STUDIES ON THE CEPHALINE GREGARINES OF JAPAN (II).

3) Description of the members belonging to the Families Didymophyidae, Actinocephalidae, Acanthosporidae, Stylocephalidae, Dactylophoridae.

HYOMA HOSHIDE

(Received Sept. 30, 1958)

Family DIDYMOPHYIDAE LEGER, 1892.

Genus *Didymophyes* STEIN, 1848.

73. *Didymophyes gigantea* STEIN, 1848.
(Figures 221–223)

Host: *Xylotrupes dichotomus* L., larva. Coleoptera, Insecta.
Habitat: Intestine.
Locality: Tabuse, Obatake (Yamaguti Pref.)

74. *Didymophyes crassa* (ISHII) WATSON

Host: *Tribolium ferrugineum* FABRICIUS Coleoptera, Insecta.
Habitat: Intestine.
Locality: Izu Province.

75. *Didymophyes diminuta* OBATA, 1953.

Host: *Aphodius rectus biformia* REITTER Coleoptera, Insecta.
Habitat: Intestine.
Locality: Hirosima (Hirosima Pref.), Izusi (Hyogo Pref.)

Family ACTINOCEPHALIDAE, 1892.

Genus *Pileocephalus* SCHNEIDER, 1875.

76. *Pileocephalus hydropsychus* HOSHIDE, 1953.
(Figures 236, 237)

Host: *Hydropsyche* sp., larva. Trichoptera, Insecta.

Habitat: Intestine.
Locality; Hikari, Obatake, Yamato (Yamaguti Pref.)

77. *Pileocephalus suhoensis* HOSHIDE, 1952.
(Figures 238, 239)

Host; *Allecula fuliginosa* MACKLIN Coleoptera, Insecta.
Habitat: Intestine.
Locality: Hikari, Obatake, Kaminoseki (Yamaguti Pref.)

Genus *Steinina* LEGER & DUBOSCQ

78. *Steinina obconica* ISHII
(Figure 224)

Host: *Lyrops sinensis* MARSEUL, *Tribolium ferrugineum* F.
Coleoptera, Insecta.
Habitat: Intestine.
Locality: (Izu Province), Obatake, Hikari (Yamaguti Pref.).

79. *Steinina minor* OBATA, 1953.

Host: Tenebrionidae sp., larva. Coleoptera, Insecta.
Habitat: Intestine.
Locality: Hirosima (Hirosima Pref.), Izusi (Hyogo Pref.).

80. *Steinina spherospora* HOSHIDE, 1952.
(Figures 225, 226)

Host: *Tenebrio picipes* HERBST. Coleoptera, Insecta.
Habitat: Intestine.
Locality: Hikari (Yamaguti Pref.).

81. *Steinina ovalis* (STEIN) LEGER & DUBOSCQ, 1904.
(Figures 275,276)

Host: *Tenebrio molitor* L., larva. Coleoptera, Insecta.
Habitat: Intestine.
Locality: Tabuse (Yamaguti Pref.).
The intestine of the host was heavily infected with this species, that is, with two hundreds or more sporonts.

The sporonts are solitary, and their bodies are stout and obese. The maximum length was 238μ, the maximum width 175μ. They average 120μ in length and 50μ in width. The ratio of LP : TL=1 : 2.4, WP : WD=1 : 1.4. The protomerite is somewhat cylindrical, terminating in a large cone. It is nearly as wide as high and is widest at the septum. There is little or no constriction at the septum. The deutomerite is short, ovoidal, ending in a bluntly pointed or in a well rounded posterior extremity. It is nearly as wide as long or slightly longer than is wide.

The nucleus is visible in vivo, spherical, 20-15μ in diameter and contains one large karyosome. The karyosome is spherical and measures 7.5—5μ in diameter.

Measurements are as follows, with dimensions given in microns:

Total length sporont	150	145	130	125	93	88
Length protomerite	63	60	55	50	40	38
Length deutomerite	87	85	75	75	53	50
Width protomerite	55	58	50	43	30	30
Width deutomerite	78	83	63	63	40	43
Ratio of LP : TL	1 : 2.4	1 : 2.4	1 : 2.4	1 : 2.5	1 : 2.3	1 : 2.3
Ratio of WP : WD	1 : 1.4	1 : 1.4	1 : 1.2	1 : 1.5	1 : 1.3	1 : 1.4
Diameter of nucleus	20	20	20	18	15	15
Diameter of karyosome	7.5	7.5	7.5	7	5	5

The epimerite is a short retractile digitiform process in the early stage of developement and it becomes a flattened bottom in the old stage. The protoplasm is dense in the deutomerite, brown in transmitted light; it is nearly as dense in the lower portion of the protomerite, but the upper portion of the latter is nearly devoid of endoplasm and forms a distinct conical hyaline area. The epimerite is transparent.

Cysts are spherical or ovoidal, average 100μ in diameter, dehisced by simple rupture. Spores are biconical, broad all through the middle part, 9μ×7.5μ.

Genus *Pyxinia* HAMMERSCHMIDT

82. *Pyxinia major* n. sp.

(Figures 257—264)

Diagnosis: Sporonts solitary, elongate cylindrical. Length 200—400μ, width 30—50μ. Ratio of LP : TL=1 : 7—10, WP : WD=1 : 1. Protomerite hemispherical, with a conical projection at anterior end. Constriction at septum. Deutomerite elongate, widest at shoulder, tapering into a slender sharp end. Endocyte dense, dark brown, containing irregular granules in protomerite. Nucleus spherical, with one karyosome. Cyst spherical or ovoidal, dehisced by simple rupture. Spores biconical, 7μ×5μ. Epimerite persistent, long slender sinuous style, set upon

the conical projection of protomerite. Many fine cirri seen on the projection.

Host : *Anthrenus vervaci* L. larva and imago. Coleoptera, Insecta.
Habitat : Intestine.
Locality : Hikari, obatake, Yanai (Yamaguti Prefecture)
Sporont :

The sporonts are solitary. The body is elongate cylindrical in shape. The maximum length is 430μ The maximum width 60μ. The length of mature individuals generally ranges between 200μ and 350μ, the width between 30μ and 50μ. The ratio of LP : TL=1 : 7—10, WP : WD=1 : 1.0. The protomerite is roughly hemispherical, widest at the base. The length of the protomerite is generally less long than its width in the old specimen, but in some specimens it is as long as, or slightly longer than, its width. The anterior end is well rounded, but there is often a small conical projection at the anterior end of the protomerite, upon which the unique slender epimerite is set in its early stage. There is a slight constriction at the septum. The deutomerite is elongate cylindrical, and widens rapidly from the septum attaining the maximum width at shoulder. It tapers from this part to a very slender posterior portion ending in a rather sharply pointed posterior extremity.

A table of the various dimensions given in microns is as follows:

Total length sporont	390	265	250	240	210
Length protomerite	40	40	35	30	30
Length deutomerite	350	225	215	210	180
Width protomerite	50	38	33	42	27
Width deutomerite	50	35	34	42	28
Ratio of LP : TL	1 : 9.8	1 : 6.6	1 : 7.1	1 : 8.0	1 : 7.0
Ratio of WP : WD	1 : 1.0	1 : 0.9	1 : 1.0	1 : 1.0	1 : 1.0
Diameter of nucleus	13	13	13	12	12

The endoc yte is dense and dark brown in colour. The protomerite contains a few large, coarse granules and it is more or less lighter than the deutomerite. The deutomerite contains fine homogineous granules. The anterior portion of protomerite is somewhat transparent, devoid of the dense endocyte.

The nucleus is visible in vivo. It is spherical in shape, measuring 10—13μ in diameter. It is situated most often towards the anterior end of the deutomerite. The position of nucleus, however, is variable. The nucleus contains one large karyosome within and occasionally several small chromatic granules are seen around the karyosome.

Cephalont:

The cephalonts are ellongate ovoidal in shape and has a long slender epimerite at the top of the protomerite. The epimerite is inserted deeply into the epithelial

cell of the intestine, which is penetrated through to the mesothelial wall. The cephalont comes off without the epimerite when it is taken out from the gut lumen in normal salt solution. At the anterior end of the protomerite, a conical or a short mobile digit-shaped projection is generally formed just before or after shedding its epimerite. In some specimens numerous fine cirri are discernible on the surface of the prjections. The slender long, sometimes sinuous style is as long as the body in young stage. In well grown cephalonts, however, it is half or shorter than the body as it grows.

The protoplasm is granular and less dense than the adults. It is palish brown in colour.

Measurments of a few cephalonts with all dimensions expressed in microns are as follows:

Total length trophozoite	80	105	123	160
Length of protomerite	15	15	18	24
Length of deutomerite	65	90	105	136
Width of protomerite	16	17	18	34
Width of deutomerite	18	21	20	36
Ratio of LP : TL	1 : 5.3	1 : 7.0	1 : 6.8	1 : 6.6
Ratio of WP : WD	1 : 1.1	1 : 1.2	1 : 1.1	1 : 1.1
Length of epimerite	50	52	54	50

Cysts and spores:

The cysts are spherical and measure between 70μ and 100μ in diameter, dehiscing by simple rupture. After the developement of the spores the cyst wall becomes much thicker, the inner mass of the center shrinking. Spores are elongate, spindle-shaped, 7μ×3μ.

Systematic position:

In my previous paper ('50) I did not fully explain the differences between this species and *Pyxinia mobuszi* LEGER & DUBOSCQ, owing to my limited observation, but now my later investigations, has made it clear that the present species may be separated from *P. mobuszi* and be classified as a new species of the genus *Pyxinia*.

The present species appears to resemble *P. mobuszi* in some points but it practically differs from the latter; that is to say, the size of the latter is much smaller than that of the former; the ratio of LP : TL is 1 : 5—6, in the latter and 1 : 7—10, in the former; spores are barrel-shaped, 6.5μ×7μ in the latter, while the former is spindle shaped, 7μ×3μ.

This species is closely resemble *P. anobii* VINCENT in the shape of the sporonts, but there is also a marked difference in size between these two species; the maximum length of the sporont of *P. anobii* is 250μ and that of this present species, 430μ. The spore is highly refringent barrel shaped in the latter but smooth

spindle-shaped is the former.

83. *Pyxinia rubecula* HAMMERSCHMIDT
(Figure 231)

Host: *Dermestes vulpinus* FABRICIUS Coleoptera, Insecta.
Habitat: Intestine.
Locality: Hikari (Yamaguti Pref.)

48. *Pyxinia japonica* HOSHIDE, 1952.
(Figures 229, 230)

Host: *Dermestes tesselatocollis* MOTSCHULSKY, *Dermestes vulpinus* FABRICIUS. Coleoptera, Insecta.
Habitat: Intestine.
Locality: Hikari, Obatake (Yamaguti Pref.).

85. *Pyxinia myelophila* HOSHIDE, 1952.
(Figures 227, 228)

Host: *Myelophilus piniperda* L. Coleoptera, Insecta.
Habitat: Intestine.
Locality: Obatake, Iwakuni, Hikari (Yamaguti Pref.)

Genus Schneideria LEGER, 1892.

85. *Schneideria pusilla* n. sp.
(Figures 240–248)

Diagnosis: Sporonts solitary, elongate. Maximum length 520μ, maximum width 90μ. Ratio of LP : TL = 1 : 5–7, WP : WD = 1 : 1. Protomerite globular, generally well rounded at anterior end, widest at of its length from the apex. No septum. Deutomerite elongate cylindrical, acutely pointed at posterior end. Epimerite a flattened disc, with a milled border, no style in the center. Nucleus spherical, with 1–5 karyosomes. Cysts spherical, 80–140μ in diameter.
Spores spindle-sha ped, 13μ × 7μ.

Host: *Penthetria japonica* WIEDEMANN. larva. Diptera, Insecta.
Habita: Intestinal caeca.
Locality: Hikari, Naruto (Yamaguti Prefecture)
Trophozoite:
The youngest forms encountered with in my preparations measured 20μ long

and 12μ wide. These forms are seen to develope intracellularly. In this stage, the body is ovoidal in shape and there is no differentiation between protomerite and deutomerite. The anterior portion of the body is slightly swollen and the posterior becomes narrower and somewhat pointed at the posterior end. The nucleus situated in the central region of the body is spherical containing one karyosome within. The nucleus measures 8μ in diameter.

When the trophozoite has grown 40μ long and 15μ wide, the parasite breaks through the host cell and sticks to the epithelial cell by means of its epimerite. The trophozoite, while still sticking to the epithelial cell, grows larger in size till it reaches about 200μ in length then it is liberated in the gut lumen losing its epimerite.

In the trophozoite of 60μ long, the anterior one-third of the body is rather more swollen than any other part of the body, and the constriction between these two parts gradually becomes visible gradually as the animal grows up.

The epimerite is a short flattened disc with a milled border, and it measures 12—15μ×8—10μ in size. There is no central style in this species.

Sporont:

The sporonts are solitary, elongate cylindrical. The largest sporont was 520μ in length and 90μ in width. The length of the sporont is generaly ranges between 250μ and 400μ, and the width between 50μ and 70μ. There is no septum between the protomerite and the deutomerite but there is a deep conspicuous constriction. The protomerite is generally globular and well rounded at the anterior end, but in some specimens the anterior half of the protomerite is rather broadly conical and narrows into a bluntly pointed end. It is widest at the beginning of posterior one third of the protomerite. The deutomerite is elongate cylindrical and its breadth is as same as that of the protomerite or slightly wider than that of the protomerite. It is widest at a short distance below the constriction or about at the beginning of the posterior two-thirds of the deutomerite. The deutomerite tapers gradually from the widest region of the greatest width, ending in a slender sharply pointed slender extremity.

Measurements of some sporonts are as follows (all dimensions are cited in microns) :

Total length sporont	440	315	310	240	220	218
Length protomerite	60	50	50	45	40	40
Length deutomerite	380	265	260	195	180	178
Width protomerite	75	60	55	50	55	50
Width deutomerite	75	60	60	50	55	52
Ratio of LP : TL	1 : 7.3	1 : 6.3	1 : 6.2	1 : 5.3	1 : 5.5	1 : 5.5
Ratio of WP : WD	1 : 1.0	1 : 1.0	1 : 1.1	1 : 1.0	1 : 1.0	1 : 1.0
Diameter of nucleus	27	28	25	27	30	25

The epicyte is thin and of even width throughout the body. The body is light brown colour of equal density in both protomerite and deutomerite. The protoplasm is homogeneous, very abundant and finely granular. The anterior region, immediately below the apex, is almost transparent, devoid of the dense endocyte.

The nucleus is spherical, and measures 27μ in average diameter. It lies generally in the upper half of the deutomerite. The nucleus is visible in vivo and contains 1—5 karyosomes which are visible without being stained.

The parasite is fairly active. Two types of movement were observed; gliding and bending. The epicyte of the deutomerite, especially that of its anterior portion, is flexible and several circular folds or wavy projections appear on the surface of the deutomerite when it moves. The protomerite does not change in shape or size while moving.

When the trophozoite has fully developed the association occurs between the liberated sporonts. The two individuals contact each other head to head. Their bodies gradually come into contract their bodies, swelling conspicuously at the anterior portion of them. The width of the protomerite attains 1 or 2 times as wide as the deutomerite. The protoplasm of the sporonts becomes thick, denser and black in transmitted light. The rotation of each member of the association is also observed. In the rotation the sporonts come closer and closer together bending their elongate slender free ends to one side and finally form a perfect sphere. The mass continues its slow rotating movement for two hours or more. The straight line which separates the two sporonts remains visible for 24—30 hours after the cyst has been formed.

While the mass is revolving, the gelatinous, transparent secreation is being excreted from the two bodies. When the movement ceases, around the cyst is formed an outer gelatinous envelope, which represents a very fine concentric layers. The cyst measures 80—140μ in total diameter and the outer envelope about 5—8μ in thickness.

The cysts are dehisced by a simple rupture and the spores are not extruded in chain. The spore is a large spindle-shaped body, measuring 13μ×7μ. It contains one large residual body in its center and 8 small sporozoites around the central body.

Systematic position:

This species belongs to the genus *Schneideria* since it is in good accordance with the features of the genus. The genus *Shneideria* has so far been reported to contains 3 species; *S. mucronata* LEGER, *S. caudata* (von SIEBOLD) LEGER, *S. praecox*. LEGER.

Among these members of the genus *Schneideria* the present gregarine bears some resemblance to *S. mucronata* and *S. caudata*,

A table of the important characteristics of the three species follows:

	S. mucronata	S. *caudata*	*S. pusilla*
Sporont	Solitary	Solitary	Solitary
Maximum length	800μ or more	1000μ	520μ
Ratio, LP : TL	1 : 7.	1 : 9.	1 : 5—7.
Ratio, WP : WD	1 : 1.	1.1 : 1.	1 : 1.
Protomerite	Irregulary, triangular, widest at posterior.	Flattened at apex widest in middle.	Globular or some what triangular, widest at posterior 2/3.
Epimerite	With milled border and a short style at center	With milled border but no style.	With milled border but no style
Nucleus	Spherical, one karyosome.	Somewhat ellipsoidal, one karyosome.	Spherical, one to five karyosome.
Cyst	Bi-spherical. 270μ×190μ	Unknown	Spherical or ellipsodal. 80—140μ in di ameter.
Spore	Fusiform, 15μ×9μ	Fusiform, 21μ×10μ	Fusiform, 13μ×7μ.
Host	*Bibio marci* L. larva.	*Sciara nitidicollis*, larva.	*Penthetria japonica*, larva.
Locality	France	France	Japan

This species closely resembles *Paraschneideria metamorphosa* (NOWLIN) NIESCHULZ ('24) in many respects but it differs from the other in size and other characters of sporont, especially in shape of the epimerite and in the life-cycle.

Genus *Cornimeritus* n. gen.

Diagnosis; Sporonts solitary. Epimerite an acute claw with a long, large flexible stalk. Cyst spherical, dehisced by simple rupture. Spores biconical extruded in lateral chains.

Systematic position:

This species belongs to the family Actinocephalidae based on the following characters peculiar to the family; Sporonts solitary, epimerite complex. Cyst dehiscence by simple rupture. Spores biconical.

In the character of the epimerite, this species has some affinity to the members of genera, *Stylocystis* LEGER 1899, *Anthorhynchus* LABBE 1899 and *Pyxinia* HAMMERSCHMIDT 1838, but it differs from them in the following points; the epimerife of this species is a sharp claw with a large flexible stalk; that of *Stylocystis* which is dicystid, is a sharply recurved cone; that of *Pyxinia* is a flat crenulate crateriform disc from the center of which rises a style; that of *Anthorhynchus* is a large fluted flattened disc which is a series of short blunt digitiform processes united laterally.

