

THE TAXONOMY OF THE FAMILY  
ENTOMOBRYIDAE (COLLEMBOLA) OF  
SOUTH AFRICA

by

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THESIS

submitted in partial fulfillment of the  
requirements for the degree

MAGISTER SCIENTIAE

at the

Potchefstroom University

for

Christian Higher Education

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February

1968

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## I UITTREKSEL

Hierdie ondersoek poog om al die bekende soorte van een van die families van die Collembola in Suidelike Afrika, t.w. die Entomobryidae, taksonomies te evalueer. Numeries oorheers die genus Seira al die ander genera te-same en word dit dus intensief ondersoek. Twaalf nuwe soorte word tot die genus Seira toegevoeg, t.w. Seira tsitsikamaensis, S. metala, S. anncla, S. rykei, S. vaneedeni, S. mathewsi, S. metarsiosa, S. addoensis, S. damerella, S. marephila, S. lindei and S. eleana. Twee van die tiepeksemlare van Womersley word herbeskryf, nl. S. capensis Womersley 1934 en S. grisea (Womersley, 1934). S. annulicornis (Borner, 1903) word herdefinieer vanaf Suid-Afrikaanse materiaal. Besonderhede aangaande die dorsale setataxie van S. barnardi word verstrek en die volgende soorte word kortliks vermeld:- S. rowani, S. annulipes, S. nagatai, S. dayi, S. flavovirens, S. munroi, S. nyassica var. pallens, S. laeta, S. incertus en S. pseudocoeruleus. Dit word bewys dat S. squamoornata nog nie in Suidelike Afrika versamel is nie.

Lepidokrugeria, 'n nuwe mono-tipiese genus word beskryf, waarvan die enkele soort, L. meyeri, van opvallende antennale aanhangsels voorsien is. Die soorte van die genera Cyphoderus en Cyphoda word slegs kortweg vermeld aangesien hulle omvattend deur Delamare-Deboutteville (1948) ondersoek is. Die swak verteenwoordigde genera Calobatinus, Pseudocyphoderus, Pseudosinella, Paronella,

Lepidocyrtus, Sinella en Entomobrya word slegs genoem.

## II ABSTRACT

This work endeavours to deal taxonomically with all the species of one family of the Collembola, the Entomobryidae, which have been found in Southern Africa to date. The genus Seira, which by sheer numbers overwhelms all other genera together, is dealt with intensively; twelve new species are described, being Seira tsitsikamaensis, S. metala, S. anncla, S. rykei, S. vaneedeni, S. mathewsi, S. metarsiosa, S. addoensis, S. damerella, S. marephila, S. lindei and S. eleana. Two of Womersley's types, S. capensis Womersley 1934 and S. grisea (Womersley, 1934) are redescribed while S. annulicornis (Borner, 1903) is redefined from South African material. Details of the dorsal chaetotaxy of S. barnardi are given and short mentions are made of ~~ten~~ other species, viz:- S. rowani, S. annulipes, S. nagatai, S. dayi, S. flavovirens, S. munroi, S. nyassica var. pallens, S. laeta, S. incertus and S. pseudocoeruleus. The reputed presence of S. squamoornata in Southern Africa is disproved.

A new monotypical genus, Lepidokrugeria, is presented; the sole species, L. meyeri, bears striking antennal adornments. The species of the genera Cyphoderus and Cyphoda, which were dealt with comprehensively by Delamare-Deboutville (1948) are mentioned briefly. The poorly represen-

ted genera Calobatinus, Pseudocyphoderus, Pseudosinella, Paronella, Lepidocyrtus, Sinella and Entomobrya are merely enumerated.

### III INTRODUCTION

This study originated in the upsurge of interest in the soil and its inhabitants which occurred a few years ago. At that stage the only sizeable sample of Southern African Collembola then in existence was the collection which had been built up by Mr. D. v. V. Webb of the Department of Agricultural Technical Services. This had already been in the hands of an overseas authority for four years and, as a matter of interest, was first reported on after a further three years. The only reference material in the country was a few specimens, including types, that had been collected during a short visit and identified by Womersley (1934) and which were in the collection of the South African Museum, Cape Town. Intensive investigations of soil ecology were envisaged at that stage and it was deemed advisable, as far as the Collembola were concerned, to lessen dependance on the good offices of overseas authorities in view of the delays entailed. Apart from the immediate background to this work, it is of interest to review very briefly the origin of the family Entomobryidae and also earlier works, scanty though they are, on Collembola in Southern Africa.

The number of species of Collembola known to science

has increased considerably since De Geer in 1740 described four species as belonging to the genus Podura. Linnaeus listed 14 podurids in the twelfth edition of his "Systema Naturae" (1767). Rather more than 100 years later, Lubbock (1870) initiated the separation of the Collembola from the Thysanura and his monograph of 1873, detailing five families, 16 genera and 131 species, resuscitated the taxonomy of the group from the chaos of synonymy (he lists 323) into which it had degenerated as a result of inadequate descriptions of species by previous authors. Lubbock's families were Smynthuridae, Papiiriidae, Degeeridae, Poduridae, Lipuridae and Anouridae. Tomosvary (1882) introduced the name Entomobryidae in what was little more than a re-arrangement of Lubbock's genera. He united Lubbock's Smynthuridae and Papiiriidae into Smynthuridae Lubb., and the latter's Lipuridae and Anouridae into Lipuridae Lubb. The Entomobryidae covered most of Lubbock's Degeeridae but Tomosvary retained the name Degeeridae Lubb. for the remainder.

Borner, in a series of articles written between 1901 and 1913, clearly enuciated the basic principles on which the systematics of the Collembola have been based ever since. In 1901, he divided the order Collembola Lubbock into the suborders Arthropleona and Symphypleona. The former contained his family Achorutidae, subfamilies Aphorurini and Achorutini, and the family Entomobryidae Tomosvary, subfamilies Isotomini Schäffer (ad partem), Tomocerini Schäffer and Entomobryini Schäffer. The Symphypleona contained the sole family Smynthuridae Tullberg. In his "Das System der Collembolen" of 1906, he retained the subfamilies Isotominae, Tomocerinae and Entomobryinae while adding his Actaletinae

and the Oncopodurinae Carl et Leb. Later, however, he elevated the Tomocerinae and Isotominae to family status leaving the Entomobryidae to be made up of the subfamily Entomobryinae with tribes Entomobryini and Orchesellini, the subfamily Paronellinae and the subfamily Cyphoderinae with tribes Troglopedetini and Cyphoderini (Borner, 1913).

Gisin (1944) adopted a conservative attitude in his consideration of Holarctic Collembola and re-incorporated the Tomoceridae into the Entomobryidae. He later followed the same line in his work "Collembolenfauna Europas" of 1960.

Salmon (1945) referred to the work of Gistel in (1848) and replaced the generic name Entomobrya Rondani, 1861 with Mydonius Gistel 1848 and consequently erected the family Mydoniidae and subfamily Mydoniinae. In his "Keys and Bibliography to the Collembola" of 1951, he erected the tribe Mydoniini. However, the International Commission on Zoological Nomenclature in its Opinion 440 of 1957 suppressed Mydonius for the Law of Priority but not for the Law of Homonymy; in the same opinion, the Commission placed Degeeria Nicolet 1841 and Degeeria Nicolet 1842 on the "Official Index of Rejected and Invalid Generic Names". A year later, the Commission invalidated both Degeeria and Mydonius and placed Entomobrya on the "Official List of Generic Names". Salmon (1951) followed Borner in treating the Tomoceridae as a separate family and further, recognised the family Oncopoduridae Denis 1932. In his monumental and comprehensive "Index to the Collembola" of 1964, he lists approximately 4245 species and subspecies in 14 families, six tribes and about 287 genera. The Entomobryidae Salmon 1964 accounts for more than one-quarter of the total

with some 1336 species in 75 genera. The Entomobryinae Schaeffer 1896 is by far the largest of the three subfamilies with 52 genera and some 1037 species; the Cyphoderinae Borner 1913 has but 34 species in 13 genera and two tribes, Troglopedetini Borner 1913 and Cyphoderini Borner 1904 whereas the Paronellinae Borner 1913 has 265 species in 20 genera.

Up to 1934, only 34 species of Collembola were known from the continent of Africa south of the equator; of these, only 11 belong to the family Entomobryidae. Borner (1907) described Pseudosira nyassica var. pallens from Little Namaland and Lepidocyrtinus (Mesira) laeta with Cyphoderus colorus both from Port Nolloth. In 1913, the same author described three new species: Cyphoderus natalensis, C. limboxiphius and Pseudocyphoderus wasmanni, and recorded C. colorus and C. bidenticulata (Parona, 1888), all from Natal and South West Africa. Entomobrya minima Brown, was described from Natal in 1926 and Womersley (1929) recorded Lepidocyrtinus (Mesira) annulicornis Borner and Cyphoderus limboxiphius from Southern Rhodesia as well as two new species Cyphoderus cuthbertsoni and C. africanus.

Womersley visited the Cape in 1930 and was able to make a small collection himself, as well as study the material that had accumulated in the South African Museum from sporadic accessions by members of the staff. In his publication of 1934, he mentioned 15 species of Entomobryidae, of which four were new, viz. Pseudosira grisea, P. grisea var. annulata, Lepidocyrtinus cooperi var. barnardi and L. capen-

sis. The other entomobryids were Entomobrya decemfasciata (Packard) 1873, E. nivalis forma immaculata Schaeffer 1896, E. nivalis forma maculata Schaeffer 1896, Lepidocyrtus lanuginosus (Gmelin) 1788, Lepidocyrtinus incertus Handschin 1925, L. pseudocoeruleus (Denis) 1924, L. flavovirens (Borner) 1903, L. flavovirens var. annulosa Wahl. 1906, L. annulipes Handschin 1929, Cyphoderus natalensis and C. arcuatus var. aethiopicus Handschin 1929. Sinella coeca (Schott) 1896 was reported from the Congo Caves (Goto, 1953).

Pacit (1959) studied the material collected by the Swedish South Africa Expedition of 1951 and also the material in the South African Museum including Womersley's holotypes, as well as material collected by other workers. In his consideration of the entomobryids, he found one new species which he put into a new monotypical genus, Diamantinum munroi, but otherwise he regarded all the material as belonging to previously described species, viz. Entomobrya nivalis (L.) 1758, E. hexfasciata Harvey 1895, Sinella hofsti Schaeffer 1896, Lepidocyrtus ferrugineus Schott 1893, L. cyaneus Tullberg 1871, Pseudosinella octopunctata Borner 1901, P. alba (Packard) 1873, P. immaculata (Lie-Pettersen) 1897, Seira (Mesira) squamoornata (Scerbakov) 1898, S. (M.) barnardi (Womersley) 1934, S. (M.) capensis (Womersley) 1934, Paronella nigromaculata Schott 1903, Cyphoderus bidenticulatus, C. assimilis Borner 1906, C. africanus, C. limboxiphius, C. colorus, C. natalensis, C. omoensis Delamare-Deboutville 1945, C. squamidives (Silvestri) 1914, Pseudocyphoderus wasmanni and Calobatinus rhadinopus (Borner) 1913.

Paclet was also favoured in 1959 with the opportunity of studying the Webb collection. This amounted to several thousand specimens, including those collected by Dr. W.G.H. Coaton of the same Department. In a preliminary publication (Paclet, 1965) he described two new species, one being the entomobryid Cyphoderus trinervoidis. His main results finally appeared in print in 1967, and, again considering the Entomobryidae only, mentioned the following species:- Entomobrya atrocincta Schott 1896, E. nivalis, E. nivalis multifasciata (Tullberg) 1812, Entomobrya sp., Lepidocyrtus lanuginosus, L. cf. lanuginosus, Seira (Mesira) squamoornata, S. (M.) barnardi, Diamantimum munroi, Paronella nigromaculata, Cyphoderus ? assimilis, C. limboxiphius, C. trinervoidis, C. squamdives, Pseudocyphoderus wasmanni, and Calobatinus rhadinopus. Of the above, only E. atrocincta had not previously been reported from South Africa. Paclet had in the meantime reported on 375 specimens from Southern Rhodesia (Paclet, 1964). Here he found 373 Seira squamoornata and one Entomobrya nivalis multifasciata.

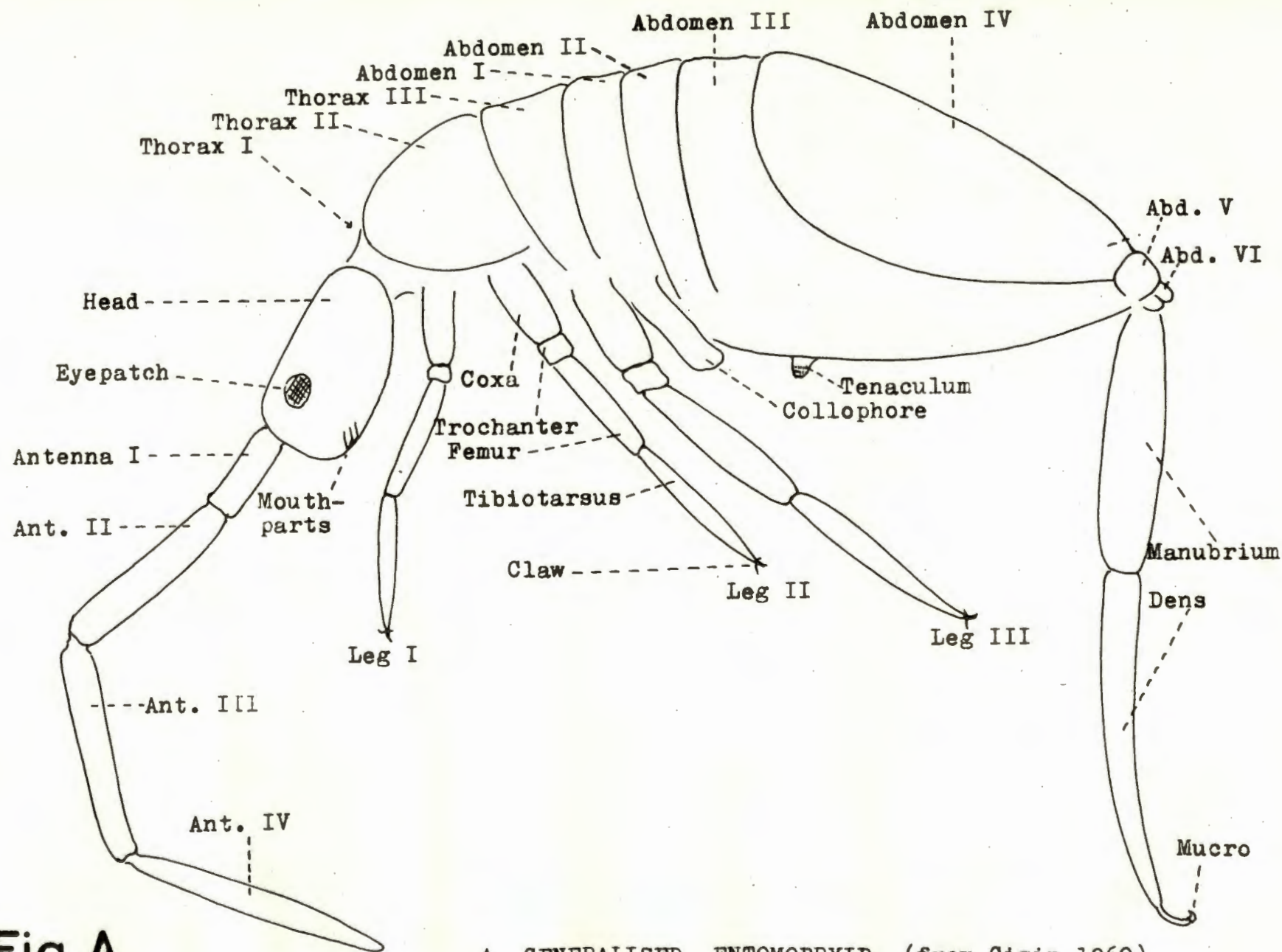
The most striking aspects of these three works by Paclet are his identification of several thousand specimens as Seira squamoornata, his attribution to the species of no less than 27 synonyms and his comments of "the variability of the species". The present author's reasons for considering at least a considerable portion of the above to be consequent on misidentification are presented on page 60.

Since Börner's work in the early years of this century, there has been a large amount of data published on more or less circumscribed regional and/or systematic bases, e.g.

Maynard (1951), Gisin (1960), Handschin (1929), Stach (1963) etc. Though the series of monographs by the latter author included world species in relation to Polish species, the series was by no means completed. As far as the present work is concerned, the series is of little use, since Stach dealt with only the Palearctic species of one genus, Entomobrya. This mass of data is scattered through so many and various and often obscure journals that the essential preliminary to a study of the group, namely, the compilation of a catalogue to the literature, became a major task. Fortunately Salmon (1964) brought order from near chaos by publishing an extremely valuable contribution to science which correlated the known Collembola of the world into one comprehensive classification as well as providing an index of all literature references to all species. It was perhaps inevitable that the classification, the first comprehensive work for over 50 years, would present points arousing discussion; however, as a basic taxonomic foundation, it is invaluable. It is therefore used in the present work.

#### IV The family ENTOMOBRYIDAE Salmon, 1964

The work by Salmon (1964) is in the form of a key supported by literature references. The following definition has been extracted by the author from his key, with minor re-arrangement to conform to the general sequence of earlier definitions.



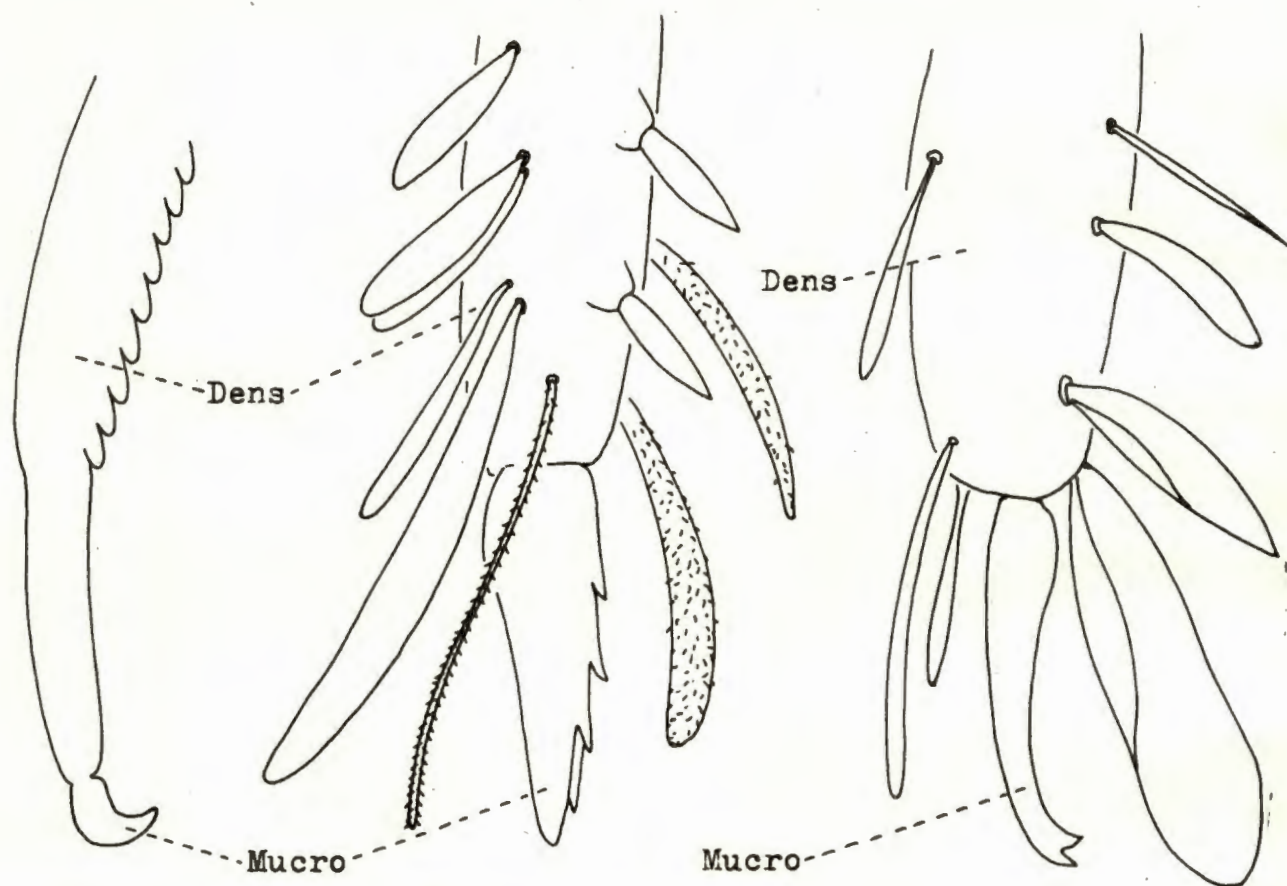
**Fig. A**

A GENERALISED ENTOMOBRYID (from Gisin, 1960)

## ENTOMOBRYIDAE Salmon, 1964 (figs. A-C )

Trunk elongate in shape with most segments distinct and usually dissimilar; prothorax dorsally without setae, usually reduced and hidden under mesotergum; abd. V & VI reduced; abd. IV usually distinctly longer, often several times longer, than abd. III; scales present or absent; setae either plain, ciliated or serrated; cuticle smooth; antennae usually long with four to six segments; post-antennal organ absent; head prognathous or obliquely prognathous with the antennae well forward on the anterior half of the head; mouthparts adapted for chewing, not projecting nor cone-like; mandible and maxilla both present; mandible with molar area; unguiculus and clavate tenent hairs usually present but sometimes absent or reduced; inner edge of claw usually with basal groove; furcula always present, usually very long; dens much longer than manubrium, often distinctly crenulated and annulated.

It should be noted that while in the key to the family, couplet 164, a lapsus calami leads to the description of the dens as "distinctly crenulated and annulated" whereas in the key to the subfamilies, the alternative to couplet 254 has the dens "neither crenulated nor annulated" (Salmon, 1964, pages 119 and 128). It would be correct to consider the crenulation and annulation of the dens as characteristics of sub-familial rank and to delete them from couplet 164. The following key to the subfamilies is also from Salmon (1964).



