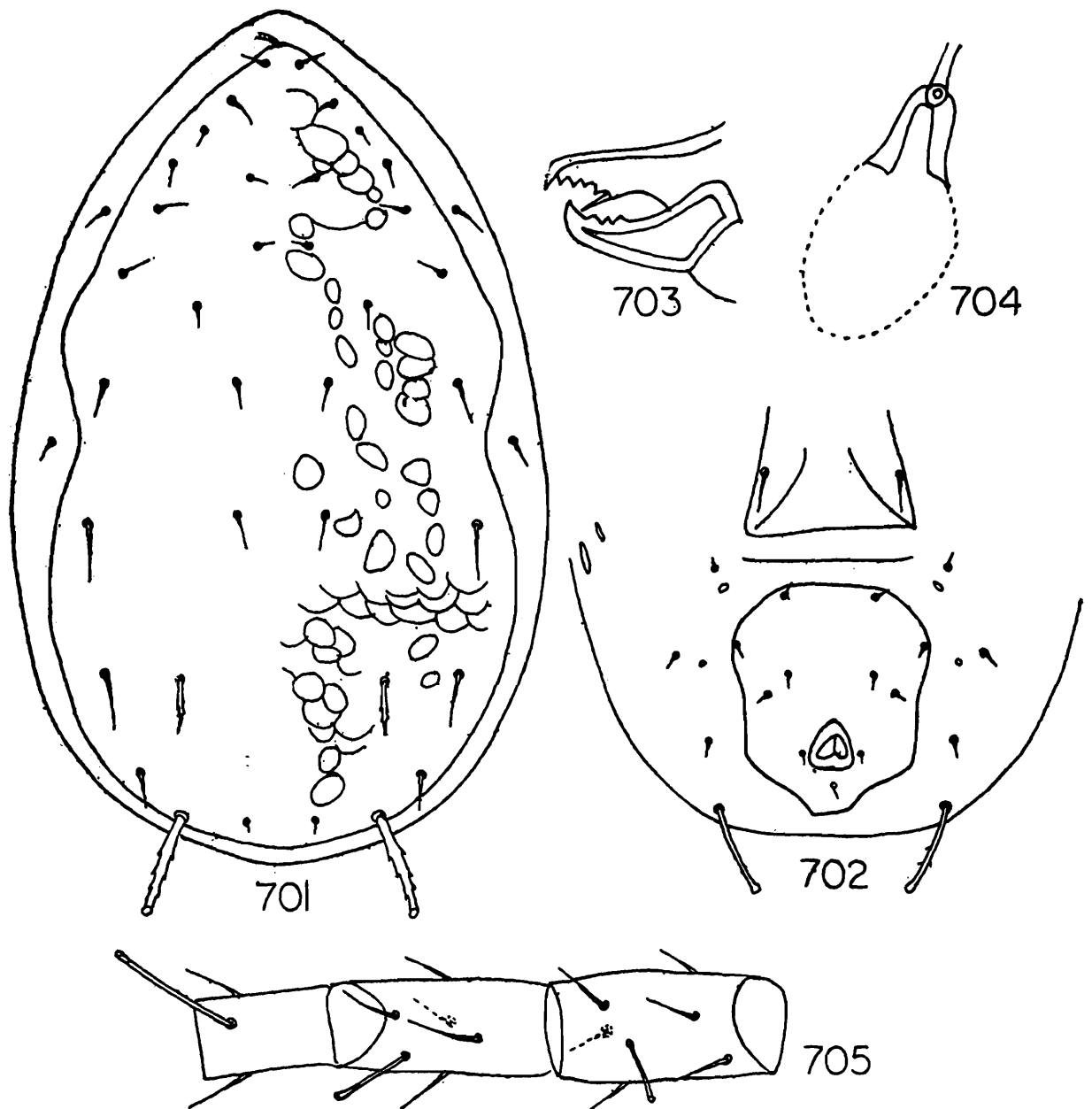
### Subgenus *Anthoseius* De Leon

1959. *Anthoseius* De Leon, *Ent. News*, 70 : 257.  
1961. *Anthoseius* : Muma, *Bull. Fla. St. Mus.*, 5(7) : 296.  
1970. *Anthoseius* : Muma & Denmark, *Arthropods of Florida*, 6 : 140.  
1978. *Typhlodromus* (*Anthoseius*) : Ehara, *Proc. Jap. Acad.*, 54(B) : 446.

*Diagnosis* : Dorsal shield reticulate with 18 pairs of setae of those 6 pairs of dorsocentrals, 2 pairs of medians, 10 pairs of laterals, all being short and simple. Dorsal shield with incision at the level of  $R_1$ ; 2 pairs of sublateral setae on lateral integument. Sternal shield with

3 pairs of sternal setae. Ventrianal shield with 3 pairs of preanal setae, 4 pairs of setae present on the membrane around ventrianal shield. Macroseta absent on leg IV.

Type : *Anthoseius hebetis* De Leon, 1959, by designation.



Figs. 701-705. *Typhlodromus (Amblydromella) sonprayagensis* Gupta  
 701. Dorsal shield  
 702. Posterior ventral surface  
 703. Chelicera (female)  
 704. Spermatheca  
 705. Genu, tibia and basitarsus of leg IV

122. *Typhlodromus* (*Anthoseius*) *majumderi* Gupta

(Figs. 706-709)

*Typhlodromus* (*Anthoseius*) *majumderi* Gupta, *Indian J. Acar.* (in press).

**Female** : Dorsal shield gently reticulate, deeply incised at the level of  $R_1$ , with 18 pairs of setae, all being smooth and simple. Measurements of setae :  $j_1$ -10,  $j_4$ -11,  $j_5$ -12,  $j_6$ -12,  $J_2$ -12,  $J_5$ -9,  $j_3$ -12,  $z_2$ -10,  $z_3$ -12,  $z_4$ -15,  $s_4$ -12,  $s_6$ -14,  $S_2$ -15,  $S_4$ -12,  $S_5$ -14,  $Z_5$ -16 (slightly thicker, smooth),  $z_5$ -14,  $Z_4$ -14,  $r_3$ -14,  $R_1$ -14. Sternal shield 78 long, 69 wide, with 3 pairs of long sternal setae ; metasternal plate triangular with seta. Genital shield 72 wide ; lateral margins incised with a pair of setae ; a fold and striation present on the interscutal membrane between genital and ventrianal shields as well as around ventrianal shield. Ventrianal shield much longer (123) than wide (90) with 3 pairs of preanal setae and a pair of preanal pores ; 4, pairs of setae and some small platelets present on the membrane around ventrianal shield ; 2 pairs of metadodal plates present, primary one 25 long, accessory one 12 long. Spermatheca as figured. Fixed digit of chelicera with 4 teeth, *pilus dentilis* apparently nondiscernible. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{1}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{0} \frac{2}{1} 1$ . Macrosetae absent on leg IV. Peritreme extends anteriorly upto  $j_1$ .

**Male** : Unknown.

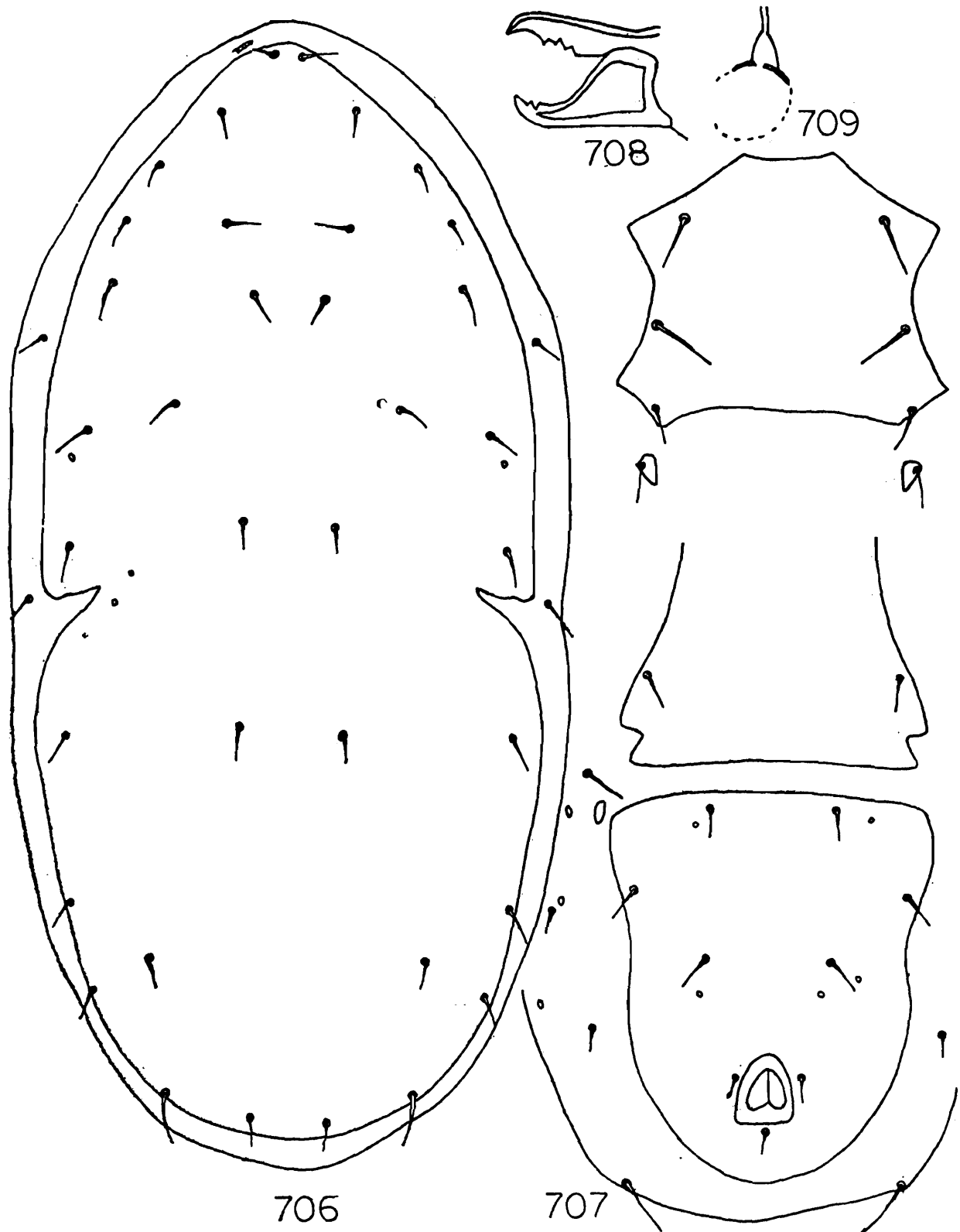
**Type locality and repository** : Holotype ♀, India : West Bengal, Kalyani, on *Heliotropium indicum*, 14.vii.1979, Coll. S. C. Majumder, deposited in ZSI, Calcutta, Reg. No. 3494/17. Paratype 1♀, same data as for holotype, Reg. No. 3495/17.

**Remarks** : This species differs from *T. singularis* Chant (1977), in having dorsal shield with cleft at the level of  $R_1$ , in having 2 pairs of metapodal plates and also in having small platelets around ventrianal shield. From *T. algonquinensis* Chant *et al.*, (1974) it differs in relative length of dorsal idiosomal setae, in shape of ventrianal shield and in spermatheca. Finally, from *T. ternatus* Ehara (1972) it differs in having dorsum deeply cleft, basitarsus IV without macroseta and in having small idiosomal setae.

**Subgenus Brethria** Tuttle & Muma1973. *Brethria* Tuttle & Muma, *Tech. Bull. Agr. Exp. Sta. Univ. Arizona*, 208 : 35.

**Diagnosis** : Dorsal shield reticulate with 6 pairs of dorsocentrals, 2 pairs of medians and 9 pairs of laterals ; 2 pairs of sublateral setae

present on lateral integument. Sternal shield entire with 3 pairs of setae. Ventrianal shield pentagonal with 4 pairs of preanal setae. Macroseta present only on basitarsus IV. Peritreme extends anteriorly upto  $j_1$ . Chelicera normal.



Figs. 706-709. *Typhlodromus (Anthoseius) majumderi* Gupta

706. Dorsal shield

707. Ventral surface

708. Chelicera (female)

709. Spermatheca

Type : *Brethria arizonica* Tuttle and Muma, 1973, by designation.

*Key to the species of Brethria*

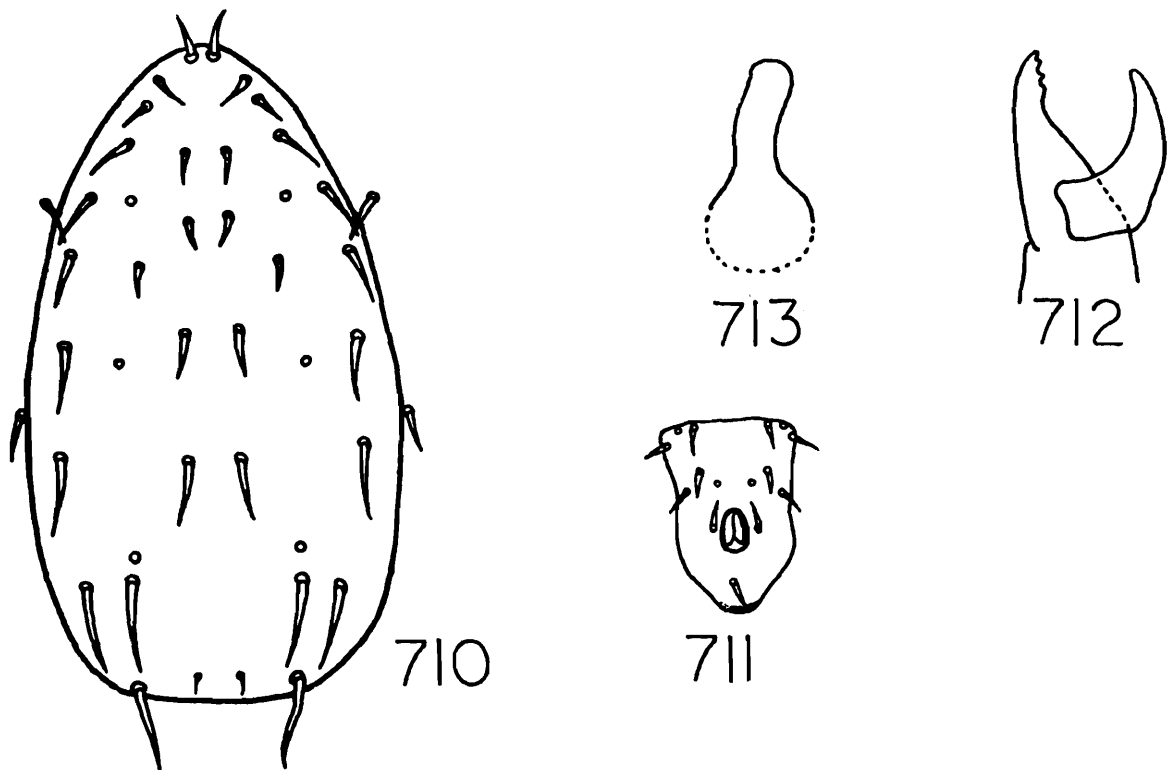
- |  |     |                   |
|--|-----|-------------------|
| 1. Ventrional shield very long, almost 2 times as long as wide, lateral margins straight | ... | <i>roshanlali</i> |
| — Ventrional shield only slightly longer than wide, lateral margins slightly concave     | ... | <i>confusus</i>   |

123. *Typhlodromus (Brethria) confusus* Narayanan, Kaur & Ghai  
(Figs. 710-713)

1960. *Typhlodromus (Typhlodromus) confusus* Narayanan, Kaur & Ghai, *Proc. Nat. Inst. Sci.*, 26B (6) : 392-393.

1974. *Typhlodromus confusus* : Prasad, A catalogue of mites of India, p. 173.

*Female* : Dorsal shield faintly reticulate, 273 long, 150 wide, with 17 pairs of setae, 9 pairs on lateral row, 2 pairs on median row and 6 pairs on dorsocentral row ; 2 pairs of sublateral setae on lateral integument, all setae smooth except  $Z_5$  and  $Z_4$  which are weakly serrate. Relative length of lateral setae ( $j_3$ - $Z_5$ ) as mentioned in original description are 7 : 5 : 7 : 8 : 9 : 12 : 13 : 13 : 13 ;  $j_1$ - $j_5$  almost of same length,



Figs. 710-713. *Typhlodromus (Brethria) confusus* Narayanan, Kaur and Ghai  
(after Narayanan *et. al.*, 1960)

710. Dorsal shield  
711. Ventrional shield (female)  
712. Chelicera (female)  
713. Spermatheca

$j_6$  slightly longer,  $J_2$  being longest among setae on dorsocentral series ;  $Z_4$  shorter than  $Z_5$  and never touches the base of the latter. Sternal shield normal. Ventrianal shield longer (85) than broad (52) with 4 pairs of preanal setae and a pair of preanal pores ; metapodal plates two paired, primary one elongate, accessory one shorter. Spermatheca as figured. Fixed digit of chelicera with 3 teeth, movable digit toothless. Leg IV with macroseta on basitarsus-27 long. Peritreme extends anteriorly upto base of  $j_1$ . Genu II and III with 7 setae.

*Male* : Unknown.

*Habitat* : Sunflower.

*Type locality and repository* : Holotype ♀, India : Delhi, on sunflower, deposited in NPC, IARI, New Delhi.

*Distribution* : India : Delhi.

*Remarks* : This species is known only from its type. The holotype of this species was examined at I. A. R. I. and the measurements of the different setae were found as follows :  $j_3$ -27,  $z_2$ -19,  $z_3$ -24,  $z_4$ -27,  $s_4$ -30,  $s_6$ -38,  $S_2$ -45,  $S_5$ -45,  $Z_5$ -54 (gently serrate),  $j_1$ -25,  $j_4$ -21,  $j_5$ -21,  $j_6$ -30,  $J_2$ -30,  $Z_4$ -45 (almost touches base of  $Z_5$ ),  $z_5$ -24,  $r_3$ -24.

#### 124. *Typhlodromus (Brethria) roshanlali* Narayanan & Ghai

(Figs. 714-718)

1964. *Typhlodromus (Typhlodromus) roshanlali* Narayanan & Ghai, *Proc. Nat. Inst. Sci.*, 29B(5) : 539.

1974. *Typhlodromus roshanlali* : Prasad, A catalogue of mites of India, p. 175.

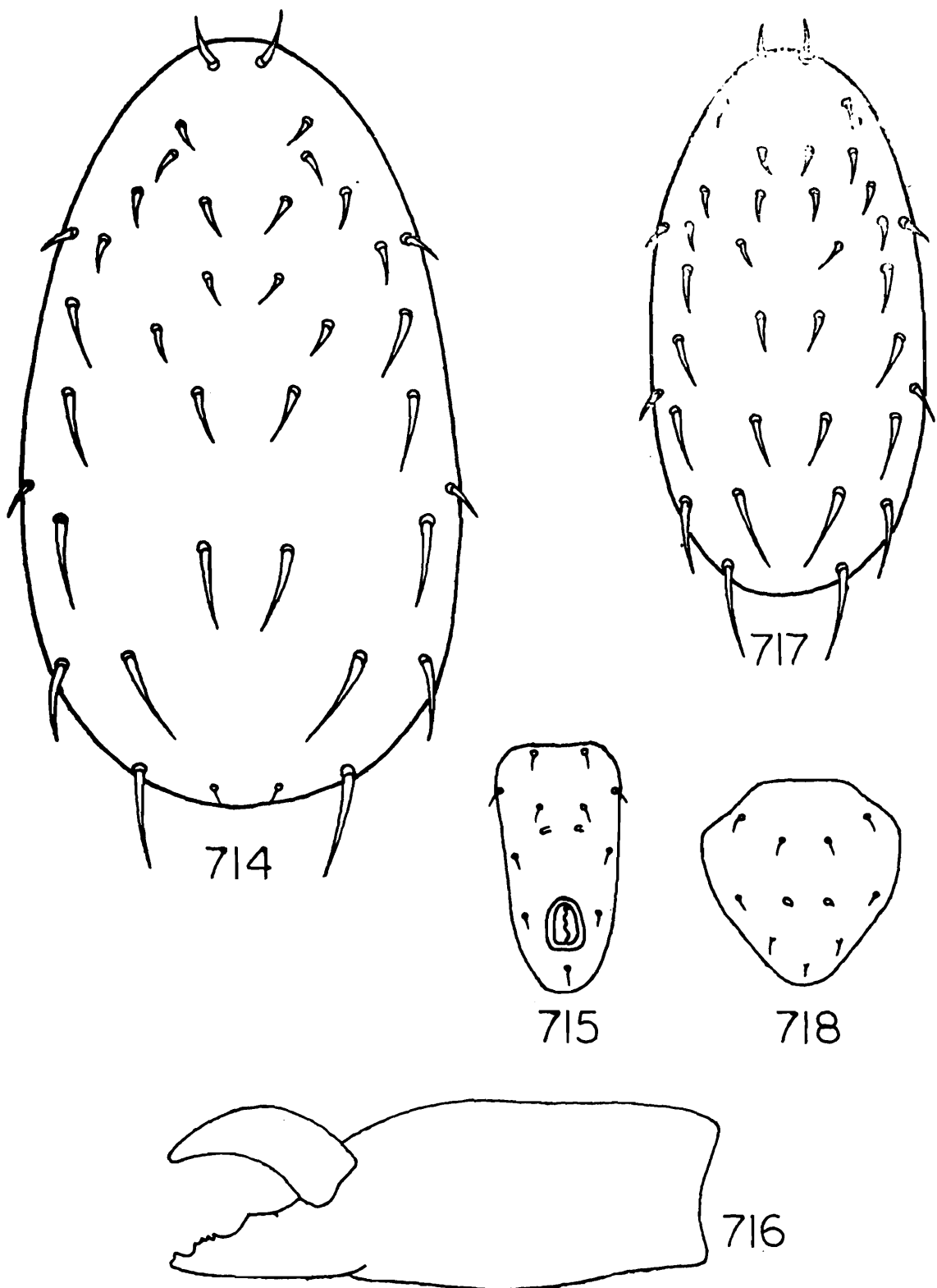
*Female* : Dorsal shield 364 long, 208 wide, well sclerotized, reticulate with 17 pairs of setae, of those, 9 pairs of laterals, 2 pairs of medians and 6 pairs of dorsocentrals, all setae smooth. Measurements of setae :  $j_1$ -24,  $J_4$ -20,  $j_5$ -20,  $j_6$ -32,  $J_2$ -44,  $J_5$ -8,  $j_3$ -15,  $z_2$ -23,  $z_3$ -31,  $z_4$ -31,  $s_4$ -35,  $s_6$ -45,  $S_2$ -50,  $S_4$ -42,  $Z_5$ -50,  $z_5$ -20,  $Z_4$ -56,  $r_3$  and  $R_1$  on lateral integument. Sternal shield normal with 3 pairs of sternal setae, metasternal plates with seta distinct. Ventrianal shield longer (124) than wide (48) with 4 pairs of preanal setae and a pair of preanal pores. Fixed digit of chelicera with 5 small teeth, movable digit without tooth. Macroseta on leg IV absent. Peritreme extends anteriorly upto  $j_1$ .

