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Notes on the Gregarines in Japan 8.

Three new species of Eugregarina from Odonata

by

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There are many species of Odonata in Japan. One hundred and seventy-three species of Odonata are reported. Though very few Odonata are examined in parasitism of gregarines, five different species of gregarines from all of the five Japanese Odonata observed before are reported by H. Hoshide and K. Obata. To think of this fact, lots of Japanese Odonata are expected to be infected with gregarines and more species of gregarines are thought to exist. To clear the fauna of gregarines, more hosts must be examined.

This time the author finds three new species of gregarines from three different species of Odonata. He wants to describe the morphological characters of these three new species and also redescribe the gregarines already reported from Japan with the system which he proposed in the previous papers.

The list of gregarines from Japanese Odonata

Parasite	Host
Acanthosporidae	
Ancyrophora gigantea H. Hoshide	*Calopteryx atrate* Selys
Ancyrophora mutabilis n. sp.	*Copera annulata* Selys
Actinocephalidae	
Hoplorhynchus hexacanthus Obata	*Coeagrion quadrigerum* Selys
H. gracilis H. Hoshide	*Aciagrion hisopa* Selys
H. orthetri H. Hoshide	*Orthetrum albistylum speciosum* Uhler
H. magnus H. Hoshide	*Crocothemis servilia* Drury
H. miyanensis n. sp.	*Ceriagrion melanurum* Selys
H. polyhamatus n. sp.	*Munais strigata* Selys

Ancyrophora gigantea H.Hoshide 1953

(Fig. 1. A, B, C)

1953 *Ancyrophora gigantea* H.Hoshide 1953:84

1958 *Ancyrophora gigantea* H.Hoshide 1958:62

Host : *Calopteryx atrata* Selys Odonata, Agriidae

Habitat : Intestine

Locality : Yamaguchi (Yamaguchi Pref.)

I. Sporadin

1. Association — Solitary.

2. Measurements

2-1. Size

Maximum — TL 3500 WD 500

Average — TL 2346 LP 154 LD 2192 WP 264 WD 392

2-2. Ratio — LP : TL = 1 : 15.2 WP : WD = 1 : 1.5

3. Shape — Elongate cylindrical.

4. Protomerite

4-1. Shape — Hemispherical, Widest at base, twice as long as wide, broadly rounded at apex.

5. Deutomerite

5-1. Shape — Elongate cylindrical, widens suddenly from septum, widest at shoulder.
Tapers gradually to posterior cuneate extremity.

6. Septum — Distinct, slightly constriction.

7. Nucleus

7-1. Shape — Spherical to ovoidal, 85μ in average diameter.

7-2. Position — In living sporadin, position of nucleus difficult to discern its situation but in stained specimen or in young stage one, nucleus always adjoin directly to septum.

7-3. Nucleolus — Many Small spherical, 10 to 15 in number.

8. Endoplasm

8-1. Color — Dark brown.

8-2. Granules — Size or coloring with dyeing solutions same in both parts, protomerite and deutomerite but in the latter much more opaque and denser than in the former.

9. Ectoplasm — Fairly thick, stout.

II. Cyst

1. Structure — Spherical, milky white, 1300-1700μ in whole diameter.
Outer cyst cover transparent, thick, 250-350μ in thickness.

2. Dehiscence — By simple rupture.

III. Spore

1. Shape — Biconical, hexagonal in optical cross section, with three spines

at each pole and six on equater ridge.

2. Size 8x 6μ

IV. Movement Sliding and bending, actively.

V. Cephalin

1. Shape Elongate cylindrical.
Protomerite compatively longer than that of adult, dome-shaped.

2. Structure Lighter than adult in color.
In certain cases very large cephalin, over 2000μ in length, stick to host intestine with epimerite.

3. Epimerite Size of epimerite grows larger with host development 50 x 70μ in cephalin of 600μ body length, 100 x 120μ in that of 1500μ.
Consists of two parts, stalk and crown.
Crown broad conical disc equipped with 15 to 20 blunt digitiform hooks at its margin.

Ancyrophora mutabilis n. sp.

(Fig. 2. A, B, C, D)
(Fig. 3. A, B, C, D, E)
(Fig. 4. A, B, C, D, E, F, G, H)
(Fig. 8. A, B, C, D)
(Fig. 9. A, B, C)
(Fig. 10. A, B, C, D)

The host *Copera annulata* is commonly found near a pond or ditch in and around Yamaguchi City at the beginning of summer. The author gathered many ones around Hase pond on 15th May, 1972, and brought back in the labolatory to find about 70% of them being parasitized with a species of gregarines, which has a curious protomerite.

The protomerite shape of cephalin is changeable, expands and contracts like an amoeba, and it presses its anterior part against the wall of the host intestine. The remaining part of body is wiggling about actively.

Host : *Copera annulata* Selys Odonata, Agrionidae
Habitat : Intestine
Locality : Yamaguchi (Yamaguchi Pref.)

I. Sporadin

1. Association Solitary.
2. Measurements
2-1. Size
Maximum TL 1300 WD 260
Average TL 849 LP 98 LD 741 WP 159 WD 227
2-2. Ratio LP : TL = 1 : 8.7 WP : WD = 1 : 1.4

3. Shape	Elongate ovoidal.
4. Protomerite	
4-1. Shape	Dome-shaped or hemispherical, widest at base or short distance above base, usually wider than high, well rounded at anterior top.
5. Deutomerite	
5-1. Shape	Elongate ovoidal, widens at anterior part, widest a little posterior from septum, gradually tapers from widest part to slender cuneate posterior extremity.
6. Septum	Distinct, conspicuous fairly deep constriction here.
7. Nucleus	
7-1. Shape	Ellipsoidal, large 80-60 x 30-25μ, but not visible in vivo in well matured sporadins.
7-2. Position	Unfixed, in some ones at anterior portion and in others at near posterior end.
7-3. Nucleolus	Many, 15-16 or more in numbers.
8. Endoplasm	
8-1. Color	Dark brown.
8-2. Granules	Very dense, almost the same in both protomerite and deutomerite but somewhat lighter in protomerite than in deutomerite.
9. Ectoplasm	Thick, stout.
II. Cyst	
1. Structure	Spherical, 530μ in average total diameter. Cyst cover consists of two membranes, outer cover gelatinous thick, 50μ in average thickness, inner one transparent thin, about 4-5μ in thickness.
2. Dehiscence	By simple rupture.
3. Cyst formation	Two matured sporadins come in contact with each anterior apex, and after turning round and round become spherical cysts.
III. Spore	
1. Shape	Biconical, hexagonal in optical section, with 3 spines at each pole and 6 spines; one to every angle on equator.
2. Size	7 x 5μ
IV. Movement	Gliding forward actively, 25μ per second in a straight line, bending anterior part of protomerite from side to side. Sometimes many fine striped patterns appear on surface of body when the path is blocked.
V. Cephalin	
1. Shape	Elongate club-shaped in grown stage, rather ellipsoidal or short club-shaped in younger stage growing longer with age. Very long cephalin found 1300μ or more in length. Characteristically protomerite in vivo changeable in its external

shape.

1) Normal or when gradually fixed with some kinds of fixing fluid
Elongate ovoidal, anterior half enlarged globular, posterior half extended cylindrically like neck, at anterior top of the former epimerite attached with stalk.

2) When living and moving actively.
Change its form especially its anterior part, widen here as sunken dish pressing its margin against host intestine.
Margin separated like flower petals surround central hollow.
Small part of anterior region of protomerite sunk into it forming small cone projected at central of hollow; epimerite sit on apex of cone.

3. Epimerite

Consist of two parts, crown and stalk.
Crown bowl-shaped, equipped 14-12 backward digitiform hooks at its margin.
Stalk more or less extended or contracted.
Epimerite easily removed if cephalin can be freely removed in some physiological solution of sodium chloride.

Table 1. Measurements and Ratio (unit μ)

Full grown sporadin stage					
Measurements					
TL	1020	880	850	830	750
LP	130	100	100	70	90
LD	890	770	750	760	660
WP	180	140	180	160	160
WD	220	240	240	220	240
Ratio					
LP : TL	1 : 7.8	1 : 8.8	1 : 8.5	1 : 11.9	1 : 8.3
WP : WD	1 : 1.4	1 : 1.7	1 : 1.3	1 : 1.4	1 : 1.5
Large cephalins					
Measurements					
TL	1050	750	710	700	640
LP	150	120	70	130	70
LD	900	630	640	570	570
WP	170	160	100	200	90
WD	100	110	70	160	70
Ratio					
LP : TL	1 : 7.0	1 : 6.3	1 : 10.1	1 : 5.4	1 : 9.1
WP : WD	1 : 0.6	1 : 0.7	1 : 0.7	1 : 0.8	1 : 0.8

Table 1. Measurements and Ratio (unit μ)

Cephalin measured with Epimerite						
TL	LP	LD	WP	WD	N	EP (crown stalk)
980	130	850	110	150	30x60	40 (20x20 20)
364	94	270	47	36	36x18	30 (18x18 12)
260	65	195	45	35	15x35	25 (20x20 5)

Measurements of Cyst					
Total diameter	600	580	550	400	350
Thickness of outer cover	50	90	40	40	35
Thickness of inner cover	4	4	4	4	4

Remarks:

Judging from the shape of the epimerite and of the spore, this species belongs to the genus *Ancyrophora*. The species has some resemblances to the *A. gigantes*, but the former is different from the latter in the size of the sporadin and of the cyst, the ratio of LP to TL, and the position of the nucleus. The writer assumes that this species is a new member of the genus *Ancyrophora*, and proposes the name ***Ancyrophora mutabilis***.

