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A polytomous key for the identification of species of the family Trichodoridae Thorne, 1935 (Nematoda: Triplonchida)

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Summary – The species of the family Trichodoridae are listed with their current taxonomical status. A polytomous key to males and females of the 90 species of the family is presented. To avoid misidentification at genus level, the species of the four genera of the family are treated as a single group in the present polytomous key.

Résumé – ***Clef polytomique d'identification des espèces de la famille des Trichodoridae Thorne, 1935 (Nematoda: Triplonchida)*** – Liste est donnée des espèces de la famille Trichodoridae avec leur statut taxinomique actuel. Une clef polytomique est présentée pour les mâles et les femelles des 90 espèces de la famille. Pour éviter des erreurs d'identification au niveau générique, les espèces des quatre genres dans la famille sont traitées comme un seul ensemble dans la présente clef.

Key-words: identification, nematodes, polytomous key, Trichodoridae.

The family Trichodoridae Thorne, 1935 is a small family. At present, it includes only 90 species and subspecies in four genera: *Allotrichodorus* Rodriguez-Montessoro, Sher & Siddiqi, 1978, *Monotrichodorus* Andrássy, 1976, *Trichodorus* Cobb, 1893, and *Paratrichodorus* Siddiqi, 1974. Siddiqi (1974) proposed three subgenera within the genus *Paratrichodorus, viz.*: *Paratrichodorus*, *Atlantadorus,* and *Nanidorus*, and he subsequenly raised these subgenera to genus level (Siddiqi, 1980). The genera *Atlantadorus* and *Nanidorus* were rejected by several reviewers, but were reinstated at the subgeneric level by Ahmad (1989) and Jairajpuri and Ahmad (1992). This viewpoint is not followed here and the Trichodoridae is considered to comprise only four genera without any subgenera. In spite of this rather small number of taxa, the identification to genus and species is not always easy. At the generic level, for example, even the most important diagnostic features may overlap between the genera and, especially in females, the features are not always conclusive:

- the number of genital branches and the relative position of the vulva differentiate didelphic from monodelphic genera; in the monodelphic species *Allotrichodorus westindicus* (Rodriguez-Montessoro, Sher & Siddiqi, 1978) Rashid, De Waele & Coomans, 1986, the position of the vulva is far more anterior than in the other monodelphic species and more comparable with that of didelphic species;
- the length of vagina as a proportion of the corresponding body diameter differentiates the didelphic genera *Trichodorus* (length of vagina about half the corresponding body width) and *Paratrichodorus* (length of vagina about 30% of corresponding body width) from each other; a number of *Trichodorus* species, however, have a very short vagina similar to that of *Paratrichodorus* species;
- the dimensions of the vaginal sclerotizations have some taxonomic value at generic level especially in relation to the didelphic genera: *Paratrichodorus* has small sclerotized pieces and *Trichodorus* has well developed pieces; however, about 30% of the *Trichodorus* species have small to minute sclerotized pieces similar to those of *Paratrichodorus* species;
- "inflation" of the body cuticle upon fixation as a differential feature between *Trichodorus* (not- or little swollen) and *Paratrichodorus* (clearly swollen) is often misleading;
- the presence or absence of caudal alae (= bursa) in males, used to differentiate *Trichodorus/Monotrichodorus* (without caudal alae) from *Paratrichodorus/Allotrichodorus* (with caudal alae), also has several exceptions: *Trichodorus cylindricus* and *T. paracedarus* both with caudal alae, and, *e.g., T. sparsus*, *T. ele-fjohnsoni*, *T. nanjingensis*, *T. vandenbergae* and *Mono-trichodorus sacchari* with rudimentary caudal alae (Decraemer, 1995); conversely, the caudal alae of several species in *Paratrichodorus* and *Allotrichodorus* are little developed.

To promote correct species identification and to avoid mistakes from being made at the very start of the identification process, *i.e.*, identification to the genus level, the species of the four genera of the family Trichodoridae are treated as a single group in the present polytomous key. Therefore, a single species list, arranged in alphabetical order, is presented for the whole family. The most important diagnostic features (spicule shape in male, vagina and vaginal sclerotized pieces in female) are presented also in alphabetical order of specific names in the illustrations (Figs 6-13).

In a recent paper (Decraemer & Baujard, 1998), *P. faisalabadensis* and *P. psidii* were proposed as junior synonyms of *P. mirzai*.

Species of the family Trichodoridae
(adapted from Decraemer, 1995)

P. acaudatus (Siddiqi, 1960) Siddiqi, 1974
= *T. acaudatus* Siddiqi, 1960
= *P. (P.) acaudatus* (Siddiqi, 1960) Siddiqi, 1974
P. acutus (Bird, 1967) Siddiqi, 1974
= *T. acutus* Bird, 1967
= *P. (N.) acutus* (Bird, 1967) Siddiqi, 1974
= *Nanidorus acutus* (Bird, 1967) Siddiqi, 1974
T. aequalis Allen, 1957
P. alleni (Andrássy, 1968) Siddiqi, 1974
= *T. alleni* Andrássy, 1968
= *P. (P.) alleni* (Andrássy, 1968) Siddiqi, 1974
P. allius (Jensen, 1963) Siddiqi, 1974
= *T. allius* Jensen, 1963
= *P. (P.) allius* (Jensen, 1963) Siddiqi, 1974
= *P. tansaniensis* Siddiqi, 1974
T. altaicus De Waele & Brzeski, 1994
P. anemones (Loof, 1965) Siddiqi, 1974
= *T. anemones* Loof, 1965
= *P. (A.) anemones* (Loof, 1965) Siddiqi, 1974
= *Atlantadorus anemones* (Loof, 1965) Siddiqi, 1974
P. anthurii Baujard & Germani, 1985 (mispelled *P. anthuriae* in Hunt, 1993)
T. aquitanensis Baujard, 1980
P. atlanticus (Allen, 1957) Siddiqi, 1974
= *T. atlanticus* Allen, 1957
= *P. (A.) atlanticus* (Allen, 1957) Siddiqi, 1974
= *A. atlanticus* (Allen, 1957) Siddiqi, 1974
T. azorensis Almeida, De Waele, Santos & Sturhan, 1989
T. beirensis Almeida, De Waele, Santos & Sturhan, 1989
T. borai Rahman, Jairajpuri & Ahmad, 1985
T. borneoensis Hooper, 1962
A. brasiliensis Rashid, De Waele & Coomans, 1986
T. californicus Allen, 1957
A. campanullatus Rodriguez-Montessoro, Sher & Siddiqi, 1978
T. carlingi Bernard, 1992
P. catharinae Vermeulen & Heyns, 1983
= *P. (A.) catharinae* Vermeulen & Heyns,1983
T. cedarus Yokoo, 1964
= *T. kurumeensis* Yokoo, 1966
= *T. longistylus* Yokoo, 1964
T. complexus Rahman, Jairajpuri & Ahmad, 1985
T. coomansi De Waele & Carbonell, 1983
T. cottieri Clark, 1963
T. cylindricus Hooper, 1962
P. delhiensis (Khan, Saha & Lal, 1993) Siddiqi, 1974
= *Atlantadorus delhiensis* Khan, Saha & Lal, 1993
T. dilatatus Rodriguez-Montessoro & Bell, 1978
T. eburneus De Waele & Carbonell, 1983
T. elefjohnsoni Bernard, 1992
T. elegans Allen, 1957
T. giennensis Decraemer, Roca, Castillo, Peña-Santiago & Gomez-Barcina, 1993
P. grandis Rodriguez-Montessoro & Bell, 1978
= *P. (A.) grandis* Rodriguez-Montessoro & Bell, 1978
= *Atlantadorus grandis* (Rodriguez-Montessoro & Bell, 1978) Siddiqi, 1974
A. guttatus Rodriguez-Montessoro, Sher & Siddiqi, 1978
P. hispanus Roca & Arias, 1986
T. hooperi Loof, 1973
T. intermedius Rodriguez-Montessoro & Bell, 1978
T. kilianae Decraemer & Marais, 1993
P. lobatus (Colbran, 1965) Siddiqi, 1974
= *T. lobatus* Colbran, 1965
= *T. clarki* Yeates, 1967
= *P. (P.) lobatus* (Colbran, 1965) Siddiqi, 1974
A. longispiculis Rashid, De Waele & Coomans, 1986
A. loofi Rashid, De Waele & Coomans, 1986
T. lusitanicus Siddiqi, 1974
P. macrostylus Popovici, 1989
T. magnus Decraemer & Marais, 1993
P. meyeri De Waele & Kilian, 1992
P. minor (Colbran, 1956) Siddiqi, 1974
= *T. minor* Colbran, 1956
= *P. (N.) minor* (Colbran, 1956) Siddiqi, 1974
= *N. minor* (Colbran, 1956) Siddiqi, 1974
= *T. christiei* Allen, 1957
= *P. (N.) christiei* (Allen, 1957) Siddiqi, 1974
= *N. christiei* (Allen, 1957) Siddiqi, 1974
= *T. obesus* Razjivin & Penton, 1975
= *P. (N.) obesus* (Razjivin & Penton, 1975) Rodriguez-Montessoro & Bell, 1978
= *P. obesus* (Razjivin & Penton, 1975) Rodriguez-Montessoro & Bell, 1978
T. minzi De Waele & Cohn, 1992
P. mirzai (Siddiqi, 1960) Siddiqi, 1974
= *T. mirzai* Siddiqi, 1960
= *P. (P.) mirzai* (Siddiqi, 1960) Siddiqi, 1974

= *T. musambi* Edward & Misra, 1970
= *P. faisalabadensis* Nasira & Maqbool, 1994
= *P. psidii* Nasira & Maqbool, 1994
M. monohystera monohystera (Allen, 1957) Andrássy, 1976
= *T. monohystera* Allen, 1957
= *M. acuparvus* Siddiqi, 1991
= *M. parvus* Siddiqi, 1991
= *M. proporifer* Siddiqi, 1991
M. monohystera vangundyi Rodriguez-Montessoro, Sher & Siddiqi, 1978
= *M. vangundyi* Rodriguez-Montessoro, Sher & Siddiqi, 1978
M. muliebris Andrássy, 1989
T. nanjingensis Liu & Cheng, 1990
P. nanus (Allen, 1957) Siddiqi, 1974
= *T. nanus* Allen, 1957
= *P. (N.) nanus* (Allen, 1957) Siddiqi, 1974
= *N. nanus* (Allen, 1957) Siddiqi, 1974
T. obscurus Allen, 1957
= *T. primitivus apud* Thorne, 1939; Goodey, 1951
T. obtusus Cobb, 1913
= *T. proximus* Allen, 1957
T. orientalis De Waele & Hashim, 1984
P. orrae Decraemer & Reay, 1991
P. pachydermus (Seinhorst, 1954) Siddiqi, 1974
= *T. pachydermus* Seinhorst, 1954
= *P. (A.) pachydermus* (Seinhorst, 1954) Siddiqi, 1974
= *A. pachydermus* (Seinhorst, 1954) Siddiqi, 1974
T. pakistanensis Siddiqi, 1962
= *T. litchi* Edward & Misra, 1970
T. paracedarus Xu & Decraemer, 1995
P. paramirzai Siddiqi, 1991
P. paraporosus Khan, Jairajpuri & Ahmad, 1989
T. parorientalis Decraemer & Kilian, 1992
T. paucisetosus Bernard, 1992
T. persicus De Waele & Sturhan, 1987
T. petrusalberti De Waele, 1988
T. philipi De Waele, Meyer & Van Mieghem, 1990
P. porosus (Allen, 1957) Siddiqi, 1974
= *T. porosus* Allen, 1957
= *P. (A.) porosus* (Allen, 1957) Siddiqi, 1974
= *A. porosus* (Allen, 1957) Siddiqi, 1974
= *T. bucrius* Lordello & Zamith, 1958
T. primitivus (de Man, 1880) Micoletzky, 1922
= *Dorylaimus primitivus* de Man, 1880
= *T. castellanensis* Arias Delgado, Jiminez Millan & Lopez Pedregal, 1965
= *T. mirabilis* Ivanova, 1977
P. queenslandensis Decraemer & Reay, 1991
T. reduncus Siddiqi & Sharma, 1995
P. renifer Siddiqi, 1974
= *P. (N.) renifer* Siddiqi, 1974
= *N. renifer* Siddiqi, 1974
P. rhodesiensis (Siddiqi & Brown, 1965) Siddiqi, 1974
= *T. rhodesiensis* Siddiqi & Brown, 1965
= *P. (P.) rhodesiensis* (Siddiqi, & Brown, 1965) Siddiqi, 1974
T. rinae Vermeulen & Heyns, 1984
M. sacchari Baujard & Germani, 1985
P. sacchari Vermeulen & Heyns, 1983
= *P. (A.) sacchari* Vermeulen & Heyns, 1983
M. samericus Marais, Swart & Heyns, 1995
T. sanniae Vermeulen & Heyns, 1984
A. sharmae Rashid, De Waele & Coomans, 1986
T. similis Seinhorst, 1963
T. sparsus Szczygiel, 1968
T. taylori De Waele, Mancini, Roca & Lamberti, 1982
P. teres (Hooper, 1962) Siddiqi, 1974
= *T. teres* Hooper, 1962
= *P. (P.) teres* (Hooper, 1962) Siddiqi, 1974
= *T. flevensis* Kuiper & Loof, 1962
T. tricaulatus Shishida, 1979
P. tunisiensis (Siddiqi, 1963) Siddiqi, 1974
= *T. tunisiensis* Siddiqi, 1963
= *P. (P.) tunisiensis* (Siddiqi, 1963) Siddiqi, 1974
T. vandenbergae De Waele & Kilian, 1992
T. variopapillatus Hooper, 1972
T. velatus Hooper, 1972
T. viruliferus Hooper, 1963
P. weischeri Sturhan, 1985
= *P. (P.) weischeri* Sturhan, 1985
A. westindicus (Rodriguez-Montessoro, Sher & Siddiqi, 1978) Rashid, De Waele & Coomans, 1986
= *P. (N.) westindicus* Rodriguez-Montessoro, Sher & Siddiqi, 1978
= *N. westindicus* Rodriguez-Montessoro, Sher & Siddiqi, 1978.
T. yokooi Eroshenko & Teplyakov, 1975

Characters and codes used in the polytomous key

MALES

A. Body length:
1. < 700 µm
2. 700-1000 µm
3. > 1000 µm

B. Onchiostyle length:
1. < 40 µm
2. 40-60 µm
3. 61-90 µm
4. > 90 µm

C. Spicule length:
1. < 40 µm
2. 40-60 µm
3. 61-80 µm
4. > 80 µm

D. Number of ventromedian cervical papillae (0, 1, 2, 3, 4) (Fig. 1 A-E)

E. Number of ventromedian cervical papillae in the onchiostyle region (0, 1, 2) (Fig. 1 A, B, E)
F. Number of ventromedian precloacal supplements (1, 2, 3, 4, 5)
G. Number of ventromedian supplements at the level of retracted spicules. (0, 1, 2, 3)
H. Position of secretory-excretory pore:
1. Near base of the onchiostyle (Fig. 1 B)
2. Opposite the isthmus (Fig. 1 E)
3. Along the anterior two-thirds of the pharyngeal bulb (Fig. 1 C, D)
4. Near the base of the pharynx (posterior third) or along anterior part of intestine (Fig. 1 A)

I. Type of pharyngo-intestinal junction (can be determined reliably only in specimens with pharynx not compressed due to rough fixation):
1. Pharyngeal bulb offset (Fig.2 G)
2. Pharynx overlaps intestine (sub)ventrally (Fig. 2 D)
3. Intestine overlaps pharynx antero-dorsally (Fig. 2 E)
4. Both pharynx and intestine overlap each other (Fig. 2 F)

J. Spicule, general shape:
1. Nearly straight (Fig. 3 A)
2. Slightly curved (Fig. 3 B)
3. Proximal end clearly curved (Fig. 3 C)
4. Distal end clearly curved (Fig. 3 D)
5. Markedly and regularly curved (Fig. 3 E).

