

### *Diplocystis oxycani* n.sp.—A Gregarine Parasite of *Oxycanus cervinatus* Walk.

By L. J. DUMBLETON, Entomology Division, Department of Scientific and Industrial Research.

[Received by the Editor, February 2, 1948; issued separately, September, 1949.]

IN the course of dissections of the larvæ of *Oxycanus cervinatus* Walk. relatively large white bodies were frequently found attached to the external wall of the intestine or free in the body cavity. These were determined to be the trophozoites of a gregarine parasite of the insect, and the present paper records the observations which have been made on this species.

The classification which I have followed is that of Bhatia, 1938, in the volume on the Sporozoa in the *Fauna of British India*. The species under discussion would fall in the Sub-order Engregarinaria, owing to the absence of schizogony, and the single-chambered trophozoite would place it in the Legion Haplocyta. The Tribe Homoplaridea is characterised by sporocysts with similar poles. Within this tribe the species would run in Bhatia's key, to the Family Diplocystidae, in which the sporocysts are oval or spherical and octozoic, and the trophozoites fuse in pairs to form spherical gametocysts. Two genera are included in the family. *Lankesteria* includes intestinal parasites of tunicates and aquatic insects, with spatulate trophozoites of small size and oval sporocysts. *Diplocystis* includes parasites occurring in the body cavity of both terrestrial and aquatic insects, the sporocysts are spherical or oval and the trophozoites are of larger size and fuse precociously to form spherical masses. The present species is considered to fall in the Genus *Diplocystis* Künstler 1887, which contains three other species, *D. schneideri* Künstler from the cockroach *Periplaneta americana*, *D. phryganeae* Feodorowa from a Trichopteron, *Phryganea* sp., and *D. clercki* Leger from the Embiid, *Embia solieri*.

#### *Diplocystis oxycani* n.sp.

*Sporocyst*. (Plate 1, fig. 1). Length 13  $\mu$ , width 6  $\mu$ , elliptical with truncate ends, more nearly ovoid than bi-conical.

*Sporozoite*. Eight per sporocyst, long, thin, transparent, as long as sporocyst. Slightly blunter at one end. Movements undulating.

*Trophozoite*. (Plate 1, fig. 2). Attached to external wall of intestine, large, opaque white, pyriform. Later, when free in body cavity, spherical. These latter when dissected show a prominence on the circumference which is probably the remains of the epimerite. Nucleus large with a single spherical endosome or karyosome 16  $\mu$  in diameter.

*Gametocyst*. Ovoid to sub-spherical, opaque white, 1.7 to 2.0 mm. in diameter.

*Gametes*. These have not been studied sufficiently to state whether or not they are differentiated into micro- and macrogametes.

