

# Nematodes of the order Dorylaimida from Andalucía Oriental, Spain. The genus *Nygolaimus* Cobb, 1913. III. Description of *N. diversus* sp. n.

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Accepted for publication 15 January 1997

**Summary.** *Nygolaimus diversus* sp. n. is described from natural biotopes in southeastern Spain. It is characterized by its medium body length ( $L=1.3-2.0$  mm), asymmetrical lip region  $12.5-15$   $\mu\text{m}$  wide offset by a weak constriction, deltoid mural tooth with its dorsal side  $10.5-12$   $\mu\text{m}$  long or two-thirds to four-fifths of the lip region width,  $V=53-59\%$ , rounded conoid tail ( $25-32$   $\mu\text{m}$ ,  $c=43-63$  and  $c'=1.1-1.4$ ), males unknown and females not containing sperm. Illustrations and a table of morphometrics are provided.

**Key words:** *Nygolaimus diversus* sp. n., Spain, taxonomy.

In this third paper of a series dealing with the taxonomy of *Nygolaimus* species from southeastern Spain we describe and illustrate a previously unknown species. Methods used are those described in Liébanas & Peña Santiago (1996, 1997).

## DESCRIPTION

### *Nygolaimus diversus* sp. n. (Fig. 1 & Table 1)

**Female.** Slender to very slender nematodes,  $1.3-2.0$  mm long. Body cylindrical, tapering slightly towards the anterior end and less so to the posterior extremity. Habitus after fixation variable but always ventrally curved, frequently to "C"-shaped but also to "J"- or "G"-shaped. Outer cuticle layer thin and smooth. Inner cuticle layer wider than the outer one throughout the body, more pronounced in the tail region. Lateral chord one-tenth to one-fifth of the midbody width. Lateral pores obscure. Lip region set-off from the adjacent body by a weak constriction; asymmetrical since most specimens examined have their dorsal side more elevated;  $2.3-2.8$  times as wide as high and about one-third of the body diameter at neck base. Lips amalgamated, in general rounded but occasionally somewhat more angular. Labial and cephalic papillae visible but without interrupting the head contour. Amphid cup-shaped, opening at level of the cephalic constriction and occupying about half of the lip region width. Stoma

typical of the genus, with sclerotized walls. Mural tooth deltoid; ventral side little longer than half of the lip region width, dorsal side two-thirds to four-fifths of the same measurement. Anterior part of the pharynx slender, muscular, then expanding gradually into the basal bulb. Pharyngeal bulb cylindrical, about three-fourths of the body diameter at neck base wide and occupying three-fifths to two-thirds of the total neck length. Pharyngeal gland nuclei clearly visible in a few specimens, as illustrated; their outlets more obscure. Cardia cylindroid to rounded, surrounded almost completely by intestinal tissue: cardiac cells ovoid,  $7-9 \times 3-4.5$   $\mu\text{m}$ . Genital system didelphic-amphidelphic. Ovaries reflexed, relatively small since they do not reach the oviduct-uterus junction. Oocytes less in number. Oviduct joining the ovary subterminally and consisting of a slender part and a well developed *pars dilatata*. Oviduct and uterus separated by a clear narrowing but a sphincter not observed. Uterus a wide and relatively short tube,  $1-1.5$  times the corresponding body width long. Sperm not seen into the genital tract. Vagina extending inwards to half of the body diameter; *pars proximalis vaginae* with straight walls; *pars distalis vaginae* as *pars proximalis* and conical or pyriform, being encompassed by more or less developed musculature. Vulva a transverse slit. Prerectum short,  $1-1.5$  anal body widths long. Rectum almost equal to this measurement. Tail rounded conoid, dorsally convex, ventrally more straight; the cuticle is moderately

**Table 1.** Measurements and diagnostic features of *Nygolaimus diversus* sp. n. (All measurements in  $\mu\text{m}$  except L in mm).