K. Spicule, shape of manubrium:
1. Offset from shaft, long and wide (Fig. 3 F)
2. Offset from shaft, knob-like or short and widened (not offset by lack of striae alone) (Fig. 3 G)
3. Not offset from shaft; manubrium without capitular extension (Fig. 3 H)
4. Not offset from shaft; manubrium with additional capitular extension (Fig. 3 I)

L. Spicule, shape of the shaft:
1. Conical (Fig. 3 J)
2. More or less cylindrical, thin or wide (Fig. 3 K)
3. Enlarged in posterior part (Fig. 3 D, L)
4. Constriction or narrower part present, usually at mid-length (Fig. 3 M, N)
5. Septum present at mid-shaft, anterior to constriction (Fig. 3 O)
6. Distal tip bifid (= divided by a septum) (Fig. 3 P, M)
7. Anterior part with irregular outline (kinking) (Fig. 3 Q)

M. Spicules, ornamentations:
1. Shaft smooth, without any striation (Fig. 3 R)
2. Shaft with continuous fine striation except at extremities (Fig. 3 S)
3. Shaft with striation except at mid-point (Fig. 3 T)
4. Shaft with striation only in distal half (Fig. 3 U)
5. Shaft with striation only in proximal half (Fig. 3 V)
6. Shaft with bristles (Fig. 3 W)
7. Shaft without bristles (Fig. 3 X)
8. Shaft with ventral velum (Fig. 3 D, Y)

N. Sperm cells:
1. Large cell with large sausage-shaped nucleus (Fig. 5 F)
2. Small cell with small oval or rounded nucleus (Fig. 5 G)
3. Thread-like without a distinct nucleus (Fig. 5 H)
4. Very long cell (fusiform) with elongated nucleus (Fig. 5 I)
5. Small cell with small nucleus, fibrillar in appearance (Fig. 5 J)
6. Medium-sized to large rounded cell with round or oval nucleus (Fig. 5 K)

O. Geographic distribution:
1. Europe
2. Africa
3. North America
4. Central and South America
5. Asia (Middle East excluded)
6. Oceania
7. Middle East
8. Worldwide

P. Habitus:
1. Straight or slightly and regularly curved (Fig. 2 B)
2. J-shaped (Fig. 2 C)
3. Only Tail region ventrally curved (state seen in *P. orrae* only; Fig. 2 A)

FEMALES

A. Body length (as in male)
B. Onchiostyle length (as in male)
C. Vulva position:
1 < 75%
2 ≥ 75%

D. Type of genital system:
1. Didelphic (Fig. 5 B-E)
2. Monodelphic (Fig. 5 A)

E. Position of the secretory-excretory pore (as in male)
F. Type of pharyngo-intestinal junction (as in male)
G. Vulva shape (ventral view):
1. Pore
2. Transverse slit (Fig. 4 Y)
3. Longitudinal slit (Fig. 4 X).

H. Shape of vagina (when vaginal constrictor muscles are relaxed):
1. Pear-shaped (conoid) (Fig. 4 A)
2. Rhomboid (Fig. 4 B)
3. Barrel-shaped/cylindrical/rectangular (Fig. 4 C)
4. Quadrangular (Fig. 4 D)
5. Wide rounded/oval (Fig. 4 E)

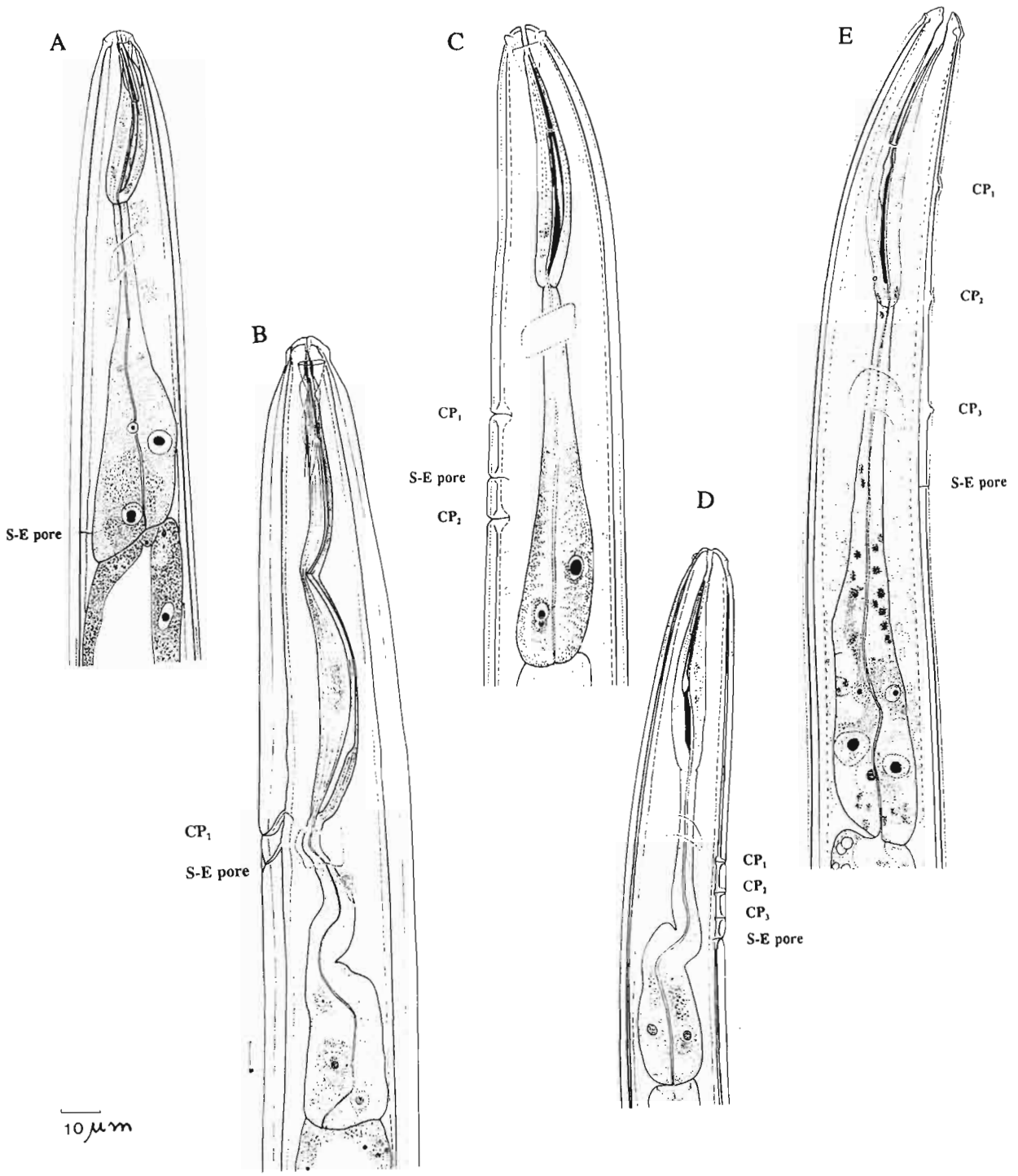

Fig. 1. *Pharyngeal region in male with information on number and position of ventromedian cervical papillae (codes* ***D, E****) and position of secretory-excretory pore (code* ***H****). A:* Paratrichodorus minor *(codes* ***D0, E0, H4****); B:* P. macrostylus *(codes* ***D1, E1, H1****); C:* Trichodorus parorientalis *(codes* ***D2, E0, H3****); D:* T. paracedarus *(codes* ***D3, E0, H3****); E:* T. viruliferus *(codes* ***D3, E2, H2****).*

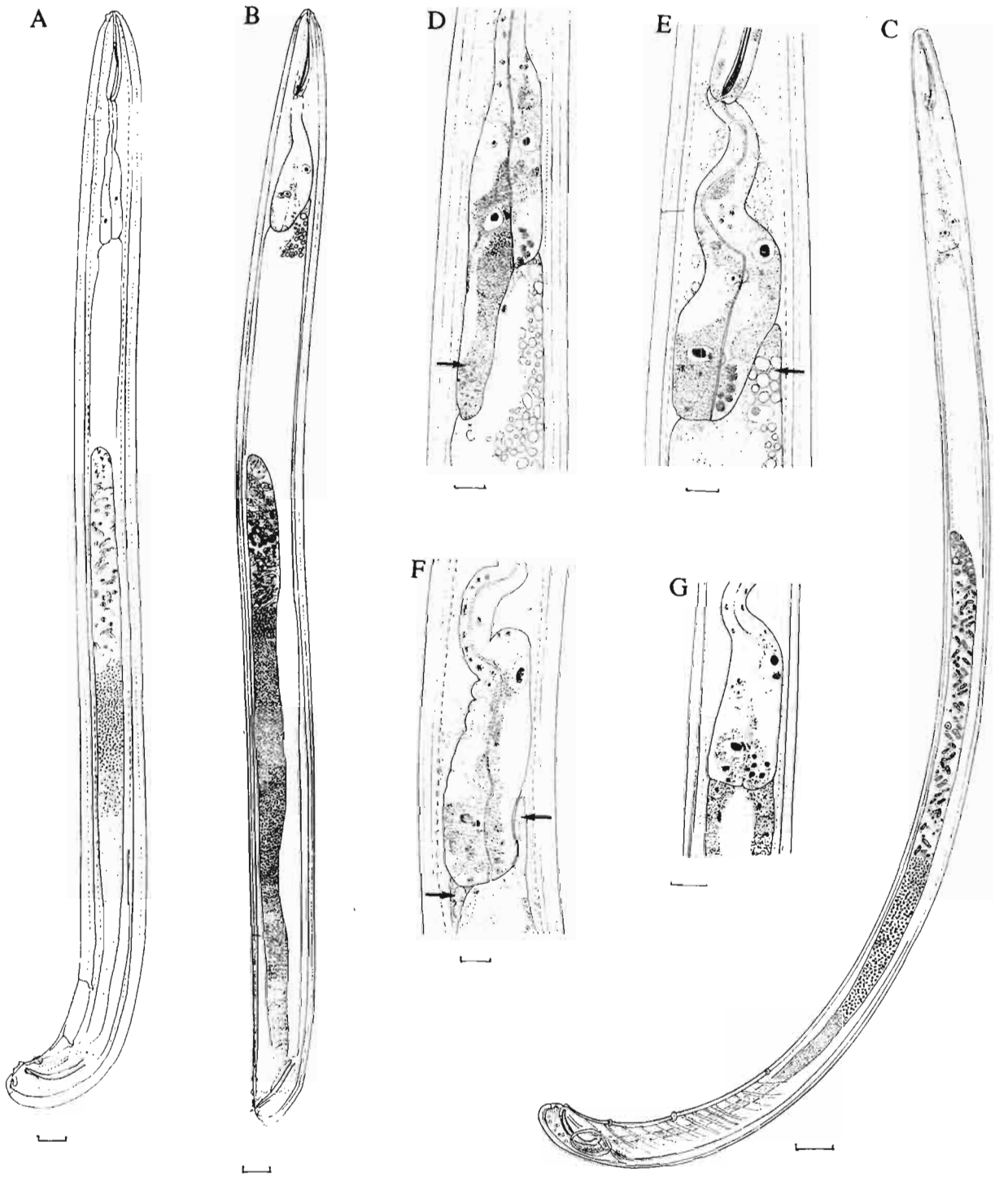

Fig. 2. *Habitus (code* ***P****) and type of pharyngo-intestinal junction (code* ***I****). A:* Paratrichodorus orrae *(code* ***P3****); B:* P. teres *(code* ***P1****); C:* Trichodorus similis *(code* ***P2****); D-G:* P. teres *(codes* ***I2, I3, I4, I1*** *respectively) (Scale bars: A-C=20 μm; D-G = 10 μm).*

