Revision of the genus *Scutellonema* Andrássy, 1958 (Nematoda : Tylenchida)

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SUMMARY

The genus *Scutellonema* Andrássy, 1958 is reviewed, and the characters reevaluated to aid specific identification. In addition : *(i)* two species are considered *species inquirendae : S. brabanum* and *S. vietnamesense; (ii)* two species are placed within *incertae sedis : S. amabile* and *S. sexlineatum; (iii)* seven species are synonymized : *S. aberrans, S. bangalorense, S. conicaudatum, S. dentivagina, S. eclipsi, S. mangiferae, S. multistriatum,* and *(iv)* five species are transferred to the genus *Rotylenchus : S. incisicaudatus, S. impar, S. insularis, S. laeviflexus* and *S. minutum.* Twenty species of *Scutellonema* are redescribed and illustrated and a key id given to the 22 species considered to be valid. In addition to classic characters such as presence or absence of males, and length of spear, additional characters are introduced including presence or absence of longitudinal striations on the basal lip annule, and presence or absence of areolation in region of the scutellum. Scutella diameter varies with the level of measurement (*i.e.*, surface *vs.* subsurface); since the level of measurement is not given in prior descriptions, these previously reported measurements are frequently of little use.

RÉSUMÉ

Révision du genre Scutellonema *Andrássy, 1958 (Nematoda : Tylenchida)*

Le genre *Scutellonema* Andrássy, 1958 est révisé et les caractères en sont réévalués pour une meilleure identification spécifique. De plus : *i)* deux espèces sont considérées comme *species inquirendae : S. brabanum* et *S. vietnamesense; ii)* deux espèces sont considérées comme *incertae sedis : S. amabile* et *S. sexlineatum; iii)* sept espèces sont synonymisées : *S. aberrans, S. bangalorense, S. conicaudatum, S. dentivagina, S. eclipsi, S. mangiferae, S. multistriatum;* cinq espèces sont transférées au genre *Rotylenchus : S. incisicaudatus, S. impar, S. insularis, S. laeviflexus et S. minutum.* Vingt espèces de *Scutellonema* sont redécrites et illustrées et il est proposé une clé des 22 espèces considérées comme valides. En sus des caractères classiques tels la présence/absence de mâles et la longueur du stylet, d'autres caractères sont utilisés dont la présence/absence de stries longitudinales sur l'anneau labial basal, et la présence/absence d'aréolation à la latitude du scutellum. Le diamètre des scutella varie suivant le niveau auquel cette mesure est faite (à la surface ou en profondeur); comme ce niveau n'est pas précisé dans les descriptions antérieures, les mesures des scutella qui y sont rapportées ne peuvent, le plus fréquemment, être utilisées.

The genus *Scutellonema,* created by Andrássy (1958) is primarily characterized by scutella (enlarged phasmids) which are opposed and located near the anus, and by the dorsal and ventral overlap of the intestine by the oesophagus. When created, *Scutellonema* had six species transferred from *Rotylenchus* Filipjev, 1936 : *S. blaberum* Steiner, 1937 (type species); *S. boocki* Lordello, 1956; *S. brachyurus* Steiner, 1938; *S. bradys* Steiner & LeHew, 1933; *S. christiei* Golden & Taylor, 1956 and *S. coheni* Goodey, G. B., 1952. Subsequently, Whitehead (1959) described *S. clathricaudatum.* Then Sher (1961) emended the diagnosis of *Scutellonema,* synonymized *S. boocki* with *S. brachyurus* and transferred *Hoplolaimus aberrans* Whitehead, 1959 to *Scutellonema.* In 1964 Sher again emended the diagnosis and synonymized *S. blaberum* and *S. dioscoreae* with *S. bradys* so that the latter became the type species. He also transferred *S. christiei* to *Peltamigratus* Sher, 1964, created six new species, and included a key to species (which he revised in 1965). At that time the genus had eleven species, however, since then a number of additional species have been described so that a new revision of the genus is needed.

In this revision we propose several synonymies, designation of some species as *incertae sedis,* and transfer of certain species to other genera. Species which are described

inadequately to differentiate them from other species and for which type material could not be observed, are placed in *species inquirendae*. The present revision recognizes 22 valid species of *Scutellonema*. Since the only keys to species of *Scutellonema* published since Sher (1965) are those of Smit (1971) and a key to South African species by van den Berg and Heyns (1973), the present revision includes a key to valid species.

Genus **Scutellonema**

Andrássy, 1958; Sher, 1961; Thorne, 1961; Sher, 1964. (Hoplolaimidae Wieser, 1953; Hoplolaiminae Filipjev, 1934.)

EMENDED DIAGNOSIS

Female. Lip region offset or continuous with body contour; rounded, flattened or truncate; with or without annulation. En face pattern (SEM) including six lips surrounding labial disc, lateral lips reduced in size relative to submedial lips. Basal lip annules with or without longitudinal striation. Lateral field with four incisures, areolated anteriorly, usually at level of phasmids, and sometimes throughout length. Spear well developed with rounded, anteriorly flattened or indented basal knobs. Oesophageal glands overlapping intestine dorsally and laterally. Epiptygma absent, single or double. Two outstretched genital branches. Tail short, generally less than body width at anus. Phasmid openings large (scutella), opposite or nearly opposite each other at level of anus. Diameter of scutellum larger internally than at surface.

Male. When present, generally similar to females (except for reproductive structures) but slightly smaller. Caudal alae crenate, enveloping tail, sometimes lobed.

TYPE SPECIES

Scutellonema bradys (Steiner & LeHew, 1933) Andrassy, 1958
- = *Hoplolaimus bradys* Steiner & LeHew, 1933
- = *Anguillulina bradys* (Steiner & LeHew) Goodey, 1935
- = *Rotylenchus bradys* (Steiner & LeHew, 1933) Filipjev, 1936
- = *Rotylenchus blaberus* (Steiner, 1947) Sher, 1964
- = *Scutellonema blaberum* (Steiner, 1937) Andrássy, 1958
- = *Scutellonema dioscoreae* (Lordello, 1959) Sher, 1964

OTHER SPECIES

S. africanum Smit, 1971
S. bizanae van den Berg & Heyns, 1973
- = *Scutellonema multistriatum* van den Berg & Heyns, 1973 [n. syn.]

*S. brachyurus** (Steiner, 1938) Andrássy, 1958
- = *Rotylenchus brachyurus* Steiner, 1938
- = *Rotylenchus coheni* Goodey, 1952
- = *Scutellonema coheni* (Goodey, 1952) Andrássy, 1958
- = *Rotylenchus boocki* Lordello, 1957
- = *Scutellonema boocki* (Lordello, 1957) Andrássy, 1958
- = *Scutellonema bangalorense** Khan & Nanjappa, 1970 [n. syn.]
- = *Scutellonema conicaudatum* Sivakumar & Selvasekaran, 1982 [n. syn.]
- = *Scutellonema orientale** (Rashid & Khan, 1974) Mattaar & Loof, 1984
- = *Scutellonema ramai* Verma, 1972 [by Mattaar & Loof, 1984]
- = *Scutellonema sheri* Edward & Rai, 1970 [by Mattaar & Loof, 1984]

S. brevistyletum Siddiqi, 1972
S. cavenessi Sher, 1964
S. clariceps Phillips, 1971
S. clathricaudatum Whitehead, 1959
- = *Hoplolaimus aberrans* Whitehead, 1960 [n. syn.]
- = *Scutellonema aberrans* (Whitehead, 1960) Sher, 1961

S. commune van den Berg & Heyns, 1973
- = *Scutellonema dentivagina** van den Berg & Heyns, 1973 [n. syn.]

S. conicephalum Sivakumar & Selvasekaran, 1983
S. erectum Sivakumar & Khan, 1981
S. grande Sher, 1964
- = *Scutellonema mangiferae* Khan & Basir, 1965 [n. syn.]
- = *Scutellonema eclipsi* Ganguly & Khan, 1983 [n. syn.]

*S. imphalum** Sultan & Jairajpuri, 1979
S. labiatum Siddiqi, 1972
*S. magniphasma** Sher, 1965
- = *Scutellonema naveenum* Sivakumar & Khan, 1981 [by Mattaar & Loof, 1984]

S. siamense Timm, 1965
S. sofiae van den Berg & Heyns, 1973

* Specific epithets of *S. brachyurum, S. dentivaginum,* and *S. magniphasmum* are modified to *S. brachyurus, S. dentivagina,* and *S. magniphasma* because these names are to be considered as substantive words, in which gender is not determined y the genus name. The specific names of *S. amabilis, S. bangalorensis, S. imphalus, S. magna, S. orientalis, S. transvaalensis, S. tsitsikamensis,* and *S. vietnamesensis* must be modified to *S. amabile, S. bangalorense, S. imphalum, S. magnum, S. orientale, S. transvaalense, S. tsitsikamense* and *S. vietnamesense* because these specific names are adjectives which must agree in gender with the genus name. Specific epithets of certain species transferred to other genera are similarly modified.

*S. transvaalense** van den Berg, 1981
S. truncatum Sher, 1964
*S. tsitsikamense** van den Berg, 1976
S. unum Sher, 1964
S. validum Sher, 1964

SPECIES INQUIRENDAE

Scutellonema brabanum Khan, Saha & Chawala, 1981
*Scutellonema vietnamesense** Eroshenko & Nguen Vu Tkan, 1981

SPECIES INCERTAE SEDIS

*Scutellonema amabile**, ** Eroshenko & Nguen Vu Tkan, 1981
Scutellonema sexalineatum Razzhivin, 1971 [by Mattaar & Loof, 1984]

SPECIES TRANSFERRED TO OTHER GENERA

Morulaimus geniculatus Sauer, 1966
= *Scutellonema magnum** Yeates, 1967 [by Smit, 1971]
Rotylenchus indorobustus Jairapuri & Baqri, 1973
= *Scutellonema petersi* Mahajan, 1977 [by Mattaar & Loof, 1984]
*Rotylenchus insularis** (Phillips, 1971), n. comb.
= *Scutellonema insulare* Phillips, 1971
*Rotylenchus incisicaudatus** (Phillips, 1971), n. comb.
= *Scutellonema incisicaudatum* Phillips, 1971
Rotylenchus leviflexus (Phillips, 1971), n. comb.
= *Scutellonema leviflexum* Phillips, 1971
Rotylenchus impar (Phillips, 1971), n. comb.
= *Scutellonema impar* Phillips, 1971
*Rotylenchus minutus** Sher, 1964, n. comb.
= *Scutellonema minutum* Sher, 1964

Characters used for differentiation of species

Reevaluation of several characters was necessary as a basis for synonymy of some species and to strengthen descriptions of others. Some original species descriptions excluded or inadequately considered one or more characters needed for diagnosis; in other cases we concluded that such definitive diagnostic characters may not occur. The range of morphologic or biometric characters generally increased when two or more species were synonymized, or when a species was defined by consideration of more than the type population. For some rare populations, however, it was more reasonable to doubt the specific identification, than to expand the limits of variability of the species to accommodate such populations***. In still other cases, species identification of populations could not be discerned, particularly when authors describing the populations lacked types for comparison.

Taxonomic decisions of the present study were not only aided by a detailed evaluation of several traditional morphological characters but by consideration of several new characters.

LONGITUDINAL STRIATIONS ON THE BASAL LIP ANNULE

The presence or absence of longitudinal striations on the basal lip annule is constant for a given species and is useful in distinguishing species groups. Among species with longitudinal lines several consistently have six lines which are aligned with the six radii of the framework. Another group of species has more than six lines, with considerable intraspecific variability in the exact number of lines. We recommend that the presence and number of longitudinal striae be included in future species descriptions of *Scutellonema.*

SHAPE AND ANNULATION OF THE LIP REGION

The shape of the lip region can be used to differentiate some species if a precise definition of the character status is widely accepted. The difference between " rounded-conoid " and " truncated-conoid ", as well as " more " or " less " set off, is too subjective to be used for interspecific differentiation. However, the shape of the lip region can be used to distinguish two groups of species. The first group includes species in which the lip region is broadly rounded and deeply set off from the body, e.g., *S. cavenessi* (Fig. 6 K, L), *S. erectum* (Fig. 6 O, P, Q). The second includes species in which the lip region is a truncate cone and is continuous or nearly so with the body contour, e.g., *S. truncatum* (Fig. 8 S) and *S. siamense* (Fig. 7 L). The number of lip annules is so variable in some species (e.g. 4-9 annules in *S. clathri-*

** The dorsal oesophageal gland opening of *S. amabile* is too distant from the spear knobs (o = 43-49 %) to conform to the diagnosis of the genus *Scutellonema.* Moreover, this species is compared in the diagnosis with *S. insulare* and *S. orientale.* However, the former species was transferred to the genus *Rotylenchus* and the latter was synonymized with *S. brachyurus* (Mattaar & Loof, 1984). Finally, no information is given concerning the place where type material was deposited.

*** Statistical measurements of variability are lacking for nearly all species of *Scutellonema.* In the present investigation generally too few paratypes were available to use for meaningful analysis; nevertheless, we agree (e.g. Fortuner, 1985) that future studies on such inter- and intraspecific variability are needed.

caudatum) that the range overlaps that of most species of the genus. Thereforce, the number of the lip annules is only useful to differentiate species in which the character lies at the extremes of the range for the genus (e.g., *S. truncatum* with no lip annules; Figs 2 A, 8 S).

AREOLATION OF THE LATERAL FIELD AT THE LEVEL OF THE SCUTELLA

In most species of *Scutellonema* the lateral field is areolated near its anterior and posterior terminus (at the level of scutellum); less frequently areolations also occur at the level of the vulva. *Scutellonema africanum* was the first species of *Scutellonema* described without areolation at the level of the scutellum, followed by five other species : *S. labiatum, S. commune, S. imphalum, S. tsitsikamense, S. brabanum.* After examination of paratypes of *S. sofiae,* however, we found that this species also does not have areolation at the level of the scutellum. This observation agrees with Figures 15 B, 10 C, and 10 D given by van den Berg and Heyns (1973) but contradicts the text.

DIAMETER OF SCUTELLA

Ali, Geraert and Coomans (1973) described three populations of *Scutellonema* from Zaire and for each grave the diameter of the scutella at the surface as well as inside the body. Surface diameters are generally smaller than internal diameters. Therefore, measurements taken of the surface from scanning electron micrographs (SEM) are usually smaller than those taken of the internal ampulla with the light microscope; measurements from the two sources may differ by 100 %. In addition, measurements taken with the light microscope are variable, depending on the level of the focus (Fig. 5). Since previous species description have not included the level at which the scutellum was measured, we recommend that this measurement only be used to differenciate species when both internal and external diameters are known (Fig. 5).

In many species scutella appear to be crescent shaped; this " crescent " is visible when internal structures are observed in transparency with the light microscope. The " crescent " was first described by Ali, Geraert and Coomans (1973) on a population of *S. clathricaudatum* from Zaire, but the shape never appears with SEM. This character cannot be defined until thin sections are evaluated with transmission electron microscopy.

Scutella measurements in the descriptions of species are given as follows : average surface diameter (range surface diameter) — average inside diameter (range inside diameter).

VAGINAL GLANDS

Sher (1963) was the first to include " conspicuous vaginal glands " as diagnostic for *S. bradys.* Although he illustrated the position of the structures they were not defined. Vaginal glands are refractive, homogeneous oval structures which occur as two pairs, one at each end of the vaginal slit near the junction of the vagina and uterus (Fig. 10 A). In lateral view a single pair consists of one anterior and one posterior to the vagina; the glands are about 5 × 2 µm with the longitudinal axis parallel to the vagina (Fig. 10 A). We were unable to confirm, with light microscopy, that the structures are indeed glands. Clearly, the vagina of species lacking such conspicuous structures also include secretory products (e.g., *S. cavenessi* as shown in Fig. 6 of Demeure, Netscher & Quénéhervé, 1980). Since conspicuous vaginal glands are consistently present in populations of *S. bradys* from throughout the world, and they are not observed or are indistinct in other species, they appear to be of diagnostic value in distinguishing *S. bradys* from species which might otherwise be considered morphologically similar (e.g., *S. cavenessi;* Fig. 10 B).

EPIPTYGMA

Authors sometimes include the presence of two, one (on either vulval lip) or no epiptygma in the diagnosis of species. However, we have observed that one or both epiptygma may be folded into the vagina. Consequently, a specimen actually with two epiptygma may seem to have less than two. Therefore, we consider two epiptygma as characteristic for a population if it includes even one specimen with two protruding flaps. We accept two epiptygma to be a valid character only in the case of *S. labiatum,* in which the long (5-7 µm) conspicuous pair projects from the body surface.

SEM observations

The head and tail region of females and males of *Scutellonema* were examined by SEM. Specimens of nine species included in the revision by Sher (1964) were available for examination. Specimens were glycerin infiltrated as previously reported (Sher & Bell, 1975), coated with 20 nm gold, and examined with a Jeol JSM-35 C SEM operated at 5 kv.

Lip patterns vary among species of *Scutellonema* but conform to the basic pattern for Tylenchida, including a labial disc encircled by six lips (sectors of the first lip annule) and several additional posterior head annules (Baldwin, Luc & Bell, 1983) (Fig. 1). *Scutellonema grande* (Fig. 1 L) most nearly conforms to the primitive pattern. The first lip annule closely follows the contour of the large rounded labial disc, and lateral sectors are

only slightly smaller than submedial sectors. There are no longitudinal lines on additional head annules (Figs 1 L; 2 J). The lip pattern of *S. validum* is similar to that of *S. grande* (Figs 1 C, D; 2 B, C).

Other species which lack longitudinal lines include *S. bradys* (Figs 1 E, F; 2 D, E), *S. cavenessi* (Figs 1 G, H; 2 F, G) and *S. clathricaudatum* (Figs 1 I; 2 H, I) (including *S. aberrans* n. syn.). These species, however, are modified from the primitive pattern by enlargement and thickening of the submedian lips, resulting in a " squarish " overall contour in face. The tendency is particularly pronounced in males (e.g., *S. bradys;* Fig. 1 E, F), and may be accompanied by medial and sometimes lateral longitudinal grooves of the head region.

