

STUDIES ON LIFE - CYCLES OF

DIGENETIC TREMATODES

A thesis presented for the Degree of Doctor of Philosophy

by

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VOLUME 2 - PLATES

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EXPLANATION OF PLATES

AUT	ascending uterus	U or UT	uterus
C or Cir	cirrus	VD	vas deferent
CGP	common genital pore	VE	vas efferent
CS	cirrus sac	VR	vitelline reservoir
CVD	common vitelline duct		
E	egg		
ED	ejaculatory duct		
ESV	external seminal vesicle		
GA	genital atrium		
GC	gland cells		
GP	genital pore		
ISV	internal seminal vesicle		
LC	Laurer's canal		
LVD	lateral vitelline duct		
M	metraterm		
MG	Mehlis' gland		
MV	median vitelline duct		
OE	oesophagus		
OOT	ootype		
OV	ovary		
OVD or OVID	oviduct		
OVIC	ovicapt		
PC	prostatic cells		
PP	pars prostatic		
PPH	prepharynx		
RS	receptaculum seminal uterinum		
SR	seminal receptacle		
SV	Seminal vesicle		
T	testis		

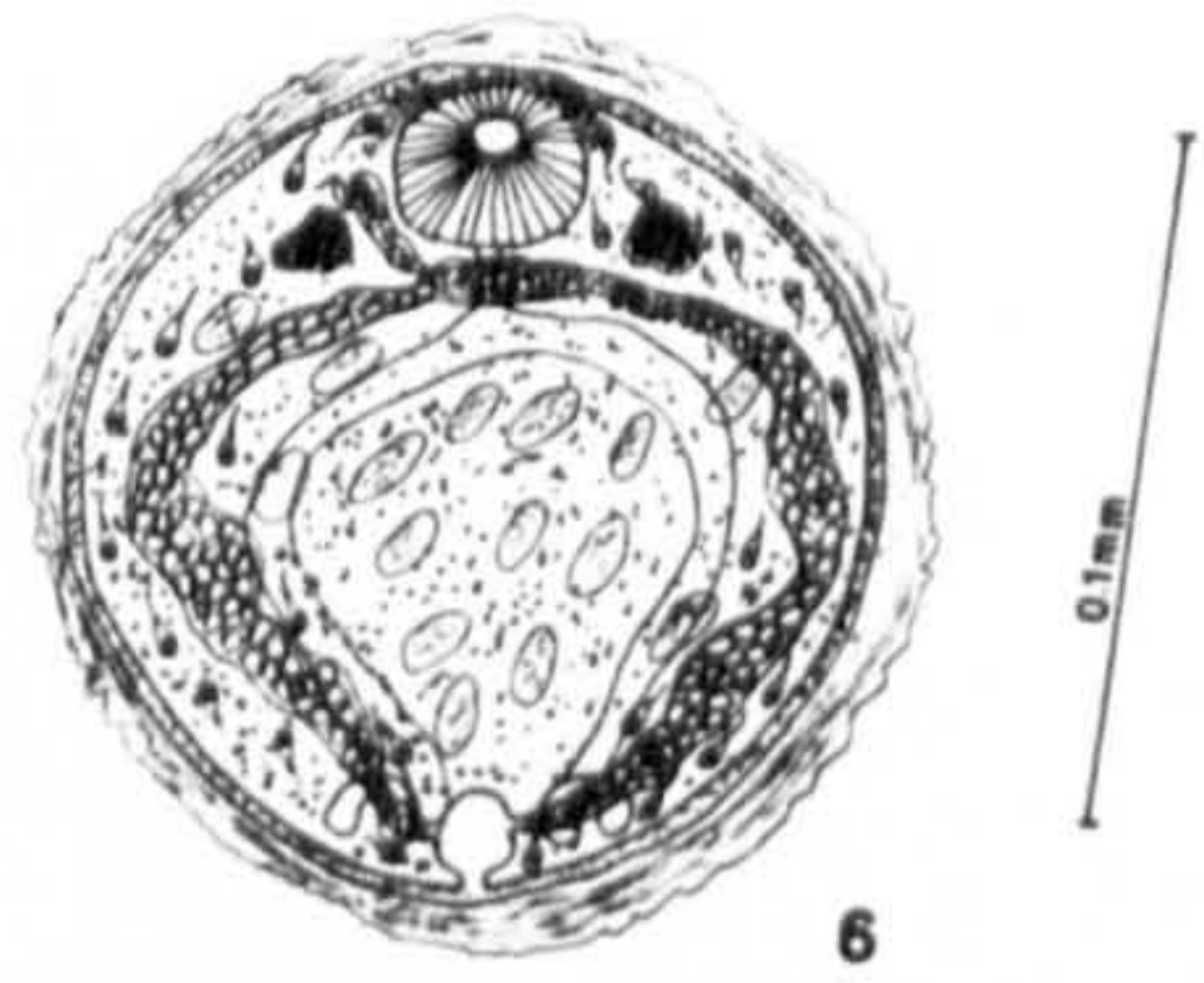
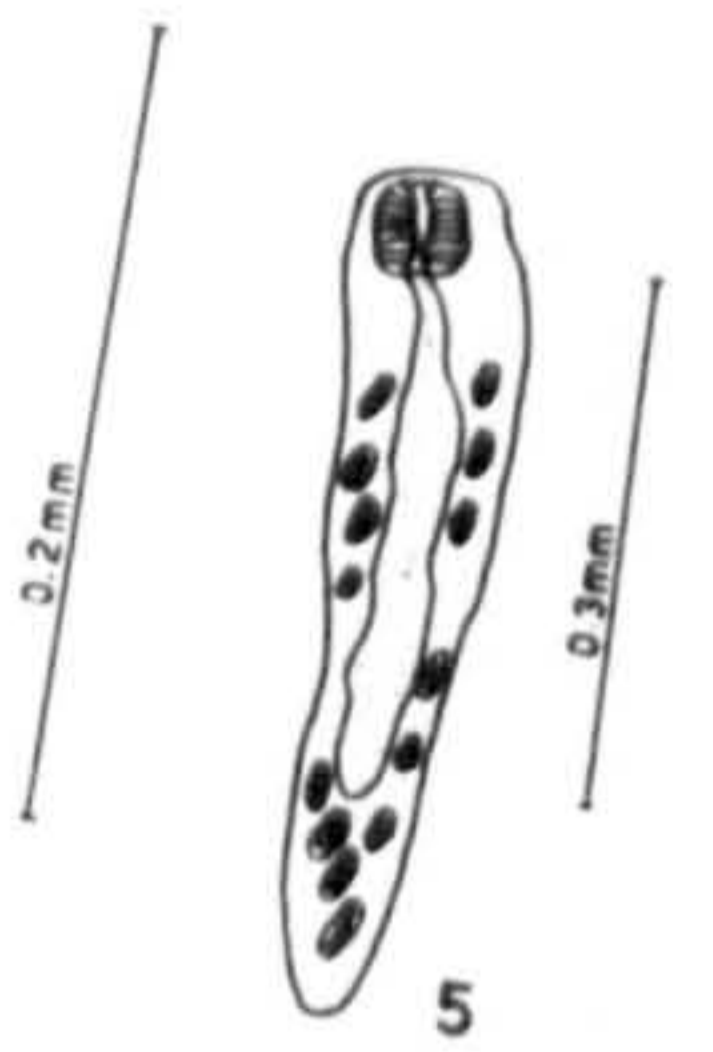
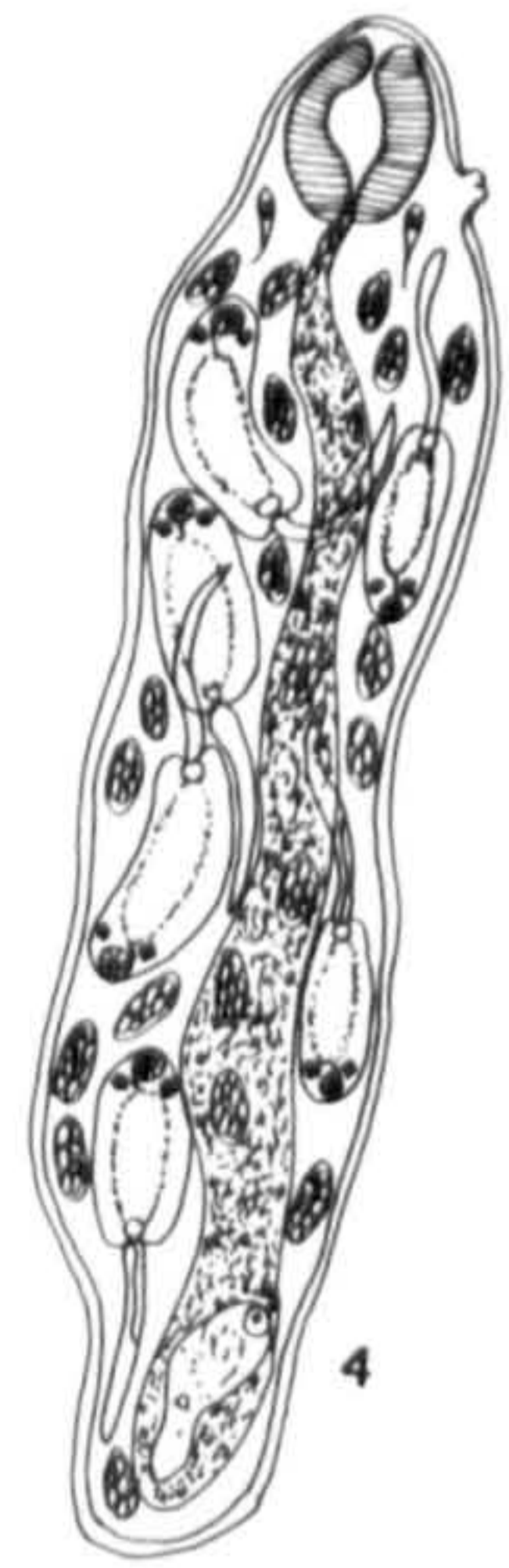
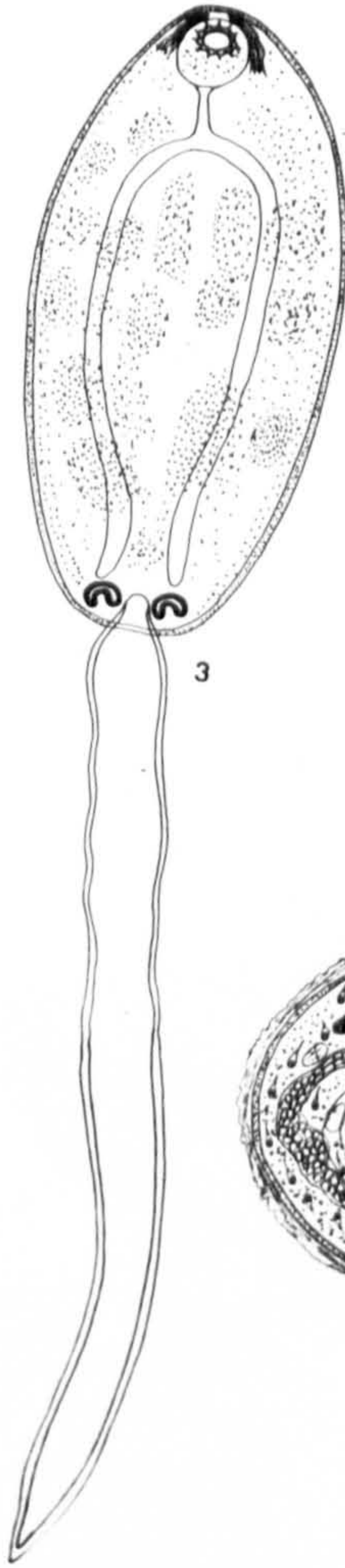
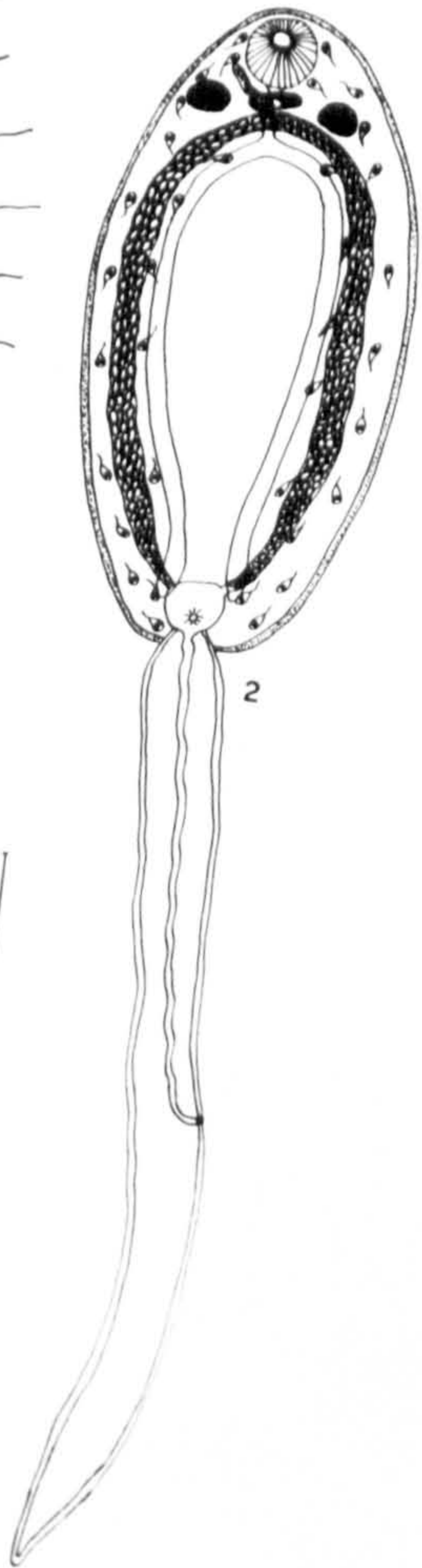
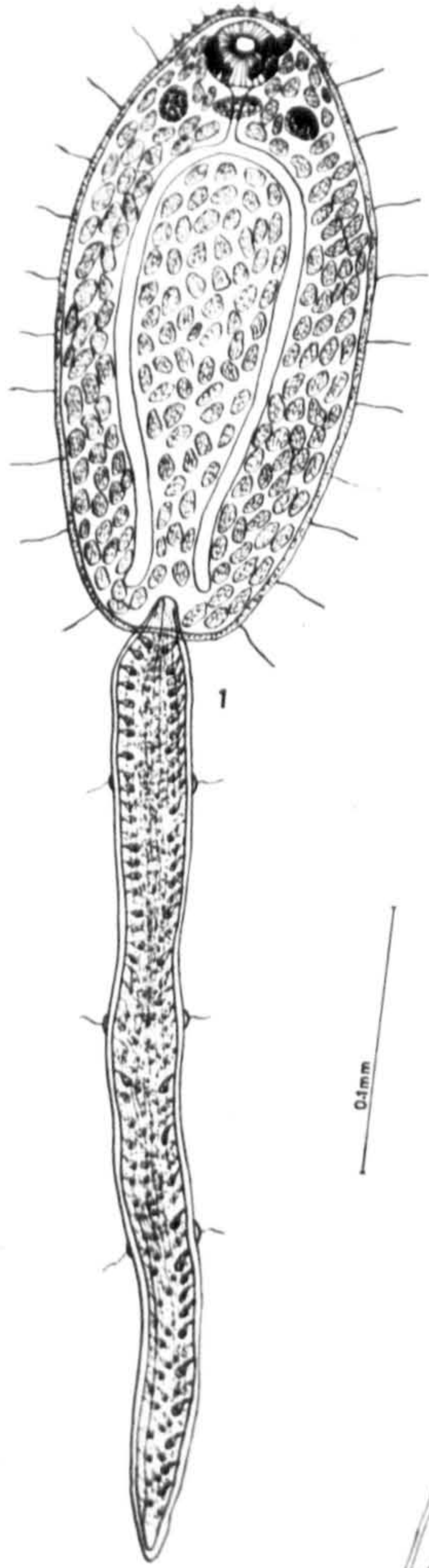
Plates 1-4'

Notocotylus imbricatus

Notocotylus imbricatus

Plate 1

- Fig. 1. Cercaria - ventral view, showing distribution of hair-like projection on papillae and cystogenous gland -cells.
- Fig. 2. Cercaria - ventral view showing protonephridial system. Note finger-like diverticulum originating from transverse commissure, probable arrangement of flame cells and undivided caudal excretory duct.
- Fig. 3. Cercaria - ventral view, showing digestive systems, mouth opening surrounded by setae on papillae, distribution of pigments over the body and locomotory pockets.
- Fig. 4. Mother redia - containing germ balls and cercariae.
Note the long intestine filled with granular material.
- Fig. 5. Small daughter rediae - containing only germ balls.
- Fig. 6. Encysted metacercaria - seven days old.



Notocotylus imbricatus

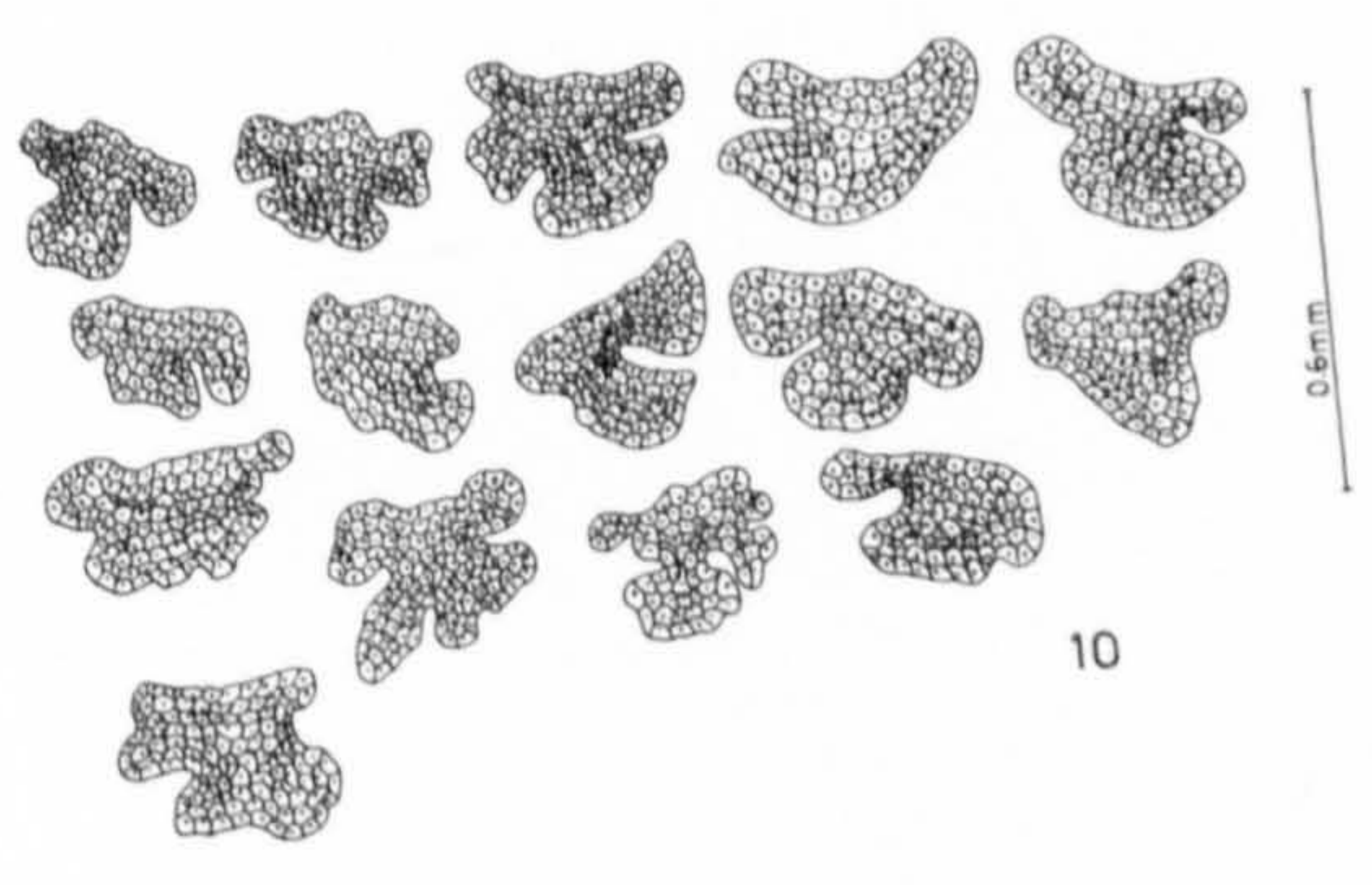
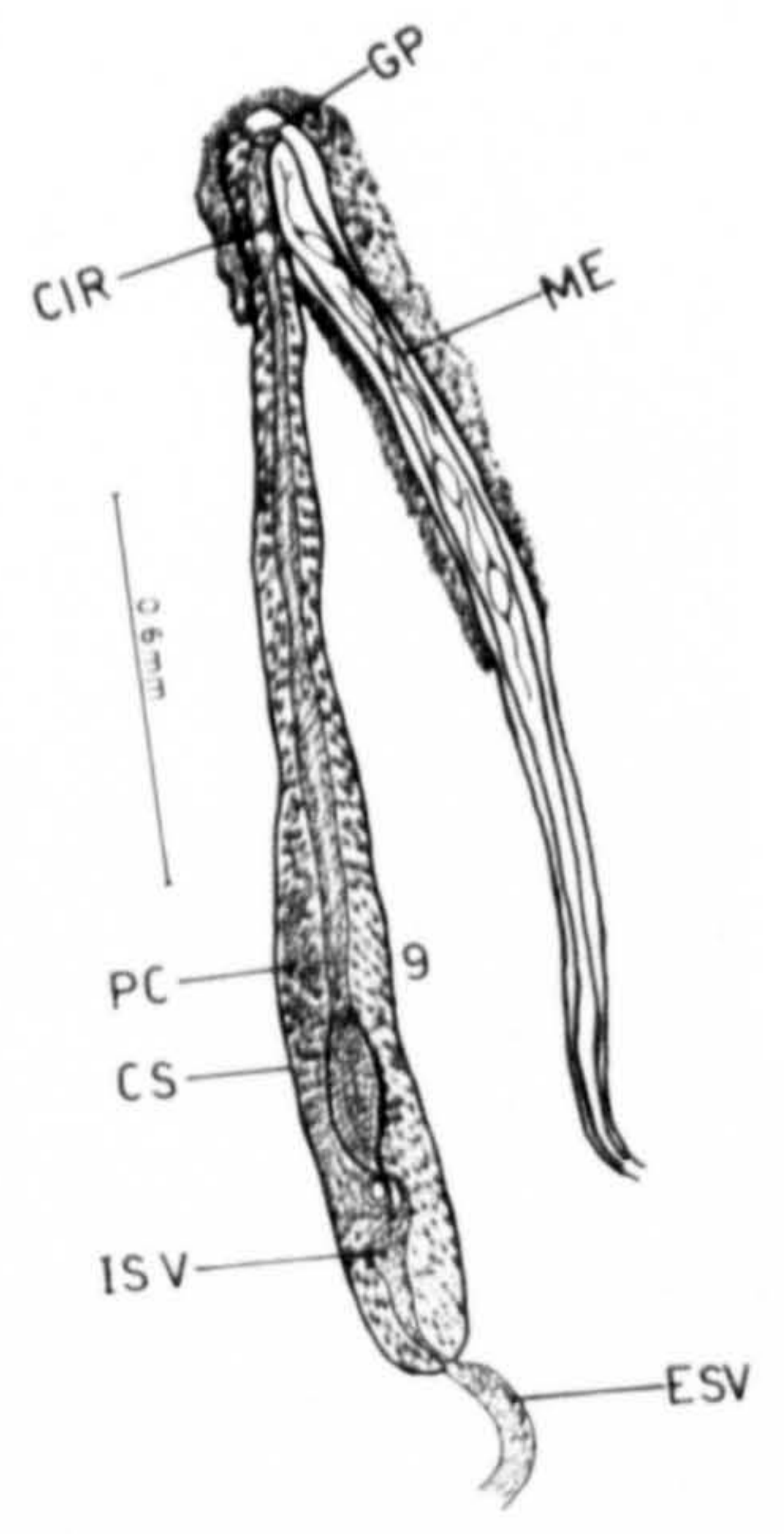
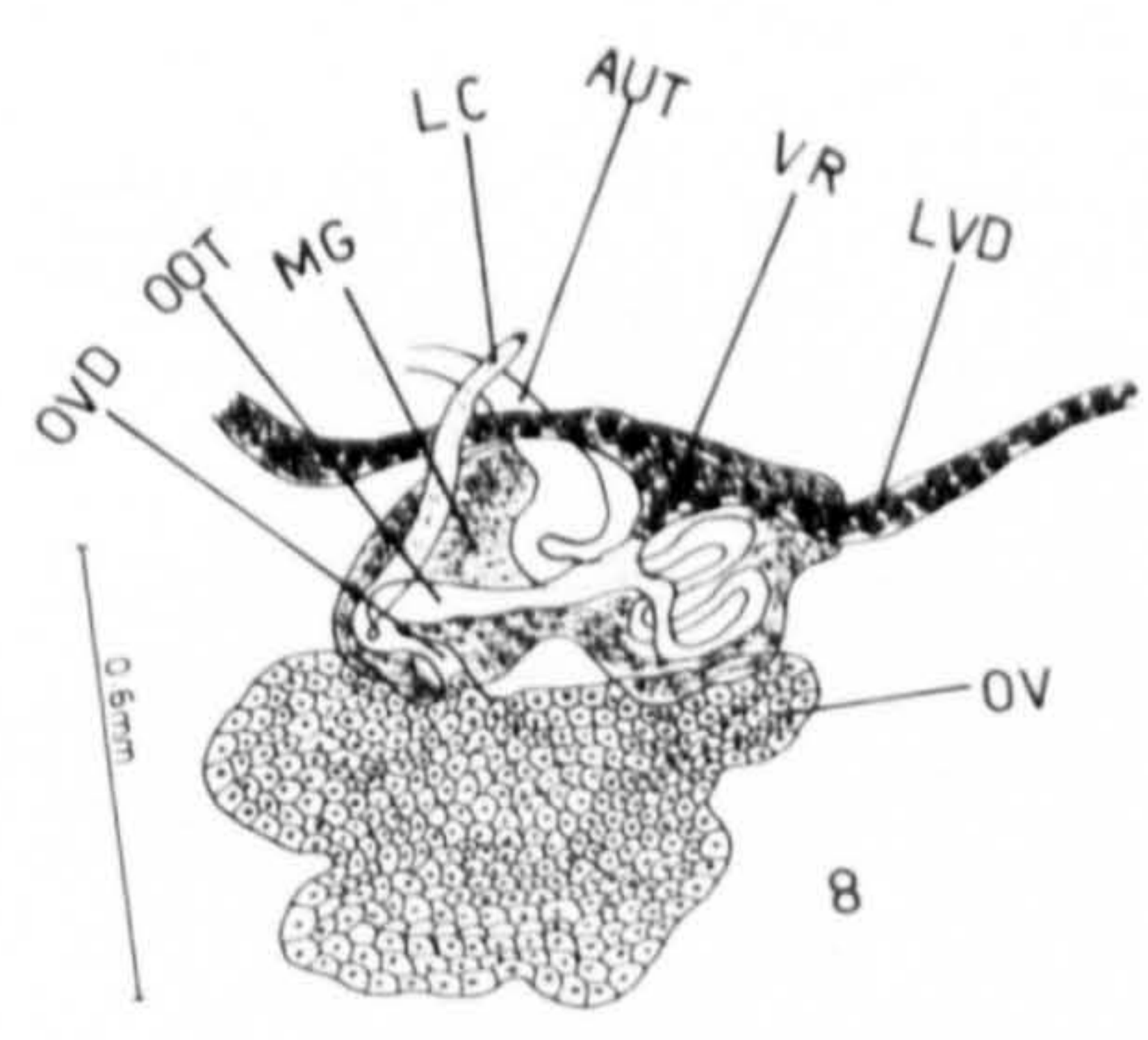
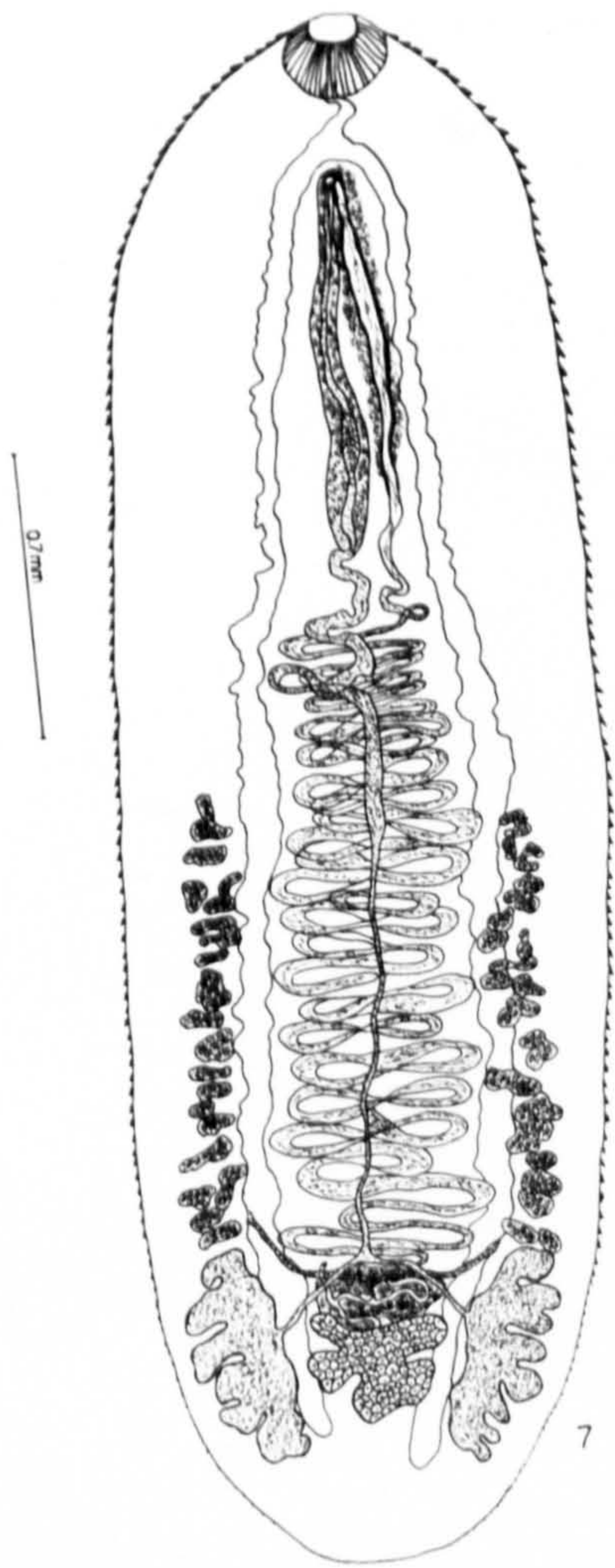
Plate 2

Fig. 7. Adult - fifteen days old from experimental infection of duck
ventral view (ventral glands omitted).

Fig. 8. Adult - female genital system.

Fig. 9. Adult - male genital ducts.

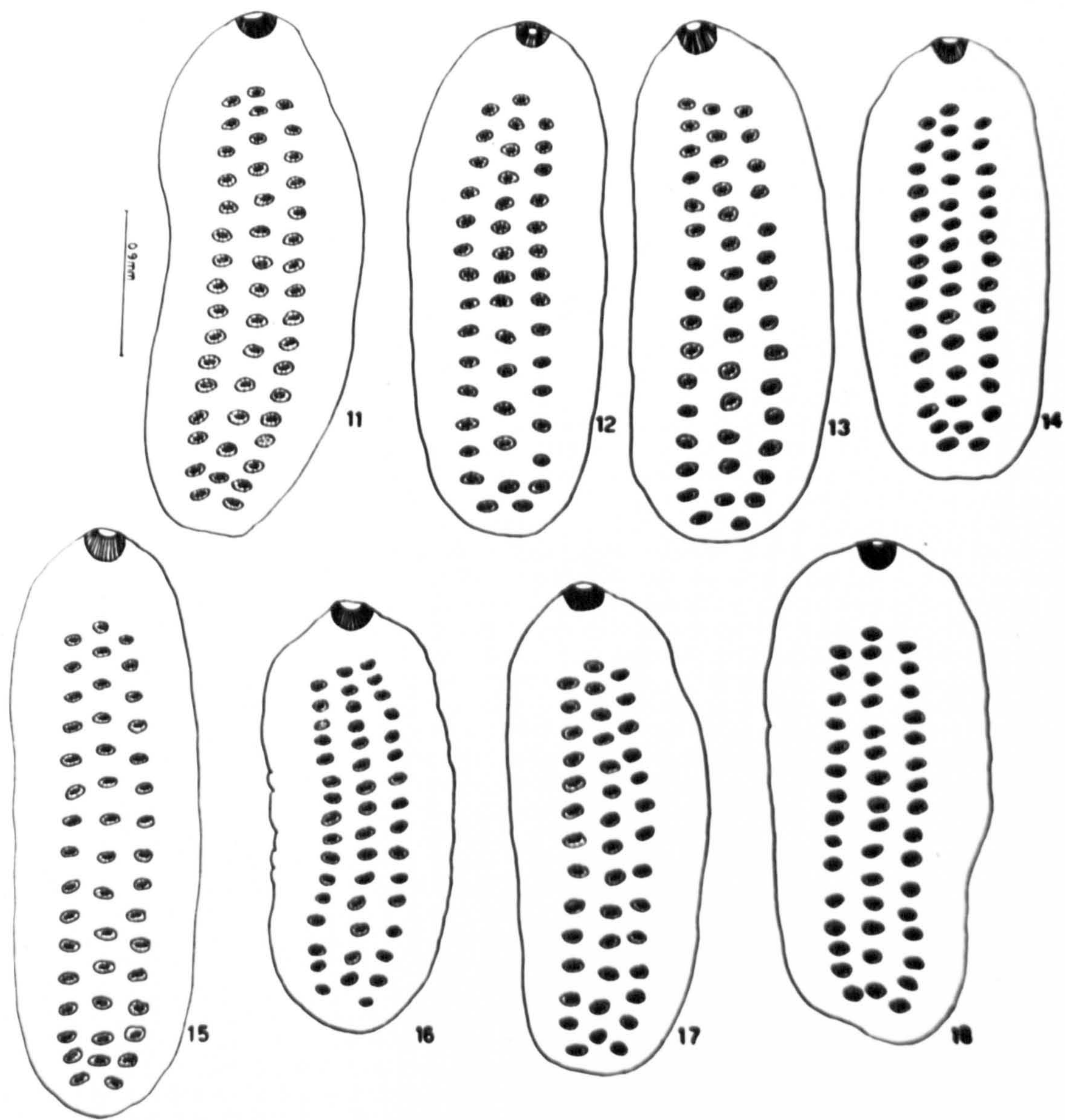
Fig. 10. Adult - showing variation in the number of ovary lobes.



Notocotylus imbricatus

Plate 3

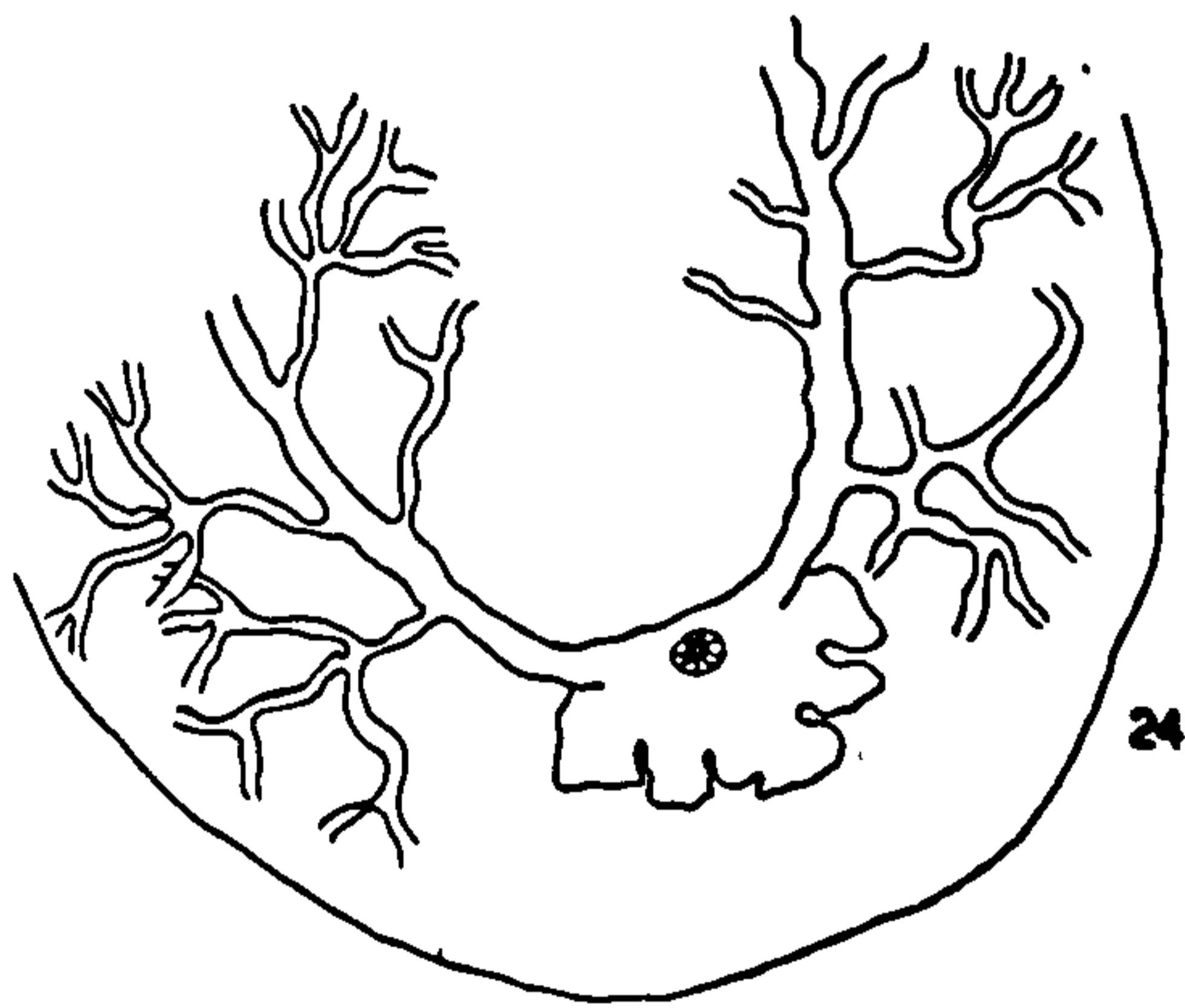
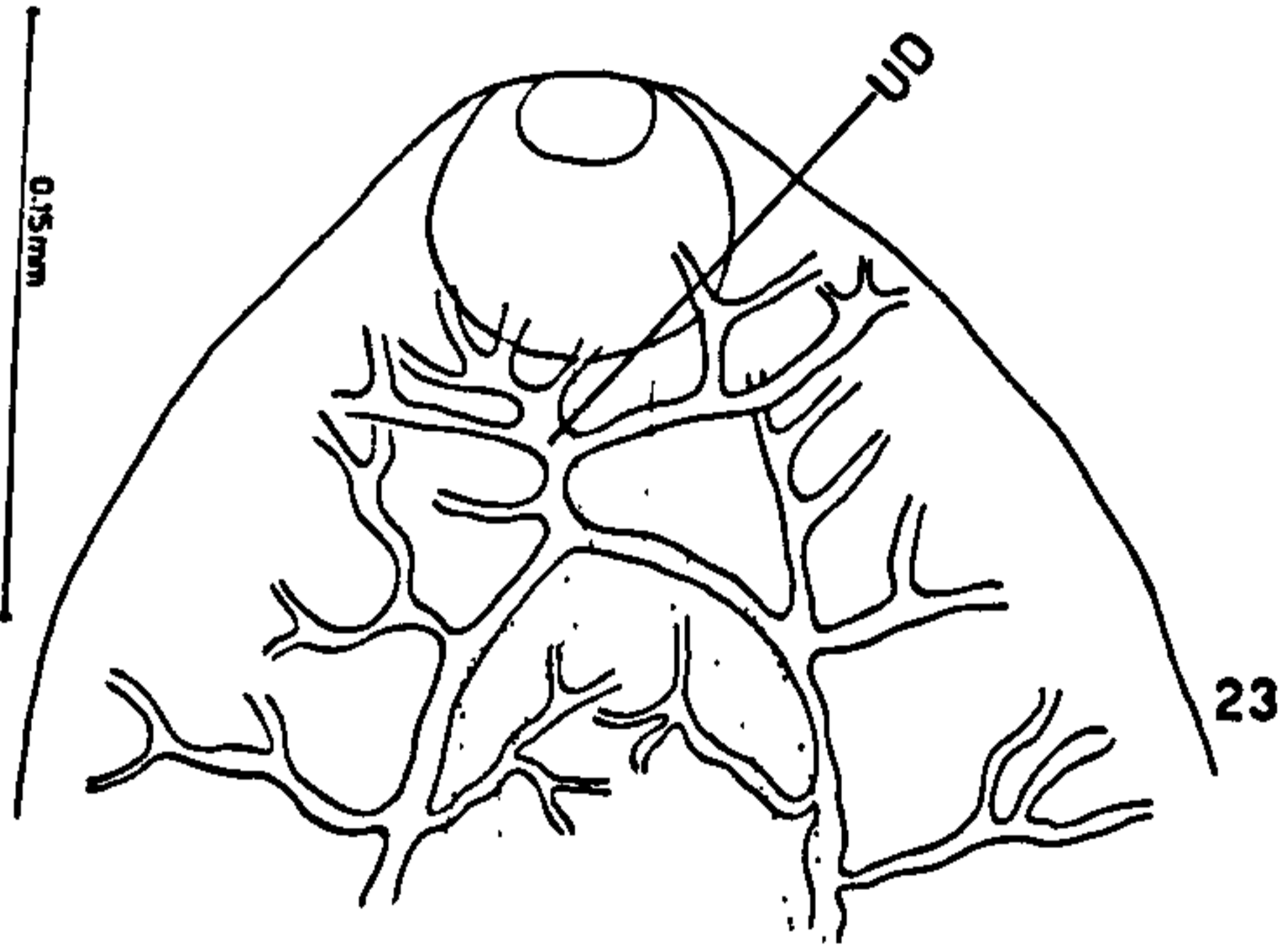
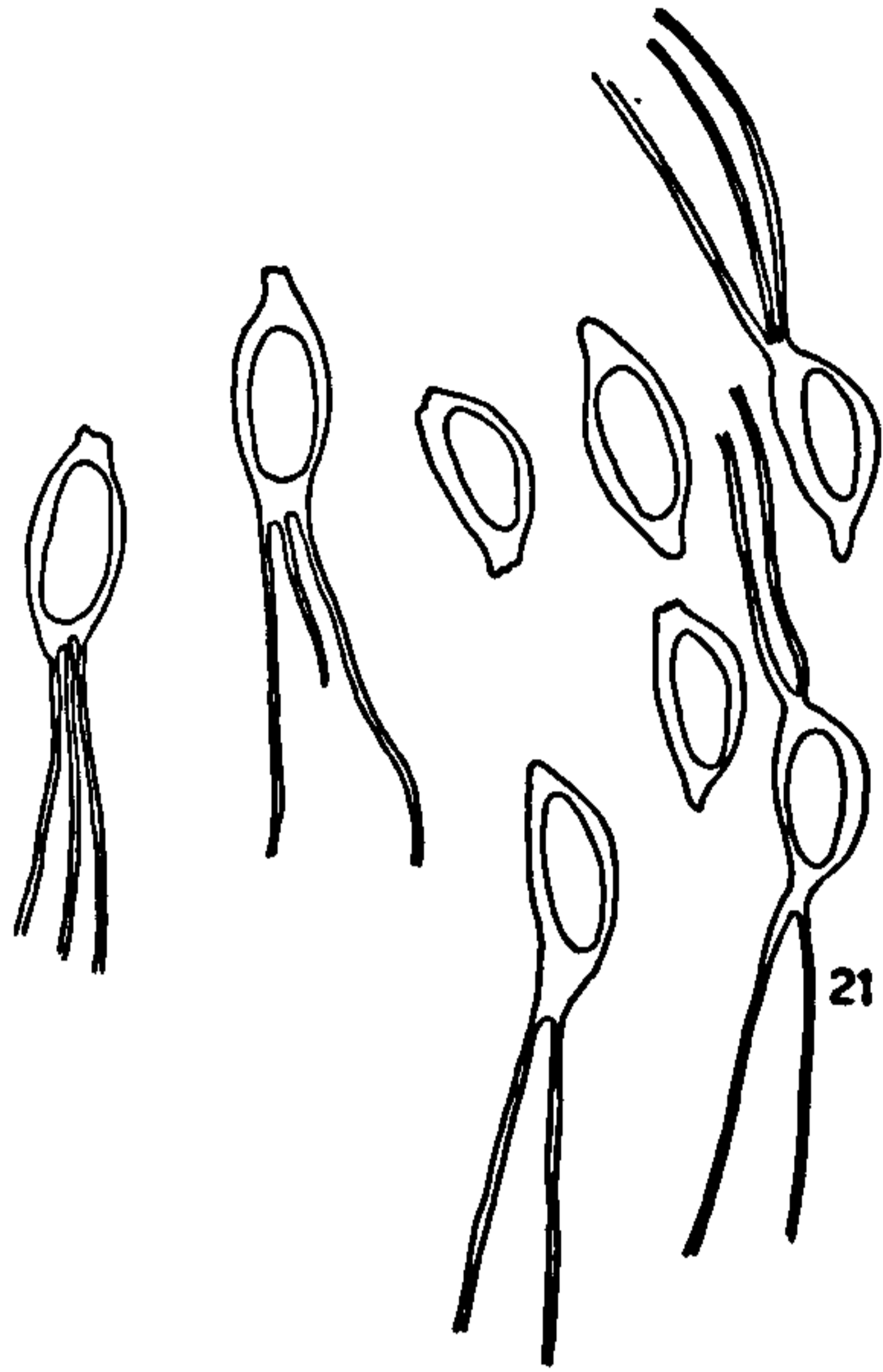
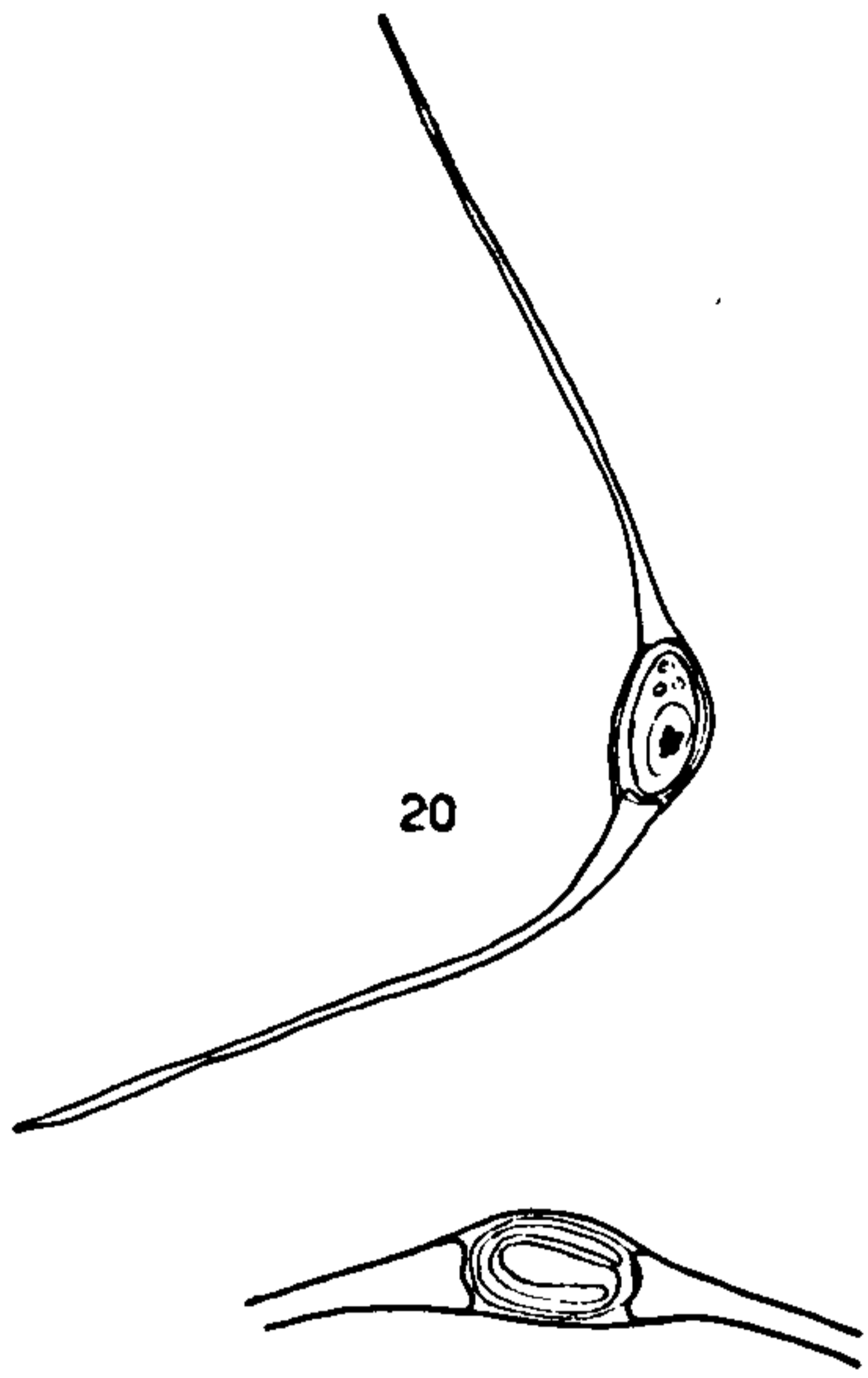
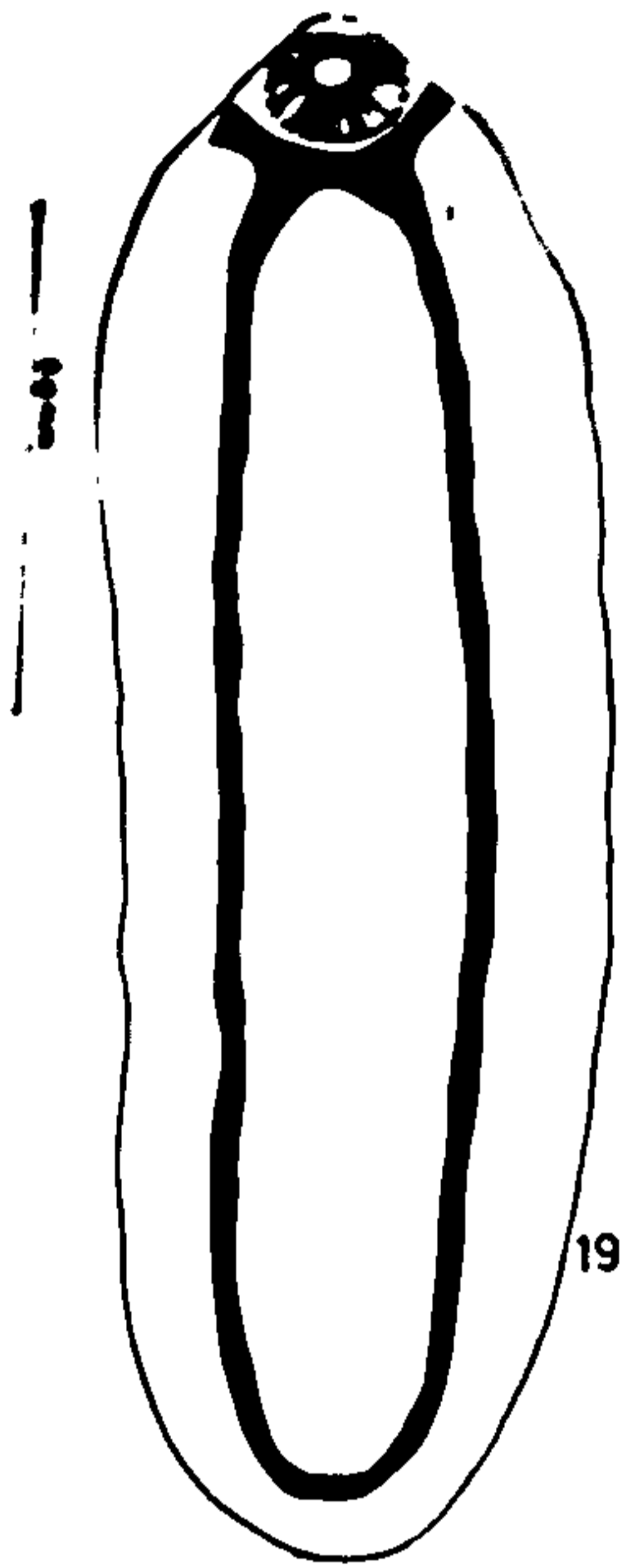
Figs. 11-18. Adult - ventral views showing variations in the number and arrangement of lateral and median ventral glands (from various hosts).



Notocotylus imbricatus

Plate 4

- Fig. 19. Ten days old immature adult - dorsal view showing nervous system.
- Fig. 20. Mature egg - showing polar filaments.
- Fig. 21. Mature egg - showing variation in number of filaments and some eggs without filaments.
- Fig. 22. Mature egg - showing internal filament.
- Fig. 23. Adult - ventral view of anterior end showing protonephridial system with a finger-like diverticulum and additional lateral branches.
- Fig. 24. Adult - ventral view of posterior end showing protonephridial system with excretory bladder and additional lateral branches on primary ducts.



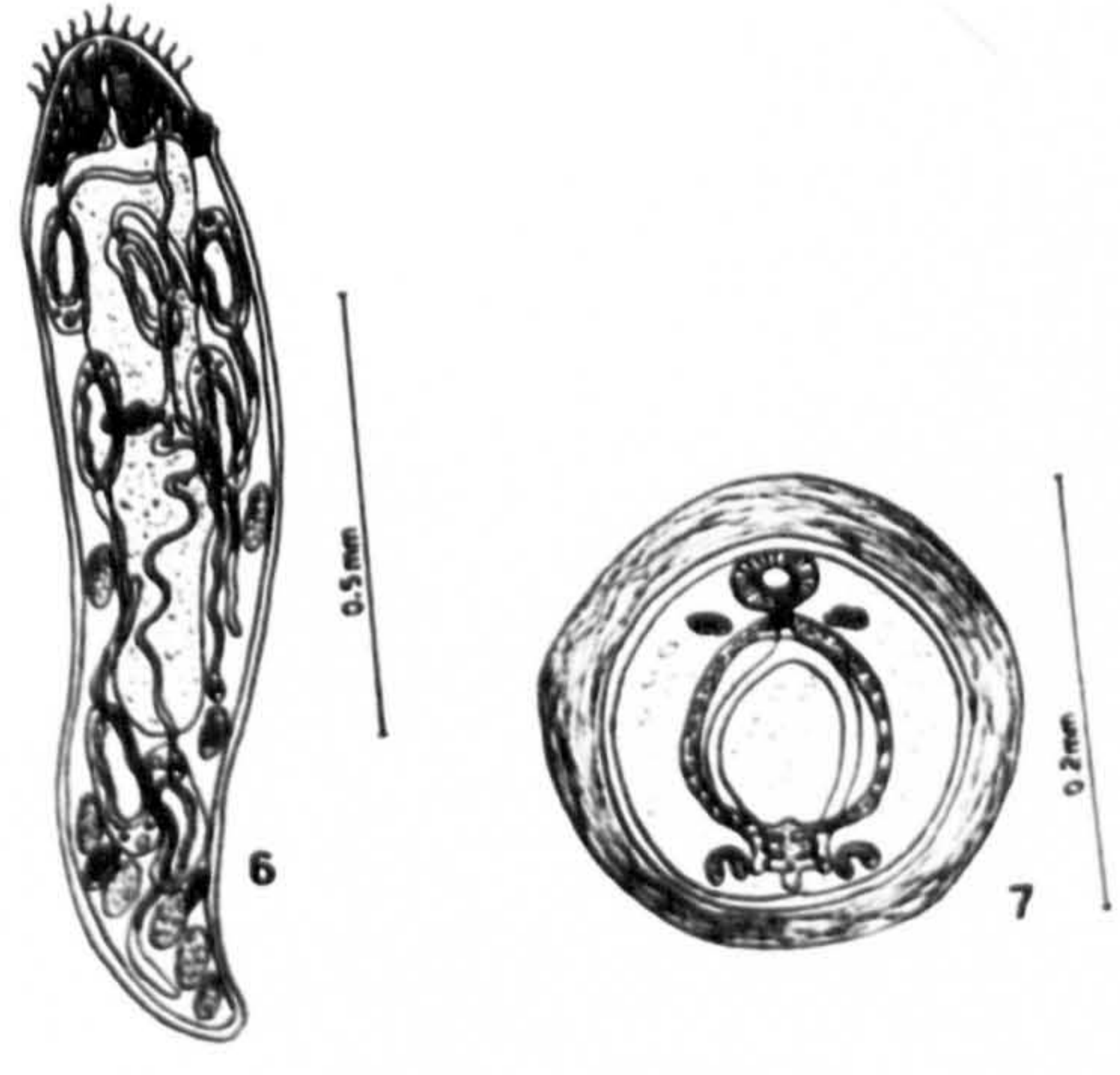
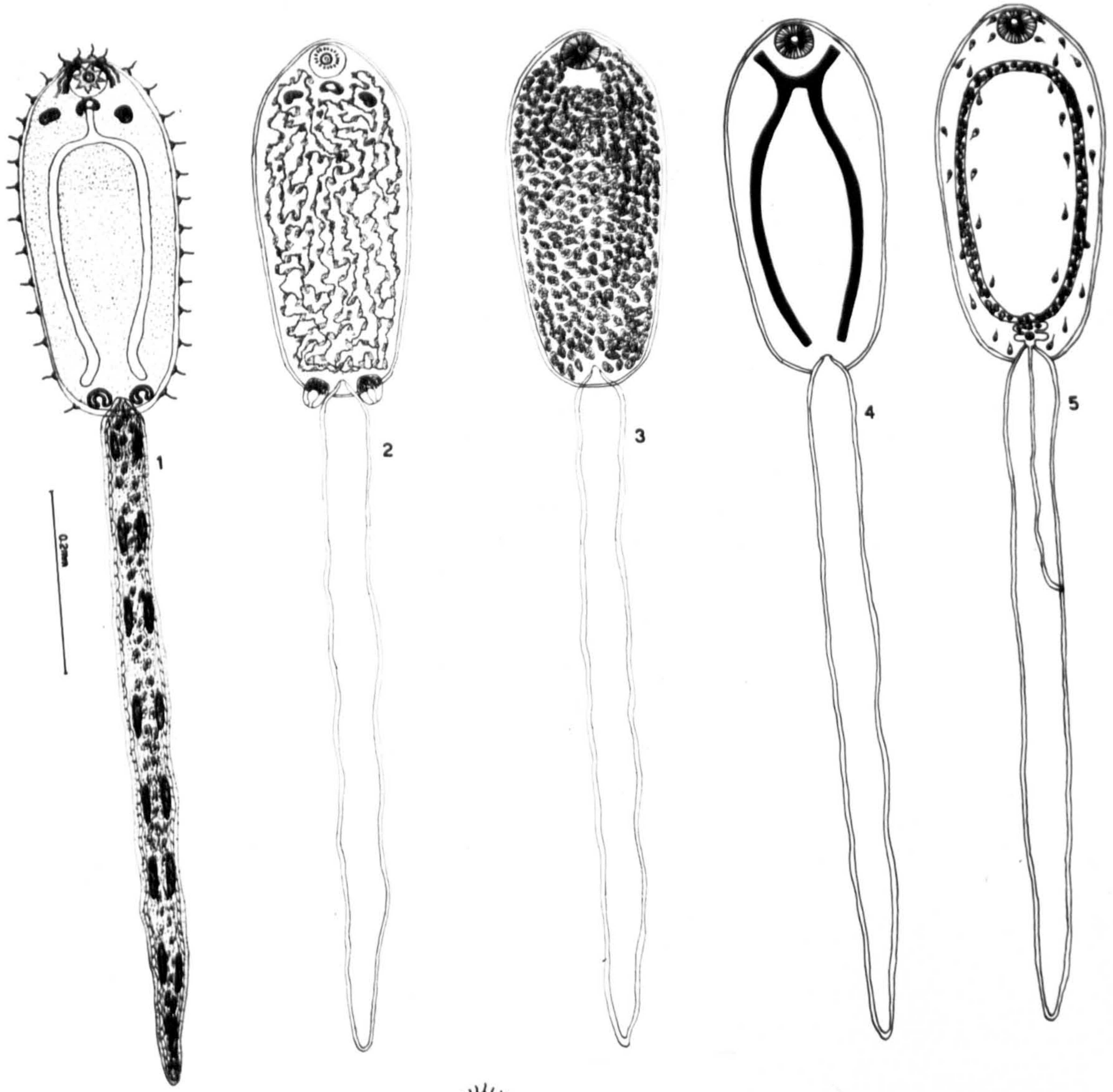
Plates 5 - 8

Notocotylus attenuatus

Notocotylus attenuatus

Plate 5

- Fig. 1. Cercaria - ventral view showing digestive system, mouth opening bordered with papillae on setae, cuticle of body with hair-like projection on papillae and glandular cells in the tail.
- Fig. 2. Cercaria - ventral view with oral sucker showing a concentric ring of minute spines. Note the distribution of pigments of body and evaginated locomotory pockets.
- Fig. 3. Cercaria - ventral view, showing distribution of cystogenous gland-cells.
- Fig. 4. Cercaria - ventral view of nervous system.
- Fig. 5. Cercaria - protonephridial system showing anterior commissure without finger-like diverticulum and probable arrange of flame cells. Note undivided excretory duct.
- Fig. 6. Redia - showing mainly short hair-like projection on papillae and the protonephridial system.
- Fig. 7. Encysted metacercaria - twenty days old.



Notocotylus attenuatus

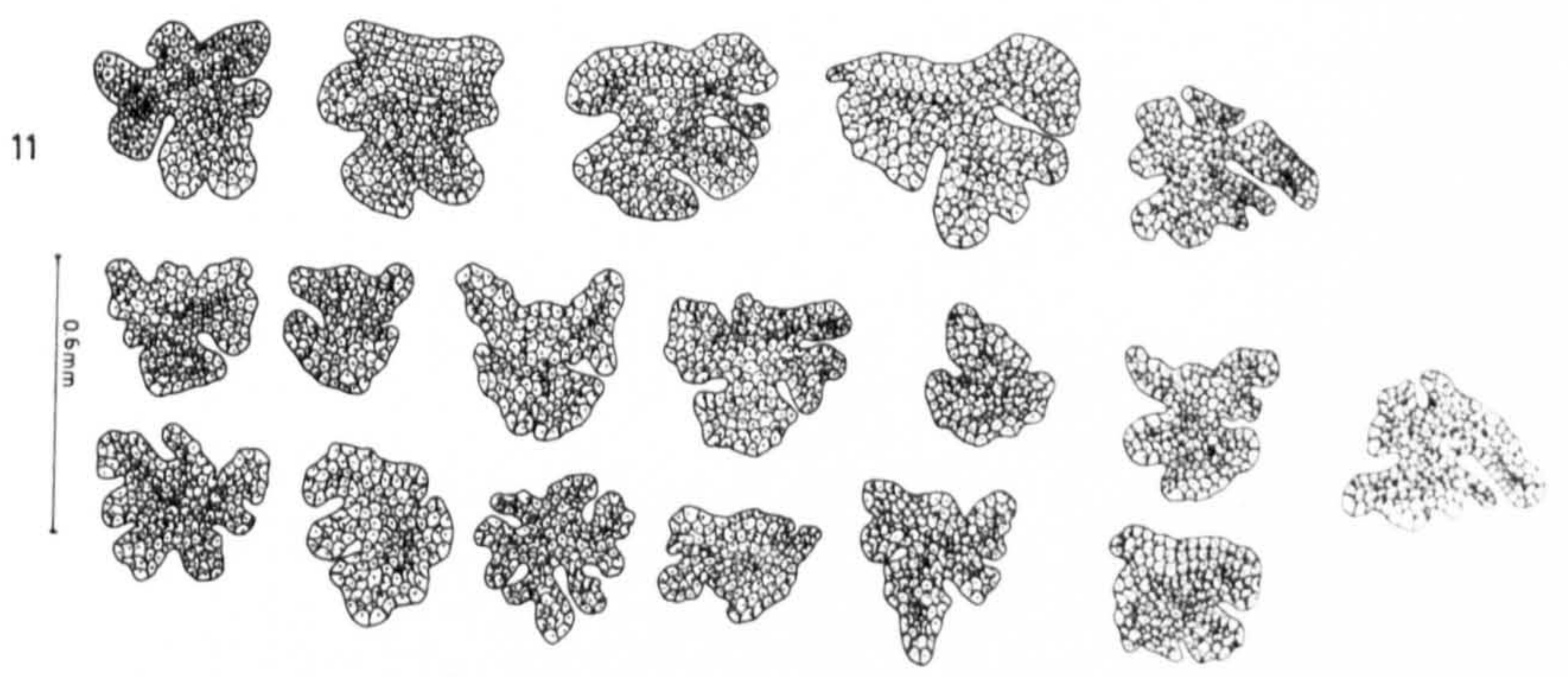
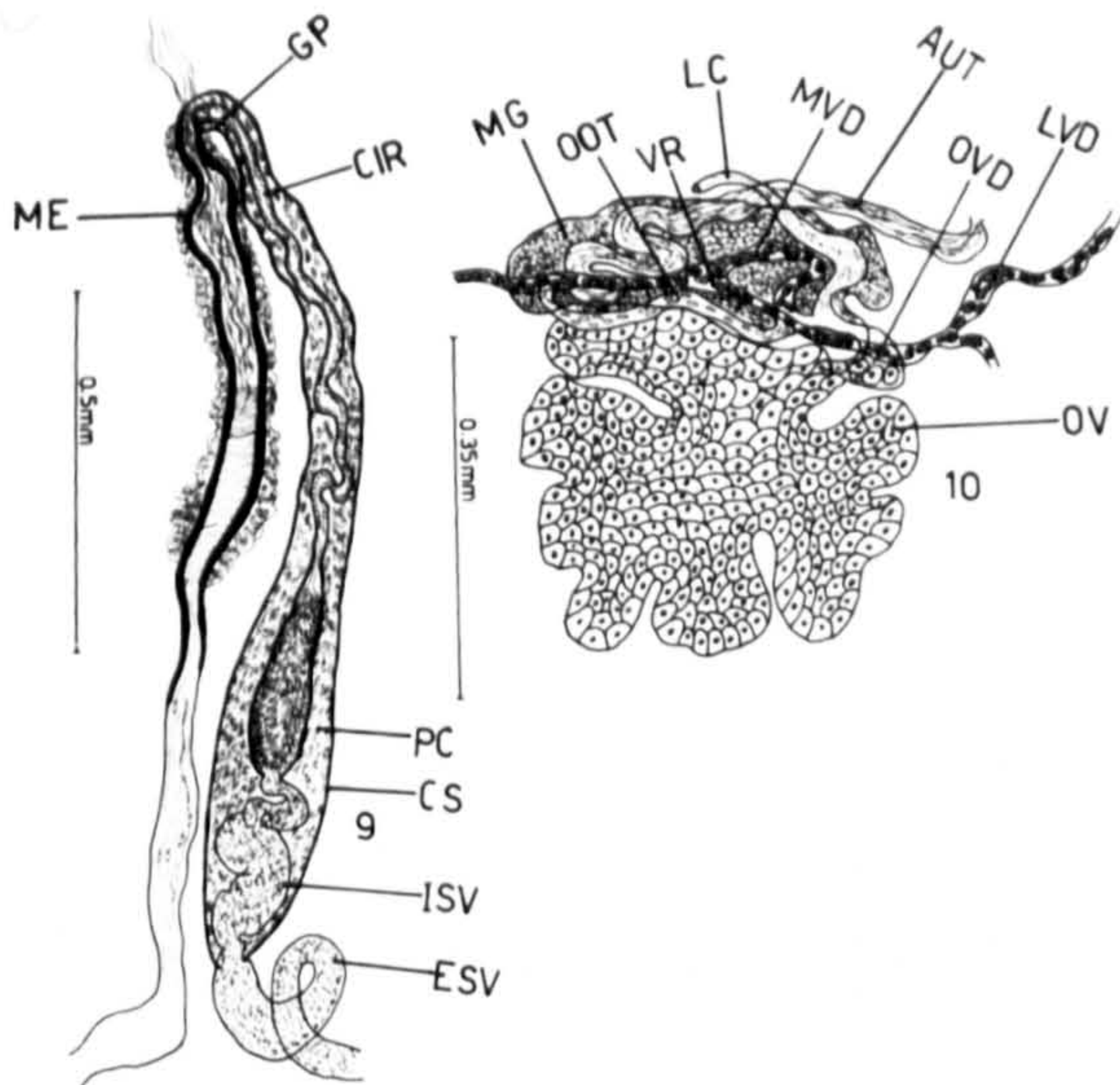
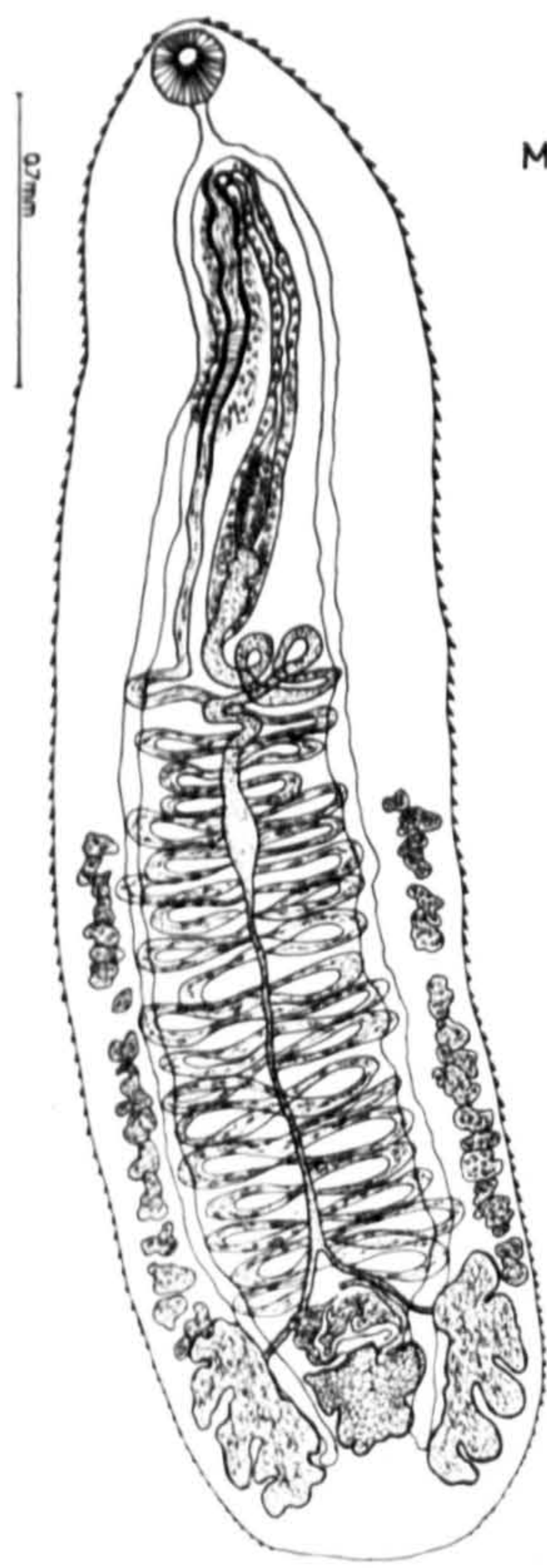
Plate 6

Fig. 8. Adult - sixteen days old from experimental of duck in ventral view (ventral glands omitted).

Fig. 9. Adult - male genital ducts.

Fig. 10. Adult - female genital system.

Fig. 11. Adult - showing variations in the number of lobes of the ovary.



Notocotylus attenuatus

Plate 7

Fig. 12. Mature egg - showing polar filaments.