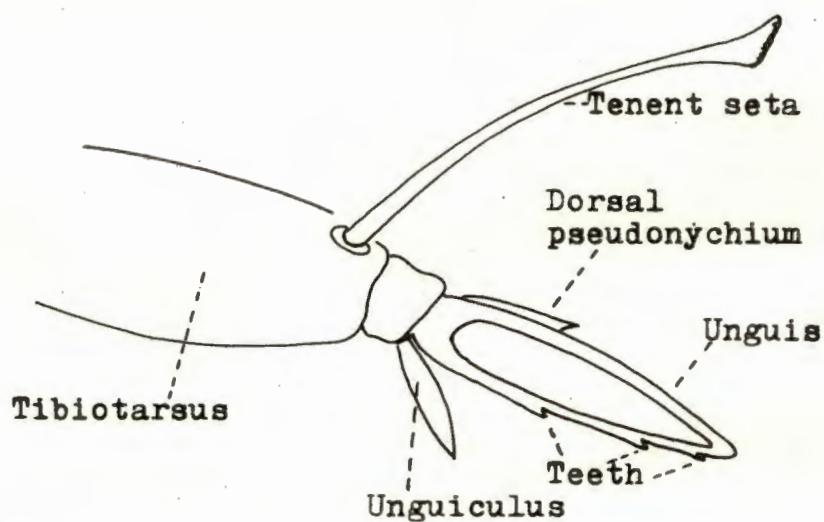
Entomobryinae

Paronellinae

Cyphoderinae

**Fig. B**

THE TYPES OF MUCRO IN THE  
SUBFAMILIES (from Gisin, 1960)



**Fig. C**

A GENERALISED CLAW.

## V KEY to the SUBFAMILIES of the ENTOMOBRYIDAE

254. The dens long, slender and tapering, prominently crenulated and annulated; mucro small .....  
 ..... Entomobryinae Schaeffer, 1896.
- The dens long but not, or only slightly tapering, neither crenulated nor annulated ..... 255.
255. The dens bearing large ciliated or fringed scales as well as setae or spines, unguiculus three winged or reduced; scales present on the body; ocelli absent ..... Cyphoderinae Börner, 1913.
- The dens without ciliated or fringed scales but bearing setae and with or without normal scales and with or without spines; unguiculus four winged; mucro plump; body with or without scales; ocelli present ..... Paronellinae Börner, 1913.

## VI KEYS to the SOUTH AFRICAN genera

The following keys to the presently-known South African genera are adapted from the same work.

## ENTOMOBRYINAE

1. Scales present on the body ..... 2
- Scales entirely absent from the body ..... 5
2. Mucro falciform ..... 3

- Mucro bidentate with basal spine ..... 4
- 3. Ant. normal ..... Seira
- Ant. I and ant. II with row and clusters of specialised setae ..... Lepidokrugeria gen. nov.
- 4. Ocelli reduced or absent; with two basal winglike teeth to each claw ..... Pseudosinella
- Ocelli eight to each side: claws normal, Lepidocyrtus
- 5. Antennae with four segments ..... Entomobrya
- Antennae with five apparent segments ..... Sinella

## CYPHODERINAE

- 1. Mandible normal with molar area ..... 2
- Mandible styliform without molar area or absent ..... Calobatinus
- 2. Dens 2-4 times as long as mucro, with two rows of large ciliate scales on posterior face ..... Cyphoderus
- Dens 14-17 times as long as mucro ..... 3
- 3. Mucro very small, falciform or absent ..... Cyphoda
- Mucro extremely small, conical or spine-like ..... Pseudocyphoderus

## PARONELLINAE

Sole South African genus ..... Paronella

VII The genera SEIRA, MESIRA and LEPIDOCYRTINUS

Modern authorities do not agree on the definitions of these three genera. Salmon (1956, 1964) considers all three to be valid and his criteria are as follows:-  
Seira with antennae not annulate, mesonotum of normal shape, Mesira with annulate antennae, mesonotum projecting noticeably forward, dens with stout club-shaped finely ciliate setae and Lepidocyrtinus with antennae annulate but mesonotum of normal shape. On the other hand, Gisin (1960) considers Mesira and Lepidocyrtinus to be synonyms of Seira and many other authors follow his lead, e.g. Yosii (1959), Gama (1964), etc. The essence of Salmon's argument is that the original definition of Seira, type S. domestica, by Lubbock (1870) described the terminal segments of the antennae as not ringed (Salmon, 1956). S. domestica has, however, recently been described as with the last segment of the antennae indistinctly annulate (Gisin & Gama, 1962), and indeed Handschin (1929) regarded it as possessing annulate terminal antennal segments. There is therefore every justification for broadening the definition of the genus to include the type species.

Lepidocyrtinus, type L. annulicornis, was erected by Börner in 1903 for forms with annulate antennae. In 1906,

however, he considered this genus to be a synonym of Mesira, which had been erected, albeit with an inadequate description, by Scerbakov (1898) with M. squamoornata, with ringed antennae, as the type species. Thus Lepidocyrtinus fell away by the action of its author and there can be little justification for Salmon to resurrect it. With the broadening of Seira to conform with its type species, Mesira also falls away as a junior synonym. As regards the other features quoted by Salmon (1964), the stout club-shaped setae are present together with a mesonotum of normal shape in most of the species described hereunder and, the shape of the mesonotum varies considerably in different members of each species. Further, his Mesira squamoornata has a mesonotum very much the same as the mesonotum of Seira munroi. There is certainly not sufficient difference to be of generic importance. Therefore, this work uses a wider definition of Seira than that of Salmon. It is freely adapted from Yosii (1959) and accomodates the range of variation of Southern African species. The unguis is here not restricted to a pair of inner proximal and an inner distal tooth since most species described hereunder do not conform in this minor respect though they do agree in all major features. Yosii's spindle-shaped scales on the ventral side of the dens have not been seen, and are presumed to be ordinary scales that have become slightly twisted and then seen in lateral view. Further, his creation of three subgenera, Afroseira, Lepidocyrtinus and Seira s. str. cannot be upheld since the presence of two or three lasiotrichia on abd. IV is of specific significance only (Salmon, 1964). It is also extremely difficult, when con-

fronted by a long series of specimens, to determine whether lasiotrichia have been present or not. Their insertions are very similar to those of scales and may also often be obscured by stomach contents.

VIII The genus SEIRA Lubbock 18~~79~~<sup>70</sup>

Typically entomobryid in appearance, with long thin antennae from one-half to more than twice the length of the body. Ant. IV with a terminal protrusible vesicle. In adults, ant. IV & III are annulated as indicated by the arrangement of the setae (e.g., figs. 29 & 55). In juveniles, this annulation is not always apparent. Eyes, 8 + 8, often on a dark eyepatch. Mesonotum usually protruded over the posterior portion of the head. Body more or less covered with large brown scales which are from bluntly oval to almost circular in shape. Scales also on tibiotarsus, femur, ant. I & II, basally on ant. III and on manubrium and dens. The insertions of a few large brushed setae on the tergites form a pattern which is useful in taxonomy. A large number of these macrosetae form a collar around the anterior edge of th. II. A few long thin ciliate sensory setae (= setae sensuales Yosii 1959 = bothriotricha Gisin 1960 = lasiotrichia Salmon 1951) are present on abd. IV, one or two on abd. III and sometimes one on ant. I. Unguis with one or more lateral teeth and dorsally, two closely appressed pseudonychia. A further dorsal pseudonychium may also be closely appressed but often stands away from the unguis. Unguiculus lanceolate, about two-thirds the length

of the claw, often with a small basal tooth. Trochanteral organ present. Tenaculum with four teeth on each side and a median seta. Furca strong, often with a few club-shaped setae dorsally on either side of the manubrium-dens joint. The coarse crenulations of the dens end abruptly leaving a thin mucronal shaft which is finely crenulate and about three times the length of the mucro. The latter is fal-ciform, without a basal spine.

## IX DETERMINATION OF SPECIES

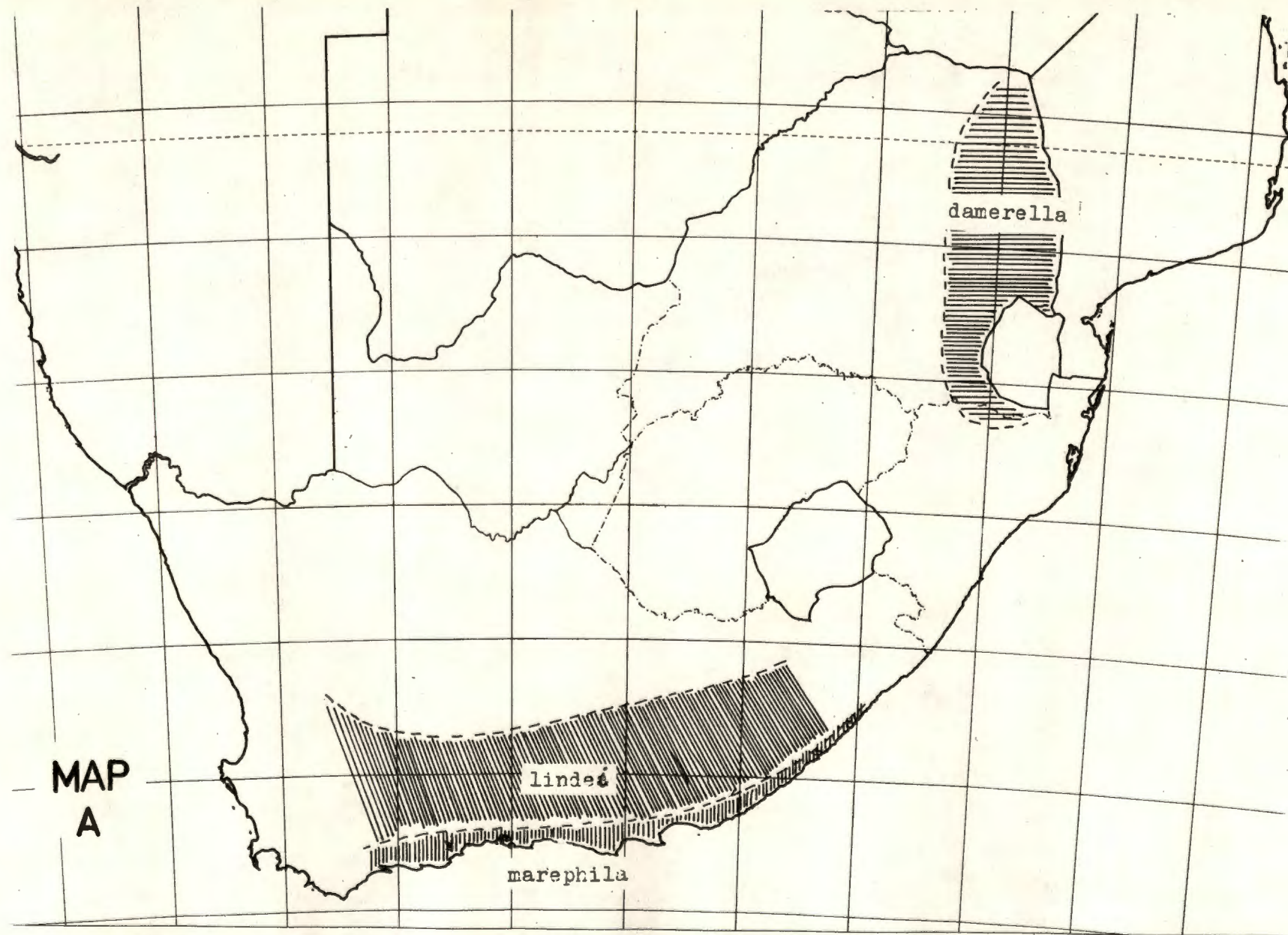
### FACTORS OF USE

1. The colour or colour pattern is so often rendered obscure by various factors that it is of little value. In many specimens, a basic dark colour, violet to black, is spread throughout the body and the brown scales on the tergites form transverse golden bands. The extent of these bands, even their presence or absence, depends on the number of scales in each band, which in turn depends on the general wear and tear to which the individual has been subjected in its lifetime. Hence, one finds colour varieties ranging from mostly gold to mostly black in one accession of the same species. The majority of specimens available for study have been captured directly into and preserved in 70% alcohol. The background colour tends to disappear and even some of the brown in the scales leaches out. It has been observed that a specimen which in life was black with transverse brown bands was almost colourless after six months sto-

rage in 70% alcohol.

2. The length of the antennae and/or segments, as compared to the length of the head and/or body, results in ratios which give useful indications of specific relationships. However, the intraspecific variation is occasionally considerable, e.g. S. tsitsikamaensis, where the antennae of the holotype are almost twice the length of the head plus body but in other specimens only one and one-half times as long.

3. Following Yosii 1959, Gisin and Gama 1962 and Gama 1966, it was found that the number of macrosetae and the pattern made by their insertions on the tergites were of decisive significance in separating species which are otherwise identical or nearly so. The problem was to decide which tergite carried a macrosetal complement which was sufficiently stable to be of taxonomic value and at the same time quickly and easily determined. On th. II, the setae forming the anterior collar are too numerous to be counted with accuracy, while the medial and posterior groups, though fairly constant, are not sufficiently so to be of decisive import. On the other hand, the number of macrosetae on th. III and abd. I and their patterns were seen to be very stable. On abd. II & III, there are too few macrosetae to be of any use. On abd. IV they are more numerous but their pattern varies considerably from specimen to specimen; quite often several are missing and the contents of the gut often obscure their insertions. The macrosetae on the head seem to be constant; unfortunately it is much more difficult and time-consuming to dis-

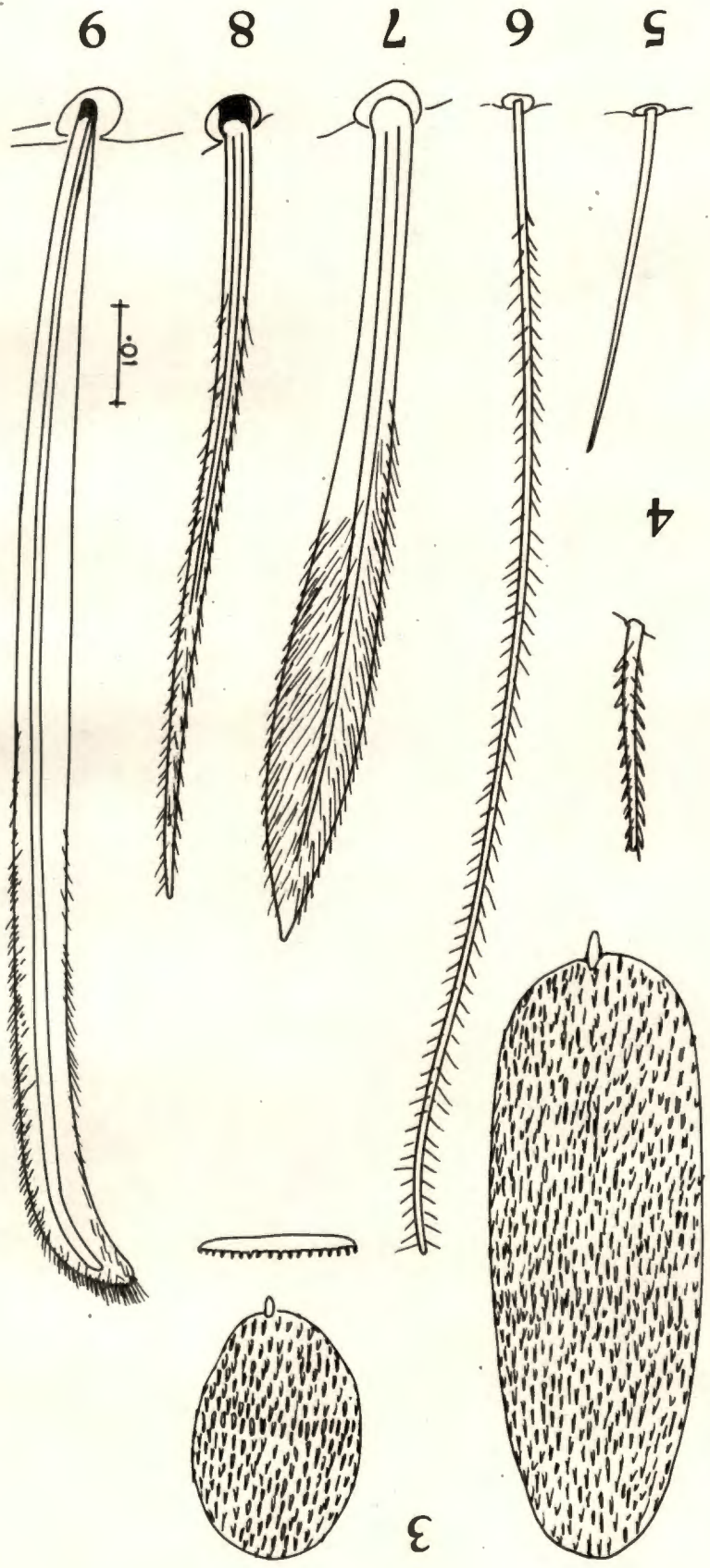


tinguish them than it is to check on those on th. III and abd. I. Their patterns are very similar to that given by Gisin & Gama (1962, p.792) for S. domestica and appear to be similar, though perhaps not identical, for all species of Seira examined in this work, e.g. figs. 12, 27, 35, and 71.

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Map A: The areas in which S. damerella, S. marephila and S. lindet have been found.

|   |    |    |        |    |         |        |         |          |
|---|----|----|--------|----|---------|--------|---------|----------|
| 1 | c. | m. | th. II | p. | th. III | abd. I | abd. II | abd. III |
|   |    |    |        |    |         |        |         |          |



## THE MACROSETAL FORMULA (fig. 1)

Some two thousand specimens collected over the period 1963-1967 were examined and found to fall into twenty-two groups when judged on th. II, III and abd. I. Initially, twelve groups were formed on the basis of the number of macrosetae on th. III, viz:- 3,4,5,6,7,8,9,10,11,12,13 and 14. The next criterion was the number of macrosetae on abd. I, which led to groups designated 14-8, 9-4, etc. This designation is referred to hereafter as the macrosetal formula. On occasion the medial and posterior clusters on th. II were also considered, leading to groups indicated by 7-3-3-8, 7-3-4-9 etc. This latter step was seldom necessary since the first two criteria of th. III and abd. I usually resulted in groups of specimens which were isolated not only morphologically but also geographically.

Some difficulty was occasioned by a few specimens which seemed to conform to an established pattern but lacked one macroseta of the pattern on one side only. In

- 
- Fig. 1: Macrosetal clusters used in formulae. On II, c - collar, m - medial group, p - posterior group.
- Figs. 2-3: Scales. 2, large bluntly ovate scale. 3, small round scale, also in cross-section.
- Figs. 4-9: Types of setae. 4, ordinary ciliate seta. 5, smooth sensory seta. 6, lasiotrichia. 7, club-shaped macroseta. 8, pointed macroseta. 9, brushed macrosetae.

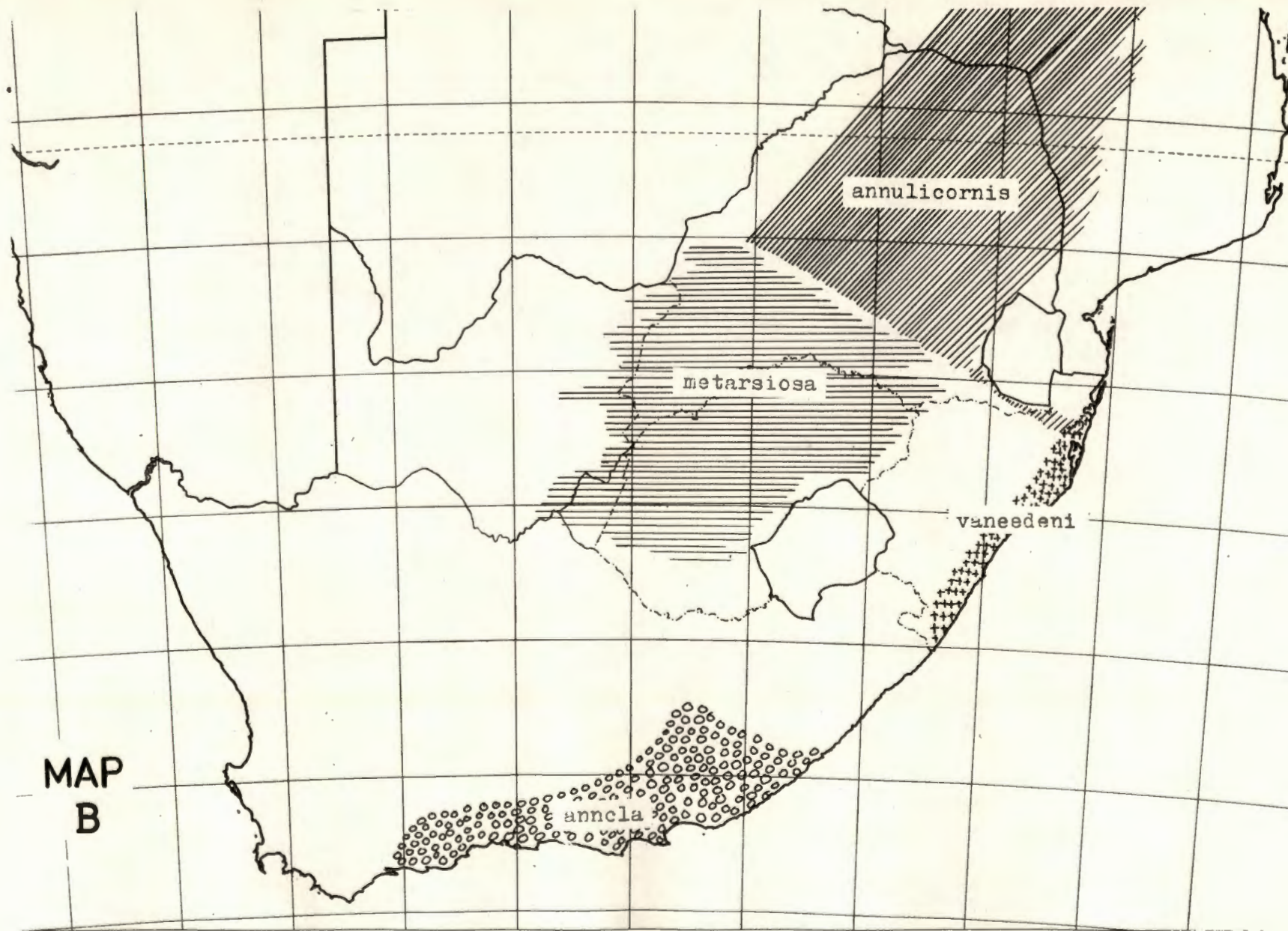
some of these cases, it was observed that that macroseta had been lost and that a replacement seta was growing in the insertion. This replacement was always short, smooth and pointed. However, where this was not clearly seen to be the case, the specimen was disregarded for the purpose of this study. About forty specimens have been examined which bear macrosetae in patterns and/or numbers unique to themselves. These "one-off" examples have been ignored pending the acquisition of more specimens.

