TWO NEW SPECIES OF NEMATODES (CEPHALOBIDA: CHAMBERSIELLIDAE) FROM MOSS FROM NORTH AND SOUTH AMERICA

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ABSTRACT

Cid del Prado, V.I.. 2012. Two new species of nematodes (Cephalobida: Chambersiellidae) from moss from North and South America. Nematropica 42:108-114.

Two new species of the family Chambersiellidae Thorne, 1937 were collected in tropical forest (Ecuador) and temperate forest (México) environments. *Geraldius galapagoensis* sp.n. is recognized by the head being separated from the body by a conspicuous constriction, the distance from the anterior end to the base of the oesophagus (141-207µm), the short isthmus (32-49 µm long), the vulva on a prominent vulval cone in the gravid females and the presence of a pair of vulval glands. The vulva is covered with a gelatinous-like material. The male is similar to the female, with a single testis extending anteriorly, not reflexed. Rectal glands present. Tail curved ventrally; tail terminuses dorsally hooked and slightly bifurcate. Pre-anal and post-anal papillae present. Two slightly curved spicules and conspicuous gubernaculum. *Diastolaimus mexicanus* sp.n. is characterized by the distance from the anterior end to the base of the oesophagus (189-236 µm), isthmus length (60-92 µm) and tail lengths of females and males (70-83 and 61-82 µm, respectively), and the presence of clearly bifurcate ends with hook-like mucros on tails of both females and males. The shape of the gubernaculum is also characteristic.

Key words: Galapagos, morphology, morphometrics, new species, taxonomy, Chambersiellidae.

RESUMEN

Cid del Prado, V.I.. 2012. Dos nuevas especies de nematodos (Cephalobida: Chambersiellidae) en musgo de Norte y Sur America. Nematropica 42:108-114.

Dos especies de la familia Chambersiellidae Thorne, 1937 fueron colectadas en un bosque tropical (Ecuador) y otro templado (México). *Geraldius galapogoensis* sp.n. es reconocida por la cabeza separada del cuerpo por una constricción, por la distancia del extremo anterior a la base del esófago, su istmo corto, la vulva sobre un prominente cono vulvar en hembras maduras, y la presencia de un par de glándulas vulvares; la vulva cubierta con un material gelatinoso. Los machos similares a las hembras, con un solo testículo sin flexiones. Glándulas rectales presentes. Cola curvada ventralmente, terminada en un gancho bifurcado ligeramente. Papilas precloacales y postcloacales presentes. Dos espículas ligeramente curvadas y conspicuo gubernaculum presente. *Diastolaimus mexicanus* sp.n. se caracteriza por el tamaño del esófago, (189-236 µm long), el tamaño del istmo (60-92 µm long), el tamaño de las colas de las hembras y machos (70-88 y 61-82 µm long, respectivamente), con un gancho claramente bifurcado terminal. La forma del gubernaculum también es característico.

Palavras-chave: Galápagos, morfología, morfometria, nuevas especies, taxonomia, Chambersiellidae.

INTRODUCTION

Two species belonging to the family Chambersiellidae Thorne, 1937 were discovered in Ecuador and Mexico. They were found in tropical and temperate habitats, respectively. Neither of them had been reported previously and they are described here as new species. The genus *Geraldius* is monotypic, the only previously known species being *G. bakeri* (Sanwal, 1957) Sanwal, 1971. This species was collected in Canada, and later, during a study of the nematode fauna in Costa Rica, was reported from lichen hanging from a tree by Holovachov *et al.* (2003). The genus *Diastolaimus*, Rahm, 1928 until now included only five described species from America and Europe: *D. papillatus* Rahm, 1928 and 1929, the type species *D. croca* (Massey, 1963) Andrássy, 1984, *D. grossus* (Truskova & Eroshenko, 1977) Andrássy, 1984, *D. damalis* (Massey, 1966) Andrássy, 1984 and *D. aculentus* (Daday, 1905) Andrássy, 1984.

MATERIALS AND METHODS

Samples of moss were kept in jars with water at room temperature and moved every 12 hours by rotating the sample; the suspension was decanted every 24 hours, over a period of 2 days.