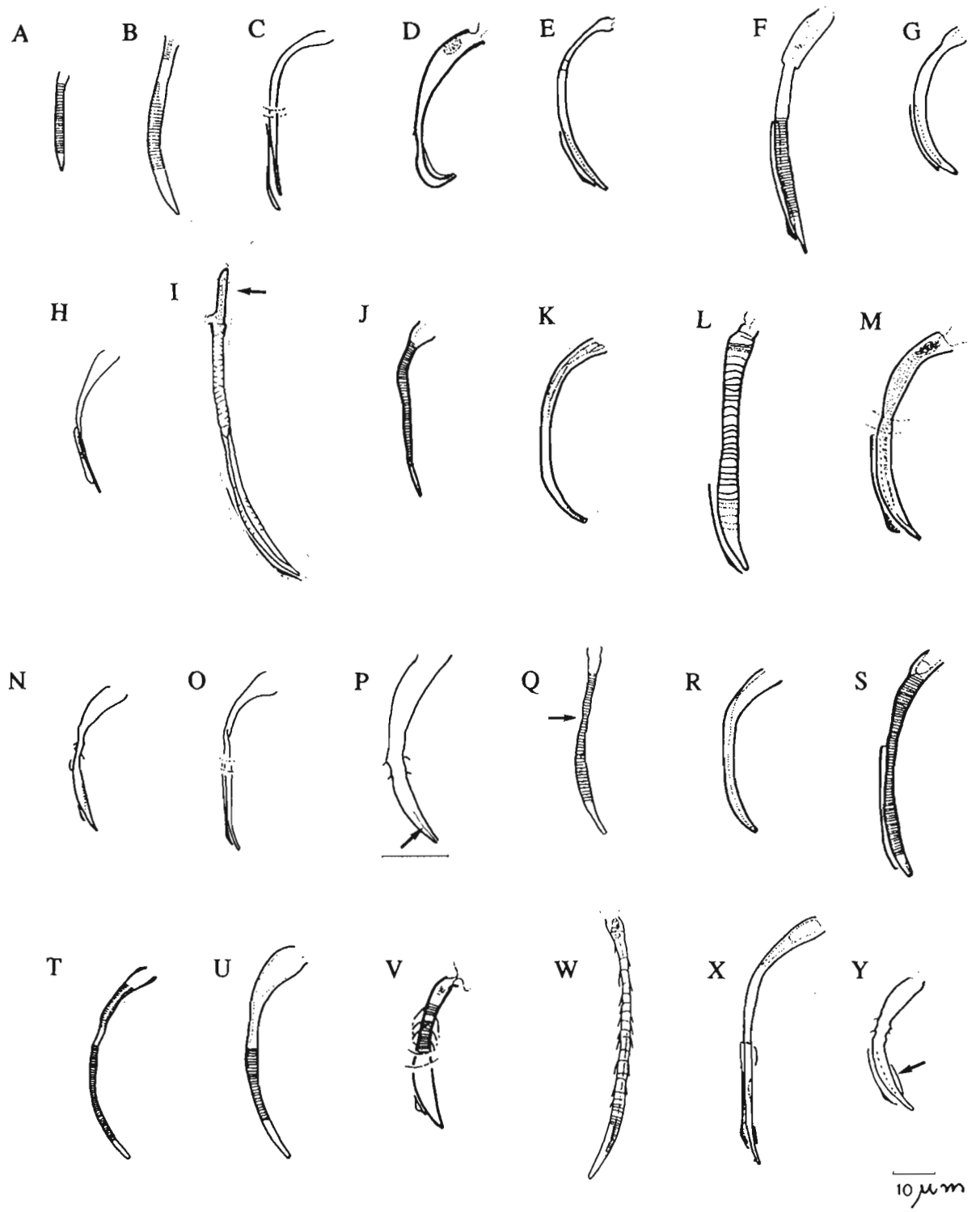

Fig. 3. *Spicules: general shape (code* ***J****), shape of manubrium (code* ***K****), shape of shaft (code* ***L****) and ornamentation (code* ***M****). A:* ***J1****; B:* ***J2****; C:* ***J3****; D:* ***J4, M8****; E:* ***J5****; F:* ***K1****; G:* ***K2****; H:* ***K3****; I:* ***K4****; J:* ***L1****; K:* ***L2****; L:* ***L3****; M:* ***L4, L6****; N:* ***L4****; O:* ***L5****; P:* ***L6****; Q:* ***L6****; R:* ***M1****; S:* ***M2****; T:* ***M3****; U:* ***M4****; V:* ***M5****; W:* ***M6****; X:* ***M7****; Y:* ***M8****.*

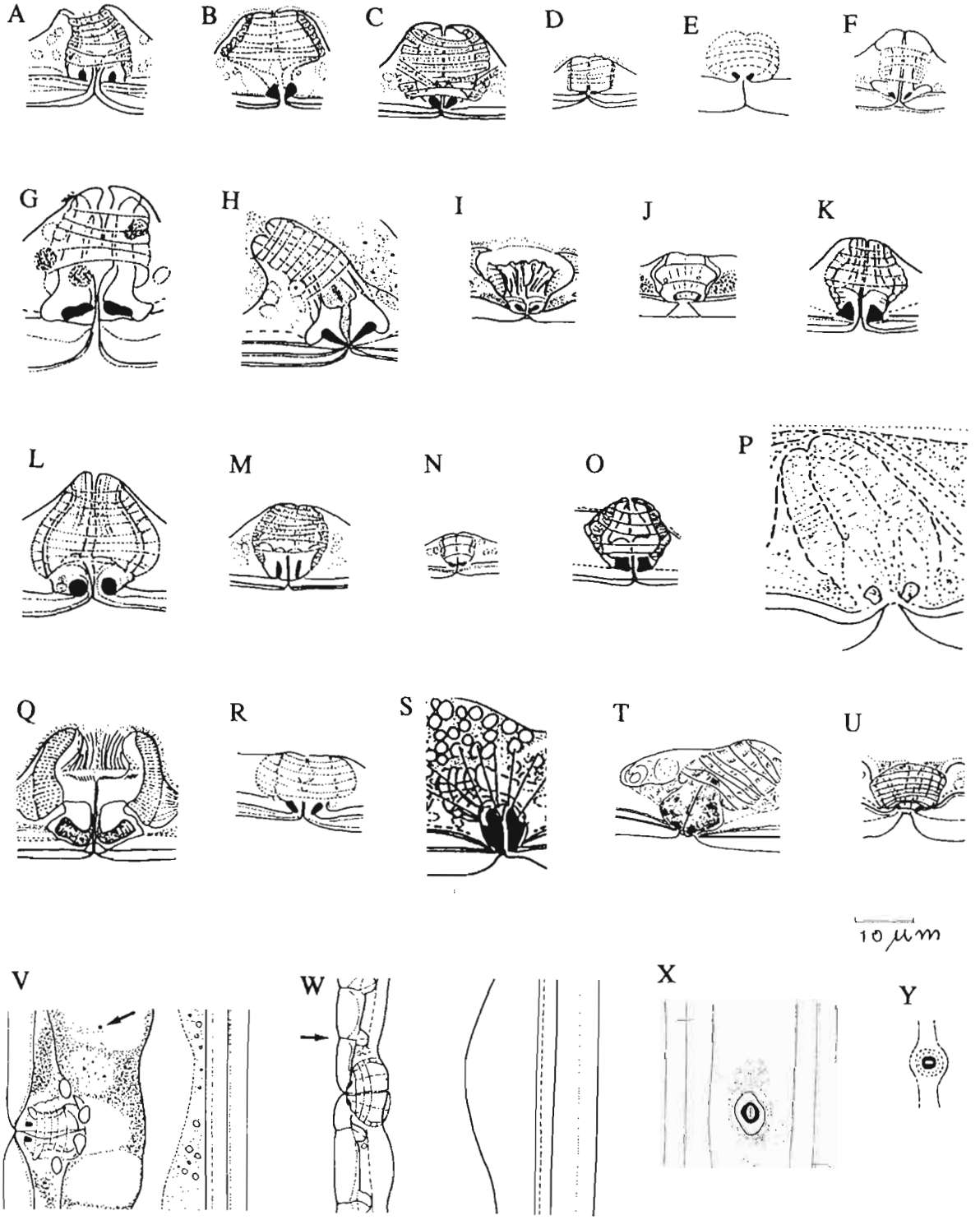

Fig. 4. *Shape of vagina (code* ***M****), shape and orientation of vaginal sclerotized pieces (codes* ***H, J****), type of vulva (code* ***G****). Position of body pores at vulva level (code* ***Q****). A:* ***H1****; B:* ***H2****; C:* ***H3****; D:* ***H4, M2****; E:* ***H5****; F:* ***H6****; G:* ***H7****; H:* ***H7, M1****; I:* ***H8****; J:* ***H9****; K:* ***J1****; L:* ***J2, M4****; M:* ***J3, M3****; N:* ***J4****; O:* ***J5****; P:* ***J6****; Q:* ***J6****; R:* ***J6****; S:* ***J7****; T:* ***J8****; U:* ***J9****; V:* ***Q1****; W:* ***Q3****; X:* ***G3****; Y:* ***G2****.*

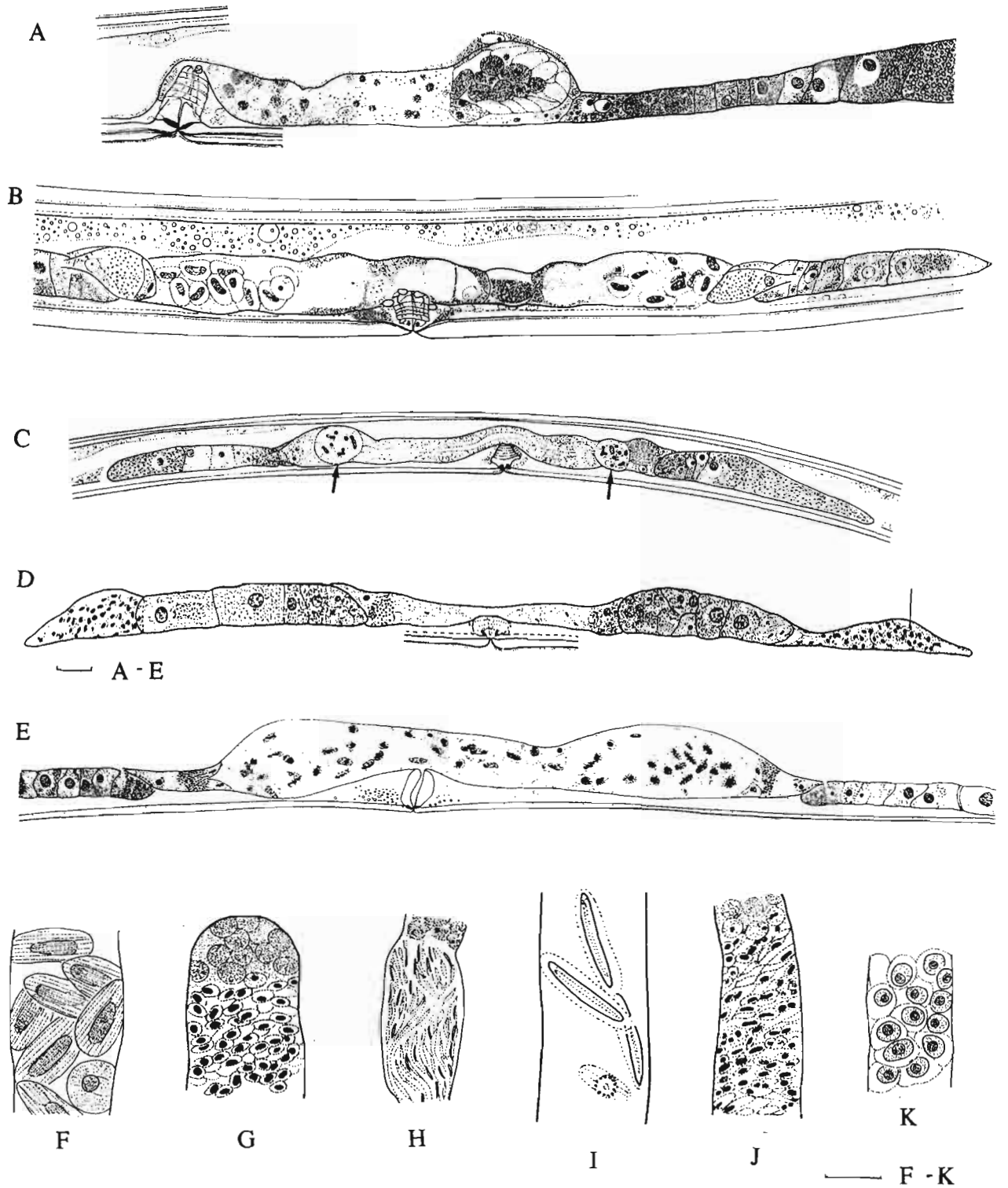

Fig. 5. *Female genital system (codes* ***D, O****) and sperm type (code* ***N****). A:* ***D2, 01****; B:* ***D1, 01****; C:* ***01, D1****; D:* ***D1, 03****; E:* ***D1, 02****; F:* ***N1****; G:* ***N2****; H:* ***N3****; I:* ***N4****; J:* ***N5****; K:* ***N6*** *(Scale bar = 10 µm).*