I was unable to place it in any known genus so that I propose to assign it to

the new genus *Cornimeritus*.

87. *Cornimeritus ovalis* n. sp. Type species
(Figures 235—288)

Host: *Nitidulidae* sp. Coleoptera, Insecta.
Habitat: Intestine.
Locality: Naruto (Yamaguti Prefecture)

Diagnosis: Sporonts solitary, ovoidal. Length 70—110μ, width 15—50μ. Ratio; LP : TL=1 : 4.7, WP : WD=1 : 1.2. Protomerite hemispherical, broadly rounded at apex. Conspicuous constriction at septum. Dentomerite ovoidal, widest at shoulder, blunt at end. Nucleus spherical with one or several karyosomes. Endocyte dense light brown. Epimerite an acute claw with a long stalk. Cyst spherical, 76μ in diameter, dehiscence by simple rupture. Spores biconical 14μ×4μ.

Sporonts:

The sporonts are solitary. The adult is broadly ovoidal, but it is more slender and elongate ovoidal in the immature stage. The epimerite still persists even on some of the largest individuals. It is a sharp claw with a long, large flexible stalk and measures 40μ or more in length. The stalk is elastic and fine longitudinal striations, and circular folds are observed on the surface of the living specimens.

The protomerite is hemispherical, widest a short distance above the base, that is, $1\frac{1}{2}$ to 2 times as wide as long and is broadly rounded at the apex. There is a fairly deep constriction at the septum. The deutomerite is ovoidal, widest at the shoulder just below the septum or at the end of the anterior one third of the deutomerite, and tapers gradually from the greatest width to a bluntly pointed posterior extremity.

In colour, the body is light brown. Both protomerite and deutomerite are of the equal density. The protoplasm is rather dense and homogeneous. The anterior narrow region immediately below the apex is transparent. The nucleus is visible in vivo and is spherical, mesuring 15—18μ in diameter. It contains one or several karyosomes within. The epicyte is rather thick and of equal width throughout. Longitudinal striations are clearly visible, when the parasite is in the younger stages.

In the younger stages, the body is comparatively elongate and is more slender than the adults. The protomerite is subglobular, widest in the middle and is as long as high. The deutomerite is elongate ovoidal or somewhat cylindrical in shape.

Some of the important measurements are given below; all dimensions are expressed in microns:

Total length sporonts	102	98	89	75	72

Length protomerite	22	20	18	17	15
Length deutomerite	80	70	71	58	57
Width protomerite	43	35	20	18	17
Width deutomerite	54	45	24	22	21
Ratio of LP : TL	1 : 4.6	1 : 4.9	1 : 4.9	1 : 4.4	1 : 4.8
Ratio of WP : WD	1 : 1.3	1 : 1.3	1 : 1.2	1 : 1.2	1 : 1.2
Diameter of nucleus	18	14	14	12	12
Length epimerite	26	25	32	34	40

Very active movements of the epimerite, bending, contracting and extending, were noted but the parasite progressed very slowly.

Cyst and spores :

The cysts are spherical, measuring 75μ in average diameter and the cyst wall is transparent, measuring 10μ in thickness. The cysts are dehisced by simple rupture, from apertures of which the spores are extruded in lateral chains. The spore is biconical and measures 14$\mu \times 4\mu$ in size.

Genus *Asterophora* LEGER 1892

88. *Asterophora pygmaea* n. sp.

(Figures 290, 291)

Diagnosis: sporonts solitary, cylindrical. Maximum length 220μ, average length 170μ, average width 50μ. Ratio of LP : TL=1 : 3.7, WP : WD=1 : 1.3. Protomerite conical. Deep constriction at septum. Deutomerite cylindrical, widest at shoulder, broadly rounded posteriorly. Epimerite a thick disc with a milled border and a flexible stile projecting from center. Nucleus spherical 23—25μ in diameter, containing one karyosome. Endocyte dense, brown. Cyst and spores not known.

Host: *Mycetophagus* sp. larva and adult. Coleoptera, Insecta.

Habitat: Intestine.

Locality: Obatake (Yamaguti Pref.)

Sporont:

The sporonts are solitary. The body is elongate cylindrical in spape. The largest sporont measured 220μ in length, while the sporonts averaged 170μ in length and 50μ in width. The average ratio of LP : TL=1 : 3.7, WP : WD=1 : 1.3. The protomerite is cone-shaped and gradually widens upwards from the septum. It is widest a short distance above the septum and from here it narrows rather rapidly to the anterior end, contracting intensly at the anterior one third and terminating in a blunt anterior end. The width of the protomerite is almost equal to its height. There is a deep constriction at the septum. The deutomerite is cylindrical or elongate ovoidal, widest at the shoulder and thence it tapers gradually to the

posterior end, terminating in a broadly rounded extremity.

The epimerite persists long after the animal has completed its developement. The epimerite is composed of two parts; the central style and the thick disc with a milled border. The former is about 3μ long and flexible, situated on the anterior end of the protomerite. The latter is supported with the central style and measures 7μ×5μ in size. Its border is milled with a fine notches.

The nucleus is spherical. Diameter attains about one third the width of the deutomerite. It measures 23—25μ in diameter and contains one large karyosome, which is spherical and measures 10μ in diameter.

A few typical measurements of sporonts are given in the following table; all dimensions are given in microns;

Total length sporont	110	175	178	190	205
Length protomerite	32	47	43	55	58
Length deutomerite	78	128	135	135	147
Width protomerite	26	38	41	58	50
Width deutomerite	32	48	53	80	63
Ratio of LP : TL	1 : 3.4	1 : 3.7	1 : 4.1	1 : 3.5	1 : 3.5
Ratio of WP : WD	1 : 1.2	1 : 1.3	1 : 1.3	1 : 1.4	1 : 1.3
Diameter of nucleus	15	22	20	24	25

The body is brown, the protoplasm being dense in all parts except the conical upper portion of the protomerite. This portion is nearly transparent containing fine granules. The epicyte is thin, 2μ in thickness, and of the same width throughout. The anterior portion of the protomerite often becomes thicker than the other portions.

Trophozoite:

The smallest trophozoite found in smears was 45μ in length and 18μ in width. The body is ovoid and nearly transparent with a small quantity of endoplasm. The measurements of a fairly large trophozoite in microns are as follows: Total length 83, length protomerite 30, deutomerite 53, width protomerite 28, deutomerite 30. Ratio of LP : TL=1 : 2.8, WP : WD=1 : 1.1. Size of epimerite 10×7. Diameter of nucleus 13. When the specimens are on a slide in a normal salt solution for a long time, the discoidal part of the epimerite is often fallen off from the body and only the central style remains, which sluggishly moves now to one side and then to the other.

Movement:

A contortion of the body is common, either with on displacement of the body as a whole or in connection with the gliding movement. The epicyte in the region just below the septum is very flexible, resulting in a nodding of the protomerite from side to side without change of position.

Systematic position:

Though the cyst and spores have not been observed, this gregarine may be classified to the genus *Asterophora* on account of the shape of the epimerite. Among the members of this genus, this species resembles superficially *A. mucronata* LEGER, except in the following points: The length of *A. pygmaea* n. sp. is 220μ in maximum; that of *A. mucronata* 250μ. The ratio of LP : TL of *A. pygmaea* is 1 : 3.7; that of *A. mucronata* is 1 : 2.2. The protomerite of *A. pygmaea* is cone-shaped and as long as wide or a little longer than it is wide; that of *A. mucronata* is elongate, twice as long as it is wide. The nucleus of *A. pygmaea* is spherical with one karyosome; that of *A. mucronata* is ovoidal with several karyosomes.

This species is the smallest of all the members of this genus.

89. *Asterophora orientalis* n. sp.

(Figures 310–314)

Diagnosis: Sporonts solitary, elongate cylindrical, aveage length 250μ, width 37μ. Average ratio of LP : TL=1 : 3.7, WP : WD=1 : 1.4. Protomerite elongate cone-shaped. Slightly constriction at septum. Deutomerite elongate cylindrical, widest slightly below shoulder, tapering to a blunt point. Epimerite a globular cushion with a central style, the periphery of cushion is milled with 7–10 ribs. Nucleus ellipsoidal, measuring 25$\mu\times$15μ, with one karyosome. Cyst spherical or somewhat ovoidal, 100μ in diameter. Dehiscence is by simple rupture. Spores elongate biconical, 15$\mu\times$7μ.

Host: *Holostrophus orientalis* LEWIS. larva and adult. Coleoptera, Insecta.

Habitat: Intestine.

Locality: Hikari (Yamaguti Pref.)

The host is a small beautiful beetle, usually caught in a rotten wood. Among sixty two hosts examined in June, 1952, twenty seven were infected by this gregarine.

Trophozoite:

Several small trophozoites are usually found in the intestine of the host. One of them measured in microns as follows: Total length 40, length protomerite 14, length deutomerite 26, width protomerite 14, width deutomerite 21. Ratio of LP : TL=1 : 2.9, WP : WD=1 : 1.5. Diameter of nucleus 9, diameter of karyosome 7. size of epimerite 17$\times$10. The body is ovoidal. The protomerite is roughly hemispherical, widest slightly above the septum and narrows gradually from this part to the anterior portion, ending in a small conical projection, on which a discoidal epimerite is situated. The epimerite consists of a discoidal cushion and a short neck. The cushion is milled with 7 fine longitudinal ribs in this species. In some specimens a central style, measuring 15–20μ in length is discernible. There is a

slight constriction at the septum. The deutomerite is subglobular or somewhat ovoidal, widest in the middle, tapering to a broadly rounded posterior extremity. The ectocyte is very thin and endcyte is light brown in colour with small quantity of fine granules. The nucleus is coparatively large, spherical, in diameter attaining half the width of the deutomerite. It contains one large karyosome within.

Sporont:

The sporonts are solitary, elongate cylindrical. The maximum length recorded was 325μ, the maximum width 52μ. The average length 250μ. Averaged width 40μ. The retio of LP : TL=1 : 3.3–4.0, WP : WD=1 : 1.2–1.7. The protomerite is elongate cone-shaped or cylindrical and widens in the middle, sometimes constricted slightly above the middle. The anterior end of the protomerite is projected in a small conical process which bears an epimerite. There is a slight constriction at the septum. The deutomerite is elongate cylindrical, widest at a short distance below the shoulder and tapers gradually from here toward the posterior region, terminating in a bluntly rounded posterior extremity. In some specimens the deutomerite is of the same width throughout and just a little bit wider than the protomerite.

The epimerite persists long, and even a fairly large adult sporont has it on the protomerite. It consists of two parts, a discoidal cushion and a central style. The periphery of the discoidal cushion is milled with 7–10 ribs. The central style 20–25μ in length is distinctly seen in some specimens, and is blunt anteriorly, but sometimes it cannot be seen or appears to be a slightly upheaved projection.

A table of dimensions of a few sporonts is given here; all dimensions are expressed in microns :

Total length sporont	125	135	138	180	230	300
Length protomerite	38	33	38	45	63	80
Length deutomerite	87	100	100	135	167	220
Widthprotomerite	23	20	30	30	30	35
Width deutomerite	33	34	38	43	35	45
Ratio of LP : TL	1 : 3.3	1 : 4.1	1 : 3.6	1 : 4.0	1 : 3.7	1 : 3.8
Ratio of WP : WD	1 : 1.4	1 : 1.7	1 : 1.3	1 : 1.4	1 : 1.2	1 : 1.3

The body is light brown in colour. The anterior small portion of the protomerite is transparent or nearly so devoid of granules but the lower portion is dark, containing large irregular deeply stained granules. The deutomerite is denser than the protomerite and contains smaller homogeneous granules. The epicyte is rather thin, transparent and of even width throughout. Longitudinal striations are easily discernible in the epicyte. The myonemes are well developed especially in the protomerite and in the region of the septum. The nucleus of sporont is an ellongate ellipsoidal and measures 25μ by 15μ. It lies with its long axis parallel or

slightly inclined to the sides of the body. The position of the nucleus is variable. Sometimes it lies slightly anterior to the middie or in other time slightly posterior to that. There is one spherical karyosome in it, and the karyosome measures 5μ in average diameter.

Movement;

The gregarine is fairly active. Two types of the movement, gliding and contorting are observed. The epicyte in the region just below the septum and near the posterior end is very flexible. Here the epicyte expands and contracts with the endocyte flowing in or withdrawing it, and while moving several circular folds appear on the surface of the posterior portion of the deutomerite.

Cyst and spore:

The cysts are collected in the posterior region of the midintestine or in the excreta. As the cysts come out of the host gut at an early stage of developement, the individed nuclei of the sporonts are discernible in the cysts obtained from the excreta. Sometimes two sporonts, which contact together head to head at their anterior ends, are found. They continue their slow rotation for more than an hour after the cyst is taken out from the body.

The cysts are spherical or somewhat ovoidal, measuring 90—120μ in diameter. The outer membrane of the cyst is thin and transparent. It is measured 7—5μ in thickness. The cysts are dehisced by simple rupture. The spores are elongate biconical and measure 15μ×7μ in size.

Systematic position:

This organism resembles *Asterophora mucronata* LEGES and *A. pygmaea* n. sp.

The features of the three species are shown in comparison in the following table:

	A. mucronata	*A. pygmaea*	*A. orientalis*
Body shape	elongate ovoidal.	elongate cylindrical.	elongate cylindrical.
Total length	250μ	Maxim. 220μ Average. 170μ	Maxim. 325μ Average. 250μ
Body width	Not given.	Average. 50μ	Average. 40μ
Ratio: LP : TL	1 : 2.2	1 : 3.7	1 : 3.7
WP : WD	1 : 1.1	1 : 1.3	1 : 1.4
Protomerite	Elongate, twice as long as wide.	Cone shaped, width equal to length.	Elongate, cone shaped or cylindrical, often twice or more as long as wide.
Cnstriction at septum	Deep.	Deep.	Shallow.
Deutomerite	Same shape as protomerite, and but little longer.	Cylindrical, widest at shoulder, broadly rounded posteriorly.	Elongate cylindrical widest slightly below shoulder.
Epimerite	A flat disc with milled border and long central style.	A thick disc with milled border and flexible central style.	A flat disc with milled 7—10 ribs, short central style.

Nucleus	Ovoidal with several karyosomes.	Spherical with one karyosome.	Ellipsoidal with one karyosome.
Cyst	Spherical, 150—200μ	Not known.	Spherical or ovoid, 90—120μ
Spore	Cylindro-biconical, 8μ×3.5μ.	Not known.	Elongate biconical, 15μ×4μ.
Host	Larva of *Rhyacophila* sp.	*Mycetophagus* sp. larva and adult.	*Holostrophus orientalis*, larva and adult.
Distribution	France.	Japan.	Japan.

Genus *Actinocephalus* STEIN, 1848.

90. *Actinocephalus kintaikyoensis* HOSHIDE, 1952.
(Figures 249—251)

Host: Perlidae sp., larvae. Plectoptera, Insecta.
Habitat: Intestine and blindsac.
Lecality: Iwakuni, Obatake, Yamato (Yamaguti Pref.).

Genus *Stictospora* LEGER, 1893.

91. *Stictospora anomalae* HOSHIDE, 1952.
(Figures 232. 233)

Host: *Anomala* sp., larva. Coleoptera, Insecta.
Habitat: Intestine.
Locality: Hikari, Obatake, Yamato (Yamaguti Pref.), Hirosima (Hirosima Pref.).

92. *Stictospora kabutomusi* HOSHIDE, 1952.
(Figures 234, 235)

Host: *Xylotrupes dichotomus* L., larva. Coleoptera, Insecta.
Habitat: Intestine.
Locality: Tabuse, Obatake, Yamato (Yamaguti Pref.).

Genus *Hoplorhynchus* CARUS, 1863.

93. *Hoplorhynchus orthetri* HOSHIDE, 1935.
(Figures 265—267)

Host: *Orthetrum albistylum speciosum* UHLER. Odonata, Insecta.

Habitat: Intestine.
Locality: Obatake, Tabuse, Hikari (Yamaguti Pref.).

94. *Hoplorhynchus bouruiensis* HUKUI, 1952.

Host: *Otocryptops rubiginosus* KOCH — Chilopoda.
Habitat: Intestine.
Locality: Hukuoka (Hukuoka Pref.), Hikari (Yamaguti Pref.).

95. *Hoplorhynchus ozakii* HUKUI, 1952.

Host: *Otocryptops rubiginosus* KOCH. — Chilopoda.
Habitat: Intestine.
Locality; Hukuoka (Hukuoka Pref.),

96. *Hoplorhynchus aratoensis* HUKUI, 1952.

Host: *Cryptops japonicus* TAKAKUWA. — Chilopoda.
Habitat: Intestine.
Locality: Arato (Hukuoka Pref.).

97. *Hoplorhynchus hexacanthus* OBATA, 1953.

Host: *Coeagrion quodrigerum* SELYS. — Odonata, Insecta.
Habitat: intestine.
Locality: Hirosima (Hirosima Pref.).

98. *Hoplorhynchus magnus* n. sp.
(Figures 321—330)

Diagnosis: Sporonts solitary, obese, bottle-shaped. Maximum length 2450μ, maximum width 600μ. Protomerite subglobular broadly rounded at apex, slight constriction through its middle. Conspicuous constriction at septum. Deutomerite elongate ovoidal, widest at anterior one third of its length from septum, sharply pointed posteriorly. Endocyte dense, dark brown to black. Nucleus ellipsoidal or ovoidal, 100$\mu\times$75μ in average size, with 20 or more karyosomes. Epimerite an umbrella-shaped crown, furnished with 6-7 recurved hooks, and a long stalk. Cyst spherical, 800—1500μ in diameter. Dehiscence by simple rupture. Spores tetrahedral and spindle-shaped, 10$\mu\times$4μ.

Host: *Crocothemis servilia* DRURY — Odonata, Insecta.
Habitat: Intestine.
Locality: Yamato, Naruto (Yamaguti Prefecture).

Out of thirty-seven dragon flies examined, eighteen yielded this gregarine. The number of parasites found in a single host was small, generally two or three, but sometimes about ten or more sporonts were taken out of one insect.

