

On the identity of *Mononchus digiturus* Cobb, 1893, *Mononchus minor* Cobb, 1893, *Mononchus trionchus* Thorne, 1924, *Mononchus montanus* Thorne, 1924, and *Mononchus amphigonicus* Thorne, 1924

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Abstract. Identities of five ancient known species of Mononchida, namely *Mononchus digiturus* Cobb, 1893, *M. minor* Cobb, 1893, *M. trionchus* Thorne, 1924, *M. montanus* Thorne, 1924, and *M. amphigonicus* Thorne, 1924 have been reassessed. These are redescribed and illustrated and their systematic positions and relationships discussed. The descriptions are based on type specimens preserved in the USDA Nematode Collection, Beltsville, Maryland, USA except for *M. digiturus* and *M. minor* of which no types are extant so we describe topotypes and propose neotypes for these species. Due to the absence of holotypes in original type specimens we have proposed lectotypes for *Miconchus trionchus* and *Mononchus amphigonicus*. These redescriptions have solved many existing taxonomic problems which are reported in this paper. Two new genera have been proposed, namely, *Montonchus* for *Mononchus montanus* Thorne, which is transferred to it as *Montonchus montanus* comb. n and *Thorneum* for *Mononchus amphigonicus* Thorne which becomes *Thorneum amphigonicum* comb. n. The latter species is transferred from *Jensenonchus* to *Thorneum*. *Comiconchus* Jairajpuri & Khan, 1982, based on *Mononchus trionchus* Thorne, 1924 is synonymized with *Miconchus* and the species returned to it.

Keywords. Mononchida, *Mononchus amphigonicus*, *M. digiturus*, *M. minor*, *M. montanus*, *M. trionchus*, *Montonchus* gen. n., redescriptions, taxonomy, *Thorneum* gen. n.

INTRODUCTION

Type specimens of ancient known *Mononchus* species proposed and described by Cobb and Thorne available in the USDA Nematode Collection, Beltsville, Maryland, USA have been studied. Some of these, namely, *Mononchus trionchus* Thorne, 1924, *Mononchus montanus* Thorne, 1924, and *Mononchus amphigonicus* Cobb in Cobb, 1915, are redescribed in this paper and their systematic positions discussed. Among the nematode specimens presented to the senior author by his employer, CAB International, there were some specimens of *Miconchus digiturus* and *Mylonchulus minor* collected from around plant roots in Fiji by Mr K. J. Orton Williams. These are topotypes of *Mononchus digiturus* Cobb, 1893, and *Mononchus minor* Cobb, 1893 for which we have proposed neotypes from among these topotypes to establish the identity of both the species. Thus, the identities of these

species have been established. Several taxonomic problems connected with the nematodes reported here have been solved. It has resulted in the proposal of two new genera, *Montonchus* and *Thorneum*, and synonymisation of *Comiconchus* Jairajpuri & Khan, 1982, based on *Mononchus trionchus* Thorne, 1924 with *Miconchus*. It is hoped that this information will be helpful for future research.

DESCRIPTIONS

1. *Mononchus digiturus* Cobb, 1893

Present status: *Miconchus digiturus* (Cobb, 1893) Andr ssy, 1958

Syn. *Mononchus digiturus* Cobb, 1893
Mononchus (Iotonchus) digiturus (Cobb, 1893) Cobb, 1916

Iotonchus digiturus (Cobb, 1893) Cobb, 1916

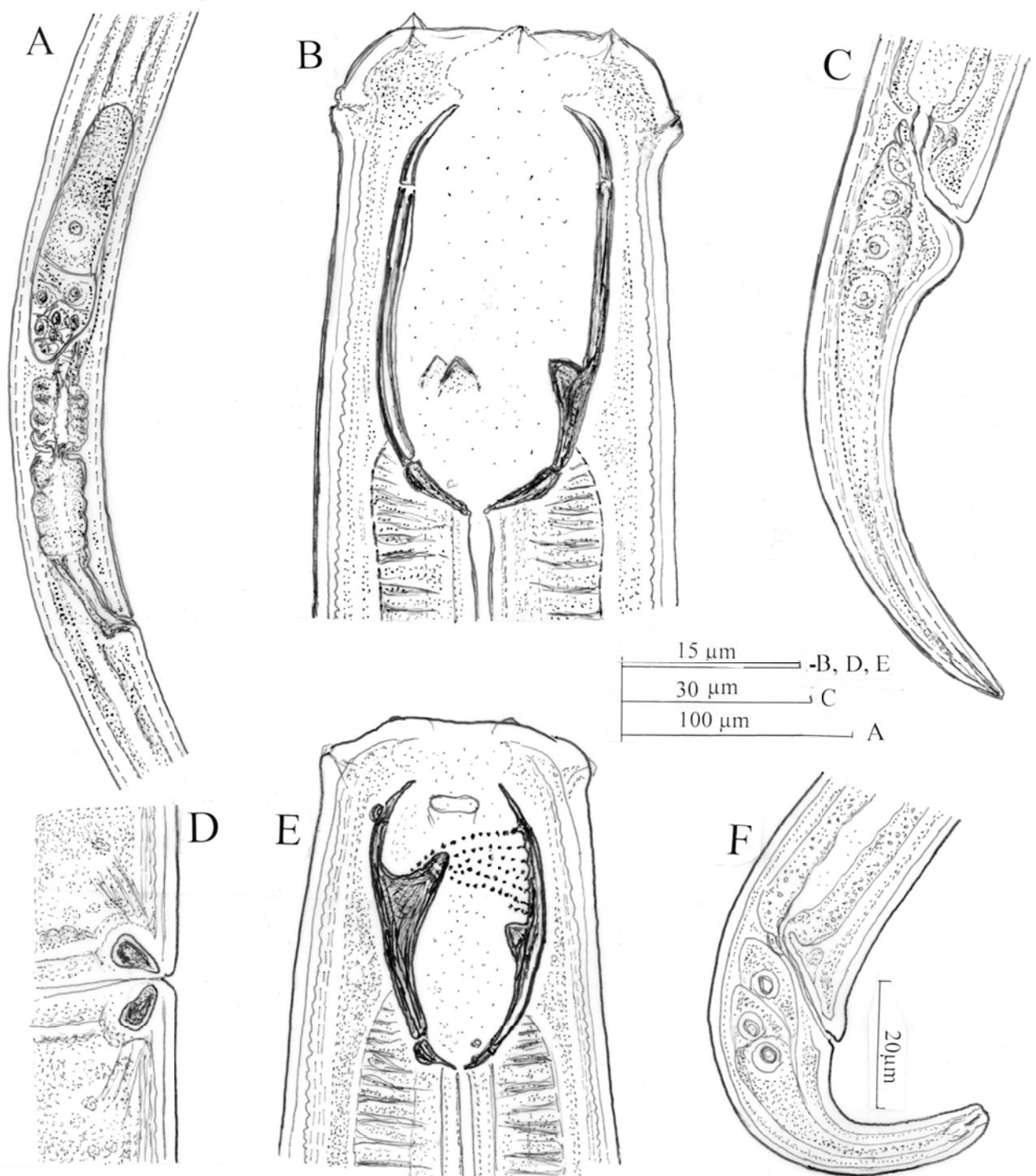


Fig. 1. A-C. *Miconchus digiturus* (Cobb). A. Female reproductive organs. B. Head and stoma. C. Tail end. D-F. *Mylonchulus minor* (Cobb). D. Vulva and sclerotized *pars refringens vaginae*. E. Head and stoma. F. Tail end.