Habitat	Meadow		Garigue	Garigue	Various	Pine
Locality	Guillimona		Fátima	Jayena	Cazorla	Segura
Province	Granada		Granada	Granada	Jaén	Jaén
	Holotype 1 female	Paratype 1 female	1 female	1 female	3 females	3 females
L	1.32	1.66	1.56	1.78	1.58±0.20 (1.30-1.74)	1.63±0.03 (1.58-1.66)
a	35.8	42.7	41.1	42.5	42.06±4.92 (35.1-45.7)	42.3±1.80 (40.6-44.8)
b	2.8	3.2	2.9	3.5	2.86±0.20 (2.6-3.1)	2.93±0.04 (2.9-3.0)
c	45.7	59.5	53.9	63.8	53.4±5.56 (46.4-60)	61.3±1.71 (59.2-63.4)
V(%)	56.7	54.4	57.8	54.1	56.7±1.12 (55.2-57.9)	58.2±1.06 (57-59.6)
G1	9.6	8.4	9	9.1	8.8±0.49 (8.1-9.2)	(n=1) 9.4
G2	9.6	9.1	7.5	8.3	8.5±0.59 (8.1-9.4)	(n=1) 11
c'	1.2	1.1	1.3	1.2	1.23±0.12 (1.1-1.4)	1.06±0.04 (1.0-1.1)
Lip region width	14	14	14	14	12.6±0.94 (12-14)	14.8±0.23 (14.5-15)
height	6	6	6	6	5±0	5.33±0.23 (5-5.5)
Amphid aperture	?	?	?	6	?	?
Mural tooth ventral side	8	7.5	8	8	7.83±0.23 (7.5-8)	7.33±0.47 (7-8)
dorsal side	12	11	12	11	10.6-0.23 (10.5-11)	10.5±0
Nerve ring-ant. end	108	107	128	?	(n=1) 92	128.6±4.02 (123-132)
Neck length	467	527	531	507	540±39.06 (487-580)	551±6.5 (544-560)
Pharyngeal bulb length	307	349	337	308	342±24.5 (314-374)	358±3.09 (354-361)
Body width: neck base	37	39	41	39	36±1.41 (35-38)	36.6±2.05 (34-39)
midbody	37	39	38	42	37.3±0.47 (37-38)	38.6±1.24 (37-40)
anus	23	26	23	24	23±0	24.6±0.47 (24-25)
Anterior ovary	62	76	82	95	85.3±25.8 (49-107)	(n=1) 75
Ant. genital branch	128	141	141	163	141±25.7 (105-161)	(n=1) 157
Posterior ovary	59	81	72	77	84.6±18.5 (58-98)	(n=1) 85
Post. genital branch	128	152	118	148	135±8.80 (123-143)	(n=1) 183
Vagina	18	?	16	?	17.17	18.6±0.47 (18-19)
Vulva-ant. end	753	907	905	967	899±105 (753-993)	955±9.41 (944-967)
Prerectum	24	38	37	44	29.3±2.35 (26-31)	27±6.48 (18-33)
Rectum/Cloaca	24	30	22	25	23±1.63 (21-25)	24.6±1.69 (23-27)
Tail	29	28	29	28	29±2.44 (26-32)	26.6±1.24 (25-28)

thickened. Two pairs of caudal pores, one lateral and the other subdorsal.

**Male.** Unknown.

**Type habitat and locality.** Soil from meadow in Puerto del Pinar, Sierra Guillimona, province of Granada, Spain.

**Other habitats and localities.** The species is widely distributed in Andalucía Oriental (the Spanish region studied), having been collected in association with: i) mediterranean garigue of *Juniperus oxycedrus* L., *Thymus vulgaris* L., *Ulex parviflorus* Pourret and *Rosmarinus officinalis* L. in Fátima, and road-verge at Jayena-Almuñécar, both in the province of Granada; ii) *Asphodelus* sp. in Sierra de Cazorla, province of Jaén; iii) pine forest in Sierra de Segura and Sierra

de Torres, both in the province of Jaén, and road-verge at Cómpea-Torrox, province of Málaga; iii) mediterranean garigue of *Cistus albidus* L., *Genista cinerea*, *Echinopartum boissieri* and *Phlomis purpurea* L. in Sierra de Jabalcuz, province of Jaén; iv) *Fraxinus angustifolia* in Sierra de Andújar Natural Park, province of Jaén; iv) mediterranean garigues of *Chamaerops humilis* L., *Retama sphaerocarpa* L. (Heywood), *Ulex parviflorus* Pourret and other plants in several localities in the province of Málaga.

