

HETEROCINETA PHORONOPSIDIS SP. NOV., A CILIATE FROM THE TENTACLES OF PHORONOPSIS VIRIDIS HILTON

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INTRODUCTION

The infestation of the tentacles of *Phoronopsis viridis* Hilton by a small ciliate of the family Ancistrocomidae Chatton and Lwoff¹ (order Holotricha, suborder Thigmotricha) was called to my attention by Professor Harold Kirby. A preliminary study of this ciliate, from slides prepared in his laboratory from material collected in Bodega Bay, California, in November, 1943, disclosed that on the basis of the organization of the ciliary system it appeared to be most closely related to species of the genus *Heterocineta* Mavrodiadi, ectoparasitic on fresh water mussels, prosobranchs, and pulmonates (Jarocki; 1934, 1935).

In June, 1945, I collected additional material of *Phoronopsis viridis*² in an intertidal mud flat in Tomales Bay. From observations of the living ciliates it was determined that this new species, which will be described herein as *Heterocineta phoronopsidis* sp. nov., differs fundamentally from other species of *Heterocineta* in having a groove-like depression originating on the left side of the body near the anterior end and extending posteriorly along the dorsal surface close to the left margin. I have studied a species of *Heterocineta* ectoparasitic on *Physa cooperi* Tryon from a locality near Mt. Eden, California, which agrees perfectly with the description of *Heterocineta janickii* given by Jarocki (1934). This ciliate, like *H. phoronopsidis*, has eight ciliary rows, but these are restricted to a more narrow area on the ventral surface. There is no dorso-lateral groove in *H. janickii*. In none of Jarocki's descriptions of ciliates of the genus *Heterocineta*, which apparently were based to a large extent upon living material, is there any mention of such a groove.

TECHNIQUE

For observation of the living ciliates the tentacles of *Phoronopsis viridis* were detached from the rest of the body by means of forceps and comminuted in a drop of sea-water on a slide. Fixation of the organisms for permanent preparations was accomplished by preparing smears in this manner on coverglasses and dropping them onto the surface of the fixative in a Petri dish. For a study of the general

¹ Chatton and Lwoff (1939) proposed the family Ancistrocomidae to include those ciliates formerly assigned to the family Hypocomidae Bütschli which differed from the type genus of the latter (*Hypocoma* Gruber) in having the suckorial tentacle disposed terminally rather than subterminally and the ciliary rows arranged singly rather than in pairs.

² Professor W. A. Hilton of Pomona College has kindly identified the phoronid species from Tomales Bay as *Phoronopsis viridis* Hilton (1930). It should here be noted, however, that no systematic revision of the phoronids from the Pacific Coast has been given in the literature and it is not impossible that *P. viridis* will later be shown to be identical with one of the species described earlier.

morphology, staining with iron hematoxylin gave good results on material fixed in Schaudinn's fluid. Differentiation of the ciliary system by impregnation with activated protein silver (protargol) was successful following fixation in Hollande's cupric-picro-formol mixture and Schaudinn's fluid, but this method was no more satisfactory than staining with iron hematoxylin. The Feulgen nuclear reaction was used after fixation in Schaudinn's fluid and a saturated aqueous solution of mercuric chloride with 5 per cent of glacial acetic acid.

HETEROCINETA PHORONOPSIDIS sp. nov.

The body is elongated, asymmetrical, and flattened dorso-ventrally. Twenty living individuals taken at random ranged in length from $26\ \mu$ to $37\ \mu$, in width from $11\ \mu$ to $16\ \mu$, and in thickness from $6.5\ \mu$ to $11\ \mu$, averaging about $29\ \mu$ by $14\ \mu$ by $8\ \mu$. As seen in dorsal view (Fig. 1A) the left side of the ciliate is conspicuously rounded, while the right side is by comparison very little curved. The body is usually widest at a point a short distance behind the middle and is rounded posteriorly. The attenuated anterior end is deflected toward the left, truncate at the tip, and bent ventrally. The reduced ciliary system, to be described presently, is disposed in a shallow concavity occupying the anterior four-fifths of the ventral surface (Fig. 1B); the dorsal surface and that part of the ventral surface posterior to the ciliary area are convex.

A contractile suctorial tentacle enables the ciliate to attach itself to epithelial cells of the tentacles of the host and to feed upon their contents. When fully extended the suctorial tentacle of *Heterocineta phoronopsidis* is about $4\ \mu$ in length and $1.5\ \mu$ in diameter; it is contracted as soon as the ciliate is dissociated from the host and is seldom preserved in an extended condition in fixed individuals except those which have been fixed in a position of attachment to the host.

The internal tubular canal (Fig. 1, c) continuous with the suctorial tentacle is about $1.5\ \mu$ in diameter in its anterior portion, which is directed dorsally, and becomes abruptly narrower in its posterior portion, which is directed ventrally and obliquely to the right. In some living specimens and in suitable preparations stained with iron hematoxylin the canal can be traced along the right side of the body to a point a short distance posterior to the macronucleus.

The cilia of *Heterocineta phoronopsidis* are about $5\ \mu$ in length and markedly thigmotactic. They are disposed in eight longitudinal rows limited to the shallow concavity on the ventral surface (Fig. 1C). All eight rows originate near the base of the suctorial tentacle. Each of the first five rows from the right margin is about three-fifths the length of the body. The fourth and fifth rows are as a rule practically straight, while the outer three are appreciably curved. The remaining three rows become progressively longer and inflexed in such a way that they end one behind the other near the mid-line. The eighth and longest row terminates at a point about four-fifths the distance from the anterior end of the body to the posterior end. The cilia of the anterior part of the thigmotactic system move rather actively, those of the posterior part sluggishly.