#### GEOGRAPHIC DISTRIBUTION

Confirmation of the validity of species erected on the basis of the macrosetal formula is obtained from a study of their geographic distribution. Seven examples are given in maps A and B.

Map A illustrates the marked gaps between the localities inhabited by three species, Seira damerella (12-6-4) in the Transvaal Lowveld and S. lindel (12-7-5) with S. marephila (12-6-5/6) in the Cape. The latter two species occupy adjoining areas, S. lindel being in an area which is climatically much drier than that inhabited by S. marephila. The macrosetal formulae of these three species are quite different though they demonstrate a superficial resemblance.

Map B illustrates the line dividing the areas occupied by S. metarsiosa (9-3) and S. annulicornis (9-5). The



geographic distribution of these two species is in separate areas, as might be deduced from the difference in their macrosetal formulae. The only district in which they have both been collected is Groblersdal in the Transvaal, which is on the border separating the two areas.

S. vaneedeni (7-3) and S. anncla (4-2), have macrosetal formulae which differ to a greater extent than those of the previous examples. Though they both have a coastal distribution, they do not overlap but are well separated. S. anncla, however, covers an area which is approximately the same as that inhabited by both S. lindea and S. marephila together. S. anncla appears to be much more tolerant of climatic variation than either of the two latter species, having been found within 100 yards of the sea as well as in the interior, in the Grahamstown district, under conditions of severe drought.

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Map B: The areas in which S. metarsiosa, S. annulicornis, S. vaneedeni and S. anncla have been found.

X KEY TO THE SOUTHERN AFRICAN SPECIES OF SEIRA

1. Three macrosetae on th. III ..... 2

- More than three macrosetae on th. III.

Four " " " " anncla spec. nov.

Five " " " " ..... rowani

Six " " " " rykei spec. nov.

Seven " " " " vaneedeni spec. nov.

Eight " " " " ..... 3

Nine " " " " ..... 4

Ten " " " " ..... 5

Eleven " " " " ..... grisea

Twelve " " " " ..... 7

Thirteen " " " flavovirens ? (Yosii 1959)

Fourteen " " " ..... 9

2. Antennae about twice as long as body ..... tsitsikamaensis spec. nov.

- Antennae about equal to the body in length ..... metala spec. nov.

3. Two macrosetae on abd. I ..... mathewsi spec. nov.

- More than two macrosetae on abd. I.

Three " " " ..... annulipes

Five " " " ..... capensis

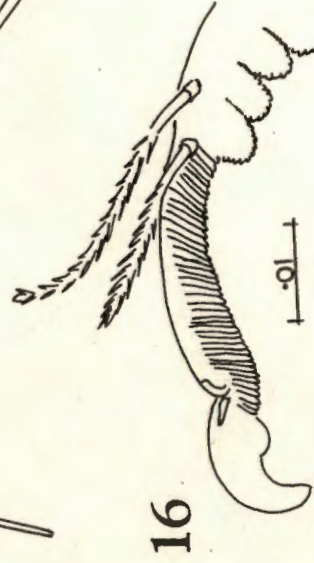
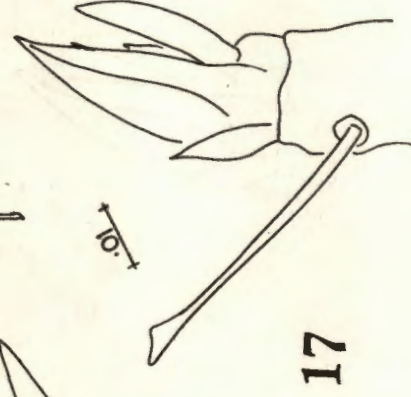
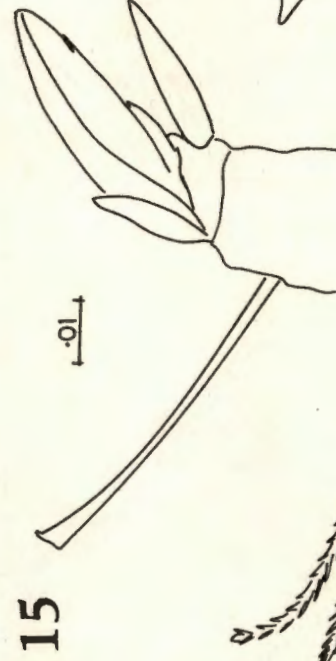
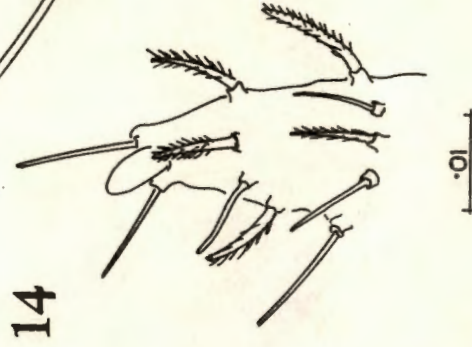
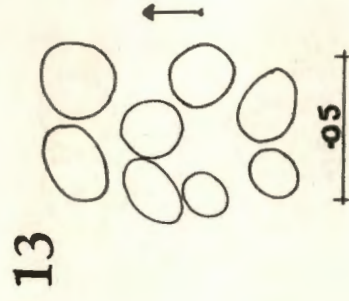
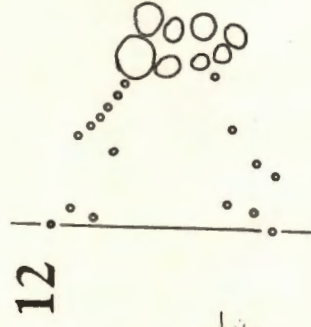
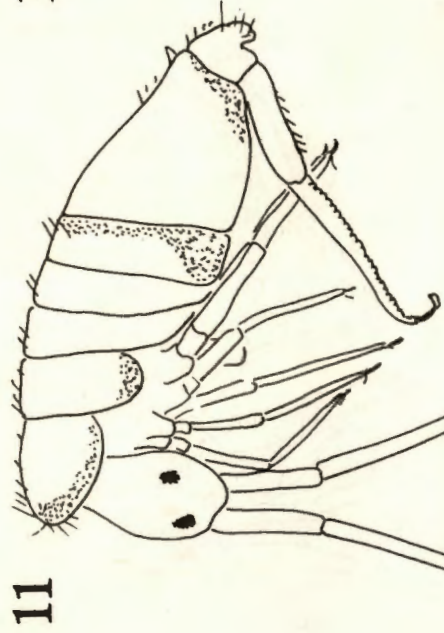
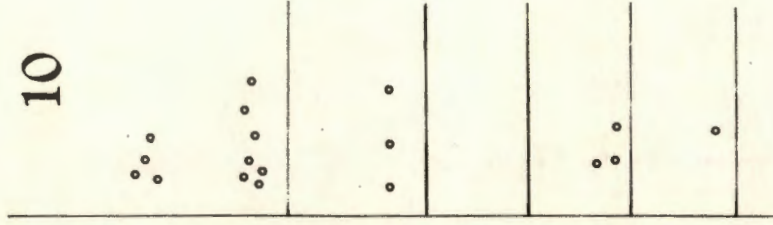
4. Three macrosetae on abd. I .. metarsiosa spec. nov.

- Five " " " ..... annulicornis

5. The five macrosetal bases on abd. I in a straight line ..... nagatai

- The five macrosetal bases on abd. I are not in a straight line, the second base being well anterior of the rest ..... 6

6. Three macrosetae in the medial cluster on th. II ..... addoensis spec. nov.



- Four, five or six macrosetae in the medial cluster on th. II ..... barnardi
- 7. Five macrosetae on abd. I ..... dayi
- More than five macrosetae on abd. I
  - Six " " " " ..... 8
  - Seven " " " " lindei spec.nov.
- 8. Four macrosetae in the medial group on th. II ..... damerella spec.nov.
- Five or six do. .... marephila spec.nov.
- 9. Six macrosetae on abd. I ..... 10
- Eight " " " " ..... eleana spec.nov.
- 10. Mucro falcate ..... flavovirens
- Mucro spoon-shaped ..... munroi

SEIRA TSITSIKAMAENSIS spec. nov. (figs. 10-17)

The most striking characteristic of this species is the extremely long antennae, those of the type specimen being 5.25 mm long on a body which is 3.0 mm long. The macrosetal formula is 3-0 (fig. 10). The setae on the antennae are mostly ciliated (fig. 4) with a few smooth sensory setae scattered distally on ant. IV (fig. 14). The ciliate setae are arranged in definite rings on ant. IV

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Figs. 10-17: S. tsitsikamaensis 10, dorsal macrosetae. 11, habitus. 12, cephalic macrosetae. 13, eyes. 14, tip of ant. IV. 15, claw II. 16, claw III. 17, mucro.

& III but the regularity does not extend to ant. II & I. Scales on ant. I, II and proximally on ant. III. Head with 8 + 8 eyes (fig. 13) on dark eyepatches, many scales and a few macrosetae in a definite pattern (fig. 12).

The body is of normal shape. The lengths of the various segments of the type specimen, measured along the mid-dorsal line, are:- ant. IV 2240 $\mu$ , ant. III 1700 $\mu$ , ant. II 840 $\mu$ , ant. I 470 $\mu$ , head 500 $\mu$ , th. II 520 $\mu$ , th. III 260 $\mu$ , abd. I 170 $\mu$ , abd. II 280 $\mu$ , abd. III 280 $\mu$ , abd. IV 840 $\mu$ , abd. V 170 $\mu$ , abd. VI 30 $\mu$ , manubrium 490 $\mu$ , dens 800 $\mu$  and mucro 30 $\mu$ . The large, distally rounded, brown scales are also present on the legs, manubrium, dens and body, in large numbers on the latter where they obscure the dark violet pigment which is scattered throughout the body and appendages. This pigment is concentrated to form dark eyepatches and also on the anterior and lateral edges of tergite th.II, the ventrolateral edge of tergite th.III, the ventrolateral and posterior edges of tergite abd. III and the posterior edges of tergites abd. IV & V. This pattern is not constant and in one of the paratypes the only concentrations of violet pigment are the eyepatches, the rest of the specimen being a uniform dark blue or violet under the brown scales, except for the furca which is white. Brushed macrosetae are arranged on the dorsum in a pattern (fig. 10). Pointed finely ciliate macrosetae (fig. 8) are scattered amongst the ciliate setae on the appendages. Legs normal, trochanteral organ of about 30 short pointed setae.

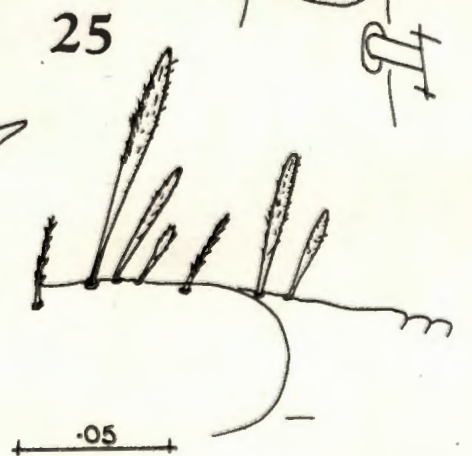
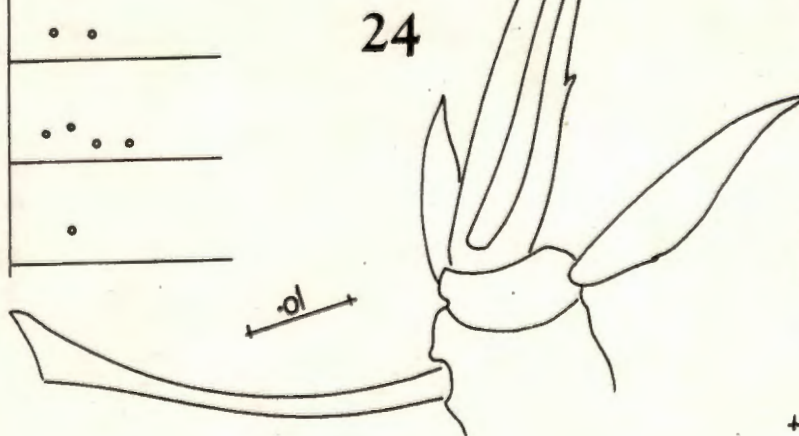
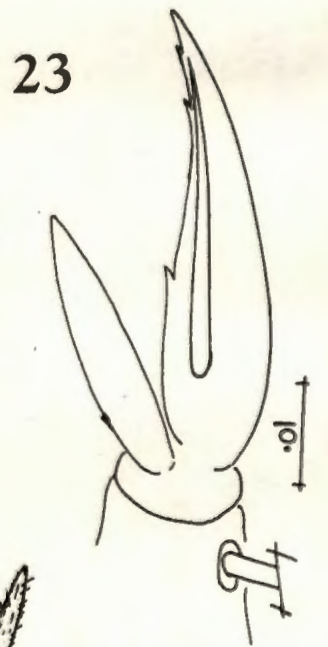
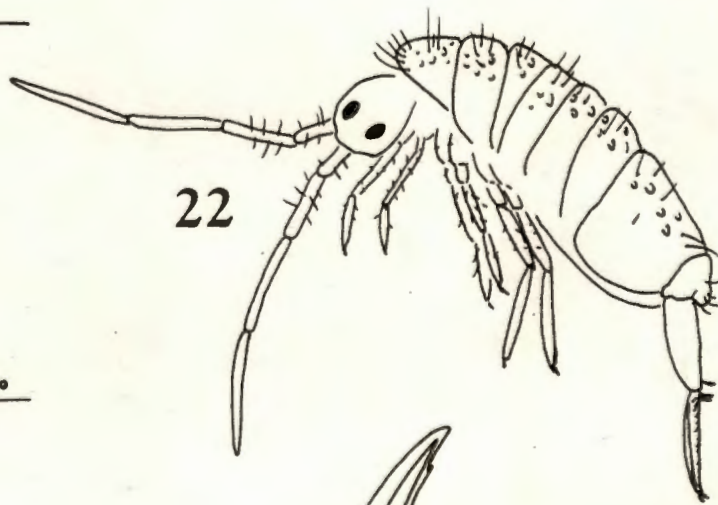
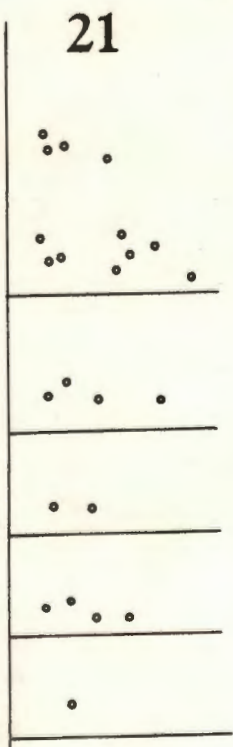
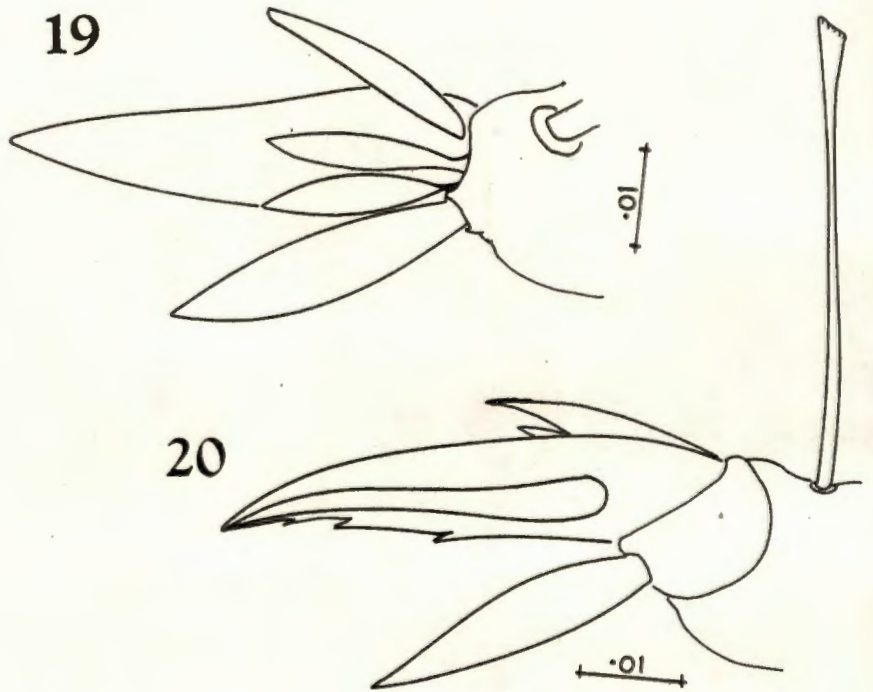
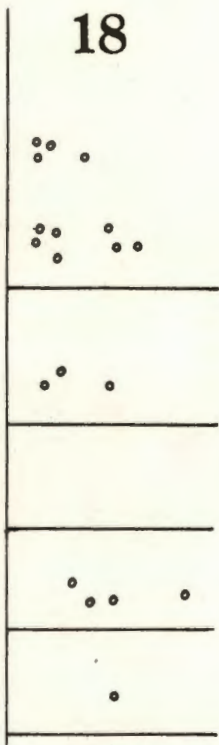
The claws (figs. 15 & 17) are similar on all legs. The unguis bears one unpaired lateral tooth at about three-

quarters the distance to the tip. Two dorsal pseudonychia closely envelope the base of the claw and their tips, which project slightly laterally of the claw at about one-third its length, may give the impression of two basal teeth. Unguiculus lanceolate. ~~Tenent~~ hair strong, rather longer than the claw. The manubrium and dens bear many ciliate setae, scales and a few scattered pointed macrosetae (fig. 8) as well as the characteristic group of six or eight forming a cluster on the manubrium near its junction with the dens. The latter, strongly annulate, tapers gradually distally but there is an abrupt transition to the shaft of the falciform mucro, which is very much thinner and finely annulate (fig. 16). No sexual differentiation was noted, all specimens having a plentiful growth of ciliate setae on the genital papilla.

Material examined. Holotype from under oak leaves, Tsitsikama Seacoast National Park, C.P., 19 January 1967 (T.J. Coates) AcV 65/96. One paratype from rotting leaves, Storms River Mouth, C.P., 20 January 1967 (T.J. Coates) AcV 65/104. One paratype from indigenous forest litter, Knysna, C.P., 9 April 1966, (J. Findlay) AcV 66/136.

SEIRA METALA spec. nov. (figs. 18-20)

This species, although with the same macrosetal formula of 3-0 as S. tsitsikamaensis differs in other respects. Firstly, the antennae are, at 2.9 mm, much the same length



as the body. Secondly, the unguis has three minute teeth (fig. 20) and a dorsal unpaired pseudonychium as well as the usual pair of closely appressed dorsal pseudonychia (fig. 19). Thirdly, the body is white, being without pigment, even the eyes being on a white field. Fourthly, the pattern of the brushed macrosetae on the tergites is slightly different (fig. 18), the middle one of the three macrosetae on th. III being inserted slightly anteriorly of the other two.

The lengths of the various segments, measured along the mid-dorsal line, are:- ant. IV 1134 $\mu$ , ant. III 1000 $\mu$ , ant. II 460 $\mu$ , ant. I 270 $\mu$ , head 590 $\mu$ , th. II 360 $\mu$ , th. III 250 $\mu$ , abd. I 144 $\mu$ , abd. II 180 $\mu$ , abd. III 180 $\mu$ , abd. IV 900 $\mu$ , abd. V 180 $\mu$ , abd. VI 45 $\mu$ , manubrium 540 $\mu$ , dens 765 $\mu$  and mucro 27 $\mu$ . The setae and their arrangement on the antennae are as for S. tsitsikamaensis as are the setae and scales on head, legs and furca. Eyes 8 + 8, no dark eyepatch. Trochanteral organ of about 20 seta. No sexual differentiation was noted.

Material studied. Holotype and two paratypes from under decaying bluegum leaves, Grootvadersbosch, Swellendam district, C.P., 9 February 1967, (T.J. Coates) AcV 66/182.

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Figs. 18-20: S. metala. 18, dorsal macrosetae. 19, posterior aspect of claw III. 20, anterolateral aspect of claw III.

Figs. 21-25: S. annula. 21, dorsal macrosetae. 22, habitus. 23, claw II. 24, claw III. 25, manubrium - dens joint.

SEIRA ANNCLA spec. nov. (figs. 21-25)

This species is distinguished by its macrosetal formula of 4-2. It has been found so far only in the Eastern Cape, between East London and Mossel Bay and as far inland as Cradock. The ground colour is dark blue scattered throughout, though in some specimens it is absent from the legs. Brown scales on the tergites obscure the blue body colour, forming golden-brown transverse bands. The number of scales varies, according to the wear-and-tear to which the particular specimen has been subjected.