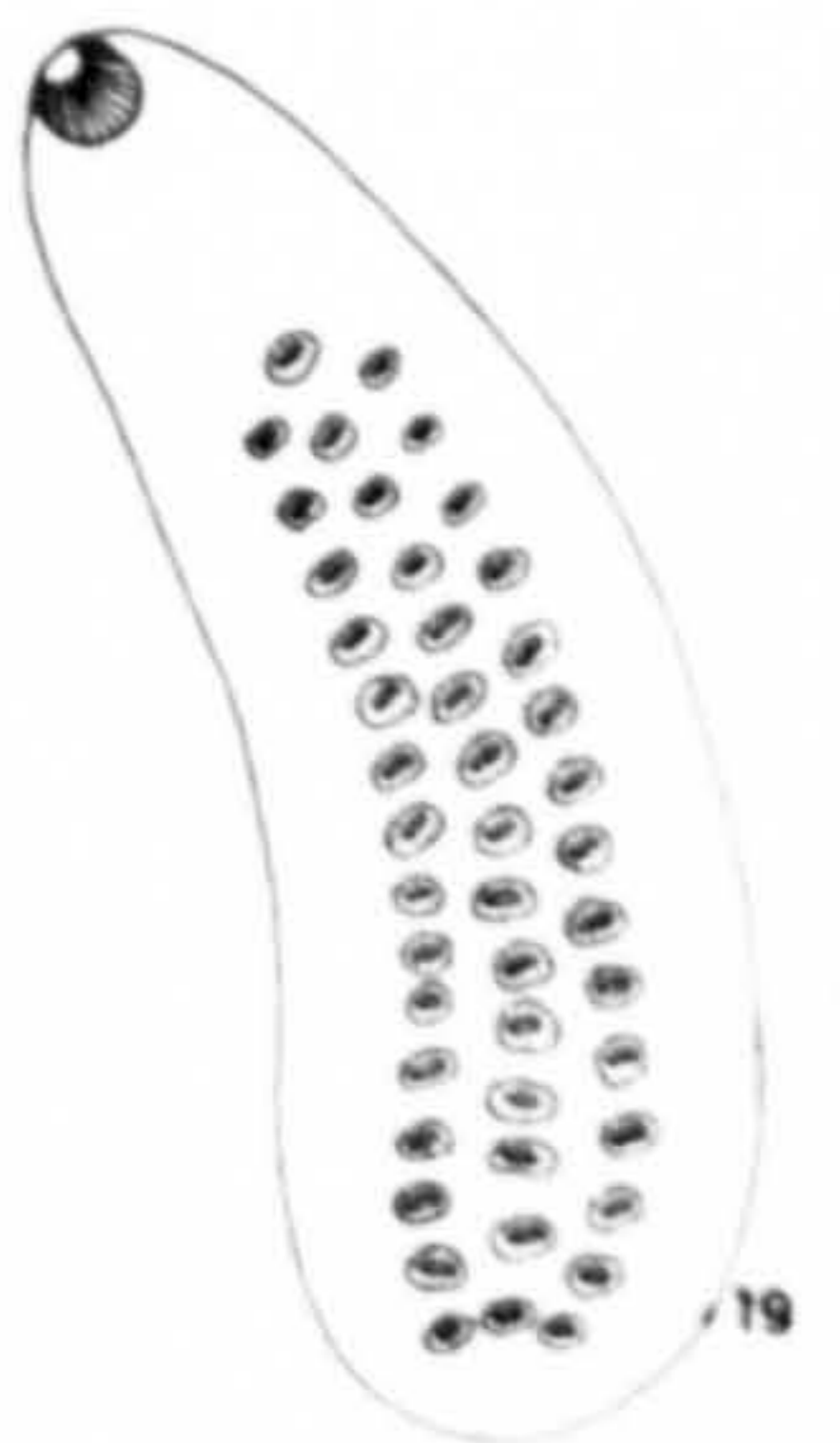
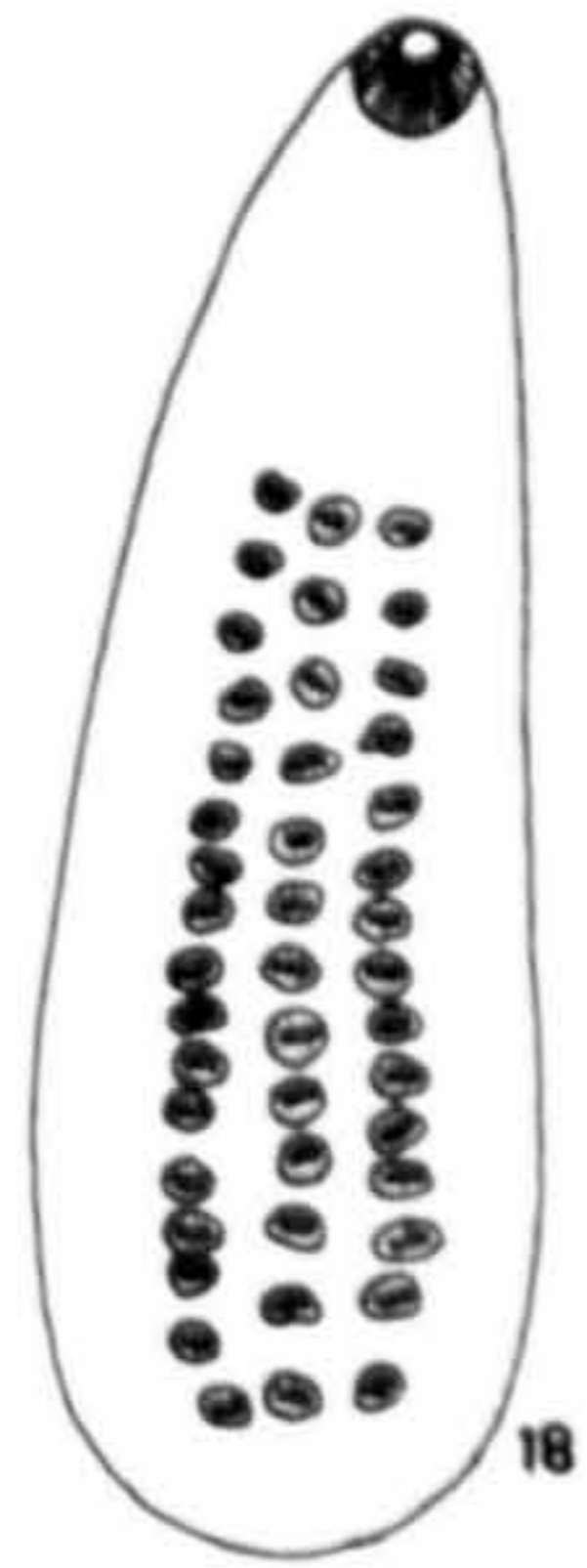
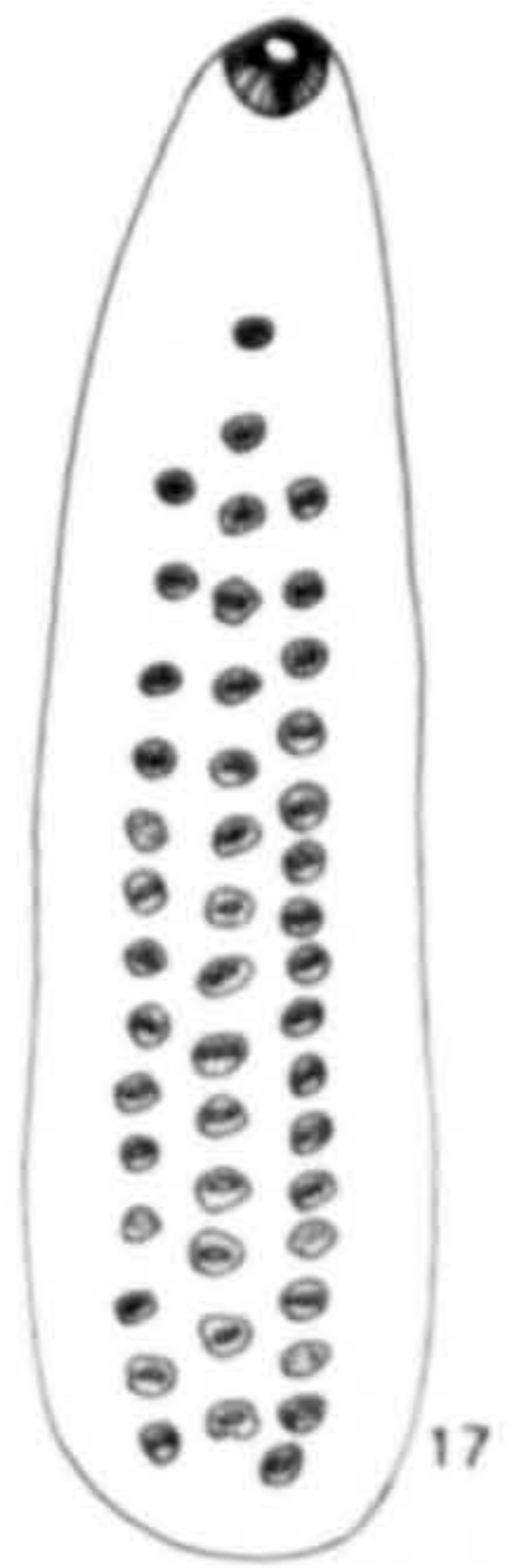
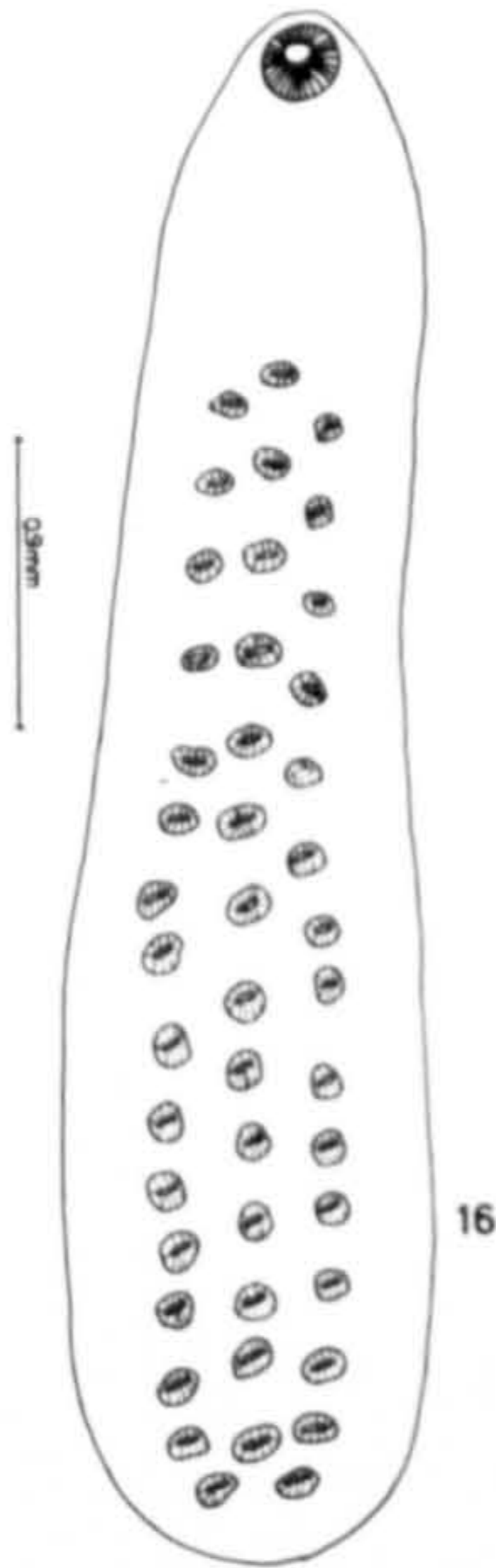
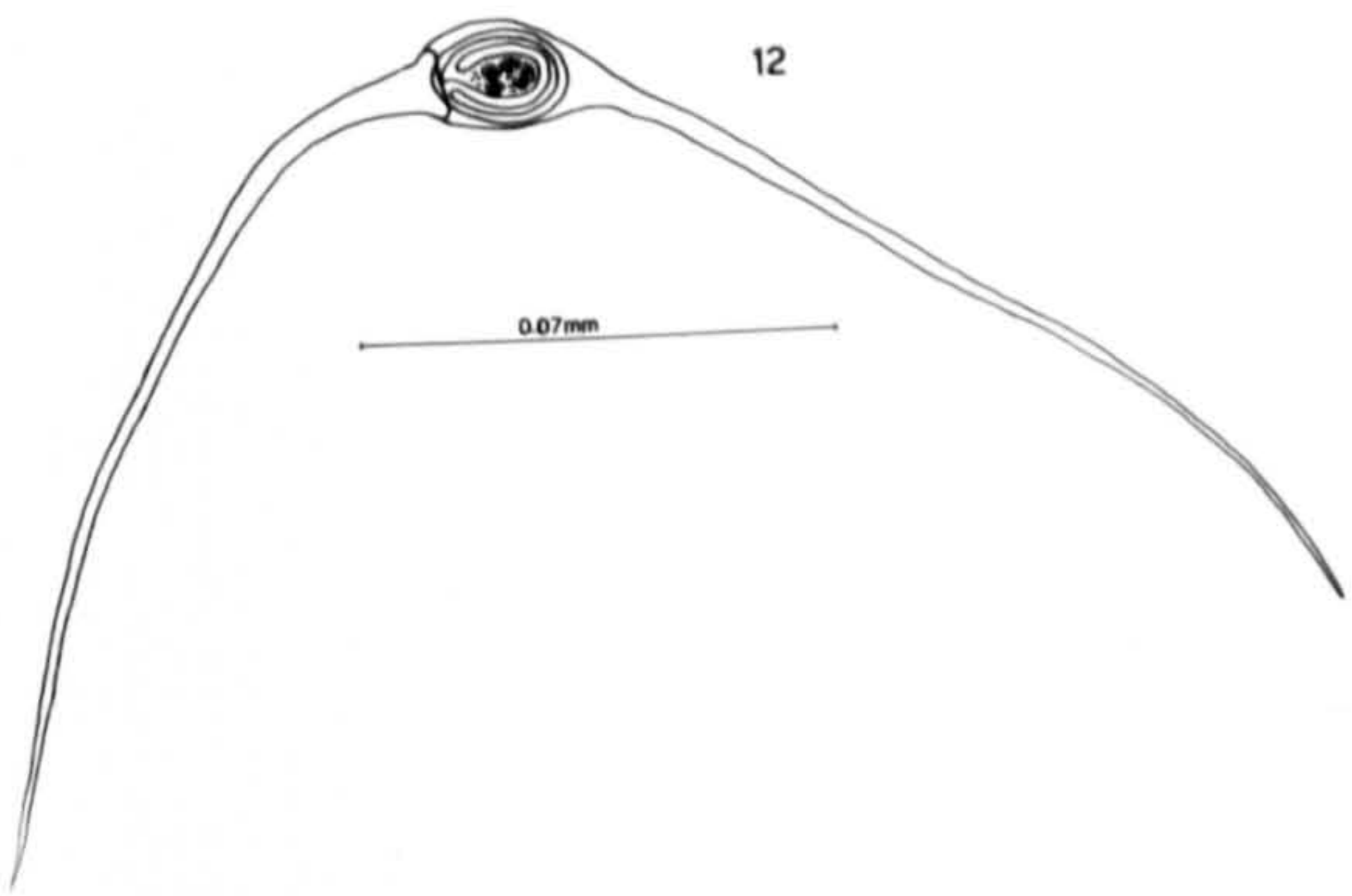
Fig. 13. Mature egg - showing internal filament forced out by the application of slight pressure to the coverslip.

Fig. 14. Mature egg - showing internal filament.

Fig. 15. Mature eggs - showing variations in the number of polar filaments.

Figs. 16-19. Adult - ventral views showing variation in lateral and median rows of ventral glands (from various hosts)

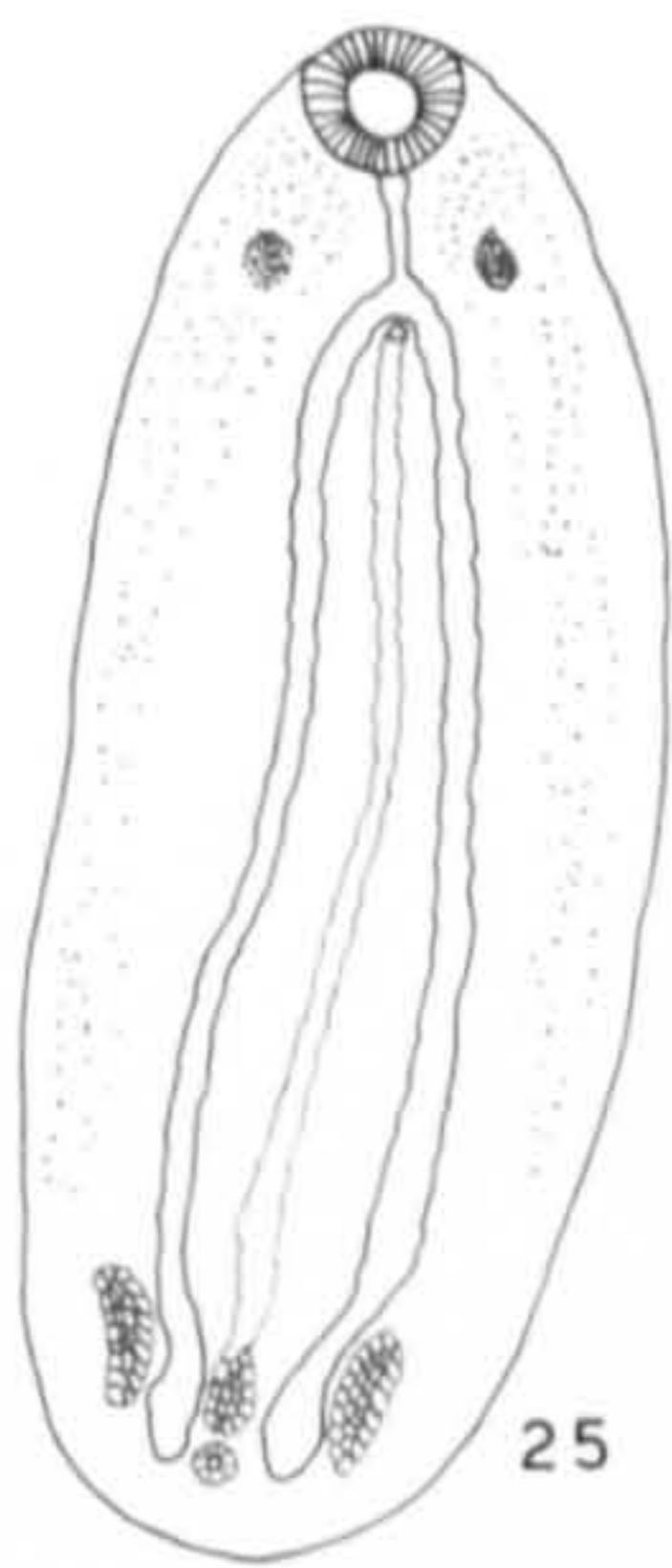
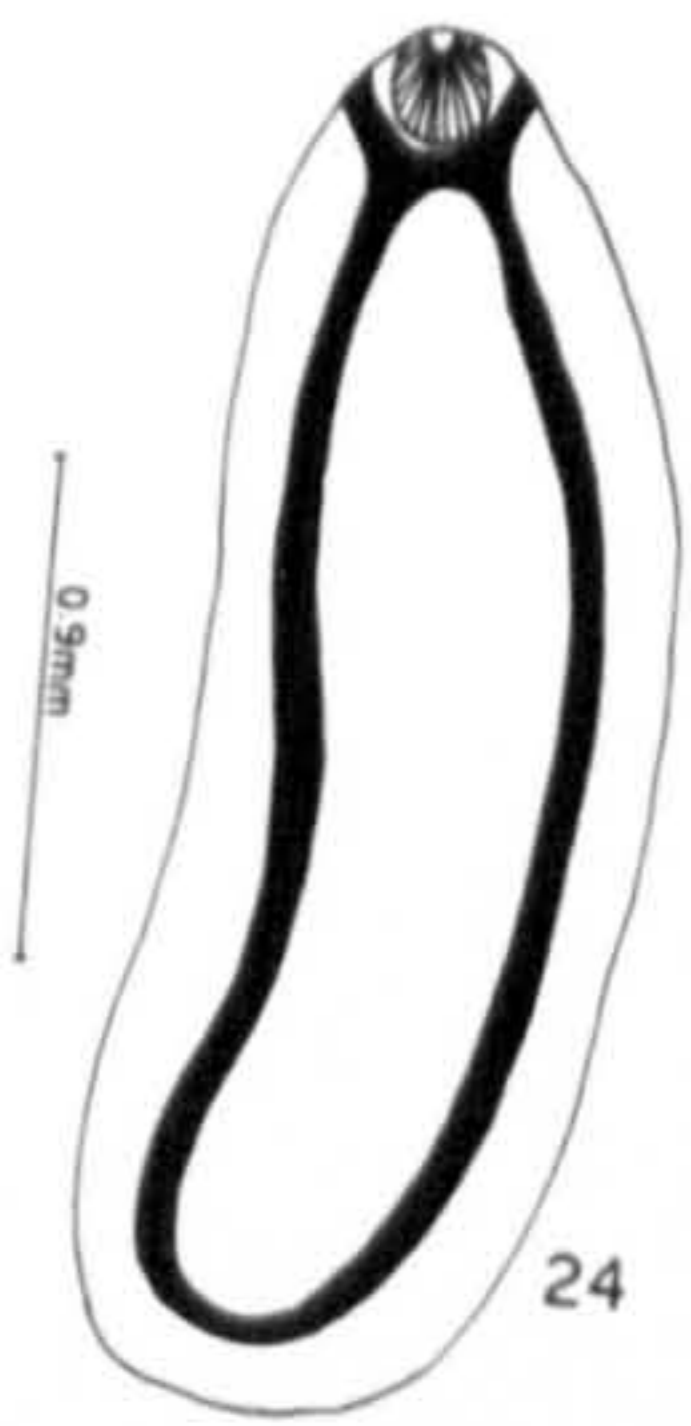
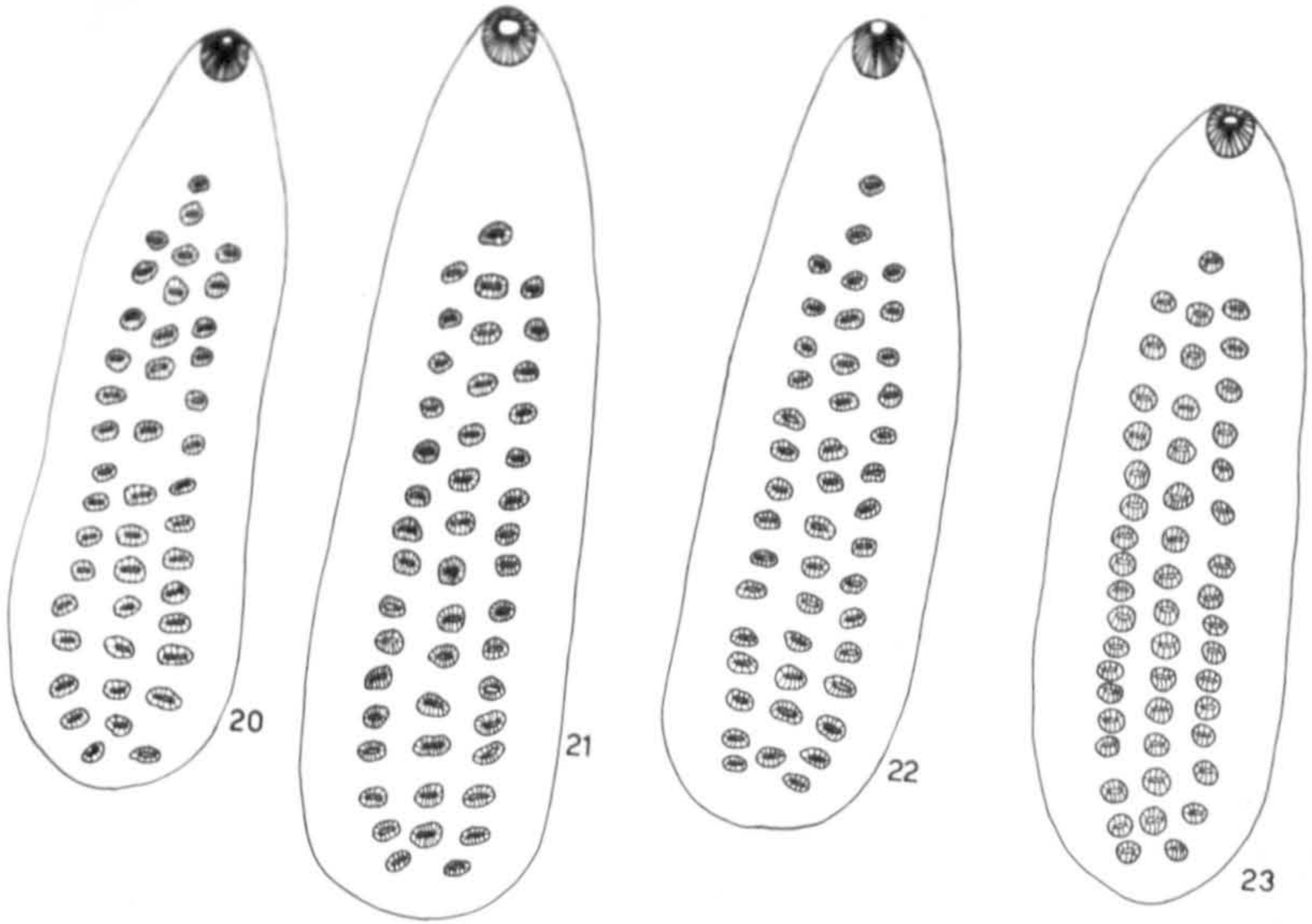
(continued in plate 4).



Notocotylus attenuatus

Plate 8

- Figs. 20-23. Adult - ventral views showing variation in lateral and median rows of ventral glands (from various hosts) (continued from Plate 4).
- Fig. 24. Immature adult - four days old showing nervous system in dorsal view.
- Fig. 25. Immature adult - six days old showing lateral eyespots, body pigments and genital rudiments.
- Fig. 26. Adult - ventral view of anterior end showing protonephridial system with additional lateral branches from anterior commissure.
- Fig. 27. Adult - ventral view of posterior end showing protonephridial system with excretory bladder and additional lateral branches from main excretory ducts.



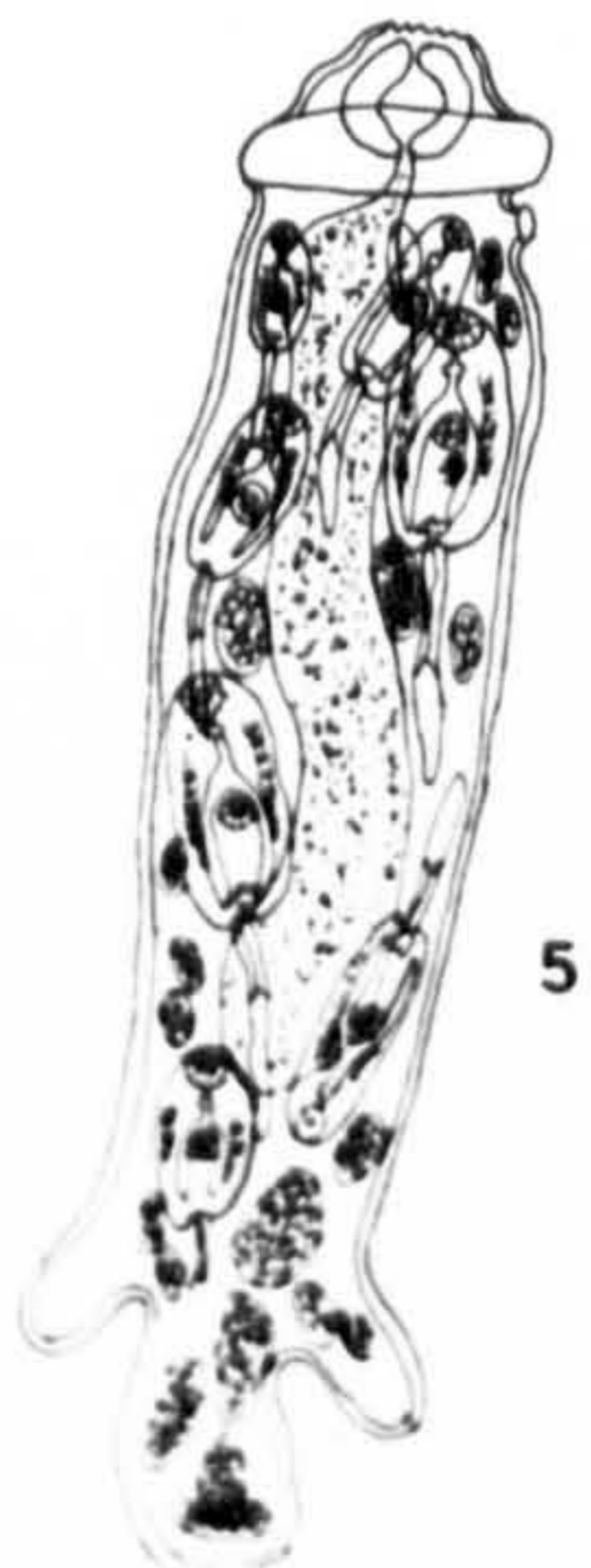
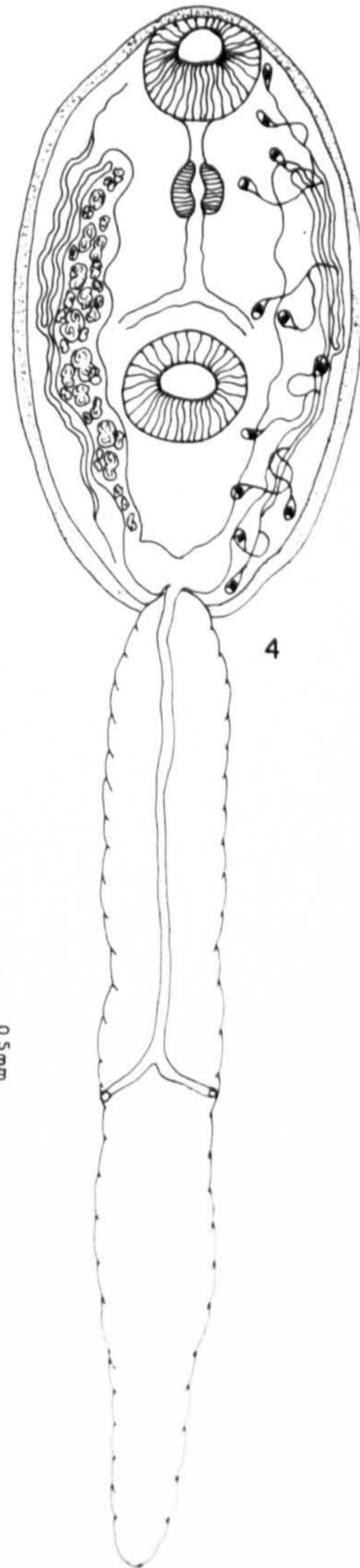
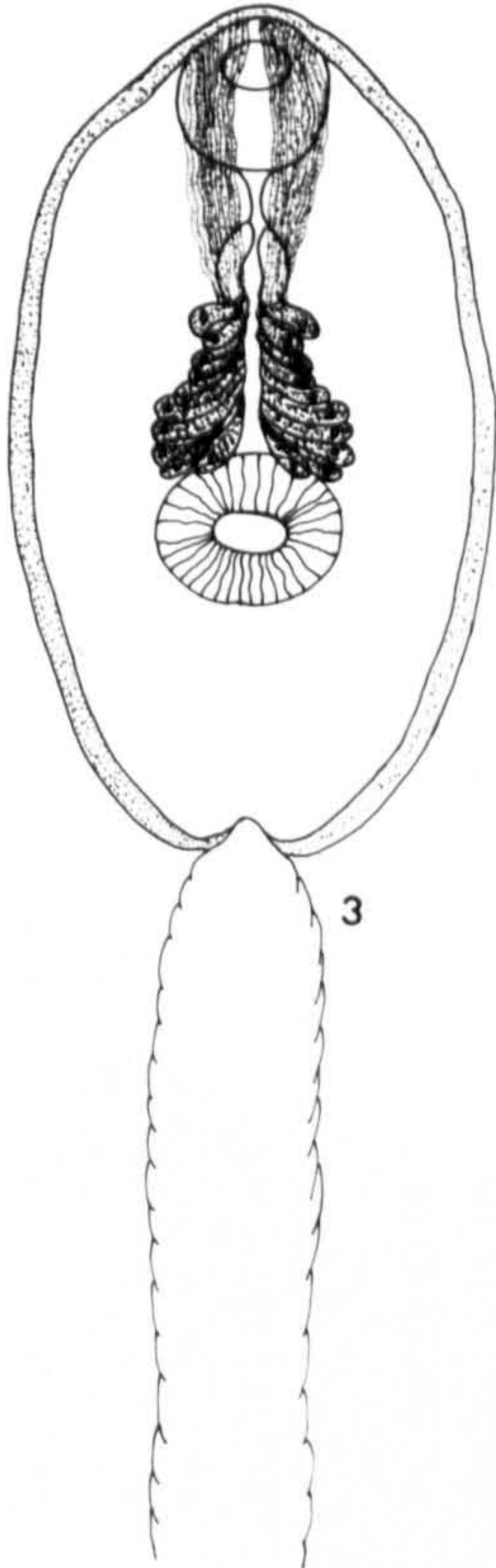
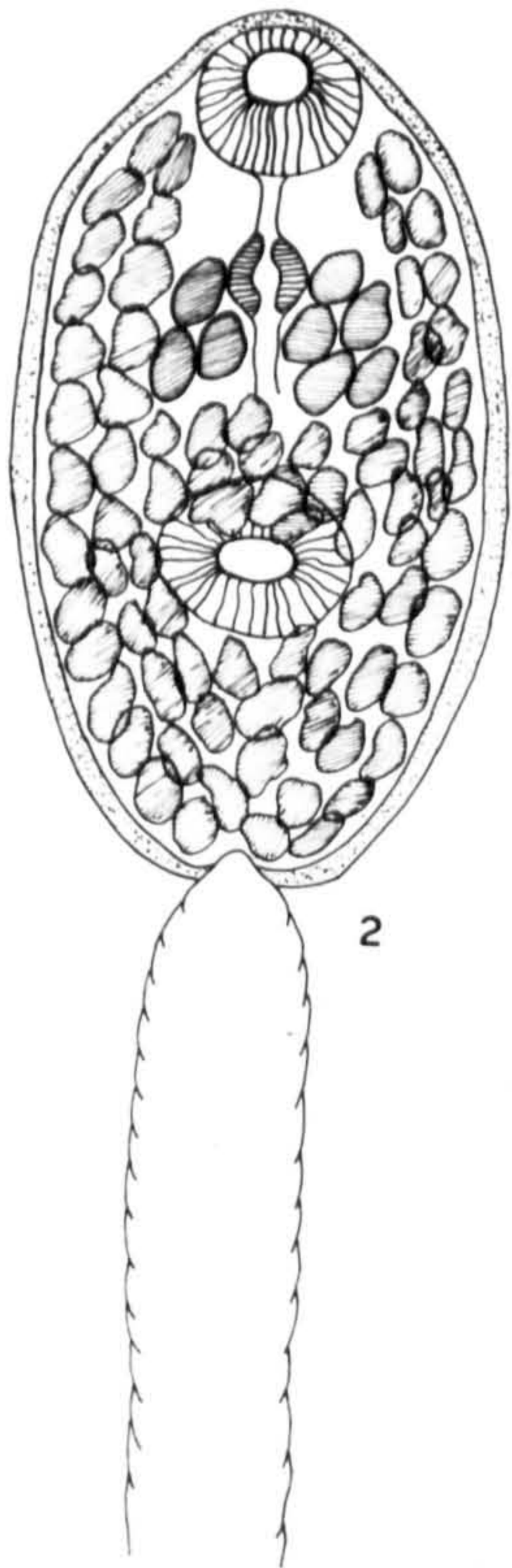
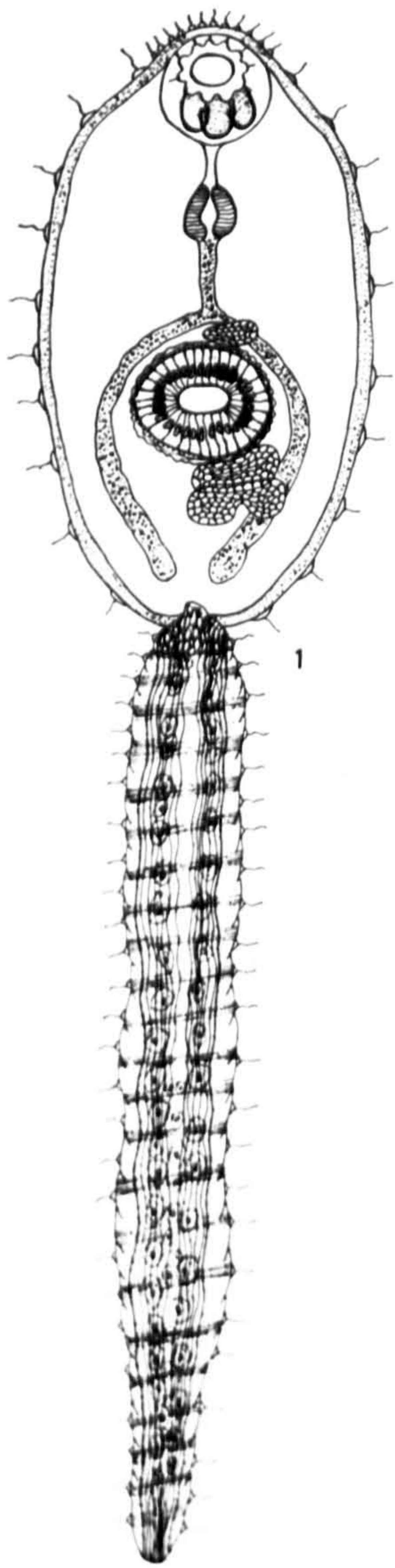
Plates 9-12

Sphaeridiotrema wintersettensis

Sphaeridiotrema wintersëttensis

Plate 9

- Fig. 1. Cercaria - ventral view showing distribution of papillae with hair-like process trilobed cephalic gland, digestive system, genital rudiments and structure of the tail.
- Fig. 2. Cercaria - ventral view showing distribution of cystogenous gland-cells.
- Fig. 3. Cercaria - ventral view showing number and location of penetration gland-cells.
- Fig. 4. Cercaria - ventral view showing protonephridial system, number and arrangement of flame cells on one side and refractile granules on the other side.
- Fig. 5. Mature redia - showing posterior locomotory appendages and cercariae in various stages of development.



0.5 mm

Sphaeridiotrema wintersettensis

Plate 10

Fig. 6. Encysted metacercariae - seven days old.

Fig. 7. Encysted metacercaria - twenty to thirty days old.

Note small cirrus sac near oesophageal bifurcation.

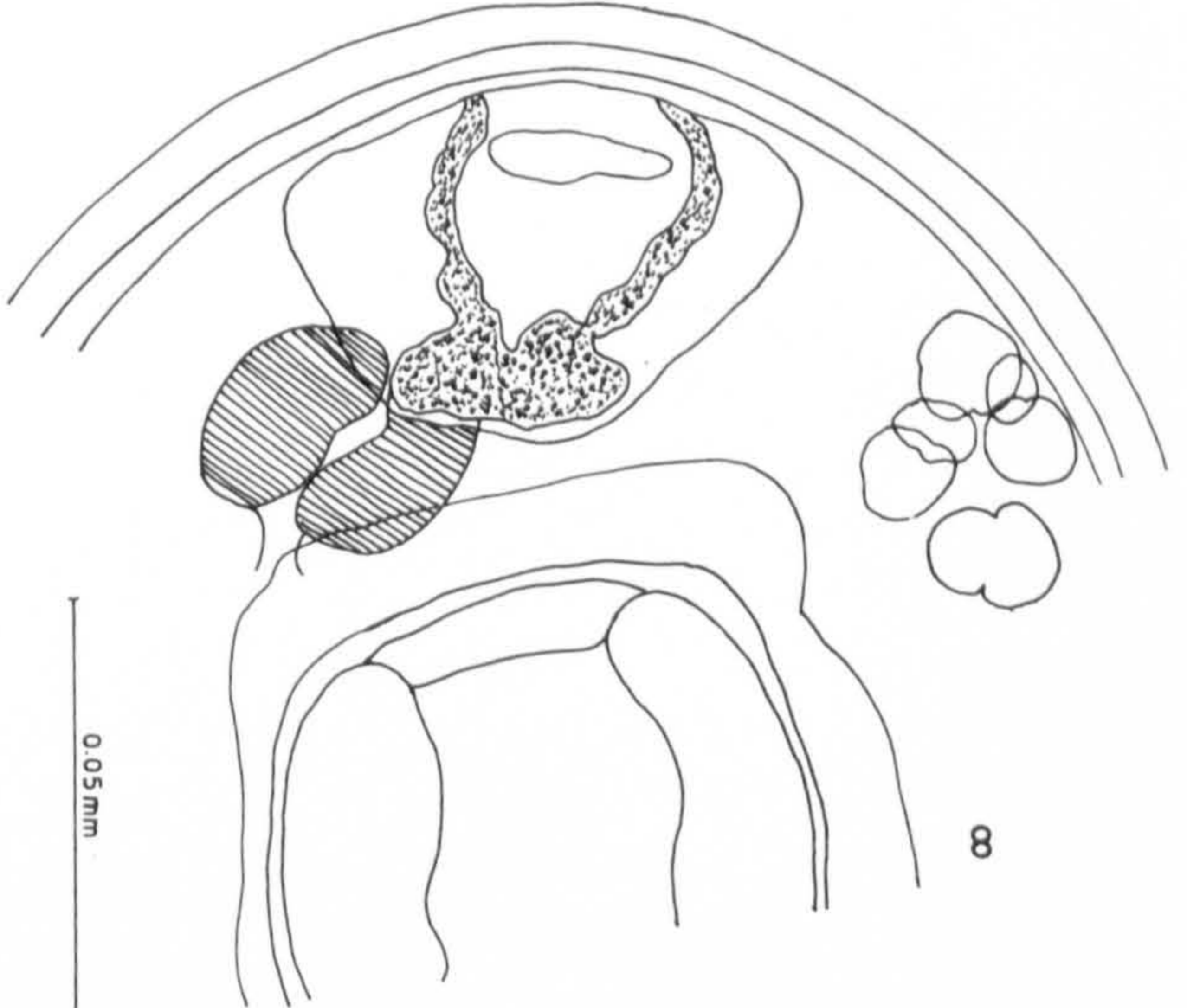
Fig. 8. Encysted metacercaria - anterior portion of twenty to thirty days old specimens showing a well developed cephalic gland with coarsely granular contents.



0.15mm



7



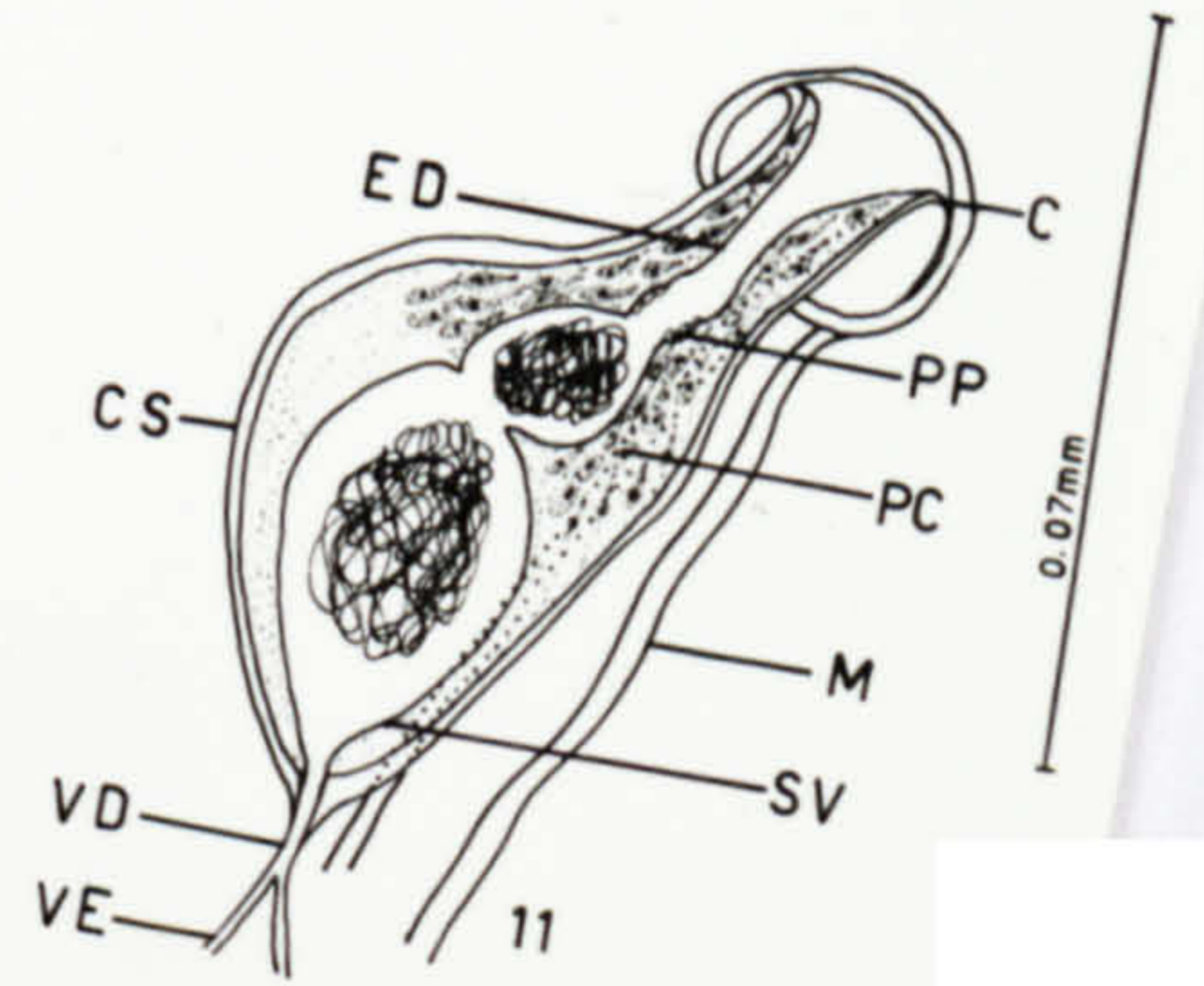
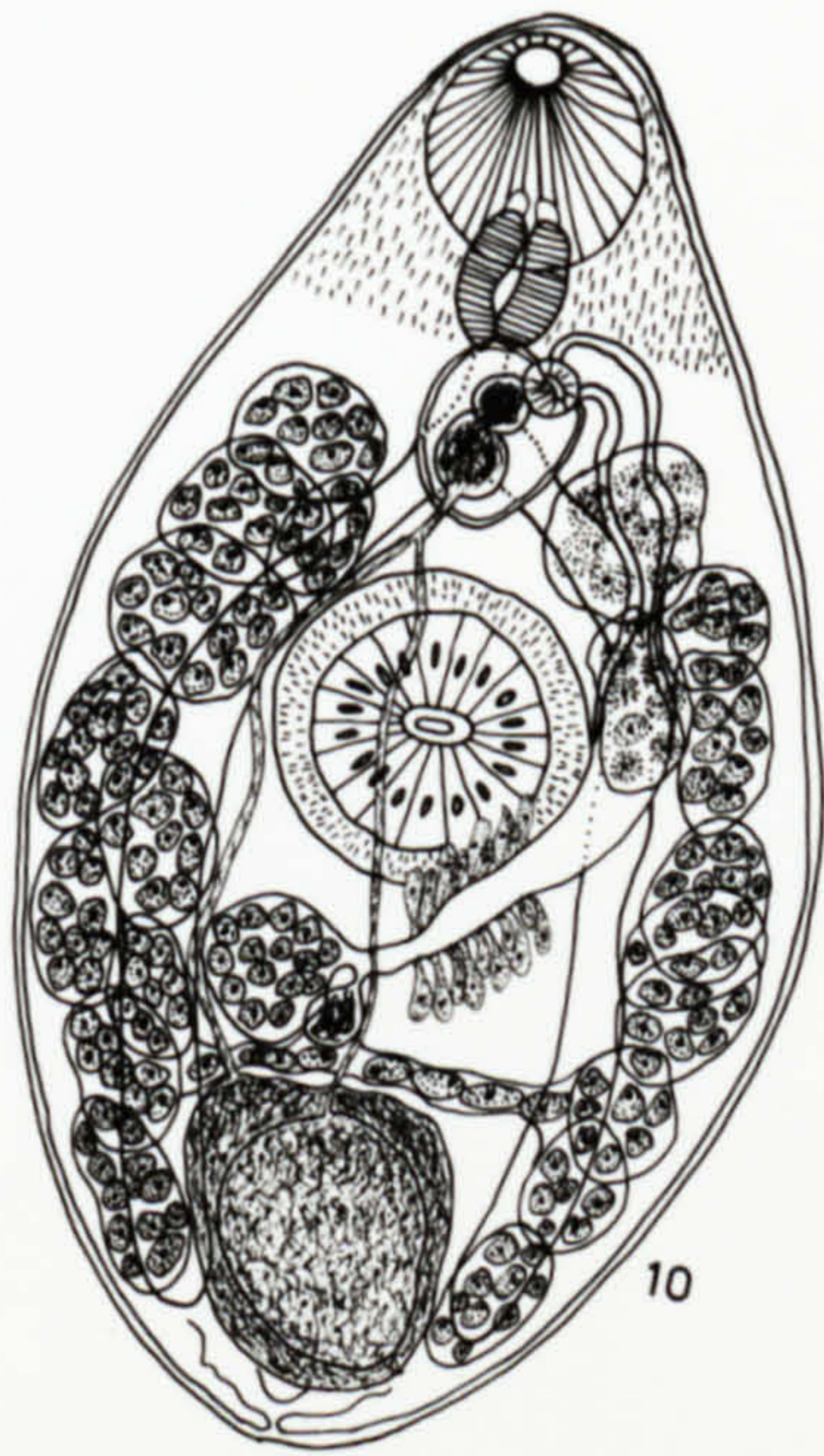
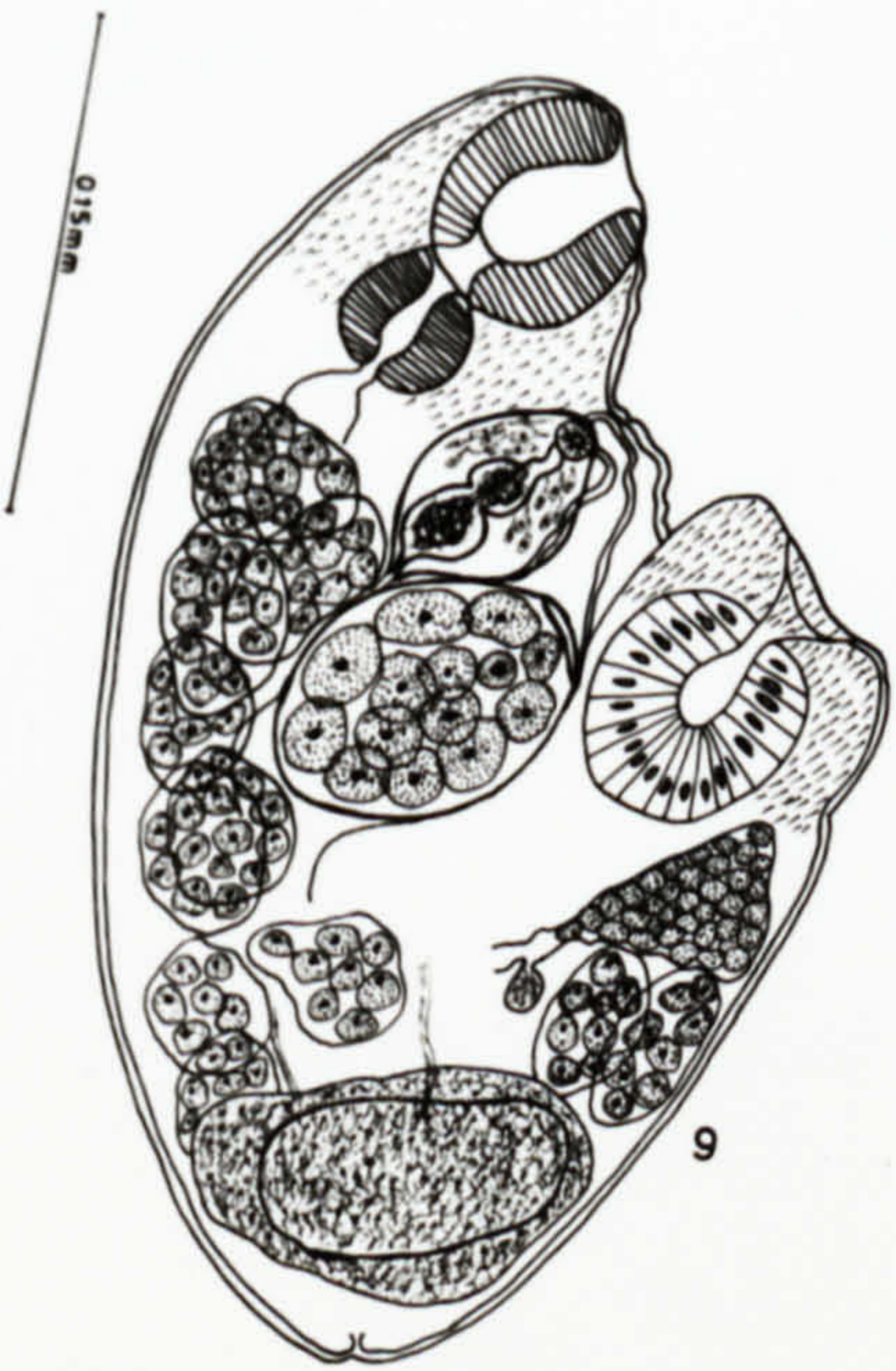
0.05mm

8

Sphaeridiotrema wintersettensis

Plate 11

- Fig. 9. Adult - three days old from experimental infections of canary lateral view. Note the size of the egg, the completely dorsoventrally overlapping testes and the projecting acetabulum.
- Fig. 10. Adult - ventral view of specimens from canary. Note the female genital system.
- Fig. 11. Adult - male genital ducts



Sphaeridiotrema wintersettensis

Plate 12

Fig. 12. Egg - newly laid.

Fig. 13. Egg - after five days incubation showing early stage of embryo. Note the position of the flame cells.

Fig. 14. Egg - after seven days incubation containing a miracidium. Note the eyespots with lens.

Fig. 15. Egg - after nine days incubation containing a miracidium. Note the size of the apical gland and position of flame cells.

Fig. 16. Egg - after fourteen days incubation, containing a miracidium. Note the penetration gland-cells, nervous system, protonephridial systems and the sensory bristles at anterior end of body.

Fig. 17. Egg with fully developed miracidium, eighteen days old specimen. Note the shape of the eyespots.

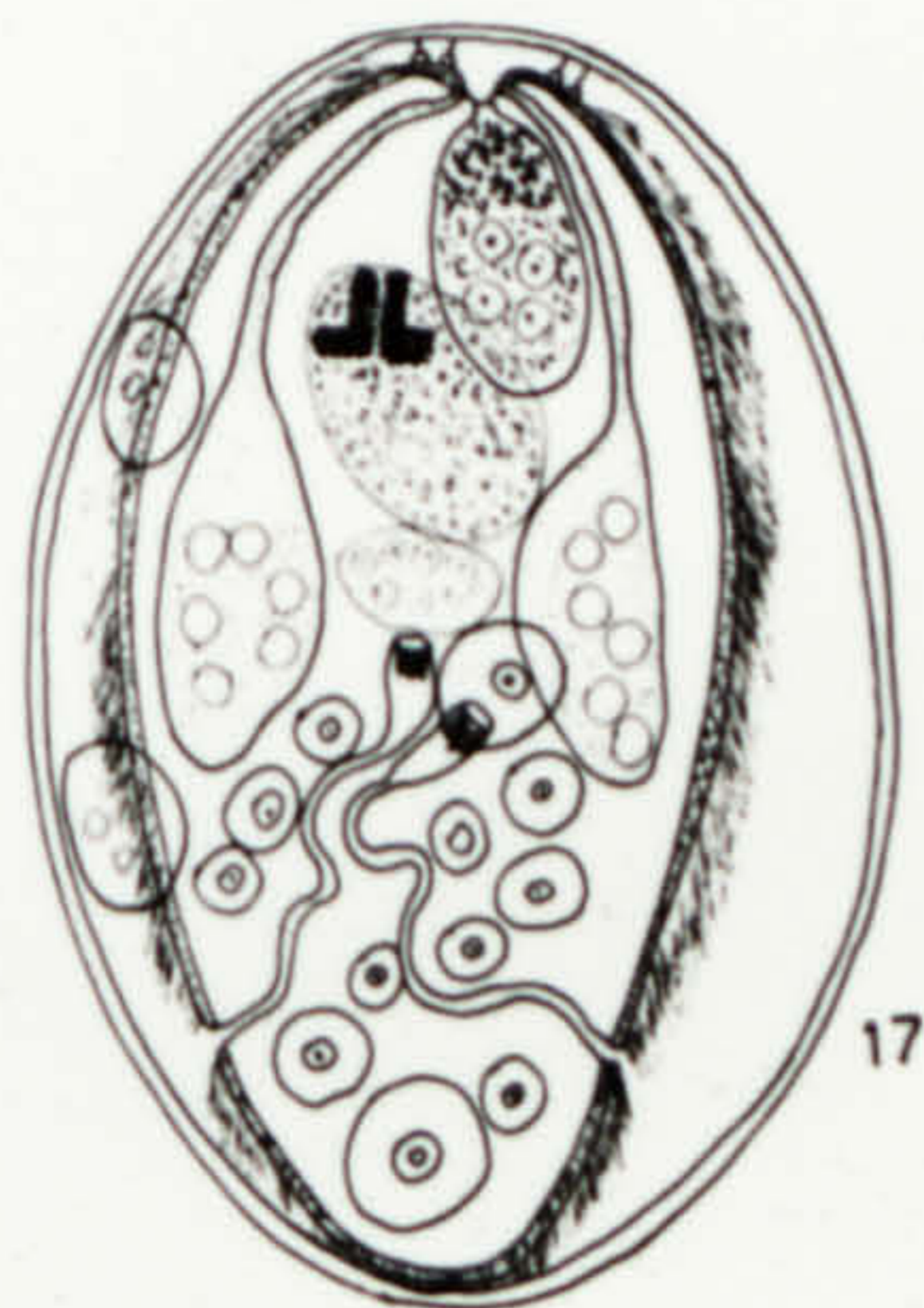
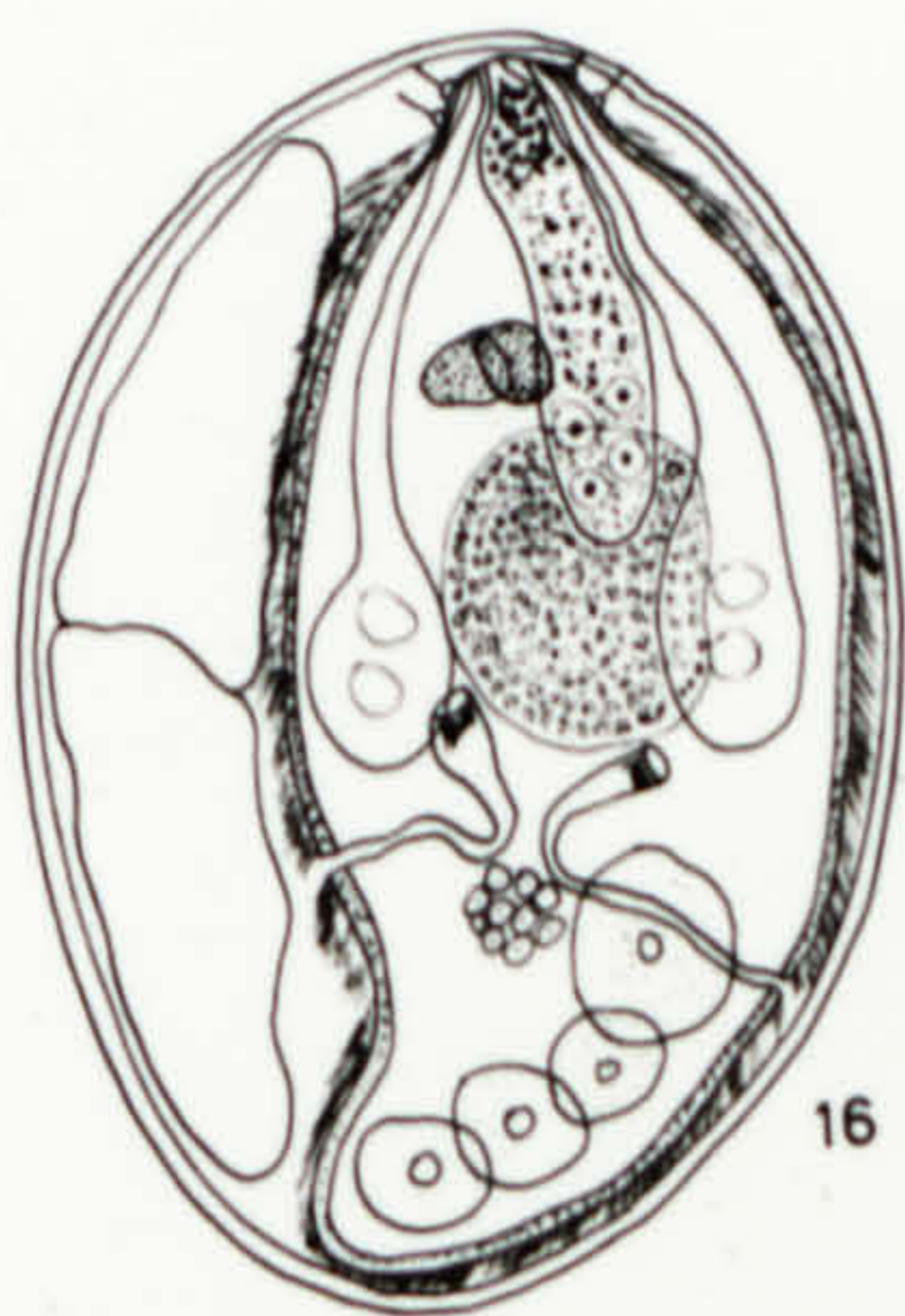
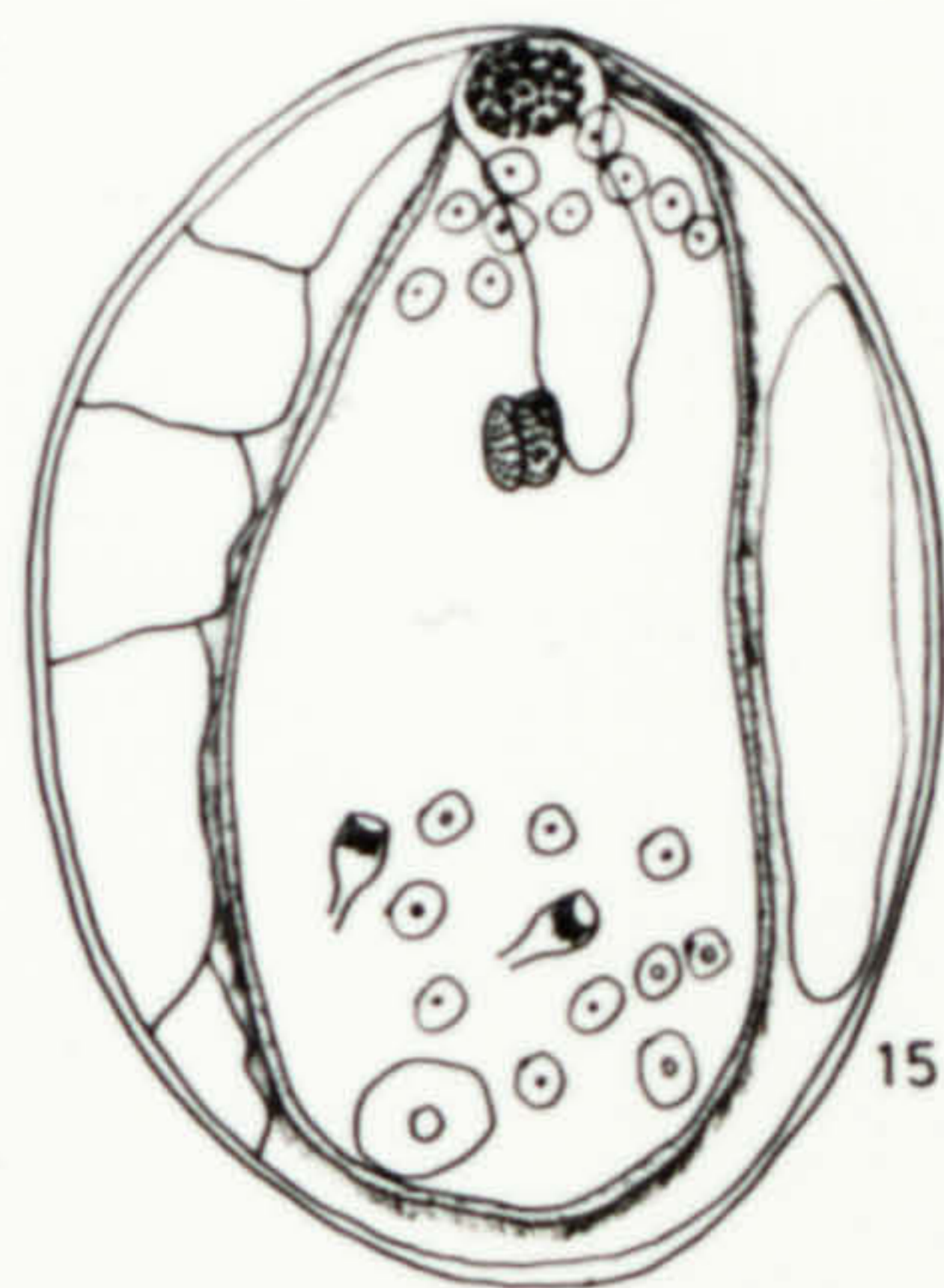
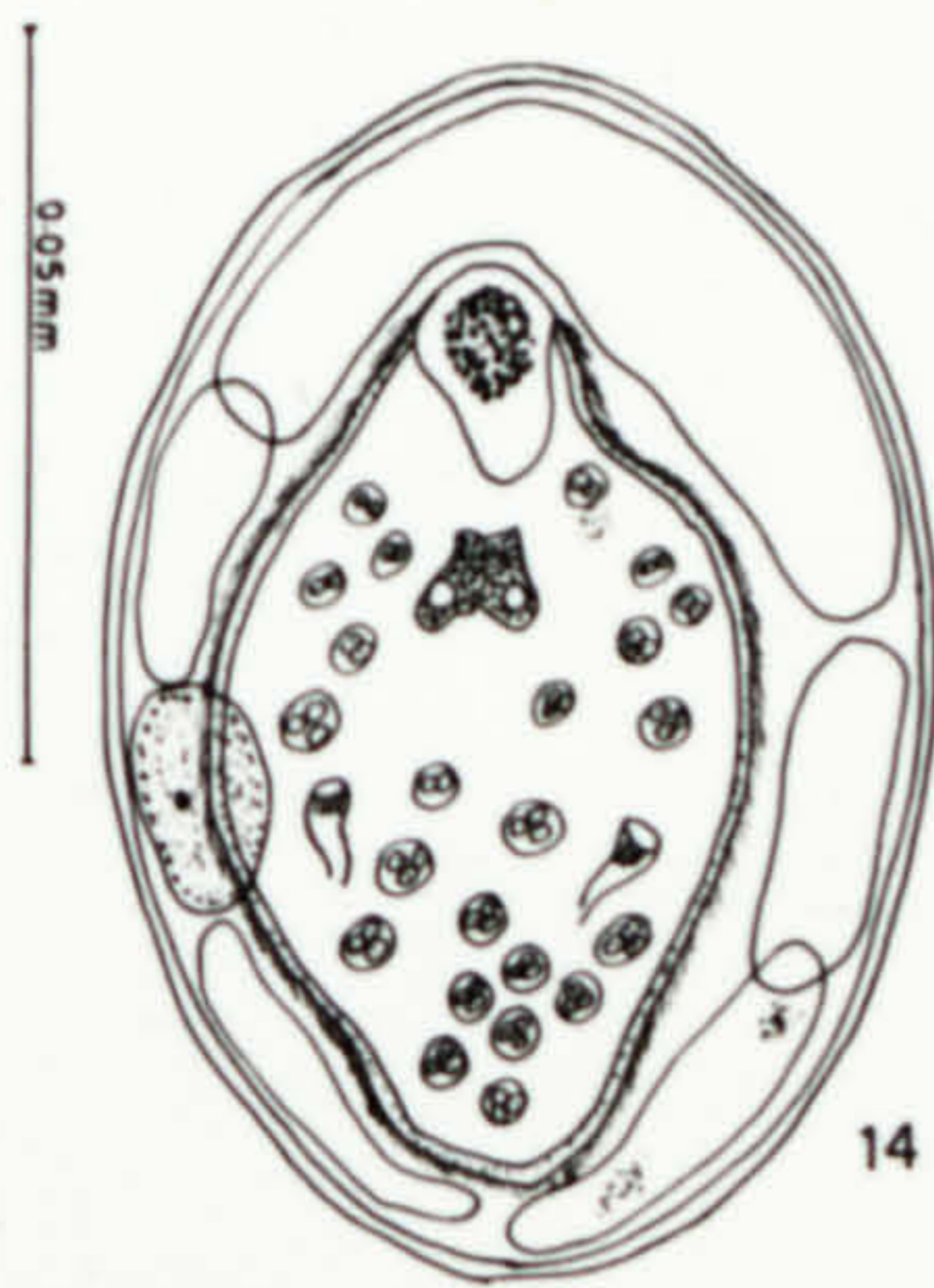
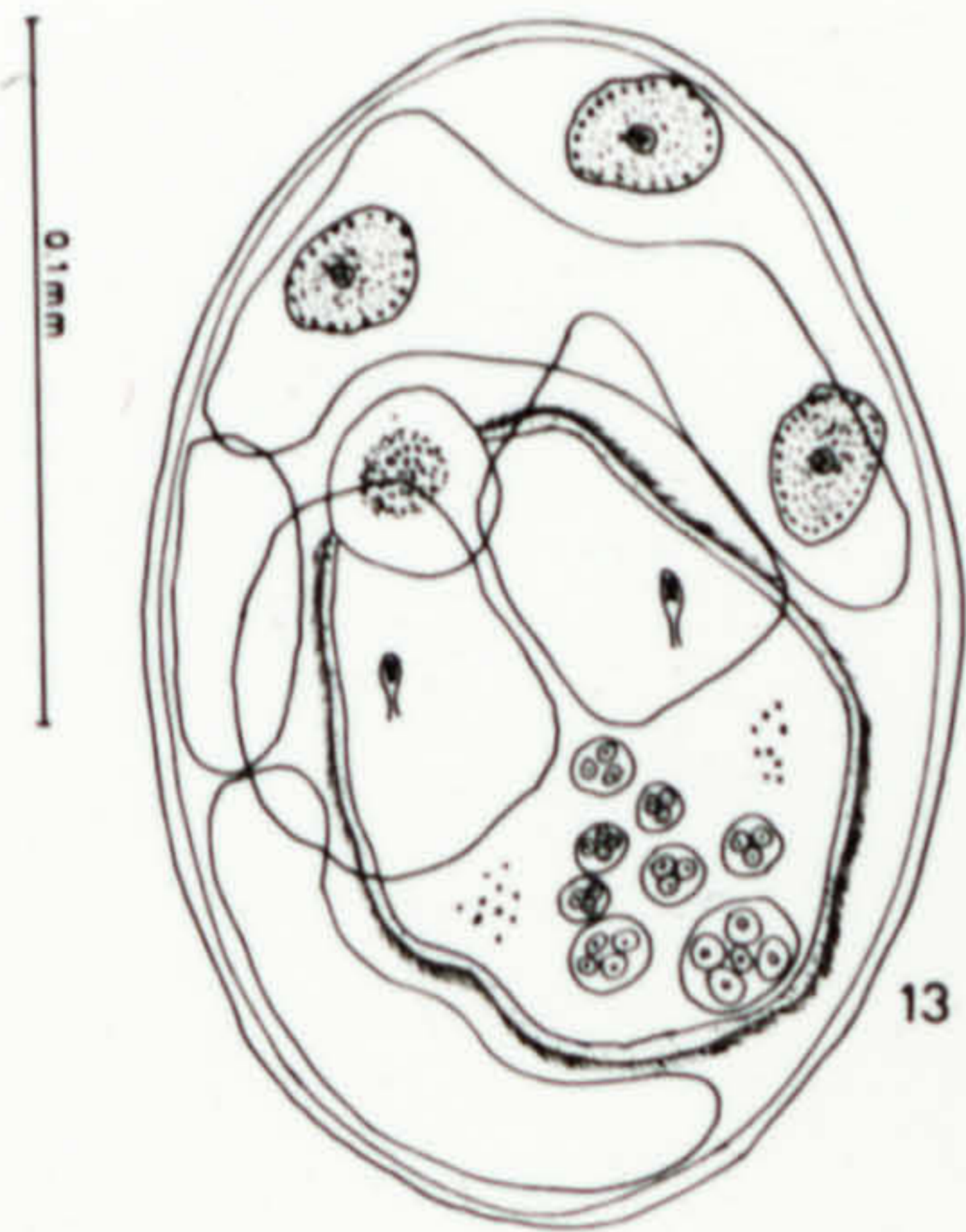
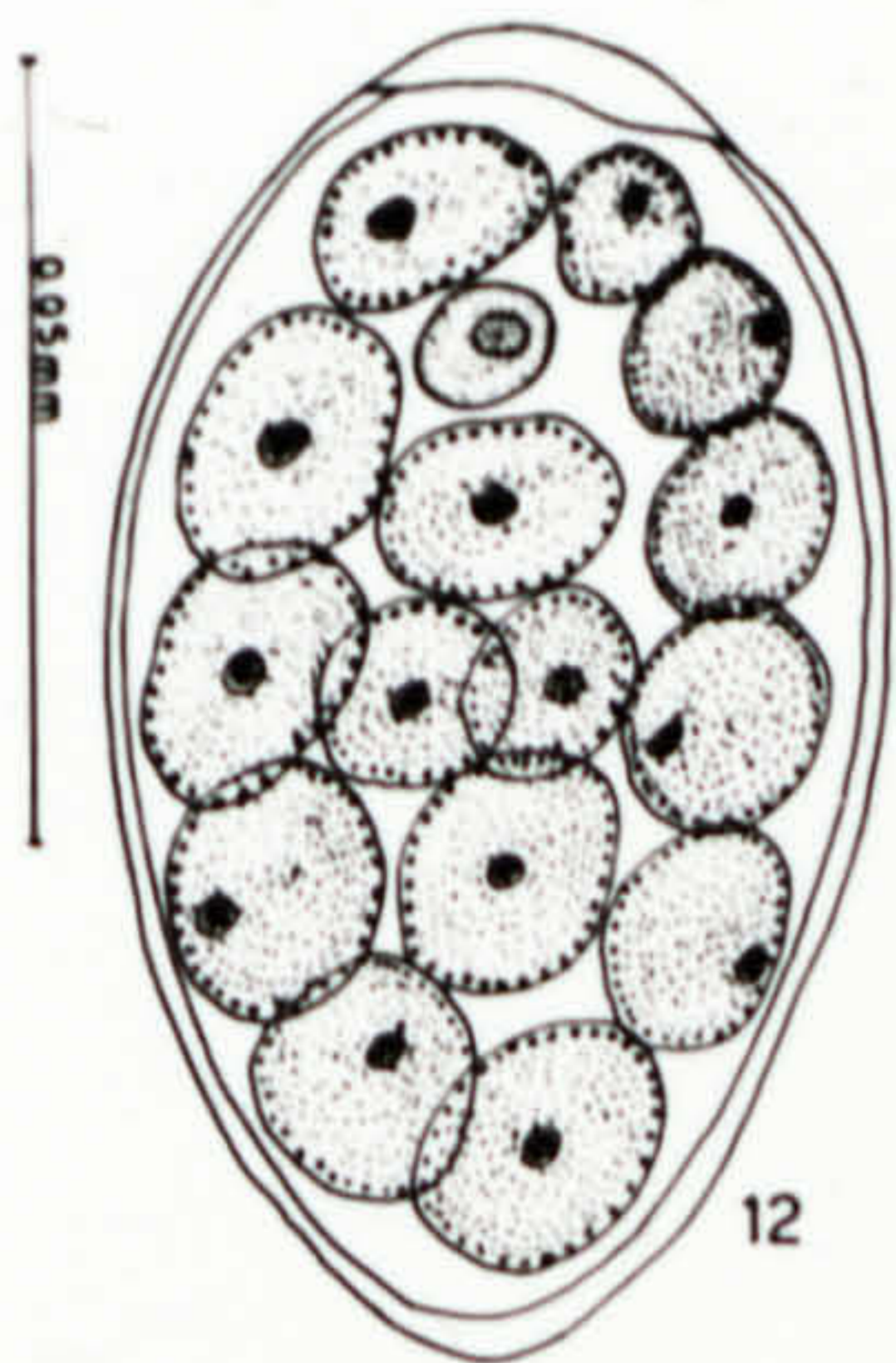


Plate 13

Cercaria gymnocephalous II

- Fig. 1. Cercaria - ventral view showing digestive system, papillate hair-like processes on cuticle of body and tail and muscle bands surrounding the acetabulum. Note the trilobed cephalic gland in posterior wall of oral sucker.
- Fig. 2. Cercaria - ventral view showing number and location of penetration gland cells and genital rudiment.
- Fig. 3. Cercaria - ventral view showing distribution of cystogenous gland-cells.
- Fig. 4. Cercaria - ventral view showing, on one side, the number and arrangement of flame cells, and, on the other side, the primary excretory duct with refractile granules.
- Fig. 5. Mature redia - showing digestive system, undivided collar, birth pore, locomotory appendages, germ balls and developing cercariae.