Thickening of submedian lips may also occur in species further modified from the primitive pattern by possessing six longitudinal lines. The lines are continuous with the boundaries of the lips and extend posteriorly through the basal head annule. An example is *S. brachyurus* (Figs 1 M, N; 2 K); however, aberrant forms may occur in which the lines are irregular (Fig. 1 N). *Scutellonema truncatum* also has six longitudinal lines but is further modified from the primitive pattern in that all head annules are fused (Figs 1 A, B; 2 A). In this species aberrants occur in which a discontinuous annulation suggests the position of the first lip annule. The head region of a final group of species of *Scutellonema,* also with transverse annules and six longitudinal lines, is distinguished by additional longitudinal lines confined to the basal annule. Examples include *S. unum* (Figs 1 K; 2 L) and *S. magniphasma* (Figs 1 O, 2 M).

Species of *Scutellonema* also vary in the shape and size of the labial disc (Fig. 1), overall contour of the head in lateral view, and degree of offset from the body (Fig. 2). These specific characters, while visible with light microscopy, are more clearly seen with SEM.

SEM examination of the tail region did not reveal new characters, but was useful in clarifying light microscopy observations of tail shape, morphology of the scutellum surface, and areolation (Figs 3, 4).

Scutellonema bradys (Steiner & LeHew, 1933) Andrássy, 1950

(Figs 1 E, F; 2 D, E; 3 D, E; 6 A-F, 10 A; Tab. 1, 2)

Measurements

Females (syntypes; n = 7) L = 0.95-1.19 mm; a = 20-30; b = ?; b' = ?; c = 30-60; V = 56-62 %; spear = 25-29 µm; o = 22-26 %.

Measurements of population from Jamaica (in Sher, 1964)

**Female* (n = 14) : L = 1 mm (0.86-1.1); a = 26.1 (23.6-30.3); b' = 5.8 (5.2-6.7); c = 43.1 (35-51) : c' = 0.95 (0.7-1.3); V = 56.5 % (52.6-59.8); spear = 27.9 µm (26-29.5); m = 50.8 % (48.1-53.8); o = 23.6 % (17.2-26.9); scutellum diameter = [2.1 µm (1.5-3.5)-4.1 (3-5)].

**Male* (n = 15) : L = 0.88 mm (0.66-0.96); a = 27.5 (23.6-33); b = 5.2 (4.1-6.8) c = 30.5 (26.5-39.6); c' = 1.43 (1.14-1.65); spear = 26.5 µm (25-28); spicules = 32.5 µm (27.5-35.5); gubernaculum = 13.6 µm (10.5-16.5); capitulum = 7.9 µm (5-12); m = 50.2 % (48-52.9) o = 23.8 % (16.3-35.3); scutellum diameter = [2 µm (1.5-2.5)-3.7 (3-4)].

Measurements of additional populations

Morphometrics of numerous populations of *S. bradys* from throughout the world are included in the literature; these are summarized for comparison (Tabs 1, 2).

Description

Female : Body slightly arcuate when relaxed, annules about 1.9 µm wide at midbody; lateral fields areolated anteriorly at level of scutellum, and sometimes partially areolated at midbody. Lip region, hemispherical, broadly rounded, knob-like, and deeply set off with 8 (7-9) annules. Basal annule without longitudinal striations; spear well-developed with oval basal knobs, sometimes flattened or with irregular anterior surface. Excretory pore at level of oesophageal gland lobe, 131.5 µm (120-137) from anterior end. Hemizonid 0-4 annules anterior to excretory pore. Spermatheca rounded, filled with sperm. Conspicuous " vaginal glands ". Intestine not overlapping rectum. Epiptygma small, double. Scutellum rounded or crescent shaped, varying 1-6 annules anterior to anus. Tail 27 µm in length, variable in shape (rounded to squarish), with striated terminus and 19 (15-23) annules.

Male : Similar to female except for reproductive structures; caudal alae relatively narrow, not lobed.

Diagnosis and relationships

Scutellonema bradys and *S. cavenessi* are distinct from other species with males and spermatheca by the combination of areolation in the region of the scutellum and the absence of longitudinal striae on the basal lip annule. *Scutellonema bradys* can be distinguished from *S. cavenessi* by the presence of conspicuous vaginal glands. Caudal alae in *S. bradys* are smoothly contoured whereas in *S. cavenessi* they are lobed. In face patterns of females and males indicate that both species have a labial disc

* Asterisks identify measurements made for the present study, *vs* those repeated from previous publications.

Table 1
Scutellonema bradys (Steiner & LeHew, 1933) Andrássy, 1958, measurements of females

	N	L (mm)	a	b	b′	c	c′	V %	Spear (µm)	m %	0 %	Scutellum diameter (µm)
S. blaberum syntypes, in Sher, 1964. Pop. 2	10	0.75-1.08	23-30	6.7-10.8	5.9-8.4	25-58	—	52-60	25-30		?	—
S. bradys from Nigeria, in Sher, 1964. Pop. 3	20	0.77-1.02	22-31	5.9-9.3	4.8-6.5	29-4?		51-61	25-29		17-30	
S. bradys from Jamaica, in Sher, 1964. Pop. 4	20	0.8-1.05	20-29	5.8-8	4.6-6.2	32-56	—	53-60	24-29		21-28	—
S. bradys from Florida, in Sher, 1964. Pop. 5	20	0.78-1.16	21-32	6.3-9.4	5.2-7	35-54	—	53-61	24-30		18-26	—
S. bradys, syntypes, in Siddiqi, 1972. Pop. 6	15	0.88-1.11	27-32	6.7-8.7	5.2-6	32-56	—	54-59	26-30		—	4
S. bradys from Brasil in Moura & Teixera, 1980. Pop. 7	20	1.1 (1-1.02)	31.4 (23.6-54.3)	9.2 (7.4-11.5)	—	39.9 (30.3-48)	1.0 (0.5-.6)	42.4 (35.9-48.4)	—		—	—
*S. bradys from Ivory Coast Pop. 8	19	0.92 (0.85-1.07)	23.9 (20.1-32.2)	—	6.4 (5.8-7)	33.8 (25.3-41.7)	1 (0.9-1.16)	56.1 (52.7-60.9)	27.7 (26.5-30)	49.5 (41.5-55.6)	22.5 (15-35.7)	3.6 (2-4.5)

surrounded by six lips. However, the four submedial lips of *S. bradys* are larger and more deeply separated from one another by indentations, than those of *S. cavenessi.*

Scutellonema africanum Smit, 1971

(Fig. 7 N, O)

MEASUREMENTS

**Female* (paratype; n = 1) : L = 0.63 mm; a = 22.5; b′ = 5.8; c = 70; c′ = 0.6; V = 54.6 %; spear = 21.5 µm; m = 47.6 %; o = 16.3 %; scutellum diameter = [(1.5)-(3.5)] µm.

**Male* (paratype; n = 1) : L = 0.65 mm; a = 27; b′ = 6.2; c = 68.4; c′ = 0.6; spear = 21.5 µm; spicules = 29 µm; gubernaculum = 14 µm; m = 46.5 %; o = 18.6 %; scutellum diameter = [(1.5)-(3.5)] µm.

Measurements (in Smit. 1971)

Female (paratypes; n = 30) : L = 0.62 mm (0.51-0.81); a = 25 (21-29); b = 7.2 (5.7-8.4); b′ = 6 (5-7.9); c = 59 (45-77); V = 59 % (48-69); spear = 20-28 µm; m = 44-55 %; o = 10-24 %; scutellum diameter = 2-3 µm.

Male (paratypes; n = 30) : L = 0.58 mm (0.5-0.64); a = 26 (23-31); b = 6.6 (5.8-7.7); b′ = 5.4 (3.9-6); c = 63 (44-82; spear = 19-26 µm; spicules = 25-32 µm; gubernaculum = 9-14 µm; capitulum = 6-8 µm; m = 41-60 %; o = 15-26 %; scutellum diameter = 2-3 µm.

Measurements, population from South Africa (in van den Berg & Heyns, 1973)

Female (n = 17) : L = 0.7 mm (0.5-0.8); a = 23.6 (18.4-29.6); b = 7.1 (4.5-8.7); b′ = 5.8 (3.8-6.7); c = 59.4 (44.2-77.4); V = 57 % (55-64); spear = 25.5 µm (22.8-28.3); m = 40-50 %; o = 16.2 % (10.8-26.5); scutellum diameter = 2.5 µm (1.1-3.3).

Male (n = 13) : L = 0.6 (0.5-0.7) mm; a = 28.1 (24.4-33.6); b = 6.8 (5.9-7.3); b′ = 5.3 (4.2-6.1); c = 55.2 (43.4-78.4); spear = 26.6 µm (21.7-27.6); spicules = 27.7 µm (24.3-34.2); gubernaculum = 12.3 µm (8.1-14.7); capitulum = 8.7 µm (6.6-11); o = 20.3 % (14.3-27).

DESCRIPTION

Female : Body a loose spiral when relaxed, annules about 1.3 µm wide at midbody. Lateral fields areolated anteriorly but not areolated at level of scutella. Lip region hemispherical, slightly set off with 3-4 annules, basal lip annule without longitudinal striations; spear well-developed with oval basal knobs with flattened or irregular anterior surface. Excretory pore at level of oesophageal gland lobe situated 96 µm (82-116) from anterior end. Hemizonid position at level of excretory pore. Spermatheca rounded with sperm. Intestine not overlapping rectum. Epiptygma double. Scutellum rounded, varying in position from two annules anterior to five annules posterior to anus. Tail rounded, 12 µm (9-13) in length with striated terminus and 6-15 annules.

Male : Similar to female except for reproductive apparatus. Caudal alae crenate, with lobe, enclosing tail. See original description (Smit, 1971).

DIAGNOSIS AND RELATIONSHIPS

S. africanum differs from all known valid species by the following combinations of characters : the lateral field is not areolated et level of scutellum, the basal lip annule lacks longitudinal striae, males are present and have a distinctly lobed caudal alae.

Scutellonema bizanae van den Berg & Heyns, 1973

(Fig. 7 H-K)

MEASUREMENTS

**Female* (paratypes; n = 2) : L = 0.74-0.79 mm; a = 17.6-18.8; b′ = 5.7-5.9; c = 49.4-52.8; c′ = 0.55-0.61; V = 56.8 %; spear = 27-29.5 µm; m = 50.8-53.7 %; o = 15.2-22.2 %; scutellum diameter = [(5.5-6.5)-(9)] µm.

**Male* (n = 2) : L = 0.63-0.66 mm; a = 17.4-19.1; b′ = 5-5.2; c = 33-36; c′ = 1.02-1.09; spear = 27-28 µm; spicules = 30.5-33.5 µm; gubernaculum = 15.5-17.5 µm; m = 51.8-53.6 %; o = 13 %; scutellum diameter = [(4.5)-(6-6.5)] µm.

Measurements (in van den Berg & Heyns, 1973)

Female (n = 9) : L = 0.7 mm (0.7-0.8); a = 20.7 (19.1-22.9); b = 6.7 (6.3-7.2); b′ = 5.5 (4.6-5.9); c = 57.5 (42.9-66.3); V = 58 % (57-60); spear = 28.4 (26.1-30.1) µm; m = 46-51 %; o = 24.8 % (17.7-33.8); scutellum diameter = 5 (4.4-5.5) µm.

Male (n = 4) : L = 0.7 mm (0.6-0.7); a = 21.7 (20.2-23.8); b = 6.3; b′ = 5.3 (5.1-5.5); c = 41.3 (37.2-44.7); spear = 27.7 (26.8-29.4) µm; spicules = 30.4 µm (29.8-31.3); gubernaculum = 14.7 µm (14.3-15.5); capitulum = 11.7 µm (10.7-12.5); o = 19,7 % (10.8-28.4).

Measurements of S. multistriatum

**Female* (paratypes; n = 3) : L = 0.76 mm (0.73-0.79); a = 22.6 (20.5-23.5); b′ = 6.2 (6.1-6.2); c = 37 (35.9-38.5); c′ = 0.82 (0.73-0.95); V = 56.3 % (55.4-57.3); spear = 28.7 µm (28-29.5); m = 52.9 % (49.1-55.3); o = 15.8 % (13.6-17.9); scutellum diameter = [3.7 µm (3.5-4)-7.7 (7-8)].

**Male* (n = 2) : L = 0.72-0.82 mm; a = 22.5-27.3; b′ = 6.1-6.2; c = 30-32.8; c′ = 0.8-1.35; spear =

Table 2
Scutellonema bradys (Steiner & LeHew, 1933) Andrássy, 1958

	N	L (mm)	a	b	b′	c	c′	Spear (µm)	Spicules (µm)	Gubernaculum (µm)	Capitulum (µm)
S. blaberum syntypes, in Sher, 1963. Pop. 2	5	0.65-0.86	22-27	7.6-8.8	5.9-6.2	24-30	—	25-28	28-32	12-14	8-11
S. bradys from Nigeria, in Sher, 1963. Pop. 3	10	0.74-0.94	24-32	6-9	4.8-6.3	25-35	—	25-29	28-35	12-17	8-12
S. bradys, from Jamaica, in Sher, 1963. Pop. 4	10	0.79-1	26-30	6.5-7.9	4.6-6.2	28-32	—	24-28	28-35	14-17	7-11
S. bradys from Florida, in Sher, 1963. Pop. 5	10	0.72-0.81	22-28	5.9-7	4.5-5.6	23-30	—	24-29	26-33	13-16	7-10
S. bradys syntypes, in Siddiqi, 1972. Pop. 6	10	1 (0.9-1.1)	28.9 (22.1-44.8)	8.5 (7.2-11)	—	39 (28-53)	1.2 (0.9-1.8)	23.5 (20-25.8)	30.5 (25-35)	—	—
S. bradys, from Brazil, in Moura & Teixera, 1980. Pop. 7	20	0.85-1	26-36	6.6-9	5.2-6.6	27-32	—	25-28	23-29	14-17	—
**S. bradys* from Ivory Coast, Pop. 8	20	0.81 (0.75-0.84)	20.9 (20.1-21.5)	—	5.6 (5.2-7)	27.4 (21.5-31.6)	1.7 (1.6-2.1)	25.8 (24-28)	31.5 (28-33)	14.6 (12-16.5)	—

26.5-27 µm; spicules = 29-30 µm; gubernaculum = 14 µm; m = 51.8-52.8 %; o = 8.9 %; scutellum diameter = [(4)-(6-8)] µm.

Measurements of S. multistriatum *(in van den Berg & Heyns, 1973)*

Female (n = 46) : L = 0.7 mm (0.6-0.8); a = 22.7 (17.9-27.6); b = 7.1 (5.5-8.4); b′ = 5.9 (4.5-7.3); c = 44.2 (29.2-88); V = 56 % (49-62); spear = 26.8 µm (23.7-29.4); m = 43-53 %; o = 20.6 % (9.1-32.9); scutellum diameter = 4.1 µm (3.1-5.5).

Male (n = 11) : L = 0.7 mm (0.6-0.8); a = 25.7 (20.7-30.8); b = 6.9 (5.5-8); b′ = 5.7 (4.7-6.7); c = 33.4 (26.1-46.6); spear = 24 µm (20.9-27.2); spicules = 25.4 µm (22.1-27.6); gubernaculum = 12.4 µm (8.5-14); capitulum = 8.8 µm (5.5-12.5); o = 23.4 % (18.5-29.8).

DESCRIPTION

Female : Body arcuate, C-shaped when relaxed, annules about 1.7 µm wide at midbody; lateral fields areolated anteriorly and at level of scutella. Lip region broadly rounded with 3-4 annules, deeply set off by constriction. Basal lip annule with 18-24 longitudinal striations; spear well-developed with basal knobs rounded. Excretory pore opposite oesophageal gland lobe situated 113 µm (107-120) from the anterior end. Hemizonid at level of excretory pore. Spermatheca rounded with sperm. Intestine not overlapping rectum. Epiptygma small, double. Scutellum round, varying from three annules anterior to three annules posterior from the anus. Tail rounded, 18 µm (14-22) in length with striated terminus and 11-20 annules.

Male : Similar to female except for reproductive structures.

DIAGNOSIS AND RELATIONSHIPS

Scutellonema bizanae is similar to *S. clariceps* in possessing males, a lateral field areolated at the scutellum, and a striated basal lip annule, but differs from *S. clariceps* by the greater number of striae on the basal head annule (18-24 *vs.* 14-15). *Scutellonema erectum* and *S. siamense* also have males and areolation at the level of the scutellum, but only have 6 longitudinal striae on the basal lip annule. *Scutellonema bizanae* can be differentiated from *S. labiatum* and *S. tsitsikamense* (which also have longitudinal striae on the basal lip annule) since the lateral field is areolated at the level of the scutellum only in *S. bizanae.*

REMARKS

Van den Berg and Heyns (1973) describe *S. bizanae* and *S. multistriatum* and differentiate these species by spicule length (respectively 29.8-31.3 µm and 22.1-27.6 µm) and body annule width (1.8 *vs.* 1.1 µm). Longitudinal striations on the basal lip annule are not mentioned for *S. bizanae.* Our measurements of paratypes of *S. bizanae* (two females and two males) and *S. multistriatum* (three females and two males), indicate annule width averages of 1.7 *vs.* 1.9 µm, and spicule length of 30-33.5 *vs.* 29-30 µm, respectively. In addition, we counted 18 longitudinal striations on the basal lip annule of *S. bizanae,* which is similar to the number reported for *S. multistriatum* (19-24). In light of these similarities, and only minor differences between the two populations, we consider them synonyms, *S. multistriatum* being the junior synonym.

Scutellonema brachyurus (Steiner, 1938) Andrássy, 1958

(Figs 1 M, N; 2 K; 3 J; 8 O, P)

MEASUREMENTS

**Female* (topotypes; n = 15) : L = 0.78 mm (0.72-0.85); a = 26.8 (24-29.8); b′ = 5.6 (5-6.1); c = 86.6 (55.4-106.2); c′ = 0.51 (0.40-0.7); V = 58.6 % (54.9-60.7); spear = 29.2 µm (27-30.5); m = 50.3 % (47-53); o = 26.4 % (19.6-37.5); scutellum diameter = [2.8 µm (2-3.5)-4.1 (3.5-5)].

