

## Taxonomic Status of *Berntsensus brachycephalus* (Nematoda: Aphelenchina)

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**Abstract:** *Berntsensus brachycephalus* is redescribed from original material collected by Thorne in Utah, and holotype and paralectotypes are designated. This species is characterized by an expanded lip region, offset head, heavily sclerotized stylet conus, and two rows of oogonia and spermatogonia. The holotype male is 720 µm long, and paralectotype males are 864 to 952 µm long. Paralectotype females are 840 µm long. Tails of both sexes are amucronate.

**Key words:** Aphelenchina, *Berntsensus brachycephalus*, holotype, nematode, paralectotype, taxonomy.

There is uncertainty about the status of a species originally described by Thorne (1935) in the genus *Aphelenchoides*. *Aphelenchoides brachycephalus* was initially transferred to the genus *Laimaphelenchus* by Massey (1956), and then to the genus *Ektaphelenchus* by Goodey (1960). Finally, Massey (1974) transferred it to the genus *Berntsensus* and designated it as the type species for the genus. Later, Baujard (1984) synonymized *E. tenuidens* (Thorne, 1935) Rühm, 1956 with *B. brachycephalus*. This synonymy was accepted by Ebsary (1991) but rejected by Hunt (1993).

Because of the continuing uncertainty regarding the status of this species, it is herein redescribed from material originally collected by Thorne, and holotype and paralectotypes are designated.

### MATERIALS AND METHODS

*Berntsensus brachycephalus* material was obtained from the Thorne Collection in the U.S. Department of Agriculture Nematode Collection (USDANC), Beltsville, Maryland. This included material used by Thorne (1935) to describe this species and by Massey (1974) to describe the genus *Berntsensus*. The majority of the material comprised specimens collected by Thorne in 1932, 1933, and 1935 from three localities in Utah (Horse Creek, Blacks Fork, and Provo Basin), and the remainder comprised specimens collected by Thorne in 1933 from Spring Canyon, Utah (Fig. 1). Measurements were taken from glycerin-mounted specimens. Spicule length and body ratios were calculated following Hooper (1986). If specimens were flattened, corrected body diameters were calculated following Geraert's second formula (1961).

