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On five species of the genus *Xiphinema* Cobb, 1913 (Nematoda: Longidoridae) recently described from India

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Summary – Examination of paratypes of five species of *Xiphinema* from India described by Singh and Khan (1998) led to the following conclusions: *X. larliani* Khan & Singh, 1998 appears a valid species close to *X. simillimum* Loof & Yassin, 1971. The other four species are considered junior synonyms, *X. digicaudatum* of *X. brasiliense* Lordello, 1951; *X. gracilicaudatum* of *X. radicicola* Goodey, 1936; *X. arunachalense* of *X. brevicollum* Lordello & Da Costa, 1961; *X. pruni* of *X. basiri* Siddiqi, 1959. Complementary morphological data, measurements and illustrations based on the paratypes are given for the five species.

Keywords – taxonomic status, *Xiphinema arunachalense*, *X. basiri*, *X. brasiliense*, *X. brevicollum*, *X. digicaudatum*, *X. gracilicaudatum*, *X. larliani*, *X. pruni*, *X. simillimum*, *X. radicicola*.

Singh and Khan (1998) described five new species of the genus *Xiphinema* Cobb, 1913 from India. Because the descriptions and illustrations did not permit an exact evaluation of these species, paratypes were requested for examination.

The five species are discussed hereunder.

Xiphinema larliani Khan & Singh, 1998** = *X. filicaudatum* Singh & Khan, 1998 *nec* Loof & Maas, 1972 (Fig. 1A-E)

MEASUREMENTS

See Table 1.

OBSERVATIONS

The specimens fit the original description, except that the amphidial aperture is slightly longer (Fig. 1). The lip region is not wholly continuous, but rather offset by a very slight depression (as indicated in Fig. 1B in Singh and Khan, 1998). The anterior genital branch, though reduced, is complete, with oviduct, oviduct sac and ovary. This was indicated in Fig. 1B of Singh and Khan (1998) and in their text.

DISCUSSION AND SYSTEMATIC POSITION

X. larliani, because of the reduced but complete anterior female genital branch, belongs in Group 3 ('anterior female genital branch complete but strongly reduced') of Loof and Luc (1990). The codes are: A3-B4-C12-D12-E2-F2-G12-H2-I1-J?-K?-L1. They are closest to those of *X. simillimum* Loof & Yassin, 1971 but differ in D (c') and I (habitus). Singh and Khan (1998), however, compared it only with *X. longicaudatum* Luc, 1961. This comparison is inappropriate because the latter is not didelphic (as their diagnosis says) but pseudomonodelphic. As, however, reduction of the anterior genital branch may have occurred repeatedly and is not indicative of relationship, it is probably correct to compare *X. larliani* with other

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** Because the name *X. filicaudatum* given by Singh and Khan (1998) is a junior homonym of *X. filicaudatum* Loof & Maas, 1972, the authors changed it to *X. larliani* Khan & Singh, 1998.

