Protozoan Parasites of the Orthoptera, with Special Reference to Those of Ohio. IV, Classified List of the Protozoan Parasites of the Orthoptera of the World. Classes Mastigophora, Sarcodina, and Sp

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PROTOZOAN PARASITES OF THE ORTHOPTERA, WITH SPECIAL REFERENCE TO THOSE OF OHIO

IV. CLASSIFIED LIST OF THE PROTOZOAN PARASITES OF THE ORTHOPTERA OF THE WORLD. CLASSES MASTIGOPHORA, SARCODINA, AND SPOROZOA

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This classified list of all protozoan parasites thus far reported for Orthoptera has been assembled for the purpose of making available from one source much information which formerly has been obtainable only by consulting and comparing a large number of books and papers.

Beginning with class, and continuing down through genus, a short, characterizing description is given for each group. That these descriptions are mutually exclusive will be seen by comparing two groups of the same level, i.e., two classes, two orders, etc.

Under species, certain symbols have been used to relate the data under the various headings. Each reference is numbered and this is the number which is used to refer to that author under the other headings for that species. For example, a synonym followed by (1) indicates that author number (1), above, used that name for the parasite. Further, each host is indicated by a letter and followed by one or more numbers. The numbers, of course, again refer to the authors who studied that host, and the letter is used to refer to the host in the following data. For example, under *Leptomonas blaberae*, the first parasite listed, we find under distribution “Catuche, Venezuela” followed by “(la).” This means that author (1) above (Tejera) found *L. blaberae* in host “a” (*Blabera* sp.) captured in Catuche, Venezuela. Where more authors, etc., are listed, the method is the same, the number always referring to the author and the letter to the host.

In the lists of references, only works of a monographic nature are cited. This excludes most texts and general works, unless they contain original work in addition to mere compilation. In every case, only the first page of a reference is given, unless it is discontinuous, in which case the separate pages are given.

In the host lists, only the accepted names are used.

For habitat, i.e., the region of the insect in which the parasite was found, only the accepted terminology is used. (References: Comstock, 1930; Imms, 1929.) Frequently, some localities are omitted under the heading “distribution.” This means that the author did not specifically state where his material was collected and where he did his work.


*A bibliography will be included in a continued paper to appear in the next issue of this Journal.*

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CLASSIFIED LIST

Class 1. MASTIGOPHORA Diesing, 1865.
Possess one or more flagella during the greater part of the life-history, and in the adult state always.

Order 1. PROTOMONADIDA Blochmann, 1895.
Possess few flagella (rarely more than 6), one nucleus, and are usually without accessory internal organs.

Family 1. Trypanosomidae Doflein, 1901.
Possess a single flagellum, and are parasitic in vertebrates, invertebrates, or plants.

Genus 1. Leptomonas Kent, 1880. Found only in invertebrate hosts, and never developing beyond the Leptomonas stage, showing only this and Leishmania forms in their life cycle.

Leptomonas blaberae Tejera, 1926.
References: (1) Tejera, 1926, 1382.
Synonymy: Name unchanged.
Hosts: (a) Blabera sp.
Habitat: ?
Distribution: Catuche, Venezuela (1a).

Leptomonas sp.
References: (1) This paper, parts II and III.
Hosts: (a) Poroblatta virginica (Brunner); (b) P. lata (Brunner); (c) P. pensylvanica (DeGeer); all by (1).
Habitat: Hind-intestine, (1a), (1b), (1c).
Distribution: Franklin (1a), (1c); Fairfield (1b), (1c); Champaign (1c); Hocking (1b); Logan (1c); Madison (1c); and Washington (1c) Counties Ohio.

Genus 2. Herpetomonas Kent, 1880. Found only in invertebrate hosts, but showing Leishmania, Leptomonas, Criithidia, and Trypanosoma types in their cycles.

Herpetomonas periplanetae Laveran and Franchini, 1920.
References: (1) Laveran and Franchini, 1920a, 145; (2) Laveran and Franchini, 1920b, 331.
Synonymy: Name unchanged.
Hosts: (a) Blatta orientalis Linnaeus, (1), (2).
Habitat: Alimentary canal, (1a), (2a).
Distribution: Paris, France, (2a); Bologna, Italy, (1a).

Family 2. Cryptobiidae Poche, 1913.
Possess two flagella, one of which is directed forward, while the other passes backward and is attached to the surface of the body, and may be raised into an undulating membrane.

Genus 1. Cryptobia Leidy, 1846. Found in intestinal canal of fishes and seminal vesicles and spermatophores of molluscs and other invertebrates.

Cryptobia Gryllotalpae (Hamburger, 1911).
References: (1) Hamburger, 1912, 216; (2) This paper, under synonymy.
Synonymy: Trypanoplasma Gryllotalpae (1); Cryptobia Gryllotalpae (2). (Genus Cryptobia Leidy substituted for Trypanoplasma Laveran and Mesnil. See Kudo, 1931, 147.)
Hosts: (a) Gryllotalpa Gryllotalpae Linnaeus (1).
Habitat: Hind-intestine, (1a).
Distribution: Heidelberg, Germany, (1a).

Possess two flagella, one of which is directed backward as a trailing flagellum.


Embadomonas blattae Bishop, 1931.
References: (1) Bishop, 1931, 287.
Synonymy: Name unchanged.
Hosts: (a) Blatta orientalis Linnaeus, (1).
Habitat: Hind-intestine, (1a).
Order 2. POLYMASTIGIDA Blochmann, 1884.
Possess three to eight flagella, one to many nuclei, and frequently axostyle or axial filament.

Tribe 1. Monozoa Calkins, 1926.
Possess one cytostome and kinetic element.

Genus 1. Retortamonas Grassi, 1879. Possess four flagella, one of which trails. Parasitic in the intestine of various insects.

Retortamonas grylotalpae Grassi, 1879.
References: (1) Grassi, 1879, 448; (2) Grassi, 1881, 153, 161, et. al.; (3) Hamburger, 1912, 216.
Synonymy: Retortamonas grylotalpae, (1), (2), Schedoacercomonas melolonthae, (1); S. grylotalpae, (1)


Octomitus periplanetae Belar, 1916.
References: (1) Belar, 1916, 254; (2) Kudo, 1931, 162; (3) McAdow, 1931, 21.
Synonymy: Name unchanged.

Order 3. HYPERMASTIGIDA Grassi, 1911.
Possess numerous flagella, a single nucleus, and may have axostyles and parabasal bodies.

Family 1. Lophomonadidae Grassi, 1885.
Flagella arise from the anterior end in a tuft. Parasitic in cockroaches and termites.


Lophomonas blattarum Stein, 1860.
References: (1) Stein, 1860, 40; (2) Batsch, 1878, 258; (3) Leidy, 1879, 204; (4) Kent, 1880-1882, 321; (5) Grassi, 1881, 172; (6) Schuster, 1898, 242; (7) Janicki, 1908, 141; (8) Janicki, 1910, 214; (9) Belar, 1916, 242; (10) Kudo, 1922, 113; (11) Kudo, 1926a, 191; (12) Kudo, 1926c, 504; (13) McAdow, 1931, 15.
Synonymy: Lophomonas Blattarum, (1), (5); Lophomonas blattarum, (2), (3), (4), (6), (7), (8), (9), (10), (11), (12), (13).