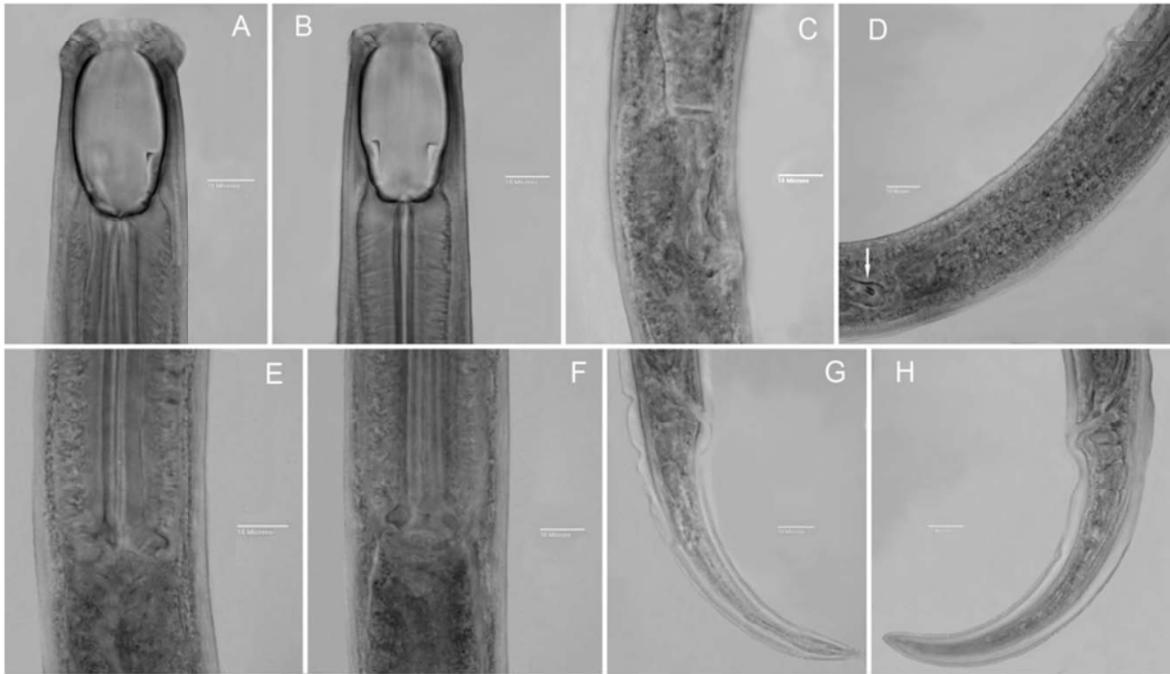


Fig. 2. A-H. Photomicrographs of *Miconchus digiturus* (Cobb). A, B. Head and stoma of neotype and topotype female, respectively. C. Vulval region of topotype. D. Part of uterus (arrow showing Z differentiation-like sphincter) in topotype female. E, F. Oesophago-intestinal junction in topotype and neotype female, respectively. G, H. Tail end of neotype and topotype female, respectively.

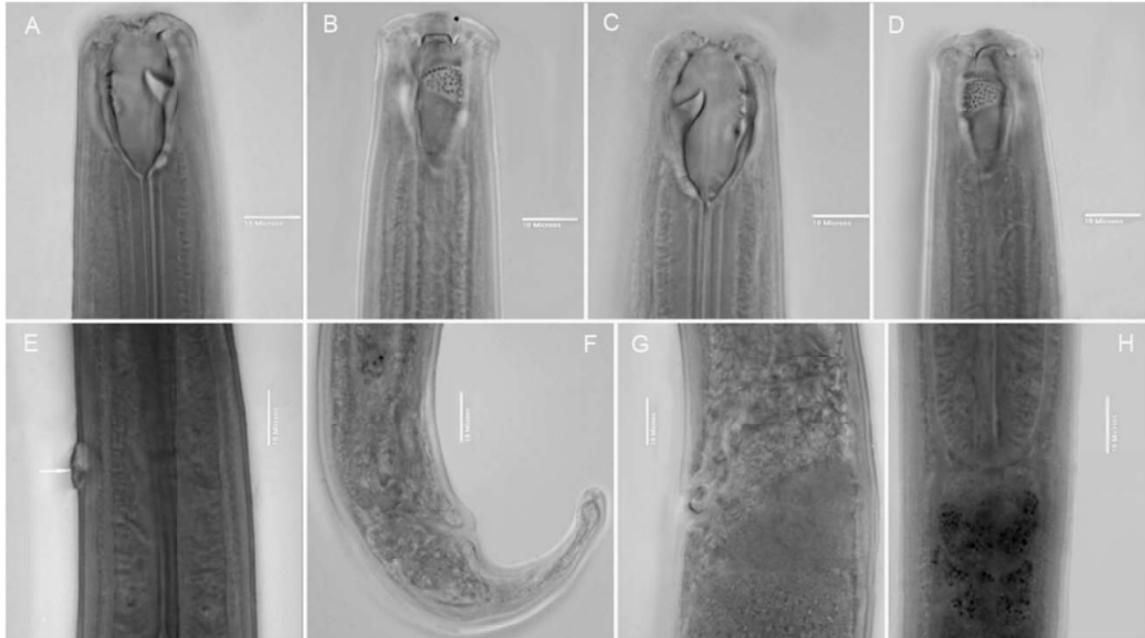


Fig. 3. A-H. Photomicrographs of *Mylonchulus minor* (Cobb). A, D. Head and stoma of topotype female. B, C. Head and stoma of neotype female. E. Portion of oesophagus, arrows showing excretory pore in topotype female. F. Tail end of female neotype. G. Vulval region of neotype. H. Oesophago-intestinal junction in topotype female.

(Fig. 1, A-C; 2, A-H)

Measurements

Neotype female from Fiji: L = 1.24 mm; a = 40; b = 3.3; c = 12.6; c' = 4.4; V = $14.6-74^0$; buccal cavity = 35×17 µm.

Topotype females from Fiji (n=6): L = 1.12-1.41 (1.26) mm; a = 31-37 (34); b = 3.1-3.6 (3.33); c = 11-15 (12.9); c' = 4-4.8 (4.47); V = 70-74 (71.8); buccal cavity = 33-39 (34.8)×17-21 (18) µm.

