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**STUDIES ON NEMATODE PARASITES OF
INDIAN VERTEBRATES
I. FISHES**

**BY
T. D. SOOTA**

**Issued by the Director
Zoological Survey of India, Calcutta**

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FOREWORD

Nearly fifty years ago Baylis (1936, 1939) published in the *Fauna of India* series a comprehensive account of the Nematodes from the Indian region. Subsequent to this publication, several taxa have been described, many nomenclatural and taxonomic changes have been made, so that there was an urgent need of a concise up to date account of these parasitic worms. I am glad to note that Dr. T. D. Soota, recently retired as Deputy Director and at present Emeritus Scientist of this department has been able to complete the Nematode parasites of Vertebrates with part I for fishes in this publication. About 200 species have been dealt with and a host-parasite list is provided. Where possible keys for identification of genera and species are also given. I sincerely hope this publication will be found useful by all interested workers in India and abroad.

Calcutta
28th October, 1983

B. K. Tikader
Director,
Zoological Survey of India

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INTRODUCTION

Nematodes play a very significant part in the economy of man and this is clearly evident even from the very early literary records of the world. This significance is more so for animal parasitic nematodes in particular which take a heavy toll of health and life of man and the animals of his interest. The first comprehensive account of these nematodes from the Indian region was published by Baylis (1936, 1939) in the *Fauna of British India* series. Since then, an enormous amount of literature has accumulated on this group, but so far a comprehensive work to meet a long-felt need of workers on the group as well as in the allied fields, has not appeared. Hence, it was felt imperative to undertake such a work. This is to be published in four successive series to ultimately form a monograph. Although a lot of contributions on the group had been made in the past by foreign as well as Indian workers it is practically only in recent years that the study of this group has been laid on modern lines with the noteworthy contributions of Anderson, Chabaud, Hartwich, Schmidt, Sprent, Petter, Durette-Desset, Quentin, Moravec, Barus, Margolis, and others, most of whom gave decades of labour for achieving the present advancement.

The monograph has been divided in four parts. The first one forming the present work deals with those parasitising fishes ; of the subsequent parts to be completed shortly, the second covers those parasitising amphibians and reptiles ; the third birds ; and the fourth mammals. The classification followed for the higher taxa is more or less based on the CIH keys. For lower taxa, keys have been given in most cases. Though every effort has been made to include upto-date Indian references and also of the neighbouring countries like Pakistan, Sri Lanka, Bangladesh, Nepal and Burma, still, considering the magnitude of the work, there is a possibility of some omissions or even errors to occur. Nevertheless, the author feels that the information contained is on the whole, at least up to 1980 complete, some taxa even having been brought more upto-date. From the relevant literature, it appears that some of the genera like *Syphacia*, *Angusticaecum*, *Ophidascaris*, *Dujardinascaris*, *Porrocaecum*, *Ascaridia*, *Camallanides* and *Cyrnea*, are not fish parasites at least in adult stage. It is possible that these records for certain taxa are cases of accidental infection, wrong identification, or displaced labels. These records, therefore, need firm authentication by examination of more material from host species. Similar confirmation is also required for six Indian genera, viz. *Neocylicostrongylus* Arya and

Johnson, 1977, *Paracylicostongylus* Srivastava and Gupta, 1978, *Amphisakis* Chakravarty and Majumdar, 1959, *Paracucullanellus* Agrawal, 1965, *Pseudocucullanus* Kalyankar, 1971, and *Neospinitectus* Kalyankar, 1971, as well as for eight species, viz. *Cylicostongylus indicus* Gupta and Garg, 1978, *C. thapari* Sood, 1968, *Cosmoxynematoides nandusi* Sood, 1972, *Paracamallanus ophiocephali* Karve, 1941, *P. theraponis* Kalyankar, 1971, *Neocamallanus ophiocephali* Rehana and Bilqees, 1972, *Comephoronema johnsoni* Arya, 1979, and *Rhabdochona magna* Khan and Yaseen, 1969, as they lack adequate descriptions. Therefore, the author holds that all the above taxa may be treated as *sedes incertae*, and has accordingly dealt with them at the end of this work where they are also accompanied by justifying remarks. Still, wherever it has been possible to obtain effective data, the monograph relegates some species and genera to the synonymy of several taxa, or makes new combinations. With regard to certain other taxa, while for some of these the author feels bound to present his own views for others suppressing his personal opinion, he has listed them in accordance with the existing combinations of earlier author (s), thus leaving the better assessment of their taxonomic validity to future reviewers. The illustrations included are redrawn from original sources unless otherwise stated. All measurements are in millimeters.

SYSTEMATIC ACCOUNT

Subclass I. ADENOPHOREA

Order ENOPLIDA

Superfamily 1 *DIOCTOPHYMATOIDEA*

Family DIOCTOPHYMATIDAE Railliet, 1915

Genus *Eustrongylides* Jagerskiold, 1909

Eustrongylides sp. larva

(Fig. 1, A & B)

1974. *Eustrongylides* sp. Kalyankar, *Acta parasit. pol.*, 22 (30), p. 331 (larva).

1979. *Eustrongylides* sp. Naidu, *Curr. Sci.*, 48 (5), p. 223 (larva).

Description : Body 30-55.36 long, 0.525-0.630 wide, with thick and smooth cuticle, and bluntly conical anterior end, posterior end being truncated to form a prepuce-like fold ; head with two circles of 12 papillae, each with two lateral and four submedian ones ; papillae 0.010-0.012 high, 0.005-0.006 in basal diameter ; lateral head papillae followed on each side by about 127 papillae ; buccal cavity tubular, 0.19-0.225 long ; nerve ring 0.20-0.30 from anterior end ; oesophagus 8.295-13.51 long.

Hosts : *Heteropneustes fossilis* ; *Ompok bimaculatus* ; *Wallago attu* ; *Mystus seenghala* ; *Mastacembalus armatus*.

Location : Mesenteries of the anterior portion of the alimentary canal near the stomach ; and in the body cavity.

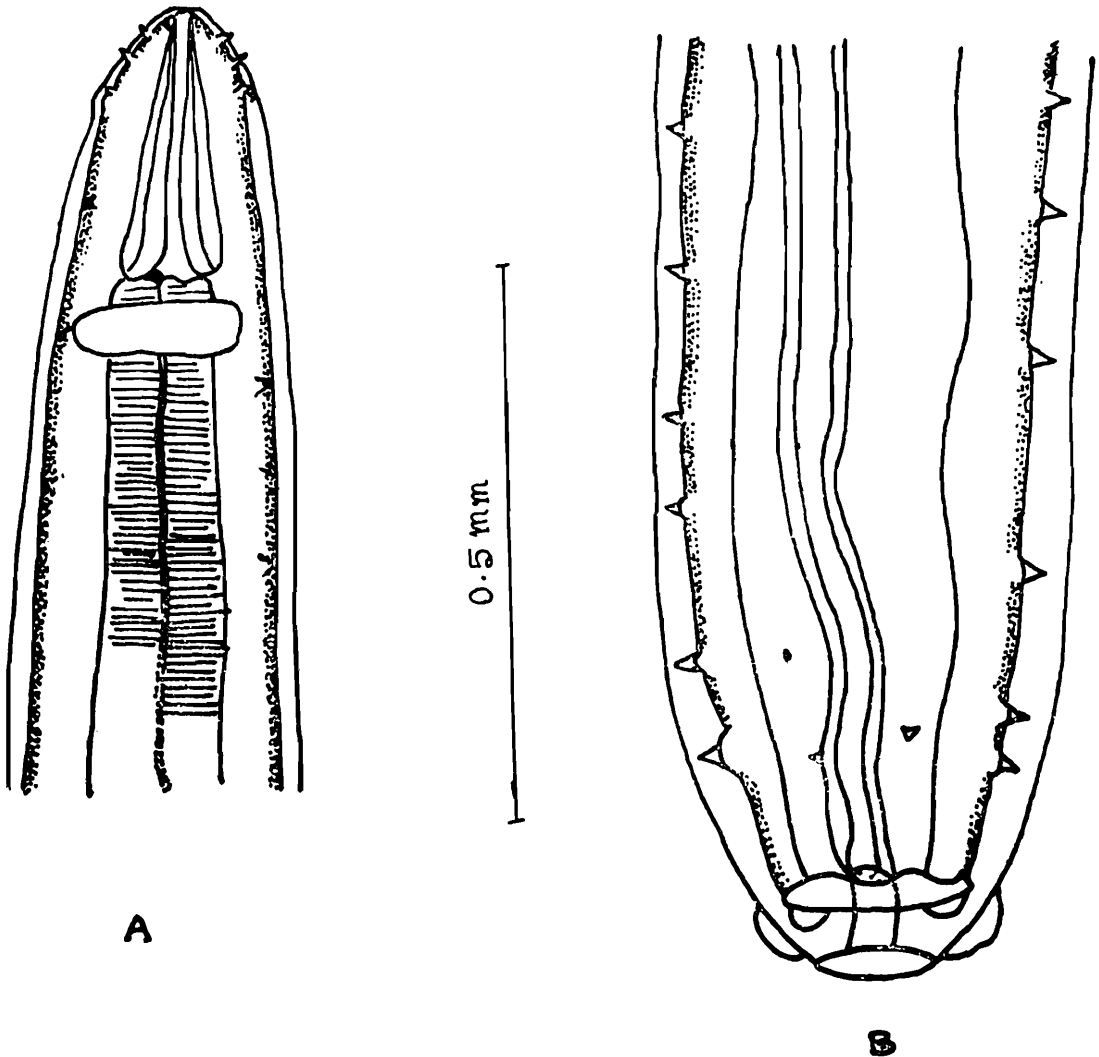


Fig. 1. *Eustrongylides* sp. larva. (After Kalyankar, 1974.) A. anterior end ; B. posterior end.

Localities : Karapilavillu, near Manampitiya, Minneriya tank, North Central Province (Sri Lanka) ; Vidarbha and Nanded, Maharashtra (India).

Remarks : Larvae of this genus were reported by Fernando and Furtado (1963) from three fishes, viz. *Heteropneustes fossilis*, *Ompok bimaculatus*, and *Wallago attu* from Sri Lanka ; by Kalyankar (1974) from another fish, *Mystus seenghala* from Nanded, Maharashtra (which host was considered as primary and piscivorous birds as definitive) ; and by Naidu (1979) from *Mastacembalus armatus* also from Maharashtra. However, adults have been recently reported for the first time from aquatic Australian snakes by Jones (1978).

Superfamily 2 *TRICHUROIDEA*

Family TRICHURIDAE Railliet, 1915

Genus *Capillaria* Zeder, 1800*Capillaria* sp.

1969. *Capillaria* sp. Rai, *Indian J. Helminth.*, 21 (2), p. 105.

Description : Female. Body 7.6 long, 0.08 wide ; oesophagus 2.05 long ; nerve ring 0.09 and excretory pore 0.20, both from anterior end ; tail 0.08 long ; vulva pre-equatorial, 2.85 from anterior end ; eggs $0.05 \times 0.024-0.025$.

Host : *Mystus seenghala*

Location : Intestine

Locality : Gorakhpur, U. P.

Remarks : In India, from fish the first record of the genus is by Moorthy (1938) who reported larval forms from three different fishes, viz. *Tor puckelli*, *T. ticto*, and *Lepidocephalichthys thermalis* from Karnataka. Subsequently, Rai (1969) reporting an adult female from a fish, *Mystus seenghala* from Gorakhpur, U. P., indicated the possibility of both, juveniles and adults, occurring in Indian fresh water fishes. He, however, was unable to give a correct identification in the absence of male specimens.

Subclass II. SECERNENTEA

Order STRONGYLIDA

Superfamily *TRICHOSTRONGYLOIDEA*

Family TRICHOSTRONGYLIDAE Leiper, 1912

Subfamily HAEMONCHINAE Skrjabin and Schulz, 1952

Genus *Haemonchus* Cobb, 1898*Haemonchus contortus* (Rud., 1803) Cobb, 1898

1803. *Strongylus contortus* Rudolphi, *Archiv. fur Zoologie und Zootomie*, 3, p. 15.

1898. *Haemonchus contortus* Cobb, *Agricultural Gazette New South Wales*, 9, p. 447.

1935. *Haemonchus contortus* : Almeida, *Mems. Inst. Oswaldo Cruz.*, 30, p. 72.

1979. *Haemonchus contortus* : Gibbons, *Systematic Parasitology*, 1 (1), p. 3.

Description : Male. Body 10.0-20.0 long, 0.23-0.4 wide ; buccal tooth 0.01-0.15 long ; oesophagus 1.2-1.5 long, club-shaped ; nerve ring 0.26-0.28, excretory pore 0.3-0.32 and cervical papillae 0.3-0.44, all from

anterior end ; spicules dark brown in colour, 0.3-0.5 long and each with small barb ; gubernaculum 0.17 long ; bursa well developed and trilobed, lateral lobes large, dorsal small and asymmetrical, attached near the base of the left lobe ; ventral rays distally divergent ; dorsal distally bifurcated into two branches, each slender, left one arising with the main stem of the dorsal ray in the left lateral lobe of bursa.

Female. Body 18.0-30.0 long, 0.2-0.45 wide ; buccal tooth 0.01-0.017 long ; oesophagus 1.56-1.64 long ; nerve ring 0.24-0.28, excretory pore 0.29-0.30 and cervical papillae 0.33-0.40, all from anterior end ; tail 0.4-0.66 long ; vulva 4.2-4.4 from posterior end, covered by a backwardly directed tongue shaped flap ; eggs $0.04-0.09 \times 0.025-0.05$.

Host : *Wallago attu*

Location : Intestine

Localities : Patna, Bihar ; Lucknow, U. P.

Remarks : Rudolphi (1803) described the species *Strongylus contortus* for the reception of which Cobb (1898) erected the genus *Haemonchus*. The latter genus, which has recently been revised by Gibbons (1979), has so far been reported only from ruminant mammals from several parts of world. However, Sahay (1966) and Sood (1968) reported this species from fish, *Wallago attu* from Patna, Bihar, and Lucknow, U. P. respectively. Its occurrence in piscian host is questionable and if at all correctly indentified should be considered as accidental infection.

Order 2. ASCARIDIDA

Superfamily 1 COSMOCERCOIDEA

Family (i) KATHLANIIDAE Lane, 1914 status emend. Travassos, 1918

Subfamily KATHLANIINAE Lane, 1914

Genus *Falcaustra* Lane, 1915

Leidy (1856) established the genus *Spironoura* with *S. gracilis* as its type species for his specimens from tortoise (*Emys serrata*) from the United States. Lane (1915) created the genus *Falcaustra* to accommodate *F. falcata* (v. Linstow, 1906) from *Geoemyda trijuga*. But, Yorke and Maplestone (1926) treated the latter genus as synonym of the former and this was followed by subsequent workers. Skrjabin and Schikhovalova (1951) erected the genus *Nematoxynema* for *Nematoxys piscicola* Linstow, 1907. Singh (1958) described another genus *Velariocephalus* for his species, *V. trilokiae*. Both the genera were, however, considered congeneric with *Spironoura* by Inglis (1959), and Khalil (1962) respec-

tively and supported by Chabaud (1965) and Hartwich (1975). But, in the recent classification of the group by Chabaud (1978) the genus *Falcaustra* has been upheld and all the above mentioned genera treated as its synonym for the reason that the type species, *S. gracilis* is poorly defined and this is followed here. Further, three species reported from this area from fishes under the genus *Kathlania* Lane, 1914, which genus normally parasitises marine turtles, are provisionally transferred under it till a thorough revision of the groups is undertaken.

The genus occurs in fishes, amphibians and reptiles and has been reported from several parts of the world. Hitherto, fourteen species are known under it from this area, of which *F. barbi* Baylis and Daubney, 1922, *F. brevicaudatum* (Khan and Yaseen, 1969), *F. chiloscyllyi* (Thwaite, 1927), *F. chauhani* (Soota, 1975), *F. kaverii* (Karve and Naik, 1951), *F. khadrai* (Karve, 1941), *F. leptcephala* Baylis and Daubney, 1922, *F. nilgiriensis* (Soota and Chaturvedi, 1971), and *F. stromatei* (Bilqees and Khanum, 1971) are reported exclusively from fishes, and one *F. trilokiae* (Singh, 1958) only from frog, and another *F. brevispiculata* (Baylis, 1935), reported from frogs from India and Sri Lanka, as well as from fish, *Puntius carnaticus* from India, the latter record being probably of accidental infection and hence not included in the key below; and three, *F. stewarti* Baylis and Daubney, 1922, *F. testudinis* Baylis and Daubney, 1922, and *F. onama* (Karve, 1927) from tortoises. A key of species from fishes is given below.

1. Preanal sucker present	...	2
Preanal sucker absent	...	6
2. Spicules equal	...	3
Spicules unequal	...	5
3. Lateral alae present	...	<i>F. chiloscyllyi</i>
Lateral alae absent	...	4
4. Caudal papillae 10 pairs	...	<i>F. barbi</i>
Caudal papillae 11 pairs	...	<i>F. kaverii</i>
5. Caudal papillae 10 pairs	...	<i>F. brevicaudatum</i>
Caudal papillae 11 pairs	...	<i>F. stromatei</i>
6. Gubernaculum absent	...	<i>F. leptcephala</i>
Gubernaculum present	...	7
7. Postanal papillae 4 pairs	...	<i>F. chauhani</i>
Postanal papillae 5 pairs	...	8
8. Spicules broadly alate	...	<i>F. nilgiriensis</i>
Spicules not broadly alate	...	<i>F. khadrai</i>

Falcaustra barbi Baylis and Daubney, 1922

1922. *Falcaustra barbi* Baylis and Daubney, *Mem. Indian Mus.*, 7, p. 305.
1926. *Spironoura barbi* Yorke and Maplestone, *Nematode parasites of Vertebrates*, p. 239.
1936. *Spironoura barbi* : Baylis, *F. B. I.*, 1, p. 165.
1951. *Spironoura kalasiensis* Karve and Naik, *J. Univ. Bombay*, 19 (5), p. 6.
1962. *Spironoura sudanensis* Khalil, *J. Helminth.*, 36, p. 51.
1975. *Spironoura barbi* : Soota, *Dr. B. S. Chauhan Comm. Vol. Zool. Soc. India.*, p. 242.
1977. *Spironoura barbi* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 4.
1977. *Spironoura kalasiensis* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 4.

Description : Male. Body 5.0-16.5 long, 0.16-0.7 wide ; head almost globular, followed by neck ; buccal cavity, pharynx and prebulbar swelling present ; oesophagus 1.1-2.1 long ; tail 0.33-0.6 long ; sucker 1.5-3.7 from caudal end ; spicules 0.22-1.13 long ; gubernaculum 0.077-0.2 long ; caudal papillae 10 pairs, and a median unpaired adanal papilla.

Female. Body 7.0-19.6 long, 0.31-1.0 wide ; anterior end as in male ; oesophagus 1.4-2.8 long ; tail 0.33-0.8 long ; vulva 3.2-7.3 from posterior end ; eggs $0.055-0.088 \times 0.05-0.088$.

Hosts : *Tor tor*, *Scaphiodon nashii* [= *Osteochilus (Osteochilichthys) nashii*] ; *Distichodus brevipennis*

Location : Intestine

Localities : Bangladesh ; Karnataka, Meghalaya (India) ; Sudan (Africa)

Remarks : The above synonymies have already been detailed by the author (1975).

Falcaustra brevicaudatum (Khan and Yaseen, 1969) n. comb.

(Fig. 2, A & B)

1969. *Kathlania brevicaudatum* Khan and Yaseen, *Bull. Dep. Zool. Punjab Univ.*, article 4, p. 1.

Description : Male. Body 10.16-11.50 long, 0.32-0.33 wide ; cuticle smooth, without striations but with a few bosses ; lateral alae moderately

developed ; lips 3, $0.03-0.033 \times 0.05$, each consisting of large main lobe and four smaller subsidiary intermediate ones, two on each side of main lobe, and an additional subsidiary lobe between two subventral lips ; each main lobe of lips with pair of small papillae on inner side ; buccal capsule with 3 teeth-like structures at anterior end ; oesophagus 0.85-0.88 long, club-shaped ; oesophageal bulb with valvular apparatus, 0.18×0.15 ; tail 0.24 long, with pointed spike ; sucker 0.15 long ; spicules broadly alate, unequal, 1.77 and 0.5 long ; gubernaculum y-shaped ; caudal papillae 10 pairs, 5 preanal, 1 adanal, 4 postanal.

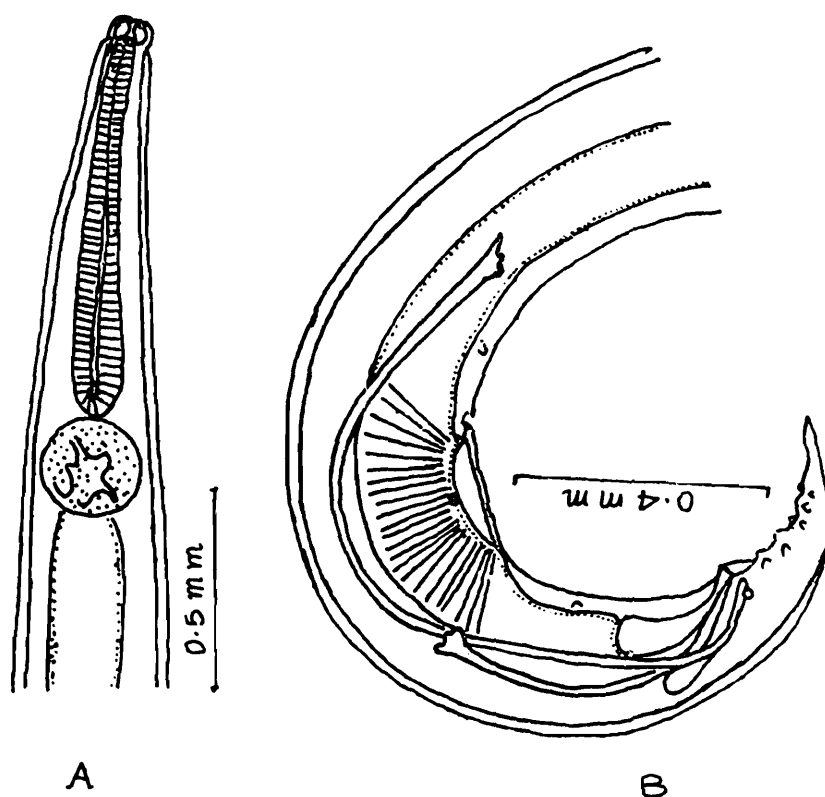


Fig. 2. *Falcaustra brevicaudatum*. (After Khan and Yaseen, 1969.) A. anterior end ; B. male posterior end.

Host : *Ompok bimaculatus*

Location : Intestine

Locality : Sylhet (Bangladesh)

Remarks : This species based on two males only was described from a fish, *Ompok bimaculatus* from Bangladesh by Khan and Yaseen (1969) as *Kathlania brevicaudatum*. But, sufficient morphological differences such as, shape of spicules, gubernaculum, and tail are evident from the description and figures, which do not justify its inclusion under *Kathlania* (normally a parasite of marine turtles) rather they suggest its inclusion under *Falcaustra*. Pending further studies of these groups, the species is treated under the latter genus.

Falcaustra chauhani (Soota, 1975)

(Fig. 3)

1975. *Spironoura chauhani* Soota, *Dr. B. S. Chauhan Comm. Vol. Zool. Soc. India*, p. 241.

1979. *Falcaustra chauhani* Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., 1 (4), p. 1012.

Description : Male. Body 7.7-10.8 long, 0.33-0.44 wide ; oesophagus including bulb 1.6-2.2 long ; bulb 0.22 long ; tail 0.33-0.44 long ; sucker absent ; spicules alate, equal, 0.41-0.44 long ; gubernaculum 0.11-0.13

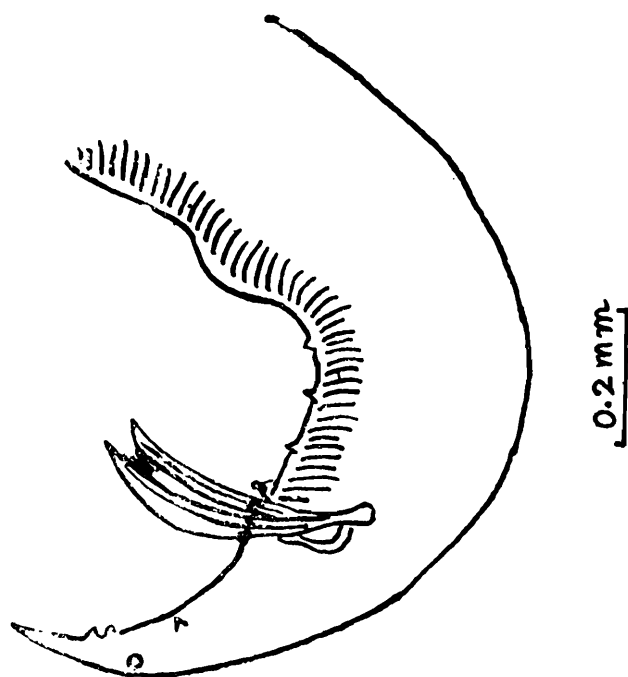


Fig. 3. *Falcaustra chauhani*. (After Soota, 1975.) Male posterior end.

long ; caudal papillae 10 pairs, 3 preanal, 3 adanal, 4 postanal, an unpaired preanal median.

Host : *Tor tor*

Location : Intestine

Locality : Shillong, probably Barapani Lake, Meghalaya

Falcaustra chiloscyllyi (Thwaite, 1927) n. comb.

1927. *Kathlania chiloscyllyi* Thwaite, *Ann. trop. Med. Parasit.*, 21, p. 236.

1936. *Kathlania chiloscyllyi* : Baylis, *F. B. I.*, 1, p. 160.

1977. *Kathlania chiloscyllyi* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 4.

Description : Male. Body 8.3-10.0 long, 0.4-0.46 wide ; cuticular striations fine ; lateral alae beginning about 0.65 from anterior end, extending upto in front of sucker ; head $0.055-0.07 \times 0.13-0.16$; each

lip with a main lobe and a variable number of accessory ones ; teeth in buccal cavity roughly pentagonal ; oesophagus 2.15-2.92 long ; buccal capsule 0.07-0.11 long ; bulb 0.23×0.3 ; cervical papillae 1.78 from anterior end ; tail 1.25-1.5 long ; sucker 0.2×0.1 , oval, 0.35 from cloacal aperture ; spicules relatively slender, sharply pointed, 2.0-2.6 long ; caudal papillae 11 pairs, 6 preanal, 5 postanal.

Female. Body 10.0-12.6 long, 0.43-0.5 wide ; anterior end as in male ; lateral alae beginning as in male, extending at about level of vulva ; tail 2.77-2.95 long ; vulva 4.58-5.7 from posterior end ; eggs 0.08×0.045 .

Host : Dog fish (*Chiloscyllium indicum*)

Location : Intestine

Locality : Sri Lanka

Remarks : The inclusion of the species here is purely tentative for not only does it share characters with the genus *Kathlania* but it is also rather inadequately described.

Falcaustra kaverii (Karve and Naik, 1951)

(Fig. 4)

1951. *Spironoura kaverii* Karve and Naik, *J. Univ. Bombay*, 19 (5), p. 2.

1977. *Spironoura kaverii* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 4.

Description : Male. Body 13.7-15.5 long, 0.6-0.75 wide ; head 0.15-0.17 wide, slightly wider than neck ; buccal cavity 0.055-0.06 ; oesophagus including bulb 2.3-2.425 long ; prebulbar swelling $0.13-0.15 \times 0.13-0.14$; bulb $0.23-0.26 \times 0.25-0.28$; nerve ring 0.38-0.43, cervical papillae 1.175-1.55, and excretory pore 1.7-1.975, all from anterior end ; tail 0.48-0.51 long ; preanal sucker present ; spicules alate, 2.0-2.225 long ; gubernaculum 0.14-0.18 long ; caudal papillae 11 pairs, 3 preanal, 1 adanal, 7 postanal, an unpaired preanal median.

Female. Body 12.8-17.21 long, 0.65-0.8 wide ; head 0.145-0.18, wider than neck ; pharynx 0.065 long ; oesophagus including bulb 1.75-2.425 long ; prebulbar swelling $0.145-0.15 \times 0.13-0.15$; bulb $0.2-0.26 \times 0.25-0.29$; nerve ring 0.35-0.562, cervical papillae 0.85-1.15, and excretory pore 1.15-1.57, all from anterior end ; tail 0.31-0.37 long, with pair of caudal papillae 0.21-0.25 from tip ; vulva 5.55-6.9 from posterior end ; eggs $0.06-0.07 \times 0.045-0.06$,

Host : *Puntius carnaticus*

Location : Intestine

Locality : Karnataka

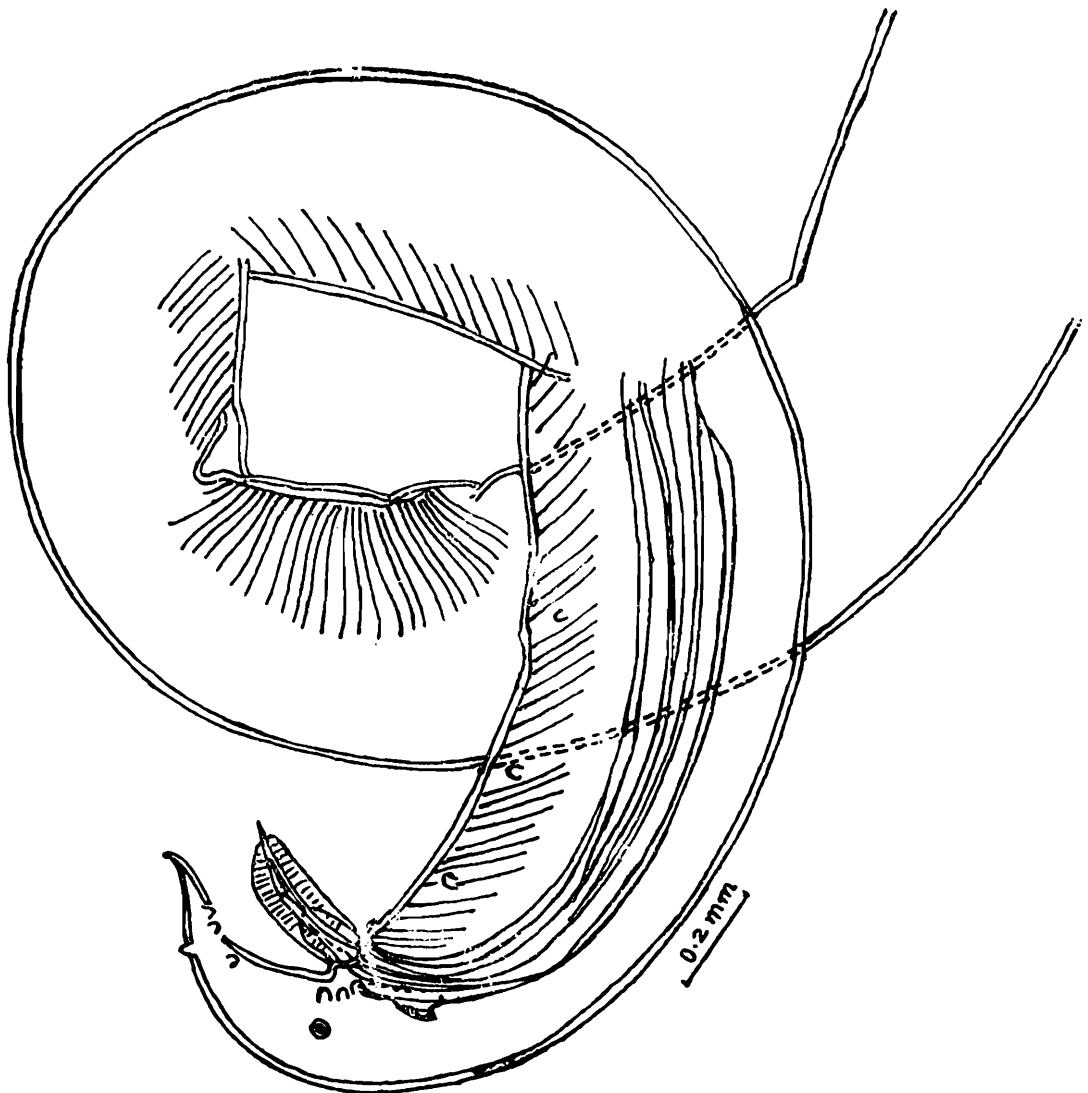


Fig. 4. *Falcaustra kaverii*. (After Karve and Naik, 1951.) Male posterior end.

***Falcaustra khadrai* (Karve, 1941)**

(Fig. 5)

1941. *Spironoura khadrai* Karve, *J. Univ. Bombay*, 10 (3), p. 10.

1977. *Spironoura khadrai* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 4.

1979. *Falcaustra khadrai* Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., 1 (4), p. 1012.

Description : Male. Body 7.15-14.25 long, 0.56-0.872 wide ; head 0.144-0.181 ; pharynx 0.056-0.059 $\times$ 0.099-0.112 ; oesophagus including bulb 1.871-2.208 long ; nerve ring 0.336-0.4, cervical papillae 1.15-1.23, and excretory pore 1.46-1.48, all from anterior end ; tail 0.36-0.365 long ; sucker absent ; spicules equal, 0.35-0.38 long ; gubernaculum 0.085-0.1 long ; caudal papillae 10 pairs, 5 preanal, 5 postanal, an unpaired preanal median.

Female : Body 12.4-13.0 long, 0.575-0.6 wide ; head 0.16-0.165 ; pharynx $0.05-0.064 \times 0.088-0.095$; oesophagus including bulb 1.925-2.17 long ; nerve ring 0.34-0.45, cervical papillae 1.06-1.07, and excretory pore 1.55-1.65, all from anterior end ; tail 0.46-0.61 long, with pair of

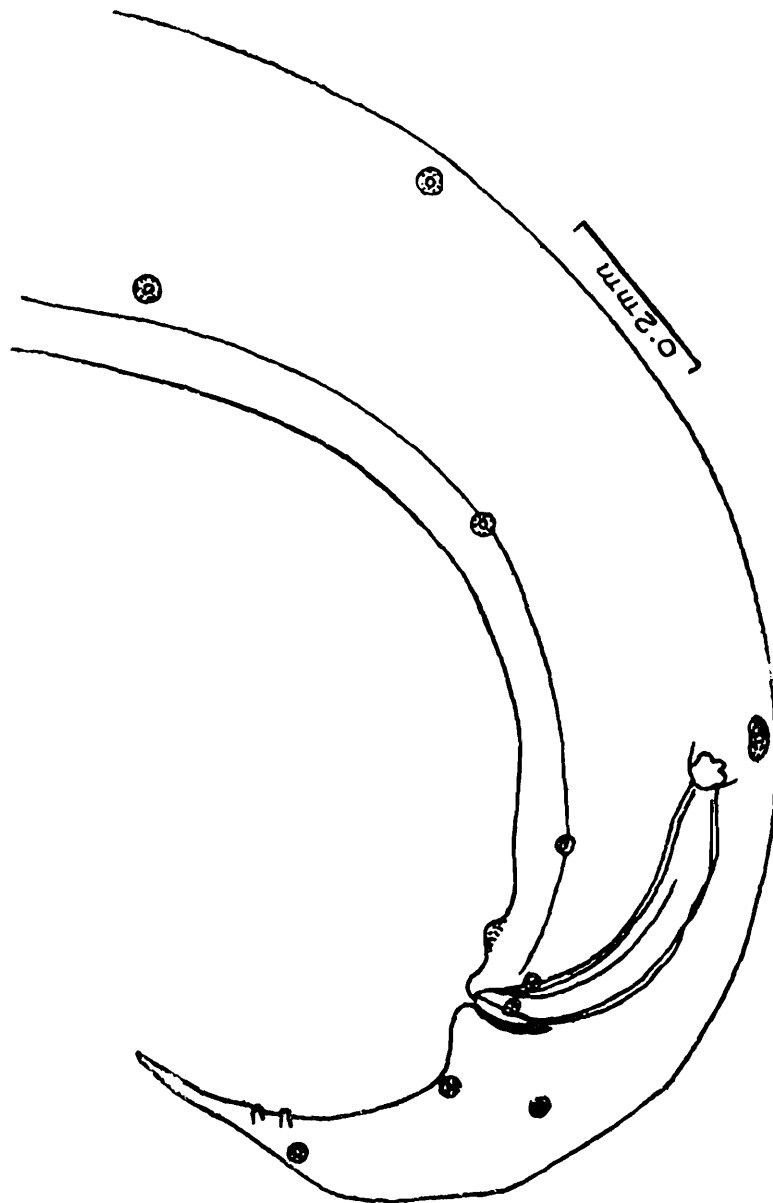


Fig. 5. *Falcaustra khadrai*. (After Karve, 1941.) Male posterior end.

caudal papillae 0.19-0.32 from tip, and another inconspicuous behind it ; vulva 7.5-7.6 from anterior end ; eggs $0.089-0.99 \times 0.065-0.072$.

Host : *Puntius dobsoni*

Location : Intestine

Locality : Pune, Maharashtra

***Falcaustra leptcephala* Baylis and Daubney, 1922**

1922. *Falcaustra leptcephala* Baylis and Daubney, *Mem. Indian Mus.*, 7, p. 306.

1926. *Spironoura leptcephalum* Yorke and Maplestone, *Nematode parasites of Vertebrates*, p. 239.

1936. *Spironoura leptcephala* : Baylis, *F. B. I.*, 1, p. 167.
1975. *Spironoura leptcephala* : Soota, *Dr. B. S. Chauhan Comm. Vol. Zool. Soc. India*, p. 241.
1977. *Spironoura leptcephala* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 4.

Description : Male. Body upto 19.0 long, 1.3 wide ; head very narrow, 0.1-0.12 in diameter, ; "neck" absent ; oesophagus upto 3.5 long ; buccal cavity about 0.05-0.06, pharynx 0.14-0.17, and prebulbar swelling alongwith bulb 0.6-0.67 long ; nerve ring 0.45-0.5, cervical papillae 1.3-1.4, and excretory pore 2.0-2.15, all from anterior end ; tail 0.7-0.85 long : preanal sucker absent ; spicules 1.0 long ; gubernaculum absent ; caudal papillae 10 pairs, an unpaired preanal median.

Female. Body upto 27.0 long, 1.4-1.8 wide ; anterior end as in male ; tail 1.1-1.3 long, with pair of very inconspicuous papillae 0.6 from tip ; vulva 11.0 from posterior end ; eggs 0.075×0.05 .

Host : *Tor tor*

Location : Intestine

Locality : Bangladesh

Falcaustra nilgiriensis (Soota and Chaturvedi, 1971)

(Fig. 6, A & B)

1971. *Spironoura nilgiriensis* Soota and Chaturvedi, *Zool. Anz.*, 186 (1/2), p. 156.
1977. *Spironoura nilgiriensis* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 5.
1979. *Falcaustra nilgiriensis* Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., 1 (4), p. 1012.

Description : Male. Body 7.5-9.6 long, 0.44-0.57 wide ; head 0.11-0.14 wide ; buccal cavity 0.04 long ; pharynx 0.07 long ; oesophagus 0.9-1.2 long ; prebulbar swelling 0.13-0.18 long ; bulb $0.22-0.25 \times 0.22-0.27$; tail 0.29-0.35 long ; spicules 0.24-0.35 long, with broad alae not extending to tip ; gubernaculum 0.11 long ; caudal papillae 10 pairs, of which 5 postanal and an unpaired preanal median.

Female : Body 7.4-8.3 long, 0.53-0.55 wide ; head 0.11 wide ; buccal cavity 0.03-0.04 long ; pharynx 0.04-0.07 long ; oesophagus 0.88-1.1 long ; prebulbar swelling 0.13-0.16 long ; bulb $0.24 \times 0.19-0.22$; tail 0.34-0.35 long ; vulva 3.0-3.3 from posterior end ; eggs $0.055-0.07 \times 0.077$.

Host : *Puntius carnaticus*

Location : Intestine

Locality : Nilgiris, Madras



Fig. 6. *Falcaustra nilgiriensis*. (After Soota and Chaturvedi, 1971.) A. male posterior end ; B. spicule.

Falcaustra stromateii (Bilqees and Khanum, 1971) n. comb.

(Fig. 7, A & B)

1971. *Kathlania stromateii* Bilqees and Khanum, *Pakist. J. Zool.*, 3 (1), p. 67.

Description : Male. Body 7.28 long, 0.3 wide ; lateral alae absent ; cuticle in cephalic region smooth, elsewhere finely striated ; cuticular bosses absent ; cephalic region not marked off from body ; lips 3, 0.013×0.019 ; buccal capsule with 3 rounded teeth-like structures at base ; pharynx well-developed, glandular, 0.065×0.039 ; oesophagus 0.9 long, club-shaped, bulb 0.16×0.21 ; tail 0.24 long ; preanal pseudosucker 0.21

long, without chitinous rim, 0.35 from cloacal opening ; caudal alae absent ; spicules two, broadly alate, unequal, 1.0 and 0.33 long ; gubernaculum V-shaped, with anterior external margins supported by chitinous structures ; caudal papillae sessile, 11 pairs, 5 preanal, 1 adanal, 5 postanal.

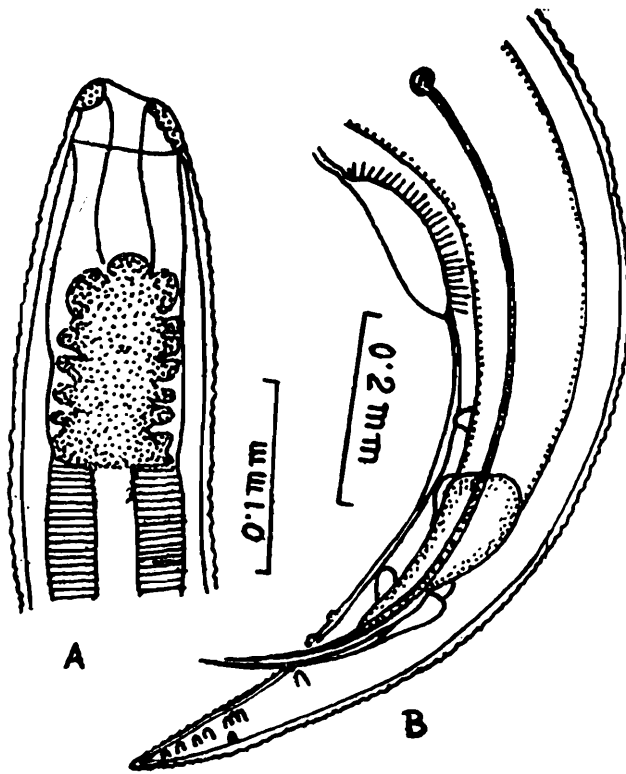


Fig. 7. *Falcaustra stromateii*. (After Bilquees and Khanum, 1971.) A. anterior end ; B. male posterior end.

Host : *Pampus chinensis*

Location : Intestine

Locality : Karachi (Pakistan)

Remarks : As this species is based on a single male only, study of more material is necessary to obtain more desirable elaborations until which it is retained here as distinct.

Family (ii) ATRACTIDAE Railliet, 1917 status emend. Travassos, 1919

Genus *Monhysterides* Baylis and Daubney, 1922

This genus is known by the species *Monhysterides piscicola* Baylis and Daubney, 1922, from Mahseer (*Tor tor*) from Bangladesh and an undetermined female reported by Sood (1972) from *Wallago attu* from Lucknow.

Monhysterides piscicola Baylis and Daubney, 1922

1922. *Monhysterides piscicola* Baylis and Daubney, *Mem. Indian Mus.*, 7, p. 342.

1936. *Monhysterides piscicola* : Baylis, *F. B. I.*, 1, p. 211.

1977. *Monhysterides piscicola* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 4.

Description : Male. Body 3.5-4.0 long, 0.15-0.2 wide ; cuticular striations fine ; oesophagus divided into two parts, anterior short, muscular, 0.2 long, posterior long, granular but also muscular, 0.32 ; nerve ring 0.22 and excretory pore 0.4, both from anterior end ; tail 0.34 long, tapering to a point ; spicules two, unequal, left 0.21 long, right 0.08 ; caudal papillae 9 pairs, 4 preanal, 5 postanal.

Female : Body 3.7-4.4 long, 0.15-0.2 wide ; anterior end as in male ; tail 0.55-0.65 long, tapering ; vulva 0.45 from cloaca.

Host : Mahseer (*Tor tor*)

Location : Intestine

Locality : Torsa river, Falakata (Bangladesh)

Monhysterides sp.

1972. *Monhysterides* sp. Sood, *Zool. Anz.*, 188 (1/2), p. 109.

Description : Female. Body 3.38' long, 0.19 wide ; cuticular striations fine ; mouth with 6 small lips, each with single papilla ; oesophagus divided into two parts, anterior short, muscular, 0.14 long, posterior long, glandular, 0.23 ; nerve ring 0.21 and excretory pore 0.39, both from anterior end ; tail 0.55 long, finely tapering ; vulva 0.41 from cloacal opening.

Host : *Wallago attu*

Location : Stomach

Locality : Lucknow, U. P.

Remarks : Sood (1972) reported a female from *Wallago attu* from Lucknow.

Superfamily 2 *SEURATOIDEA*Family (i) *Quimperiidae* Baylis, 1930Subfamily *QUIMPERIINAE* Gendre, 1928

Hitherto, from this area six genera from fishes are reported under it, a key of which is given below.

1. Preanal sucker absent or weakly developed. ...	...	2
Preanal sucker present, ...	...	3

2. Lips. and oblique muscle bands in preanal region of male absent ; oesophagus without pharynx, and teeth not protruding into buccal cavity.

... Haplonema Ward and Magath, 1917

Lips and oblique muscle bands present ; oesophagus with distinct pharyngeal portion, and teeth protruding into buccal cavity.

... Paraquimperia Baylis, 1934
3. Cephalic vesicle absent ; cervical alae well-developed.

... 4

Cephalic vesicle present ; cervical alae usually absent.

... 5
4. Oesophagus gradually swelling posteriorly ; buccal cavity present but weakly developed.

... Paragendria Baylis, 1939

Oesophagus cylindrical, buccal cavity absent

... Pingus Hsu, 1933
5. Buccal cavity with 3 teeth, with both ventrolaterals sometimes reduced.

... Gendria Baylis, 1930

Buccal cavity with 6 teeth.

... Buckleynema Ali and Singh, 1954

Genus **Buckleynema** Ali and Singh, 1954

Ali and Singh (1954) created the genus *Buckleynema* with *B. buckleyi* as its type species for their specimens from *Mystus cavasius* from Hyderabad, Andhra Pradesh. Another species *B. singhi* from *Mystus seenghala* from Gorakhpur, U. P., was added by Rai (1969). A key for both these is given below.

Caudal papillae 8 pairs.	...	<i>B. singhi</i>
Caudal papillae 11 pairs.	...	<i>B. buckleyi</i>

Buckleynema buckleyi Ali and Singh, 1954

(Fig. 8, A & B)

1954. *Buckleynema buckleyi* Ali and Singh, *J. Helminth.*, 28 (1-2), p. 17.
1969. *Buckleynema buckleyi* : Rai, *Indian J. Helminth.*, 21 (2), p. 103.
1977. *Buckleynema buckleyi* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 5.

Description : Male. Body 5.8-6.45 long, 0.19-0.22 wide ; head bluntly rounded, with cuticular cephalic inflation ; mouth bounded by triangular cuticular rim ; cephalic papillae and “amphids” very prominent ; submedians prominent appearing on head like knobs between which amphids situated laterally ; four spike-like structures directed anteriorly associated with submedian papillae ; teeth 3 pairs, projecting into mouth cavity from its three angles ; oesophagus 0.37-0.39 long, club-shaped, and with a pair of uninucleate glands with granular cytoplasm in its

posterior half ; nerve ring 0.16-0.18, and excretory pore 0.6-0.65, both from anterior end ; tail 0.22-0.23 long, sharply pointed, with slightly developed caudal alae ; sucker 0.32 from cloacal aperture ; caudal pores or "phasmids" about 0.1 from cloacal aperture ; spicules 0.128-0.13 long,

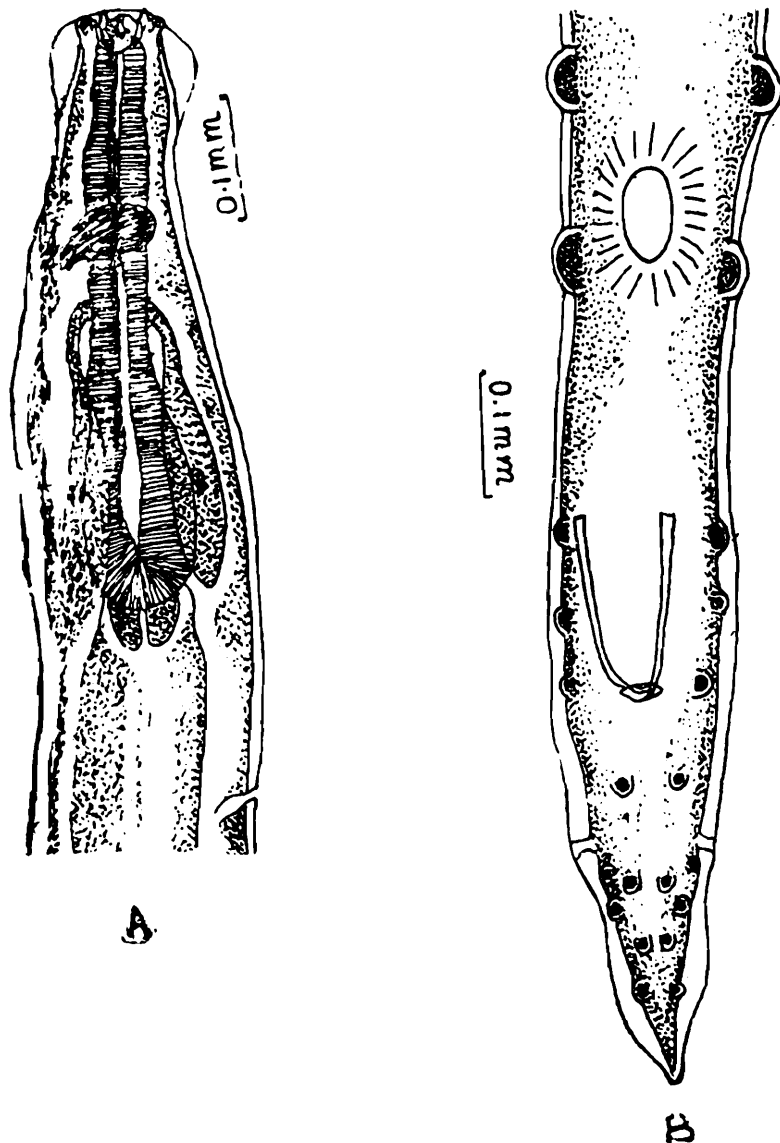


Fig. 8. *Buckleynema buckleyi*. (After Ali and Singh, 1954.) A. anterior end ; B. male posterior end.

acicular, similar ; gubernaculum "V" shaped ; caudal papillae 11 pairs, 5 preanal, 6 postanal ; a pair of minute papillae on membranous flap projecting from anterior border of cloacal aperture.

Female : Body 9.43-10.5 long, 0.34-0.38 wide ; anterior end as in male ; oesophagus 0.37-0.39 long ; nerve ring 0.18-0.2, and excretory pore 0.6-0.63, both from anterior end ; tail 0.22-0.23 long ; vulva with inconspicuous lips, post-equatorial ; eggs 0.071-0.075 in diameter.

Host : *Mystus cavasius*

Location : Intestine

Locality : Hyderabad, Andhra Pradesh

Buckleynema singhi Rai, 1969

(Fig. 9)

1969. *Buckleynema singhi* Rai, *Indian J. Helminth.*, 21 (2), p. 103.

Description : Male. Body 6.8-9.0 long, 0.17-0.19 wide ; anterior end bluntly rounded with slightly inflated cuticle (in some specimens only) ; teeth 3 pairs ; oesophagus 0.65-0.70 long, club-shaped ; nerve ring 0.23-0.27 and excretory pore 0.54-0.58, both from anterior end ; tail 0.15-0.18 long, with extremely narrow caudal alae ; preanal sucker 1.5-1.78 from posterior end ; spicules 0.078-0.092 long, acicular, similar ; gubernaculum 0.031-0.039 long, slightly curved ; caudal papillae pedunculate, 8 pairs, 4 preanal, 4 postanal.

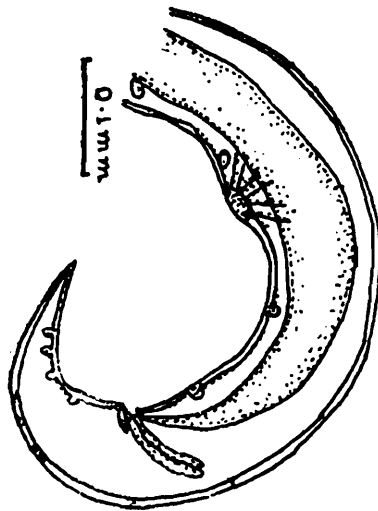


Fig. 9. *Buckleynema singhi*. (After Rai, 1969.) Male posterior end.

Female : Body 7.8-10.0 long, 0.19-0.21 wide ; oesophagus 0.72-0.78 long ; nerve ring 0.24-0.30 and excretory pore 0.60-0.62, both from anterior end ; tail 0.20-0.28 long ; vulva post-equatorial 2.62-2.82 from posterior end ; eggs $0.05-0.07 \times 0.039-0.041$, ellipsoidal.

Host : *Mystus seenghala*

Location : Stomach

Locality : Gorakhpur, U. P.

Remarks : This species is mainly separated from *Buckleynema buckleyi* Ali and Singh, 1954, by the number of caudal papillae and egg shape, but some more material is necessary for fuller confirmation until which it is being kept as separate.

Genus *Gendria* Baylis, 1930*Gendria brevispiculum* Karve, 1941

(Fig. 10, A & B)

1941. *Gendria brevispiculum* Karve, *J. Univ. Bombay*, 10 (3), p. 14.1977. *Gendria brevispiculum* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 5.

Description : Male. Body 6.95 long, 0.19 wide ; cuticle finely striated, inflated anteriorly forming oval expansion ; cervical alae absent ;

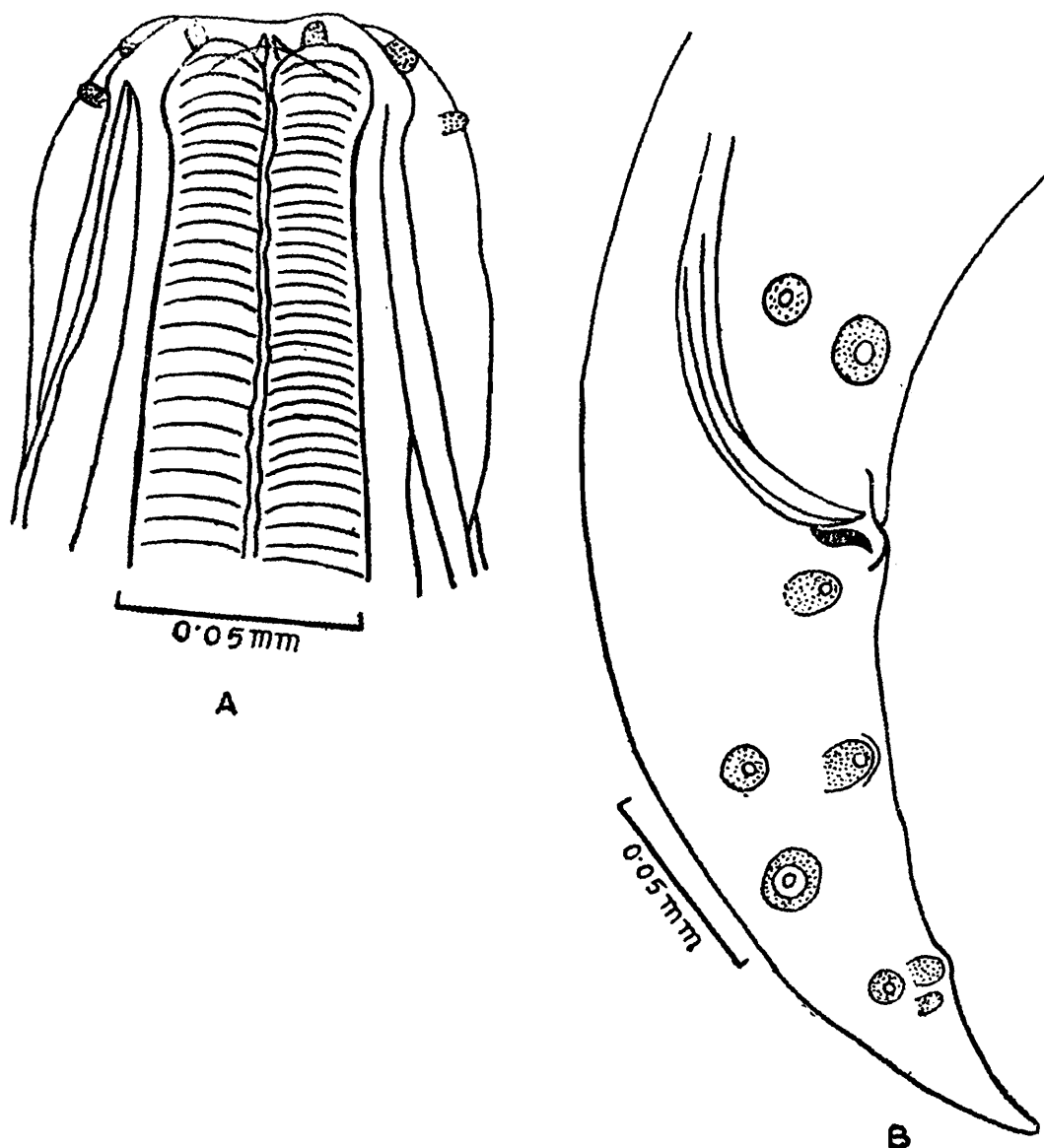


Fig. 10. *Gendria brevispiculum*. (After Karve, 1941.) A. anterior end ; B. male posterior end.

cephalic papillae 3 pairs ; mouth as shallow depression without definite lips, but with a dorsal and two subventral teeth ; oesophagus 0.33 long, club-shaped, not divided into two parts ; nerve ring 0.2 and cervical papillae 0.65, both from anterior end ; excretory pore at level of cervical papillae ; tail 0.22 long ; sucker 0.57 from cloacal aperture ;

spicules sickle-shaped, equal, 0.17 long ; gubernaculum present ; caudal papillae 15 pairs, 8 preanal, 7 postanal.

Female. Body 5.9 long, 0.21 wide ; oesophagus 0.41 long ; nerve ring 0.25 and cervical papillae 0.61, both from anterior end ; tail 0.24 long, with pair of papillae 0.15 from tip ; vulva 2.2 from posterior end.

Host : *Mystus* sp.

Location : Intestine

Locality : Pune, Maharashtra

Genus **Paragendria** Baylis, 1939

Stewart (1914) described the species *Heterakis macronis* from *Mystus aor* from Lucknow, U. P. Barreto (1919) transferred it under the genus *Subulura*. But, Baylis (1939) created the genus *Paragendria* for it and this was accepted by subsequent workers. Karve (1941) established another genus *Metaquimperia* with *M. callichroi* as its type species for his specimens from *Ompok bimaculatus* from Pune, Maharashtra ; and Agrawal (1965) *Neometaquimperia* for her two species, viz. *N. vittatusi* and *N. buckleyi*, with the first as its type species, from *Mystus vittatus* from Lucknow. Rai (1969), however, considered *Neometaquimperia*, though upheld by Gupta and Verma (1976), Chaturvedi and Kansal (1977), and Gupta and Bakshi (1980), congeneric with *Metaquimperia*, inspite of the fact that this genus is itself, according to recent classification of the group by Chabaud (1978), synonym of another, *Paragendria* and this is followed here. The following 6 species are known under the genus, a key for which is given below.

1. Gubernaculum present.	...	...	2
Gubernaculum absent.	...	...	4
2. Spicules non-alate.	...	<i>P. vittatusi</i>	
Spicules alate.	...	...	3
3. Caudal papillae 11 pairs.	...	<i>P. callichoroi</i>	
Caudal papillae 13 pairs.	...	<i>P. bagarii</i>	
4. Caudal papillae 6 pairs.	...	<i>P. vagrae</i>	
Caudal papillae 9-11 pairs.	...	<i>P. macronis</i>	
Caudal papillae 13 pairs.	...	<i>P. madhuai</i>	

Paragendria bagarii (Karve 1941)

(Fig. 11 A & B)

1941. *Metaquimperia bagarii* Karve, *J. Univ. Bombay*, 10 (3), p. 25.
 1976. *Metaquimperia bagarii* : Gupta and Verma, *Riv. Parassit.*, 37 (2-3), p. 185.
 1977. *Metaquimperia bagarii* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 5.
 1980. *Metaquimperia bagarii* : Arya, *Indian J. Helminth.*, 31 (1979), p. 19.
 1980. *Metaquimperia bagarii* : Gupta and Bakshi, *Indian J. Helminth.*, 31 (1979), p. 161.

Description : Male. Body 6.4-7.0 long, 0.13-0.15 wide ; lips three, one dorsal, two subventral ; cephalic papillae one pair ; teeth 3, 1 dorsal, 2 sub-ventral ; lateral alae starting from head, broadening at level

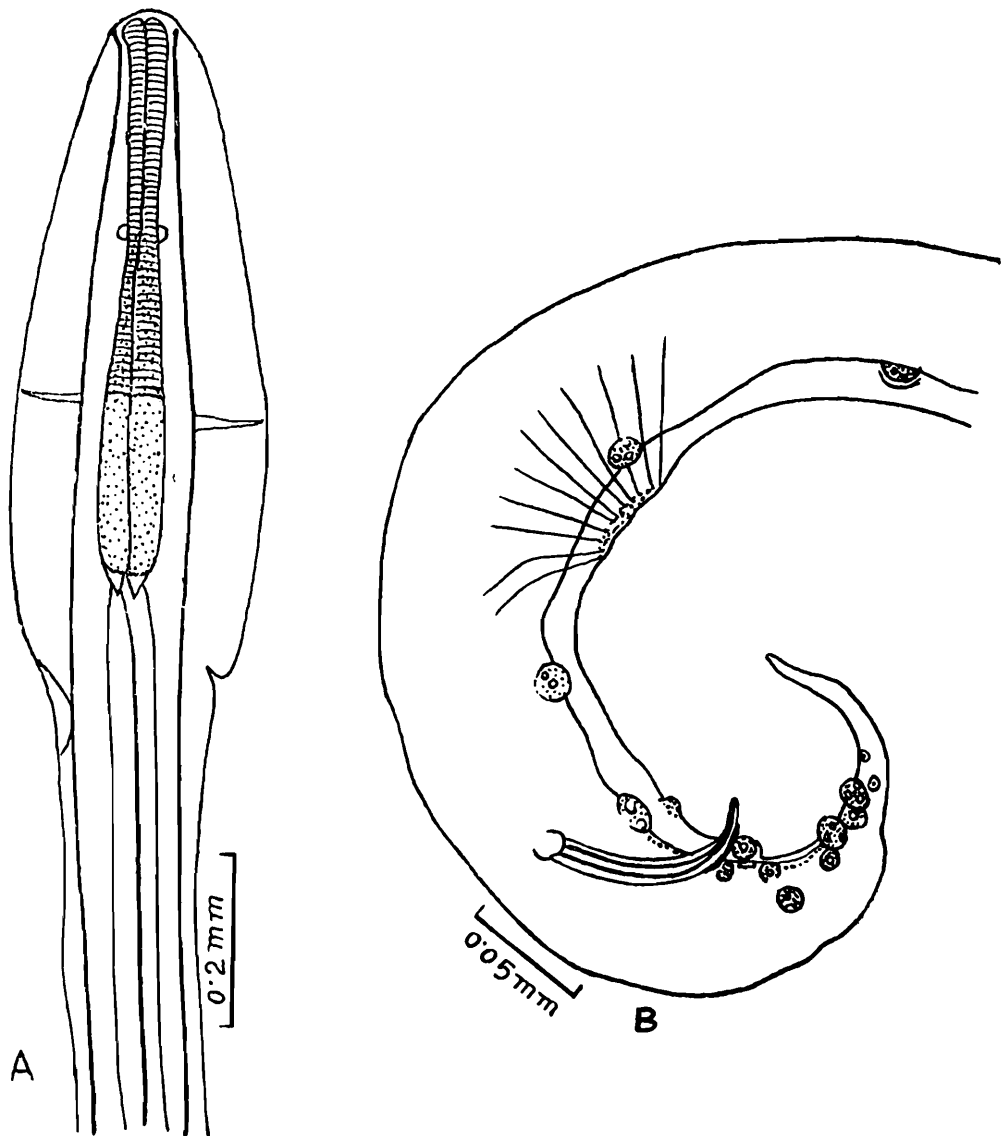


Fig. 11. *Paragendria bagarii*. (After Karve, 1941.) A. anterior end ; B. male posterior end.

of or a little behind cervical papillae, then narrowing behind oesophagus and ending in front of cloacal opening ; oesophagus divided into two

parts, anterior muscular 0.22-0.26 long, posterior glandular 0.39-0.4 ; nerve ring 0.25-0.27 and cervical papillae 0.3-0.45, both from anterior end ; excretory pore not discernible ; tail 0.16-0.19 long, with fairly well developed caudal alae, and stout spike ending in small spine ; preanal sucker present ; spicules alate, sickle-shaped, equal, 0.08-0.095 long ; gubernaculum present ; caudal papillae 13 pairs, 4 preanal, 1 adanal, 8 postanal ; two median papillae, one in front of cloacal opening, other at base of caudal spike.

Female : Body 6.7-7.05 long, 0.15 wide ; head and cervical alae as in male ; oesophagus, anterior muscular 0.23-0.25 long, posterior glandular 0.38-0.41 ; nerve ring 0.26-0.32 and cervical papillae 0.41-0.5, both from anterior end ; tail 0.24-0.27 long, with small spine, and pair of small papillae just in front of tip ; vulva post-equatorial, 2.5-2.55 from posterior end ; eggs 0.045×0.035 .

Host : *Bagarius bagarius*

Location : Intestine and rectum

Locality : Pune, Maharashtra

Remarks : This species was described by Karve (1941) from *Bagarius bagarius* (= *B. yarellii*) from Pune, Maharashtra, and separated from his earlier species *M. calichroi* from *Ompok bimaculatus* from the same locality, by having semi-globular lips, a comparatively slender oesophagus, two median papillae in male, smaller spicules, and a gubernaculum with coiled chitinous band attached to it, but some more material is necessary for fuller confirmation until which it is being kept as separate.

Paragendria callichroi (Karve, 1941)

(Fig. 12, A & B)

- 1941. *Metaquimperia callichroi* Karve, *J. Univ. Bombay*, 10 (3), p. 21.
- 1976. *Metaquimperia callichroi* : Gupta and Verma, *Riv. Parassit.*, 37 (2-3), p. 185.
- 1977. *Melaquimperia callichroi* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 5.
- 1980. *Metaquimperia callichroi* : Arya, *Indian J. Helminth.*, 31 (1979), p. 19.
- 1980. *Metaquimperia callichroi* : Gupta and Bakshi, *Indian J. Helminth.*, 31 (1979), p. 161.

Description : Male. Body 14.95-16.6 long, 0.18-0.22 wide ; lips 3, flat, broad, each with two papillae ; cephalic papillae 3 pairs ; cervical alae wide, ending at level of excretory pore or a little beyond cervical

papillae ; teeth 3, one dorsal, two subventral ; oesophagus divided into two parts, anterior muscular, posterior glandular, 0.52-0.70 long ; nerve ring 0.27-0.36 and cervical papillae 0.84-0.86, both from anterior end ; excretory pore very small, at level or a little in front of cervical papillae ; tail 0.24-0.34 long ; sucker 0.31-0.42 from cloacal aperture ; spicules alate, equal, 0.17-0.19 long ; gubernaculum 0.025 long ; caudal papillae 11 pairs, 4 preanal, 1 adanal, 6 postanal ; two pairs of papillae, one on anterior, other on posterior margin of cloacal aperture, and large median papilla in front of it.

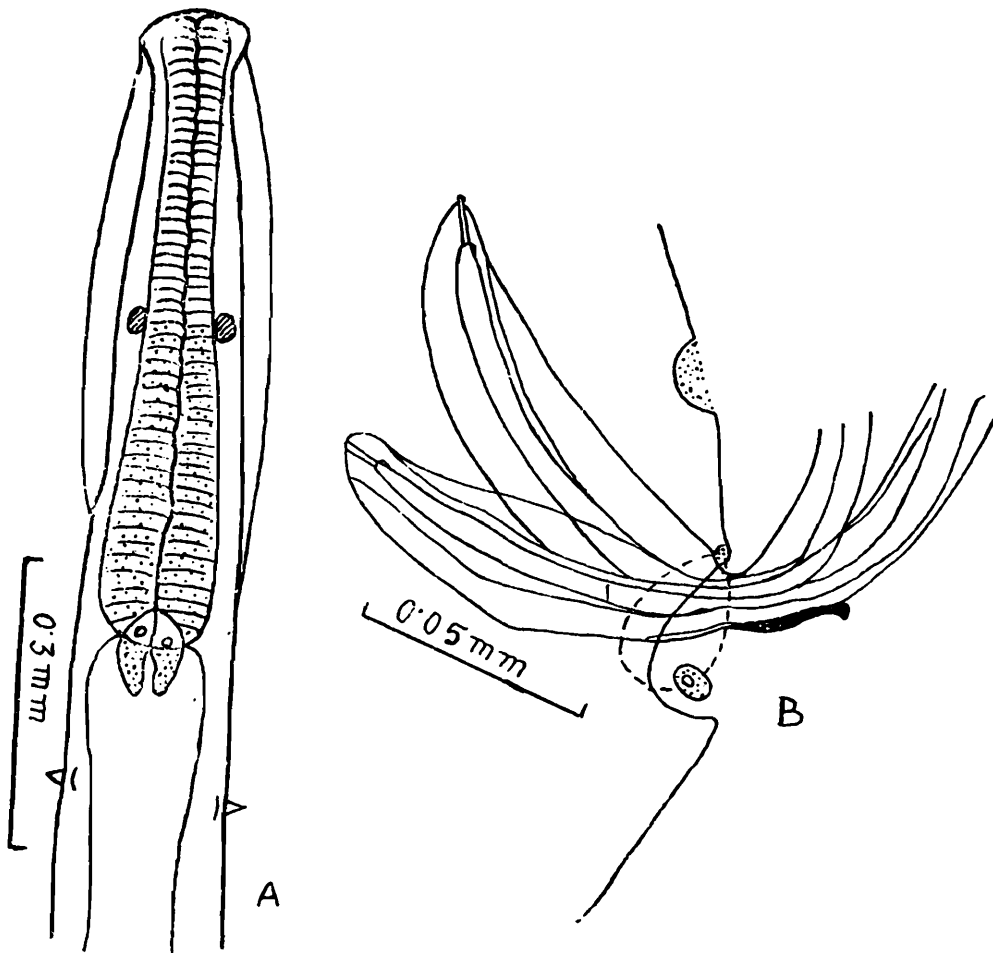


Fig. 12. *Paragendria callichroi*. (After Karve, 1941.) A. anterior end ; B. male posterior end.

Female ; Body 14.8-17.15 long, 0.21-0.23 wide ; cervical alae 0.59-0.65 long, ending in front of, sometimes a little beyond oesophagus ; oesophagus as in male, 0.59-0.65 long ; nerve ring 0.31-0.32 and cervical papillae 0.77-0.78, both from anterior end ; excretory pore as in male ; tail 0.38-0.41 long, with pair of papillae ; vulva post-equatorial, 5.1-6.7 from posterior end ; eggs $0.045-0.055 \times 0.025-0.04$.

Host : *Ompok bimaculatus*

Location : Intestine

Locality : Pune, Maharashtra

Paragendria macronis (Stewart, 1914) Baylis, 1939

1914. *Heterakis macronis* Stewart, *Rec. Indian Mus.*, 10, p. 170.
1939. *Paragendria macronis* Baylis *F. B. I.*, 2, p. 252.
1955. *Paragendria baylisi* Khera, *Ciencia Mex.*, 14 (11-12) p. 257.
1968. *Paragendria macronis* : Sood, *Indian J. Helminth.*, 20 (2), p. 86.
1968. *Metaquimperia wallagonia* Sood, *Indian J. Helminth.*, 20 (2), p. 83.
1974. *Metaquimperia wallagonia* : Sood, *Indian J. Helminth.*, 24 (1972), p. 76.
1976. *Metaquimperia wallagonia* : Gupta and Verma, *Riv. Parassit.*, 37 (2-3), p. 185.
1977. *Metaquimperia wallagonia* : Sood *et al.*, *J. Res. Punjab Agric. Univ.*, 14 (3), p. 332.
1977. *Paragendria macrones* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 5.
1977. *Metaquimperia wallagonia* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 5.
1977. *Paragendria baylisi* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 5.
1980. *Metaquimperia wallagonia* : Arya, *Indian J. Helminth.*, 31 (1979), p. 19.
1980. *Metaquimperia wallagonia* : Gupta and Bakshi, *Indian J. Helminth.*, 31 (1979), p. 160.

Description : Male. Body 3.65-10.2 long, 0.148-0.26 wide ; head 0.03-0.08 in diameter ; lateral alae broad, extending upto anterior third or entire length of body ; oesophagus 0.67-1.02 long ; nerve ring 0.24-0.35, excretory pore 0.41-0.52, and cervical papillae 0.39-0.63, all from anterior end ; tail 0.15-0.20 long, with caudal alae and spine ; preanal sucker 0.12-0.52 from cloaca ; spicules non-alate, similar, equal, 0.059-0.12 long ; caudal papillae 9-11 pairs, 4-5 preanal, 0-1 adanal, 5-6 postanal.

Female : Body 6.6-14.2 long, 0.129-0.32 wide ; oesophagus 0.98-1.08 long ; nerve ring 0.29-0.38, excretory pore 0.35-0.55, and cervical papillae 0.56-0.73, all from anterior end ; tail 0.221-0.49 long, tapering ; vulva post-equatorial, 4.4-8.2 from anterior end, eggs 0.03-0.13 × 0.017-0.049.

Hosts : *Mystus aor* ; *M. seenghala* ; *Wallago attu* ; *Notopterus notopterus* ; *Channa marulius*

Location : Intestine

Localities : Lucknow, U. P. ; Ludhiana, Punjab

Remarks : Baylis (1939) created the genus *Paragendria* to accommodate *Heterakis macronis* Stewart, 1914, from *Mystus aor* from Lucknow, U. P., and this was accepted by subsequent workers. Khera (1955) added another species *P. baylisi* from *Mystus seenghala* from the same locality which, however, was treated as its synonym by Sood (1968).

The latter also described another species *Metaquimperia wallagonia* from *Wallago attu*, also from the same locality which, however, too is treated by the present author as its synonym. A comparative chart of the species shown under the synonymy is appended.

		<i>Paragendria macronis</i> (Stewart, 1914)	<i>P. macronis</i> (of Sood, 1968)	<i>P. baylisi</i> Khera, 1955	<i>P. wallagonia</i> (Sood, 1968)
Body length	: ♂	3.65-7.41	5.47-9.53	9.0-10.2	8.07
	: ♀	6.6-8.5	10.29	11.1-14.2	9.15-9.65
Body width	: ♂	0.148	0.18-0.24	0.23-0.26	0.22
	: ♀	0.129-0.153	0.27	0.28-0.32	0.22-0.26
Head diameter	: ♂	—	0.035	0.047-0.06	0.08
	: ♀	0.04-0.055	0.065	0.046-0.053	0.06-0.07
Oesophagus	: ♂	—	0.67-1.02	0.85-0.89	0.69
length	: ♀	0.75-0.85	1.05	0.98-1.08	0.80-1.02
Nerve ring from	♂	—	0.24-0.35	0.29-0.31	0.29
anterior end	: ♀	0.314-0.425	0.38	0.37-0.385	0.29-0.32
Excretory pore	♂	—	0.41-0.52	—	0.39
from ant. end	: ♀	—	0.55	—	0.35-0.40
Cervical papillae	♂	0.56	0.39-0.57	0.58-0.63	0.55
from anterior end	: ♀	—	0.73	0.66-0.723	0.56-0.64
Tail length	: ♂	0.17-0.185	0.15-0.18	0.17-0.135	0.20
	: ♀	0.221-0.259	0.37	0.3-0.346	0.30-0.49
Spicule length	:	—	0.059-0.069	0.093-0.12	0.085
Caudal papillae		11 pairs, 5 preanal 6 postanal	11 pairs, 5 preanal 6 postanal	9 pairs, 4 preanal 1 adanal	9 pairs, 4 preanal 5 postanal
		also 2 median preanal ones		4 postanal	
Vulva from		4.433-5.61	6.95	7.4-8.2	5.32-6.00
ant. end	:				
Eggs		—	0.03-0.033 × 0.017-0.024	—	0.041-0.05 × 0.03-0.049
Host	:	<i>Mystus aor</i>	<i>Mystus seenghala</i>	<i>Mystus seenghala</i>	<i>Wallago attu</i>

***Paragendria madhuai* (Sood, 1973)**

(Fig. 13, A&B)

1973. *Metaquimperia madhuai* Sood, Zool. Anz., 190 (5/6), p. 347.

1980. *Metaquimperia madhuai* : Arya, Indian J. Helminth., 31 (1979), p. 19.

Description : Male. Body 7.45 long, 0.21 wide ; head 0.05 in diameter, and with broad lateral alae extending upto a little behind oesophagus ; oesophagus divided into two parts, anterior muscular 0.23

long, posterior glandular 0.51 ; nerve ring 0.24, and cervical papillae 0.55, both from anterior end ; excretory pore indiscernible ; tail 0.13 long, subulate, with spine and curved ventrally ; caudal alae broad, extending upto tip of tail ; preanal sucker spindle-shaped, 0.19 from cloacal aperture ; spicules similar, equal, 0.075 long ; caudal papillae 13 pairs, 5 preanal, 2 adanal, 6 postanal.

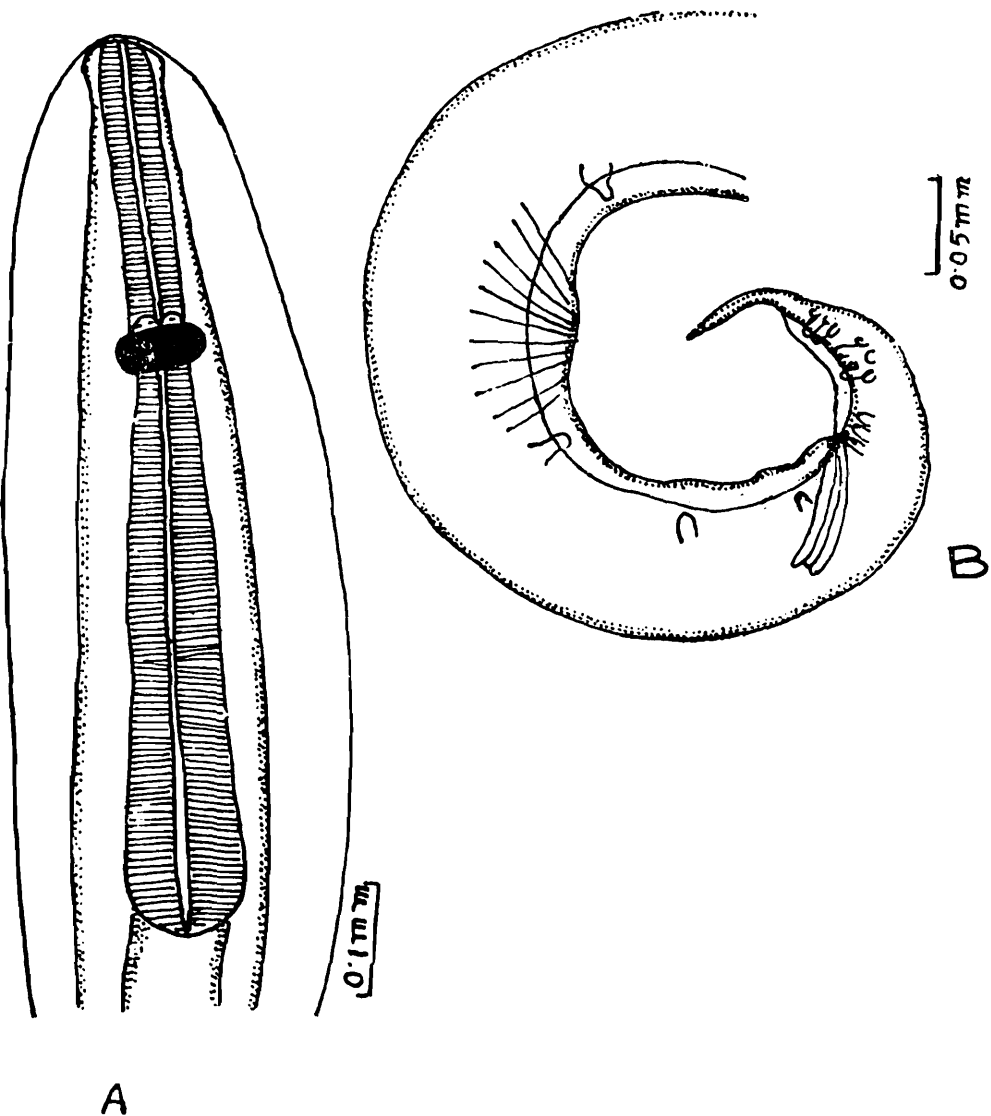


Fig. 13. *Paragendria madhuai*. (After Sood, 1973.) A. anterior end ; B. male posterior end.

Female : Body 8.21 long, 0.21 wide ; head 0.04 in diameter ; oesophagus, anterior muscular 0.22 long, posterior glandular 0.48 ; nerve ring 0.23, and cervical papillae 0.51, both from anterior end ; excretory pore indiscernible ; tail 0.027 long, tapering ; vulva post-equatorial, 5.21 from anterior end ; eggs $0.038-0.04 \times 0.06-0.07$.

Host : *Channa striatus*

Location : Intestine

Locality : Lucknow, U. P.

Remarks : This species was described by Sood (1973) from *Channa striatus* from Lucknow as *Metaquimperia madhuai* and distinguished from the preceding one from the same locality, mainly in the number and arrangement of caudal papillae. Hence, study of more material may not be undesirable.

Paragendria vagrae (Arya, 1980)
(Fig. 14, A-D)

1980. *Metaquimperia vagrae* Arya, *Indian J. Helminth.*, 31 (1979), p. 15.

Description : Male. Body 4.0 long, 0.27 wide ; head 0.04 in diameter ; lips 3, rounded, each with two papillae ; teeth 3, 1 dorsal, 2 subventral ; cervical alae broad, smooth, extending from anterior end upto a little behind oesophagus ; oesophagus divided into two parts, anterior muscular 0.11 long, posterior glandular 0.85 ; nerve ring 0.16, excretory pore 0.23, and cervical papillae 0.35, all from anterior end ; tail 0.19 long, tapering ; caudal alae broad, extending upto tip of tail ; preanal sucker spindle-shaped, 0.20 from cloacal aperture ; spicules similar, non-alate, equal, 0.084 long ; caudal papillae 6 pairs, 5 preanal, 1 postanal.

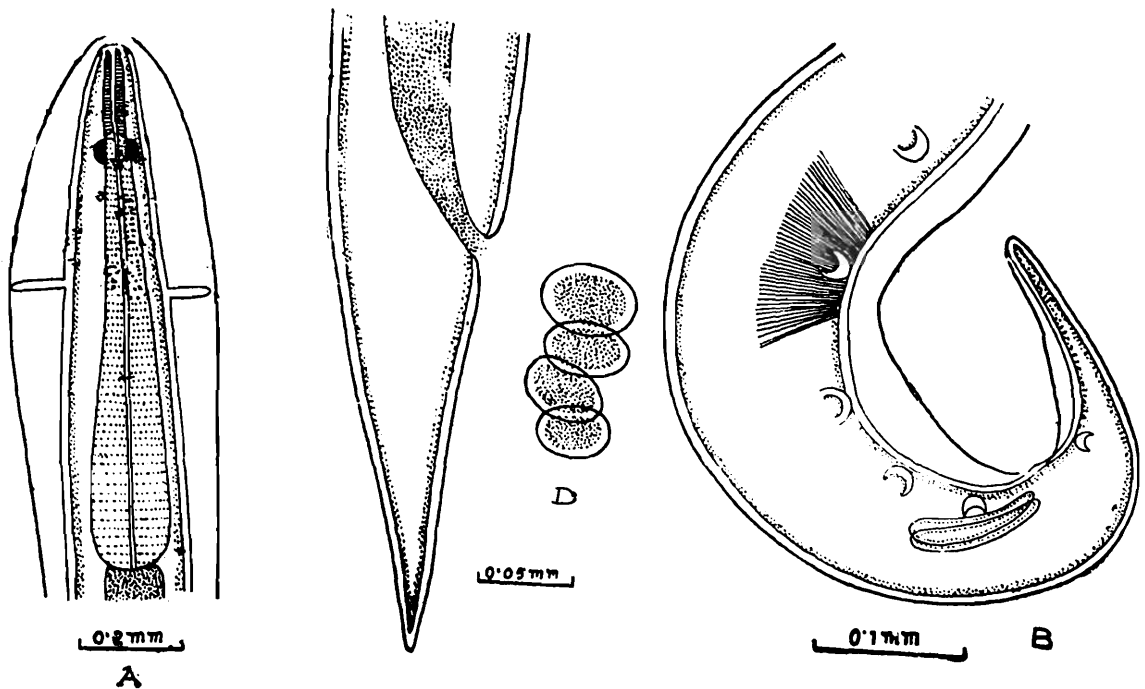


Fig. 14. *Paragendria vagrae*. (After Arya, 1980.) A. anterior end ; B. male posterior end ; C. female posterior end ; D. eggs.

Female. Body 6.0-8.10 long, 0.35-0.37 wide ; head 0.045-0.052 in diameter ; anterior end as in male ; oesophagus, anterior muscular 0.19-0.35 long, posterior glandular 0.74-0.93 ; nerve ring 0.22-0.37, excretory pore 0.35-0.51, and cervical papillae 0.53-0.60, all from anterior end ; tail 0.20-0.212 long, tapering ; vulva post-equatorial, 3.71-4.35 from anterior end ; eggs $0.03-0.037 \times 0.02-0.031$.

Host : *Barilius vagra*

Location : Intestine.

Locality : Nainital, U. P.

Remarks : Like the preceding one, this species too has been separated from *P. macronis* mainly in the number and arrangement of caudal papillae. Hence, study of more material may not prove vain.

Paragendria vittatusi (Agrawal, 1965)

(Fig. 15, A & B)

- 1965. *Neometaquimperia vittatusi* Agrawal, *Indian J. Helminth.*, **17** (1), p. 1.
- 1965. *Neometaquimperia buckleyi* Agrawal, *Indian J. Helminth.*, **17** (1), p. 4.
- 1969. *Metaquimperia vittatusi* Rai, *Indian J. Helminth.*, **21** (2), p. 105.
- 1969. *Metaquimperia buckleyi* Rai, *Indian J. Helminth.*, **21** (2), p. 105.
- 1969. *Metaquimperia seenghalai* Rai, *Indian J. Helminth.*, **21** (2), p. 105.
- 1971. *Neometaquimperia seenghalai* Verma, *Proc. natn. Acad. Sci. India*, **41**, p. 387.
- 1976. *Metaquimperia lucknowia* Gupta and Verma, *Riv. Parassit.*, **37** (2-3), p. 183.
- 1976. *Neometaquimperia seenghalai* Gupta and Verma, *Riv. Parassit.*, **37** (2-3), p. 185.
- 1977. *Neometaquimperia buckleyi* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional paper No. 5, p. 5.
- 1977. *Neometaquimperia vittatusi* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional paper No. 5, p. 5.
- 1980. *Metaquimperia gomtii* Gupta and Bakshi, *Indian J. Helminth.*, **31** (1979), p. 157.

Description : Male. Body $5.10-9.92 \times 0.11-0.28$; head $0.03-0.08$ in diameter ; lips 3, flat, broad, each with 2 papillae and pair of lateral amphids ; buccal cavity with 3 chitinated teeth, 1 dorsal, 2 subventral ; cervical alae broad, extending from anterior end to a little behind oesophagus ; oesophagus $0.555-0.88$ long ; club-shaped ; nerve ring $0.185-0.34$, excretory pore $0.25-0.65$ and cervical papillae $0.375-0.74$, all from anterior end ; tail $0.13-0.26$ long, sharply pointed, curved, with terminal spike ; caudal alae present or absent ; preanal sucker spindle-shaped, $1.02-1.31$ from cloacal aperture ; spicules similar, non-alate, almost equal $0.06-0.11$ long ; gubernaculum $0.03-0.06$ long ; caudal papillae pedunculate, 9-11 pairs, 4-5 preanal, 0-1 adanal, 5 postanal, and occasionally two single medians, one preanal, one postanal.

Female. Body $6.95-11.2 \times 0.16-0.21$; head $0.04-0.08$ in diameter ; oesophagus $0.56-0.86$ long, club-shaped ; nerve ring $0.21-0.33$, excretory pore $0.24-0.71$ and cervical papillae $0.46-0.89$, all from anterior end ;

tail 0.258 long, with spike; vulva post-equatorial, 2.94-5.44 from posterior end; eggs spherical, $0.04-0.07 \times 0.02-0.042$.

Hosts : *Mystus vittatus*; *M. seenghala*; *Channa punctatus*

Location : Intestine

Localities : Lucknow & Gorakhpur, U. P.

Remarks : Agrawal (1965) created the genus *Neometaquimperia* for her two species, viz. *N. vittatusi* and *N. buckleyi* with first as its type

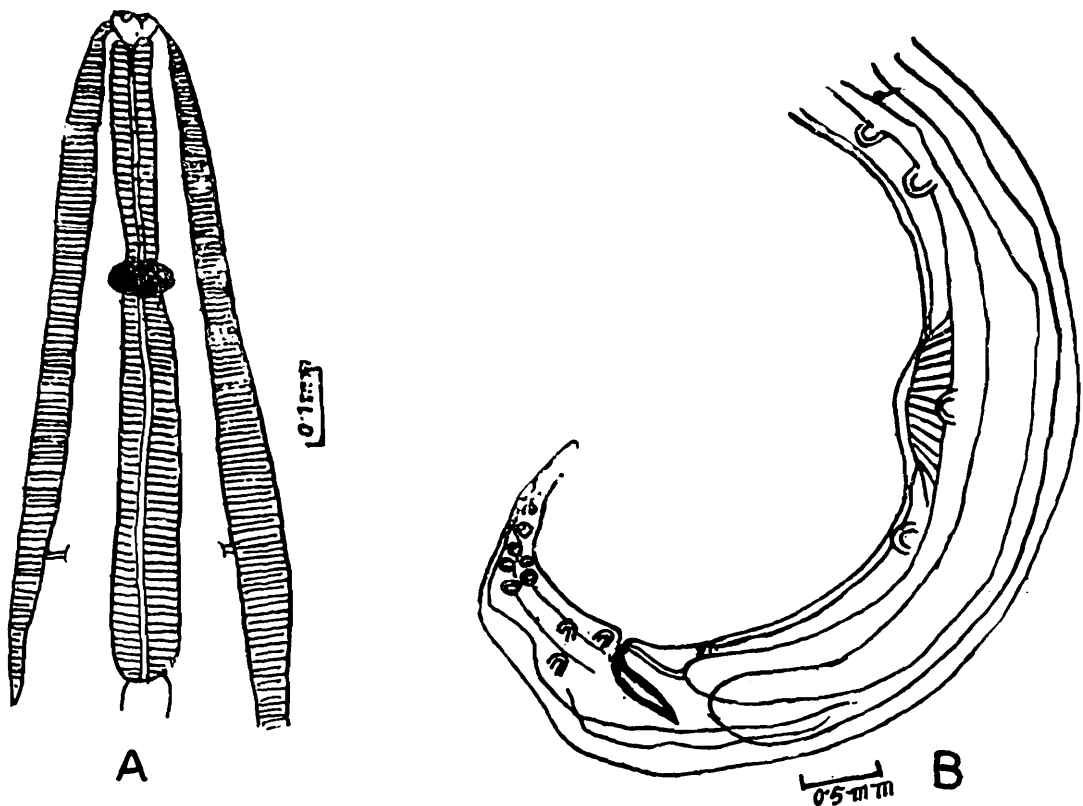


Fig. 15. *Paragendria vittatusi*. (After Agrawal, 1965.) A. anterior end; B. male posterior end.

species, from *Mystus vittatus* from Lucknow. Rai (1969) considered the above genus as congeneric with *Metaquimperia* under which he described another species, *M. seenghalai* from *Mystus seenghala* from Gorakhpur, U. P. [which Gupta and Verma (1976) renamed as *N. seenghalai*]. Three more species, viz. *N. seenghali* and *M. lucknowia*, from the same above host and *M. gomtii* from *Channa punctatus* from Lucknow were added by Verma (1971), Gupta and Verma (1976) and Gupta and Bakshi (1980) respectively. But, in the recent classification of the group Chabaud (1978) treated both *Neometaquimperia* and *Metaquimperia* as congeneric with *Paragendria*. The present author is of the opinion that all the above species may be conspecific with *Paragendria vittatusi* as the characters on the basis of which these species have been separated, are rather not very stable. A comparative chart of the species shown under synonymy is given.

	<i>Paragendria vittatusi</i> (Agrawal, 1965)	<i>P. buckleyi</i> (Agrawal, 1965)	<i>P. seenghalai</i> (Rai, 1969)	<i>P. lucknowia</i> (Gupta and Verma, 1976)	<i>P. gontii</i> (Gupta and Bakshi, 1980)
Body length	♂ 8.48-9.92 ♀ 8.59-9.05	6.84-7.72 7.08-8.42	6.8-8.7 10.2-11.2	8.7-9.55 9.85	5.10-7.0 6.95
Body width	♂ 0.20-0.28 ♀ 0.18-0.21	0.18-0.20 0.17-0.21	0.11-0.15 0.16-0.21	0.17-0.19 0.15	0.15-0.17 0.19
Head diameter	♂ 0.05-0.08 ♀ 0.06-0.07	0.03-0.05 0.05	— —	0.04-0.05 0.05	— —
Vestibule	♂ 0.03-0.04 × 0.03-0.06 ♀ 0.03-0.04 × 0.04-0.05	0.08-0.13 × 0.03-0.05 0.11-0.13 × 0.04-0.05	— —	— —	— —
Oesophagus length	♂ 0.65-0.81 ♀ 0.56-0.81	0.60-0.63 0.62-0.66	0.68-0.70 0.70-0.84	0.77-0.88 0.86	0.55-0.65 0.65
Nerve ring from ant. end	♂ 0.21-0.34 ♀ 0.21-0.33	0.21-0.30 0.26-0.29	0.28-0.32 0.30-0.32	0.29-0.32 0.29	0.185-0.230 0.228
Excretory pore from ant. end	♂ 0.25-0.46 ♀ 0.24-0.38	0.26-0.35 0.30-0.31	0.62-0.65 0.64-0.71	0.47-0.51 0.43	0.265-0.345 0.315
Cervical papillae from ant. end	♂ 0.52-0.74 ♀ 0.51-0.89	0.48-0.57 0.54-0.6	— —	0.6-0.62 0.56	0.375-0.480 0.46
Tail length including terminal spike	♂ 0.16-0.24 ♀ 0.26-0.32	0.13-0.23 0.25-0.26	0.17-0.18 —	0.23-0.26 0.26	0.155-0.175 0.258
Spicule length	0.066-0.086	0.06-0.085	0.07-0.08	0.09-0.11	0.075-0.095
Gubernaculum length	0.04-0.055	0.030-0.043	0.03-0.06	0.05-0.051	0.036-0.042
Caudal papillae	11 pairs, 5 preanal, 1 adanal 5 postanal	10 pairs, 5 preanal — 5 postanal	10 pairs, 4 preanal 1 adanal 5 postanal	9 pairs, 4 preanal — 5 postanal	10 pairs, 4 preanal 2 adanal 4 postanal & 2 single median, one preanal, one postanal
Vulva from anterior end	5.55-5.65	4.82-5.44	7.08-8.14	6.54	4.65
Egg	0.04-0.06 × 0.02-0.04	0.042-0.080 × 0.03-0.04	0.04-0.06 × 0.02-0.04	0.06-0.062 × 0.023-0.030	0.053-0.057 × 0.038-0.042
Host	<i>Mystus vittatus</i>	<i>Mystus tengara</i>	<i>Mystus seenghala</i>	<i>Mystus seenghala</i>	<i>Channa punctatus</i>

Genus **Paraquimperia** Baylis, 1934
Paraquimperia anguillae Karve, 1941
 (Fig. 16, A & B)

1941. *Paraquimperia anguillae* Karve, *J. Univ. Bombay*, **10** (3), p. 18.

1977. *Paraquimperia anguillae* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 5.

Description : Male. Body 5.43-7.2 long, 0.12-0.168 wide ; lips 3, small, each with single papilla ; cephalic papillae two pairs ; mouth with 3 teeth at base ; cervical alae present ; oesophagus divided into two parts, anterior muscular 0.3-0.314 long, posterior glandular 0.275-0.28 ; nerve ring 0.26 and cervical papillae 0.45-0.591, both from anterior end ; excretory pore at level or a little behind nerve ring ; tail 0.27-0.3 long, pointed ; sucker and caudal alae absent ; spicules equal, 0.22-0.26 long ; caudal papillae 15 pairs, 4 preanal, 11 postanal, and a pre-anal median.

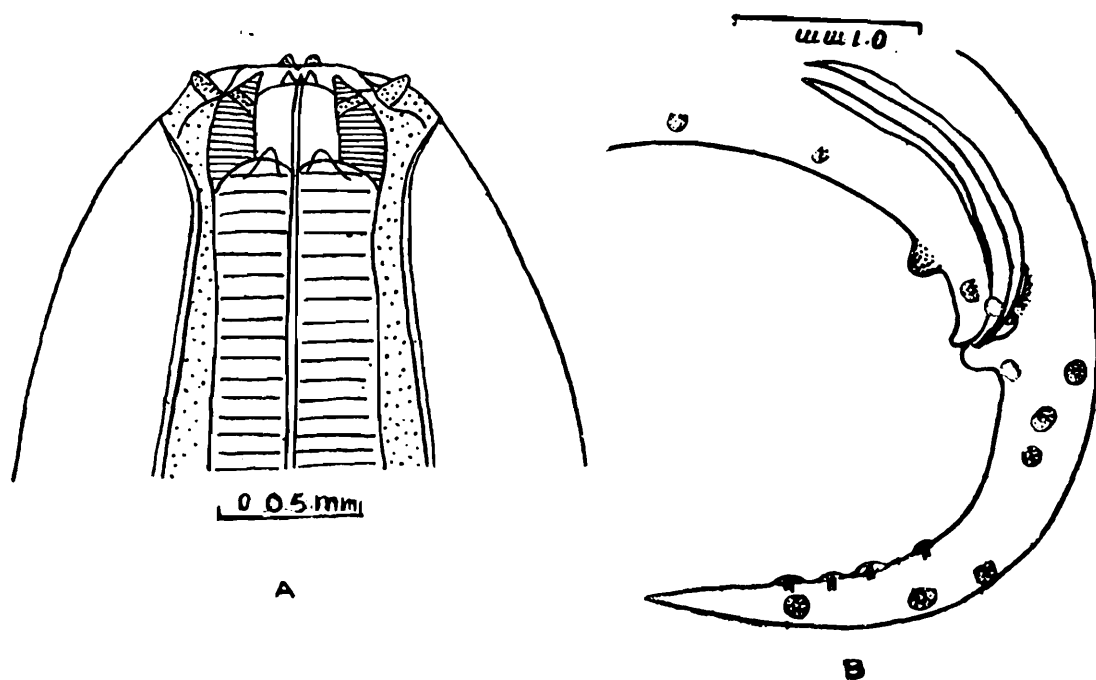


Fig. 16. *Paraquimperia anguillae*. (After Karve, 1941.) A. anterior end ; B. male posterior end.

Female. Body 9.6-12.14 long, 0.2-0.25 wide ; oesophagus, anterior muscular 0.56-0.633 long, posterior glandular 0.5-0.577 ; nerve ring 0.366-0.5 and cervical papillae 0.833-0.922, both from anterior end ; tail 0.38-0.435 long, pointed, with pair of small papillae 0.22-0.23 from posterior end ; vulva in posterior third of body, 2.79-3.81 from posterior end ; eggs $0.068-0.072 \times 0.046-0.054$.

Host : *Anguilla elphinstonei*

Location : Intestine

Localities : Pune & Nagpur, Maharashtra

Genus **Pingus** Hsu, 1933**Pingus aori** Khan and Yaseen, 1969

1969. *Pingus aori* Khan and Yaseen, *Bull. Dep. Zool. Panjab Univ.*, article 4, p. 2.

Description : Male. Body 7.02-7.03 long, 0.17-0.18 wide ; head with 2 lateral amphids and 4 submedian papillae ; oesophagus club-shaped, divided into two parts, anterior muscular 0.33 long, posterior glandular 0.48-0.49 ; excretory pore just behind oesophagus ; tail 0.23 long, ending in spike ; precloacal sucker 0.04 long, without chitinous rim ; spicules two, small ; caudal papillae pedunculate, 4 pairs preanal discernible.

Female. Body 7.10-7.20 long, 0.18 wide, with well-developed lateral flanges ; head and excretory pore as in male ; oesophagus, anterior muscular 0.33-0.36 long, posterior glandular 0.56-0.60 ; tail straight, tapering gradually to sharp point.

Host : *Mystus aor*

Location : Intestine

Locality : Sylhet (Bangladesh)

Remarks : As this inadequately described species based on two males and two females has been separated from its closest ally *Pingus sinensis* Hsu, 1933, mainly on the basis of body size, more data based on a good series of specimens is necessary for a definite conclusion, until when its inclusion will be entirely tentative.

Genus **Haplonema** Ward and Magath, 1917**Haplonema lysani** Gupta and Garg, 1976

(Fig. 17, A & B)

1976. *Haplonema lysani* Gupta and Garg, *Revta ibe'r. Parasit.*, **36** (3-4), p. 185.

Description : Male. Body 5.222-5.914 long, 0.173-0.179 wide, and with lateral flanges extending 0.256-0.269 from anterior end ; cuticle thin, finely striated anteriorly, coarsely posteriorly ; lips inconspicuous ; buccal capsule absent oesophagus divided into two parts, anterior muscular 0.666-0.717 long, posterior glandular 0.249-0.269 ; nerve ring 0.205-0.211, and cervical papillae 0.275-0.288, both from anterior end ; tail 0.051-0.058 long and with appendage 0.009 ; spicules two, similar, equal, 0.045 long ; caudal papillae 5 pairs, 2 preanal, 3 postanal.

Host : *Scomberoides lysan*

Location : Intestine

Locality : Panaji, Goa

Remarks : The genus established by Ward and Magath (1917) with *H. immutatum* as its type species, has recently been revised by Arthur and Margolis (1975). In India, it was reported for the first time by Gupta and Garg (1976) who from males only described their species *H. lysani* from *Scomberoides* [= *Chorinemus*] *lysan* from Panaji, Goa, but their figure shown as posterior end of adult male actually

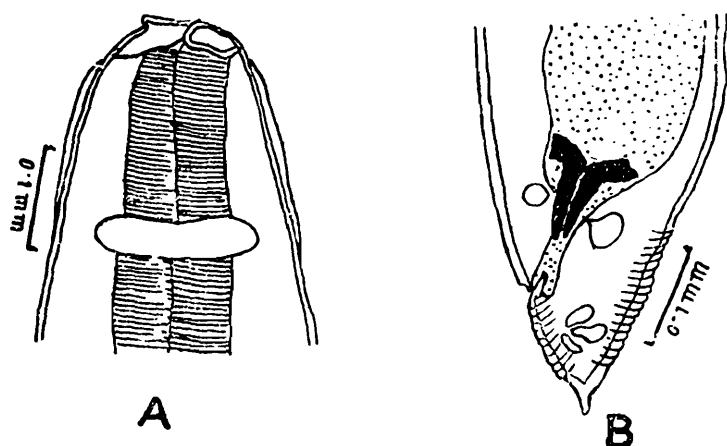


Fig. 17. *Haplonema lysani*. (After Gupta and Garg, 1976.) A. anterior end ; B. male posterior end.

appears to be that of a juvenile female. Hence, more material needs to be examined for fuller confirmation until when the species is retained here purely tentatively.

Family CUCULLANIDAE Cobbold, 1864

The family Cucullanidae created by Cobbold (1864) has been dealt with by several authors including Barreto (1922), Tornquist (1931), Baylis (1939), Ali (1957), Yamaguti (1941, 1961), Campana-Rouget (1957, 1961), Inglis (1967), Rasheed (1968), Kalyankar (1971), and Maggenti (1971), all of whom were not in agreement in the matter of including the number of genera under it. While Barreto (*op. cit.*) admitted only the genus *Cucullanus* Mueller, 1777, as valid, Tornquist (*op. cit.*) recognised five, viz. *Cucullanus*, *Cucullanellus* Tornquist, 1931, *Dichelyne* Jagerskiold, 1902, *Dacnitis* Dujardin, 1845 and *Neocucullanus* Travassos, Artigas and Pereira, 1928. He merged *Bulbodacnitis* Lane, 1916, with *Dacnitis*, and *Dacnitoides* Ward and Magath, 1916, with *Dichelyne*, stressing especially for the last two genera the common possession of an anterior dorsal intestinal caecum. Campana-Rouget (*op. cit.*), however, declaring that the above basis of separation were of no definite significance, recognised only 4 genera, viz. *Dacnitis*, *Cucullanus*, *Neocucullanus*, and *Indocucullanus*. The first included those cucullanids with the oral aperture dorsally oblique to the longitudinal axis of the body ; and the other three included those, with or without

precloacal sucker, and intestinal caecum which latter either dorsal or ventral, as well as showing restricted number of preanal papillae. Rasheed (1968) while upholding Campana-Rouget's (*op. cit.*) arrangement, at the same time did not accept the synonymy of *Neocucullanellus* with *Neocucullanus*, and gave convincing elaborations for her non-acceptance of this synonymy. Maggenti (*op. cit.*) observing Barreto's (*op. cit.*) and Campana-Rouget's (*op. cit.*) conclusions going counter to the generally held taxonomic definition of a genus recognised 8 genera, viz. *Neocucullanus*, *Dacnitoides*, *Cucullanellus*, *Cucullanus*, *Bulbodacnitis*, *Indocucullauns*, *Dichelyne*, and *Neocucullanellus*; and Kalyankar (*op. cit.*) five, viz. *Cucullanus*, *Indocucullanus*, *Neocucullanus*, *Paracucullanus*, and *Pseudocucullanus*. But, in the study on the family Cucullanidae by Petter (1974) who presented an excellent revision of the same, only 3 genera have been considered valid, viz. *Truttaedacnitis* Petter, 1974 (= *Dacnitis sensu* Tornquist, 1931, *nec* Dujardin, 1845 = *Bulbodacnitis sensu* Maggenti, 1971 *nec* Lane, 1916), is found in the most primitive fishes: Cyclostomata, Elasmobranchii, Acipenseriformes and Salmoniformes; the genus *Cucullanus* (= *Indocucullanus* Ali, 1957) is distributed in most Teleostei with the exception of the Salmoniformes, and occasionally in Chelonia; the genus *Dichelyne* with the subgenera *Cucullanellus*, *Dichelyne* and *Neocucullanellus* [though not upheld by Margolis and Arthur (1979)] is found mainly in the more evolved Teleostei (especially the Perciformes) and occasionally in other fishes and in Chelonia. However, in the recentmost classification of the group by Chabaud (1978), the number has been raised to four by the inclusion of *Neocucullanus* Travassos, Artigas and Pereira, 1928, and this is accepted here.

Subfamily Cucullaninae Yorke and Maplestone, 1926

Hitherto, four genera and three subgenera are known under it, a key of which is given below.

1. Oral opening greatly bent dorsally and without cuticularized frame; cuticular lining of oesophastome formed of a complex set of thickened cuticularized pieces separated by the sutures. ... *Truttaedacnitis* Petter, 1974.
- Oral opening straight or slightly bent and supported by a peribuccal cuticularized frame to which are joined cuticularized pieces which project into adjacent oesophageal muscles; cuticular lining of oesophastome formed of few cuticularized plates and separated by a single Y-shaped suture. ...

2.	Intestinal caecum absent.	...	...	3
	Intestinal caecum present.	...	...	4
3.	Tail in male usually conical and without small terminal caudal alae ; preanal papillae usually 3 ; oesophastome well-developed.	...	Cucullanus Mueller, 1777.	
	Tail in male short and rounded with small caudal alae ; preanal papillae more than 3 (7 pairs) ; oesophastome reduced.	...	Neocucullanus Travassos, Artigas and Pereira, 1928.	
4.	Species generally of small size, with thick cuticle.	...	Dichelyne Jagerskiold, 1902.	
	Key to the subgenera of the genus Dichelyne Jagerskiold, 1902			
1.	Caudal papillae more than 11 pairs, of which preanal more than 3.	...	Dichelyne (Neocucullanellus) (Yamaguti, 1941 genus)	
	Caudal papillae 11 pairs, of which preanal 3.	...	...	2
2.	Preanal sucker present.	...	Dichelyne (Cucullanellus) (Tornquist, 1931 gen.)	
	Preanal sucker absent.	...	Dichelyne (Dichelyne) Jagerskiold, 1902.	

Genus **Cucullanus** Mueller, 1777

This genus which was erected by Mueller (1777) with *C. cirratus* as its type species occurs in fishes and occasionally in chelonians, barring an accidental record of a female, *Cucullanus* sp. from jungle babbler, *Turdoides striatus* from Lucknow, by Gupta and Kazim (1979). Ali (1957) created another genus *Indocucullanus* with *I. jaiswali* as its type species. Five more species were added to this genus as follows : *I. arabianse* by Ali and Kalyankar (1967), *I. longispiculum* by Khan (1969), and *I. jalnaensis*, *I. alii*, and *I. malvanae* by Kalyankar (1971). But, Petter (1974) in her noteworthy review of the family *Cucullanidae* synonymised *Indocucullanus* with *Cucullanus*, and this was followed by Chabaud (1978) and Soota and Dey Sarkar (1980). However, apparently unaware of this, nine more species and one subspecies were added to *Indocucullanus* as follows : *I. calcariferii* and *I. karachii* by Zaidi and Khan (1975), *I. guerreroi* by Arya and Johnson (1975), *I. puriensis* and *I. ariusi* by Srivastava and Gupta (1976), *I. wertheimae* by Gupta and Garg (1976) who also emended the characters of the genus by including forms both having or lacking dentigerous ridges, *I. dorabi* and *I. otolithi* by Ashraf *et al.* (1977), *I. longispiculum diacanthis* by Bilqees, Fatima and Rehana (1977) and *I. sciaenai* by Gupta and Gupta (1979). But, barring *I. longispiculum* and *I. (L.) diacanthis* falling under

Dichelyne, all the others are now placed under the genus *Cucullanus*. Hitherto, 22 species are known under it from this area, of which a key for 18 species is given below. *C. bilqeesi*, *C. callichroi*, and *C. olivoceus*, which are based on females only, and *C. chrysophrydes* of Gupta and Garg (1977) which better fits under the genus *Dichelyne* are excluded from the key.

1.	Preanal sucker present	...	...	2
	Preanal sucker absent	...	...	8
2.	Head with dorsal prominence	...	<i>C. bulbosa</i>	
	Head without dorsal prominence	...	...	3
3.	Preanal sucker with chitinous rim	...	...	4
	Preanal sucker without chitinous rim	...	...	7
4.	Rim elongated, simple	...	...	5
	Rim showing multi-petalled appearance	...	...	6
5.	Caudal papillae 11 pairs	...	<i>C. hians</i>	
	Caudal papillae 14 pairs	...	<i>C. lucknowi</i>	
6.	Body with spherical cuticular thickenings	...	<i>C. ritai</i>	
	Body without spherical cuticular thickenings	...	<i>C. pangasius</i>	
7.	Caudal papillae 8-9 pairs	...	<i>C. pseudotropi</i>	
	Caudal papillae 11 pairs	...	<i>C. armatus</i>	
8.	Cephalic alae present	...	...	9
	Cephalic alae absent	...	...	12
9.	Spicules subequal	...	<i>C. ariusi</i>	
	Spicules equal	...	...	10
10.	Caudal papillae 9-11 pairs	...	...	11
	Caudal papillae 12 pairs	...	<i>C. karachii</i>	
11.	Cloacal lips strongly cuticularized	...	<i>C. theraponi</i>	
	Cloacal lips not strongly cuticularized	...	<i>C. arabianse</i>	
12.	Spicules subequal	...	<i>C. jalnaensis</i>	
	Spicules unequal	...	...	13
	Spicules equal	...	...	14
13.	Spicules similar	...	<i>C. alii</i>	
	Spicules dissimilar	...	<i>C. malvanae</i>	
14.	Caudal papillae 4-5 pairs	...	<i>C. jaiswali</i>	
	Caudal papillae 8 pairs	...	...	15
15.	Spicules alate	...	<i>C. sciaenai</i>	
	Spicules non-alate	...	...	16
16.	Gubernaculum v-shaped	...	<i>C. rivulatus</i>	
	Gubernaculum rod-shaped	...	<i>C. guerreroi</i>	

Cucullanus alii (Kalyankar, 1971) Petter, 1974

(Fig. 18)

1971. *Indocucullanus alii* Kalyankar, *Marathwada Univ. J.*, 10, Sci. 3, p. 103.1974. *Cucullanus alii* Petter, *Bull. Mus. natn. Hist. nat., Paris*, 177 (255), p. 1483.1980. *Indocucullanus alii* : Arya, *Indian J. Helminth.*, 32 (1), p. 31.1980. *Cucullanus alii* : Soota and Dey Sarkar, *Rec. zool. Surv. India*, 76, p. 3.

Description : Male. Body 2.4-6.0 long, 0.22-0.38 wide ; head 0.14 in diameter ; mouth with two lips, each having 3 papillae, and opening

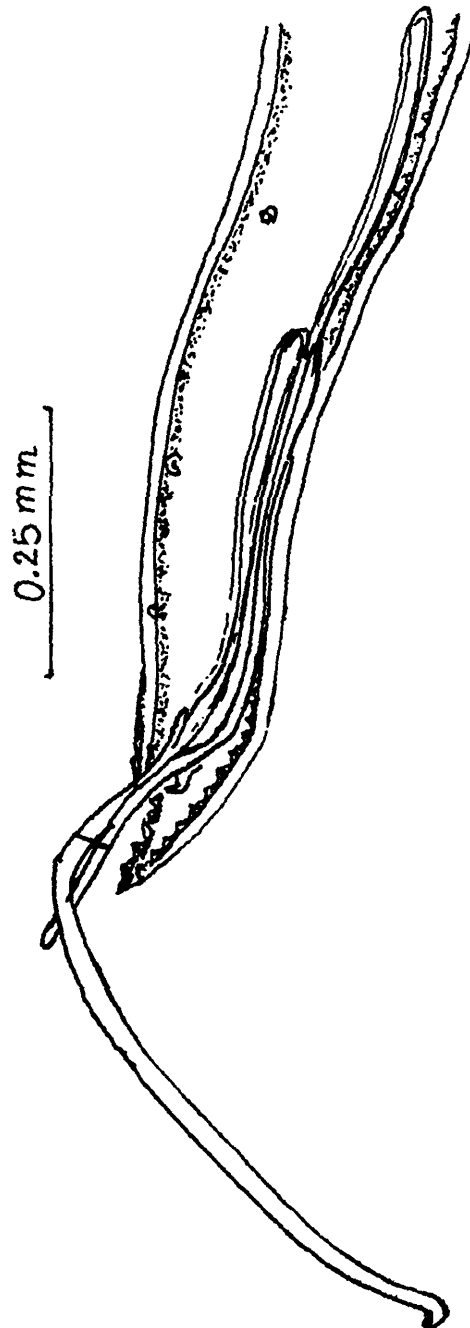


Fig. 18. *Cucullanus alii*. (After Kalyankar, 1971.) Male posterior end.

into pseudobuccal capsule with pair of conspicuous teeth and a lining of dentigerous membrane ; oesophagus 0.55-0.7 long ; nerve ring 0.24 from anterior end ; tail 0.1-0.2 long, and sometimes with well-deve-

loped caudal muscles ; spicules similar, unequal, 0.04 and 1.12 long ; gubernaculum somewhat V-shaped, 0.05-0.1 long ; caudal papillae 9-12 pairs, 5-6 preanal, 0-1 adanal, 4-5 postanal.

Female. Body 3.2-4.8 long, 0.23-0.38 wide ; head 0.15 in diameter ; pseudobuccal capsule as in male ; oesophagus 0.55-0.7 long ; nerve ring 0.26 from anterior end ; phasmids very prominent, 0.085-0.1 from posterior end ; vulva post-equatorial, 1.12-2.2 from posterior end ; eggs round, 0.022-0.038 in diameter.

Hosts : *Johnius dussumieri* ; *Lutjanus johni* ; *Sillago sihama* ; *Protognibea diacanthus* ; *Caranx* sp.

Location : Intestine

Localities : Bombay ; Mangalore ; Calicut ; Pondicherry ; Madras.

Remarks : This species was originally described as *Indocucullanus alii* by Kalyankar (1971). But, Petter (1974) though transferring it under the genus *Cucullanus* on account of its lacking intestinal caecum, remarked that its systematic position is doubtful as by having a short tail and in the absence of sucker it shows affinities with the genus *Dichelyne* (*Dichelyne*), parasites of Sciaenidae. Following her, the present author too, tentatively retains the species under *Cucullanus*.

***Cucullanus arabianse* (Ali and Kalyankar, 1967) Petter, 1974**

(Fig. 19, A & B)

- 1967. *Indocucullanus arabianse* Ali and Kalyankar, *Indian J. Helminth.*, 18 (Seminar Supplement), p. 74.
- 1971. *Indocucullanus arabiansae* : Kalyankar, *Marathwada Univ. J.*, 10, Sci. 3, p. 99.
- 1974. *Cucullanus arabianse* Petter, *Bull. Mus. natn. Hist. nat. Paris*, 177 (255), p. 1483.
- 1975. *Cucullanus tachysurus* Akram, *Sind Univ. Res. Jour. (Sci. Ser.)*, 9, p. 1.
- 1977. *Indocucullanus arabianse* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 11.
- 1980. *Indocucullanus arabianse* : Arya, *Indian J. Helminth.*, 32 (1), p. 31.
- 1980. *Cucullanus arabianse* : Soota and Dey Sarkar, *Rec. zool. Surv. India*, 76, p. 4.

Description : Male. Body 5.4-14.72 long, 0.24-0.36 wide ; anterior end expanded into a rounded head, 0.39-0.47 in diameter, and with cephalic alae 0.9-0.10 wide, limited to anterior most margin and forming a crown-like structure ; mouth with two lateral lips, each having 3 papillae, and opening dorsoventrally into pseudobuccal capsule with a pair of conspicuous teeth and lining of dentigerous membrane ; oesophagus 0.9-1.66 long ; tail 0.2-0.62 long, without caudal alae ; spicules similar, equal, 0.13-0.42 long ; gubernaculum present ; caudal papillae 9-11 pairs, 3-4 preanal, 1-3 adanal, 4-5 postanal.

Female : Body 11.46-18.06 long, 0.32-0.4 wide ; head 0.39-0.47 in diameter ; cervical alae 0.09-0.10 wide ; oesophagus 1.48-1.74 long ; tail 0.22-0.50 long ; vulva 4.4-6.4 from posterior end ; eggs 0.057×0.042 .

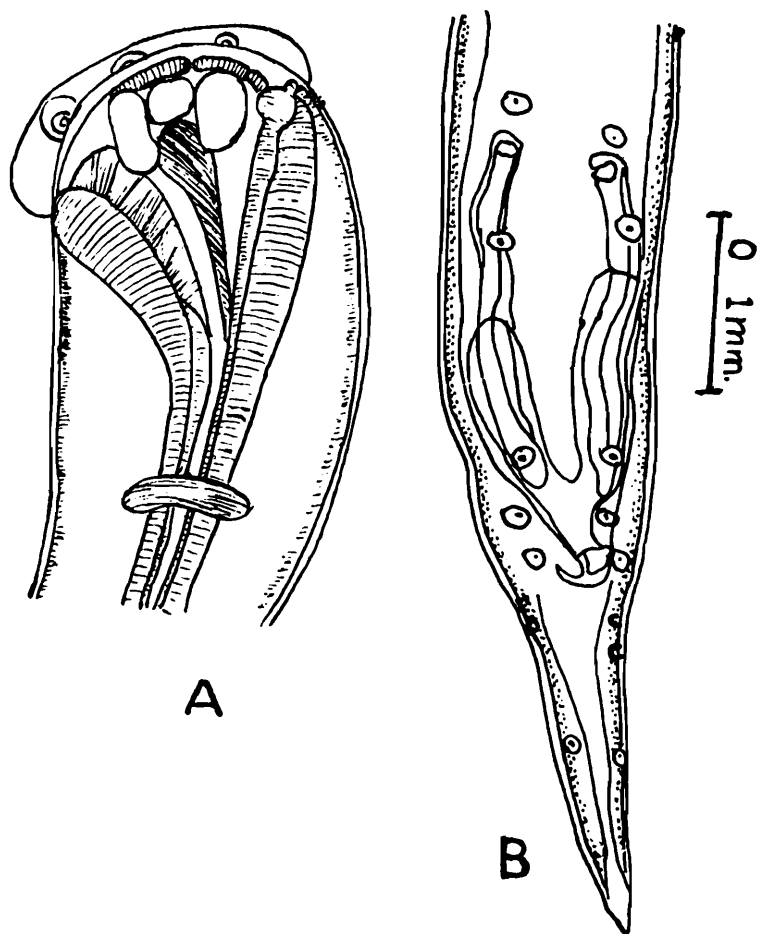


Fig. 19. *Cucullanus arabianse*. (After Ali and Kalyankar, 1967.) A. anterior end ; B. male posterior end.