Hosts: (a) Blatta orientalis Linnaeus, (1), (2), (7), (8), (10), (11), (12); (b) Blatta sp. (5); (c) Lophomonas Blattarum, (1), (2), (7), (8), (10), (11), (12), (13); (d) Grylotalpa sp., (8).

Distribution: Europe, (8a); Germany, (8a); Rome, Italy, (7a); Rovellasca, Italy (?); Urbana, Illinois, (10a), (11a), (12a); Ohio, (137).

Lophomonas striata Batsch, 1878.
References: (1) Batsch, 1878, 258; (2) Kent, 1880-1882, 322; (3) Grassi, 1881, 177; (4) Schuster, 1898, 243; (5) Janicki, 1908, 144; (6) Janicki, 1910, 244; (7) Belar, 1916, 242; (8) Kudo, 1922, 113; (9) Yakimoff and Miller, 1922a, 9; (10) Yakimoff and Miller, 1922b, 133; (11) Kudo, 1926c, 504; (12) Tejera, 1926, 1382; (13) Lucas, 1928, 172; (14) Weill, 1929, 22; (15) McAdow, 1931, 15.
Synonymy: *Lophomonas striata*, (1), (2), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15); *Lophomonas Striata*, (8); *Lophomonas sulcata*, (4). (*L. sulcata* was distinguished by Schuster from *L. striata* chiefly on the basis of the greater size of the former. Kudo (1926c, 505) intimates that the size and characteristics described for *L. sulcata* are comprehended by those of *L. striata*.)

Hosts: (a) *Blatta orientalis* Linnaeus, (1), (5), (6), (8), (11); (b) *Periplaneta americana* (Linnaeus), (4), (14); (c) *Gryllotalpa* sp., (6).

Habitat: Alimentary canal, (4b), (13?); hind-intestine, (1a), (5a), (6a), (6c), (14b); colon and rectum, (15?).

Distribution: Europe, (6a), (6c); Germany, (1a); Rome, Italy, (5a); French Indo-China, (14b); Urbana, Illinois, (8a), (11a); Ohio, (15?).

Class 2. SARCODINA Hertwig and Lesser, 1874.

Capable of changing the body form and forming pseudopodia, both for locomotion and food-capturing.

Order 1. AMOEBIDA Calkins, 1902.

Body unprotected by any shell or skeletal structure. Cytoplasm differentiated into endo- and ectoplasm.


Endoparasitic, with wide zoological distribution.


*Endamoeba blattae* (Butschli, 1878) Leidy, 1879.

References: (1) Butschli, 1878, 273; (2) Leidy, 1879, 204; (3) Grassi, 1881, 184; (4) Schubotz, 1905, 6; (5) Mercier, 1907, 1132; (6) Janicki, 1908, 148; (7) Mercier, 1908b, 943; (8) Elmassian, 1909, 144; (9) Janicki, 1909, 381; (10) Mercier, 1910, 143; (12) Belar, 1916, 242; (13) Kudo, 1922, 113; (14) Yakimoff and Miller, 1922b, 135; (15) Kudo, 1926b, 139; (16) Kudo, 1926c, 505; (17) Thompson and Lucas, 1926, 41; (18) Lucas, 1927a, 220; (19) Lucas, 1928, 161 and 171; (20) McAdow, 1931, 13; (21) Balch, 1932, 237.

Synonymy: *Amoeba blattae*, (1), (2), (4), (5), (6), (7), (8), (10); *Endamoeba blattae*, (2), (13), (15), (16), (17), (18), (19), (20); *Amoeba blattae*, (3), (11), (12), (14).

Yakimoff and Miller (1922a) and Tejera (1926) mention an *Entamoeba battarum* in "*Periplaneta orientalis*" and "*Blattes*," respectively; later corrected by Yakimoff (1922b) and changed to *Entamoeba blattae*. For the same hosts, they give a *Monas* sp. (origin?), Yakimoff and Miller including *Lophomonas blattae* (doubtless *L. blattarum* Stein, 1860) and *Oicomonas* sp. (origin?), and Tejera includes *Oikomonas blattae* (origin?) and *Plagiostoma blattarum* (undoubtedly *Plagiodoia blattarum* Stein, 1859, now *Nycotherus ovalis* Leidy, 1850.)

Hosts: (a) *Blatta orientalis* Linnaeus, (1), (4), (5), (6), (7), (8), (10); (b) *Blatta orientalis* Linnaeus, (1), (4), (5), (6), (7), (8), (9), (10), (11), (13), (15), (17), (19), (20); (b) *Periplaneta americana* (Linnaeus), (19).

Habitat: Alimentary canal, (10a); hind-intestine, (1a), (4a), (5a), (6a), (9a), (11a), (17a); colon, (15a), (20a); rectum, (20a).

Distribution: London, England, (19a); France, (6a), (10a), (11a); Germany, (1a), (4a); Rome, Italy, (6a), (9a); Rovellasca, Italy (7); Urbana, Illinois, (13a), Baltimore, Maryland, (19b); Ohio, (20a).

*Endamoeba thomsoni* Lucas, 1927.

References: (1) Lucas, 1927b, 224; (2) Lucas, 1928, 173; (3) Smith and Barret, 1928, 272; (4) Taliaferro, 1928, 274; (5) McAdow, 1931, 14; (6) Balch, 1932, 237.

Synonymy: *Entamoeba thomsoni*, (1), (2), (4), (5); *Endamoeba thomsoni*, (3), (6).

Hosts: (a) *Blatta orientalis* Linnaeus, (1), (4), (5), (6), (7), (8), (9), (10), (11), (13), (15), (17), (19), (20); (b) *Periplaneta americana* (Linnaeus), (19).

Habitat: Hind-intestine, (3c); colon and rectum, (5a), (5b), (5c).

Distribution: England, (1c); Charlotte, North Carolina, (3c); Ohio, (5a), (5b), (5c).


*Entamoeba nana* Tejera, 1926.

References: (1) Tejera, 1926, 1382.

Synonymy: Name unchanged.

Hosts: (a) *Blaberus atropos* (Stoll), (1).

Habitat: Alimentary canal, (1a).

Distribution: Venezuela, (1a).

Endolimax blattae Lucas, 1927.
References: (1) Lucas, 1927a, 220; (2) Lucas, 1927b, 229; (3) Weill, 1929, 23; (4) McAdow, 1931, 21.
Synonymy: Name unchanged.
Hosts: (a) Blatta orientalis Linnaeus, (2); (b) Periplaneta americana (Linnaeus), (2), (3).
Habitat: Hind-intestine, (2a), (2b); rectum, (3b).
Distribution: England, (2a), (2b); French Indo-China, (3b).

Class 3. SPOROZOA Leuckart, 1879.
Possess no cilia or flagella. Occasionally move about by pseudopodia when immature, but nutrition is by absorption only. Usually non-motile and reproducing by spores.

Subclass 1. TELOSPORIDIA Schaudinn, 1900.
Spores have neither polar capsule nor polar filament. Spore formed at the end of the trophic life and contains one to several sporozoites.

ORDER 1. GREGARINIDA Butschli, 1882.
Coelozoic parasites in invertebrates. The vast majority do not undergo schizogony.

Tribe 1. Acephalinidea Kölliker, 1848.
Body an oval or semi-circular, with eight sporozoites.