Cephalont:

The cephalonts are generally elongate ovoidal in shape. The protomerite is ovoidal and nearly as long as broad. It is widest at the base and from here narrows gradually toward the apex, terminating in a well rounded anterior end. But at the center of the apex there is usually a small conical process from which the stalk furnished with the umbrella-like crown rises. The secondary constriction in the middle of the protomerite of the full-grown sporont does not appear in this stage. But the true one at the septum is rather deep. The deutomerite is ovoidal, widest at the shoulder and tapers from here gradually to the posterior end. A small conical projection is generally found at this extremity.

The epimerite consists of an umbrella-shaped crown on a long slender cylindrical stalk. The crown is furnished with 6—7 recurved sharp hooks with which the body is stuck firmly to the wall of the host gut.

For instance, measurements in micron of the body parts of a small cephalont are: total length excepting epimerite 205, length of epimerite 85, protomerite 76, deutomerite 129, width of protomerite 69, deutomerite 72. Ratio of LP : TL=1 : 2.7, WP : WD=1 : 1. The diameter of the umbrellashaped disc is 22μ and each hook measures 10μ in length. The stalk is usually somewhat dilated basally and it arises from the anterior end of the protomerite. There is a distinct constriction at the connected region just bellow the crown which is easily detached from the stalk. The nucleus is ovoidal, measures 50μ×30μ in size and contains many karyosomes.

A table of measurments of some trophozoites, in which dimensions are given in microns, follows.

Total length	470	425	390	210
Length protomerite	102	85	82	70
Length deutomerite	368	340	308	140
Width protomerite	119	128	110	70
Width deutomerite	153	155	145	70
Ratio of LP : TL	1 : 4.6	1 : 5.0	1 : 4.8	1 : 3.0
Ratio of WP : WD	1 : 1.3	1 : 1.2	1 : 1.3	1 : 1.0
Length epimerite	65	50	55	105

Sporonts:

Form and Size: The sporonts are solitary. While living the outline of its body is usualy elongated and looks like a bottle-shape easily visible with the naked eye. The largest sporont measured is 2450μ in length and 600μ in width, while they average 1950μ in length and 570μ in width. The ratio of length protomerite to total length is 1 to 6.5—8.7. The ratio of width protomerite to width deutomerite is 1 to 1.4—1.6.

The protomerite is subglobular, it is widest at the base, either flat or broadly rounded on the top. In young stage of sporont, sometimes a small cone is left by

the detachment of the epimerite persists at the apex of the protomerite. The protomerite is usually wider than it is high. There are two constrictions in the protomerite, the one is at the middle and the other at the true septum. The latter is slightly deeper than the former. The deutomerite is elongate ovoidal and it is generally constricted just below the septum. The width of this anterior portion of the deutomerite is practically the same as that of the posterior portion of the protomerite. It suddenly widens out at the end of the anterior third of the deutomerite, where it attains the maximum width of the body. From this portion of the greatest width it gradually tapers to the posterior end, terminating in a sharply pointed posterior end. But in some specimens the anterior constriction of the deutomerite does not occur and the deutomerite is simply ovoidal in outline, widest at the shoulder, tapering from here to a sharply pointed posterior extremity.

Ecto and Endoplasm: The full-grown sporont and young trophozoit differ from each other in the density of the endoplasm. The endoplasm of the sporont is much denser, being opaque and dark brown or black in transmitted light. The protomerite granules are slightly larger than those of the deutomerite. The epicyte is thick. Longitudinal and annular fine striations are easily disernible after the body crushed and the dense endoplasm released.

Measurments: A table of measurements follows, all dimensions given in microns:

Length sporont	1405	1432	1920	2210	2288
Length protomerite	215	220	250	255	264
Length deutomerite	1190	1212	1670	1955	2024
Width protomerite	272	282	320	383	396
Width deutomerite	425	440	480	553	572
Ratio of LP : TL	1 : 6.5	1 : 6.5	1 : 7.7	1 : 8.7	1 : 8.7
Ratio of WP : WD	1 : 1.6	1 : 1.6	1 : 1.5	1 : 1.4	1 : 1.4

Nucleus: The nucleus is large ellipsoidal or ovoidal, and measures $100\mu \times 75\mu$ in average size. In one of the largest specimens seen, the nucleus was $140\mu \times 110\mu$ in size and its diameter was one-sixth the breadth of the deutomerite. While the diameter of the nucleus is generally one-fourth the width of the deutomerite in adults. The ratio of the nucleus diameter to the deutomerite width seems to decrease little by little with the growth of the body which becomes shorter and wider with ages. The nucleus contains about 20 or more spherical karyosomes which measure 8μ in average diameter. The position of the nucleus is variable but it is most often in the anterior half of the deutomerite. The nucleus is invisible in vivo in the large and dense adults.

Cyst and spore:

The cysts are large, spherical shape and covered with the very thick gerati-

nous membrane. They are found in the intestinal canal or in the excreted faeces. The thickness of the cyst wall varies with the age, and it is thinner when the cyst is fresh.

A table of measurements of a few cysts is appended herewith, all dimensions given in mincros:

Number of specimen	Total diameter of cyst	Thickness of cyst wall	Diameter of inner mass
1	1400	340	720
2	1250	300	650
3	1148	255	638
4	1150	190	770
5	850	160	480

Many concentric fine layers are seen in the gelatinous membrane. The cysts are dehisced by simple rupture and the coagulated spore masses are extruded from the opening of rupture. The spore has two types: one is tetrahedral, measuring 10μ in the length of each ridge, and the other, irregular spindrical, measuring $10\mu \times 4\mu$.

Systematic position:

This species closely resembles in many respects *H. orthetri* HOSHIDE, but the present species differs from the latter in the maximum size of the sporont, which is 1850μ in length and 450μ in width in the latter, and is 2450μ in length and 600μ in width of this species. The diameter of the cysts is also much larger in this species than in the latter. The ratio of WP : WD is different between the former and the latter.

This species is different from any other members of this genus *Hoplorhynchus* in its marked large size of the sporont, then therefore, I propose for the new species the name *Hoprorhynchus magnus*.

99. *Hoplorhynchus gracilis* HOSHIDE 1954
(Figures 271—274)

Host: *Aciagrion hisopa* SELYS. Odonata, Insecta.
Habitat: Intestine.
Locality: Hikari, Tabuse, Yamato, Naruto (Yamaguti Pref.)

Genus *Ascocephalus* OBATA, 1953.

100. *Ascocephalus armatus* OBATA, 1953.
Host: *Chalaenius nigricans* WIEDEMAN, Coleoptera, Insecta.
Habitat: Intestine.
Locality: Hirosima (Hirosima Pref.), Izusi (Hyogo Pref.).

Genus *Alaspora depressa* OBATA, 1953.

101. *Alaspora depressa* OBATA, 1953.

Host: *Anoplogenius cyanescence* HOPE. Coleoptera, Insecta.
Habitat: Intestine.
Locality: Hirosima (Hirosima Pref.).

Umbracephalus n. gen.

Diagnosis: Sporonts solitary, elongate cylindrical. Nucleus elongate ellipsoidal. Epimerite, a very long neck and a anterior crown with 20 or so recurved hooks. Cyst spherical. Spores not known.

Type species: *Umbracephalus longicollis* n. sp.

Systematic position.

Though the spores and cyst dehiscence have not been observed, this species may be assigned to the family Actinocephalidae, because the sporonts are solitary and the epimerite, complex.

Among the members of this family this species is well correlated with the following genera in having the epimerite with recurved hooks; *Taeniocystis* LEGER, *Actinocephalus* STEIN, and *Hoplorhynchus* CARUS. But this species differs from the former two, *Taeniocystis* and *Actinocephalus*, in having a long neck rather than a short neck or sessile. It is distinguishable from the last one, *Hoplorhynchus* which has also a long neck and a elongate nucleus, by a considerably different number of hooks.

102. *Umbracephalus longicollis* n. gen., n. sp.
(Figures 188–190)

Host: *Lithobius* sp. Chilopoda.
Habitat: Intestine.
Locality: Naruto, Hikari (Yamaguchi Prefecture). Sakurai (Ehime Prefecture)

The host is a small centipede found under stones, barks of wood and decayed timbers in damp localities. The percentage of host animals infected by this species averaged 10% during the period of 1951 to 1952 at Naruto. But in May, 1953, out of 38 individuals of the host examined, 12 were found parasitized with this gregarine at Hikari.

Sporont

The sporonts are solitary. The shape is very elongate cylindrical. The largest sporont recorded was 1500μ in length and 250μ in width. The protomerite is elongate conical or is shaped like a bottle, widest a short distance above the septum

and from here it tapers rather acutely into a long slender neck. It terminates in a blunt point at the apex. While living the position of the greatest width of the protomerite is variable; sometimes, it is widest through the middle and othertime near the anterior extremity. There is a slight or no constriction at the septum. The deutomerite is elongate cylindrical, broadening rapidly from the septum and attaining to the greatest width in a little distance below the septum. From here it tapers gradually to a long slender tail, ending in a acutely pointed extremity.

The epimerite persists in well developed individuals. It consists of a long slender stalk and an umbrella-like crown. The crown is surmounted by a rosette of 17 to 22 recurved rigid hooks around its margine. In a large specimen the crown measured 60μ in diameter. The stalk is flexible, contractive. and is projected from the anterior conical apex of the protomerite. The length of the stalk is often over half of the length of the body.

A table of dimensions of a few sporonts is given in microns here:

Total length sporont	700	821	1000	1400	1430
Length protomerite	110	130	160	170	170
Length deutomerite	600	691	840	1230	1260
Width protomerite	60	85	70	140	170
Width deutomerite	65	90	90	160	250
Ratio of LP : TL	1 : 6.4	1 : 6.3	1 : 6.3	1 : 8.2	1 : 8.4
Ratio ofWP : WD	1 : 1.1	1 : 1.1	1 : 1.3	1 : 1.1	1 : 1.5
Length epimerite	285	320	360		

The protoplasm is dense in the deutomerite, brown in transmitted light; it is nearly as dense as in the main part of the protomerite, but the anterior projected portion is nearly devoid of endoplasm. The granules of the body are somewhat smaller in the protomerite than those in the deutomerite. The epicyte is rather thin, transparent and of even width throughout the body. Longitudinal fine striations are discernible in the epicyte and those are also seen on the long stalk.

The nucleus of the sporonts is an elongate ellipsoidal and generally it lies with its long axis parallel to the side of the body. But in some specimens it slightly inclined or rather perpendicular to the body side. The nucleus of the sporonts is an elongate ellipsoidal and generally it lies with its long axis parallel to the side of the body. But in some specimens it slightly inclined or rather perpendicular to the body side. The nucleus is not visible in vivo in the large and dense adults. The stained specimens show the nucleus containing 2 to 5 spherical or ovoidal karyosomes within. The nucleus approximates to 50μ×25μ in size in the large specimens. The position of the nucleus in the deutomerite is variable, it is usually situated at the anterior swollen portion, sometimes at the extreme anterior end or on the contrary at the posterior extremity.

This parasite is fairly active. Gliding motion and contortion of the body are

commonly observed. The anterior regions of the body, protomerite and epimerite stalk are very motile. Here the epicyte expands and contracts or bends freely, so that these protomerite and stalk take the shape of a long, crane neck.

Cephalont

In the young stages of developement, the parasite has already differentiated into the three segments. One of the small cephalonts is measured in microns as follows; Total length 172, length of epimerite 140, protomerite 46, deutomerite 126, width of protomerite 24, deutomerite 36, ratio of LP : TL = 1 : 3.7, WP : WD = 1 : 1.5. Size of nucleus 32×12. As compared with the mature sporont, the epimerite of this small individual is larger and longer, and the deutomerite shorter and more ovoidal.

Cyst

The cysts are spherical and milkish white in colour. The diameter of cysts varies above all in accordance with the thickness of the cyst wall.

Measurements of some cysts are shown here: dimensions are given in micron:

Number of specimens	Total diameter of cyst	Thickness of cyst wall	Diameter of inner mass
1	390	48	294
2	360	32	296
3	325	38	253
4	320	31	268
5	280	30	220

The cyst wall consists of two different layers of membrane, the outer one is thick, geratinous, and many fine concentric striations are seen in it, the inner one is thin, transparent and cuticular.

Urnaepimeritus n. gen.

Diagnosis: Sporonts solitary, elongate. Nucleus spherical. Epimerite a short stalk and a bowl-shaped crown with 30 or more recurved hooks. Cyst spherical, dehisced by simple rupture. Spores spindle-shaped.

Type species: *Urnaepimeritus spathiformis* n. sp.

Systematic position.

The characters mentioned above are sufficient to place the gregarine in the family Actinocephalidae. Among the members of this family, this gregarine resembles the genera, *Actinocephalus*, *Taeniocystis*, *Hoplorhynchus* and *Umbracephalus* n. gen., in that the epimerite of these genera is furnished with recurved hooks. In the genera *Actinocephalus*, *Taeniocystis*, and *Hoplorhynchus* the number of hooks is only six to eight or to ten, while in this gregarine it is 30 or more. The genus *Umbracephalus* has 20 hooks or so, but this species has 30 or more hooks. Moreo

ver the two genera have some important differences as follows: the nuclus of the present gregarine is spherical, while that of *Umbracephalus* is elongate ellipsoidal; the stalk of epimerite is short in this species, but it is very long in *Umbracephalus*; the crown of epimerite is bowl-shaped, obese in this species, but it is flattened in *Umbracephalus*.

This gregarine is unique in possessing the epimerite which is composed of a short stalk and bowl-shaped crown with 30 or more recurved hooks at its margine.

103. *Urnaepimeritus spathiformis* n. sp.
(Figures 293—298)

Diagnosis: Sporonts solitary, elongate spoon-shaped. Maximum length 280μ, maximum width 85μ. Average ratio of LP : TL=1 : 9, WP : WD=1 : 1.3. Protomerite hemispherical, twice as wide as high. No constriction at septum. Deutomerite elongate widest at anterior fourth, bluntly pointed at posterior end. Endocyte dense, brown. Nucleus spherical, 15μ in diameter, with several karyosomes. Epimerite, a short neck with 30 or more recurved hooks. Cyst spherical 125μ in average diameter, dehisced by simple rupture. Spores spindle-shaped 9μ×4.5μ.

Host: *Prolamnonxy holstii* POCOCK Chilopoda.

Habitat: Intestine.

Locality: Hikari (Yamaguti Prefecture)

Out of thirteen centipedes examined, six yielded parasites, in April, 1954. The infection was not heavy; each host contained about a dozen gregarincs.

Sporont

The sporonts are solitary. The body looks like a tadpole in shape, being swollen at the anterior half and attenuated at the posterior half. The protomerite is hemispherical, widest at the base and tapers to a well rounded anterior end. It is about twice as wide as high. There is no constriction at the septum. The deutomerite is nearly spoon-shaped, broadening rapidly backwards from the septum and attaining its greatest width at the beginning of the anterior one fourth of the body. From here the deutomerite rapidly contracts about the middle and thence it tapers very gradually to the slender tail portion, ending in a blunt extremity.

The largest sporont seen was 280μ long and 85μ wide. The average ratio of LP : TL=1 : 9, WP : WD=1 : 1.3.

Measurements of a few sporonts with all dimensions expressed in microns are as follows:

Total length sporont	195	205	245	265
Length protomerite	30	23	25	25
Length deutomerite	165	182	220	240
Width protomerite	50	53	50	58

Width deutomerite	58	75	68	77
Ratio of LP : TL	1 : 6.5	1 : 8.9	1 : 9.8	1 : 10.6
Ratio of WP : WD	1 : 1.2	1 : 1.4	1 : 1.4	1 : 1.3

The body is brown in colour, the protoplasm being very dense in all parts except the anterior region of the protomerite, immediately below the apex. This portion is transparent almost devoid of protoplasm. The main part of the protomerite is very dense and opaque, especially the lower half, deing almostblack in tra nsmitted light. The protoplasm is also dense and opaque in deutomerite but it is somewhat lighter in colour than that of protomerite. The granules are equally fine in both protomerite and deutomerite. The epicyte is rather thick transparent, measuring 2—3μ in thickness, and of even width throughout the body.

The nucleus is spherical and measures 15μ in average diameter. It contains several karyosomes within. The nucleus is not visible in vivo in the dense and opaque individuals. The situation of the nucleus, however, is variable it lies most often in the upper spherical region of the deutomerite.

The gliding movement is commonly observed and the animal moves forward very rapidly in a straight line at the rate of 6.5μ and 7μ per second. Each of these rates is for a different specimen and each movement is kept at a uniform rate over several minutes, but sometimes the parasite moves onward and backward intermittently for a short while.

Cephalont

The trophozoites are usually found sticking to the epithelial cell of the host intestine with their epimerites. They are rather elongate cylindrical in shape. The protomerite is ovoidal, widest just above the septum and is longer than wide. It is well rounded at the anterior end. There is a fairly deep constriction at the septum. The deutomerite widens rapidly from the septum and is widest at the shoulder, thence tapering gradually to a long slender but blunt cone at its extremity.

The epimerite is a wide bowl-shaped crown projecting from the anterior end of the protomerite with a fairly broad, short stalk. The crown is furnished with about 30 recurved sharp hooks circularly arranged around the anterior margin of the crown. The epimeritus meaures 30μ in width and 32μ in length in a large specimen.

A table of measurements of some cephalonts, in which all dimensions are in microns, is given here:

Total length sephalont	63	80	88	98	150
Length protomerite	30	35	38	35	50
Length deutomerite	33	45	50	63	100
Width protomerite	20	20	22	27	30
Width deutomerite	20	18	22	25	33
Ratio of LP : TL	1 : 2.1	1 : 2.3	1 : 2.3	1 : 2.8	1 : 3.0

Ratio of WP : WD	1 : 1.0	1 : 0.9	1 : 1.0	1 : 0.9	1 : 1.1
Diameter of nucleus	12	13	12	14	15
Size of epimerite	15×15	20×15	27×25	26×25	30×32

Cyst and spore

The cysts collected from the intestine or from the excreta are spherical in shape and have an average diameter of 125μ.

Measurements of a few cysts are as follows all dimensions expressed in microns:

Number of Specimens	Total diameter of cyst	Thickness of cyst wall	Diameter of inner mass
1	136	15	106
2	127	12	103
3	125	12	101
4	123	19	85

When cysts were incubated on a slide in a moist chamber, almost of them completed their development after 10 days in May, 1954.

The spores are spindle-shaped and measure 9μ×4.5μ, and they are extruded from the cyst by the simple rupture. The spores contain one large spherical residual body which is situated at its center with small eight sporozoites around the central bodies.

Acanthoepimeritus n. gen.

