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THE DEVELOPMENT OF PARACAMALLANUS CYATHOPHARYNX (BAYLIS, 1923) (NEMATODA: CAMALLANIDAE)

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Abstract. The life-cycle of the nematode *Paracamallanus cyathopharynx* (Baylis, 1923), a widespread and abundant intestinal parasite of fishes of the family Clariidae in Africa, was studied. At experimental infection, *Mesocyclops leuckarti* (Claus) (Copepoda) was found to serve as intermediate host. The larvae develop to the third stage in the body of a cyclops within 8—9 days at the temperatures of 23—24 °C. The infective larvae possess a large yellow-brown buccal capsule of *Paracamallanus* type and three small conical processes at the tip of tail. Apparently the definitive host acquires infection through the reservoir hosts (different small fishes) or more directly by swallowing the infected cyclops. All developmental stages of *P. cyathopharynx* are described in details and figured. The mode of the development of this parasite suggests close affinities between the genera *Paracamallanus* and *Zeylanema*.

The nematode *Paracamallanus cyathopharynx* (Baylis, 1923) is a common parasite of catfishes of the family Clariidae in Africa. It has been reported from Egypt (Baylis 1923, Myers, Kuntz, Wells 1962, Imam 1971, Moravec 1964a), the Sudan (Törnquist 1931, Khalil 1969) and Zaïre (Campana—Rouget 1961a); Paperna (1964) found it even in Israel. As it has already been mentioned in the previous paper (Moravec 1974), the same nematode species was reported from Senegal under the synonym *Paracamallanus senegalensis* Vassiliades, 1970. Unlike the other members of the family Camallanidae employing usually a wide range of definitive hosts (e.g. *Camallanus*, *Procamallanus*), this species seems to be bound only to fishes of the family Clariidae. It is located in the posterior part of intestine, mosty near rectum. In Egypt, this nematode belongs to the most frequent parasites of fishes *Clarias lazera* and *C. anguillaris* and occurs both in the Nile and irrigation canals and drains. In the spring season (April, May) this parasite was recovered from 30% of *C. lazera* bought at the fish market in Cairo (Gíza) (out of 27 specimens examined), the intensity of infection ranging from 1 to 29 (average 8.5) specimens per fish. In 15% of the dissected fishes this species occurred along with the other camallanid nematode — *Procamallanus laeviconchus* (parasitic in stomach) and only in 5% with the nematode *Spinitectus allaeri* (parasitic in stomach). Unlike the other fish species of economic importance in Egypt, the representatives of the genus *Clarias* occur frequently also in the local irrigation system (in canals and drains) and belong therefore to the most common freshwater fishes serving as a food for the inhabitants. For this reason also the parasites of these fishes and their ecology deserve attention.

Up to the present time, *P. cyathopharynx* has been the only known representative of the genus *Paracamallanus* Yorke et Maplestone, 1926. However, a revision of literary data revealed that the species *Camallanus longitridentatus* Fernando et Furtado, 1963

from *Clarias batrachus* from Malaya corresponded in its general morphology to the genus *Paracamallanus* to which it should be transferred as *P. longitridentatus* (Fernando et Furtado, 1963) comb. n. The development of members of this genus has not yet been studied, but this knowledge is of considerable theoretical importance, for it may contribute to understanding of phylogenetical relations among different nematodes of the family Camallanidae. Of other genera belonging to this family only the following were studied in respect of their life-cycle: *Camallanus* (Mecznikow 1866, Leuckart 1876, Linstow 1909, Leiper 1910, Kupryanova 1954, Campana—Rouget 1961b, Moravec 1969, 1971a, b, Stromberg, Crites 1974), *Zeylanema* (Moorthy 1938), *Procamallanus* (Moravec, in press) and *Spirocamallanus* (Li 1935, Pereira et al. 1936). The present paper deals with the study of the life-cycle of *P. cyathopharynx* carried out during the author's short stay in Egypt in spring 1973 while working at the National Research Centre, Cairo.

MATERIAL AND METHODS

Adult specimens of *P. cyathopharynx* were recovered from the intestine of naturally infected fishes *Clarias lazera* C. & V. bought at the fish market in Cairo (Giza). The fish supplied to this market originate mostly from the River Nile, sometimes also from the local irrigation canals and drains. The nematodes were observed under the microscope and only females containing moving larvae in their uteri were selected for further studies. These were transferred to petri dishes containing water, 3 specimens per dish. Their bodies were torn with mounted needles and the larvae were released into water. The contents of each dish were then poured in a glass flask (⌀ 7 cm) and filtered Nile water was added in such a quantity that the water column reached about 8 cm. 20 laboratory-reared copepods *Mesocyclops leuckarti* (Claus) were placed in the flask and a small quantity of detritus and filamentous algae were added. The flasks were then kept at the average laboratory temperatures of 23—24 °C. Copepods were examined on day 1, 2, 5, 9 and 14 after infection. Free larvae of *P. cyathopharynx* dissected from the uterus of females, as well as the larvae obtained from cyclops or fishes, were studied in the same way as described in another paper (Moravec, in press) dealing with the development of *Procamallanus laeviconchus*.

RESULTS

EXPERIMENTAL INFECTION OF CYCLOPS

The gravid females of *P. cyathopharynx*, like other representatives of the family Camallanidae, contain in their uteri already moving larvae of the first stage. After release into the water the larvae are very active, usually attach themselves by the tail to the bottom and wave with their bodies from one side to another or they alternately roll up and unroll. The cyclops feed on them actively. Already several hours after being swallowed the larva bores with the help of its dorsal tooth through the intestinal wall into the haemocoel of the intermediate host, where further development takes place. During the first phases of development in the body of cyclops the larvae are still very active, but with the continuous enlargement of their sizes they become less movable and the third-stage larvae (infective larvae) in the cyclops body are usually coiled in a circle or a spiral and change their position only if excited, for example when the cyclops is pressed under the cover slip. The infected larvae are located mostly in the cephalothorax of the intermediate host, less often in the abdomen or other parts. Due to their orange colour they are easily discernible in the body of living infected cyclops already at low magnification under the dissecting microscope.

In our experiments only the species *Mesocyclops leuckarti* (Claus) was used as intermediate host. The incidence reached about 20% only, the intensity of infection ranged between 1 to 6 larvae per cyclops (average 2 larvae).

