

# On the systematics of eleven *Xiphinema* species (Nematoda: Longidoridae) described from India

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## SUMMARY

Observations made on eleven *Xiphinema* species described from India have resulted in the authors confirming *X. elitum* Khan, Chawla & Saha, 1978 as a valid species. *X. neodimorphicaudatum* Khan, 1982 and *X. tugewai* Darekar & Khan, 1983 are both considered junior synonyms of *X. insigne* Loos, 1949 ; *X. nagarjunense* Khan, 1982 and *X. uasi* Edward & Sharma, 1982, both junior synonyms of *X. elongatum* Schuurmans Stekhoven & Teunissen, 1938 ; *X. mammillocaudatum* Khan, 1982, a junior synonym of *X. brasiliense* Lordello, 1951 ; *X. cobbi* Sharma & Saxena, 1981 and *X. hayati* Javed, 1983, both junior synonyms of *X. basiri* Siddiqi, 1959 ; *X. neoelongatum* Bajaj & Jairajpuri, 1976, a junior synonym of *X. pachtaicum* (Tulaganov, 1938) Kirjanova, 1951. *X. neoamericanum* Saxena, Chhabra & Joshi, 1973 and *X. sharmai* nom. nov. (= *X. indicum* Sharma & Saxena, 1981 nec Siddiqi, 1959) are both considered *species inquirendae*. Type specimens were available for examination for only the six first cited species. Therefore, only published descriptions could be examined for the remaining five species. The authors emphasise the basic requirement of a thorough knowledge of the appropriate theoretical concepts before any taxonomic action is undertaken. The basic concepts that are regarded as a prerequisite for systematists working at the specific level are listed.

## RÉSUMÉ

Sur la systématique de onze espèces de *Xiphinema*  
(Nematoda : Longidoridae) décrites de l'Inde

Les observations faites par les auteurs au sujet de onze espèces de *Xiphinema* décrites de l'Inde les conduisent aux propositions suivantes : *X. elitum* Khan, Chawla & Saha, 1978 est considéré comme une espèce valide ; *X. neodimorphicaudatum* Khan, 1982 et *X. tugewai* Darekar & Khan, 1983 sont considérés comme synonymes mineurs de *X. insigne* Loos, 1949 ; *X. nagarjunense* Khan, 1982 et *X. uasi* Edward & Sharma, 1982 comme synonymes mineurs de *X. elongatum* Schuurmans Stekhoven & Teunissen, 1938 ; *X. mammillocaudatum* Khan, 1982 comme synonyme mineur de *X. brasiliense* Lordello, 1951 ; *X. cobbi* Sharma & Saxena, 1981 et *X. hayati* Javed, 1983 comme synonymes mineurs de *X. basiri* Siddiqi, 1959 ; *X. neoelongatum* Bajaj & Jairajpuri, 1976 comme synonyme mineur de *X. pachtaicum* (Tulaganov, 1938) Kirjanova, 1951 ; *X. neoamericanum* Saxena, Chhabra & Joshi, 1973 et *X. sharmai* nom. nov. (= *X. indicum* Sharma & Saxena, 1981 nec Siddiqi, 1959) sont placés parmi les *species inquirendae*. Des spécimens types n'ont pu être examinés que pour les six premières espèces citées et seules les descriptions originales ont pu être utilisées pour les cinq autres espèces. Les auteurs insistent sur la nécessité impérieuse d'une profonde connaissance des concepts théoriques appropriés avant qu'une décision d'ordre systématique ne soit prise. Une liste des notions de base considérées comme indispensables pour les travaux de systématique au niveau spécifique est donnée.

Eleven species of *Xiphinema* Cobb, 1913 described as new from India attracted the attention of the authors by one or the other of the following characteristics : the similarity to one or other relatively common species, already recorded from India, description of atypical features for the genus, as for example the presence of a Z organ in a species having no anterior female genital branch, or of an odontophore nearly as long as the odontostyle. The eleven

species were : *X. elitum* Khan, Chawla & Saha, 1978, *X. neodimorphicaudatum* Khan, 1982, *X. tugewai* Darekar & Khan, 1983, *X. nagarjunense* Khan, 1982, *X. mammillocaudatum* Khan, 1982, *X. uasi* Edward & Sharma, 1982, *X. cobbi* Sharma & Saxena, 1981, *X. hayati* Javed, 1983, *X. neoelongatum* Bajaj & Jairajpuri, 1976, *X. neoamericanum* Saxena, Chhabra & Joshi, 1973, *X. sharmai* nom. nov. (= *X. indicum* Sharma & Saxena, 1981 nec Siddiqi, 1959).

