

Description of *Bakernema dauniense* n. sp. (Nematoda: Criconematidae) from Italy

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Abstract: *Bakernema dauniense* n. sp., a bisexual species from the rhizosphere of *Pinus halepensis* Mill. in Italy, is described and illustrated. Primary differentiating characteristics of the female are body annules bearing short, membranous projections 1.4–2.2 μm long, an anterior vulval lip slightly overlapping the posterior, and a linearly arcuate vagina. The juvenile differs markedly from adults by having annules with a beaded margin, which lack membranous projections. Generic and specific relationships of *B. dauniense* n. sp. are discussed. This occurrence is the first for a species of *Bakernema* in Europe.

Key words: *Bakernema dauniense* n. sp., *B. inaequale*, Criconematidae, morphology, nematode, new species, ring nematode, scanning electron microscopy (SEM), taxonomy.

Soil samples collected from the rhizosphere of *Pinus halepensis* Mill. in natural habitats along the Adriatic coast in southern Italy yielded an unknown species of *Bakernema*. Sufficiently numerous juveniles, adult females, and males were found to permit a detailed study of the species, which is here described.

MATERIALS AND METHODS

Specimens used in this study were extracted from soil by centrifugation, fixed in hot 4% formaldehyde:1% propionic acid and processed to glycerol by Seinhorst's rapid method. Morphological study by light (LM) and scanning electron microscopy (SEM) was based on 50 females and 12 males. Specimens were prepared for SEM (6), then coated with gold and observed with a JEOL 50A stereoscan at 5–10 kV of accelerating voltage. Abbreviations used are defined in Siddiqi (5). All measurements are in micrometers (μm) unless otherwise stated.

SYSTEMATICS

Bakernema dauniense n. sp.
(Figs. 1–4)

Holotype (female in glycerol): Morphometric data in Table 1.

Female ($n = 30$): Morphometric data in Table 2. Relaxed body cylindrical, slightly curved ventrally, narrowing from stylet base to labial region and from vulva to tail terminus. Lip region annules two, posterior most being larger, oral plate circular, prominent; submedian lobes inconspicuous by SEM.

Body cuticle thick, annules 5.9 ± 0.4 (4.6–6.6) wide, posterior edges bearing irregularly disposed thin, transparent membranous projections, margins smooth. Annule anastomoses rare. Stylet well developed, knobs anteriorly directed, 8.6 ± 0.5 (7.8–9.5) wide. Excretory pore 2 or 3 annules anterior or posterior esophagus base. Ovary outstretched, sometimes extending to stylet knobs (Fig. 1B). Spermatheca spherical, diameter 9–12, filled with sperms. Vagina slightly arcuate, never sigmoid. Vulva closed, on annule seven or eight anterior to tail terminus. Anterior vulval lip slightly overlapping posterior. Anus distinct, pit-like, at annule three or four anterior to tail terminus. Tail bluntly conoid, terminal annule with distinct rosette of membranous projections (Fig. 2F).

Allotype (male): Morphometric data from glycerol mounts in Table 1.

Male ($n = 12$): Males common, 3–5% of populations. Body strongly curved ventrally, narrowing gradually anteriorly. Labial region hemispherical. Cephalic sclerotization weak, stylet absent, esophagus underdeveloped. Hemizonid anterior to excretory pore, 6–8 wide, occupying one or two annules. Reproductive system 72–