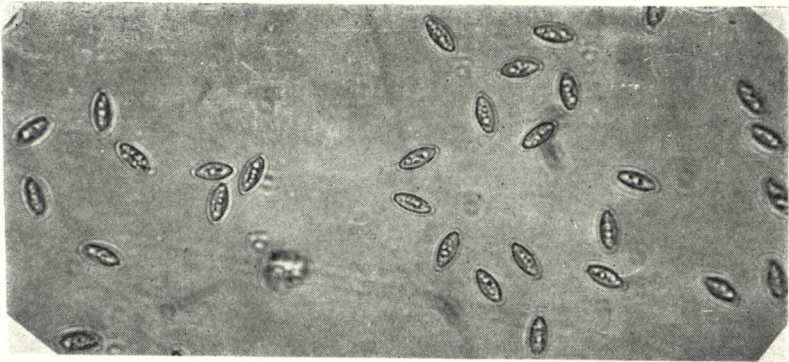


FIG. 1.—*Diplocystis oxycani* n.sp., sporocysts

B. Given photo.

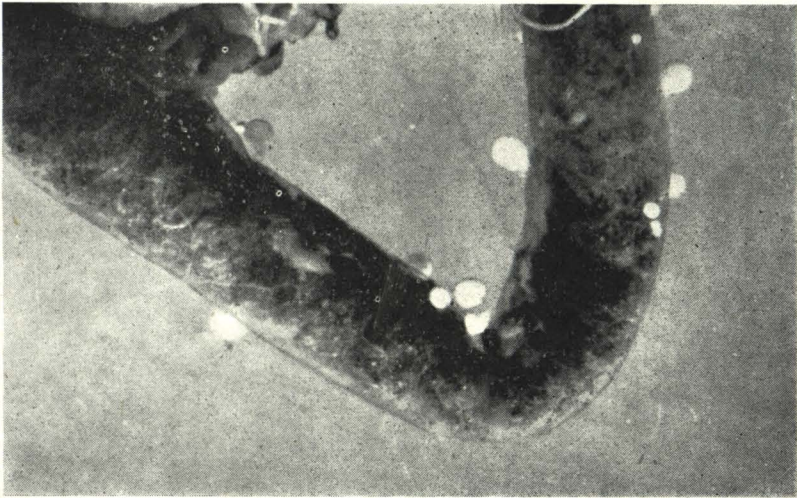


FIG. 2.—*Diplocystis oxycani* n.sp., trophozoites on host intestine.

W. C. Davies photo.

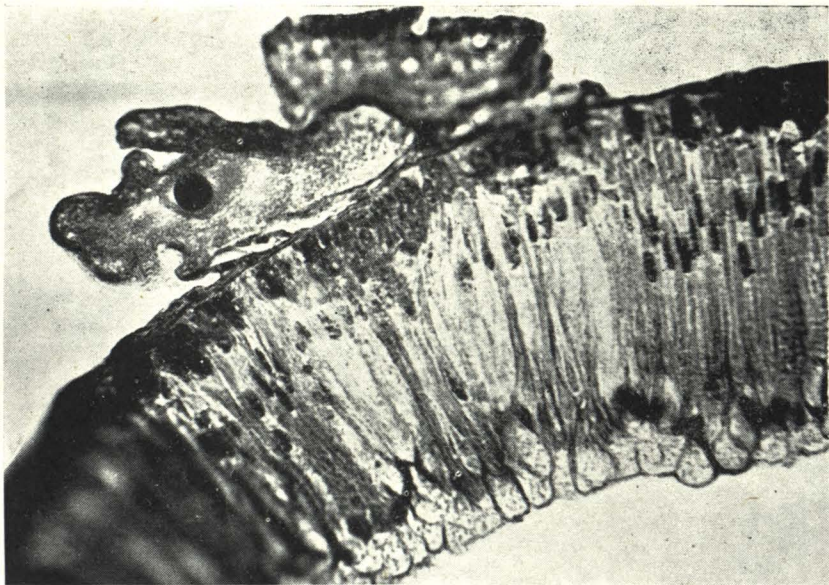
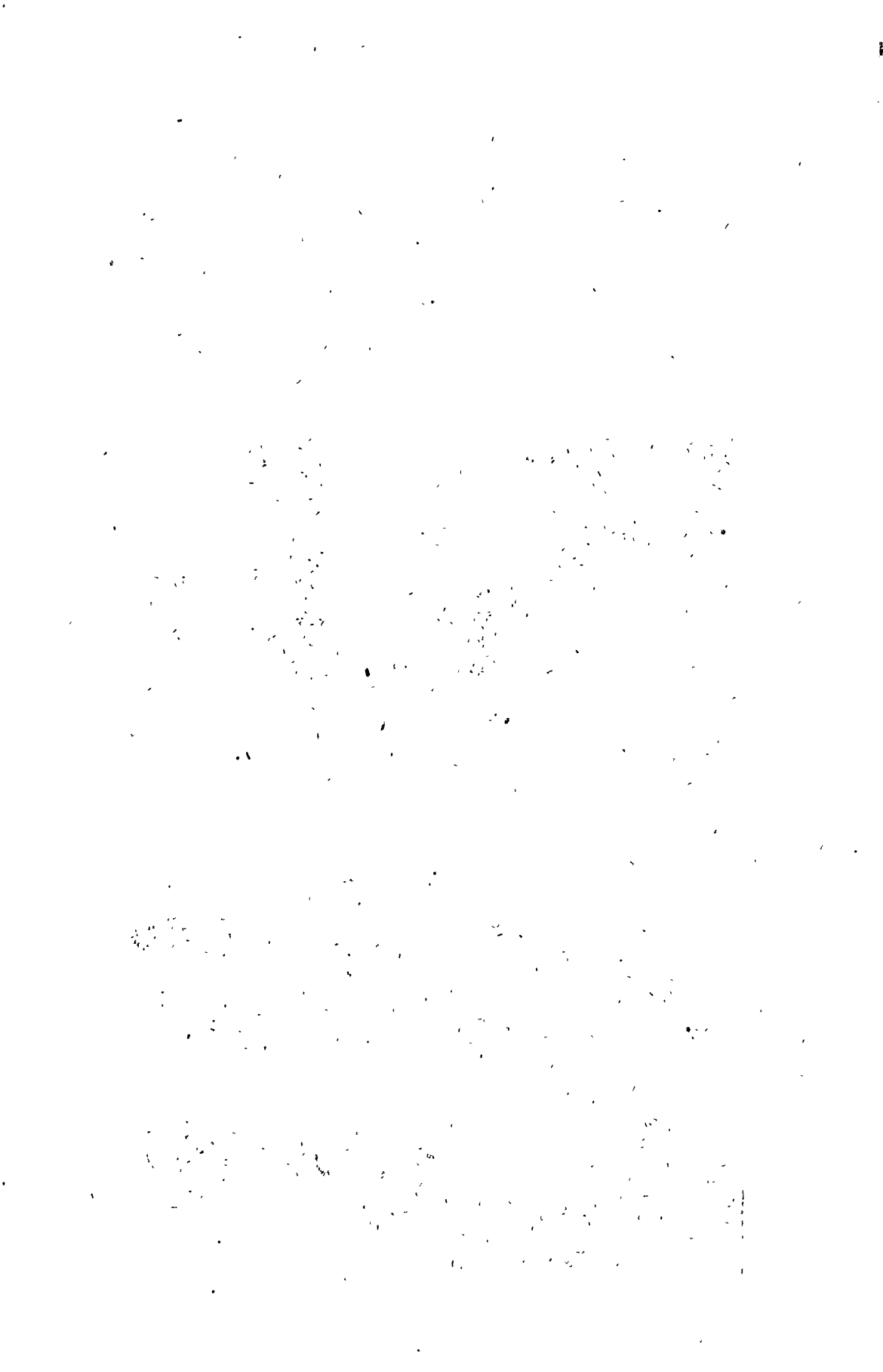