Hoplorhynchus hexacanthus Obata 1953

(Fig. 1. H, I)

1953 *Hoplorhynchus hexacanthus* Obata 1953:16

Host : *Coeagrion quadrigerum* Selys Agrionidae

Habitat : Intestine

Locality : Hiroshima (Hiroshima Pref.)

I. Sporadin

1. Association — Solitary.
2. Measurements
   - 2-1. Size
     - Maximum — TL 700 WD 55
     - Average — TL 611 LP 68 LD 543 WP 35 WD 39
   - 2-2. Ratio — LP : TL = 1 : 9.0 WP : WD = 1 : 1.1
3. Shape — Slender, very long, always curved slightly.
4. Protomerite
   - 4-1. Shape — Like bulb of Allium, twice as long as high, widest at one third from septum.

5. Deutomerite
5-1. Shape — Cylindrical, narrowed slightly just under septum, widen as more as protomerite or wider than it, curved slightly, tapering to attenuate posterior end.
6. Septum — Slight constriction.
7. Nucleus
7-1. Shape — Elongate ellipsoidal, with many nucleolus about 20.
8. Endoplasm
8-1. Color — Yellowish, semitransparent.
II, III. Cyst, Spore — Unknown.
IV. Movement — Not mentioned.
V. Cephalin
3. Epimerite — Average length of epimerite 80μ.
Long slender stalk with crown at top.
Crown discoidal, 20μ in diameter, equipped six backwardly directed digitiform processes at margin.

Hoplorhynchus gracilis H.Hoshide 1953
(Fig. 1. J, K, L, M, N)

1953 *Hoplorhynchus gracilis* H.Hoshide 1953:4
1958 *Hoplorhynchus gracilis* H.Hoshide 1958:54
Host : *Aciagrion hisopa* Selys Odonata, Agrionidae
Habitat : Intestine
Locality : Obatake (Yamaguchi Pref.)

I. Sporadin
1. Association — Solitary.
2. Measurements
2-1. Size
Maximum — TL 700 WD 95
Average — TL 535 LP 62 LD 473 WP 79 WD 98
2-2. Ratio — LP : TL = 1 : 8.6 WP : WD = 1 : 1.2
3. Shape — Elongate cylindrical.
4. Protomerite
4-1. Shape — Dome-shaped, widest just above base, rounded anteriorly, often with small conical projection at apex.
5. Deutomerite
5-1. Shape — Elongate cylindrical, widest at shoulder, tapering gradually to acuneate posterior extremity.
6. Septum — Distinct, fairly deep constriction.
7. Nucleus

7-1. Shape	Ellipsoidal, 40μ by 30μ.
7-2. Position	Unfixed, but generally in anterior half. Find it difficult to discern nucleus position in vivo in matured sporadin, except softly pressed specimens. Axis of nucleus parallel usually to body axis.
7-3. Nucleolus	A great many, gather often foamy.
8. Endoplasm	
8-1. Color	Black to dark brown.
8-2. Granules	Dense. In protomerite more coarse and larger than in deutomerite, especially large granules are found at anterior region of protomerite.
9. Ectoplasm	Thick, 4-5μ in thickness. Fine longitudinal striations on body surface.
II. Cyst	
1. Structure	Ellipsoidal to spherical, 370-300μ by 320-290μ in over all size measured. Size of inner substantial part almost fix 300μ by 290μ.
2. Dehiscence	By simple rupture.
III. Spore	
1. Shape	Tetrahedral or biconical.
2. Size	10-9 x 7-8μ
IV. Movement	Active sliding and bending movement. One sporadin goes forward at a rate of 8.5μ a second.
V. Cephalin	
1. Shape	Ovoidal in young, grow in size especially in length with age. Long, slender cephalin attain rarely 900μ or more in length.
2. Structure	About the same as sporadin but lighter in color, light brown.
3. Epimerite	Consist of two parts: stalk and crown. Stalk cylindrical slender, 75μ in length. Crown discoidal, 32μ in diameter and 10μ in height, with 6-8 recurved hooks around crown. Each hook pointed, 12 to 15μ in length.

Hoplorhynchus orthetri H.Hoshide 1953
(Fig. 1. D, E, F, G)
(Fig. 11. A, B, C, D)

1953 *Hoplorhynchus orthetri* H.Hoshide 1953 : 84
1958 *Hoplorhynchus orthetri* H.Hoshide 1958 : 50
Host : *Orthetrum albistylum speciosum* Uhler Libellulidae
Habitat : Intestine

Locality: Obatake, Yanai, Hikari, Yamaguchi (Yamaguchi Pref.)

I. Sporadin

1. Association — Solitary.

2. Measurements

2-1. Size

Maximum — TL 1850 WD 450

Average — TL 1354 LP 209 LD 1145 WP 269 WD 348

2-2. Ratio — LP : TL = 1 : 6.4 WP : WD = 1 : 1.3

3. Shape — Elongate cylindrical.

4. Protomerite

4-1. Shape — Subglobular to dome-shaped.
Widest in middle, slightly wider than high, broadly rounded anteriorly with small cone at apex.

5. Deutomerite

5-1. Shape — Elongate cylindrical, slightly constrict just below shoulder, widen gradually from constricted portion, widest at middle, taper down from here to cuneate posterior extremity.

6. Septum — Distinct, conspicuous constriction.

7. Nucleus

7-1. Shape — Elongate ovoidal to ellipsoidal.

7-2. Position — Unfixed, not visible in vivo due to its dense endoplasm.

7-3. Nucleolus — Many small, more 10 to 20.

8. Endoplasm

8-1. Color — Deutomerite dark brown, protomerite lighter than deutomerite.

8-2. Granules — In deutomerite very opaque dense, in protomerite less dense than deutomerite.
Many dark granules in anterior cone.

9. Ectoplasm — Epicyte thick.
Longitudinal and annular fine striations obvious in living body surface.

II. Cyst

1. Structure — Average 820μ in over all diameter.
Cyst cover thick, transparent 90μ in thickness.

2. Dehiscence — By simple rupture.

III. Spore

1. Shape — Biconical or tetrahedral come out in lumps.

2. Size — 10μ by 6μ.

IV. Movement — Sliding and bending movement in active.

V. Cephalin

1. Shape — Nearly ovoidal, comparatively short and large.
Protomerite subglobular, width almost the same height, at-

taching stalk of epimerite at anterior center.
Deutomerite ovoidal acutely pointed at posterior end.

2. Structure — Endoplasm light brown in color with fine granules.
Nucleus spherical but become gradually ellipsoidal with body grew larger.

3. Epimerite — Consist of two parts: crown and stalk.
Crown umbrella-shaped, measure 15 x 10μ, equipped 12-10μ recurved hooks at its margin.
Stalk slender long, length 100μ or more in well grown cephalin.

Hoplorhynchus magnus H.Hoshide 1958
(Fig. 5. A, B, C, D, E, F)
(Fig. 14. A, B, C, D)
(Fig. 15. A, B, C, D)

1958 *Hoplorhynchus magnus* H.Hoshide 1958 : 51
Host : *Crocothemis servilia* Drury Libellulidae
Habitat : Intestine
Locality : Yamato, Obatake (Yamaguchi Pref.)

I. Sporadin

1. Association — Solitary.

2.Measurements

2-1. Size

Maximum — TL 2450 WD 600

Average — TL 1851 LP 241 LD 1610 WP 330 WD 494

2-2. Ratio — LP : TL = 1 : 7.8 WP : WD = 1 : 1.5

3. Shape — Obese, elongate ovoidal to bottle-shaped.

4. Protomerite

4-1. Shape — Subglobular, widest at base, broadly rounded or almost flat at apex, wider than height.
In some specimens a secondary fairly deep constriction in middle, in addition to constriction at septum.

5. Deutomerite

5-1. Shape — Elongate ovoidal, generally constrict just below septum, widest at anterior third of deutomerite, tapers gradually from here to posterior end, sharply pointed at posterior extremity.
In some no constriction below septum, widest at shoulder.

6. Septum — Distinct, deep constriction.

7. Nucleus

7-1. Shape — Ellipsoidal to ovoidal, 100x 75μ in average size.
Diameter of nucleus attain one fourth breadth of deutomerite.