Measurements (in Steiner, 1938)

Female (paratypes; n not given) : L = 0.72-0.89 mm; a = 22.4-29.3; b = 5.6-6.4; c = 47-80; V = 59-61 %; spear = 29 µm.

Measurements (in Sher, 1964)

Female (syntypes; n = 12) : L = 0.65-0.84 mm; a = 24-32; b′ = 4.7-7; c = 67-99; V = 57-61 %; spear = 26-29 µm.

Measurements (in Sher, 1964)

Female (topotypes; n = 20) : L = 0.72-0.88 mm; a = 24-34; b = 6.3-8.2; b′ = 5-6.3; c = 56-92; V = 58-62 %; spear = 27-31 µm; o = 17-28 %; scutellum diameter = 3-4 µm.

Male (from California, USA; n = 8); L = 0.63-0.85 mm; a = 25-33; b = 6.1-7.5; b′ = 4.5-6.6; c = 45-58; spear = 24-27 µm; o = 25-29 %; gubernaculum = 12-14 µm; capitulum = 7-9 µm.

Measurements (in Siddiqi, 1974)

Female (lectotype; n = 1) : L = 0.82 m; a = 30; b = 8.7; b′ = 7.8; c = 102; c′ = 0.6; V = 58 %; spear = 27 µm.

Measurements from Zaire (in Ali, Geraert & Coomans, 1973)

Female (n = 7) : L = 0.59-0.66 mm; a = 22-26; b = 6-7.8; b′ = 5-6.5; c = 72-118; c′ = 0.4-0.5; V = 55-59 %; spear = 24.5-28 µm; m = 44-50 %; o = 12.5-21 %; scutellum diameter = [(2.5-4)-(3-4.5)] µm.

Measurements from South Africa (in van den Berg & Heyns, 1973)

Female (n = 860) : L = 0.7 mm (0.5-1); a = 26.1 (18.2-35.6); b = 7 (4.9-10.3); b′ = 5.8 (4-9.1); c = 60.2 (37.2-108.7); V = 58 % (53-67); spear = 26.8 µm (21.7-30.9); m = 43-50 %; o = 18.7 % (6.8-35.5); scutellum diameter = 2.9 µm (1.8-4.8).

Male (n = 6) : L = 0.7 mm (0.6-0.8); a = 34.3 (31.6-36.9); b = 7.3 (6.9-8.1); b′ = 5.4 (5.3-5.6); c = 37-39.8; spear = 22.9 µm (22.4-24.2); o = 12,8 % (3.3-23.3); spicules = 26.1 µm (25-27.2); gubernaculum = 12 µm (10.7-13.2); capitulum = 7.5 µm (7-8.1).

Measurements of S. bangalorense *(in Khan-& Nanjappa, 1970)*

Female (paratypes; n = 23); L = 0.61-0.78 mm; a = 28-36; b = 5-6; c = 63-97; V = 58-65 %; spear = 22-25 µm; o = 20-25 %; scutellum diameter = 3 µm.

Measurements of S. conicaudatum *(in Sivakumar & Selvasekaran, 1982)*

Female (paratypes; n = 12) : L = 0.59 mm (0.54-0-65); a = 21.8 (16.7-27.8); b = 6.8 (5.9-7.9); b′ = 5 (4.4-5.3); c = 57.5 (48-72.6); c′ = 0.63 (0.56-0.73); V = 59.6 % (56.5-61.2); spear = 28 µm (26.9-29.3); m = 49.6 % (47-52.3); o = 16.4 % (14-17); scutellum diameter = 5.8 µm (5-6).

DESCRIPTION

Female : Body spiral when relaxed, annules about 1.4 µm wide at midbody; lateral fields areolated anteriorly and at level of scutellum. Lip region hemispherical, slightly set off from body with 3-5 annules. Basal lip annule with six coarse longitudinal striations. Spear well-developed with basal knobs oval, flattened on anterior surface. Excretory pore at level of oesophageal gland lobe, 132 µm (115-150) from anterior end. Hemizonid varying 0-4 annules enterior to excretory pore. Spermatheca not seen. Intestine overlapping rectum. Epiptygma double. Scutellum rounded in some specimens or crescent shaped, varying from two annules posterior to five annules anterior to anus. Tail rounded, 9.5 µm (7-13) in length with 12 (9-14) annules, terminus variable in shape.

Male : Rare.

DIAGNOSIS AND RELATIONSHIPS

Scutellonema brachyurus, S. clathricaudatum and *S. truncatum* all lack males (*i.e.,* very rare), and are areolated in the region of the scutellum, but the head region of the species are distinct. In *S. brachyurus* the head region is annulated with six longitudinal striae; in *S. clathricaudatum* it is annulated but lacks striae, and in *S. truncatum,* it lacks annules, but has six striae.

REMARKS

Khan and Nanjappa (1970) described *Scutellonema bangalorense* as having 16-22 longitudinal striae on the basal lip annule and, in the diagnosis, compared it with *S. unum* and *S. brachyurus.* After examination of a single female paratype of *S. bangalorense* we observed that the basal lip annule had only six longitudinal striations as in *S. brachyurus.* Therefore, *S. bangalorense* must be considered a junior synonym of *S. brachyurus.*

Sivakumar and Selvasekaran (1982) differentiated *S. conicaudatum* by the shape of the lip region which is " set off, hemispherical, much narrower than body width at basal plate " and by the shape of the tail which is " tapering, conical ". This species is distinguished from *S. unum* by the number of longitudinal striae on the basal lip annule. In fact, when comparing paratypes of this species with *S. brachyurus* we found no difference between the two species. The shape of the head and tail of *S. brachyurus* accommodate a certain variability. Figure 11 of a population of *S. brachyurus* described by Ali, Geraert and Coomans (1973) compared with Figure 1 C illustrating *S. conicaudatum,* shows no noticeable difference in the head shape between the two species. Van ben Berg and Heyns (1973) described the tail of a population of 860 specimens of *S. brachyurus* as " varying considerably in shape, length and number of annules, the shape varying from almost pointed to bluntly rounded, with the dorsal side more convex than the ventral ". Figures 4 K, 4 N in van den Berg and Heyns (1973) illustrates this variability and support consideration of *S. conicaudatum* as a synonym of *S. brachyurus.*

Scutellonema brevistyletum Siddiqi, 1972

(Fig. 8 Q, R)

MEASUREMENTS

* *Female* (paratypes; n = 3) : L = 0.62 mm (0.61-0.64); a = 20.6 (18.8-22); b′ = 5.5 (5.4-6); c = 66 (39.4-100.3); c′ = 0.54 (0.34-0.75); V = 57.4 % (54.9-59); spear = 23 µm (22.5-23.5); m = 52.9 % (51-55.6); o = 21.7 %; scutellum diameter = [(1.5-2)-(4)] µm.

Measurements (in Siddiqi, 1972).

Female (paratypes; n = 10) : L = 0.63 mm (0.59-0.69); a = 25.5 (24-27); b = 7.1 (6.5-7.6); b′ = 5.7 (5.4-6.2); c = 61 (53-91); V = 57 % (55-60); spear = 22.6 µm (21-23); m = 50 % (49-52); o = 24 % (21-28); scutellum diameter = 3.5-4 µm.

DESCRIPTION

Female : Body arcuate to C-shaped when relaxed, annules about 1.8 µm wide at midbody; lateral field areolated anteriorly at level of scutella. Lip region broadly rounded with three annules and deeply offset by constriction; labial disc elevated. Basal lip annule with ten longitudinal striations; spear well-developed, basal knobs oval with flattened anterior surface. Excretory pore at the end of oesophageal gland lobe, 102 µm from the anterior end. Hemizonid adjacent to excretory pore. Spermatheca small, round. Intestine not overlapping rectum. Epiptygma not seen. Scutellum round, varying from three annules posterior to three annules anterior to anus. Tail rounded, 11 µm (6-15.5) in length, with striated terminus, and 8-11 annules.

Male : Unknown.

DIAGNOSIS AND RELATIONSHIPS

Scutellonema brevistyletum resembles *S. unum* and *S. magniphasma* with respect to the absence of males, areolation at the level of the scutellum, and longitudinal striae on the basal annule of the head region. However, *S. brevistyletum* is distinct by the shorter stylet (23 µm *vs* 28 and 35, respectively) and fewer longitudinal striae on the head region (10 striae, *vs* 15-22 and 20-26 respectively).

Scutellonema cavenessi Sher, 1964

(Figs 1 G, H; 2 F, G; 3 F, G; 6 K-N; 10 B)

MEASUREMENTS

**Female* (paratypes; n = 12) : L = 0.77 mm (0.7-0.87); a = 26 (24-27.7); b′ = 5.6 (5-6.4); c = 38.1 (28.6-45.9); c′ = 0.85 (0.67-1.02); V = 57.8 % (56.5-59.4); spear = 25.1 µm (24-26.5); m = 47.4 % (44.2-49); o = 30 % (28-34.7); scutellum diameter = [1.7 µm (1.3-3)-3.6 µm (3-5)].

**Male* (paratypes; n = 11) : L = 0.7 mm (0.63-0.8); a = 25.9 (22.6-29.4); b′ = 5.2 (4.6-5.9); c = 27 (24.1-30.2); c′ = 1.43 (1.2-1.9); spear = 23.5 µm (21-25.5); spicules = 24.2 µm (23.5-25); gubernaculum = 7.5 µm (7-9.5); capitulum = 11 µm (10-13 µm); m = 47.9 % (46.4-51); o = 28.7 % (20.4-33.3); scutellum diameter = [1.7 µm (1.5-3)-3.1 µm (2.5-3.5)].

Measurements (in Sher, 1964)

Female (paratypes; n = 20) : L = 0.6-0.88 mm; a = 22-29; b = 6-8.4; b′ = 4.6-6.5; c = 27-41; V = 54-60 %; spear = 23-28 µm; o = 23-31 %; scutellum diameter = 4 µm.

Male (paratypes; n = 20); L = 0.58-0.78 mm; a = 23-30; b = 5.8-7.1; b′ = 4.6-6.5; c = 21-31; spear = 22-25 µm; spicules = 28-33 µm; gubernaculum = 13-17 µm; capitulum = 10-13 µm; o = 25-32 %.

Measurements from Pueraria javanica, Congo (in Elmiligy 1970)

Female (n = 15) L = 0.73 mm (0.63-0.8); a = 21.2 (18-28); b′ = 6.3 (5.3-6.8); c = 39 (31.5-48); c′ = 0.65-0.8; V = 57.5 % (55-62); spear = 25 µm (24-27.9).

Male (n = 5) : L = 0.72 (0.62-0.74); a = 24 (23-27); b′ = 5.3 (5.2-5.5); c = 27 (22-31); c′ = 1.5-1.8; spear = 23-25 µm; spicules = 34 µm (33-35); gubernaculum = 16 µm.

Measurements from cotton, USA (in Elmiligy, 1970)

Female (n = 5) : L = 0.72 mm (0.68-0.76); a = 26 (21.5-30); b′ = 5.6 (5.2-5.8); c = 50 (43-57); c′ = 0.57-0.67; V = 59 % (56-62), spear = 24 µm (23.5-25).

Male (n = 6) : L = 0.7 mm (0.6-0.78); a = 24-29; b′ = 5.4 (4.8-6.2); c = 30 (28-33); c′ = 1.3; spear = 23-24 µm; spicules = 30 µm (28-33); gubernaculum = 13-17 µm.

Measurements from cotton, Congo (in Elmiligy, 1970)

Female (n = 2) : L = 0.75-0.86 mm; a = 25-26; b′ = 5.2-6.2; c = 37-41; c′ = 0.8-0.9; V = 55-60.6 %; spear = 25 µm.

Male (n = 1); L = 0.74; a = 26.2; b′ = 4.9; c = 24.5; c′ = 1.7; spear = 23 µm; spicules = 33 µm; gubernaculum = 15.5 µm.

Measurements from Stylosanthes gracilis, *Congo (in Elmiligy, 1970)*

Female (n = 6) : L = 0.69 (0.67-0.74); a = 23.6 (20-28); b′ = 6 (5.8-6.5); c = 35 (32-39); V = 55.6 % (52-58); spear = 24 µm (23-25).

Measurements from Coffea sp., *South Africa (in van den Berg and Heyns, 1973)*

Female (n = 20) : L = 0.7 mm (0.6-0.9); a = 22.7 (17-27); b = 6.9 (5.2-8.5); b′ = 5.8 (4.5-7.3); c = 44.3 (35.3-58.6); V = 58 % (54-61; spear = 23.3 µm (20.6-25); m = 42-50 %; o = 17.4 % (8.9-29); scutellum diameter = 2.6 µm (1.8-3).

Male (n = 13) : L = 0.7 mm (0.5-0.8); a = 23 (17.9-28.6); b = 6.8 (6-8.2); b′ = 5.7 (5.3-6.4); c = 34.7 (22.1-55.2); spear = 21.7 µm (20.6-23.5); spicules = 28.2 µm (27.2-30.1); gubernaculum = 14.5 µm (11-16.9); capitulum = 7.5 µm (6.6-8.5).

DESCRIPTION

Female : Body arcuate, C-shaped or a loose spiral when relaxed, annules about 1.8 µm wide at midbody; lateral fields areolated anteriorly and at level of scutellum sometimes partially areolated at midbody. Lip region hemispherical, broadly rounded and deeply set off with 8 (6-9) annules. Basal lip annule without longitudinal striations; spear well-developed with oval knobs, flattened and irregular on anterior surface. Excretory pore at level of oesophageal gland lobe, 105 µm (95-115) from anterior end. Hemizonid, 0-3 annules anterior to excretory pore. Spermatheca rounded with sperm. " Vaginal glands " not observed. Intestine slightly overlapping rectum. Epiptygma double. Scutellum rounded, varying from four annules posterior to two annules anterior to anus. Tail rounded, 26 µm (23.5-31) in length, with striated terminus and 13 (10-18) annules.

Male : Similar to female, except for reproductive structures, caudal alae lobed.

DIAGNOSIS AND RELATIONSHIPS

Scutellonema cavenessi is distinct from other species with males and spermatheca by its broadly rounded deeply set off lip region *(vs* truncate and not set off as in *S. transvaalense* and *S. siamense),* except *S. erectum* and *S. bradys* which also have a rounded, set off lip region. However, *S. cavenessi* is readily distinguished by absence of longitudinal striae on the basal annule of the lip region of the former. *S. bradys* also lacks basal lip striae, but *S. cavenessi* is distinct by absence of vaginal glands (*vs* distinct vaginal glands in *S. bradys*), and a tendency for caudal alae to be lobed (*vs* smoothly contoured in *S. bradys*).

Scutellonema clariceps Phillips, 1971

MEASUREMENTS (in Phillips, 1971)

Female (paratypes; n = 4) : L = 0.78 mm (0.66-0.85); a = 25 (23-26); b = 6.8 (5.8-7.7); b′ = 5.9 (5.0-6.4); c = 51 (48-54); c′ = 0.7 (0.6-0.8); V = 59 % (57-63); stylet = 29 µm (26-31).

Male (paratypes; n = 8) : L = 0.68 mm (0.59-0.74); a = 28 (25-29); b = 6.6 (6.2-7.1); b′ = 5.4 (5.1-5.8); c = 37 (33-41); stylet = 27 µm (26-28); spicules = 25 µm (24-25); gubernaculum = 13 µm (11-14).

DESCRIPTION (in Phillips, 1971)

Female (holotype) : " Body a loose spiral. Lip region hemispherical to subconical, set off, four annules; basal annule with 14-15 longitudinal lines. Lateral fields with four incisures; bands areolated in oesophageal region and near scutella. Stylet knobs rounded. Dorsal oesophageal gland orifice 5 µm behind stylet. Hemizonid immediately anterior to excretory pore. Spermatheca large, with sperms. Epiptygma double. Scutella 5 (4-6) µm in diameter, adanal. Tail broadly rounded, twelve annules; terminal striations coarse. "

Male (allotype) : " Body C-shaped. Lip region hemispherical set off, four annules. Stylet knobs rounded, with flattened anterior surfaces. Dorsal oesophageal gland orifice 7 µm behind stylet. Excretory pore opposite posterior end of oesophageal glands. Hemizonid immediately anterior to excretory pore. Lateral fields areolated anteriorly and posteriorly. Scutella 4.0 (3.1-4.6) µm in diameter, adanal. Gubernaculum with swollen distal portion. "

DIAGNOSIS AND RELATIONSHIPS

Among species with males (*i.e.,* sperm in the spermatheca) and areolation at the level of the scutellum, only *S. clariceps* and *S. bizanae* have more than six longitudinal striae on the basal lip annule (in contrast to *S. erectum* and *S. siamense* with six striae). *Scutellonema clariceps* is distinct from *S. bizanae* by fewer longitudinal striae (14-15 *vs.* 18-24).

Scutellonema clathricaudatum Whitehead, 1959

(Figs 1 I, J; 2 H, I; 3 H; 8 K-N)

MEASUREMENTS of a population from Western Nigeria previously identified to *S. clathricaudatum* by Sher 1964

**Female* (n = 12) : L = 0.76 mm (0.7-0.86); a = 25.3 (21.9-27.6); b′ = 5.8 (5-6.8); c = 44.3 (35-59.1); c′ = 0.77 (0.63-0.89); V = 57.9 % (51-62.1); spear = 27.6 µm (25.5-29.5); m = 46.7 % (45.1-48.1); o = 26.6 % (21-33.3) scutellum diameter = [2.6 µm (1.5-3.5)-4.4 (3.5-5.3)].

Measurements of a population from Western Nigeria previously identified to S. aberrans *by Sher (unpublished records)*

**Female* (n = 12) : L = 0.76 mm (0.67-0.82); a = 24 (20.3-27.9); b′ = 5.8 (4.6-6.7); c = 46.3 (35.5-62.4); c′ = 0.81 (0.53-1.02); V = 57.4 % (52.6-59.5); spear = 27 µm (25.5-29); m = 45.8 % (43.4-48.1); o = 26.6 % (19.2-31.4); scutellum diameter = [2.7 µm (2-4.3)-4.9 (4-6)].