*Male* : Dorsal shield 256 long, 140 wide, Ventrianal shield 120 long, 140 wide, with 4 pairs of preanal setae.

*Habitat* : Mango malformed twig.

*Type locality and repository* : Holotype ♀, India, New Delhi,

on malformed mango twig, deposited in NPC, IARI, New Delhi.  
Paratypes 3 ♀ ♀ , 3 ♂ ♂ , same data and repository as for holotype.



Figs. 714-718. *Typhlodromus (Brethria) roshanlali* Narayanan and Ghai  
(after Narayanan & Ghai, 1964)

- 714. Dorsal shield (female)
- 715. Ventrianal shield (female)
- 716. Chelicera (female)
- 717. Dorsal shield (male)
- 718. Ventrianal shield (male)

*Remarks* : This species is known only from its type. The holotype was re-examined but the specimen suffered so much of shrinkage that detail study could not be made. The measurements of different setae which were taken are :  $j_3$ -30,  $z_2$ -24,  $z_3$ -30,  $z_4$ -30,  $s_4$ -33,  $s_6$ -45,  $Z_5$ -48,  $j_6$ -21,  $J_2$ -30. The measurements of the latter two setae taken during re-examination did not agree with those given in original description.

*Subgenus* : **Clavidromus** Muma

1961. *Clavidromus* Muma, *Bull. Fla. St. Mus.*, 5(7) : 296.

1970. *Clavidromus* : Muma & Denmark, *Arthropods of Florida*, 6 : 128.

1973. *Clavidromus* : Denmark & Muma, *Rev. Brasil Biol.*, 33(2) : 272.

1981. *Clavidromus* : Matthyse & Denmark, *Fla. Ent.*, 64(2) : 352.

*Diagnosis* : Dorsal shield highly sclerotized, reticulate with 18 pairs of setae, of those, 6 pairs of dorsocentrals, 2 pairs of medians and 10 pairs of laterals, all but  $j_1$  and  $J_5$  being plumose ; 2 pairs of sublateral setae on lateral integument. Sternal shield with 2-3 pairs of sternal setae. Ventrianal shield with 3-4 pairs of preanal setae. Leg IV with knobbed macroseta on genu, tibia and basitarsus of leg IV ; macroseta absent on legs I-III. Peritreme extends anteriorly upto  $j_1$ .

Type : *Kampimodromus transvaalensis* Nesbitt, 1951 by designation (Muma, 1961).

125. **Typhlodromus (Clavidromus) neotransvaalensis** Gupta

(Figs. 719-723)

1978. *Typhlodromus neotransvaalensis* Gupta, *Bull. Zool. Surv. India*, 1(1) : 49-50.

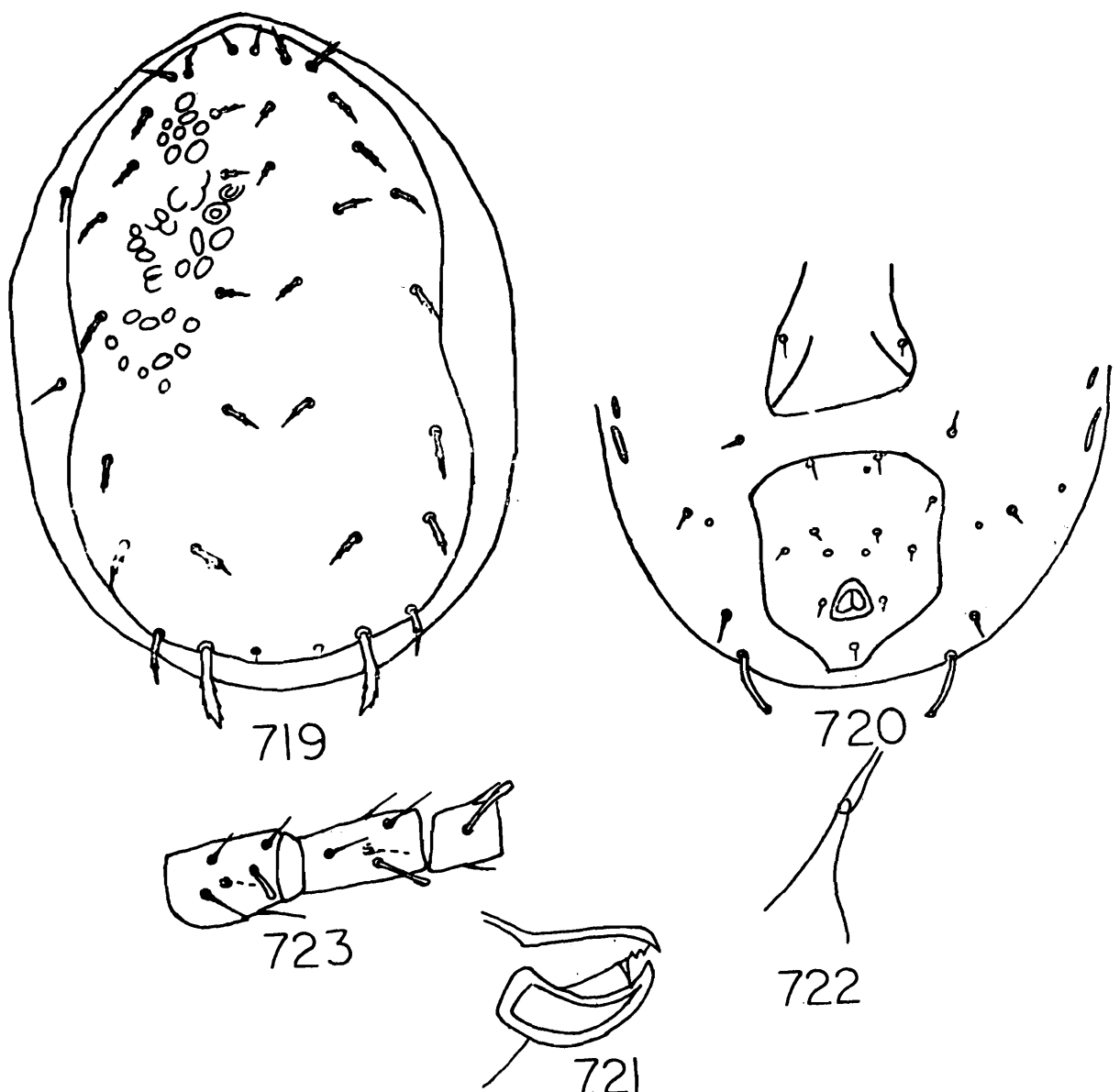
*Female* : Dorsal shield heavily sculptured as in *Phytoseius*, 328 long, 190 wide, with 18 pairs of setae, sublateral setae lie on lateral integument ; all setae on dorsal shield appear to be weakly serrate and never touch the bases of the following setae ;  $Z_5$  longest, thickest,  $S_5 = S_4$ . Measurements of setae :  $j_1$ - $j_4$  and  $J_2$ -16-20 each,  $J_5$ -12,  $j_3$ ,  $z_2$ ,  $z_3$ ,  $z_4$ -18 each,  $s_4$ -20,  $s_6$ -24,  $S_2$ -24,  $S_4$ -24,  $S_5$ -24,  $Z_5$ -36,  $z_5$ -18,  $Z_4$ -28,  $r_3$ -20,  $R_1$ -20. Sternal shield smooth, weakly sclerotized with 3 pairs of long sternal setae, metasternal plate with seta distinct. Genital shield 68 wide with a pair of genital setae. Ventrianal shield 112, long, 92 wide, smooth with 4 pairs of preanal setae (8 long), 4 pairs of setae and some small platelets present around ventrianal shield,  $JV_5$ -32 long (knobbed tip), 2 pairs of metapodal plates present, primary one 28 long, Spermatheca as figured. Peritreme extends anteriorly upto  $j_1$ . Fixed digit of chelicera with 2-3 teeth and strong

*pilus dentilis*, movable digit apparently toothless. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{2}{0} \frac{2}{1} 1$ , genu III  $1 \frac{1}{1} \frac{2}{1} 1$ . Macrosetae on leg IV : genu-16, tibia-20, basitarsus-26, all with flattened tip.

*Male* : Unknown.

*Habitat* : *Casuarina* sp., tea.

*Type locality and repository* : Holotype ♀, India : Tamil Nadu, Ootacamund, Botanical Garden, on *Casuarina* sp., deposited in ZSI, Calcutta, Reg. No. 3496/17. Paratype 1 ♀, Aruvankadu, on tea, in ZSI, Calcutta, Reg. No. 3497/17.



Figs. 719-723. *Typhlodromus (Clavidromus) neotransvaalensis* Gupta

719. Dorsal shield

720. Posterior ventral surface

721. Chelicera (female)

722. Spermatheca

723. Genu, tibia and basitarsus of leg IV

*Distribution* : India : Tamil Nadu.

*Remarks* : It is known only from its types.

### Subgenus *Orientiseius* Muma & Denmark

1961. *Amblydromella* Muma, *Bull. Fla. St. Mus.*, 5(7) : 294. (in part).  
 1962. *Amblydromella* : Muma, *Fla. Ent.*, 45(1) : 278 (in part).  
 1968. *Orientiseius* : Muma & Denmark, *Fla. Ent.*, 51 : 238.  
 1970. *Orientiseius* : Muma & Denmark, *Arthropods of Florida*, 6 : 141.  
 1975. *Orientiseius* : Chaudhri, *Pak. J. Zool.*, 7(2) : 185.

*Diagnosis* : Dorsal shield smooth or reticulate, with 18 pairs of setae, of those, 10 pairs of laterals, 2 pairs of medians and 6 pairs of dorsocentrals, some of the dorsal setae long or very long while others are very short ; 2 pairs of sublateral setae present on lateral integument. Sternal and ventrianal shields with 3 and 4 pairs of setae, respectively. Ventrianal shield elongate, pentagonal, broad anteriorly. Peritreme extends anteriorly upto  $j_1$ . Macrosetae on leg IV present on genu, tibia and basitarsus, no macroseta on legs I-III.

Type : *Typhlodromus (Typhlodromus) rickeri* Chant, 1970, by designation Muma & Denmark (1968)

### Key to the species of subgenus *Orientiseius*

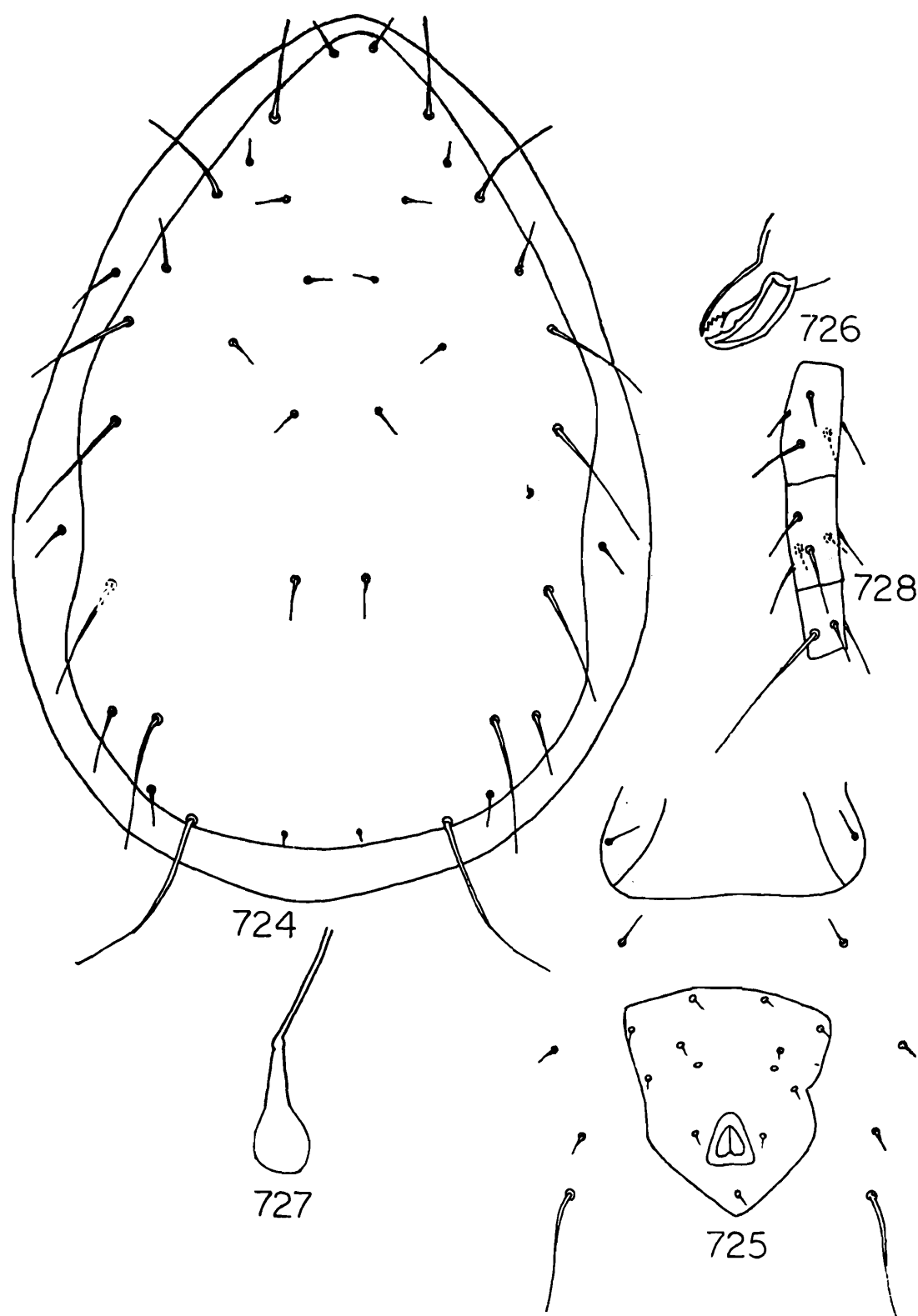
- |  |     |                         |
|--|-----|-------------------------|
| 1. $z_3$ only 2 times as long as $z_2$                                 | ... | <i>manipurensis</i>     |
| — $z_3$ over 3-4 times as long as $z_2$                                | ... | 2                       |
| 2. Length of $j_4-j_6$ vary between 8-20 microns                       | ... | 3                       |
| — Length of $j_4-j_6$ vary between 26-60 microns                       | ... | 5                       |
| 3. $z_2$ and $z_4$ equal   | ... | <i>pruni</i>            |
| — $z_2$ and $z_4$ unequal  | ... | 4                       |
| 4. $S_6$ less than $\frac{1}{2}$ of $S_2$ , spermatheca as in fig. 727 | ... | <i>channabasavannai</i> |
| — $S_6$ more than $\frac{1}{2}$ of $S_2$ , spermatheca as in fig. 732  | ... | <i>had:i</i>            |
| 5. Ventrianal shield only slightly longer than wide                    | ... | <i>orissaensis</i>      |
| — Ventrianal shield about $1\frac{1}{2}$ times as long as wide         | ... | <i>rickeri</i>          |

### 126. *Typhlodromus (Orientiseius) channabasavannai*\* Gupta ( Figs. 724-728 )

1978. *Typhlodromus channabasavanni* Gupta, *Bull. Zool. Surv. India*, 1(1) : 50-52.

*Female* : Dorsal shield 302 long, 160 wide, weakly sclerotized, reticulate with 18 pairs of setae and 3 pairs of pores, all setae smooth

\*Same explanation as given for species No. 3 holds good for this species also.



**Figs. 724-728.** *Typhlodromus (Orientiseius) channabasavannai* Gupta  
 724. Dorsal shield  
 725. Posterior ventral surface  
 726. Chelicera (female)  
 727. Spermatheca  
 728. Genu, tibia and basitarsus of leg IV

and pointed,  $Z_5$  being longest,  $Z_4 > s_6 = S_2$ ,  $s_6 > s_4$ . Measurements of setae :  $j_1$ -16-20,  $j_4$ -10-16,  $j_5$ -10-16,  $j_6$ -16-20,  $J_2$ -18-24,  $J_5$ -5-6,  $j_3$ -36-41,  $z_2$ -9-11,  $z_3$ -36-40,  $z_4$ -22,  $s_4$ -40-50,  $s_6$ -48-68,  $S_2$ -48-68,  $S_4$ -30-34,  $S_5$ -12-15,  $Z_5$ -70-90,  $z_5$ -17-22,  $Z_4$ -50-72,  $r_3$ -22-29,  $R_1$ -16-22. Margins of sternal shield indistinct with 3 pairs of sternal setae, 4th pair lie on metasternal plates. Genital shield 64-75 wide, smooth with a pair of genital setae. Ventrianal shield 100-123 long, 75-100 wide, anterior margin rounded, lateral margins concave with 4 pairs of preanal setae (16 long) and a pair of preanal pores : 4 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -45-50 long ; 2 pairs of metapodal plates present, primary one 18-20 long, accessory one 14-15 long. Fixed digit of chelicera multidentate and a strong *pilus dentilis* ; movable digit with 2 teeth. Spermatheca as figured. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Macrosetae on leg IV : genu 40-50, tibia 38-48, basitarsus 60-70. Peritreme extends anteriorly upto  $j_1$ .

*Male* : Unknown.

*Habitat* : Tea.

*Type locality & repository* : Holotype ♀, India : Tamil Nadu ; Aruvankadu, on tea, deposited in ZSI, Calcutta, Reg. No. 3498/17.

*Distribution* : India : Tamil Nadu.

*Remarks* : Some specimens examined recently from Coimbatore, Top slip, showed variation in macrosetae in respect of left and right sides of leg IV. In original description the author stated that genu and tibia IV were devoid of macrosetae but later re-examination of the holotype slide revealed that macrosetae were present on both leg segments besides on basitarsus IV.