7-2. Position	Unfixed variable, most often in anterior half of deutomerite but rarely near posterior end.
7-3. Nucleolus	Many spherical, 6-8μ in diameter and about 20 or more in number.
8. Endoplasm	
8-1 Color	Dark brown to black.
8-2. Granules	In deutomerite very dense, more opaque than protomerite. In protomerite granules slightly larger than those of deutomerite, sometimes anterior region of protomerite almost transparent.
9. Ectoplasm	Epicyte thick, longitudinal and annular fine striations easily discernible especially when dense endoplasm released under operation.
II. Cyst	
1. Structure	Large, spherical, covered with very thick cyst cover. Total diameter of cyst measure 1400-1800μ, thickness of cyst cover 340-200μ.
2. Dehiescence	By simple rupture, coagulated spore mass extrude from opening of rupture.
III. Spore	
1. Shape	Tetrahedral or irregular spindrical.
2. Size	10x 4μ
IV. Movement	Sliding and bending actively.
V. Cephalin	
1. Shape	Elongate ovoidal. No secondary constriction at protomerite in this stage.
2. Structure	Lighter than mature sporadin.
3. Epimerite	Consist of two parts: crown and stalk. Crown umbrella-shaped, furnished with 6-7 recurved sharp hooks. Stalk slender, long cylindrical, in some cephalins stalk length 80-90μ when stretched.

Hoplorhynchus miyanensis n. sp.

(Fig. 6. A, B, C, D, E, F, G)

The host dragonfly is small and slender ; it flies over or among the leaves of rice from summer to early autumn in Yamaguchi Prefecture. The author found his first specimen of this parasite in the host that he caught at Miyano in Yamaguchi City on the 10th of August, 1972.

The parasitic rate of this gregarine is usually low. At Obatake in 1973, all the collected hosts were only 30% of total number of hosts. By this time he was unable to find

spores of this gregarine.

Host : *Ceriagrion melanurum* Selys Odonata, Agrionidae

Habitat : Intestine

Locality : Yamaguchi, Yanai, Obatake (Yamaguchi Pref.)

I. Sporadin

1. Association — Solitary.
2. Measurements
   - 2-1. Size
     - Maximum — TL 1925 LP 250 LD 1675 WP 500 WD 675
     - Average — TL 768 LP 72 LD 696 WP 74 WD 114
   - 2-2. Ratio — LP : TL = 1 : 12.5 WP : WD = 1 : 1.4
3. Shape — Cylindrical to elongate ovoidal.
   Obese, oboidal just before cyst formation.
4. Protomerite — Dome-shaped or hemispherical, wider than high.
5. Deutomerite
   - 5-1. Shape — Elongate ovoidal, widest at shoulder, tapering from here to posterior end, posterior extremity attenuate or rather cuneate.
6. Septum — Distinct, deep or shallow constriction here.
7. Nucleus
   - 7-1. Shape — Large, ellipsoidal, 55x 30μ.
   - 7-2. Position — Unfixed, but in anterior half in many cases, but indistinct generally its position in well matured sporadins because its cytoplasm is too dense to find the nucleus position.
   - 7-3. Nucleolus — Many spherical small bodies, 12 or more in some specimens.
8. Endoplasm
   - 8-1. Color — Dark brownish.
   - 8-2. Granules — Fine, very dense.
     In anterior portion of protomerite more scanty than other body parts.
9. Ectoplasm — Rather thick, about 2μ in thickness.

II. Cyst

1. Structure — Spherical to ellipsoidal, milky white substantial body with transparent gelatinous cyst cover.
   Substantial part, 300 to 350μ in average diameter, gelatinous cover 30 to 50 or 60μ in thickness.

III. Spore — Not obrerved.

IV. Movement — Sliding actively, move forward 150μ per minute.

V. Cephalin

1. Shape — Ovoidal.
   Grow longer little by little with age and become elongate ovoidal.

2. Structure — Color light brown, granules less in protomerite than in deutomerite.
Nucleus comparatively large, ellipsoidal, generally situated in anterior half of deutomerite.

3. Epimerite — Consist of two parts: stalk and discoidal top.
Stalk projecting from anterior end of protomerite, slender, long, 20 to 40μ in length.
Discoidal top, equipped with 5-7 backword directed hooks, each hook about 10μ in length projecting radially from margin of top.

Table 2.

Hoplorhynchus miyanensis n. sp.

Measurements and Ratio of Sporadins (unit μ)

Measurements					
TL	525	700	720	820	1030
LP	45	60	50	60	80
LD	480	630	670	760	950
WP	65	90	90	80	90
WD	95	150	120	130	140
Ratio					
LP : TL	1 : 11.7	1 : 11.7	1 : 14.4	1 : 13.7	1 : 12.9
WP : WD	1 : 1.5	1 : 1.7	1 : 1.3	1 : 1.6	1 : 1.6

Remarks:

The feature of genus *Hoplorhynchus* is as follows: The sporadin is slender with an elongate ovoidal nucleus. The epimerite is a very long neck with six to eight hooks slightly recurved.

The cyst dehisces by simple rupture. The spore of this species is not observed this time, but judging from the shape of the body, the shape of nucleus and the structure of the epimerite, this species obviously belongs to the genus *Holorhynchus*. This species closely resembles *H. magnus* H. Hoshide and *H. hexacanthus* in the structure of the epimerite. But it differs from the latter two species in the following points. Compared with *H. magnus*, this species is smaller in the average size of the sporadin and is extremely larger in the size of the cyst. The ratio of LP to TL is diffffferent between this species and *H. magnus*. Compared with *H. hexacanthus*, this species is larger in the size and obese.

The writer assumes that species is a new member of the genus *Hoplorhynchus* and proposes the name *Hoplorhynchus miyanensis* n. sp.

Hoplorhynchus polyhamatus n. sp.

(Fig. 7. A, B, C, D, E, F, G)
(Fig. 12. A, B, C, D)
(Fig. 13. A, B, C, D, E, F)

The host dragonfly of this parasite is commonly found along a stream in the woods around Yamaguchi City. The specimens for this study were caught in the early summer of 1972 and 1973 at the upper reaches of Era River around Fudosama Falls and Inuboe Falls of the upper Niho River.

Of the captured hosts about 40% were found to be parasitized by this gregrarine at each time. In some cases full grown sporadins were free at the anterior area of the host intestine but the large cephalins generally adhered to the wall of intestine with their epimerites.

Host : *Munais strigata* Selys Agriidae
Habitat : Intestine
Locality : Yamaguchi (Yamaguchi Pref.)

I. Sporadin

1. Association — Solitary.
2. Measurements
   2-1. Size
      Maximum — TL 3303 LP 416 LD 2887 WP 697 WD 780
      Average — TL 2650 LP 328 LD 2322 WP 488 WD 677
   2-2. Ratio — LP : TL = 1 :8.1 WP : WD = 1 : 1.4
3. Shape — Elongate ovoidal.
4. Protomerite
   4-1. Shape — Hemispherical or dome-shaped, widest at base or a little above base, wider than long.
5. Deutomerite
   5-1. Shape — Elongate ovoidal, widest a little below septum, gradually taper to posterior end.
6. Septum — Conspicuous but no constriction or very shallow one.
7. Nucleus
   7-1. Shape — Spherical, large, about 100μ in diameter.
   7-2. Position — Just below septum, always attached directly to septum.
   7-3. Nucleolus — Many, about 14-16 or more.
8. Endoplasm
   8-1. Color — Dark brown.
   8-2. Granules — Very dense. fine, almost same quality in both protomerite and deutomerite.
9. Ectoplasm — Very thick, stout.

II. Cyst

1. Structure — Spherical, 637μ in total diameter on an average,covered with

80-90μ layers in thickness, consist of two different layers: outer thick gelatinous membrane and inner thin transparent membrane.

2. Dehiscence — By simple rupture.

III. Spore

1. Shape — Tetrahedral, dehiscence in clusters contacting with their edges.

2. Size — One side of tetrahedron 9-10μ in length.

IV. Movement — Fairly active.

V. Cephalin

1. Shape — Ellipsoidal in young stage. Protomerite ovoidal, deutomerite elogate ovoidal.

2. Structure — In some small cephalins nucleus ellipsoidal not attach to septum, situate about in middle portion of deutomerite.

This species seems to have long cephaline stage, and then very large individuals, 2000μ or more long ones, stick in the host intestine with their epimerite.

Measurtment of such cephalins shown as example follows.

Total length of body with epimerite.	702	1440	2048
LP	104	166	229
LD	478	1212	1746
LE	26	26	26
Length of epimerite crown	52	36	47
Width of epimerite crown	74	130	166

3. Epimerite — Consist of two parts: crown and stalk.

Crown; margin of its base notched like flower calyx leaf sets an upward digitiform spine on it.

In some young specimens central part of crown projects as circular cone but in older ones this part has sunken in and only circular base epuipped with 15-17 spines is remained.

Stalk; in young specimens comparatively extended but in older ones it contracts and transforms to bowl-shaped receptor.