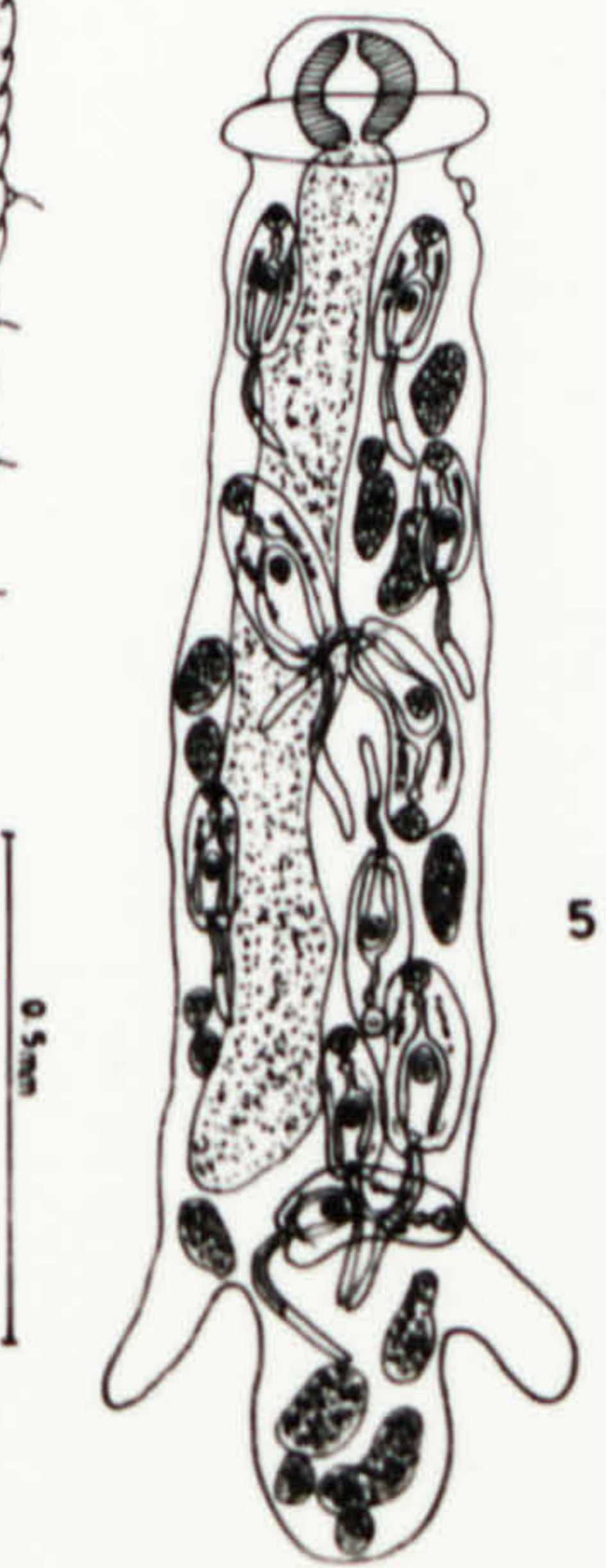
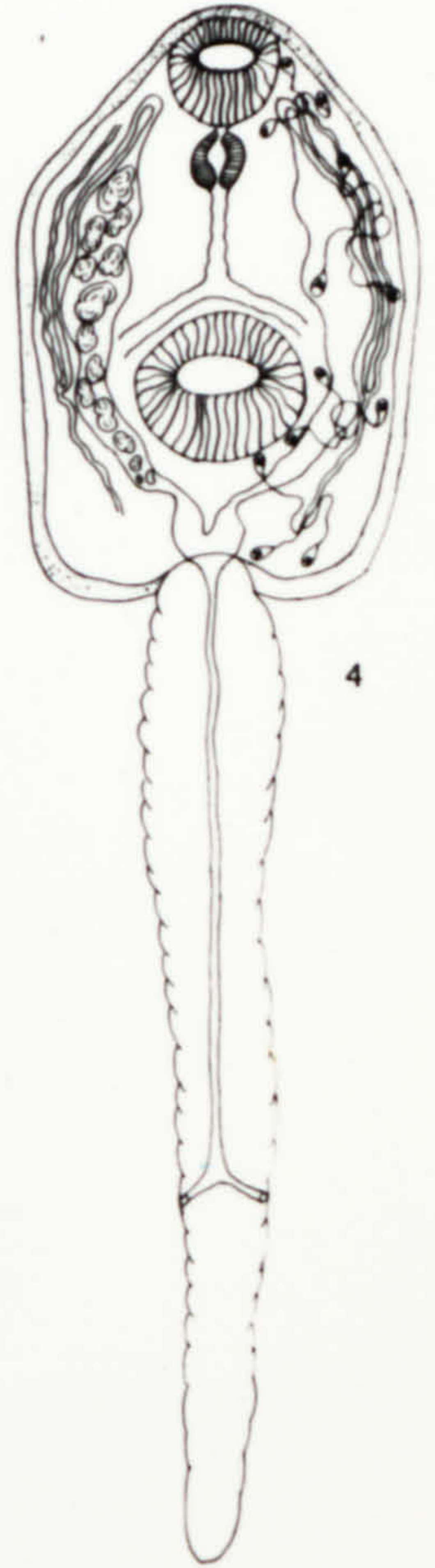
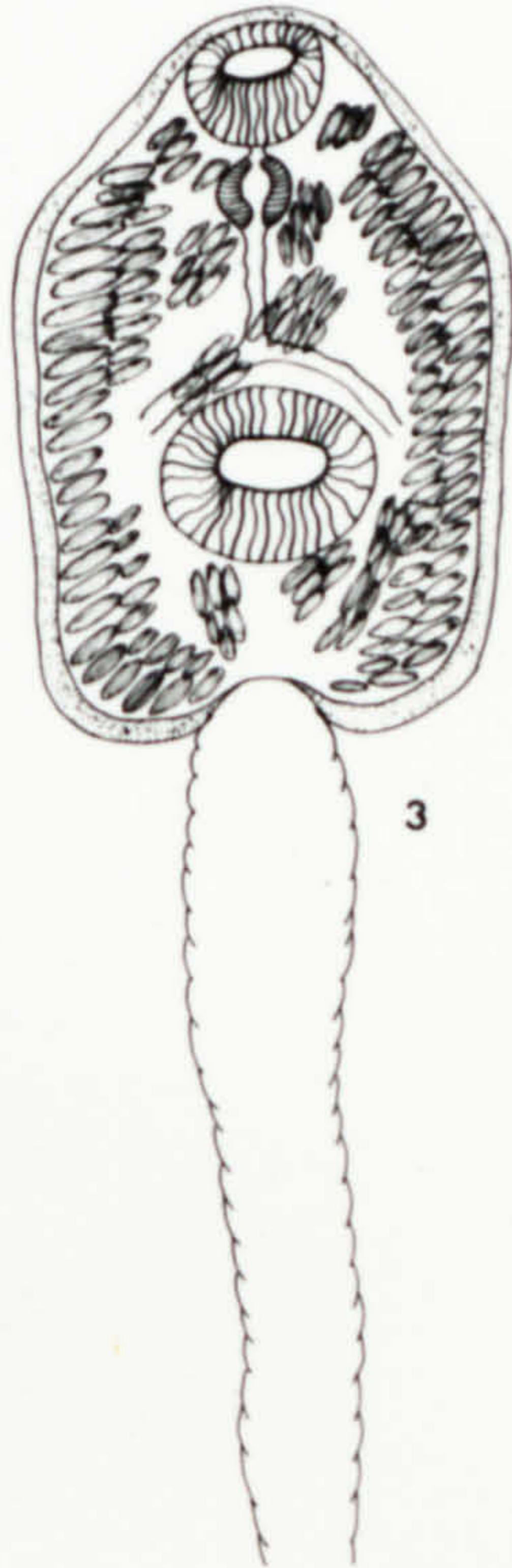
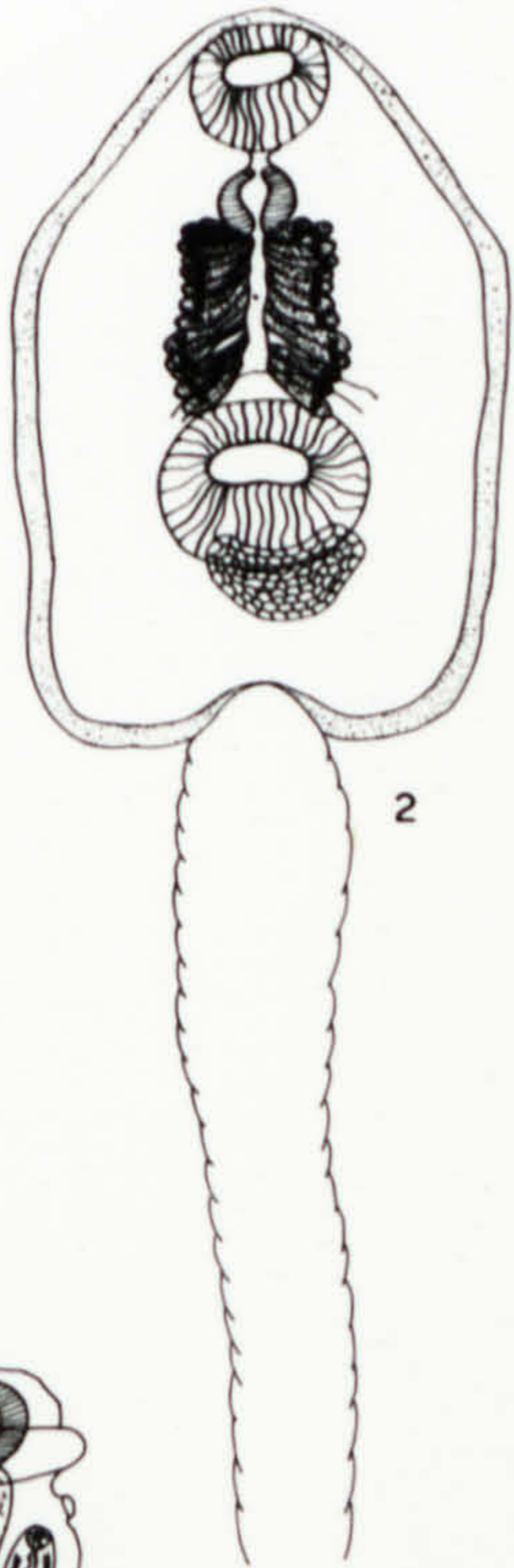
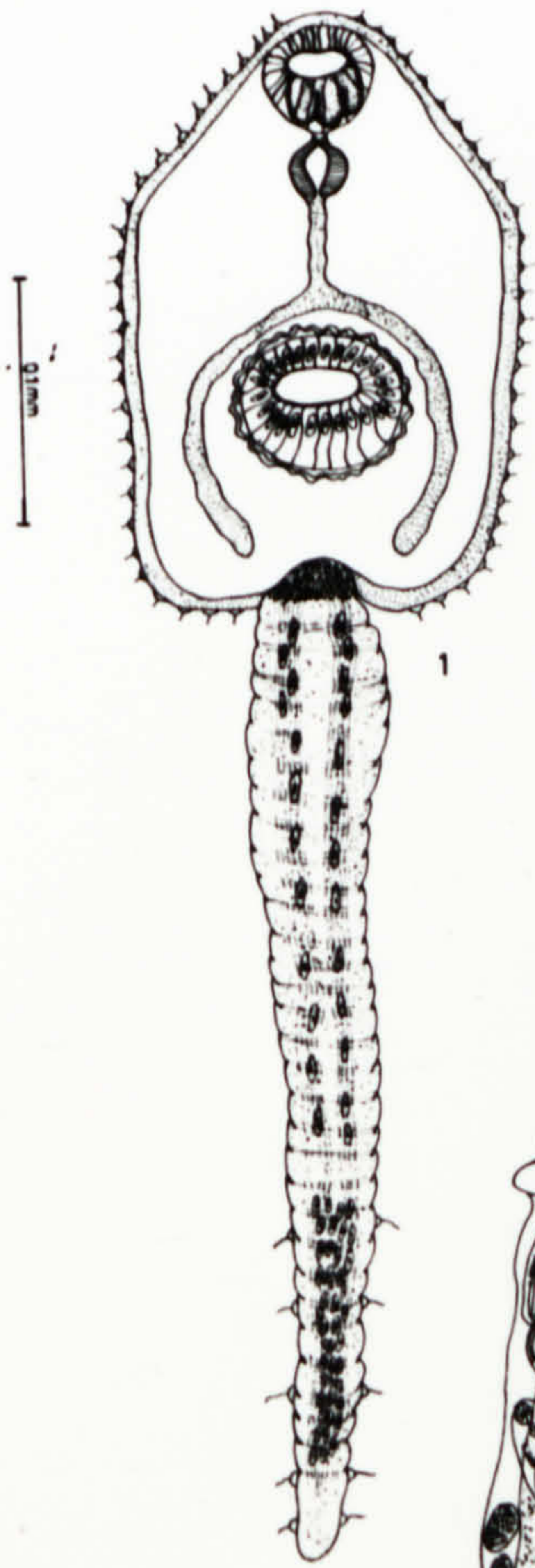


Plate 14

Cercaria gymnocephalous III

- Fig. 1. Cercaria - ventral view showing body spination, papillate hair-like processes at anterior end of body and on tail, structure of tail and digestive system.
- Fig. 2. Cercaria - showing distribution of cystogenous gland-cells. Ventral small cells shown on right side only and dorsal large cells shown on left side only.
- Fig. 3. Cercaria - ventral view showing the number and location of penetration gland-cells.
- Fig. 4. Cercaria - ventral view showing, on one side, the number and arrangement of flame cells and ciliated patches and, on the other side the primary excretory duct containing refractile granules.
- Fig. 5. Oral sucker of cercaria - showing mouth opening surrounding by papillae with setae, and trilobed cephalic gland.
- Fig. 6. Mature redia - showing digestive, undivided collar, locomotory appendages, germ balls and developing cercariae.
- Fig. 7. Encysted metacercaria - two hours old.

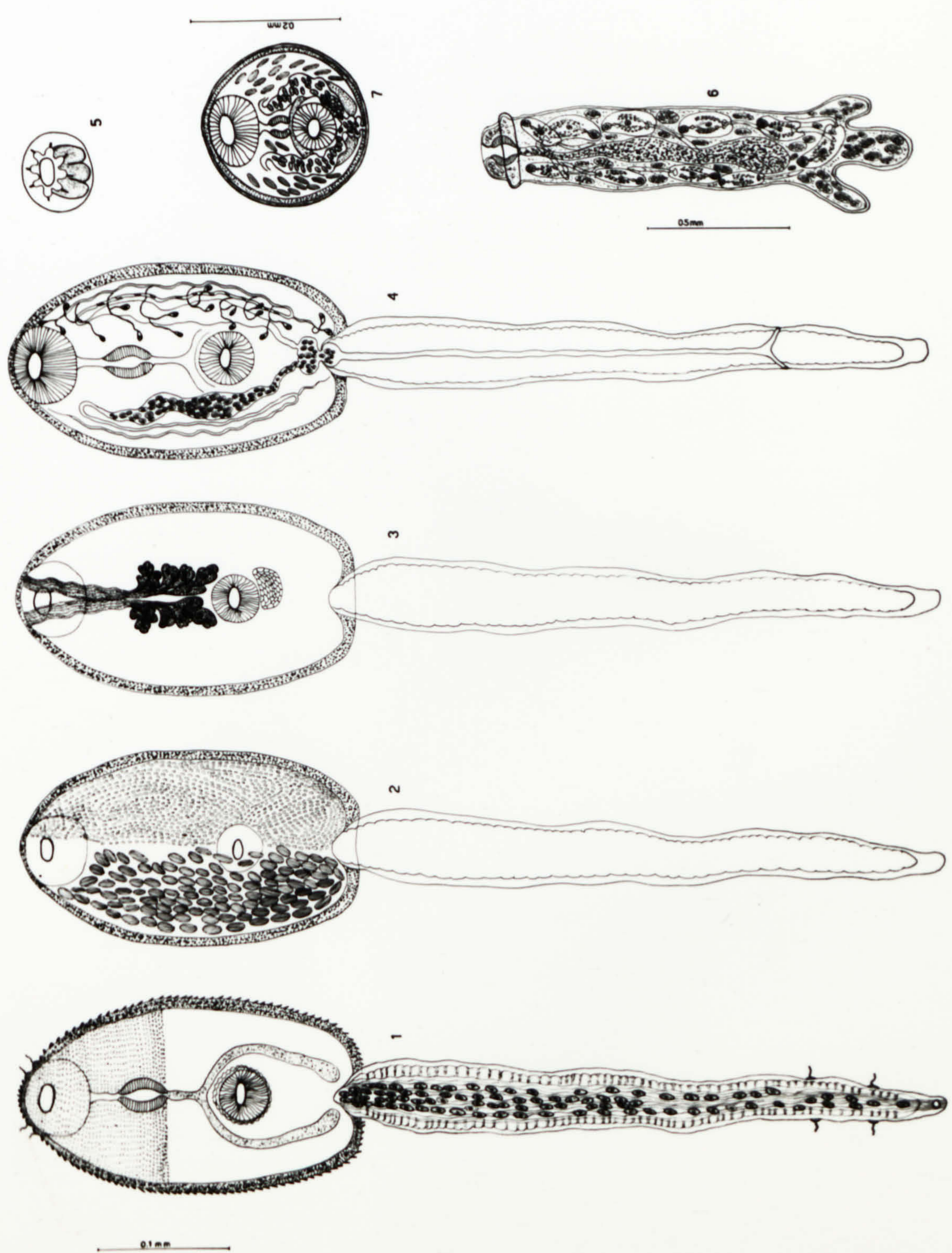
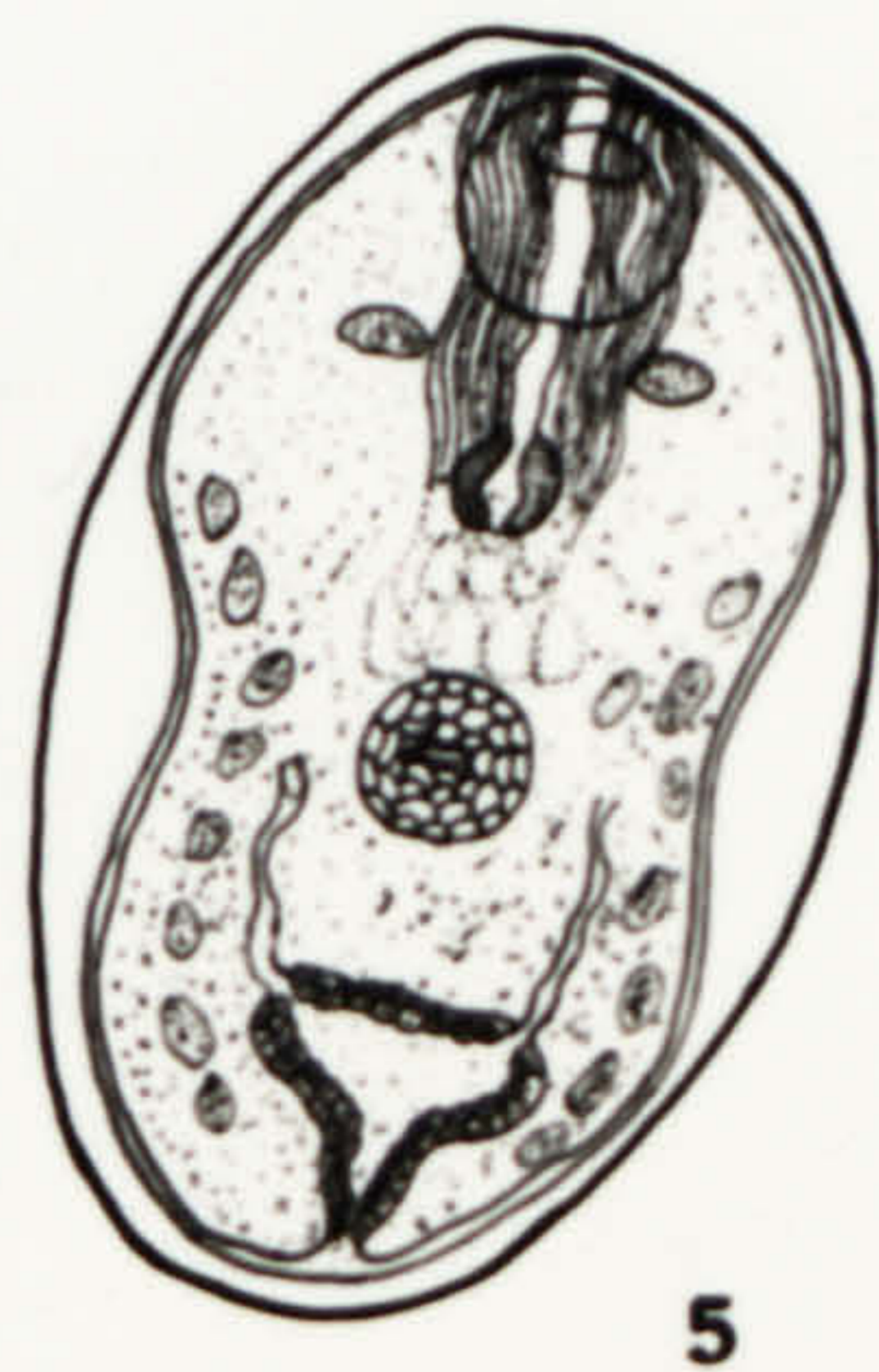
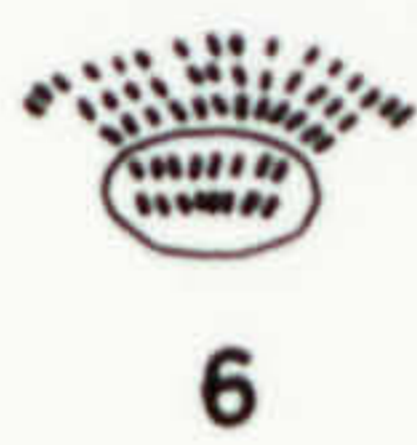
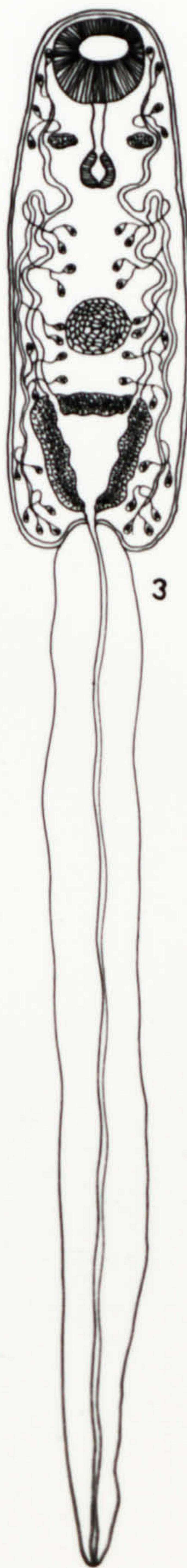
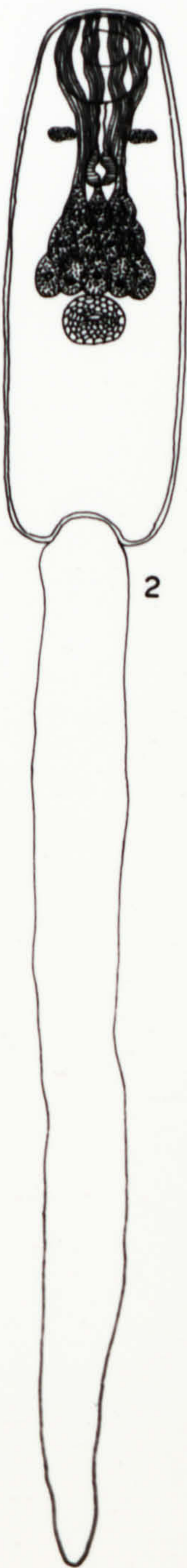
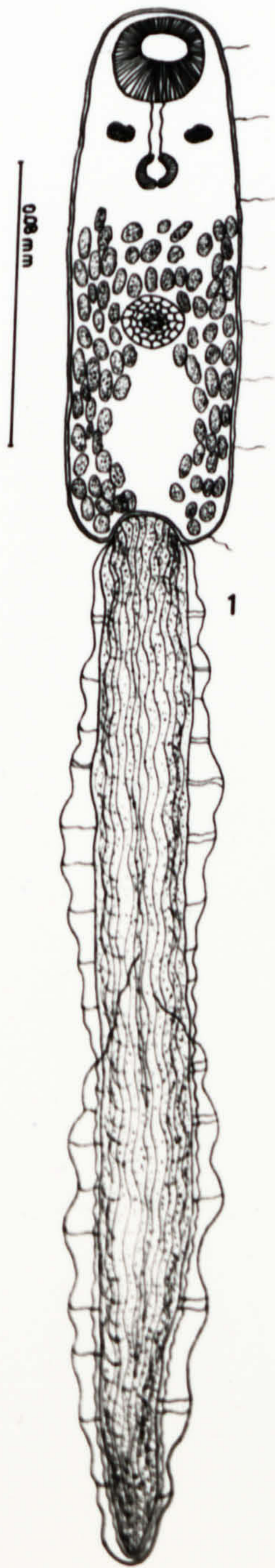


Plate 15

Cercaria pleurolophocerca I

- Fig. 1. Cercaria - ventral view showing distribution of cystogenous gland-cells, prepharynx, pharynx and rudimentary acetabulum. Tail with lateral and dorso ventral fin-folds. Note long hair-like projection illustrated on one side only.
- Fig. 2. Cercaria - ventral view showing number and location of penetration gland-cells.
- Fig. 3. Cercaria - ventral view showing protonephridial systems.
- Fig. 4. Mature redia - showing digestive systems, germ balls, developing cercariae and many flame cells. Note the hair-like projections at the anterior end of the body.
- Fig. 5. Encysted metacercaria - one day old.
- Fig. 6. Cercaria - arrangement of spines in, and anterior to, mouth. (Diagrammatic).



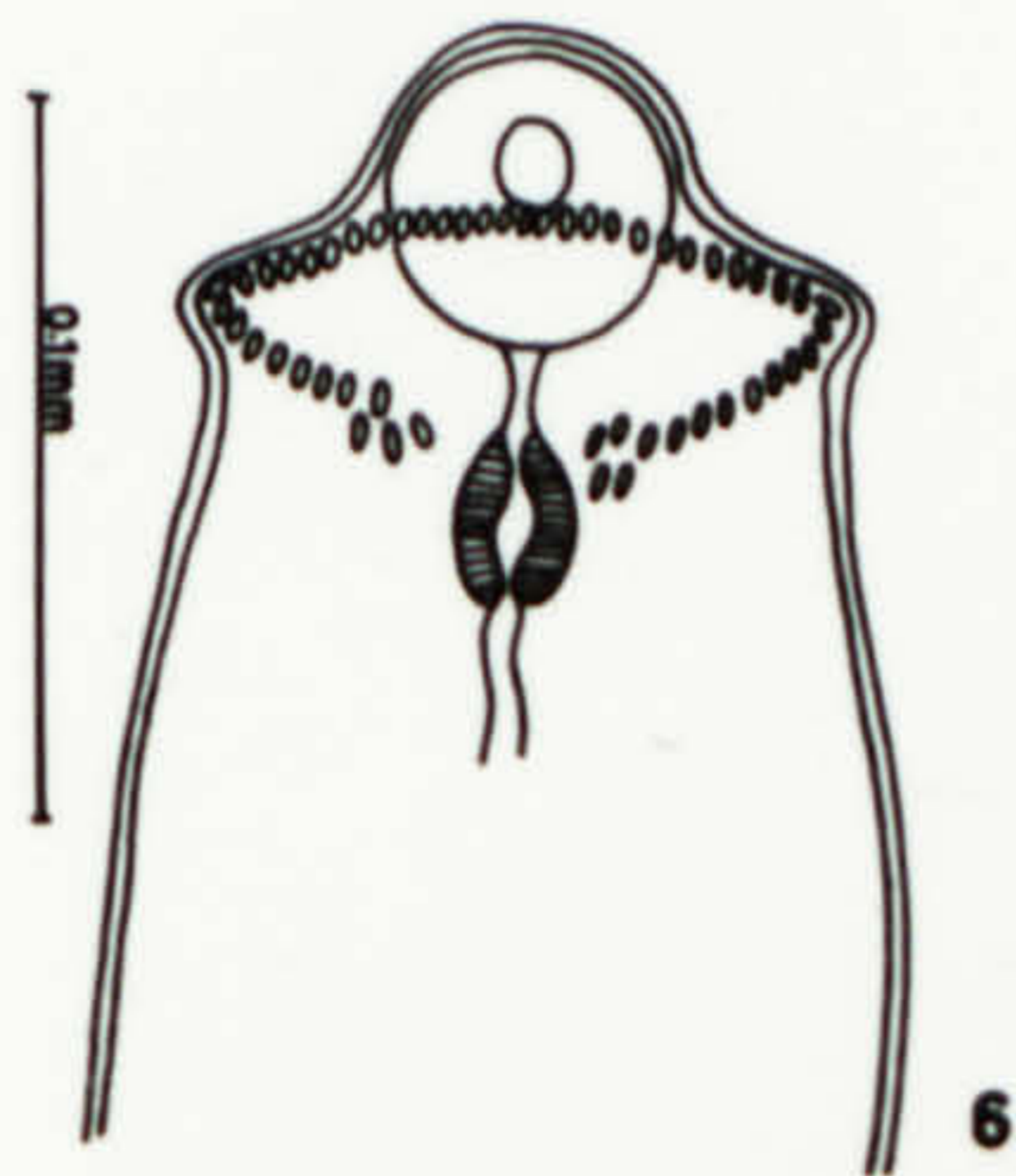
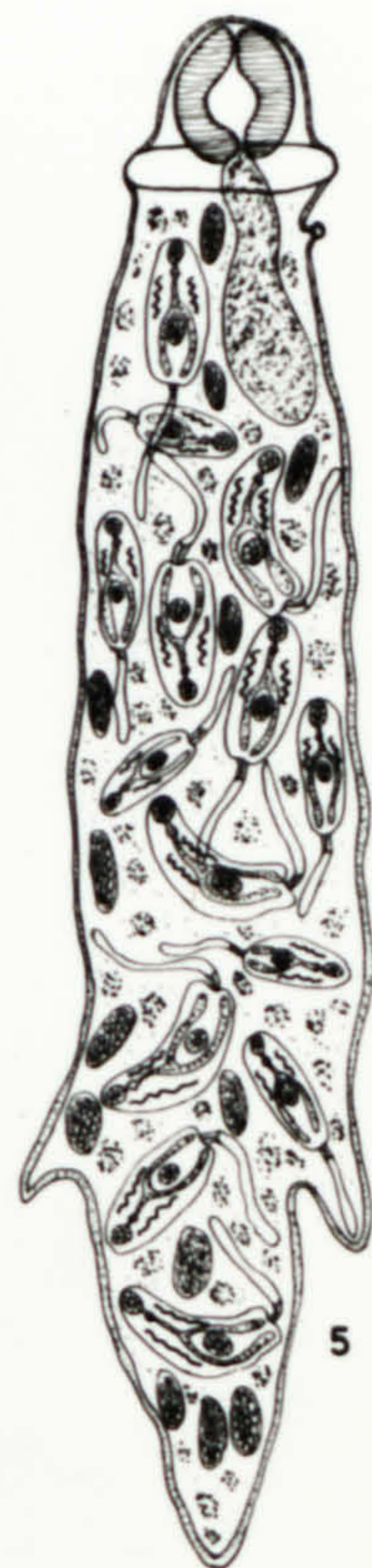
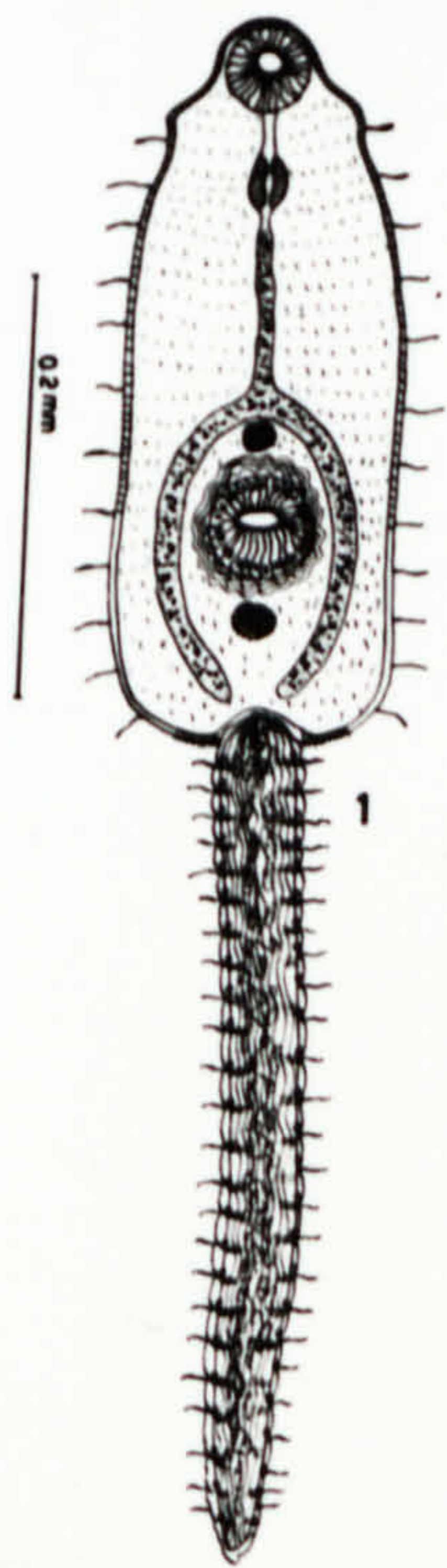
Plates 16-19

Hypoderaeum conoideum

Hypoderaeum conoideum

Plate 16

- Fig. 1. Cercaria - ventral view showing arrangement of hair-like projection, digestive system and muscles surrounding the acetabulum.
- Fig. 2. Cercaria - ventral view of protonephridial system showing, on one side, probable arrangement of flame cells and on the other, the primary excretory duct filled with excretory refractile granules.
- Fig. 3. Cercaria - ventral view, showing number and location of penetration gland-cells.
- Fig. 4. Cercaria - ventral view showing distribution of the cystogenous gland-cells.
- Fig. 5. Mature redia - containing germ balls and developing cercariae. Note the birth pore behind the collar.
- Fig. 6. Cercaria - anterior end of the body, showing number and arrangement of collar spines.

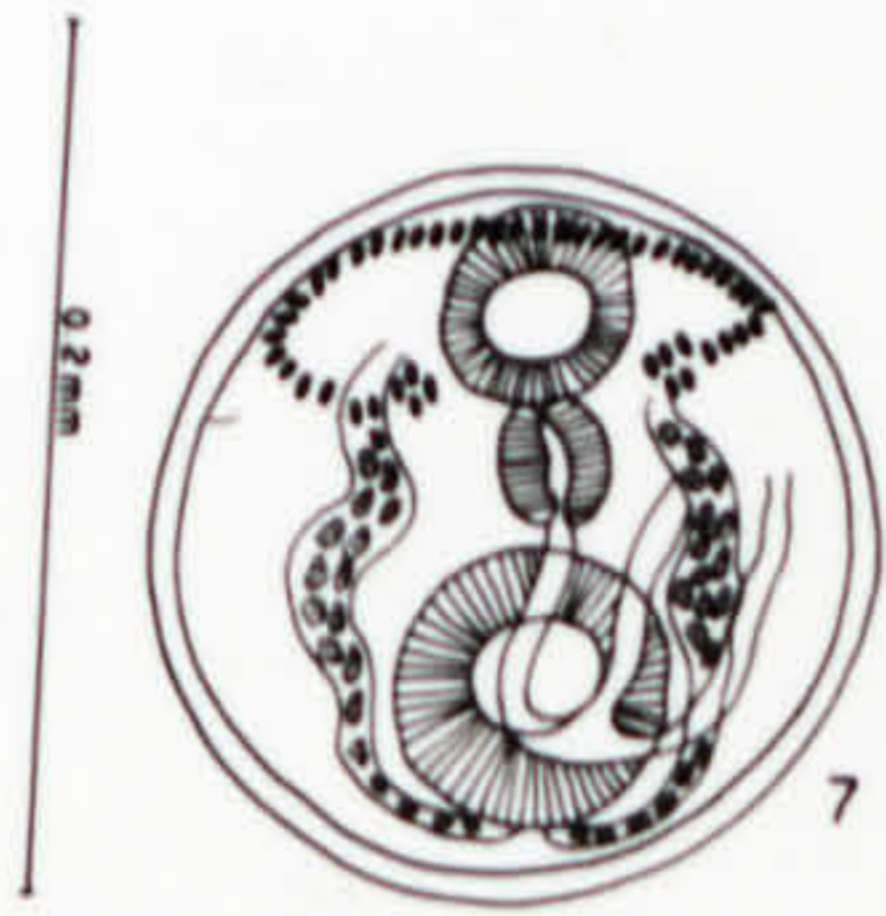
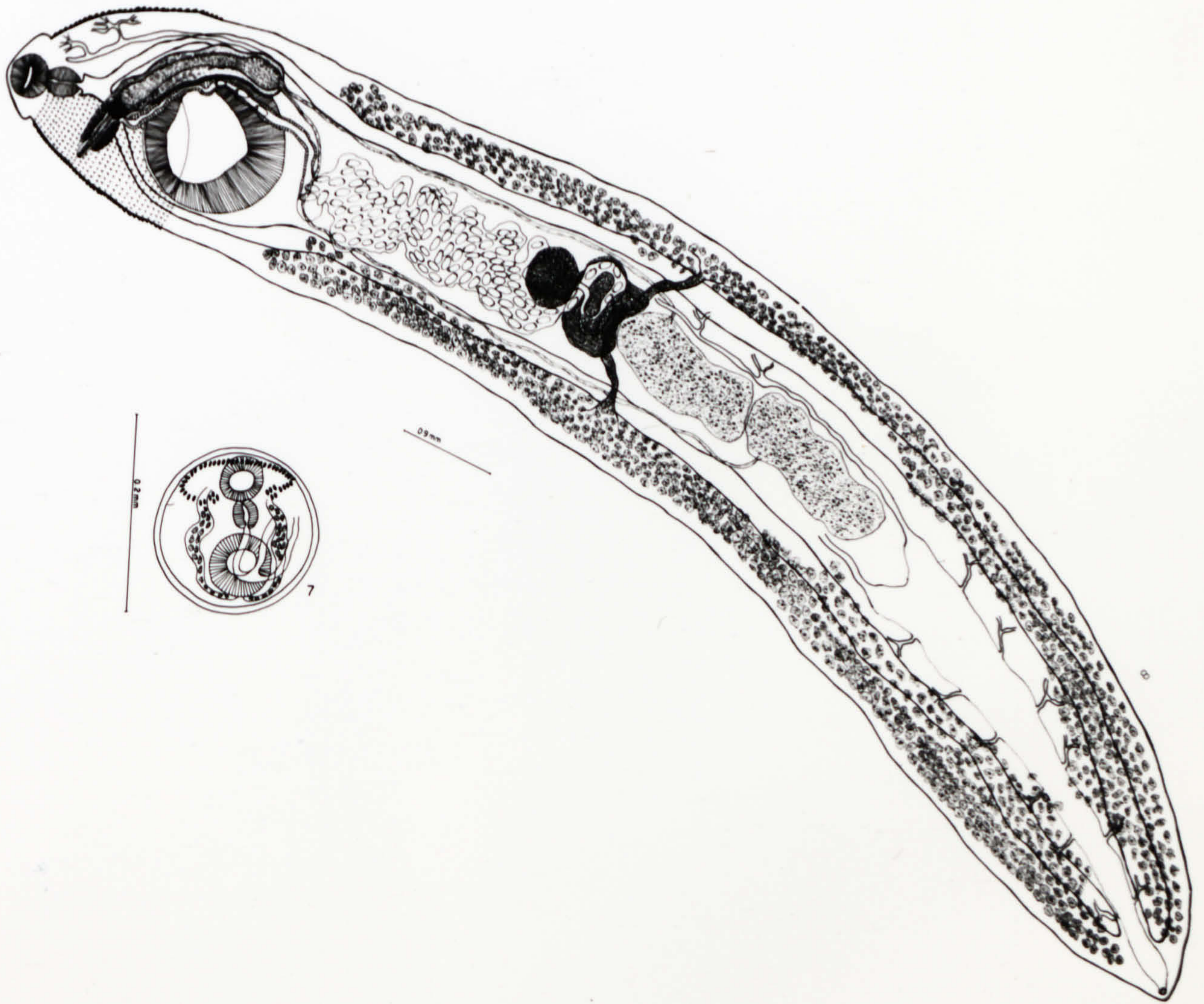


Hypoderaeum conoideum

Plate 17

Fig. 7. Encysted metacercaria - fifteen days old.

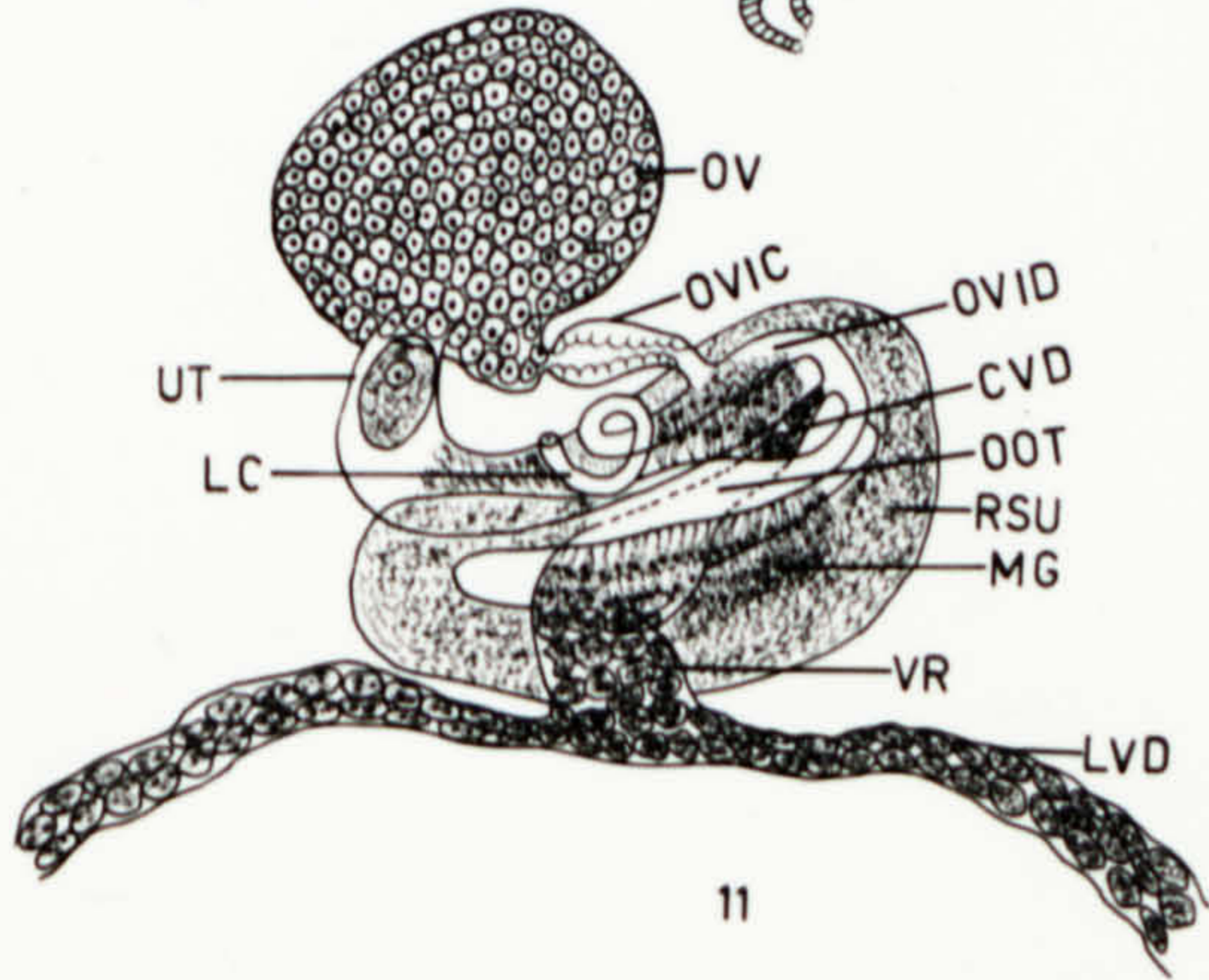
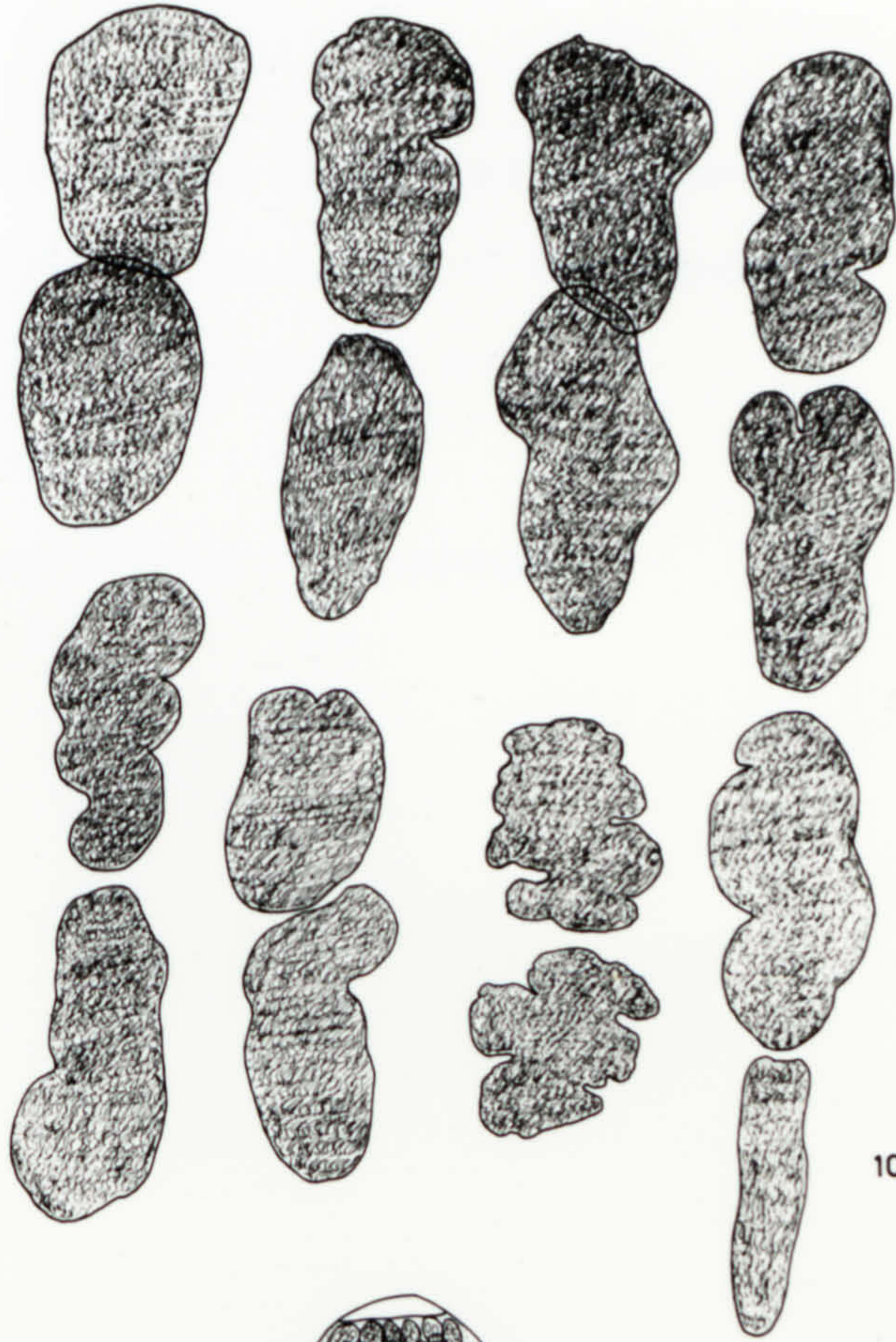
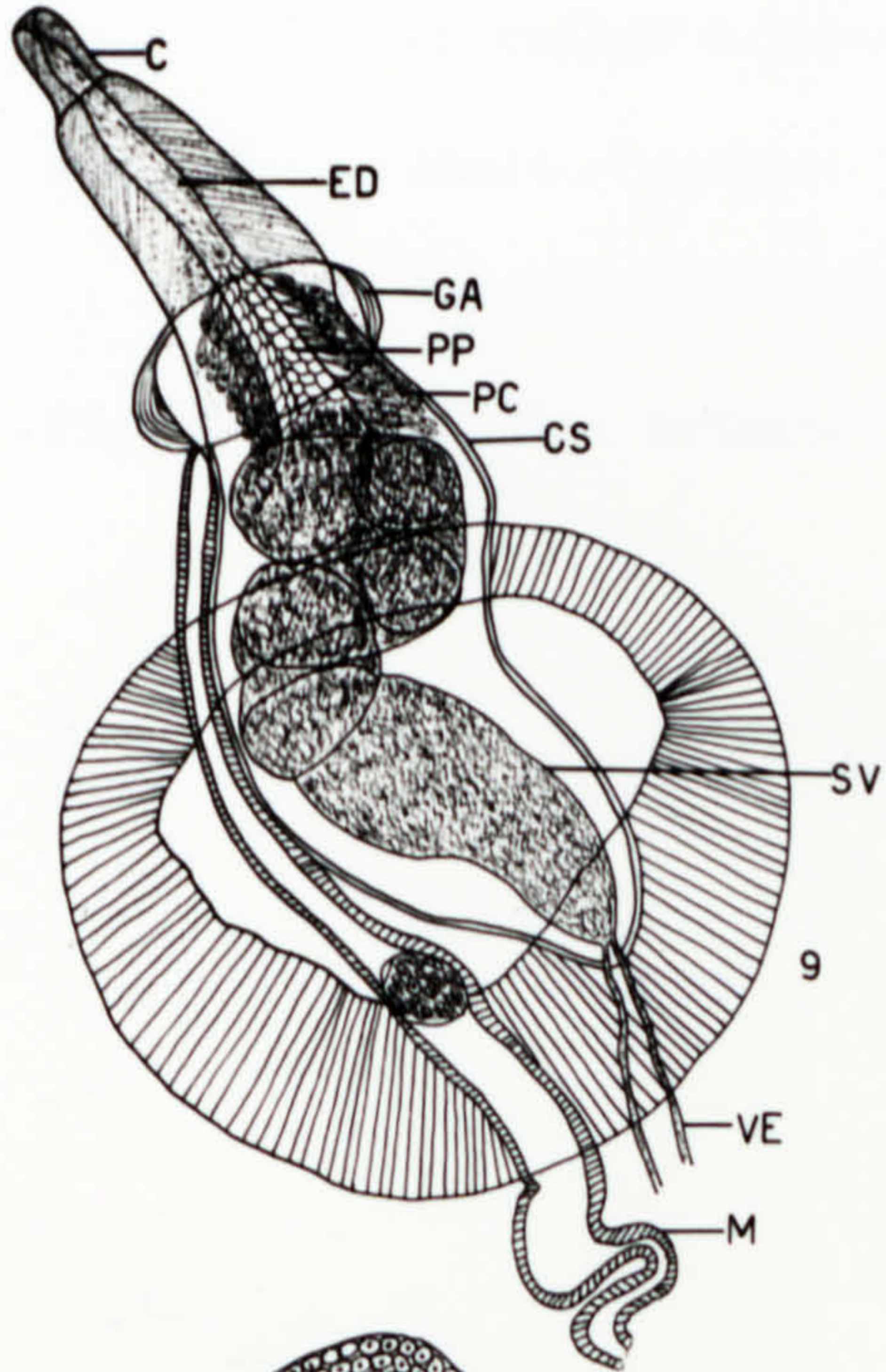
Fig. 8. Adult - fifteen days old from experimental infection of pigeon in ventral view.



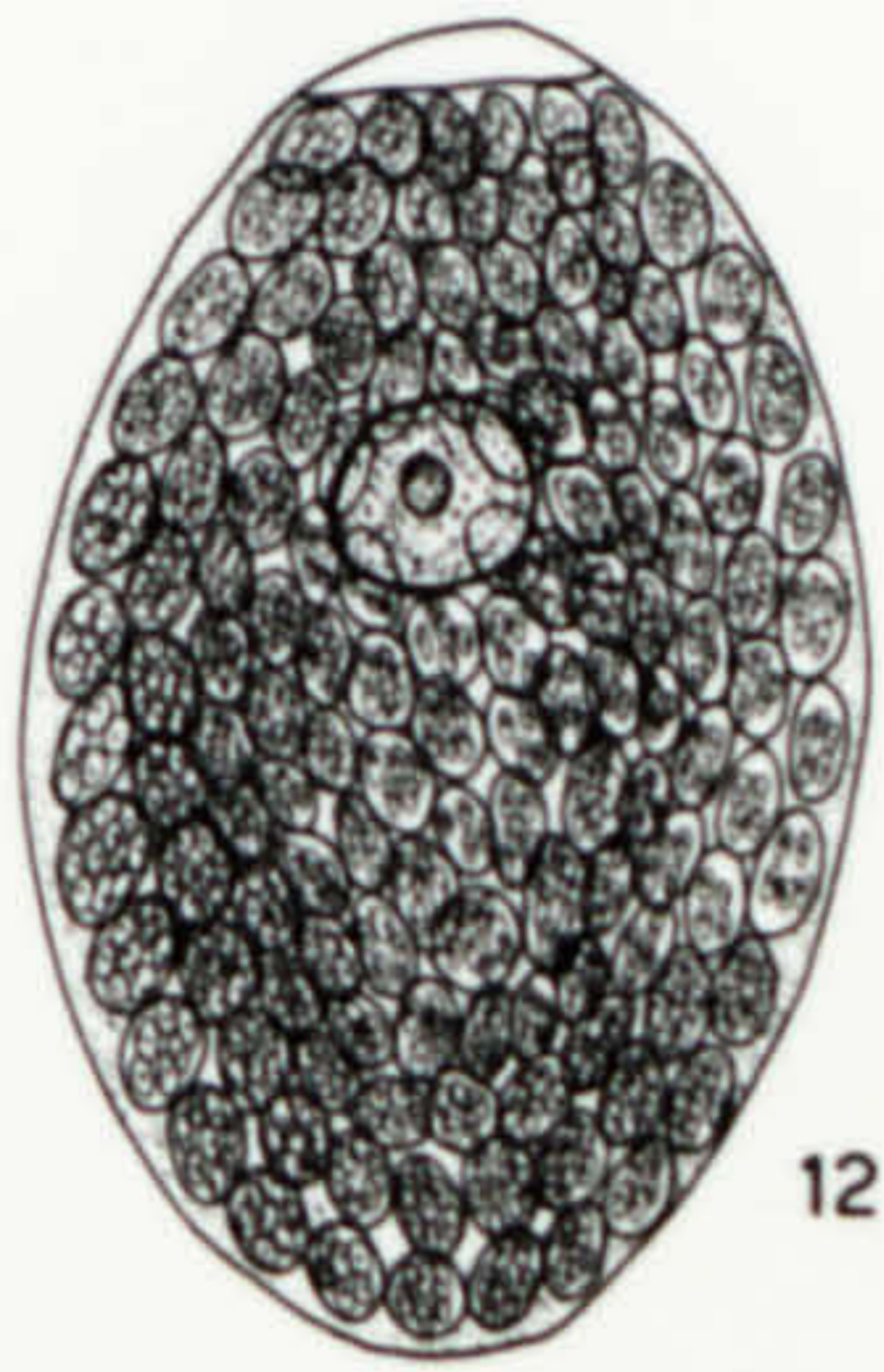
Hypoderaeum conoideum

Plate 18

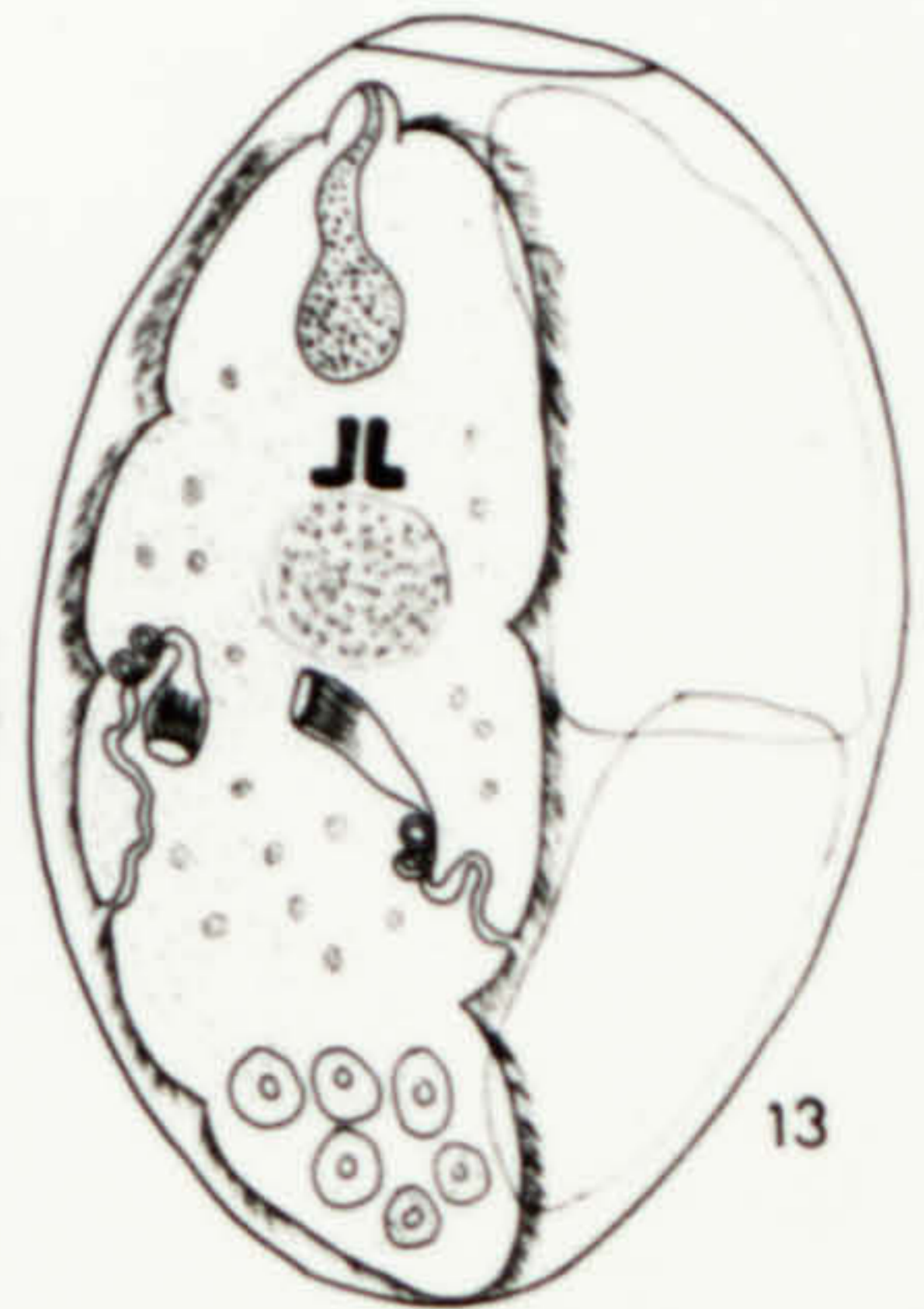
- Fig. 9. Adult - male genital ducts.
- Fig. 10. Adult - showing variation in the shape of the testes.
- Fig. 11. Adult - female genital system.
- Fig. 12. Egg - specimen immediately after laying.
- Fig. 13. Egg - showing fully developed miracidium.



0.1mm



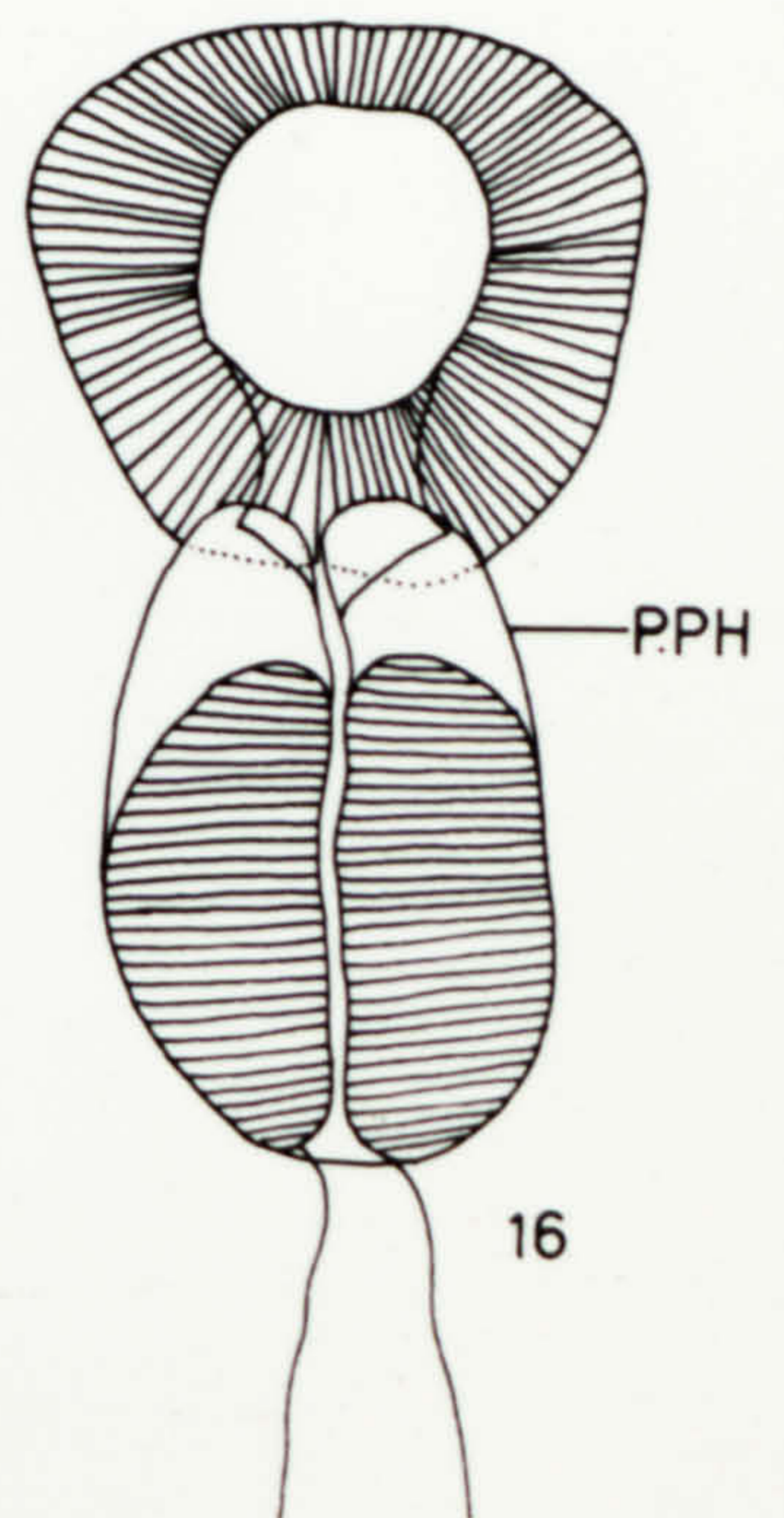
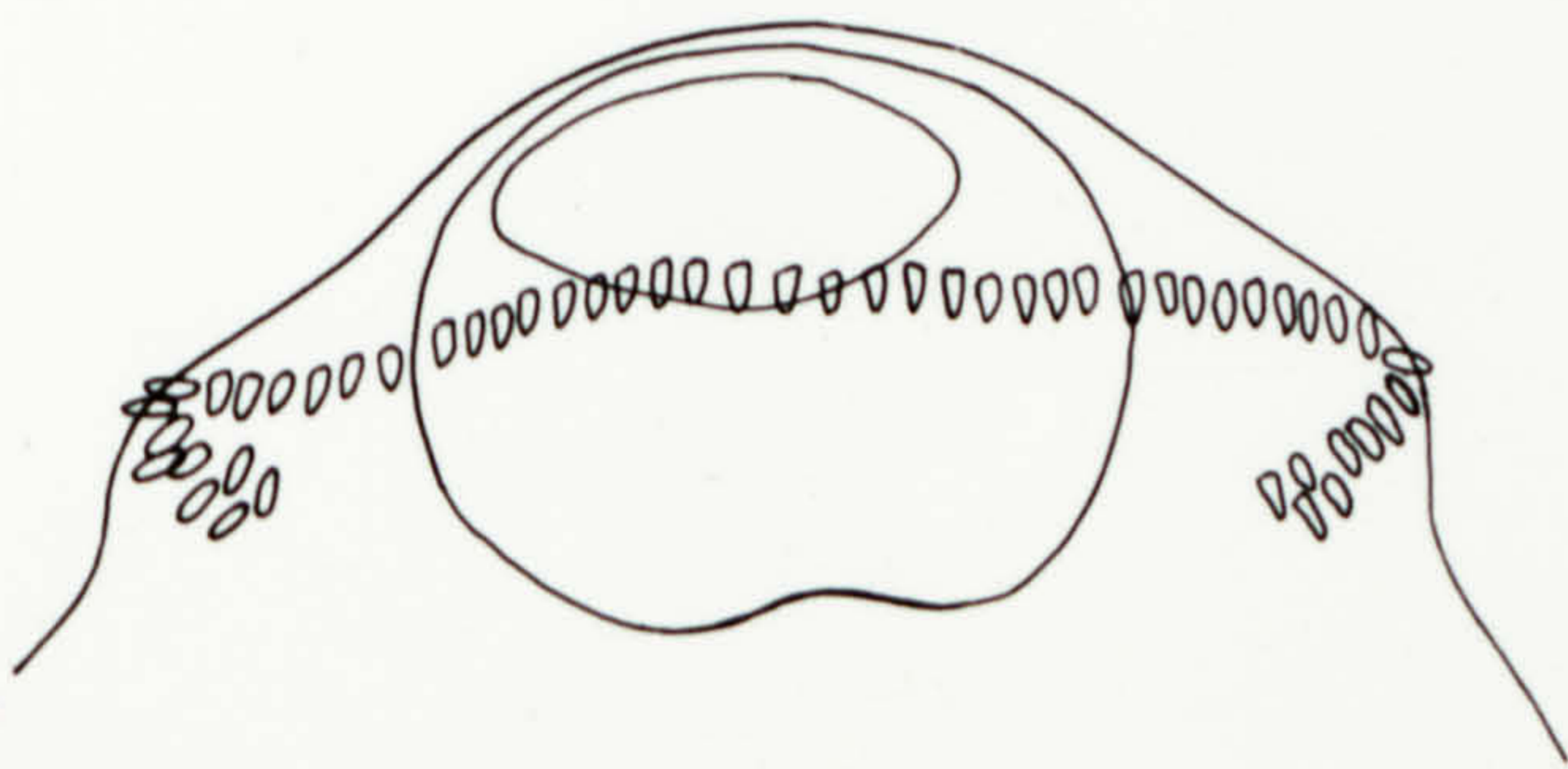
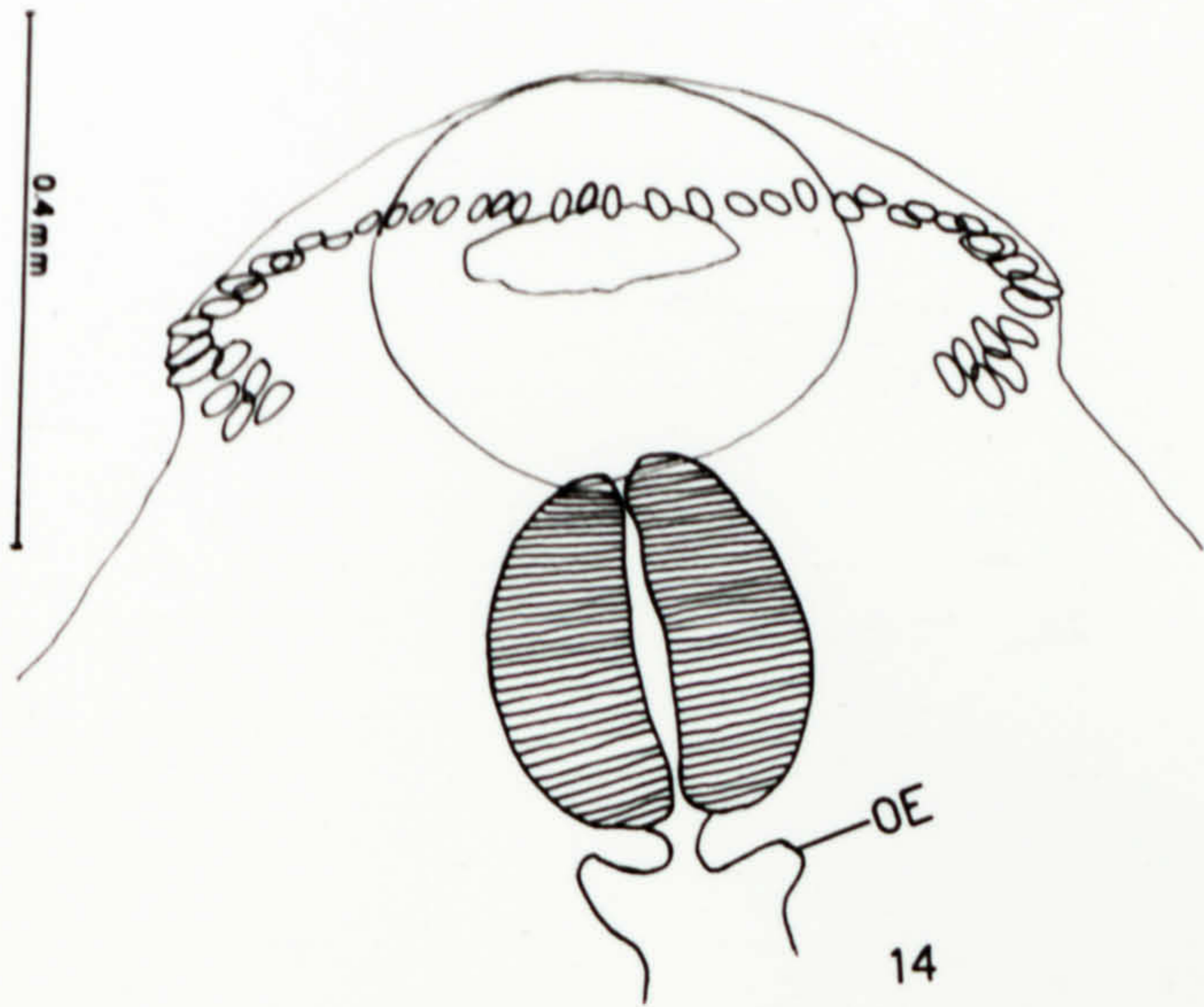
0.08mm



Hypoderaeum conoideum

Plate 19

- Fig. 14. Adult - anterior end, showing arrangement and number of collar spines (47) and diverticula of the oesophagus.
- Fig. 15. Adult - another specimen but with 52 spines. Showing the prepharynx.
- Fig. 16. Adult - anterior end showing the prepharynx.