Extracted nematodes were killed by heating (to 65 ºC) in about 7 ml of water in a 5-cm-diameter Petri dish, until movement ceased. An equal volume of 8% formalin at room temperature was added to the suspension for a final fixative concentration of 4% formalin; the covered dish was stored at room temperature for 10 days. The fixative was then carefully removed by pipetting from the surface, without disturbing the nematodes, until the depth was reduced to ~4 mm. The covered Petri dish was placed in a small desiccator over 96% ethanol and incubated at 40ºC. After 3 days, when the odor of formalin was no longer detectable, the volume of liquid in the dish was reduced to half, without disturbing the nematodes, by removing liquid with a pipette under a microscope.

Samples were processed to glycerin using a modification of the Seinhorst (1959) and De Grisse & Choi (1971) methods. An equal volume of Seinhorst A solution (1 part glycerin, 20 parts 96% ethanol, 79 parts water) was added to the dish and it was incubated at 40ºC with the cover slightly open. When the solution level dropped to 2 mm, more Seinhorst A solution was added and the incubation continued. When the solution level dropped to 1 mm, Seinhorst B solution (95 parts 96% ethanol, 5 parts glycerin) was added and the dish again incubated at 40ºC. When the solution level again dropped to 1 mm, Seinhorst C solution (80 parts 96% ethanol, 20 parts glycerin) was added. Three days later, 1 ml of pure glycerin was added to the dish. Selected nematodes were hand-picked from the dish for mounting on glass slides using the paraffin wax ring method (de Maeseneer and d'Herde, 1963). Measurements and drawings were made using a drawing tube mounted on an American Optical compound microscope. The specimens for scanning electron microscope studies were washed in magnesium buffer solution, pH 7.2, for 20 minutes and dehydrated in an ethanol solutions series, from 10 to 100% in ten stages for 15 minutes each. Samples were then critical point dried before coating with gold/palladium (80/20%) during 4 minutes and observation in a Jeol JSM-6390 microscope at 10 KV acceleration voltage.

Geraldius galapagoensis sp.n.

DESCRIPTION

(Measurements: See Table 1)

Female (n=19) Body C-shaped when heat relaxed, attenuated towards both ends, cuticle very finely annulated (annules 0.6 µm wide), head marked by a constriction from the rest of the body. Labial region with six lips, rounded with six cirri, with four clear branches 4 µm long; on the base of each cirrus there are at the same level six outer and four cephalic setae, 2 and 1 µm long respectively. Oval amphid aperture 11-22 (14±0.1) µm from the anterior end. Lip region 7-11 (8±0.3) µm wide and 2.8-4 times as long as the stoma, heavily sclerotised. Lateral field with two incisures. Stoma divisible into three regions: cheilostom 4-8 (5±0.2) µm long by 4-8 (6±0.3) µm wide, anterior margin not projecting out of the oral opening, gymnostom 5-8 (7±0.2) µm long by 4-7 (5±0.2) µm wide, and stegostom 12-17 (14±0.4) µm long by 2-4 (2.3±0.1) µm wide enveloped by muscular pharyngeal tissue, with conspicuous cuticular lining. Dorsal pharyngeal gland orifice found in the last third of stegostom. Pharyngeal corpus cylindrical without a median bulb, with prominent cuticular lining. Narrow isthmus with thinner cuticular lining than the corpus. Basal pharyngeal bulb oval, with strong transverse/butterfly valve apparatus and visible pharyngeal glands. Nerve ring encircling the pharynx in the anterior part of the isthmus. Excretory pore clearly visible at mid-length of the isthmus and posterior to the nerve ring. Deirids 113-152 (138±2.8) µm from the anterior end. Reproductive system didelphic-amphidelphic, ovaries opposed and reflexed with oocytes arranged in single file. Vagina with thick transverse muscular layers, 10-30 (19±1.5) µm long. Vulval glands seen in three specimens, anterior one 30-40 (34) µm long and the posterior 40-60 (37) µm long; vulva in mature females on an elevated vulva cone, often covered with a dense secretion – presumably a copulation plug. Tail conoid, narrowing gradually and ending in a pair of sclerotized mucros, 0.5 µm long and with rounded ends.