Hosts : *Tachysurus maculatus* ; *Tachysurus* sp.

Location : Intestine

Localities : Bombay, Maharashtra ; Mangalore, Karnataka ; Karachi (Pakistan).

Remarks : Petter (1974) restricted its occurrence in Siluriform hosts and gave only 3 pairs of preanal papillae for species.

***Cucullanus ariusi* (Srivastava and Gupta, 1976)**
(Fig. 20)

1976. *Indocucullanus ariusi* Srivastava and Gupta, *Jap. J. Zool.*, 26 (1), p. 46.

1980. *Indocucullanus ariusi* : Arya, *Indian J. Parasit.*, 4 (1), p. 105.

1980. *Indocucullanus ariusi* : Arya, *Indian J. Helminth.*, 32 (1), p. 30.

Description : Male. Body 2.526 long, 0.645 wide, and entirely with lateral alae ; dorsoventral diameter of head 0.31 ; mouth with two

large lips, each having 3 papillae ; buccal capsule 0.248×0.17 , with pair of conspicuous lateral teeth ; oesophagus 0.615 long ; nerve ring 0.35 and excretory pore 0.38, both from anterior end ; tail 0.154 long, conical ; spicules similar, subequal, left 0.727 long, right 0.744 ; gubernaculum 0.071 long ; caudal papillae, pedunculate 6 pairs, 3 preanal, 3 postanal, sessile 1 pair, postanal.

Female. Body $4.5-5.0 \times 0.41-0.42$, and with lateral alae ; head 0.33-0.35 in diameter ; mouth dorsoventral, with two lateral lips, each having 3 papillae ; pseudobuccal capsule $0.21-0.23 \times 0.17$, with pair of lateral teeth ; oesophagus 0.59-0.61 long ; nerve ring 0.31-0.38, and excretory pore 0.360-0.367, both from anterior end ; tail 0.21-0.23 long, conical, tapering ; vulva post-equatorial, 3.10-3.12 from anterior end ; eggs spherical, $0.021-0.025 \times 0.018-0.02$.

Host : *Tachysurus platystomus*

Location : Body cavity

Localities : Pantkota, Puri, Orissa ; Trichy, Tamil Nadu.

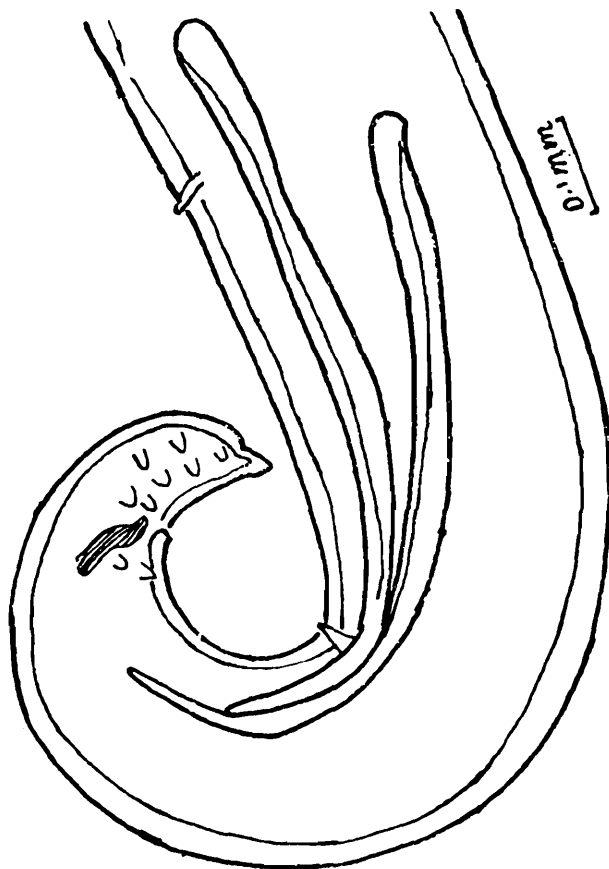


Fig. 20. *Cucullanus ariusi*. (After Srivastava and Gupta, 1976.) Male posterior end.

Remarks : This species was originally based on a single male only. The female description was subsequently furnished by Arya (1980) for his specimens from the same host from Trichy, Tamil Nadu.

Cucullanus armatus Yamaguti, 1954

(Fig. 21)

1954. *Cucullanus armatus* Yamaguti, *Acta Med. Okayama*, **9**, p. 124.1968. *Cucullanus armatus* : Rasheed, *An. Esc. nac. Cienc. biol., Mex.*, **15**, p. 49.1974. *Cucullanus armatus* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, **177** (255), p. 1483.1980. *Cucullanus quadrii* Bilgees and Fatima, *Pakist. J. Zool.* **12** (1), p. 27.

Description ; Male. Body 7.95-13.35 long, 0.3-0.6 wide ; head broad, 0.216-0.348, having U-shaped chitinous pads, with anterior-most

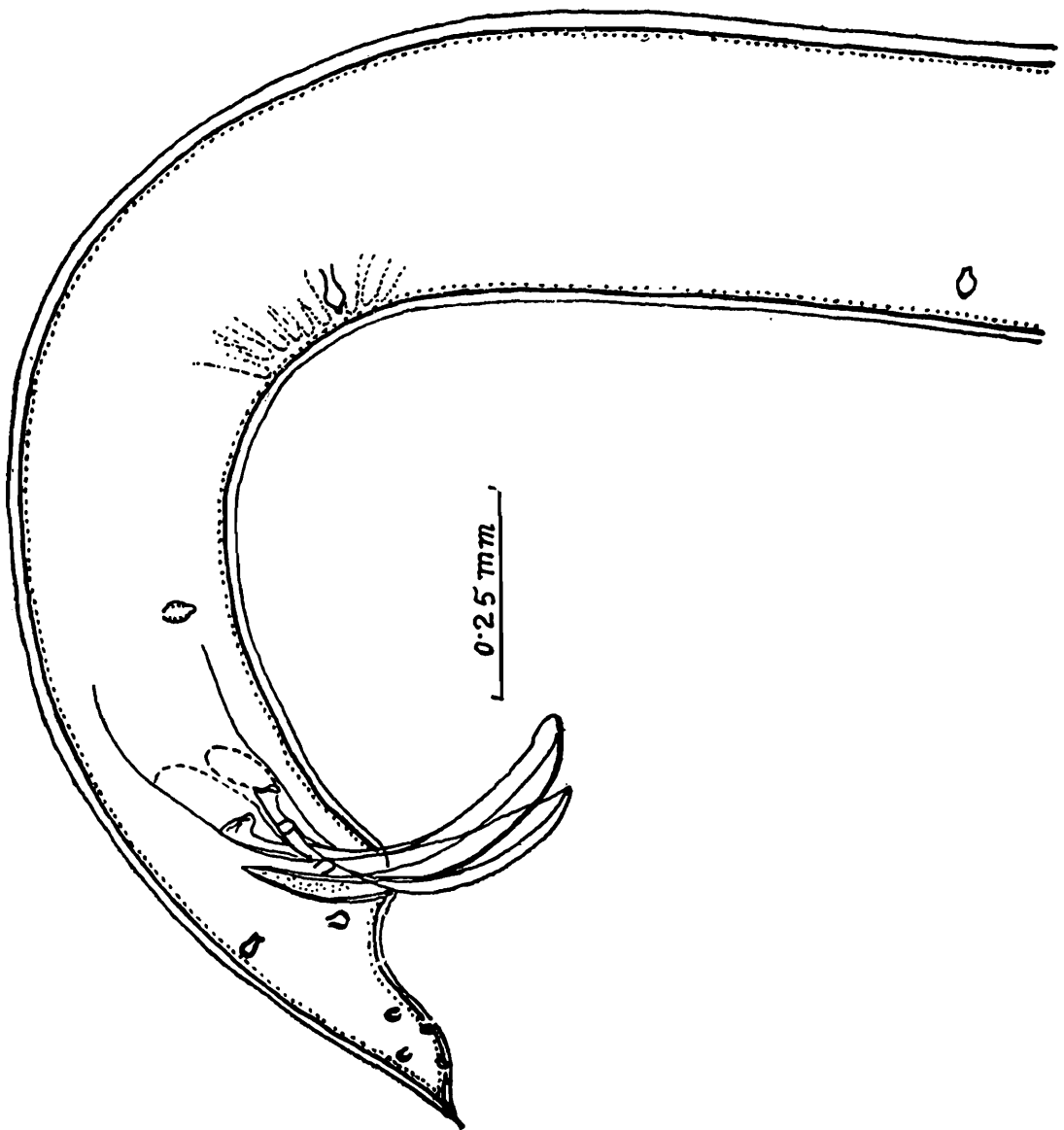


Fig. 21. *Cucullanus armatus*. (After Rasheed, 1968.) Male posterior end.

largest ; mouth dorsoventrally elongated, surrounded by thin dentigerous cuticle ; oesophagus 0.80-1.62 long ; intestinal caecum absent ; nerve ring 0.46-0.66 and cervical papillae 0.12-1.1, both from anterior end ; excretory pore 0.84-0.90, sometimes indiscernible ; tail 0.19-0.30 long, ending abruptly in fine point ; ventrally weakly developed sucker-

like structure, about 0.66-0.9 from cloacal aperture ; spicules broadly alate, 0.33-0.66 long ; gubernaculum 0.08-0.16 long, 25μ - 30μ thick ; caudal papillae 9-11 pairs, preanal 3, adanal 1-4 [according to Rasheed indefinitely 4 (the 1st and last being inclusive under pre- and postanal respectively), postanal 4.

Female. Body 10.0-20.0 long, 0.5-0.82 wide ; head as in male ; oesophagus 1.59-1.9 long ; nerve ring 0.55-0.65 and cervical papillae 1.0-1.2, both from anterior end ; excretory pore indiscernible ; tail 0.25-0.35 long, ending in spine-like process, and with a pair of lateral phasmids 0.14 from tip ; vulva 4.95-7.7 from posterior end ; sometimes not very prominent, with lips unprotruded ; eggs $61 \times 35\mu$.

Hosts : *Tachysurus serratus* ; *Tachysurus* sp.

Location : Intestine

Localities : Karachi (Pakistan) ; Borneo.

Remarks : This species was originally described by Yamaguti (1954) from *Tachysurus* [= *Arius*] sp. from Banjarmassin, Borneo, and subsequently reported by Rasheed (1968) from *T. serratus* from Karachi (Pakistan), and recently by Bilqees and Fatima (1980) from the same host and locality but considered as a new species *C. quadrii*.

***Cucullanus bilqeesi* Petter, 1974**

(Fig. 22, A & B)

1971. *Cucullanus elongatus* Bilqees et al., J. Sci. Karachi, **1**, p. 182 (preoccupied).

1974. *Cucullanus bilqeesi* Petter, Bull. Mus. natn. Hist. nat., Paris, **177** (255), p. 1483.

Description : Female. Body 14.1 long, 0.55 wide, with anterior end rounded and slightly bent dorsally ; mouth with two small lateral lips ; pseudocapsule 0.61×0.53 ; dilation of anterior end of oesophagus with five finger-like projections free anteriorly and attached posteriorly ; oesophagus 1.9 long, muscular ; tail 0.31 long, conical, with spine ; cloacal aperture surrounded by prominent muscles ; vulva post-equatorial, 5.9 from posterior end, with two muscular pads ; eggs rounded, 0.039×0.039

Host : *Erethistes elongata*

Location : Intestine

Locality : Karachi coast (Pakistan)

Remarks : This species was described as *Cucullanus elongatus* by Bilqees, Khanum and Jehan (1971) from a female from *Erethistes elongata* from Karachi coast (Pakistan). But Petter (1974) finding the name *elongatus* as preoccupied, renamed the species as *Cucullanus bilqeesi*.

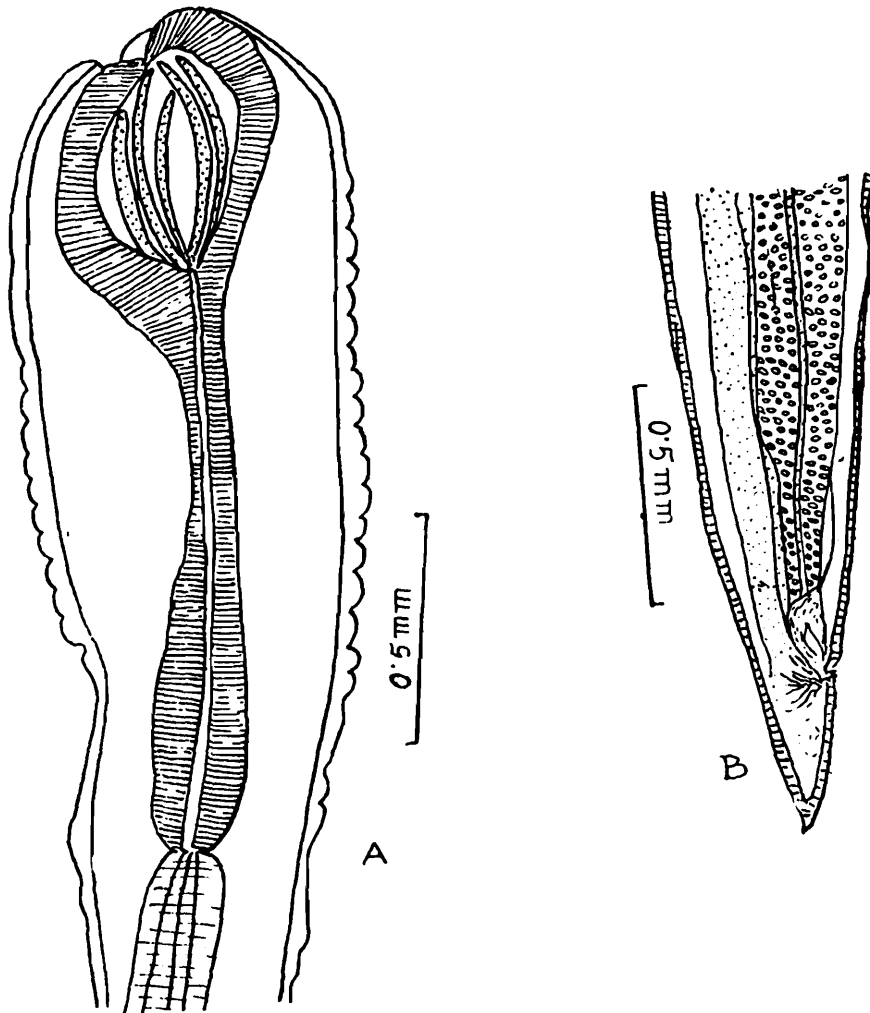


Fig. 22. *Cucullanus bilqeesi*. (After Rasheed, 1968.) A. anterior end ; B. female posterior end.

***Cucullanus bulbosa* (Lane, 1916) Barreto, 1918 ?**

- 1916. *Bulbodacnitis bulbosa* Lane, *Indian J. med. Res.*, **4**, p. 93.
- 1918. *Cucullanus bulbosa* Barreto, *Brasil Medico*, **32**, p. 137.
- 1931. *Dacnitis bulbosa* Tornquist, *Goteborgs Kungl. Vetensk.—och Vitterh.—Samh. Handl.* (5), p. 208.
- 1939. *Cucullanus bulbosus* : Baylis, *F. B. I.*, **2**, p. 222.
- 1974. *Cucullanus bulbosa* : Petter, *Bull. Mus. natn. Hist. nat. Paris*, **177** (255), p. 1482.
- 1977. *Cucullanus bulbosus* : Chaturvedi and Kansal, *Rec. zool. Surv. India, Occasional Paper No. 5*, p. 10.

Description : Male. Body 13.3 long, 0.375 wide ; “head” with hemispherical bulbous prominence, 0.2 in diameter ; oesophagus about 1.7 long ; nerve ring 0.6 from anterior end ; tail 0.425 long, with small

spike ; sucker-like organ 1.0 from posterior end ; spicules 0.7 long, somewhat like "battered kukri" ; gubernaculum about 0.11 long ; caudal papillae 11 pairs, 5 preanal, 1 adanal, 5 postanal.

Female : Body 14.0 long, 0.45 wide ; head, oesophagus, and nerve ring as in male ; tail about 0.4 long, bluntly conical, ending in spike ; vulva on hemi-spherical prominence, 8.0 from anterior end ; eggs 0.075×0.05 .

Host : *Caranx melampygus*

Location : Intestine

Locality : Cheval Paar, Gulf of Mannar, Sri Lanka.

Remarks : This species is tentatively placed under the genus *Cucullanus* as its taxonomy is rather confused.

***Cucullanus callichroi* (Stewart, 1914) Barreto, 1922**

1914. *Dacnitis callichroi* Stewart, *Rec. Indian Mus.*, **10** (1), p. 173.

1922. *Cucullanus callichroi* Barreto, *Mems Inst. Oswaldo Cruz*, **14**, p. 68.

1939. *Cucullanus callichroi* : Baylis, *F. B. I.*, **2**, p. 223.

1974. *Cucullanus callichroi* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 177 (255), p. 1483.

1977. *Cucullanus callichroi* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, 11.

Description : Female. Body 6.63-7.225 long, 0.39-0.43 wide ; "head" not curved dorsally ; mouth surrounded by membranous fringe bearing 32-36 longitudinal striations on each side, and slightly tilted towards dorsal ; oesophagus 0.77 long ; tail 0.17-0.203 long, conical, pointed, with pair of prominent papillae slightly behind middle ; anus with prominent anterior lip ; vulva 2.72-3.14 from posterior end ; eggs 0.085×0.056 .

Host : *Ompok macrophthalmus*

Location : Intestine

Locality : Lucknow, U. P.

Remarks : This species is based on two females only.

***Cucullanus chrysophrydis* Gendre, 1927**

1927. *Cucullanus chrysophrydes* Gendre, *Bull. Comp. Etud. hist. scient. Afr. Occid. Fr.*, **10**, p. 262.

1957. *Cucullanus chrysophrydes* : Campana-Rouget. *Bull. Inst. fr. Afr. noire*, ser. A, **19**, p. 421.

1974. *Cucullanus chrysophrydis* : Petter, *Bull. Mus. natn. Hist. nat. Paris*, 177 (255) p. 1482.

1977. *Cucullanus chrysophrydes* : Gupta and Garg, *Indian J. Helminth.*, 28 (1976), p. 17.

Description : Male. Body 3.174-6.00 long, 0.089-0.30 wide ; oesophagus 0.397-1.10 long, muscular ; intestinal caecum 0.429-0.442 long ; nerve ring 0.425-0.704, cervical papillae 0.88, and excretory pore 1.2, all from anterior end ; tail 0.096-0.2 long, pointed ; caudal alae absent ; sucker without chitinous rim, 0.346-0.72 from posterior end ; spicules similar, 0.179-0.44 long ; gubernaculum 0.051-0.11 long ; caudal papillae sessile, 6 pairs, all postanal.

Female. Body 1.08-1.87 long, 0.064-0.37 wide ; oesophagus 0.269-1.51 long ; nerve ring 0.450-0.704, cervical papillae 0.91, and excretory pore 1.25, all from anterior end ; tail 0.121-0.3 long ; vulva 2.298-9.72 from anterior end ; eggs $0.025-0.075 \times 0.012-0.045$.

Hosts : *Argyrops aurata* ; *Acanthopagrus berda* ; *Pegellus bogaravea*

Location : Intestine

Localities : Panaji, Goa (India) ; W. Africa.

Remarks : This species was first described by Gendre (1927) from *Argyrops* [= *Sparus*] *aurata* from Mauritania (W. Africa) and subsequently reported by Campana-Rouget (1957) from another fish host *Pagellus bogaravea* also from West Africa. Recently, the species has been recorded by Gupta and Garg (1977) for the first time from another fish host *Acanthopagrus* [= *Sparus*] *berda* and also from India, but actually it is better referable to another genus *Dichelyne* for showing the presence of an intestinal caecum.

***Cucullanus dogieli* Krotas, 1959**

1959. *Cucullanus dogieli* Krotas, *Trudy Akad. Nauk Litovskoi SSR* (ser. B), 2, p. 173.

1969. *Cucullanus dogieli* : Khan and Yaseen, *Bull. Dep. Zool. Panjab Univ.*, article 4, p. 16.

1974. *Cucullanus dogieli* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 177 (255), p. 1481.

Description : Male. Body 10.26 long, 0.40 wide, and entirely with cuticular expansion ; lips two, lateral, each with 3 papillae ; oesophagus dilated anteriorly to form pseudocapsule, 0.20 long, 0.17 wide ; posterior oesophagus 0.60 long, 0.13 wide ; nerve ring 0.27 from anterior end ; tail 0.15 long ; caudal alae feebly developed, 0.009 wide ; precloacal sucker 0.22 long, without chitinous rim ; spicules similar, equal, 0.6 long, tapering gradually to sharp point distally ; gubernaculum 0.06 long, 0.01 wide, tooth-like ; caudal papillae pedunculate, 11 pairs, 6 preanal, 5 postanal.

Female. Body 11.88-12.69 long, 0.40-0.50 wide ; anterior end as in male ; posterior oesophagus 0.77 long ; nerve ring 0.29 from anterior end ; tail 0.1-0.2 long ; vulva in middle region of body, dividing it into two almost equal halves ; eggs 0.02-0.04 in diameter.

Host : *Chanda nama*

Location : Intestine

Locality : Sylhet (Bangladesh).

Remarks : This species was originally described by Krotas (1959) from a Cyprinoid fish from U. S. S. R., and subsequently unexpectedly from a Perciform fish by Khan and Yaseen (1969), as already remarked by Petter (1974).

***Cucullanus guerreroi* (Arya and Johnson, 1975)**

(Fig. 23)

1975. *Indocucullanus guerreroi* Arya and Johnson, *Mem. Soc. Cienc. nat. La Salle*, 35, (102), p, 291.

1980. *Indocucullanus guerreroi* : Arya, *Indian J. Helminth.*, 32 (1) p. 28.

Description : Male. Body 12-13 long, 0.18-0.20 wide ; cuticular striations pronounced, 0.004-0.005 apart ; mouth opening dorsoven-

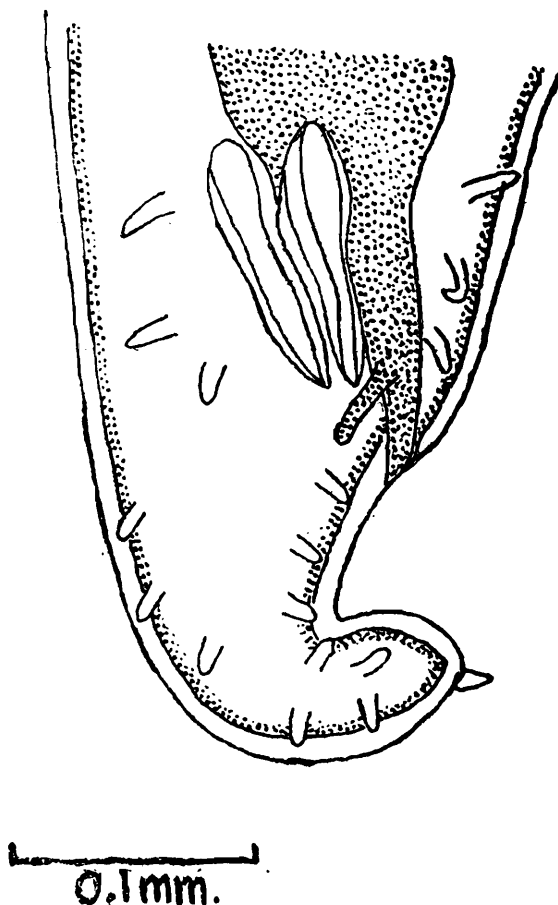


Fig. 23. *Cucullanus guerreroi*. (After Arya, 1980.) Male posterior end.

trally into pseudobuccal capsule, with pair of conspicuous teeth and lining of dentigerous membrane ; oesophagus entirely muscular, 0.75-0.79 long, claviform posteriorly ; oesophago-intestinal valve conspicuous ; nerve ring 0.26-0.28, and excretory pore 0.29-0.30, both from anterior end ; tail 0.16-0.18 long, tapering, ending, in a short spine ; spicules two, similar, non-alate, and equal, 0.11-0.14 long ; gubernaculum rod-shaped, 0.03-0.037 long ; caudal papillae pedunculate, 8 pairs, 3 pre-anal, 5 postanal.

Female. Body 14.0-15.0 long, 0.21-0.24 wide ; cuticular striations well developed ; mouth opening as in male ; oesophagus entirely muscular, 0.85-0.96 long, 0.07-0.13 wide, with swollen posterior end ; oesophago-intestinal valve conspicuous ; nerve ring 0.3-0.31, and excretory pore 0.31-0.32, both from anterior end ; tail 0.185-0.19 long, tapering, ending in short spine ; vulva post-equatorial, 3.0-4.6 from posterior end, with two lips ; eggs 0.005-0.01 in diameter, spherical.

Host : *Scomberomorus guttatus*

Location : Intestine

Locality : Fish market, Jodhpur, Rajasthan.

Remarks : This species was originally based on two females only from *Scomberomorus* [= *Cybium*] *guttatus*. The male description was subsequently furnished by Arya (1980) for his specimens from the same host.

***Cucullanus hians* (Dujardin, 1845) Campana-Rouget and Chabaud, 1956**
(Fig. 24)

1845. *Dacnitis hians* Dujardin, *Histoire nat. Helminth. Paris*, Roret, p. 270.

1901. *Dacnitis hians* : Linton, *U. S. Fisheries Comm. Bull.*, 19, p. 436.

1956. *Cucullanus hians* Campana-Rouget and Chabaud, *Vie Milieu*, 7 (2), p. 267.

1968. *Cucullanus hians* : Rasheed, *An. Esc. nac. Cienc. biol., Me'x.*, 15, p. 37.

1974. *Cucullanus hians* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 177 (255), p. 1481.

Description : Male. Body 9.5-17.0 long, 0.35-0.4 wide ; mouth surrounded by cuticular border of two rows of 'serrations' or teeth-like structures ; head with usual number of papillae in two circles, in outer 4 large submedian, and amphids 2, lateral ; in inner circle 6, small ; oesophagus 1.0-1.3 long ; intestinal caecum or diverticulum absent ; nerve ring 0.36-0.46, cervical papillae 1.2-1.25, and excretory pore 1.1-1.2, all from anterior end ; tail 0.22-0.25 long ; sucker large, well-developed, 0.55-0.8 from cloacal opening ; spicules 0.88-1.2

long, thick, alate, slightly tapering to bluntly pointed tip ; gubernaculum 0.18-0.19 long, heavily cuticularized ; caudal papillae 11 pairs, 3 preanal, 4 adanal, 4 postanal.

Female. Body 17.0-23.0 long, 0.4-0.45 wide ; head as in male ; oesophagus 1.3-1.45 long ; intestinal caecum or diverticulum absent ;

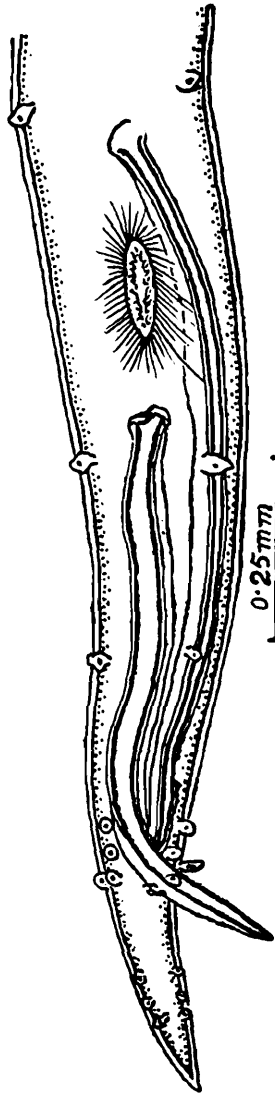


Fig. 24. *Cucullanus hians*. (After Rasheed, 1968.) Male posterior end.

nerve ring 0.44-0.48, cervical papillae 1.3-1.7, and excretory pore 1.1-1.2, all from anterior end ; tail 0.37-0.45 long ; vulva post-equatorial, 9.5 from posterior end ; eggs $62-70\mu \times 37-40\mu$.

Hosts : *Lates calcarifer* ; *Johnius* sp. ; *Strongylura strongylurus* ; *Sparus* sp. ; *Acanthopagrus berda*

Location : Intestine

Locality : Karachi (Pakistan)

Remarks : Campana-Rouget's (1957) claim of host specificity in the genus *Cucullanus* and restricted distribution of its species was not

supported by the findings of Rasheed (1968) who has dealt with the above species very elaborately and reported it from different hosts and different locality. Petter (1974), however, followed Campana-Rouget (*op. cit.*), restricting its distribution only to Anguilliformes.

***Cucullanus jaiswali* (Ali, 1957) Petter, 1974**

(Fig. 25)

1957. *Indocucullanus jaiswali* Ali, *Indian J. Helminth.*, **8**, p. 23.

1971. *Indocucullanus jaiswali* : Kalyankar, *Marathwada Univ. J.*, **10**, Sci. **3**, p. 106.

1974. *Cucullanus jaiswali* Petter, *Bull. Mus. natn. Hist. nat., Paris*, **177** (255), p. 1483.

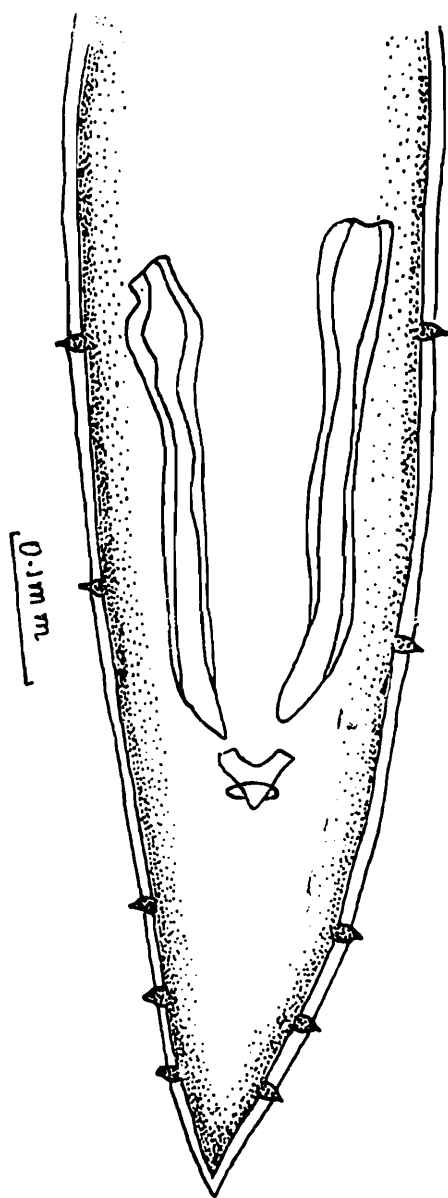


Fig. 25. *Cucullanus jaiswali*. (After Ali, 1957.) Male posterior end.

1975. *Indocucullanus calcariferii* Zaidi and Khan, *Pakist. J. Zool.*, **7** (1), p. 64.

1976. *Indocucullanus wertheimae* Gupta and Garg, *Revta iber'. Parasit.*, **36** (3-4), p. 182.

1977. *Indocucullanus jaiswali* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional paper No. 5, p. 11.
1980. *Indocucullanus calcariferii* : Arya, *Indian J. Helminth.*, 32 (1), p. 30.
1980. *Indocucullanus wertheimae* : Arya, *Indian J. Helminth.*, 32 (1), p. 30.
1980. *Indocucullanus jaiswali* : Arya, *Indian J. Helminth.*, 32 (1), p. 31.

Description : Male. Body 2.58-8.9 long, 0.173-0.411 wide ; mouth with two lateral lips, each with 3 papillae ; oesophagus 0.542-0.94 long ; nerve ring 0.275-0.3 from anterior end ; tail 0.122-0.25 long ; spicules equal, 0.198-0.3 long ; gubernaculum 0.044-0.141 long ; caudal papillae 4-5 pairs, 2-3 preanal, 0-1 adanal, 1-3 postanal.

Female : Body 3.103-9.519 long, 0.211-0.44 wide ; oesophagus 0.657-1.0 long ; tail 0.122-0.23 long ; vulva post-equatorial, 1.56-5.83 from anterior end ; eggs 0.032-0.065×0.019-0.055.

Hosts : *Puntius sarana* ; *Lates calcarifer* ; *Tachysurus thalassimus*.

Location : Intestine.

Localities : Hyderabad, Andhra Pradesh ; Calicut, Kerala ; Karachi coast (Pakistan).

Remarks : Ali (1957) on the basis of a male and a female from a freshwater fish, *Puntius sarana* from Hyderabad, Andhra Pradesh, described *Indocucullanus jaiswali*, which was subsequently transferred under the genus *Cucullanus* by Petter (1974). Later, under the genus *Indocucullanus* two more species, viz. *I. calcariferii* from *Lates calcarifer* from Karachi coast, and *I. wertheimae* from *Tachysurus thalassimus* from Calicut, Kerala, were added respectively by Zaidi and Khan (1975), and Gupta and Garg (1976), which are now placed here under the genus *Cucullanus*. As the main differences between these 3 species, viz. body size and number of caudal papillae are taken here as intraspecific variations, all these three are treated as conspecific, until more material is examined to reveal clearer and more definite differences. It may be noted, however, that Petter (*op. cit.*) restricted its occurrence in Cypriniform hosts only. A comparative chart of the species shown under synonymy is given below.

		<i>Cucullanus jaiswali</i> (Ali, 1957) Petter, 1974	<i>Cucullanus calcariferii</i> (Zaidi and Khan, 1975)	<i>Cucullanus wertheimae</i> (Gupta and Garg, 1976)
Body length :	♂	8.9	2.53-2.98	4.957
	♀	9.519	3.103-4.147	5.875
Body width :	♂	0.411	0.203-0.260	0.173
	♀	0.44	0.340-0.370	0.211-0.231

	<i>Cucullanus jaiswli</i> (Ali, 1975) Petter, 1974	<i>Cucullanus calcariferii</i> (Zaidi and Khan, 1975)	<i>Cucullanus wertheimae</i> (Gupta and Garg, 1976)
Pseudobuccal capsule :	♂ — ♀ —	0.108 wide 0.137	0.166 × 0.147 0.166-0.211 × 0.16-0.198
Oesophagus length :	♂ 0.94 ♀ 1.0	0.542-0.611 0.669-0.738	0.646 0.657-0.768
Cervical papillae from ant. end.	♂ 0.62 ♀ 0.289	— —	— —
Nerve ring from ant. end. :	♂ 0.3 ♀ 0.32	0.275-0.287 —	— —
Excretory pore from ant. end. :	♂ 0.55 ♂ 0.637	— —	— —
Tail length :	♂ 0.25 ♀ 0.23	pointed and terminally with two spines. blunt, with a pair of postanal pedunculate papillae ; terminally without spine	0.122 ,,
Spicule length	0.30	0.319-0.344	0.198
Gubernaculum length	0.044. V-shaped	triangular	0.141, rounded anteriorly and pointed posteriorly
Caudal papillae	5 pairs, sessile 2 preanal 3 postanal	4 pairs 2 preanal pedunculate 1 adanal sessile, 1 postanal sessile	5 pairs, equidistant.
Vulva from ant. end.	5.83, post-equatorial	1.56-1.98, equatorial	post-equatorial having lips
Eggs	0.065 × 0.055	0.048-0.051 in diameter.	0.032-0.038 × 0.019-0.026
Host	<i>Puntius sarana</i>	<i>Lates calcarifer</i>	<i>Tachysurus thalassimus</i>

***Cucullanus jalnaensis* (Kalyankar, 1971) Petter, 1974**
(Fig. 26)

1971. *Indocucullanus jalnaensis* Kalyankar, *Marathwada Univ. J.*, 10 Sci. 3, p. 100.
1974. *Cucullanus jalnaensis* Petter, *Bull. Mus. natn. Hist. nat., Paris*, 177 (255), p. 1483.
1976. *Indocucullanus puriensis* Srivastava and Gupta, *Jap. J. Zool.*, 26 (1), p. 46.
1980. *Indocucullanus jalnaensis* : Arya, *Indian J. Helminth.*, 32 (1), p. 31.
1980. *Indocucullanus puriensis* : Arya, *Indian J. Helminth.*, 32 (1), p. 31.

Description : Male. Body 8.9-13.03 long, 0.55-0.81 wide ; head 0.23-0.275 in diameter ; mouth with two lateral lips, each having 3 papillae, and opening into pseudobuccal capsule with a pair of conspicuous teeth

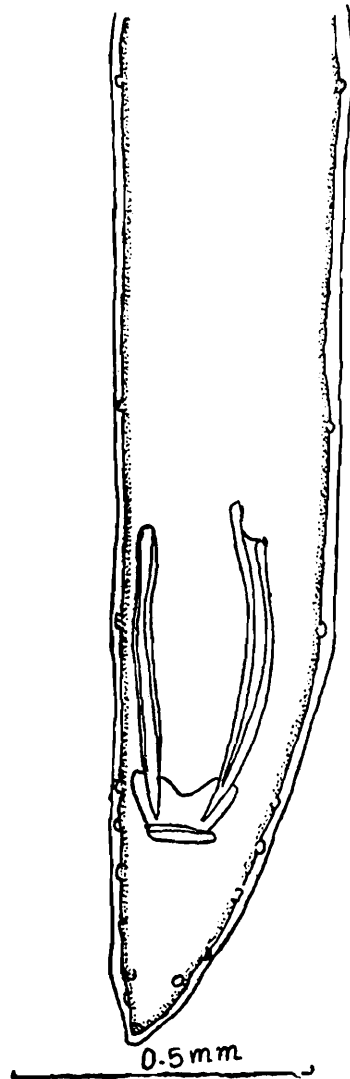


Fig. 26. *Cucullanus jalnaensis*. (After Kalyankar, 1971.) Male posterior end.

and lining of dentigerous membrane ; oesophagus 1.0-1.30 long ; nerve ring 0.42-0.53 from anterior end ; tail 0.257-0.38 long, conical ; spicules similar, subequal, 0.322-0.55 and 0.31-0.50 long ; gubernaculum present ; caudal papillae 9 pairs, 3 preanal, 0.2 adanal, 4-6 postanal.

Female : Body 15.13-16.38 long, 0.45-0.61 wide ; anterior end as in male ; head 0.325-0.41 in diameter ; oesophagus 1.37-1.52 long ; nerve ring 0.5-0.69 and excretory pore 0.7-0.84, both from anterior end ; tail 0.31-0.49 long, conical ; vulva post-equatorial, 6.0-6.627 from posterior end, and with conspicuous lips ; eggs 0.051-0.062 x 0.037-0.052.

Hosts : *Labeo rohita* ; *Tachysurus platystomus*

Location : Intestine

Localities : Jalana, Maharashtra ; Pentkota, Puri, Orissa

Remarks : This species was originally based on a single male only. It is to be remarked, however, that Petter (1974) restricted its occurrence in Cypriniform hosts.

***Cucullanus karachii* (Zaidi and Khan, 1975)**

(Fig. 27)

1975. *Indocucullanus karachii* Zaidi and Khan, *Pakist. J. Zool.*, 7 (1), p. 65.

1980. *Indocucullanus karachii* : Arya, *Indian J. Helminth.*, 32 (1), p. 31.

Description : Male. Body 4.350-4.405 long, 0.319-0.320 wide, with lateral alae extending throughout body but more pronounced in oesophageal region ; lips two, lateral, each with 3 papillae and numerous teeth-like structures at base ; pseudobuccal capsule 0.137 wide, and

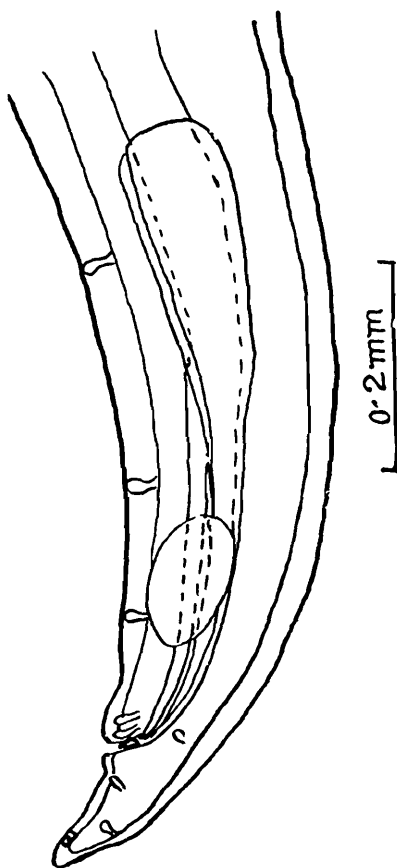


Fig. 27. *Cucullanus karachii*. (After Zaidi and Khan, 1975.) Male posterior end.

with pair of conspicuous teeth ; oesophagus 0.699 long ; nerve ring 0.246 from anterior end ; spicules equal, 0.640 long ; gubernaculum oval, 0.102×0.033 ; caudal papillae pedunculate, 12 pairs, 6 preanal, 1 adanal, 5 postanal.

Host : *Stolephorus indicus* [= *Engraulis indica*]

Location : Intestine

Locality : Fish Harbour, Karachi (Pakistan)

Remarks : This species is based on four males only.

***Cucullanus lucknowi* Campana Rouget, 1961**

(Fig. 28)

1956. *Cucullanus antipodeus* Khera, *Indian J. Helminth.*, **6** (2), p. 94 (*nec* Baylis, 1932).
1961. *Cucullanus lucknowi* Campana-Rouget, *Publ. Inst. r. Sci. nat. Belgique*, **3** (4), p. 21.
1974. *Cucullanus lucknowi*: Petter. *Bull. Mus. natn. Hist. nat. Paris*, 177 (255), p. 1481.
1977. *Cucullanus antipodeus*: Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 10.

Description : Male. body 6.0-8.7 long, 0.18-0.3 wide ; head 0.14-0.19 in diameter ; oesophagus 0.67-0.8 long ; nerve ring 0.25-0.32, and excretory pore 0.7-1.5, both from anterior end ; cervical papillae a little

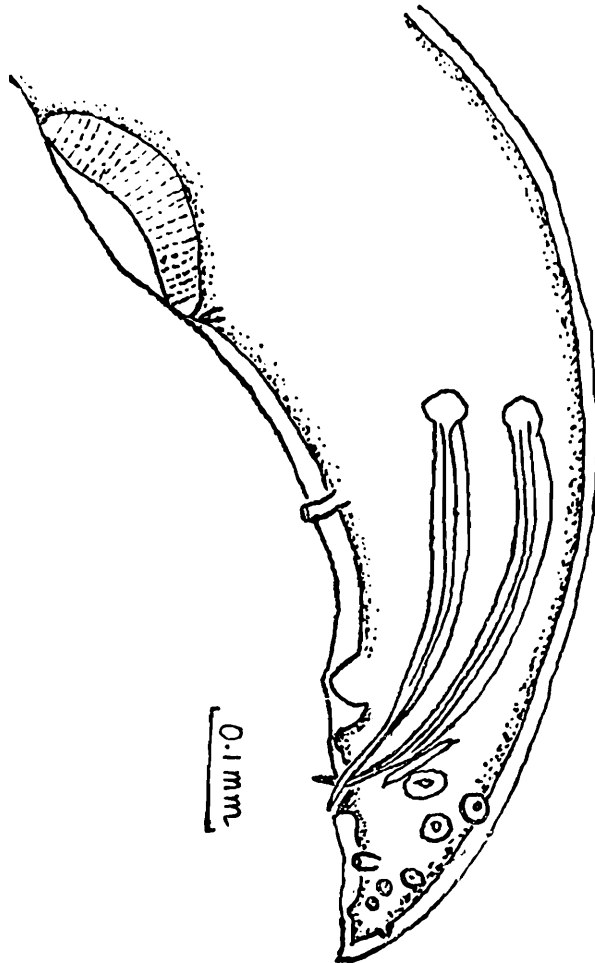


Fig. 28. *Cucullanus lucknowi*. (After Khera, 1956.) Male posterior end.

behind nerve ring ; tail 0.15-0.7 long ; spicules 0.45-0.5 long ; gubernaculum 0.077 long ; caudal papillae 14 pairs, 4 preanal, 1 adanal, 9 postanal.

Female. Body 8.7-19.6 long, 0.25-0.45 wide ; oesophagus 0.75-0.94 long ; head, nerve ring, excretory pore, and cervical papillae as in

male ; tail 0.32-0.55 long, with pair of caudal papillae 0.15-0.22 from tip ; vulva 3.7-8.8 from posterior end ; eggs $0.077-0.085 \times 0.045-0.05$.

Host : *Mystus seenghala*

Location : Intestine

Locality : Fish market, Lucknow, U. P.

Remarks : Khera (1956) described his species from *Mystus seenghala* from Lucknow as *Cucullanus antipodeus* Baylis, 1932. But, at the same time, rather unusually, he not only undervalued the character given specific importance by Chitwood and Wehr (1934), but also ignored Baylis' (1927) advocacy for the formation of new species on the basis of new host record in this genus on the ground that "There is already too much confusion prevailing as to the identity of various species". Margolis (1960) cast strong doubts on Khera's (*op. cit.*) identification, and in fact, Campana-Rouget (1961) actually placed latter's specimens under the new species *Cucullanus lucknowi* and this was accepted by Petter (1974) and now followed here.

***Cucullanus malvanae* (Kalyankar, 1971) Petter, 1974**

(Fig. 29)

1971. *Indocucullanus malvanae* Kalyankar, *Marathwada Univ. J.*, **10**, Sci. 3, p. 104.

1974. *Cucullanus malvanae* Petter, *Bull. Mus. natn. Hist. nat., Paris*, **177** (255), p. 1483.

1980. *Indocucullanus malvanae* : Arya, *Indian J. Helminth.*, **32** (1), p. 31.

Description : Male. Body 17.11 long, 0.64 wide ; mouth with two lips, opening into pseudobuccal capsule with a pair of teeth and lining of dentigerous membrane ; oesophagus 0.96 long ; nerve ring 0.57 from anterior end ; tail 0.28 long ; spicules dissimilar, unequal, 0.77 and 0.40 long, with longer one covered by sheath, 0.03-0.04 wide ; gubernaculum 0.61 long, 0.097 wide ; caudal papillae 11 pairs, 6 preanal, 5 postanal.

Host : *Tachysurus maculatus*

Location : Intestine

Locality : Malvan, Maharashtra

Remarks : This species is based on a single male only.

***Cucullanus olivoceus* Akram, 1975**

1975. *Cucullanus olivoceus* Akram, *Sind Univ. Res. Jour. (Sci. Ser.)*, **9**, p. 3.

Description : Female. Body 10.96-15.28 long, 0.26-0.74 wide ; lips surrounded by ridged cuticle, and each with 2 large papillae, an amphid,

and 2 pads with anterior large ; oesophagus 1.3-1.62 long ; tail 0.22-0.40 long, tapering or conical ; lateral papillae 0.08-0.10 from tip ; vulva 3.62-5.70 from posterior end, and with protruding lips supported by strong muscles.

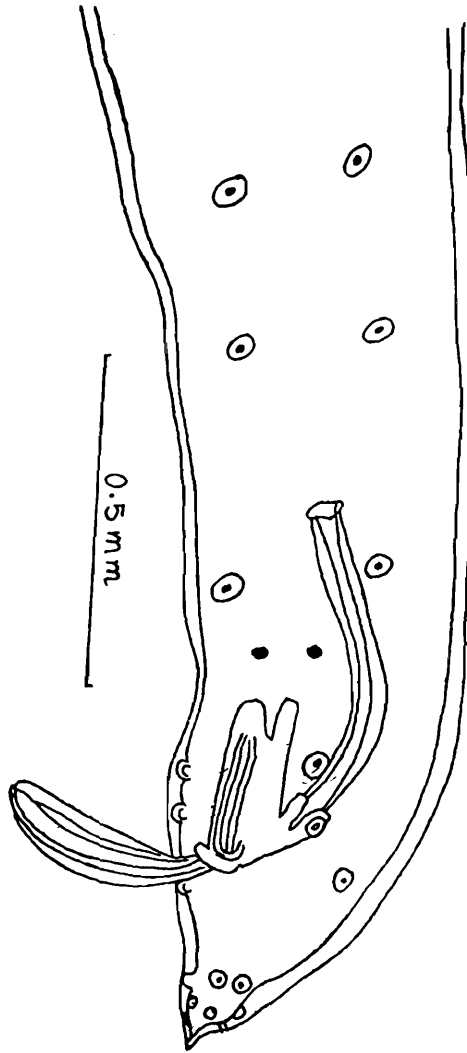


Fig. 29. *Cucullanus malvanae*. (After Kalyankar, 1971.) Male posterior end.

Hosts : *Tachysurus serratus* ; *Pomadasys olivaceus*

Location : Intestine

Locality : Karachi Coast (Pakistan)

Remarks : As this species based on four females only is very inadequately described, its inclusion here is purely tentative.

***Cucullanus pangasius* Soota and Chaturvedi, 1971**

(Fig. 30)

1971. *Cucullanus pangasius* Soota and Chaturvedi, *Zool. Anz.*, **187**, p. 310.

1974. *Cucullanus pangasius* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, **177** (255), p. 1481.

1977. *Cucullanus pangasius* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 11.

Description : Male. Body 30-32 long, 0.9-0.99 wide ; head with two lateral lips, each bordered with narrow denticulate cuticle and with three small papillae on outer surface ; buccal capsule 0.28-0.29 long, 0.22-0.23 wide ; oesophagus 0.9-1.1 long ; nerve ring 0.33 from anterior end ; tail 0.27-0.31 long ; preanal sucker 0.044-0.055 from cloacal aperture ; spicules equal, 1.5-1.8 long ; gubernaculum 0.14-0.16 long ; caudal papillae 11 pairs, 1 anterior and 2 behind sucker, 4 near and 4 posterior to cloaca.

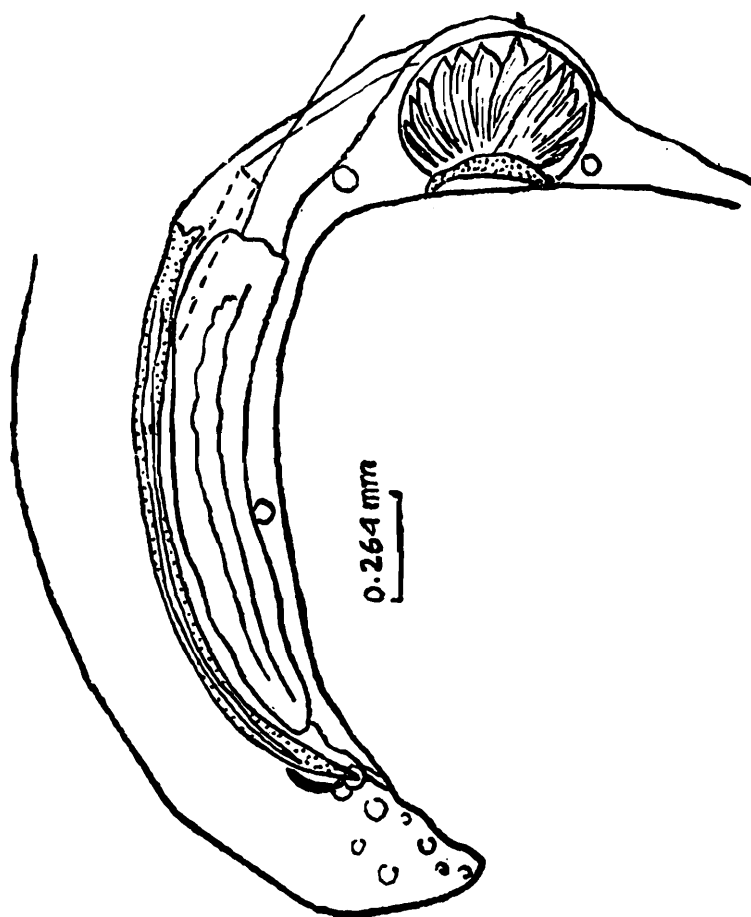


Fig. 30. *Cucullanus pangasius*. (After Soota and Chaturvedi, 1971.) Male posterior end.

Female : Body 34.4-35.2 long, 1.27-1.32 wide ; buccal capsule 0.33-0.38 long, 0.31-0.33 wide ; oesophagus 1.2-1.3 long ; nerve ring 0.38 from anterior end ; tail 0.44-0.5 long ; vulva 23.4-24.2 from anterior end ; eggs round, 0.044×0.044 .

Host : *Pangasius pangasius*

Location : Intestine

Locality : Mettur Dam, Madras

Remarks : As this species comes close to *Cucullanus ritai* Karve, 1952, study of more material of both the species may prove them to be conspecific.

***Cucullanus pseudeutropi* Agrawal, 1967**

(Fig. 31)

- 1967. *Cucullanus pseudeutropi* Agrawal, *Annls Parasit. hum. comp.*, **42** (3), p. 328.
- 1972. *Cucullanus pseudeutropi* : Sood, *Indian J. Helminth.*, **24** (2), p. 81.
- 1974. *Cucullanus pseudeutropi* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, **177** (255), p. 1481.
- 1977. *Cucullanus pseudeutropi* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 11.

Description : Male. Body 3.57-10.16 long, 0.27-0.41 wide, and entirely with narrow lateral alae ; head 0.07-0.15 in diameter ; mouth

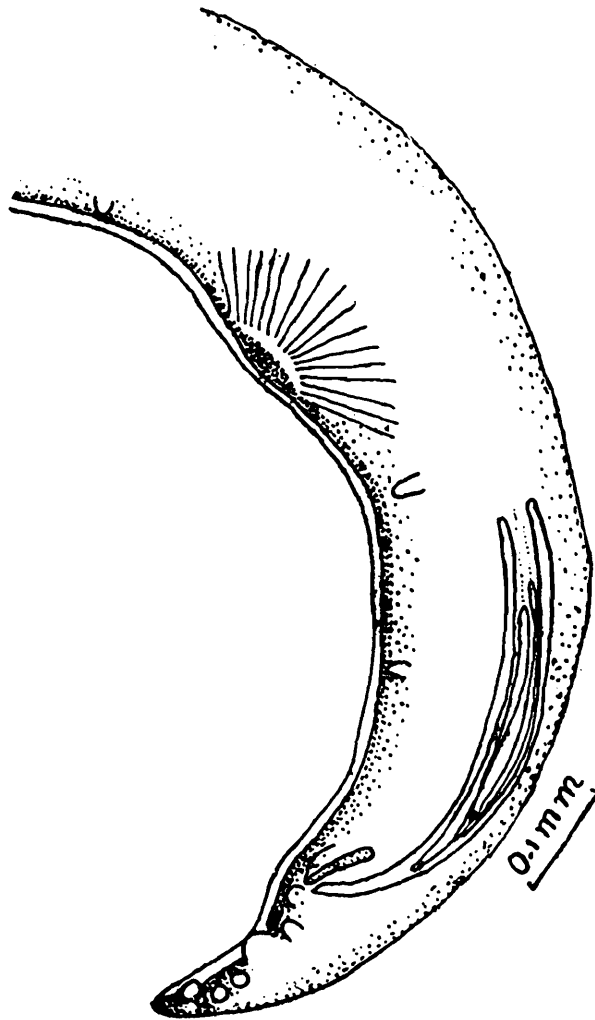


Fig. 31. *Cucullanus pseudeutropi*. (After Agrawal, 1967). Male posterior end.

with two lateral lips, each having 3 well-developed papillae, and behind its opening with a dentigerous ridge ; anterior dilated pseudobuccal

capsule 0.13-0.22 long, 0.11-0.18 wide, posterior muscular oesophagus 0.41-0.48 and 0.08-0.17 respectively ; entire oesophagus 0.54-0.69 long ; nerve ring 0.14-0.26, excretory pore 0.26-0.31, and bristle-like cervical papillae 0.42-0.61, all from anterior end ; tail 0.18 long, pointed, with narrow caudal alae and a pair of phasmids at tip ; spicules similar, equal, 0.38-0.52 long, broad anteriorly and sharply pointed posteriorly ; gubernaculum wedge-shaped, 0.062-0.10 long ; preanal sucker muscular, spindle-shaped, 0.16-0.365 long, and 0.34-0.45 from cloacal aperture ; caudal papillae pedunculate, 8-9 pairs, 4 preanal, 0-1 adanal, 3-5 postanal.

Female : Body 3.42-11.68 long, 0.26-0.45 wide ; anterior end as in male ; head 0.1-0.15 in diameter ; anterior dilated pseudobuccal capsule 0.12-0.22 long, 0.09-0.16 wide, posterior muscular oesophagus 0.39-0.52 long, 0.09-0.17 wide ; entire oesophagus 0.51-0.74 long ; nerve ring 0.14-0.27, excretory pore 0.28-0.33, and bristle-like cervical papillae 0.43-0.65, all from anterior end ; tail short, pointed, without lateral papillae ; vulva post-equatorial, 2.4-4.56 from posterior end ; eggs 0.04×0.02 -0.04.

Hosts : *Pseudeutropius garus* ; *Mystus seenghala*

Location : Intestine

Locality : Lucknow, U. P.

Cucullanus ritai Karve, 1952

(Fig. 32 A & B)

1952. *Cucullanus ritai* Karve, J. Univ. Bombay, **21** (3), p. 9.

Description : Male. Body 7.9 long, 0.5 wide ; with spherical cuticular thickenings of varying size ; tail 0.15 long, bluntly rounded, with roughly triangular spike ; sucker 1.02 from posterior end ; spicules two, alate, sickle-shaped, equal, 0.73 long ; gubernaculum 0.095 long ; caudal papillae 11 pairs, 5 preanal, 6 postanal ; single median papilla just anterior to cloacal opening.

Female. Body 10.9 long, 0.6 wide, with spherical cuticular thickenings as in male ; head 0.16 wide, broader than neck ; false buccal capsule 0.25 long, 0.17 wide ; lips two, lateral, lined with dentigerous membrane, each with 3 papillae on outer surface, two submedian, one lateral ; oesophagus 0.8 long, club-shaped ; nerve ring 0.32, excretory pore 0.57, and cervical papillae 0.64, all from anterior end ; tail 0.13 long, bluntly rounded, ending in spike ; vulva 4.2 from posterior end ; eggs 0.045×0.03 -0.035.

Host : *Rita buchanani*

Location : Intestine

Locality : Calcutta

Remarks : As this species is based only on a male and an incomplete female, study of more material will be very fruitful.

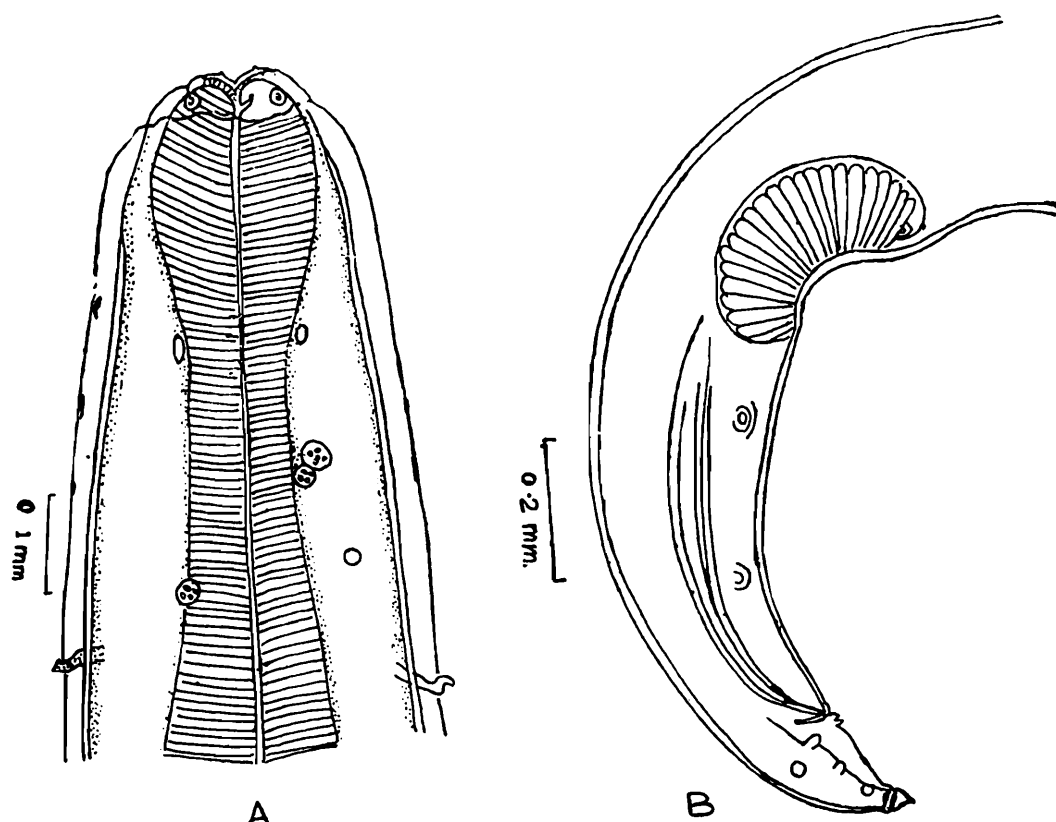


Fig. 32. *Cucullanus ritai*. (After Karve, 1952.) A. anterior end ; B male posterior end.

***Cucullanus rivulatus* Soota and Dey Sarkar, 1980**

(Fig. 33)

1980. *Cucullanus rivulatus* Soota and Dey Sarkar, *Rec. zool. Surv. India*, **76**, p. 1.

Description : Male. Body 4.5-7.5 long, 0.55-0.7 wide ; oesophagus 0.75-1.16 long ; tail 0.2-0.22 long, pointed ; caudal muscles well developed ; spicules non-alate, similar, equal, 0.7-0.9 long ; gubernaculum V-shaped, 0.05-0.1 long ; caudal papillae 8 pairs, 3 preanal, 1 adanal, 4 postanal.

Female : Body 6.7-7.8 long, 0.77-0.88 wide ; oesophagus 1.2-1.4 long ; tail 0.16-0.22 long, pointed ; pair of phasmids 0.05-0.08 from posterior end ; vulva 3.08-3.25 from posterior end ; eggs 0.066×0.044 .

Host : *Lutjanus rivulatus*

Location : Intestine

Locality : Madras

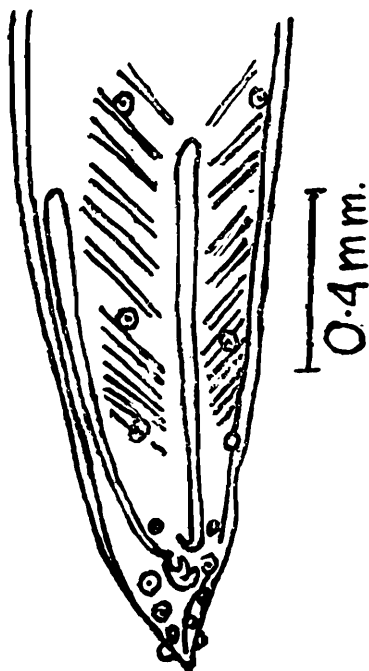


Fig. 33. *Cucullanus rivulatus*. (After Soota and Dey Sarkar, 1980.) Male posterior end.

Remarks : This species approaches *C. lutjani* Schmidt and Kuntz, 1969, described from two damaged specimens and renamed by Petter (1974) as *D. (D.) lutjani* but expressedly doubting its systematic position.

***Cucullanus sciaenai* (Gupta and Gupta, 1979)**

(Fig. 34)

1979. *Indocucullanus sciaenai* Gupta and Gupta, *Indian J. Helminth.*, 29 (1-2), p. 110.

1980. *Indocucullanus sciaenai* : Arya, *Indian J. Helminth.*, 32 (1), p. 31.

Description : Male. Body 9.25 long, 0.29 wide ; head 0.260 in dorsoventral diameter ; oesophagus 1.7 long ; nerve ring 0.45, and excretory pore 0.565, both from anterior end ; tail 0.45 long, conical ; spicules alate, similar, equal, 0.27 long ; gubernaculum L-shaped, 0.182 long ; caudal papillae sessile, 8 pairs, 4 preanal, 4 postanal.

Female. Body 18.0 long, 0.45 wide ; head 0.4 in dorsoventral diameter ; oesophagus 1.65 long ; nerve ring 0.52, and excretory pore 0.82, both from anterior end ; tail 0.41 long, conical ; vulva post-equatorial, 6.6 from posterior end ; eggs 0.055-0.065 × 0.038-0.053.

Host : *Johnius volgeri*

Location : Intestine

Locality : Puri, Orissa

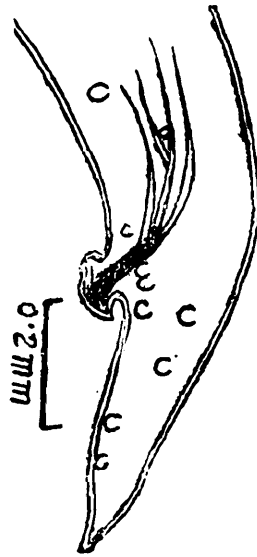


Fig. 34. *Cucullanus sciaenai*. (After Gupta and Gupta, 1979.) Male posterior end.

***Cucullanus theraponi* Rasheed, 1968**

(Fig. 35 A&B)

1968. *Cucullanus theraponi* Rasheed, *An. Esc. nac. Cienc. biol., Me'x.*, **15**, p. 41.

1974. *Cucullanus theraponi* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, **177** (255), p. 1483.

Description : Male. Body 9.0-12.0 long, 0.3-0.34 wide ; cuticle thin, transverse striations indiscernible or even lacking, but with longitudinal markings (especially in female) ; head 0.3-0.33 in diameter, with characteristic cuticular expansion forming asymmetrical cephalic alae more expanded dorsally ; mouth surrounded by thin, wavy cuticle, without dentition, serrations or other thickenings ; cephalic papillae as usual in two circles, in outer 4, submedial, showing double nerve endings, and amphids 2, lateral ; in inner circle 6 small papillae, 3 on each lip ; oesophagus 1.2-1.4 long, with 3 pairs of thickenings anteriorly ; intestinal caecum absent ; nerve ring 0.47-0.48, cervical papillae 0.88-0.89, and excretory pore 1.8-2.06, all from anterior end ; tail 0.24-0.26 long, simple, tapering ; ventral sucker or pseudosucker absent, but strong muscles near cloaca present ; cloacal lips strongly cuticularised, conspicuously protruding, elevated, and with outstanding conical projections ; spicules small, equal, 0.25-0.29 long, with abruptly

pointed fine tips ; gubernaculum 0.15-0.18 long, thick ; caudal papillae 11 pairs, preanal 3, adanal 4 (the first and last may be grouped under preanal and postanal respectively), postanal 4 (the last appearing like phasmids).

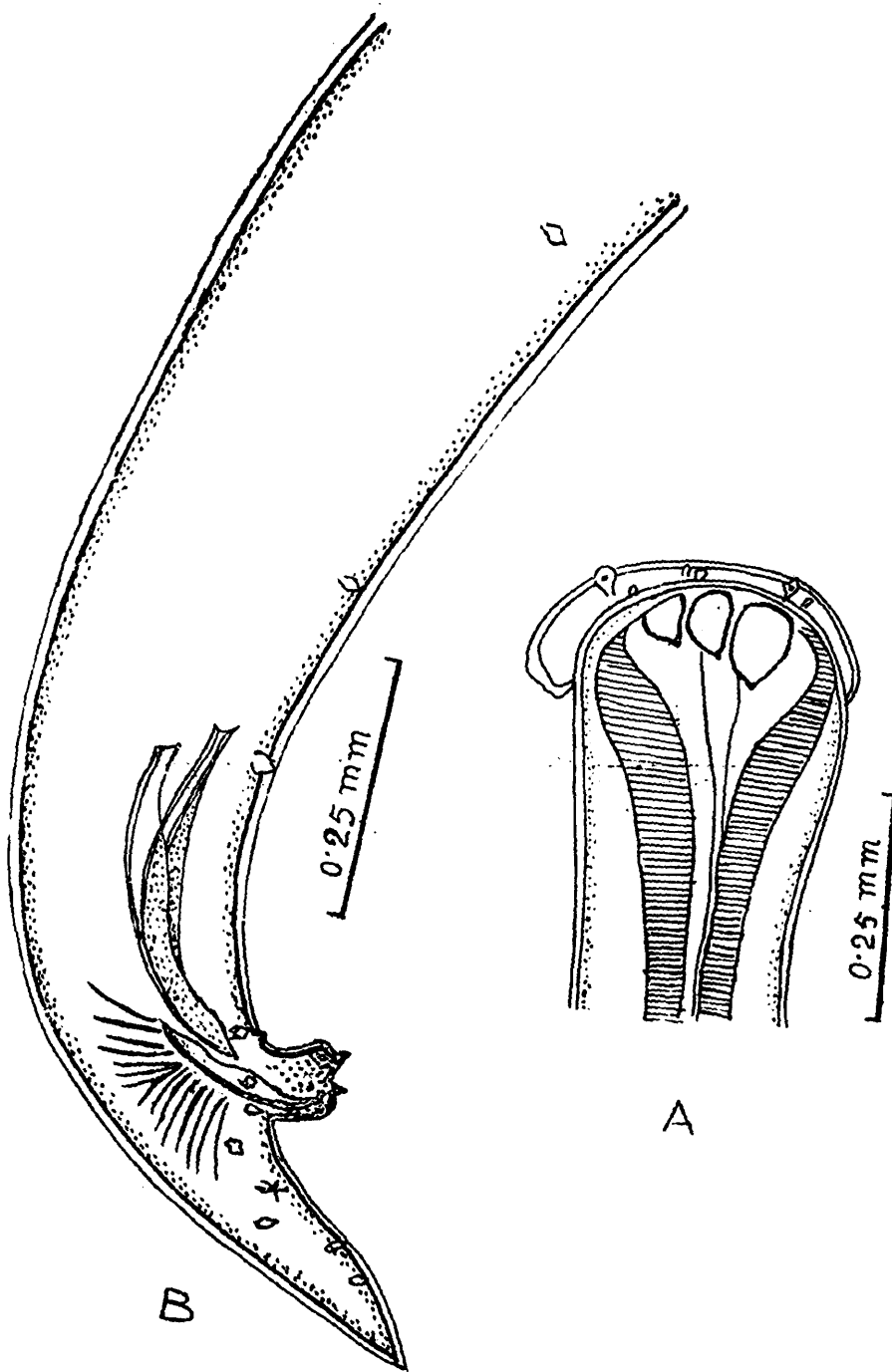


Fig. 35. *Cucullanus theraconi*. (After Rasheed, 1968.) A. anterior end ; B. male posterior end.

Female : Body 10.0-14.5 long, 0.31-0.42 wide ; head as in male ; oesophagus 1.35-1.55 long ; nerve ring 0.55-0.56, cervical papillae 0.9-1.1, and excretory pore 2.3-2.5, all from anterior end ; tail 0.42-0.5 long, tapering, simple ; vulva post-equatorial, 4.7-5.3 from posterior end, with small lips ; eggs $70-75\mu \times 40-45\mu$, subglobular to oval.

Hosts : *Therapon* sp. ; *Ilisha* sp.

Location : Intestine

Locality : Karachi (Pakistan)

Remarks : This species, as already observed by Petter (1974), has been separated from other members of the genus by the presence of cephalic cuticular expansion. However, examination of more material will very probably go towards establishing the species on sound basis. It may be borne in mind that Petter (*op. cit.*) restricted its occurrence in Perciform hosts only.

Genus **Dichelyne** Jagerskiold, 1902

Subgenus **Dichelyne** Petter, 1974

Dichelyne (Dichelyne) diminutus (Rasheed, 1968) Petter, 1974

(Fig. 36, A & B)

1968. *Cucullanus diminutus* Rasheed, *An. Esc. nac. Cienc. biol., Me'x.*, **15**, p. 35.

1974. *Dichelyne (Dichelyne) diminutus* Petter, *Bull. Mus. natn. Hist. nat., Paris*, **177** (255), p. 1485.

Description : Male. Body 1.98 long, 0.12 wide, with indistinct transverse striations ; head 0.098 in diameter ; mouth surrounded by thin dentigerous cuticular border ; oesophagus 0.32 long ; intestinal caecum 0.22 long ; nerve ring 0.16, cervical papillae or dierids 0.2, and excretory pore 0.55, all from anterior end ; tail 0.18 long, posteriorly and ending in 'horn' or 'spine' bearing extremely minute spinules ; ventral sucker or 'muscles' absent ; spicules 1.1 long ; tapering gubernaculum 68μ long, 8μ wide, heavily chitinized ; caudal papillae 11 pairs, 4 preanal, 3 adanal, 4 postanal including pair of 'phasmids'.

Host : *Apolectus niger*

Location : Intestine

Locality : Karachi (Pakistan)

Remarks : This species, based on a single male only, was described by Rasheed (1968) as *Cucullanus diminutus* from *Apolectus* [= *Parastro-mateus*] *niger* from Karachi (Pakistan) and subsequently transferred by Petter (1974) under the genus *Dichelyne* and this is followed here.

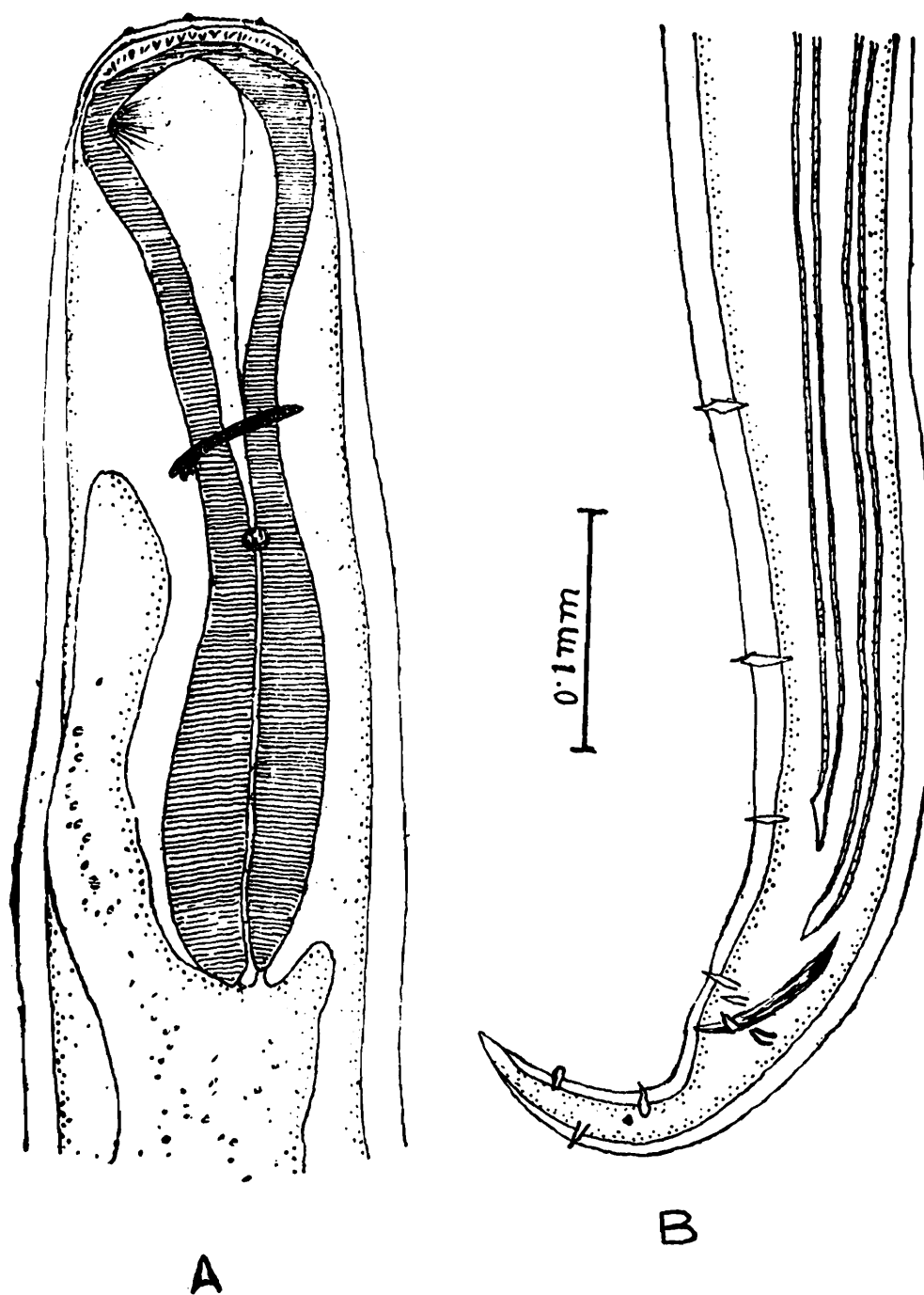


Fig. 36. *Dichelyne (Dichelyne) diminutus*. (After Rasheed, 1968.) A. anterior end ; B. male posterior end.

***Dichelyne (Dichelyne) exiguus* (Yamaguti, 1954) Petter, 1974**
(Fig. 37, A & B)

1954. *Cucullanus exiguus* Yamaguti, *Acta Med. Okoyama*, **9** (1), p. 125.

1968. *Cucullanus exiguus* : Rasheed, *An. Esc. nac. Cienc. biol., Me'x.*, **15**, p. 31.

1974. *Dichelyne (Dichelyne) exiguus* Petter, *Bull. Mus. natn. Hist. nat., Paris*, **177** (255), p. 1485.

Description : Male. Body 2.3-3.2 long, 0.25-0.29 wide, with smooth cuticle ; mouth dorsoventrally elongated, surrounded by thin serrated, or according to some, dentigerous cuticle ; head 0.1-0.12 in dorsoven-

tral diameter; cuticle laterally slightly pushed out of body to appear as small 'teeth'; head papillae in two circles, in outer 4, submedian, showing double nerve endings, result of union of two papillae, and amphids 2, lateral; in inner circle 6 small, somewhat elongated

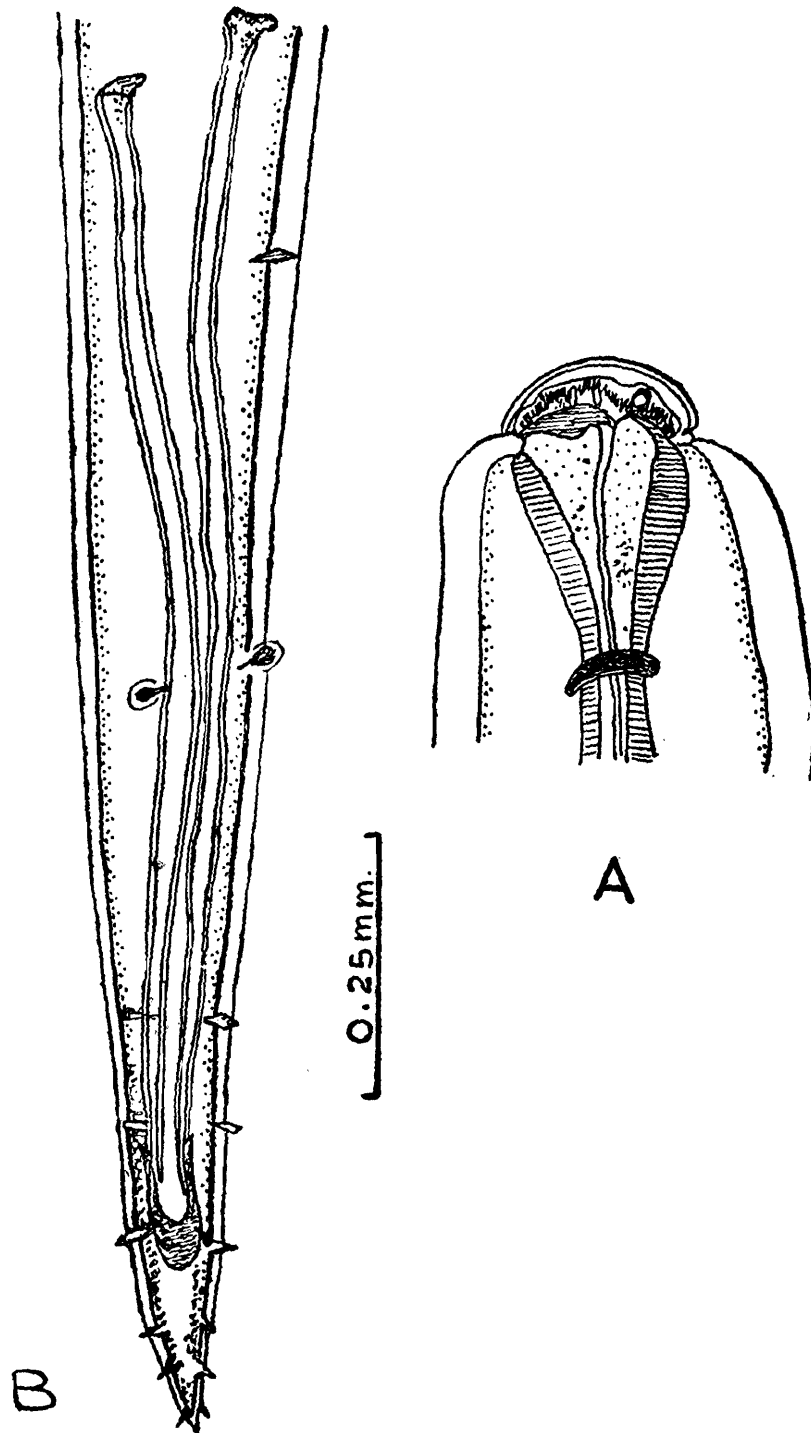


Fig. 37. *Dichelyne (Dichelyne) exiguus*. (After Rasheed, 1968.) A. anterior end; B. male posterior end.

papillae; oesophagus 0.5-0.56 long; intestinal caecum 0.31 long, dorsal; nerve ring 0.22-0.25, cervical papillae 0.38, and excretory pore 0.53-0.71, all from anterior end; tail 0.12-0.14 long, tapering evenly to fine point, before bifurcating at tip with two additional lateral

spikes ; caudal alae, sucker or pseudo-sucker absent ; spicules equal, 1.02-1.2 long ; gubernaculum 74—99 μ long, near proximal ends of spicules ; caudal papillae 10 pairs, 3 preanal, 3 adanal, 4 postanal ; preanal papilla-like structure present.

Female. Body 2.8-7.2 long, 0.44-0.55 wide ; head as in male, 0.12-0.15 in dorso-ventral diameter ; oesophagus 0.5-0.86 long ; intestinal caecum 0.37 long, dorsal ; nerve ring 0.3-0.35, cervical papillae 0.56, and excretory pore 0.68-0.86, all from anterior end ; tail 0.13-0.23 long, papillae-like structure as in male, 1.8 from tail tip ; pair of large phasmids 0.09-0.1 from tip ; vulva post-equatorial, 1.3-3.4 from posterior end ; eggs 48-50 μ in diameter, globular.

Hosts : *Lates calcarifer* ; *Protonibea* sp.

Location : Intestine

Locality : Karachi (Pakistan)

Remarks : Like the preceding one, this species was also transferred by Petter (1974) under the genus *Dichelyne*. Here also, Campana-Rouget's claim of host-specificity in the genus *Cucullanus* was not supported by the findings of Rasheed (*op. cit.*) who reported the species from different host and different locality. The species, however, occurs in Perciformes.

***Dichelyne* (*Dichelyne*) *indentatus* (Rasheed, 1968) Petter, 1974**

(Fig. 38, A-C)

1968. *Cucullanus indentatus* Rasheed, *An. Esc. nac. Cienc. biol., Me'x.*, **15**, p. 52.

1974. *Dichelyne* (*Dichelyne*) *indentatus* Petter, *Bull. Mus. natn. Hist. nat., Paris*, **177** (255), p. 1485.

Description : Male. Body 7.0-12.5 long, 0.2-0.34 wide, tapering at both ends ; cuticle thin, with deep transverse striations appearing from sides like a 'saw' ; head rounded, lips each bearing in outer circle 2 large papillae and one amphid, in inner circle 3 smaller papillae ; mouth surrounded by thin, finely striated cuticle, denticles or 'teeth-like ridges' absent ; oesophagus 0.93-1.33 long, produced anteriorly into three cuticular thickenings appearing in dorsoventral view like small projection in oesophageal cavity ; intestinal caecum 0.38 long, dorsal ; oesophageal-intestinal valves large, 79 μ in diameter ; nerve ring 0.31-0.33, cervical papillae 0.68-0.7, and excretory pore 1.4-1.5, all from anterior end ; tail 0.2-0.24 long, thick, abruptly ending in small conical tip ; anterior lip of cloaca slightly bigger ; ventral sucker or pseudosucker absent ; in preanal region a few scattered muscles present ; spicules

broadly alate, similar, equal, 0.55-0.75 long, with bluntly pointed tips ; gubernaculum 0.12-0.13 long ; caudal papillae 11 pairs, 3 preanal, 4 adanal, 4 postanal.

Female. Body 7.0-14.0 long, 0.31-0.40 wide ; head as in male ; oesophagus 0.94-1.2 long ; intestinal caecum 0.63 long ; neve ring 0.3-0.35, cervical papillae 0.72-0.74, and excretory pore 1.4-1.5, all from anterior end ; tail 0.18-0.2 long, tapering, ending in conical tip ; phas-mids 0.12 from tail tip ; vulva post-equatorial, 3.6-4.2 from posterior end, very conspicuous with protruding fleshy lips supported by strong muscles ; eggs $62-65\mu \times 59-63\mu$, thin-shelled.

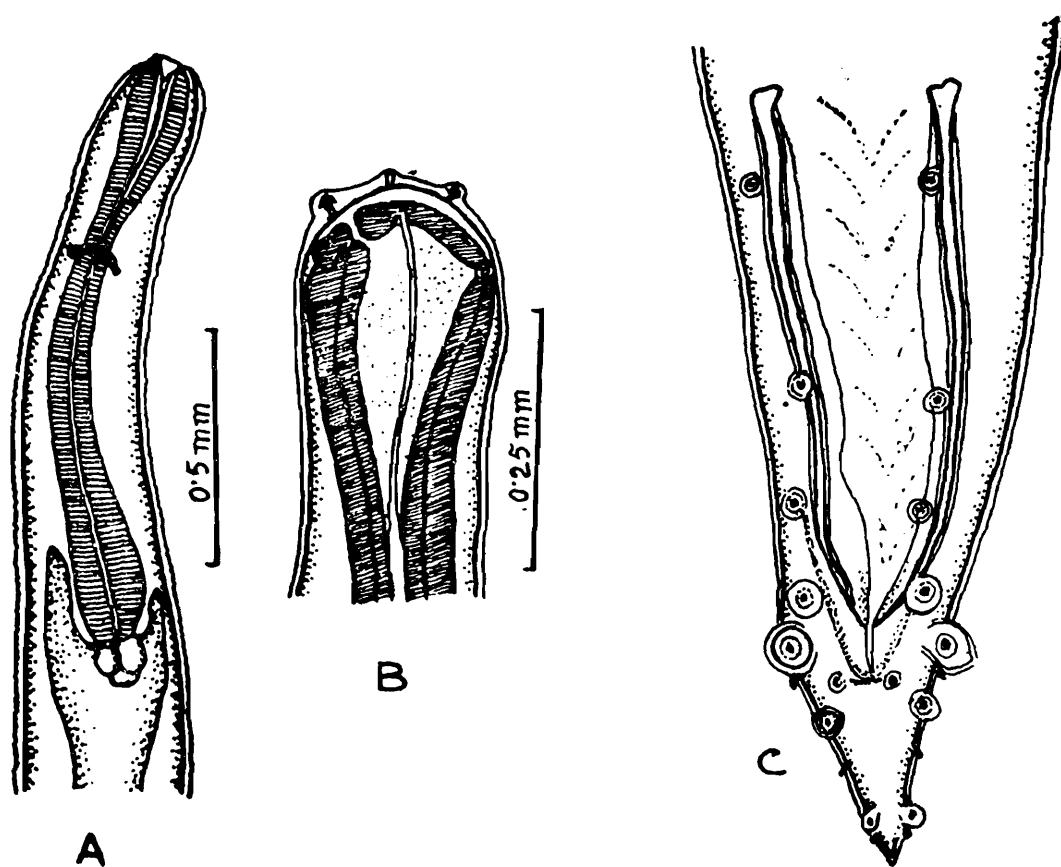


Fig. 38. *Dichelyne (Dichelyne) indentatus*. (After Rasheed, 1968.) A-B. anterior end ; C. male posterior end.

Hosts : *Eleutheronema tetradactylum* ; *Pomadasys hasta*

Location : Intestine

Locality : Karachi (Pakistan)

Remarks : This species was described by Rasheed (1968) as *Cucullanus indentatus* from two fish hosts, *Eleutheronema* [= *Polynemus*] *tetradactylum* and *Pomadasys* [= *Pristipoma*] *hasta* from Karachi (Pakistan) and subsequently transferred by Petter (1974) under the genus *Dichelyne*, and this is followed here.

Dichelyne (Dichelyne) rasheedae Petter, 1974

(Fig. 39, A-E)

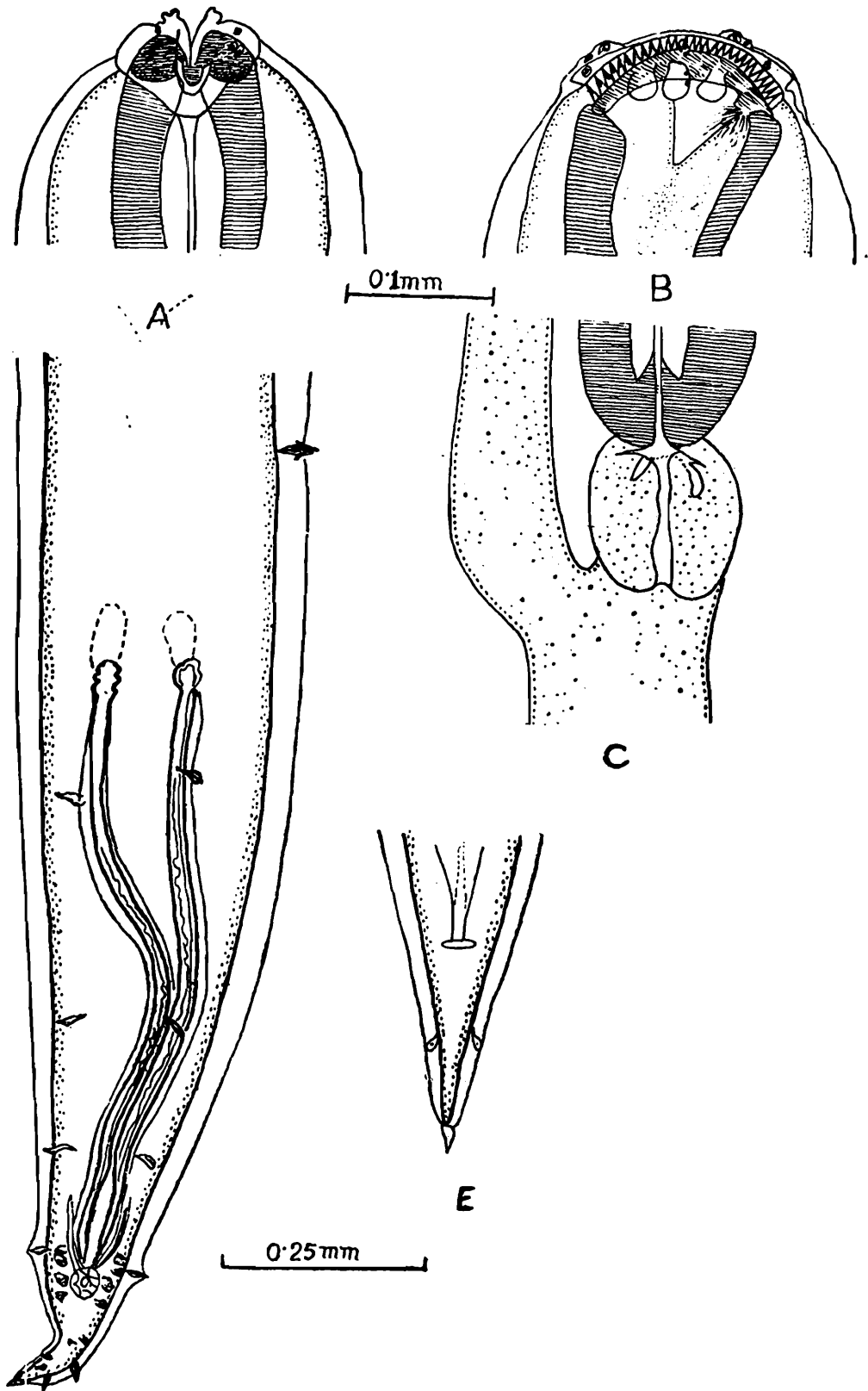
1968. *Cucullanus fastigatus* Rasheed, *An. Esc. nac. Cienc. biol., Me'x.*, **15**, p. 27.1974. *Dichelyne (Dichelyne) rasheedae* Petter, *Bull. Mus. natn. Hist. nat., Paris*, **177** (255), p. 1485.

Fig. 39. *Dichelyne (Dichelyne) rasheedae*. (After Rasheed, 1968.) A-B. anterior end ; C. oesophageal region ; D. male posterior end ; E. female posterior end.

Description : Male. Body 4.5-5.2 long, 0.33 wide, evenly tapering towards posterior ; cuticular striations extremely faint, $1-1.5\mu$ apart ; head 0.15 in diameter ; mouth surrounded by fringed, dorsoventral dentigerous collar ; oesophagus 0.64-0.69 long ; intestinal caecum 0.2-0.37 long, ventral, on same side on which excretory pore ; nerve ring 0.29, cervical papillae 0.86-0.87, and excretory pore 1.1, all from anterior end ; tail 0.14-0.15 long, ending in papillae-like 'horn' or spine bearing extremely minute spinules ; sucker or pseudo-sucker absent ; spicules with fine points, equal, 0.77-0.86 long ; gubernaculum trough-like, 0.14-0.16 long ; caudal papillae 10 pairs, 3 preanal, 5 adanal, 2 postanal ; pair of phasmids present.

Female. Body 6.2 long, 0.55 wide ; head as in male, 0.19 in diameter ; oesophagus 0.78 long ; intestinal caecum as in male, 0.47 long ; nerve ring 0.31, and excretory pore 1.3, both from anterior end ; tail 0.2 long, ending as in male, and with pair of large papillae-like phasmids near middle ; vulva flush with body, post-equatorial, 2.37 from posterior end ; eggs $37 \times 37\mu$, thin-shelled, globular.

Host : *Pomadasys hasta*

Location : Intestine

Locality : Karachi (Pakistan)

Remarks : Rasheed (1968) referred her specimens from *Pomadasys* [= *Pristipoma*] *hasta* from Karachi (Pakistan) to *Cucullanus fastigatus* Chandler, 1935. But, re-examination of Chandler's specimens by Stromberg and Crites (1972) revealed them to be really distinct from Rasheed's. Petter (1974) following this, renamed Rasheed's species as *Dichelyne* (*Dichelyne*) *rasheedae* and this is followed here.

Subgenus *Neocucullanellus* (Yamaguti, 1941, genus) Petter, 1974

Dichelyne* (*Neocucullanellus*) *longispiculum (Khan, 1969) Petter, 1974

(Fig. 40, A & B)

1969. *Indocucullanus longispiculum* Khan, *Pakist. J. Zool.*, **1** (1), p. 77.

1974. *Dichelyne* (*Neocucullanellus*) *longispiculum* Petter, *Bull. Mus. natn. Hist. nat., Paris*, **177** (255), p. 1486.

1975. *Indocucullanus longispiculum* : Zaidi and Khan, *Pakist. J. Zool.*, **7** (1), p. 62.

1977. *Indocucullanus longispiculum diacanthis* Bilqees *et al.*, *Pakist. J. Zool.*, **9** (2), p. 167.

Description : Male. Body 3.103-4.36 long, 0.203-0.36 wide, and entirely with lateral alae but more pronounced in oesophageal region ;

mouth with two lateral lips, each having 3 papillae and numerous teeth-like structures, and behind its opening a pair of lateral conspicuous teeth protruding into buccal capsule ; oesophagus 0.492-0.598 long ; nerve ring 0.099-0.291 from anterior end ; tail 0.12-0.18 long, blunt, ending in small spike ; sucker absent but set of strong muscles present ; spicules similar, equal or subequal, 0.864-1.078 long ; caudal papillae 12-13 pairs, 7-9 preanal, 1 adanal, 2-5 postanal.

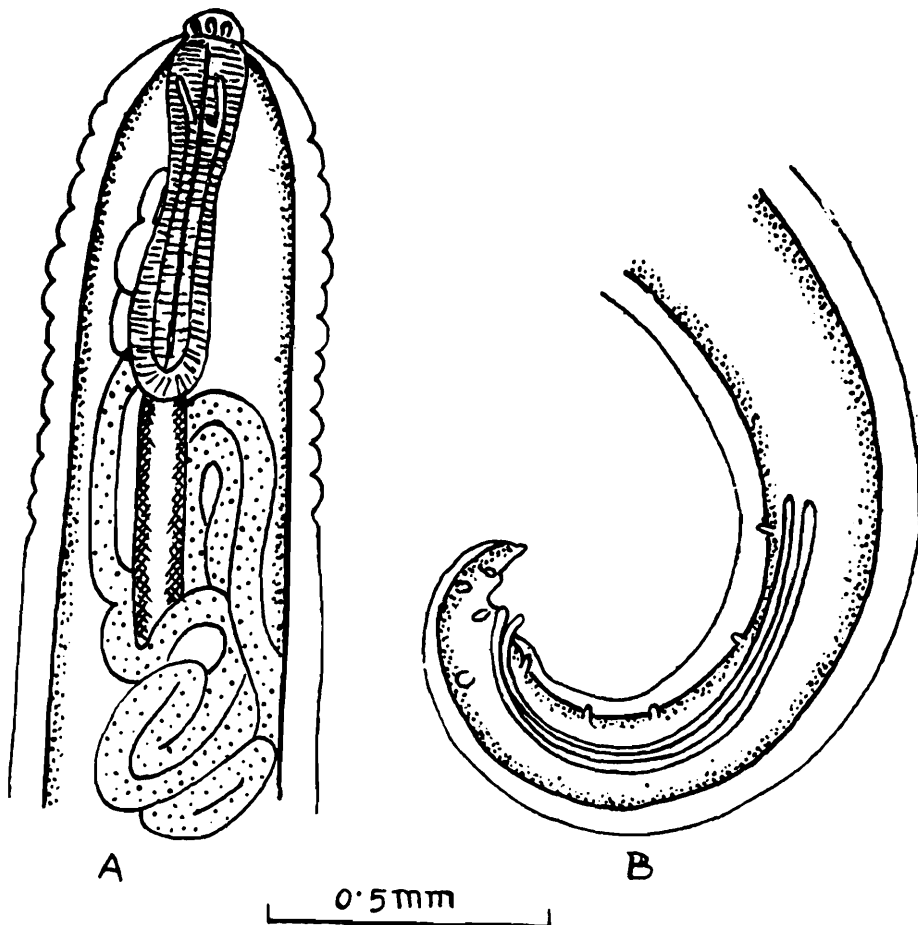


Fig. 40. *Dichelyne (Neocucullanellus) longispiculum*. (After Khan, 1969.)

A. anterior end ; B. male posterior end.

Female. Body 2.4-6.307 long, 0.380-0.514 wide ; anterior end as in male ; oesophagus 0.460-0.778 long ; nerve ring 0.10-0.29 from anterior end ; tail 0.095-0.21 long, blunt, ending in forked spike ; with pair of postanal pedunculate papillae ; vulva equatorial or post-equatorial ; eggs 0.029-0.039 in diameter.

Hosts : *Protonibea diacanthus* ; *Lates calcarifer*

Location : Intestine

Locality : Karachi (Pakistan)

Remarks : Khan (1969) described this species as *Indocucullanus longispiculum* from *Protonibea* [= *Sciaena*] *diacanthus* from Karachi

(Pakistan). But, Petter (1974) remarked that though, an intestinal caecum had not been reported in this species, by having short, thick, cuticular and bifurcated tail it showed close affinities with *Dichelyne* (*Dichelyne*) *exiguus* and *D. (D.) spinicaudatus* which are parasites of Sciaenidae and closely related families. Zaidi and Khan (1975) reported it from another fish, *Lates calcarifer* from Karachi. But, it is quite apparent that the validity of the species has not been clearly established, still it is being included here, though provisionally. Also, treated here as a synonym of the above species is a subspecies *Indocucullanus longispiculum diacanthis* described by Bilquees, Fatima and Rehana (1977) from the same host from Pakistan.

***Dichelyne* (*Neocucullanellus*) *yamagutii* (Kalyankar, 1971) Petter, 1974
(Fig. 41, A & B)**

1971. *Neocucullanellus yamagutii* Kalyankar, *Riv. Parassit.*, 32 (1), p. 40.

1974. *Dichelyne* (*Neocucullanellus*) *yamagutii* Petter, *Bull. Mus. natn. Hist. nat., Paris.*, 177 (255), p. 1485.

Description : Male. Body 2.96 long, 0.03 wide ; cuticle thick, without striations, with uneven folds ; head 0.16 in diameter ; mouth opening a dorsoventral slit, having two lateral lips, each with 3 papillae and pair of teeth ; mouth cavity with a dentigerous lining ; cephalic glands present ; oesophagus 0.55 long ; intestinal caecum 0.18 long, ventral ; nerve ring 0.24 from anterior end ; tail 0.22 long, with two spines ; caudal alae absent ; spicules similar, equal, 0.88 long ; gubernaculum present ; caudal papillae 12 pairs, 6 preanal, 6 postanal.

Female. Body 3.12 long, 0.06 wide ; head 0.17 in diameter ; anterior end as in male ; oesophagus 0.52 long ; intestinal caecum 0.19 long ; nerve ring 0.22 from anterior end ; tail 0.108 long, gradually tapering to sharp tip, with three spines ; phasmids 0.091 from posterior end ; cuticle swollen into oval bulb near opening of vulva which latter 1.5 from posterior end ; eggs 0.032-0.034 in diameter.

Host : *Scoliodon sorrakowah*

Location : Intestine

Locality : Bombay, Maharashtra

Remarks : This species was originally described as *Neocucullanellus yamagutii* by Kalyankar (1971), but later renamed as *Dichelyne* (*Neocucullanellus*) *yamagutii* by Petter (1974) and this is followed here.

***Dichelyne wallagoni* Chakravarty and Majumdar, 1961**

1961. *Dichelyne wallagoni* Chakravarty and Majumdar, *Parasitology*, 51, p. 404.

Description : Male. Body 15.48 long, 0.50 wide ; head 0.46 in diameter ; pseudo-buccal capsule 0.45 long ; entire oesophagus 1.37 long ;

intestinal caecum 0.32 long ; nerve ring 0.57, and excretory pore 1.0, both from anterior end ; tail 0.35 long, with spike ; preanal sucker 0.40 from cloaca ; spicules two, left 2.40 long, right 2.17 ; gubernaculum 0.065 long ; caudal papillae 15 pairs, 6 preanal, 9 postanal.

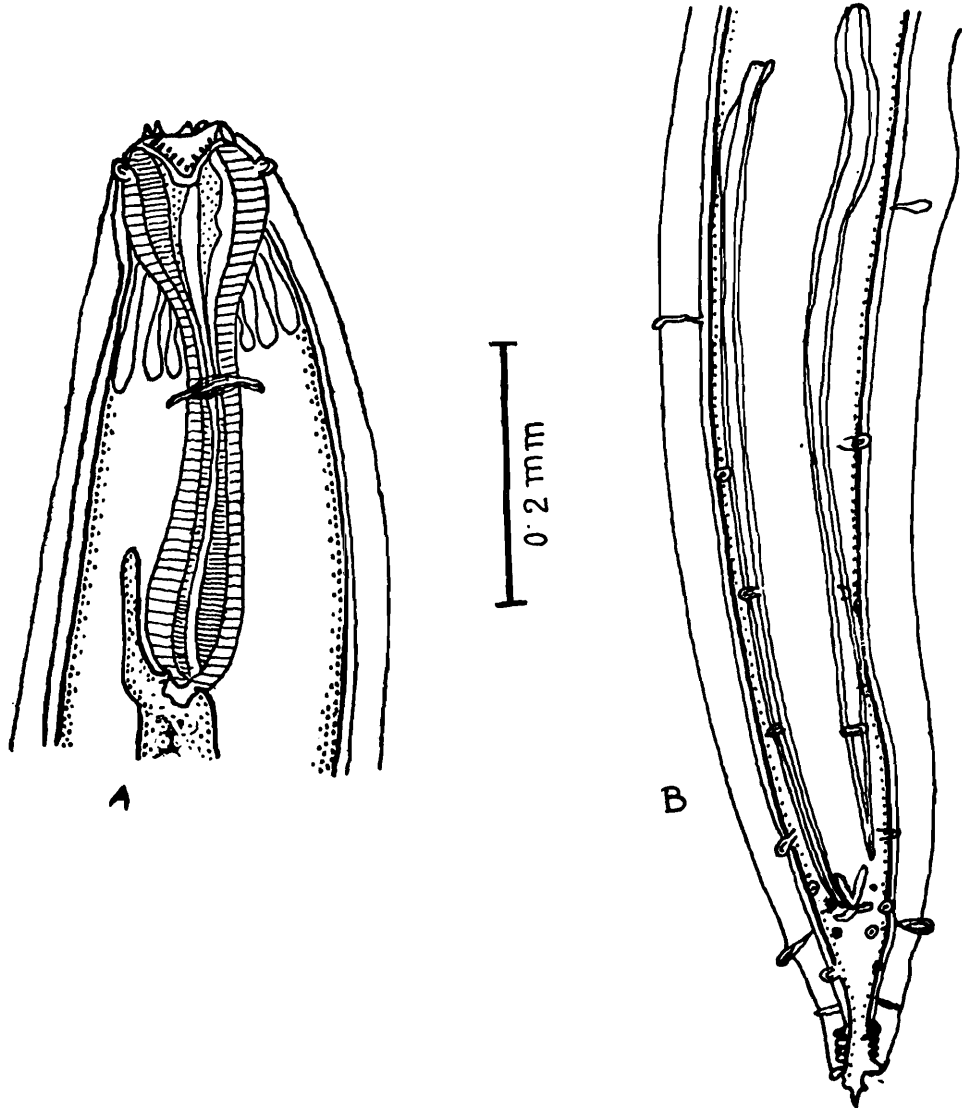


Fig. 41. *Dichelyne (Neocucullanellus) yamagutii*. (After Kalyankar, 1971.) A. anterior end ; B. male posterior end.

Female. Body 13.0-15.83 long, 0.39-0.52 wide ; pseudo-buccal capsule 0.39-0.46 long ; entire oesophagus 1.19-1.24 long ; intestinal caecum 0.26-0.28 long ; nerve ring 0.52-0.58, and excretory pore 0.95-1.0, both from anterior end ; tail 0.28-0.32 long ; vulva 4.8-6.2 from posterior end ; eggs 0.052×0.039 .

Host : *Wallago attu*

Location : Intestine

Locality : Calcutta

Remarks : This species was described by Chakravarty and Majumdar (1961) from a fish, *Wallago attu*, from Calcutta. But Petter (1974) observing an abnormal arrangement of cloacal papillae, and showing no

real affinity with the members of the genus *Dichelyne* inspite of its having an intestinal caecum declined to give it an exact systematic position. So, it is best that the species is provisionally given the taxonomic position as above.

Superfamily 3 ASCARIDOIDEA

Family ANISAKIDAE Railliet and Henry, 1912 status emend.

Skrjabin and Karokhin, 1945

Subfamily GOEZIINAE Travassos, 1919

[Yamaguti's (1961) key for the two genera under it is retained here tentatively].

Cuticular rings posteriorly with spines ;
oesophagus with posterior ventricular appenda-
ges. ...

Goezia Zeder, 1800

Cuticular rings without the spines ; oesophagus
without the appendages. ...

Neogoezia Kreis, 1937

Genus *Goezia* Zeder, 1800

Zeder (1800) established the genus *Goezia* for the reception of the species *Cucullanus ascaroides* Goeze, 1782. Subsequently, it was reviewed by Dollfus (1935), and much later by Rasheed (1965), and more recently by Sprent (1978), and Deardorff and Overstreet (1980). Mosgovoy (1951) on the basis of the number of ventricular appendices split the genus into two subgenera, viz. *Goezia* and *Pseudogoezia*, and this was referred to by Hartwich (1957, 1974, 1975). Though this splitting was accepted by Yamaguti (1961) and Zaidi and Khan (1975), Rasheed (1965) considered this differentiating character as invalid pointing out that double appendix was created by the folding of the single appendix on itself due to a longitudinal groove. Kreis (1937) on the structure of the cuticular rings and the absence of ventricular appendage, established another genus *Neogoezia*. While Skrjabin and Schikhoblova (1951) treated the genus as synonym of *Goezia*, Yamaguti (1961) upheld its validity on the ground that unspined cuticular rings and simple oesophagus without posterior appendage are sufficiently distinct characters for its separation from *Goezia*. Rai (1967) while recording for the first time from India a fish goeziine, reported forms showing intermediate characters between both the above genera, viz. unspined cuticular rings as in *Neogoezia*, and double character of the oesophageal appendix as in *Goezia*. Thus, the separate status of *Neogoezia* was nullified, and the opinions of Skrjabin and Schikhoblova (*op. cit.*) upheld. Hartwich (1974) treated it a doubtful synonym of

Raphidascaris, accepting only the genus *Goezia* in the subfamily Goeziinae (under the family Anisakidae), under which he placed a restricted number of forms namely, those showing cuticular rings with posterior spines, though earlier Khan and Begum (1971), Bilqees and Khanum (1972), and Zaidi and Khan (1975) had upheld the validity of *Neogoezia*. But, again (1975) while still retaining the dubious position of *Neogoezia*, he placed it under the family Goeziidae as he had done earlier (1957) which is not followed here. Recently, under *Goezia* Sprent (1978, p. 92) suggested that, 'It seems appropriate to exclude species without the characteristic spines on the body. Accordingly *magna* Kreis, 1937, *onchorhynchi* Fujita, 1940, and the specimens described by Rai (1967) should not be included in *Goezia*', and with this view the present author concurs albeit the opinions of Zaidi and Khan (*op. cit.*). Relevantly also, their specimens of all the three species cannot be placed under *Goezia* pending a really revisionary work.

The first report of a goeziine worm from India is by Maplestone (1930) who while describing a new species *Goezia gavialidis* from a single female specimen from the stomach of gharial (*Gavialis gangeticus*) from the Zoological Garden, Alipur, Calcutta, opined that the worm may have been a pseudoparasite as normally it parasitizes fishes. The first report of goeziine from an Indian fish is very probably that of Rai (1967) from *Catla catla* from Keethan lake, U. P., which was subsequently treated as the new species *Goezia* (*Pseudogoezia*) *chitali* by Zaidi and Khan (1975) who obtained more specimens from *Notopterus chitala* from Sind (Pakistan). The very first though not fully confirmed record of this worm from fish from Bangladesh is that of Ali (1968). Recently, a new species *Goezia aspinulosa* has been described by Arya (1980) from a fish *Scomberomorus* [= *Cybium*] *guttatum* from market in Jodhpur, Rajasthan, from which body spines have been reported absent, but the species, needs confirmation. The specimens of *Goezia* collected by the present author and now being studied consist of one juvenile from a turtle and some adults from a fish (*Channa punctatus*), both hosts procured from market in Shillong, Meghalaya. Hitherto, under the genus *Goezia*, 7 species from fishes are known from this area, of which a key for 4 species is given below. *Goezia* (*Goezia*) *taunsai*, *G.* (*Pseudogoezia*) *heteropneusti*, and *G.* (*P.*) *chitali*, all by Zaidi and Khan (1975) and based on females only have been excluded from the key.

Caudal papillae 14 pairs	...	<i>G. ascaroides</i>
Caudal papillae 19-20 pairs	...	<i>G. aspinulosa</i>
Caudal papillae 31 pairs	...	<i>G. pseudascaroides</i>
Caudal papillae 37 pairs	...	<i>G. pakistanica</i>

Goezia ascaroides (Goeze, 1782) Railliet and Henry, 1915

(Fig. 42, A & B)

1782. *Cucullanus ascaroides* Goeze, *Versuch einer Naturgeschichte der Eingeweide wurmer mer thierischer Korper*. Blankenburg, p. 134.

1915. *Goezia ascaroides* Railliet and Henry, *Bull. Soc. path. exot.*, 8, p. 273.

1935. *Goezia ascaroides* : Dollfus, *Bull. Soc. zool. Fr.*, 60, p. 253.

1975. *Goezia (Goezia) ascaroides* Hartwich, *Tierwelt Dtl.*, 62, p. 119.

Description : Male. Body 10.53-23.22 long, 0.15-0.67 wide ; entire body covered with cuticular rings of varying length 0.06-0.15 long, each with circlet of backwardly directed spines posteriorly ; mouth with 3 well developed lips, each with dentigerous ridge ; interlabia 0.04-0.05

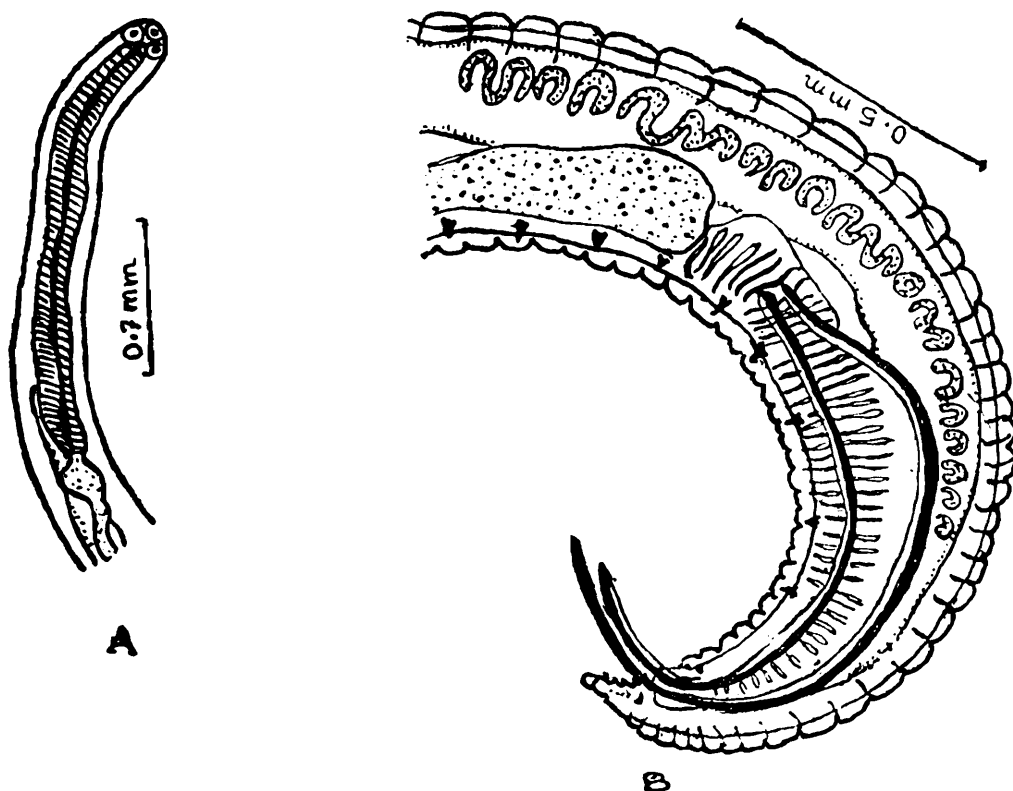


Fig. 42. *Goezia ascaroides*. (After Khan and Yaseen, 1969.) A. anterior end ; B. male posterior end.

in diameter ; oesophagus 1.78-3.10 long ; ventriculus 0.13×0.20 ; ventricular appendix 2.56-4.32 long ; intestinal caecum 0.06-1.2 long ; tail 0.06-0.09 long ; spicules two, similar, subequal, longer 1.30-2.02 long, smaller 1.20-1.90 ; caudal papillae sessile, 14 pairs, 9 preanal, 2 adanal, 3 postanal.

Female. Body 27.00-30.37 long, 0.64-0.73 wide ; cuticle and lips as in male ; oesophagus 3.10-3.37 long ; ventriculus $0.09-0.10 \times 0.10$; ventricular appendix 5.2-5.5 long ; intestinal caecum 1.30-1.40 long ; tail

0.23-0.25 long; vulva pre-equatorial, 8.00 from anterior end; eggs $0.03-0.04 \times 0.04-0.05$.

Host : *Thryssa hamiltonii*

Location : Stomach

Locality : Khulna (Bangladesh)

Remarks : Since, as already remarked by Maplestone (1930), Hsü (1933) and Rasheed (1965) this type species is very insufficiently described, the reference of Khan and Yaseen (1969) of their specimens from *Thryssa* [= *Thrissocles*] *hamiltonii* from Bangladesh to this species, is to be taken here only tentatively especially as the host is different and locality very separate.

***Goezia aspinulosa* Arya, 1980**

(Fig. 43, A & B)

1980. *Goezia aspinulosa* Arya, *Indian J. Helminth.*, 30 (1978), p. 96.

Description : Male. Body 25.0-27.5 long, 0.48-0.52 wide, with striations 0.008-0.01 apart, pronounced but not spiny; lips 3, dorsal with two pairs of double papillae, subventral each with pair of double papillae, a single papilla and an amphid; head $0.15-0.16 \times 0.18-0.25$;

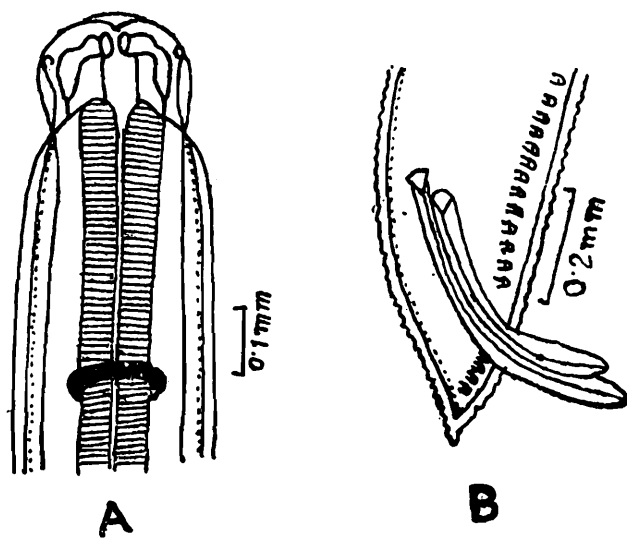


Fig. 43. *Goezia aspinulosa*. (After Arya, 1980.) A. anterior end; B. male posterior end.

oesophagus excluding ventriculus 2.48-2.50 long, muscular; ventriculus $0.07-0.18 \times 0.09-0.25$; ventricular appendix $0.88-1.3 \times 0.06-0.13$; intestinal caecum $0.35-0.40 \times 0.09-0.16$; oesophago-intestinal valve conspicuous; nerve ring 0.46-0.64 and excretory pore 0.67-0.68, both from anterior end; tail 0.10-0.15 long, slightly coiled, with spiny brushes at

tip ; spicules stout, expanded proximally, blunt distally, alate, unequal, left 0.58-0.60 long, right 0.50-0.52 (excepting in one specimen where left 1.90 long, right 1.70) ; gubernaculum absent ; caudal papillae 19-20 pairs, 13-14 preanal, 2 adanal, 4 postanal.

Female. Body 61.0-62.5 long, 0.52-0.75 wide, with cuticular striations 0.002-0.003 apart ; head 0.15-0.20 $\times$ 0.28-0.31 ; oesophagus excluding ventriculus 4.5-4.9 $\times$ 0.15-0.18 ; ventriculus 0.18-0.30 $\times$ 0.23-0.33 ; ventricular appendix 1.13-1.60 $\times$ 0.09-0.14 ; intestinal caecum 0.55-0.57 $\times$ 0.18-0.20 ; nerve ring 0.70-0.77 and excretory pore 0.74-0.80, both from anterior end ; tail 0.40-0.45 long, conical, with spiny brushes at tip ; vulva flush, inconspicuous ; eggs 0.11-0.13 $\times$ 0.06-0.08, unembryonated, oval, thin-walled.

Host : *Scomberomorus guttatus*

Location : Intestine

Locality : Fish market, Jodhpur, Rajasthan

Remarks : As the specimens have been shown to lack body spines, an important generic character, study of more material is desirable.

Goezia chitali Zaidi and Khan, 1975

1975. *Goezia* (*Pseudogoezia*) *chitali* Zaidi and Khan, *Pakist. J. Zool.*, 7 (1), p. 54.

