

Xiphinema clavicaudatum sp. n. and *X. fluminense* sp. n. (Nemata : Longidoridae) from Brazil

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SUMMARY

Two new species of *Xiphinema* are described from Brazil. *X. clavicaudatum* sp. n. is unique by its ovejector presenting two blind extensions. Among the pseudomonodelphic species, it is most closely related to *X. filicaudatum* Loof & Maas, 1972 differing by a shorter tail ($c' = 3.4-4.5$ vs 10-15 for *X. filicaudatum*) and to *X. longicaudatum* Luc, 1961 ($c' = 7$). Also the clavate tail of *X. clavicaudatum* sp. n. is different from effilated or cylindrical tail of the other two species. *X. fluminense* sp. n. is related to the group of species with two equally developed female genital branches without "Z" differentiation or uterine spines and a short rounded tail. It differs from all by its relatively long body and short stylet.

RÉSUMÉ

Xiphinema clavicaudatum sp. n. et *X. fluminense* sp. n. (Nemata : Longidoridae) provenant du Brésil

Deux nouvelles espèces de *Xiphinema* provenant du Brésil sont décrites. *X. clavicaudatum* sp. n. présente la caractéristique, unique dans le genre, d'un ovejeteur pourvu de deux extensions aveugles. Parmi les espèces pseudomonodelphiques, *X. clavicaudatum* sp. n. est proche de *X. filicaudatum* Loof & Maas, 1972, dont il diffère par une queue plus courte ($c' = 3,4-4,5$ contre 10-15 pour *X. filicaudatum*), et de *X. longicaudatum* Luc, 1961 ($c' = 7$); la queue renflée à son extrémité de *X. clavicaudatum* sp. n. diffère également de la queue effilée ou cylindrique observée chez les deux espèces citées. *X. fluminense* sp. n. appartient au groupe des espèces pourvues de deux branches génitales femelles également développées et fonctionnelles sans différenciation Z ni épines utériennes; cette nouvelle espèce diffère de toutes les autres de ce groupe par la combinaison d'un corps long et d'un stylet court.

Among the *Xiphinema* species collected from various regions of Brazil between 1975 and 1983, two were found to be new, which are described below.

Nematodes were killed by gentle heat (60°/min) soon after extracted and preserved in a mixture of glycerin-formalin-water (2:8:90) as formulated by Golden (see Hooper, 1970). Permanent toto mounts were prepared according to the rapid dehydration and glycerin impregnation scheme of Seinhorst (1959). Descriptions and measurements were based on the glycerin toto mounts.

Xiphinema clavicaudatum sp. n.

(Fig. 1)

DIMENSIONS

Female (paratypes; n = 13) : L = 3.39 ± 0.363 (2.96-4.42) mm; a = 61.7 ± 10.2 (52.4-85.2); b = 6.7 ± 0.9 (4.9-8.7); tail = 136 ± 7 (124-248) μ m; c = 24.9 ± 2.5 (21.0-31.3); $c' = 4.01 \pm 0.29$ (3.45-4.52); V = 42.1 ± 3.17 (32.1-44.4) %; odontostyle = 156 ± 12

(140-186) μ m; odontophore = 91 ± 11 (69-110) μ m; stylet = 247 ± 10.3 (230-272) μ m.

Juveniles (second-stage [?] n = 5) : L = 1.47 ± 0.10 (1.34-1.58) mm; a = 50.6 ± 1.38 (48.8-52.3); b = 4.2 ± 0.53 (3.7-4.8); tail = 182 ± 10.8 (163-189) μ m; c = 8.1 ± 1.00 (7.2-9.1); $c' = 8.9 \pm 1.20$ (7.1-10.3); odontostyle = 94 ± 4.49 (91-102) μ m; odontophore = 58 ± 2.88 (56-63) μ m; stylet = 152 ± 6.91 (148-165) μ m; guiding ring = 81 ± 9.04 (71-94) μ m; new odontostyle = 106 ± 5.89 (101-116) μ m; oesophagus = 350 ± 53.32 (292-431) μ m.