Measurements of S. clathricaudatum *(in Whitehead, 1959)*

Female (paratypes; n = 15) : L = 0.6-0.75 mm; a = 19.1-25.4; b = 4.7-6.9; c = 27-47.5; V = 51.2-60.3 %; spear = 21-25 µm.

Measurements of S. clathricaudatum *(in Sher, 1964)*

Female (paratypes; n = 7); L = 0.71-0.79 mm; a = 23-26; b = 6.9-9.5; b′ = 5.5-7.5; c = 28-42; V = 56-58 %; spear = 25-27 µm.

Measurements of S. clathricaudatum *from Western Nigeria (in Sher, 1964)*

Female (n = 15) : L = 0.68-0.91 mm; a = 20-29; b = 5.6-8.4; b′ = 4.8-6.9; c = 30-67; V = 55-61 %; spear = 24-28 µm; o = 19-26 %.

Measurements of S. clathricaudatum *from Zaire (in Ali, Geraert & Coomans, 1973)*

Female (n = 15) : L = 0.58-0.86 mm; a = 20-28; b = 5.7-7.3; b′ = 4.6-8.5; c = 35-64; c′ = 0.5-1; V = 55-61 %; spear = 25.5-29.5 µm; m = 44-50 %; o = 8-27 %; scutellum diameter = [(2.5-4)-(4-6)] µm.

Measurements of S. aberrans *(in Sher, 1964)*

Female (paratypes; n = 20) : L = 0.65-0.98 mm; a = 20-32; b = 6.2-8.9; b′ = 4.6-7.1; c = 33-56; V = 50-60 %; spear = 25-31 µm; o = 21-33 %; scutellum diameter = 3-4 µm.

Measurements of S. aberrans *from South Africa (in van den Berg & Heyns, 1973)*

Female (paratypes; n = 4) : L = 0.69 mm (0.63-0.85); a = 24.5 (20.8-27.2); b = 6.7 (6.3-7.4); b′ = 5.5 (5.2-6); c = 42.1 (40.3-43.6); V = 58 % (58-59); spear = 24.3 µm (24-25); m = 42-46 %; o = 12.1 % (9.2-15.2); scutellum diameter = 3.2 µm (2.6-3.7).

DESCRIPTION

Female : Body arcuate, C-shaped when relaxed, annules about 1.6 µm wide at midbody; lateral fields areolated anteriorly and at level of scutellum; in some cases areolated at additional regions. Lip region hemispherical, slightly flattened anteriorly, usually slightly set-off, occasionally well set off, with 4-9 annules. Basal lip annule without longitudinal striations; spear well-developed with rounded to oval basal knobs and irregular anterior surface. Excretory pore at level of oesophageal gland lobe, 118 µm (100-150) from anterior end. Hemizonid 0-8 anterior to excretory pore. Spermatheca not seen. Intestine slightly overlapping rectum. Epiptygma double, scutellum crescent-shaped, varying from nine annules anterior to one annule posterior to anus. Tail rounded, 18 µm (11.5-22.5) in length with 9-16 annules, terminus variably shaped.

Male : Unknown.

DIAGNOSIS AND RELATIONSHIPS

Scutellonema clathricaudatum is similar to *S. conicephalum* with respect to lack of males, absence of longitudinal striae on the basal lip annule and no areolation at the level of the scutellum. However, *S. clathricaudatum* is distinct by 4-9 lip annules *vs* three in *S. conicephalum.*

REMARKS

Sher (1964) differentiated *S. aberrans* from *S. clathricaudatum* by a hemispherical lip region which is " more set off from the body ". Ali, Geraert and Coomans (1973) described a population of *S. clathricaudatum* from Zaïre as intermediate between *S. aberrans* and *S. clathricaudatum.* In addition, we observed (SEM and light microscopy) individuals in type populations of both species having the lip region varying continuously from rounded and distinctly set off, to truncate and slightly set off or truncate and distinctly set off. Therefore, *S. aberrans* is considered a junior synonym of *S. clathricaudatum.*

Scutellonema commune
van den Berg & Heyns, 1973

(Fig. 8 G, H)

MEASUREMENTS

* *Female* (paratypes; n = 8); L = 0.83 mm (0.75-0.91); a = 20.2 (17.9-24.2); b′ = 5.8 (5.7-5.9); c = 36.4 (34.4-37.7); c′ = 0.8 (0.77-0.83); V = 55 % (51.2-58.7); spear = 33 µm (31-35); m = 48.5 % (45.7-50); o = 18.6 % (15.7-21); scutellum diameter = [2.8 µm (2-4) -4.5 (3.5-6)].

Measurements of S. commune *(in van den Berg & Heyns, 1973)*

Female (paratypes; n = 86) : L = 0.8 mm (0.7-1); a = 22.1 (18.2-27.6); b = 7.3 (5.2-9.3); b′ = 6.1 (4.8-8.3); c = 48.5 (29.6-76); V = 56 % (53-59); spear = 32.5 µm (27.2-36.8); m = 44-49 %; o = 16.9 % (8.1-25.6); scutellum diameter = 3.4 µm (2.2-6.4).

Measurements of S. dentivagina

**Female* (paratypes; n = 2) : L = 0.75 mm; a = 19.7-20.8; b′ = 5.2-5.8; c = 41.7-44.1; c′ = 0.68-0.78; V = 56-56.3 %; spear = 33-34.5 µm; m = 47.8-50 %; scutellum diameter [(3.5-4)-(5-5.5)] µm.

Measurements of S. dentivagina *(in van den Berg & Heyns, 1973)*

Female (paratypes; n = 8) : L = 0.7 mm (0.7-0.8); a = 23.7 (21.6-25.1); b = 6.9 (6.6-7.4); b′ = 5.5 (5-6.1); c = 57.7 (43.9-70.7); V = 58 % (56-59); spear = 32.6 µm (31-34.3); m = 45-48 %; o = 14.9 % (8.6-21.8); scutellum diameter = 3.6 µm (3.3-4).

DESCRIPTION

Female : Body spiral when relaxed, annules about 1.3 µm wide at midbody; lateral field areolated anteriorly but not areolated at level of scutella. Lip region subconi-

cal with 5-7 annules, slightly set off. Basal lip annule with six longitudinal striations. Spear well-developed with rounded basal knobs having irregular anterior surface. Excretory pore opposite oesophageal gland lobe, 114 µm (100-143) from anterior end. Hemizonid position varying from 0-6 annules anterior to excretory pore. Spermatheca not seen. Intestine not overlapping rectum. Epiptygma double. Scutellum crescent shaped, varying from 2-5 annules posterior to anus. Tail rounded, 22 µm (17-25) in length with striated terminus and 15-20 annules.

Male : Unknown.

DIAGNOSIS AND RELATIONSHIPS

Scutellonema commune is similar to *S. sofiae* by the lack of males, absence of areolation at the level of the scutellum, and six longitudinal striae on the basal lip annule. However, *S. commune* is distinguished by its slightly set off head region and longer (27-37 µm) stylet (*vs.* continuous head region and stylet length of 24-27 in *S. sofiae).*

REMARKS

Scutellonema dentivagina is described as having a sclerotized " tooth-like structure on the wall of the vagina ". We examined paratypes of this species but observed no particular structure on the vaginal wall except invaginated (retrorse) epiptygma. The authors may have confused these structures with denticles. Since " denticles " are the only basis for differentiating *S. dentivagina* from *S. commune,* the two species must be considered synonyms, *S. dentivagina* being the junior synonym.

Scutellonema conicephalum
Sivakumar & Selvasekaran, 1982

(Fig. 8 I, J)

MEASUREMENTS

**Female* (paratypes; n = 4) : L. = 0.64 mm (0.58-0.69); a = 24.5 (23.2-26); b′ = 4.7 (4.4-5); c = 68 (61-72); c′ = 0.6 (0.56-0.64); V = 60 % (57.8-61.3); spear = 26.6 µm (25-28); m = 51.6 % (48.2-54.5) o = 25 % (21.4-28); scutellum diameter = [3.6 µm (2.5-4.5)-4.2 (3.5-4.5)].

Measurements (in Sivakumar & Selvasekaran, 1982)

Female (paratypes; n = 31) : L = 0.7 mm (0.63-0.78); a = 24.9 (21-27.5); b = 6.7 (5.3-8); b′ = 5.1 (4.3-6); c = 66.2 (52-83); c′ = 0.61 (0.52-0.75); V = 60.2 % (56.5-62.7); spear = 29 µm (27.4-31.2); m = 53.8 % (51-56.9); o = 20.7 % (15.3-25.2); scutellum diameter (given for holotype only) = 6.4 µm.

DESCRIPTION

Female : Body a loose spiral when relaxed, annules about 1.2 µm wide at midbody; lateral fields areolated anteriorly and at level of scutellum. Lip region hemispherical slightly set-off with three annules. Basal lip annule without longitudinal striations. Spear well-developed, basal knobs oval with irregular anterior surface. Excretory pore at level of oesophageal gland lobe, 124 µm (115-137) from anterior end. Hemizonid 0-3 annules anterior to excretory pore. Spermatheca not seen. Intestine not overlapping rectum. Epiptygma single. Scutellum crescent-shaped, varying 0-5 annules anterior to anus. Tail rounded 9.4 µm (9-10) in length variable in shape with striated terminus and 9-12 annules.

Male : Unknown.

DIAGNOSIS AND RELATIONSHIPS

S. conicephalum is similar to *S. brachyurus* with respect to the lack of males, absence of longitudinal striae on the basal lip annule (*vs.* striae on *S. brachyurus*), and no areolation at the level of the scutellum. However, *S. conicephalum* differs from *S. clathricaudatum* by fewer lip annules (3 *vs.* 4-9).

Scutellonema erectum Sivakumar & Khan, 1981

(Fig. 6 O-S)

MEASUREMENTS

**Female* (paratypes; n = 2) : L = 0.67-0.69 mm; a = 23.5-25; b′ = 5.1-5.7; c = 57.5-70.5; c′ = 0.5-0.65; V = 59.4-61.2 %; spear = 22-25 µm; m = 54-56.8 %; o = 12 %; scutellum diameter = [(2)-(6.5)] µm.

**Male* (paratypes; n = 2) : L = 0.63-0.69 mm; a = 25.6-28.6; b′ = 5.8-6.2; c = 43-46.7; spear = 21.5 µm; spicules = 24-26 µm; gubernaculum = 11 µm; m = 51.1 %; o = 23.1 %; scutellum diameter = [(1.5)-(3)] µm.

Measurements (in Sivakumar & Khan, 1981)

Female (paratypes; n = 20) : L = 0.67 µm (0.6-0.72); a = 27 (21.7-33.7); b = 7.3 (5.8-8.9); b′ = 5.9 (5.1-6.7); c = 41 (34.2-62.4); c′ = 1 (0.8-1.3); V = 58.5 % (53.8-62.3); spear = 22.6 µm (19-24); m = 49.5 (48-50); o = 14.7 (13-18); scutellum diameter = 3.3 µm (3-4).

Male : (paratypes; n = 15) : L = 0.61 mm (0.51-0.63); a = 27.6 (24.3-31.2); b = 6.3 (5.8-7.3); b′ = 5.1 (4.5-5.5); c = 37.1 (30.4-45); spear = 21.9 µm (21-24); spicules = 26.7 µm (23-31); gubernaculum = 11.1 µm (10-12); m = 49.2 (48-50); o = 16.2 (14-18); scutellum diameter = 3-4 µm.

DESCRIPTION

Female : Body straight or slightly arcuate when relaxed, annules about 1.5 µm wide at midbody. Lateral fields areolated anteriorly and at level of scutella. Lip region broadly rounded with 2-3 annules, deeply set off. Basal lip annule with six longitudinal striations; spear well-developed having oval basal knobs with flattened anterior surface. Excretory pore about 106 µm from the anterior end at level of oesophageal gland lobe. Hemizonid 0-5 annules anterior to excretory pore. Spermatheca round with sperm. Intestine not overlapping rectum. Epiptygma double. Scutellum rounded, varying 0-3 annules anterior to anus. Tail tapering, 9.5-12 µm in length with striated flattened terminus and 13-14 annules.

Male : Similar to female except for reproductive structures and less robust stylet.

DIAGNOSIS AND RELATIONSHIPS

Among species with males only *S. erectum, S. siamense, S. bizanae,* and *S. clariceps* have areolation in the region of the scutellum as well as longitudinal striae on the head region. However, *S. erectum* and *S. siamense* only have six longitudinal striae *vs.* at least 14 in the other species. *S. erectum* is distinguished from *S. siamense* by its broadly rounded deeply set off head region, *vs.* a head region that is truncate and not set off in the latter.

Scutellonema grande Sher, 1964

(Figs 1 L; 2 J; 3 I; 6 G-J)

MEASUREMENTS

**Female* (paratypes; n = 8); L = 0.94 mm (0.76-1.06); a = 29.5 (24-39.6); b′ = 6.3 (4.9-7.3); c = 45.6 (34.5-63.9); c′ = 0.8 (0.69-1.02); V = 56.6 % (53.5-58.7); spear = 35.1 µm (32.5-36.5); m = 43.1 % (41.5-45.7); o = 15.6 % (9.7-21.7); scutellum diameter = [2.1 µm (2-2-2.5)-3.9 (3-5)].

Measurements of S. grande *(in Sher, 1964)*

Female (paratypes; n = 15); L = 0.87-1.2 mm; a = 25-36; b = 7.1-10.4; b′ = 5.4-7.6; c = 36-60; V = 53-60 %; spear = 35-39 µm; o = 9-12 %; scutellum diameter = 3 µm.

Male (paratypes; n = 3) : L = 0.81-1.05 µm; a = 27-31; b = 7.1-9.3; b′ = 5.8-8.4; c = 36-40; spear = 33-36 µm; spicules = 32-37 µm; gubernaculum = 13-17 µm; capitulum = 7-9 µm; o = 9-13 %; scutellum diameter = 3 µm.

Measurements of S. mangiferae *(in Khan & Basir, 1965)*

Female (paratypes; n = 5) : L = 1-1.24 mm; a = 27-33; b′ = 7.1-8.8; c = 39-62; V = 54.6-56.9 %; spear = 32-35 µm; m = < 50 %; o = 16-21.8 %; scutellum diameter = 3 µm.

Male (paratypes; n = 3) : L = 0.98-1.07 mm; a = 31-39.5; b = 7.6-8.1; c = 32-42; o = 16.6-20 %; spear = 30-32 µm; spicules = 41-45 µm; gubernaculum = 17-19 µm.

Measurements of S. eclipsi

**Female* (paratypes; n = 2) : L = 1.12-1.19 mm; a = 22-24.6; b′ = 6.9-7; c = 35.5-39.3; c′ = 0.9-0.95; V = 54.1-55.2 %; spear = 36-37 µm; m = 44.4-45.9 %; o = 10.8-13.9 %; scutellum diameter = [(3)-(5.5-6)] µm.

Measurements of S. eclipsi *(in Ganguly & Khan, 1983)*

Female (paratypes; n = 10) : L = 0.85-1.24 mm; a = 25-37; b = 7.5-10.9; b′ = 6-8.5; c = 25-39; V = 53-60 %; spear = 34-39 µm; m = 40-44 %; o = 17-28 %; scutellum diameter = 5-6 µm.

Male (paratypes; n = 2) : L = 0.78-0.97 mm; a = 28-32; b = 6.9-7.4; b′ = 6-6.1; c = 28-30.3; spear = 34-37 µm; spicules = 37-40 µm; gubernaculum = 15-17 µm; capitulum = 7 µm; o = 16-18 %; scutellum diameter = 5 µm.

DESCRIPTION

Female : Body slightly arcuate when relaxed, annules about 1.8 µm wide at midbody; lateral fields areolated anteriorly and at level of scutella. Lip region hemispherical with 6-9 annules, not offset. Basal lip annule without longitudinal striations; spear well-developed with rounded basal knobs having irregular anterior surface. Excretory pore at level of nerve ring, 99 µm (96-100) from anterior end. Hemizonid 0-12 annules posterior to excretory pore. Spermatheca oval with sperm. Intestine not overlapping or slightly overlapping rectum. Epiptygma double. Scutellum crescent shaped, varying 4-10 annules anterior to anus. Tail rounded, 20.8 µm (15.5-30) in length with striated terminus and 17 (15-21) annules.

Male : Similar to female except for reproductive structures.

DIAGNOSIS AND RELATIONSHIPS

Scutellonema grande can be distinguished from all other species by the position of the excretory pore opposite the nerve ring and the position of the hemizonid posterior to the excretory pore. In all other species of the genus the excretory pore is at the level of the oesophageal glands or posterior, and the hemizonid is anterior to the excretory pore.

REMARKS

After examining the paratypes of *Scutellonema mangiferae*, Siddiqi (1972) concluded that there is no major difference between this species and *Scutellonema grande*. We agree with him.

Ganguly and Khan (1980) described *Scutellonema eclipsi* and differentiated it from *S. grande* primarily by the larger, crescent-shaped scutella. However, our comparisons indicate that paratypes of both species are the same size; reported differences suggest that the diameter of the scutella of *S. grande* was measured at the surface, whereas scutella of *S. eclipsi* were measured more deeply. Furthermore, scutella of both species are crescent-shaped (Fig. 6 I, J). Therefore, *S. eclipsi* and *S. mangiferae* must be considered junior synonyms of *S. grande*.

Scutellonema imphalum Sultan & Jairajpuri, 1978

MEASUREMENTS (in Sultan & Jairajpuri, 1978)

Female (paratypes; n = 0.71 mm (0.62-0.79); a = 25 (22-30); b = 7.0 (6.1-7.8); b′ = 5.8 (5.1-6.7); c = 43 (36-47); c′ = 0.9 (0.7-0.9); V = 58 % (56-62); spear = 28-30 µm; m = 47 % (45-50); o = 17 % (14-18).

DESCRIPTION (in Sultan & Jairajpuri, 1978)

" Body forms a spiral upon fixation. Cuticle marked with fine striations. Lateral fields with four incisures, outer incisures crenate in scutellar region. Lip region continuous with body, hemispherical with 4-5 annules, basal annule marked with four longitudinal lines. Spear 28-30 µm long, basal knobs slightly indented anteriorly. Excretory pore 90-100 µm from anterior extremity. Hemizonid 0-3 annules above excretory pore, 86-100 µm from anterior extremity. Hemizonion 5-8 annules below excretory pore. Nerve ring near middle of isthmus.

