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Seven *Acantholaimus* (Chromadoridae: Nematoda) species from one deep-sea sediment sample (Angola Basin, south-east Atlantic)

MARIA A. MILJUTINA[1], DMITRY M. MILJUTIN[1] AND ALEXEI V. TCHESUNOV[2]

[1]Senckenberg Gesellschaft für Naturforschung, Senckenberg am Meer, Deutsches Zentrum für Marine Biodiversitätsforschung, Südstrand 44, 26382 Wilhelmshaven, Germany, [2]Department of Invertebrate Zoology, Faculty of Biology, Moscow State University, 119991 Moscow, Russia

The genus Acantholaimus *(Chromadoridae: Nematoda) is one of the most species-rich deep-sea nematode genera. The descriptions of two new species and supplemental descriptions of five known species from the Angola Basin (south-east Atlantic Ocean) and a depth of about 5500 m are given.* Acantholaimus formosus *sp. nov. is characterized by a spindle-shaped body with narrow elongated anterior end, the position of amphideal fovea on the apical tip of the body and by robust rugae and onchia.* Acantholaimus skukinae *sp. nov. is characterized by its cylindrical body shape; short outer labial, cephalic, cervical, and somatic setae; large amphideal fovea; the position of its amphideal fovea (situated relatively far from the head end); and relatively small onchia.* Acantholaimus angustus *was previously found in the Peru Basin (central-eastern Pacific) and the Clarion–Clipperton Nodule Province (Equatorial Pacific), about 13,000 km apart from the nearest previous location of finding. The type location of* A. verscheldi *is the Kenyan coast of the Indian Ocean. New specimens of this species were found about 8000 km apart from the type location.* Acantholaimus akvavitus, A. iubilus *and* A. quintus *were previously found in different parts of the Atlantic and the Pacific.*

Keywords: biodiversity, distribution, DIVA-I expedition, marine nematodes, new species, taxonomy

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INTRODUCTION

The genus *Acantholaimus* Allgén, 1933 is considered to be one of the most species-rich deep-sea nematode genera. Twelve *Acantholaimus* species were found in the deep Tropical West Pacific (Tietjen, 1989). Twenty morphotypes of this genus were distinguished by Bussau (1993) in the Peru Basin (Atlantic) at a depth of about 4200 m. Muthumbi & Vincx (1997) found 37 *Acantholaimus* morphotypes from the Indian Ocean off Kenya (depth of 500–2179 m). Lambshead *et al.* (2003) recognized 7 morphotypes of *Acantholaimus* among nematodes from the Clarion–Clipperton Fracture Zone (Pacific) and 8 morphotypes in the Porcupine Abyssal Plain (Atlantic). De Mesel *et al.* (2006) found 55 *Acantholaimus* morphotypes in samples from four areas of Antarctic seas at a depth of 182–2009 m. Thirty-three morphotypes of this species were reported from the Clarion–Clipperton Fracture Zone (Pacific) at a depth of about 5000 m (Miljutina *et al.*, 2010). Nineteen morphotypes were distinguished in one sample from the Angola Basin (present work).

Several publications indicate a high abundance of this genus in deep-sea nematode assemblages; it is often one of dominating genera (Bussau, 1993; Soetaert & Heip, 1995; Soetaert *et al.*, 1995; Vanaverbeke *et al.*, 1997; Vanreusel *et al.*, 2000; Sebastian *et al.*, 2007; Miljutina *et al.*, 2010). Some *Acantholaimus* species were also in a dominating species complex (Bussau, 1993; Miljutin *et al.*, 2010).

The analysis of morphological traits important for *Acantholaimus* systematics was made by De Mesel *et al.* (2006). Among them are: shape of a head; size and location of an amphid; length of outer labial setae; position, length and arrangement of cervical setae; length and thickness of cephalic setae; arrangement of a cuticle ornamentation; and shape and length of a tail.

Forty-five *Acantholaimus* species are described up to date (including 2 new ones described in the present paper). Of them, 29 species are known from the Atlantic, 21 species from the Pacific, and 7 species from the Indian Ocean (some species were found in several oceans). Of 46 possible cosmopolitan deep-sea nematode species (i.e. species recorded at least in two different oceans), 7 species belonged to the *Acantholaimus* genus (Miljutin *et al.*, 2010).

The present study is a result of examination of nematodes of the genus *Acantholaimus* found in one sample from the DIVA-I expedition (RV 'Meteor'), which took place in summer 2000, in the Angola Basin. It was a part of the global deep-sea biodiversity programme Census of the Diversity of Abyssal Marine Life (CeDAMar). A number of species have been already described using the material of the

Corresponding author:
M.A. Miljutina
Email: mmiljutina@senckenberg.de

DIVA-I expedition (e.g. Malyutina *et al.*, 2001; Gad, 2003; Mursch *et al.*, 2008; Willen, 2008). One paper with descriptions of three new nematode species has been also published (Tchesunov, 2008).

In total, 189 individuals of the *Acantholaimus* genus (15.8% of all examined nematode individuals) were found in the sample. 19 morphotypes were distinguished, but only 7 of them possessed enough adult individuals of both sexes (for making qualitative taxonomic descriptions of new species) or, at least one adult specimen (for descriptions of new findings of known species).

MATERIALS AND METHODS

General data on the Angola Basin site and sample methods used in the DIVA-I expedition are published by Kröncke & Türkay (2003) and Rose *et al.* (2005). The value of total organic carbon in the sampling site was 0.62%, chlorophyll-*a* content 1.67 μg/g and mud content 95.23%.

Samples were taken with aid of a Barnett's multicorer. Tubes of multicorer had an inner diameter of 9.6 cm (the surface of each core amounted to 72.4 cm^2). Each sample represented the upper 5-cm-thick layer of sediment of the volume of about 362 cm^3. Samples were fixed with 5% formaldehyde solution on-board. In the laboratory, meiobenthic organisms were separated from sediments using Levasil®-kaolin medium (McIntyre & Warwick, 1984) with the following triple-time centrifugation at 4000 rpm for 6 minutes. After the centrifugation, the upper fraction containing meiobenthic organisms was sieved using a mesh size of 40 μm and washed with fresh water.

For the present study, 1193 nematode specimens were extracted from the single sample (core) from station No. 346 (16°17.0′S 005°27.0′E; depth 5389 m) and examined. Then nematodes were sorted out, processed in glycerin using the method of slow evaporation (Seinhorst, 1959), and permanently mounted on glycerin–paraffin slides. The nematodes were examined under a Leica DM 2500 light microscope equipped with Nomarski optics and a drawing apparatus. For preliminary species identification, the *NeMys* web database (Deprez *et al.*, 2005) was used.

After preliminary identification, nematodes of the genus *Acantholaimus* were studied in detail, measured, and described. Measurements of stoma and male spicules were made as described by Miljutina & Miljutin (2011).

Slides with type specimens of the new species were deposited in the collection of Senckenberg Gesellschaft für Naturforschung (Senckenberganlage 25, 60325 Frankfurt, Germany).

List of abbreviations used in this paper:

–,	parameter absent;
a,	ratio 'body length/maximum body diameter';
a′,	ratio 'body length without tail/maximum body diameter';
b,	ratio 'body length/length of pharynx';
b′,	ratio 'body length without tail/length of pharynx';
c,	ratio 'body length/length of tail';
c',	ratio 'length of tail/body diameter at anus';
c.b.d.,	corresponding body diameter;
f,	female;
i,	intersex;
L,	total body length;
L′,	body length without tail;
m,	male;
n.a.,	not available for measuring because of poor position or condition of specimen, broken tail or inverted head;
V,	ratio 'distance from anterior end to vulva/total body length' (%);
V′,	ratio 'distance from anterior end to vulva/body length without tail' (%).

SYSTEMATICS

Order CHROMADORIDA Chitwood, 1933
Family CHROMADORIDAE Filipjev, 1917
Genus *Acantholaimus* Allgén, 1933
Acantholaimus angustus Bussau, 1993
(Figure 1; Table 1)

MATERIAL EXAMINED

Two males and 1 intersex (possessing well developed female reproductive system and male spicules with gubernaculum but without testis and vas deferens) (Table 1).

DESCRIPTION

Measurements are given in Table 1. Body slightly spindle-shaped, with narrowed anterior end and filiform posterior end. Somatic setae 2–8 μm long, numerous, situated along entire body in 4 sublateral rows. In postanal region, somatic setae clavate, i.e. with widened distal end; on rest of body, setae cylindrical or clavate. Cuticle densely dotted (dots arranged in transverse rows), with lateral fields consisting of larger dots. Lateral fields beginning at posterior border of amphideal fovea and extending along entire body length except filiform part of tail. Cuticle about 1.0–1.5 μm thick along entire body length except at level of cephalic setae, where it is thinner (0.3–0.5 μm), and except level of amphids, where it is thicker (~2 μm). Lips not visible. Two rings of head sensilla visible: 6 outer labial setae 3.5–4.5 μm long, and 4 submedian cephalic setae 7–8 μm long. Amphideal fovea large (about 1 c.b.d. in width in males), ventrally coiled, single-spiral, in form of longitudinally oriented oval or round, 9–10 μm width in males situated in 0.55–0.65 midamphideal c.b.d. from anterior end. Two pairs (latero-subdorsal and latero-subventral) of cervical setae 4–6 μm long, located close to posterior part of amphideal fovea. In latero-subventral pair of cervical setae, the distance between anterior and posterior setae is approximately twice the distance between setae of latero-subdorsal pair. Stoma consisting of wide, barrel-shaped cheilostoma and narrow pharyngostoma. At least two small sclerotized onchia ~1 μm long (presumably, dorsal and subventral) visible at anterior end of pharyngostoma. Pharyngostoma ~10 μm long. Pharynx muscular, relatively thin and cylindrical in anterior 3/4 of its length, posterior 1/4 of pharynx widened and containing large, regularly alternating plasmatic inclusions. Nerve ring and renette cell not visible. Cardia small, surrounded by intestine. Tail consisting of proximal conical part and long terminal filiform cylindrical part constituting ~70% of entire tail length.

