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Scutellonema paralabiatum sp. n., *S. propeltatum* sp. n. and *Bitylenchus singularis* sp. n. Found Associated with Pigeonpea in Kenya

M. R. Siddiqi* and S. B. Sharma**

*International Institute of Parasitology, 395a Hatfield Road, St. Albans, Herts., AL4 0XU, England

**International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru 502 324, Andhra Pradesh, India

Abstract. *Scutellonema paralabiatum* sp. n., *S. propeltatum* sp. n. and *Bitylenchus singularis* sp. n. collected from pigeonpea soil in Kenya are described and illustrated. *S. paralabiatum* has 4-6 μm long epitygma projecting from the vulva, a continuous cephalic region with 4-5 annules, 25-28 (26.6) μm long stylet, phasmids 3.4-3.8 (3.5) μm in diameter and located just preanally and lateral fields in the phasmid region not areolated, female tail shorter than anal body width, spermathecae lacking sperms and no males. *S. propeltatum* has a continuous cephalic region with 4-5 annules, 22-25 (23.3) μm long female stylet, epitygma not projecting through vulva, phasmids well anterior to anal level at 25-38 (30.4) μm from female tail tip, lateral field not areolated on female tail and males with 25-28 (26.5) μm long spicules and 15.5-16.5 (16) μm long gubernaculum. *B. singularis* has stylet 13-14 μm long with large knobs about 4 μm across, cephalic region offset by a sharp constriction and bearing 8-9 fine annules, a subcylindroid female tail with smooth terminus and 36-46 (40) annules, measuring 2.0-2.6 (2.3) anal body widths long and no males.

Keywords: *Bitylenchus singularis*, Kenya, pigeonpea, *Scutellonema paralabiatum*, *S. propeltatum*, new nematode species, taxonomy.

The distribution of plant-parasitic nematodes was studied in the major pigeonpea-producing regions in north-eastern Kenya in January, 1992 (see Sharma *et al.*, 1993). Detailed examination revealed the presence of two new species of the genus *Scutellonema* and one new species of *Bitylenchus* which are described here as *Scutellonema paralabiatum*, *S. propeltatum* and *Bitylenchus singularis*.

Nematodes were extracted from soil samples collected around plant roots by decanting and sieving followed by modified funnel technique. They were killed and fixed in hot 4 per cent formalin, processed to and mounted in glycerine by the rapid method using lactophenol (Siddiqi, 1986).

SYSTEMATICS

Scutellonema paralabiatum sp. n.

(Fig. 1, A-D)

Measurements

Holotype female: L = 0.69 mm; a = 24; b = 6.7; b' = 5.6; c = 49; c' = 0.7; V = $^{22}58.7^{21}$; stylet = 25 μm .

8 paratype females: L = 0.65-0.87 (0.78 \pm 0.058) mm; a = 22-31 (26.5 \pm 3.2); b = 6.4-6.9 (6.7 \pm 0.16); b' = 5.2-6.2 (5.6 \pm 0.38); c = 49-77 (61.8 \pm 9.7); c' = 0.58-0.72 (0.64 \pm 0.05); V = 51-59 (56.2 \pm 2.7); stylet = 25-28 (26.7 \pm 0.9) μm .

10 paratype females (from Uganda): L = 0.66-0.74 (0.68 \pm 0.02) mm; a = 24-28 (26.1 \pm 1.3); b = 6.5-8.3

(7.3 \pm 0.53); b' = 5.1-5.9 (5.6 \pm 0.3); c = 73-88 (78 \pm 6.3); c' = 0.50-0.59 (0.55 \pm 0.02); V = 54.5-59.7 (57.6 \pm 1.9); stylet = 25.0-26.5 (26 \pm 0.5) μm .