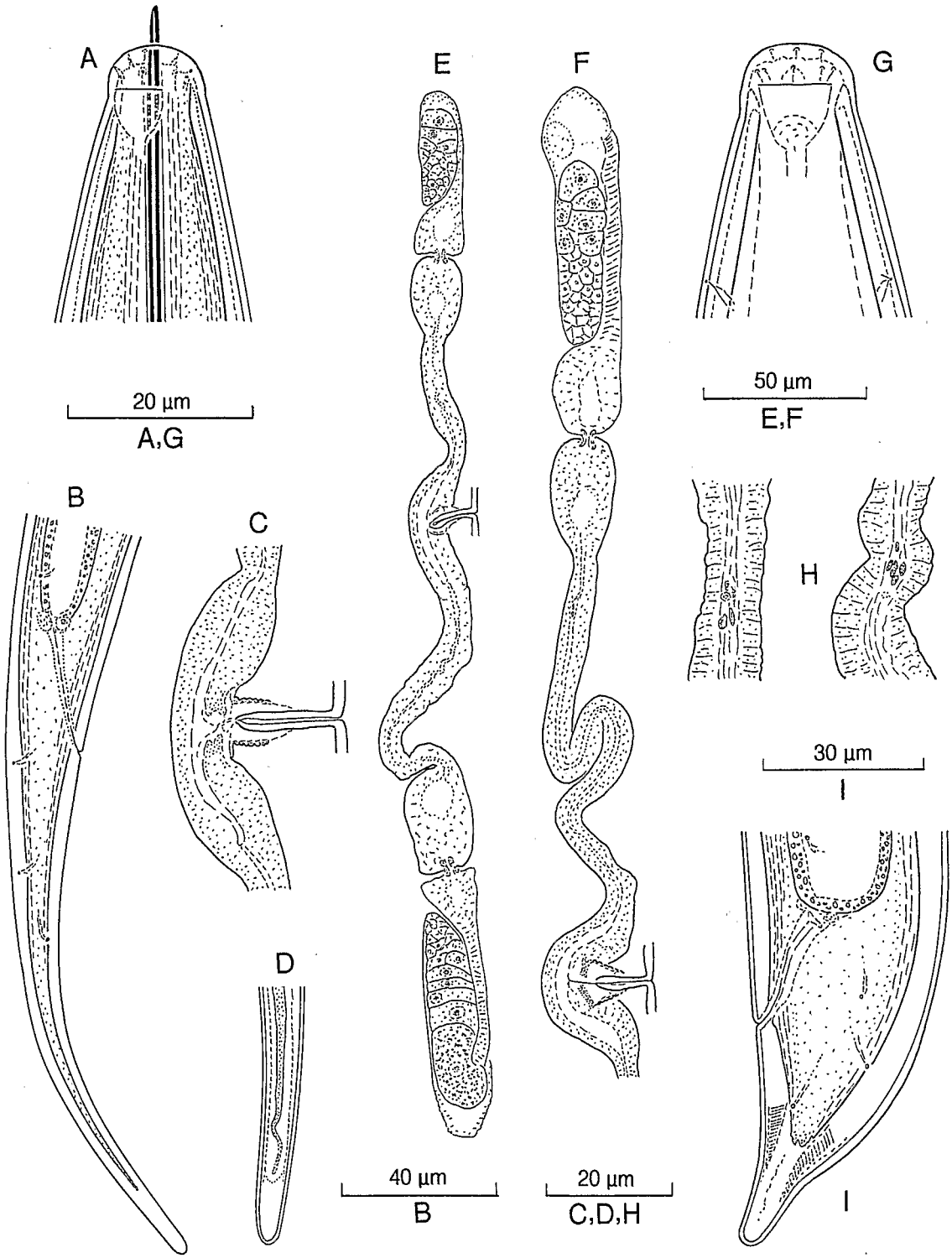

Fig. 1. Xiphinema larliani *(A-E) and* X. 'pruni' *(F-I). A, G: Head; B, I: Tail region; C: Ovejector and vulva region; D: Tail tip; E: Female reproductive system; F: Anterior branch of female reproductive system; H: Z-differentiation.*

long-tailed species; however, only species with a short or medium hyaline distal part of the tail should be considered, not *X. longicaudatum* which has a very long hyaline part (Luc, 1961; Luc & Hunt, 1978).

X. larliani Khan & Singh, 1998 is considered a valid species, the closest related species being *X. simillimum*.

Xiphinema pruni Singh & Khan, 1998
(Fig. 1F-I)

Measurements

See Table 1.

Observations

The specimens correspond well to the description. The lip region is not continuous as Fig. 5C of Singh and Khan (1998) suggests, but offset by a shallow but distinct depression (corresponding to their Fig. 5B). The drawing of the female genital apparatus is schematic; as the sphincter between uterus and oviduct was not drawn, we can only guess what the exact position of the small oval swelling is. In the paratypes a (not very distinct) pseudo-Z-organ is present.