\* Nematologist of ORSTOM.

Paratype specimens of the first six cited species only were available for examination. Despite repeated enquiries no answers were obtained to requests for the loan of type specimens of the five remaining species. Furthermore, for *X. cobbi* and *X. sharmai* nom. nov. the designation and deposition of type specimens were not recorded in the descriptions of the species.

**Xiphinema elitum** Khan, Chawla & Saha, 1978  
(Fig. 1)

This species described from four females is considered by its authors to resemble *X. elongatum* Schuurmans Stekhoven & Teunissen, 1938 and *X. italiae* Meyl, 1953.

Examination of a paratype female gave the following data.

**Morphometrics** : L = 2.15 mm ; a = 56.6 ; b = 6.9 ; tail = 50  $\mu$ m ; c = 43.0 ; c' = 2.0 ; V = 47.4 ; odontostyle = 107  $\mu$ m ; odontophore = 54  $\mu$ m.

**Morpho-anatomy** : body hook-shaped ; lip area flat anteriorly, separated from the rest of the body by a shallow depression ; two genital branches with-

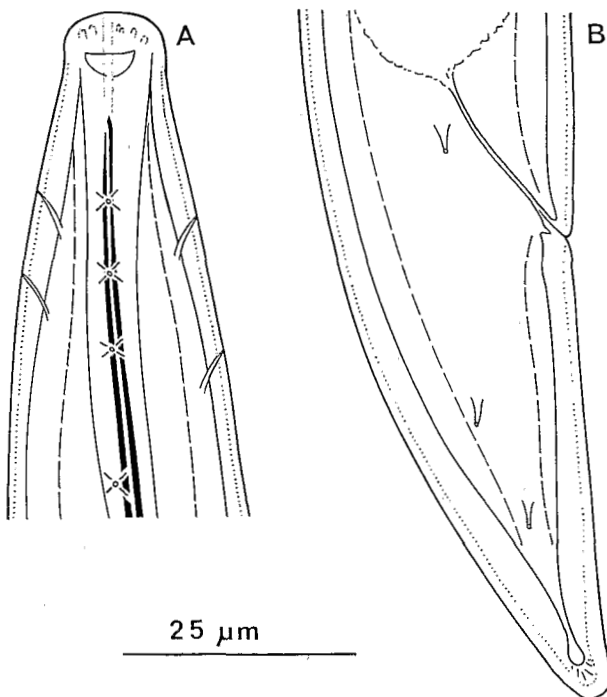


Fig. 1. *Xiphinema elitum* Khan, Chawla & Saha, 1978, paratype female. A : Anterior end. B : Tail.

out Z differentiation or uterine spines ; tail conical, curvature mainly dorsal, extremity rounded ; two pairs of caudal pores, one pair of adanal pores ; the protoplasmic inner content of the tail shows at its extremity a characteristic appearance *i.e.* it forms a thin canal which expands terminally, the cuticle being thin (4  $\mu$ m) at the tail tip.

Such a structure of the tail extremity, which is a good specific character, is quite rare, having been described in two species only, *i.e.* *X. attorodorum* Luc, 1961 and *X. algeriense* Luc & Kostadinov, 1982. *X. elitum* differs from *X. attorodorum* principally by having a more posteriorly situated vulva (V = 47.4-50.0 *vs* 40.1-42.0), a less prominent lip-region, a shorter body (1.9-2.4 mm *vs* 2.49-2.81 mm) and a shorter stylet (161-180  $\mu$ m *vs* 184-193  $\mu$ m). The tail shape in both species is relatively similar. *X. elitum* differs from *X. algeriense* by several characters of which the most evident is the presence of a prominent Z organ in the latter species.

Consequently *X. elitum* Khan, Chawla & Saha, 1978 is considered a valid species, most closely resembling *X. attorodorum* Luc, 1961.