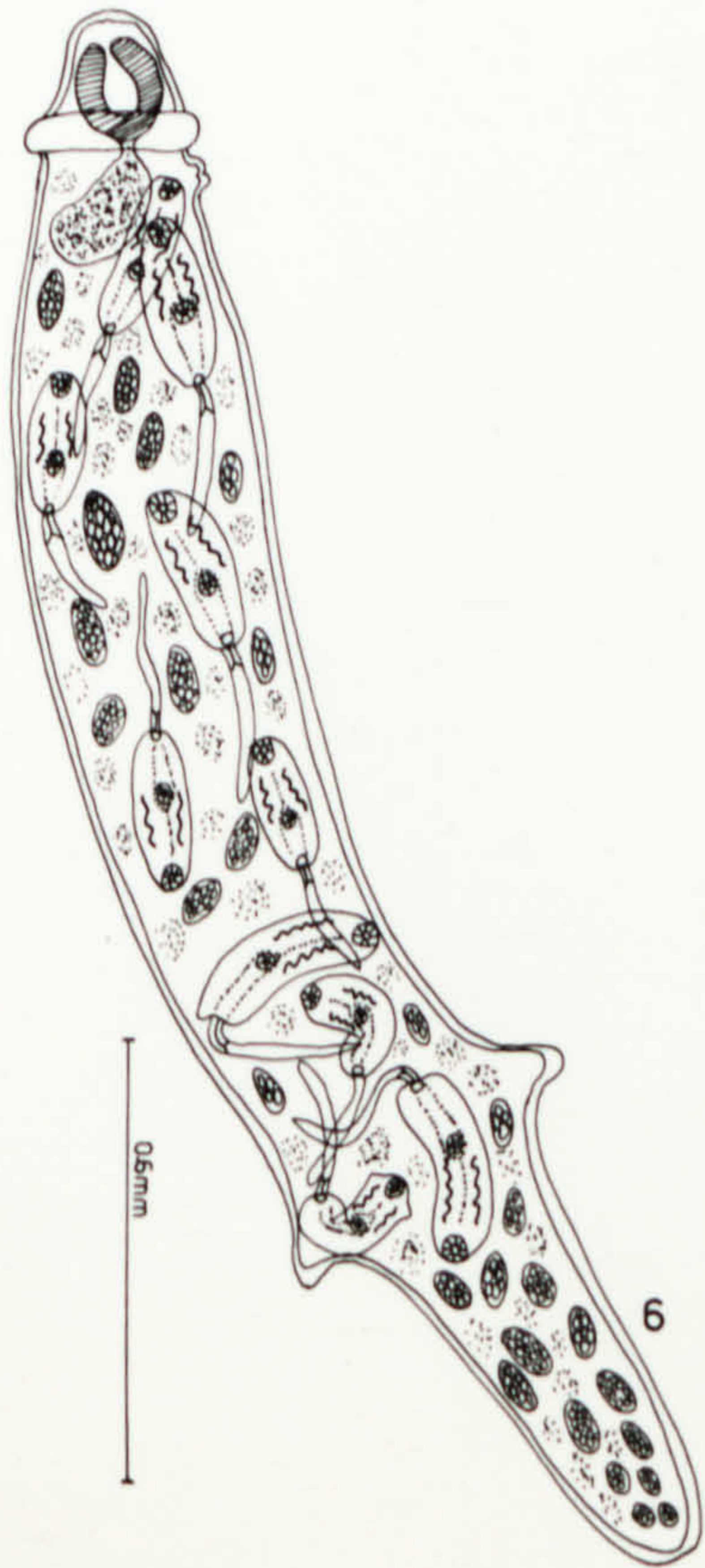
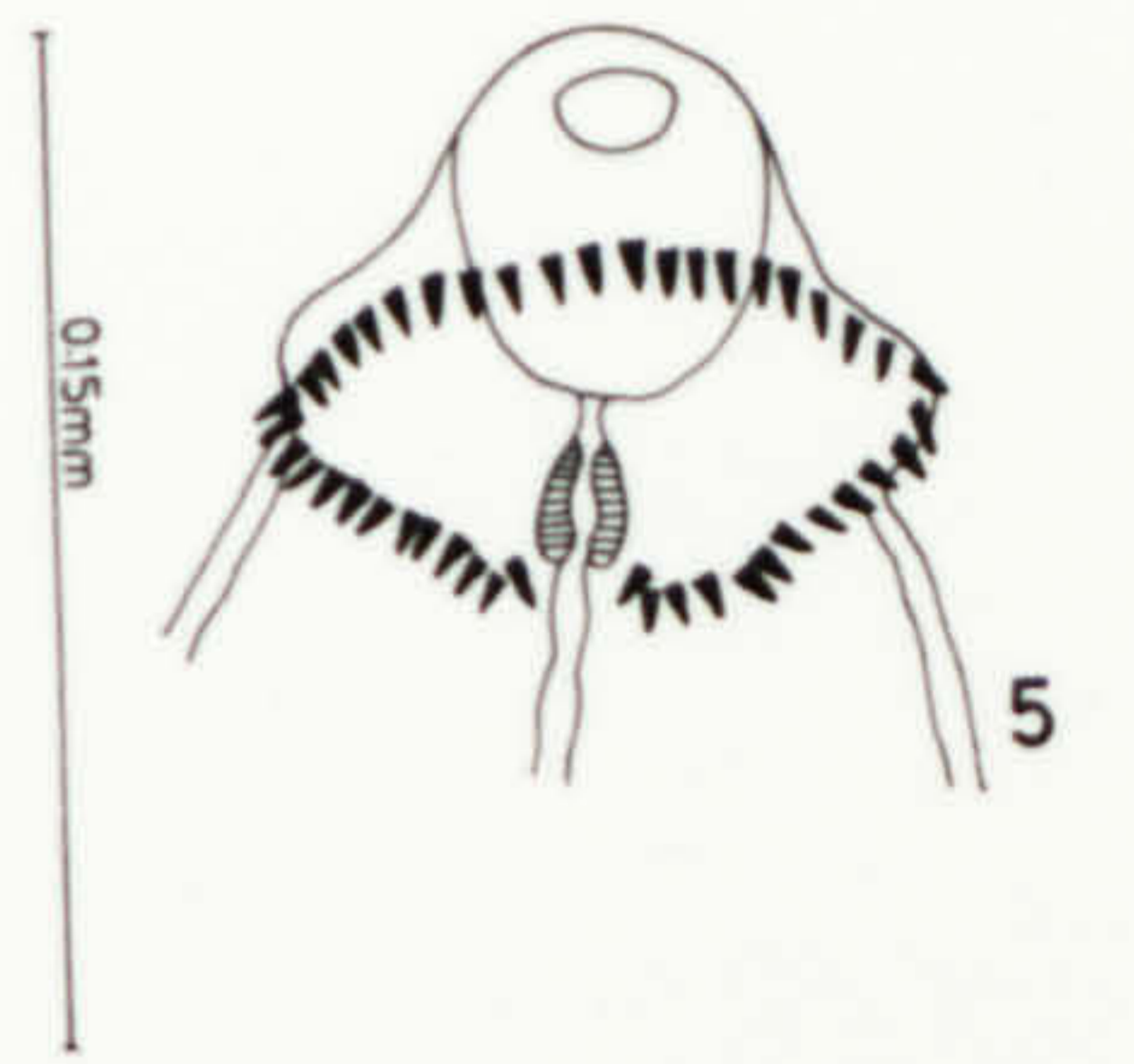
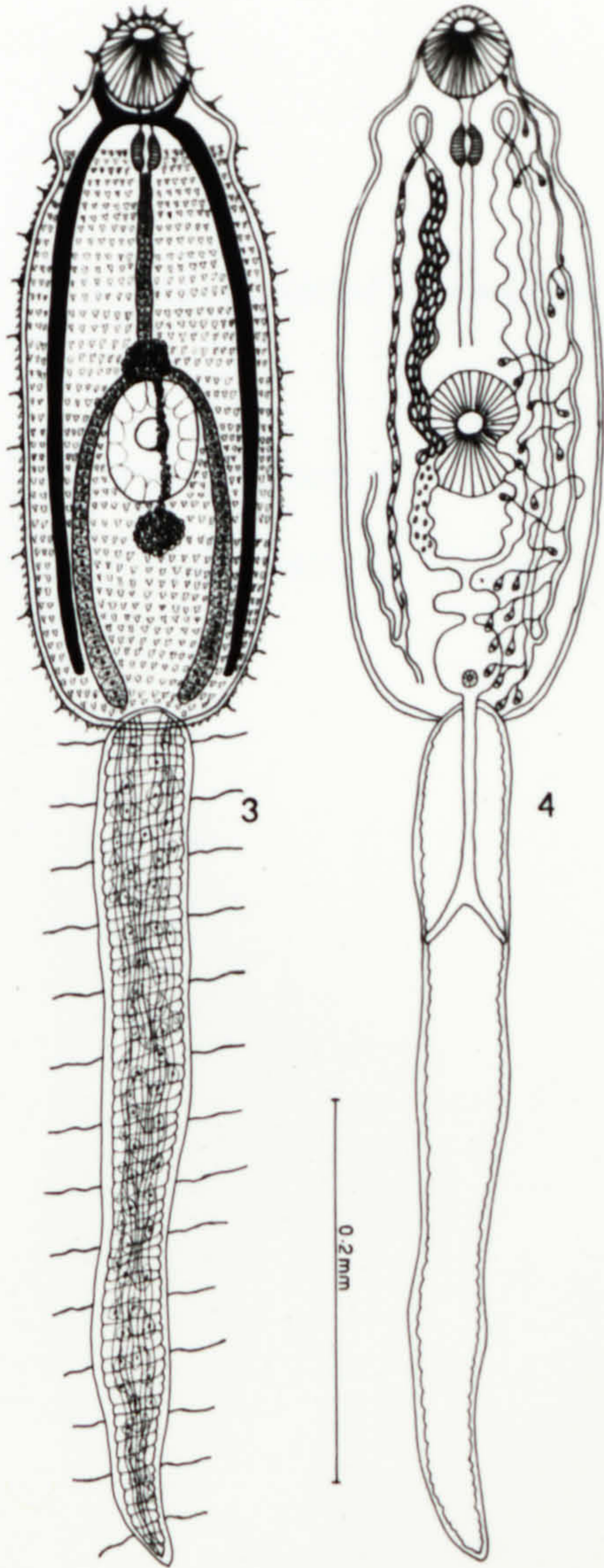
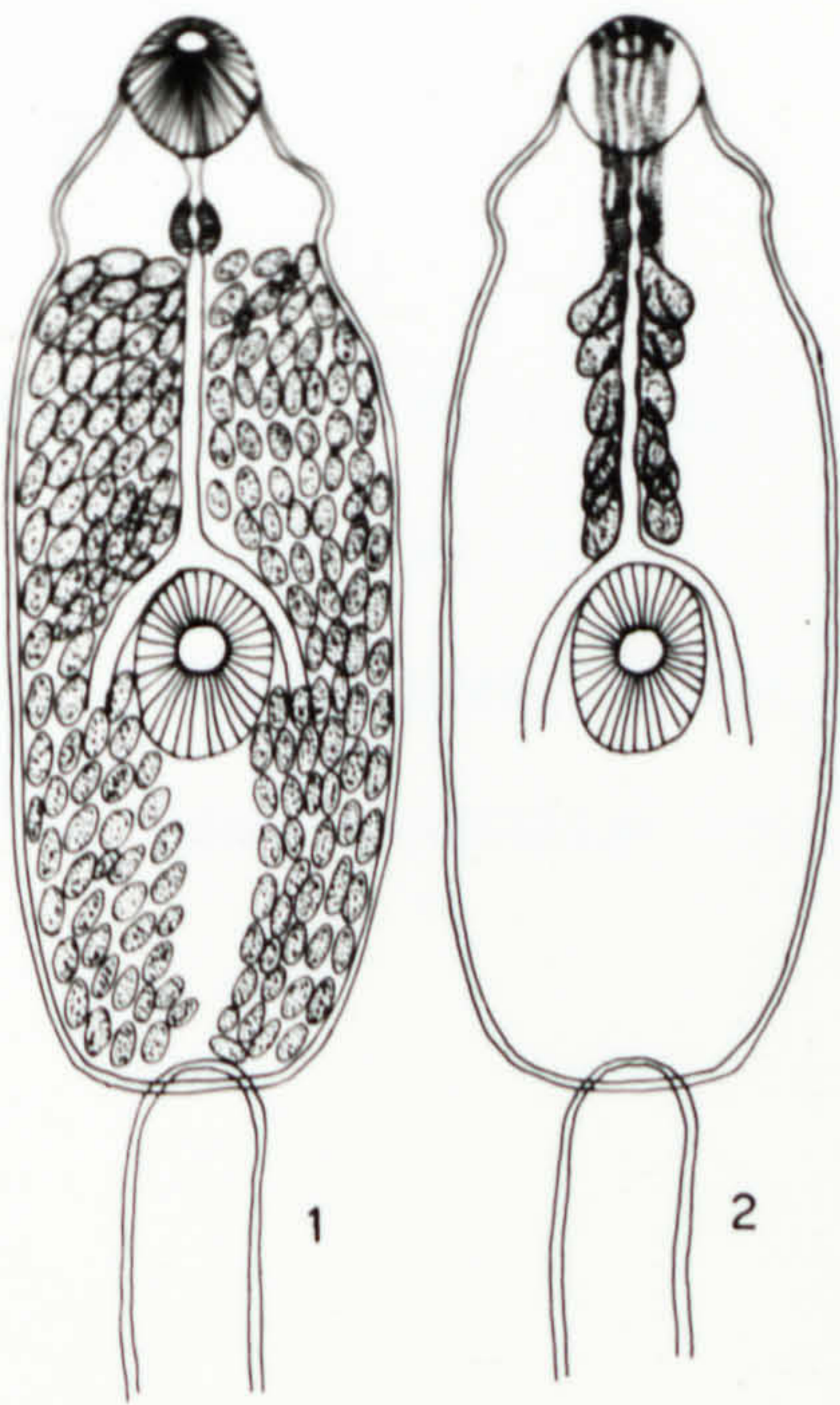
Plates 20-22

Echinoparyphium recurvatum

Echinoparyphium recurvatum

Plate 20

- Fig. 1. Cercaria - ventral view showing distribution of cystogenous gland-cells.
- Fig. 2. Cercaria - ventral view showing number and location of penetration gland-cells.
- Fig. 3. Cercaria - to show arrangement of spines, hair-like projections digestive system and nervous system.
- Fig. 4. Cercaria - ventral view showing protonephridial system with number and arrangement of flame cells on one side and excretory refractile granules and ciliary patches on the other side.
- Fig. 5. Cercaria - ventral view of anterior third showing the neck and 45 collar spines.
- Fig. 6. Mature redia - with germ balls and cercariae. Note one posterior locomotory appendages and birth pore.
- Fig. 7. Encysted metacercaria - 15 days old.



Echinoparyphium recurvatum

Plate 21

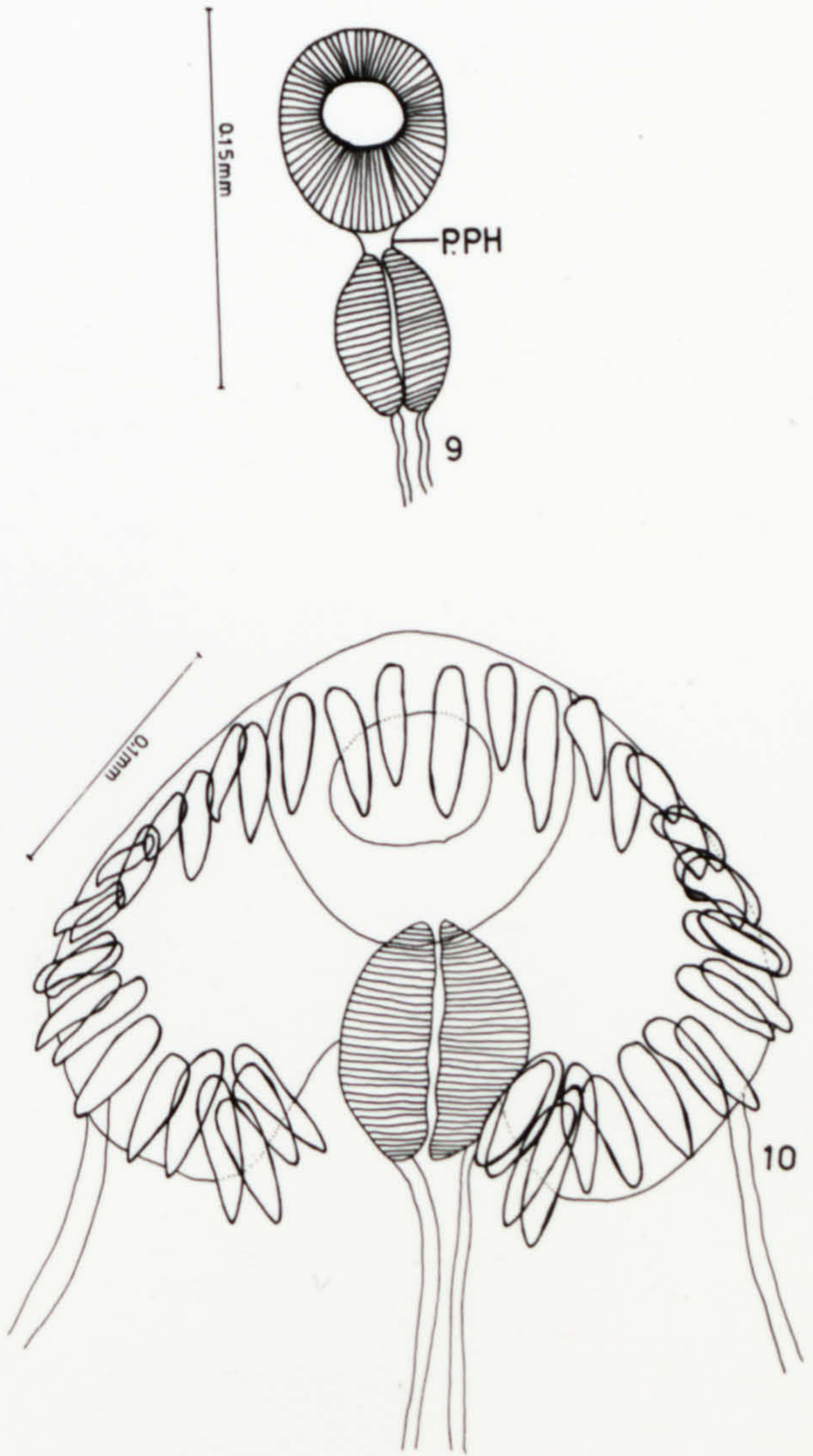
Fig. 8. Adult - fifteen days old from experimental infection of pigeon
in ventral view.

Fig. 9. Adult - anterior end showing the prepharynx.

Fig. 10. Adult - anterior end showing arrangement of collar spines.



0.5mm



Echinoparyphium recurvatum

Plate 22

Fig. 11. Adult - male genital ducts.

Fig. 12. Adult - female genital systems

Fig. 13. Egg - from uterus showing fertilised ovum surrounded by
vitelline cells.

Fig. 14. Egg - 4 days after laying.

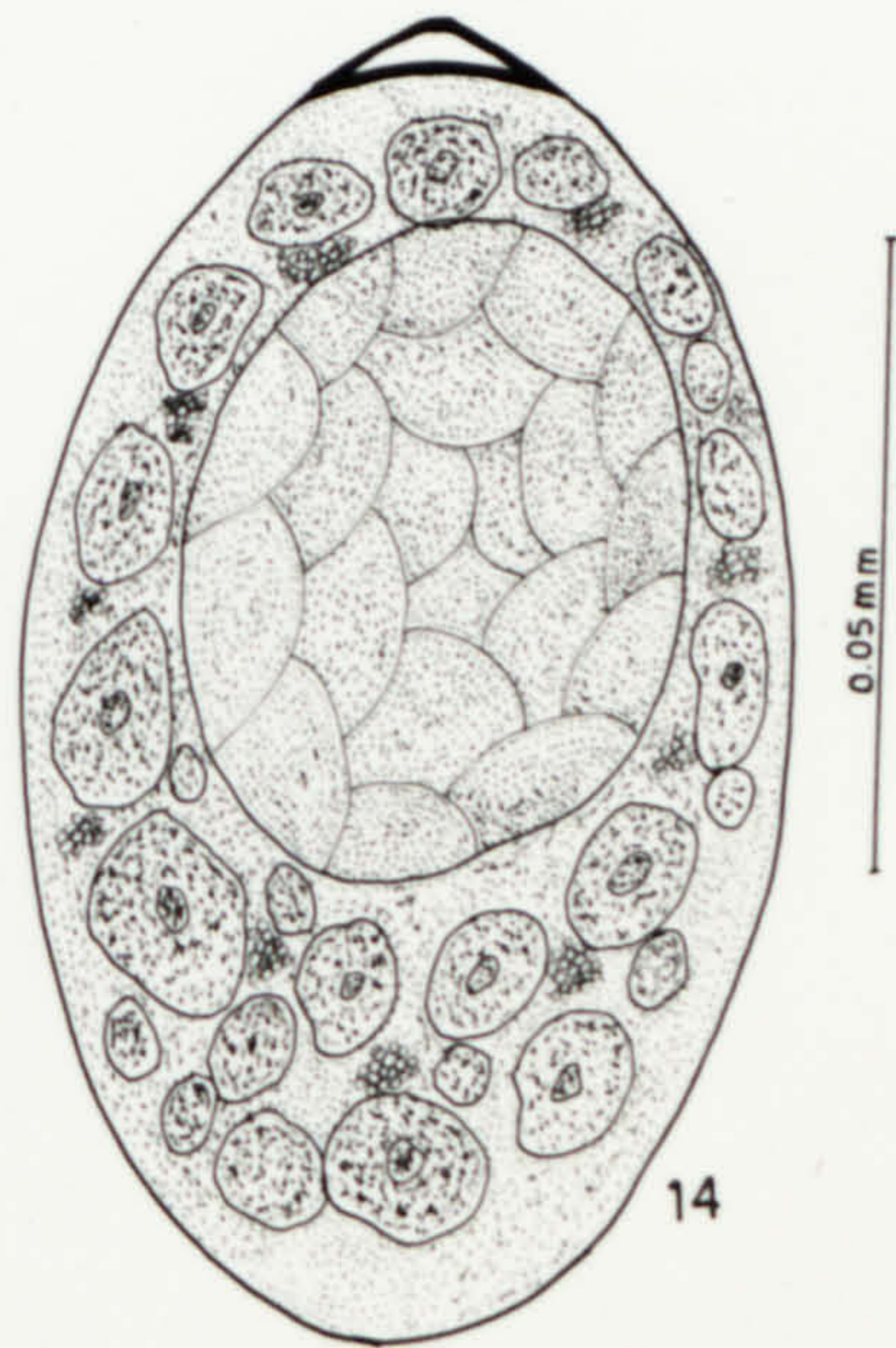
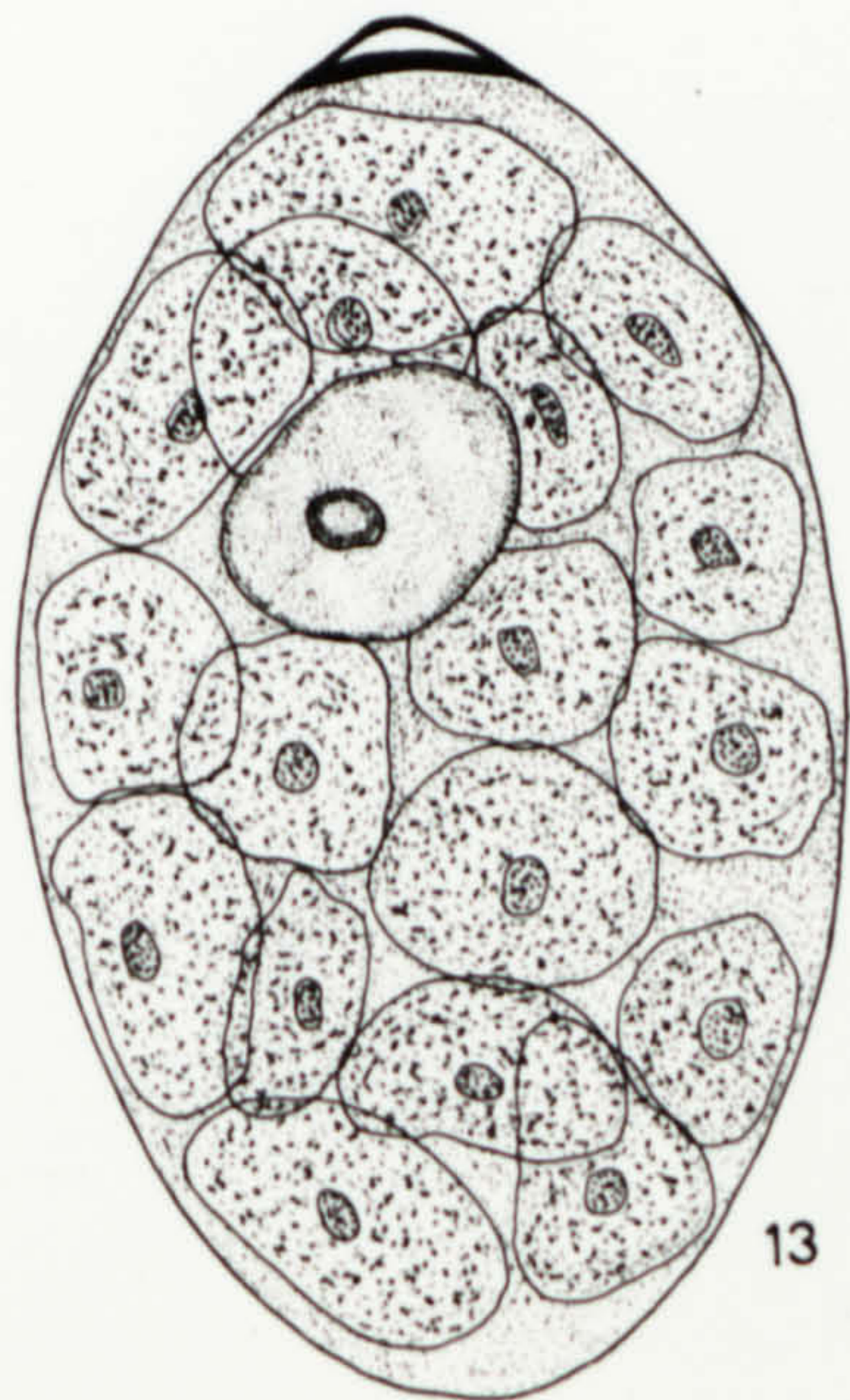
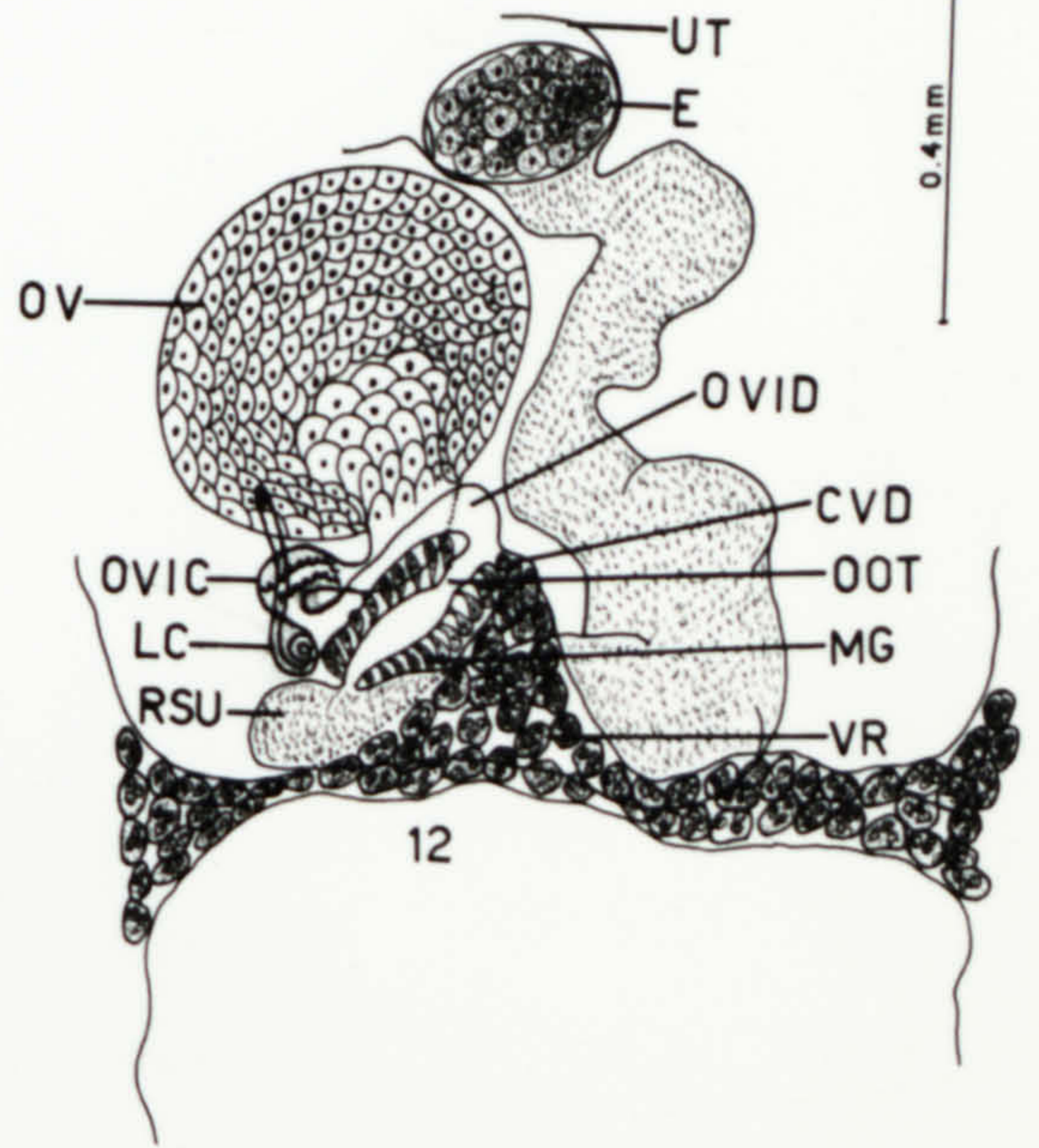
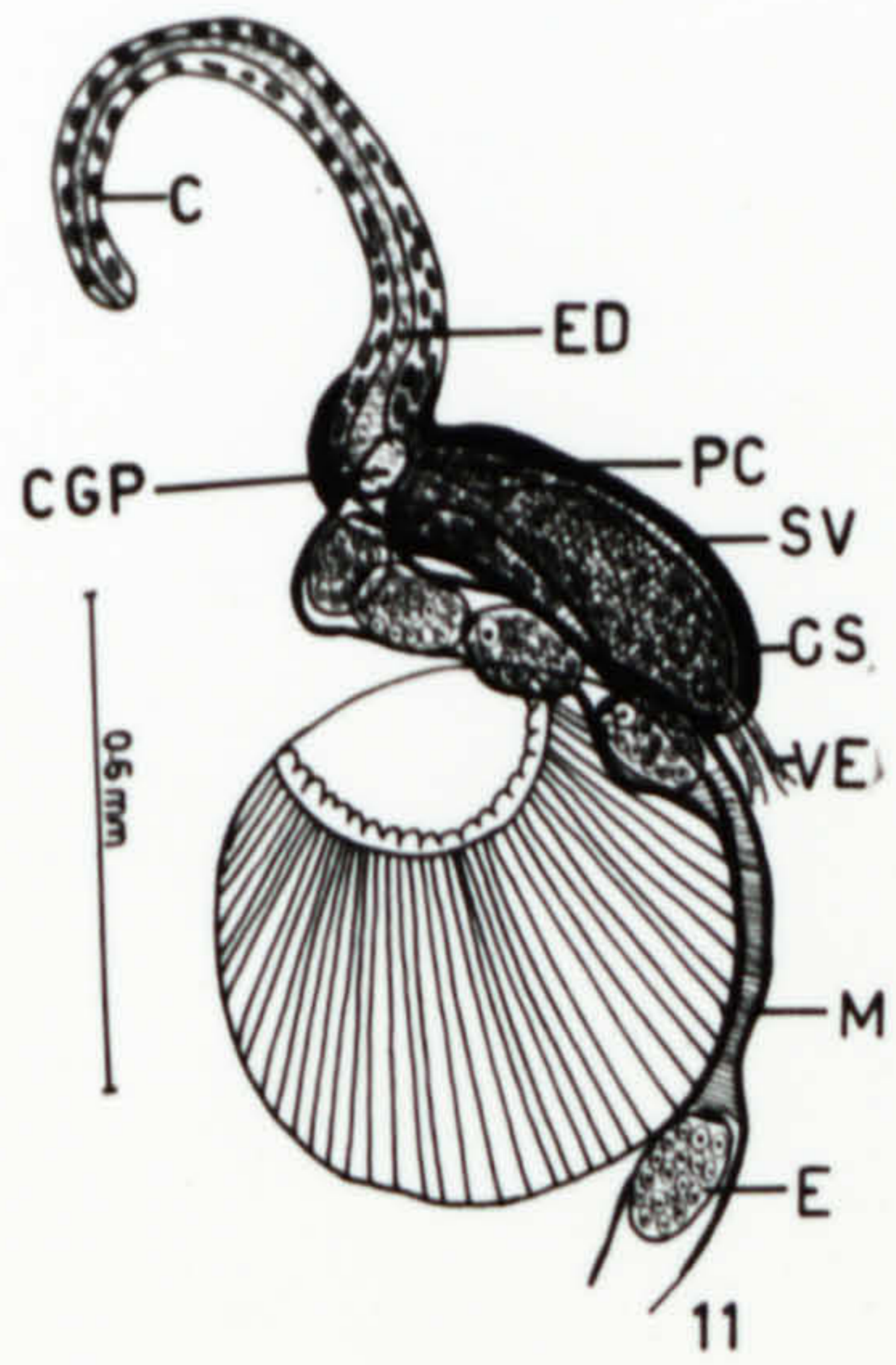


Plate 23

Cercaria echinostoma III

- Fig. 1. Cercaria - ventral view showing spination, refractile granules at either side of pharynx and digestive systems.
- Fig. 2. Cercaria ventral view showing on one side, the number of flame cells and, on the other the anterior loop, excretory refractile granules and ciliary patches.
- Fig. 3. Cercaria - ventral view showing distribution of cystogenous gland-cells.
- Fig. 4. Mature redia - showing birth pore, entire collar, digestive system, locomotory appendages and developing cercariae.
- Fig. 5. Cercaria - anterior end showing number and arrangement of spines.
- Fig. 6. Encysted metacercaria - seven days old.

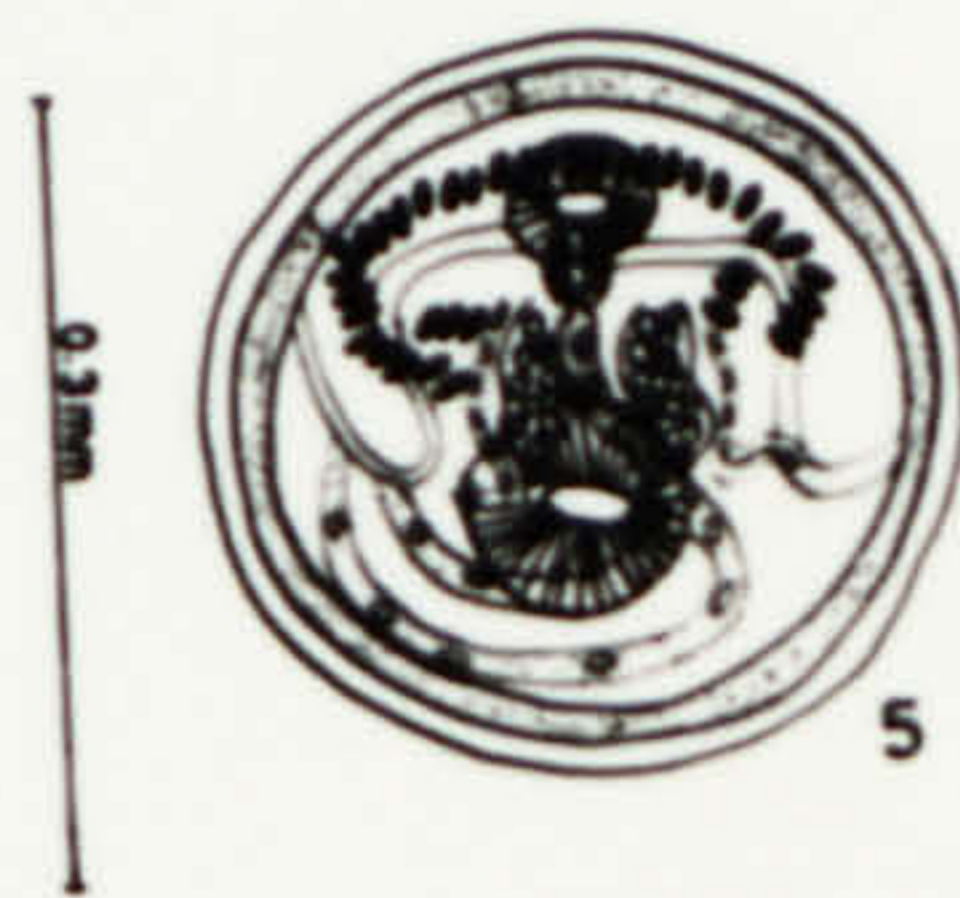
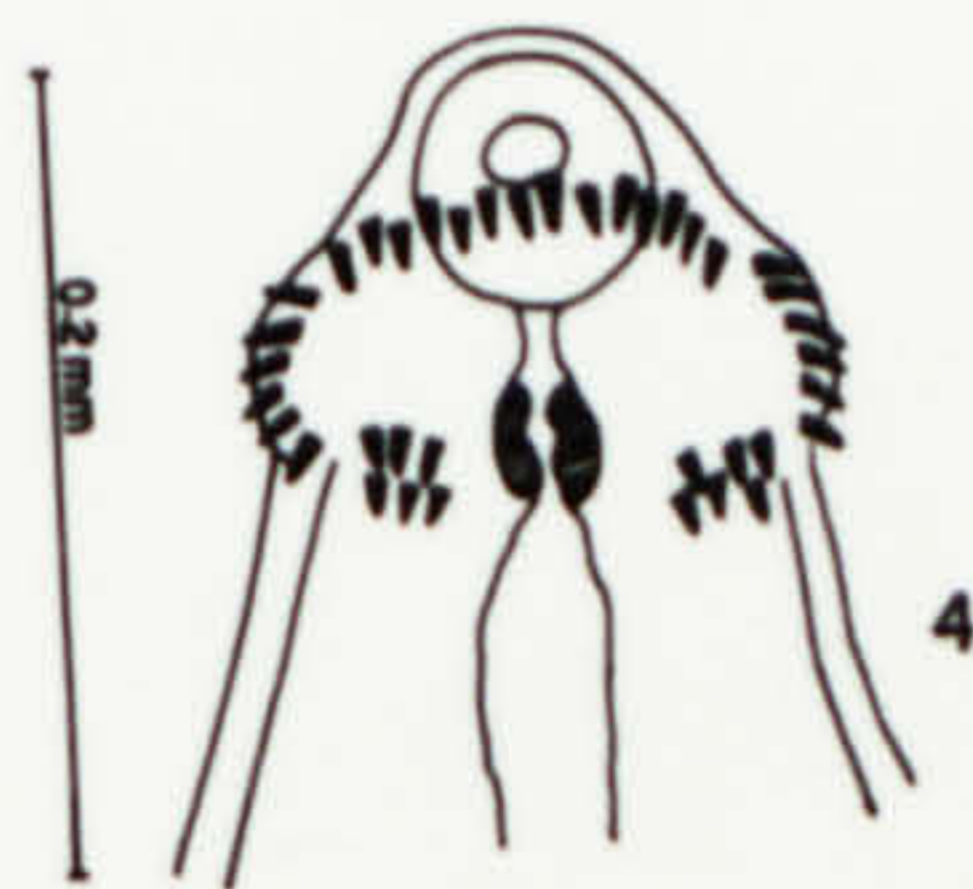
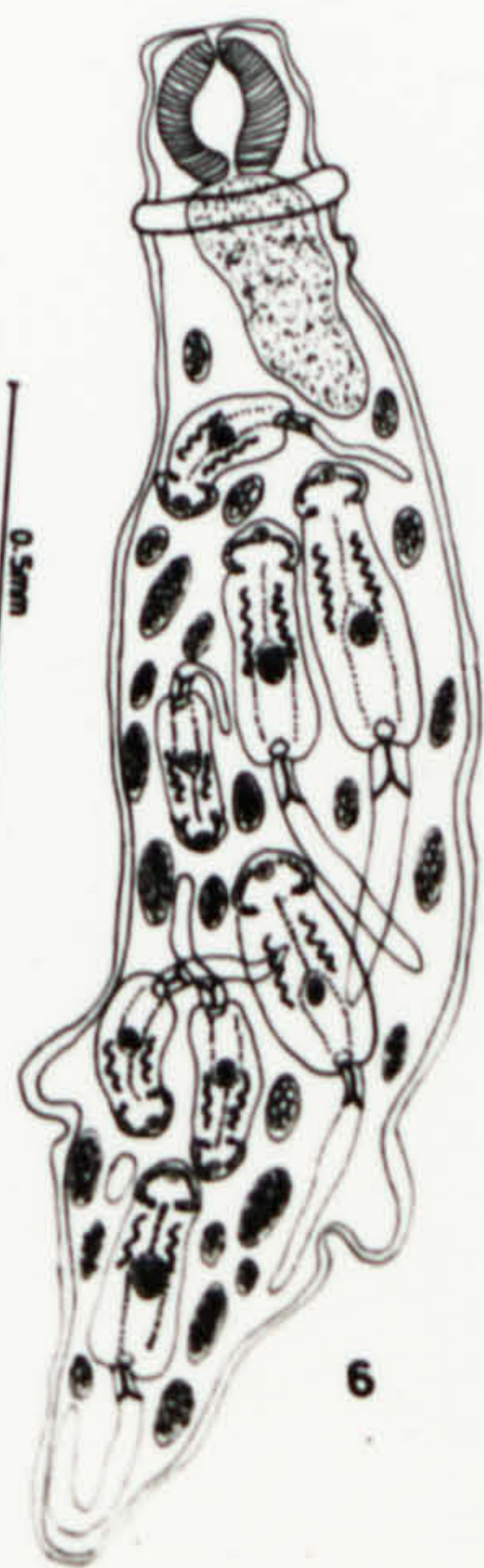
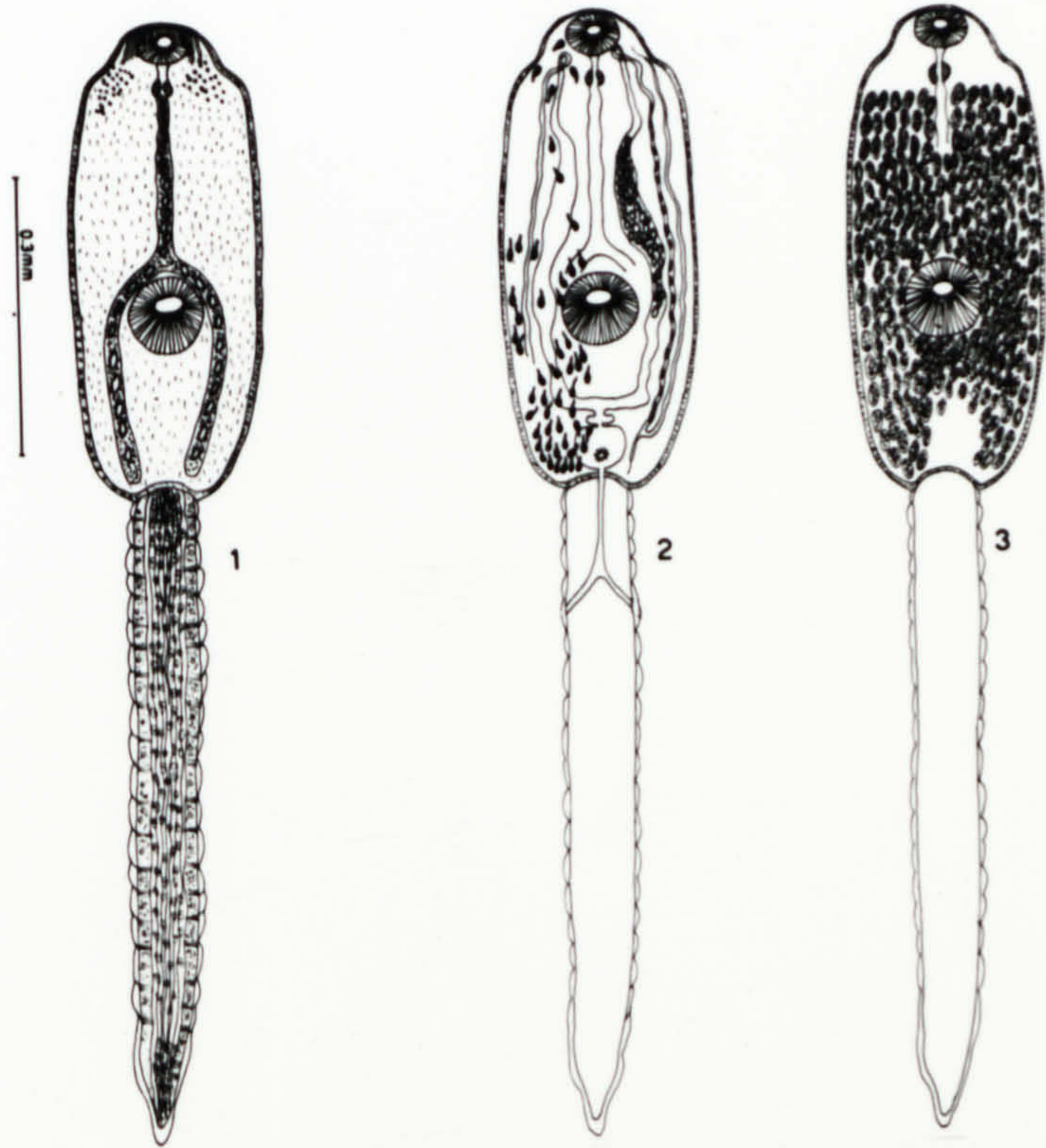


Plate 24

Cercaria magnacauda I

- Fig. 1. Cercaria - ventral view showing detail of body spination, digestive system, genital rudiments, distribution of orange pigments and structure of the tail.
- Fig. 2. Cercaria - ventral view showing distribution of cytogenous gland-cells.
- Fig. 3. Cercaria - ventral view showing, on one side, number and arrangement of flame cells, and on the other side, refractile granules and ciliary patches. Note the short blind caudal excretory duct.
- Fig. 4. Cercaria - ventral view showing number and arrangement of spines and a probable rudiment of cirrus sac.
- Fig. 5. Encysted metacercaria - one day old.
- Fig. 6. Mature redia - showing details of digestive system, locomotory appendages, germ balls and developing cercariae.

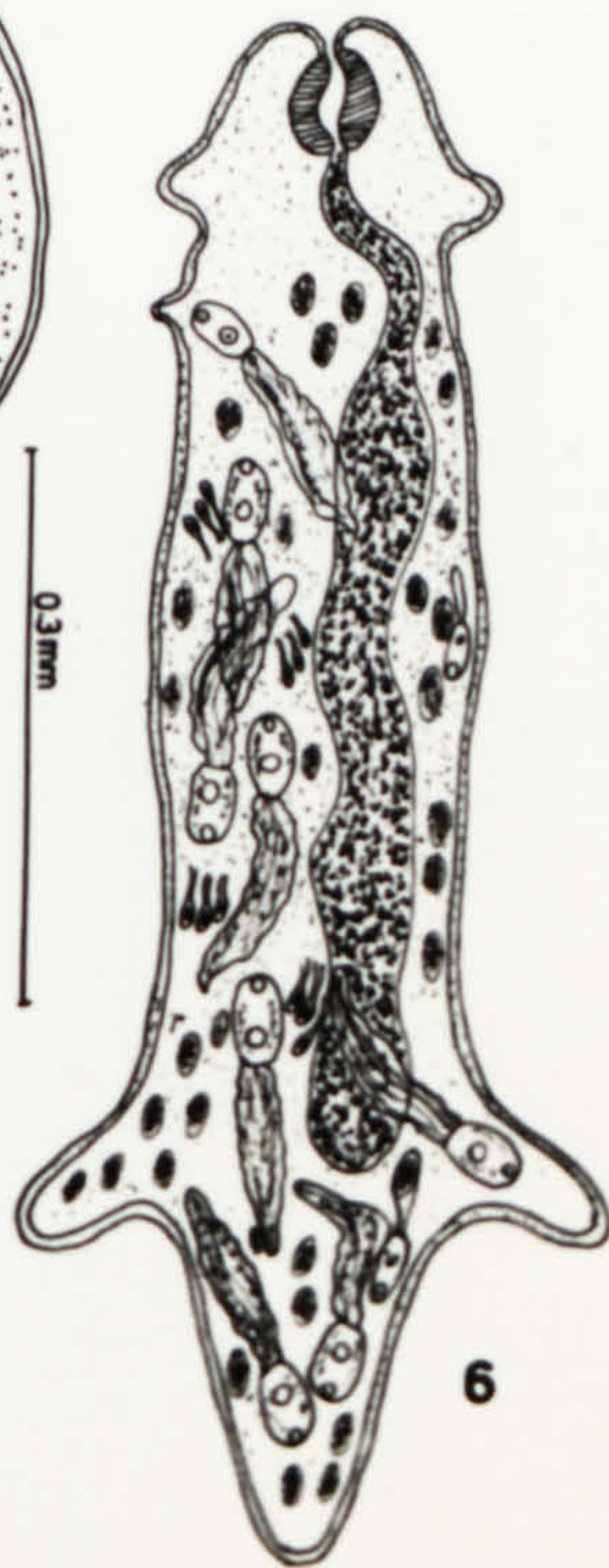
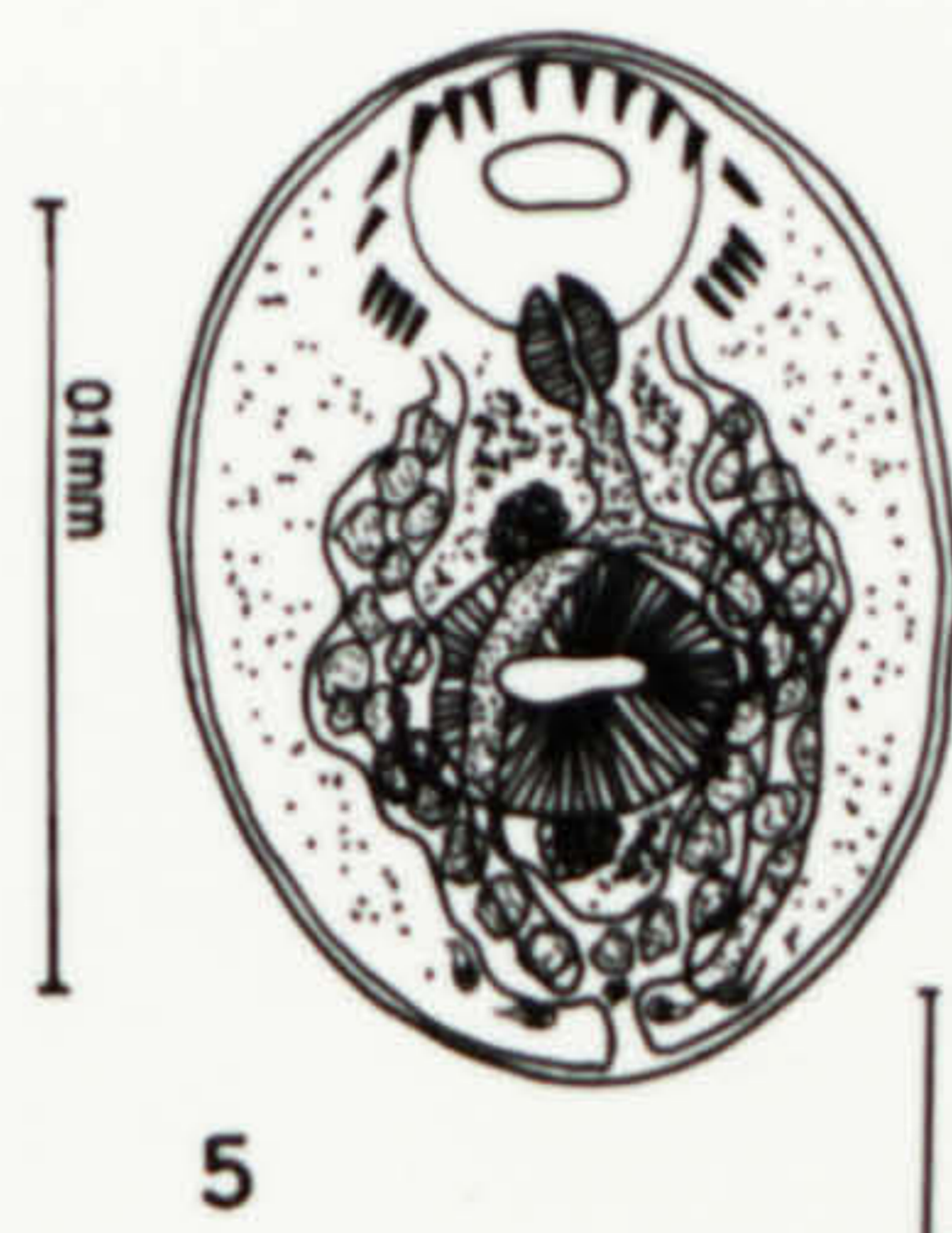
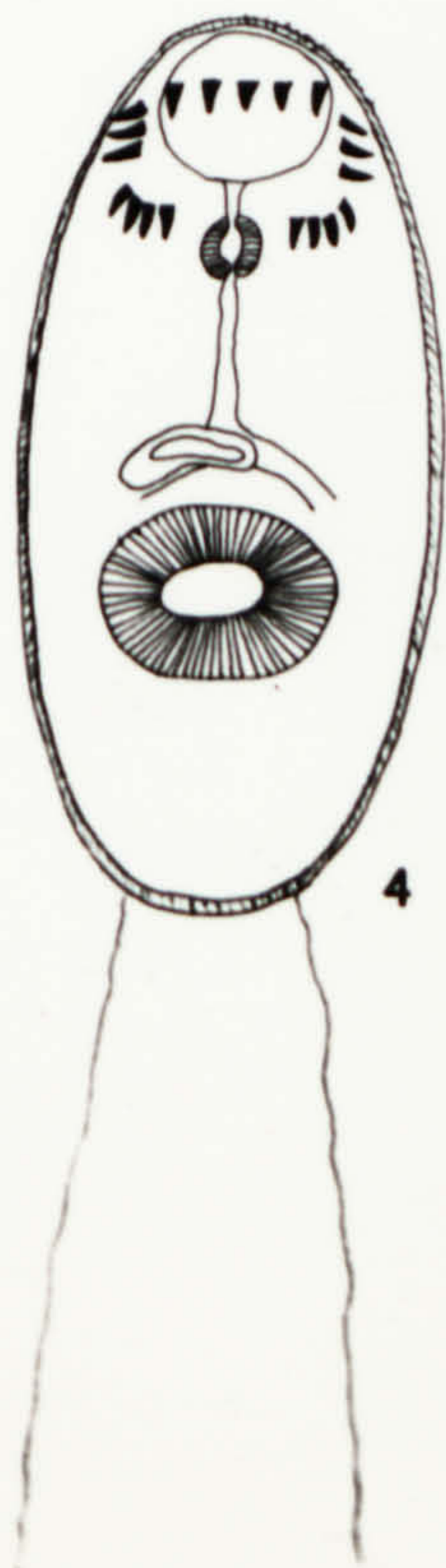
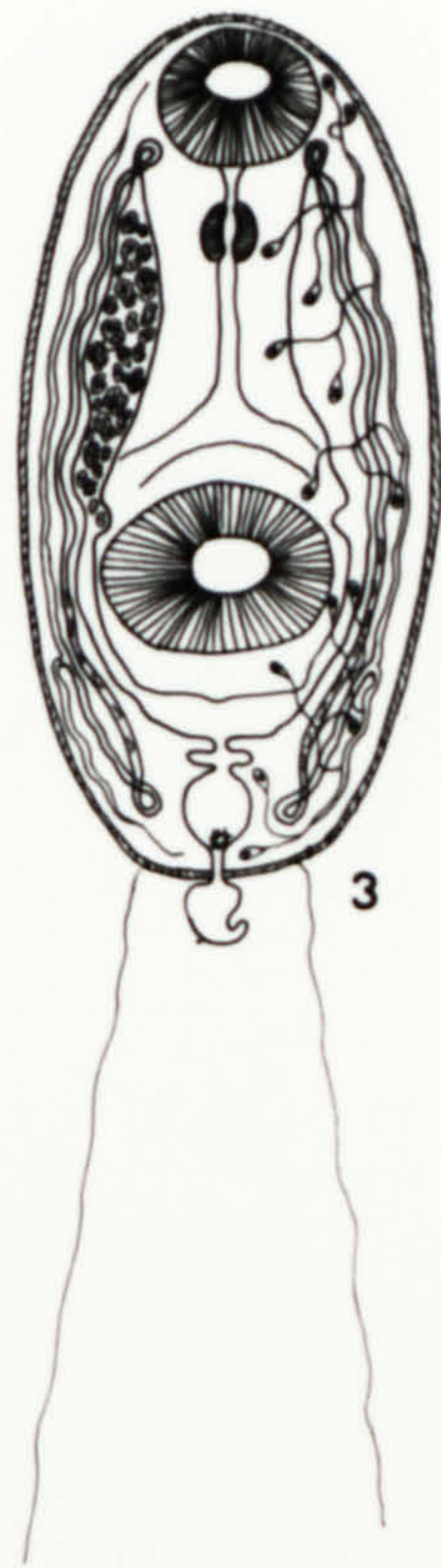
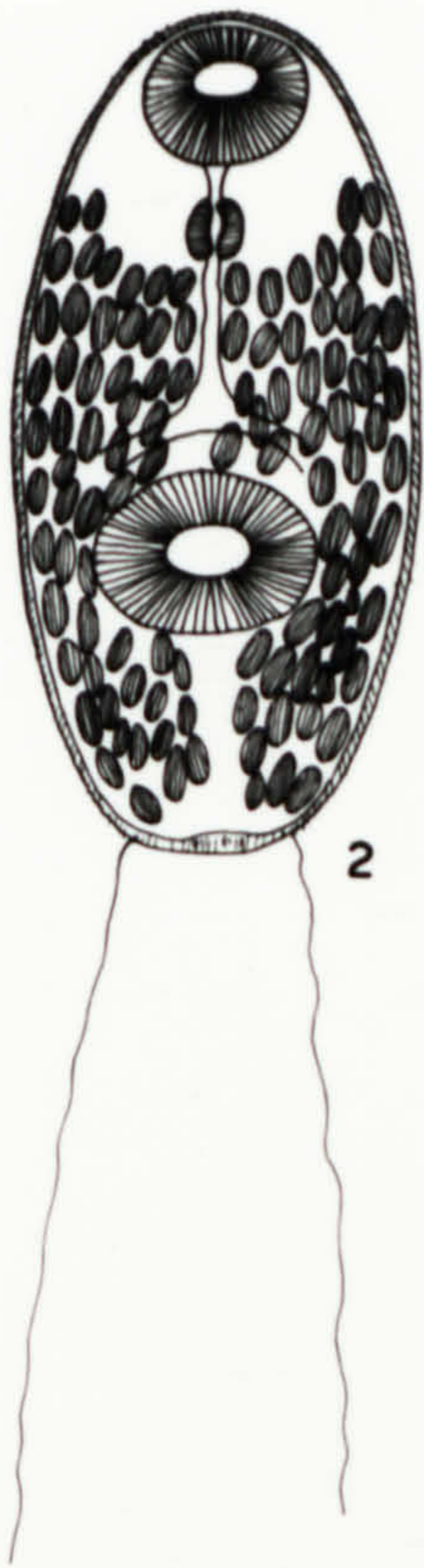
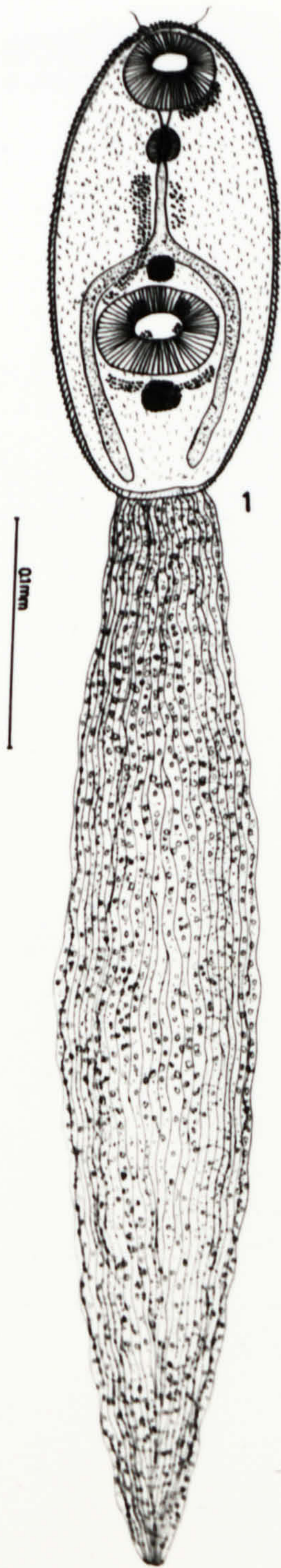


Plate 25

Cercaria magnacauda II

- Fig. 1. Cercaria - ventral view showing hair-like projections on body and tail, the musculature of the tail and the circle of papillae without setae surrounding the mouth.
- Fig. 2. Cercaria - ventral view showing on one side the number and arrangement of flame cells and on the other the primary excretory duct filled with refractile granules. Note the blind ending caudal excretory duct.
- Fig. 3. Cercaria - anterior end showing 10 small spines (no collar spines) in front of mouth, digestive system, genital rudiment, spines surrounding arifice of acetabulum and nervous system.
- Fig. 4. Encysted metacercaria - five hours old.
- Fig. 5. Encysted metacercaria - twenty days old. Note the outfolding of the ventral body wall.
- Fig. 6. Mature redia - showing digestive system, undivided collar, birth pore and locomotory appendages.

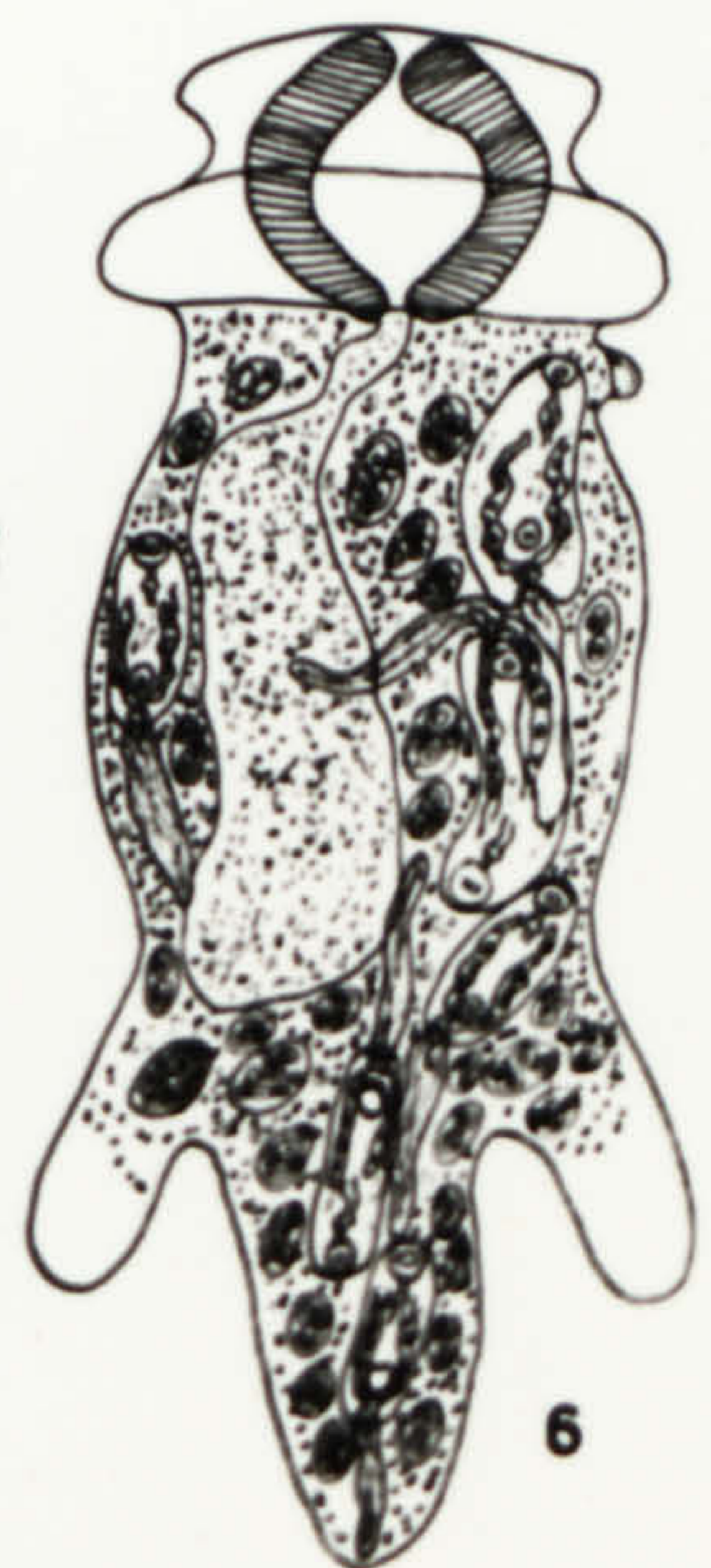
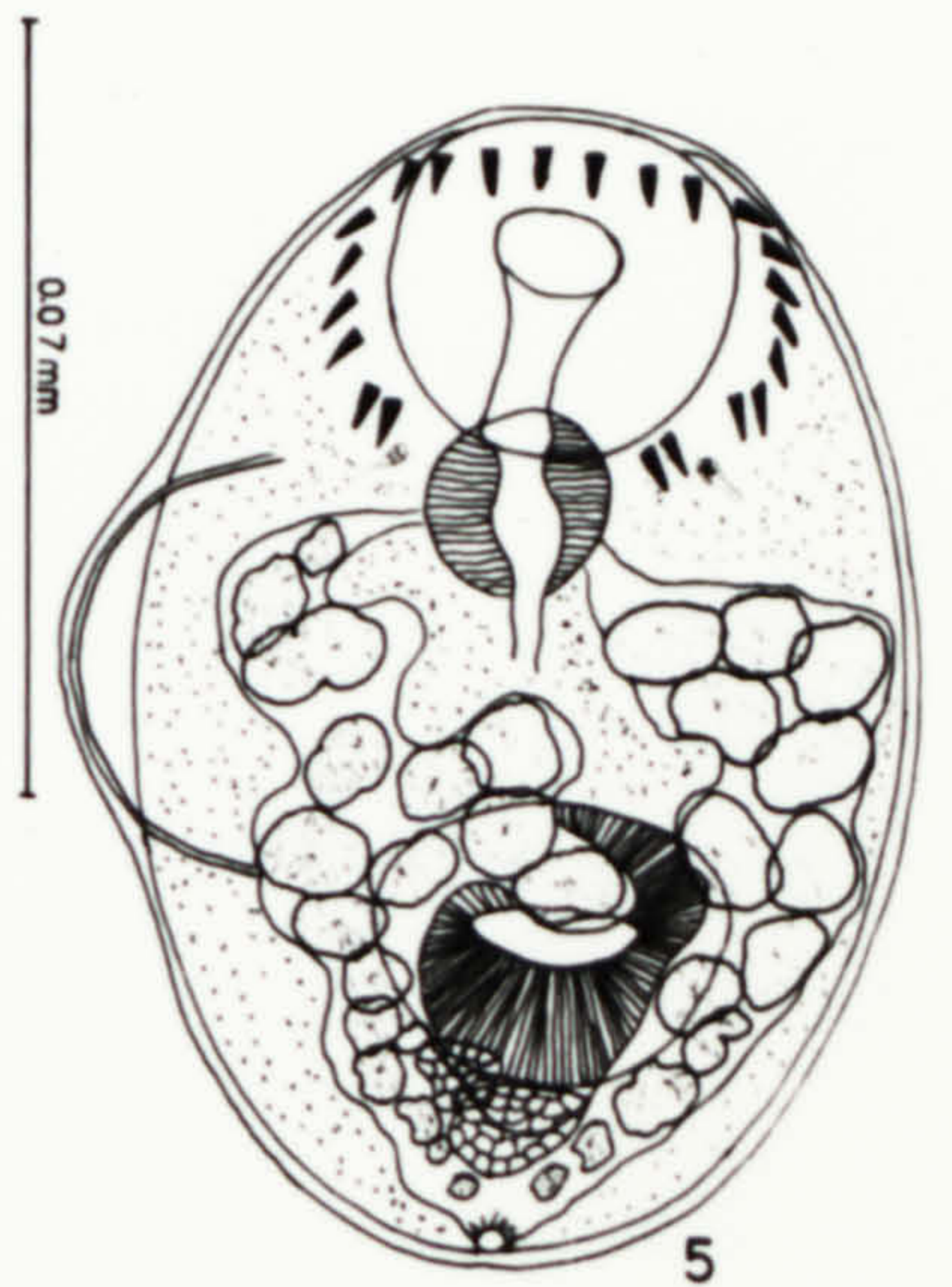
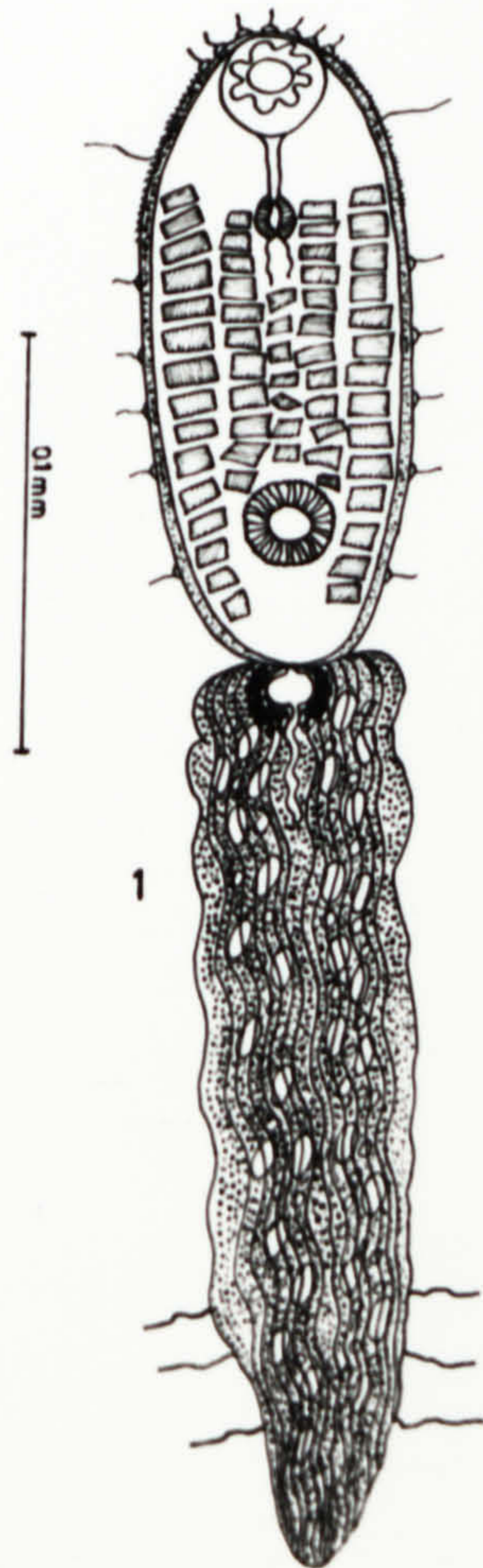
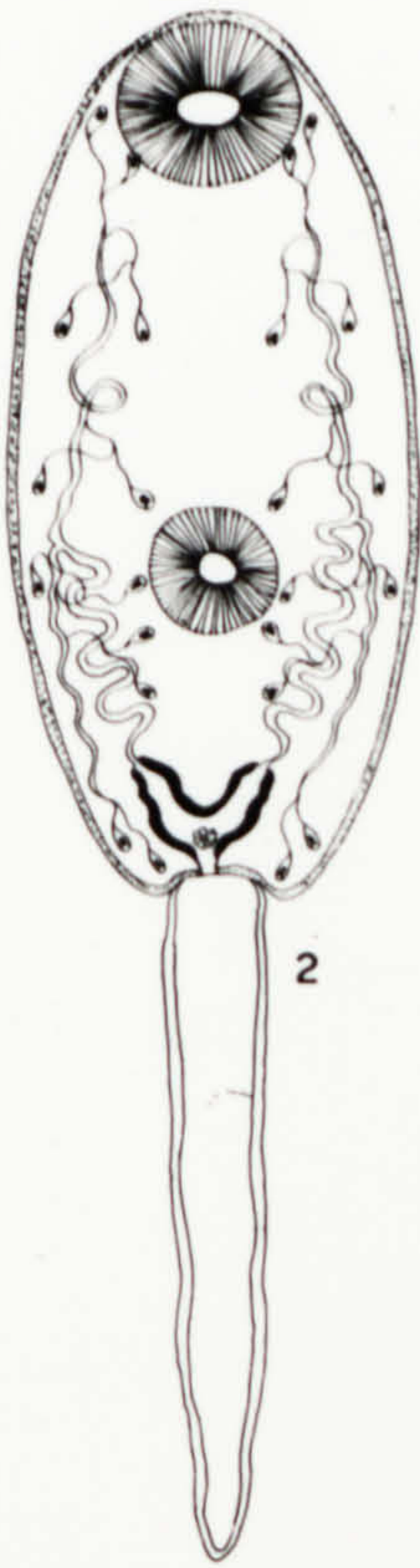
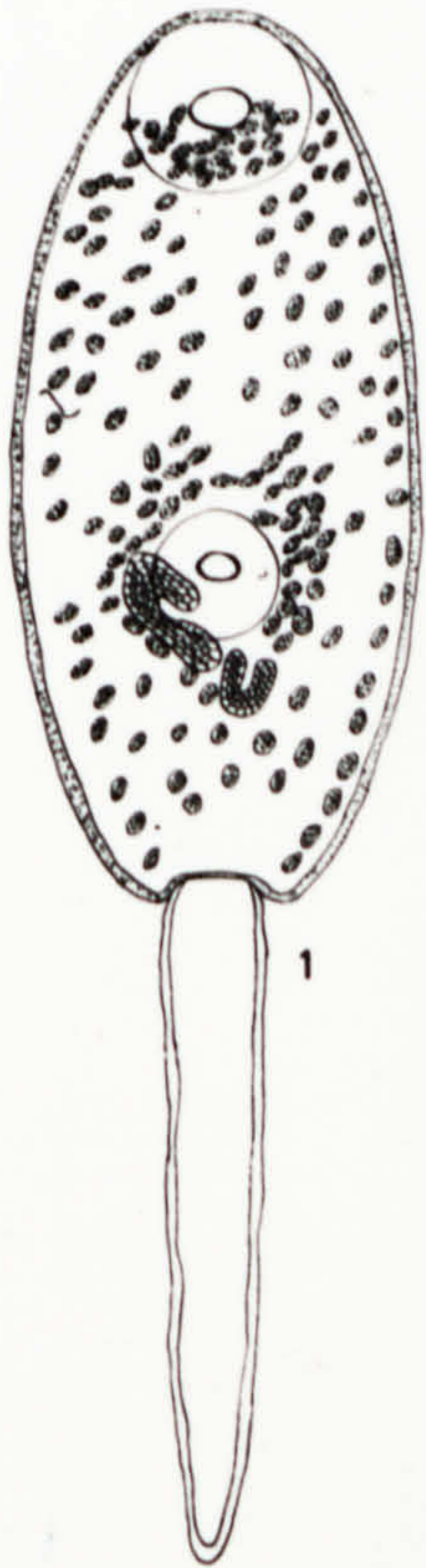