The development in the definitive host could not be experimentally studied owing to the lack of time and to the difficulties in obtaining suitable fishes for our experiments. Fourth-stage larvae and adults in different stage of development were obtained only from naturally infected fishes *Clarias lazera*.

DESCRIPTION OF DEVELOPMENTAL STAGES OF *P. CYATHOPHARYNX*

a) First-stage larvae from the uteri of females

Fig. 1A—C

Larval body slender, colourless, nearly transparent, somewhat tapering towards both extremities, with smooth cuticle. Length of body 0.287—0.315*), maximum

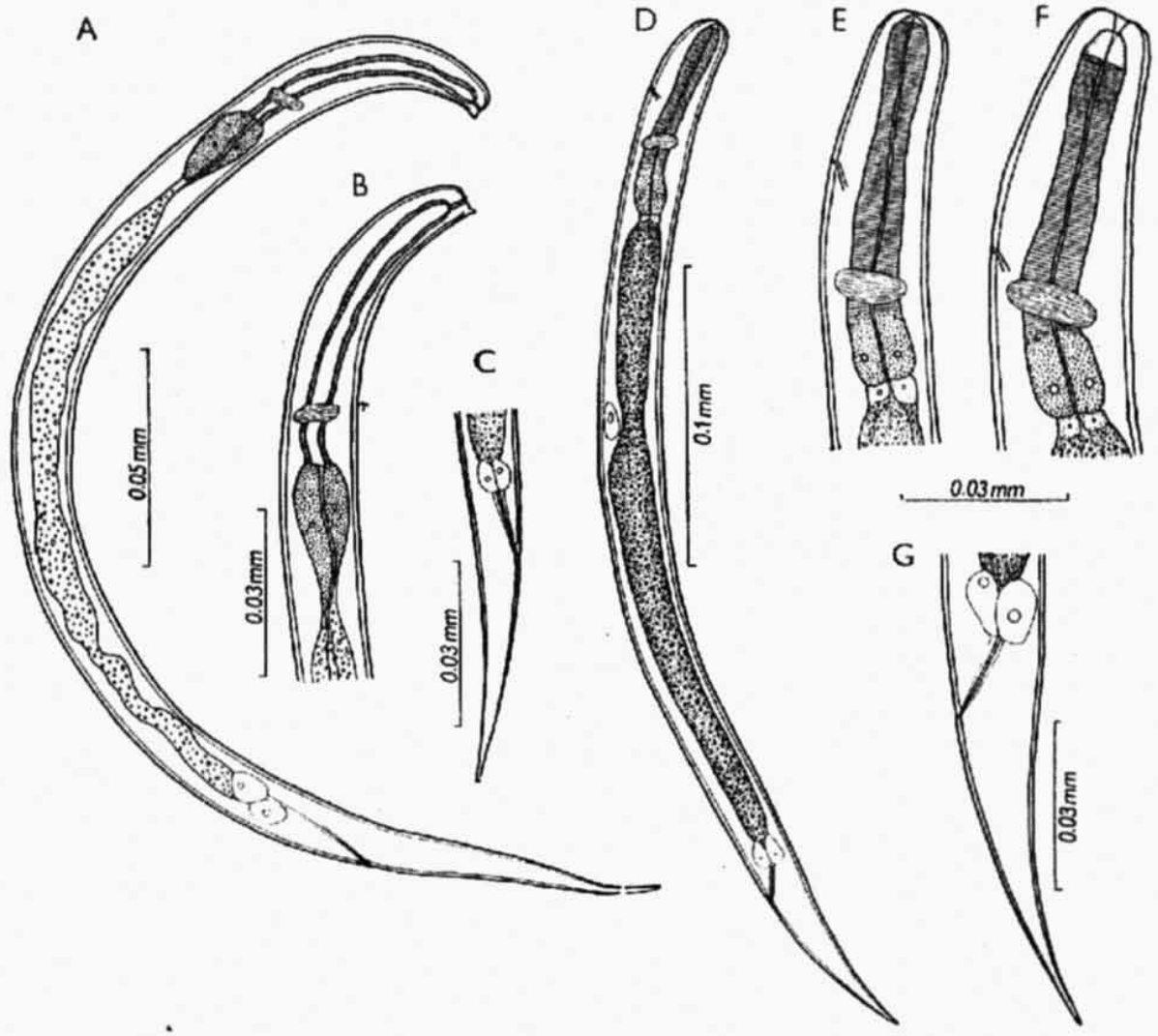

Fig. 1. *Paracamallanus cyathopharynx* (Baylis, 1923). A, B, C — free first-stage larva (A — overall view, B — anterior end of body, C — tail); D—G — second-stage larva from cyclops, 2 days p.i. (D — overall view, E, F — anterior end of body, G — tail).

width 0.011—0.014. Head end dorsally bent, provided with undetermined number of minute mouth papillae and a distinct dorsal tooth-like process. Short, feebly sclerotized buccal tube is followed by thin-walled oesophagus with spacious cavity inside; this part of oesophagus (0.039—0.053 long and 0.0035 wide) is approximately at the end of

*) All measurements in mm.

its four-fifth encircled by nerve ring situated at the distance of 0.032—0.039 from anterior end of body. Below this oesophagus, digestive tube runs through three large elongate unicellular glands; they are of granulated structure and darker than other surrounding tissue. This glandular formation, measuring 0.018—0.021 in length and 0.007—0.011 in width, is the base of later glandular oesophagus. Below this glandular part follows the intestine, which is strongly narrowed at anterior end; intestine is straight, in posterior part somewhat undulate, containing numerous small granules. Junction of intestine and rectum is surrounded by three unicellular rectal glands. Narrow rectum is thin-walled, colourless, anus poorly distinct. Tail is conical, 0.039—0.053 long.