Description

Female. Body ventrally curved in 1.0-1.6 spirals; maximum body width 27-30 (28.6 \pm 0.9) μm . Cuticle strongly yet finely annulated; annules averaging 1.1 μm wide at midbody. Lateral field with four incisures forming 3 bands of almost equal width, not areolated except in oesophageal region. Cephalic region continuous with body contour, slightly tapering to a flat disc, with 4-5 annules; framework strongly sclerotized, with outer margins extending 2-4 annules into body. Stylet strong, in two almost equal parts; knobs rounded, 3.5-4.8 μm across. Cephalids indistinct. Dorsal oesophageal gland orifice 5-7 (6) μm behind stylet knobs. Median oesophageal bulb oval, 14-15 \times 10-11 μm , extending over 10-11 annules, with distinct oval valvular apparatus in centre which lies at 61-84 (74 \pm 4.6) μm from anterior end. Oesophageal glands forming 22-31 μm long lobe over dorsal side of intestine. Excretory pore opposite oesophago-intestinal junction, 102-125 (112 \pm 9.1) μm or 89-99 (94) annules from anterior end. Hemizonid 3-4 annules long, 0-3 annules in front of excretory pore. Vulva located in a depression, 380-498 (441 \pm 36) μm from anterior end of body, with double epitygma 4-6 μm long, projecting from body surface. Both branches of reproductive system equally developed. Sperma-