**Type material.** Two females (holotype and paratype) deposited in Departamento de Biología Animal, Vegetal y Ecología, Universidad de Jaén, Spain, on slides n° 0191 and 0192. Two females belonging to other populations which have been used to describe the new species are deposited in the

**Table 1 (continued).** Measurements and diagnostic features of *Nygolaimus diversus* sp. n. (All measurements in  $\mu\text{m}$  except L in mm).

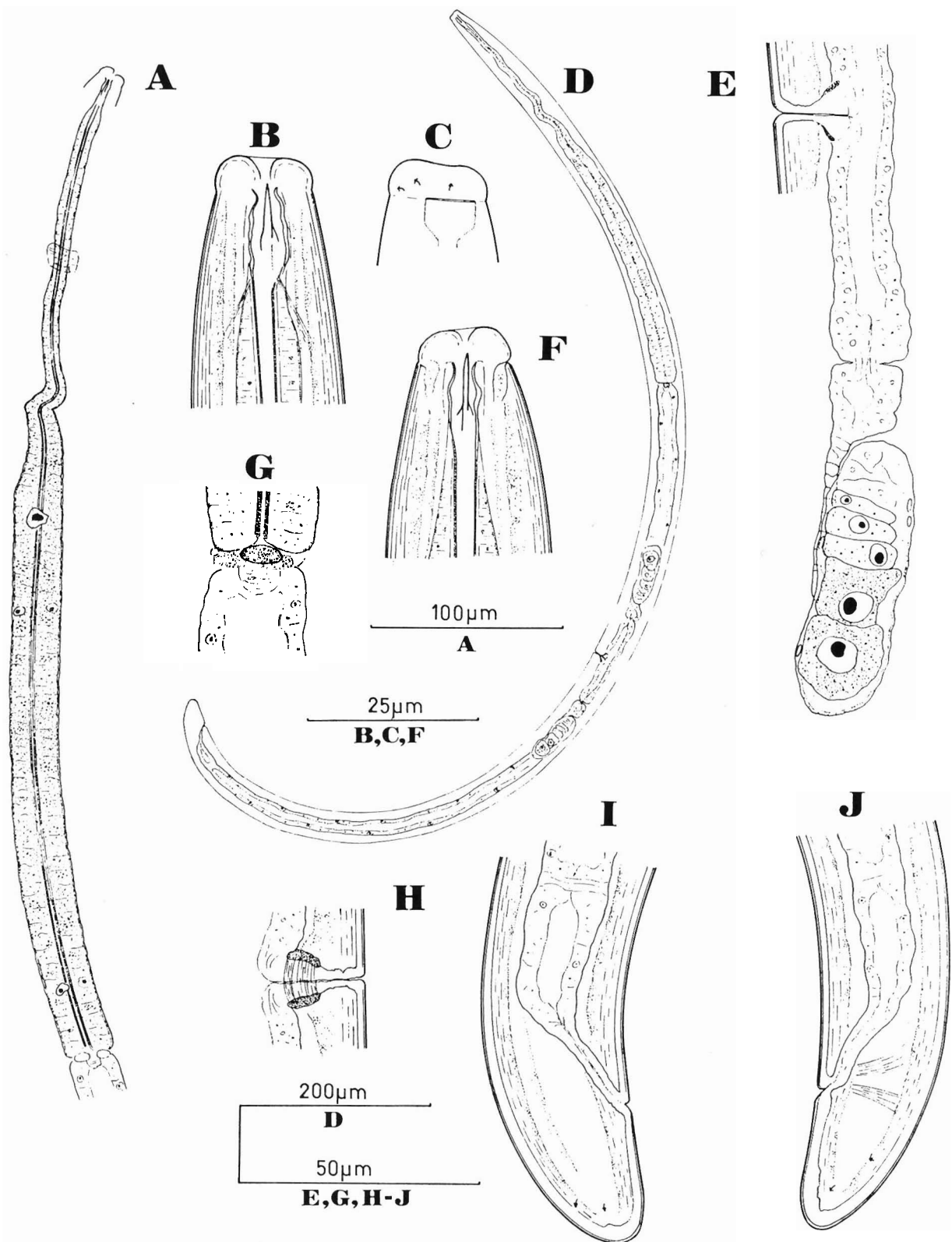
Habitat	Garigue	Pine	<i>Fraxinus</i>	Various	Meadow	Garigue	Garigue
Locality	Jabalucz	Torres	Andújar	Various	Alfarnatejo	Montecorto	Piletas
Province	Jaén	Jaén	Jaén	Málaga	Málaga	Málaga	Málaga
	1 female	1 female	4 females	3 females	1 female	1 female	1 female
L	1.37	1.51	1.85±0.13 (1.66-2.02)	1.78±0.08 (1.72-1.90)	1.66	1.62	1.92
a	31.1	44.5	39.6±2.36 (37.4-43)	44±4.32 (38-47.8)	42.6	45.2	45.6
b	3.1	3.0	3.43±0.12 (3.3-3.6)	3.4±0.16 (3.2-3.6)	3.0	3.5	3.8
c	52.7	52.1	72.1±4.96 (63.8-76.7)	58.1±2.34 (55.9-61.4)	50.4	70.7	68.5
V(%)	56.9	58.5	54.4±1.8 (52.5-57.4)	52.2±2.34 (49-54.5)	59.9	56.5	58.6
G1	7.9	8.8	6.7±0.58 (6.2-7.7)	7.2±1.15 (5.7-8.5)	8.8	10.7	10
G2	8.9	8.8	7.82±1.80 (5.6-10.6)	8.5±0.49 (7.9-9.1)	7.7	11.1	11.2
c'	1.0	1.3	0.95±0.08 (0.8-1.0)	1.2±0	1.3	0.9	1.0
Lip region width	14	14.5	14.7±0.25 (14.5-15)	14.5±0.41 (14-15)	13.5	13	14.5
height	8	5	5.5±0.5 (5-6)	5.16±0.23 (5-5.5)	5	5	5.5