Vulva a depressed, transverse slit. Spermatheca without sperms. Tail almost hemispherical, marked with 8-18 annules ventrally. Scutella 4-5 µm wide located at or below anal level.

Male : Not found. "

DIAGNOSIS AND RELATIONSHIPS (in Sultan & Jairajpuri, 1978)

" *Scutellonema imphalus* n. sp. comes close to *S. unum* and *S. clariceps*. From the former, it differs in having nonareolated lateral fields in the region of the scutella, basal annule of lip region with lesser number of longitudinal striae, in shape of spear knobs, absence of epiptygma, and tail with more striae (areolations present in the region of scutella, basal annule of lip region marked with 20-21 longitudinal striae, spear knobs rounded, epiptygma double, and tail striae 7 in *S. unum*). It differs from *S. clariceps* in having lesser longitudinal lines on the basal annule of lip region, in the shape of spear knobs, spermatheca without sperms and absence of epiptygma (basal annule of lip region with 14-15 longitudinal lines, spear knobs rounded, spermatheca large with sperms and epiptygma double in *S. clariceps*). "

Scutellonema labiatum Siddiqi, 1972

(Fig. 7 P-S)

MEASUREMENTS

**Female* (paratypes; n = 8) : L = 0.62 mm (0.58-0.68); a = 24.3 (21-28) : b′ = 5.4 (4.8-6); c = 59.5 (40-82.7); c′ = 0.65 (0.51-0.85); V = 58.6 % (57.3-61); spear = 22 µm (21-23); m = 50.9 % (48-54.8); o = 17.6 % (13.6-19.6); scutellum diameter = [2.1 µm (2-2.5)-4 (3.5-4.5)].

**Male* (paratypes; n = 3) : L = 0.59 mm (0.58-0.6); a = 26 (24.2-27); b′ = 5 (4.6-5.2); c = 51.1 (48-52.7); c′ = 0.73 (0.68-0.75); spear = 21.8 µm (21-23); spicules = 28-30 µm; gubernaculum = 11-13.5 µm; m = 48.9 % (47.8-50); o = 18.2 % (14-19); scutellum diameter = [2.5 µm (2-2.5)-(4)].

Measurements (in Siddiqi, 1972)

Female (paratypes; n = 30) : L = 0.61 mm (0.57-0.77); a = 26 (23-32); b = 7 (5.8-8); b′ = 5.7 (4.6-6.5); c = 55 (45-70); V = 58 % (55-61); spear = 22.5 µm (20-25); m = 50 % (48-52); o = 19 % (14-28); scutellum diameter = 3-4.5 µm.

Male (paratypes; n = 12) : L = 0.58 mm (0.54-0.64); a = 28.5 (26-32); b = 6.6 (6-7.6); b′ = 5.2 (4.7-5.4); c = 65 (49-81); T = 46 % (40-56); spear = 21.5 µm (20-25); spicules = 28.5 µm (27-32); gubernaculum = 12.7 µm (12-14); m = 50 % (49-51); o = 21 % (18-28); scutellum diameter = 3.2-4 µm.

DESCRIPTION

Female : Body loose spiral when relaxed, annules about 1.6 µm wide at midbody; lateral fields areolated anteriorly but not at level of scutella. Lip region hemispherical, rounded, slightly set off from body with 4-5 annules. Basal lip annule with 7-15 longitudinal striations. Spear well-developed, basal knobs oval, with flattened surface. Excretory pore at level of oesophageal gland lobe, situated 100 µm (93-106) from anterior end. Hemizonid position varying 0-3 annules anterior to excretory pore. Spermatheca rounded, sometimes oval, with sperm. Intestine not overlapping rectum. Epiptygma double, 5-7 µm long, protruding. Scutellum crescent shaped, varying in position from two annules posterior to two annules anterior to anus. Tail 11 µm (7.5-14.5) in length, rounded, conical with striated terminus and 8-13 annules.

Male : Similar to female except for reproductive apparatus.

DIAGNOSIS AND RELATIONSHIPS

The striking character of *S. labiatum* in the long projecting epiptygma. The species resembles *S. africanum* with respect to the presence of males and absence of areolation at the level of the scutellum, but differs by the presence of longitudinal striae on the basal lip annule in *S. labiatum.* Similar longitudinal striae occur in *S. tsitsikamense* but *S. labiatum* is distinct from the latter by the much shorter stylet (20-25 µm *vs.* 30.9-39.7).

Scutellonema magniphasma Sher, 1963

(Figs 1 O, P; 2 M; 4 P; 9 A-E)

MEASUREMENTS

**Female* (paratypes; n = 12) : L = 0.82 mm (0.76-0.9); a = 20.5 (18-23); b′ = 6 (5.1-6.8); c = 53.4 (31-72); c′ = 0.64 (0.6-0.8); V = 57.4 % (57-59); spear = 35.2 µm (34-38); m = 49.4 % (47-51); o = 26.9 % (20-33.8); scutellum diameter = [6.5 µm (4.5-8)-8 (5.5-10)].

Measurements (in Sher, 1964)

Female (paratypes; n = 20) : L = 0.75-0.87 mm; a = 20-27; b = 6.5-8.2; b′ = 5.3-6.6; c = 42-70; V = 56-61 %; spear = 34-38 µm; o = 8-14 %; scutellum diameter = 7 µm.

Measurements of S. naveenum

**Female* (paratypes; n = 7) : L = 0.75 mm (0.71-0.82); a = 19.4 (17.4-21.5); b′ = 5.9 (5.7-6.4); c = 60.9 (43.4-81.1); c′ = 0.59 (0.43-0.78); V = 58.8 % (57.1 %-63.9); spear = 32.7 µm (32.5-33); m = 48 % (46-49); o = 13.5 % (11.5-15.7); scutellum diameter = [5.8 µm (5.1-6.4)-8.2 (7-10)].

Measurements of S. naveenum *(in Sivakumar & Khan, 1981)*

Female (paratypes; n = 20) : L = 0.73 mm (0.66-0.82); a = 23.3 (20.3-27); b = 7.4 (6.2-8.6); b′ = 5.6 (4-6.8); c = 50.3 (42.9-60.1); c′ = 0.62 (0.5-0.7); spear = 33.5 µm (31-36); m = 48.4 % (47-50); o = 10.6 % (10-12); scutellum diameter = 8.2 µm (7-11).

DESCRIPTION

Female : Body C-shaped when relaxed, annules about 2.3 µm wide at mibody; lateral fields areolated anterioly and at level of scutella. Lip region with 5 (3-6) annules, typically hemispherical and slightly offset but some varients conoid and deeply set off; labial disc elevated. Basal lip annule with 20-26 longitudinal striations. Spear well-developed with oval basal knobs and anterior surface flattened. Excretory pore at level of oesophageal gland lobe 118 µm (115-160) from anterior end. Hemizonid varying 0-4 annules anterior to excretory pore. Spermatheca not seen. Intestine not overlapping rectum. Epiptygma inconspicuous, double. Scutellum varying from four annules posterior to four annules anterior anus. Tail 12.8 µm (11.5-19) in length; subconical with coarse striated terminus and 9 (6-11) annules.

Male : Unknown.

DIAGNOSIS AND RELATIONSHIPS

Scutellonema magniphasma is similar to *S. unum* and *S. brevistyletum* by the absence of males, areolation at the level of scutellum and ten or more longitudinal striae on the basal lip annule. However, *S. magniphasma* differs by its longer spear and bigger scutellum, as well as from *S. brevistyletum* by the greater number of longitudinal striae on the basal lip annule (15-26 *vs.* 10).

REMARKS

We agree with Mattaar and Loof (1984) in their synonomy of *S. naveenum* with *S. magniphasma.* The former species was described as having 12-14 longitudinal striae on lip annules and is distinguished from *S. magniphasma* primarily by its smaller body size, more conical head, and rounded stylet knobs. Differences, of the number of longitudinal striae on basal lip annule is not mentioned (12-14 *vs.* 24-26) in the diagnosis, however, we found a paratype of *S. naveenum* to have 20 longitudinal striations. Consequently, there is no major difference between the two putative species; *S. naveenum* is considered the junior synonym.

Scutellonema siamense Timm, 1965

(Fig. 7 L, M)

MEASUREMENTS

**Female* (paratypes; n = 3) : L = 0.66 mm (0.65-0.67); a = 17.1 (16.4-17.7); b′ = 5.7 (5.6-5.9); c = 39.5 (34.7-43.3); c′ = 0.7 (0.6-0.8); V = 56.1 % (55.4-56.9); spear = 27 µm (26-27.5); m = 47.5 % (45.4-51.9); scutellum diameter = [3 µm (2-4)-5.2 (4-6)].

Measurements (in Timm, 1965)

Female (paratypes; n = 10) : L = 0.65 mm (0.59-0.72); a = 23.4 (22.4-26.4); b = 10.9 (9.6-11.9); b′ = 5.7 (4.5-6.3); c = 50 (39-65); V = 56.9 %

(54.5-58.4); spear = 24-26 µm; m = 42 %; o = 27-32 %; scutellum = 4 µm.

Male (paratypes; n = 10) : L = 0.6 mm (0.51-0.66); a = 25.1 (21.4-29.4); b = 10.2 (9.5-10.9); b′ = 5.7 (4.5-7.4); c = 41 (36-47); spear = 22-25 µm; spicules = 22-26 µm; gubernaculum = 10-12 µm; o = 28-32 %; scutellum = 3 µm.

DESCRIPTION

Female : Body loose spiral when relaxed, annules about 1.8 µm wide at midbody, lateral fiels areolated anteriorly and at level of scutella, partially areolated on midbody. Head region truncate, tapering with 3-4 annules not set off from body; basal lip annule with six longitudinal striations; spear well-developed with oval basal knobs. Excretory pore at level of oesophageal gland lobe, situated at 90 µm (85-93) from the anterior end. Hemizonid not seen. Spermatheca present, round, with sperm. Intestine not overlapping rectum. Epiptygma double. Scutellum rounded, at level of anus. Tail rounded, 17 µm (15-19) in length with striated terminus and 7-16 annules.

Male present. See original description (Timm, 1965).

DIAGNOSIS AND RELATIONSHIPS

Scutellonema siamense is similar to *S. trucatum* with respect to the truncate shape of the head region, but is readily distinguished by the annulated head region, and males (*vs.* smooth head region and absence of males). *Scutellonema erectum*, like *S. siamense* has annules on the head region and males, but differs by the broadly rounded deeply set-off head region.

Scutellonema sofiae
van den Berg & Heyns, 1973

(Fig. 8 E, F)

MEASUREMENTS

**Female* (paratypes; n = 2) : L = 0.7-0.72 mm; a = 23.2-30.4; b′ = 5.6-5.9; c = 49.6-60.9; c′ = 0.68-0.85; V = 56.8-58.3 %; spear = 27 µm; m = 48.1-50 %; o = 9.2-13 %; scutellum diameter = [(2)-(3.5-4)] µm.

Measurements (in van den Berg & Heyns, 1973)

Female (paratypes; n = 9); L = 0.6 mm (0.6-0.7); a = 27.7 (24.4-30.2); b = 7 (6.3-7.7); b′ = 5.6 (5.1-6.3); c = 51.4 (43.2-59.7); V = 57 % (56-59); spear = 25.1 µm (23.9-26.8); m = 44-48 %; o = 19.9 % (14.3-24.2); scutellum diameter = 2.4 µm (1.8-3.3).

DESCRIPTION

Female : Body arcuate, C-shaped when relaxed, annules about 1.4 µm wide at midbody; lateral fields areolated anteriorly but not areolated at level of scutella. Lip region hemispherical, slightly set off with 3-4 annules. Labial disc elevated. Basal lip annule with six longitudinal striations. Spear well-developed with basal knobs rounded and with flattened or irregular anterior surface. Excretory pore at level of oesophageal gland lobe situated 100-102 µm from the anterior end. Hemizonid at level of excretory pore. Spermatheca not seen. Intestine not overlapping rectum. Epiptygma double. Scutellum crescent shaped varying from 1-6 annules posterior to anus. Tail rounded 12.5 µm (10.7-14.9), variable in shape, with striated terminus and 9-13 annules.

Male : Unknown.

DIAGNOSIS

Scutellonema sofiae resembles *S. imphalum* and *S. commune* in that all three species lack males and areolation at the level of the scutellum. However, *S. sofiae* has a shorter spear (24-27 µm *vs.* 28-30 and 31-37, respectively). In addition, *S. sofiae* and *S. commune* have six longitudinal striae on the basal lip annule whereas *S. imphalum* has four.

Scutellonema transvaalense van den Berg, 1981

MEASUREMENTS (in van den Berg, 1981)

Female (n = 9) : L = 0.96 mm (0.77-1.24); a = 21.8 (19.6-24.9); b = 8.7 (7.1-10.3); c = 73.2 (31.2-164.7); c′ = 0.6 (0.3-0.8); V = 54 % (49-59); spear = 27.0 µm (23.9-30.1); o = 20.9 % (16.9-27.4).

Male (n = 24) : L = 0.84 mm (0.69-101); a = 28.9 (22.4-35.1); b = 6.2 (5.0-7.3); c = 28.1 (22.8-34.3); c′ = 1.8 (1.4-2.4); o = 19.3 % (13.5-31.0); spear = 22.8 µm (18.8-25.7); spicules = 24.9 µm (21.3-27.2); gubernaculum = 11.0 µm (9.5-14.7); capitulum = 7.7 µm (7.0-8.8).

DESCRIPTION

See original description (van den Berg, 1981).

DIAGNOSIS AND RELATIONSHIPS (in van den Berg, 1981)

« When following the keys of Sher (1964) and Smit (1971) this species keys out at *S. cavenessi.* It differs from the latter species in the following : (1) Although slightly larger (690-1005 compared with 500-800 µm) the males of the new species have slightly smaller spicules and gubernaculi, 24.9 µm (21.3-27.2) and 11.0 µm (9.6-14.7) compared with 27.2-33 µm and

11-17 µm respectively. (2) Female lip region truncate compared with hemispherical. (3) Male tail slightly longer, 29.7 µm (23.5-34.2) compared with 20.6 µm (13.6-28.7); scutellum situated very far back on tail, sometimes almost opposite hyaline part of tail, compared with opposite or slightly posterior to cloaca. (4) Male head shape not hemispherical when seen laterally; *en face* view and stereoscan photos show lobe-like appearance which was not seen in the *S. cavenessi* specimens from South Africa (van den Berg & Heyns, 1973) and was also not mentioned by Sher (1964) in his description of the species. (5) Tail of female shorter; c = 73.2 (31.2-164.7) compared with c = 27 to 41 (Sher, 1964) and c = 44.3 (35.3 to 58.6); van den Berg & Heyns, 1973). This new species also comes close to *S. bradys*, but differs from it in the following : (1) Excretory pore not situated at level of oesophago-intestinal valve as mentioned by Sher (1963) and depicted by Siddiqi (1972), but much more posterior. (2) Oesophageal lobes short and cap-like over anterior end of intestine and not as long as illustrated by Steiner and LeHew (1933) and Siddiqi (1972). (3) Head of South African male specimens with four longitudinal lobes. This is not mentioned by Siddiqi (1972) or Sher (1964) and neither does it show in the *en face* view illustrated by Steiner and LeHew (1933). (4) In *S. bradys* the females have a hemispherical head, whilst in the new species the females have small flattened lip regions. (5) Although the number of annules between the male cloaca and scutellum is not mentioned in any of the descriptions of *S. bradys*, the illustrations show the scutellum to be situated just behind the cloaca or at most 7 annules posterior to it. In the South African specimens the scutellum of the male is situated very far back on the tail, 10 to 19 annules posterior to the cloaca. In some specimens it is situated almost opposite the beginning of the hyaline portion of the tail. (6) Spicules and gubernaculum of male slightly shorter than in *S. bradys* : 24.9 µm (21.3-27.2) and 11.0 µm (9.6-14.7) compared with 29-33 µm and 14-17 µm (Siddiqi, 1972) and 26-35 µm and 12-17 µm (Sher, 1964) respectively. »

Scutellonema truncatum Sher, 1963

(Fig. 1 A, B; 2 A; 3 A; 8 S, T)

Measurements

**Female* (paratypes; n = 17) : L = 0.62 mm (0.55-0.73); a = 23.3 (17.9-29.7); b′ = 4.9 (4.1-5.7); c = 68.9 (22-98.3); c′ = 0.6 (0.48-0.72); V = 58.5 % (56.4-61.6); spear = 26.5 µm (24.5-27.5); m = 49 % (46.1-54.9); o = 19.5 % (11.3-30.6); scutellum diameter [1.6 µm (1.3-2)-3.4 (2.5-4)].

Measurements (in Sher, 1964)

Female (paratypes; n = 20) : L = 0.61-0.75 mm; a = 22-28; b = 5.7-7.5; b′ = 4.7-5.9; c = 50-80; V = 55-60 %; spear = 26-29 µm; o = 16-27 %; scutellum diameter = 3 µm.

Measurements from South Africa (in van den Berg & Heyns, 1973)

Female (n = 89) : L = 0.6 mm (0.5-0.8); a = 24.2 (18.3-34.4); b = 6.6 (5.2-8.6); b′ = 5.3 (4.2-8.7); c = 63 (41.7-100.7); V = 58 % (55-63); spear = 25.7 µm (21.3-29); m = 43-53 %; o = 16.1 % (5.7-31); scutellum diameter = 2.5 µm (1.8-3.7).

Description

Female : Body spiral when relaxed; annules about 1 µm wide at midbody; lateral fields areolated anteriorly and at level of scutellum. Lip region conical, truncated, not offset, without annules; labial disc elevated, basal lip annule with six longitudinal striations; spear well-developed with oval basal knobs having flattened anterior surface. Excretory pore at level of oesophageal gland lobe, 102 µm (98-108) from anterior end. Hemizonid 0-4 annules anterior to excretory pore. Spermatheca not seen. Intestine slightly overlapping rectum. Epiptygma double; scutellum crescent shaped, 0-4 annules posterior to anus. Tail rounded, 9 µm (6-11) in length with striated terminus and 10 (8-14) annules.

