terisierenden Varianten läßt es wünschenswert erscheinen, einen Organismus, der sich wie *Hydra* so ungemein leicht kultivieren läßt, gelegentlich des Auftretens solcher auffälliger und wahrscheinlich vererbbarer Abweichungen zum Gegenstande von Untersuchungen über Vererbung bei Organismen mit geschlechtlicher und ungeschlechtlicher Vermehrung zu machen.

Wien, II. Zoologisches Institut, im August 1913.

4. Gregarines from some Michigan Orthoptera[1].

By Max M. Ellis, University of Colorado.

(With 8 figures.)

eingeg. 16. August 1913.

During the month of July 1913, three species of gregarines were collected from Orthoptera taken in the vicinity of Douglas Lake, at the University of Michigan Biological Station. Of the several species of Orthoptera examined the following were found to contain gregarines, *Melanoplus luridus* (Dodge), *Melanoplus femur-rubrum* (De Geer), *Melanoplus bivittatus* (Say), *Ceuthophilus maculatus* (Say), *Ceuthophilus latens* Scudder, and *Ischnoptera pennsylvanica* (De Geer).

Gregarina longiducta sp. nov.

Hosts, *Ceuthophilus latens* Scudder and *Ceuthophilus maculatus* (Say); Douglas Lake, Michigan; det. Dr. Paul S. Welch.

Habitat, Intestine.

Primite. Primite shorter than the satellite in all associations observed; length of the protomerite 2 to 3 in the length of the deutomerite; width of the protomerite about equal to or a little less than the length of the deutomerite; protomerite broader than long rather oval in outline, in some specimens with a slight concavity in its anterior end, (see fig 5). Deutomerite rather cylindrical, varying to barrel-shaped, widest towards the anterior end, its greatest width usually 0,75 or more of its length. Epicyte thin and flexible over the entire gregarine; sarcocyte scarcely if at all visible in the living animal; endocyte very dense, black by transmitted light and a milky white by reflected light, completely obscuring the nucleus.

Satellite. Longer than the primite, to which it is broadly joined, otherwise much the same; posterior portion of the deutomerite tapering gradually, its margin broadly rounded.

Associations. Average associations 800 to 900 μ; practically all of the individuals above 300 μ in association; smallest association noted

[1] Contribution from Univ. Michigan Biol. Station Nr. 15.

was of a 220 μ individual and a 245 μ one. The associations were of two types, either simple, i. e., composed of two individuals, or multiple, composed of several pairs of individuals. The multiple associations as far as observed were always made up of an even number of individuals, just as if several simple associations had become joined into a string of individuals. The uniting of several individuals in association has already been described for *Hirmocystis polymorpha* Leger[2] and for *Gregarina socialis* Leger[3]. The multiple association of *Gregarina longiducta* differs from those of the two first mentioned species in that it lacks the small individuals attached to the last large individual of the series and is composed of an even number of individuals. In the small simple associations the deutomerites were shorter and more globose than those of the individuals of average sized associations.

Cephalont. The protomerite and deutomerite of the cephalont are very much the same size and both are rather globose. The epimerite is a small digitiform structure, (see fig 6), about one-half the length of the deutomerite. The largest individuals seen with the epimerite were 200 μ in length The small sporonts of which very few were seen, are rather intermediate between the primites of small associations and the cephalonts.

Cysts. The cysts were recovered in considerable numbers from the excrement of the host and a few were found in the alimentary canal of animals killed immediately after they were collected. In general the excrement of a cricket which had been starved for three days yeilded more cysts than that of individuals which had been kept in captivity for a longer time or those fresh from the field. On one occasion, July 15, 53 cysts were taken from a single discharge of excrement from a cricket which had been in captivity for three days. Rarely however were more than 6 cysts taken from a single mass. The cysts when first discharged or as found in the alimentary canal of the host are spherical and covered with two hyaline gelatinous envelopes. The outer of these envelopes is the thicker although the less dense. This envelope is often more or less torn and may contain entangled fragments of excrement. Inside of this outer envelope and covering the cyst proper is a second thinner but more dense envelope which has a slightly different refractive index and consequently is easily seen. This inner envelope is much tougher than the outer one and when a cyst was subjected to pressure under a coverglass the former would remain in tact until the entire cyst was ruptured, after which fragments of the inner envelope were still recognizable in the otherwise homogeneous mass. The cyst proper is densely opaque, being