## 127 *Typhlodromus (Orientiseius) hadii* Chaudhri

(Figs. 729-733)

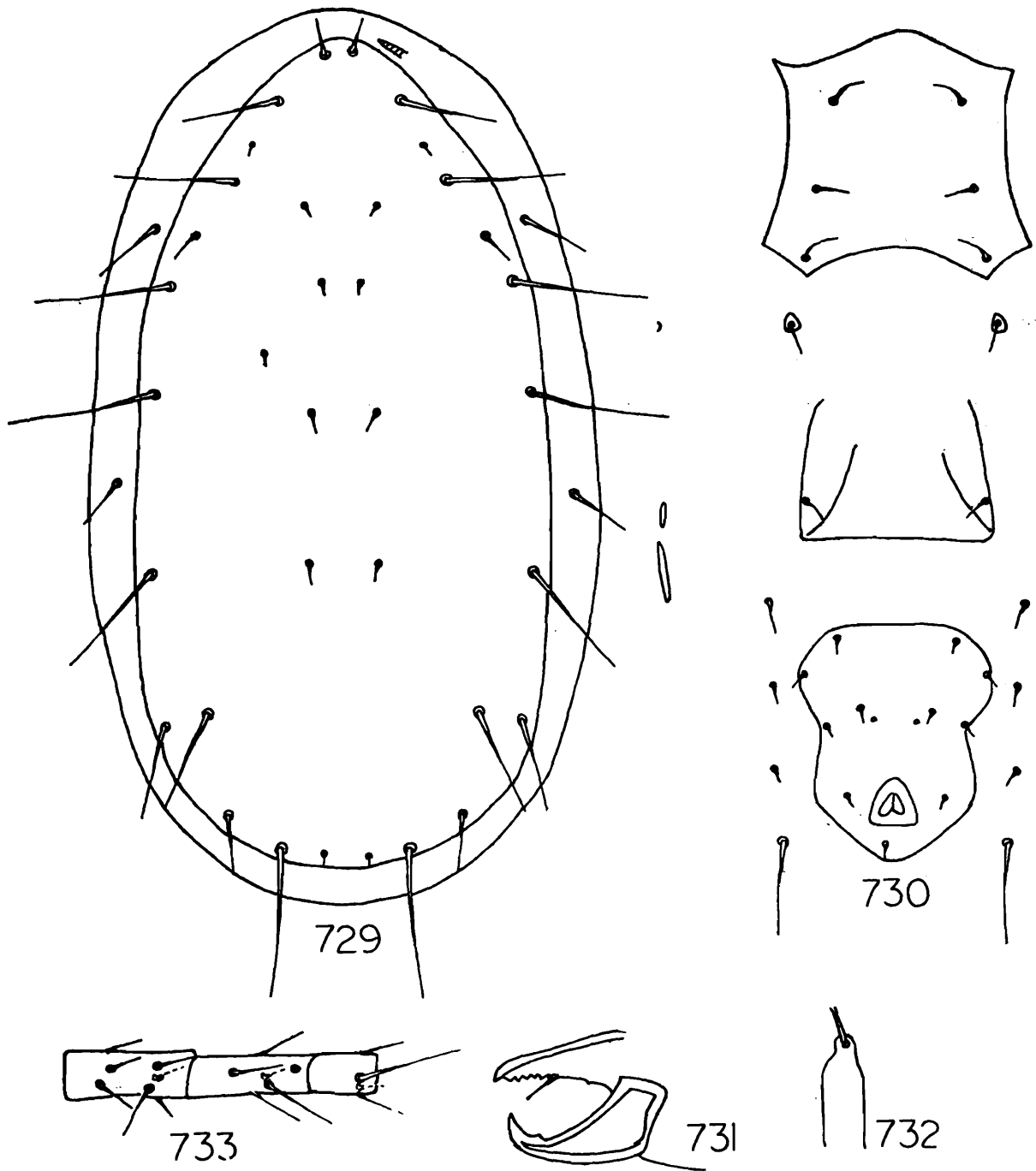
1965. *Typhlodromus hadii* Chaudhri, *Acarologia*, 7 : 632-633.

1981. *Typhlodromus kashmiricus* Gupta, *Indian J. Acar.*, 5 : 37-38. (new synonymy).

1982. *Typhlodromus kashmiricus* : Gupta, *Indian J. Acar.*, 6 : 30.

*Female* : Dorsal shield 344-345 long, 175-180 wide with 18 pairs of setae, all being smooth and pointed and with 5-6 pairs of pores. Measurements of setae :  $j_1$ -22-23,  $j_4$ -5-7,  $j_5$ -5-8,  $j_6$ -10-16,  $J_2$ -14-16,  $J_5$ -4-5,  $j_3$ -38-43,  $z_2$ -7-8,  $z_3$ -49-53,  $z_4$ -18-25,  $s_4$ -45-55,  $s_6$ -56-61,  $S_2$ -43-53,  $S_4$ -32-40,  $S_5$ -29-35,  $Z_5$ -68-74,  $z_5$ -5-7,  $Z_4$ -40-55,  $r_3$ -27-29,  $R_1$ -25-31. Sternal shield smooth, as long (80) as wide, with 3 pairs of sternal setae,

metasternal plate with seta distinct. Genital shield 72 wide with a pair of setae. Ventrianal shield 76 wide, 100 long, with 4 pairs of preanal setae and a pair of preanal pores; 4 pairs of setae and a number of small platelets present around ventrianal shield,  $JV_5$ -48 long; 2 pairs of metapodal plates present, primary one 31 long, accessory one 9 long. Fixed digit of chelicera with 4-5 sharp teeth anterior to strong *pilus*



Figs. 729-733. *Typhlodromus (Orientiseius) hadii* Chaudhri  
 729. Dorsal shield  
 730. Ventral surface  
 731. Chelicera (female)  
 732. Spermatheca  
 733. Genu, tibia and basitarsus of leg IV

*dentilis*, movable digit with one tooth. Peritreme terminates anteriorly between  $j_1$ - $j_3$ , Spermatheca as figured. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Macrosetae on leg IV : genu 24-30, tibia 32-35, basitarsus 40-50.

*Male* : Unknown.

*Habitat* : Rose, apple.

*Type locality and repository* : Holotype ♀, Pakistan : Behrain, Swat State, in Dept. of Entomology, University of Agriculture, Lyallpur.

*Distribution* : India : Jammu & Kashmir, Uttar Pradesh ; outside India : Pakistan.

*Remarks* : The author, being unaware of the species *T. (O.) hadii* Chaudhri, (1965), described *T. (O.) kashmiricus* from Jammu & Kashmir. Later, with the availability of Chaudhri's papers obtained through the courtesy of Dr. E. W. Baker and comparing type of *T. kashmiricus* with the original description of *T. (O.) hadii*, it was found that both are identical. Therefore, *T. (O.) kashmiricus* is treated here as a synonym for *T. (O.) hadii*.

### 128. *Typhlodromus (Orientiseius) manipurensis* Gupta (Figs. 734-739)

1977. *Typhlodromus manipurensis* Gupta, *Indian J. Acar.*, 2 : 1-2.

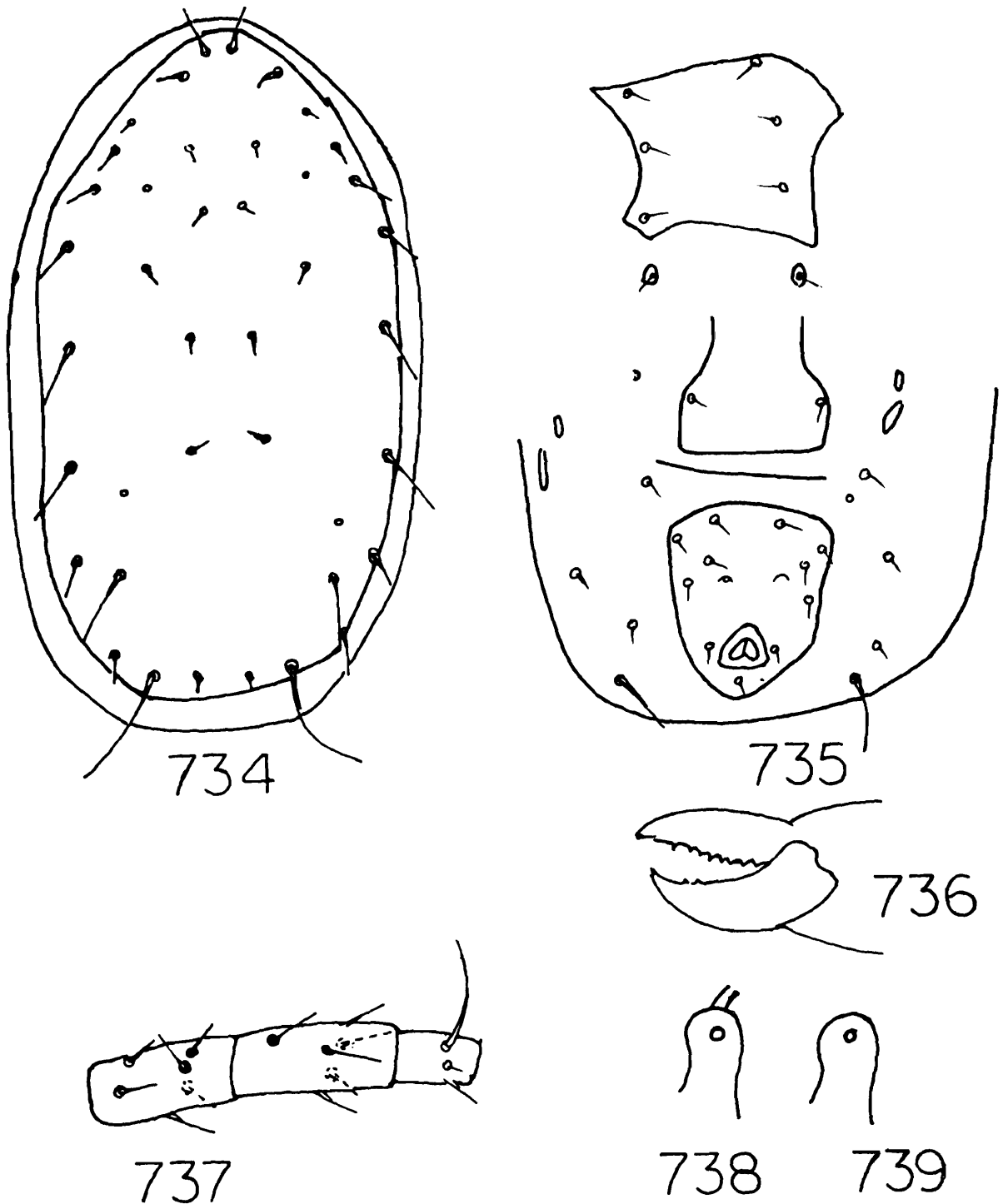
*Female* : Dorsal shield weakly sclerotized, smooth, 288 long, 160 wide, with 18 pairs of setae, all setae simple,  $Z_5$  longest 52, other setae measure :  $j_1$ -20,  $j_4$ -8,  $j_5$ -12,  $j_6$ -16,  $J_2$ -16,  $J_5$ -16,  $j_3$ -12,  $z_2$ -8,  $z_3$ -18,  $z_4$ -18,  $s_4$ -24,  $s_6$ -32,  $S_2$ -32,  $S_4$ -24,  $S_5$ -20,  $z_5$ -12,  $Z_4$ -32,  $r_3$  and  $R_1$  both on lateral integument. Sternal shield almost as long as wide, with 3 pairs of sternal setae, 4th pair lie on metasternal plates. Genital shield 60 wide, narrower than the greatest width of ventrianal shield. Ventrianal shield longer (88) than wide (68) with 4 pairs of preanal setae and a pair of preanal pores ; 4 pairs of setae present around ventrianal shield ; 2 pairs of metapodal plates present, primary one 16 long, 4 wide, accessory one 8 long. Peritreme extends anteriorly almost upto the base of  $j_1$ . Fixed digit of chelicera multidentate, movable digit with 2 teeth. Spermatheca as figured. Macrosetae on leg IV : genu 25, tibia 28, basitarsus 56.

*Male* : Unknown.

*Habitat* : Collected on an undetermined plant.

*Type locality and repository* : Holotype ♀, India : Manipur, Mao, on an undetermined plant, deposited in ZSI, Calcutta, Reg. No. 3499/17. Paratypes 3 ♀♀, same data and repository as for holotype, Reg. No. 3500/17.

*Distribution* : India : Manipur.



Figs. 734-739. *Typhlodromus (Orientiseius) manipurensis* Gupta

734 Dorsal shield

735. Ventral surface

736. Chelicera (female)

737. Genu, tibia and basitarsus of leg IV

738, 739. Spermathecae

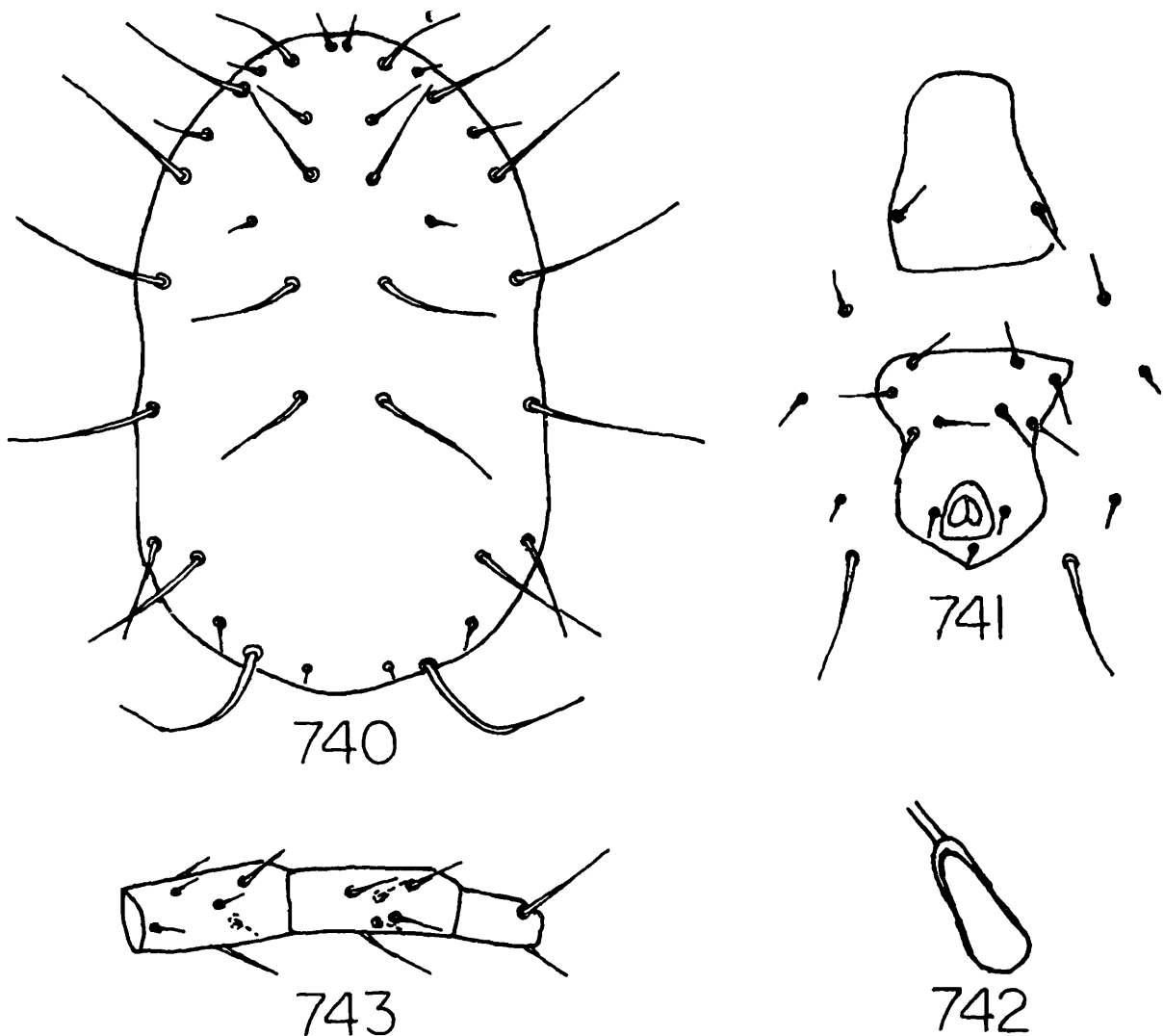
*Remarks* : This species is known only from its types. It differs from *T. (O.) channabasavannai* Gupta in relative length of  $z_2$  and  $z_3$ . as  $z_3$  in *channabasavannai* is 4 times as long  $z_2$  while  $z_3$  in *manipurensis* 2 times as long as  $z_2$ .

129. ***Typhlodromus (Orientiseius) orissaensis* Gupta**

(Figs. 740-743)

1977. *Typhlodromus orissaensis* Gupta, *Indian J. Acar.*, 2 : 4-6.

*Female* : Dorsal shield slightly sclerotized, 280 long, 148 wide, with 18 pairs of setae. Excepting  $z_2$ ,  $z_5$ ,  $J_5$  and  $S_5$  all other setae being long, smooth and slender. Measurements of setae :  $j_1$ -24,  $j_4$ -26,  $j_5$ -33,  $j_8$ -48,  $J_2$ -54,  $J_5$ -5,  $j_3$ -44,  $z_2$ -6,  $z_3$ -53,  $z_4$ -24,  $s_4$ -53,  $s_6$ -64,  $S_2$ -62,  $S_4$ -40,  $S_5$ -16,  $Z_5$ -64,  $z_5$ -12,  $Z_4$ -56,  $r_3$  and  $R_1$  on lateral integument,



Figs. 740-743. *Typhlodromus (Orientiseius) orissaensis* Gupta

740. Dorsal shield

741. Posterior ventral surface

742. Spermatheca

743. Genu, tibia and basitarsus of leg IV

each 20 long. Sternal shield indistinct with 3 pairs of sternal setae, metasternal plate inconspicuous. Genital shield 64 wide, with a pair of setae. Ventrianal shield 88 long, 76 wide, broader at the anterior margin while lateral margins deeply concave, with 4 pairs of preanal setae, 4 pairs of setae present around ventrianal shield,  $JV_5$ -42 long; 2 pairs of metapodal plates present, primary one 24 long, accessory one 12 long. Dentition of chelicera not discernible. Spermatheca as figured. Leg chaetotactic formula: genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{2}{1} \frac{1}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{2}{1} \frac{1}{1} 1$ . Macrosetae on leg IV: genu-10, tibia-14, basitarsus-36.

*Male*: Unknown.

*Habitat*: Collected on an undetermined plant.

*Type locality and repository*: Holotype ♀, India: Orissa, Angul, Soil conservation farm, on an undetermined plant, deposited in ZSI, Calcutta, Reg. No. 3337/17.

*Distribution*: India: Orissa.

*Remarks*: This species differs from *T. (O.) rickeri* Chant (1960), in relative length and width of ventrianal shield and from *T. (O.) hadii* Chaudhri (1965) in relative length of  $j_4$  and  $j_5$ .

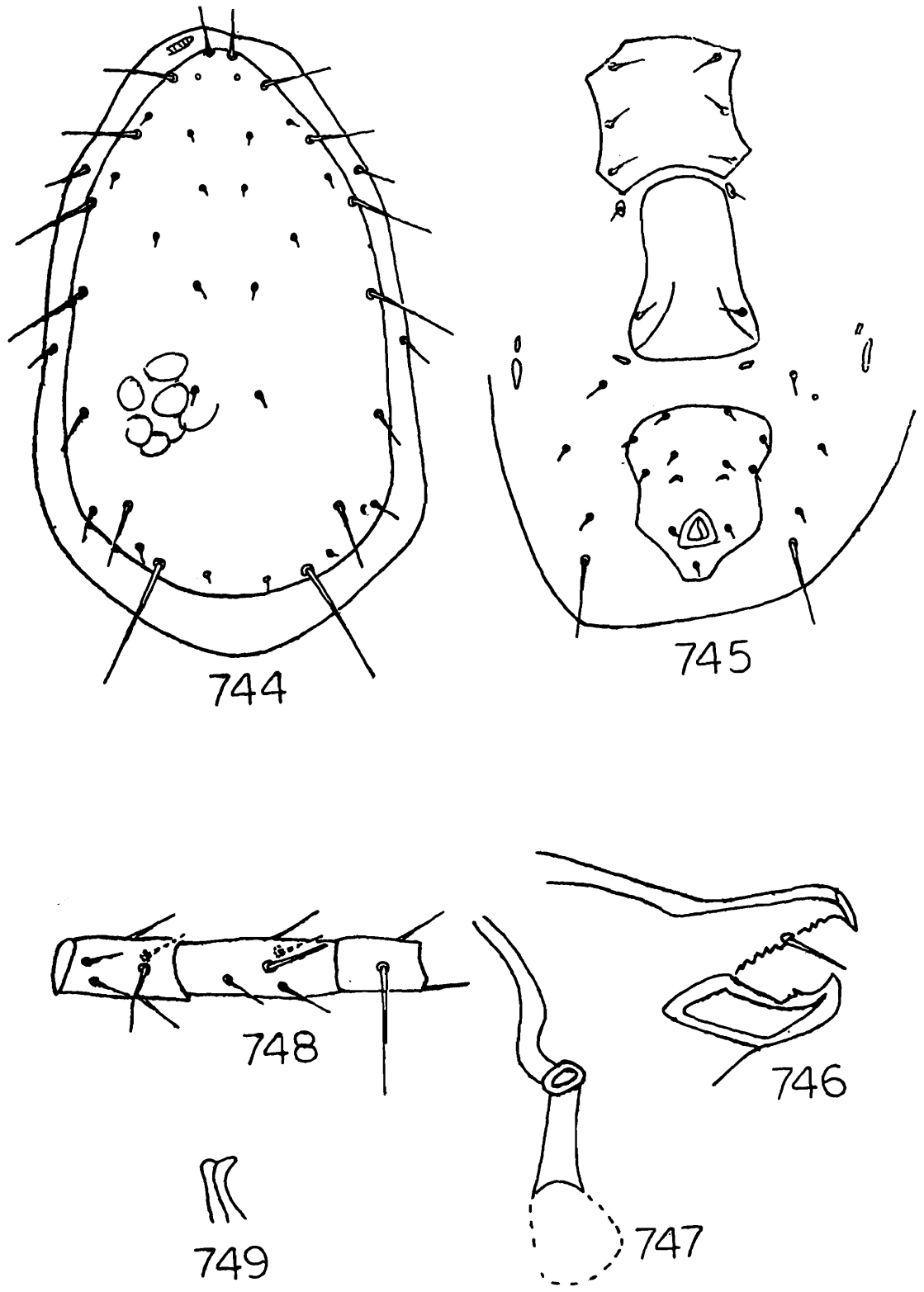
### 130. *Typhlodromus (Orientiseius) pruni* Gupta

(Figs. 744-749)

1970. *Typhlodromus pruni* Gupta, *Oriental Ins.*, 4: 189-190.