Diagnosis: Sporonts solitary. Nucleus spherical. Epimerite a swollen club, with numerous recurved hooks, covering its anterior surface with 9—10 rows of hooks around it.

Type species: *Acanthoepimeritus jimukade* n. sp.

Systematic position

This species resembles the genus *Geneiorhynchus* SCHNEIDER in having many spines on the epimerite but those of the latter are short bristles not in rows and those of the present species are recurved hooks in 9—10 rows around the surface of the globular crown. The anterior crown of the latter species on its short stout neck.

I would not place it in any known genus. Although I have not observed cysts and spores of these species yet, I consider this species so unique that I wish to create it as a new genus on the ground that it has a swollen club-shaped epimerite, furnished with numerous recurved hooks in 9—10 rows around it.

This genus should be assigned next to the genus *Geneiorhynchus*.

104. *Acanthoepimeritus jimukade* n. sp.
(Figures 302, 303)

Diagnosis: Sporonts solitary, ovoidal. Maximum length 200μ, maximum width 70μ. Average ratio of LP : TL=1 : 2.7, WP : WD=1 : 0.8. Protomerite subglobular, as wide as high. Slight constriction at septum. Deutomerite ovoidal, widest at shoulder, sharply pointed posteriorly. Nucleus spherical 14—17μ in diameter, with 6—10 karyosomes. Cyst and spores not known.

Host; *Mecistocephalus marmoratus* VER. Chilopoda.

Habitat: Intestine.

Locality: Kojiro, Naruto (Yamaguti Prefecture).

Sporont

The sporonts are solitary and ovoidal. The largest individual seen was 200μ in length and 70μ in width. The average ratio of LP : TL=1 : 2.7, WP : WD=1 : 0.8. The protomerite is subglobular, widest a short distance above the septum or about the middle, and its width is almost equal to its height. The anterior margin of the protomerite is well rounded. There is a shallow but conspicuous constriction at the septum. The deutomerite is roughly ovoidal, widening rapidly from the septum and attaining the maximum width at the shoulder. Thence it tapers gradually toward the posterior end, terminating in a sharply pointed extremity.

The epimerite is a mushroom-shaped structure, surmounted by numerous recurved spines in 9 to 10 rows around the upper spheric region. The region of stalk is rather broad and stout, projecting from the anterior end of the protomerite.

The body is brown in colour. The protoplasm is dense, homogeneous, containing very fine granules in the protomerite. In the deutomerite it is as dense as that of the protomerite, but the granules are slightly coarcer and larger. The epimerite is transparent easily falling off when the parasite is brought out from the host intestine in normal salt solution.

Just before the cephalont sheds its epimerite, a vacuole is formed at the base of the epimerite, and a small part of the protoplasm in the protomerite flows into the stalk of the epimerite.

The nucleus is just visible in the living specimen. It is spherical in shape and is generally situated in the anterior portion of the deutomerite; its position, however, is variable. It measures 14—17μ in diameter containing several, or 6—10, karyosomes within.

Figures for a few individuals measured are as follows; all dimensions are given in microns:

Total length sporont	170	140	124	108	94
Length protomerite	66	52	44	38	32

Length deutomerite	104	88	80	70	62
Width protomerite	62	54	46	42	39
Width deutomerite	48	40	38	34	36
Ratio of LP : TL	1 : 2.6	1 : 2.7	1 : 2.8	1 : 2.8	1 : 2.9
Ratio of WP : WD	1 : 0.8	1 : 0.7	1 : 0.8	1 : 0.8	1 : 0.9
Size of epimerite			44×30	42×25	34×20

Family ACANTHOSPORIDAE LEGER,

Genus *Ancyrophora* LEGER, 1892.

105. *Ancyrophora gigantea* HOSHIDE, 1953.
(Figures 268—270)

Host : *Calopteryx atrata* SELYS. Odonata, Insecta.
Habitat : Intestine.
Locality : Yamato, Yamaguti (Yamaguti Pref.).

Genus *Ramicephalus* OBATA, 1953.

106. *Ramicephalus ozakii* OBATA, 1953.

Host : *Chlaenius inops* CHAUDOIR Coleoptera, Insecta.
Habitat : Intestine.
Locality : Hirosima (Hirosima Pref.).

Coronoepimeritus n. gen.

Diagnosis : Sporonts solitary. Epimerite a crown-like, globular structure, situated on a short neck and furnished with many small digitiform processes branched or not, covering the surface of the crown. Cysts dehisce by simple rupture. Spores ellipsoidal or ovoidal with long filament like polar spines.

Type species : *Coronoepimeritus japonicus* n. sp.

Systematic position

The gregarine may be classified to the family Acanthosporidae, since the sporont is solitary, the cyst is dehisced by a simple rupture and the spore has polar spines.

This gregarine superficially resembles the genus *Ramicephalus* OBATA in that the epimerite is furnished with many small processes, but it differs from the latter as follows : The small processes on the epimerite of *Coronoepimeritus* n. gen. are

numerous, and cover almost all the surface of the crown and consist of ones branched and not branched; those of *Ramicephalus* are less in number, arranged at the periphery of the disc alone and all of them are branched in dendroidal. The spore of *Coronoepimeritus* is ellipsoidal or ovoidal with one or four long filament like polar spines; but that of *Ramicephalus* is biconical with one row of polar on both sides and one row of equatorial spines.

The characters of this genus are different from any other genus of this family Acanthosporidae; *Acanthospora*, *Corycella*, *Ancyrophora*, *Prismatospora*, and *Cometoides* in some points, especially so in the well developed crown like epimerite and the remarkably long filament like polar spines. Then I propose to create a new genus named *Coronoepimeritus* for this gregarine and the new genus will be fixed next to *Ramicephalus*.

107. *Coronoepimeritus japonicus* n. gen., n. sp.
(Figures 304–308)

Diagnosis : Sporonts solitary, elongate ovoid. Length 700μ to 1200μ, width 250μ to 450μ. Average ratio of LP : TL=1 : 8.0, WP : WD=1 : 1.2. Protomerite dome-shaped, twice as wide as high. Slight constriction at septum. Deutomerite elongat ovoidal, widest a short distance below shoulder, tapering to a bluntly pointed posterior end. Endocyte very dense, light brown, ectocyte thick. Nucleus spherical, measuring 90μ in average diameter, with about 10 karyosomes. Epimerite a crown-like globular structure with short neck, furnished with numerous small digitiform processes branched or not branched, covering the surface of the crown. Cysts spherical, 650–1050μ in total diameter, dehiscence by simple rutpure. Spores ellipsoidal, 6μ×12μ, with 2 long filament-like polar spines at each pole.

Host : *Locusta migratoria danica* LINNE, *Oedaleus infernalis de* SAUSSURE, *Atractomorpha bedeli* BOLIVAR, *Oxa japonica* WILLEMSE, *Oxa velox* FABRICIUS, *Acrida lata* MOTSVHULSKY, Orthoptera, Insecta.

Habitat : Intestine and pyloric caeca.

Locality : Various districts in Yamaguti and Hirosima Prefectures.

This parasite seems to stick commonly to the intestine of various grasshoppers in the western districts of Japan. The infection was heavy, more than two hundreds parasites found in each of several hosts, and more than 50% of the hosts examined contained at least 20 or 30 parasites in autumn, 1953, at Naruto, Yamaguti Prefecture.

Trophozoite

A small ovoidal trophozoite which penetrate into the epithelial cell of the intestine was found in its youngest stage in sections. The intra-cellular stage is

relatively brief in this species, very few examples being observed in sections. There is no septum in its body but a well defined spherical nucleus with one karyosome is discernible in the middle. It measures $17\mu \times 10\mu$.

The intra-cellular trophozoite, which attains a length of 30μ has the septum between the protomerite and the deutomerite. It is situated at the terminal portion of the epithelial cell. As the animal increases in size, the epimerite is differentiated as a small papilla from the apex of the protomerite. The surface of the epimerite is smooth at first without any digit-shape process.

The cephalonts, soon after the intra-cellular stage, come to be provided with a globular epimerite with several digit-shaped processes on its top. The epimerite still remains embedded in the epithelial cell. The main part of the body is exposed in the gut lumen. They measure 50μ in length and 20μ in width.

Forms measuring $50-650\mu \times 30-250\mu$ were commonly seen, sticking to the epithelial cells by means of an epimerite. Epimerite in this stage of development, is a crown-like, globular structure with a short neck furnished with numerous digitiform processes. Some of these processes are diversified into several fine branchs but others are simple digitform processes which are blunt at their tips. The globular crown measured $100\mu \times 70\mu$ in size in the individual of 620μ length. Almost all surface of the crown is covered with many processes and even at its undersurface many processess are seen surrounding the short neck.

Measurements of a fow cephalonts with all dimensions expressed in microns are as follows :

Total length	65	90	142	420	585	620
Length protomerite	20	25	33	90	110	110
Length deutomerite	45	62	109	330	475	510
Width protomerite	30	37	60	140	160	180
Width deutomerite	40	45	63	165	175	220
Ratio of LP : TL	1 : 3.3	1 : 3.6	1 : 4.3	1 : 4.7	1 : 5.3	1 : 5.6
Ratio of WP : WD	1 : 1.3	1 : 1.2	1 : 1.1	1 : 1.2	1 : 1.1	1 : 1.2
Diameter of nucleus	22	25	30	60	70	85

In a fairly large cephalont, the body is elongate ovoidal in shape. The protomerite is hemispherical, widest at the base, and it is approximately one and a half times as wide as high. There is a constriction, not very deep, at the septum. The deutomerite is elongate ovoidal, broadening rapidly from the septum and attaining the maximum width a short distance below the shoulder. It tapers gradually toward the posterior end, terminating in a blunt extremity.

The endocyte of the deutomerite is very opaque and dense, being light brown in transmitted light. The protomerite is somewhat less dense than the deutomerite. The anterior small region of the protomerite is almost transparent devoid of endoplasm. Both protomerite and deutomerite are finely granular, and often larger and

coarser granules are seen in the peripheral layer of the endocyte. The ectocyte is thick and measures 20μ in thickness, and the epicyte is also thick, transparent, of even width throughout and is longitudinally striated. The myonemes are will developed especially on the deutomerite and in the region of the septum. They are shown as a series of delicate reticular fibrillae embedded in the peripheral layer of the endocyte.

The nucleus is spherical and measures 50—80μ in diameter. It contains 6 to 10 spherical karyosomes within. A large karyosome looks like an alveolar body, clearly formed of chromatin and achromatin. The nucleus is invisible in the dense individuals but visible in the young trophozoites.

As the body of trophozoites in size, the ratio of various body parts varies, especially the ratio of protomerite length to total increases gradually.

Sporont

The sporonts are solitary, elongate ovoidal or cylindrical. The maximum length observed was 1200μ and the maximum width 450μ. The length of sporonts generally varies between 750μ and 1000μ, the width between 250μ and 400μ. The average ratio of LP : TL=1 : 8.0, WP : WD=1 : 1.2.

The protomerite is dome-shaped, dilated just avove the base and tapering rapidly to a broadly rounded anterior end. The widest part is a little anterio to the septum. It is about twice as wide as high. There is often a small conical projection at the anterior center of the protomerite and a slight indentation is discernible here, and it is left by the detachment of the epimerite. There is no constriction or only a vague one, if ever, at the septum. The deutomerite is elongate and its shape is almost same as that of the cephalont.

The endocyte become denser than that in the trophic stage and the body is pearly white in reflected light. It is light or dark brown in transmitted light on account of protoplasm. The nucleus is not visible because of the density of protoplasm. In the stained preparations the nucleus is spherical or somewhat ovoidal in shape and contains 10 or more spherical karyosomes. The diameter of the nucleus averages 90μ and is nearly half the width of the deutomerite.

A table of measurements in which all dimensions are given in microns is shown here :

Specimens collected from *Locusta migratoria danica* LINNE

Total length	927	970	1088	950	1100	956
Length protomerite	110	102	136	175	176	185
Length deutomerite	817	868	952	775	924	771
Width protomerite	253	255	298	280	270	380
Width deutomerite	298	306	310	315	310	445
Ratio of LP : TL	1 : 8.4	1 : 9.5	1 : 8.0	1 : 5.4	1 : 6.3	1 : 5.2
Ratio WP : WD	1 : 1.2	1 : 1.2	1 : 1.1	1 : 1.1	1 : 1.1	1 : 1.2

Specimens from *Acrida lata* MOTSCHULSKY

Total length	698	765	850	808	798	1050
Length protomerite	93	110	126	85	112	180
Length deutomerite	605	655	724	723	686	870
Width protomerite	204	238	298	360	270	285
Width deutomerite	221	289	383	460	408	420
Ratio of LP : TL	1 : 7.5	1 : 7.0	1 : 6.7	1 : 9.5	1 : 7.1	1 : 5.8
Ratio of WP : WD	1 : 1.1	1 : 1.2	1 : 1.3	1 : 1.3	1 : 1.5	1 : 1.5

The body in the young sporonts is elongate ovoidal, but it broadens appreciably in the matured ones. Young sporonts are very active in their movements and both gliding and bending movement are observed. The older ones become slugish in progressing forwards but tend only to bend and twist their body or to lie motionless in masses coming together with other mature ones. The two sporonts which first attach themselves to each other by the anterior end of the body then begin to rotate and come laterally closer and closer together. After two or three hours' slow rotation of the mass, a perfect sphere is formed. In the newly formed cyst one can still perceive the protomerite and deutomerite of each sporont through the thin outer cyst membrane, since the two parts are different in their density. But this defference will soon disappear and the straight line separating the two sporonts alone is left visible. This line persistted long after the cyst had been formed and in some specimens it was visible for about thirty hours.

Cyst and spore

The cyst completely formed is a opaque, pearly white spherule surrounded by a thick cyst wall. The cyst wall is composed of two different membranes; an inner and an outer one. The inner one, enclosing the two sporonts is thin, transparent and non-structure. It averages 10μ in thickness. The outer one is thick, gelatinous and stratified with many fine concentric threads.

A table of measurements of some cysts follows, in which all dimensions are given in microns :

Total diameter of cyst	Thickness of cyst wall	Diameter of inner mass
950	195	560
935	190	555
808	152	502
680	115	450
665	110	445
660	125	410

After the cyst has been formed, the separating line between two sporonts are

discernible for two or three days, but it becomes faintly and disappears soon. When the cysts are kept in Ringer's solution, they are generally dehisced by simple rupture after five or six days. The outer gelatinous membrans is dissolved and the inner one is equally divided in two. The inner sporemass is remarkably swollen and extruded through this opening.

The spore is eilipsoidal and measures $6\mu \times 12\mu$. There are two long filament like spines at each pole. The length of each spine is about three times as long as the spore and measures 30μ or 32μ.

108. *Coronoepimeritus monospinus* n. sp.
(Figures 327–331)

Diagnosis : Sporonts solitary, elongate ellipsoidal or cylindrical. Maximum length of sporont, 1400μ, width 500μ. Protomerite hemispherical, widest at the base, well rounded anteriorly. Slight constrition at septum. Deutomerite elongate cylindrical, widest at the shoulder, tapering to a broadly rounded end. Ratio, of LP : TL=1 : 5.6–7.1, WP : WD=1 : 1.1–1.7. Endocyte dense, dark brown, epicyte thick, stout. Nucleus spherical, 80μ in average diameter, with many karyosomes. Epimerite a crown-like, subglobular structure sets upon a short neck, furnished with many digitiform processes on the crown. Cysts spherical, measuring 1700μ in average diameter, covered with very thick cyst wall. Cyst dehiscence by simple rutpure. Spores ovoidal, $13\mu \times 8\mu$, with one long filament-like spine at one pole.

Host : *Euconocephalus thumbergi* STAL Orthoptera, Insecta.

Habitat : Intestine and gastric caeca.

Locality : Naruto, Yanai (Yamaguti Prefecture)

During the autumn of 1952, I frequently found that out of twenty five grasshoppers examined thirteen were parasitized by this gregarine.

Sporont

The parasites are solitary, never associative in the normal sporont life. The maximum length of sporonts found was 1400μ and maximum width 500μ. Ratio of LP : TL=1 : 5.6–7.1, WP : WD=1 : 1.1–1.7. The sporont is elongate ellipsoidal or cylindrical in shape. The protomerite is nearly hemispherical, generally wider than high, widest at the base and is well rounded apically. But a small indentation is present at the anterior end of the protomerite, where the epimerite is detached. There is a slight constriction at the septum. The deutomerite is elongate cylindrical or ovoidal, widest at the shoulder and tapers gradually from the widest portion toward the posterior end, terminating in a broadly rounded extremity. In some sporonts there is a fairly deep constriction a little above the middle and the widest portion is at the middle. As the sporont becomes older, the body gets

shorter and shorter.

A table of dimensions of a few sporonts is given here; all dimensions are expressed in microns :

Total length	1270	1190	960	700	970	940
Length protomerite	180	200	140	125	150	145
Length deutomerite	1090	990	820	575	820	795
Width protomerite	310	270	190	200	390	320
Width deutomerite	435	420	230	230	430	560
Ratio of LP : TL	1 : 7.1	1 : 6.0	1 : 6.9	1 : 5.6	1 : 6.5	1 : 6.5
Ratio of WP : WD	1 : 1.4	1 : 1.6	1 : 1.2	1 : 1.2	1 : 1.1	1 : 1.8

The endocyte of the deutomerite is dense and opaque, dark brown in transmitted light. The protomerite is somewhat less dense than the deutomerite and is light brown in colour. The anterior small portion immediately below the apex is nearly transparent. The epicyte is fairly thick, 2μ in thickness and of even width troughout except the anterior portion of the protomerite and near the septum where it becomes thicker. Longitudinal fine epicytal striations running all over the body are easily perceivable in vivo. The sarcocyte and myonemes are also well developed. They are especially so at the anterior end of the protomerite.

The nucleus is spherical, measuring 80μ in average diameter and contains many small spherical karyosomes. They are 20 or more in number. The nucleus is not visible in the dense adults, but visible in the younger trophozoites.

Trophozoite

Trophozoites which stick to the epithelial cells of the intestine are commonly observed in sections. The epimerite is a large, crown-like subglobular structure set upon the anterior end of the protomerite with a short neck. The crown measures 90μ×70μ in a fairly large cephalonts, and is furnished with many digitiform processes on its surface. Some of the processes branch off into several fine.

Measurements of a cephalont in microns are given as follows : Total length 430, protomerite 70, deutomerite 360, width of protomerite 132, deutomerite 195, Ratio of LP : TL=1 : 6.1, WP : WD=1 : 1.5. Size of epimerite 70×55. Diameter of nucleus 65.

