# STUDIES ON THE CEPHALINE GREGARINES OF JAPAN. (II).

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

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### Family GREGARINIDAE LABBE, 1899.

### Genus *Gregarina* DUFOUR, 1828.

29. *Gregarina inago* n. sp.

(Figures 133–139)

Diagnosis: Sporonts biassociative, ovoidal, obese, rather stout. Maximum length of association 810$\mu$. Sporonts 250–410$\mu$ long, 180–290$\mu$ wide. Ratio, $\frac{LP:TL}{lp:tl}=\frac{1:3.3}{1:6.8}$, $\frac{WP:WD}{wp:wd}=\frac{1:2.0}{1:1.4}$. Protomerite conical, wider than long, with a small indentation at apex. Deutomerite subglobular, widest about in the middle, well rounded posteriorly, but concaved upwards at posterior end of satellite. Ectocyte remarkably thick, especially so in sarcocyte. Endocyte dense, reddish orange. Nucleus invisible in vivo, spherical, 30–40$\mu$ in diameter, with many karyosomes. Epimerite a small knob. Cyst spherical, average diameter 410$\mu$, dehisced by 2–3 long spore ducts measuring 800$\mu$ in length Spores barrel shaped, 4$\mu$×5.5$\mu$.

Host: *Oxa velox* FABRICIUS, *Oxa japonica* WILLESME. Orthoptera, Insecta.

Habitat: Intestine.

Locality: Naruto, Yamato, Hikari. (Yamaguti Prefecture)

This parasite was very commonly found in the intestine of the ordinary locusts. This species seems to be present as the first one. It never occurs in large numbers but is generally found in the same host as another gregarine of 285 locusts examined at Yamato-mura during August, 1950, 34 found to be parasitized but about 60% of the hosts yielded the species when the collection was made in the fall of 1953.

Sporont

The sporonts are commonly biassociative; on rare occasions, however, they associate in three. The longest association measured 810$\mu$. The sporonts are obese and almost ovoidal to subglobular in shape, the maximum length recorded 410$\mu$, and the maximum width 290$\mu$.

(Primite) The average ratio of LP : TL = 1 : 3.3, WP : WD = 1 : 2.0. The protomerite is nearly conical, widest just at the anterior to the base, and its breadth slightly exceeds its height. It tapers rather acutely from the base but with a blunt point at the apex where a small indentation is seen. There is a deep, conspicuous

constriction at the septum. The deutomerite is subglobular and broadens gradually from the septum to the central region. Its widest part is in the middle or slightly below the middle and then gradually becomes narrower, ending in a broadly rounded extremity. At its widest part, the deutomerite is about twice the widest part of the protomerite.

(Satellite) The interlocking device between primite and satellite is deep and well developed. The average ratio of LP : TL=1 : 6.8, WP : WD=1 : 1.4. The protomerite is flattened at top and bottom, being three to four times as wide as high. A lens-shape thickened area is discernible at the anterior end of the protomerite, by which the connection of the sporonts seems to be strethened. The constriction at the septum is deep. The deutomerite is subglobular broadening rapidly from the septum and attaining its maximum width at the end of the anterior third of the body or in the middle. From here the deutomerite gradually contracts, ending in a very broadly rounded and somewhat flattened posterior end. The posterior margine is generally concaved upward and small indentation is observed here.

The protomerite is reddish orange in colour, containing fine homogeneous granules. The deutomerite is slightly lighter than the protomerite and contains somewhat larger granules. The endoplasm is much more opaque than in many gregarines. The epicyte is thick, transparent, stout and of even width throughout. The sarcocyte is well developed, measuring 20$\mu$ in average thickness, except and the septum between protomerite and deutomerite, where it becomes thinner. Longitudinal striations ase easily discernible in the epicyte.

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

| | | | | | |
|---|---|---|---|---|---|
| Total length association | 670 | 650 | 690 | 760 | 535 |
| Primite : | | | | | |
| Total length sporont | 345 | 330 | 360 | 400 | 285 |
| Length protomerite | 100 | 90 | 120 | 130 | 100 |
| Length deutomerite | 245 | 240 | 240 | 270 | 185 |
| Width protomerite | 124 | 120 | 132 | 142 | 120 |
| Width deutomerite | 250 | 240 | 265 | 280 | 200 |
| Ratio of LP : TL | 1 : 3.5 | 1 : 3.7 | 1 : 3.0 | 1 : 3.1 | 1 : 2.9 |
| Ratio of WP : WD | 1 : 2.0 | 1 : 2.0 | 1 : 2.0 | 1 : 2.0 | 1 : 1.7 |
| Diameter of nucleus | 35 | 38 | — | — | 30 |
| Satellite : | | | | | |
| Total length sporont | 325 | 320 | 330 | 360 | 250 |
| Length protomerite | 50 | 42 | 61 | 50 | 35 |
| Length deutomerite | 275 | 282 | 269 | 310 | 215 |
| Width protomerite | 152 | 177 | 185 | 205 | 140 |
| Width deutomerite | 225 | 234 | 250 | 280 | 180 |
| Ratio of LP : TL | 1 : 6.5 | 1 : 7.6 | 1 : 5.4 | 1 : 7.2 | 1 : 7.1 |
| Ratio of WP : WD | 1 : 1.5 | 1 : 1.3 | 1 : 1.4 | 1 : 1.4 | 1 : 1.3 |

The nucleus is not visible in vivo in the large and dense individuals, but is seen in vivo in the younger sporonts and in the trophozoites. It is spherical and contains many small karyosomes. The nucleus measures 30—40$\mu$ in diameter, generally placed at the anterior portion of the deutomerite or at the middle.

In the young stage, the sporont are elongate cylindrical in shape. The protomerite of primite is hemispherical, well rounded at the apex, and the protomerite of the satellite is somewhat flattened and is a little shorter than that of the primite. The tail of the primite fits into a depression in the protomerite of the satellite, and a small indentation as that of the primite is usually seen at its anterior The deutomerite of both primite and satellite are cylindrical, of same width throughout and but little wider than the protomerite.

Cephalont

The epimerite is a small, simple and sessile knob. A slight indentation which is left by the detachment of this epimerite, persists at the apex of the protomerite. The body is ovoidal. The protomerite is hemispherical but a small conical projection at the anterior end of the protomerite to which the epimerite attach. Measurements in microns of a fairly large cephalont are : total length 120, length of epimerite 7, protomerite 40, deutomerite 80, width of protomerite 60, deutomerite 70. Ratio of LP : TL=1 : 3.0, WP : WD=1 : 1.2.

The deutomerite is ovoidal to ellipsoidal, widest at a short distance below the septum and terminates in a well rounded posterior end. The depression of the posterior surface is not observed in this stage; the ectocyte, however, is well developed and becomes thick, measuring 7$\mu$ in averaged thickness.

Cyst and spore

The encystment of the sporonts takes place in the host intestine. The newly formed cysts are reddish orange in colour and opaque and in the living specimens the position of the nuclei is invisible. The cysts are present in great number in the excreta and the whole process of the spore formation takes place outside the body of the host. Maturation period is 10 days or so in summer but much longer in autumn.

The cysts are spherical and when obtained it is at first 410$\mu$ in average diameter with an envelope, 15$\mu$ thick. Afterwards the envelope is swollen and then two different membranes are discernible. The outer one is gelatinous, and thick showing fine concentric striae, the inner one is transparent, nonstructure and thin, measuring 5—7$\mu$ in thickness.

Dehiscence is effected by sporeducts from 3—2 in number. The sporeduct measures 800$\mu$ in length. Spores are extruded from the ducts in chains. The spores are barrel-shaped and measure 4$\mu$ by 5.5$\mu$.

Measurements of several cysts, with all dimensions given in microns, follow:

| Total diamenter | Thickness of inner membrane | Thickness of outer membrane | Diameter of inner mass |
|---|---|---|---|
| 675 | 7 | 95 | 471 |
| 650 | 5 | 85 | 470 |
| 580 | 5 | 90 | 390 |
| 560 | 6 | 80 | 388 |
| 470 | 5 | 45 | 370 |

Systematic position

This species resembles *Gregarina oviceps* DIESING in some respects; for instance, the average size of the sporonts, and the ratio of LP : TL. However, there are many different points between *G. oviceps* and the present species; that is to say, the ratio of WP : WD in the latter Japanese form is larger than in the former American form, the size of cysts and spores is larger in the latter than in the former, the protomerite of the latter is slightly wider than its height, whereas that of the former is twice as wide as long.

This species has some resemblance to *G. longiducta* ELLIS and *G. nigra* WATSON, in having the approximate size of body and the ratio of LP : TL, but this species differs from them in the ratio of WP : WD, in the shape of body.

This species is distinguished from *G. rigida* (HALL) ELLIS by the considerable difference in the size and shape of body and the differece in the characters of cyst.

30. *Gregarina scapsipedae* n. sp.

(Figures 140–143)

Diagnosis : Sporonts biassociative, ovoidal. Maximum length association 579$\mu$. Average ratio, $\frac{LP : TL}{lp : lt}=\frac{1 : 3.8}{1 : 3.7}$, $\frac{WP : WD}{wd : wd}=\frac{1 : 0.9}{1 : 1.2}$. Protomerite low and broad, width twice the height. Deutomerite ovoidal, widest near shoulder, broadly rounded posterorly. Endocyte dense, dark brown. Nucleus spherical, with several karyosomes. Cyst spherical, 190–250$\mu$ in diameter, dehisce by 3–5 spore ducts, Spores barrel shape, 2$\mu$×5$\mu$.

Host : *Scapsipedus asperuo* WALKER Orthoptera, Insecta.

Habitat : Intestine.

Locality : Yamato (Yamaguti Prefecture)

Sporont

The sporonts are biassociative, even to the smallest observed. The largest association measured 579$\mu$. The sporonts are ovoidal in shape, the maximum length in primite recorded being 235$\mu$, and the maximum width 130$\mu$.

(Primite) The average ratio of LP : TL=1 : 3.8, WP : WD=1 : 0.9. The pro-

tomerite is low and broad, either flat or slightly concaved at the anterior end and generally about two times as wide as high. It is usually a little wider than the deutomerite and is widest in the middle. There is a deep constriction at the septum. The deutomerite is roughly ovoidal, widest at the shoulder or a short distance below it, tapering thence to a broadly rounded posterior extremity.

The interlocking device between the primite and the satellite is well developed.

(Satellite) The average ratio of LP : TL=1 : 3.7, WP : WD=1 : 1.2. The protomerite is cylindrical flattened at top and bottom, and the width almost equals the height or is slightly wider than long, never excessing 1½ times as long. The constriction at the septum is conspicuous. The deutomerite is elongate ovoidal, widest at a short distance below the shoulder and is approximately at the same width as the deutomerite of the primite.

The endocyte of the deutomerite is very opaque and dense, being dark brown in transmitted light. The protomerite is somewhat less dense and lighter than the deutomerite. The nucleus is not visible in vivo. It is spherical, measuring 25$\mu$ in average diameter, in diameter about one-third to one-fourth the width of the deutomerite and contains several small karyosomes. The epicyte is rather thick, of even width throughout the body. Fine longitudinal striations in the epicyte are discernible.

A table of measurements of some sporonts follows; the dimensions are expressed in microns :

| | | | | | |
|---|---|---|---|---|---|
| Total length association | 480 | 435 | 412 | 275 | 278 |
| Primite : | | | | | |
| Total length sporonts | 230 | 213 | 182 | 130 | 118 |
| Length protomerite | 60 | 56 | 50 | 34 | 25 |
| Length deutomerite | 170 | 157 | 132 | 96 | 93 |
| Width protomerite | 100 | 102 | 108 | 68 | 55 |
| Width deutomerite | 100 | 98 | 97 | 51 | 50 |
| Ratio of LP : TL | 1 : 3.8 | 1 : 3.8 | 1 : 3.6 | 1 : 3.8 | 1 : 4.7 |
| Ratio of WP : WD | 1 : 1 0 | 1 : 1.0 | 1 : 0.9 | 1 : 0.8 | 1 : 0.9 |
| Satellite : | | | | | |
| Total length sporonts | 250 | 222 | 230 | 145 | 160 |
| Length protomerite | 70 | 65 | 62 | 43 | 35 |
| Length deutomerite | 180 | 167 | 168 | 102 | 125 |
| Width protomerite | 90 | 70 | 67 | 38 | 37 |
| Width deutomerite | 110 | 95 | 80 | 44 | 45 |
| Ratio of LP : TL | 1 : 3.6 | 1 . 3.4 | 1 : 3.7 | 1 : 3.4 | 1 : 4.6 |
| Ratio of WP : WD | 1 : 1.2 | 1 : 1.4 | 1 : 1.2 | 1 : 1.2 | 1 : 1.2 |

Cyst and spore

The cysts are spherical and vary from 190$\mu$ to 250$\mu$ in diameter, the transparent envelope being about 15$\mu$ in thickness when the cyst is new. Dehiscence is by spore ducts from three to four or five in number, and the ducts measure 400$\mu$ in length. The spores are extruded from the long ducts in chains and are barrel shaped, measuring 2$\mu$ by 5$\mu$.

Systematic position

Among the members of the genus *Gregarina*. this species closely resembles in many respects the two known species *G. galliveri* WATSON and *G. korogi* HOSHIDE, but it differs from them in some important points.

The following table indicates the chief characters of the three species:

| | *G. galliveri* | *G. korogi* | *G. scapsipedae* |
|---|---|---|---|
| Maximum length of association | 590$\mu$ | 400$\mu$ | 579$\mu$ |
| Ratio LP : TL<br>WP : WD | 1 : 5<br>1 : 0.8 | 1 : 4<br>1 : 0.9 | 1 : 3.7<br>1 : 0.9 |
| Shape of protomerite of primite | Broad and flat shape slightly irregular 3 times as wide as high | Broad and flat shape bi-symmetrical 2 or 3 times as wide as high | Broad and flat shape slightly irregular 2 times as wide as high |
| Shape protomerite of satellite | Flattened, 4 times as wide as high | Flattened, same or 2 times as wide as high | Cylindrical, width equal or slightly wider than the height |
| Shape deutomerite of primite | Constricted below septum, dilated below and widest in posterior twohirds | Ovoidal, widens rapidly from septum widest at shoulder | Ovoidal, widest at or a short distance below shoulder |
| Shape deutomerite of satellite | Subspherical to broadly ovate | Ovoidal, widest at shoulder | Elongate ovoidal, widest a little below shoulder |
| Nucleus | Spherical, small | Spherical, 20$\mu$ in diameter | Spherical 25$\mu$ in diameter |
| Karyosome | —— | one | many |
| Endocyte | Very dense, deep brown in both protomerite and deutomerite | Very dense, black in both protomerite and deutomerite | Very dense, dark brown in deutomerite and somewhat less dense and lighter in protomerite |
| Cyst, diameter | 350$\mu$ | 200—300$\mu$ | 190—250$\mu$ |
| Dehiscence | Many spore pucts | 2—3 in number, 800$\mu$ length | 3—5 in number, 400$\mu$ length |
| Spores | Barrel shape 3$\mu$ × 6$\mu$ | Barrel shape 3$\mu$ × 5$\mu$ | Barrel shape 2$\mu$ × 5$\mu$ |
| Host | *Gryllus abbreviatus* SERV. | *Gryllus mitratus* SAUSSURE | *Scapsipedus asperus* WALKER |
| Locality | America | Japan | Japan |

31. *Gregarina concava* HOSHIDE, 1952.
(Figure 102)

Host : *Gampsocleis burgeri* de HAAN. Orthoptera, Insecta.
Habitat : Intestine and gastric caeca.
Locality : Obatake, Hikari (Yamaguti Pref.)

32. *Gregarina acantholobae* HOSHIDE, 1952.
(Figure 107)

Host : *Acantholobus japonicus* de HAAN. Orthoptera, Insecta.
Habitat : Intestine.
Locality : Obatake, Tabuse (Yamaguti Pref.)

33. *Gregarina korogi* HOSHIDE, 1952.
(Figure 112)

Host : *Gryllus mitratus* de SAUSSURE. Orthoptera, Insecta
Habitat : Intestine and gastric caeca.
Locality : Hikari, Obatake (Yamaguti Pref.)

34. *Gregarina diestrammenae* HOSHIDE, 1953.
(Figures 144, 145)

Host : *Diestrammena japonica* KARNY. Orthoptera, Insecta.
Habitat : Intestine.
Locality : Obatake Tabuse (Yamaguti Pref.)

35. *Gregarina mouoducta* HOSHIDE. 1953.
(Figure 146)

Host : *Diestremmena japonica* KARNY. Orthoptera, Insecta.
Habitat : Intestine.
Locality : Obatake, Tabuse (Yamaguti Pref.)

36. *Gregarina blatterum* SIEBOLD.

Host : *Blattella germanic* LINNE. Orthoptera, Insecta.
Habitat : Intestine.
Locality : Izusi (Hyogo Pref.), Obatake, Hagi, Yamaguti, Yamato (Yamaguti Pref.)

37. *Gregarina minuta* ISHII.
(Figures 174—180)

Host : *Tribolium ferrugineum* FABRICTUS. Coleoptera, Insecta.
Habitat : Intestine.
Locality : Naruto, Hikari (Yamaguti Prefecture), Izu-province.

This host is commonly found in the province of Suho, and it is caught in a ricechest. ISHII (1914) reported *Gregarina minuta* ISHII from the same host canght in the province of Izu, Japan.

Fourty five beetles were examined and thirty-two was found to be parasitized with this species. The infection was fairly heavy, several intestines filled with this parasites when examined during the summer 1949, at Hikari City.

Sporont

The sporonts are biassociative, elongate cylindrical. The maximum length of an association seen was 250$\mu$, length of the primite being 155$\mu$, its width 34$\mu$.

(Primite) The ratio of LP : TL = 1 : 6.5-7.8, WP : WD = 1 : 1.4-1.7. The protomerite is hemispherical, well rounded at the anterior end and is widest at the base. It is slightly wider than long or in some specimens the width equals the height. There is a conspicuous constriction at the septum. The deutomerite is elongate cylindrical, broadening rapidly from the septum and soon attaining the maximum width. It remains almost of the same width throughout the body length, terminating in a well rounded extremity.

(Satellite) The interlocking device between primite and satellite is well developed; the posterior end of the primite fits intimately into the concavity of the apex of the satellite The satellite is also elongate cylindrical, being well resembled the primite in shape.

The ratio of LP : 1 : 7.1-11.0, WP : WD = 1 : 1.2-1.7. The protomerite of the satellite is practically the same width as that of the primite, though it is slightly flattened. There is a slight constriction at the septum. The deutomerite is elongate cylindrical, slightly widens in the middle portion and tapers very gradually to the posterior portion, ending in a broadly rounded posterior extremity.