1974. *Typhlodromus pruni*: Prasad, A catalogue of mites of India, p. 174.

*Female*: Dorsal shield 328-335 long, 170-180 wide, reticulate, with 18 pairs of setae. Measurements of setae:  $j_1$ -25-27,  $j_4$ -4-9,  $j_5$ -5-9,  $j_6$ -7-10,  $J_2$ -9-12,  $J_5$ -4-7,  $j_3$ -36,  $z_2$ -5-7,  $z_3$ -36-45,  $z_4$ -6-9,  $s_4$ -42,  $s_6$ -48,  $S_2$ -27,  $S_4$ -14,  $S_5$ -9,  $Z_5$ -76,  $z_5$ -5,  $Z_4$ -36,  $r_3$ -27,  $R_1$ 13. Sternal shield 76 long, 76 wide, with 3 pairs of sternal setae, metasternal plate with seta distinct. Genital shield 68-74 wide, with a pair of setae. Ventrianal shield 100-110 long, 72-80 wide, with 4 pairs of preanal setae and a pair of preanal pores; 4 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -45-47 long; a few rounded platelets present around ventrianal shield; 2 pairs of metapodal plates present, primary one 18 long, accessory one 10 long. Chelicera with 3 teeth anterior to strong *pilus dentilis* and 5 teeth posterior to it; movable digit with 2 teeth. Peritreme extends anteriorly upto  $j_1$ . Spermatheca as figured. Leg chaetotactic formula:



Figs. 744-749. *Typhlodromus (Orientiseius) pruni* Gupta  
744. Dorsal shield  
745. Ventral surface  
746. Chelicera (female)  
747. Spermatheca  
748. Genu, tibia and basitarsus of leg IV  
749. Spermatophoral process

genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Macrosetae on leg IV : genu-35-40, tibia-27, basitarsus-45, all being simple.

*Male* : Dorsal chaetotaxy as in female. Spermatophoral process as figured.

*Habitat* : *Prunus persica*.

*Type locality and repository* : Holotype ♀, India : West Bengal, Kalimpong, on *Prunus persica*, deposited in ZSI, Calcutta, Reg. No. 2950/17. Paratype 1 ♀, same data and repository as for holotype, Reg. No. 3102/17.

*Distribution* : India : West Bengal, Arunachal Pradesh.

*Remarks* : This species differs from *T. (O.) rickeri* Chant (1960), and *T. (O.) channabasavannai* Gupta (1978) in relative length of  $z_2$  and  $z_4$  as well as in  $j_6$  and  $J_2$ . Besides, the spermatheca also differs.

### 131. *Typhlodromus (Orientiseius) rickeri* Chant

(Figs. 750-754)

1960. *Typhlodromus (Typhlodromus) rickeri* Chant, *Can. Ent.*, 92 : 62-64.

1964. *Typhlodromus rickeri* : Rao, & Rao, *Comm. Inst. Biol. Contr. Tech. Bull.*, 4 : 38-39.

1974. *Typhlodromus rickeri* : Prasad, A catalogue of mites of India, p. 175.

1977. *Typhlodromus rickeri* : Gupta, *Indian J. Acar.*, 2 : 6.

1982. *Typhlodromus rickeri* : Gupta, *Rec. zool. Surv. India*, 79 (3-4) : 369.

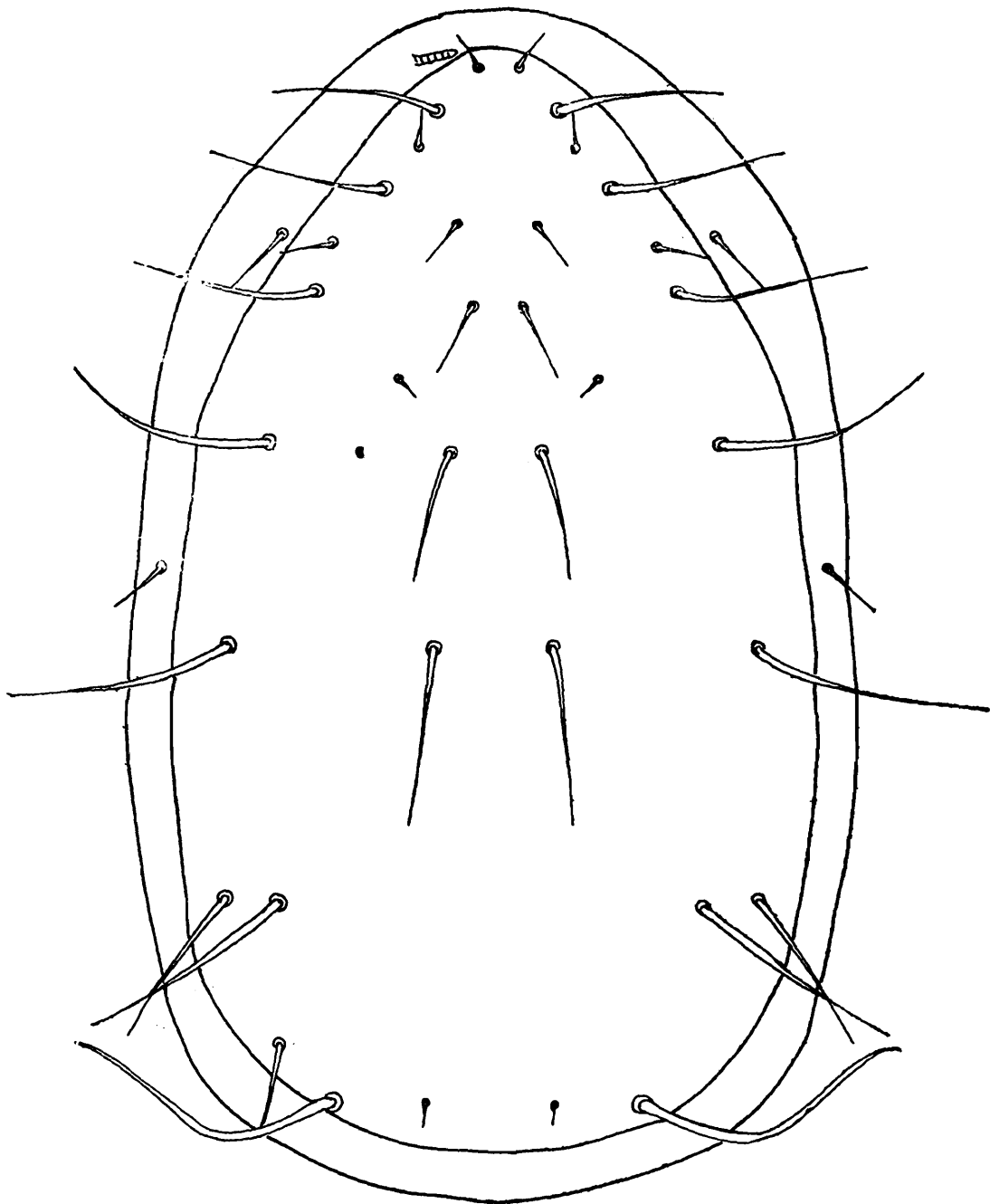
1982. *Typhlodromus rickeri* : Gupta, *Indian J. Acar.*, 6 : 30.

*Female* : Dorsal shield 380 long, 214 wide, smooth, with 3-4 pairs of minute pores. Peritreme extends anteriorly upto  $j_1$ ,  $J_2 > j_6$ ,  $j_5 > j_4$ ,  $z_4 > z_3$ ,  $s_6 > s_4$ ,  $s_6 = S_2$ ,  $Z_4 < S_2$ ,  $Z_5 > S_2$ ,  $r_3 > R_1$ ,  $j_3 > j_1$ . Measurements of setae :  $j_1$ -27,  $j_4$ -22,  $j_5$ -36,  $j_6$ -47,  $J_2$ -63,  $J_5$ -7,  $j_3$ -67,  $z_2$ -18,  $z_3$ -74,  $z_4$ -25,  $s_4$ -78,  $s_6$ -85,  $S_2$ -85,  $S_4$ -49,  $S_5$ -27,  $Z_5$ -104,  $z_5$ -16,  $Z_4$ -78,  $r_3$ -31,  $R_1$ -27. Sternal shield 116 long, 98 wide, with 3 pairs of sternal setae, metasternal plate with seta distinct. Genital shield 78 wide with a pair of setae. Ventrianal shield 134 long, 88 wide, with 4 pairs of preanal setae and a pair of crescent-shaped preanal pores, 4 pairs of setae present around ventrianal shield,  $JV_5$ -67 long; 2 pairs of metapodal plates present, primary one 30 long. Dentition of chelicera not discernible. Spermatheca as figured. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Macrosetae on leg IV : genu-45, tibia-51, basitarsus-63.

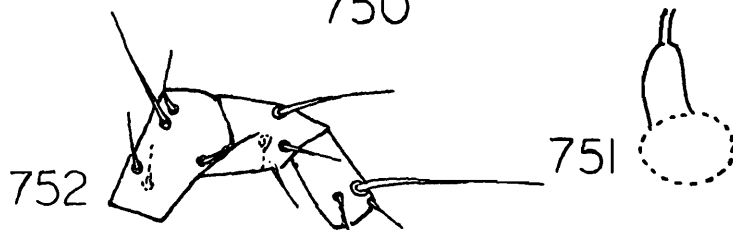
*Male* : Ventrianal shield as figured.

*Habitat* : Citrus, peach.

*Type locality and repository* : Holotype ♀, India : Meghalaya, Shillong, on citrus, deposited in Canadian National Collection, Belleville, Canada, No. 7006. Paratypes 3 ♀♀, 1 ♂, 2 proto-and 3 deutonymphs, same data and repository as for holotype ; 4 ♀♀, 1 ♂,



750



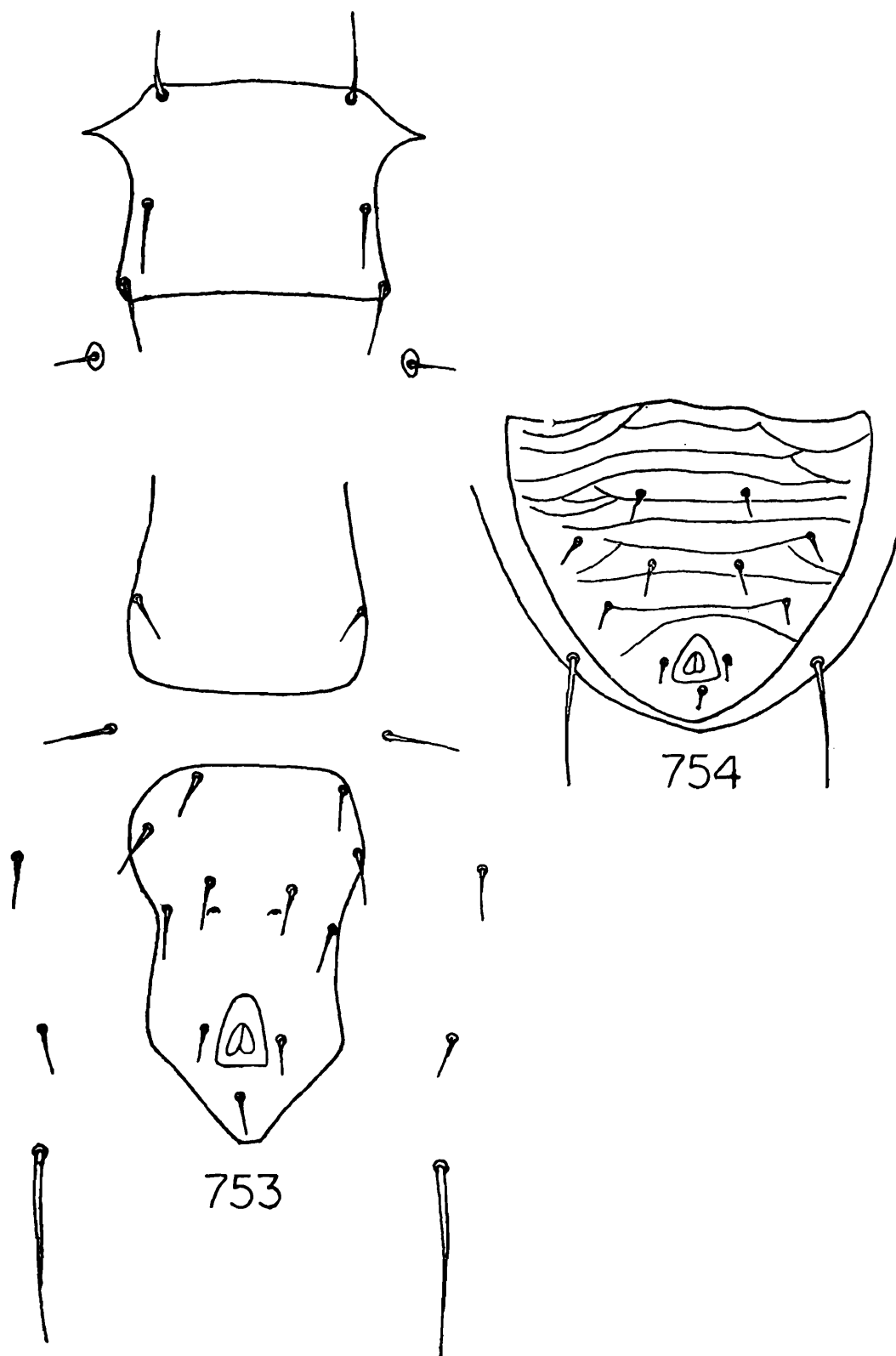
752

751

Figs. 750-752. *Typhlodromus (Orientiseius) rickeri* Chant  
 750. Dorsal shield  
 751. Spermatheca  
 752. Genu, tibia and basitarsus of leg IV

1 protonymph, Bangalore, on citrus, deposited in Citrus Expt. Station, Riverside, California.

*Distribution* : India : Meghalaya, Karnataka, Nagaland, Madhya Pradesh, Uttar Pradesh ; outside India : Florida (introduced).



Figs. 753-754. *Typhlodromus (Orientiseius) rickeri* Chant  
 753. Ventral surface  
 754. Ventrianal shield (male)

*Remarks* : The relationship of this species with *orissaensis* and *pruni* has been discussed earlier. The measurements given above are based upon the examination of the holotype bearing No. 7006, which was borrowed from Dr. D. A. Chant. This mite readily feeds on citrus rust mite, *Phyllocoptruta oleivora* (Ash.) and, therefore, it was introduced in Florida citrus groves. Post introduction recoveries have been made for 2 weeks to 3 months following releases but post-freeze establishment has not been proved (Muma, 1964). McMurtry & Scriven (1964) studied its biology.

#### *Subgenus Paraseiulus* Muma

1961. *Paraseiulus* Muma, *Bull. Fla. St. Mus.*, 5(7) : 299.  
 1970. *Paraseiulus* : Muma & Denmark, *Arthropods of Florida*, 6 : 142.  
 1974. *Paraseiulus* : Chaudhri *et al.*, : 226.  
 1980. *Typhlodromus (Paraseiulus)* : Ehara & Hamaoka, *Acta Arachnol.*, 29(1) : 3.  
 1981. *Paraseiulus* : Matthyse & Denmark, *Fla. Ent.*, 64(2) : 353.

*Diagnosis* : Dorsal shield reticulate with 19 pairs of setae, of those, 6 pairs of dorsocentrals, 3 pairs of medians and 10 pairs of laterals,  $Z_5$  and  $Z_4$  serrate. Sternal shield with 2 pairs of sternal setae ; 3rd pairs on small platelets and 4th pairs on metasternal plates. Ventrianal shield with 2-4 pairs of preanal setae. Leg IV macroseta present only on basitarsus. Peritreme extends anteriorly upto  $j_1$ .

Type : *Seiulus soleiger* Ribaga, 1902 by designation Muma (1961).

#### 132. *Typhlodromus (Paraseiulus) neosoleiger* Gupta (Figs. 755-758)

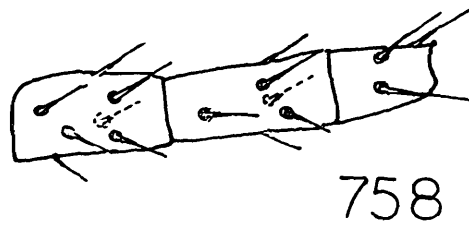
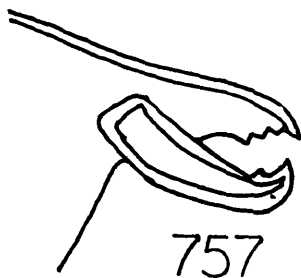
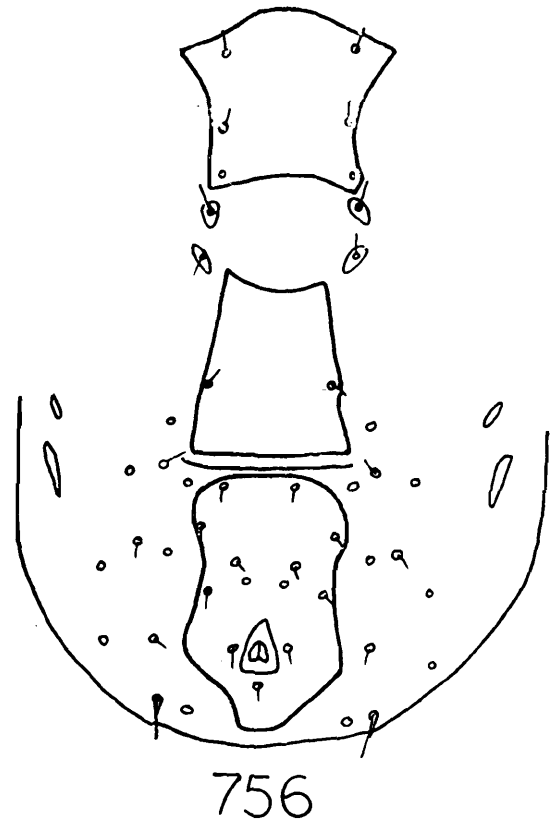
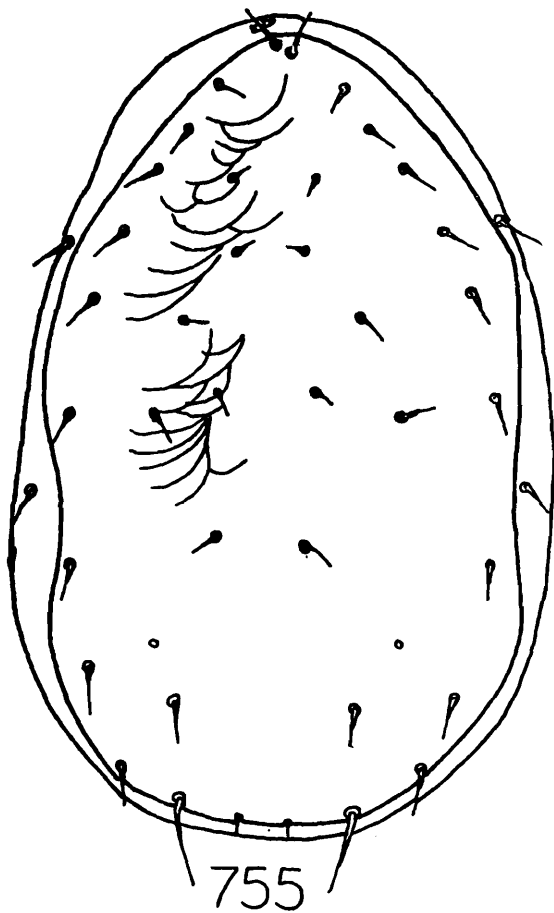
1981. *Typhlodromus neosoleiger* Gupta, *Indian J. Acar.*, 5 : 41-43.