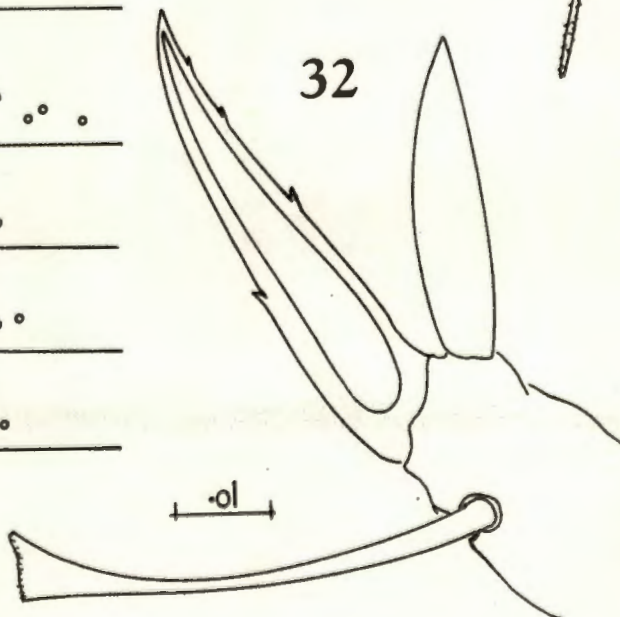
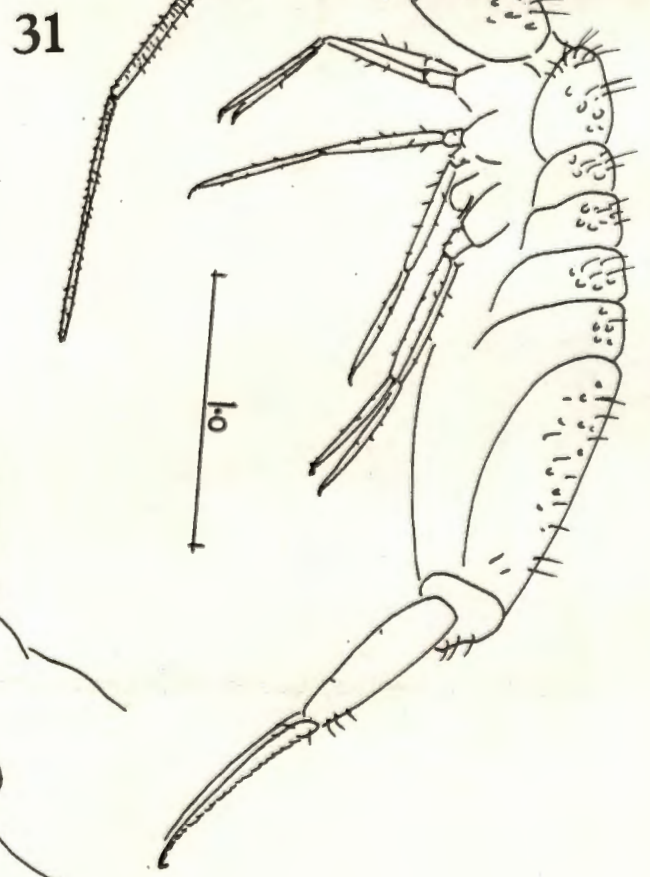
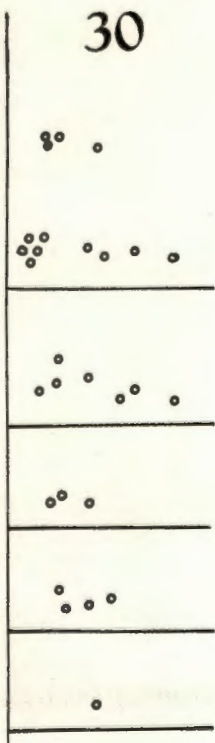
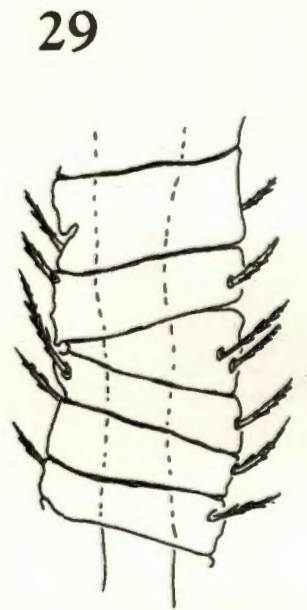
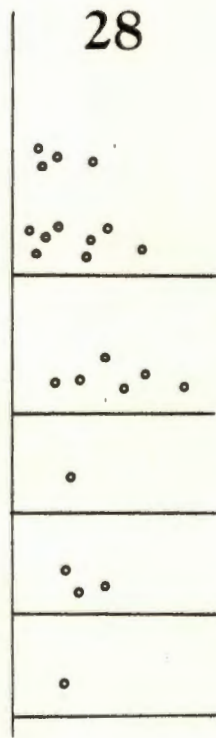
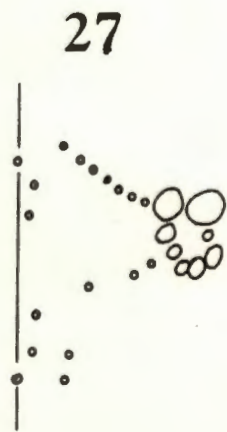
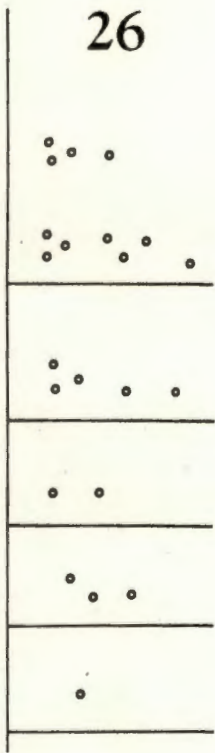
The lengths of the various segments of the holotype, measured in the mid-dorsal line, are:- ant. IV 470 $\mu$ , ant. III 250 $\mu$ , ant. II 180 $\mu$ , head 405 $\mu$ , th. II 315 $\mu$ , th. III 200 $\mu$ , abd. I 150 $\mu$ , abd. II 135 $\mu$ , abd. III 180 $\mu$ , abd. IV 720 $\mu$ , abd. V 135 $\mu$ , abd. VI 25 $\mu$ , manubrium 450 $\mu$ , dens 585 $\mu$ , mucro 10 $\mu$ . An antennae thus totals 1.4 mm, head plus body 2.3 mm and furca 1.0 mm. Ant. IV with apical protrusible bulb. Ant. IV and III annulated with rings of ciliate setae interspersed with a few smooth sensory setae with some scales on the basal portion of ant. III. Ant. II and I with scales, a few pointed macrosetae and ciliate setae. At least one trichobothrium on ant. II. Head with several clubbed setae in a definite pattern (as in fig. 27), 8 + 8 eyes on dark eyepatches and many scales. Th. II projects forwards slightly, with a collar of brushed macrosetae around its anterior margin.

Other brushed macrosetae are inserted on the tergites in a pattern which serves to distinguish this species (fig. 21). The number of brushed macrosetae in the medial cluster

on th. II is four and is remarkably stable in this species, as are the number and pattern of the posterior cluster. However, the macrosetal complement on abd. IV is not uniform. Both manubrium and dens of the long furca bear scales, the latter only ventrally. Three setae with a streamlined shape rather like that of an Indian club are carried on each side of the manubrium next to its junction with the dens, the proximal seta being the longest. Adjacent, on each limb of the dens, are two similar setae (fig. 25). Mucro falciform, with a delicately annulate shaft about twice its own length. Legs normal, with scales and pointed macrosetae on all segments. Trochanteral organ of about 24 setae. Claws with three minute teeth (figs. 23 & 24), two dorsal pseudonychia closely appressed and one mediodorsal pseudonychium which sometimes stands away from the claw but sometimes remains closely appressed. Thus some claws may seem to have a basal winglike tooth, which actually is this pseudonychium standing out. The unguiculus is lanceolate with occasionally a small tooth on its proximal lamella about a quarter of the distance to the tip. No sexual differentiation was noted.

Material examined. Holotype and one paratype from Scutia myritima and four paratypes from Grewia sp., Grahamstown district, C.P., 13 January 1965 (T.J. Coates) AcV 65/67, 69, 70. About forty other specimens from the Eastern Cape.

The species is named in honour of Mrs. Ann Claassens for her sympathetic encouragement.



SEIRA ROWANI Yosii, 1959 (figs. 26-27)

Seira rowani Yosii 1959. Seto Mar. biol. Lab. special publ.  
June 1959 : 15-17.

According to Yosii, this species has a macrosetal formula of 5-2. The author has collected four specimens from the Tsitsikama Seacoast National Park with the same formula but with a slightly different pattern (fig. 26 & 27). Since otherwise they agree with Yosii's description, they are referred to this species.

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Figs. 26-27: S. rowani. 26, dorsal macrosetae. 27, cephalic macrosetae.

Figs. 28-29: S. rykei. 28, dorsal macrosetae. 29, annulations on ant. IV.

Figs. 30-32: S. vaneedeni. 30, dorsal macrosetae. 31, habitus. 32, claw III.

SEIRA RYKEI spec. nov. (figs. 28-29)

The group of specimens with the 6-1 macrosetal formula resolves itself into one species with a 6-1-4-8 pattern from the Western Cape, with several other specimens each with its own particular macrosetal pattern. The latter do not show the clearcut differences which would warrant a separate description and cannot be judged until more specimens are forthcoming.

This species has the macrosetal pattern given in fig. 28. The general habitus is as for the genus. The lengths of the various segments of the holotype, measured along the mid-dorsal line, are:- ant. IV 320 $\mu$ , ant. III 350 $\mu$ , ant. II 350 $\mu$ , ant. I 210 $\mu$ , head 525 $\mu$ , th. II 455 $\mu$ , th. III 350 $\mu$ , abd. I 140 $\mu$ , abd. II 140 $\mu$ , abd. III 175 $\mu$ , abd. IV 700 $\mu$ , abd. V 210 $\mu$ , abd. VI 30 $\mu$ , manubrium 385 $\mu$ , dens 630 $\mu$  and mucro 10 $\mu$ . Antennae at 1.2 mm slightly less than half the length of the body plus head. Ant. IV with a terminal protrusible bulb. Ant. IV & III are definitely annulate in the holotype (fig. 29) especially where the outer sheath has contracted away from the inner core. They carry many ciliate setae, scales on ant. I & II and basally on ant. III. Head with 8 + 8 eyes, on dark eyepatches, brushed macrosetae in a definite pattern and many dark brown scales. Th. II carries a collar and pattern of brushed macrosetae. Pointed ciliate macrosetae scattered on ant. I, the legs and manubrium with a few on the dens. Two or three thick finely ciliate setae (fig. 7) are dorsally on each side of the manubrium adjacent to its junction with the dens. The dens has another two or three similar, but much thicker, setae

on each side.

Claws with three small inner teeth on the medial side of the unguis, one half-way, one three-quarters and one seven-eighths of the distance to the tip. Two dorsal pseudonychia are closely appressed except on one claw III of the holotype where they stand out rather. The dorsal unpaired pseudonychium usually stands well away from the claw. The lanceolate unguiculus is often provided with a minute basal tooth at one-third of the distance to the tip. No sexual differentiation was noted. Genital papilla covered with about 20 ciliated setae of various lengths.

Material studied. Holotype and one paratype from Metalasia muricata, Robinson Pass, C.P., 25 January 1965 (T.J. Coates) AcV 65/16. Two specimens from Helichrysum crispum, Grootvadersbosch, C.P., and one from grass, Suurbraak, C.P., 11 February 1965 (T.J. Coates) AcV 66/187 & 189. Unfortunately the latter three specimens lack the terminal joints of their antennae.

The species is named in honour of Prof. Dr. Dr. P.A.J. Ryke of the Zoological Research Institute, Potchefstroom University for C.H.E.

SEIRA VANEEDENI spec. nov. (figs. 30-32)

This species has, so far, been found only in the coastal region of Natal, from Mkuze in the north to near the Um-tamvuna River in the South. The macrosetal formula is 7-3;

on th. II, the medial cluster is occasionally 3 while the posterior cluster is either 8 or 9, very occasionally 10. The length of the various segments of the holotype, measured along the mid-dorsal line, are:- ant IV 945 $\mu$ , ant. III 864 $\mu$ , ant. II 405 $\mu$ , ant. I 270 $\mu$ , head 540 $\mu$ , th. II 322 $\mu$ , th. III 175 $\mu$ , abd. I 105 $\mu$ , abd. II 105 $\mu$ , abd. III 140 $\mu$ , abd. IV 890 $\mu$ , abd. V 210 $\mu$ , abd VI 35 $\mu$ , manubrium 595 $\mu$ , dens 770 $\mu$  and mucro 20 $\mu$ . The antennae are, at 2.5 mm, approximately equal in length to the head plus body. The antennae are long and thin (fig. 31) with ant. IV & III annulate as indicated by the rings of ciliate setae. Ant. IV bears terminally a protrusible vesicle. Scales are present on ant. II & I and basally on ant. III. Head with 8 + 8 eyes, on dark eyepatches, many brushed macrosetae and covered with scales. Macrosetae on dorsal tergites in pattern as in fig. 30. Tergite of abd. III has at least two lasiotrichia on each side and abd. IV has at least three on each side, of which the most posterior has no short setae surrounding its base. Dorsum with many large brown scales, bluntly oval when large but tending to be circular when smaller. Scales also on legs, manubrium and dens. The manubrium and dens each bear dorsally, on each side near their joint, two or three thick ciliate setae. From the latter, a row of similar setae alternated with ordinary ciliate setae runs distally (e.g. fig. 44). Claws as for the genus, with three inner teeth on the medial aspect, dorsally three pseudonychia, two closely appressed and one standing away slightly, a lanceolate unguiculus and a strong tenent hair. Sometimes, e.g. on claws III of the holotype and on one of claws II of a paratype, another minute tooth may be seen not

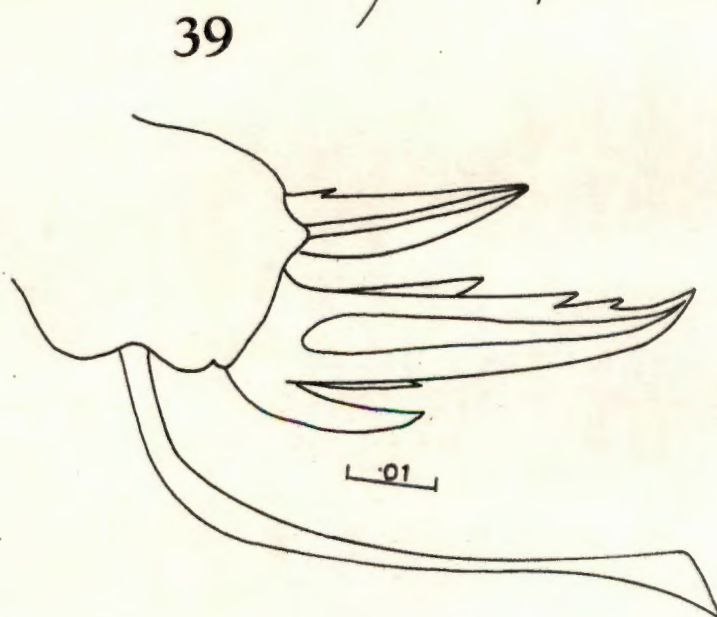
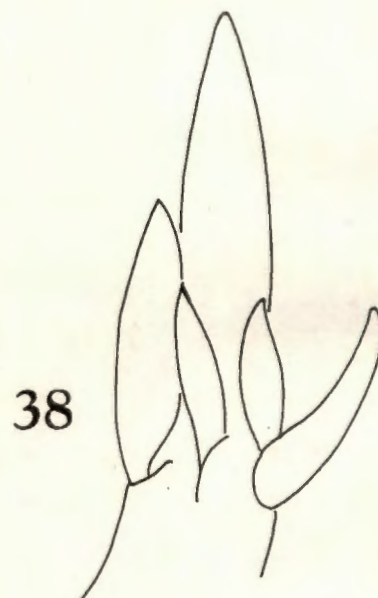
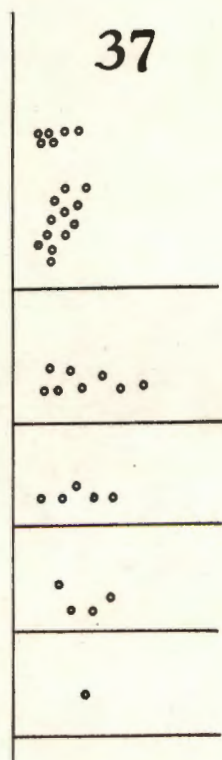
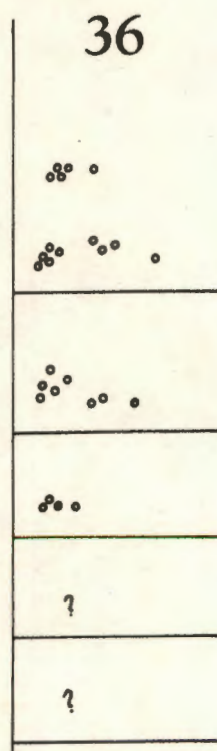
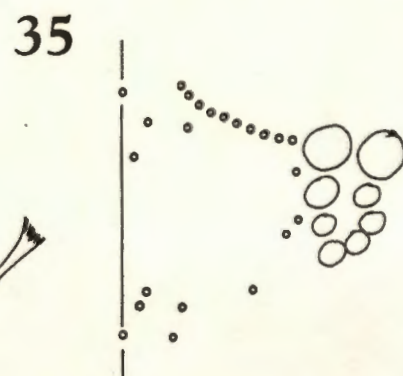
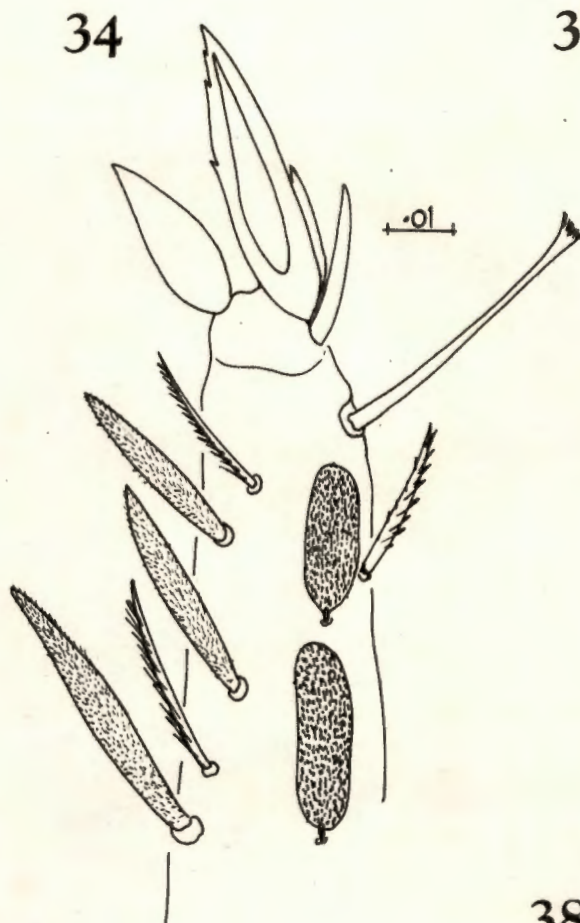
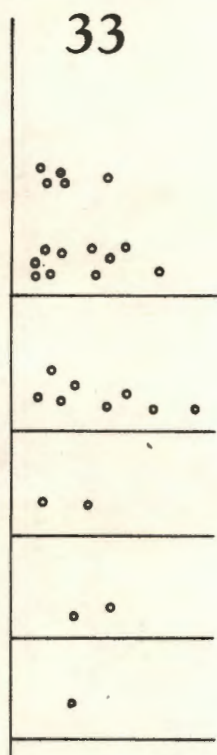
quite halfway to the tip, opposite the other inner tooth (fig. 32). No sexual differentiation noted. Genital papilla covered with some 20 ciliate setae of various lengths.

Material studied. Holotype from grass, Oribi Gorge, Natal, 2 February 1966 (T.J. Coates) AcV 66/116. One paratype from unidentified shrub, Charters Creek, St. Lucia, 24 January 1966 (T.J. Coates) AcV 66/63. Three paratypes from grass, Mkuze, 24 January 1966 (T.J. Coates) AcV 66/76. One paratype from grass, Park Rynie, 31 January 1966 (T.J. Coates) AcV 66/141. About 100 other specimens from the Natal coast (map B).

The species is named in honour of Prof. Dr. J.A. van Eeden of the Department of Zoology, Potchefstroom University for C.H.E.

SEIRA MATHEWSI spec. nov. (figs. 33-35)

The macrosetal pattern of 8-2 is found on a group of specimens from the Cape Province (fig 33). The posterior cluster on th. II may be from 8 to 10 and the medial cluster is five. The pattern on th. III is similar to that of S. capensis but abd. I carries only two macrosetae. The lengths of the various segments of the holotype, measured along the mid-dorsal line, are:- ant. IV 735 $\mu$ , ant. III 700 $\mu$ , ant. II 350 $\mu$ , ant. I 245 $\mu$ , head 600 $\mu$ , th. II 315 $\mu$ , th. III 210 $\mu$ , abd. I 175 $\mu$ , abd. II 245 $\mu$ , abd. III 245 $\mu$ , abd. IV 1015 $\mu$ , abd. V 280 $\mu$ , abd. VI 35 $\mu$ , manubrium 665 $\mu$ , dens 875 $\mu$ , mucro



30 $\mu$ . Antennae 2.0 mm, head plus body 3.1 mm and the furca 1.5 mm. Note that in one slightly larger paratype, ant. IV is 770 $\mu$  and ant. III slightly longer, 840 $\mu$ . Antennae obviously annulated as indicated by the rings of ciliate setae on the last two segments. Scales on ant. I, II and basally on ant. III. Head with 8 + 8 eyes, many brown scales and several brushed macrosetae in a pattern (fig. 35) which is nearly identical with that of other species (figs. 12, 27, & 71). Body as for the genus, with scales and macrosetae. Legs with scales, a few long macrosetae and a few thicker ciliate setae on the tibiotarsi adjacent to the claws (fig. 34). The latter with inner teeth on one side only, the usual three dorsal pseudonychia and a lanceolate unguiculus. Furca as for the genus with two or three club-shaped macrosetae dorsally on either side of the manubrium-dens joint. Genital papilla with about twenty ciliate setae. No sexual differentiation noted.

Material studied. Holotype and two paratypes from Serruria fucifolia and three paratypes from Chondropelatum nudum, Bontebok National Park, Swellendam C.P., 8 February, 1967, (T.J. Coates) AcV 67/172 & 173. One paratype from Grewia

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Figs. 33-35: S. mathewsi. 33, dorsal macrosetae. 34, tibiotarsus III. 35, cephalic macrosetae.