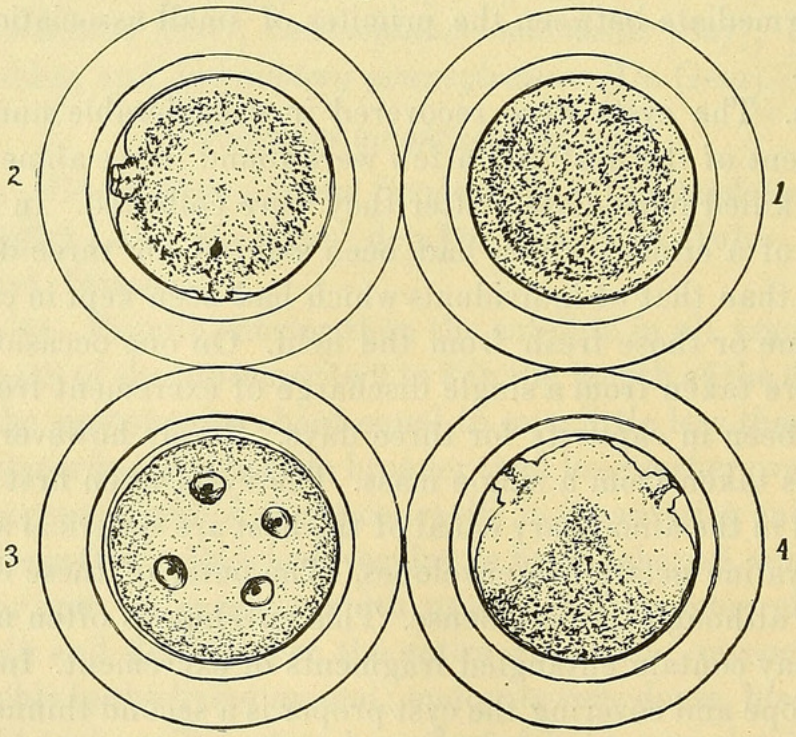
[2] Leger, Tabl Zool. 3, p. 113, t. 3, 1892.
[3] Leger, Arch. f. Protistke. Bd. vii, S. 106—130, 1906.

a milky white by reflected light. It is divided into two equal halves by an equatorial depression. After the cyst has been expelled from the host for about six hours this equatorial constriction disappears whether the cyst be kept moist or not. As a result of the complete fusion of the two halves the cyst proper becomes a regular sphere. Many cysts when first discharges from the host were already in this stage showing that the complete fusion may take place within the alimentary canal of the host. The measurements of three average cysts taken immediately after their discharge from the cricket may suffice to show the relative and absolute thickness of the cyst and its envelopes.

Total diameter	Outer envelope	Inner envelope	Cyst proper
560	96	15	338
640	150	10	320
512	70	8	356

The variation in the diameter of mature cysts exclusive of their envelopes is shown in the following series of measurements taken from

Fig. 1—4.



Figures 1 to 4. Cysts of *G. longiducta.*

Figure 1. After 30 hours in water, showing the light peripheral zone.

Figure 2. Side view at end of 48 hours.

Figure 3. Polar view at the end of the third day.

Figure 4. Side view of 3, showing the conical more dense mass in the center and at the pole opposite that surrounded by the sporoduct-buds.

seventeen cysts which were contained in a single mass of excrement. These cysts were kept after being measured until sporoducts formed that their maturity might be established. Their diameters were 195,

200, 210, 220, 223, 250, 280, 280, 300, 300, 300, 310, 315, 320, 325, 340, and 350 μ.

The maturation period for the cysts is from 4 to 6 days in water. Throughout the period of maturation each cyst was observed to pass through a regular series of changes. This cycle may be followed in the changes of a cyst collected on July 18 and kept in water. During the first thirty hours in water the cyst proper become lighter and less dense in a peripheral zone which extended into the cyst for about one-eighth of its diameter. This less dense zone was rather uniformly filled with fine granulations while the central mass was even more dense than when the cyst was first discharged, as if the more dense material had simply concentrated in the center. Toward the close of the second day four buds appeared on the central mass. These were symmetrically arranged about 30 degrees from an imaginary pole. These four buds pushed out into the less dense peripheral zone of the cyst and shaped themselves into sporoducts. The distal end of each sporoduct-bud contained a shallow depression while a narrow flange was elevated around the proximal portion near its junction with the main spore mass. By the end of the third day these sporoduct-buds were well developed and quite prominent. Meanwhile changes had taken place in the central mass of the cyst. The more dense material had settled back to the pole opposite that surrounded by the sporoduct-buds, extending up into the center of the cyst as a conical mass, while the less dense material rested on top of the more dense just below the sporoduct-buds, (see fig. 4). Dehiscence took place late in the fourth day.