Genus 1. Diplocystis Bhatia, 1930.
Trophozoites fuse precociously to form spherical masses. Coelomic.

Diplocystis schneideri Kunstler, 1887. (Not Penard, 1890. See Cuénot, 1897b.)
References: (1) Kunstler, 1887, 25; (2) Léger, 1892, 45; (3) Labbé, 1899, 46; (4) Magalhães, 1900, 44; (5) Cuénot, 1901, 508; (6) Léger and Duboscq, 1902b, 384; (7) Lühe, 1904, 113, 139; (8) Woodcock, 1904, 127; (9) Schiffman, 1919, 81; (10) Jameson, 1920, 207; (11) Bhatia, 1930, 161.
Synonymy: Diplocystis schneideri, (1), (3), (4), (5), (7), (9), (10), (11); Diplocystis Schneideri, (2), (6), (8).
Hosts: (a) Blatta orientalis Linnaeus, (8), (10); (b) Periplaneta americana (Linnaeus), (1), (10).
Habitat: Coelom, (1b), (10a), (10b); posterior mid-intestinal wall, (10a), (10b).
Distribution: London, England, (10a), (10b); France, (1b).

Diplocystis major Cuénot, 1897.
References: (1) Cuénot, 1894, 806; (2) Cuénot, 1895, 322; (3) Cuénot, 1897a, 54; (4) Labbé 1899, 46; (5) Léger and Duboscq, 1900, 1567; (6) Caullery and Mesnil, 1901, 84; (7) Cuénot, 1901, 505; (8) Léger and Duboscq, 1901, 439; (9) Léger and Duboscq, 1902a, 41; (10) Léger and Duboscq, 1902b, 384, 452; (11) Lühe, 1904, 93, 96, 113, 139, 161; (12) Woodcock, 1904, 127; (13) Dogiel, 1909, 201, 206; (14) Wellmer, 1910, 532; (15) Wellmer, 1911, 144.
Synonymy: Diplocystis sp., (1); Diplocystis major, (2), (3), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15).
Hosts: (a) Gryllus domesticus Linnaeus, (1), (2), (3), (7), (9), (14), (15).
Habitat: Coelom, (1a), (2a), (3a), (7a), (9a), (15a), (87).
Distribution: East Prussia, (14a), (15a); Altkirch and Roscoff, France, (7a); Ardennes, France, (2a), (3a); Haute-Loire, France, (7a); Joinville and Nancy, France, (3a), (7a).

Diplocystis minor Cuénot, 1897.
References: (1) Cuénot, 1897a, 54; (2) Labbé, 1899, 46; (3) Cuénot, 1901, 595; (4) Léger and Duboscq, 1902b, 385; (5) Lühe, 1904, 113; (6) Woodcock, 1904, 127; (7) Dogiel, 1909, 206.
Synonymy: Name unchanged.
Hosts: (a) Gryllus domesticus Linnaeus, (1), (3).
Habitat: Coelom, (1a), (3a).
Distribution: Beauvais and Chauny, France, (1a), (3a); Sauville, Villerle-Tilleul, Vendresse, and Nancy, France, (3a).

Body divided into two portions by a septum of the ectoplasm.

Associative or solitary; satellite with septum. Epimerite symmetrical, simple. (In the opinion of the author, the mere observation of cyst development and dehiscence does not give conclusive evidence as to the identity of an adult found
in the same habitat, unless cyst formation is observed, which is rarely the case. Unless the latter phenomenon has been observed, cyst characters are disregarded in the description of new species of Gregarinidae, and they are classified as far as possible on the basis of adult characteristics, comparing them with previously named species. In order to make possible a more accurate classification of Gregarinidae than now exists, it will be necessary to determine methods of culturing species of gregarines so as to obtain them in large numbers, and to perfect a technique for bringing about cyst formation under observation.


**Leidyana gryllorum** (Cuenot, 1897) Watson, 1916.

References: (1) Cuenot, 1897a, 54; (2) Labbé, 1899, 10; (3) Cuenot, 1901, 594; (4) Watson, 1916a, 120; (5) Bhatia and Setna, 1924, 288; (6) This paper, parts II and III.

Synonymy: **Clepsidrina gryllorum**, (1); **Gregarina macrocephala**, (2); **Gregarina gryllorum**, (3); **Leidyana gryllorum**, (4), (5), (6).

Hosts: (a) *Gryllus assimilis* Fabricius, (6); (b) *Gryllus domesticus* Linnaeus, (1), (2), (3); (c) *Gryllus* spp., (5); (d) *Nemobius fasciatus fasciatus* (DeGeer), (6).

Habitat: Alimentary canal, (1b), (2b), (2d); gizzard and mid-intestine, (5c); enteric ceca and mid-intestine, (6e); mid-intestine, (3b), (6a).

Distribution: Ardennes, France, (2b), (2d), (1b), (3b); Nancy, Joinville, and Roscoff, France, (3b); Lahore, India, (5c); Franklin and Washington Counties, Ohio, (6a), (6e).

**Leidyana erratica** (Crawley, 1907) Watson, 1916.

References: (1) Crawley, 1903a, 45; (2) Crawley, 1903b, 639, 641; (3) Crawley, 1907, 221; (4) Ellis, 1913c, 286; (5) Watson, 1915, 35; (6) Watson, 1916a, 118; (7) Kamm, 1922a, 133; (8) Bhatia and Setna, 1924, 288; (9) This paper, parts II and III.

Synonymy: **Gregarina achetae abbreviatae**, (1), (2); **Stephanophora erratica**, (3), (4); **Leidyana solitaria**, (5); **Leidyana erratica**, (6), (7), (8), (9).

Hosts: (a) *Gryllus assimilis* Fabricius, (3), (5), (6), (9); (b) *Gryllus* spp., (8); (c) *Nemobius fasciatus fasciatus* (DeGeer), (9); (d) *Nemobius fasciatus socius* Scudder, (9); (e) *Anaxipha exigua* Say, (9); (f) *Hapithus agitator agitator* Uhler, (9).

Habitat: Alimentary canal, (6a); gizzard, (8b); enteric ceca, (9c), (6a); mid-intestine, (8b), (9a), (9c), (9d), (9e), (9f).

Distribution: Lahore, India, (8b); Beach Haven, New Jersey, (3a); Cold Spring Harbor and Oyster Bay, New York, (6a); Champaign County, Ohio, (9d); Franklin County, Ohio, (9a); Delaware County, Ohio, (9e); Washington County, Ohio, (9a), (9c), (9e), (9f).


**Gregarinoides locustanae** Fantham, 1925.

References: (1) Fantham, 1923, 495; (2) Fantham, 1924, 438; (3) Fantham, 1925, 351; (4) Bush, 1928, 157, et. al.

Synonymy: Reference, but name not used, (1), (2); **Gregarinoides locustanae**, (3), (4).

Hosts: (a) *Locustana pardalina* (F. Walker), (1), (3); (b) 35 ? species of “Acridiidae” common to Natal, South Africa, (4).

Habitat: Mid-intestine, (1a), (3a).

Distribution: Pietermaritzburg, Natal, (4b); Johannesburg, Transvaal, (1a), (3a).


This classification is based, in part, on the presence of these gregarines in hosts of common classification, i. e., hosts of the same family, etc. This is justifiable inasmuch as these groups of protozoan parasites from related hosts present certain marked resemblances, whether through adaptation or common ancestry.

