

# Nematodes of the order Dorylaimida from Andalucía oriental, Spain. The genus *Chitwoodius* with description of two new species

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## SUMMARY

Two new species belonging to the genus *Chitwoodius* are described from natural areas in the province of Jaén, Spain. *C. parafuscus* sp. n. is characterized by a small size (0.7-1.1 mm), lip region offset by constriction, lips moderately separated, cuticularized pieces present in the perioral area, odontostyle 8-11  $\mu\text{m}$  long, sclerotized thickened area near the point where the odontophore joins the pharyngeal lining, prerectum 2.7-8.8 times as long as anal body width and males absent. *C. heynsi* sp. n. can be distinguished by medium size (1.5-1.7 mm), lip region well offset by a deep constriction, lips separated and with inner part forming a perioral disc, cuticularized pieces present in the perioral area, odontostyle 14-16  $\mu\text{m}$  long, sclerotized thickened area near the point where the odontophore joins the pharyngeal lining, prerectum 5.3-6.1 times as long as anal body width and absence of males. An emendation of the diagnosis of *Chitwoodius* is proposed. Finally, a tabular key to the species of *Chitwoodius* is presented.

## RÉSUMÉ

*Nématodes de l'ordre des Dorylaimida provenant d'Andalousie orientale, Espagne.  
Le genre Chitwoodius, avec description de deux nouvelles espèces*

Deux nouvelles espèces du genre *Chitwoodius* sont décrites provenant d'aires géographiques naturelles de la province de Jaén, Espagne. *C. parafuscus* n. sp. est caractérisé par la faible longueur du corps (0,7-1,1 mm), la région labiale séparée du reste du corps par une constriction, les lèvres séparées, la présence de pièces cuticularisées dans la région périorale, la longueur de l'odontostyle (8-11  $\mu\text{m}$ ), une zone sclérotisée au voisinage de la jonction entre l'odontophore et le pharynx, la longueur du prérectum (2,7-8,8 diamètres du corps à l'anus) et l'absence de mâles. *C. heynsi* sp. n. peut être distingué par la longueur moyenne du corps (1,5-1,7 mm), la région labiale séparée du reste du corps par une forte constriction, les lèvres séparées, la présence d'un disque périoral, celle de pièces cuticularisées dans la région périorale, la longueur de l'odontostyle (14-16  $\mu\text{m}$ ), une zone sclérotisée au voisinage de la jonction entre l'odontophore et le pharynx, la longueur du prérectum (5,3-6,1 diamètres du corps à l'anus) et l'absence de mâles. Un amendement à la diagnose du genre *Chitwoodius* est proposé. Enfin, une clé tabulaire est établie pour la détermination des espèces de *Chitwoodius*.

This is the fourth paper of a series on the taxonomy of dorylaimid nematodes from Southeastern Spain. Previous papers dealt with the genus *Paraxonchium* Krall, 1958 (Peña Santiago & Jiménez Millán, 1986), three new species of Dorylaimida, one belonging to the genus *Tylencholaimellus* Cobb in M. V. Cobb, 1915 and two to the genus *Axonchium* Cobb, 1920 (Peña Santiago & Coomans, 1990) and the genus *Funaria* van der Linde, 1938 (Peña Santiago, 1991). This paper presents the description of two new species of the genus *Chitwoodius* (Furstenberg & Heyns, 1966) Furstenberg & Heyns, 1966.

Nematodes were extracted by Baermann funnel technique, fixed in F.A. 4 : 1 and processed to anhydrous glycerin according to Seinhorst (1959, 1962).

## *Chitwoodius parafuscus* sp. n.

(Fig. 1)

### MEASUREMENTS

See Table 1.