FIG. 3.—T.S. of host intestine and attached trophozoite.

B. Given photo,

To face page 530]



*Host.*

Larvæ, pupæ and adults of both sexes of the Hepialid moth *Oxycanus cervinatus* Walk. It probably occurs in some of the other 18 N.Z. species of the genus. *O. cervinatus* is a single-brooded insect the moths of which fly in October. The larvæ and pupæ occur in the soil where the larva constructs a burrow or tunnel. It emerges to feed on green vegetation and is a serious defoliator of pastures. The adult insect is very short-lived and, lacking functional mouthparts, takes no food.

*Distribution.*

Throughout the South Island and probably in the North Island.

*Pathogenicity.*

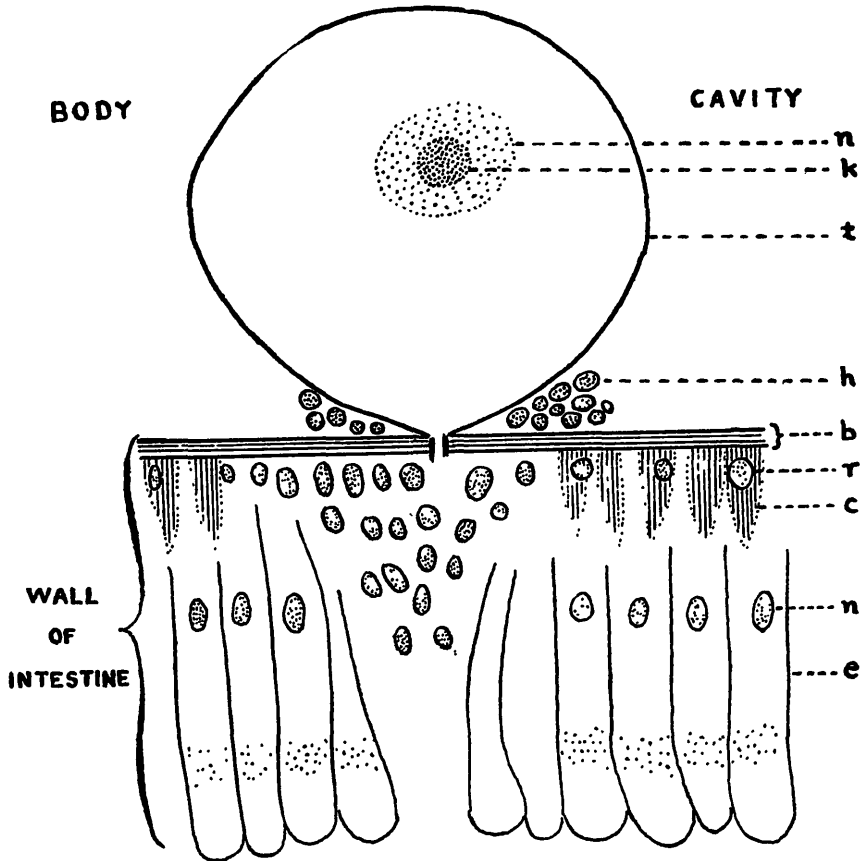
The parasite is apparently non-pathogenic since infected larvæ produce normal adults. The infected larvæ do not appear to be significantly retarded in growth as compared with uninfected larvæ.