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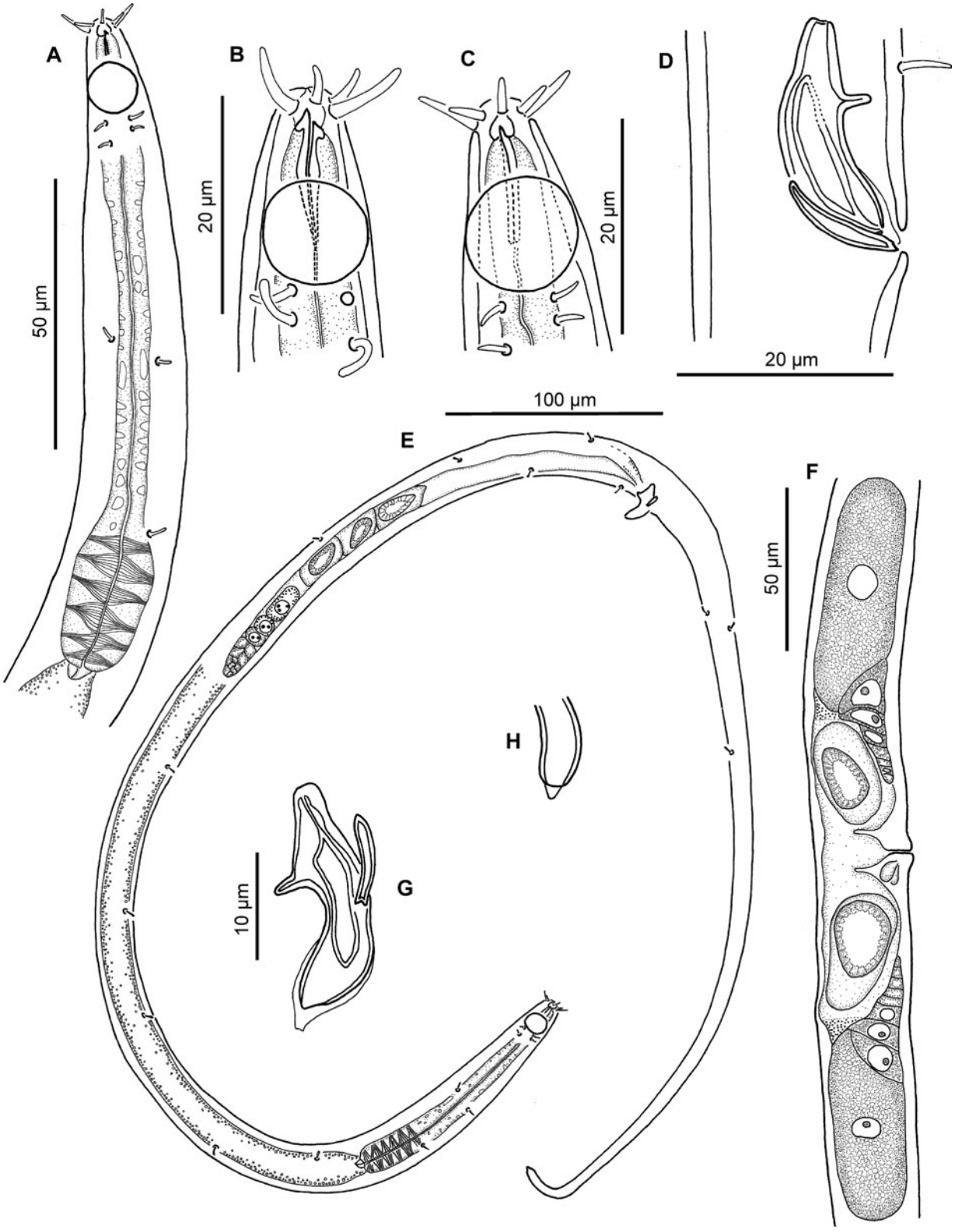

Fig. 1. *Acantholaimus angustus* Bussau, 1993: (A) specimen No. 1, male, anterior end; (B) specimen No. 2, intersex, head; (C) specimen No. 1, head; (D) specimen No. 2, spicule region; (E) specimen No. 1, total view; (F) specimen No. 2, female reproductive system; (G) specimen No. 1, spicule; (H) specimen No. 1, caudal tip.

Male reproductive system monorchic. Testis directed anteriorly, outstretched, lying to the right of intestine, occupying 40–50% of total body length. Spermatozoa oval, large (~48 × 16 µm), with clearly visible, oblong nuclei. Curved spicules possessing complex cuticular sculpture with thickened cuticular areas in form of longitudinal ridges. Gubernaculum shaped as curved stick with edged proximal end and bifurcated distal end. Supplementary organs not found.

Female reproductive system was examined in intersex only. It consisted of two antidromous ovaries (anterior ovary lying

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Table 1. *Acantholaimus angustus* Bussau, 1993. Measurements (in μm) and body indices.

Specimen No.	1	2	3
Slide number	A33	A1	A2
Number of specimen on slide	5	2	3
Sex	m	i	m
L	1060	n.a.	n.a.
L′	666	665	568
Amphidial diameter	9	10	10
Length of outer labial setae	3.5	3.5	4.5
Length of cephalic setae	7	7.5	8
Length of cervical setae	3.5	5	6
Length of somatic setae at cervical region	2.0	5.0	6.5
Length of somatic setae at midbody	3.0	4.5	n.a.
Length of somatic setae at caudal region	3.5	6.5	8.0
Length of cheilostoma	4.5	4	4.5
Length of pharyngostoma	10	10	10
Length of spicule in chord	23	23	26
Length of spicule in arc	25	26	31
Length of gubernaculum	10	14	14
Distance from anterior end to amphid	8	8	7.5
Diameter at level of cephalic setae	5	5	5
Diameter at level of middle of amphid	11	11	14
Diameter at level of cardia	20	23	27.5
Diameter at level of anus	17	20	21
Maximum body diameter	20	29	29
a	53.0	n.a.	n.a.
b	8.5	n.a.	n.a.
c	2.7	n.a.	n.a.
V	–	n.a.	–
a′	33.3	23.0	19.6
b′	5.3	5.5	4.4
c′	23.2	n.a.	n.a.
V′	–	62	–
Notes	–	Broken fusiform part of tail	Broken fusiform part of tail

n.a., not available.

to right of intestine, and posterior one lying to left of intestine). Total length of female reproductive system constituting ~36% of preanal body length. Length of ovaries 85–96 μm. Each ovary containing one mature oocyte, 57 × 22 μm in size. Two spermatozoa ~36 × 17 μm in size visible in uterus.

ABUNDANCE

Ten specimens were found (about 0.8% of all nematodes examined in the sample).

RE-EXAMINATION OF HOLOTYPE

The holotype of *A. angustus* was re-examined (Figure 2). This re-examination revealed some inaccuracies in the original description. The length of cephalic setae is 11 μm instead of 15 μm in the original description. The cuticle is distinctly thickened at a level of the amphideal fovea, whereas it was described by Bussau (1993) as possessing the same thickness as at more anterior and more posterior regions of the body. Left and right gubernacula vary in their form in the holotype (one of them is curved, the other one has a form of a tortuous stick), whereas only tortuous gubernaculum was described by Bussau (1993). Labial, cephalic, and cervical setae are cylindrical or clavate versus conical with rounded edge in the original description. The spicule length in arc was 26 μm versus 16 μm in the original description (it can be caused by differences in methods of spicule measuring).

REMARKS

Acantholaimus angustus was previously described from the Pacific only (Bussau, 1993; Miljutina & Miljutin, 2011). The

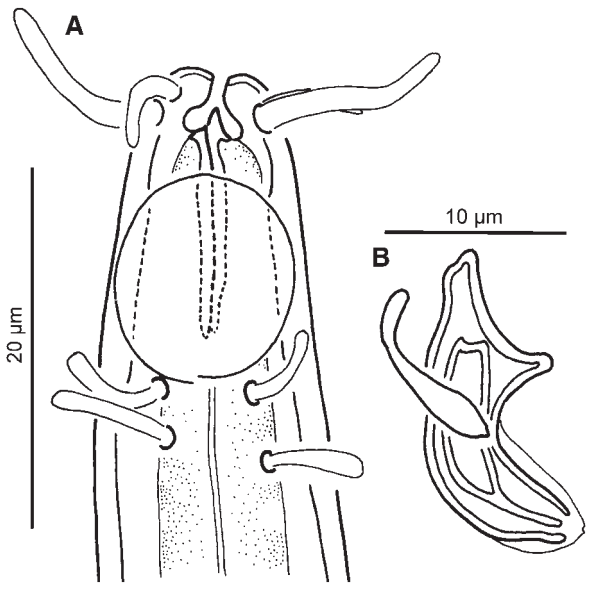

Fig. 2. *Acantholaimus angustus* Bussau, 1993, re-drawing of holotype male: (A) head; (B) spicule.

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newfound specimens were therefore found about 13,000 km apart from the nearest previous location of finding (through the Drake Passage).

The newfound specimens correspond well with type individuals in their general appearance; size, location of amphideal fovae; number, location, and size of cervical setae; shape and size of spicules; and the arrangement of the stoma.

The newfound individuals are longer than type specimens ($L' = 568-666$ μm versus 471–570 μm, respectively). The tail is longer in new specimens ($c = 2.7$ in only specimen with non-broken tail versus 4.7–5.5 in type specimens). However, the tail length can vary a lot in *Acantholaimus* genus. For instance, in *A. angustus* found in the Clarion–Clipperton Fracture Zone, Pacific (Miljutina & Miljutin, 2011), the 'c' parameter varied 2.3 to 4.1. The cephalic setae are shorter in new specimens (7–8 μm versus 11 μm in re-examined holotype). All these differences can be explained by interpopulation variability.

DISTRIBUTION

South-eastern Pacific, Peru Basin, nodule fields, 4157 m depth, 4159 m (Bussau, 1993); north-eastern tropical Pacific, Clarion–Clipperton Fracture Zone, nodule fields, abyssal plain without nodules, 4800–5042 m depth, ooze (Miljutina & Miljutin, 2011); south-eastern Atlantic, Angola Basin, 5450 m depth (present report).

Acantholaimus akvavitus Gerlach, Schrage & Riemann, 1979 (Figures 3–4, 5A, B, 6A; Table 2)

MATERIAL EXAMINED

Two males, one female. One male is a little bit flattened between the object and cover glasses.

DESCRIPTION

Measurements are given in Table 2. Body spindle-shaped, with strongly narrowed anterior end and filiform posterior one. Cuticle dotted densely with lateral differentiation, with beginning posterior amphideal fovea and lasting along whole body length except filiform part of tail. Width of lateral fields ~15 μm at level of pharynx and ~20 μm at midbody. Dots of lateral fields being bigger and situated sparser than ones outside lateral fields. At both lateral fields and outside lateral fields, dots arranged in more or less regular transversal rows. Cuticle thickness 0.5–1.0 μm at head tip, 2.0–2.5 μm at pharyngeal region, 1.5–2.0 μm at midbody, and 2–3 μm at caudal region. Somatic setae cylindrical or clavate, present along the whole body posterior amphideal fovea, arranged in 4 sublateral rows situated on each side of lateral fields, 7–8 μm long at pharyngeal region, 8–9 μm long at midbody, 9–11 μm at caudal region. Six triangle-shaped, very large lips ~7 μm long visible. Inner labial sensilla invisible. Six outer labial setae 5–6 μm long and 4 submedian cephalic setae 8–10 μm long, located close to each other, and lying at almost the same level. Amphideal fovea round, single-spiral, with fine concentric striation visible inside. Amphideal fovea situated in ~1 c.b.d. behind anterior end. Arrangement of cervical setae not clear because of lack of many of them. Possibly, a laterosubdorsal pair of setae located distant from each other and one laterosubventral setae present behind each amphideal fovea. Their length 8–10 μm. Stoma consisting of cup-shaped cheilostoma (6–10 μm long) and narrow, funnel-shaped pharyngostoma (13–19 μm long). Cheilostoma possessing 6 pairs of rod-shaped, many-jointed and tortuous cuticular rugae. Rugae laying deep in cheilostoma, at level of tips of onchia. Pharyngostoma containing 4 sclerotized onchia: dorsal and subventral ones 3.5–6.5 μm long (in different specimens), and 2 smaller ones 2.0–2.5 μm long. Walls of pharyngostoma, being a prolongation of onchia, looking very thick and possessing a complicated construction. Pharynx regularly muscular, gradually widening to its posterior end. Anterior part of pharynx at level of esophasoma looking as detached from rest pharynx by small junction. Posteriormost 3/4 of pharynx containing numerous, regularly arranged plasmatic inclusions. Nerve ring and renette cell not found. Cardia triangular. Tail consisting of proximal conical part and long terminal filiform cylindrical part constituting ~80% of whole tail length.