Female. Body cylindrical, slender, ventrally arcuate in C shape when relaxed. Cuticle smooth, thin, striation indistinct; maximum width 32-45 (36 µm). Cephalic region broadly rounded, set off from body by expansion, 27-34 µm in diameter; with slightly projecting labial papillae. Amphids oval transverse slit 5-6 µm long, 12-14 µm from anterior end. Buccal cavity elongate barrel-shaped measuring 35×17 µm in neotype with total stoma length × width 43×17 µm. Walls of buccal cavity thin, metarhabdions elongate. Dorsal and subventral teeth on large raised structures on metarhabdion, in neotype their apices at 14.5 µm or 42.6 per cent of buccal cavity length from its base (Fig. 1, B; 2, A). Distinct geusids (one dorsal and two on each of basal lateral plates) opening through foramina located on telorhabdion.

Oesophagus cylindroid, base tuberculate. In neotype, oesophageal gland orifices are located up from the base of oesophagus as follows: SV2 16, 17 µm, SV1 situated together at 120 µm and DO 185 µm. Oesophagus 370-390 (av. 379, in neotype 380) µm; distance from oesophagus to vulva 472-630 (av. 541, in neotype 550) µm. Nerve ring and indistinct excretory pore present at 120 and 167 µm from anterior end. Oesophago-intestinal junction tuberculate; cardia large, hemispheroidal (Fig. 2, E & F).

Distance from vulva to anus 220-278 (258) µm. Vulva a small slit, lips not raised. Vagina leading inward and slightly forward, a little less than one-third of vulvae body width long; *pars refringens* without sclerotization. Gonad monodelphic-prodelphic, posterior branch completely lacking. Ovary with 6-8 oocytes, reflexed; in neotype 100 µm long (Fig. 1, A). Oviduct pouch prominent, separated from uterus by a well developed sphincter. Sperm not seen in gonoduct.

Rectum about one anal body width long. Anus distinct, posterior lip large rounded, body narrowing considerably behind it (Fig. 1, C; 2, G & H). Tail conoid, ventrally arcuate, 85-120 (97) µm or 4.0-4.8 anal body widths long; terminus minutely rounded, with a central indistinct pore. Three caudal glands present (Fig. 1, C). Hypodermal body pores absent.

Male. Not found.

Type habitat and locality: Soil around plant roots in Fiji.

Type specimens: Neotype and two topotype females deposited in the USDA Nematode Collection, Beltsville,

Maryland, USA. Two topotype females are deposited in each of these collections: The British Nematode Collection, Food and Environment Research Agency, Sand Hutton, York, YO41 1LZ, England, and the Indian National Nematode Collection, IARI, New Delhi.

Remarks. Zullini *et al.* (2002) gave measurements, a short description and illustration of *Miconchus digiturus* (Cobb) from Los Almendros, Costa Rica. These specimens were given a new name, *Miconchus costaricensis* by Ahmad and Jairajpuri (2010). They argued that in the population from Costa Rica studied by Zullini *et al.* (2002) the posterior genital branch was completely absent, whereas in *M. digiturus* it was always present. They pointed out that Andrassy (2008) put a question mark on the conspecificity of Cobb's *digiturus* and the Costa Rican specimen. They differentiated *M. costaricensis* from *M. digiturus* by stating, "The Costa Rican specimens differ from *M. digiturus* in having comparatively larger buccal cavity (39-40 vs 35-36 µm), in the posterior position of dorsal tooth apex (19-23 vs 46-50% of buccal cavity length from its base) and in the absence of a post-uterine sac (vs one vulvar body diam. long sac present)."

Cobb (1893) notably stated about *M. digiturus*, "This and the next [i.e. *Mononchus* (now *Iotonchus*) *gymnolaimus*] are the only known species in which the female sexual organs are not double and symmetrical, and as usual it is the posterior branch which has disappeared; the remaining anterior branch is short and reflexed." Cobb's statement 'it is the posterior branch which has disappeared' should mean that there was no posterior branch, not even a sac. We admire Cobb's (1893) observation, for example, on the presence of a ventral pore behind the nerve ring and his illustration of a terminal pore on the tail tip – characters so difficult to see at present. Our redescription of *M. digiturus* based on topotypes from Fiji completely agrees with the original description of Cobb and helps in establishing the identity of the species.

2. *Mononchus minor* Cobb, 1893

Present status: *Mylonchulus minor* (Cobb, 1893) Cobb, 1916

Syn. *Mononchus minor* Cobb, 1893

Mononchus (*Mylonchulus*) *minor* (Cobb, 1893) Cobb, 1916

(Fig. 1 D-F; 3, A-H)

Measurements

Neotype female from Fiji: L = 1.07 mm; a = 39.6; b = 3.3; c = 26.7; c' = 2; V = 58.6; buccal cavity = 24×9 µm.

Topotype females from Fiji (n=7): L = 1.0-1.19 (1.12) mm; a = 32-41 (36.5); b = 3.2-3.6 (3.43); c = 22.8-27 (25); c' = 2.0-2.5 (2.2); V = 56.0-58.6 (77.2); buccal cavity = 24-25×9-10.5 µm.

Female. Body cylindrical, slender, ventrally arcuate to variously curved; maximum width 27-34 (30) µm. Cuticle