Male (n=7). Body habitus an open C-shape, posterior end curved ventrally, when killed by gentle heat. Cuticle finely annulated. Head offset by a constriction from the rest of the body. Cirri and setae similar to those of female: six outer setae, 2-3 (2.6±0.2) µm long, cephalic setae difficult to measure. Oval amphid aperture 10-15 (13±0.8) µm from the anterior end. Head width 7-10 (8±0.4) µm. Cheilostom 4-7 (5±0.6) µm long by 3-5 (4.5±0.3) µm wide, anterior margin not projecting out of the oral opening. Gymnostom 6-7 (6.7±0.2) µm long by 4-5 (4.3±0.2) µm wide and the stegostom 14-15 (14.8±0.1) µm long by 2-3 (2.1± 0.1) µm wide. Oesophagus parts as described in females. Single gonad extends anteriorly, not reflexed, 255-688 (476±110) µm long and 23-65 (49±9.9) % of body length. Rectal glands present. Tail curved ventrally, ending in dorsally hooked end. Seven pairs of latero-ventral pre-anal papillae and three pairs of post-anal in the following positions: one pair latero-ventral and two pairs dorso-lateral. Phasmid at same level as the second pair of latero-dorsal papillae. Two slightly curved spicules with asymmetric manubrium with an anterior extension, conspicuous gubernaculum present, anterior part wide and reducing gradually with tip crura appearing like a small drop of water.

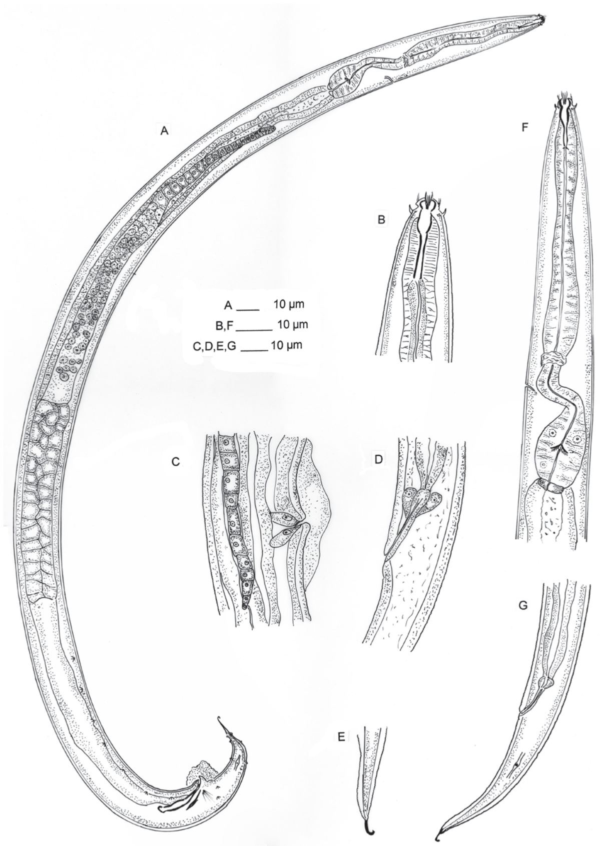

Fig. 1. *Geraldius galapogoensis* sp.n. Male A. Entire body. Female B-F. B,F. Anterior end; C: Vulva lateral view; D. Rectum; E. Tail end; F. Anterior end; G. Tail.

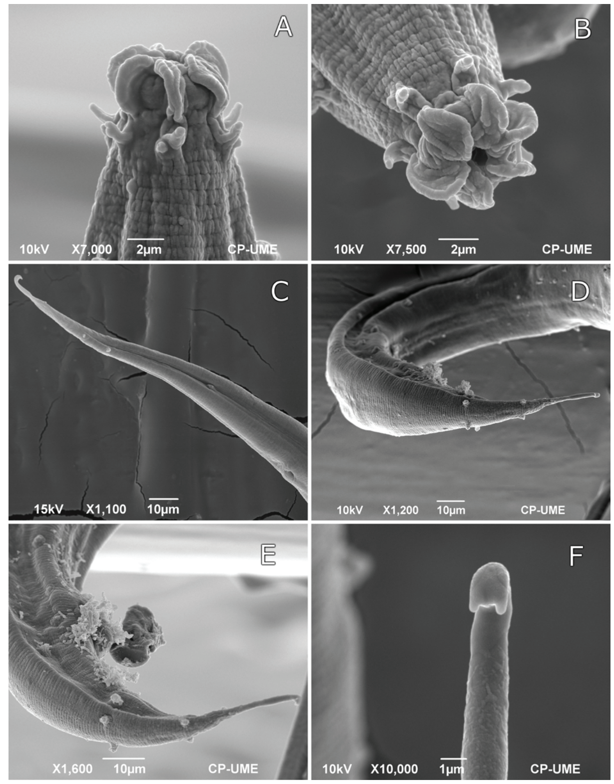

Fig. 2. Scanning electron photomicrographs of *Geraldius galapogoensis* sp.n. A,B. Juvenile A. Lateral view of head; B. Face view; Male. C.Tail; D. Bifid end tail; E. Tail female; F. Tail male.