b) **Development of first-stage larvae in the intermediate host**

Having penetrated into the haemocoel of the cyclops, the first-stage larvae do not change at the beginning, they only somewhat enlarge in their size. The larva studied 16 hrs p.i. measured 0.354 in length and 0.021 in width, its cuticle was already thickened, with transverse striation on the surface. Wall of the anterior part of oesophagus became thicker, so that the cavity inside oesophagus disappeared and there remained only a narrow canal; posterior glandular formation containing giant cell nuclei was more compact and lighter than in free larvae and together with anterior muscular part it formed continuous oesophagus 0.074 long. Nerve ring encircled the oesophagus at the distance of 0.063 from anterior end of body. Excretory pore lay somewhat more anteriorly, at the distance of 0.046. Length of tail was 0.060. After 24 hrs the larvae underwent the first moulting; it was difficult to recognize it and the moulting was distinct mostly on the head end only.

c) **Second-stage larvae** Fig. 1D—G

The second-stage larvae were obtained from cyclops two days after infection. At that time the larvae measured 0.378—0.396 in length and 0.023—0.025 in width. Their cuticle was smooth, with slight transverse striation on the tail only. Head end was relatively wide, bluntly rounded, without dorsal denticle. Mouth in form of a short fine tube (0.004 long) opened into oesophagus. Anterior part of oesophagus was covered with thin hyaline sclerotized „cap", which was considerably larger in older larvae and got usually the shape of bell; this formation gave later rise to buccal capsule. Oesophagus was 0.067—0.070 long, not distinctly divided into muscular and glandular part. Posterior end of oesophagus was slightly widened, with three giant cell nuclei; it opened into the intestine through distinct valves, 0.007 long. Nerve ring was situated 0.053—0.056 from anterior extremity, excretory pore lay slightly more anteriorly, at the distance of 0.035—0.046. Intestine was wide, straight, still without orange colouring. Rectal glands were distinct, rectum was a thin narrow tube. Tail was conical, 0.046—0.063 long. Genital primordium was not located. The second moult of larvae occurred on 7th—8th day after infection.

d) **Third-stage larvae (infective larvae) from cyclops** Fig. 2. Plate I

The third-stage larva, immediately after the second moult, was observed in the cyclops first on 9th day after infection. At that time the larva measured 0.525 in length and 0.032 in width. Its cuticle was smooth, buccal capsule feebly sclerotized, but already of yellow colour. Anterior part of buccal capsule measured 0.018 in length and 0.018 in width, posterior part was 0.011 long and 0.011 wide; oesophageal cup measured 0.007×0.007. Ornamentation on anterior part of buccal capsule was already similar to that of older larvae of this stage. In the region around the oesophageal cup there were large highly refractile cells of irregular shape regularly distributed on the periphery. They have probably the character of glands and with their secretions participate in the construction of the capsule. They were no longer present in older larvae.

Oesophagus was distinctly divided in anterior muscular (0.140 long) and posterior glandular part (0.091 long). Excretory pore was already shifted under the level of the nerve ring. Intestine was of yellow colour. Tail measured 0.039.

Fully developed third-stage larvae were obtained on 14th day p.i. They were relatively large, their cuticle had dense transverse striation and they always tended to coil in spiral. Length of body was 0.508—0.574, maximum width 0.035—0.039. Mouth was bifid. Head end was provided with a large, orange, highly sclerotized buccal capsule, divided in anterior and posterior portion. Anterior portion of capsule had the character of lateral valves; anterior margin of each valve was thickened by two submedial curved thickenings. In lateral view each valve of the anterior part of capsule was provided inside with rather long oblique ribs and tooth-like processes; this ornamentation extended only to two thirds of anterior part of capsule. In all larvae examined there were 7 ribs on one valve, the tooth-like processes numbered about 20—22. Length of the whole buccal capsule was 0.035 (of anterior part 0.021, of posterior part 0.014), width of anterior part