A table of dimensions of a few associations is given here, all dimensions expressed in microns :

| | | | | | |
|---|---|---|---|---|---|
| Total length association | 264 | 260 | 231 | 215 | 128 |
| Primite : | | | | | |
| Length sporont | 150 | 128 | 126 | 140 | 78 |
| Length protomerite | 17 | 18 | 18 | 18 | 12 |
| Length deutomerite | 133 | 110 | 108 | 122 | 66 |
| Width protomerite | 19 | 20 | 19 | 20 | 14 |

| | | | | | |
|---|---|---|---|---|---|
| Width deutomerite | 32 | 30 | 30 | 33 | 20 |
| Ratio of LP : TL | 1 : 8.8 | 1 : 7.1 | 1 : 7.0 | 1 : 7.8 | 1 : 6.5 |
| Ratio of WP : WD | 1 : 1.7 | 1 : 1.5 | 1 : 1.5 | 1 : 1.7 | 1 : 1.4 |
| Satellite | | | | | |
| Length sporont | 114 | 132 | 105 | 75 | 50 |
| Length protomerite | 10 | 13 | 11 | 10 | 12 |
| Length deutomerite | 104 | 119 | 94 | 65 | 38 |
| Width protomerite | 19 | 20 | 20 | 18 | 12 |
| Width deutomerite | 32 | 30 | 32 | 22 | 18 |
| Ratio of LP : TL | 1 : 11.4 | 1 : 10.2 | 1 : 9.5 | 1 : 7.5 | 1 : 7.1 |
| Ratio of WP : WD | 1 : 1.7 | 1 : 1.5 | 1 : 1.6 | 1 : 1.2 | 1 : 1.5 |

The protoplasm is not dense in deutomerite, being light brown in transmitted light. It is less dense and lighter in the protomerite, containing fine homogeneous granules. But the upper portion of the protomerite is nearly transparent, devoid of the endocyte. The epicyte is thin and of the same width throughout. Longitudinal striations are discernible in the epicite.

The nucleus is clearly visible in vivo. It is spherical, measuring 10—15$\mu$ in diameter, and contains one karyosome within. The position of the nucleus is variable, and it situates most often a short distance above the middle or nearly in the middle.

Trophozoite

This species in the earliest stages which were observed were the young cephalonts. They messured 30$\mu$ in length and differentiated into three segments; epimerite, protomerite and deutomerite. The epimerit persists fairly long after they have grown larger, attaining the body length of 100$\mu$.

The epimerite is a simple spherical or ovoidal hyaline papilla set upon the anterior end of the protomerite without a stalk.

The dimensions of a fairly developed trophozoite are measured in microns as follow: Total length; 78, length protomerite; 11, length deutomerite; 67, width protomerite; 10, width deutomerite; 15, size of epimerite; 8×6. Ratio; LP : TL = 1 : 7.1, WP : WD = 1 : 1.5. Diameter of nucleus; 8. The body is elongate cylindrical. The protomorite is somewhat long conical, slightly longer than wide, widest at base, and tapers to a bluntly pointed anterior end. The deutomerite is elongate almost same as that of the adults in shape.

Cyst and spore

The cysts are spherical, measuring 50$\mu$ to 85$\mu$ in total diameter and enveloped with a rather thick outer membrane which measures 15$\mu$ in average thickness. The cysts are dehisced by one or two spore ducts. The spore duct measures about 30$\mu$

in length. The spores are barrel shaped, 6$\mu$×4$\mu$ in size, and extruded in chains.

In some occasion the writer found the large specimens which are nearly same in shape as ISHII('14) mentioned as large types. But in my case the protomerite of the satellite is visible as a very low and broad cup-like one and the body measures much larger than ISHII's specimen.

A table of measurements of a few large types is as follows, in which all demensions are expressed in microns :

| | | | |
|---|---|---|---|
| Total length association | 550 | 567 | 432 |
| Primite : | | | |
| Length sporont | 270 | 232 | 220 |
| Length protomerite | 20 | 20 | 17 |
| Length deutomerite | 250 | 262 | 203 |
| Width protomerite | 21 | 27 | 22 |
| Width deutomerite | 40 | 42 | 41 |
| Ratio of LP : TL | 1 : 13.5 | 1 : 14.1 | 1 : 12.9 |
| Ratio of WP : WD | 1 : 1.9 | 1 : 1.6 | 1 : 1.9 |
| Satellite : | | | |
| Length sporont | 280 | 285 | 212 |
| Length protomerite | 10 | 11 | 10 |
| Length deutomerite | 270 | 274 | 202 |
| Width protomerite | 21 | 27 | 22 |
| Width deutomerite | 40 | 35 | 33 |
| Ratio of LP : TL | 1 : 28.0 | 1 : 25.0 | 1 : 21.2 |
| Ratio of WP : WD | 1 : 1.9 | 1 : 1.3 | 1 : 1.5 |

Note : This gregarine is one of the gregarines which were found first in Japan and reported by Japanese investigator, ISHII('14). He drow two different types of association of the same species G. *minuta*. The figure of the latter large type lacks the protomerite of the satellite, and he mentioned this character— Protomerite……is not large, especially so in the satellite, in which it is not infrequently hidden from view being entirely imbedded in the deutomerite of the primite.

WATSON ('16) pointed out this queer character of this species and considered that ISHII's species would be divided into two other species, small one, Gregarine minuta and the other larger one *Didymophyes minuta*. She had discussed on this problem in details in the appendix of her paper.

The gregarine which was observed and described by the writer herein is taken commonly from the same host *Tribolium ferrugineum* F. in Yamaguti Prefecture. This form is in good agreement with the description given by ISHII except for the differences in size and the character of the protomerite of the satellite. But the protomerite of the satellite trends to be compressed in a shallow cup in my old specimens and then in this point the two specimens may agree in some parts. The

difference in the size are not sufficient to justify the character of separate other species, when it is considered that both are taken in the same host.

38. *Gregarina rotundicephala* n. sp.
(Figures 189, 190)

Diagnosis : Sporonts biassociative, elongate cylindrical. Maximum length association 260$\mu$, while length spront averages 120$\mu$, width 30$\mu$. Ratio, $\frac{LP : TL}{lp : tl} = \frac{1 : 4.5}{1 : 6.0}$, $\frac{WP : WD}{wp : wd} = \frac{1 : 1.5}{1 : 1.4}$. Primite; protomerite elongate, constricted through anterior third, well rounded at apex, slight constriction at septum, deutomerite cylindrical, widest a short distance below shoulder, well rounded posteriorly but a small mammilate projection at posterior end. Satellite; protomerite cylindrical, deutomerite elongate, widest through middle, rounded at end. Nucleus spherical with one karyosome. Endocyte dense brownish. Cysts and spores not known.

Host : *Mycetophagus* sp. Coleoptera, Insecta.

Habitat : Intestine.

Locality : Naruto (Yamaguti Prefecture)

The host of this species is a small beetle ; adult and larva, which are captured in hen-houses. They are infected by two other gregarines at the same time. The infection of this gregarine is more often found than two others, being about 30% of the hosts examined are parasitized by this species in May of 1952. The infection was not heavy.

Sporont

The sporonts are biassociative, occasionally three sporonts, forming a linear association are found. The longest association of two individuals measures 260$\mu$ in length while sporonts average 120$\mu$ in length and 30$\mu$ in width. They are elongate cylindrical in shape.

(Primite) The ratio of LP : TL = 1 : 4.3-6.0, WP : WD = 1 : 1.4-1.6. The protomerite is characteristic, because it is cylindrical, dome-shaped, and has a shallow but conspicuous constriction through the anterior third. It is usually longer than wide, the width being about two-thirds its height. The anterior one-third region is globular in shape and well rounded at the anterior end. The protomerite broadens very gradually from this constricted portion to the base, where is widest. There is also a constriction, not so deep, at the septum between protomerite and deutomerite. The deutomerite is cylindrical, widening from the septum towards the middle and attaining the maximum width a short distance below the shoulder. From thence it narrows gradually to the posterior portion, terminating in a broadly rounded or sometimes in a truncated posterior end. There is usually a small mammilate projection at the end of the deutomerite which fits into

the apex of the protomerite of satellite, presenting an appearance of a plug. So the interlocking device between the primite and the satellite is well developed.

(Satellite) The ratio of LP : TL=1 : 5.0-6.5, WP : WD=1 : 1.1-1.5. The protomerite of the satellite does not show the constriction through anterior third as that of the satellite, and it as long as or a little shorter than its width. It is widest in the middle and more or less flattened top and bottom. There is a slight constriction at the septum. The deutomerite is elongate cylindrical or elongate ellipsoidal in shape, widening from the septum very gradually and is widest about the middle. Thence it tapers very gradually to the posterior region and ends in a well rounded extremity. There is no projection here.

The body is brown, the protoplasm being dense in all parts except the anterior third region of the primite. This region is nearly transparent with very fine granules, but the lower region is dense and dark coloured as well as the deutomerite. The epicyte is thin and of the same width throughout the body. Fine longitudinal striations are discernible in the epicyte, when the parasite is young or is starved.

The nucleus is spherical. It measures 18$\mu$ in diameter in the large mature sporonts, containing one large spherical karyosome.

Movement : The gliding movement common to most polycystids is also observed and the animal moves forward in a straight line at the average rates of 4$\mu$ and 6$\mu$ per second. Each rate is not constant as the animal varies its speed intermittently. The protomerite of the primite changes in shape and size, by bending the posterior region to one side and to the other as it nods its head.

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

| | | | | | |
|---|---|---|---|---|---|
| Total length association | 249 | 239 | 239 | 199 | 188 |
| Primite : | | | | | |
| Length sporont | 125 | 124 | 120 | 109 | 90 |
| Length protomerite | 21 | 26 | 28 | 22 | 20 |
| Length deutomerite | 104 | 98 | 92 | 87 | 70 |
| Width protomerite | 18 | 20 | 20 | 13 | 18 |
| Width deutomerite | 26 | 30 | 32 | 20 | 26 |
| Ratio of LP : TL | 1 : 6.0 | 1 : 4.8 | 1 : 4.3 | 1 : 4.5 | 1 : 4.5 |
| Ratio of WP : WD | 1 : 1.4 | 1 : 1.5 | 1 : 1.6 | 1 : 1.5 | 1 : 1.4 |
| Diameter of nucleus | 17 | 16 | 13 | 10 | 12 |
| Satellite : | | | | | |
| Length sporont | 124 | 115 | 119 | 90 | 98 |
| Length protomerite | 20 | 19 | 20 | 18 | 15 |
| Length deutomerite | 104 | 96 | 99 | 72 | 83 |
| Width protomerite | 23 | 23 | 21 | 18 | 19 |

| | | | | | |
|---|---|---|---|---|---|
| Width deutomerite | 31 | 35 | 30 | 20 | 27 |
| Ratio of LP : TL | 1 : 6.4 | 1 : 6.1 | 1 : 6.0 | 1 : 5.0 | 1 : 6.5 |
| Ratio of WP : WD | 1 : 1.3 | 1 : 1.5 | 1 : 1.4 | 1 : 1.1 | 1 : 1.4 |
| Diameter of nucleus | 17 | 18 | 15 | 11 | 12 |

Cephalont

The smallest cephalont found in the smears is an elongate ovoidal one which is measred $25\mu \times 8\mu$ in size, and it is divided into three divisions. A fairly large cephalont is measured in microns as follows : Total length 105, length protomerite 18, length deutomerite 87, width protomerite 14, width deutomerite 18, size of epimerite $5 \times 3$, diameter of nucleus 7. Ratio of LP : TL = 1 : 5.8, WP : WD = 1 : 1.3. In this stage the protomerite is clearly divided into two parts as adult by a conspicuous constriction which runs through a little above the middle. The deutomerite is elongate cylindrical, widest at the shoulder, but practically the width of the anterior portion and that of the posterior are almost equal.

The epimerite is simple elongate papilla situated immediately on the anterior end of the protomerite without stalk. This epimerite evidently persists after it is out of use, and is generally seen on a fairly large specimen, sometimes on the sporont associating with another individual.

Systematic position

Although the cysts and spores ware not observed, this gregarine may belong to the genus *Gregarina* because spronts are biassociative in the normal specimen, the epimerite is a simple elongate hyaline papilla.

Among the members of this genus this species resemblances to *G. polymorpha* (HAMMER.) STEIN and to *G. tenebrionella* WATSON in the ratio of the body parts but it is essily distinguished from the two others by the difference of the body size and the shape and characters of the primite protomerite.

39. *Gregarina conoducla* n. sp.
(Figures 191—195)

Diagnosis : Sporonts biassociative, ellipsoidal to ovoidal. Maximum length association $290\mu$, largest primite $155\mu$ long and $60\mu$ wide. Ratio $\frac{LP : TL}{lp : tl} = \frac{1 : 4.5}{1 : 7\text{-}8}$, $\frac{WP : WD}{wp : wd} = \frac{1 : 1.5}{1 : 1.3}$. Protomerite dome-shaped, wider than high. Deutomerite elongate ovoidal, widest in the middle, rounded posteriorly. Endocyte brown to black, darker in deutomerite. Nucleus spherical, with one karyosome. Cyst spherical, $60—85\mu$ in diameter, dehiscence by one spore duct, $10\mu$ long, $15\mu$ wide at base, $8\mu$ wide at end, conical in shape. Spores extruded in chains, barrel shaped $8.3\mu \times 4.1\mu$.

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

This is the secondary gregaine found in the gut of the beetle, the same one which is parasitized by *G. rotundicephala* n. sp. and another gregarina which belongs to the genus *Asterophora*. The infection by this species is occasionally much heavier than the others but it is not found so commonly as them.

Sporont

The spronts are biassociative. The body is ellipsoidal to elongate cylindrical in shape. The maximum length of association observed was 290$\mu$. While the length of the sporonts generally varies between 70$\mu$ and 130$\mu$ width between 35$\mu$ and 55$\mu$.

(Primite) The ratio of LP : TL =1 : 4.2-4.6, WP : WD=1 : 1.4-1.5. The protomerite is dome-shaped, widest about the middle, always a little wider than long. It is broadly rounded at the apex. The constriction at the septum is deep and conspicuous. The deutomerite is elongate ovoidal, broadening rapidly from the septum to the shoulder and then attaining its greatest width in the middle. Thence the deutomerite tapers gradually to the posterior half, terminating in a broadly rounded posterior extremity.

(Satellite) The ratio of LP : TL=1 : 6.7-7.9, WP : WD=1 : 1.2-1.3. The protomerite of the satellite is flattened or slightly concaved at its anterior and, so as to accept the posterior end of the primite. The interlocking device between the primite and satellite is fairly developed.

The protomerite is twice or more as wide as high. The constriction at the septum is not so deep as that of the primite but is conspicuous. The deutomerite is ellipsoidal to somewhat cylindrical, slightly widening at the middle portion, and tapers from there very gradually to the posterior end. It terminates in a broadly rounded posterior end as that of the primite.

The epicyte is rather thick. The endocyte of the deutomerite is very opaque and dense, being brown to black in transmitted light. The protomerite is somewhat less dense than the deutomerite, especially the anterior portion just below the apex is nearly transparent. Longitudinal striations are discernible after crushing the body and releasing the dense endocyte.

The nucleus is spherical, 16$\mu$ to 20$\mu$ in diameter, containing one karyosome. It generally lies in the anterior half of the deutomerite.

Cephalont

The trophozoites with epimerite are commonly found, both free in the gut lumen sticking to the epithelial cells of the host gut. They are almost transpa-

rent. The epimerite is a simple spherical hyaline knob setting directly upon the anterior end of the protomerite without a stalk.

Movement : Two types of movement were observed, the one was the gliding accompanied by no bodily contortion and advanced at the rates of 10$\mu$ to 6$\mu$ per second, the other was commonly bending the body. The region of the epicyte just below septum was very frexible and motile.

A few measurements are as follows, all dimensions given in microns :

| | | | | |
|---|---|---|---|---|
| Total length association | 255 | 205 | 188 | 182 |
| Primite : | | | | |
| Length sporont | 125 | 105 | 100 | 87 |
| Length protomerite | 27 | 25 | 25 | 20 |
| Length deutomerite | 98 | 80 | 75 | 67 |
| Width protomerite | 35 | 33 | 35 | 28 |
| Width deutomerite | 52 | 45 | 50 | 42 |
| Ratio of LP : TL | 1 : 4.6 | 1 : 4.2 | 1 : 4.0 | 1 : 4.4 |
| Ratio of WP : WD | 1 : 1.5 | 1 : 1.4 | 1 : 1.4 | 1 : 1.5 |
| Diameter of nucleus | 21 | 20 | 15 | 16 |
| Satellite : | | | | |
| Length sporont | 130 | 100 | 88 | 95 |
| Length protomerite | 18 | 15 | 13 | 12 |
| Length deutomerite | 112 | 85 | 75 | 83 |
| Width protomerite | 38 | 38 | 35 | 30 |
| Width deutomerite | 48 | 45 | 43 | 40 |
| Ratio of LP : TL | 1 : 7.2 | 1 : 6.7 | 1 : 6.8 | 1 : 7.9 |
| Ratio of WP : WD | 1 : 1.3 | 1 : 1.2 | 1 : 1.2 | 1 : 1.3 |
| Diameter of nucleus | 20 | 20 | 18 | 18 |

Cyst and spores

The cysts are spherical and vary form 60$\mu$ to 85$\mu$ in diameter. The outer transparent envelope is about 10$\mu$ in thickness when the cysts are fresh. Dehiscence is by one short characteristic spore duct. It is measured 10$\mu$ in length. and 15$\mu$ in its basal portion, narrowing to 8$\mu$ at the end of the duct. It is conical in shape, projecting from the surface of the cyst. The spores are extruded from the spore duct in chains. The spores are barrelshaped and truncated at both ends. It measures 4.1×8.3$\mu$ in size.

Systematic position

This parasite clearly belongs to the genus *Gregarina* for its characters of sporonts, epimerite and cysts and spores. Among the members of the genus *Gregarina*,

this species closely resembles *G. intestinalis* WATSON and *G. gracilis* WATSON in the ratio of the body parts and in the size of the body, but it differs from *G. intestinalis* in the ratio of WP : WD of the primite, which is 1 : 2 in the American species and is 1 : 1.5 in my species. It differs from *G. gracilis* mainly in the size of the body and in the ratio of WP : WD. viz. : the length of association varies between 237 $\mu$ and 368 $\mu$, while in my species maximum length association is 290 $\mu$; the ratio of WP : WD is 1 : 1.7—2.1 in the primite of th latter and it is 1 : 1.4—1.5 in that of my species. The characters of cyst and spores are not described yet on the American species. In the present species those are characteristic, especially the shape of the spore duct, conical one is unique in this species.

40. *Gregarina pumila* n. sp.
(Figures 196—202)

Diagnosis : Sporonts biassociative, ovoidal. Maximum length association 160 $\mu$. Length of sporont 50 $\mu$ to 95 $\mu$, width 15 $\mu$ to 35 $\mu$. Ratio, $\frac{LP : TL}{lp : tl} = \frac{1 : 5-6}{1 : 5-7} \frac{WP : WD}{wp : wd} = \frac{1 : 1,7}{1 : 1.6}$. Protomerite hemispherical to subglobular, a little wider than long, well rounded or flattened anteriorly. Deutomerite ovoidal, widest at posterior third. Endocyte dense, light brown. Nucleus spherical, 7—8 $\mu$ in diameter, with one karyosome. Cyst spherical 25—52 $\mu$ in diameter, spores cylindrical, dehisced by one pore, 5.5 $\mu$ × 2.5 $\mu$.

Host : Tenebrionidae sp. larva and adult. Coleoptera, Insecta.

Habitat : Intestine.

Locality : Naruto (Yamaguti Prefecture)

The host is a small beetle which is caught in rice-bran during spring or summer. About 40% or more of the insects examined were found infected by this gregarine in the seasons, 1951.

Sporont

The sporonts are biassociative. The animals are very small and ovoidal in shape. The largest association observed was 160 $\mu$ in length and the maximum length of sporont was 95 $\mu$, width 35 $\mu$.