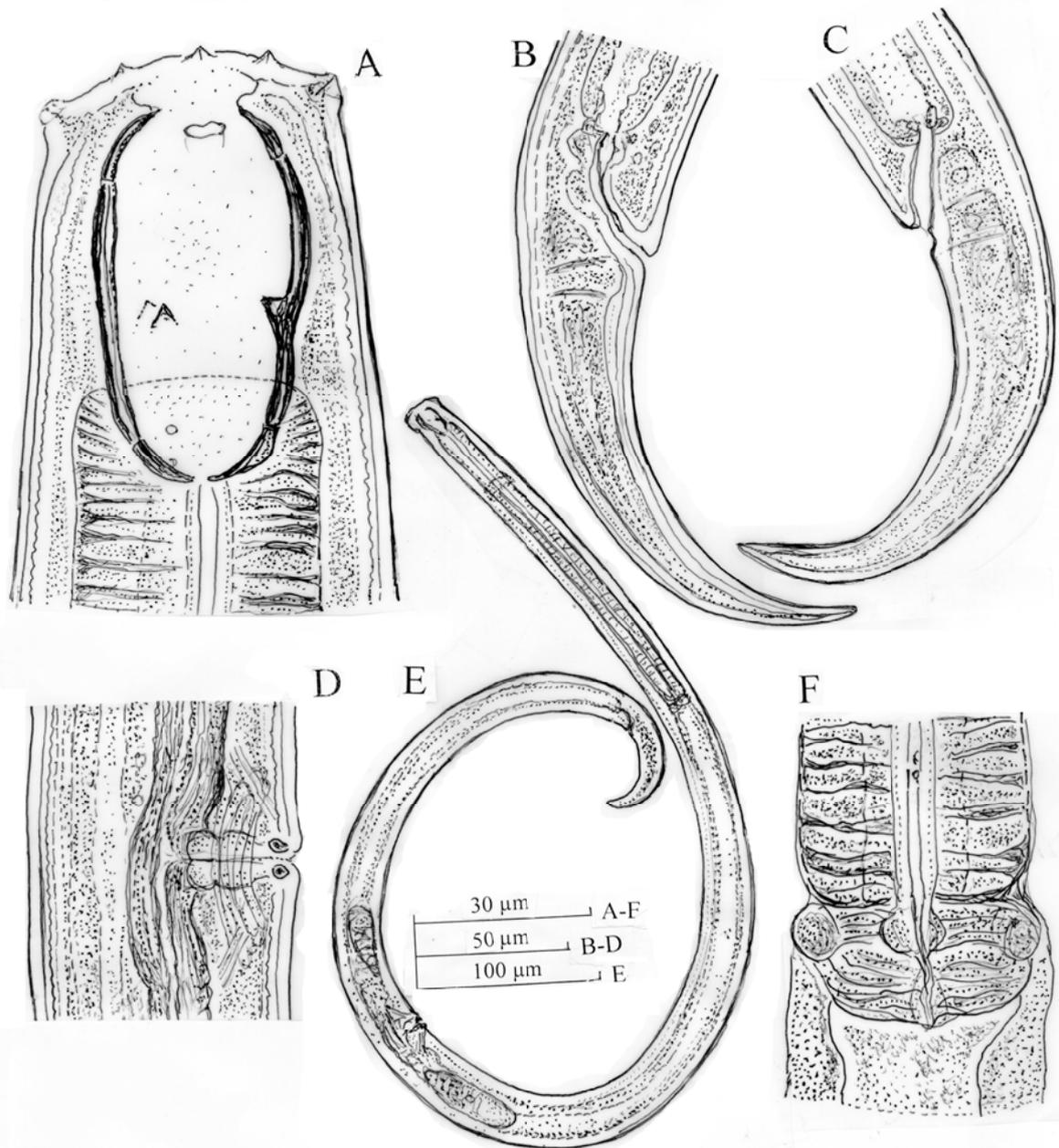


Fig. 4. A-F. *Miconchus trionchus* (Thorne). A. Stoma. B, C. Female tails. D. Vaginal region. E. Entire female. F. Oesophago-intestinal junction. A, C and E. Lectotype female.

smooth, thin, striation indistinct. Cephalic region broadly rounded, almost continuous with body contour, only outer labial papillae slight raised, set off from body by expansion, 21-24 μm in diameter; with slightly projecting labial papillae. Amphidial aperture transversely oval, 4 μm wide, 2 μm long as seen laterally, 7-8 μm from anterior end. Buccal cavity oval with posterior region conoid, thick-walled, measuring 24-25 μm long, 9-10.5 μm wide at middle. Total stoma length 28-30 μm (29 μm in neotype). Dorsal tooth strong, thick, 9-10 μm high, apex directed anteriorly, 9-11

μm from anterior end. Subventral teeth strong, one on each enlarged part of ridge just behind rasplike area (Fig. 1, E). The latter comprises six rows of denticles arising from ventral ridge and proceeding towards dorsal plate; anteriormost row is curved and has 13-15 denticle going past the apex of dorsal tooth, middle rows with 8-9 denticles each one of which may not be in a file, the last row is incomplete with 3-4 denticle (Fig. 1, E; 3, B & D). Two distinct geusids 2 μm apart usually are visible about 10 μm behind each SV tooth.



Fig.5. A-F. Photomicrographs of *Miconchus trionchus* (Thorne). Female Lectotype. A, B. Stoma. C. Oesophago-intestinal junction. D. Vaginal region. E. Rectum and anus. F. Tail end.

Oesophagus cylindroid, muscular, base non-tuberculate. Oesophageal gland orifices are located up from the base of oesophagus as follows: SV2 24-26 μm , SV1_{1,2} situated together at 84-86 μm anterior to SV2 and DO at 41-43 μm anterior to SV1. Oesophagus 324-340 (333) μm ; distance from oesophagus to vulva 315-340 (320) μm . Nerve ring and indistinct excretory pore present at 94 and 130 μm from anterior end, respectively. Cardia large, hemispheroidal to mammiform.

Vulva located at 627-680 (648) μm from anterior end of body and 450-510 (478) μm anterior to tail end. Vulva a small slit, lips may be slightly raised. Vagina leading inward and slightly forward, a little less than one-third of vulvar body width long; *pars refringens* distinctly sclerotized,

sclerotization appears as two large pieces of various shapes – lemon, triangular or spuarish (Fig. 1, D). Gonad didelphic with well developed ovary, short round pouch-like uterine chamber, short glandular part separated from oviduct by a weakly developed sphincter; each ovary with 10-12 oocytes; anterior ovary on right, posterior on left side of intestine. Sperm not seen in gonoduct.

Anus prominent, anterior lip rounded, protruding. Rectum rather sinuate with thick walls, about one anal body width long. Tail short conoid, ventrally arcuate, 43-50 (46.5) μm or 2.2-2.5 (2.2) anal body widths long; terminus broadly rounded, with a central indistinct pore (Fig. 1, F; 3, F). Three caudal glands in tandem fill most of the space in rectal region and anterior third of tail; spinneret present, tail width at

spinneret about one-third body diameter at anus (Fig. 1, F; 3, F).

Male. Not found.

Type habitat and locality: Soil around plant roots in Fiji, South Pacific.

Type specimens: Neotype female and one topotype female deposited in the USDA Nematode Collection, Beltsville, Maryland, USA. Two topotype females are deposited in each of these collections: The British Nematode Collection, Food and Environment Research Agency, Sand Hutton, York, YO41 1LZ, England; the Indian National Nematode Collection, IARI, New Delhi; and M. R. Siddiqi's Nematode Collection at Luton, England.

Remarks. Our specimens from Fiji fit very well with the measurement and description of the female given by Cobb (1893). Mulvey and Jensen (1967) described the buccal cavity of *M. minor* quoting Cobb (1917) as 25×24 µm. Figure 2 of Cobb (1893) is of a flattened specimen since the apex of the dorsal tooth does not reach middle of buccal cavity. On the other hand, Cobb's Figure 3 of stoma and oesophagus and the body curvature tally with Cobb's Figure 1 of the entire female. The buccal cavity in Figure 3 appears normal and not flattened and its measurements are similar to our topotypes. We are not comparing here the descriptions of *M. minor* to those of other workers, but we hope that our description of topotypes will establish the identity of the species and solve many inherent and intricate taxonomic problems relating to this species.

3. *Mononchus trionchus* Thorne, 1924

Present Status: *Miconchus trionchus* (Thorne, 1924) Andrassy, 1958

Syn. *Mononchus trionchus* Thorne, 1924
Mononchus (Itonchus) trionchus Thorne, 1924
 (Micoletzky, 1927)
Comiconchus trionchus (Thorne, 1924) Jairajpuri &
 Ahmad, 1982, new synonymy
 (Fig. 4, A-F; 5, A-F)

Measurements

Lectotype female (moss at base of tree, City Creek Canyon, Utah, October, 1923): L = 2.95 mm; a = 31; b = 4.43; c = 17.3; c' = 3.9; V = $7.8 \cdot 61.2 \cdot 7.8$; buccal cavity = 64×30 µm; dorsal tooth apex from base of buccal cavity = 31 µm, 48.4%.