**Xiphinema neodimorphicaudatum** Khan, 1982

The name of this species is derived from *X. dimorphicaudatum* Heyns, 1966 and in both species females have long tails whereas males have short tails. However, the two species differ markedly in body length (in *X. dimorphicaudatum* body length reaches 4.9 mm which is twice that of *X. neodimorphicaudatum*) and in the position of the vulva (V = 32-38 *vs* 49-53 in *X. dimorphicaudatum*).

*X. neodimorphicaudatum* is said to show "certain similarities with *X. insigne* Loos, 1949 but can be distinguished by the differently shaped head, longer stylet and position of vulva..... and furthermore by the presence of a large number of males in the population displaying dimorphism in the shape of the tail" (Khan, 1982).

Examination of one female and two male paratypes revealed the following characteristics.

**Morphometrics** : Female : L = 2.32 mm ; a = 43 ; b = 5.9 ; tail = 104  $\mu$ m ; c = 22.3 ; c' = 4.7 ; V = 29.7 ; odontostyle = 104  $\mu$ m ; odontophore = 50  $\mu$ m. Male : L = 2.27, 2.32 mm ; a = 55.4, 58.0 ; b = 6.1, 6.4 ; tail = 51, 59  $\mu$ m ; c = 44.5, 39.3 ; c' = 2.0, 2.2 ; odontostyle = 104, 106  $\mu$ m ; odontophore = 57  $\mu$ m ; spicules = 51  $\mu$ m.

**Morpho-anatomy** : Female : body ventrally curved, mainly in the posterior half ; lip area weakly offset ;

two short genital branches each without a Z differentiation; tail long, regularly conoid and ventrally curved, extremity rounded; hyaline terminal part 14  $\mu\text{m}$  long; two pairs of caudal pores; one pair of adanal pores. Male: general shape as in female, but body more acutely curved in posterior third; spicules slightly curved; ventral double papilla 13, 14  $\mu\text{m}$  anterior to cloaca; five ventral supplements (distance from double papilla-S1 = 50, 65  $\mu\text{m}$ ; S1-S2 = 20, 25  $\mu\text{m}$ ; S2-S3 = 20, 15  $\mu\text{m}$ ; S3-S4 = 20, 8  $\mu\text{m}$ ; S4-S5 = 23  $\mu\text{m}$ ); tail conoid, curvature mainly dorsal, extremity slightly detached and more pointed than in female; hyaline terminal part 17, 18  $\mu\text{m}$ .

All these data fit satisfactorily within the range of variation recorded for various populations of *X. insigne* (Bajaj & Jairajpuri, 1977; Luc & Southey, 1980). Also, the data for the males accord with the description of male *X. insigne* given by Bajaj and Jairajpuri (1977). Consequently, for the present, *X. neodimorphicaudatum* Khan, 1982 is considered a junior synonym of *X. insigne* Loos, 1949, a species which has been recorded several times in India, and Khan's population is regarded as one in which males were unusually numerous.

#### *Xiphinema tugewai* Darekar & Khan, 1983

This species is reported to resemble *X. insigne* Loos, 1949 (the only species cited in the diagnosis) but to differ from it in the shape of the lip region (continuous *vs* slightly offset), in having a smaller *c* value, longer rectum and prerectum, differently shaped and longer tail, and in the presence of a Z organ in the genital branches.

Two paratype females were examined and had the following characteristics.

**Morphometrics:** L = 2.15, 2.33 mm; a = 48.9, 48.5; b = 5.4, 6.5; tail = 111, 114  $\mu\text{m}$ ; c = 19.4, 20.1; c' = 5.2, 5.0; V = 32.6, 32.2; odontostyle = 113, 116  $\mu\text{m}$ ; odontophore = 60, 62  $\mu\text{m}$ ; stylet = 173, 178  $\mu\text{m}$ .

**Morpho-anatomy:** body slightly curved ventrally; lip area weakly offset; two short genital branches without Z differentiation; tail long, conoid, ventrally curved in the posterior half, extremity rounded; hyaline terminal part 11  $\mu\text{m}$ ; two pairs of caudal pores; one pair of adanal pores.

These data fit satisfactorily within the range of variation recorded for populations of *X. insigne* as reported above. Therefore, *X. tugewai* Darekar & Khan, 1983 is considered a junior synonym of *X. insigne* Loos, 1949, the population represented by "*X. tugewai*" being characterised by having short bodies and long stylets.