Table 3. Measurements and Ratio (unit μ)

Well grown cephalins						
Measurements						
TL	3005	2829	2735	2642	2215	2163
LP	364	312	385	333	260	260
LD	2641	2517	2350	2209	1955	1903
WP	458	499	437	406	489	489
WD	551	645	562	562	634	707
EP	156 x 291	156 x 239	177 x 187	125 x 218	146 x 229	135 x 260
Ratio						
LP : TL	1 : 8.3	1 : 9.1	1 : 7.1	1 : 8.0	1 : 8.5	1 : 8.3
WP : WD	1 : 1.2	1 : 1.3	1 : 1.3	1 : 1.4	1 : 1.3	1 : 1.4

Remarks:

The structure of the epimerite, the shape of the sporadin and of the spore, the cyst dehiscence and other features of this species indicate that it belongs to the genus *Hoplorhynchus*. Among the members of the genus this species has some resemblances to *H. magnus* in the shape of the body and of the spore. But the sporadin of this species is larger than that of *H. magnus* and the shape of the epimerite is different between the two species.

Because of the feature of the epimerite the writer considers it a new species and proposes the name *Hoplorhynchus polyhamatus* n. sp.

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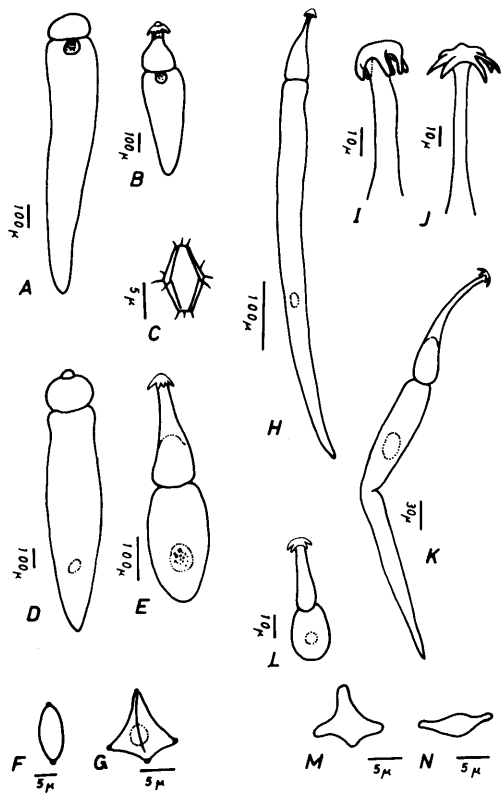
Explanation of Fig. 1.

A. *Ancyrophora gigantea* H. Hoshide 1953. After H. Hoshide 1953, Fig. 8.
B. *Ancyrophora gigantea* H. Hoshide 1953, After H. Hoshide 1953, Fig. 9.
C. *Ancyrophora gigantea* H. Hoshide 1953. After H. Hoshide 1953, Fig. 12a.
D. *Hoplorhynchus orthetri* H. Hoshide 1953. After H. Hoshide 1953, Fig. 1.
E. *Hoplorhynchus orthetri* H. Hoshide 1953. After H. Hoshide 1953, Fig. 2.
F. *Hoplorhynchus orthehri* H. Hoshide.1953. After H. Hoshide 1953, Fig. 5.
G. *Hoplorhynchus orthetri* H. Hoshide 1953. After H. Hoshide 1953, Fig. 6.
H. *Hoplorhynchus hexacanthus* Obata 1953. After Obata 1953, Plate, Fig. 31.
I. *Hoplorhynchus hexacanchus* Obata 1953. After Obata 1953, Plate, Fig. 33.
J. *Hoplorhynchus gracilis* H. Hoshide 1953, After H. Hoshide 1953, Plate, Fig. 11.
K. *Hoplorhynchus gracilis* H. Hoshide 1953. After H. Hoshide 1953, Fig. 10.
L. *Hoplorhynchus gracilis* H. Hoshide 1953. After H. Hoshide 1953, Fig. 9.
M. *Hoplorhynchus gracilis* H. Hoshide 1953. After H. Hoshide 1953, Fig. 12a.
N. *Hoplorhynchus gracilis* H. Hoshide 1953. After H. Hoshide 1953, Fig. 12b.

Fig.1.



Explanation of Fig. 2.

Ancyrophora mutabilis n. sp.

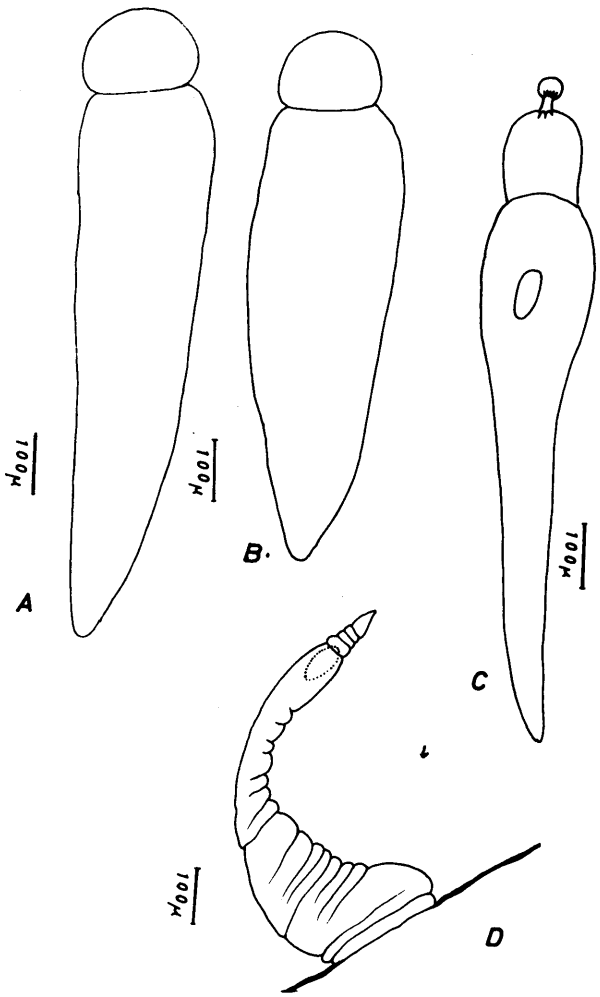
A. Well mature sporadin.

B. Another sporadin.

C. Fairly grown cephalin with epimerite at apex.

D. Cephalin sticking to host's intestine which is contorting and showing many furrows on the surface of body.

Fig. 2.



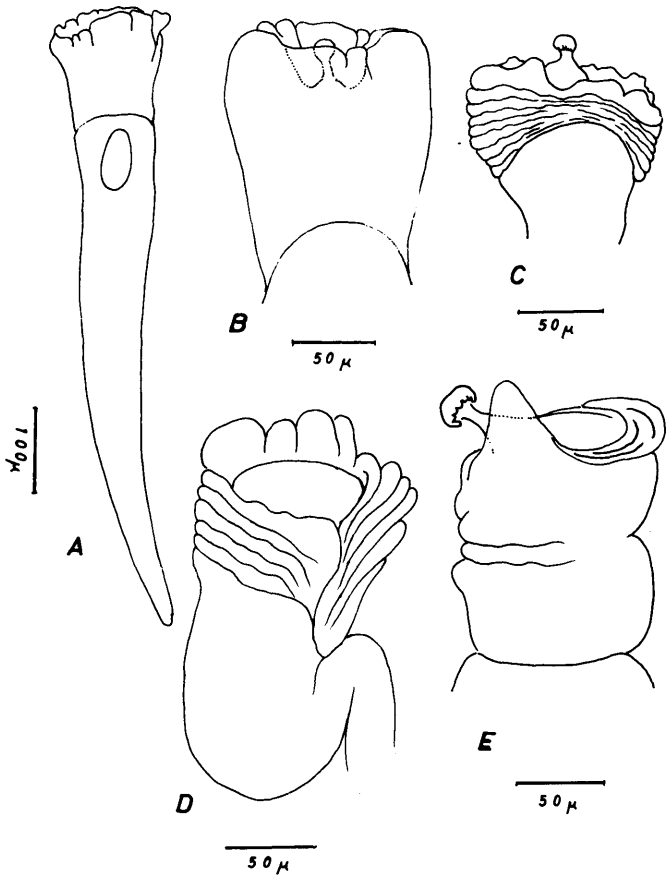
Explanation of Fig. 3.

Ancyrophora mutabilis n. sp.

A. Cephalin; the anterior portion with epimerite sinks into the hollow of protomerite.

B. C. D. E. Various aspects of protomerite.

Fig.3.