*Female* : Dorsal shield sclerotized, reticulate, 340 long, 210 wide, with concavity at the level of  $R_1$  and with 19 pairs of setae. Measurements of setae :  $j_1$ -23,  $j_4$ -16,  $j_5$ -16,  $j_6$ -16,  $J_2$ -16,  $J_5$ -6,  $j_3$ -20,  $z_2$ -16,  $z_3$ -18,  $z_4$ -20,  $s_4$ -20,  $s_6$ -20,  $S_2$ -20,  $S_4$ -22,  $S_5$ -20,  $Z_5$ -36,  $z_5$ -16,  $z_6$ -16,  $Z_4$ -24,  $r_3$ -24,  $R_1$ -20, the sublateral setae lie on lateral integument. Sternal shield 80 long, 68 wide with 2 pairs of setae ; 3rd pairs on small platelets and 4th pairs on metasternal plates. Genital shield 68 wide with a pair of setae. Ventrianal shield much longer than broad, lateral margins concave, with 4 pairs of preanal setae and a pair of round preanal pores ; 4 pairs of setae and 5-6 small round platelets present around ventrianal shield,  $JV_5$ -32 long ; 2 pairs of metapodal plates present, primary one 28 long, accessory one 8 long. Peritreme extends

anteriorly upto  $j_1$ . Fixed digit of chelicera with 3 teeth, movable digit with one tooth. Spermatheca not discernible. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Macroseta on basitarsus IV-24 long.

*Male* : Unknown.

*Habitat* : Chrysanthemum.



Figs. 755-758. *Typhlodromus (Paraseiulus) neosoleiger* Gupta

755. Dorsal shield

756. Ventral surface

757. Chelicera (female)

758. Genu, tibia and basitarsus of leg IV

*Type locality and repository* : Holotype ♀, India : Jammu & Kashmir, Srinagar, on chrysanthemum, deposited in ZSI, Calcutta, Reg. No. 3099/17.

*Distribution* : India : Jammu & Kashmir.

*Remarks* : This species is known only from its type. It differs from *T. (P.) operantis* (Chaudhri *et al.*, 1974) in having distal tip of peritreme straight rather than recurved as in *operantis* and from *T. (P.) ignavus* (Chaudhri *et al.*, 1974) and *T. (P.) trimediseti* Xin *et al.*, 1980 = *T. soleiger* (Ribaga), in having macroseta on basitarsus IV which is absent in the other two species.

### Subgenus *Typhloctomus* Muma

1961. *Typhloctomus* Muma, *Bull. Fla. St. Mus.*, 5(7) : 299.

1974. *Typhloctomus* : Chaudhri *et al.*, : 231.

*Diagnosis* : Dorsal shield sclerotized, reticulate, with 17 pairs of setae, of those, 11 pairs of laterals, 2 pairs of medians and 6 pairs of dorsocentrals ; 2 pairs of sublateral setae present on lateral integument. Sternal shield with 2-4 pairs of setae. Ventrianal shield with 3-4 pairs of preanal setae ; 4 pairs of setae present on the membrane around ventrianal shield. Leg IV with 0-3 macrosetae.

Type : *Typhlodromus tiliarum* Oudemans, 1930.  
by designation Muma (1961)

### Key to the species of subgenus *Typhloctomus*

- |  |     |                   |
|--|-----|-------------------|
| 1. Ventrianal shield with 3 pairs of preanal setae | ... | <i>nesbitti</i>   |
| — Ventrianal shield with 4 pairs of preanal setae  | ... | <i>transitans</i> |

### 133. *Typhlodromus (Typhloctomus) nesbitti* Womersley ( Figs. 759-761)

1954. *Typhlodromus nesbitti* Womersley, *Aust. J. Zool.*, 2 : 179-180.

1964. *Typhlodromus (Typhlodromus) nesbitti* : Narayanan & Ghai, *Proc. Nat. Inst. Sci.*, 29B(5) : 541-542.

1974. *Typhlodromus nesbitti* : Prasad, A catalogue of mites of India, p. 174.

*Female* : Dorsal shield smooth with 19 pairs of setae. Measurements of setae :  $j_1$ -28,  $j_4$ -17,  $j_5$ -17,  $j_6$ -17,  $J_2$ -20,  $J_5$ -11,  $j_3$ -20,  $z_2$ -20,  $z_3$ -22,  $z_4$ -22,  $s_4$ -25,  $s_6$ -25,  $Z_1$ -20,  $S_2$ -28,  $S_4$ -22,  $S_5$ -22,  $Z_5$ -56,  $z_5$ -17,  $Z_4$ -36,  $r_3$ ,  $R_1$ -20 each. Sternal shield with 3 pairs of sternal setae, 4th

pair lie on metasternal plates. Ventrianal shield longer (143) than broad (110), imbricate with 3 pairs of preanal setae ; 4 pairs of setae present on the membrane around ventrianal shield. Fixed digit of chelicera multidentate with strong *plus dentilis*, movable digit with 3 teeth. Macroseta present only on basitarsus IV.

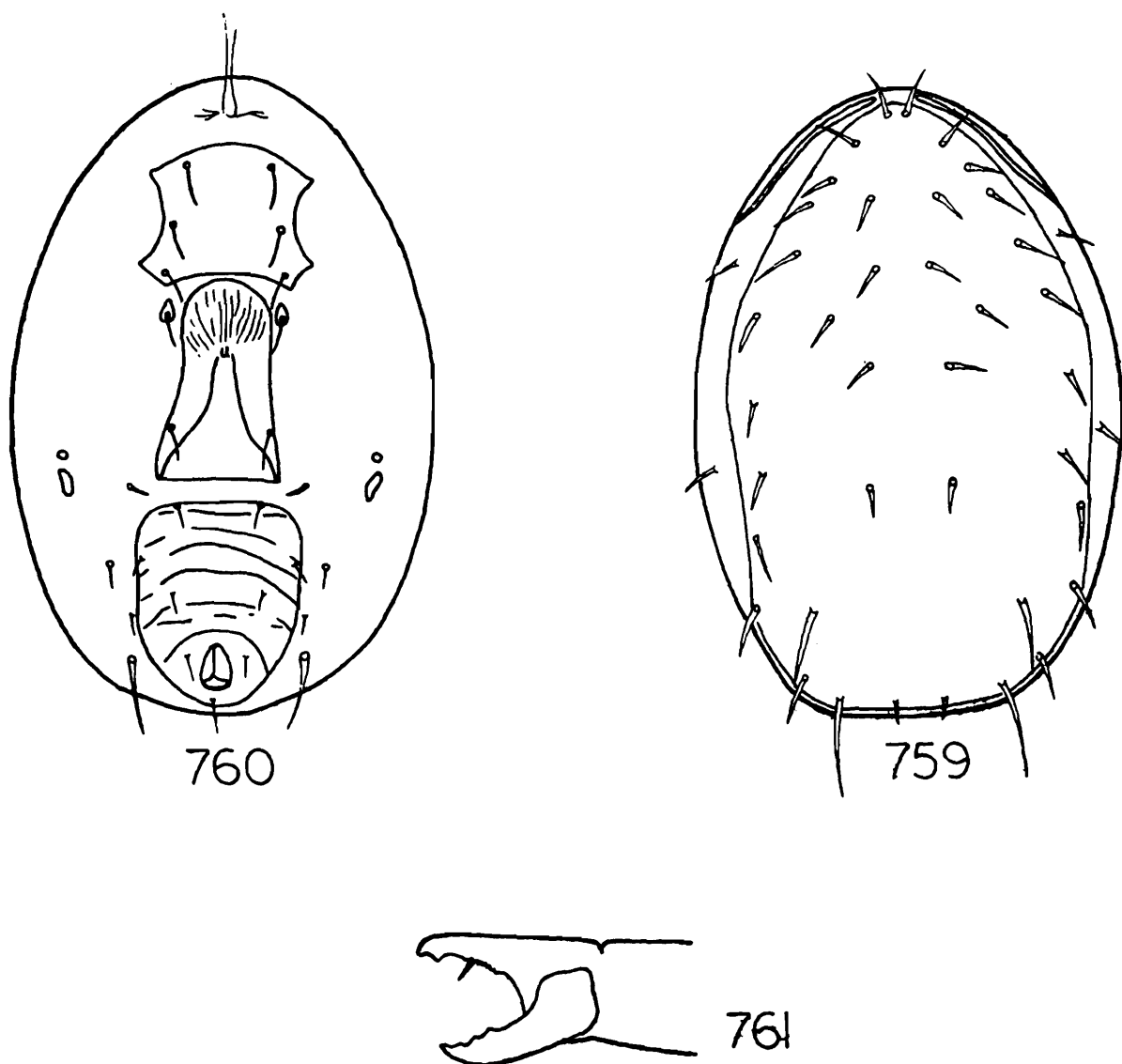
*Male* : Unknown.

*Habitat* : Mango malformation.

*Type locality and repository* : Holotype ♀, New South Wales, Goulburn, from galls on tree lucerne, deposited, in South Australian Museum.

*Distribution* : India : Delhi ; outside India : Australia.

*Remarks* : Though Narayanan & Ghai (1964) recorded this species



Figs. 759-761. *Typhlodromus (Typhloctomus) nesbitti* Womersley  
(after Womersley, 1954)

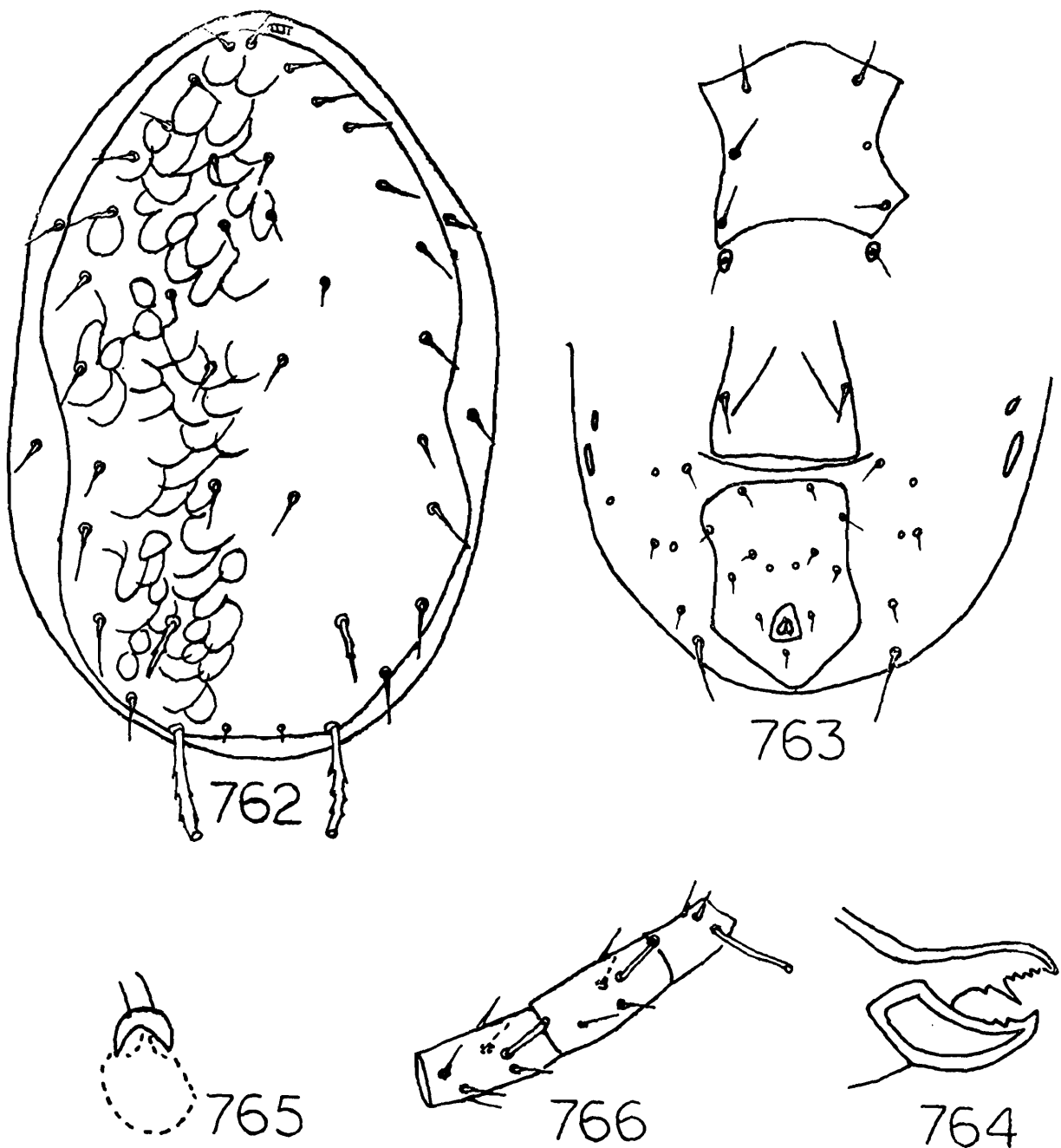
- 759. Dorsal shield
- 760. Ventral surface
- 761. Chelicera (female)

from India but this material was not available to the author. Hence, the measurements given above are based upon the original description of Womersley (1954).

134. **Typhlodromus (Typhloctomus) transitans** Gupta  
(Figs. 762-766)

1981. *Typhlodromus transitans* Gupta, *Indian J. Acar.*, 5 : 40-41.

*Female* : Dorsal shield lightly sclerotized, reticulate, 320 long, 176



Figs. 762-766. *Typhlodromus (Typhloctomus) transitans* Gupta

762. Dorsal shield

763. Ventral surface

764. Chelicera (female)

765. Spermatheca

766. Genu, tibia and basitarsus of leg IV

wide, with 19 pairs of setae.  $Z_5$  serrate, knobbed,  $Z_4$  serrate ; other setae smooth and simple. Measurements of setae :  $j_1$ -16,  $j_4$ -16,  $j_5$ -16,  $j_6$ -18,  $J_2$ -20,  $J_5$ -8,  $j_3$ -21,  $z_2$ -16,  $z_3$ -21,  $z_4$ -24,  $s_4$ -24,  $s_6$ -25,  $Z_1$ -20,  $S_2$ -28,  $S_4$ -28,  $S_5$ -20,  $Z_5$ -48,  $z_5$ -16,  $Z_4$ -28,  $r_3$ -21,  $R_1$ -20. Sternal shield as long as wide, with 3 pairs of sternal setae, metasternal setae on small platelets. Genital shield 64 wide, with a pair of genital setae. Ventrianal shield smooth, 92 long, 64 wide, with 4 pairs of preanal setae and a pair of preanal pores ; 4 pairs of setae and small platelets present around ventrianal shield ; 2 pairs of metapodal plates present, primary one 24 long, accessory one 7 long ;  $JV_5$ -36 long. Peritreme extends anteriorly upto base of  $J_1$ . Fixed digit of chelicera multidentate, movable digit with 2 teeth. Spermatheca as figured. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Macrosetae on leg IV : genu-20, tibia-18, basitarsus-36, all knobbed.

*Male* : Unknown.

*Habitat* : Pear.

*Type locality and repository* : Holotype ♀, India : Jammu & Kashmir, Anantnag, on pear, deposited in ZSI, Calcutta, Reg. No. 3096/17. Paratypes 2 ♀♀, Srinagar, Nishat Bag, on mulberry 3097-98/17.

*Distribution* : India : Jammu & Kashmir.

*Remarks* : This species is known only from its types. It is differentiated from *T. (T.) vollsella* (Chaudhri *et al.*, 1974) by relative size of ventrianal shield.

### *Subgenus Typhlodromus* Scheuten

1957. *Typhlodromus* Scheuten, *Arch. Für. Naturges.*, 23 : 111 (in part).

1961. *Typhlodromus* : Muma, *Bull. Fla. St. Mus.*, 5(7) : 298.

1965. *Typhlodromus* : Chant, *Can. Ent.*, 97 : 368-369 (in part).

1978. *Typhlodromus* : Knisley & Denmark, *Fla. Ent.*, 61(1) : 14.

*Diagnosis* : Dorsal shield well sclerotized with 18 pairs of setae, of those, 10 pairs of laterals, 2 pairs of medians and 6 pairs of dorsocentrals ; all the setae smooth and pointed ; 2 pairs of sublateral setae on lateral integument. Sternal shield with 3 pairs of sternal setae. Ventrianal shield with 4 pairs of preanal setae ; 4 pairs of setae present on the membrane around ventrianal shield. Macroseta present only on basitarsus IV.

Type : *Typhlodromus pyri* Scheuten, 1857 by subsequent designation, Oudemans, 1929.

Muma (1961) recognised this genus for those *Typhlodromus* species having 6 pairs of dorsocentral, 2 pairs of median and 9 pairs of lateral setae, 2 pairs of sternal setae, 4 pairs of preanal setae and one macroseta on leg IV. That definition is slightly modified here. In addition, to 9 pairs of lateral setae, those with 10 pairs of lateral setae and 3 pairs of setae on sternal setae are also included. He mentioned this genus to be monotypic which the present author does not agree.

*Key to the species of subgenus Typhlodromus*

- |  |     |                    |
|--|-----|--------------------|
| 1. Besides $Z_5$ which is quite long, the other lateral setae also mostly long, all over 35 microns (except $S_5$ ), anterior ones nearly reach the bases of the next setae in line          | ... | <i>sijiensis</i>   |
| — Besides $Z_5$ which is normally long, the other lateral setae mostly short and never more than 20-30 microns long, $z_3$ - $s_4$ shorter, never reach upto the bases of setae next in line | ... | 2                  |
| 2. Ventrianal shield much longer than broad  | ..  | <i>garhwalicus</i> |
| — Ventrianal shield almost as long as broad  | ... | 3                  |
| 3. $S_5$ very small, nearly $\frac{1}{2}$ as long as $S_4$ , $Z_4$ much shorter than the distance between its base and that of $Z_5$   | ... | <i>communis</i>    |
| — $S_5$ subequal to $S_4$ , $Z_4$ almost touches the base of $Z_5$   | ... | <i>neorhenanus</i> |

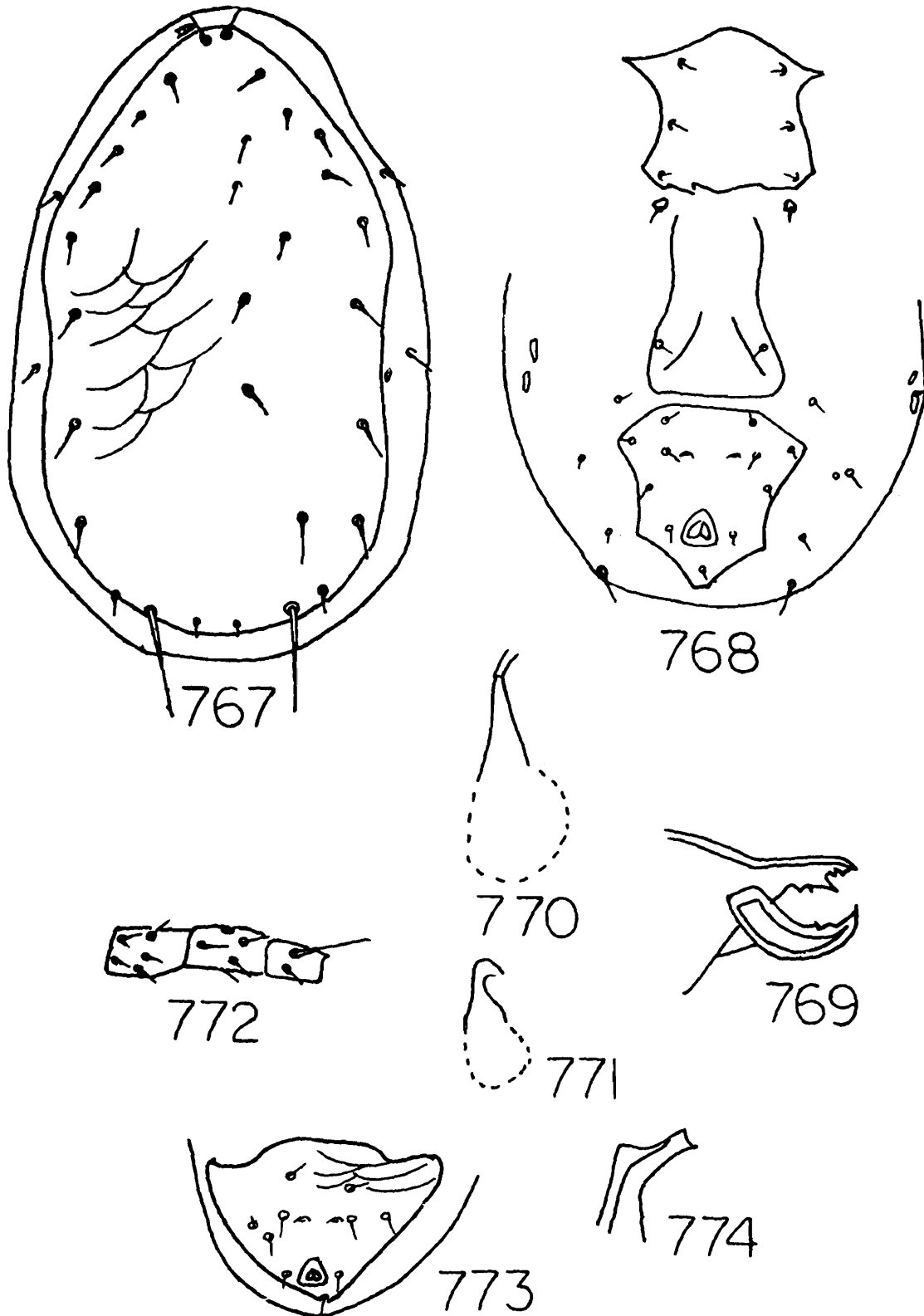
135. *Typhlodromus* (*Typhlodromus*) *communis* Gupta

(Figs. 767-774)

1978. *Typhlodromis communis* Gupta, *Bull. Zool. Surv. India*, 1 : 53.