Description : Female. Body 3.3-3.35 long, 0.13-0.14 wide, and with cuticular annulations without spines ; cuticular rings closely placed at both extremities 0.003-0.005 apart, in middle 0.23-0.26 ; lips 3, 0.018 long, 0.013-0.14 wide ; each with single papilla ; oesophagus 0.329 long, with two unequal appendices posteriorly, 0.089 and 0.077 long ; intestinal caecum 0.89 long ; vulva 0.421 from anterior end.

Hosts : *Catla catla* ; *Notopterus chitala*

Location : Stomach

Localities : Keethan lake, U. P. (India) ;
Taunsa Barrage, Sind (Pakistan).

Remarks : Rai (1967) reported some undetermined goeziine worms from *Catla catla* from Keethan lake, U. P. Zaidi and Khan (1975) found their specimens from *Notopterus chitala* from Sind (Pakistan) similar to Rai's and treated them as new species *Goezia* (*Pseudogoezia*) *chitali*. But even, as both the descriptions are based on females only, its inclusion here is purely tentative till male description is made available.

***Goezia heteropneusti* Zaidi and Khan, 1975**

1975. *Goezia (Pseudogoezia) heteropneusti* Zaidi and Khan, *Pakist. J. Zool.*, **7** (1), p. 55.

Description : Female. Body 6.81-6.89 long, 0.266-0.267 wide, with cuticular annulations unspined; cuticular rings closer at extremities 0.003-0.005 apart, in middle 0.020-0.031; lips 3, 0.046-0.051 long, 0.023-0.031 wide, and without papillae; oesophagus 0.552 long, and with two equal appendices 0.247 long; intestinal caecum 0.247 long; tail 0.102 long; vulva 1.440-1.456 from anterior end; eggs not fully developed.

Host : *Heteropneustes fossilis*

Location : Intestine

Locality : Taunsa Barrage, Sind (Pakistan)

Remarks : As this species is based on females only, its inclusion here is purely tentative.

***Goezia pakistanica* Bilquees, Fatima and Rehana, 1977**

(Fig. 44, A & B)

1977. *Goezia pakistanica* Bilquees et al., *Pakist. J. Sci. Ind. Res.*, **20** (4-5), p. 270.

Description : Male. Body 11.12-21.30 long, 0.611-0.715 wide, and with cephalic alae 0.260×0.091 with granulated protoplasmic cells; body covered entirely with a series of rings with backwardly directed spines which latter having very narrow and feeble cuticular striations at their edges; head 0.195-0.26 in diameter; lips 3, $0.208-0.221 \times 0.156-0.182$, flattened, each with 2 pairs of prominent papillae, and expanded outwards with large granulated protoplasmic sheet and separated from body by a constriction: dentigerous ridges absent but cuticle of internal surface of lips produced into teeth-like structures; interlabia $0.065-0.104 \times 0.05$, and with well marked grooves running to base of lips; oesophagus highly muscular, 2.535-2.665 long; ventriculus 0.338 long, and posteriorly with a single appendage about 0.715; intestinal caecum 0.445 long; nerve ring 0.715-0.910 from anterior end; tail conical, 0.195-0.20 long, and with an appendage having a series of circlets of spines; spicules alate, subequal, 1.781 and 1.872 long; gubernaculum present; caudal papillae pedunculate, 37 pairs, 30 preanal, 1 adanal, 6 postanal.

Female. Body 26.25-37.29 long, 0.60-0.78 wide, and with series of annulations having outwardly directed edges; head 0.234-0.299 in diameter; lips large, $0.26-0.27 \times 0.15-0.2$; interlabia 0.091×0.078 ; oeso-

phagus 3.185-5.5 long ; ventriculus 0.338 long, and posteriorly with an appendage about 2.15 ; intestinal caecum 0.585 long ; nerve ring

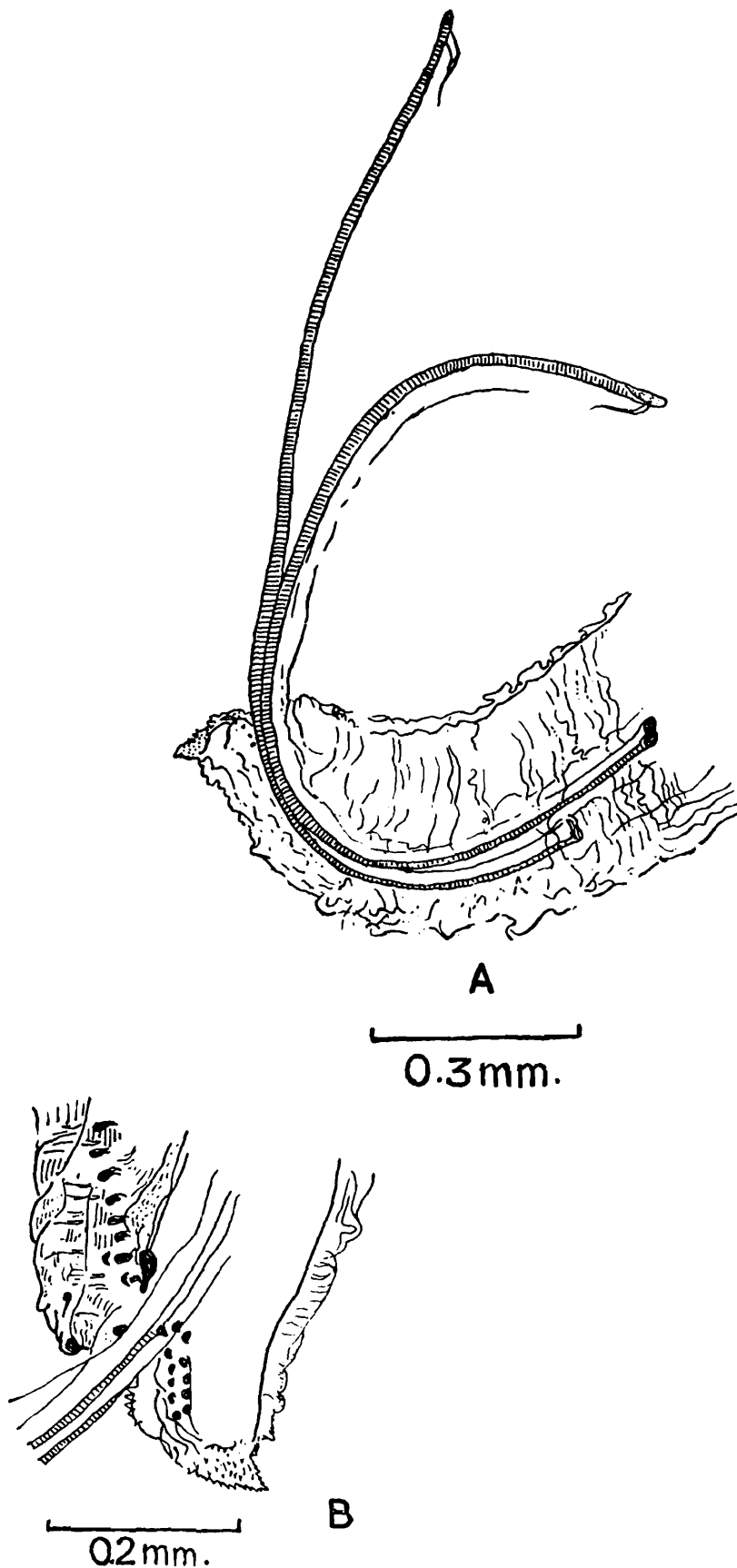


Fig. 44. *Goezia pakistanica*. (After Bilqees, Fatima and Rehana, 1977.) A. male posterior end showing spicules ; B. same showing circlet of spines.

indistinct ; tail abruptly conical, with two pairs of large papillae and tip armed with circlets of spines ; eggs $0.039-0.065 \times 0.039-0.042$.

Host : *Apolectus niger*

Location : Intestine

Locality : Karachi (Pakistan)

***Goezia pseudascaroides* Rehana and Bilqees, 1972**

(Fig. 45, A & B)

1972. *Goezia pseudascaroides* Rehana and Bilqees, *Agr. Res. Counc. Cat. Pakistan* p. 87.

Description : Male. Body 3.65-4.56 long, 0.49-0.51 wide ; entire body covered with a series of circlets of spines ; mouth with three well developed lips ; flattened and expanded laterally ; oesophagus 0.55-0.59 long ;

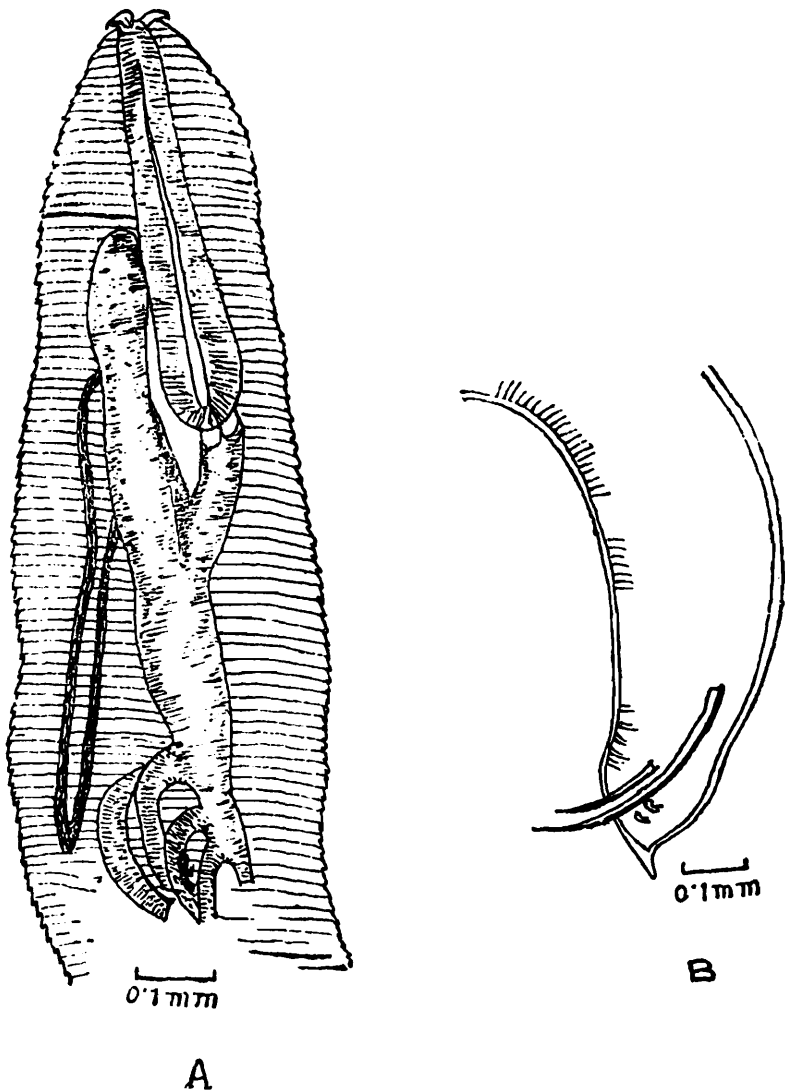


Fig. 45. *Goezia pseudascaroides*. (After Rehana and Bilqees, 1972.) A. anterior end ; B. male posterior end.

ventriculus, ventricular appendix and intestinal caecum not clearly discernible ; tail 0.11-0.14 long, conical, with small appendage ; caudal

alae absent ; spicules unequal, longer 0.34-0.41 long, smaller 0.15-0.19 ; gubernaculum absent ; caudal papillae 31 pairs, 29 preanal arranged in three groups of 19, 7 and 3, postanal 2.

Female. Body 3.78-7.89 long, 0.68-0.92 wide ; oesophagus 0.43-0.88 long ; ventricular appendix 0.77 long (discernible only in one specimen) ; intestinal caecum 1.05 long ; tail 0.14-0.22 long ; vulva 1.21-1.95 from anterior end ; eggs $0.02-0.03 \times 0.02$.

Host : *Mastacembalus punctatus*

Location : Stomach

Locality : Kalri Lake, Sind (Pakistan)

Goezia taunsai Zaidi and Khan, 1975

1975. *Goezia (Goezia) taunsai* Zaidi and Khan, *Pakist. J. Zool.*, 7 (1), p. 52.

Description : Female. Body 3.45-4.408 long, 0.138-0.158 wide, with cuticular annulations unspined ; cuticular rings closer at extremities 0.005-0.008 apart, in middle 0.015-0.020 ; lips 3, 0.018-0.29 long, 0.013-0.014 wide, and each with a single papilla ; oesophagus 0.216-0.315 long ; ventriculus 0.038-0.079 long, and with an appendix 0.335-0.394 ; intestinal caecum 0.197-0.246 long ; nerve ring 0.140 from anterior end ; tail 0.084 long ; vulva 0.166-0.178 from anterior end ; eggs rounded, 0.005-0.008 in diameter.

Hosts : *Channa gachua* ; *Notopterus chitala*

Location : Intestine

Locality : Taunsa Barrage, Sind (Pakistan)

Remarks : As this species is based on females only, its inclusion here is purely tentative.

Genus Neogoezia Kreis, 1937

Yamaguti (1961) placed both *Goezia* and *Neogoezia* under the subfamily Goeziinae, but Hartwich (1974) included only the first genus under it. Although, the second has been inadequately described, the present author still prefers, though tentatively, to retain both the genera included by Yamaguti (*op. cit.*) till more description of the latter genus specifically of its excretory system and indicating the exact location of the excretory pore are made available.

Hitherto, under this genus eight species, all from Pakistan, have been described, one *Neogoezia elacateiae* by Khan and Begum, 1971 ; and seven from one host and one locality, by Bilqees and Khanum,

1972, viz. *N. alaetocephala*, *N. spirocaudata*, *N. karachiensis*, *N. mangra*, *N. multipapilla*, *N. aspinosa*, and *N. manazi*. A perusal of the relevant literature shows that the differentiating characters upon which some of these separate species have been based, are of minor nature and may at best be taken as intraspecific variations. So, pending the necessary examination of more and well preserved specimens, all the eight species are included here, a tentative key of which is given below.

1. Interlabia absent	...	<i>N. elacateiae</i>	
Interlabia present	...	...	2
2. Gubernaculum present	...	...	3
Gubernaculum absent	...	...	6
3. Cervical alae present	...	<i>N. alaetocephala</i>	
Cervical alae absent	...	...	4
4. Vulva simple	...	<i>N. spirocaudata</i>	
Vulva with cuticular expansions or spines.	...	...	5
5. Vulva with cuticular expansions	...	<i>N. karachiensis</i>	
Vulva with cuticular spines	...	<i>N. mangra</i>	
6. Caudal alae present	...	<i>N. multipapilla</i>	
Caudal alae absent	...	...	7
7. Spicules almost equal	...	<i>N. manazi</i>	
Spicules subequal	...	<i>N. aspinosa</i>	

***Neogoezia alaetocephala* Bilqees and Khanum, 1972**

(Fig. 46, A & B)

1972. *Neogoezia alaetocephala* Bilqees and Khanum, *Pakist. J. Zool.*, **4** (2), p. 138.

Description : Male. Body 20.65 long, 0.27 wide anteriorly, 0.58 posteriorly ; cuticle raised into prominent rings throughout body length ; lips 3, 0.132-0.135 long, each with 5 or more cephalic papillae ; interlabia present ; cervical alae 0.23 long ; oesophagus 2.97 long, muscular ; tail 0.108 long, strongly curved ventrally, with caudal alae and spine ; spicules subequal, 8.53 and 7.73 long ; gubernaculum with two elongated chitinized plates giving of lateral chitinized branch.

Female. Body 26.73-30.78 long, 0.21-0.32 wide anteriorly, 0.81-0.89 posteriorly ; lips 0.135-0.162 long ; cervical alae 0.13-0.26 long ; oesophagus 3.78-4.32 long ; tail 0.48-0.52 long, conical, with spine ; vulva 3.89-6.48 from anterior end ; eggs 0.033-0.034 × 0.033-0.035, rounded.

Host : *Myrmillo manazo*

Location : Intestine

Locality : Fish market, Karachi (Pakistan)

Remarks : This species is based on a male and three females only.

***Neogoezia aspinosa* Bilqees and Khanum, 1972**

1972. *Neogoezia aspinosa* Bilqees and Khanum, *Pakist. J. Zool.*, **4** (2), p. 148.

Description : Male. Body 20.10 long, 0.21 wide anteriorly, 0.48 posteriorly ; lips 0.10-0.11 long, with backwardly directed cuticular projection at base ; oesophagus 2.40 long, muscular ; tail 0.135 long, rounded, without spines, not curved ventrally ; caudal alae absent ; spicules subequal, 6.50 and 7.00 long ; gubernaculum absent.

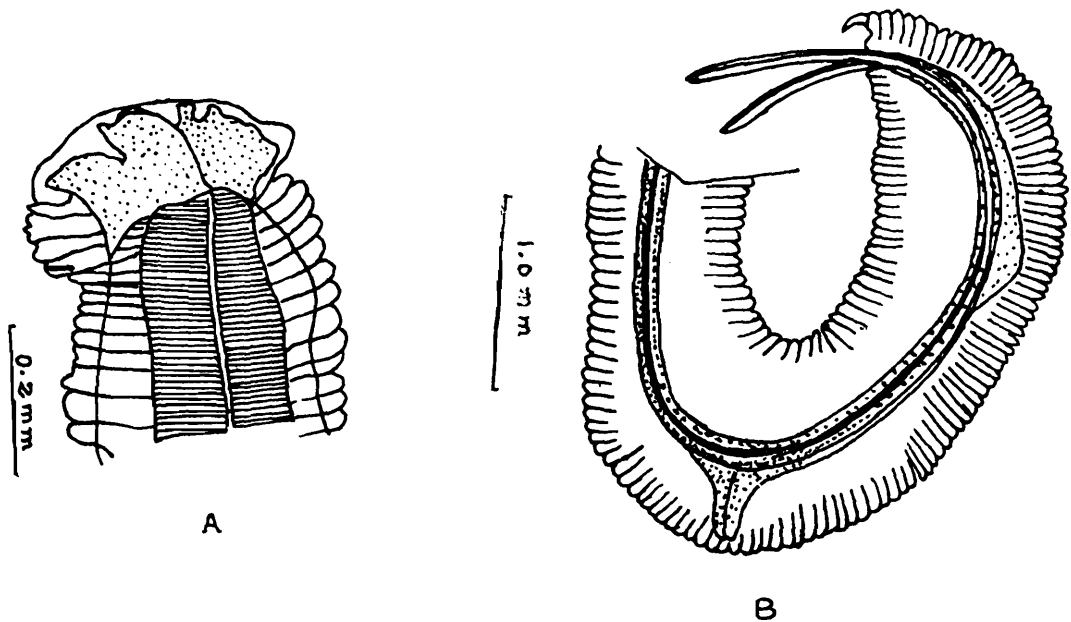


Fig. 46. *Neogoezia alaetocephala*. (After Bilqees and Khanum, 1972.) A. anterior end ; B. male posterior end.

Female. Body 28.40 long, 0.27 wide anteriorly, 0.78 posteriorly ; lips 0.135-0.136 long ; interlabia present ; tail 0.43 long, conical, with spine ; vulva 13.80 from anterior end, simple ; eggs $0.02-0.022 \times 0.02-0.022$.

Host : *Myrmillo manazo*

Location : Intestine

Locality : Fish market, Karachi (Pakistan)

Remarks : This species is based on two males and four females only.

***Neogoezia elacateiae* Khan and Begum, 1971**

(Fig. 47, A & B)

1971. *Neogoezia elacateiae* Khan and Begum, *Bull. Dep. Zool. Panjab Univ.*, article 5, p. 12.

Description: Male. Body 24.480-27.499 long, 0.408-0.421 wide, with striated cuticle forming prominent rings which anteriorly more

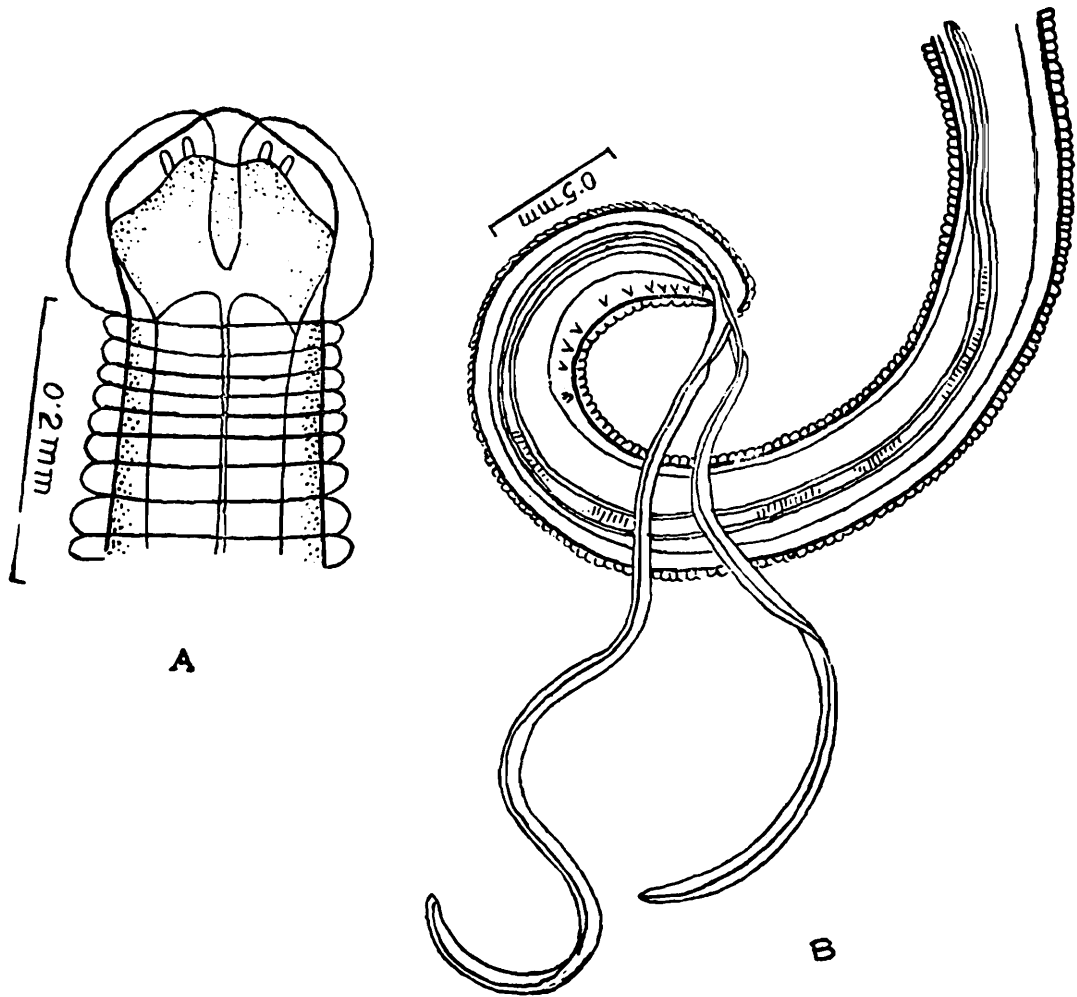


Fig. 47. *Neogoezia elacateiae*. (After Khan and Begum, 1971.) A. anterior end ; B. male posterior end.

distinct ; head with three prominent lips, 0.108-0.122 long, 0.126-0.129 wide, each with tooth-like structure ; interlabia absent ; oesophagus 3.032-3.172 long, with ventriculus $0.363-0.380 \times 0.141-0.149$; ventricular appendix absent ; intestinal caecum $0.315-0.373 \times 0.085$; tail 0.081 long, blunt, with terminal spike ; spicules two, alate, subequal, 5.589-5.916, and 5.612-5.625 long ; gubernaculum absent ; caudal papillae 11 pairs, all preanal.

Female. Body 13.858-37.073 long, 0.231-0.421 wide ; head and cuticle as in male ; oesophagus with indistinct ventriculus, 2.856-3.848 long ;

intestinal caecum 0.149-0.285 long ; tail 0.217-0.435 long, finely pointed ; vulva pre-equatorial.

Host : *Rachycentron canadus*

Location : Alimentary canal

Locality : Karachi coast (Pakistan)

Remarks : Pending availability of the male description of *Neogoezia magna* Kreis, 1937, the species is treated as distinct. However, Deardorff and Overstreet (1980) consider it synonym of *Iheringascaris iniquies* (Linton, 1901).

***Neogoezia karachiensis* Bilqees and Khanum, 1972**

1972. *Neogoezia karachiensis* Bilqees and Khanum, *Pakist. J. Zool.*, **4** (2), p. 141.

Description : Male. Body 27.3-28.2 long, 0.22-0.32 wide anteriorly, 0.79-0.81 posteriorly ; lips 0.1-0.12 long, each with 6 or more cephalic papillae ; interlabia present ; oesophagus 2.70 long, muscular ; tail 0.13-0.14 long, strongly curved ventrally, with curved spine ; spicules equal, 5.05-5.07 long ; gubernaculum with two elongated quadrangular chitinized plates firmly attached together, posterior end of which triangular and anterior narrow.

Female. Body 32.9 long, 0.48 wide anteriorly, 0.62 posteriorly ; lips 0.134-0.136 long ; oesophagus 3.20 long ; tail 0.30 long, conical, with spine ; vulva 12.55 from anterior end, with cuticular expansions ; eggs 0.033-0.034 × 0.033-0.034 ; rounded.

Host : *Myrmillo manazo*

Location : Intestine

Locality : Fish market, Karachi (Pakistan)

Remarks : This species is based on two males and one female only.

***Neogoezia manazi* Bilqees and Khanum, 1972**

1972. *Neogoezia manazi* Bilqees and Khanum, *Pakist. J. Zool.*, **4** (2), p. 146.

Description : Male. Body 25.4-27.0 long, 0.24-0.26 wide anteriorly, 0.45-0.46 posteriorly ; cuticle raised into prominent rings ; cephalic alae absent ; lips 0.135-0.136 long ; cephalic papillae indiscernible ; interlabia present ; oesophagus 4.2-4.4 long, muscular, slightly swollen at base ; tail 0.18-0.21 long, strongly curved ventrally, with curved spine ; caudal alae absent ; spicules equal, 7.04-7.06 long ; gubernaculum absent.

Female. Body 44.01-45.8 long, 0.64-0.68 wide anteriorly, 0.8-0.9 posteriorly ; oesophagus as in male, 5.30-5.40 long ; tail conical, 0.48-0.52 long, with curved spine ; vulva 15.30-15.50 from anterior end, simple ; eggs $0.054-0.055 \times 0.054-0.056$, rounded.

Host : *Myrmillo manazo*

Location : Intestine

Locality : Fish market, Karachi (Pakistan)

Remarks : Though this species is based on very adequate number of examples, both males and females, more details will be definitely helpful.

***Neogoezia mangra* Bilquees and Khanum, 1972**

1972. *Neogoezia mangra* Bilquees and Khanum, *Pakist. J. Zool.*, **4** (2), p. 143.

Description : Male. Body 24.20 long, 0.25 wide anteriorly, 0.41 posteriorly ; lips 0.13 long, each with 5 papillae ; oesophagus not distinctly marked off from intestine ; tail 0.10 long, strongly curved ventrally, with curved spine ; caudal alae not prominent ; spicules subequal, 7.40 and 7.60 long ; gubernaculum with two pairs of chitinized plates lying close together, broader at middle, narrower at ends, with anterior tip of posterior plates and posterior tip of anterior almost united.

Female. Body 28.32 long, 0.24 wide anteriorly, 0.59 posteriorly ; lips 0.145-0.146 long ; oesophagus as in male ; tail 0.4 long, conical, with curved spine ; vulva 6.7 from anterior end, ventral, median, with cuticular spines ; eggs $0.026-0.027 \times 0.026-0.027$.

Host : *Myrmillo manazo*

Location : Intestine

Locality : Fish market, Karachi (Pakistan).

Remarks : This species is based on two males and 4 females only.

***Neogoezia multipapilla* Bilquees and Khanum, 1972**

(Fig. 48, A & C)

1972. *Neogoezia multipapilla* Bilquees and Khanum, *Pakist. J. Zool.*, **4** (2), p. 145.

Description : Male. Body 20.4 long, 0.21 wide anteriorly, 0.46 posteriorly ; lips 0.085-0.086 long, each with numerous papillae ; interlabia present ; oesophagus not distinctly marked off from intestine ; tail 0.119 long, strongly curved ventrally, with curved spine ; caudal alae present ; spicules almost equal, 6.05 and 6.07 long ; gubernaculum absent.

Female. Body 37.8 long, 0.25 wide anteriorly, 0.50 posteriorly ; lips 0.10-0.102 long ; oesophagus as in male ; tail 0.28 long, conical with, spine ; vulva about 13.0 from anterior end, simple ; eggs $0.049 \times 0.049-0.05$.

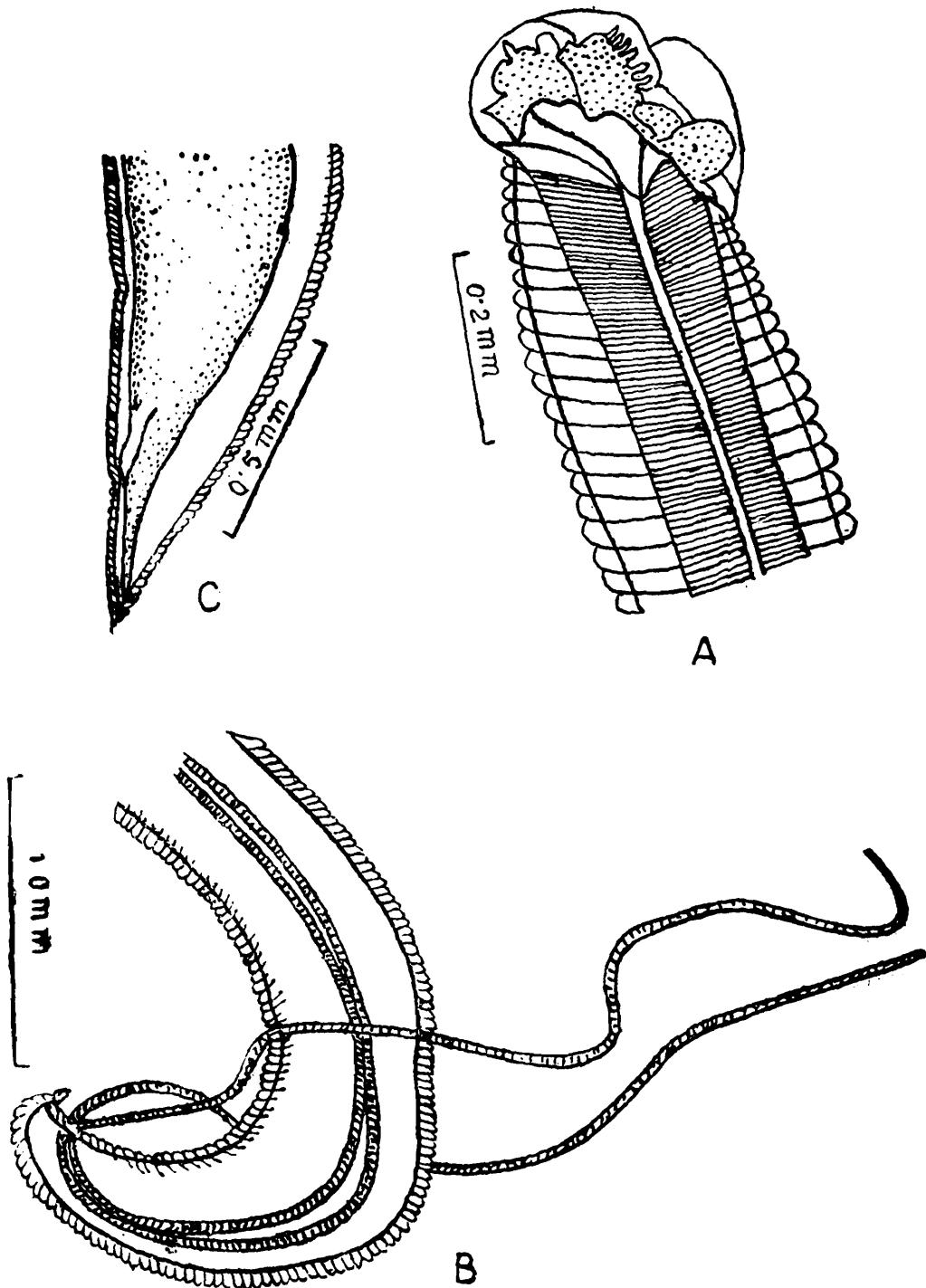


Fig. 48. *Neogoezia multipapilla*. (After Bilqees and Khanum, 1972.) A. anterior end ; B. male posterior end ; C. female posterior end.

Host : *Myrmillo manazo*

Location : Intestine

Locality : Fish market, Karachi (Pakistan)

Remarks : This species is based on one male and six females only,

Neogoezia spirocaudata Bilqees and Khanum, 1972

1972. *Neogoezia spirocaudata* Bilqees and Khanum, *Pakist. J. Zool.*, 4 (2), p. 140.

Description : Male. Body 26.5-28.2 long, 0.18-0.23 wide anteriorly, 0.51-0.61 posteriorly ; lips 3, well developed, 0.093-0.133 long, each with seven or more papillae ; interlabia present ; oesophagus not distinctly marked off from intestine ; tail about 0.3 long, strongly curved ventrally, with curved spine ; spicules almost equal, 6.0 and 6.01 long ; gubernaculum very large, with chitinized elongated plates giving off three lateral branches.

Female. Body 32.2-33.5 long, 0.25-0.26 wide anteriorly, 0.38-0.39 posteriorly ; lips 0.146-0.150 long ; oesophagus as in male ; tail 0.26-0.29 long ; vulva 7.6-7.9 from anterior end, simple ; eggs 0.036-0.037 $\times$ 0.036-0.038, rounded.

Host : *Myrmillo manazo*

Location : Intestine

Locality : Fish market, Karachi (Pakistan)

Remarks : This species is based on seven males and nine females.

Subfamily ANISAKINAE Railliet and Henry, 1912

Tribe ANISAKINEA Chabaud, 1965

Genus *Terranova* Leiper and Atkinson, 1914

Leiper and Atkinson (1914) created the genus *Terranova* with *T. antarctica* as its type species by original designation. Baylis (1916) expressed his doubt that *Ascaris decipiens* Krabbe, 1878, might belong to the genus *Terranova* but preferred to keep it with its original combination. Though Baylis (1920, 1936), Yorke and Maplestone (1926), and Dollfus (1933) treated the genus as a synonym of *Porrocaecum*, Johnston and Mawson (1945) upheld its validity. Karochin (1946) treated it as a subgenus of *Porrocaecum*, and Mosgovoï (1951) split it into two subgenera, viz. *Terranova* and *Sauronema*. But Hartwich (1957, 1974), Yamaguti (1961), Majumdar (1964), Margolis (1970) and Sprent (1979) rejecting the subgeneric ranking treated it as a valid genus with whom the present author agrees, and also upholds *T. antarctica* as its type since the synonymy of this species with *T. decipiens* (Krabbe, 1878) was never confirmed. Hitherto, two species from fishes are known from the area under the genus, viz. *T. pristis* and *T. galeocerdonis*. Although, according to Baylis (1936) both the species are very closely related, the present author prefers to keep them provisionally separate.

Terranova galeocerdonis (Thwaite, 1927) Johnston and Mawson, 1945

1927. *Porrocaecum galeocerdonis* Thwaite, *Ann. trop. Med. Parasit.*, **21**, p. 225.
 1936. *Porrocaecum galeocerdonis* : Baylis, *F. B. I.*, **1**, p. 77.
 1945. *Terranova galeocerdonis* Johnston and Mawson, *Rep. B. A. N. Z. Antarctic Res. Exped.*, **5**, p. 111.
 1977. *Terranova galeocerdonis* : Chaturvedi and Kansal, *Rec. zool. Surv. India* Occasional Paper No. 5, p. 6.

Description : Male. Body 17.7-32.6 long, 0.67-0.89 wide ; lateral alae narrow, extending from base of lips to posterior third of body ; head 0.18 in diameter ; lips 3, each with dentigerous ridges and narrow anterior projection bearing two tooth-like processes ; dorsal lip with two large papillae, ventrolateral lips each with larger ventral and smaller lateral papilla ; pulp of dorsal lip with two rounded anterior lobes ; oesophagus 2.3-3.1 long ; ventriculus 0.6-0.83 long ; intestinal caecum 1.1-1.8 long ; nerve ring slightly in front of cervical papillae ; tail 0.275 long, sharply pointed, ventrally with a number of cuticular spines behind cloaca ; spicules sharply pointed, equal or subequal, 0.52-0.774 long ; caudal papillae 55-78 pairs, 47-70 preanal, 8 postanal, and a large median papilla on anterior lip of cloaca.

Female. Body 22.2-44.0 long, 0.83-1.4 wide ; tail 0.4 long ; sharply pointed ; vulva 8-12.8 from anterior end ; eggs 0.041 in diameter.

Host : Shark (*Galeocерdo tigrinum*)

Location : Intestine

Locality : Twynams paar, Pearl Banks, Sri Lanka

Terranova pristis (Baylis and Daubney, 1922) Johnston and Mawson, 1945

1922. *Porrocaecum pristis* Baylis and Daubney, *Mem. Indian Mus.*, **7**, p. 280.
 1936. *Porrocaecum pristis* : Baylis, *F. B. I.*, **1**, p. 75.
 1945. *Terranova pristis* Johnston and Mawson, *Rep. B. A. N. Z. Antarctic Res. Exped.*, **5**, p. 111.
 1977. *Terranova pristis* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 7.

Description : Male. Body upto 26.6 long, 0.74 wide ; head 0.16-0.18 in diameter ; lips small, each with dentigerous ridge, and narrow, bilobed, anterior process carrying two small cuticular projections on inner surface ; interlabia absent ; oesophagus including an oblong ventriculus 2.3-2.7 long ; ventriculus 0.6-0.78 long ; intestinal caecum 0.95-1.3 long ; cervical papillae 0.65-0.67 and nerve ring 0.46-0.53, both from anterior end ; tail 0.38 long, conical, with slight caudal alae ;

spicules non-alate, equal, 0.9 long; caudal papillae about 47 pairs, 40 preanal, 7 postanal, and a median papilla on anterior lip of cloaca.

Female. Body 34.2 long, 1.06 wide; tail 0.44 long, bluntly conical, with pair of caudal papillae 0.162 from tip; vulva 12.3 from anterior end; eggs 0.0475 in diameter, spherical.

Host : Saw fish (*Pristis perrotteti*)

Location : Intestine

Locality : Ulubaria, River Hooghly

Subfamily RAPHIDASCARIDINAE Hartwich, 1954

KEY TO GENERA

1. Lips surrounded posteriorly by ring with small anteriorly directed curves between them; ventro-lateral lips with two thick conical processes. ... 2
 Lips without such postlabial ring or conical processes. ... 3
2. Lips without teeth, vulva pre-equatorial. ... *Lappetascaris* Rasheed, 1965
 Lips each with teeth, vulva post-equatorial. ... *Mehdiascaris* Kalyankar, 1969
3. Cuticle with two lateral longitudinal rows of trilobed papilla-like structures. ... *Alisascaris* Kalyankar, 1971
 Cuticle without longitudinal rows of papilla-like structures. ... 4
4. Ventricular appendix present, intestinal caecum absent. ... 5
 Ventricular appendix and intestinal caecum both present or absent. ... 7
5. Lips markedly longer than wide, interlabia small. ... *Raphidascaroides* Yamaguti, 1941
 Lips usually not longer than wide, interlabia absent. ... 6
6. Gubernaculum absent ... *Raphidascaris* Railliet and Henry, 1915
 Gubernaculum present ... *Alibagascaris* Kalyankar, 1970
7. Ventricular appendix and intestinal caecum both present ... 8

8. Cuticle with distinctly plicated annulations lacking spines.	...	<i>Iheringascaris</i> Pereira, 1935
Cuticle with annulations moderately or weakly defined or lacking.	...	<i>Hysterothylacium</i> Ward & Magath, 1917
Ventricular appendix and intestinal caecum both absent.	...	<i>Paranisakis</i> Baylis, 1928

Tribe LAPPETASCARIDINEA Rasheed, 1965 status emend. Hartwich, 1974

Genus *Lappetascaris* Rasheed, 1965

The genus *Lappetascaris*, with *L. lutjani* as its type species, was established by Rasheed (1965) to accommodate her specimens from two different marine fishes, viz. *Lutjanus* sp. and *Ilisha ilisha* from Karachi coast (Pakistan) ; and was characterised mainly in having lappets and a head with cuticularised lips surrounded posteriorly by a ring with small curve between them.

From India, the type species was first reported from Sagar Island, West Bengal, from *Kurtus indicus* by De, Ghosh and Majumdar (1978). Subsequently, it was reported from Karaikal, South India, by Soota and Dey Sarkar (1980), and later from Calcutta, also from the same host, by Soota (1981). The differences of characters reported by these authors from those of Rasheed's description of the species, viz. in body size, in size of spicules, and in number and arrangement of caudal papillae etc. are considered here as intraspecific variations.

Lappetascaris lutjani Rasheed, 1965

(Fig. 49, A & B)

1965. *Lappetascaris lutjani* Rasheed, *J. Helminth.*, **39** (4), p. 313.
1975. *Lappetascaris suraiyae* Kalyankar, *Marathwada Univ. J.*, **14** (7), p. 243.
1977. *Lappetascaris lutjani* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 6.
1978. *Lappetascaris lutjani* : De et al., *Folia parasit.*, **25**, p. 317.
1980. *Lappetascaris lutjani* : Soota and Dey Sarkar, *Rec. zool. Surv. India*, **76**, p. 4.
1981. *Lappetascaris lutjani* : Soota, *Rec. zool. Surv. India*, **79**, p. 63.

Description : Male. Body 8.0-32.5 long, 0.1-0.66 wide ; head heavily cuticularised appearing like a mass of small cuticular thickenings instead of a three-lipped structure ; lips 3, somewhat rectangular ; dorsal lip with two double papillae, ventro-laterals each with one double, one single papilla and a lateral amphid ; cuticular wall of lips produced anteriorly into two small semi-lunar plates interlocking with their counter

parts in adjacent lips, each of which, at about middle of its convex surface with small thickenings ; cuticular collar or 'ring' surrounding all three lips behind them ; two thick, solid cuticularized cone-shaped processes attached to cuticle of bases of latero-ventral lips ; interlabia not dis-

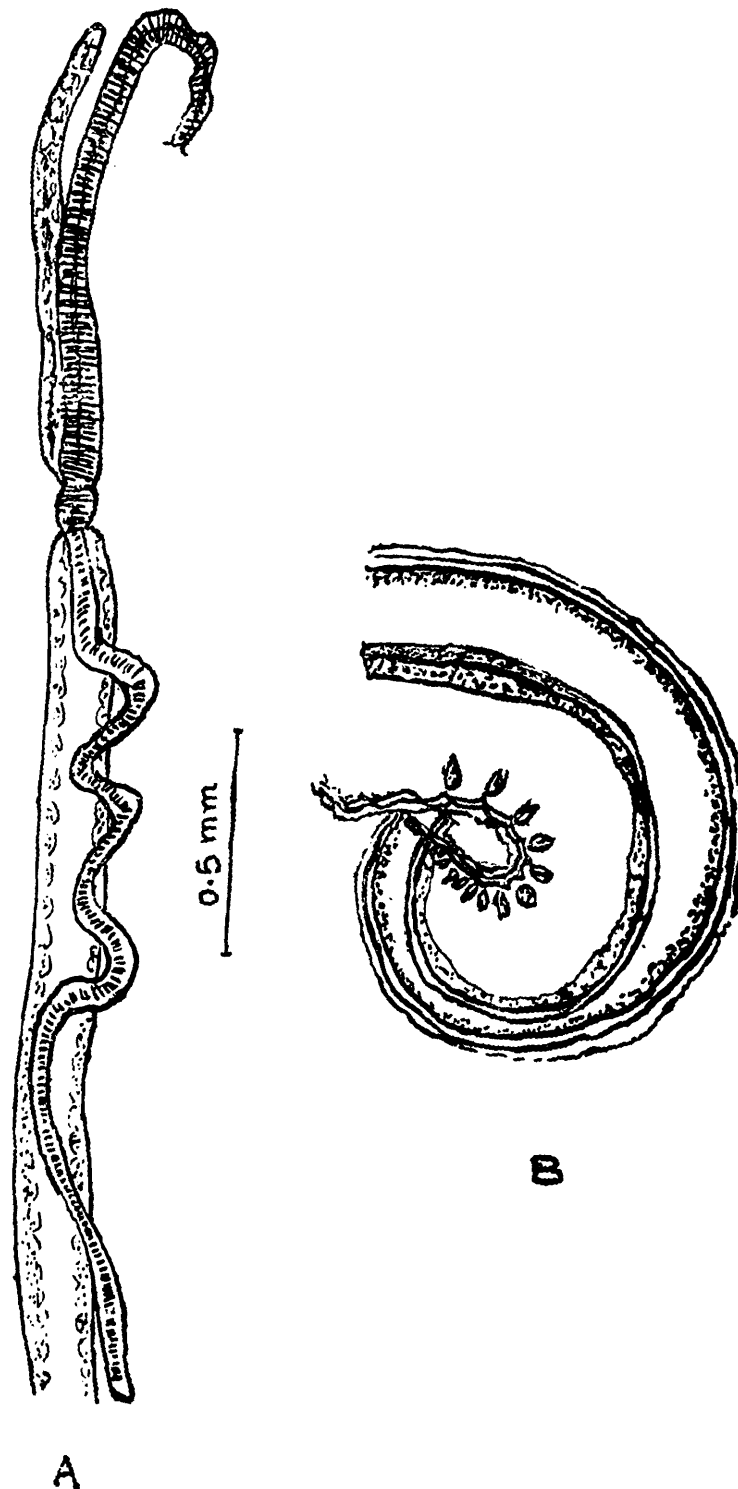


Fig. 49. *Lappetascaris lutjani*. (After Rasheed, 1965.) A. anterior end ; B. male posterior end.

cernible ; oesophagus 1.5-2.75 long ; oesophageal appendix 2.5-2.9 long ; intestinal caecum 1.04-1.2 long ; nerve ring 0.33-0.37, excretory pore

0.3-0.48 and cervical papillae 0.43, all from anterior end ; tail 0.05-0.11 long, with papilla-like process at tip and pair of phasmids near it ; spicules similar, alate, equal or subequal 1.77-3.2 long, distally with blunt, conical, bifid tip surrounded by hyaline membrane ; caudal papillae 17-20 pairs, 14-17 preanal, 3-4 postanal.

Female. Body 11.17-35.0 long, 0.25-1.1 wide ; head as in male ; oesophagus 1.48-3.5 long ; oesophageal appendix 2.6-3.6 long ; intestinal caecum 1.5-2.0 long ; nerve ring 0.3-0.4, excretory pore 0.29-0.49 and cervical papillae 0.45, all from anterior end ; tail as in male, 0.05-0.29 long, ending in conical papilla-like tip and with pair of prominent phasmids 0.066 from tip ; vulva pre-equatorial, 4.23-7.80 from anterior end ; eggs $0.03-0.047 \times 0.036-0.045$, oval.

Hosts : *Lutjanus* sp. ; *Ilisha ilisha* ; *I. filigera* ; *Anodontostoma* [= *Chatoessus*] *chacunda* ; *Johnius* sp. ; *Kurtus indicus*

Location : Intestine

Localities ; Karachi (Pakistan) ; Karaikal, Pondicherry ; Bombay, Maharashtra ; Sagar Island & Calcutta, West Bengal

Genus *Mehdiascaris* Kalyankar, 1969

This genus was established by Kalyankar (1969) for the reception of two new species, viz. *M. bombayensis* and *M. suraiyae*, both from the same host *Muraenesox talabonoides* from Bombay, Maharashtra ; and was separated from *Lappetascaris* Rasheed, 1965, mainly in the :

1. Origin of lappets from anterior border of lips instead of from behind as in case of latter genus ;
2. Presence of prominently developed teeth on lips instead of their absence ;
3. Position of vulva post-equatorial instead of pre-equatorial ;
4. Larger body size.

But, as the above distinguishing characters are not very strong, it will be very fruitful if more distinctive characters are brought out between both the genera, pending which *Mehdiascaris* is retained here as it is. Also, of the two species under it, only the type species *M. bombayensis* is included here as the differentiating characters between it and the other species *M. suraiyae* (based on a single male only) are not adequate enough to warrant their separate status. The genus has, however, not been included by Hartwich (1974).

Mehdiascaris bombayensis Kalyankar, 1969

(Fig. 50, A-C)

1969. *Mehdiascaris bombayensis* Kalyankar, *Marathwada Univ. J.*, 8 (1), p. 89.1969. *Mehdiascaris suraiyae* Kalyankar, *Marathwada Univ. J.*, 8 (1), p. 91.

Description : Male. Body 46.55-55.69 long, 0.35 wide anteriorly, 0.62 posteriorly ; lips 3, each with pair of teeth and cuticular band at anterior margin from which arising pair of cone-shaped lappets ; dorsal lip with two papillae, subventral with one each and pair of lateral amphids ; head 0.21-0.22 in diameter, separated from body by cuticular

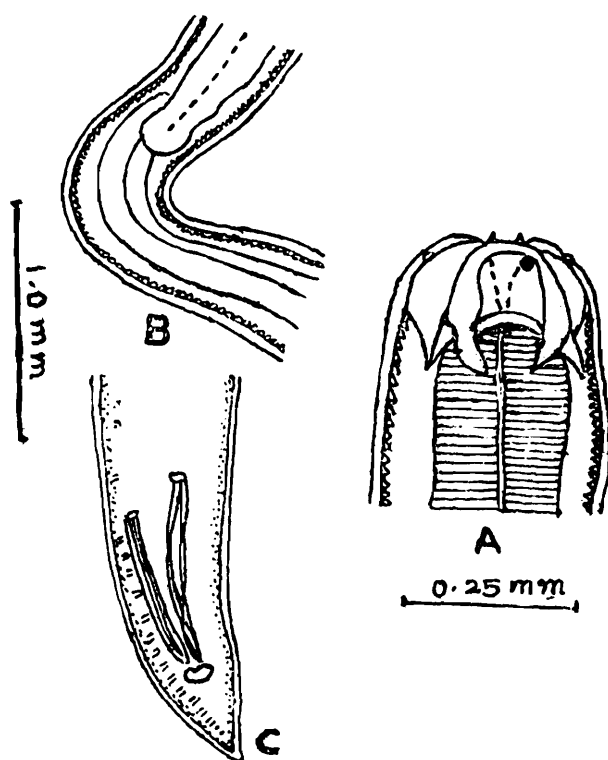


Fig. 50. *Mehdiiascaris bombayensis*. (After Kalyankar, 1969.) A. anterior end ; B. showing oesophageal appendix and intestinal caecum ; C. male posterior end.

collar or ring ; interlabia absent ; oesophagus 2.16-4.02 long ; ventriculus 0.21-0.28 long ; oesophageal appendix 6.10-7.97 long ; intestinal caecum 0.24-0.36 long ; nerve ring 0.41-0.68 and excretory pore 0.66-0.90, both from anterior end ; tail 0.23-0.75 long ; with minute spines ; spicules alate, similar, subequal, right 0.71-0.82 long, left 0.61-0.78 ; gubernaculum absent ; caudal papillae 22-31 pairs, 14-21 preanal, 8-10 postanal.

Female. Body 51.79-67.73 long ; head as in male ; oesophagus 3.18-3.94 long ; ventriculus 0.22-0.26 long ; oesophageal appendix 7.08-7.10 long ; intestinal caecum 0.34-0.36 long ; nerve ring 0.56-0.65 and excretory pore 0.60-0.71, both from anterior end ; tail as in male, 0.23-0.35

long ; vulva post-equatorial, 25.71-31.65 from posterior end ; eggs 0.02-0.03 in diameter, rounded.

Host : *Muraenesox talabonoides*

Location : Intestine

Locality : Bombay, Maharashtra

Tribe ALIASCARIDINEA Kalyankar, 1971 status emend. Hartwich, 1974

Genus *Aliascaris* Kalyankar, 1971

Generic diagnosis : Body with two cuticular longitudinal rows of trilobed wart-like structures, and all along with irregular transverse lines and lateral alae ; ventriculus without appendix ; intestinal caecum and cordons present ; stoma and caudal alae absent ; spicules equal, similar ; papillae numerous ; gubernaculum and caudal alae absent ; vulva pre-equatorial ; oviparous. Parasites of fishes.

Aliascaris indica Kalyankar, 1971

(Fig. 51 A & B)

1971. *Aliascaris indica* Kalyankar, *Riv. Parassit.*, **32** (2), p. 85.

Description : Male. Body 13.13 long, 0.67 wide, stout, tapering towards extremities, yellowish-white in colour, with uniformly thick cuticle having trilobed papilla-like structures laterally, and covered all over with irregularly arranged transversely raised lines ; lateral alae very conspicuous in cervical region and cordons extending all along body ; head 0.14 in diameter ; mouth trilobed with three distinct lips, each carrying a well developed compound papilla ; stoma absent ; oesophagus 1.14 long, muscular ; ventriculus 0.60 long, glandular ; intestinal caecum 1.07 long ; nerve ring 0.30, and excretory pore 0.34, both from anterior end ; tail 0.19 long, with rounded tip ; caudal alae absent ; spicules similar, equal, 0.57 long ; gubernaculum absent ; caudal papillae 54 pairs, 49 preanal, 5 postanal.

Female. Body 19.96 long, 0.73 wide, and as in male ; cervical papillae prominent, 0.42 from anterior end ; head 0.18 in diameter ; oesophagus 1.68 long ; ventriculus 0.61 long ; intestinal caecum 1.15 long ; nerve ring 0.30, and excretory pore 0.34, both from anterior end ; tail 0.38 long, conical, with rounded tip ; vulva pre-equatorial, 6.18 from anterior end ; eggs 0.044×0.037 , oval, thin shelled.

Host : *Dasyatis sephen*

Location : Intestine

Locality : Panaji, Goa

Remarks : This genus which was created by Kalyankar (1971) has been accepted by Hartwich (1974).

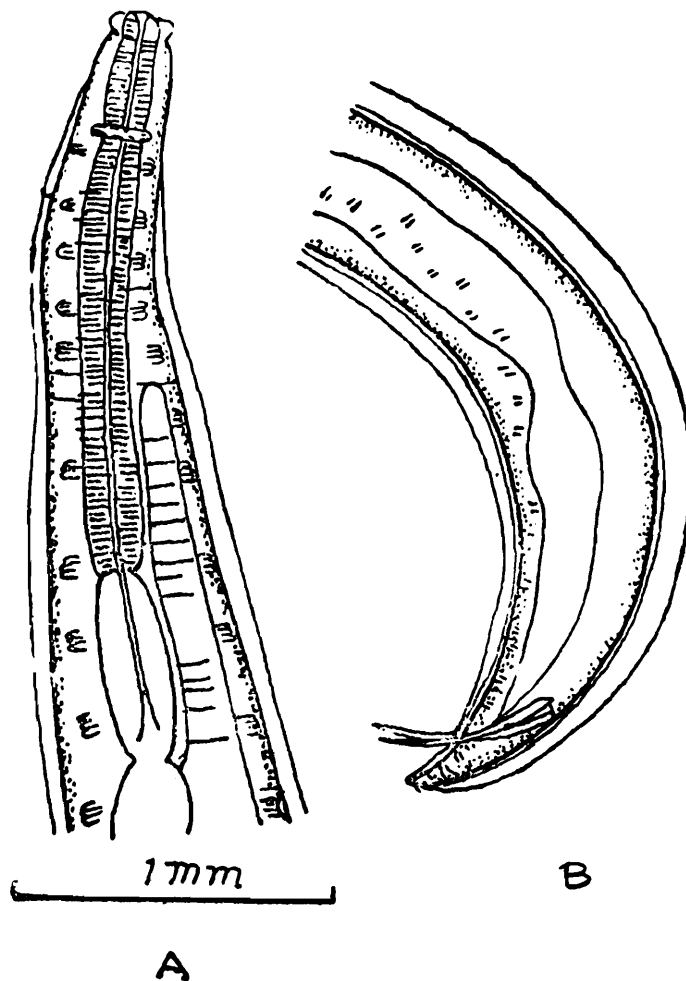


Fig. 51. *Aliascris indica*. (After Kalyankar, 1971.) A. anterior end ; B. male posterior end.

TRIBE RAPHDASCARIDINEA Chabaud, 1965

Genus *Alibagascaris* Kalyankar, 1970

Generic diagnosis : Lips 3, each with dentigerous ridge and prominent tooth ; interlabia absent ; oesophagus simple ; ventriculus and ventricular appendix present ; intestinal caecum absent ; male tail conical, with tuft of spines ; spicules equal and similar ; gubernaculum present ; caudal papillae numerous ; female tail conical with spines at tip ; vulva pre-equatorial. Parasites of marine fishes.

Alibagascaris pseudosciaenae Kalyankar, 1970

(Fig. 52, A-C)

1970. *Alibagascaris pseudosciaenae* Kalyankar, *Jap. J. Parasit.*, 19 (5), p. 549.

Description : Male. Body 14.50-15.33 long, 0.48-0.50 in diameter ; lips 3, one dorsal, two subventral ; each lip with dentigerous ridge,

tooth, two papillae ; a pair of amphids present ; interlabia absent ; oesophagus with ventriculus 1.20-1.41 long, muscular ; ventriculus 0.09-0.10 long ; oesophageal appendix 0.46-0.48 long ; nerve ring 0.34-0.37, and excretory pore 0.36-0.37, both from anterior end ; tail 0.10-0.11 long, conical, tip covered with minute spines ; caudal alae absent ; spicules similar, almost equal, 0.29-0.33 long ; gubernaculum V-shaped, 0.11 long ; caudal papillae 49 pairs, 40 preanal, 9 postanal.

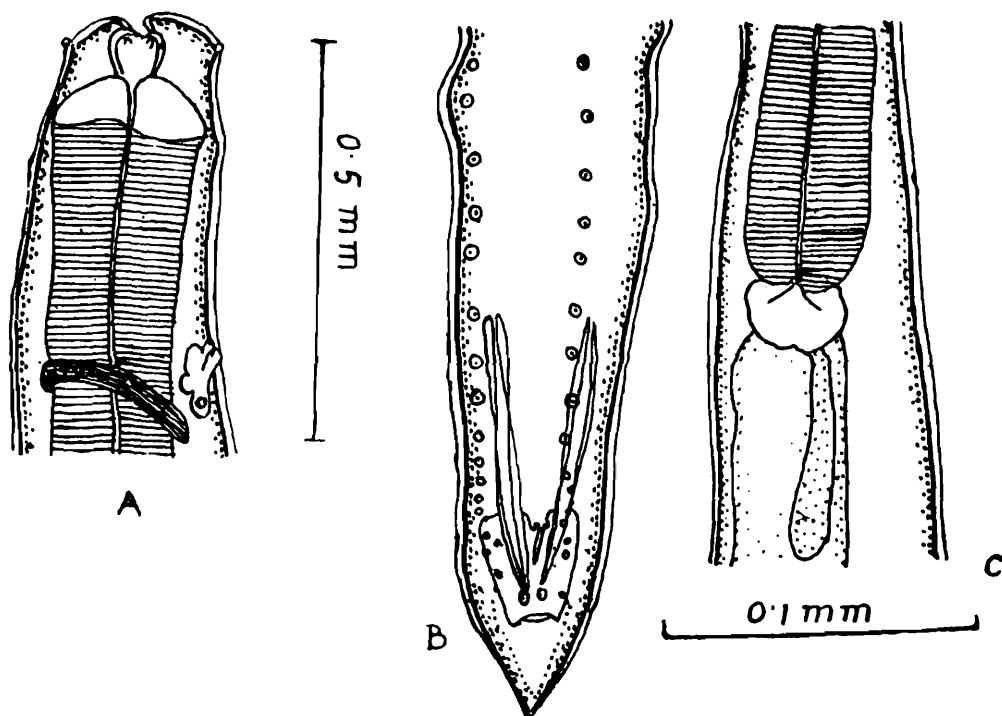


Fig. 52. *Alibagascaris pseudosciaenae*. (After Kalyankar, 1970.) A. anterior end ; B. male posterior end ; C. oesophageal region showing appendix.

Female. Body 16.36-18.59 long, 0.73-0.75 in diameter ; lips as in male ; oesophagus 1.68-1.80 long ; ventriculus 0.140-0.143 long ; oesophageal appendix 0.55-0.79 long ; nerve ring 0.41-0.43, and excretory pore 0.40-0.48, both from anterior end ; tail conical, tip covered with minute spines ; vulva 3.72-3.74 from anterior end ; eggs 0.034-0.035 in diameter.

Hosts : *Protonibea diacanthus* ; *Johnius dussumieri* ; *Harpadon nehereus*

Location : Intestine

Localities : Alibag & Bombay, Maharashtra

Remarks : This monotypic genus created by Kalyankar (1971) and hitherto known from India has, however, not been included by Hartwich (1974).

Genus **Raphidascaris** Railliet and Henry, 1915**Raphidascaris ? acus** (Bloch, 1779) Railliet and Henry, 1915

1915. *Raphidascaris acus* Railliet and Henry, *Bull. Soc. path. exot.*, 8, p. 271.

1975. *Raphidascaris acus* : Hartwich, *Tierwelt Dtl.*, 62, p. 102.

1976. *Raphidascaris acus*, Arthur *et al.*, *J. Fish. Res. Bd. Canada*, 33 (1), p. 2489.

Description : Female. Body 18.7-20.0 long, 0.44-0.46 wide ; head 0.06 long, 0.13-0.15 wide ; oesophagus 1.5-1.7 long ; ventriculus 0.11 long, appendix 0.63-0.8 ; vulva 3.0-4.0 from anterior end ; tail 0.3-0.4 long ; eggs $0.02-0.03 \times 0.02-0.03$; papillae opposite anus, 0.28-0.36 from posterior end.

Host : *Clupea* sp.

Location : Intestine

Locality : Porbander, Gujarat

Remarks : This species based on two females only was doubtfully recorded from India by Soota and Chaturvedi (1971). Pending availability of further material including male, the species is tentatively included here.

Raphidascaris panijii Khan and Yaseen, 1969

1969. *Raphidascaris panijii* Khan and Yaseen, *Bull. Dep. Zool. Panjab Univ.*, article 4, p. 30.

Description : Male. Body 8.56 long, 0.33 wide ; lateral alae present along entire body length ; lips 3, 0.023 long ; oesophagus 0.70 long, ventriculus round, 0.06 ; ventricular appendix 3.07 long ; nerve ring 0.21 from anterior end ; spicules similar, alate, equal, 0.09 long ; gubernaculum absent.

Host : *Sillaginopsis panijus*

Location : Intestine

Locality : Khulna (Bangladesh)

Remarks : This species is not only based on a single male only, but also inadequately described. Also, the author's figure shown as posterior end of adult male actually appears to be that of a juvenile female. Hence, the inclusion of the species here is purely tentative.

Genus **Raphidascaroides** Yamaguti, 1941

Hitherto, two species from the area from fishes are known under the genus, a key of which is given below.

Caudal papillae 8 pairs.	...	<i>R. blochii</i>
Caudal papillae very much more.	...	<i>R. diadonisi</i>

Raphidascaroides blochii Bilqeas and Khanum, 1974

(Fig. 53, A-C)

1974. *Raphidascaroides blochii* Bilqeas and Khanum, *Pakist. J. Zool.*, 6 (1 & 2), p. 151.

Description : Male. Body 17.9 long, 0.133 wide anteriorly, 0.4 posteriorly ; lips 3, 0.133 long, without dentigerous ridges ; interlabia present ;

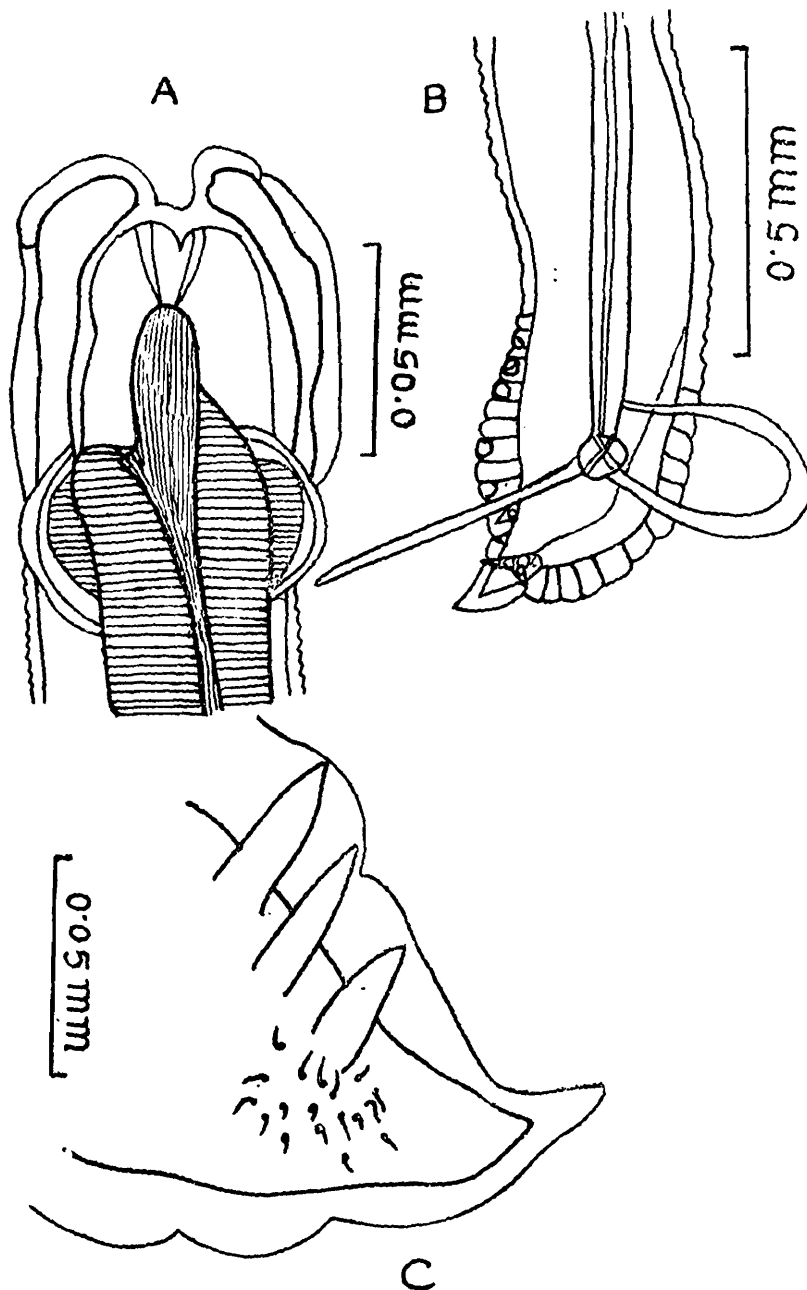


Fig. 53. *Raphidascaroides blochii*. (After Bilqeas and Khanum, 1974.) A. anterior end ; B-C. male posterior end.

oesophagus 2.08 long ; ventriculus oval, 0.25×0.16 , indistinctly marked off from intestine, giving out posteriorly ventricular appendix, 0.09 long ; tail 0.25 long, conical, pointed, with well developed caudal alae ; numerous rudimentary spines posteriorly ; spicules subequal, 3.12 long ; caudal papillae 8 pairs, 5 preanal, 3 postanal.

Female. Body 37.0 long, 0.384 wide anteriorly, 0.577 posteriorly ; lips 0.170-0.183 long ; oesophagus 3.67 long ; ventriculus 0.364×0.208 , ventricular appendix 0.143 long ; tail 0.584 long with short spine ; rudimentary spines as in male ; vulva 15.19 from anterior end ; eggs $0.04-0.05 \times 0.049-0.061$, oval.

Host : *Sphyrna blochii*

Location : Intestine

Locality : Karachi (Pakistan)

Raphidascaroides diadonis (Thwaite, 1927) Olsen, 1952

1927. *Raphidascaris diadonis* Thwaite, *Ann. trop. Med. Parasit.*, **21**, p. 229.

1936. *Raphidascaris diadonis* : Baylis, *F. B. I.*, **1**, p. 68.

1952. *Raphidascaroides diadonis* Olsen, *Publ. Inst. mar. Sci. Univ. Tex.*, **11**, p. 186.

1977. *Raphidascaroides diadonis* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 6.

Description : Male. Body 38.0-52.0 long ; 1.0 wide ; lips 0.24-0.34 long, 0.18-0.25 wide ; interlabia 0.092-0.138 long ; oesophagus excluding ventriculus 4.9-6.7 long ; ventricular appendix 0.86-1.46 long ; nerve ring 0.1, excretory pore and cervical papillae 1.0, all from anterior end ; tail 0.15-0.23 long, conical, with tip smooth or covered with spines ; spicules alate, equal, 0.276-0.35 long, terminating distally in small knobs ; caudal papillae 26-41 pairs, 3-6 preanal, 23-35 postanal ; a median preanal papilla sometimes present.

Female. Body 45.0-62.0 long, 1.5 wide ; lips and oesophagus as in male ; tail 0.46-0.54 long, conical ; vulva at about anterior third of body ; eggs 0.063×0.056 .

Host : *Diodon hystrix*

Location : Intestine

Locality : Sri Lanka

Remarks : Thwaite (1927) described the species *Raphidascaris diadonis* and showed the presence of interlabia and this was accepted by Baylis (1936). Yamaguti (1941), however, created the genus *Raphidascaroides* separating it from *Raphidascaris* mainly on the presence of interlabia. Olsen (1952) transferred Thwaite's species under the genus and this was accepted by Yamaguti (1961).

Genus **Hysterothylacium** Ward and Magath, 1917

Ward and Magath (1917) established the genus *Hysterothylacium* with *H. brachyurum* as its type which, however, was not recognised by

subsequent workers. Dollfus (1933) erected another genus *Thynnascaris* for his species *T. legendrei* assuming that it lacked a ventricular appendage, but subsequently (1935) reduced it to a subgeneric rank under the genus *Contracaecum*, realizing that the appendage was present, a view accepted by Johnston and Mawson (1945). Another genus *Iheringascaris* was described by Pereira (1935) for his species *I. iheringascaris*. Mosgovoy (1951) [in Skrjabin, Schikhobalova and Mosgovoy] treated both the above genera, *Thynnascaris* and *Iheringascaris* as synonyms of *Contracaecum*. Ivashkin (1953), and Yamaguti (1961) too held the same view but Hartwich (1957, 1974, 1975), and Rasheed (1965) treated *Iheringascaris* as congeneric with *Thynnascaris*. Mosgovoy (*op. cit.*) split *Contracaecum* into three subgenera including *Ershowicaecum*, and Kreis (1952) the same into two including *Simplexonema*. But, both these subgenera were invalidated by Hartwich (*op. cit.*) who considered them as synonyms of *Thynnascaris*, which latter he (1957) infact reinstated to the original generic rank on the basis of the position of excretory pore and host specificity and this was accepted by Chabaud (1965), and Rasheed (1965). He, however, restricted the genus to adult forms occurring in fish hosts and confined *Contracaecum* to those in fish eating birds and aquatic mammals, and this was supported by Rasheed (*op. cit.*). Margolis and Arthur (1979) also upheld the genus *Thynnascaris*. Deardorff and Overstreet (1980) on the other hand, in their excellent review, had considered it synonymous with *Hysterothylacium* Ward and Magath, 1917, which they in fact reinstated to the original generic rank, and also resurrected *Iheringascaris* Pereira, 1935 which is accepted in the present work. Out of six species known from this area, a key for five only is given, *Hysterothylacium plagiostomorum* (v. Linstow, 1905) which is inadequately described being omitted from it. Further, four species, viz. *Contracaecum aori* Khan and Yaseen, 1969 ; *C. brevicaecum* Khan and Yaseen, 1969 ; *C. collieri* Chandler, 1935 ; and *C. vittatii* Khan and Begum, 1971, have not been described for they are, as rightly observed by Deardorff and Overstreet (1980), "Larval ascarioids of uncertain status". Regarding two species, viz. *Contracaecum serrani* Kalyankar, 1972, and *C. synpapillus* Bilqees, Khanum and Jehan, 1971, due to their uncertain status in the opinion of the above authors, they are being included only tentatively as they may be, "possibly referable to *Hysterothylacium* because they contain an intestinal caecum and ventricular appendage and mature in the alimentary canal of fishes".

1. Spicules long, more than 4.0 mm.	...	<i>H. incurvum</i>
Spicules small	...	... 2

2. Caudal papillae probably 3 pairs	...	<i>H. synpapillus</i>
Caudal papillae 26 pairs	...	<i>H. serrani</i>
Caudal papillae 28 pairs	...	<i>H. carangis</i>
Caudal papillae over 32 pairs	...	<i>H. trichiuri</i>

Hysterothylacium carangis (Kalyankar, 1971)
(Fig. 54, A-C)

1971. *Thynnascaris carangis* Kalyankar, *Acta parasit. pol.*, **19** (12), p. 147.
1980. *Hysterothylacium carangis* Deardorff and Overstreet, *Proc. Biol. Soc. wash.*, **93** (4), p. 1040.

Description : Male. Body 39.85 long ; cuticle thick, with deep transverse grooves discontinuous on both sides ; “striae” deep, body appearing segmented ; striations very distinct in middle ; head .017 in

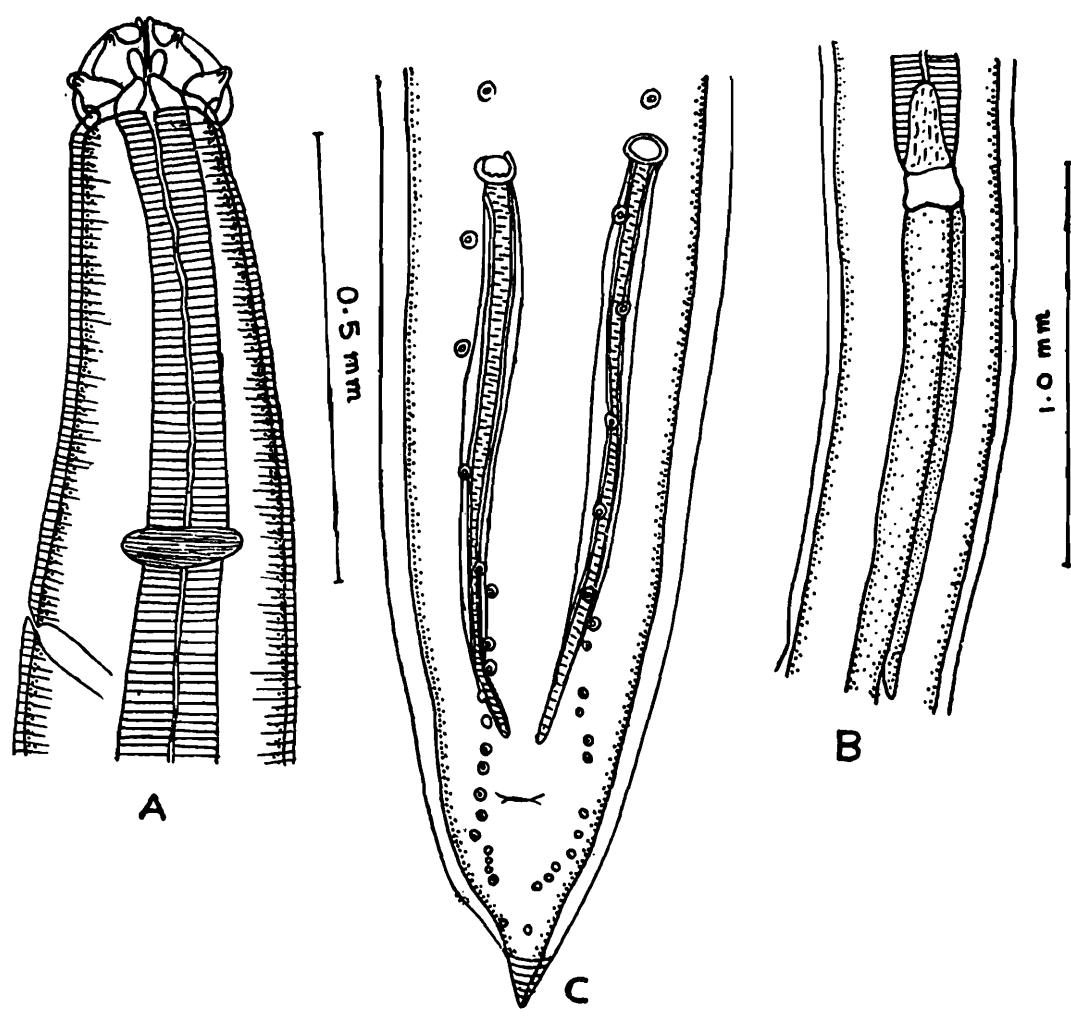


Fig. 54. *Hysterothylacium carangis*. (After Kalyankar, 1971.) A. anterior end ; B. showing intestinal caecum ; C. male posterior end.

diameter, separated from body by small constriction ; lips 3, dorsal with two papillae, subventrals with one each ; lip folds deep appearing like “lappets”, 0.07 ; oesophagus 3.83 long, and with a ventriculus 0.12,

ventricular appendix 1.23 ; intestinal caecum 0.22 long ; nerve ring 0.57, and excretory pore 0.64, both from anterior end ; tail short, bluntly pointed ; spicules two, similar, equal, 0.7 long ; caudal papillae 28 pairs, 18 preanal, 10 postanal.

Female. Body 52.95 long ; and as in male ; striations distinct excepting anterior most region ; oesophagus 3.91 long, and with a ventriculus 0.2 ; ventricular appendix 3.3 long ; intestinal caecum 0.27 long ; nerve ring 0.58, and excretory pore 0.62, both from anterior end ; tail short, ending in bluntly pointed tip ; vulva 25.99 from posterior end ; eggs 0.052×0.034 ; phasmids 0.27 from posterior end.

Host : *Carangoides malabaricus*

Location : Intestine

Locality : Panaji, Goa

Hysterothylacium incurvum (Rud., 1819) Deardorff and Overstreet, 1980

- 1819. *Ascaris incurva* Rudolphi, *Entozoorum Synopsis cui Accedunt mantissa Duplex et Indices Locupletissimi. Berolini*, p. 51.
- 1901. *Ascaris incurva* : Linton, *U. S. Fisheries Comm. Bull.*, **19**, p. 446.
- 1922. *Contracaecum incurvum* Baylis and Daubney, *Mem. Indian Mus.*, **7**, p. 282.
- 1935. *Contracaecum* (*Thynnascaris*) *iucurvum* Dollfus, *Bull. Soc. zool. Fr.*, **60**, p. 92.
- 1935. *Contracaecum* (*Thynnascaris*) *incurvum* : Dollfus, *Bull. Travaux Station Agric., Castiglione*, p. 273.
- 1935. *Contracaecum incurvum* : Yamaguti, *Jap. J. Zool.*, **6** (2), p. 342.
- 1936. *Contracaecum incurvum* : Baylis, *F. B. I.*, **1**, 88.
- 1957. *Thynnascaris incurva* Hartwich, *Zool. Jb.*, **85**, p. 240.
- 1971. *Contracaecum incurvum* : Machida, *Jap. J. Parasit.*, **20** (4), p. 305.
- 1975. *Thynnascaris incurvum* : Hartwich, *Tierwelt Dtl.*, **62**, p. 112.
- 1977. *Contracaecum incurvum* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 6.
- 1979. *Thynnascaris incurva* : Margolis and Arthur, *Bull. Fish. Res. Bd. Canada*, **199**, p. 107.
- 1980. *Hysterothylacium incurvum* Deardorff and Overstreet, *Proc. Biol. Soc. wash.*, **93** (4), p. 1058.

Description : Male. Body 34.3-90.0 long, 0.55-0.75 wide ; cuticular striations coarse, prominent ; head 0.2-0.4 in diameter ; lips having sinous margins anteriorly and laterally, with hinder portions produced into broad cuticular flanges ; interlabia short, compressed between lips ; interlabial grooves well marked, running round bases of lips ; cervical alae 2.0 long, 0.05 wide ; cervical papillae 0.65, nerve ring 0.55 and excretory pore 0.68, all from anterior end (in only one specimen 34.3

long) ; oesophagus including ventriculus 3.0 long (according to Dujardin 7.2) ; ventriculus 0.16 in diameter ; ventricular appendix 3.0 long ; intestinal caecum 2.0-6.2 long ; tail 0.2 long, tapering, with spike ; longitudinal ridges present ventrally, pronounced, interrupted by transverse grooves about 0.7 from posterior end ; spicules broadly alate, 4.1-4.4 long ; caudal papillae 20 pairs, 15 preanal, 1 double adanal, 4 postanal.

Female. Body 22.0-122.0 long (or even 267.0 according to Linton), 0.75-3.0 wide, and as in male ; lips also as in male ; tail 0.36-1.7 long, straight, pointed ; vulva at about anterior third of body ; eggs 0.07×0.05 .

Hosts : Sword fish (*Xiphias gladius*) ; Peacock fish (*Istiophorus gladius*)

Location : Stomach

Localities : India ; Sri Lanka

Hysterothylacium plagiostomorum (v. Linstow, 1905)

1905. *Ascaris plagiostomorum* Linstow, *Zeitschr. Wiss. Zool.*, 82, p. 192.

1936. *Contracaecum plagiostomorum* Baylis, *F. B. I.*, 1, p. 90.

1977. *Contracaecum plagiostomorum* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5., p. 6.

Description : Male. Body 17.0 long, 0.75 wide ; lips short, broad, each on inner side with rounded projection having two 'teeth' at apex and abruptly truncate in front and bearing denticles ; dentigerous ridges and interlabia reportedly absent ; oesophagus $1/12$ of body length, with longer posterior appendix ; intestinal caecum $5/12$ of length of oesophagus ; cervical papillae close in front of middle of oesophagus ; tail $1/86$ of body length, with finger-shaped terminal appendage ; caudal papillae 76 pairs, 70 preanal, 6 postanal.

Female. Body 28.0 long, 1.58 wide ; tail $1/75$ of body length, blunt ; vulva equatorial ; eggs 0.039 in diameter, spherical.

Hosts : *Catorhinus* [*Selache*] *maximus* ; *Raja radiata*

Location : Stomach & gills

Locality : Sri Lanka

Remarks : This inadequately described species has not been included by Deardorff and Overstreet (1980).

***Hysterothylacium serrani* (Kalyankar, 1972)**

(Fig. 55, A & B)

1972. *Thynnascaris serrani* Kalyankar, *Riv. Parassit.*, 33 (3), p. 204.

Description : Male. Body 44.98 long, with distinct transverse striations ; head 0.24 in diameter ; mouth with 3 lips, and a dentigerous lining at its junction with oesophagus ; oesophagus 5.93 long, with a ventriculus 0.22 ; ventricular appendix 1.10 long ; intestinal caecum 0.13 long ; nerve ring 0.66 from anterior end ; tail 0.19 long, and with a mucronate point 0.07 long ; spicules similar, almost equal, right

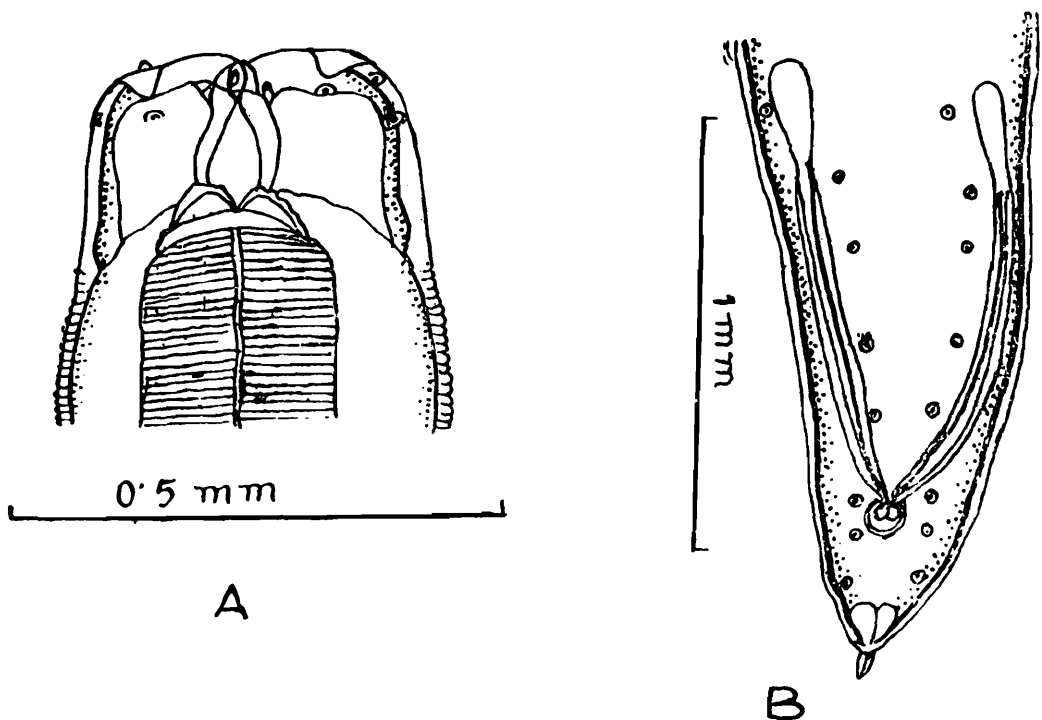


Fig. 55. *Hysterothylacium serrani*. (After Kalyankar, 1972.) A. anterior end ; B. male posterior end.

0.82 long, left 0.81, both proximally with small bulb-like expansion (spicule sacs) 0.19 long ; caudal papillae 26 pairs discernible, 23 preanal, 3 postanal.

Female. Body 54.67 long ; anterior end as in male ; oesophagus 6.44 long, with a ventricular appendix 1.30 long ; intestinal caecum present ; nerve ring 0.93 from anterior end ; tail 0.59 long, simple, bluntly pointed, and without a mucronate point ; vulva 21.53 from anterior end ; eggs 0.03-0.05 in diameter, rounded.

Host : *Serranus ferio*

Location : Intestine

Locality : Malvan, Maharashtra

Remarks : Deardorff and Overstreet (1980) regarded it as species of uncertain status possibly belonging to the genus *Hysterothylacium*. Its inclusion here therefore is only tentative (*vide supra*).

***Hysterothylacium synpapillus* (Bilqees, Khanum and Jehan, 1971)**

1971. *Contracaecum synpapillus* Bilqees *et al.*, *J. Sci. Karachi*, **1** (1), p. 179.

1977. *Contracaecum synpapillus* : Khanum and Farooq, *Biologia*, Lahore, **23** (1), p. 7.

Description : Male. Body 44.0 long, 0.87 wide, and entirely striated ; lips 3, without dentigerous ridges ; interlabia, intestinal caecum and reduced ventriculus present ; tail 0.085 long ; cushion-like structure near cloacal aperture present protecting spicules, formed probably by fusion of three pedunculate papillae ; spicules unequal, left 0.45 long, right 0.34.

Female. Body 56.9 long, 1.28 wide ; tail 0.43 long, bluntly pointed ; vulva elevated, post-equatorial, 22.1 from posterior end ; eggs very small and oval.

Host : *Muraenesox cinereus*

Location : Intestine

Locality : Karachi (Pakistan)

Remarks : Deardorff and Overstreet (1980) regarded it as species of uncertain status possibly belonging to the genus *Hysterothylacium*. Its inclusion here therefore is only tentative (*vide supra*).

***Hysterothylacium trichiuri* (Thwaite, 1927) Deardorff and Overstreet, 1980**

1927. *Contracaecum trichiuri* Thwaite, *Ann. trop. Med. Parasit.*, **21**, p. 227.

1938. *Contracaecum trichiuri* : Hsü, *Peking nat. Hist. Bull.*, **8**, p. 149.

1936. *Contracaecum trichiuri* : Baylis, *F. B. I.*, **1**, p. 91.

1977. *Contracaecum trichiuri* : Ohaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 6.

1978. *Contracaecum trichiuri* : Srivastava and Gupta, *Indian J. Helminth.*, **28** (2), p. 152.

1980. *Hysterothylacium trichiuri* Deardorff and Overstreet, *Proc. Biol. Soc. wash.*, **93** (4), p. 1042.

Description : Male. Body 21.9-34.4 long, 0.28-1.1 wide ; interlabia present ; lateral alae transversely striated, originating immediately behind lips ; oesophagus 3.0 long ; ventricular appendix 0.95-2.7 long ; intestinal caecum 0.36-2.1 long ; cervical papillae 0.63 and excretory pore 0.54-0.78, both from anterior end ; nerve ring just in front of cervical papillae ; tail 0.14-0.205 long, conical, with tip covered with

minute cuticular spines ; spicules slender, alate, equal or subequal, 0.82 and 0.835-1.265 long ; preanal papillae 24-94 pairs, postanal inconspicuous, ventrally numerous, sometimes only 7 pairs.

Hosts : *Lepturacanthus savala* ; *Tachysurus venosus*

Location : Intestine

Localities : Sri Lanka ; Pentkota, Puri, Orissa

Genus *Iheringascaris* Pereira, 1935

Iheringascaris inquires (Linton, 1901) Deardorff and Overstreet, 1980

(Fig. 56, A-C)

1901. *Ascaris inquires* Linton, U. S. Fisheries Comm. Bull., **19**, p. 452.
 1935. *Iheringascaris iheringascaris* Pereira, Arch. Inst. Biol. Sao Paulo, **6**, p. 56.
 1945. *Contracaecum* (*Thynnascaris*) *inquires*, Johnston and Mawson, Rep. B. A. N. Z. Antarctic Res. Exped., **5**, p. 132.
 1957. *Thynnascaris iheringascaris* Hartwich, Zool. Jb., **85**, p. 240.
 1961. *Contracaecum inquires* Yamaguti, Systema Helminthum, **3**, p. 28.
 1965. *Thynnascaris inquires* Rasheed, J. Helminth., **39** (4), p. 323.
 1972. *Thynnascaris inquires* : Kalyankar, Riv. Parassit., **33** (3), p. 203.
 1972. *Thynnascaris inquires* : Kalyankar, Marathwada Univ. J., **11** (4), p. 950.
 1980. *Iheringascaris inquires* Deardorff and Overstreet, Proc. Biol. Soc. wash., **93** (4), p. 1068.

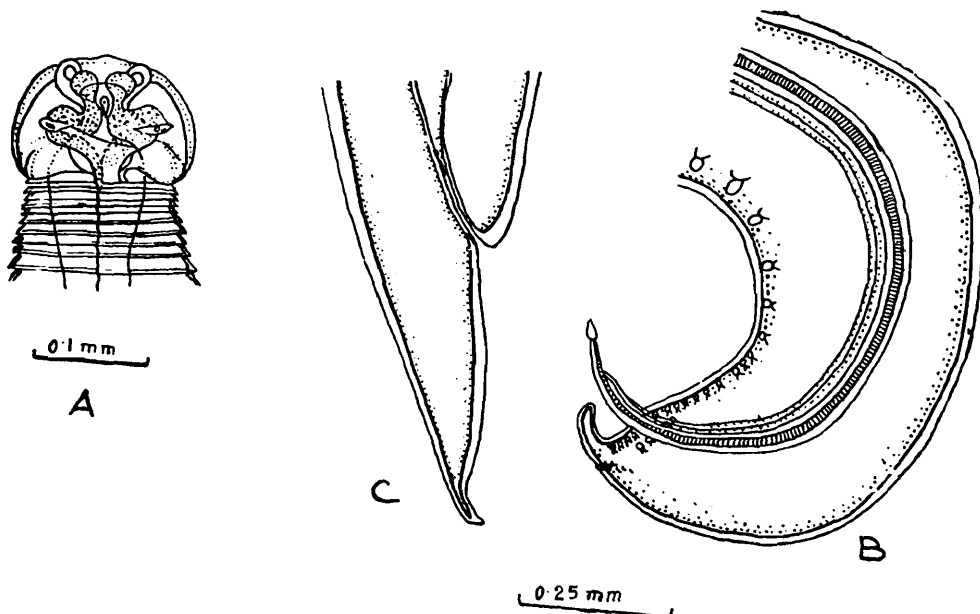


Fig. 56. *Iheringascaris inquires*. (After Rasheed, 1965.) A. anterior end ; B. male posterior end ; C. female posterior end.

Description : Male. Body 21.0-25.0 long, 0.14-0.45 wide, with maximum width posteriorly in mature worms, (though specimens upto

10.0 or 15.0 long also having developed genitalia) ; body striations very conspicuous ; cuticle thick with deep transverse grooves, laterally discontinuous ; in anterior half body appearing segmented due to "striae" or grooves being deep ; lips 3, separated from body by a small "neck" ; dorsal lip submedially with 2 double papillae, and subventrals each with one submedial, one lateral, and an amphid close to latter ; interlabia large, covered with thick cuticle ; oesophagus with ventriculus 3.5-4.5 long ; ventriculus 0.1 in diameter ; ventricular appendix 1.2-1.6 long, with a "seam-like" groove in middle of duct, which when folded on itself appearing like 2 canals instead of one ; intestinal caecum 0.3-0.38 long ; nerve ring 0.38, excretory pore 0.45, and cervical papillae 0.52, all from anterior end ; tail 0.1-0.12 long, terminating in mucronate process ; spicules similar, alate, equal, 4.9-5.9 long ; caudal papillae generally in smaller specimens variable, about 33 pairs, 27 preanal, 6 postanal.

Female. Body upto 45.0 long, 0.15-0.19 wide, and as in male ; oesophagus with ventriculus 3.9-5.0 long ; ventriculus 0.15 in diameter ; ventricular appendix 1.3-1.89 long ; intestinal caecum 0.35-0.49 long ; nerve ring 0.45, excretory pore 0.49, and cervical papillae 0.67, all from anterior end ; tail as in male, 0.35-0.39 long ; vulva pre-equatorial.

Host : *Rachycentron canadus*

Location : Stomach

Locality : Karachi, (Pakistan) ; Ratnagiri, Maharashtra (India)

Remarks : From India, the species was first recorded by Kalyankar (1972) who also reported larval forms from the gill of a sea-crab from Ratnagiri, Maharashtra, which forms first record of its kind.

Tribe PARANISAKINEA Hartwich, 1974

Genus **Paranisakis** Baylis, 1923

Paranisakis kherai Gupta and Garg, 1977

1977. *Paranisakis kherai* Gupta and Garg, *Riv. Parassit.*, 37 (1976), p. 265.

Description : Female. Body 4.94-5.89 long, 0.154-0.166 wide, and with longitudinal ridges ; lips 3, 0.019 long ; interlabia 0.006 long ; oesophagus muscular 0.653-0.762 long ; ventriculus 0.269-0.358 long ; ventricular appendix and intestinal caecum absent ; nerve ring 0.108-0.141 from anterior end ; tail 0.032-0.038 long, and with caudal appendage 0.006-0.01 long ; vulva inconspicuous ; eggs with thin shells containing unsegmented ova.

Host : *Trichiurus* sp.

Location : Intestine

Locality : Calicut, Kerala

Remarks : As this species is based on females only, its inclusion here is purely tentative till male description is made available.

***Paranisakis pastinacae* (Rud., 1819) Baylis, 1936**

1819. *Ascaris pastinacae* Rudolphi, *Entozoorum Synopsis cui Accedunt mantissa Duplex et Indices Locupletissimi*, Berolini, p. 56.

1927. *Paranisakis taeniurae* Thwaite, *Ann. trop. Med. Parasit.*, **21**, p. 232.

1936. *Paranisakis pastinacae* Baylis, *F. B. I.*, **1**, p. 92.

1977. *Paranisakis pastinacae* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5., p. 6.

Description : Male. Body 43.0 long, 0.87 wide ; lips quadrilateral, with narrow base ; dentigerous ridges and interlabia present ; oesophagus with small bulb, 1/18 of body length ; tail 1/215 of total length, bluntly rounded, with terminal spike ; spicules 0.53 long ; caudal papillae 14 pairs, 8 preanal, 1 adanal, 5 postanal.

Female. Body 46.0-61.0 long, 0.83-1.2 wide ; lateral alae narrow, starting 0.15-0.33 from anterior end, running posteriorly along body ; head 0.115-0.16 long, 0.22-0.28 wide ; neck wider than head ; interlabia rectangular, 0.045-0.07 ; oesophagus including ventriculus 3.0-3.8 long ; cervical papillae 0.73-0.86 from anterior end ; nerve ring in front of them ; tail 0.63-0.73 long, conical ; vulva equatorial or pre-equatorial ; eggs 0.07×0.04.

Hosts : *Dasyatis pastinacae* ; *Taeniura* sp. ; *Taeniura malanospiros*

Location : Intestine

Locality : Sri Lanka

***Paranisakis sciaenae* (Khan and Begum, 1971)**

(Fig. 57, A & B)

1971. *Ortoanisakis sciaenae* Khan and Begum, *Bull. Dep. Zool. Punjab Univ.*, article 5, p. 14.

Description : Male. Body 23.827 long, 0.312 wide ; lips 3, 0.095 long, each with small papillae ; dentigerous ridges absent, interlabia present ; oesophagus 2.312 long, with rounded ventriculus 0.13 in diameter ; ventricular appendix and intestinal caecum both absent ; tail 0.108 long, bluntly conical, with terminal spike having 5 pairs of lateral spines ; spicules alate ; gubernaculum absent ; caudal papillae 12 pairs, 9 preanal, 3 postanal.

Host : *Johnius* sp.

Location : Intestine

Locality : Karachi coast (Pakistan)

Remarks : This species based only on a single male from *Johnius* [= *Sciaena*] sp. from Pakistan, was originally described under the genus

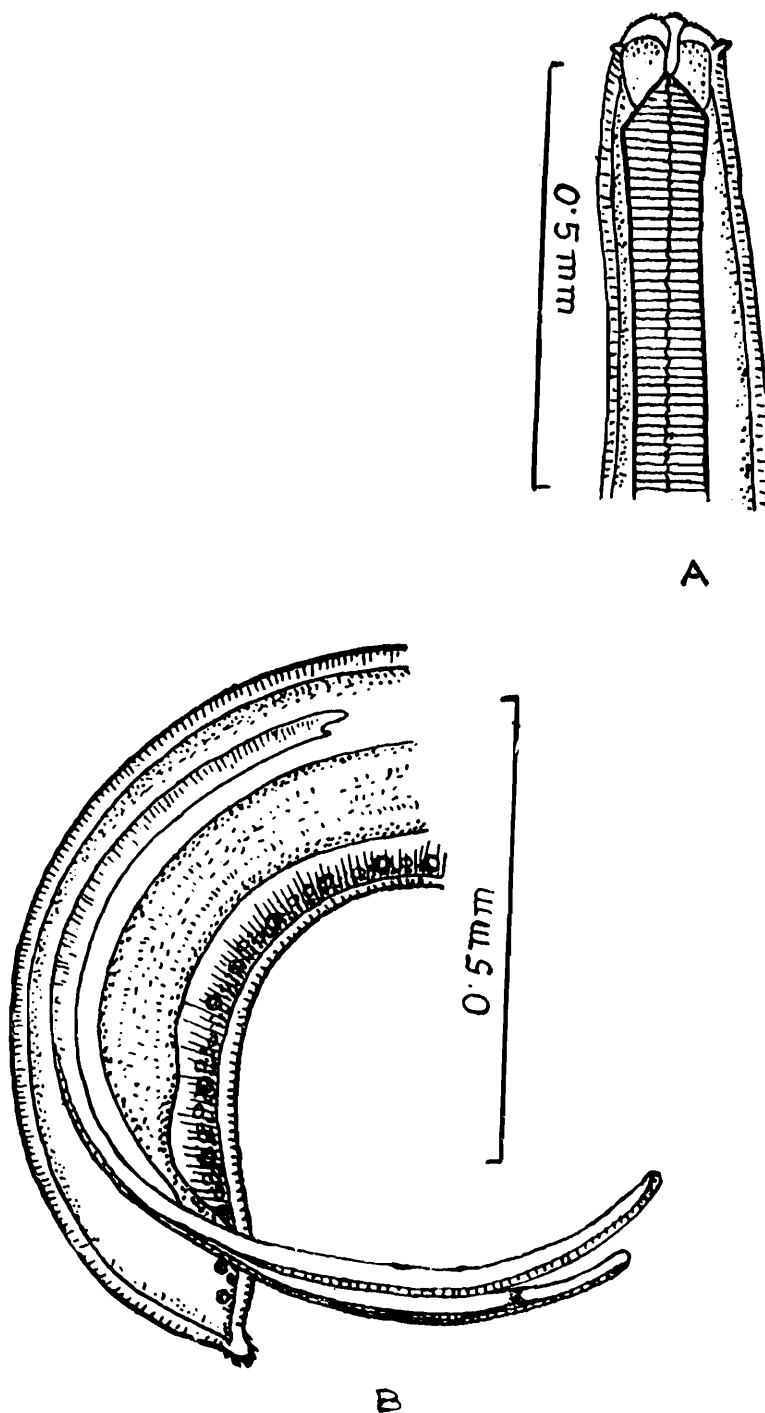


Fig. 57. *Paraanisakis sciaenae*. (After Khan and Begum, 1971.) A. anterior end ; B. male posterior end.

Ortoanisakis, which genus has since then been synonymised with *Para-*
nisakis by Hartwich (1974). However, study of more material will be
worthwhile.

Order SPIRURIDA

Suborder CAMALLANINA

Superfamily CAMALLANOIDEA

Family CAMALLANIDAE Railliet and Henry, 1915

Railliet and Henry (1915) created the family Camallanidae which in 1960 was split into two subfamilies differently, by Yeh into Camallaninae and Procamallaninae, and by Chakravarty and Majumdar into Camallaninae and Neocamallaninae. However, Bashirullah (1975) rejected Neocamallaninae, a fact obviously supported by Arya (1980), and further only Yeh's splitting was accepted by Kalyankar and Palladwar (1977), and Petter (1979), and this is followed here. Following Petter (*op. cit.*) the family at present contains nine genera, four, viz. *Procamallanus* Baylis, 1923 (= *Neocamallanus sensu* Chakravarty *et al.*, 1961, *nec* Ali, 1957 ; = *Indocamallanus* Chakravarty *et al.*, 1963) ; *Malayocamallanus* Jothy and Fernando, 1970 ; *Spirocamallanus* Olsen, 1952 ; and *Onchocamallanus* Petter, 1979, under Procamallaninae ; and five, viz. *Paracamallanus* Yorke and Maplestone, 1926 (= *Neocamallanus* Ali, 1957, in part ; *Zeylanema* Yeh, 1960, in part) ; *Camallanus* Railliet and Henry, 1915 (= *Neocamallanus* Ali, 1957, in part ; *Zeylanema* Yeh, 1960, in part) ; *Oncophora* Diesing, 1851 (= *Piscilania* Yeh, 1960) ; *Serpinema* Yeh, 1960 ; and *Camallanides* Baylis and Daubney, 1922, under Camallaninae. Chabaud (1975), however, placed all the eight genera under Camallanidae. It is relevant to recall that Sahay and Narayan (1967) included eight genera under the subfamily Camallaninae, and Kalyankar and Palladwar (*op. cit.*) only seven under the family Camallanidae, all holding *Neocamallanus* and *Zeylanema* as valid albeit Chabaud's (*op. cit.*) and Petter's (*op. cit.*) opinion to the contrary. A key of the genera is given below.

1. Buccal capsule not divided into two valves. ...	2
Buccal capsule divided into two lateral valves ...	4
2. Buccal capsule with smooth internal walls. ...	Procamallanus Baylis, 1923
Buccal capsule with walls reinforced by sclerotized bands ...	3
3. Sclerotized bands of buccal capsule longitudinal, rather irregular, sometimes armed at base with denticles ...	Malayocamallanus Jothy and Fernando, 1970
Sclerotized bands of buccal capsule transverse ...	Onchocamallanus Petter, 1979
Sclerotized bands of buccal capsule forming spirals ...	Spirocamallanus Olsen, 1952

4.	Buccal capsule divided into two levels	...	...	5
5.	Buccal cavity large behind valves	...	Paracamallanus Yorke and Maplestone, 1926	
	Buccal cavity reduced or absent behind valves	...	...	6
6.	Buccal valves with a thick lateral, longitudinal external band; sclerotized rods instead of dorsal and ventral tridents	...	Camallanides Baylis and Daubney, 1922	
	Buccal valves without a thick lateral longi- tudinal band	...	...	7
7.	Longitudinal bands supporting buccal valves transformed posteriorly into rows of spines or a few combs. Posterior buccal cavity present. Posterior extremity in mature female enlarged		Oncophora Diesing, 1851	
	Longitudinal bands supporting buccal valves continuous	...	...	8
8.	Longitudinal bands supporting buccal valves in two groups, ventral and dorsal	...	Serpinema Yeh, 1960	
	Longitudinal bands supporting buccal valves ungrouped into ventral and dorsal	...	Camallanus Railliet and Henry, 1915	

Subfamily CAMALLANINAE Yeh, 1960

Genus **Paracamallanus** Yorke and Maplestone, 1926

Yorke and Maplestone (1926) separated from *Camallanus* those forms having a large chitinous buccal cavity or pharynx behind buccal valves and placed them under their genus *Paracamallanus* with *P. cyathopharynx* (Baylis, 1923) as its type species. Ali (1957) separated from *Camallanus* other forms lacking tridents and placed them under his genus *Neocamallanus*. Yeh (1960), however, not laying much emphasis on this character treated the latter genus as a synonym of *Camallanus*, modifying its characters to include both the presence or absence of tridents. Though Yamaguti (1961), Sahay and Narayan (1967), Sahay (1968, 1972), Wahid and Perveen (1969), Ky (1971), Soota and Chaturvedi (1971), Kalyankar (1971), Ghosh and Majumdar (1972), Rehana and Bilqees (1972), Sahay (1974), Akram (1976), Bilqees (1977), Chaturvedi and Kansal (1977), Kalyankar and Palladwar (1977), Agrawal and Misra (1980), Sharma and Sharma (1980), Naidu and Thakare (1980), Dhar and Fotedar (1980), and Gupta and Bakshi (1980) upheld the validity of the genus, Yeh (1960), Campana-Rouget (1961), Khan and Yaseen (1969), Ivashkin *et al.* (1971), Bashirullah and Rahman (1972), Bashirullah (1973), Zaidi and Khan (1975), Chabaud (1975), and currently Petter (1978, 1979), Sood (1980), Gupta and Gupta (1980), and Arya (1980), with

whom the present author agrees, did not accept it. It is to be remarked that the genus *Neocamallanus* was reintroduced (1961) as a new genus with *N. heteropneusti* as its type species by Chakravarty, Majumdar and Sain, who later (1963) changed it to *Indocamallanus heteropneusti*, since the name *Neocamallanus* was preoccupied. Fernando and Furtado (1963) unaware of the renaming of the genus *Neocamallanus* to *Indocamallanus* treated *Neocamallanus* as synonym of *Procamallanus* and renamed *Neocamallanus heteropneusti* as *Procamallanus chakravartyi* [which was earlier considered by Sood (1967) as synonym of *Procamallanus daccii*] as the former name was occupied by *Procamallanus heteropneustus* Ali, 1957. Sinha and Sahay (1966) unaware of this change also placed *Indocamallanus* under *Procamallanus*. The genus has been treated as congeneric with *Paracamallanus* by Chabaud (1975), and Petter (1978, 1979), followed by Sood (1980). Hitherto, four species are known under it from this area, a key of which is given below. *Camallanus ophiocephali* (Pearse, 1933) inadequately described by Karve (1941) and later referred to the genus *Paracamallanus* by Petter (1979) has been omitted here.

1. Tridents absent	...	<i>P. singhi</i>
Tridents present	...	2
2. Buccal ridges beaded	...	<i>P. sweeti</i>
Buccal ridges smooth	...	3
3. Spicules equal	...	<i>P. equispiculus</i>
Spicules unequal	...	<i>P. ceylonensis</i>

***Paracamallanus ceylonensis* (Fernando and Furtado, 1963) Petter, 1978**

1963. *Camallanus ceylonensis* Fernando and Furtado, *Z. ParasitenKde*, 23, p. 142.
 1977. *Camallanus ceylonensis* : Verma et al., *Excerta Parasitologica Memoria Doctor ECY Caballero*, p. 488.
 1978. *Paracamallanus ceylonensis* Petter, *Bull. Mus. natn. Hist. nat., Paris*, 3 (515), p. 326.
 1979. *Paracamallanus ceylonensis* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser. 1 (4), p. 993.

Description : Male. Body 4.2 long, 0.11 wide ; buccal capsule 0.6 × 0.6, of two lateral valves each with 8 longitudinal ridges, of which innermost long ; tridents present ; oesophagus divided into two parts, anterior muscular 0.3 long, posterior glandular 0.52 ; nerve ring 0.12 from anterior end ; tail 0.075 long, tip bifid ; spicules similar, unequal, right 0.12 long, left 0.18 ; caudal papillae 3 pairs, all postanal.

Host : *Wallago attu*

Location : Small intestine

Locality : Manampittiya, North Central Province (Sri Lanka)

Remarks : This species, based on a single male only, was originally described as *Camallanus ceylonensis* by Fernando and Furtado (1963), and recently placed by Petter (1978, 1979) under the genus *Paracamallanus*, and this is followed here.

***Paracamallanus equispiculus* (Sood, 1968) Petter, 1978**

(Fig. 58, A & B)

1968. *Camallanus equispiculus* Sood, *Indian J. Helminth.*, **20** (2), p. 91.

1977. *Camallanus equispiculus* : Verma *et al.*, *Excerta Parasitologica Memoria Doctor ECY Caballero*, p. 489.

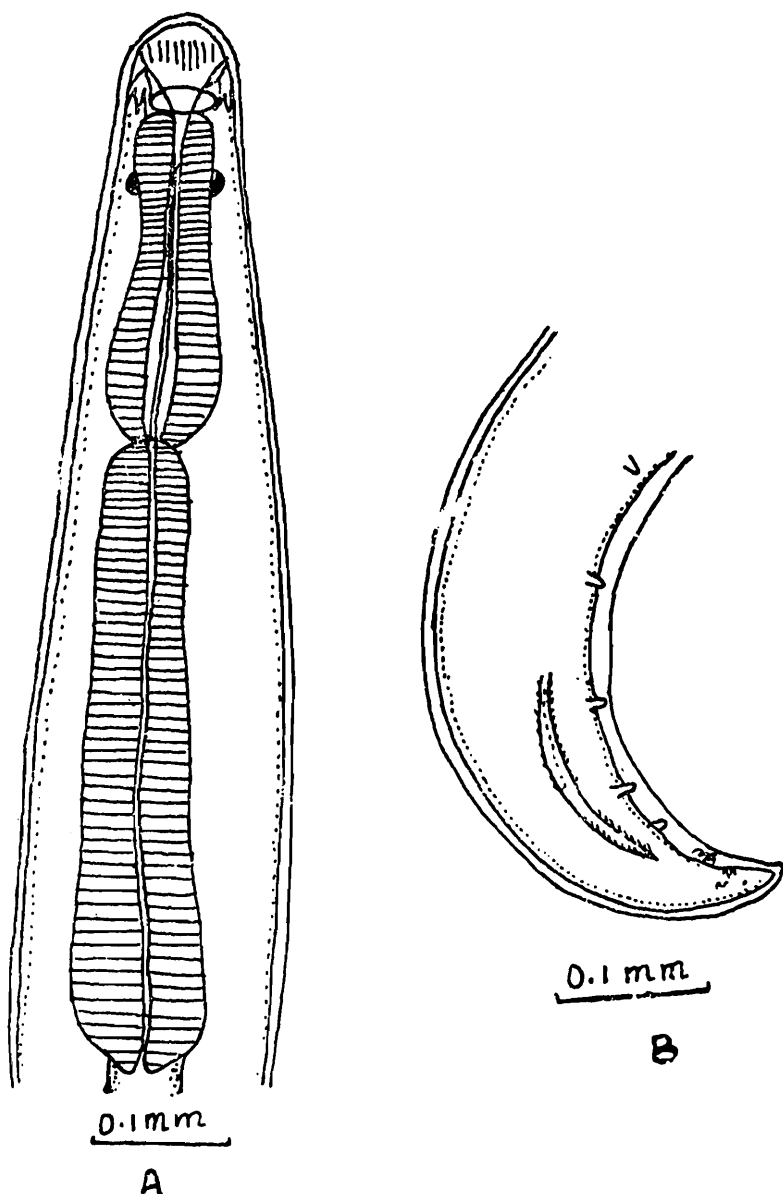


Fig. 58. *Paracamallanus equispiculus*. (After Sood, 1968.) A. anterior end ; B. male posterior end.

1977. *Camallanus equispiculus* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 7.

1978. *Paracamallanus equispiculus* Petter, *Bull. Mus. natn. Hist. nat., Paris*, **3** (515), p. 319.

1979. *Paracamallanus equispiculus* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., **1** (4), p. 993.

Description : Male. Body 7.08 long, 0.025 wide ; buccal capsule 0.041×0.053 , with 11 unarmed ridges ; tridents with lateral prongs 0.022-0.032 long, middle 0.019-0.024 ; oesophagus divided into two parts, anterior muscular 0.21 long, posterior glandular 0.445 ; nerve ring 0.105 and excretory pore 0.12, both from anterior end ; tail 0.078 long, conical ; caudal alae 0.26 long, narrow ; spicules equal, 0.145 long ; caudal papillae 11 pairs, pedunculate 5 preanal, 3 postanal, sessile 3 postanal.

Female. Body 8.34 long, 0.045 wide ; buccal capsule 0.045×0.059 , with 13 unarmed ridges ; tridents with lateral prongs 0.025-0.036 long, middle 0.021-0.023 ; oesophagus as in male ; anterior muscular 0.231 long, posterior glandular 0.439 ; nerve ring 0.103, and excretory pore 0.14, both from anterior end ; tail 0.12 long, conical, with two spinous processes ; vulva slightly pre-equatorial, 3.91 from anterior end.

Host : *Heteropneustes fossilis*

Location : Stomach

Locality : Lucknow, U. P.

Remarks : This species, originally described as *Camallanus equispiculus* by Sood (1968), was placed by Petter (1978, 1979) under the genus *Paracamallanus*, which is followed here.

***Paracamallanus singhi* (Ali, 1957) Campana-Rouget 1961**

(Fig. 59, A & B)

1957. *Neocamallanus singhi* Ali, *Indian J. Helminth.*, **8**, (1956) p. 19.

1960. *Camallanus singhi* Yeh, *J. Helminth.*, **34** (1/2), p. 120.

1961. *Paracamallanus singhi* Campana-Rouget, *Publ. Inst. r. Sci. nat. Belgique*, **3** (4), p. 27.

1965. *Camallanides hemidenta* Majumdar, *Zool. Anz.*, **175** (2/3), p. 223.

1967. *Neocamallanus singhi* : Sahay and Narayan, *An. Inst. Biol. Univ. Me'x.*, **38**, ser. Zool. (1), p. 24.

1969. *Camallanus singhi* : Khan and Yaseen, *Bull. Dep. Zool. Panjab Univ.*, article 4, p. 10.

1971. *Neocamallanus bengalensis* Soota and Chaturvedi, *Zool. Anz.*, **187** (5/6), p. 311.

1972. *Neocamallanus apapillata* Ghosh and Majumdar, *Proc. 59th Indian Sci. Congr.*, pt. III, abstract, p. 428.

1974. *Camallanus adamsi* Bashirullah, *Norw. J. Zool.* **22**, p. 58.

1975. *Camallanus singhi* : Zaidi and Khan, *Pakist J. Zool.*, **7** (1), p. 59.
1976. *Camallanus adamsi* : Bashirullah and Ahmed, *Can. J. Zool.*, **54** (12), p. 2055.
1977. *Neocamallanus singhi* : Verma *et al.*, *Excerta Parasitologica Memoria Doctor ECY Caballero*, p. 490.
1977. *Camallanides hemidentata* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 8.
1977. *Neocamallanus bengalensis* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 8.
1977. *Neocamallanus singhi* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 8.
1978. *Paracamallanus bengalensis* Petter, *Bull. Mus. natn. Hist. nat., Paris* (ser. 2), p. 326.
1978. *Paracamallanus singhi* : Petter, *Bull. Mus. natn. Hist. nat., Paris* (ser. 3), p. 326.
1979. *Paracamallanus bengalensis* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., **1** (4), p. 993.
1979. *Paracamallanus singhi* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., **1** (4), p. 993.
1980. *Camallanus* (*Neocamallanus*) *singhi* : Arya, *Indian J. Helminth.*, **30** (1978), p. 116.
1980. *Camallanus* (*Neocamallanus*) *apapillata* : Arya, *Indian J. Helminth.*, **30** (1978), p. 116.
1980. *Camallanides hemidentata* : Arya, *Revta bras. Biol.*, **40** (3), p. 465.
1980. *Neocamallanus singhi* : Agrawal and Misra, *Indian J. Helminth.*, **30** (1978), p. 124.
1980. *Neocamallanus apapillata* : Agrawal and Misra, *Indian J. Helminth.*, **30** (1978), p. 124.
1980. *Neocamallanus bareilliensis* Sharma and Sharma, *J. Helminth.*, **54** (1), p. 21.
1980. *Neocamallanus singhi* : Sharma and Sharma, *J. Helminth.*, **54** (1), p. 23.
1980. *Neocamallanus bengalensis* : Sharma and Sharma, *J. Helminth.*, **54** (1), p. 23.
1980. *Neocamallanus apapillata* : Sharma and Sharma, *J. Helminth.*, **54** (1), p. 23.
1980. *Paracamallanus singhi* : Sood, *J. Res. Punjab agric. Univ.*, **17** (1), p. 81.
1980. *Neocamallanus singhi* : Naidu and Thakare, *Indian J. Anim. Sci.*, **50** (7), p. 597.
1980. *Neocamallanus benghalensis* : Naidu and Thakare, *Indian J. Anim. Sci.*, **50** (7), p. 599.
1980. *Neocamallanus apapillata* : Naidu and Thakare, *Indian J. Anim. Sci.*, **50** (7), p. 599.

Description : Male. Body 3.96-6.62 long, 0.13-0.18 wide ; head 0.055-0.077 wide ; buccal valves excluding basal ring $0.033-0.044 \times 0.055$; oesophagus divided into two parts, anterior muscular 0.26-0.33 long, posterior glandular 0.52-0.73 ; tail 0.077-0.14 long ; caudal alae 0.34-0.39 long ; spicules not well-chitinized, unequal, right longer 0.11-0.178 long,

left shorter 0.055-0.094 ; caudal papillae pedunculate, 9-12 pairs, 4-5 preanal, 2 adanal, 3-5 postanal.

Female. Body 5.77-14.0 long, 0.15-0.27 wide ; head 0.066-0.180 wide ; buccal valves excluding basal ring 0.044-0.55 $\times$ 0.066-0.077 ; oesophagus, anterior muscular 0.265-0.43 long, posterior glandular 0.19-0.85 ; tail 0.10-0.49 long, and sometimes with pair of phasmids, 0.026 from tip ; vulva with prominent lips, equatorial or pre-equatorial, 2.86-9.32 from anterior end.

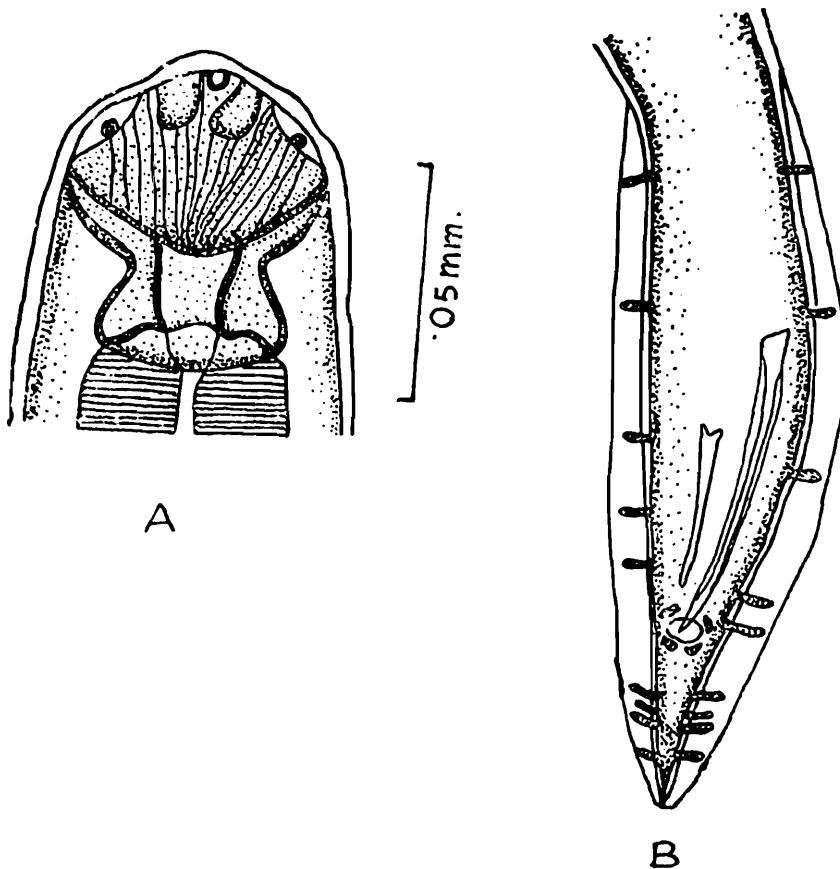


Fig. 59. *Paracamallanus singhi*. (After Ali, 1957.) A. anterior end ; B. male posterior end.