Male : Unknown.

Diagnosis and relationships

S. truncatum differs from all other species of the genus in having a head region which is truncated, not set off, and lacks annules.

Scutellonema tsitsikamense van den Berg, 1976

(Fig. 8 A-D)

Measurements

**Female* (paratypes; n = 5) : L = 1.1 mm; (0.99-1.2) a = 28 (27.2-30); b′ = 6.1 (5.5-6.8); c = 55 (42.5-68.7); c′ = 0.67 (0.6-0.8); V = 57.4 % (57.1-58.2); spear = 37.2 µm (36-39); m = 51.9 % (48.7-54.8); o = 14 % (9-17.8); scutellum diameter = [3.9 µm (3.5-5)-7.3 (7-8)].

**Male* (paratypes; n = 6) : L = 0.97 (0.88-1.03) mm; a = 27.5 (21.5-32.7); b′ = 5.3 % (4.4-6.5); c = 43.9 (33.9-51.5); c′ = 1.08 (0.9-1.3); spear = 34.4 µm (32.5-36); spicules = 39.4 µm (36-44); gubernaculum = 19.6 µm (19-20); m = 51.2 % (45.7-55.5); o = 15.6 % (13.8-20.3); scutellum diameter = 2.9 µm (2.5-4)-5.5 (5-6.5) '.

Measurements (in van den Berg, 1976)

Female (paratypes; n = 79) : L = 1.04 mm; (0.93-1.25); a = 30.2 (25.2-36.2); b = 7.9 (6.7-9.6); b′ = 6 (5-7.4); c = 61.4 (44.4-79.3); c′ = 0.6 (0.4-0.9); V = 57 % (48-61); spear = 35.8 µm (30.9-39.7); m = 47-54 %; o = 19.6 % (13-24.5); scutellum diameter = 4.9 µm (2.9-6.3).

Male (paratypes; n = 38) : L = 0.95 mm (0.85-1.12); a = 31.2 (27.4-40.3); b = 7.2 (6.5-7.9); b′ = 5.2 (4.5-6.3); c = 42.4 (34.6-57.5); c′ = 1.2 (0.9-1.3); spear = 33.2 µm (30.9-36); spicules = 36.7 µm (33.5-41.9); gubernaculum = 19.1 µm (17.7-21.3); capitulum = 14.5 µm (10.7-16.5); o = 19.8 % (14.8-25.3).

DESCRIPTION

Female : Body C-shaped when relaxed, annules about 1.7 µm wide at midbody; lateral field areolated anteriorly but not at level of scutellum. Lip region hemispherical, slightly flattened anteriorly, slightly set off, bearing 4-6 annules. Basal lip annule with 21 longitudinal striations. Spear well-developed, basal knobs oval, with flattened, irregular anterior surface. Excretory pore at level of oesophageal gland lobe, 141 µm (133-153) from the anterior end. Hemizonid position varying 0-2 annules anterior to excretory pore. Spermatheca usually rounded sometimes oval, with sperm. Intestine not overlapping rectum. Epiptygma double. Scutellum crescent-shaped varying 1-4 annules posterior to anus. Tail rounded, with flattened striated terminus, 20 µm (16-24) in length with 12-14 annules.

Male : Similar to female except for reproductive structures.

DIAGNOSIS AND RELATIONSHIPS

Scutellonema tsitsikamense resembles *S. labiatum* by the presence of males (sperm in spermatheca), absence of areolation at the level of the scutellum, and presence of longitudinal striae on the basal lip annule. However, *S. tsitsikamense* differs by its larger spear (30.9-39.7 *vs.* 20-25 µm). *Scutellonema commune* also has a long stylet and lacks areolation at the level of the scutellum, but differs from *S. tsitsikamense* by the presence of males. *Scutellonema bizanae* is similar by the presence of males and longitudinal striae on the basal lip, but differs by areolation at the level of the scutellum.

Scutellonema unum Sher, 1964

(Figs 1 K; 2 L; 4 K-O; 8 U, V)

MEASUREMENTS

**Female* (paratypes; n = 14) : L = 0.61 mm (0.55-0.72); a = 21.7 (17.9-27.7); b′ = 5.1 (4.5-5.5); c = 57.5 (48.8-72.9); c′ = 0.58 (0.44-0.7); V = 58.3 % (55.6-62.3); spear = 29 µm (27.5-30); m = 50.2 % (46.4-52.6); o = 50.2 % (46.4-52.6); scutellum diameter [3.3 µm (2-4.5)-4.4 (3.5-5.5)].

Measurements of a population from Peking, China

**Female* (n = 50) : L = 0,83 mm (0.74-0.92); a = 27,4 (21.1-34.2); b′ = 6.5 (5.6-7.6); c = 53.8 (40-72.6); c′ = 0.75 (0.56-0.92); V = 56.8 % (52.6-61.8); spear = 25 µm (22.8-26.4); m = 53.6 % (50-60); o = 27.1 % (19-38); scutellum diameter = [4.6 µm (3.5-6)-5.4 (4.5-6.5)].

Measurements (in Sher, 1964)

Female (paratypes; n = 20) : L = 0.55-0.73 mm; a = 20-29; b = 5.9-7.2; b′ = 4.7-5.8; c = 44-67; V = 56-62 %; spear = 29-32 µm; o = 10-17 %; scutellum diameter = 4 µm.

Measurements of a population from Zaire (in Ali, Geraert & Coomans, 1973)

Female (n = 5) : L = 0.57-0.7 mm; a = 21-23; b = 5.7-6.5; b′ = 4.8-5.4; c = 58-80; c′ = 0.4-0.5; V = 57-59 %; spear = 30-31 µm; m = 42-47 %; o = 10-16 %; scutellum diameter = 4-5 µm.

Measurements of a population from South Africa (in van den Berg & Heyns, 1973)

Female (n = 32) : L = 0.6 mm (0.5-0.8); a = 21 (17.1-25.7); b = 6.2 (4.5-7.3); b′ = 5.1 (4-6.7); c = 70 (50.3-105.5); V = 60 % (57-63); spear = 28.1 µm (25-33.1); m = 43-48 %; o = 12 % (8.1-20); scutellum diameter = 3.7 µm (2.6-5.9).

DESCRIPTION

Female : Body C-shaped or a loose spiral when relaxed, annules about 1.7 µm wide at midbody; lateral fields areolated anteriorly and at level of scutella. Lip region subconical, slightly set off from body with 4-6 annules; labial disc elevated. Basal lip annule with 15-22 longitudinal striations; spear well-developed with basal knobs flattened. Excretory pore opposite oesophageal gland lobe, situated 100.6 µm (93-122) from anterior end. Hemizonid position varying 0-3 annules anterior to excretory pore. Spermatheca not seen. Intestine slightly overlapping rectum. Epiptygma double. Scutellum usually rounded, sometimes crescent shaped; varying from two annules posterior to three annules anterior to anus. Tail rounded, subconical, 10.5 µm (8-12.5) in length, with striated terminus and 7 (5-11) annules.

Male : Unknown.

DIAGNOSIS AND RELATIONSHIPS

Scutellonema unum, S. magniphasma and *S. brachyurus* all have rare or no males, areolation at the level of the scutellum, six or more striae on the basal lip annule and relatively long spears (more than 26 µm). However, *S. unum* differs from *S. magniphasma* by the shorter spear, bigger scutellum and finer body annulation (1.7 µm *vs.* 2.3); it differs from *S. brachyurus* by the greater number of longitudinal striae on the basal lip annule (15-22 *vs.* 6).

Scutellonema validum Sher, 1964

(Figs 1 C, D; 2 B, C; 3 B, C; 7 A-G)

MEASUREMENTS

**Female* (paratypes; n = 20) : L = 0.9 mm (0.77-1.02); a = 23 (18.3-30.3); b′ = 5.7 (4.7-6.3); c = 60.3 (40-70); c′ = 0.55 (0.39-0.77); V = 60.2 % (57.3-63.6); spear = 36.1 µm (30-38); m = 53.8 % (50-58.3); o = 13 % (10.6-17.6); scutellum diameter = [3 µm (2-3.5)-5.6 µm (3.5-7.5)].

**Male* (n = 10) : L = 0.86 mm (0.73-0.96); a = 23.6 (20.2-27.5); b′ = 5.9 (4.9-6.7); c = 29.4 (25.4-34.8); c′ = 1.3 (1.1-1.4); spear = 34.7 µm (31-37); spicules = 41 µm (37-45); gubernaculum = 20 µm (19-21); m = 53.9 % (50.8-57.7); o = 12.5 % (9.4-18.2); scutellum diameter = 1.7 µm (1.3-2.5)-3.6 (3-5)].

Measurements (in Sher, 1964)

Female (n = 10) : L = 0.81-1.1 mm; a = 21-31; b = 6.0-8.2; b′ = 5.2-6.2; c = 53-87; V = 55-62 %; spear = 33-38 µm; m > 50 %; o = 12-20 %; scutellum diameter = 4 µm.

Male (n = 10) : L = 0.8-0.94 mm; a = 23-27; b = 6-7.4; b′ = 5.1-6; c = 30-36; spear = 32-36 µm; spicules = 35-42 µm; gubernaculum = 17-20 µm; capitulum = 11-14 µm; o = 14-22 %.

DESCRIPTION

Female : Body slightly arcuate, C-shaped when relaxed, annules about 1.6 µm wide at midbody; lateral field areolated anteriorly and at level of scutella. Lip region hemispherical, slightly set off from body with 7 (6-8) annules. Basal lip annule without longitudinal striations; spear well-developed with rounded basal knobs having irregular anterior surface. Excretory pore at level of oesophageal gland lobe, 140 µm (130-150) from the anterior end. Hemizonid varying 3-4 annules anterior to excretory pore. Spermatheca rounded with sperm. Intestine slightly overlapping rectum. Epiptygma double; scutellum crescent-shaped, varying 0-9 annules anterior to anus. Tail 15 µm (11-23) in length, variable in shape with striated terminus and 13 (9-18 annules).

Male : Similar to female except for reproductive structures.

DIAGNOSIS AND RELATIONSHIPS

Among species with males, *S. validum, S. africanum, S. transvaalense,* and *S. grande* are distinct by the absence of longitudinal lines on the lip region. *Scutellonema validum* can be distinguished from *S. africanum* by the absence of areolation at the level of the scutellum in the latter, and from *S. transvaalense* which has a truncate (*vs.* broadly rounded) head. *S. validum* is easily separated from the otherwise similar *S. grande* by the presence of the hemizonid anterior to the excretory pore, versus the unique position posterior to the pore in *S. grande.*

Discussion of species transferred to other genera [1]

Smit (1971) proposed to consider *S. magnum* Yeates, 1967 as a junior synonym of *Morulaimus geniculatus* Sauer, 1966. We agree with this opinion. Paratypes of *S. petersi* Mahajan, 1977 were compared with those of *Rotylenchus fallorobustus* Sher, 1965. No difference was observed between the two species. Fasciculi were present in both species. Neither author mentioned these structures. On the other hand, Loof (1984), who compared *S. petersi* to the paratypes of *R. indorobustus* Jairajpuri & Baqri, 1973, considers these two species as synonyms. Some doubt remains concerning the specific names unless *R. fallorobustus* and *R. indorobustus* are synonyms.

Scutellonema insulare, S. incisicaudatum, S. laeviflexum, S. impar and *S. minutum* are closer to *Rotylenchus* than *Scutellonema,* especially with respect to the size and the position of phasmids (e.g., phasmids are small and not opposite). It should be observed that *S. insulare* and *S. minutum* have an areolated lateral field which is unusual for the genus *Rotylenchus.* This character was mentioned in only one other species, *R. ouensensis* Boag & Hooper, 1981 which was transferred by the authors to *Pararotylenchus.*

A *Scutellonema* population from South Africa (Mica and Middleburg), referred to as *S. minutum* by van den Berg (1981) differs from the original population in having larger phasmids (3.5 µm *vs.* 1.5 for *S. minutum*).

Phylogenetic relationships within Hoplolaimidae

Although *Scutellonema* is easily distinguished by the pair of opposite scutella posterior to the vulva, its phylogenetic position among Hoplolaimidae is not clear.

(1) See list on page 290.

Hypotheses of common ancestry of genera could be formulated based on shared derived characters, but in the case of Hoplolaimidae there is little information to indicate character polarity (ancestral *vs.* derived states). *Pararotylenchus* Baldwin & Bell, 1981, however, might be considered as the genus of Hoplolaimidae having the most ancestral characters based on outgroup comparisons with other Tylenchidae. These include the hexaradiate lip pattern with no longitudinal striae on the basal annule, an oesophagus with glands in a basal bulb, and small opposite phasmid openings near the level of the anus. If the large phasmid opening in *Scutellonema*, then, is the derived condition, it may suggest a common ancestor of *Scutellonema* with other genera having large phasmid openings. These are *Aorolaimus*, *Peltamigratus* and *Hoplolaimus*, genera further modified by migration of one phasmid anteriorly. All four genera have a dorsal and lateral overlap of esophageal glands, but this character also occurs in genera with small phasmid openings.

Synonymies (e.g., *R. indorobustus*, *R. insularis*, *R. incisicaudatus*, *R. laeviflexus*, *R. impar*, *R. minutus*) previously have suggested a close relationship between *Scutellonema* and *Rotylenchus*. Both genera have dorsal and lateral overlap of esophageal glands, phasmids are positioned posteriorly, and longitudinal lines occur on basal lip annules of many species. These characters, however, are not unique to the two genera, and probably are not useful for supporting a hypothesis of common ancestry. Common ancestry between the two genera would require parallel or convergent evolution of the enlarged phasmid within Hoplolaimidae. Such homoplasy might be tested by comparative fine structural examination of phasmids of Hoplolaimidae.

Hoplolaimidae is diverse, with few consistent derived characters shared throughout the family. Further studies including morphological, biochemical, and cytogenetic investigations are needed to identify new characters. Such studies will not only be useful to establish relationships within the family, but are required to further test the hypothesis of monophyly of Hoplolaimidae.

Key to species of *Scutellonema*

1. Spermatheca functional (with sperm); males present 2
   Spermatheca nonfunctional (without sperm); males absent 13
2. Lateral field without areolation at level of scutellum 3
   Lateral field with areolation at level of scutellum 5
3. Basal lip annule without longitudinal striae ..... *S. africanum*
   Basal lip annule with longitudinal striae 4
4. Spear 20-25 µm long; basal annule with 7-15 striae ..... *S. labiatum*
   Spear 31-40 µm; basal annule with 21 striae ..... *S. tsitsikamense*
5. Basal lip annule with longitudinal striae 6
   Basal lip annule without longitudinal striae .. 9
6. Basal lip annule with 6 longitudinal striae 7
   Basal lip annule with 14-24 longitudinal striae 8
7. Head broadly rounded, deeply set off *S. erectum*
   Head truncate, not set off ..... *S. siamense*
8. Basal lip annule with 18-24 striae .... *S. bizanae*
   Basal lip annule with 14-15 striae .... *S. clariceps*
9. Spear 30 µm or less 10
   Spear 33 µm ore more 12
10. Head truncate ..... *S. transvaalensis*
    Head broadly rounded 11
11. Vaginal glands conspicuous ..... *S. bradys*
    Vaginal glands absent ..... *S. cavenessi*
12. Hemizonid posterior to excretory pore *S. grande*
    Hemizonid anterior to excretory pore *S. validum*
13. Lateral field without arcolation at level of scutellum 14
    Lateral field with areolation at level of scutellum 16
14. Basal lip annule with 4 striae; vulva region depressed ..... *S. imphalum*
    Basal lip annule with 6 striae; vulva region not depressed 15
15. Spear 23-27 µm ..... *S. sofiae*
    Spear 27-37 µm ..... *S. commune*
16. Basal lip annule without striae 17
    Basal lip annule with striae 18
17. Lip annules, 3 ..... *S. conicephalum*
    Lip annules, 4-9 ..... *S. clathricaudatum*
18. Basal lip annule with 6 striae 19
    Basal annule with 10 or more striae 20
19. Lip region not annulated ..... *S. truncatum*
    Lip region annulated ..... *S. brachyurus*
20. Spear 21-23 µm, basal lip annule with 10 striae .. *S. brevistyletum*
    Spear 29-26 µm, basal lip annule with 15-26 striae 22
21. Spear 29 µm ..... *S. unum*
    Spear 34 µm ..... *S. magniphasma*