Diagnosis and relationships. Geraldius galapagoensis sp.n. is characterized by the head being offset from the body by a conspicuous constriction, the distance from the anterior end to the base of the oesophagus, short isthmus, vulva on a vulval cone, and the presence of a pair of vulval glands.

The new species is similar to *G. bakeri* Sanwal, 1957 in the labial region, which is rounded with six cirri, the structure of the stoma, the shape of the tail, and the presence of rectal glands in females and males. It differs by the head being marked by a constriction from the rest of the body, by the distance from the anterior end to the base of the oesophagus (141-207 vs 224-248 µm long), in the size of the isthmus (32-45 vs 52-63 µm long), in the size of the tail (81-121 vs 121-144 µm long), in the distance of the excretory pore and deirid from the anterior end (110-145 vs 171-190 and 129-152 vs 166-190 µm, respectively), and in the position of the vulva (39-49 vs 49-52%).

Type locality and habitat. *Geraldius galapagoensis* sp.n. was collected from mosses from the family Meteoriaceae, growing abundantly in endemic trees *Scalesia pedunculata* Hook. (Asteraceae) in tropical forest on the twin volcanoes of Isla Santa Cruz, Galápagos Islands, Ecuador, 0° 38' S, 90° 21' W at 800 meters above sea level and 200 meters from the main road.

Type specimens. Accession numbers of type specimens deposited in the Laboratorio de Helmintología del Instituto de Biología, UNAM, México, are holotype female CNHE 8185, allotype male CNHE 8186, paratype females CNHE 8187. Other paratype material is deposited in the University of California Riverside Nematode Collection (UCRNC), the Wageningen University Nematode Collection (WUNCO) WT 3671 and the Colegio de Postgraduados Nematode Collection (CPNC) A-066-2.

Etymology. The specific epithet refers to the geographical origin of the species, the Galápagos Islands, Ecuador.

Diastolaimus mexicanus sp.n.

DESCRIPTION

(Measurements: See Table 1)

Female (n=14) Body open C-shaped when heat relaxed, cuticle very finely annulated, head rounded, continuous with the rest of the body, lateral field with

Table 1. Holotype and paratype characteristics of females of *Geraldius bakeri* and *G. galapagoensis* sp.n. Measurements in µm except for L in mm.