Juveniles (fourth-stage; n = 4) : L = 2.54 ± 0.19 (2.43-2.82) mm; a = 56.9 ± 5.24 (53.4-64.7); b = 5.2 ± 0.55 (4.5-5.8); tail = 160 ± 12.76 (150-178) μ m; c = 16.0 ± 1.99 (13.7-18.5); $c' = 5.7 \pm 0.53$ (5.2-6.4); odontostyle = 132 ± 3.16 (129-136) μ m; odontophore = 82 ± 1.50 (80-83) μ m; stylet = 214 ± 4.03 (210-219) μ m; guiding ring = 117 ± 9.60 (103-124) μ m; new odontostyle = 148 ± 2.94 (145-152) μ m; oesophagus = 486 ± 37.88 (456-540) μ m.

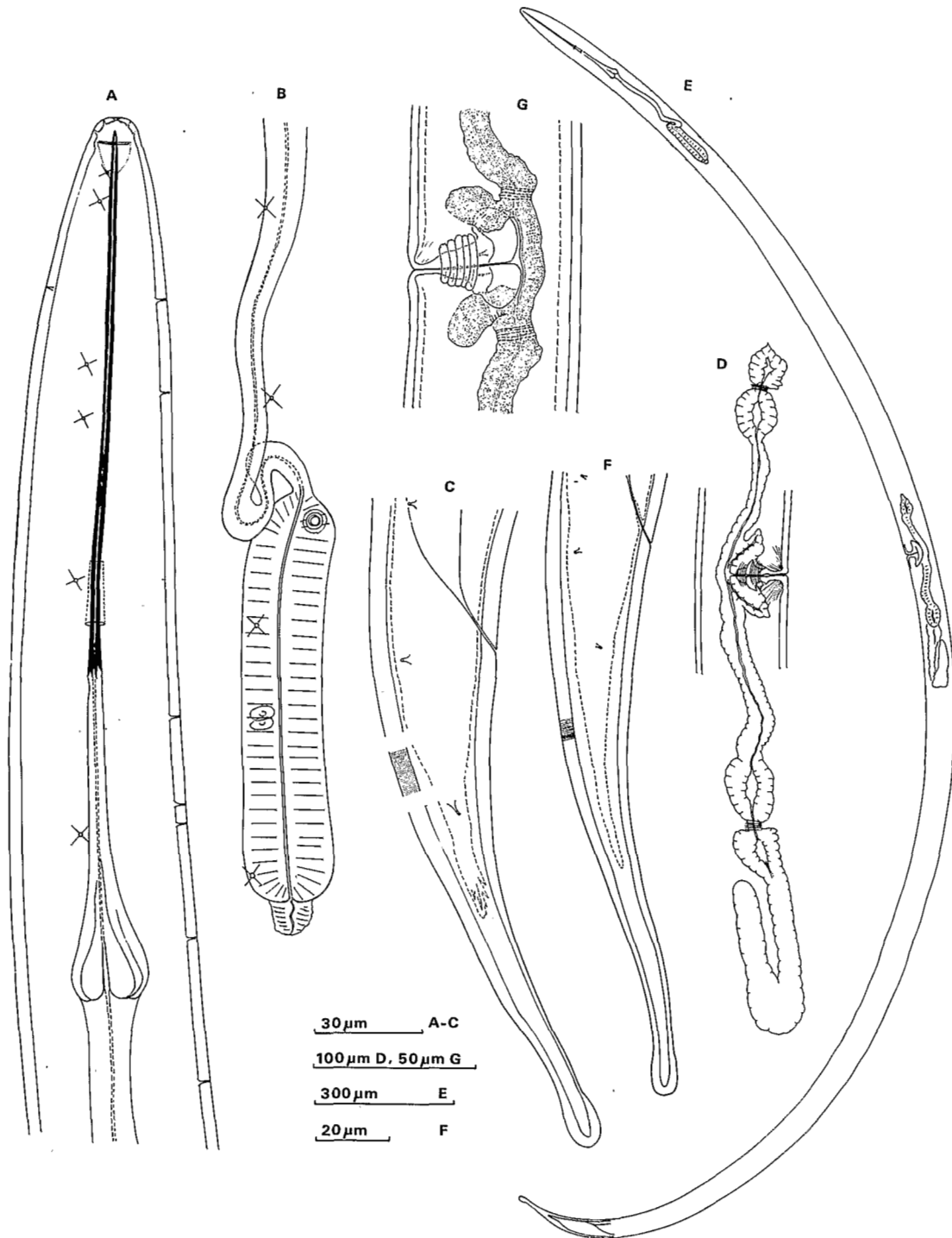


Fig. 1. *Xiphinema clavicaudatum* sp. n. Female. A = anterior region; B = esophagus; C = tail; D = reproductive system; E = full length; G = ovejector; Juvenile (fourth-stage); F = tail.

Holotype (female) : L = 3.40 mm; a = 56.7; b = 6.8; tail = 141 μ m; c = 22.5; c' = 4.2; V = 42.1; odontostyle = 150 μ m; odontophore = 90 μ m.

DESCRIPTION

Female : Body tapering toward both extremities, assuming an open "C" form after killed by gentle heat. Cuticle smooth, 3.5-5.3 μ m, 2.2-4.4 μ m and 1.3-4.9 μ m thick in esophageal, vulval and tail regions, respectively. Arrays of regularly spaced radial striae throughout the cuticle, especially in tail region. Lip region high, anteriorly rounded, about 10-11 μ m wide, nearly continuous with the rest of body. Amphidial slit straight, about 4-7 μ m wide. Odontophore flanges 17 (16-20) μ m wide. Basal bulb of esophagus measuring 111 (105-121) \times 25 (23-28) μ m. Esophageal-intestinal valve hemispherical, prominent. Reproductive system pseudomonodelphic. Vagina perpendicular to long body axis, extending about 60 % of corresponding diameter, with exceptionally thick wall; perivaginal sphincter well developed; ovejector symmetrical, poorly muscularized, presenting two blind extensions forming a sac-like structure at each of its extremities. Posterior genital branch well