

A new nematode, *Dichelyne alatae* sp. n. (Cucullanidae), from *Sillaginopsis panijus* (Pisces) of West Bengal, India

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Key words: *Dichelyne*, Nematoda, *Sillaginopsis panijus*, India

Abstract. A new nematode, *Dichelyne alatae* sp. n., is described on the basis of the worms recovered from the intestine of the whiting, *Sillaginopsis panijus* (Perciformes: Sillaginidae) from the estuary of the river Hooghly at Kalyani, West Bengal, India. *Dichelyne alatae* differs from congeners in having a small body size, deirids posterior to the oesophagus, short and wide caudal alae at the level of cloacal opening, unequal, alate spicules, a shield-shaped gubernaculum, a different number of caudal papillae and a conical tail with spines in its distal region.

Several cucullanid nematodes were collected from the intestine of the whiting, *Sillaginopsis panijus* (Hamilton) from the estuary of the river Hooghly at Kalyani, West Bengal, India. Examination of these nematodes revealed that they represented a new and hitherto undescribed species of the genus *Dichelyne* Jägerskiöld, 1902. The worms are described, illustrated and named as *D. alatae* sp. n.

MATERIALS AND METHODS

A number of nematodes was recovered from the intestine of 43 whiting, *Sillaginopsis panijus*, caught in the estuary of the river Hooghly at Kalyani, West Bengal, India, during the period from February, 1991 to July, 1993. Immediately after collection, most of the worms were washed thoroughly in 0.85% saline and fixed in hot (60°C) 10% formalin overnight. The fixed specimens were then washed thoroughly in distilled water and transferred to 70% ethanol through a graded series of ethanol. For light microscopy, 20 specimens of each sex were put in a solution of 5 parts glycerine and 95 parts of 70% ethanol and examined in glycerine after evaporation of the ethanol. After examination the worms were again washed and conserved in 70% ethanol.

For scanning electron microscopy (SEM) two thoroughly washed specimens of each sex were fixed in 10% buffered formalin. Thereafter the anterior and posterior ends of the worms were cut off using a sharp razor blade and the detached heads and tails were kept in the fixative for 10 days. The cut ends were immersed in distilled water overnight and then washed thoroughly in distilled water with several changes. They were then dehydrated in an ascending series of ethanol, transferred to 100% iso-amylacetate via the mixtures of ethanol and iso-amylacetate. The specimens were then critical point dried in liquid carbon dioxide using a Hitachi HCP-2