Table 1. *Measurements of females of* Xiphinema larliani *and of* X. 'pruni' *(all measurements in µm except L in mm).*

	X. larliani		*X. 'pruni'*	
n	9*	2**	10*	2**
L	1.57-1.95	1.91-1.97	2.6-3.5	2.91-2.98
a	41-57	42-47	62-80	52-53***
b	4.8-9.5	5.4-5.6	6.6-8.8	7.0-7.5
c	12-18	13.3-14.3	66-88	63-73
c′	6.6-9.0	7.0-7.3	1.4	1.1-1.3***
V	30-34	31-32	51-58	49
Odonstostyle	78-98	91-97	110-132	123-128
Odontophore	50-68	58-61	48-66	59-65
Stylet	–	149-158		182-193
Guiding ring	75-80	84-94	80-112	82-97
Body diam.				
at mid body	34	42-45	46	56***
at anus	18-19	19-20	29	35-37***
Tail	120-143	136-145	40	41-46
h	–	–	21	12
h%	–	–	50	29

* According to Singh and Khan (1998).
** Our own measurements.
*** Specimens flattened.

Discussion and systematic position

The species belongs to Group 5 ('both female genital branches equal; presence of a pseudo-Z-organ, or pseudo-Z-organ plus uterine spines') of Loof and Luc (1990) and the codes are: A4-B2-C4-D45-E56-F3-G2-H2-I3-J?-K?-L1. These codes are wholly identical with those of *X. basiri* Siddiqi, 1959, from which *X. pruni* was said to differ by: *i*) length of hyaline part of tail in relation to anal body diameter (slightly less than 1 *vs* more than 0.5); *ii*) smaller number of caudal pores (two *vs* four pairs); *iii*) relative width of amphid aperture (over 70% *vs* 60%).

As to *i*): no exact values nor ranges were given. Study of descriptions of *X. basiri* showed: Siddiqi (1959, Fig. 3C): 12.5/17 = 72%; Loof and Yassin (1971, Fig. 4B): 10/24 = 42%; Zeidan and Coomans (1992, Fig. 4B): 9.5/15 = 63%; Nasira and Maqbool (1992, Fig. 2I): 16/22 = 73%: Swart and Quénéhervé (1998, Fig. 2C): 12/19 = 63%. Fig. 5F of Singh and Khan (1998) gives 29/34 = 75%. In view of the range 42-73 in *X. basiri* the difference from the single value 75 cannot be regarded diagnostic.

As to *ii*): as remarked above the number of caudal pores is variable, mainly due to the position of the anterior one which may lie behind, at level of, and before the anus. In fact, of the four pores drawn by Siddiqi (1959) two are preanal, one adanal and one postanal. Loof and Yassin (1971) show a similar arrangement. Fig. 9A-C, E-J of Cohn and Sher (1972) show one to three caudal pores; Fig. 4B of Zeidan and Coomans (1992) two (the third does not lie on the tail). So this difference is not valid.

As to *iii*): this character, of course, also has some variation but no ranges were given. Fig. 5B of Singh and Khan (1998) shows the amphid aperture 10/16 = 63% of lip region diameter and Fig. 5C: 4.5/7 = 64%. Siddiqi (1959) says indeed that the aperture is three-fifths (or 60%) of lip region. Fig. 4C of Zeidan and Coomans (1992) gives 6.8/9.4 = 72%. So this difference also lapses.

Consequently, we conclude that *X. pruni* Singh & Khan, 1998 is a junior synonym of *X. basiri* Siddiqi, 1959, a species repeatedly recorded from India (*cf. X. cobbi* Sharma & Saxena, 1981 and *X. hayati* Javed, 1983, both considered junior synonyms of *X. basiri* by Luc *et al.* (1985)).