### DESCRIPTION

*Female* : Moderately slender nematodes of small size, generally under 1 mm. Body cylindrical, tapering slightly toward anterior end. Habitus slightly ventrally arcuate, sometimes more curved in the posterior half. Outer cuticle with conspicuous transverse striations which are more distinct at anterior end and on tail. Inner

Table 1

Morphometric data and diagnostic features of females of two new species of the genus *Chitwoodius*  
(all measurements in  $\mu\text{m}$ , except L in mm).

	<i>C. parafuscus</i> sp. n.		<i>C. heynsi</i> sp. n.			<i>C. parafuscus</i> sp. n.		<i>C. heynsi</i> sp. n.	
	Holotype	Paratypes	Holotype	Paratypes		Holotype	Paratypes	Holotype	Paratypes
n		19		2					
L	0.85	0.88 $\pm$ 0.0.9 (0.75 - 1.10)	1.74	1.51, 1.60	Pharyngeal bulb	88	88.7 $\pm$ 8.45 (68 - 100)	133	146, 142
a	29.4	28.5 $\pm$ 2.75 (23.0 - 33.3)	47.1	33.5, 39.9	Cardia width	8	8.5 $\pm$ 0.5 (8 - 9)	10	12, 12
b	4.0	4.1 $\pm$ 0.35 (3.7 - 5.0)	5.6	24.3, 5.3	length	12	11.4 $\pm$ 1.53 (9 - 14)	17	12, 17
c	40.6	45.6 $\pm$ 6.79 (40.6 - 62.5)	64.5	58.0, 57.0	Body width-neck base	28	29.3 $\pm$ 2.32 (24 - 34)	35	41, 40
c'	1.0	0.89 $\pm$ 0.08 (0.7 - 1.0)	0.9	0.9, 0.9	-midbody	29	30.9 $\pm$ 2.42 (27 - 35)	37	245, 40
V	56.3	54.4 $\pm$ 2.19 (50.6 - 59.1)	55.6	58.1, 52.2	-anus	22	22.0 $\pm$ 1.56 (19 - 24)	29	28, 32
G1	15.0	17.1 $\pm$ 2.81 (11.7 - 21.9)	12.2	14.8, 13.2	Anterior ovary	48	53.5 $\pm$ 28.8 (28 - 163)	80	74, 60
G2	15.0	18.0 $\pm$ 1.39 (15.7 - 21.8)	13.8	14.6, 14.0	Ant. gen. branch	128	153 $\pm$ 25.9 (103 - 203)	212	224, 211
Lip region width	11	11.9 $\pm$ 1.05 (11 - 14)	14	14, 15	Posterior ovary	64	53.8 $\pm$ 25.2 (31 - 141)	58	77, 65
Amphid	7	6.6 $\pm$ 0.71 (6 - 8)	?	9, 8	Post. gen. branch	128	158 $\pm$ 19.9 (122 - 193)	241	220, 223
Odontostyle	9	8.9 $\pm$ 1.20 (8 - 11)	14	16, 15	Vagina length	14	13.8 $\pm$ 0.42 (13 - 14)	20	23, 20
Odontophore	13	13.9 $\pm$ 1.20 (13 - 16)	15	16, 15	Vulva-ant. end	480	480 $\pm$ 39.6 (420 - 533)	968	877, 833
Guid. r.-ant. end	8	8.1 $\pm$ 0.62 (7 - 9)	12	12, 11	Prerectum	88	100 $\pm$ 32.1 (62 - 144)	177	149, 162
Nerv. r.-ant. end	78	78.7 $\pm$ 7.75 (66 - 91)	122	114, 115	Rectum	22	22.3 $\pm$ 2.25 (18 - 25)	32	27, 34
Neck length	213	211 $\pm$ 15.2 (183 - 233)	312	351, 300	Tail	21	19.6 $\pm$ 1.87 (16 - 24)	27	26, 28