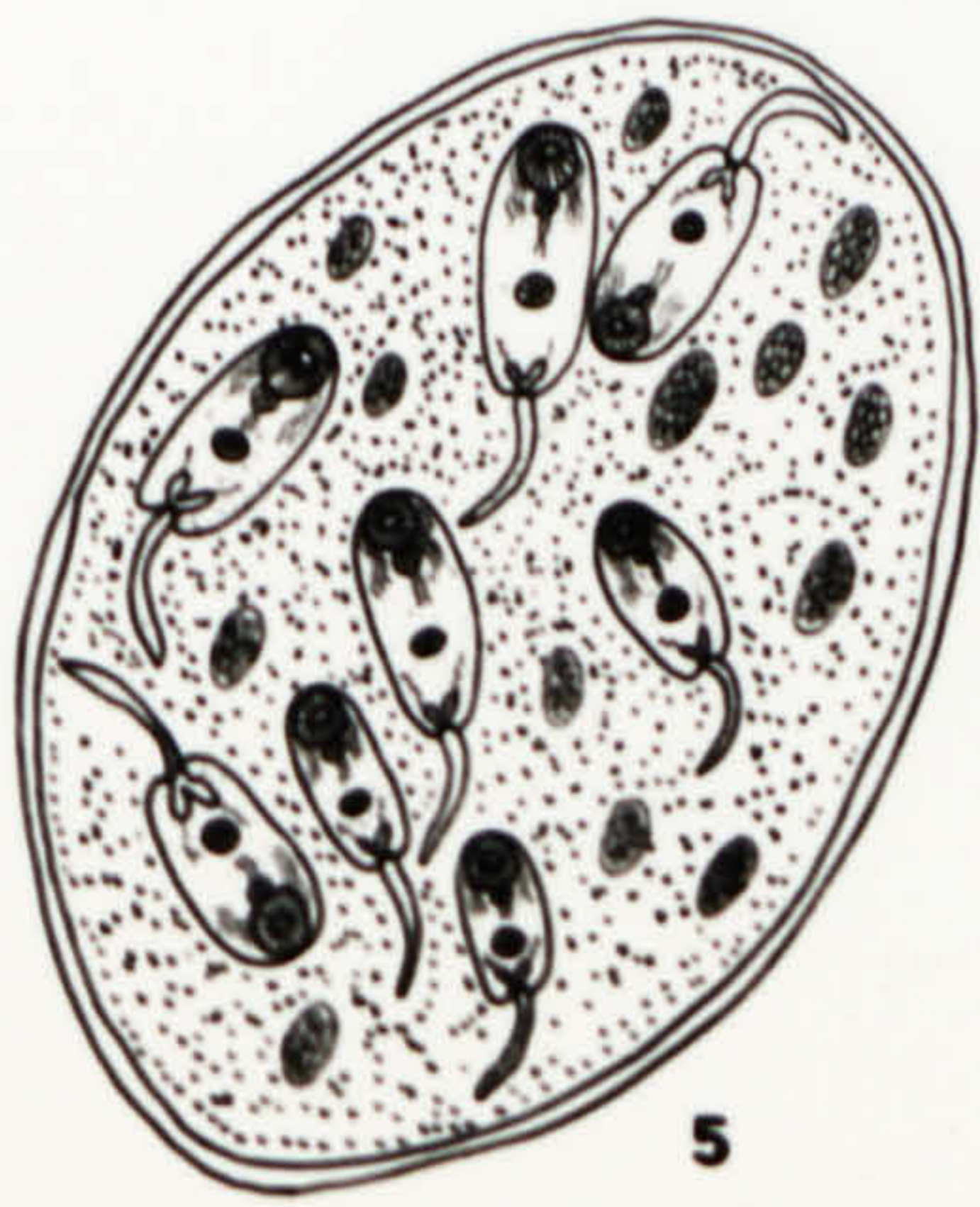
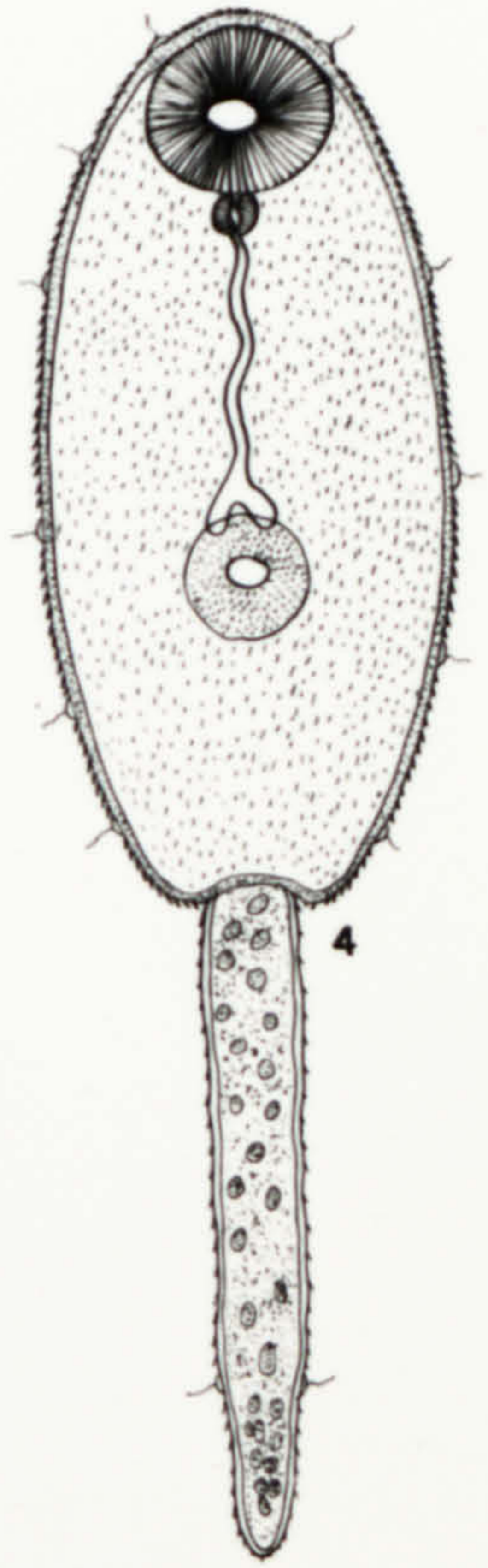
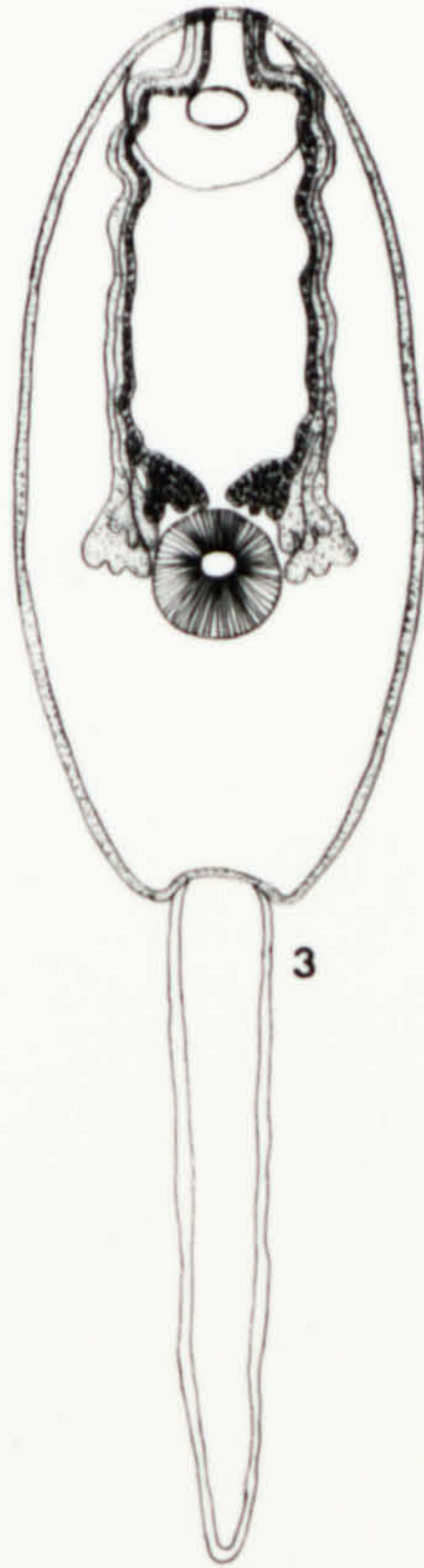
Plate 26

Cercaria microcotylea I

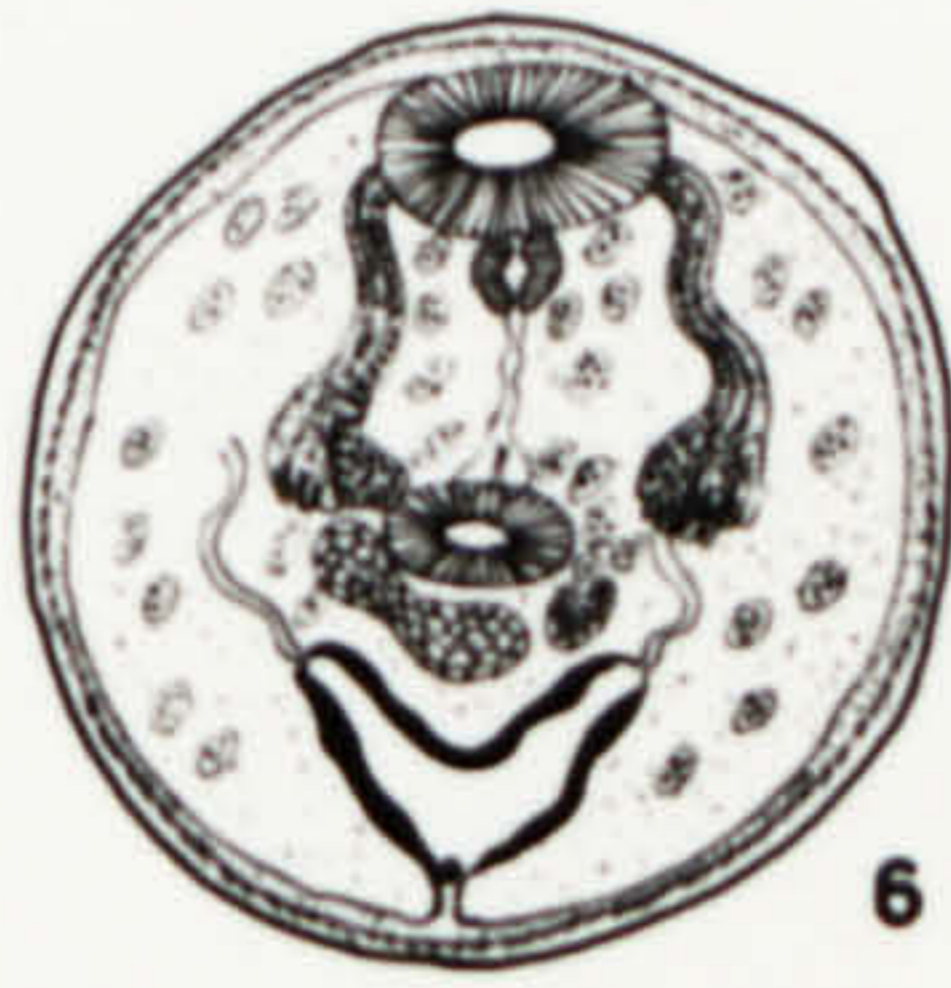
- Fig. 1. Cercaria - dorsal view showing distribution of cystogenous gland-cells and genital rudiments.
- Fig. 2. Cercaria - ventral view showing protonephridial system.
- Fig. 3. Cercaria - ventral view showing penetration gland-cells.
- Fig. 4. Cercaria - ventral view showing body papillate hair-like structures, spination and digestive system.
- Fig. 5. Sporocyst - containing cercariae and germ balls.
- Fig. 6. Encysted metacercaria - nine hours old.
- Fig. 7. Stylet - dorsal view.



0.08 mm



0.05 mm



0.2 mm



Plate 27

Cercaria tarda

- Fig. 1. Cercaria - ventral view showing spination, digestive system, virgula organ and distribution of oil globules in body.
- Fig. 2. Cercaria - ventral view showing distribution of cystogenous gland-cells.
- Fig. 3. Cercaria - ventral view showing number and location of penetration gland-cells.
- Fig. 4. Cercaria - ventral view showing protonephridial system.
- Fig. 5. Encysted metacercaria - seven days old.
- Fig. 6-8. Cercaria - oral sucker of three specimens showing variation in the shape of the virgula with age (for details see page 153).
- Fig. 9. Stylet - dorsal view.
- Fig. 10. Sporocyst - containing germ balls and developing cercariae.

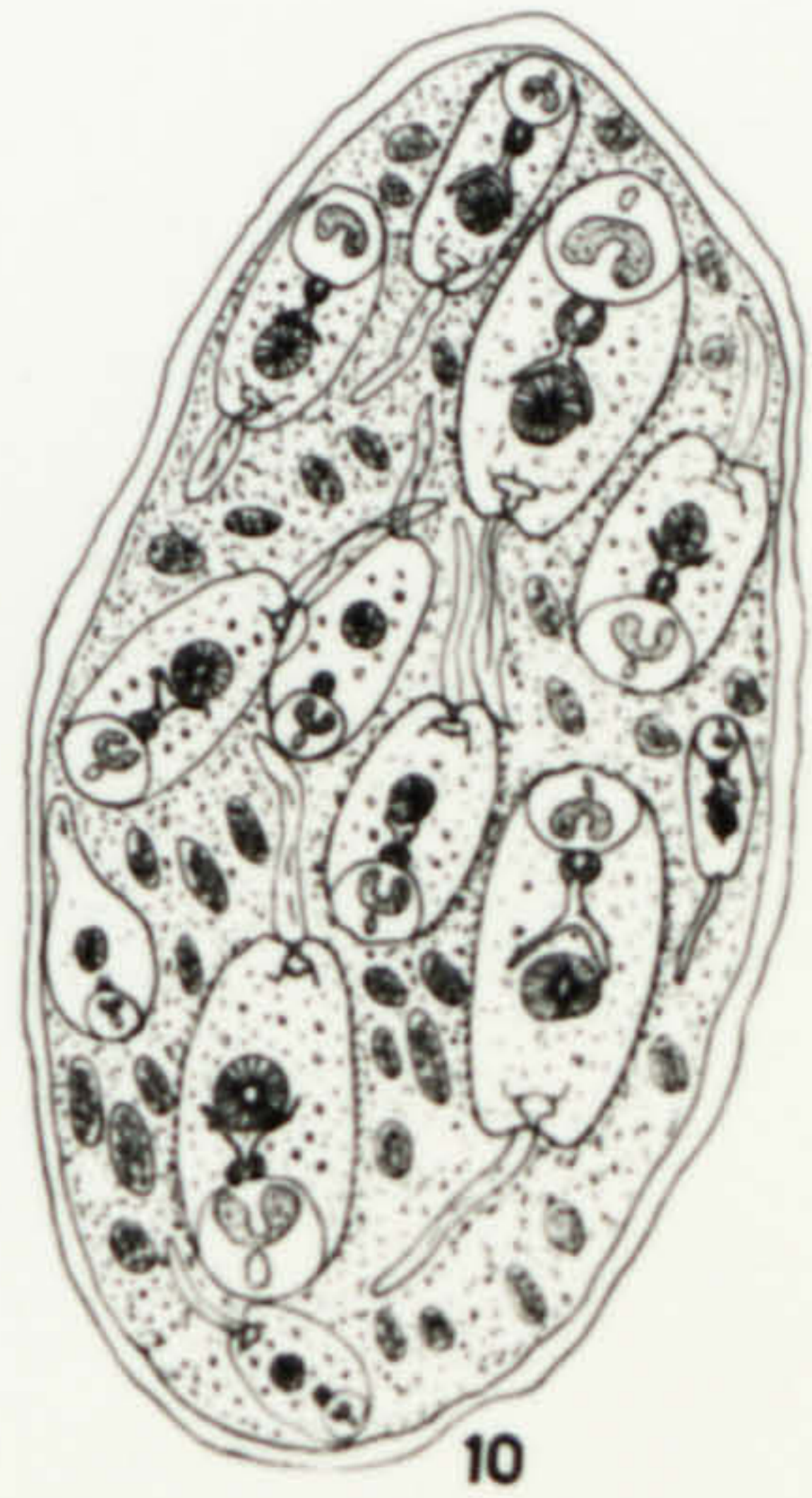
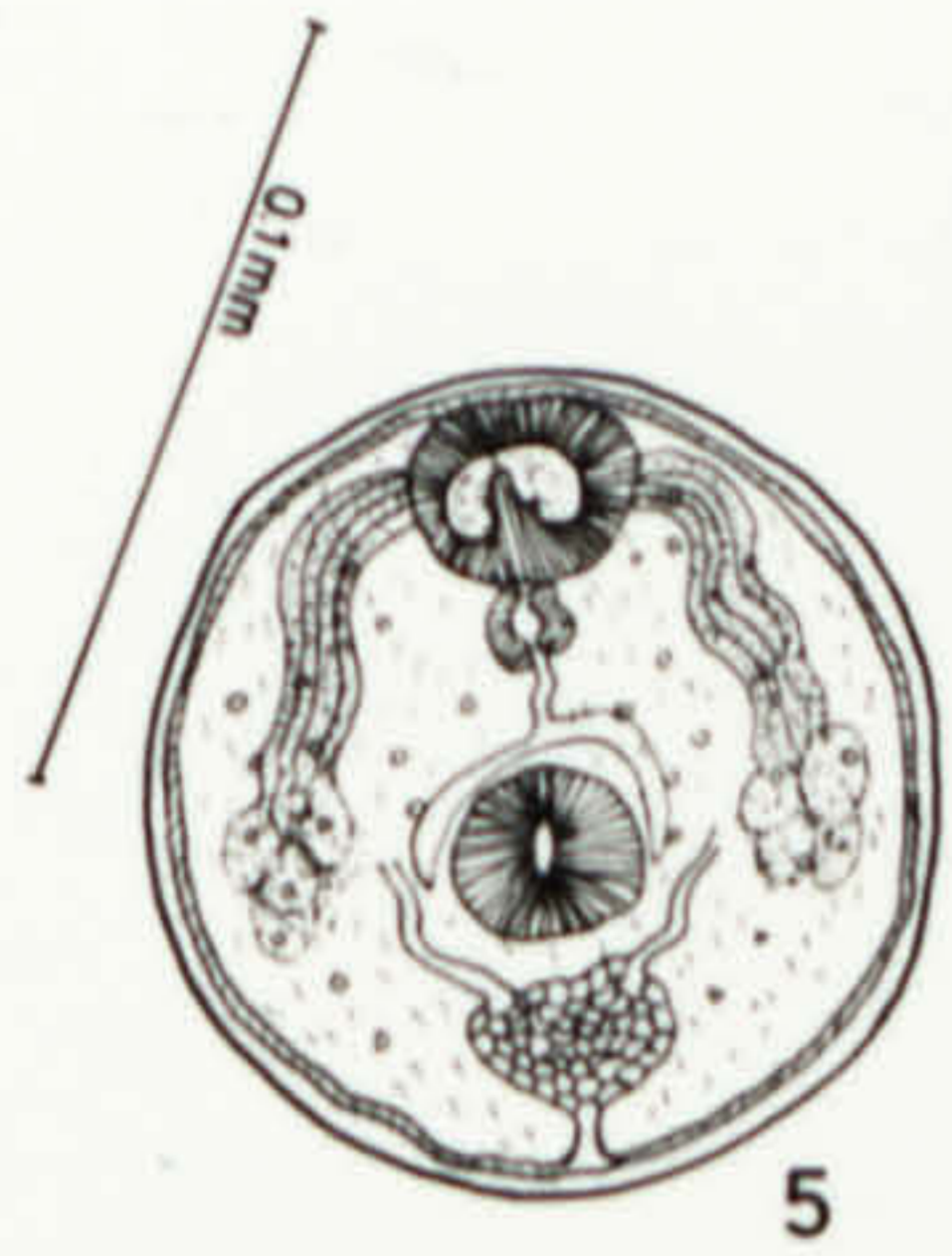
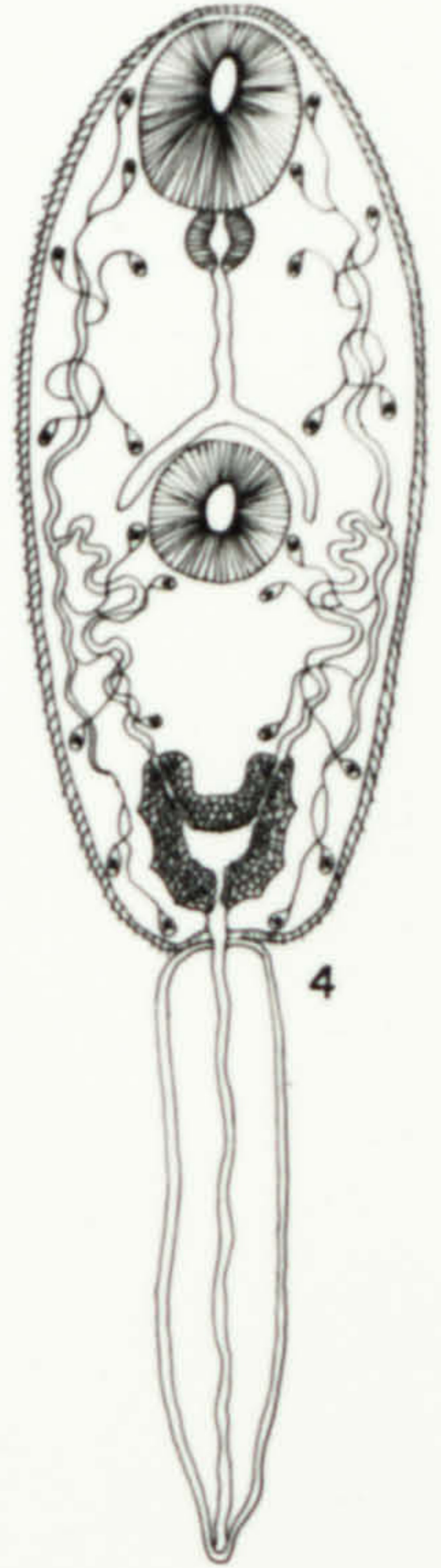
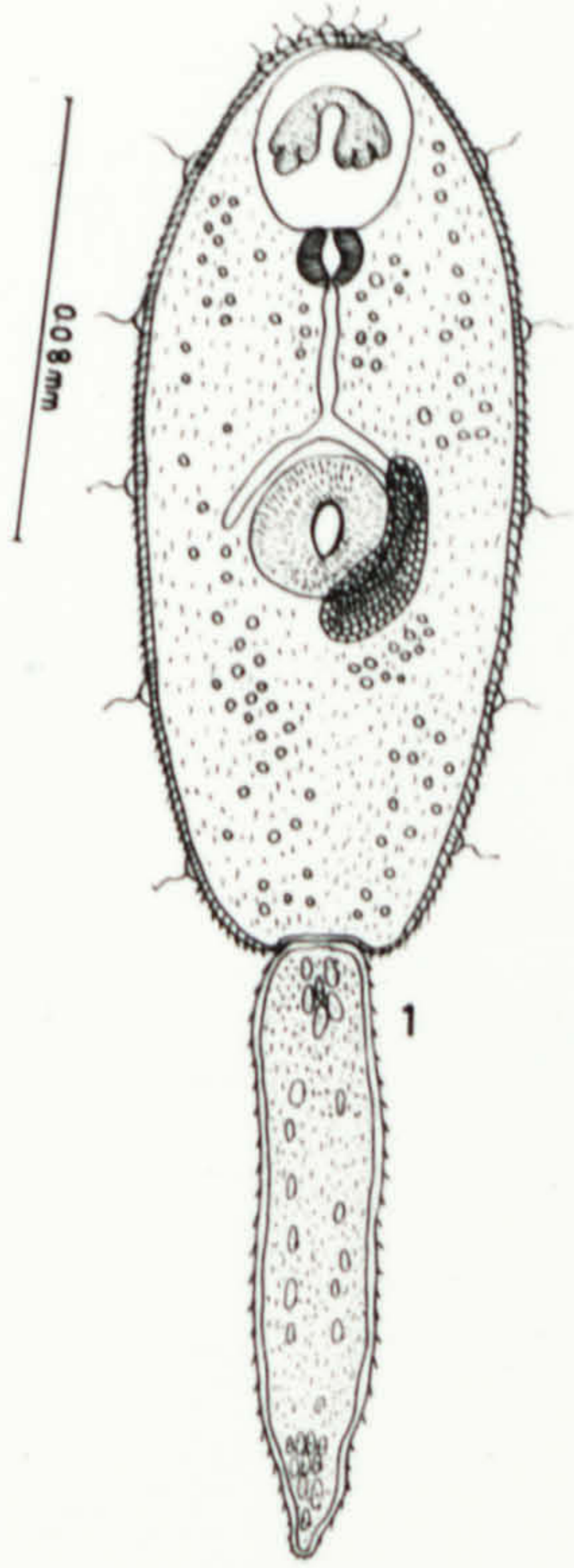
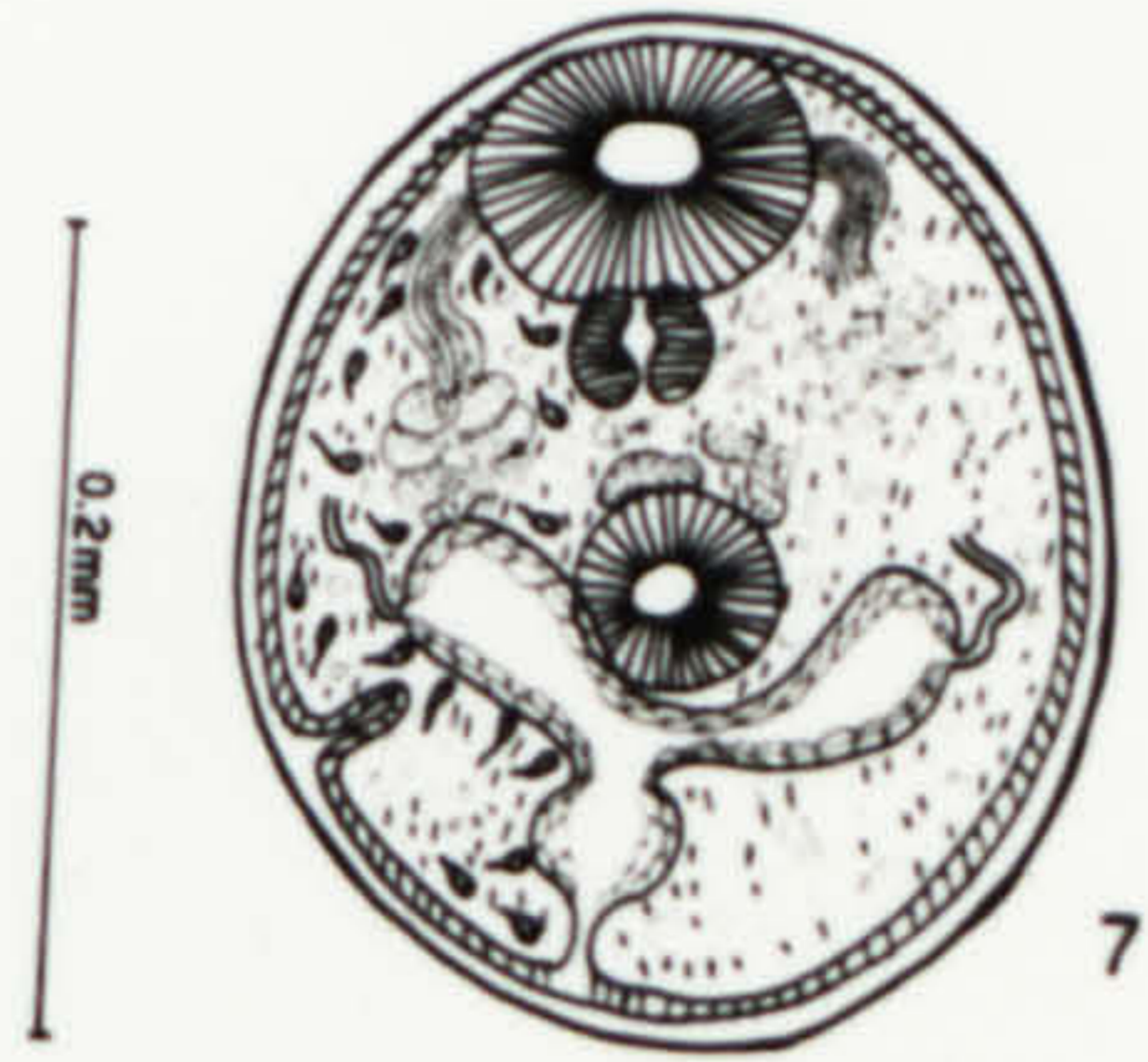
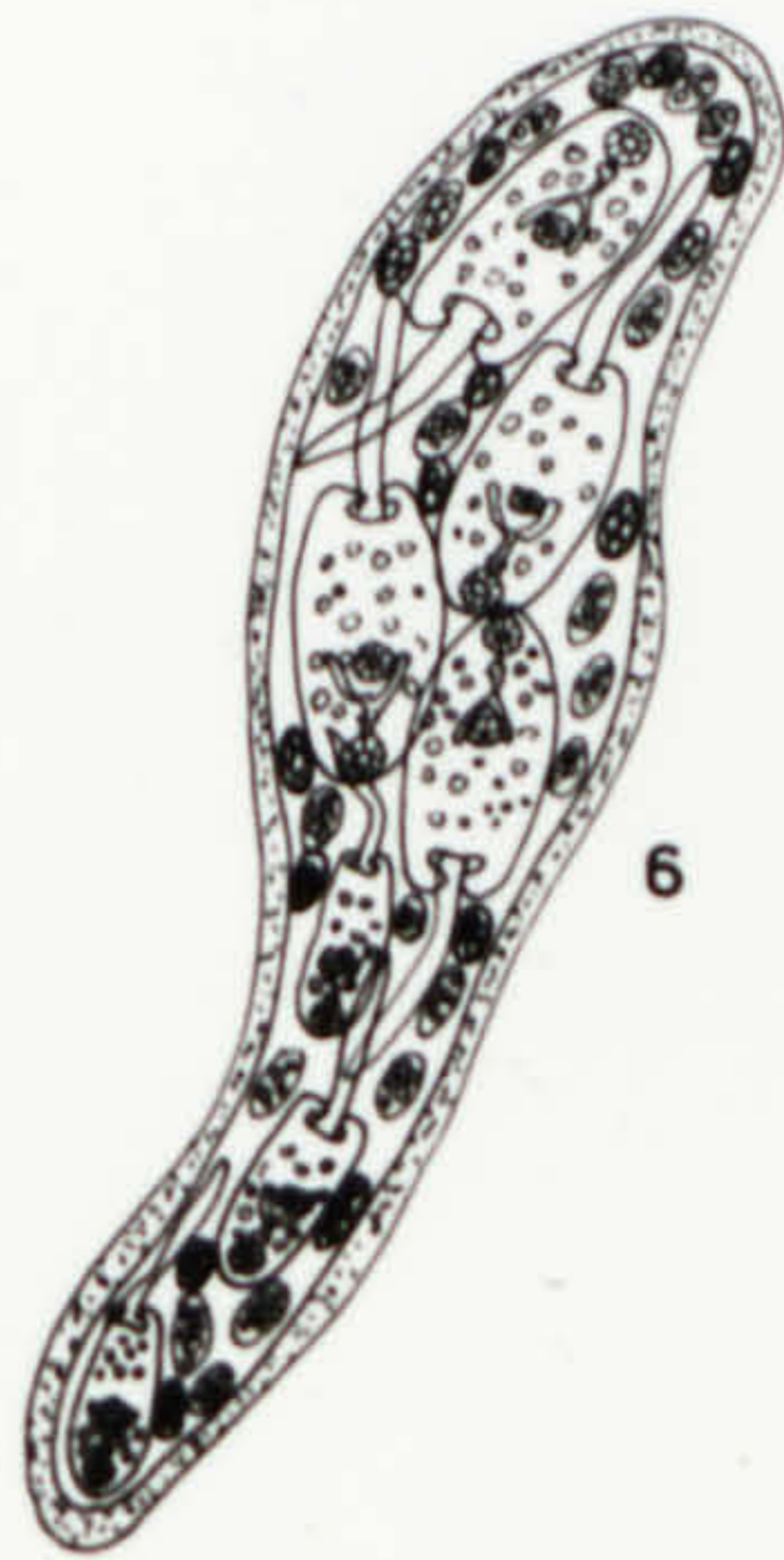
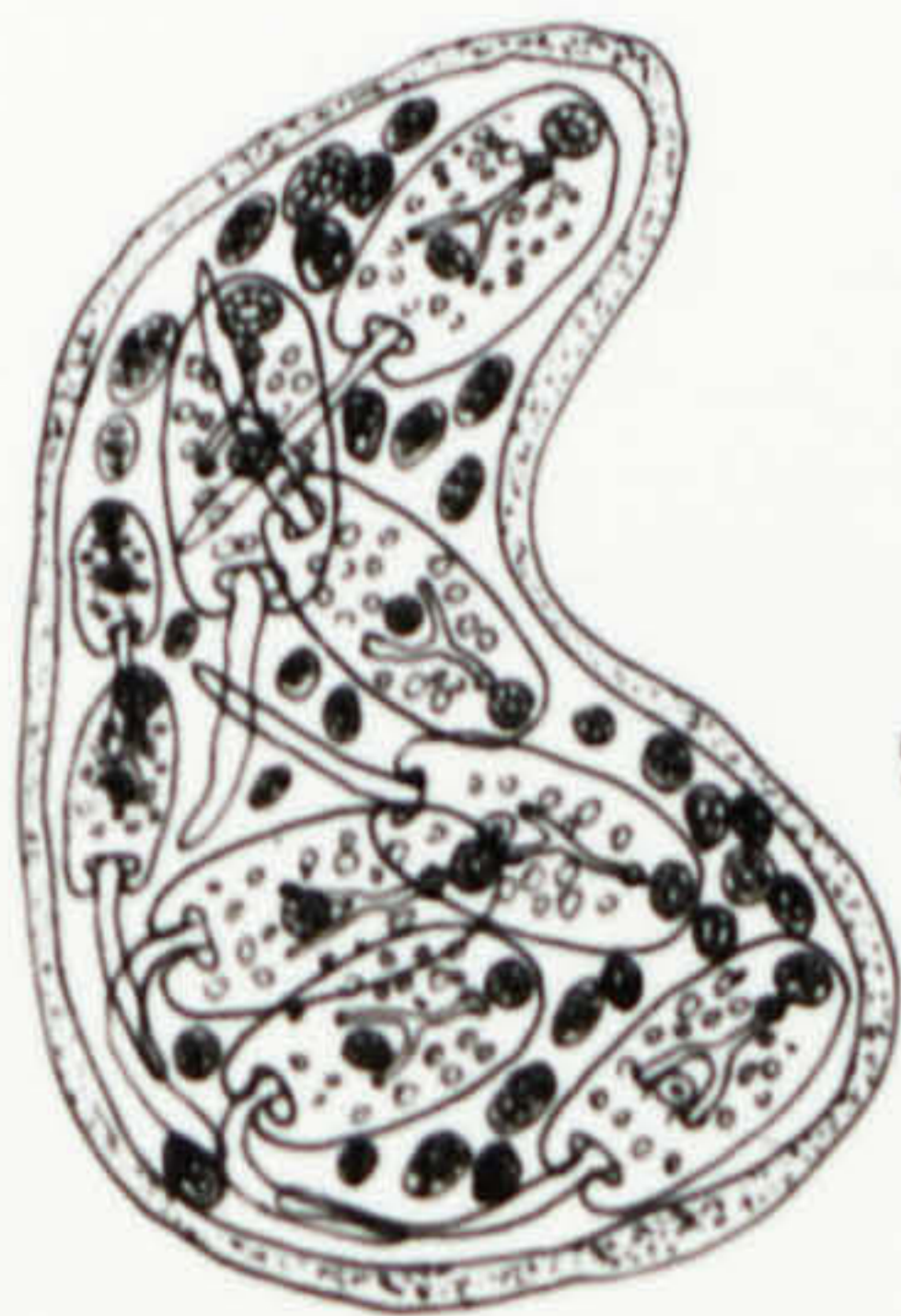
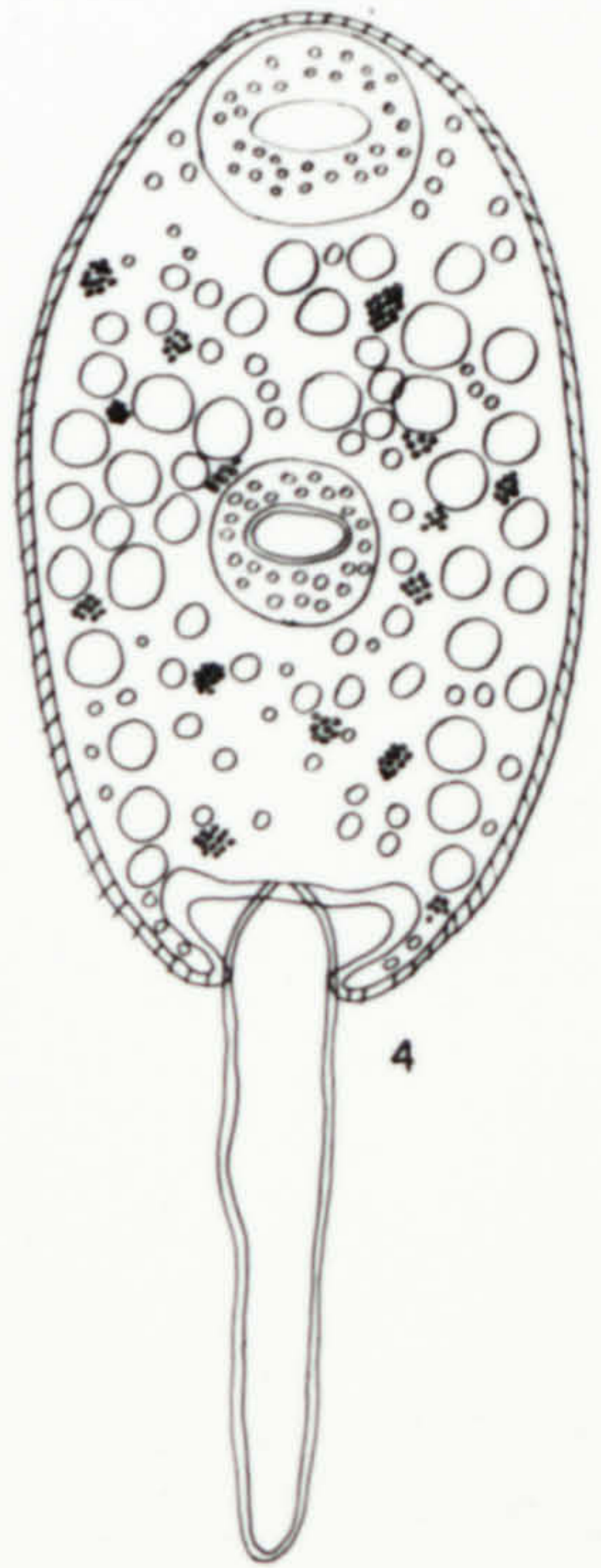
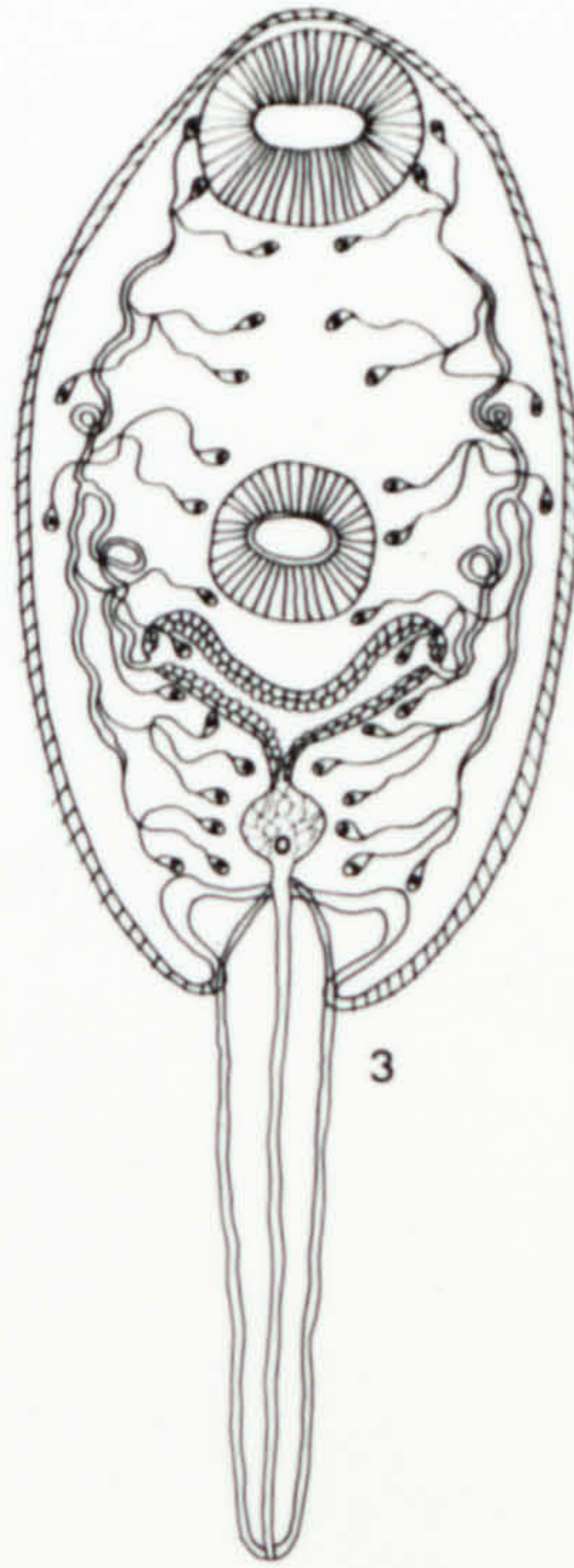
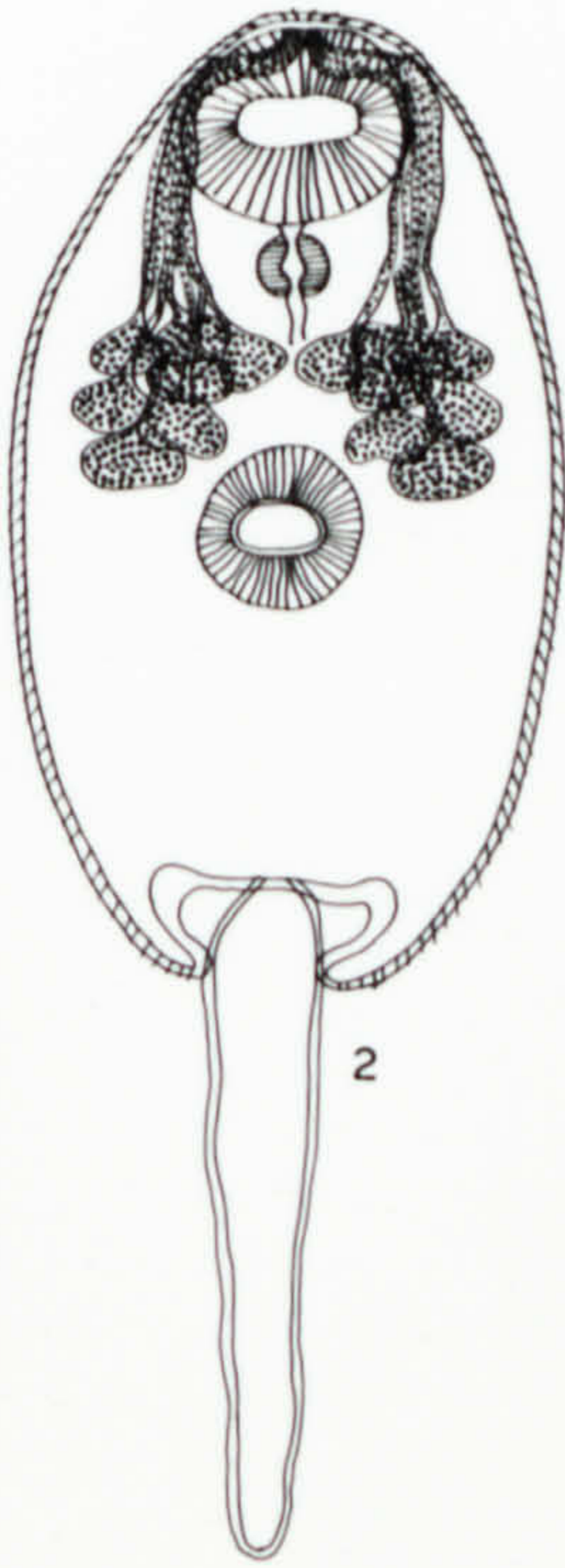
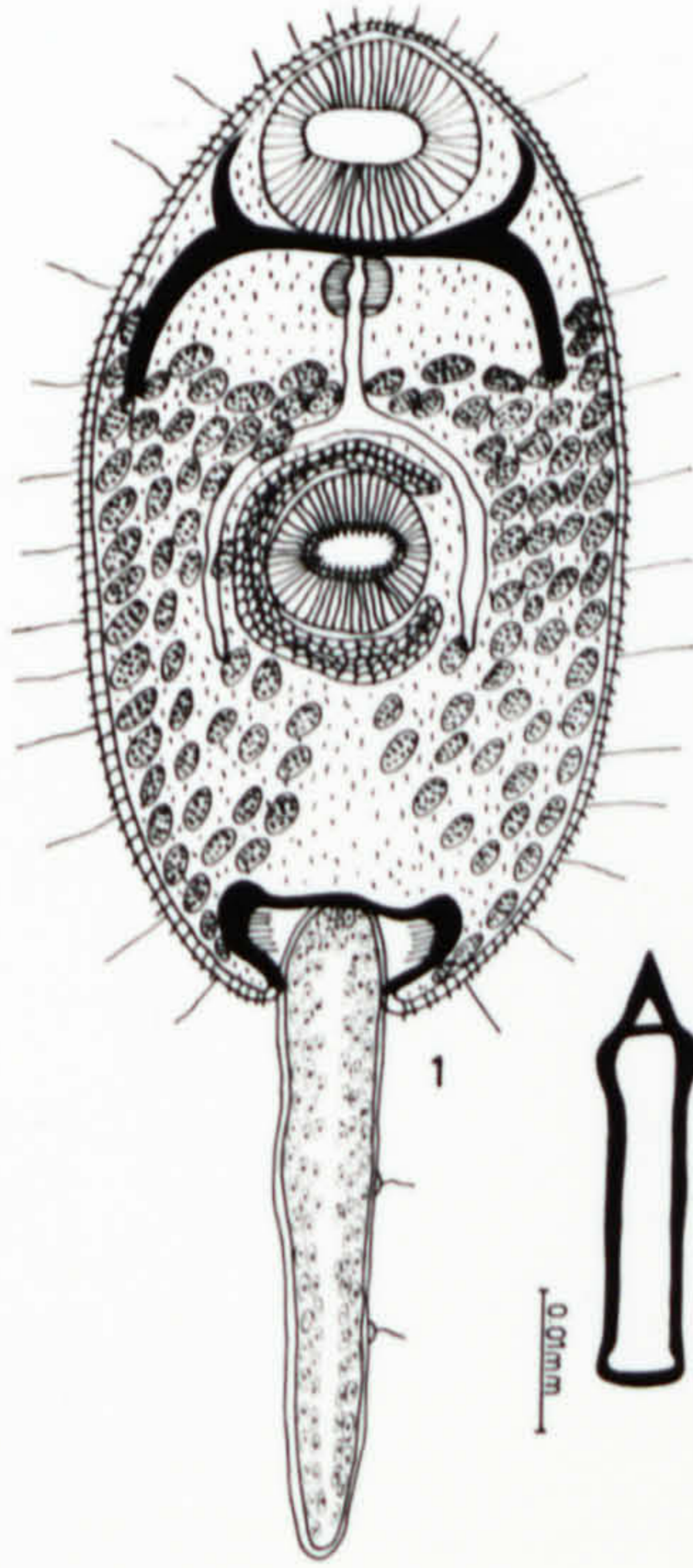


Plate 28

Cercaria xyphidiocercaria IX

- Fig. 1. Cercaria - dorsal view showing body spination and long hair-like projections, caudal pocket, digestive system, distribution of cystogenous gland-cells and nervous system. Note in all specimens 2 hair-like projections were seen only on one side.
- Fig. 2. Cercaria - ventral view showing number and location of penetration gland-cells.
- Fig. 3. Cercaria - ventral view showing protonephridial system.
- Fig. 4. Cercaria - dorsal view showing the distribution of globular refractile bodies.
- Fig. 5. Oval sporocyst - containing germ balls and developing cercariae.
- Fig. 6. Elongate sporocyst (sausage-shaped).
- Fig. 7. Encysted metacercaria - twelve days old.



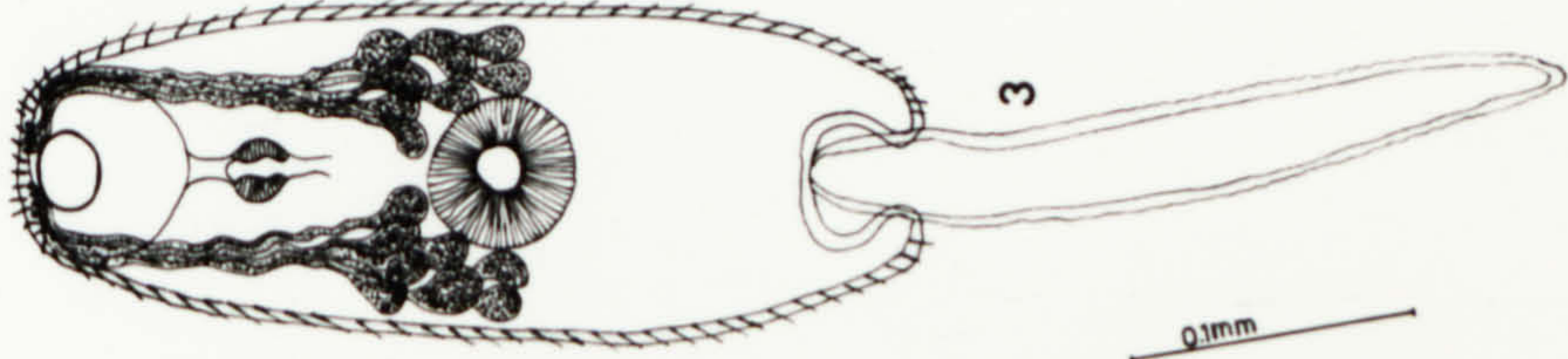
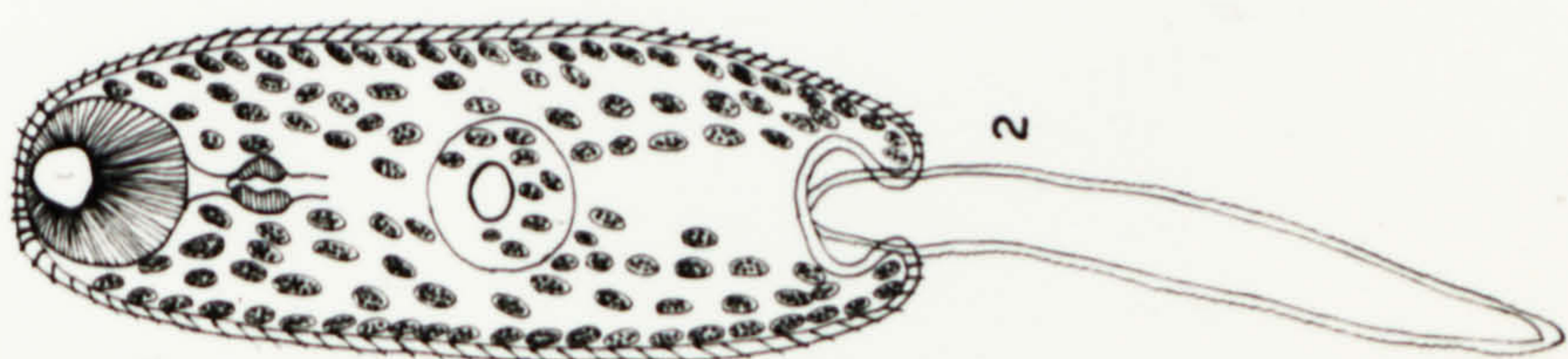
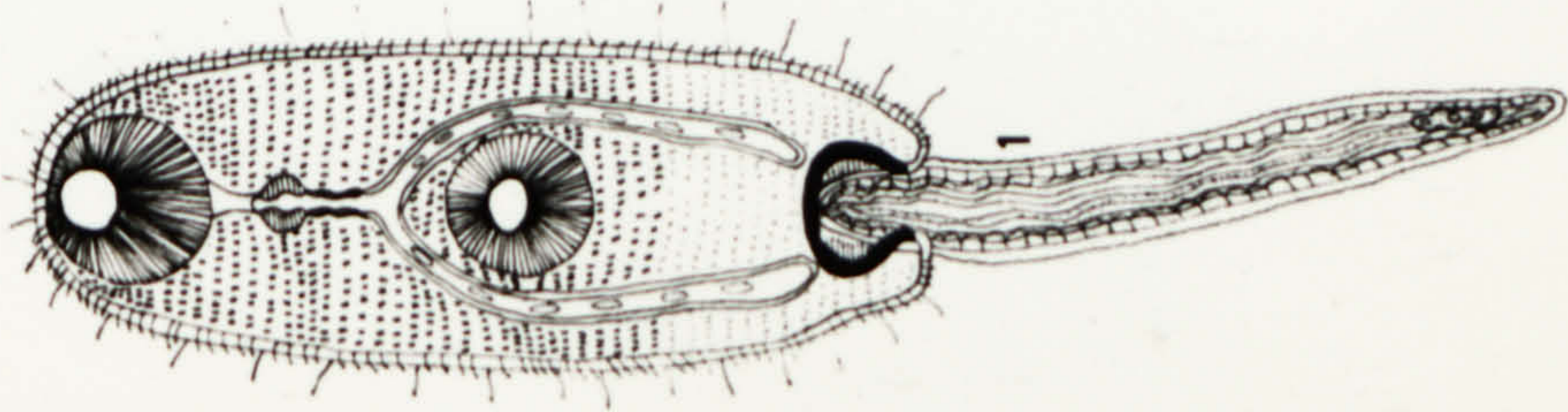
Plates 29-33

Dolichosaccus rastellus

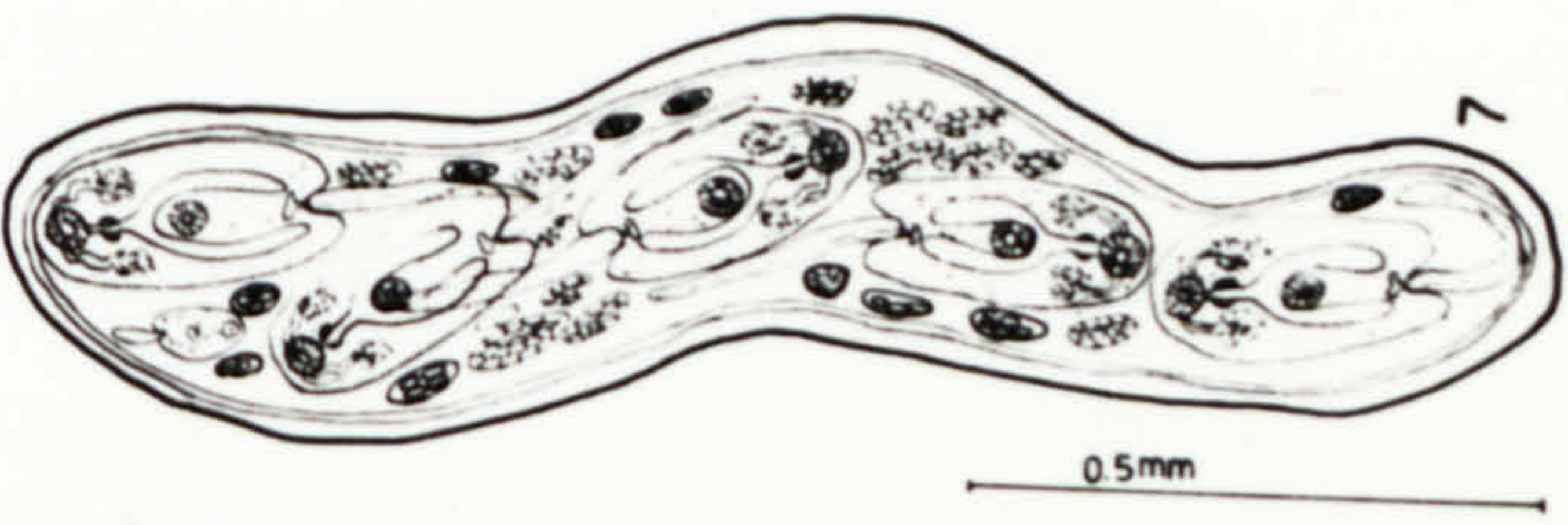
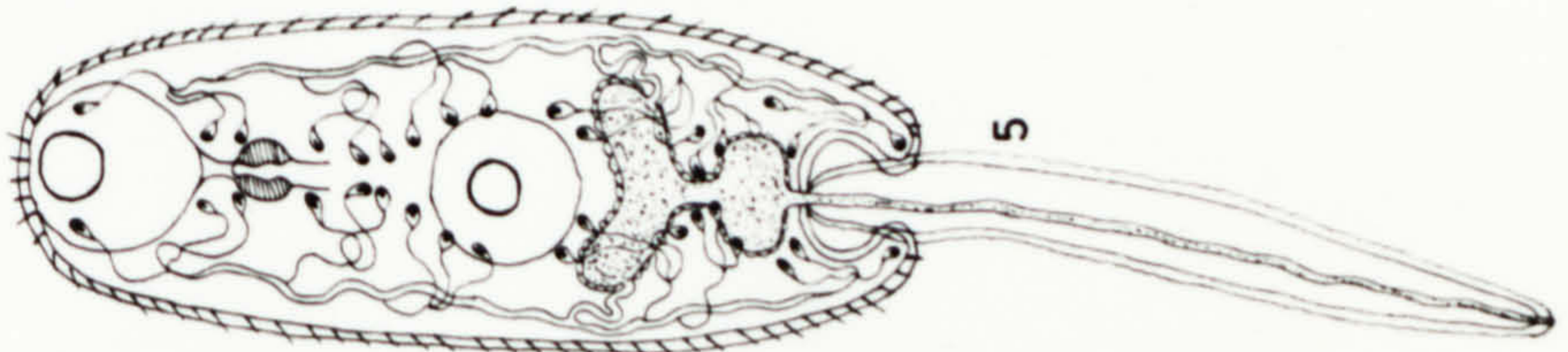
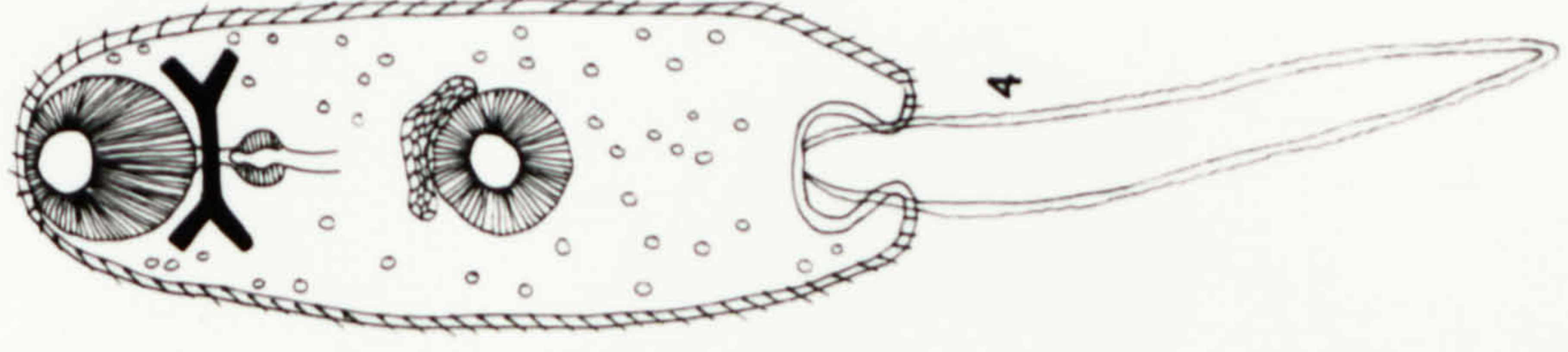
Dolichosaccus rastellus

Plate 29

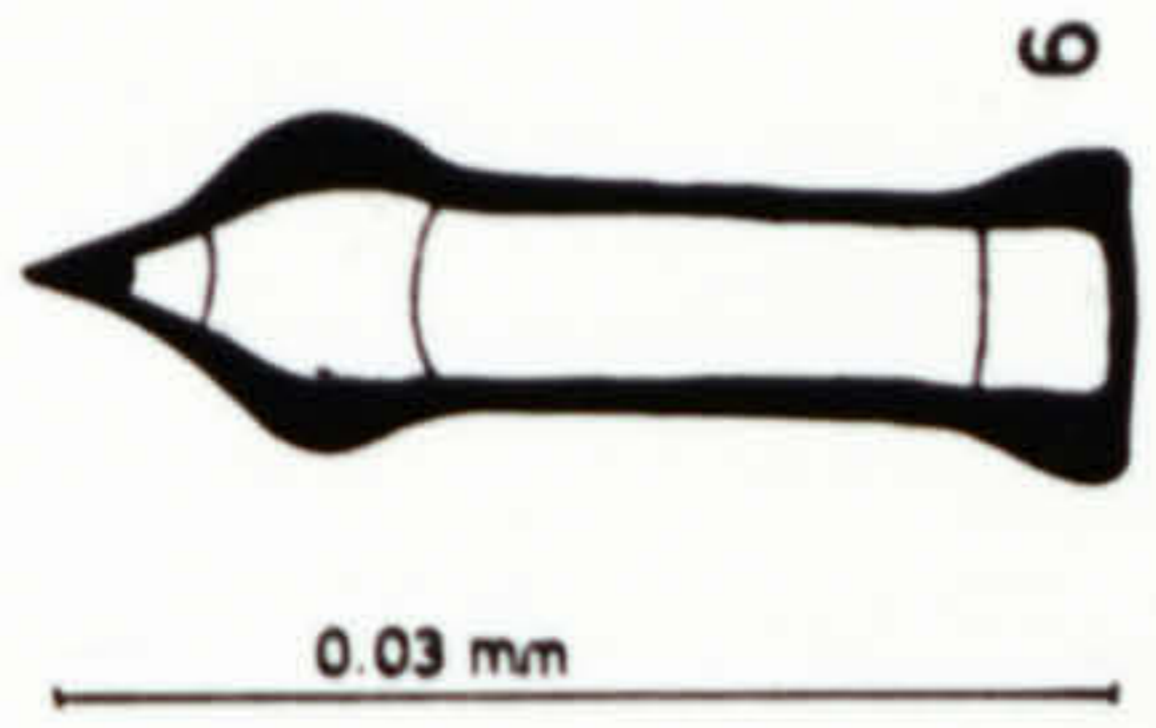
- Fig. 1. Cercaria - ventral view showing body spination, long hair-like projections, caudal pockets and digestive system. Note the thick-walled oesophagus.
- Fig. 2. Cercaria - dorsal view showing distribution of cystogenous gland-cells.
- Fig. 3. Cercaria - ventral view showing number and location of penetration gland-cells.
- Fig. 4. Cercaria - ventral view showing refractile globules, genital rudiments and nervous system.
- Fig. 5. Cercaria - ventral view showing protonephridial system. Note main excretory ducts arising subterminally from each cornua of the bladder.
- Fig. 6. Stylet - dorsal view showing re-inforced base with lateral projections.
- Fig. 7. Sporocyst - containing germ balls and cercariae.



0.1mm



0.5mm



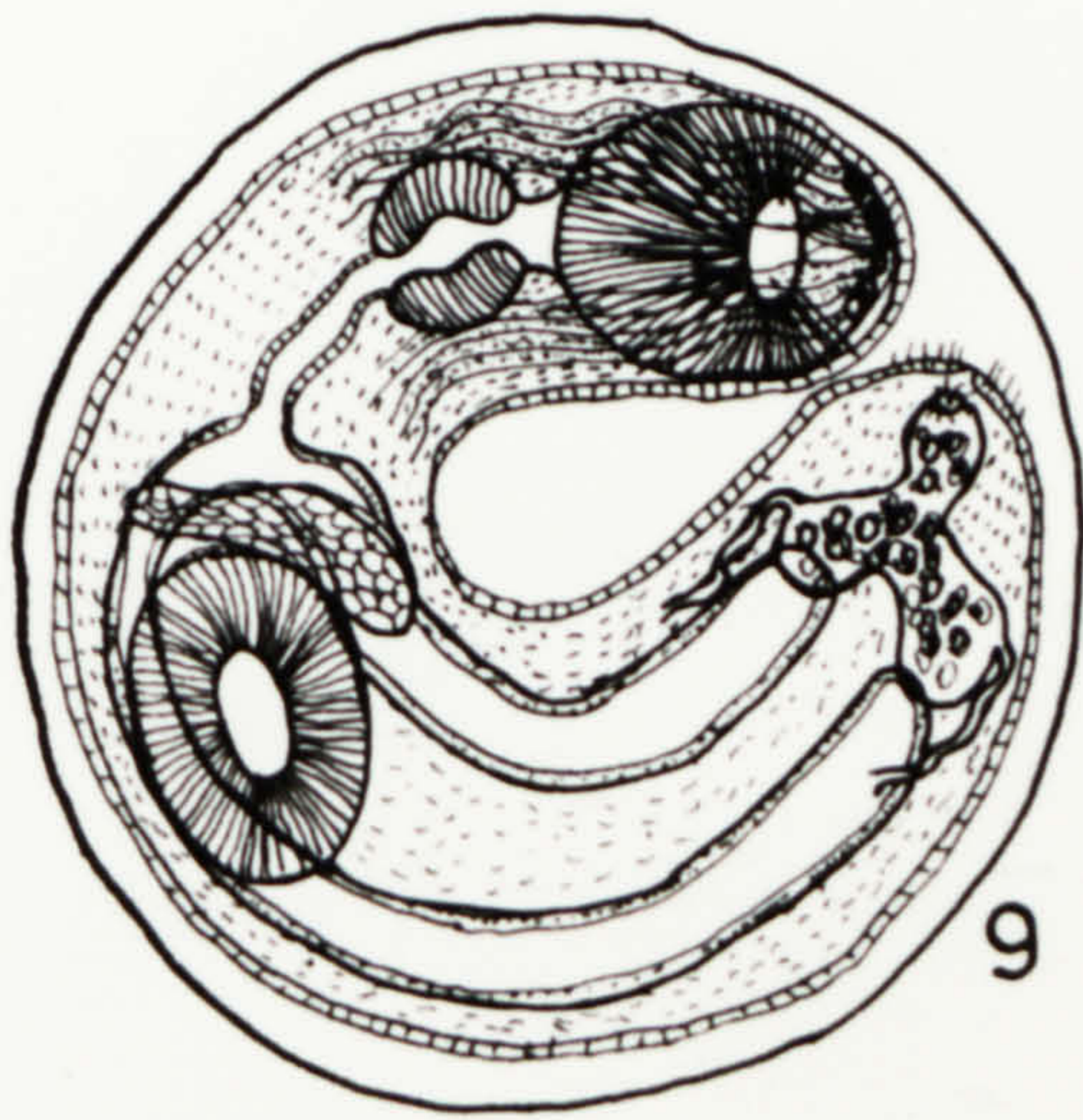
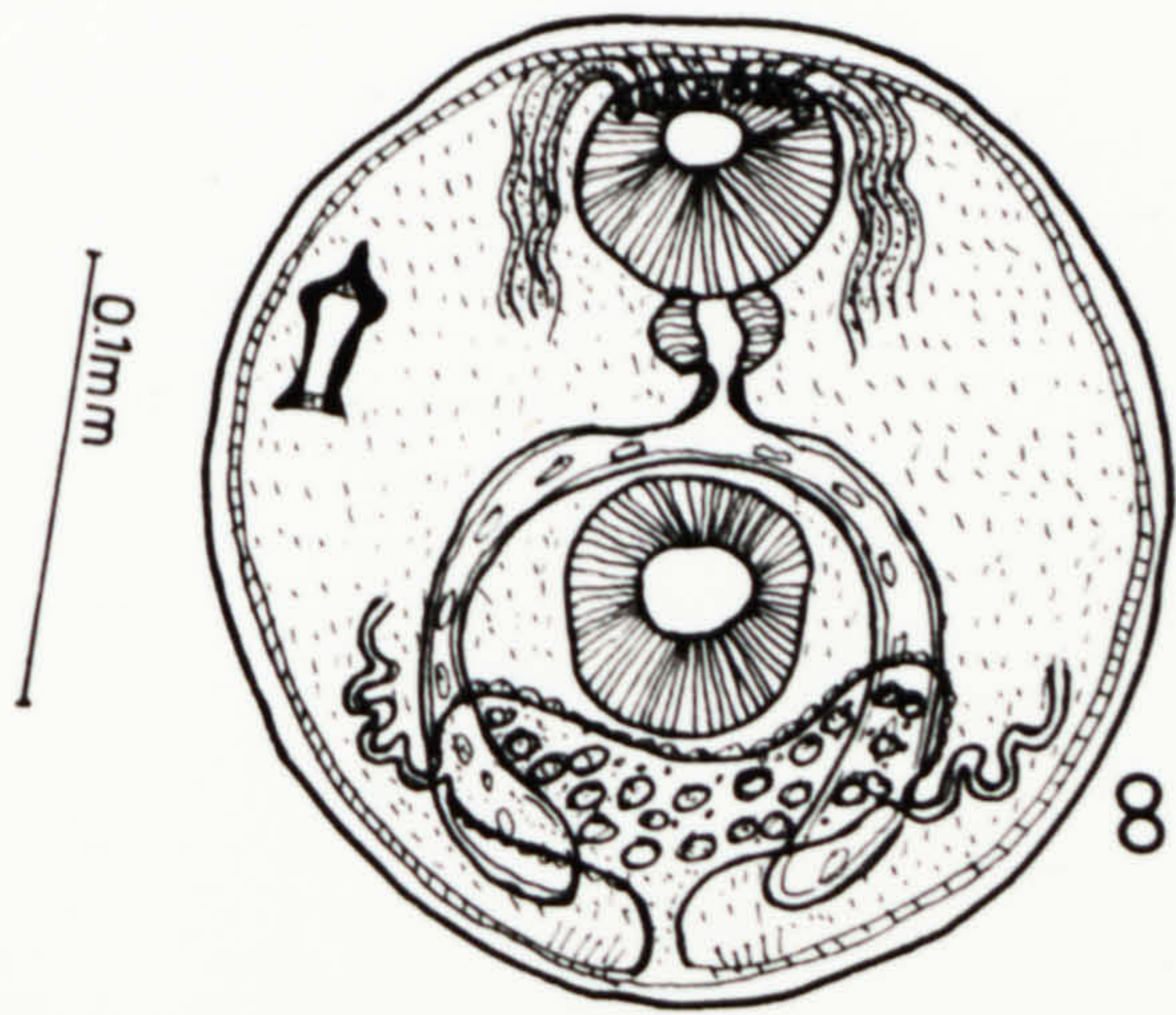
0.03 mm

Dolichosaccus rastellus

Plate 30

Fig. 8. Encysted metacercaria - one day old. From trichopteran larva.

Fig. 9. Encysted metacercaria - ten days old. From trichopteran larva.



Dolichosaccus rastellus

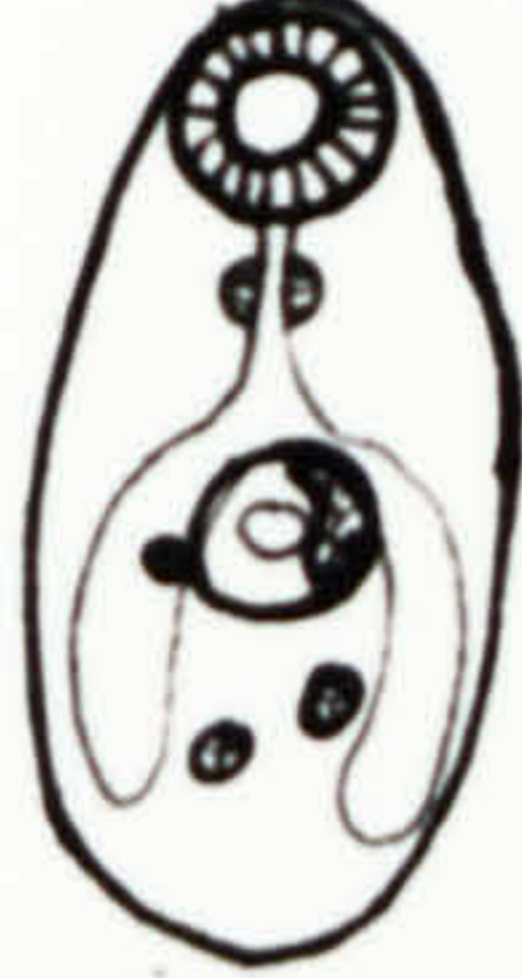
Plates 31

Fig. 10-22. Developmental stages in the small intestine of Bufo bufo from 3 to 164 days. (for details see text).

Note - all the figures to same scale.