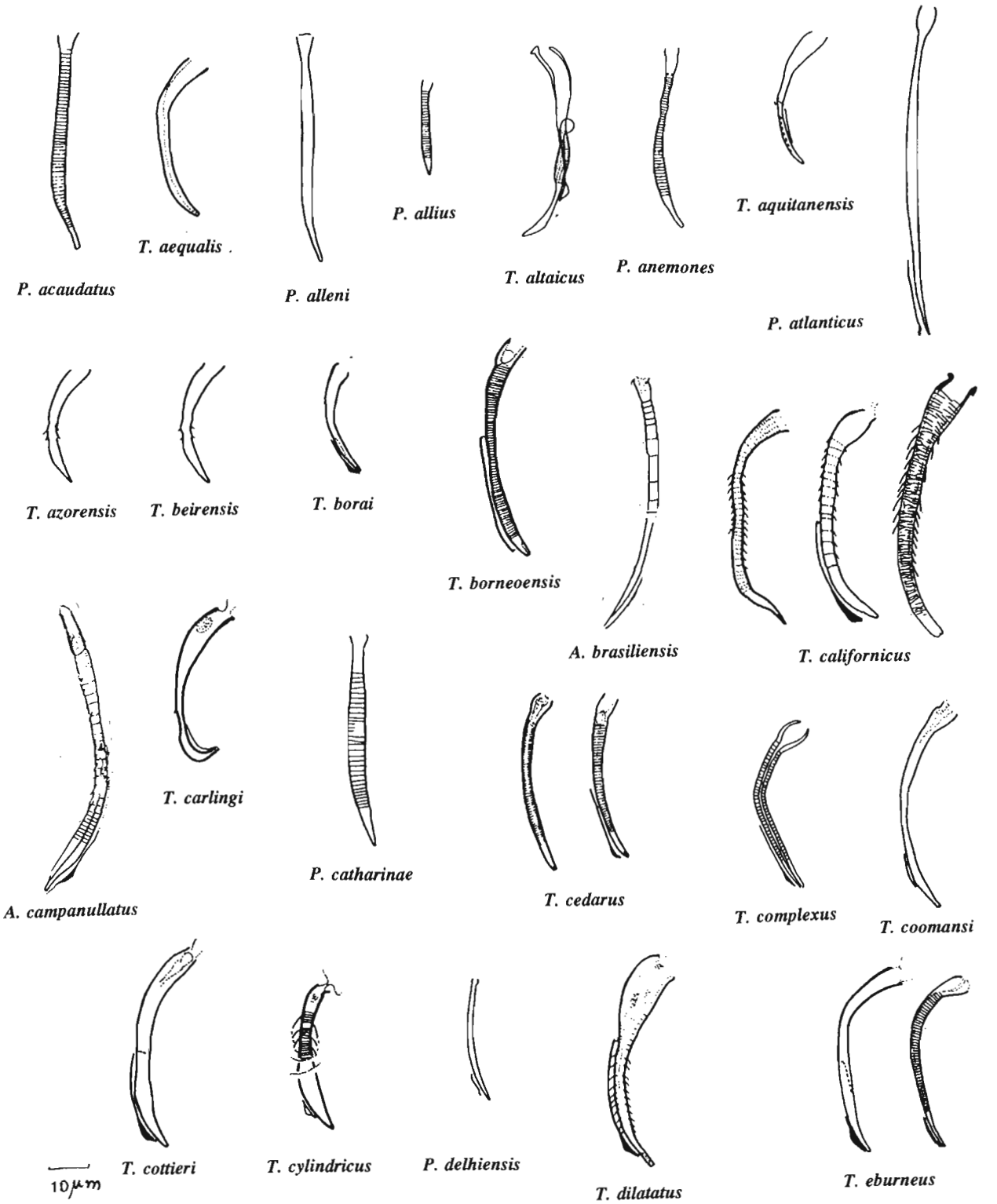

Fig. 6. Spicules shapes.

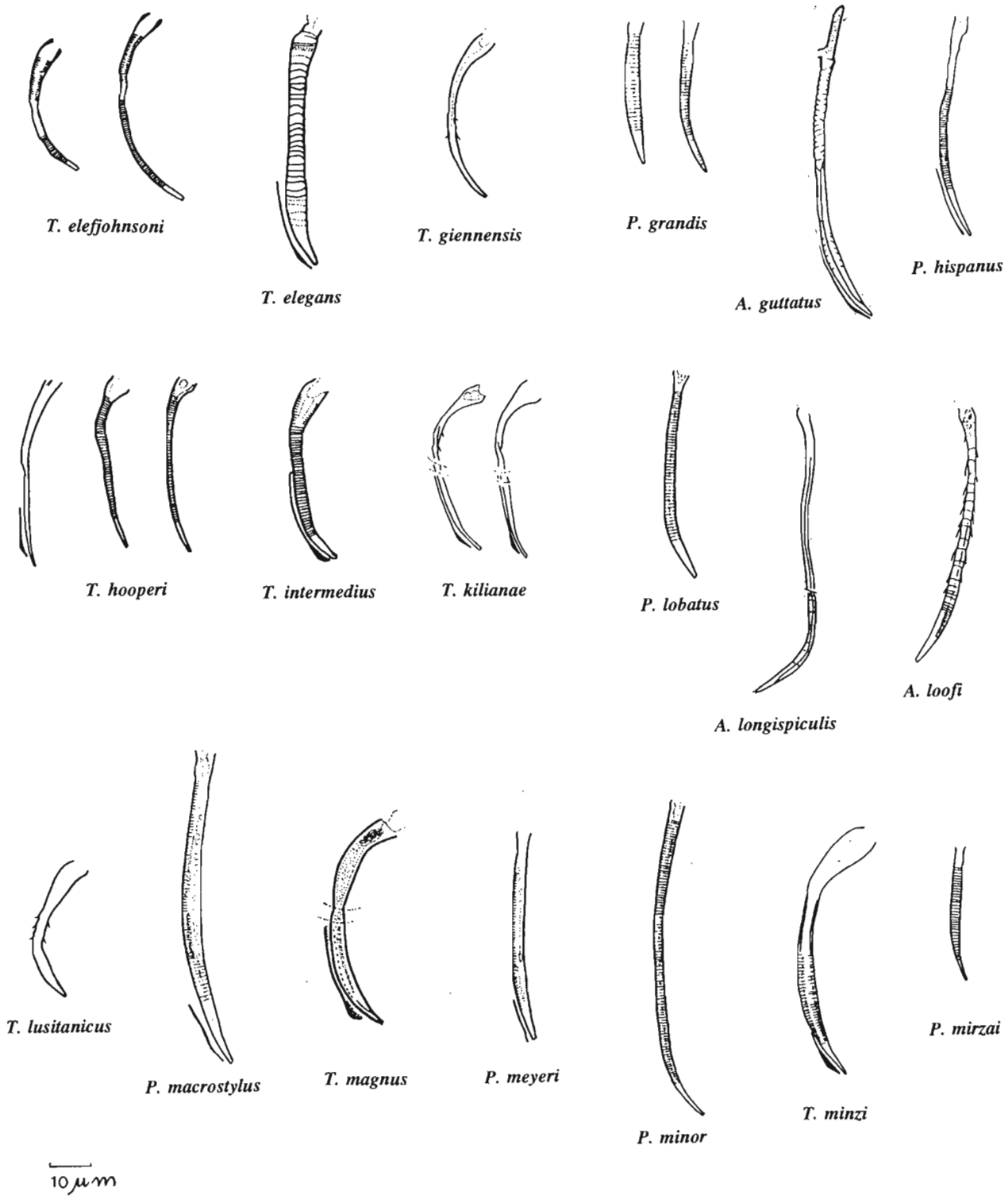

Fig. 7. Spicule shapes.

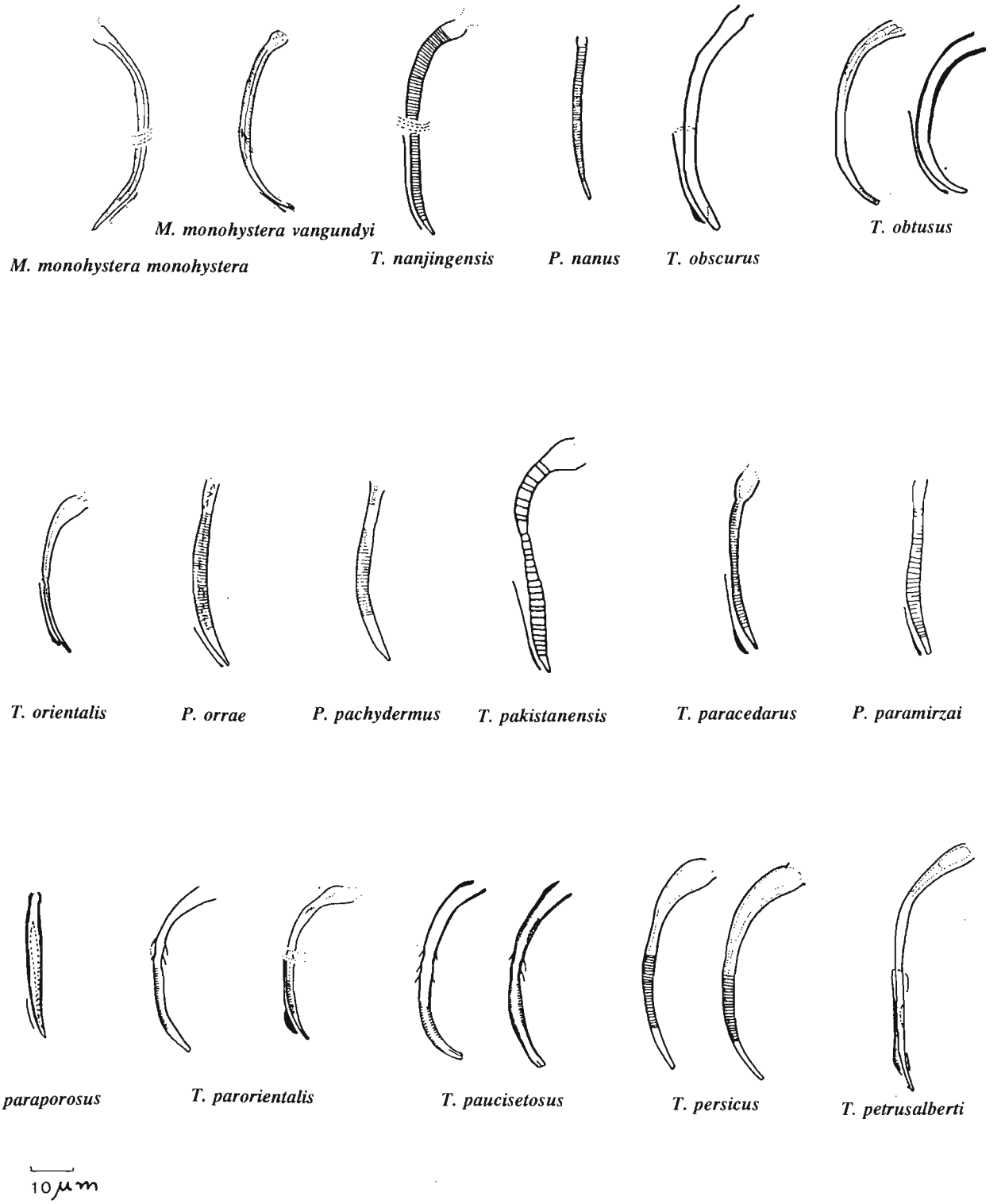

Fig. 8. Spicule shapes.

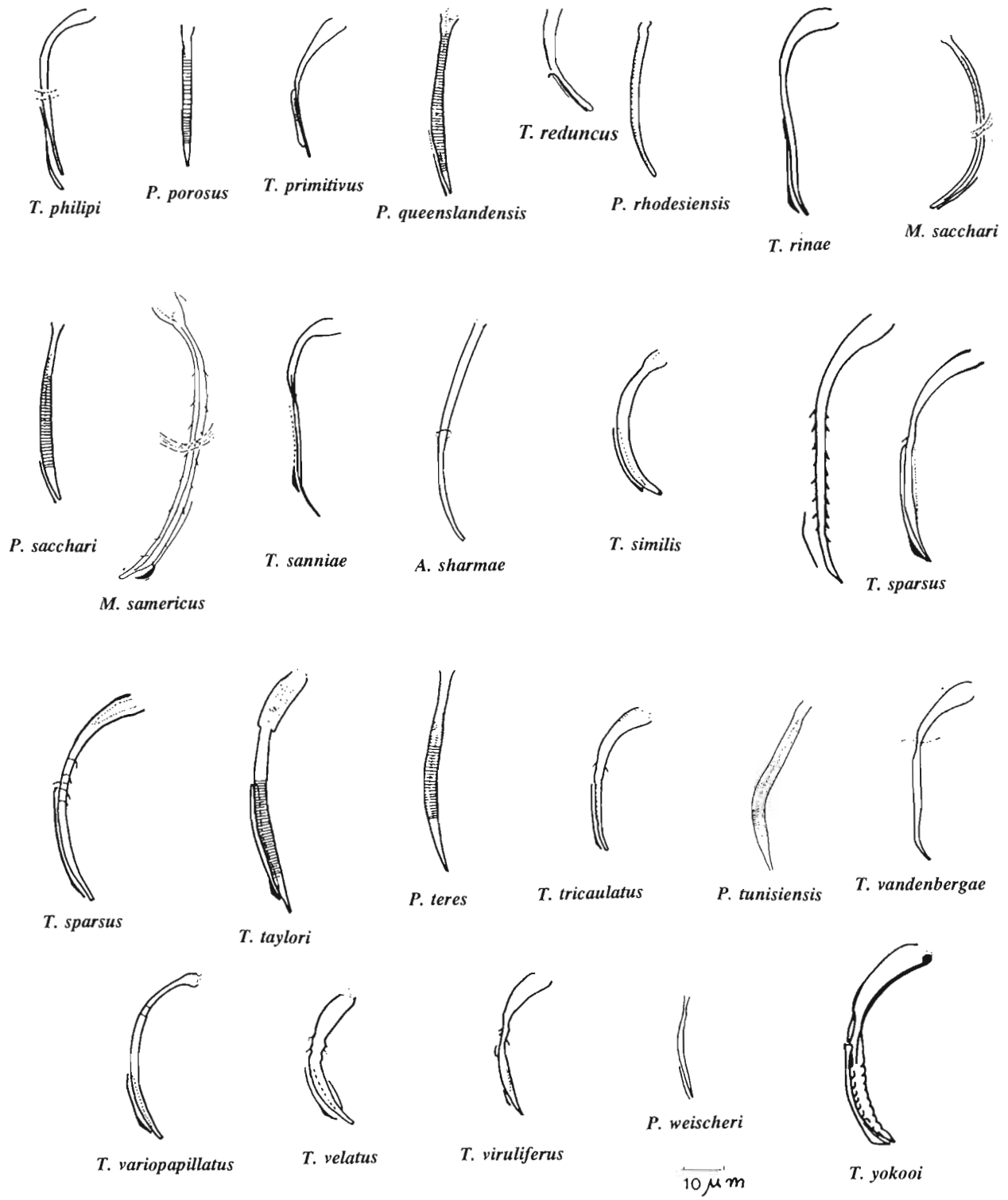

Fig. 9. Spicule shapes.