Paralectotype females (female, Timpanogos Loop, Aspen Creek, Utah, 1924): L = 2.95 mm; a = 30.7; b = 3.93; c = 16.4; c' = 4.5; V = 65; buccal cavity = 65×37 µm; dorsal tooth apex from base of buccal cavity = 30 µm, 46%.

Paralectotype (?) females (5 females, Little Cottonwood Canyon, Utah, stream bank, June 1927): L = 3.43-3.79 (3.68) mm; a = 33-42 (35.5); b = 4.0-4.66 (4.46); c = 16.6-20 (18.5); c' = 3.8-4.6 (4.1); V = 62.7-65.0 (63.6); buccal cavity = 60-65×30-35 µm; dorsal tooth apex from base of buccal cavity = 30 µm, 46%.

Female. Important characters. body cylindrical, slender, ventrally curved in closed C-shaped or in a single spiral (Fig. 4, E). Cephalic region almost continuous with body contour, with protruding labial papillae (Fig. 4, A). Amphidial aperture small oval, level with anterior margins of buccal cavity. Buccal cavity barrel-shaped with moderately thick walls, about twice as long as wide. Dorsal and two sub-ventral teeth similar in size located at the same level just behind middle of buccal cavity, behind middle of metarhabdions (Fig. 4, A). Oesophagus cylindrical, muscular, base tuberculate (Fig. 4, F; 5, C). Vulva a small pore. Vagina straight, about two-fifths of body width long; *pars refringens* sclerotized, sclerotization appearing as round balls in lateral view (Fig. 4, D; 5, E). Sphincter present between uterus and oviduct. Ovaries paired, reflexed. Rectum prominent (Fig. 5, F), with wide lumen in lectotype female (Fig. 4, C). Tail conoid, ventrally arcuate, about four anal body widths long (Fig. 4, B, C). Spinneret and terminal caudal pore present but not conspicuous (Fig. 4, B, C; 5, F).

Remarks. The buccal cavity and oesophago-intestinal junction of *Mononchus trionchus* Thorne are similar to the species of the genus *Miconchus* Andrassy, 1958, to which Andrassy (1958) assigned it. However, in 1982, Jairajpuri and Khan proposed a new genus, *Comiconchus*, for it largely because of the reported non-tuberculate oesophago-intestinal junction. The presence or absence of the tuberculate oesophago-intestinal junction depends on the relative development and thickness of three radial canals which appear rounded or tuberculate at the base. Whereas in most Anatonchidae, the tuberculate junction is clearly marked, in some, it is difficult to confirm with certainty. In their emended diagnosis of the genus *Miconchus*, Mulvey and Jensen (1967) stated, "Oesophago-intestinal valve tuberculate, with few exceptions." They placed this species in *Miconchus*. We accept their action and, therefore, *Comiconchus* is proposed as a junior synonym of *Miconchus*.

4. *Mononchus montanus* Thorne, 1924

Present Status: *Montonchus montanus* (Thorne, 1924) gen. n., comb. n.

Syn. *Mononchus montanus* Thorne, 1924
Mononchus (Mylonchulus) montanus Thorne, 1924
 (Micoletzky, 1927)
Mylonchulus montanus (Thorne, 1924) Goodey, 1951

Remarks. Andrassy (1958) synonymised *Mononchus montanus* Thorne, 1924 with *M. polonicus* (Stefański, 1915) Cobb, 1917. Mulvey (1961) described 10 Canadian females and 2 males of *Mylonchulus montanus* (Thorne) and gave a table of differentiating characters of this species from *M. polonicus* (Stefański, 1915) and *M. subtenuis* Cobb, 1917. The main characters for differentiating *M. montanus* were the lengths of body and tail. Ahmad and Jairajpuri (2010) listed *M. montanus* as a junior synonym of *M. polonicus*, and considered *M. subtenuis* as a valid species. Mulvey (1961) pointed out that because of inadequate illustration by

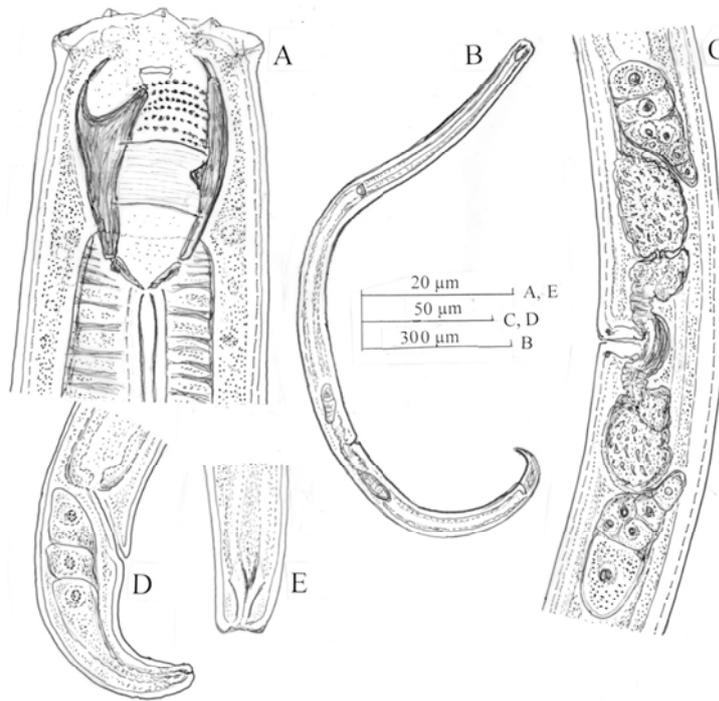


Fig. 6. A-E. *Montonchus montanus* (Thorne) gen. n., comb. n. Lectotype female. A. Stoma. B. Entire body. C. Reproductive organs. D. Tail end. E. Spinneret.



Fig. 7. A-F. Photomicrographs of *Montonchus montanus* (Thorne) gen. n., comb. n. A-B. Lectotype female showing two transverse ridges in Stoma. C. Paralectotype female head with stoma showing teeth. D. Oesophago-intestinal junction in Lectotype female. E. Vulval region in Lectotype female. F. Tail end showing rectum and spinneret in Paralectotype female.