(Primite) The primite is somewhat longer than, or as long as the satellite. The ratio of LP : TL=1 : 5—6, Wp : WD=1 : 1.7. The protomerite is hemispherical or subglobular, widest just above the septum and is always a little wider than long. It is broadly rounded or rather flattened at the anterior end of the protomerite. There is a slight constriction at the septum. The deutomerite is ovoidal, widening from the septum very gradually towards the posterior portion, attaining the greatest width at the beginning of the posterior one-third of the deutomerite. In some specimens a shallow constriction occures at the posterior third and it is

widest about the center. The end of the deutomerite is broadly rounded.

(Satellite) The satellite is rather ellipsoidal, dilating through the middle. The ratio of LP : TL=1 : 6—7, WP : WD=1 : 1.6.

The protomerite is slightly conpressed up and down, and nearly flattened. The interlocking device between the sporonts is weakly developed and the individuals often barely touching are easily separated. There is a slight constriction at the septum. The deutomerite is ovoidal to ellipsoidal in shape. It is generally widest about the middle, however, the position of the widest region is variable. In some specimens it is widest at shoulder and in others a short distance above the posterior end. The posterior end is broadly rounded.

A table of measurements with dimensions given in microns is as follows:

| | | | | | |
|---|---|---|---|---|---|
| Total length association | 152 | 132 | 141 | 125 | 142 |
| Primite: | | | | | |
| Length sporont | 90 | 78 | 73 | 75 | 71 |
| Length protomerite | 15 | 14 | 12 | 13 | 15 |
| Length deutomerite | 75 | 64 | 61 | 62 | 56 |
| Width protomerite | 18 | 15 | 15 | 17 | 16 |
| Width deutomerite | 30 | 28 | 25 | 30 | 18 |
| Ratio of LP : TL | 1 : 6.0 | 1 : 5.2 | 1 : 6.1 | 1 : 5.6 | 1 : 4.7 |
| Ratio of WP : WD | 1 : 1.7 | 1 : 1.9 | 1 : 1.7 | 1 : 1.8 | 1 : 1.1 |
| Satellite: | | | | | |
| Length sporont | 62 | 54 | 68 | 50 | 71 |
| Length protomerite | 10 | 9 | 10 | 10 | 12 |
| Length deutomerite | 52 | 45 | 58 | 40 | 59 |
| Width protomerite | 15 | 14 | 16 | 14 | 15 |
| Width deutomerite | 25 | 25 | 25 | 22 | 21 |
| Ratio of LP : TL | 1 : 6.2 | 1 : 6.0 | 1 : 6.8 | 1 : 5.0 | 1 : 5.9 |
| Ratio of WP : WD | 1 : 1.7 | 1 : 1.8 | 1 : 1.6 | 1 : 1.6 | 1 : 1.4 |

The protomerite is dense in the deutomerite, being light brown in transmitted light; it is nearly as dense in the lower half of the protomerite, but the upper portion of the latter is nearly devoid of endoplasm. The granules in the protomerite are slightly larger and coarser than those in the deutomerite. The epimerite is transparent.

The nucleus is spherical, measuring 7—8$\mu$ in diameter, and contains one spherical karyosome within. The position of the nucleus in the deutomerite is not fixed but it is most often in the posterior half in primite and in the anterior half in satellite.

Movement: The gliding movement common to most gregarines is seen in the present species, but it is very slow, the progression has been observed at the rates of 0.6$\mu$, 0.5$\mu$ and 0.2$\mu$ per second. The animal moves forward generally in

a straight line, however, often partial rotation of the body on its own axis and a bending on the anterior half of the body over the posterior one are observed. The epicyte in the region just below the septum is very flexible, resulting in nodding of the protomerite or in dragging it into the deutomerite.

Trophozoite

The smallest trophozoite found was the ovoidal young cephalont. The body measured $25\mu \times 10\mu$ in size. This trophozoite was provided with a simple spherical epimerite, which is transparent and situated on the apex of the protomerite without a stalk.

A fairly developed cephalont, attaining the length of $50\mu$ or so, is elongate cylindrical in shape. Measurements of this specimen are as follows in microns: total length; 48, length protomerite; 8, length deutomerite; 40, width protomerite; 9, width deutomerite; 12, diameter of nucleus; 4. Ratio of LP : TL=1 : 6.0, WP : WD =1 : 1.3.

Cyst and spores

The cysts are spherical and vary from $25\mu$ to $52\mu$ in diameter. The outer transparent envelope is thin, measuring $3\mu$ to $5\mu$ in thickness when the cysts is fresh. Spores are expressed in chains from a pore. The spores are somewhat cylindrical, widening slightly in the central portion and truncated at both ends, $5.5\mu \times 2.5\mu$.

Systematic position

This species resembles *Gregarina tenebrionella* WATSON in the size of body, nucleus and in the ratio of WP : WD, but it differs from the latter in the ratio of LP : TL, which is 1 : 4 in the latter and 1 : 5—6 in the former, and in the shape of the deutomerite, which is broad, globose and widest through median portion in the latter, while it is generally ovoidal and widest at posterior third in the former.

This species bears some resemblance to *G. steini* BERNDT from the larva of *Tenebrio molitor* L. in the body size, differing from the latter in these points, viz.: the deutomerite is widest at the posterior third or through the middle, instead of being widest at shoulder; Cyst is spherical, $25—52\mu$ in diameter, instead of ovoidal, $70—100\mu \times 85—160\mu$.

This species is distinguished rom *G. minuta* ISHII by the considerable difference in shape of the body.

41. *Gregarina kokunusuto* n. sp.
(Figures 129—132)

Diagnosis: Sporonts biassociative, elongate ovoidal. Maximum length of associa-

tions 390 $\mu$, length of sporont 150—200 $\mu$, width 60—90 $\mu$. Ratio; $\frac{LP : TL}{lp : tl} = \frac{1 : 5.3}{1 : 7.0}$, $\frac{WP : WD}{wp : wd} = \frac{1 : 1.9}{1 : 1.8}$. Primite protomerite subglobular to hemispherical, satellite protomerite slightly depressed. Slight constriction at septum. Deutomerite elongate ovoidal in both primite and satellite broadly rounded posteriorly. Endocyte dense, light brown. Nucleus spherical with one karyosome. Cysts spherical or slightly ellipsoidal, 95—130 $\mu$ in diameter. Dehiscence by 1—3 short soreducts. Spores extruded in chains. Spore cylindrical, widening in the middle in another side view, measures 10 $\mu \times 4 \mu$.

Host: *Tenebrioides mauritanicus* LINNE, larva and adult.

Coleptera, Insecta.

Habitat: Intestine.

Locality: Kuraki (Simane Prefecture)

Cephalont

The epimerite is a small, simple and sessile knob. Only a few trophozoites stuck to the epithelial cells of the intestine were found during the summer, 1953. Measurements in microns of a fairly large cephalont are; total length 120, length of epimerite 8, protomerite 22, deutomerite 98, width of protomerite 30, deutomerite 45. Ratio of LP : TL =1 : 5.5. WP : WD=1 : 1.5. Diameter of nucleus 20. The protomerite is subglobular, widest through its middle, slightly wider than high and is well rounded at the apex. There is a conspicuous, deep constriction at the septum. The deutomerite is elongate ovoidal or cylindrical, widening gradually from the septum and attaining a maximum width a short distance above the middle. It tapers gradually from the widest portion to the posterior portion and terminates in a broadly rounded posterior end. In some younger specimens the deutomerite is almost the same width throughout from the septum to the posterior end.

Sporont

The maximum recorded length of an association was 390 $\mu$. The length of sporonts varies generally between 150 $\mu$ and 200 $\mu$, and the width between 60 $\mu$ and 90 $\mu$.

(Primite) The ratio of LP : TL=1 : 5.1—5.5, WP : WD=1 : 1.7—2.0. The protomerite is subglobular or hemispherical with no papilla or indentation at the anterior end. It is well rounded in front, widest a short distance above the septum, equal in width from half to two-thirds the width of the deutomerite and is slightly wider than high. There is a slight constriction at the septum. The deutomerite is elongate ovoidal. broadening gradually from the septum and attaining its greatest width in the middle or slightly posterior to the middle. From here the deutomerite gradually contracts, ending in a broadly rounded posterior extremity. In some specimens, the deutomerite is almost cylindrical, a little wider in

the middle. The interlocking device is not well developed, sporonts of an association being dissociated by slight pressure.

(Satellite) The ratio of LP : TL=1 : 6.7—7.4, WP : WD=1 : 1.7—1.9. The protomerite of the satellite is practically of the same width as that of the primite, but is sligitly depressed. Its anterior end is nearly flattened or slightly concaved to receive the end of the primite. The constriction at the septum is shallow but conspicuous. The deutomerite is elongate ovoidal and aproximately of the same shape as that of the primite.

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

| | | | | |
|---|---|---|---|---|
| Total length association | 360 | 338 | 280 | 248 |
| Primite: | | | | |
| Length sporont | 176 | 170 | 145 | 128 |
| Length protomerite | 32 | 31 | 28 | 24 |
| Length deutomerite | 144 | 139 | 115 | 104 |
| Width protomerite | 40 | 50 | 33 | 30 |
| Width deutomerite | 75 | 85 | 67 | 56 |
| Ratio of LP : TL | 1 : 5.5 | 1 : 5.5 | 1 : 5.1 | 1 : 5.4 |
| Ratio of WP : WD | 1 : 1.9 | 1 : 1.7 | 1 : 2.0 | 1 : 1.9 |
| Satellite: | | | | |
| Length sporont | 184 | 168 | 135 | 120 |
| Length protomerite | 25 | 23 | 20 | 18 |
| Length deutomerite | 159 | 145 | 115 | 102 |
| Width protomerite | 48 | 45 | 40 | 30 |
| Width deutomerite | 88 | 85 | 75 | 50 |
| Ratio of LP : TL | 1 : 7.4 | 1 : 7.3 | 1 : 6.8 | 1 : 6.7 |
| Ratio of WP : WD | 1 : 1.8 | 1 : 1.9 | 1 : 1.9 | 1 : 1.7 |

In colour, the body is light brown or tun, of equal density in both protomerite and deutomerite; the protoplasm is homogeneous and very abundant. The anterior small portion of the primite protomerite is transparent. containing minute granules. The epicyte is thin, 1—1.5$\mu$ in thickness, and of the same width throughout except in the protomerites of both primite and satellite. It is considerably thicker at their anterior ends.

The nucleus is small and spherical, in diameter 1/3 to 1/4 the width of the deutomerite and measures 20$\mu$ to 25$\mu$ in diameter. It is just visible in vivo and contains one karyosome.

Cyst and spore

The cysts seen in the intestine or collected from the faeces are spherical sometimes slightly ellipsoidal and measure between 95$\mu$ and 130$\mu$ in diameter. The

cyst wall is comparatively thin and measures 10 $\mu$ or 12 $\mu$ in thickness. Dehiscence is by spore ducts from one to three in number. The spore ducts are always short and the spores are extruded from them in chains. The spores are cylindrical, 10 $\mu \times 4\mu$. The outline of a spore is rectangular in one side view but in another side view it is elongate barrelshaped, slightly widening in the middle.

Systematic position

This species resembles *Gregarina steini* BERNDT in the length of sporont, differing as follows: The width of the sporonts of *G. kokunusuto* is from 60 $\mu$ to 90 $\mu$; that of *G. steini* is from 16 $\mu$ to 30 $\mu$. The cyst of *G. kokunusuto* is generally spherical and sometimes ellipsoidal, measuring 95 $\mu$ to 130 $\mu$ in diameter, that of *G. steini* is ovoidal, 70—100 $\mu \times 85$—160 $\mu$.

This species resembles *G. polymorpha* (HAMMERSCHMIDT) STEIN, differing from it in the size of the sporont and in the shape of the protomerite.

This species is also separated from *Gregarina tenebrionella* WATSON, *G. alphitophagi* FOERSTER and other species from the family Tenebrionidae in the size of the body, the proportions of body parts and in the shape and size of the spore.

42. *Gregarina grandicephala* n. sp.
(Figures 149—151)

Diagnosis : Sporonts biassociative, elongate cylindrical, Length association 630—850 $\mu$. Length primite 300—450 $\mu$. Ratio, $\frac{LP : TL}{lp : tl} = \frac{1 : 5.2-5.8}{1 : 10.7-11.2}$, $\frac{WP : WD}{wp : wd} = \frac{1 : 1.3-1.8}{1 : 1.1-1.2}$. Primite protomerite cylindrical, devided with secondary septum into two parts, no constriction at primary septum. Deutomerite cylindrical, widest near the end, but almost of the same width throughout, well rounded at end. Endocyte dense, light brown. Nucleus spherical with one karyosome. Cyst spherical, 425—510 $\mu$ in diameter, dehiscence by 5 or 4 sporeducts. Spores barrel shape, 9 $\mu \times 4.5\mu$.

Host: *Amisodactylus signatus* PANZER Coleoptera. Insecta.

Habitat: Intestine.

Locality: Yamato (Yamaguti Prefecture)

Sporont

The sporonts are biassociative. The maximum length observed of an association was 850 $\mu$. The body is elongate cylindrical.

(Primite) The average ratio of LP : TL=1 : 5.5, WP : WD=1 : 1.5. The protomerite is cylindrical, and divided into two parts with secondary septum. The upper half is conical and its basal width is as wide as or slightly wider than the lower half. The lower half is cylindrical, of the same width throughout. There is no constriction at the primary septum. The deutomerite is elongate cylindrical,

broadens very gradually from the septum downwards and is widest at a short distance above the posterior end. Thence it tapers to a broadly rounded posterior extremity.

(Satellite) The interlocking device between two sporonts is fairly well developed, the tail of the primite fitting into the depression in the protomerite of the satellite. The ratio of LP : TL=1 : 11.0, WP : WD=1 : 1.2. The protomerite is slightly depressed top and bottom. It is concaved at the anterior end, widest in the middle and always wider than high. There is a slight constriction at the septum. The deutomerite remains of the same width throughout most of the length and is widest near the end. But its upper and lower portions are of about equal width. It terminates in a well rounded posterior end.

The colour of this species is light brown. The endocyte is dense in both protomerite and deutomerite, but it is less dense in the upper half of protomerite. The nucleus is large and spherical, often being 25$\mu$ in diameter in a fairly large specimen.

The trophozoite is much less dense than the sporont. The epimerite is a round, sessile, transparent knob.

Cyst and spore

The cysts collected from the intestine or from the excreted faeces are incubated on a slide in a moist chamber and almost all of them complete their developement.

The cysts are spherical and covered with a thick cyst wall. The cyst wall is composed of two different membranes; an outer and an inner ones. The inner one is thin and transparent and the outer one is thick, geratinous and stratified with many fine threads.

Measurements of some cysts are as follows; all dimensions given in microns:

| Total diameter of cyst | Thickness of cyst wall | Diameter of inner mass | Number of sporeduct |
|---|---|---|---|
| 510 | 117 | 276 | 5 |
| 500 | 100 | 300 | 4 |
| 468 | 95 | 278 | 4 |
| 467 | 90 | 287 | 4 |
| 425 | 82 | 261 | 5 |

The spores are barrel shaped and measure 9$\mu$×4.5$\mu$ and they are extruded from the cyst through sporeducts. The sporeducts are 5 or 4 in number and their length varies from 370$\mu$ to 350$\mu$.

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

| Length association | | | | |
|---|---|---|---|---|
| Primite: | 820 | 735 | 690 | 630 |

| | | | | |
|---|---|---|---|---|
| Length sporont | 440 | 400 | 360 | 330 |
| Length protomerite | 85 | 75 | 62 | 58 |
| Length deutomerite | 355 | 325 | 298 | 272 |
| Width protomerite | 55 | 55 | 50 | 63 |
| Width deutomerite | 90 | 98 | 65 | 83 |
| Ratio of LP : TL | 1 : 5.2 | 1 : 5.3 | 1 : 5.8 | 1 : 5.7 |
| Ratio of WP : WD | 1 : 1.6 | 1 : 1.8 | 1 : 1.3 | 31 : 1.3 |
| Satellite: | | | | |
| Length sporont | 380 | 335 | 330 | 300 |
| Length protomerite | 35 | 30 | 30 | 28 |
| Length deutomerite | 345 | 305 | 300 | 272 |
| Width protomerite | 70 | 68 | 60 | 65 |
| Width deutomerite | 82 | 80 | 65 | 70 |
| Ratio of L : TL | 1 : 10.9 | 1 : 11.2 | 1 : 11.0 | 1 : 10.7 |
| Ratio of WP : WD | 1 : 1.2 | 1 : 1.2 | 1 : 1.1 | 1 : 1.1 |

Systematic position

This gregarine may be assigned to the genus *Gregarina* on account of the shape of the epimerite, the characters of the sporonts, of its cysts and spores.

This species somewhat resembles *Gregarina monarchia* WATSON, differing from it chiefly as follows: The primite promerite of *G. brevicephala* is cylindrical, and divided with a secondary septum into two parts; that of *G. monarchia* is dome-shaped and is but little wider than high. The total length of association of *G. brevicephala* is 850 $\mu$ in the maximum; that of *G. monarchia* is 1070 $\mu$ in one specimen observed. The ratio of LP : TL is in *G. brevicephala* is 1 : 5.5 (primite), 1 : 11 (satellite); that in the latter is 1 : 7 (primite) 1 : 16 (satellite).

This species also resembles *Gregalina platini* WATSON, but the former is distinguished from the latter in some points; The ratio of LP : TL is in *G. platini* 1 : 4—4.3 (primite), 1 : 6.2—7.5 (satllite). The primite protomerite of *G. platini* is characterized by a constriction in the middle, but not by a secondary septum as *G. brevicephala*.

43. *Gregarina echinata* n. sp.

(Figures 181—188)

Diagnosis; Sporonts, biassociative, ovoidal or cylindrical, maximum length 125 $\mu$, and maximum width 55 $\mu$. Primite, protomerite subglobular, deutomerite ovoidal, widest at anterior one-third, broadly rounded posteriorly. Satellite protomerite flattened top and bottom, deutomerite elongate, with a tassell of many small rods at posterior end. Ratio, $\frac{LP : TL}{lp : tl} = \frac{1 : 3.8}{1 : 3.7}$, $\frac{WP : WD}{wp : wd} = \frac{1 : 1.5}{1 : 1.2}$. Epimerite a simple spherical knob. Endocyte dense, light brown. Nucleus spherical with one

karyosome. Spherical cysts, measuring 130—170$\mu$, dehisced by 4—7 sporeducts. Spores, extruded in chains, barrel-shaped, 9$\mu$×6$\mu$.

Host: *Lesticus magnus* MOTSHULSKY. Coleoptera, Insecta.

Habitat: Intestine.

Locality: Yamato (Yamaguti Prefecture)

Trophozoite

The earliest stage found was a small young trophozoite. This is spherical, measuring 15$\mu$ in diameter, without any septum in the body. There is a spherical nucleus which measures 7—5$\mu$ in diameter and situates at the central portion of the body. Some of these spherical trophozoites have a tassell of small rods at the posteror end.

Then the animal grows gradually and increases in size, especially in length. The next stage observed is a cephalont which is generally stuck to the cell of the intestine. The body is divided into three divisions, epimerite, protomerite and deutomerite. The epimerite is a simple, spherical and sessile knob situated on the anterior end of the protomerite. Measurements in microns of a small cephalont are: total length 31, length protomerite 8, deutomerite 23, epimerite 5, width of protomerite 14, deutomerite 16. Ratio of LP : TL=1 : 3.9, WP : WD=1 : 1.1.