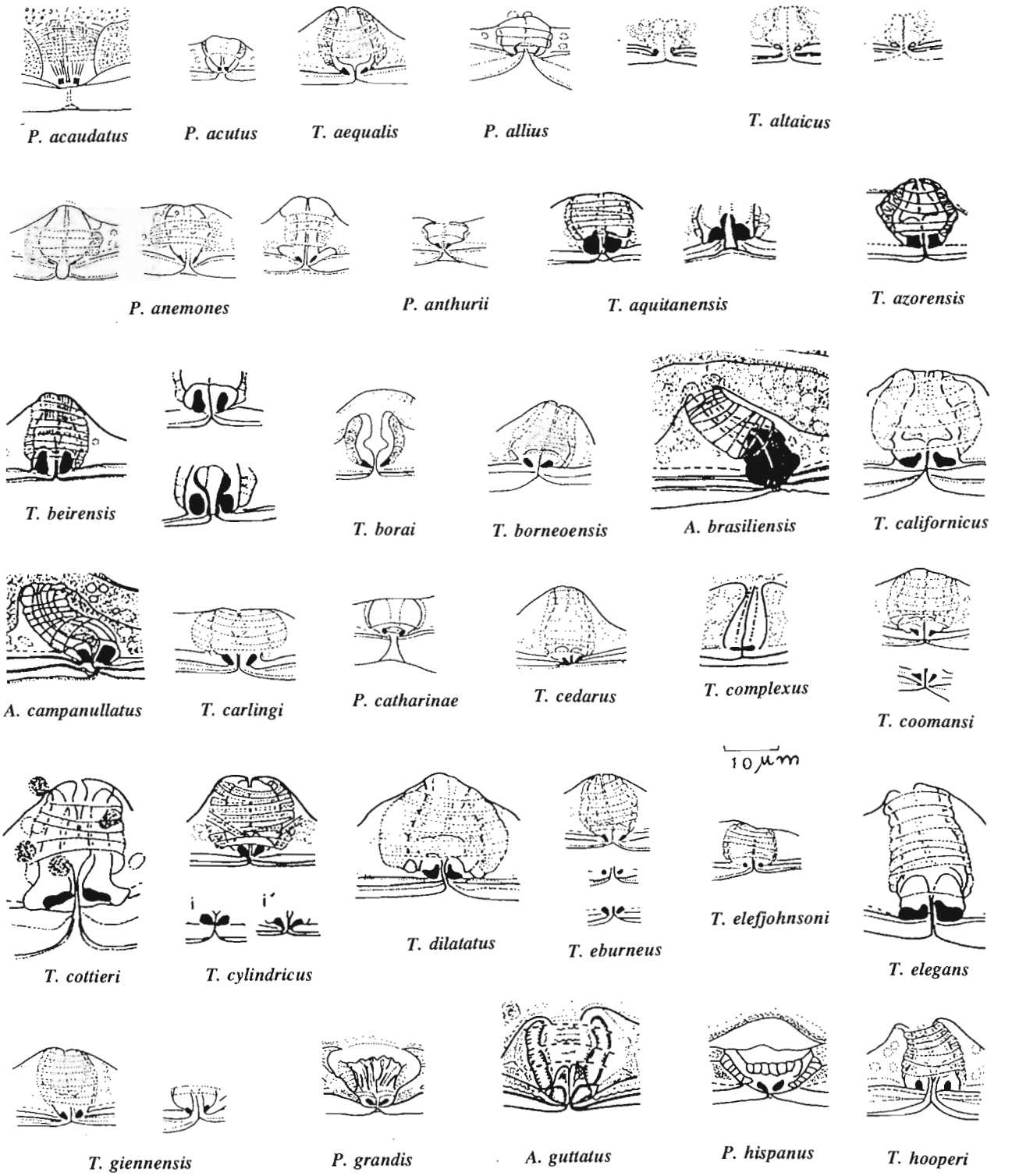

Fig. 10. *Shapes of vagina and vulvar sclerotizations.*

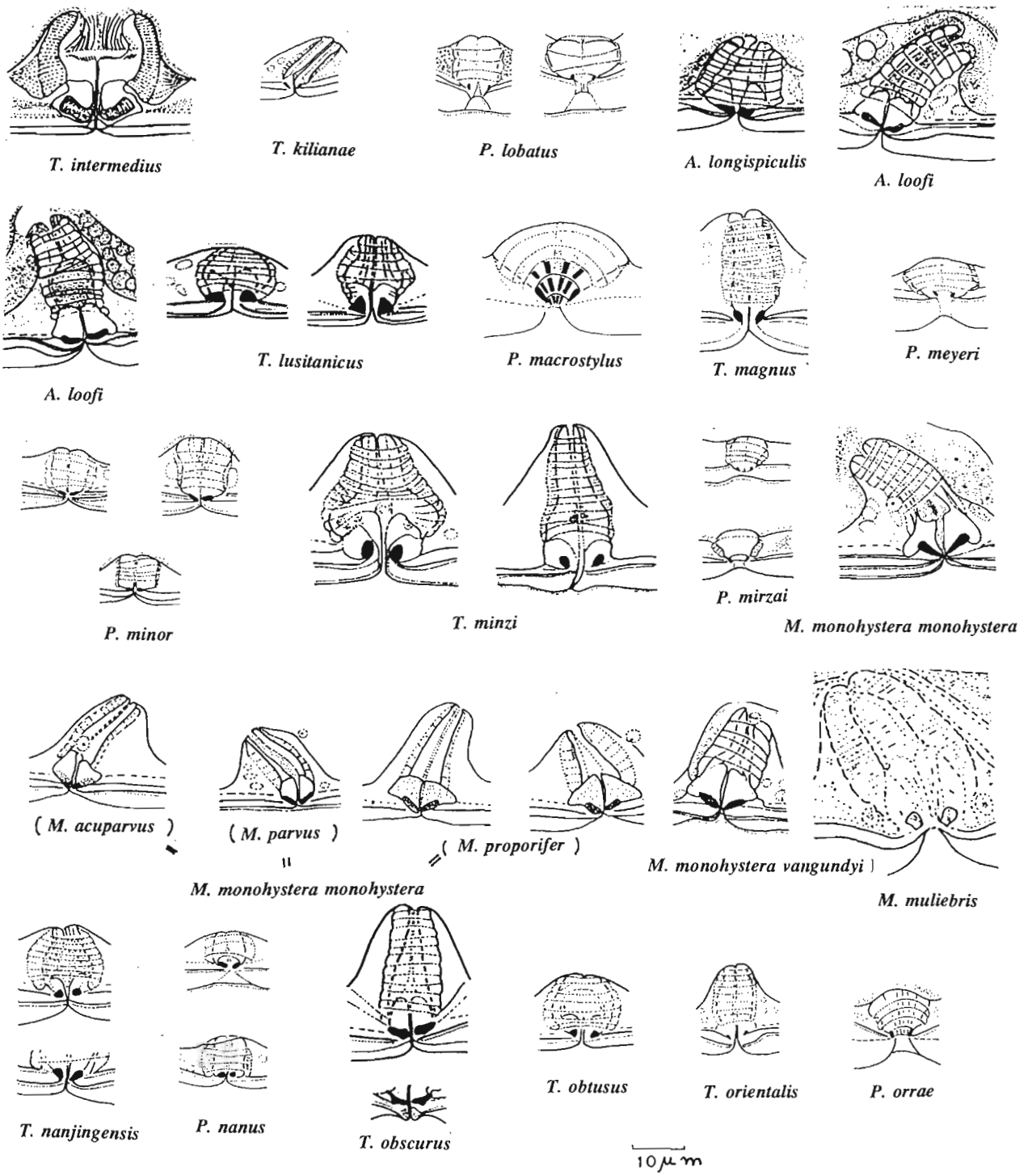

Fig. 11. *Shapes of vagina and vulvar sclerotizations.*

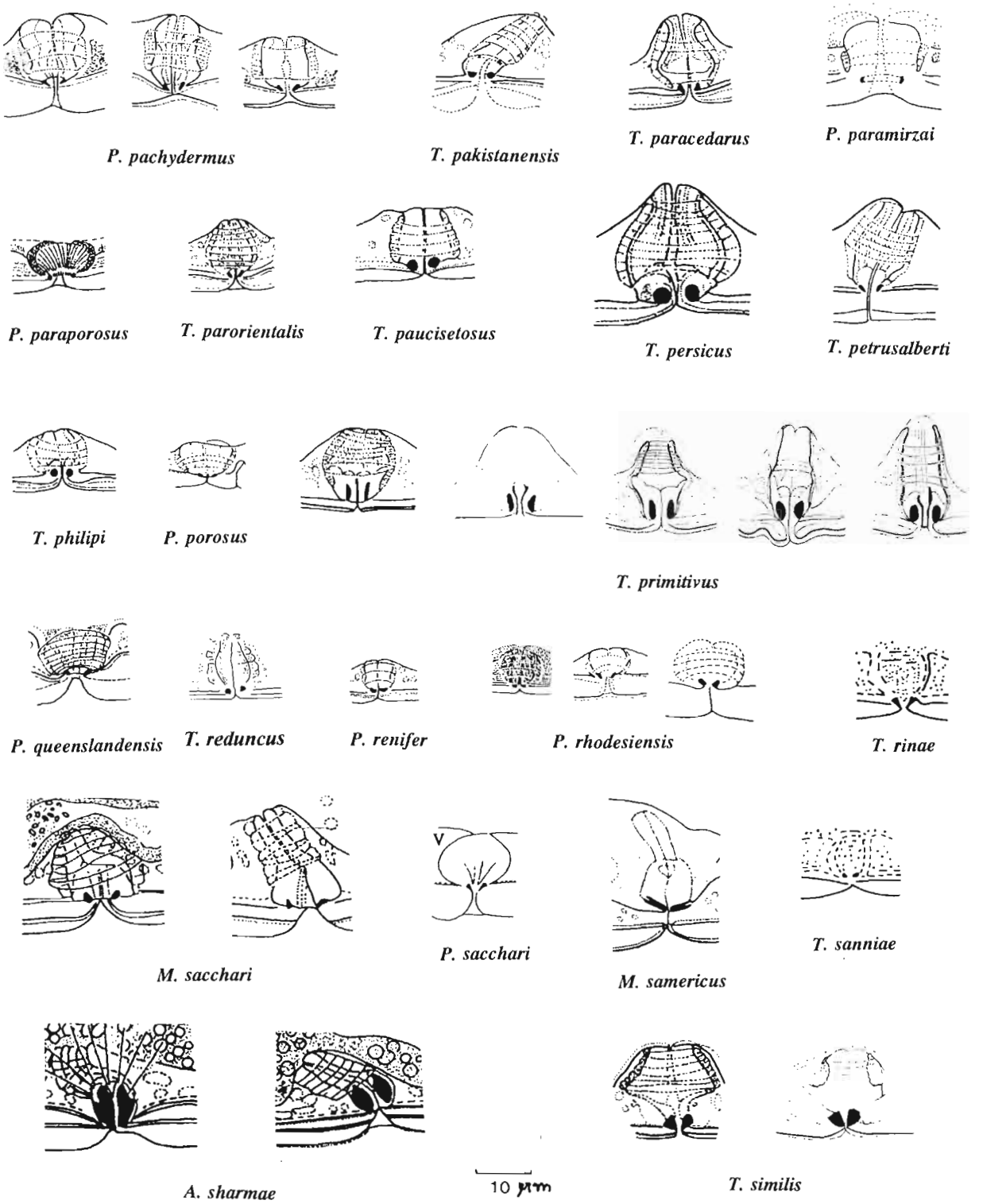

Fig. 12. Shapes of vagina and vulvar sclerotizations.

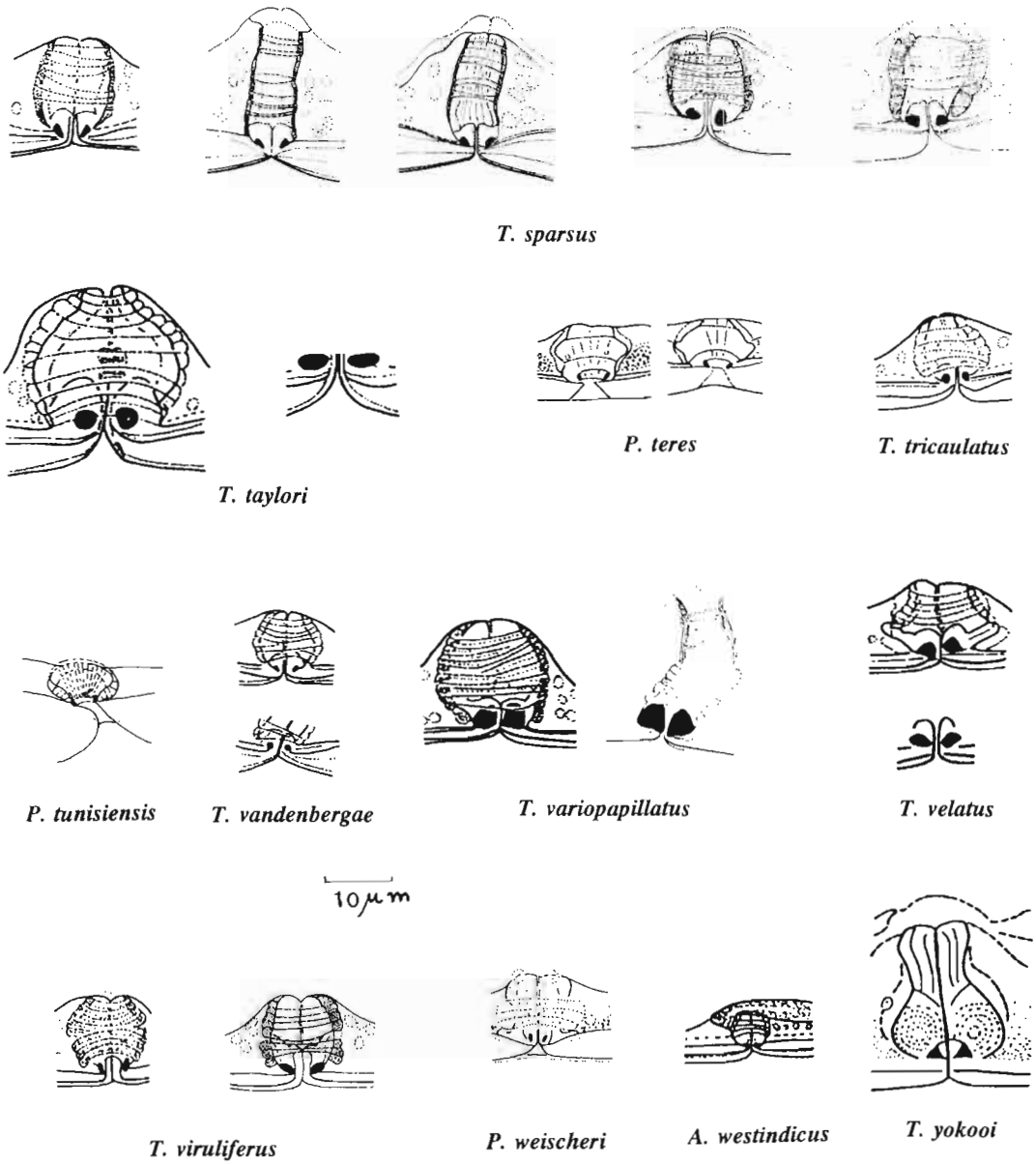

Fig. 13. *Shapes of vagina and vulvar sclerotizations.*

6. Strongly indented at mid-vagina upon fixation (Fig. 4 F)
7. Largely cylindrical but clearly widened at level of sclerotized ring (Fig. 4 G, H)
8. Trapezoidal (Fig. 4 I)
9. About rhomboid, protruding at mid-vagina (Fig. 4 J)