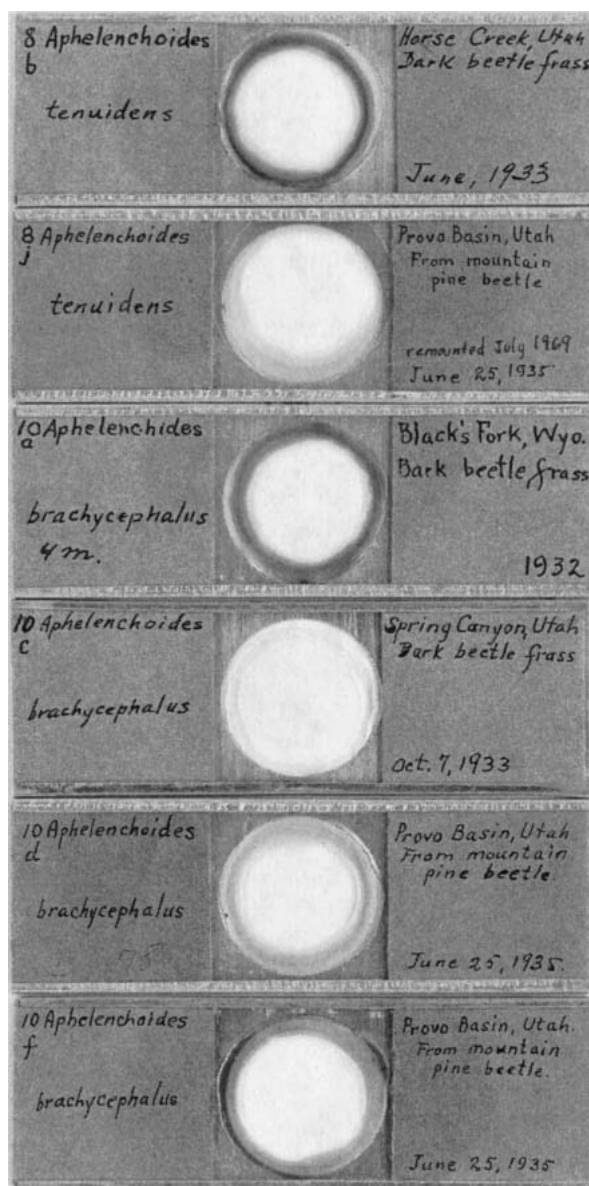


FIG. 1. Slides from the Thorne Collection that were used in this study. Note that although slides 8b and 8j are labeled "*Aphelenchoides tenuidens*," they do contain specimens of *Berntsensus brachycephalus*.

Received for publication 22 April 2002.

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The author thanks Z. Handoo, USDA ARS Nematology Laboratory, for the loan of specimens.

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This paper was edited by R. T. Robbins.

## SYSTEMATICS

*Berthsenus brachycephalus* (Thorne, 1935) Massey, 1974  
 syn. *Aphelenchoides brachycephalus* Thorne, 1935  
 syn. *Laimaphelenchus brachycephalus* (Thorne, 1935)  
 Massey, 1956  
 syn. *Ektaphelenchus brachycephalus* (Thorne, 1935)  
 Goodey, 1960  
 (Figs. 2A-J)

## Description

*Male*: Measurements of holotype and paralectotype males are given in Table 1. Body J-shaped, 720 to 952  $\mu\text{m}$  long. Tail curved to conoid, amucronate terminus (Figs. 2B and 2D). Cuticle with fine, transverse striae. Incisures not observed. Head distinctly offset, lip region expanded. Stylet 20 to 21  $\mu\text{m}$  long; conus 8 to 10  $\mu\text{m}$  long, heavily sclerotized. Posterior portion of stylet difficult to distinguish; knobs appear to be absent. Pro-