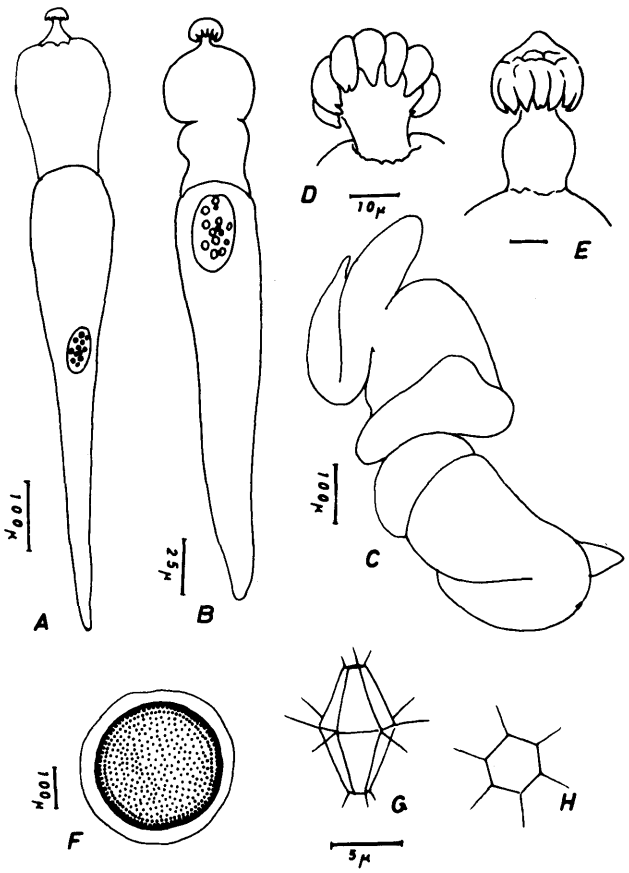


Explanation of Fig. 4.

Ancyrophora mutabilis n. sp.

A. Fairly grown cephalin with epimerite.
B. Comparatively young cephalin.
C. Pair of sporadins attached to each other head to head contorting and rotating for cyst formation.
D. Epimerite showing several recurved hooks furnished on its top.
E. Lateral view of an epimerite.
F. Cyst.
G. Spore.
H. Optical section of a spore.

Fig. 4.



Explanation of Fig. 5.

Hoplorhynchus magnus H. Hoshide 1958.

A. Well mature sporadin.

B. Another sporadin.

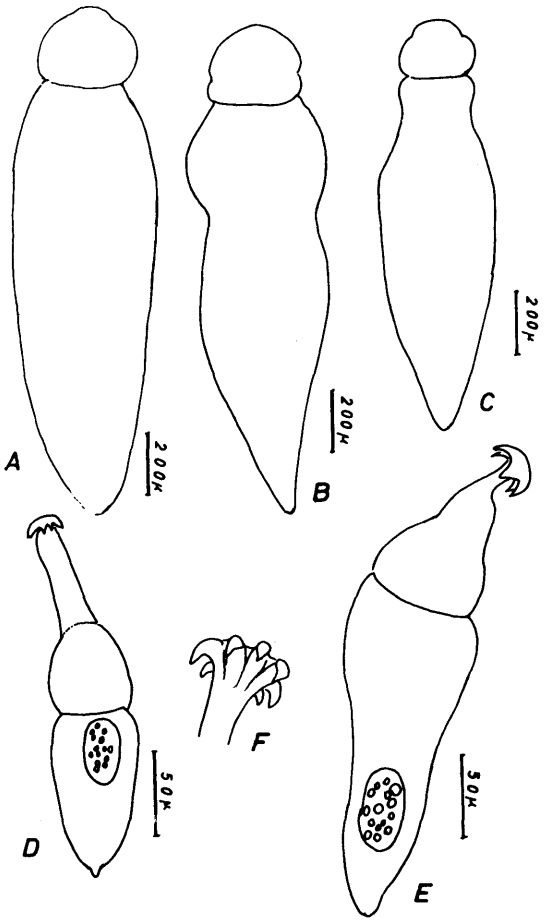
C. Another one which is younger than above two.

D. Young cephalin with epimerite.

E. Another cephalin, a little more grown.

F. Oblique underside view of epimerite.

Fig.5.



Explanation of Fig. 6.

Hoplorhynchus miyanensis n. sp.

A. Mature sporadin.

B. Well mature sporadin swollen just before cyst formation.

C. Young cephalin.

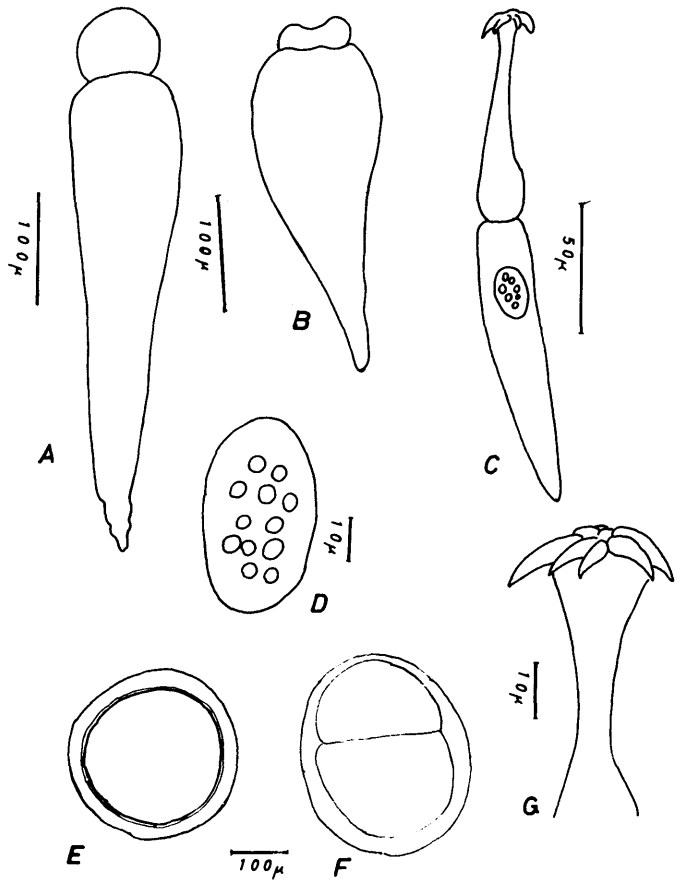
D. Nucleus enlarged showing several nucleoli in it.

E. Cyst.

F. Cyst; the line of separation between the two sporadins is visible.

G. Enlarged epimerite with long stalk furnished six recurved hooks on its top.

Fig.6.



Explanation of Fig. 7.

Hoplorhynchus polyhamatus n. sp.

A. Cephalin showing the nucleus attached to septum and the crown-shape epimerite with short stalk.

B. Epimerite of fairly old cephalin, its cone-like central part being sunk and its margical calyx-like projections surround the central part.

C. Epimerite of another cephalin which is younger than the former, its central cone being remained at its top.

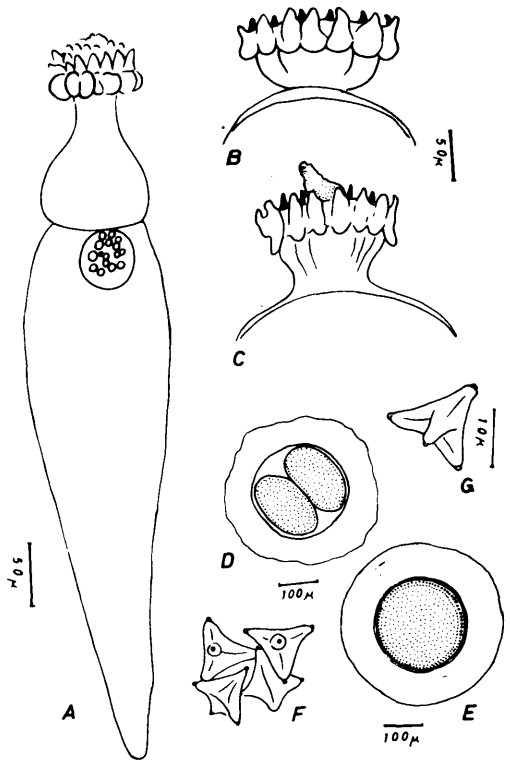
D. Cyst covered with thick cyst membrane and the line of separation between the two sporadins is still visible.

E. Cyst covered with the inner thin transparent membaran and the outer thick gelatinous one: the inner mass is homogeneous.

F. Four spores intertwined each other.

G. Tetrahedral spore.

Fig.7.



Explanation of Fig. 8. 9. 10.

Ancyrophora mutabilis n. sp.

Fig. 8.

A. Sporadin.

B. Four mature sporadins.

C. Mature sporadin.

D. Anterior part of the body; ellipsoidal nucleus with nine nucleolus.

Fig. 9.

A. Large cephalin with epimerite.

B, C. protomerite with epimerite.

Fig. 10.

A, B. Anterior part of bodies with spherical epimerite.

C. Cyst.

D. Spore.

Explanation of Fig. 11. 12. 13.

Hoplorhychus orthetri H. Hoshide.

Fig. 11.

A, B, C, D. Large mature sporadin with thick endoplasm.

Hoplorhynchus polyhamatus n. sp.

Fig. 12.

A. Farirly grown cephalin being slightly pressed to show its nucleus situation.

B. Young cephalin.

C. Well grown cephalin.

D. Young cephalin.

Fig. 13.

A. Anterior portion of well grown cephalin. Crown of epimerite epuipped with spines is shown and stalk is contracted.

B. Epimerite of fairly young cephalin; its central cone is remained at apex.

C. Epimerite with stalk of young cephalin.

D. Tetrahedral spores.

E. Spherical cyst covered with inner and outer cyst mombranes.

F. Cyst after rotation ended.

Explanation of Fig. 14. 15.

Hoplorhynchus magnus H. Hoshide.

Fig. 14.