The everted sporoducts were extremely long when compared with the size of the cyst and their own diameter. They varied in length from 3000 μ to 3500 μ, (3 to 3.5 mm.), and with one exception were always four in number. One cyst which was apparently the same as the rest produced five sporoducts. The sporoducts were of uniform diameter, being about 10 μ in width excepting at their junctions with the spore mass where they widened to 14 μ. The envelopes of the cyst seemed to suffer very little from the dehiscence, although the outer was pushed out somewhat around the sporoducts in the regions they passed through. Cysts from which all of the spores had been discharged showed the inner envelope to have thickened internally to about twice its original thickness around a small gray residual mass, suggesting that the compression of the spore mass by this internal thickening supplied the power by which the spores were expelled.

Spores. The spores were discharged in chains and were united when they left the sporoduct. The chains however broke up very soon after they were expelled from the sporoduct so that the individual spores

were always found free in the surrounding medium near the cysts from which the spores had been discharged twelve hours or more. The individual spores are elongate hyaline ovals, whose long sides are parallel or nearly so, and whose ends are broadly rounded. Average spores measured 3 by 6.5 μ.

The dehiscence as described here is for cysts developed in water. It was found that cysts would develope to the sporoduct-bud stage in Ringer's solution and in 3.6 % Acetic acid solution but would not dehisce.

Fig. 5—7.

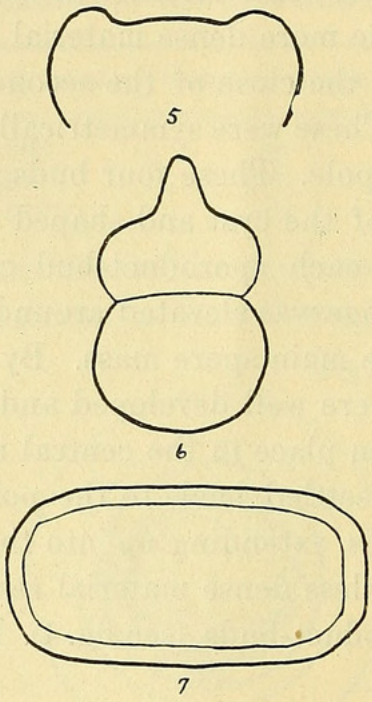


Fig. 8.

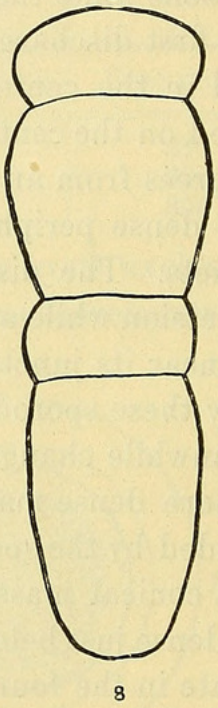


Figure 5. Profile of the protomerite with the anterior depression.
Figure 6. Cephalont. Length 180 μ.
Figure 7. Spore of *G. longiducta*. 3 μ by 6.5 μ.
Figure 8. Association of *G. longiducta*. Length 850 μ.

This gregarine was found in enormous numbers in almost all of the hosts examined. When first removed from the intestine of the cricked the gregarines were very sluggish. They were however capable of very rapid movements and of bending the protomerite and deutomerite quite readily.

The writer has received specimens of cephalonts and sporonts of gregarines probably referable to this species collected from Ceuthophili at Urbana, Illinois by Mr. Herman Doughitt.

Gregarina melanopli Crawley.

Gregarina melanopli Crawley, Proc. Acad. Nat. Sci. Phila., Vol. LIX, p. 220—228, 1907.

This species was found fairly abundant in *Melanoplus luridus, M. femur rubrum* and *M. bivittatus* during July. Cysts were found and the

generic determination made for this species, which was described without the cysts.

Cyst. The opaque lemon yellow cysts taken from the excrement of the host were spherical. The cyst proper measured about 300 μ while the single tough gelatinous envelope varied from 2 μ to 10 μ in thickness. Cysts taken on July 19 on July 21 showed several bright orange spots just under the gelatinous envelope. On July 23 these has developed into definite sporoduct-buds some 4 μ high and 5 μ in diameter. In the meantime the cyst had become pale gray. The following day dehiscence took place. The brilliant orange sporoducts when everted were quite short not exceeding 200 μ in length. The largest number seen on a single cyst was ten. Some cysts had but seven sporoducts. These were scattered over the surface of the cyst apparantly without arrangement for often two or three would be found quite close together. Cysts taken from the alimentary canal of the host were also spherical and differed if at all from those collected from the excrement in being a little paler in color. In this particular they were unlike the cysts of *Gregarina acridiorum* (Leger) which according to Wellmer[4] are oval in shape while in the intestine although spherical after being discharged.