Male reproductive system. Single testis directed anteriorly, outstretched, lying to the left of intestine (in both examined males), however spermaduct lying to the right of intestine. Curved funnel-shaped paired spicules possessing cuticular sculpture with thickened cuticular areas in shape of longitudinal or transversal ridges. Construction of spicules and shape of gubernacula not well seen because of their bad position. Total length of male reproductive system ~45% of precloacal body length. Size of spermatozoa ~45 × 33 μm.

Female reproductive system consisting of two antidromous ovaries 40–50 μm long (anterior one lying to the right of intestine, and posterior one lying to the left of intestine), and short oviducts. Total length of female reproductive system ~27% of preanal body length. Vulvar glands surrounding short vulva seen.

ABUNDANCE

Three specimens were found (0.25% of all nematodes examined in the sample).

REMARKS

The newfound specimens of *A. akvavitus* show good resemblance with the original description in their general appearance, the body parameters, the length and the arrangement of head and somatic setae, the character of lateral fields. A very characteristic feature is the arrangement of cervical setae (a laterosubdorsal pair of setae and a single laterosubventral seta), that have been still described in *A. akvavitus* only.

Newfound specimens of *A. akvavitus* differ from all other known *Acantholaimus* species by the construction of its onchia, which looks much more complicated than in other *Acantholaimus* species. This construction of onchia was not highlighted in the original description, however the similar constructions are discernible on the original figures of this species. The unusual position of testis was also noted by Gerlach *et al.* (1979).

DISTRIBUTION

South-eastern Pacific, Chile–Peru Trench, 4526–4925 m depth (Gerlach *et al.*, 1979); north-western Atlantic, Bay of Biscay, 4700 m depth (Vivier, 1985); south-eastern Atlantic, Angola Basin, 5450 m depth (present report).

Acantholaimus formosus sp. nov. (Figures 5C, 6B, 7; Table 3)

TYPE MATERIAL

Holotype: one male. Paratypes: 2 males.

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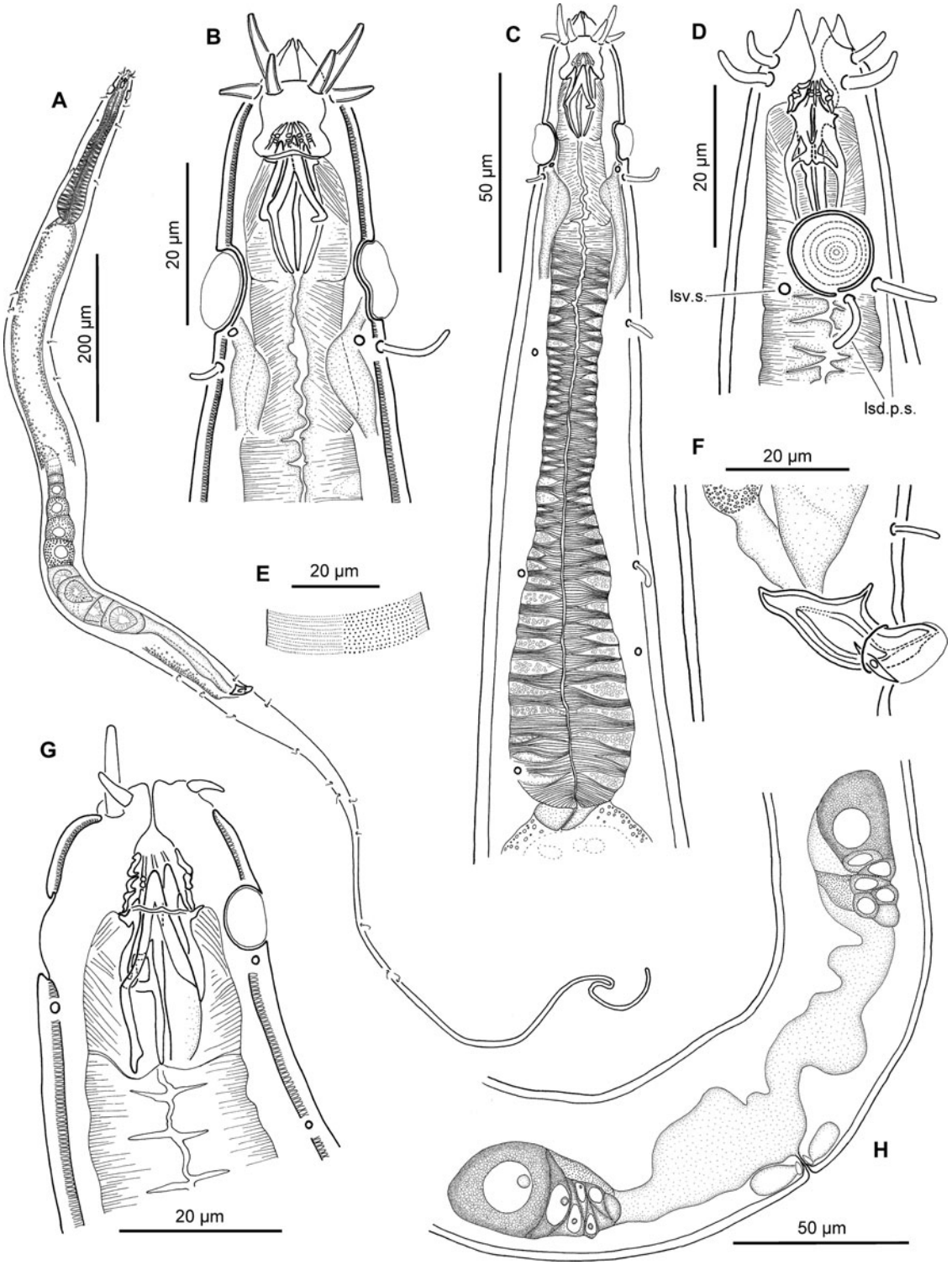

Fig. 3. *Acantholaimus akvavitus* Gerlach *et al.*, 1979: (A) specimen No. 1, male, total view; (B) specimen No. 1, head; (C) specimen No. 1, anterior end; (D) specimen No. 3, female, head; (E) specimen No. 1, lateral view of cuticle surface at midbody; (F) specimen No. 1, spicule region; (G) specimen No. 2, male, head; (H) specimen No. 3, reproductive system. Abbreviations: lsd.p.s., laterosubdorsal pair of cervical setae; lsv.s., pit for single laterosubventral cervical seta (seta itself is lost).

ETYMOLOGY

Latin *formosus* (= beautiful).

DESCRIPTION

Measurements are given in Table 3. Only males were found. Body spindle-shaped, with strongly narrowed anterior end and filiform posterior one. Cuticle dotted densely with lateral differentiation, with beginning posterior to amphideal fovea and lasting along whole body length except filiform part of tail. Width of lateral fields 10–12 µm. Dots of lateral fields being bigger and situated sparser than ones outside lateral fields. Dots arranged in more or less regular transversal rows. At the optical cut-section of the cuticle the dots are

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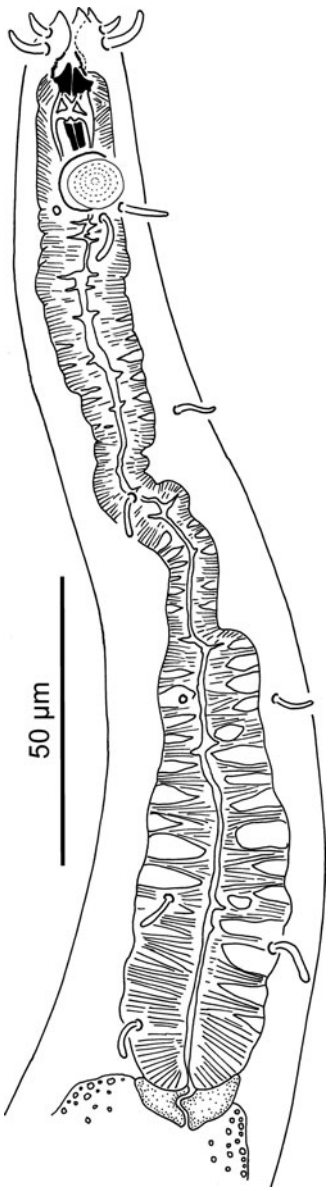

Fig. 4. *Acantholaimus akvavitus* Gerlach *et al.*, 1979, specimen No.3, female, anterior region.

discernible as tiny radial struts. Cuticle ~1 μm thick at level of head tip; ~1.5 thick at level of entire body except caudal region, where it is 2.5 μm. Head of paratypes slightly inverted. Somatic setae cylindrical, sometimes with slightly widened tips. Somatic setae sparse, cylindrical in form, 6–9 μm long at preanal body region and 10–13 μm long at caudal region, present along the whole body, arranged in 4 submedian rows situated on each side of lateral fields. Numerous pores (~1 μm in diameter) visible also between somatic setae in those 4 submedian rows. There are 6 triangle-shaped lips with edged anterior tips. Inner labial sensilla invisible. 6 outer labial setae 3.0–3.5 μm long and 4 submedian cephalic setae 7.0–7.5 μm long locating close to each other and lying at same level. Amphideal fovea round or in shape of transversally oriented oval, very weakly visible, without cuticular edging. Central spot of amphideal fovea visible better than its boundary. Amphideal fovea situated close to head end. Two cervical setae 7–8 μm long (laterosubdorsal one and laterosubventral one) located at a short distance from posterior end of every amphideal fovea. Stoma consisting of cup-shaped cheilostoma (3.5–7.5 μm long) and narrow, funnel-shaped esophagostoma (13.5–16.0 μm long). Cheilostoma possessing 6 pairs of teeth-like jointed cuticular rugae. Esophagostoma with 2 massive sclerotized onchia. Rugae and onchia situated at same level, therefore discernible hard. Pharynx enlarged at level of esophastoma. Anterior third of pharynx regularly muscular, remaining part of pharynx containing numerous and large plasmatic inclusions. Middle third of pharynx slightly but noticeably narrowed. Last third of pharynx gradually widening without formation of distinct bulbus. Nerve ring and renette cell not found. Cardia large, triangular. Tail consisting of proximal conical part and long terminal filiform cylindrical part constituting 79% of whole tail length.

Male reproductive system. Single testis directed anteriorly, outstretched, lying to the right of intestine. Curved funnel-shaped paired spicules possessing cuticular sculpture with thickened cuticular areas in shape of longitudinal or transversal ridges. Gubernaculum in shape of wide plate with edged distal end and toothed proximal end. Supplementary organs not found. Size of mature spermatozoa ~40 × 32 μm.

DIFFERENTIAL DIAGNOSIS

Acantholaimus formosus sp. nov. is characterized by its spindle-shaped body with strongly narrowed anterior end; large, amphideal fovea with hard visible amphideal rim but with well noticeable central spot; the position of its amphideal fovea (situated very close to head end); and massive sclerotized onchia.