I. Length of vagina as a percentage of corresponding body width:
1. ≤ 33%
2. 34-50%
3. > 50%

J. Shape of vaginal sclerotized pieces in lateral optical section:
1. Triangular/ rounded triangular (Fig. 4 K)
2. Rounded (Fig. 4 L)
3. Rod-like (= narrow triangular, long oval) (Fig. 4 M)
4. Reniform (Fig. 4 N)
5. Quadrangular (Fig. 4 O)
6. Rectangular/ trapezoidal (Fig. 4 P, Q, R)
7. Mitten-shaped (Fig. 4 S)
8. Bipartite* (Fig. 4 T)
9. Short oval (Fig. 4U).

K. Size of vaginal sclerotized pieces (based on largest dimension, *i.e.*, length or diameter):
1. <1 µm
2. 1-1.9 µm
3. 2-2.9 µm
4. 3-3.9 µm
5. ≥ 4 µm.

L. Position of vaginal sclerotized pieces:
1. Close, 1 µm apart
2. Slightly separated, 1-2 µm apart
3. Widely separated, 2.5-3.5 µm apart

M. Orientation of vaginal sclerotized pieces:
1. Oblique (if triangular, tips directed towards vulva) (Fig. 4 H)
2. Parallel to longitudinal body axis (Fig. 4 D)
3. Parallel to vagina lumen (Fig. 4 M)
4. Non oriented (when pieces are round) (Fig. 4 L).

N. Occurrence of males:
1. Common
2. Rare
3. Absent.

O. Location of sperm:
1. In spermatheca or concentrated near the oviduct (Fig. 5 A-C)
2. Dispersed throughout the uterus (Fig. 5 E)
3. At tip of reflexed genital branch (Fig. 5 D)
4. Absent.

P. Sperm cells (as in male)

Q. Position of body pores:
1. (Sub)lateral (Fig. 4 V)
2. Subventral
3. Medioventral (Fig. 4 W)
4. Absent.

R. Presence/absence of postadvulvar body pores (= pores within one body width posterior to vulva):
1. Present
2. Absent.

S. Geographic distribution (as in male)

As one character may have several states within the group, or even within a species, each code has one or several digits. The number of digits of the code for a particular character depends upon the number of states of this character (this makes numerical sorting possible with the computerized version of the key). If the character has only one state in a given species, the character code for this species is composed of the same repeated digit; in other cases, the first digit of the code is that of the most frequent state of the character in the species and the other digits in the code are given by decreasing frequency of occurrence. In the case of a character having several states of which one appears less frequently than the two others, the digit of this state is separated from the other digits by a 0, which does not correspond to any character state. In some cases, when a state of a character rarely occurs in the species, this state is indicated between parenthesis after the code. For morphometric data such as body length, the first digit of the code represents the mean value, followed by digits representing successively the minimum and maximum values.

Polytomous key

Two polytomous keys are provided, one for males and one for females. They follow the same arrangement as that used for the genus *Xiphinema* (Luc & Dalmasso, 1975 *a, b*; Loof & Luc, 1990, 1993; Loof *et al.*, 1996), with "prime characters" (indicated by bold codes in the key) placed first, which permits an early easy differentiation into smaller groups and subgroups. These groups correspond to "nests" (Fortuner, 1988) in that they have no taxonomic value and do not indicate phylogenetic relationships, but are defined only to facilitate identification.

Males

The prime characters chosen are F (number of ventromedian precloacal supplements), D (number of ventromedian cervical papillae), and P (habitus), which are easy to observe, most often constant within species, and known for all species. Sorting by these prime characters gives a polytomous key with thirteen groups.

* Bipartite sclerotizations are not really different from other trichodorids; the impression of a double structure is due to an additional (inner) part of the vagina being more refractive.

Table 1. *Polytomous key for Trichodoridae males (males unknown for* Paratrichodorus acutus, P. anthurii, P. renifer, Allotrichodorus westindicus, *and* Monotrichodorus muliebris).

Group 1	**F**	**D**	**P**	A	B	***C***	E	G	H	I	***J***	***K***	L	M	***N***	O
P. nanus	1	0	1	100	11	22	0	11	44	11	100	22	12	270	22	120
P. minor	1	0	1	100	11	32	0	11	44 (3)	22 (1)	140	33	22	270	35	800 (1)
Group 2	**F**	**D**	**P**	A	B	***C***	E	***G***	***H***	I	J	K	L	M	N	O
P. delhiensis	2	0	1	100	11	11	0	11	33	11	120	22	22	170		500
P. allius	2	0	1	100	22	11	0	22	23	22	100	33	22	270	22	34271
P. alleni	2	0	1	200	22	22	0	22	22	22	100	22	22	270	22	200
P. lobatus	2 (3)	0	1	213	22	23	0	22	33	22	210	22	22	270	55	260
P. acaudatus	2	0	1	200	33	33	0	22	11	22	104	22	22	270	22	500
Group 3	**F**	**D**	**P**	A	B	C	E	G	H	I	J	K	L	M	N	O
P. porosus	2	1	1	120	22	11	0	22	22	33	100	32	22	270	11	62354
Group 4	**F**	**D**	**P**	A	B	C	E	G	H	I	***J***	***K***	L	M	***N***	O
P. rhodesiensis	3	0 (1)	1	100	21	22	0	22	33	22	200	22	22	270	22	200
P. teres	3	0	1	213	23	21	0	22	33	22 (34)	100	33	22	270	55	123
A. brasiliensis	3	0	1	120	32	32	0	23	22	33 (1)	210	33	22	270	66	400
A. guttatus	3	0	1	210	33	33	0	33	22	33	200	44	23	270	66	400
Group 5	**F**	**D**	**P**	A	B	C	E	G	H	I	J	K	L	M	N	O
T. obscurus	3	0	2	231	33	23	0	11 (2)	23	11	200	32	22	270	66	300
Group 6	**F**	**D**	**P**	A	B	***C***	***E***	*G*	*H*	*I*	*J*	*K*	*L*	M	***N***	O
P. weischeri	3 (4)	1 (0)	1	120	22	11	0	22	22	33	200	22	77	170	11	100
P. queenslandensis	3	1	1	102	23	12	0	22 (1)	22	13	120	22	11	270	11	600
P. anemones	3	1	1	200	22	22	0	22	22	22	100	33	77	270	11	100
P. pachydermus	3	1	1	210	23	22	0	22	33 (2)	33 (214)	200	33	22	270	11	130
P. sacchari	3	1	1	100	21	22	0	22	22	44	120	22	22	270	11	200
P. catharinae	3	1	1	120	22	22	0	22	11	23	100	22	22	270	22	203
P. meyeri	3	1 (0)	1	120	22	22	0	22	33	44	100	23	22	270	22	200
P. tunisiensis	3	1	1	200	22	22	0	22	22	22	400	23	22	270	22	120
A. loofi	3	1	1	100	33	22	0	23	22	33	200	33	22	261	66	400
P. hispanus	3	1	1	231	23	23	0	22	33 (2)	33	200	33	77	270	11	100
A. campanullatus	3	1	1	120	23	23	0	23	22	13	210	44	23	270	66	400
A. sharmai	3	1	1	210	33	32	0	23	22	33	200	33	22	170	66	400
A. longispiculis	3	1	1	100	22	33	0	33	22	33 (4)	400	33	22	270	66	400
P. atlanticus	3	1	1	320	33	43	0	22	33	33 (1)	100	22	11	170	11	300
P. grandis	3	1	1	230	33	21	11	22 (1)	22	33	120	33	11	270	11	300
P. macrostylus	3	1	1	300	44	34	11	22	11	22	120	33	22	270	44	100
Group 7	**F**	**D**	**P**	A	***B***	C	*E*	*G*	*H*	I	J	K	***L***	M	***N***	O
T. philipi	3	1	2	100	11	21	0	11	44	11	300	33 (2)	44	270	11	200
T. vandenbergae	3	1	2	200	22	22	0	11	33	11 (3)	340	22	44	170	11	200
T. kilianae	3 (4)	1	2	230	22	22	0	11 (0)	33	13	300	22 (3)	45	167	11	200
T. sanniae	3	1	2	120	22	22	0	10	44	33	340	22	45	170	11	200

Table 1. (continued).

Group 7 *(cont.)*	**F**	**D**	**P**	A	***B***	C	*E*	*G*	*H*	I	J	K	***L***	M	***N***	O
T. eburneus	3 (4)	1	2	231	23	22	0	0 (1)	22	11 (3)	300	33 (2)	12	270	11	200
T. cottieri	3	1	2	230	23	22	0	11	22	11	200	33	23	270	11	600
T. magnus	3	1	2	300	33	22	0	10	33	11	200	33	46	176	11	200
T. borai	3	1	2	100	22	11	11	11	22	11	200	33	11	170	66	500
M. monohystera vangundyi	3	1	2	210	22	22	0	22	22	11	250	22	22	260	66	400
T. obtusus	3	1	2	320	23	23	0	0 (1)	33 (2)	11	250	33	22	170	66	300
M. monohystera monohystera	3	1 (0)	2	210	23	21	0	12	22	11 (2)	250	22	22	260	66	400
M. sacchari	3	1	2	120	23	22	0	22	22	11	250	22	22	260	66	400
T. californicus	3	1	2	231	32	23	0	11	22	11	234	33	22	260	66	230
T. dilatatus	3	1	2	230	33	22	0	21	33	11	200	33	22	260	66	300
T. intermedius	3	1	2	200	33	22	0	22	33	11	200	33 (2)	22	260	66	300
M. samericus	3	1	2	100	33	22	11	22	11	11	200	22	22	260	66	400
T. elegans	3	1	2	320	44	23	0	11	33	11	100	33	22	270	66	300
Group 8	**F**	**D**	**P**	A	B	C	E	G	H	I	J	K	L	M	N	O
P. orrae	3	1	3	100	21	21	0	22	33	13	200	22	22	270	11	600
Group 9	**F**	**D**	**P**	A	***B***	C	E	G	H	I	J	***K***	L	M	***N***	O
P. mirzai	3	2	1	100	11	11	0 (1)	12	22	13 (2)	100	33	22	270	66	503
P. paramirzai	3	2	1	120	22	11	10	22	22	12	100	11	11	270	11	500
Group 10	**F**	**D**	**P**	A	B	C	***E***	***G***	***H***	I	*J*	*K*	*L*	*M*	N	O
T. carlingi	3	2	2	210	32	22	0	0	33	11	400	33	33	187	11	300
T. complexus	3	2	2	200	22	22	0	10	22	11	500	22	22	270	66	500
T. sparsus	3 (2)	2 (1)	2	231	23	23	0	11 (0)	22 (3)	11 (2)	320	33 (2)	22	260	11	100
T. paucisetosus	3	2	2	210	32	22	0	11 (0)	23	11	500	33	44	360 (4)	11	300
T. hooperi	3 (4)	2	2	230	23	22	0	11	33 (2)	11	100	22	11	270	11	100 (35)
T. minzi	3	2 (1)	2	230	23	33	0	11	33	33 (1)	200	11	33	470	11	700
T. taylori	3	2	2	231	33	32	0	11	33	33 (1)	200	11	11	470	11	100
T. coomansi	3	2 (3)	2	230	23	22	0	11	33	11 (3)	200	22	22	270	11	200
T. parorientalis	3	2	2	200	22	21	0	11 (0)	33	11 (3)	200	33	44	476	11	200
T. rinae	3	2	2	213	23	22	0	11	43	13	300	22	22	270	11	200
T. nanjingensis	3 (4)	2 (10)	2	230	22	22	0	11	33	11	301	32	22	270 (6)	11	500
T. altaicus	3	2	2	120	21	21	0	11 (0)	33	11	340	33	11	270	11	500
T. persicus	3	2 (13)	2	210	33	23	0	11	33 (2)	33 (1)	500	13	11	470	11	700
T. giennensis	3 (45)	2 (1)	2	213	23	21	0 (1)	11 (0)	33	33 (12)	500	33 (2)	22 (4)	160	11	100
T. aequalis	3 (4)	2	2	210	32	21	0	11 (0)	33 (4)	11	500	33	22	170	11	350
T. elefjohnsoni	3	2	2	120	23	21	0 (1)	11	33	11 (3)	520	32	24	370	11	300
T. petrusalberti	3	2	2	200	33	33	0	11	44 (3)	33	350	33 (2)	11	270	11	200
T. borneoensis	3	2	2	210	23	22	0	22	22	11	203	33 (2)	32	270	11	500 (3)
T. orientalis	3	2 (1)	2	210	22	12	10	11 (0)	22	33 (1)	200	32	44	470	11	700
T. vario-papillatus	3	2	2	200	22	22	11	11 (0)	22	11 (2)	500	22	22 (6)	176	11	100
T. lusitanicus	3	2	2	231	21	11	12	0 (1)	22	13	200	33	44	160	66	100