Spores. The barrel-shaped spores are discharged in chains which do not disintegrate for some time after they leave the sporoduct. The individual spores are hyaline but with an easily visible endospore. A distinct variation in the shape of the spores was observed, some having such well defined angles that whey were hexagonal in profile while others were so uniformly rounded that they were almost oval. Size 5 μ by 8 μ.

The dehiscence of the cysts by sporoducts differentiates this species from *Hirmocystis rigida* Hall which is also reported from grasshoppers of the genus *Melanoplus*.

Gregarina blattarum Siebold.

Gregarina blattarum Siebold, 67, taf. 3, 1839.

This gregarine was found in several specimens of the native roach *Ischnoptera pennsylvanica* from the woods near Douglas Lake. The large oval cysts were collected from the excrement of individuals in captivity during July and when placed in water these cysts dehisced in ten days.

Although no introduced roaches have been collected in the vicinity of the Biological Station this gregarine from native roaches seems undoubted the typical *G. blattarum* agreeing in spores, cysts and sporonts with that species. The biological question of interest is of course the

[4] Schrift. Physik-ökonom. Ges. Königsberg i. Pr., LII, II, p. 113, 1911.

source of infection of these native roaches taken in aspen thickets so far from introduced roaches; it is possible however that *G. blattarum* is established in the native roaches of the new world. Crawley[5] did not find *I. pennsylvanica* infected with gregarines and both Frenzel[6], Magalhaes[7] found the native roaches to be infected with gregarines other than *G. blattarum*, although the species examined by Magalhaes contained both.

5. Sowerbys Wal an der deutschen Ostseeküste.

Von W. Kükenthal, Breslau.

eingeg. 20. August 1913.

Einer der seltensten Wale ist der Wal Sowerbys, *Mesoplodon bidens* (Sow.), sind doch von der 8 Arten umfassenden Gattung *Mesoplodon* Gerv. überhaupt nur einige 50 Individuen bekannt geworden. Wie Japha (1908) in seiner wertvollen »Zusammenstellung der in der Ostsee bisher beobachteten Wale« ausführt, sind bis jetzt 4 Exemplare dieser Art in der Ostsee erbeutet worden, der 4. Teil aller bisher überhaupt beobachteten Exemplare von *Mesoplodon bidens*. Von diesen 4 Exemplaren stammen zwei von der schwedischen Küste von Bohuslän, zwei von der jütländischen Ostküste vom Herringholm-Strande. Von der deutschen Küste ist bis jetzt noch kein Exemplar bekannt geworden.

Nunmehr bin ich in der Lage von einem Wal dieser Art zu berichten, der auf deutschem Gebiete und zwar an der Greifswalder Oie erlegt worden ist. Am 2. August dieses Jahres erhielt ich von dem Besitzer des Strandhotels Carlshagen auf Usedom, Herrn A. Neste, die Mitteilung, daß er an der Greifswalder Oie ein Tier geschossen habe von 3,80 m Länge, 2 m Umfang und etwa 9 Zentner Gewicht. Aus einer beigelegten Photographie ließ sich die Art nicht mit Sicherheit feststellen, doch handelte es sich augenscheinlich um einen Schnabelwal. Da das Tier mittlerweile in Fäulnis übergegangen und vergraben war, erwarb ich den Kadaver für unser Museum, um wenigstens das Skelet zu retten, und unserm ersten Präparator, Herrn L. Pohl, gelang es nach Überwindung erheblicher Schwierigkeiten die Reste zu bergen. Kopf und Brustflossen konnten sogar noch mit ihren Weichteilen in Formol konserviert werden.

Die Untersuchung ergab mir nun, daß es sich um ein junges weibliches Exemplar von *Mesoplodon bidens* (Sow.) handelt. Nach der Aussage der Fischer dieser Gegend ist er schon seit etwa 14 Tagen dort

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[5] Proc. Acad. Nat. Sci. Phila., Vol. LV, p. 44, 1903.

[6] Jen. Zeitschr. f. Naturw. Bd. XXVII, NF. XX, 233–336, 1892.

[7] Arch. d. Parasitol., III, p. 38–45, 1900.