cuticle with irregular outline and often loose from the outer cuticle. Radial refractive elements abundant, visible along the entire body but specially obvious near head and tail. Lateral chord occupying about the half of the midbody width. Lateral pores coarse, located in two rows but mostly near the ventral margin of the lateral chord. Lip region well offset by constriction, cap-like, twice as wide as high and about 35-45 % of the neck base diameter. Lips rounded, moderately separated. Inner labial papillae forming liplets. Outer labial and cephalic papillae slightly protruding. Amphids cup-shaped; openings somewhat behind the cephalic constriction and as wide as the corresponding head diameter; *fusus* situated at level of the odontophore base. Stoma from truncated-conical to cylindrical, generally with some-

what wider base. Two cuticularized pieces present in perioral area. Odontostyle elongate-tubular, shorter than the lip region diameter; aperture about 1/4-1/5 of its total length. Odontophore rod-like, somewhat longer than the odontostyle; lining sclerotized at junction of odontophore to pharynx. Guiding ring simple, situated at a distance equals 3/4 of the lip region width from the anterior end. Anterior portion of the pharynx slender, weakly muscular. Basal bulb separated from the slender part by a constriction, cylindrical in shape and about 36-47 % of the total neck length. Dorsal and posterior ventrosublateral gland nuclei and outlets obvious, first ventrosublateral ones often obscure. Nerve ring located at 31-38 % of the neck length. Cardia spheroidal. Genital system didelphic-amphidelphic.