A. Sporadin.

B. Spordin in young stage.

C. Cephalin without epimerite.

D. Cephalin.

Fig. 15.

A. Sporadin

B. Five sporadins

C. Stout sporadin

D. Cephalin

Fig.8.

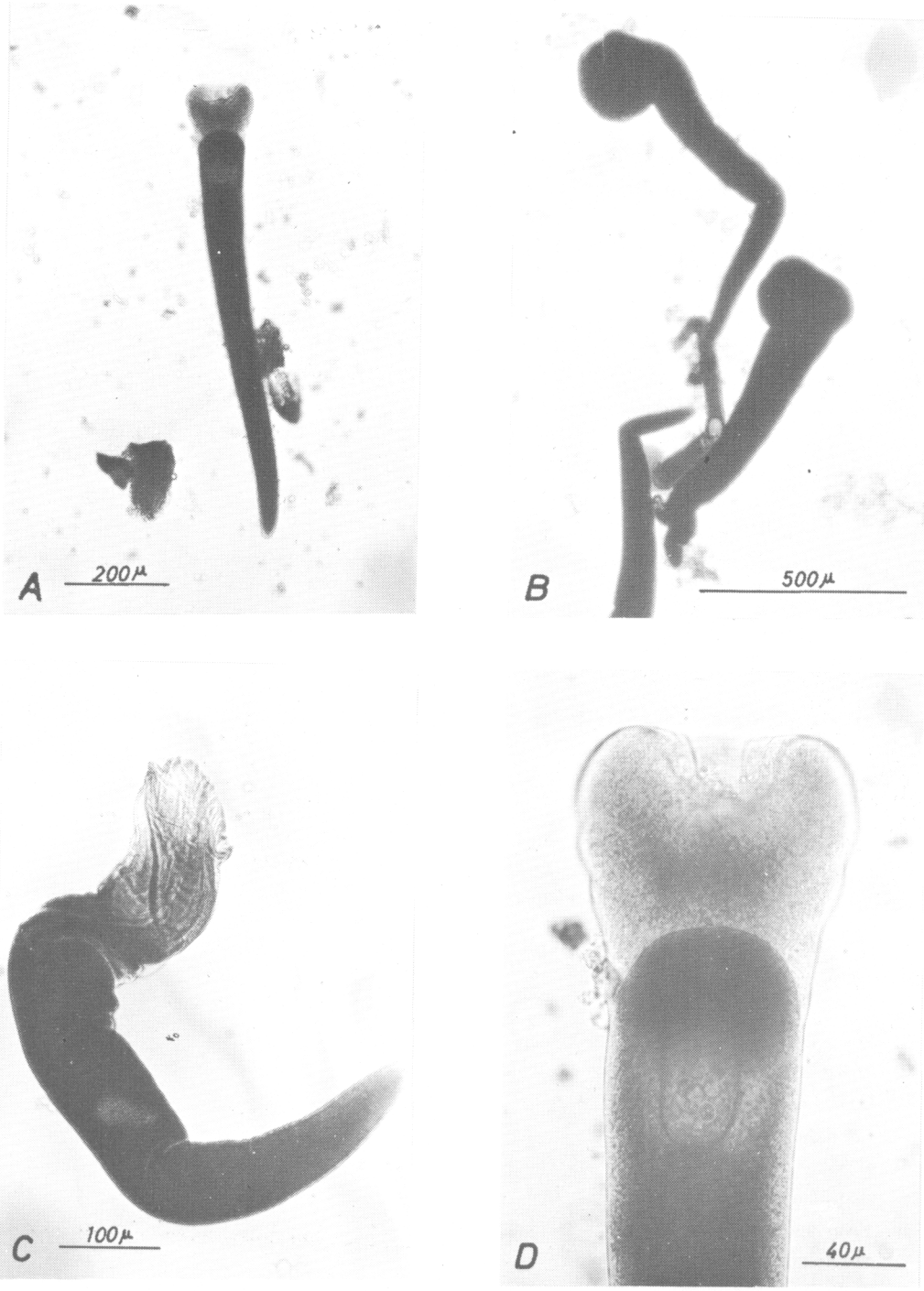
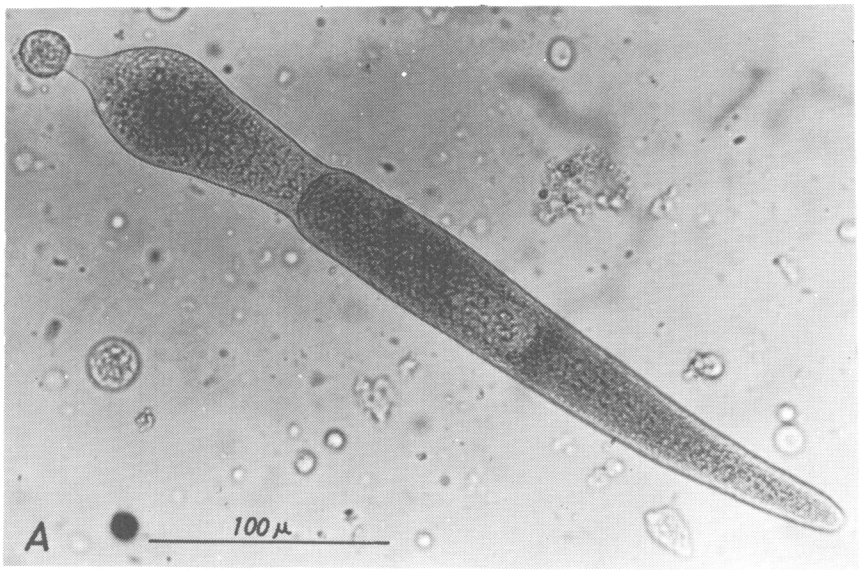
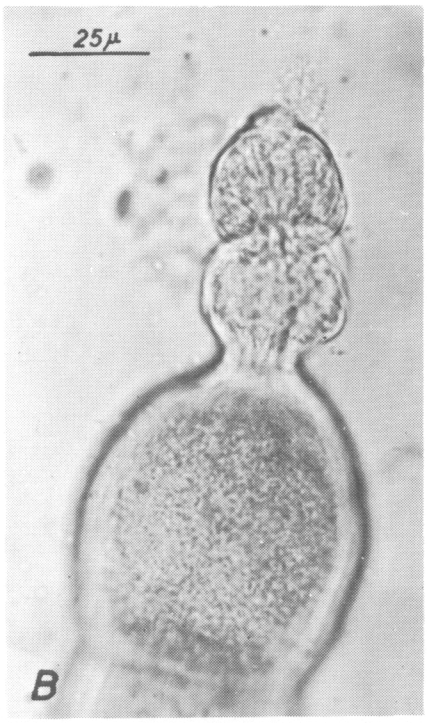


Fig.9.





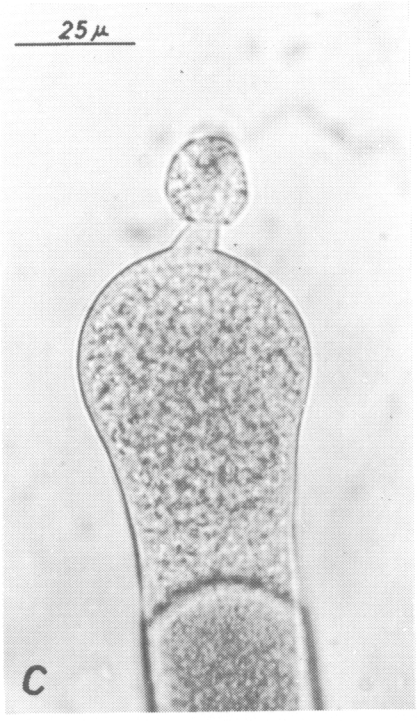


Fig. 10.