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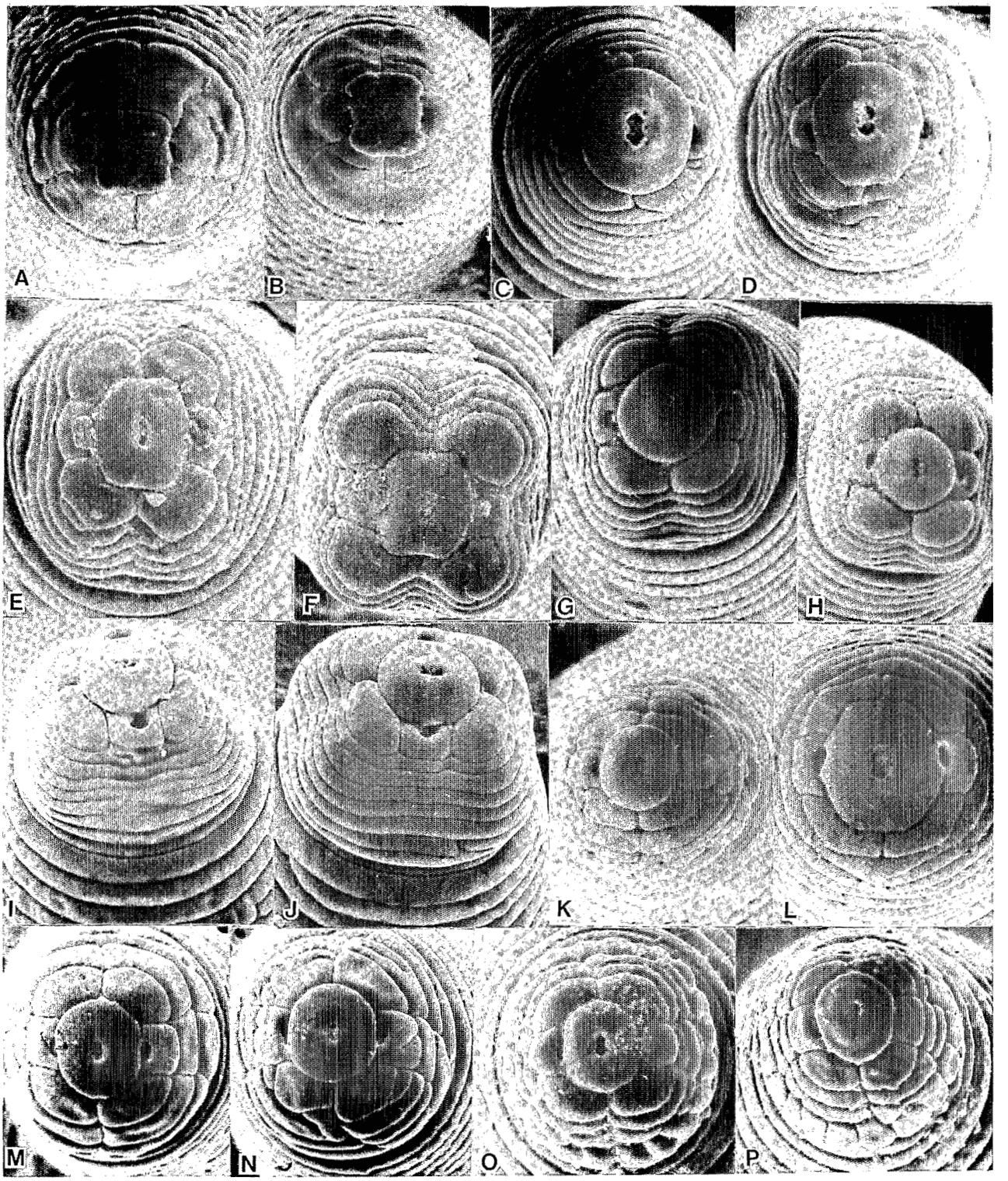

Fig. 1. *En face* patterns of *Scutellonema* spp. as viewed with SEM (× 4 500). A : *S. truncatum,* female, without annulation. B : *S. truncatum* female with an incomplete annulation. C : *S. validum,* female. D : *S. validum,* male. E : *S. bradys,* female. F : *S. bradys,* male. G : *S. cavenessi,* female (turned slightly lateral). H : *S. cavenessi,* male (turned slightly lateral). I : *S; clathricaudatum,* female. J : *S. aberrans,* female. K : *S. unum,* female. L : *S. grande,* female. M : *S; brachyurus* female with typical pattern. N : *S. brachyurus,* female with aberrant longitudinal markings. O : *S. magniphasma,* female with typical pattern. P : *S. magniphasma,* female with slightly aberrant pattern.

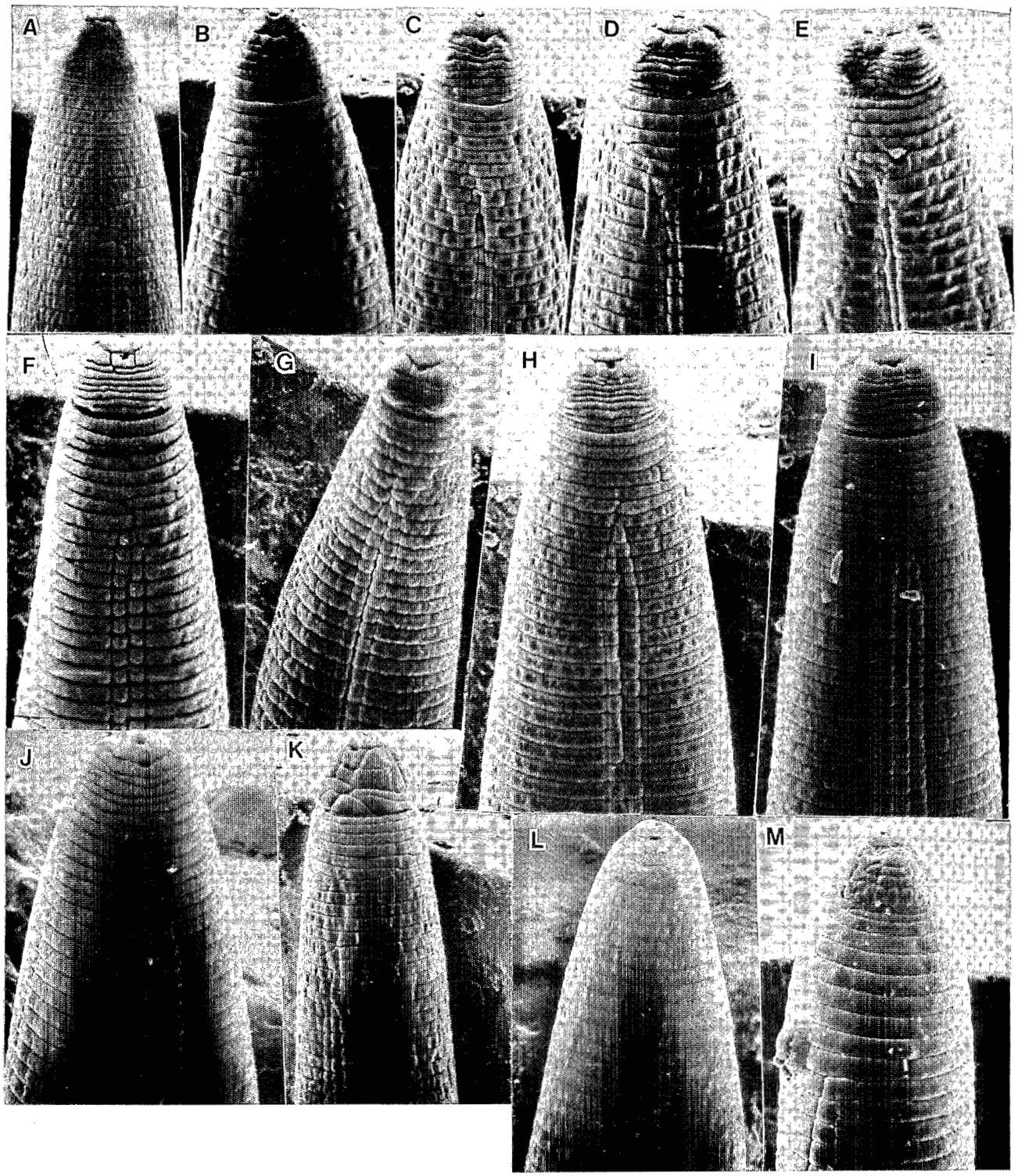

Fig. 2. Anterior end of *Scutellonema* spp. as viewed laterally with SEM (× 1 850). A : *S. truncatum*, female. B : *S. validum*, female. C : *S. validum*, male. D : *S. bradys*, female. E : *S. bradys*, male. F : *S. cavenessi*, female. G : *S. cavenessi*, male. H : *S. clathricaudatum*, female. I : *S. clathricaudatum* (*S. aberrans*, n. syn.), female. J : *S. grande*, female. K : *S. brachyurus*, female. L : *S. unum*, female. M : *S. magniphasma*, female.

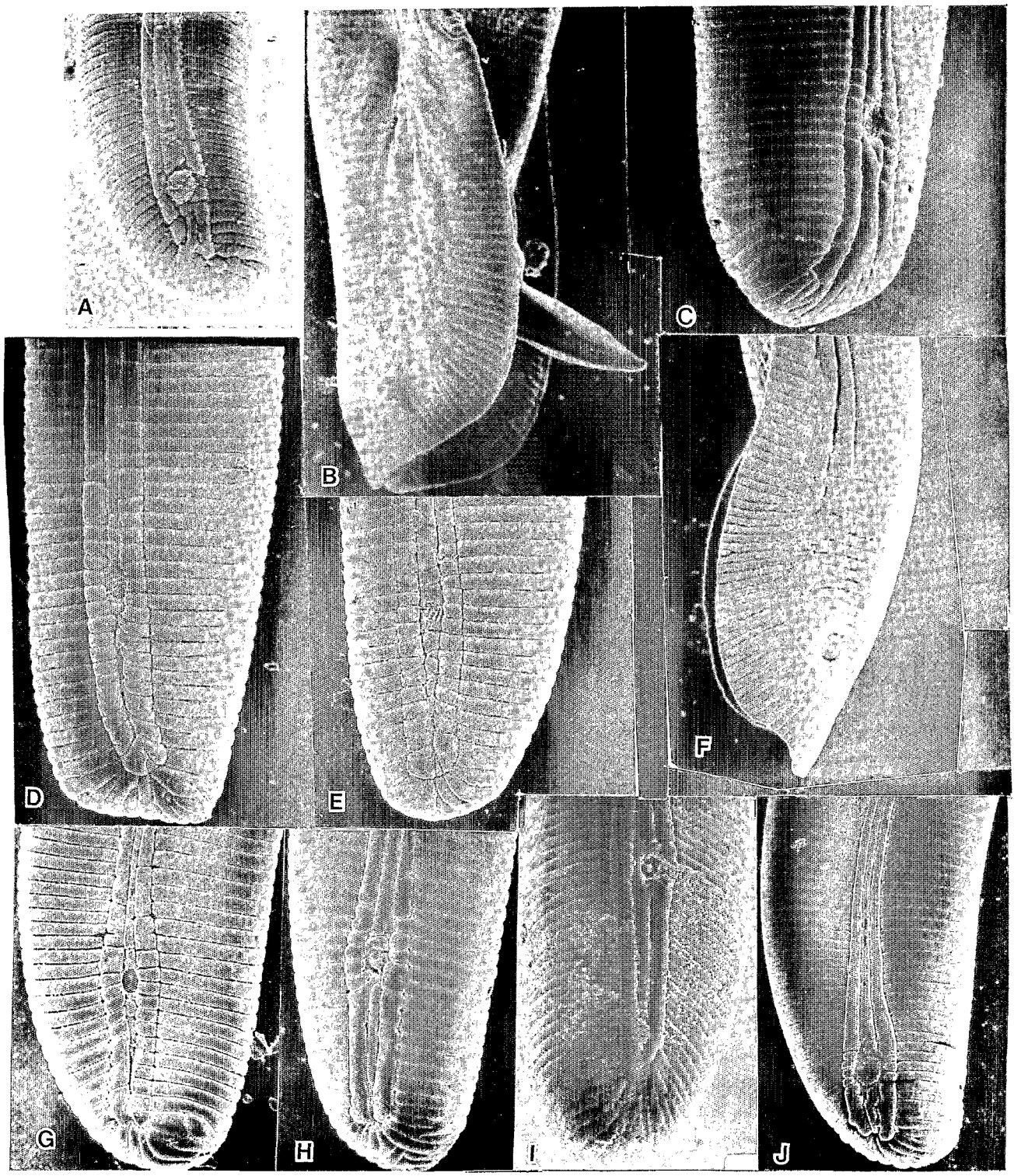

Fig. 3, 4. Posterior end of *Scutellonema* spp. as viewed laterally with SEM (× 1 500) : A : *S. truncatum;* B : *S. validum,* female; C : *S. validum,* male; D., E : *S. bradys,* female; F : *S. cavenessi,* male; G : *S. cavenessi;* H : *S. clathricaudatum,* female; I : *S. grande;* J : *S. brachyurus,* female; K, L; M, N, O : *S. unum,* female; P : *S. magniphasma,* female.

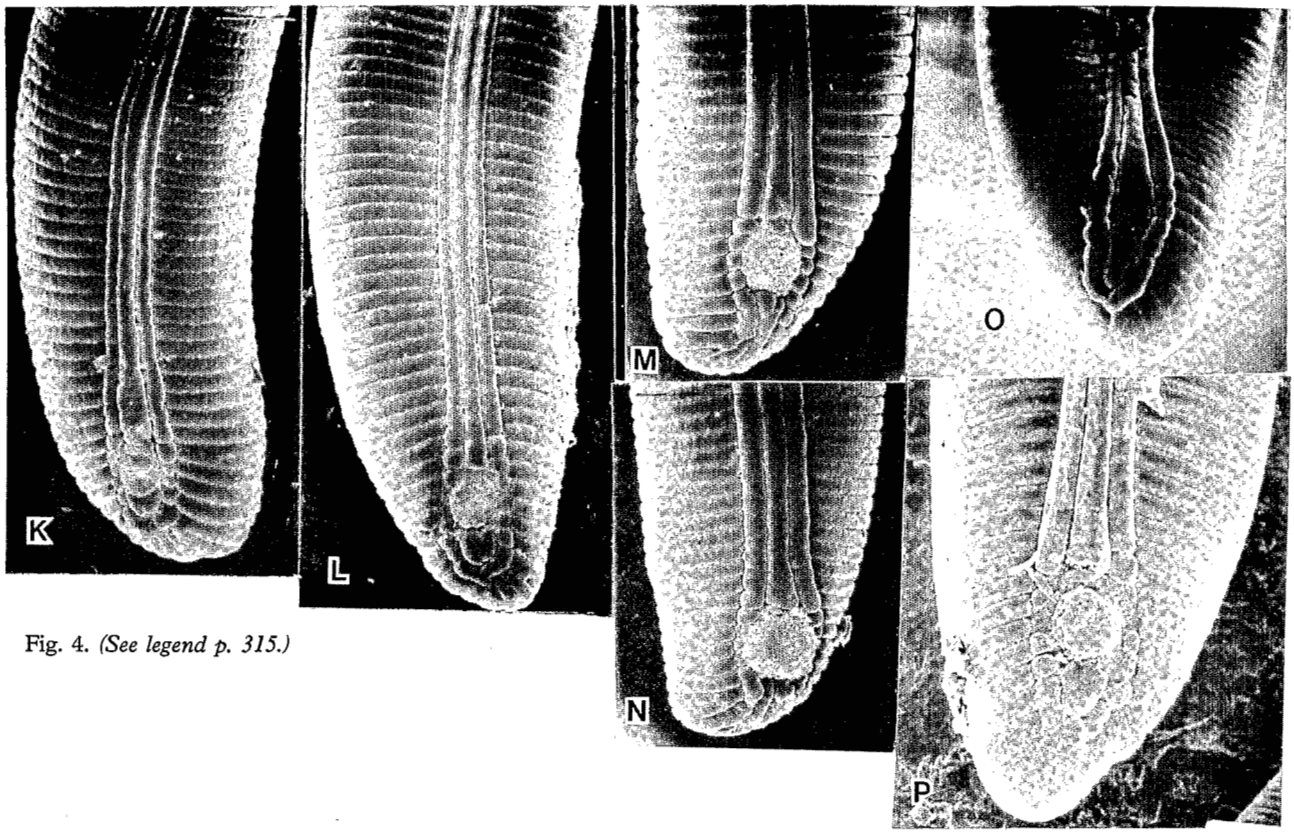

Fig. 4. *(See legend p. 315.)*

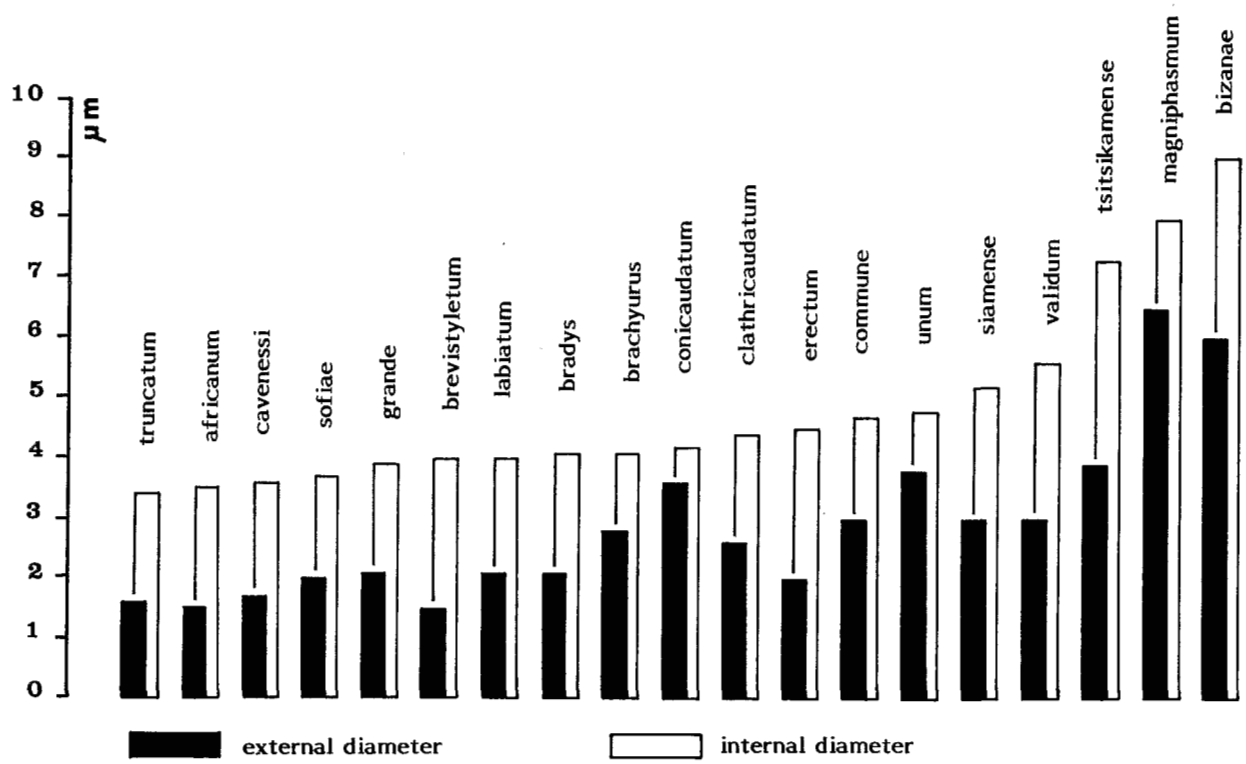

Fig. 5. Diagram comparing the diameter of the scutellum for nineteen species of the external opening and the internal ampulla.