#### *Xiphinema nagarjunense* \* Khan, 1982

This species is reported to resemble *X. elitum* Khan, Chawla & Saha, 1978 and *X. elongatum* Schuurmans Stekhoven & Teunissen, 1938 but differs from the former by lacking the characteristic structure of the tail tip of that species (see above). The author of *X. nagarjunense* reported that the species differed from *X. elongatum* "by having a more set off head, differently shaped tail, posteriorly located vulva and protoplasmic core extended more deeply in the tail region".

One paratype female was examined and had the following characteristics.

**Morphometrics:** L = 2.21 mm; a = 56.7; b = 6.7; tail = 51  $\mu\text{m}$ ; c = 43.3; c' = 2.0; V = 43; odontostyle = 105  $\mu\text{m}$ ; odontophore = 60  $\mu\text{m}$ .

**Morpho-anatomy:** body curved in posterior part; lip region slightly offset; amphid aperture about 50% of the corresponding diameter; two similar genital branches, without Z differentiation; tail conical, extremity rounded, very slightly constricted subterminally; hyaline terminal part 12  $\mu\text{m}$ , without any particular feature.

These data fit satisfactorily within the range of variation recorded for *X. elongatum* (Luc & Southey, 1980). Also, the male of *X. nagarjunense* is similar to that of *X. elongatum*, described by Heyns (1974) particularly in spicule shape and length, number and position of ventral supplements and shape and length of tail. Consequently *X. nagarjunense* Khan, 1982 is considered a junior synonym of *X. elongatum* Schuurmans Stekhoven & Teunissen, 1938.

#### *Xiphinema uasi* Edward & Sharma, 1982

This species, described on fifteen females, is reported to resemble *X. vulgare* Tarjan, 1964 from which it is differentiated using Luc and Dalmasso's (1976) polytomous key for the identification of *Xiphinema* species.

Four topotype females were examined and have the following characteristics:

**Morphometrics:** L = 2.17-2.29 mm (2.24); a = ? (specimens flattened); b = 6.2-6.5 (6.3); tail = 56-62  $\mu\text{m}$  (58.5); c = 36.9-40.2 (38.4); c' = 2.0-2.3 (2.1); V = 37.3-40.6 (38.9); odontostyle = 89-94  $\mu\text{m}$  (92); odontophore = 57-61  $\mu\text{m}$  (59); stylet = 150-

\* *X. nagarjunensis* emend., as *Xiphinema* is neuter in gender.

152  $\mu\text{m}$  (151);  $h^* = 14-18 \mu\text{m}$  (16.5);  $h\%^* = 25-29$  (28).

**Morpho-anatomy**: Body slightly curved ventrally; lip area weakly offset; two genital branches without Z differentiation; tail regularly conical, slightly ventrally bent, extremity rounded; two pairs of caudal pores; one pair of adanal pores.

These data fit perfectly within the range of variation recorded for populations of *X. elongatum* (Luc & Southey, 1980). Consequently *X. uasi* Edward & Sharma, 1982 is considered a junior synonym of *X. elongatum* Schuurmans Stekhoven & Teunissen, 1938.

#### ***Xiphinema mammillocaudatum* Khan, 1982**

One paratype female, in poor condition, was examined and gave the following data.

**Morphometrics**:  $L = 1.63 \text{ mm}$ ; tail = 34  $\mu\text{m}$ ;  $c = 47.9$ ;  $c' = 1.0$ ;  $V = 34.4$ ; odontostyle = 138  $\mu\text{m}$ ; odontophore = 65  $\mu\text{m}$ .

**Morpho-anatomy**: body C-shaped; labial area slightly offset; tail short, rounded, with a terminal mucro 10  $\mu\text{m}$  long; no blind canal; two pairs of caudal pores. Vagina directed posteriorly; no trace of an anterior genital branch; no Z organ in the posterior genital branch, contrary to the original description.

Khan (1982) reported the presence of a Z organ in the genital branch of *X. mammillocaudatum* but did not describe the structure. In Figure 3 E of Khan's paper four small triangular structures are shown situated at the level of the uterine pouch but not in the part of uterus where the Z organ or pseudo Z organ is normally present. No Z organ or pseudo Z organ has ever been recorded in *Xiphinema* species having only one genital branch. Also, occasionally crystals (fixative?) have been observed in the genital tracts of *Xiphinema* females and this may explain Khan's report of a "Z organ" in *X. mammillocaudatum*.