Amphid aperture	?	6	?	?	?	?	5.5
Mural tooth ventral side	8	7.5	8.5±0.5 (8-9)	8±0.41 (7.5-8.5)	8	8	8
dorsal side	12	11	11.2±0.25 (11-11.5)	11.5±0.41 (11-12)	9.5	9.5	9.5
Nerve ring-ant. end	?	95	106±6.13 (98-113)	(n=2) 137,134	115	120	151
Neck length	443	505	527±28.3 (507-567)	520±11.1 (505-531)	551	467	505
Pharyngeal bulb length	?	305	354±20.8 (313-380)	342±30.8 (311-384)	367	300	308
Body width: neck base	44	36	44±2.40 (42-48)	39±4.24 (36-45)	38	37	39
midbody	44	34	46.2±4.81 (41-54)	41±6.37 (36-50)	39	36	42
anus	26	23	26.5±1.11 (25-28)	25.3±1.24 (24-27)	26	25	27
Anterior ovary	50	54	97.5±21.1 (64-117)	48±2.94 (45-52)	92	92	78
Ant. genital branch	109	134	125±18.9 (108-157)	127±15.9 (108-147)	147	174	193
Posterior ovary	54	45	115±45.2 (43-166)	65.6±17.9 (44-88)	72	75	170
Post. genital branch	122	134	148±43.8 (94-215)	151±4.10 (147-157)	128	180	216
Vagina	17	16	17.7±1.30 (17-20)	16±2.16 (14-19)	16	14	14
Vulva-ant. end	780	885	1010±55.4 (953-1093)	929±10.03 (915-938)	997	920	1125
Prerectum	30	25	28.2±4.38 (24-34)	34.3±2.05 (32-37)	31	22	?
Rectum/Cloaca	25	25	25.5±3.5 (21-31)	28.6±1.70 (27-31)	28	22	30
Tail	26	29	25.7±1.08 (24-27)	30.6±2.49 (28-34)	33	23	28

following nematode systematic collections: Instituut voor Dierkunde, Rijksuniversiteit Gent, Belgium; Muséum National d'Histoire Naturelle, Paris, France; and Landbouwniversiteit, Wageningen, the Netherlands.