Table 1. *(continued).*

Group 11	**F**	**D**	**P**	A	B	C	***E***	G	***H***	***I***	J	***K***	***L***	M	N	O
T. paracedarus	3	3 (2)	1	120	21	21	0	11	33 (2)	11	210	22	22	260	11	500
T. cylindricus	3	3	1	120	21	12	11	11	33 (2)	22 (4)	200	33	33	562	11	103
Group 12	**F**	**D**	**P**	A	B	C	E	***G***	H	I	*J*	*K*	*L*	*M*	N	O
T. lusitanicus	3	3	2	231	21	11	12	0 (1)	22	13	200	33	44	160	66	100
T. reduncus	3	3	2	120	12	11	0	0 (1)	33	11	200	33	11	170	11	500
T. tricaulatus	3	3 (21)	2	210	21	12	0	0	23	44 (2)	200	33	11	276	11	500
T. viruliferus	3 (2)	3	2	210	21	11	21	0	33 (2)	12	250	33	44	167	11	103
T. yokooi	3	3	2	210	32	21	0	0	33 (2)	11	500	33	22	470		500
T. azorensis	3	3 (24)	2	210	32	11	21	10	33	11	500	33	44	160	11	100
T. beirensis	3	3 (4)	2	210	21	11	11	10	33 (2)	11	500	33	46	160	11	100
T. similis	3 (24)	3 (2)	2	213	21	12	11 (2)	10	22 (3)	11 (2)	500	22	11	167	11	103
T. primitivus	3	3	2	231	22	21	21	11	22 (3)	11 (23)	200	33	11	160	11	136
T. cedarus	3 (4)	3 (214)	2	210	23	21	0	11	33	11	210	32	22	206	11	500
T. pakistanensis	3	3	2	231	21	22	0	11	22	11	300	32	22	370 (6)	11	500
T. velatus	3	3	2	210	22	11	11	11	33 (2)	11 (2)	500	33	44	168	11	103
T. aquitanensis	3	3	2	210	23	12	22	11	22	11	500	33	22	170	11	100
T. vario-papillatus	3	3	2	200	22	22	11	11 (0)	22	11 (2)	500	22	22 (6)	176	11	100
Group 13	**F**	**D**	**P**	A	B	C	E	G	H	I	J	K	L	M	N	O
P. paraporosus	4	1	1	120	21	11	11	33	22	22	100	22	11	270	66	500

Exceptionnaly in some species, a prime character is intraspecifically polymorphic with the same probability of occurrence. In such cases, the species is placed in both corresponding groups. For example, because the number of ventromedian cervical papillae is variable (two or three) in *T. lusitanicus* and *T. variopapillatus*, these two species were placed in both groups 10 and 12.

In each group, species are arranged according to additional characters (indicated by bold italic codes in the key); other additional characters (indicated by italic codes in the key) allow a further characterization of the species).

Males are unknown for five species: *P. acutus, P. anthurii, P. renifer, A. westindicus, M. muliebris.*

Group 1: The two species in group 1 can be separated by codes C, J, K, and N.

Group 2: The five species in group 2 can be separated by codes G, C, and H, in this order (N unknown for *P. delhiensis*). *P. alleni* (coding based on one male) and *P. lobatus* (coding based on males originating from several populations) differ by minor differences only, of which some lie within the range of intraspecific variability. *P. alleni* was described with a shorter bursa (extending to the middle of the retracted spicules *vs* to the spicule head in *P. lobatus*; Decraemer, 1995).

Group 3: Only one species is present in group 3.

Group 4: The four species in group 4 can be separated by codes K, J, and N, in this order.

Group 5: Only one species is present in group 5.

Group 6: The sixteen species in group 6 can be separated into four subgroups by codes E, C, and N, in this order. Within each subgroup, species can be further characterized by codes B, H, I, J, K, and L. Bristles were not observed in Italian specimens of *P. tunisiensis* provided by Dr. F. Roca as it was described by Roca and Lamberti (1984).

Group 7: The seventeen species in group 7 can be separated into five subgroups by codes N, B, and L, in this order. Within each subgroup, species can be further characterized mainly by codes E, G, and H.

Group 8: Only one species is present in group 8.

Group 9: The two species in group 9 are easily separated by codes B, K, and N.

Group 10: The 21 species in group 10 can be separated into five subgroups by codes E, G, and H. Within each subgroup, species can be further characterized mainly by codes J, K, L, and M.

Table 2. Polytomous key to Trichodoridae females (females unknown for Paratrichodorus alleni*).*

Group 1																		
Subgroup 1-1	**D**	**C**	***L***	***K***	A	B	E	F	*G*	*H*	I	*J*	M	N	*O*	P	Q	R	S
P. nanus	1	1	1	**100**	100	100	400	100	2	33	11	11	1	(2)2	23	22	1	22	12
P. anthurii	1	1	1	100	100	100	340	100	1	55	11	11	1	3	11	22	4	22	4
P. acutus	1	1	1	100	100	100	403	100 (2)	2	88	11	22	4	3	22	33	4	22	321
P. porosus	1	1	**1**	100	120	210	203	300 (12)	1	88 (5)	11	33 (9)	1	2	22	11	3	11	8 (1)
P. rhodesiensis	1	1	**1**	**100**	120	210	300	200	3	53	11	99	2	1	32	22	4	22	2
Subgroup 1-2	**D**	**C**	***L***	***K***	A	B	E	F	*G*	*H*	I	*J*	*M*	*N*	O	*P*	Q	R	S
T. cedarus	1	1	1	200	120	230	300	100	2	11	22	11	1	1	11	11	2	11	5 (3)
T. coomansi	1	1	1	200	230	230	300	100 (3)		22 (7)	22	11	1	1	11	11	1	11	2
T. kilianae	1	1	1	200	200	200	300	100 (3)	1	33	23	11 (9)	1	1	11	11	1	11	2
P. sacchari	1	1	1	200	120	200	200	340	1	55	11	11	1	1	12	11	1	22	2
P. grandis	1	1	1	200	320	300	230	300 (1)	1	88	11	11	1	1	22	11	1	12	3
P. nanus	1	1	1	**200**	100	100	400	100	2	33	11	11	1	(2)2	23	22	1	22	12
T. complexus	1	1	1	200	210	200	200	100	1	11	22	19	2	1	11	66	1	11	5
P. renifer	1	1	1	200	100	100	400	100 (2)	2	34	11	44	2	3	22	33	4	22	26513
T. parorientalis	1	1	1	200	210	200	300	100	1	11	22	99	1	1	11	11	1	11	2
P. rhodesiensis	1	1	**1**	**200**	120	210	300	200	3	53	11	99	2	1	32	22	4	22	2
P. minor	1	1	1	200	231	120	403	200 (1)	2	44 (3)	11	99 (3)	2	2	22	23	4	22	8 (1)
Subgroup 1-3	**D**	**C**	***L***	***K***	A	B	E	F	G	*H*	I	*J*	M	N	O	*P*	Q	R	S
T. similis	1	1	1	300	210	210	203	100 (2)	2	22	22	11	1	1	11	11	1	11	10 (3)
T. cylindricus	1	1	1	300	120	210	302	200 (4)	2	33 (1)	22	11	1	1	11	11	1	11	10 (3)
T. rinae	1	1	1	300	231	230	304	130	3	33	22	11	1	1	11	11	1	11	2
P. hispanus	1	1	1	300	231	230	300	300	1	88	11	11	1	1	11	11	1	22	1
T. yokooi	1	1	1	300	120	300	300	100		11	22	11	1	1	11		1	11	5
T. velatus	1	1	1	300	210	200	300	100 (2)	2	22	22	16	1	(2)1	11	11	1	11	10 (3)
T. borai	1	1	1	300	100	200	200	100	1	33	22	19	1	1	11	66	4	22	5
T. azorensis	1	1	1	300	120	120	300	100		22 (1)	22	55	3	1	11	11	1	11	1
T. aquitanensis	1	1	1	**300**	200	200	200	100	2	33	22	55	3	1	11	11	1	22	1
Subgroup 1-4	**D**	**C**	***L***	***K***	A	B	E	F	G	*H*	I	*J*	*M*	N	O	P	Q	R	S
T. dilatatus	1	1	1	400	230	300	300	100	2	11	22	11	3	1	11	66	1	11	3
T. variopapillatus	1	1	1	400	213	200	200	100 (2)	2	22	22 (3)	55	3	1	11	11	1	11	1
T. aquitanensis	1	1	1	**400**	200	200	200	100	2	33	22	55	3	1	11	11	1	22	1
T. obscurus	1	1	1	400	230	300	300	100	2	33	22	61	2	1	11	66	1	22	3
Subgroup 1-5	**D**	**C**	***L***	***K***	A	*B*	E	F	*G*	H	I	J	M	N	O	P	Q	R	S
P. delhiensis	1	1	1		100	100	300	100	1		11			1			4	22	5
P. atlanticus	1	1	1		230	300	300	300	1					1	11	11	2	11	3
T. intermedius	1	1	1	500	231	300	200	100	2	77	22 (3)	11	1	1	11	66	1	11	3
T. elegans	1	1	1	500	320	444	300	100		33	22	66	2	1	11	66	1	11	3
Subgroup 1-6	**D**	**C**	***L***	***K***	A	B	E	F	G	*H*	I	*J*	*M*	N	O	P	Q	R	S
T. vandenbergae	1	1	**2**	100	120	200	200	100 (3)	1	11	22	11 (2)	1 (4)	1	11	11	2	11	2
T. eburneus	1	1	2	**100**	231	200	200	100 (3)		33	22	11 (2)	1 (4)	1	11	11	2	11	2
P. pachydermus	1	1	2	**100**	213	200	200	300 (124)	1	33	11	19	1	1	22	11	1	22	13 (5?)

Table 2. (continued).

Subgroup 1-6 *(cont.)*	**D**	**C**	***L***	***K***	A	B	E	F	G	*H*	I	*J*	*M*	N	O	P	Q	R	S
T. sanniae	1	1	2	100	210	200	400	300	3	33	11	22	4	1	11	11	1	11	2
P. porosus	1	1	**2**	**100**	120	210	203	300 (12)	1	88 (5)	11	33 (9)	1	2	22	11	3	11	8 (1)
P. rhodesiensis	1	1	**2**	**100**	120	210	300	200	3	53	11	99	2	1	32	22	4	22	2
P. weischeri	1	1	2	100	120	200	200	300	2	66	11	99	3	1	11	11	1	22	1
Subgroup 1-7	**D**	**C**	***L***	***K***	A	B	E	F	G	*H*	*I*	J	*M*	N	O	P	Q	R	S
P. pachydermus	1	1	2	**200**	213	200	200	300 (124)	1	33	11	19	1	1	22	11	1	22	13 (5?)
P. meyeri	1	1	2	200	210	200	300	400 (23)	3	88	11	11	1	1	22	22	1	22	2
P. queenslandensis	1	1	2	200	100	200	200	130	3	88	11	99	1	1	22	11	1	11	6
T. aequalis	1	1	2	200	210	210	320	100	1	11	22	19	1	1	11	11	1	11	3 (5)
T. paracedarus	1	1	2	200	120	210	302	100	2	11	22	11	1	1	11	11	1	11	5
T. tricaulatus	1	1	2	200	120	210	230	200	1	11	22	11 (2)	1 (4)	1	11	11	1	11	5
T. petrusalberti	1	1	2	200	200	300	403	300 (1)	1	22	22	11	1	1	11	11	1	11	2
T. eburneus	1	1	2	**200**	231	200	200	100 (3)		33	22	11 (2)	1 (4)	1	11	11	2	11	2
T. sparsus	1	1	2	**200**	213	230	203	100 (2)	1	33	22	11	1	1	11	11	1	11	1
T. giennensis	1	1	**2**	200	230	230	300	300 (41)		33	22 (3)	11 (2)	1	1	11	11	1	11	1
T. obtusus	1	1	**2**	200	300	230	300	100	1	33	22	11 (9)	1	1	11	66	1	11	3
P. anemones	1	1	2	200	210	200	203	200 (1)	1	63	22	11	1	1	11	11	1	22	1
P. rhodesiensis	1	1	**2**	**200**	120	210	300	200	3	53	11	99	2	1	32	22	4	22	2
T. philipi	1	1	2	200	100	100	400	100	1	22	11	22 (9)	4 (1)	1	11	11	1	11	2
Subgroup 1-8	**D**	**C**	***L***	***K***	A	B	E	F	G	*H*	*I*	J	M	N	*O*	P	Q	R	S
T. paucisetosus	1	1	2	300	200	320	230	100	1	33	11	29	4	1	11	11	1	11	3
T. borneoensis	1	1	2	300	210	200	200	100	1	11	22	11 (9)	1	1	11	11	1	11	5
T. magnus	1	1	2	300	320	300	300	100	1	33	22	91	1	1	11	11	1	11	2
T. sparsus	1	1	2	**300**	213	230	203	100 (2)	1	33	22	11	1	1	11	11	1	11	1
T. nanjingensis	1	1	2	300	320	200	300	100	1	11 (3)	12	11 (2)	1 (4)	1	22	11	1	11	5
Subgroup 1-9	**D**	**C**	***L***	***K***	A	B	E	F	G	*H*	I	J	*M*	N	O	P	Q	R	S
T. californicus	1	1	2	400	320	310	300	100	2	11	22	11	2	1	11	66	1	11	3
T. beirensis	1	1	2	400	231	210	302	100 (3)	2	33 (1)	22	11 (9)	3	1	11	11	4	22	1
Subgroup 1-10	**D**	**C**	***L***	***K***	A	B	E	F	G	H	I	J	M	N	O	P	Q	R	S
T. cottieri	1	1	2	500	230	320	200	100	2	77	22	66	2	1	11	11	1	11	6
Subgroup 1-11	**D**	**C**	***L***	***K***	A	B	E	F	*G*	*H*	I	*J*	*M*	N	O	P	*Q*	R	S
T. orientalis	1	1	3	100	210	200	200	310		33	22	11	1	1	11	11	1	11	7
T. vandenbergae	1	1	**3**	100	120	200	200	100 (3)	1	11	22	11 (2)	1 (4)	1	11	11	2	11	2
P. catharinae	1	1	3	100	120	210	120	230	1	55	11	22	4	1	22	22	1	22	2
P. mirzai	1	1	3	100	100	100	200	130	3	88	11	22	4	1	24	66	1	22 (1)	5
P. paraporosus	1	1	3	100	120	210	200	200	3	55	11	22	4	1	11	22	3	11	5
T. elefjohnsoni	1	1	3	100	120	200	200	100	1	33	11	92	1 (4)	1	11	11	1	11	3
P. lobatus	1	1	3	100	213	200	300	200	3	55	11	99	3	1	21	22	1	22	624
P. tunisiensis	1	1	3	100	230	200	320	200	3	88	11	99	3 (1)	1	21	22	1	22	2
P. teres	1	1	3	**100**	231	230	230	234 (1)	3	99	11	99	1	2	42	22	1	22	1 (32)
Subgroup 1-12	**D**	**C**	***L***	***K***	A	B	E	F	*G*	*H*	I	*J*	*M*	N	O	P	*Q*	R	S
T. altaicus	1	1	3	200	120	210	300	100	1	11	11	11	1	1	11	11	1	11 (2)	5

Table 2. (continued).