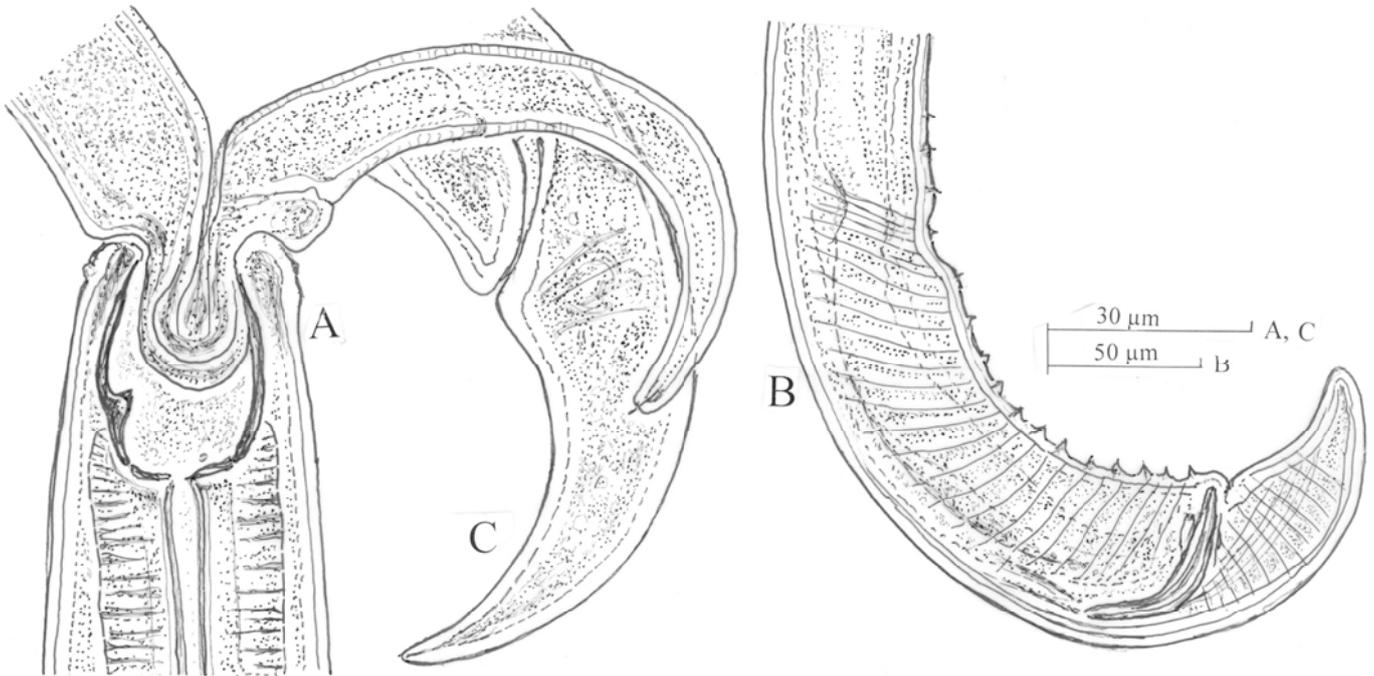


Fig. 8. *Thorneum amphigonicum* (Thorne, 1924) gen. n., comb. n. A. Stoma with portion of prey body. B. Tail end of male. C. Tail end of female.

Stefański (1915) it was difficult to compare the buccal cavities of the two species so he did not accept Andrassy's synonymy. Table provided by him shows clear differences between the two species, *M. montanus* having longer body ($L=1.8-2.5$ vs. 1.43 mm) and tail ($84-117$ vs. 68 μm).

Our study of the type specimens of *Mononchus montanus* Thorne housed at Beltsville, Maryland changed the whole picture. We found *M. montanus* to be unique among Mononchida in having two widely spaced distinct ridges across the middle of the buccal cavity. We, therefore, propose a new genus, *Montonchus*, to accommodate *Mononchus montanus* Thorne, 1924.

4A. Genus *Montonchus* gen. n.

Diagnosis. Mononchidae, Mylonchulinae. Cephalic region continuous or slightly offset from body; sensilla papilloid, low. Amphid cup-shaped, aperture oval slit located just posterior to outer labial sensilla. Buccal cavity with abnormally thick walls, roughly subcylindroid anteriorly, conoid posteriorly. Dorsal tooth massive, apex anteriorly directed. Two subventral teeth present near middle of buccal cavity, much smaller than dorsal tooth, flanked by two transverse ridges well separated from each other and running across entire subventral metarhabdial plates. Opposite dorsal tooth and anterior to subventral teeth are 6-7 transverse rows of small bead-like denticles. Oesophagus cylindroid, strongly muscular, base tuberculate; cardia well developed. Intestine

with distinct lumen throughout; rectum and anus prominent. Didelphic. Vulva pore-like, postmedian. Vagina perpendicular to body axis. Sphincter between uterus and oviduct indistinct. Ovaries short reflexed antidromously. Tail short, subcylindroid, ventrally arcuate, less than 4 anal body widths long. Three large caudal glands filling most of tail cavity. The spinneret is well formed with a central terminal pore.

Male not known.

Type species

Montonchus montanus (Thorne, 1924) gen. n., comb. n.

No other species.

Etymology. Generic name *Montonchus* is derived from *Mont* for mountain, the habitat and locality of type species, and *onchus* = tooth. The name is masculine in gender.

Diagnosis and relationship. Among the Mylonchinae, *Montonchus* gen. n. is recognized by its structure of the buccal cavity, which has two prominent transverse ridges on the subventral metarhabdial plates enclosing the subventral teeth. The ridges are well separated from each other, one located anterior and the other posterior to well developed subventral teeth being about equidistant from them; fine transverse scratches present between the ridges make the area between them look like a broad band. The genus has a massive dorsal tooth, conoid posterior end of buccal cavity, and 6-7 transverse rows of denticles opposite the dorsal