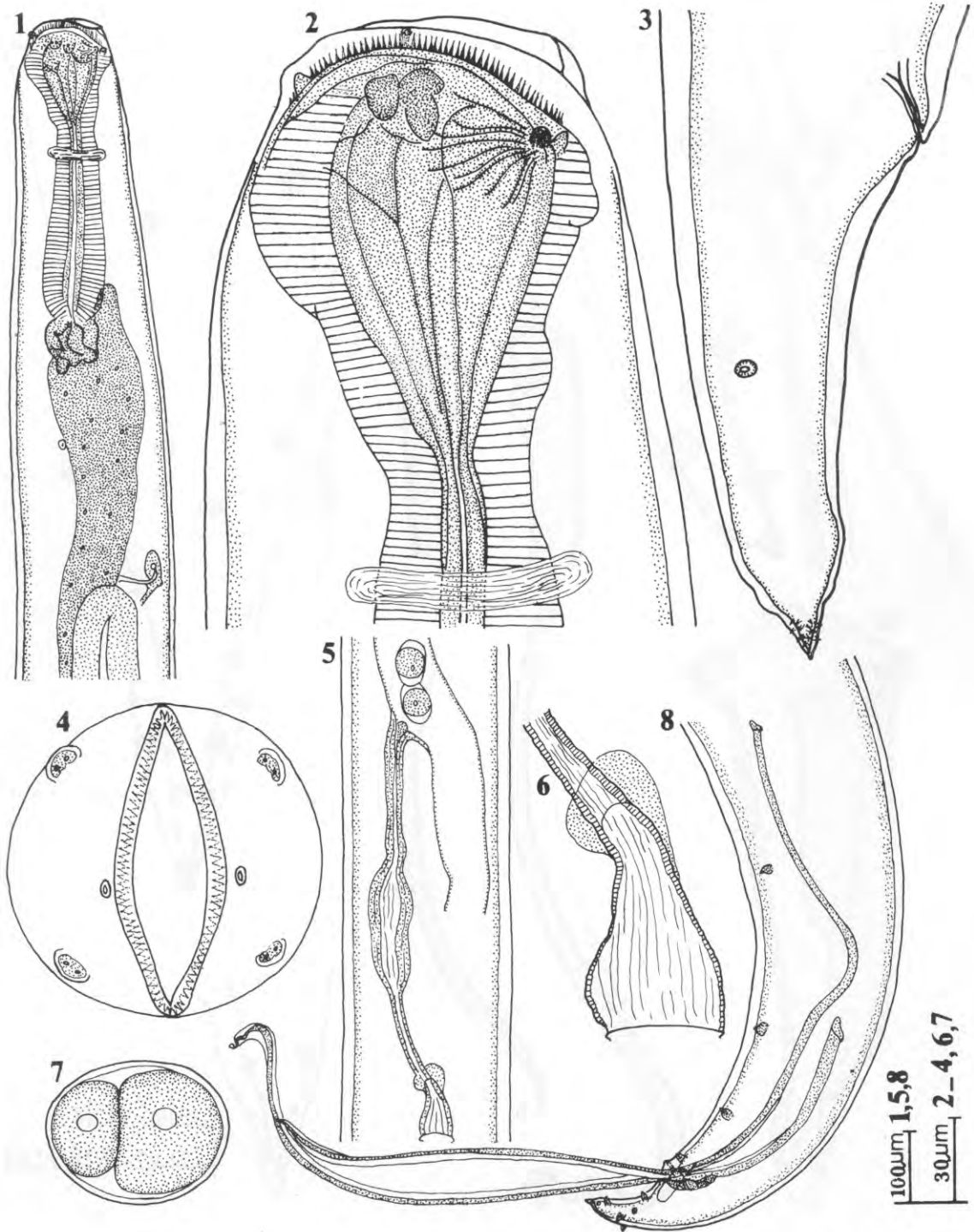
apparatus. The specimens were mounted on copper stubs, coated with gold in an IB2 ion coater and observed under a Hitachi S-530 scanning electron microscope operated at 15 kV.

RESULTS

Dichelyne alatae sp. n.

Table 1, Figs. 1–19

Description: Small worms. Body elongate, cylindrical, widest at short distance posterior to oesophagus and tapering towards tail. Body cuticle thick with distinct transverse striations. Anterior region straight (Fig. 1). Distinct collarette surrounding large, dorsoventrally elongate, slit-like oral aperture, bearing on inner surface 80–100 short, triangular ridges (Figs. 4, 15–16). These ridges remain webbed at their bases but free distally (Fig. 16). Two pairs of large submedian cephalic papillae and one pair of lateral amphids lie external to collarette (Figs. 4, 15–16). Under light microscope each large cephalic papilla is oval with two nerve-endings (Fig. 4) but under SEM it appears to be single structure distinctly elevated from the surrounding cephalic surface (Fig. 15). Amphids in form of cuticular rim surrounding elongate central pore. Oesophagus club-shaped (Fig. 1); anterior portion swollen, with funnel-like expansion of inner lumen forming pseudobuccal capsule (= oesophastome of Inglis 1967) (Figs. 1–2); oesophagus opens posteriorly into intestine through valvular apparatus (Fig. 1). Smooth, convex peribuccal rim lies immediately within collarette; narrows at dorsal, ventral and two subdorsal points; peribuccal groove situated within peribuccal rim (Fig. 16). Nerve-ring

