

The Occurrence of *Leptomonas ctenocephali* (Fantham, 1912) (Protozoa: Protomonadina) in the Intestine and Malpighian Tubules of the Cat Flea, *Ctenocephalides felis* (Bouche, 1835), in New Zealand*

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NINE specimens of the cat flea, *Ctenocephalides felis* (Bouché, 1835), were collected from two domestic cats in Kelburn, Wellington, on June 25, 1948. Smear preparations made from the gut and Malpighian tubules of these insects were fixed in absolute alcohol, and stained with Giemsa. Microscopical examination showed the presence of a leptomonad flagellate in the preparations from four of the insects.

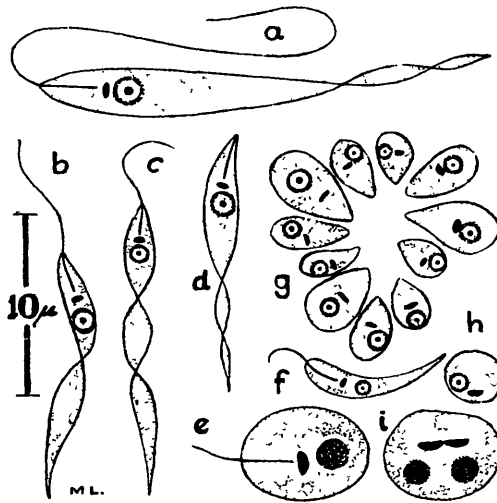
Fantham (1912) recorded a flagellate from three of 68 specimens of the dog flea (*Ctenocephalus*) = *Ctenocephalides canis*, collected from dogs in England. He assigned the provisional name of *Herpetomonas ctenocephali* to this organism. In no cases were the flagellates numerous, and the only stages seen were rounded leishmania forms and elongate oval uniflagellate ones. Earlier workers had seen herpetomonads in preparations from the dog flea, and Patton (1908) had recorded *Crithidia* sp.? from the gut of the larva of the cat flea in Madras. Brumpt (1913) assigned the name *Herpetomonas pseudo-leishmania* to the flagellate of the dog flea, but as Fantham (1913) pointed out, his specific name of *ctenocephali* has priority. Subsequent studies failing to disclose either crithidia or trypanosome forms in any part of the life cycle of Fantham's parasite, the species was transferred to the genus *Leptomonas*. Woodcock (1914) seems to have been the first to apply this generic name to *L. ctenocephali*, and for a number of years many workers continued to regard the species as belonging to *Herpetomonas*.

Patton (1914) states that (*Ctenocephalus*) = *Ctenocephalides felis* is the flea found on both dogs and cats in Madras, and that from 1 to 3% of these insects "are naturally infected with a species of *Herpetomonas* which I found in 1907" This author, although intending to describe his parasite from the cat flea in due course, never published such a description. As Patton (1908) observed crithidia forms of his parasite, he was therefore dealing with a flagellate distinct from *Leptomonas ctenocephali*.

In all four infected cat fleas studied in the present instance, both hind gut and rectum were heavily parasitized by *Leptomonas ctenocephali*. In one case the Malpighian tubules were also infected, a few large leptomonad forms (Text Fig. 1, a) being the only stages

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present in them. Gibbs (1947), dealing with material from *Ctenocephalides canis*, also found only large active leptomonads in these tubules. His parasites measured about 23μ in length and exhibited one or more twists in the body. Those from *Ctenocephalides felis* range from 20.3 to 25.2μ in length, with an average of 24.1μ (25 examples measured). The flagellum is as long as or rather longer than the body, which usually has two twists posteriorly. The karyosomatic nucleus is placed immediately behind the deeply staining kinetoplast, and is in the anterior third to quarter of the body. With Giemsa the alveolar cytoplasm stains light blue.



Leptomonas ctenocephali
(Fantham, 1912).

TEXT FIGURE 1

Both leptomonad and leishmania forms, the latter predominating in my material, are found in the hind gut and rectum of *Ctenocephalides felis*. Very few forms with even moderately long flagella (Text Fig. 1, b, c) are present. In the leptomonad stages most commonly present the flagellum is either very short (Text Fig. 1, f) or has no free portion at all (Text Fig. 1, d). Gibbs (1947) found leptomonads with short free flagella and measuring some 5.5μ in length to be the most abundant forms of the parasite present in the gut and rectum of *Ctenocephalides canis*. The corresponding stages of the flagellate in the cat flea (Text Fig. 1, f) range from 5.0 to 8.1μ in length and from 1.3 to 1.8μ in their greatest breadth. These small leptomonads, like those described by Gibbs, exhibit no twisting of the body. However, the bodies of the larger leptomonads (Text Fig. 1, b-d) from the gut of *C. felis* do have one or two twists. Gibbs (1947) found no such forms in the gut of *C. canis*, all his leptomonad forms from this site being attached ones of the small type described above. Wenyon (1926) claims that active leptomonads of *L. ctenocephali* may be present in the gut contents of engorged dog fleas. All the cat fleas dissected were more or less engorged, and it is

possible that the larger twisted leptomonads in their gut smears represent such active forms as described by Wenyon, although Gibbs never found such forms even in recently engorged fleas.

Large round or ovoid forms (Text Fig. 1, e-i) measure from 4.5 to 6.7μ by 4.5 to 6.2μ , those from *C. canis* being some 5μ in diameter (Gibbs, 1947). Like those described by Gibbs as being in process of development to or from the leptomonad form, they often have a short free flagellum. The nucleus may or may not be karyosomatic, and like that of the equivalent stage from *C. canis* it is usually positioned eccentrically. Division stages of preflagellate forms (Text Fig. 1, i) are abundant.

Many rosettes of small pyriform leishmania forms are present in my material (Text Fig. 1, g), individuals ranging in size from 2.6 by 1.8μ to 5.2 by 2.9μ . The nucleus is situated in the broader part of the body, the kinetoplast being anterior to this structure and at the inner end of a non-staining area extending from the narrow extremity. Resistant bodies (Text Fig. 1, h), the small leishmania forms which pass out in the faeces and serve to infect larval fleas, are round to ovoid in shape and about 2.9μ in diameter. Those studied by Gibbs measured some 3 by 2.2μ . The appearance of the resistant bodies of the flagellates from *C. canis* and *C. felis*, as stained by modifications of the Romanowsky method, is very similar indeed, the nucleus and kinetoplast being situated towards one end and more or less side by side, while the clear area in which the rhizoplast develops extends from the kinetoplast to the opposite limit of the body.

SUMMARY

Leptomonas ctenocephali (Fantham, 1912) is well known as a parasite of the dog flea, *Ctenocephalides canis*. The flagellates discussed herein were obtained from four of nine specimens of the cat flea, *Ctenocephalides felis*, collected in Kelburn, Wellington. They are identified as *L. ctenocephali*, a comparison with this species as described from the dog flea by Gibbs (1947) and others having failed to reveal any significant points of difference justifying their separate consideration. The species has not previously been recorded from New Zealand.

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