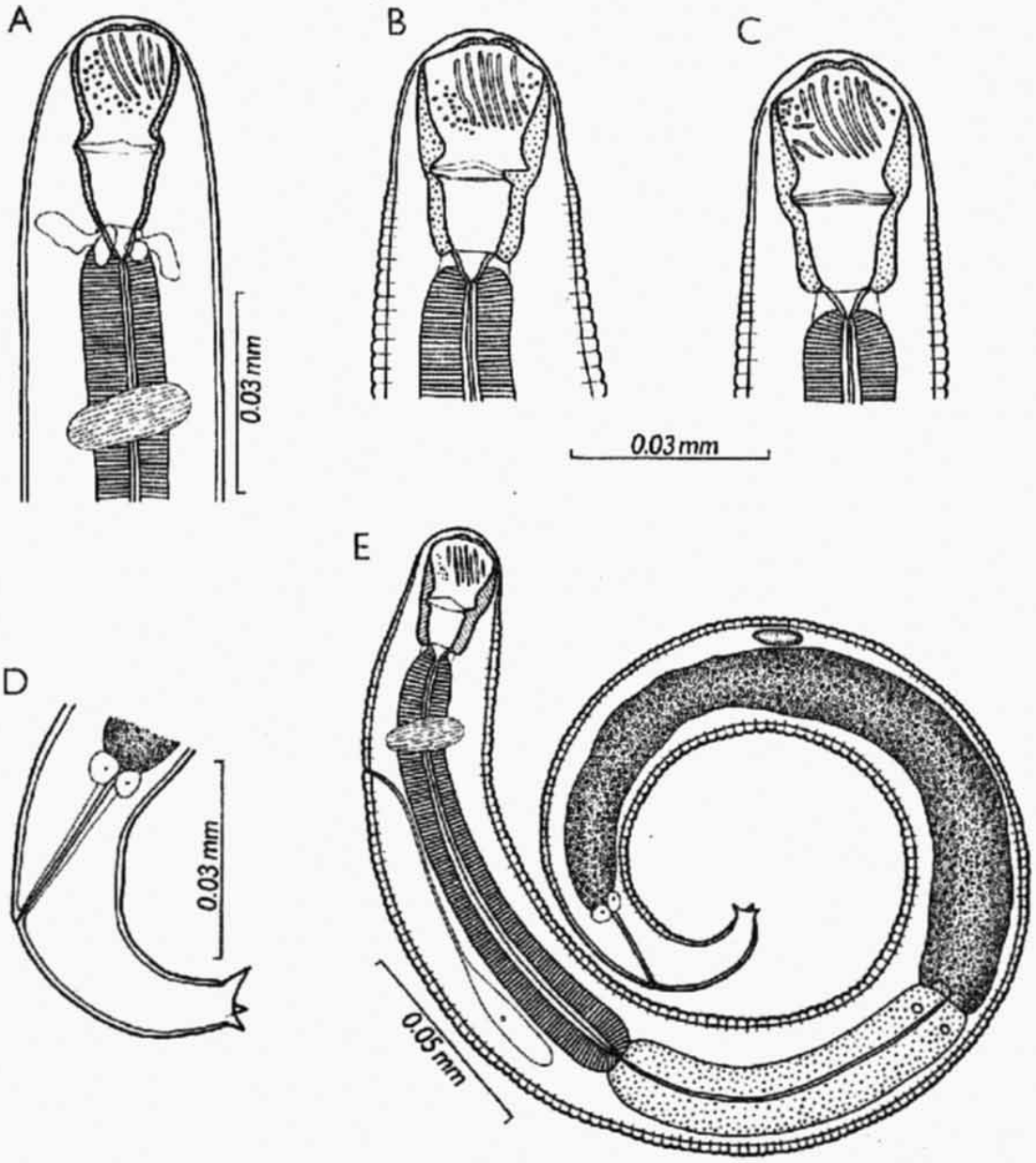

Fig. 2. *Paracamallanus cyathopharynx* (Baylis, 1923) — third-stage larva (infective larva) from cyclops. A—C — buccal capsule (lateral view) (A — 9 days p.i., B, C — 14 days p.i.); D — tail (14 days p.i.); E — overall view (14 days p.i.).

0.021, of posterior part 0.014. Demarcation between both parts was formed by bands without teeth. Sclerotized oesophageal cup was rather large (length 0.004, width 0.004). Muscular oesophagus measured 0.123—0.140; it was provided with a strong cuticular lining inside. Glandular oesophagus was somewhat shorter (0.091—0.116), with three large cell nuclei at its end. Oesophagus opened into the intestine through a valvular apparatus. Intestine was straight, wide, of deep orange-brown colour. Rectum was a narrow colourless tube. The junction of rectum and intestine was surrounded by three small unicellular rectal glands. Genital primordium was of oval shape, situated behind the midlength of intestine, 0.140—0.175 from posterior end of body. Tail was conical, 0.035—0.042 long, ended by three conical processes measuring 0.004 in length. One of them was dorsal and two subventral.

e) **Fourth-stage larva** Fig. 3

A single fourth-stage larva was obtained from naturally infected fish *Clarias lazera*; its location in the host was the same as of adult specimens, i.e. near posterior end of intestine. The body of larva was much more attenuated and slender than that of third-stage larvae; length of body was 1.965, maximum width 0.057. Cuticle was strikingly thick, with fine dense transverse striation. Yellow buccal capsule was strongly sclero-

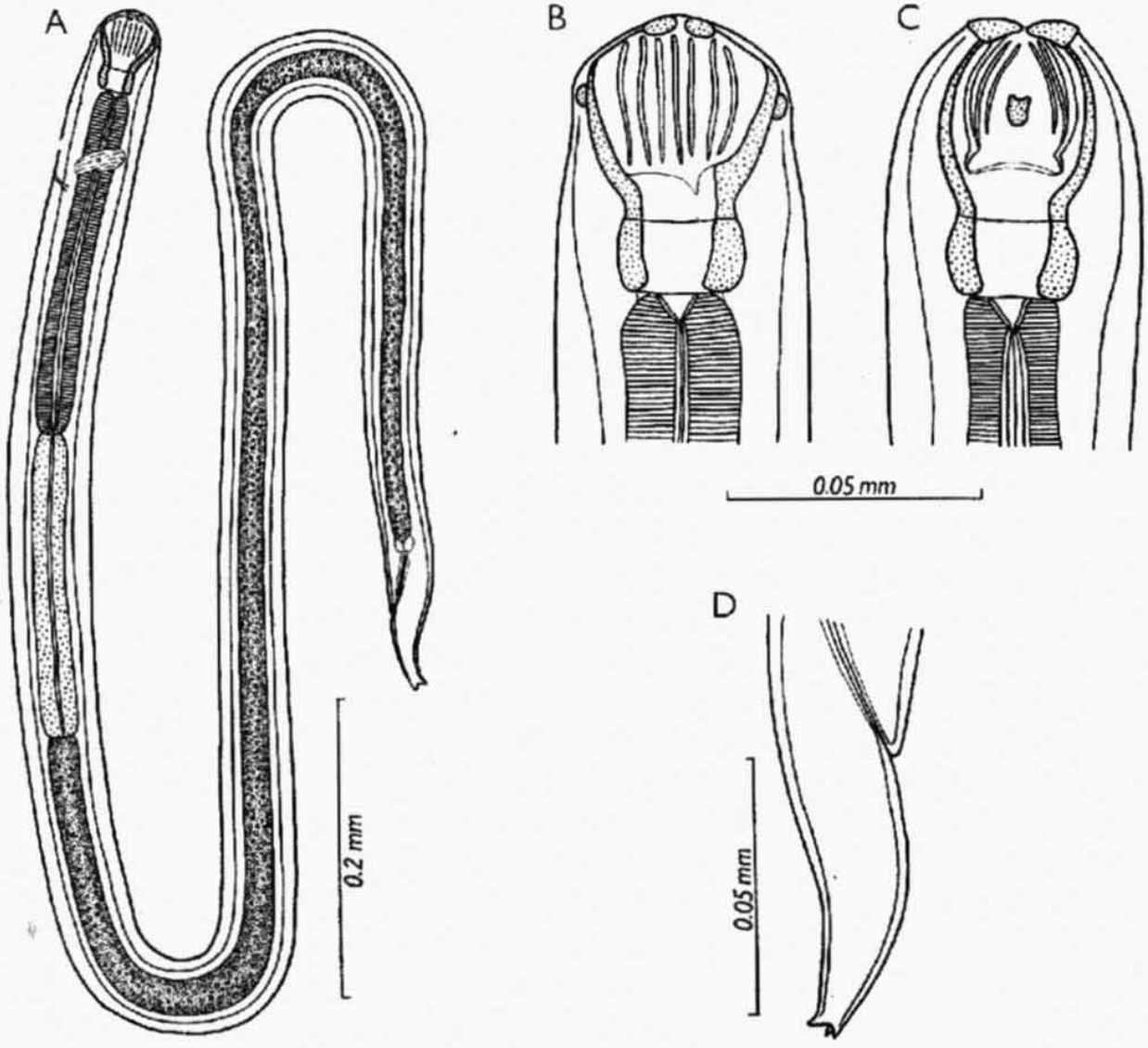

Fig. 3. *Paracamallanus cyathopharynx* (Baylis, 1923) — fourth-stage larva from intestine of naturally infected fish *C. lazera*. A — overall view; B, C — buccal capsule (lateral and dorsal view); D — tail.