	G. bakeri ♀	*G. bakeri* ♂	*G. galapagoensis* sp.n. ♀ n=19	*G. galapagoensis* sp.n. ♂ n=7
L	1.1-1.3	1.1-1.3	0.8-1.2(1.0±1.3)	0.8-1.1(1.0±0.03)
a	17.6-23.5	26.9-31.5	19.3-35(25±0.9)	18.6-31.5(25±1.9)
b	4.4-5.3	4.8-5.3	4.9-6.8(5.7±0.1)	4.6-8.3(5.8±0.5)
c	8.0-9.5	9.5-11.1	8.1-10.8(9.6±0.2)	9.5-14.1(11.6±0.6)
c’	4.1-6.3	2.8	3.7-6.3(4.7±0.2)	1.8-2.6(2.2±0.1)
body diameter	46-67	42.5-40.5	30-55(41±1.8)	32-55(43±3.5)
Oesophagus base to anterior end	224-248	240-242	141-207(179±4.5)	122.5-226(183±12.5)
Corpus	120-138	135-136	112-145(125±2.3)	101-136(125±5.3)
Isthmus	52-63	58	32-45(39±2.3)	32-57(43±3.8)
Bulb length	32-42	37-38	21-42(30±1.4)	25-32(28±1.5)
Bulb width			17-30(23±0.8)	22-27(25±0.8)
Corpus/isthmus	2.1-2.5	2.3-2.4	1.1-4.4(3.0±0.2)	2.4-4.1(3.0±0.2)
Cheilostom width			4.0-8.0(6.0±0.3)	3.0-5.0(5.0±0.3)
Cheilostom length			4.0-7.0(4.5±0.2)	4.0-7.0(5.3±0.6)
Gymnostoma length			5.0-8.0(6.6±0.2)	6.0-7.0(6.7±0.2)
Stegostom length			12.0-17((14.2±0.4)	14-15(14.9±0.1)
Tail length	121-144	115-121	81-121(105±2.5)	78-98(88.7±2.4)
Tail width	23-31	41.5-43	18-28(22.8±0.5)	33-50(41±2.2)
Rectum			24-35(30±1.0)	
rectum/tail width			0.7-4.7(1.6±0.2)	
Head width			7.0-11.0(8.4±0.3)	7.0-10.0(8.1±0.4)
Nerve ring	144-165	170	110-145(130.5±2.6)	107-157(133.6±6.7)
Excretory pore	171-190	194-195	73-161(133)	108-169(145)
Deirid to anterior	166-190		129-152(138±2.7)	113-174(147±10.4)
Phasmid to anus	33-46	40.5-54	32-51(40.5±1.4)	32-40(35.7±1.3)
phasmid/tail	28-33	33.4-47.1	31-50(39±1.3)	35.5-45.9(40±1.6)
V% or T	48.8-52.3	60.5-55.5	39-50(47±0.7)	23.3-65(45±2.0)
Vagina	13-23		10-30(19±1.5)	
Body width at vulva			35-64(49±2.2)	
Spicule		50-52		44-59(49±2.0)
Gubernaculum		24		20-25(22±0.7)

two incisures. Inner cephalic papillae inconspicuous, outer setiform 4-5 (4.5±0.1) µm long; the cephalic setae near the base of outer setae are difficult to see. Oval amphid aperture at 5-23 (10.4±1.3) µm from the anterior end, stoma subdivided into: cheilostom, heavily sclerotized 6-7 (6.3±0.1) µm long by 5-7 (5.6±0.2) µm wide, gymnostom with more thickly sclerotized walls 6-7 (6.3±0.1) µm long by 3-5 (4.3±0.2) µm wide and the stegostom 3-11 (6.8±0.5) µm long, enveloped by muscular oesophageal tissue and difficult to distinguish. Oesophageal corpus muscular and cylindrical, 115-159 (134±3.1) µm from the anterior end; isthmus narrower and less muscular, 60-92 (75.7±2.0) µm long; basal bulb pyriform with very conspicuous valvular apparatus. Nerve ring almost at level of the union of corpus with isthmus at 105-169 (140±4.7) µm from the anterior end; deirid posterior to the nerve ring at 120-186 (154±4.9) µm from the anterior end; excretory pore with conspicuous channel at same level as the nerve ring at 118-185 (149±5.0) µm from the anterior