Hosts : *Channa punctatus* ; *C. orientalis* ; *C. striatus* ; *Trachinotus blochii*

Location : Intestine

Localities : Ramtek, dist. Nagpur, Maharashtra ; Hyderabad, Andhra Pradesh ; Calcutta, West Bengal ; Bareilly & Lucknow, U. P. ; Ludhiana, Panjab ; Dacca & Sylhet (Bangladesh) ; Karachi (Pakistan)

Remarks : This species was originally described as *Neocamallanus singhi* by Ali (1957) from a fish, *Channa punctatus* from Hyderabad, and later placed by Yeh (1960) under the genus *Camallanus*, and by Campana-Rouget (1961) under the genus *Paracamallanus*. Subsequently,

two more examples of the species were reported by Khan and Yaseen (1969) from *Channa striatus* from Bangladesh. Wahid and Perveen (1969) described another species under the genus *Neocamallanus*, viz. *N. vachaii* from *Eutropiichthys vacha* from Sind (Pakistan) ; Soota and Chaturvedi (1971) *N. bengalensis* from *Channa orientalis* from Calcutta, and Ghosh and Majumdar (1972) *N. apapillata*, from *C. striatus* from Burdwan (West Bengal) which last was, however, transferred under the genus *Camallanus* and treated as a synonym of the above *vachaii* by Bashirullah (1974). Sahay (1968) and later supported by Verma, Sahay and Sahay (1977) transferred from *Camallanus* all the forms lacking tridents under the genus *Neocamallanus*, and thus (1972) wrongly treated *Neocamallanus bengalensis* as conspecific with *Camallanus atridentus* Khera, 1956. But, Petter (1979) while refuting this synonymy treated *Neocamallanus* as congeneric with *Paracamallanus*, and transferred all its species under the latter and this is accepted here, inspite of Agrawal and Misra's (1980) continuing acceptance of Sahay's (*op. cit.*) opinion which is very probably due to their being unaware of Petter's (*op. cit.*) recent work. The latter (*op. cit.*) rightly doubted the validity of *Camallanides hemidentata* Majumdar, 1965, as the present author after examining the types in the collection of the Zoological Survey of India has found them to belong to the above species as shown under the synonymy. Likewise is treated *Neocamallanus bareilliensis* Sharma and Sharma, 1980. Sood (1980) treated *Neocamallanus thapari* Agrawal and Misra, 1980, as its synonym but the present author prefers to consider it as *Camallanus intestinalis* Bashirullah, 1974 (vide remarked under species).

***Paracamallanus sweeti* (Moorthy, 1937) Campana-Rouget, 1961**

- 1937. *Camallanus sweeti* Moorthy, *J. Parasit.*, **23**, p. 302.
- 1939. *Camallanus sweeti* : Baylis, *F. B. I.*, **2**, p. 212.
- 1956. *Camallanus sweeti* : Kulasiri and Fernando, *Parasitology*, **46**, p. 420.
- 1960. *Zeylanema sweeti* Yeh, *J. Helminth.*, **34** (1/2), p. 122.
- 1961. *Paracamallanus sweeti* Campana-Rouget, *Publ. Inst. r. Sci. nat. Belgique*, **3** (4), p. 28.
- 1963. *Zeylanema sweeti* : Fernando and Furtado, *Z. Parasiten Kde.*, **23**, p. 142.
- 1966. *Zeylanema sweeti* : Sahay and Sinha, *Jap. J. med. Sci. Biol.* **19** (5), p. 251.
- 1967. *Camallanus sweeti* : Agrawal, *Annls Parasit. hum. comp.* **42** (3), p. 333.
- 1977. *Zeylanema sweeti* : Shendge and Deshmukh, *Riv. Parassit.* **38** (2/3), p. 167.
- 1977. *Camallanus sweeti* : Chaturvedi and Kansal, *Rec. zool. Surv. India, Occasional Paper*, No. 5, p. 7.
- 1978. *Paracamallanus sweeti* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, ser. **3** (515), p. 326.

1979. *Paracamallanus sweeti* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., **1** (4), p. 998.
1980. *Camallanus sweeti* : Gupta and Gupta, *Acta parasit. pol.*, **27** (37), p. 316.
1981. *Zeylanema sweeti* : Gupta and Duggal, *Res. Bull. Panjab Univ.*, **28** (1977), p. 177.

Description : Male. Body 3.0-3.9 long, upto 0.13 wide ; buccal valves including basal ring 0.06-0.07 long, each with 9 longitudinal beaded ridges, and 2 quadrilateral external thickenings ; tridents with middle prong longest, 0.046 long, outer prongs 0.025 ; oesophagus divided into two parts, anterior 0.31-0.42 long, posterior 0.38-0.52 ; nerve ring at anterior third of anterior oesophagus ; tail 0.05-0.063 long, with 3 spines, median relatively small ; sucker-like organ 0.32 from posterior end ; spicules two, unequal, right 0.21-0.3 long, left 0.1-0.18 ; caudal papillae 13-15 pairs, 4-6 preanal, 1 adanal, 8 postanal.

Female. Body 3.2-5.5 long, upto 0.15 wide ; anterior end as in male ; excretory pore 0.16 from anterior end ; tail 0.05-0.07 long, with three spines at tip ; vulva 2.0-3.0 from anterior end, and with prominent lips.

Host : *Channa gachua*

Location : Intestine

Locality : Karnataka

Genus **Camallanus** Railliet and Henry, 1915

This genus, based mainly on the presence of tridents, was created by Railliet and Henry (1915), to accommodate *Echinorhynchus lacustris* Zoega, 1776. Ali (1957) established the genus *Neocamallanus* mainly on the basis of the absence of tridents or rods. Yeh (1960), however, did not accept the validity of the latter genus, instead preferred to split *Camallanus* into four genera, viz. *Camallanus*, *Piscillania*, *Serpinema* and *Zeylanema*, of which only the first and last were accepted by Kalyankar (1971), and Kalyankar and Palladwar (1977) ; and the first and third by Chabaud (1975), and Petter (1979), both of whom latter have suppressed *Neocamallanus* and *Zeylanema* though upheld by Sahay and Narayan (1967), Kalyankar (*op. cit.*), and Kalyankar and Palladwar (*op. cit.*). Myers and Kuntz (1969), Zaidi and Khan (1975), Agrawal (1976), and Gupta and Duggal (1981) accepted *Zeylanema*. De et al. (1978) followed Chabaud (*op. cit.*). The present author supports Chabaud (*op. cit.*) and Petter (*op. cit.*). Hitherto, 29 species are known under the genus from this area, of which a key for 22 species is given below. *C. fernandoi* Yeh, 1960, based on three females only, *C. pearsei* Yeh, 1960, *C. salmonae*

Chakravarty, 1942, and *C. xenentodoni* Khan and Yaseen, 1969, all based on two females, *C. magnavaginus* and *C. cinereusis* Bilquees, Khanum and Jehan, 1971, both based on a single female, and *C. cabelleri* Arya, 1980, described in abstract, have been excluded from the key.

1.	Tridents absent	...	...	2
	Tridents vestigial	...	<i>C. kulasirii</i>	
	Tridents present	...	...	6
2.	Spicule single	...	...	3
	Spicules double	...	...	4
3.	Spicule with simple tip	...	<i>C. kumaonus</i>	
	Spicule with forked tip	...	<i>C. lucknowensis</i>	
4.	Spicules equal	...	<i>C. intestinalus</i>	
	Spicules unequal	...	...	5
5.	Buccal capsule with a ring of fine teeth at base	...	<i>C. atridentus</i>	
	Buccal capsule without such a ring	...	<i>C. vachaii</i>	
6.	Spicule single	...	...	7
	Spicules double	...	...	11
7.	Buccal ridges armed	...	...	8
	Buccal ridges unarmed	...	...	9
8.	Caudal papillae 11-13 pairs, caudal alae well-developed	...	<i>C. mastacembeli</i>	
	Caudal papillae 13 pairs, caudal alae present...		<i>C. aurangabadensis</i>	
	Caudal papillae 16 pairs, caudal alae absent	...	<i>C. unispiculus</i>	
9.	Spicule with simple tip	...	<i>C. trichiuris</i>	
	Spicule with forked tip	...	...	10
10.	Both prongs equal	...	<i>C. surmai</i>	
	Both prongs unequal	...	<i>C. chorinemi</i>	
11.	Spicules equal and similar	...	...	12
	Spicules unequal but similar	...	...	14
	Spicules unequal and dissimilar	...	...	16
12.	Buccal ridges unbroken	...	<i>C. cotti</i>	
	Buccal ridges broken	...	...	13
13.	Caudal papillae 7 pairs	...	<i>C. guttatii</i>	
	Caudal papillae 16 pairs	...	<i>C. qadrii</i>	
14.	Buccal ridges armed	...	<i>C. anabantis</i>	
	Buccal ridges unarmed	...	...	15

15.	Caudal papillae 9 pairs	...	<i>C. karachiensis</i>
	Caudal papillae 13 pairs	..	<i>C. thaparus</i>
	Caudal papillae 14-16 pairs	...	<i>C. fotedari</i>
16.	Buccal ridges armed	...	... 17
	Buccal ridges unarmed	...	<i>C. kirandensis</i>
17.	Caudal papillae 8 pairs	...	<i>C. barragi</i>
	Caudal papillae 12 pairs	...	<i>C. magna</i>

Camallanus anabantis Pearse, 1933

(Fig. 60)

1933. *Camallanus anabantis* Pearse, *J. Siam. Soc. Nat. Hist. Supplement*, 9 (2), p. 179.
1939. *Camallanus anabantis* : Chakravarty, *Sci. Cult.*, 5 (5), p. 317.
1956. *Camallanus anabantis* : Kulasiri and Fernando, *Parasitology*, 46 (3-4), p. 420, 421.
1960. *Zeylanema anabantis* Yeh, *J. Helminth.*, 34 (1/2), p. 122.
1963. *Zeylanema anabantis* : Fernando and Furtado, *Z. ParasitenKde*, 23, p. 142, 153.
1966. *Zeylanema anabantis* : Sahay and Sinha, *Jap. J. med. Sci. Biol.*, 19 (5), p. 251.
1967. *Camallanus anabantis* : Agrawal, *Annls Parasit. hum. comp.*, 42 (3), p. 333.
1969. *Zeylanema anabantis* : Myers and Kuntz, *J. Fish. Res. Bd. Canada*, 26 (4), p. 793.
1971. *Zeylanema anabantis* : Kalyankar, *Marathwada Univ. J.*, 10 (3), p. 98.
1973. *Zeylanema anabantis* : Bashirullah, *Bangladesh J. Zool.*, 1 (1), p. 73, 77.
1977. *Zeylanema anabantis* : Shendge and Deshmukh, *Riv. Parassit.*, 38 (2/3), p. 167.
1977. *Camallanus anabantis* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 7.
1978. *Camallanus anabantis* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, ser. 3 (515), zool. 354, p. 322.
1979. *Camallanus anabantis* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., 1 (4), p. 994.
1980. *Camallanus anabantis* : Arya, *Indian J. Helminth.*, 30 (1978), p. 116.
1980. *Camallanus anabantis* : Gupta and Gupta, *Acta parasit. pol.*, 27 (37), p. 316.
1981. *Camallanus anabantis* : Soota and Dey Sarkar, *Rec. zool. Surv. India*, 78, p. 125.
1981. *Zeylanema jullundurens* Gupta and Duggal, *Res. Bull. Panjab Univ.*, 28 (1977), p. 175.
1981. *Zeylanema anabantis* : Gupta and Duggal, *Res. Bull. Panjab Univ.*, 28 (1977), p. 177.

Description : Male. Body 2.9-16.773 long, 0.10-0.45 wide ; buccal capsule of two valves, each with nine longitudinal rows of teeth ; tridents 0.023-0.1 long ; cephalic papillae present ; oesophagus divided into two parts, anterior muscular 0.25-0.634 long, posterior glandular 0.38-1.068 ; nerve ring 0.14-0.3 from anterior end ; tail 0.09-0.099 long, with two spines and a short precaudal ala ; spicules two, unequal, smaller 0.07-0.32 long, larger 0.35-0.65 ; caudal papillae 10-13 pairs, 4-7 preanal, 0-2 adanal, 5-6 postanal ; a pair of phasmids.

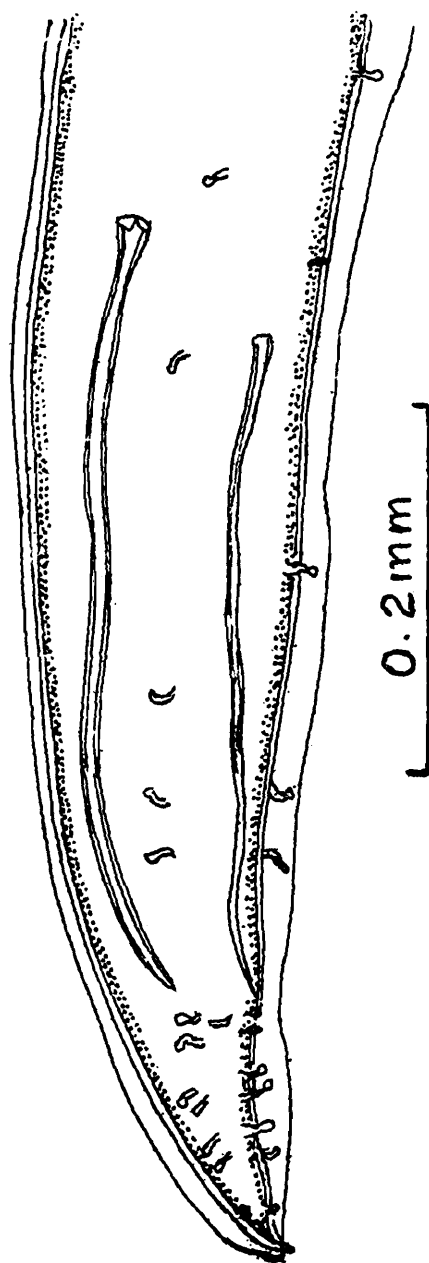


Fig. 60. *Camallanus anabantis*. (After Kalyankar, 1971.) Male posterior end.

Female. Body 7.2-20.0 long, 0.15-0.55 wide ; tridents 0.022 long ; cephalic papillae present ; a pair of cervical papillae also sometimes observable, 0.22 from anterior end ; oesophagus, anterior muscular 0.36-0.651 long, posterior glandular 0.52-1.002 ; tail 0.1-0.24 long, bifid ; vulva pre-equatorial.

Hosts : *Anabas testudineus* ; *Clarias batrachus* ; *Channa gachua* ; *C. punctatus* ; *Puntius filamentosus* ; *Betta unimaculata* ; *Mastacembalus armatus* ; *Trichogaster trichopterus*

Location : Intestine

Localities : Bangkok (Thailand) ; North Borneo (Sabah) & Kuala Lumpur (Malaysia) ; Sri Lanka ; Calcutta, West Bengal ; Aurangabad, Maharashtra ; Patna, Bihar ; Jullundur, Panjab

Remarks : This species was originally described from the Climbing perch (*Anabas testudineus*) from Bangkok, Siam (now Thailand) by Pearse (1933) who also later reported from the same locality a female of the species from *Clarias batrachus*. He reported the presence of tridents in males only. The species was subsequently redescribed from the type host from Calcutta by Chakravarty (1939) who reported tridents in female also ; and some more data and new host records for it from Sri Lanka were presented by Kulasiri and Fernando (1956). Yeh (1960) while reviewing the family Camallanidae had the species transferred to the genus *Zeylanema*, created by him which was accepted by some subsequent workers. He also opined that Pearse (*op. cit.*) had been dealing with specimens of two different species and so treated the females, all of which lacking tridents, as new species, *C. pearsei*. He also described another species *Zeylanema kulasirii* for his specimens showing vestigial tridents, both of which are tentatively retained here till their male descriptions are available. Fernando and Furtado (1963) redescribed *Zeylanema anabantis* from the type host from Sri Lanka, and Kalyankar (1971) from *Channa gachua* from Aurangabad, Maharashtra. But Chabaud (1975) upheld the original genus stressing the variability of the distinguishing character of the longitudinal bands in cephalic valves. Currently, Petter (1978) while reporting some variations in her specimens from *Betta unimaculata* from Kuala Lumpur (Malaysia), clearly expressed her acceptance of the original name *Camallanus anabantis*, and also later (1979) upheld it.

***Camallanus atridentus* Khera, 1956**

(Fig. 61)

- 1956. *Camallanus atridentus* Khera, *Indian J. Helminth.*, **6** (1954), p. 103.
- 1960. *Zeylanema atridentus* Yeh, *J. Helminth.*, **34** (1/2), p. 122.
- 1967. *Camallanus atridentus* : Agrawal, *Annls Parasit. hum. comp.*, **42** (3), p. 333.
- 1972. *Neocamallanus atridentus* Sahay, *Indian J. Ani. Res.*, **6** (2), p. 97.
- 1977. *Neocamallanus atridentus* : Verma et al., *Excerta Parasitologica Memoria Doctor ECY Caballero*, p. 487, 490.
- 1977. *Camallanus atridentus* : Chaturvedi and Kansal, *Rec. zool. Surv. India, Occasional Paper No. 5*, p. 7.

1979. *Camallanus atridentus* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., 1 (4), p. 994.
1980. *Camallanus atridentus* : Arya, *Indian J. Helminth.*, 30 (1978), p. 116.
1980. *Neocamallanus atridentus* : Agrawal and Misra, *Indian J. Helminth.*, 30 (1978), p. 124.
1981. *Zeylanema atridentus* : Gupta and Duggal, *Res. Bull. Panjab Univ.*, 28 (1977), p. 177.

Description : Male. Body 4.2-4.9 long, 0.077-0.108 wide ; buccal capsule comprising of two lateral valves, and with a ring of fine teeth at base ; buccal valves each $0.031-0.0345 \times 0.039-0.048$, with 2 external

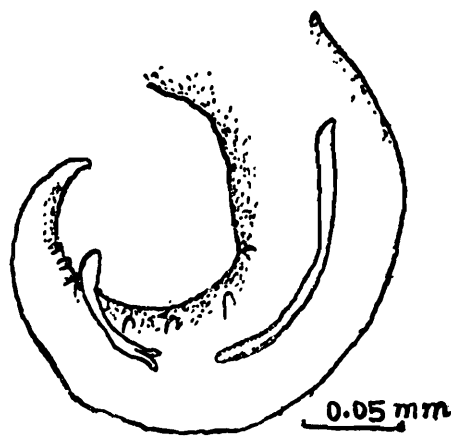


Fig. 61. *Camallanus atridentus*. (After Khera, 1956.) Male posterior end.

thickenings, and 20 smooth longitudinal ridges ; buccal ring 0.035-0.045 in diameter ; tridents absent ; oesophagus divided into two parts, anterior muscular 0.22-0.24 long, posterior glandular 0.41-0.48 ; nerve ring 0.083-0.086, cervical papillae and excretory pore 0.096-0.1, all from anterior end ; tail 0.065-0.068 long ; caudal alae and sucker absent ; spicules two, feebly and imperfectly chitinized, unequal, right simple, slender, 0.156 long, left stout, cleft at root and expanded just before distal tip, 0.07 ; caudal papillae pedunculate, 10 pairs, 5 preanal, 2 adanal, 3 postanal.

Female. Body 7.6-9.1 long, 0.11-0.12 wide ; buccal valves as in male, $0.04-0.045 \times 0.063-0.068$; buccal ring 0.052 in diameter ; tridents absent ; oesophagus, anterior muscular 0.21-0.27 long, posterior glandular 0.53-0.58 ; nerve ring 0.097-0.126, cervical papillae and excretory pore 0.11-0.135, all from anterior end ; tail 0.22-0.3 long, with bluntly pointed tip ; vulva pre-equatorial, with protruding lips ; larvae 0.124-0.14 long.

Host : *Channa punctatus*

Location : Intestine

Locality : Saharanpur, U. P.

Remarks : As this species is based on a few specimens which do not seem to have attained full maturity, study of more material especially of mature males, is necessary for fuller confirmation.

***Camallanus aurangabadensis* nom. nov.**

(Fig. 62, A & B)

1977. *Zeylanema ophiocephali* Shendge and Deshmukh, *Riv. Parassit.*, 38 (2/3), p. 165 (preoccupied).

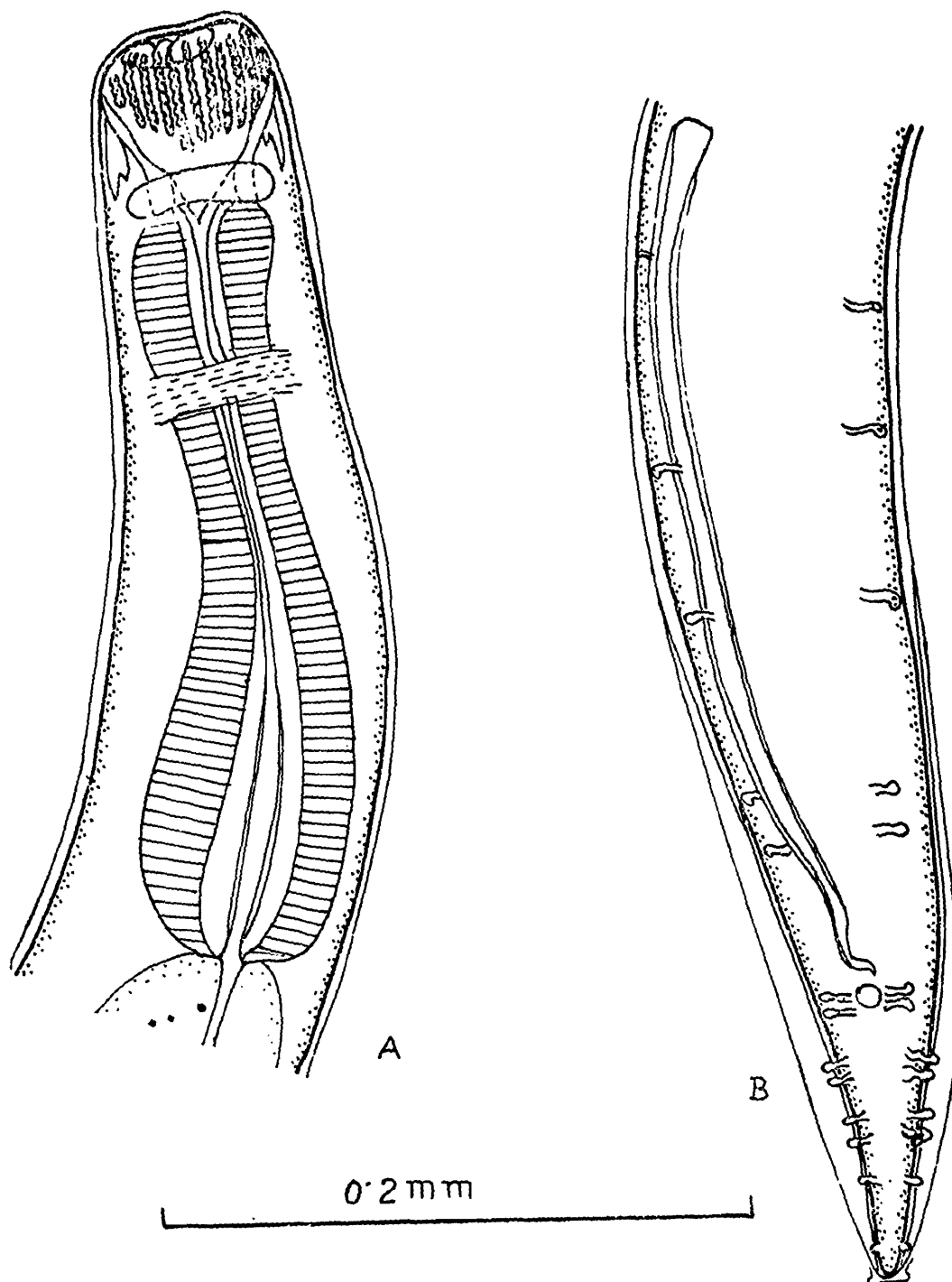


Fig. 62. *Camallanus aurangabadensis*. (After Shendge and Deshmukh, 1977.)
A. anterior end ; B. male posterior end.

Description : Male. Body 2.90-3.25 long, 0.12 wide ; cuticle smooth, without striations ; buccal capsule 0.046×0.057 , and consisting of two valves with two external thickenings and eleven beaded longitudinal ridges ; basal ring 0.011 in diameter ; tridents with lateral prongs equal, 0.03 long, middle 0.01 ; oesophagus divided into two parts, anterior muscular 0.19-0.25 long, posterior glandular 0.30-0.33 ; nerve ring 0.09-0.11 from anterior end ; tail 0.09-0.22 long, bifurcated at tip, and with short narrow caudal alae ; spicule single, 0.29-0.32 long ; caudal papillae 13 pairs, 5 preanal, 2 adanal, 6 postanal, all pedunculate excepting last two which sessile.

Host : *Channa striatus*

Location : Intestine

Locality : Aurangabad, Maharashtra

Remarks : This species appears to approach *Camallanus unispiculus* Khera, 1956 (as in the case of *C. mastacembeli* vide remarked under that species) excepting body size, and number and arrangement of caudal papillae, but some more material of all the above three species is necessary for final confirmation. However, the transfer of this species to the genus *Camallanus* makes it homonym of *C. ophiocephali* Pearse, 1933, and hence the new name *C. aurangabadensis* has been proposed only tentatively.

***Camallanus barragi* (Zaidi and Khan, 1975)**

(Fig. 63, A & B)

1975. *Zeylanema barragi* Zaidi and Khan, *Pakist. J. Zool.*, 7 (1), p. 60.

Description : Male. Body 10.295-10.301 long, 0.158-0.160 wide, and entirely with cuticular striations ; buccal valves 0.089×0.115 , each with nine armed ridges ; basal ring 0.02×0.076 ; tridents with lateral prongs equal, 0.089 long, middle one longer 0.107 ; oesophagus divided into two parts, anterior muscular 0.532 long, posterior glandular 0.709 ; tail 0.059 long and with narrow caudal alae ; spicules dissimilar, unequal, longer 0.360 long, shorter 0.130 ; caudal papillae pedunculate, 8 pairs, 5 preanal, 3 postanal.

Host : *Mastacembalus armatus*

Location : Intestine

Locality : Taunsa Barrage, Sind (Pakistan)

Remarks : This species based on males only, comes very close to *Camallanus magna* (Khan and Yaseen, 1969), from the same generic host from Bangladesh.

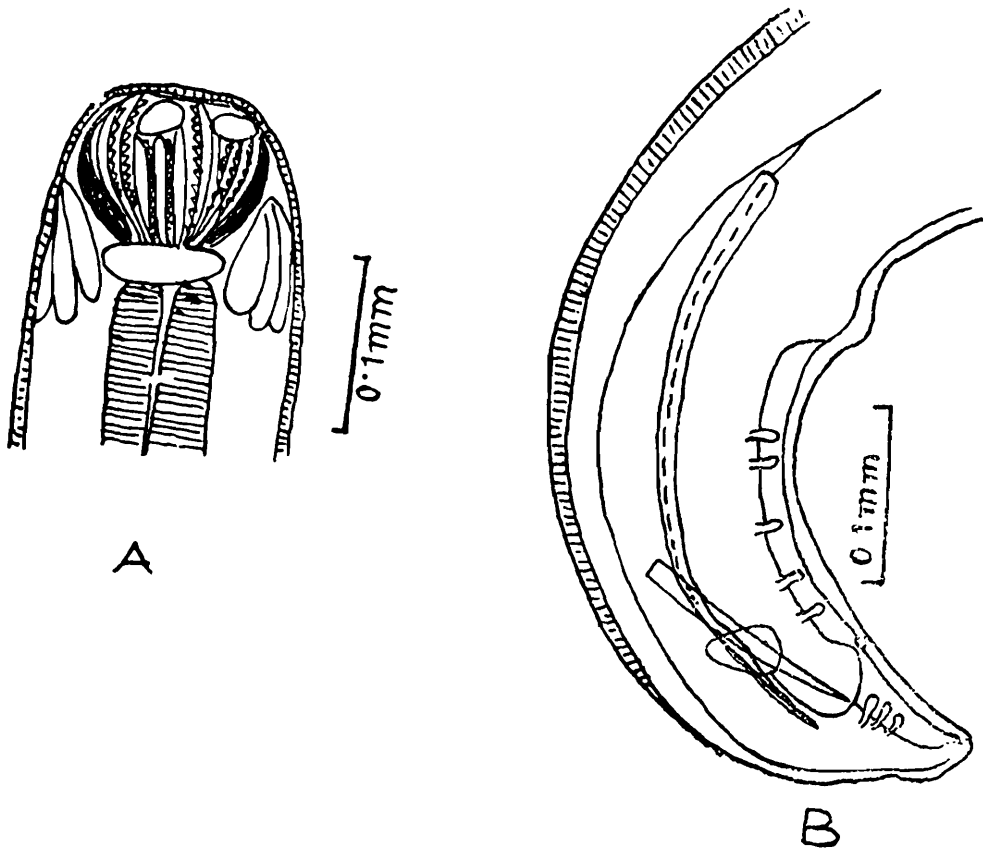


Fig. 63. *Camallanus barragi*. (After Zaidi and Khan, 1975.) A. anterior end ;
B. male posterior end.

***Camallanus chorinemi* Rasheed, 1970**

(Fig. 64, A-D)

- 1970. *Camallanus chorinemi* Rasheed, *Revta Soc. mex. Hist. nat.*, 31, p. 193.
- 1971. *Camallanus indicus* Kalyankar, *Marathwada Univ. J.*, 10 (3), p. 95.
- 1979. *Camallanus chorinemi* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., 1 (4), p. 996.
- 1979. *Camallanus indicus* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., 1 (4), p. 996.

Description : Male. Body 6.0-24.35 long, 0.1-0.23 wide ; buccal capsule 0.1-0.13 long, bivalved, each valve with 36-45 longitudinal "thickenings" or ridges, short and continuous anteriorly, broken posteriorly, which latter sometimes appearing as "spines" ; cephalic papillae in external circle 4 large submedians and a pair of lateral amphids, in internal circle indistinct ; basal ring present ; tridents having unequal prongs ; oesophagus divided into two parts, anterior muscular 0.69-0.86 long, posterior glandular 0.94-1.2 ; nerve ring 0.18-0.22 from anterior end ; caudal alae well-developed ; spicule heavily cuticularized, single, 0.2-0.36 long, and with forked tip having unequal prongs ; gubernaculum absent ; caudal papillae pedunculate, 13-16 pairs, 7-8 preanal, 1-2 adanal, 5-7 postanal ; a pair of phasmids near posterior end.

Female : Body 13.0-24.41 long, 0.16-0.29 wide ; buccal capsule as in male, 0.13-0.132 ; tridents also as in male ; oesophagus, anterior muscular 0.69-1.7 long, posterior glandular 1.0-1.7 ; nerve ring 0.2-0.24

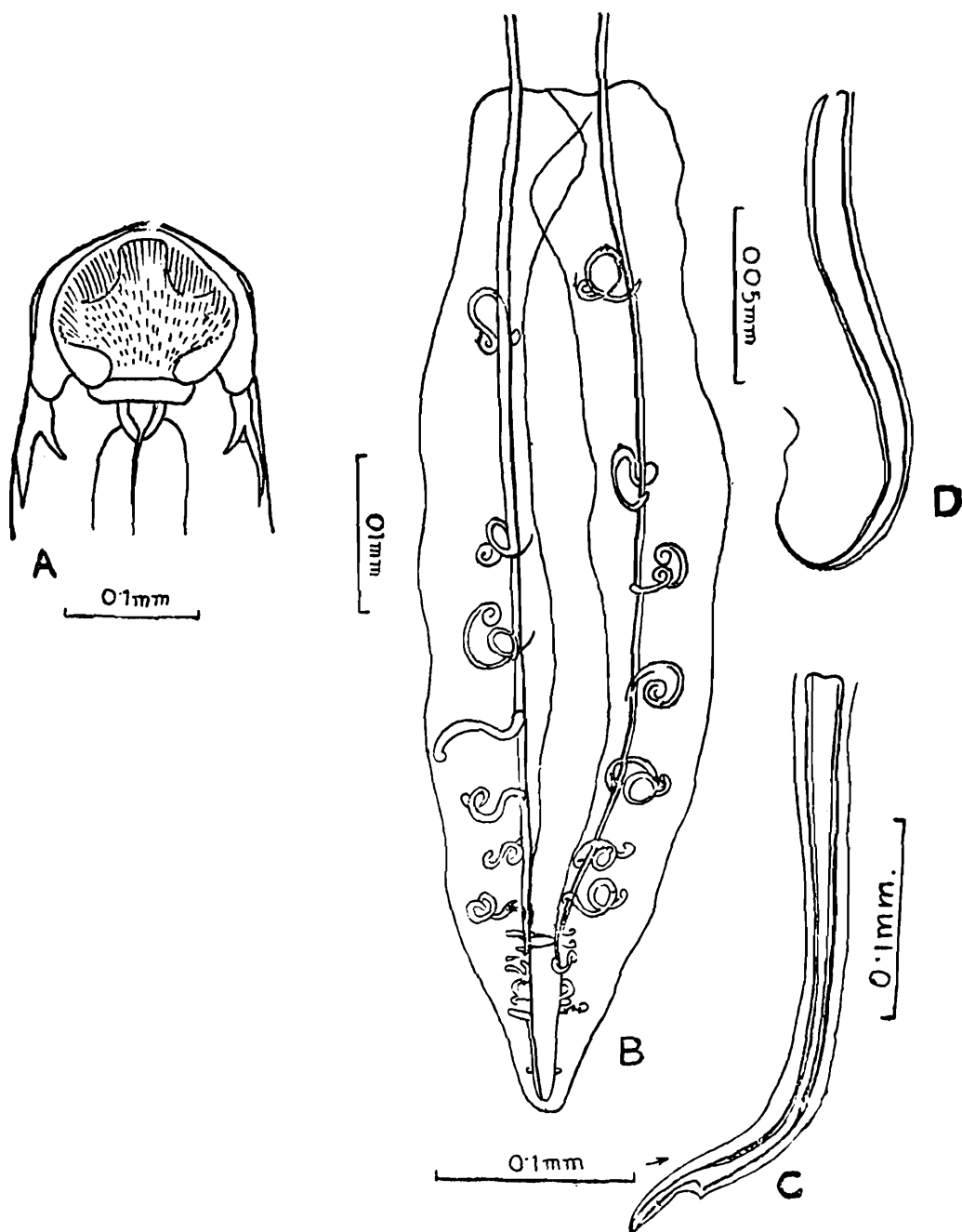


Fig. 64. *Camallanus chorinemi*. (After Rasheed, 1970.) A. anterior end ; B. male posterior end ; C. spicule ; D. larva.

from anterior end ; tail 0.075-0.19 long, tapering, sometimes with bifurcated tip ; vulva conspicuous, pre-equatorial, 8.73-8.74 from anterior end, and with two prominent lips 0.037-0.074 long, hanging over vulval aperture, with longest lobe 0.1 long ; embryos surrounded by thin cuticular sheath, head with 2 minute lips, one having small tooth ; tail long, subulate, of adult short, tapering and slightly bifid having a pair of small phasmids 0.1 from tip.

Hosts : *Scomberoides tala* ; *Protonibea diacanthus*

Location : Intestine

Localities : Karachi (Pakistan) ; Malvan, Maharashtra (India)

Remarks : Rasheed (1970) described *Camallanus chorinemi* from *Scomberoides* [= *Chorinemus*] *tala* from Karachi (Pakistan), pointing out at the same time that the specimens in having broken buccal ridges posteriorly could be placed in the genus *Piscilania* Yeh, 1960. Kalyankar (1971) added another species *Camallanus indicus* from the same host from Malvan, Maharashtra (India) which agrees practically in all the characters with it excepting the number of spicules. While Rasheed (*op. cit.*) reported a single spicule with bifurcated tip, Kalyankar (*op. cit.*) gave two very unequal ones which, however, need confirmation, until when both the species are considered conspecific.

Camallanus cinereus Bilqees, Khanum and Jehan, 1971

1971. *Camallanus cinereus* Bilqees *et al.*, *J. Sci. Karachi*, 1, p. 178.

1979. *Camallanus cinereus* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., 1 (4), p. 996.

Description : Female. Body 29.2 long, 0.36 wide, and entirely with cuticular striations ; buccal capsule 0.16×0.14 , consisting of 2 valves, each with 24 smooth ridges, and anteriorly with 2 squarish chitinized thickenings ; basal ring present ; tridents with equal prongs, each 0.12 long ; tail 0.21 long ; vulva pre-equatorial, 10.98 from anterior end, and surrounded by an elevated chitinized folding ; eggs 0.052×0.052 , rounded.

Host : *Muraenesox cinereus*

Location : Intestine

Locality : Karachi coast (Pakistan)

Remarks : This species, based on a single female only, is tentatively included here pending availability of male description.

Camallanus cotti Fujita, 1927

1927. *Camallanus cotti* Fujita, *Jap. J. Zool.*, 1, p. 170.

1941. *Camallanus cotti* : Yamaguti, *Jap. J. Zool.*, 9, p. 377.

1975. *Camallanus cotti* : Stumpp, *Z. ParasitKde*, 46, p. 277.

1979. *Camallanus cotti* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser. 1 (4), p. 995.

Description : Male. Body 3.5 long, 0.17 wide ; buccal capsule with 16 smooth ridges 0.15 in length and breadth ; trident with equal outer

prongs, 0.12 long, middle about half long ; nerve ring 0.20 and excretory pore 0.18, both from anterior end ; tail 0.16 long ; caudal alae not conspicuous ; spicules two, 0.20 long ; caudal papillae 14 pairs, 7 preanal, 7 postanal.

Female. Body 4.72-11.47 long, 0.20-0.35 wide ; buccal capsule with 16-22 smooth ridges ; tridents with longer middle prongs, outer ones shorter ; oesophagus divided into two parts, anterior muscular 0.43-1.14 long, posterior glandular 0.53-1.20 ; tail 0.14-0.89 long ; vulva in posterior third of body, 3.42-8.0 from anterior end ; eggs 0.02-0.03 in diameter, rounded.

Hosts : *Parasilurus asotus* ; *Zacco platypus* ; *Opsarichthys unirostris* ; *Cottus polax* ; *Polynemus indicus*

Location : Intestine

Localities : Japan ; Bangladesh

Remarks : This species was originally described from Lake Biwa and Lake Tazawa (Japan), and redescribed by Yamaguti (1941), and Stumpp (1975). As the subsequent record by Khan and Yaseen (1969) from Khulna (Bangladesh) is only of a female, the validity or otherwise will pend till the male is described. So, the species is tentatively included here.

Camallanus fernandoi (Yeh, 1960)

- 1960. *Zeylanema fernandoi* Yeh, *J. Helminth.*, 34 (1/2), p. 114, 122.
- 1963. *Zeylanema fernandoi* : Fernando and Furtado, *Z. ParasitenKde*, 23, p. 142.
- 1966. *Zeylanema fernandoi* : Sahay and Sinha, *Jap. J. med. Sci. Biol.*, 19 (5), p. 251.
- 1967. *Camallanus fernandoi* Agrawal, *Annls Parasit. hum. comp.*, 42 (3), p. 333.
- 1977. *Zeylanema fernandoi* : Shendge and Deshmukh, *Riv. Parassit.*, 38 (2/3), p. 167.
- 1977. *Zeylanema fernandoi* : Chaturvedi and Kansal, *Rec. zool. Surv. India, Occasional Paper No. 5.*, p. 10.
- 1979. *Camallanus fernandoi* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., 1 (4), p. 995.
- 1980. *Camallanus fernandoi* : Gupta and Gupta, *Acta parasit. pol.*, 27 (37), 316.
- 1981. *Zeylanema fernandoi* : Gupta and Duggal, *Res. Bull. Panjab Univ.*, 28 (1977), p. 177.

Description : Female. Body 2.9-5.4 long, 0.14-0.27 wide ; buccal ridges armed ; oesophagus, anterior muscular 0.36-0.40 long, posterior glandular 0.52-0.65 ; deirids 0.16-0.18 and nerve ring 0.21, both from anterior end ; vulva slightly post-equatorial ; tail 0.1 long.

Host : *Channa punctatus*

Location : Intestine

Locality : Sri Lanka

Remarks : As this species is based on three females only, it is tentatively included here till male description is made available.

***Camallanus fotedari* Raina and Dhar, 1972**

(Fig. 65, A & B)

1972. *Camallanus fotedari* Raina and Dhar, *J. Helminth.*, **46** (2), p. 157.

1976. *Camallanus fotedari* : Campana-Rouget *et al.*, *Bull. Acad. ve't. Fr.*, 49, p. 205.

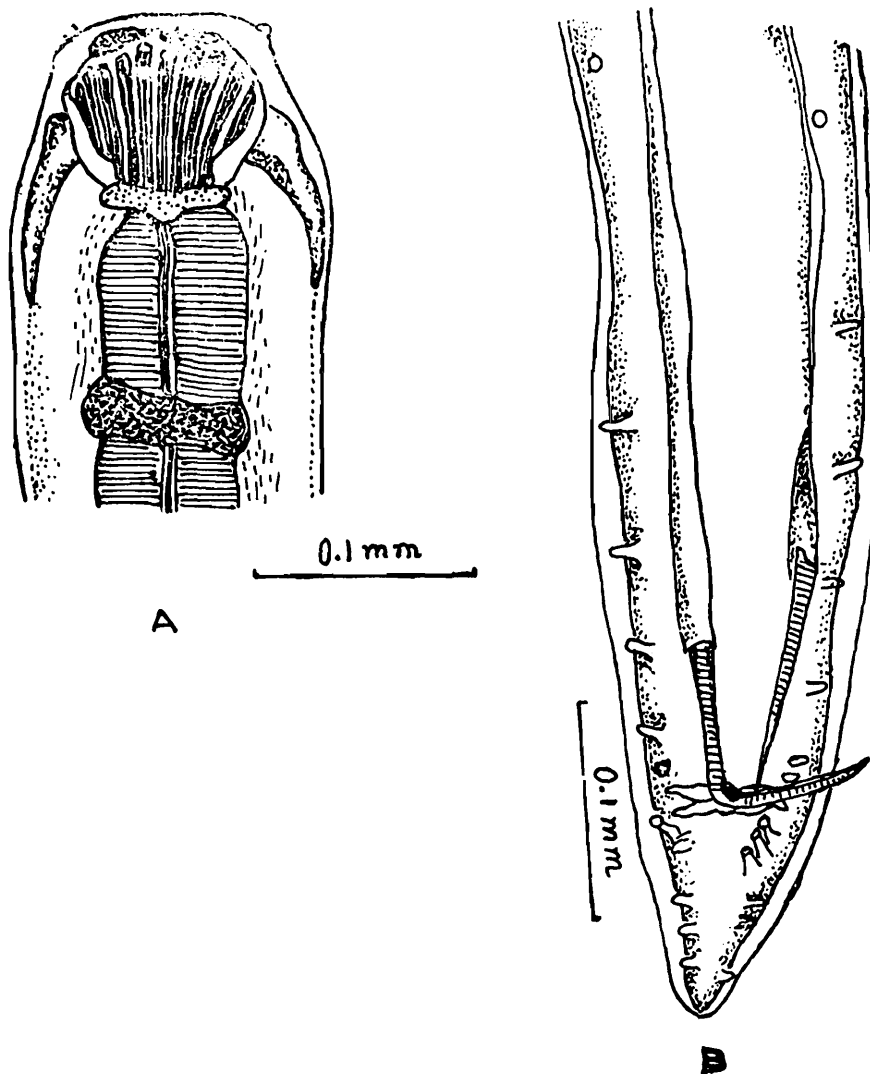


Fig. 65. *Camallanus fotedari*. (After Raina and Dhar, 1972.) A. anterior end ; B. male posterior end.

1977. *Camallanus fotedari* : Verma *et al.*, *Excerta Parasitologica Memoria Doctor ECY Caballero*, p. 489.

1979. *Camallanus fotedari* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., **1** (4), p. 995.

Description : Male. Body 2.03-4.95 long, 0.09-0.27 wide ; buccal capsule $0.06-0.09 \times 0.09-0.1$; with two lateral valves, each with 15-25 ridges ; tridents with equal arms, occasionally middle one long ; oesophagus divided into two parts, anterior muscular 0.28-0.45 long, posterior glandular 0.29-0.49 ; tail 0.05-0.12 long, conical, with small lateral alae ; spicules unequal, 0.1-0.11, and 0.13-0.16 long, with pointed tips ; caudal papillae pedunculate, 14-16 pairs, 6-8 preanal (though some showing unequal number on the two sides), 2 adanal, 6 postanal.

Female. Body 1.98-11.92 long, 0.12-0.52 wide ; buccal capsule $0.07-0.5 \times 0.05-0.16$, and as in male ; tridents also as in male ; oesophagus, anterior 0.16-0.66 long, posterior 0.28-0.87 ; tail 0.28-1.45 long, with rounded tip ; vulva post-equatorial, conspicuous, 2.17-6.82 from anterior end.

Hosts : *Noemacheilus kashmirensis* ; *Lebistes reticulatus* ; *Danio rerio*

Location : Intestine

Localities : Srinagar, Kashmir ; France

Remarks : Chakravarty (1942) while describing his species *Camallanus salmonae* from a trout from Kashmir, reported the absence of tridents in his specimens. Raina and Dhar, (1972) describing their species *C. fotedari* from *Noemacheilus kashmirensis* from Kashmir, employed the presence of tridents as a distinguishing character from *C. salmonae*. This species has also been recently reported by Campana-Rouget *et al.* (1976) from aquarium fish, *Lebistes reticulatus* and *Danio rerio*, from France.

***Camallanus guttatii* Khan and Begum, 1971**

(Fig. 66, A & B)

1971. *Camallanus guttatii* Khan and Begum, *Bull. Dep. Zool. Panjab Univ.*, article 5, p. 9.

1979. *Camallanus guttatii* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., 1 (4), p. 996.

Description : Male. Body 8.636 long, 0.151 wide ; buccal capsule 0.083×0.095 , divided into two lateral valves, each with 38-40 broken longitudinal ridges, and two lateral external thickenings ; head with 4 papillae ; buccal ring 0.068 in diameter ; tridents 0.092 long, with each prong 0.043 ; oesophagus 0.571 long, not very distinctly divided ; tail 0.052 long, tapering, curved ventrally ; caudal alae moderately developed ; sucker absent but a strong set of caudal muscles present ; spicules two, similar, equal, 0.214 long ; gubernaculum absent ; caudal papillae 7 pairs, all preanal.

Host : *Scomberomorus guttatus*

Location : Intestine

Locality : Karachi Coast (Pakistan)

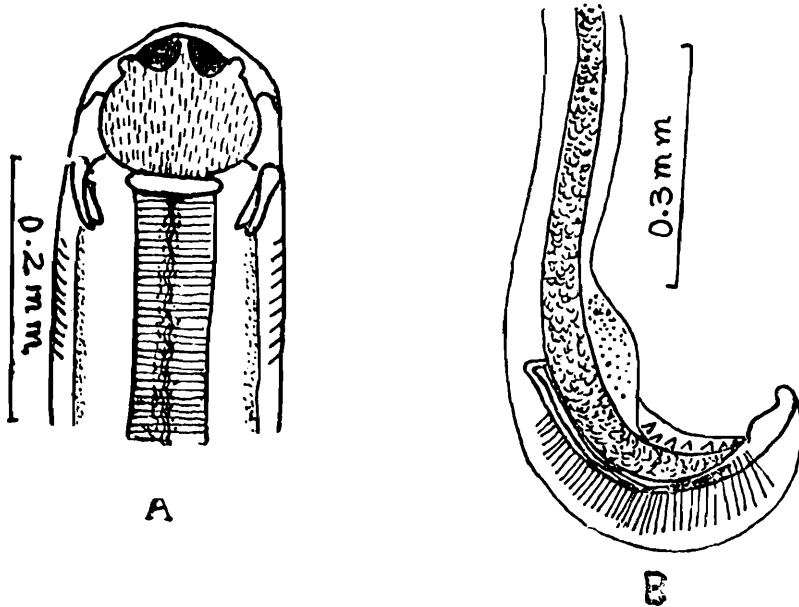


Fig. 66. *Camallanus guttatii*. (After Khan and Begum, 1971.) A. anterior end ; B. male posterior end.

Remarks : As the species is based on a single male only and has been separated from other species only on the character of the broken nature of the longitudinal thickenings of its buccal capsule, it is necessary to examine more material to confirm its validity.

***Camallanus intestinalus* Bashirullah, 1974**

(Fig. 67, A & B)

1974. *Camallanus intestinalus* Bashirullah, *Norw. J. Zool.*, 22, p. 57.

1980. *Neocamallanus thapari* Agrawal and Misra, *Indian J. Helminth.*, 30 (1978), p. 122.

Description : Male. Body 3.56-5.30 long, 0.09-0.12 wide ; buccal capsule excluding basal cuticular ring 0.035-0.041 long, bivalved, each valve with 23-24 longitudinal ridges, cuticular longitudinal thickening on head, and on either side two papillae, a cephalic and a submedian ; basal ring 0.037-0.048 wide ; tridents absent ; oesophagus divided into two parts, anterior muscular 0.21-0.28 long, posterior glandular 0.34-0.64 ; nerve ring 0.11-0.18 and excretory pore 0.195-0.230, both from anterior end ; tail 0.074-0.093 long, with blunt tip and poorly developed caudal alae ; sucker without rim present ; spicules equal, 0.09-0.275 long ; caudal papillae 13-14 pairs, 6-8 preanal, 2 adanal, 3-6 postanal.

Female. Body 7.81-14.19 long, 0.12-0.253 wide ; buccal capsule excluding basal ring 0.058-0.061 long ; basal ring 0.055-0.061 wide ; tridents absent ; oesophagus, anterior muscular 0.287-0.42 long, posterior glandular 0.469-0.81 ; nerve ring 0.123-0.186, and excretory pore 0.242-

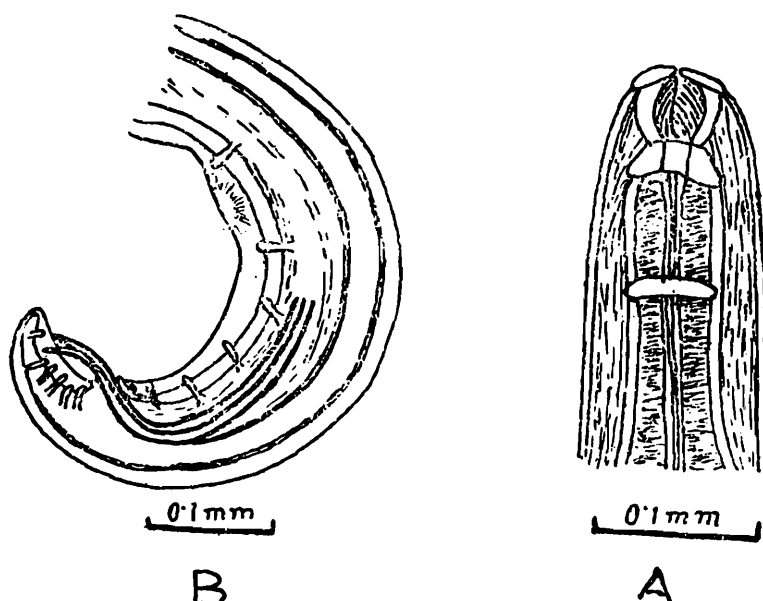


Fig. 67. *Camallanus intestinalis*. (After Bashirullah, 1974.) A. anterior end ; B. male posterior end.

0.353, both from anterior end ; tail 0.258-0.48 long, finger-shaped, without any terminal spine ; vulva pre-equatorial, 3.53-5.01 from anterior end.

Host : *Channa striatus*

Location : Intestine

Localities : Dacca (Bangladesh) ; Lucknow, U. P.

Remarks : *Neocamallanus thapari* Agrawal and Misra (1980) treated as conspecific with *Paracamallanus singhi* (Ali, 1957) by Sood (1980) is considered here as *C. intestinalis* which, however, has not been included by Petter (1978).

***Camallanus karachiensis* Khan and Begum, 1971**

(Fig. 68, A & B)

1971. *Camallanus karachiensis* Khan and Begum, *Bull. Dep. Zool. Panjab Univ.*, article 5, p. 10.

1979. *Camallanus karachiensis* : Petter, *Bull. Mus. natn. Hist. nat., Paris* 4th ser., 1, p. 996.

Description : Male. Body 14.565 long, 0.190 wide ; cephalic papillae absent ; buccal capsule 0.102×0.111 , divided into two lateral valves, each with 27 longitudinal ridges, which sometimes broken in middle ;

basal ring 0.074 in diameter ; tridents 0.117 long ; oesophagus divided into two parts, anterior muscular 0.087 long, posterior glandular 0.312 ; tail 0.136 long, sharply attenuated ; caudal muscles thick ; caudal alae present ; spicules two, stout, unequal, longer 0.326 long, shorter 0.272 ; caudal papillae pedunculate, 9 pairs, 8 preanal ; 1 postanal ; sessile several aggregated at tip of tail.

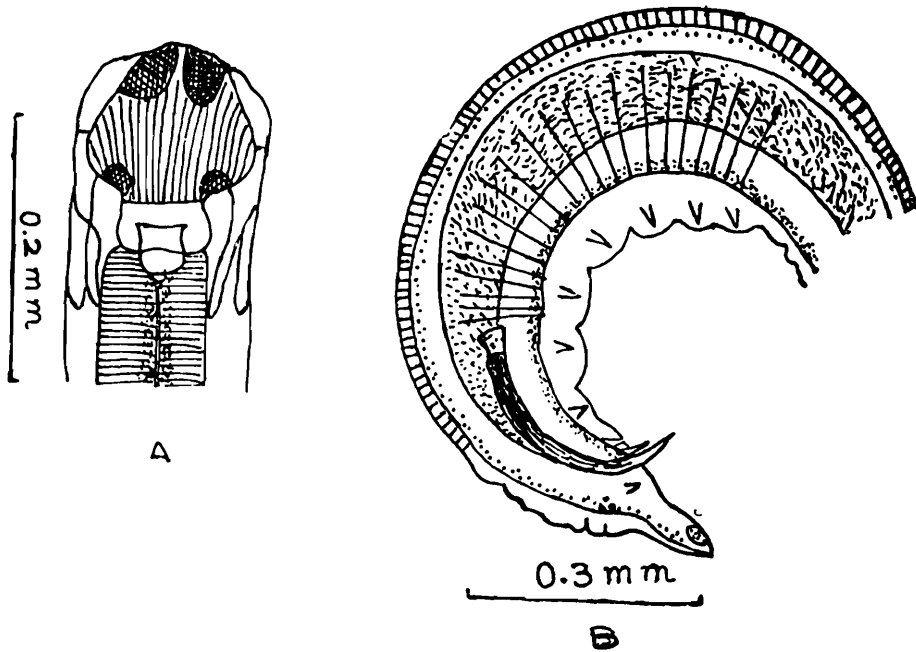


Fig. 68. *Camallanus karachiensis*. (After Khan and Begum, 1971.) A. anterior end ; B. male posterior end.

Female. Body 14.320 long, 0.285 wide ; buccal capsule 0.151×0.151 , divided into two lateral valves, each with 26 longitudinal ridges ; head with 4 papillae ; tridents 0.160 long, with middle prong 0.095-0.111, lateral 0.083-0.095 ; oesophagus, anterior muscular 1.047 long, posterior glandular 0.992 ; nerve ring 0.43 from anterior end ; tail 0.284 long, tapering ; vulva pre-equatorial, 6.460 from anterior end, with two prominent lips.

Host ; *Rastrelliger kanagurta*

Location ; Intestine

Locality ; Karachi (Pakistan)

Remarks ; This species is based on a male and a female only.

***Camallanus kirandensis* Baylis, 1928**

1928. *Camallanus kirandensis* Baylis, *Ann. Mag. nat. Hist.*, ser. 10, 1, p. 554.

1968. *Camallanus kirandensis* : Sahay and Narayan, *Indian J. Helminth.*, 20 (2), p. 122.

1969. *Camallanus kirandensis* : Khan and Yaseen, *Bull. Dep. Zool. Panjab Univ.*, article 4, p. 6.
1973. *Camallanus kirandensis* : Khalil, *Annls Parasit. hum. comp.*, 48 (6), p. 812.
1977. *Camallanus kirandensis* : Verma et al., *Excerta Parasitologica Memoria Doctor ECY Caballero*, p. 489.
1978. *Camallanus kirandensis* : Amin, *J. Parasit.*, 64 (1), p. 93.
1979. *Camallanus kirandensis* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., 1 (4), p. 995.

Description : Male. Body 7.80-10.57 long, 0.24-0.48 wide ; buccal capsule 0.099-0.10 $\times$ 0.09-0.1, divided into two lateral valves, each with 18-26 smooth rib-like thickenings ; tridents with lateral prongs equal, 0.10 long, middle longer 0.067-0.12 ; oesophagus divided into two parts, anterior muscular 0.448-0.870 long, posterior glandular 0.630-1.0 ; nerve ring 0.14-0.17 from anterior end ; tail 0.090-0.160 long ; caudal alae slightly to moderately developed ; spicules two, dissimilar, unequal, larger 0.138-0.260 long, smaller 0.115-0.20 ; caudal papillae pedunculate, 10 pairs, 7 preanal, 2 adanal, 1 postanal.

Female. Body 8.40-20.00 long, 0.27-0.90 wide ; buccal capsule as in male, 0.100-0.140 $\times$ 0.100-0.130, each with 20-26 longitudinal ridges ; tridents also as in male ; oesophagus, anterior muscular 0.588-1.05 long, posterior glandular 0.742-1.400 ; tail 0.17 long ; vulva at 3/5 to about middle from anterior end, behind with a small papilla which with a fine hair-like process at tip ; eggs 0.02-0.04 in diameter, almost round ; tail 0.868-1.400 long, conical, tapering to fine point.

Hosts : Saw-fish (*Pristis* sp.) ; *Polynemus indicus* ; *Labeo niloticus*

Location : Intestine

Localities : Khulna (Bangladesh) ; Africa ; Egypt

Remarks : This species was originally described by Baylis (1928) from Africa, subsequently from a male and a female specimen by Khan and Yaseen (1969) from Bangladesh, and finally from Egypt by Amin (1978) who last gave a detailed description.

***Camallanus kulasirii* (Yeh, 1960)**

1960. *Zeylanema kulasirii* Yeh, *J. Helminth.*, 34 (1/2), p. 112, 122.
1963. *Zeylanema kulasirii* : Fernando and Furtado, *Z. ParasitenKde*, 23, p. 142.
1967. *Camallanus kulasirii* Agrawal, *Ann. Parasit. hum. comp.*, 42 (3), p. 333.
1977. *Zeylanema kulasirii* : Shendge and Deshmukh, *Riv. Parassit.*, 38 (2/3), p. 167.
1977. *Zeylanema kulasirii* : Chaturvedi and Kansal, *Rec. zool. Surv. India, Occasional Paper*, No. 5, p. 10.

1979. *Camallanus kulasirii* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., **1** (4), p. 994.
1980. *Camallanus kulasirii* : Gupta and Gupta, *Acta parasit. pol.*, **27** (37), p. 316.
1981. *Zeylanema kulasiri* : Gupta and Duggal, *Res. Bull. Panjab Univ.*, **28** (1977), p. 177.

Description : Male. Body 1.8-2.6 long, 0.07-0.08 wide ; buccal ridges armed ; oesophagus divided into two parts, anterior muscular 0.23-0.26 long, posterior glandular 0.27-0.34 ; tail with caudal alae, ending in two digits ; a pair of phasmids ; spicules two, lightly sclerotized, unequal, left 0.15-0.19 long, right 0.40-0.42 ; caudal papillae 12 pairs, 6 preanal, 6 postanal.

Hosts : *Anabas testudineus* ; *Channa punctatus*

Location : Intestine

Locality : Sri Lanka

Remarks : Yeh (1960) created this species for his genus *Zeylanema*, later treated as a synonym of *Camallanus* by Chabaud (1975), and Petter (1978, 1979). The species was differentiated as having vestigeal tridents, but pending study of more material it is retained here only tentatively.

***Camallanus kumaonus* Arya, 1980**

(Fig. 69, A & B)

1980. *Camallanus kumaonus* Arya, *Indian J. Helminth.*, **30** (1978), p. 113.

Description : Male. Body 6.0-6.1 long, 0.11-0.14 wide ; cephalic papillae 2 pairs, submedian ; buccal capsule excluding basal ring 0.051-

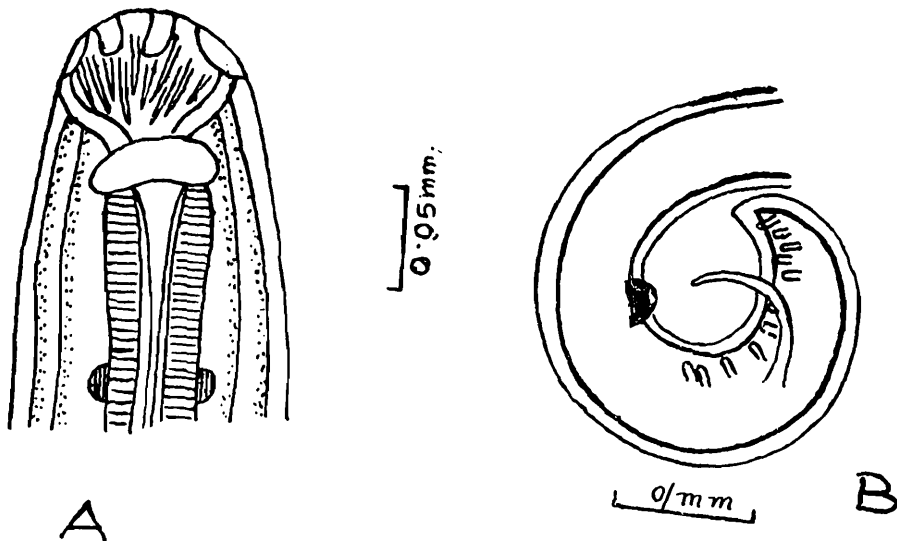


Fig. 69. *Camallanus kumaonus*. (After Arya, 1980.) A. anterior end ; B. male posterior end.

0.052×0.061-0.065, with 18-19 longitudinal ridges and on anterior margin two triangular chitinous projections ; basal ring 0.015-0.18 wide ; tridents absent ; oesophagus divided into two parts, anterior muscular 0.21-0.27 long, posterior glandular 0.45-0.48 ; nerve ring 0.150-0.178, and excretory pore 0.17-0.23, both from anterior end ; cervical papillae absent ; tail 0.07-0.08 long, curved, tapering, ending in blunt tip ; sucker 0.028-0.048 long, and 0.17-0.21 from posterior end ; spicule single, 0.16-0.17 long ; caudal papillae pedunculate, 11 pairs, 6 preanal, 5 postanal.

Female. Body 8.0-8.4 long, 0.14-0.16 wide ; anterior end as in male ; buccal capsule excluding basal ring 0.05-0.06×0.06-0.08, basal ring 0.012-0.02 wide ; oesophagus, anterior muscular 0.24-0.30 long, posterior glandular 0.52-0.54 ; nerve ring 0.150-0.175, and excretory pore 0.18-0.26, both from anterior end ; tail 0.33-0.34 long, cylindrical, tapering, with blunt tip ; vulva pre-equatorial, 3.5-3.8 from anterior end ; eggs 0.03-0.032×0.011-0.0212, oval, thin-walled, embryonated.

Host : *Chrossocheilus latius*

Location : Intestine

Locality : Nainital, U. P.

***Camallanus lucknowensis* (Gupta and Bakshi, 1980)**

(Fig. 70, A & B)

1980. *Neocamallanus lucknowensis* Gupta and Bakshi, *Indian J. Helminth.*, **31** (1979), p. 161.

Description : Male. Body 5.20-6.17 long, 0.13-0.19 wide ; buccal capsule comprising of two valves, 0.035-0.044×0.050-0.057, with 20 longitudinal ridges ; basal ring 0.010-0.012×0.040-0.046 ; oesophagus divided into two parts, anterior muscular 0.255-0.265 long, posterior glandular 0.52-0.65 ; nerve ring 0.124-0.140, and excretory pore 0.125-0.160, both from anterior end ; tail 0.70-0.85 long, with well developed caudal alae ; spicule single, with bifid tip, 0.12-0.13 long ; gubernaculum absent ; caudal papillae pedunculate 5 pairs, 3 preanal, 2 postanal, sessile 3 pairs, 1 preanal, 2 postanal.

Female. Body 12.10-18.65 long, 0.255-0.350 wide ; anterior end as in male ; buccal capsule 0.045-0.059×0.068-0.079 ; basal ring 0.010-0.015×0.049-0.057 ; oesophagus, anterior muscular 0.30-0.35 long, posterior glandular 0.69-0.81 ; nerve ring 0.147-0.190, and excretory pore 0.169-0.235, both from anterior end ; tail 0.310-0.475 long ; bluntly

pointed ; vulva pre-equatorial, 4.42-6.78 from anterior end, with two distinct lips.

Host : *Channa striatus*

Location : Intestine

Locality : Lucknow, U. P.

***Camallanus magna* (Khan and Yaseen, 1969)**

1969. *Zeylanema magna* Khan and Yaseen, *Bull. Dep. Zool. Panjab Univ.*, article 4, p. 4.
 1976. *Zeylanema magna* : Bilqeess, *Proc. Pakistan Acad. Sci.*, 13 (2), p. 110.
 1977. *Zeylanema magna* : Shendge and Deshmukh, *Riv. Parassit.*, 38 (2/3), p. 167.
 1979. *Camallanus magna* Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., 1 (4) p. 994.

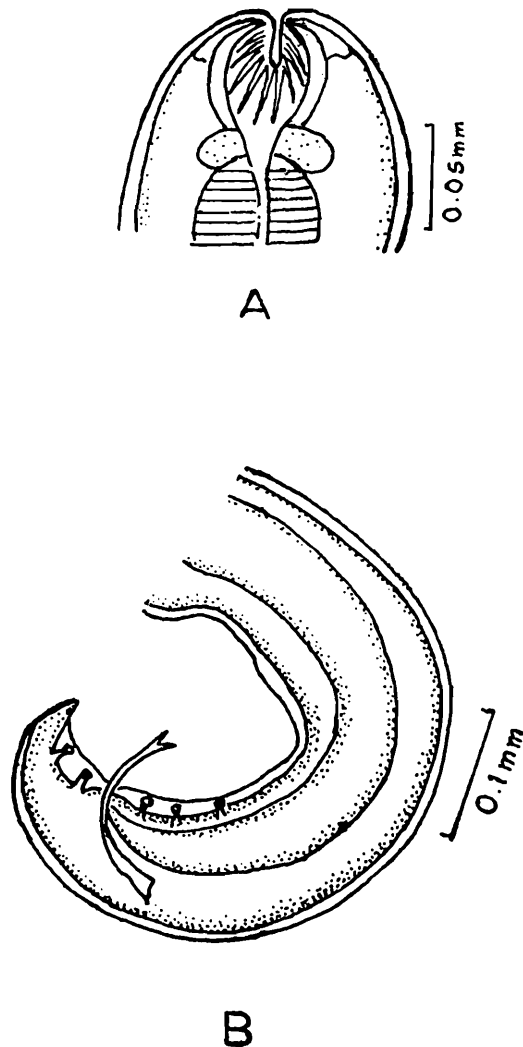


Fig. 70. *Camallanus lucknowensis*. (After Gupta and Bakshi, 1980). A. anterior end ; B. male posterior end.

Description : Male. Body 15.22-16.60 long, 0.17-0.18 wide ; buccal capsule comprising of two valves, each 0.10 long with 9 longitudinal

ridges, latter each with 12 teeth ; buccal ring 0.01×0.06 ; lateral external thickenings present ; tridents with lateral prongs equal, 0.04 long, middle one longer, 0.06 ; oesophagus divided into two parts, anterior muscular 0.6 long, posterior glandular 0.89-0.94 ; tail 0.37 long with 3 spines, median smaller ; caudal alae narrow ; spicules two, dissimilar, unequal, longer 0.45 long, shorter 0.13 ; caudal papillae pedunculate, 12 pairs, 6 preanal, 6 postanal.

Female. Body 40.96-41.85 long, 0.22-0.27 wide ; buccal capsule as in male, 0.12×0.12 ; buccal ring $0.01 \times 0.08-0.10$; tridents with lateral prongs 0.09 long, middle 0.10 ; oesophagus, anterior muscular 0.72-0.76 long, posterior glandular 1.09-1.18 ; tail 0.2 long, tapering, with 3 spines ; vulva pre-equatorial, 11.9 from anterior end, and bounded by two prominent lips with anterior well developed over hanging the posterior ; eggs 0.02-0.04 in diameter, rounded.

Host : *Mastacembalus punctatus*

Location : Intestine

Locality : Khulna (Bangladesh)

Camallanus magnavaginus Bilquees, Khanum and Jehan, 1971

1971. *Camallanus magnavaginus* Bilquees *et al.*, *J. Sci. Karachi*, **1**, p. 176.

1979. *Camallanus magnavaginus* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., **1** (4), p. 996.

Description : Female. Body 42.45 long, 0.42 wide ; buccal capsule 0.17×0.16 , comprising of two lateral valves, each constricted into 3 pieces and with numerous smooth ridges, and at anterior end having a large somewhat triangular thickening ; tridents with equal prongs, each 0.143 long ; buccal ring incomplete ; oesophagus undivided ; muscular ; tail 0.36 long ; vulva almost equatorial.

Host : *Muraenesox cinerius*

Location : Intestine

Locality : Karachi coast (Pakistan)

Remarks : This species, based on a single female only, is tentatively included here pending availability of male description.

Camallanus mastacembeli (Sahay and Sinha, 1966) Agrawal, 1967

(Fig. 71)

1966. *Zeylanema mastacembeli* Sahay and Sinha, *Jap. J. med. Sci. Biol.*, **19** (5), p. 247.

1967. *Camallanus mastacembeli* Agrawal, *Annls Parasit. hum. comp.*, **42** (3), p. 380.

1968. *Camallanus mastacembeli* : Sood, *Indian J. Helminth.*, **20** (2), p. 83.
1968. *Camallanus patnai* Sood, *Indian J. Helminth.*, **20** (2), p. 91.
1971. *Zeylanema mastacembeli* : Sinha and Sahay, *Indian J. Anim. Res.*, **5** (2), p. 67.
1976. *Zeylanema varanasiensis* Agrawal, *Indian J. Zootomy*, **15** (1974), p. 11.
1977. *Zeylanema mastacembeli* : Verma *et al.*, *Excerta Parasitologica Memoria Doctor ECY Caballero*, p. 488.
1977. *Zeylanema mastacembeli* : Shendge and Deshmukh, *Riv. Parassit.*, **38** (2/3), p. 167.
1977. *Camallanus mastacembeli* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 7.
1977. *Camallanus patnai* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 7.
1978. *Camallanus mastacembeli* : De *et al.*, *Folia Parasit.*, **25**, p. 321.
1979. *Camallanus mastacembeli* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., **1** (4), p. 994.
1980. *Camallanus patnai* : Gupta and Gupta, *Acta parasit. pol.*, **27** (37), p. 316.
1980. *Camallanus varanasiensis* Gupta and Gupta, *Acta parasit. pol.*, **27** (37), p. 316.
1981. *Zeylanema mastacembeli* : Gupta and Duggal, *Res. Bull. Panjab Univ.*, **28** (1977), p. 177.

Description : Male. Body 8.54-13.16 long, 0.19-0.208 wide ; buccal capsule $0.085-0.112 \times 0.112-0.128$, comprising of two valves, each with 9-12 toothed ridges, and two external thickenings ; basal ring $0.08-0.085 \times 0.01-0.02$; tridents with subequal prongs, middle 0.03-0.05 long, laterals 0.058-0.09 ; oesophagus divided into two parts, anterior muscular 0.48-0.784 long, posterior glandular 0.75-0.93 ; nerve ring 0.22-0.336, and excretory pore 0.48-0.59, both from anterior end ; tail 0.09-0.1 long ; caudal alae 0.41-0.62 long, well developed ; spicule single, 0.336-0.76 long ; caudal papillae 11-13 pairs, 7-9 preanal, 1-2 adanal, 2-4 postanal ; sometimes an unpaired sessile papilla near tip of tail ; cuticular swelling 0.384 from posterior end.

Female. Body 16.25-26.28 long, 0.224-0.30 wide ; head 0.11-0.13 in diameter ; buccal capsule $0.10-0.11 \times 0.12-0.13$, and as in male ; basal ring $0.07-0.09 \times 0.02-0.03$; tridents with middle prong 0.03-0.084 long, laterals 0.055-0.10 ; oesophagus, anterior muscular 0.52-0.61 long, posterior glandular 0.78-0.93 ; nerve ring 0.1-0.26, and excretory pore 0.25-0.51, both from anterior end ; tail 0.16-0.22 long ; vulva pre-equatorial, 5.63-9.28 from anterior end.

Hosts : *Mastacembalus armatus* ; *Rita rita*

Location : Intestine

Localities : Lucknow & Varanasi, U. P. ; Patna, Bihar.

Remarks : Sahay and Sinha (1966) described the species *Zeylanema mastacembeli* from *Mastacembalus armatus* from Patna, Bihar. Agrawal (1967) did not accept the genus *Zeylanema* and described her specimens from the same host from Lucknow as *Camallanus mastacembeli*. Sood (1968) while redescribing this species agreed with Agrawal (*op. cit.*) and transferred *Zeylanema mastacembeli* Sahay and Sinha, 1966, to the genus

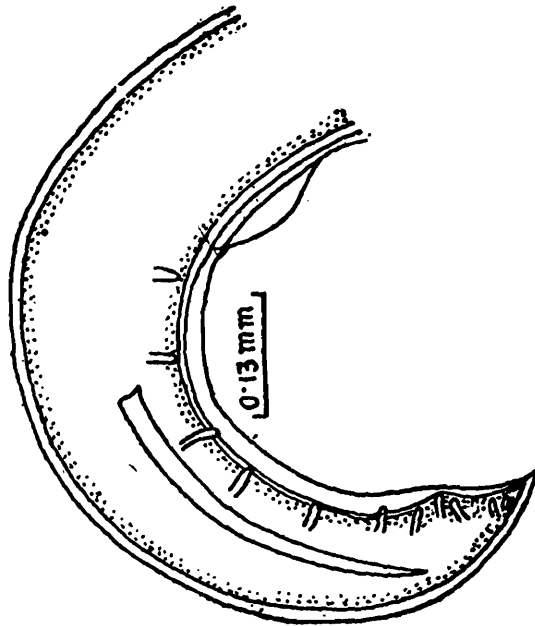


Fig. 71. *Camallanus mastacembeli*. (After Sahay and Sinha, 1966.) Male posterior end.

Camallanus renaming the species as *C. patnai* on the basis of homonymy, and this was accepted by Chaturvedi and Kansal (1977), and Gupta and Gupta (1980). But, this is contrary to the Rules of Zoological Nomenclature whereby the name to be changed has to be applied to the species described by the latter author which is here Agrawal. Sinha and Sahay (1971) on the other hand treated *Camallanus mastacembeli* as a synonym of their species *Zeylanema mastacembeli*. As the validity of the genus *Zeylanema* has not been upheld by Chabaud (1975), and Petter (1978, 1979), *Zeylanema mastacembeli* is renamed as *Camallanus mastacembeli* as done by De, Ghosh and Majumdar (1978), and Agrawal's species treated as its synonym as proposed by Sahay and Sinha (*op. cit.*); and likewise is treated *Zeylanema varanasiensis* Agrawal, 1976, from *Rita rita* from Varanasi, U. P. However, the species approaches *Camallanus unispiculus* Khera, 1956 (based on a male and two females) excepting body size, and number and arrangement of caudal papillae; but some more material for both the species (*vide* remarked under latter) is necessary for final confirmation, until which the species may be kept separate.

Camallanus pearsei (Yeh, 1960)

1933. *Camallanus anabantis* (in part) Pearse, *J. Siam. Soc. Nat. Hist. Supplement*, 9 (2), p. 179.
1960. *Zeylanema pearsei* (in part) Yeh, *J. Helminth.*, 34 (1/2), p. 111, 122.
1963. *Zeylanema pearsei* : Fernando and Furtado, *Z. ParasitenKde*, 23, p. 142.
1966. *Zeylanema pearsei* : Sahay and Sinha, *Jap. J. med. Sci. Biol.* 19 (5), p. 251.
1967. *Camallanus pearsei* Agrawal, *Annls Parasit. hum. comp.*, 42 (3), p. 333.
1973. *Zeylanema pearsei* : Bashirullah, *Bangladesh J. Zool.*, 1 (1), p. 73, 78.
1977. *Zeylanema pearsei* : Shendge and Deshmukh, *Riv. Parassit.*, 38 (2/3), p. 167.
1977. *Zeylanema pearsei* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 10.
1979. *Camallanus pearsei* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., 1 (4), p. 994.
1980. *Camallanus pearsei* : Gupta and Gupta, *Acta parasit. pol.*, 27 (37), p. 316.
1981. *Zeylanema pearsei* : Gupta and Duggal, *Res. Bull. Panjab Univ.*, 28 (1977), p. 177.

Description : Female. Body 5.1 long, 0.15 wide ; buccal ridges armed ; oesophagus divided into two parts, anterior muscular 0.36 long, posterior glandular 0.52 ; tail 0.11 long, ending in 3 clear spines ; vulva slightly pre-equatorial.

Host : *Rasbora daniconius*

Location : Intestine

Locality : Sri Lanka

Remarks : This species, based on two females only, was originally described as *Camallanus anabantis* by Pearse (1933). But, Yeh (1960) mainly on the basis of its lacking tridents treated it as a distinct species which, however, is tentatively retained here pending availability of male description.

Camallanus qadrii Ashraf, Farooq and Khan, 1977

1977. *Camallanus qadrii* Ashraf *et al.*, *Biologia, Lahore*, 23 (2), p. 111.

Description : Male. Body 24.35 long, 0.23 wide, and entirely with striated cuticle ; head with four papillae ; buccal capsule excluding basal ring 0.130×0.132 , almost rounded, and consisting of two lateral valves, each with 28 longitudinal ridges not continuous but broken at several points throughout their length, and anteriorly with two squarish chitinized thickenings ; basal ring 0.023×0.096 ; tridents with unequal prongs, middle 0.034 long, laterals 0.054 and 0.062 ; oesophagus divided into two parts, anterior muscular 0.691 long, posterior glandular 1.160 ;

nerve ring 0.22 from anterior end ; tail 0.09 long, with moderately developed caudal alae ; spicules similar, equal, 0.33 long ; caudal papillae 16 pairs, 8 preanal pedunculate, one sessile adanal, and 7 sessile postanal.

Female. Body 24.41 long, 0.29 wide ; buccal capsule as in male, excluding basal ring 0.132×0.134 ; basal ring 0.025×0.096 ; tridents as in male ; oesophagus, anterior muscular 0.695 long, posterior glandular 1.162 ; nerve ring 0.23 from anterior end ; tail 0.075 long, conical, tapering ; vulva conspicuous, 8.74 from anterior end.

Host : *Protonibea diacanthus*

Location : Intestine

Locality : Karachi coast (Pakistan)

***Camallanus salmonae* Chakravarty, 1942**

1942. *Camallanus salmonae* Chakravarty, *Curr. Sci.*, **11** (11), p. 441.

1960. *Camallanus salmonae* : Yeh, *J. Helminth*, **34** (1/2), p. 120.

1977. *Neocamallanus salmonae* Verma et al., *Excerpta Parasitologica Memoria Doctor ECY Caballero*, p. 490.

1977. *Camallanus salmonae* : Chaturvedi and Kansal, *Rec. zool. Surv. India, Occasional Paper No. 5*, p. 7.

1979. *Camallanus salmonae* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., **1** (4), p. 994.

1980. *Camallanus salmonae* : Arya, *Indian J. Helminth.*, **30** (1978), p. 116.

Description : Female. Body 12.0 long, 0.38 wide ; buccal capsule 0.14×0.15 ; buccal valve each with 15 simple longitudinal ridges ; tridents absent ; muscular oesophagus 0.39 long ; nerve ring 0.21 from anterior end ; tail finger-like, rounded, tip without spines ; vulva almost in middle of body, with slight cuticular expansion.

Host : *Salmo* sp.

Location : Intestine

Locality : Kashmir

Remarks : The species is based on two females, of which only one was in a good condition. Petter (1979) also observed the inadequacy of its description. However, in the absence of males, it is included here tentatively.

Camallauus surmai Rasheed, 1970

(Fig. 72, A-C)

1970. *Camallanus surmai* Rasheed, *Revta Soc. mex. Hist. nat.*, **31**, p. 195.1979. *Camallanus surmai* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser. (1), no. 4, p. 996.

Description : Male. Body 23.0-28.0 long, 0.27-0.3 wide, and with fine transverse striations ; buccal capsule 0.15 long, bivalved, each valve with 20-26 continuous ridges ; basal ring 0.037×0.087 ; tridents 0.17 long ; oesophagus divided into two parts, anterior muscular 1.1-1.3 long, posterior glandular 1.58-1.6 ; nerve ring 0.3, cervical papillae 0.46-0.48, and excretory pore 1.0-1.5, all from anterior end ; tail simple,

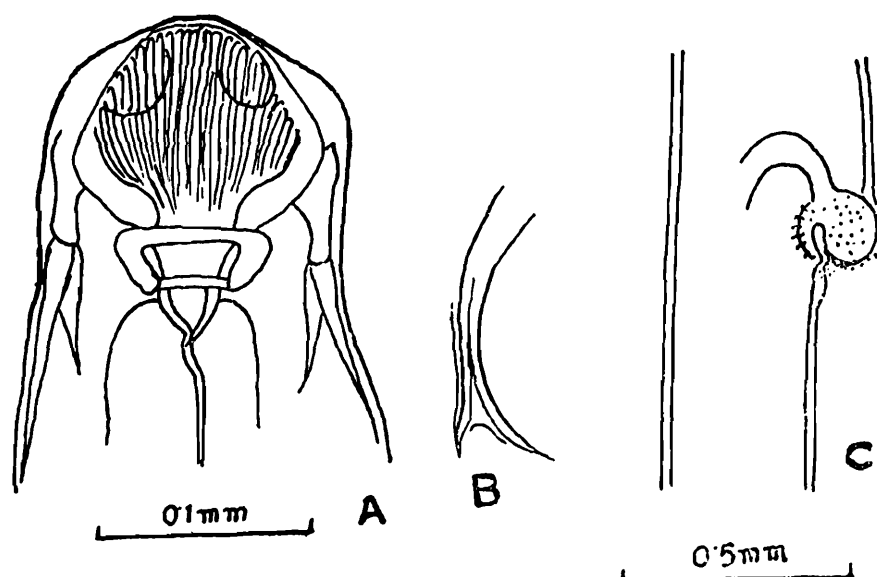


Fig. 72. *Camallanus surmai*. (After Rasheed, 1970.) A. anterior end ; B. spicule ; C. vulval region.

with caudal alae 0.940-1.0 long and 0.27-0.3 wide ; spicule single, 0.31-0.37 long and with forked tip having equal prongs ; caudal papillae obscured due to the presence of some globular structure, only 8 clearly discernible, 6 preanal, 2 postanal.

Female. Body 35.0-45.0 long, 0.37-0.45 wide ; tridents 0.17 long ; anterior end as in male ; oesophagus, anterior muscular 1.1-1.5 long, posterior glandular 1.8-2.05 ; nerve ring 0.45, cervical papillae 0.48-0.52, and excretory pore 1.5-2.0, all from anterior end ; tail very slightly bifid, with phasmids 0.140 from its tip ; vulva pre-equatorial, conspicuous, with extremely large lips, 0.470 long, and forming 3 thick lobes, two ventral and one dorsolateral with largest lobe over hanging vulval aperture, which latter just behind with another thickening ventrally.

Host : *Scomberomorus interruptum* (a mackerel locally known in Karachi as "Surmai".)

Location : Intestine

Locality : Karachi (Pakistan)

Remarks : *Camallanus goaensis* from a mackerel from Panaji, Goa, described by the present author (1981) as new, comes close to the above species in almost every respect excepting in the number of caudal papillae which are obscured in both the cases, only 7 pairs, 3 preanal, 1 adanal, and 3 postanal being discernible (*versus* 8 pairs, 6 preanal and 2 postanal in *surmai*).

***Camallanus thaparus* Sahay and Narayan, 1968**

(Fig. 73, A & B)

1968. *Camallanus thaparus* Sahay and Narayan, *Indian J. Helminth.*, 20 (2), p. 118.
1977. *Camallanus thaparus* : Verma *et al.*, *Excerta Parasitologica Memoria Doctor ECY Caballero*, p. 489.
1977. *Camallanus thaparus* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 8.
1979. *Camallanus thaparus* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., 1 (4), p. 995.

Description : Male. Body 7.00-7.44 long, 0.20-0.22 wide, and apparently without striations ; buccal capsule consisting of two valves, each $0.095-0.115 \times 0.09-0.110$, with nine longitudinal ridges and anteriorly with two thickenings ; basal ring 0.08-0.09 in diameter ; tridents with unequal prongs, having bluntly pointed tips, lateral 0.06-0.07 long, middle 0.025 ; oesophagus divided into two parts, anterior muscular 0.51-0.52 long, posterior glandular 0.41-0.43 ; nerve ring 0.16-0.18 from anterior end ; tail 0.17-0.183 long, conical, with caudal alae and two spines ; spicules two, unequal, left imperfectly chitinized, 0.20-0.225 long, right 0.425 ; caudal papillae 13 pairs, 7 preanal, 2 adanal, 4 postanal.

Female. Body 16.6 long, 0.237 wide ; anterior end as in male ; buccal valves excluding posterior chitinous ring 0.13×0.16 ; basal ring 0.115 in diameter ; lateral prongs of tridents 0.06 long, middle 0.035 ; oesophagus, anterior muscular 0.725 long, posterior glandular 0.525 ; nerve ring 0.23 from anterior end ; tail 0.15 long, with rounded end and two spine-like structures ; vulva post-equatorial, 5.5 from posterior end.

Host : *Channa striatus*

Location : Intestine

Locality : Patna, Bihar

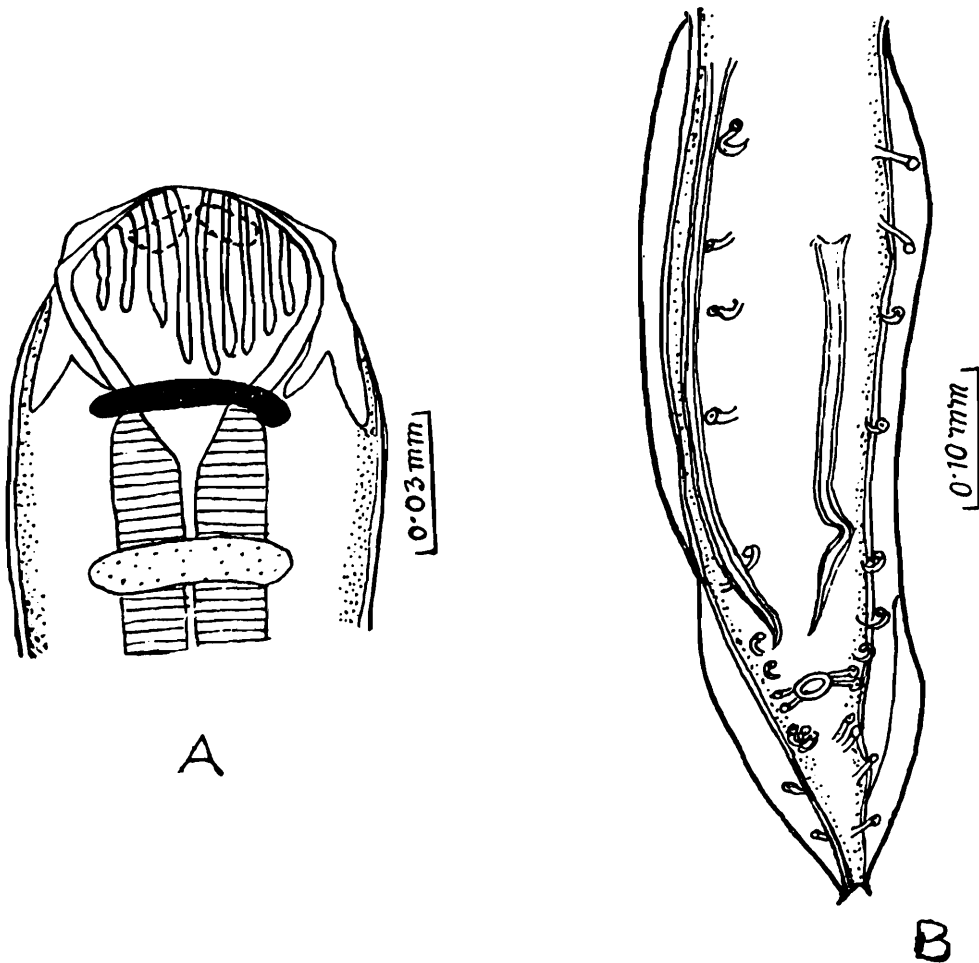


Fig. 73. *Camallanus thaparui*. (After Sahay and Narayan, 1968.) A. anterior end ; B. male posterior end.

***Camallanus trichiuris* Bashirullah and Rahman, 1972**

(Fig. 74, A & B)

- *1972. *Camallanus trichiuris* Bashirullah and Rahman, *Riv. Parassit.*, **33** (4), p. 289.
- 1973. *Camallanus trichiuris* : Bashirullah, *Bangladesh J. Zool.*, **1** (1), p. 71.
- 1973. *Camallanus atropusi* Bashirullah and Rahman, *Riv. Parassit.*, **34** (4), p. 291.
- 1973. *Camallanus dollfusi* Bashirullah and Rahman, *Riv. Parassit.*, **34** (4), p. 294.
- 1973. *Camallanus atropusi* : Bashirullah, *Bangladesh J. Zool.* **1** (1), p. 71.
- 1973. *Camallanus dollfusi* : Bashirullah, *Bangladesh J. Zool.*, **1** (1), p. 71.
- 1975. *Camallanus chauhani* Srivastava and Gupta, *Indian J. Helminth.*, **27** (2), p. 124.

* To avoid undue repetitions, the species listed in Petter's (1979) have been excluded from the synonymy as they are already covered under it.

1975. *Camallanus puriensis* Srivastava and Gupta, *Indian J. Helminth.*, **27** (2), p. 127.
 1975. *Camallanus therapsi* Srivastava and Gupta, *Indian J. Helminth.*, **27** (2), p. 129.
 1976. *Camallanus trichiurusi* Srivastava and Gupta, *Jap. J. Parasit.*, **25** (2), p. 126.
 1976. *Camallanus pentkotai* Srivastava and Gupta, *Jap. J. Parasit.*, **25** (2), p. 128.
 1980. *Camallanus ophichthys* Gupta and Gupta, *Acta parasit. pol.*, **27** (37), p. 314.
 1980. *Camallanus trichiurusi* : Gupta and Gupta, *Acta parasit. pol.*, **27** (37), p. 316.
 1980. *Camallanus pentkotai* : Gupta and Gupta, *Acta parasit. pol.*, **27** (37), p. 316.

Description : Male. Body 4.93-20.15 long, 0.192-0.52 wide ; head 0.109-0.25 in dorsoventral diameter ; buccal capsule bivalved, each valve with 25-51 longitudinal ridges, and two cuticular thickenings on antero-lateral margins ; basal ring 0.055-0.104×0.017-0.026 ; tridents

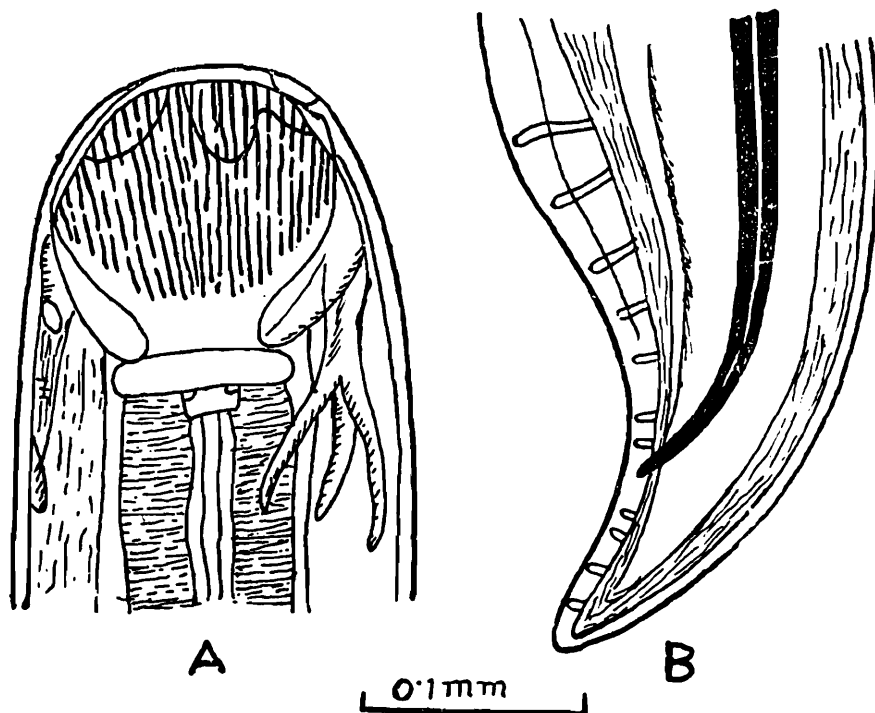


Fig. 74. *Camallanus trichiuris*. (After Bashirullah and Rahman, 1972.) A. anterior end ; B. male posterior end.

well developed, middle prong 0.1-0.153 long, laterals 0.12-0.18 ; oesophagus divided into two parts, anterior muscular 0.72-1.4 long, posterior glandular 0.78-1.65 ; nerve ring 0.205-0.67 from anterior end ; tail 0.083-0.25 long, with well developed caudal alae ; spicule single, 0.25-0.4 long ; caudal papillae 11-16 pairs, 7 preanal, 0-2 adanal, 4-9 post-anal.

Female. Body 9.98-16.08 long, 0.2-0.355 wide ; head 0.144-0.25 in dorsoventral diameter ; buccal capsule as in male ; basal ring 0.088-0.130×0.017-0.026 ; tridents well developed, 0.16-0.2 long ; oesophagus, anterior muscular 0.88-1.5 long, posterior glandular 1.19-1.7 ; nerve ring

0.30-0.7 from anterior end ; tail 0.174-0.25 long, tapering ; vulva 3.5-5.9 from anterior end, with prominent lips.

Hosts : *Lepturacanthus savala* ; *Trichiurus muticus* ; *T. venosus* ; *Therapon theraps* ; *Pisodonophis* [= *Ophichthys*] *boro* ; *Upeneus macrone-mus* ; *Chirocentrus dorab* ; *Trachinocephalus myops*

Location : Intestine & body cavity

Localities : Bangladesh ; Pentkota, Puri, Orissa

Remarks : Bashirullah and Rahman (1972) while describing their species *Camallanus trichiuris* reported two spicules. Subsequently (1973) they reported a single spicule in two other species, viz. *C. atropusi* and *C. dollfusi*. But, probably unaware of this, Srivastava and Gupta (1975) described three species, viz. *C. chauhani*, *C. puriensis* and *C. therapsi*, and again (1976) two more species, viz. *C. trichiurusi*, and *C. pentkotai*, all showing one spicule in their specimens. Gupta and Gupta (1980) added one more species, *C. ophichthys* which also shows single spicule. Apparently, the spicules for *C. trichiuris* have been incorrectly given as two. So, it is highly probable that all the species are conspecific which will be revealed by examination of more material. A comparative chart of the species shown under synonymy is given. It may be noted, however, that the species come very close to *C. marinus* Schmidt and Kuntz, 1969.

Camallanus unispiculus Khera, 1956

- 1956. *Camallanus unispiculus* Khera, *Indian J. Helminth.*, **6** (1954), p. 100.
- 1960. *Zeylanema anabantis* Yeh, *J. Helminth.*, **34** (1/2), p. 122.
- 1966. *Zeylanema unispiculus* Sahay and Sinha, *Jap. J. med. Sci. Biol.*, **19** (5), p. 251.
- 1967. *Camallanus unispiculus* : Agrawal, *Annls Parasit. hum. comp.*, **42** (3), p. 338.
- 1977. *Zeylanema unispiculus* : Shendge and Deshmukh, *Riv. Parassit.*, **38** (2/3), p. 167.
- 1977. *Camallanus unispiculus* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 8.
- 1979. *Camallanus unispiculus* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., **1** (4), p. 994.
- 1980. *Camallanus unispiculus* : Gupta and Gupta, *Acta parasit. pol.*, **27** (37), p. 316.
- 1981. *Zeylanema unispiculus* : Gupta and Duggal, *Res. Bull. Panjab Univ.*, **28** (1977), p. 177.

Description : Male. Body 10.9 long, 0.124 wide ; buccal capsule bivalved, 0.09×0.1, each valve with nine noded ridges, and two quadrilateral external thickenings ; basal ring 0.07 in diameter ; tridents

To facilitate future comparison, a comparative chart of the species shown under synonymy is given below to clarify their systematic position.

		<i>Camallanus trichiuris</i> Bashirullah and Rahman, 1972	<i>C. atropusi</i> Bashirullah and Rahman, 1973	<i>C. dollfusi</i> Bashirullah and Rahman, 1973	<i>C. chauhani</i> Srivastava and Gupta, 1975	<i>C. puriensis</i> Srivastava and Gupta, 1975	<i>C. therapsi</i> Srivastava and Gupta, 1975	<i>C. trichiurusi</i> Srivastava and Gupta, 1976	<i>C. pentkotai</i> Srivastava and Gupta, 1976	<i>C. ophichthys</i> Gupta and Gupta, 1980
		1	2	3	4	5	6	7	8	9
Body length :	♂	4.98-8.91	11.37-12.53	11.01-11.91	10.3	10.82-13.66	9.35	12.45-15.38	11.9-20.15	9.8-10.95
	♀	9.98-12.58	—	—	—	12.69-16.08	—	15.25-18.54	6.5-23.62	13.15-19.25
Body width :	♂	0.192-0.225	0.28-0.29	0.30-0.31	0.35	0.25-0.3	0.35	0.28-0.43	0.3-0.52	0.25-0.3
	♀	0.306-0.331	—	—	—	0.2-0.355	—	0.46-0.55	0.29-0.52	0.21-0.25
Tridents length.										
Middle prong :	♂	—	0.102-0.104	0.094-0.095	0.1	0.12	0.127	0.15-0.21	0.12-0.17	0.07-0.10
	♀	—	—	—	—	0.16-0.2	—	0.15-0.17	0.18-0.2	0.13-0.15
Lateral prongs :	♂	—	0.083-0.084	0.084	0.12	0.12	0.18	0.17-0.22	0.12	0.12-0.15
	♀	—	—	—	—	0.16-0.2	—	0.16-0.19	0.13-0.2	0.14-0.19
Oesophagus length.										
ant. muscular	♂	0.72-1.04	1.29-1.32	1.196-1.198	0.85	1.12-1.4	0.875	0.965-1.035	1.0-1.26	1.0-1.2
	♀	0.88-1.25	—	—	—	1.3-1.5	—	1.06-1.48	0.92-1.4	1.34-1.65
Post. glandular	♂	0.78-1.55	1.31-1.32	1.128-1.129	1.12	1.35-1.65	1.18	1.2-1.65	0.85-1.3	0.9-1.0
	♀	1.19-1.33	—	—	—	1.4-1.7	—	1.30-1.53	1.0-1.74	1.12-1.45
Nerve ring from ant. end	♂	0.205-0.231	0.217-0.224	0.214-0.219	0.35	0.6-0.67	0.255	0.22-0.27	0.25-0.38	0.4-0.5
	♀	0.30-0.34	—	—	—	0.62-0.7	—	0.26-0.32	0.322-0.445	0.45-0.55

		1	2	3	4	5	6	7	8	9
Excretory pore from ant. end.	♂	—	0.182-0.189	0.299-0.314	0.415	0.73-0.805	0.36	0.32-0.38	0.29-0.45	0.5-0.7
	♀	—	—	—	—	0.8-0.952	—	0.44-0.49	0.39-0.6	0.57-0.66
Tail length	♂	0.083-0.139	0.140-0.145	0.123-0.126	—	0.18-0.25	—	0.11-0.14	0.11-0.15	0.14-0.147
	♀	0.174-0.183	—	—	—	0.22-0.25	—	0.17-0.22	0.09-0.2	0.1-0.235
Spicule length	double,* equal	Single	Single	Single	Single	Single	Single	Single	Single	Single
		0.25-0.231	0.282-0.285	0.260-0.263	0.295	0.25-0.3	0.3	0.281-0.333	0.26-0.305	0.37-0.4
Caudal papillae	11 pairs, 7 preanal	13 pairs, 7 preanal	13 pairs, 7 preanal	13 pairs, 7 preanal	16 pairs, 7 preanal	12 pairs, 7 preanal	15 pairs, 7 preanal	12-13 pairs, 7 preanal	12 pairs, 7 preanal	
	—	—	2 adanal	—	—	—	1 adanal	—	—	
Vulva from ant. end	4 postanal	6 postanal	4 postanal	6 postanal	9 postanal	5 postanal	7 postanal	5-6 postanal	5 postanal	
	5.11-5.54	—	—	—	5.8-7.75	—	7.6-9.25	3.39-11.22	3.85-8.6	
<i>Lepturacanthus savala</i>	<i>Lepturacanthus savala</i>	<i>Atropus atropus</i>	<i>Lepturacanthus haumela</i>	<i>Trichiurus muticus</i>	<i>Arius venosus</i>	<i>Therapon theraps</i>	<i>Trichiurus muticus</i>	<i>Chirocentrus dorab,</i> <i>Upeneus macronemus,</i> <i>chrysophrys sarba,</i> <i>Saurus myops</i>	<i>Ophichthys bro</i>	

* This character needs definite confirmation *vide* under remarks.

with lateral prongs equal, 0.079 long, middle shorter, 0.029, all with pointed tips ; oesophagus divided into two parts, anterior muscular 0.37 long, posterior glandular 0.48 ; nerve ring 0.17, and cervical papillae 0.21, both from anterior end ; excretory pore indiscernible ; tail 0.058 long ; caudal alae absent ; cloacal lips prominent ; a slight depression (which may be the outline of an incipient sucker) 0.43 from posterior end , spicule not readily discernible, single, imperfectly chitinized, 0.63 long , caudal papillae pedunculate, 16 pairs, 14 preanal, 2 postanal.

Female : Body 16.3-17.2 long, 0.2-0.225 wide ; buccal capsule as in male, $0.08-0.085 \times 0.137-0.14$; basal ring 0.082-0.09 in diameter ; tridents also as in male, lateral prongs 0.086-0.093 long, middle 0.02-0.024 ; oesophagus, anterior muscular 0.57 long, posterior glandular 0.088-0.9 ; nerve ring 0.18-0.217, and cervical papillae 0.23, both from anterior end ; excretory pore indiscernible ; tail 0.186-0.19 long, tapering to a blunt tip ; vulva pre-equatorial, 6.77 from anterior end in a specimen 16.3 long.

Host : *Mastacembalus armatus*

Location : Intestine

Locality : Lucknow, U. P.

Remarks : This species based on a male and two females only, was treated as a synonym of *Camallanus anatantis* Pearse, 1933, by Yeh (1960), but not accepted by Agrawal (1967). However, more description is desirable based on fully matured specimens.

***Camallanus vachaii* (Wahid and Perveen, 1969)**

1969. *Neocamallanus vachaii* Wahid and Perveen, *Pakist. J. Zool.*, **1** (1), p. 81.

1972. *Camallanus vachaii* Bashirullah and Rahman, *Riv. Parassit.*, **33** (4), p. 291.

1974. *Camallanus vachaii* : Bashirullah, *Norw. J. Zool.*, **22**, p. 57.

1980. *Camallanus vachaii* : Arya, *Indian J. Helminth.*, **30** (1978), p. 116.

1980. *Neocamallanus vachaii* : Naidu and Thakare, *Indian J. Anim. Sci.*, **50** (7), p. 599.

Description : Male. Body 7.0 long, 0.160 wide ; buccal capsule 0.240×0.272 , with 20-22 prominent buccal ridges, and anteriorly with 2 pairs of small cuticularized structures ; oesophagus divided into two parts, anterior muscular 0.288 long, posterior glandular 0.704 ; nerve ring 0.176 from anterior end ; tail 0.080 long, with caudal alae extending upto 0.496 from tip, and without digits ; spicules two, unequal,

longer 1.696 long, shorter 0.352 ; caudal papillae, pedunculate 12 pairs, 5 preanal, 7 postanal, sessile 2 pairs, 1 anterior, 1 immediately posterior to cloaca.

Female : Body 15.0 long, 0.256 wide ; buccal capsule 0.320×0.383 , and as in male ; oesophagus, anterior muscular 0.320 long, posterior glandular 0.864 ; nerve ring 0.320 from anterior end ; vulva pre-equatorial, 5.408 from anterior end, situated between a cuticular protuberance forming papilla-like structure.

Host : *Eutropiichthys vacha*

Location : Intestine

Locality : Kalri lake, Sind (Pakistan)

Remarks : This species based on a male and a female only, was described by Wahid and Perveen (1969) under the genus *Neocamallanus*. But Bashirullah and Rahman (1972), and later supported by Bashirullah (1974), and Arya (1980), transferred it under the genus *Camallanus*. However, more description is desirable until when its inclusion here is tentative. The species has, however, not been included by Petter (1978, 1979) as the description was not available to her.

***Camallanus xenentodoni* Khan and Yaseen, 1969**

(Fig. 75, A & B)

1969. *Camallanus xenentodoni* Khan and Yaseen, *Bull. Dép. Zool. Panjab Univ.*, article 4, p. 9.

1979. *Camallanus xenentodoni* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 4th ser., 1 (4), p. 994.

Description : Female. Body 7.91-15.85 long, 0.24-0.41 wide, and with poorly formed transverse striations ; buccal capsule $0.17-0.18 \times 0.18-0.21$, formed of two lateral valves, each internally with a few smooth longitudinal thickenings on margins only ; basal ring $0.02-0.4 \times 0.13-0.18$; tridents absent ; oesophagus divided into two parts, anterior muscular 0.47-0.64 long, posterior glandular 0.45-0.62 ; nerve ring 0.15 from anterior end ; tail 0.04-0.09 long, conical ; vulva equatorial, with prominent lips ; eggs 0.02-0.04 in diameter, almost rounded.

Hosts : *Xenentodon cancila* ; *Macrogathus aculeatum*

Location : Intestine

Localities : Khulna & Sylhet (Bangladesh)

Remarks : This species is based on two females only, and characterised in having a few very fine smooth longitudinal ridges limited to the anterior margin of buccal capsule.

Subfamily PROCAMALLANINAE Yeh, 1960

Genus *Procamallanus* Baylis, 1923

Baylis (1923) created the genus *Procamallanus* with *P. laeviconchus* (Wedl, 1862) as its type species, and characterised the genus either as having spiral thickenings or lacking the same. Subsequently, several species were added under it. Tornquist (1931) published a monograph on Cucullanidae and Camallanidae. Annereaux (1946) gave a key of

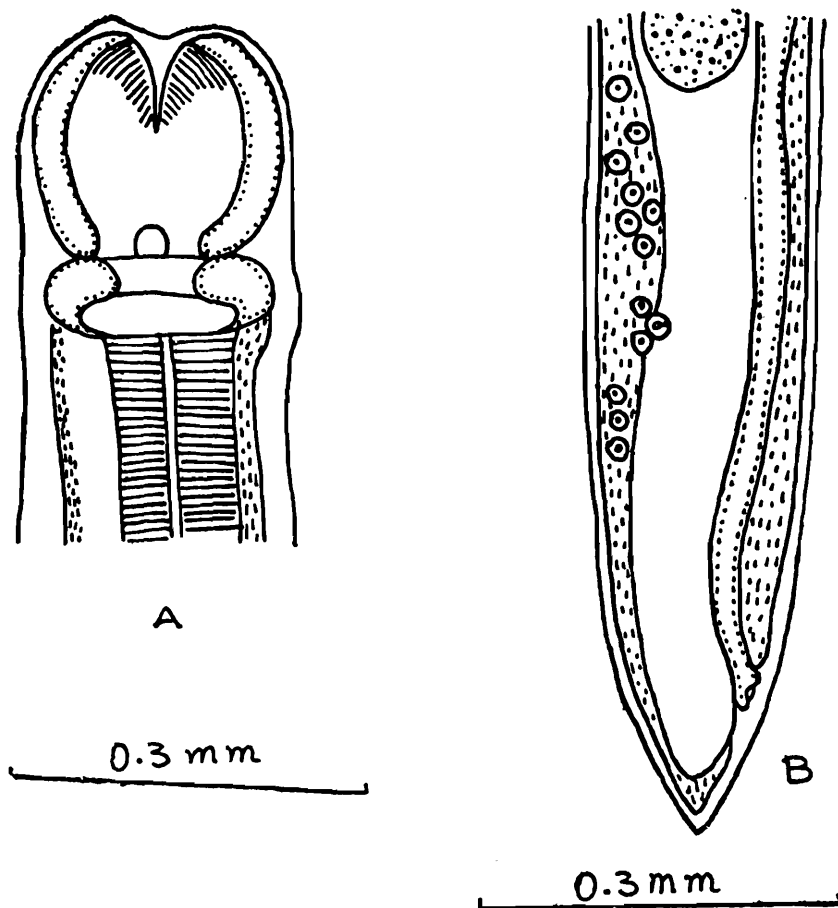


Fig. 75. *Camallanus xenentodoni*. (After Khan and Yaseen, 1969.) A. anterior end ; B. male posterior end.

the species under the genus *Procamallanus*. Olsen (1952) separated the forms having spiral thickenings under a new genus *Spirocamallanus*. Since then, diverse opinions were current regarding the validity or otherwise of the new genus, resulting in a lot of undesirable confusion. Ali (1957) on the basis of presence or absence of spicules [of which Yamaguti (1961) made only a foot-note reference] split the genus *Procamallanus* into three subgenera, viz. *Monospiculus*, *Isospiculus*, and *Procamallanus*, and later (1960) added fourth one *Aspiculus*. But, though upheld by Sahay (1966), Sinha and Sahay (1966), Bilquees, Khanum and Jehan (1971), Gupta and Duggal (1973), and Dhar and

Fotedhar (1980), this splitting has not been accepted by Campana-Rouget (1961), Pande *et al.* (1963), Fernando and Furtado (1963), Agrawal (1966), Sood (1967), Akram (1975), and in his recent classification of the group by Chabaud (1975), and currently by Petter (1979), Arya (1980), and Naidu and Murhar (1980), and the present author follows suit. In fact, Petter (*op. cit.*) in her magnificent work separated all the species of the subfamily Procamallaninae into four genera on the following basis, viz. 1. *Procamallanus* distinguished by the smooth inner wall of the buccal capsule, 2. *Onchocamallanus* distinguished by the incomplete transverse crests on the inner wall of the buccal capsule and the three chitinous projections at the base of the capsule, 3. *Spirocamallanus* distinguished by the spiral crests on the inner wall of the buccal capsule, 4. *Malayocamallanus* distinguished by the longitudinal crests on the inner wall of the buccal capsule.

So far, under the genus *Procamallanus*, 15 species are known from Indian subcontinent, of which, a key for 11 is given below. *Procamallanus cancilus* Bashirullah and Hafizuddin, 1974, and *P. karachii* Rehana and Bilqees, 1979, both of which are based on females only; and *P. khatibi* and *P. ramteki* Naidu and Murhar, 1980, both apparently based on juvenile forms, have been excluded from the key.

1. Buccal capsule with leaf crown	...	...	2
Buccal capsule without leaf crown	...	...	3
2. Spicules equal and similar	...	<i>P. mehrii</i>	
Spicules unequal and dissimilar	...	<i>P. attui</i>	
3. Spicules absent	...	<i>P. guptae</i>	
Spicules present	...	...	4
4. Spicules subequal	...	<i>P. ahiri</i>	
Spicules very unequal, buccal capsule posteriorly with complex structure	...	<i>P. bilaspurensis</i>	
Spicules equal and similar	...	...	5
Spicules unequal and dissimilar	...	...	6
Spicules unequal but similar	...	...	7
5. Caudal papillae 8 pairs	...	<i>P. planoratus</i>	
Caudal papillae 14-18 pairs	...	<i>P. muelleri</i>	
6. Caudal papillae 7 pairs	...	<i>P. spiculogubernaculus</i>	
Caudal papillae 12-18 pairs	...	<i>P. daccii</i>	
7. Gubernaculum present	...	<i>P. saccobranchi</i>	
Gubernaculum absent	...	<i>P. heteropneustus</i>	

Procamallanus ahiri Karve, 1952

(Fig. 76, A & B)

1952. *Procamallanus ahiri* Karve, *J. Univ. Bombay*, **21** (3), p. 2.

Description : Male. Body 14.85-16.03 long, 0.37-0.4 wide with anterior end truncate; mouth surrounded by two pairs of papillae; buccal capsule longer than broad, $0.13-0.17 \times 0.07-0.08$; oesophagus divided into two parts, anterior muscular 0.59-0.78 long, posterior glandular 0.77-1.05; oesophageal glands voluminous, surrounding anterior part of muscular oesophagus, some beyond nerve ring; cervical papillae 0.25-0.29, nerve ring 0.268-0.32 and excretory pore 0.63-0.65, all from

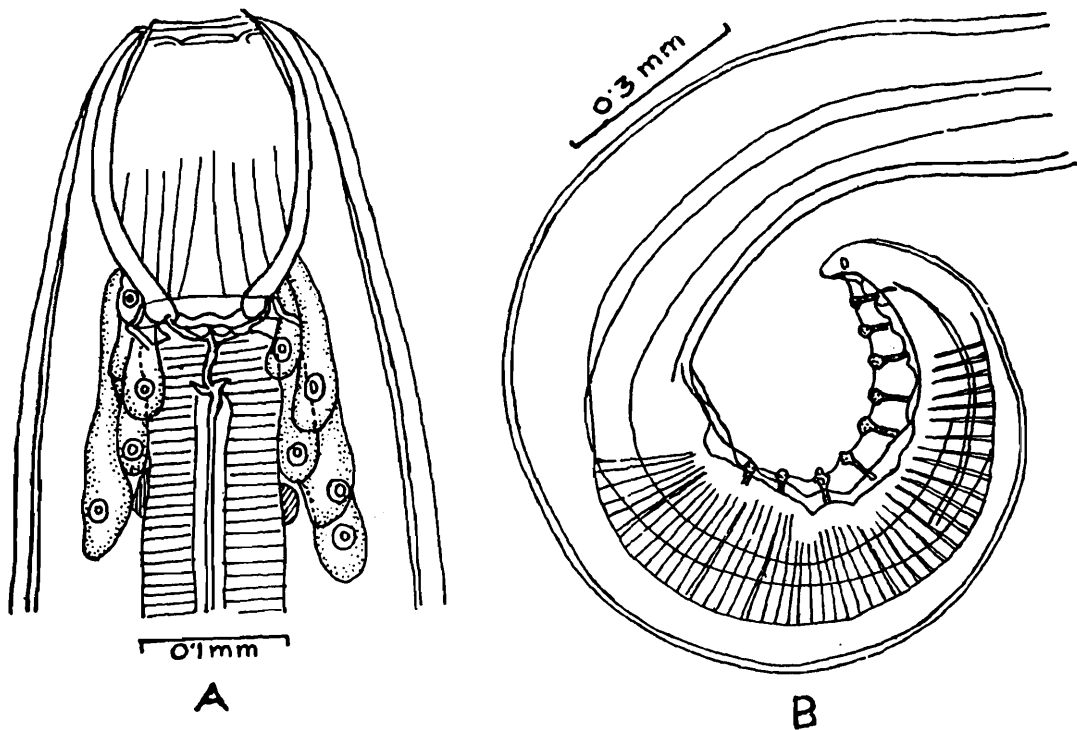


Fig. 76. *Procamallanus ahiri*. (After Karve, 1952.) A. anterior end; B. male posterior end.

anterior end; tail 0.07-0.1 long, strongly curved ventrally, with blunt rounded tip and transverse parallel muscle bands; spicules subequal, 0.35-0.38 long, right chitinated, tough, slightly longer than left, which latter feebly chitinated, wavy, very difficult to observe; gubernaculum fully chitinated, 0.058-0.064 long; caudal papillae 17 pairs pedunculate, 9 preanal, 8 postanal, and sessile postanal; additional sessile preanal papillae also.

Female. Body 19.35 long, 0.45 wide, with anterior end as in male; buccal capsule 0.19×0.13 ; oesophagus, anterior muscular 0.87 long, posterior glandular 1.14; oesophageal glands as in male; nerve ring 0.36 and cervical papillae 0.42, both from anterior end; tail 0.08 long,

tip truncated, surrounded by six short blunt projections and with three pairs of papillae a little before posterior end.

Host : *Anguilla elphinstonei*

Location : Stomach

Locality : Pune, Maharashtra

Remarks : This species has, however, not been included by Petter (1979).

***Procamallanus attui* Pande, Bhatia and Rai, 1963**

(Fig. 77)

- 1963. *Procamallanus attui* Pande et al., *Indian J. Helminth.*, **15** (2), p. 117.
- 1967. *Procamallanus attui* : Sood, *Proc. natn. Acad. Sci. India*, sec B, **37** (1-4), p. 300.
- 1969. *Procamallanus attui* : Rai, *Indian J. Helminth.*, **21** (2), p. 106.
- 1973. *Procamallanus wallagus* Rehana and Bilqees, *Sind Univ. Res. J. (Sci. ser.)*, **7** (1), p. 14.
- 1973. *Procamallanus (Procamallanus) attui* Gupta and Duggal, *Riv. Parassit.*, **34** (4), p. 301.
- 1975. *Procamallanus attui* : Akram, *Biologia, Lahore*, **21** (2), p. 98.
- 1975. *Procamallanus wallagus* : Akam, *Biologia, Lahore*, **21** (2), p. 98.
- 1976. *Procamallanus wallagus* : Bilqees, *Proc. Pakistan Acad. Sci.*, **13** (2), p. 110.
- 1977. *Procamallanus attui* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 8.
- 1977. *Spirocamallanus mehri* Gupta and Garg, *Indian J. Helminth.*, **28** (1), p. 4.
- 1979. *Procamallanus wallagus* : Rehana and Bilqees, *Pakist. J. Zool.*, **11** (2), p. 287.
- 1979. *Procamallanus attui* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, **1** (4), p. 221.
- 1980. *Procamallanus (Monospiculus) kashmirensis* Dhar and Fotedar, *Indian J. Helminth.*, **31** (1979), p. 128.

Description : Male. Body 7.0-40.0 long, 0.034-0.51 wide ; buccal capsule with 4-6 oval chitinous plates, each with 10-14 elements forming fringe-like leaf crowns ; oesophagus divided into two parts, anterior muscular 0.627-1.4 long, posterior glandular 0.57-1.4 ; nerve ring 0.23-0.481 and excretory pore 0.33-0.77, both from anterior end ; tail with caudal alae ; spicules dissimilar, unequal, right stouter, longer, 0.25-0.31 long, left needle-like, shorter, 0.1-0.191 ; gubernaculum absent ; caudal papillae costiform, 12-26 pairs, 8-15 preanal, 1-3 adanal, 3-8 postanal ; sometimes also an additional unpaired postanal sessile papilla.

Female. Body 14.50-21.7 long, 0.28-0.378 wide ; buccal capsule 0.17-0.275×0.052-0.240, and as in male ; oesophagus, anterior muscular 0.6-1.33 long, posterior glandular 0.51-1.91 ; nerve ring 0.23-0.49 and

excretory pore 0.29-0.95, both from anterior end ; tail 0.1-0.38 long, with pointed process appearing tridigitate, sometimes with pair of small papillae ; vulva 2.36-11.00 from posterior end.

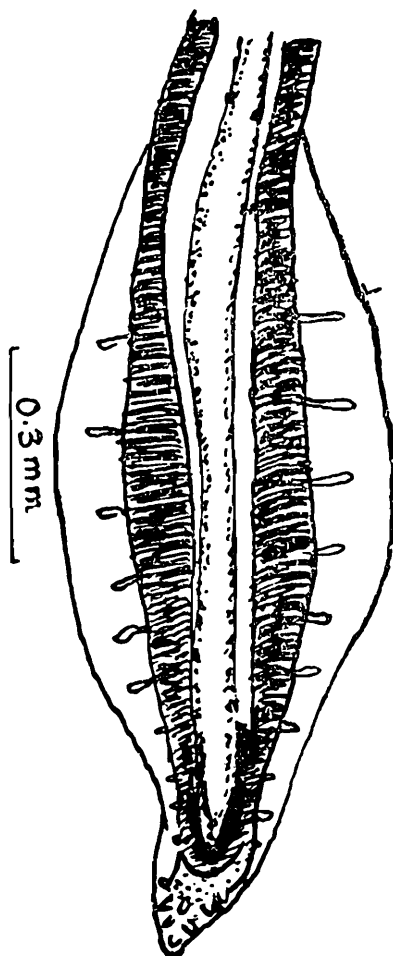


Fig. 77. *Procammallanus attui*. (After Pande, Bhatia and Rai, 1963.) Male posterior end.