1980. *Typhlodromus communis* Gupta, *Entomologists' mon. Mag.*, 115 : 209.

*Female* : Dorsal shield 280-300 long, 160-180 wide, reticulate with 18 pairs of setae, all being simple and pointed. Measurements of setae :  $j_1$ -13-16,  $j_4$ -10-13,  $j_5$ -10-15,  $j_6$ -12-16,  $J_2$ -16-20,  $J_5$ -5-8,  $j_3$ -12-16,  $z_2$ -6-7,  $z_3$ -12-16,  $z_4$ -12-17,  $s_4$ -13-18,  $s_6$ -16-20,  $S_2$ -18-24,  $S_4$ -21-24,  $S_5$ -11-15,  $Z_5$ -55-65,  $z_5$ -12-16,  $Z_4$ -30-40,  $r_3$ -10-15,  $R_1$ -10-15. Sternal shield as long (83) as wide, with 3 pairs of sternal setae, metasternal plate with seta distinct. Genital shield 63-65 wide with a pair of genital setae. Ventrianal shield almost as long as wide or only slightly longer than wide, with 4 pairs of preanal setae and a pair of preanal pores ; 4 pairs



Figs. 767-774. *Typhlodromus (Typhlodromus) communis* Gupta  
 767. Dorsal shield  
 768. Ventral surface  
 769. Chelicera (female)  
 770, 771. Spermathecae  
 772. Genu, tibia and basitarsus of leg IV  
 773. Ventrianal shield (male)  
 774. Spermatophoral process

of setae present on the membrane around ventrianal shield,  $JV_5$ -30 long ; 2 pairs of metapodal plates present, primary one 15-20 long, accessory one 12 long. Fixed digit of chelicera with 3 teeth anterior to *pilus dentilis* and 2 teeth beyond it ; movable digit with 2 teeth. Spermatheca as figured. Peritreme extends anteriorly upto  $j_1$ . Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Macroseta only on basitarsus IV-35 long.

*Male* : Ventrianal shield and spermatophoral process as figured.

*Habitat* : *Pyrus communis*, *Eucalyptus* sp., *Dalbergia* sp.

*Type locality and repository* : Holotype ♀, India : Darjeeling Dist., Kalimpong, Agricultural Farm, on *Pyrus communis*, deposited in ZSI, Calcutta, Reg. No. 3501/17 Paratypes 2 ♀ ♀, same data and repository as for holotype, Reg. No. 3502-03/17.

*Distribution* : India : West Bengal, Arunachal Pradesh, Karnataka, Tamil Nadu.

*Remarks* : This species is recognised from *T. (T.) neorhenanus* Gupta (1977b) by having  $S_5$  very small nearly  $\frac{1}{2}$  as long as  $S_4$  and  $Z_4$  much shorter than the distance between its base and that of  $Z_5$  while in *neorhenanus*,  $S_4$  and  $S_5$  subequal and  $Z_4$  almost touches the base of  $Z_5$ . In Gupta (1978), the species name was misprinted as *Typhlodromis communis*.

### 136. *Typhlodromus (Typhlodromus) garhwalicus* Gupta

(Figs. 775-778)

1982. *Typhlodromus garhwalicus* Gupta, *Indian J. Acar.*, 6 : 29-30.

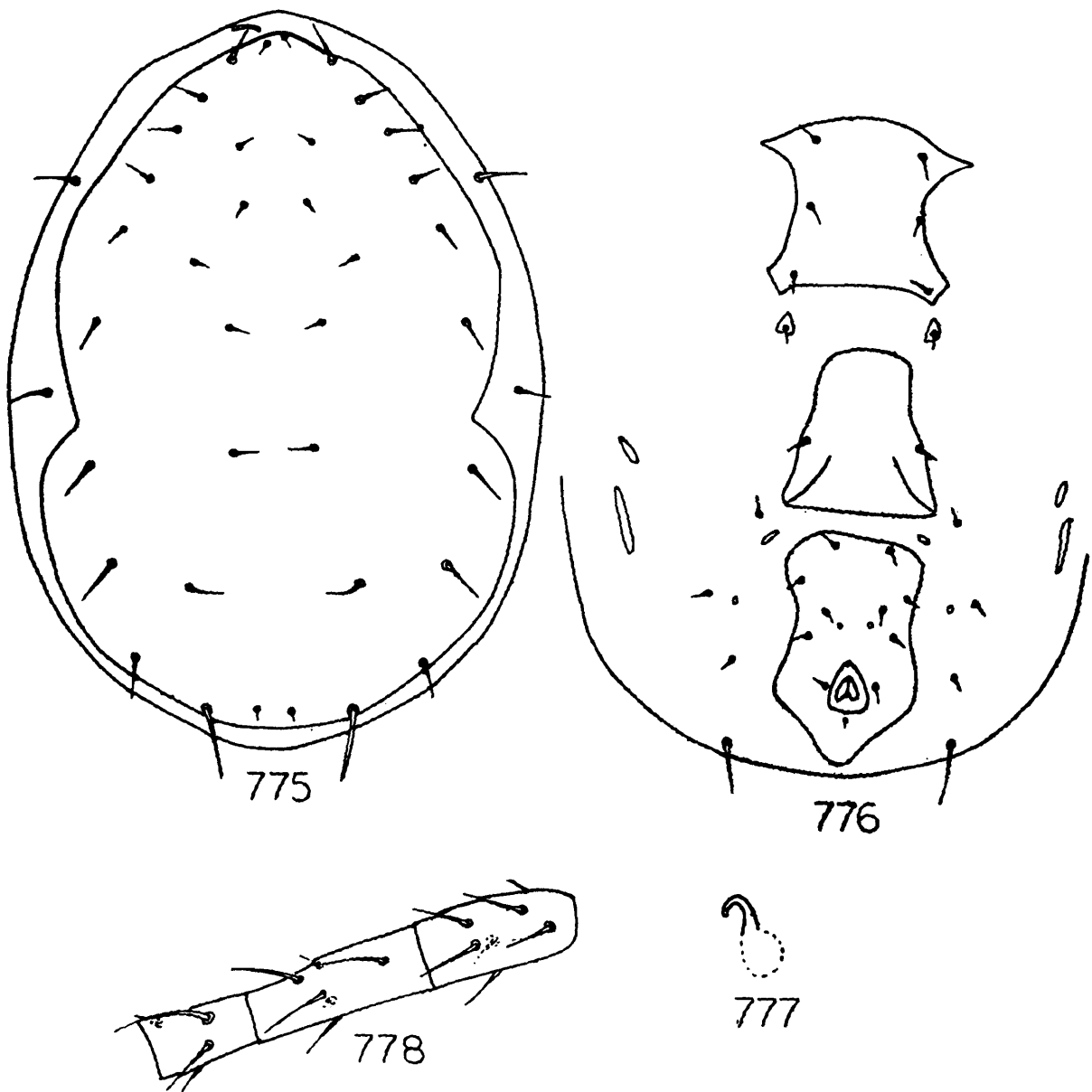
*Female* : Dorsal shield 387 long, 228 wide, reticulate with 18 pairs of setae, mostly small except  $Z_5$  which is long. Measurements of setae :  $j_1$ -13,  $j_4$ - $j_6$ ,  $J_2$ -14-18 each,  $J_5$ -8,  $j_3$ -22,  $z_2$ -17,  $z_3$ -17,  $z_4$ -17,  $s_4$ -13,  $s_6$ -22,  $S_2$ -26,  $S_4$ -30,  $S_5$ -21,  $Z_5$ -39,  $z_5$ -14,  $Z_4$ -26,  $r_3$ -26,  $R_1$ -17. Sternal shield as long as broad with 3 pairs of short sternal setae, metasternal plate with seta distinct. Genital shield 65 wide with a pair of setae. Ventrianal shield 129 long, 69 wide, with 4 pairs of preanal setae and a pair of preanal pores ; 4 pairs of setae and some small platelets present around ventrianal shield, 2 pairs of metapodal plates present. Peritreme extends anteriorly upto the base of  $j_1$  and curves inwards. Fixed digit of chelicera with 3 teeth, movable digit apparently toothless. Spermatheca as figured. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{0} \frac{2}{1} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Macroseta present only on basitarsus IV-52 long.

*Male* : Unknown.

*Habitat* : *Casuarina* sp.

*Type locality and repository* : Holotype ♀, India : Uttar Pradesh, Almora, Kausanie, on *Casuarina* sp., deposited in ZSI, Calcutta, Reg. No. 3130/17.

*Distribution* : India : Uttar Pradesh.

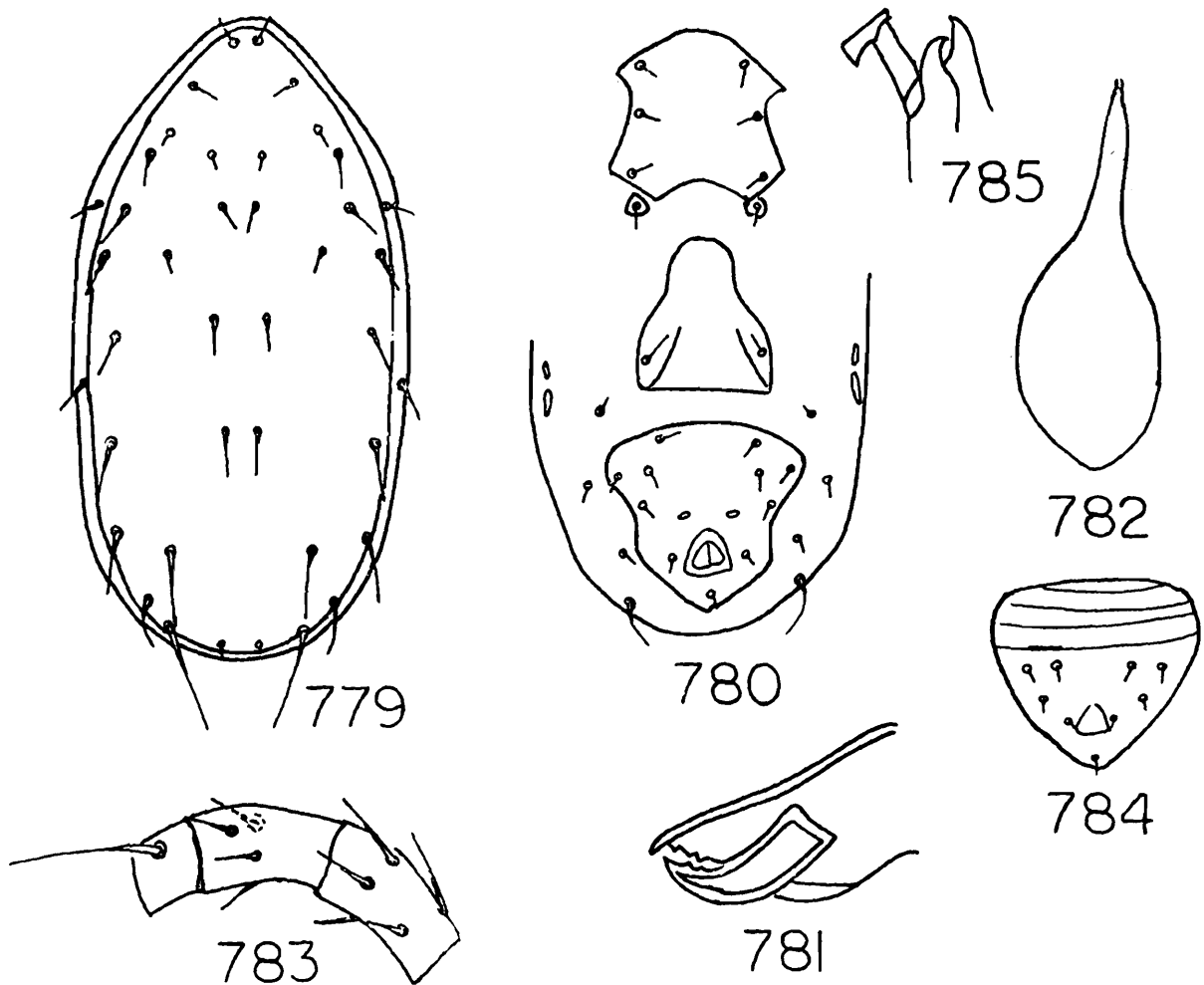


**Figs. 775-778.** *Typhlodromus (Typhlodromus) garhwalicus* Gupta  
 775. Dorsal shield  
 776. Ventral surface  
 777. Spermatheca  
 778. Genu, tibia and basitarsus of leg IV

137 *Typhlodromus (Typhlodromus) neorhenanus* Gupta  
( Figs. 779-785 )

1977. *Typhlodromus neorhenanus* Gupta, *Indian J. Acar.*, 2 : 4.

*Female* : Dorsal shield smooth, sclerotized, 296 long, 156 wide, with 18 pairs of setae, all setae smooth,  $z_2$  small and  $\frac{1}{2}$  as long as  $z_3$  ;  $Z_4$  almost touches base of  $Z_5$  ; other setae small and never reach bases of the following setae. Measurements of setae :  $j_1$ -16,  $j_4$ -10,  $j_5$ -16,  $j_6$ -20,  $J_2$ -24,  $J_5$ -8,  $j_3$ -13,  $z_2$ -8,  $z_3$ -16,  $z_4$ -22,  $s_4$ -25,  $s_6$ -20,  $S_2$ -33,  $S_4$ -36,  $S_5$ -32,  $Z_5$ -36,  $z_5$ -16,  $Z_4$ -44,  $r_3$  and  $R_1$  on lateral integument measuring 20 and 24, respectively. Sternal shield with 3 pairs of setae, metasternal plate round with a seta. Genital shield narrower than the greatest width of ventrianal shield, with a pair of setae. Ventrianal shield



Figs. 779-785. *Typhlodromus (Typhlodromus) neorhenanus* Gupta  
779. Dorsal shield  
780. Ventral surface  
781. Chelicera (female)  
782. Spermatheca  
783. Genu, tibia and basitarsus of leg IV  
784. Ventrianal shield (male)  
785. Spermatophoral process

broader at the anterior region and concave at the preanal region with 4 pairs of preanal setae and a pair of preanal pores ; 4 pairs of setae present around ventrianal shield ; 2 pairs of metapodal plates present. Fixed digit of chelicera with 3 teeth and strong *pilus dentilis*, movable digit with 2 teeth. Spermatheca as figured. Macroseta present only on basitarsus IV-40 long.

**Male :** Chaetotaxy of dorsal shield similar as in female. Ventrianal shield and spermatophoral process as figured.

**Habitat :** Fern.

**Type locality and repository :** Holotype ♀, India : Meghalaya, Tura, on fern, deposited in ZSI, Calcutta, Reg. No. 3504/17. Paratypes 3 ♀ ♀, 1 ♂, same data and repository as for holotype, Reg. No. 3505-06/17.

**Distribution :** India : Meghalaya.

**Remarks :** This species is known only from its types.

### 138. *Typhlodromus (Typhlodromus) sijiensis* Gupta

(Figs. 786-788)

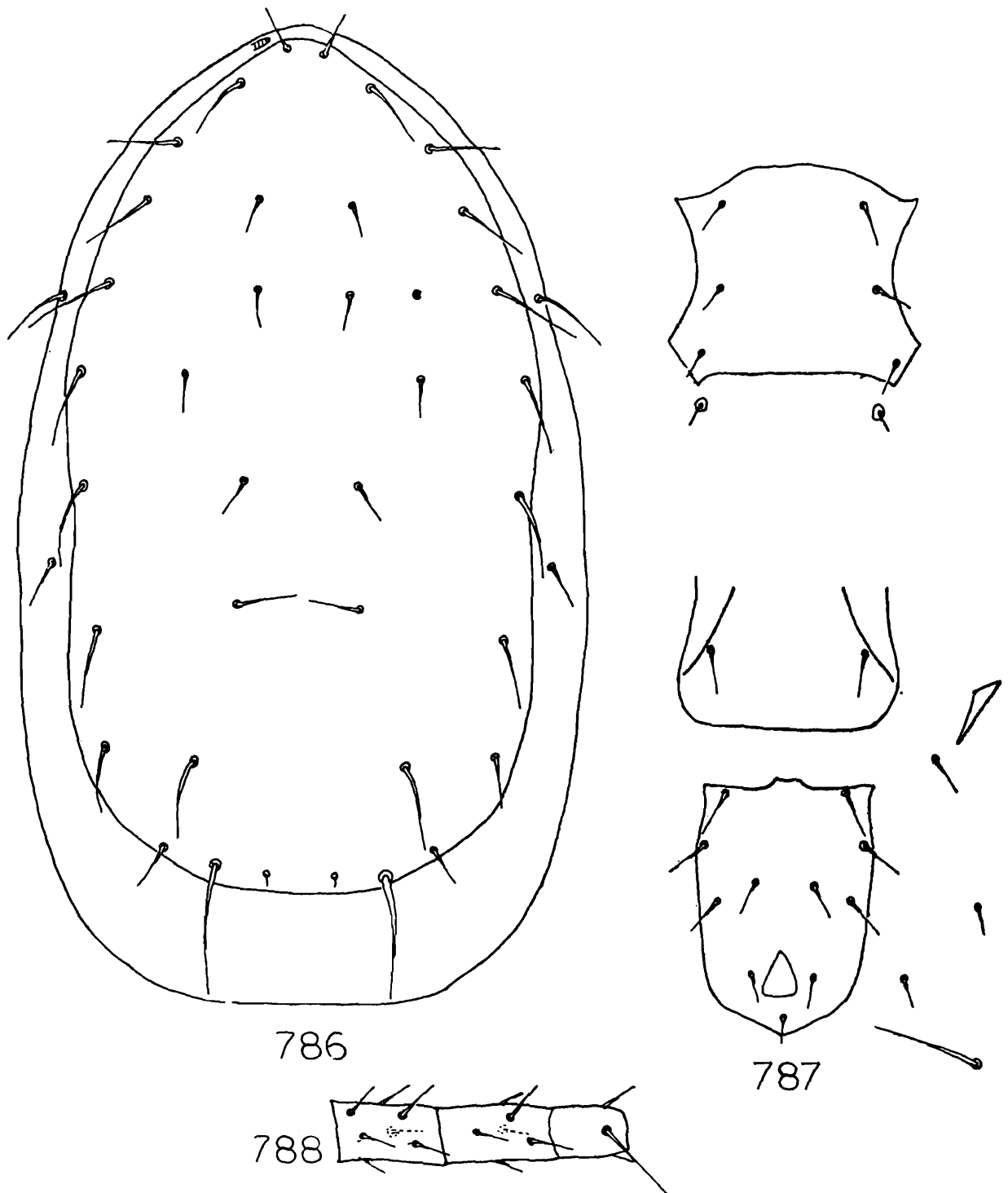
*Typhlodromus (Typhlodromus) sijiensis* Gupta, *Oriental Ins.* (in press).

**Female :** Dorsal shield smooth, 370 long, 202 wide, with 18 pairs of setae, all being smooth and simple. Measurements of setae :  $j_1$ -26,  $j_4$ -20,  $j_5$ -20,  $j_6$ -22,  $J_2$ -24,  $J_5$ -7,  $j_3$ -44,  $z_2$ -41,  $z_3$ -35,  $z_4$ -44,  $s_4$ -44,  $s_6$ -42,  $S_2$ -37,  $S_4$ -34,  $S_5$ -26,  $Z_5$ -56,  $z_5$ -20,  $Z_4$ -38,  $r_3$ -40,  $R_1$ -26 ;  $Z_4$  extends beyond base of  $S_5$ . Sternal shield smooth with 3 pairs of sternal setae, metasternal plate very weakly sclerotized with a pair of setae. Genital shield 67 wide with a pair of setae. Ventrianal shield 125 long, 109 wide, shaped as figured, with 4 pairs of preanal setae, preanal pores apparently not visible, 4 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -52 long ; metapodal plates large, triangular, 31 long. Fixed digit of chelicera with 2 apical teeth, movable digit with at least one tooth. Spermatheca not discernible. Leg chaetotactic formula : genu II  $2 \frac{2}{0} \frac{2}{0} 1$ , tibia II  $1 \frac{1}{1} \frac{2}{1} 1$ , genu III  $1 \frac{2}{1} \frac{2}{0} 1$ , tibia III  $1 \frac{1}{1} \frac{2}{1} 1$ . Macroseta present only on basitarsus IV-56 long, simple, pointed.

**Male :** Unknown.

**Type locality and repository :** Holotype ♀, Arunachal Pradesh, Siji, on soil, 15.x.1981, Coll. S. K. Gupta, deposited in ZSI, Calcutta, Reg. No. 3507/17.

*Remarks* : This species appears to be similar to *T. (T.) kerkirae* Swirski & Ragusa (1976) but differs in having sternal shield with 3 pairs of setae instead of 2 pairs as in *kerkirae*. From *T. (T.) rhenanoides* Athias-Henriot (1961), *T. (T.) singularis* Chant (1957) and *T. (T.) yamashigitai* Ehara (1972) this species differs in shape of ventrianal shield and in relative length of anterolateral setae.