A well developed tassell of rods, which is situated at the limitted portion of the posterior end is easily discernible in some specimens. The tasselled one may become the satellite later, associating with the non-tasselled one.

Sporont

The sporonts are biassociative as adults. The longest association ever observed was 235$\mu$. The sporonts are ovidal or cylindrical, the maximum length recorded being 125$\mu$ and the maximum width 55$\mu$.

(Primite) The average ratio of LP : TL=1 : 3.8, WP : WD=1 : 1.5. The protomerite is subglobular, well rounded in the front, widest slightly below the middle and is almost as wide as high or a little wider than high. There is a fairly deep constriction as the septum. The deutomerite is ovoidal, widening gradually from the septum and attaining its maximum width at the beginning of the posterior one-third. It tapers rapidly to the posterior end, terminating in a broadly rounded extremity.

(Satellite) The interlocking device between the sporonts is well developed. The individuals of an association are not easily detached by pressure. The average ratio of LP : TL=1 : 3.7, WP : WD=1 : 1.2. The protomerite is generally flattened top and bottom. In some specimens the anterior end of the protomerite is concaved slightly to receive the end of the primite. There is a slight constriction at the septum. The deutomerite is cylindrical or elongate ovoidal, widening appreciably

to form a shoulder and attaining the widest at a short distance below the shoulder. From here it gradually tapers to the posterior end, termiating in a broadly rounded extremity. The small terminal region is adorned with a tassell of fine rod-shape processes. The processes grown at the lower part of the region are longer than those at the upper.

The protoplasm is dense in the deutomerite, being light brown in transmitted light; it is no less dense in the lower main part of the protomerite, but the upper small portion of the latter is nearly transparent devoiding of the endoplasm. The granules of the deutomerite are not homogeneous, smaller being interpersed with larger and those of the protomerite are slightly larger and coarser. The corner region of the shoulder is sometimes is less opaque than other parts of the deutomerite, containing fine granules. The epicyte is thin, transparent and of even width throughout except the anterior portion of the protomerite of the primite, where it becomes considerably thicker. Longitudinal striations are discernible in the epicyte.

The nucleus is visible in vivo as a spherical body which is measured 20—15 $\mu$ in diameter. It contains one spherical karyosome. The positon of the nucleus is variable and it lies at the middle of the deutomerite in some specimens but in others at the anterior end or at the extreme posterior extremity.

A table of measurements all dimensions given in microns:

| | | | | | |
|---|---|---|---|---|---|
| Length association | 195 | 201 | 187 | 148 | 107 |
| Primite: | | | | | |
| Length sporont | 112 | 89 | 87 | 80 | 60 |
| Length protomerite | 30 | 23 | 23 | 22 | 15 |
| Length deutomerite | 82 | 66 | 64 | 58 | 45 |
| Width protomerite | 37 | 27 | 27 | 28 | 23 |
| Width deutomerite | 50 | 44 | 42 | 42 | 27 |
| Ratio of LP : TL | 1 : 3.7 | 1 : 3.9 | 1 : 3.8 | 1 : 3.6 | 1 : 4.0 |
| Ratio of WP : WD | 1 : 1.4 | 1 : 1.6 | 1 : 1.6 | 1 : 1.5 | 1 : 1.2 |
| Satellite: | | | | | |
| Length spront | 83 | 112 | 100 | 58 | 47 |
| Length protomerite | 25 | 27 | 25 | 17 | 14 |
| Length deutomerite | 78 | 85 | 75 | 41 | 33 |
| Width protomerite | 35 | 31 | 25 | 22 | 21 |
| Width deutomerite | 42 | 39 | 30 | 29 | 25 |
| Ratio of LP : TL | 1 : 3.3 | 1 : 4.2 | 1 : 4.0 | 1 : 3.4 | 1 : 3.4 |
| Ratio of WP : WD | 1 : 1.2 | 1 : 1.3 | 1 : 1.2 | 1 : 1.3 | 1 : 1.2 |

Cyst and spore

The cysts collected from the faeces or from the intestine are spherical in

shape and measure 130—170 $\mu$ in diameter. The outer membrane consists of two layers; the outer layer is semi-transparent, measuring 15—12 $\mu$ in thickness and the inner one is transparent 2—3 $\mu$ in thickness.

The cysts are dehisced by 4—7 spore-ducts. The ducts are swollen at the basal portion where a spherical plate is discernible. The ducts are measured 40—45 $\mu$ in length. The spores are barrel-shaped and measure 9 $\mu$ × 6 $\mu$. They are extruded from the cyst through the sporeducts in chains.

Systematic position

The gregarine may clearly be classified to the genus *Gregarina*. The sporonts are biassociative, the simple epimerite, the method of cyst dehiscence and the barrel-shaped spore are all characteristics of this genus.

Among the members of the genus *Gregarina*, this species resembles *G. longirostris* (LEGER) LABBE and *G. gomimusi* HOSHIDE in the size of the sporont differing from them in the ratio of body parts and in having a tassell of many small rods at the end of the body.

44. *Gregarina plesiophthalmi* HOSHIDE, 1952
(Figure 109)

Host: *Plesiophthalmus nigrocyaneus* MOTCHULSKY, Coleoptera, Insecta
Habitat: Intestine
Locality: Ogo, Marifu, Takane (Yamaguti Pref.)

45. *Gregarina ulomae* HOSHIDE, 1951
(Figure 110)

Host: *Uloma latimanus* KOLBE, Coleoptera, Insecta
Habitat: Intestine
Locality: Obatake, Yanai (Yamaguti Pref.)

46. *Gregarina minor* HOSHIDE, 1952
(Figure 106)

Host: *Allecula fulginosa* MACKLIN, Coleoptera, Insecta
Habitat: Posterior portion of midintestind.
Locality: Kaminoseki (Yamaguti Pref.)

47. *Gregarina gomimusi* HOSHIDE, 1952
(Figure 103)

Host: *Amara chalcites* DEJEAN Coleoptera, Insecta
Habitat: Intestine
Locality: Hikari (Yamaguti Pref.)

48. *Gregarina katherina* WATSON, 1915
(Figure 108)

Host: *Coccinella bruckii* MULO, Aiolocharia mirabilis MOTSCULSKY Coleoptera, Insecta
Habitat: Intestine.
Locality: Hikari (Yamaguti Pref.)

49. *Gregarina phyllotretae* HOSHIDE, 1952
(Figure 104)

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

50. *Gregarina rhomborrhinae* HOSHIDE, 1952
(Figure 111)

Host: *Rhomborrhina japonica* HOPE, Coleoptera, Insecta
Habitat: Intestine.
Locality: Hikari (Yamaguti Pref.)

51. *Gregarina lypropsi* HOSHIDE, 1951
(Figures 94—96)

Host: *Lyprops sinensis* MARSEUL, Coleoptera, Insecta
Habitat: Intestine.
Locality: Hikari, Ogori, Obatake (Yamaguti Pref.)

52. *Gregarina platycephala* HOSHIDE, 1952
(Figures 100, 101)

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

53. *Gregarina cuneata* STEIN, 1848
(Figures 123—128)

Host: *Tenebrio molitor* L. larva and adult, *T. obscurus* FABRICIUS, *Tribolium ferrugineum* FABRICIUS, Coleoptera, Insecta
Habitat: Intestine.
Locality: Hikari, Tabuse (Yamaguti Pref.) Hirosima (Hirosima Pref.) and Izu-province.

54. *Gregarina polymorpha* (HAMMERSCHMIDT) STEIN,
(Figures 147, 148)

Host: *Tenebrio molitor* L. larva. Coleoptera, Insecta
Habitat: Intestine.
Locality: Tabuse (Yamaguti Pref.)

55. *Gregarina ovata* DUFOUR, 1826
(Figures 97, 98)

Host: *Anisolabis maritima* BORELLI, *A. annulipes* LUCAS. Dermaptera, Insecta
Habitat: Intestine.
Locality: Hikari, Iwakuni, Kudamatu, Obatake (Yamaguti Pref.) Sakurai, Hasihama (Ehime pref.)

56. *Gregarina gonocephali* OBATA, 1953

Host: *Gonocephalus pubens* MAREUL, Coleoptera, Insecta
Habitat: Intestine.
Locality: Yagi (Hirosima Pref.), Izusi (Hyogo Perf.)

57. *Gregarina ovosatellites* OBATA, 1953

Host: *Chlaenius noguchii* BATES, *Chl nigricans* WIEDEMAN, *Chl. circumdatus* BRULLE, *Chl. inops* CHAUDOIR Coleoptera, Insecta
Habitat: Intestine.
Locality: Hirosima (Hirosima Pref.) Izusi (Hyogo Pref.)

58. *Gregarina tokonoi* OBATA, 1953

Host: *Uloma latimanus* KOLBE' Coleoptera, Insecta
Habitat: Intestine.
Locality: Hirosima (Hirosima Pref.) Izusi (Hyogo Pref.)

59. *Gregarina chilochori* OBATA,

Host: *Chilocorus rubidus* HOPE, Coleoptera, Insecta
Habitat: Intestine.
Locality: Hirosima (Hirosima Pref.)

60. *Gregarina craspedonoti* OBATA, 1953

Host: *Craspedonotus tibialis* SCHAUMANN Coleoptera, Insecta
Habitat: Intestine.
Locality: Nakafukawa, Yagi (Hirosima Pref.)

61. *Gregarina kamenote* HOSHIDE, 1951
(Figure 105)

Host: *Mitella mitella* (LINNE) Crustacea
Habitat: Intestine.
Locality: Obatake, Murozumi (Yamaguti Pref.)

*Triseptata* n. gen.

Diagnosis: Sporonts biassociative, cylindrical. Epimerite a simple ovoidal knob. Body of cephalont segmented with three septa. Cyst dehiscence by spore ducts, spores ellipsoibal, extruded in chains.

Type species: *Triseptata fungicola* n. sp.

Systematic position

The segmented gregarines of Cephaline gregarines, which have been recorded are the genus *Taeniocystis* LEGER, *Metamera* DUKE and *Gregarina* DUFOUR. The last one, *Gregarina* belongs to the family Gregarinidae but the former two are to other groups, Actinocephalidae and Dactylophoridae.

The present species is clearly assigned to the family Gregarinidae. since the sporonts are biassociative with a symmetrical simple epimerite. Cysts dehisce by spore ducts, and spores are symmetrical. Then this species is different from the former two genera in the following points: In *Taeniocystis*. sporonts are solitary, epimerite is a small sessile sphere set with 6—8 recurved hooks and the deutomerite is segmented with septa. In *Metamera*, sporonts are also solitary, epimerite is an eccentric cone set peripherally with numerous branched digitiform processes and the segmentation is confined to the posterior region of the deutomerite and is not always present.

The secondary septum in the deutomerite of the present species is formed at

the fixed position of the body and is always only one. The divided two parts of the deutomerite are so much different in the characters of contents from each other. This species differs from the members of the genus *Gregarina*—*G. segmentata* VINCENT, *G. angulata* GREAF, *G. grandicephala* n. sp.— essentially in these points above mentioned, which are considered to be worthy to create a new genus.

This genus belongs to the family Gregarinidae and its position will be fixed between *Gregarina* and *Prolomaaglhaensia*.

62. *Triseptata fungicola* n. gen., n. sp.
(Figures 152—154)

Host: Elotylidae sp. Coleoptera, Insecta.

Habitat: Intestine.

Locality: Hikari (Yamaguti Prefecture)

Diagnosis: Sporonts biassociative, elongate cylindrical. Average length sporont, 170 $\mu$, width 30 $\mu$. Ratio, $\frac{LP:TL}{lp:tl}=\frac{1:12}{1:35}$, $\frac{WP:WD}{wp:wd}=\frac{1:1\cdot3}{1:1.6}$. Protomerite subspherical, with 7—8 elevated ridges on its surface. Deutomerite devided into two divisions with one secondary septum, anterior one cylindrical, posterior one elongate ovoidal to ellipsoidal. Nucleus spherical 10—15 $\mu$ in diameter, with one karyosome. Epimerite a simple elongate ovoidal sessile knob. Cyst spherical averages 85 $\mu$ in biameter. Dehiscence by 4—5 sporeducts. Spores ellipsoidal, 6 $\mu$ × 5 $\mu$ in size, extruded in chains.

Sixty-five adults and eighteen larvae of the host beetle were examined at Murozumi, in April, 1953, and all of them yielded parasites. The infection, however, was not so heavy as to find some ten parasites in each host.

Sporont

The sporonts are biassociative, elongate cylindrical. The largest association measured 450 $\mu$ in length while sporonts averaged 170 $\mu$ in length and 30 $\mu$ in width.

(Primite) The ratio of LP : TL =1 : 9.7—13.9, WP : WD=1 : 1.0—1.4. The protomerite is subspherical, one and half times as wide as high, well rounded at the anterior end It is widest a little above the base, 7 or 8 longitudinal elevated riges are discernible on the protomerite surface. There is a fairly deep constriction at the primary septum. The deutomerite is divided into two parts with a secondary septum; an anterior deutomerite is elongate cylindrical, remaining of the same width throughout most of the length and widening slightly near the secondary septum. A shallow constriction or none at all is present at this septum. The posterior deutomerite is elongate ellipsoidal or ovoidal in shape, broadening very gradually backwards from the septum and and attaining its greatest width in the middle. From here it so gradually contracts, ending in a well rounded and not flattened posterior end.

(Satellite) The ratio of LP : TL=1 : 29.0—39.0, WP : WD=1 : 1.4—1·7 The interlocking device is well constructed, sporonts of an association being contactly contiguous and not easily dissociated by pressure. The posterior end of the primite fits into a very deep concavity of the satellite protomerite. The protomerite is compressed, forming a broad and shallow plate. It is about two times as wide as long and usually apically concaved at the anterior extremity. There is a deep constriction at the septum which concaves deeply into the anterior end of the deutomerite. The deutomerite is also definitely devided into two parts with the secondary septum. The shape of the satellite deutomerite is nearly equal to that of the primite.

The endocyte of the posterior deutomerite is very opaque and dense, being dark brown in transmitted light. The granules of the deutomerite are not homogeneous, smaller ones being interspersed with larger ones. The protomerite is less dense than the posterior deutomerite and it contains homogeneous granules. The anterior deutomerite, however, is the least dense of the body segments, being nearly transparent and finely granular. Often in this anterior deutomerite, there are a few irregular large granules scattering near the first septum, which are stained deeply with haematoxylin. The epicyte is rather thick and of the even width throughout except in the protomerite of the satellite. It is considerably thicker at the place of interlocking than elsewhere in the association. especially its anterior center being thickened and giving the appearance of a plug between two sporonts. In the posterior deutomerite the sarcocyte is so much well developed and distinctly visible, measuring 5—7$\mu$ in thickness. Longitudinal fine striations are discernible in the epicyte. Two or three strongly refractive bodies often come arise at the center of the first septum.

The nucleus is spherical, being in diameter half or one-third the width of the posterior deutomerite, in the middle of which it generally lies. In some specimens the nucleus is situated a little below the middle of the posterior deutmerite. In measures 10—15$\mu$ in diameter and contains one spherical karyosome.

A table of measurements follows; in which all dimensions are given in microns:

| | | | | | |
|---|---|---|---|---|---|
| Length of association | 320 | 401 | 408 | 381 | 406 |
| Primite: | | | | | |
| Length sporont | 175 | 218 | 213 | 223 | 218 |
| Length protomerite | 18 | 18 | 16 | 16 | 18 |
| Length of anterior deutomerite (aLD) | 87 | 112 | 110 | 117 | 102 |
| Length of posterior deutomerite (pLD) | 70 | 88 | 87 | 90 | 88 |
| Width protomerite | 25 | 28 | 25 | 30 | 25 |
| Width of anterior deutomerite (aWD) | 25 | 25 | 25 | 30 | 25 |
| Width of posterior deutomerite (pWD) | 28 | 40 | 28 | 30 | 30 |
| Ratio of LP : TL | 1 : 9.7 | 1 : 12.1 | 1 : 13.3 | 1 : 13.9 | 1 : 12.1 |

| | | | | | |
|---|---|---|---|---|---|
| Ratio of aLD : pLD | 1 : 0.8 | 1 : 0.8 | 1 : 0.8 | 1 : 0.8 | 1 : 0.8 |
| Ratio of WP : pWD | 1 : 1.1 | 1 : 1.4 | 1 : 1.1 | 1 : 1.0 | 1 : 1.2 |
| Ratio of aWD : pWD | 1 : 1.1 | 1 : 1.6 | 1 : 1.1 | 1 : 1.0 | 1 : 1.2 |
| Satellite: | | | | | |
| Length sporont | 145 | 183 | 195 | 158 | 188 |
| Length protomerite | 5 | 5 | 5 | 5 | 5 |
| Length of anterior deutomerite (aLD) | 75 | 98 | 102 | 95 | 108 |
| Length of posterior deutomerite (pLD) | 65 | 80 | 88 | 60 | 75 |
| Width protomerite | 20 | 22 | 22 | 20 | 22 |
| Width of anterior deutomerite (aWD) | 25 | 35 | 33 | 28 | 33 |
| Width of posterior deutomerite (pWD) | 28 | 38 | 38 | 30 | 38 |
| Ratio of LP : TL | 1 : 29.0 | 1 : 36.7 | 1 : 39.0 | 1 : 31.8 | 1 : 37.8 |
| Ratio of aLD : pLD | 1 : 0.9 | 1 : 0.8 | 1 : 0.9 | 1 : 0.6 | 1 : 0.7 |
| Ratio of WP : pWD | 1 : 1.4 | 1 : 1.7 | 1 : 1.7 | 1 : 1.5 | 1 : 1.7 |
| Ratio of aWD : pWD | 1 : 1.1 | 1 : 1.1 | 1 : 1.2 | 1 : 1.1 | 1 : 1.2 |

Trophozoite

The smallest trophozoite found in smears was 12$\mu$ ×7$\mu$ in size. It is ovoidal and divided into merely two segments, protomerite and deutomerite. The trophozoite of this stage is buried in the epithelial cell of the intestine.

The next stage seen was a cephalont in which the body was divided into four divisions by three septa, because the deutomerite was secondarily segmented by a newly arisen septum.

Measurements in microns of a fairly large cephalont are: Total length 63, length of protomerite 10, anterior deutomerite 32, posterior deutomerite 21, width of protomerite 12, anterior deutomerite 12, posterior deutomerite 15, Size of epimerite 8×4. Diameter of nucleus 8. Ratio of LP : TL=1 : 6.3, pLD : aLD=1 : 1.5, WP : WD=1 : 1.3.

The epimerite is a simple club-shaped or ovoidal sessile knob, narrowing slightly near the base. The protomerite is subspherical. widest through the middle and is well rounded at apex. The deutomerite is clearly separated with definite septum into two compartments, the anterior one is cylindrical and the posterior one is ovoidal containing one spherical, large nucleus.

Two types of movement, gliding and bending, are commonly observed. The animal moves forward slowly in a straight line, turning intermittently the protomerite from side. Progression has been observed at the rate of 4.5$\mu$ per second in one specimen. The anterior region of the anterior deutomerite is flexible.