Cyst and spore

Cysts are easily collected from the intestine or from the excreted faeces. They are spherical in shape and the total diameter varies mainly depending on the thickness of the cyst wall. The cyst wall consists of two layers of membrane; an inner and an outer one. The inner membrane is transparent, non-structure and stout. The outer one is geratinous, grayish and very thick.

Measurements of some cysts (all dimensions expressed in microns) are :

Total diameter of cyst	Thickness of inner membrane	Thickness of outer membrane	Diameter of inner mass
1770	30	485	740
1810	25	510	740
2190	35	700	720
2090	35	640	740
750	25	50	600
820	25	60	650

The cyst is dehisced by simple rupture. The spore is ovoidal and measures $13\mu \times 8\mu$. There is a long filament-like spine measured 60μ in length at one end and the other end well rounded. Two mounted bands are seen over the surface of the spore as shown in Fig. 331.

Systematic position

This organism closely resembles *Coronoepimeritus japonicus* n. sp. in the character of the epimerite and in the shape of the sporont but it differs from the latter as follows : The maximum length of sporont of *C. monospinus* is 1400μ: that of *C. japonicus* is 1200μ. The total diameter of cyst is much larger in *C. monospinus* than in *C. japonicus*. The spore of *C. monospinus* is ovoidal and has a long filament-like spine at one pole; the spore of *C. japonicus* has 4 long spines, which are less longer than the former one.

Family STYLOCEPHALIDAE ELLIS, 1912.

Genus *Stylocephalus* ELLIS, 1912.

109. *Stylocephalus japonicus* HOSHIDE, 1951.
(Figures 253–255)

Host : *Gonocephalus pubens* MARSEUL, *Gonocephalus japanum* MOTSCHULSKY Coleoptera, Insecta.

Habitat : Intestine.

Loicalty : Hikari (Yamaguti Pref.).

Genus *Spherorhynchus* LABBE, 1899.

110. *Spherorhynchus sedenis* HOSHIDE, 1952.
(Figure 252)

Host : *Sedenis valpiges* MARS Coleoptera, Insecta.

Habitat : Intestne.

Locality : Obatake (Yamaguti Pref.).

Family DACTYLOPHORIDAE LEGER, 1892.

Genus *Trichorhynchus* SCHNEIDER, 1882.

111. *Trichorhynchus pulcher* SCHNEIDER, 1882.
(Figure 256)

Host : *Thereunema tuberculata* WOOD, *Thereunema clunifera* WOOD. Chilopoda.
Habitat : Intestine.
Locality : Hikari, Tokuyama, Obatäke (Yamaguti Pref.).

Genus *Filipodium* HUKUI, 1939.

112. *Filipodium ozakii* HUKUI, 1939.

Host : *Siphonosoma cumanense* (KERERSTEIN) Sipunculidae, Annelida.
Habitat : Trophic stage in gut, sporont in rectal wall, cyst in coelom.
Locality : Onomiti, Hirosima (Hirosima Pref.), Obatake, Hikari (Yamaguti Pref.)

Genus *Nina* GREBNECKI, 1873.

113. *Nina japonica* HOSHIDE, 1952.
(Figuress 315,316)

Host : *Scolopendra subspinipes multilans* L. KOCH. Chilopoda.
Habitat : Intestine.
Locality : Hikari, Iwakuni, Obatake (Yamaguti Pref.).

Family GREGARINIDAE

114. *Gregarina ctenolepsimae* HOSHIDE, 1954.
(Figure 292)

Host : *Ctenolepsima villosa* ESCHERICH Thysanura, Insecta.
Habitat : Intestine.
Hocality : Hikari, Yanai, Obatake (Yamaguti Pref.).

Tintinospora n. gen.

Diagnosis : Sporonts in associations of two or three. Epimerite a simple globular papilla. Cysts dehisce by simple rupture, and spores extruded in chains.

Spores combined in pair, dumb-bell-shaped.

Type species : *Tintinospora soroniae* n. sp.

Sistematic position : This parasite belongs to the family Gregarinidae since the sporonts are bi- or tri-associative, each member having a septum, and the trophozoites having a simple symmetrical epimerite.

In point that the sporonts are ocassionally tri-associative and the epimerite, a simple papilla, this species resembles the genera *Hirmocystis*, *Protomagalhaensia* and *Gregarina*, but it also differs from those genera in having a queer spores. I was unable to place it in any known genus. Therefore, I have this species assigned to a new genus, and named *Tintinospora* n. gen. Fixing it to the last position of this family.

115. *Tintinospora soroniae* n. sp.
(Figures 277–285)

Diagnosis : Sporonts bi- or triassociative, elongate. Maximum length association 350μ, average length sporont 150μ, width 50μ. Ratio, $\frac{LP : TL}{lp : tl} = \frac{1 : 3.9-5.0}{1 : 6.3-8.4}$, $\frac{WP : WD}{wp : wd} = \frac{1 : 1.3-1.7}{1 : 1.2-1.4}$. Protomerite hemispherical, well rounded anteriorly. Deep constriction at septum. Deutomerite cylindrical or elongate ovoidal, widest at posterior fifth, broadly rounded or truncated at end. Nucleus spheircal, 20μ in diameter, with one karyosome. Endocyte very dense, brown. Cysts spherical, 90μ in average diameter, Spores extruded by simple rupture in lateral chains. Spore dumbell-like. measures $14.4\mu \times 5\mu$.

Host : *Soronia japonica* REITTER Coleoptera, Insecta.

Habitat : Intestine.

Locality : Obatake (Yamaguti Prefecture)

The host of this species is a small light brown beetle which is commonly caught on the fallen fruit of *Citrus sinensis*. The larva of this beetle feeds on the same rotten fruit during ealy summer, and is also parasited by this gregarine. The infection was fairly heavy; as many as one hundred or more parasits was found in each of hosts, and some hosts contained at least a few parasites.

Trophzoite :

The youngest trophozoite found in the epithelial cells of the host gut is a small ovoidal or ellipsoidal one, measuring $15\mu \times 10\mu$, and has no septum in the body. When the intracellular trophozoite grows, slightly and its body attains 20μ or more, they are provided with a definite septum between the protomerite and the deutomerite. They generally lie in the outer marginal portion of the host cell. Soon after this intracellular stage the ovoidal trophozoites, which insert their small epimerite into the host cell and hang down in the gut lumen, are usually found in sections. They measure $22\mu-25\mu \times 14-17\mu$ in size, and the epimerite is

a small spherical knob.

The body is swolen simply at first but afterwards it increases in length as it grows, and becomes a cylindrical or an ellongate ovoidal cephalont. The epimerite of the fairly developed cephalonts is a small hyaline spherical knob attached to the anterior end of the protomerite without a stalk.

The protomerite of the cephalont is hemispherical, rather wider than it is high and widest just above the septum. There is a deep conspicuous constriction at the septum. The deutomerite is ovoidal or cylindrical, widest just below the septum, tapering very gradually into the broadly rounded posterior end. It is from $1\frac{1}{2}$ to 2 times as long as its breadth and is slightly constricted about the middle portion. The endocyte is not dense. It is noticed that the anterior region of the protomerite is nearly transparent and several fine striations are often radiated on its epicyte.

The nucleus is spherical and usually placed slightly anteriorly or about the middle of the deutomerite. It has a distinct nuclear membrane and contains one spherical karyosome.

The following table denote the measurements of some cephalonts in microns :

Total length cephalont	30	42	70	110	128	200
Length protomerite	10	13	20	26	30	40
Length deutomerite	20	29	50	84	98	160
Width protomerite	17	22	30	35	32	50
Width deutomerite	25	30	32	38	40	65
Ratio of LP : TL	1 : 3.0	1 : 3.2	1 : 3.5	1 : 4.2	1 : 4.3	1 : 5.0
Ratio of WP : WD	1 : 1.5	1 : 1.4	1 : 1.1	1 : 1.1	1 : 1.3	1 : 1.3
Diameter of nucleus	11	11	13	15	15	25
Diameter of epimerite	7	7	8	8	8	10

Sporont :

The sporonts are biassociative, elongate ovoidal or ellipsoidal. Sometimes three sporonts in association were found. The maximum length of an association observed was 350μ. Sporonts averaged 150μ in length and 50μ in width. The primite is generally larger than the satellite, but in some specimens, on contrary to this general rule, either the satellite is slightly larger or the two sporonts differ but little in size.

(Primite) The average ratio of LP : TL=1 : 4.5, WP : WD=1 : 1.5. The protomerite is subglobulal, widest at the base, and terminates in a well rounded extremity. Sometimes there is a slight constriction just above the base, which is especially conspicuous in the living specimens. The constriction at the septum is fairly deep and conspicuous. The deutomerite is cylidrical or elongate ovoidal, broadening gradually backwards from the septum and attaining its greatest width

at the beginning of the posterior one fifth of the deutomerite. From this portion the deutomerite rapidly contracts and terminates in a very broadly rounded or a somewhat flattened posterior end.

(Satellite) The average ratio of LP : TL = 1 : 7.5, WP : WD = 1 : 1.3. The protomerite is flattened at top and bottom and two to three times as wide as high. The anterior portion of the protomerite is slightly widened and usually wider than the posterior portion. The anterior top is concaved in a shallow dish, in which the end of the primite is accepted and fitted closely. The interlocking device between the primite and the satellite is well constructed. sporonts of an association being not easily dissociated by slight pressure. The constriction at the septum is conspicuous. The deutomerite is cylindrical or ovoidal, widest a little behind the septum and it tapers from the widest portion towards the posterior end, ending in a well rounded, or sometimes in a truncated posterior extremity. In the living stage, a deep constriction often occurs at the posterior portion of the deutomerite, and the portion is swollen in a subglobular form.

The endocyte is very dense both in protomerite and in deutomerite, and is light brown in colour. The anterior part of the protomerite of the pritmite is transparent. The epicyte is thin and of even width throughout, in which fine longitudinal striations are easily discernible when the animal is not so dense.

The nucleus is scarcely visible in vivo. It is spherical, averaged 20μ in diameter and the diameter is about two-thirds of the width of the deutomerite. One large karyosome is seen in it.

A list of the essential measurements with dimensions in microns is shown here :

Total length association	325	325	275	225	235
Primite :					
Length sporont	185	175	150	125	117
Length protomerite	40	38	38	25	26
Length deutomerite	145	137	112	100	91
Width protomerite	38	38	48	35	30
Width deutomerite	58	55	61	45	50
Ratio of LP : TL	1 : 4.6	1 : 4.6	1 : 3.9	1 : 5.0	1 : 4.5
Ratio of WP : WD	1 : 1.5	1 : 1.4	1 : 1.3	1 : 1.3	1 : 1.7
Diameter of nucleus	20	20	22	17	17
Satellite :					
Length sporont	140	150	125	100	118
Length protomerite	18	18	20	13	14
Length deutomerite	122	132	105	87	104
Width protomerite	50	48	45	38	38
Width deutomerite	63	61	53	50	52

Ratio of LP : TL	1 : 7.8	1 : 8.3	1 : 6.3	1 : 7.7	1 : 8.4
Ratio of WP : WD	1 : 1.3	1 : 1.3	1 : 1.2	1 : 1.3	1 : 1.4
Diameter of nucleus	20	22	20	16	17

The parasite is fairly active. Gliding motion was observed at the rate of 14μ or 8μ per second. It was accompanied by no bodily contortion for the given animal the rate was fairly constant as long as ten minutes. Sometimes a few gregarines, which move forwards intermittently, was observed, changing its rate of speed. Besides the progressive movement, bending or contorting movement is also commonly to be observed. This movement is chiefly performed at the just upper or lower portion of the septum. The protomerite is turned from side to side while the parasite is gliding forwards.

Cyst and spore :

Many cysts are found in the intestine or in the faecal matters of the host. They are spherical and measure from 85μ to 105μ in total diameter. The cyst wall is transparent and averages 20μ in thickness. The cysts are dehisced by simple rupture and the spores are exuded from the aperture in lateral chains, attaching to each other side by side. The form of the spore is characteristic, dumbbell-shaped. It measures 14.4μ×5μ in size and has a covering around the middle portion.

Abbreviation

TL = total length
tl = total length of satellite
LP = length of protomerite
lp = length of protomerite of satellite
WP = width of protomerite
wp = width of protomerite of satellite
WD = width of deutomerite
wd = width of deutomerite of satellite
LE = length of epimerite
N = nucleus
K = karyosome

IV. The cephaline gregarines of Japan together with their hosts.

Parasite	Host	Order or Class
LECUDINIDAE		
1. *Lecudina longissima* HOSHIDE	*Lumbriconereis japonica* MARENZELLER	Polychaeta
2. *L. mammilata* HOSHIDE	*Nereis japonica* IZUKA	
	N. mictodonta MARENZELLER	
3. *L. arabellae* n. sp.	*Arabella iricor* (MONTAGU)	
4. *L. amphora* n. sp.	*Glycera rouxii* AUDOUIN & EDWARD	
5. *L. fluktus* IITSUKA	*Urechis unicinctus* von DRASCH	Echiuroidea
6. *Cochleomeritus lysidici* HOSHIDE	*Lysidice punctatus* RISSO	Polycaeta
7. *Ferraria iwamusii* HOSHIDE	*Marphysa iwamusi* IZUKA	
POLYRHABDINIDAE		
8. *Sycia cirratuli* n. sp.	*Cirratulus cirratulus* MULLER	
CEPHALOIDOPHORIDAE		
9. *Cephaloidophora communis* MAWRODIADI	*Balanus amphitrite albicostatus* PILSB.	Cirripedia
10. *C. setoutiensis* n. sp.	*Orchestia platensis* KROYER	Amphipoda
11. *C. punctata* n. sp.	*Ampithoe japonica*(STEBBING)	
12. *C. obatakeensis* n. sp.	*Orchestia* sp.	
13. *C. pagri* n. sp.	*Eupagrus samuelis* STIMPSON	Deeapoda
14. *C. lata* n. sp.	*Penaeopsis akayebi* (RATHBUN)	
15. *C. akayebi* n. sp.	*Penaeopsis akayebi* (RATHBUN)	
16. *Carcinoecetes ozakii* n. sp.	*Penaeopsis akayebi* (RATHBUN)	
17. *C. japonicus* n. sp.	*Penaeus japonicus* (BATE)	
STENOPHORIDAE		
18. *Stenophora fusiuli* HOSHIDE	*Fusiulus* sp.	Dipropoda
19. *St. suhoensis* HOSHIDE	*Fuisulus simodanus* TAKAKUWA	
20. *St. murozumiensis* HOSHIDE	*Fusiulus* sp.	
21. *St. orthomorphae* HOSHIDE	*Orthomorpha* sp.	
22. *Stenophora flexuosa* n. sp.	*Orthomorpha* sp.	Dipropoda
23. *St. kojiroensis* n. sp.	*Orthomorpha* sp.	
24. *St. hagiensis* n. sp.	*Rhysodesmus semicircularis hosidei* MIYOSI	
25. *St. triangula* HUKUI	*Nedyopus patrioticus patrioticus* ATTEMS	
26. *St. nematoides* LEGER & DUBOSCQ	*Orthomorpha gracilis* KOCH	
27. *St. ozakii* HUKUI	*O. gracilis* KOCH	
28. *St. caudatum* (ISHII) WATSON	*Fontaria coarctata* POCOCK	

GREGARINIDAE

29. *Gregarina inago* n. sp.	*Oxa velox* FABRICIUS	Orthoptera
	O. japonica WILLESME	
30. *G. scapsipedae* n. sp.	*Scapsipedus asperuo* WALKER	
31. *G. concava* HOSHIDE	*Gampsocleis burgeri* de HAAN	
32. *G. acantholobae* HOSHIDE	*Acantholobus japonicus* de HAAN	
33. *G. korogi* HOSHIDE	*Gryllus mitratus* de SAUSSURE	
34. *G. diestrammenae* HOSHIDE	*Diestrammena japonica* KARNY	
35. *G. monoducta* HOSHIDE		
36. *G. batterum* SIEBOLD	*Blattella germanica*	
37. *G. minuta* ISHII	*Tribolium ferrugineum* FABRICIUS	Coleoptera
38. G. *rotundicephala* n. sp.	*Mycetophagus* sp.	
39. *G. conoducta* n. sp.		
40. *G. pumila* n. sp.	Tenebrionidae sp.	
41. *G. kokunusuto* n. sp.	*Tenebrioides mauritanicus* L.	
42. *G. grandicephala* n. sp.	*Anisodactylus signatus* PANZER	
43. *G. echinata* n. sp.	*Lesticus magnus* MOTSCHULSKY	
44. *G. plesiophthalmi* HOSHIDE	*Plesiophthalmus nigrocyanus* MOTSCHULSKY	
45. *G. ulomae* HOSHIDE	*Uloma latimanus* KOLBE	
46. *G. minor* HOSHIDE	*Allecula fulginosa* MACKLIN	
47. *G. gomimusi* HOSHIDE	*Amara chalcites* DEJEAN	
48. *G. katherina* WATSON	*Coccinella bruckii* MULO	
49. *G. phyllotretae* HOSHIDE	*Phyllotreta vittata* FABRICIUS	
50. *G. rhomborrhinae* HOSHIDE	*Rhomborrhina japonica* HOPE	
51. *G. lypropsi* HOSHIDE	*Lyprops sinensis* MARSEUL	
52. *G. platycephala* HOSHIDE	*Tenebrio picipes* HERBST	
53. *G. cuneata* STEIN	*Tenebrio molitor* L.	
	T. obscurus FABRICIUS	
54. *G. polymorpha* (HAMM.) STEIN	*Tenebrio molitor* L.	
55. *G. ovata* DUFOUR	*Anisolabis maritima* BORELLI	Dermaptera
	A. annulipes LUCAS	
56. *G. gonocephali* OBATA	*Gonocephalus pubens* MARSEUL	Coleoptera
57. *G. ovosatellites* OBATA	*Chlaenius noguchii* BATES,	
	Chl. nigricans WIEDEMAN	
	Chl. circumdatus BRULLE	
	Chl. inops CHAUDOIR	
58. *G. tokonoi* OBATA	*Uloma latimanus* KOLBE	
59. *G. chilichori* OBATA	*Chilochorus rubidus* HOPE	
60. *G. craspedonoti* OBATA	*Craspedonotus tibialis* SCHAUMANN	

61. *G. kamenote* HOSHIDE	*Mitella mitella* (LINNE)	Crustacea
62. *Triseptata fungicola* n. gen., n. sp.	Elotylidae sp.	Coleoptera
63. *Leidyana latiformis* n. sp.	*Tinea granella* L.	Lepidoptera
64. *L. lancea* n. sp.	*Aphonia gularis* ZELLER	
65. *L. aglossae* n. sp.	*Aglossa dimidiata* HAWORTH	
66. *Gamocystis ephemerae* (FRANZIUS) LABBE	Potamantidae sp.	Ephemeroptera
67. *Hirmocystis mirabilis* HOSHIDE	*Lyprops sinensis* MARSEUL	Coleoptera
68. *Chemidospora rhysodesmi* HOSHIDE	*Rhysodesmus semicircularis hosidei* MIYOSHI	Diplopoda
69. *C. takaoensis* n. sp.	*Rhysodesmus* sp.	
70. *Pyxinoides balani* (KOLLIKER) TRGOUBOFF	*Balanus amphitrite albicostatus* PILSBRY	Crustacea
71. *P. fujitubo* HOSHIDE	*Balanus amphitrite communis* DARWIN	
72. *Caulocephalus japonicus* n. sp.	*Chrysomela aurichalces* MANNER.	Coleoptera
	Aulacophora femoralis MOTSCHL.	