tized, composed of two portions. In lateral view the length of the whole buccal capsule was 0.060 (of anterior portion 0.042, of posterior portion 0.018), maximum width was 0.042 in anterior and 0.029 in posterior portion. Anterior portion of buccal capsule was formed by two lateral valves; their inner surface was strengthened with 7 longitudinal ribs reaching approximately to two thirds of length of anterior portion of buccal capsule. Near their posterior ends the ribs were slightly widened and formed tooth-like processes protruding into the buccal capsule. Each valve of the buccal capsule was provided with two subapical, strongly sclerotized plates on anterior margin. On dorsal and ventral side of the anterior portion of capsule there was a small strongly sclerotized knob-like structure forming two small anterior protrusions in dorsoventral view. Walls of posterior portion of capsule were strongly sclerotized; inside this portion was a spacious cavity. Oesophageal cup was well developed, but less sclerotized than buccal capsule. Muscular oesophagus was provided with strong cuticular lining inside and measured 0.255. Glandular oesophagus measured 0.210. The distance of nerve ring was 0.120, small cervical papillae lay at its level. Excretory pore lay a short distance below the nerve ring, 0.132 from anterior end of body. Intestine was straight. Rectum was a thin straight tube, rectal glands feebly distinct. Tail was conical, 0.060 long, ended by three small sharp processes. The dorsal process was somewhat larger than subventral processes. Genital primordium or the base of sexual glands were not observed.

f) **Adults** Fig. 4

The nematodes at the last stage of development (pre-adults and adults) were obtained from posterior portion of intestine of naturally infected *C. lazera*. Their body was rather elongated, in females distinctly tapering towards posterior end. In younger specimens the cuticle was mostly smooth, in older ones with fine transverse striation. Mouth was bifid, yellow-brown buccal capsule well developed, strongly sclerotized. Anterior portion of buccal capsule was formed by two wide lateral valves, braced on inner surface by some strong longitudinal ribs reaching approximately to two thirds of valve length. Near the anterior margin each valve bore two large elongate oblique and strongly sclerotized plates on the surface. Posterior portion of buccal capsule („pharynx") consisted of two parts. Anterior part, substantially longer, was represented by a thick-walled ring, posterior, shorter part had the shape of inverted truncated cone and its walls were much thinner. In older females we observed three distinct fairly large teeth on the bottom of pharynx; in juvenile females and males they were indistinct. Posterior margin of buccal capsule was followed by a small, colourless, feebly sclerotized oesophageal cup. On its dorsal and ventral side the buccal capsule was provided with large sclerotized tridents originating in the middle of anterior portion of buccal capsule and its processes extended approximately to posterior margin of thickened part of pharynx. Oesophagus was divided into anterior, muscular portion (with thick inner cuticular lining) and larger, glandular posterior portion; the latter opened into intestine through a small valvular apparatus. Nerve ring encircled muscular oesophagus a small distance below buccal capsule, small cervical papillae lay approximately at its level. Excretory pore lay a short distance below the nerve ring.

Male (11 specimens): Length of body 2.04—6.54, maximum width 0.082—0.122. Length of whole buccal capsule 0.082—0.108 (of anterior portion 0.060—0.069, of posterior portion (pharynx) 0.033—0.042), maximum width of anterior portion 0.063—0.075, width of pharynx 0.051—0.060. Each valve of capsule was strengthened with 9 ribs. Length of tridents 0.051—0.066. Muscular oesophagus was 0.381—0.465 long, glandular oesophagus 0.420—0.681 long. Nerve ring, cervical papillae and excretory pore were situated 0.135—0.183, 0.129—0.156 and 0.219, respectively, from anterior end of body. Tail was conical, 0.063—0.078 long, in older males always ventrally bent. Tail

end with two very small conical processes was observable in dorsoventral view only; in some younger males these processes were indistinct. Posterior part of body was provided with wide lateral alae. There were 5 pairs of large pedunculate preanal papillae. Postanal papillae were arranged in the following way: a small distance under cloaca there were 3 pairs of large pedunculate papillae lying close one to another and a similar pair of papillae lay approximately in the middle of tail length; the latter was exceptionally doubled; in addition to these papillae there was another pair of very small papillae near posterior end of tail. Anterior and posterior lip of cloaca possessed feebly sclerotized transverse ridges; in younger males lateral margins of these formations appeared as small papillae. Right spicule was well developed, sclerotized, its total length was 0.240—0.309; distal end was provided with subulate process (length 0.030—0.039) with two fine cuticular alae. Left spicule was not found. There was a feebly sclerotized structure in form of gubernaculum, measuring 0.033—0.048 in length.

Female (10 specimens): In our material, there were mostly juvenile and young females, first-stage larvae were present only in the uterus of the largest nematode. Body measu-