Cyst and spore

The cysts obtained from the intestine or from the faeces are spherical in shape. They measure between 65$\mu$ to 90$\mu$ in diameter. The cyst wall is rather

thin and averages 7 $\mu$ in thickness. The cyst dehiscence is by 4—5 spore ducts which are 30—35 $\mu$ in length. The spores are extruded in chains and ellipsoidal 6 $\mu \times 5 \mu$.

Genus *Leidyana* WATSON, 1915

63. *Leidyana latiformis* n. sp.
(Figures 203—207)

Host: *Tinea granella* LINNE, larva. Lepidoptera, Insecta.

Habitat: Intestine.

Locality: Naruto, Hikari and Yamaguti, (Yamaguti Prefecture).

Sporont:

The sporonts are solitary. The maximum recorded length is 275 $\mu$, the maximum width 110 $\mu$. The ratio of LP : TL=1 : 5.2—7.1, WP : WD=1 : 1.2—1.8 The body is elongate ovoidal in shape. The protomerite is hemispherical, usually larger in width than in height, widest in the middle and well rounded at the apex. There is a fairly deep constriction at the septum. The deutomerite is elongate, widening rapidly from the septum and attaining the greatest width at the shoulder or about the middle. Thence it tapers very gradually to the posterior end, terminating in a broadly rounded end.

Figures for a few individuals measured are as follows (dimensions are given in miorons);

| | | | | | | |
|---|---|---|---|---|---|---|
| Total length of sporont | 210 | 223 | 242 | 252 | 255 | 263 |
| Length protomerite | 34 | 36 | 35 | 36 | 45 | 50 |
| Length deutomerite | 176 | 187 | 207 | 216 | 210 | 213 |
| Width protomerite | 42 | 50 | 56 | 59 | 58 | 58 |
| Width deutomerite | 55 | 78 | 84 | 105 | 102 | 100 |
| Ratio of LP : TL | 1 : 6.2 | 1 : 6.2 | 1 : 6.9 | 1 : 7.0 | 1 : 5.8 | 1 : 5.3 |
| Ratio of WP : WD | 1 : 1.3 | 1 : 1.5 | 1 : 1.5 | 1 : 1.8 | 1 : 1.8 | 1 : 1.7 |

The endocyte is very dense in the deutomerite, light brown in transmitted light: it is nearly as dense as in the lower main part of the protomerite, but the upper portion of the latter immediately below the apex is almost devoid of endoplasm.

The nucleus is spherical, measuring 30—35 $\mu$ in diameter and contains one spherical karyosome within. It is not visible in the dense adults, but is seen in the younger sporonts and trophozoites in vivo.

Trophozoite:

The trophozoite about 10 $\mu$ long and 6 $\mu$ wide has its epimerite buried in the epithelial cell of the host intestine. At this stage the septum between the protomerite and the deutomerite is not yet well pronounced. The trophozoite 30 $\mu$ long

and 12 $\mu$ wide has differentiated three segments of its body. The protoplasm is nearly transparent and that of the protomerite is less dense than that of the deutomerite.

The trophozoite increases in size till it reaches about 180—200 $\mu$ in length and then it is liberated in the lumen of the intestine, losing the epimerite inserted into the epitherial cell. The epimerite is subglobular or somewhat ellipsoidal in shape and measures 10—15 $\mu$ in diameter. The protoplasm of the cephalont is granular and light coloured. In the living specimen the nucleus is seen more transparent area to our eyes, and is most often situated about the middle region of the deutomerite. Its position, however, is often changeable.

Association;

The parasites are solitary, never associative in the normal sporont stage but they will come together just before the cyst formation. Sometimes associated individuals are found. The shape of the members is almost similar to that of individuals which are solitary and free in the gut lumen, except that the deutomerite of primite is more broadly rounded at the posterior end than that of the former.

Measurements of two specimens of association are as follows, (all dimensions given in microns):

| Total length association | 399 | | 430 | |
|---|---|---|---|---|
| | Primite | Satellite | Primite | Satellite |
| Length of sporont | 210 | 189 | 190 | 240 |
| Length protomerite | 34 | 32 | 40 | 50 |
| Length deutomerite | 176 | 157 | 150 | 190 |
| Width protomerite | 53 | 55 | 53 | 52 |
| Width deutomerite | 84 | 84 | 100 | 103 |
| Ratio of LP : TL | 1 : 6.2 | 1 : 5.9 | 1 : 4.8 | 1 : 4.8 |
| Ratio of WP : WD | 1 : 1.6 | 1 : 1.5 | 1 : 1.9 | 1 : 2.0 |

Cyst and spore:

The cysts are spherical, measuring 100—130 $\mu$ in diameter (the wall included). The transparent outer-envelope is adout 20 $\mu$ thick. Dehiscence by spore ducts from six to eight in number. The spore duct measures 50—60 $\mu$ in length. Maturation period was 3—4 days during August, 1950.

The spores are extruded out of the ducts in chains. They are barrel-shapéd and measure 4 $\mu$ by 6 $\mu$.

Systematic position:

The genus *Leidyna* was created by WATSON for the gregarine from Orthoptera, *Leydyana erratica* (CRAWLEY) WATSON. which had been described as *Stenophora erratica* CRAWLEY. By this time 7 species had been attatched to this genus;

2 from Orthoptera, 2 from Lepidoptera, 1 from Coleoptera, 1 from Hymenoptera and 1 from Turbellaria.

KEILIN, 1918 described the gregarine for the first time from Lepidoptera, *L. tinei* KEILIN and DAVIAULT, 1929 added *L. ephestiae* DAVIAULT from Lepidoptera.

The gregarine described above may be easily assigned to the genus *Leidyana* on account of its shape and various characters of the body and it resembles in some respects to *L. tinei* and *L. ephestiae* but some characters prevent it from being assigned to either of these species. The following table indicates the chief differences:

| | *L. tinei* | *L. ephestiae* | *L. latiformis* |
|---|---|---|---|
| Maximum length of sporont | 300 $\mu$ | 350 $\mu$ | 275 $\mu$ |
| Maximum width of sporont | 85 $\mu$ | 85 $\mu$ | 110 $\mu$ |
| Maximum length of protomerite | 40 $\mu$ | 88 $\mu$ | 50 $\mu$ |
| Cyst diameter | 90—110 $\mu$ | 140—175 $\mu$ | 100—130 $\mu$ |
| Number of sporeducts | 2—5 | 3—8 | 6—8 |
| Length of sporeducts | 40—50 $\mu$ | 40—50 $\mu$ | 50—60 $\mu$ |
| Length of spore | 7 $\mu$ | 6.6 $\mu$ | 6 $\mu$ |
| Posterior end of deutomrite | Blunt | Broadly rounded | Broadly rounded |

64. *Leidyana lancea* n. sp. (Figures 208—213)

Host: *Aphonia gularis* ZELLER, larva. Lepidoptera, Insecta.

Habitat: Intestine.

Locality: Naruto, Hikari (Yamaguti Prefecture)

Sporont:

The sporonts are solitary until just before the cyst formation as is the case with all members of this genus. The body is shaped like a lance, widest near the top and tapers very gradually to a pointed posterior extremity. The maximum recorded length is 450 $\mu$, the average length 350 $\mu$, and the maximum width 140 $\mu$. The ratio of LP : TL=1 : 7—9, WP : WD=1 : 1.3—1.5.

A table of dimensions of some sporonts is given here; (all dimensions are expressed in microns):

| | | | | | | |
|---|---|---|---|---|---|---|
| Total length sporont | 320 | 340 | 370 | 380 | 380 | 350 |
| Length protomerite | 38 | 48 | 42 | 43 | 55 | 50 |
| Length deutomerite | 282 | 292 | 328 | 337 | 325 | 300 |
| Width protomerite | 52 | 54 | 50 | 50 | 60 | 55 |
| Width deutomerite | 75 | 67 | 75 | 68 | 80 | 120 |
| Ratio of LP : TL | 1 : 8.4 | 1 : 7.1 | 1 : 8.8 | 1 : 8.8 | 1 : 6.9 | 1 : 7.0 |
| Ratio o f WP : WD | 1 : 1.4 | 1 : 1.2 | 1 : 1.5 | 1 : 1.4 | 1 : 1.3 | 1 : 2.3 |

The protomerite is hemispherical, slightly larger in width than in height and widest

just above the base. There is a deep constriction at the septum. The deutomerite is elongate cylindrical, widening rapidly from the septum. It is widest a short distance below the constriction at the septum and tapers thence gradually toward the posterior end, terminating in a rather sharply pointed extremity The width of the deutomerite increases gradually with years and the deutomerite becomes an elongate ovoid in the full grown sporont, but the protomerite does not change its shape cosiderably.

The endocyte is very dense and brown in the deutomerite and paler in the protomerite. The nucleus is spherical and contains one large karyosome. In some specimens a few small chromatic granules are seen around the karyosome. The nucleus measures 25—30 $\mu$ in diameter and the karyosome 7—8 $\mu$ in diameter. It is not visible except in young sporonts or in trophozoites. The position of the nucleus changes in the deutomerite.

Cephalont:

The earliest stages of *Leidyana lancea* observed were the young cephalonts measured 35 $\mu$ long and 10 $\mu$ wide. These are provided with a large spherical or ellipsoidal epimerite buried in the epitherial cell of the host. The body of the trophozoite is already divided into three parts; epimerite, protomerite, and deutomerite in its early stage.

The cephalont attaching to the epitherial cell of the host gut increases much in size till it gets about 150—200 $\mu$ in length, them it becomes a sporont, losing the epimerite and is set free in the gut lumen. Measurements in microns made of a fairly large cephalont are: total length 130, length of epimerite 15, protomerite 23, deutomerite 92, width of protomerite 19, deutomerite 28. Ratio of LP : TL=L : 5.0, WP : WD=1 : 1.5. The protomerite is larger in length than in width or wide as much as it is long. The anterior half of the protomerite is rather broadly conical and is blunt at the apex. The deutomerite rapidly widens at the septum, becoming about 1.5 times as large as or less than the maximum width of the protomerite at the shoulder. Thence it tapers gradually to a slender posterior end, terminating in a sharply pointed extremity.

Cyst and spore:

Cysts are dense, spherical and average 150 $\mu$ in outer diameter. The inner diameter is approximately 90 $\mu$. Spores are extruded from spore ducts in chains. The maximum number of spore ducts seen on a cyst was ten. The ducts are 60—70 $\mu$ long. The spores are barrel-shaped 7 $\mu$ by 5 $\mu$.

Systematic position:

This species is similar in outline of the deutomerite to *Leidyana tinei* KEILIN, but they differ in size of the sporont, which in *L. tinei*, is 300 $\mu$ in maximum len-

gth, and in this species, 450 $\mu$.

This species is easily distinguishable from *L. ephestiae* DAIVAULT by the shape of its body and its larger size. In the latter the deutomerite is elongate ellipsoidal in outline and broadly rounded at the posterior end, while in this species it is lance-shaped slender and sharply pointed at the end. The maximum length recorded of *L. ephestiae* is 350 $\mu$, but of this species it is 450 $\mu$.

65. *Leidyana aglossae* n. sp.
(Figures 214–220)

Host: *Aglossa dimidiata* HAWORTH. larva. Lepidoptera, Insecta.
Habitat: Intestine.
Locality: Tabuse. (Yamaguti Prefecture)

Sporont:

The sporonts are solitary, the body, elongate cylindrical. The largest sporont seen was 380 $\mu$ in length and 110 $\mu$ in width. The protomerite is subglobular or hemispherical in spape, slightly wider than it is long, widest at a short distance above the base and is broadly rounded at the anterior end. There is a deep constriction at the septum. The deutomerite is elongate cylindrical, widening rapidly from the septum to the shoulder and thence broadens very gradually to the posterior region. The widest part is usually at a little distance above the end or sometimes about the middle. Then, the deutomerite becomes narrower, ending in a very blunt extremity. The deutomerite is practically of the same width throughout.

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

| | | | | | |
|---|---|---|---|---|---|
| Total length sporont | 242 | 330 | 345 | 360 | 265 |
| Length protomerite | 43 | 20 | 45 | 60 | 62 |
| Length deutomerite | 199 | 290 | 300 | 300 | 203 |
| Width protomerite | 50 | 65 | 50 | 65 | 70 |
| Width deutomerite | 65 | 85 | 60 | 90 | 120 |
| Ratio of LP : TL | 1 : 5.6 | 1 : 6.8 | 1 : 7.7 | 1 : 6.0 | 1 : 4.3 |
| Ratio of WP : WD | 1 : 1.3 | 1 : 1.3 | 1 : 1.2 | 1 : 1.4 | 1 : 1.7 |

The body is light brown, and the protoplasm is homogeneous consisting of fine granules in the deutomerite. The protomerite is slightly paler in colour than the deutomerite. Especially the anterior end of the protomerite is devoid of granules. The nucleus is not visible in adults because of the density of the protoplasm. It is spherical, measuring 30–35 $\mu$ in diameter, and contains one large spherical karyosome within. The position of the nucleus, which will often change, is most generally near the posterior end.

Trophozoite:

This species observed in the youngest stages are small trophozoites about 40 $\mu$ long and 10 $\mu$ wide. The three segments are already differentiated in the body. The epimerite is a simple and sessile knob, narrowing slightly near the base. It is inserted into the epithelial cell of the host gut.

The cephalont, while still attaching to the host cell, grows and increases in size. Attaining to the length of 150—200 $\mu$, they detach from the epithelium losing the epimerite and is liberated in the gut lumen. Measurements of a cephalont taken by the micron are: total length 210, length of epimerite 17, protomerite 37, deutomerite 156, width of protomerite 37, deutomerite 45, diameter of nueleus 25, Ratio of LP : TL=1 : 5.2, WP : WD=1 : 1.2. The protomerite is subglobular and as wide as it is long. The deutomerite is elongate cylindrical and of the same width throughout.

Cyst and spore:

The cysts are spherical, 140—160 $\mu$ in total diameter. The envelope composed of gelatinous substance measures 26 $\mu$ in thickness. Dehiscence is produced dy means of 8 to 10 short spore ducts. The spore duct averages 60 $\mu$ in length and is swollen at the basal portion. It narrows gradually from the basal portion to the tip of duct. The spores are extruded in chains. The spore is barrel-shaped and is 7 $\mu$ by 5.5 $\mu$.

Systematic position

Among the members of the genus *Leidyana*, this species resembles the sporont and the cyst, *L. ephestiae* DAVIAULT in shape and size, but it differs from the latter in the maximum length of the protomerite which in *L. ephestiae* is 88 $\mu$ and in this pecies is less than 65 $\mu$. They differ also in the size of spores.

This species is easily to be distinguished from *L. tinei* KEILIN and *L. latiformis* by the considerable difference in size and shape of the sporont. It differs from *L. lancea* in the shape of the sporont and in the character of cyst and spore.

## Genus *Gamocystis* SCHNEIDER 1875

### 66, *Gamocystis ephemerae* (FRANZIUS) LABBE

(Figures 168—173)

Host: *Potamantidae* sp. larva. Ephemeroptera, Insecta.

Habitat: Intestine.

Locality; Hikari (Yamaguti Prefecture)

Trophozoite:

The small trophozoites generally found in the smears are spherical or slightly

ovoidal and measure 30 $\mu$ × 28—25 $\mu$. They have no septum in the body in this stage. The parasite exhibits slow and undulating movements along the margine of the body, which are easily noticeable under low magnification. It is nearly transparent with a few large and small protoplasmic granules. The nucleus is visible in vivo, surrounded by the large granules which seem to cling to the nucleus in a cluster. It is comparatively large and spherical, often half the width of the body in diameter, and contains one karyosome within.

The trophzoites in the following stage are the ovoidal ones which lie freely in the intestine of the host. They measure between 50 $\mu$ and 55 $\mu$ in length, and between 30 $\mu$ and 35 $\mu$ in width. The anterior half of the body widens slightly in a subglobular shape and is broadly rounded or a little flattened at the anterior end. There is a very shallow constriction through the middle, then the posterior half becomes smaller and subglobular, ending in a well rounded posterior extremity. In some cases no constriction is found in the middle of its body and the body is practically ovoidal in shape.

The nucleus is spherical and measures 14 $\mu$ or 15 $\mu$ in diameter. It situates usually in the center of the anterior swollen half.

Sporont:

An important feature of the parasite is that the adult sporonts are always associated in pairs, there is, the association in apposition, two individuals equal in size attached with head on head.

The adult sporont is ovoidal, widening acutely from the anterior end where it comes in contact with another sporont, and becoming widest at the end of anterior one-third of the body. It tapers gradually towards the posterior end. terminating in a well rounded or a bluntly pointed extremity. It is flattened at the place of union There is no septum in the body. The range in length is from 120 $\mu$ to 140 $\mu$ and in width from 85 $\mu$ to 90 $\mu$. The ratio of width to length in each individual is 1 : 1.5.

The body is dark brown, the protoplasm being very dense in all parts except in the small region near the posterior end, where it is less dense than in any other regions of the body. The epicyte is rather thick, transparent and of the same width throughout the body. The sarcocyte is well developed at each posterior end of the sporonts. In each sporont there is a spherical nucleus which is an average of 25 $\mu$ in diameter. It is just visible in vivo and contains one large karyosome within. The nucleus generally lies more or less near the united end but in some cases it is situated in the middle or slightly below the middle.

The smallest sporont observed was 65 $\mu$ in length and 40 $\mu$ in width. In the early stage the two conjuants are also nearly identical in size and shape, but there are some differnces between these and adults. There are a slight const-

rictions through the middle of the body like the trophzoite. The colour of the body is light brown and less opaque than that of the adult sporont. Longitudinal striations are easily discernible in the epicyte in this early stage of developement.

Cyst and spore:

The associating pairs become short and subglobular. The endoplasm in this maturation stage increases the density more and becomes practically black in transmitted light, so that the position of the nucleus is scarcely visible in living specimens. The associated sporonts begin to rotate and come closer and closer together to form the complete spherule.

The cysts are spherical and measure a total of 200—230 $\mu$ in diameter. The cyst wall is rather thin, measuring 5—8 $\mu$ in thickness, transparent but elastic and strong. The dehiscence of cysts is done by simple rupture. The spore is spherical and measures 6 $\mu$ in dimeter.

Notes: This parasite found in Japan coincides with the European forms in the size and characters of the sporont, except in the shape of its posterior end. But the difference is too little to separate the Japanese form from the Enropean one.

## Genus *Hirmocystis* LABBE 1899

67. *Hirmocystis mirabilis* HOSHIDE 1951.
(Figures 156, 157)

Host: *Lyprops sinensis* MARSEUL. Coleoptera, Insect.
Habitat: Intestine.
Locality: Naruto, Ogori (Yamaguti Pretecture).

## Genus *Cnemidospora* SCHNEIDER 1882

68. *Cnemidospora rhysodesmi* HOSHIDE (Figures 163—165)
(= syn. *Stenophora rhysodesmi* HOSHIDE 1952)

Host: *Rhysodesmus semicircularis hosidei* MIYOSI Juliformia, Diplopoda.
Habitat: Intestine.
Locality: Hagi (Yamaguti-Prefecture)
Sporont:
The sporonts are solitary. The body, when expanded, is shaped like a bag or

is ellipsoidal, The largest sporont found was 310 $\mu$ in length and 115 $\mu$ in width. The average ratio of LP : TL = 1 : 5.9, WP : WD = 1 : 1.9 The protomerite is divided clearly into two parts; an anterior conical part and a posterior ellipsoidal one. The protomerite is subglobular on the whole, rather not so high as it is wide and widest a short distance above the base. There is a deep, conspicuous constriction at the septum. The deutomerite is ellipsoidal or cylindrical. In the old large specimens it broadens gradually from the septum to the widest portion, which is generally the end of anterior one-third of the deutomerite. But in some growing specimens, it is widest just below the shoulder or at the beginning of the posterior one-third of the deutomerite. Occasionally the body is widest through the middle part and a shallow constriction is noticed at a little distance below there. The posterior end is rather truncated, or broadly rounded.