The new species shares with *A. coruscus* Bussau, 1993, *A. elegans* Jensen, 1988, *A. heipi* Muthumbi & Vincx, 1997 and *A. verscheldi* Muthumbi & Vincx, 1997 a small body length (L′ = 300–500 μm), a large amphideal fovea, a long pharynx (b = 4–6), thin anterior part of the body (till at least the middle of the pharynx) and big robust onchia. New species differs from all these species by the location of amphideal fovea (on the apical tip of the body versus 8–15 μm behind apical end). Besides this feature, *A. formosus* sp. nov. differs from these four species by below mentioned characteristics.

Acantholaimus formosus sp. nov. distinctly differs from *A. coruscus* by the length of cephalic setae (7 μm versus 17 μm); by the position of cervical setae (almost on the same level just posterior amphideal fovae versus one behind other on a visible distance from amphideal fovea) and the quantity of teeth (2 versus 3).

The new species differs from *A. verscheldi* by spindle shaped body with strongly narrowed anterior end versus cylindrical body with weakly narrowed anterior end; by the quantity of teeth (2 versus 3) and by the length of spicules (22–24 μm versus 14–18 μm).

The new species differs from *A. heipi* by thicker spindle shaped body with strongly narrowed anterior end versus thinner cylindrical body with weakly narrowed anterior end (a = 21 versus a = 31–44); by the length of spicules (22–24 μm versus 14–18 μm); by the length of cephalic setae (7 μm versus 11–13 μm) and the quantity of teeth (2 versus 3).

The new species is more close to *A. elegans* according to the shape and the length of the body and length of outer labial and cephalic setae. New species differs from *A. elegans* by the presence of lateral differentiation of cuticle; by the location of cervical setae (almost on the same level just posterior amphideal

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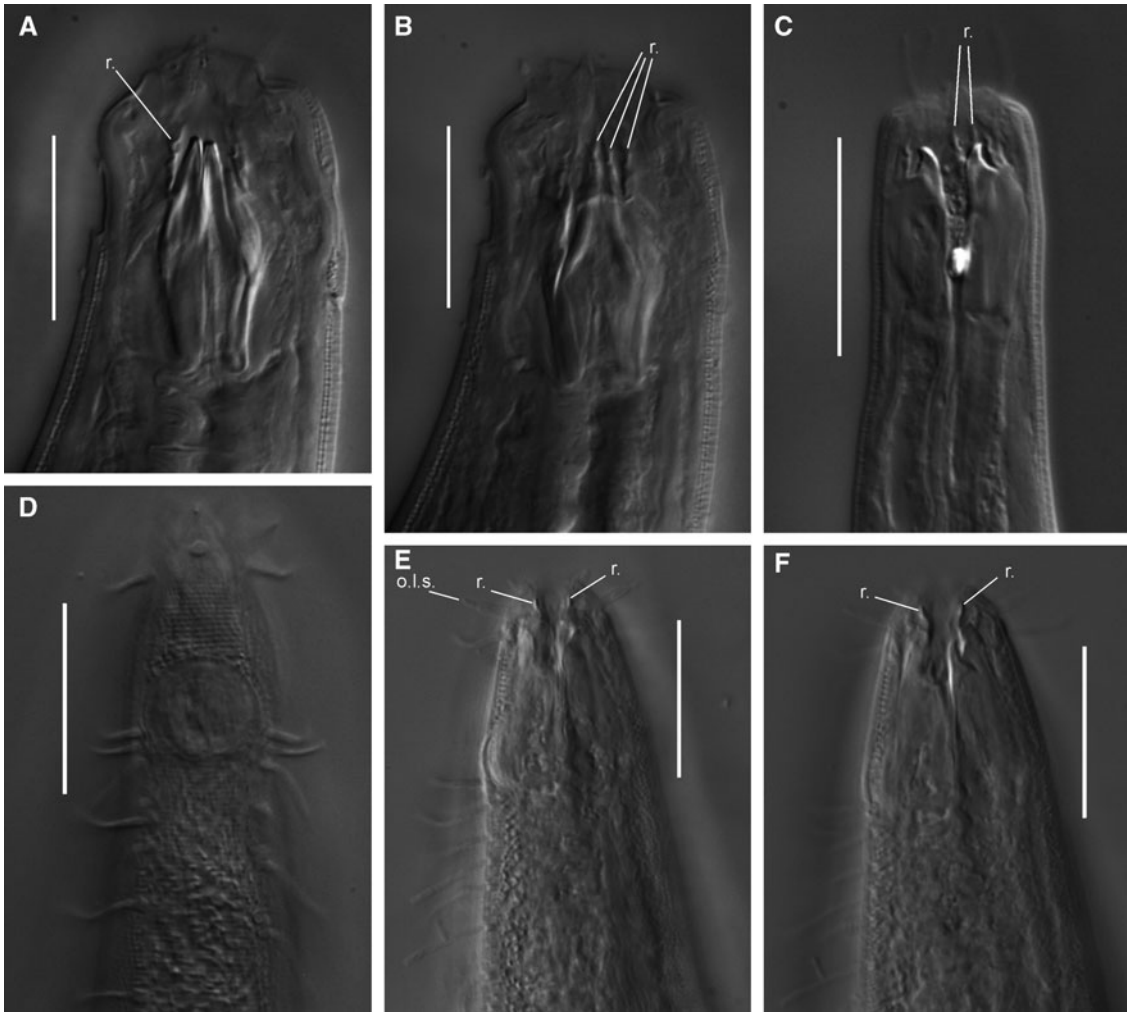

Fig. 5. Heads of *Acantholaimus* species, micrographs: (A, B) *A. akvavitus* Gerlach *et al.*, 1979; (C) *A. formosus* sp. nov.; (D–F) *A. quintus* Gerlach *et al.*, 1979.

fovae versus one behind other on a visible distance from amphideal fovea); by the quantity of teeth (2 versus 4) and by the presence of 12 massive ragae.

ABUNDANCE

Three specimens were found (0.25% of all nematode individuals examined in the sample).

Acantholaimus iubilus Gerlach, Schrage & Riemann, 1979
(Figures 6C, 8)

MATERIAL EXAMINED

One female.

DESCRIPTION

Measurements: L′ = 946 μm; a′ = 13.7; b′ = 4.5. Body diameter at level of: amphid = 26 μm; cardia = 53 μm; anus = 28 μm. Maximum body diameter = 69 μm.

The fusiform part of the tail is broken in examined specimen. Body cylindrical, with narrowed anterior end and filiform tail. Somatic setae cylindrical or clavate, 7 μm long at pre-anal body, 8–9 μm long at tail, arranged in 4 submedian longitudinal rows (except filiform part of tail). Cuticle dotted. At pre-amphidial region, dots arranged irregularly, lateral fields absent. At post-amphidial body, dots arranged in transverse rows; lateral fields present. Size of dots very small at anterior part of pre-amphideal body; dots much larger and looking like rings at posterior part of pre-amphidial body. Posterior from amphideal fovea, dots looking smaller. In lateral fields, dots larger than between lateral fields. Width of lateral fields 15 μm at level of pharynx; 32 μm at midbody. At tail region, lateral fields absent; dots getting larger again and fused together in transverse rows. Cuticle ~0.5 μm at level of head tip; 3 μm thick at level of pharynx; 1.3 μm at level of midbody; 3.5 μm at level of anus. Six inner labial thick papillae ~1.5 μm long, 6 outer labial short setae 3 μm long, and 4 straight thick cephalic setae 9 μm long visible. Amphideal fovea single-spiral, round, with fine concentric striation, ~12 μm wide, ~1.2 amphidial c.b.d. from anterior end. Two pairs (latero-subdorsal and latero-subventral) of cervical setae 10–12 μm long located at level of a middle of amphideal fovea. Stoma consisting of wide, cup-shaped cheilostoma ~9 μm long and narrow, funnel-shaped pharyngostoma ~21 μm long, with thicker cuticular walls. Cheilostoma containing 6 pairs of large, well discernible cylindrical rugae ~3 μm long. Two long, very robust sclerotized onchia ~10 μm long visible in cheilostoma. Basal parts of onchia situated in anterior part of pharyngostoma,

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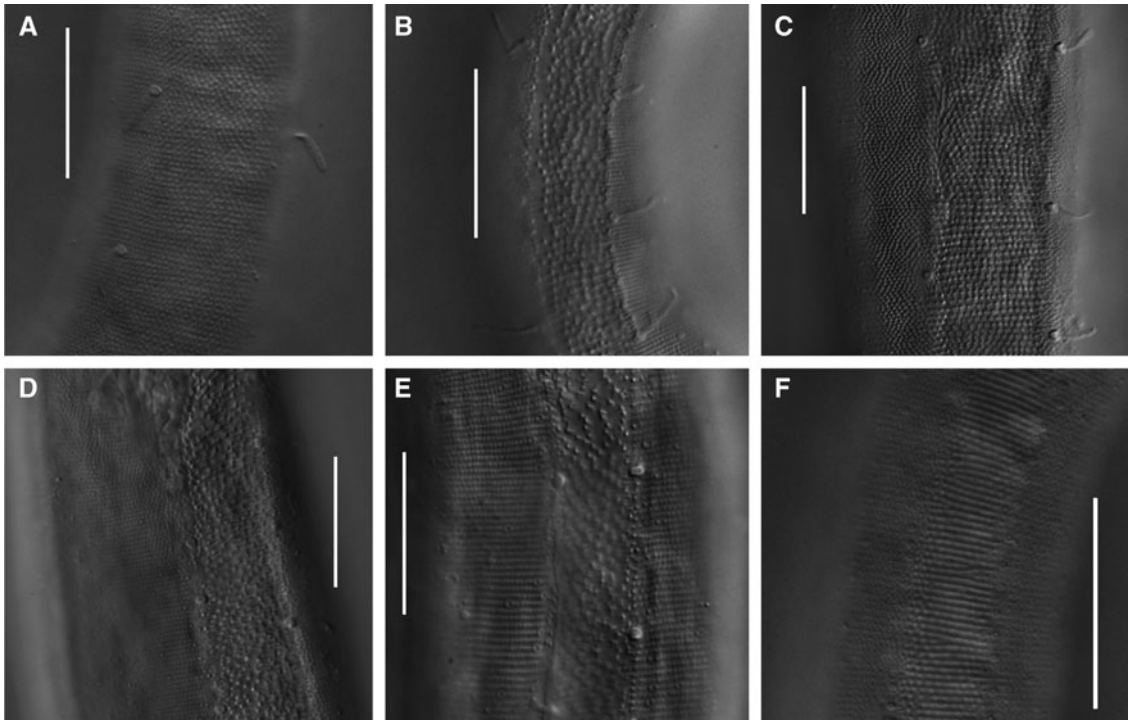

Fig. 6. View of cuticular lateral fields of *Acantholaimus* species, micrographs: (A) *A. akvavitus* Gerlach *et al.*, 1979; (B) *A. formosus* sp. nov.; (C) *A. iubilus* Gerlach *et al.*, 1979; (D) *A. quintus* Gerlach *et al.*, 1979; (E, F) *A. skukinae* sp. nov.

Table 2. *Acantholaimus akvavitus* Gerlach *et al.*, 1979. Measurements (in μm) and body indices.