Subgroup 1-12 (cont.)	**D**	**C**	***L***	***K***	A	B	E	F	*G*	*H*	I	*J*	*M*	N	O	P	*Q*	R	S
T. reduncus	1	1	3	200	120	120	300	100	2	11	11	11	1	1	11	11	1	11	5
T. obtusus	1	1	**3**	200	300	230	300	100	1	33	22	11 (9)	1	1	11	66	1	11	3
T. giennensis	1	1	**3**	200	230	230	300	300 (41)		33	22 (3)	11 (2)	1	1	11	11	1	11	1
T. hooperi	1	1	3	200	230	200	302	100	2	11	22	22	4	1	11	11	1	11	10 (35)
T. viruliferus	1	1	3	200	210	210	300	100 (2)	1	22	22	33	1 (3)	1	11	11	1	11	10 (3)
P. acaudatus	1	1	3	200	200	400	100	100	1	44	11	55	4	1		22	4	22	5
T. pakistanensis	1	1	3	200	231	210	200	100	2	33	22	92	1 (4)	1	11	11	1	11	5
P. paramirzai	1	1	3	200	120	200	200	120	3	55	11	99	3	1	22	11	1	22	5
P. orrae	1	1	3	200	120	210	300	130	3	88	11	99	3 (1)	1	22	11	1	11	6
P. teres	1	1	3	**200**	231	230	230	234 (1)	3	99	11	99	1	2	42	22	1	22	1 (32)
P. allius	1	1	3	200	213	210	203	200 (4)	3	55	11	99	1	2	23	22	4 (1)	22 (1)	3421
Subgroup 1-13	**D**	**C**	***L***	***K***	A	*B*	E	F	G	H	I	*J*	M	N	O	P	Q	R	S
T. lusitanicus	1	1	3	**300**	210	210	200	100 (3)	1	11	22	11 (2)	3	1	11	66	1	11	1
T. taylori	1	1	3	**300**	213	210	300	300 (1)	1	11	22	22	4 (2)	1	11	11	1	11	1
T. minzi	1	1	3	300	200	213	300	300 (1)		11	23	22 (9)	4 (1)	1	11	11	1	11	7
T. persicus	1	1	3	300	200	300	300	300 (1)		11	33	22	4	1	11	11	1	11	7
T. primitivus	1	1	3	**300**	210	210	203	100 (23)	2	22	22	33	3	1	11	11	1	11	13 (64)
T. carlingi	1	1	3	300	200	310	300	100	1	33	11	66	1	1	11	11	1	11	3
Subgroup 1-14	**D**	**C**	***L***	***K***	A	B	E	F	G	H	I	*J*	*M*	N	O	P	Q	R	S
T. lusitanicus	1	1	3	**400**	210	210	200	100 (3)	1	11	22	11 (2)	3	1	11	66	1	11	1
T. taylori	1	1	3	**400**	213	210	300	300 (1)	1	11	22	22	4 (2)	1	11	11	1	11	1
P. macrostylus	1	1	3	400	300	400	100	200	3	88	11	33	1	1	11	44	1	22	1
T. primitivus	1	1	3	**400**	210	210	203	100 (23)	2	22	22	33	3	1	11	11	1	11	13 (64)
Subgroup 1-15	**D**	**C**	***L***	***K***	A	B	E	F	G	H	I	J	M	N	O	P	Q	R	S
T. taylori	1	1	3	**500**	213	210	300	300 (1)	1	11	22	22	4 (2)	1	11	11	1	11	1
Group 2	D	C	L	K	A	B	E	F	G	H	I	J	M	N	O	P	Q	R	S
A. westindicus	2	1	1	100	100	100	403	100 (2)	2	55	11	11	1	3	42	33	4	22	4
Group 3																			
Subgroup 3-1	**D**	**C**	***L***	K	A	B	*E*	F	G	H	*I*	*J*	***M***	N	O	P	*Q*	R	S
M. samericus	2	2	1	400	100	320	100	100	2	77	33	33	1	1	11	66	1	22	4
M. monohystera monohystera	2	2	1	435	210	230	200	100 (2)	2	77	33	33	1	1	11	66	1	22 (1)	4
M. monohystera vangundyi	2	2	1	400	210	200	200	100	2	77	33	33	1	1	11	66	1	22	4
A. guttatus	2	2	1	400	120	300	200	300	2	33	22	11	1	1		66	4	22	4
A. campanullatus	2	2	1	340	120	230	200	130	2	77	33	11 (6)	1	1	11	66	4	22	4
Subgroup 3-2	**D**	**C**	***L***	K	A	B	E	F	G	H	I	J	***M***	N	O	P	Q	R	S
A. loofi	2	2	1	400	100	230	230	300		77	23	33	2	1	11	66	4	22	4
A. longispiculis	2	2	1	430	210	320	200	310		77	33	33	2	1	11	66	4	22	4
Subgroup 3-3	**D**	**C**	***L***	K	A	B	E	F	G	H	I	*J*	***M***	N	O	P	Q	R	S
A. sharmai	2	2	1	500	120	230	300	300	2	77	22	77	3	1	11	66	4	22	4
A. brasiliensis	2	2	1	500	100	320	200	300	2	77	33	88	3	1	11	66	4	22	4

Table 2. *(continued).*

Subgroup 3-4	**D**	**C**	***L***	*K*	*A*	B	E	F	G	H	I	J	***M***	N	O	P	Q	R	S
M. sacchari	2	2	3	200	120	200	200	100	3	77	22	16	1	1	11	66	1	22	4
M. muliebris	2	2	3	340	300	200	200	100	3	77	33	66	1	3	11	66	1	22	4

Group 11: The two species in group 11 are clearly separated by codes E, H, I, K, and L.

Group 12: The thirteen species in group 12 can be separated into three subgroups by code G. Within each of the subgroup, species can be further characterized by codes J, M, K, and L (code N unknown for *T. yokooi*). *T. azorensis* and *T. beirensis* differ by minor differences such as degree and position of the constriction of the spicule shaft (slight constriction at mid-shaft *vs* clear constriction posterior to mid-shaft, respectively) and distal end of spicule not grooved *vs* grooved.

Group 13: Only one species is present in group 13.

FEMALES

The prime characters selected are D (type of genital system) and C (vulva position), which are easy to observe, constant and known for all species (except *P. alleni* known from males only). Sorting by prime characters (indicated by bold codes in the key) gives a polytomous key with three groups. Groups 1 and 3 are large groups that include the didelphic and the monodelphic species, respectively; group 2 contains only one "aberrant" species, *A. westindicus*. Within each of the large groups, a number of subgroups can be defined based on additional characters (indicated by bold italic codes in the key) for an easier differentiation of the species included in the group. In some subgroups, other additional characters (indicated by italic codes in the key) allow a further characterization of the species. Females are unknown for one species: *T. alleni*.

Group 1: Further sorting of the species in group 1 by characters K (size of vaginal sclerotized pieces) and L (position of vaginal sclerotized pieces) results in the definition of fifteen subgroups. Character K is unknown for two species: *P. atlanticus* and *P. delhiensis*. Several states of characters K and L may occur within the same species. In such cases, the species is included in the several corresponding subgroups and the variable characters are given in bold italic figures in the key.

Subgroup 1-1: The five species in subgroup 1-1 can be separated by codes J, H, G, and O, in this order.

Subgroup 1-2: The eleven species in subgroup 1-2 can be separated by codes J, M, N, P, H, and G, in this order (code G unknown for *T. coomansi*).

Subgroup 1-3: The nine species in subgroups 1-3 can be separated by codes J, P, and H, in this order (code G unknown for *T. azorensis* and *T. yokooi*; code P unknown for *T. yokooi*). *T. cylindricus* further differs from *T. rinae* by code A (L = 419-770 *vs* 624-1083 µm, respectively) and by the detailed shape of the vaginal sclerotized pieces (rounded triangular *vs* sharp triangular, respectively). *T. similis* further differs from *T. velatus* by the detailed shape of the vaginal sclerotized pieces (triangular *vs* broadly rounded triangular to trapezoid, respectively).

Subgroup 1-4: The four species in subgroup 1-4 can be separated by codes J, H, and M, in this order.

Subgroup 1-5: The four species in subgroup 1-5 can be separated by codes B and G (G unknown for *T. elegans*). Details of vagina region in *P. atlanticus* and *P. delhiensis* are known from dorso-ventral view only.

Subgroup 1-6: The seven species in subgroup 1-6 can be separated by codes J, M, O, and H, in this order (code G unknown for *T. eburneus*).

Subgroup 1-7: The fourteen species in subgroup 1-7 can be separated by codes M, I, and H, in this order (code G unknown for *T. eburneus* and *T. giennensis*). *P. queenslandensis* and *P. meyeri* can be further separated by codes J and A, *T. paracedarus, T. tricaulatus*, and *T. aequalis* by codes G, F and A. The differentiation of *P. anemones, T. sparsus, T. giennensis, T. obtusus* and *T. eburneus* remains difficult; it is based on codes P, F, and Q.

Subgroup 1-8: The five species in subgroup 1-8 can be separated by codes O, I, and H, in this order. *T. sparsus* and *T. magnus* can be differentiated from each other, with difficulty, by the detailed shape of the sclerotized pieces (triangular *vs* mainly short oval, respectively).

Subgroup 1-9: The two species in subgroup 1-9 can be distinguished based on codes M, Q and H.

Subgroup 1-10: Only one species is present in subgroup 1-10.

Subgroup 1-11: The nine species in subgroup 1-11 can be further separated by codes J, Q, G, H, and M

(code G unknown for *T. orientalis*). *P. lobatus* and *P. tunisiensis* are difficult to separate, based on vagina shape (rounded oral *vs* about trapezoidal*, respectively) and number of lateral body pores (usually with one *vs* two pairs**, respectively). Sperm exhibits a fibrillar appearance (code P) in *P. lobatus, P. teres* and *P. tunisiensis* (only in males, not in female).

Subgroup 1-12: The eleven species in subgroup 1-12 can be separated by codes J, I, G, P, and H, in this order (code G unknown for *T. giennensis*; code O unknown for *P. acaudatus*). In *P. acaudatus*, the vulva was previously described as a minute aperture without distinctive shape, but it is here provisionally considered to be a pore); code P known from male only.

Subgroup 1-13: The six species in subgroup 1-13 can be separated by codes J and B, in this order (code G unknown for *T. minzi, T. persicus*). *T. minzi* and *T. taylori* differ by the detailed shape of the vaginal sclerotized pieces, which are somewhat smaller and more oval in *T. minzi*; by a slight difference in onchiostyle length (53-64 *vs* 60-72 µm, respectively), and by the number of lateral body pores (mainly two** *vs* one postvulvar, respectively); also, *T. minzi* females usually have large inclusions in the uteri.

Subgroup 1-14: The four species in subgroup 1-14 are separated by codes J and M, in this order.

Subgroup 1-15: Only one species is present in subgroup 1-15.

Group 2: Only one species is present in group 2; code P known from type population only.

Group 3: Further sorting of the species in group 3 by characters L (position of vaginal sclerotized pieces) and M (orientation of vaginal sclerotized pieces) results in four subgroups.

Subgroup 3-1: The five species in subgroup 3-1 can be separated by codes Q, I, and E, in this order (code O unknown for *A. guttatus*). *M. monohystera vangundyi* differs from *M. monohystera monohystera* by the presence of lateral cervical pores at the level of the amphids.

Subgroup 3-2: The females of the two species in subgroup 3-2 are very similar; they differ by the vaginal pieces, which are slightly larger and less sclerotized in *A. loofi* (code G unknown).

Subgroup 3-3: The two species in subgroup 3-3 are separated by code J.

Subgroup 3-4: The two species in subgroup 3-4 species are separated by codes K and A.

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* based on specimens from Colona (courtesy Dr. F. Roca); allotype and paratype specimens (slides 191/8/2-3) in dorso-ventral or oblique dorso-ventral position, respectively.
** one pre- and one postvulvar.

* Only those references not included in Decraemer (1995) are given below.