Accepting the absence of the Z organ in *X. mammillocaudatum* all the morphometrical and anatomical data fit satisfactorily within the range of variation reported for populations of *X. brasiliense* Lordello, 1951 (a species not cited in the "Diagnosis and Relationships" by Khan, 1982). Therefore, *X. mammillocaudatum* Khan, 1982 is considered a junior

synonym of *X. brasiliense* Lordello, 1951, a species previously recorded from India.

#### ***Xiphinema cobbi* Sharma & Saxena, 1981**

Sharma and Saxena (1981) did not record the designation and deposition of type material of *X. cobbi* and no paratypes of this species could be obtained for examination.

The description and illustration of *X. cobbi* are poor and discrepancies exist between the text and illustration e.g. in the text stylet length is 140 + 72  $\mu\text{m}$  whereas in the illustration it is 106 + 63  $\mu\text{m}$ . Sharma and Saxena (1981) compare *X. cobbi* with *X. basiri* Siddiqi, 1959 from which they claim it differs by having a longer tail ( $c = 52-57$  vs 62-80), longer odontostyle and odontophore (119 and 61  $\mu\text{m}$  respectively in *X. basiri*), Z organ absent and smaller  $c'$  value (1.3 vs 1.5).

The criteria used to distinguish between the two species are inadequate because the actual tail length of *X. cobbi* is not given and the coefficient  $c$  is unreliable in respect of this value. Also,  $c$  values of 52-57 do not correspond with those given for the type specimens (females = 55-59; male = 66), and, the  $c$  and  $c'$  values overlap between the two species (52-57 and 1.3, respectively, in *X. cobbi* vs 54-84 and 1.2-2.0 in *X. basiri*, *vide* Cohn and Sher (1972), but excluding *X. ifacolum* Luc, 1961 which is a valid species). Furthermore, the stylet length of *X. cobbi*, measured from the illustration fits within the range of stylet length recorded for *X. basiri* (162-203  $\mu\text{m}$ ). Sharma and Saxena (1981) did not observe a Z organ, however, Luc and Dalmasso (1976) reported that the Z organ in *X. basiri* was frequently very weakly differentiated which made it difficult to observe.

Although paratypes could not be examined it is concluded from the above data that *X. cobbi* Sharma & Saxena, 1981 is a junior synonym of *X. basiri* Siddiqi, 1959, a species frequently recorded in India.

#### ***Xiphinema hayati* Javed, 1983**

No paratypes of this species could be obtained for examination. *X. hayati* was described from ten females and was considered to resemble *X. sahelense* Dalmasso, 1969, *X. basiri* Siddiqi, 1959, *X. meridianum* Heyns, 1971 and *X. coxi* Tarjan, 1964. The differences between *X. hayati* and these species were listed as follows. Compared with *X. sahelense*: a shorter body (3.0-3.6 mm vs 3.7-4.9); well offset head which is narrower than the adjacent neck (in *X. sahelense* the head is continuous and narrower than the body); shorter odontophore (60-65  $\mu\text{m}$  vs

\*  $h$  = length of the hyaline terminal part of the tail, in  $\mu\text{m}$ ;  $h\%$  = same data, expressed as a percentage of the tail length.

74-80  $\mu\text{m}$ ) and a more posterior vulva ( $V = 49-52$  vs 45-48). Compared with *X. basiri*: a differently shaped lip region; longer odontophore (60-65  $\mu\text{m}$  vs 57-63  $\mu\text{m}$ ); longer odontostyle (127-133  $\mu\text{m}$  vs 111-125  $\mu\text{m}$ ) and Z organ absent. Compared with *X. meridianum*: a longer odontostyle (127-133  $\mu\text{m}$  vs 92-104  $\mu\text{m}$ ); less slender body ( $a = 60-77$  vs 83-115) and Z organ absent. Compared with *X. coxi*: a longer odontostyle (127-133  $\mu\text{m}$  vs 113-127  $\mu\text{m}$ ); shorter odontophore (60-65  $\mu\text{m}$  vs 68-82  $\mu\text{m}$ ); more posterior vulva ( $V = 49-52$  vs 40-46); smaller  $c'$  (1.4-1.5 vs 1.5-2.0) and Z organ absent. Figure 2 A given with the description of *X. hayati* indicates that the specimen was badly fixed, the peculiar shape of the neck evidently being an artefact. Also, from Figure 2 D, tail length = 52  $\mu\text{m}$  and  $c'$  ratio = 1.7.