Specimen No.	**1**	**2**	**3**
Slide number	A3-A	B37-3	A5
Number of specimen on slide	11	2	11
Sex	m	m	f
L	1,778	n.a.	n.a.
L′	926	1218	773
Amphidial diameter	9	10	10
Length of outer labial setae	5	6	6
Length of cephalic setae	8	10	9
Length of cervical setae	10	n.a.	8
Length of somatic setae at cervical region	9	n.a	8
Length of somatic setae at midbody	9	n.a.	9
Length of somatic setae at caudal region	11	n.a.	9–11
Length of cheilostoma	6	n.a.	10
Length of pharyngostoma	17	19	13
Length of spicule in chord	27	–	–
Length of spicule in arc	37	–	–
Length of gubernaculum	n.a.	–	–
Distance from anterior end to amphid	21	n.a.	22
Diameter at level of cephalic setae	14	n.a.	15
Diameter at level of middle of amphid	20	n.a.	21
Diameter at level of cardia	46	n.a.	41
Diameter at level of anus	26	n.a.	25
Maximum body diameter	53	n.a.	49
a	33.5	n.a.	n.a.
b	8.9	n.a.	n.a.
c	2.1	n.a.	n.a.
V	–	n.a.	n.a.
a′	17.5	n.a.	15.8
b′	4.6	4.0	4.2
c′	32.7	n.a.	n.a.
V′	–	n.a.	63
Notes	–	Broken fusiform part of tail; specimen is squashed up	Broken fusiform part of tail

n.a., not available.

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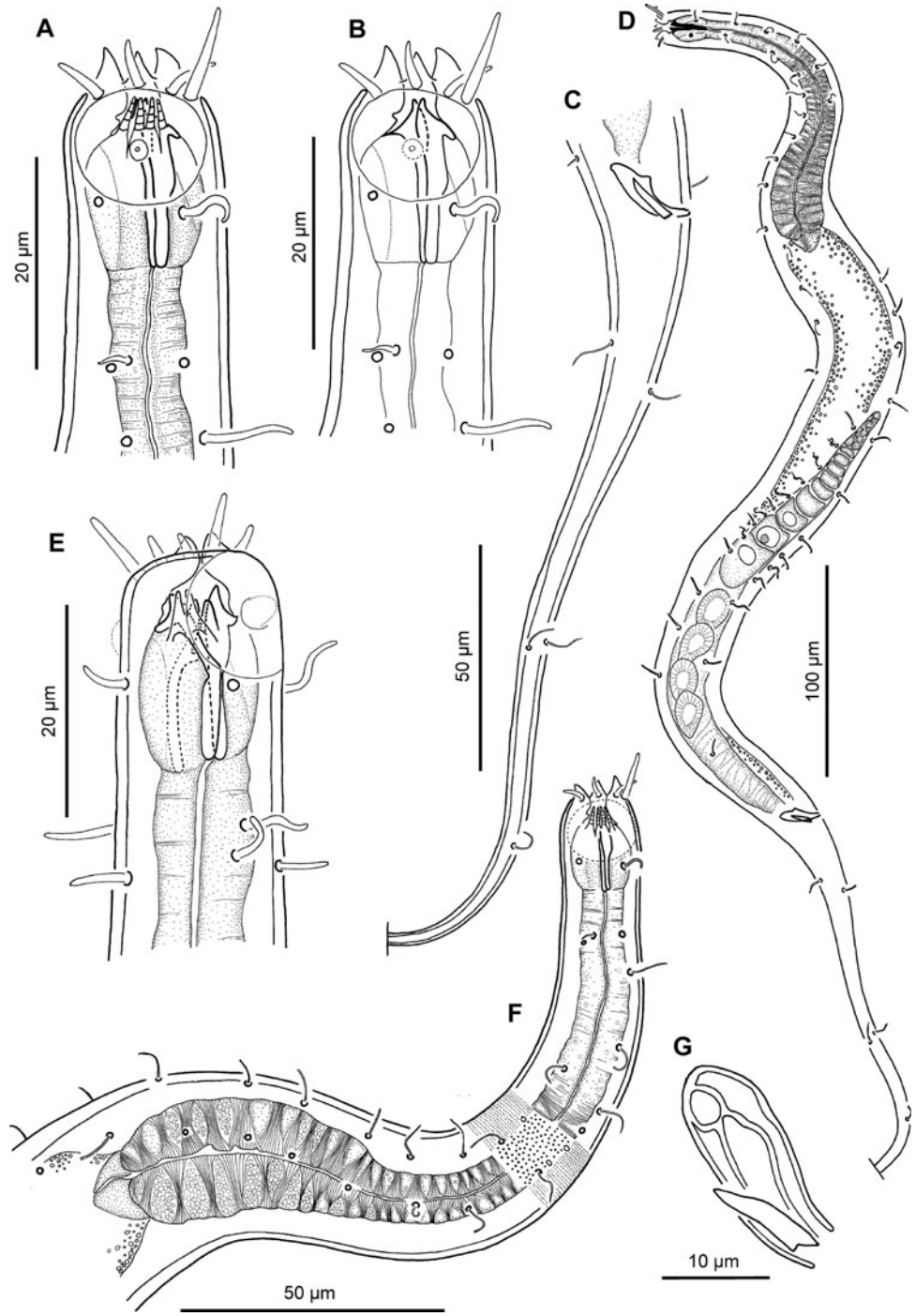

Fig. 7. *Acantholaimus formosus* sp. nov.: (A, B) holotype, male, head; (C) holotype, posterior region; (D) holotype, total view; (E) paratype No. 1, male, head; (F) holotype, anterior end; (G) Paratype No. 1, spicule.

and their apical parts protruding outside mouth opening. Pharynx thin at its anterior part, gradually widening to its posterior end, with large plasmatic interruptions along its entire length. Cardia flattened in direction of main body axis. Nerve ring not visible. Renette cell not visible. Intestine filled with fine and coarse (up to 9 µm long) particles of irregular shape. Tail gradually narrowed into filiform, cylindrical terminal part. No caudal glands visible. Female reproductive system consisting of two antidromous, uniformly sized ovaries (anterior ovary lying to right of intestine, and posterior one lying to left of intestine).

REMARKS

Our individual closely resembles the type specimens in its general appearance; in its body length; in the size and position of the amphideal fovea; in the number and position of the cervical setae; in the shape of head (truncated cone); and in the length and position of setae of all rings of head sensilla.

Our specimen differs from the type specimens by the number of onchia (only 2 onchia were found). Various authors described different numbers of onchia in this species. Gerlach *et al.* (1979) found, presumably, 5 onchia in the type description. Gourbault & Vincx (1985) and

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Table 3. *Acantholaimus formosus* sp. nov. Measurements (in μm) and body indices.

Specimen collection status	Holotype	Paratype No. 1	Paratype No. 2
Slide number	A17	A27	A36
Collection number	SMF 16906	SMF 16905	SMF 16910
Number of specimen on slide	1	10	11
Sex	m	m	m
L	n.a.	n.a.	910
L′	482	511	497
Amphidial diameter	10	10	10
Length of outer labial setae	3.5	3.0	3.5
Length of cephalic setae	7.0	7.0	7.5
Length of cervical setae	7–8	7–8	7–8
Length of somatic setae at cervical region	7	6	7–9
Length of somatic setae at midbody	8	8	6–9
Length of somatic setae at caudal region	9	13	10–11
Length of spicule in chord	20	22	n.a.
Length of spicule in arc	22	24	n.a.
Length of gubernaculum	n.a.	13	n.a.
Distance from anterior end to amphid	2	<1	<1
Diameter at level of cephalic setae	14	15	15
Diameter at level of middle of amphid	15	16	15
Diameter at level of cardia	35	34	42
Diameter at level of anus	20	21	26
Maximum body diameter	40	37	46
a	n.a.	n.a.	20.7
b	n.a.	n.a.	5.6
c	n.a.	n.a.	2.2
a′	13.0	13.8	11.3
b′	3.0	3.2	3.1
c′	n.a.	n.a.	15.9
Notes	Broken fusiform part of tail	Broken fusiform part of tail	–

n.a., not available.

Miljutina & Miljutin (2011) described 3 onchia. Not all onchia can be visible because of bad position of a head or because of presence of foreign particles in a stoma.

ABUNDANCE

One specimen of *A. iubilus* was found.

DISTRIBUTION

South-eastern Pacific, Chile–Peru Trench, 3086–6313 m depth, fine silt (Gerlach *et al.*, 1979); north-eastern Atlantic, Bay of Biscay, 4725 m depth (Vivier, 1985); south-eastern Atlantic, 2063–4308 m depth (Gourbault & Vincx, 1985); North Atlantic, Norway Sea, 970–3294 m depth (Jensen, 1988); central-western Atlantic, Hatteras plain, 5411 m depth and Puerto Rico Trench, 7460–8380 m depth (Tietjen, 1989); north-eastern tropical Pacific, Clarion–Clipperton Fracture Zone, nodule fields and area without nodules, 5000–5035 m depth (Milutina & Miljutin, 2011); south-eastern Atlantic, Angola Basin, 5450 m depth (present report).

Acantholaimus quintus Gerlach, Schrage & Riemann, 1979 (Figures 5D–F, 6D, 9–10; Table 4)

MATERIAL EXAMINED

Two males, 2 females.

DESCRIPTION

Measurements are given in Table 4. Body slightly spindle-shaped, with narrowed anterior end and filiform posterior end. Somatic setae cylindrical, 5–12 μm long, situated along entire body in 4 submedian rows, very numerous at pharyngeal region. Cuticular pores 1.0–1.5 μm in diameter possessing distinct rim also visible in these 4 submedian rows and, possibly, indicating places of lost setae. Cuticle densely dotted, with lateral fields, beginning posterior to amphideal fovea and continuing along entire body length, except filiform part of tail. Width of lateral fields 14–15 μm at level of pharynx, 9–12 μm at midbody, and 12–15 μm at caudal region. Dots of lateral fields larger and arranged irregularly and more sparsely than dots outside lateral fields. Outside lateral fields, cuticular dots arranged in transverse rows along whole body. Except dots, numerous small pores ~1 μm in diameter, lacking distinct rim, visible outside lateral fields. Usually, these pores arranged irregularly, except level of pharynx, where they form longitudinal rows of 1 pore at borders of lateral fields. Cuticle about ~0.5 μm thick at level of head tip, 1.5–2.5 μm at rest of body (except filiform part of tail, where their thickness is less than 1 μm). Lips not visible. Three rings of head sensilla visible: 6 short and thick inner labial setae, 2.0–2.5 μm long; 6 outer 2-jointed labial setae 4.0–5.5 μm long; and 4 longer submedian cephalic setae 8–10 μm long. Amphideal fovea situated at level of pharyngostoma, at 0.7–1.0 c.b.d. from the anterior end, round, ventrally coiled, single-spiral, 10–11.5 μm in diameter, located in 15–16 μm from anterior tip. Two triplets (latero-subdorsal and latero-subventral ones) of cervical setae, 9–10 μm long, situated very close to each other and located at same level close to posterior part of each amphideal fovea. In addition, a group of several somatic setae (usually 4–6 setae