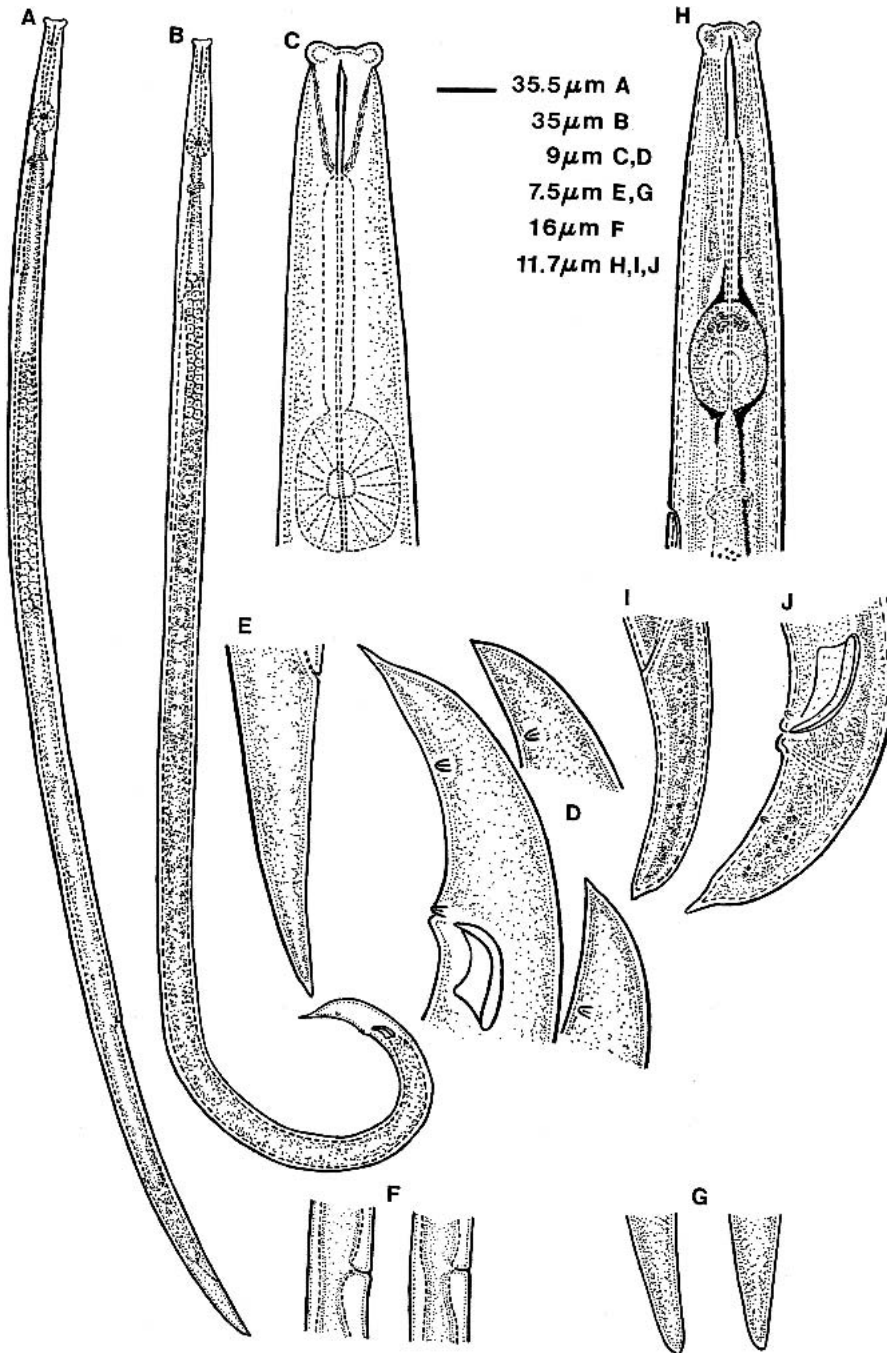


FIG. 2. *Berthsenus brachycephalus* (Thorne, 1935) Massey, 1974. A) Full view of female. B) Full view of male. C) Head and neck of male. D) Variation in male tails. E) Female tail. F) Variation in vulval region. G) Variation in female tails. H) Head and neck. I) Female tail. J) Male tail. Note: H-J are redrawn from Thorne, 1935.

TABLE 1. Measurements of lectotypes of *Beritsenus brachycephalus* (Thorne, 1935) Massey, 1974.

	Paralectotype females (n=2)	Hololectotype male	Paralectotype male	Paralectotype male
	Provo Basin, UT	Provo Basin, UT	Provo Basin, UT	Horse Creek, UT
Linear ( $\mu\text{m}$ )				
Body length	840	720	864	952
Greatest width	22	20	22	24.9 <sup>a</sup>
Procorpus length	33 (32–40)	36	45	37
Metacarpus length	21 (20–22)	22	22	22
Metacarpus width	14	16	16	15.4 <sup>a</sup>
Stylet length	17 (16–18)	20	21	20
Tail length	40 (38–42)	30	32	38
Anal body width	11 (10–12)	13	14	17 <sup>a</sup>
Spicule length	-	19	20	18
Postuterine sac	99 (90–108)	-	-	-
Ratios				
a	38.2	36	39.2	38.2 <sup>a</sup>
b	10 (9.9–10.1)	8	8.3	10.6
b'	5 (4.6–5.3)	4.4	4.8	5.5
c	21.1 (20–22.1)	24	27	25.1
c'	3.7 (3.2–4.2)	2.3	2.3	2.2 <sup>a</sup>
V or T	75.5 (75–76)	66	77	79

<sup>a</sup> Value corrected for flattened specimen following Geraert's second formula (1961).

corpus 36 to 45  $\mu\text{m}$ . Median bulb 22  $\mu\text{m}$  long by 15.4 to 16  $\mu\text{m}$  wide, valves centrally situated. Excretory pore indistinct in all specimens. Nerve ring 90 to 104  $\mu\text{m}$  from anterior end. Testis not reflexed, at times reaching gland lobes. Spermatogonia in two rows. Spicules 18 to 20  $\mu\text{m}$  long; apex and rostrum weakly developed. Two pairs of caudal papillae present: first pair adcloacal, second pair pre-anal. Bursa and gubernaculum absent.