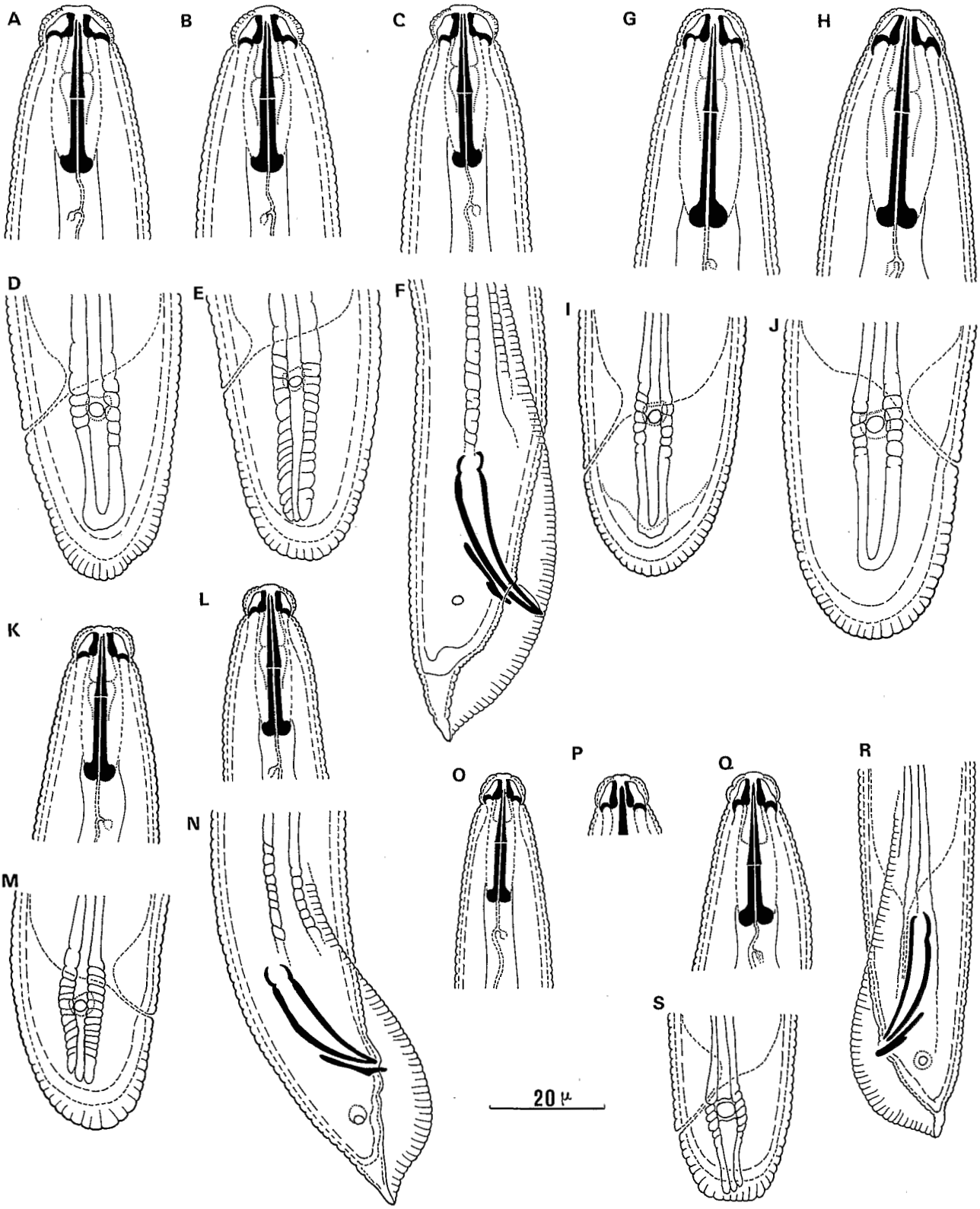

Fig. 6. *Scutellonema bradys.* Female. A, B : Anterior end; D, E : Posterior end; Male. C : Anterior end. F : Posterior end. *Scutellonema grande.* Female (paratype). G : Anterior end. I : Posterior end. Female (syn. *S. eclipsi*). H : Anterior end. J : Posterior end. *Scutellonema cavenessi.* Female. K : Anterior end. M : Posterior end; Male. L : Anterior end. N : Posterior end. *Scutellonema erectum.* Female. P, Q : Anterior end. S : Posterior end; Male. O : Anterior end. R : Posterior end.

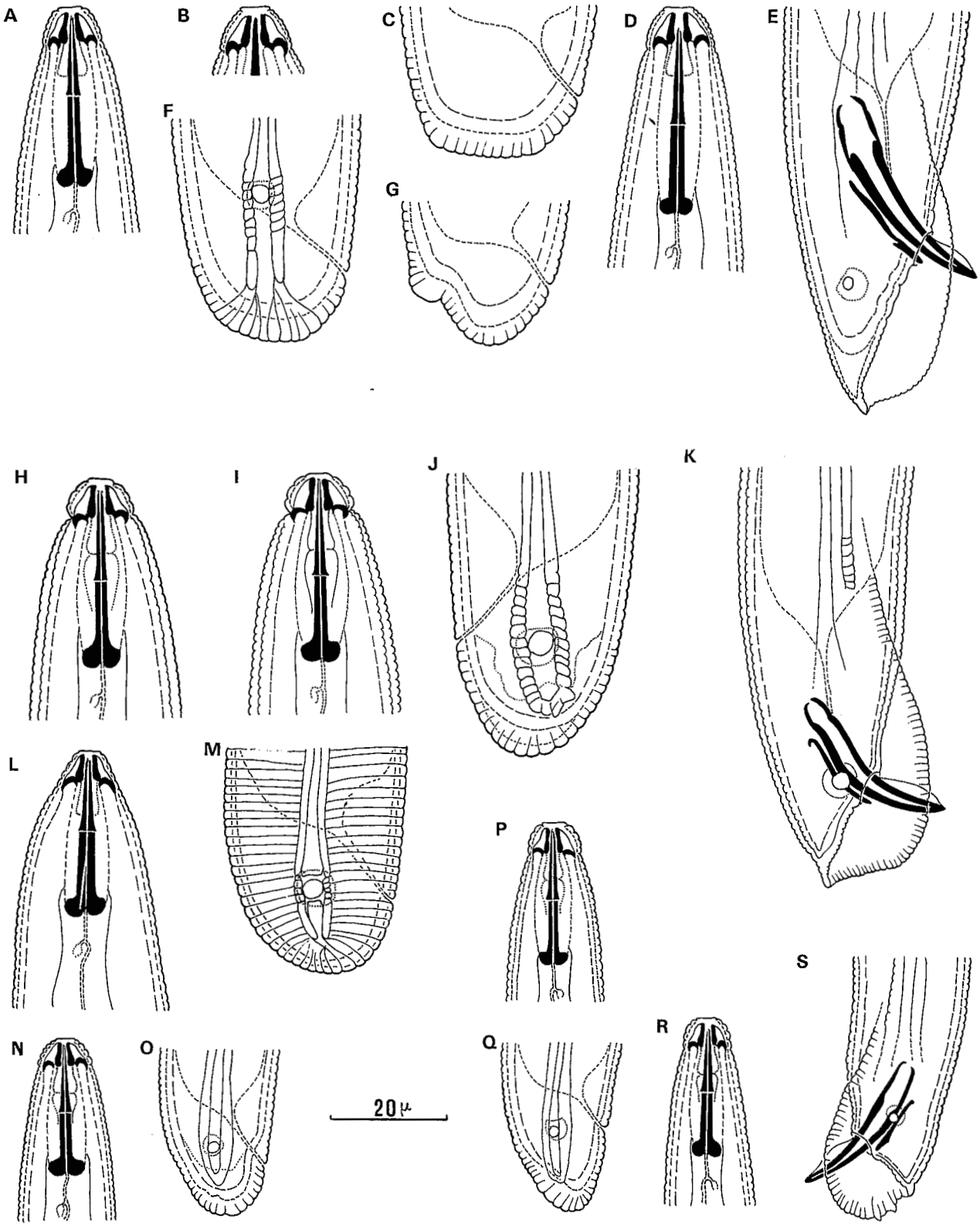

Fig. 7. *Scutellonema validum.* Female. A, B : Anterior end. C, F, G : Posterior end; Male. D : Anterior end. E : Posterior end. *Scutellonema bizanae.* Female (paratype). H : Anterior end. J : (syn. *S. multistriatum*); Posterior end; Male (paratype). I : Anterior end. K : Posterior end. *Scutellonema siamense.* Female. L : Anterior end. M : Posterior end. *Scutellonema africanum.* Female. N : Anterior end. O : Posterior end. *Scutellonema labiatum.* Female. P : Anterior end. Q : Posterior end. Male. R : Anterior end. S : Posterior end.

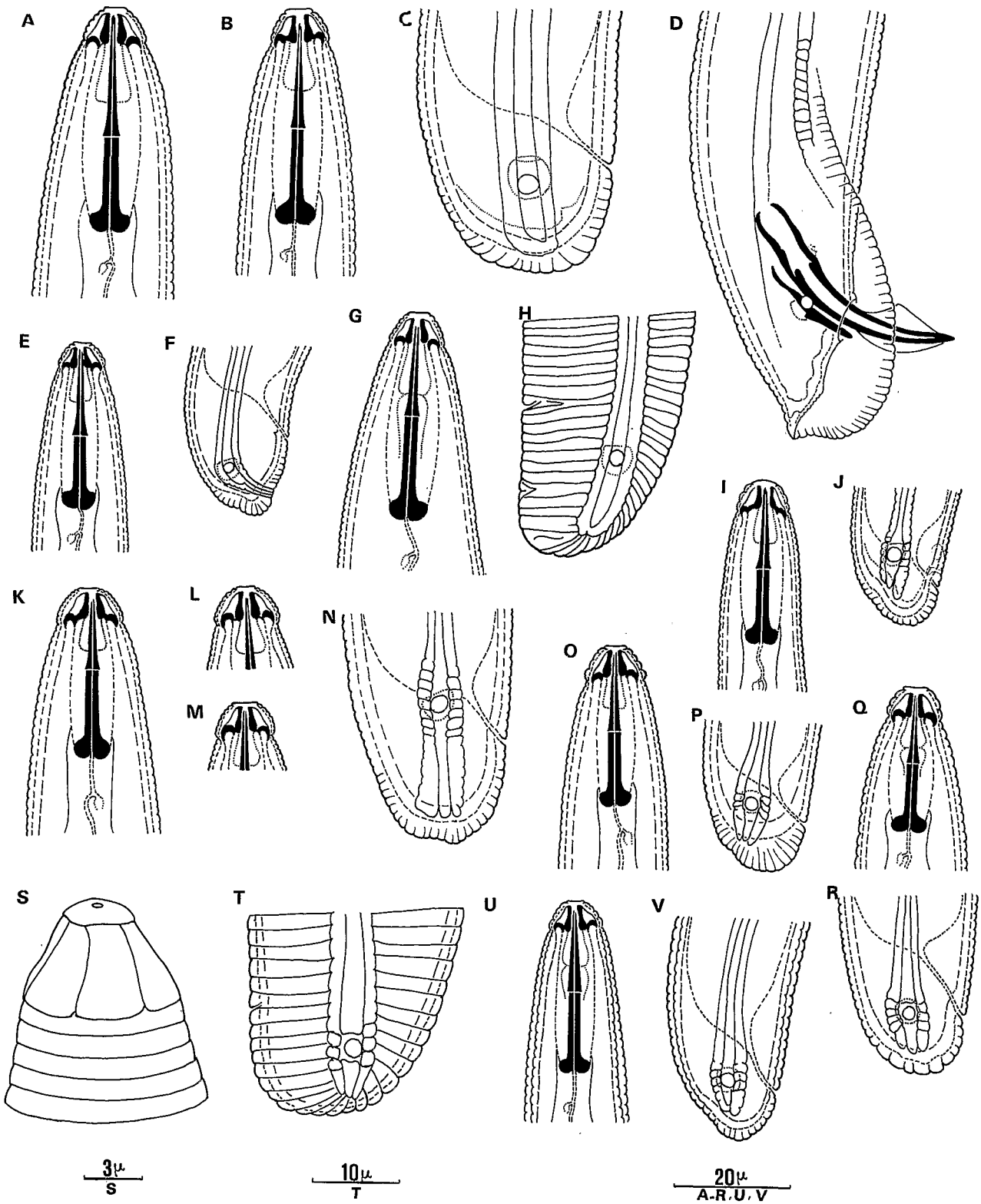

Fig. 8. *Scutellonema tsitsikamense.* Female. A : Anterior end. C : Posterior end; Male. B : Anterior end. D : Posterior end. *Scutellonema sofiae.* Female. E : Anterior end. F : Posterior end. *Scutellonema commune.* Female. G : Anterior end. H : Posterior end. *Scutellonema conicephalum.* Female. I : Anterior end. J : Posterior end. *Scutellonema clathricaudatum.* Female. K, L, M : Anterior end. N : Posterior end. *Scutellonema brachyurus.* Female. O : Anterior end. P : Posterior end. *Scutellonema brevistyletum.* Female. Q : Anterior end. R : Posterior end. *Scutellonema truncatum.* Female. S : Anterior end. T : Posterior end. *Scutellonema unum.* Female. U : Anterior end. V : Posterior end.

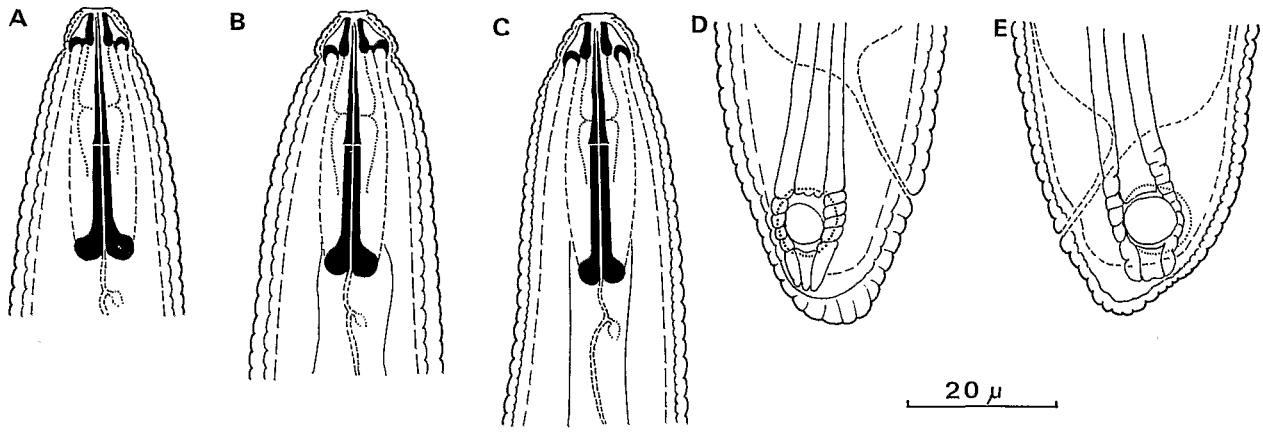

Fig. 9. *Scutellonema magniphasma.* Female (paratype). A, B : Anterior end. D : Posterior end; Female (syn. *S. naveenum*). C : Anterior end. E : Posterior end.

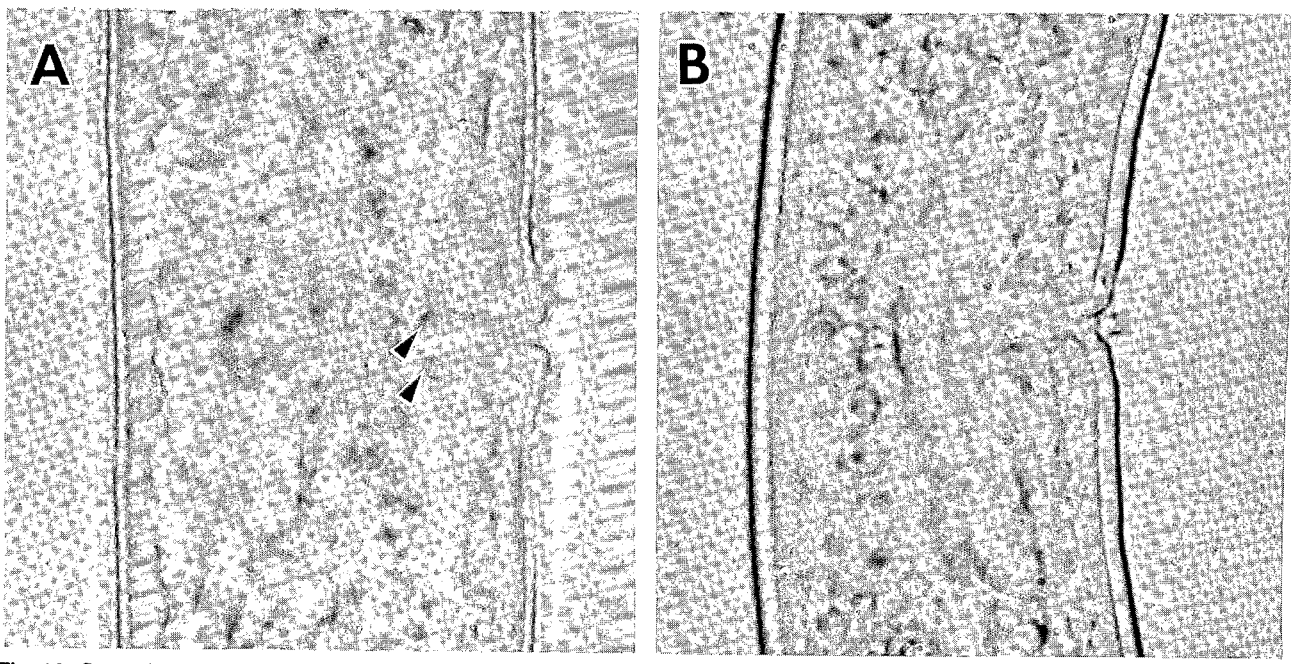

Fig. 10. Lateral view of vaginal region in A : *Scutellonema bradys* and, B : *S. cavenessi.* Arrows indicate position of vaginal glands.