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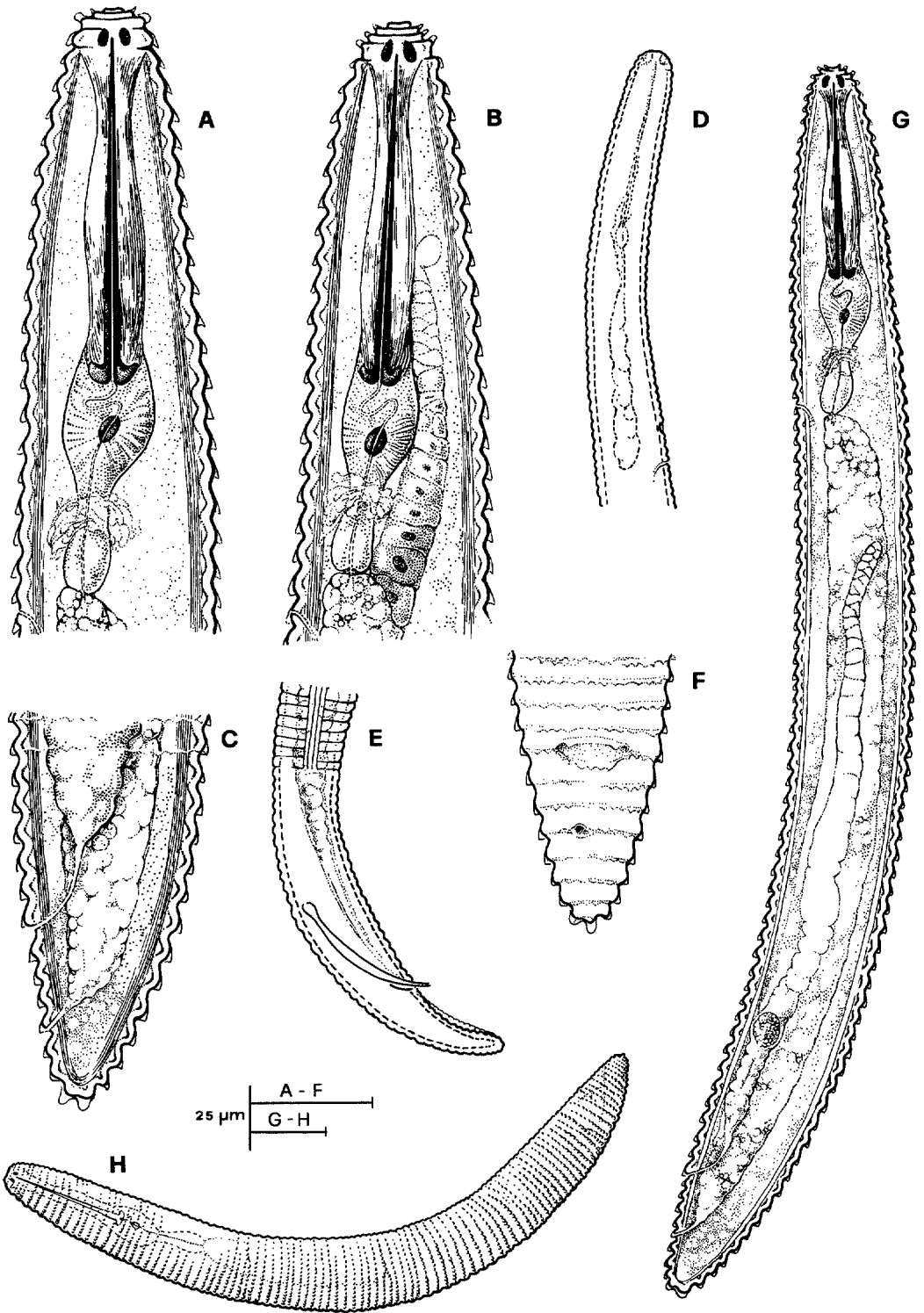


FIG. 1. Female, male, and fourth-stage juvenile of *Bakernema dauniense* n. sp. A,B) Female anterior region. C,F) Female lateral and ventral posterior body portions. D,E) Male anterior and posterior body portions. G) Female. H) Fourth-stage juvenile.