Division 1. **Actinocephalus**-like sporonts. Hosts, Gryllidae, etc.

**Gregarina hyalocephala** Dufour, 1837.

References: (1) Dufour, 1837, 13; (2) Siebold, 1839, 70; (3) Frantzius, 1846; (4) Diesing, 1851, 11; (5) Diesing, 1859, 731; (6) Lancaster, 1863, 94; (7) Labbé, 1899, 34; (8) Watson, 1916a, 97, 214.

Synonymy: Name unchanged.

Hosts: (a) **Tridactylus variegatus** (Latreille), (1); (b) **Tridactylus** spp., (1).

Habitat: Mid-intestine, (1a), (1b).

Distribution: France, (1a), (1b).
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Gregarina conica Dufour, 1837.
References: (1) Dufour, 1837, 12; (2) Siebold, 1839, 70; (3) Desmarest, 1845, 317; (4) Frantzius, 1846, 10; (5) Diesing, 1851, 8; (6) Diesing, 1859, 729; (7) Lankester, 1863, 95; (8) Watson, 1916a, 125.
Synonymy: Name unchanged.
Hosts: (a) Gryllidae, spp., (1).
Habitat: Mid-intestine, (1a).
Distribution: France, (1a).

Gregarina oblonga Dufour, 1837.
References: (1) Dufour, 1837, 13; (2) Frantzius, 1846; (3) Frantzius, 1848, 195; (4) Diesing, 1851, 11; (5) Diesing, 1859, 732; (6) Lankester, 1863, 94; (7) Watson, 1916a, 96.
Synonymy: Name unchanged.
Hosts: (a) Locusta migratoria Linnaeus, (1); (b) Acheta campestris (Linnaeus), (1).
Habitat: Mid-intestine, (1a), (1b).
Distribution: France, (1a), (1b).

Division 2. Gregarine more or less cylindric.

Subdivision 1. Hosts, Blattidae.

Group 1. Gregarine tenuous.

Gregarina panchlorae Frenzel, 1892. Possibly there is a close relationship between this species and Protomagalhaensia serpentina.
References: (1) Frenzel, 1892, 299; (2) Wasielewski, 1896, 138; (3) Labbe 1899, 35; (4) Ellis, 1913c, 265; (5) Watson, 1916a, 103.
Synonymy: Name unchanged.
Hosts: (a) Panchlora exoleta Burmeister, (1).
Habitat: Mid-intestine, (1a).
Distribution: Cordoba, Argentina, (1a).

Group 2. Gregarine thick.

Gregarina ohioensis Semans, 1939.
References: (1) This paper, parts II and III.
Hosts: (a) Parcoblatta virginica (Brunner), (1).
Habitat: Mid-intestine, (1a).
Distribution: Franklin County, Ohio, (1a).

Gregarina thomasi Semans, 1939.
References: (1) This paper, parts II and III.
Hosts: (a) Parcoblatta pensylvanica (DeGeer), (1).
Habitat: Alimentary canal, (1a).

Gregarina parcoblattae Seffians, 1939.
References: (1) This paper, parts II and III.
Hosts: (a) Parcoblatta uhlerianna (Saussure), (1); (b) Parcoblatta pensylvanica (DeGeer), (1).
Habitat: Mid-intestine, (1a), (1b).
Distribution: Fairfield County, Ohio, (1a), (1b); Franklin County, Ohio, (1b); Washington County, Ohio, (1a).

Gregarina blattarum Siebold, 1839. (G. blattarum described by Watson, 1916b, 73, appears to be a variation of that described in Europe, and is referred to elsewhere as "Watson variety")
References: (1) Siebold, 1837, 408; (2) Siebold, 1839, 67; (3) Dujardin, 1845, 638; (4) Frantzius, 1846; (5) Frantzius, 1848, 193, 195; (6) Stein, 1848, 223; (7) Diesing, 1851, 10; (8) Leidy, 1853a, 239; (9) Leidy, 1856, 47; (10) Dujardin, 1859, 731; (11) Lankester, 1863, 85, 94; (12) Schneider, 1876, 92, etc.; (13) Bütschli, 1881, 885; (14) Schneider, 1882, 424, 442; (15) Balbiani, 1884, 13, 68, 170; (16) Kunstler, 1887, 32, 53; (17) Schneider, 1887, 74, 75; (18) Wolters, 1891, 102, 107, 115, 128, 131; (19) Léger, 1892, 45, 75, 93; (20) Marshall, 1893, 25; (21) Pfeiffer, 1893, 4, 132; (22) Schewiakoff, 1894, 342; (23) Wasielewski, 1896, 34, 136; (24) Schuster, 1898, 244; (25) Labbe, 1899, 35; (26) Magalhães, 1900, 38; (27) Caullery and Mesnil, 1901, 84; (28) Cuénot, 1901, 619; (29) Léger and Duboscq, 1901, 441; (30) Léger and Duboscq, 1902b, 421, 428; (31) Crawley, 1903a, 43; (32) Crawley, 1903b, 639; (33) Lühe, 1904, 118, 154, 159, 172; (34) Hall, 1907, 149, 151, etc.; (35) Léger and Duboscq, 1908, 98, 99; (36) Wellmer, 1910, 531; (37) Wellmer,
Gregarina rigida columnar Semans, 1939.

References: (1) This paper, parts II and III.

Hosts: (a) Arphia sulphurea (Fabricius), (1); (b) Chorthippus viridifasciata (DeGeer), (1); (c) Encoptolophus sordidus (Burmeister), (1); (d) Pardalophora apiculata (Harris), (1); (e) Dissosteira carolina (Linnaeus), (1); (f) Spharagonom bolli Scudder, (1); (g) S. collare (Scudder), (1); (h) Melanoplus obovatus (Blatchley), (1); (i) M. scudder scudder (Uhler), (1); (j) M. differentialis (Thomas), (1); (k) M. bivittatus (Say), (1); (l) M. mexicanus mexicanus (Saussure), (1); (m) M. keeleri lurtdus (Dodge), (1);

Habitat: Base of enteric ceca, (1f), (1h), (1m); enteric ceca and mid-intestine, (1a), (1b), (1c), (1d), (1e), (1g), (1h), (1i), (1k), (1l), (1m).

Distribution: Gary, Indiana, (1g), (1h), (1i); Fairfield County, Ohio, (1a), (1b), (1d), (1e), (1f), (1g), (1h), (1i), (1k), (1l), (1m); Licking County, Ohio, (1e), (1f), (1h), (1i), (1j), (1k), (1l), (1m); Union County, Ohio, (1j).

Gregarina rigida rigida (Hall, 1907) Ellis, 1913.

References: (1) Hall, 1907, 150, 169, etc.; (2) Crawley, 1907, 223; (3) Sokolow, 1911, 279; (4) Wellmer, 1911, 105; (5) Ellis, 1913a, 464; (6) Ellis, 1913b, 82; (7) Ellis, 1916, 267; (8) Watson, 1915, 34; (9) Watson, 1916a, 10; (10) Kamm, 1920, 23; (11) this paper, parts II and III.

Synonymy: Hirmocystis rigida (1), (3), (4), (6); Gregarina melanopli, (2), (3), (6); Gregarina rigida, (7), (8), (9), (10); Gregarina rigida rigida, (11).