Host : *Wallago attu*

Location : Air bladder, stomach & intestine

Localities : Lucknow, Mathura & Gorakhpur, U. P. ; Patiala, Panjab ; Chandigarh ; Jammu ; Sind (Pakistan).

Remarks : This species was described by Pande, Bhatia and Rai (1963) from *Wallago attu*. Karve (1941) described some males from the same host and placed them under *P. mehrii* Agarwal, 1930 which, however, were transferred under *P. attui* by Sood (1967). This has been accepted by Petter (1979) and the present author does likewise. Rehana and Bilquees (1973) described from the same host from Pakistan another species *Procammallanus wallagus* and subsequently (1979) redescribed it also from the same host, which agrees practically in all characters with the above species. Dhar and Fotedar (1980) added another species *Procammallanus (Monospiculus) kashmirensis* also from the same host

from Jammu in which they reported single spicule. As the left spicule is not readily discernible, it is better that more specimens be examined, pending which the species is treated as synonym of *P. attui*.

***Procamallanus bilaspurensis* Gupta and Duggal, 1973**

(Fig. 78, A & B)

1973. *Procamallanus* (*Procamallanus*) *bilaspurensis* Gupta and Duggal, *Riv. Parassit.*, **34** (4), p. 295.

1979. *Procamallanus bilaspurensis* Petter, *Bull. Mus. natn. Hist. nat., Paris*, **1** (4), p. 223.

Description : Male. Body 6.7-6.8 long, 0.128-0.153 wide, with smooth cuticle ; mouth with very poorly developed papillae ; buccal capsule 0.102×0.066 ; posteriorly with two transversely rounded grooves which incomplete dorsally ; oesophagus divided into two parts, anterior muscular 0.47-0.51 long, posterior glandular 0.732 ; nerve ring 0.2 from anterior end, and cervical papillae anterior to it ; excretory pore not discernible ; tail 0.061-0.066 long, with caudal alae anterior to which a bladder-like structure ; spicules dissimilar, unequal, with a ratio of 1:5, left smaller 0.028-0.031 long, right longer 0.148-0.164 ; caudal papillae pedunculate, 11 pairs, 7 preanal, 4 postanal, and sessile 5 pairs, 3 preanal, 2 postanal.

Female : Body 10.63-13.31 long, 0.164-0.204 wide, and as in male ; buccal capsule $0.128-0.143 \times 0.07$; oesophagus, anterior muscular 0.656-0.76 long, posterior glandular 1.0-1.03 ; tail 0.112-0.164 long, with alae-like thick cuticle ventrally and 3 very small spines at posterior round end ; vulva equatorial or subequatorial, 6.51-7.52 from anterior end, guarded by two well developed lobes, one on anterior, other on posterior side.

Host : *Mastacembalus armatus*

Location : Intestine

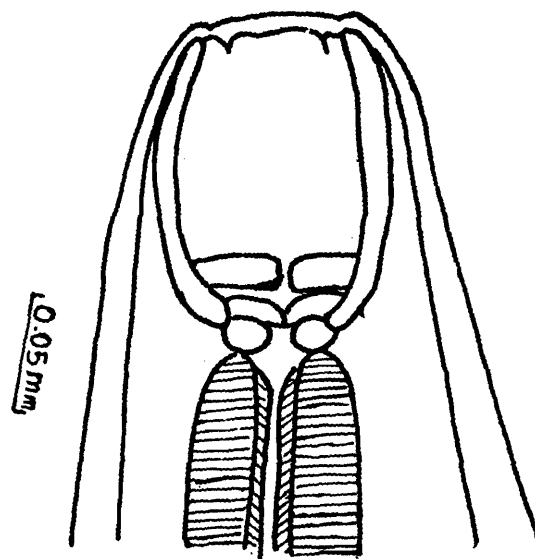
Locality : Bilaspur, H. P.

***Procamallanus cancelus* Bashirullah and Hafizuddin, 1974**

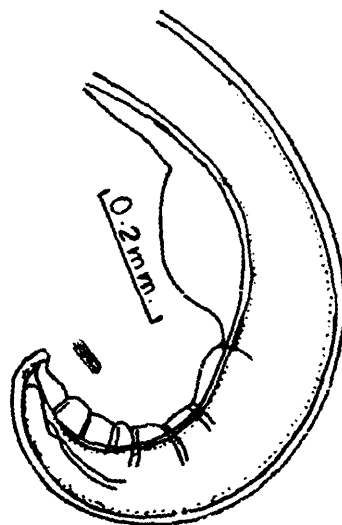
1974. *Procamallanus cancelus* Bashirullah and Hafizuddin, *Norw. J. Zool.*, **22**, p. 54.

Description : Female. Body 14.6-17.57 long, 0.44-0.51 wide ; and with prominent transverse striae ; buccal capsule $0.212-0.246 \times 0.220-0.236$, with 20 ridge-like elements at anterior rim ; oesophagus divided into two parts, anterior muscular 0.803-0.863 long, posterior glandular 0.602

-0.701 ; nerve ring 0.390-0.432, and excretory pore 0.581-0.650, both from anterior end ; tail simple, 0.075-0.111 long ; vulva post-equatorial, 8.38-10.27 from anterior end.



A



B

Fig 78. *Procammallanus bilaspurensis*. (After Gupta and Duggal, 1973.)

A. anterior end ; B. male posterior end.

Host : *Xenentodon cancila*

Location : Intestine

Locality : Dacca (Bangladesh)

Remarks : As this species is based on females only, its inclusion here is purely tentative. The species has, however, not been included by Petter (1979).

Procamallanus daccai Gupta, 1959

(Fig. 79)

- *1959. *Procamallanus daccai* Gupta, *Can. J. Zool.*, **39**, p. 775.
- 1961. *Neocamallanus heteropneusti* Chakravarty et al., *Zool. Anz.*, **166** (5/6), p. 223.
- 1963. *Procamallanus mathurai* Pande et al., *Indian J. Helminth.*, **16** (2), p. 114.
- 1963. *Procamallanus chakravartyi* Fernando and Furtado, *Z. ParasitenKde.*, **23**, p. 156.
- 1963. *Procamallanus confusus* Fernando and Furtado, *Z. ParasitenKde.*, **23**, p. 156.
- 1965. *Procamallanus hindensis* Chandan Lal, *Labdev J. Sci. Tech.*, **3** (3), p. 199.
- 1965. *Procamallanus magurii* Chandan Lal, *Labdev J. Sci. Tech.*, **3** (3), p. 199.
- 1966. *Procamallanus devendri* Sinha and Sahay, *Zool. Anz.*, **176** (5), p. 385.
- 1966. *Procamallanus (Monospiculus) heteropneusti* Sinha and Sahay, *Zool. Anz.*, **176** (5), p. 387.
- 1966. *Procamallanus (Monospiculus) devendri* Sahay, *Jap. J. med. Sci. Biol.*, **19** (3), p. 167.
- 1966. *Procamallanus (Monospiculus) heteropneusti* : Sahay, *Jap. J. med. Sci. Biol.*, **19** (3), p. 167.
- 1967. *Procamallanus daccai* : Sood, *Proc. natn. Acad. Sci. India*, **37** (1-4), sect. B, p. 298.
- 1969. *Procamallanus mathurai* : Rai, *Indian J. Helminth.*, **21** (2), p. 106.
- 1971. *Procamallanus daccai* : Verma, *Proc. natn. Acad. Sci. India*, **41**, p. 393.
- 1971. *Procamallanus ottuei* Varma and Varma, *Indian J. Anim. Res.*, **5** (1), p. 29.
- 1974. *Procamallanus sprengi* Bashirullah and Hafizuddin, *Norw. J. Zool.*, **22**, p. 53.
- 1975. *Procamallanus daccai* : Akram, *Biologia, Lahore*, **21** (2), p. 97.
- 1976. *Procamallanus daccai* : Sood et al., *J. Res. Punjab agric. Univ.*, **14** (3), p. 332.
- 1977. *Procamallanus daccai* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 9.
- 1977. *Procamallanus devendri* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 9.
- 1977. *Procamallanus mathurai* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 9.
- 1979. *Procamallanus (Monospiculus) devendri* : Bose and Sinha, *Curr. Sci.*, **48** (6), p. 275.
- 1979. *Procamallanus daccai* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, **1** (4), p. 222.
- 1980. *Procamallanus daccai* : Sood, *J. Res. Punjab agric. Univ.*, **17** (1), p. 83.

Description : Male. Body 2.58-5.29 long, 0.05-0.149 wide ; mouth surrounded by 2 lateral and 4 submedian papillae ; buccal capsule 0.048-0.075×0.025-0.053 ; oesophagus divided into two parts, anterior mus-

*To avoid undue repetitions, the species listed in Petter's (1979) have been excluded from the synonymy as they are already covered under it.

cular 0.16-0.371 long, posterior glandular 0.55-0.599 ; nerve ring 0.11-0.312 and excretory pore 0.18-0.27, both from anterior end ; tail 0.04-0.07 long, bluntly rounded, with caudal alae ; spicules dissimilar, unequal, right 0.227-0.514 long, left 0.044-0.07 ; caudal papillae 12-18 pairs, 7-10 preanal, 1-2 adanal, 4-9 postanal.

Female. Body 4.4-11.53 long, 0.11-0.256 wide ; papillae as in male ; buccal capsule 0.054-0.107 $\times$ 0.03-0.064 ; oesophagus, anterior muscular 0.26-0.658 long, posterior glandular 0.341-0.720 ; nerve ring 0.12-0.224 and excretory pore 0.2-0.29, both from anterior end, and cervical papillae in some specimens 0.102-0.228 as reported by Bashirullah and Hafizuddin (1974) ; tail 0.085-0.18 long, bluntly rounded, with 2-3 spinous processes and also with two cuticular spines 0.054-0.068 from posterior end ; vulva post-equatorial, 2.4-6.14 from anterior end.

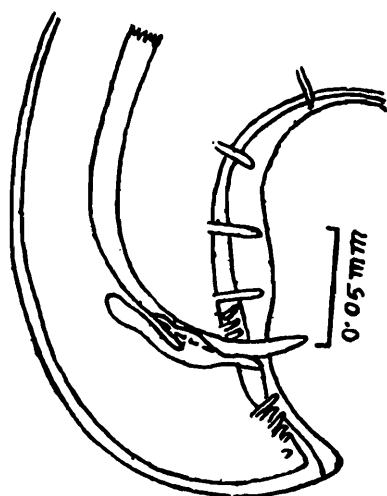


Fig. 79. *Procamlanus daccii*. (After Gupta, 1959.) Male posterior end.

Hosts : Undetermined cat fish ; *Heteropneustes fossilis* ; *Clarias batrachus* ; *Wallago attu*

Location : Intestine

Localities : Bangladesh ; Ludhiana & Ferozepur, Punjab ; Sirsa, Haryana ; Gorakhpur, Meerut, and Lucknow, U. P. ; Purnia Dist., North Bihar (though unpublished but noted by the present author)

Remarks : This species was described by Gupta (1959) from an undetermined fish from Bangladesh, and he gave postanal caudal papillae as numbering 9 pairs, a rather excessive number, and hence calling for a fuller confirmation (in the figure shown 6 only), especially the later reports of the species by Sood (1967) and Verma (1971) included only 5 pairs. Later, two other species, viz. *P. chakravartyi* Fernando and Furtado, 1963 (= *Neocamlanus heteropneusti sensu* Chakravarty, Majumdar and Sain, 1961 = *Indocamlanus heteropneusti*

Chakravarty, Mujumdar and Sain, 1963), and *P. mathurai* Pande, Bhatia and Rai, 1963, both from *Heteropneustes fossilis*, were treated as conspecific with this species by Sood (*op. cit.*) who further not only reported *P. daccai* from Lucknow, U. P., but also proposed synonymy of *P. confusus* Fernando and Furtado, 1963, with *P. daccai* which latter, however, is accepted here only tentatively. Later Sood *et al.* (1976) reported the species from Punjab. Five more species, viz. *P. hindensis* and *P. magurii* Chandan Lal, 1965; *P. devendri* Sinha and Sahay, 1966; *P. ottuei* Varma and Varma, 1971; and *P. sprengi* Bashirullah and Hafizuddin, 1974, of which only the first three were proposed by Akram (1975), are treated here as synonym of *P. daccai*. But it is possible that all the above species may prove conspecific with *P. spiculogubernaculus* Agarwal, 1958, when more details of this last species are available as remarked below under it. Till then, the species is retained as distinct. However, a comparative chart of the species shown under synonymy is included to clarify their systematic position.

***Procamallanus guptae* Arya, 1980**

(Fig. 80)

1980. *Procamallanus guptae* Arya, *Indian J. Helminth.*, 30 (1978), p. 117.

Description : Male. Body 7.5 long, 0.12 wide, with well defined cuticular striations, 0.006 apart; buccal capsule excluding basal plate 0.075 long, without chitinous lining, with pair of cephalic papillae; basal plate 0.01 wide; cervical papillae absent; oesophagus divided

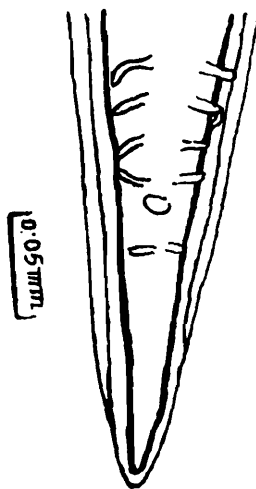


Fig. 80. *Procamallanus guptae*. (After Arya, 1980.) Male posterior end.

into two parts, anterior muscular 0.26 long, posterior glandular 0.32; nerve ring 0.142 from anterior end; excretory pore indiscernible; tail 0.125 long, tapering with blunt tip; caudal alae 0.04 from posterior end;

		<i>Procamallanus daccii</i> Gupta, 1959 ; of Sood, 1967 ; of Verma, 1971.	<i>P. mathurai</i> Pande, Bhatia and Rai, 1963.	<i>P. hindensis</i> Chandanlal, 1965.	<i>P. magurii</i> Chandanlal, 1965.	<i>P. devendri</i> Sinha and Sahay, 1966.	<i>P. ottuei</i> Varma and Varma, 1971.	<i>P. sprengi</i> Bashirullah and Hafizuddin, 1974.
		1	2	3	4	5	6	7
Body length	♂	2.58-4.5	3.2-4.1	2.7-4.0	3.36-5.29	3.2-3.5	3.56-4.27	4.40-4.93
	♀	4.11-7.39	5.0-7.8	5.1-7.1	7.14-11.53	6.4-6.8	5.0-7.6	4.99-7.36
Body width	♂	0.07-0.125	0.092-0.11	0.05-0.11	0.096-0.149	0.05-0.08	0.07-0.1	0.084-0.089
	♀	0.12-0.15	0.13-0.15	0.11-0.17	0.149-0.256	0.13-0.14	0.08-0.14	0.013-0.018
Buccal capsule length	♂	0.05-0.06	0.048-0.051	0.053-0.059	0.053-0.075	0.032-0.036	—	0.063-0.067
	♀	0.06-0.08	0.054-0.064	0.064	0.085-0.107	0.048-0.05	0.07-0.03	0.073-0.098
width	♂	0.025-0.042	0.032-0.038	0.032	0.043-0.053	0.028-0.038	—	0.036-0.045
	♀	0.03-0.05	0.04	0.043-0.059	0.048-0.064	0.03-0.032	0.04-0.05	0.048-0.052
Oesophagus length, ant. muscular	♂	0.19-0.625	0.23-0.29	0.166-0.298	0.245-0.371	0.144-0.158	0.23-0.25	0.250-0.311
	♀	0.26-0.35	0.3-0.4	0.268-0.357	0.330-0.658	0.2-0.202	0.25-0.33	0.308-0.389
Posterior glandular	♂	0.27-0.29	0.26-0.33	0.255-0.426	0.413-0.599	0.21-0.24	0.31-0.58	0.340-0.390
	♀	0.38-0.42	0.37-0.48	0.341-0.639	0.511-0.720	0.27-0.274	0.37-0.49	0.390-0.530
Nerve ring from anterior end	♂	0.11-0.13	0.12-0.13	0.138-0.170	0.149-0.213	—	0.12-0.14	0.138-0.151
	♀	0.12-0.17	0.14-0.16	0.192-0.224	0.180-0.213		0.14-0.20	0.165-0.198
Excretory pore	♂	0.18-0.25	0.24-0.27	indiscernible	indiscernible	—	0.18	0.201-0.244
	♀	0.204-0.26	0.2-0.29				0.23	0.251-0.305

		1	2	3	4	5	6	7
Tail length	♂	0.04-0.07,						0.061-0.071
	♀	0.11-0.18, and with 2-3 spinous processes	0.09-0.112	0.085-0.149, bifid	0.107-0.170, bifid	with two spi- nous processes at tip	0.08-0.14	0.116-0.161, and with 3 small spikes
Spicule length :								
Longer		0.36-0.48	0.25-0.27	0.227-0.514	0.371-0.436	0.288-0.3	0.31-0.35	0.354-0.424
Smaller		0.06-0.07	0.06-0.07	—	—	—	0.05-0.06	0.039-0.045
Caudal papillae		17-18 pairs, 7-10 preanal 1-2 adanal 5-9* postanal	12 pairs, 7 preanal 1 adanal 4 postanal	13 pairs, 9 preanal — 4 postanal	14 pairs, 9 preanal — 5 postanal	3 pairs, 8 preanal — 5 postanal	12 pairs, 7 preanal 1 adanal 4 postanal	16 pairs, 9 preanal 1 adanal 6 postanal
Vulva from anterior end		2.35-3.96	2.54-3.28	3.0-4.7	3.427-6.141	3.47-3.62	post-equatorial	2.67-3.79
Host		an undetermined fish ; <i>Heteropneustes fossilis</i>	<i>Heteropneustes fossilis</i>	<i>Heteropneustes fossilis</i>	<i>Clarias batrachus</i>	<i>Heteropneustes fossilis</i>	<i>Heteropneustes fossilis</i>	<i>Heteropneu- stes fossilis</i>

* Maximum needs definite confirmation *vide* under remarks.

spicules and gubernaculum absent ; caudal papillae pedunculate, 5 pairs, 4 preanal, 1 postanal.

Female. Body 8.0 long, 0.13 wide, with cuticular striations 0.008 apart ; buccal capsule excluding basal plate 0.088 long ; basal plate 0.012 wide ; oesophagus, anterior muscular 0.27 long, posterior glandular 0.42 ; nerve ring 0.170 from anterior end ; tail 0.21 long, tapering, with pair of bubble-shaped very small swelling at tip ; vulva post-equatorial, 2.8 from posterior end ; eggs $0.033-0.052 \times 0.018-0.02$, embryonated, oval, thin walled ; larvae 0.07-0.09 long, slender.

Host : *Schizothorax richardsoni*

Location : Intestine

Locality : Nainital, U. P.

Remarks : This species is based on a male and a female only.

***Procamallanus heteropneustus* Ali, 1957**

(Fig. 81)

- 1957. *Procamallanus (Procamallanus) heteropneustus* Ali, *Indian J. Helminth.*, **8**, p. 3.
- 1957. *Procamallanus (Procamallanus) clarius* Ali, *Indian J. Helminth.*, **8**, p. 6.
- 1966. *Procamallanus heteropneustus* Sahay, *Jap. J. med. Sci. Biol.*, **19** (3), p. 167.
- 1966. *Procamallanus clarius* Sahay, *Jap. J. med. Sci. Biol.*, **19** (3), p. 167.
- 1966. *Procamallanus heteropneustus* : Agrawal, *Proc. helminth. Soc. Wash.*, **33** (2), p. 207.
- 1967. *Procamallanus heteropneustus* : Sood, *Proc. natn. Acad. Sci. India*, **37** (1-4), sect. B, p. 299.
- 1973. *Procamallanus (Procamallanus) heteropneustus* : Gupta and Duggal, *Riv. Parasit.*, **34** (4), p. 301.
- 1973. *Procamallanus (Procamallanus) clarius* : Gupta and Duggal, *Riv. Parasit.*, **34** (4), p. 301.
- 1975. *Procamallanus heteropneustus* : Akram, *Biologia, Lahore*, **21** (3), p. 97.
- 1977. *Procamallanus clarius* : Chaturvedi and Kansal, *Rec. zool. Surv. India, Occasional Paper No. 5*, p. 8.
- [1977. *Procamallanus heteropneustus* : Chaturvedi and Kansal, *Rec. zool. Surv. India, Occasional Paper No. 5*, p. 9.
- 1979. *Procamallanus heteropneustus* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, **1** (4), p. 222.

Description : Male. Body 2.44-4.56 long, 0.089-0.1 wide ; cephalic papillae two pairs of submedians and a pair of lateral amphids ; buccal capsule 0.053-0.063 long ; oesophagus divided into two parts, anterior muscular 0.23-0.28 long, posterior glandular 0.32-0.69 ; nerve ring

0.12-0.16 and excretory pore 0.37, both from anterior end ; tail rounded with caudal alae ; spicules similar, unequal, right 0.073-0.087 long, left 0.029-0.043 ; caudal papillae 13-14 pairs, 8-10 preanal, 4-5 postanal.

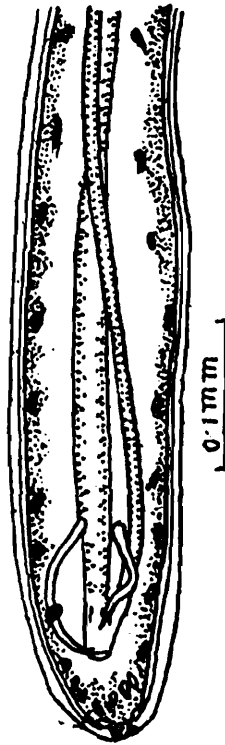


Fig. 81. *Procammallanus heteropneustus*. (After Ali, 1957.) Male posterior end.

Female. Body 5.69-7.7 long, 0.13-0.149 wide ; cephalic papillae as in male ; buccal capsule 0.058-0.071 long ; oesophagus, anterior muscular 0.36-0.39 long, posterior glandular 0.56-0.69 ; nerve ring 0.16-0.18 and excretory pore 0.46, both from anterior end ; tail 0.037 long, bluntly pointed ; vulva post-equatorial, 1.67-2.74 from posterior end, and with distinct lips.

Hosts : *Heteropneustes fossilis* ; *Clarias batrachus*

Location : Intestine

Locality : Hyderabad, Andhra Pradesh

Remarks : Ali (1957) described *Procammallanus heteropneustus* from *Heteropneustes fossilis* and *P. clarius* from *Clarias batrachus*, both from Hyderabad, as new species and separated both mainly on the basis of spicules length, and number and arrangement of caudal papillae, which differences do not merit specific distinction. Agrawal (1966), and Sood (1967) treated the latter species [redescribed by Fernando and Furtado (1963)] as conspecific with *P. heteropneustus*, which is accepted here.

Procamallanus karachii Rehana and Bilqees, 1979

1979. *Procamallanus karachii* Rehana and Bilqees, *Pakist. J. Zool.*, 11 (2), p. 284.

Description : Female. Body 5.435×0.103 ; buccal capsule 0.071×0.05 , somewhat barrel-shaped, with basal ring in form of two knob-like structures, having lower part of buccal wall thicker than anterior upper one, and posterior margin greatly thickened into a rim articulating with anterior end of oesophagus ; oesophagus 0.789×0.062 , club-shaped, muscular ; tail sharply conical with pointed projection, lacking spine ; vulva 3.472 from anterior end.

Host : *Wallago attu*

Location : Swim bladder

Locality : Kalri Lake, Sind (Pakistan)

Remarks : As this species is based on a single female only, its inclusion here is purely tentative.

Procamallanus khatibi Naidu and Murhar, 1980

1980. *Procamallanus khatibi* Naidu and Murhar, *Riv. Parassit.*, 41 (1), p. 105.

Description : Male. Body 3.255 long, 0.090 wide ; buccal capsule 0.045×0.030 ; oesophagus divided into two parts, anterior muscular 0.270 long, posterior glandular 0.300 ; nerve ring 0.120, and excretory pore 0.190, both from anterior end ; caudal alae narrow ; spicule single, 0.054 long ; gubernaculum absent ; caudal papillae pedunculate, 7 pairs, 5 preanal, 2 postanal.

Female. Body 4.445-7.000 long, 0.097-0.120 wide ; buccal capsule $0.060-0.075 \times 0.037-0.045$; oesophagus, anterior muscular 0.255-0.330 long, posterior glandular 0.330-0.390 ; nerve ring 0.165-0.195, and excretory pore 0.255-0.285, both from anterior end ; tail 0.105-0.135 long ; vulva 2.430-3.450 from anterior end ; eggs $0.021-0.024 \times 0.018-0.021$.

Host : *Heteropneustes fossilis*

Location : Stomach wall

Locality : Muddi tank, Ramtek, Dist. Nagpur, Maharashtra

Remarks : The specimens do not seem to have attained full maturity, but from the description it appears that they belong to a species akin to *P. daccii* Gupta, 1959.

Procamallanus mehrii Agarwal, 1930

1930. *Procamallanus mehrii* Agarwal, *Allahabad Univ. Stud.*, **6**, 2 (Sci. Sect.), p. 59.
1939. *Procamallanus mehrii* : Baylis, *F. B. I.*, **2**, p. 218.
1954. *Procamallanus mehrii* : Khera, *An. Esc. nac. Cienc. biol.*, **8** (3-4), p. 243.
1957. *Procamallanus (Isospiculus) mehrii* Ali, *Indian J. Helminth.*, **8** p. 16.
1966. *Procamallanus mehrii* : Agrawal, *Proc. helminth. Soc. Wash.*, **33** (2), p. 207.
1966. *Procamallanus mehrii* : Sahay and Narayan, *Ranchi U. Jour.*, **3**, p. 64.
1966. *Procamallanus mehrii* : Sahay, *Jap. J. med. Sci. Biol.*, **19** (3), p. 167.
1969. *Procamallanus mehrii* : Rai, *Indian J. Helminth.*, **21** (2), p. 106.
1975. *Procamallanus mehrii* : Akram, *Biologia, Lahore*, **21** (2), p. 98.
1977. *Procamallanus mehrii* : Chaturvedi and Kansal, *Rec. zool. Surv. India, Occasional Paper No. 5*, p. 9.
1979. *Procamallanus mehrii* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, **1** (4), p. 221.

Description : Male. Body 16.0-19.0 long, 0.32-0.36 wide ; buccal capsule 0.17×0.17 , cup-shaped, with leaf crowns, and anteriorly with 4 chitinous plates ; oesophagus divided into two parts, anterior muscular 0.92-1.14 long, posterior glandular 0.8-1.02 ; nerve ring 0.27-0.32, and excretory pore 0.48-0.5, both from anterior end ; tail 0.1 long, with caudal alae ; spicules equal, 0.255 long ; caudal papillae 11 pairs, an unpaired one near tip of tail.

Female. Body 33.0-40.0 long, 0.425-0.75 wide ; buccal capsule $0.312-0.355 \times 0.2-0.212$, and as in male ; oesophagus, anterior muscular 1.55-1.71 long, posterior glandular 1.41-1.52 ; nerve ring 0.50-0.54, and excretory pore 0.96-1.2, both from anterior end ; cervical papillae prominent ; tail 0.23-0.248 long, digitate ; vulva post-equatorial, 10.0-14.8 from posterior end, and immediately in front with a thickened cuticle forming a "crenated" swelling ventrally ; dorsal swelling reported by Agarwal (1930) not observed both by Khera (1954), and Sahay and Narayan (1966).

Host : *Wallago attu*

Location : Intestine, air bladder & body cavity

Localities : Lucknow, U. P. ; Patna, Bihar

Remarks : This species was described by Agarwal (1930) from *Wallago attu*. Khera (1954) described females from the same host from Lucknow, U. P., and Sahay and Narayan (1966) also described females from the same host from Patna, Bihar. Karve (1941) wrongly referred some males from the same host to the species which, however, were not accepted by Sood (1967), and Petter (1979).

Procamallanus muelleri Agrawal, 1966

(Fig. 82, A & B)

1966. *Procamallanus muelleri* Agrawal, *Proc. helminth. Soc. Wash.*, **32** (2), p. 204.
 1975. *Procamallanus muelleri* : Akram, *Biologia, Lahore*, **21** (2), p. 97.
 1977. *Procamallanus muelleri* : Chaturvedi and Kansal, *Rec. zool. Surv. India, Occasional Paper No. 5*, p. 9.
 1979. *Procamallanus muelleri* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, **1** (4), p. 228.

Description : Male. Body 4.64 long, 0.11 wide ; mouth surrounded by two lateral and four submedian papillae ; buccal capsule 0.07×0.04 ; oesophagus divided into two parts, anterior muscular 0.27 long,

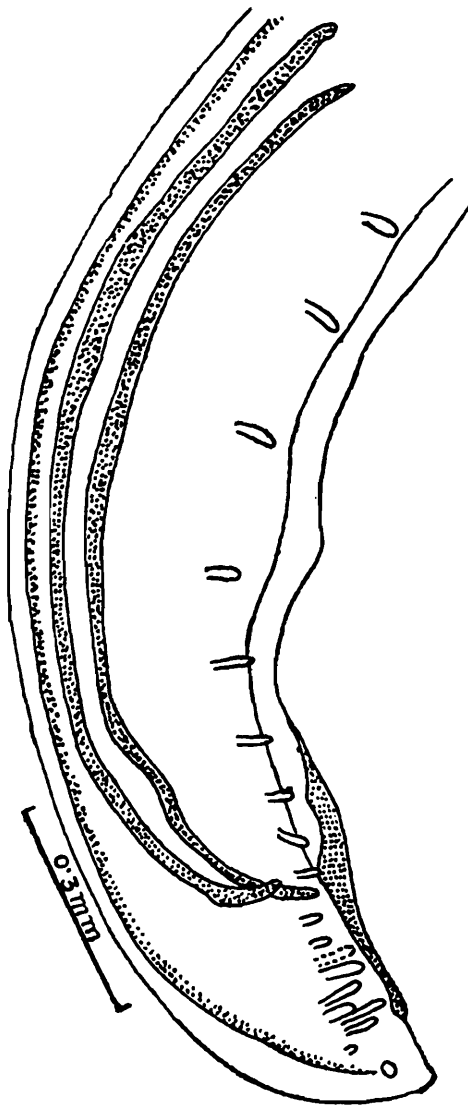


Fig. 82. *Procamallanus muelleri*. (After Agrawal, 1966.) Male posterior end.

posterior glandular 0.24 ; nerve ring 0.12 and excretory pore 0.18, both from anterior end ; tail 0.13-0.22 long, bluntly rounded, with caudal alae ; spicules similar, equal, 1.40-1.41 long ; caudal papillae pedunculate, 14-18 pairs, 8-9 preanal, 1 adanal, 5-7 postanal, sessile 2 pairs around anal aperture ; pair of phasmids.

Female. Body 3.56-6.54 long, 0.11-0.17 wide ; buccal capsule 0.057-0.07×0.04-0.05 ; oesophagus, anterior muscular 0.28-0.31 long, posterior glandular 0.31-0.39 ; nerve ring 0.13-0.16 and excretory pore 0.17-0.21, both from anterior end ; tail 0.10-0.15 long, bluntly rounded, with two small spinous processes ; vulva post-equatorial, 1.98-3.61 from anterior end.

Host : *Heteropneustes fossilis*

Location : Stomach

Locality : Lucknow, U. P.

***Procamallanus planoratus* Kulkarni, 1935**

1935. *Procamallanus planoratus* Kulkarni, *Proc. Indian Acad. Sci.*, **2**, p. 29.
 1939. *Procamallanus planoratus* : Baylis, *F. B. I.*, **2**, p. 219.
 1952. *Procamallanus planoratus* : Karve, *J. Univ. Bombay*, **21** (3), p. 9.
 1956. *Procamallanus planoratus* : Kulasiri and Fernando, *Parasitology*, **46**, p. 420, 422.
 1957. *Procamallanus (Isospiculus) planoratus* Ali, *Indian J. Helminth.*, **8** p. 16.
 1966. *Procamallanus planoratus* : Sahay, *Jap. J. med. Sci. Biol.*, **19** (3), p. 167.
 1975. *Procamallanus planoratus* : Akram, *Biologia, Lahore*, **21** (2), p. 97.
 1977. *Procamallanus planoratus* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 9.
 1977. *Spirocamallanus planoratus* Gupta and Garg, *Indian J. Helminth.*, **28** (1), p. 7.
 1979. *Procamallanus planoratus* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, **1** (4), p. 222.

Description : Male. Body 3.85 long, 0.061 wide ; buccal capsule 0.082×0.061, with basal ring in form of two knob-like structures ; oesophagus 0.41 long ; nerve ring 0.24 and excretory pore 0.31, both from anterior end ; tail bluntly rounded ; spicules equal, 0.12 long ; caudal papillae 8 pairs, 7 preanal, 1 postanal.

Female. Body 5.0-7.45 long, 0.079-0.082 wide ; buccal capsule 0.082-0.09×0.052-0.061, with basal ring as in male ; oesophagus 0.41-0.79 long ; nerve ring 0.19-0.24, cervical papillae 0.21 and excretory pore 0.31-0.32, all from anterior end ; tail 0.1-0.11 long, with three small spines and pair of papillae ; vulva 1.4-3.5 from posterior end, with prominent lobe on anterior lip.

Hosts : *Clarias batrachus* ; *C. teysmanni* ; *Channa punctatus* ;
C. striatus

Location : Intestine

Localities : Nagpur, Maharashtra ; Sri Lanka

Remarks : This species was first described from *Clarias batrachus* from Nagpur by Kulkarni (1935), and subsequently reported from the same host and same locality by Karve (1952), and from three more fish hosts from Sri Lanka by Kulasiri and Fernando (1956).

***Procamallanus ramteki* Naidu and Murhar, 1980**

1980. *Procamallanus ramteki* Naidu and Murhar, *Riv. Parassit.*, 41 (1), p. 108.

Description : Male. Body 2.690 long, 0.067 wide, with cuticular striations 0.003 apart ; buccal capsule 0.045×0.030 ; oesophagus divided into two parts, anterior muscular 0.225 long, posterior glandular 0.285 ; nerve ring 0.150, and excretory pore 0.225, both from anterior end ; caudal alae narrow ; spicules two, equal, 0.285 long ; gubernaculum Y-shaped, with equal arms, 0.180 long ; caudal papillae 3 pairs.

Female. Body 5.530-6.055 long ; 0.090-0.105 wide ; with cuticular striations 0.003-0.005 apart ; head 0.030 in diameter ; buccal capsule $0.075-0.082 \times 0.060-0.067$; oesophagus, anterior muscular 0.300-0.375 long, posterior glandular 0.525-0.575 ; nerve ring 0.180-0.210, and excretory pore 0.315-0.360, both from anterior end ; vulva post-equatorial, 3.090-3.450 from anterior end ; vulval appendage 0.180-0.195.

Host : *Heteropneustes fossilis*

Location : Stomach wall

Locality : Muddi tank, Ramtek, Dist. Nagpur, Maharashtra

Remarks : The specimens do not seem to have attained full maturity, but from the description it appears that they represent a species coming closer to *P. spiculogubernaculus* Agarwal, 1958.

***Procamallanus saccobranchi* Karve, 1952**

(Fig. 83)

1952. *Procamallanus saccobranchi* Karve, *J. Univ. Bombay*, 21 (3), p. 6.

Description : Male. Body 4.2 long, 0.07 wide, truncated at anterior end ; papillae 2 pairs around mouth ; buccal capsule 0.065×0.037 ; oesophagus divided into two parts, anterior muscular 0.21 long, posterior glandular 0.33 ; nerve ring 0.16 from anterior end ; tail 0.08 long, strongly curved, digitate, with well developed caudal alae and transverse parallel muscle bands ; spicules unequal, right 0.32 long, stout, chitinated, left 0.17, slender, very feebly chitinated ; gubernaculum present ; caudal papillae 17 pairs, 9 preanal, 8 postanal.

Female. Body 6.7 long, 0.15 wide ; buccal capsule 0.075×0.05 ; anterior end as in male ; oesophagus, anterior muscular 0.27 long, posterior glandular 0.36 ; nerve ring 0.18 from anterior end ; tail 0.11 long, with three blunt, somewhat thick, small processes ; vulva 3.30 from posterior end.

Host : *Heteropneustes fossilis*

Location : Intestine

Locality : Nagpur, Maharashtra

Procamallanus spiculogubernaculus Agarwal, 1958

1958. *Procamallanus spiculogubernaculus* Agarwal, *Curr. Sci.*, **27**, p. 348.
1960. *Procamallanus spiculogubernaculus* : Yeh, *J. Helminth.*, **34** (1/2), p. 116.
1963. *Procamallanus spiculogubernaculus* : Fernando and Furtado, *Z. ParasitKde*, **23**, p. 142.
1966. *Procamallanus spiculogubernaculus* : Agrawal, *Proc. helminth Soc. Wash.*, **33**, p. 207.
1973. *Procamallanus (Procamallanus) spiculogubernaculus* Gupta and Duggal, *Riv. Parassit.*, **34** (4), p. 300.
1977. *Procamallanus spiculogubernaculus* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 10.
1979. *Procamallanus spiculogubernaculus* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, **1** (4), p. 222.

Description : Male. Body 3.68 long, 0.08 wide ; buccal capsule 0.06×0.036 ; oesophagus divided into two parts, anterior muscular 0.24 long, posterior glandular 0.3 ; nerve ring 0.12 from anterior end ; tail blunt, conical ; caudal alae absent ; spicules two, right 0.334 long, left 0.05 ; gubernaculum 0.05 long, separate or incompletely fused with smaller spicule ; caudal papillae 7 pairs, 4 preanal, 3 postanal (sometimes indiscernible as given under remarks).

Female. Body 4.84 long, 0.088 wide ; buccal capsule 0.08×0.048 ; oesophagus 0.46 long ; nerve ring 0.142 and excretory pore 0.232, both from anterior end ; tail 0.1 long, tapering, pointed, bifid at tip ; vulva post-equatorial, 2.64 from anterior end, markedly elevated on body.

Hosts : *Heteropneustes fossilis* ; *Clarias teysmanni*

Location : Intestine

Localities : Allahabad, U. P. ; Sri Lanka

Remarks : Agarwal (1958) inadequately described this species from *Heteropneustes fossilis* from Allahabad, U. P., and subsequently it was reported from Sri Lanka by Yeh (1960) from another freshwater fish, *Clarias batrachus*. Pande, Bhatia and Rai (1963) while describing their

species *P. mathurai* from the same host compared it with the above species submitting that further examination of Agarwal's inadequately described species may prove their species as its conspecific. But, the present author has examined several specimens from the same host from Bihar and all these were immature and make it very likely that

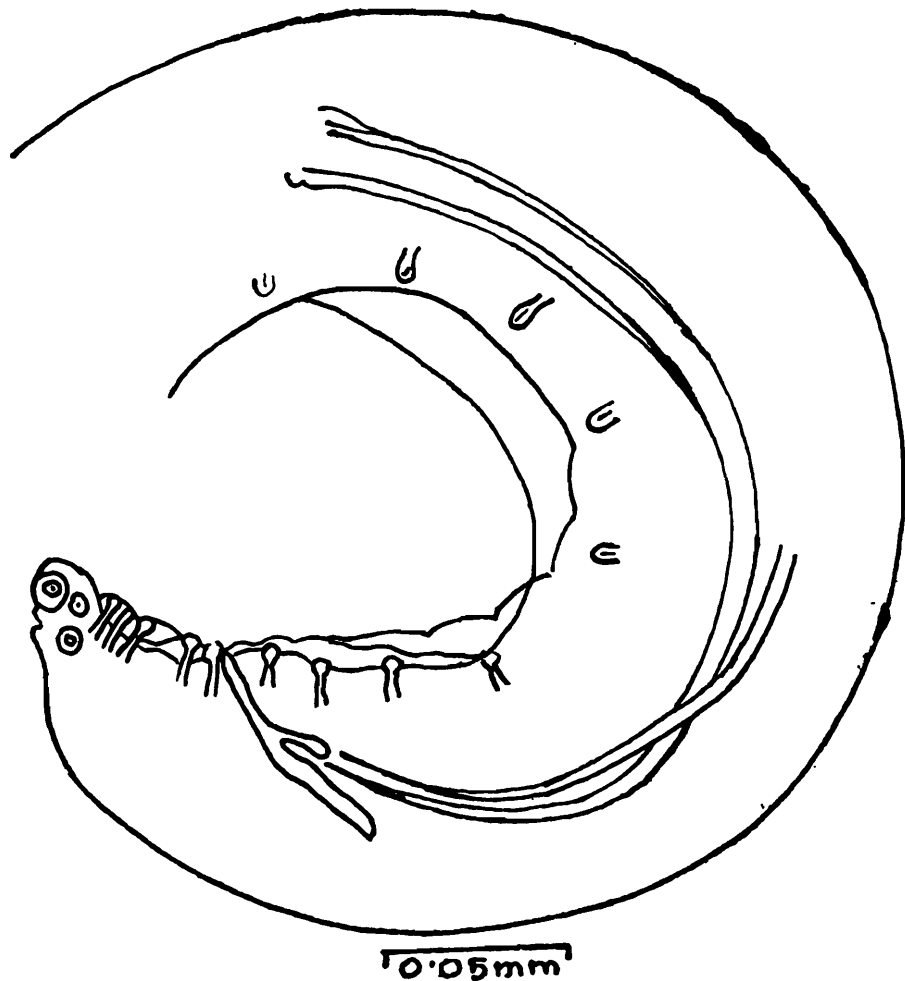


Fig. 83. *Procammallanus saccobranchi*. (After Karve, 1952.) Male posterior end.

Agarwal's were also juveniles since structural details tally excepting that the gubernaculum is unattached to smaller spicule and caudal papillae are not discernible. So, it is necessary to examine fully mature specimens to confirm its validity. Hence, it is not possible to accept *P. confusus* Fernando and Furtado, 1963, as its synonym as held by Sahay *et al.* (1970). Further, it is possible that *P. daccai* Gupta, 1959, and all the other species already shown under its synonymy may prove conspecific with it when more adult details are available.

Genus *Spirocammallanus* Olsen, 1952

Baylis (1923) erected the genus *Procammallanus* with *P. laeviconchus* (Wedl, 1862) as its type species. Olsen (1952) on the basis of presence or absence of spiral thickenings in buccal capsule split the genus into two,

Procamallanus for forms lacking thickenings and *Spirocamallanus* for those showing their presence. But, Khera (1955), Ali (1957, 1960), Chakravarty and Majumdar (1960), Chakravarty *et al.* (1961), Yamaguti (1961), Agrawal (1966), Sood (1967), Bilqees *et al.* (1971), Akram (1975), Ashraf *et al.* (1977), and Rehana and Bilqees (1979) disagreed to the splitting, the first two authors pointing out that spiral thickenings are not the only structures found on the walls of the buccal capsule. *Spirocamallanus* was given the rank of subgenus by Sahay (1966), and Kalyankar (1971), and it was given the status of genus by Yeh (1960), Sinha and Sahay (1965), Sahay (1967), Khan and Yaseen (1969), Freitas and Ibanes (1970), Ivashkin *et al.* (1971), Khan and Begum (1971), Majumdar and Datta (1972), Bashirullah (1973), Bashirullah and Hafizuddin (1973), Zaidi and Khan (1975), Chabaud (1975), Kalyankar and Palladwer (1977), and currently upheld by Petter (1979), who further separated from *Spirocamallanus* members of the genus having transverse spiral thickenings into a separate genus *Onchocamallanus* and this is followed here. Dhar and Fotedar (1980), Arya (1980), and Bashirullah and Williams (1980) too accepted the genus *Spirocamallanus*. Hitherto, 16 species are known under the genus from this area, of which a key for 12 is given below. *S. spiralis* Baylis, 1923, *S. neobuccalis* (Bilqees, Fatima and Rehana, 1977), *S. kerri* (Pearse, 1933), and *S. kalriai* (Rehana and Bilqees, 1979), all based on females only, have been excluded.

1. Spicule single	...	<i>S. crossorhombi</i>	
Spicules double	...	...	2
2. Gubernaculum present	...	...	3
Gubernaculum absent	...	...	4
3. Spicules unequal and somewhat dissimilar	...	<i>S. alii</i>	
Spicules unequal but similar	...	<i>S. mysti</i>	
4. Spicules unequal but similar	...	...	5
Spicules unequal and dissimilar	...	...	8
5. Buccal capsule with finger-shaped thickenings	...	<i>S. ditchelli</i>	
Buccal capsule without finger-shaped thickenings	...	...	6
6. Caudal papillae 10 pairs	...	<i>S. sparus</i>	
Caudal papillae 11 pairs	...	...	7
7. Adanal papillae conspicuous	...	<i>S. pereirei</i>	
Adanal papillae totally absent	...	<i>S. vachai</i>	

8. Buccal capsule with finger-shaped thickenings	...	<i>S. gubernaculus</i>
Buccal capsule without finger-shaped thickenings.	...	... 9
9. Caudal papillae 6 pairs	...	<i>S. sihami</i>
Caudal papillae 9 pairs	...	<i>S. dussumieri</i>
Caudal papillae 10-14 pairs	...	<i>S. singhi</i>
Caudal papillae numerous	...	<i>S. otolithi</i>

***Spirocamallanus alii* (Kalyankar, 1971) Petter, 1978**

(Fig. 84)

1971. *Procamallanus* (*Spirocamallanus*) *alii* Kalyankar, *Marathwada Univ. J.*, **10** (3), p. 91.
1975. *Procamallanus alii* Akram, *Biologia, Lahore*, **21** (2), p. 98.
1978. *Spirocamallanus alii* Petter, *Bull. Mus. natn. Hist. nat., Paris*, ser. 3 (515), p. 319, 326.
1979. *Spirocamallanus alii* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, **1** (4), p. 226.
1980. *Spirocamallanus alii* : Bashirullah and Williams, *J. Helminth.*, **54** (4), p. 249.

Description : Male. Body 8.0-15.62 long ; head 0.12-0.16 in diameter ; oesophagus divided into two parts, anterior muscular 0.33-0.55 long, posterior glandular 0.52-0.67 ; nerve ring 0.225-0.32 and cervical papillae 0.15-0.16, both from anterior end ; tail 0.17-0.22 long, rounded, with finger-like projection having two spines ; caudal alae 0.52-0.55 × 0.040-0.045 ; spicules two, slightly sclerotized, somewhat dissimilar, unequal, 0.18-0.26 and 0.23-0.45 long ; gubernaculum 0.035-0.045 ; caudal papillae pedunculate, 11-13 pairs, 3 preanal, 2-4 adanal, 4-6 postanal.

Female. Body 10.01-15.58 long, 0.50-0.56 wide ; oesophagus, anterior muscular 0.63-0.64 long, posterior glandular 0.69-0.84 ; cervical papillae 0.14-0.15 and nerve ring 0.30-0.32, both from anterior end ; tail 0.19 long ; vulva 7.40-8.14 from anterior end.

Hosts : *Johnius carutta* ; *J. dussumieri* ; *Polynemus indicus*

Location : Intestine

Localities : Ratnagiri, Bombay, Maharashtra ; Khulna (Bangladesh) ; Kuala Lumpur & Penang (Malaysia)

Remarks : This species was originally described under the genus *Procamallanus* by Kalyankar (1971) who treated *Spirocamallanus* as its subgenus. But, Petter (1978) holding *Spirocamallanus* as a separate genus transferred the species under it and also reported the species from a new locality. Khan and Yaseen, (1969) named their specimens from

Polynemus [= *Polydactylus*] *indicus* from Khulna (Bangladesh) incorrectly as *Spirocamallanus mazabukae* Yeh, 1957, later renamed as *Procamallanus mazabukae* by Bilqees, Khanum and Jehan (1971), and upheld by Rehana and Bilqees (1979), but Petter (1978, 1979) correctly rectified it as *S. alii*.

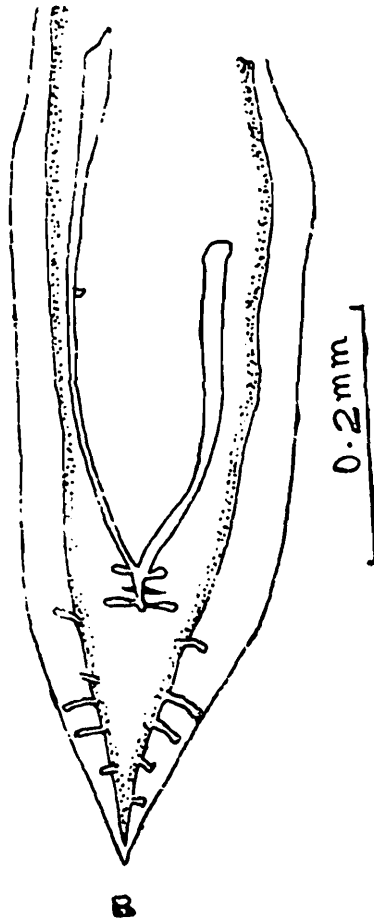


Fig. 84. *Spirocamallanus alii*. (After Kalyankar, 1971.) Male posterior end.

***Spirocamallanus crossorhombi* Zaidi and Khan, 1975**

(Fig. 85, A & B)

1975. *Spirocamallanus crossorhombi* Zaidi and Khan, *Pakist. J. Zool.*, 7 (1), p. 6.

Description : Male. Body 13.920-13.990 long, 0.187-0.189 wide ; buccal capsule oval, yellowish in colour, $0.071-0.072 \times 0.06-0.062$, and with 13 spiral thickenings ; buccal ring 0.007 long, 0.043 wide ; oesophagus divided into two parts, anterior muscular 0.423 long, posterior glandular 0.542 ; tail 0.028 long, and with caudal alae ; spicule single, 0.326 long, and tapering distally to fine point ; caudal papillae pedunculate, 9 pairs, 2 preanal, 3 adanal, 4 postanal.

Host : *Crossorhombus azureus*

Location : Intestine

Locality : Fish Harbour, Karachi (Pakistan)

Remarks : This species based on males only, needs further elaboration until which it is kept separate.

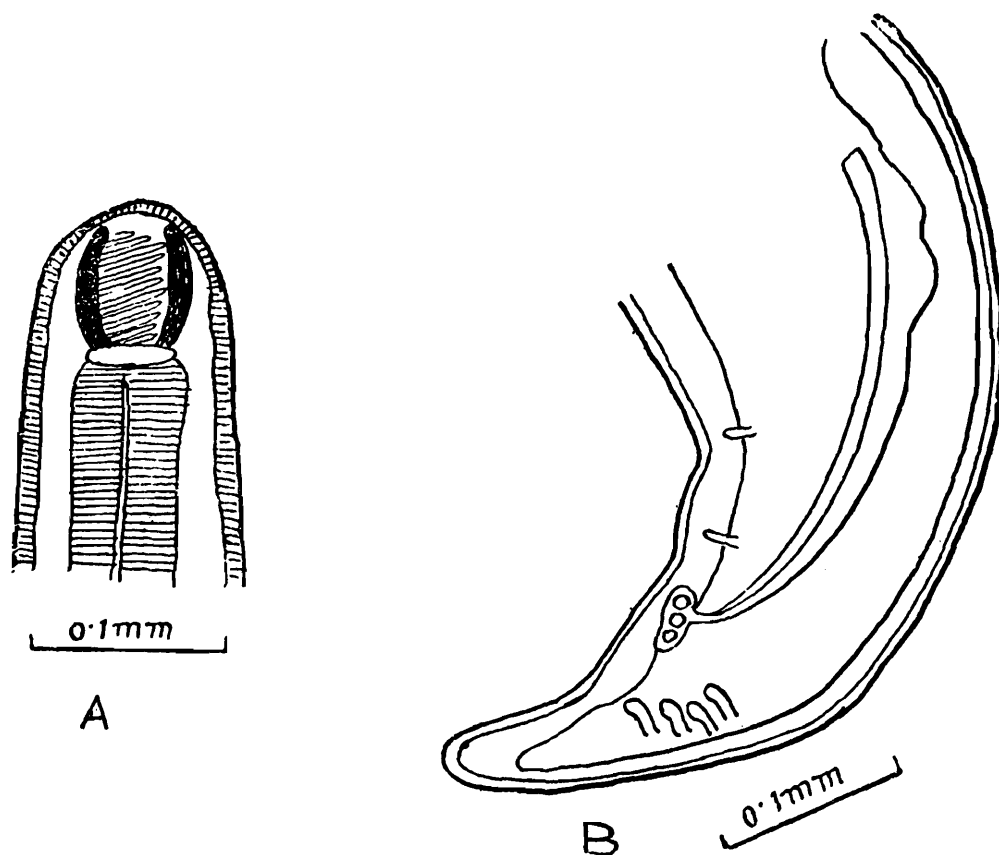


Fig. 85. *Spirocamallanus crossorhombi*. (After Zaidi and Khan, 1975.) A. anterior end ; B. male posterior end.

***Spirocamallanus ditchelli* Gupta and Garg, 1977**

(Fig. 86, A & B)

1977. *Spirocamallanus ditchelli* Gupta and Garg, *Indian J. Helminth.*, 28 (1976), p. 1.

Description : Male. Body 6.485-7.488 long, 0.089-0.109 wide ; buccal capsule 0.032×0.015 -0.026, with pair of lateral finger-shaped thickenings parallel to it ; buccal sinus absent ; oesophagus divided into two parts, anterior muscular 0.147-0.198 long, posterior glandular 0.243-0.288 ; nerve ring 0.115-0.167 from anterior end ; tail curved ventrally, with two spines ; caudal alae well developed ; spicules unequal, right feebly chitinised, 0.109-0.160 long, left 0.044-0.053 ; caudal papillae pedunculate, 7 pairs, 3 preanal, 4 postanal, sessile, 2 pairs preanal, several postanal.

Female. Body 5.312-11.394 long, 0.154-0.216 wide ; buccal capsule 0.038 - 0.045×0.018 -0.032 ; oesophagus, muscular 0.218-0.307 long, gland-

ular 0.269-0.365 ; tail 0.019 long, rounded, with caudal appendage having two spines ; vulva pre-equatorial, 2.624-4.684 from anterior end.

Host : *Pellona ditchella*

Location : Intestine

Locality : Port Blair, Andaman and Nicobar Islands

***Spirocamallanus dussumieri* (Bilquees, Khanum and Jehan, 1971)
Petter, 1979**

1971. *Procamallanus dussumieri* Bilquees et al., *J. Sci. Karachi*, **1** (1), p. 180.

1975. *Procamallanus dussumieri* : Akram, *Biologia, Lahore*, **21** (2), p. 98.

1979. *Spirocamallanus dussumieri* Petter, *Bull. Mus. natn. Hist. nat., Paris*, **1** (4), p. 228.

Description : Male. Body 14.4 long, 0.33 wide, posteriorly rounded with knob-like structure ; buccal capsule 0.091×0.078 , with 13 spiral

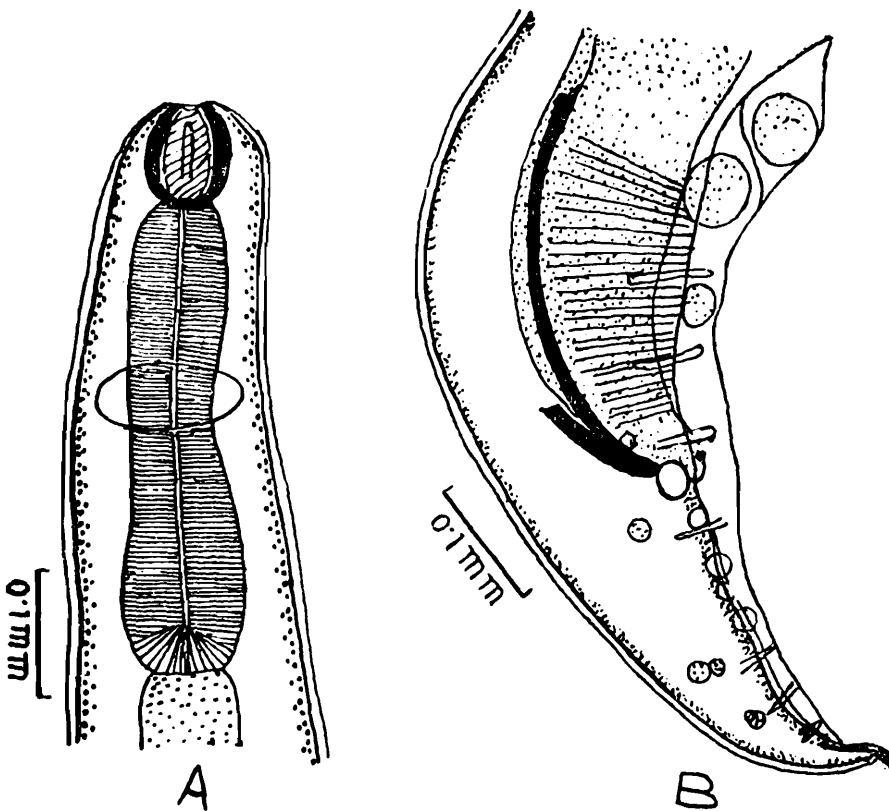


Fig. 86. *Spirocamallanus ditchelli*. (After Gupta and Garg, 1977.) A. anterior end ; B. male posterior end.

thickenings ; oesophagus undivided, 0.585 long ; tail 0.17 long, without caudal alae ; cloacal opening surrounded by prominent muscles ; spicules unequal, longer 0.13 long, shorter 0.10 ; caudal papillae 9 pairs.

Host : *Johnius dussumieri*

Location : Intestine

Locality : Karachi coast (Pakistan)

Remarks : As this species is not only based on a single male, but also inadequately described, its inclusion here is purely tentative. The author's figure shown as Posterior end of male actually appears of female as already remarked by Petter (1979).

***Spirocamallanus gubernaculus* (Khera, 1955)**

(Fig. 87, A & B)

- 1955. *Procamallanus gubernaculus* Khera, *An. Esc. nac. Cienc. biol., Mex.*, 8, p. 245.
- 1961. *Neocamallanus gubernaculus* Chakravarty et al., *Zool. Anz.*, 166 (5/6), p. 223.
- 1965. *Spirocamallanus gubernaculus* Sinha and Sahay, *Indian J. Helminth.*, 17 (1), p. 52.
- 1966. *Procamallanus gubernaculus* : Sahay, *Jap. J. med. Sci. Biol.*, 19 (3), p. 167.
- 1966. *Spirocamallanus chauhani* Sahay, *Jap. J. med. Sci. Biol.*, 19 (3), p. 167.
- 1967. *Spirocamallanus gubernaculus* : Sahay, *Indian J. Helminth.*, 18 (1966), p. 115, 119.
- 1967. *Spirocamallanus chauhani* : Sahay, *Indian J. Helminth.*, 18 (1966), p. 120.
- 1967. *Procamallanus gubernaculus* : Sood, *Proc. natn. Acad. Sci. India*, 37, p. 294.
- 1968. *Procamallanus gubernaculus* : Sood, *Indian J. Helminth.*, 20 (2), p. 94.
- 1973. *Procamallanus (Procamallanus) gubernaculus* Gupta and Duggal, *Riv. Parassit.*, 34 (4), p. 301.
- 1974. *Procamallanus gubernaculus* : Sood, *Indian J. Helminth.*, 24 (1972), p. 78.
- 1975. *Procamallanus gubernaculus* : Akram, *Biologia, Lahore*, 21 (2), p. 98.
- 1977. *Procamallanus gubernaculus* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 9.
- 1977. *Spirocamallanus chauhani* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 10.
- 1977. *Spirocamallanus gubernaculus* : Gupta and Garg, *Indian J. Helminth.*, 28 (1976), p. 11.
- 1977. *Spirocamallanus chauhani* : Gupta and Garg, *Indian J. Helminth.*, 28 (1976), p. 12.
- 1977. *Spirocamallanus gubernaculus* : Bashirullah, *Excerta Parasitologica Memoria Doctor ECY Caballero*, p. 398.
- 1977. *Spirocamallanus chauhani* : Bashirullah, *Excerta Parasitologica Memoria Doctor ECY Caballero*, p. 398.
- 1979. *Spirocamallanus gubernaculus* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, 1 (4), p. 225.
- 1980. *Spirocamallanus gubernaculus* : Bashirullah and Williams, *J. Helminth.*, 54 (4), p. 249.

Description : Male. Body 3.75-10.79 long, 0.09-0.14 wide ; mouth surrounded by six papillae, four submedian, two lateral ; buccal capsule 0.049-0.0855×0.025-0.05, elongated, barrel-shaped, with 16-18

spiral thickenings and pair of lateral finger-shaped thickenings parallel to longitudinal axis; oesophagus divided into two parts, anterior muscular 0.27-0.432 long, posterior glandular 0.39-0.765; nerve ring 0.11-0.18, cervical papillae 0.39 and excretory pore 0.165-0.34, all from anterior end; tail 0.04-0.06 long, tapering, blunt, with caudal alae; spicules two, dissimilar, unequal, right 0.17-0.301 long, left 0.0585-0.07; caudal papillae 11-12 pairs, 5-7 preanal, 5-6 postanal.

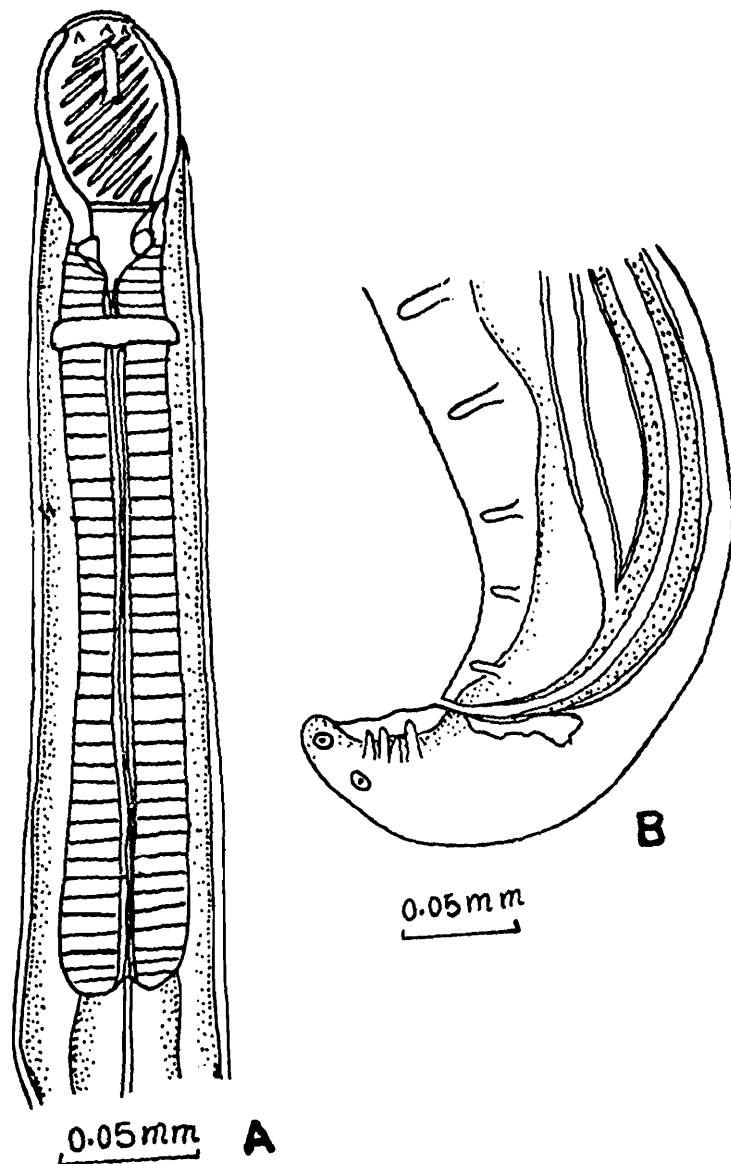


Fig. 87. *Spirocamallanus gubernaculus*. (After Khera, 1955.) A. anterior end; B. male posterior end.

Female. Body 6.67-18.25 long, 0.08-0.19 wide; buccal capsule as in male, $0.06-0.0923 \times 0.03-0.05$; oesophagus, anterior muscular 0.28-0.568 long, posterior glandular 0.49-1.0968; nerve ring 0.113-0.37, cervical papillae 0.13-0.3 and excretory pore 0.15-0.28, all from anterior end; tail 0.07-0.175 long, sometimes with pair of papillae at tip; vulva 1.3-8.45 from anterior end.

Hosts : *Rita rita* ; *Mystus cavasius* ; *Notopterus notopterus*

Location : Intestine

Localities : Lucknow, U. P. ; Patna, Bihar ; Hooghly river, West Bengal

Remarks : This species was described by Khera (1955) from *Rita rita* from Lucknow, and subsequently reported from another host, *Mystus cavasius* by Sood (1968) who also treated *S. chauhani* Sahay, 1966, as its synonym, a fact noted by Petter (1979) and also accepted here. Again, this species was reported by Sood (1974) from another fish host, *Notopterus notopterus* from Lucknow. Akram (1975) treated three other species, *Spirocamallanus gomtii* and *S. fasciatusi* (Sood, 1967), and *S. ompoci* Majumdar and Datta, 1972, as its synonym. The present author, however, holds these three species as conspecific with *S. singhi* (Ali, 1957) till examination of more material.

A comparative chart of the species shown under synonymy is given.

		<i>Spirocamallanus gubernaculus</i> (Khera, 1955)	<i>S. gubernaculus</i> (of Sood, 1968)	<i>S. chauhani</i> Sahay, 1966.
Body length :	♂	8.5	4.25-4.31	10.79
	♀	18.25	7.59-9.06	14.79
Body width :	♂	0.109	0.09-0.1	0.126
	♀	0.141	0.19-0.20	0.140
Oesophagus length	♂	0.41	0.27-0.32	0.432
anterior muscular :	♀	0.28	0.31-0.39	0.568
Posterior glandular :	♂	0.645	0.39-0.44	0.765
	♀	0.925	0.49-0.60	1.0968
Nerve ring from ant. end :	♂	0.155	0.11-0.13	1.180
	♀	0.113	0.13-0.145	0.2013
Excretory pore from ant. end :	♂	—	0.16	—
	♀	0.2	0.17-0.19	—
Cervical papillae from ant. end :	♂	0.39	—	—
	♂	0.3	—	—
Tail length :	♂	—	0.025-0.33	—
	♀	0.175	0.07-0.81 with 2 spinous processes	with 2 bifurcated projections
Spicule length Right :		0.29	0.21-0.22	0.301
Left :		0.066	0.065-0.07	0.0585
Caudal papillae :		11 pairs, 5 preanal 6 postanal	12 pairs 7 preanal 5 postanal	12 pairs, 6 preanal 6 postanal
Vulva from ant. end :		10.25	4.81-5.70	8.441
Host :		<i>Rita rita</i>	<i>Mystus cavasius</i>	<i>Mystus cavasius</i>

***Spirocamallanus kalriai* (Rehana and Bilqees, 1979)**

1979. *Procamallanus kalriai* Rehana and Bilqees, *Pakist. J. Zool.*, **11** (2), p. 281.

Description : Female. Body 11.92×0.172 ; buccal capsule 0.068×0.033 , elongated, barrel-shaped, with basal ring having two knob-like structures on either side ; oesophagus divided into two parts, anterior muscular, club-shaped, 0.309×0.068 , posterior glandular, slender, 0.516×0.069 ; nerve ring 0.172 from anterior end ; tail ending conically having two small spiny structures at posterior end ; vulva post-equatorial, 6.948 from anterior end.

Host : *Wallago attu*

Location : Swim bladder

Locality : Kalri lake, Sind (Pakistan)

Remarks : As this species is based on a single female only, its inclusion here is purely tentative.

***Spirocamallanus kerri* (Pearse, 1933) Olsen, 1952**

1933. *Procamallanus kerri* Pearse, *J. Siam. Soc.*, **9**, p. 189.

1952. *Spirocamallanus kerri* Olsen, *Publs. Inst. mar. Sci. Univ. Tex.*, **11**, p. 196.

1970. *Spirocamallanus kerri* : Rasheed, *Revta Soc. mex. Hist. nat.*, **31**, p. 204.

1977. *Spirocamallanus kerri* : Gupta and Garg, *Indian J. Helminth.*, **28** (1976), p. 14.

1979. *Spirocamallanus kerri* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, **1** (4), p. 228.

Description : Female. Body 5.45 long ; buccal capsule barrel-shaped, continuous, having two sets of oblique spiral thickenings on inner wall ; oesophagus divided into two parts, anterior muscular 0.29 long, posterior glandular 0.32 ; vulva at junction of first and second third of body ; tail constricted near middle with two spinous processes at tip.

Host : *Glossogobius giuris*

Location : Intestine

Locality : Paknam

Remarks : This species described by Pearse (1933) as *Procamallanus kerri* from *Glossogobius giuris* from Siam (now Thailand) was transferred by Olsen (1952) under the genus *Spirocamallanus*. Yamaguti (1961), however, retained its original status, but Rasheed (1970), Gupta and Garg (1977), and Petter (1979) followed Olsen (*op. cit.*) and this is accepted here. It may, however, be noted that Rasheed (*op. cit.*) has already pointed out the similarity in female tail tips between *S. kerri* and *S. pereirei*, but the description of the former species is inadequate for a proper comparison, thus necessitating study of more material.

Spirocamallanus mysti (Karve, 1952)

(Fig. 88)

1952. *Procamallanus mysti* Karve, *J. Univ. Bombay*, 21 (3), p. 5.
 1967. *Procamallanus vittatusi* Sood, *Proc. natn. Acad. Sci. India*, 37 (B), 3, p. 291.
 1973. *Procamallanus* (*Procamallanus*) *vittatusi* Gupta and Duggal, *Riv. Parassit.*, 34 (4), p. 301.
 1975. *Procamallanus vittatusi* : Akram, *Biologia, Lahore*, 21 (2), p. 98.
 1977. *Procamallanus vittatusi* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 10.

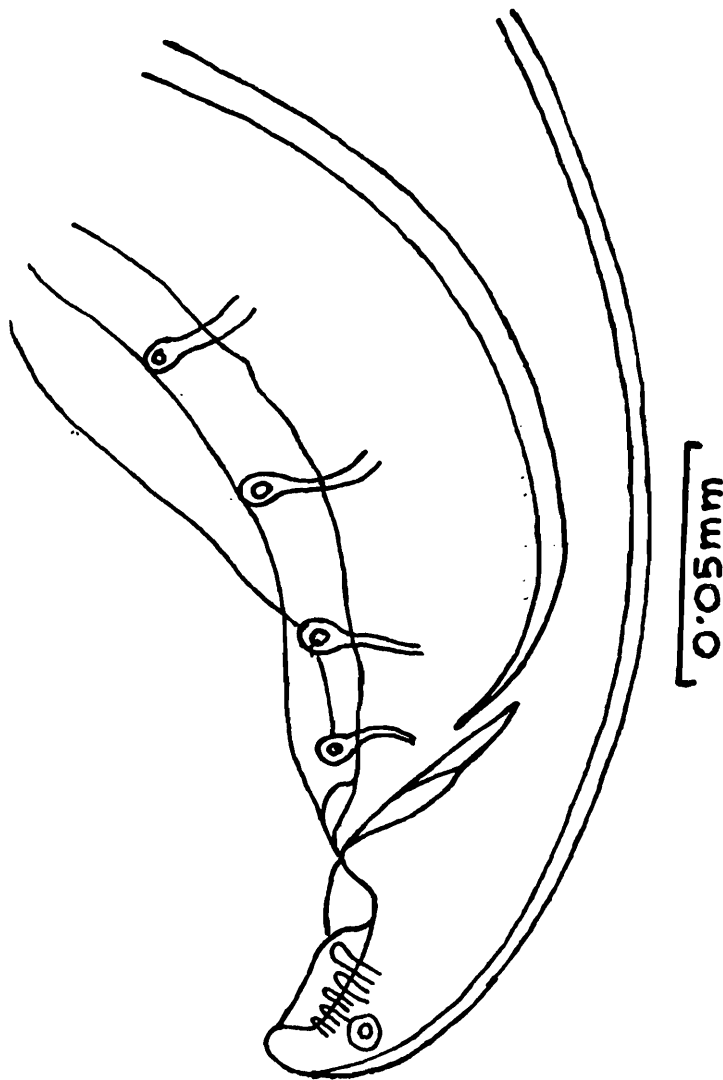


Fig. 88. *Spirocamallanus mysti*. (After Karve, 1952.) Male posterior end.

Description : Male. Body 4.51-6.1 long, 0.07-0.09 wide ; mouth with two lateral, four submedian papillae ; buccal capsule with discontinuous ridges, $0.04-0.05 \times 0.02-0.03$; oesophagus divided into two parts, anterior muscular 0.23-0.24 long, posterior glandular 0.31-0.35 ; nerve ring 0.11-0.14 and excretory pore 0.13, both from anterior end ; tail 0.04-0.065 long, broadly rounded at tip ; caudal alae well developed ;

spicules similar, sharply pointed at posterior end, unequal, right 0.18-1.02 long, left 0.065-0.13 ; gubernaculum 0.058-0.06 long ; caudal papillae 13-15 pairs, 7-9 preanal, 6 postanal.

Female. Body 5.23-7.3 long, 0.12-0.16 wide ; buccal capsule 0.06-0.07 $\times$ 0.025-0.05 ; oesophagus, anterior muscular 0.28-0.33 long, posterior glandular 0.4-0.52 ; nerve ring 0.145-0.16 and excretory pore 0.16-0.19, both from anterior end ; tail 0.044-0.068 long, bluntly rounded at tip, with 2-3 spinous processes, sometimes with pair of caudal papillae ; vulva post-equatorial, 2.73-4.52 from anterior end.

Hosts : *Mystus cavasius* ; *M. vittatus*

Location : Intestine

Localities : Pune, Maharashtra ; Lucknow, U. P.

Remarks : Karve (1952) described his new species as *Procamallanus mysti* from *Mystus cavasius* from Pune, Maharashtra. Sood (1967) added another species *P. vittatusi* from the same generic host from Lucknow, U. P. But, as both the species agree in most of the characters excepting size of spicules which, however, needs confirmation, Sood's species is tentatively treated as conspecific with *S. mysti*.

***Spirocamallanus neobuccalaris* (Bilqees, Fatima and Rehana, 1977)**

1977. *Procamallanus neobuccalaris* Bilqees et al., *Pakist. J. Zool.*, 9 (2), p. 170.

Description : Male. Body 14.16-19.8 long, 0.60-1.02 wide ; buccal capsule 0.096 $\times$ 0.072-0.084, with twelve spiral thickenings, two teeth, one on each side, and anteriorly with 3 conical processes ; oesophagus divided into two parts, anterior muscular 0.048-0.064 long, posterior glandular 0.78-1.04 ; nerve ring 0.216-0.288 from anterior end ; tail 0.192-0.24 long, bluntly rounded, with spike at tip 0.042-0.055 long having two spine-like structures ; vulva 6.06-6.09 from anterior end ; eggs rounded, 0.024-0.032 in diameter.

Host : *Protonibea diacanthus*

Location : Intestine

Locality : Karachi coast (Pakistan)

Remarks : As this species is based on females only, its inclusion here is purely tentative.

***Spirocamallanus otolithi* (Ashraf, Farooq and Khanum, 1977)**

1977. *Procamallanus otolithi* Ashraf et al., *Biologia, Lahore*, 23 (2), p. 114.

Description : Male. Body 25.71-27.05 long, 0.22-0.24 wide ; buccal capsule excluding basal ring 0.075-0.076 $\times$ 0.066-0.074, with eleven spiral

ridges on each side, and having 3 teeth-like structures anteriorly ; basal ring 0.004×0.057 ; oesophagus divided into two parts, anterior muscular 0.405-0.435 long, posterior glandular 0.571-0.615 ; nerve ring 0.029-0.318 from anterior end ; tail 0.185 long, with caudal alae and forked tip ; spicules two, dissimilar, unequal, longer 0.45 long, shorter 0.22 ; caudal papillae numerous, sessile.

Host : *Otolithes argenteus*

Location : Intestine

Locality : Karachi coast (Pakistan)

Remarks : This inadequately described species based on two males only, requires further elaboration until when it is retained here as distinct.

***Spirocamallanus pereirei* (Annereaux, 1946) Olsen, 1952**

1946. *Procamallanus pereirei* Annereaux, *Trans. Am. microsc. Soc.*, 69, p. 299.

1952. *Spirocamallanus pereirei* Olsen, *Publs. Inst. mar. Sci. Univ. Tex.*, 11, p. 197.

1957. *Procamallanus pereirei* : Ali, *Indian J. Helminth.*, 8, p. 15.

1960. *Spirocamallanus pereirei* : Noble and King, *J. Parasit.*, 46, p. 679.

1970. *Spirocamallanus pereirei* : Rasheed, *Revta Soc. mex. Hist. nat.*, 31, p. 199.

1978. *Spirocamallanus pereirei*, Fusco and Overstreet, *J. Parasit.*, 64 (2), p. 239.

1979. *Spirocamallanus pereirei* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, ser. 4, 1 (1), p. 227.

1980. *Spirocamallanus pereirei* : Bashirullah and Williams, *J. Helminth.*, 54 (4), p. 249.

Description : Male. Body 10.5-14.0 long, 0.31-0.35 wide ; buccal capsule $0.038-0.46 \times 0.074-0.075$; oesophagus divided into two parts, anterior muscular 0.41-0.49 long, posterior glandular 0.76-0.85 ; cervical papillae 0.12-0.15, nerve ring 0.27-0.28, and excretory pore 0.5-0.53, all from anterior end ; tail 0.2-0.23 long, with caudal alae ; spicules two, similar, unequal, 0.23-0.29 and 0.41-0.47 long ; caudal papillae 11 pairs, 3 preanal, 2 adanal, 6 postanal.

Female. Body 10.5-20.0 long ; buccal capsule $0.071-0.081 \times 0.077-0.092$; oesophagus, anterior muscular 0.45-0.53 long, posterior glandular 0.55-0.86 ; cervical papillae 0.12-0.13, nerve ring 0.28-0.31, and excretory pore 0.5-0.53, all from anterior end ; tail 0.2-0.26 long ; vulva 6.9-9.3 from anterior end.

Hosts : *Mugil speigleri* ; *Pomadasys hasta* ; *Otolithes ruber*

Location : Intestine

Locality : Karachi (Pakistan)

***Spirocamallanus sihamai* Khan and Begum, 1971**

(Fig. 89, A-C)

1971. *Spirocamallanus sihamai* Khan and Begum, *Bull. Dep. Zool. Panjab Univ.*, article 5, p. 5.
 1979. *Spirocamallanus sihamai* : Rehana and Bilqees, *Pakist. J. Zool.*, **11** (2), p. 2.

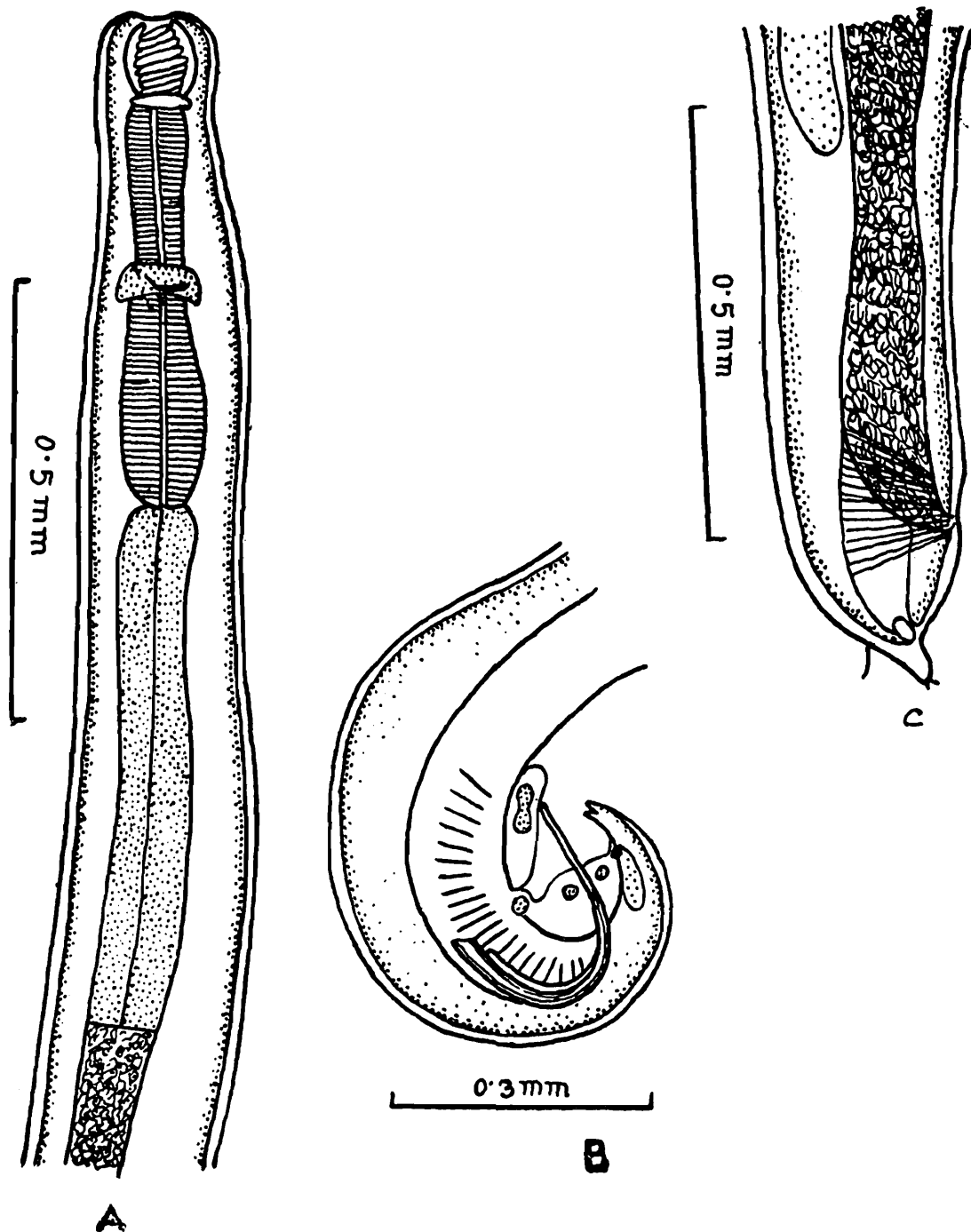


Fig. 89. *Spirocamallanus sihamai*. (After Khan and Begum, 1971.) A. anterior end. B. male posterior end ; C. female posterior end.

Description : Male. Body 14.130 long, 0.236 wide ; buccal capsule 0.071×0.061 , anteriorly with two lateral teeth, 0.009 long ; oesophagus divided into two parts, anterior muscular 0.421 long, posterior glandular 0.557 ; nerve ring 0.309 from anterior end ; tail 0.136 long with caudal

alae and set of muscles, having slightly forked tip ; spicules two, dissimilar, unequal, right thicker 0.394 long, left thinner 0.111 ; caudal papillae 6 pairs, 4 preanal, 2 postanal.

Female. Body 14.701 long, 0.340 wide ; buccal capsule 0.074×0.071 ; oesophagus 1.133 long ; tail 0.190 long, bluntly rounded, with small forked spike 0.040 long ; vulva pre-equatorial.

Host : *Sillago sihama*

Location : Intestine

Locality : Karachi (Pakistan)

Remarks : This species is based on a male and a female.

Spirocamallanus singhi (Ali, 1957)

(Fig. 90)

- *1957. *Procamallanus* (*Procamallanus*) *singhi* Ali, *Indian J. Helminth.*, 8, p. 9.
- 1957. *Procamallanus* (*Procamallanus*) *hyderabadensis* Ali, *Indian J. Helminth.*, 8, p. 11.
- 1957. *Procamallanus* (*Procamallanus*) *viviparus* Ali, *Indian J. Helminth.*, 8, p. 13.
- 1965. *Spirocamallanus singhi* Sinha and Sahay, *Indian J. Helminth.*, 17 (1), p. 52.
- 1965. *Spirocamallanus hyderabadensis* Sinha and Sahay, *Indian J. Helminth.*, 17 (1), p. 52.
- 1965. *Spirocamallanus viviparus* Sinha and Sahay, *Indian J. Helminth.*, 17 (1), p. 52.
- 1966. *Procamallanus hyderabadensis* Sahay, *Jap. J. med. Sci. Biol.*, 19 (3), p. 168.
- 1966. *Procamallanus singhi* Sahay, *Jap. J. med. Sci. Biol.*, 19 (3), p. 168.
- 1966. *Procamallanus viviparus* Sahay, *Jap. J. med. Sci. Biol.*, 19 (3), p. 168.
- 1966. *Procamallanus singhi* : Agrawal, *Proc. helminth. Soc. Wash.*, 33 (2), p. 204.
- 1967. *Spirocamallanus singhi* : Sahay, *Indian J. Helminth.*, 18 (1966), p. 119.
- 1967. *Spirocamallanus hyderabadensis* : Sahay, *Indian J. Helminth.*, 18 (1966), p. 119.
- 1967. *Procamallanus gontii* Sood, *Proc. natn. Acad. Sci. India*, 37 (B), III, p. 294.
- 1967. *Procamallanus fasciatusi* Sood, *Proc. natn. Acad. Sci. India*, 37 (B), III, p. 295.
- 1967. *Procamallanus singhi* : Sood, *Proc. natn. Acad. Sci. India*, 37 (B), III, p. 296.
- 1969. *Procamallanus viviparus* : Khan and Yaseen, *Bull. Dep. Zool. Panjab Univ.*, article 4, p. 15.
- 1972. *Spirocamallanus ompoci* Majumdar and Datta, *Acta parasit. pol.*, 20 (19), p. 199.
- 1973. *Procamallanus* (*Procamallanus*) *singhi* : Gupta and Duggal, *Riv. Parassit.*, 34 (4), p. 302.

*To avoid undue repetitions, the species listed in Petter's (1979) have been excluded from the synonymy as they are already covered under it.

1973. *Procamallanus* (*Procamallanus*) *viviparus* : Gupta and Duggal, *Riv. Parassit.*, **34** (4), p. 302.
1973. *Procamallanus* (*Procamallanus*) *hyderabadensis* : Gupta and Duggal, *Riv. Parassit.* **34** (4), p. 302.
1973. *Spirocamallanus timmi* Bashirullah, *Am. Midl. Nat.*, **90** (1), p. 221.
1973. *Spirocamallanus viviparus* : Bashirullah, *Bangladesh J. Zool.*, **1** (1), p. 72.
1973. *Spirocamallanus timmi* : Bashirullah, *Bangladesh J. Zool.* **1** (1), p. 72.
1973. *Spirocamallanus olsen* Bashirullah, *Am. Midl. Nat.*, **90** (1), p. 223.
1973. *Spirocamallanus* (*Procamallanus*) *singhi* Bashirullah, *Am. Midl. Nat.*, **90** (1), p. 223.
1973. *Spirocamallanus intestinecolae* Bashirullah, *Am. Midl. Nat.*, **92** (1), p. 256.
1973. *Spirocamallanus notopteri* Bashirullah and Hafizuddin, *Riv. Parassit.*, **34** (2), p. 115.
1973. *Spirocamallanus inglisi* Bashirullah and Hafizuddin, *Riv. Parassit.*, **34** (2), p. 117.
1973. *Spirocamallanus inglisi* : Bashirullah, *Bangladesh J. Zool.*, **1** (1), p. 71.
1975. *Procamallanus bengalensis* Akram, *Biologia, Lahore*, **21** (2), p. 93.
1975. *Procamallanus singhi* : Akram, *Biologia, Lahore*, **21** (2), p. 98.
1977. *Procamallanus fasciatus* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 9.
1977. *Procamallanus gontii* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 9.
1977. *Procamallanus hyderabadensis* ; Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 9.
1977. *Procamallanus singhi* Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 9.
1977. *Procamallanus viviparus* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 10.
1977. *Spirocamallanus singhi* : Gupta and Garg, *Indian J. Helminth.*, **28** (1), p. 9.
1977. *Spirocamallanus hyderabadensis* : Gupta and Garg, *Indian J. Helminth.*, **28** (1), p. 15.
1979. *Spirocamallanus singhi* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, **1** (4), p. 225.
1980. *Spirocamallanus singhi* : Bashirullah and Williams, *J. Helminth.*, **54** (4), p. 249.
1980. *Spirocamallanus ompoki* : Bashirullah and Williams, *J. Helminth.*, **54** (4), p. 252.

Description : Male. Body 2.3-12.11 long, 0.07-0.15 wide ; buccal capsule 0.035-0.085 long ; oesophagus divided into two parts, anterior muscular 0.16-0.41 long, posterior glandular 0.23-0.772 ; nerve ring 0.066-0.198 and excretory pore 0.15-0.426, both from anterior end ; tail 0.028-0.047 long, with caudal alae ; spicules two, dissimilar, unequal,

right 0.12-0.28 long, left 0.042-0.102 ; caudal papillae 10-14 pairs, 6-7 preanal, 0-3 adanal, 3-7 postanal.

Female. Body 3.03-17.99 long, 0.07-0.241 wide ; buccal capsule 0.05-0.109 long ; oesophagus, anterior muscular 0.20-0.750 long, posterior glandular 0.25-0.990 ; nerve ring 0.09-0.210 and excretory pore 0.16-0.486, both from anterior end ; vulva 1.9-12.91 from anterior end ; tail 0.04-0.16 long, with two small processes at tip.

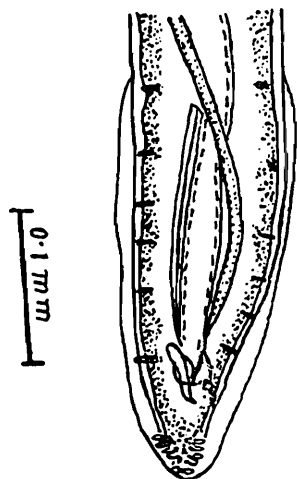


Fig. 90. *Spirocamallanus singhi*. (After Ali, 1957.) Male posterior end.

Hosts : *Eutropiichthys vachai* ; *Trichogaster fasciatus* ; *Mystus cavasius* ; *M. seenghala* ; *M. vittatus* ; *M. microphthalmus* ; *Channa striatus* ; *Ompok bimaculatus* ; *Heteropneustes fossilis* ; *Notopterus notopterus* ; *Clupisoma murius*

Location : Intestine

Localities : Lucknow, U. P. ; Hyderabad, Andhra Pradesh ; Dacca & Sylhet (Bangladesh)

Remarks : This species was originally described by Ali (1957) from *Ompok bimaculatus* from Hyderabad, Andhra Pradesh, and subsequently described under different names by several workers as included under the synonymy. Those in the author's opinion are based on minor variations and hence conspecific with the above species. This is all the more so since no comparative study, urgently much desired, of all the species concerned has been undertaken, and also due to referring one sole structure by two different terms e. g., "left spicule" and "gubernaculum" resulting in conflict and ambiguity. It is not clear how Khan and Yaseen (1969) referred their female specimens from *Heteropneustes fossilis* from Dacca (Bangladesh) having smooth buccal capsule to this species showing spiral thickenings. Further, Akram (1975) treated only *S. timmi* and *S. olseni* Bashirullah, 1973, as its synonym and also named the latter species as *Procamallanus bengalensis*

		<i>Spirocammallanus singhi</i> (Ali, 1957)	<i>S. singhi</i> (of Sood, 1967)	<i>S. hyderabadensis</i> (Ali, 1957)	<i>S. viviparus</i> (Ali, 1957)	<i>S. gombii</i> (Sood, 1967)	<i>S. fasciatus</i> (Sood, 1967)
Body length :	♂	5.9-6.68	5.85-8.05	3.03-3.13	2.3-3.19	3.47	2.62-3.21
	♀	6.152-6.92	12.37-13.59	5.58-6.01	4.98-5.27	4.38	3.03-3.59
Body width :	♂	0.133-0.143	0.10-0.15	0.077	0.093-0.092	0.07	0.07-0.08
Oesophagus :	♀	0.166-0.170	0.19-0.21	0.130	0.183-0.211	0.1	0.07-0.1
	♂	0.305-0.316	0.37-0.41	0.24-0.31	0.20-0.23	0.306	0.16-0.22
ant. muscular	♀	0.44-0.48	0.54-0.55	0.269-0.37	0.29-0.31	0.48	0.195-0.24
post. glandular	♂	0.38-0.40	0.64-0.66	0.35-0.42	0.25-0.29	0.37	0.23-0.32
	♀	0.61-0.64	1.01-1.05	0.37-0.40	0.41-0.48	0.57	0.27-0.34
Nerve ring from	♂	0.105-0.107	0.14-0.16	0.066-0.069	0.098-0.11	0.134	0.09-0.11
ant. end :	♀	0.161-0.170	0.18-0.19	0.13-0.138	0.133-0.138	0.13	0.09-0.135
Excretory pore from	♂	0.31	0.20-0.23	0.20	0.26	0.168	0.15-0.17
ant. end :	♀	0.45	0.25-0.29	0.26	0.29	0.21	0.16-0.19
Tail length :	♂	0.039-0.041	0.06-0.07	0.068	—	0.033	0.03-0.04
	♀	0.025-0.028, with 2 small pro- jections at tip.	0.09-0.16, with 2 spinous processes.	0.036	with 3 minute processes	0.077, with 2 spinous processes.	0.04-0.05, with 2 spinous processes.
Spicule : Right		0.20-0.205	0.22-0.258	0.18-0.20	0.186	0.184	0.12-0.16
left		0.012-0.044	0.05-0.054	0.042-0.050	0.069	0.043	0.061-0.069
Caudal papillae		11 pairs, 7 preanal	10 pairs, 6 preanal	10 pairs, 6 preanal	10 pairs, 6 preanal	10 pairs, 6 preanal	14 pairs, 6 preanal
		—	—	—	—	—	3 adanal
		4 postanal	4 postanal	4 postanal	4 postanal	4 postanal	5 postanal
Vulva from ant. end.		—	7.59-7.81	—	—	3.09	1.9-2.32
Egg		—	—	—	—	—	—
Host		<i>Ompok bimaculatus</i>	<i>Mystus seenghala</i>	<i>M. seenghala</i>	<i>M. microphthalmus</i>	<i>Eutropiichthys vacha</i>	<i>Trichogaster fasciatus</i>

<i>S. ompoci</i> Majumdar and Datta, 1972	<i>S. timmi</i> Bashirullah,, 1973.	<i>S. intestinecolas</i> Bashirullah, 1973 [= <i>S. olseni</i> Bashirullah, 1973 ; = <i>S. bengalensis</i> (Akram, 1975)],	<i>S. notopteri</i> Bashirullah and Hafizuddin, 1973.	<i>S. inglisi</i> Bashirullah and Hafizuddin, 1973.
4.16-5.38	3.45-6.13	3.56-4.21	5.26	12.03-12.11
6.67-8.78	5.51-9.12	4.51-5.55	6.52-7.85	14.93-17.99
0.10-0.11	0.13-0.17	0.079-0.082	0.102	0.11-0.12
0.08-0.15	0.12-0.19	0.117-0.119	0.283-0.291	0.160-0.241
0.39-0.40	0.227-0.290	0.201-0.216	0.364	0.660-0.680
0.42-0.44	0.33-0.41	0.259-0.274	0.269-0.321	0.687-0.750
0.45	0.279-0.410	0.298-0.313	0.680	0.756-0.772
0.45	0.56-0.67	0.459-0.474	0.601-0.627	0.854-0.990
0.18	0.120-0.160	0.099-0.106	0.145	0.182-0.198
0.22-0.37	0.108-0.170	0.121-0.131	0.130-0.167	0.186-0.210
0.25-0.34	0.181-0.201	0.164-0.183	0.219	0.412-0.426
0.15-0.28	0.145-0.165	0.244-0.271	0.266-0.289	0.445-0.486
0.04-0.06	0.03-0.047	0.070-0.090	0.044	0.028-0.044
0.06, bifurcated at tip	0.03-0.04, with 2 cuticular spines	0.054-0.055, with 2 cuticular spines	0.061-0.069, with 2 cuticular spines	0.088-0.125, with 2 spines
0.20-0.25	0.189-0.280	0.189-0.202	0.176	0.186-0.217
0.06-0.07	0.049-0.070	0.063-0.087	0.069	0.085-0.102
14 pairs, 6 preanal	12 pairs, 6 preanal	12 pairs, 7 preanal	12 pairs, 6 preanal	10 pairs, 6 preanal
1 adanal	—	—	1 adanal	1 adanal
7 postanal	6 postanal	5 postanal	5 postanal	3 postanal
3.86-5.21	3.71-6.15	3.15-3.73	4.1-4.26	10.42-12.91
0.014 × 0.012	—	—	—	—
<i>Ompok bimaculatus</i>	<i>Mystus cavasius</i> , <i>M. vittatus</i> , <i>Heteropneustes fossilis</i>	<i>Channa striatus</i>	<i>Notopterus notopterus</i>	<i>Clupisoma murius</i>

since the name *olseni* was pre-occupied, probably unaware that it had already been renamed in 1973 as *S. intestinecolas* by the original author himself. For ready reference, a comparative chart of the species shown under the synonymy is given.

***Spirocamallanus sparus* (Akram, 1975)**

1975. *Procamallanus sparus* Akram, *Biologia, Lahore*, **21** (2), p. 95.

Description : Male. Body 16.44 long, 0.18 wide ; mouth with two pairs of submedian papillae and a pair of lateral amphids ; buccal capsule excluding basal ring 0.09 long, 0.07 wide, and with 10-12 ridges ; basal ring 0.008×0.047 in diameter ; oesophagus divided into two parts, anterior muscular 0.46 long, posterior glandular 0.8 ; cervical papillae 0.15-0.16 from anterior end ; tail 0.19 long, conical, with a pair of spines and well-developed caudal alae extending 0.68 from posterior end ; spicules two, similar, unequal, right 0.45 long, left 0.22 ; gubernaculum absent ; caudal papillae pedunculate, 10 pairs, 3 preanal, 2 adanal, 5 postanal.

Female. Body 15.78-22.84 long, 0.52-0.82 wide ; anterior end as in male ; buccal capsule excluding basal ring 0.09-0.1 long, 0.085-0.09 wide, and with 11-15 ridges ; basal ring $0.006-0.012 \times 0.055-0.064$ in diameter ; oesophagus, anterior muscular 0.54-0.58 long, posterior glandular 0.86-0.92 ; cervical papillae 0.15-0.16 from anterior end ; tail 0.18-0.21 long, with a spike 0.043-0.047 long and having a pair of spines ; tail papillae 0.064 ; vulva 9.66-13.28 from anterior end.

Host : *Argyrops spinifer*

Location : Intestine

Locality : Karachi Coast (Pakistan)

***Spirocamallanus spiralis* Baylis, 1923**

1923. *Spirocamallanus spiralis* Baylis, *Parasitology*, **15**, p. 27.

1952. *Spiracamallanus spiralis* : Olsen, *Publ. Inst. mar. Sci. Univ. Tex.*, **11**, p. 196.

1967. *Procamallanus spiralis* Sood, *Proc. natn. Acad. Sci. India*, **37**, p. 293.

1971. *Spirocamallanus spiralis* : Khan and Begum, *Bull. Dep. Zool. Punjab Univ.*, article 5, p. 7.

1977. *Spirocamallanus spiralis* : Bilqees *et al.*, *Pakist. J. Zool.*, **9** (2), p. 170.

1979. *Spirocamallanus spiralis* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, **1** (4), p. 226.

Description : Female. Body 21.542 long, 0.544 wide ; buccal capsule 0.081×0.087 , and anteriorly with four teeth-like structures ; oesophagus

divided into two parts, anterior muscular 0.503 long, posterior glandular 0.720 ; nerve ring 0.27 from anterior end ; tail 0.17 long, bluntly rounded, ending in spike having two small spine-like structures at tip ; caudal muscles well developed ; vulva 9.628 from anterior end ; eggs 0.021-0.035 in diameter, rounded.

Hosts : *Tachysurus caelatus* ; *Sphaeroides lunaris*

Location : Body cavity

Locality : Karachi (Pakistan)

Remarks : This species, based on females only, was first reported from Egypt, and subsequently from Pakistan by Khan and Begum (1971) from *Tachysurus caelatus*, and by Bilqees, Fatima and Rehana (1977) from *Sphaeroides lunaris*.

***Spirocamallanus vachai* Sinha and Sahay, 1965**

(Fig. 91)

1965. *Spirocamallanus vachai* Sinha and Sahay, *Indian J. Helminth.*, **17** (1), p. 52.

1967. *Spirocamallanus vachai* : Sahay, *Indian J. Helminth.*, **18** (1966), p. 119.

1967. *Procamallanus vachai* Sood, *Proc. natn. Acad. Sci. India*, **37**, p. 293.

1975. *Procamallanus vachai* : Akram, *Biologia, Lahore* **21** (2), p. 98.

1977. *Spirocamallanus vachai* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 10.

1977. *Spirocamallanus vachai* : Gupta and Garg, *Indian J. Helminth.*, **28** (1), p. 13.

1979. *Spirocamallanus vachai* : Petter, *Bull. Mus. natn. Hist. nat., Paris*, **1** (4), p. 226.

1980. *Spirocamallanus vachai* : Bashirullah and Williams, *J. Helminth.*, **54** (4), p. 249.

Description : Male. Body 4.64-7.308 long, 0.05-0.084 wide ; buccal capsule 0.04-0.05×0.042 ; oesophagus divided into two parts, anterior muscular 0.34-0.4 long, posterior glandular 0.42-0.52 ; nerve ring 0.124-0.148 from anterior end ; tail 0.04-0.042 long, conical, with caudal alae ; spicules two, similar, unequal, right 0.182 long ; left 0.056 ; caudal papillae 11 pairs, 6 preanal, 5 postanal ; a wing like cuticular process on either side immediately behind last postanal pair.

Female. Body 8.9-12.72 long, 0.1-0.164 wide ; buccal capsule 0.056-0.064×0.046-0.056 ; oesophagus, anterior muscular 0.45-0.52 long, posterior glandular 0.58-0.72 ; nerve ring 0.12-0.14 from anterior end ; tail conical, 0.02 long, and with two short processes ; vulva 3.28-3.68 from posterior end.

Host : *Eutropiichthys vacha*

Location : Intestine

Locality : Patna, Bihar

Genus *Onchocamallanus* Petter, 1979

This genus was established by Petter (1979) with *Onchocamallanus bagarii* (Karve and Naik, 1951) as its type species to accommodate members of the genus *Spirocamallanus* having transverse buccal thickenings. She also transferred under the genus *Procamallanus globoconchus*

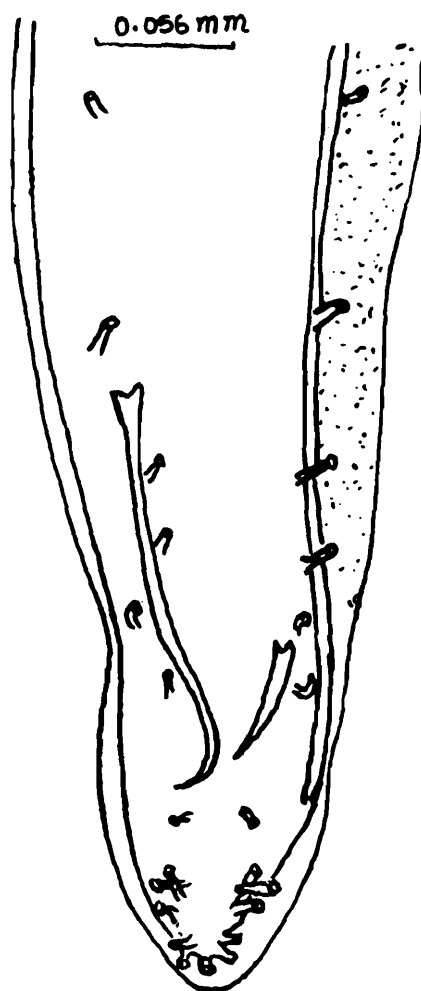


Fig. 91. *Spirocamallanus vachai*. (After Sinha and Sahay, 1965.) Male posterior end.

Ali, 1960, of which *P. ophicephalus* Ali, 1960, is considered a synonym by Agrawal (1966) and accepted here. It may be noted that Karve and Naik (*op. cit.*) while describing their above species reported two unequal spicules alongwith a gubernaculum, which character, however, needs confirmation as it is quite possible that they confused gubernaculum with left spicule. If their observations are proved erroneous, then *O. globocephalus* (Ali, 1960) will be conspecific with the type species pending which both the species may be kept separate. A key for both the species is given below.

Spicules slightly unequal, gubernaculum
present ...

O. bagarii

Spicules very unequal, gubernaculum absent...

O. globoconchus

Onchocamallanus bagarii (Karve and Naik, 1951) Petter, 1979

(Fig. 92, A & B)

1951. *Procamallanus bagarii* Karve and Naik, *J. Univ. Bombay*, 19 (5), p. 80.
1955. *Procamallanus aspiculus* Khera, *An. Esc. nac. Cienc. biol. Me'x.*, 8 (3-4), p. 247.
1961. *Spirocamallanus bagarii* Campana-Rouget, *Publ. Inst. r. Sci. nat. Belgique*, 3 (4), p. 26.
1965. *Spirocamallanus bagarii*: Sinha and Sahay, *Indian J. Helminth.*, 17 (1), p. 52.
1966. *Procamallanus bagarii*: Sahay, *Jap. J. med. Sci. Biol.*, 19 (3), p. 168.
1966. *Procamallanus bagarii*: Agrawal, *Proc. helminth. Soc. Wash.*, 33 (2), p. 204, 207.
1966. *Procamallanus aspiculus*: Agrawal, *Proc. helminth. Soc. Wash.*, 33 (2), p. 204, 207.
1967. *Spirocamallanus bagarii*: Sahay, *Indian J. Helminth.*, 18 (1966), p. 119.
1967. *Procamallanus bagarii*: Sood, *Proc. natn. Acad. Sci. India*, 37, p. 293.
1969. *Spirocamallanus berdii* Khan and Yaseen, *Bull. Dep. Zool. Panjab Univ.*, article 4, p. 12.
1971. *Procamallanus (Aspiculus) berdii* Bilqees, Khanum and Jehan, *J. Sci. Karachi*, 1, p. 181.
1973. *Procamallanus (Procamallanus) bagarii* Gupta and Duggal, *Riv. Parassit.*, 34 (4), p. 301.
1975. *Spirocamallanus berdii*: Zaidi and Khan, *Pakist. J. Zool.*, 7, p. 56.
1975. *Procamallanus aspiculus*: Akram, *Biologia, Lahore*, 21 (2), p. 97.
1975. *Procamallanus bagarii*: Akram, *Biologia, Lahore*, 21 (2), p. 98.
1975. *Procamallanus berdii* Akram, *Biologia, Lahore*, 21 (2), p. 98.
1977. *Procamallanus aspiculus*: Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5; p. 8.
1977. *Procamallanus bagarii*: Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 8.
1977. *Spirocamallanus bagarii*: Gupta and Garg, *Indian J. Helminth.*, 28 (1), p. 12.
1977. *Spirocamallanus aspiculus* Bashirullah, *Excerta Parasitologica Memoria Doctor ECY Caballero*, p. 398.
1977. *Spirocamallanus bagarii*: Bashirullah, *Excerta Parasitologica Memoria Doctor ECY Caballero*, p. 398.
1979. *Aspiculus berdii* Rehana and Bilqees, *Pakist. J. Zool.*, 11 (2), p. 284.
1979. *Onchocamallanus bagarii* Petter, *Bull. Mus. natn. Hist. nat., Paris*, 1 (4), p. 219.
1980. *Procamallanus aspiculus*: Arya, *Indian J. Helminth.*, 30 (1978), p. 119.
1980. *Spirocamallanus bagarii*: Arya, *Indian J. Helminth.*, 30 (1978), p. 119.

Description: Male. Body 4.96-14.97 long, 0.12-0.31 wide; buccal capsule 0.075-0.112×0.075-0.135, with transverse ridges; oesophagus divided into two parts, anterior muscular 0.27-0.7 long, posterior glan-

dular 0.27-0.87 ; nerve ring 0.14-0.265 from anterior end ; excretory pore 0.23 from anterior end, or a little behind junction of two parts of oesophagus ; tail 0.055-0.41 long, with well developed caudal alae and muscles ; spicules not readily discernible, dissimilar, subequal, right stouter 0.15-0.165 long, left feebly chitinised, 0.13-0.145 ; gubernaculum 0.033-0.0475 long ; caudal papillae 6-13 pairs, 2-7 preanal, 1 adanal, 2-6 postanal.

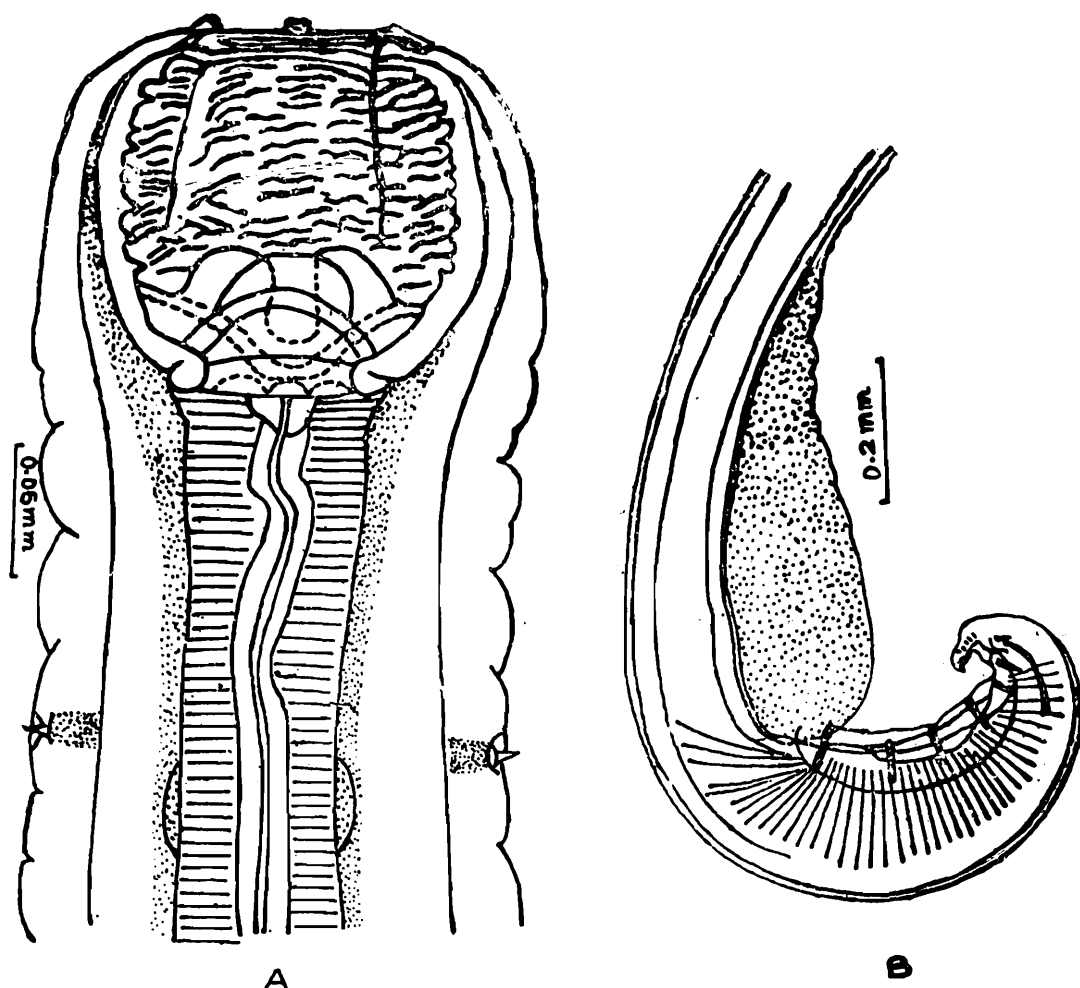


Fig. 92. *Onchocamallanus bagarii*. (After Karve and Naik, 1951.) A. anterior end ; B. male posterior end.

Female. Body 14.1-20.76 long, 0.3-0.435 wide ; buccal capsule as in male, $0.10-0.13 \times 0.08-0.17$; oesophagus, anterior muscular 0.4-0.95 long, posterior glandular 0.17-1.21 ; nerve ring 0.25-0.3 from anterior end ; excretory pore a little behind junction of two parts of oesophagus ; tail 0.11-0.16 long, with 3 spines, and pair of caudal papillae 0.055 from tip ; vulva 7.85-9.6 from anterior end.

Hosts : *Bagarius bagarius* ; *Ompok bimaculatus* ; *Acanthopagrus berda*

Location : Intestine

Localities ; Pune & Nagpur, Maharashtra ; Lucknow, U. P. ; Khulna (Bangladesh)

Remarks : Karve and Naik (1951) described the species *Procamallanus bagarii* from two different fish hosts, viz. *Bagarius bagarius* and *Ompok bimaculatus* from Pune and Bombay, and observed the difficulty in discerning the spicules. Khera (1955) described another species *Procamallanus aspiculus* from *Bagarius bagarius* from Lucknow, and reported the absence of spicules. As the spicules are not easily discernible in this species, he was obviously dealing with Karve and Naik's species. So, Campana-Rouget (1961) treated Khera's species as conspecific with *S. bagarii*. But, although Agrawal (1966) did not accept this synonymy, Petter (1979) holding both as conspecific, transferred the species under her genus *Onchocamallanus* and this is followed here. Also, it has been rightly observed by her (*op. cit.*) that Majumdar's specimens from *Channa striatus* from Barasat near Calcutta and referred to *Procamallanus aspiculus* differ from it in buccal capsule and its spiral thickenings.

***Onchocamallanus globoconchus* (Ali, 1960) Petter, 1979**
(Fig. 93, A-C)

- 1960. *Procamallanus globoconchus* Ali, *J. Helminth.* **34** (1/2), p. 131.
- 1960. *Procamallanus ophicephalus* Ali, *J. Helminth.*, **34** (1/2), p. 132.
- 1965. *Spirocamallanus ophicephalus* Sinha and Sahay, *Indian J. Helminth.*, **17** (1), p. 52.
- 1966. *Procamallanus globoconchus* : Sahay, *Jap. J. med. Sci. Biol.*, **19** (3), p. 166.
- 1966. *Procamallanus globoconchus* : Agrawal, *Proc. helminth. Soc. Wash.*, **33** (2), p. 204, 207.
- 1967. *Spirocamallanus globoconchus* Sahay, *Indian J. Helminth.*, **18** (1966), p. 119.
- 1973. *Procamallanus* (*Procamallanus*) *globoconchus* Gupta and Duggal, *Riv. Parassit.*, **34** (4), p. 295, 302.
- 1973. *Procamallanus* (*Procamallanus*) *ophicephalus* Gupta and Duggal, *Riv. Parassit.*, **34** (4), p. 302.
- 1975. *Procamallanus globoconchus* : Akram, *Biologia, Lahore*, **21** (2), p. 98.
- 1977. *Procamallanus globoconchus* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 9.
- 1977. *Procamallanus ophicephalus* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 9.
- 1977. *Spirocamallanus ophicephalus* : Gupta and Garg, *Indian J. Helminth.*, **28** (1), p. 5.
- 1977. *Spirocamallanus globoconchus* : Gupta and Garg, *Indian J. Helminth.*, **28** (1), p. 6.
- 1977. *Spirocamallanus globoconchus* : Bashirullah, *Excerta Parasitologica Memoria Doctor ECY Caballero*, p. 398.
- 1977. *Spirocamallanus ophicephalus* : Bashirullah, *Excerta Parasitologica Memoria Doctor ECY Caballero*, p. 398.

1979. *Onchocamallanus globoconchus* Petter, *Bull. Mus. natn. Hist. nat., Paris*, **1** (4), p. 225.
1980. *Spirocamallanus nainitalensis* Arya, *Indian J. Helminth.*, **30** (1978), p. 110.

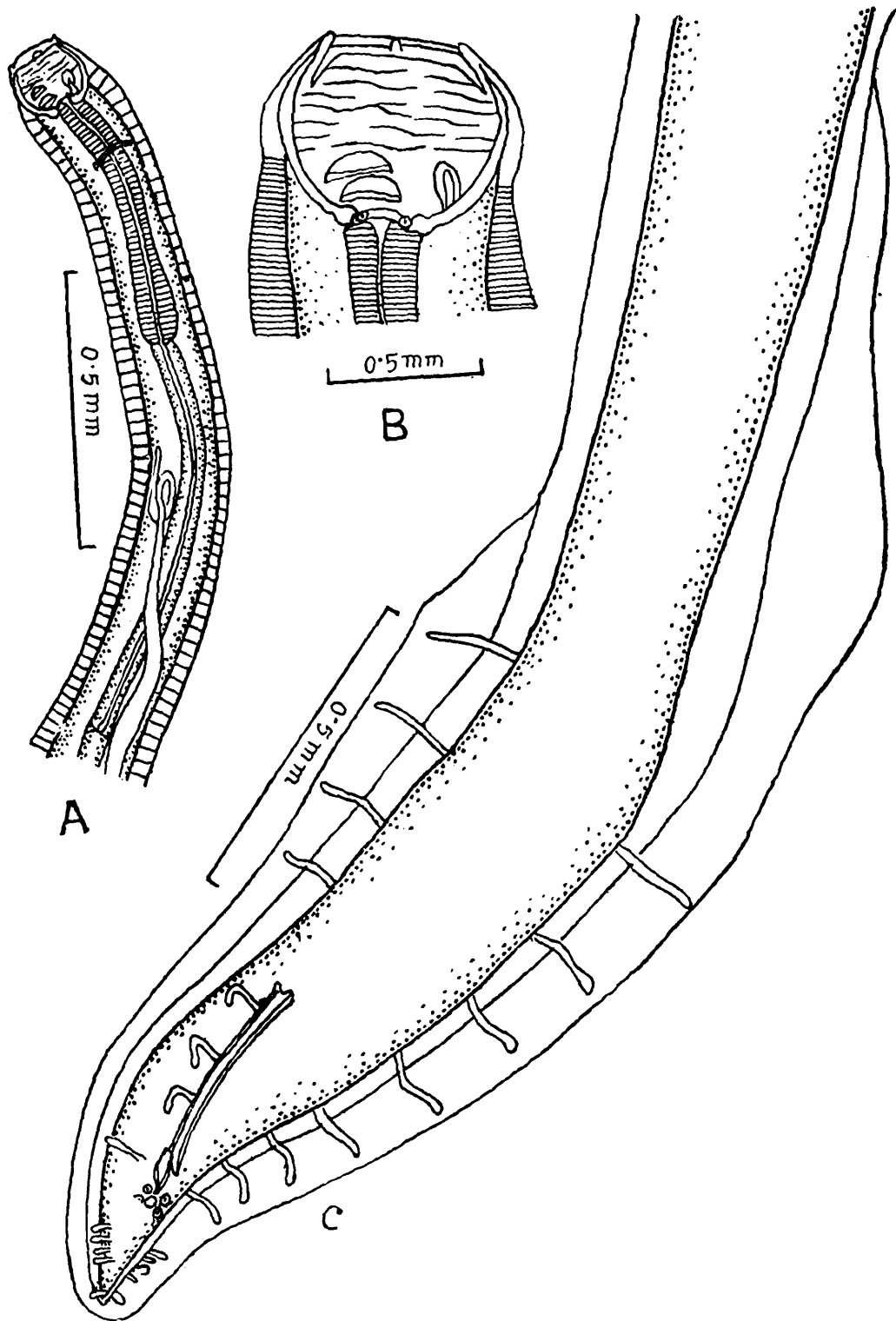


Fig. 93. *Onchocamallanus globoconchus*. (After Ali, 1960.) A. anterior end ; B. buccal capsule ; C. male posterior end.

Description : Male. Body 5.8-9.98 long, 0.12-0.204 wide ; buccal capsule 0.128-0.15 long ; with transverse thickenings ; oesophagus divided into two parts, anterior muscular 0.50-0.914 long, posterior glandular 0.73-1.05 ; nerve ring 0.23-0.35 and excretory pore 0.23-0.6,

both from anterior end ; tail 0.02-0.36 long, with broad caudal alae ; spicules dissimilar, unequal, right longer 0.13-0.18 long, left shorter 0.025-0.035 ; caudal papillae pedunculate, 12-13 pairs, 7-8 preanal, 4-5 postanal ; sometimes an additional pair of postanal sessile papillae present.

Female. Body 17-32 long, 0.29 wide ; buccal capsule as in male, 0.169 long ; oesophagus, anterior muscular 0.914 long, posterior glandular 1.05 ; nerve ring 0.384 and excretory pore 0.5-0.6, both from anterior end ; tail triangular, with 3 rudimentary blunt spines ; vulva post-equatorial, 10.16 from anterior end.

Hosts : *Rita kuturnee* ; *Channa punctatus* ; *Mystus seenghala* ; *Barilius vagra*

Location : Intestine

Localities : Hyderabad, Andhra Pradesh ; Jullundhur, Punjab ; Nainital, U. P.

Superfamily (2) DRACUNCULOIDEA

Chabaud (1975) has rightly observed that dracunculoids, which are characterised by marked deformation due to adapting an intra-tissue life, bear relationships to species close to camallanoids, which are hardly specialised. Rasheed's (1963) useful data on the Philometridae was adopted by Chabaud (*op. cit.*), though provisionally, as in most cases descriptions of males were lacking, entailing the employment of characters involving cuticular ornamentation in the classification of this complicated group.