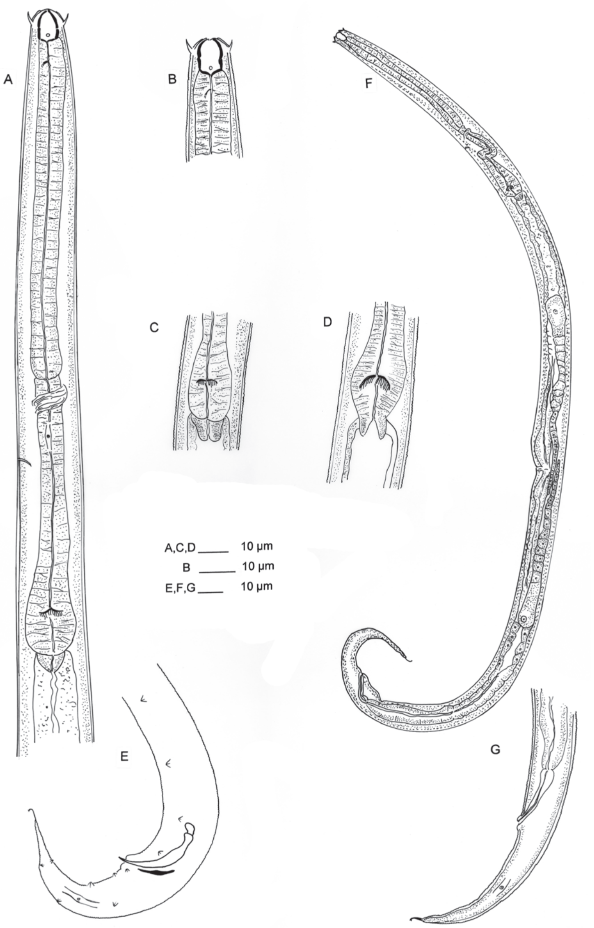

Fig. 3. *Diastolaimus mexicanus* sp.n. Male: A.C,E. A. Anterior end; C. Cardia; E. Tail. Female: B, D, G, F. B. Anterior end; D. Cardia; G. Tail; F. Entire body.

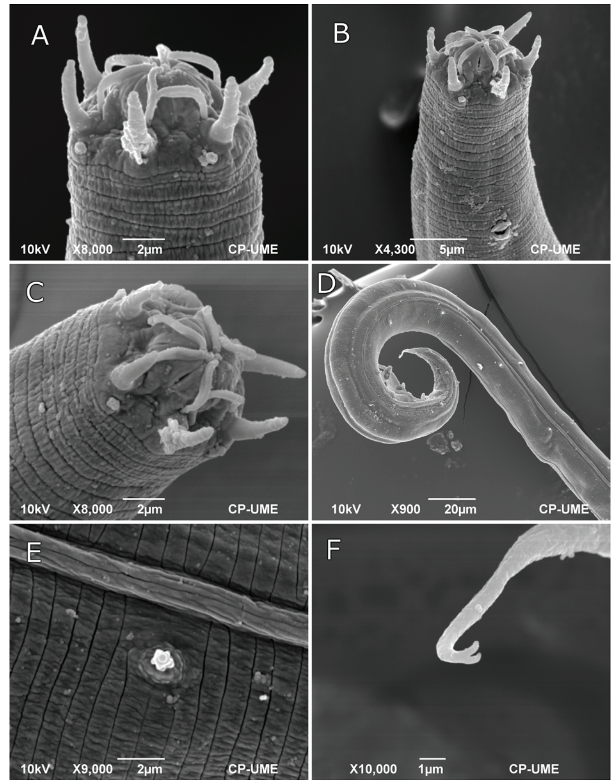

Fig. 4. Scanning electron photomicrographs of *Diastolaimus mexicanus* sp.n. Male A-F. A. Head; B. Anterior end; C. Head face view; D. Posterior end; E. Somatic papillae; F. Bifid end tail.

end. Reproductive system didelphic-amphidelphic, with reflexed ovaries. In some specimens the reflexed anterior and posterior germinal ovary zones are posterior and anterior, respectively, to the vulva; vagina short 6-14 (9±0.6) µm long and 0.2-0.5 (0.3±0.02) µm times as long as vulval body diameter, with sclerotized walls; in a few mature females the vulva is covered with a transparent gelatinous-like material; vulval lips slightly protruding. Rectum 25-32 (28±0.5) µm long, with three cells with granular cytoplasm at the anterior end. Tail conoid, with the last part straight and ending in a dorsally hooked terminus.

Male (n=12) Body C-shaped when heat relaxed with the posterior extremity curved ventrally; cuticle, head setae and lateral fields similar to those of females. Oval amphid aperture at 7-19 (11.8± 0.9) µm from the anterior end. Stoma subdivided into: cheilostom, heavily sclerotized 5-7 (6.4±0.2) µm long by 4-8 (6.3±0.3) µm wide; gymnostom with more heavily sclerotized walls 5-7 (6.1±0.2) µm long by 3-6 (4.3±0.2) µm wide; and the stegostom 4-8 (5.4±0.3) µm long, enveloped by muscular pharyngeal tissue and difficult to distinguish. Oesophageal corpus muscular and cylindrical, 120-143 (130±2.1) µm long, measured from the anterior end; isthmus narrower and less muscular, 70-83 (77±1.0) µm long; basal bulb pyriform with very conspicuous valvular apparatus, 20-25 (23±0.7) µm long and 17-20 (18±0.7) µm wide. Nerve ring anterior to excretory pore at 130-163 (143±3.9) µm from the anterior end; deirid posterior to the nerve ring at 136-181 (162±4.6) µm from the anterior end. Reproductive system monorchic. In most specimens the testis is straight; spicules cephalated, ventrally curved and with rounded end; oval manubrium and delicate velum; gubernaculum heavily sclerotized with anterior end rounded and the posterior finely acute. Three cells present near the anterior part of spicules. Twenty-six genital papillae arranged as follows: seven pairs pre-anal subventral, one adcloacal and five pairs post-anal: 2 subdorsal and 3 subventral. Phasmids located anterior to middle of tail, 12-27 (18±1.6) µm from the anus. Tail conoid, curved ventrally, sclerotized and with finely hook-like mucro dorsally curved and with acute end.