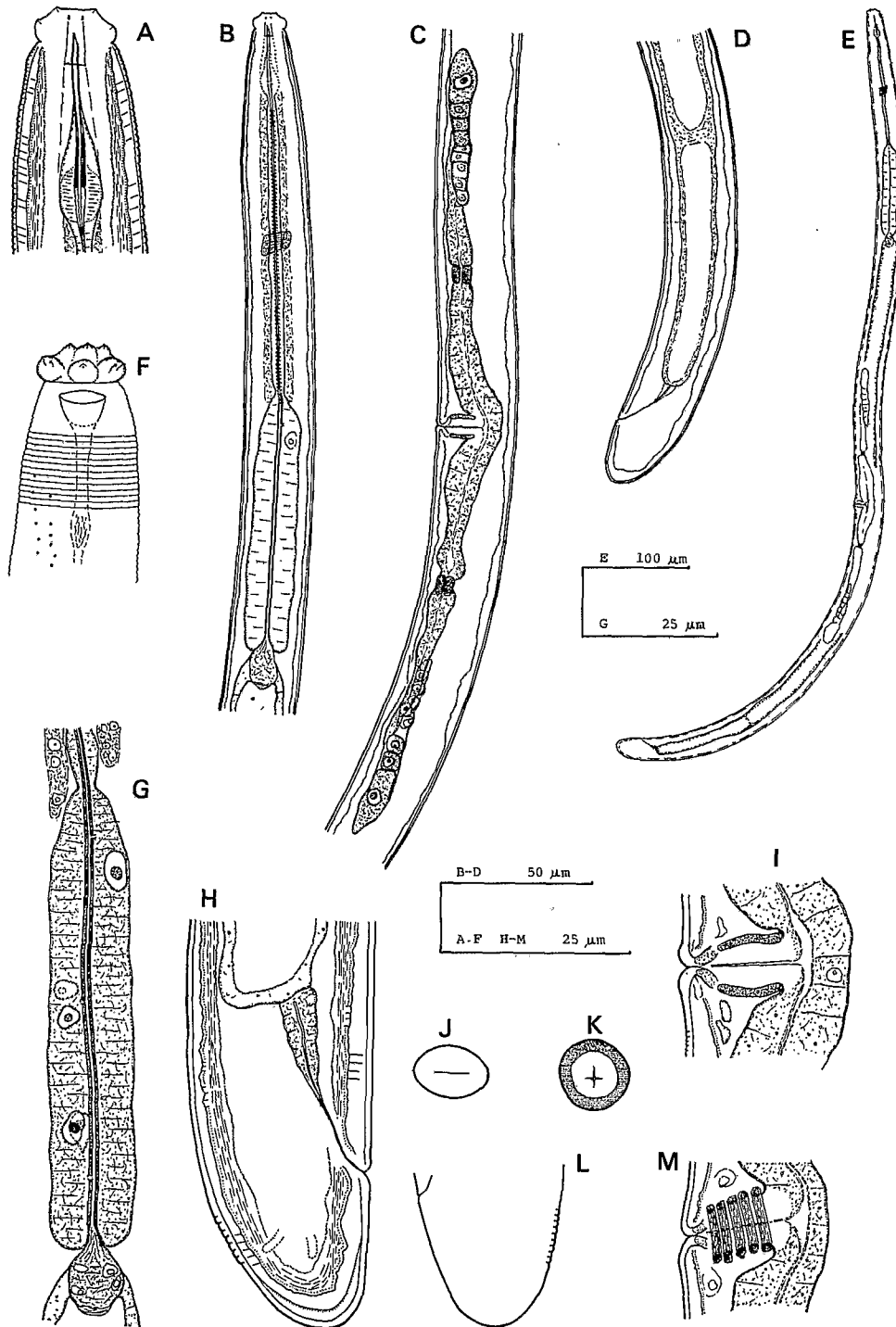


Fig. 1. *Chitwoodius parafuscus* sp. n. (female). A : Head; B : Neck region; C : Genital system; D : Posterior body region; E : Entire body; F : Head in surface view; G : Pharyngeal bulb and cardia; H, L : Tail; I, M : Vagina in lateral view; J : Vulva in ventral view; K : Vagina in ventral view.

Ovaries reflexed, with oocytes not very numerous and apparently in a single row. Oviduct with a slender part and a slightly developed *pars dilatata*. Sphincter present at the oviduct-uterus junction. Uterus wider than oviduct, without differentiations. Vagina practically cylindrical and surrounded by circular musculature, extending inward about 40-50 % of the corresponding body width, and with a sclerotized area near the vulva. Vulva a transverse slit. Genital tract not containing sperm. Prerectum 2.7-8.8 times as long as anal body diameter. Rectum about one anal body width long. Tail convex-conoid with broadly rounded tip; its length equal or somewhat less than the anal body width. Caudal pores two pairs, located about at the middle of the tail, one subdorsal and other lateral.

*Male* : Not found.

#### TYPE HABITAT AND LOCALITY

Basic soil around roots of *Andryalium agardhii* Rivas Martinez, 1961 (brushwood), Sierra de la Pandera, Valdepeñas de Jaén, province of Jaén, Spain.

#### TYPE MATERIAL

Holotype and six female paratypes in collection of the Departamento de Biología Animal, Universidad de Granada, Granada, Spain. Two paratypes each in the following collections : Instituut voor Dierkunde, Rijksuniversiteit Gent, Belgium; Laboratoire des Vers, Muséum national d'Histoire naturelle, Paris, France; CABI Institute of Parasitology, St. Albans, UK.

#### DIAGNOSIS AND RELATIONSHIPS

*C. parafuscus* sp. n. is characterized by a small size, lip region offset by constriction, lips moderately separated, cuticularized pieces present in the perioral area, odontostyle 8-11 µm long, sclerotized thickened area near the point where the odontophore joins the pharyngeal lining, prerectum 2.7-8.8 times as long as anal body width and males absent.

*C. parafuscus* sp. n. is close to *C. fuscus* Sauer, 1969 from which it differs in having wider lateral chord (*vs* 1/4 of the body width), shorter odontostyle (*vs* 12-18 µm), cuticularized pieces in the perioral area (*vs* no pieces), cardia spheroidal (*vs* cylindrical), tail relatively shorter (*vs* usually longer than anal body diameter), two pairs of caudal pores (*vs* not seen) and male absent (*vs* present).