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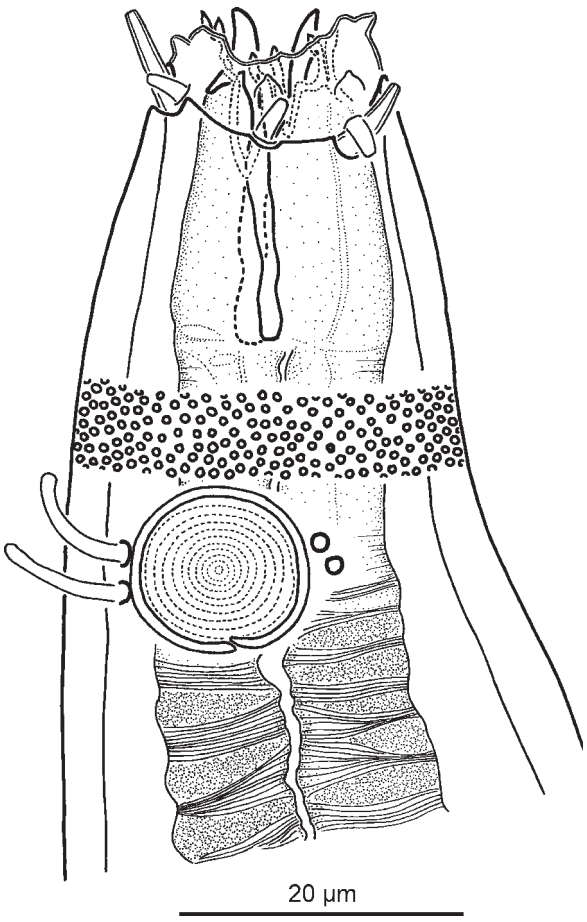

Fig. 8. *Acantholaimus iubilus* Gerlach *et al.*, 1979, female, head.

in each of 4 latero-median rows) located just posterior to cervical setae, these somatic setae set more closely than other somatic setae. Of this group, anterior 3–4 setae being 10–12 μm long, and posterior 7–8 μm long. Rest of somatic setae 7–8 μm long and arranged relatively sparse. Cheilostoma cup-shaped, 8–9 μm long, possessing 12 thin, elongated rugae. Pharyngostoma narrow, funnel-shaped, ~10 μm long, with thick cuticular walls and 5 sclerotized onchia: dorsal and subventral ones ~7 μm long, and other three onchia 3–4 μm long. Basal parts of onchia situated in anterior part of pharyngostoma, and their apical parts intruding into cheilostoma. Pharynx muscular, with numerous plasmatic inclusions, gradually widening to its posterior end. Pharynx slightly enlarged at level of pharyngostoma (evidently, this swelling consisting of muscles operating onchia, plasmatic inclusions absent in this part). Nerve ring and renette cell not visible. Cardia triangular. Tail consisting of proximal conical part, and long terminal filiform cylindrical part constituting ~70% of entire tail length.

Male reproductive system monorchic. Testis directed anteriorly, outstretched, lying to right of intestine. Spermatozoa oval, very large (53 × 20 μm in specimen No.1 and 78 × 20 μm in specimen No. 2), with clearly visible, oblong nuclei. Curved, funnel-shaped spicules possessing complex cuticular sculpture. Gubernaculum with edged proximal end and bifurcated distal end. Supplementary organs not visible.

Female reproductive system possessing two antidromous ovaries (anterior ovary lying to right of intestine, and posterior one lying to left of intestine).

REMARKS

Our individuals closely resemble the type specimens in most body measurements and parameters. However, there are several small distinctions. Outer labial setae are 2-jointed in newfound specimens; this fact was, however, not mentioned clearly in type description. It was therefore noted here that these setae possess thinner distal part and thicker basal part. This construction may be interpreted as a sign of two-jointing of these setae. Two bigger and three smaller onchia were found in newfound specimens, whereas three bigger onchia and several smaller ones were described in type specimens. However, the arrangement of onchia can be quite complicated in the *Acantholaimus* genus, and it is sometimes impossible to distinguish real number and arrangement of onchia in some individuals or species. Therefore, these distinctions in number and size of onchia could be caused by the different position of examined specimens on the slide, by different quality of microscopes used for the examination, and some other reasons.

This species was previously reported from the Angola Basin by Gourbault & Vincx (1985); however the description of this species was given very briefly.

ABUNDANCE

Eleven specimens were found (about 0.9% of all nematodes examined in the sample).

DISTRIBUTION

South-eastern Pacific, Chile–Peru Trench, 5986–6134 m depth (Gerlach *et al.*, 1979); north-western Atlantic, Bay of Biscay, 1960 m depth (Vivier, 1985); south-eastern Atlantic, Cape Basin, 2992–4180 m depth (Gourbault & Vincx, 1985); south-eastern Atlantic, Angola Basin, 2063–4308 m depth (Gourbault & Vincx, 1985); south-eastern Atlantic, Angola Basin, 5450 m depth (present report).

Acantholaimus skukinae sp. nov.
(Figures 6E, F, 11–12; Table 5)

TYPE MATERIAL

Holotype: one male. Paratypes: 2 females.

ETYMOLOGY

In honour of Elena Skukina (Russian Federal Institute of Fisheries and Oceanography, Moscow, Russia).

DESCRIPTION

Measurements are given in Table 5. Body mainly cylindrical, with slightly narrowed anterior end and filiform posterior end. Somatic setae sparse, cylindrical in form, 2.5–3.0 μm long at preanal body region and 4–7 μm long at caudal region, situated along entire body in 4 sublateral rows. Cuticle ~0.5 μm thick at head tip; 1.0–1.5 μm thick at pharyngeal region; 0.7–1.2 μm thick at rest body. Cuticle densely dotted (dots arranged in transverse rows), with lateral fields consisting of larger dots. Lateral fields beginning at posterior border of amphideal fovea and extending along entire body length except filiform part of tail. A row of small pores ~1 μm in diameter situated along borders of lateral fields. Similar pores arranged irregularly visible also outside lateral fields. Lips not developed. Three rings of head sensilla visible: 6 inner labial conical papillae 0.7–1.2 μm long; 6 outer labial setae 2–3 μm long, and 4 submedian cephalic setae 5.0–5.5 μm long. Setae of second and

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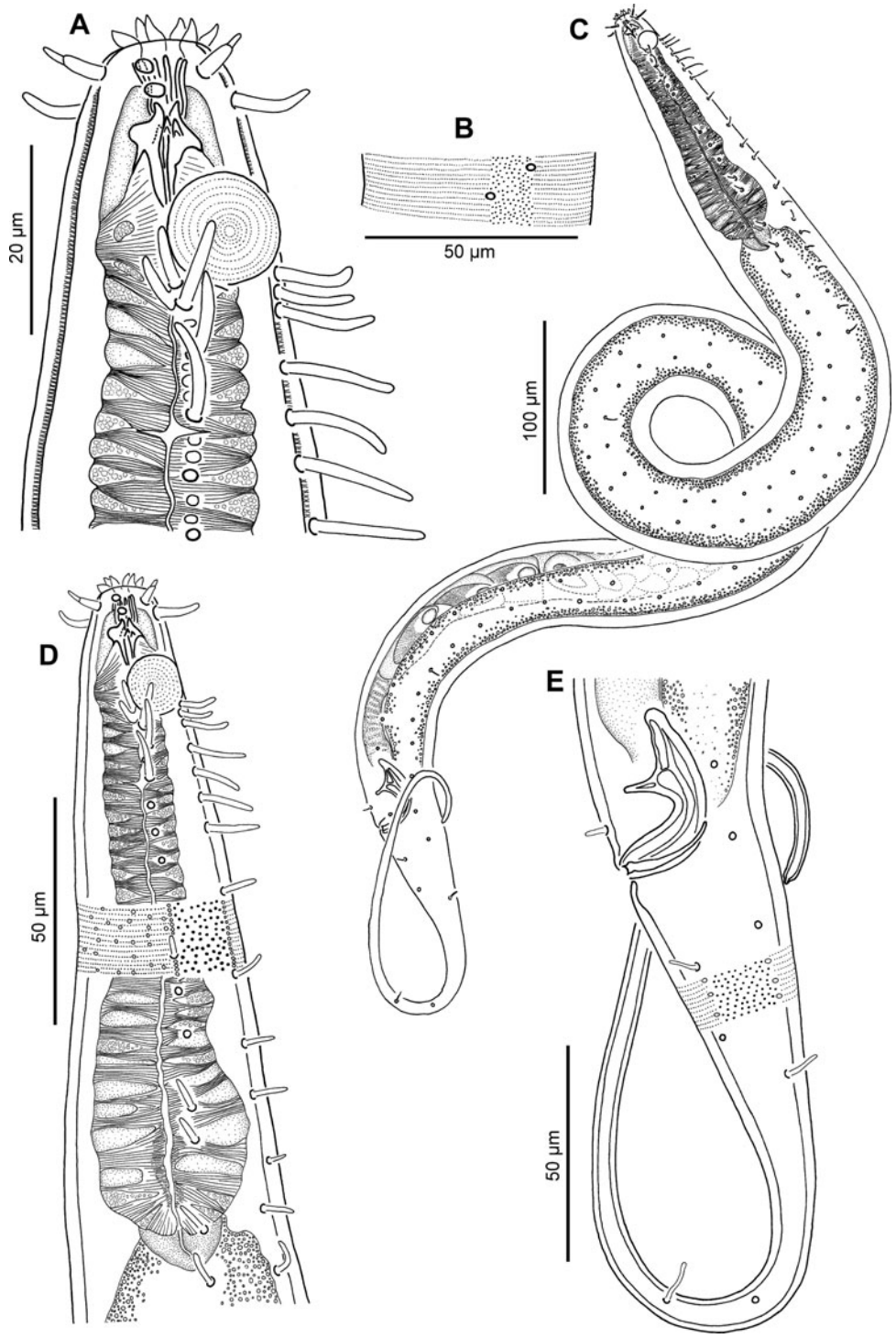

Fig. 9. *Acantholaimus quintus* Gerlach *et al.*, 1979, specimen No. 1, male: (A) head; (B) lateral view of cuticle surface at midbody; (C) total view; (D) anterior end; (E) posterior end.

third ring situated very close to each other. Amphideal fovea large, 10–12 µm in diameter (representing 0.7–0.8 c.b.d. in width), round, ventrally coiled, single-spiral, situated in 9–13 µm from anterior end. Two pairs (latero-subdorsal and latero-subventral) of cervical setae 2.0–2.5 µm long, located in 3–5 µm posterior to amphideal fovea. Stoma consisting of wide, barrel-shaped cheilostoma 2–4 µm long and narrow pharyngostoma 6–8 µm long. Small rod-shaped rugae visible in cheilostoma. Two sclerotized onchia ~1.5 µm long (dorsal and subventral ones) and one smaller one ~0.8 µm long (subventral) visible at anterior end of pharyngostoma. Pharynx muscular, cylindrical in its anterior half, slightly widening to its posterior end, containing numerous and regularly arranged plasmatic inclusions. Nerve ring and renette cell not visible. Cardia large, rounded, surrounded by intestine. Tail consisting of proximal conical part and long terminal filiform cylindrical part.