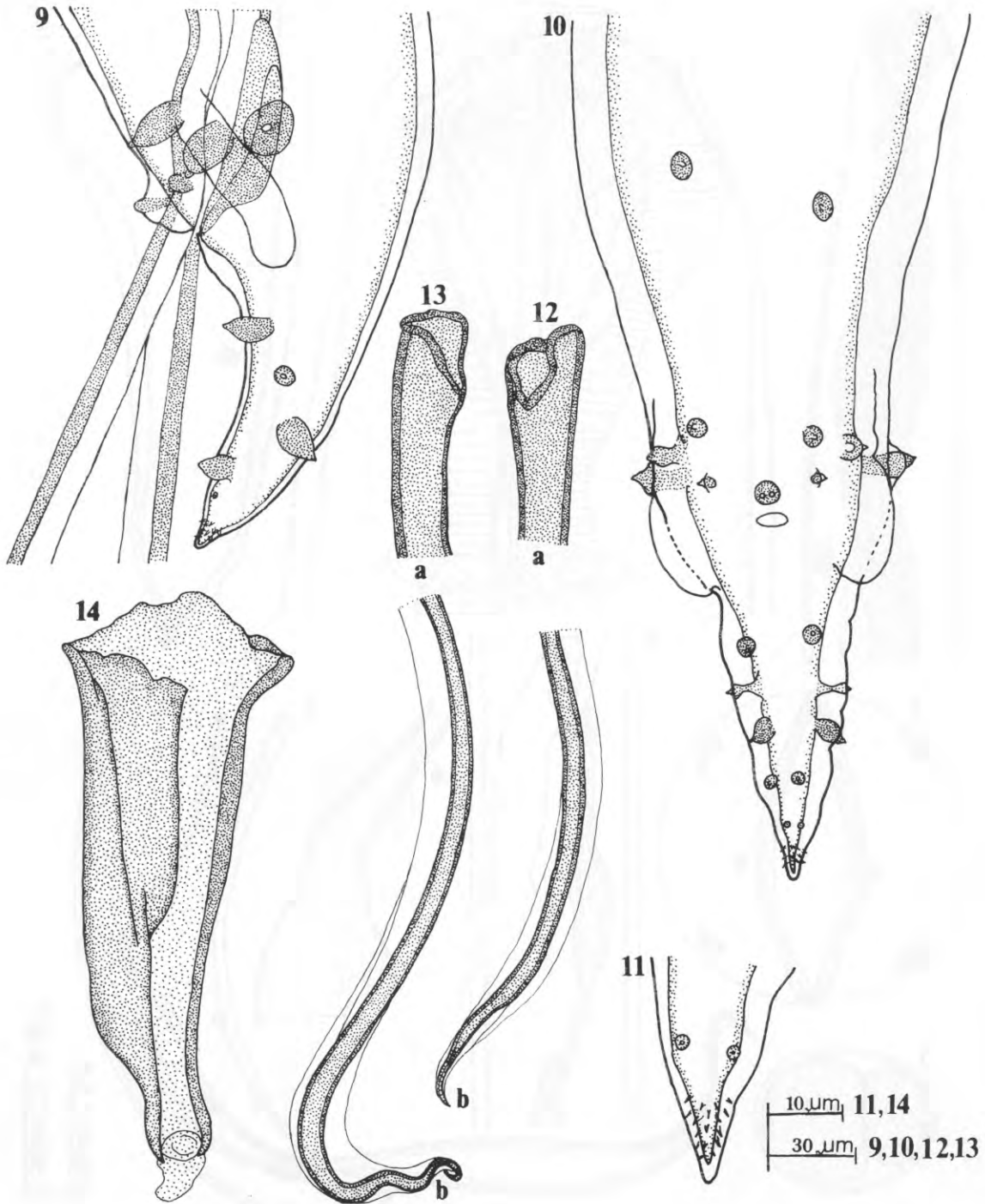


Figs. 1–8. *Dichelyne alatae* sp. n. **Fig. 1.** Anterior end of male, ventrolateral view. **Fig. 2.** Anterior end of male, enlarged lateral view. **Fig. 3.** Posterior end of female, enlarged lateral view. **Fig. 4.** *En face* view of male. **Fig. 5.** Vulva region, ventral view. **Fig. 6.** Vulva region, enlarged ventral view. **Fig. 7.** Egg. **Fig. 8.** Posterior end of male, lateral view.