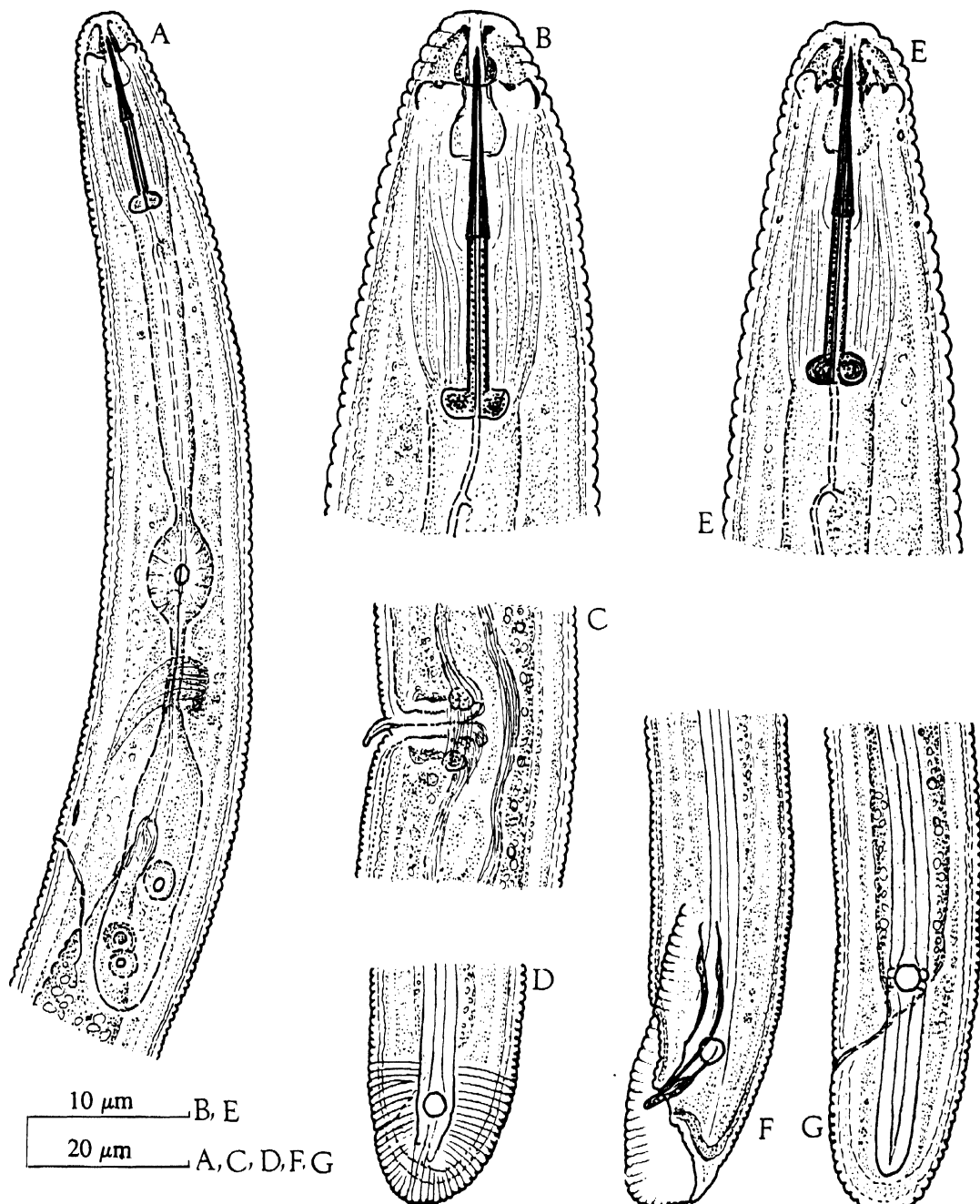


Fig. 1. A-D. *Scutellonema parabiatum* sp. n. A. Oesophageal region of female. B. Head end of female. C. Vulva region. D. Tail end of female. E-G. *Scutellonema propeltatum* sp. n. E. Head end of female. F. Tail end of male. G. Tail end of female.

thecae not developed. Ovaries outstretched. Intestine not extending over rectum. Anus distinct. Tail conoid-rounded to hemispherical, 8-13 (10) μm or less than 0.75 anal body with long, distinctly and regularly annulated, with 11-14 (12) annules. Caudalid not seen. Phasmids 2.5-3.8 (3.5) μm in diameter, slightly smaller than phasmidial pouch underneath, just preanal, sometimes adanal in position, usually 11-12 μm from tail terminus. Lateral field at phas-mids not areolated.

Male. Not found.

Type habitat and locality: Soil around roots of pigeonpea (*Cajanus cajan* (L.) Millsp. in Kisau village, Makueni district, Kenya. Also examined from samples collected by Danny Coyne from around roots of sweet potato at Kapchorwa, Uganda.

Type specimens: Holotype female and 10 paratype females at the International Institute of Parasitology, St Albans, England; 4 paratype females each at Rothamsted Experimental Station, Harpenden, England and ICRISAT, Patancheru, Andhra Pradesh, India.

Relationship: *Scutellonema paralabiatum* sp. n. comes close to *S. labiatum* Siddiqi, 1972 (hence the species name), *S. brachyurus* (Steiner, 1938) Andr ssy, 1958 and *S. africanum* Smit, 1971. From *S. labiatum* it differs in having finer body annules (averaging 1.5 μm at midbody in *S. labiatum*), cephalic region tapering and continuous with body contour, a longer stylet (22.5 (20-25) μm long in *S. labiatum* (after Siddiqi, 1972), excretory pore 89-99 (94) annules behind anterior end of body (vs. 68-75 (71) annules in four paratype females of *S. labiatum* examined by us) and in the absence of males. From *S. brachyurus* it differs in having a continuous cephalic region, prominent and projecting epiptygma, no areolations in lateral field in phasmid region and finer body annules (averaging 1.4 μm wide at midbody in *S. brachyurus*, see Siddiqi, 1974). It can be differentiated from *S. africanum* in having finer body annules, projecting epiptygma, phasmids usually preanal and the absence of males.

Scutellonema propelatum sp. n.

(Fig. 1, E-G)

Measurements

Holotype female: L = 0.845 mm; a = 29.6; b = 8.1; b' = 6.7; c = 38.4; c' = 1; V = ²⁴54.3²⁷; stylet = 23 μm .

7 paratype females: L = 0.79-0.87 (0.82 \pm 0.035)mm; a = 26-30 (28.2 \pm 1.1); b = 7.2-8.8 (7.98 \pm 0.62); b' = 5.8-6.7 (6.1 \pm 0.31); c = 38-62 (53 \pm 6.8); c' = 0.7-1.2 (0.9 \pm 0.17); V = 54.0-57.4 (55.5 \pm 1.3); stylet = 22-25 (23.3 \pm 0.9) μm .