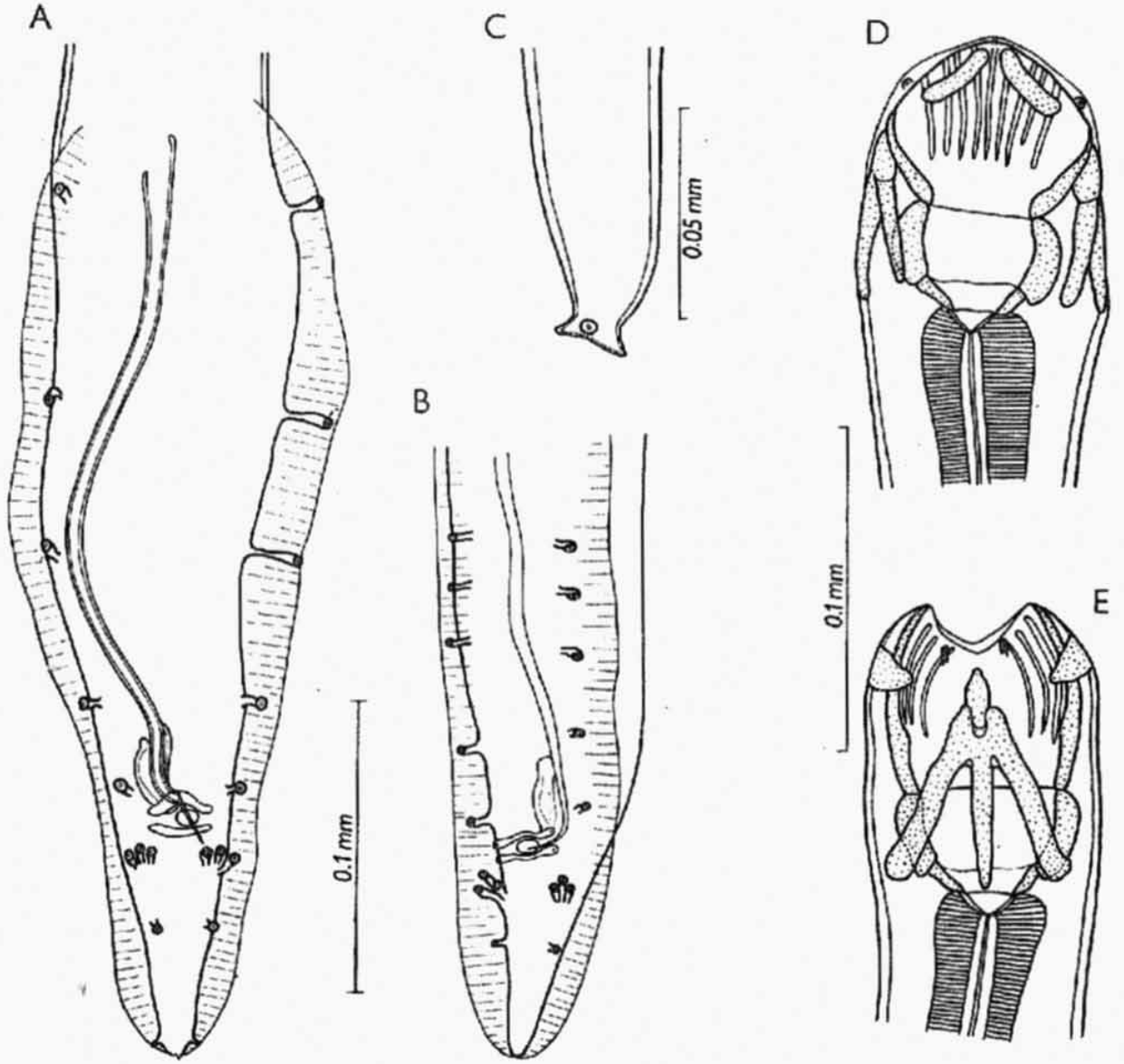

Fig. 4. *Paracamallanus cyathopharynx* (Baylis, 1923) — adults from intestine of naturally infected fish *C. lazera*. A, B — posterior end of adult and juvenile male (ventral view); C — tail tip of female; D, E — buccal capsule of juvenile male (lateral and dorsal view).

red 5.81—13.75 in length and 0.122—0.190 in maximum width. Length of whole buccal capsule was 0.132—0.165 (of anterior portion 0.081—0.099, of posterior portion 0.054—0.069), maximum width of anterior portion was 0.090—0.162, of posterior portion 0.072—0.087. Each valve of mouth capsule was strengthened with 10 longitudinal ribs. Tridents were 0.069—0.099 long. Muscular oesophagus measured 0.510—0.680, glandular oesophagus 0.525—0.884 in length. Nerve ring, cervical papillae and excretory pore were situated 0.186—0.249, 0.162—0.210 and 0.210—0.255, respectively, from anterior end of body. Tail was conical, elongated, 0.228—0.570 long, ended by three small conical processes (0.006—0.009 long). Vulva of older females was approximately equatorial, in young females it was shifted backwards; its distance from posterior end of body was 2.45—7.41. Uterus of older females was filled with round eggs (diameter 0.018—0.024) or moving first-stage larvae.

DISCUSSION

According to our results the life-cycle of *P. cyathopharynx* is the following: First-stage larvae are released by adult female nematodes into the intestine of the host and get into water along with its faeces. Free larvae sink to the bottom, attach to the substrate by their tails and persistently wave their bodies from side to side or roll and unroll. In this way they draw the attention of cyclops who swallow them readily. During some hours the swallowed larvae bore with the help of their dorsal tooth into the haemocoel of the intermediate host where further development takes place. At the temperatures of 23—24°C the larvae undergo the first moult already after 24 hrs, the second moult occurs on 8th—9th day p.i. The infective larvae of the third stage possess a large yellow-brown, strongly sclerotized buccal capsule of *Paracamallanus* type and three small conical processes on the end of tail. No further development takes place in the body of a cyclops. Although the development in the definitive host could not be followed experimentally, it is likely to be similar as that of other representatives of this family, i.e. the larvae in the body of the definitive host must undergo two more moults before reaching maturity. The definitive hosts (siluroid fishes) may become infected either directly by swallowing the cyclops containing third-stage larvae or by eating different small fishes which may serve as reservoir hosts of infective larvae of this parasite; the latter way of infection seems to be more frequent in nature. The reservoir parasitism of larvae of this family was observed not only in the genera *Camallanus* (Kupryanova 1954, Moravec 1971a, Stromberg, Crites 1974), *Procamallanus* (Moravec, in press) and *Spirocamallanus* (Pereira et al. 1936), but also in a very close genus *Zeylanema* (Moorthy 1938).