Type locality and habitat. Diastolaimus mexicanus sp.n. was collected from moss growing on trees,

Table 2. Holotype and paratype characteristics of females of *Diastolaimus croca* and *D. mexicanus* sp.n.

	Diastolaimus croca ♀	*D. croca* ♂	*D.croca* ♀	*D.croca* ♂	*D. mexicanus* sp.n.♀	*D. mexicanus* sp.n. ♂
	Costa Rica	Costa Rica	Andrassy	Andrassy	n=14	. n=12
L mm	1.1-1.2	1.1	1.4-1.6	1.2	0.8-1.1(1.0±0.02)	0.8-1.2(1.0±0.03)
a	25-31	27.6	32	35	32-43(36±0.8)	34-45(0.9)
b	4.2-4.5	4.6	6.0-7.0	7	4.2-5.4(4.6±0.1)	3.6-5.6(4.4±0.2)
c	9.6-12	11.4	11	11	10.3-14.5(12.7±0.4)	12.3-16.1(14.3±0.3)
c’	3.2-5.2	2.9			4.0-5.0(4.6±0.09)	2.2-3.3(2.7±0.08)
Body diameter	38-46	43			25-30(28±0.4)	25-30(27±0.4)
Oesophagus base to anterior end	263-284	104			189-236(216±3.7)	210-273(233±4.7)
Corpus	114-133	115			115-159(134±3.1)	120-143(130±2.1)
Isthmus	92-98	86.5			60-92(76±2.0)	70-83(77±1.0)
Bulb length	32-42	40.5			20-25(23±0.5)	20-25(23±0.7)
Bulb width					17-20(18±0.3)	17-20(18±0.3
corpus-isthmus	1.2-1.4	1.3			1.6-3.8(2.0±0.2)	1.6-2.9(1.8±0.1)
Cheilostom width					5.0-7.0(6.0±0.2)	4.0-8.0(6.3±0.3)
Cheilostoma length					6.0-7.0(6.3±0.1)	5.0-7.0(6.4±0.2)
Gymnostom length					6.0-7.0(6.3±0.1)	5.0-7.0(6.1±0.2)
Stegostom length					3.0-11.0(6.8±0.5)	4.0-8.0(5.4±0.3)
Tail length	92-127	104			70-88(787±1.4)	61-82(71±1.6)
Tail width	24-29	36			16-19(17±0.3)	25-30(27±0.5)
Rectum	43				26-32(28±0.5)	30-45(38±7.5)
rectum/tail width	1.8				1.4-1.9(1.7±0.04)	1.1-1.8(1.5±0.4)
Head width					10.0-11.0(10.4±0.1)	6.0-11.0(9.9±0.4)
Nerve ring	140-158	144			105-169(140±4.7)	130-163(143±3.9)
Excretory pore	151-178	161			118-185(149±5.0)	134-177(158±3.9)
Deirid-anterior	158-183	167			120-186(154±4.9)	136-181(162±4.6)
Phasmid to anus	43-46	45			27-38(32±0.9)	12-27(18±1.6)
phasmid/tail	34-48	43				
V% or T	52-55	57			47-54(51±0.5)	29-75(58.8±3.7)
Vagina	12.0-14.0				6.0-14(9±0.6)	
Vulva diameter					25-29(27±0.3)	
Spicule		52				30-40(36±1.0)
Gubernaculum		21				16-21(19±0.4)

Buddleia cordata, in San Diego Huehuecalco, Amecameca, México State N 19° O5' 68.7" W 98° 49' 72.7".