#### *Chitwoodius heynsi* sp. n.

(Fig. 2)

#### MEASUREMENTS

See Table 1

#### DESCRIPTION

*Female* : Slender nematodes of medium size. Body

cylindrical, tapering slightly toward anterior end. Habitus slightly ventrally arcuate to strongly curved. Outer cuticle with fine transverse striations which are more distinct at level of anterior end and tail. Inner cuticle with irregular outline and often loose from the outer cuticle. Radial refractive elements abundant, visible along the entire body. Lateral chord occupying about 35-46 % of the body diameter near midbody. Lateral pores coarse, located in two rows but mostly near the ventral margin of the lateral chord. Lip region well offset by a deep constriction, twice as wide as high and about 1/3-2/5 of the neck base width. Lips rounded, separated. Perioral area disc-like, with six rounded separated liplets. Labial and cephalic papillae slightly protruding. Amphids cup-shaped, amphid openings at level of the constriction behind the lip region and occupying about 53-64 % of the corresponding head width; *fusus* situated somewhat anterior to the odontophore base. Stoma almost cylindrical. Two cuticularized pieces present in the perioral area. Odontostyle elongate-tubular, equal or slightly longer than the lip region diameter; aperture about 1/4-1/5 of its total length. Odontophore rod-like, as long as the odontostyle; a slightly sclerotized thickened area present at the junction with the pharyngeal lining. Guiding ring simple, situated at 73, 85 % of the lip region diameter from the anterior end. Anterior portion of the pharynx slender, weakly muscular. Basal bulb cylindrical, about 42-47 % of the total neck length, separated from the slender part by a short isthmus-like portion. Dorsal and posterior ventrosublateral gland nuclei and outlets obvious, anterior ventrosublateral ones obscure. Nerve ring located at 32-39 % of the neck length. Cardia spheroidal to cylindroid. Genital system didelphic-amphidelphic. Ovaries reflexed, with oocytes first in two rows, then in a single row. Oviduct with a slender part and a moderately developed *pars dilatata*. A sphincter with cuticularized walls present at the oviduct-uterus junction. Uterus with a thickened portion near the sphincter, without other differentiations. Vagina nearly cylindrical or somewhat fusiform, surrounded by circular muscles, extending inward about the half of the corresponding body diameter, with a sclerotized area near the vulva. Vulva apparently a short transverse slit but not seen in ventral view. Genital tract not containing sperm. Prerectum 5.3-6.1 times as long as anal body diameter. Rectum about one anal body diameter long. Tail convex-conoid, its length about one anal body diameter; inner cuticle outline irregular and retracted. Two pairs of caudal pores, one subdorsal somewhat behind the anus level and other lateral at the middle of the tail.

*Male* : Not found.

#### TYPE HABITAT AND LOCALITY

Basic soil around roots of *Paeonio-Quercetum rotundifoliae* Rivas Martinez, 1946 (holm-oak forest), Piedra del Aguila, Valdepeñas de Jaén, Province of Jaén, Spain.