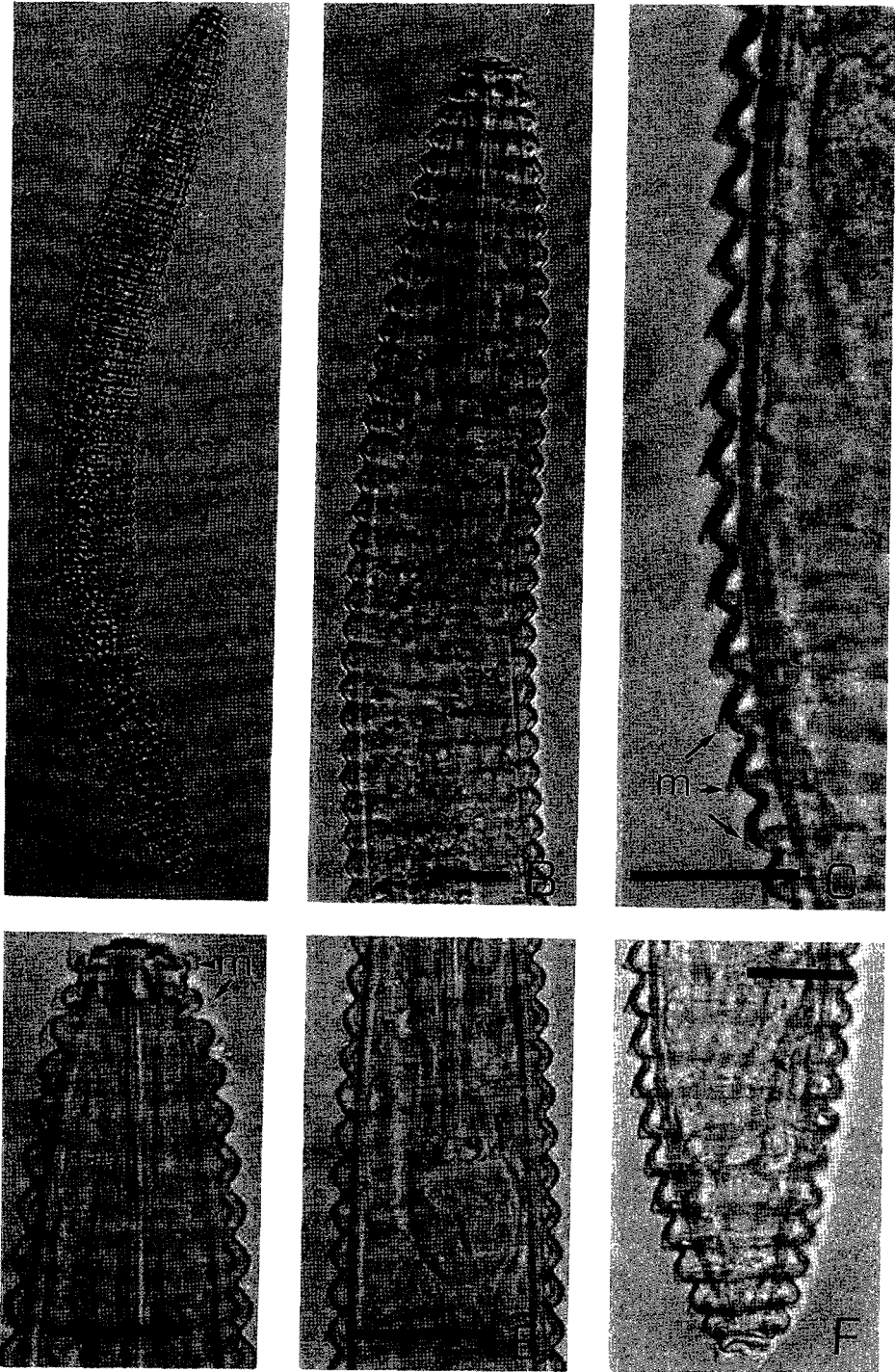


FIG. 2. Photomicrographs of *Bakernema dauniense* n. sp. female. Scale bar = 15 μ m. A) Whole body. B) Anterior body. C) Body annules with membranous projections (m). D) Anterior body at high magnification. Note the membranous transparent projections (m). E) Esophageal region. F) Posterior body.