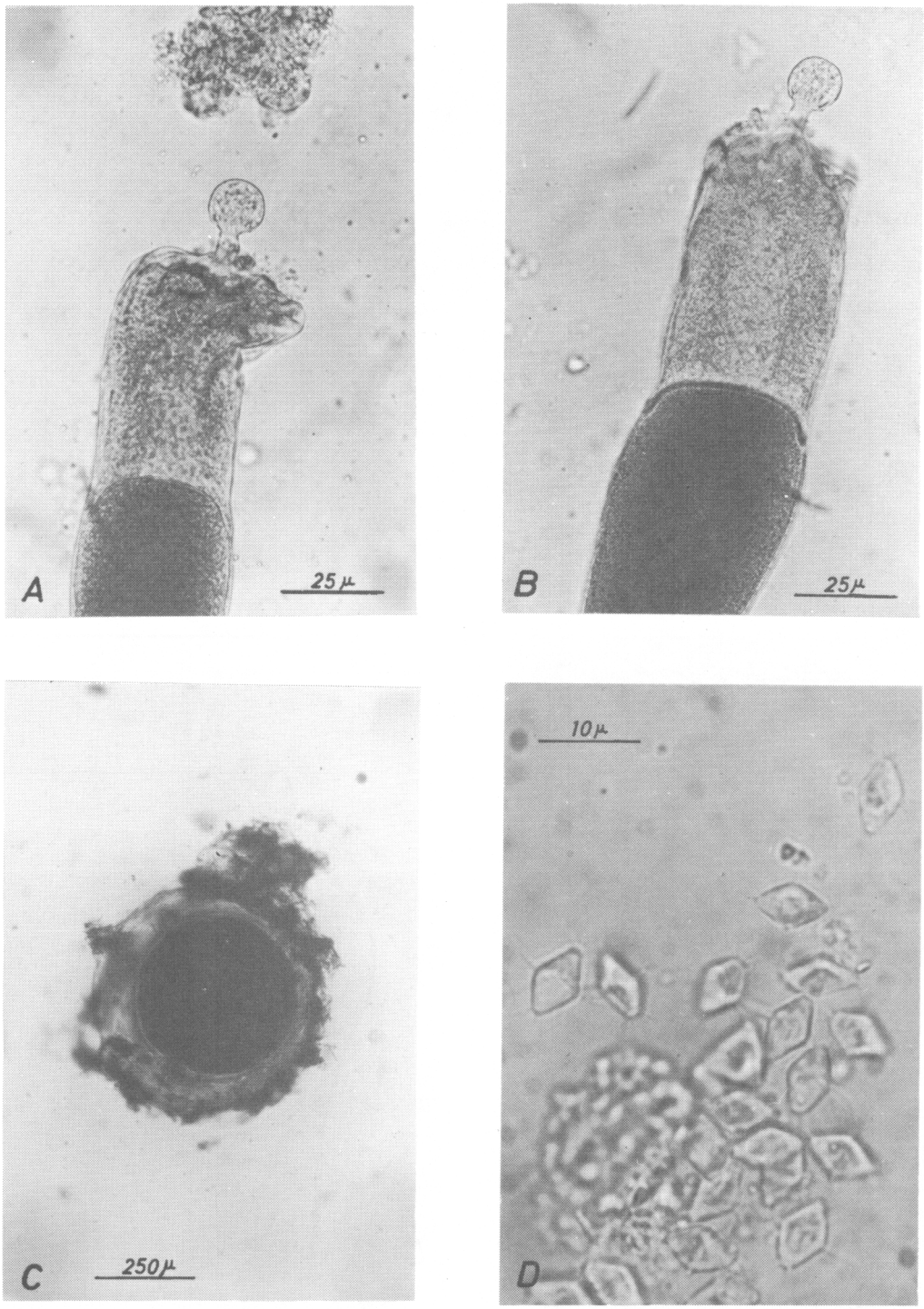
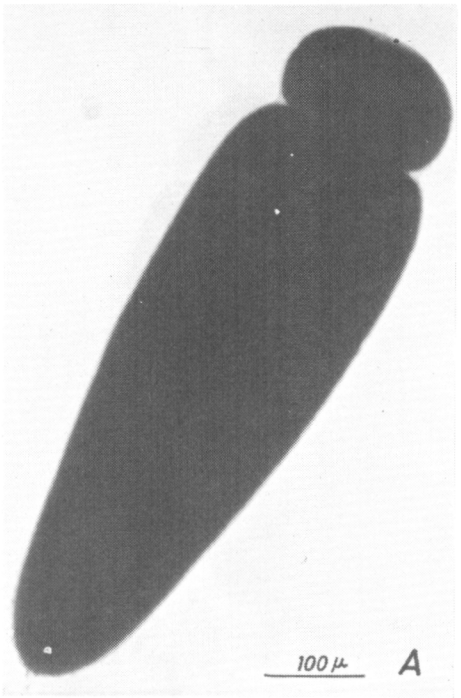
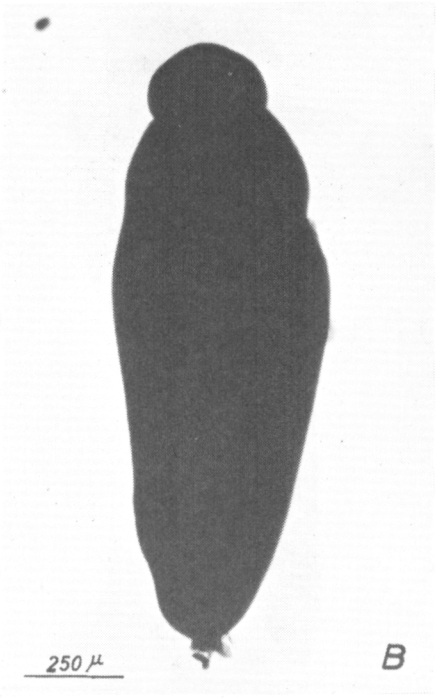
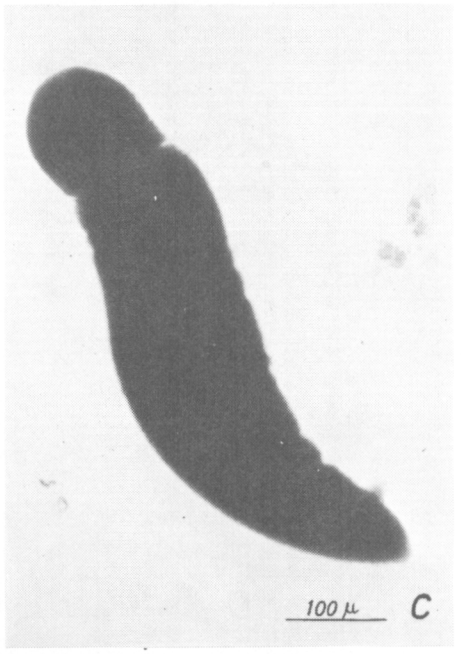


Fig. 11.







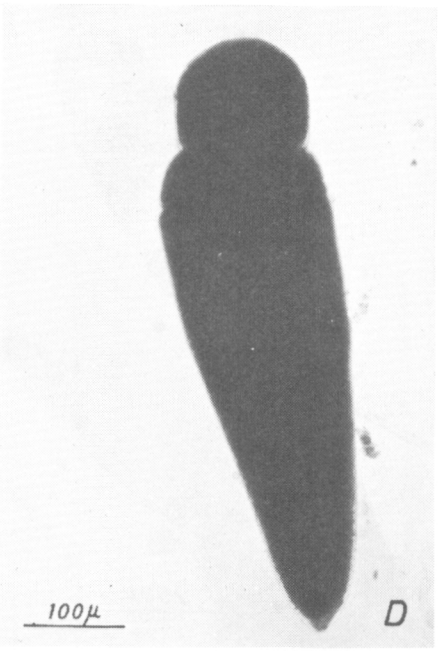


Fig. 12.

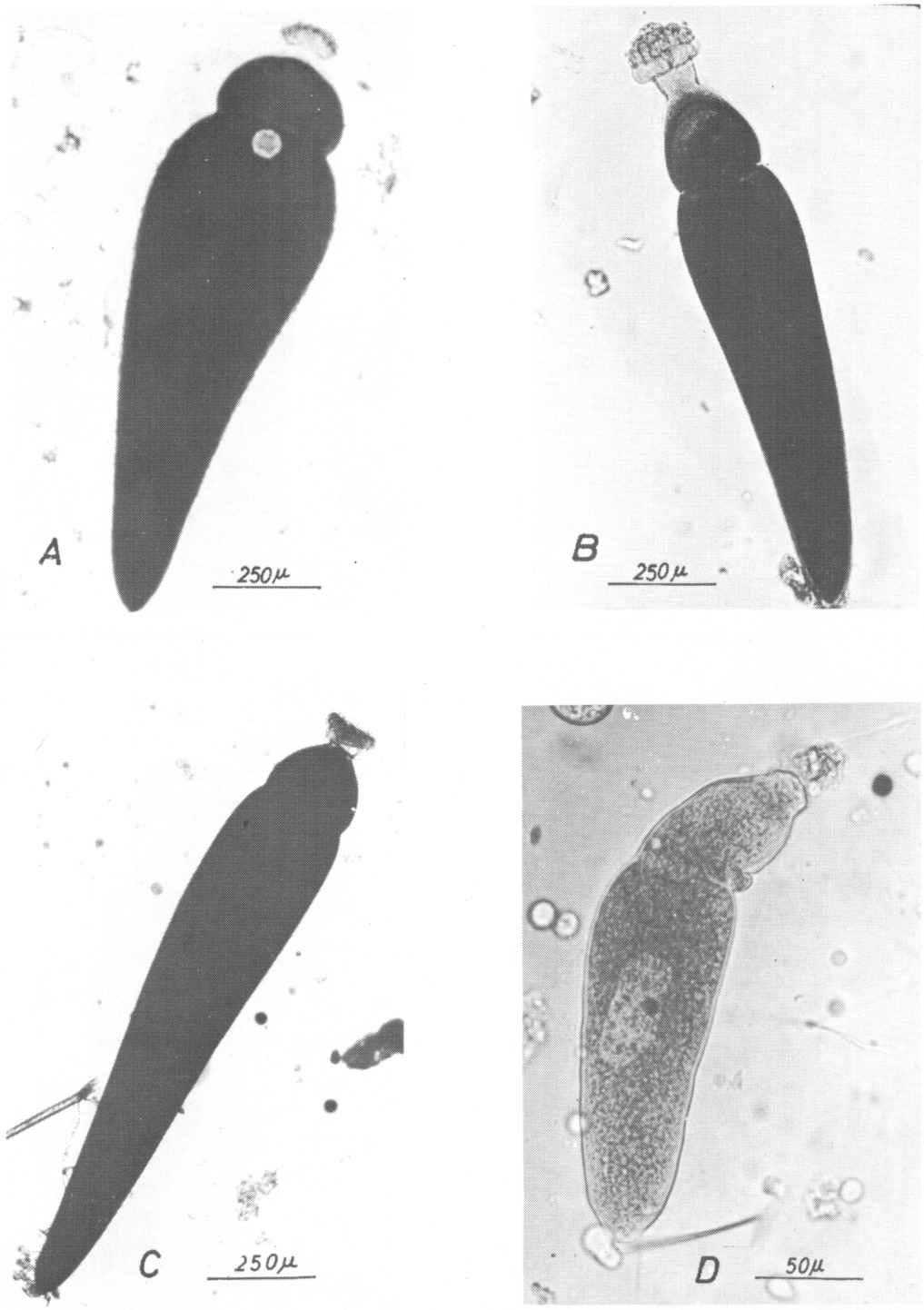


Fig.13.