developed; uterus long, distal end differentiated into a pouch; no "Z" differentiation, nor uterine spines. Well-developed sphincter between uterus and oviduct; pouch of the oviduct wide; straight part of the oviduct and ovary without particularity. Anterior genital branch much shorter than posterior; uterus similar to that of posterior branch, only shorter; sphincter between uterus and oviduct well-developed; pouch of the oviduct reduced; no straight part of the oviduct; no ovary. Sperms not observed. Two pairs of adanal pores; one pair of caudal pores in anterior third of tail. Tail elongated, with a clavate terminus; terminal hyaline part 63 ± 5.1 (55-69) μ m long and 47 ± 3.3 (41-53) % of the tail length. From anterior end to the level of esophago-intestinal junction : 8-13 pairs of lateral somatic pores, 6-10 ventral pores and 2-3 dorsal pores were present.

Male : Not found.

Juvenile : Similar to female in general aspect, but notable for tails which are clavate as in adult but longer in fourth-stage, still longer in second-stage. Hyaline area in tail of juveniles same as in adults [60.9 ± 7.94 (48-69) μ m and 35.4 ± 3.75 (31-43) % of tail length].

TYPE SPECIMENS

Holotype (female) : deposited in the University of Brasilia Nematode Collection, Brasilia-DF, Brazil.

Paratypes : Thirteen females, five juveniles, distributed as follows : two females at USDA Nematode

Collection, Beltsville, Md, USA; two females and one juvenile at Muséum national d'Histoire naturelle, Paris, France; three females and two juveniles at University of California Nematode Collection, Davis (UCNC-Davis); one female at Laboratorio de Nematologia Agraria, Bari, Italy, two females at the Instituut voor Dierkunde, Rijksuniversiteit, Gent, Belgium and the rest at the University of Brasilia Nematode Collection, Brasilia, DF, Brazil.