Fig. 36: S. annulipes dorsal macrosetae.

Figs. 37-39: S. capensis. 37, dorsal macrosetae. 38, claw III - dorsal aspect. 39, claw III - antero-lateral aspect.

sp., Mountain Zebra National Park, 27 January 1965  
(T.J. Coates) AcV 65/37. Two paratypes from grass in  
vlei, Joubertina, 26 January 1965 (T.J. Coates) AcV 65/36.  
Other specimens from Grootvadersbosch, C.P.

The species is named in honour of Ivan Mathews of  
the Citrus Research Station, Addo, C.P.,

SEIRA ANNULIPES (Handschin, 1929) (fig. 36)

In the collection of the South African Museum are 24  
specimens from Inchanga, Natal, November, 1917 (K.H. Barnard)  
which were referred by Womersley (1934) "with some hesita-  
tion" to Lepidocyrtinus annulipes and by Paclt (1959) to  
S. squamoornata. Their macrosetal formula is 8-4-5-9  
(fig. 36). They are in poor condition due to discoloura-  
tion and shrinkage of the mounting medium and attempts to  
remount some of them were not too successful. The author  
considers they could well fit the description by Handschin  
(1929).

SEIRA CAPENSIS (Womersley, 1934) (figs. 37-39)

Lepidocyrtinus capensis Womersley, 1934. Ann. S. Afr.

Mus 30: 462.

Seira (Mesira) capensis (Womersley, 1934). Paclt, 1959.

Collembola. In Hanstrom et al: South African Animal Life

Pt. 6: 55.

Seira (Seira) capensis (Womersley, 1934). Yosii, 1959.

Seto mar. biol. lab. spec. publ, June 1959: 20-21.

Lepidocyrtinus capensis (Womersley, 1934). Salmon, J.T., 1964. Bull. R. Soc. N.Z. 7: 488.

The following re-description is based on two co-types on slides 82 and 83 of the collection of the South African Museum. The specimen on slide 82 is here selected as the lectotype. Colour, yellowish ground with deep blue pigment on head, ant. I, th. III and laterally on abdominal segments in the darkest specimens (Womersley, 1934). The colour distribution obviously varies from specimen to specimen, since Yosii (1959) shows that his two specimens are slightly different, as are several collected by the author, e.g. the head may be intensely pigmented, or darkly pigmented with intense pigment in the fore margin and median line, or slightly pigmented, with similar variations in the rest of the body and appendages. The lengths of the various segments of the lectotype, measured in the mid-dorsal line, are:- ant. IV 900 $\mu$ , ant. III 720 $\mu$ , ant. II 635 $\mu$ , ant. I 340 $\mu$ , head 810 $\mu$ , th. II 450 $\mu$ , th. III 225 $\mu$ , abd. I 180 $\mu$ , abd. II 225 $\mu$ , abd. III 220 $\mu$ , abd. IV 1620 $\mu$ , abd. V 270 $\mu$ , abd. VI 30 $\mu$ , manubrium 1035 $\mu$ , dens 1260 $\mu$ , mucro 30 $\mu$ . Antennae 2.6 mm, head plus body 3.6 mm, furca 1.3 mm. Note that Womersley (1934) is in error in giving ant. IV shorter than ant. III. This is not so in any of the specimens examined by the author, nor in Womersley's figure 11a.

The macrosetal formula of the lectotype is 8-5-6-12, but the posterior cluster on th. II $\frac{1}{2}$  varies from 11 to 14.

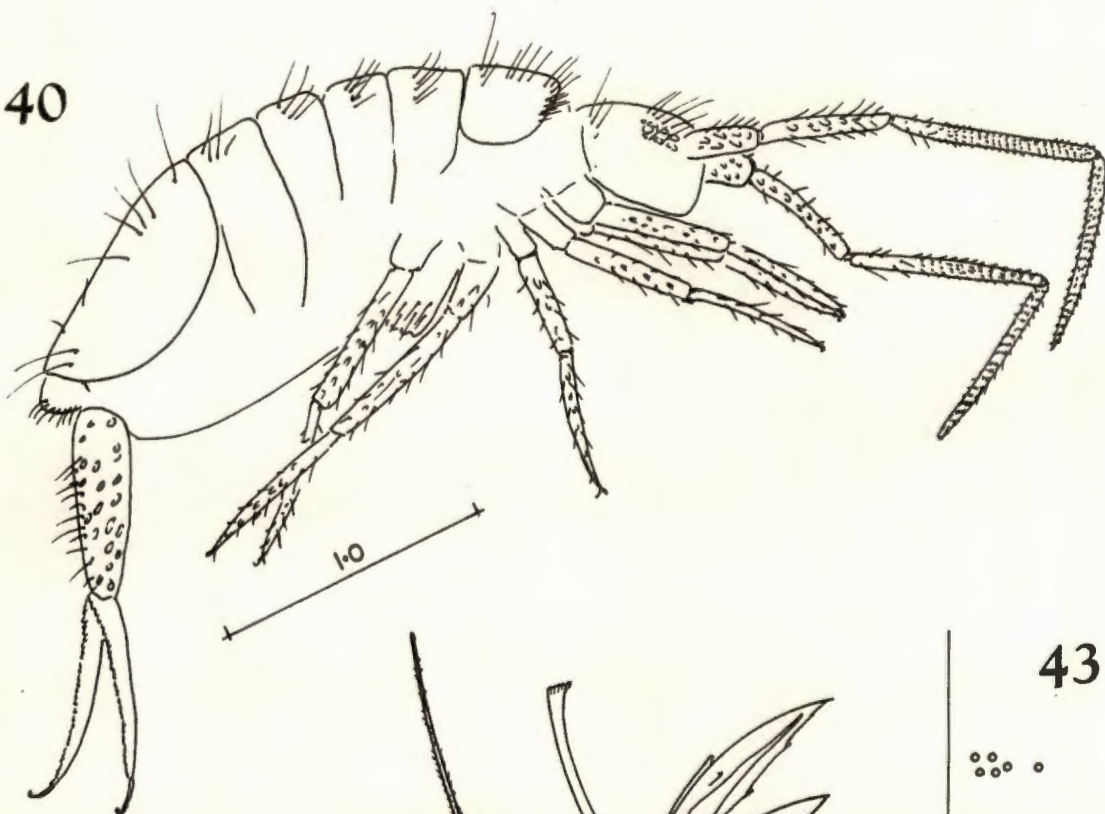
The pattern is given in fig. 37 and agrees very nearly with that given by Yosii for his specimen B. Ant. IV & III annulate, as indicated by the rings of setae. Scales on ant. I, II and basally on III. Head with 8 + 8 eyes on dark eye-patches, many scales and brushed macrosetae. Body also with many scales and brushed macrosetae. Two or three lasiotrichia on abd. IV. Manubrium with one or two club-shaped ciliate setae dorsally, adjacent to the joint with the dens, and two or three similar setae on each limb of the dens near those on the manubrium. A few long pointed finely ciliate macrosetae dorsally on the furca and on the legs. Claws as illustrated by Womersley except that the usual two dorsal closely appressed pseudonychia are present (figs. 38, 39). No sexual differentiation noted. Genital papilla with many ciliate setae.

Material studied. Lectotype and paratype from Matroosberg, 3500 ft. June 1917 (K.H. Barnard), slides 82 and 83 of the collection of the South African Museum, Cape Town. Several specimens from Port Alfred, Citrusdal, Tulbagh etc., C.P., 1966-67 (T.J. Coates). One specimen from Tulbagh, C.P., identified by Womersley as Lepidocyrtinus ?annulipes and another from Tulbagh similarly originally identified but re-assigned by Paclt to S. squamoornata.

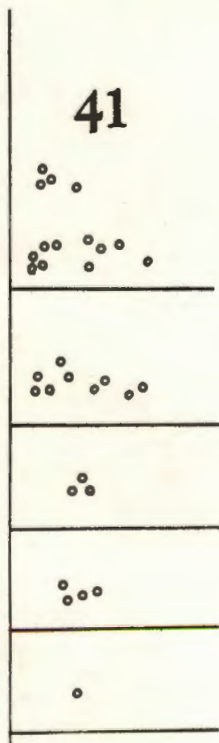
SEIRA METARSIOSA spec. nov. (figs. 40-42)

This species is very similar to S. annulicornis but

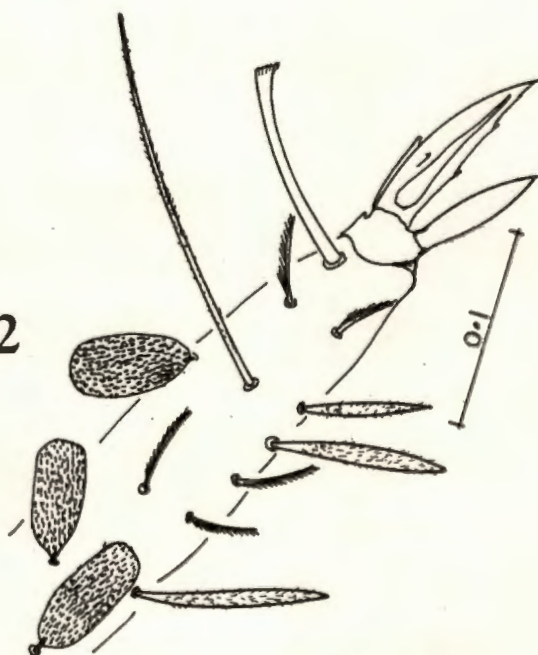
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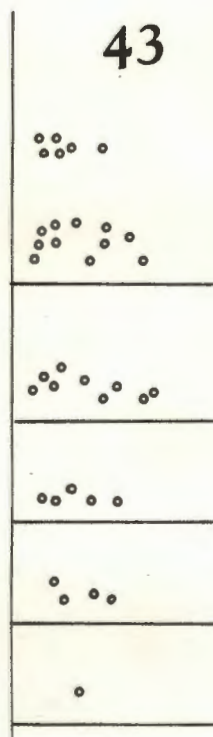
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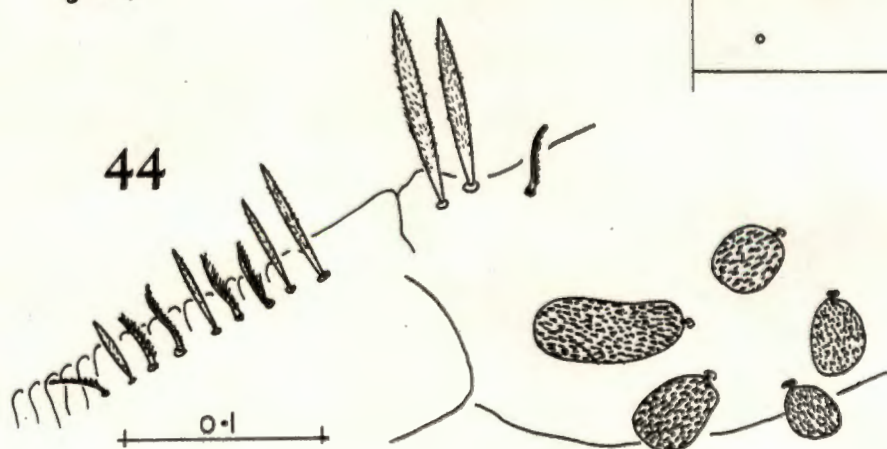
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43



44



the macrosetal complement of abd. I is three, not five and there are no black eyepatches. The geographical distribution is south west of the line joining Pretoria and Pongola, i.e. mainly highveld whereas S. annulicornis has mainly a more northerly or coastal distribution, though both species have been collected at Groblersdal.

Body colour is white with dark brown scales forming transverse bands across the dorsum. Long brushed macrosetae (fig. 9) form a collar around the anterior edge of th. II and are also found on the head and tergites in a definite pattern, that for the body being given in fig. 41. The macrosetal formula is 9-3, with, on th. II, the medial cluster with four and the posterior cluster with ten or eleven macrosetae. Eyes 8 + 8, without dark eyepatches. Head with scales and brushed macrosetae, the latter in the usual pattern (e.g. fig. 35). The lengths of the various segments, measured in the mid-dorsal line, are:- ant. IV 805 $\mu$ , ant. III 735 $\mu$ , ant. II 350 $\mu$ , ant. I 245 $\mu$ , head 525 $\mu$ , th. II 350 $\mu$ , th. III 245 $\mu$ , abd. I 210 $\mu$ , abd. II 245 $\mu$ , abd. III 280 $\mu$ , abd. IV 980 $\mu$ , abd. V 175 $\mu$ , abd. VI 20 $\mu$ , manubrium 700 $\mu$ , dens 805 $\mu$ , mucro 35 $\mu$ . The antennae total 2.1 mm, the head plus body 3.0 mm and the furca 1.5 mm. Note that though ant. IV is here longer than ant. III, at least 30% of the approximately 70 specimens before the author

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Figs. 40-42: S. metarsiosa. 40, habitus. 41, dorsal macrosetae. 42, tibiotarsus III.

Figs. 43-44: S. annulicornis. 43, dorsal macrosetae. 44, manubrium-dens joint.

have ant. III equal to or slightly longer than ant. IV.

Ant. IV and III annulated, ant. IV with terminal protrusible bulb. Scales on ant. I, II and the proximal half of ant. III. Scales also on legs. Trochanteral organ of about 25 thin setae. Femurs and tibiotarsi with a few long pointed macrosetae and several thicker setae distally, adjacent to the claw. The latter with three minute teeth on the medial lamina and one on the lateral lamina, as well as the usual three dorsal pseudonychia and the lanceolate unguiculus. Furca with scales both dorsally and ventrally on the manubrium but only ventrally on the dens. Ciliate setae dorsally on both with two or three thick ciliate setae on both sides of the manubrium - dens joint, as in fig. 44. Genital papilla with some 20 rather thick ciliate setae. No sexual differentiation noted.

Material studied. Holotype and three paratypes from grass, Hammonia district, Orange Free State, 16 August 1967 (T.J. Coates) AcV 67/49. Two paratypes from lucerne, Kakamas, C.P., 2 December 1965 (M.K.P. Meyer) AcV 65/274. About 65 other specimens from Edenville, Ficksburg and Clocolan in the Orange Free State and from Groblersdal, Transvaal.

SEIRA ANNULICORNIS (Borner, 1903) (figs. 43-44)

Lepidocyrtus (Lepidocyrtinus) annulicornis Borner, 1903.  
Sber Ges. naturf. Freunde Berlin 1903: 154.

Lepidocyrtinus annulicornis (Borner, 1903). Salmon, J.T.

1956. Annls Mus. r. Congo belge Ser. 8vo 51: 25-26.

Pseudosira (Mesira) annulicornis C.B. Womersley, H. 1929.  
Entomologist's mon. Mag. 65: 154.

Seira (Lepidocyrtinus) annulicornis (Borner, 1903).

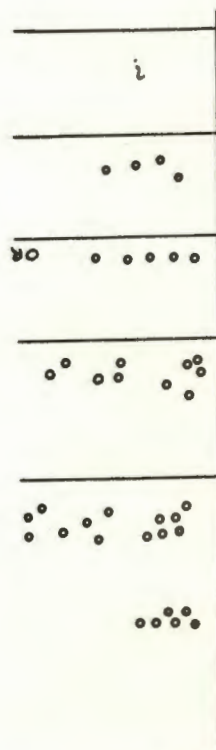
Yosii, 1959. Seto. Mar. biol. Lab. special publ. June  
1959: 10-12.

Lepidocyrtinus annulicornis (Borner, 1903). Salmon, J.T.  
1964. Bull. R. Soc. N.Z. 7: 488.

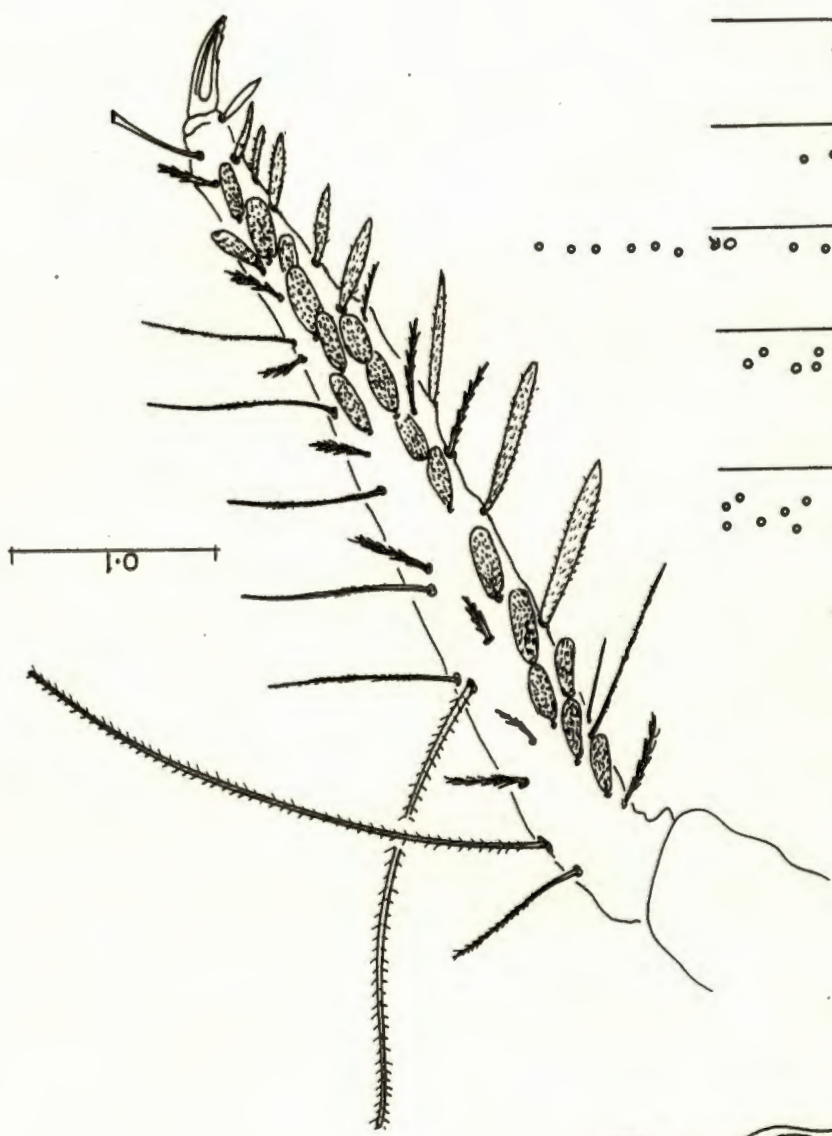
This species was found over most of the Transvaal and Orange Free State and appears to have a very wide distribution, being reported from Malawi, Rhodesia, the Belgian Congo and the Cape. Yosii (1959) was the first to describe the dorsal chaetotaxy of the species from eight specimens from Table Mountain. The following description is slightly wider than his, probably because it is based on more specimens (about 250), though they agree in all essentials, e.g., macrosetal formula of 9-5, and pattern (fig. 43), etc. The medial cluster of macrosetae on th. II is usually 6 but occasionally 5, while the posterior cluster is usually 11 but occasionally 10. The lengths of the segments, measured along the mid-dorsal line, are:- ant. IV 530 $\mu$ , ant. III 530 $\mu$ , ant. II 280 $\mu$ , ant. I 170 $\mu$ , head 310 $\mu$ , th. II 310 $\mu$ , th. III 140 $\mu$ , abd. I 155 $\mu$ , abd. II 170 $\mu$ , abd. III 170 $\mu$ , abd. IV 840 $\mu$ , abd. V 140 $\mu$ , abd. VI 30 $\mu$ , manubrium 530 $\mu$ , dens 575 $\mu$ , mucro 15 $\mu$ . Antennae 1.5 mm, head plus body 2.2 mm, furca 1.1 mm. Note that ant. III is not shorter than ant. IV as is the case with Yosii's specimens. Ant. III and IV annulate with rings of ciliate setae, interspersed with smooth setae, ant. IV with a terminal protrusible bulb. Scales and long, pointed

finely ciliate macrosetae (fig. 8) on ant. I, II and the basal half of ant. III. Eyes 8 + 8 on dark eyepatches. Head with scales and brushed macrosetae in the usual pattern. Body with scales and brushed macrosetae in pattern (fig. 43) though the pattern on abd. IV is not constant. Body colour white, scales brown. Legs with many ciliate setae, about 20 short pointed setae in the trochanteral organ and also many scales with a few long pointed macrosetae on femurs and tibia-tarsi (fig. 44). Claws with three minute teeth on the medial lamina, one at a half, one at three-quarters and one at seven-eighths of the distance on the tip. One minute tooth on the lateral lamina half-way to the tip. The usual three dorsal pseudonychia, two closely appressed and one standing out somewhat. Unguiculus lanceolate, three-quarters the length of the claw with its proximal edge carrying minute serrations. Furca with scales ventrally on both manubrium and dens and dorsally with long ciliate setae. Dorsally on the manubrium, adjacent to the manubrium - dens joint, are two or three club-shaped setae with several similar setae continuing alternately with ciliate setae in a row down the dens. Genital papilla with about 20 ciliate setae of various lengths. No sexual differentiation noted.

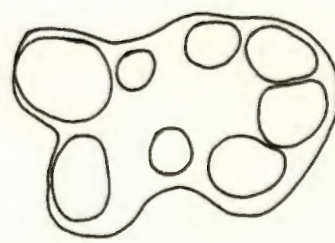
Material examined. About 250 specimens, from north-east of a line joining Pongola and Pretoria, including Mocambique.