Hosts: (a) Chorthippus curtipennis curtipennis (Harris), (1); (b) Arphia sulphurea (Fabricius), (11); (c) Encoptolophus sordidus (Burmeister), (9); (d) Dissosteira carolina (Linnaeus), (11); (e) Spharagonom bolli Scudder, (11); (f) Brauckysilviana magna (Girard), (5), (7); (g) Schistocerca americana americana (Drury), (9); (h) Hesperotetix viridis praenensis (Scudder), (9); (i) Melanoplus obovatus (Blatchley), (11); (j) M. differentialis (Thomas), (1); (k) M. bivittatus (Say), (1); (l) M. mexicanus mexicanus (Saussure), (97), (11); (m) M. keeleri lurtdus (Dodge), (11); (n) M. angustipennis (Dodge), (1), (99).

Habitat: Alimentary canal, (1j), (1k), (1o); gizzard, (11); base of ceca, (11), (11n); enteric ceca, (11a), (11c), (11d), (11i), (11k), (11m), (11n); mid-intestine, (11a), (11b), (11c), (11d), (11e), (11g), (11h), (11i), (11m), (11n).

Distribution: Franklin County, Ohio, (11c), (11d), (11e), (11g), (11h), (11i), (11m), (11n); Monroe County, Ohio, (11), (11n); Licking County, Ohio, (11), (11n); Franklin County, Ohio, (11), (11n); Licking County, Ohio, (11), (11n); Washington County, Ohio, (11), (11n); Wyncote, Pennsylvania, (11), (11n); Wyncote, Pennsylvania, (2k).

Gregarina indianaensis Semans, 1939.

References: (1) This paper, parts II and III.

Hosts: (a) Chorthippus curtipennis curtipennis (Harris), (1); (b) Melanoplus differentialis (Thomas), (1); (c) M. bivittatus (Say), (1); (d) M. mexicanus mexicanus (Saussure), (1).

Habitat: Enteric ceca, (1a), (1b), (1c), (1d); mid-intestine, (1a), (1b), (1c), (1d).

Distribution: Gary, Indiana, (1a), (1b), (1c), (1d).

Gregarina nigra Watson, 1915.

References: (1) Watson, 1915, 33; (2) Watson, 1916a, 116; (3) Kamm, 1922a, 130; (4) Kamm, 1922b, 84; (5) Bush, 1928, 154, et. al.; (6) this paper, part II.

Synonymy: Name unchanged.

Hosts: (a) Encoptolophus sordidus (Burmeister), (1); (b) Zonocerus elegans (Thunberg), (5); (c) Encoptolophus sordidus (Burmeister), (5); (d) Trypanosoma fusiforme (Fabricius), (5); (e) Melanoplus differentialis (Thomas), (3), (4); (f) M. femur-rubrum femur-rubrum (DeGeer), (1), (6).

Habitat: Alimentary canal, (5b), (5c), (5d); mid-intestine, (5f).
Distribution: Pietermaritzburg, Natal, (5b), (5c), (5d); Urbana, Illinois, (1a), (1f), (3e), (4e); Washington County, Ohio, (6f).

**Gregarina locustae** Lankester, 1863.

References: (1) Leidy, 1853a, 239; (2) Leidy, 1856, 47; (3) Dising, 1859, 730; (4) Lankester, 1863, 94; (5) Léger, 1897, 10; (6) Labbé, 1899, 35; (7) Crawley, 1903a, 54; (8) Crawley, 1903b, 640; (9) Crawley, 1907, 225; (10) Ellis, 1913c, 268; (11) Watson, 1916a, 100; (12) this paper, parts II and III.

Synonymy: *Gregarina Locustae Carolinae*, (1); *Gregarina Locustae carolinae*, (2); *Gregarina fimbriata*, (3); *Gregarina Locustae*, (4), (5); *Gregarina locustae-carolinae*, (6); *Stephanophora locustae-carolinae*, (7), (8); *Gregarina locustae-carolinae*, (9), (10); *Gregarina locustae*, (11), (12).

Hosts: (a) *Dissosteira carolina* (Linnaeus), (1), (9), (12).

Habitat: Alimentary canal, (la); mid-intestine, (12a).

Distribution: Gary, Indiana, (12a); Wyncote, Pennsylvania, (9a).


References: (1) Künckel d’Herculais, 1899, 622; (2) Watson, 1916, 104.

Synonymy: *Clepsidrina paranensis*, (1); *Gregarina paranensis*, (2).

Hosts: (a) *Schistocerca paranensis* (Burmeister), (1).

Habitat: Alimentary canal, (la).

Distribution: Parana, Argentina, (la).

**Gregarina acridiorum** Ledger, 1893.

References: (1) Légier, 1893, 811; (2) Wasielewski, 1896, 138, 139; (3) Léger, 1897, 27; (4) Labbé, 1899, 10; (5) Léger and Duboscq, 1901, 440, 441; (6) Léger and Duboscq, 1902b, 381, 423, 430, 462; (7) Lühe, 1904, 81, 96, 194; (8) Léger and Duboscq, 1909, 88; (9) Wellmer, 1910, 531; (10) Wellmer, 1911, 112; (11) Watson, 1916a, 104.

Synonymy: *Clepsidrina acridiorum*, (1), (2), (5), (6); *Clepsidrina Acridiorum*, (3); *Gregarina acridiorum*, (4), (5), (6), (7), (8), (9), (10), (11).

Hosts: (a) *Tryxalis* sp., (1), (3); (b) *Oedipoda coerulescens* Linnaeus, (9), (10); (c) *Sphingonotus* sp., (3); (d) *Pamphagus* sp., (1), (3); (e) *Calliptamus italicus* (Linnaeus), (5), (6).

Habitat: Alimentary canal, (1a), (1d) (5a), (5c), (5d), (5e); mid-intestine, (10b).

Distribution: Nemours, Algeria, (1a), (1d); France, (5a), (5c), (5d), (5e); Germany, (9b), (10b).

Subdivision 3. Host, one of the Copiphorinae, subfamily of the Tettigonidae.

**Gregarina chagasi** Pinto, 1918. (It is singular that this is the only protozoan parasite of any kind described for Tettigonidae.)

References: (1) Pinto, 1918a, 49; (2) Pinto, 1919, 81; (3) Kamm, 1922a, 132; (4) Kamm, 1922b, 84.

Synonymy: Name unchanged.

Hosts: (a) *Neoconocephalus fratellus* (Griffini), (1).

Habitat: Alimentary canal, (1a).

Distribution: Manguinhos, Brazil, (1a).

Subdivision 4. Hosts, Gryllidae.

**Gregarina kingi** Crawley, 1907.

References: (1) Crawley, 1907, 221; (2) Sokolow, 1911, 279; (3) Ellis, 1913c, 271; (4) Watson, 1911, 106; (5) this paper, parts II and III.

Synonymy: *Gregarina kingi*, (1), (2), (4), (5); *Gigaductus kingi*, (3).

Hosts: (a) *Gryllus assimilis* Fabricius, (1), (5).

Habitat: Alimentary canal, (1a); gizzard, (5a); enteric ceca, (5a); mid-intestine, (5a).

Distribution: Beach Haven, New Jersey, (1a); Franklin and Washington Counties, Ohio, (5a); Wyncote, Pennsylvania, (1a).