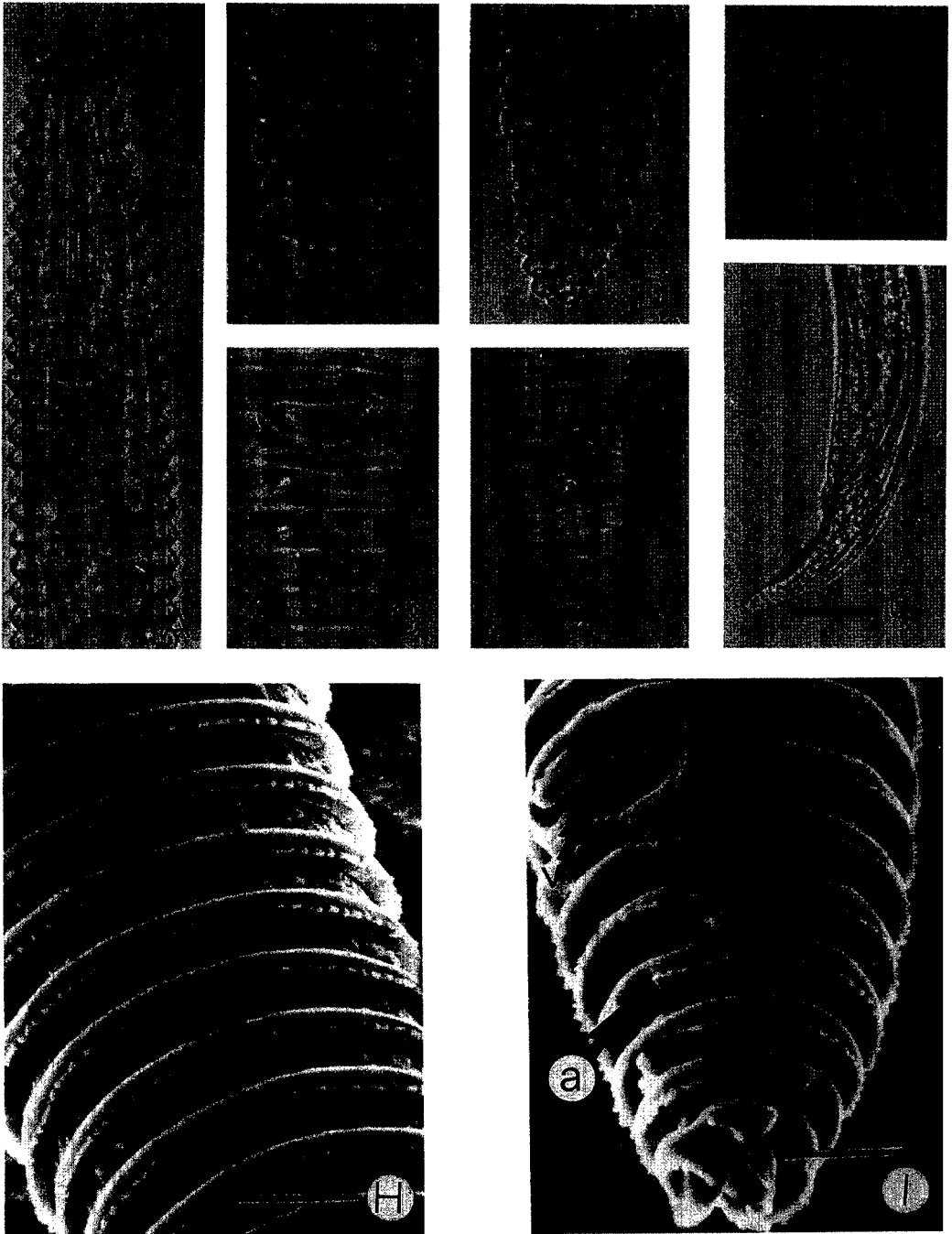


FIG. 3. Photomicrographs of female and male of *Bakernema dauniense* n. sp. (A–G) and SEM micrographs of female midbody and posterior body portions. Scale bars = 15 μm in A–E; 10 μm in F, G. A) Female anterior region. B) Female tail terminus with cuticular membranous projections on terminal annule (m). C) Vulva–anal area, ventral view. (v = vulva; a = anus). D) Female tail. E) Anastomosed annule (arrow). F, G) Male anterior and posterior body portions. H) Female body annules showing posterior edges marked by membranous fringes. I) Female posterior region and vulva terminus, lateroventral view. Note the vulva (v) and anus (a) position and roselike terminal annule.