10



11



12



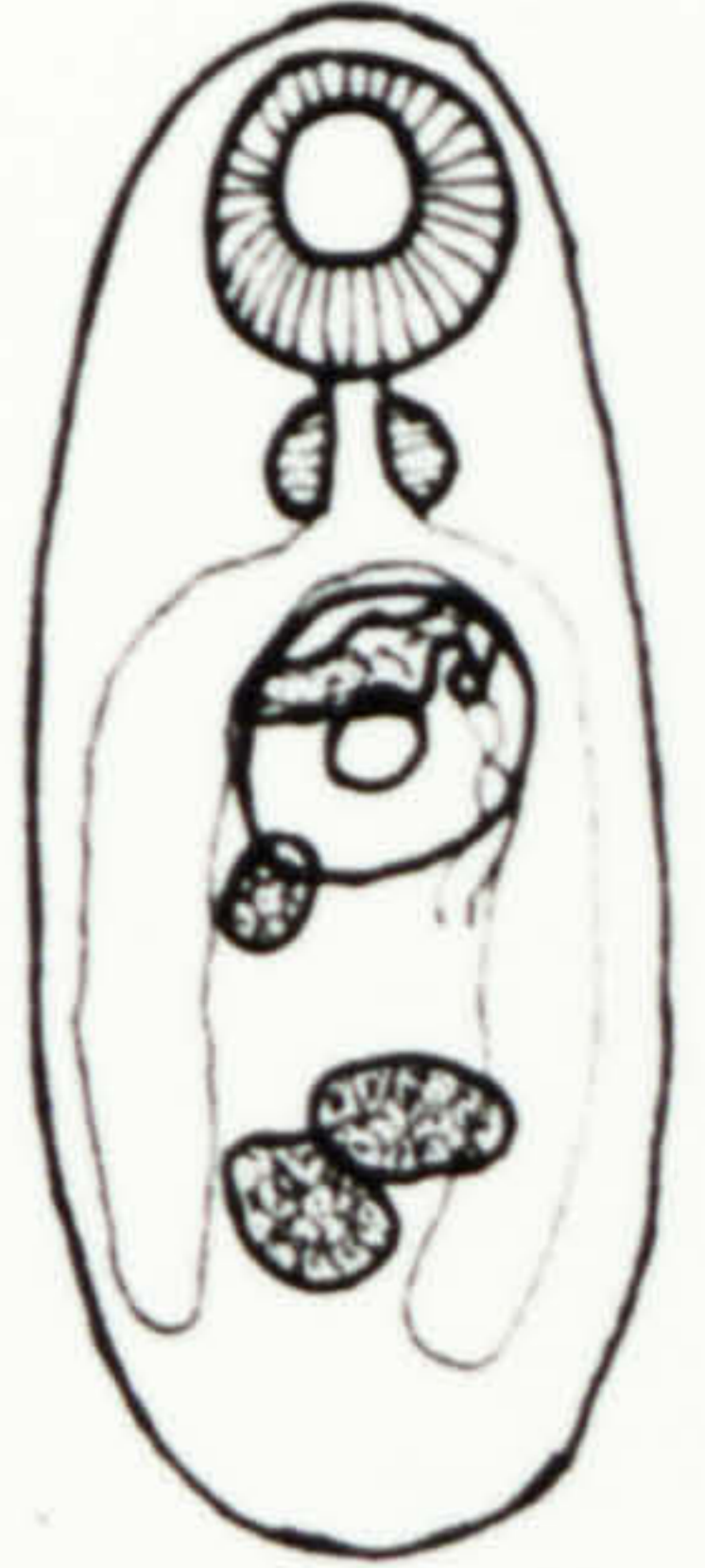
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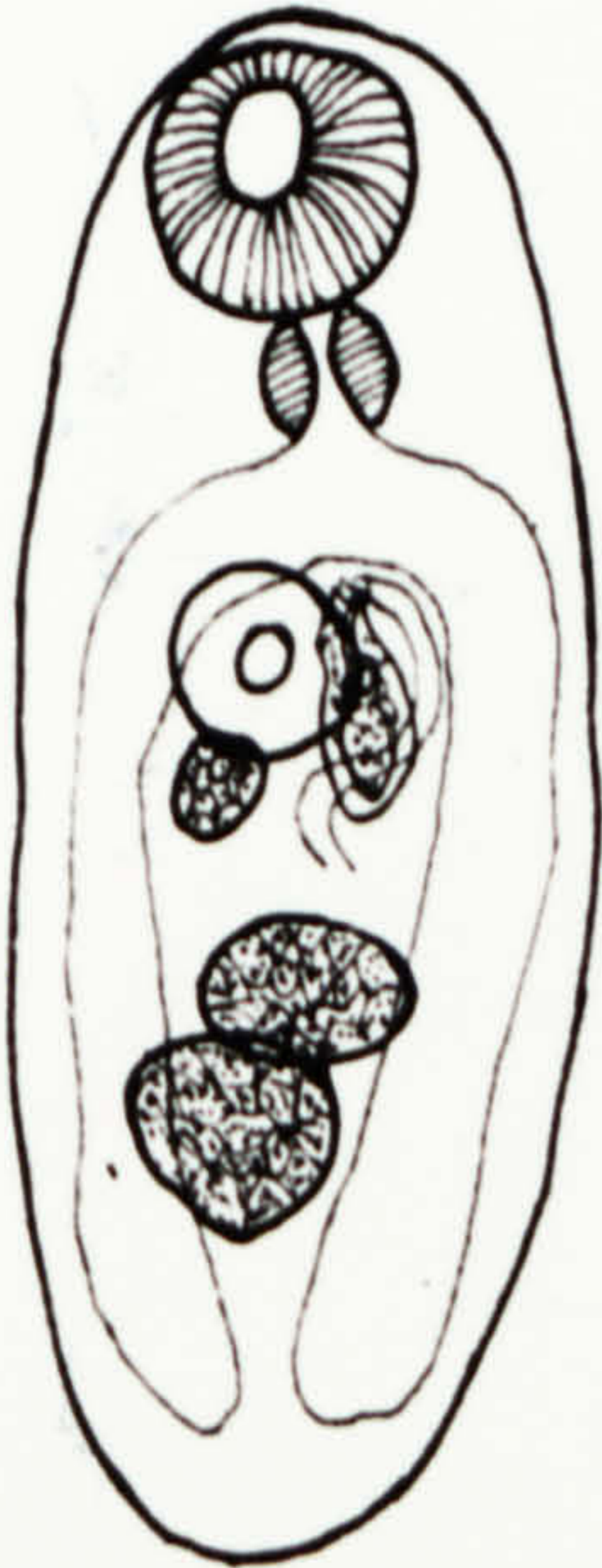
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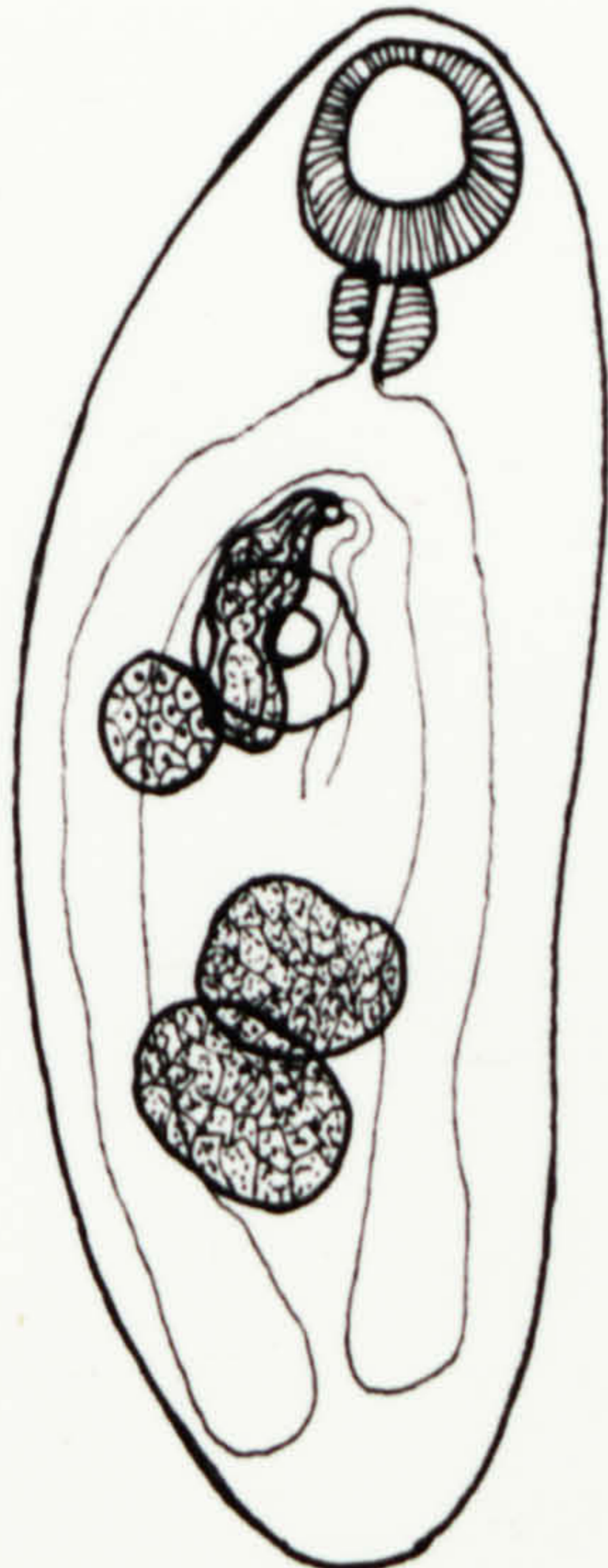
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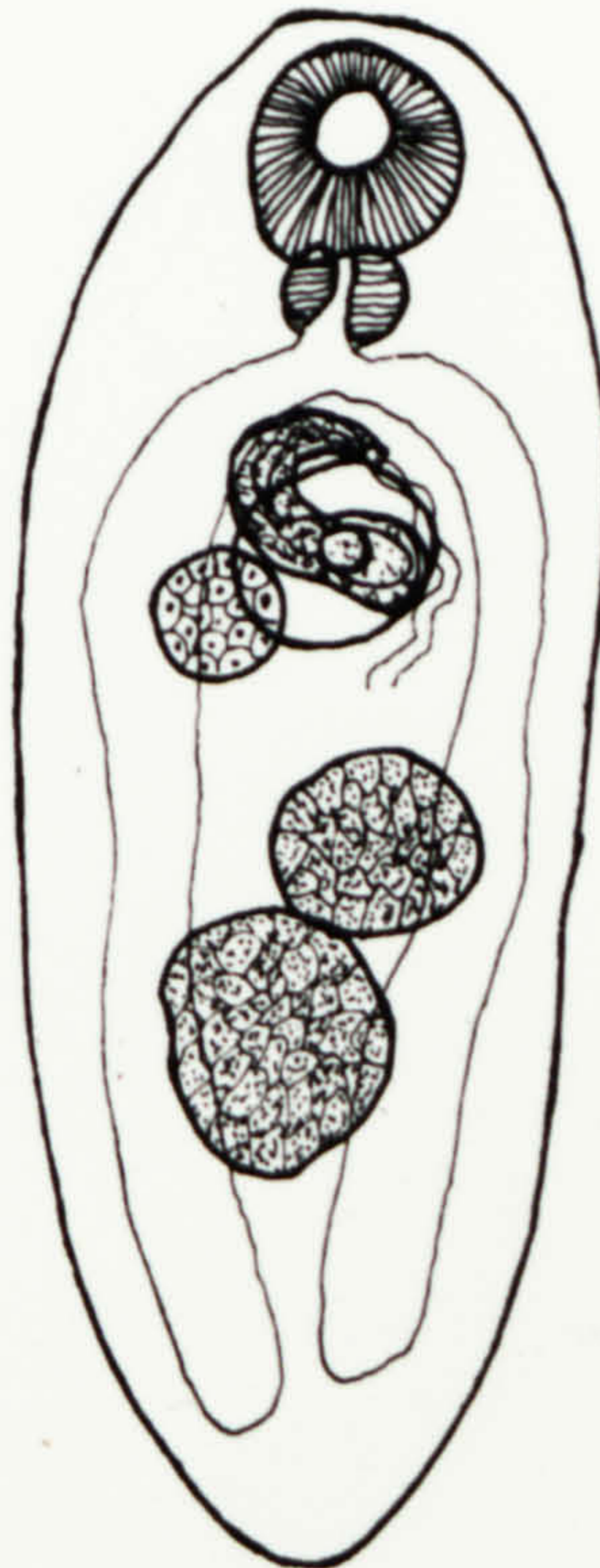
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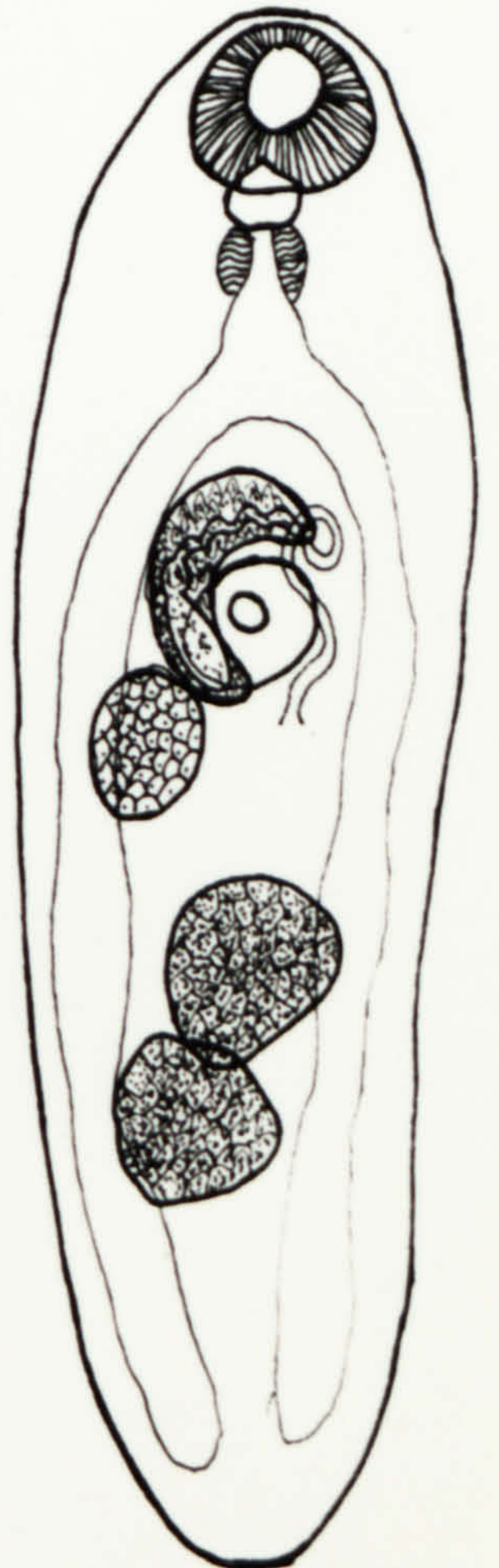
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18



19



20

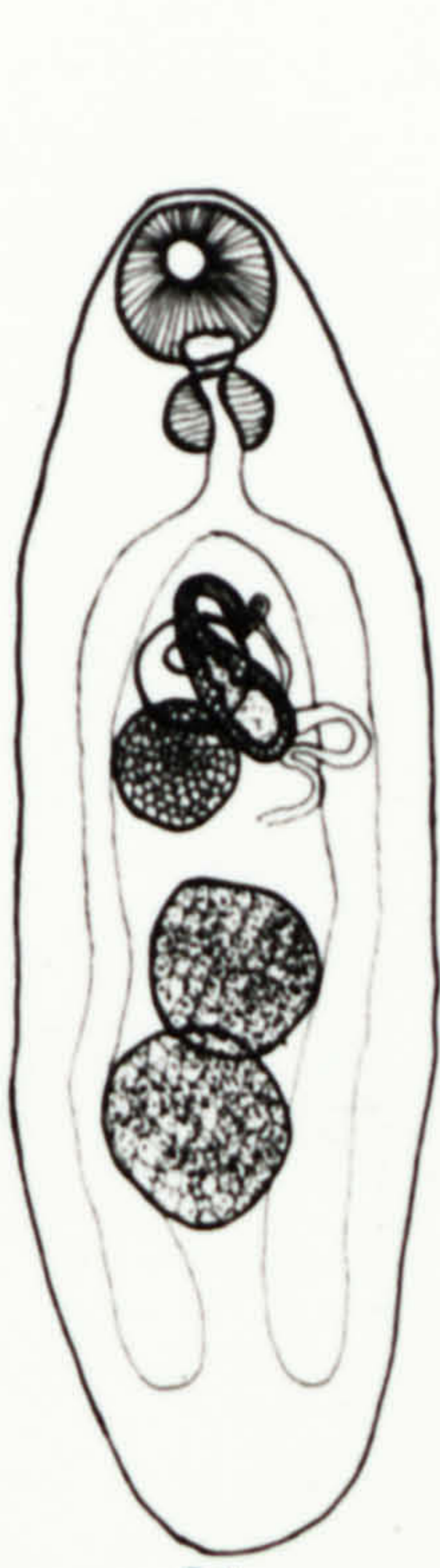
Dolichosaccus rastellus

Plate 32

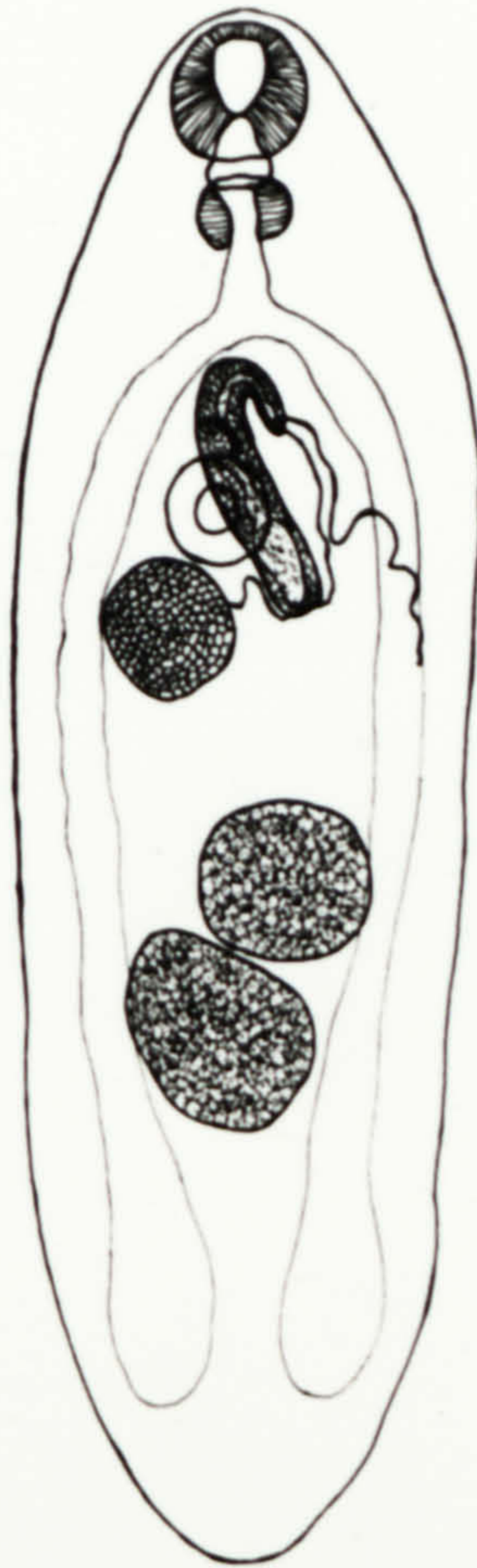
Fig. 23. Adult - ventral view of specimen from experimental infection of B. bufo.

Fig. 24. Adult - ventral view of specimen from natural infection of B. bufo.

Note - all the figures to same scale.



21



22



23



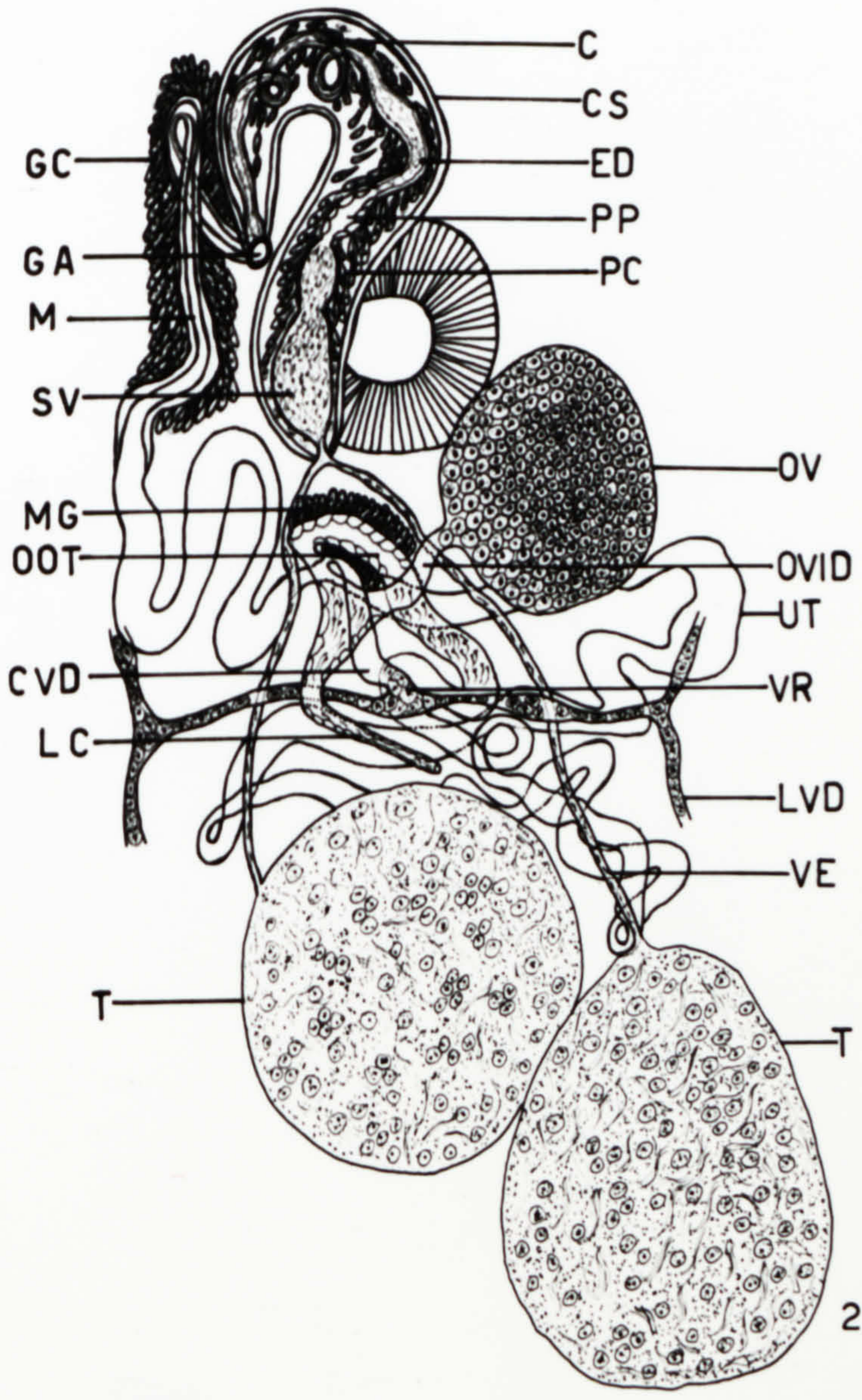
24

0.55 mm

Dolichosaccus rastellus

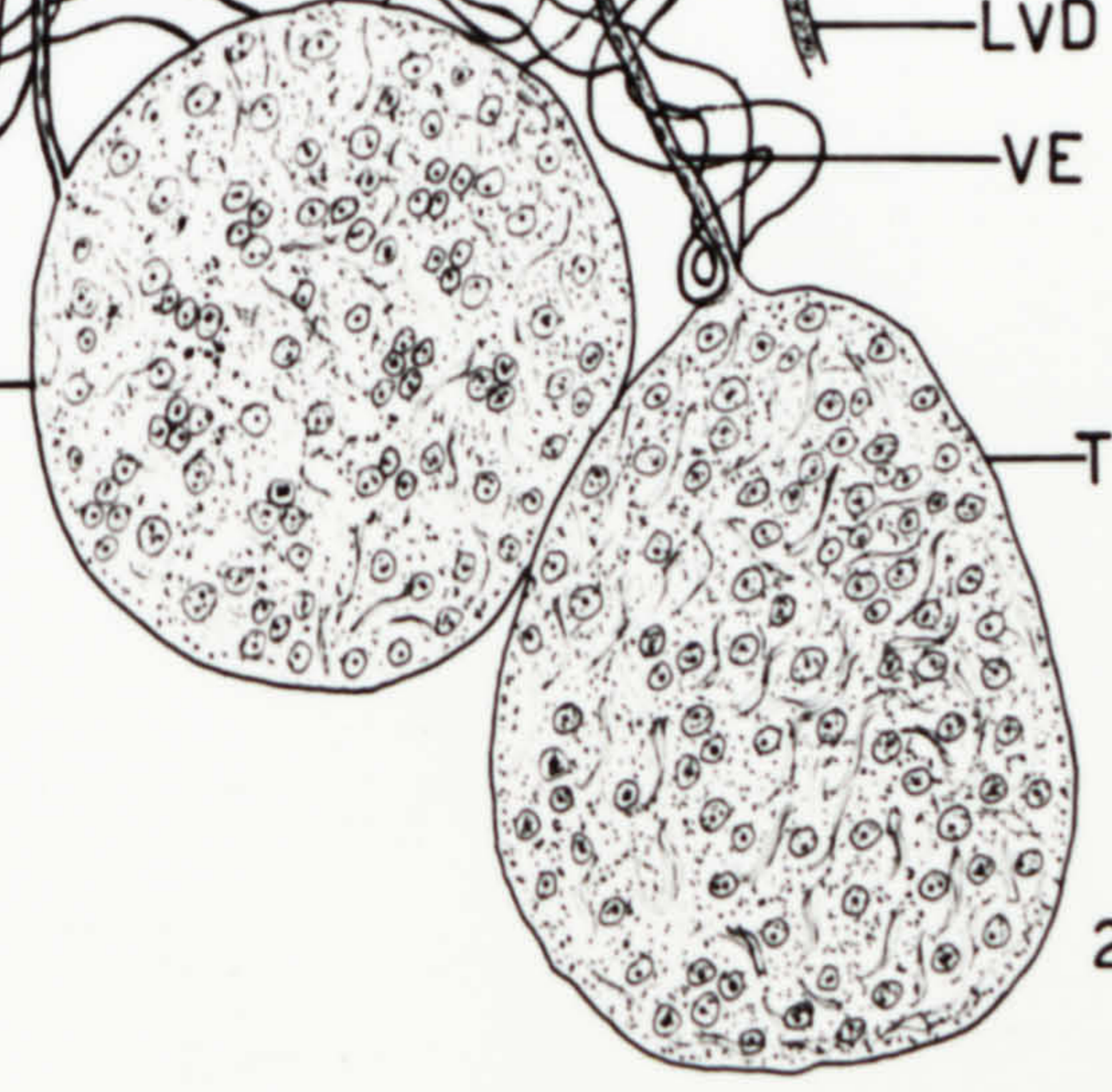
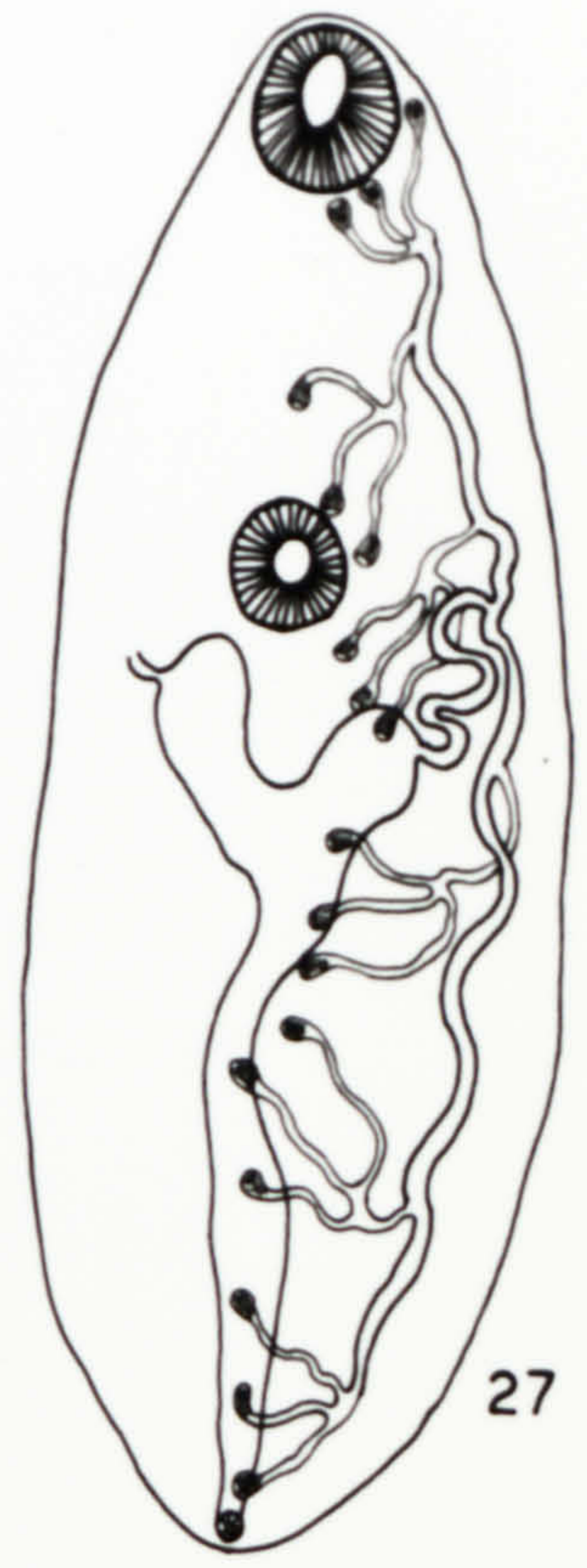
Plate 33

- Fig. 25. Adult - dorsal view showing male and female genital systems.
- Fig. 26. Egg- newly laid uncleaved showing binucleated zygote.
- Fig. 27. Adult - from experimental infection showing the protonephridial system of one side.
- Fig. 28. Adult - anterior end showing prepharynx, pharynx, oesophagus and peripharyngeal gland-cells. Note the thick wall of the oesophagus.



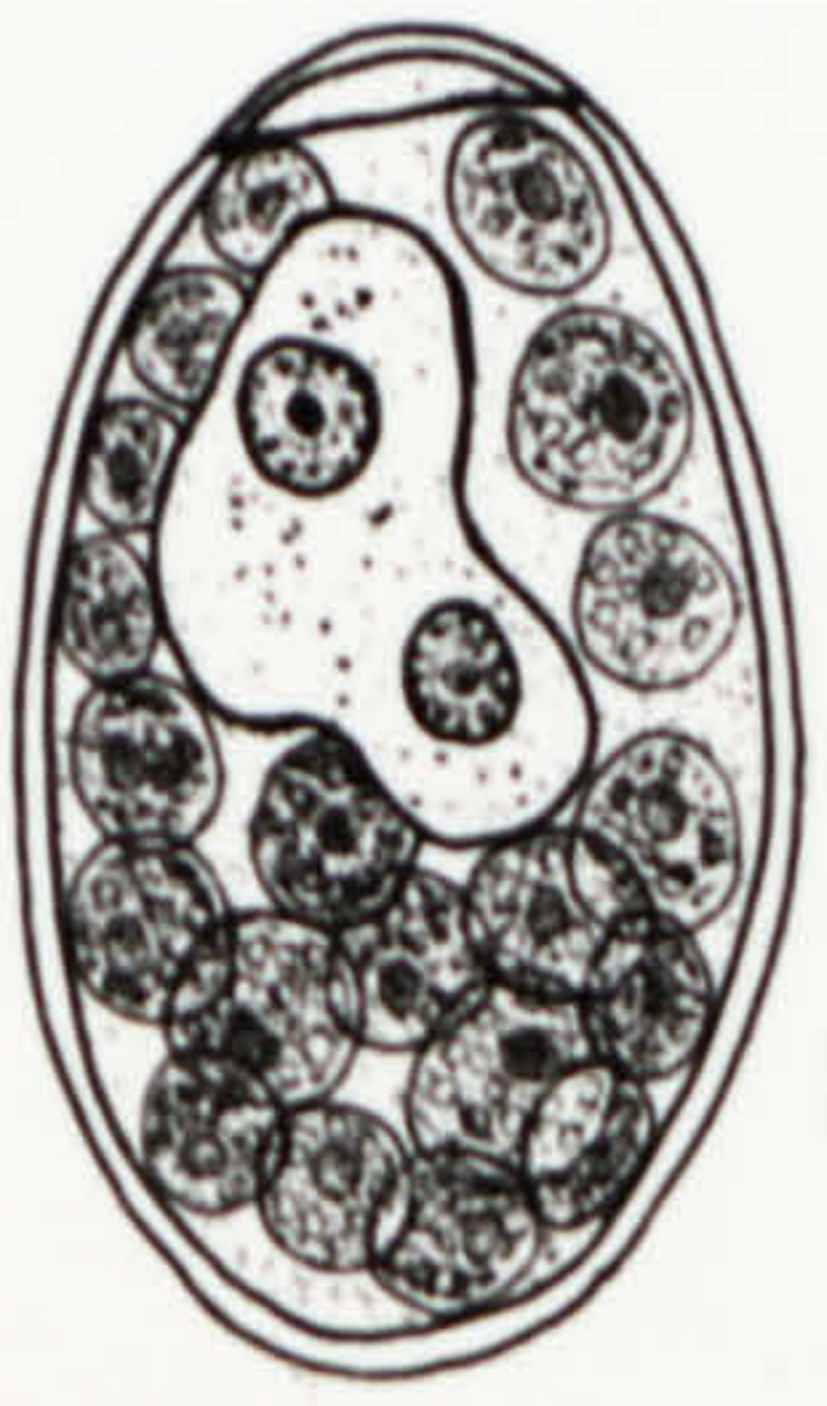
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0.15mm

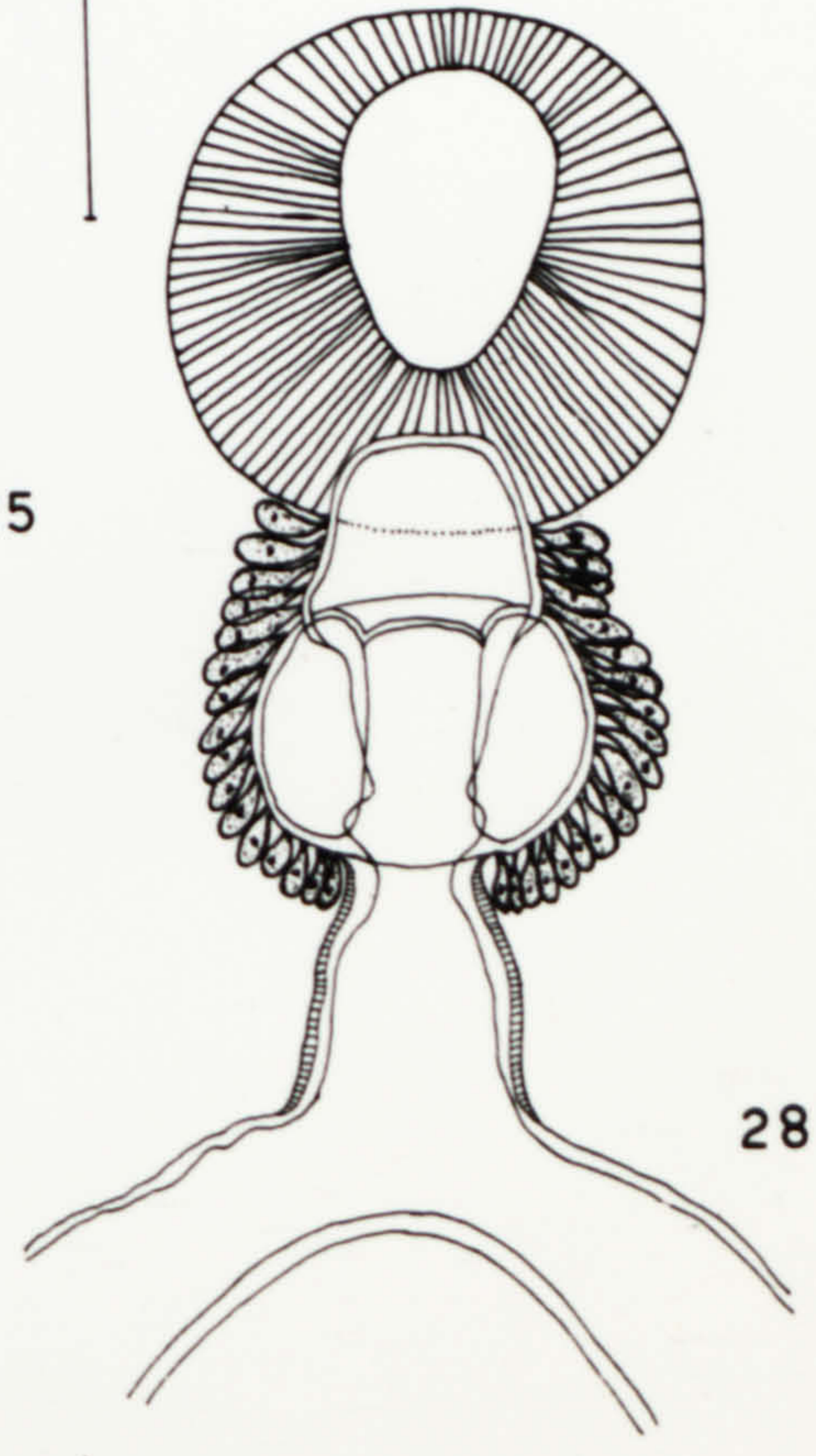


25

0.04mm



26



28

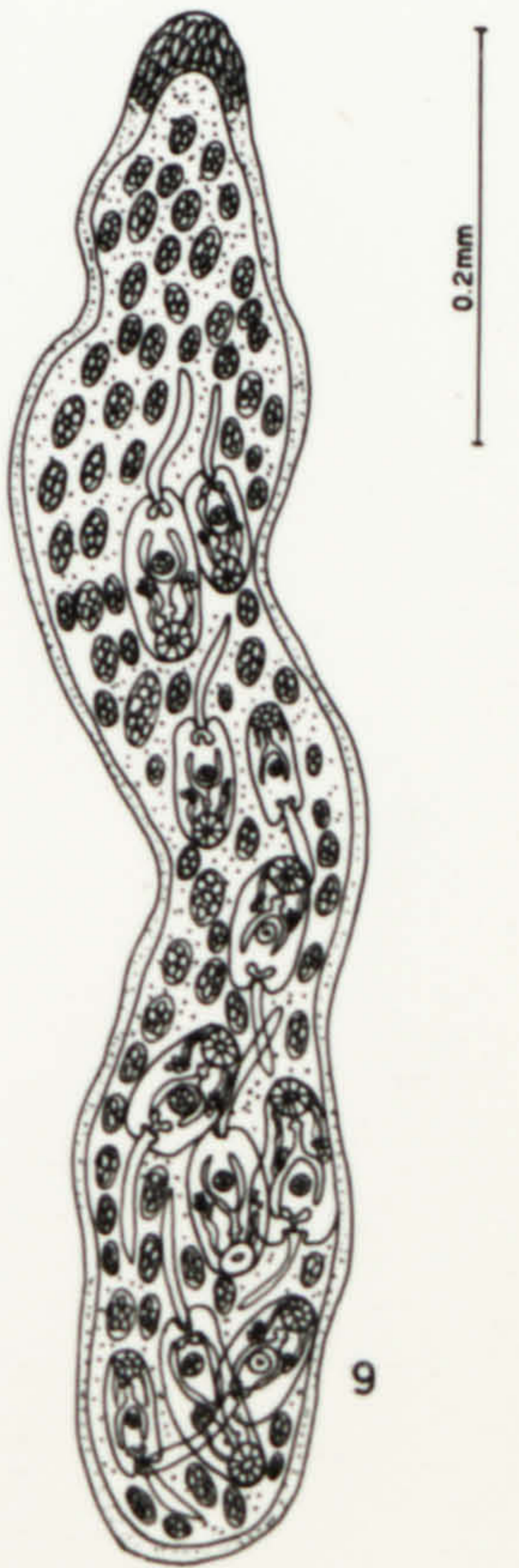
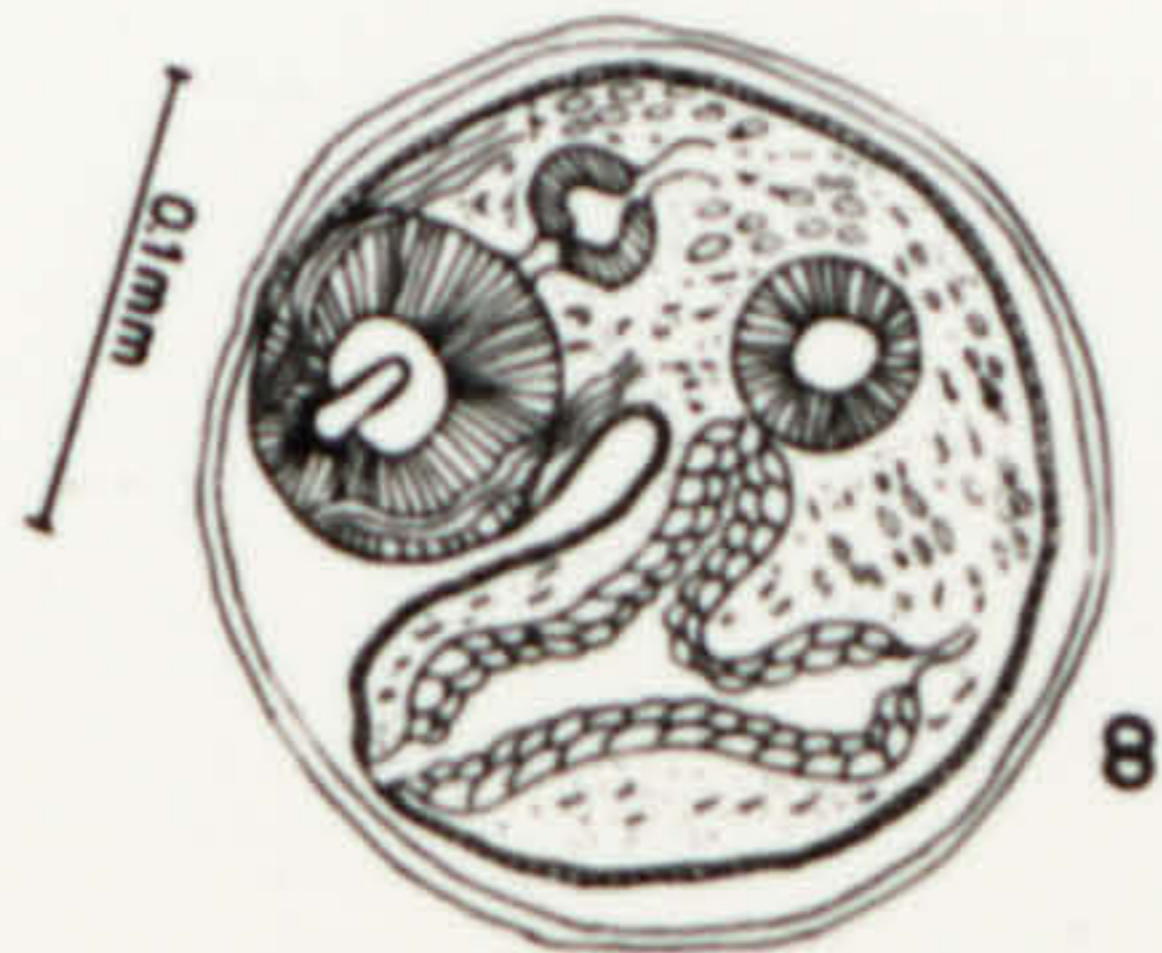
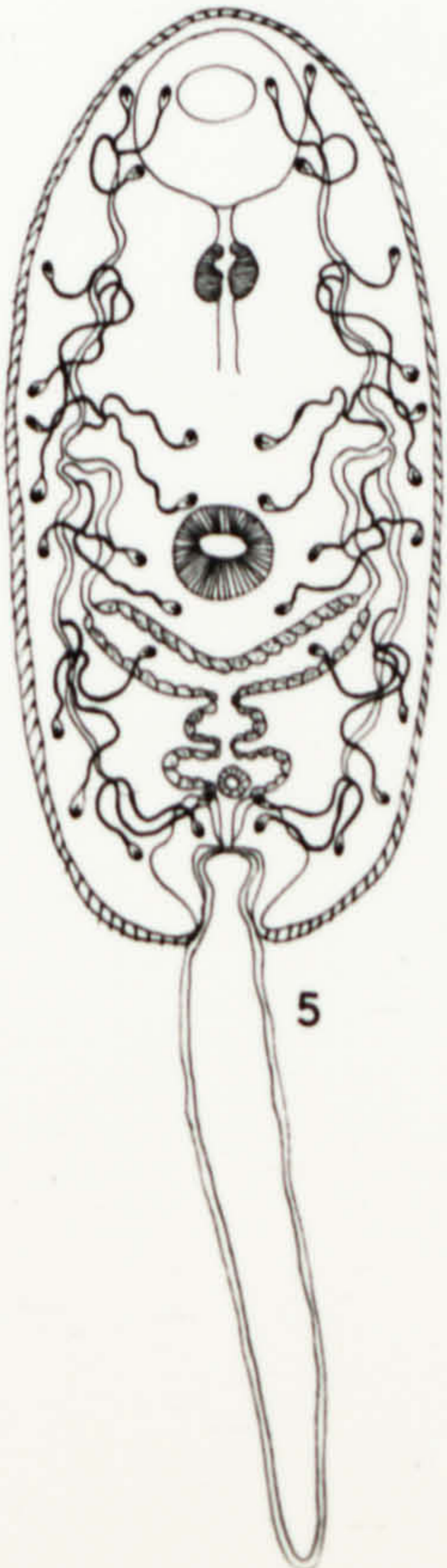
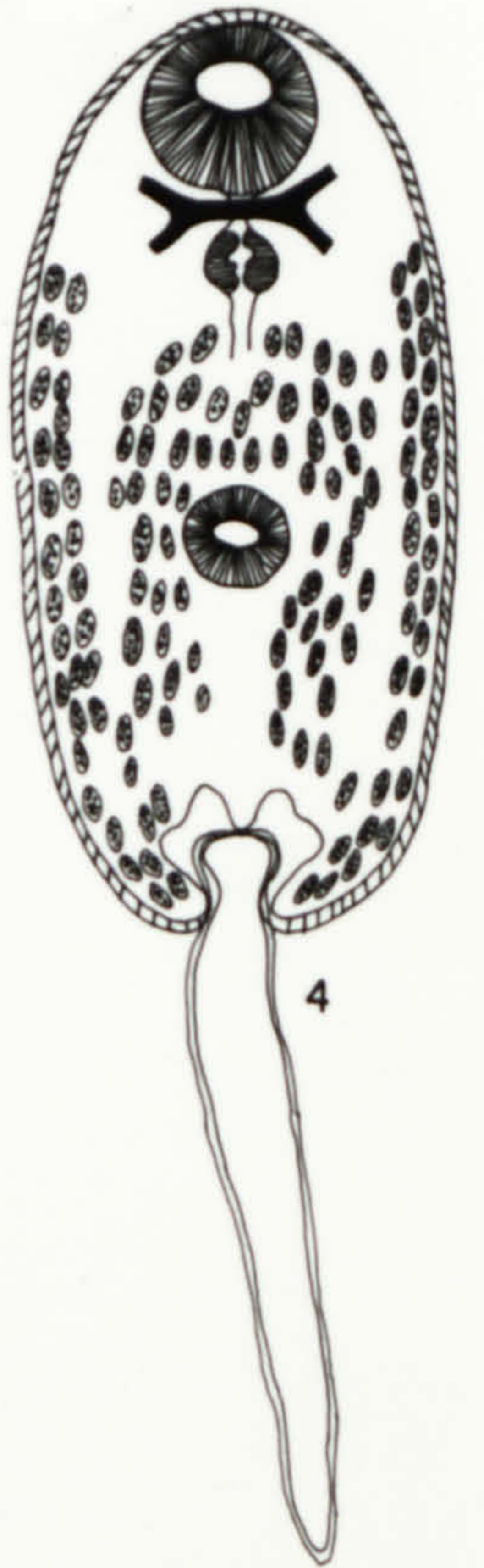
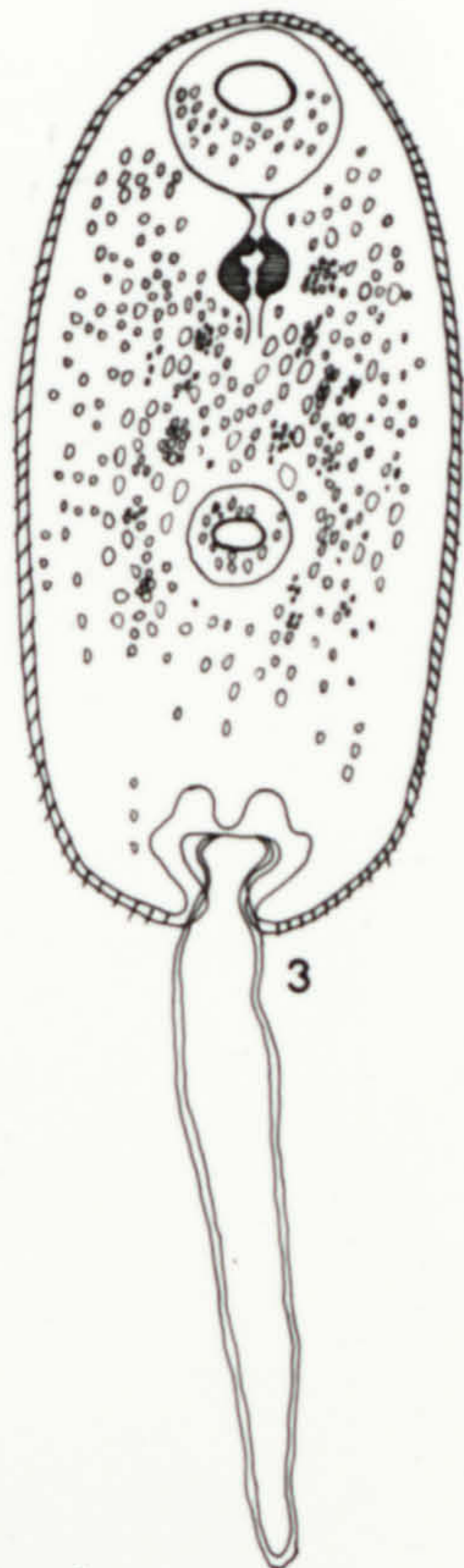
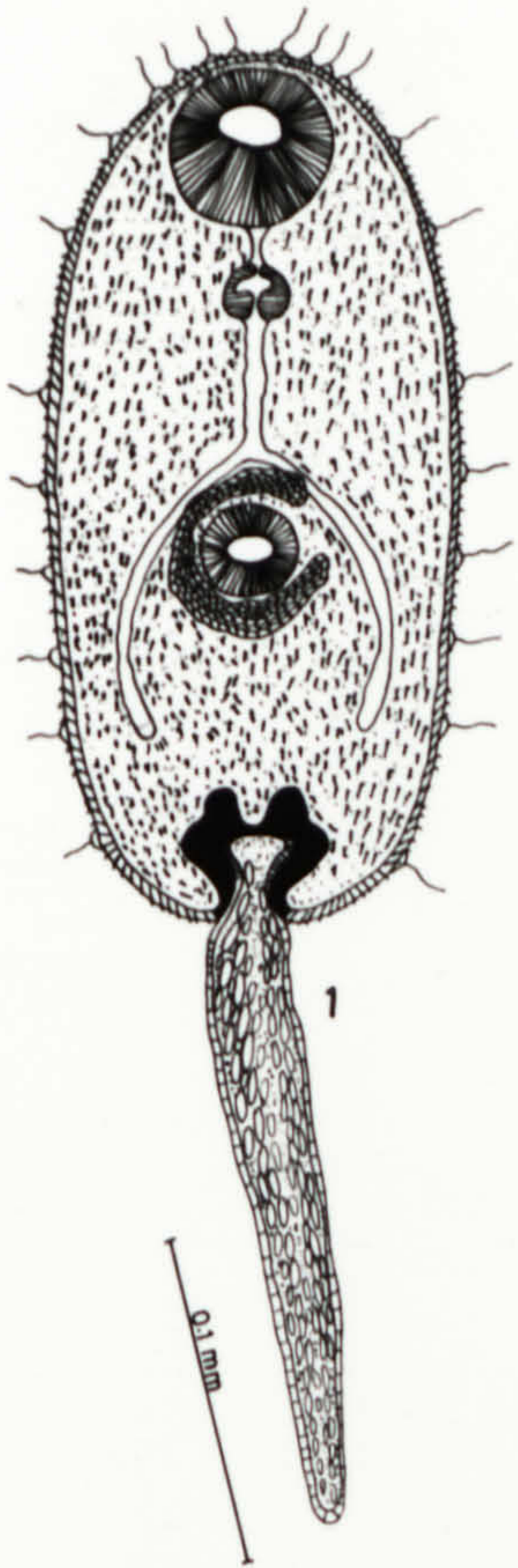
Plates 34-36

Plagiorchis farnleyensis

Plagiorchis farnleyensis

Plate 34

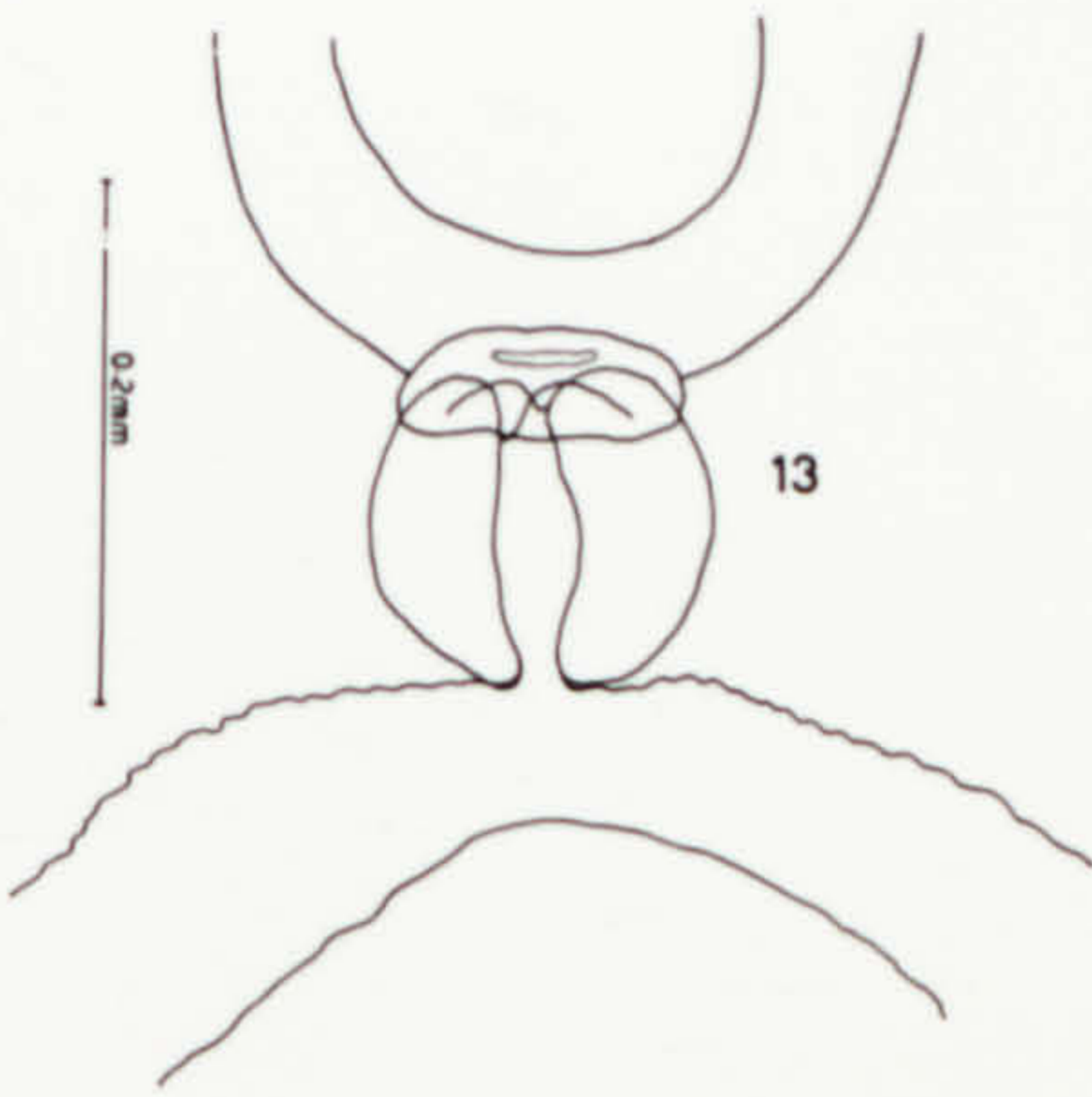
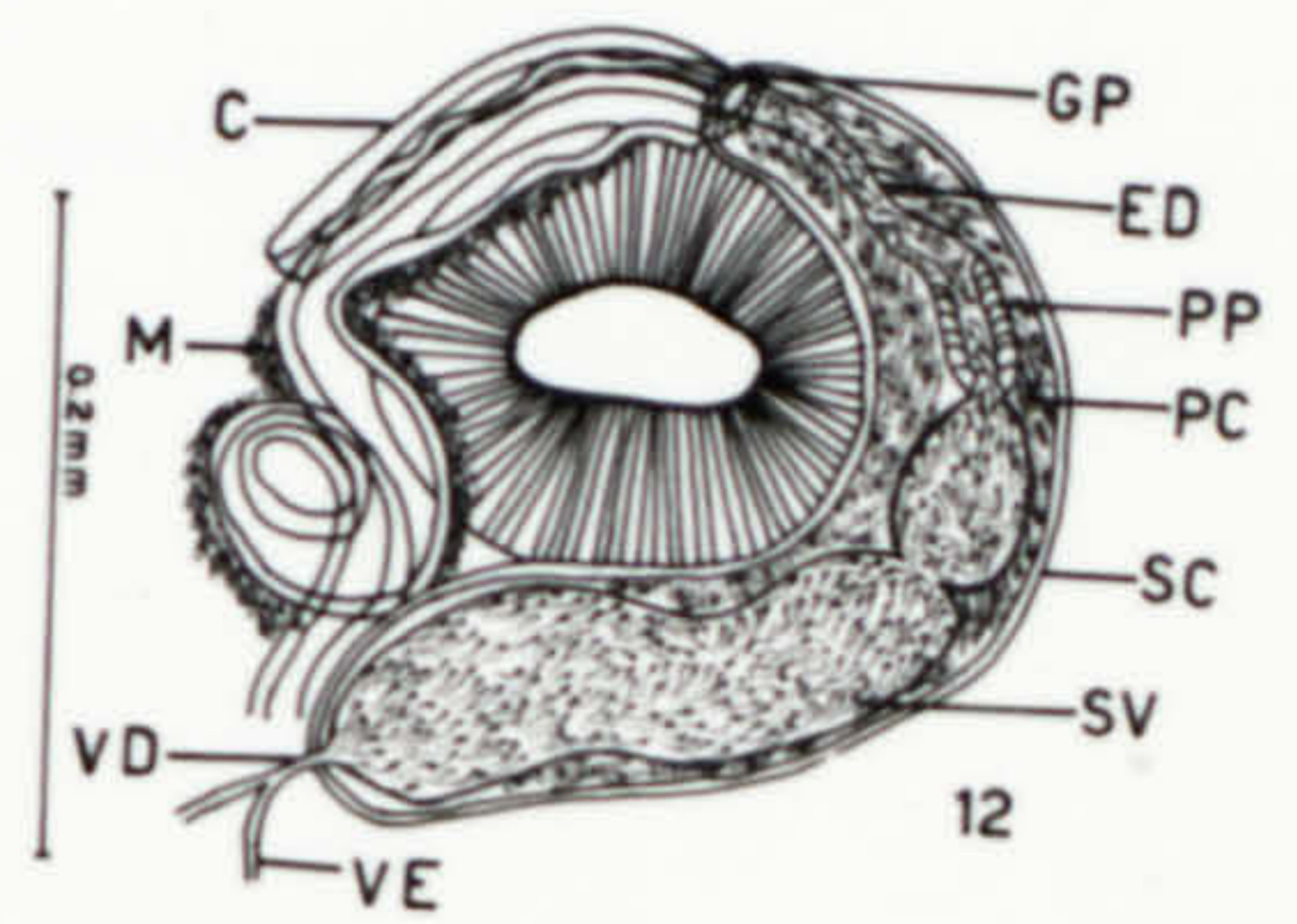
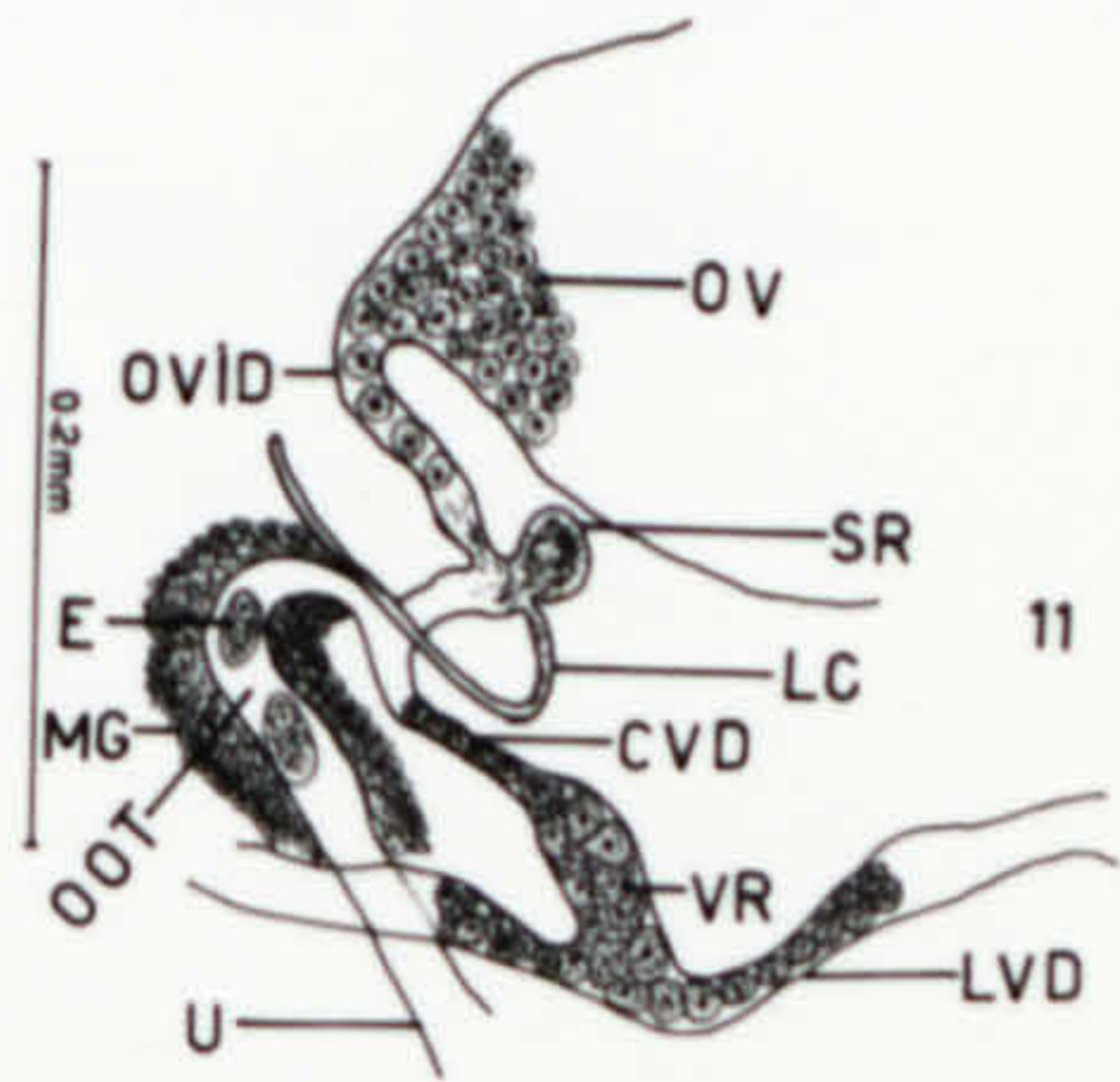
- Fig. 1. Cercaria - ventral view showing arrangement of spines, hair-like projections on papillae, digestive system and caudal pocket.
- Fig. 2. Cercaria - ventral view showing number and location of penetration gland-cells.
- Fig. 3. Cercaria - ventral view showing small refractile globules.
- Fig. 4. Cercaria - ventral view showing distribution of cystogenous gland-cells, and nervous system.
- Fig. 5. Cercaria - ventral view showing protonephridial system.
- Fig. 6. Stylet - dorsal view.
- Fig. 7. Encysted metacercaria - eight days old.
- Fig. 8. Encysted metacercaria - another specimen showing the folded and curved body.
- Fig. 9. Sporocyst - containing germ balls and developing cercaria.



Plagiorchis farnleyensis

Plate 35

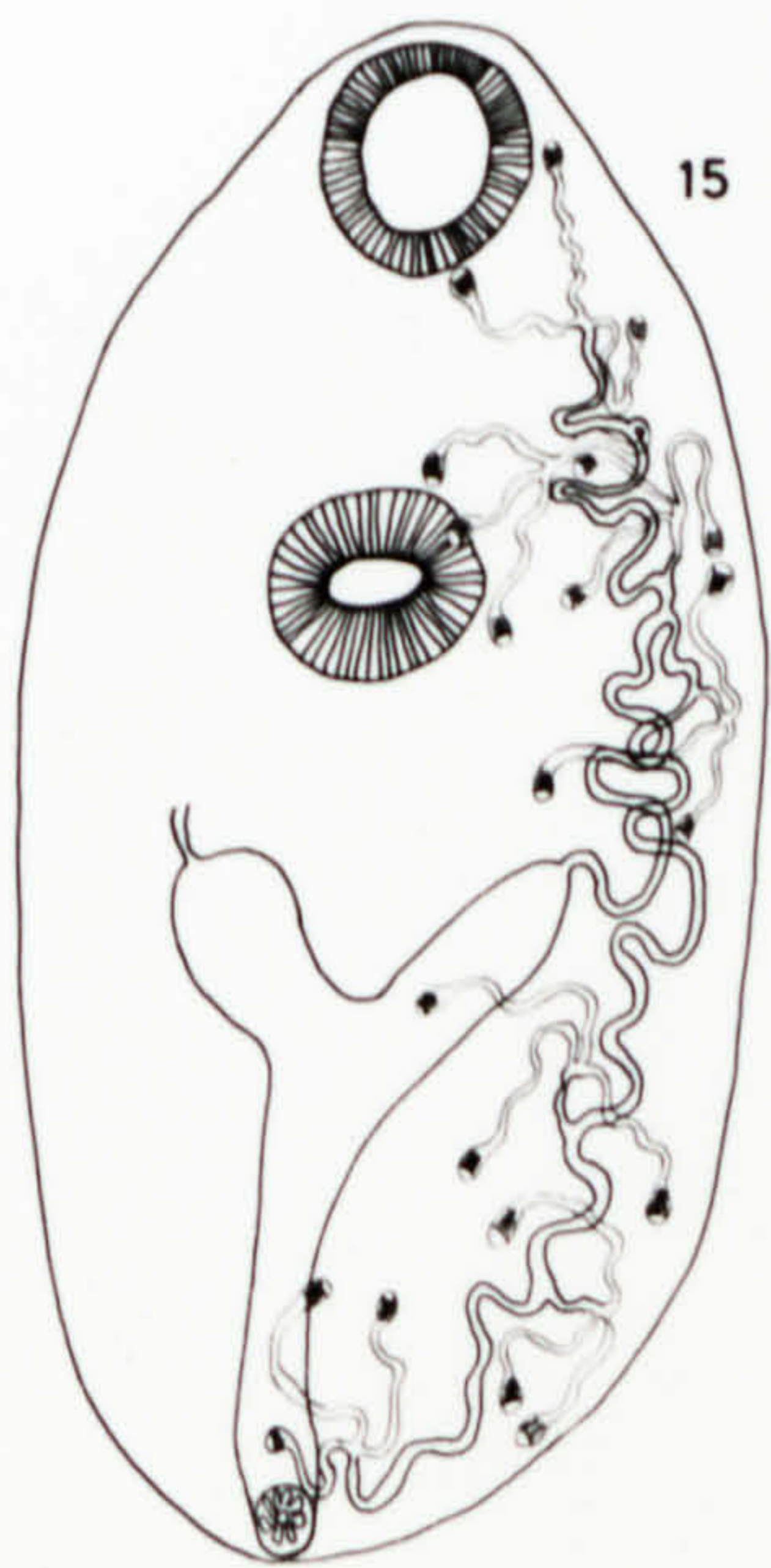
- Fig. 10. Adult - six days old from experimental infection of mouse in dorsal view.
- Fig. 11. Adult - female genital system.
- Fig. 12. Adult - male genital ducts.
- Fig. 13. Adult - anterior end showing small and lobes of pharynx.
- Fig. 14. Egg - immediately after laying.
- Fig. 14a. Egg - showing fully developed miracidium. Note single protonephridial system with only one flame cell.



Plagiorchis farnleyensis

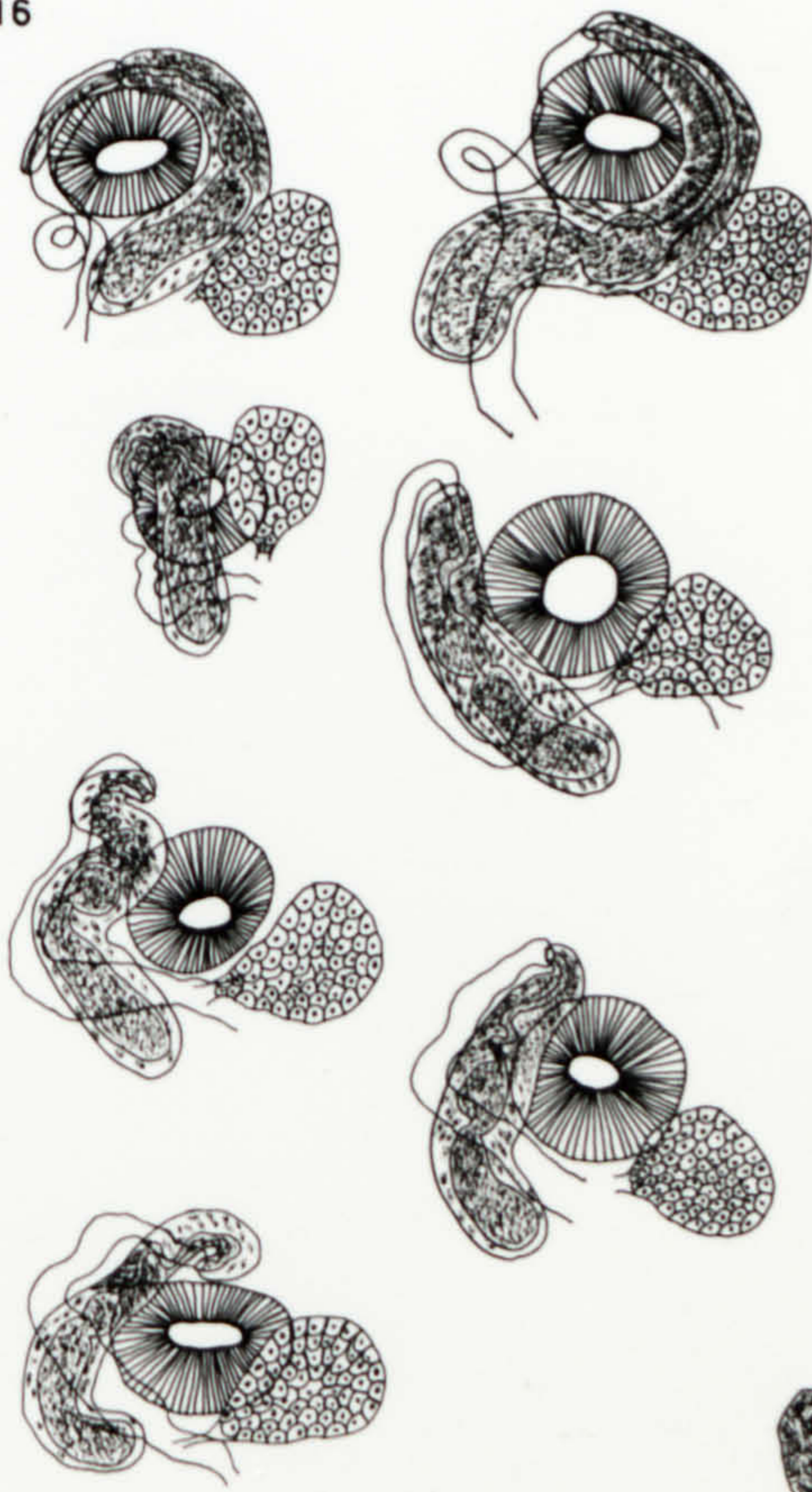
Plate 36

- Fig. 15. Adult - protonephridial system showing number and arrangement of flame cells on one side only.
- Fig. 16. Adult - showing variation in the location of the cirrus sac and ovary with relation to the acetabulum.
- Fig. 17. Adult - showing variation in position of ovary and testes relative to that of the acetabulum.