**Gregarina galliveri** Watson, 1915.

References: (1) Watson, 1915, 33; (2) Watson, 1916a, 111; (3) Kamm, 1922a, 130; (4) Kamm, 1922b, 84; (5) this paper, parts II and III.

Synonymy: Name unchanged.

Hosts: (a) *Gryllus assimilis* Fabricius, (1), (2), (5); (b) *Hapithus agitator agitator* Uhler, (5).

Habitat: Alimentary canal, (1a), (2a); crop and gizzard, (5a), (5b); enteric ceca, (5a), (5b).

Distribution: Oyster Bay, New York, (1a), (2a); Franklin County, Ohio, (5a); Washington County, Ohio, (5a), (5b).


**Gregarina hadenoeci** Semans, 1939.

References: (1) This paper, parts II and III.

Hosts: (a) *Hadenoecus puteanus* Scudder, (1).

Habitat: Mid-intestine, (1a).

Distribution: Washington County, Ohio, (1a).
Gregarina longiducta Ellis, 1913.
References: (1) Ellis, 1913b, 78; (2) Ellis, 1913c, 266; (3) Watson, 1916a, 107; (4) Kamm, 1922a, 129; (5) Kamm, 1922b, 83; (6) this paper, part II.
Synonymy: Name unchanged.
Hosts: (a) Ceuthophilus palidipes E. M. Walker, (erroneously, according to T. H. Hubbell, called C. maculatus (Harris)), (1); (b) Ceuthophilus meridionalis Scudder, (erroneously, according to Hubbell, called C. latens Scudder), (1).
Habitat: Alimentary canal, (1a), (1b).
Distribution: Douglas Lake, Michigan, (1a), (1b).

Gregarina proteocephala Semans, 1939.
References: (1) This paper, parts II and III.
Hosts: (a) Ceuthophilus gradlipes (Haldeman), (1).
Habitat: Mid-intestine, (1a).
Distribution: Washington County, Ohio, (1a).

Gregarina stygia Watson, 1915.
References: (1) Watson, 1915, 33; (2) Watson, 1916a, 114; (3) Kamm, 1922a, 131; (4) Kamm, 1922b, 83; (5) this paper, part II.
Synonymy: Name unchanged.
Hosts: (a) Probably Ceuthophilus gracilipes (Haldeman), erroneously called C. stygia (Scudder, according to T. H. Hubbell), (1), (4).
Habitat: Alimentary canal, (1a).

Gregarina consobrina Ellis, 1913.
References: (1) Ellis, 1913b, 267; (2) Watson, 1916a, 108; (3) Kamm, 1922a, 128; (4) Kamm, 1922b, 83; (5) this paper, part II.
Synonymy: Name unchanged.
Hosts: (a) Ceuthophilus uniformis Scudder, (1).
Habitat: ?
Distribution: Near Boulder, Colorado, (1a).

Gregarina sp.
References: (1) This paper, parts II and III.
Hosts: (a) Ceuthophilus diversgens Scudder, (1).
Habitat: Mid-intestine, (1a).
Distribution: Franklin County, Ohio, (1a).

Gregarina neglecta Watson, 1916.
References: (1) Watson, 1916b, 69; (2) Kamm, 1922a, 131; (3) Kamm, 1922b, 83; (4) this paper, part II.
Synonymy: Name unchanged.
Hosts: (a) Uncertain. Ceuthophilus nigricans Scudder, or, possibly, Ceuthophilus brevipes Scudder, or? (According to T. H. Hubbell, ), (1).
Habitat: ? (1a).
Distribution: Oyster Bay, New York, (1a).

Gregarina ceuthophilii Semans, 1939.
References: (1) This paper, parts II and III.
Hosts: (a) Ceuthophilus gracilipes (Haldeman), (1); (b) Ceuthophilus brevipes Scudder, (1); (c) Ceuthophilus diversgens Scudder, (1).
Habitat: Mid-intestine, (1a), (1b), (1c).
Distribution: Fairfield and Washington Counties, Ohio, (1a); Franklin County, Ohio, (1c); Licking County, Ohio, (1b).

Gregarina prima Semans, 1939.
References: (1) This paper, parts II and III.
Hosts: (a) Ceuthophilus uhleri Scudder, (1).
Habitat: Mid-intestine, (1a).
Distribution: Fairfield and Logan Counties, Ohio, (1a).

Gregarina udeopsyllae Watson, 1916.
References: (1) Watson, 1916a, 117; (2) Kamm, 1922a, 131; (3) Kamm, 1922b, 84; (4) this paper, part II.
Synonymy: Name unchanged.
Hosts: (a) Udeopsylla robusta (Haldeman), (1).
Habitat: Mid-intestine, (1a).


Gregarina macrocephala (Schneider, 1875) Labbé, 1899.
References: (1) Schneider, 1876, 18, 19, 32, 86; (2) Schneider, 1882, 442; (3) Schneider, 1885,
Division 5. Protomerite of satellite almost obliterated. Hosts, Acrydinae, subfamily of Acrididae.

Gregarina acrydinarum Semans, 1939.
References: (1) This paper, parts II and III.
Hosts: (a) Acrydium arenosum angustum Hancock, (1); (b) Paratettix cucullatus cucullatus (Burmeister), (1).
Habitat: Mid-intestine, (la), (lb).
Distribution: Franklin County, Ohio, (la); Delaware County, Ohio, (lb).

Division 6. Relationships not apparent.

Gregarina oviceps Diesing, 1859.
References: (1) Leidy, 1853a, 238; (2) Leidy, 1856, 47; (3) Diesing, 1859, 728; (4) Lankester, 1863, 94; (5) Labbe, 1899, 34; (6) Crawley, 1903a, 45; (7) Crawley, 1903b, 639; (8) Crawley, 1907, 220; (9) Ellis, 1913c, 266; (10) Watson, 1916a, 101; (11) Bhatia and Setna, 1924, 287; (12) this paper, parts II and III.
Synonymy: Gregarina Achetae abbreviatae, (1), (2), (5); Gregarina oviceps, (3), (11), (12), (13); Gregarina Achetae, (4); Gregarina achetae-abbreviatae, (5), (6), (7); Gregarina achetae-abbreviatae, (8), (9), (10).
Hosts: (a) Gryllus assimilis Fabricius, (1), (8), (9), (11), (12), (13); (b) Gryllus spp., (12).
Habitat: Alimentary canal, (lb), (19b), (20b), (22c), (24b), (27b); mid-intestine, (12b).
Distribution: Lahore, India, (12b); Urbana, Illinois, (11a); Douglas Lake, Michigan, (9a); Beach Haven, New Jersey, (8a); Oyster Bay, New York, (11a); Franklin and Washington Counties, Ohio, (13a); Haverford and Philadelphia, Pennsylvania, (11a); Wyncote, Pennsylvania, (8a).

Gregarina davini Leger and Duboscq, 1899.
References: (1) Leger and Duboscq, 1899, 38; (2) Leger and Duboscq, 1902b, 380, 461; (3) Mercier, 1908a, 377; (4) Sokolow, 1911, 278; (5) Watson, 1916a, 126.
Synonymy: Gregarina Davini, (1), (2), (5); Clepsidrina davini, (3); Gregarina davini, (4).
Hosts: (a) Gryllomorpha dalmatina (Occkay de Occkó), (1).
Habitat: Mid-intestine, (1a).
Distribution: Japan, (1a).