The presence of a distinct Z organ, and the tail shape of *X. meridianum* and *X. coxi* clearly distinguishes these species from *X. hayati*. Similarly, body size and the odontophore/odontostyle ratio distinguishes *X. hayati* from *X. sahelense* (ratio 0.47 vs 0.58). However, *X. hayati* can not be distinguished from *X. basiri* because differences in lip region shape are unreliable; odontostyle and odontophore lengths are inadequate as these measurements in a population of *X. basiri* from the Sudan (Loof & Yassin, 1971) are similar to those of *X. hayati* and, as reported above, the pseudo Z organ in *X. basiri* is very weakly developed and frequently difficult to observe. Therefore, it is concluded that *X. hayati* Javed, 1983 is a junior synonym of *X. basiri* Siddiqi, 1959.

#### *Xiphinema neoelongatum*

Bajaj & Jairajpuri, 1976

No paratypes of this species could be obtained for examination. *X. neoelongatum* was described from four females and was considered to resemble *X. elongatum* Schuurmans Stekhoven & Teunissen, 1938 and *X. mediterraneum* Martelli & Lamberti, 1967 (now a junior synonym of *X. pachtaicum* (Tulaganov, 1938), Kirjanova, 1951).

*X. neoelongatum* is readily distinguished from *X. elongatum* by its shorter body (1.4-1.7 mm vs. 1.95-2.77 mm), more posterior vulva ( $V = 54-55$  vs 34.5-48.9) and shorter tail ( $c' = 1.4-1.8$  vs 1.9-3.7) with a more pointed terminus. *X. neoelongatum* differs from *X. pachtaicum* by "being more robust, in having a differently shaped and less offset lip region, in tail shape and in lower value of  $c$  ratio". However, the  $a$  and  $c$  coefficients are very variable in *X. pachtaicum* (43-74 and 47-84 respectively) and the figures recorded for *X. neoelongatum* overlap and extend only slightly their lower limit (37-46 and 40-50 respectively). Similarly, the lip-region shape

of *X. neoelongatum* is within the variation recorded in *X. pachtaicum* [compare Fig. F in Bajaj and Jairajpuri (1976) with Fig. 14 in Heyns (1977)], as are all other characteristics including tail shape. Consequently *X. neoelongatum* Bajaj & Jairajpuri, 1976 is considered a junior synonym of *X. pachtaicum* (Tulaganov, 1938) Kirjanova, 1951.

#### *Xiphinema neoamericanum*

Saxena, Chhabra & Joshi, 1973

No paratypes of this species could be obtained for examination. The description of *X. neoamericanum*, based on four females, contains obvious errors: coefficient  $c$  is recorded as 27-29 from which a tail length of 60-70  $\mu\text{m}$  can be calculated, but, in Figure 1 D the tail measurement is only 30  $\mu\text{m}$ ; the cuticle is recorded as "exceptionally thick" in the region of the head and tail but this is not substantiated in the corresponding Figures 1 B and 1 D; the tail is reported as having a subacute terminus but in Figure 1 D the tail terminus is broadly rounded. With these discrepancies in the description, and paratype specimens being unavailable for examination, *X. neoamericanum* Saxena, Chhabra & Joshi, 1973 is considered a *species inquirenda*.

#### *Xiphinema sharmai* nom. nov.

= *Xiphinema indicum* Sharma & Saxena, 1981 nec Siddiqi, 1959

*X. indica* Sharma & Saxena, 1981 is here emended to *X. indicum* as the gender of *Xiphinema* is neuter. This species is a junior homonym of *X. indicum* Siddiqi, 1959; thus we propose *X. sharmai* nom. nov. for *X. indicum* Sharma & Saxena, 1981.

Sharma and Saxena (1981) did not record the designation and deposition of type material of *X. sharmai* nom. nov. and no paratypes of this species could be obtained for examination.