16

0.35 mm



17

0.55 mm



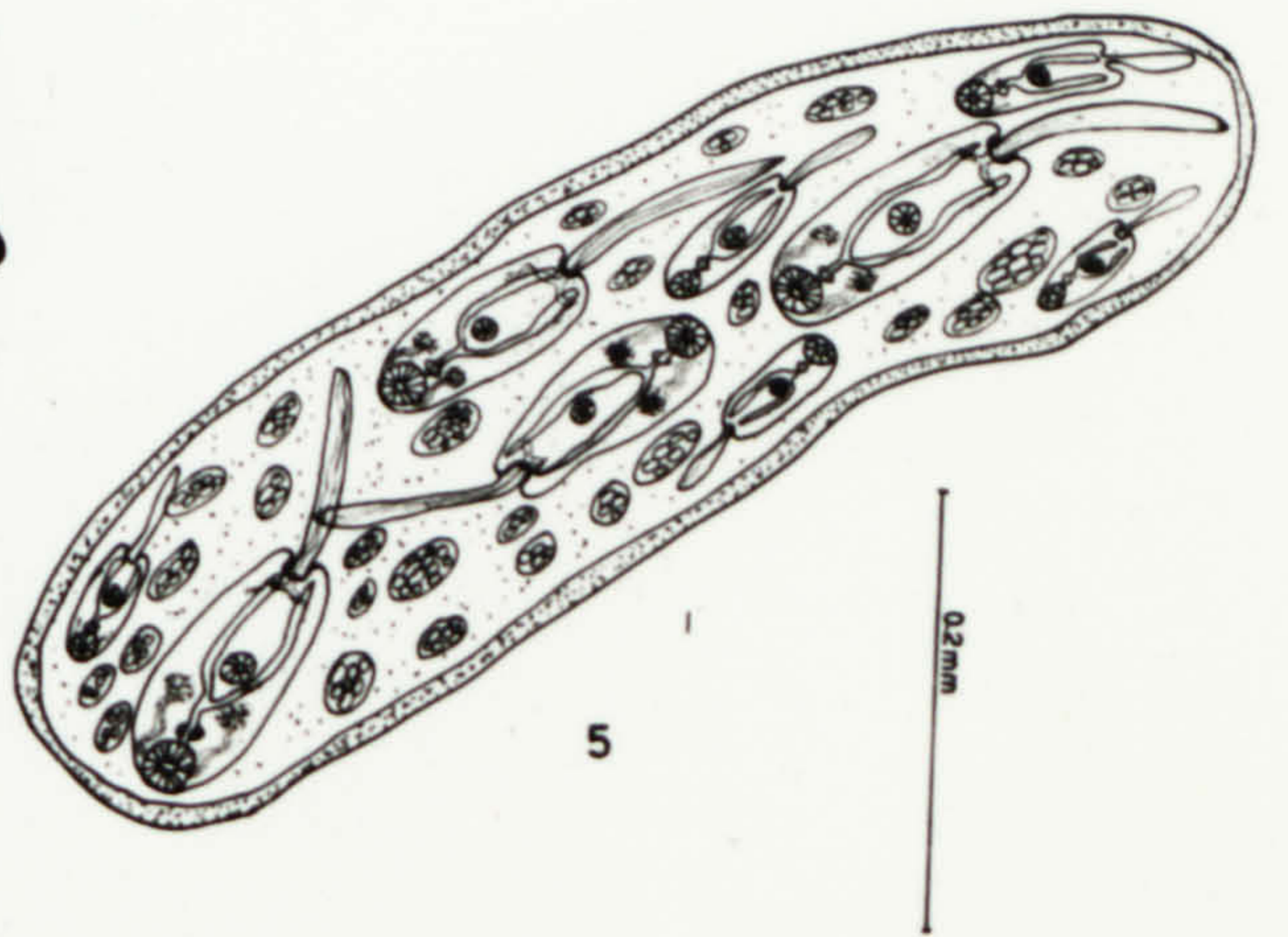
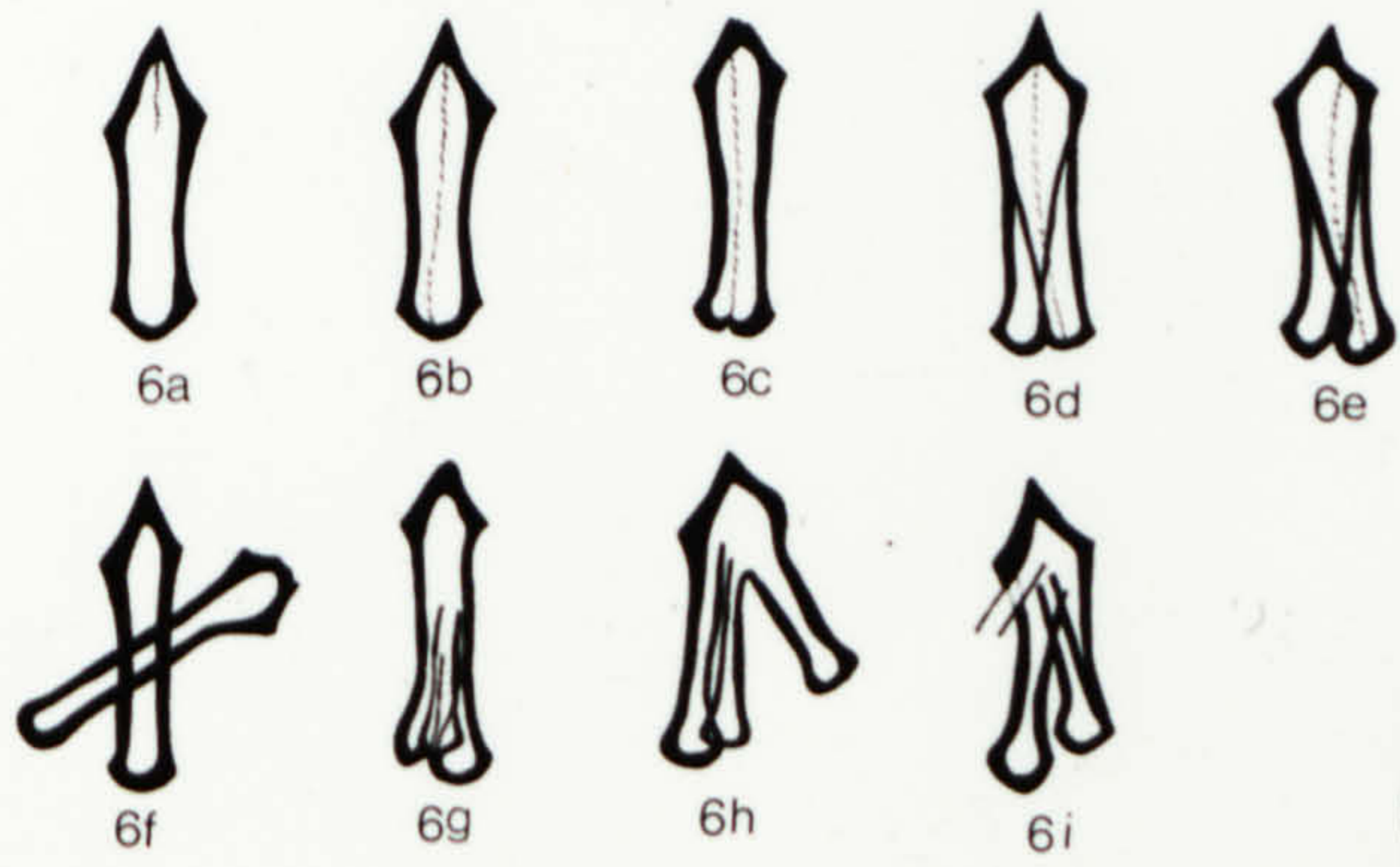
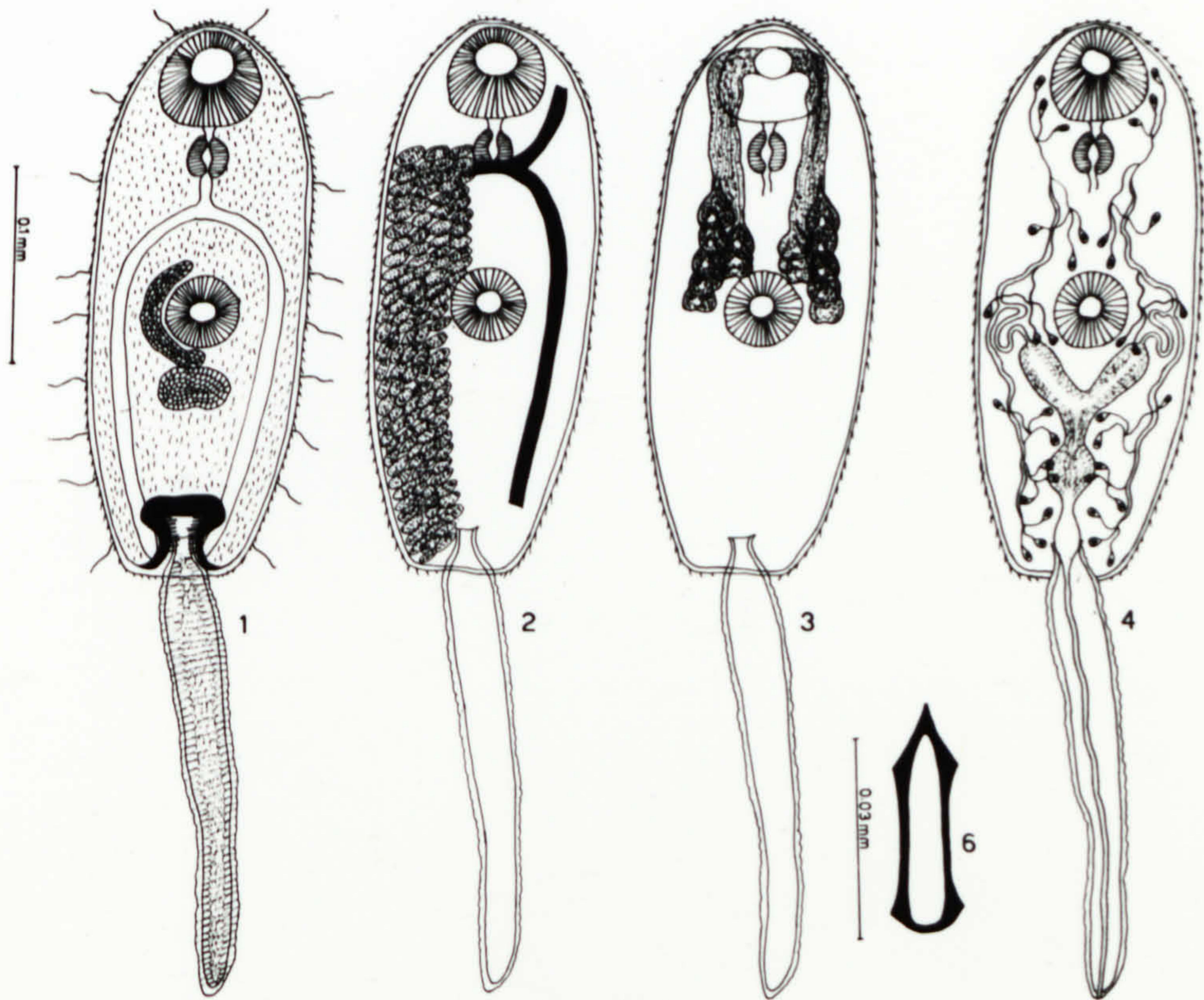
Plates 37-39

Plagiorchis kirkstallensis

Plagiorchis kirkstallensis

Plate 37

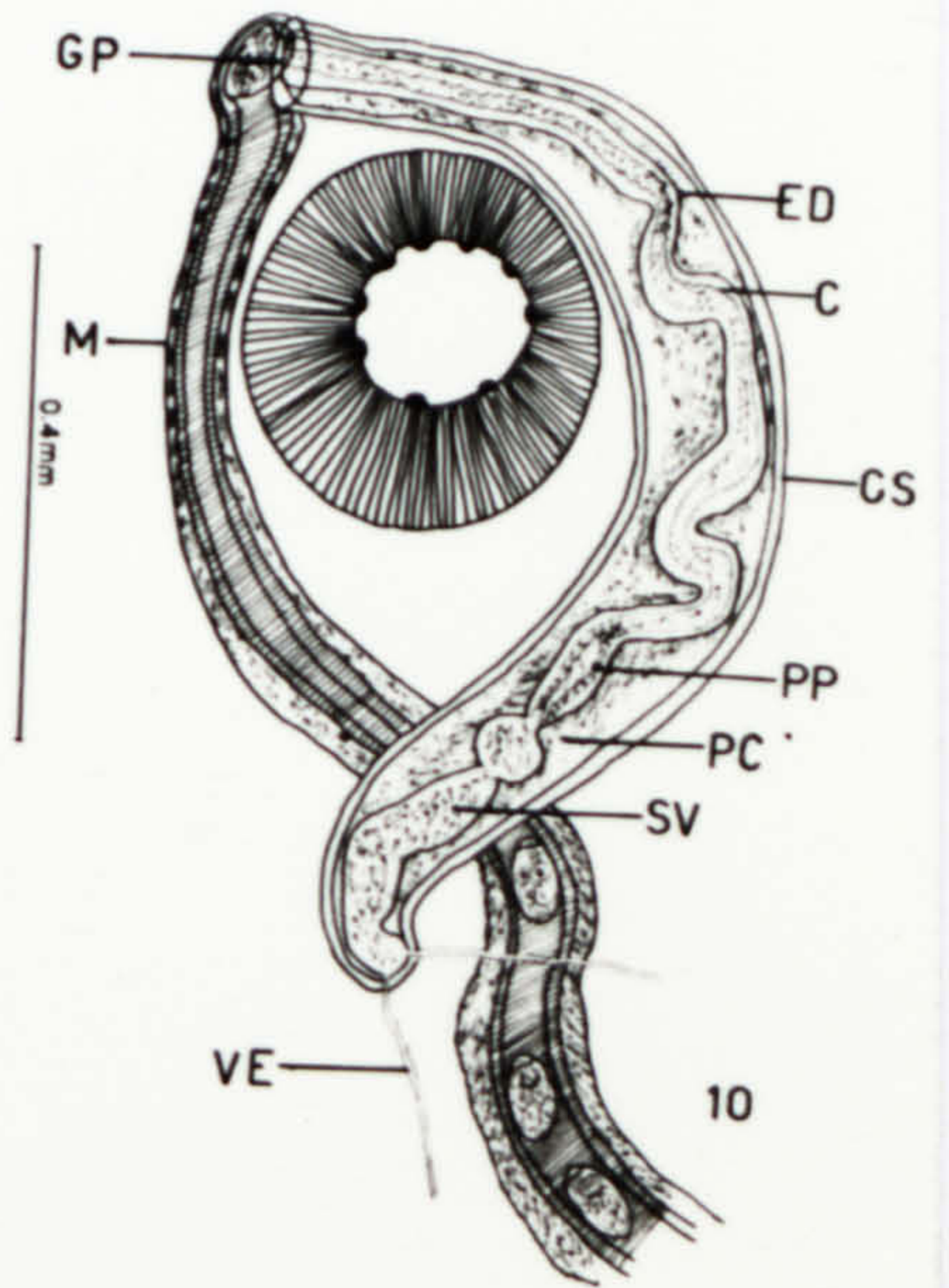
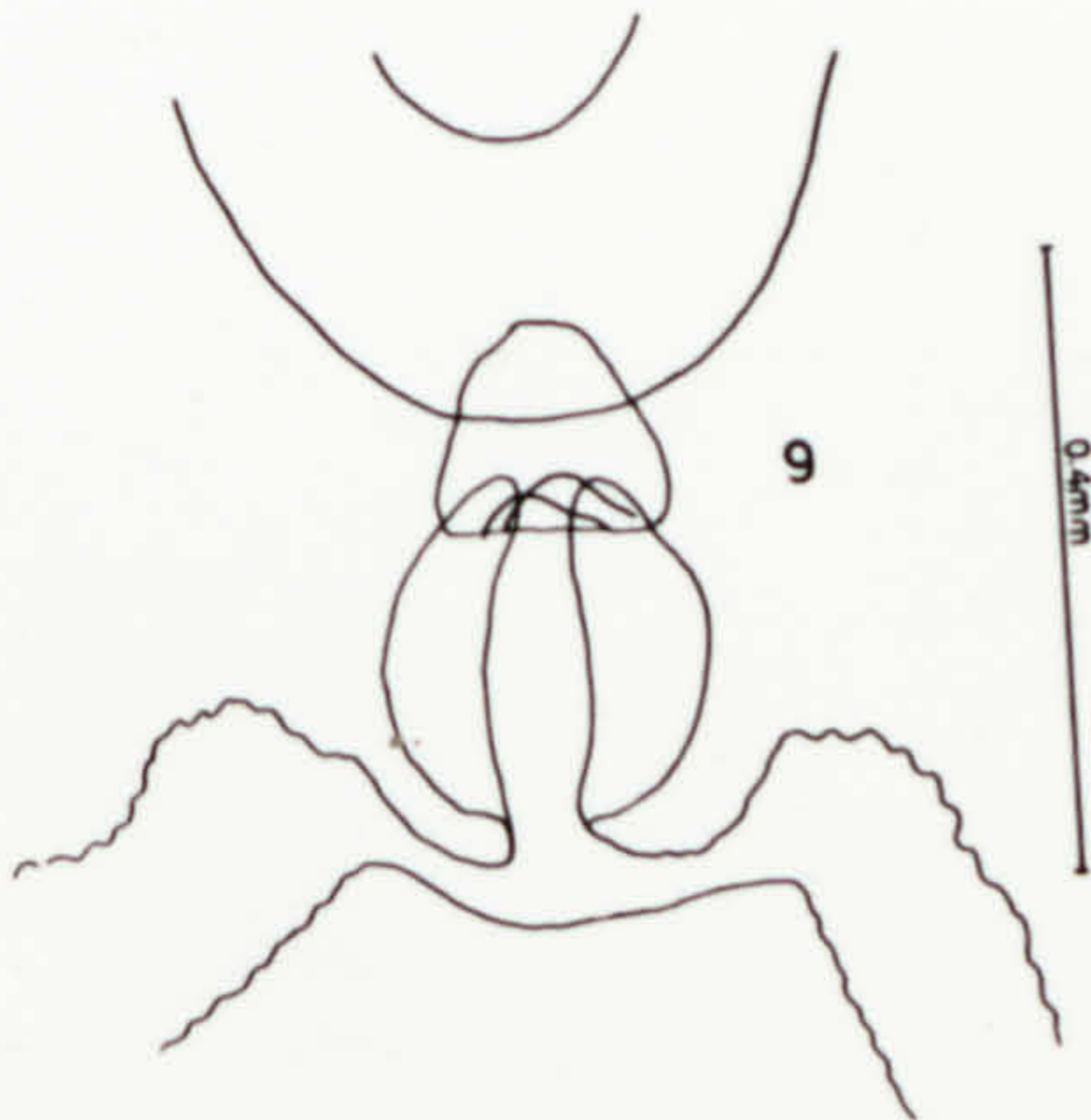
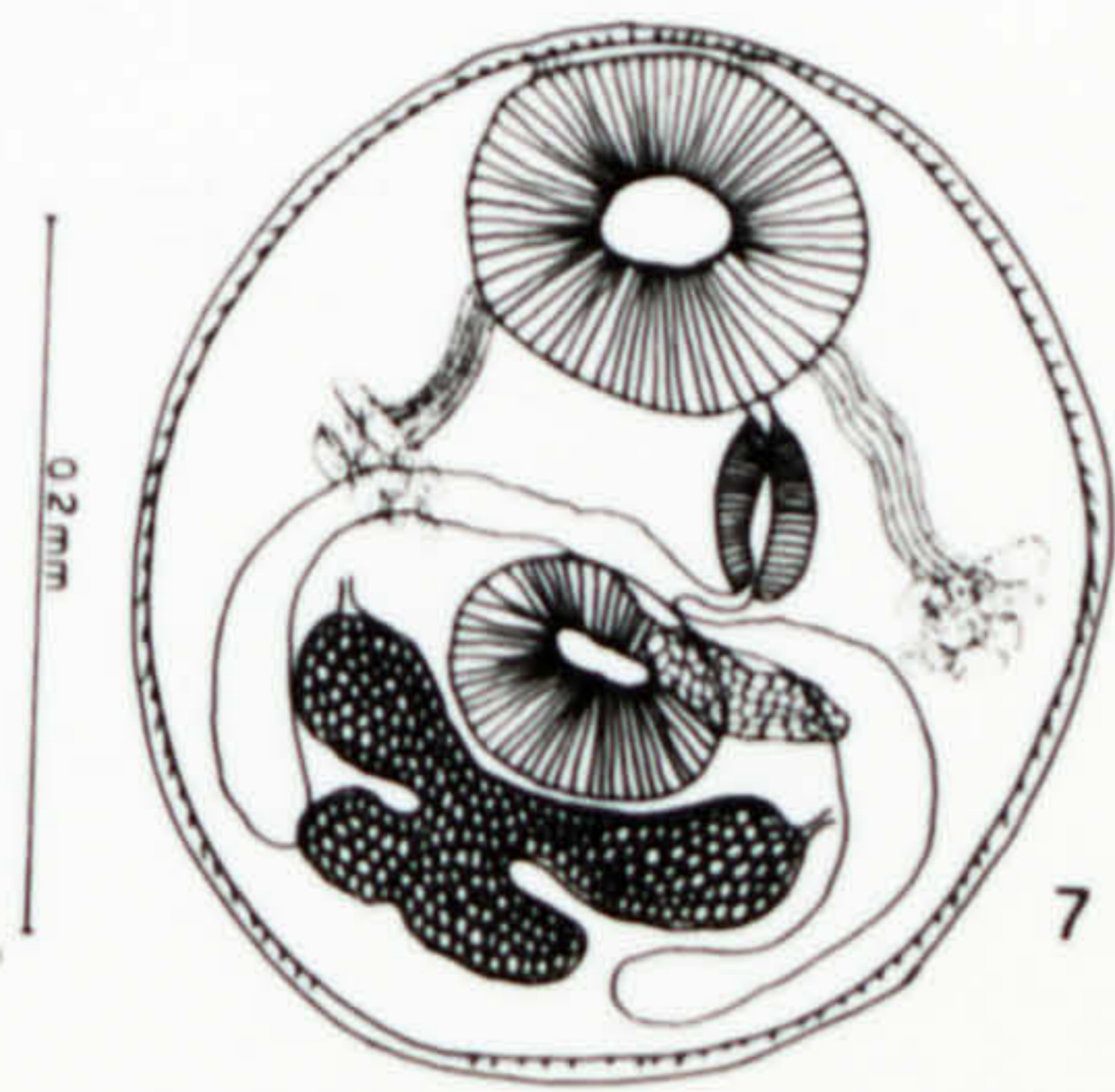
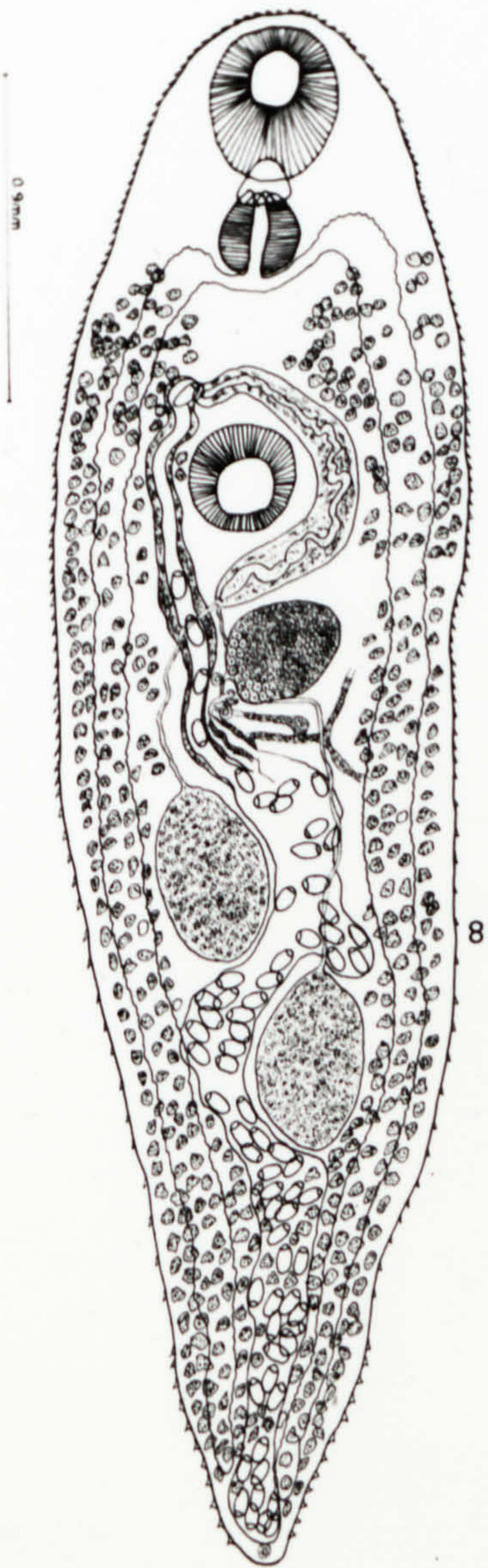
- Fig. 1. Cercaria - ventral view showing arrangement of spines and hair-like structures, digestive system and caudal pocket.
- Fig. 2. Cercaria - ventral view showing distribution of cystogenous gland-cells, and nervous system.
- Fig. 3. Cercaria - ventral view, showing number and location of penetration gland-cells.
- Fig. 4. Cercaria - ventral view, showing protonephridial system.
- Fig. 5. Sporocyst - containing germ balls and cercariae in different stages of development.
- Fig. 6. Normal stylet - dorsal view.
- Fig. 6a - 6f. - showing possible stages in the formation of two abnormal stylets.
- Fig. 6g - 6i. - showing possible stages in the formation of three abnormal stylets.



Plagiorchis kirkstallensis

Plate 38

- Fig. 7. Encysted metacercaria - seven days old.- showing excretory bladder filled with highly refractile granules.
- Fig. 8. Adult - eight days old from experimental infection of mouse in dorsal view.
- Fig. 9. Adult - ventral view of anterior end showing prepharynx, pharynx and oesophagus. Note the four lobes in pharynx.
- Fig. 10. Adult - male genital ducts. Note the vasa efferentia entering cirrus sac separately.



Plagiorchis kirkstallensis

Plate 39

Fig. 11. Adult- showing variation of cirrus sac with relation to the acetabulum.

Fig. 12. Adult - female genital system.

Fig. 13a-b. Mature egg - showing one and two nucleated zygotes.

Fig. 13c. Egg - showing fully developed miracidium. Note the protonephridial system with 2 flame cells.

Fig. 14. Adult - showing protonephridial system on one side only.

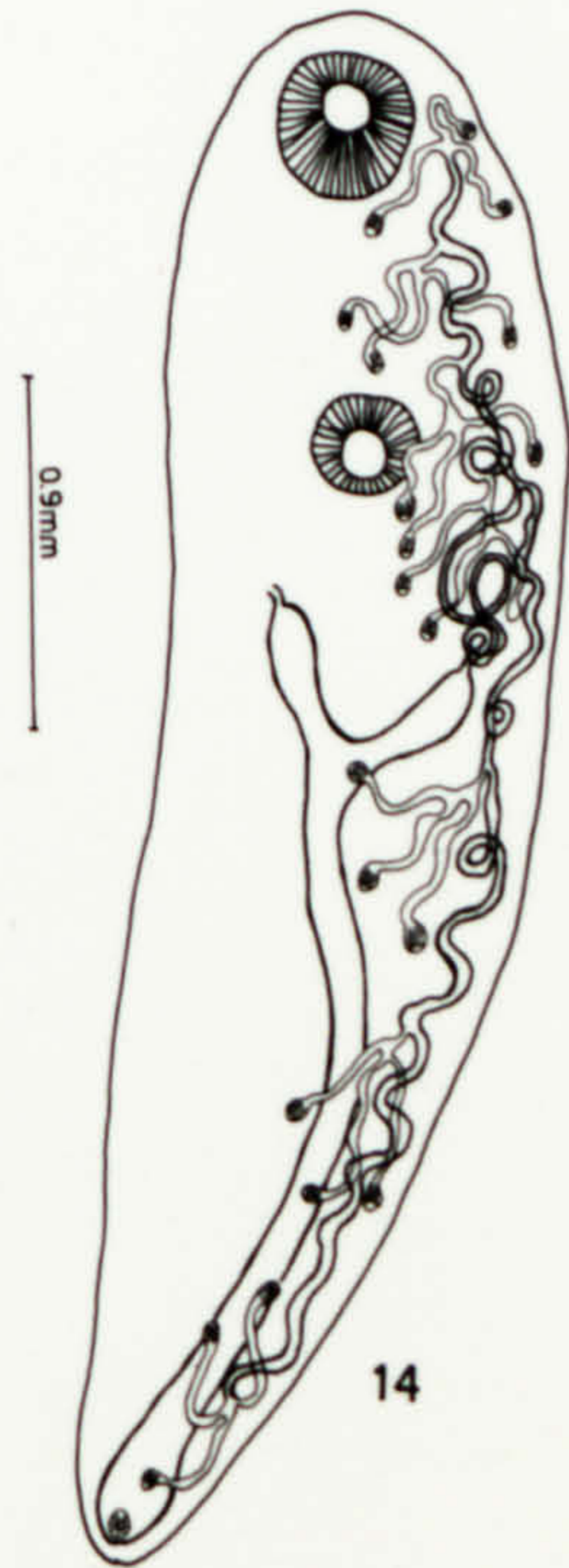
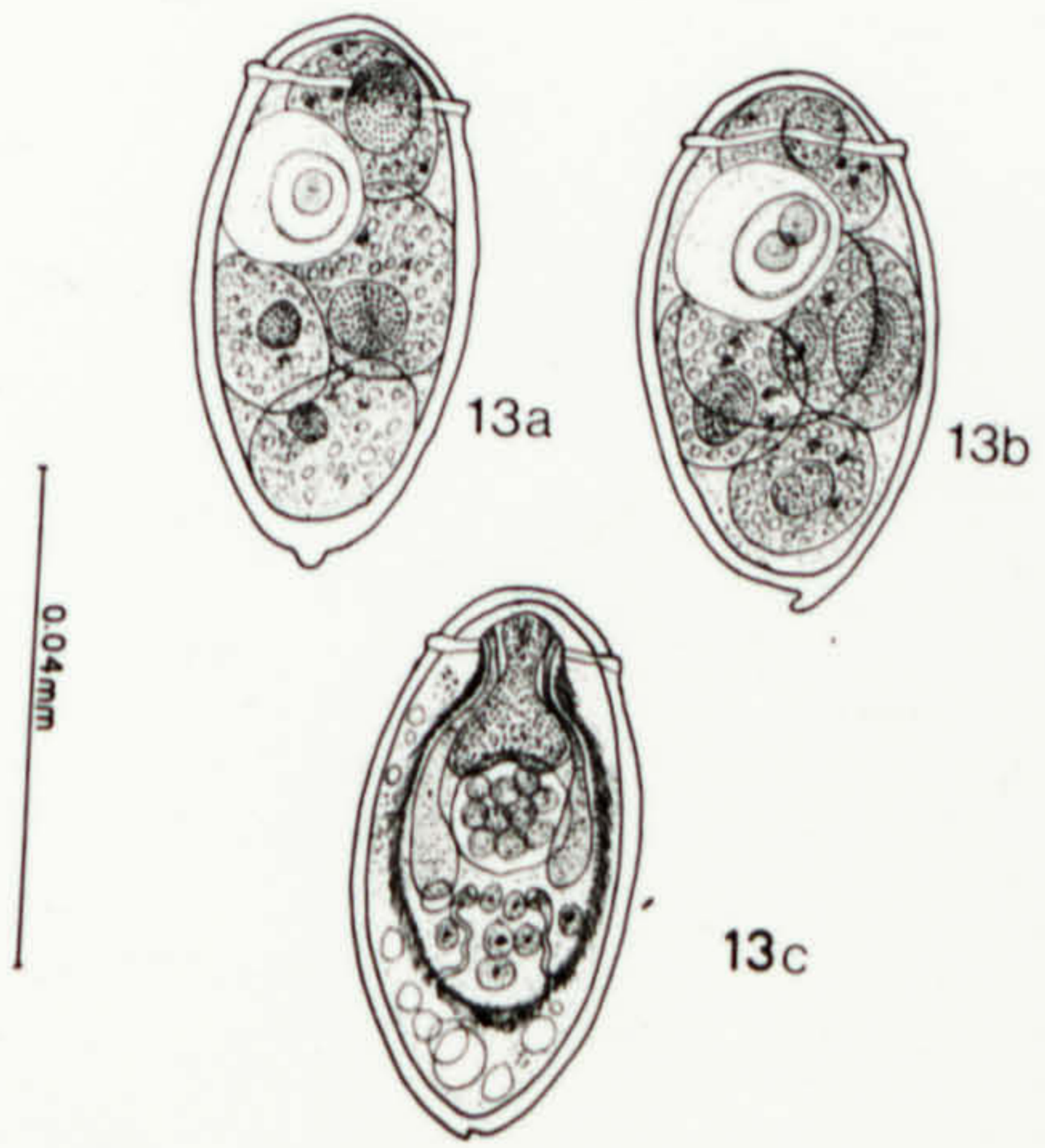
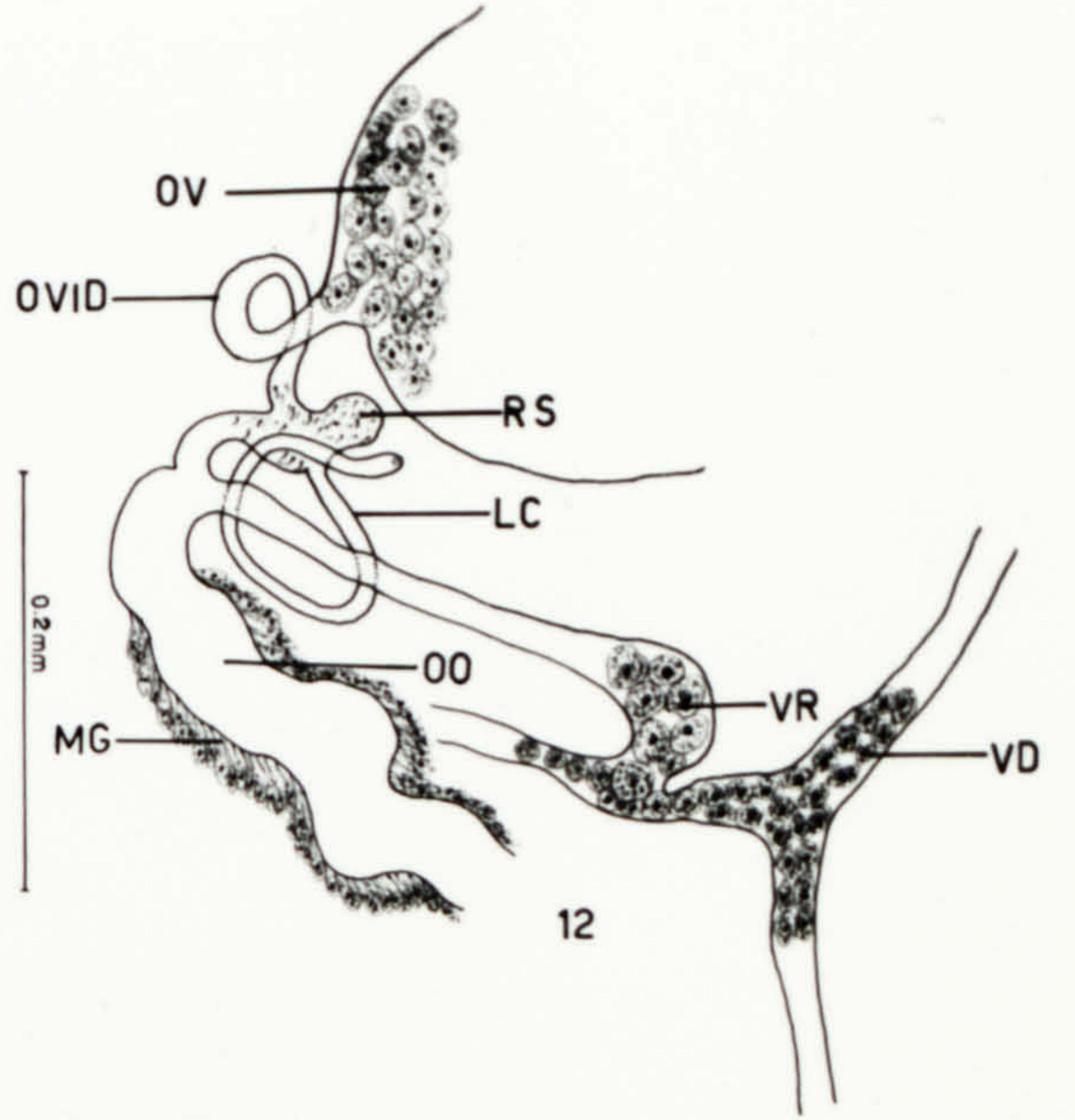
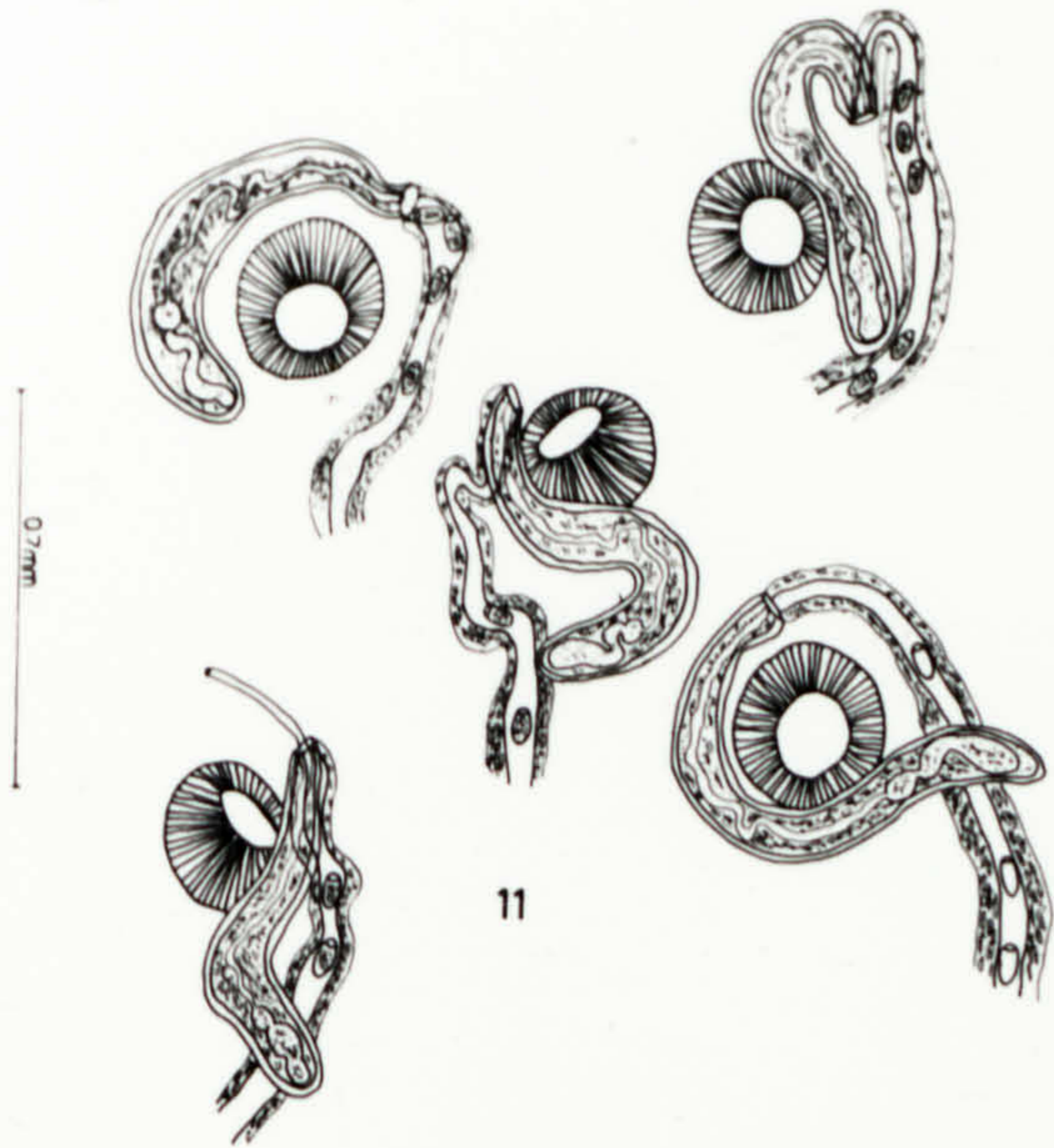
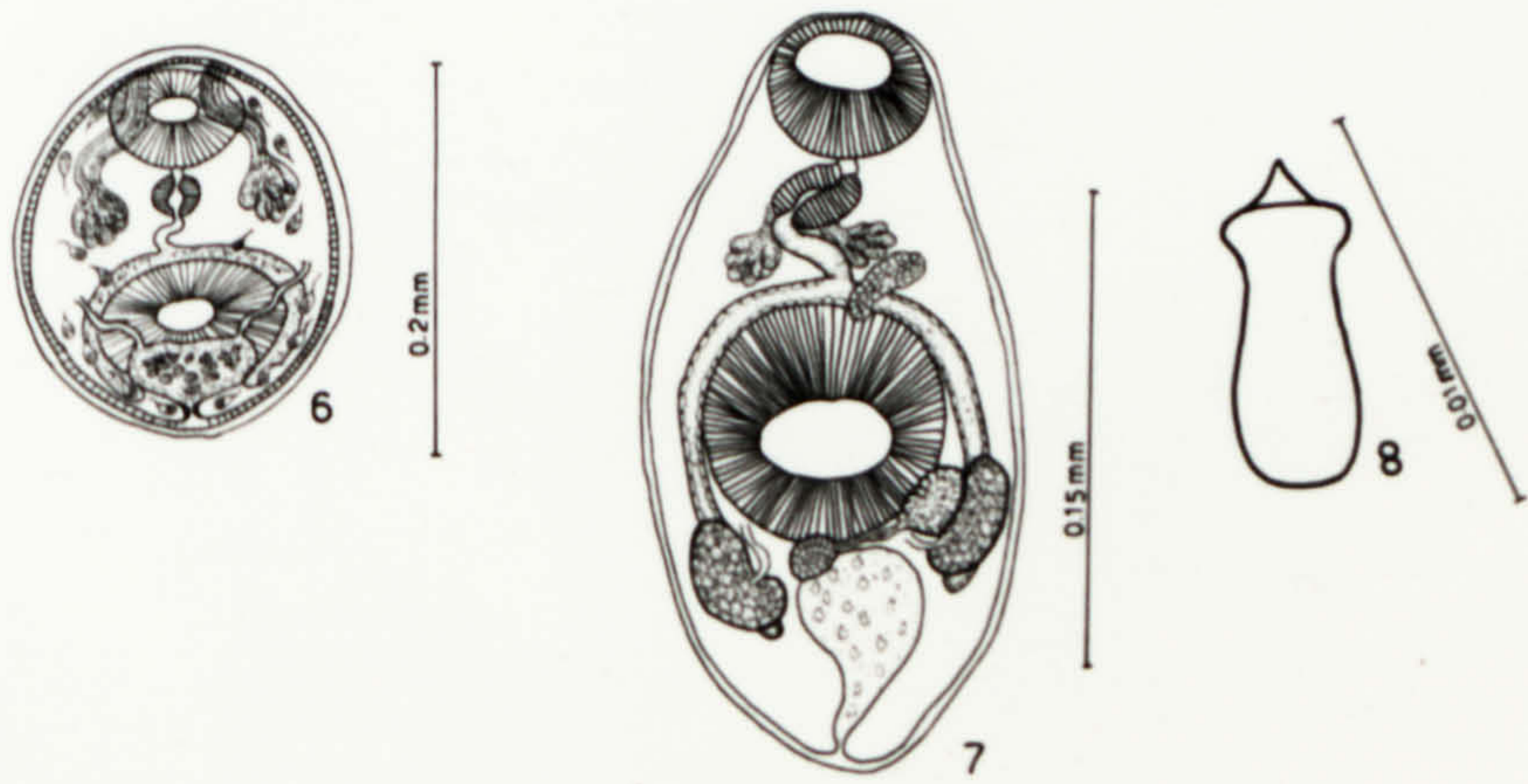
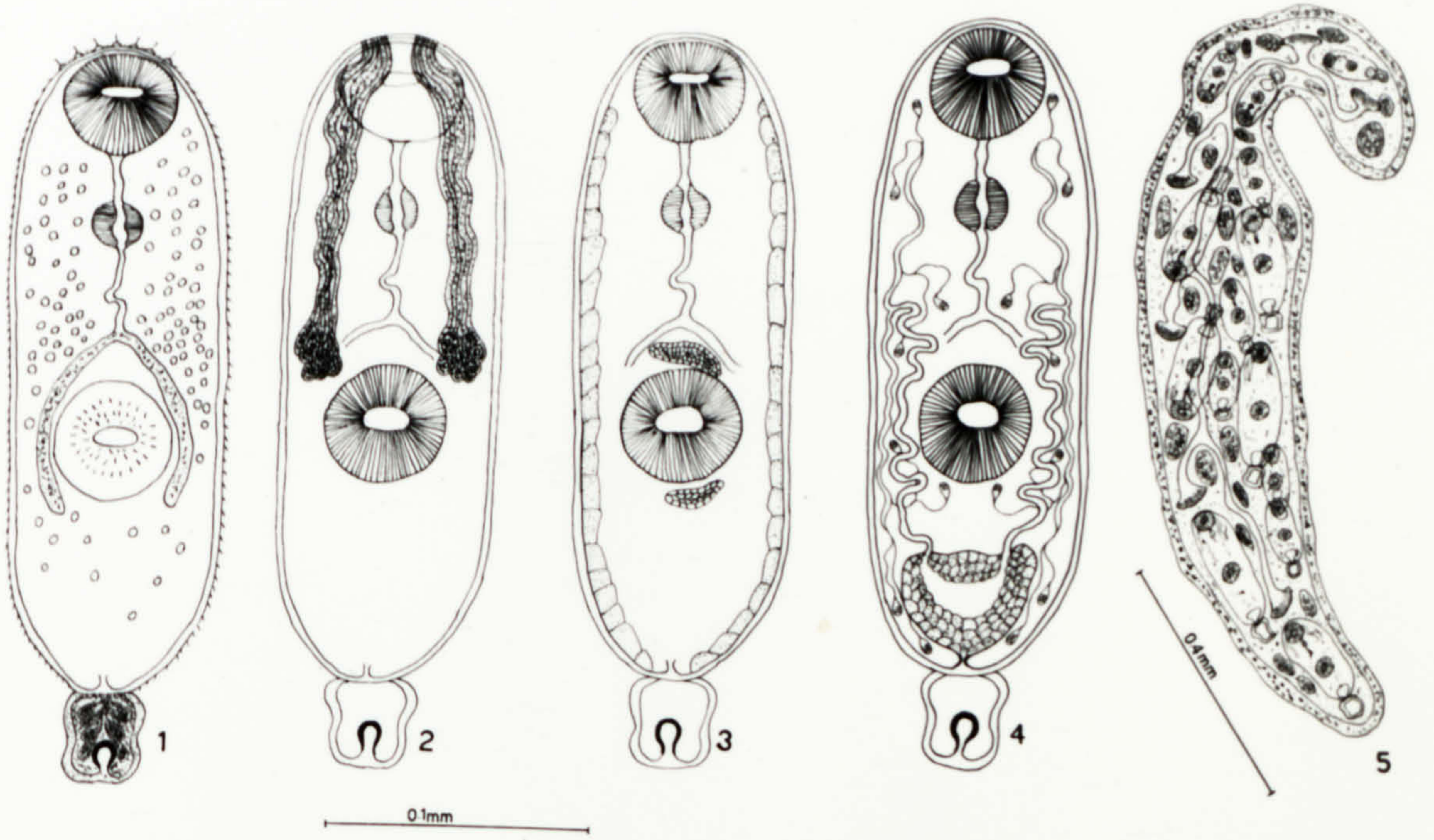


Plate 40

Cercaria microcercous I

- Fig. 1. Cercaria - ventral view showing details of body spination, digestive system. (Note the curved oesophagus), distribution of refractile globules, the tail and its gland-cells.
- Fig. 2. Cercaria - ventral view showing number and location of penetration gland-cells.
- Fig. 3. Cercaria - ventral view showing distribution of cystogenous gland cells and rudiment of genitalia.
- Fig. 4. Cercaria - ventral view showing protonephridial system.
- Fig. 5. Sporocyst - showing protonephridial system, germ balls and developing cercariae.
- Fig. 6. Encysted metacercaria - fifteen day old specimen from Physa fontinalis.
- Fig. 7. Immature adult - from experimented infection of chub (L. (S.) cephalus).



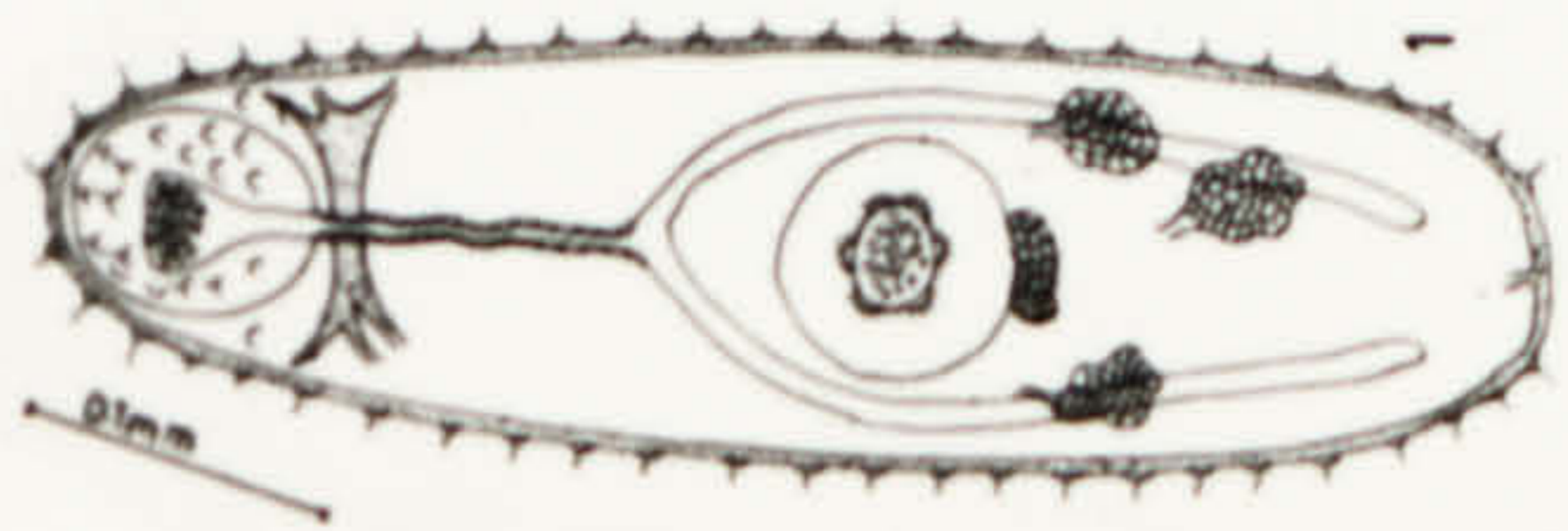
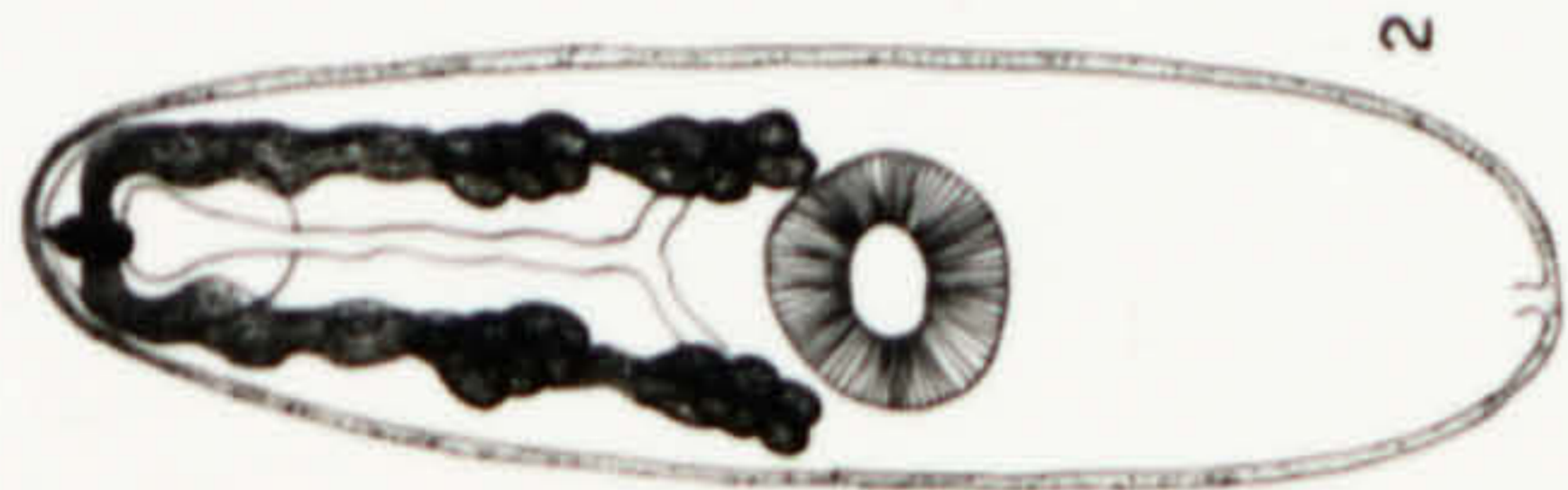
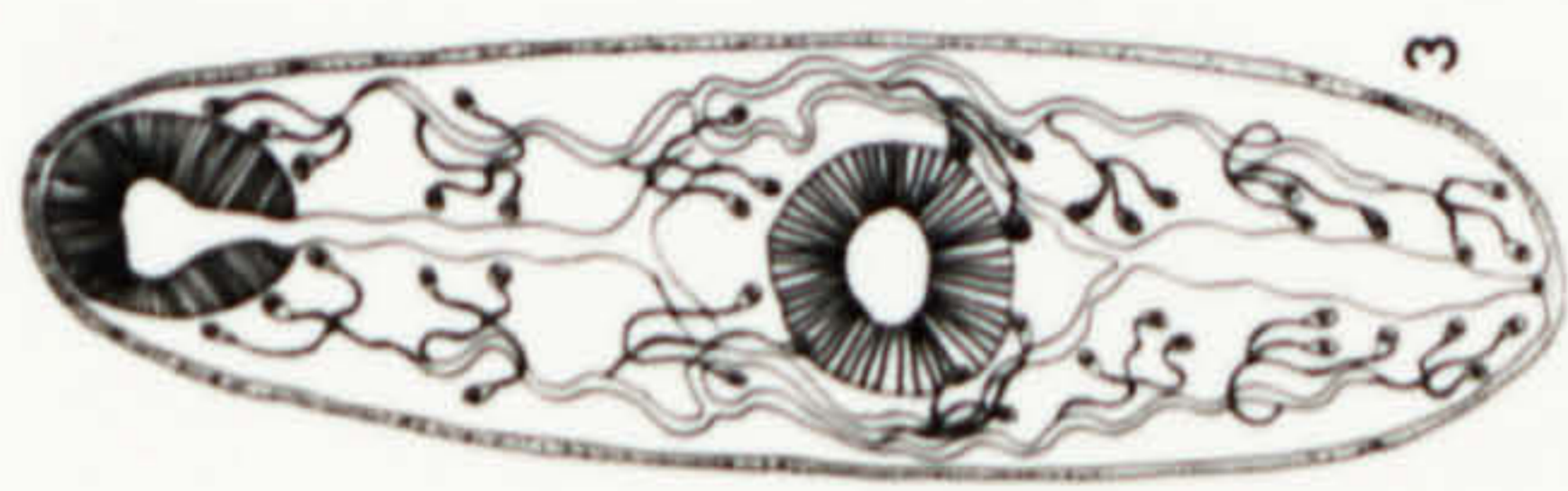
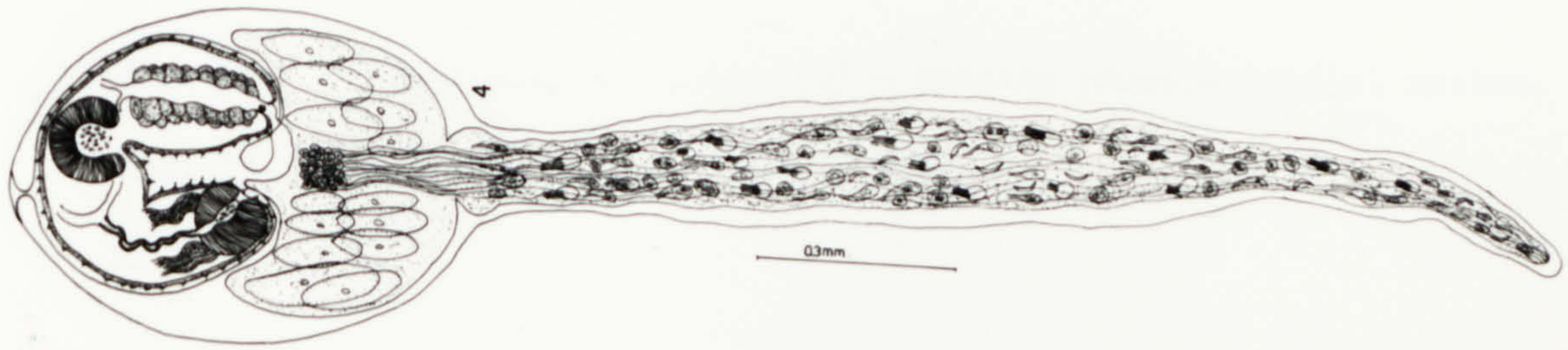
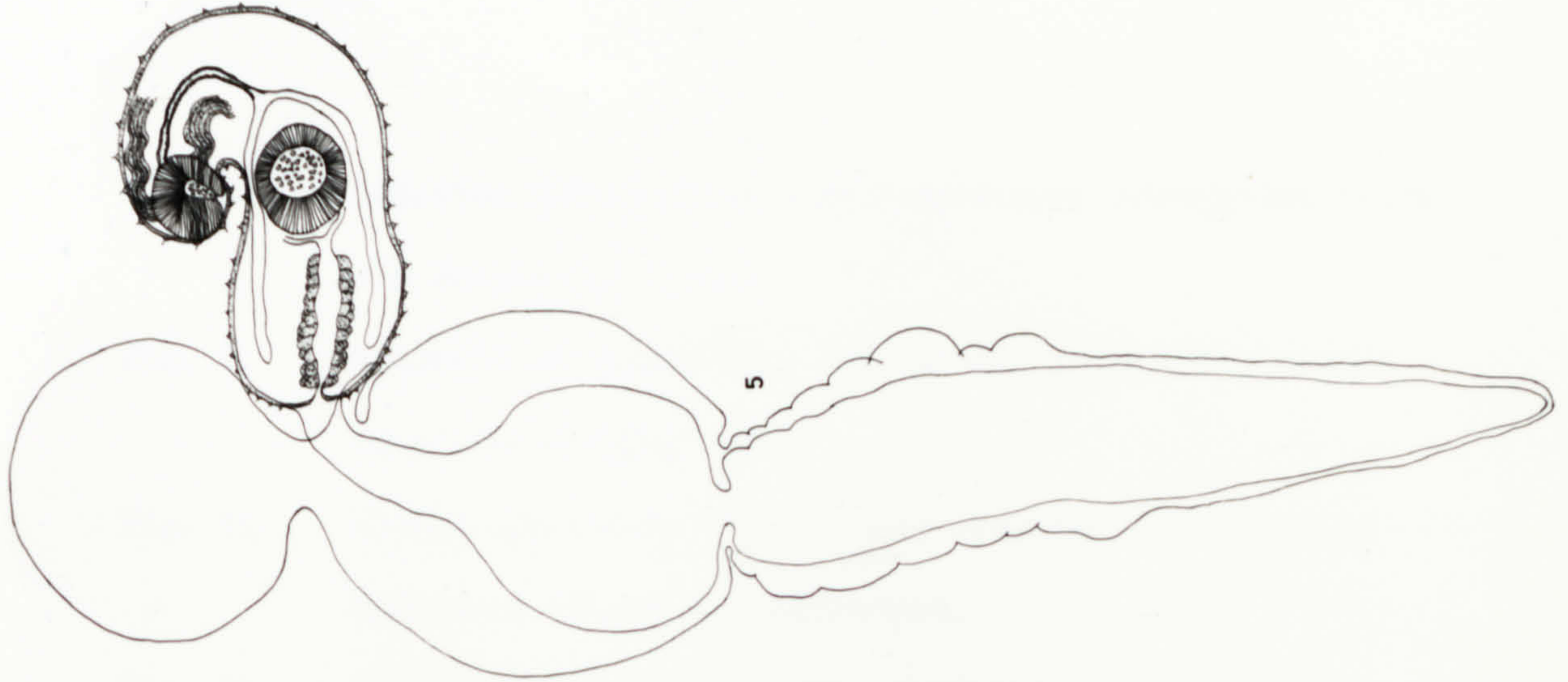
Plates 41-42

Cercaria macrocerca I

Cercaria macrocerca I

Plate 41

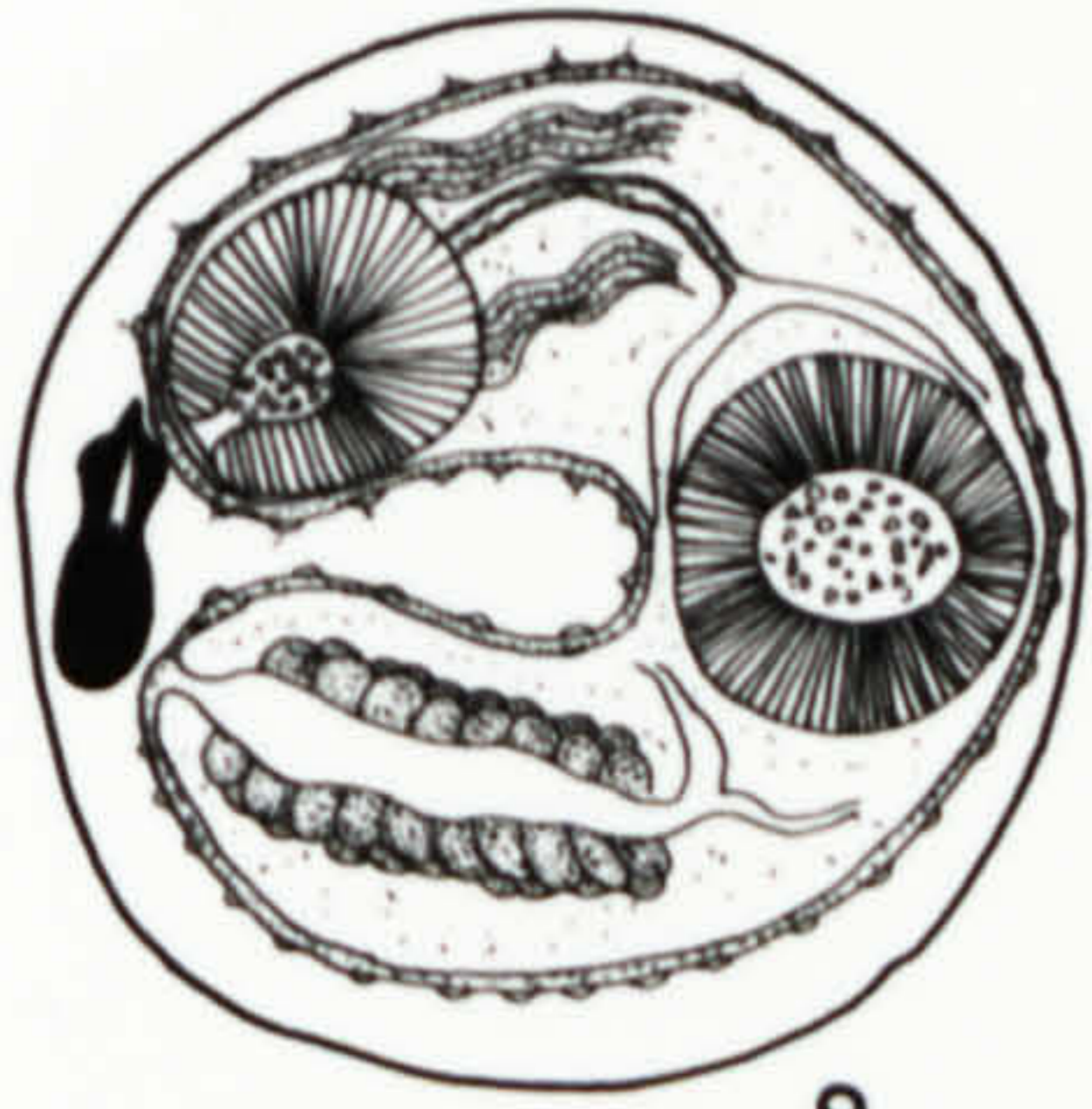
- Fig. 1. Cercaria - ventral view of body showing papillate hair-like projections, oral sucker, surface and periphery of acetabulum, genital rudiments, dorsal view and nervous system.
- Fig. 2. Cercaria - ventral view of body showing number, arrangement and location of penetration gland-cells.
- Fig. 3. Cercaria - ventral view of body showing protonephridial system.
- Fig. 4. Cercaria complete - ventral view showing body withdrawn into chamber.
- Fig. 5. Cercaria complete - showing cercarial body protruded from chamber.
- Fig. 6. Cercaria - excretory bladder surrounded by cystogenous gland-cells.
- Fig. 7. Cercaria - outline of excretory bladder typical of some specimens (Cystogenous gland-cells not included).



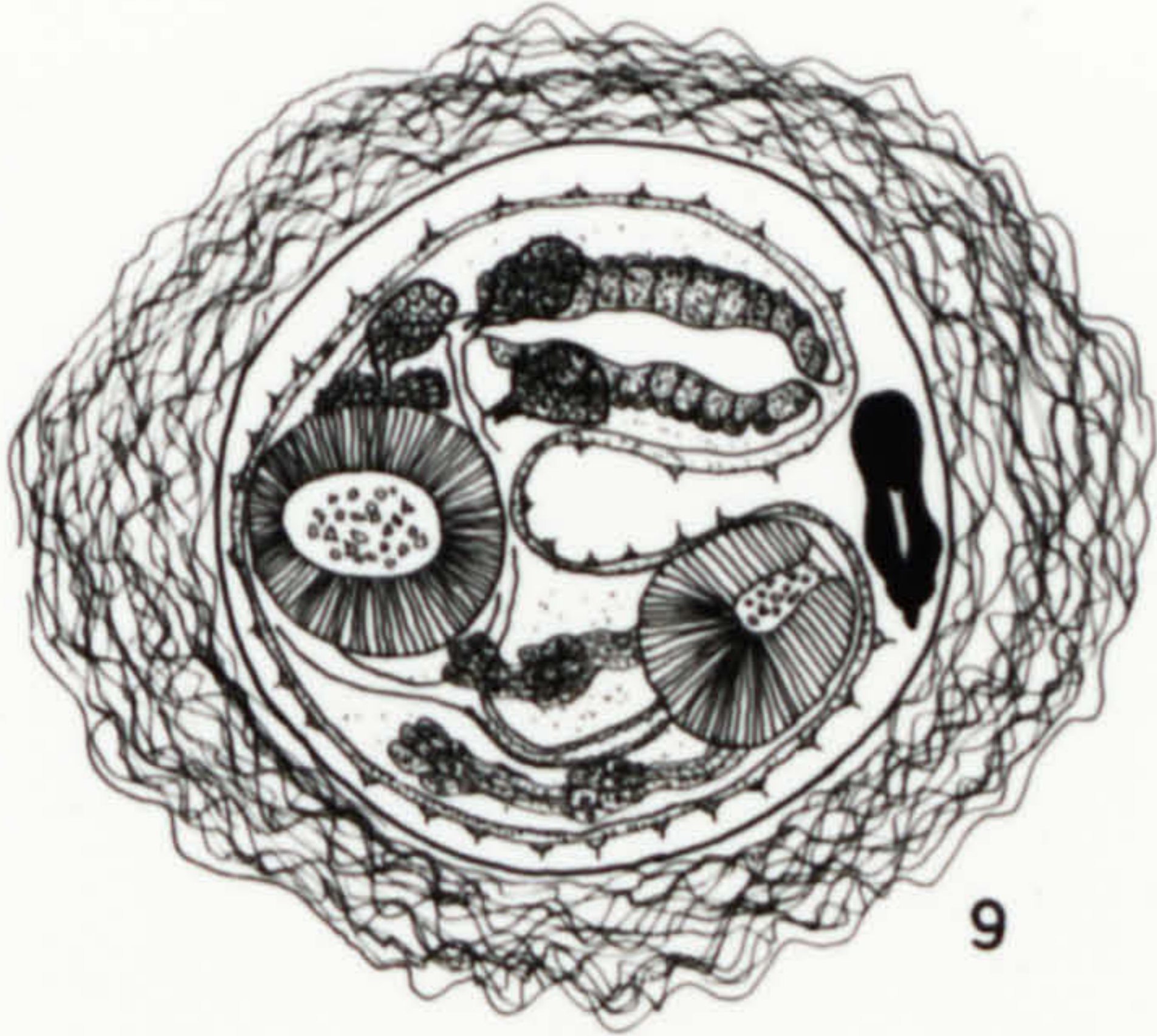
Cercaria macrocerca I

Plate 42

- Fig. 8. Encysted metacercaria - from specimens seventy-two hours old dragon-fly nymph.
- Fig. 9. Encysted metacercaria - seventy-two hours old specimen from trichopteran larva.
- Fig. 10. Mother sporocysts - containing daughter sporocysts in different stages of development.
- Fig. 11. Mature daughter sporocyst - containing germ balls and developing cercaria.
- Fig. 12. Young daughter sporocyst - showing protonephridial system.
- Fig. 13. Cercaria stylet - dorsal view.

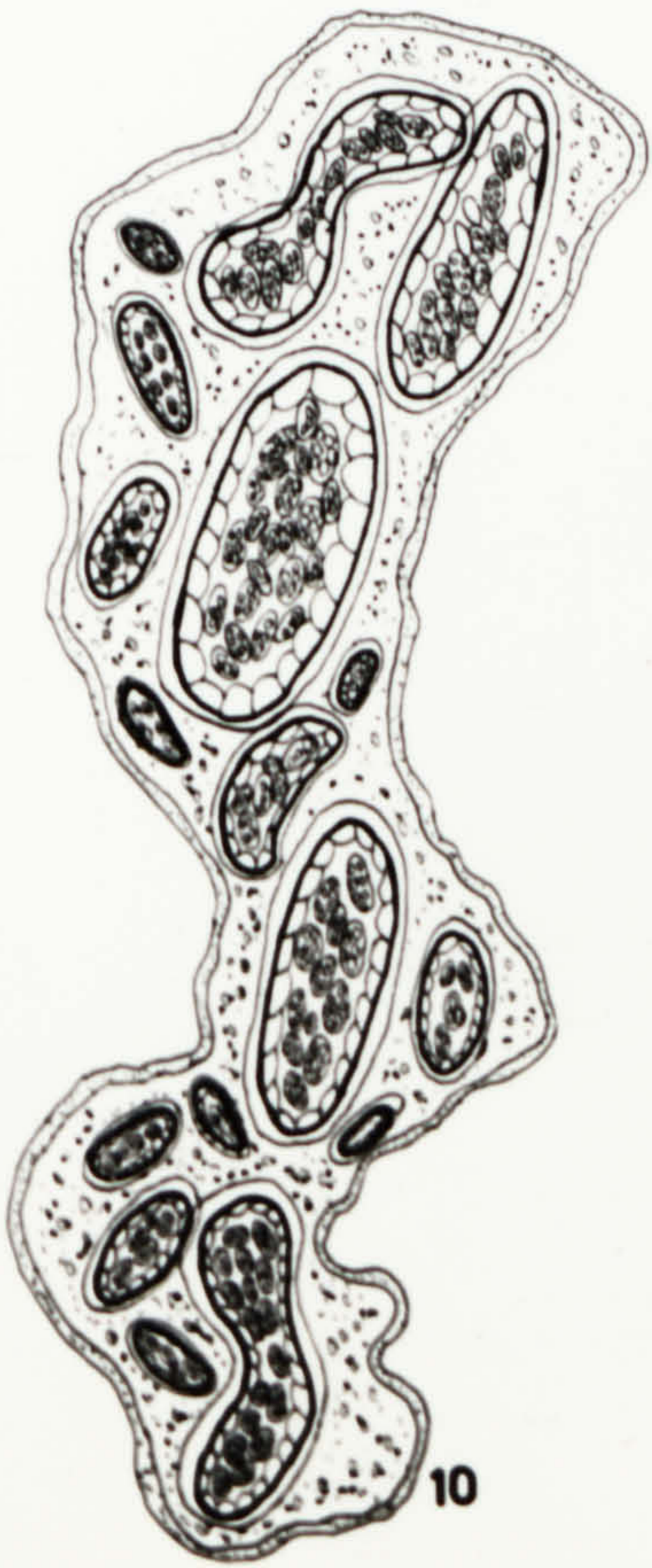


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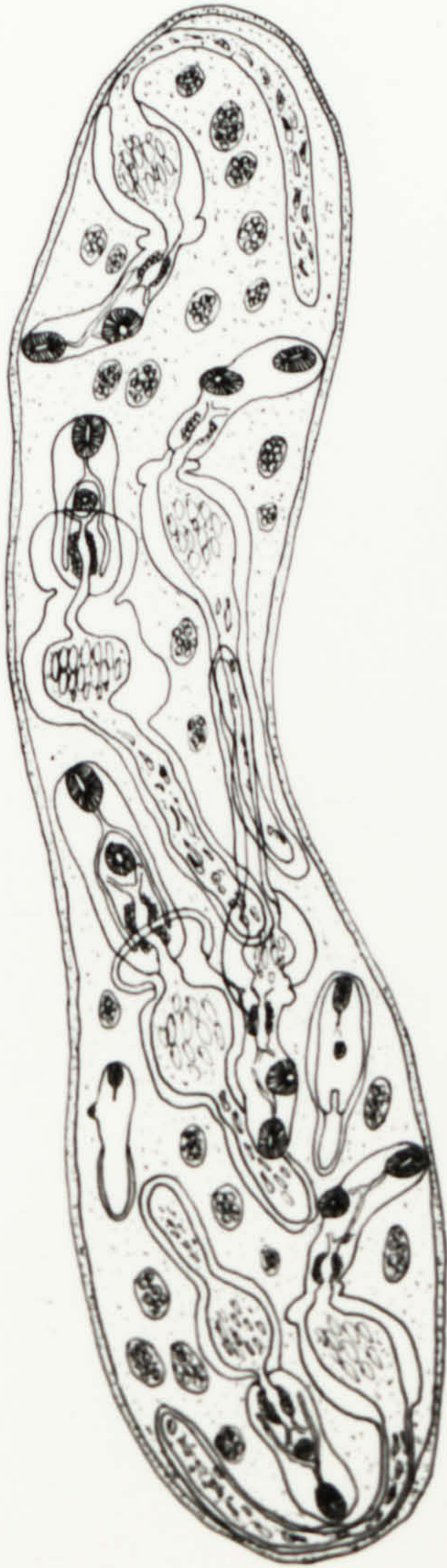


9

0.1mm



10



12



11

0.2mm



13

0.02mm

Plate 43

Apatemon gracilis minor

- Fig. 1. Cercaria - ventral view showing detail of spines and hair-like projections, digestive system, unpigmented eyespots and caudal bodies.
- Fig. 2. Cercaria - ventral view showing number and location of penetration gland-cells.
- Fig. 3. Cercaria - ventral view showing protonephridial system.
- Fig. 4. Sporocyst - containing germ balls and developing cercariae.