Gregarina ovata Dufour, 1828.
References: (1) Dufour, 1828, 367; (2) Dufour, 1837, 12; (3) Siebold, 1837, 408; (4) Hammerschmidt, 1838; (5) Desmarest, 1845, 317; (6) Franztius, 1846; (7) Franztius, 1846, 194, 195; (8) Diesing, 1851, 10; (9) Leidy, 1853a, 233; (10) Diesing, 1859, 731; (11) Lanecker, 1863, 94; (12) Schneider, 1873, 515; (13) Schneider, 1876, 90; (14) Schneider, 1882, 442; (15) Baliani, 1884, 13; (16) Schneider, 1885, 25; (17) Wasielewski, 1896, 22, 33, 137; (18) Labbe, 1899, 10; (19) Puehler, 1904, 64; (20) Schnitzler, 1905, 309; (21) Leger and Duboscq, 1909, 85; (22) Brandley and Potts, 1910, 836; (23) Wellmer, 1910, 531; (24) Wellmer, 1911, 106, 111; (25) Ellis, 1913c, 265; (26) Watson, 1916a, 97; (27) Brandley, 1918, 167; (28) Schiffman, 1919, 84; (29) this paper, part II.
Synonymy: Gregarina ovata, (1), (2), (3), (5), (6), (7), (8), (9), (10), (11), (12), (15), (18), (19), (21), (22), (23), (24), (25), (26), (28), (29); Clepsidrina conoides, (4); Clepsidrina ovata, (13), (14), (16), (17), (20), (27).
Hosts: (a) Acheta campestris (Linnaeus), (2); (b) Forficula auricularia Linnaeus. (This insect belongs to the family Forficulidae of the Dermoptera, formerly, but no longer, included in the Orthoptera.) (1), (12), (13), (19), (20), (23), (24), (27); (c) Forficula sp., (22).
Habitat: Alimentary canal, (1b), (19b), (20b), (22c), (24b), (27b); mid-intestine, (12b).
Distribution: France, (1b), (13b); East Prussia, (23b); Marburg, Germany, (20b); St. Marys, Isles of Scilly, (27b); Farne Islands, (22c).

Gregarina legeri Pinto, 1918.
References: (1) Pinto, 1918a, 113; (2) Pinto, 1918b, 322; (3) Pinto, 1919, 86; (4) Kamm, 1922a, 140.
Synonymy: Name unchanged.
Hosts: (a) Periplaneta americana (Linnaeus), (1).
Habitat: Alimentary canal, (1a).
Distribution: Rio de Janeiro, Brazil, (1a).
Gregarina sphaerulosa Dufour, 1837. (Only cyst is known.)
References: (1) Dufour, 1837, 12; (2) Frantzius, 1846; (3) Diesing, 1851, 11; (4) Diesing, 1859, 752; (5) Lankester, 1883, 94; (6) Léger, 1892, 112; (7) Labbé, 1899, 13; (8) Watson, 1916a, 126.
Synonymy: Gregarinia sphaerulosa, (1), (3), (4), (5), (8); Eirmocystis gryllotalpae, (6); Hirmocystis gryllotalpae, (7).
Hosts: (a) Gryllotalpa spp., (1); (b) Oedipoda spp., (1).
Habitat: Mid-intestine, (1a), (1b).
Distribution: France: (1a), (1b).

Genus 4. Protomagalhaensia Pinto, 1918. Spores barrel-shaped with spine at each corner. Sporonts attenuated, several individuals in association, often attached laterally.

Protomagalhaensia serpentula (Magalhães, 1900) Pinto, 1918.
References: (1) Magalhães, 1900, 43; (2) Sokolow, 1911, 278; (3) Ellis, 1913c, 266; (4) Watson, 1916a, 104; (5) Pinto, 1918b, 321; (6) Kamm, 1922a, 133.
Synonymy: Gregarinia serpentula, (1), (2), (3), (4); Protomagalhaensia serpentula, (5), (6).
Hosts: (a) Periplaneta americana (Linnaeus), (1).
Habitat: Coelom and alimentary canal, (1a).
Distribution: Rio de Janeiro, Brazil, (1a).


Gamocystis tenax Schneider, 1875.
References: (1) Schneider, 1876, 99, etc.; (2) Schneider, 1882, 444, 445; (3) Balbiani, 1884, 13, 50; (4) Wasielewski, 1896, 36, 186; (5) Léger, 1899, 12; (6) Lühe, 1904, 155; (7) Wellmer, 1910, 532; (8) Wellmer, 1911, 108, 122; (9) Ellis, 1913c, 271; (10) Watson, 1916a, 122.
Synonymy: Name unchanged.
Hosts: (a) Ectobia lapponica (Linnaeus), (1), (7), (8).
Habitat: Alimentary canal, (1a), (8a).
Distribution: France, (1a); East Prussia, (7a); Germany, (8a).


Tettigonospore stenopelmati (Smith, 1929) Smith, 1930.
References: (1) Smith, 1929, 57; (2) Smith, 1930, 445.
Synonymy: Coccospora stenopelmati, (1); Tettigonospore stenopelmati, (2).
Hosts: (a) Stenopelmatus pictus Scudder, (1); (b) Stenopelmatus fuscus Haldeman, (1); (c) Stenopelmatus intermedius Davis and Smith, (2).
Habitat: Cecae and mid-intestine, (1a), (1b); excrement, (2c).
Central Distribution: California, (1a), (1b); Oakland, California, (2c).

Hirmocystis gryllotalpae (Léger, 1892) Labbé, 1899.
References: (1) Léger, 1892, 112; (2) Wasielewski, 1896, 35; (3) Léger, 1897, 11; (4) Labbé, 1899, 13; (5) Watson, 1916a, 123.
Synonymy: Gregarinia sphaerulosa, (1), (4); Eirmocystis gryllotalpae, (1), (2); Eirmocystis Gryllotalpae, (3); Hirmocystis Gryllotalpae, (4), (5).
Hosts: (a) "Courtilieres" (a gryllid), (1).
Habitat: Alimentary canal, (1a).
Distribution: Vallée du Clain, Poitou, France, (1a).

Family 2. Actinocephalidae Léger, 1892.

Genus 1. Pileocephalus Schneider, 1875. Epimerite a lance-shaped or simple cone. Spores ovoid, pointed.
Pileocephalus tachycines Semans, 1939.
References: (1) This paper, parts II and III.
Hosts: (a) Tachycines asinamorus (Adelung), (1).
Habitat: Mid-intestine, (1a).
Distribution: Franklin County, Ohio, (1a).
Pileocephalus blaberae (Frenzel, 1892) Labbé, 1899.
References: (1) Frenzel, 1892, 300; (2) Wasielewski, 1896, 136; (3) Labbé, 1899, 20; (4) Ellis, 1913c, 266; (5) Watson, 1916a, 123; (6) This paper, part II.
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Synonymy: Gregarina blaberae, (1), (2), (4); Pileocepalus blaberae, (3), (5), (6).
Hosts: (a) Blaptica dubia (Serville), and related species, (1).
Habitat: Mid-intestine, (1a).
Distribution: Cordoba, Argentina, (1a).