4 paratype males: L = 0.74-0.78 (0.76 \pm 0.012) mm; a = 33.4-37.5 (35.4 \pm 1); b = 6.2-7.3 (6.8 \pm 0.3); b' = 5.0-6.8(5.9 \pm 0.6); c = 50-60 (56 \pm 3.8); c' = 1.0-1.2 (1.11 \pm 0.06); T = 48-54 (51.2 \pm 2.3); stylet = 22-23 (22.3 \pm 0.4) μm .

Description

Female. Body open to closed C-shaped when relaxed; maximum width 26.5-30.0 (28.3 \pm 1.2) μm . Cuticle prominently annulated; annules about 2 μm wide near middle of oesophagus and about 1.6 μm wide at midbody. Lateral fields with 4 incisures forming 3 bands of which the middle band is equal to or slightly wider than the outer ones; areolated in oesophageal region and opposite, but not behind phasmids. Cephalic region continuous with body contour, slightly tapering anteriorly, about 7.5 μm wide at base and 5 μm high, with 4, rarely 5 annules. Outer margins of cephalic framework conspicuous, extending 2-3 annules into body. Anterior and posterior cephalids sometimes seen at 2 and 6 annules behind cephalic framework, respectively.

Stylet strong, in two almost equal parts; conus 11-12 μm long; basal knobs round, 3.2-3.8 μm across. Orifice of dorsal oesophageal gland 6.0-7.5 μm behind stylet base. Median oesophageal bulb about 15 \times 11 μm , extending over 5-7 annules; distance from its centre to anterior end of body 69-76 (72.3 \pm 2.7) μm . Oesophageal glands extending on dorsal side of intestine for 15-26 (21) μm . Excretory pore opposite oesophageal glands, 103-120 (108.8 \pm 5.6) μm from anterior end of body, 1-3 annules behind hemizonid which is 2-3 annules long.

Vulva flush with body; epiptygma double, not projecting above body surface. Both sets of reproductive organs equally developed and outstretched in opposite directions. Spermathecae filled with sperms, at 55-69 (62.5 \pm 3.3) μm from vulva. Rectum about 1 anal body width long and may be partially overlapped by intestine. Tail hemispherical to subcylindroid, regularly annulated, 14-23 (17) μm long, with 8-16 (13) annules. Phasmids well anterior to anal level (hence the species name), 25-38 (30.4 \pm 3.6) μm from tail tip, 3.5-4.0 μm in diameter; phasmidial pouch larger, about 6 μm in diameter. Caudalid seen on two females at 6 μm in front of anus.

Male. Body C-shaped; maximum width 21-23 (21.8 \pm 0.7) μm . Stylet weaker than that of female. Excretory pore at 103-115 (107.5 \pm 3.5) μm from anterior end. Spicules slightly cephalated and ventrally arcuate, 25-28 (26.5 \pm 1.1) μm long. Gubernaculum robust, protrusible, 15.5-16.5 (16) μm long. Bursa with large lateral lobes, distinctly crenate. Phasmids 3.5 μm in diameter, 5-6 μm anterior to cloacal aperture.

Type habitat and locality: Soil around roots of pigeonpea (*Cajanus cajan*) in Mutonguni village, Makueni district, Kenya.

Type specimens: Holotype female and 3 paratype females and 3 males at the International Institute of Parasitology, St Albans, England; 1 paratype female and 1 paratype male each at Rothamsted Experimental Station, Harpenden, England and ICRISAT, Patancheru, Andhra Pradesh, India.