surrounds oesophagus just posterior to pseudobuccal capsule (Figs. 1–2). Intestine with ventral intestinal caecum (Fig. 1) of variable length. Deirids lie posterior to oesophagus (Fig. 1). Small slit-like excretory pore situated posterior to deirids (Fig. 1). Lumen of proximal

part of rectum expands to form sclerotised cup. Tail conical with spined distal region and pointed tip (Figs. 3, 8–10).

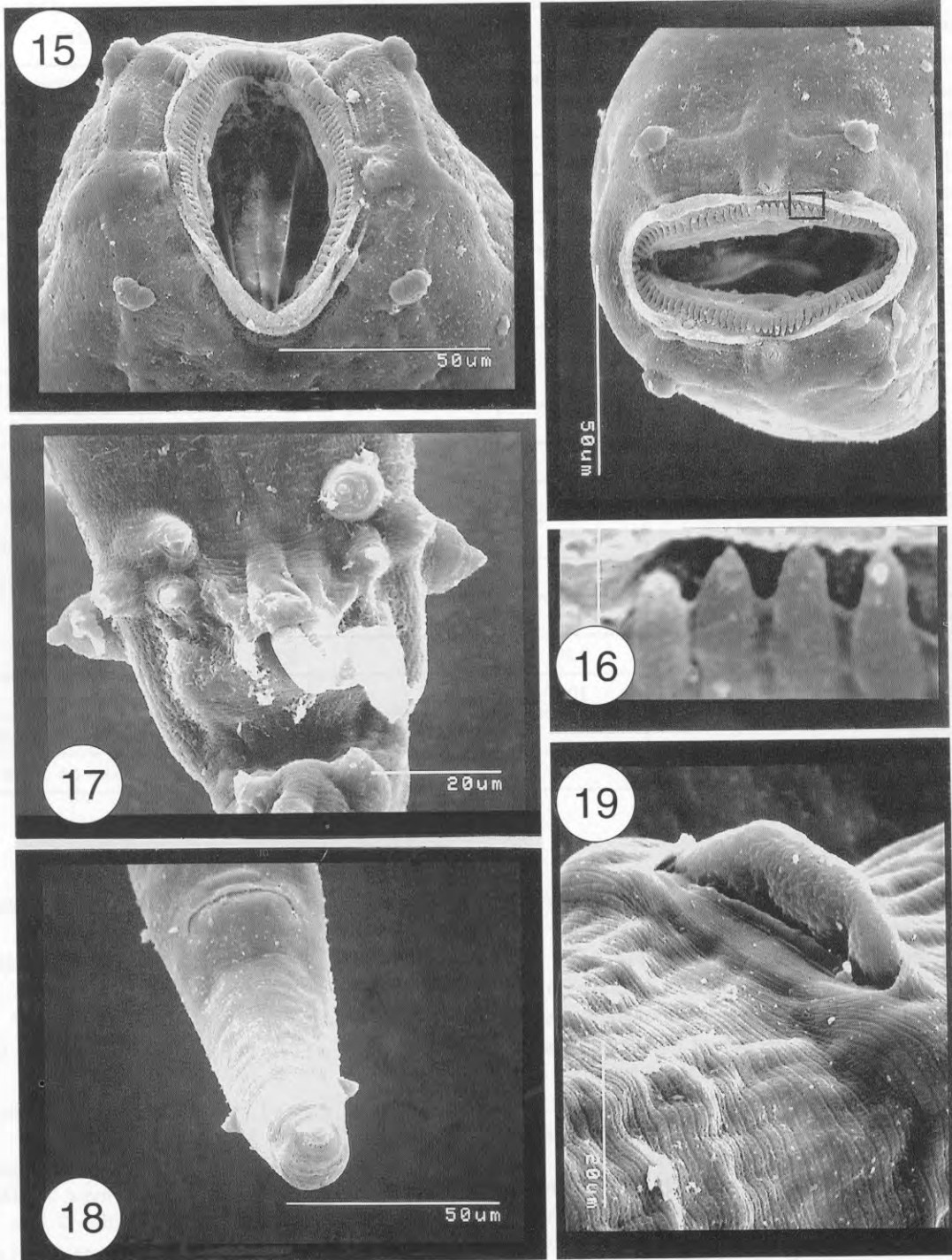
Male (20 specimens): Body length and diameter almost equal to those of female. Preanal sucker absent but well-