Figs. 786-788. *Typhlodromus (Typhlodromus) sijiensis* Gupta  
 786. Dorsal shield  
 787. Ventral surface  
 788. Genu, tibia and basitarsus of leg IV

## Subfamily GNORIMINAE Chaudhri

1975. *Gnoriminae* Chaudhri, *Pak. J. Agric. Sci.*, 12(1-2) : 99.

1981. *Gnoriminae* : Gupta & Ray, 1981, *Bull. Zool. Surv. India*, 4(3) : 267.

**Diagnosis** : Dorsal shield light to heavily sclerotized with 12 pairs of lateral setae of diverse shape and nature, 3 pairs of sublateral setae, 2 pairs of setae present on the membrane around ventrianal shield ; ventrianal shield large to robust, reticulate with 6-7 pairs of preanal setae ; a pair of preanal and a long serrate postanal seta present ; a fold like structure present on ventrianal shield little anterior to anal region.

Type : *Gnorimus* Chaudhri (1975) by designation.

Genus *Garhwalicus* Gupta & Ray

1981. *Garhwalicus* Gupta & Ray, *Bull. Zool. Surv. India*, 4(3) : 268.

**Diagnosis** : Dorsal shield heavily sclerotized with 12 pairs of lateral setae of diverse length, 2 pairs of median setae and 6 pairs of dorso-central setae, sublateral setae 3 pairs present on lateral integument. Most of the setae on dorsal shield rod-like and a few with widened base. Sternal shield reticulate with 3 pairs of sternal setae. Ventrianal shield robust, reticulate with 7 pairs of preanal setae. Metapodal and metasternal plates absent. Peritreme extends anteriorly upto  $j_1$ . Leg IV with 2 macrosetae each on genu and tibia and 1 on basitarsus, all being spatulate. Spermatheca scarcely visible.

Type : *Garhwalicus himalayensis* Gupta & Ray, 1981  
by original designation.

It differs from the only other genus *viz.* *Gnorimus* Chaudhri (1975) known under this subfamily by macrosetae of leg IV, by having characteristic setae (rod like and some with widened base) on dorsal shield and in having a serrate, rod like postanal seta. Both *Garhwalicus* Gupta & Ray and *Gnorimus* Chaudhri are monotypic and the latter is known only from Pakistan.

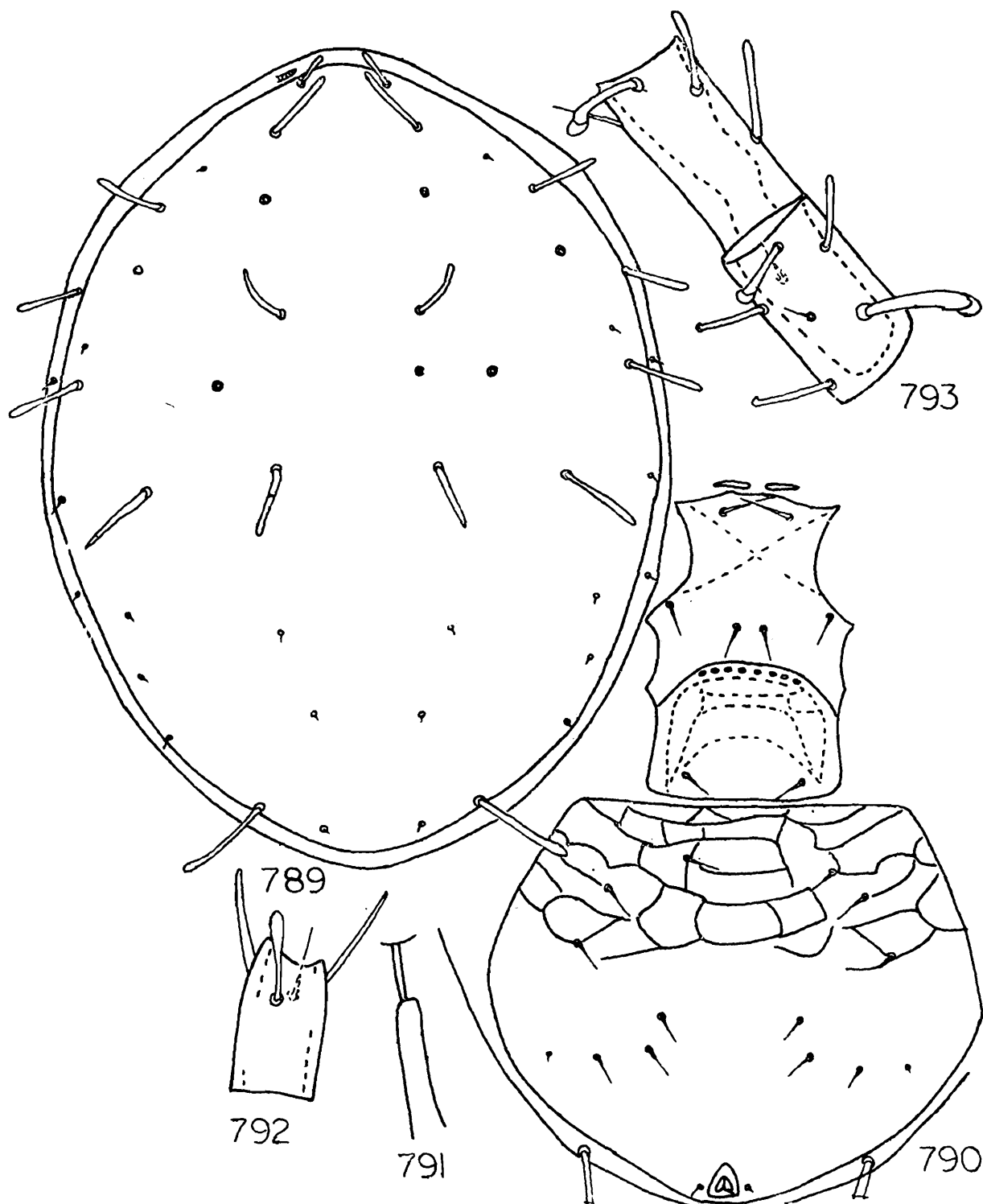
139. *Garhwalicus himalayensis* Gupta & Ray

(Figs. 789-793)

1981. *Garhwalicus himalayensis* Gupta & Ray, *Bull. Zool. Surv. India*, 4(3) : 268-269.

**Female** : Dorsal shield 370 long, 278 wide, heavily sclerotized with 12 pairs of setae on lateral series, 2 pairs on median series and 6 pairs on dorsocentral series ; 3 pairs of sublateral setae present on

lateral integument. Most of the dorsal setae rod-like, a few of those with widened base ; some setae both on lateral and dorsocentral series small. Measurements of setae :  $j_1$ -18,  $j_4$ -31 (broken),  $j_5$ -29.  $j_6$ -34,  $J_2$ -7,  $J_5$ -4,  $j_3$ -38,  $z_2$ -5,  $z_3$ -44,  $z_4$ -36 (broken),  $s_4$ -5,  $s_6$ -44,  $Z_1$ -6,  $S_2$ -44 (broken)  $S_3$ -5,  $S_4$ -5,  $S_5$ -5,  $Z_5$ -60,  $z_5$ -broken,  $Z_4$ -6. Lateral integument heavily



Figs. 789-793. *Garhwalicus himalayensis* Gupta and Ray

789. Dorsal shield

790. Ventral surface

791. Spermatheca

792. Basitarsus of leg IV

793. Genu and tibia of leg IV

sclerotized with 3 pairs of sublateral setae measuring  $r_3$ -38,  $R_1$  and  $R_4$  being small. Sternal shield reticulate, 67 long, 100 wide, with 3 pairs of moderately long sternal setae ; metasternal plate with seta absent. Genital shield granulate on either side of the shield, 67 wide, with a pair of genital setae. Ventrianal shield robust, 190 long, 210 wide, reticulate anteriorly with 7 pairs of preanal setae, a distinct fold present on the shield little anterior to anal region, one pair of paraanal and a conspicuously long postanal seta present, 88 long ; 2 pairs of setae present on the membrane around ventrianal shield,  $JV_5$ -51 long. Leg IV with 2 macrosetae on genu (27 and 18 long), tibia also with 2 macrosetae (18 and 20 long), basitarsus-22 long ; all being spatulate. Spermatheca scarcely visible. Chelicera not possible to examine because of the position of specimen. Peritreme extends anteriorly upto  $j_1$ .

*Male* : Unknown.

*Type locality and repository* : Holotype ♀, India : Uttar Pradesh, Garhwal region, Uttar Kashi, Siror village, on an undetermined plant, deposited in ZSI, Calcutta, Reg. No. 3177/17.

*Distribution* : India : Uttar Pradesh.

*Remarks* : This species is known only from its type.

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## INDEX

### A

- aberrans* (*Amblyseius*) 3  
*acereae* (*Amblyseius*) 102  
 Aceodrominae 30  
*Aceodromus* 25, 30  
 Aceosejidae 25  
*aerialis* (*Amblyseius*) 36, 39  
*addoensis* (*Amblyseius*) 144  
*adhatodae* (*Amblyseius*) 36, 37, 39  
*ainu* (*Amblyseius*) 109  
*alpicola* (*Amblyseius*) 136  
*alstoniae* (*Amblyseius*) 74  
*amba* (*Phytoseius*) 220  
*Amblydromella* 262, 263, 264, 298  
*Amblydromus* 262  
*Amblyscutus* 33  
*Amblyseiella* 33  
*Amblyseiulella* 33  
 Amblyseiinae 26, 27, 30, 32  
 Amblyseiini 27, 32  
*Amblyseiopsis* 33  
*Amblyseiulus* 33, 131  
*Amblyseius* 7, 8, 15, 18, 24, 26, 27,  
     28, 31, 33, 34, 35, 131,  
     159  
*Amblyseius* (*Amblyseiopsis*) 33  
*Amblyseius* (*Amblyseius*) 11, 19, 35,  
     73  
*Amblyseius* (*Asperoseius*) 11, 19, 67  
*Amblyseius* (*Euseius*) 19  
*Amblyseius* (*Neoseiulus*) 19  
*Amblyseius* (*Paraphytoseius*) 11, 19,  
     122  
*Amblyseius* (*Phytoscutella*) 14, 19  
*Amblyseius* (*Proprioseiopsis*) 12, 19,  
     131  
*Amblyseius* (*Proprioseius*) 11, 19  
*Amblyseius* (*Ptenoseius*) 33, 122  
*Amblyseius* (*Typhlodromalus*) 19, 140  
*Amblyseius* (*Typhlodromips*) 19  
*Ameroseius* 24  
*amitai* (*Amblyseius*) 51  
*amtalaensis* (*Amblyseius*) 51  
*andamanicus* (*Iphiseius*) 198, 200  
*anneckeii* (*Amblyseius*) 142  
*Anthoseius* 242, 263, 289  
*arecae* (*Amblyseius*) 159, 160  
*arizonica* (*Brethria*) 293  
*aripo* (*Amblyseius*) 148, 152  
*arunachalensis* (*Amblyseius*) 131, 132  
*arunachalensis* (*Typhlodromus*) 265  
 Ascidae 10  
*Asperoseius* 25, 27, 33, 134, 67  
*assamensis* (*Amblyseius*) 101, 104  
*assamensis* (*Typhlodromus*) 104  
*Athiaseius* 33  
*Australiseiulus* 262

### B

- bakeri* (*Iphiseius*) 202  
*bakeri*, *Neoseiulus* 101, 102  
*bakeri* (*Typhlodromus*) 270, 278  
*balakotiensis* (*Typhlodromus*) 267  
*bambusae* (*Amblyseius*) 74, 76  
*bambusae* (*Typhlodromus*) 285  
*bambusicolus* (*Typhlodromus*) 264,  
     267, 272  
*bandipurensis* (*Phytoseius*) 228, 229  
*baraki* (*Amblyseius*) 102, 105, 107  
*bhadrakaliensis* (*Amblyseius*) 123,  
     125, 126  
*bhadrakaliensis* (*Paraphytoseius*) 123

*bindrai* (*Amblyseius*) 112  
 Blattisocidae 28, 29, 30  
 Blattisocinae 25  
*Blattisocius* 24  
*Brethria* 263, 291

## C

*caudiglans* (*Typhlodromus*) 21, 22, 270  
*channabasavannai* (*Amblyseius*) 37, 41  
*channabasavannai* (*Typhlodromus*) 298, 304, 307  
*Chantia* 7, 8, 18, 20  
*Chanteius* 262  
 Chantiini 27  
*charui* (*Amblyseius*) 180, 182  
*Chelaseius* 20, 34  
*chikmagalurensis* (*Amblyseius*) 141  
*Chiliseius* 262  
*chitradurgae* (*Amblyseius*) 141, 142  
*chrysanthemi* (*Typhlodromus*) 265, 269, 270, 281  
*cinnabarinus* (*Tetranychus*) 192  
*Clavidromina* 262,  
*Clavidromus* 262, 296  
*coccineae* (*Amblyseius*) 74, 78  
*coccineae* (*Euseius*) 78  
*coccosocius* (*Amblyseius*) 74, 80  
*coccosocius* (*Euseius*) 80  
*confusus* (*Typhlodromus*) 293  
*communis* (*Typhlodromis*) 316, 318  
*communis* (*Typhlodromus*) 316  
*contiguus* (*Typhlodromus*) 31  
*corniger* (*Phytoseius*) 228, 230  
*cracentis* (*Amblyseius*) 125  
*crinitus* (*Phytoseius*) 228, 230  
*crotalariae* (*Amblyseius*) 160, 162, 185  
*cucumeris* (*Amblyseius*) 2  
*curvatus* (*Phytoseius*) 227

*Cydnodromella* 262  
*Cydnodromus* 33, 100  
*Cydnoseius* 262  
*cynodonae* (*Amblyseius*) 101, 107

## D

*dactylifera* (*Typhlodromus*) 276  
*daturae* (*Amblyseius*) 185, 187, 188  
*daturae* (*Typhlodromips*) 185  
*degenerans* (*Seius*) 198  
*degenerans* (*Iphiseius*) 200  
*deleoni* (*Amblyseius*) 45, 47  
*delhiensis* (*Amblyseius*) 74, 82  
*delhiensis* (*Typhlodromus*) 82  
*dhooriai* (*Amblyseius*) 105, 107  
*darjeelingensis* (*Typhlodromus*) 264, 270, 272  
 Digamasellidae 30  
*divergentis* (*Typhlodromus*) 276  
*Dubininellus* 227

## E

*Echinoseius* 262  
*eharai* (*Indoseiulus*) 193  
*eharai* (*Typhlodromus*) 270, 272  
*Ehareius* 34  
*Entomoseius* 26, 29  
*Eotetranychus* 41  
*Epicroseiopsis* 24  
 Eriophyidae 1, 23  
*eucalypti* (*Amblyseius*) 74, 84  
*eucalypticus* (*Amblyseius*) 141, 144, 152  
*eujeniae* (*Amblyseius*) 160, 164  
*Euseius* 34, 35, 73

## F

*fallacis* (*Amblyseius*) 101, 109  
*fallacis* (*Iphidulus*) 109

- fallacis* (*Neoseiulus*) 109  
*fallacis* (*Typhlodromus*) 109  
*ficusi* (*Amblyseius*) 141, 146  
*fijiensis* (*Tetranychus*) 43  
*finlandicus* (*Amblyseius*) 21, 74, 86  
*finlandicus* (*Seiulus*) 73, 86  
*fleschneri* (*Typhlodromus*) 264, 272  
*formosanus* (*Paraamblyseius*) 204,  
 205, 206  
*fragariae* (*Paraamblyseius*) 204, 205  
*fraterculus* (*Amblyseius*) 101, 111  
*Fundiseius* 34
- G
- Galendrominus* 262  
*Galendromus* 26, 262  
 Gamasidae 25  
*Gamasus* 220  
*Garhwalicus* 20, 27, 323  
*garhwalicus* (*Typhlodromus*) 316, 318  
*Garmania* 24  
*Gigagnathus* 7, 15, 18, 20, 27  
*giganticus* (*Amblyseius*) 45  
*ghanii* (*Amblyseius*) 174  
*glomus* (*Iphiseius*) 202  
 Gnoriminae 27, 32, 323  
*Gnorimus* 20, 27, 323  
*gongylus* (*Trochoseius*) 202  
*gopali* (*Typhlodromus*) 264, 274  
*guajavae* (*Amblyseius*) 160, 166
- H
- hadii* (*Typhlodromus*) 298, 300, 302,  
 305  
*hapoli* (*Iphiseius*) 198, 200  
*hapoliensis* (*Amblyseius*) 36, 43  
*havu* (*Amblyseius*) 148  
*Hemipteroseius* 26, 29  
*hebetis* (*Asperoseius*) 290  
*herbicolus* (*Amblyseius*) 36, 45, 47  
*heveae* (*Amblyseius*) 67  
*heveae* (*Kampimodromus*) 67  
*heveae* (*Typhlodromus*) 67  
*hibisci* (*Amblyseius*) 3, 86  
*hima* (*Amblyseius*) 144  
*hima* (*Typhlodromalus*) 150  
*himalayana* (*Okiseius*) 211  
*himalayensis* (*Garhwalicus*) 323  
*himalayensis* (*Typhlodromus*) 264,  
 276  
*homalii* (*Typhlodromus*) 264, 278, 280  
*hongkongensis* (*Phytoseius*) 223  
*horrifer* (*Amblyseius*) 123, 125, 126  
*horrifer* (*Paraphytoseius*) 123  
*hyalinus* 125  
*hyauliangensis* (*Amblyseius*) 67, 69
- I
- ignavus* (*Typhlodromus*) 312  
*imbricatus* (*Amblyseius*) 101, 114  
*improcerus* (*Phytoseius*) 227  
*indica* (*Raoiella*) 43, 192  
*indicus* (*Amblyseius*) 101, 112  
*indicus* (*Phytoseius*) 228, 234  
*indicus* (*Typhlodromus*) 112  
*indirae* (*Amblyseius*) 36, 47  
*Indodromus* 7, 8, 20, 27, 217  
*Indoseiulus* 7, 12, 15, 19, 27, 32, 192  
*Indoseius* 192  
*insularis* (*Typhlodromus*) 267, 270  
*intermedius* (*Phytoseius*) 228, 236  
*invectus* (*Typhlodromus*) 285  
*Iphidozercon* 24  
*Iphidulus* 24, 262  
*Iphiseiini* 197  
*Iphiseiodes* 197  
*Iphiseius* 7, 13, 18, 19, 25, 27, 33,  
 136, 197, 198  
*Iphiseius* (*Iphiseius*) 197, 198

*Iphiseius (Trochoseius)* 202  
*ipomoeae (Amblyseius)* 37, 39  
*ishizuchiensis (Amblyseius)* 134

## J

*jarooa (Amblyseius)* 141, 148, 150  
*jaunpurensis (Phytoseius)* 252, 253  
*johoreae (Amblydromella)* 174  
*jujuba (Phytoseius)* 228, 238

## K

*kalimpongensis (Amblyseius)* 141,  
 144, 150  
*Kampimodromus* 24, 33  
*kapuri (Phytoseius)* 221, 225  
*kashmiricus (Typhlodromus)* 300, 302  
*kerkirae (Typhlodromus)* 322  
*kikyunensis (Typhlodromus)* 285  
*kishii (Phytoseius)* 227  
*Klemania* 24  
*kodaikanalensis (Euseius)* 96  
*kodaikanalensis (Typhlodromus)* 265,  
 270, 280  
*kogi (Amblyseius)* 136  
*kulini (Amblyseius)* 36, 50  
*kumaonensis (Amblyseius)* 138  
*kumaonensis (Proprioseius)* 138

## L

*laaensis (Amblyseius)* 141, 152  
*labis (Amblyseius)* 174  
*lablabi (Amblyseius)* 141, 154  
*Laelaptidae* 24  
*largoensis (Amblyseius)* 36, 45, 47,  
 50, 51  
*lindquisti (Amblyseius)* 134  
*linearis (Amblyseius)* 188  
*liturivorus (Amblyseius)* 195

*longispinosus (Amblyseius)* 1, 101,  
 116  
*longispinosus (Neoseiulus)* 116  
*longispinosus (Typhlodromus)* 116  
*longulus (Amblyseius)* 134  
*ludeni (Tetranychus)* 116, 192  
*lula (Amblyseius)* 119  
*lunatus (Paraamblyseius)* 204