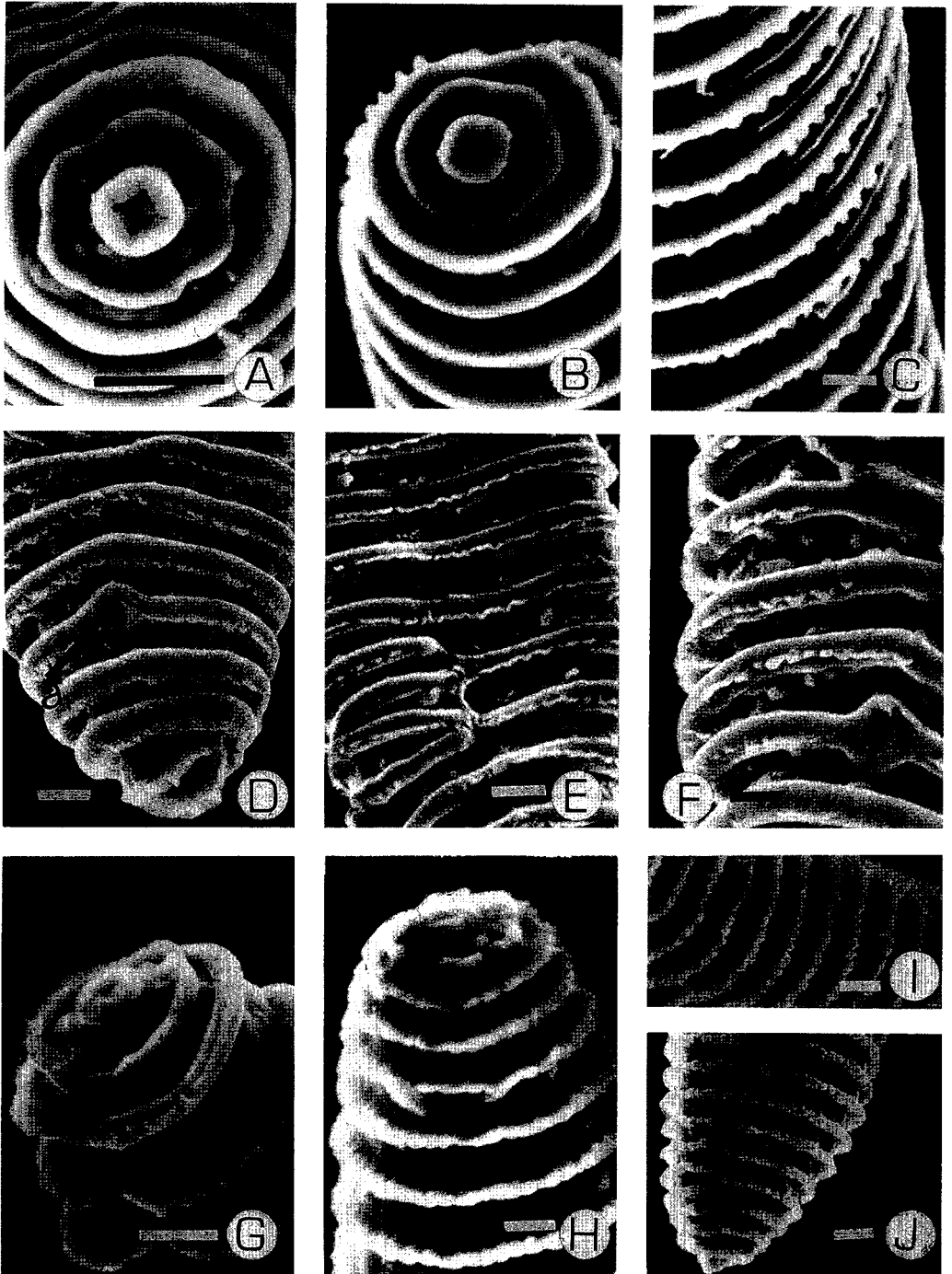


FIG. 4. SEM micrographs of *Bakernema dausiense* n. sp. female and fourth-stage juveniles. Scale bars = 5 μ m. A,B,G) Face view of female. Note the small submedian lobes and the prominent labial plate. C) Female lateral view at midbody showing numerous irregularly disposed projections on the body annules. D) Posterior body portion (a = anus). E) Lateral view showing regular and anastomosed annules. F) Irregularly disposed membranous projections at the anal area. H-J) Body annule margins at anterior end, midbody, and tail of a fourth-stage juvenile showing beadlike cuticular ornamentations.

TABLE 1. Morphometric data for holotype female and allotype male of *Bakernema dauniense* n. sp.

Characters	Female	Male
Linear (μm)		
L	420	332
Body width	35	16
Esophagus length	126	
Excretory pore	115	84
Stylet length	73	
Stylet knobs width	8.4	
Tail length	17	27
Spicules		35
Gubernaculum		6
Annule number		
R (ventral side)	76	
Rst	16	
Res	25	
Rex	23	
RV	8	
Ran	4	
Percentages		
V	92	
St% L	17	
St% es	60	
T		44
Ratios		
a	12	20
b	3.3	
c	25	12
VL/VB	1.2	
VL/St	0.5	

95 long, about 30% body length. Spicules slender, slightly curved, cephalated. Gubernaculum simple, slightly curved. Caudal alae absent. Lateral field with four incisures. Tail conoid, terminus round.