Although the general morphology of the first-stage larvae of *P. cyathopharynx* are typical of the larvae of this family (the presence of dorsal tooth, the structure of oesophagus etc.), the shape and length of tail suggest the relation to the larvae of the genus *Zeylanema* (the tail of first-stage larvae of *Camallanus*, *Procamallanus* and *Spirocamallanus* is more slender and longer). Also the length of body of these larvae is the same as of *Z. sweeti* (Moorthy 1938), while the larvae of other genera of the family Camallanidae are of much larger sizes. Also the third- and fourth-stage larvae of *Paracamallanus* and *Zeylamena* are very similar both in their morphology and measurements. The structure of buccal capsule of these larvae is nearly identical in both genera, only in adult forms of *Zeylanema* the ribs on valves of buccal capsule are armed with numerous teeth, while in *Paracamallanus* they are smooth. The buccal capsule of the third-stage larvae of *P. cyathopharynx* partially resembles that of the third-stage larvae of *Camallanus*; in the latter genus, however, the anterior portion of capsule is separated

from the posterior one by several strongly sclerotized plates (Plate II A, B), which are absent from the larvae of the genus *Paracamallanus* (and apparently also of *Zeylanema*).

The adult nematodes of *P. cyathopharynx* have recently been redescribed (Moravec 1974). The present material enabled to determined more widely the metrical variability of this species and to study in more detail some of its morphological characters (distribution of tail papillae in male, structure of spicules, of buccal capsule etc.), which confirmed the conspecificity of *P. cyathopharynx* and *P. senegalensis* (see Moravec 1974).

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РАЗВИТИЕ НЕМАТОДЫ *PARACAMALLANUS CYATHOPHARYNX* (BAYLIS, 1923) (NEMATODA: CAMALLANIDAE)

Ф. Моравец

Резюме. Исследовали жизненный цикл нематоды *Paracamallanus cyathopharynx* (Baylis, 1923). Эта нематода является частым и широко распространенным паразитом кишечника рыб семейства Clariidae в Африке. При экспериментальном заражении промежуточным хозяином служил циклоп *Mesocyclops leuckarti* (Claus) (Copepoda). Развитие личинки до 3-ей стадии происходит в теле циклопа в течение 8—9 суток при температуре 23—24 °C. Инвазионные личинки имеют изжелта-бурую ротовую капсулу, которая типична для *Paracamallanus* и три небольших конических отростка на конце хвоста. Дефинитивный хозяин заражается очевидно через резервуарного хозяина (разные малые рыбы) или прямо после поглощения зараженного циклопа. Даны описания и рисунки всех стадий развития нематоды *P. cyathopharynx*. По типу развития этого паразита можно судить, что род *Paracamallanus* очень близок роду *Zeylanema*.

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Fifteen years of the Czechoslovak Parasitological Society, associate to the Czechoslovak Academy of Sciences

The Czechoslovak Parasitological Society, associate to the Czechoslovak Academy of Sciences, was established in 1959 as an organization grouping all research and professional parasitologists, biologists, veterinarians and physicians. Its foundation was prompted by the great advances of parasitology as an independent scientific field, especially by its rapid development after the Second World War and the effort of all parasitologists to unite on a common platform.

The foundation of this Society was witnessed by our outstanding parasitologists headed by its first and long-term chairman, the late Academician O. Jírovec. The members of the preparatory committee were the present chairman of the Society, Academician B. Rosický, Academician J. Hovorka, Associate Professor B. Ryšavý, Professor J. Kramář, Prof. J. Dyk, Dr. K. Rašín, Associate Professor I. Zmoray, Dr. O. Mačička, the late Dr. O. Havlík and others. Due to their long-lasting work the Czechoslovak parasitology has attained one of the first places in Europe and their organizational efforts had given rise to Czechoslovak Parasitological Society, associate to the Czechoslovak Academy of Sciences, prior to analogous societies in the German Federal Republic, France, the Netherlands etc. The Society is a member of World Federation of Parasitologists where the late Academician O. Jírovec was once the Czechoslovak representative holding the office of vice-president; the Society is also a member of the International Union of Biological Sciences. The principal goals set up by the Society at its rise may be summed up in following points: to orientate the research activities in parasitology in Czechoslovakia to the solutions of the economically important problems and to direct the scientific work at