*Pathology.*

(Plate 1, fig. 3 and text fig. 1). Transverse sections through the intestine and the attached trophozoites show considerable changes in the region of attachment of the parasite. In the body cavity many hæmocytes or phagocytes are crowded round the point of attachment between the trophozoite and the intestine. In some sections there shows a yellow staining, apparently tubular structure piercing the basal membrane at the point of attachment of the parasite. This is probably to be interpreted as a product of cellular reaction at the point where the young trophozoite pierced the basal membrane in order to leave the epithelial cell. Mesad of the point of attachment the epithelial cells and the connective tissue have degenerated and been replaced by a triangular aggregation of regenerative cells. Elsewhere the normal pattern of the intestine wall is unchanged, consisting of long columnar epithelial cells with the nucleus at approximately mid-length, conical connective tissue elements based on the basal membrane, and regenerative cells between the connective tissue elements and close to the basal membrane.

*Life Cycle.*

The sporocysts are probably ingested by the *Oxycanus* larvæ, either with contaminated grass, or in the process of excavating the tunnel in the soil. It is assumed that the sporozoites escape from the sporocyst in the gut and enter the epithelial cells of the intestinal wall, later passing through the basal membrane and coming to lie in the body cavity, though still attached to the intestine. After the growth of the trophozoite is complete it becomes detached from the intestine and floats free in the body cavity of the larva. These free trophozoites or sporonts may then be observed to attach in pairs, at first only at one point on the circumference, but later fused into a spherical mass, with each sporont hemispherical in shape. Gametes are produced by each sporont and the dividing wall between the sporonts disappears to allow the fusion of the gametes to form zygotes, each of which gives rise to a sporocyst containing eight sporozoites. All these stages may be observed (except the intra-cellular trophozoite, which has not been seen) in the body cavity of the host larvæ. The later stages, the gametocysts and the contained sporocysts, have also



### LUMEN OF INTESTINE

TEXT FIG. 1.—T.S. of host intestine and attached trophozoite.

B., basal membrane of intestine wall; c., connective tissue of intestine wall; e., epithelial cell of intestine wall; h., haemocyte or phagocyte; k., karyosome or endosome; n., nucleus; r., regenerative cell; t., trophozoite.

been found in the body cavity of the pupæ and of both sexes of the adult insect. The only occasion on which hatching of the sporozoites from the sporocyst was observed was when sporocysts obtained from adult insects were mounted in a hanging drop consisting of the fluid part of the gut contents of the larva. On this occasion eight sporozoites were observed to emerge from a single sporocyst. The sporocysts are non-mobile and are in any case probably contained in the gametocyst until mechanical disruption of this occurs after the death of the adult insect. There is no exit from the body cavity for the gametocysts or sporocysts, and it is assumed that the sporocysts are liberated either by the disintegration of the dead body of the host or possibly passed through the intestine of birds which may devour the host insect. The host insect takes no food and excretes only the meconium after emergence. No evidence was seen of the presence of sporocysts in this meconium,