In the diagnosis *X. pruni* was also differentiated from *X. vulgare* Tarjan, 1964 (a junior synonym of *X. setariae* Luc, 1958), but this species belongs in a different group (7, 'both female genital branches equal, without uterine differentiation, tail elongate to conical').

Xiphinema digicaudatum Singh & Khan, 1998 [= *X. digicaudata* emend.] (Fig. 2A-C)

MEASUREMENTS

See Table 2.

OBSERVATIONS

The specimens seen by us correspond to the original description and illustrations, except for possessing a less slender, somewhat clavate terminal peg. The description indicates some very wide ranges, *e.g.*, tail length was given as 34 μm, c′ = 1.7, so ABD = 20 μm, but in the holotype the tail measures about 55 μm (2115 : 38.4) thus ABD = 31 μm.

DISCUSSION AND SYSTEMATIC POSITION

The species belongs in Group 1 ('no anterior female genital branch') of Loof and Luc (1990) and the codes are: A1-B4-C5a-D5-E1-F3-G3-H2-I23-J?-K?-L1. These codes are closest to those of *X. brasiliense* Lordello, 1951. Like all common and widespread species this has a very wide range of measurements; from literature we compiled: L = 1.30-2.37 mm; a = 30-52; c = 30-64; c′ = 0.9-1.6; tail = 28-49 μm; V = 26-37; odontostyle = 108-162 μm; odontophore = 52-82 μm (Cohn & Sher, 1972; Loof & Sharma, 1979; Luc & Coomans, 1992). Since 1990 new populations of *X. brasiliense* have been found and described, with the result that the codes have extended. The codes for *X. digicaudatum* and *X. brasiliense* now overlap and there are no clear-cut gaps except a small one for V (20-25 *vs* 26-37). The difference of head shape (round-elevated in *X. digicaudatum*, low truncated in *X. brasiliense*) is not convincing (Fig. 2A). The paratypes studied have tail pegs differing from Singh and Khan's Fig. 2F but agreeing with Fig. 2E, F of Luc (1981).

We therefore consider *X. digicaudatum* Singh & Khan, 1998 a junior synonym of *X. brasiliense* Lordello, 1951, a species already known from India.

Xiphinema gracilicaudatum Singh & Khan, 1998 [= *X. gracilicaudatus* emend.] (Fig. 2D-F)

MEASUREMENTS

See Table 2.

OBSERVATIONS

The specimens seen agree generally with the description, but a dorsal body pore was observed in the odontostyle region (Fig. 2E) and the tail terminus is more rounded than depicted.

DISCUSSION AND SYSTEMATIC POSITION

X. gracilicaudatum belongs in Group 1 ('no anterior female genital branch') of Loof and Luc (1990) and has the following codes: A1-B4-C4-D4-E1-F2-G2-H2-I3-J?-K?-L1. These codes are wholly identical to those of *X. radicicola* Goodey, 1936. *X. gracilicaudatum* was diagnosed only against *X. pararadicicola* Phukan & Sanwal, 1982, but the authors did not take into account that the latter was synonymized, after comparison of many populations, with *X. radicicola* Goodey 1936 by Luc *et al.* (1986). These authors found the tail length of paratypes of *X. pararadicicola* not 55 μm, as Singh and Khan (1998) stated, but 60-62 μm; h was 28-31 μm and h% 47-53; these values are all identical with those given for *X. gracilicaudatum*. Number of caudal pores is an uncertain character: due to particles adhering to tails some may be missed and there is variation due to the position of the anterior pore (see above). This leaves the direction of the vagina; it is not known if this is a constant character or one influenced by other factors, *e.g.*, by passage of eggs; moreover Fig. 3D (printed upside down) of Singh and Khan (1998) agrees with Fig. 1H of McLeod and Khair (1971) for *X. australiae* McLeod & Khair, 1971, a junior synonym of *X. radicicola*; moreover in Luc's (1981) Fig. 1I the vagina is slightly directed posteriad.