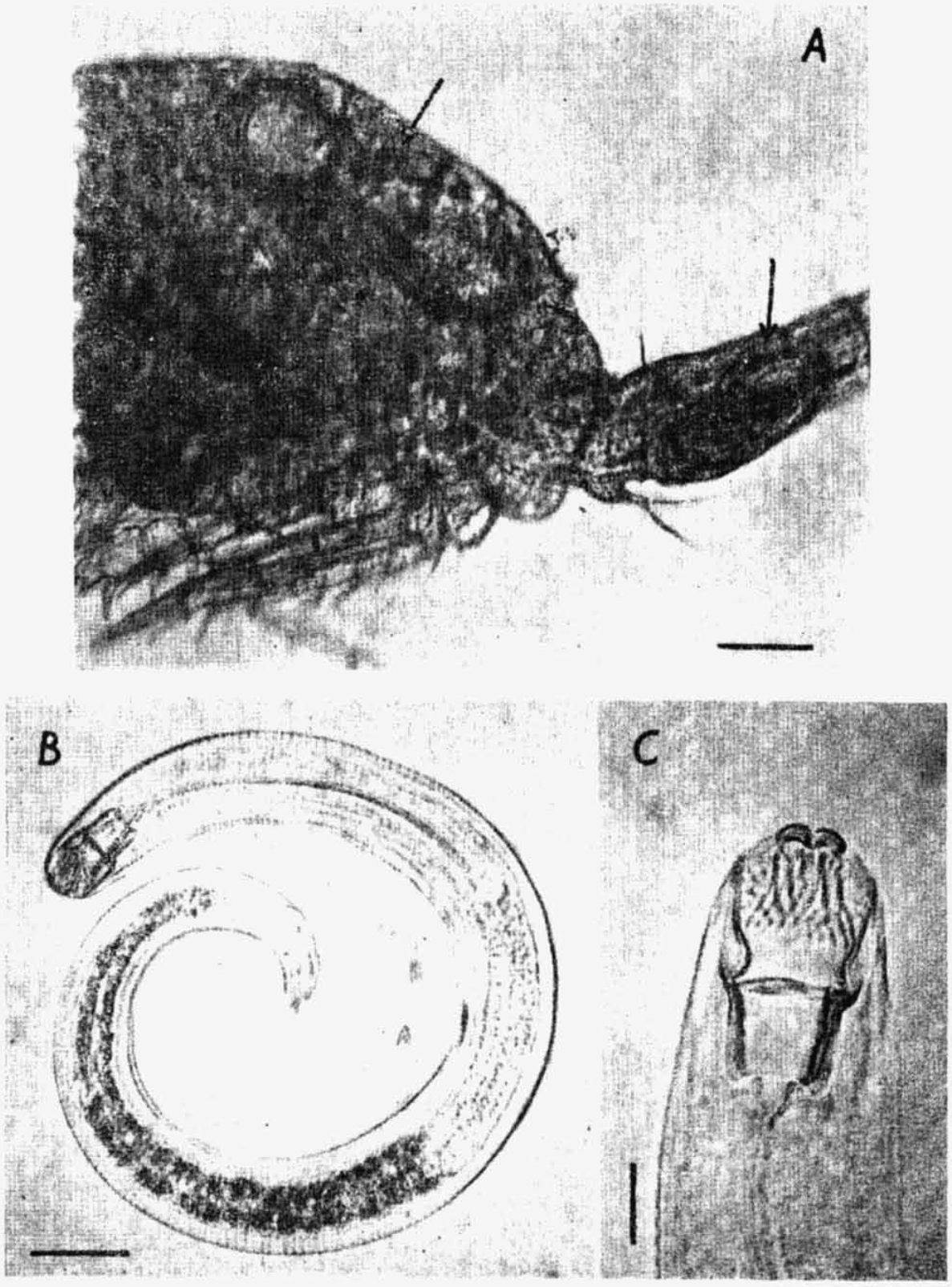

Plate I

Fig. 1. *Paracamallanus cyathopharynx* (Baylis, 1923). A — infective larvae in haemocoel of cyclops (scale = 100 μ); B — third-stage larva (infective larva) from cyclops (scale = 35 μ); C — buccal capsule of third-stage larva (lateral view) (scale = 10 μ). Photo by B. Ryšavý.

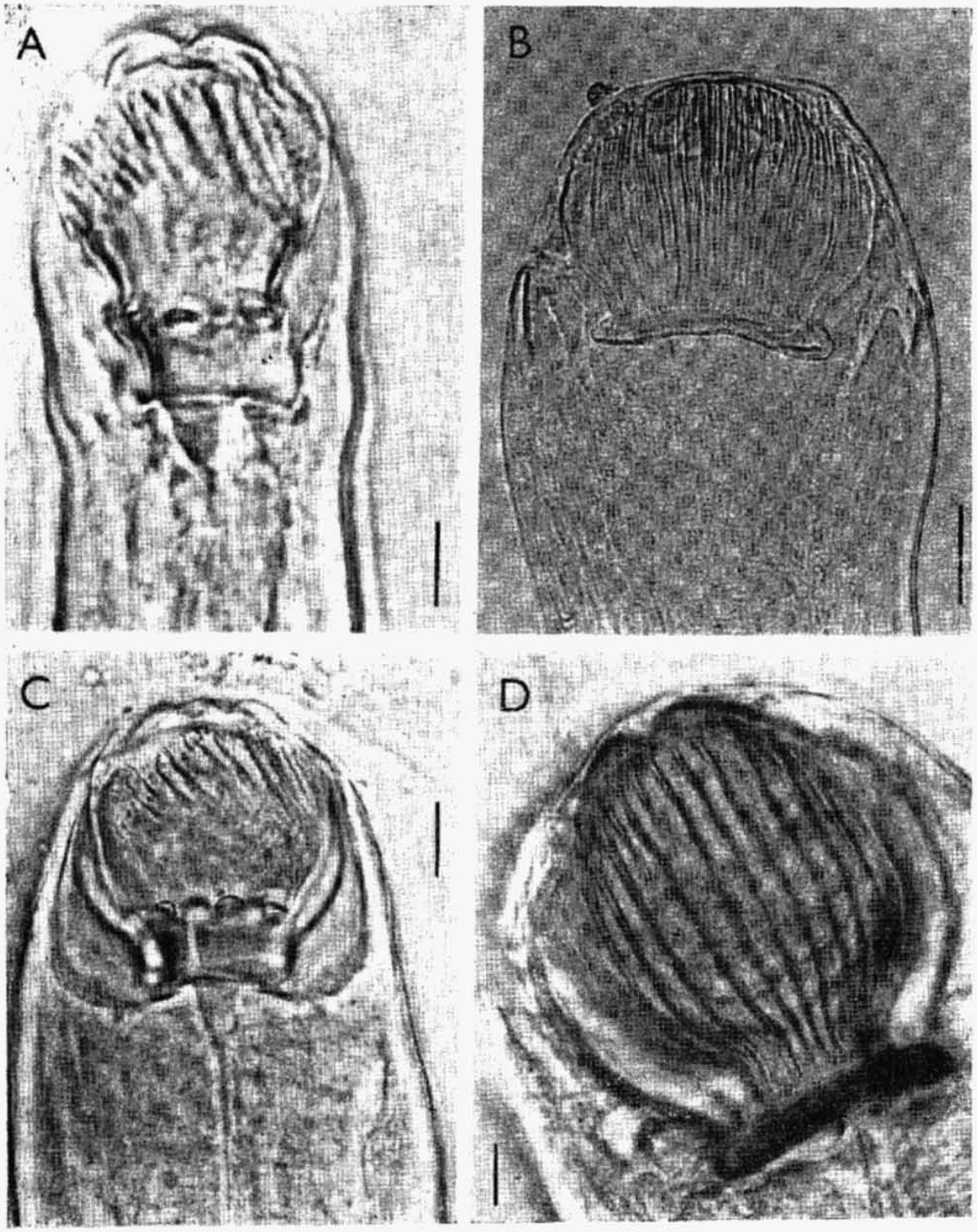

Plate II

Fig. 2. *Camallanus lacustris* (Zoega, 1776). A — buccal capsule of third-stage larva (infective larva) from cyclops (lateral view) (scale = 15 μ); B — buccal capsule of juvenile male from intestine of perch 55 days p.i. (lateral view) (scale = 30 μ); C — head end of larva immediately before the third moult; below the old buccal capsule the new one is already forming (from experimentally infected perch, 14 days p.i.) (scale = 10 μ); D — buccal capsule of older fourth-stage larva from experimentally infected perch, 69 days p.i. (lateral view) (scale = 10 μ).