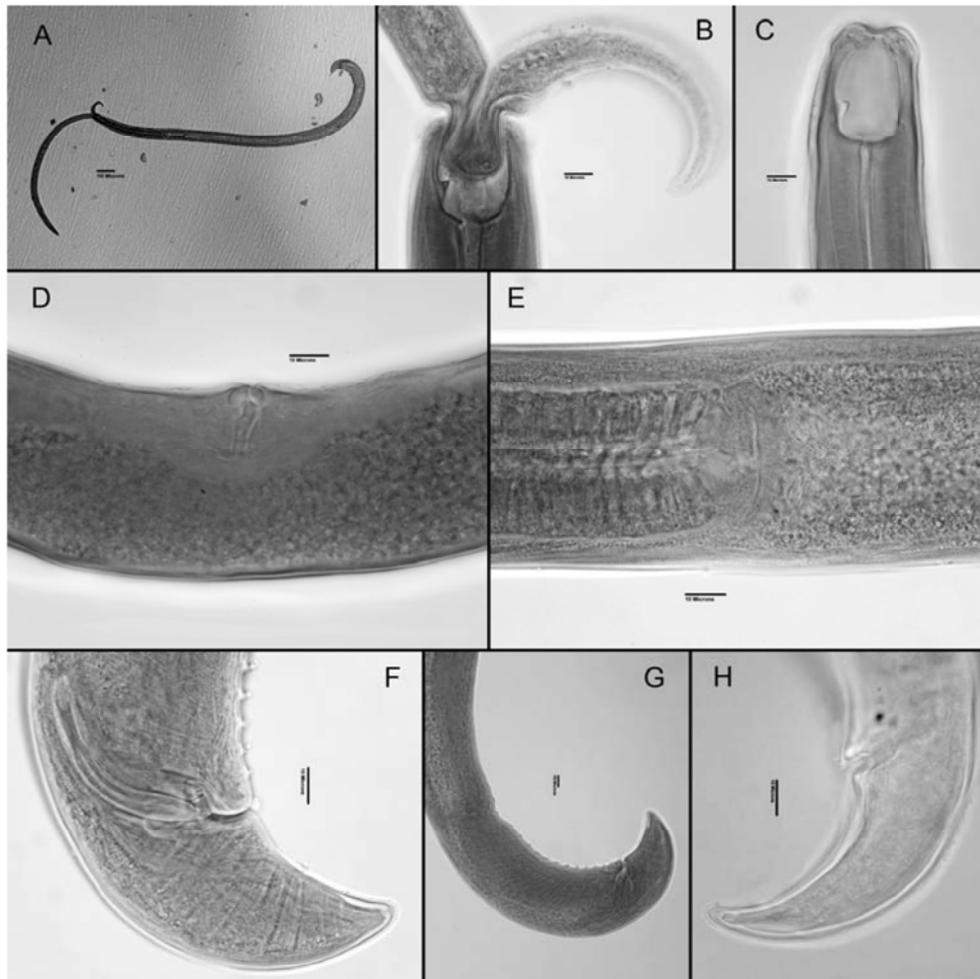


Fig. 9. A-H. *Thorneum amphigonicum* (Thorne, 1924) gen. n., comb. n. A, B, F, G. Male Lectotype. A. Full picture with predator and prey showing male devouring a nematode. B. Enlarged portion of head and stoma devouring a nematode with portion of prey body. C. Paralectotype female stoma showing dorsal tooth located posterior to middle of buccal cavity. D. Vulval region. E. Male lectotype oesophago-intestinal junction. F, G. Male Lectotype cloacal region, G. Tail end showing all supplements. H. Female paralectotype tail end.

tooth, thus resembling the genus *Mylonchulus*. One or rarely two closely spaced transverse ridges occur in the anterior region of the buccal cavity in species of the genus *Mononchus*, which has a barrel-shaped buccal cavity with no subventral teeth or denticles.

4B. *Montonchus montanus* (Thorne, 1924) gen. n., comb. n.

(Fig. 6, A-E; 7, A-F)

Syn. *Mononchus montanus* Thorne, 1924

Mononchus (*Mylonchulus*) *montanus* Thorne, 1924 (Goodey, 1951)

Mylonchulus montanus (Thorne, 1924) Andr ssy, 1958

Measurements

Lectotype female (from Granite Mountain, Utah, near spring, 1923): L = 1.62 mm; a = 32.4; b = 3.48; c = 18; c' = 2.8; V = ^{6.9}64.5^{-6.9}; buccal cavity = 33×13 µm (width taken at middle of buccal cavity).

Topotype females (from Granite Mountain, collected by Thorne in 1926, n=2):

1). L = 1.9 mm; a = 36.5; b = 3.52; c = 20; c' = 2.7; V = 62.7; buccal cavity = 31×15 µm.

2). L = 2.015 mm; a = 33; b = 3.73; c = 19; c' = 2.86; V = 64.7; buccal cavity distorted.

Female. See Thorne (1924) for the description of the

species. Our observations on a few available type specimens are given here. Body 1.6-2 mm long, ventrally arcuate to irregularly curved (Fig. 6, B); maximum width 61-62 μm (slightly flattened specimens). Cuticle thin, smooth. A few body pores present in anterior region: two ventral pores seen between stoma and nerve ring, one at 4-21 μm behind stoma in two specimens and another at 134 μm from anterior end. A ventral pore seen at 80 μm behind vulva. Excretory pore located a little behind the nerve ring. Amphidial apertures large oval, about 5 μm wide, at 9-10 μm from anterior end, fovea cup-shaped, sensilla sac just behind fovea.

Buccal cavity with abnormally thick walls, roughly subcylindroid anteriorly, conoid posteriorly. Dorsal tooth massive, 12-14 μm high, its apex at 12-13 μm from anterior end, pointing anteriorly. A pair of small subventral teeth located at opposite basal region of dorsal tooth. Two distinct well spaced lateral ridges present in the middle of buccal cavity, along the entire width of subventral metarhabdial plates (Fig. 6, A). The ridges are about 9-10 μm apart but 8 μm apart at their junction with the dorsal plate. Thorne (1924) noted minute teeth-like structures at the junctions of the longitudinal ribs of dorsal and subventral plates (see remarks). The two transverse ridges are at about equal distance in front and behind the subventral teeth. Fine transverse striations in the region between the transverse ridges make it look like a cuticular band. A rasp-like structure opposite dorsal tooth and just anterior to front transverse ridge, there are 6-7 transverse rows of small bead-like denticles forming the rasp-like structure; anterior most row with 11-12, middle with 8-9 and posterior most with only 3-4 denticles (Fig. 6, A). Oesophagus cylindroid, strongly muscular, base tuberculate; cardia large. Intestine with distinct lumen throughout.

Didelphic, with equally developed branches of genital organs (Fig. 6, C). Vulva pore-like, postmedian. Vagina perpendicular to body axis, about one-third of body width long; *pars refringens* lightly sclerotized. Sphincter between uterus and oviduct weakly developed. Ovaries antidromously reflexed, short with 6-10 oocytes, but in a mature female 17 oocytes were present. Rectum thick-walled with distinct lumen, about one anal body width long. Anus a prominent wide transverse aperture; anal body width 32-37 μm . Tail subcylindroid, ventrally arcuate with broadly rounded terminus (Fig. 6, D), short when compared to anal body width, but 90-106 (96) μm long. Three large caudal glands lie in tandem, filling most of tail cavity and extending over rectum (Fig. 7, F); spinneret well-formed with distinct terminal pore (Fig. 6, E; 7, F).

Male. Not known.

Type habitat and locality: Soil near a spring on Granite Mountain (Granite Mountain is a mass of solid rock one mile up Little Cottonwood Canyon in the Wasatch Range of Utah, not too far from Salt Lake City).

Type specimens: Collected by G. Thorne. Lectotype labelled 1923, soil from spring, Granite Mountain; two topotype females from Granite Mountain soil are labelled

1926. Lectotype and two topotypes identified by Thorne are at the USDA Nematode Collection, Beltsville, Maryland, USA.

Etymology. Specific epithet is Latin meaning pertaining to a mountain, place of occurrence of the species.

Relationship: *Montonchus montanus* (Thorne, 1924) gen. n., comb. n. is unique in having two transverse ridges running across the entire width of the subventral metarhabdial plates of the buccal cavity. It is similar to species of *Mylonchulus* Cobb, 1916, but differs in the presence of these ridges. Thorne (1924) who originally reported on this nematode from mountains of Utah, USA, stated, "The basal portion of the pharynx is heavily striated and where these striae cross the longitudinal ribs of the pharynx they often form rows of minute teeth." The two transverse ridges as mentioned by Thorne (1924) in the *M. montanus* buccal cavity are structures seen just anterior and posterior of rasplike area.