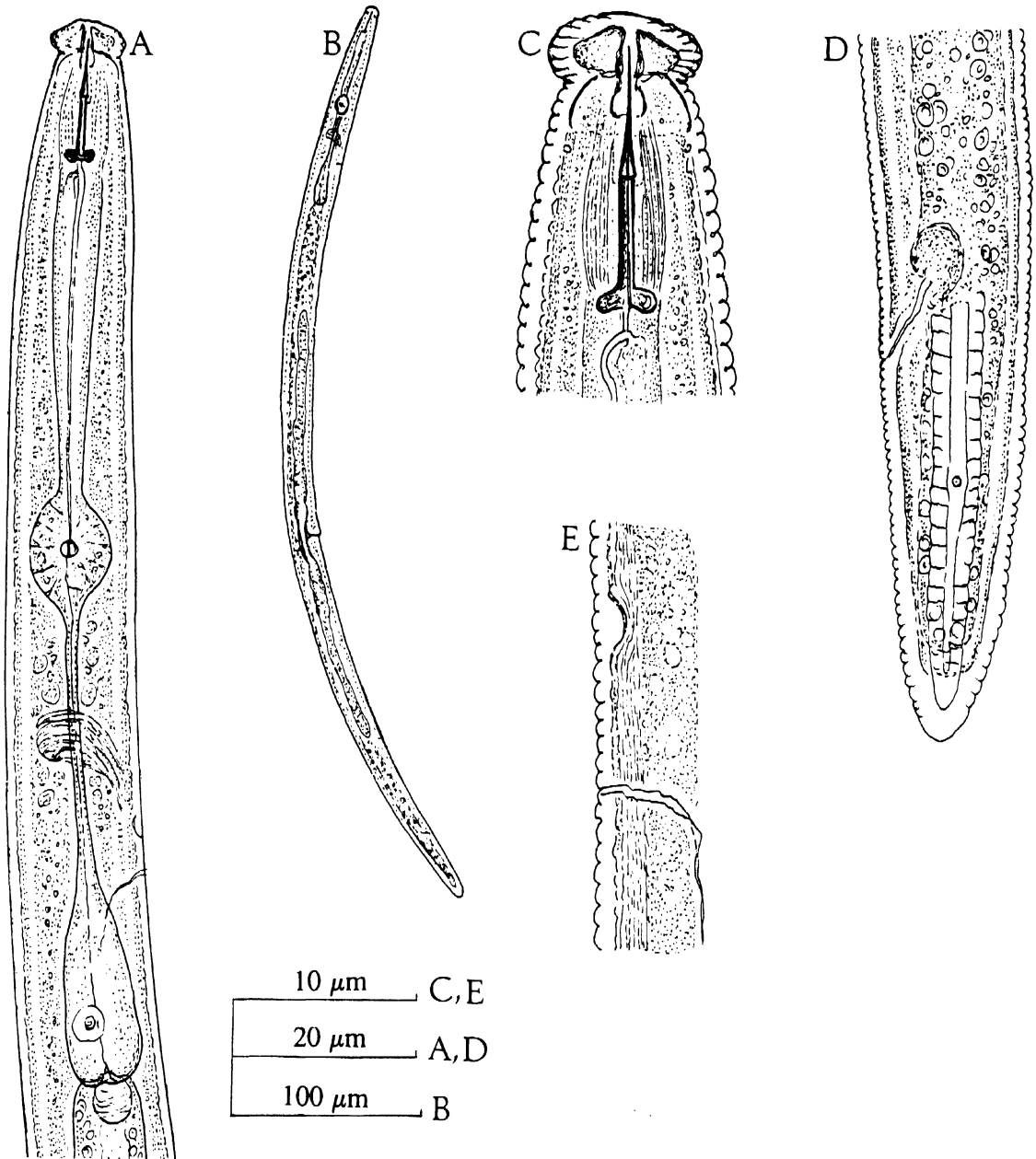


Fig. 2. *Bitylenchus singularis* sp. n. Females. A. Oesophageal region. B. Entire body. C. Head end. D. Tail end. E. Hemizonid and excretory pore.

Relationship: *Scutellonema propeltatum* sp. n. is close to *S. africanum* Smit, 1971 from which it differs in having a longer body (females 0.51-0.81 (0.62) mm, males 0.05-0.64 (0.58) mm in *S. africanum*, after Smit, 1971), larger and more anteriorly located phasmids and longer gubernaculum (9-14 μ m long in *S. africanum*).