Figs. 9–14. *Dichelyne alatae* sp. n. **Fig. 9.** Posterior end of male, enlarged lateral view. **Fig. 10.** Posterior end of male, enlarged ventral view. **Fig. 11.** Tail end of male, enlarged ventral view. **Fig. 12.** Left spicule, enlarged ventral view. **Fig. 13.** Right spicule, enlarged ventral view. **Fig. 14.** Gubernaculum, enlarged ventral view.

developed caudal musculature present. Caudal alae short and wide, arising short distance anterior to and ending abruptly just posterior to cloacal aperture (Figs. 8–10, 17). Seven pairs of preanal papillae present, one pair (6th) being lateral and remainder subventral; first 3

pairs evenly spaced but remaining 4 pairs lie close to each other (Figs. 8–10, 17); in addition, in one male specimen examined one papilla occurred adjacent to 2nd preanal papilla on left side. One large papilla with 2 nerve endings lies on cuticular prominence of anterior



Figs. 15–19. *Dichelyne alatae* sp. n., SEM micrographs. **Fig. 15.** Anterior end of female, apical view. **Fig. 16.** Anterior end of male, apical view. **Fig. 17.** Tail end of male, ventral view. **Fig. 18.** Tail end of female, ventral view. **Fig. 19.** Vulva, enlarged lateral view.

lip of cloaca (Figs. 8–10, 17). Among 3 pairs of large postanal papillae 2nd pair (from cloacal aperture) sub-dorsal and remainder subventral (Figs. 8–10); additional indistinct pair of minute subventral papillae occurs short distance from tip of tail (Figs. 9–11); in one specimen one additional papilla occurs adjacent to 3rd postanal

papilla of left side. Phasmids lie between 1st and 2nd pair of postanal papillae (Figs. 8–10). Spicules unequal but identical in shape, long, slender and alate (Figs. 8, 12–13). Spicular alae ending short distance from distal tip, hence distal extremity appears to bear small spike (Fig. 17). Gubernaculum appears to be distinct rod-like

Table 1. *Dichelyne alatae* sp. n. Body measurements (in micrometres unless otherwise indicated) of holotype, allotype and paratypes (ranges from 20 males and 20 females).