Fourth-stage juvenile female: Body slightly curved ventrally, tapering gradually toward extremities. Body annules with beaded margins, lacking membranous projections (Fig. 3H, L). Labial region hemispherical, oral plate prominent, submedian lobes small, distinct by LM. Annule anastomoses rare, mainly in posterior body. Tail terminus conoid, terminal annule single or bilobed.

Type host and locality

Specimens collected from soil around roots of pine (*Pinus halepensis* Mill.) from the Adriatic coast at Isola Varano, Foggia province, southern Italy.

Type designations

Holotype, allotype, and 18 paratypes deposited in the Nematode Collection of the Istituto di Nematologia Agraria, Consiglio Nazionale delle Ricerche, Bari, Italy. Glass slides containing female and male paratypes deposited in Nematode Collection of Entomology and Nematology Department, Rothamsted Experimental Station, Harpenden, Herts, England; Nematode Collection of Landbouwhogeschool, Wageningen, The Netherlands; University of California Davis Nematode Collection, University of California, USA; United States Department of Agriculture Nematode Collection, Beltsville, Maryland, USA; Collection Nationale de Nématodes, Laboratoire des Vers, Muséum national d'Histoire naturelle, Paris, France.

Diagnosis

Bakernema dauniense n. sp. differs from the type and only other species of the genus, *B. inaequale*, by having body annule ornamentations of short, 1.4–2.2 μm long transparent membranous projections; a short anterior vulval lip that slightly overlaps the posterior; a linearly curved vagina; body, stylet, and spicules lengths of 391–461, 65–67, and 31–37, respectively; and by R = 69–79, RV = 7–8, and Ran = 3–4. *Bakernema inaequale* (Taylor, 1936) Mehta & Raski, 1971 differs from *B. dauniense* by the longer (6–10 μm) membranous projections on the body annule margins; a more strongly developed anterior vulval lip, which extends well over the posterior; a sigmoid vagina; body, stylet, and spicules lengths of 420–610, 60–70, and 36–48, respectively; and by R = 63–72, RV = 5–7, and Ran = 3–5.

Relationships

Bakernema dauniense is similar to species in the genera *Ogma* Southern, 1914 and *Bandicephalanema* and *Pateracephalanema* Mehta & Raski, 1971 by their elaborate cuticular projections on the female body annules. The female of *B. dauniense*, however, is uniquely different from that of

TABLE 2. Morphometric data for 30-female and 12-male paratypes of *Bakernema dauniense* n. sp.

Characters	Female			Male		
	Range	Mean	SD ^o	Range	Mean	SD [†]
Linear (μm)						
L	391-461	431	16.3	304-363	337	15
Body width	34-43	40	2.4	15-17	16	0.6
Esophagus length	110-134	120	6.7			
Excretory pore	109-137	124	8.0	84-95	90	3.6
Stylet length	65-74	70	2.3			
Stylet knobs width	7.8-9.5	8.6	0.5			
Tail length	13-21	16	2.0	20-27	25	2.0
Spicules				31-37	34	1.7
Gubernaculum				6-7	6.4	0.4
Annule number						
R (ventral side)	69-79	75	2.0			
Rst	13-16	15	0.9			
Res	20-25	22	1.3			
Rex	21-26	23	1.0			
RV	7-8					
Ran	3-4					
Percentages						
V	90-93	91	0.8			
St% L	15-17	16	0.6			
St% es	52-62	58	2.6			
T				29-44	35	2.0
Ratios						
a	10-13	11	0.7	18-23	20	1.7
b	3.2-4.0	3.6	0.2			
c	22-35	28	3.6	12-23	14	3.0
VL/VB	1.0-1.4	1.2	0.1			
VL/St	0.4-0.7	0.5	0.05			

† SD = standard deviation

these species in having unusually strong sclerotization of the labial framework, a prominent labial plate, indistinct submedian lobes, and by marked differences between adults and juveniles in cuticular ornamentations.

Etymology

The name of *B. dauniense* is derived from *Daunia*, an ancient Apulian region colonized by Greeks and ruled by the Peloponnesian *Damnus*.

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