DIDYMOPHYDAE

73. *Didymophyes gigantea* STEIN	*Xylotrupes dichotomus* L.	Coleoptera
74. *D. crassa* (ISHII) WATSON	*Tribolium ferruginenm* FABRICIUS	
75. *D. diminuta* OBATA	*Aphodius rectus biformis* REITTER	

ACTINOCEPHALIDAE

76. *Pileocephalus hydropsychus* HOSHIDE	*Hydropsychus* sp.	Trichoptera
77. *P. suhoensis* HOSHIDE	*Allecula fulginosa* MACKLIN	Coleoptera
78. *Steinina obconica* ISHII	*Lyrops sinensis* MARSEUL	
	Tribolium ferrugineum F.	
79. *S. minor* OBATA	Tenebrionidae sp.	
80. *S. spherospora* HOSHIDE	*Tenebrio picipes* HERBST	
81. *S. ovalis* (STEIN) LEGER & DUBOSCQ	*Tenebrio molitor* L.	
82. *Pyxinia major* n. sp.	*Anthrenus vervaci* L.	
83. *Pyx. rubecula* HAMMERSCHMIDT	*Dermestes vulpinus* FABR.	
84. *Pyx. japonica* HOSHIDE	*D. tesselatocollis* MOTSCHULSKY	
85. *Pyx. myelophila* HOSHIDE	*Myelophilus piniperda* L.	
86. *Schneideria pusilla* n. sp.	*Penthetria japonica* WIEDEMANN	Diptera

87. *Cornimeritus ovalis* n. gen., n. sp.	Nitudilidae sp.	Coleoptera
88. *Asterophora pygmaea* n. sp.	*Mycetophagus* sp.	
89. *A. orientalis* n. sp.	*Holostrophus orientalis* LEWIS	
90. *Actinocephalus kintaikyoensis* HOSHIDE	Perlidae sp.	Plecoptera
91. *Stictospora anomalae* HOSHIDE	*Anomala* sp.	Coleoptera
92. *St. kabutomusi* HOSHIDE	*Xylotrupes dichotomus* L.	
93. *Hoplorhynchus orthetri* HOSHIDE	*Orthetrum albistylum speciosum* UHLER	Odonata
94. *H. bouruiensis* HUKUI	*Otocryptopus rubiginosus* KOCH	Chilopoda
95. *H. ozakii* HUKUI	*O. rubiginosus* KOCH	
96. *H. aratoensis* HUKUI	*Cryptops japonicus* TAKAKUWA	
97. *H. hexacanthus* OBATA	*Coeagrion quodrigerum* SELYS	Odonata
98. *H. magnus* n. sp.	*Crochothemis servilia* DRURY	
99. *H. gracilis* HOSHIDE	*Aciagrion hisopa* SELYS	
100. *Ascocephalus armatus* OBATA	*Chalaenius nigricans* WIEDEMANN	Coleoptera
101. *Alaspora depressa* OBATA	*Anoprogenius cyanescence* HOPE	
102. *Umbracephalus longicollis* n. gen. n. sp.	Lithobius sp.	Chilopoda
103. *Urnaepimeritus spathiformis* n. gen., n. sp.	*Prolamnonyx holstii* (POCOCK)	
104. *Acanthoepimeritus jimukade* n. gen., n. sp.	*Mecistocephalus marmatus* VER.	
ACANTHOSPORIDAE		
105. *Ancyrophora gigantea* HOSHIDE	*Calopteryx atrata* SELYS	Odonata
106. *Ramicephalus ozakii* OBATA	*Chlaenius inops* CHAUDOIR	Coleoptera
107. *Coronoepimeritus japonicus* n. gen., n. sp.	*Locusta migratoria danica* LINNE.	Orthoptera
	Oedaleus infernalis de SAUSSURE	
	Atractomorpha bedli BOLVER	
	Oxa japonica WILLEMSE	
	O. velox FABRICIUS	
	Acrida lata MOTSCHULSKY	
108. *Coronoepimeritus monospinus* n. gen., n. sp.	*Euconocephalus thumbergi* STAL	
STYLOCEPHALIDAE		
109. *Stylocephalus japonicus* HOSHIDE	*Gonocephalus pubens* MARSEUL	Coleoptera
	G. japanum MOTSCHULSKY	

110. *Spherorhynchus sedenis* HOSHIDE	*Sedenis valpiges* MARS	
DACTYLOPHORIDAE		
111. *Trichorhynchus pulcher* SCHNEIDER	*Thereunema tuberculata* WOOD	Chilopoda
	T. clunifera WOOD	
112. *Filipodium ozakii* HUKUI	*Siphonostoma cumanense* (KEFERSTEIN)	Annelida
113. *Nina japonica* HOSHIDE	*Scolopendra subspinipes multilans* KOCH	Chilopoda
GREGARINIDAE		
114. *Gregarina ctenolepsimae* HOSHIDE	*Ctenolepsima villosa* ESCHERICH	Thysanura
115. *Tinlinospora soroniae* n. gen., n. sp.	*Soronia japonica* REITTER	Coleoptera

Hosts with their Cephaline Gregarines Parasites

Host	Parasite
ANNELIDA	
Polychaeta	
Lumbriconereis japonica MARENZELLER	*Lecudina longissima* HOSHIDE
Nereis japonica IZUKA	*Lecudina mammilata*HOSHIDE
N. mictodonta MARENZELLER	
Arabella iricor (MONTAGU)	*Lecudina arabellae* n, sp.
Glycera rouxii AUDOUIN & EDWARD	*Lecudina amphora* n. sp.
Urechis unicinctus von DRASCH	*Lecudina fluktus* IITSUKA
Lysidice punctata RISSO	*Cochleomeritus lysidici* HOSHIDE
Marphysa iwamusi IZUKA	*Ferraria iwamusi* HOSHIDE
Cirratulus cirratulus MULLER	*Sycia cirratuli* n. sp.
Echiuroidea	
Siphonostoma cumanense (KEFERSTEIN)	*Filipodium ozakii* HUKUI
ARTHROPODA	
CRUSTACEA	
Cirripedia	
Balanus amphitrite albicostatus PILSB	*Cephaloidophora communis* MAWRODIADI

	Pyxinoides balani (KOLLIKER) TREGOUBOFF
Balanus amphitrite communis DARWIN	*Pyxinoides fujitubo* HOSHIDE
Mitella mitella (LINNE)	*Gregarina kamenote* HOSHIDE
Decapoda	
Eupagrus samuelis STIMPSON	*Cephaloidophora pagri* n. sp.
Penaeopsis akayebi (RATHBUN)	*Cephaloidophora lata* n. sp.
	Cephaloidophora akayebi n. sp.
	Carcinoecetes ozakii n. sp.
Penaeus japonicus (BATE)	*Carcinoecetes japonicus* n. sp.
Amphipoda	
Orchestia platensis KROYER	*Cephaloidophora setoutiensis* n. sp.
Amphithoe japonica (STEBBING)	*Cephaloidophora punktata* n. sp.
Orchestia sp.	*Cephaloidophora obatakeensis* n. sp.
CHILOPODA	
Otocryptopus rubiginosus KOCH	*Hoplorhynchus bouruiensis* HUKUI
	H. ozakii HUKUI
Cryptopus japonicus TAKAKURA	*Hoprorhynchus aratoensis* HUKUI
Prolamnonyx holstii (POCOCK)	*Urnaepimeritus spathiformis* n. gen., n. sp.
Lithobius sp.	*Umbracephalus longicollis* n. gen., n. sp.
Mecistocephalus marmoratus VER.	*Acanthoepimeritus jimukade* n. gen., n. sp.
Scolopendra subspinipes multilans KOCH	*Nina japonica* HOSHIDE
Threunema tuberculata WOOD	*Trichorhynchus pulcher* SCHNEIDER
T. clunifera WOOD	
DIPROPODA	
Fusiulus sp.	*Stenophora fusiuli* HOSHIDE
Fusiulus simodanus TAKAKUWA	*Stenophora suhoensis* HOSHIDE
Fusiulus sp.	*Stenophora murozumiensis* HOSHIDE
Orthomorpha sp.	*Stenophora orhtomorphae* HOSHIDE
Orthomorpha sp.	*Stenophora flexuosa* n. sp.
Orthomorpha sp.	*Stenophora kojiroensis* n. sp.
Rhysodesmus semicircularis hosidei (MIYOSI)	*Stenophora hagiensis* n. sp.

	Cnemidospora rhysodesmi HOSHIDE (=*Stenophora rhysodesmi*)
Rhysodesmus sp.	*Cnemidospora takaneensis* n. sp.
Nedyopus patrioticus patrioticus ATTEMS	*Stenophora triangula* HUKUI
Orthomorpha gracilis (KOCH)	*Stenophora nematoides* LEGER & DUBOSCQ
	Stenophora ozakii HUKUI
Fontaria coarctata POCOCK	*Stenophora caudatum* (ISHII) WATSON

INSECTA

Orthoptera

Gampsocleis burgeri de HAAN	*Gregarina concava* HOSHIDE
Acantholobus japonicus de HAAN	*Gregarina acantholobae* HOSHIDE
Gryllus mitratus de SAUSSURE	*Gregarina korogi* HOSHIDE
Diestrammena japonica KARNY	*Gregarina diestrammenae* HOSHIDE
	Gregarina monoducta HOSHIDE
Oxa velox FABRICIUS	*Gregarina inago* n. sp.
Oxa japonica WILLESME	*Coronoepimeritus japonicus* n. gen., n. sp.
Scapsipedus asperus WALKER	*Gregarina scapsipedae* n. sp.
Blatella germanica LINNE	*Gregarina blatterrum* SIEBOLD
Locusta migratoria danica L.	*Coronoepimeritus japonicus* n. gen., n. sp.
Oedaleus infernalis de SAUSSURE	
Atractomorpha bedli BOLIVER	
Acrida lata MOTSCHULSKY	
Euconocephalus thumbergi STAL	*Coronoepimeritus monospinus* n. gen., n. sp.

Dermaptera

Anisolabis maritima BORELLI	*Gregarina ovata* DUFOUR
Anisolabis annulipes LUGAS	

Odonata

Orthetrum albistylum speciosum UHLER	*Hoplorhynchus orthetri* HOSHIDE
Coeagrion quodrigerum SELYS	*Hoplorhynchus hexacanthus* OBATA
Crocothemis servilia DRURY	*Hoplorhynchus magnus* n. sp.
Aciagrion hisopa SELYS	*Hoplorhynchus gracilis* HOSHIDE
Calopteryx atrata SELYS	*Ancyrophora gigantea* HOSHIDE

Plecoptera

Perlidae sp.	*Actinocephalus kintaikyoensis* HOSHIDE
Ephemeroptera	
Potamantidae sp.	*Gamocystis ephemerae* (FRANZ.) LABBE
Trichoptera	
Hydropsyche sp.	*Pileocephalus hydropsychus* HOSHIDE
Lepidoptera	
Tinea granella L.	*Leidyana latiformis* n. sp.
Aphonia gularis ZELLER	*Leidyana lancea* n. sp.
Aglossa dimidiata HAWORTH	*Leidyana aglossae* n. sp.
Diptera	
Penthetria japonica WIEDEMANN	*Schneideria pusilla* n. sp.
Coleoptera	
Tenebrio molitor L.	*Gregarina cuneata* STEIN
	Gregarina polymorpha (HAMM.) STEIN
	Steinina ovalis (STEIN.) LEGER & DUBOSCQ
Tenebrio obscurus FABR.	*Gregarina cuneata* STEIN
Tenebrio picipes HERBST	*Gregarina platycephala* HOSHIDE
	Steinina sphaerospora HOSHIDE
Lyprops sinensis MARSEUL	*Gregarina lypropsi* HOSHIDE
	Steinina obconica ISHII
	Hirmocystis mirabilis HOSHIDE
Plesiophthalmus nigrocyanus MOTSCHULSKY	*Gregarina plesiophtalmi* HOSHIDE
Uloma latimanus KOLBE	*Gregarina ulomae* HOSHIDE
	Gregarina tokonoi OBATA
Allecula fulginosa MACKLIN	*Gregarina minor* HOSHIDE
	Pileocephalus suhoensis HOSHIDE
Amara chalcites DEJEAN	*Gregarina gomimusi* HOSHIDE
Coccinella bruckii NULO	*Gregarina katherina* WATSON
Alocharia mirabilis MOTSCH.	
Phyllotreta vitata FABR.	*Gregarina phyllotretae* HOSHIDE
Rhomborrhina japouica HOPE	*Gregariua rhomborrhinae* HOSHIDE
Tribolium ferrugineum FABR.	*Gregarina minuta* ISHII

	Gregerina cuneata STEIN
	Didymophyes crassa (ISHII) WATSON
Chilochorus rubidus HOPE	*Gregarina chilochori* OBATA
Craspedonotus tibialis SCHAUMANN	*Gregarina craspedonoti* OBATA
Gonocephalus pubens MARSEUL	*Gregarina gonocephali* OBATA
	Stylocephalus japonicus HOSHIDE
Chlaenius noguchii BATES	*Gregarina ovosatellites* OBATA
Ch. nigricans WIEDEMAN	
Ch. circumdatus BRULLE	
Ch. inops CHAUDOIR	
Mycetophagus sp.	*Gregarina rotundicephala* n. sp.
	Gregarina conoduta n. sp.
	Asterophora pygmaea n. sp.
Tenebrionidae sp.	*Gregarina pumila* n. sp.
Tenebrioides mauritanicus L.	*Gregarina kokunusto* n. sp.
Anisodactylus signatus PANZER	*Gregarina grandicephalus* n. sp.
Lesticus magnus MOTSCHLSKY	*Gregarina echinata* n. sp.
Elotylidae sp.	*Triseptata fungicola* n. gen., n. sp.
Chrysomela aurichalcea MANNERHEIM	*Caulocephalus japonicus* n. sp.
Aulacophora femoralis MOTSCHULSKY	
Soronia japonica REITTER	*Timlinospora soroniae* n. gen., n. sp.
Nitidulidae sp.	*Cornimeritus ovalis* n. gen., n. sp.
Xylotrupes dichotomus L.	*Didymophyes gigantea* STEIN.
	Stictospora kabutomusi HOSHIDE
Aphodius rectus biforma REITTER	*Didymophyes diminuta* OBATA
Anthrenus vervaci L.	*Pyxinia major* n. sp.
Dermestes vulpinus FABR.	*Pyxinia rubecula* HAMMERSCHMIDT
Dermestes tesselatocollis MOTSCLSKY	*Pyxinia japonica* HOSHIDE
Myelophilus piniperda L.	*Pyxinia myelophila* HOSHIDE
Holostrophus orientalis	*Asterophora orientalis* n. sp.
Anomala sp.	*Stictospora anomalae* HOSHIDE
Chalaenius nigricans WIEDEMANN	*Ascocephalus armatus* OBATA
Anoprogenius cyanescence HOPE	*Alaspora depressa* OBATA
Chlaenius inops CHAUDOIR	*Ramicephalus ozakii* OBATA
Gonocephalus japanum MOTSCULSKY	*Stylocephalus japonicus* HOSHIDE
Sedenis valpiges MARS.	*Spherorhynchus sedenis* HOSHIDE
Thysanura	
Clenolepsima villosa ESCHERICH	*Gregarina ctenolepsimae* HOSHIDE

SUMMARY

This dissertation is divided into two parts. The primary part, (I) containing the results from my observations on the relation between the host cells of some typical cephaline gregarines and their early growth was already summerized.

The secondary part, (II) contains the entries of all the cephaline gregarines found in Japan: 10 Families, 41 Genera, 115 Species that had reported before 1954 including newly recorded 7 genera and 40 species. As for the 21 species reported by the other investigaters. It is as in the following;

1) Description of those belonging to the Families Lecudinidae, Polyrhabdinidae. Cephaloidophoridae and Stenophoridae.

i. There are five species heretofore found in Japan in the Family Lecudinidae. All but *Lecudina fluktus* found from Echiuroidea by IIZUKA (1923) are parasitic on Polychaeta. More two new species, *Lecudina arabellae* n. sp., *L. amphora* n. sp. are added to these.

ii. A tricystid gregarine *Sycia cirratuli* n. sp. is added to the Family Polyrhabdinidae. Its existence had been open to doubts on account of no report ever since that done by LEGER (1892).

iii. *Cephaloidophora communis* MAWRODIADI was already found to be distributed in Japan by me (1952). Moreover 6 new species of the genus *Cephaloidophora* and 2 new species of the genus *Carcinoecetes* are founded. The latter 2 species in particular bear a striking resemblance in outward form to the genus *Porospora*. They are of the kind that does not change host.

iv. Family Stenophoridae : The three new species reported in this paper has now brought up the number of the species found in Japan to eleven. Ressembling to *Stenophora nematoides* LEGHER & DUBOSCQ, *Stenophora flexuosa* n. sp., and *St. hagiensis* n. sp. are of the interesting ones with their characteristic peculiarity of outlasting the epimerite even after it has turned a sporont.

2) Description of the members belonging to the Family Gregarinidae.

v. Family Gregarinidae : makes up the greatest number of genera and species. We have now got 3 new genera and 16 new species added. It has, therefore, brought up the aggregate number of those recorded in this family as found in Japan to 11 gera, 40 species.