The shallow groove-like depression which distinguishes *Heterocineta phoronopsidis* from other species of *Heterocineta* has its inception on the left side of the body near the anterior end and is about four-fifths the length of the body (Fig. 1A, g). As it extends posteriorly it comes to lie on the dorsal surface along the left margin.

The groove is visible only in living individuals. There are no traces of ciliature at any point along its course. Staining with iron hematoxylin and impregnation with protein silver fail to bring out any basal granules in the region occupied by the groove.

The cytoplasm is colorless and contains a number of small refractile granules in addition to food inclusions. The refractile granules (Fig. 1A, cg) are apparently lipid droplets, as they are dissolved out by toluol used for clearing following staining. At least one large food-vacuole and usually several smaller ones are present near the posterior end of the body (Fig. 1, fv). The contents of the food-vacuoles

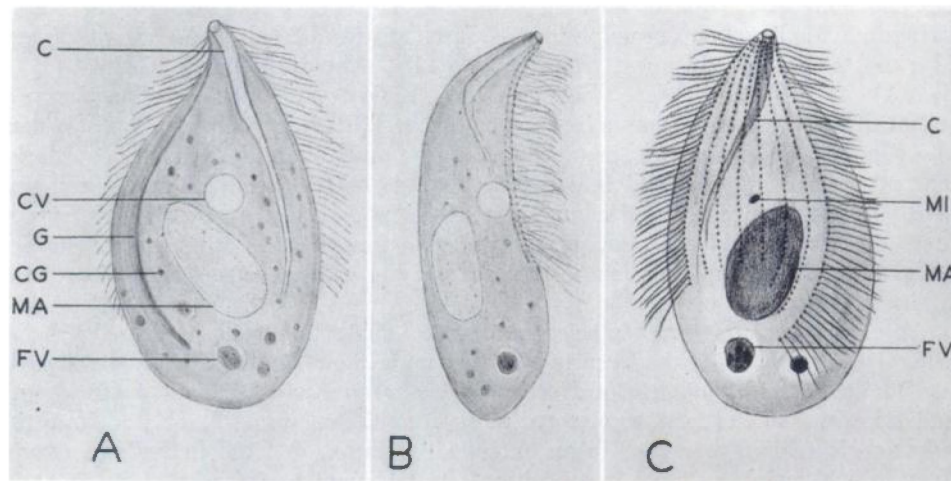


FIGURE 1. *Heterocineta phoronopsidis* sp. nov.

A. Dorsal aspect, from life; B. lateral aspect from right side, from life; C. ventral aspect. Schaudinn's fixative-iron hematoxylin. Drawn with aid of camera lucida. $\times 1940$.

c = internal tubular canal, cg = cytoplasmic granule, cv = contractile vacuole, fv = food vacuole, g = dorso-lateral groove, ma = macronucleus, mi = micronucleus.

are seen to consist mainly of ingested nuclei or fragments of nuclei from the epithelial cells of the tentacles of the host.

The contractile vacuole (Fig. 1, cv) lies near the middle of the body and opens to the exterior on the ciliated ventral surface. I have not distinguished a permanent opening in the pellicle.

The oval or rod-shaped macronucleus (Fig. 1, ma) is placed dorsally near the center of the body, its longitudinal axis lying obliquely to the longitudinal axis of the body. In ten individuals fixed in Schaudinn's fluid and stained by the Feulgen nuclear reaction on the macronucleus ranged in length from $5.25\ \mu$ to $7.5\ \mu$ and in width from $3\ \mu$ to $4.5\ \mu$.

The fusiform, rod-shaped, or crescentic micronucleus (Fig. 1C, mi) is situated anterior to the macronucleus. It is very difficult to distinguish in living specimens and is stained only weakly by iron hematoxylin and the Feulgen nuclear reaction. In ten individuals fixed in Schaudinn's fluid and stained by the Feulgen reaction

the micronucleus ranged in length from $1.5\ \mu$ to $2.25\ \mu$ and in width from $0.75\ \mu$ to $1.2\ \mu$.

When attached to the tentacles of the host *Heterocineta phoronopsidis* is almost immobile, exhibiting only a passive vibratory motion due to the energetic movement of the epithelial cilia. When dissociated from the host the ciliate swims slowly, usually rotating on its longitudinal axis and tracing wide arcs with its attenuated anterior end.

Heterocineta phoronopsidis sp. nov.

Diagnosis: Length $26\ \mu$ – $37\ \mu$, average about $29\ \mu$; width $11\ \mu$ – $16\ \mu$, average about $14\ \mu$; thickness $6.5\ \mu$ – $11\ \mu$, average about $8\ \mu$. The anterior end is attenuated, bent ventrally, and provided with a contractile suckorial tentacle continuous with an internal tubular canal. The ciliary rows are eight in number and originate near the base of the suckorial tentacle. The first five rows from the right are about three-fifths the length of the body, while the remaining three rows become progressively longer and are inflexed in such a way that they end one behind the other near the mid-line. A groove-like depression, without any trace of ciliature, extends from the anterior end of the body posteriorly along the dorsal surface close to the left margin. Ectoparasitic on the tentacles of *Phoronopsis viridis* Hilton (Tomales Bay, California). Syntypes are in the collection of the author.

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