Type specimens. Accession numbers of type specimens deposited in the Laboratorio de Helmintología del Instituto de Biología, UNAM, México, are holotype female (CNHE 8188), allotype male (CNHE 8189), paratype females (CNHE 8190). Other paratype material is deposited in the University of California Riverside Nematode Collection (UCRNC), Wageningen University Nematode Collection (WUNCO) (WT 3570) and the Colegio de Postgraduados Nematode Collection (CPNC) A-067-2.

Etymology. The specific epithet refers to the geographical origin of the species, México.

Diagnosis and relationships. Diastolaimus mexicanus sp.n. is characterized by the distance from the anterior end to the base of the oesophagus 210-273 µm, isthmus 70-83 µm in length, tails of females and males 70-88 and 61-82 µm long respectively, shape of gubernaculum, and the sclerotized tail with finely hooked mucro dorsally curved and with an acute end.

The new species is similar to *D. croca* (Massey, 1963) Andrássy, 1984 in the size of the body, size of the corpus, the structure of the stoma and the shape of the tail. But it differs in the size of the tail (61-82 vs 92-127 µm long), the width of the tail in females (16-19 vs 24-29 µm), in c' (2.2-3.3 vs 3.2-4.5), the distance from the phasmid to the anus (27-38 vs 43-46 µm), the size of the spicules (32-40 vs 52 µm long), and the shape of the gubernaculum. *Diastolaimus mexicanus* sp.n. is also close to *D. damalis* (Massey, 1966) Andrássy, 1984 in the indices a and b in females (32-43 and 4.2-4.9 and 36-41 and 4.8-5.3, respectively), and in the position of the vulva (47-54 vs 51% in *D. damalis*). It differs in body length of female (0.8-1.2 vs 1.1-1.2 mm), size of the outer setae, and the vulval lips not protruding. Males also differ in the size of the body (0.8-1.2 vs 1.2-1.4 mm long), the indices a and b (34-45 and 3.6-5.6 and 44-50 and 5.0-5.8, respectively), and by the number and distribution of pre-anal papillae (7 vs 4) and number of the post-anal papillae: I pair ad-cloacal, and 5 pairs post-anal: 2 subdorsal and 3 subventral vs 6 pairs post-anal: 4 subventral and 2 subdorsal.

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LITERATURE CITED

Andrássy, I. 1984. *Klasse* Nematoda. (*Ordnungen Monhysterida, Desmoscolecida, Araeolaimida, Chromadorida, Rhabditida*). Akademie Verlag, Berlin, 509 pp.

De Grisse, A.T. and Y.E. Choi. 1971. A rapid method for the transfer of fixed nematodes to anhydrous glycerine. Meded. Fakulteit Landbouwwetenschappen Gent 36:617-619.

De Maeseneer, J. & J. d'Herde, 1963. Méthodes utilisées pour l'étude des anguillules libres du sol. Revue d'Agriculture 16:441-447.

Holovachov, H., A. Esquivel and T. Bongers. 2003. Free-living nematodes from nature reserves in Costa Rica. 4. Cephalobina. Nematology 5:1-15.

Massey, C .L. 1963. *Santafea* new genus (Rhabditoidea, Chambersiellidae) and a change in the systematic position of *Macrolaimus* Maupas, 1900. Proceedings of the Helminthological Society of Washington 30:26-28.

Rahm, G. F. 1928. Alguns nematodes parasitas e semiparasitas das plantas culturaes do Brasil. Archivos do Instituto Biologico de Defesa Agricola e Animal, São Paulo 1:239-251.

Rahm, G.F. 1929. Nematodes parasitas e semi-parasitas de diversas plantas culturaes do Brasil. Archivos do Instituto Biologico de Defesa Agricola e Animal, São Paulo 2:67-136.

Sanwal, K.C. 1971. *Geraldius* n. gen. Macrolaiminae n. subfam. with a revision of the subfamilies and genera of Chambersiellidae (Nematoda). Canadian Journal of Zoology 49:965-967.

Seinhorst, J. 1959. A rapid method for the transfer of nematodes from fixative to anhydrous glycerin. Nematologica 4:67-69.

Truskova, G. M. & A. S. Eroshenko.1977. Nematodofauna vegetativnykh organov travjanistykh I drevesnykh rastenij elnikov primorja. Trudy Biologo-Pochvennogo Instituta 47:35-49

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