The ectocyte is well developed all over the body surface, especially it is so at the anterior half of the protomerite. The ectocyte measured 10 $\mu$ in thickness on the surface of the deutomerite. Longitudinal fine striations are easily discernible in the epicyte. There is an apparent pore at the anterior end of the protomerite. The endoplasm in the deutomerite is most dense and opaque than in other parts. It is brown in colour and contains small granules. The anterior conical portion of the protomerite is stained to be a fairly homogeneous shade, and is filled with fine and almost pale gray protoplasm. The lower half of the ellipsoid is denser than the anterior half but is less dense than the deutomerite, containing a few lare granules.

The nucleus is large and spherical in shape, measureing 30 $\mu$ in average diameter. It contains one spherical karyosome which is 10 $\mu$ or so in diameter.

The movement is fairly active with two types of motion, gliding and bending, which are common to all the animals of this species. Ameboid movement is noticed, chiefly confined to the anterior portion of the deutomerite and then intermittently withdrawing or extending the protomerite.

A table of measurements is appended, in which all dimensions are expressed in microns:

| | | | | | | |
|---|---|---|---|---|---|---|
| Total length sporont | 260 | 225 | 222 | 220 | 210 | 190 |
| Length protomerite | 40 | 40 | 37 | 38 | 38 | 32 |
| Length deutomerite | 220 | 185 | 185 | 182 | 172 | 158 |
| Width protomerite | 52 | 42 | 40 | 40 | 42 | 35 |
| Width deutomerite | 105 | 90 | 90 | 72 | 65 | 65 |
| Ratio of LP : TL | 1 : 6.5 | 1 : 5.6 | 1 : 6.0 | 1 : 5.8 | 1 : 5.5 | 1 : 5.9 |
| Ratio of WP : WD | 1 : 2.0 | 1 : 2,1 | 1 : 2.3 | 1 : 1.8 | 1 : 1.5 | 1 : 1.9 |

Systematic position:

I attached ('52) this species to the genus *Stenophora* but it has now become

clear according to the later observations that this animal is to be transfered to the genus *Cnemidospora*. It has a clearly divided protomerite, of which anterior half is pale, somewhat gray, and the posterior one is slightly darker like the type species.

It is separated from the type species, *C. lutea* SCHNEIDER on account of considerable differences in the size and the shape of the body.

69. *Cnemidospora takaneensis* n. sp.
(Figures 159—162)

Diagnosis: Sporonts solitary, elongate. Maximum length 640 $\mu$, length generally between 400 $\mu$ and 630 $\mu$, width between 60 $\mu$ and 90 $\mu$. Average ratio LP : TL =1 : 12, WP : WD=1 : 1.7. Protomerite subglobular. It is not so long as it is broad. Divided into twoparts: the anterior globular with thickened area at apex, a pore and a canal visible in the center; the posterior somewhat crescentic. Slight constriction at septum. Deutomerite cylindrical, widest at anterior 1/4 to 1/5 of the body, posterior region cylindrical, truncated at the end. Nucleus spherical, 30 in diameter, with one karyosome. Endocyte dense and light brown. Anterior half of protomerite nearly transparent with homogeneous protoplasm.

Host: *Rhysodesmus* sp. Juliformia. Diplopoda.

Habitat: Intestine.

Locality: Takane (Yamaguti-Prefecture)

In August, 1953, I obtained many large diplopods belonging to the genus *Rhysodesmus* at the foot of Mt. Kanmuri, Yamaguti Prefecture. I found that this Takane diploped was also sheltered by a species of gregarines. The infection is not heavy but almost all hosts are parasitized by this species.

Sporont:

The sporonts are solitary like other members of this genus. the body is elongate cylindrical in shape. The largest sporont observed was 640 $\mu$ in length and 100 $\mu$ in width, though generally most of them varies between 400 $\mu$ and 630 $\mu$, in length, and between 60 $\mu$ and 90 $\mu$ in width. The average ratio of LP : TL=1 : 12, WP : WD=1 : 1.7. The protomerite is apparently divided by thin membrane into two parts: the anterior half is nearly globular which is almost surrounded by another parts, and this part, is penetrated with a small canal in its center from the anterior end to the base: the posterior half is somewhat crescentic, dilating through the middle. The protomerite is subglobular on the whole, widening gradually from the base with its widest part at the beginning of posterior third of the protomerite. It narrows gradually thence upwards and terminates in a broadly rounded anterior end. A small conical upheaval is usually seen at the center of the apex. There is a slight constriction at the septum. The deutomerite is elongate

cylindrical, broadening very gradually downwards from the septum and it is widest at the end of one-fourth or one-fifth of the body. The deutomerite is almost twice as wide as the protomerite. From this widest region the deuromerite tapers very gradually to the posterior end, terminating in a truncated or well rounded extremity. Practically the narrowed posterior portion is of the same width throughout and appears to be a elongate cylider.

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

| | | | | | |
|---|---|---|---|---|---|
| Total length sporont | 624 | 600 | 560 | 480 | 400 |
| Length protomerite | 56 | 48 | 40 | 48 | 40 |
| Length deutomerite | 568 | 552 | 520 | 432 | 360 |
| Width protomerite | 52 | 48 | 48 | 56 | 40 |
| Width deutomerite | 88 | 88 | 80 | 104 | 64 |
| Ratio of LP : TL | 1 : 11 | 1 : 13 | 1 : 14 | 1 : 10 | 1 : 10 |
| Ratio of WP : WD | 1 : 1.7 | 1 : 1.8 | 1 : 1.7 | 1 : 1.9 | 1 : 1.6 |
| Diameter of nucleus | 32 | 32 | 32 | 32 | 30 |

The colour of this spceies is light brown. The protoplasm is dense both in the deutomerite and in the posterior half of the protomerite. The granules of these parts are not homogeneous and smaller ones are interspersed with larger ones. In the posterior half of the protomerite, the granules occasionally clustered at the central region. The anterior half of the protomerite is much lighter in colour, containing fine homogeneous granules of protoplasm. At the anterior end of this part is a conical thickning of epicyte with an apparent pore at apex. The epicyte of the protomerite is rathr thick, and it is especially so at the apex and near the septum. They measure 4—5 $\mu$ in thickness. The epicyte of the deutomerite is less thick, measuring 2—2.5 $\mu$, transparent, of even width throughout. The nucleus is spherical, and large specimens measure 30—32 $\mu$ in diameter. It contains one large spherical karysome, 10—12 $\mu$ in diameter and some small irregular chromatin bodies are often seen around it. The position of the nucleus is not definite, but most of ten it is found near the posterior end of the deutomerite.

Trophozoite:

The cephlonts about 35 $\mu$ in length were found in the earliest stages. They were ovoidal in shape and were provided with a small spherical epimerite at the anterior end of the protomerite. The trophozoits in the net stage of growth that comes to possess two types of body; an elongated type and a contraced globular one. Both have the same characters in all points but the shape of the deutomerite. The protomerite is clearly divided into two parts and an invagination and a small canal running through the center are dicernible. With ages the

trophozoite grows and increases in size, especially in length rather than in girth. The fairly large trophozoites become cylindrical-shape and usually no dilation of the body is observed. In some specimens a small conical projection rises at the posterior end of the body.

The following is a table of the various dimensions of a few trophozoites given in microns:

| | | | | | |
|---|---|---|---|---|---|
| Total length of body | 224 | 188 | 67 | 50 | 70 |
| Length of protomerite | 30 | 26 | 18 | 12 | 20 |
| Length of deutomerite | 186 | 162 | 49 | 38 | 50 |
| Width of protomerite | 40 | 26 | 27 | 18 | 25 |
| Width of deutomerite | 64 | 28 | 29 | 27 | 65 |
| Ratio of LP : TL | 1 : 7.5 | 1 : 7.2 | 1 : 3.8 | 1 : 4.2 | 1 : 3.5 |
| Ratio of WP : WD | 1 : 1.6 | 1 : 1.1 | 1 : 1.1 | 1 : 1.5 | 1 : 4.3 |
| Diameter of nucleus | 25 | 24 | 10 | 9 | 18 |

Systimatic position:

Although the cysts and spores have not been observed, this parasite may be classified to the genus *Cnemidospora* since it has a protomerite separated into two parts, this is applicable to the cheracteristic features of the type species of this genus. It closely resembles *C. lutea* SCHNEIDER in some respects: for instance, the ratio of LP : TL and ratio of WP : WD, the colour of the deutomerite. There are, however, many different points between this present species and *C. lutea*; that is to say, the deutomerite is elongate cylindrical. In the latter it has no dilation as that of the Japanese form. The protomerite of the latter is not so long as it is broad, the ratio being 3 : 4, while in the former it is slightly wider than it is long; the shape of the nucleus is ellipsoidal, twice as long as the latter is wide, but the former is spherical in shape.

This species is easily distinguished from the other one, *C. rhysodesmi* HOSHIDE found in Japan, which is considerably different in size

## Genus *Pyxinoides* TREGOUBOFF, 1920

### 70, *Pyxinoides balani* (KOLLIKER) TREGOUBOFF
(Figures 158)

Host : *Balanus amphitrite albicostatus* PILSBRY. Cirripedia, Crustacea
Habitat : Intestine.
Locality : Murozumi, Obatake (Yamagnti Pref.)

71. *Pyxinoides fujitubo* HOSHIDE, 1951.
(Figures 166, 167)

Host: *Balanus amphitrite communis* DARWIN Cirripedia, Crustacea
Habitat: Intestine.
Locality: Obatake (Yamaguti Pref.)

## Genus: *Caulocephalus* BHATIA & SETNA 1924

72. *Caulocephalus japonicus* n. sp.
(Figures 113–122)

Diagnosis: Sporonts biassociative, ellongate cylindrical or ellipsoidal. Maximum length of association 1mm. Maximum length of promite 490 $\mu$, width 125 $\mu$. Protomerite slightly wider than long, widest just above base, well rounded at the anterior. Slight constriction at septum. Deutomerite elongate, widest all through the middle, truncated in primite and well rounded in satellite. Nucleus spherical. 20–30 $\mu$ in diameter. with two karyosomes. Ratio, $\frac{LP : TL}{lp : tl}=\frac{1 : 4-7}{1 : 5-8}$, $\frac{WP : WD}{wp : wd}=\frac{1 : 1.3-1.8}{1 : 1.2-1.8}$. Endocyte dense, reddish orange. Epimerite with characters of the genus persists long. Cyst spherical or slightly ellipsoidal, dehisced by 3–6 short sporeducts, spores barrel shaped, 9 $\mu \times 5 \mu$.

Host: *Chrysomela aurichalces* MANNERHEIM, Aulacophora femoralis MOTSCHULSKY. larvae and adults. Coleoptera, Insecta.
Habitat: Intestine.
Locality: Hikari, Naruto, Yanai (Yamaguti-Prefecture)

This gregarine was found at first in the alimentary canal of *Aulacophora femmoralis*, during the summer, 1948. I reported it as *Gregarina munieri* (SCHNEIDER) LABBE in 1951 because it has some resemblances to the latter in its body shape and colour. According to the later ivestigations, however, it became evident that this speciecies would be assigned to the genus *Caulocephalus* as a new species.

Sporont:

The sporonts usually associate in couples. But in some specimens three individuals associate in a straight line. The sporonts are elongate cylindrical or ellipsoidal in shape. The maximum length of association was 1mm. The largest primite measured 490 $\mu$ long and 125 $\mu$ wide. The largest satellite was 520 $\mu$ long and 141 $\mu$ wide.

(Primite) The ratio of LP : TL=1 : 4–7, WP : WP=1 : 1.3–1.8. The protome-

rite is slightly wider than is long, well rounded at apex and widest just above the base. It tapers gradually to the broadly rounded anterior end. There is usually a slight constriction all through the middle of the protomerite, so that the protomerite is divided into two regions, the anterior and the posterior. The anterior half looks like a cap and is subspherical in outline. There is a characteristic clear zone crossed by the protoplasmic strands at the end of this cap. The constriction at the septum is fairly deep and conspicuous. The deutomerite is elongate cylindrical or ellipsoidal, 1—3 times as long as broad, widening gradually downwards from the septum and attaining the widest part through the middle or a short distance above the middle. This part, however, is changeable. In some specimen, then, it is at the shoulder, and in others it is near the posterior end. It terminates in a broad or rather truncated posterior end.

(Satellite) The ratio of LP : TL=1 : 5—8, WP : WD=1 : 1.2—1.8. The interlocking device between the primite and the satellite is well developed, and the posterior end of primite fits into the shallow concavity of the anterior end of the satellite. At the center of th e jointing plane a small transparent lens-shaped body is discernible, by which the contact seems to be strengthened. The protomerite is lower and broader than that of the primite and somewhat flattened top and bottom. The deutomerite of the satellite is cylindrical or elongate ellipsoidal, widest usually through the middle or slightly above the middle. Thence it tapers gradually downwards, terminating in the well rounded posteior extremity. In some specimen, when young, the body is of same width throughout.

Nucleus: The nucleus is spherical, measurig 20—30$\mu$ in diameter. It usally contains two karyosomes of different characters; the larger and the smaller ones. The latter, attaching to the former, is compact and less stains with haematoxylin, while the former is vacoulated and deeply stains. The nucleus generally is situated about the middle portion of the deutomerite or slightly above the middle, but its position is variable.

A table of measurements of the sporonts in microns follows:

| | | | | | |
|---|---|---|---|---|---|
| Total length association | 923 | 625 | 460 | 385 | 300 |
| Primite: | | | | | |
| Total length sporont | 428 | 277 | 240 | 140 | 150 |
| Length protomerite | 70 | 49 | 54 | 34 | 28 |
| Length deutomerite | 358 | 228 | 186 | 156 | 122 |
| Width protomerite | 48 | 47 | 45 | 40 | 35 |
| Eidth deutomerite | 120 | 68 | 84 | 60 | 50 |
| Ratio of LP : TL | 1 : 6.1 | 1 : 5.7 | 1 : 4.4 | 1 : 5.9 | 1 : 5.3 |
| Ratio of WP : WD | 1 : 1.8 | 1 : 1.4 | 1 : 1.8 | 1 : 1.4 | 1 : 1.4 |
| Diameter of nucleus | 28 | 27 | 25 | 25 | 22 |

Satellite:

| | | | | | |
|---|---|---|---|---|---|
| Total length sporont | 495 | 348 | 220 | 195 | 150 |
| Length protomerite | 70 | 56 | 40 | 27 | 26 |
| Length deutomerite | 425 | 292 | 180 | 165 | 124 |
| Width protomerite | 75 | 71 | 52 | 45 | 40 |
| Width deutomerite | 134 | 108 | 70 | 58 | 51 |
| Ratio of LP : TL | 1 : 7.1 | 1 : 6.2 | 1 : 5.5 | 1 : 7.2 | 1 : 5.7 |
| Ratio of WP : WD | 1 : 1.8 | 1 : 1.5 | 1 : 1.3 | 1 : 1.2 | 1 : 1.2 |
| Diameter of nucleus | 27 | 26 | 25 | 25 | 24 |

The endocyte is dense and reddish brown in colour. That of the deutomerite is very opaque and finely granular but that of the protomerite is less dense and lighter in colour than the former. In some mature specimen, the deutomerite contains many clusters of reddish brown granules but the protomerite contains none. The epicyte is thin and of even width throughout the body surface. Longitudinal striations are discernible in the epicyte.

cephalont:

The smallest trophozoite observed was 30 $\mu$ in length and 10 in width. It was ovoid in shape and was already possessed of a septum between the deutomerite and the protomerite. The trophozoite grows rapidly and undergoes a good deal of alteration in its appearance. The size of the cepbalonts stuck to the gut epithelium is variable. The largest cephalont ever seen attained a length of 420 $\mu$. But the length of normal ones ranges between 200 $\mu$ and 100 $\mu$.

The protomerite is subspherical or somewhat conical, slightly wider than is long and is widest just above tho septum. The anterior ene of thd protomerite is well rounded or rather pointed in a small cone.

The deutomerite is generally cylindrical, widest at the shoulder or slightly above the middle, and its length is generally 1–3 times as long as its breadth. It tapers gradually towards the posterior end, terminating in a well rounded extremity. In some cases the deutomerite is swollen and is ovoidal or subglobular in shape.

In the early stage of developement the epimerite is a simple sphrical knob but with ages it becomes larger and is ususally dilated anteriorly like a cauliflower as that of the type species. and it gets narrower basally, where it slightly falls into the anterior end of the protomerite. The epimerite persists in well-developed free individuals, rarely in associated sporonts.

A list of the essential measurements of some cephalonts with dimensions in microns is given below:

| | | | | | |
|---|---|---|---|---|---|
| Total length sporont | 218 | 101 | 92 | 70 | 57 |

| | | | | | |
|---|---|---|---|---|---|
| Length protomerite | 44 | 22 | 21 | 17 | 17 |
| Length deutomerite | 174 | 79 | 71 | 53 | 40 |
| Width protomerite | 40 | 24 | 23 | 20 | 18 |
| Width deutomerite | 60 | 32 | 31 | 30 | 23 |
| Ratio of LP : TL | 1 : 5.0 | 1 : 4.6 | 1 : 4.4 | 1 : 4.1 | 1 : 3.4 |
| Ratio of WP : WD | 1 : 1.5 | 1 : 1.3 | 1 : 1.3 | 1 : 1.5 | 1 : 1.3 |
| Diameter of nucleus | 24 | 17 | 13 | 15 | 10 |
| Length epimerite | 10 | 8 | 7 | 7 | 5 |

Cyst and spore:

The cysts of this species seen in the intestine or in the faecal matters, are spherical or slightly ellipsoidal. The cyst wall consists of two different membranes, the outer one is gelatinous, showing fine concentric striations within, and measuring 15—18 $\mu$ in thickness, the inner one, transparent, cuticular and measuring 2—3 $\mu$ in thickness. The cysts average 230 $\mu$ in diameter. Dehiscence is by spore ducts from 3 to 6 in number. The spore ducts are short, measuring 35 $\mu$ in length, and are less long than the radius of the cyst. The spores are extruded from the ducts in chains. They are barrel-shaped, measuring 9 $\mu \times 5\mu$, truncated at both ends.

Systematic position:

BHATIA & SETNA ('22) created the genus *Caulocephalus* for the gregarine from *Aulacophora farcicollis* KUST in India. This genus has included up to the present only one species, *C. crenata* BHATIA & SETNA.

I have classified the gregarine from *Aulacophora femoralis* into the genus *Gregarina* and considered the species identical with *Gregarina munieri* (SCHNEIDER) LABBE at first because this species in many respects resembles the latter species: sporonts are biassociative in both species, ratio of LP : TL and ratio of WP : WD are almost approximate. The colour of the body is reddish orange, cysts dehisced by 3—6 short spore-ducts.

According to the late investigations, however, it has become clear that the present species may be a member of the genus *Caulocephalus*, for the shape and characters of the epimerite are identical with those of the Indian form epimerite.

This species differs from *C. crenata* BHATIA & SETNA in the size of the body and characters of cysts and spores.