**Etymology.** The specific epithet is the Latin word "diversus" which means diverse or different.

**Differential diagnosis and relationships.** The new species can be distinguished by its medium sized (L=1.3-2.0 mm) body, lip region 12.5-15  $\mu\text{m}$  wide, asymmetrical and offset by a weak constriction, deltoid mural tooth with its dorsal side 10.5-12  $\mu\text{m}$  long, V=53-59%, rounded conoid tail (25-32  $\mu\text{m}$ , c=43-63 and c'=1.1-1.4), males unknown and females not containing sperm.

*N. diversus* sp. n. belongs to a group of *Nygolaimus* species with intricate taxonomy: *N. cylindricus* Thorne, 1974, *N. directus* Heyns, 1968, *N. dorotheae* (Heyns, 1968) Thorne, 1974, *N. hyans* Thorne, 1974, *N. minimus* Vinciguerra & Zullini, 1980, *N. paratenus* Thorne, 1974, and *N. parvus* Thorne, 1974. It can be distinguished from *N. cylindricus* by its ventrally curved habitus after fixation (vs straight), vagina with a morphology typical for the genus (vs with atypical or peculiar morphology, see Thorne's Fig. 41D), more anterior vulva (vs V=61%) and absence of subterminal caudal pore (vs present); from *N. directus* by its ventrally curved habitus (vs straight), narrower lip region (vs 14.5-18  $\mu\text{m}$ ) offset by a weak constriction (vs a deep constriction), absence of a dorsal subterminal projection of internal



**Fig. 1.** *Nygolaimus diversus* sp. n. (female). A: Neck region; B, F: Lip region in median view; C: Same in surface view; D: Entire; E: Genital system; G: Cardia. H: Vagina; I, J: Tail.

core of the tail (*vs* present), and two pairs of caudal pores (*vs* one pair); from *N. dorotheae* by its shorter (*vs* L=1.9-2.6 mm in females) body, longer mural tooth (*vs* 8.5-10  $\mu$ m), relatively longer tail (*vs* c=63-83), and male unknown (*vs* male present); from *N. hyans* by its ventrally curved habitus after fixation (*vs* straight), lip region offset by a weak constriction (*vs* a deep constriction), longer (*vs* 9  $\mu$ m) and stouter mural tooth, and longer tail (*vs* 20  $\mu$ m, c=64); from *N. minimus* in the longer (*vs* L=0.95-1.1 mm) and more slender (*vs* a=27-28) body, lip region offset by a weak constriction (*vs* a deep constriction), longer mural tooth (*vs* 8-11  $\mu$ m) and absence of a clear depression on the anal aperture (*vs* presence of depression); from *N. parvus* by the morphology of the vagina being typical for the genus (*vs* atypical morphology), longer tail (*vs* 21.5  $\mu$ m, c=65 in females), and male unknown (*vs* males present); and from *N. paratenuis* in its asymmetrical (*vs* symmetrical) lip region which is offset by a weak (*vs* deep) constriction, vagina with different morphology (see Thorne's Fig. 40F), and absence of males (*vs* males known).

We accept that the differences reported here between the new species and these previously described are small, but, in our opinion, they are consistent and reliable thus justifying the proposal of a new taxon.

## ACKNOWLEDGEMENT

The second author gratefully acknowledges financial support provided by the Project "Fauna Ibérica III" (DGICYT PB92-0121).

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Liébanas G., Peña Santiago R. Нематоды отряда Dorylaimida из Восточной Андалусии, Испания. Род *Nygolaimus* Cobb, 1913. III. Описание *N. diversus* sp. n.

**Резюме.** *Nygolaimus diversus* sp. n. описан из природных биотопов юго-восточной Испании. Новый вид характеризуется средними размерами тела (L=1,3-2,0 мм), асимметричным губным отделом шириной 12,5-15 мкм, обособленным от остального тела небольшим сужением, дельтовидным онхиумом с длиной его дорсальной стороны 10,5-12 мкм (2/3-4/5 ширины губного отдела), V=53-59%, округло-коническим хвостом (длиной 25-32 мкм, c=43-63 и c'=1,1-1,4). Самцы и спермии в половых трубках самок обнаружены не были. Приведены рисунки и таблицы с морфометрией нового вида.

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