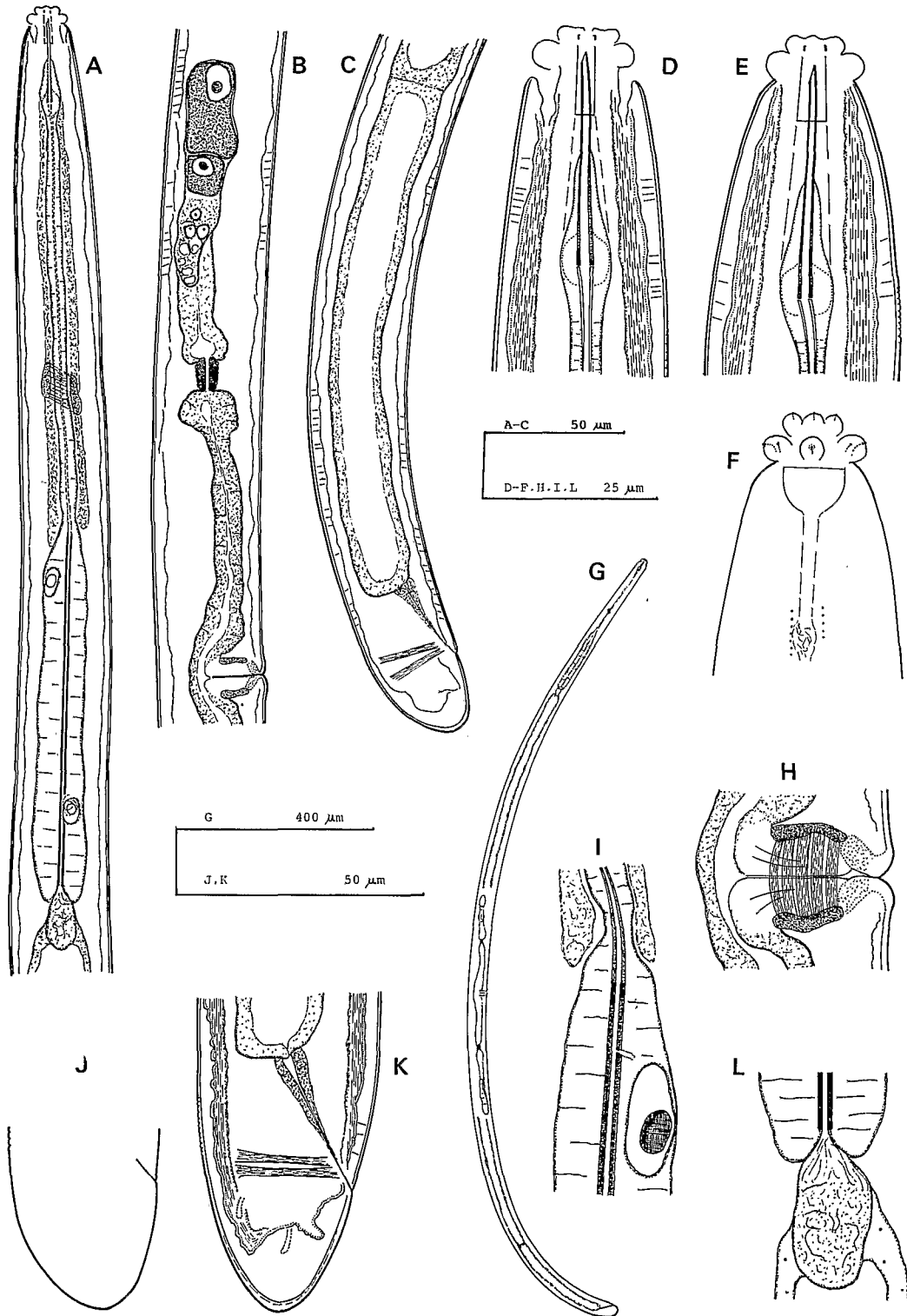


Fig. 2. *Chitwoodius heynsi* sp. n. (female). A : Neck region; B : Anterior genital branch; C : Posterior body region; D : Head in ventral view; E : Head in lateral view; F : Head in surface view; G : Entire body; H : Vagina; I : Isthmus-like portion of the pharynx; J, K : Tail; L : Cardia.

TYPE MATERIAL

Holotype female in collection of the Departamento de Biología Animal, Universidad de Granada, Granada, Spain. One paratype in collection of the Instituut voor Dierkunde, Rijksuniversiteit Gent, Belgium.

DIAGNOSIS AND RELATIONSHIPS

*C. heynsi* sp. n. is characterized by a medium size, lip region well offset by a deep constriction, lips separated and with inner part forming a perioral disc, cuticularized pieces present in the perioral area, odontostyle 14-16 µm long, sclerotized thickened area near the point where the odontophore joins the pharyngeal lining, prerectum 5.3-6.1 times as long as anal body width and absence of males.