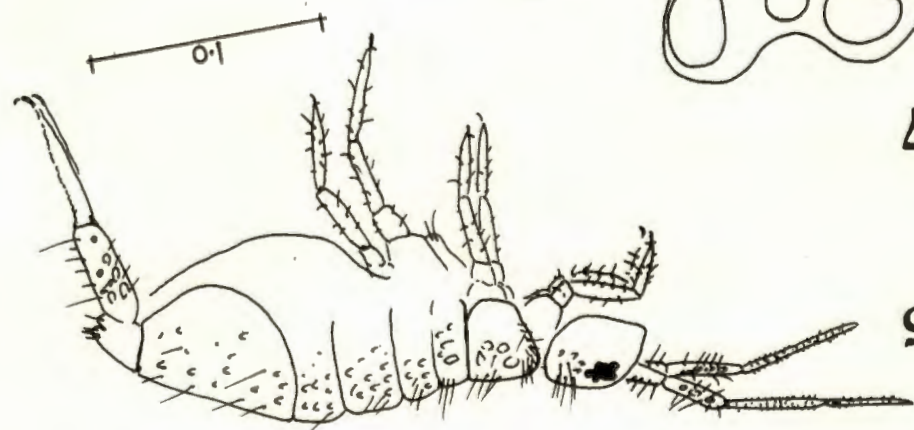
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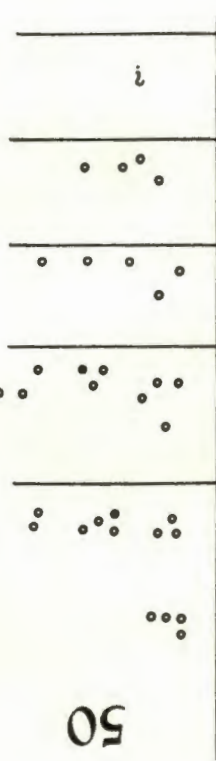
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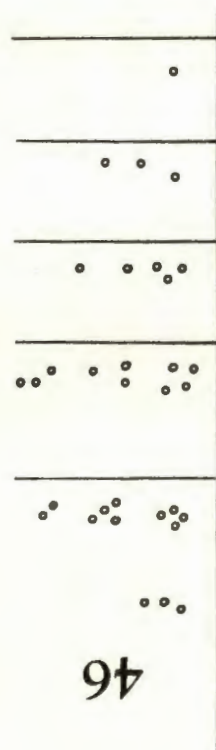
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45



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46

SEIRA ADDOENSIS spec. nov. (figs. 45-48)

This species has a macrosetal formula of 10-5-3-9/10. Two other species, S. barnardi and S. nagatai, also have ten macrosetae on th. III. S. addoensis has these ten macrosetae in a 4-3-3 pattern as does S. nagatai, but S. barnardi carries them in a 5-3-2 pattern. S. addoensis also resembles S. nagatai in that the second macroseta on abd. I is situated well anterior to the rest whereas in S. barnardi their bases are in a straight line.

S. addoensis is separated from S. nagatai by the presence of three macrosetae in the medial cluster on th. II while the latter species has four. Further, the pattern of the macrosetal insertions on th. II is quite different in these two species. In S. addoensis the cluster of four macrosetae closest to the midline is compact, with the anteromedial seta situated well within the cluster (fig. 46). In S. nagatai the equivalent cluster of four macrosetae is relatively dispersed with the anteromedial seta carried well anterior to the rest of the cluster (fig. 50).

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Figs. 45-48: S. addoensis. 45, habitus. 46, dorsal macrosetae. 47, eyes. 48, tibiotarsus III.

Fig. 49: S. barnardi - dorsal macrosetae.

Fig. 50: S. nagatai - dorsal macrosetae (from Yosii, 1959).

The lengths of the various segments of the holotype, measured in the mid-dorsal line, are:- ant. IV 390 $\mu$ , ant. III 420 $\mu$ , ant. II 280 $\mu$ , ant. I 195 $\mu$ , head 475 $\mu$ , th. II 280 $\mu$ , th. III 170 $\mu$ , abd. I 195 $\mu$ , abd. II 195 $\mu$ , abd. III 250 $\mu$ , abd. IV 700 $\mu$ , abd. V 225 $\mu$ , abd. VI 20 $\mu$ , manubrium 480 $\mu$ , dens 590 $\mu$ , mucro 25 $\mu$ . Thus the antennae total 1.3 mm, the head plus body 2.5 mm and the furca 1.1 mm. Ant. IV and III must be regarded as about equal in length, since in one paratype ant. IV is slightly longer than ant. III. Body colour white, with dark blue pigment scattered throughout in fine grains. The pigment is concentrated in the antennae which are dark blue, in the black eyepatches and in dark patches which are often found laterally on thorax and abdomen, on the coxae and transversely on abd. III. Large brown scales are plentiful, except on the terminal segments of the antennae and on the venter, and tend to obscure the body colour. The antennae segments III and IV are annulated, as indicated by the rings of ciliate setae, with a few smooth setae interspersed on the terminal part of ant. IV. Scales on ant. I, II and most of ant. III, interspersed with a few long pointed ciliate macrosetae. At least one long lasiotrichia on ant. II. Head with 8 + 8 eyes (fig. 47) on dark eyepatches, scales and many brushed macrosetae in a definite pattern, e.g. fig. 35. Th. II bears not only the dense collar of brushed macrosetae on the anterior edge of the tergite but also a medial cluster of three or four and a posterior cluster of from nine to eleven. Th. III carries ten brushed macrosetae in three minor clusters of 4-3-3 as opposed to the 5-3-2 pattern on th. III of S. barnardi. On abd. I the distance separating the late-

ral macroseta from its nearest neighbour is about twice the distance between each of the others. On abd. II, there are only three macrosetae in the cluster. The macrosetal pattern on abd. IV is not constant, but at least three lasiotrichia are present. Posteriorly on abd. IV two or three extremely long ciliate setae are present. They are much thicker than the lasiotrichia and seem to be ordinary ciliate setae which have grown very long. Genital papilla with about 40 ciliate setae of various lengths. No sexual differentiation noted. Manubrium and dens with scales ventrally and long ciliate setae dorsally. No club-shaped setae seen. Mucro falcate. Legs with scales and a few long pointed ciliate macrosetae amongst the many ciliate setae. Tibiotarsi with several thick ciliate setae as well. Proximally on both femurs and tibiotarsi (fig. 48) is at least one, possibly two lasiotrichia, which are very easily lost during fixation. Trochanteral organ of about 30 setae. Claws of usual shape with three minute setae on the medial lamina, one just beyond half, one three-quarters and one seven-eighths of the distance to the tip. No tooth seen on the lateral lamina. Three dorsal pseudonychia, all closely appressed but one standing out in at least one paratype. Unguiculus lanceolate, slightly more than half the length of the claw.

Material examined. Holotype from under grass, Addo Elephant National Park, 12 January 1965 (T.J. Coates) AcV 65/98. Two paratypes, one from soil and the other from Euclea undulata, Addo Elephant National Park, 11 January 1965 (T.J. Coates) AcV 65/46 & 47. Several other speci-

mens, with incomplete antennae, were included in the same accessions.

SEIRA BARNARDI (Womersley, 1934) (fig. 49)

Lepidocyrtinus cooperi var. barnardi Womersley, 1934. Ann. S. Afr. Mus. 30: 461.

Seira (Mesira) barnardi (Womersley, 1934). Paclt, 1959. Collembola, In Hanstrom et al. South African Animal Life Pt. 6: 54.

Seira (Lepidocyrtinus) barnardi (Womersley, 1934). Yosii, 1959. Seto Mar. biol. Lab. special publ. June 1959: 12-13.

Lepidocyrtinus cooperi barnardi Womersley, 1934. Salmon, J.T. 1964. Bull. R. Soc. N.Z. 7: 488.

This species is very adequately figured by Yosii (1959) except for the fact that three co-types on slides 73, 75 and 76 of the collection of the South African Museum all have six setae on abd. I instead of five. However, amongst specimens collected by the author are some from the Tsitsikama with six setae on abd. I and others from the Heidelberg and Swellendam districts in the Cape which bear five setae (fig. 49). All specimens fit the rather rudimentary description by Womersley (1934) and the full description by Yosii (1959) and all have the macrosetae on th. III in a 5-3-2 pattern. The author therefore regards S. barnardi as having the macrosetal formula of 10-5/6 - 4/6 - 10/13.

On th. II the medial cluster may be four, five or six and the posterior cluster may be from 10 to 13, usually the latter.

The species is differentiated from S. addoensis and S. nagatai by the arrangement of the macrosetae on th. III in the 5-3-2 pattern, not 4-3-3. Further, the second macroseta on abd. I is not situated anterior to the rest but all bases on abd. I are in a straight line.

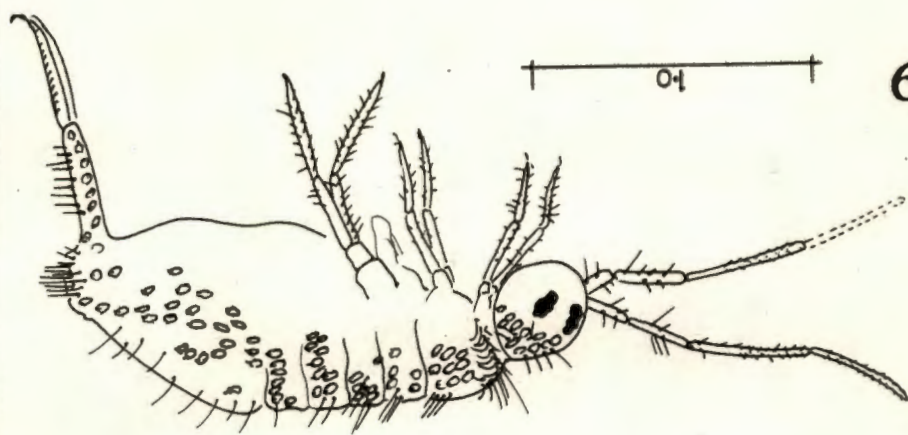
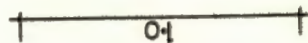
Material examined. Three specimens designated by Womersley (1934) as co-types on slides 73, 75 and 76 in the collection of the South African Museum, Cape Town. The specimen on slide 75, still as originally mounted by Womersley, is here designated the lectotype. Seventeen other specimens from grass in the Heidelberg, Suurbraak, Swellendam, and Tsitsikama districts, C.P., collected by the author, 1965-1967.

SEIRA NAGATAI Yosii, 1959 (fig. 50)

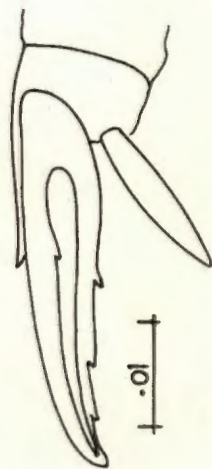
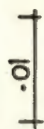
Seira nagatai Yosii, 1959. Seto Mar. biol. Lab. special publ. June 1959 : 19-20. Salmon, J.T. 1964. Bull R. Soc. N.Z. 7 : 504.

This species was described by Yosii (1959) from 12 specimens collected near Cape Town. The macrosetal formula is 10-5-4-9. It differs from S. barnardi in that it has the macrosetae on th. III in a 4-3-3 pattern, not 5-3-2. Also, the second macrosetae on abd. I is situated anterior

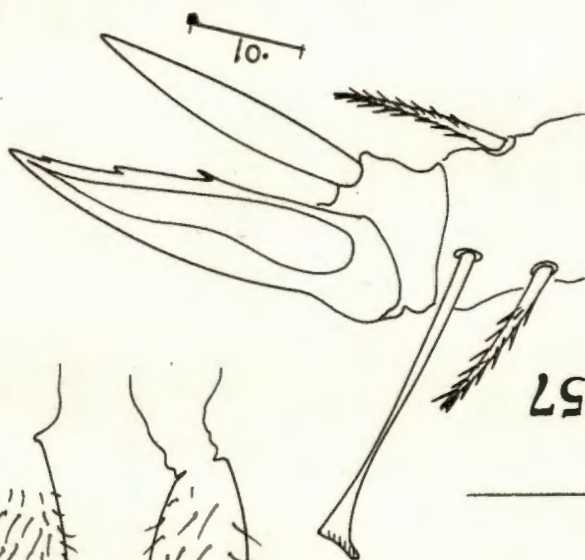
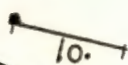
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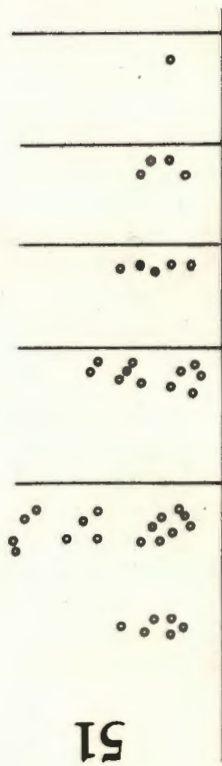
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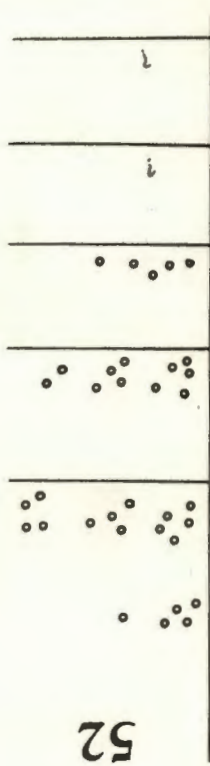
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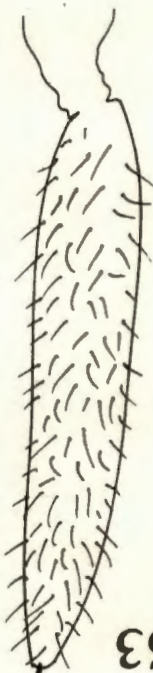
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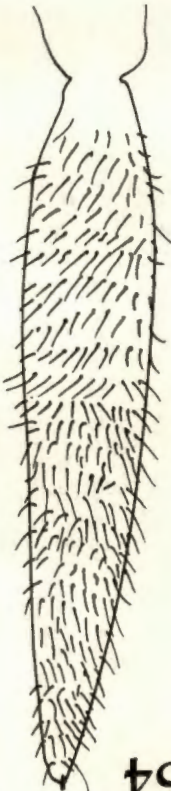
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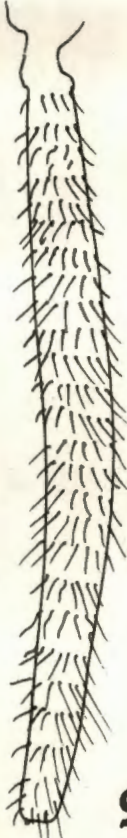
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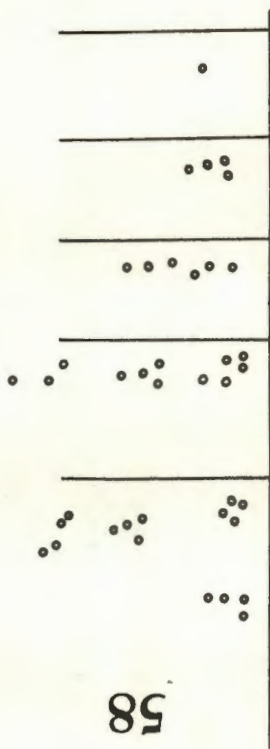
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58



to the rest whereas in S. barnardi all bases on abd. I are in a straight line. S. nagatai differs from S. addoensis in the presence of four macrosetae in the medial cluster on th. II, not three. It also differs in that the medial cluster of four macrosetae on th. III is rather scattered in comparison to the equivalent cluster in S. addoensis. In S. nagatai the ant<sup>o</sup>medial seta of this cluster is situated well anterior to the rest whereas in S. addoensis this seta is within the cluster, even posterior to the anterolateral seta.

SEIRA GRISEA (Womersley, 1934) (figs. 51-56)

Pseudosira grisea f. principalis et var. annulata. Womersley, 1934. Ann. S. Afr. Mus. 30: 459-460.

Seira grisea (Womersley, 1934). Salmon, J.T., 1964. Bull. R. Soc. N.Z. 7: 502.

The description hitherto available is that by Womersley (1934) which is rather brief. The following re-descrip-

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Figs. 51-56: S. grisea. 51, lectotype - dorsal macrosetae. 52, Katberg specimen - dorsal macrosetae. 53, lectotype - ant. IV. 54, paratype - ant. IV. 55, Katberg specimen - ant. IV. 56, lectotype - claw III.

Figs. 57-59: S. damerella. 57, claw III. 58, dorsal macrosetae. 59, habitus.

tion is based on a co-type on slide 71 of the collection of the South African Museum, the specimen having been remounted by the author and designated the lectotype. A co-type of the var. annulata has also been remounted. It differs in no morphological detail from the f. *principalis*. The lectotype was entirely bluish-black except the furca, tibiae and apical antennal segments which were somewhat lighter (Womersley, 1934). He described the variety as bluish-black with the pigmentation much lighter on the anterior half of th. III and abd. I-VI, giving the appearance of transverse stripes. But this variation in colour could have been due to the presence of brown scales in transverse bands, such as commonly occurs throughout the genus. Specimens collected by the author at Katberg have many brown scales on the tergites which completely shade the bluish body colour and produce transverse stripes. The amount of scales present is often a function of the condition of the individual specimen and is not a varietal or specific characteristic. Therefore the variety annulata (Womersley, 1934) is here regarded as identical with the forma *principalis*.

The lengths of the various segments of the lectotype, measured along the mid-dorsal line, are:- ant. IV 470 $\mu$ , ant. III 375 $\mu$ , ant. II 280 $\mu$ , ant. I 190 $\mu$ , head 705 $\mu$ , th. II 330 $\mu$ , th. III 235 $\mu$ , abd. I 235 $\mu$ , abd. II 190 $\mu$ , abd. III 280 $\mu$ , abd. IV 940 $\mu$ , abd. V 330 $\mu$ , abd. VI 40 $\mu$ , manubrium 705 $\mu$ , dens 705 $\mu$ , mucro 25 $\mu$ . The antennae total 1.3 mm, the head plus body 3.3 mm, and the furca 1.4 mm. Ant. IV is scarcely annulate (fig. 53) and is a rather pointed shape. The specimens on slide 72, formerly var. annulata,

has an ant. IV which, though still pointed (fig. 54), clearly indicates annulation by rings of ciliate setae. The author's specimens from Katberg have elongate ant. IV (fig. 55) similar to other species of the genus. This range of antennal forms appears also to be present in at least one other species, S. domestica (Gisin and Gama, 1962). Ant. I and II with scales and long ciliate macrosetae. Head with 8 + 8 eyes on dark eyepatches, scales and brushed macrosetae. Body with scales and brushed macrosetae in a pattern (fig. 51) which gives a macrosetal formula of 11-5. On th. II the medial cluster is five or six and the posterior cluster from 13 to 16. Number of setae on abd. IV no longer discernible. Legs with scales and pointed ciliate macrosetae, with a few thick ciliate setae distally. Trochanteral organ of about 18 setae. Claw with three minute teeth on the medial lamina (fig. 56), not two as given by Womersley (1934) and sometimes one half-way along the lateral lamina. Three dorsal pseudonychia present, two closely appressed and one which sometimes stands out. Unguiculus lanceolate, half the length of the claw. Furca normal, though the usual club-shaped setae situated dorsally near the manubrium-dens joint were not seen in the lectotype, but two or three are on the dens of the specimen on slide 72.

Material studied: Lectotype and one paralectotype on slides 71 & 72 of the collection of the South African Museum, from Rondebosch and Kirstenbosch respectively, 29 and 23 July 1930 (H. Womersley).. Two specimens from Hedera helix, Katberg, C.P., 15 January 1965 (T.J. Coates) AcV 65/74 and two specimens from Elytropappus rhinocerotis, Bontebok National Park,

Swellendam, C.P., 7 February 1967 (T.J. Coates) AcV 66/167.

SEIRA DAYI Yosii, 1959

Seira (Lepidocyrtinus) dayi Yosii, 1959. Seto Mar. biol. Lab. special publ. June 1959: 14-15.

Lepidocyrtinus dayi (Yosii, 1959) Salmon J.T. Bull. R. Soc. N.Z. 7: 488.