## PLATE VII

### Explanation of Plate

Figs. 94—96. *Gregarina lypropsi* HOSHIDE.

Fig. 94. A large association.

Fig. 95. A slender association.

Fig. 96. A young trophozoite, with epimerite.

Figs. 97, 98. *Gregarina ovata* DUFOUR.

Fig. 97. A large association.

Fig. 98. A small association.

Fig. 99. *Gregarina cuneata* STEIN, a trophozoite.

Figs. 100, 101. *Gregarina platicephala* HOSHIDE.

Fig. 100. A mature association.

Fig. 101. A trophozoite, with epimerite.

Fig. 102. *Gregarina concava* HOSHIDE, a mature association.

Fig. 103. *Gregarina gonimusi* HOSHIDE, a mature association.

Fig. 104. *Gregarina phylloiretae* HOSHIDE, An association.

Fig. 105. *Gregarina kamenote* HOSHIDE, A mature association.

Fig. 106. *Gregarina minor* HOSHIDA, An association.

Fig. 107. *Gregarina acantholobae* HOSHIDA, A mature association.

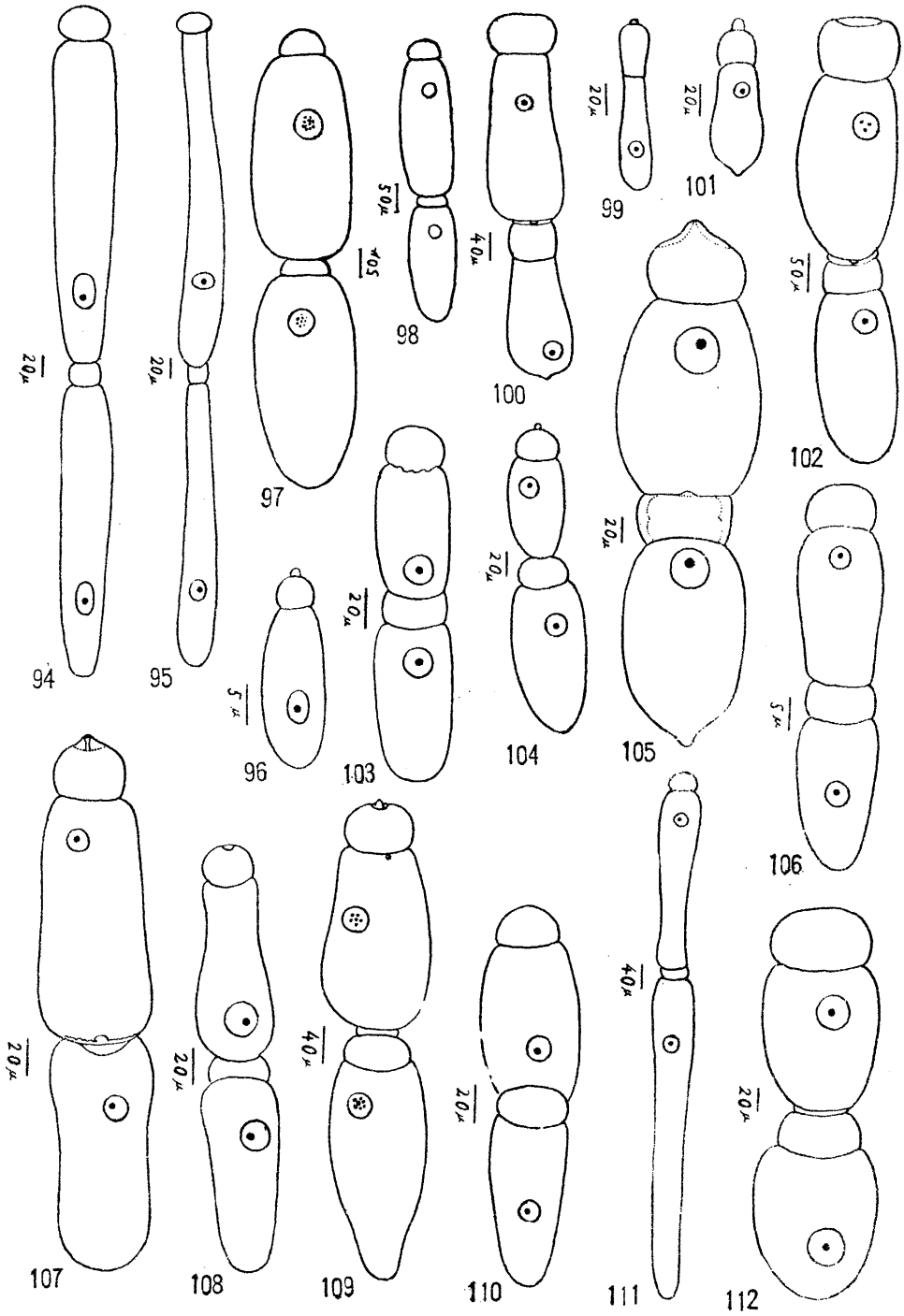
Fig. 108. *Gregarina katherina* WATSON, An association.

Fig. 109. *Gregarina plesiophthalmi* HOSHIDE, An adult association.

Fig, 110. *Gregarina ulomae* HOSHIDE, An association.

Fig. 111. *Gregarina rhomborrhinae* HOSHIDE, An association.

Fig. 112. *Gregarina korogi* HOSHIDE, An association.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## PLATE VIII

### Explanation of Plate

Figs. 113—122. *Caulocephalus japonicus* n. sp.

Fig. 113. A large asaociation.

Fig. 1I4. A slender association in living.

Fig. 115. A young trophozoite, wtih an epimerite.

Fig. 116. The nucleus of a sporont.

Fig. 117. A cyst, extruding spores in chain from three short spore dncts.

Fig. 118. The spore duct has become inverted and the spores are being extruded.

Fig. 119. Two ripe spores.

Fig. 120. A trophozoite.

Fig. 121. An association of three individuals.

Fig. 122. A small association.

Figs. 123—128. *Gregarina cuneata* STEIN.

Fig. An association.

Fig. Unique association, of four sporonts.

Fig. 125. The protomerite, showing the conical projection of the septum against the protomerite.

Fig. 126. A ripe cyst with six spore ducts in the process of extruding spores.

Fig. 127. The spore duct extruding spores in chain.

Fig. 128. Two spores.

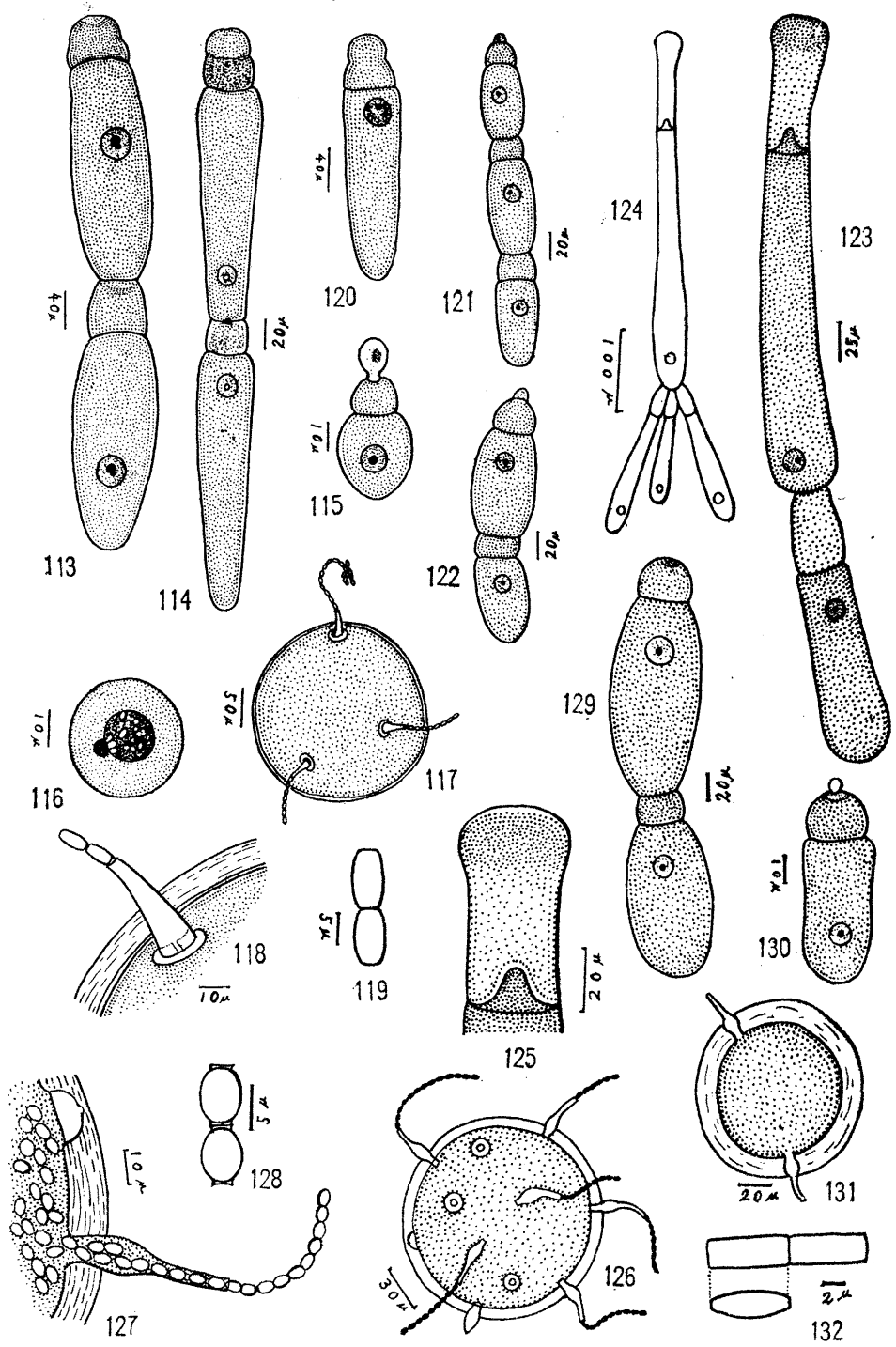
Figs. 129—132. *Gregarina kokunusuto* n. sp.

Fig. 129. Mature association.

Fig. 130. A small cephalont.

Fig. 131. A cyst with two extended spore ducts.

Fi g. 132. Two cylindrical jointed spores, and one spore, showing its side view,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## PLATE IX.

### Explanation or Plate

Figs. 133—139. *Gregarina inago* n. sp.

Fig. 133. An association, early stage in developement.

Fig. 134. A trophozoite with epimerite, free in lumen of intestine.

Fig. 135. Mature association.

Fig. 136. Association of three sporonts.

Fig. 137, a. Longitudinal section of protomerite of primite, showing an indentation in apex.

b. Longitudinal section of protomerite of satellite, showing a lense shaped thickening for interlocking with primite.

Fig. 138. The completed cyst.

Fig. 139. Two spores in chain and the transverse section of a spore is shown under them.

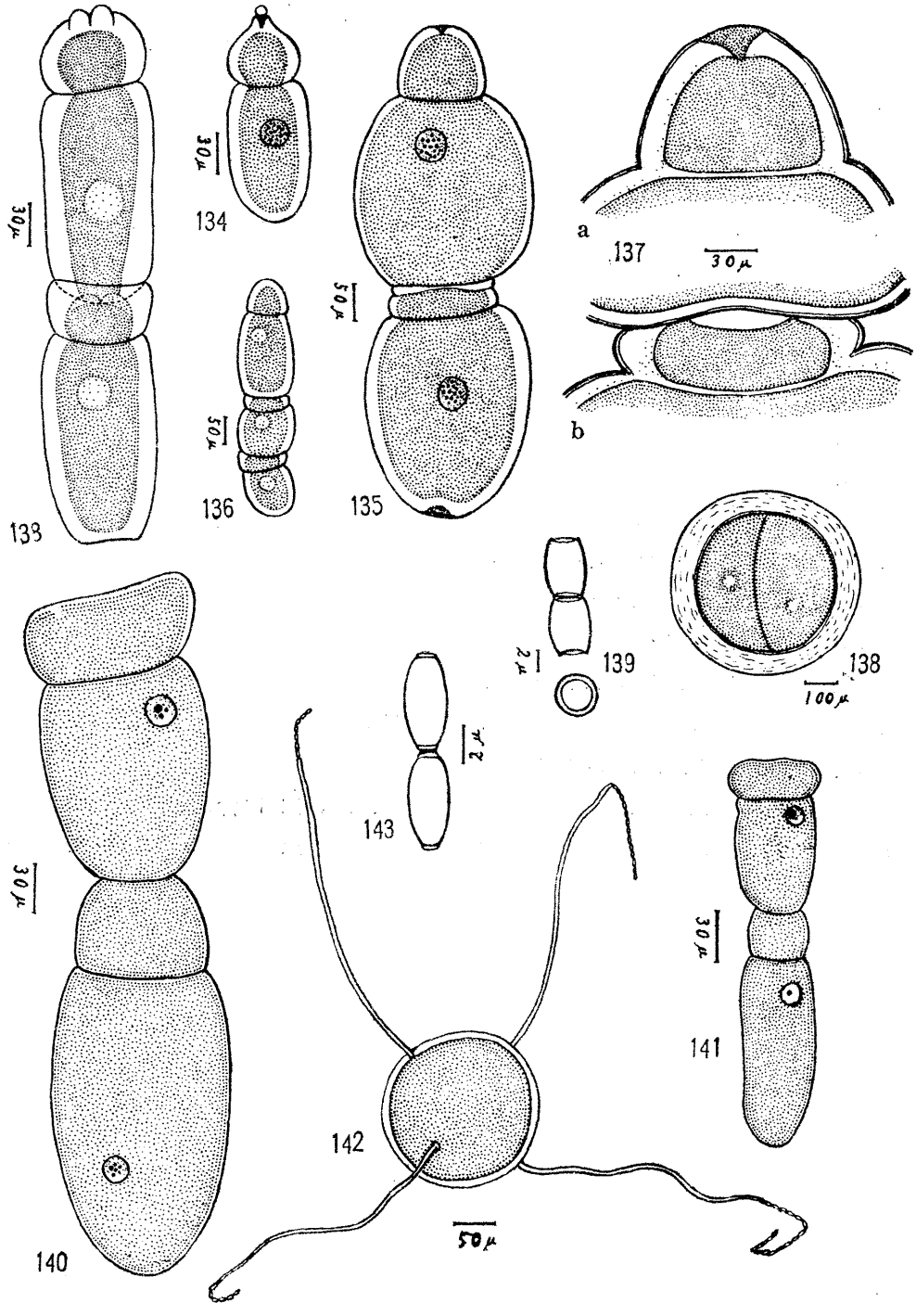
Figs. 140—143. *Gregarina scapsipedae* n. sp.

Fig. 140. A large association.

Fig, 141. A small association.

Fig. 142. A cyst with four spore ducts in the process of extruding spores.

Fig. 143. Two. spores.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## PLATE X.

### Explanation of Plate

Figs. 144, 145. *Gregarina diestrammenae* HOSHIDE.

Fig. 144. A mature association.

Fig. 145. An immature association.

Fig. 146. *Gregarina monoducta* HOSHIDE. A mature association.

Figs. 147, 148. *Gregarina polymorpha* (HAMMERSCHMIDT) STEIN.

Fig. 147. A mature association.

Fig. 148. A trophozoite.

Figs. 149–151. *Gregarina grandicephala* n, sp.

Fig. 149. A mature association.

Fig. 150. A cyst with 4 long spore ducts,

Fig. 151. Two spores in chain.

Figs, 152–154. *Triseptata fungicola* n. gen., n. sp.

Fig. 152. A mature association.

Eig. 153. A cephalont.

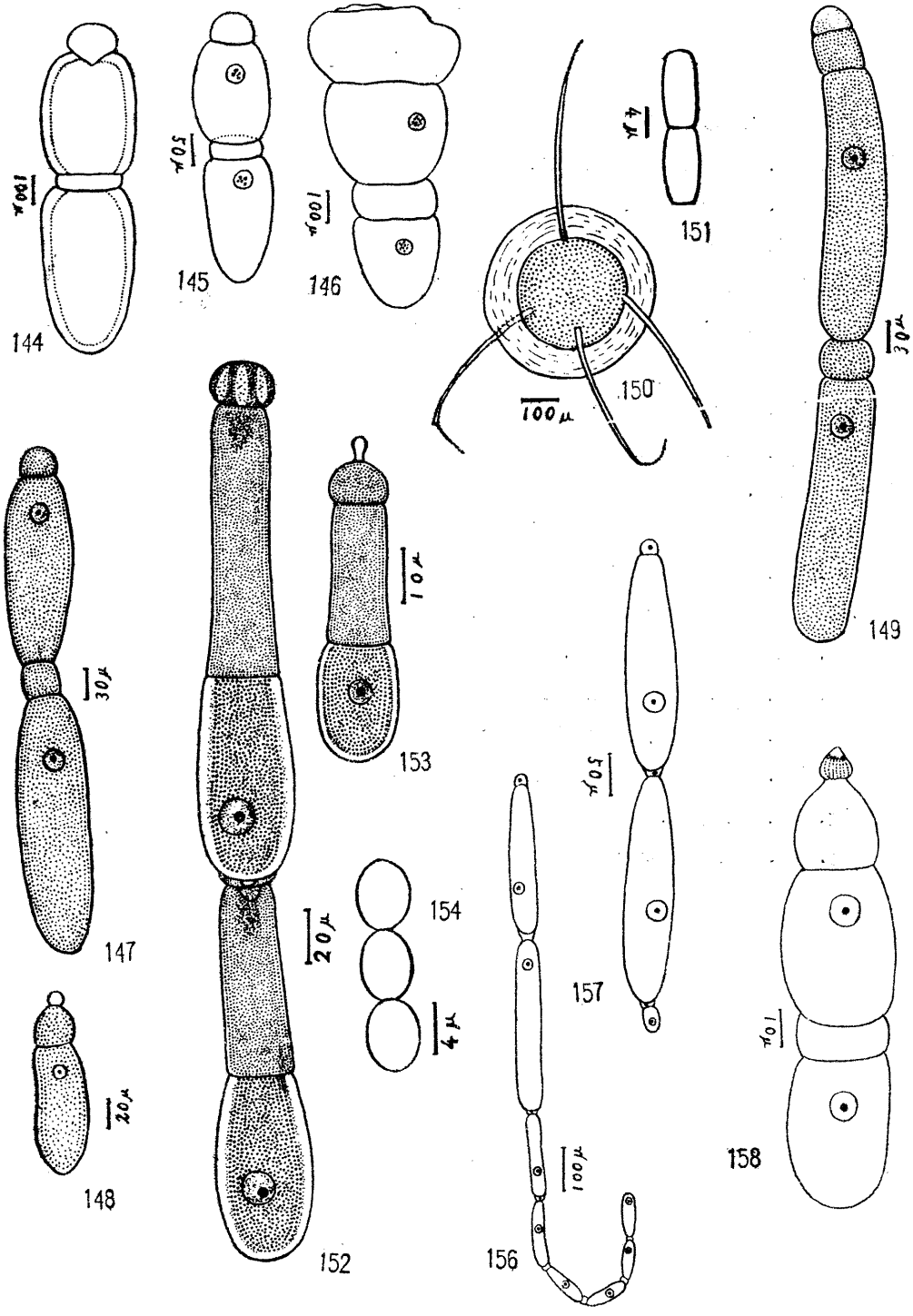
Fig. 154. Three spores in chains.