Gergarina inago n. sp. is of the species remarkably thick in ectoplasm. *Gregarina echimata* n. sp. and *G. grandicephala* n. sp. found from Coleoptera are both of interesting nature, the former is particular possessed of a number of spinous processes at the posterior part of the body.

Three new species to be included in the genus *Leidyana* are found from Lepidoptera.

Triseptata fungicola n. gen., n. sp., *Cornimeritus ovalis* n. gen., n. sp. and

Tintinospora soroniae n. gen., n. sp are respectively worthy of special note for their own peculiar characteristics. *Tintinospora soroniae* together with *Gregarina ctenolepsimae* are written on the last pages of this paper, 3).

3) Description of the members belonging to the Didymophyidae, Actinocephalidae, Acanthosporidae, Stylocephalidae, Dactylophoridae.

vi. Family Didymophydae : three species are found to be distributed in Japan.

vii. Family Actinocephalidae : 7 genera and 8 species are newly added to as indigenous to Japan, totalling 18 genera, 27 species.

Umbracephalus longicollis n. gen., n. sp., *Urnaepimeritus spathiformis* n. gen., n. sp. and *Acanthoepimeritus jimukade* n. gen., n. sp. each with a complicated epimerite have been found from Chilopoda.

Besides, *Pyxinia major* n. sp., *Schneideria pusilla* n. sp., and *Hoplorhynchus magnus* n. sp. have newly added to this family, and new lights have been thrown upon the whole history of their lives.

viii. Family Acanthosporidae : *Coronoepimeritus* n. gen. widely distributed parasitic on Japanese Orthoptera have been found. It is worthy of notice in this that its sporont bears a striking resemblance to that of gregarines that have hitherto been reported as the genus *Leidyana* or the genus *Actinocephalus*, parasitic on the Orthoptera indigenous to Europe and America.

ix. Family Stylocephalidae : contains 2 genera and 3 species found in Japan.

x. Family Dactylophoridae : contains 3 genera and 3 species.

xi. All the cephaline gregarines and their hosts that have hitherto reported in Japan are listed at the end.

I express my gratitude to Mr. F. Shigematsu for correcting the English of the manuscript and also to the members of the Hikari Branch of Yamaguti Univarsity for their encouragements during this investigations.

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PLATE XV

Explanation of Plate

Figs. 221–223. *Didymophyes gigantea* STEIN.

Fig. 221. A short and broad association.

Fig. 222. An elongate association.

Fig. 223. The upper half is an anterior portion of primite, and the under half is that of satellite.

Figs. 224. *Steinina obconica* ISHII, A sporont.

Figs. 225–226. *Steinina sphaerospora* HOSHIDE.

Fig. 225. A sporont, adult stage in developement.

Fig. 226. A spore.

Figs. 227–228. *Pyxinia myelophila* HOSHIDE.

Fig. 227. A large sporont.

Fig. 228. A trophozoite.

Figs. 229–230. *Pyxinia japonica* HOSHIDE.

Fig. 229. Mature sporont.

Fig. 230. Three spores.

Fig. 231. *Pyxinia rubecula* HAMMERSCHMIDT. A mature sporont.

Figs. 232–233. *Stictospora anomalae* HOSHIDE.

Fig. 232. Mature sporont.

Fig. 233. Anterior portion of the cephalont, showing epimerite.

Figs. 234–235. *Stictospora kabutomusi* HOSHIDE.

Fig. 234. A mature sporont.

Fig. 235. Protomerite with epimerite

Figs. 236–237. *Pileocephalns hydropsychus* HOSHIDE.

Fig. 236. Mature sporont.

Fig. 237. Cephalont.

Figs. 238–239. *Pileocephalus suhoensis* HOSHIDE.

Fig. 238. Cephalont.

Fig. 239. Mature sporont.

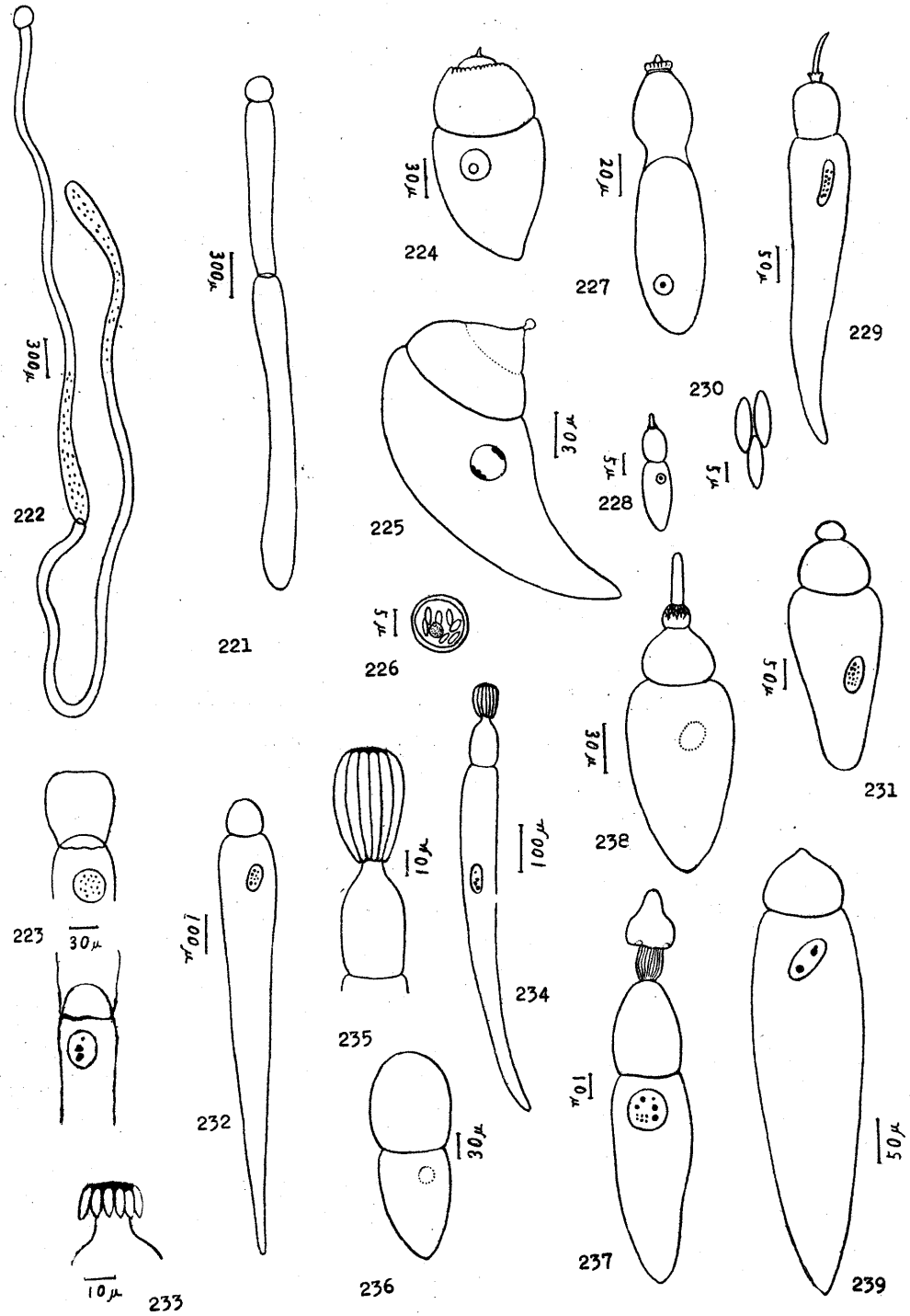
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PLATE XVI

Explanation of Plate

Figs. 240—248. *Schneideria pusilla* n. sp.

Fig. 240. One of the small trophozoites.

Fig. 241. A trophozoite with a discoidal epimerite at apex.

Fig. 242. Enlarged view of the epimerite showing its milled border.

Fig. 243. A fairly developed cephalont. Some wavy folds are seen on the body.

Fig. 245. A large sporont measured over 300μ long, showing somewhat triangular protomerite.

Fig. 246. Pair of sporonts attached to each other head to head.

Fig. 247. Section of cyst,

Fig. 248. One ripe spindle shaped spore.

Figs. 249—251. *Actinocephalus kintaikyoensis* HOSHIDE.

Fig. 249. An adult sporont with epimerite.

Fig. 250. Two spores.

Fig. 251. Anterior portion of the protomerite showing epimerite.

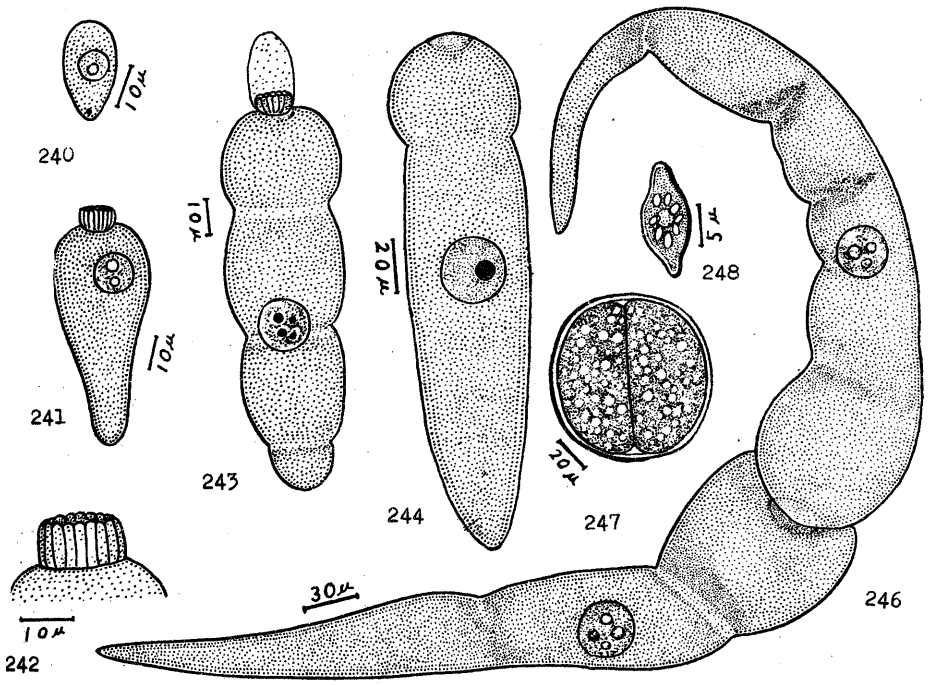
Fig. 252. *Sphaerorhynchus sedenis* HOSHIDE. A sporont.

Figs. 253—255. *Stylocephalus japonicus* HOSHIDE.

Fig. 253. An adult sporont.

Fig. 254. An individual with flame-shaped epimerite.

Fig. 255. Three cap-shaped spores in chain.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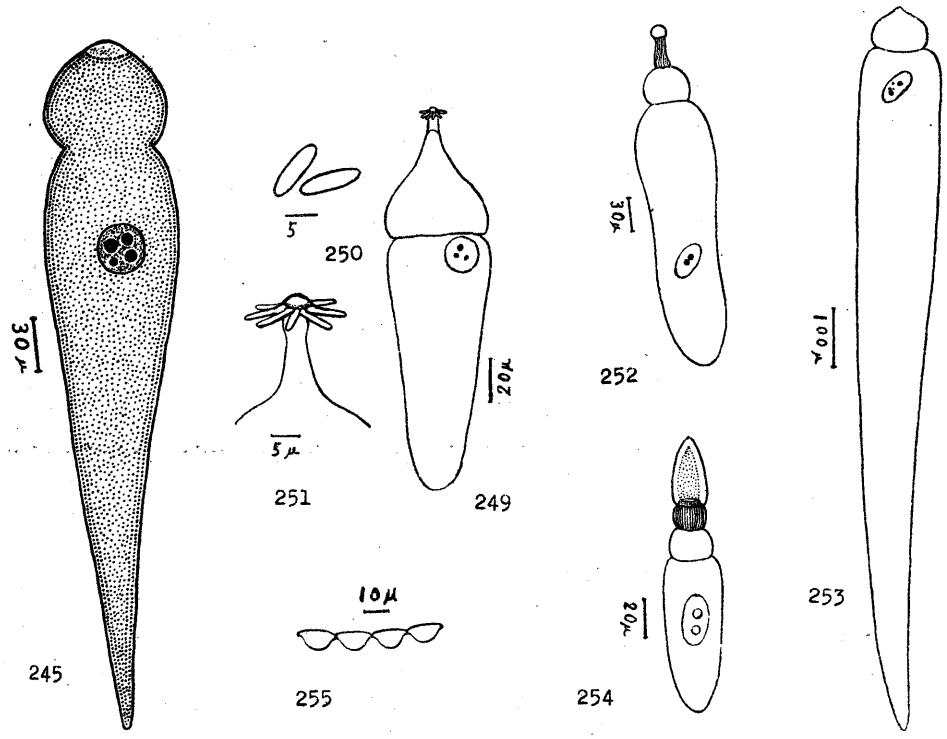
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PLATE XVII.

Explanation of Plate

Fig. 256. *Trichorhynchus pulcher* SCHNEIDER. An adult sporont.

Figs. 257–264. *Pyxinia major* n. sp..

Fig. 257. Mature sporont.

Fig. 258. Young sporont.

Fig. 259. A small cephalont.

Fig. 260. A cephalont, with epimerite in process of destruction.

Fig. 261. Enlarged view of anterior end of body, showing a slender style and a swollen basal portion with numerous cirri on its surface.

Fig. 262. Cyst after rotation has ended.

Fig. 263. A cyst, containing ripe spores and a central mass.

Fig. 264. Two ripe spores.

Figs. 265–267. *Hoplorhynchus orthetri* HOSHIDE.

Fig. 265. Mature sporont.

Fig. 266. A fairly large cephalont.

Fig. 267. Spores, (a) biconical type. (b) tetrahedral type.

Figs. 268–270. *Ancyrophora gigantea* HOSHIDE.

Fig. 268. Mature sporont.

Fig. 269. A cephalont.

Fig. 270. A spore.

Figs. 271–274. *Hoporhynchus gracilis* HOSHIDE.

Fig. 271. Mature sporont.

Fig. 272. A small cephalont.

Fig. 273. Enlarged view of epimerite.

Fig. 274. Ripe spores, (a) tetrahedral type, (b) irregular spindle-shaped one.

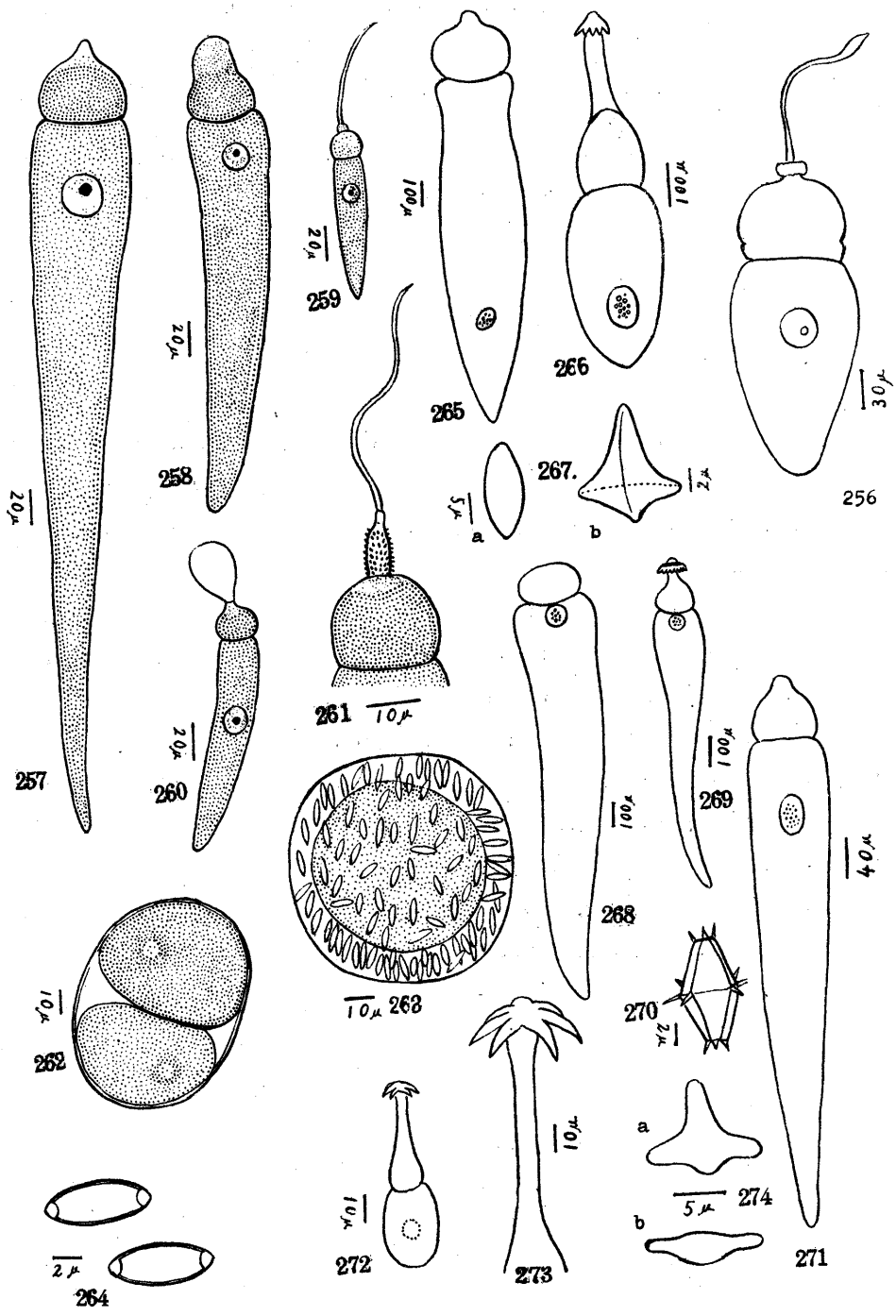
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PLATE XVIII

Explanation of Plate

Figs. 275—276. *Steinina ovalis* (STEIN) LEGER & DUBOSCQ.

Fig. 275. Asporont.

Fig. 276. Enlarged view of epimerite set upon anterior end of protomerite

Figs. 277—285. *Tintinospora soroniae* n. sp..

Fig. 277. Mature association.

Fig. 278. Another association.

Fig. 279. Association of three sporonts.

Fig. 280. Small cephalonts.

Fig. 281. Cyst.

Fig. 282. Exudation of spores from the ripe cyst by its simple rupture, and the exuded spores remain attached laterally in chains

Fig. 283. Four spores, showing they are connected side by side in chains.