*Female:* Measurements of paralectotype females are given in Table 1. Body 840  $\mu\text{m}$  long, tapering posteriorly to conoid, amucronate tail (Figs. 2E and 2G). Tail 38 to 42  $\mu\text{m}$  long. Stylet 16 to 18  $\mu\text{m}$  long, otherwise same as male. Procorpus 32 to 40  $\mu\text{m}$  long. Median bulb 20 to 22  $\mu\text{m}$  long by 14  $\mu\text{m}$  wide. Excretory pore visible in one specimen, 101  $\mu\text{m}$  from anterior end. Nerve ring 83 to 90  $\mu\text{m}$  from anterior end. Intestine terminating in rectum and anus. Ovary single, outstretched; spermatheca indistinct. Oogonia in two rows. Postuterine sac present, 90 to 108  $\mu\text{m}$  long. Vulva posteriorly located (V=75–76), lips protuberant or not protuberant; flap absent. Vagina transverse or slightly oblique.

#### *Type habitat and locality*

Associated with mountain pine beetle (*Dendroctonus ponderosae* Hopk.) on lodgepole pine (*Pinus contorta* Douglas), Provo Basin, Utah, and also from bark beetle frass, Horse Creek, Utah.

#### *Type specimens*

Hololectotype male and one paralectotype male collected by G. Thorne on 25 June 1935 on slide no. T-562t, deposited in USDANC, Beltsville, Maryland. One paralectotype male collected in June 1933 on slide

no. T-5101p, and two paralectotype females collected on 25 June 1935 on slide no. T-5102p, also in USDANC.

#### *Diagnosis*

*Beritsenus brachycephalus* is distinguished by an expanded lip region, offset head, two rows of oogonia and spermatogonia, and a heavily sclerotized stylet conus.

#### *Relationships*

A longer female body (840  $\mu\text{m}$  vs. 652–736  $\mu\text{m}$ ), tail (38–42  $\mu\text{m}$  vs. 26–34  $\mu\text{m}$ ), postuterine sac (90–108  $\mu\text{m}$  vs. 80–90  $\mu\text{m}$ ), and larger c' ratio (3.2–4.2 vs. 2.8) distinguish *B. brachycephalus* from the only other species in the genus, *B. labiosus* Massey, 1974.

#### *Remarks*

In this study, stylet knobs were not observed in either *B. brachycephalus* or *B. labiosus*. This is contrary to observations by Thorne (1935) and Massey (1974), who included these structures in the original drawings of these species. Perhaps knobs become transparent over time and are not observable in old specimens. This might explain why Massey used the lack of knobs in *B. brachycephalus* as one criterion for differentiating these species.

Measurements of specimens from the different localities sampled by Thorne generally corresponded well to those given in descriptions by Thorne (1935) and Massey (1974) (Tables 1 and 2). Some males from Provo Basin and Blacks Fork, Utah were shorter than originally reported by Thorne (720–786  $\mu\text{m}$  vs. 800–1,000  $\mu\text{m}$ ); however, these measurements are within the 7% to 9% shrinkage range that is expected for old glycerin-mounted specimens (Esser, 1974). Although this species was listed as *E. brachycephalus* by Ebsary (1991) and

TABLE 2. Measurements of different populations of *Berntsenus brachycephalus* (Thorne, 1935) Massey, 1974 from Utah (this study), from Thorne's 1935 description, and from Massey's 1974 description.