*C. heynsi* sp. n. comes close to *C. fuscus* Sauer, 1969 and *C. parafuscus* sp. n. From *C. fuscus* the new species differs in having a greater size (vs 0.68-1.12 mm), different shape of the lip region and males absent (vs males present). From *C. parafuscus* sp. n. it differs in having a greater size (vs 0.74-1.1 mm), different shape of the lip region and longer odontostyle (vs 8-11 µm).

Remarks on the genus *Chitwoodius*

Furstenberg and Heyns (1966) diagnosed originally the genus *Chitwoodius* by "well-offset, cap-like head, the very long acicular spear, the spear extension without flanges, the large enlarged basal part of the oesophagus and the fringy appearance of the anterior part of the vagina". Later several species have been described from very different localities and geographical areas which present interesting variability in measurements and morphological features. Some of these characters re-

quire a modification of the diagnosis of the genus. As a consequence, the following emendation of the diagnosis of *Chitwoodius* is proposed :

"Tylencholaiminae Filipjev, 1934. Body small to medium size (0.7-2.5 mm long). Outer cuticle smooth or with transverse striations. Inner cuticle often with irregular outline, coarsely striated and loose from the outer cuticle. Radial refractive elements abundant. Lip region offset by constriction, usually cap-like (with perioral disc in *C. heynsi*). Amphids with large cup-shaped fovea. Odontostyle elongate-tubular with narrow lumen and very short aperture. Odontophore rod-like. Slender part of the pharynx more or less muscular, enlarging after its middle. Vulva-vagina junction fringed or not. Vulva a longitudinal or transverse slit, or pore-like. Female reproductive system didelphic-amphidelphic. Tail convex-conoid with rounded tip. Spicules dorylaimoid. Ventromedian supplements widely spaced".

*Chitwoodius* comes close to *Tylencholaimus* de Man, 1876 but differs in the shape and size of the odontostyle and mainly in the nature of the odontophore base.

For the present nine species have been included in the genus *Chitwoodius* :

- C. brasiliensis* Siddiqi, 1983
- C. fuscus* Sauer, 1969
- C. heynsi* sp. n.
- C. parafuscus* sp. n.
- C. retezatensis* Popovici, 1990
- C. rusticulus* Siddiqi, 1983
- C. seshadrii* Baqri, 1980
- C. transvaalensis* (Furstenberg & Heyns, 1966) Furstenberg & Heyns, 1966
- C. undulatus* Altherr, 1977

These species can be distinguished using the polytomous key presented in Table 2.

Table 2

Polytomous key to species of *Chitwoodius*.

	1. Perioral region 1a : disc-like 1b : normal	2. Vulva shape 2a : transverse 2b : pore-like 2c : longitudinal	3. Odontostyle length (µm) 3a : < 20 3b : 20-40 3c : > 40	4. Spicules length (µm) 4a : < 45 4b : > 45	5. Ventromedian supplements 5a : < 7 5b : > 7
<i>C. heynsi</i>	1a	2a	3a	— (*)	—
<i>C. fuscus</i>	1b	2a	3a	4a	5a
<i>C. parafuscus</i>	1b	2a	3a	—	—
<i>C. rusticulus</i>	1b	2b	3b	—	—
<i>C. seshadrii</i>	1b	2c (**)	3b	4a	5b
<i>C. retezatensis</i>	1b	2c	3b	4b	5a
<i>C. brasiliensis</i>	1b	2c	3b	4b	5b (***)
<i>C. transvaalensis</i>	1b	2c	3b	4b	5b (***)
<i>C. undulatus</i>	1b	?	3c	?	?

(\*) : male absent, no sperm in the uteri.

(\*\*) : including data from Ahmad and Jairajpuri (1982).

(\*\*\*) : two close species (see Furstenberg & Heyns, 1966; Monteiro, 1970; Siddiqi, 1983).

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