TYPE LOCALITY

Rhizosphere of *Rheedia* sp. ("bacuri" in local language), Forest Reserve of the Tropical Fruits and Forest Experiment Station, National Amazon Research Institute (INPA), approximately 45 km north of the city of Manaus by Highway 174, State of Amazonas, Brazil (collected by C. S. Huang and J. E. Cares; December, 1981).

OTHER HABITATS

From the general area of type locality, populations of *X. clavicaudatum* sp. n. also were found in the rhizospheres of *Anona muricata*, *Anacardium occidentale*, *Guilielma gasipaes*, *Pouroma cecropiifolia*, *Pouroma* sp., *Cocos nucifera*, *Bellucia imperialis*, *Monotagma* sp., *Cecropia leucocoma*, *Miconia phanerostila*, *M. argyrophilla*, *Bauhinia* sp., *Vismia guianensis*, *Triplaris* sp., *Parkia* sp., *Ponteria* sp. and *Xylopia* sp.

DIAGNOSIS

X. clavicaudatum n. sp. is unique in the genus by the structure of the ovejector presenting two blind extensions. Moreover, in the group of pseudomonodelphic species, *X. clavicaudatum* n. sp. is different from the only two other species presenting an elongated tail, its tail being shorter : c' = 3.4-4.5 vs 10-15 in *X. filicaudatum* Loof & Maas, 1972 and about 7 in *X. longicaudatum* Luc, 1961; in both these latter species, tail extremity is effiliated or cylindrical and not clavate as in *X. clavicaudatum* sp. n.

Xiphinema fluminense sp. n.

(Fig. 2)

Female (paratypes; n = 2) : L = 3.428-3.507 μ m; a = 73-78; b = 15.2-16.5; tail = 28 μ m; c = 122.4-125.3; c' = 0.85-0.89; V = 47.08-47.81; odontostyle = 88-91 μ m; odontophore = 42-59 μ m; stylet = 138 ± 7.8 (133-147) μ m.

Male (paratypes; n = 2) : L = 3.072-3.105 mm; a = 77.63-90.35; b = 11.54-13.53; tail = 25 μ m; c =

122.9-124.2; $c' = 0.826-0.851$; spicules = 50-55 μm ;
odontostyle = 86-90 μm ; odontophore = 39-41 μm ;
stylet = 125-131 μm .

Juvenile [third-stage (?); $n = 1$]: $L = 1.922$ mm; $a = 60$; $b = 11.2$; tail = 30 μm ; $c = 64$; $c' = 1.25$;

odontostyle = 65 μm ; odontophore = 27 μm ; stylet = 92 μm ;
guiding ring = 52 μm ; new odontostyle = 73 μm ;
eosophagus = 172 μm .

Juvenile (fourth-stage; $n = 2$): $L = 2.149-2.272$ mm;
 $a = 54-57$; $b = 7.8-11.3$; tail = 26-33 μm ; $c = 65-87$;