Fig. 284. One spore.

Fig. 285. Cross section of the intestine of *Soronia japonica*, showing three trophozoites sheltered, two of them being in the cell and one attaching to the surface of the cell with epimerite.

Figs. 286—289. *Cornimeritus ovalis* n. gen., n. sp..

Fig. 286. Mature sporont.

Fig. 287. A younger sporont.

Fig. 288. Exudation of spores from the ripe cyst.

Fig. 289. Spores, showing two sporonts attached in chain laterally and one spore viewed on its side.

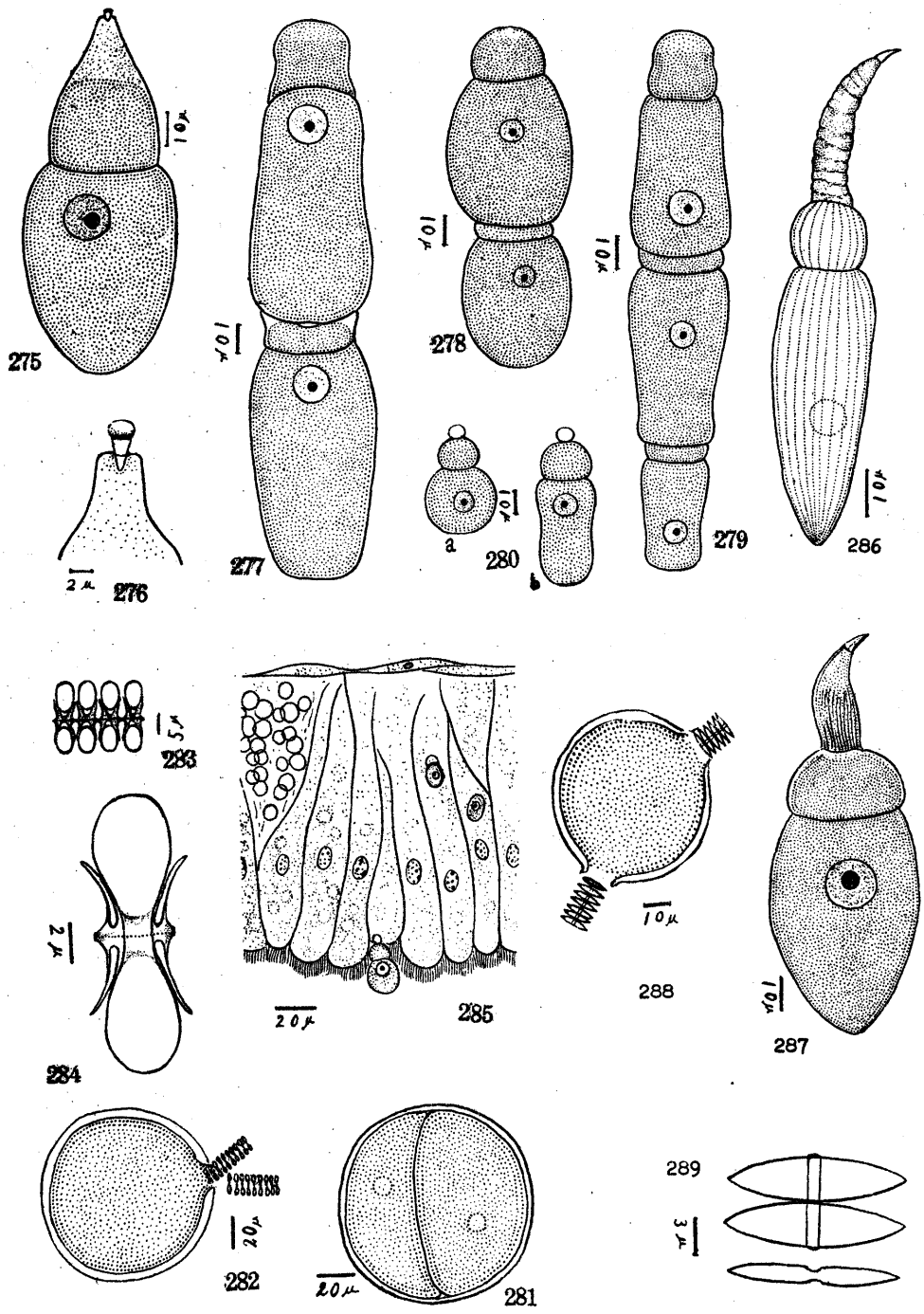
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PLATE XIX

Explanation of Plate

Figs. 290—291. *Asterophora pygmaea* n. sp..

Fig. 290. Anterior region of body, showing its unique epimerite.

Fig. 291. A sporont.

Fig. 292. *Gregarina ctenolepsimae* HOSHIDE. Mature sporont.

Figs. 293—298. *Urnaepimeritus spathiformis* n. gen., n. sp..

Fig. 293. Mature sporont.

Fig. 294. A cephalont.

Fig. 295. Enlarged view of epimerite.

Fig. 296. Underside view of the epimerite.

Fig. 297. Mature cyst, spores are being extruded by simple rupture.

Fig. 298. A ripe spore.

Figs. 299—301. *Umbracephalus longicollis* n. gen., n. sp..

Fig. 299. Mature sporont.

Fig. 300. A small cephalont.

Fig. 301. Enlarged view of the crown of epimerite.

Figs. 302—303. *Acanthoepimeritus jimukade* n. gen., n. sp..

Fig. 302. A sporont.

Fig. 303. Enlarged view of the anterior portion of the body.

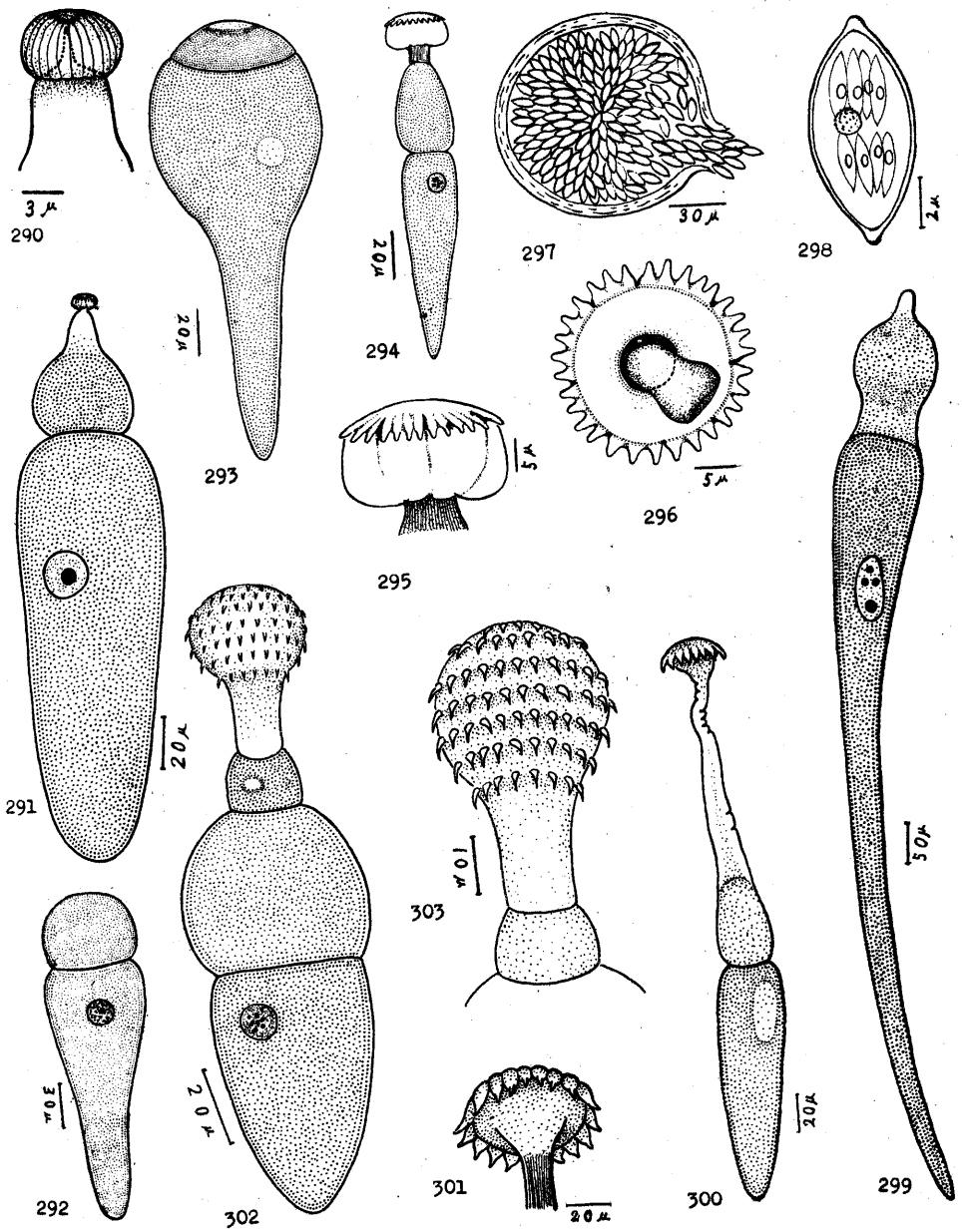
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PLATE XX

Expanation of Plate

Figs. 304—308. *Coronoepimeritus japonicus* n. gen., n. sp..

Fig. 304. A large cephalont.

Fig. 305. Two types of mature sporont. a. elongate type. b. swollen type.

Fig. 306. An epimerite, enlarged view.

Fig. 307. Cross section of sporont, showing the nucleus with 5 karyosomes.

Fig. 308. Dehiscence of cyst is shown.

Fig. 309. A spore with 4 long polar filament.

Figs. 310—314. *Asterophora orientalis* n. sp..

Fig. 310. Mature sporont.

Fig. 311. Enlarged view of the epimerite.

Fig. 312. A sporont in living.

Fig. 313. A spore.

Fig. 314. Small trophozoite.

Figs. 315—316. *Nina japonica* HOSHIDE.

Fig. 315. Mature sporont.

Fig. 316. Spores united in chains.

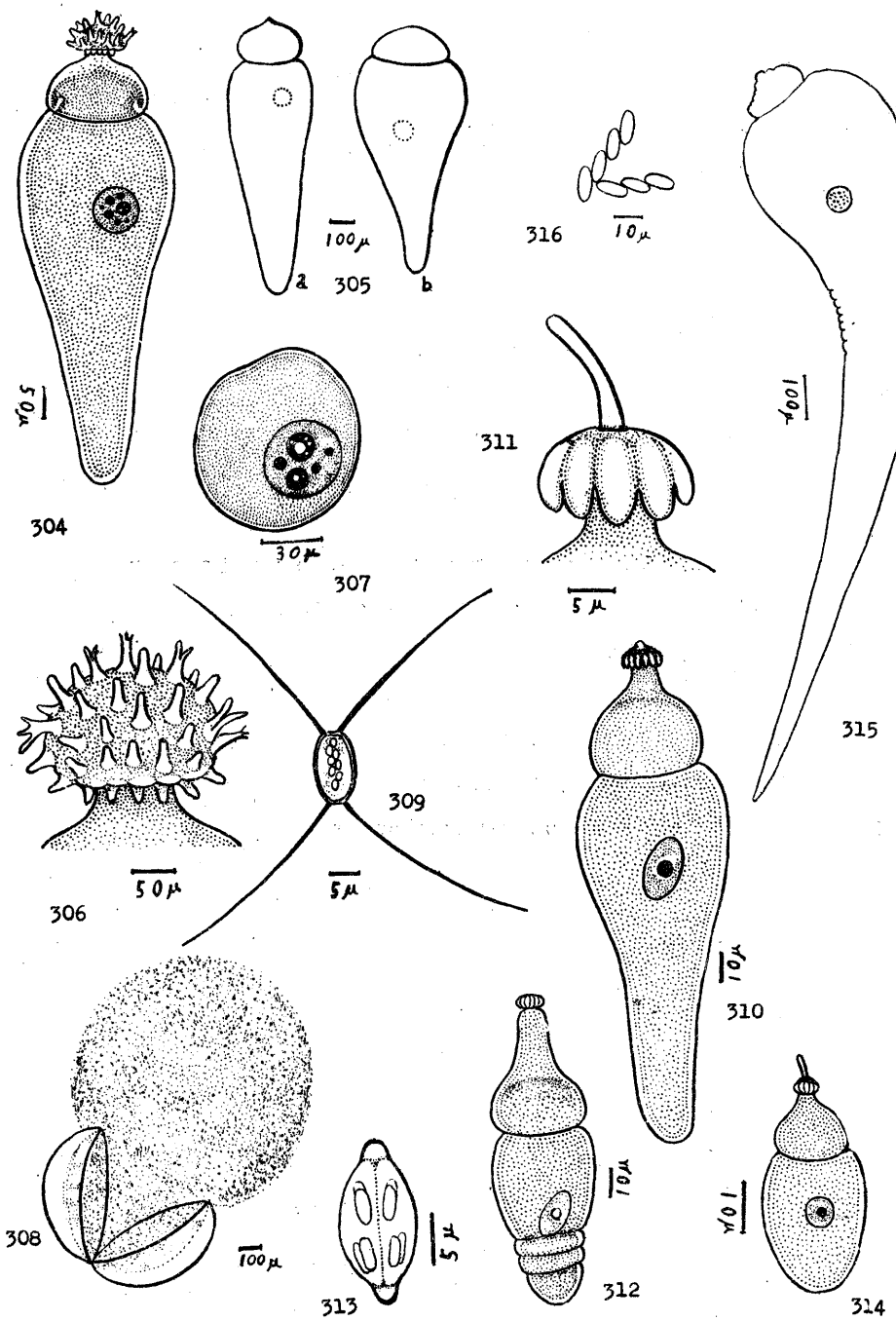
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PLATE XXI

Expanation of Plate

Figs. 317—326. *Hoplorhynchus magnus* n. sp..

Fig. 317. Mature spornt.

Fig. 318. Another large mature sporont.

Fig. 319. A sporont.

Fig. 320. A small triophozoite.

Fig. 321. Epimerite, enlarged under view.

Fig. 322. Epimerite, enlarged side view.

Fig. 323. Cyst covered with thick cyst wall.

Fig. 324. Tetrahedral spore.

Fig. 325. Spindrical spore.

Fig. 326. Two nuclei. a. in large specimen, b. in small specimen.

Figs. 327—331. *Coronoepimeritus monospinus* n. gen., n. sp..

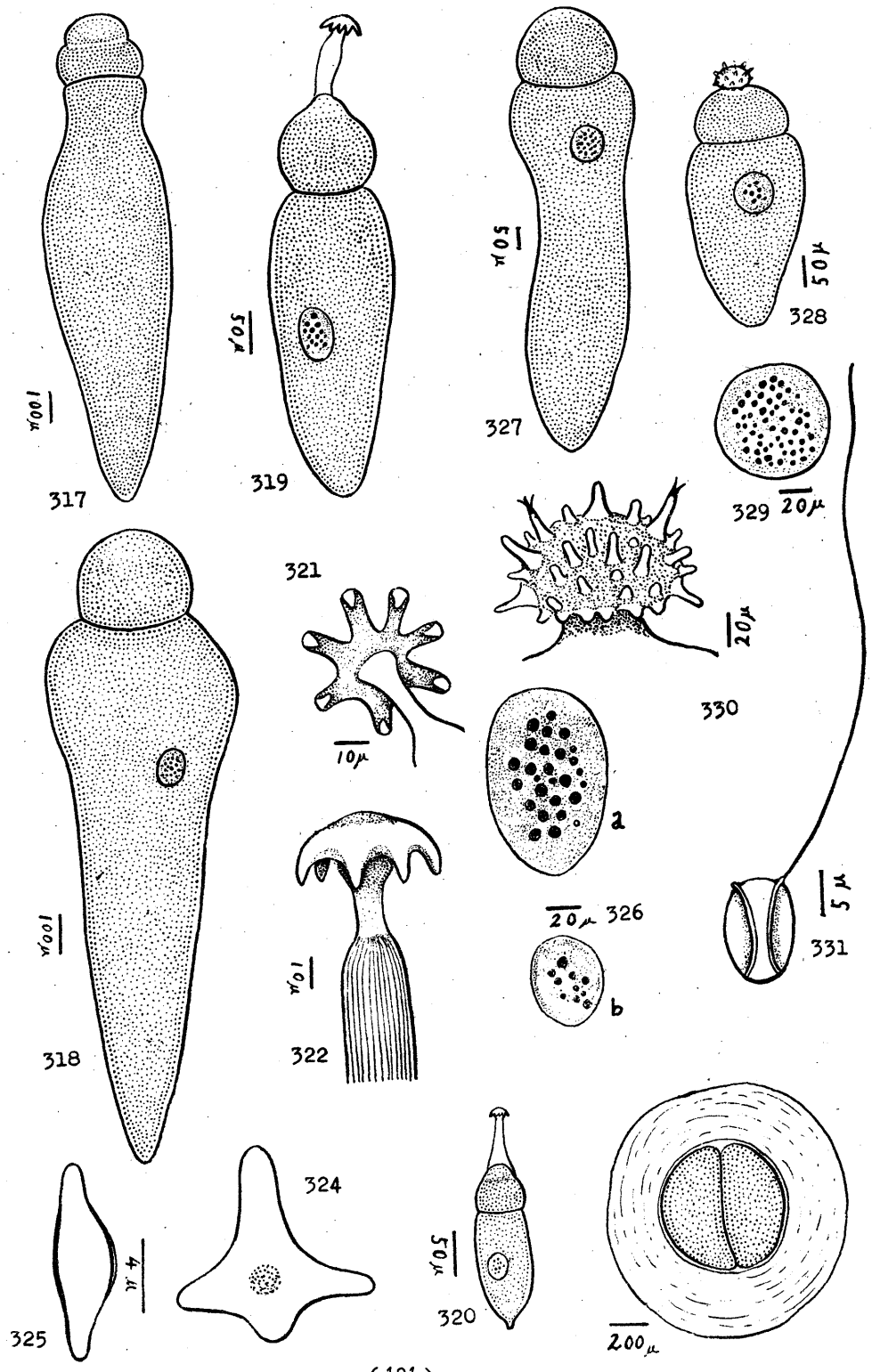
Fig. 327. Large sporont.

Fig. 328. A cephalont.

Fig. 329. A nucleus of a large sporont.

Fig. 330. Epimerite, enlarged side view.

Fig. 331. A spore with one long polar filament.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