***Bitylenchus singularis* sp. n.**
(Fig. 2)

Measurements

Holotype female: L = 0.67 mm; a = 35; b = 5.32; c = 16.6; c' = 2.6; V = $^{19}55.3^{20}$; stylet = 14 μ m.

25 paratype females: L = 0.48-0.68 (0.58±0.06) mm; a = 29-39 (34±2.9); b = 4.0-5.3 (4.7±0.3); c = 12.9-17.2 (14.4±1.1); c' = 2.0-2.6 (2.3±0.2); V = 52-56 (54.4±1.3); stylet = 13-14 (13.5±0.4) µm.

Description

Female. Body straight, slightly arcuate or sometimes C-shaped when relaxed; maximum width 15-21 (17.2±1.2) µm. Cuticle very finely but deeply annulated; annules about 0.8-1.0 µm wide near midbody. Lateral fields with 4 incisures forming 3 bands of which the middle band is wider than the outer ones which are irregularly areolated along entire body length. Cephalic region offset from body by a sharp constriction, appearing somewhat *Dolichodoros*-like, about 8 µm wide and 3.5-4.0 µm high, with very fine 7-9 transverse striations making 8-10 annules; labial disc indistinct (Fig. 2C). Cephalic framework lightly sclerotized; outer margins conspicuous, extending 4-5 annules into body. Anterior cephalids just behind outer margins of cephalic framework. Stylet strong, in two almost equal parts; conus solid-appearing in its anterior half, 6-7 µm long; basal knobs round, posteriorly sloping, about 4 µm across. Orifice of dorsal oesophageal gland about 1.5-2.0 µm behind stylet base.

Median oesophageal bulb round to oval, about 10-12 × 8.5-10 µm, extending over 10-12 annules; distance from its centre to anterior end of body 56-67 (62.5±3.3) µm. Basal oesophageal bulb cylindrical, 19-24 × 7-9 µm, with indented base. Cardia large, rounded. Excretory pore opposite base of isthmus or basal bulb, 92-109 (100±6.4) µm from anterior end of body, 4-11 (6) annules behind hemizonid which is distinct and 4-6 annules long (Fig. 2E). Hemizonion 16-21 (18) annules behind hemizonid.

Vulva a depressed transverse slit, 4-5 µm long, at 265-360 (314±27) µm from anterior end of body. Vagina extending halfway into body. Both sets of reproductive organs equally developed, Spermathecae lacking sperm. Ovaries outstretched, each with 9-12 oocytes. Rectum 0.5-0.8 times anal body width long, overlapped by intestine which forms a postanal intestinal sac filling the entire tail cavity. Tail subcylindrical to a conoid-rounded, smooth terminus, 33-42 (37.5±33) µm or 2.0-2.6 (2.3) anal body widths long, regularly annulated, with 34-46 (39±2.3) annules; hyaline terminal portion 4-7 µm long. Phasmids anterior to middle of tail, 5-13 (8) µm behind anal level. Caudalid seen in a few

specimens, 2-4 µm anterior to anus.

Male. Not found.

Type habitat and locality: Soil around roots of pigeonpea (*Cajanus cajan*) in Kisasi village, Kitui district, Kenya.

Type specimens: Holotype female and 15 paratype females at the International Institute of Parasitology, St Albans, England; 5 paratype females each at Rothamsted Experimental Station, Harpenden, England and ICRISAT, Patancheru, Andhra Pradesh, India.

Relationship: *Bitylenchus singularis* sp. n. comes close to *B. goffarti* Sturhan, 1966 from which it differs in having finer body annules, a more offset cephalic region which is about twice as wide as high and has 8-9 annules (6-7 annules in *B. goffarti*, after Sturhan, 1966), more annules between excretory pore and hemizonid (0-5 annules in *B. goffarti*) and the absence of functional spermathecae and males. The new species has been compared with specimens of *B. goffarti* collected in Cyprus, Libya and Mozambique and found to be distinct.

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