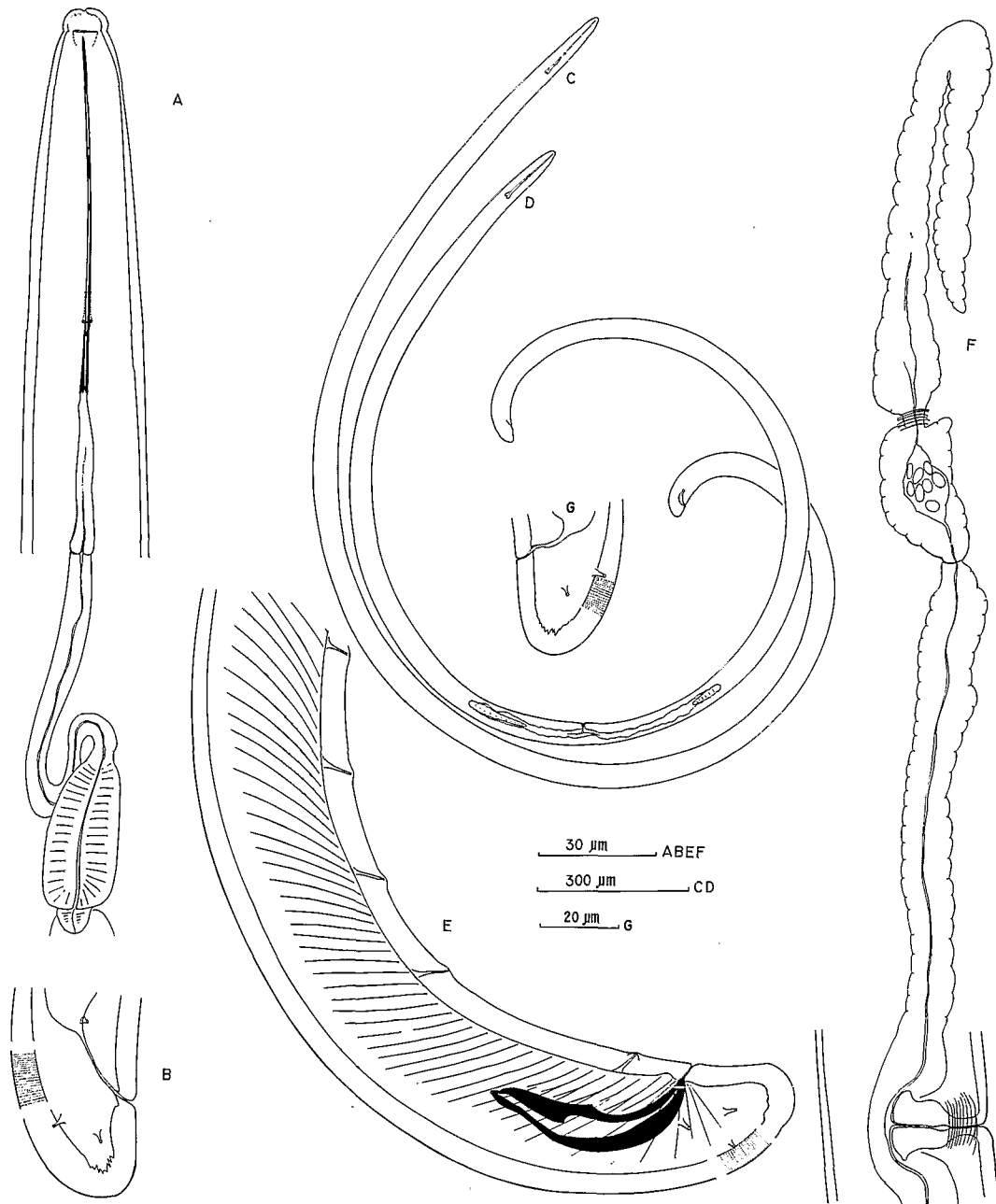


Fig. 2. *Xiphinema fluminense* sp. n. Male. A = head and esophagus; C = full length; E = tail. Female. B = tail; D = full length; F = reproductive system with anterior gonad. Juvenile (fourth-stage). G = tail.

$c' = 1.0-1.32$; odontostyle = 69-88 μm ; odontophore = 36-38 μm ; stylet = 104-126 μm ; guiding ring = 64-78 μm ; new odontostyle = 87-97 μm ; oesophagus = 251-275 μm .

Holotype (female) : L = 3.114 mm; a = 74.14; b = 13.54; tail = 24 μm ; c = 129.75; $c' = 0.813$; V = 48.7; odontostyle = 90 μm ; odontophore = 44 μm .