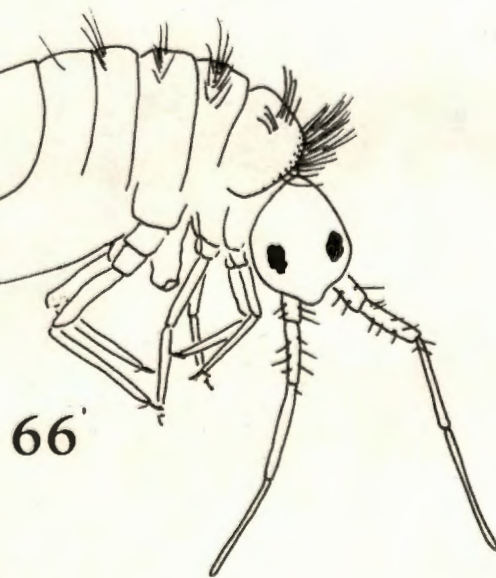
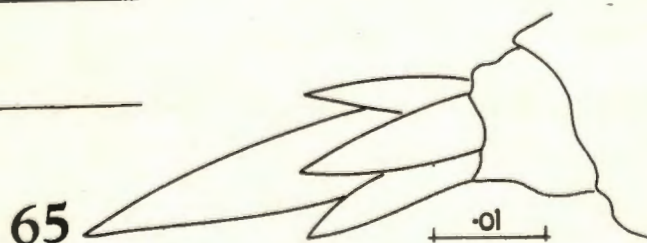
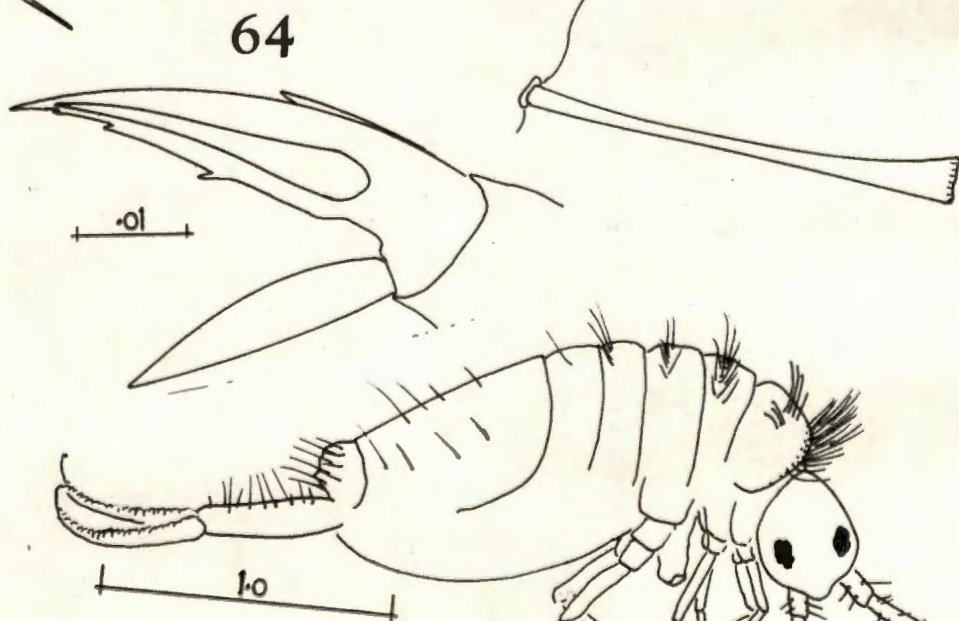
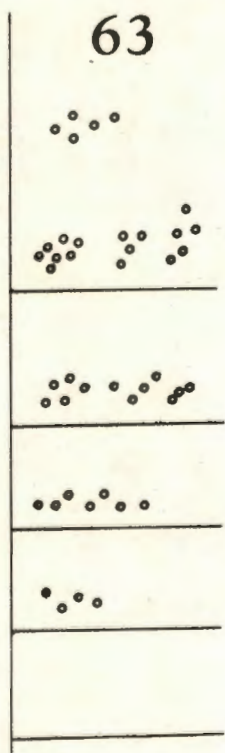
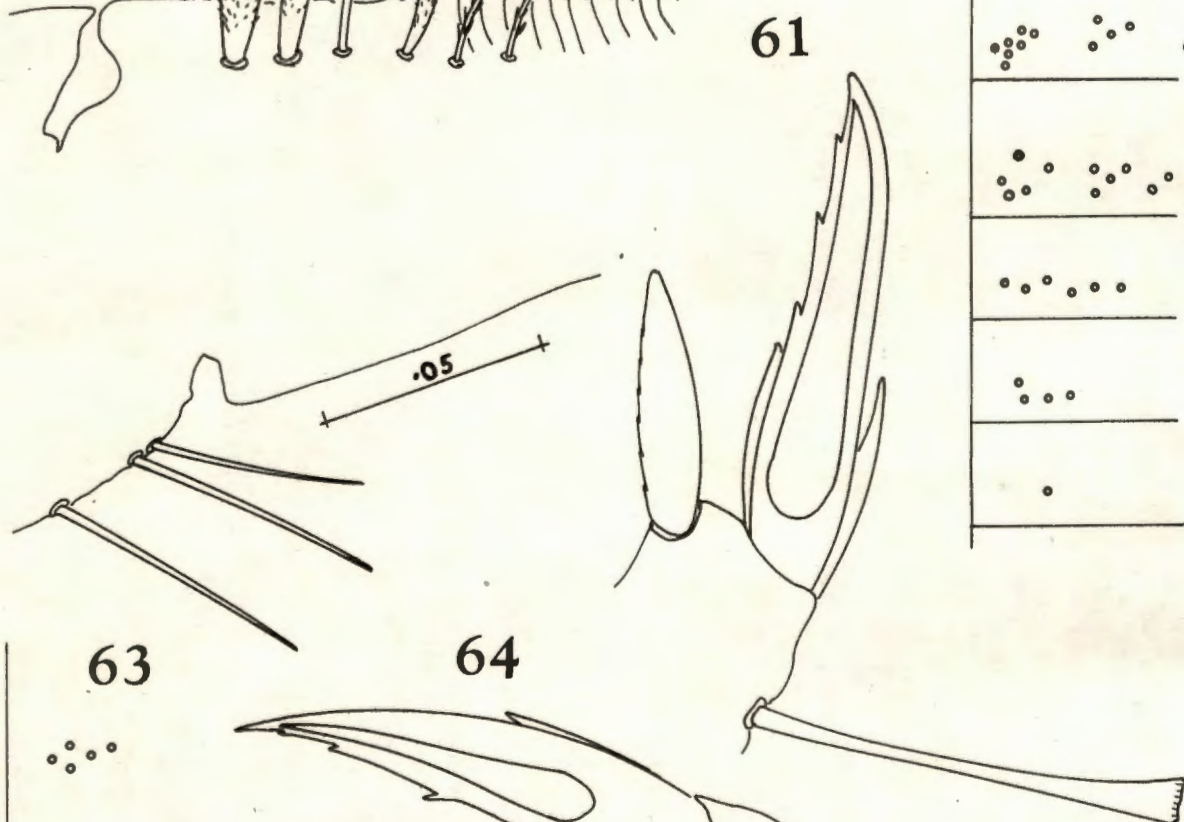
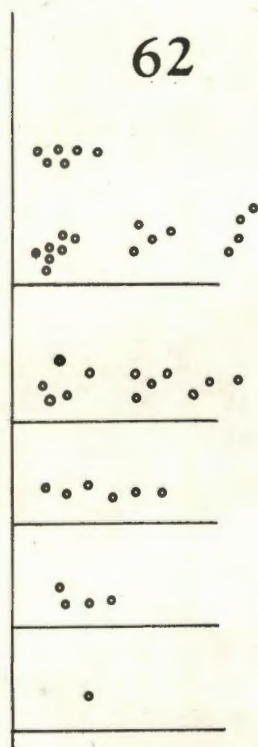
Yosii's description of this species is based on three specimens from Table Mountain. They have the macrosetal formula of 12-5. The author has collected about ten examples from Grootvadersbosch and Heidelberg, C.P.

SEIRA DAMERELLA spec. nov. (figs. 57-59)

This species has a very similar macrosetal pattern and formula to S. marephila spec. nov. but differs in that the presence of only four brushed macrosetae in the medial cluster on th. II is correlated with its geographical distribution which is restricted to the Transvaal lowveld. The posterior cluster on th. II is either 12 or 13 and does not exceed 13 (fig. 58).

Blue pigment is scattered throughout the body, some areas being darker than others. In the holotype the eye-patches are very dark, the antennae are blue and patches of

bluish-black colour are present in the coxae and terminally in the femurs. Dark brown scales cover the pigment, especially on the tergites, to an extent which varies with the number of scales present. The lengths of the various segments of the holotype, measured in the mid-dorsal line, are:- ant. IV 365 $\mu$ , ant. III 430 $\mu$ , ant. II 225 $\mu$ , ant. I 170 $\mu$ , head 365 $\mu$ , th. II 280 $\mu$ , th. III 125 $\mu$ , abd. I 112 $\mu$ , abd. II 95 $\mu$ , abd. III 140 $\mu$ , abd. IV 615 $\mu$ , abd. V 140 $\mu$ , abd. VI 25 $\mu$ , manubrium 475 $\mu$ , dens 475 $\mu$ , mucro 30 $\mu$ . The antennae are 1.2 mm long, the head plus body 1.4 mm and the furca 1.0 mm. Antennae dark blue, ant. IV with a terminal protrusible bulb, ant. IV and III segmented with rings of ciliate setae with a few smooth sensory setae amongst them. Scales and long pointed finely ciliate macrosetae on ant. I and II, with a few of each basally on ant. III. Head with scales, brushed macrosetae and 8 + 8 eyes on dark eyepatches. Collar of brushed macrosetae on anterior edge of th. II. Body tergites with scales and brushed macrosetae, the latter in the pattern on th. II, III and abd. I which is characteristic for the species (fig. 58). The pattern and number on abd. IV is not constant within the species, but at least three lasiotrichia are present. Genital papilla with about 40 ciliate setae. No sexual differentiation seen. Manubrium and dens with scales ventrally and long ciliate setae dorsally. The dens carries dorsally, near the manubrium-dens joint, two or three club-shaped, finely ciliate setae on each side and opposite them the manubrium carries ventrally three long smooth pointed setae, as in fig. 60. Legs with the usual long finely ciliate macrosetae, scales and ordinary ciliate setae.



Claws of normal shape with three minute teeth on the distal half of the medial lamina, none on the lateral lamina and a lanceolate unguiculus three-quarters the length of the claw (fig. 57). The dorsal pseudonychia appear to be short. Tenent setae strong.

Material examined. Holotype and one paratype from grass under citrus, Politsi, Tvl., 16 January 1964. One paratype from under dead leaves at Letsitele, one from grass at Phalaborwa, both 16 January 1964, and one from mulch in banana orchard, Nelspruit, 7 July 1966. About twenty other specimens from the Lowveld. All material T.J. Coates leg.

SEIRA MAREPHILA spec. nov. (figs. 60-62)

A species with a distribution rather similar to Seira anncla is S. marephila. It was found from Mossel Bay to East London, sometimes next to the sea and never more than a few miles inland, e.g. Swellendam. The macrosetal formula is 12-6 with, on th. II, the medial cluster either five or six and the posterior cluster from 14 to

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Figs. 60-62: S. marephila. 60, manubrium-dens joint.  
61, claw III. 62, dorsal macrosetae.

Figs. 63-66: S. lindei. 63, dorsal macrosetae. 64, claw III. 65, claw II - dorsal aspect. 66, habitus.

17. The body colour is from dark to light blue, with dark eyepatches. Concentrations of blue colour also occur, in the holotype, at the bases of ant. IV, III and II, the whole of ant. I, and the femora. The brown scales, which are plentiful except on the terminal segments of the antennae, cover up the blue colour especially on the tergites where they form transverse brown or yellow bands. The extent of these bands varies from specimen to specimen according to the number of scales present. The lengths of the various segments of the holotype, measured along the mid-dorsal line, are:- ant. IV 440 $\mu$ , ant. III 350 $\mu$ , ant. II 265 $\mu$ , ant. I 175 $\mu$ , head 485 $\mu$ , th. II 350 $\mu$ , th. III 265 $\mu$ , abd. I 220 $\mu$ , abd. II 220 $\mu$ , abd. III 265 $\mu$ , abd. IV 880 $\mu$ , abd. V 175 $\mu$ , abd. VI 25 $\mu$ , manubrium 660 $\mu$ , dens 705 $\mu$ , mucro 35 $\mu$ . The antennae total 1.2 mm, the head plus body 2.9 mm and the furca 1.4 mm.

Ant. IV with a terminal protrusible vesicle. Ant. IV and III annulate with many ciliate setae, amongst them a few smooth sensory setae, set in rings. Ant. III with a few scales and long pointed macrosetae proximally. Ant. II and I both with many scales and long pointed macrosetae, the latter finely ciliate (fig. 8). Head with 8 + 8 eyes on dark eyepatches, many scales and several brushed macro-setae (fig. 9) in a pattern very similar to that of fig. 35. Tergites with many scales and brushed macrosetae, the latter in the characteristic pattern for the species (fig. 62). The number and pattern of the macrosetae on abd. IV is not constant. Genital papilla with about 20 thick ciliate setae. No sexual differentiation seen. Legs with the usual complement of scales, long pointed macrosetae, thick ciliate

setae and ordinary ciliate setae. At least one very long macroseta proximally on tibiotarsus III, as e.g. fig. 48. Claws with three minute teeth on the medial lamina, one at half, one at two-thirds and one at three-quarters of the way to the tip, but no tooth on the lateral lamina (fig. 61). Unguiculus lanceolate, two-thirds of the length of the claw, with a proximal edge sometimes serrate. The usual three dorsal pseudonychia are present, one standing away slightly. Furca as for the genus with scales dorsally and ventrally on the manubrium and ventrally on the dens. Dorsally on the dens, near its junction with the manubrium are two or three thick, club shaped finely ciliate setae in a row down the dens. The row continues with ordinary ciliate setae. Ventrally on the manubrium, opposite the thick setae, are three smooth pointed setae (fig. 60).

Material examined. Holotype from Zygophyllum sp. Hartenbos, C.P., 25 January 1965 (T.J. Coates) AcV 65/32. Two paratypes from rotting leaves, Storms River Mouth, C.P., 20 January 1965 (T.J. Coates). Three paratypes from Rhus undulata, Serruria fucifolia and under rotting wood respectively, Bontebok National Park, 7 and 8 February 1967 (T.J. Coates) AcV 66/169, 171, 172. Thirty other specimens from the coast between East London and Mossel Bay.

SEIRA LINDEI spec. nov. (figs. 63-66)

This species occurs in the Cape Province, mainly be-

tween George and East London, but not within a few miles of the coast. The macrosetal formula is 12-7 and the pattern on th. III is 5-4-3 (fig. 63). On th. II, the medial cluster has five or six setae and the posterior cluster 15-17.

The lengths of the various segments of the holotype, measured along the mid-dorsal line, are:- ant. IV 350 $\mu$ , ant. III 295 $\mu$ , ant. II 210 $\mu$ , ant. I 140 $\mu$ , head 350 $\mu$ , th. II 280 $\mu$ , th. III 210, abd. I 140 $\mu$ , abd. II 155 $\mu$ , abd. III 175 $\mu$ , abd. IV 700 $\mu$ , abd. V 140 $\mu$ , abd. VI 15 $\mu$ , manubrium 490 $\mu$ , dens 560 $\mu$ , mucro 35 $\mu$ . Colour dark bluish-black throughout with black eye spots. Other specimens are lighter in colour but all are covered to a greater or lesser extent with dark brown scales, particularly on the tergites, where the dark blue may be completely hidden by transverse bands of scales. Ant. IV and III annulate with many ciliate setae in rings, with a few smooth sensory setae interspersed. Scales and strong ciliate macrosetae on ant. I, II and the proximal half of ant. III. Scales also on head and body with long brushed macrosetae including a thick collar or macrosetae on the anterior dorsal edge of th. II. The brushed macrosetae on the tergites form a definite pattern (fig. 63), with the macrosetal formula 12-7. On the genital papilla are many long and short ciliate setae. No sexual differentiation was noted. The furca is normal for the genus with scales both dorsally and ventrally on the manubrium but only ventrally on the dens. Two or three thick club-shaped setae are present dorsally on each side of the dens. The narrow macronal shaft is finely annulate, as usual. Mucro falcate. Legs with scales, point-

ed finely ciliate macrosetae and a few thick ciliate setae distally. Claws as usual, with three minute teeth on the medial lamina, one at half, one at three-quarters and one at seven-eighths the distance of the tip. One minute tooth is situated on the lateral lamina, opposite the proximal tooth of the other side. Three dorsal pseudonychia are present. On claw III, two are closely appressed and one stands away slightly (fig. 64). On claw II, all three stand away slightly, producing a slightly winged effect (fig. 65).

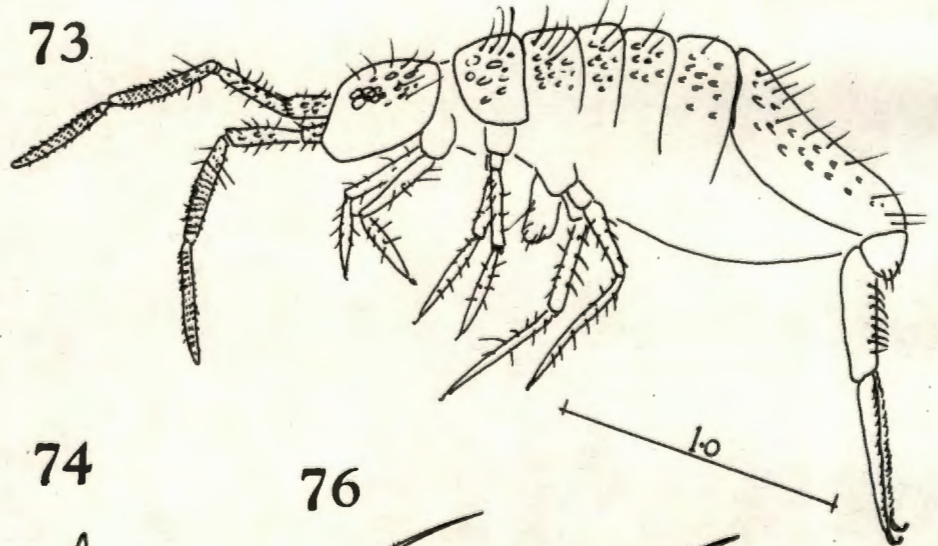
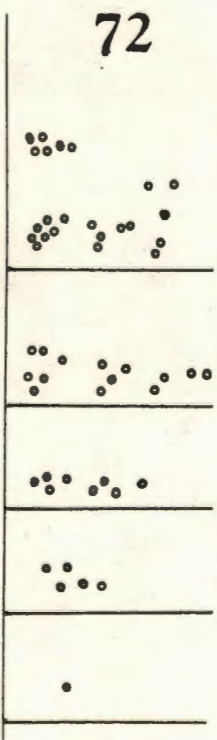
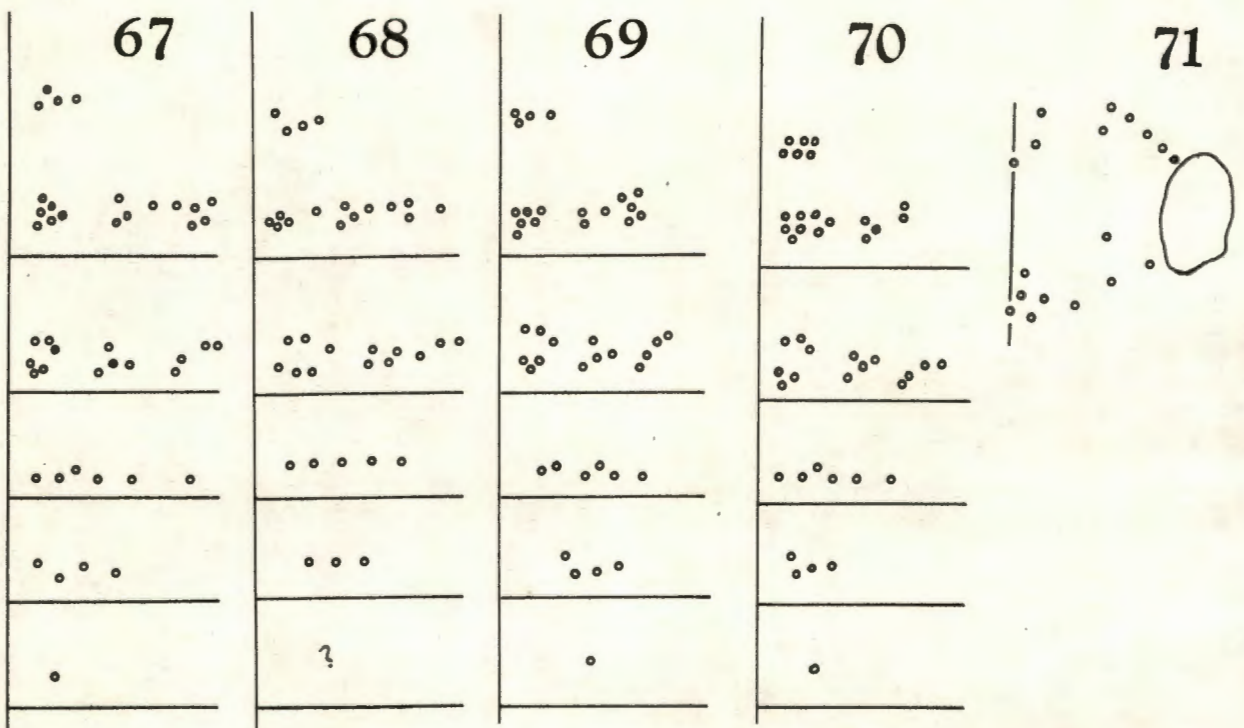
Material examined. Holotype and two paratypes from rotting leaves in stream, Mountain Zebra National Park, 29 January 1965 (T.J. Coates) AcV 65/28. Two paratypes from rotting grass, Zuurberg C.P., 13 January 1965 (T.J. Coates) AcV 65/65. Other specimens from Addo, Fort Beauford, van Stadens River, Heidelberg and Piekeniers Kloof, all in the Cape.

The species is named in honour of Dr. W.J. van der Linde of the Plant Protection Research Institute.

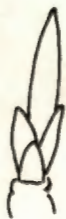
SEIRA FLAVOVIRENS (Borner, 1903) (figs. 67-68).

Lepidocyrtinus flavovirens Borner, 1903. Sber. ges. naturf. Freunde Berlin 1903: 150. Womersley, H. 1934. Ann. S. Afr. Mus. 30: 463.

Seira flavovirens (Borner, 1903). Yosii, 1959. Seto Mar.

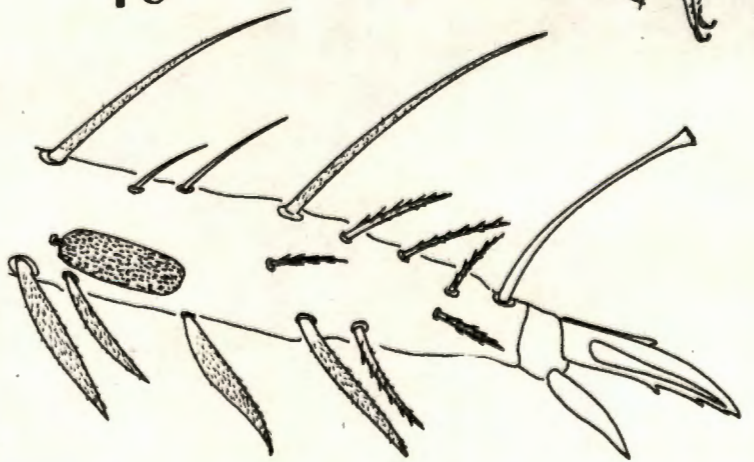


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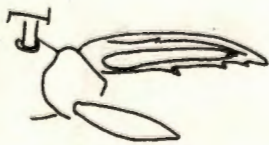


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75



biol. Lab. special publ. June 1959: 18-19.

Some confusion exists over this species. Two specimens in the collection of the South African Museum were from several identified by Womersley as this species; they have the macrosetal formula of 14-6 (fig. 67). Several more specimens with the same formula and pattern have been collected by the author recently from the same area, e.g. Elsenberg, and also from Trawal. On the other hand, Yosii (1959) redescribed the species from two specimens from Table Mountain which bore the macrosetal formula of 13-5 (fig. 68). In spite of quite intensive collecting, the author has found no specimens of this format. To add to the confusion, S. arenaria Gama, 1966, recently described from Bulgaria, also has a 14-6 formula, with a macrosetal pattern (fig. 69) almost identical with that of the South African specimens.