Therefore, as the dimensions wholly lie within the limits for *X. radicicola* as given by Luc and Loof (1993) we consider *X. gracilicaudatum* Singh & Khan, 1998 a junior synonym of *X. radicicola* Goodey, 1936, a species reported from India many times.

Xiphinema arunachalense Singh & Khan, 1998 [= *X. arunachalensis* emend.] (Fig. 2G-I)

MEASUREMENTS

See Table 2.

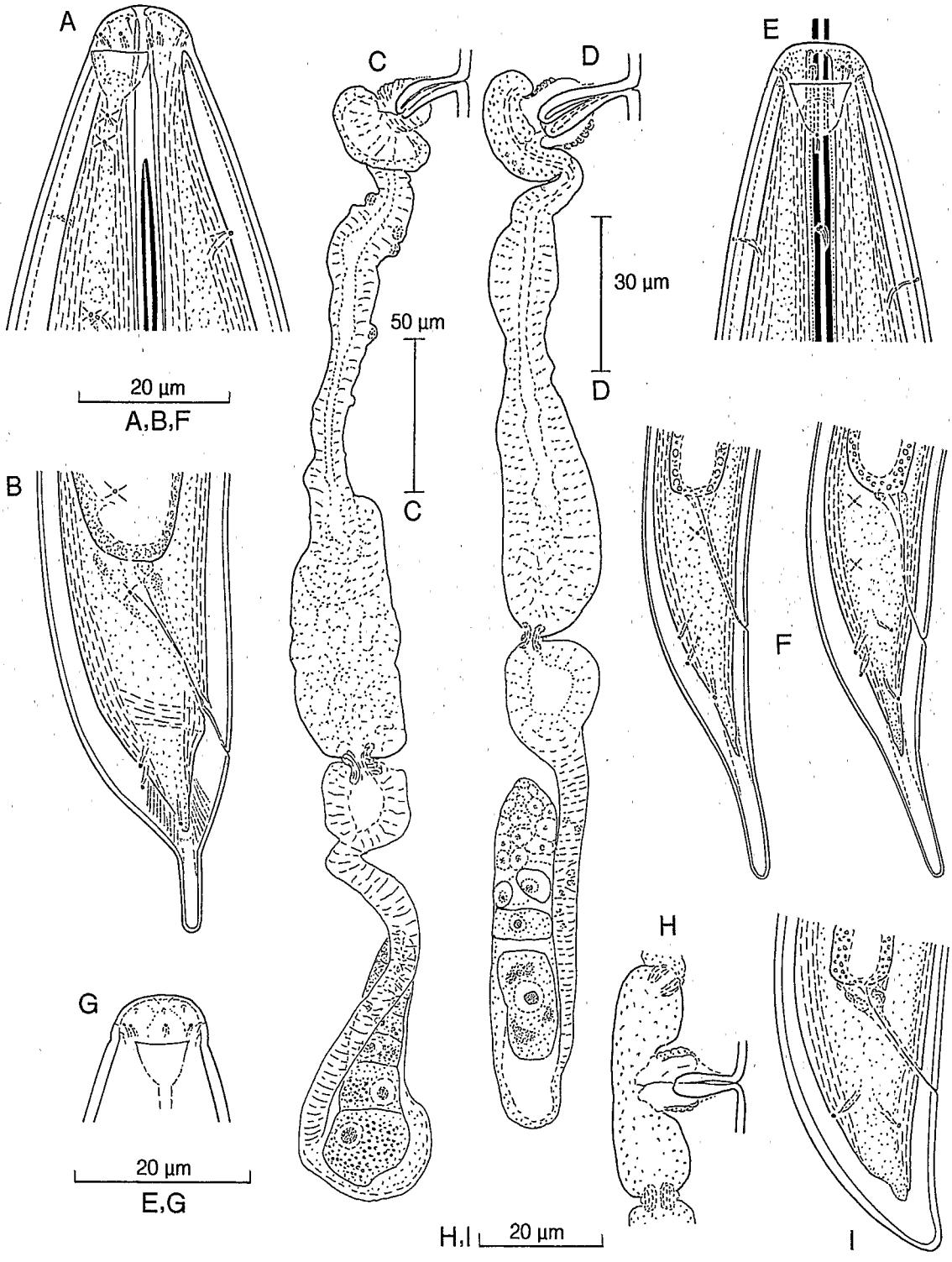

Fig. 2. Xiphinema 'digicaudatum' *(A-C),* X. 'gracilicaudatum' *(D-F) and* X. 'arunachalense' *(G-I). A, E, G: Head; B, F, I: Tail end; C, D: Female reproductive system; H: Ovejector and vulva region.*

Table 2. *Measurements of* Xiphinema 'digicaudatum', X. 'gracilicaudatum' *and* X. 'arunachalense' *(all measurements in µm except L in mm).*

	X. 'digicaudatum'		*X. 'gracilicaudatum'*		*X. 'arunachalense'*	
n	13*	2**	16*	8**	12*	2**
L	1.96-2.45	2.58-2-59	1.60-2.06	1.83-2.39	1.40-1.56	1.42-1.77
a	33-49	38-41	40-56	46-51	37-41	35-43
b	5.1-6.7	5.9	4.5-5.3	5.0-5.5	4.0-6.1	4.4-5.2
c	37-53	49-53	27-31	19-37	55-70	57-64
c'	1.2-1.8	1.4	2.8	2.0-2.6	1.08	1.1-1.3
V	20-25	24	23-28	24-26	53-60	57-59
Odontostyle	110-125	131-132	104-130	113-138	94-105	102-118
Odontophore	55-75	78-80	56-70	63-71	44-54	51-57
Stylet	–	209-212	–	177-207	153	153-175
Guiding ring	102-144	121-123	86-114	97-118	80-95	93-103
Body diam.						
at mid body	58	65-68***	38	40-52	41	40-41
at anus	21-31	34-40***	22	25-29	21	23-25
Tail	34-55	48-55	62	58-69	27	25-28
h	15	25	30	32-37	–	–
h%	47	45	50	55-60	–	–

* According to Singh and Khan (1998).
** Our own measurements.
*** One specimen flattened.

OBSERVATIONS