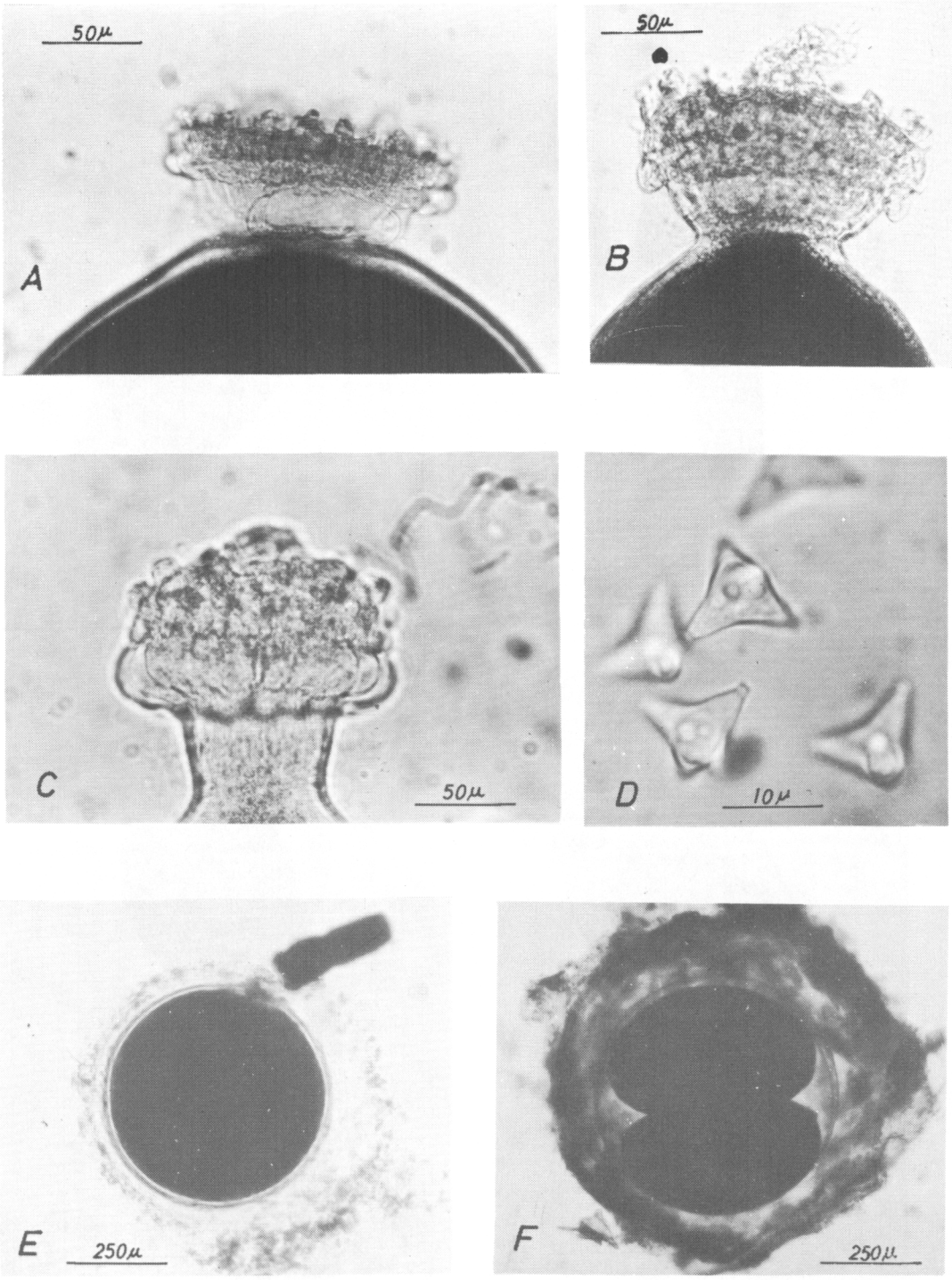


Fig. 14.

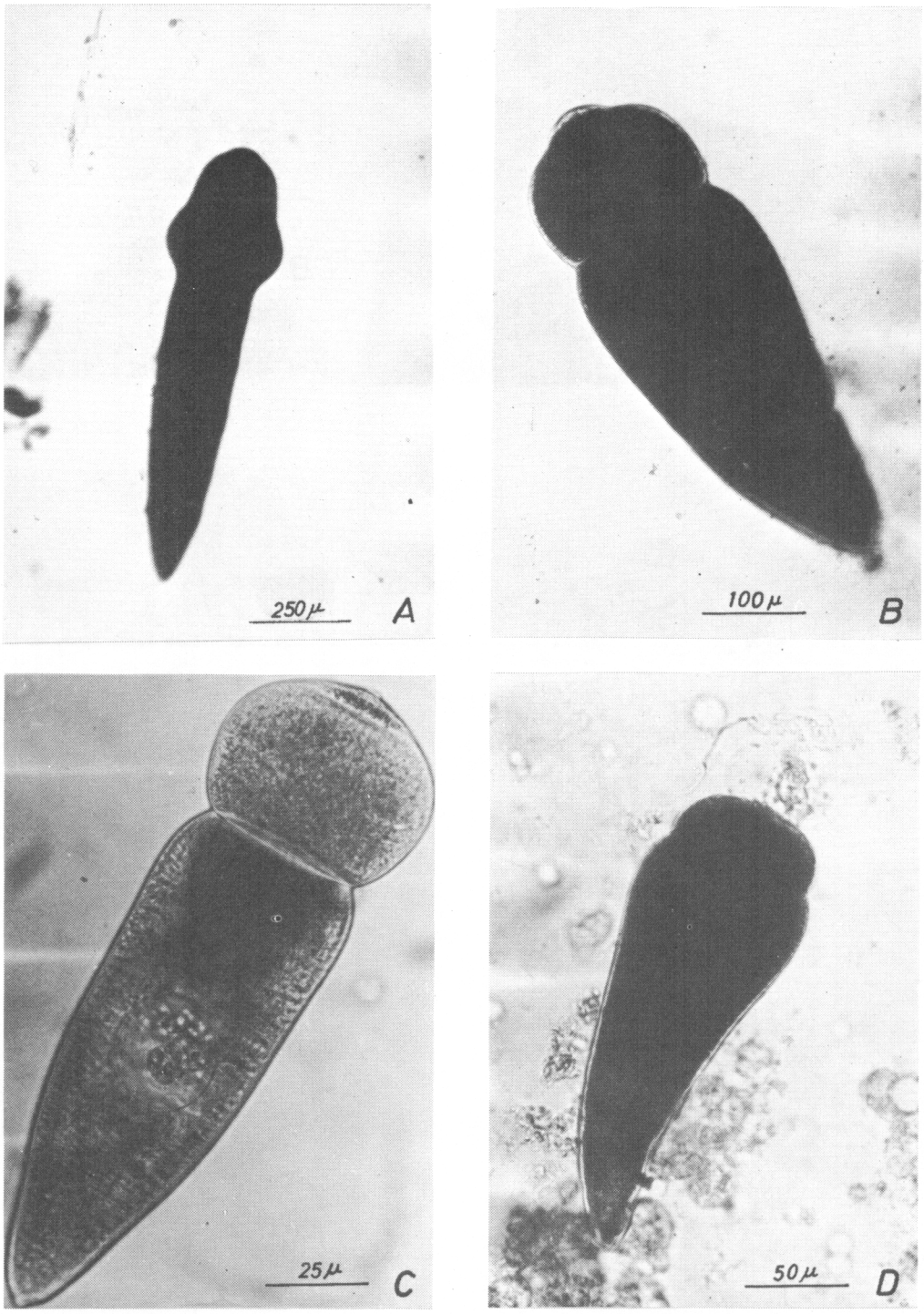


Fig.15.