It is obvious that a chaetotaxic examination of the type

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Fig. 67 : S. flavovirens sensu Womersley, 1934.

Fig. 68 : S. flavovirens sensu Yosii, 1959.

Fig. 69 : S. arenaria Gama, 1966.

Figs. 70-71: S. munroi. 70, dorsal macrosetae. 71, cephalic macrosetae.

Figs. 72-75: S. eleana. 72, dorsal macrosetae. 73, habitus. 74, claw II - posterior aspect. 75, claw III - anterolateral aspect.

Fig. 76 : Lepidokrugeria meyeri - tibiotalarsus III.

of S. flavovirens is necessary. Pending this, the author will follow the lead of Womersley (1934).

SEIRA MUNROI (Paclt, 1959) (figs. 70-71)

Diamantinum munroi Paclt, J. 1959. Collembola. In Hanstrom et al. South African Animal Life Pt. 6:

Seira munroi (Paclt, 1959) Salmon, J.T. 1964. Bull. R. ent. Soc. N.Z. 7: 133, 504.

Salmon (1964) is correctly of the opinion that Diamantinum is a synonym of Seira. In the holotype, the macrosetal formula is 14-6, with on th. II, six macrosetae in the medial cluster and thirteen in the posterior cluster (fig. 70). Fig. 71 details the cephalic macrosetae.

SEIRA ELEANA spec. nov. (figs. 72-75)

This species is very common in the Transvaal lowveld and Mocambique. It is of the usual entomobryid shape, body colour dark blue or black with dark eyepatches and dark areas anteriorly and laterally on the tergites, on the distal ends of ant. II and III and on most of ant. I. Dark brown scales cover large areas of the body, antennae, legs and furca but are especially plentiful on the head and tergites. On the dorsum amongst these scales are large brushed macrosetae (fig. 9) which are inserted in a pattern

(fig. 72) on th. II, III and abd. I which is specific to the species. The macrosetal formula is 14-8 while on th. II, the medial cluster may be four, five or six and the posterior cluster is usually 15 or 16 but occasionally may be 14 or 17. The lengths of the various segments of the holotype, measured along the mid-dorsal line, are:- ant. IV 420 $\mu$ , ant. III 385 $\mu$ , ant. II 245 $\mu$ , ant. I 175 $\mu$ , head 455 $\mu$ , th. II 345 $\mu$ , th. III 175 $\mu$ , abd. I 175 $\mu$ , abd. II 175 $\mu$ , abd. III 210 $\mu$ , abd. IV 665 $\mu$ , abd. V 175 $\mu$ , abd. VI 15 $\mu$ , manubrium 490 $\mu$ , dens 595 $\mu$ , mucro 35 $\mu$ . The antenna totals 1.2 mm, the head plus body 2.3 mm and the furca 1.1 mm.

Ant. IV and III are annulated with regular rings of ciliate setae amongst which are a few smooth sensory setae. Ant. I, II and the basal portion of ant. III have scales, long pointed ciliate setae and the normal ciliate setae. Head with 8 + 8 eyes, many scales and several brushed macrosetae, the latter in the usual pattern. Tergites also with many brown scales and brushed macrosetae, the latter in the specific pattern (fig. 72). Legs with scales and long pointed macrosetae. Distally are a few thickened ciliate setae on the tibiotarsi. The trochanteral organ has about 19 setae. On the medial lamina of the claw are three very small teeth, one at halfway, one at three-quarters and one at seven-eighths of the distance of the tip. The two proximal teeth are well defined. Another small tooth is situated on the external aspect of the lateral lamina, opposite the proximal tooth of the other side (fig. 75). Three closely appressed pseudonychia are carried dorsally, the middle one being rather smaller than the other two (fig.

74). Furca as for the genus, with falcate mucro. Scales ventrally and dorsally on the manubrium but only ventrally on the dens. Both carry many long pointed finely ciliate macrosetae dorsally, with about five lasiotrichia on the manubrium. No club-shaped setae are present dorsally near the manubrium-dens joint. No sexual differentiation noted. Genital papilla with about thirty ciliate setae. Tenaculum with four-toothed rami and a median ciliate macroseta.

Material examined. Holotype and four paratypes from dry grass, Bundu Inn, Groblersdal district, Transvaal, 15 March 1967 (T.J. Coates) AcV 67/14. About 100 other specimens from the Kruger National Park and Mocambique.

The species is named in honour of my wife in gratitude for her continued moral support and inspiration.

SEIRA SQUAMOORNATA (Scerbakov, 1898)

Mesira squamoornata Scerbakov, 1898. Zool. Anz. 21 : 63.

Seira (Mesira) squamoornata (Scerbakov, 1898) Paclt, J. 1959. Collembola, In Hanstrom et al. South African Animal Life Pt. 6 : 51-4. Paclt, J. 1967. J. ent. Soc. sth. Afr. 29 : 140-1.

Seira squamoornata (Scerbakov, 1898) Paclt, J. 1964. J. ent. Soc. sth. Afr. 27 : 74-6. Gama, M.M. da. 1966. Mens Estud. Mus. zool. Univ. Coimbra 295 : 14-16.

The author was advised by Prof. Dr. Yosii (in litt.)

that:- "As for S. squamoornata, the species described from the Ukraina, it has no relation at all with the S. African fauna." The type specimen is apparently lost to science but recently Gama (1966) was able to study the dorsal chaetotaxy of specimens obtained from the type locality in 1934. These had been compared with the type specimen by Stach and identified by him as S. squamoornata. Gama's illustration shows that the macrosetal formula is 16-9 with, on th. II, ten in the medial cluster and 24 in the posterior cluster.

The author has not so far found any specimens with that macrosetal formula in Southern Africa. Further, the author has examined a few specimens of each of the many accessions in his possession that have been labelled as S. squamoornata by Pacit. All these specimens have fallen into one or other of the species dealt with in this work and none have shown a macrosetal formula of more than 14-8. The author is therefore in complete agreement with Yosii and the name S. squamoornata must be deleted from the list of Southern African Collembola.

SEIRA NYASSICA var. PALLENS (Borner, 1908)

Pseudosira nyassica var. pallens. Borner, 1908. Denkschr. med.-naturw. Ges. Jena 13: 55.

Originally reported from Little Namaland, South West Africa, this variety has not been reported since. Macrosetal formula not known.

SEIRA LAETA (Borner, 1908)

Pseudosira (Mesira) laeta, Borner, 1908. Denkschr. med.-naturw. Ges. Jena 13: 55.

Originally described by Borner from Port Nolloth, South West Africa, the species has not been reported again. Salmon (1956) regards it as a synonym of S. squamoornata. Macrosetal formula not known.

SEIRA INCERTUS (Handschin, 1925)

SEIRA PSEUDOCOERULEUS (Denis, 1924)

Both these species were reported by Womersley (1934). Unfortunately, the medium in which they are mounted has deteriorated to such an extent that it is impossible to discern their macrosetal formulae.

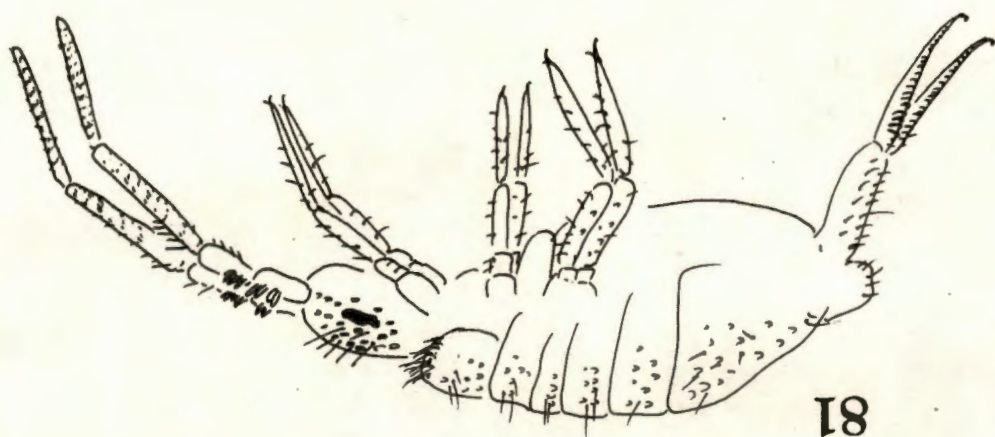
LEPIDOKRUGERIA gen. nov.

The characteristics separating this genus from Seira and Lepidoregia are easily visible (fig. 77). Firstly, a cluster of very broad, finely ciliate setae of characteristic shapes is carried proximally on ant. II. It is accompanied by several short, broad setae. A similar but rather more scattered group is carried distally on ant. I. Secondly, a row of about 20 strongly ciliate setae is carried longitudinally on ant. II, not transversely as in Lepidoregia where nine such setae form a coronet. Otherwise of entomobryid appearance with long antennae, the two distal segments of which are annulated. A small protrusible vesicle is carried terminally on ant. IV. Eyes 8 + 8. Mesonotum protruding slightly over the rear of the head. Body with many scales. Insertions of brushed macrosetae on tergites form a pattern which is constant for a species. Furca long, dens crenulate and annulate, mucro falcate. Claw large, with a few minute teeth, usually three pseudonychia dorsally and a strong clavate tenent seta.

This genus is so far represented by only one species, Lepidokrugeria meyeri gen. et spec. nov.

LEPIDOKRUGERIA MEYERI gen. et spec. nov. (figs. 76-81)

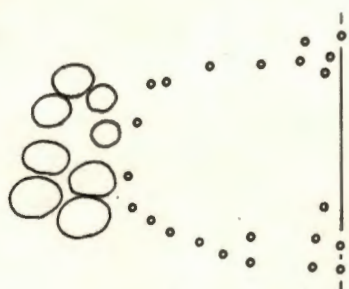
The antennae are long, ant. IV and ~~III~~ annulate, with rings of ciliate setae and a few smooth sensory setae (fig.



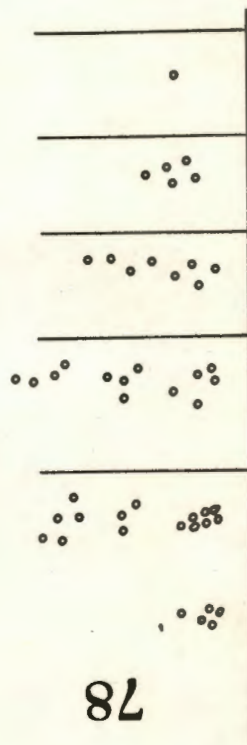
81



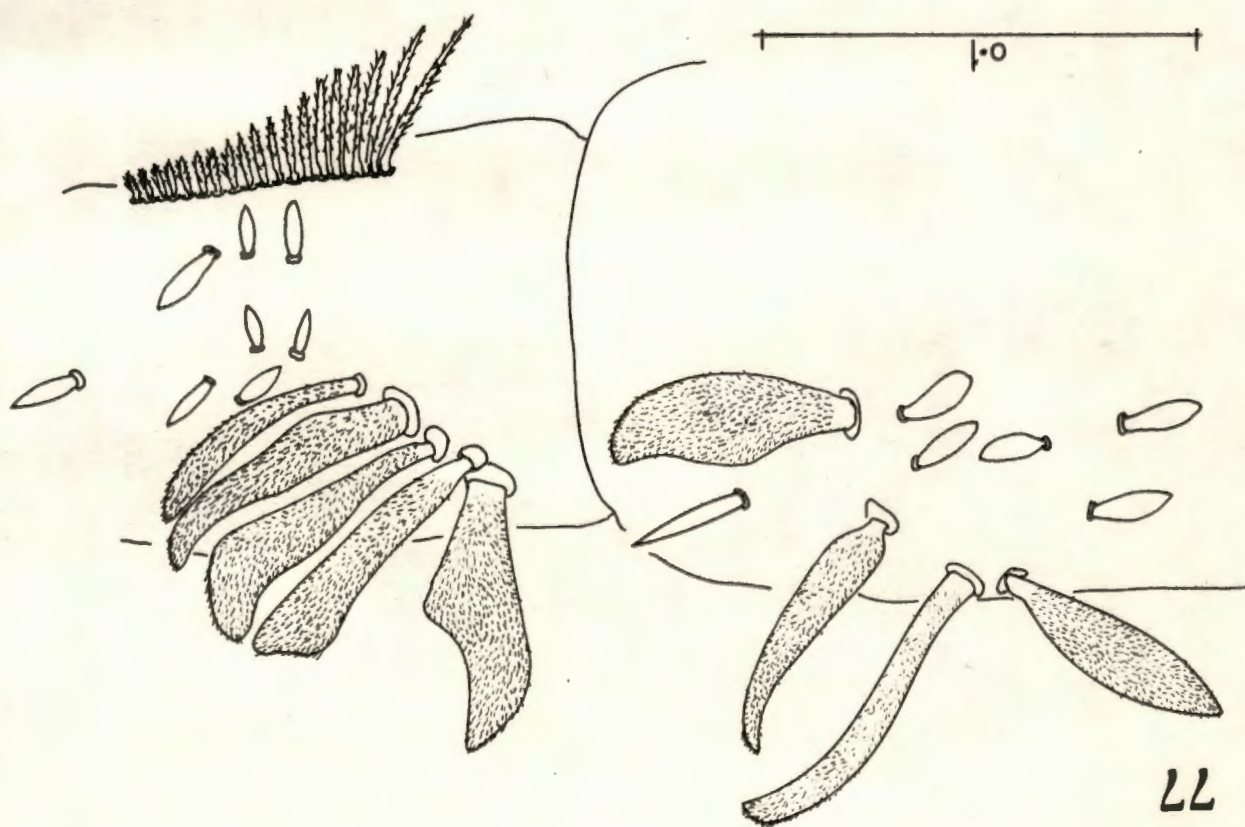
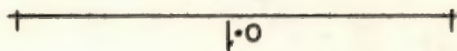
80



79



78



77

80). Ant. I and II bear many scales, long pointed macrosetae and normal ciliate setae. In addition, ant. II carries proximally a cluster of five specialised setae of characteristic shape on its dorsum and a longitudinal row of about 20 strongly ciliate setae ventrally. Next to this row on the lateral aspect of the segment are some nine or ten short broad setae. Ant. I carries, distally, one short pointed smooth seta, three strong broad specialised finely ciliate setae and again several short broad setae (fig. 77).

The lengths of the various segments of the holotype, measured along the mid-dorsal line, are:- ant. IV 595 $\mu$ , ant. III 490 $\mu$ , ant. II 245 $\mu$ , ant. I 210 $\mu$ , head 420 $\mu$ , th. II 245 $\mu$ , th. III 175 $\mu$ , abd. I 125 $\mu$ , abd. II 155 $\mu$ , abd. III 195 $\mu$ , abd. IV 735 $\mu$ , abd. V 105 $\mu$ , abd. VI 15 $\mu$ , manubrium 455 $\mu$ , dens 560 $\mu$ , mucro 35 $\mu$ . The length of an antenna is thus 1.5 mm, the head plus body 2.2 mm and the furca 1.0 mm. The head carries 8 + 8 eyes on a dark eyepatch, many dark brown scales and a few macrosetae, some brushed but the majority pointed. The tergites also carry many similar scales, with brushed macrosetae in a definite pattern (fig. 78), of which that on th. III and abd. I gives the macrosetal formula of 14-8. The medial cluster on th. II has four or five such macrosetae and the posterior cluster 16, occasionally 15. One lasiotrichia is carried on abd. II, two on abd.

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Figs. 77-81: Lepidokrugeria meyeri<sup>i</sup>. 77, specialised setae on ant. I and ant. II. 78, dorsal macrosetae. 79, cephalic macrosetae. 80, annulations on ant. III. 81, habitus.

III and at least three on abd. IV. Tenaculum with four teeth each side and a median seta. Legs with scales and long pointed macrosetae. Femur with one long lasiotrichia proximally, tibiotarsi with two. The latter also with some thicker ciliate setae (fig. 76). Trochanteral organ of about 20 setae. Claws long, pointed, with three prominent teeth on the medial lamina at one-eighth, one-quarter and one-half the distance from the tip (fig. 76). A minute tooth is on the lateral lamina about half-way. Three dorsal pseudonychia carried, the middle one smaller than the other two. Unguiculus broadly lanceolate, two-thirds the length of the claw. Tenent seta strong, clavate genital papilla with several thickened ciliate setae. No sexual differentiation noted.

Material examined. Holotype and three paratypes from dead leaves, Letaba River, Kruger National Park N.237, Transvaal, 14 January 1964 (T.J. Coates) AcV 64/94. About thirty other specimens from the Kruger Park, Groblersdal and Machava, Mombambique.

The species is named in honour of Dr Magdalena K.P. Meyer of the Plant Protection Research Institute, Dept. of Agricultural Technical Services, in gratitude for inspiration, advice and criticism freely dispensed to the author over a period of several years.

## XII The genus CYPHODERUS Nicolet, 1847

This genus was revised by Delamare-Deboutville in 1948, who erected the genus Cyphoda for those species with a simple mucro. The following species have been reported from Southern Africa:-

Cyphoderus africanus Womersley, 1929, from a single specimen from an ant nest (Pheidole sp.) in Southern Rhodesia. No other reports.

Cyphoderus assimilis Börner, 1906. Reported by Paclt (1959) from ant nest in Natal.

Cyphoderus bidenticulatus (Parona), 1888. The first South African report was by Börner (1913), from a termite nest (Odontotermes latericius) in Natal. Recently, twelve specimens have been found in virgin soil, Empangeni, Natal (T.J. Coates).

Cyphoderus limboxiphius Börner, 1913, was first described from a nest of the termite, Trinervitermes trinervius, in Natal. It has also been reported by Womersley (1929) from ant nests (Pheidole sp.) in Southern Rhodesia and by Paclt (1967) from nests of Odontotermes transvaalensis and O. badius, Transvaal.

Cyphoderus omoensis Delamare Deboutville, 1945. A specimen from the Congo Caves, C.P. was labelled C. arcuatus var. aethiopicus by Womersley (1934). Paclt (1959) considers it to be C. omoensis.

Cyphoderus squamidives (Silvestri, 1917) was originally found in association with the termite, Macrotermes natalensis.

Pacit (1959) records it from the Drakensberg and also in 1967 from Simonstown. It was also reported from rotten potatoes in Southern Rhodesia by Womersley (1929) as C. cuthbertsoni, a designation which was placed into synonymy by Delamare-Deboutville (1948).

Cyphoderus trinervoidis Pacit, 1965 was first described from a nest of Trinervitermes trinervoides, Pretoria. He reported further accessions from the Transvaal in 1967.

### XIII The genus CYPHODA Delamare-Deboutville, 1948

Cyphoda colorus (Borner, 1908). Originally described by Borner from nests of the termite Microhodotermes at Steinkopf, C.P., he reported it again in 1913 from South West Africa. No further records.

Cyphoda natalensis (Borner, 1913). Borner described this species from a nest of Macrotermes natalensis, Natal. A further report by Womersley (1934) from ant nests on Table Mountain and at Hout Bay. Eleven specimens were found in a nest of Trinervitermes trinervoides, Pretoria, 17 December 1963.

XIV The genus PSEUDOCYPHODERUS Imms, 1912

Pseudocyphoderus wasmanni. Borner 1913. Zool. Anz. 41: 281. Paclt, J. 1967. J. ent. Soc. sth. Afr. 29: 143.

Originally described from nest of Odontotermes vulgaris, Natal. The only subsequent report is by Paclt (1967) from nests of Odontotermes transvaalensis, O. latericius and Macrotermes natalensis in the Transvaal, near Pretoria.

XV The genus CALOBATINUS Silvestri, 1917

Colabatinus rhadinopus (Borner, 1913). Zool. Anz. 41: 282. Paclt, J. 1967. J. ent. Soc. sth. Afr. 29: 143.

This species was first reported from a nest of Macrotermes natalensis in Natal. Silvestri (1918) reported it from a nest of the same species near Pretoria, as did Paclt (1967). The latter included an accession from a nest of M. waterbergi from Rust der Winter, Transvaal.

XVI The genus PSEUDOSINELLA Schott, 1893

Pacit (1959) has reported Pseudosinella immaculata (Lie-Pettersen, 1897), P. alba (Packard, 1873) and P. octopunctata Börner, 1903 from South Africa. Cardoso (1966) has reported the latter two species from Mocambique.

XVII The genus PARONELLA Schott, 1893

Paronella nigromaculata Schott, 1903 was reported by Pacit (1959) from the Drakensberg. No other reports from Southern Africa.

XVIII The genus LEPIDOCYRTUS Bourlet, 1839

Lepidocyrtus lanuginosus (Gmelin, 1788) has been reported by Womersley (1934) and Pacit (1959, 1967). The latter author has also (1959) reported L. ferrugineus Schott, 1893 and L. cyaneus Tullberg, 1871. Cardoso (1966) reports the latter species and L. violaceus Lubbock, 1873 from Mocambique.

XIX The genus SINELLA Brook, 1882

Sinella hofti Schaffer, 1896 was reported by Paclt (1959) from the Congo Caves. S. coeca (Schott, 1896) was reported from the same locality by Goto (1953). Paclt (1959) regards the two as synonymous.

XX The genus ENTOMOBRYA Rondani, 1861

Womersley (1934) reported Entomobrya decemfasciata (Packard, 1873) and two forms of E. nivalis. Paclt (1959) reported E. hexfasciata and E. nivalis, regarding all Womersley's accessions as synonyms of the latter. In 1967, Paclt reported E. atrocincta. The author has collected many specimens of E. nivalis from all over South Africa.

## XXI ACKNOWLEDGEMENTS

The author would like to express his heartfelt thanks and appreciation to:-

Professor P.A.J. Ryke, for his stimulating interest and advice;

Professor J.A. van Eeden, for his encouragement and interest;

Dr W.J. van der Linde, for his continued interest;

Dr Magdalena K.P. Meyer, for being an unfailing source of inspiration, advice and criticism as and when needed by the author over the past few years;

The Department of Agricultural Technical Service for permission to use the data presented in this work:

My wife and son, for their moral support and forbearance.

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