The description contains a contradiction: the head is first said to be continuous, but farther on considered slightly constricted at base. The latter is correct (Fig. 2G).

DISCUSSION AND SYSTEMATIC POSITION

This species belongs in the *X. americanum*-group. It was considered most close to *X. brevicollum* Lordello & Da Costa, 1961, from which it was differentiated by lower values of L: 1.40-1.56 mm *vs* 1.8-2.2; b: 4-6 *vs* 7-11; c: 55-70 *vs* 63-93. These data for *X. brevicollum* were evidently taken from the original description.

We consulted various redescriptions and found (excluding *X. pseudoguirani* Lamberti *et al.*, 1992 and *X. taylori* Lamberti *et al.*, 1992):

— L ranges from 1.51 (Rahman Razak & Loof, 1998) to 2.31 (Coomans & Heyns, 1997); including *X. diffusum* Lamberti & Bleve-Zacheo, 1979 (a junior synonym of *X. brevicollum*; see Luc *et al.*, 1998), the lower limit even sinks to 1.30.

— Values for 'b' have practically no significance in longidorids, since the pharynx is often coiled to various degrees; besides, smaller values of 'b' in smaller specimens are due to allometry.

— Values of 'c' range from 56 (Rahman Razak & Loof, 1998) to 112 (Lamberti & Bleve-Zacheo, 1979); inclusion of *X. diffusum* gives a lower limit of 48. Here too allometry is a factor.

We conclude that there is no real difference and that *X. arunachalense* Singh & Khan, 1998 is a junior synonym of *X. brevicollum* Lordello & Da Costa, 1961, a species already recorded from India.

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