Family PHILOMETRIDAE Baylis and Daubney, 1926

Subfamily PHILOMETRINAE Baylis and Daubney, 1962 ; Chabaud, 1975

Hitherto, four genera are reported from fishes from this area, a key of which is given below.

1. Cuticle smooth	...	...	2
Cuticle ornamented	...	...	3
2. Cephalic papillae four, large and lobe-like	...	<i>Thwaitia</i> Rasheed, 1963	
Cephalic papillae more than four, small or large, sometimes obscure	...	<i>Philometra</i> Costa, 1845	
3. Cuticle with rod-like structures arranged in patterns ; oesophageal teeth cuticularized ; cephalic papillae large, flat, lobe-like	...	<i>Buckleyella</i> Rasheed, 1963	
Cuticle with small, irregular bosses ; oesophageal teeth present or absent ; cephalic papillae small	...	<i>Philometroides</i> Yamaguti, 1935,	

Genus **Philometra** Costa, 1845

Rudolphi (1819) described the species *Filaria globiceps*. But, later taxonomic confusion was created when Diesing (1861) transferred it to *Ichthyonema*, and Railliet (1916) found it conspecific with *Philometra reticulatum* described by Costa (1916) from *Uranoscopus scaber*. Since then, quite a number of species have been added under *Philometra*. Recently, Rasheed (1963) in her very painstaking review of the genus split it into three subgenera, viz. *Philometra*, *Ranjhinema*, and *Alinema*, which was tentatively accepted by Chabaud (1975) in his recent classification of the group and now followed here, a key of which is given below.

1. Cephalic papillae of external circle large, lobe-like, and in double pairs ... *Philometra* (*Ranjhinema*) Rasheed, 1963.
- Cephalic papillae of external circle smaller, often fused but not in double pairs ... 2
2. Rim of oral opening studded with small, cuticularized, bead-like structures, cephalic papillae minute and indistinct ... *Philometra* (*Alinema*) Rasheed, 1963.
- Rim of oral opening simple and un-ornamented, cephalic papillae of both circles distinct in apical view ... *Philometra* (*Philometra*) Costa, 1845.

Philometra (Philometra) lateolabracis (Yamaguti, 1935)
Yamaguti, 1941

1935. *Sanguinifilaria lateolabracis* Yamaguti, *Jap. J. Zool.*, **6**, p. 358.
1935. *Sanguinifilaria scomberomori* Yamaguti, *Jap. J. Zool.*, **6**, p. 360.
1941. *Philometra sciaenae* Yamaguti, *Jap. J. Zool.*, **9**, p. 391.
1941. *Philometra lateolabracis* Yamaguti, *Jap. J. Zool.*, **9**, p. 392.
1963. *Philometra rajani* Mukherjee, *J. zool. Soc. India*, **15** (1), p. 76.
1963. *Philometra* (*Philometra*) *lateolabracis* Rasheed, *J. Helminth.*, **37** (1/2), p. 96, 121.
1965. *Philometra lateolabracis* : Rasheed, *J. Helminth.*, **39** (4), p. 349.
1969. *Philometra* (*Philometra*) *lateolabracis* : Schmidt and Kuntz, *Parasitology*, **59**, p. 395.
1970. *Philometra rajani* : Lal Mohan, *J. mar. biol. Ass. India*, **12** (1 & 2), p. 1.
1971. *Philometra* (*Philometra*) *lateolabracis* : Kalyankar, *Marathwada Univ. J.*, **10** Sci. 3, p. 85.
1971. *Philometra* (*Philometra*) *lateolabracis* : Kalyankar, *Acta zool. mex.*, **10** (3), p. 1.
1975. *Philometra cephalus* Ramachandran, *Zool. Anz.*, **194** (1/2), p. 140.

1977. *Philometra lateolabracis* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 16.

1977. *Philometra rajani* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 16.

Description : Female. Body 84.0-320.0 long, 0.43-0.95 wide, with bluntly pointed ends ; cuticle thin, smooth ; head with usual number of papillae, 8 in outer circle and 4 in inner, former in four groups of two, latter on submedian line ; pair of lateral amphids ; papillae quite distinct in *en face* preparation though obscure in dorsoventral or lateral views ; oesophagus 0.73-1.4 long, swollen as in other species of genus near anterior extremity and muscular throughout ; ventriculus and appendix with very prominent glandular cells and opening into intestine, which very broad, occupying most of width of body and ending blindly near tail end, and attached to body wall ; nerve ring 0.11-0.44 from anterior end ; ovaries slender ; uterus in larger specimens filled with embryos and in smaller specimens with eggs in different stages of development ; larvae 0.0332-0.49 long.

Hosts : *Lateolabracis japonicus* ; *Parapristipoma trilineatum* ; *Epino-phelus akaara* ; *Otolithes ruber* ; *Hemispharus georgii* ; *Scomberomorus* sp. ; *Sciaena schlegeli* ; *S. glevui* ; *S. coitor* ; *Lates calcarifer* ; *Johnius sina* ; *Sciaenoides brunneus* ; *Protonibea diacanthus* ; *Eleutheronema tetradactylus* ; *Mugil cephalus*

Location : Ovary

Localities : Japan ; Karachi (Pakistan) ; Kerala, Bombay & Madras (India)

Remarks : The species is of wide occurrence in Indo-Japanese waters having been reported from several species of fishes.

***Philometra* (*Philometra*) *hyderabadensis* Rasheed, 1963**

(Fig. 94, A & B)

1963. *Philometra* (*Philometra*) *hyderabadensis* Rasheed, *J. Helminth.*, **37** (1/2), p. 97.

1977. *Philometra hyderabadensis* Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 16.

Description : Male. Body 23.0 long, 0.63 wide, with slight tapering ends ; cuticle smooth ; lateral fields very prominent with wide glandular areas ; cephalic papillae in two circles, external carrying eight papillae in groups of two, internal having four small submedially ; pair of lateral amphids ; oesophagus swollen like a bulb with wide lumen in anterior most region ; entire oesophagus 3.28 long ; oesophageal gland very prominent with large nucleus in middle, opening anteriorly just behind

nerve ring and continuing posteriorly upto end of oesophagus ; ventriculus fleshy, opening into intestine which latter ends blindly some distance in front of tip of tail ; anterior ovary starting near posterior end of oesophagus, posterior from end of intestine ; posterior end of body rounded and slightly tapering with two small papillae at tip, each having double nerve endings ; uterus filled with larvae 0.18-0.25 long ;

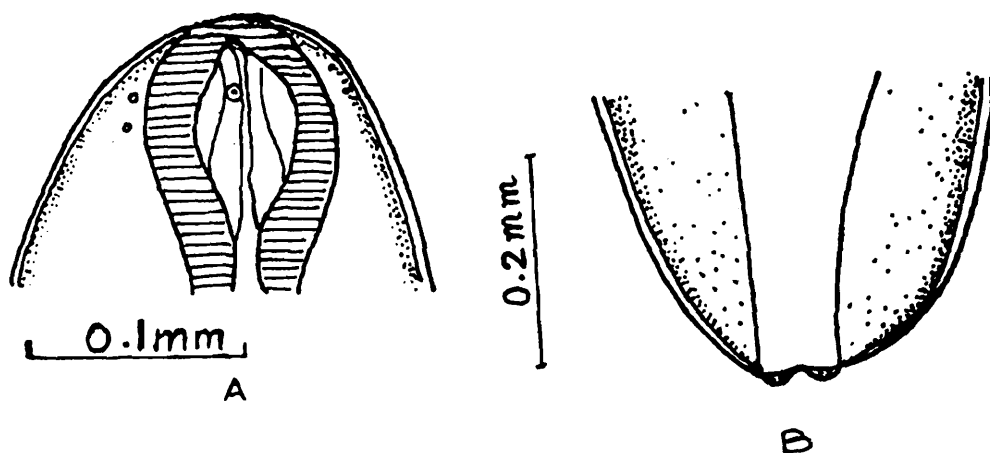


Fig. 94. *Philometra* (*Philometra*) *hyderabadensis*. (After Rasheed, 1963.) A. anterior end ; B. female posterior end.

anterior end of embryo rounded with probably tooth-like projection near mouth and tail sharply attenuated.

Host : *Wallago attu*

Location : Intestine

Locality : Hyderabad, Andhra Pradesh

Remarks : The species is based on a female only.

***Philometra* (?) *pellucida* (Jagerskiold, 1893)**

1893. *Ichthyonema pellucidum* Jagerskiold, *Zool. Jahrb. Anat.*, **6**, p. 490.

1941. *Philometra sebastisci* Yamaguti, *Jap. J. Zool.*, **9**, p. 393.

1962. *Philometra* (*Philometra*) *pellucida* Rasheed, *J. Helminth.*, **37** (1/2), p. 121.

1965. *Philometra* (?) *pellucida* Rasheed, *J. Helminth.*, **39** (4), p. 352.

1979. *Philometra* (*Philometra*) *pellucida* : Naidu and Thakare, *Riv. Parassit.*, **40** (3), p. 281.

Description : Female. Body 50-135 long, 0.87-0.2 wide ; oesophagus 0.9-1.5 long, with wide oesophageal lumen anteriorly.

Hosts : *Tylosurus leiurus* ; *Xenentodon cancila*

Location : Intestine ; ovary

Localities : Kerala ; Nagpur, Maharashtra

Remarks : Under this species Rasheed (1963), because of the presence of a wide anteriorly oesophageal lumen, provisionally placed a poorly preserved incomplete female from the collection of the British Museum (Nat. Hist.), which hardly permitted a detailed study.

***Philometra (Philometra) suraiyae* Kalyankar, 1971**

(Fig. 95)

1971. *Philometra (Philometra) suraiyae* Kalyankar, *Acta zool. mex.*, 10 (3), p. 4.

Description : Female. Body 31.39 long, 0.64 wide ; head with 8 papillae in groups of two in external circle and four on submedian line in internal ; cuticle smooth ; anterior end of body truncated, ending in 3 sharp teeth ; oesophagus 1.9 long, anteriorly with 3 lobe-like

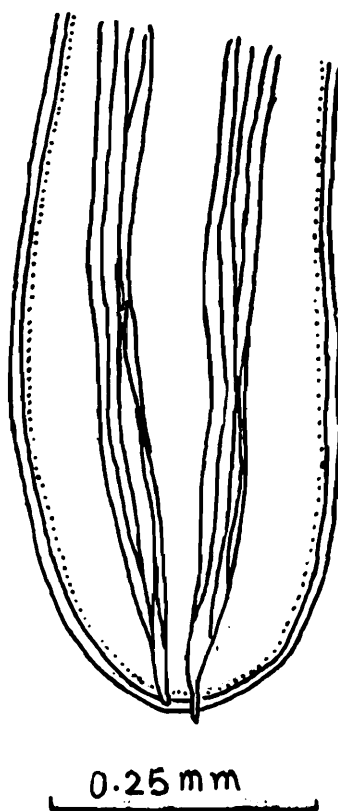


Fig. 95. *Philometra (Philometra) suraiyae*. (After Kalyankar, 1971.) Female posterior end.

papillae, posteriorly with small muscular ventriculus which giving rise posteriorly to lobed glandular appendix projecting into lumen of intestine ; oesophageal gland well-developed ; nerve ring 0.20 from anterior end ; intestine ending blindly near posterior end ; ovaries two, running in opposite directions and connected with a common uterine tract ; posterior end of body rounded, with two very conspicuous papillae ; anus and vulva atrophied ; larvae 0.35×0.014 ; embryo 0.09×0.03 .

Host : *Ompok bimaculatus*

Location : Body cavity

Locality : Bombay, Maharashtra

Remarks : The species is based on a single female only

***Philometra* (*Ranjhinema*) *polynemii* Rasheed, 1963**

(Fig. 96, A & B)

1963. *Philometra* (*Ranjhinema*) *polynemii* Rasheed, *J. Helminth.*, 37 (1/2), p. 104.

1977. *Philometra polynemii* Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 16.

Description : Female. Body 51.0-60.0 long, 0.9-1.2 wide, yellowish-white ; cuticle smooth but in some parts transverse fibres well developed and in bundles ; head 0.21-0.26 in diameter, bluntly rounded, with pair of lateral amphids, and 8 fleshy lobes in four groups of two each submedially, each of these lobes with two papillae, each with rather

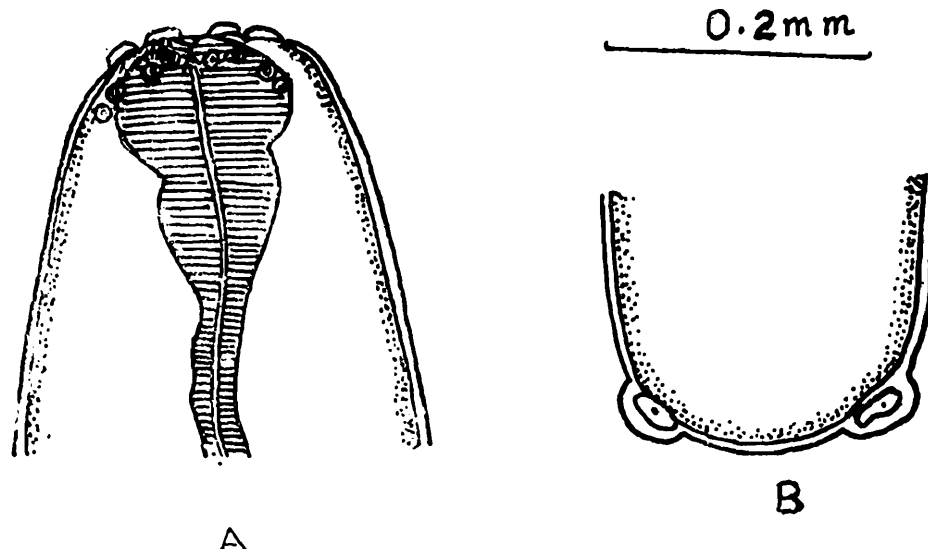


Fig. 96. *Philometra* (*Ranjhinema*) *polynemii*. (After Rasheed, 1963.) A. anterior end ; B. female posterior end.

indistinct nerve endings ; oesophagus 2.04-2.08 long, flask-shaped, with base near mouth, followed by slight constriction and having almost an equal diameter throughout excepting posteriorly where again becoming gradually enlarged ; oesophageal gland large, continuing upto end of oesophagus, opening near-nerve ring ; ventriculus small, less muscular ; intestine ending blindly near posterior end ; nerve ring 0.23-0.26 from anterior end ; tail rounded, with two large papillae at end ; anus and vulva atrophied ; ovaries. opposed, thin, long ; uterus distended with larvae, which latter 0.38-0.39 long, 15-16 μ in diameter.

Host : *Eleutheronema tetradactylum*

Location : Body cavity

Locality : Karachi (Pakistan)

Genus **Philometroides** Yamaguti, 1935

Philometroides denticulatus Rasheed, 1965

(Fig. 97, A-C)

1965. *Philometroides denticulatus* Rasheed, *J. Helminth.*, **39** (4), p. 358.

1977. *Philometroides denticulatus* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 16.

Description : Male. Body 250-320 long, 0.52-0.67 wide, yellowish white, tapering towards extremities ; cuticle thin, bearing prominent bosses all over body ; head papillae minute ; oesophagus 1.0-2.15 long, swollen anteriorly near mouth into large bulb, end of which coming out of mouth in form of 3 small cuticularized portions appearing as teeth ; oesophageal gland saccular, with large nucleus in centre, attached throughout length of oesophagus, and opening near anterior swelling about 60μ posterior to head end ; nerve ring 0.38-0.45 from anterior end ; ovaries commencing near anterior and posterior ends of body and continuing into blind uterine sac ; larvae 0.63-0.73 long, $9-11\mu$ wide ; posterior end of body bluntly rounded, with two small papillae near tip ; anus absent.

Hosts : *Pomadasys hasta* ; *Otolithes ruber*

Location : Swim bladder, & body cavity

Locality : Karachi (Pakistan)

Remarks : The genus was reported from the Indian subcontinent for the first time by Rasheed (1965).

Genus **Thwaitia** Rasheed, 1963

This genus was created by Rasheed (1963) for the reception of Thwaite's (1927) undetermined species *Philometra* sp. described from a female specimen from the eye of a fish, *Balistes* sp. Under the genus she also provisionally transferred those species of *Philometra* showing four papillae. The validity of the genus *Thwaitia* was upheld by Khalil (1965) and also later, in spite of Moravac and Ergner's (1970) holding it congeneric with *Philometra*, by Chabaud (1975), and Shendge and Deshmukh (1977), and the present author too follows suit. At present, two species have been placed under it from this area.

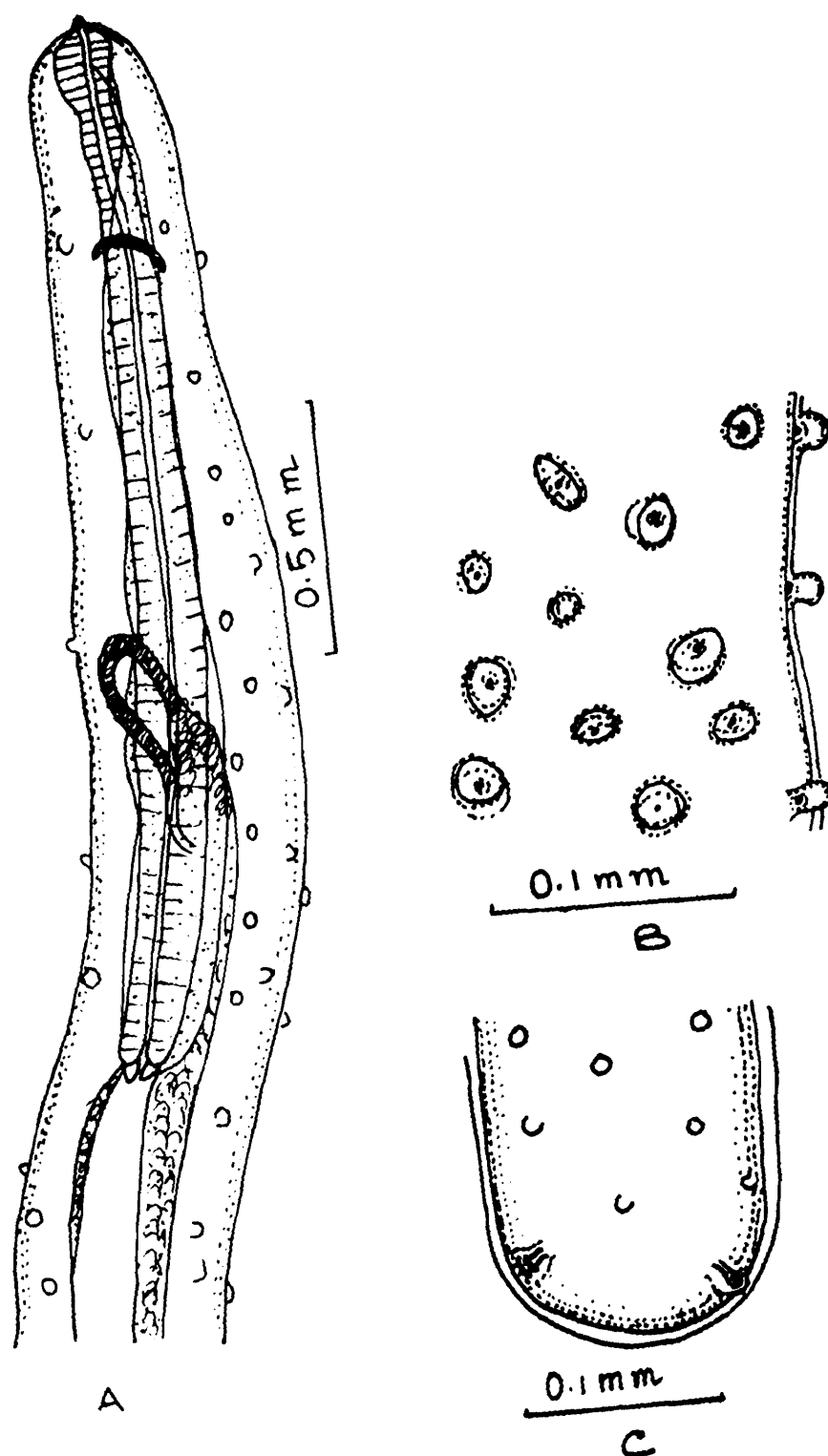
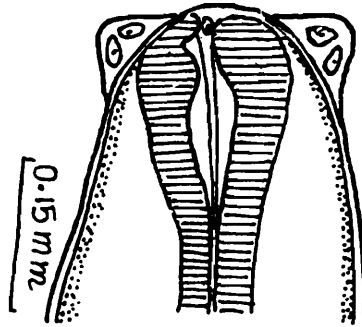


Fig. 97. *Philometroides denticulatus*. (After Rasheed, 1965.) A. anterior end ; B. cuticular papillae ; C. female posterior end.

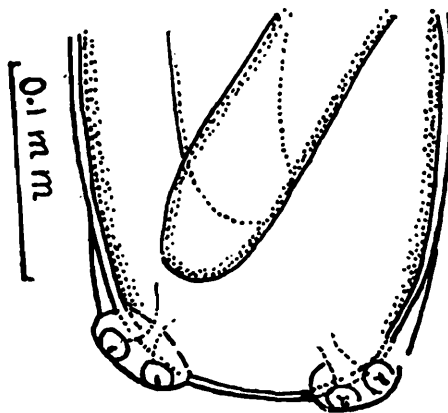
***Thwaitia balistii* Rasheed, 1963**
(Fig. 98, A & B)

1927. *Philometra* sp. Thwaite, *Ann. trop. Med. Parasit.*, **21**, p. 242.
 1963. *Thwaitia balistii* Rasheed, *J. Helminth.*, **37** (1/2), p. 111.
 1973. *Thwaitia balistii* : Parukhin, *Biol. Maria*, **31**, p. 172.
 1977. *Thwaitia balistii* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 16.

Description : Female. Body upto about 210.0 long, 0.54-0.6 wide, yellowish-white ; head 0.18-0.19 in diameter, quite blunt, appearing square in dorsoventral view with large papillae projecting from sides, and with four flat lobes, each having two fleshy papillae with very minute nerve endings ; these double papillae submedian, and in addition pair of comparatively small lateral amphids ; oesophagus 2.04-2.34



A



B

Fig. 98. *Thwaitia balistii*. (After Rasheed, 1963.) A. anterior end ; B. female posterior end.

long, swollen anteriorly ; oesophageal gland not prominent as in *Philometra* ; oesophageal ventriculus or appendix absent ; intestine slightly broader in diameter than posterior oesophagus and ending blindly near posterior end of body ; nerve ring 0.14-0.15 from anterior end ; tail bluntly rounded, with two laterally projecting lobes, which each with two papillae ; ovaries two, one anteriorly and other posteriorly ; uterus fully distended with larvae which latter 0.36-0.4 long, 17-19 μ in diameter,

Host : *Balistes* sp.

Location : Eye

Locality : Sri Lanka

Remarks : Thwaite (1927) described a female from the eye of a fish, *Balistes* sp. as *Philometra* sp. which, however, on re-examination by Rasheed (1963) proved to be both, a new genus and a new species, *Thwaitia balistii*. According to her, the present specimen was found to come closer to the genus *Rumai* Travassos, 1960, by showing the same type of cephalic papillae, differing in having a cylindrical oesophagus at the anterior end, in presence in its anterior region of cuticularized projections looking like "pyramids", and in having a conical tail. This was also shown by her to differ from *Philometra* (*sensu stricto*) mainly in the number and arrangement of cephalic papillae, the latter genus having 8 small papillae in the outer circle and 4 submedians in the inner circle. The internal submedians were not discernible in the material examined by her, 4 double lobe-like papillae alone in the external circle being located by her.

***Thwaitia macronesi* Shendge and Deshmukh, 1977**

(Fig. 99, A & B)

1977. *Thwaitia macronesi* Shendge and Deshmukh, *Riv. Parassit.*, 38 (2/3), p. 157.

Description : Female. Body 10.01-14.16 long, 0.57-0.59 in diameter ; head with four prominent fleshy lobes, each having two papillae and

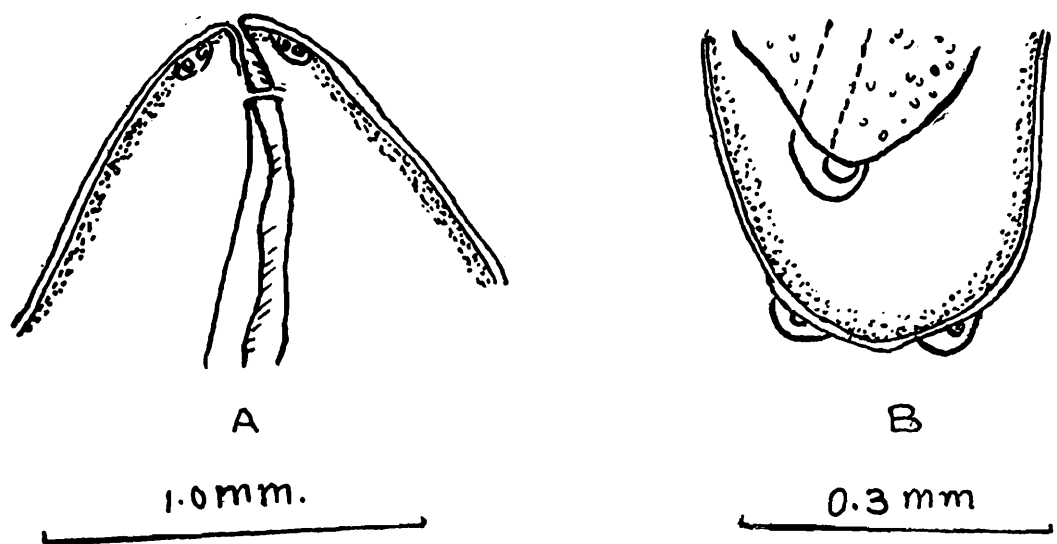


Fig. 99. *Thwaitia macronesi*. (After Shendge and Deshmukh, 1977.) A. anterior end ; B. female posterior end.

pair of amphids ; oesophagus 1.07-1.8 long, muscular, with prominent oesophageal gland by sides ; nerve ring 0.12 from anterior end ; tail

bluntly rounded, with two prominent lobes, which with a single papilla ; ovaries two.

Host : *Mystus seenghala*

Location : Buccal cavity

Locality : Nanded, Maharashtra

Remarks : This species has been held by the author as intermediate between *T. balistii* Rasheed, 1963, and *T. bagri* Khalil, 1965. Hence, it is absolutely necessary that more material is examined for clearly establishing the systematic position of all these species.

Genus **Buckleyella** Rasheed, 1963

Buckleyella buckleyi Rasheed, 1963

(Fig. 100, A & B)

1963. *Buckleyella buckleyi* Rasheed, *J. Helminth.*, **37** (1/2), p. 114.

1977. *Buckleyella buckleyi* ; Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 15.

Description : Female. Body 46.0-110.0 long, 0.3-0.5 wide ; blood red ; cuticle produced externally into sharp needle-shaped or rod-like structures which arranged in set patterns, overlying some fibrillar concentrations and appearing wart-like, very prominent in specimens not fully stretched or filled by embryos but not so in fully stretched or tightly packed by embryos ; head 0.17-0.19 in diameter, and with 8 elongated flat lobe-like papillae, and pair of amphids, quite characteristic of genus ; oesophagus 3.96-5.1 long, with bulbous swelling anteriorly and with 3 cuticularized teeth protruding out of buccal rim ; oesophageal gland membranous, not so prominent ; ventriculus rather indiscernible ; intestine with reticular epithelium, ending blindly near posterior end ; nerve ring 0.25-0.3 from anterior end ; anus absent ; tail bluntly rounded, with two quite large lateral papillae, sometimes making tail appear lobed ; ovaries two, anterior and posterior ; embryos 0.39-0.48 long, 12.5-15 μ in diameter.

Host : *Scomberoides tala*

Location : Mesentery

Locality : Karachi (Pakistan)

Remarks : This genus was created by Rasheed (1963) for her specimens from a fish, *Scomberoides* [= *Chorinemus*] *tala* from Karachi (Pakistan), and accepted by subsequent workers.

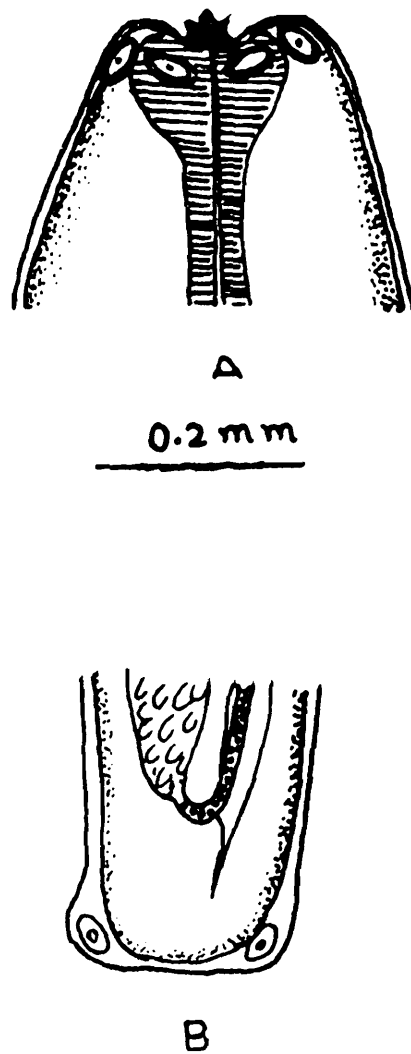


Fig. 100. *Buckleyella buckleyi*. (After Rasheed, 1963.)
A. anterior end ; B. female posterior end.

Superfamily (3) GNATHOSTOMATOIDEA

Chabaud (1975) accepted the arrangement of three subfamilies suggested by Chitwood and supported by Ivashkin (1960). The previous description of the genus *Ancyracanthus* was recently redone by Gomes and Kohn (1970). The genus *Piayussunema* Kohn, Gomes and Motta (1968) was rejected by Chabaud (*op. cit.*) on account of the extreme variation of the pseudolabial ornamentation of certain spirurids.

Family GNATHOSTOMATIDAE Railliet, 1895

Subfamily GNATHOSTOMATINAE Railliet, 1895 : Baylis and Lane, 1920

Genus *Echinocephalus* Molin, 1858

The genus *Echinocephalus* was created by Molin (1858) with *E. uncinatus* as its type species. As this species included forms with two distinct characters as shown by variations in body size and more so of

extreme difference in number of rows of hooks on head-bulb, Baylis and Lane (1920) suggested that these forms be separated into two species, viz. *E. spinosissimus* (von Linstow, 1905) and *E. uncinatus* Molin, 1858, and this was accepted by subsequent workers. Millemann (1963), however, pointed out that the above variations were due to different developmental stages shown by the specimens and hence *E. spinosissimus* was conspecific with *E. uncinatus*. Also, he not only rejected *E. actobati* created by MacCallum (1921) on juvenile forms but following Baylis and Lane (*op. cit.*) treated *E. striatus* as *nomen nudum* as well, and this was accepted by Kalyankar (1971), and Ko (1975). Kumari and Rao (1980) also followed the synonymy of *E. spinosissimus* with *E. uncinatus*. Thus, only six species can be accepted, even tentatively as valid of which, four have been reported from the area covered in this work. A key for all these is given below. *E. muraenesocis* Bilquees, Khanum and Jehan, 1971, *E. oligocanthus* Arya, 1977, and *E. uncinatus* reported by Gupta and Garg (1977) are treated as juvenile forms.

1. Medial lobes of lips each with 2 teeth	...	...	2
Medial lobes of lips without teeth	...	...	3
2. Head with 16-21 rows of hooks	...	<i>E. pseudouncinatus</i>	
Head with 26-29 rows of hooks	...	<i>E. sinensis</i>	
Head with 35-45 rows of hooks	...	<i>E. mobulae</i>	
3. Dorsal, ventral lobes of lips each with 8-11 teeth ; head with 11-13 rows of hooks	...	<i>E. multidentatus</i>	
Dorsal, ventral lobes of lips each with 2 teeth ; head with more than 13 rows of hooks	...	...	4
4. Head with 15-18 rows of hooks	...	<i>E. southwelli</i>	
Head with 30-40 rows of hooks	...	<i>E. uncinatus</i>	

***Echinocephalus mobulae* Kalyankar, 1971**

(Fig. 101, A & B)

1971. *Echinocephalus mobulae* Kalyankar, *Zool. Anz.*, 187 (5/6), p. 317.

Description : Male. Body 17.49 long, 0.55 wide ; anterior end swollen into head bulb having 35-45 transverse rows of hooks ; lips large, massive, dorsal and ventral lobe of each with two teeth interlocking with those of opposite lips ; each lip with two central papillae ; oesophagus 3.38 long ; nerve ring 0.47 and cervical papillae 0.60, both from anterior end ; ballonets 4, extending posteriorly to form cervical sacs terminating in bulb-like appendages ; tail 0.46 long ; spicules nearly equal, 0.47 long, with transverse striations ; caudal papillae 8 pairs, 3 preanal. 5 postanal.

Host : *Mobula diabolus*

Location : Spiral valve

Locality : Bombay

Remarks : As already observed by Ko (1975), more definite observations of this inadequately described species are necessary to confirm its validity. Hence, at present its inclusion here is purely tentative.

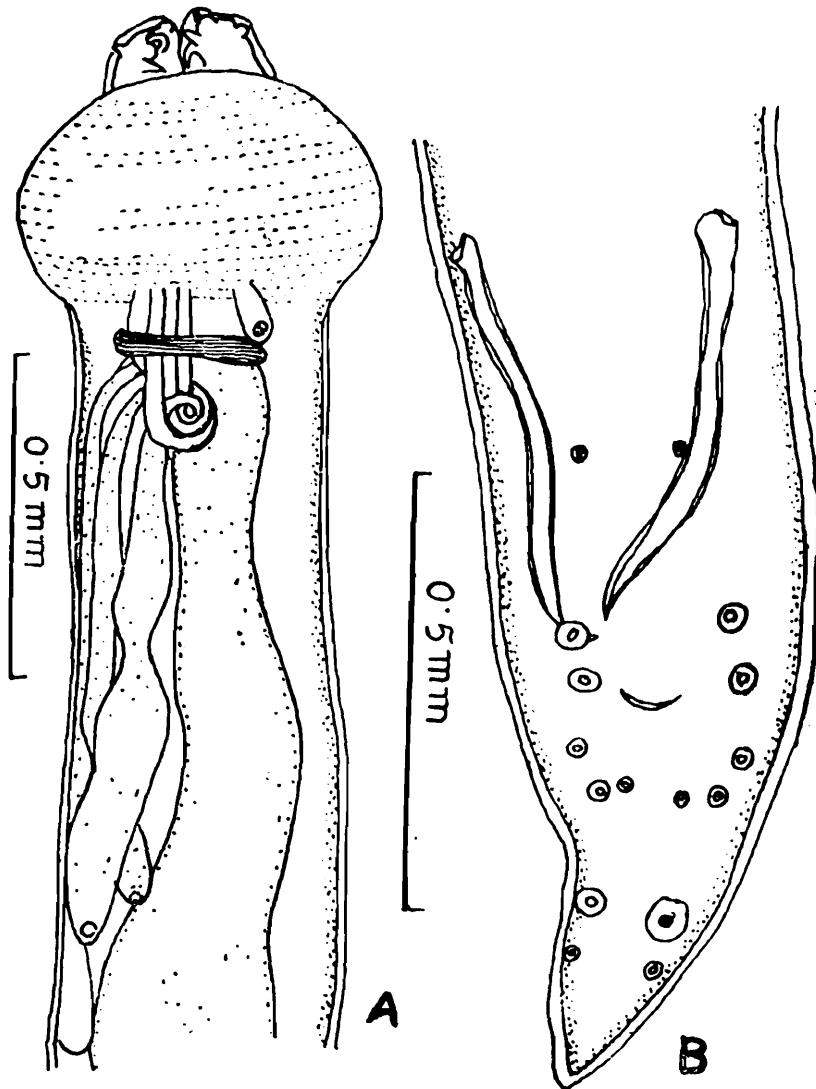


Fig. 101. *Echinocephalus mobulae*. (After Kalyankar, 1971.)
A. anterior end ; B. male posterior end.

***Echinocephalus multidentatus* Baylis and Lane, 1920**

- 1920. *Echinocephalus multidentatus* Baylis and Lane, *Proc. zool. Soc. London*, No. 19, p. 285.
- 1939. *Echinocephalus multidentatus* : Baylis, *F. B. I.*, 2, p. 197.
- 1971. *Echinocephalus multidentatus* : Kalyankar, *Zool. Anz.*, 187 (5/6), p. 319.
- 1975. *Echinocephalus multidentatus* : Ko, *Can. J. Zool.*, 53 (4), p. 490.

1977. *Echinocephalus multidentatus* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 11.
1980. *Echinocephalus multidentatus* : Kumari and Rao, *Indian J. Parasit.*, **4** (1), p. 28.

Description : Male. Body 14.7-15.3 long, 0.55 wide ; head bulb considerably wider than body, $0.47-0.55 \times 0.85-0.86$, having 11-13 rows of relatively large hooks ; dorsal and ventral lobes of each lip with 8-11 longitudinal tooth-like ridges internally ; oesophagus and cervical sacs 1.9-2.3 long ; nerve ring 0.65, cervical papillae and excretory pore 0.75-0.9, all from anterior end ; tail 0.3 long ; spicules rather slender, with smooth and knob-like tips, left 1.49 long, right 1.4 ; caudal papillae 8 pairs, 3 preanal, 5 postanal.

Female. Body 16.15-16.55 long, 0.6 wide ; tail 0.29-0.31 long, bluntly conical, with pair of papillae 0.11 from tip ; eggs 0.05×0.03 .

Host : *Urogymnus asperrimus*

Location : Spiral valve

Locality : Off Sri Lanka

***Echinocephalus southwelli* Baylis and Lane, 1920**

1920. *Echinocephalus southwelli* Baylis and Lane, *Proc. zool. Soc. London*, No. 19, p. 288.
1939. *Echinocephalus southwelli* : Baylis, *F. B. I.*, **2**, p. 195.
1971. *Echinocephalus southwelli* : Kalyankar, *Zool. Anz.*, **187** (5/6), p. 319.
1975. *Echinocephalus southwelli* : Ko, *Can. J. Zool.*, **53** (4), p. 490.
1977. *Echinocephalus southwelli* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 12.
1980. *Echinocephalus southwelli* : Kumari and Rao, *Indian J. Parasit.*, **4** (1), p. 28.

Description : Male. Body 21.0 long, 0.5 wide ; head bulb 0.37×0.55 , with 15-18 rows of hooks ; lips somewhat depressed, dorsal and ventral lobes with two teeth each ; oesophagus 2.4-2.8 long ; cervical sacs 2.25-2.55 long ; nerve ring 0.42-0.55, cervical papillae 0.62-0.65 and excretory pore 0.7-0.75, all from anterior end ; tail 0.3 long ; spicules 2.0 long ; caudal papillae 8 pairs, 3 preanal, 1 adanal, 4 postanal.

Female. Body 21.5 long, 0.55 wide ; tail 0.23 long, with pair of papillae 0.11 from tip ; vulva 0.55 from posterior end ; eggs 0.052×0.03 .

Host : *Urogymnus asperrimus*

Location : Spiral valve

Locality : Off Sri Lanka

Echinocephalus uncinatus Molin, 1858

1858. *Echinocephalus uncinatus* Molin, *Sber. Akad. Wiss. Wien.*, **30**, p. 154.
1904. *Cheiracanthus uncinatus* v. Linstow, in Shipley and Hornell, *Rep. Pearl Oyster Fisheries, Gulf of Mannar*, p. 100.
1906. *Echinocephalus gracilis* Stossich, in Shipley and Hornell, *Rep. Pearl Oyster Fisheries, Gulf of Mannar*, p. 89.
1920. *Echinocephalus spinosissimus* Baylis and Lane, *Proc. zool. Soc. Lond.*, no. **19**, p. 277.
1939. *Echinocephalus uncinatus* : Baylis, *F. B. I.*, **2**, p. 192.
1939. *Echinocephalus spinosissimus* : Baylis, *F. B. I.*, **2**, p. 193.
1954. *Echinocephalus spinosissimus* : Soota, *Rec. Indian Mus.*, **51**, p. 560.
1971. *Echinocephalus uncinatus* : Khan and Begum, *Bull. Dep. Zool. Punjab Univ.*, article 5, p. 3.
1971. *Echinocephalus uncinatus* : Kalyankar, *Zool. Anz.*, **187** (5/6), p. 319.
1973. *Echinocephalus uncinatus* : Parukhin, *Biol. Moria*, Kiev, **31**, p. 162.
1975. *Echinocephalus uncinatus* : Ko, *Can. J. Zool.*, **53** (4), p. 490.
1976. *Echinocephalus spinosissimus* : Shafee and Natrajan, *Curr. Sci.*, **45** (9), p. 339.
1976. *Echinocephalus uncinatus* : Shafee and Natrajan, *Curr. Sci.*, **45** (9), p. 340.
1977. *Echinocephalus spinosissimus* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 12.
1977. *Echinocephalus uncinatus* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 12.
1977. *Echinocephalus uncinatus* : Gupta and Garg, *Indian J. Helminth.*, **28** (1), p. 21.
1980. *Echinocephalus uncinatus* : Kumari and Rao, *Indian J. Parasit.*, **4** (1), p. 28.

Description : Male. Body 13.0-35.4 long, 0.55-0.8 wide ; head bulb 0.5-0.7×0.48-0.81, with 30-40 transverse rows of hooks which several hundred per row ; some rows branched, some incomplete ; hooks 0.0125-0.015 long ; lips trilobed, with peripheral papillae ; dorsal and ventral lobes each with two teeth interlocking with those of opposite lobe, and small tooth-like serrations on posterior surface ; oesophagus 3.7-5.1, and cervical sacs 1.9-3.8 long ; nerve ring 0.6-0.8, cervical papillae and excretory pore 0.76-1.15, all from anterior end ; tail 0.48-0.6 long, with slight caudal alae ; spicules two, right 1.52-1.875 long ; left 1.55-1.9 ; caudal papillae 8 pairs, 2 preanal, 1 adanal, 5 postanal.

Female. Body upto 31.0 long, 0.86 wide ; head bulb 0.75×0.72 ; hooks 0.0125 long ; oesophagus 4.6-4.9 and cervical sacs 3.3-3.8 long ; nerve ring 0.8, cervical papillae and excretory pore 1.15, all from anterior end ; tail 0.7-0.75 long with pair of papillae 0.27 from tip ; vulva 1.25-1.35 from posterior end ; eggs absent.

Hosts : *Dasyatis brucco* ; *D. pastinaca* ; *D. sephen* ; *D. walga* ; *Urogy-mnus asperrimus* ; *Cynoglossus sidenses* ; *Lates calcarifer* ; *Thrissoles sp.*, *Aetobatis narinari*

Location : Spiral valve ; inner wall of stomach and intestine

Localities : Adriatic ; off Sri Lanka ; Karachi coast (Pakistan) ; Gulf of Mannar, Porto Novo, Tamil Nadu ; Hooghly river, West Bengal

Superfamily (4) PHYSALOPTEROIDEA

In the recent classification of this superfamily, Chabaud (1975) accepted only one family Physalopteridae, embracing three subfamilies, viz. Thubunaeinae, Proleptinae and Physalopterinae.

As the Thubunaeinae is typified by perfect symmetry of the oral opening, asymmetry of the same cannot be used as a character. It is preferable to employ the cephalic collarete and the caudal bursa as more reliable characters as stressed by Chabaud (*op. cit.*).

The Proleptinae is clearly distinguished from Thubunaeinae by having common characters of the group parasitising fish.

In the Physalopterinae the following genera corresponding to the changes in homogenous line either in a group of hosts, e. g. *Pseudophysaloptera* in Soricoidea, or in a specific geographical region, e. g. *Turgida* in South America were retained. In agreement with Chabaud (*op. cit.*) the present author declines to stress division based on uterine branches as multiplication of these occurs in species in different hosts and in different regions and so, can be taken as an evidence of convergence.

The cephalic dentition which seems much related to the distribution in different groups of hosts, may be considered as a very determining character.

Pseudabbreviata (Lichtenfels & Quigley, 1968) as pointed out by Chabaud (*op. cit.*) occupies an intermediate position between Thubunaeinae and Physalopterinae. Rasheed's (1966) genera, *Bulbocephalus* and *Cestocephalus* presented taxonomic difficulties which were resolved by Le-Van-Hoa *et al.* (1972) when they found beneath the evaginated lobes of the oesophagus reduced pseudolabia having physalopteroid features. This would mean that *Bulbocephalus* would come near *Heliconema*, and *Cestocephalus* congeneric with *Bulbocephalus* as already pointed out by Chabaud (*op. cit.*).

Family PHYSALOPTERIDAE Railliet, 1893 status emend. Leiper, 1908.

Subfamily PROLEPTINAE Schulz, 1927

Hitherto, all the four genera of the subfamily are reported from fishes from this area, a key of which is given below. *Paraleptus macronemi* Gupta and Srivastava, 1981, based on three males only, has not been described pending availability of female description.

1. Vulva near anus	...	2	
Vulva away from anus	...	3	
2. Spicules unequal. Pseudolabia each with a single interno—lateral tooth	...		<i>Proleptus</i> Dujardin, 1845
3. Oesophageal lobes not protrusible	...	4	
Oesophageal lobes protrusible	...	5	
4. Spicules equal. Vulva a little post-equatorial. Pseudolabia each with a series of denticles on internal border besides interno-lateral tooth	...		<i>Paraleptus</i> H. W. Wu, 1927
Spicules markedly unequal. Vulva a little pre-equatorial. Pseudolabia each with an internal tooth only on internal border, sometimes a simple tooth at each dorsoventral extremity			<i>Heliconema</i> Travassos, 1919 (= <i>Ortleppina</i> Schulz, 1927)
5. Pseudolabia reduced. Collarette absent. Vulva in posterior fourth of body	...		<i>Bulbocephalus</i> Rasheed, 1966 (= <i>Gestocephalus</i> Rasheed, 1966)

Genus *Proleptus* Dujardin, 1845

Proleptus australis Baylis, 1933

1933. *Proleptus australis* Baylis, *Ann. Mag. nat. Hist.* (10), 12, p. 330.

1976. *Proleptus australis*: Deshmukh and Shendge, *Natural Sci. J. Marathwada Univ.*, 15 (8), p. 185.

Description : Male. Body 14.0-20.72 long, 0.46-0.48 wide, surrounded by cuticular inflation anteriorly ; lips two, each with median lateral tooth and two pairs of long spine-like teeth subdorsally and subventrally and having small denticles in between these ; oesophagus divided into two parts, 2.4-2.7 long ; nerve ring and cervical papillae 0.33-0.38, and excretory pore 0.54-0.6, all from anterior end ; tail 0.55-0.71 long, tessellated and with caudal alae ; spicules unequal, right 0.26-0.27 long,

stout, left slender, 1.15-1.2 ; caudal papillae 9 pairs, pedunculate 7-8, sessile 1-2, 3-4 preanal, 0-2 adanal, 4-5 postanal.

Female. Body 18.5 long, 0.75 wide ; anterior end as in male ; oesophagus 3.4 long ; tail 0.4 long, blunt ; vulva 8.2 from posterior end ; eggs 0.038×0.027 .

Hosts : "Tiger-shark" (probably *Galeocерdo tigrinum*) ; *Carcharias giganticus*

Location : Intestine

Localities : Off Flinders Islands, North Queensland ; Ratnagiri, Maharashtra (India)

***Proleptus inflatus* (Linstow, 1890) Baylis, 1933**

1890. *Spiroptera inflata* Linstow, *Arch. Naturgesch.*, 56, p. 180.

1933. *Proleptus inflatus* Baylis, *Ann. Mag. nat. Hist.* (10), 12, p. 326.

1969. *Proleptus inflatus* : Khan and Yaseen, *Bull. Dep. Zool. Punjab Univ.*, article 4, p. 18.

Description : Male. Body 19.00-31.05 long, 0.19-0.45 wide ; mouth with two large, triangular, lateral lips, each having conical tooth and 3 papillae, two submedian, one lateral ; cuticular cephalic collar present ; oesophagus divided into two parts, anterior muscular 0.34-0.42 long, posterior glandular 2.13-3.0 ; nerve ring 0.25-0.31, cervical papillae 0.30-0.37 and excretory pore 0.28-0.35, all from anterior end ; tail 0.14-0.27 long, blunt, with well developed caudal alae ; spicules dissimilar, unequal, longer 0.42-0.54 long, shorter 0.19-0.25 ; caudal papillae pedunculate, 8 pairs, 3-4 preanal, 1 adanal, 3-5 postanal, sessile one pair, adanal or postanal.

Female. Body 21.66-42.9 long, 0.37-0.6 wide ; mouth and collarette as in male ; cervical alae extending upto nerve ring ; entire oesophagus 3.08-4.92 long ; nerve ring 0.27-0.45, cervical papillae 0.33-0.41 and excretory pore 0.29-0.34, all from anterior end ; tail 0.15-0.18 long ; blunt ; vulva post-equatorial, sometimes near anus, 2.26-11.94 from posterior end ; eggs $0.022-0.045 \times 0.015-0.025$, oval, thick-shelled, embryonated.

Host : *Mastacembalus armatus*

Location : Intestine

Localities : Sylhet (Bangladesh) ; Lucknow, U. P.

Remarks : This species was first reported by Linstow (1890) from a fish, *Scyllium immoratum*, from an unknown locality, and subsequently by Khan and Yaseen (1969) from *Mastacembalus armatus* from Sylhet (Bangladesh).

Proleptus obtusus Dujardin, 1845

1845. *Proleptus obtusus* Dujardin, *Histoire Natur. Helminthes*, p. 105.
1933. *Proleptus obtusus* : Baylis, *Ann. Mag. nat. Hist.* (10), 12, p. 325.
1939. *Proleptus obtusus* : Baylis, *F. B. I.*, 2, p. 163.
1977. *Proleptus obtusus* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 12.

Description : Male. Body 32.0-38.0 long, 0.55 wide ; somewhat tapering anteriorly ; lips somewhat rounded, each with conical tooth ; behind lips in young an annular cuticular thickening, outer cuticle of which in adult separating from underlying layer to form prominent circular fold or collar which may be turned back like an umbrella, or forward so as to surround lips like cup ; oesophagus 3.6-4.9 long ; nerve ring 0.4-0.65, cervical papillae 0.46-0.54 and excretory pore 0.67-1.17, all from anterior end ; tail 1.0-1.76 long, with caudal alae 2.0 long ; body ventrally for some distance in front of cloacal aperture with elongate, quadrangular, cuticular elevations in longitudinal rows ; spicules dissimilar, unequal, left 1.32-2.13 long, slender, transversely striated, pointed, with small dorsal tubercle at about distal third, right 0.36-0.41 long, very characteristically shaped, stout in proximal half, tapering distally with tip bent towards left ; caudal papillae pedunculate, 8 pairs, 3 preanal or adanal, 5 postanal.

Female. Body 32.0-69.0 long, 0.73-0.91 wide ; anterior end as in male ; oesophagus 3.7-6.9 long ; tail 0.4-0.7 long, forming digitiform process bent dorsally with small terminal spike and bearing according to Seurat (1919) pair of "caudal pores" 0.042 from tip ; vulva often with much inflated cuticle, 0.89-1.0 from posterior end ; eggs 0.047-0.052 $\times$ 0.029-0.037.

Hosts : *Aetobatus flagellum* ; *Acanthias vulgaris*

Location : Stomach & intestine

Locality : Off Sri Lanka

Genus Heliconema Travassos, 1919

The genus *Heliconema*, created by Travassos (1919) with *H. heliconema* as its type species for his specimens from *Echidna catenata* from Trinidad, West Indies, has been revised by Ogden (1969). Though, considered a parasite only of fishes, this genus as *Physaloptera longissima*, has also been recorded from Australian snakes by Ortlepp (1923). However, to accommodate this species *P. longissima*, Schulz (1927) preferred to create the new genus *Ortleppina* which in turn was synony-

mised with *Heliconema* by Chabaud and Campana-Rouget (1956). This was upheld by Ogden (*op. cit.*), Chabaud (1975) in his recent classification of group, and Jones (1978, 1980) who last also reported the genus again from some Australian snakes and this is followed here.

***Heliconema ahiri* Karve, 1941**

(Fig. 102, A & B)

1941. *Heliconema ahiri* Karve, *J. Univ. Bombay*, 10 (3), p. 31.

1969. *Heliconema ahiri* : Ogden, *J. nat. Hist.*, 3, p. 480.

1977. *Heliconema ahiri* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 12.

Description : Male. Body 21.45-25.1 long, 0.475-0.6 wide ; cuticle with fine transverse striations, and inflated in cervical region as far back as cervical papillae, and sometimes forming collar surrounding lips ; lips two, each with conical tooth on inner surface and three papillae ;

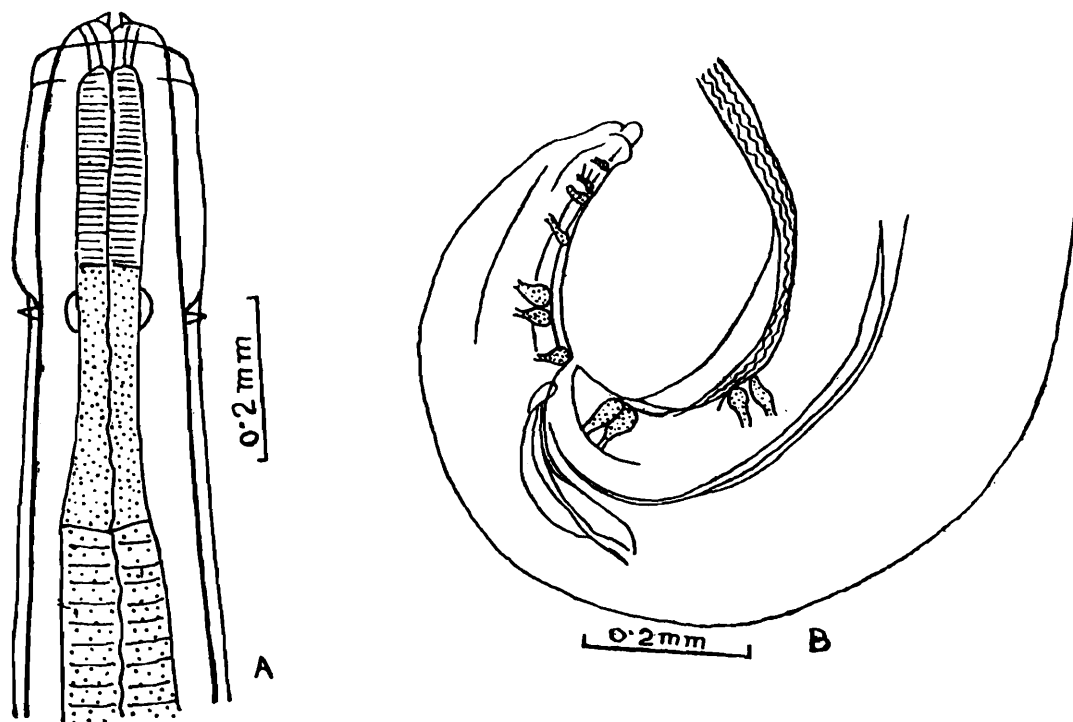


Fig. 102. *Heliconema ahiri* (After Karve, 1941.)

A. anterior end ; B. male posterior end.

oesophagus 4.0-4.3 long ; nerve ring 0.35-0.36, cervical papillae 0.35-0.38 and excretory pore 0.47-0.58, all from anterior end ; posterior part of body in front of cloacal opening tessellated ventrally ; tail 0.36-0.46 long, with well developed caudal alae and rounded tip ; spicules dissimilar, unequal, right small, broad, boat-shaped, 0.25-0.27 long, left alate in anterior two-thirds, 0.63-0.77 ; caudal papillae pedunculate, 11 pairs, 4 preanal, 7 postanal.

Female. Body 27.3-32.72 long, 0.55-0.95 wide ; anterior end as in male ; oesophagus 4.3-4.65 long ; nerve ring 0.36-0.44, cervical papillae 0.36-0.42 and excretory pore 0.53-0.58, all from anterior end ; tail 0.12-0.13 long, conical, truncate, with very small cuticular spine ; pair of papillae 0.02 from posterior end ; vulva 14.15-15.62 from anterior end, with feebly developed lips ; eggs $0.035-0.045 \times 0.025-0.03$.

Host : *Anguilla elphinstonei*

Location : Stomach

Locality : Pune, Maharashtra

Remarks : This species comes very close to *Heliconema longissima* (Ortlepp, 1922) Chabaud and Campana-Rouget, 1956 (of which *H. anguillae* Yamaguti, 1933, is a synonym) differing only in the arrangement of caudal papillae, as already observed by Ogden (1969).

***Heliconema brevispiculum* Baylis, 1934**

1934. *Heliconema brevispiculum* Baylis, *Ann. Mag. nat. Hist.* (10), 14, p. 146.

1969. *Heliconema brevispiculum* : Khan and Yaseen, *Bull. Dep. Zool. Punjab Univ.*, article 4, p. 20.

1969. *Heliconema brevispiculum* : Ogden, *J. nat. Hist.*, 3, p. 428.

Description : Male. Body 16.0-19.5 long, 0.2-0.26 wide ; cuticle with fine transverse striations and somewhat inflated in cervical region as far back as cervical papillae and sometimes forming collar surrounding lips ; lips two, each with single small conical tooth on inner surface ; oesophagus 2.2-2.6 long, divided into two parts ; nerve ring 0.16-0.25, cervical papillae 0.27-0.3 and excretory pore 0.36-0.43, all from anterior end ; asymmetrical ala with well-marked longitudinal striations in front of cloacal aperture ; tail 0.6 long, with well developed caudal alae appearing like series of separate lobes ; spicules unequal, left 0.5-0.52 long, slender, tapering, partly alate, right 0.23-0.25, broad ; caudal papillae pedunculate, 10 pairs with only 4 preanal. [According to Ogden (1969) who examined co-types and paratypes, in the male the following characters are observable : about twenty non-tessellated cuticular ridges ventrally, precloacal papillae 4 pairs, paracloacal one pair, postcloacal 5 pairs, arranged in groups of two, one and two pairs].

Female. Body 14.0-27.0 long, 0.17-0.4 wide ; anterior end as in male ; oesophagus 2.2-3.2 long ; nerve ring, cervical papillae and excretory pore, all as in male ; tail 0.22-0.27 long, conical, rapidly tapering ; vulva pre-equatorial, 5.94-9.5 from anterior end, with lips prominent, projecting outward ; eggs $0.030-0.038 \times 0.02-0.026$

Hosts : *Muraenesox cinereus* ; *Channa marulius*

Location : Stomach

Localities : Tounsville (Africa) ; Rajshahi (Bangladesh)

Remarks : According to Ogden (1969) this species comes very close to *Heliconema heliconema* Travassos, 1919, in the arrangement of caudal papillae and in showing a pronounced vulva, differing in spicules size and the non-tessellated ridges on the cuticle.

***Heliconema hamiltonii* Bilqees and Khanum, 1970**

1970. *Heliconema hamiltonii* Bilqees and Khanum, *Pakist. J. Zool.*, 2 (2), p. 21.

Description : Female. Body 21.4 long, 0.85 wide, anteriorly almost rounded, with distinct cap-like structure formed by unfolding of cuticle, posteriorly conical with triangular piece ending in sharp spine ; cuticle transversely striated, more prominent in tail region ; lips 2, prominent, each with small cuticular projection ; buccal cavity small ; oesophagus divided into two parts, anterior muscular 0.82 long, 0.12 wide, posterior-glandular 1.7 long, 0.12 wide ; vulvular structure at junction of oesophagus and intestine ; tail 0.19 long ; vulva pre-equatorial, 0.3 from anterior end ; eggs 0.027×0.027 , rounded.

Host : *Mugil hamiltonii*

Location : Intestine

Locality : Pasni (Pakistan)

Remarks : As this species is based on females only, its inclusion here is purely tentative till male description is made available.

***Heliconema heliconema* Travassos, 1919**

1919. *Heliconema heliconema* Travassos, *Arch. Mus. nac.*, 22, p. 165.

1969. *Heliconema heliconema* : Ogden, *J. nat. Hist.*, 3, p. 425.

1971. *Heliconema heliconema* : Khan and Begum, *Bull. Dep. Zool. Punjab Univ.*, article 5, p. 1.

1976. *Heliconema heliconema* : Soota and Dey Sarkar, *First National Convention Indian Helminthologists, Bhubaneswar*, p. 62.

1976. *Heliconema heliconema* : Guimaraes *et al.*, *Atas Soc. Biol. Rio de Janeiro*, 18, p. 21.

1977. *Heliconema heliconema* : Gupta and Garg, *Indian J. Helminth.*, 28 (1976), p. 24.

Description : Male. Body 5.594-18.101 long, 0.122-0.340 wide ; cuticle smooth, thick, slightly inflated at anterior end forming cephalic collarette ; mouth with two simple lateral lips, each having

conical tooth on inner surface ; oesophagus 1.139-2.277 long, divided into two parts, anterior muscular, posterior glandular ; nerve ring 0.102-0.23 from anterior end ; tail 0.421-0.448 long, with well developed and tessellated caudal alae ; spicules dissimilar, unequal, right 0.103-0.272 long, left 2.227-4.841 ; gubernaculum absent ; caudal papillae pedunculate, 8-10 pairs, 4 preanal, 0-1 adanal, 4-5 postanal.

Female. Body 8.109-56.440 long, 0.141-0.802 wide ; head as in male ; oesophagus 1.382-4.705 long ; tail 0.109-0.380 long, sometimes with about six small spine-like structures ; vulva pre-equatorial, with overhanging anterior lip ; eggs $0.034-0.037 \times 0.018-0.021$.

Hosts : *Echidna catenata* ; *Muraenesox cinereus* ; *M. sp.*

Location : Oesophagus & stomach

Localities : Trinidad ; Karachi (Pakistan) ; Calicut, Tuticorin, Pondicherry, Madras, Calcutta.

Remarks : This species was originally described from *Echidna catenata* from Trinidad, West Indies. Subsequently, it was reported by Khan and Begum (1971) from *Muraenesox cinereus* from Karachi (Pakistan) ; and from the same host from India by Soota and Dey Sarkar (1976), and Gupta and Garg (1977), the specimens of the last authors being the smallest so far known for the species. According to Ogden (1969) this species is distinct in the arrangement of caudal papillae and in size of spicules, the left being twenty times longer than right.

***Heliconema longissima* (Ortlepp, 1922) Chabaud and Campana-Rouget, 1956**

- 1922. *Physaloptera longissima* Ortlepp, *Proc. zool. Soc. London*, 2, p. 1041.
- 1927. *Ortleppina longissima* Schulz, *Samml. Helm. Arbeit*, Prof. K. I. Skrajabin, Moscow, p. 298.
- 1935. *Heliconema anguillae* Yamaguti, *Jap. J. Zool.*, 6, p. 371.
- 1956. *Heliconema longissima* Chabaud and Campana-Rouget, *Annls Parasit. hum. comp.*, 31, p. 308.
- 1969. *Heliconema longissima* : Ogden, *J. nat. Hist.*, 3, p. 428.
- 1970. *Paraleptus komiyai* Sood, *Jap. J. Parasit.*, 19 (5), p. 437.
- 1978. *Heliconema longissima* : Jones, *Mem. Qd. Mus.*, 18 (2), p. 252.
- 1978. *Heliconema longissimum* : De et al., *Fol. parasit.*, 25, p. 319.
- 1980. *Heliconema longissima* : Jones, *Aust. J. Zool.*, 28 (3), p. 428.
- 1981. *Paraleptus komiyai* : Gupta and Srivastava, *Helminthologia*, 18, p. 63.

Description : Male. Body 14.0-31.68 long, 0.31-0.62 wide ; cuticle with prominent transverse cuticular striations and well developed cuticular

inflation at anterior end ; lips two, large, lateral, each having on inner surface an anteriorly directed conical tooth ; oesophagus divided into two parts, anterior 0.23-0.53 long, posterior 1.97-3.37 ; nerve ring 0.22-0.34, deirids 0.22-0.36 and excretory pore 0.34-0.56, all from anterior end ; tail 0.22-0.45 long, ventrally bent, with broad, continuous caudal alae and having longitudinal rows of elongate, quadrangular, cuticular elevations ventrally for some distance above cloacal level ; spicules dissimilar, unequal, left 0.49-0.83 long, larger, tapering, gutter-like distally, right 0.19-0.23, shorter, with broad base, rounded distal tip with hyaline cap ; caudal papillae 11 pairs, 4 pedunculate preanal, 7 postanal, of which first three with large peduncles, 4th with very small ones, remaining 3 lacking the same.

Female. Body 14.0-34.50 long, 0.38-0.79 wide ; anterior end as in male ; oesophagus, anterior 0.32-0.53 long, posterior 2.31-3.87 ; nerve ring 0.25-0.39, cervical papillae 0.25-0.40 and excretory pore 0.37-0.52, all from anterior end ; tail 0.10-0.24 long, with bluntly rounded tip ; pair of small subterminal papillae (phasmids) ; vulva equatorial 9.27-18.16 from posterior end ; eggs $0.027-0.059 \times 0.020-0.038$.

Hosts : *Mastacembalus armatus* ; 'Snakes'

Location : Stomach & intestine

Localities : Australia ; China ; Japan ; South Africa ; Sonarpur, 24 Parganas, West Bengal ; Khagra (India)

Remarks : The first Indian record of this species from a fish is that of Ogden (1969) who reported the species from *Mastacembalus armatus* from Khagra. De *et al.* (1978) also reported the species from the same host but from Sonarpur, West Bengal. Subsequently, from Lucknow, U. P., from the same host, Sood (1970) described a new species *Paraleptus komiyai*, comparing it with a disputed species *Paraleptus australis* Johnston and Mawson, 1943, as according to Yamaguti (1961, p. 56), the species on account of its having very unequal and dissimilar spicules, hardly fits into the genus *Paraleptus* which being characterised as having equal spicules. But, Sood (*op. cit.*) disagreeing with Yamaguti (*op. cit.*) stated that the size and shape of spicules is a variable character within the genus. Yamaguti (*op. cit.*) suggested the probability of *Paraleptus australis* representing a distinct genus. However, De *et al.* (*op. cit.*) finding a close similarity between their specimens and of Sood's opined that *P. komiyai* should be synonymised with *Heliconema longissimum*, and the present author concurs with this opinion. Gupta and Srivastava (1981) while accepting the validity of Sood's species were obviously unaware of De *et al.* (*op. cit.*). Their species described as new *Paraleptus macronemi*, based

on three males from a marine fish *Upeneus macronemus* from Puri, Orissa, desirably requires confirmation after examination of fresh material including females. However, the species has recently been again recorded from Australian snakes by Jones (1978, 1980) who also reported some variations.

Genus *Bulbocephalus* Rasheed, 1966

1966. *Bulbocephalus* Rasheed, *Parasitology*, **56**, p. 151.
1966. *Cestocephalus* Rasheed, *Parasitology*, **56**, p. 157.
1972. *Bulbocephalus* : Le-Van-Hoa *et al.*, *Bull. Soc. Path. exot.*, **65** (2), p. 321.
1975. *Bulbocephalus* : Chabaud, *CIH keys*, No. 3, p. 14.

Bulbocephalus inglisi Rasheed, 1966

(Fig. 103, A-F)

1966. *Bulbocephalus inglisi* Rasheed, *Parasitology*, **56**, p. 151.
1966. *Cestocephalus serratus* Rasheed, *Parasitology*, **56**, p. 157.
1972. *Bulbocephalus serratus* Le-Van-Hoa *et al.*, *Bull. Soc. Path. exot.*, **65** (2), p. 317, 320-321.
1977. *Bulbocephalus inglisi* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 13.

Description : Male. Body 10.8-10.89 long, 0.15 wide ; pseudolips absent ; head swollen anteriorly to form bulb, more prominently in females, entire head strengthened by peculiar thickening or 'pouches', which being laterally paired and medially unpaired to surround most anterior part of oesophagus, and supported by strong sets of muscles probably controlling their movements ; oesophagus, very characteristic and unique, extending more than half body length, and divided into two parts, small anterior muscular with two prominent enlargements or bulbs, 0.3-0.31 long, and very large posterior glandular 6.3 ; nerve ring 0.25, cervical papillae 0.2 and excretory pore 0.29, all from anterior end ; tail 0.17 long, bluntly pointed, with alae turned ventrally ; spicules slightly dissimilar, unequal, right 0.09 long, small, alate, tapering, with bifid tip, left 0.26, alate, bluntly tapering, with minute spinules on tip ; caudal papillae pedunculate, 9 pairs, 4 preanal, 5 postanal.

Female. Body 15.3 long, 0.23 wide ; head structure same as in male, with 3 pouches apparently having ejected out of mouth opening ; oesophagus, anterior muscular 0.33-0.34 long, posterior glandular 7.7 ; nerve ring 0.25 from anterior end ; cervical papillae and excretory pore not clearly discernible ; tail 0.16 long, with three small points ; vulva in posterior fourth of body, about 3.7 from tail tip ; eggs $37-38\mu \times 18-19\mu$.

Hosts : *Eleutheronema tetradactylum*, and an undetermined fish ('Jhikar', in Sindhi)

Location : Intestine

Locality : Karachi (Pakistan)

Remarks : Rasheed (1966) described two new genera, viz. *Bulbocephalus* and *Cestocephalus* from marine fish from Karachi (Pakistan),

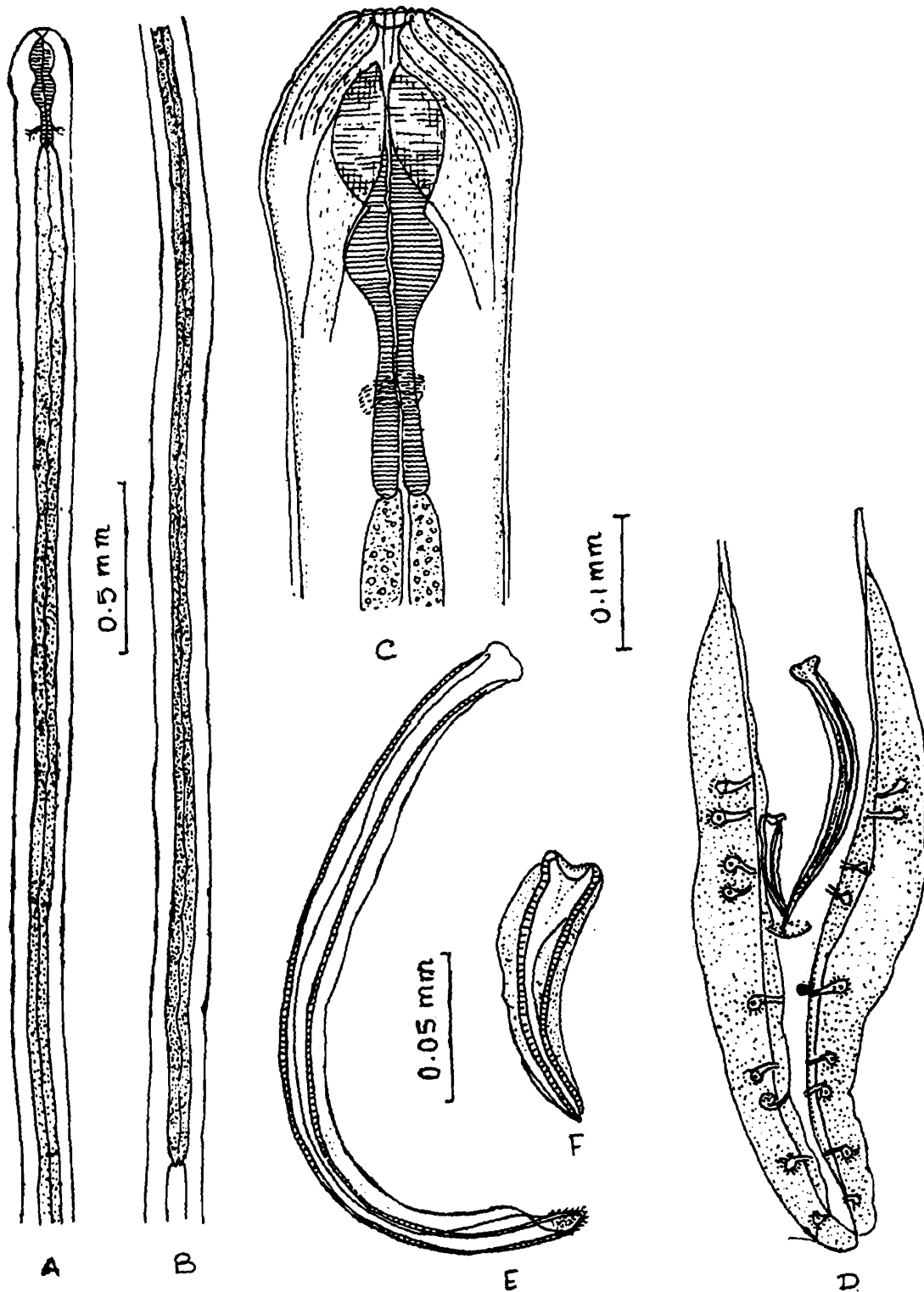


Fig. 103. *Bulbocephalus inglisi* (After Rasheed, 1966.) A. anterior end ; B. showing oesophageal region ; C. anterior end (magnified) ; D. male posterior end ; E & F. spicules.

but Le-Van-Hoa *et al.* (1972) and Chabaud (1975) treated the second genus congeneric with the first. The present author has included only one species under the present genus, the second species *Bulbocephalus serratus*, being based on a female only, is not being considered though Le-Van-Hoa *et al.* (*op. cit.*) retained it as separate.

Superfamily (5) HABRONEMATOIDEA

Family CYSTIDICOLIDAE Skrjabin, 1946, status emend.

Chabaud, 1975

Skrjabin (1946) for the reception of the genus *Cystidicola* Fischer, 1798, created the subfamily Cystidicolinae under the family Rhabdionidae, but Chabaud (1975) raised it to family rank. Recently, under the family, the following four genera were added : *Cristitectus* Petter, 1970, *Salvelinema* Trofimenko, 1962, *Ctenascarophi* Mamaev, 1968, and *Spinitectoides* Petter, 1969. Another genus *Sterliadochona* Skrjabin, 1946, synonymised with *Cystidicoloides* by Rasheed (1965). and Moravec (1967), but upheld by Maggenti and Paxman (1971) was also not accepted by Chabaud (1975). Following him (1965, 1975) and confirmed by Le-Van-Hoa *et al.* (1969), the present author includes the genus *Pseudoproleptus* Khera, 1955, in the family Cystidicolidae and not in Physalopteridae.

Following Johnson and Khera (1967), and Sahay (1967) who were supported by Khalil (1973), Chabaud (1975), Margolis (1975) and Soota and Dey Sarkar (1980), the genus *Notopteroides* Chakravarty and Majumdar, 1962, is accepted as a synonym of *Pseudoproleptus*. As regards *Collarinema* Sey, 1970, it has been accepted as synonym of *Pseudoproleptus* both by Margolis (1975) and Chabaud (1975).

Regarding the genus *Neospinitectus* Kalyankar, 1971, showing peculiarity in cervical ornamentation, its inadequate description has prevented its definite classification as already observed by Chabaud (*op. cit.*).

Genus *Pseudoproleptus* Khera, 1955

Khera (1955) established the genus *Pseudoproleptus* with *P. vestibulus* as its type species, for his specimens from a fresh water fish, *Mastacembalus armatus*, from Lucknow, U. P. This genus is characterised as mouth bounded by two lateral lips, each with a pair of submedian papillae and a single tooth ; anterior end encircled by a cuticular structure described by Khera as "a circular fold or collar of cuticle which may be turned back like an umbrella or forward so as to surround

the anterior end like a cup"; oesophagus undivided, well developed vestibule (=stoma, buccal cavity, or pharynx); spicules unequal and dissimilar in shape; preanal papillae pedunculated and 4 pairs; vulva post-equatorial; eggs embryonated, non-filamented, and thick shelled.

Khera (*op. cit.*) was probably unaware of the species *Metabronema notopteri* described by Karve and Naik (1951) from a freshwater fish, *Notopterus notopterus* with which his species agrees in most of the characters excepting the number of caudal papillae and certain other minor details and variations some of which have been shown to be erroneous. Hence, it is necessary to make a careful re-examination of the specimens of both Karve and Naik (*op. cit.*), and Khera (*op. cit.*). Margolis (1975) in his noteworthy review of the genus *Pseudoproleptus* is of the opinion that only one species, *P. notopteri* is valid. If the number of caudal papillae observed in both the species is same on re-examination, then obviously *P. notopteri* becomes type species. Pending this, a key for both the species is tentatively given below.

Caudal papillae 12 pairs.	...	<i>P. notopteri</i>
Caudal papillae 10 pairs	...	<i>P. vestibulus</i>

***Pseudoproleptus notopteri* (Karve and Naik, 1951)**

Margolis, 1975

1951. *Metabronema notopteri* Karve and Naik, *J. Univ. Bombay*, 19 (5), p. 8.

1970. *Collarinema notopteri* Sey, *Acta zool. hung.*, 16, p. 210.

1975. *Pseudoproleptus notopteri* Margolis, *Dr. B. S. Chauhan Comm. Vol. Zool. Sc. India*, p. 25.

Description : Male. Body 6.40-7.61 long, 0.16-0.18 wide; cuticle of head region generally reflected back; lips two, each with pair of submedian papillae on outer surface at anterior corners, and forwardly directed tooth on inner surface at margin; pharynx 0.08-0.09 long; oesophagus divided into two parts, anterior muscular 0.2-0.23 long, posterior glandular 1.15-1.325; cervical papillae 0.13-0.175, nerve ring 0.15-0.18, and excretory pore 0.32-0.36, all from anterior end; tail 0.31-0.34 long, with moderately developed caudal alae; tessellated band starting from upper lip of cloacal opening running anteriorly and ventrally; spicules dissimilar, unequal, right short, broad, 0.15-0.19 long, left 0.49-0.52, with two slightly variable processes at tip; caudal papillae pedunculate, 10 pairs, 4 preanal, 6 postanal; sessile 2 pairs near posterior end.

Female. Body 8.5-12.5 long, 0.25-0.32 wide; anterior end as in male; oesophagus, anterior muscular 0.225-0.27 long, posterior glandular 1.15-1.62; cervical papillae 0.16-0.205, nerve ring 0.17-0.21, and

excretory pore 0.34-0.37, all from anterior end ; tail 0.1-0.12 long, bluntly rounded, with pair of caudal papillae about 0.01 from posterior end ; vulva 3.4-4.35 from posterior end ; eggs $0.07-0.08 \times 0.04-0.045$.

Host : *Notopterus notopterus*

Location : Stomach

Locality : Pune, Maharashtra ; Ahmedabad, Gujarat

***Pseudoproleptus vestibulus* Khera, 1955**

(Fig. 104)

- 1955. *Pseudoproleptus vestibulus* Khera, *Indian J. Helminth.*, **5** (1953), p. 115.
- 1962. *Notopteroides notopteri* Chakravarty and Majumdar, *Proc. zool. Soc., Calcutta*, **15**, p. 24.
- 1965. *Notopteroides alatae* Majumdar, *Bull. syst. zool. Calcutta*, **1** (1), p. 85.
- 1967. *Pseudoproleptus notopterus* Johnson and Khera, *Indian J. Helminth.*, **18** (1966), p. 149.
- 1967. *Pseudoproleptus alatus* Johnson and Khera, *Indian J. Helminth.*, **18** (1966), p. 149.
- 1967. *Pseudoproleptus notopteri* : Sahay, *Indian J. Helminth.*, **18** (1966), Seminar suppl., p. 80.
- 1967. *Pseudoproleptus satendri* Sahay, *Indian J. Helminth.*, **18** (1966), Seminar suppl., p. 80.
- 1970. *Pseudoproleptus satendri* : Singh, *Indian J. Sci. Industry* (B, anim. Sci.), **4**, p. 41.
- 1970. *Pseudoproleptus alatae* : Singh, *Indian J. Sci. Industry* (B, anim. Sci.), **4**, p. 42.
- 1970. *Pseudoproleptus alatae* : Sahay, Sinha and Sadhu, *Indian J. Sci. Industry* (B, anim. Sci.), **4**, p. 52.
- 1970. *Pseudoproleptus armati* Sahay, Sinha and Sadhu, *Indian J. Sci. Industry* (B, anim. Sci.), **4**, p. 52.
- 1971. *Pseudoproleptus notopteri* : Verma, *Proc. natn. Acad. Sci., India*, **41**, p. 387.
- 1974. *Pseudoproleptus notopteri* : Sood, *Indian J. Helminth.*, **24** (1972), p. 5.
- 1975. *Pseudoproleptus vestibulus* : Margolis, *Dr. B. S. Chauhan Comm. Vol. Zool. Soc. India*, p. 21.
- 1977. *Pseudoproleptus alatae* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 12.
- 1977. *Pseudoproleptus notopteri* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 12.
- 1977. *Pseudoproleptus satendri* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 12.
- 1977. *Pseudoproleptus vestibulus* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 13.

1980. *Pseudoproleptus notopteri* : Ray, Saha and Majumdar, *Proc. 67th Indian Sci. Congr.*, pt. III, abstract, p. 147.

1980. *Pseudoproleptus vestibulus* : Soota and Dey Sarkar, *Proc. zool. Soc., Calcutta*, 31 ('978), p. 40.

Description : Male. Body 5.9-29.7 long, 0.184-0.48 wide ; oesophagus divided into two parts, anterior muscular, 0.184-0.27 long, posterior glandular 1.067-0.4 ; nerve ring 0.175-0.41 from anterior end ; tail 0.17-0.33 long, with caudal alae ; spicules dissimilar, unequal, smaller 0.168-0.234 long, larger 0.4-0.6 ; caudal papillae 10 pairs, 4 preanal, 6 postanal.

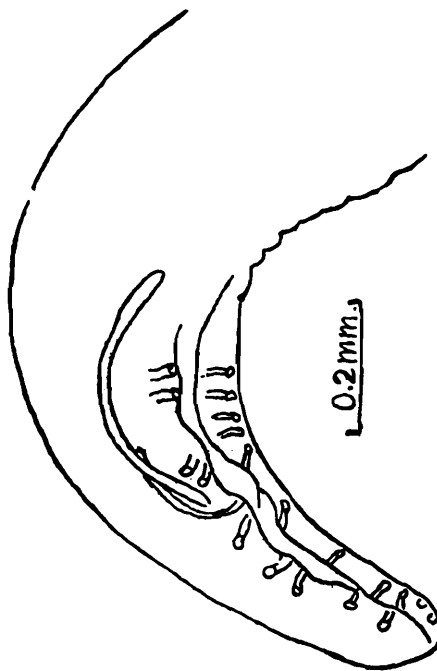


Fig. 104. *Pseudoproleptus vestibulus*. (After Soota and Dey Sarkar, 1980.)
Male posterior end.

Female. Body 6.09-34.2 long, 0.20-0.66 wide ; vestibule 0.059-0.11 long ; oesophagus, anterior muscular 0.156-0.368 long, posterior glandular 0.992-3.9 ; nerve ring 0.1-0.49 from anterior end ; tail 0.09-0.21 long ; vulva post-equatorial, 2.75-15.0 from posterior end ; eggs $0.044-0.084 \times 0.022-0.033$.

Hosts : *Mastacembalus armatus* ; *Notopterus notopterus* ; *N. chitalu*

Location : Intestine & stomach

Localities : Lucknow, U. P. ; Siliguri & Calcutta, West Bengal ; Ranchi, Bihar.

Remarks : Verma (1971) while describing some specimens as *Pseudoproleptus notopteri* from *Notopterus notopterus* from Lucknow, gave the total number of caudal papillae as eight pairs instead of ten, without specifying their location.

Genus **Parascarophis** Campana-Rouget, 1955.**Parascarophis bharatii** Agrawal, 1965

(Fig. 105, A & B)

1965. *Parascarophis bharatii* Agrawal, *Proc. helminth. Soc. Wash.*, **32** (2), p. 247.

Description : Male. Body 16.35-23.12 long, 0.25-0.35 wide, with fine transversely striated cuticle ; cephalic extremity covered by a circular disc with 2 amphids and 4 submendian papillae ; head 0.10-0.14 in diameter, with cap-like cuticular expansion extending backwards more dorsally than ventrally ; lips two, large, bilobed, lateral, each with 2 large teeth and 3 well-developed papillae ; vestibule 0.03-0.05 long, 0.05-0.07 wide ; oesophagus divided into two parts, anterior muscular 0.32-0.41 long, posterior glandular 1.91-3.03 ; nerve ring 0.21-0.28, excretory pore 0.22-0.31, and cervical papillae 0.24-0.35, all from anterior end ; tail 0.22-0.28 long, with well developed caudal alae ; spicules broad, alate, unequal, right 0.54-0.66 long, left 0.22-0.27 ; gubernaculum absent ; caudal papillae pedunculate 9 pairs, 4 preanal, 1 adanal, 4 postanal ; sessile one pair, near tip of tail, close to which also pair of phasmids.

Female. Body 16.78-26.29 long, 0.26-0.35 wide ; anterior end as in male ; head 0.15-0.19 in diameter ; oesophagus, anterior muscular 0.37-0.43 long, posterior glandular 2.61-3.56 ; nerve ring 0.25-0.31, excretory pore 0.26-0.34, and cervical papillae 0.29-0.35, all from anterior end ; vulva post-equatorial, 8.98-15.46 from anterior end ; eggs oval, $0.08-0.085 \times 0.05-0.055$, without polar filaments.

Host : *Mastacembalus armatus*

Location : Stomach

Locality : Assam

Remarks : This genus, based on a female only, was reported for the first time from India by Agrawal (1965) who furnished descriptions not only of the female but also of the male.

Genus **Spinitectus** Fourment, 1883

Fourment (1883), on the basis of females, established the genus *Spinitectus* with *S. oviflagellis* as its type species, and subsequently the description was completed from males by Rahman (1964). Zeder (1800) described *Goezia inermis* which, renamed as *Spinitectus inermis*, was redescribed by Neveu-Lemire (1927). *S. echinta* (v. Linstow, 1878) later described under the genus was treated as synonym of *S. oviflagellis* by Morishita, and as a larval form of *S. inermis* by Yorke and Maplestone. Stewart (1914) described from males only a variety *Spiroptera*

denticulata var. *minor* from *Wallago attu* from India, which was renamed as *Spinitectus minor* by Baylis (1939). Subsequently several species were added under the genus. A careful study of the relevant literature shows that the validity of most of the Indian species is doubtful and this has resulted in a lot of confusion.

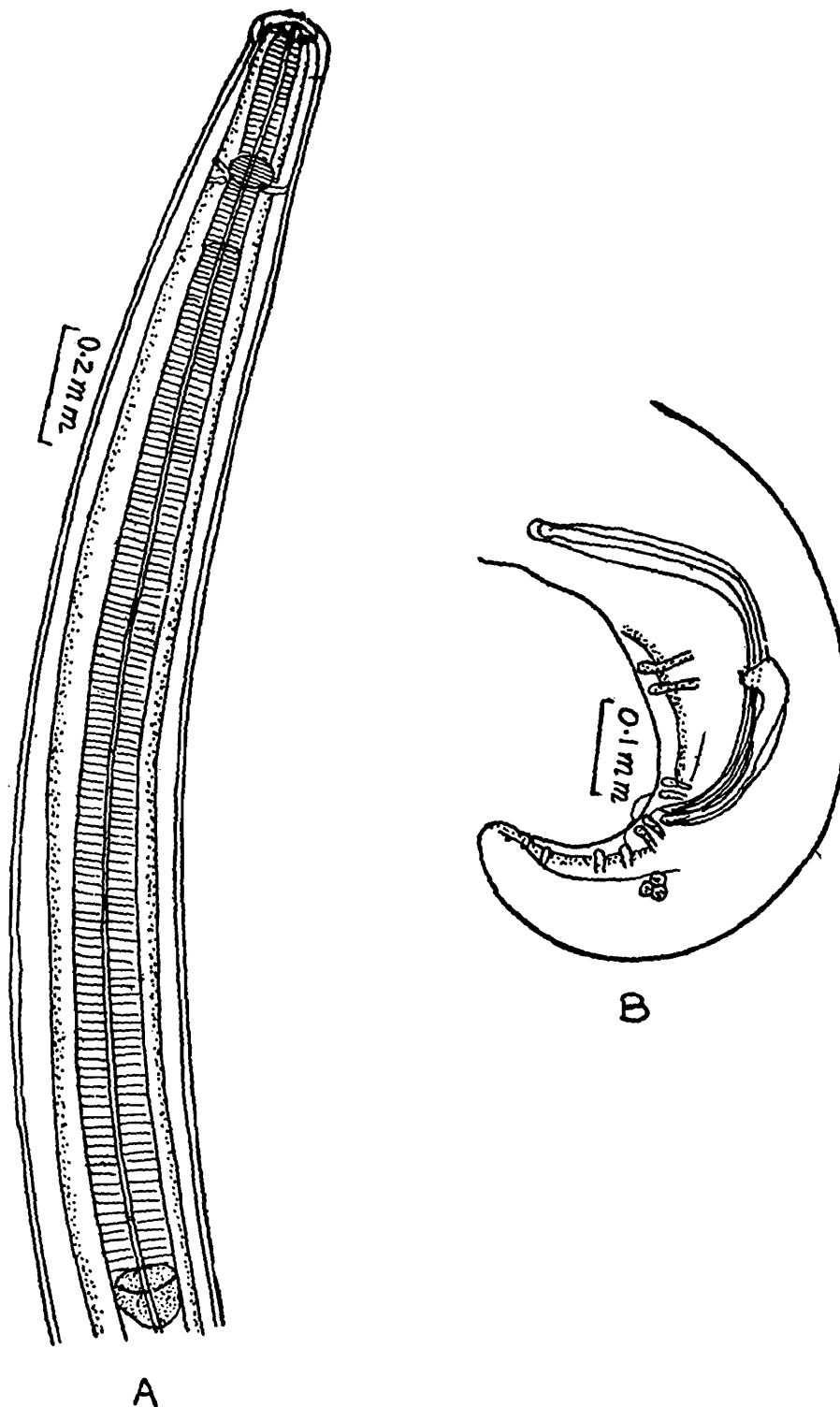


Fig. 105. *Parascarophys bharti*. (After Agrawal, 1965.) A. anterior end ;
B. male posterior end.

Regarding the taxonomy of the genus, Yorke and Maplestone (1926) included it under the subfamily Rictulariinae of the family Rictulariidae.

Subsequently, it was placed by Baylis and Daubney (1926) as an appendix to the subfamily Thelaziinae ; in their new subfamily Rhabdochoniinae by Travassos, Artigas and Pereira (1928) and in his new family Rhabdochonidae and subfamily Spinitectinae by Skrjabin (1946, 1969) and this was followed by Yamaguti (1961). Recently, after being dealt with by Khera (1956), Ali (1957), Sahay and Prasad (1965), Sahay (1970), and Kalyankar (1975), the genus was finally placed under the family Cystidicollidae by Chabaud (1975) and this arrangement has been followed in this paper.

A key to various species under the genus is given below.

1. Spicules equal and similar	...	...	2
Spicules unequal but similar	...	<i>S. longipapillatus</i>	
Spicules unequal and dissimilar	...	...	3
2. Caudal papillae 8-9 pairs	...	<i>S. indicus</i>	
Caudal papillae 14 pairs	...	<i>S. seenghalai</i>	
3. Longer spicule with foot-shaped distal portion	...	<i>S. minor</i>	
Longer spicule without foot-shaped distal portion	...	...	4
4. Caudal alae present	...	...	5
Caudal alae absent	...	...	7
5. Longer spicule about double length of smaller		<i>S. neilli</i>	
Longer spicule more than double length of smaller	...	...	6
6. Caudal papillae 8-9 pairs	...	<i>S. komiyai</i>	
Caudal papillae 16 pairs	...	<i>S. notopteri</i>	
7. Caudal papillae 8 pairs	...	<i>S. caballeroi</i>	
Caudal papillae 9 pairs	...	<i>S. pandharinathi</i>	

Spinitectus caballeroi Datta and Majumdar, 1972

(Fig. 106)

1972. *Spinitectus caballeroi* Datta and Majumdar, *An. Inst. Biol. Univ. Mex.*, 43, ser. *Cienc. Del. Mar. y Limnol.* (1), p. 85.

Description : Male. Body 5.40 long, 0.17 wide, with 102 spinous circlets, beyond which spines absent ; first 16 compact, and closely set, remaining sparsely distributed ; head 0.03 in dorsoventral diameter ; lips 2, lateral, each with papilla ; buccal capsule 0.07 long, funnel-shaped ; oesophagus divided into two parts, anterior muscular 0.55 long, posterior glandular 1.80 ; nerve ring 0.12 from anterior end ;

tail 0.12 long, bluntly rounded; caudal region with five longitudinal rows of discontinuous tubercles ventrally; caudal alae absent; spicules dissimilar, unequal, right smaller, narrow, gradually tapering, 0.22 long; left longer, wide, with knob proximally, 0.89; caudal papillae 8 pairs, 5 preanal, 1 adanal, 2 postanal.

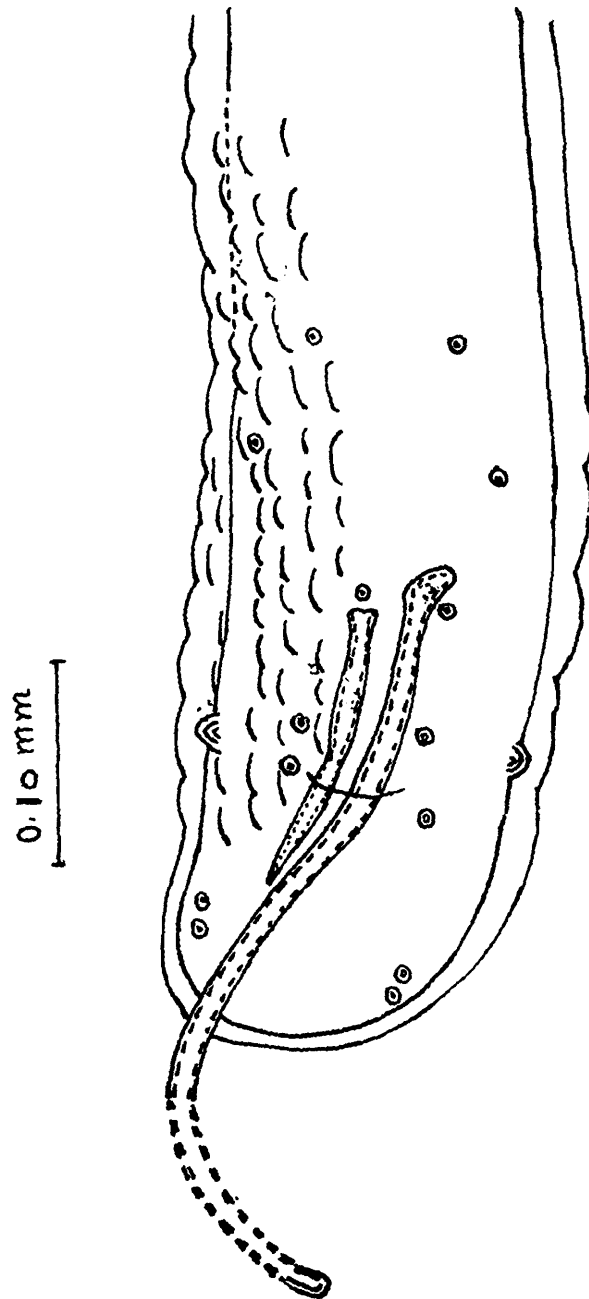


Fig. 106. *Spinitectus caballeroi*. (After Datta and Majumdar, 1972.)
Male posterior end.

Female. Body 22.34 long, 0.20 wide, with 208 spinous circlets and sparsely distributed spines upto tail tip; first 21 compact and closely set; head 0.05 in dorsoventral diameter; lips as in male; buccal capsule 0.09 long; oesophagus, anterior muscular 1.08 long, posterior glandular 3.10; nerve ring 0.18 from anterior end; tail 0.12 long,

conical ; vulva on prominence just anterior to anal aperture, 0.36 from posterior end ; eggs 0.03×0.02 , oval.

Host : *Bagarius bagarius*

Location : Stomach

Locality : Midnapore, West Bengal

***Spinitectus indicus* Verma and Agarwal, 1932**

1932. *Spinitectus indicus* Verma and Agarwal, *Rec. Indian Mus.*, **34**, p. 263.
1939. *Spinitectus indicus* : Baylis, *F. B. I.*, **2**, p. 172.
1965. *Spinitectus indicus* : Sahay and Prasad, *Jap. J. med. Sci. Biol.*, **18** (3), p. 148.
1969. *Spinitectus indicus* : Khan and Yaseen, *Bull. Dep. Zool. Panjab Univ.*, article 4, p. 21.
1970. *Spinitectus indicus* : Sahay, *Annls Parasit. hum. comp.*, **45** (5), p. 658.
1971. *Spinitectus agrawali* Verma, *Proc. natn. Acad. Sci. India*, **41** (B), p. 387.
1972. *Spinitectus indicus* : Datta and Majumdar, *An. Inst. Biol. Univ. Me'x.*, **43**, ser. *Cienc. Del. Mar. y Limnol.* (1) : p. 90.
1973. *Spinitectus indicus* : Fotedar and Dhar, *J. Sci., Univ. Kashmir*, **1** (1-2), p. 64.
1975. *Spinitectus indicus* : Kalyankar, *Natural Sci. J. Marathwada Univ.*, **14** (7), p. 238.
1977. *Spinitectus indicus* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 14.
1979. *Spinitectus muelleri* Gupta and Verma, *Indian J. Helminth.*, **26**, (1977), p. 144.

Description : Male. Body 6.0-7.32 long, 0.11-0.23 wide ; cuticle with more than 150 spiny annulations with 22-28 spines in each ; anterior 20-30 conspicuous, posterior gradually becoming less prominent, and completely disappearing near anus ; mouth with four inconspicuous papillae ; vestibule 0.02-0.12 long, narrow, tubular ; oesophagus 1.5-1.7 long ; tail 0.16 long ; caudal alae absent ; spicules similar, equal, 0.11-0.21 long, each sometimes proximally forming rod at right angle to main axis which latter somewhat depressed near middle by tubercle-like swelling ; caudal papillae 8-9 pairs, 4-5 preanal, 4 postanal.

Female. Body 3.3-9.6 long, 0.21-0.39 wide ; spiny annulations of cuticle as in male ; vestibule 0.02-0.05 long ; oesophagus 1.9 long ; tail 0.08-0.27 long, with pointed tip ; vulva 0.28-5.36 from posterior end.

Hosts : *Pseudeutropius garua* ; *Eutropiichthys vacha* ; *Wallago attu* ; *Notopterus notopterus*

Location : Intestine

Locality : Allahabad & Lucknow, U. P. ; Dacca (Bangladesh)

Remarks : Verma and Agarwal (1932) described *Spinitectus indicus* from two different freshwater fishes, *Pseudeutropius garua* and *Eutropiichthys vacha*. Subsequently, the species was reported by Khan and Yaseen (1969) from *Wallago attu* from Dacca (Bangladesh). Verma (1971) described the species *S. agrawali*, and Gupta and Verma (1979) another, *Spinitectus muelleri*, both from *Notopterus notopterus* from Lucknow, which both, barring body size and position of vulva, do not appear to be distinct from *S. indicus*, and hence treated as its synonym.

***Spinitectus komiyai* Sahay and Prasad, 1965**

(Fig. 107)

- 1965. *Spinitectus komiyai* Sahay and Prasad, *Jap. J. med. Sci. Biol.*, **18**, p. 143.
- 1965. *Spinitectus pseudeutropii* Agrawal, *Indian J. Helminth.*, **17** (1), p. 13.
- 1968. *Spinitectus pseudeutropii* : Sood, *Indian J. Helminth.*, **20** (2), p. 105.
- 1970. *Spinitectus komiyai* : Sahay, *Annls Parasit. hum. comp.*, **45** (5), p. 658.
- 1972. *Spinitectus komiyai* : Datta and Majumdar, *An. Inst. Biol. Univ. Me'x.*, **43**, Ser. Cienc. Del. Mar. y Limnol. (1), p. 90.
- 1972. *Spinitectus pseudeutropii* : Datta and Majumdar, *An. Inst. Biol. Univ. Me'x.*, **43**, Ser. Cienc. Del. Mar. y Limnol. (1), p. 90.
- 1973. *Spinitectus komiyai* : Fotedar and Dhar, *J. Sci., Univ. Kashmir*, **1** (1-2), p. 65.
- 1973. *Spinitectus pseudeutropii* : Fotedar and Dhar, *J. Sci., Univ. Kashmir*, **1** (1-2), p. 65.
- 1975. *Spinitectus komiyai* : Kalyankar, *Natural Sci. J. Marathwada Univ.*, **14** (7), p. 239.
- 1977. *Spinitectus komiyai* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 15.
- 1977. *Spinitectus pseudeutropii* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 15.
- 1979. *Spinitectus pseudeutropii* : Gupta and Verma, *Indian J. Helminth.*, **29** (1-2), p. 147.

Description : Male. Body 5.02-10.30 long, 0.15-0.27 wide, and with 18-20 rings of spines more conspicuous anteriorly and upto end of oesophagus, beyond which indiscernible ; first two rings very prominent ; cephalic papillae 3 pairs, two submedian, one lateral ; vestibule funnel-shaped, 0.0315 long ; oesophagus divided into two parts, anterior muscular 0.15-0.32 long, posterior glandular 1.12-1.50 ; nerve ring 0.08-0.17 from anterior end ; tail 0.15-0.195 long, with caudal alae and spine ; spicules dissimilar, unequal, right 0.05-0.09 long, left 0.17-0.25 ; caudal papillae 8-9 pairs, 4 preanal, 4-5 postanal, sometimes with median sessile papilla.

Female. Body 5.38-12.07 long, 0.19-0.32 wide ; and as in male ; vestibule 0.036 long ; oesophagus, anterior muscular 0.19-0.43 long, posterior glandular 1.05-1.60 ; tail 0.16-0.32 long, conical and with

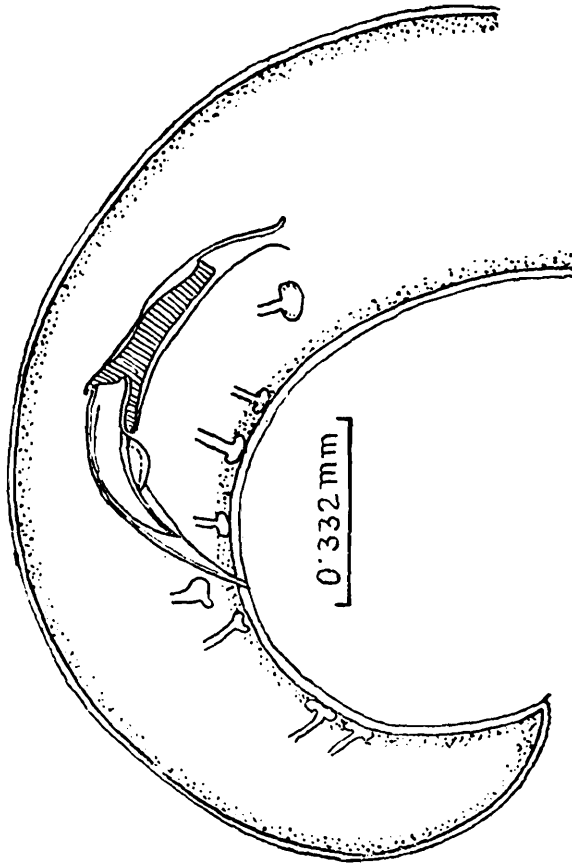


Fig. 107. *Spinitectus komiyai*. (After Sahay and Prasad, 1965.)
Male posterior end.

spine on a knob-like structure laterally serrated ; vulva pre-equatorial, 2.35-4.50 from anterior end ; eggs $0.02-0.42 \times 0.0125-0.3$.

Hosts : *Pseudeutropius garua* ; *Eutropiichthys vacha* ; *Wallago attu*

Location : Intestine

Localities : Lucknow & Gorakhpur, U. P. ; Patna, Bihar

Remarks : Sahay and Prasad (1965) created the species *Spinitectus komiyai* for their specimens from *Eutropiichthys vacha* from Patna, Bihar. A little later, Agrawal (1965) described her species *S. pseudeutropii* as new from *Pseudeutropius garua* from Lucknow, U. P., which was accepted by Sood (1968), Verma (1971), and Gupta and Verma (1979) as valid, and the first species considered by them as its synonym. Rai (1969) added another new species *S. pandei* from two fishes, viz. *Pseudeutropius garua* and *Eutropiichthys vacha* from Gorakhpur U. P., separating it from *S. pseudeutropii* mainly in showing slight difference in the number of caudal papillae which, however, is treated here merely as an intraspecific variation, and accordingly Rai's species is considered

as conspecific with *S. neilli* (*vide infra*). Sahay (1970), however, while accepting the conspecificity of both *S. komiyai* Sahay and Prasad, 1965, and *S. pseudotropii* Agrawal, 1965, contended that according to Law of Priority Sahay and Prasad's species should receive priority, and the present author agrees with it. Chaturvedi and Kansal (1977), however, made a foot-note reference only of Sood (*op. cit.*).

Further, it is possible that future studies of more material may prove the above species as conspecific with *Spinitectus neilli* Karve and Naik, 1951, until when the species may be treated as valid.

***Spinitectus longipapillatus* Ali, 1957**

- 1957. *Spinitectus longipapillatus* Ali, *Indian J. Helminth.*, **8**, p. 34.
- 1965. *Spinitectus longipapillatus* : Sahay and Prasad, *Jap. J. med. Sci. Biol.*, **18** (3), p. 149.
- 1970. *Spinitectus longipapillatus* : Sahay, *Annls Parasit. hum. comp.*, **45** (5), p. 658.
- 1972. *Spinitectus longipapillatus* : Datta and Majumdar, *An. Inst. Biol. Univ. Me'x.*, **43**, Ser. Cienc. Del. Mar. y Limnol. (1), p. 90.
- 1973. *Spinitectus longipapillatus* : Fotedar and Dhar, *J. Sci., Univ. Kashmir*, **1** (1-2), p. 64.
- 1975. *Spinitectus longipapillatus* : Kalyankar, *Natural Sci. J. Marathwada Univ.*, **14** (7), p. 239.
- 1977. *Spinitectus longipapillatus* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 15.

Description : Male. Body 3.93 long, 0.126 wide, and with 92 spiny rings upto a short distance in front of caudal alae ; first two rings set close ; lips two, each with a pair of submedian papillae and a lateral amphid ; vestibule 0.039 long ; oesophagus divided into two parts, anterior muscular 0.189 long, posterior glandular 0.571 ; nerve ring 0.107, and excretory pore 0.164, both from anterior end ; tail 0.102 long, conical, pointed, and with broad caudal alae ; spicules similar, unequal, right 0.045 long, left about double right, 0.092 ; caudal papillae pedunculate, 8 pairs, 4 preanal, 4 postanal ; sessile 5 at tip of tail.

Female. Body 3.98 long, 0.134 wide, and with 98 spiny rings upto tip of tail ; first two rings set close ; lips as in male ; vestibule 0.042 long ; oesophagus, anterior muscular 0.192 long, posterior glandular 0.578 ; nerve ring 0.107, and excretory pore 0.169, both from anterior end ; tail 0.092 long ; vulva at about junction of middle and posterior third of body ; eggs $66 \times 20 \mu$.

Host : *Rita kuturnee*

Location : Stomach

Locality : Hyderabad, Andhra Pradesh

Spinitectus minor (Stewart, 1914) Baylis, 1939

- *1914. *Spiroptera denticulata* var. *minor* Stewart, *Rec. Indian Mus.*, **10**, p. 175.
1938. *Spinitectus corti* Moorthy, *J. Parasit.*, **24**, p. 319.
1939. *Spinitectus minor* Baylis, *F. B. I.*, **2**, p. 171
1939. *Spinitectus corti* : Baylis, *F. B. I.*, **2**, p. 173.
1951. *Spinitectus mastacembeli* Karve and Naik, *J. Univ. Bombay*, **19** (5), p. 13.
1956. *Spinitectus major* Khera, *Indian J. Helminth.*, **6** (2), p. 80.
1957. *Spinitectus thapari* Ali, *Indian J. Helminth.*, **8**, p. 27.
1957. *Spinitectus armatus* Ali, *Indian J. Helminth.*, **8** p. 29.
1957. *Spinitectus singhi* Ali, *Indian J. Helminth.*, **8**, p. 32.
1957. *Spinitectus corti* : Ali, *Indian J. Helminth.*, **8**, p. 36.
1957. *Spinitectus minor* : Ali, *Indian J. Helminth.*, **8**, p. 38.
1961. *Spinitectus bengalensis* Chakravarty et al., *Zool. Anz.*, **166** (5/6), p. 227.
1966. *Spinitectus fossili* Chandan Lal, *Labdev J. Sci. Tech.*, **4** (2), p. 121.
1966. *Spinitectus batrachi* Chandan Lal, *Labdev J. Sci. Tech.*, **4** (2), p. 121.
1968. *Spinitectus mastacembeli* : Sood, *Indian J. Helminth.*, **20**, p. 101.
1970. *Spinitectus alii* Kalyankar, *Marathwada Univ. J.*, **9**, p. 5.
1976. *Spinitectus major* : Deshmukh and Shendge, *Marathwada Univ. J.*, **15** (8), p. 189.
1976. *Spinitectus armatus* : Deshmukh and Shendge, *Marathwada Univ. J.*, **15** (8), p. 191.
1976. *Spinitectus mastacembeli* : Sood et al., *J. Res. Punjab. Agric. Univ.*, **14** (3) p. 333.
1979. *Spinitectus mastacembeli* : Gupta and Verma, *Indian J. Helminth.*, **29** (1-2), p. 147.

Description : Male. Body 1.87-6.7 long, 0.068-0.108 wide ; cuticle with series of transverse rings having backwardly directed spines diminishing posteriorly in size and number ; lips absent ; vestibule 0.03-0.07 long, tubular ; oesophagus 0.13-2.56 long, divided into two parts ; nerve ring 0.073-0.33, and excretory pore 0.15-0.197, both from anterior end ; tail 0.059-0.87 long, and with caudal alae ; spicules dissimilar, unequal, right shorter 0.05-0.1 long, left longer 0.38-0.77, with "foot-shaped" distal portion ; caudal papillae 7-12 pairs, 3-4 preanal, 0-1 adanal, 3-8 postanal.

Female. Body 4.08-11.1 long, 0.074-0.088 wide ; anterior end as in male ; vestibule 0.045-0.075 long ; oesophagus 1.15-2.56 long ; tail

* To avoid undue repetitions, the species listed by Sahay and Prasad (1965), Sahay (1970), Datta and Majumdar (1972), Fotedar and Dhar (1973), Kalyankar (1975), and Chaturvedi and Kansal (1977) have been excluded from the synonymy as they are already covered under it.

0.059-0.09 long ; vulva 0.25-0.4 from posterior end ; eggs 0.0228-0.056 $\times$ 0.013-0.038.

Hosts : *Wallago attu* ; *Channa gachua* ; *Mastacembalus armatus* ; *Notopterus notopterus* ; *N. chitala* ; *Mystus cavasius* ; *M. vittatus* ; *M. seenghala* ; as well as *Clarias batrachus* and *Heteropneustes fossilis* (though unpublished, but clearly observed by the present author)

Location : Intestine

Localities : Lucknow, U. P. ; Ludhiana, Punjab ; Chitaldrug district, Karnataka ; Paithan, Pune & Nagpur, Maharashtra ; Hyderabad, Andhra Pradesh ; Calcutta, West Bengal ; and Purnia dist., North Bihar (though unpublished, but noted by the present author)

Remarks : Stewart (1914) described from two males *Spiroptera denticulata* var. *minor* from *Wallago attu* from Lucknow, which Baylis (1939) transferred under the genus *Spinitectus* as *S. minor*. Moorthy (1938) described the species *S. corti* from females from *Channa gachua* from Karnataka. Ali (1957) redescribed, from the type hosts from Hyderabad, Andhra Pradesh, both above species, the former species from a male only and the latter from both males and females. As Ali's (*op. cit.*) descriptions of both the males tally with that of the first species, it is quite possible that they represent one and the same species. Further, he was able to report only seven caudal papillae in *S. minor* and this clearly shows the great numerical variability of the caudal papillae in this species. As such, *S. corti* is treated conspecific with *S. minor*. Subsequently, under the genus several species from India were added, all of which were treated as valid as shown in the keys of the genus given by Ali (*op. cit.*), Sahay and Prasad (1965), Sahay (1970), Kalyankar (1975), and the list of the Indian species by Fotedar and Dhar (1973). But, Sood (1968), while elaborately dealing with the species *Spinitectus mastacembeli* Karve and Naik, 1951, treated the following species as its conspecific : *S. corti* Moorthy, 1938 ; *S. major* Khera, 1956 ; *S. thapari* Ali, 1957 ; *S. armatus* Ali, 1957 ; *S. singhi* Ali, 1957 ; and *S. bengalensis* Chakravarty, Sain and Majumdar, 1961. However, with regard to this species it is more pertinent to remind that Karve and Naik (*op. cit.*) while describing their species clearly stressed the strong similarity in size and shape of spicules of the above species with *S. minor* alongwith their pointing out some variations in the number and arrangement of caudal papillae. Even, they suggested the advisability of examining more material for the arrival of more definite conclusions. The present author, however, is of the opinion that all the above species should be treated as conspecific with *Spinitectus minor*, the earliest known species as in the shape of the

bigger spicule and number of caudal papillae, they all agree, albeit Verma's (1971), and Gupta and Verma's (1979) support of Sood's opinion in favour of species described subsequently to *S. minor*. Another species possibly approaching it very closely is *S. palawanensis* Schmidt and Kuntz, 1969.

***Spinitectus neilli* Karve and Naik, 1951**

(Fig. 108)

1951. *Spinitectus neilli* Karve and Naik, *J. Univ. Bombay*, **19** (5), p. 17.
1965. *Spinitectus neilli* : Sahay and Prasad, *Jap. J. med. Sci. Biol.*, **18** (3), p. 149.
1969. *Spinitectus pandei* Rai, *Indian J. Helminth.*, **21** (2), p. 100.
1970. *Spinitectus neilli* : Sahay, *Annls Parasit. hum. comp.*, **45** (5), p. 658.
1973. *Spinitectus neilli* : Fotedar and Dhar, *J. Sci., Univ. Kashmir*, **1** (1-2), p. 64.

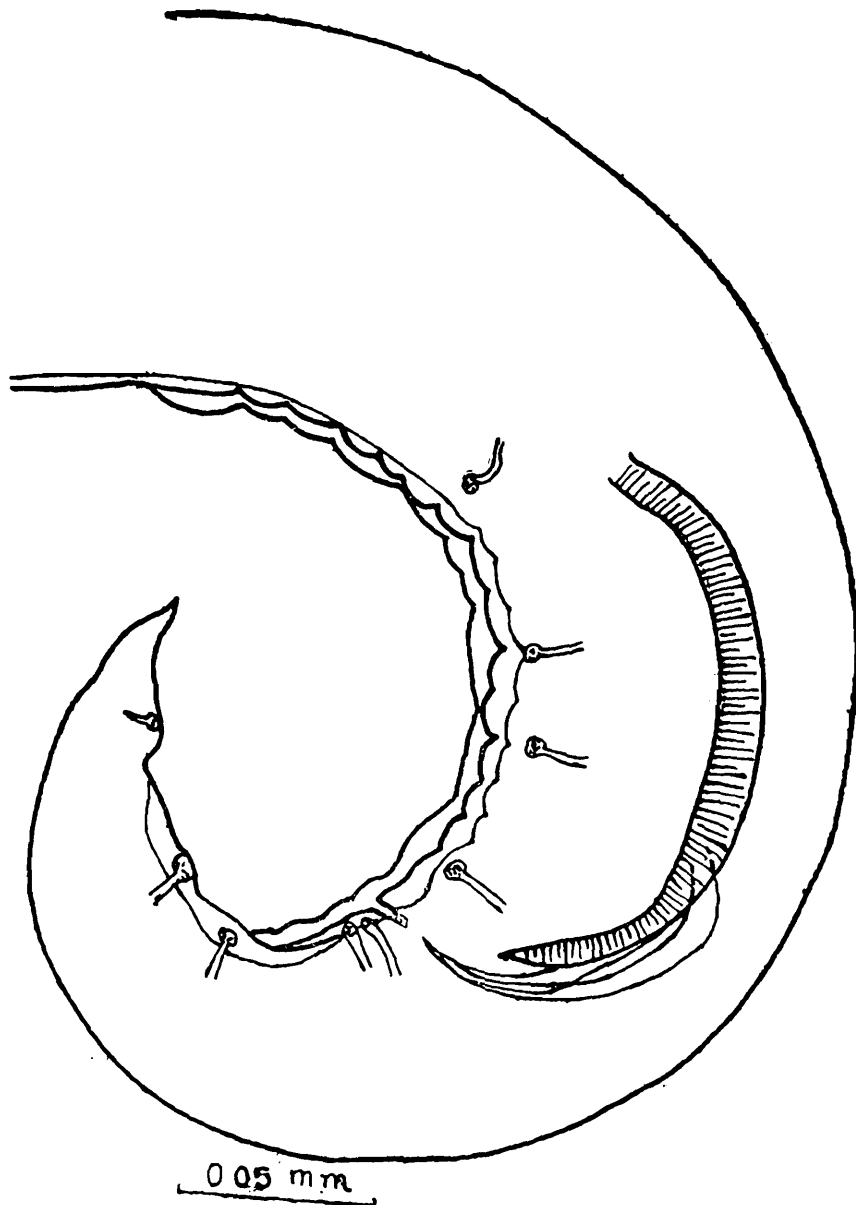


Fig. 108. *Spinitectus neilli*. (After Karve and Naik, 1951.)
Male posterior end.

1975. *Spinitectus neilli* : Kalyankar, *Natural Sci. J. Marathwada*, **14** (7), p. 239.

1977. *Spinitectus neilli* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 15.

Description : Male. Body 7.06-10.30 long, 0.11-0.27 wide, with 32 rings of spines, each with 28 spines ; lips two, inconspicuous, each with 2 small stalked papillae ; buccal capsule 0.03 long ; oesophagus divided into two parts, anterior muscular 0.25 long, posterior glandular 1.40-1.50 ; nerve ring 0.16-0.17, and excretory pore 0.20-0.21, both from anterior end ; tail 0.15-0.19 long, with caudal alae ; tubercles present ventrally in front of cloacal aperture ; spicules dissimilar, unequal, right 0.08-0.105 long, left about double right, 0.17-0.19, and with cross striations ; caudal papillae 9 pairs, 4 preanal, 5 postanal.

Female. Body 7.10-12.7 long, 0.17-0.31 wide, and entirely with 60 rings of spines, each with 30 spines ; lips as in male ; buccal capsule 0.035-0.038 long ; oesophagus, anterior muscular 0.25-0.43 long, posterior glandular 1.1-1.60 ; nerve ring 0.17-0.195, and excretory pore 0.23-0.285, both from anterior end ; tail 0.175-0.23 long, sometimes with small spine and probably with pair of caudal papillae ; vulva 4.6-8.47 from posterior end ; eggs $0.039-0.055 \times 0.020-0.035$.

Hosts : *Tor neilli* ; *Pseudeutropius garua*

Location : Stomach

Localities : Nagpur, Maharashtra ; Gorakhpur, U. P.

Remarks : This species was described by Karve and Naik (1951) from a freshwater fish *Tor neilli* from Nagpur. Another species, *Spinitectus pandei*, was described by Rai (1969) from a different freshwater fish, *Pseudeutropius garua* from Gorakhpur. Gupta and Verma (1979) treated the second species as conspecific with another species *S. Pseudeutropii* which is considered actually as synonym of *S. komiyai*, under which the relevant remark has been made. However, the present author feels that on the basis of spicule ratio, the second species is conspecific with first ; and possibly the study of more material may reveal, as already stated, even the third which has provisionally been treated as valid, may also be conspecific with the first.

***Spinitectus notopteri* Karve and Naik, 1951**

(Fig. 109)

1951. *Spinitectus notopteri* Karve and Naik, *J. Univ. Bombay*, **19** (5), p. 16.

1965. *Spinitectus notopteri* : Sahay and Prasad, *Jap. J. med. Sci. Biol.*, **18** (3), p. 149.

1970. *Spinitectus notopteri* : Sahay, *Annls Parasit. hum. comp.*, **45** (5), p. 658.

1973. *Spinitectus notopteri* : Fotedar and Dhar, *J. Sci., Univ. Kashmir*, 1 (1-2), p. 64.
1975. *Spinitectus notopteri* : Kalyankar, *Natural Sci. J. Marathwada Univ.*, 14 (7), p. 239.
1977. *Spinitectus notopteri* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 15.