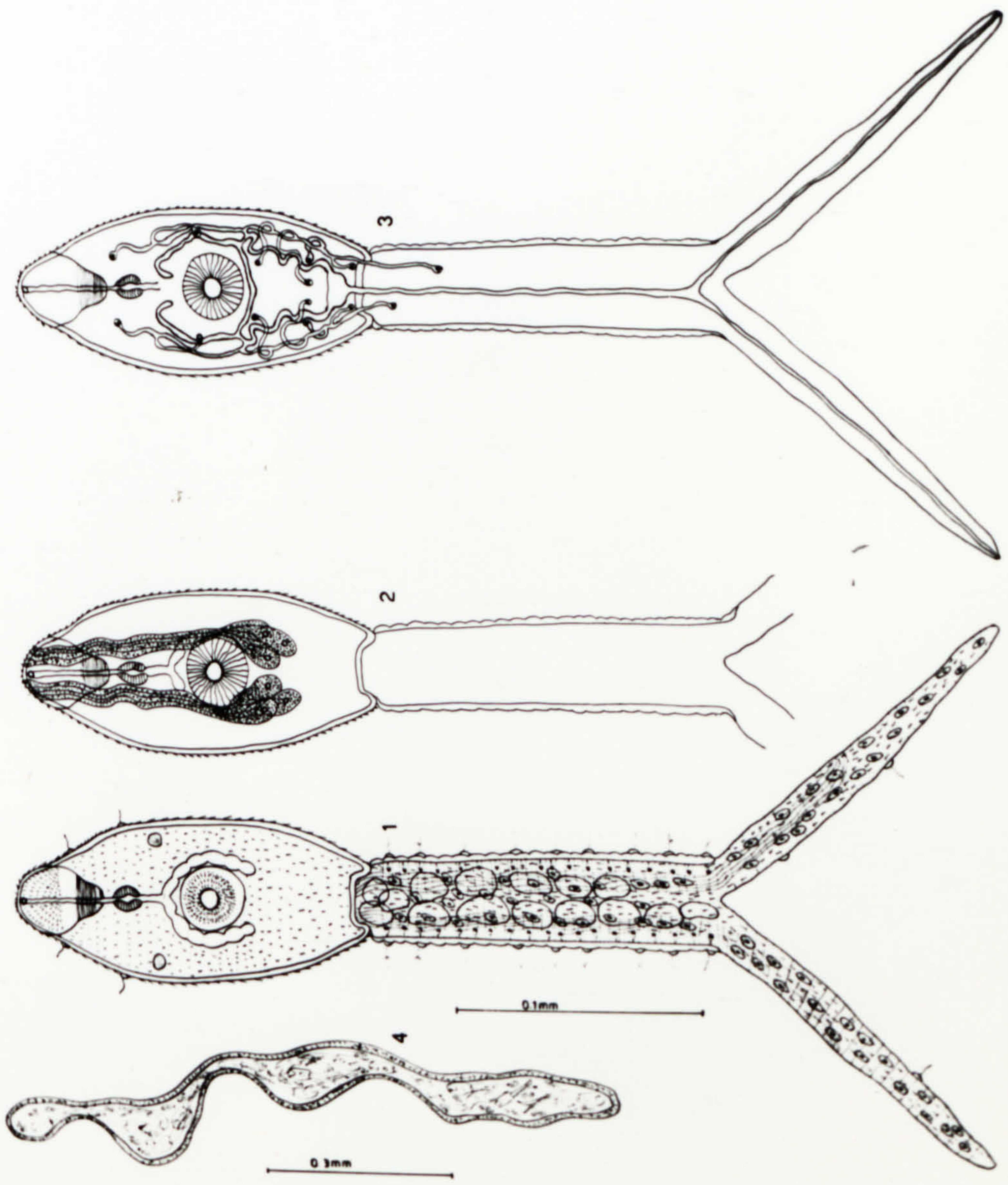


Plate 44

Cercaria furcocercaria IV

- Fig. 1. Cercaria - ventral view showing arrangement of spines and hair-like structures on papillae, digestive system and structure of the tail.
- Fig. 2. Cercaria - ventral view showing protonephridial system.
- Fig. 3. Cercaria - ventral view showing globular particles, escape glands and caudal bodies.
- Fig. 4. Cercaria - ventral view showing number and location of penetration gland-cells and genital rudiment.
- Fig. 5. Sporocyst - showing dark green pigments, germ balls and developing cercariae.

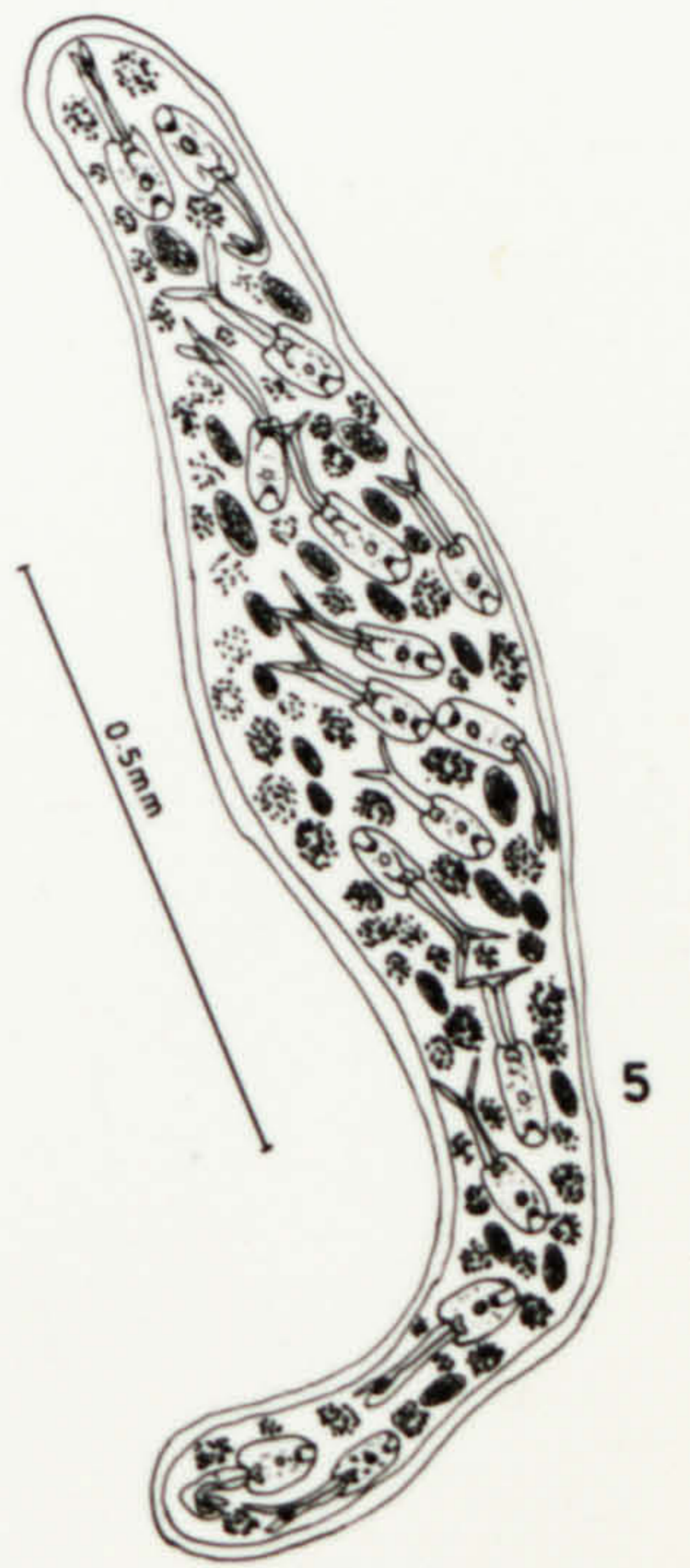
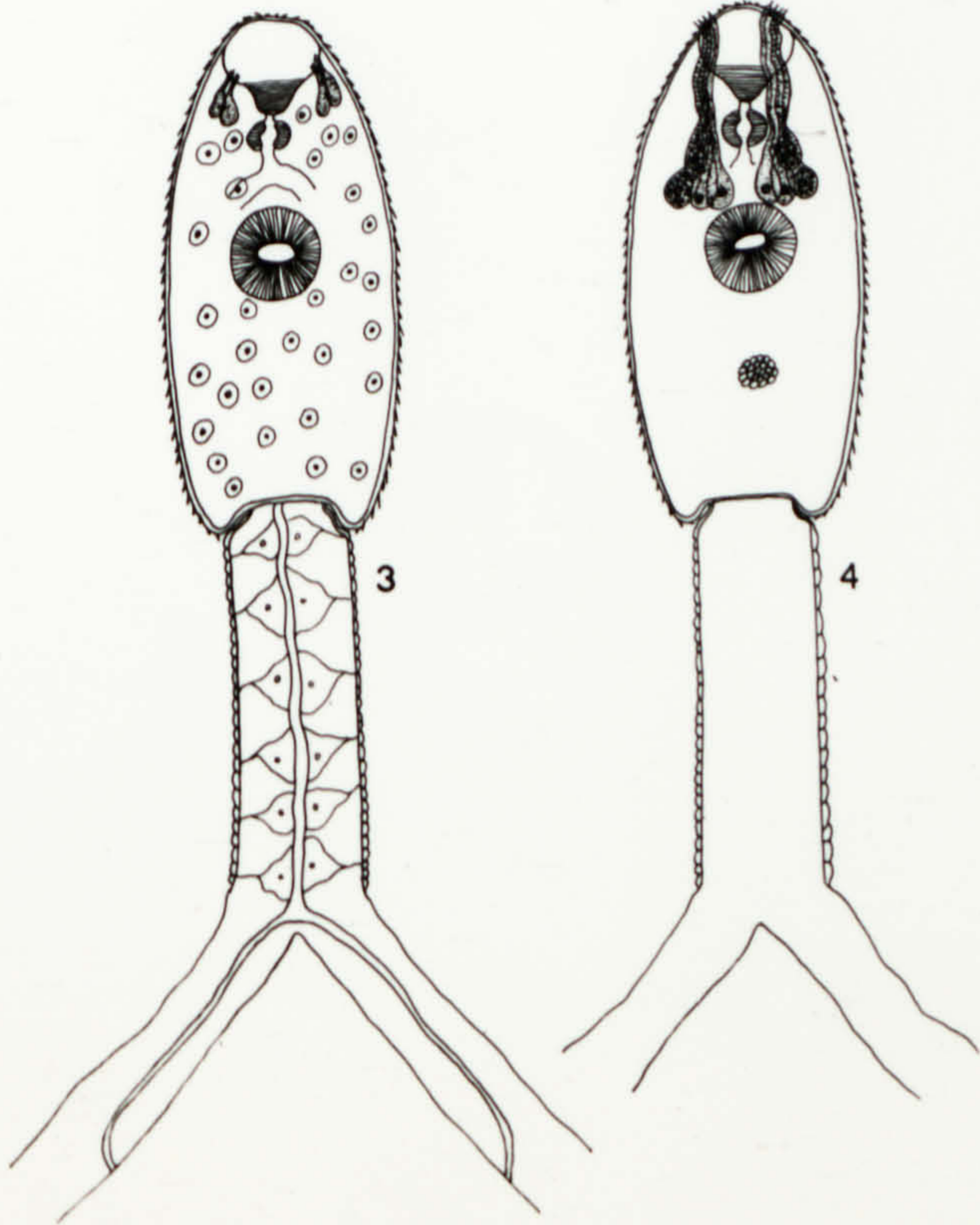
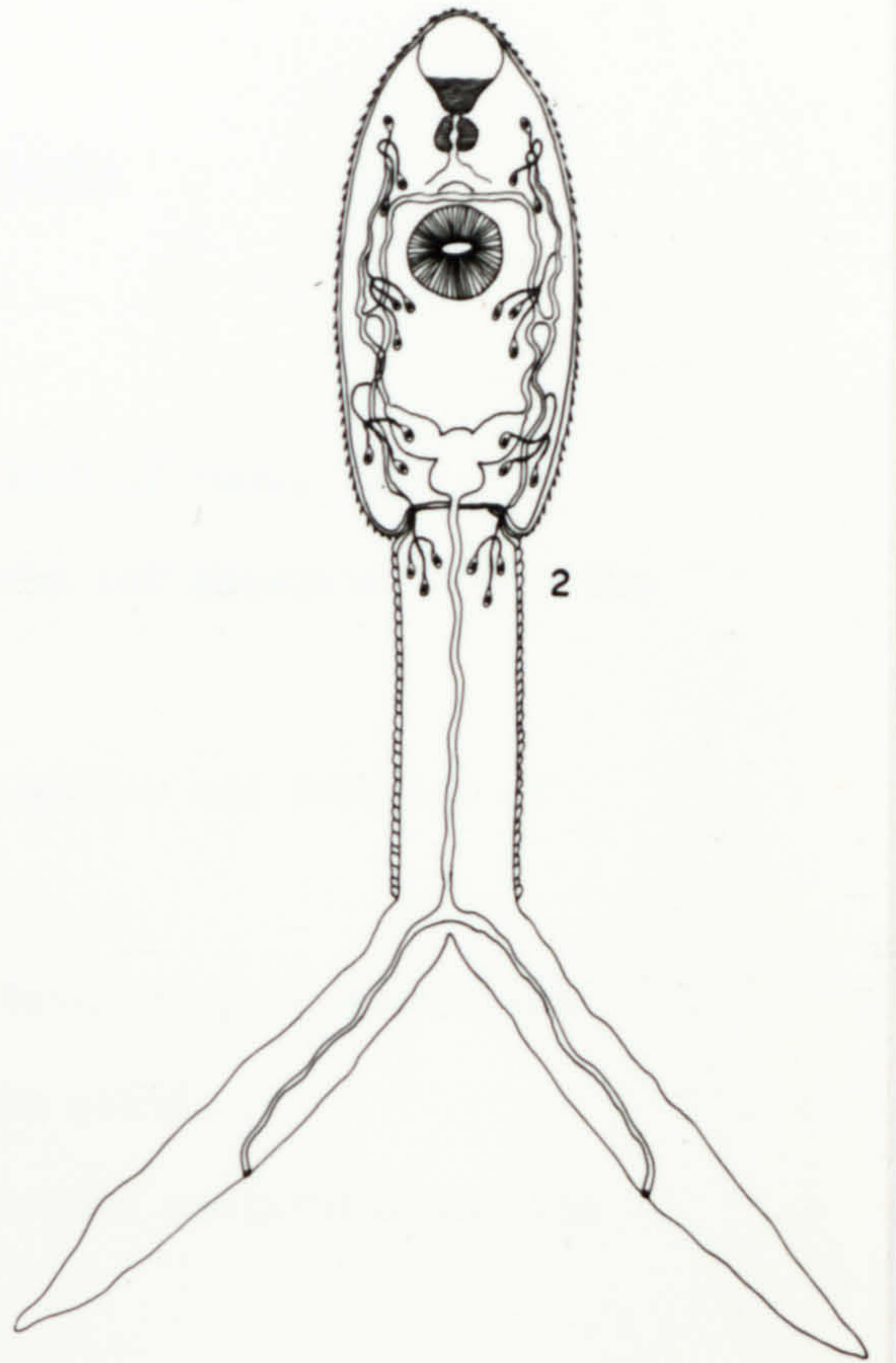
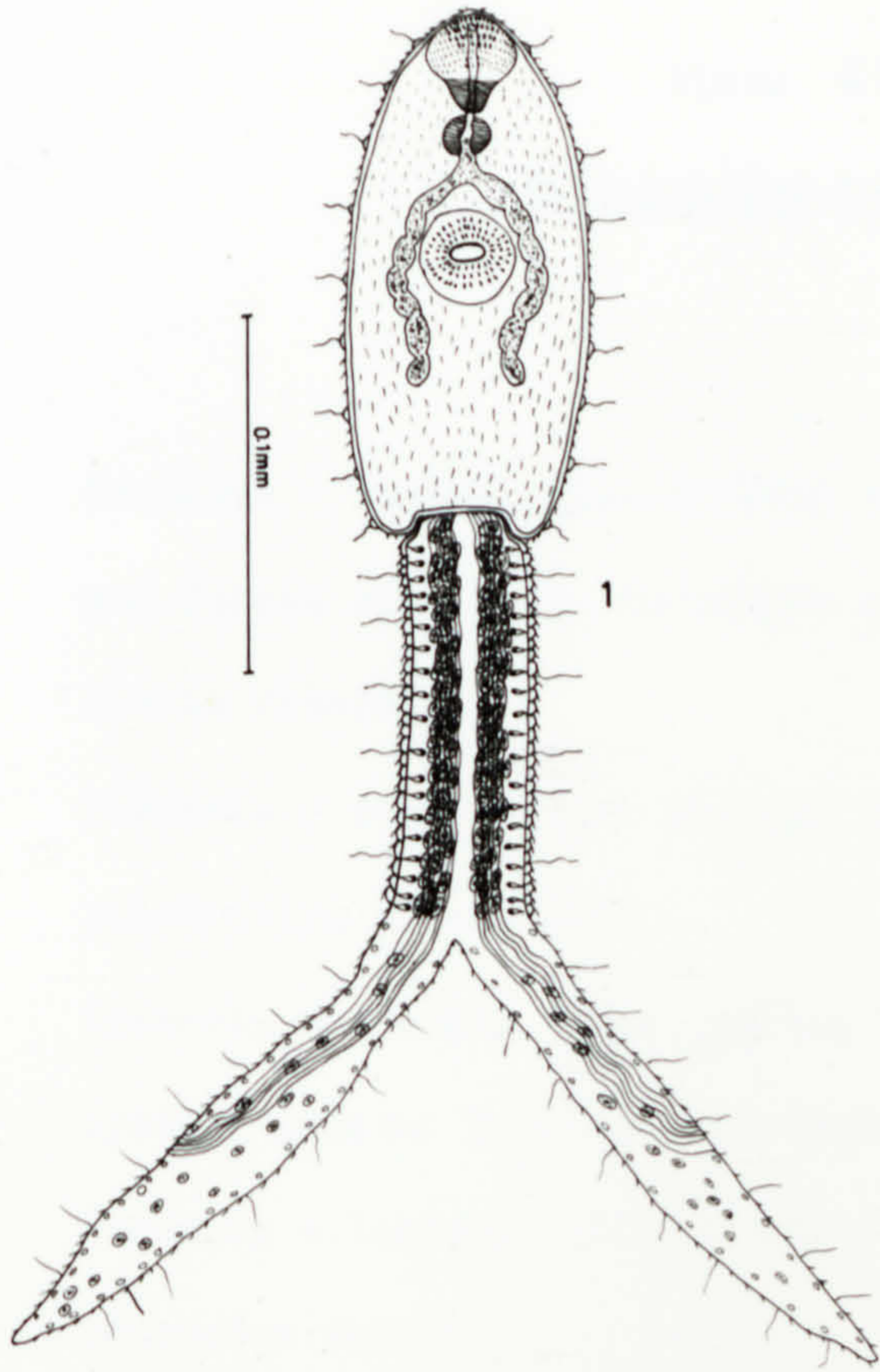


Plate 45

Bilharziellae polonicae

- Fig. 1. Cercaria - Ventral view showing details of body, tail and furcae spination, digestive system and eyespots. Note the furcae fin-folds.
- Fig. 2. Cercaria - ventral view showing the number and location of penetration gland-cells.
- Fig. 3. Cercaria - ventral views showing details of protonephridial system, genital rudiment and cephalic gland.
- Fig. 4. Cercaria - lateral view showing protruded acetabulum and its retractor muscles.
- Fig. 5. Sporocyst - containing germ balls and developing cercariae.

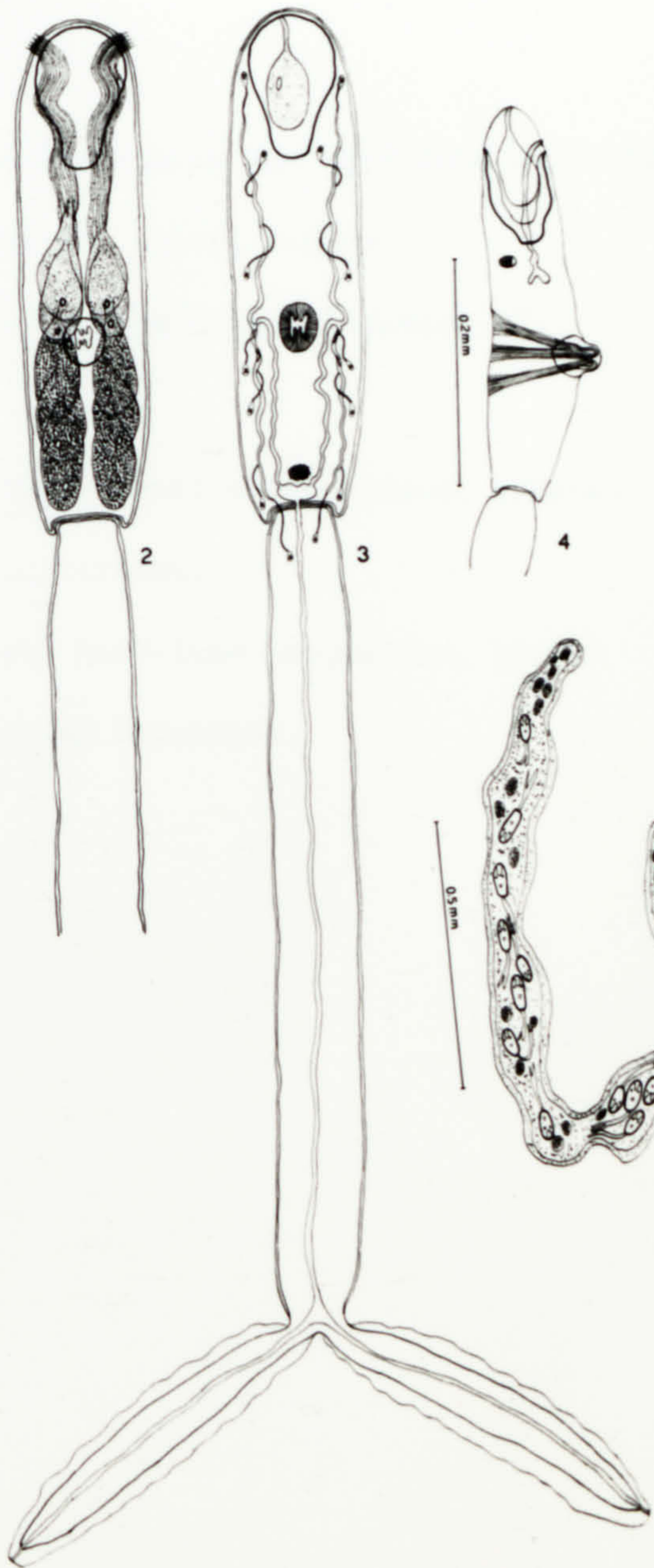
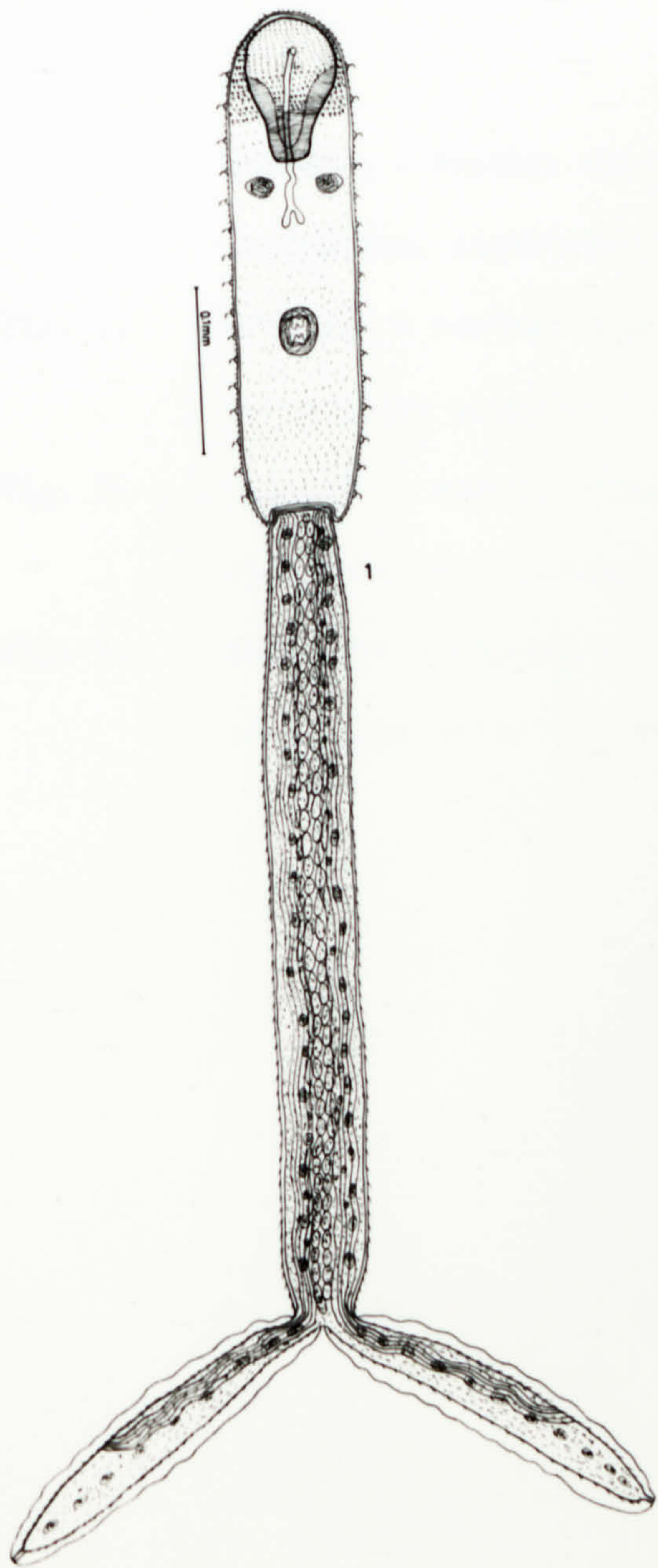


Plate 46

Cercaria letifera

- Fig. 1. Cercaria - ventral view showing spines and papillate hair-like projection, digestive system and caudal bodies.
- Fig. 2. Cercaria - ventral view showing number and location of penetration gland-cells.
- Fig. 3. Cercaria - ventral view showing penetration spines, genital rudiments and protonephridial system.
- Fig. 4. Sporocyst - showing papillate hair-like projection, birth pore, germ balls and developing cercariae.

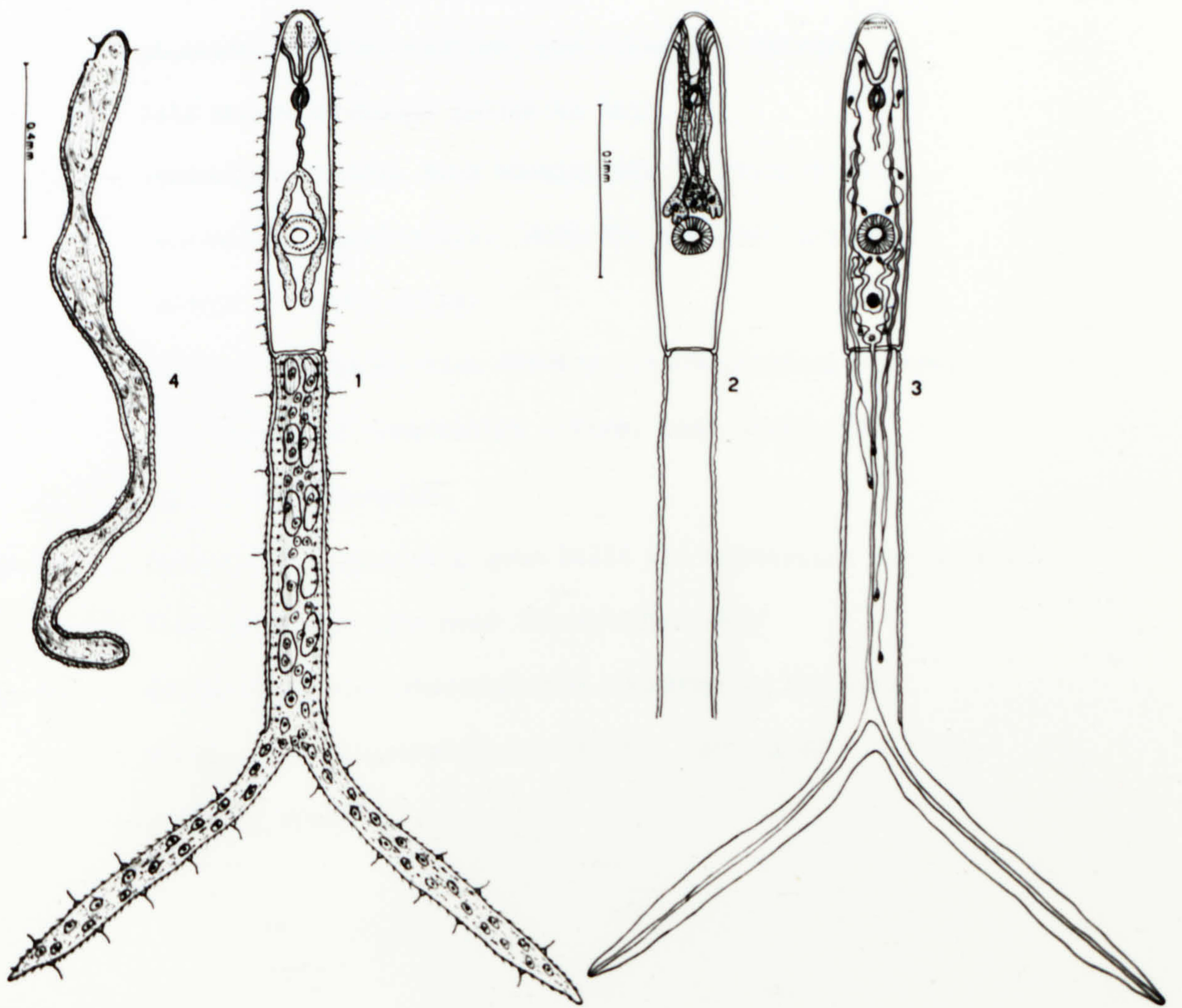


Plate 47

Cercaria paracauda

- Fig. 1. Cercaria - ventral view showing spination, distribution of papillate hair-like projections, distribution of pigments, genital rudiment and digestive system. Note numerous caudal bodies in tail.
- Fig. 2. Cercaria - ventral view showing the location of the penetration gland-cells. Note the trilobed lateral outline of these cells.
- Fig. 3. Cercaria - ventral view showing protonephridial system, arrangement of penetration spines, head gland and spines on acetabulum.
- Fig. 4. Sporocyst - containing germ balls and developing cercariae. Note the birth pore near the anterior end.
- Fig. 5. Cercariae- some abnormalities observed in the tail furcae (the illustration at the top left is of a normal specimen).

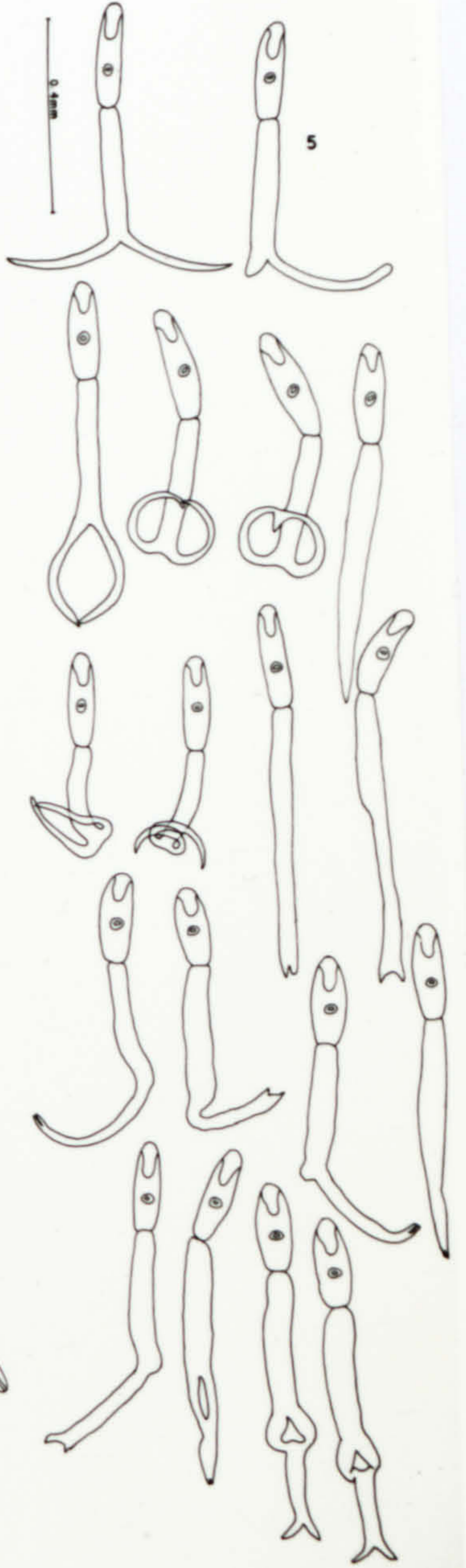
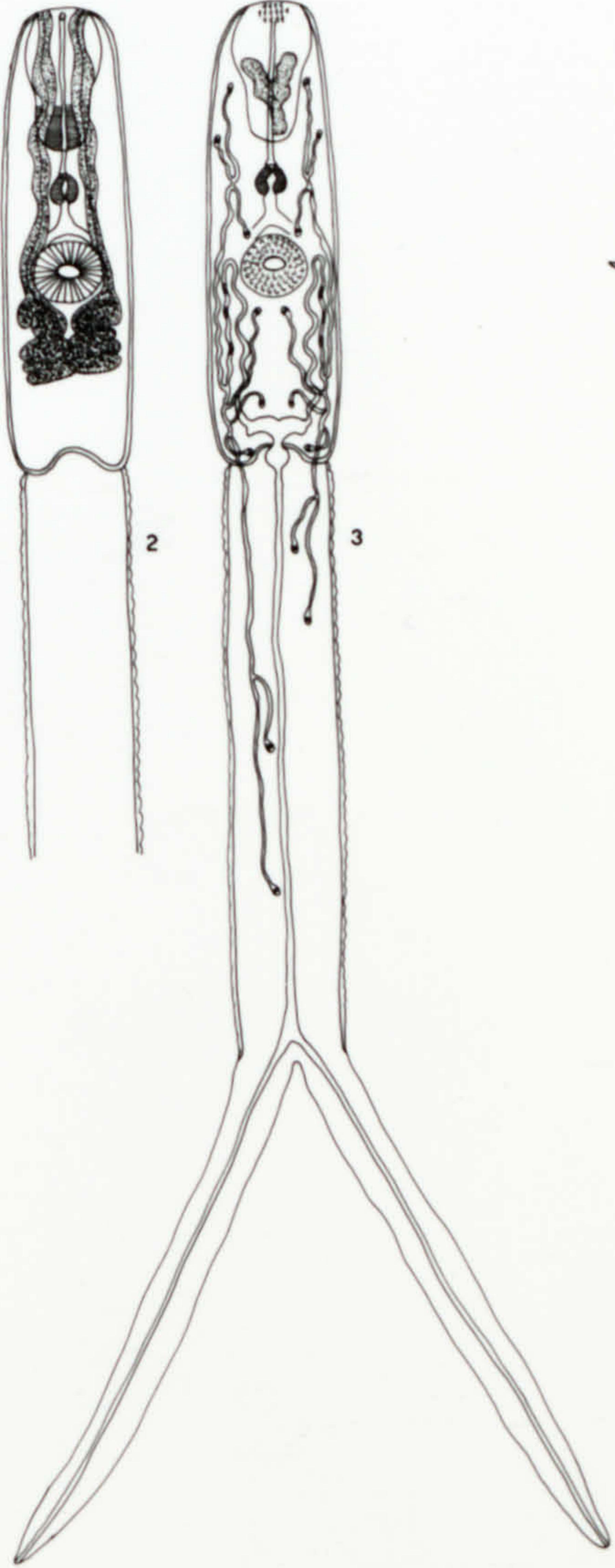
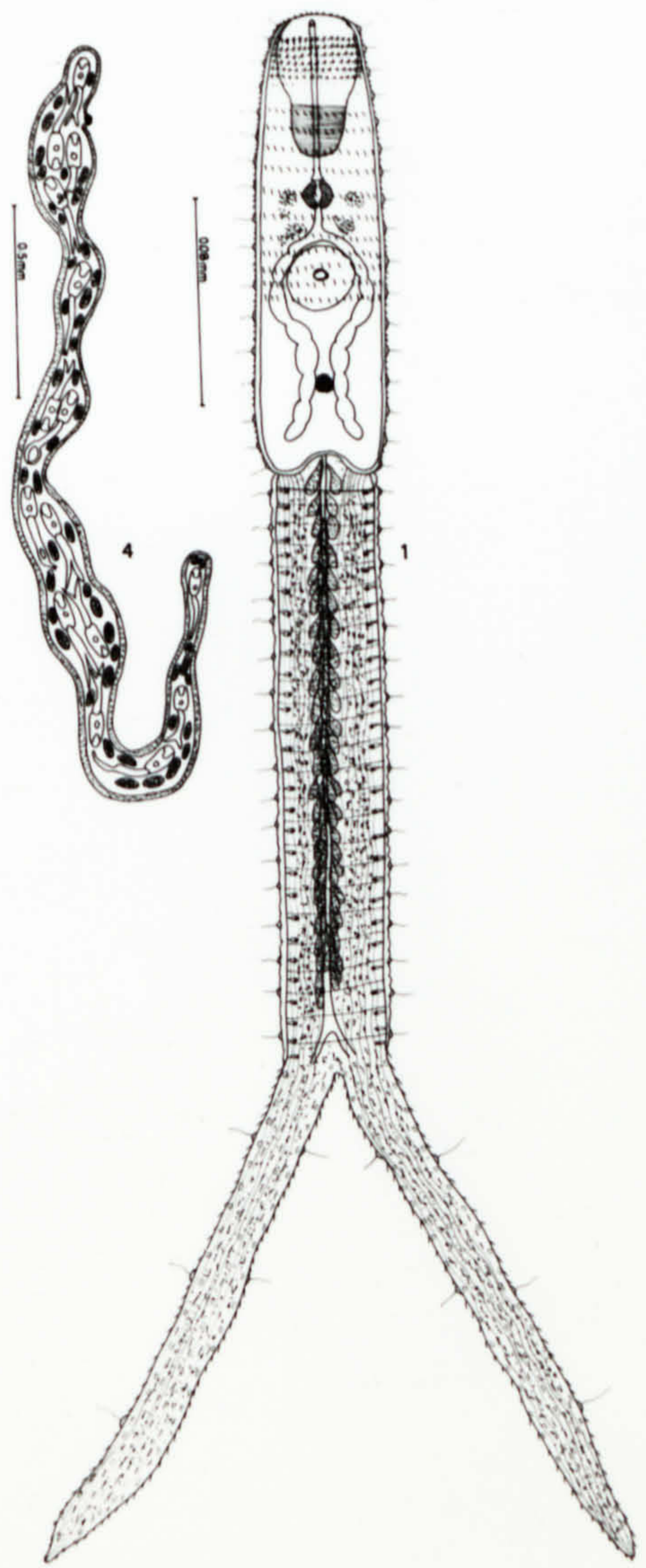


Plate 48

Cotylurus brevis

- Fig. 1. Cercaria - ventral view showing details of spines and hair-like structures on papillae digestive system and caudal bodies.
- Fig. 2. Cercaria - ventral view showing unpigmented eyespots and the number and arrangement of penetration gland-cells.
- Fig. 3. Cercaria - ventral view showing details of spines, genital rudiment and protonephridial system.
- Fig. 4. Sporocyst - showing birth pore, germ balls and developing cercariae.

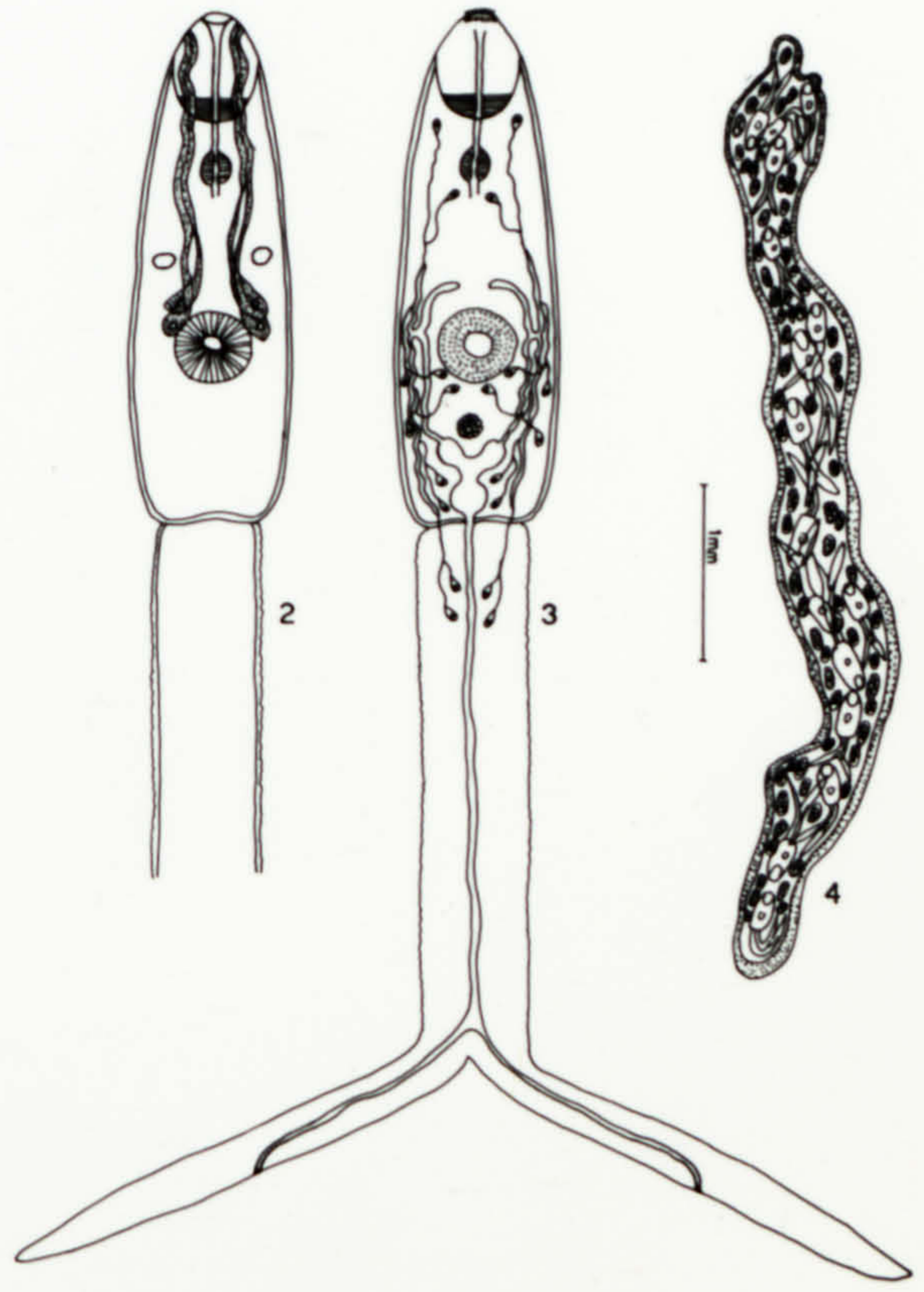
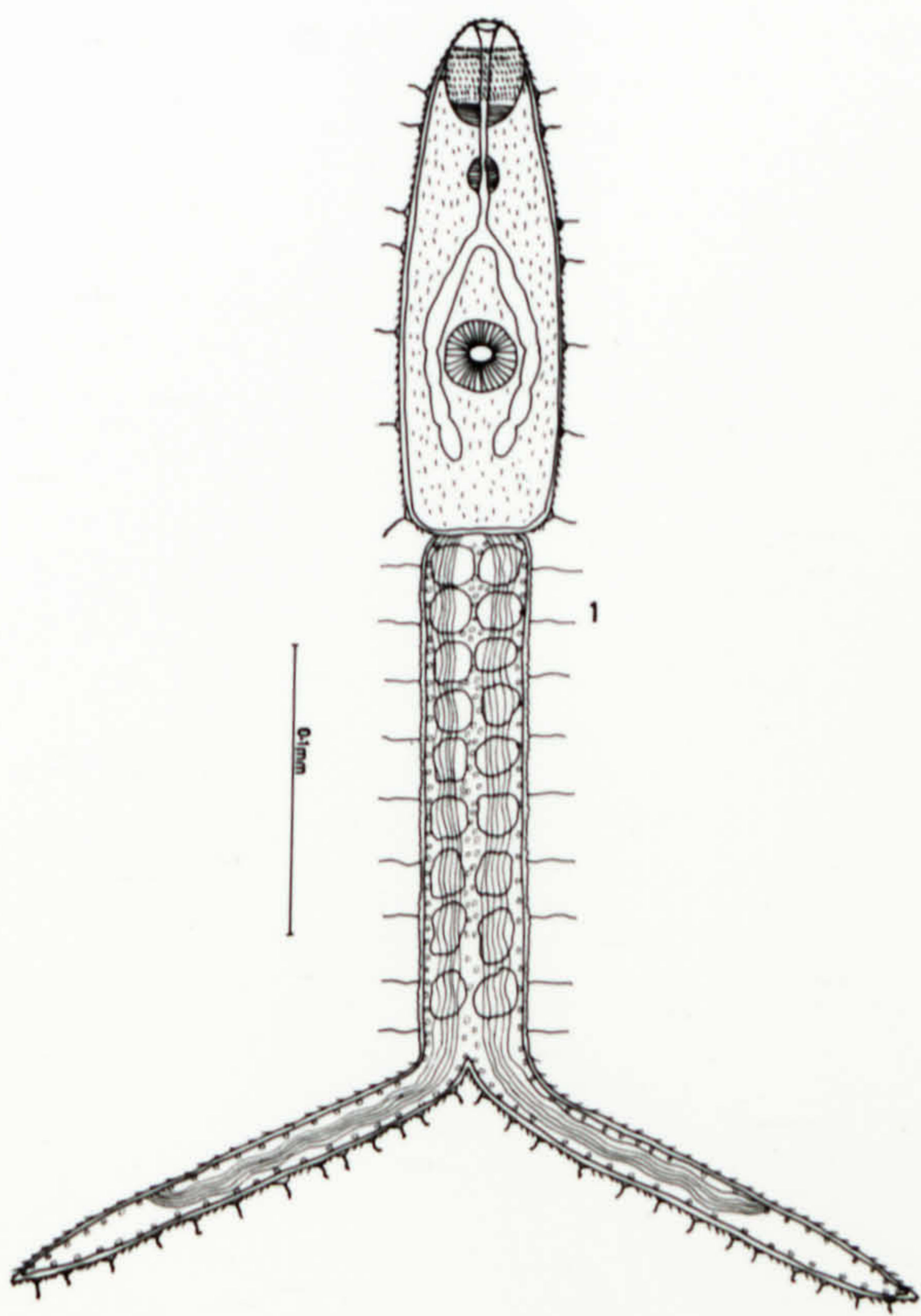


Plate 49

Cercaria furcocercaria VII.

- Fig. 1. Cercaria - ventral view showing arrangement of spines and hair-like structures on papillae, digestive system and caudal bodies.
- Fig. 2. Cercaria - ventral view showing number and location of penetration gland-cells. Note the two impigmented eyespots anterolateral to the acetabulum.
- Fig. 3. Cercaria - ventral view showing protonephridial system.
- Fig. 4. Sporocyst - showing the birth pore and developing cercariae.

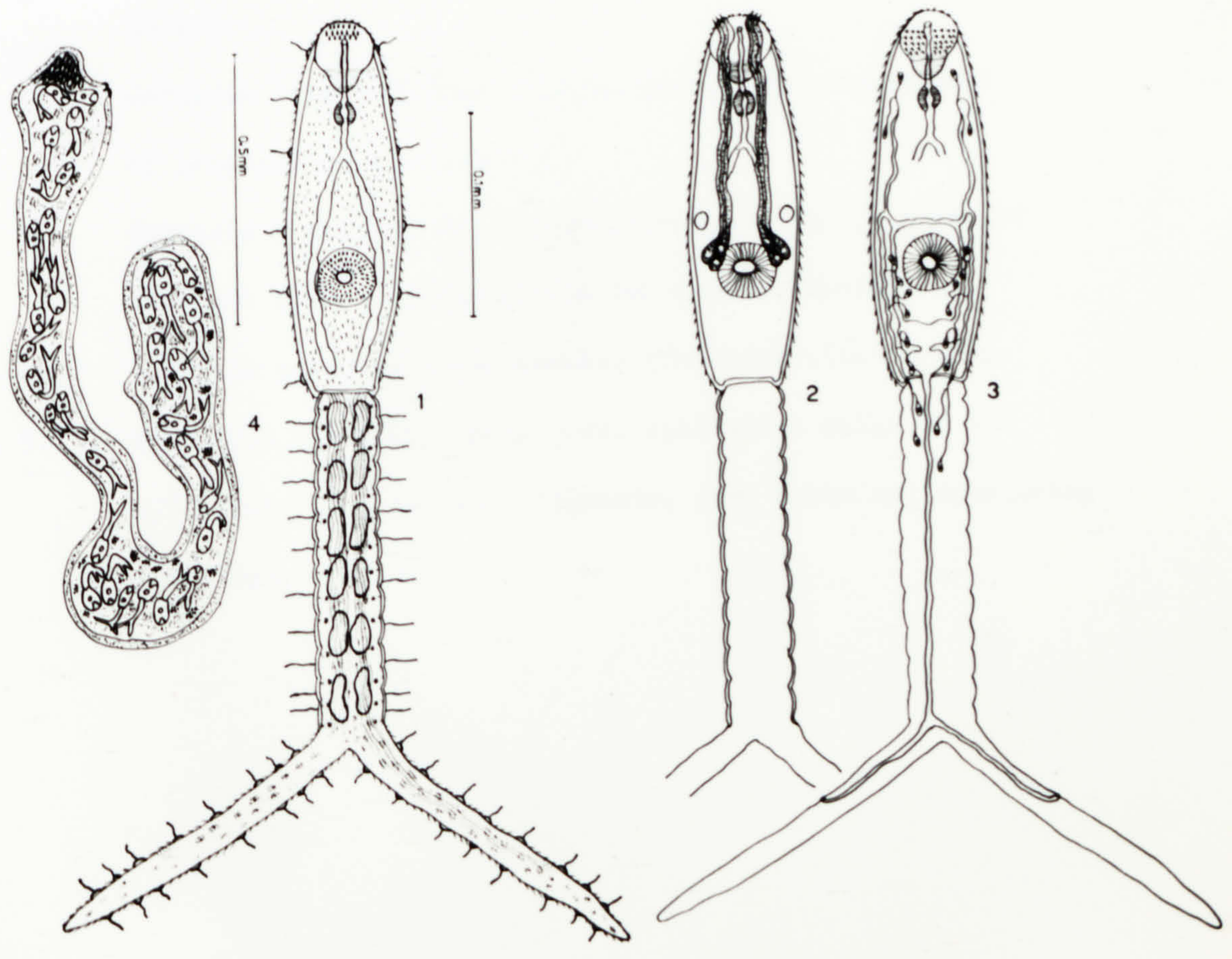


Plate 50

Diplostomum phoxini

- Fig. 1. Cercaria - ventral view showing spines and hair-like projections, digestive system, genital rudiment and caudal bodies.
- Fig. 2. Cercaria - ventral view showing number and arrangement of penetration gland-cells.
- Fig. 3. Cercaria - ventral view showing cephalic gland, muscular ring and spines of acetabulum and nervous system.
- Fig. 4. Cercaria - ventral view showing protonephridial system.
- Fig. 5. Sporocyst - showing birth pore, epithelial cells of the body wall, dark granular pigments, germ balls and developing cercariae.

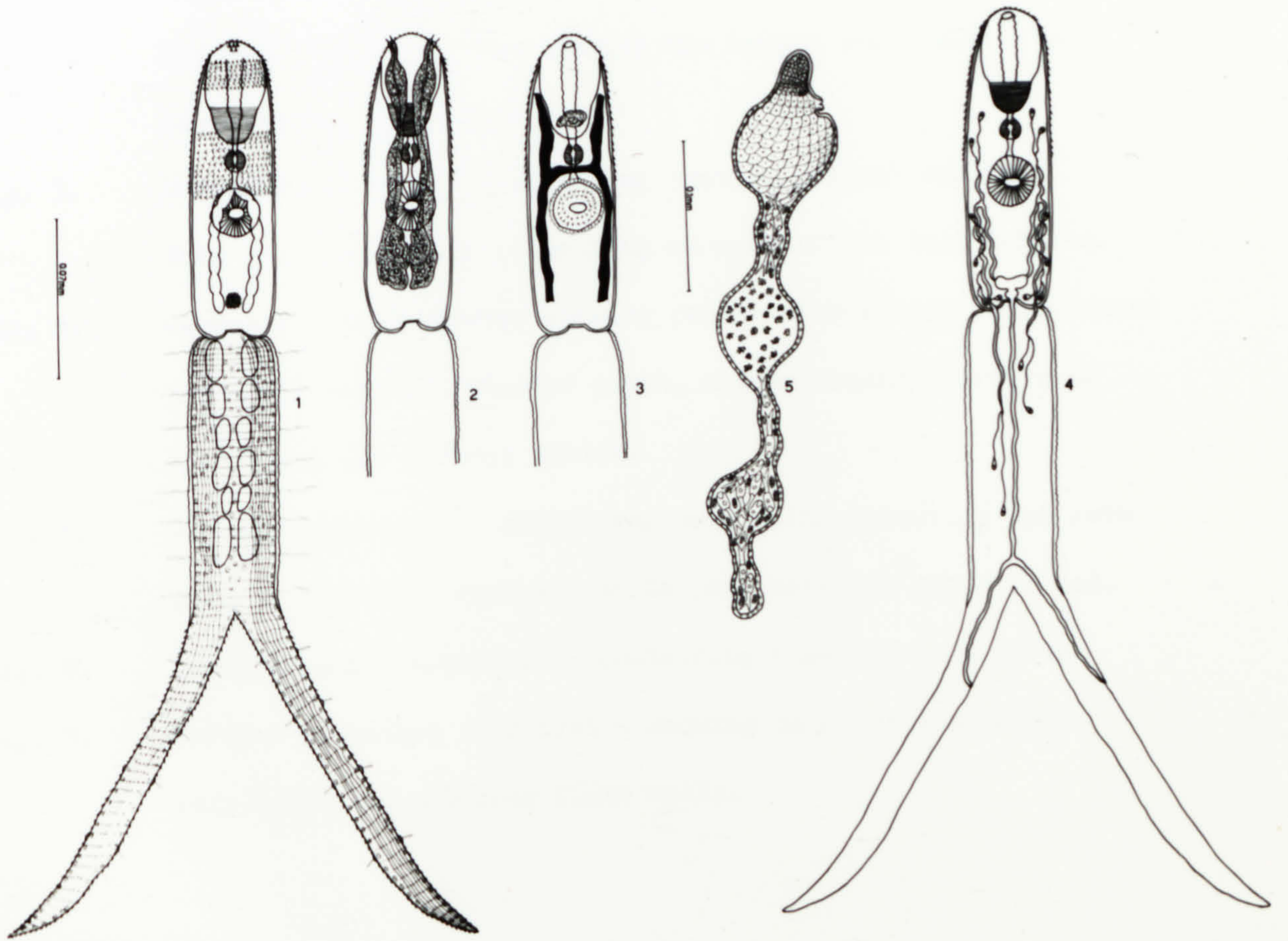


Plate 51

Cercaria furcocercaria II

- Fig. 1. Cercaria - ventral view showing spination, digestive system (note the swollen caeca), pigmented eyespots, genital rudiments and caudal bodies.
- Fig. 2. Cercaria - ventral view showing the number and location of penetration gland cells.
- Fig. 3. Cercaria - ventral view showing photonephridial system. Note the presence of a swelling on each of the tail tubules.
- Fig. 4. Cercaria - ventral view showing penetration spines, musculature posterior part of anterior organ, spines around aperture of acetabulum and nervous system.
- Fig. 5. Daughter sporocyst - containing developing cercariae and germ ball. Note the prominent birth pore near its anterior end.
- Fig. 6. Young daughter sporocyst - containing numerous germ balls.
- Fig. 7. Portion of mother sporocyst - showing daughter sporocysts germ balls and numerous flame cells.

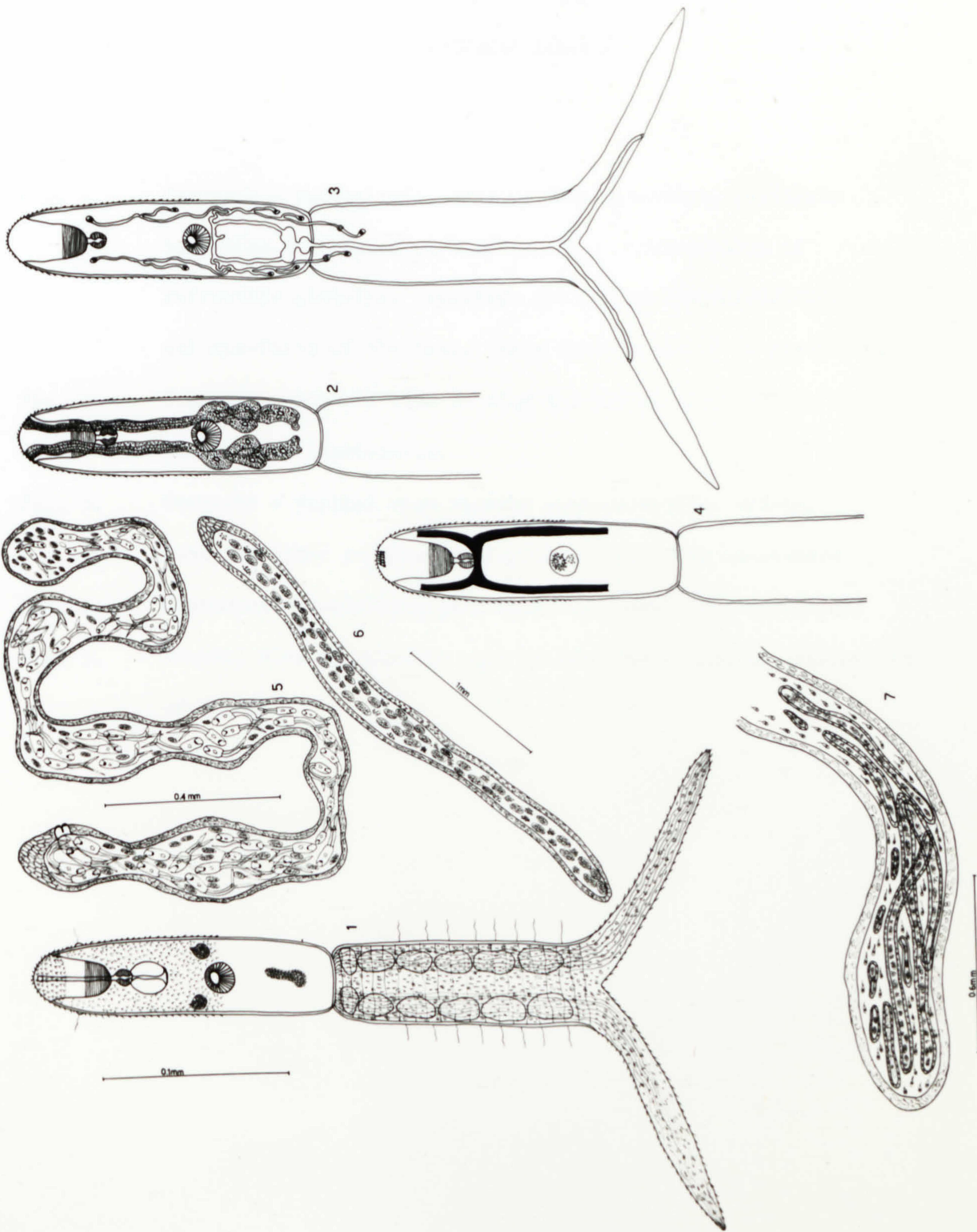


Plate 52

Cercaria vivax I

- Fig. 1. Cercaria - ventral view showing body spination, papillate hair-like structures on body and tail, distribution of refractile globules, digestive system and the musculature and fin-folds of the tail. Note the absence of an acetabulum.
- Fig. 2. Cercaria - ventral view showing the number and location of penetration gland-cells.
- Fig. 3. Cercaria - ventral view showing protonephridial system. Note the blind pouches arising from transverse commissure.
- Fig. 4. Sporocyst - containing germ balls and developing cercariae.
- Fig. 5. Ventral view of anterior part of cercaria - showing arrangement of spines.

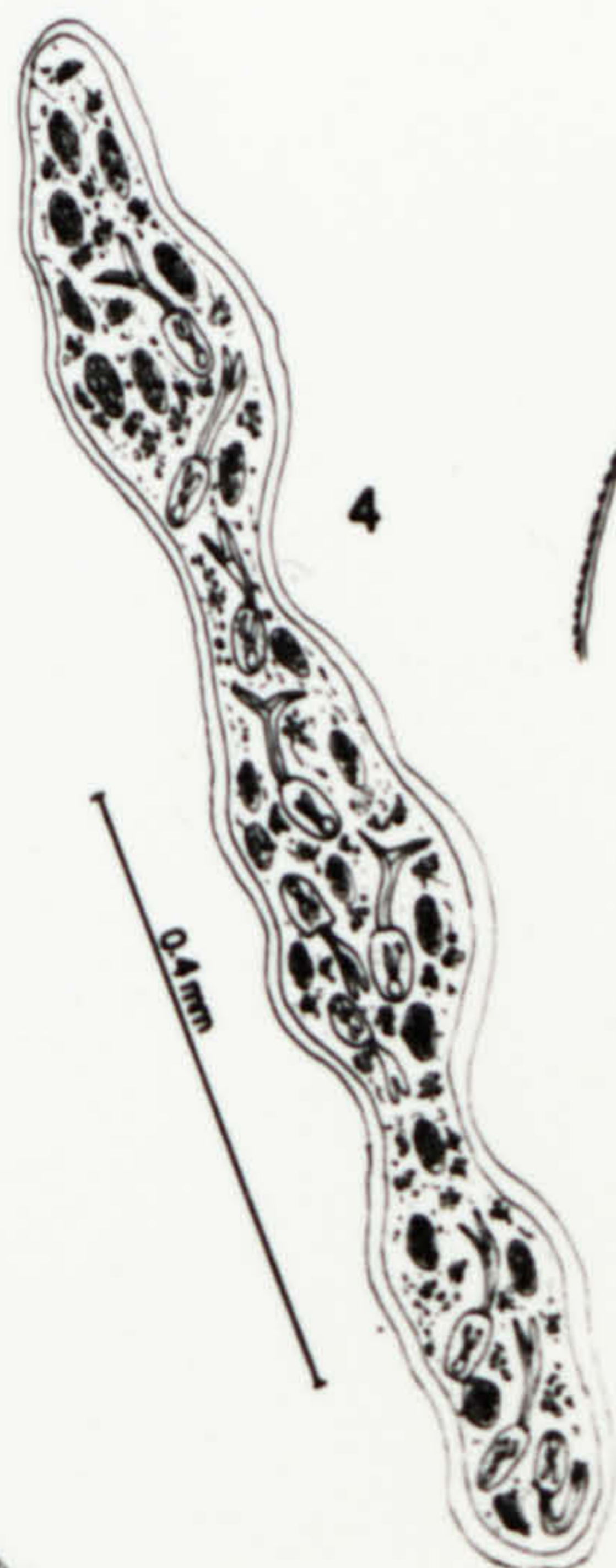
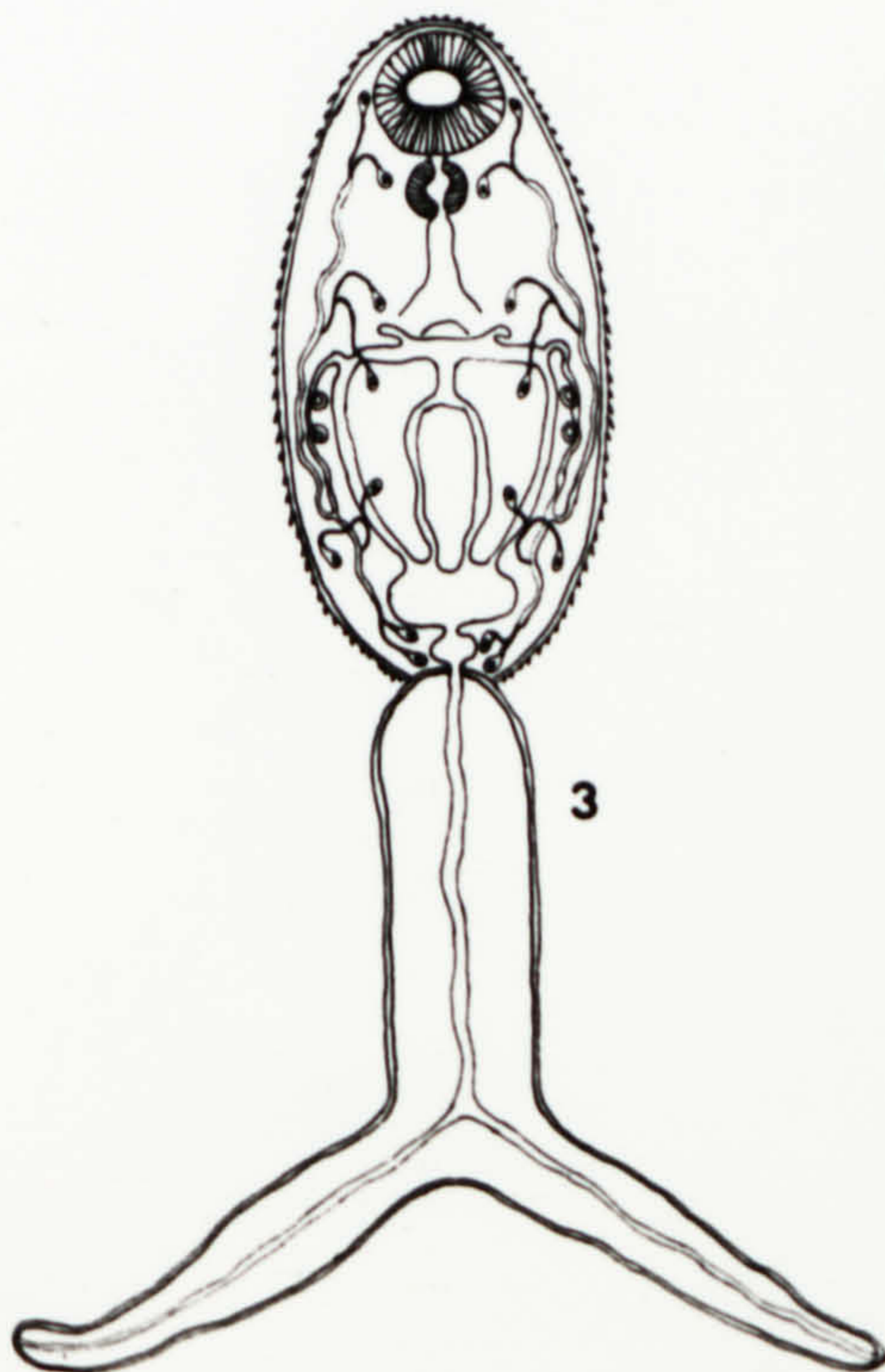
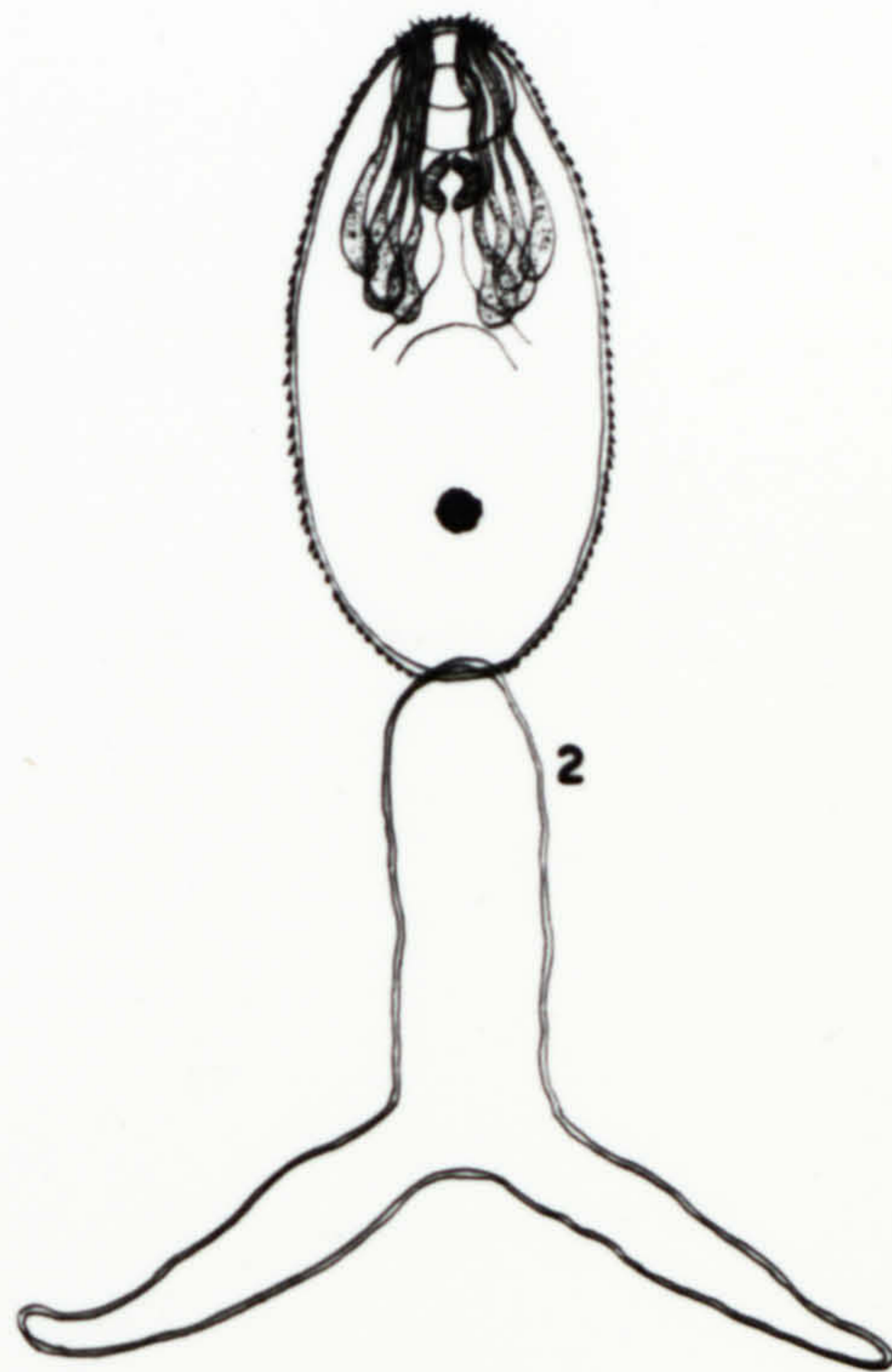
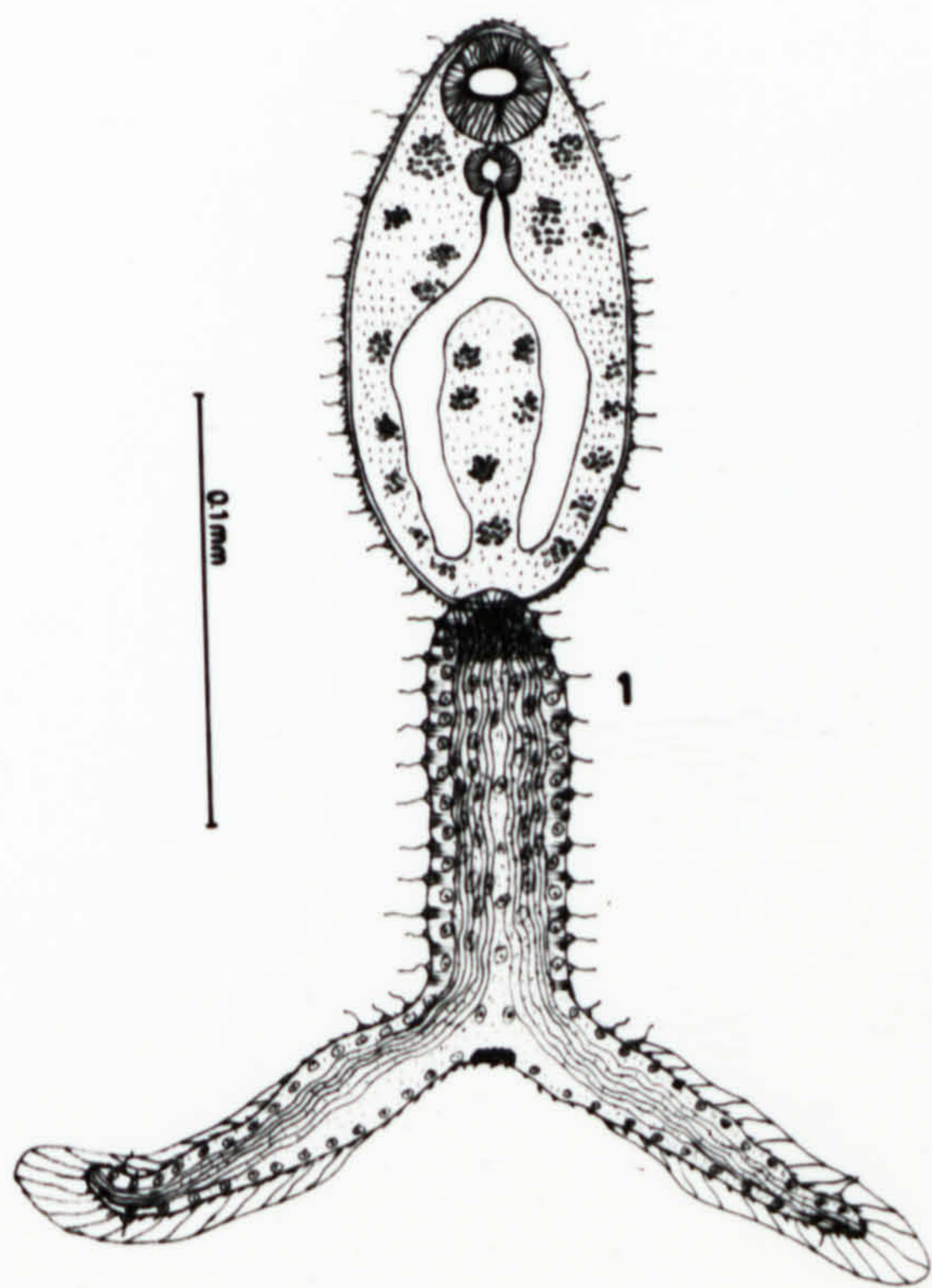


Plate 53

Cercaria vivax II

- Fig. 1. Cercaria - ventral view showing body spination, digestive system, musculature of the tail and furcae and hair-like structure on tail (papillate on furcae). Note the small fin-fold on tip of each furca.
- Fig. 2. Cercaria - dorsal view showing location and number of penetration gland-cells.
- Fig. 3. Cercaria - ventral view showing protonephridial system.
- Fig. 4. Sporocyst - with developing cercariae and germ balls.
- Fig. 5. Cercaria - ventral view of anterior organ showing arrangement of spines.