Genus 2. Actinocephalus Stein, 1848. Epimerite small, sessile or on a short neck, with 8 or 10 short, sharp spines or simple, bifurcate digitiform processes. Spores biconic.

Division 1. South African species.

Actinocephalus giganteus Bush, 1928.
References: (1) Bush, 1928, 149, et. al.
Hosts: (a) Majority of the grasshopper species. (This refers to 35 ? species of "Acridiidae" examined by Bush.) ... did not occur in Locustana pardalina," (1).
Habitat: Alimentary canal, (1a).
Distribution: Pietermaritzburg, Natal, (1a).

References: (1) Bush, 1928, 152, et. al.
Hosts: (a) Perga xanthopiera (Stal), (1); (b) Catantops humeralis (Thunberg), (1).
Habitat: Alimentary canal, (1a), (1b).
Distribution: Pietermaritzburg, Natal, (1a), (1b).

Actinocephalus amphoriformis Bush, 1928.
References: (1) Bush, 1928, 149, et. al.
Synonymy: Name unchanged.
Hosts: (a) Practically all the species of grasshoppers. (This refers to 35 ? species of "Acridiidae" examined by Bush.) ... did not occur in Locustana pardalina." (1).
Habitat: Alimentary canal, (1a).
Distribution: Pietermaritzburg, Natal, (1a).


Actinocephalus sp.
References: (1) This paper, parts II and III.
Hosts: (a) Pardalophora apiculata (Harris), (1).
Habitat: Mid-intestine, (1a).
Distribution: Washington County, Ohio, (1a).

References: (1) Leidy, 1853a, 239; (2) Leidy, 1856, 47; (3) Diesing, 1859, 730; (4) Crawley, 1903a, 54; (5) Crawley, 1903b, 640; (6) Crawley, 1907, 226; (7) Ellis, 1913c, 278; (8) Watson, 1916a, 124; (9) this paper, part II.
Synonymy: Gregarina Locustae Carolinae, (1); Gregarina Locustae caroliniae, (2); Gregarina fimbriata, (3); Stephanophora locustae-carolinae, (4), (5); Stephanophora pachyderma, (6); Actinocephalus pachydermus, (7); Actinocephalus fimbriatus, (8), (9).
Hosts: (a) Dissosteira carolina (Linnaeus), (1), (6).
Habitat: Alimentary canal, (1a).

Actinocephalus elongatus Semans, 1939.
References: (1) This paper, parts II and III.
Hosts: (a) Dichromorpha viridis (Scudder), (1); (b) Arphia sulphurea (Fabricius), (1); (c) Chortophaga viridifasciata (DeGeer), (1); (d) Schistocerca americana americana (Drury), (1, A. elongatus ?); (e) Melanieps mexicanus mexicanus (Saussure), (1, A. elongatus ?).
Habitat: Coelom, (1c); enteric ceca, (1c), (1b); mid-intestine, (1a), (1c), (1d).
Distribution: Fairfield County, Ohio, (1c); Franklin County, Ohio, (1d); Washington County, Ohio, (1a), (1b), (1c).


Legeria sp. Bush, 1928. (Possibly the immature of the South African Gregarina nigra Watson. See this paper, part II, under Gregarina indianaensis n. sp.)
References: (1) Bush, 1928, 153, et. al.
Hosts: (a) Phloeonotus jugatus (F. Walker), (1).
Habitat: Alimentary canal, (1a).
Distribution: Pietermaritzburg, Natal, (1a).

Subclass 2. NEOSPORDIA Schaudinn, 1900.
Spores formed more or less continuously throughout the trophic stages, the sporoblasts being carried about with the organism, which may ultimately become a huge mass of spores.
Order 1. Microsporidia Balbiani, 1884.

Small spores, frequently less than 5 microns in length. Possess one, or exceptionally, two polar capsules, which under pressure extrude exceedingly long filaments.

Family 1. Nosematidae Labbé, 1899.

Ovoid or pyriform spores developed from uninucleate rounded bodies which are the products of multiple or binary fission of the vegetative forms.

Genus 1. Plistophora Gurley, 1893. Each sporont gives rise to many spores, more than 16.

Plistophora periplanetae (Lutz and Splendore, 1903) Perrin, 1905.

References: (1) Schaudinn, 1902, 309; (2) Lutz and Splendore, 1903, 154; (3) Perrin, 1905, 204; (4) Mercier, 1906a, 1083; (5) Perrin, 1906, 615; (6) Mercier, 1908a, 373; (7) Mercier, 1908c, 41; (8) Shiwago, 1909, 647; (9) Wellmer, 1910, 532; (10) Epstein, 1911, 677; (11) Shiwago, 1911, 49; (12) Wellmer, 1911, 145; (13) Swarczewsky, 1914, 50, 74, 91; (14) Georgévitch, 1925a, 1191; (15) Georgévitch, 1925, 102, 104; (16) Georgévitch, 1927, 9.

Synonymy: Not named, (1); Nosema periplanetae, (2); Plistophora periplanetae, (3), (5), (8), (9), (10), (11), (12), (13), (14), (15); Plistophora periplanetae, (4), (7), (16), (17).

Hosts: (a) Blattella germanica (Linnaeus), (12); (b) Blatta orientalis Linnaeus, (3), (4), (8), (9), (10), (12), (14); (c) Periplaneta americana (Linnaeus), (2); (d) “Blattes,” (15).

Habitat: Alimentary canal, (2c); Malpighian tubules, (3b), (4b), (8b), (10b), (12a), (12b), (15d).

Distribution: Brazil, (2c); England, (3b); France, (4b); Königsberg, Germany, (12b); Munich, Germany, (10b); East Prussia, (9b); Moscow, Russia, (8a), (8b), (10b); Belgrade, Yugoslavia, (14b).

Species related to Plistophora periplanetae (Lutz and Splendore, 1903) mentioned by Lutz and Splendore, 1903.

References: (1) Lutz and Splendore, 1903, 154.

Hosts: (a) Gryllotalpa sp., (1).

Habitat: Mid-intestine, wall, (1a).

Distribution: Brazil, (1a).

Species related to Plistophora periplanetae (Lutz and Splendore, 1903) mentioned by Perrin, 1905.

References: (1) Perrin, 1905, 208.

Hosts: (a) Blatta orientalis Linnaeus, (1).

Habitat: Malpighian tubules, (1a).

Distribution: England, (1a).

Plistophora sp. Mercier.

References: (1) Mercier, 1908, 373; (2) Kudo, 1924, 178.

Hosts: (a) Blatta orientalis Linnaeus, (1).

Habitat: Fat bodies, (1a).

Distribution: ?

Order 2. Haplosporidia Lühe, 1900.

Spores spherical or ovoid, the surface variously marked with ridges, but without polar capsules. Possess a tail-like process in some cases.


Coelosporidium periplanetae (Lutz and Splendore, 1903) Swarczewsky, 1914.


Synonymy: Nosema periplanetae, (1); Coelosporidium blattellae, (2), (3); Bertramia blattellae, (4), (5); Coelosporidium periplanetae, (6), (7), (8), (9), (10).

Hosts: (a) Blattella germanica (Linnaeus), (2), (5); (b) Blatta orientalis Linnaeus, (7).

Habitat: Malpighian tubules, (2a), (5a).

Distribution: Königsberg, Germany, (5a); United States, (2a); Urbana, Illinois, (7b).