	Holotype	Allotype	Paratypes ♂♂	Paratypes ♀♀
Length (mm)	2.80	3.41	1.67 – 4.21	2.28 – 5.50
Max. width	206	252	137 – 359	153 – 443
Diameter of head	137	153	99 – 198	107 – 229
Pseudobuccal capsule length	151	170	113 – 174	125 – 214
Pseudobuccal capsule width	106	115	81 – 125	85 – 160
Entire oesophagus length	366	458	298 – 481	343 – 618
Diameter of posterior part of oesophagus	74	83	55 – 95	57 – 99
Nerve ring *	159	208	142 – 191	144 – 237
Excretory pore (mm) *	0.67	0.76	0.48 – 0.90	0.54 – 1.12
Deirid (left) *	511	580	382 – 710	420 – 938
Deirid (right) *	504	572	366 – 702	404 – 931
Intestinal caecum length	275	282	114 – 366	153 – 458
Tail length	99	175	84 – 130	137 – 198
Left spicule length (mm)	1.16	–	0.91 – 1.59	–
Right spicule length (mm)	1.03	–	0.80 – 1.28	–
Gubernaculum length	102	–	66 – 123	–
Vulva (mm) **	–	1.15	–	0.71 – 1.89
Egg		–	57 × 42	51 – 64 × 38 – 51

* measured from anterior extremity

** measured from posterior extremity

thickening on dorsal cloacal wall in lateral view (Figs. 8–9) but in ventral view it appears shield-shaped with broad proximal and narrow distal parts (Fig. 14).

Female (20 specimens): Phasmids lie laterally in mid tail region (Figs. 3, 18). Vulva in form of transverse slit (Figs. 5–6), located near junction of middle and posterior third of body, bears protuberant posterior lip (Fig. 19). Muscular vagina directed anteriorly, leading to 2 opposed uteri (Fig. 5). Eggs rounded or oval (Fig. 7), thin-walled and cleaved in uterus.

Specific diagnosis: With characters of *Dichelyne* Jägerskiöld, 1902. Body small, cylindrical. Cuticle thick, with transverse striations. Deirids just postoesophageal in position. Male tail without preanal sucker. Caudal alae short, ending abruptly just posterior to cloacal opening. Caudal papillae 11 pairs (excluding phasmids); 7 pairs preanal, 4 pairs postanal; one large ventral papilla with 2 nerve endings on anterior cloacal lip. Spicules similar but unequal, slender and alate. Gubernaculum shield-shaped, with wide proximal and narrow distal parts. Female vulva in form of transverse slit, with protuberant posterior lip. Eggs rounded or oval, thin-walled and cleaved in uterus.

Host: *Sillaginopsis panijus* (Hamilton) (Sillaginidae, Perciformes).

Type locality: Hooghly estuary, 23° N, 88° 28'E, Kalyani, West Bengal, India.

Site: intestine.

Date of collection: 18 February 1991 to 7 July 1993.

Infection level: prevalence 41.9%; intensity of infection 1–10 (mean 3.4).

Type material: Holotype (♂): Kalyani University, Helminthology Laboratory, Kalynai, India, 741235. Reg. No. KUHL 1991–93.26; date of collection 2 Dec. 1992.

Allotype (♀): Kalyani University, Helminthology Laboratory. Reg. No. KUHL 1991–93. 27; date of collection 2 Dec. 1992.

Paratypes (25 ♂♂ and 23 ♀♀): Kalyani University, Helminthology Laboratory. Reg. No. KUHL 1991–93. 28–69. The Natural History Museum. Cromwell Rd., London, BM(NH) Reg. No. 1994.6.28. 1–4. Institute of Parasitology, Academy of Sciences of the Czech Republic, České Budějovice; Cat. No. N – 638.

Etymology: The species name relates to the presence of distinct caudal alae in male.