Male reproductive system monorchic. Testis directed anteriorly, outstretched, lying to the right of intestine, occupying

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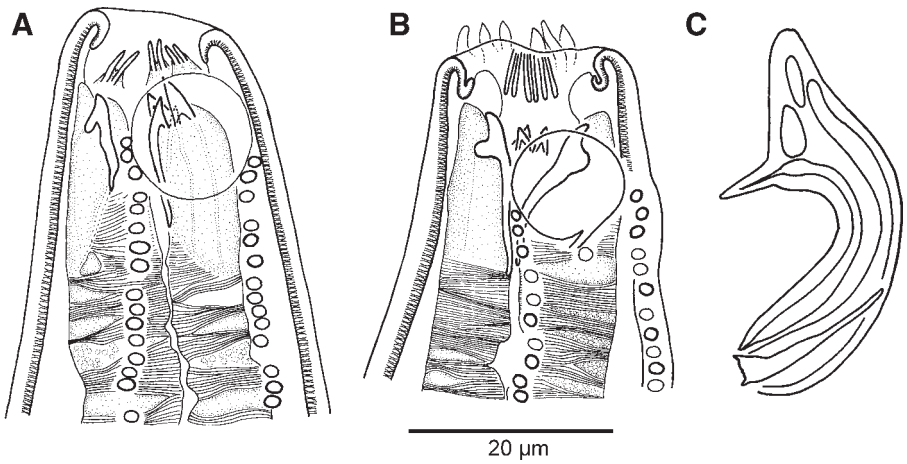

Fig. 10. *Acantholaimus quintus* Gerlach *et al.*, 1979: (A) specimen No. 3, female, head; (B) specimen No. 2, male, head; (C) specimen No. 2, spicule.

~40% of preanal body length. Curved spicules possessing complex cuticular sculpture with thickened cuticular areas in form of longitudinal ridges. Gubernaculum shaped as curved or almost outstretched stick with bifurcated distal end. Supplementary organs not found.

Female reproductive system consisting of two antidromous ovaries. Total length of female reproductive system constituting ~25% of preanal body length. Mature oocyte 40 × 19 μm in size.

DIFFERENTIAL DIAGNOSIS

Acantholaimus skukinae sp. nov. is characterized by its cylindrical body shape; short outer labial and cephalic, cervical, and somatic setae; large amphideal fovea; the position of its

Table 4. *Acantholaimus quintus* Gerlach *et al.*, 1979. Measurements (in μm) and body indices.

Specimen No.	1	2	3	4
Slide number	A3-C	A3-C	A3-A	A10
Number of specimen on slide	3	4	4	6
Sex	m	m	f	f
L	1257	n.a.	1050	1240
L′	921	1,005	760	934
Amphidial diameter	12	12	11	10
Length of inner labial setae	2.5	n.a.	n.a.	2.0
Length of outer labial setae	4–5	n.a.	n.a.	5.5
Length of cephalic setae	8–10	n.a.	n.a.	7
Length of cervical setae	10	10	n.a.	9
Length of somatic setae at cervical region	11–12	n.a.	n.a.	7–9
Length of somatic setae at midbody	7–9	n.a.	7	5
Length of somatic setae at caudal region	8	n.a.	n.a.	6
Length of cheilostoma	9	n.a.	n.a.	8
Length of pharyngostoma	10	n.a.	10	10
Length of spicule in chord	35	31	–	–
Length of spicule in arc	54	44	–	–
Length of gubernaculum	20	16	–	–
Distance from anterior end to amphid	16	n.a.	n.a.	15
Diameter at level of cephalic setae	13	n.a.	n.a.	11
Diameter at level of middle of amphid	22	25	22	20
Diameter at level of cardia	51	50	55	44
Diameter at level of anus	35	32	37	23
Maximum body diameter	56	63	75	57
a	22.4	n.a.	14.0	24.8
b	8.3	n.a.	8.3	8.2
c	4.0	n.a.	3.6	4.1
V	–	–	53	54
a′	16.4	16.0	10.1	16.4
b′	6.1	7.1	6.0	8.2
c′	8.9	n.a.	7.8	13.3
V′	–	–	73	72
Notes	–	Broken fusiform part of tail; retracted head	Retracted head	–

n.a., not available.

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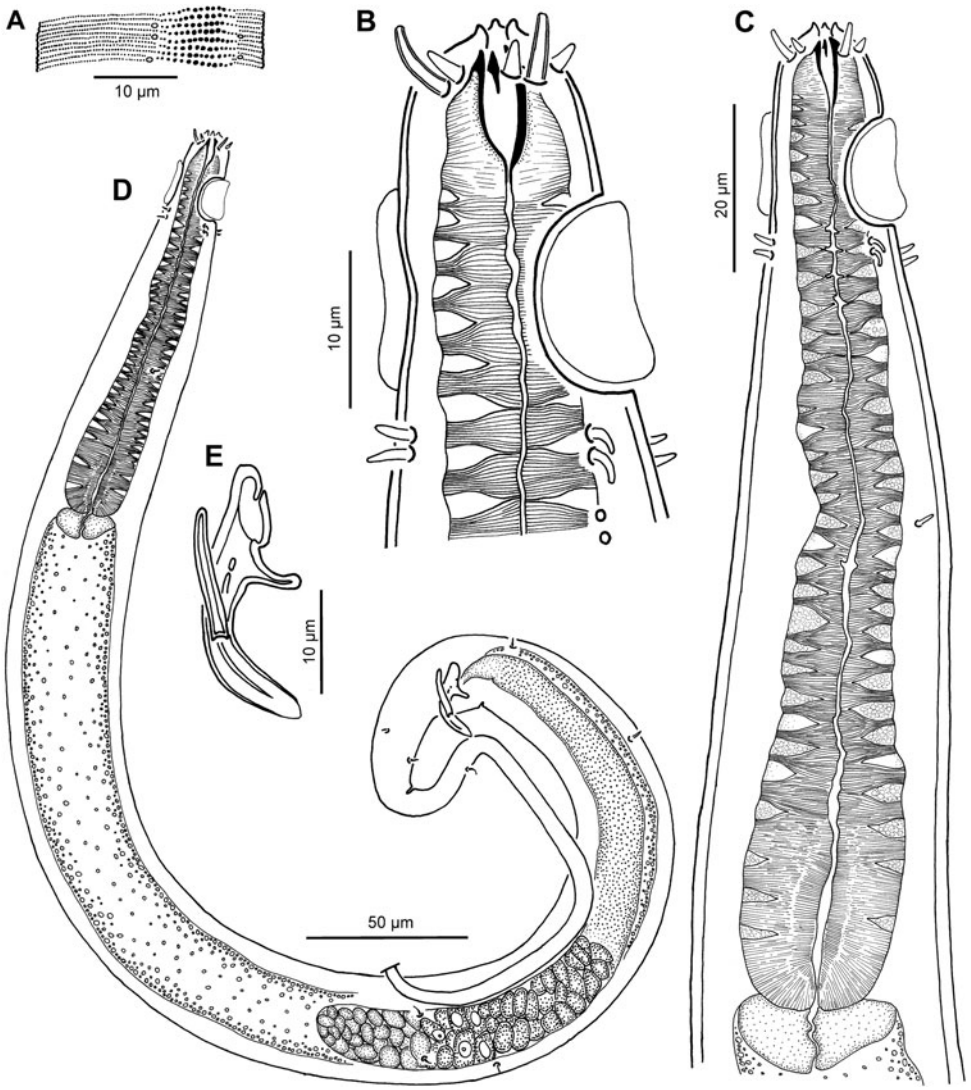

Fig. 11. *Acantholaimus skukunae* sp. nov., holotype, male: (A) lateral view of cuticle surface at midbody; (B) head; (C) anterior end; (D) total view; (E) spicule.

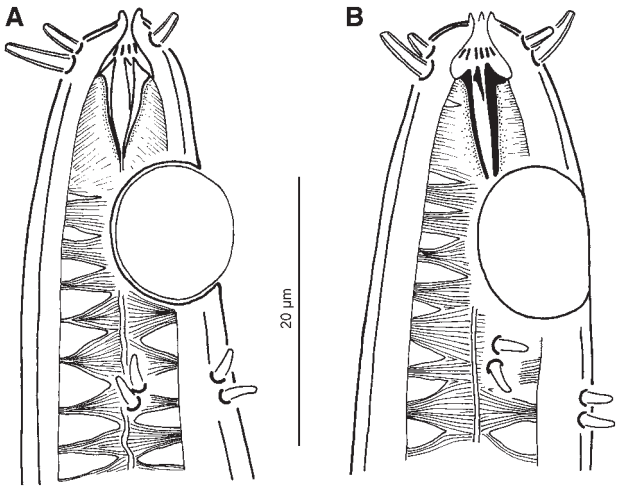

Fig. 12. *Acantholaimus skukunae* sp. nov., females: (A) paratype No. 2, head; (B) paratype No. 3, head.

amphideal fovea (situated relatively far from the head end); and relatively small onchia.

The new species resembles *A. obviatus* Vivier, 1985 with its general appearance; body length; shape of the head; and length and position of cervical setae. It differs from the latter one by larger amphideal fovea (10–12 µm in diameter versus 6 µm, respectively); by the position of an amphideal fovea (9–13 µm from the anterior end versus 5 µm, respectively); by the arrangement of head sensilla (outer labial setae and cephalic setae are close to each other, whereas they separated from each other distinctly in *A. obviatus*); by the length of stoma (8–11 µm versus 5 µm, respectively).

The new species resembles *A. incomptus* Vivier, 1985 with its general appearance and head shape; size and arrangement of its stoma; position of the amphideal fovea. The new species differs from the latter one by its longer body (L′= 520–658 µm versus 349–403 µm, respectively); larger amphid (10–12 µm in diameter versus 4.5 µm, respectively); by shorter outer labial setae (2–3 µm versus 4 µm, respectively); and by its shorter cephalic setae (5–6 µm versus 9 µm, respectively).

The new species resembles *A. minutus* Vitiello, 1970 with its general appearance; size and arrangement of labial,

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Table 5. *Acantholaimus skukinae* sp. nov. Measurements (in μm) and body indices.

Specimen collection status	Holotype	Paratype No. 1	Paratype No. 2
Slide number	B50	A17	A30
Collection number	SMF 16909	SMF16908	SMF16907
Number of specimen on slide	2	7	6
Sex	m	f	f
L′	520	561	658
Amphidial diameter	12	10	10
Length of inner labial setae	0.7	1.2	0.8
Length of outer labial setae	2	3	2
Length of cephalic setae	5.5	5.0	5.5
Length of cervical setae	2.0	2.5	n.a.
Length of somatic setae at cervical region	n.a.	2.5	2.5
Length of somatic setae at midbody	2.5	3.0	2.5
Length of somatic setae at caudal region	4.0	5.0	7.0
Length of cheilostoma	0.7	0.8	0.8
Length of pharyngostoma	7.0	6.5	7.5
Length of spicule in chord	22	–	–
Length of spicule in arc	26	–	–
Length of gubernaculum	13	–	–
Distance from anterior end to amphid	9	10	13
Diameter at level of cephalic setae	8	8	7
Diameter at level of middle of amphid	12	14	15
Diameter at level of cardia	29	27	26
Diameter at level of anus	17	16	18
Maximum body diameter	33	33	28
a′	16.0	17.3	24.0
b′	4.5	4.5	4.8
V′	–	n.a.	72
Notes	Broken fusiform part of tail	Broken fusiform part of tail	Broken fusiform part of tail

n.a., not available.

cephalic, and cervical setae. The new species differs from the latter one by its longer body (L′= 520–658 μm versus 301–393 μm, respectively); larger amphideal fovea (10–12 μm in diameter versus 4.5 μm, respectively).