Figs. 156, 157. *Hirmocystis mirabilis* HOSHIDE.

Fig. 156. A linear association.

Fig. 157. An another association, elongate ovoidal type.

Fig. 158. *Pyxinoides balani* (KOLLIKER) TREGOUBOFF. A mature association.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## PLATE XI

### Explanation of Plate

Figs. 159—162. *Cnemidospora takaneensis* n. sp.

Fig. 159. A small cephalont.

Fig. 160. A sporont.

Fig. 161. A trophozoite.

Fig. 162. Anterior portion of sporont.

Figs. 163—165. *Cnemidospora rhysodesmi* HOSHIDE.

Fig. 163. A sporont.

Fig. 164. A trophozoite.

Fig. 165. A trophozoite.

Figs. 166, 167. *Pyxinoides fujitubo* HOSHIDE.

Fig. 166. A mature association.

Fig. 167. A cephalont.

Figs. 168—173. *Gamocystis ephemerae*.

Fig. 251. An association.

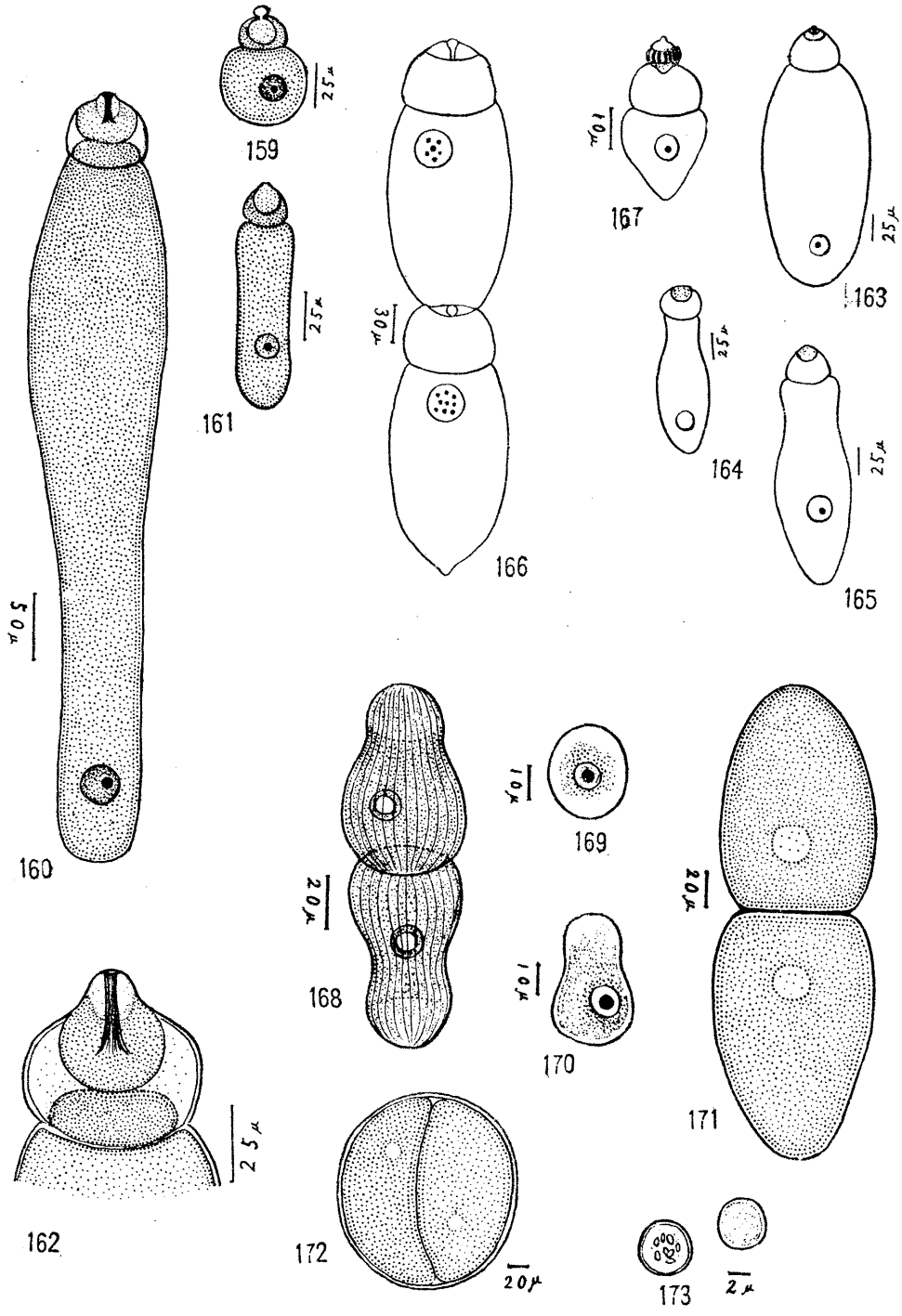
Fig. 252. Small trophozoite.

Fig. 253. Still larger trophozoite.

Fig. 254. An adult association.

Fig. 255. A cyst.

Fig. 256. Two spores.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## PLATE XII

### Explanation of Plate

Figs. 174–180. *Gregarina minuta* ISHII.

Fig. 174. Mature association.

Fig. 175. Other association with satellite much younger than primite.

Fig. 176. Large association, showing the cuplike compressed protomerite of satellite.

Fig. 177. Small association.

Fig. 178. A cephalont.

Fig. 179. A mature cyst from which the spores are being extruded by one spore duct in chains.

Fig. 180. Three ripe spores.

Figs. 181–188. *Gregarina echinata* n. sp.

Fig. 181. Mature association.

Fig. 182. A trophozoite with many digit-form projections at end of body.

Fig. 183. Another trophozoite without projection.

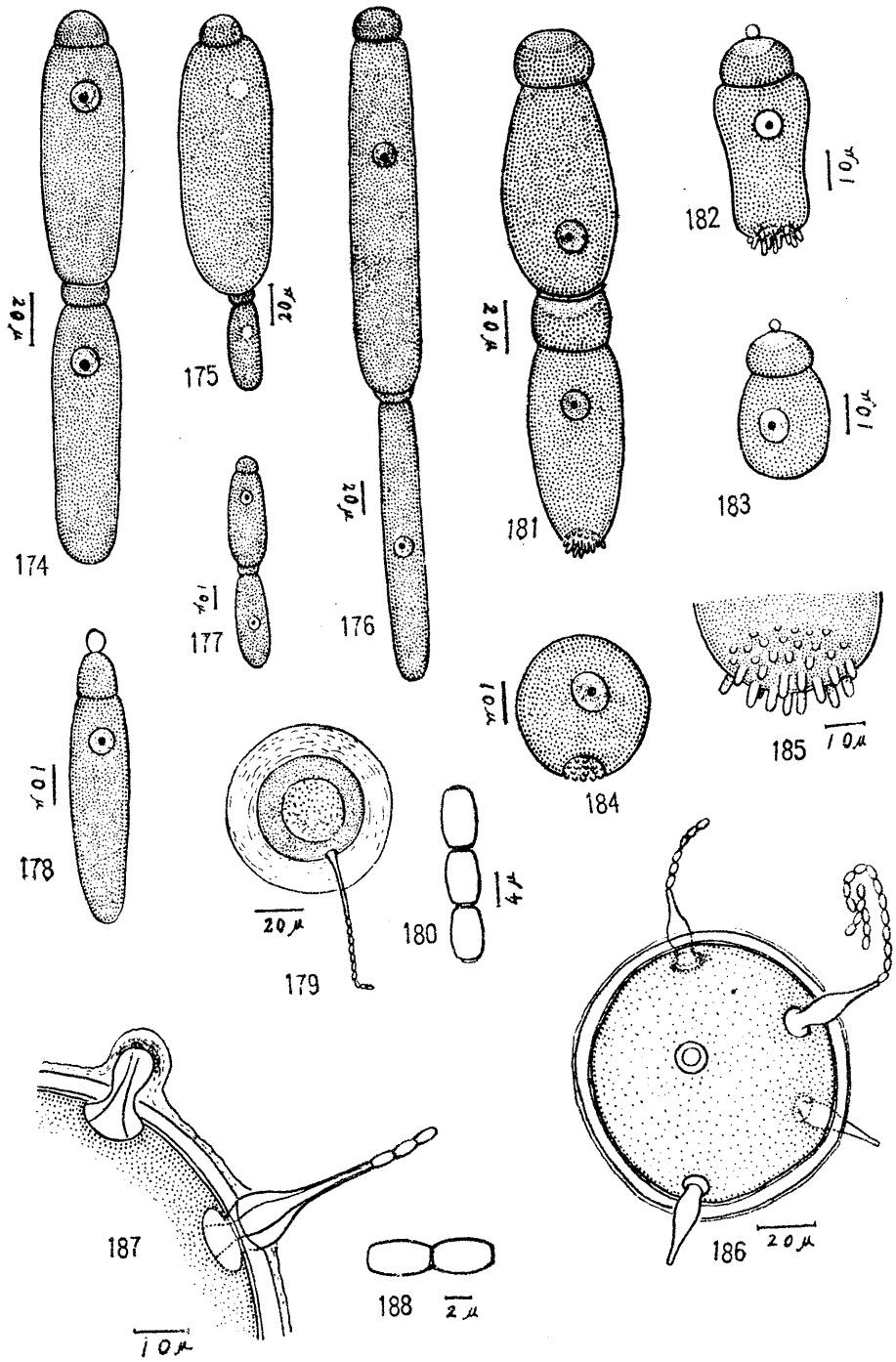
Fig. 184. Small spherical trophozoite with anlages of projections.

Fig. 185. Enlarged posterior portion of deutomerite of satellite, showing many digit-form projections.

Fig. 186. A mature cyst with four sporeducts in the process of extruding spores.

Fig. 187. Enlarged view of sporeducts, the lower one has become inverted and the spores are being eytruded.

Fig. 188. Two ripe spores.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## PLATE XIII

### Explanation of PIate

Figs. 189, 190. *Gregarina rotudicephala* n. sp.

Fig. 189. Mature association, persisting the epimerite at apex.

Fig. 190. A cephalont, attaching to the host epithelial cell.

Figs. 191–195. *Gregarina conoducta* n. sp.

Fig. 191. Mature association.

Fig. 192. A small trophozoite.

Fig. 193. A mature cyst from which the spores are being extruded in chains.

Fi8. 194. The conical spore duct has come inverted and the spores are being extruded in chains.

Fig. 195. Two mature spores in chain and optical cross section of spore.

Figs. 196–202. *Gregarina pumila* n. sp.

Fig. 196. Mature association.

Fig. 197. Mature association, slightly constricted primite being shown.

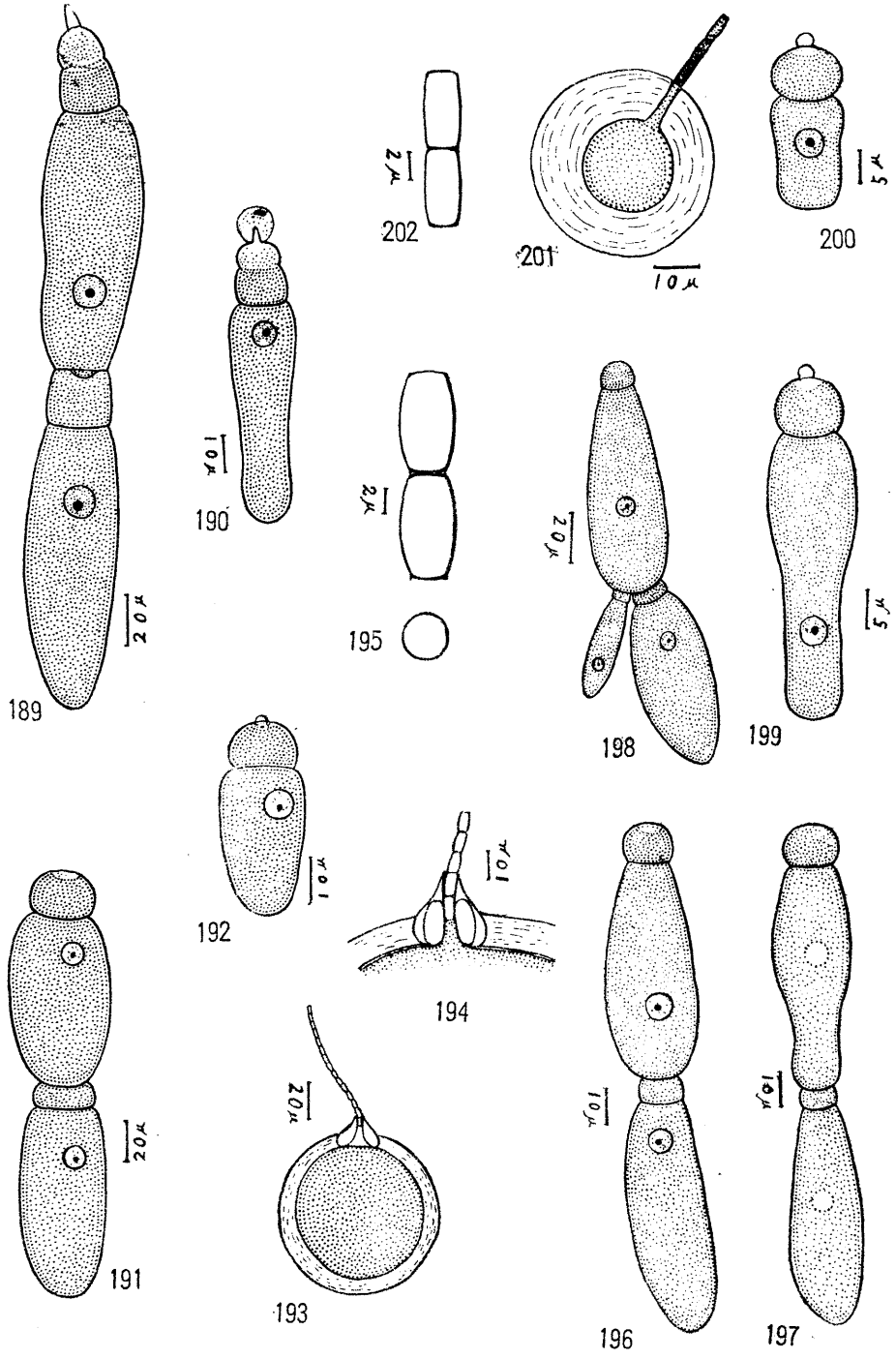
Fig. 198. Unique association of three sporonts.

Fig. 199. A fairly large cephalont.

Fig. 200. A small trophozoite.

Fig. 201. The cyst with one pore in the process of extruding spores in chains.

Fig. 202. Two mature spores.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## PLATE XIV

### Explanation of Plate

Figs.203—207. *Leidyana latiformis* n. sp.

Fig. 203. A full grown sporont.

Fig. 204. A young sporont.

Fig. 205. A fairly large cephalont.

Fig. 206. A small cephalont.

Fig. 207. Associated sporonts.

Figs. 208—213. *Leidyana lancea* n. sp,

Fig. 208. A small young cephalont.

Fig: 209. A fairly developed cephalont.

Fig. 210. An adult sporont.

Fig. 211. Another well developed sporont.

Fig. 212. Ripe spores in chain.

Fig. 213. A mature cyst form which the spores are being extruded in chains.

Figs. 214—220. *Leidyana aglossae* n. sp.

Fig. 214. A cephalont.

Fig. 215. A young slender sporont.

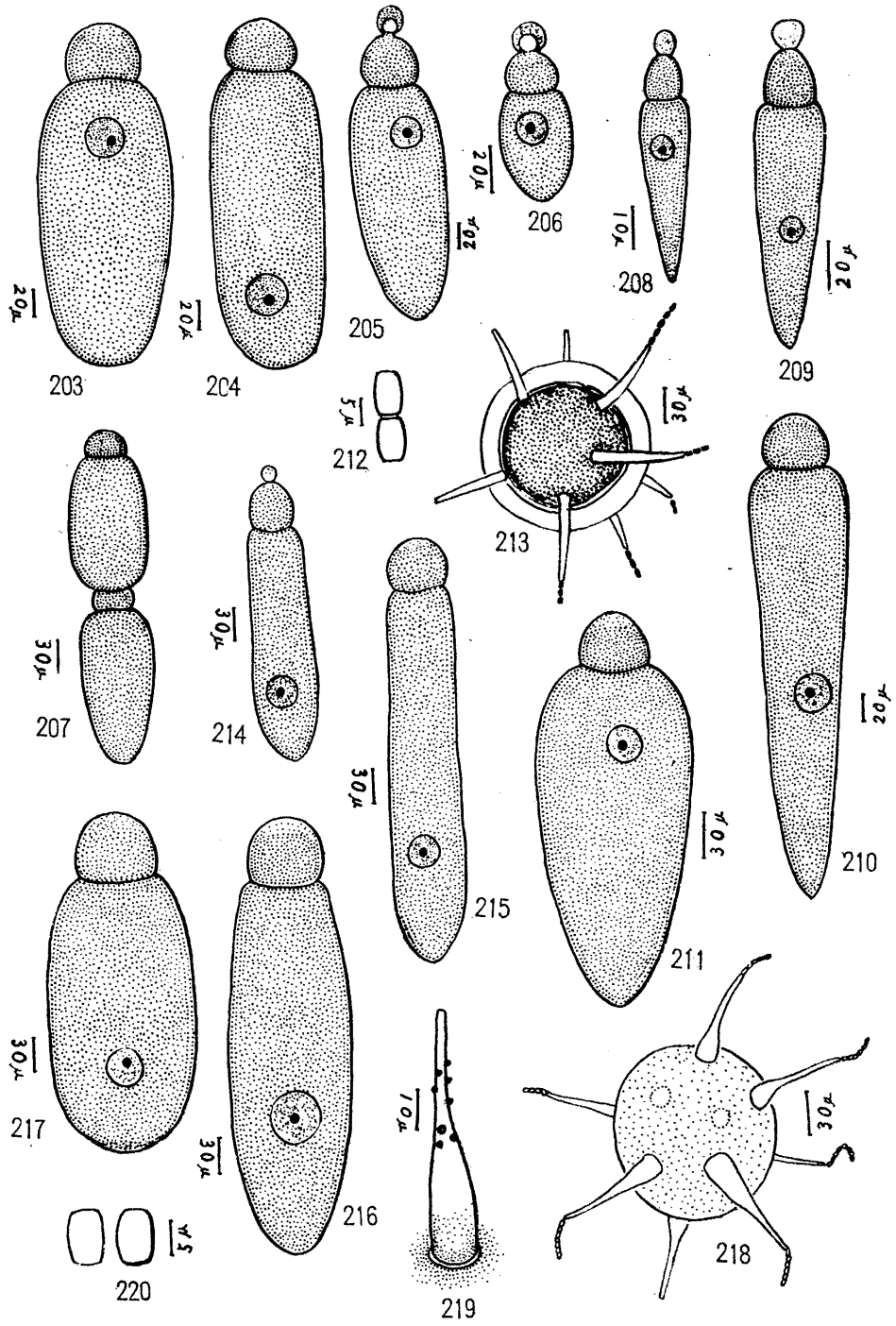
Fig. 216. An adult sporont.

Fig. 217. Another well matured sporont

Eig. 218. A mature cyst with 7 extended spore ducts from which spores are being extruded in chains.

Fig. 219. A spore duct.

Fig. 220. Ripe spores.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