DISCUSSION

Petter (1974) proposed a new classification for the family Cucullanidae Cobbold, 1864 on the basis of the study of some important characters and the correlation between these characters and the nature of the hosts. Three genera, including *Dichelyne* Jägerskiöld, 1902 with three subgenera, *Dichelyne*, *Cucullanellus* (Törnquist, 1931 gen.) and *Neocucullanellus* (Yamaguti, 1941 gen.) were recognised. The general morphology of the cucullanid worms recovered from the intestine of *Sillaginopsis panijus* exhibits a relationship with the genus *Dichelyne*. They possess no preanal sucker and so they are akin to the subgenus *Dichelyne*. Petter (1974), listed nine species under this subgenus. Four of these, namely *D. (D.) diminutus* (Rasheed, 1968), *D. (D.) exiguus* (Yamaguti, 1954), *D. (D.) indentatus* (Rasheed, 1968) and *D. (D.) rasheedae* Petter, 1974 were recorded from the Indian subcontinent. Subsequently Wang and Ling (1975) described a new species, *D. longispiculata*, from fishes of Fujian Province of China, and Vassiliades and Petter (1981) described another new species, *D. (D.) pomadasysi*, from Senegal and also incorporated *D. lepisosteus* Casto et McDaniel, 1967 and *D. longispiculata* in the subgenus *Dichelyne*. Recently, Petter (1989) added one more new species, *D. (D.) leporini*, from a Paraguayan fish. At present there are 13 nominal species listed under the subgenus *Dichelyne*. Among the above mentioned species from the Indian subcontinent, only *D. diminutus*, *D. exiguus* and *D. rasheedae* resemble the present worms both in general morphology and measurements. *Dichelyne indentatus*, however, bears larger body measurements. Nevertheless, all of them bear equal spicules, no caudal alae and no median ventral papilla on anterior cloacal lip and, therefore, differ from *D. alatae* sp. n. Only *D. longispiculata* possesses unequal spicules and thus resembles the present worms. The present nematodes, however, differ from *D. longispiculata* in the presence of distinct caudal alae at the level of cloacal opening and a different number of caudal papillae. Combinations of important features, such as small body size (< 6 mm), thick cuticle, the postoesophageal position of the deirids, short, wide caudal alae at the level of cloacal opening, seven paired and one unpaired preanal and 4 pairs postanal (excluding phasmids) papillae, a conical tail with minute spines distally, unequal alate spicules and a shield-shaped gubernaculum distinguish the present nematodes from other species of the subgenus *Dichelyne*.

In recent years, again a number of cucullanid worms, namely *Indocucullanus alii* Kalyankar, 1971, *D. thapari* Gupta et Masoodi, 1982, *D. dighaensis* Gupta et Masoodi, 1989, *Cucullanus gonii* Khan et al. 1991, *C. khalili* Khan et al. 1991, *C. vijayawadensis*

Raiyalakshmi, Hanumantha Rao et Shyamasundari, 1991 and *Neocucullanus indica* Gupta et Naiyer, 1992 has been described from the fishes of Indian subcontinent. Descriptions in most of these cases, however, are not based on detailed studies and are also inadequate. Petter (1974) considered the genus *Indocucullanus* Ali, 1956 as a synonym of *Cucullanus* Mueller, 1777 and referred to *I. alii* as *C. alii*. She, however, expressed doubt about the systematic position of this species, and in her opinion the presence of a short tail and the absence of a preanal sucker in *C. alii* show its close affinity with the genus *Dichelyne* and its nominate subgenus. Kalyankar (1971) described *C. alii* on the specimens recovered from the intestine of *Johinus dussumieri* (= *Sciaena glaucus*). Later, Soota and Dey Sarkar (1980) redescribed *C. alii* on the specimens collected from the intestine of *Sillago sihama* (Sillaginidae) and fishes of other families. Sood (1988), however, preferred to retain the species under the genus *Indocucullanus*. The present specimens were also recovered from the intestine of the sillaginid fish, *Sillaginopsis panijus* and resemble *C. alii* in morphology and measurements. The present worms, however, possess an intestinal caecum, alate spicules and distinct caudal alae in the male, and thus differ from *C. alii*. Differences also lie in their number and arrangement of the caudal papillae. *Dichelyne thapari* was described on a single male specimen. Its placement in the subgenus *Neocucullanellus* is doubtful as it bears only 6 pairs and 2 unpaired caudal papillae instead of more than 11 pairs. However, *D. thapari* bears preanal sucker and thus differs from *D. alatae* sp. n. Other important distinguishing features of *D. thapari* from the present worms are the absence of caudal alae in the male, shorter and non-alate spicules and different number of caudal papillae. Gupta and Masoodi (1989) reported the presence of broad lateral alae, reaching up to tail tip in both sexes of *D. dighaensis* Gupta et Masoodi, 1989, but the illustrations given (text to Figs. 1, 4 and 7) do not reveal that. It may be so that the very thick cuticle present throughout the body, as in some other cucullanid worm, was mistakably treated as cuticular ala (see De 1989). *D. alatae* sp. n. possesses deirids and excretory pore in the post-oesophageal region, unequal spicules and short and wide caudal alae in male and so differs from *D. dighaensis*. Among the rest four species only *C. vijayawadensis* possesses intestinal caecum and resembles the present worms. Raiyalakshmi et al. (1991), perhaps due to unawareness of the work of Petter (1974), included