The new species resembles *A. vermeuleni* Mithumbi & Vincx, 1997 with its general appearance; short head sensilla; and large amphideal fovea. The new species differs from the latter one by its longer body (L′= 520–658 μm versus 209–423 μm, respectively); by the location of the amphideal fovea (situated in 9–13 μm from the head end versus 3–5 μm, respectively); by more robust (a′ = 16–24 versus 30) and thicker (maximum body diameter is 28–38 μm versus 10–11 μm) body.

ABUNDANCE

Four specimens were found (about 0.3% of all nematodes examined in the sample).

Acantholaimus verscheldi Muthumbi & Vincx, 1997 (Figure 13; Table 6)

MATERIAL EXAMINED

Two males, 3 females.

DESCRIPTION

Measurements are given in Table 6. Body thin, cylindrical, with a long pharyngeal region. Somatic setae cylindrical, 6–9 μm long, arranged very sparse along body, arranged in 4 sublateral rows. Lateral fields indistinct. Dots usually arranged more or less in transverse rows. Cuticle very thin along whole body, ~0.5 μm thick. There are 6 triangular lips with edged anterior tips. Inner labial sensilla not visible. Six outer labial setae 3.0–4.5 μm long and 4 submedian cephalic setae 6.0–7.5 μm long, appearing confluent and lying at almost same level. Amphideal fovea ventrally coiled, single-spiral, round, with indistinct borders, 6–10 μm in diameter, situated at 15 μm from anterior end. One pair of cervical setae 7–8 μm long located at a short distance posterior to each amphideal fovea. Stoma consisting of cup-shaped cheilostoma ~4 μm long and funnel-shaped pharyngostoma ~8 μm long. Cheilostoma possessing 6 pairs of poor discernible rugae. Number of onchia hard to detect; 5 onchia visible in specimens with everted head, whereas only 2–3 onchia, biggest and smallest of which 2–3 μm and ~1.5 μm long, respectively, detectable in specimens with non-everted head. Pharynx regularly muscular, almost cylindrical, with slightly widening posterior end. Anterior third of pharynx containing no plasmatic interruptions. Nerve ring and renette cell not visible. Cardia triangular. In some specimens, anterior part of pharynx everted and protruding outside, including onchia. Tail consisting of proximal conical part and long terminal filiform cylindrical part constituting 55–80% of entire tail length.

Male reproductive system constituting ~50% of preanal body length. Single testis directed anteriorly, outstretched, lying to right of intestine. Spermatozoa oval, ~20 × 11 μm, with clearly visible, oblong nuclei. Spicules funnel shaped. Gubernaculum in shape of slightly curved stick with rounded proximal end and bifurcated distal end. Supplementary organs not found.

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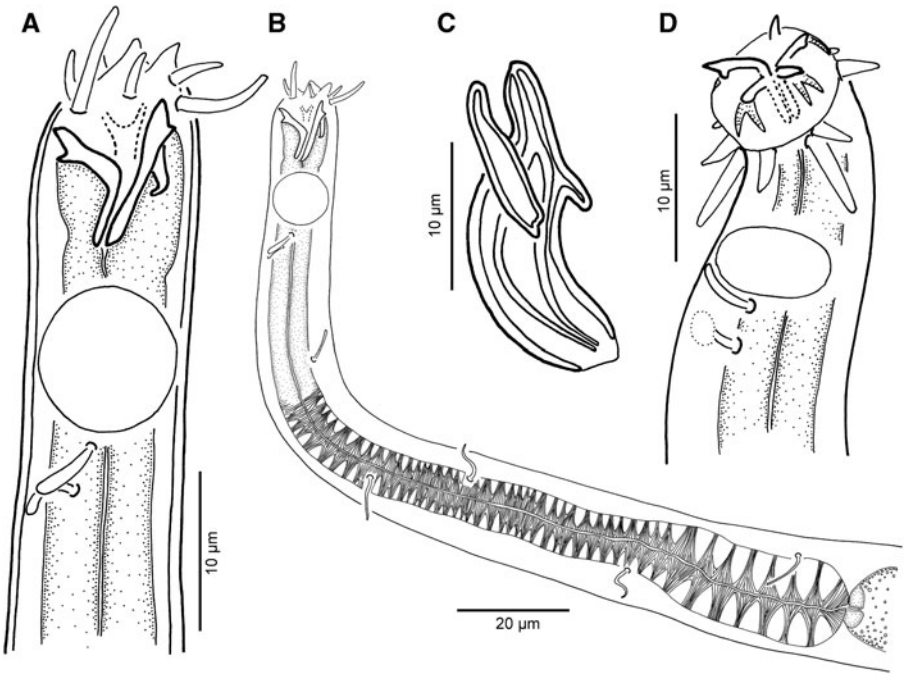

Fig. 13. *Acantholaimus verscheldi* Muthumbi & Vincx, 1997: (A) specimen No. 4, female, head; (B) specimen No. 4, anterior end; (C) specimen No. 1, male, spicule; (D) specimen No. 2, male, head.

Female reproductive system consisting of two antidromous ovaries (anterior ovary lying to right of intestine, and posterior one lying to left of intestine), and short oviducts, constituting ~50% of preanal body length. Length of ovaries 40–70 µm. Each ovary containing one mature ovocyte ~53 × 23 µm in size. Uterus not defined. Three pairs of vulvar glands with granular content surrounding short vagina.

REMARKS

Our individuals closely resemble the type specimens in most body measurements and parameters. However, there are several small distinctions. Type specimens are more slender than newfound ones (maximum body diameter 13–16 µm versus 21–31 µm, respectively). In type specimens, spicules are 11–15 µm long versus 20–22 µm in newfound individuals. Besides amphideal fovea is larger in our individuals (6–10 µm versus 4–7 µm). As type specimens were described from the Indian Ocean (i.e. very far from the new location of finding), it can be explained by some interpopulation variations. In addition, the distinction in spicule measurements could be caused by difference in methods of spicule measuring.

The type location of *A. verscheldi* is the Kenyan coast of the Indian Ocean (Muthumbi & Vincx, 1997). New specimens were found about 8000 km apart from the type location.

ABUNDANCE

Five specimens were found (about 0.4% of all nematodes examined in the sample).

DISTRIBUTION

Western Indian Ocean, off the Kenyan coast, 520–2179 m depth (Muthumbi & Vincx, 1997); south-eastern Atlantic, Angola Basin, 5450 m depth (present report).

DISCUSSION

In the present investigation, we found 5 known *Acantholaimus* species. Of them, *A. verscheldi* Muthumbi & Vincx, 1997 was previously known from the Indian Ocean only. *Acantholaimus angustus* Bussau, 1993 was described from the Peru Basin (Pacific) and later found in the Clarion–Clipperton Fracture Zone (Pacific), about 5200 km apart from the type location (Miljutina & Miljutin, 2011). *Acantholaimus iubilus* Gerlach *et al.*, 1979 was initially described from the Pacific and found later in the other very distant Pacific region (Miljutina & Miljutin, 2011) and in four different Atlantic regions (Gourbault & Vincx, 1985; Vivier, 1985; Jensen, 1988; Tietjen, 1989). *Acantholaimus akvavitus* Gerlach *et al.*, 1979 was also initially described from the Pacific, but later recorded in the Atlantic (Vivier, 1985). Except its type location in the Pacific, *A. quintus* Gerlach *et al.*, 1979 was found also in three different Atlantic regions (Gourbault & Vincx, 1985; Vivier, 1985).

Therefore, based on morphological descriptions (unfortunately, there are still no data on molecular taxonomy of this genus), we can conclude, that many *Acantholaimus* species are widespread in the World's oceans. Many species of *Acantholaimus* seem to be cosmopolitan. It is already known, that, according to morphological and genetic arguments, some marine nematode species are cosmopolitan or very widespread (Decraemer *et al.,* 2001; Bhadury *et al.,* 2008; Bik *et al.,* 2010). Cosmopolitan species were found also among other meiobenthic groups: foraminiferans (Lecroq *et al.,* 2009) and harpacticoids (Menzel *et al.,* 2011).

Whereas *Acantholaimus* species are mainly deep-sea and, therefore, have not been able to use shallow-water facilities for their dispersal, e.g. strong near-shore currents, transportation by the way of adhering to birds or floating materials, dispersal using of ballast water or sand from commercial vessels, etc. (Gerlach, 1977; Palmer, 1988), the fact of a wide

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Table 6. *Acantholaimus verscheldi* Muthumbi & Vincx, 1997. Measurements (in μm) and body indices.

Specimen No.	1	2	3	4	5
Slide number	A93	A63	A98	A98	A78
Number of specimen on slide	7	1	8	4	4
Sex	m	m	f	f	f
L	n.a.	678	n.a.	628	544
L′	441	415	409	488	415
Amphidial length	n.a.	6	9	10	6
Amphidial width	n.a.	6	8	8	6
Length of outer labial setae	n.a.	3	4.5	3.5	3
Length of cephalic setae	7	6	7	7.5	6.5
Length of cervical setae	7	7.5	7	8	n.a.
Length of somatic setae at cervical region	n.a.	6	7–8	10	7–8
Length of somatic setae at midbody	n.a.	8	9	9	7
Length of somatic setae at caudal region	8	6–7	7–9	7–8	6
Length of spicule in chord	20	22	–	–	–
Length of spicule in arc	29	29	–	–	–
Length of gubernaculum	9	11	–	–	–
Distance from anterior end to amphid	n.a.	n.a.	n.a.	15	n.a.
Diameter at level of cephalic setae	n.a.	n.a.	n.a.	10	n.a.
Diameter at level of middle of amphid	10	10	11	11	10
Diameter at level of cardia	19	19	19	19	19
Diameter at level of anus	20	17	15	20	15
Maximum body diameter	22	21	31	28	22
a	n.a.	32.3	n.a.	26.7	24.7
b	n.a.	5.5	n.a.	3.8	3.8
c	n.a.	2.6	n.a.	4.5	4.2
V	–	–	n.a.	52	n.a.
a′	20.1	19.8	13.2	17.4	18.9
b′	3.6	3.4	2.3	3.0	2.9
c′	n.a.	15.4	n.a.	7.0	8.6
V′	–	–	76	67	n.a.
Notes	Head everted; fusiform part of tail broken	Head everted	Head everted; fusiform part of tail broken	–	Head everted

n.a., not available.

distribution of them can indicate a very longstanding age of these species.

The other assumption is that, in spite of very high local and regional species diversity of this genus, the total number of *Acantholaimus* species could be not too large. This assumption is based on the fact of a very wide distribution of many *Acantholaimus* species. The different combinations of the same species could form the species diversity of this genus in different localities and regions. It is highly likely that natural habitats of different *Acantholaimus* species will be extended as new deep-sea areas of the world's ocean will be studied.

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Correspondence should be addressed to:
M.A. Miljutina
Senckenberg Gesellschaft für Naturforschung
Senckenberg am Meer, Deutsches Zentrum für Marine Biodiversitätsforschung
Südstrand 44, 26382 Wilhelmshaven, Germany
email: mmiljutina@senckenberg.de