Thorne (1924) also noted some behavioural differences between this species and other species now in the genus *Mylonchulus*, which he considered under *Mononchus*, *sensu lato*. He stated, "Several thousand specimens of *parabrachyurus* about 300 of *montanus* and two of *striatus*, mostly observed while alive, have convinced the writer that these too are distinct species. Each has characteristic movements when alive and many distinct morphological characters. Under our present knowledge of life history, habits and morphology it is deemed best to consider such forms as distinct species." That has proven true.

5. *Mononchus amphigonicus* Thorne, 1924

Present Status: *Thorneum amphigonicum* (Thorne, 1924) gen. n., comb. n.

Thorne (1924) described *Mononchus amphigonicus*, which he found abundant in the scrub oak belt along the lower hills of the Wasatch Mountains, Utah.

Our study of specimens of *M. amphigonicus* Thorne, 1924 shows a suprabasal dorsal tooth, a broad and flat base of buccal cavity and a tuberculate oesophago-intestinal junction. Moreover, there are no longitudinal ridges in the anterior region of the stoma as is the case with *Jensenonchus*. therefore, we propose a new genus, *Thorneum*, to accommodate the species.

5A. Genus *Thorneum* gen. n.

Diagnosis. Iotonchinae, Anatonchidae. Cuticle thin smooth. Cephalic region continuous or slightly offset from body; sensilla papilloid, low. Amphidial apertures transversely oval slits located just posterior to outer labial sensilla.

Buccal cavity broad barrel-shaped with somewhat flat base. Dorsal tooth of medium size, located suprabasally on dorsal metarhabdial plate, apex directed ventrally and forwardly and opposed by a pair of thick lateral transverse ridges, one on each subventral plate. No other teeth, denticles

or ridges in buccal cavity. Oesophagus cylindroid, strongly muscular, base tuberculate; cardia well developed, rounded. Intestine with large lumen throughout; rectum and anus prominent.

Didelphic. Vulva pore-like, postmedian. Vagina perpendicular to body axis; *pars refringens* sclerotized. Sphincter valve between uterus and oviduct indistinct. Ovaries reflexed. Rectum prominent, in type species one anal body width long. Tail conoid, arcuate, short less than three anal body widths long; terminus finely rounded, lacking a terminal pore. Caudal glands and spinneret absent. Males present, as abundant as females as observed by Thorne (1924). Tail similar to that of female but shorter and thicker. Supplements mammiform with echinate tip, over ten in number, located in front of cloacal aperture being close together about equidistant from each other. Spicules paired, arcuate, with lateral guiding pieces that appearing furcate at tip. Gubernaculum complex.

Type species

Thorneum amphigonium (Thorne, 1924) gen. n., comb. n.

Syn. *Mononchus amphigonius* Thorne, 1924

Iotonchus amphigonius Andr ssy, 1958

Jensenonchus amphigonius (Thorne, 1924)

Andr ssy, 1993, new synonymy

No other species.

Relationship. The species *Mononchus amphigonius* Thorne, 1924 has been of considerable taxonomic interest. The dorsal tooth is located in the posterior half of buccal cavity and is opposed by a distinct transverse ridge. Thorne described and illustrated the ridge, and perhaps on that basis, it was transferred by Andr ssy (1993) to the genus *Jensenonchus* Jairajpuri & Khan, 1982, not considering the posterior location of the dorsal tooth and the absence of longitudinal ridges near it.

The suprabasal location of the dorsal tooth and its opposing transverse ridges are important characters to distinguish the new genus *Thorneum* of the superfamily Anatonchoidea. All eleven new species of *Iotonchus* described by Siddiqi (2001) from West Africa had only one small dorsal tooth located at the base of the metarhabdial plate. A suprabasal tooth is a characteristic of the genera *Parkellus* Jairajpuri, Tahseen & Choi, 2001 and *Supronchus* Siddiqi, 2015 (in this issue of IJN). From these it differs by the presence of a pair of transverse ridges opposite dorsal tooth. It further differs from the former by its broad based buccal cavity and tuberculate oesophago-intestinal junction, and from the latter by the presence of two ovaries and a short conoid tail (*versus* long filiform) lacking spinneret and terminal pore.

Etymology. Generic name is a patronym honouring the Late Professor Gerald Thorne, the Pioneer nematode taxonomist who served the Department of Agriculture, USA for his almost entire working life without taking a day off on sick leave (as he once told the first author). The name is neuter in gender.

5B. *Thorneum amphigonium* (Thorne, 1924) gen. n., comb. n.

(Fig. 8, A-C; 9, A-H)

Measurements

Female paralectotype (from Timpanogos Loop, Aspen Grove, Utah): L = 2.02 mm; a = 36.7; b = 5.3; c = 23.7; c' = 2.7; V = 70; buccal cavity deformed due to presence of crushed body of *Dorylaimus parvus* de Man; vulva-anus distance 520 μ m; tail 85 μ m long.

Male lectotype (from Emigration Canyon, Utah, oak soil): L = 1.91 mm; a = 34.5; b = 4.65; c = 24.8; c' = 2; T = ?; buccal cavity (with captured *Cylindrolaimus* female) = 34 \times 24 μ m; tail = 77 μ m

Female (slightly flattened). See Thorne (1924) for full description of the species. Our observations are on two females, which were fixed in the state of injecting other nematodes and are slightly flattened.

Cuticle thin, transversely striated; striae about 1 μ m apart. Cephalic region almost continuous with body; labial papillae slightly raised. Buccal cavity broad with flat base, wall thin, sclerotized, 34 \times 24 μ m. Dorsal tooth located behind middle of metarhabdial plate, on a raised area (Fig. 8, A; 9, B & C)..

Oesophagus very muscular with cuticularized inner linings, base tuberculate. Cardia rounded. Nerve ring and excretory pore indistinct in female studied but in male situated at 102 and 154 μ m from anterior end of body. Both braches of female reproductive organs equally developed (hence the species name). Ovaries paired, short, reflexed. Rectum and anus prominent, former about one anal body width long. Tail ventrally arcuate, finely rounded, 85 μ m long (Fig. 8, C); caudal pores not seen due to flattened specimen but Thorne (1924) reported three pairs.

Male. Male anterior end shows a captured *Cylindrolaimus* female (Fig. 8, A; 9, A & B). It has a broad based buccal cavity with dorsal tooth located behind its middle; a distinct transverse subventral ridge reported by Thorne (1924) was not seen mainly due to expanded nature of stoma walls as the body portion of the prey is filling more than half of buccal cavity. Tail similar to that of female, but strong bands of dorso-ventral muscles cover the entire tail (Fig. 9, F), shorter and posterior half not as tapered, 77 μ m long. Supplements mammiform with echinate tips, 16 in number, located in front of cloacal aperture being close together and about equidistant from each other, series extending over 180 μ m (Fig. 8, B; 9, F). Spicules paired, arcuate, 66 μ m long, with lateral guiding pieces appearing furcate at tip. Gubernaculum linear but complex as its walls are raised and variously modified, including formation of lateral guiding pieces for spicules.

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