	Spring Canyon		Provo Basin		Blacks Fork		Thorne (1935)		Massey (1974)	
	Females (n=2)	Males (n=4)	Males (n=4)	Males (n=4)	Females (n=2)	Males (n=2)	Females (n=2)	Males (n=2)	Females (n=2)	Males (n=2)
Linear (µm)	91.2 (862-962)	806 (743-900)	827 (786-890)	900 (800-1000)	900 (800-1000)	900 (800-1000)	955 (950-960)	830 (820-840)		
Body length	28.7 <sup>a</sup>	35.3 (34-36.3) <sup>a</sup>	28.7 (24.9-32.5) <sup>a</sup>	27 (24-30)	27 (24-30)	25.2 (22.4-28)	34 <sup>b</sup>			
Greatest width	31 (29-33)	33.8 (31-38)	33.8 (31-38)	30.1 <sup>b</sup>	30.1 <sup>b</sup>	30.1 <sup>b</sup>	33.9 <sup>b</sup>	33.9 <sup>b</sup>		
Procorpus length	21	22.5 (19-26)	22 (20-24)	28.6 <sup>b</sup>	28.6 <sup>b</sup>	28.6 <sup>b</sup>	24.2 <sup>b</sup>	24.2 <sup>b</sup>		
Metacarpus length	17.4 (16.4-18.3) <sup>a</sup>	21.7 (20.3-23) <sup>a</sup>	17.4 (15.4-19.3) <sup>a</sup>	15 <sup>b</sup>	15 <sup>b</sup>	15 <sup>b</sup>	24.2 <sup>b</sup>	24.2 <sup>b</sup>		
Metacarpus width	18 (17-19)	17.8 (16-21)	18.8 (16-22)	19.5 (17.3-21.7)	19.5 (17.3-21.7)	19.5 (17.3-21.7)	18.2 (16-20.3) <sup>b</sup>	18.2 (16-20.3) <sup>b</sup>		
Stylet length	41	34.8 (31-36)	40 (36-42)	39.2 (34.8-43.5)	39.2 (34.8-43.5)	33.8 (30-37.5)	48.4 <sup>b</sup>	48.4 <sup>b</sup>		
Tail length	11.3 <sup>a</sup>	21.4 (17.9-22.5) <sup>a</sup>	18.3 (17-20.7) <sup>a</sup>	12.2 (10.8-13.5)	12.2 (10.8-13.5)	18.2 (16.2-20.3)	13.4 <sup>b</sup>	13.4 <sup>b</sup>		
Anal body width	-	19.8 (18-22)	20.8 (20-22)	-	-	22.6 <sup>b</sup>	-	-		
Spicule length	118 <sup>d</sup>	-	-	108 (96-120)	108 (96-120)	-	85 (68-102)	85 (68-102)		
Postuterine sac										
Ratios										
a	31.8 (30-33.5) <sup>a</sup>	22.9 (20.5-26.5) <sup>a</sup>	29.1 (24.2-33.5) <sup>a</sup>	33.3 (26.7-41.7)	33.3 (26.7-41.7)	35.7 (28.6-44.6)	26.5 (25.6-27.3)	39.2 (37.3-41.1)		
b	10.3 (9.8-10.7)	9.3 (8-10.6)	8.9 (8.6-9.1) <sup>c</sup>	8.3 6.6-10.4	8.3 6.6-10.4	9.1 (7.3-11.4)	11 (11-11)	10.4 (10.3-10.5)		
b'	5.3 <sup>d</sup>	5 (4.6-5.4) <sup>c</sup>	- <sup>c</sup>	-	-	-	4.9 <sup>b</sup>	4.9 <sup>b</sup>		
c	22.3 (21-23.5)	23.2 (21-25)	20.7 (19-21.8)	16.7 (13.3-20.8)	16.7 (13.3-20.8)	20 (16-25)	21.9 (21.8-21.9)	25.1 (22.3-27.9)		
c'	3.6 <sup>a</sup>	1.6 (1.6-1.7) <sup>a</sup>	2.2 (2-2.5) <sup>a</sup>	3.5 (2.8-4.4)	3.5 (2.8-4.4)	2.5 (2-3.1)	3.6 <sup>b</sup>	2.2 <sup>b</sup>		
V or T	76.5 (75-78)	- <sup>c</sup>	62.8 (58.2-67.2) <sup>c</sup>	76	76	25	75	-		

<sup>a</sup> Value corrected for flattened specimens following Geraert's second formula (1961).<sup>b</sup> Calculated from figures.<sup>c</sup> Character not observable.<sup>d</sup> Value obtained from one specimen.<sup>e</sup> Value obtained from two specimens.<sup>f</sup> Flattened specimens.

synonymized with *E. tenuidens* by Baujard (1984), the presence of an anus excludes it from *Ektaphelenchus* and the expanded lip region and distinctive stylet differentiate it from *E. tenuidens*.

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