The description and illustration of this species are poor and discrepancies exist between the text and illustration. The values given for the odontostyle and odontophore are 100  $\mu\text{m}$  and 84  $\mu\text{m}$  respectively (stylet = 184  $\mu\text{m}$  of which the odontophore represents 46%) but in the original Figure 2.3 these structures measure only 53.5  $\mu\text{m}$  and 68.5  $\mu\text{m}$  respectively (stylet = 112  $\mu\text{m}$  of which the odontophore represents 56%). Furthermore, no description is given of the genital tracts in the female other than their length as a percentage of body length and the reported absence of a Z organ. The labial profile and tail shape are not presented as specific characteristics.

Despite the relatively large body length of *X. sharmai* nom. nov. its authors classify it in the "subgenus *Xiphinema*" Cohn & Sher, 1972, i.e. in the "americanum" group. *X. sharmai* nom. nov. is compared with *X. brevicolle* Lordello & da Costa, 1961 from which it is claimed to differ by having a more posteriorly situated vulva ( $V = 55-57$  vs 50), longer tail ( $c = 66-70$  vs 87) and longer odontophore and odontostyle (84 and 100  $\mu\text{m}$  respectively vs 55 and 95  $\mu\text{m}$ ). Further minor differences are given which help differentiate the species from *X. brevicolle* and also from *X. rivesi* Dalmasso, 1969.

Body posture, tail shape and size (= 39  $\mu\text{m}$ , measured from the original Fig. 2.2) and lip area shape of *X. sharmai* nom. nov. are similar to *X. brevicolle*. However, body length exceeds that of *X. brevicolle* which rarely exceeds 2 mm, and the odontophore length in relation to that of the odontostyle is unique in *X. sharmai* nom. nov. no similar relationship having been recorded previously in a *Xiphinema* species. Given the discrepancies and peculiarities recorded in the description of this species, and type specimens being unavailable for examination, *X. sharmai* nom. nov. is considered a *species inquirenda*.

#### Comment

Of the eleven *Xiphinema* species examined here which had been described as new species from India only *X. elitum* is considered valid, a conclusion based on an anatomical character not reported by its authors. Two species are considered *species inquirendae* because they were poorly described, discrepancies existed between text and illustrations, and paratype specimens were unavailable for examination. The eight remaining species were all found to be junior synonyms of relatively well known species all of which have previously been recorded from India. Moreover, these known species have each been described in several publications which have included detailed illustrations and numerous data on the variability of morphometrical and anatomical characters and which have appeared in easily obtainable nematological journals. It is therefore difficult to understand how these eight populations could have been described, or accepted by referees appointed by the journals, as representing new species. A likely explanation appears to be several misinterpretations of observable structures e.g. describing as continuous a labial region which is offset, reporting the presence of a Z organ when it is absent and using coefficients such as V and c, or tail shape, as diagnostic characters when these fit satisfactorily within the recorded range of variation of one of the compared species.

Proliferation of new species on the basis of insufficiently careful work does systematics a disservice, discredits the authors and is unnecessarily wasteful of colleagues time and resources. It should be realised that systematics is as serious a science as, for example, biochemistry and that before becoming involved in systematics the worker should be familiar with the theoretical concepts of the science.

The requirements for systematists working at the specific level may be summarised as follows :

- 1) Insight into natural *versus* artificial systems.
- 2) Appreciation of differences between scientific systems and identification keys.
- 3) Structure of populations, their variability and its repercussions on the type concept.
- 4) The concepts of genus and species and their underlying philosophy ; the difference between species and local populations.
- 5) Understanding of types, particularly paratypes.
- 6) Thorough knowledge of the animal group with which one is working including which nominal species exist, where they occur and how they vary.
- 7) Thorough knowledge of artefacts caused by killing, fixation, processing and mounting specimens and experience in recognizing them.

A detailed explanation of these and other concepts in systematics is given in Mayr, Linsley and Usinger (1953). Goodey (1959) lists data to be considered, observed and reported upon when describing new species of nematodes. Knowledge and appreciation of the contents of these two publications, the availability and correct use of a good quality highpower microscope, a proper sense of scientific responsibility and comparison with authentic specimens instead of merely with descriptions can do much to reduce the possibility of erroneously establishing a new nematode species.

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