## M

*macropilis (Phytoseius)* 229, 240  
*macropilis (Sejus)* 240  
*macrosetosus (Phytoseius)* 228, 242  
*Macroseiinae* 24, 25, 26, 27, 30, 32  
*Macroseiini* 27  
*Macroseius* 3, 7, 8, 18, 20, 24, 25,  
 27, 29, 30  
*macrospatulatus (Amblyseius)* 73, 89  
*majumderi (Typhlodromus)* 291  
*maindaimi (Amblyseius)* 148  
*mangiferae (Amblyseius)* 160, 168  
*mangiferus (Oligonychus)* 54  
*manipurensis (Typhlodromus)* 298,  
 302  
*manipurensis (Amblyseius)* 141, 148,  
 156  
*mcmurtryi (Amblyseius)* 36, 55  
*meerutensis (Indodromus)* 217  
*meghalayensis (Amblyseius)* 160, 170  
*Melodromus* 262  
*meridionalis (Proprioseius)* 138  
*Metaseiulus* 262, 263  
*meyerae (Phytoseius)* 228, 244  
*minutus (Phytoseius)* 221, 223  
*mixtus (Phytoseius)* 228, 246, 257  
*mori (Typhlodromus)* 264, 282  
*multidentatus (Amblyseius)* 123, 125,  
 126  
*multidentatus (Paraphytoseius)* 123  
*mumai (Paraamblyseius)* 204, 206

*mumai* (*Platyseiella*) 208, 248  
*muraleedharani* (*Amblyseius*) 36, 57

## N

*namdaphaensis* (*Phytoseius*) 221, 225  
*narayanani* (*Amblyseius*) 123, 125,  
 126  
*neglecta* (*Phytoseius*) 234,  
*neocaledonicus* (*Tetranychus*) 190  
*neococcineae* (*Amblyseius*) 74, 90  
*neocorniger* (*Phytoseius*) 228, 248  
*neocrotalariae* (*Amblyseius*) 160, 172  
*neoferox* (*Phytoseius*) 228, 250  
*neoghonii* (*Amblyseius*) 160, 174  
*Neoledius* 34  
*neorhenanus* (*Typhlodromus*) 316,  
 318, 320  
*neorykei* (*Amblyseius*) 36, 59  
*Neoseiulella* 262  
*Neoseiulus* 34, 35, 100, 262  
*neosoleiger* (*Typhlodromus*) 310  
*neotransvaalensis* (*Typhlodromus*)  
 296  
*nesbitti* (*Typhlodromus*) 312  
*nicobarensis* (*Amblyseius*) 123, 125,  
 126  
*nilgiriensis* (*Typhlodromus*) 264, 283  
*nucifera* (*Amblyseius*) 71  
*nucifera* (*Paraphytoseius*) 71

## O

*obtusus* (*Zercon*) 34, 36  
*occidentalis* (*Typhlodromus*) 2, 21  
*octavus* (*Typhlodromus*) 267  
*officinaria* (*Amblyseius*) 160, 174,  
 176  
*oguroi* (*Amblyseius*) 188  
*Okiseius* 7, 8, 12, 19, 33, 210  
*oleivora* (*Phyllocoptruta*) 310

*olombo* (*Amblyseius*) 154  
*operantes* (*Typhlodromus*) 129, 312  
*orientalis* (*Amblyseius*) 36, 61  
*orientalis* (*Eutetranychus*) 80  
*orientalis* (*Typhlodromus*) 123  
*Orientiseius* 263, 298  
*orissaensis* (*Typhlodromus*) 298, 304,  
 310  
*Otopheidomenidae* 26, 27, 28, 29  
*Otopheidomeninae* 25, 26  
*Otopheidomenies* 26  
*ovalis* (*Amblyseius*) 73, 92  
*ovalis* (*Euseius*) 92  
*ovalis* (*Typhlodromus*) 92

## P

*paraaerialis* (*Amblyseius*) 36, 63  
*Paraamblyseius* 8, 12, 15, 17, 18,  
 19, 27, 33, 202  
*parabilis* (*Amblyseius*) 125  
*Paradromus* 33  
*Paraphytoseius* 33, 34, 122, 123  
*Paraseiulella* 262  
*Paraseiulus* 10, 262, 263, 310  
*paspalivorus* (*Amblyseius*) 102, 119  
*paspalivorus* (*Typhlodromus*) 119  
*peltatus* (*Amblyseius*) 131, 134  
*Pennaseius* 220  
*peregrinis* (*Typhlodromus*) 140  
*Phyllocoptruta* 310  
*Phyllodromus* 33  
*Phytodromus* 33  
*Phytoseiulella* 197  
*Phytoseius* (*Pennaseius*) 20  
*Phytoscutella* 33, 34, 128  
*Phytoscutus* 33, 128  
*Phytoseiidae* 1, 10, 22, 24, 25, 26,  
 27, 28, 29, 30, 31, 32  
*Phytoseiinae* 24, 25, 26, 27, 30, 32,  
 216

- Phytoseiini* 26  
*Phytoseiulus* 7, 20, 21, 25, 27  
*Phytoseius* 7, 8, 15, 18, 19, 24, 25,  
     26, 27, 28, 32, 217, 219,  
     220, 227  
*Phytoseius* (*Pennaseius*) 12, 20  
*Phytoseius* (*Dubininellus*) 227  
*platypilis* (*Platyseiella*) 208  
*Phytoseius* (*Phytoseius*) 13, 20, 227  
*Platyseiella* 7, 8, 18, 20, 27, 33,  
     206  
*plebius* (*Typhlodromus*) 278, 280  
*plumifer* (*Gamasus*) 220  
Podocinae 24  
*Podocinum* 24  
*polyantheae* (*Amblyseius*) 160, 178  
*pomi* (*Seius*) 23  
*potentillae* (*Amblyseius*) 160, 180,  
     182  
*Proprioseiopsis* 33, 34, 131  
*Proprioseius* 25, 26, 27, 33, 34, 138  
*Proprioseiulus* 34  
*pruni* (*Amblyseius*) 74, 94  
*pruni* (*Typhlodromus*) 298, 305  
*Ptenoseius* 122  
*punicae* (*Iphiseius*) 134, 136  
*punjabensis* (*Phytoseius*) 228, 252,  
     253  
*pyri* (*Eriophyes*) 23  
*pyri* (*Typhlodromus*) 22, 262, 316
- Q
- Quadromalus* 34  
*quianshanensis* (*Phytoseius*) 227
- R
- rachelae* (*Phytoseius*) 229, 253  
*rangatensis* (*Amblyseius*) 101, 121  
*Raoiella* 43, 192  
*rhabdus* (*Amblyseius*) 57  
*rhododendronis* (*Amblyseius*) 73, 96  
*rhododendronis* (*Euseius*) 96  
*rhododendroni* (*Typhlodromus*) 7,  
     286, 287  
*rhenanus* (*Typhlodromus*) 3, 265,  
     286, 287  
*rhenanus* (*Seiulus*) 285  
*rhenanoides* (*Typhlodromus*) 322  
*ricini* (*Indoseiulus*) 193, 195  
*ricini* (*Indoseius*) 195  
*ricinus* (*Amblyseius*) 90  
*Ricoseius* 8  
*rickeri* (*Typhlodromus*) 2, 21, 298,  
     303, 305, 307  
*rosellus* (*Amblyseius*) 134  
*roseus* (*Phytoseius*) 228, 255, 257  
*roshanlali* (*Typhlodromus*) 293, 294  
*rubini* (*Amblyseius*) 2, 21  
*rugosus* (*Phytoseius*) 257  
*rugulosus* (*Phytoseius*) 257  
*rykei* (*Amblyseius*) 180
- S
- sacchari* (*Amblyseius*) 73, 98  
*sacchari* (*Euseius*) 98  
*salebrosus* (*Amblyseius*) 128  
*salebrosus* (*Typhlodromus*) 128  
*santurcensis* (*Amblyseius*) 125  
*sapienticola* (*Amblyseius*) 160, 174,  
     182  
*scleroticus* (*Amblyseius*) 123, 126  
*Seiopsis* 24  
*Seiulus* 25, 262  
*Seius* 24  
*Seius* (*Seiulus*) 262  
*sexmaculatus* (*Eotetranychus*) 41  
*sighanus* (*Amblyseius*) 50  
*shoreae* (*Amblyseius*) 36, 65  
*sijiensis* (*Amblyseius*) 160, 183

- sijiensis* (*Typhlodromus*) 316, 321  
*sikkimensis* (*Okiseius*) 213  
*similis* (*Amblyseius*) 23  
*simplexus* (*Amblyseius*) 174  
*simplicissimus* (*Typhlodromips*) 159  
*singularis* (*Typhlodromus*) 322  
*sojaensis* (*Amblyseius*) 94  
*soleiger* (*Typhlodromus*) 2, 28, 312  
*sonprayagensis* (*Typhlodromus*) 264, 289  
*sorghumae* (*Amblyseius*) 141, 157  
*subtropicus* (*Amblyseius*) 125  
*subtropicus* (*Okiseius*) 211, 213  
*suknaensis* (*Amblyseius*) 159, 185, 187, 188  
*swaga* (*Amblyseius*) 148, 150  
*swirskii* (*Phytoseius*) 228, 259  
*synachattiensis* (*Amblyseius*) 131, 136  
*syzygii* (*Amblyseius*) 159, 188
- T
- taianensis* (*Phytoseius*) 227  
 Tarsonemidae 1, 23  
 Tenuipalpidae 1, 23  
*terrestris* (*Typhlodromus*) 131  
 Tetranychidae 1, 23  
*tetranychivorus* (*Amblyseius*) 160, 190  
*tetranychivorus* (*Typhlodromips*) 190  
*tiliarum* (*Typhlodromus*) 312  
*transitans* (*Typhlodromus*) 312, 314  
*transvaalensis* (*Kampimodromus*) 296  
*Treatia* 26, 29  
 Treatinae 26
- trimesiseti* (*Typhlodromus*) 312  
*Trochoseius* 197, 202  
*Tropicoseius* 67  
*Typhloctomus* 262, 263, 312  
*Typhlodromalus* 33, 35, 140, 141  
*Typhlodromella* 262, 263  
 Typhlodromidae 262  
*Typhlodromina* 262  
 Typhlodromini 27, 262  
*Typhlodromips* 33, 34, 159  
*Typhlodromopsis* 159  
*Typhlodromus* 7, 8, 15, 18, 24, 25, 26, 27, 28, 31, 217, 262, 263, 315  
*Typhlodromus* (*Amblydromella*) 20  
*Typhlodromus* (*Amblyseius*) 33  
*Typhlodromus* (*Anthoseius*) 20, 289  
*Typhlodromus* (*Brethria*) 14, 20  
*Typhlodromus* (*Clavidromus*) 20  
*Typhlodromus* (*Orientiseius*) 20  
*Typhlodromus* (*Paraseiulus*) 10, 13, 15, 20, 310  
*Typhlodromus* (*Typhloctomus*) 13, 20  
*Typhlodromus* (*Typhlodromus*) 14, 20, 262  
*Typhlodromus* (*Typhlodromopsis*) 33, 100  
*Typhloseiella* 33  
*Typhloseiopsis* 25, 262  
*Typhloseius* 33  
*Tyrophagus* 236
- U
- umbraticus* (*Amblyseius*) 3  
*umbratus* (*Typhlodromus*) 274  
*urumanus* (*Amblyseius*) 125

## V

*volsella* (*Typhlodromus*) 315

## W

*wainsteini* (*Phytoseius*) 228, 260

*woodburyi* (*Phytoseius*) 242

## Y

*yamashaitai* (*Typhlodromus*) 322

*yazuliensis* (*Okiseius*) 213, 215

## Z

*zalelestes* (*Otopheidomenis*) 28, 29

*Zercon* 34, 36

ERRATA

<i>Page</i>	<i>Line</i>	<i>Printed as</i>	<i>Read as</i>
xv	Species serial No. 99	Chaudhuri	Chaudhri
xv	Species serial No. 116	<i>T. (A.) kodaikanalensis</i>	<i>T. (A.) kodaikanalensis</i> Gupta
xvi	13th, 14th and 15th lines from top	<i>Typloctomus</i>	<i>Typhloctonus</i>
xvi	last line	Index...346	Index...343
11	Fig. 8	k. n. $Z_4$	k. $Z_5$
11	Fig. 8	l $Z_5$	l $z_5$
11	Fig. 8	m $z_4$	m. $Z_4$
12	Fig. 12	p. $Z_4$	p. $S_5$ (seta interior to it is $Z_4$ )
13	Fig. 15	<i>Typhlodromus (Typhloc- tomus)</i>	<i>Typhlodromus (Typhloc- tonus)</i>
20	5th line from top	<i>Platyseiela</i>	<i>Platyseiella</i>
20	11th line from top	<i>Typhlodromus (Typhloc- tomus)</i>	<i>Typhlodromus (Typhloc- tonus)</i>
21	10th line from bottom	tophoras	tophores
24	18th line from bottom	<i>Ribaga</i>	Ribaga
24	last line	<i>Macroseiinae</i>	Macroseiinae
27	1st and 2nd lines	<i>Typhlodromini</i>	Typhlodromini
28	8th line from top	Tuttle (1973)	Tuttle & Muma (1973)
29	20th line from top	otopheidomenidae	Otopheidomenidae
30	4th line from bottom	premitive	primitive
34	Key couplet 5 (both)	$J_5$	$j_5$
43	6th line from top	Paratype	Paratypes

<i>Page</i>	<i>Line</i>	<i>Printed as</i>	<i>Read as</i>
43	15th line from bottom (sp. No. 4)	<i>Amblyseius (Amblyseius)</i> <i>hapoliensis</i> Gupta	<i>Amblyseius (Amblyseius)</i> <i>hapoliensis</i> Gupta, sp. nov.
44	6th line from bottom	Do	Do
43	14th line from bottom	<i>Amblyseius hapoliensis</i> Gupta, <i>Indian J. Acar.</i> (In press)	delete
47	14th line from bottom	<i>Amblyseius (Amblyseius)</i> <i>indirae</i> Gupta, <i>Entomon</i> (In press)	<i>Amblyseius (Amblyseius)</i> <i>indirae</i> Gupta, <i>Entomon</i> 10(3) : 209-211 (1985)
47	5th line from bottom	presen&slightly	present slightly
57	7th line from top	<i>Amblyseius (Amblyseius)</i> <i>muraleedharani</i> Gupta <i>Env. &amp; Ecol.</i> (In press)	<i>Amblyseius (Amblyseius)</i> <i>muraleedharani</i> Gupta <i>Env. &amp; Ecol.</i> 3(3) : 434 (1985)
89	1st line from top and 6th line from bottom (sp. No. 25)	<i>Amblyseius (Euseius)</i> <i>macrospatulatus</i> Gupta	<i>Amblyseius (Euseius)</i> <i>macrospatulatus</i> Gupta, sp. nov.
89	2nd line from top	<i>Amblyseius</i> <i>macrospatulatus</i> Gupta, <i>Indian J. Acar.</i> (In press)	delete
119	7th line from bottom	Gainsuille	Gainsville
125	11th line from bottom	Malagassy	Malagasy
125	Do	Madagascar	delete
128	8th line from top	J <sub>5</sub>	j <sub>5</sub>
128	2nd line from bottom	presenl	present
132	1st line from top and 3rd line from bottom (sp. No. 45)	<i>Amblyseius (Proprio-</i> <i>seiopsis) arunachalensis</i> Gupta	<i>Amblyseius (Proprio-</i> <i>seiopsis) arunachalensis</i> Gupta, sp. nov.

<i>Page</i>	<i>Line</i>	<i>Printed as</i>	<i>Read as</i>
132	3rd line from top	<i>Amblyseius arunachalensis</i> Gupta, <i>Indian J. Acar.</i> (In press)	delete
136	10th line from top	<i>Amblyseius (Proprioseiopsis) synachattiensis</i> Gupta, <i>Entomon</i> (In press)	<i>Amblyseius (Proprioseiopsis) synachattiensis</i> Gupta, <i>Entomon</i> 10 (3) : 209-211 (1985)
141	18th line from bottom	<i>Env. Ecol.</i> (In press)	<i>Env. &amp; Ecol.</i> 3 (3) : 434-435 (1985)
143	2nd line from top	<i>Env. Ecol.</i> (In press)	<i>Env. &amp; Ecol.</i> , 3 (3) : 435-436 (1985)
152	11th line from top (sp.No. 55)	<i>Amblyseius (Typhlodromalus) laaensis</i> Gupta	<i>Amblyseius (Typhlodromalus) laaensis</i> Gupta, sp. nov.
152	12th line from top	<i>Amblyseius laaensis</i> Gupta, <i>Indian J. Acar.</i> (In press)	delete
153	6th line from bottom	<i>Amblyseius (Typhlodromalus) laaensis</i> Gupta	<i>Amblyseius (Typhlodromalus) laaensis</i> Gupta, sp. nov.
174	1st line from top (sp. No. 66)	<i>Amblyseius (Typhlodromips) neoghonii</i> Gupta	<i>Amblyseius (Typhlodromips) neoghonii</i> Gupta, sp. nov.
174	2nd line from top	<i>Amblyseius neoghonii</i> Gupta, <i>Indian J. Acar.</i> (In press)	delete
175	5th line from bottom	<i>Amblyseius (Typhlodromips) neoghonii</i> Gupta	<i>Amblyseius (Typhlodromips) neoghonii</i> Gupta, sp. nov.
183	13th line from bottom (sp. No. 71)	<i>Amblyseius (Typhlodromips) sijiensis</i> Gupta	<i>Amblyseius (Typhlodromips) sijiensis</i> Gupta, sp. nov.
183	12th line from bottom	<i>Amblyseius sijiensis</i> Gupta, <i>Indian J. Acar.</i> (In press)	delete
184	7th line from bottom	<i>Amblyseius (Typhlodromips) sijiensis</i> Gupta	<i>Amblyseius (Typhlodromips) sijiensis</i> Gupta, sp. nov.

<i>Page</i>	<i>Line</i>	<i>Printed as</i>	<i>Read as</i>
211	19th line from top (sp. No. 83)	<i>Okiseius himalayana</i> Gupta	<i>Okiseius himalayana</i> Gupta, sp. nov.
211	17th line from bottom	<i>Okiseius himalayana</i> Gupta, <i>Indian J. Acar.</i> (In press)	delete
212	5th line from bottom	<i>Okiseius himalayana</i> Gupta	<i>Okiseius himalayana</i> Gupta, sp. nov.
213	10th line from top	<i>Okiseius sikkimensis</i> Gupta	<i>Okiseius sikkimensis</i> Gupta, sp. nov.
213	11th line from top	<i>Okiseius sikkimensis</i> Gupta, <i>Indian J. Acar.</i> (In press)	delete
214	5th line from bottom	<i>Okiseius sikkimensis</i> Gupta	<i>Okiseius sikkimensis</i> Gupta, sp. nov.
235	5th line from top	eqsitarsus	basitarsus
253	1st line from top	o	of
257	5th line from top	assynonym	as synonym
262	22nd line from top	<i>Galendrominus</i>	<i>Galendromimus</i>
262	25th line from top	<i>Typhloctomus</i>	<i>Typhloctonus</i>
263	2nd line from top	<i>Typhloctomus</i>	<i>Typhloctonus</i>
265	7th line from top and last line	<i>rhododendronis</i>	<i>rhododendroni</i>
283	8th line from bottom (sp. No. 118)	<i>Typhlodromus (Ambly-</i> <i>dromella) nilgiriensis</i> Gupta	<i>Typhlodromus (Ambly-</i> <i>dromella) nilgiriensis</i> Gupta, sp. nov.
283	7th line from bottom	<i>Typhlodromus (Ambly-</i> <i>dromella) nilgiriensis</i> Gupta <i>Indian J. Acar.</i> (In press)	delete
284	5th line from bottom	<i>Typhlodromus (Ambly-</i> <i>dromella) nilgiriensis</i> Gupta	<i>Typhlodromus (Ambly-</i> <i>dromella) nilgiriensis</i> Gupta, sp. nov.

<i>Page</i>	<i>Line</i>	<i>Printed as</i>	<i>Read as</i>
291	1st line from top (sp. No. 122)	<i>Typhlodromus (Anthoseius) majumderi</i> Gupta	<i>Typhlodromus (Anthoseius) najumderi</i> Gupta, sp. nov.
291	2nd line from top	<i>Typhlodromus (Anthoseius) majumderi</i> Gupta, <i>Indian J. Acar.</i> (In press)	delete
292	5th line from bottom	<i>Typhlodromus (Anthoseius) majumderi</i> Gupta	<i>Typhlodromus (Anthoseius) majumderi</i> Gupta, sp. nov.
312	11th, 12th. 13th, 22nd and 25th lines from top	<i>Typhloctonus</i>	<i>Typhloctonus</i>
313	5th line from bottom	<i>Typhlodromus (Typhloctonus) nesbitti</i> Womersley	<i>Typhlodromus (Typhloctonus) nesbitti</i> Womersley
314	4th line from top (sp. No. 134) and 5th line from bottom	<i>Typhlodromus (Typhloctonus) transitans</i> Gupta	<i>Typhlodromus (Typhloctonus) transitans</i> Gupta
315	11th line from top	J <sup>1</sup>	j <sub>1</sub>
326	11th line from top	Athias-Henriot, C. 1960	Athias-Henriot, C. 1962
345	12th line from top (left column)	<i>Galendrominus</i>	<i>Galendromimus</i>
347	10th line from top (Right column)	<i>Otopheidomenies</i>	<i>Otopheidomenis</i>
349	10th line from bottom (Right column)	<i>Typhlodromus (Typhloctonus)</i>	<i>Typhlodromus (Typhloctonus)</i>