their species under the genus *Cucullanus*. *C. vijayawadensis* differs from *D. alatae* sp. n. by the larger body size, presence of preanal sucker and absence of caudal alae in male. Shape and size of spicules are also different.

REFERENCES

- DE N. C. 1989: Morphology of *Cucullanus ritai* Karve, 1952 and remarks on the validity of the genus *Paracucullanus* Agrawal, 1965 and its type species. *Folia Parasitol.* 36: 153–160.
- INGLIS W. G. 1967: The relationship of the nematode superfamily Seuratoidea. *J. Helminthol.* 41: 115–136.
- GUPTA P. C., MASOODI B. A. 1982: Three new and one known piscine nematodes from Kanpur. *Kanpur Univ. Res. J. (Sci.)* 3: 57–70.
- GUPTA P. C., MASOODI B. A. 1989: *Dichelyne (Neocucullanellus) dighaensis* new species (Nematoda: Cucullanidae) from *Johinus glaucus* (Pisces: Sciaenidae) from Bay of Bengal, Digha coast, West Bengal, India. *Riv. Parassitol.* 50: 37–41.
- KALYANKAR S. D. 1971: Studies on a known and some new nematode parasites of fishes from India. *Marathwada Univ. J.* 10: 89–107.
- PETTER A. J. 1974: Essai de classification de la famille des Cucullandidae. *Bull. Mus. Natn. Hist. Nat., Paris*, 3^{ème} ser., No. 255, Zool., 177: 1469–1490.
- PETTER A. J. 1989: Nematodes de poissons du Paraguay. V. Cucullanidae. Description de deux especes nouvelles et redefinition du genre *Neocucullanus* Travassos et al. *Rev. suisse Zool.* 96: 591–603.
- RAJYALAKSHMI I., HANUMANTHA RAO K., SHYAMASUNDARI K. 1988: *Cucullanus vijayawadensis* n. sp. (Nematoda: Cucullanidae) from the intestine of freshwater fish, *Barbus ticto* (Gunther). *Riv. Parassitol.* 49: 317–324.
- SOOD M. L. 1988: Fish Nematodes from South Asia. Kalyani Publishers, New Delhi-Ludhiana, 389 pp.
- SOOTA T. D., DEY SARKAR S. R. 1980: On three species of the nematode genus *Cucullanus* Mueller, 1777, and a note on *Lappetascaris lutjani* Rasheed, 1965, from Indian marine fishes. *Rec. Zool. Surv. India* 76: 1–6.
- VASSILIADES G., PETTER A. J. 1981: Une nouvelle espèce de nematode parasite de poisson des côtes du Senegal. *Bull. IFAN, ser. A* 43: 104–110.
- WANG P., LING X. 1975: Some nematodes of the suborder Camallanata from Fujian Province, with notes on their life-histories. *Acta Zool. Sin.* 21: 350–358.

Received 1 August 1994

Accepted 19 June 1995