DESCRIPTION

Female : Large slender nematodes, tapered toward anterior extremity. Posterior one- to two-thirds body curled in loose spiral form after killed by gentle heat. Cuticle smooth, 1.3-2.2 μm , 2.5-3.6 μm and 5.3-8.0 μm thick in stylet, vulva and tail regions, respectively. Lip region hemispherical with central oral depression, separated from body by slight but distinct constriction. Amphidial aperture long, horizontal slit, occupying almost entire neck width, located immediately behind lips. Odontophore moderately developed with flanges at basal portion whose contour is ill defined. Basal esophageal bulb, lageniform, measuring 53 \times 18 μm . Esophago-intestinal valve small, hemispherical, indistinct. Reproductive system didelphic, amphidelphic. Both gonads equally developed. Oblong sperms present in uterine pouch. No "Z" differentiation. Vagina perpendicular to long body axis, extending about one-half body width, walls moderately thickened. Uteri not convoluted. Tail short, terminus bluntly rounded. Cuticular radial striae prominent, especially in tail region. Two pairs of caudal papillae, one located subventrally, one subdorsally.

Male : Similar to female in size, general format and anterior region. Testis extended about one-half body length. Double preloacal papilla, located approximately one-third body width anterior to cloaca opening. Four or five ventromedian supplements anterior to adanal supplements. Three pairs of caudal pores, one subdorsal and two lateral. Tail short, dorsally convex and terminally rounded. On one male, distance on ventral line from anus to double papilla = 15 μm , to first ventral supplement 53 μm from double papilla then, 28 μm to second supplement, 28.9 μm to third and 30 μm to fourth. On second male, distance from anus = 16, 42, 29, 21, 25, 19 μm , respectively to double papilla and first to fifth supplement.

Juvenile : Assuming open "C" after killed by gentle heat. Three juveniles were examined and measured. They appear to be quite similar to adult females in most characteristics but smaller. One is judged to be third-stage but may represent part of a widely variable fourth-stage. The juveniles have a thinner cuticle than adults (1.8 μm and 6.3 μm in oesophageal and tail regions, respectively). Two caudal papillae present.

TYPE SPECIMENS

Holotype female : deposited in University of Brasilia Nematode Collection.

Paratypes : one female, one male and one juvenile, deposited at the UCNC-Davis; one female, one male and two juveniles at the University of Brasilia Nematode Collection.

TYPE LOCALITY

Rhizosphere of *Zea mays* L. near Balão de São Domingo, Municipality of Cambuci, Rio de Janeiro (collected by Anoz Ferreira Soares, September 1979).

DIAGNOSIS

In the group of species having two equally developed female genital branches without "Z" differentiation or uterine spines and a short and rounded tail without bulge nor mucro (*X. bacaniboia* Orton Williams, 1984; *X. brevicolle* Lordello & da Costa, 1961; *X. colombiense* Hunt, 1982; *X. guirani* Luc & Williams, 1978; *X. macrostylum* Esser, 1966; *X. pyrenaicum* Dalmasso, 1960; *X. riocaquetae* Hunt, 1982; *X. silvaticum* Luc & Williams, 1978; *X. yapoense* Luc, 1958) *X. fluminense* sp. n. is differentiated by the combination of a relative long body and a short stylet. All the species of the group but *X. brevicolle*, have a stylet largely exceeding 150 μm . Body length of *X. brevicolle* is 1.7-2.2 mm (exceptionally 2.6 μm) vs 3.1-3.5 mm in *X. fluminense* sp. n.

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REFERENCES

- HOOPER, D. J. (1970). Handling, fixing, staining and mounting nematodes. In Southey, J. F. (Ed.), *Laboratory methods for work with plant and soil nematodes*. Common. agric. Bur., England, Techn. Bull. No. 2 : 39-54.
- SEINHORST, J. W. (1959). A rapid method for the transfer of nematodes from fixative to anhydrous glycerin. *Nematologica*, 4 : 67-69.

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