Description : Male. 4.6 long, 0.1 wide, with rings of spines ; first and second closer, and with 24 and 28 spines respectively, remaining equidistant in anterior half ; buccal capsule 0.04 long, funnel-shaped ;

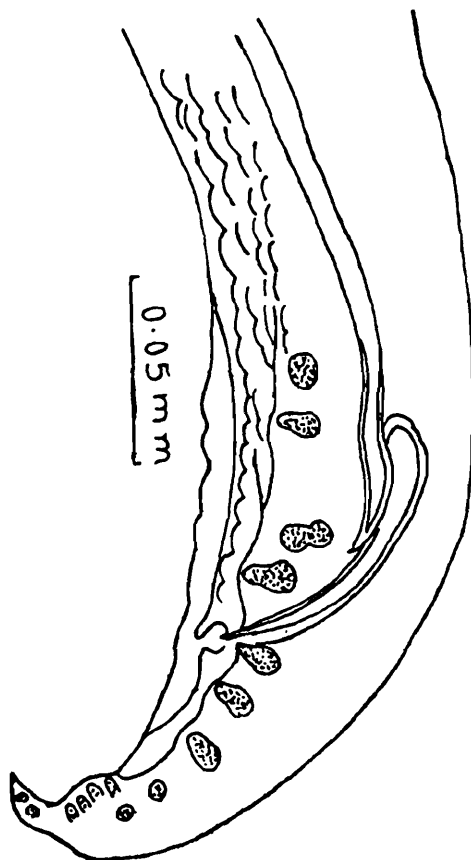


Fig. 109. *Spinitectus notopteri*. (After Karve and Naik, 1951.)
Male posterior end.

oesophagus divided into two parts, anterior muscular 0.41 long, posterior glandular 1.45 ; nerve ring 0.08, and excretory pore 0.155, both from anterior end ; tail 0.1 long, with moderate caudal alae, and a spine 0.02 long ; tubercles ventrally in front of cloacal aperture ; spicules dissimilar, unequal, right 0.08 long, with a gutter-like cavity ventrally, left 0.47 with a spoon-like process distally ; caudal papillae 16 pairs, 5 pedunculate, preanal, 11 postanal of which latter 5 subventral, 4 ventral and grouped together, 2 lateral.

Host : *Notopterus notopterus*

Location : Stomach

Locality : Pune, Maharashtra

Remarks : The species is based on a single male only.

***Spinitectus pandharinathi* Kalyankar, 1973**

(Fig. 110)

1973. *Spinitectus pandharinathi* Kalyankar, *Riv. Parassit.*, **34** (1), p. 55.1975. *Spinitectus pandharinathi*: Kalyankar, *Natural Sci. J. Marathwada Univ.*, **14** (7), p. 240.

Description : Male. Body 1.06 long, 0.11 wide, with rings of cuticular spines upto end of oesophagus, beyond which sparse ; seven rows of spines distinct with first two closer ; head 0.037 in diameter ; mouth surrounded by inconspicuous lips, leading into buccal capsule 0.03 long ; oesophagus divided into two parts, anterior muscular 0.07 long, posterior glandular 0.2 ; nerve ring 0.07 from anterior end ; tail 0.037 long, curved ventrally, without caudal alae ; spicules dissimilar, unequal, 0.27 and 0.06 long ; caudal papillae 9 pairs, 5 preanal, 4 postanal.

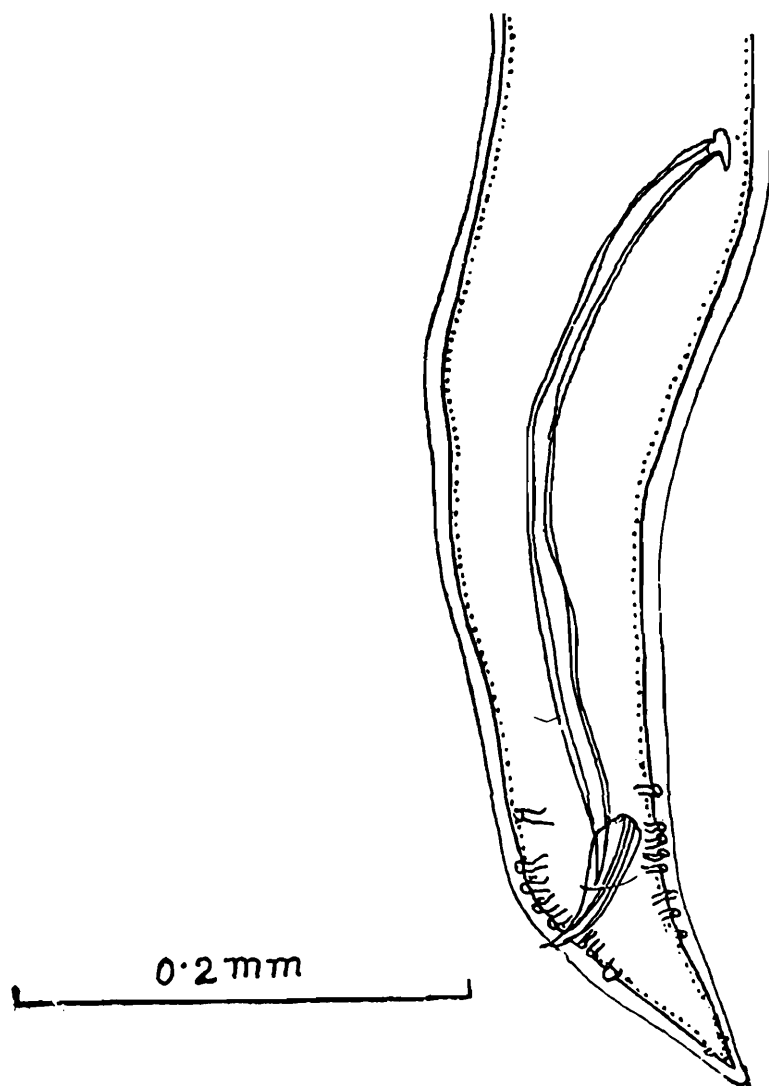


Fig. 110. *Spinitectus pandharinathi*. (After Kalyankar, 1973.)
Male posterior end.

Female. Body 1.33 long, 0.15 wide ; cuticular spines as in male with 13 rows distinct ; buccal capsule 0.04 long ; oesophagus, anterior

muscular 0.09 long, posterior glandular 0.25 ; nerve ring 0.10 from anterior end ; tail 0.045 long ; vulva 0.17 from posterior end.

Host : *Channa striatus*

Location : Stomach

Locality : Aurangabad, Maharashtra

Remarks : This species is based on a male and three females only.

***Spinitectus seenghalai* Zaidi and Khan, 1975**

1975. *Spinitectus seenghalai* Zaidi and Khan, *Pakist. J. Zool.*, 7 (1), p. 69.

Description : Male. Body 6.93-7.01 long, 0.128-0.129 wide, with about 114 spiny annulations, anterior 20 conspicuous, posterior gradually becoming less prominent, and each annulation with 20-24 spines 0.020-0.021 long ; buccal capsule 0.063-0.064 $\times$ 0.020-0.021, funnel-shaped anteriorly, tubular posteriorly ; oesophagus divided into two parts, anterior muscular 0.362 long, posterior glandular 1.300 ; tail 0.089 long, bent terminally ; spicules similar, equal, 0.089-0.091 long, proximally with swellings and distally tapering to fine point ; caudal papillae 14 pairs, 4 preanal, 10 postanal.

Female. Body 6.93 long, 0.123 wide, with about 300 spiny annulations, anterior ones prominent, and each annulation with 16-22 spines ; buccal capsule as in male, 0.051 $\times$ 0.020 ; oesophagus, anterior muscular 0.239 long, posterior glandular 1.102 ; tail 0.285 long, straight and tapering to a point ; vulva 1.241 from posterior end ; eggs oval, 0.020-0.023 $\times$ 0.010-0.013.

Host : *Mystus seenghala*

Location : Intestine

Locality : Taunsa Barrage, Sind (Pakistan)

Remarks : This species differs from *Spinitectus indicus* Verma and Agarwal, 1932, mainly in the number of postanal papillae.

Family HEDRUDIDAE Railliet, 1916 status emend. Petter, 1971

Genus *Hedruris* Nitzsch, 1812

***Hedruris* sp. larva**

Hosts : *Wallago attu* ; *Ompok bimaculatus* ; *Glossogobius giuris*

Location : Mesenteries of the posterior part of the alimentary canal.

Localities : Karapilavillu (Near Manampitiya) and Minneriya Tank (Ridiyagama), Southern Province, Sri Lanka

Remarks : The larvae of the genus have been reported from several freshwater fishes.

Superfamily (6) THELAZIOIDEA

Family RHABDOCHONIDAE Travassos, Artigas & Pereira, 1928

status emend. Skrjabin, 1946

Genus *Rhabdochona* Railliet, 1916

Various authors like Gustafson (1949), Choquet (1951), Jainszeuska (1955), Campana-Rouget (1961), Roytman and Trofimenko (1964), Rasheed (1965), Holloway and Klewar (1969), Moravec (1972, 1975) Margolis *et al.* (1975), etc. have dealt both with the taxonomy as well as the morphology of the genus *Rhabdochona*, and the character of egg has been generally selected as a key feature for the genus. It was on the presence or absence of egg filaments that the genus was subdivided by Saidov (1953) into two subgenera, viz. *Rhabdochona* (eggs without filaments) and *Filochona* (eggs with filaments), and the character taken as generic diagnosis by Janiszewska (1955) who also created the new subfamily Rhabdochonoidinae for the species with filamented eggs. Yamaguti (1961), however, attached greater importance to the filaments when he elevated *Filochona* to the generic rank, a position accepted by several subsequent workers. But, majority of the recent workers, viz. Roytman and Trofimono (1964), Dzhililov (1964), Rasheed (1964, 1965), Sahay, Nath and Kumar (1969), Sood (1972), Moravec (1968, 1972, 1975), and Margolis *et al.* (1975) have declined to recognise the generic rank of *Filochona*. Moravec (1972) on the basis of egg types had split the genus *Rhabdochona* into three subgenera, *Rhabdochna*, *Filochona*, and *Globochona*, which was accepted by Margolis *et al.* (1975), Chabaud (1975) in the recent classification of the group, Fotedar and Dhar (1977), and Arya and Johnson (1977). However, Moravec's (1975) recent studies show that egg character alone does not suffice to group the species into three subgenera. He felt that it was necessary to include also characters such as, number and arrangement of teeth in the prostom, presence of cervical alae, shape of the female tail tip, and shape of deirids. As a result he raised the number of subgenera to four, viz. *Rhabdochona*, *Globochona*, *Globochonoides*, and *Sinonema*, and this was accepted by Bilqees (1979), and Soota and Dey Sarkar (1981), and now followed here. The generic and sub-generic diagnosis given below are mostly after Moravec (1975).

Generic diagnosis : Rhabdochoninae, Mouth with small lateral pseudolabia ; prostom funnel or barrel-shaped, with longitudinal thickening projecting anteriorly as teeth which variable in number ; mesostom long, narrow ; deirids simple or bifurcate ; lateral alae present or absent. In male, preanal papillae numerous, postanal 5-7 pairs ; caudal

alae absent ; spicules dissimilar, unequal ; gubernaculum absent ; tail conical ; tail tip rounded or with cuticular spike. In female, uteri opposed ; vulva in about middle of body ; tail tip rounded or with spike, sometimes with numerous spines, spikes, or small mucronate points ; eggs elliptical, embryonated, with smooth shells, filamented, or with special swellings. Parasites of freshwater fishes.

Type species : *R. denudata* (Dujardin, 1845) Railliet, 1916

1. Subgenus **Rhabdochona** Railliet, 1916

(Syn. : *Filochona* Saidov, 1953)

Diagnosis : *Rhabdochona* ; prostom with 10, 14 or exceptionally 16 anterior teeth ; basal teeth present or absent ; lateral alae absent ; deirids bifurcate, well developed ; tail tip of female conical, ending in sharp cuticular spike or rounded ; eggs with smooth surface, or with very fine, irregular gelatinous flocks, filaments or special polar swellings.

Type species : *R. (R.) denudata* (Dujardin, 1845)

2. Subgenus **Globochona** Moravec, 1972

Diagnosis : *Rhabdochona* ; prostom with 8 or 12 anterior teeth ; basal teeth mostly present ; lateral alae absent ; deirids simple, rarely bifurcate, mostly weakly developed ; tail tip of female widely rounded, often with numerous spines, mucronate points, or tooth-like processes ; eggs smooth or with lateral globules or swellings.

Type species : *R. (G.) gambiana* Gendre, 1921

3. Subgenus **Globochonoides** Moravec, 1975

Diagnosis : *Rhabdochona* ; prostom with 8 anterior teeth, lateral teeth clearly larger than dorsal and ventral ones ; basal teeth present ; lateral alae wide, starting below deirids and extending along almost entire length of body ; deirids simple, weakly developed ; tail tip of female with crown of minute tooth-like processes ; tail tip of male rounded ; eggs smooth.

Type- and the only species : *R. (G.) coronacauda* Belouss, 1965

4. Subgenus **Sinonema** Moravec, 1975

Diagnosis : *Rhabdochona* ; prostom with 20-22 anterior teeth ; basal teeth present ; lateral alae wide, starting in front of deirids and extend-

ing to level of posterior end of oesophagus ; deirids medium sized, at level of posterior end of prostom ; tail tip of female rounded ; egg surface (?).

Type- and the only species : *R. (S.) euchiloglanis* Wu, 1949.

Hitherto, 20 species are known under the genus from this area. According to Moravec (1975), the species *Rhabdochona magna* Khan and Yaseen, 1969, is not only based on females, but also the description and drawings included are not very clear and definite ; thus hindering its proper comparison with other related species. The authors have also presented vague distinguishing characters. Moravec (*op. cit.*) also opined that it should be considered as *species inquirendae* as it was not proper to consider it conspecific with *Rhabdochona garuai*, though showing some resemblances, and this is followed here, as Zaidi and Khan's (1975) description based on females only too is inadequate. Further, Foteder and Dhar's (1977) four species viz. *Rhabdochona (Globochona) jammuensis* from *Barilius vagra*, and *R. (R.) oreini* from *Oreinus richardsoni*, both from Jammu ; *R. (R.) tori* from *Tor tor* from Kashmir ; and *R. (R.) himalayai* from *Ptychobarbus rattanis* from Ladakh, have not been dealt with here as detailed descriptions are not available due to their being published only in abstract. Also, *Rhabdochona (Rhabdochona) unispinate* Arya, 1980, based on females only, is retained here tentatively pending the examination of males.

Subgenus *Rhabdochona* Railliet, 1916

Morphological group A

(eggs without filaments or swellings)

Rhabdochona (Rhabdochona) oligopapillata Arya and Johnson, 1977

(Fig. 111, A-C)

1977. *Rhabdochona (Rhabdochona) oligopapillata* Arya and Johnson, *J. Zool. Res.*, **1** (1), p. 22.

Description : Male. Body 7.5 long, 0.30 wide ; head 0.044 in diameter ; prostom 0.01×0.02 , with 14 denticles ; mesostom 0.17×0.015 ; oesophagus divided into two parts, anterior muscular 0.34 long, posterior glandular 1.80 ; nerve ring 0.24, and excretory pore 0.32, both from anterior end ; tail 0.37 long ; spicules alate, dissimilar, unequal, left tubular, distally pointed, proximally expanded 0.50 long, right scoop-shaped, 0.08 ; gubernaculum absent ; caudal papillae sessile, 4 pairs, 1 preanal, 3 postanal.

Female. Body 12.5 long, 0.33 wide ; head 0.051 in diameter ; prostom as in male, 0.018×0.022 ; mesostom 0.019×0.02 ; oesophagus, anterior muscular 0.37 long, posterior glandular 2.40 ; nerve ring 0.25, and excretory pore 0.34, both from anterior end ; tail 0.30 long,

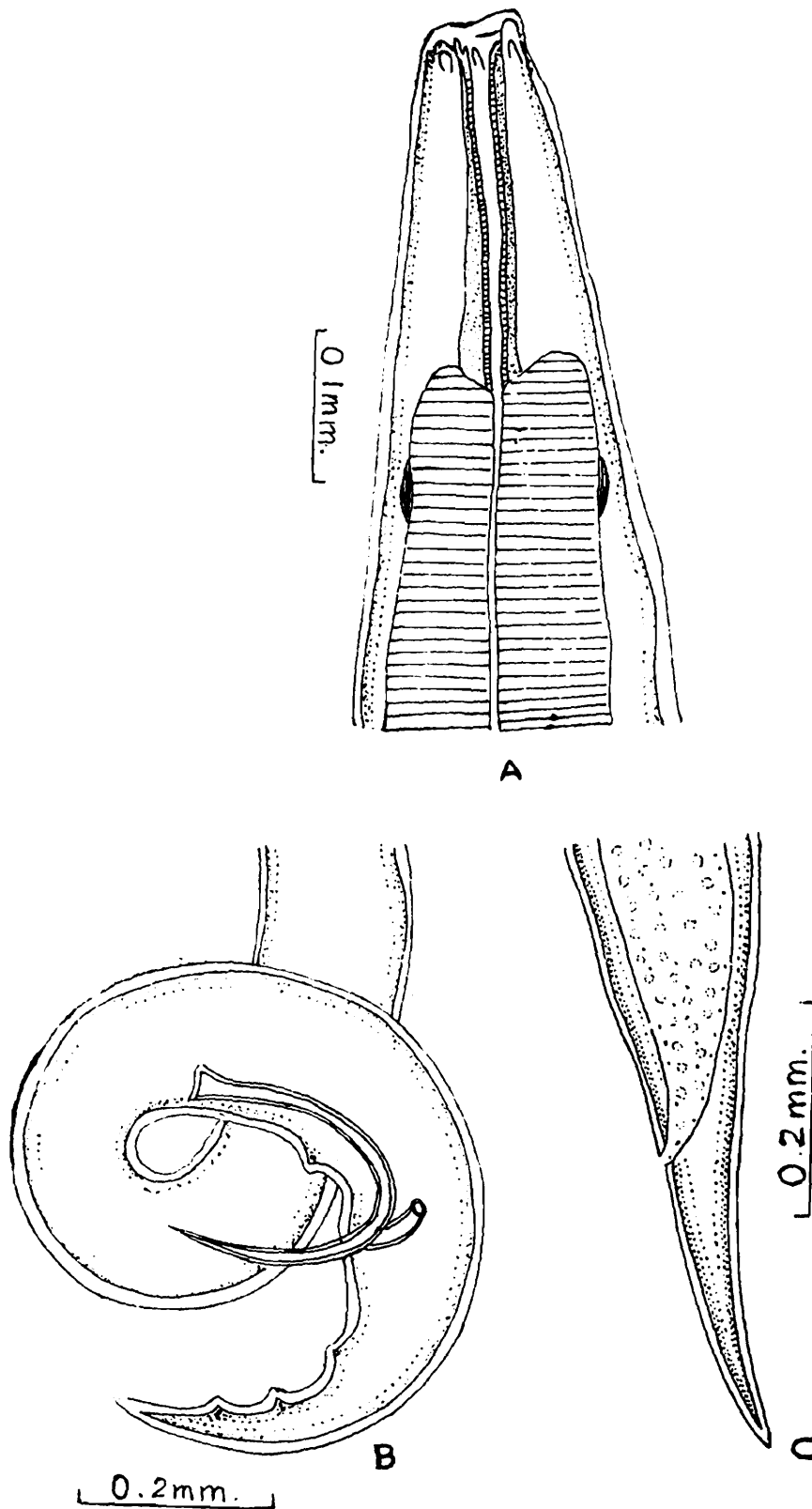


Fig. 111. *Rhabdochona (Rhabdochona) oligopapillata*. (After Arya and Johnson, 1977.) A. anterior end ; B. male posterior end ; C. female posterior end.

tapering ; vulva conspicuous, post-equatorial, 7.9 from anterior end ; eggs $0.02-0.04 \times 0.015-0.021$, without filaments or floats.

Host : *Scomberomorus guttatus*

Location : Intestine

Locality : Fish market, Jodhpur, Rajasthan

***Rhabdochona* (*Rhabdochona*) *parastromatei* Bilqees, 1979**

(Fig. 112, A-C)

1979. *Rhabdochona* (*Rhabdochona*) *parastromatei* Bilqees, *Zoologica Scripta*, 8, p. 107.

Description : Male. Body 10.53-15.61 long, 0.30-0.37 wide, with indistinct cervical alae ; cephalic papillae indiscernible but pair of small amphids present ; prostom 0.03-0.04 long, with a circle of 16 teeth ; vestibule including prostom 0.17-0.20 long ; oesophagus divided into two parts, anterior muscular 0.28-0.34 long, posterior glandular 2.1-2.4 ; nerve ring 0.22-0.24 from anterior end ; tail conical, tapering and with narrow caudal alae ; spicules unequal, right larger 0.48-0.50 long, left shorter 0.10-0.12 ; caudal papillae 10-11 pairs, 3-4 preanal, 1 adanal, 6 postanal.

Female. Body 13.89-23.33 long, 0.36-0.46 wide ; prostom 0.032-0.045 long ; vestibule including prostom 0.19-0.23 long ; oesophagus, anterior muscular 0.28-0.38 long, posterior glandular 2.3-3.2 ; nerve ring 0.22-0.31 from anterior end ; tail conical, tapering ; vulva-pre-equatorial, about 2/5 of anterior end, and retracted forming a sucker-like depression in body wall, probably an artefact ; eggs oval, smooth, 0.044×0.025 .

Host : *Formio niger*

Location : Attached to intestine

Locality : Karachi coast (Pakistan)

***Rhabdochona* (*Rhabdochona*) *unispinate* Arya, 1980**

1980. *Rhabdochona* (*Rhabdochona*) *unispinate* Arya, *Indian J. Helminth*, 30 (1978), p. 137.

Description : Female. Body 20.0-22.3 long, 0.30-0.33 wide ; cuticular striations well defined, 0.008-0.10 apart ; lips two, large, well developed, with two pairs of cephalic papillae ; prostom $0.03-0.031 \times 0.008-0.009$, cup-shaped, with 4-5 small teeth and one large median tooth 0.008-0.01 long ; mesostom $0.18-0.23 \times 0.07-0.072$, cylindrical ; oesophagus divided into two parts, anterior muscular 0.53-0.67 long, 0.16-0.19 wide ; oesophago-intestinal valve conspicuous ; nerve ring 0.20-0.21, excretory pore 0.22-0.23, and cervical papillae 0.30-0.32, all from anterior end ; tail 0.08-0.082 long, tapering, with transversely

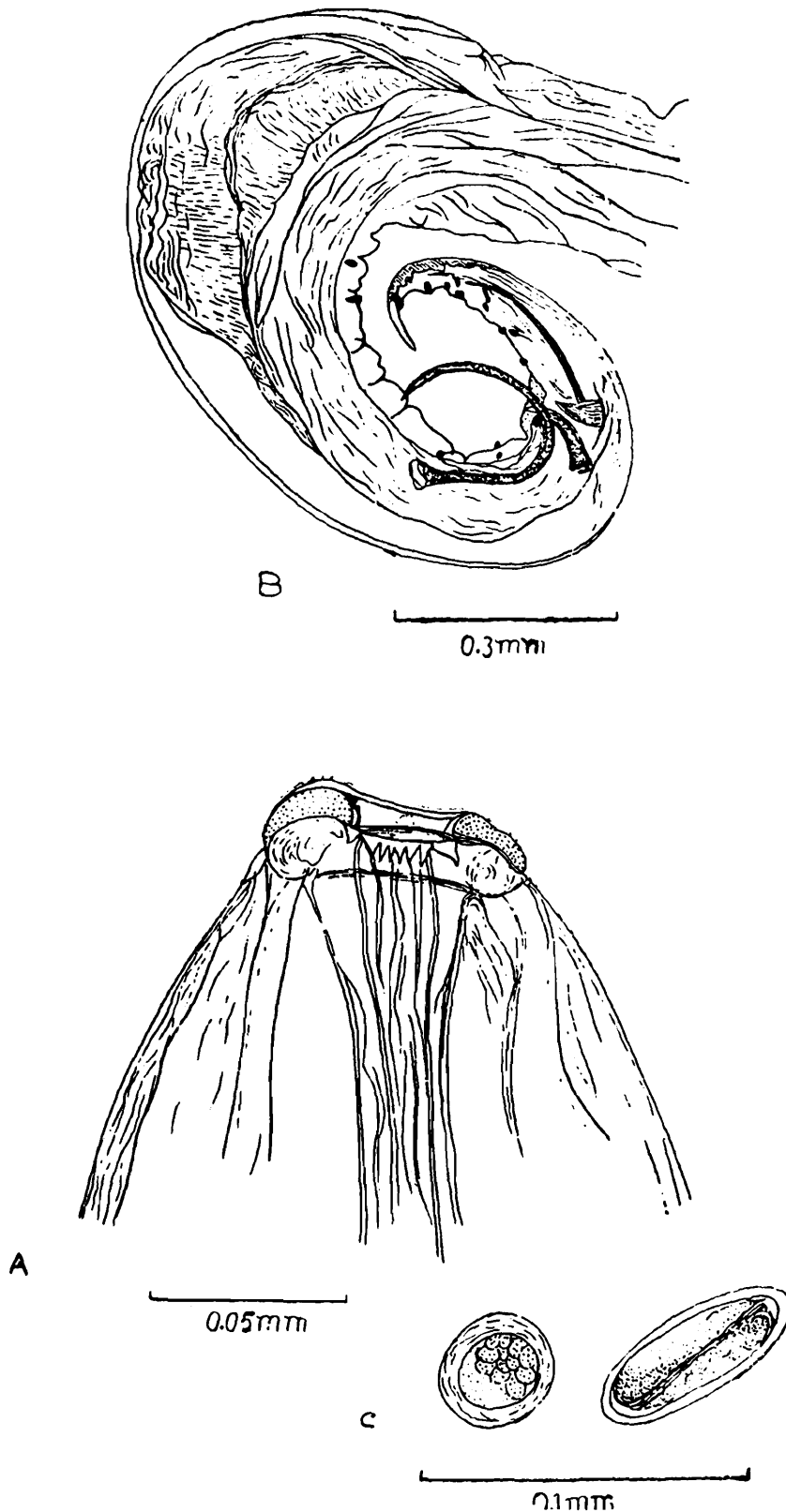


Fig. 112. *Rhabdochona* (*Rhabdochona*) *parastrumatei*. (After Bilqees, 1979.)
A. anterior end ; B. male posterior end ; C. eggs.

striated spine at tip ; vulva inconspicuous ; eggs $0.010-0.013 \times 0.011-0.014$, oval, thick-walled, unembryonated.

Host : *Scomberomorus guttatus*

Location : Intestine

Locality : Fish market, Jodhpur, Rajasthan

Remarks : As this species is based on 2 females only, its inclusion here is tentative.

Rhabdochona (Rhabdochona) chanawanensis Zaidi and Khan, 1975

1975. *Rhabdochona chanawanensis* Zaidi and Khan, *Pakist. J. Zool.* 7 (1), p. 68.

Description : Male. Body 7.308-11.455 long, 0.089-0.138 wide, and bluntly rounded posteriorly ; lips three, inconspicuous ; cervical papillae absent ; prostom 0.026-0.031 $\times$ 0.018-0.023, and with 4 longitudinal thickenings, appearing anteriorly as teeth ; mesostom 0.077-0.084 $\times$ 0.013-0.014 ; oesophagus divided into two parts, anterior muscular 0.248-0.630 long, posterior glandular 2.940-6.940 ; nerve ring 0.150-0.190 from anterior end ; tail 0.242-0.381 ; spicules two, unequal, larger 0.510-0.525 long, smaller 0.230-0.268, and both with bifid tips ; caudal papillae 20 pairs, 11 preanal, 9 postanal, and in two rows, a ventral and other ventrolateral, of which ventrals sessile 6 preanal, pedunculate postanal 5, and ventrolaterals sessile 5 preanal, 4 postanal.

Host : *Eutropiichthys vacha*

Location : Intestine

Locality : Chanawan fish farm, Wazirabad, Punjab (Pakistan)

Remarks : This species is based on five males only. Hence, as in the absence of females, its comparison with other species is not possible, its inclusion here is tentative.

Morphological group B

(eggs with filaments)

Rhabdochona (Rhabdochona) glyptothoracis Karve and Naik, 1951

(Fig. 113, A-C)

1951. *Rhabdochona glyptothoracis* Karve and Naik, *J. Univ. Bombay*, 19 (5), p. 21.

1965. *Rhabdochona glyptothoracis* : Agrawal, *Indian J. Helminth.*, 17 (1), p. 13.

1965. *Rhabdochona glyptothoracis* : Rasheed, *Acta parasit. pol.*, 13 (42), p. 416.

1970. *Filochona glyptothoracis* Fotedar and Dhar, *Kashmir Science*, 7 (1-2), p. 108.

1971. *Rhabdochona glyptothoracis*, Majumdar and De, *Folia Parasit.*, 18, p. 384.

1972. *Rhabdochona glyptothoracis* : Sood, *Zool. Anz.*, 188 (1/2), p. 105.

1975. *Rhabdochona (Rhabdochona) glyptothoracis* Moravec, *Studie CSAV*, 8, p. 47.

1977. *Rhabdochona glyptothoracis* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 14.

Description : Male. Body 9.6-11.8 long, 0.07-0.08 wide ; pharynx divisible into two parts, anterior 0.0275-0.03 long, 0.015-0.0175 wide, bell-shaped, with 12 ribs or longitudinal ridges on internal surface projecting anteriorly as small teeth on rim of mouth, posterior 0.07-0.

0.75 long, 0.01 wide, tubular ; oesophagus divided into two parts, anterior muscular 0.4-0.41 long, posterior glandular 2.3-3.01 ; nerve ring 0.165-0.185, excretory pore 0.245-0.28, and cephalic papillae 0.0575-0.06, all from anterior end ; tail 0.27-0.3 long, with finger-shaped tip ; spicules dissimilar, unequal, left longer, 0.40-0.485 long, right shorter, boat-shaped, with rounded tip, 0.105-0.11 ; caudal papillae 17 pairs, 10 preanal, 7 postanal.

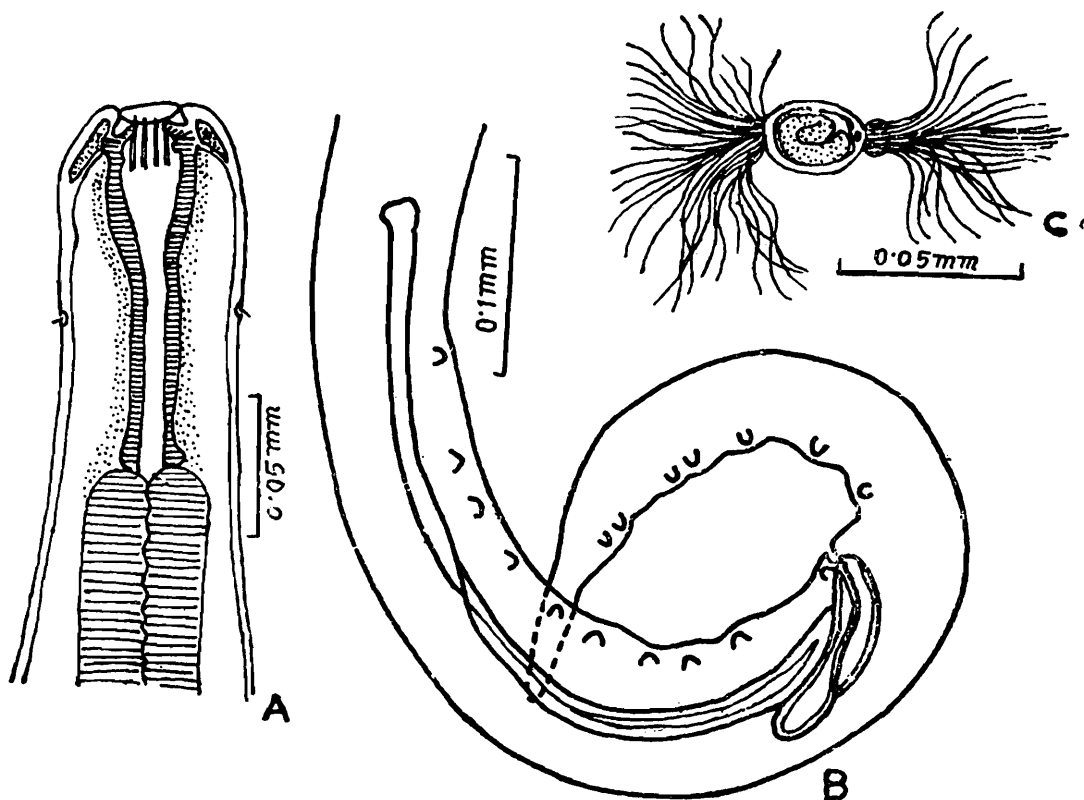


Fig. 113. *Rhabdochona (Rhabdochona) glyptothoracis*. (After Karve and Naik, 1951.) A. anterior end ; B. male posterior end ; C. eggs.

Female. Body 20.6-29.6 long, 0.2-0.3 wide ; anterior end as in male ; oesophagus, anterior muscular 0.82-1.05 long, posterior glandular 5.21-7.6 ; nerve ring 0.18-0.2, excretory pore 0.28-0.35, and cephalic papillae 0.725-0.8, all from anterior end ; tail 0.27-0.35 long, conical, with bluntly rounded tip ; vulva 8.38-10.5 from posterior end ; eggs 0.025-0.03 $\times$ 0.0175-0.0225, with a bunch of fine long filaments at each pole.

Host : *Glyptothorax lonah*

Location : Intestine

Locality : Pune, Maharashtra

Remarks : Moravec (1975) while accepting Karve and Naik's (1951) "relatively good description" still desired "a more detailed description". The present author upholds this essential need.

Rhabdochona (Rhabdochona) hellichi (Sramek, 1901) Chitwood, 1933.

(Fig. 114, A & B)

1901. *Filaria hellichi* Sramek, *Arch. Naturw Landesdurchforsch Bohmeo*, **11** (3), p. 31.
1933. *Rhabdochona hellichi* Chitwood, *J. Parasit.*, **20**, p. 10.
1950. *Rhabdochona kashmirensis* Thapar, *Indian J. Helminth.*, **2** (1), p. 35.
1965. *Rhabdochona kashmirensis* : Agrawal, *Indian J. Helminth.*, **17** (1), p. 13.
1965. *Rhabdochona kashmirensis* : Rasheed, *Acta parasit. pol.*, **13** (42), p. 416.
1965. *Rhabdochona hellichi* : Rasheed, *Acta parasit. pol.*, **13** (42), p. 417.
1970. *Filochona kashmirensis* Fotedar and Dhar, *Kashmir Sci.* **7** (1-2), p. 107.
1971. *Rhabdochona kashmirensis* : Majumdar and De, *Folia Parasit.*, **18**, p. 384.
1972. *Rhabdochona kashmirensis* : Sood, *Zool. Anz.*, **188** (1/2), p. 105.
1975. *Rhabdochona (Rhabdochona) hellichi* Moravec, *Studie CSAV*, **3** p. 51.
1977. *Rhabdochona kashmirensis* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 14,
1977. *Rhabdochona (Filochona) kashmirensis* Fotedar and Dhar, *All-India Symposium on Helminthology*, Srinagar, August 8-11, p. 34.
1978. *Rhabdochona hellichi* : Moravec and Amin, *Acta Sc. Nat. Brno*, **12** (6), p. 32.
1981. *Rhabdochona (Rhabdochona) hellichi* : Soota and Dey Sarkar, *Rec. zool. Surv. India*, **79**, p. 173.

[For fuller synonymy see Moravec (1975)]

Description : Male. Body 5.18-10.19 long, 0.12-0.177 wide, and with smooth cuticle ; prostom funnel-shaped, 0.018-0.024 long, 0.015 wide, mostly without basal teeth ; vestibule including prostom 0.130-0.195 long ; oesophagus divided into two parts, anterior muscular 0.27-0.44 long, posterior glandular 2.3-3.29 ; deirids 0.054-0.105, nerve ring 0.180-0.270, and excretory pore 0.210-0.345, all from anterior end ; tail 0.24-0.42 long, conical, with sharp cuticular point ; spicules two, dissimilar, unequal, smaller 0.1-0.144 long, with distinct dorsal barb distally, longer 0.35-0.52, bifurcate, with fine cuticular membrane ; caudal papillae 14-18 pairs, 7-12 preanal, 5-9 postanal.

Female. Body 6.2-15.0 long, 0.15-0.285 wide ; prostom 0.021-0.027 long, 0.015-0.021 wide ; vestibule including prostom 0.120-0.174 long ; oesophagus, anterior muscular 0.12-0.5 long, posterior glandular 2.2-3.83 ; deirids 0.051-0.084, nerve ring 0.174-0.233, and excretory pore 0.276-0.345, all from anterior end ; tail 0.204-0.261 long, conical, with sharp cuticular spike (in older females bluntly pointed) ; vulva post-equatorial, 3.67-5.98 from posterior end ; mature eggs 0.027-0.036 × 0.018-0.024, oval, having at each pole long (about 0.39) relatively wide filaments which in younger eggs substantially shorter and thinner or completely lacking.

Hosts : *Schizothorax niger* ; *S. plagiosomum* ; *S. esocinus* ; *S. curvifrons* ; *Noemacheilus kashmirensis*

Location : Intestine

Localities : Kashmir ; Arki, Himachal Pradesh

Remarks : This species described under different names, is of world-wide occurrence. In India, it is known only from Kashmir and Himachal Pradesh.

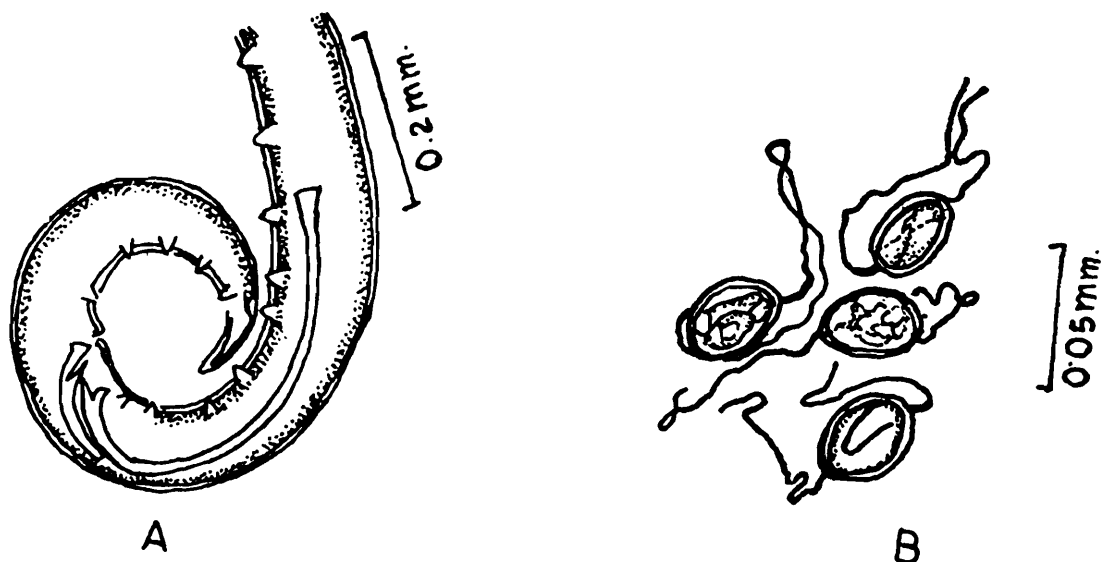


Fig. 114. *Rhabdochona (Rhabdochona) hellichi* (After Thapar, 1950.) A. male posterior end ; B. eggs.

***Rhabdochona (Rhabdochona) hospeti* Thapar, 1950**

1950. *Rhabdochona hospeti* Thapar, *Indian J. Helminth.*, **2**, p. 38.
1951. *Rhabdochona barbi* Karve and Naik, *J. Univ. Bombay*, **19** (5), p. 24.
1965. *Rhabdochona hospeti* : Agrawal, *Indian J. Helminth.*, **17** (1), p. 13.
1965. *Rhabdochona barbi* : Agrawal, *Indian J. Helminth.*, **17** (1), p. 13.
1965. *Rhabdochona penangensis* Furtado, *Zool. Anz.*, **174**, p. 231.
1970. *Filochona barbi* Fotedar and Dhar, *Kashmir Sci.*, **7** (1-2) p. 108.
1971. *Rhabdochona hospeti* : Majumdar and De, *Folia parasit.*, **18**, p. 384.
1971. *Rhabdochona barbi* : Majumdar and De, *Folia parasit.*, **18**, p. 384.
1972. *Rhabdochona ghaggari* Sood, *Zool. Anz.*, **188** (1/2), p. 100.
1972. *Rhabdochona barbi* : Sood, *Zool. Anz.*, **188** (1/2), p. 105.
1972. *Rhabdochona hospeti* : Sood, *Zool. Anz.*, **188** (1/2), p. 105.
1972. *Rhabdochona labeonis* Kalyankar, *Riv. Parassit.*, **33** (4), p. 284.
1972. *Rhabdochona alii* Kalyankar, *Riv. Parassit.*, **33** (4), p. 286.
1975. *Rhabdochona (Rhabdochona) hospeti* Moravec, *Studie CSAV*, **8**, p. 59.
1976. *Rhabdochona ghaggari* : Sood *et al.*, *J. Res. Punjab Agric. Univ.*, **14** (3), p. 333.

1977. *Rhabdochona barbi* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 13.
1977. *Rhabdochona ghaggari* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 14.
1977. *Rhabdochona hospeti* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 14.
1978. *Rhabdochona (Rhabdochona) hospeti* : Moravec and Amin, *Acta Sc. Nat. Brno.*, 12 (6), p. 34.
1980. *Rhabdochona ghaggari* : Arya, *Indian J. Helminth.*, 30 (1978), p. 140.
1981. *Rhabdochona (Rhabdochona) hospeti* : Soota and Dey Sarkar, *Rec. zool. Surv. India*, 79, p. 174.

Description : Male. Body 5.82-11.3 long, 0.09-0.15 wide ; prostom 0.012-0.024 long, 0.008-0.015 wide ; vestibule including prostom 0.098-0.138 long ; oesophagus divided into two parts, anterior muscular 0.11-0.45 long, posterior glandular 1.83-4.28 ; deirids 0.065-0.09, nerve ring 0.12-0.33, and excretory pore 0.21-0.28, all from anterior end ; tail 0.19-0.5 long ; spicules two, dissimilar, unequal, shorter 0.10-0.15 long, longer 0.55-0.71 ; caudal papillae 12-18 pairs, 7-12 preanal, 5-6 postanal.

Female. Body 7.56-22.2 long, 0.12-0.25 wide ; prostom 0.013-0.035 long, 0.009-0.017 wide ; vestibule including prostom 0.095-0.187 long ; oesophagus, anterior muscular 0.13-0.5 long, posterior glandular 2.2-4.8 ; deirids 0.065-0.09, nerve ring 0.11-0.405, and excretory pore 0.24-0.3, all from anterior end ; tail 0.15-0.525 long ; vulva 5.71-10.1 from posterior end ; eggs $0.02-0.09 \times 0.015-0.065$, with filaments.

Hosts : *Tor tor* ; *T. khudree* ; *Puntius kolus* ; *P. innominatus* ; *Labeo rohita*

Location : Intestine

Localities : Madras, Tamil Nadu ; Ludhiana, Punjab ; near Chandigarh ; Pune, & Nanded, Maharashtra ; Solan fish market, Himachal Pradesh ; Malaysia.

Remarks : The original description of *Rhabdochona hospeti* by Thapar (1950) was on a female specimen typified by filamented eggs. Subsequently, several authors described it under different names. Thus, Sood's *R. ghaggari* showing the absence of egg filaments, though from the drawings it is clear that the specimens examined were immature, Moravec (1975) hardly attached any significance to this character ; Karve and Naik's *R. barbi* showing resemblances in many key characters with *R. hospeti*, and also due to their occurring in the same geographical region, where Rasheed (1965), and again Moravec (*op. cit.*) indicated the possibility of their being conspecific ; and finally Kalyankar's *R. labeonis* and *R. alii*, being separated from each other by the number

		<i>Rhabdochona hospeti</i> Thapar, 1950	<i>R. barbi</i> Karve and Naik, 1951	<i>R. penangensis</i> Furtado, 1965	<i>R. ghaggari</i> Sood, 1972	<i>R. labeonis</i> Kalyankar, 1972	<i>R. alii</i> Kalyankar, 1972
Body length	♂	—	9.7-11.3	9.6	5.82-7.52	9.92	7.40-7.46
	♀	15.82	15.5-19.3	22.2	7.55-13.29	15.51	15.09-17.04
Body width	♂	—	0.11-0.15	0.150	0.09-0.13	0.15	0.13-0.14
	♀	0.162	0.12-0.17	0.25	0.13-0.22	0.22	0.22-0.23
Prostom length	♂	—	0.017-0.023	0.021-0.024	0.012-0.016	0.02	0.015-0.018
	♀	0.013	0.023-0.035	0.030	0.02-0.027	0.025	0.025-0.028
Prostom width	♂	—	—	0.009-0.015	0.008-0.012	—	—
	♀	—	—	0.015	0.01-0.017	—	—
Vestibule including prostom length	♂	—	0.130-0.137	0.120	0.098-0.121	0.13	0.125-0.138
	♀	—	0.12-0.17	0.135	0.133-0.187	0.135	0.095-0.128
Oesophagus length :							
Anterior muscular	♂	—	0.295-0.36	0.36-0.45	0.11-0.29	0.12	0.25-0.33
	♀	0.16	0.39-0.43	0.480	0.29-0.41	0.13	0.24-0.29
Posterior glandular	♂	—	4.05-4.28	3.15-3.60	1.83-2.49	0.24 ?	2.54-2.60
	♀	6.25 ?	3.67-4.45	4.80	3.25-3.52	0.35 ?	3.49-4.08
Nerve ring from anterior end	♂	—	0.155-0.18	0.300-0.330	0.12-0.14	0.17	0.13-0.14
	♀	0.22	0.18-0.23	0.405	0.15-0.21	0.18	0.11-0.14

		<i>Rhabdochona hospeti</i> Thapar, 1950	<i>R. barbi</i> Karve and Naik, 1951	<i>R. penangensis</i> Furtado, 1965	<i>R. ghaggari</i> Sood, 1972	<i>R. labeonis</i> Kalyankar, 1972	<i>R. alii</i> Kalyankar, 1972
Excretory pore from anterior end	♂	—	0.265-0.28	—	0.21-0.25	—	—
	♀	0.3	0.24-0.3	—	0.27-0.29	—	—
Tail length	♂	—	0.4-0.5	0.300-0.375	0.19-0.24	0.35	0.27-0.29
	♀	0.285	0.24-0.28	0.525	0.15-0.29	0.20	0.16-0.17
Spicule length							
Larger		—	0.67-0.71	0.660-0.700	0.55-0.71	0.57	0.55-0.57
Smaller		—	0.11-0.14	0.120-0.150	0.11-0.14	0.12	0.10-0.12
Caudal papillae		—	16, 10 5+1	19, ? 13 ? 6	15, 10 5	17 ? 9 8 ?	15, ? 7 8 ?
Vulva from anterior end		9.46	8.62-9.2	—	4.51-7.58	8.86	8.5-9.73
Eggs		0.025	0.075-0.09 × 0.06-0.065	—	0.02-0.03 ? × 0.016-0.021	0.034 × 0.0.15	0.023-0.030 × 0.017-0.018

of caudal papillae and type of eggs, here again Moravec (*op. cit.*) not only discounted the accuracy of the caudal papillae count, but also suggested that the eggs being examined in situ possibly resulted in the filaments being obscured, treating therefore, both the species as synonym of *R. hospeti*. Hence, all the above four species alongwith *R. bosei* (= *R. garuai*) of Verma (1972) from *Wallago attu* from Lucknow, were considered by him conspecific with *Rhabdochona hospeti*, and this is followed here. For ready reference a comparative chart of the species shown under the synonymy is given.

***Rhabdochona (Rhabdochona) smythi* Agrawal, 1965**

(Fig. 115, A-C)

1965. *Rhabdochona smythi* Agrawal, *Indian J. Helminth.*, **17**, p. 6.
1971. *Rhabdochona smythi* : Majumdar and De, *Folia parasit.*, **18**, p. 304.
1972. *Rhabdochona smythi* : Sood, *Zool. Anz.*, **188** (1/2), p. 105.
1975. *Rhabdochona (Rhabdochona) smythi* Moravec, *Studie CSAV*, **8**, p. 72.
1977. *Rhabdochona smythi* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 14.

Description : Male. Body 4.68-6.78 long, 0.10-0.12 wide ; head 0.016-0.018 in diameter ; prostom 0.020-0.022 long, funnel-shaped, with longitudinal thickenings produced anteriorly as teeth, exact number of which undeterminable ; mesostom 0.1-0.12 long ; oesophagus divided into two parts, anterior muscular 0.20-0.21 long, posterior glandular 1.63-2.05 ; nerve ring 0.140-0.165, and excretory pore 0.22-0.24, both from anterior end ; tail 0.60-0.68 long, pointed, with very narrow caudal alae ; spicules dissimilar, with bifid tips, unequal, shorter boat-shaped, 0.11-0.15 long, longer tubular, 0.62-0.68 ; caudal papillae 17 pairs, 10 preanal, 7 postanal.

Female. Body 6.04-9.0 long, 0.11-0.18 wide ; head 0.015-0.02 in diameter ; prostom as in male, 0.020-0.022 long ; mesostom 0.080-0.125 long ; oesophagus, anterior muscular 0.18-0.30 long, posterior glandular 2.07-3.13 ; nerve ring and excretory pore 0.12-0.19 from anterior end ; tail 0.16-0.20 long, straight ; vulva post-equatorial, 3.70-5.10 from anterior end ; eggs 0.029-0.031 $\times$ 0.012-0.016, with filament at one end.

Host : *Mystus vittatus*

Location : Intestine

Locality : Lucknow, U. P.

Remarks : Though, in shape of female tail tip and in length and shape of spicules, the species comes closer to *R. hospeti* Thapar, 1950,

Moravec (1975) in the absence of important details, viz. number of teeth in the prostom, shape of deirids, and of distal end of larger spicule etc., suggested redescription of the species including description of mature eggs. He also doubted the presence of caudal alae in male. As such, the species is included here tentatively.

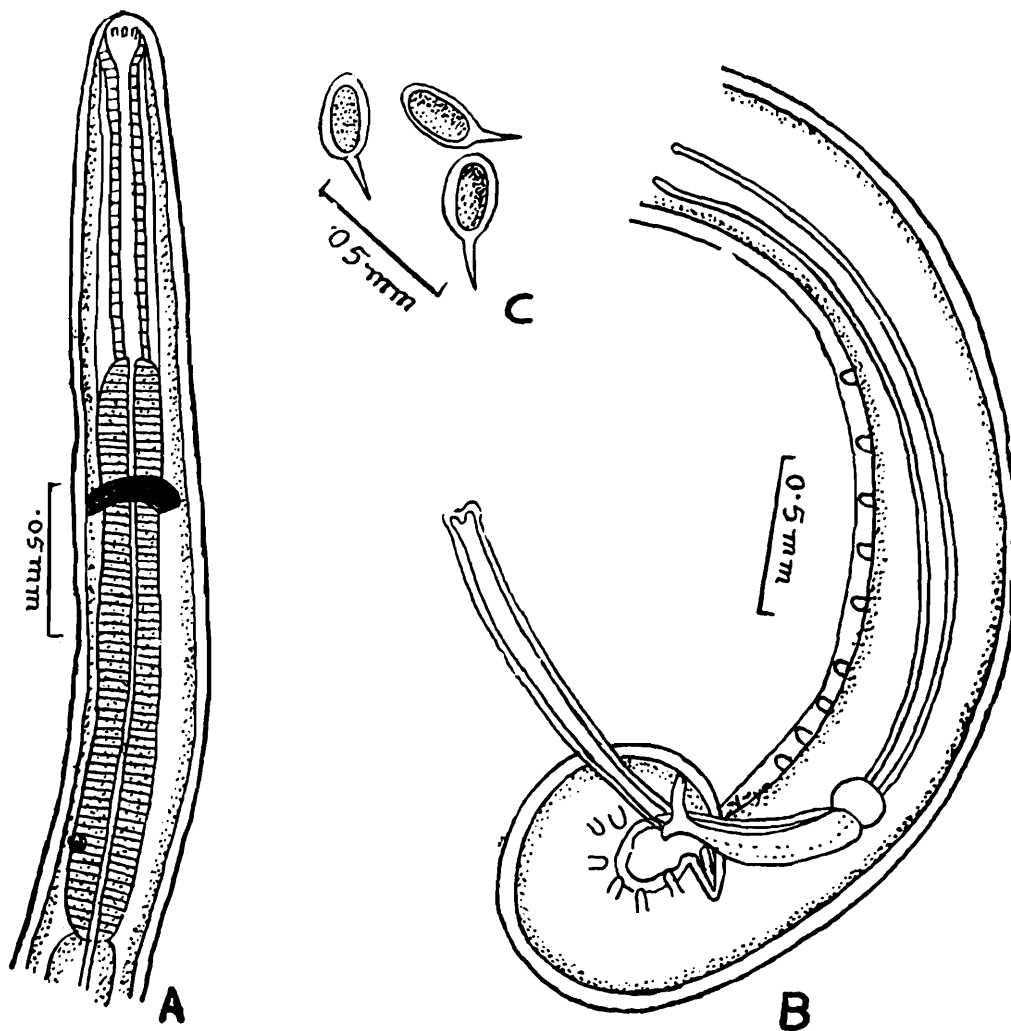


Fig. 115. *Rhabdochona (Rhabdochona) smythi*. (After Agrawal, 1965.) A. anterior end ; B. male posterior end ; C. eggs.

Subgenus **Globochona** Moravec, 1972

Morphological group A (eggs smooth)

Rhabdochona (Globochona) garuai Agrawal, 1965

(Fig. 116, A-C)

- 1965. *Rhabdochona garuai* Agrawal, *Indian J. Helminth.*, **17** (1), p. 10.
- 1966. *Rhabdochona bosei* Sahay, *Indian J. Helminth.*, **18**, p. 57.
- 1969. *Rhabdochona baylisi* Rai, *Indian J. Helminth.*, **21** (2), p. 98.
- 1970. *Rhabdochona bosei* : Fotedar and Dhar, *Kashmir Sci.*, **7** (1-2), p. 108.
- 1970. *Rhabdochona garuai* : Fotedar and Dhar, *Kashmir Sci.*, **7** (1-2), p. 108.

1971. *Rhabdochona garuai* : Majumdar and De, *Folia parasit.*, 18, p. 384.
 1971. *Rhabdochona bosei* : Majumdar and De, *Folia parasit.*, 18, p. 384.
 1971. *Rhabdochona bosei* : Sahay and Narayan, *Indian J. Anim. Res.*, 5, p. 51.
 1972. *Rhabdochona garuai* : Sood, *Zool. Anz.*, 188 (1/2), p. 103, 105.
 1972. *Rhabdochona bosei* : Sood, *Zool. Anz.*, 188 (1/2), p. 105.
 1975. *Rhabdochona (Globochona) garuai* Moravec, *Studie CSAV*, 8, p. 77.
 1977. *Rhabdochona bosei* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 13.
 1977. *Rhabdochona garuai* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 13.
 1980. *Rhabdochona bosei* : Arya, *Indian J. Helminth.*, 30 (1978), p. 140.

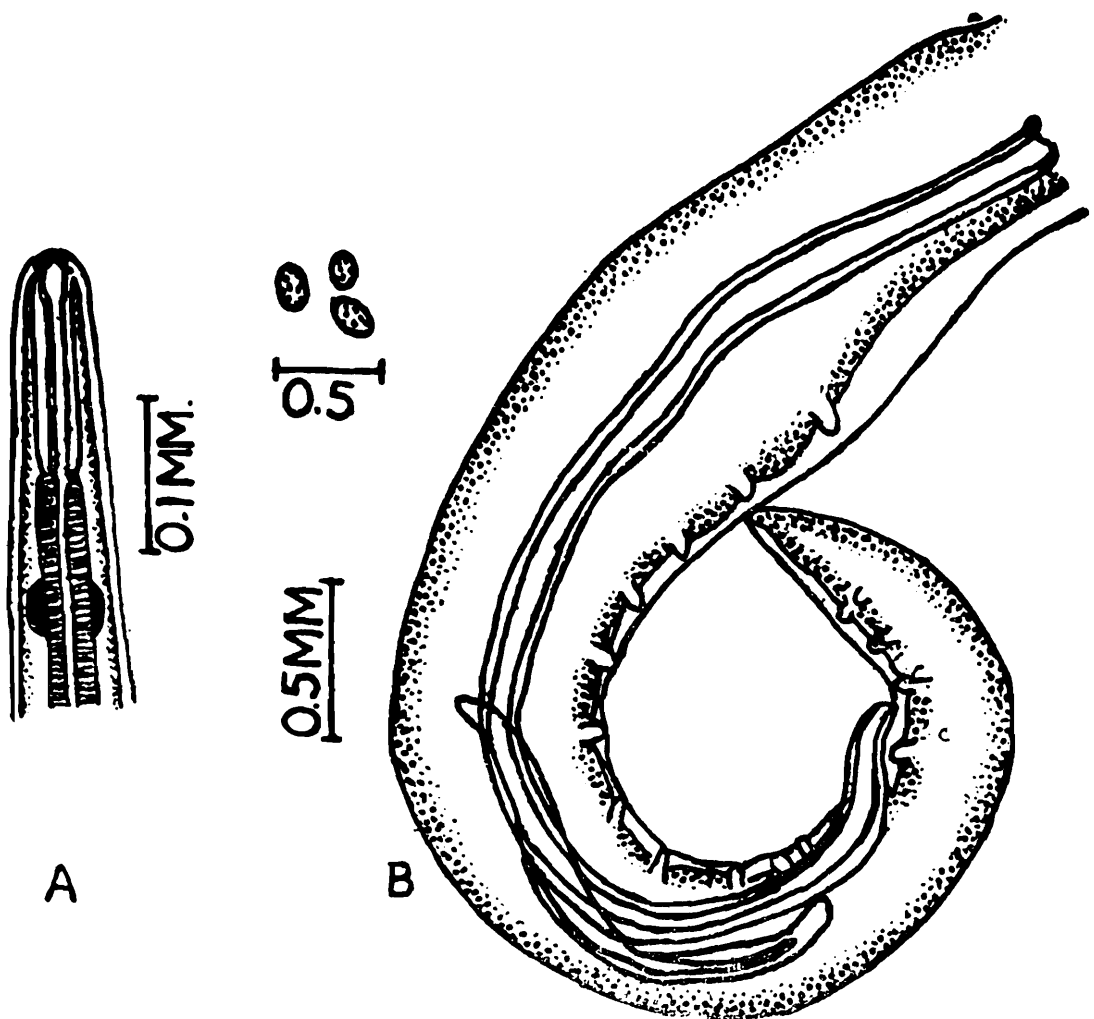


Fig. 116. *Rhabdochona (Globochona) garuai*. (After Agrawal, 1965.) A. anterior end ; B. male posterior end ; C. egg.

Description : Male. Body 11.20-22.58 long, 0.168-0.25 wide ; prostom 0.025-0.034 long, 0.015-0.027 wide, markedly thick-walled with conspicuous basal teeth ; anterior teeth in prostom large, conical, their exact number undeterminable (probably 8) ; deirids small, bifurcate, and in anterior half of vestibule ; vestibule including prostom 0.10-0.18 long ; oesophagus divided into two parts, anterior muscular 0.32-0.609

long, posterior glandular 1.6-4.56 ; nerve ring 0.13-0.267, and excretory pore 0.26-0.48, both from anterior end ; tail 0.13-0.366 long, conical, with rounded tip ; caudal alae absent but cuticle in front of cloaca somewhat strengthened, and in front of preanal papillae very fine longitudinal ventral cuticular ridges present ; spicules two, dissimilar, unequal, smaller 0.20-0.366 long, and without dorsal barb, larger slender, 0.87-1.125 long, and distally with alate sheath ; caudal papillae 15-20 pairs, 11-14 preanal, 4-6 postanal.

Female. Body 9.0-33.05 long, 0.22-0.40 wide ; prostom 0.03-0.045 long, 0.015-0.030 wide, and as in male ; vestibule including prostom 0.1-0.18 long ; oesophagus, anterior muscular 0.3-0.75 long, posterior glandular 1.84-4.76 ; nerve ring 0.12-0.279, and excretory pore 0.28-0.53, both from anterior end ; tail 0.18-0.24 long, conical, with rounded tip ; vulva 7.60-13.6 from posterior end ; eggs $0.02-0.041 \times 0.015-0.024$, filaments or floats not observed.

Hosts : *Pseudeutropius garua* ; *Eutropiichthys vacha* ; *Mystus* sp.

Location : Intestine

Localities : Lucknow & Gorakhpur, U. P. ; Patna, Arraha & Gaya, Bihar ; Ropar, Punjab.

Remarks : Agrawal (1965) described her species *Rhabdochona garuai* from *Pseudeutropius garua* from Lucknow. Subsequently, two more species were added under the genus, viz. *R. bosei* from *Eutropiichthys vacha* from Patna, Bihar, by Sahay (1966), and *R. baylisi* from *Pseudeutropius garua* from Gorakhpur, U. P., by Rai (1969), of which the latter species was considered as synonym of the former by Sahay and Narayan (1971). Sood (1972) redescribed *R. garuai* from *Pseudeutropius garua* from Lucknow ; and Verma (1972) reported *R. bosei* from *Wallago attu* from Lucknow. However, both *R. bosei* and *R. baylisi* were treated as conspecific with *R. garuai* by Moravec (1975), and this is followed here.

***Rhabdochona* (*Globochona*) *mazeedi* Prasad and Sahay, 1965**

(Fig. 117)

- 1965. *Rhabdochona mazeedi* Prasad and Sahay, *Indian J. Helminth.*, **17** (1), p. 43.
- 1965. *Rhabdochona dasi* Sahay and Prasad, *Jap. J. med. Sci. Biol.*, **18**, p. 311.
- 1969. *Rhabdochona dasi* : Sahay et al., *Indian J. Sci. & Indust.*, **3**, p. 117.
- 1970. *Rhabdochona mazeedi* : Fotedar and Dhar, *Kashmir Sci.*, **7** (1-2), p. 103.
- 1971. *Rhabdochona mazeedi* : Majumdar and De, *Folia parasit.*, **18**, p. 384.
- 1971. *Rhabdochona dasi* : Majumdar and De, *Folia parasit.*, **18**, p. 384.
- 1972. *Rhabdochona yarrelli* Verma, *Jap. J. Parasitol.*, **21**, p. 296.

1972. *Rhabdochona mazeedi* : Sood, *Zool. Anz.*, **188** (1/2), p. 105.
 1972. *Rhabdochona dasi* : Sood, *Zool. Anz.*, **188** (1/2), p. 105.
 1973. *Rhabdochona cavasius* Rehana and Bilqees, *Pakist. J. Sci. Ind. Res.*, **16** (3-4), p. 110.
 1975. *Rhabdochona* (*Globochona*) *mazeedi* Moravec, *Studie CSAV*, **8**, p. 82.
 1976. *Rhabdochona cavasius* : Bilqees, *Proc. Pakistan Acad., Sci.*, **13** (2), p. 110.
 1977. *Rhabdochona dasi* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 13.
 1977. *Rhabdochona mazeedi* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 14.
 1980. *Rhabdochona dasi* : Arya, *Indian J. Helminth.*, **30** (1978), p. 140.

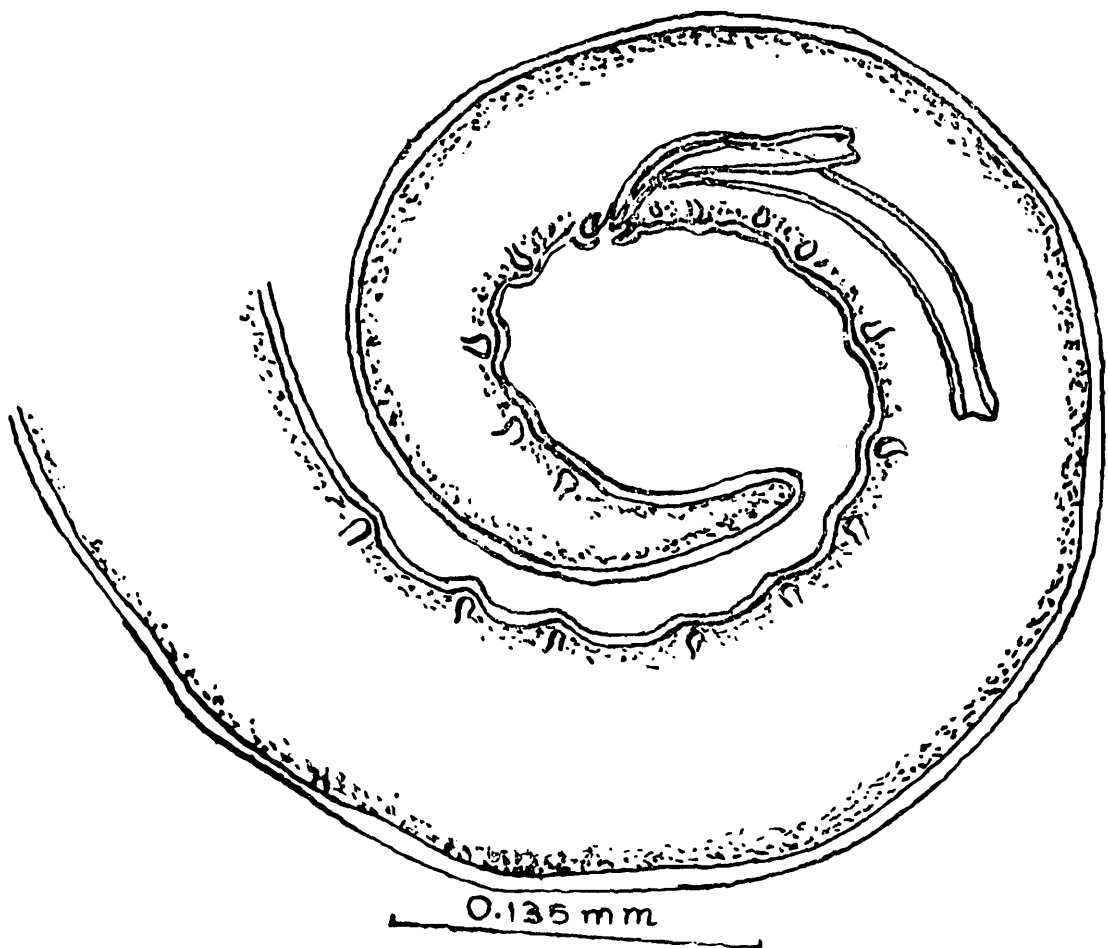


Fig. 117. *Rhabdochona* (*Globochona*) *mazeedi*. (After Prasad and Sahay, 1965.)
 Male posterior end.

Description : Male. Body 6.50-9.32 long, 0.10-0.14 wide, with very fine transverse striations posteriorly ; prostom 0.028-0.030 long, 0.017-0.020 wide ; vestibule including prostom 0.13-0.15 long ; oesophagus divided into two parts, anterior muscular 0.40-0.42 long, posterior glandular 1.52-2.19 ; nerve ring 0.17-0.218, and excretory pore 0.25, both from anterior end ; tail 0.114-0.195 long ; with finger-shaped tip ; spicules two, dissimilar, unequal, smaller 0.078-0.098 long, longer 0.167-0.27 ; caudal papillae 15-17 pairs, 11-12 preanal, 4-5 postanal.

Female. Body 10.5-17.6 long, 0.12-0.21 wide ; prostom 0.034-0.036 long, 0.014-0.025 wide ; vestibule including prostom 0.125-0.145 long ; oesophagus, anterior muscular 0.31-0.46 long, posterior glandular 1.87-2.4 ; nerve ring 0.18-0.246, and excretory pore 0.29, both from anterior end ; tail 0.278-0.331 long, with finger-shaped tip ; vulva 5.08-7.4 from posterior end ; eggs $0.01-0.034 \times 0.01-0.028$, non-filamented.

Hosts : *Eutropiichthys vacha* ; *Ompok bimaculatus* ; *Bagarius bagarius* ; *Mystus cavasius*

Location : Intestine

Localities : Patna, Bihar ; Lucknow, U. P.

Remarks : Prasad and Sahay (1965) described the species *Rhabdochona mazeedi* from *Eutropiichthys vacha* ; Sahay and Prasad (1965) *R. dasi* from *Ompok bimaculatus* [= *Callichrous pabda*] both from Patna ; and Verma (1972) *R. yarrelli* from *Bagarius bagarius* from Lucknow. Sahay, Nath and Kumar (1969) accepted first two species, but Moravec (1975) synonymised all with the first species. Moravec and Daniel (1976) also synonymised another species *R. cavasius* Rehana and Bilqees, 1973, from *Mystus cavasius* from Kalri Lake, Sind (Pakistan) with *R. mazeedi* Prasad and Sahay, 1965, and this is followed here. However, according to Moravec (*op. cit.*), in structure and measurements of spicules the species seems to resemble the African species *R. paski* Baylis, 1928, and *R. congolensis* Campana-Rouget, 1961.

***Rhabdochona (Globochona) minima* Moravec and Daniel, 1976**

1976. *Rhabdochona (Globochona) minima* Moravec and Daniel, *Folia parasit.*, 23, p. 175.

1981. *Rhabdochona (Globochona) minima* : Soota and Dey Sarkar, *Rec. zool. Surv. India*, 79, p. 172.

Description : Male. Body 2.37-2.56 long, 0.054 wide ; cuticle smooth ; lateral alae absent ; oral papillae indistinct ; prostom 0.004-0.005 long, 0.004 wide, barrel-shaped, with inner surface having longitudinal ribs produced anteriorly as teeth exact number of which undeterminable ; basal teeth of prostom indistinct ; vestibule including prostom 0.075-0.093 long ; oesophagus divided into two parts ; anterior muscular 0.105-0.120 long, posterior glandular 0.405-0.444 ; nerve ring 0.10-0.111, and excretory pore 0.150-0.153, both from anterior end ; deirids not discernible ; tail 0.066-0.078 long, with rounded tip, ventral preanal cuticular ridges absent ; spicules dissimilar, unequal, left 0.255 long, distally slightly narrowed, almost conical ; right 0.066-0.072, simple without dorsal barb ; caudal papillae 13 pairs, 7 preanal, of which

6 subventral and 1 lateral, and 6 postanal, of which 5 subventral and 1 lateral.

Host : *Noemacheilus rupicola* var. *inglisi* Hora

Location : Intestine

Locality : Village Bhotebas, Nepal.

Remarks : This species was originally described by Moravec and Daniel (1976) from two males only from *Noemacheilus rupicola* var. *inglisi* from Nepal. The present author has collected female specimens from the same host from Sikkim, an adjoining area, and has found eggs non-filamented.

***Rhabdochona* (*Globochona*) *sarana* Karve and Naik, 1951**

- 1951. *Rhabdochona sarana* Karve and Naik, *J. Univ. Bombay*, **19** (5), p. 28.
- 1965. *Rhabdochona sarana* : Agrawal, *Indian J. Helminth.*, **17** (1), p. 13.
- 1965. *Rhabdochona sarana* : Rasheed, *Acta parasit. pol.*, **13** (42), p. 416.
- 1970. *Rhabdochona sarana* : Fotedar and Dhar, *Kashmir Sci.*, **7** (1-2), p. 103.
- 1971. *Rhabdochona sarana*, Majumdar and De, *Folia parasit.*, **18**, p. 384.
- 1972. *Rhabdochona sarana* : Kalyankar, *Riv. Parassit.*, **33** (4), p. 283.
- 1972. *Rhabdochona sarana* : Sood, *Zool. Anz.*, **188** (1/2), p. 105.
- 1975. *Rhabdochona* (*Globochona*) *sarana* Moravec, *Studie CSAV*, **8**, p. 84.
- 1977. *Rhabdochona sarana* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 14.

Description : Female. Body 8.55-12.275 long, 0.14-0.2 wide ; prostom bell-shaped, 0.0224-0.025 long, 0.017-0.02 wide, with 8-10 prominent ribs produced anteriorly as small teeth ; basal teeth of prostom probably 4 ; vestibule 0.093-0.1 long ; oesophagus divided into two parts, anterior muscular 0.267-0.29 long, posterior glandular 2.44-3.14 ; cervical papillae 0.07-0.13, nerve ring 0.13-0.15, and excretory pore 0.17-0.2, all from anterior end ; tail 0.115-0.15 long, rounded, with stumpy projection having 3 blunt spines ; vulva 3.275-4.65 from posterior end ; eggs 0.0275×0.0175 -0.02, without polar filaments.

Hosts : *Puntius sarana* ; *Labeo rohita*

Location : Intestine

Localities : Pune & Aurangabad, Maharashtra

Remarks : Karve and Naik (1951) from female specimens, characterized by the presence of the crown of conical processes at tail tip, described the species, *Rhabdochona sarana* from *Puntius sarana* from Pune. Osmarov (1957) described another new species, *R. chodukini*.

Rasheed (1965) pointed out many similarities between the two and this was noted by Moravec (1975). Kalyankar (1972) while reporting a female of the first species from another host, *Labeo rohita* from Aurangabad, also pointed out its close similarity with the second. However, male description when available, will not be unfruitful.

Morphological group B (eggs with lateral floats)

Hitherto, four species, viz. *Rhabdochona* (*Globochona*) *gambiana* Gendre, 1922, *R. (G.) barusi* Majumdar and De, 1971, *R. (G.) bariliusi* Soota and Dey Sarkar, 1981, and *R. (G.) singhi* Ali, 1957, are known under this group. Though, they have been reported from two widely separated areas, viz. Africa and India, the first three species show very close morphological affinities, and are from the same generic host, viz. *Barilius*, as already observed by Moravec (1972, 1975) in the case of first two species.

***Rhabdochona* (*Globochona*) *bariliusi* Soota and Dey Sarkar, 1981**

(Fig. 118, A-C)

1981. *Rhabdochona* (*Globochona*) *bariliusi* Soota and Dey Sarkar, *Rec. zool. Surv. India*, **79**, p. 171.

Description : Male. Body 7.5 long, 0.11 wide ; tail 0.31 long ; spicules two, dissimilar, unequal, shorter 0.11 long, longer 0.44, both with bifurcated tips ; caudal papillae 16 pairs, 10 preanal, 6 postanal.

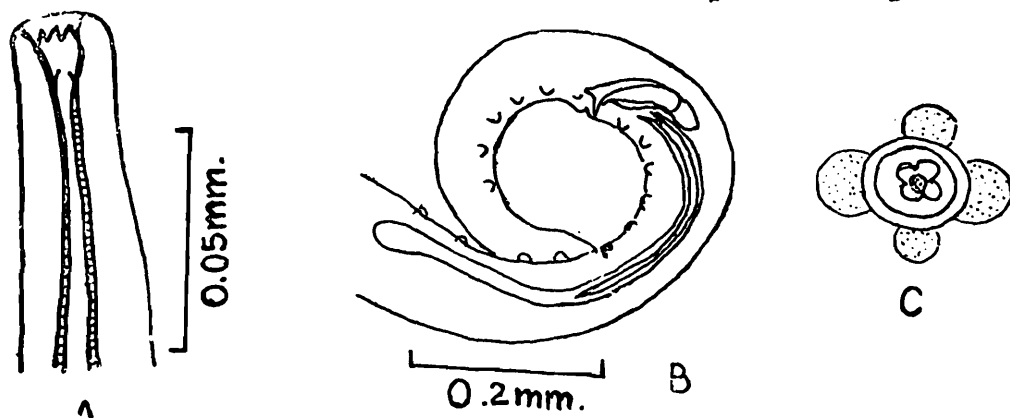


Fig. 118. *Rhabdochona* (*Globochona*) *bariliusi*. (After Soota and Dey Sarkar, 1981.)
A. anterior end ; B. male posterior end ; C. egg.

Female. Body 11.9-13.5 long, 0.2 wide ; tail conical, with short spine ; vulva 7.6-8.8 from anterior end ; eggs $0.022-0.033 \times 0.022$, with four cuticular floats, lateral very large.

Host : *Barilius bendelisis*

Location : Intestine

Locality : Arki, Himachal Pradesh.

***Rhabdochona (Globochona) barusi* Majumdar and De, 1971**

(Fig. 119, A-D)

1971. *Rhabdochona barusi* Majumdar and De, *Folia parasit.*, 18, p. 381.

1975. *Rhabdochona (Globochona) barusi* Moravec, *Studie CSAV*, 8, p. 84.

1981. *Rhabdochona (Globochona) barusi* : Soota and Dey Sarkar, *Rec. zool. Surv. India*, 79, p. 172.

Description : Male. (incomplete with posterior part only).

Body 1.94 (3.01-3.42) long, 0.081 (0.10) wide, with rough transverse and very fine longitudinal striations ; vestibule relatively short, (0.05-0.06 long) anteriorly forming fairly big prostom (0.01 long) with distinct basal teeth, exact number of anterior teeth indiscernible, probably 8 ; spicules two, dissimilar, unequal, longer 0.417 (0.36) long, almost

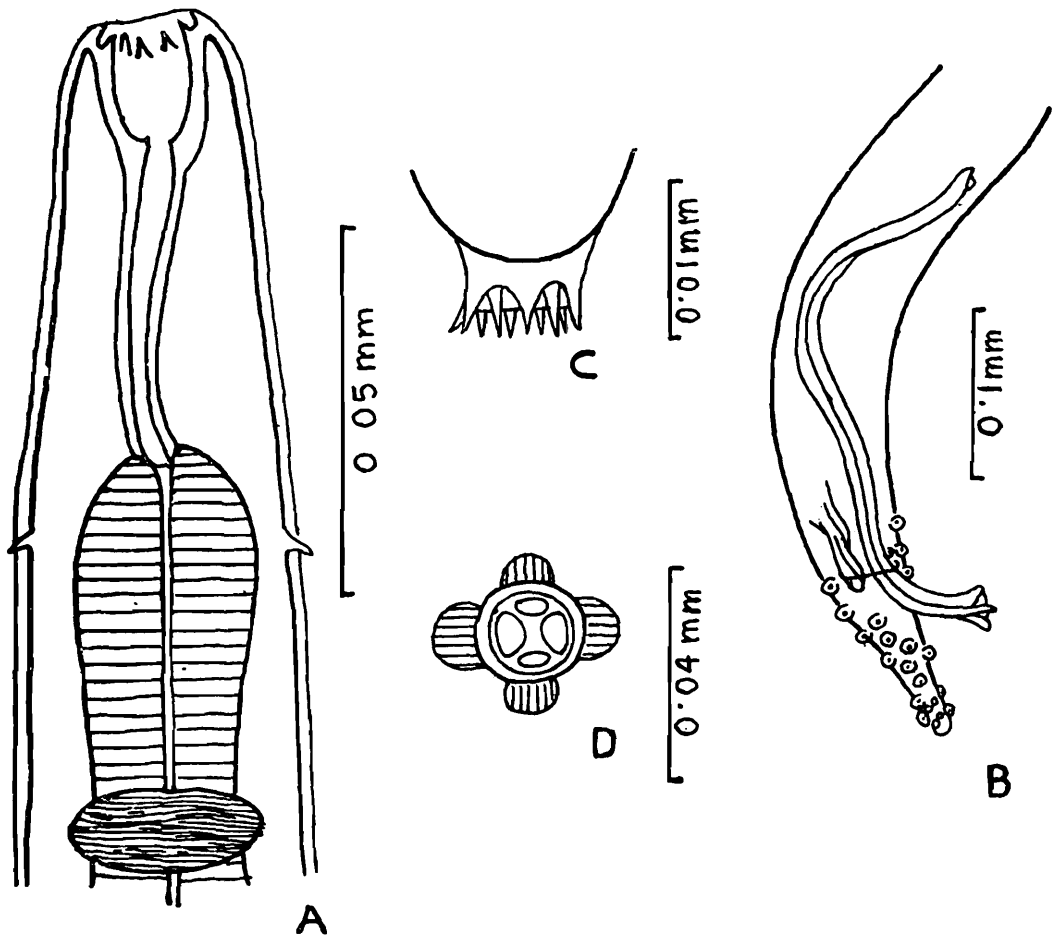


Fig. 119. *Rhabdochona (Globochona) barusi*. (After Majumdar and De, 1971.)

A. anterior end ; B. male posterior end ; C. female posterior end ;
D. egg.

uniformly wide, with indistinct division into shaft and blade, shorter 0.066 (0.06-0.07), without dorsal barb ; caudal papillae 15 pairs, (twenty-two, 10 pairs, + 2 unpaired), 9 preanal of which 8 subventral and one lateral, 6 postanal of which 4 subventral and 2 lateral (9 pairs postanal,

one pair adanal, and two unpaired preanal; two minute papillae-like formations apparent at tail tip.

Female. Body 4.11-5.64 (4.41-5.70) long, 0.068-0.109 (0.10-0.12) wide, with striations somewhat denser posterior to vulva; anterior end as in male; prostom 0.015-0.018 (0.01) long, 0.012-0.015 wide; vestibule including prostom 0.060 long; oesophagus divided into two parts, anterior muscular 0.135 (0.12) long, posterior glandular 0.843-0.884 (1.21-1.27); deirids very small, hardly visible 0.063, nerve ring 0.093-0.111 (0.09-0.10), and excretory pore 0.150-0.186, all from anterior end; tail 0.060-0.075 long, relatively wide, at tip conspicuous crown of about 10 conical processes, which number variable; vulva nearly equatorial, in older specimen slightly pre-equatorial, in younger somewhat post-equatorial, 1.84-2.86 from posterior end (2.50-2.73 from anterior end); eggs with four hemispherical swellings ("floats"), opposite larger than remaining ones, immature eggs without swellings, $0.042-0.048 \times 0.021-0.024$ (egg with floats 0.045×0.037).

Host : *Barilius* sp.

Location : Intestine

Locality : Suwarnarekha River near Ranchi, Bihar.

Remarks : The description of Moravec (1975) based on paratypes is adopted here, while the measurements in parentheses follow those of Majumdar and De (1971).

***Rhabdochona* (*Globochona*) *singhi* Ali, 1957**

(Fig. 120, A & B)

- 1957. *Rhabdochona singhi* Ali, *Indian J. Helminth.*, **8**, p. 4.
- 1965. *Rhabdochona singhi* : Agrawal, *Indian J. Helminth.*, **17** (1), p. 13.
- 1965. *Rhabdochona singhi* : Rasheed, *Acta parasit. pol.*, **13** (42), p. 416.
- 1970. *Rhabdochona singhi* : Fotedar and Dhar, *Kashmir Sci.*, **7** (1-2), p. 108.
- 1971. *Rhabdochona singhi* : Majumdar and De, *Folia parasit.*, **18**, p. 384.
- 1972. *Rhabdochona singhi* : Sood, *Zool. Anz.*, **188** (1/2), p. 105.
- 1975. *Rhabdochona* (*Globochona*) *singhi* Moravec, *Studie CSAV*, **8**, p. 85.
- 1977. *Rhabdochona singhi* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 14.
- 1981. *Rhabdochona* (*Globochona*) *singhi* : Soota and Dey Sarkar, *Rec. zool. Surv. India.*, **79**, p. 172.

Description : Male. Body 4.36-4.52 long, 0.058-0.06 wide; head 0.013 in diameter; vestibule funnel-shaped, lined internally with longitudinal ridges produced forward to form 5 pairs of pointed teeth, and

at base two pairs ; oesophagus divided into two parts, anterior muscular 0.07 long, posterior glandular 1.5 ; cervical papillae 0.035, nerve ring 0.04, and excretory pore 0.062, all from anterior end ; tail pointed, with two pairs of "phasmids" ; spicules dissimilar, unequal, right 0.062 long, left 0.48 ; caudal papillae 12 pairs, 7 preanal, 5 postanal, the 1st and 3rd preanal and last postanal symmetrical, others asymmetrical.

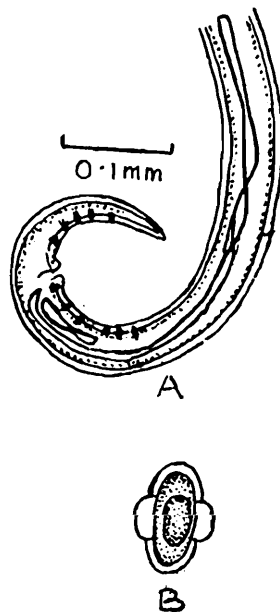


Fig. 120. *Rhabdochona (Globochona) singhi*. (After Ali, 1957.) A. male posterior end ; B. egg.

Female. Body 5.45-6.0 long, 0.068-0.085 wide ; head 0.014 in diameter ; vestibule as in male ; oesophagus, anterior muscular 0.081 long, posterior glandular 1.67 ; cervical papillae 0.038, nerve ring 0.042, and excretory pore 0.064, all from anterior end ; tail 0.168 long ; vulva 3.0 from anterior end ; eggs $36\mu \times 17\mu$, with floats.

Host : *Glossogobius giuris*

Location : Intestine

Locality : Hyderabad, Andhra Pradesh

Genus **Hepatinema** Rasheed, 1964

Generic diagnosis : Body medium sized, cylindrical, with attenuated extremities, and entirely covered by small digitiform papillae ; head with cuticular inflation, without lips or pseudolips ; cephalic papillae 8, 4 each in outer and inner circles, in latter very small ; vestibule elongated, not dilated anteriorly, lacking oral ribs or teeth ; oesophagus anteriorly thick, short, posteriorly claviform ; male with pointed tail, without caudal alae, spicules unequal ; female with only one gonoduct ; vulva closer to anus.

Hepatinema karachiensis Rasheed, 1964

(Fig. 121, A & B)

1964. *Hepatinema karachiensis* Rasheed, *J. Helminth.*, **38** (1/2), p. 63.1977. *Hepatinema karachiensis* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 11,

Description : Male. Body 15.0-30.0 long, 0.6-0.9 wide, covered with very minute digitiform papillae appearing laterally as minute transparent peduncles ; head somewhat truncate, 0.09-0.14 in diameter ; mouth slightly hexagonal, without lips or pseudolips ; circumoral membrane over anterior extremity ; cephalic papillae 4 large submedial in outer, 4 very small circumoral in inner circle ; paired lateral amphids

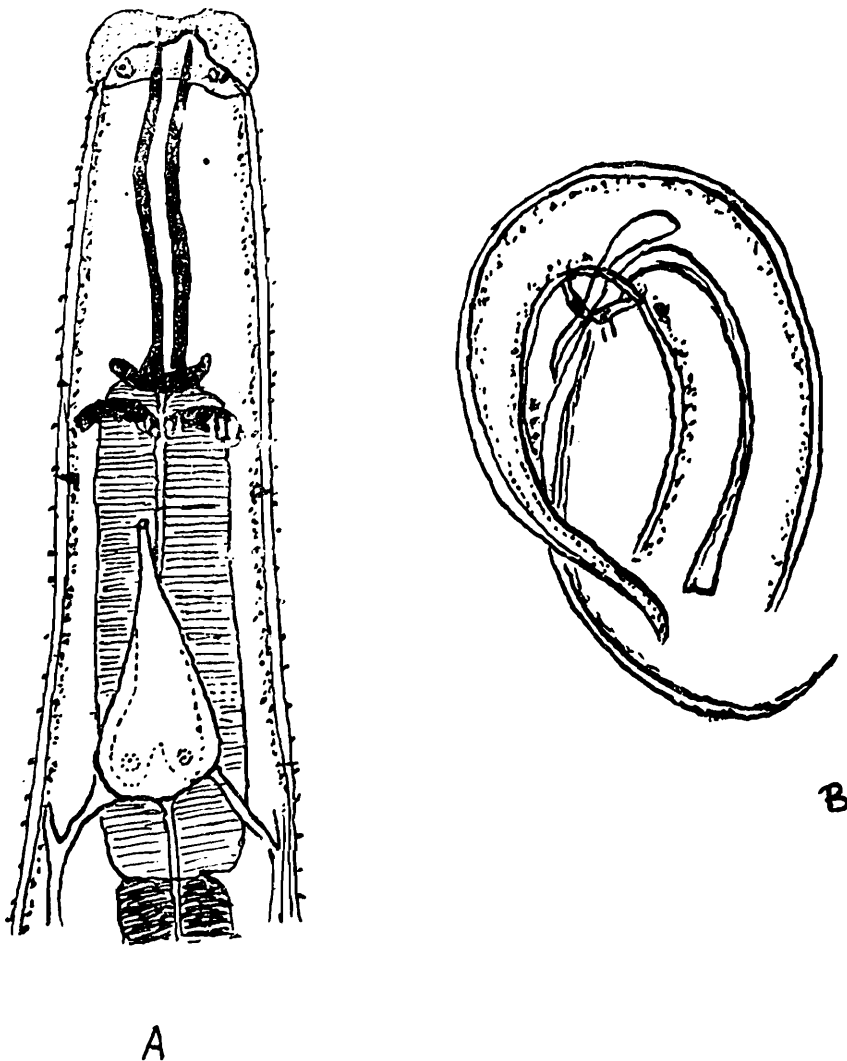


Fig. 121. *Hepatinema karachiensis*. (After Rasheed, 1964.) A. anterior end ; B. male posterior end.

in outer circle ; cervical alae or lateral flanges absent ; cervical papillae in paired cuticular pits on side of body 0.25-0.34 from anterior end ; vestibule 0.27-0.35 long, lacking ridges or teeth even in mouth, not dilated anteriorly with almost same diameter throughout length ; nerve ring 0.32-0.37, and excretory pore 0.4-0.48, both from anterior end ;

oesophagus divided into two parts, anterior 0.35-0.40 long, posterior 3.2-3.8 ; tail 0.4-0.6 long, caudal alae absent ; cloacal lips very conspicuous, with surrounding cuticle slightly enlarged over them, and each lip with a very minute double papilla, anterior more prominent ; spicules two, very unequal, left 1.0-1.9 long, right 0.19-0.25, both with narrow alae and pointed tips ; caudal papillae 3 pairs, 1 preanal, 2 postanal.

Female. Body 25.0-45.0 long, 1.1-1.6 wide, and as in male covered with minute digitiform papillae ; head also as in male, 0.1-0.19 in diameter ; vestibule 0.35-0.45 long ; cervical papillae 0.37-0.49, nerve ring 0.40-0.48, and excretory pore 0.5-0.59, all from anterior end ; oesophagus, anterior 0.43-0.59 long, posterior 3.8-5.0 ; tail 0.64-0.88 long ; vulva post-equatorial, 2.14-4.48 from posterior end or 1.5-3.6 from anus ; eggs $40-50\mu \times 25-29\mu$, without plugs or filaments ; reproductive system peculiar, apparently showing a tendency towards monodelphy.

Host : *Scomberoides tala*

Location : Liver

Locality : Karachi (Pakistan)

Genus *Heptochona* Rasheed, 1965

Generic diagnosis : Body medium sized, more attenuated posteriorly ; cuticle smooth ; head with small cuticular inflation, lacking lips or pseudolabia ; vestibule elongated, without funnel-shaped anterior expansion, with 25-30 well defined teeth anteriorly ; caudal alae circum-anal ; caudal papillae 5-11 pairs, 1-6 preanal, 1-2 adanal, 3 postanal ; vulva post-equatorial ; uteri prodelphic, both functional ; ovaries in anterior and posterior regions of body.

Heptochona stromatei Rasheed, 1965

(Fig. 122, A & B)

1965. *Heptochona stromatei* Rasheed, *Acta parasit. pol.*, **53** (42), p. 419.

1972. *Heptochona yamagutii* Kalyankar, *Riv. Parassit.*, **33** (4), p. 281.

1977. *Heptochona stromatei* : Chaturvedi and Kansal, *Rec. zool. Surv. India*, Occasional Paper No. 5, p. 11.

Description : Male. Body 9.5-14.47 long, 0.25-0.48 wide, somewhat robust, medium sized, tapering, more attenuated posteriorly ; cuticle thin, smooth, with faint transverse striations near extremities, and with longitudinal and cubical markings (as reported for another genus *Hepatinema* Rasheed, 1964) ; head with cuticular inflation like ala and in outer circle with 4 large papillae and a pair of small lateral amphids ;

in inner circle papillae indiscernible ; vestibule 0.14-0.15 long, chitinized, with almost same diameter throughout length, hardly expanding anteriorly to form buccal capsule (as reported for *Rhabdochona*) ; buccal ridges prominent anteriorly in vestibule, appearing in en face view as about 30 sharply pointed teeth ; oesophagus divided into two parts, anterior muscular, posterior glandular, the latter 1.85-2.33 long ; nerve ring and cervical papillae 0.16-0.22, and excretory pore 0.23-0.27, all from anterior end ; tail 0.31-0.45 long, tapering to fine point ; cloacal

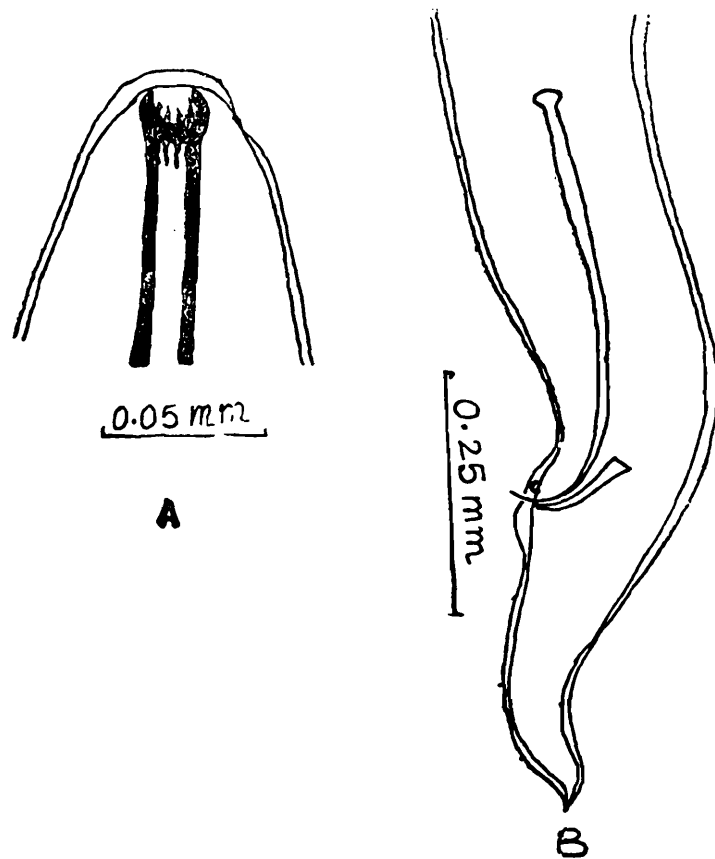


Fig. 122. *Heptochona stromatei*. (After Rasheed, 1965.) A. anterior end ; B. male posterior end.

aperture surrounded by two small lateral alae apparently fused together ventrally ; papillae-like folds opposite cloaca present ; spicules somewhat dissimilar, unequal, left thin, tapering to a fine point, 0.51-0.58 long, right short, broad, slightly curved with tip insignificantly bifurcated and having small alate expansion ; caudal papillae 5-11 pairs, 1-6 preanal, 1-2 adanal, 3 postanal.

Female. Body 17.5-30.52 long, 0.55-0.70 wide ; cuticle, vestibule, and oesophagus as in male ; head 0.051-0.058 in diameter ; vestibule 0.16-0.17 long ; oesophagus 2.3-2.7 long ; nerve ring and cervical papillae 0.19-0.25, and excretory pore 0.24-0.28, all from anterior end ; tail as in male, 0.19-0.37 long ; vulva 11.63-20.27 from anterior end ; eggs $0.034-0.039 \times 0.012-0.020$, without polar filaments or other thickenings.

Host : *Apolectus niger*

Location : Body cavity

Localities : Karachi (Pakistan) ; Bombay, Maharashtra

Remarks : Rasheed (1965) for her specimens from *Apolectus* [= *Stromateus*] *niger* from Karachi (Pakistan), created the genus *Heptochona* with *H. stromatei* as its type species. Kalyankar (1972) from the same host from Bombay added another species *H. yamagutii* separating it from the type species mainly in the number of caudal papillae which, however, appears to be a variable character and needs confirmation. Pending this, both the species are treated as conspecific.

THE TAXONOMIC STATUS OF THE TAXA DEALT WITH BELOW IS
UNCERTAIN AND TILL SUCH TIME AS THEIR IDENTITY IS CONFIRMED,
THEY ARE TREATED AS *GENERA / SPECIES INQUIRENDÆ*.

Genus 1. *Neocylicostrongylus* Arya and Johnson, 1977

Arya and Johnson (1977) on the basis of a single male specimen from *Scomberomorus* [= *Cybium*] *guttatus* from fish market, Jodhpur, Rajasthan, established the genus *Neocylicostrongylus* with *N. surmai* as its type species. It appears that the specimen is a juvenile and the characters are still in the process of development. Hence, pending examination of fully matured specimens, the taxonomic position of this genus remains controversial.

Genus 2. *Paracylicostrongylus* Srivastava and Gupta, 1978.

Srivastava and Gupta (1978) erected the genus *Paracylicostrongylus* for their species *P. trichiurusi* from *Trichiurus muticus* collected at puri, Orissa. The description is inadequate and from the figure the genus shows greater affinity with *Kalicephalus* Molin, 1861. The same can be said in respect of *Cylicostrongylus indicus* Gupta and Garg, 1978 (*vide infra*).

Genus 3. *Amphisakis* Chakravarty and Mujumdar, 1959

Chakravarty and Majumdar (1959) on the basis of females from *Eutropiichthys vacha* from Calcutta, West Bengal, established the genus *Amphisakis* and placed it under the family Cucullanidae. But, in his recent classification of the group, Chabaud (1978) opined, "*Amphisakis* Chakravarty & Majumdar, 1960, is not a member of the Cucullanidae. It may be a larval ascaridoid", and with this observation the present author concurs.

Genus 4. **Paracucullanellus** Agrawal, 1965

This genus was established by Agrawal (1965) for her specimens from a fish, *Rita rita* from Lucknow, U. P., with *P. indica* (sic) as its type species. It is distinguished from *Cucullanus* mainly by the presence of cephalic glands, well-developed caudal alae, post-equatorial vulva, and a transverse cuticular ridge. But, according to Petter (1974), caudal extremity in the males show intermediate condition between two families, viz. Seuratidae and Cucullanidae, for which reason she did not clearly assign the genus to a particular systematic position. In his recent classification of the group, Chabaud (1978) too, has not included the genus, and this is followed here.

Genus 5. **Pseudocucullanus** Kalyankar, 1971

This monotypic genus was created by Kalyankar (1971) for his specimens from a fish, *Tachysurus maculatus* from Malvan, Maharashtra, with *P. tachysuri* as its type species. According to him, the genus resembles *Neocucullanus* Travassos, Artigas and Pereira, 1928, and *Paracucullanellus* Agrawal, 1965, in having anterior extremity straight, but differs from the first in having gubernaculum, and from the second in having pseudo-sucker and not true sucker. But, according to Petter (1974), the males as in *Paracucullanellus* Agrawal, 1965, show caudal extremity intermediate condition between two families, viz. Seuratidae and Cucullanidae, for which reason she treated the genus of uncertain position (*vide supra*). In his recent classification of the group, Chabaud (1978) too, has not given any consideration to the genus for its inadequate description (*vide infra*).

Genus 6. **Neospinitectus** Kalyankar, 1971

This monotypic genus based on a single male only from *Channa* [= *Ophiocephalus*] *punctatus* from Aurangabad, Maharashtra, has not been classified by Chabaud (1975) because of its inadequate description as well as its showing a peculiarity in cervical ornamentation.

1. **Cylicostrongylus indicus** Gupta and Garg, 1978

(Fig. 123, A & B)

1978. *Cylicostrongylus indicus* Gupta and Garg, *Acta parasit. pol.*, 25, p. 243,

Description : Male. Body 2.455-2.898 long, 0.083-0.096 wide, and with bulbous head; buccal capsule 0.064×0.064 , cup-shaped, with three prominences on its inner wall, one median and two lateral;

oesophagus 0.166-0.173 long, muscular and dilated posteriorly ; nerve ring 0.083-0.088 from anterior end ; spicules two, similar, equal, 0.160-0.166 long ; gubernaculum absent ; bursa 0.088-0.141 long, well developed, almost circular, and with 5 pairs of simple lateral rays, a pair of externodorsals, and a median dorsal dividing into two branches, each of which splitting into three ; pre-bursal papillae absent.

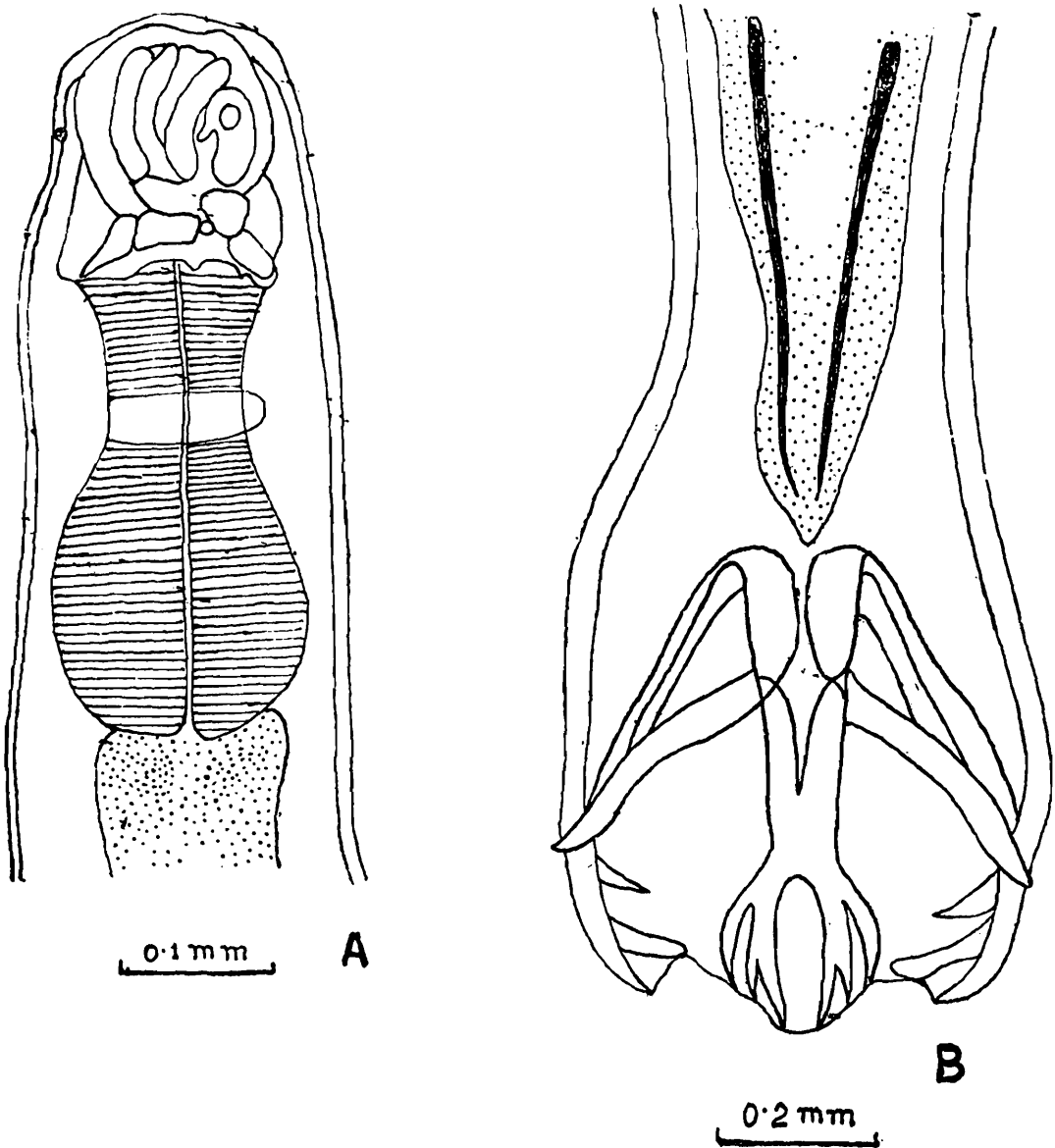


Fig. 123. *Cylicostrongylus indicus*. (After Gupta and Garg, 1978.) A. anterior end ; B. male posterior end.

Female. Body 2.938-3.768 long, 0.109-0.122 wide ; anterior end as in male ; buccal capsule $0.071-0.083 \times 0.064-0.083$; oesophagus 0.187-0.205 long ; nerve ring 0.088-0.103 from anterior end ; tail 0.071-0.083 long ; vulva post-equatorial, with well developed folds.

Host : *Scomberomorus commersoni*

Location : Intestine

Locality : Calicut, Kerala

Remarks : Gupta and Garg (1978) referred some nematodes from *Scomberomorus* [*Cybium*] *commersoni* collected at Calicut as *Cylicostrongylus indicus* n. sp. It may be noted that the genus itself is based on inadequate description. Further, the specimens under report lack the fundamental character of the genus namely, cup-shaped buccal capsule with a spinose median stylet, as given by Yamaguti (1961). Therefore, their taxonomic status remains uncertain.

2. *Cylicostrongylus thapari* Sood, 1967

(Fig. 124, A-D)

1967. *Cylicostrongylus thapari* Sood, *Indian J. Helminth.*, 18 (1966), p. 181.

Description : Male. Body 14.19-14.52 long, 0.33-0.44 wide ; buccal capsule $0.16-0.18 \times 0.15$; horn-like thickenings three pairs, one ventrolateral, two dorsals ; spinose median stylet 0.09-0.12 long, projecting into buccal capsule, not reaching oral aperture ; cervical papilla anterior 0.71-0.74 and posterior 0.75-0.77, both from anterior end ; oesophagus 1.16-1.19 long ; nerve ring 0.49-0.55 and excretory pore 0.73-0.77, both from anterior end ; spicules two, broad anteriorly, narrow posteriorly, equal, 0.64-0.66 long ; bursa well developed, almost circular, divided into two asymmetrical lateral lobes and a well differentiated dorsal lobe ; rays long, reaching nearly margin of bursa ; ventrolateral and lateroventral rays widely apart, mediolateral and postero-lateral close together and externolateral somewhat separated ; dorsal ray simple, externo-dorsal stout and approximately of equal length of dorsal ; prebursal papillae absent.

Female. Body 15.48 long, 0.34 wide ; buccal capsule 0.22×0.18 ; median stylet 0.08 long ; cervical papilla anterior 0.73, posterior 0.79, both from anterior end ; oesophagus 1.24 long ; nerve ring 0.54 and excretory pore 0.74, both from anterior end ; tail 0.33 long, blunt ; eggs $0.05-0.08 \times 0.02-0.04$, oval.

Host : *Mastacembalus armatus*

Location : Intestine

Locality : Lucknow, U. P.

Remarks : Sood (1967) collected some specimens from *Mastacembalus armatus* at Lucknow and placed them under the genus *Cylicostrongylus* Yamaguti, 1961, as *C. thapari*. The controversial position of the genus *Cylicostrongylus* has already been referred to above. Hence, it is difficult to fix taxonomic status of the species.

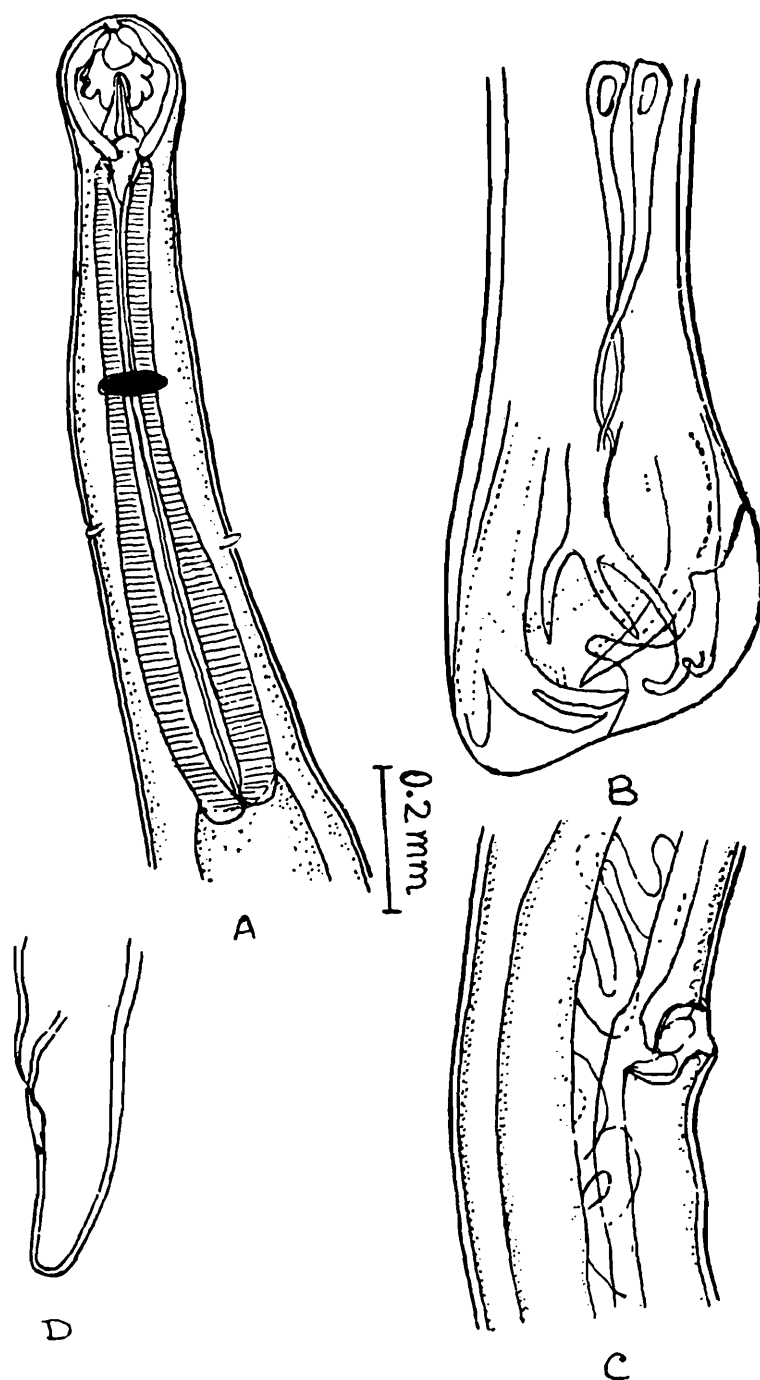


Fig. 124. *Cylicostrongylus thapari*. (After Sood, 1967.) A. anterior end ; B. male posterior end ; C. showing vulva ; D. female posterior end.

3. *Neocylicostrongylus surmai* Arya and Johnson, 1977

(Fig. 125, A & B)

1977. *Neocylicostrongylus surmai* Arya and Johnson, *Revta. bras. Biol.*, **37** (3), p. 567.

Description : Male. Body 60.0 long, 0.43 wide ; cuticular striations well defined, 0.011-0.013 apart ; head 0.08×0.16 , slightly swollen, and with 3 pairs of cephalic papillae, of which one pair terminal and two lateral ; lips shallow ; buccal capsule 0.1×0.08 , well developed, with 7 longitudinal aspinose rays, of which median longest ; oesophagus 10.7 long ; cervical papillae 0.08, nerve ring 0.13, and excretory pore 0.34, all

from anterior end ; copulatory bursa 0.15×0.37 , circular, with 5 simple rays, 2 dorsolateral, 2 ventrolateral and a median ; caudal papillae 14 pairs ; 11 prebursal and pedunculate, 3 bursal and sessile ; spicules similar, stout, proximally knobbed, equal, 0.25 long ; gubernaculum present.

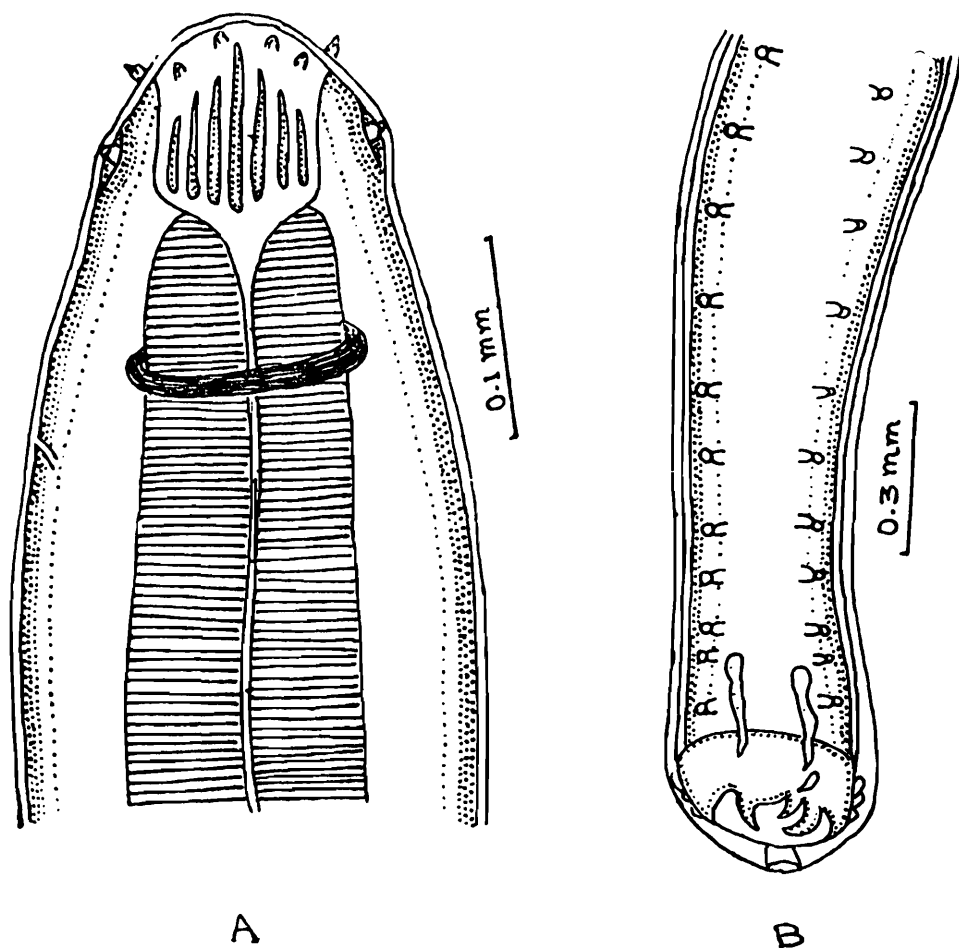


Fig. 125. *Neocylicostrongylus surmai*. (After Arya and Johnson, 1977.) A. anterior end ; B. male posterior end.

Host : *Scomberomorus guttatus*

Location : Intestine

Locality : Fish market, Jodhpur, Rajasthan

Remarks : This species is based on a single male specimen. The difficulty regarding the taxonomic status of the genus *Neocylicostrongylus* has already been referred to above. The same difficulty also arises for the species.

4. *Paracylicostrongylus trichiurusi* Srivastava and Gupta, 1978

(Fig. 126, A & B)

1978. *Paracylicostrongylus trichiurusi* Srivastava and Gupta, *Indian J. Helminth.*, 28 (1976), p. 153.

Description : Male. Body 6.8 long, 0.13 wide, cylindrical ; head 0.2 in dorsoventral diameter, bulbous ; buccal capsule 0.145×0.165 , cup-

shaped, and with 3 distinct chitinous ridges ; oesophagus 0.35 long, strongly muscular, and without posterior bulb ; nerve ring 0.1 and excretory pore 0.2, both from anterior end ; spicules similar, subequal, left 0.37 long, right 0.34 ; bursa well developed, circular, entire, supported by 7 simple rays ; ventrals closely opposed, laterals well developed

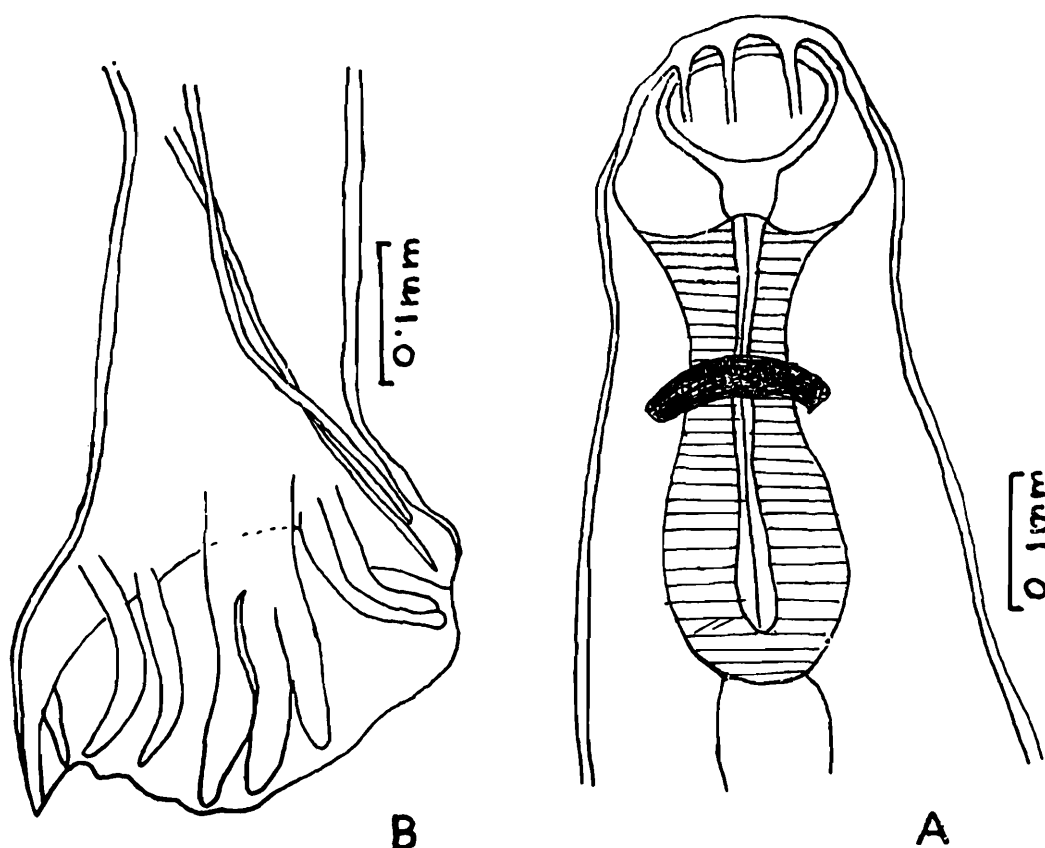


Fig. 126. *Paracylicostrongylus trichiurusi*. (After Srivastava and Gupta, 1978.)
A. anterior end ; B. male posterior end.

and arising from a common trunk, anterolateral shorter than others, externodorsal arising separately, dorsal simple and without accessory branches.

Host : 'Sapua' (*Trichiurus noticus*)

Location : Intestine

Locality : Pentkota, Puri, Orissa

Remarks : This species was described by Srivastava and Gupta (1978) from a single male specimen from a fish, *Trichiurus noticus* from Orissa. But, the description and supporting figures of the species seem to indicate that it comes under the genus *Kalicephalus* Molin, 1861, a common parasite of snakes and lizards. Hence, re-examination of the type as well as examination of more material is really desirable to remove this apparent ground for doubt.

5. *Syphacia myopsi* Srivastava and Gupta, 1977

(Fig. 127, A-D)

1977. *Syphacia myopsi* Srivastava and Gupta, *Indian J. Helminth.*, 27 (1975), p. 116.

Description : Male. Body 1.8 long, 0.15 wide, tapering towards both extremities ; lips 3, each with two papillae ; cervical alae present ; oesophagus excluding bulb 0.165 long ; bulb 0.075 long ; nerve ring 0.13 and excretory pore 0.225, both from anterior end ; cuticular mamelones ventrally two, both 0.1 long, posterior 0.437, anterior 0.785 from posterior end ; tail ; 0.227 long, tapering, with narrow caudal alae ; spicule single, slender, poorly chitinised, 0.1 long ; gubernaculum 0.045 long, rod-shaped ; caudal papillae sessile, 2 pairs, 1 adanal and other postanal.

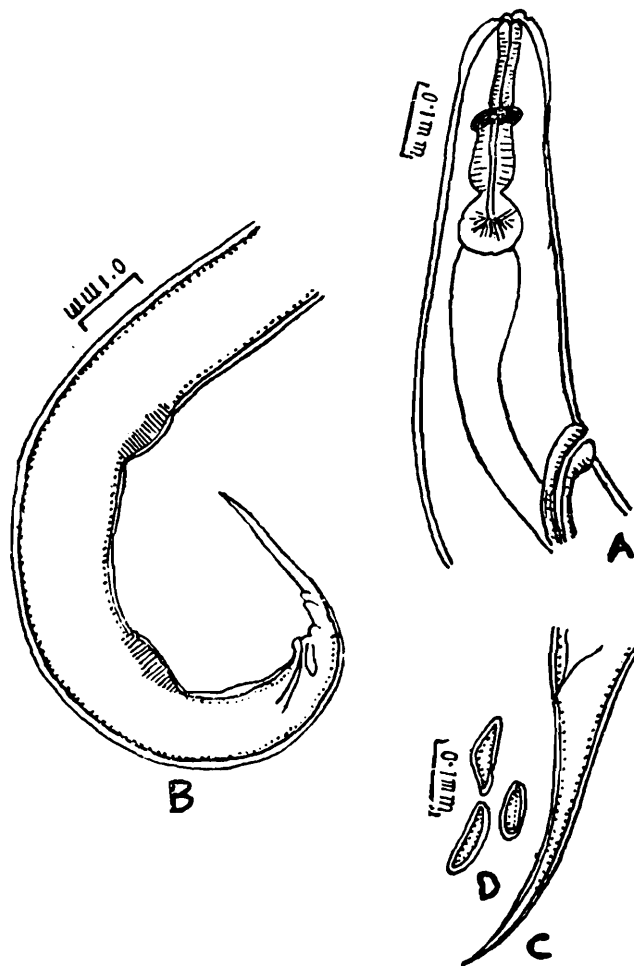


Fig. 127. *Syphacia myopsi*. (After Srivastava and Gupta, 1977.) A. anterior end ; B. male posterior end ; C. female posterior end ; D. eggs.

Female. Body 2.195-2.6 long, 0.24-0.26 wide ; oesophagus excluding bulb 0.23-0.24 long ; oesophageal bulb 0.085-0.092 long ; nerve ring 0.118-0.13 and excretory pore 0.25-0.32, both from anterior end ; tail 0.35-0.45 long, tapering ; vulva pre-equatorial, 0.557-0.62 from anterior end ; eggs $0.11-0.77 \times 0.025-0.03$, asymmetrical.

Hosts : *Hara batta* ; *Trachinocephalus myops*

Location : Intestine

Locality : Puri, Orissa

Remarks : As this genus has hitherto been reported only from mammalian hosts, this is apparently its first record from a fish. But, excepting in showing near cloaca one pair of papillae less, this species agrees practically in all other respects with that of *Syphacia sciuri* Mirza and Singh, 1934, as described by Gupta and Kazim (1980) from *Funambulus palmarum* from Lucknow. Hence, examination of more material is definitely called for final confirmation.

6. *Cosmoxynemoides nandusii* Sood, 1972

(Fig. 128, A & B)

1972. *Cosmoxynemoides nandusii* Sood, *Zool. Anz.*, 188 (1/2), p. 106.

Description : Female. Body 2.33-3.41 long, 0.17-0.31 wide ; head 0.03-0.05 ; lateral flanges absent ; cephalic end covered with smooth

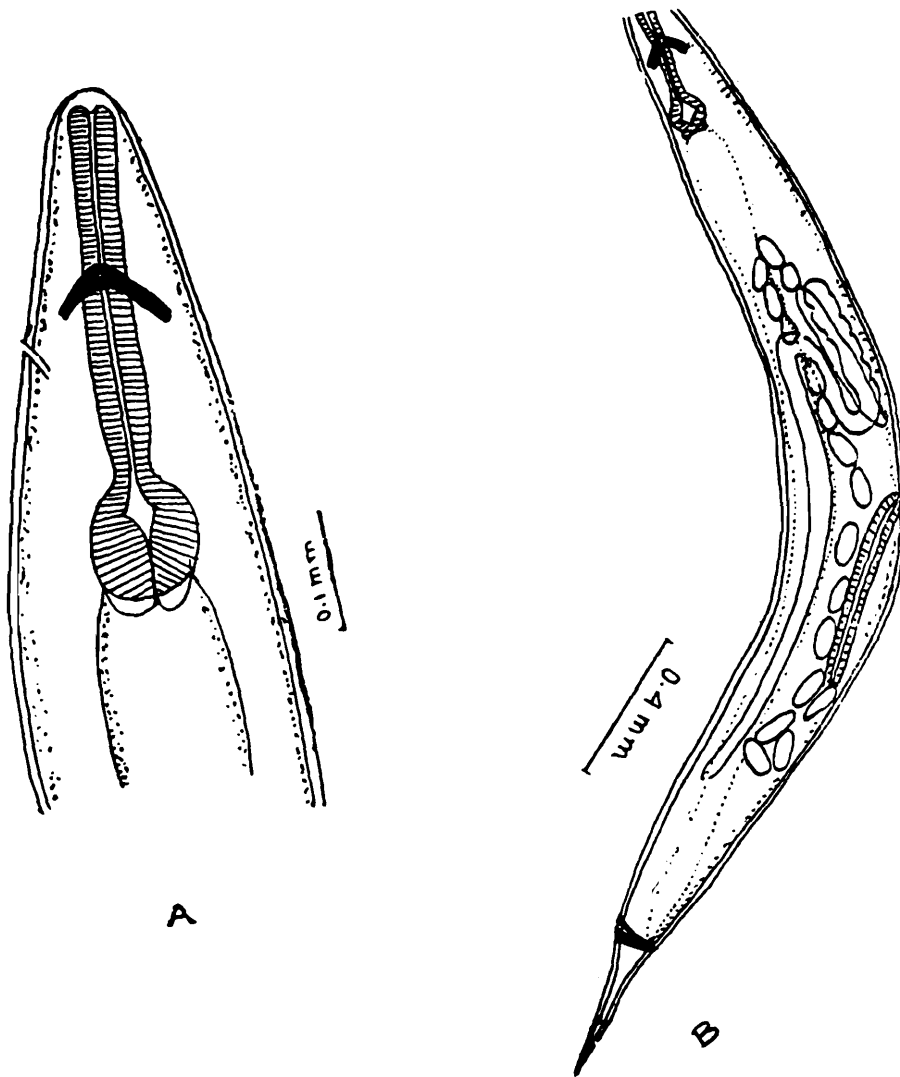


Fig. 128. *Cosmoxynemoides nandusii*. (After Sood, 1972.) A. anterior end ; B. female.

cuticle, separated from body by annular groove ; buccal capsule absent ; oesophagus 0.32-0.42 long ; bulb 0.08-0.11 long ; nerve ring 0.12-0.16 and excretory pore 0.18-0.25, both from anterior end ; tail 0.36-0.41 long, conical, with sharp point ; vulva pre-equatorial, 1.09-1.61 from anterior end ; eggs $0.104-0.106 \times 0.052-0.062$, elongated.

Host : *Nandus nandus*

Location : Intestine

Locality : Lucknow, U. P.

Remarks : The above genus, based on females only, from the two fishes, *Curimata gilberti* and *Geophagus brasiliensis* from Brazil, was created by Travassos (1949) with *C. anguirrei* as its type species. Sood (1972) added *C. nandusii* also based on females, from another fish, *Nandus nandus* from Lucknow. While Yamaguti (1961) placed the genus under the subfamily Cosmocercinae of the family Oxyuridae, Chaubaud (1978) has not included it in his recent classification of the group. Therefore, the taxonomic status of the species remains uncertain.

7. *Ascaridia ganpatii* Sood, 1967

(Fig. 129, A-C)

1967. *Ascaridia ganpatii* Sood, *Indian J. Helminth.*, 18 (1966), p. 184.

Description : Male. Body 27.70-28.77 long, 0.84-0.85 wide ; lateral alae feebly developed ; head 0.17-0.20 in diameter ; mouth with 3 strongly developed almost semi-circular lips ; oesophagus 1.66-1.93 long, club-shaped ; nerve ring 0.45-0.46 and excretory pore 0.56-0.62, both from anterior end ; sucker almost circular with chitinous rim, 0.12-0.14 in diameter, 0.22-0.24 from cloacal aperture ; tail 0.42-0.50 long, pointed, with caudal alae extending upto tip ; spicules similar, unequal, left 1.7-1.9 long, right 1.15-1.16 ; caudal papillae 11 pairs, 4 preanal, 3 adanal, 4 postanal.

Female. Body 35.94 long, 0.93 wide ; head 0.21 in diameter ; oesophagus 1.93 long ; tail 1.01 long, pointed ; vulva post-equatorial, 19.54 from anterior end ; eggs $0.10-0.13 \times 0.05-0.08$, thick shelled.

Host : *Mastacembalus armatus*

Location : Intestine

Locality : Lucknow, U. P.

Remarks : Froelich (1789) described the species *Ascaris hermaphrodita* for which Dujardin (1845) created a subgenus *Ascaridia* under the genus *Ascaris* with *Ascaris truncata* Zeder, 1803, as its type species. While Schneider (1866) and Stossich (1888) merged the subgenus with

Heterakis, Railliet and Henry (1912) preferred to treat it as a separate genus *Ascaridia* and this was accepted by subsequent workers. The genus has hitherto been reported from several parts of the world from only birds and reptiles barring two records of apparent accidental infection, viz. *A. brevicauda* (Ratz, 1897) Railliet and Henry, 1914, from *Lucioperca sandra* from Balton, Hungary ; and another *A. ganpatii* Sood, 1967, from *Mastacembalus armatus* from Lucknow.

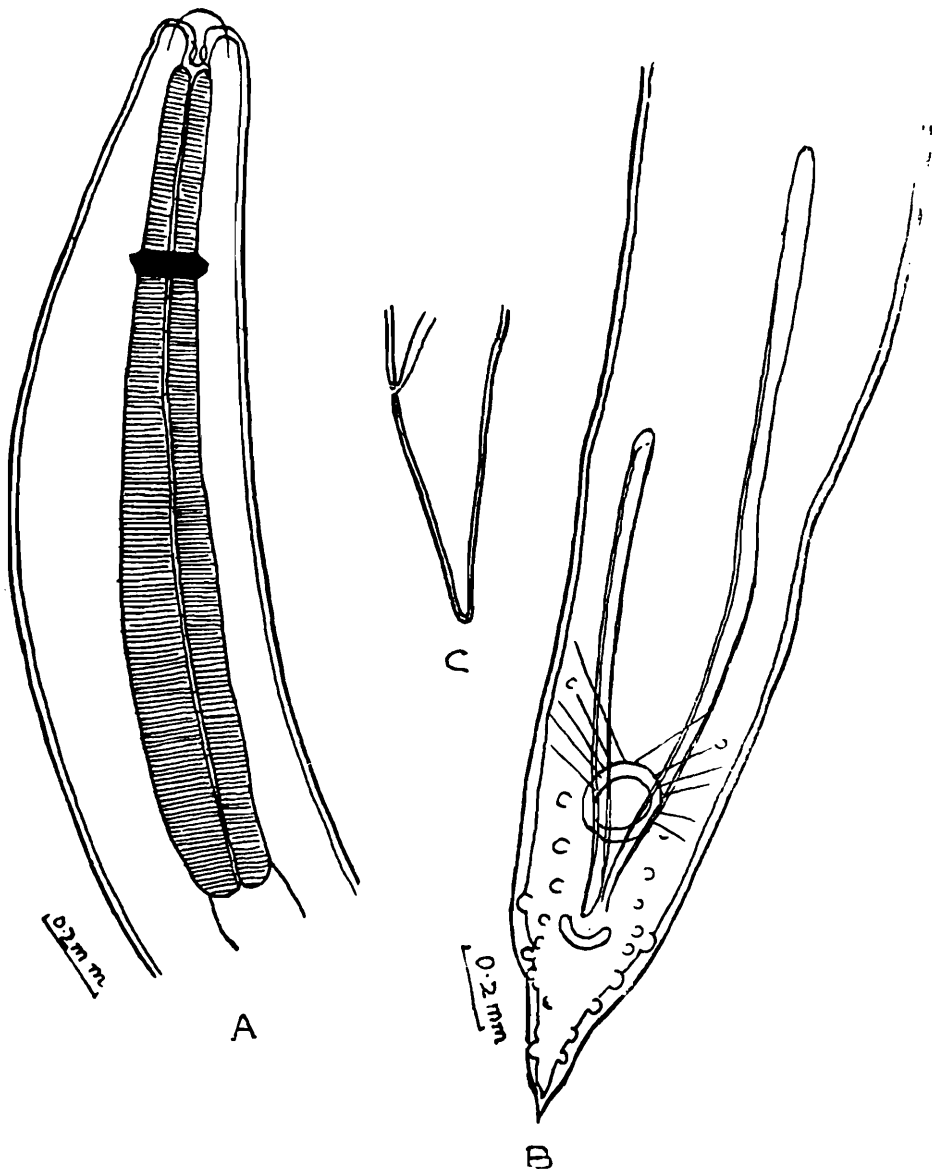


Fig. 129. *Ascaridia ganpatii*. (After Sood, 1967.) A. anterior end ; B. male posterior end ; C. female posterior end.

8. *Amphisakis bengalensis* Chakravarty and Majumdar, 1959

1959. *Amphisakis bengalensis* Chakravarty and Majumdar, *Proc. zool. Soc., Calcutta*, 12 (2), p. 117.

Description : Female. Body 17.21-24.34 long, 0.338-0.65 wide; striated finely, excepting anteriorly which coarse ; anterior end straight ; lips two, lateral, each with 3 papillae ; oesophagus 2.3-3.15 long,

muscular, without pseudo-capsule or posterior dilatation ; oesophageal appendix 0.416-0.455, and intestinal caecum 1.70-2.38 long ; nerve ring 0.364-0.416, and excretory pore 0.377-0.416, both from anterior end ; eggs $0.065-0.09 \times 0.039-0.065$.

Host : *Eutropichthys bengalensis*

Location : Intestine

Remarks : Chabaud (1978) considers this genus as based on description of a larval stage of an ascaridoid, and as such has no taxonomic validity.

9. *Paracucullanellus indica* Agrawal, 1965

(Fig. 130, A & B)

1965. *Paracucullanellus indica* Agrawal, *Proc. helminth. Soc. Wash.*, **32** (2), p. 246.

Description : Male. Body 3.78-10.93 long, 0.38-0.67 wide ; mouth with two lips, each having 3 well-developed papillae, 2 submedian and one lateral ; pair of lateral amphids ; head 0.09-0.13 in diameter ; pseudobuccal capsule 0.15-0.26 long ; posterior oesophagus 0.32-0.51 long ;

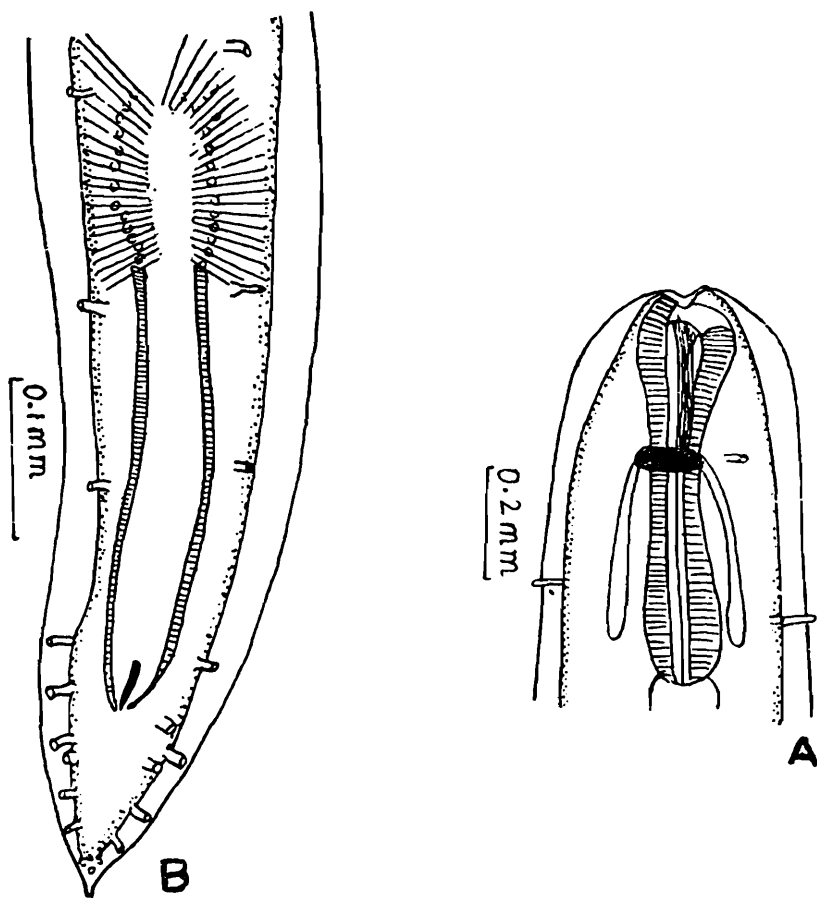


Fig. 130. *Paracucullanellus indica*. (After Agrawal, 1965.) A. anterior end ; B. male posterior end.

entire oesophagus 0.47-0.77 long ; nerve ring 0.16-0.27, excretory pore 0.20-0.49 and cervical papillae 0.45-0.7, all from anterior end ; tail

0.18-0.23 long, with well developed caudal alae ; preanal sucker 0.12-0.36 long, spindle-shaped, without chitinous rim, 0.41-0.54 from cloacal opening ; spicules similar, sharply pointed posteriorly, equal or subequal, 0.49-0.67 long ; gubernaculum 0.07-0.12 long ; caudal papillae 10-12 pairs, 4-5 preanal, 0-2 adanal, 5-6 postanal.

Female. Body 3.98-12.76 long, 0.23-0.62 wide ; head 0.10-0.20 in diameter ; oesophagus as in male, anterior pseudo-buccal capsule 0.19-0.39 long, posterior oesophagus 0.44-0.64 long ; entire oesophagus 0.63-1.03 long ; nerve ring 0.22-0.30, excretory pore 0.30-0.50, and cervical papillae 0.51-0.73, all from anterior end ; tail 0.12-0.38 long, with two lateral processes ; vulva post-equatorial, 1.15-6.0 from anterior end ; eggs $0.045-0.065 \times 0.028-0.041$.

Hosts : *Rita rita* ; *Wallago attu*

Location : Intestine

Locality : Lucknow, U. P.

Remarks : This genus was created by Agrawal (1965) for her specimens from a fish *Rita rita* from Lucknow, with *P. indica* (sic) as its type species. Sood (1968) redescribed the type and subsequently (1970) added another species *P. gontiaii* from *Wallago attu* from Lucknow. Three more species, viz. *P. bagarii*, *P. ritai*, and *P. alatae* were later added by Verma (1971), Gupta and Gupta (1977), and Gupta and Bakshi (1980) respectively. However, the differences separating these species are very inadequate and so, all these may be treated as synonyms. It is relevant to remark that considering the inadequacy of the important differentiating character, viz. presence of cephalic glands for establishing a separate genus, which in fact has been reported to be absent in case of some species, Petter (1974) did not clearly assign the genus to a particular systematic position. In his recent classification of the group, Chabaud (1978) treated it as a *species inquirendae* because the description of the cephalic structures does not correspond with the figures, and this is followed here.

10. *Pseudocucullanus tachysuri* Kalyankar, 1971

(Fig. 131, A & B)

1971. *Pseudocucullanus tachysuri* Kalyankar, *Riv. Parasit.*, 32 (1), p. 37.

Description : Male. Body 14.31 long, 0.61 wide ; mouth with two lips, each with 3 papillae and on inner surface fine dents ; head 0.36 in diameter ; pseudobuccal capsule subconical ; cephalic glands and intestinal caecum absent ; oesophagus 1.56 long, muscular ; nerve ring 0.58 from anterior end ; tail 0.31 long, ending in cone-like structure,

0.017 long ; caudal alae short, narrow, upto end of tail ; pseudo sucker very distinct ; spicules similar, subequal, 0.59 and 0.61 long ; gubernaculum 0.21 long, 0.13 wide ; caudal papillae 12 pairs, 4 preanal, 2 adanal, 6 postanal.

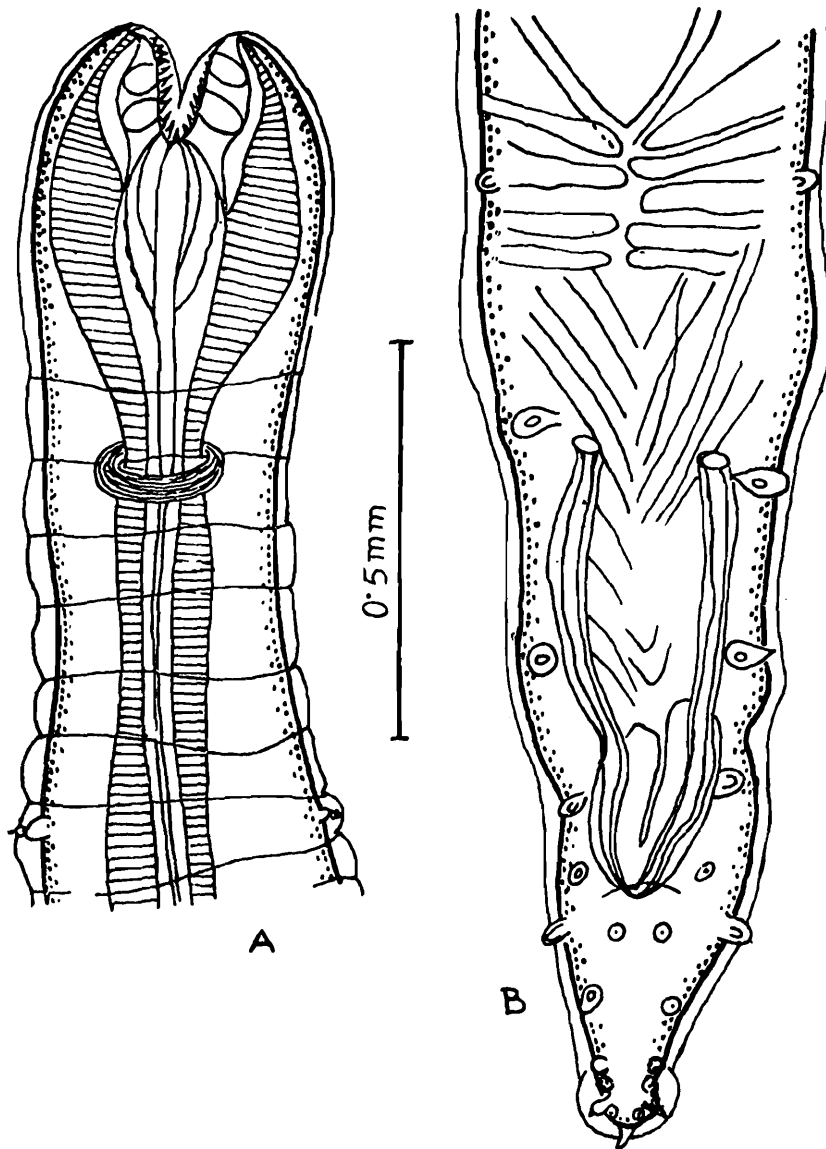


Fig. 131. *Pseudocucullanus tachysuri*. (After Kalyankar, 1971.) A. anterior end ; B. male posterior end.

Female. Body 12.12-17.26 long, 0.53-0.67 wide ; anterior end as in male ; oesophagus 1.40-1.88 long ; nerve ring 0.57-0.61 from anterior end ; tail 0.39-0.49 long, ending in cone-shaped structure 0.025-0.028 long ; phasmids 0.11-0.12 from tip of tail ; vulva with two prominent lips, 5.13-5.87 from posterior end ; eggs $0.040-0.044 \times 0.037-0.040$.

Host : *Tachysurus maculatus*

Location : Intestine

Locality : Malvan, Maharashtra

Remarks : The difficulty regarding the systematic position of the genus *Pseudocucullanus* has already been referred to. The same difficulty also arises for the species.

11. **Angusticaecum tetrodoni** (Gupta and Gupta, 1979)
(Fig. 132, A-C)

1979. *Amplicaecum tetrodoni* Gupta and Gupta, *Indian J. Helminth.*, 29 (1977), p. 106.

Description : Male. Body 39.4-45.05 long, 0.51-0.6 wide, cylindrical, tapering towards extremities ; head 0.5-0.27 in diameter ; mouth with three well-developed rectangular lips, one dorsal, two subventral ; dorsal lip with two large and one very small ventral papillae ; oesophagus 2.8-5.35 long, without posterior bulb ; intestinal caecum 2.5-3.25 long ; nerve ring 0.35-0.65 and excretory pore 0.51-0.83, both from anterior end ; tail 0.19-0.28 long ; spicules alate, equal, 0.92-1.1 long ; gubernaculum absent ; caudal papillae sessile, 21 pairs, 16 preanal, 5 postanal.

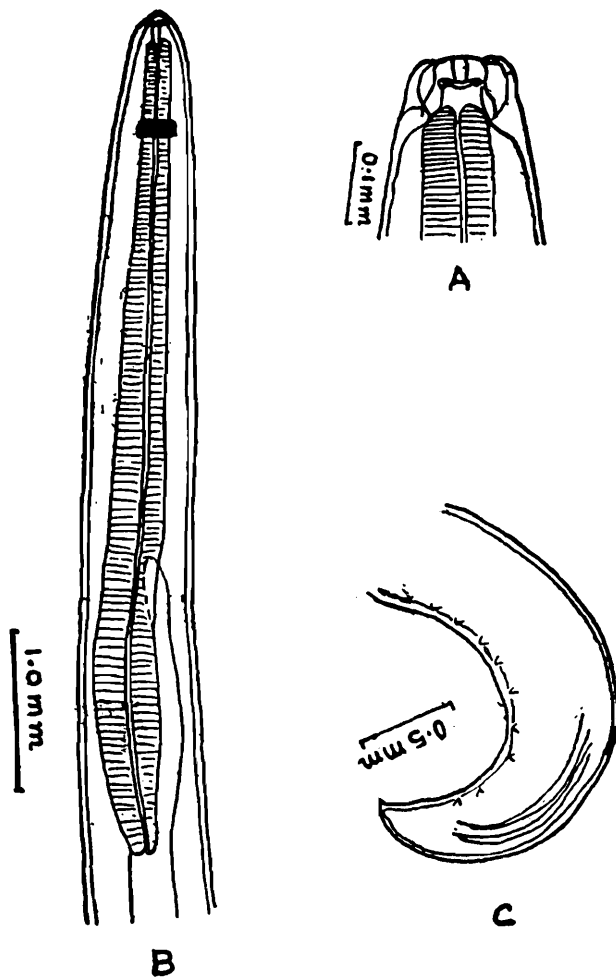


Fig. 132. *Angusticaecum tetrodoni*. (After Gupta and Gupta, 1979.) A. anterior end ; B. showing intestinal caecum ; C. male posterior end.

Female. Body 41.75-53.25 long, 0.51-0.7 wide ; head 0.155-0.185 in diameter ; oesophagus 3.75-7.5 long ; intestinal caecum 2.75-4.5 long ; nerve ring 0.45-0.75 and excretory pore 0.57-0.95, both from anterior end ; tail 0.25-0.477 long, blunt ; vulva pre-equatorial, 15.6-22.4 from anterior end.

Host : *Sphaeroides lunaris*

Location : Intestine

Locality : Quilon, Kerala

Remarks : Gupta and Gupta (1979) while describing their two new species, *Amplicaecum tetrodoni* and *A. singhi* from two marine fishes, reported the absence of interlabia, the presence of which is a key generic character. Hence, both their species are transferred under the genus *Angusticaecum* Baylis, 1920, differentiated mainly from the former genus due to lacking the above character. This genus which is a parasite of reptiles is now recorded for the first time from fishes, and has not so far been reported from the Indian subcontinent. However, it will not be unfruitful if re-examination of their specimens is made.

12. *Angusticaecum singhi* (Gupta and Gupta, 1979)

(Fig. 133 A-C)

1979. *Amplicaecum singhi* Gupta and Gupta, *Indian J. Helminth.*, **29** (1977), p. 108.

Description : Male. Body 35.5 long, 0.65 wide, cylindrical, tapering towards extremities ; head 0.15 in diameter ; mouth with 3 well-deve-

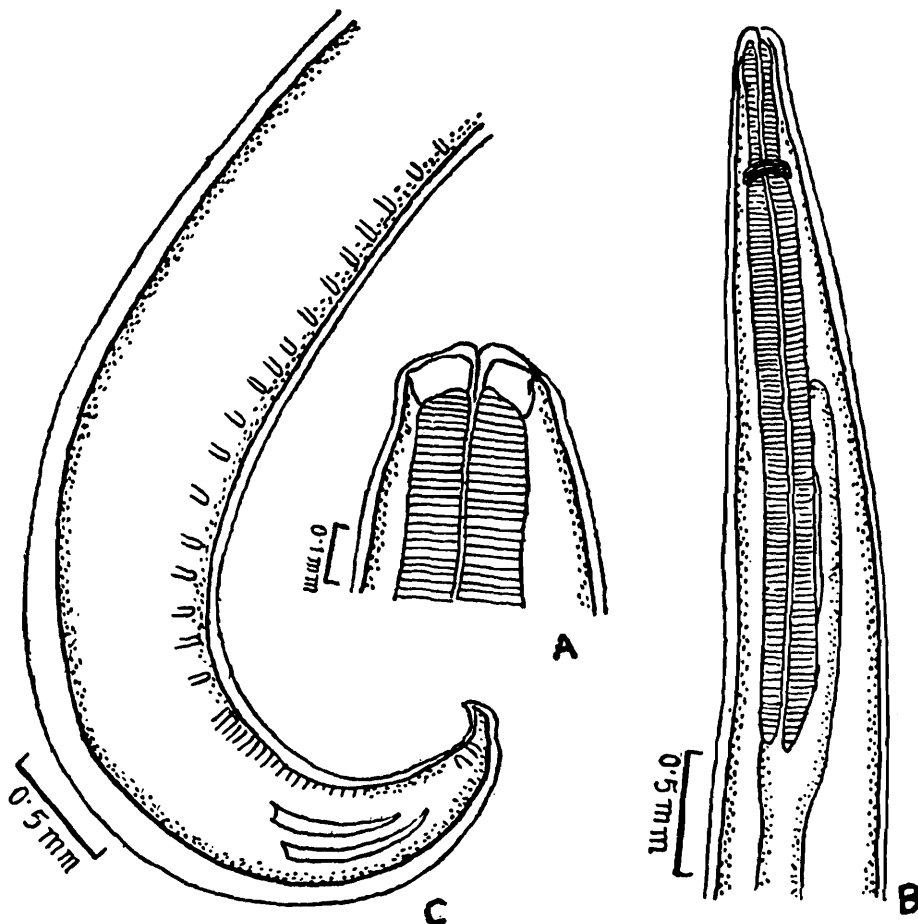


Fig. 133. *Angusticaecum singhi*. (After Gupta and Gupta, 1979.) A. anterior end ; B. showing intestinal caecum ; C. male posterior end,

loped rectangular lips, one dorsal, two subventral ; dorsal lip with two large papillae, ventrolateral each with large papilla ventrally and very small one laterally ; interlabia absent ; oesophagus 2.89 long, without ventriculus or bulb ; intestinal caecum 1.66 long ; nerve ring 0.53 and excretory pore 0.58, both from anterior end ; tail 0.12 long, without caudal alae ; spicules unequal, left 0.62 long, right 0.53 ; gubernaculum absent ; caudal papillae 50 pairs, 46 preanal, 4 postanal.

Host : *Trichiurus malabaricus*

Location : Intestine

Locality : Quilon, Kerala

Remarks : When more material is made available, it is likely that this species now based entirely on a single male only, may prove conspecific with the above controversial *A. tetrodoni*.

13. *Ophidascaris puriensis* Srivastava and Gupta, 1978

(Fig. 134, A & B)

1978. *Ophidascaris puriensis* Srivastava and Gupta, *Indian J. Helminth.*, 28 (1976), p. 148.

Description : Male. Body 15.0-18.8 long, 0.32-0.4 wide, cylindrical, finely striated, tapering towards extremities ; head 0.08-0.1 in dorso-ventral

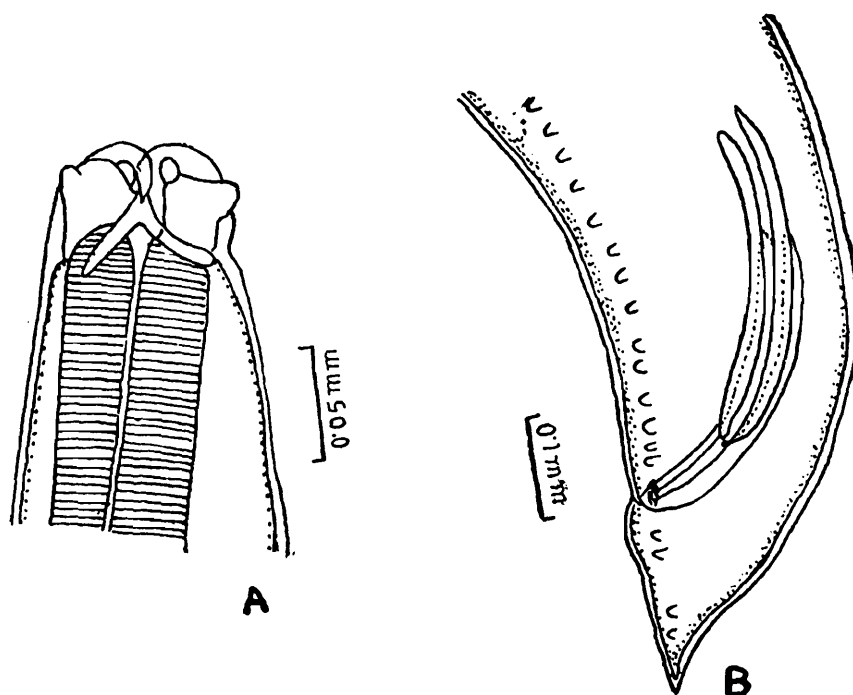


Fig. 134. *Ophidascaris puriensis*. (After Srivastava and Gupta, 1978.) A. anterior end ; B. male posterior end.

diameter ; cervical alae absent ; lips almost square, dorsal slightly larger than ventrolaterals ; dentigerous ridges present ; interlabia present ; oesophagus 1.3-1.7 long, club-shaped, without ventriculus ; nerve ring

0.252-0.47 and excretory pore 0.327-0.6, both from anterior end ; tail 0.17-0.22 long, conical ; spicules similar, alate, equal, 0.335-0.44 long ; gubernaculum absent ; caudal papillae sessile, 25-34 pairs, 15-27 preanal, 1 adanal, 6-9 postanal.

Female. Body 16.0-29.52 long, 0.3-0.4 wide ; head 0.07-0.125 in dorso-ventral diameter ; oesophagus 1.33-1.55 long ; nerve ring 0.36-0.51 and excretory pore 0.4-0.58, both from anterior end ; tail 0.2-0.6 long ; vulva pre-equatorial.

Host : *Trichiurus noticus*

Location : Intestine

Locality : Puri, Orissa

Remarks : The genus *Ophidascaris*, which is normally a reptilian and amphibian parasite, has been reported by Srivastava and Gupta (1978) for the first time from a fish *Trichiurus noticus*, from Bay of Bengal. Subsequently, another species *O. cameroni* was described by Gupta and Gupta (1979) from the same host and the same locality. Although, the latter authors have reported in their species *O. cameroni*, the absence of interlabia, a key generic character, their figure clearly shows this structure as well as interlabial grooves. Also, the exact location of vulva has not been given, only it has been shown to be post-equatorial under the discussion. Hence, re-examination of material is desirable, pending which both are treated as conspecific.

14. *Porrocaecum pentkotai* Srivastava and Gupta, 1978

1978. *Porrocaecum pentkotai* Srivastava and Gupta, *Indian J. Helminth.*, 28 (1976), p. 150.

Description : Male. Body 18.1 long, 0.2 wide, cylindrical, tapering towards extremities ; mouth surrounded by 3 lips, dorsal with two large papillae, sub-ventrals each with two small ones ; interlabia present ; head 0.11 in dorsoventral diameter ; oesophagus 2.66 long ; ventriculus 0.14. long ; intestinal caecum 1.96 long ; nerve ring 0.32 and excretory pore 0.44, both from anterior end ; tail 0.11 long ; spicules similar, alate, equal, 1.03 long ; gubernaculum absent ; caudal papillae 26 pairs, 20 preanal, 1 adanal, 5 postanal.

Host : *Trachinocephalus myops*

Location : Body cavity

Locality : Pentkota, Puri, Orissa

Remarks : The genus was established by Railliet and Henry (1912) for the reception of the species *Ascaris crassa* Deslongchamps, 1824,

from Domestic duck, *Anas bosches* [according to Yorke and Maplestone (1926)]. Though normally a parasite of birds, 3 inadequately described species, viz. *P. pentkotai*, *P. ruberum* and *P. trichiuri*, from India, Pakistan, and Bangladesh respectively, are reportedly known from fishes from this area. In fact, these species should have been placed under the genus *Terranova* Leiper and Atkison, 1914. But, the presence of interlabia merits their inclusion under *Porrocaecum*. It now becomes a debatable question whether the splitting of the genus *Porrocaecum* into *Porrocaecum* and *Terranova* is justified or not.

15. *Porrocaecum ruberum* Bilqees, Khanum and Jehan 1971

1971. *Porrocaecum ruberum* Bilqees et al., *J. Sci. Karachi*, **19** p. 181.

Description : Male. Body 14.0 long, 0.36 wide ; lips 3, with dentigerous ridges ; interlabia present ; oesophagus 0.08 long, with ventriculus ; tail 0.144 long, with a spine ; spicules almost equal, about 0.13 long ; caudal alae absent ; caudal papillae present.

Female. Body 17.8 long, 0.7 wide ; oesophagus 1.2 long ; ventriculus 0.1×0.13 ; tail 0.18 long ; vulva pre-equatorial, 1.62 from anterior end ; eggs 0.039×0.039 , rounded.

Host : *Otolithes ruber*

Location : Body cavity

Locality : Karachi coast (Pakistan)

16. *Porrocaecum trichiuri* Chandler, 1935

1935. *Porrocaecum trichiuri* Chandler, *Proc. U. S. natn. Mus.*, **83**, p. 145.

1969. *Porrocaecum trichiuri* : Khan and Yaseen, *Bull. Dep. Zool. Panjab Univ.*, article **4**, p. 25.

Description : Male. Body 4.42-7.56 long, 0.16-0.17 wide ; lips 3, with dentigerous ridges ; interlabia present ; oesophagus 0.80-0.90 long ; ventriculus $0.20-0.30 \times 0.06-0.08$, glandular ; intestinal caecum 0.62-0.63 long ; nerve ring 0.26 and excretory pore 0.42, both from anterior end ; tail 0.08 long ; spicules similar, equal, 0.08 long ; gubernaculum, caudal alae, and caudal papillae absent.

Female. Body 8.10-8.30 long, 0.19-0.24 wide ; lips 0.01 long, with dentigerous ridges ; interlabia present ; oesophagus 0.94-0.99 long ; ventriculus 0.08-0.09 long ; intestinal caecum 0.06-0.07 long ; tail 0.01 long ; vulva equatorial ; eggs very small, almost rounded.

Host : *Polynemus indicus*

Location : Body cavity

Locality : Khulna (Bangladesh)

Remarks : This species was originally described from juveniles from *Trichiurus lepturus* from Galveston Bay, Tex, by Chandler (1935) and

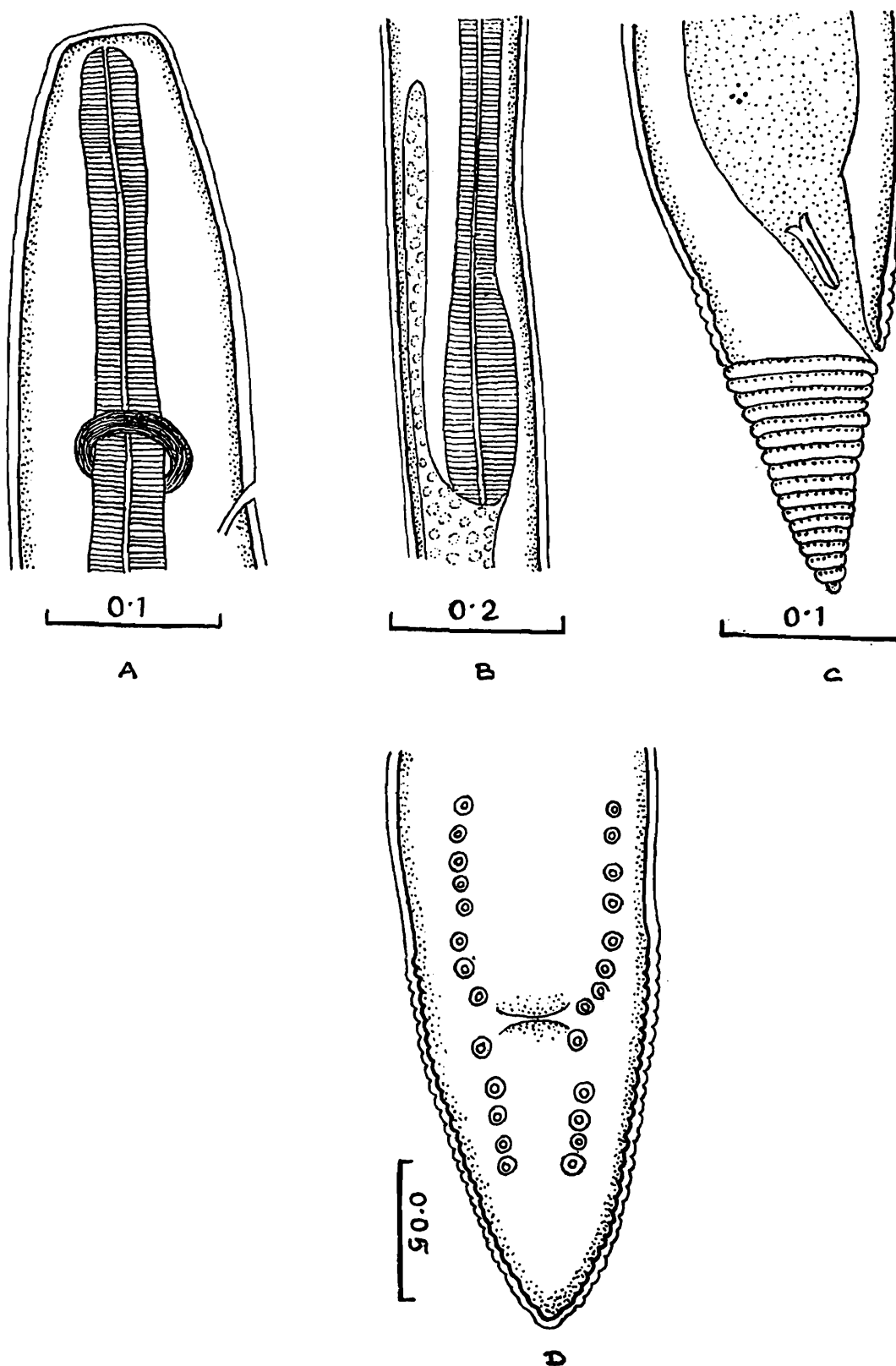


Fig. 135. *Dujardinascaris cybii*. (After Arya and Johnson, 1978.) A. anterior end ; B. showing intestinal caecum ; C. male posterior end showing spicules ; D. same showing papillae.

subsequently reported from *Polynemus indicus* from Bangladesh by Khan and Yaseen (1969). But, the latter author's figure shown as posterior end of adult male actually appears to be that of a juvenile female.

17. **Dujardinascaris cybii** Arya and Johnson, 1978

(Fig. 135, A-D)

1978. *Dujardinascaris cybii* Arya and Johnson, *Vest. csl. Spol. zool.*, **42** (2), p. 81.

Description : Male. Body 7.5-11.0 long, 0.08-0.27 wide, attenuated posteriorly ; cuticular striations well defined, 0.005-0.014 apart ; stoma 0.021-0.03 ; oesophagus 1.06-1.18 long, muscular, somewhat dilated posteriorly ; intestinal caecum 0.50-0.62 long ; nerve ring 0.26-0.28 and excretory pore 0.29-0.31, both from anterior end ; tail 0.14-0.17 long, tapering, with prominent striations giving ring-like appearance ; spicules slender, similar, equal, 0.05-0.10 long ; gubernaculum absent ; caudal papillae 13 pairs, 8 preanal, 5 postanal.

Female. Body 12.5-17.5 long, 0.33-0.53 wide, and as in male ; stoma 0.02-0.04 ; oesophagus 1.07-1.60 long, and also as in male ; intestinal caecum 0.12-0.22 long ; nerve ring 0.30-0.38 and excretory pore 0.40-0.50, both from anterior end ; vulva inconspicuous, flush, at about middle of body ; eggs 0.01-0.012 in diameter, spherical, thin-shelled.

Host : *Scomberomorus guttatus*

Location : Intestine

Locality : Fish market, Jodhpur, Rajasthan.

Remarks : The genus which normally occurs in crocodilians, was created by Baylis (1947) for the reception of the species *Dujardinia dujardini* Travassos, 1920, as the latter genus was preoccupied. Hitherto, from fishes from this area four species are known under it, of which in 3, gubernaculum has been reported absent, the presence of which is a key generic character, the 4th based on juvenile females only.

18. **Dujardinascaris magna** Khan and Begum, 1971

(Fig. 136. A-C)

1971. *Dujardinascaris magna* Khan and Begum, *Bull. Dep. Zool. Punjab Univ.*, article 5, p. 19.

1977. *Dujardinascaris magna* : Bilqees *et al.*, *Pakist. J. sci. ind. Res.*, **20** (1), p. 44.

Description : Male. Body 66.463-71.604 long, 1.727-2.031 wide ; lips 3, each 0.204 long, without dentigerous ridges but internally pro-

duced into tooth-like structure ; interlabia and interlabial grooves present ; oesophagus 4.107-4.175 long, without ventriculus but with small bulb 0.476-0.530 ; intestinal caecum 0.489-0.748 long ; nerve ring 1.088-1.156 from anterior end ; tail 0.503-0.598 long ; spicules alate,

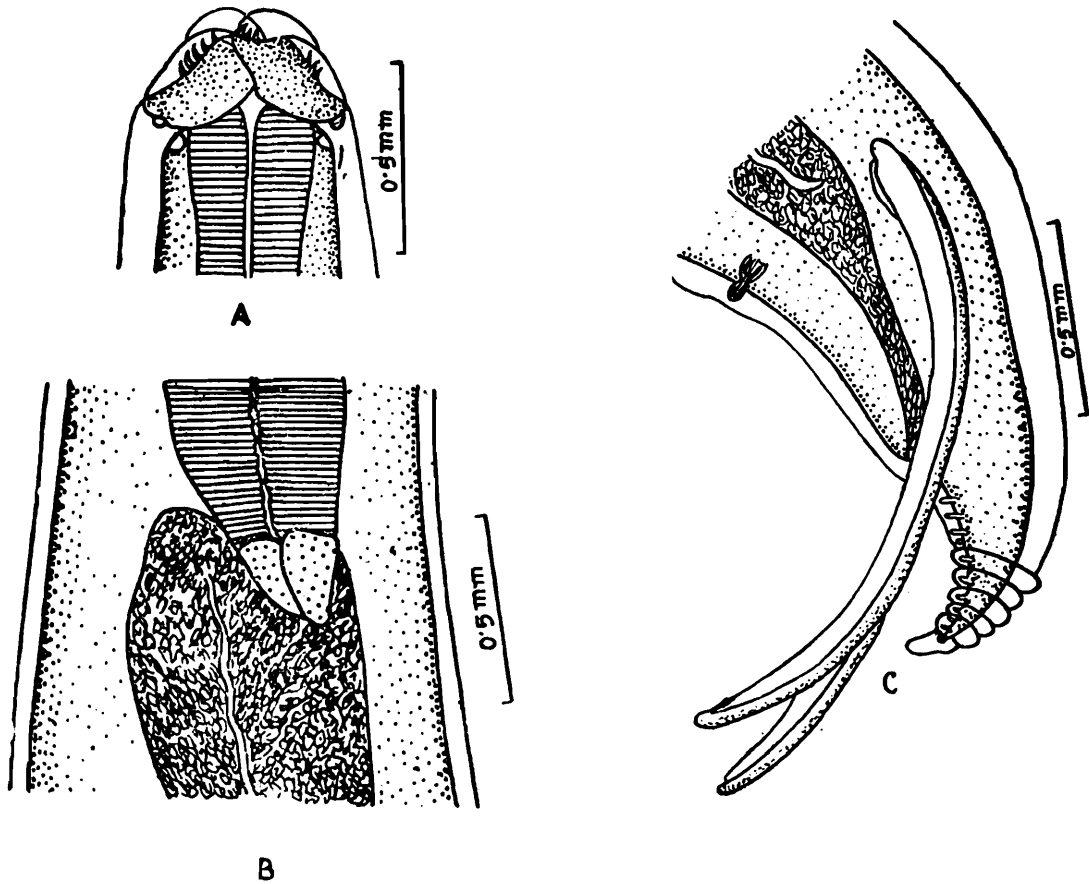


Fig. 136. *Dujardinascaris magna*. (After Khan and Begum, 1971.) A. anterior end ; B. oesophageal region ; C. male posterior end.

equal, 1.700-1.768 long ; gubernaculum absent ; caudal papillae conical, 30 pairs, 20 preanal, 10 postanal.

Host : *Johnius* sp.

Location : Stomach

Locality : Karachi coast (Pakistan)

Remarks : *vide supra*

19. *Dujardinascaris qadrii* Zubairi and Farooq, 1976

(Fig. 137, A & B)

1976. *Dujardinascaris qadrii* Zubairi and Farooq, *Pakist. J. Zool.*, 8 (1), p. 73.

1977. *Dujardinascaris sciaenae*, Bilqees *et al.*, *Pakist. J. sci. ind. Res.*, 20 (1), p. 44.

Description : Male. Body 9.5-22.74 long, 0.25-0.51 wide ; lips 3, each 0.088-0.128 long ; without dentigerous ridges but produced internally into tooth-like structures ; interlabia and interlabial grooves present ; cephalic alae 0.012×0.028 ; oesophagus 3.055-3.300 long, bulb

0.060-0.14 ; intestinal caecum 0.288-0.4 long ; nerve ring 0.160-0.266, and excretory pore 0.525, both from anterior end ; spicules equal or subequal, 5.2-5.3 and 5.4-5.52 long ; gubernaculum absent ; tail 0.120-0.166 long, ending in pointed tip or spike ; caudal alae present ; caudal papillae 23 pairs, pedunculate 12, sessile 11, of which 19 preanal, 1 adanal, 3 postanal.

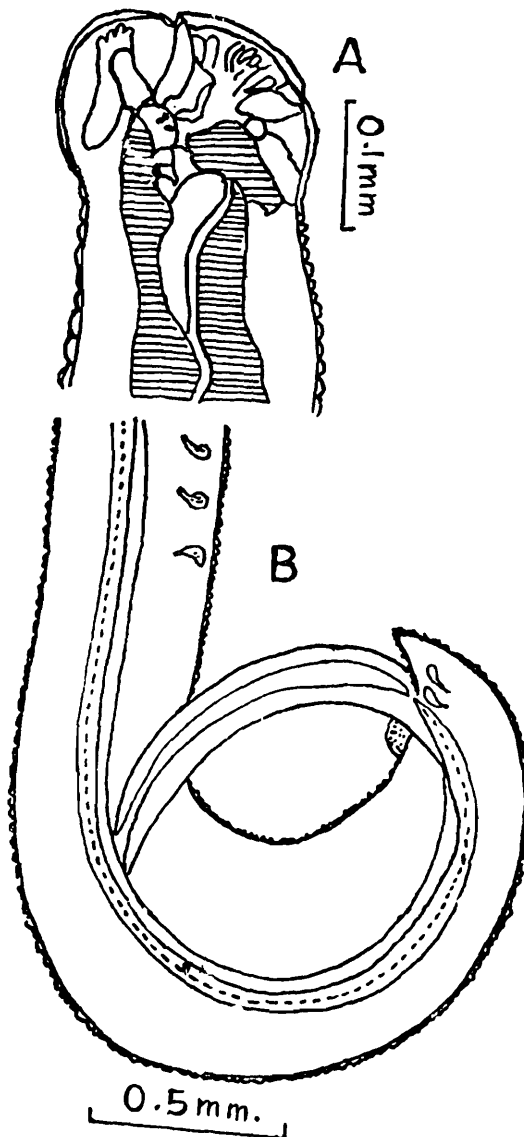


Fig. 137. *Dujardinascaris qadrii*. (After Zubairi and Farooq, 1976.) A. anterior end ; B. male posterior end.

Female. Body 11.4-27.2 long, 0.144-0.35 wide ; lips and interlabia as in male ; oesophagus 1.909-3.648 long, bulb 0.180-0.216 ; intestinal caecum 0.349-0.450 long ; nerve ring 0.252-0.382 from anterior end ; tail 0.330-0.349 long, pointed ; vulva pre-equatorial, 8.9-10.0 from anterior end ; eggs $0.024-0.055 \times 0.03-0.04$, rounded.

Hosts : *Protonibea diacanthus* ; *Protonibea* sp.

Location : Intestine

Locality : Karachi (Pakistan)

Remarks : This species was first described by Zubairi and Farooq (1976) from *Protonibea* sp. from Karachi coast (Pakistan). Bilqees *et al.* (1977) described as new *D. sciaenae* from the same locality and from the same generic host, viz. *Protonibea diacanthus* and it agrees with *D. qadrii* in practically most of the characters excepting in body size and in number of caudal papillae which being given as 23 pairs, pedunculate 12, sessile 11 (versus 14 pairs total, 11 + 1 + 2, given for *qadrii*). These differences are treated as individual variations and accordingly *D. sciaenae* is considered as conspecific with *D. qadrii*.

20. *Dujardinascaris ritai* Zaidi and Khan, 1975

1975. *Dujardinascaris ritai* Zaidi and Khan, *Pakist. J. Zool.*, **7** (1), p. 51.

1977. *Dujardinascaris ritai* : Bilqees *et al.*, *Pakist. J. sci. ind. Res.*, **20** (1), p. 44.

Description : Female. Body 23.200-33.350 long, 0.720-0.899 wide ; lips three, prominent, without dentigerous ridges but with cuticle produced internally into tooth-like structures, 0.064-0.069 long, 0.038-0.043 wide ; interlabia present ; oesophagus excluding bulb 2.058-2.600 long ; oesophageal bulb 0.138-0.148 $\times$ 0.128-0.138 ; intestinal caecum 1.625-1.773 long ; nerve ring 0.315-0.344 from anterior end ; tail bluntly pointed, 0.197-0.246 long ; vulva pre-equatorial, 1.908-2.013 from anterior end.

Host : *Rita rita*

Location : Intestine

Locality : Lahore (Pakistan)

Remarks : This species is based on juvenile females only.

21. *Paracamallanus ophiocephali* Karve, 1941

1941. *Paracamallanus ophiocephali* Karve, *J. Univ. Bombay*, **10** (3), p. 40.

Description : Female. Body 9.6-11.55 long, 0.3-0.34 wide ; head with 3 pairs of papillae ; buccal valves two, each with 9-11 longitudinal ridges, each having 2-3 tubercles ; valves including buccal cavity or "pharynx" 0.14-0.16 long and wide ; basal ring 0.1-0.13 in diameter ; tridents with unequal arms, middle longer 0.105 long ; oesophagus divided into two parts, anterior muscular 0.4-0.45 long, posterior glandular 0.78-0.95 ; cervical papillae 0.24, nerve ring and excretory pore 0.27, all from anterior end ; tail 0.095-0.11 long, finger-shaped, with rounded and blunt tip having pair of papillae ; vulva pre-equatorial, 6.6 from posterior end (in the largest specimen).

Host : *Channa gachua*

Location : Intestine

Locality : ?

Remarks : Karve (1941) described this species based only on females collected from a fish, *Channa gachua*. Yeh (1960) treated it as conspecific with *Zeylanema sweeti*, which was questioned by Petter (1979) later, who also opined that it may prove the earlier species *Paracamallanus ophiophali* (Pearse, 1933).

22. *Paracamallanus theraponis* Kalyankar, 1971

(Fig. 138, A & B)

1971. *Paracamallanus theraponis* Kalyankar, *Marathwada Univ. J.*, 10, Sci. 3, p. 92.

Description : Male. Body 9.81 long, 0.26 wide ; buccal capsule divided into two distinct parts by septum, and with smooth longitudinal ribs of irregular length ; buccal valves, tridents, and also large chitinous

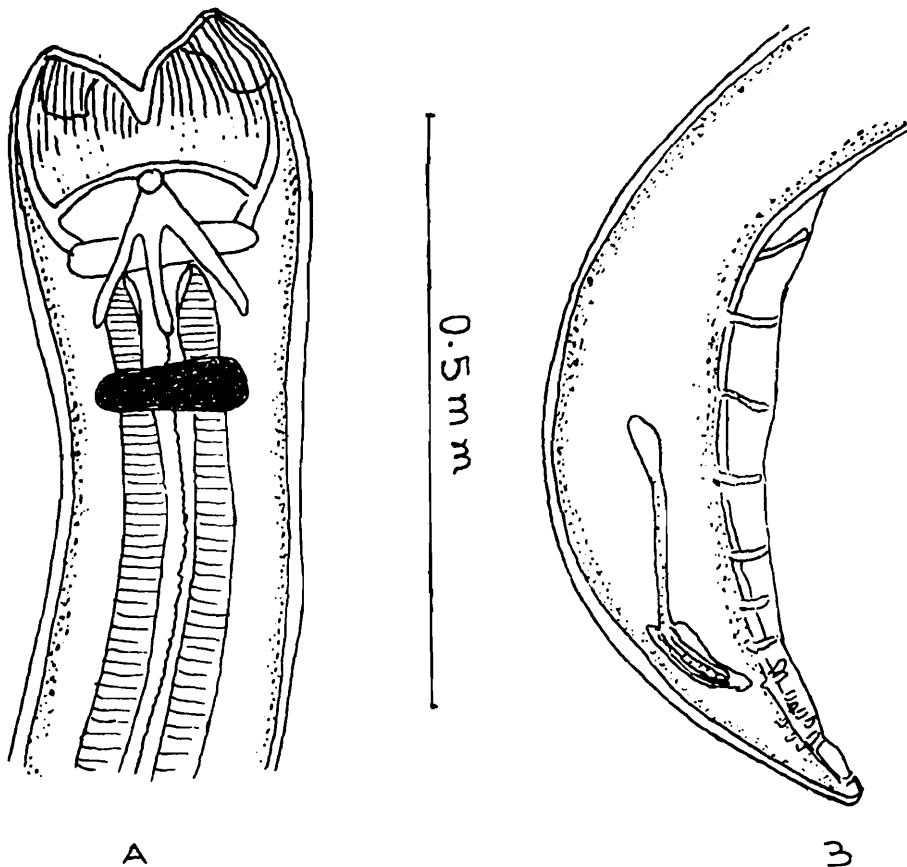


Fig. 138. *Paracamallanus theraponis*. (After Kalyankar, 1971.) A. anterior end ; B. male posterior end.

buccal cavity present ; oesophagus divided into two parts, anterior muscular 0.92 long, posterior glandular 0.82 ; nerve ring 0.20, and cervical papillae 0.42, both from anterior end ; tail 0.093 long, with caudal alae ; spicule single, 1.16 long ; gubernaculum 0.62 long, caudal papillae pedunculate, 13 pairs, 7 preanal, 2 adanal, 4 postanal.

Female. Body 9.91 long, 0.28 wide ; anterior end as in male ; oesophagus, anterior muscular 1.43 long, posterior glandular 1.14 ; nerve ring

0.22 and cervical papillae 0.45, both from anterior end ; tail 0.173 long ; vulva post-equatorial, 6.35 from anterior end ; eggs 0.005 in diameter.

Host : *Therapon jarbua*

Location : Intestine

Locality : Vizag, Andhra Pradesh

Remarks : Kalyankar (1971) while describing his above species as *Paracamallanus theraponis* reported the buccal capsule as divided into two distinct parts by septum, which the figure shows it as a chitinoid basal ring, a fact first observed by Petter (1979) who accordingly questioned its reference to the genus *Paracamallanus*, though earlier (1978) accepted by her.

23. *Neocamallanus ophiocephali* Rehana and Bilqees, 1972

1972. *Neocamallanus ophiocephali* Rehana and Bilqees, *Agricultural Research Council Government of Pakistan*, p. 92.

1980. *Neocamallanus ophiocephali* : Agrawal and Misra, *Indian J. Helminth.*, **30** (1978), p. 124.

1980. *Neocamallanus ophiocephali* : Sharma and Sharma, *J. Helminth.*, **54** (1), p. 23.

1980. *Neocamallanus ophiocephali* : Naidu and Thakare, *Indian J. Anim. Sci.*, **50** (7), p. 599.

Description : Male. Body 5.18-6.69 long, 0.133-0.179 wide ; buccal capsule $0.064-0.072 \times 0.067-0.072$; oesophagus divided into two parts, anterior muscular 0.186-0.261 long, posterior glandular 0.549-0.679 ; nerve ring 0.161-0.181 from anterior end ; tail 0.142-0.196 long, with caudal alae ; spicules unequal, 0.72-0.92 long ; caudal papillae 7-8 pairs, 3-4 preanal, 1 adanal, 3 postanal.

Female : Body 5.20-14.75 long, 0.143-0.286 wide ; buccal capsule $0.068-0.072 \times 0.0667-0.072$; oesophagus, anterior muscular 0.284-0.393 long, posterior glandular 0.602-0.857 ; nerve ring 0.188-0.199 from anterior end ; tail 0.348-0.465 ; vulva 2.484-6.19 from anterior end ; eggs $0.020-0.025 \times 0.010-0.015$.

Hosts : *Channa striatus* ; *Wallago attu*

Location : Intestine & stomach

Locality : Kalri Lake, Sind (Pakistan)

Remarks : As the description of the species was not available to Petter (1978), she was not able to relegate it to any genera merely suggesting that it be placed under *Paracamallanus*. But, subsequently she (1979) was not only unable to place it under *Paracamallanus* or *Camallanus* on the basis of posterior buccal cavity shown in the figure, but even remarked that the name *N. ophiocephali* has been pre-occupied.

24. *Camallanides kumaoni* Arya, 1980

(Fig. 139, A & B)

1980. *Camallanides kumaoni* Arya, *Revta bras. Biol.*, 40 (3), p. 463.

Description : Male. Body 4.0 long, 0.12 wide ; cuticular striations 0.005-0.008 apart ; head 0.058 wide, with six cephalic papillae, 4 sub-median, 2 lateral ; buccal capsule cup-shaped, without dorsal and ventral chitinoid bodies, 0.032×0.05 , and with 18 longitudinal ridges ; chitinous ring 0.006 wide ; rods 2, backwardly projecting, 0.02 long ;

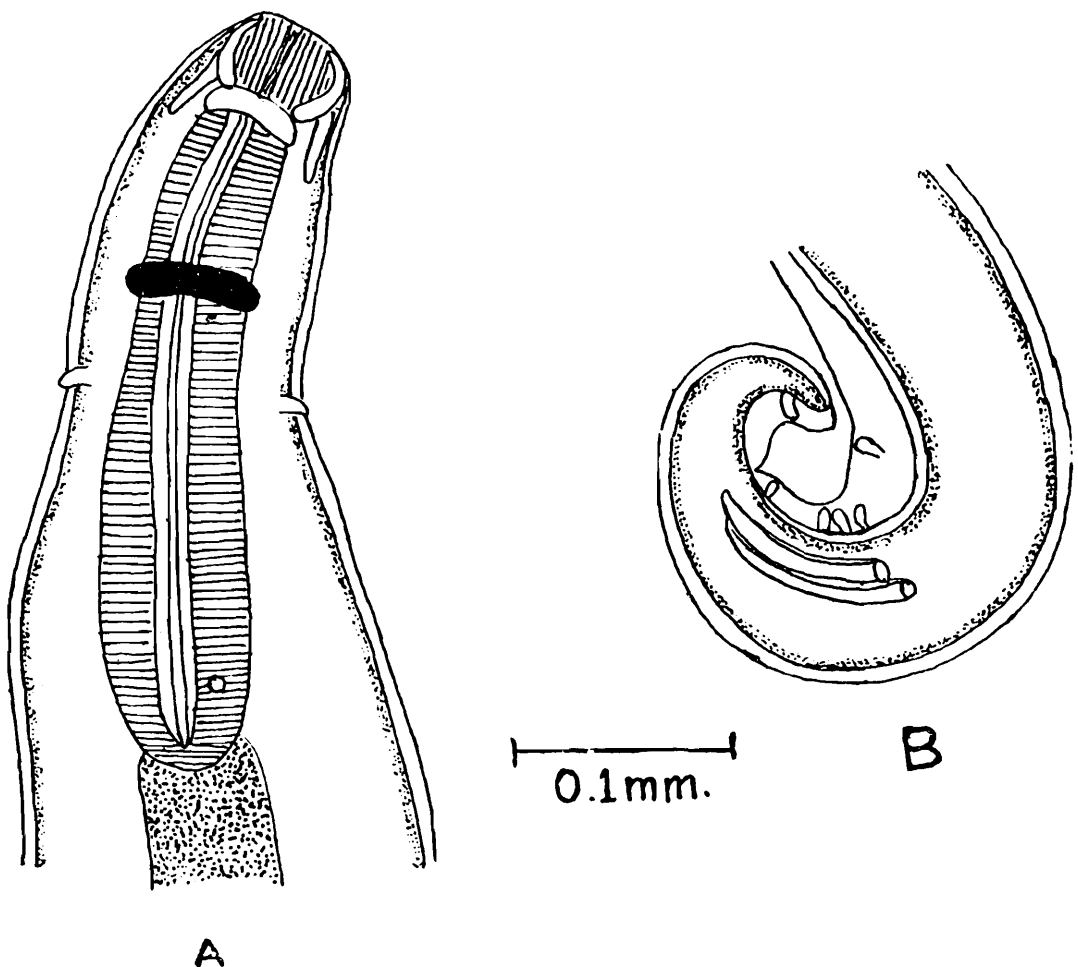


Fig. 139. *Camallanides kumaoni*. (After Arya, 1980.) A. anterior end ; B. male posterior end.

oesophagus divided into two parts, anterior muscular, 0.20 long, posterior glandular 0.46 ; oesophago-intestinal valve present ; nerve ring 0.14, cervical papillae 0.153, and excretory pore 0.26, all from anterior end ; tail 0.08 long, with caudal alae 0.21×0.03 ; spicules two, chitinized, subequal, left 0.08 long, right 0.09 ; gubernaculum absent ; caudal papillae pedunculate, 6 pairs, 5 preanal, 1 postanal.

Female. Body 7.0-8.0 long, 0.170-0.172 wide ; cuticular striations 0.008-0.01 apart ; head 0.06-0.08 wide, and as in male ; buccal capsule also as in male, $0.035-0.042 \times 0.05-0.06$; chitinous ring 0.007-0.008 wide ;

rods 0.03-0.04 long ; oesophagus, anterior muscular 0.21-0.23 long, posterior glandular 0.65-0.66 ; nerve ring 0.125-0.140, cervical papillae 0.142-0.157, and excretory pore 0.31-0.34, all from anterior end ; tail 0.23-0.32 long, tapering, with blunt tip ; vulva conspicuous, 2.62-2.77 from anterior end ; eggs somewhat spherical, $0.014-0.02 \times 0.015-0.021$; larvae 0.16-0.25 long.

Host : *Barilius vagra*

Location : Intestine

Locality : Nainital, U. P.

Remarks : This species is based on a male and two females. The genus has hitherto been known only as a parasite of snakes. Hence, its record from a fish is questionable especially as the earlier Indian record of *C. hemidenta* Majumdar, 1965, was found on re-examination of type material to be actually *Paracamallanus singhi* (Ali, 1957) Campana-Rouget, 1961 (*vide* remarked under the species).

25. *Comephoronema johnsoni* Arya, 1979

(Fig. 140, A-C)

1979. *Comephoronema johnsoni* Arya, *Indian J. Helminth.*, 30 (1978), p. 17.

Description : Female. Body 77.5-77.7 long, 0.34-0.4 wide, without cuticular striations but with spine-like projections spirally ; cervical alae and cervical papillae absent ; mouth with 4 lips, both lateral promi-

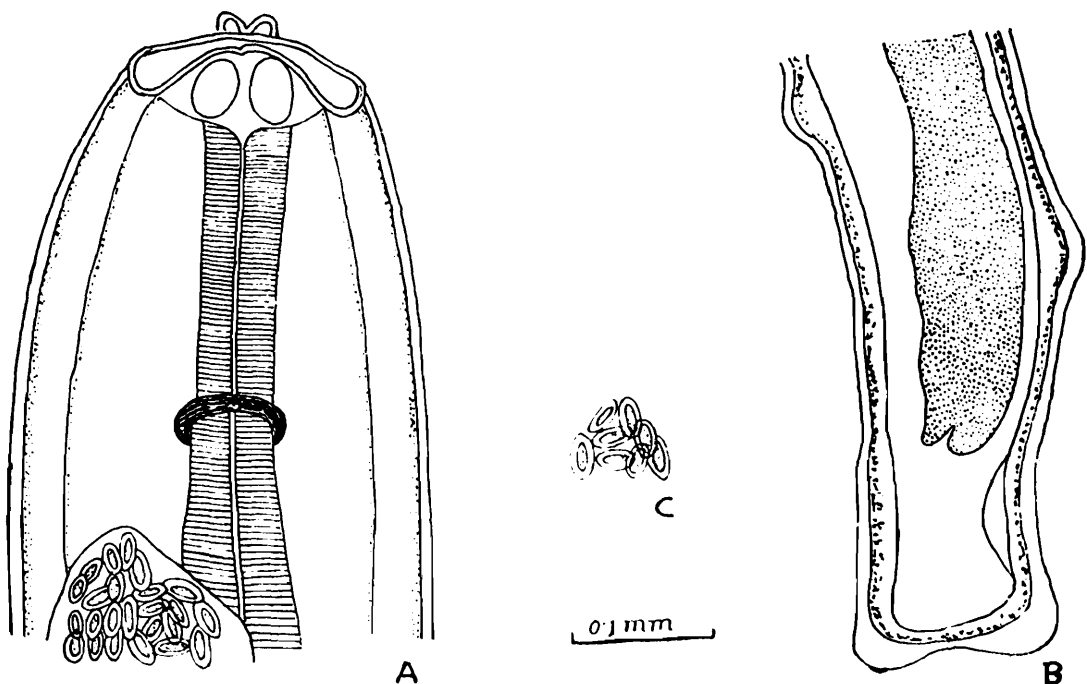


Fig. 140. *Comephoronema johnsoni*. (After Arya, 1979.) A. anterior end ; B. female posterior end ; C. eggs.

nent, median rudimentary, with two pairs of cephalic papillae ; teeth two pairs, each 0.021-0.03 wide ; buccal capsule 0.07-0.08 $\times$ 0.048-0.11, conical ; oesophagus divided into two parts, anterior muscular 2.1-2.2 $\times$ 0.07-0.08, posterior glandular 3.5-3.7 $\times$ 0.10-0.11 ; nerve ring 0.20-0.24, and excretory pore 0.24-0.30, both from anterior end ; tail 0.16-0.21 long, flat, fan-shaped, and with caudal alae ; vulva flush, about equatorial ; eggs 0.03-0.05 $\times$ 0.015-0.017, elliptical, thin-shelled, unembryonated, and without polar filament but with pointed tips.

Hosts : *Scomberomorus guttatus*

Location : Intestine

Locality : Fish market, Jodhpur, Rajasthan

Remarks : Arya (1979) on the basis of two females from a fish, *Scomberomorus* [= *Cybium*] *guttatus* from Jodhpur, Rajasthan, described his species *Comephoronema johnsoni*. However, the genus has since been synonymised with *Cystidicola* Fisher, 1798, by Chabaud (1975). Further, the species itself has been very inadequately described.

26. *Cyrnea* (*Procyrnea*) *chabaudi* Rasheed, 1965

(Fig. 141, A-C)

1965. *Cyrnea* (*Procyrnea*) *chabaudi* Rasheed, *J. Helminth.*, 39 (4), p. 343.

Description : Male. Body 11.0-13.0 long, 0.25 wide ; head of two large, lateral, somewhat trilobed lips concave anteriorly, each with 3 small teeth on inner side and near base large lateral amphid, along with three rounded structures ; head also having dorsal and ventral lobe or 'pseudolip' anteriorly convex, with pair of large and small submedian papillae, and rod-like cuticular median thickening ; submedian papillae, according to Rasheed, on dorsal and ventral lobes instead of "at the base of the lateral lips" as reported earlier ; mouth leading into vestibule 55-59 μ long (excluding lips) ; oesophagus divided into two parts, anterior muscular 0.31-0.39 long, posterior glandular 2.8-3.2 ; nerve ring 0.25-0.27, cervical papillae 0.2-0.29 and excretory pore 0.3-0.37, all from anterior end ; ala single, lateral, 0.18-0.29 from head to 2.3-3.0 behind glandular portion of oesophagus ; tail thick, with wide caudal alae having scale-like thickenings ventrally and distinct wavy cuticular markings dorsally ; spicules tapering, unequal, right 0.48-0.54 long, left 1.4-1.55 ; gubernaculum brown, heavily cuticularized, 79 μ $\times$ 63 μ ; caudal papillae pedunculate, 6 pairs, 4 preanal in two groups of 2 pairs each, 2 postanal, sessile, 5 pairs near tip of tail.

Female. Body 15.0-17.0 long, 0.26-0.33 wide ; anterior end as in male ; vestibule (excluding lips) 68-74 μ long ; oesophagus, anterior

muscular 0.36-0.4 long, posterior glandular, 3.2-3.8 ; nerve ring 0.27-0.29, cervical papillae 0.2-0.29, and excretory pore 0.31-0.38, all from anterior end ; lateral ala ending 1.5 in front of vulva ; tail 0.15-0.17 long, tapering ; vulva slightly pre-equatorial, 7.0-7.9 from anterior end ; eggs $42-45\mu \times 20-23\mu$.

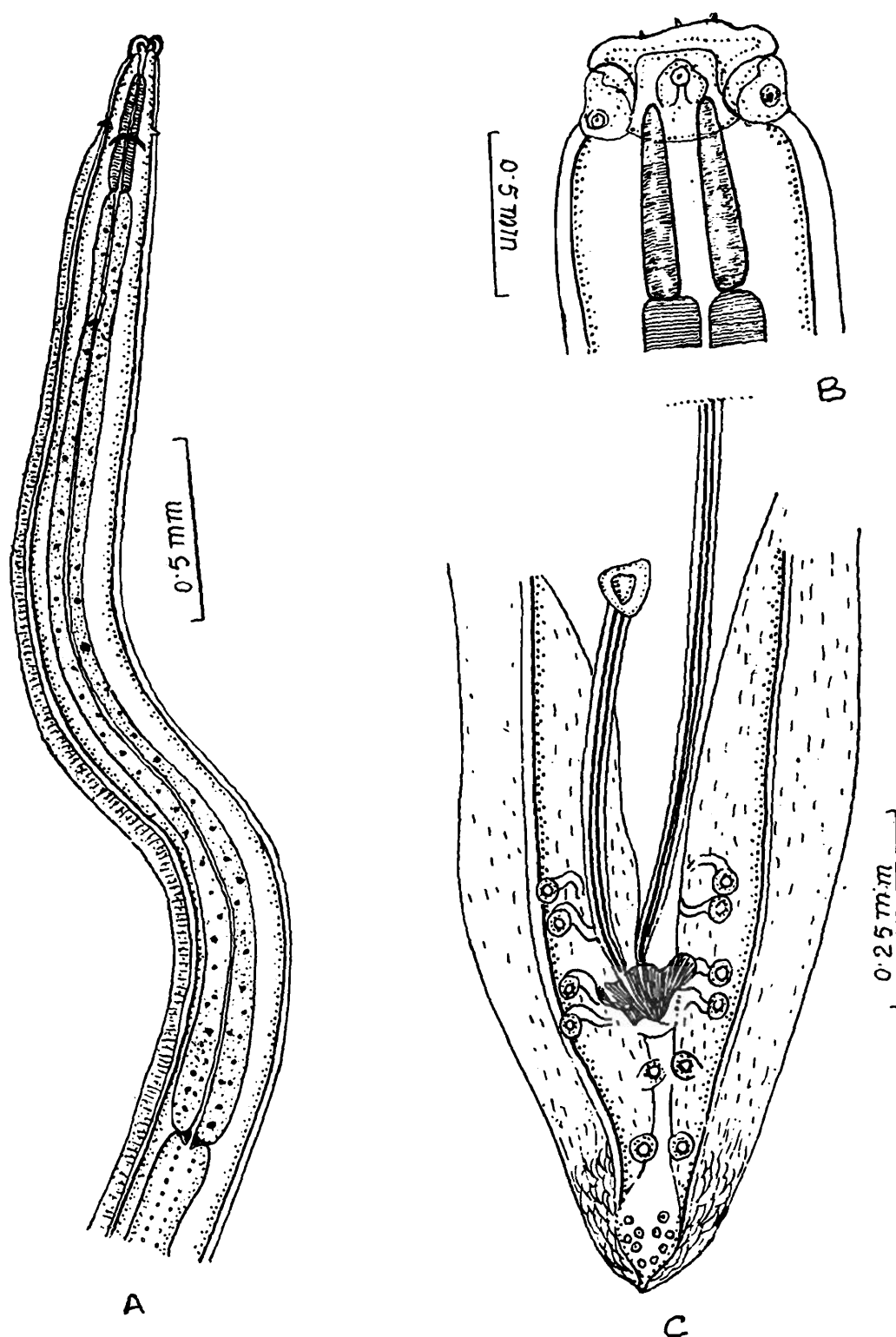


Fig. 141. *Cyrnea (Procyrnea) chabaudi*. (After Rasheed, 1965.) A. anterior end ; B. same ; C. male posterior end.

Host : *Pampus* sp.

Location : Stomach

Locality : Karachi (Pakistan)

Remarks : This genus was only known from birds until Rasheed (1965) recorded it from a marine fish from Karachi (Pakistan). However, the genus needs fuller confirmation.

27. *Neospinitectus ophiocephali* Kalyankar, 1971

1971. *Neospinitectus ophiocephali* Kalyankar, *Acta parasit. pol.*, **19** (2), p. 247.

1980. *Neospinitectus ophiocephali* : Ali, *Acta parasit. pol.*, **27** (43), p. 387.

Description : Male. Body 1.26 long, 0.3 wide, with one simple cuticular ring without spines and 12-13 other complete such with spines which latter very distinct anteriorly ; between simple ring and first of complete ones with spines annulations and three pairs of anteriorly directed spines ; lips two ; vestibule 0.03 long, funnel-shaped ; oesophagus divided into two parts, muscular and glandular, 0.34 long ; nerve ring 0.05 from anterior end ; tail 0.044 long, ventrally curved and with well developed caudal alae ; spicules dissimilar, unequal, 0.24 and 0.059 long ; caudal papillae 8 pairs pedunculate, 5 preanal, 2 adanal, 1 postanal, sessile 3, postanal.

Host : *Channa punctatus*

Location : Wall of oesophagus

Locality : Aurangabad, Maharashtra

Remarks : The difficulty regarding the systematic position of the genus *Neospinitectus* has already been referred to. The same difficulty also arises for the species.

28. *Rhabdochona magna* Khan and Yaseen, 1969

1969. *Rhabdochona magna* Khan and Yaseen, *Bull. Dep. Zool. Panjab Univ.*, article 4, p. 22.

1975. *Rhabdochona magna* : Zaidi and Khan, *Pakist. J. Zool.*, **7** (1), p. 66.

Description : Female. Body 20.79-23.82 long, 0.20 wide ; lips 2, inconspicuous ; buccal capsule funnel-shaped 0.12×0.02 , with longitudinal rib-like thickenings protruding anteriorly as 3 small teeth ; oesophagus divided into two parts, anterior muscular 0.48 long, posterior glandular 4.86 ; tail 0.21 long ; vulva equatorial, 12.19 from anterior end ; eggs without polar filaments, $0.026 \times 0.011-0.014$.

Host : *Rita rita*

Location : Intestine

Locality : Chandpur (Bangladesh)

Remarks : Due to its inadequate description, it has already been treated as *species inquirendae* by Moravec (1975), which is upheld here.

HOST—PARASITE LIST

Host	Parasite
Order I. Lamniformes	
Family Carcharhinidae	
<i>Carcharhinus giganticus</i>	<i>Proleptus australis</i> Baylis, 1933
<i>Galeocerdo tigrinum</i>	<i>Proleptus australis</i> Baylis, 1933
	<i>Terranova galeocerdonis</i> (Thwaite, 1927)
	Johnston and Mawson, 1945
<i>Myrmillo manazo</i>	<i>Neogoezia alaetocephala</i> Bilqees and
	Khanum, 1972
	<i>N. aspinosa</i> Bilqees and Khanum, 1972
	<i>N. karachiensis</i> Bilqees and Khanum,
	1972
	<i>N. manazi</i> Bilqees and Khanum, 1972
	<i>N. mangra</i> Bilqees and Khanum, 1972
	<i>N. multipapilla</i> Bilqees and Khanum,
	1972
	<i>N. spirocaudata</i> Bilqees and Khanum,
	1972
<i>Scoliodon sorrakowah</i>	<i>Dichelyne (Neocucullanellus) yamagutii</i>
	(Kalyankar, 1971) Petter, 1974
Family Orectolobidae	
<i>Chiloscyllium indicum</i>	<i>Falcaustra chiloscyllii</i> (Thwaite, 1927)
<i>Scyllium canicula</i>	<i>Proleptus obtusus</i> Dujardin, 1845
Family Pristidae	
<i>Pristis perrotteti</i>	<i>Terranova pristis</i> (Baylis and Daubney,
	1922) Johnston and Mawson, 1945
<i>Pristis</i> sp.	<i>Camallanus kirandensis</i> Baylis, 1928
Family Sphyrnidae	
<i>Sphyrna blochii</i>	<i>Raphidascaroides blochii</i> Bilqees and
	Khanum, 1974
Family Squalidae	
<i>Acanthias vulgaris</i>	<i>Proleptus obtusus</i> Dujardin, 1845

Host	Parasite
Order II. Rajiformes	
Family Dasyatidae	
<i>Dasyatis brucco</i>	<i>Echinocephalus uncinatus</i> Molin, 1858
<i>Dasyatis pastinaca</i>	<i>Echinocephalus uncinatus</i> Molin, 1858
	<i>Paranisakis pastinacae</i> (Rud., 1819)
	Baylis, 1936
<i>Dasyatis sephen</i>	<i>Aliascaris indica</i> Kalyankar, 1971
	<i>Echinocephalus uncinatus</i> Molin, 1858
<i>Dasyatis walga</i>	<i>Echinocephalus uncinatus</i> Molin, 1858
<i>Taeniura malanospiros</i>	<i>Paraniskis pastinacae</i> (Rud., 1819)
	Baylis, 1936
<i>Taeniura</i> sp.	<i>Paranisakis pastinacae</i> (Rud., 1819)
	Baylis, 1936
<i>Urogymnus asperimus</i>	<i>Echinocephalus multidentatus</i> Baylis and Lane, 1920
	<i>E. southwelli</i> Baylis and Lane, 1920
	<i>E. uncinatus</i> Molin, 1858
Family Mobulidae	
<i>Mobula diabolus</i>	<i>Echinocephalus mobulae</i> Kalyankar, 1971
Family Myliobatidae	
<i>Aetobatus flagellum</i>	<i>Echinocephalus uncinatus</i> Molin, 1858
	<i>Proleptus obtusus</i> Dujardin, 1845
Family Rajidae	
<i>Raja radiata</i>	<i>Hysterothylacium plagiostomorum</i> (v. Linstow, 1905)
Order III. Clupeiformes	
Family Clupeidae	
<i>Anodontostoma chacunda</i>	<i>Lappetascaris lutjani</i> Rasheed, 1965
<i>Clupea</i> sp.	<i>Raphidascaris ? acus</i> (Bloch, 1779)
	Railliet and Henry, 1915
<i>Ilisha filigera</i>	<i>Lappetascaris lutjani</i> Rasheed, 1965
<i>Ilisha ilisha</i>	<i>Lappetascaris lutjani</i> Rasheed, 1965
<i>Ilisha</i> sp.	<i>Cucullanus theaponi</i> Rasheed, 1968
<i>Pellona ditchella</i>	<i>Spirocamallanus ditchelli</i> Gupta and Garg, 1977
Family Engraulidae	
<i>Stolephorus indicus</i>	<i>Cucullanus karachii</i> (Zaidi and Khan, 1975)

Host	Parasite
<i>Thrissocles</i> sp.	<i>Echinocephalus uncinatus</i> Molin, 1858
<i>Thryssa hamiltonii</i>	<i>Goezia ascaroides</i> (Goeze, 1782) Railliet and Henry, 1915
Family Chirocentridae	
<i>Chirocentrus dorab</i>	<i>Cucullanus dorabi</i> (Ashraf, Khanum and Farooq, 1977)
Order IV. Osteoglossiformes	
Family Notopteridae	
<i>Notopterus chitala</i>	<i>Goezia chitali</i> Zaidi and Khan, 1975 <i>G. taunsai</i> Zaidi and Khan, 1975 <i>Pseudoproleptus vestibulus</i> Khera, 1955 <i>Spinitectus minor</i> (Stewart, 1914) Baylis, 1939
<i>Notopterus notopterus</i>	<i>Paragendria macronis</i> (Stewart, 1914) Baylis, 1939 <i>Pseudoproleptus notopteri</i> (Karve and Naik, 1951) Margolis, 1975 <i>P. vestibulus</i> Khera, 1955 <i>Spinitectus indicus</i> Verma and Agarwal, 1932 <i>S. minor</i> (Stewart, 1914) Baylis, 1939 <i>S. notopteri</i> Karve and Naik, 1951 <i>Spirocamallanus gubernaculus</i> (Khera, 1955) <i>S. singhi</i> (Ali, 1957)
Order V. Salmoniformes	
Family Harpadontidae	
<i>Harpadon nehereus</i>	<i>Alibagascaris pseudosciaenae</i> Kalyan- kar, 1970
Family Salmonidae	
<i>Salmo</i> sp.	<i>Camallanus salmonae</i> Chakravarty, 1942
Family Synodidae	
<i>Trachinocephalus myops</i>	<i>Camallanus trichiuris</i> Bashirullah and Rahman, 1972 <i>Porrocaecum pentkotai</i> Srivastava and Gupta, 1978 <i>Syphacia myopsi</i> Srivastava and Gupta, 1975

Host	Parasite
Order VI. Cypriniformes	
Family Cobitidae	
<i>Noemacheilus kashmirensis</i>	<i>Camallanus fotedari</i> Raina and Dhar, 1972 <i>Rhabdochona</i> (<i>Rhabdochona</i>) <i>hellichi</i> (Sramek, 1901) Chitwood, 1933
<i>Noemacheilus rupicola</i> var. <i>inglisi</i>	<i>Rhabdochona</i> (<i>Globochona</i>) <i>minima</i> Moravec and Daniel, 1976
Family Cyprinidae	
<i>Barilius bendelisis</i>	<i>Rhabdochona</i> (<i>Globochona</i>) <i>bariliusi</i> Soota and Dey Sarkar, 1981
<i>Barilius vagra</i>	<i>Camallanides kumaoni</i> Arya, 1980 <i>Onchocamallanus globoconchus</i> (Ali, 1960) Petter, 1979 <i>Paragendria vagrae</i> (Arya, 1980) <i>Rhabdochona</i> (<i>Globochona</i>) <i>jammuensis</i> Fotedar and Dhar, 1977
<i>Barilius</i> sp.	<i>Rhabdochona</i> (<i>Globochona</i>) <i>barusi</i> Majumdar and De, 1971
<i>Catla catla</i>	<i>Goezia chitali</i> Zaidi and Khan, 1975
<i>Chrossocheilus latius</i>	<i>Camallanus kumaonus</i> Arya, 1980
<i>Danio rerio</i>	<i>Camallanus fotedari</i> Raina and Dhar, 1972
<i>Labeo rohita</i>	<i>Cucullanus jalnaensis</i> (Kalyankar, 1971) Petter, 1974 <i>Rhabdochona</i> (<i>Rhabdochona</i>) <i>hospeti</i> Thapar, 1950 <i>Rhabdochona</i> (<i>Globochona</i>) <i>sarana</i> Karve and Naik, 1951
<i>Puntius innominatus</i>	<i>Rhabdochona</i> (<i>Rhabdochona</i>) <i>hospeti</i> Thapar, 1950
<i>Puntius carnaticus</i>	<i>Falcaustra brevispiculata</i> (Baylis, 1935) <i>F. kaverii</i> (Karve and Naik, 1951) <i>F. nilgiriensis</i> (Soota and Chaturvedi, 1971)
<i>Puntius dobsoni</i>	<i>Falcaustra khadrai</i> (Karve, 1941)

Host	Parasite
<i>Puntius filamentosus</i>	<i>Camallanus anabantis</i> Pearse, 1933
<i>Puntius kolus</i>	<i>Rhabdochona</i> (<i>Rhabdochona</i>) <i>hospeti</i> Thapar, 1950
<i>Puntius sarana</i>	<i>Cucullanus jaiswali</i> (Ali, 1957) Petter, 1974 <i>Rhabdochona</i> (<i>Globochona</i>) <i>sarana</i> Karve and Naik, 1951
<i>Rasbora daniconius</i>	<i>Camallanus anabantis</i> Pearse, 1933 <i>C. pearsei</i> (Yeh, 1960)
<i>Scaphiodon nashii</i>	<i>Falcaustra barbi</i> Baylis and Daubney, 1922
<i>Schizothorax curvifrons</i>	<i>Rhabdochona</i> (<i>Rhabdochona</i>) <i>hellichi</i> (Sramek, 1901) Chitwood, 1933
<i>Schizothorax esocinus</i>	<i>Rhabdochona</i> (<i>Rhabdochona</i>) <i>hellichi</i> (Sramek, 1901) Chitwood, 1933
<i>Schizothorax niger</i>	<i>Rhabdochona</i> (<i>Rhabdochona</i>) <i>hellichi</i> (Sramek, 1901) Chitwood, 1933
<i>Schizothorax plagiostomum</i>	<i>Rhabdochona</i> (<i>Rhabdochona</i>) <i>hellichi</i> (Sramek, 1901) Chitwood, 1933
<i>Schizothorax richardsoni</i>	<i>Procamallanus guptae</i> Arya, 1980 <i>Rhabdochona</i> (<i>Rhabdochona</i>) <i>oreini</i> Fotedar and Dhar, 1977
<i>Tor khudree</i>	<i>Rhabdochona</i> (<i>Rhabdochona</i>) <i>hospeti</i> Thapar, 1950
<i>Tor neilli</i>	<i>Spinitectus neilli</i> Karve and Naik, 1951
<i>Tor tor</i>	<i>Falcaustra barbi</i> Baylis and Daubney, 1922 <i>F. chauhani</i> (Soota, 1975) <i>F. leptcephala</i> Baylis and Daubney, 1922 <i>Monhysterides piscicola</i> Baylis and Daubney, 1922 <i>Rhabdochona</i> (<i>Rhabdochona</i>) <i>hospeti</i> Thapar, 1950 <i>R. (R.) tori</i> Fotedar and Dhar, 1977

Host	Parasite
Order VII. Siluriformes	
Family Ariidae	
<i>Tachysurus caelatus</i>	<i>Spirocamallanus spiralis</i> Baylis, 1923
<i>Tachysurus maculatus</i>	<i>Cucullanus arabianse</i> (Ali and Kalyankar, 1967) Petter, 1974
	<i>C. malvanae</i> (Kalyankar, 1971) Petter, 1974
	<i>Pseudocucullanus tachysuri</i> Kalyankar, 1971
<i>Tachysurus platystomus</i>	<i>Cucullanus ariusi</i> (Srivastava and Gupta, 1976)
	<i>C. jalnaensis</i> (Kalyankar, 1971) Petter, 1974
<i>Tachysurus serratus</i>	<i>Cucullanus armatus</i> Yamaguti, 1954
	<i>C. olivoceus</i> Akram, 1975
<i>Tachysurus thalassinus</i>	<i>Cucullanus jaiswali</i> (Ali, 1957) Petter, 1974
<i>Tachysurus venosus</i>	<i>Hysterothylacium trichiuri</i> (Thwaite, 1927) Deardorff and Overstreet, 1980
<i>Tachysurus</i> sp.	<i>Cucullanus arabianse</i> (Ali and Kalyankar, 1967) Petter, 1974
	<i>C. armatus</i> Yamaguti, 1954
Family Bagridae	
<i>Mystus aor</i>	<i>Paragendria macronis</i> (Stewart, 1914) Baylis, 1939
	<i>Pingus aori</i> Khan and Yaseen, 1969
<i>Mystus cavasius</i>	<i>Buckleyinema buckleyi</i> Ali and Singh, 1954
	<i>Rhabdochona</i> (<i>Globochona</i>) <i>mazeedi</i> Prasad and Sahay, 1965
	<i>Spinitectus minor</i> (Stewart, 1914) Baylis, 1939
	<i>Spirocamallanus gubernaculus</i> (Khera, 1955)
	<i>S. mysti</i> (Karve, 1952)
	<i>S. singhi</i> (Ali, 1957)

Host	Parasite
<i>Mystus microphthalmus</i>	<i>Spirocamallanus singhi</i> (Ali, 1957)
<i>Mystus seenghala</i>	<i>Buckleynema singhi</i> Rai, 1969
	<i>Capillaria</i> sp.
	<i>Cucullanus lucknowi</i> Campana-Rouget, 1961
	<i>C. pseudeutropi</i> Agrawal, 1967
	<i>Eustrongylides</i> sp. larva
	<i>Onchocamallanus globoconchus</i> (Ali, 1960) Petter, 1979
	<i>Paragendria macronis</i> (Stewart, 1914) Baylis, 1939
	<i>P. vittatusi</i> (Agrawal, 1965)
	<i>Spinitectus minor</i> (Stewart, 1914) Baylis, 1939
	<i>S. seenghalai</i> Zaidi and Khan, 1975
	<i>Spirocamallanus singhi</i> (Ali, 1957)
	<i>Thwaitia macronesi</i> Shendge and Deshmukh, 1977
<i>Mystus tengara</i>	<i>Paragendria vittatusi</i> (Agrawal, 1965)
<i>Mystus vittatus</i>	<i>Parugendria macronis</i> (Stewart, 1914) Baylis, 1939
	<i>P. vittatusi</i> (Agrawal, 1965)
	<i>Rhabdochona</i> (<i>Rhabdochona</i>) <i>smythi</i> Agrawal, 1965
	<i>Spinitectus minor</i> (Stewart, 1914) Baylis, 1939
	<i>Spirocamallanus mysti</i> (Karve, 1952)
	<i>S. singhi</i> (Ali, 1957)
<i>Mystus</i> sp.	<i>Gendria brevispiculum</i> Karve, 1941
	<i>Rhabdochona</i> (<i>Globochona</i>) <i>garuai</i> Agrawal, 1965
<i>Rita buchanani</i>	<i>Cucullanus ritai</i> Karve 1952

Host	Parasite
<i>Rita kuturnee</i>	<i>Onchocamallanus globoconchus</i> (Ali, 1960) Petter, 1979 <i>Spinitectus longipupillatus</i> Ali, 1957 <i>Spriocamallanus gubernaculus</i> (Khera, 1955)
<i>Rita rita</i>	<i>Camallanus mastacembeli</i> (Sahay and Sinha, 1966) Agrawal, 1967 <i>Dujardinascaris ritai</i> Zaidi and Khan, 1975 <i>Paracucullanellus indica</i> Agrawal, 1965 <i>Rhabdochona magna</i> Khan and Yaseen, 1969 <i>Spirocamallanus gubernaculus</i> (Khera, 1955)
Family Citharinidae	
<i>Distichodus brevipennis</i>	<i>Falcaustra barbi</i> Baylis and Daubney, 1922
Family Claridae	
<i>Clarias batrachus</i>	<i>Camallanus anabantis</i> Pearse, 1933 <i>Procamallanus heteropneustus</i> Ali, 1957 <i>P. planoratus</i> Kulkarni, 1935
<i>Clarias teysmanni</i>	<i>Procamallanus daccai</i> Gupta, 1959 <i>P. planoratus</i> Kulkarni, 1935 <i>P. spiculogubernaculus</i> Agarwal, 1958
Family Heteropneustidae	
<i>Heteropneustes fossilis</i>	<i>Eustrongylides</i> sp. larva <i>Goezia heteropneusti</i> Zaidi and Khan, 1975 <i>Paracamallanus equispiculus</i> (Sood, 1968) Petter, 1978 <i>Procamallanus daccai</i> Gupta, 1959 <i>P. heteropneustus</i> Ali, 1957 <i>P. khatibi</i> Naidu and Murhar, 1980 <i>P. muelleri</i> Agrawal, 1966

Host**Parasite***P. ramteki* Naidu and Murhar, 1980*P. saccobranchi* Karve, 1952*P. spiculogubernaculus* Agarwal, 1958*Spirocamallanus singhi* (Ali, 1957)

Family Schilbeidae

*Clupisoma murius**Spirocamallanus singhi* (Ali, 1957)*Eutropiichthys bengalensis**Amphisakis bengalensis* Chakravarty
and Majumdar, 1959*Eutropiichthys murius**Spirocamallanus singhi* (Ali, 1957)*Eutropiichthys vacha**Camallanus vachai* (Wahid and Per-
veen, 1969)*Rhabdochona* (*Rhabdochona*) *chanawane-*
nsis Zaidi and Khan, 1975*R. (Globochona) garuai* Agrawal, 1965*R. (G.) mazeedi* Prasad and Sahay, 1965*Spinitectus indicus* Verma and Agarwal,
1932*S. komiyai* Sahay and Prasad, 1965*S. minor* (Stewart, 1914) Baylis, 1939*Spirocamallanus singhi* (Ali, 1957)*S. vachai* Sinha and Sahay, 1965*Pseudeutropius garua**Cucullanus pseudeutropi* Agrawal, 1967*Rhabdochona* (*Globochona*) *garuai* Agra-
wal, 1965*Spinitectus indicus* Verma and Agra-
wal, 1932*S. komiyai* Sahay and Prasad, 1965*S. neilli* Karve and Naik, 1951

Family Pangasiidae

*Pangasius pangasius**Cucullanus pangasius* Soota and Cha-
turvedi, 1971

Host	Parasite
Family Siluridae	
<i>Ompok bimaculatus</i>	<i>Eustrongylides</i> sp. larva <i>Falcaustra brevicaudatum</i> (Khan and Yaseen, 1969) <i>Hedruris</i> sp. larva <i>Onchocamallanus bagarii</i> (Karve and Naik, 1951) Petter, 1979 <i>Paragendria callichroi</i> (Karve, 1941) <i>Philometra</i> (<i>Philometra</i>) <i>suraiyae</i> Kalyan- kar, 1971 <i>Rhabdochona</i> (<i>Globochona</i>) <i>mazeedi</i> Prasad and Sahay, 1965 <i>Spirocamallanus singhi</i> (Ali, 1957)
<i>Ompok macrophthalmus</i>	<i>Cucullanus callichroi</i> (Stewart, 1914) Barreto, 1922
<i>Wallago attu</i>	<i>Dichelyne wallagoni</i> Chakravarty and Majumdar, 1961 <i>Eustrongylides</i> sp. larva <i>Haemonchus contortus</i> (Rud., 1803) Cobb, 1898 <i>Hedruris</i> sp. larva <i>Monhysterides</i> sp. <i>Neocamallnus ophiocephali</i> Rehana and Bilqees, 1972 <i>Paracamallanus ceylonensis</i> (Fernando and Furtado, 1963) Petter, 1978 <i>Paracucullanellus indica</i> Agrawal, 1965 <i>Paragendria macronis</i> (Stewart, 1914) Baylis, 1936 <i>Philometra</i> (<i>Philometra</i>) <i>hyderabadensis</i> Rasheed, 1963 <i>Procamallanus attui</i> Pande, Bhatia and Rai, 1963 <i>P. daccai</i> Gupta, 1959 <i>P. karachii</i> Rehana and Bilqees, 1979 <i>P. mehrii</i> Agarwal, 1930

Host**Parasite**

Rhabdochona (Globochona) garuai, 1965
Spinitectus indicus Verma and Agarwal, 1932
S. komiyai Sahay and Prasad, 1965
S. minor (Stewart, 1914) Baylis, 1939
Spirocamallanus kalariai (Rehana and Bilqees, 1979)

Family Sisoridae

Bagarius bagarius

Onchocamallanus bagarii (Karve and Naik, 1951) Petter, 1979

Paragendria bagarii (Karve, 1941)

Rhabdochona (Globochona) mazeedi
 Prasad and Sahay, 1965

Spinitectus caballeroi Datta and Majumdar, 1972

*Erethistes elongata**Cucullanus bilqeesi* Petter, 1974*Glyptothorax lonah*

Rhabdochona (Rhabdochona) glyptothoracis Karve and Naik, 1951

Order VIII. Anguilliformes

Family Anguillidae

*Anguilla elphinstonei**Heliconema ahiri* Karve, 1941*Paraquimperia anguillae* Karve, 1941*Procamallanus ahiri* Karve, 1952

Family Muraenesocidae

Muraenesox cinereus

Camallanus cinereus Bilqees, Khanum and Jehan, 1971

C. magnavaginus Bilqees, Khanum and Jehan, 1971

Heliconema brevispiculum Baylis, 1934*H. heliconema* Travassos, 1919

Hysterothylacium synpapillus (Bilqees, Khanum and Jehan, 1971)

Muraenesox talabonoides

Mehdiascaris bombayensis Kalyankar, 1969

Muraenesox sp.*Heliconema heliconema* Travassos, 1919

Host	Parasite
Family Muraenidae	
<i>Echidna catenata</i>	<i>Heliconema heliconema</i> Travassos, 1919
Family Ophichthyidae	
<i>Pisodonophis boro</i>	<i>Camallanus trichiuris</i> Bashirullah and Rahman, 1972
Order IX. Atheriniformes	
Family Belonidae	
<i>Tylosurus leiurus</i>	<i>Philometra</i> (?) <i>pellucida</i> (Jagerskiold, 1893)
<i>Strongylura strongylurus</i>	<i>Cucullanus hians</i> (Dujardin, 1845) Campana-Rouget and Chabaud 1956
<i>Xenentodon cancila</i>	<i>Camallanus xenentodoni</i> Khan and Yaseen, 1969 <i>Philometra</i> (<i>Philometra</i>) <i>pellucida</i> (Jagerskiold, 1893) <i>Procamallanus cancelus</i> Bashirullah and Hafizuddin, 1974
Order X. Channiformes	
Family Channidae	
<i>Channa gachua</i>	<i>Camallanus anabantis</i> Pearse, 1933 <i>Goezia taunsai</i> Zaidi and Khan, 1975 <i>Paracamallanus ophiocephali</i> Karve, 1941 <i>P. sweeti</i> (Moorthy, 1937) Campana-Rouget, 1961 <i>Spinitectus minor</i> (Stewart, 1914) Baylis, 1939
<i>Channa marulius</i>	<i>Heliconema brevispiculum</i> Baylis, 1934 <i>Paracamallanus ophiocephali</i> (Pearse, 1933) Petter, 1978 <i>Paragendria macronis</i> (Stewart, 1914), Baylis, 1939
<i>Channa orientalis</i>	<i>Paracamallanus singhi</i> (Ali, 1957) Campana-Rouget, 1961
<i>Channa punctatus</i>	<i>Camallanus anabantis</i> Pearse, 1933 <i>C. atridentus</i> Khera, 1956 <i>C. fernandoi</i> (Yeh, 1960) <i>C. kulasirii</i> (Yeh, 1960)

Host**Parasite**

	<i>Neospinitectus ophiocephali</i> Kalyankar, 1971
	<i>Onchocamallanus globoconchus</i> (Ali, 1960) Petter, 1979
	<i>P. singhi</i> (Ali, 1957) Campana-Rouget, 1961
	<i>Paragendria vittatusi</i> (Agrawal, 1965)
	<i>Procamallanus planoratus</i> Kulkarni, 1935
<i>Channa striatus</i>	<i>Camallanus aurangabadensis</i> (Shendge and Deshmukh, 1977)
	<i>C. intestinalis</i> Bashirullah, 1974
	<i>C. lucknowensis</i> (Gupta and Bakshi, 1980)
	<i>C. thaparus</i> Sahay and Narayan, 1968
	<i>Neocamallanus ophiocephali</i> Rehana and Bilqees, 1972
	<i>Paracamallanus singhi</i> (Ali, 1957) Campana-Rouget, 1961
	<i>Paragendria madhuai</i> (Sood, 1973)
	<i>Procamallanus planoratus</i> Kulkarni, 1935
	<i>Spinitectus pandharinathi</i> Kalyankar, 1973
	<i>Spirocamallanus singhi</i> (Ali, 1957)

Order XI. Perciformes

Family Centropomidae

Lates calcarifer

<i>Cucullanus hians</i> (Dujarnin, 1845) Campana-Rouget and Chabaud, 1956
<i>C. jaiswali</i> (Ali, 1957) Petter, 1974
<i>Dichelyne (Dichelyne) exiguus</i> (Yamaguti, 1954) Petter, 1974
<i>D. (Neocucullanellus) longispiculum</i> (Khan, 1969) Petter, 1974
<i>Echinocephalus uncinatus</i> Molin, 1858
<i>Philometra (Philometra) lateolabracis</i> (Yamaguti, 1935) Yamaguti, 1941

Host	Parasite
Family Ambassidae	
<i>Chanda nama</i>	<i>Cucullanus dogieli</i> Krotas, 1959
Family Anabantidae	
<i>Anabas testudineus</i>	<i>Camallanus anabantis</i> Pearse, 1933 <i>C. kulasirii</i> (Yeh, 1960)
Family Carangidae	
<i>Carangoides malabaricus</i>	<i>Hysterothylacium carangis</i> (Kalyankar, 1971) Deardorff and Overstreet, 1980
<i>Caranx melampygus</i>	<i>Cucullanus bulbosa</i> (Lane, 1916) Barreto, 1918
<i>Caranx</i> sp.	<i>Cucullanus alii</i> (Kalyankar, 1971) Petter, 1974
<i>Scomberoides lysan</i>	<i>Haplonema lysani</i> Gupta and Garg, 1976
<i>Scomberoides tala</i>	<i>Buckleyella buckleyi</i> Rasheed, 1963 <i>Camallanus chorinemi</i> Rasheed, 1970 <i>Hepatinema karachiensis</i> Rasheed, 1964
<i>Trachinotus blochii</i>	<i>Paracamallanus singhi</i> (Ali, 1957) Campana-Rouget, 1961
Family Gobiidae	
<i>Glossogobius giuris</i>	<i>Hedruris</i> sp. larva <i>Rhabdochona</i> (<i>Globochona</i>) <i>singhi</i> Ali, 1957 <i>Spriocamallnus kerri</i> (Pearse, 1933) Olsen, 1952
Family Istiophoridae	
<i>Istiophorus gladius</i>	<i>Hysterothylacium incurvum</i> (Rud., 1819) Deardorff and Overstreet, 1980
Family Kurtidae	
<i>Kurtus indicus</i>	<i>Lappetascaris lutjani</i> Rasheed, 1965
Family Lutjanidae	
<i>Lutjanus johni</i>	<i>Cucullanus alii</i> (Kalyankar, 1971) Petter, 1974
<i>Lutjanus rivulatus</i>	<i>Cucullanus rivulatus</i> Soota and Dey Sarkar, 1980
<i>Lutjanus</i> sp.	<i>Lappetascaris lutjani</i> Rasheed, 1965

Host	Parasite
Family Mugilidae	
<i>Mugil cephalus</i>	<i>Philometra</i> (<i>Philometra</i>) <i>lateolabracis</i> (Yamaguti, 1935) Yamaguti, 1941
<i>Mugil hamiltonii</i>	<i>Heliconema hamiltonii</i> Bilquees and Khanum, 1970
<i>Mugil speigleri</i>	<i>Spirocamallanus pereirei</i> (Annereaux, 1946) Olsen, 1952
Family Mullidae	
<i>Upeneus macronemus</i>	<i>Camallanus trichiuris</i> Bashirullah and Rahman, 1972
Family Nandidae	
<i>Nandus nandus</i>	<i>Cosmoxyinemoides nandusii</i> Sood, 1972
Family Osphronemidae	
<i>Trichogaster fasciatus</i>	<i>Spirocamallanus singhi</i> (Ali, 1957)
<i>Trichogaster trichopterus</i>	<i>Camallanus anubantis</i> Pearse, 1933
Family Polynemidae	
<i>Eleutheronema tetradactylum</i>	<i>Bulbocephalus inglisi</i> Rasheed, 1966 <i>Dichelyne</i> (<i>Dichelyne</i>) <i>indentatus</i> (Rasheed, 1968) Petter, 1974 <i>Philometra</i> (<i>Philometra</i>) <i>lateolabracis</i> (Yamaguti, 1935) Yamaguti, 1941 <i>Philometra</i> (<i>Ranjhinema</i>) <i>polynemii</i> Rasheed, 1963
<i>Polynemus indicus</i>	<i>Camallanus cotti</i> Fujita, 1927 <i>C. kirundensis</i> Baylis, 1928 <i>Porrocaecum trichiuri</i> (Chandler, 1935) <i>Spirocamallanus alii</i> (Kalyankar, 1971) Petter, 1978
Family Pomadasyidae	
<i>Pomadasyys hasta</i>	<i>Dichelyne</i> (<i>Dichelyne</i>) <i>indentatus</i> (Rasheed, 1968) Petter, 1974 <i>D. (D.) rasheedae</i> Petter, 1974 <i>Philometroides denticulatus</i> Rasheed, 1965 <i>Spirocamallanus pereirei</i> (Annereaux, 1946) Olsen, 1952
<i>Pomadasyys olivaceus</i>	<i>Cucullanus olivaceus</i> Akram, 1975

Host	Parasite
Family Rachycentridae	
<i>Rachycentron canadus</i>	<i>Neogoezia elacateiae</i> Khan and Begum, 1971
	<i>Iheringascaris inquires</i> (Linton, 1901) Deardorff and Overstreet, 1980
Family Sciaenidae	
<i>Johnius carutta</i>	<i>Spirocamallanus alii</i> (Kalyankar, 1971) Petter, 1978
<i>Johnius dussumieri</i>	<i>Alibagascaris pseudosciaenae</i> Kalyankar, 1970
	<i>Cucullanus alii</i> (Kalyankar, 1971) Petter, 1974
	<i>Spirocamallanus alii</i> (Kalyankar, 1971) Petter, 1978
	<i>S. dussumieri</i> (Bilqees, Khanum and Jehan, 1971) Petter, 1979
<i>Johnius sina</i>	<i>Philometra (Philometra) lateolabracis</i> (Yamaguti, 1935) Yamaguti, 1941
<i>Johnius volgeri</i>	<i>Cucullanus sciaenai</i> (Gupta and Gupta, 1979)
<i>Johnius</i> sp.	<i>Cucullauus hians</i> (Dujardin, 1845) Campana-Rouget and Chabaud, 1956
	<i>Dujardinascaris magna</i> Khan and Begum, 1971
	<i>Lappetascaris lutjani</i> Rasheed, 1965
	<i>Paranisakis sciaenae</i> (Khan and Begum, 1971)
<i>Protonibea diacanthus</i>	<i>Alibagascaris pseudosciaenae</i> Kalyankar, 1970
	<i>Camallanus chorinemi</i> Rasheed, 1970
	<i>C. qadrii</i> Ashraf, Farooq and Khanum, 1977
	<i>Cucullanus alii</i> (Kalyankar, 1971) Petter, 1974
	<i>Dichelyne (Neocucullanellus) longispiculum</i> (Khan, 1969) Petter, 1974

Host	Parasite
	<i>Dujardinascaris quadrii</i> Zubairi and Farooq, 1976
	<i>Philometra</i> (<i>Philometra</i>) <i>lateolabracis</i> (Yamaguti, 1935) Yamaguti, 1941
	<i>Spirocamallanus neobuccalaris</i> (Bilqees, Fatima and Rehana, 1977)
<i>Protonibea</i> sp.	<i>Dichelyne</i> (<i>Dichelyne</i>) <i>exiguus</i> (Yamaguti, 1954) Petter, 1974
<i>Pennahia macrophthalmus</i>	<i>Philometra</i> (<i>Philometra</i>) <i>lateolabracis</i> (Yamaguti, 1935) Yamaguti, 1941
<i>Otolithes argenteus</i>	<i>Cucullanus otolithi</i> (Ashraf, Khanum and Farooq, 1977)
	<i>Spirocamallanus otolithi</i> (Ashraf, Farooq and Khanum, 1977)
<i>Otolithes ruber</i>	<i>Philometra</i> (<i>Philometra</i>) <i>lateolabracis</i> (Yamaguti, 1935) Yamaguti, 1941
	<i>Philometroides denticulatus</i> Rasheed, 1965
	<i>Porrocaecum ruberum</i> Bilqees, Khanum and Jehan, 1971
	<i>Spirocamallanus pereirei</i> (Annereaux, 1946) Olsen, 1952
Family Sillaginidae	
<i>Sillago sihama</i>	<i>Cucullanus alii</i> (Kalyankar, 1971) Petter, 1974
	<i>Onchocamallanus bagarii</i> (Karve and Naik, 1951) Petter, 1979
	<i>Spirocamallanus sihamai</i> Khan and Begum, 1971
<i>Sillaginopsis panijus</i>	<i>Porrocaecum ruberum</i> Bilqees, Khanum and Jehan, 1971
	<i>Raphidascaris panijii</i> Khan and Yaseen, 1969
Family Scomberomoridae	
<i>Scomberomorus commerson</i>	<i>Cylicostrongylus indicus</i> Gupta and Garg, 1978
<i>Scomberomorus guttatus</i>	<i>Camallanus guttatii</i> Khan and Begum, 1971

Host	Parasite
	<i>Comephoronema johnsoni</i> Arya, 1979
	<i>Cucullanus guerreroi</i> (Arya and Johnson, 1975)
	<i>Dujardinascaris cybii</i> Arya and Johnson, 1978
	<i>Goezia aspinulosa</i> Arya, 1980
	<i>Neocylicostrogylus surmai</i> Arya and Johnson, 1977
	<i>Rhabdochona</i> (<i>Rhabdochona</i>) <i>oligopapillata</i> Arya and Johnson, 1977
	<i>R.</i> (<i>R.</i>) <i>unispinata</i> Arya, 1980
<i>Scomberomorous interruptum</i>	<i>Camallanus surmai</i> Rasheed, 1970
<i>Scomberomorous</i> sp.	<i>Philometra</i> (<i>Philometra</i>) <i>lateolabracis</i> (Yamaguti, 1935) Yamaguti, 1941
Family Scrombidae	
<i>Rostrelliger kanagurta</i>	<i>Camallanus karachiensis</i> Khan and Begum, 1971
Family Sparidae	
<i>Acanthopagrus berda</i>	<i>Cucullanus chrysophrydis</i> Gendre, 1927
	<i>C. hians</i> (Dujardin, 1845) Campana-Rouget and Chabaud, 1956
	<i>Onchocamallanus bagarii</i> (Karve and Naik, 1951) Petter, 1979
	<i>Spirocamallanus berdii</i> Khan and Yaseen, 1969
	<i>S. sparus</i> (Akram, 1975)
<i>Argyrops aurata</i>	<i>Cucullanus chrysophrydis</i> Gendre, 1927
<i>Argyrops spinifer</i>	<i>Spirocamallanus sparus</i> (Akram, 1975)
<i>Sparus</i> sp.	<i>Cucullanus hians</i> (Dujardin, 1845) Campana-Rouget and Chabaud, 1956
Family Apolectidae	
<i>Apolectus niger</i>	<i>Dichelyne</i> (<i>Dichelyne</i>) <i>diminutus</i> (Rasheed, 1968) Petter, 1974
	<i>Goezia pakistanica</i> Bilqees, Fatima and Rehana, 1977

Host	Parasite
	<i>Heptochona stromatei</i> Rasheed, 1965
	<i>Rhabdochona</i> (<i>Rhabdochona</i>) <i>parastrumatei</i> Bilqees, 1979
Family Stromateidae	
<i>Pampus chinensis</i>	<i>Falcaustra stromatei</i> (Bilqees and Khanum, 1971
<i>Pampus</i> sp.	<i>Cyrnea</i> (<i>Procyrnea</i>) <i>chabaudi</i> Rasheed, 1965
Family Theraponidae	
<i>Therapon jarbua</i>	<i>Paracamallanus theraponis</i> Kalyankar, 1971
<i>Therapon theraps</i>	<i>Camallanus trichiuris</i> Bashirullah and Rahman, 1972
<i>Therapon</i> sp.	<i>Cucullanus theraponi</i> Rasheed, 1968
Family Trichiuridae	
<i>Lepturacanthus savala</i>	<i>Camallanus trichiuris</i> Bashirullah and Rahman, 1972
	<i>Hysterothylacium trichiuri</i> (Thwaite, 1927) Deardorff and Overstreet, 1980
<i>Trichiurus lepturus</i>	<i>Angusticaecum singhi</i> (Gupta and Gupta, 1979)
<i>Trichiurus malabaricus</i>	<i>Angusticaecum singhi</i> (Gupta and Gupta, 1979)
<i>Trichiurus muticus</i>	<i>Camallanus trichiuris</i> Bashirullah and Rahman, 1972
	<i>Ophidascaris puriensis</i> Srivastava and Gupta, 1978
	<i>Paracylicostrongylus trichiurusi</i> Srivastava and Gupta, 1978
<i>Trichiurus venosus</i>	<i>Camallanus trichiuris</i> Bashirullah and Rahman, 1972
<i>Trichiurus</i> sp.	<i>Paranisakis kherai</i> Gupta and Garg, 1977

Host	Parasite
Family Xiphiidae	
<i>Xiphias gladius</i>	<i>Hysterothylacium incurvum</i> (Rud., 1819) Deardorff and Overstreet, 1980
Family Mastacembalidae	
<i>Macrognathus aculeatus</i>	<i>Camallanus xenentodoni</i> Khan and Yaseen, 1969
<i>Mastacembalus armatus</i>	<i>Ascaridia ganpatii</i> Sood, 1967 <i>Camallanus anabantis</i> Pearse, 1933 <i>C. barragi</i> (Zaidi and Khan, 1975) <i>C. mastacembeli</i> (Sahay and Sinha, 1966) Agrawal, 1967 <i>C. unispiculus</i> Khera, 1956 <i>Cylicostrongylus thapari</i> Sood, 1966 <i>Eustrongylides</i> sp. larva <i>Heliconema longissima</i> (Ortlepp, 1922) Chabaud and Campana-Rouget, 1956 <i>Parascarophis bharatii</i> Agrawal, 1965 <i>Procamallanus bilaspurensis</i> Gupta and Duggal, 1973 <i>Proleptus inflatus</i> (Linstow, 1890) Baylis, 1933 <i>Pseudoproleptus vestibulus</i> Khera, 1955 <i>Spinitectus minor</i> (Stewart, 1914) Baylis, 1939
<i>Mastacembalus punctatus</i>	<i>Camallanus magna</i> (Khan and Yaseen, 1969) <i>Goezia pseudascaroides</i> Rehana and Bilquees, 1972
Order XII. Pleuronectiformes	
Family Bothidae	
<i>Crossorhombus azureus</i>	<i>Spirocamallanus crossorhombi</i> Zaidi and Khan, 1975
Family Cynoglosside	
<i>Cynoglossus sidenses</i>	<i>Echinocephalus uncinatus</i> Molin, 1858

Host	Parasite
Order XIII. Tetraodontiformes	
Family Balistidae	
<i>Balistes</i> sp.	<i>Thwaitia balistii</i> Rasheed, 1963
Family Diodontidae	
<i>Diodon hystrix</i>	<i>Raphidascaroides diadonis</i> (Thwaite, 1927) Olsen, 1952
Family Tetraodontidae	
<i>Sphaeroides lunaris</i>	<i>Angusticaecum tetrodonti</i> (Gupta and Gupta, 1979)
	<i>Spirocamallanus spiralis</i> Baylis, 1923

SUMMARY

This is the first instalment of the series of studies on nematode parasites of Indian vertebrates, and covers exclusively those parasitising fishes. It deals with over 200 species of the total of about 300 so far recorded from this area, the remaining being considered either as synonyms or as doubtful taxa. The classification followed is practically up-to-date being based mostly on C. I. H. keys, includes up-to-date references particularly relating to the Indian subcontinent forms, and also presents a host-parasite list. Every effort has been made, where possible, to provide keys for identification of genera and species and to cite references of as late as 1980-81.

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ERRATA

<i>Page</i>	<i>Line</i>	<i>Instead of</i>	<i>Read</i>
9	B8	<i>Falcaustra chiloscyllii</i> (Thwaite, 1927) n. comb.	<i>Tonaudia chiloscyllii</i> (Thwaite, 1927) Inglis, 1957*
44	T5	(After Rasheed, 1968.)	(After Bilqees, Khanum and Jehan, 1971.)
52	T3	1975	1957
59	T7	1972. <i>Cucullanus</i> ...	1974. <i>Cucullanus</i> ...
60	T19	<i>Pseudeutropius garus</i>	<i>Pseudeutropius garua</i>
114	B8	Bilqees (197)	Bilqees (1976)
145	B10	...Khan, 1977	...Khanum, 1977
156	T9	B. male...	B. female
163	T5	16	15
187	B17	Male	Female
202	B14	1962	1926
204	B7	Male	Female
208	T10	Male	Female
221	B3	(1923)	(1922)
247	B9	Hedrudidae	Hedruridae
306	B8	<i>Falcaustra chiloscyllii</i>	<i>Tonaudia chiloscyllii</i>
315	B8	Baylis, 1936	Baylis, 1939
320	B11	(Chandler,...)	Chandler,...
328	T20	<i>Tr.</i>	<i>Trans.</i>
347	B7	...Prasad,	...Prasad, D.

T =from Top

B =from Bottom

*This species was transferred by Inglis in 1957 (*vide* his revision of *Kathlania* and *Tonaudia* in *Ann. Mag. nat. Hist.*, ser. 12, 10 : 785-800) from *Kathlania* to *Tonaudia*, and accepted by Chabaud (1978).