

STUDIES ON CILIATES OF THE FAMILY ANCISTROCOMIDAE
CHATTON AND LWOFF (ORDER HOLOTRICHA,
SUBORDER THIGMOTRICHA)

III. ANCISTROCOMA PELSENEERI CHATTON AND LWOFF,
ANCISTROCOMA DISSIMILIS SP. NOV., AND
HYPOCOMAGALMA PHOLADIDIS SP. NOV.

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INTRODUCTION

Chatton and Lwoff described in 1926 two ciliates for which they created the genus *Ancistrocoma*: *A. pelseeneeri*, from the gills and palps of *Macoma balthica* (L.); and *A. pholadis*, from *Barnea (Pholas) candida* (L.). Their descriptions of these two species are of a preliminary nature and are not accompanied by illustrations. More detailed descriptions of *A. pelseeneeri*, together with illustrations, are given in two papers of Raabe (1934, 1938).

Kofoed and Bush (1936) described as *Parachaenia myae* a ciliate from the pericardial cavity and excurrent siphon of *Mya arenaria* L. which Kirby (1941) noted was in several respects apparently identical with *A. pelseeneeri*. Kudo (1946), however, listed *Parachaenia myae* as a valid species in the suborder Gymnostomata. Kofoed and Bush stated that they did not find *P. myae* in any other molluscs which were present in the same localities as the host species. I have studied the ciliate associated with *Mya arenaria* in San Francisco Bay and have compared it with similar forms from *Cryptomya californica* (Conrad), *Macoma inconspicua* Broderip and Sowerby,¹ *Macoma nasuta* (Conrad), and *Macoma irus* (Hanley) from San Francisco Bay, and from *Macoma secta* (Conrad) from Tomales Bay, California. I have concluded that the ciliate described by Kofoed and Bush as *Parachaenia myae* is not specific in *Mya arenaria* and that *P. myae* is identical with *Ancistrocoma pelseeneeri* Chatton and Lwoff.

On the gills and palps of the rock-boring piddock *Pholadidea penita* (Conrad) there occurs a species of *Ancistrocoma* which is clearly distinct from *A. pelseeneeri* and which I will describe in this paper as *Ancistrocoma dissimilis* sp. nov. Another ciliate I have studied from *P. penita* is referable to the genus *Hypocomagalma*, created by Jarocki and Raabe (1932) for *H. dreissenae*, from the fresh water mussel *Dreissena polymorpha* (Pall.). It will be described herein as *Hypocomagalma pholadidis* sp. nov.

¹ By some malacologists the small species of *Macoma* referred to in this paper as *M. inconspicua* is considered to be conspecific with *M. balthica*; by others it is considered to be a subspecies of *M. balthica*. No conclusive evidence has been presented in the literature in recent years either to support or refute these contentions.

ANCISTROCOMA PELSENEERI CHATTON AND LWOFF

(Figure 1; Plate I, Figs. 1, 2)

The body is elongated and somewhat flattened dorso-ventrally.² As seen in lateral view, the ciliate is banana-shaped, the ventral surface being incurved. The anterior end is more or less attenuated. The body is usually widest and thickest in its posterior third. Forty living individuals taken at random from *Mya arenaria* ranged in length from 50μ to 83μ , in width from 14μ to 20μ , and in thickness from 11μ to 16μ , averaging about 62μ by 16μ by 12.5μ . Twenty individuals from *Macoma inconspicua* ranged in length from 52μ to 78μ , in width from 14μ to 19μ , and in thickness from 11μ to 15μ .

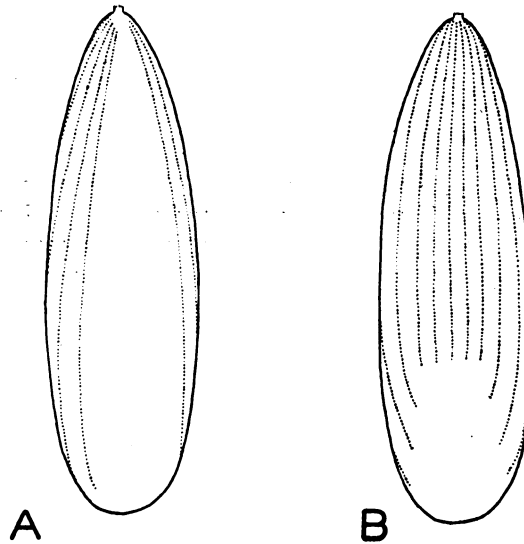


FIGURE 1. *Ancistrocoma pelseeneeri* Chatton and Lwoff. Distribution of ciliary rows, somewhat diagrammatic.³ A, dorsal aspect; B, ventral aspect.

The anterior end is provided with a contractile suckorial tentacle which enables the ciliate to attach itself to the epithelial cells of the gills and palps of the host and to suck out their contents. The internal tubular canal continuous with the tentacle is directed at first dorsally and then ventrally and obliquely toward the right side of the body. It can usually be traced in fixed individuals stained with iron hematoxylin for about two-thirds the length of the body. Kofoed and Bush suggested only in the title of their paper that the form which they named *Parachaenia myae* was parasitic in *Mya arenaria*, but did not describe attachment of the ciliate to the epithelium. They found the ciliate in the pericardial cavity and excurrent siphon

² Kofoed and Bush stated in their description of "*Parachaenia myae*" that the body of this ciliate is bilaterally compressed, the transverse diameter being about two-thirds the dorso-ventral diameter. Obviously their orientation of the form in question is not in agreement with the orientation assigned to it by Chatton and Lwoff, Raabe, and myself.

³ All text-figures illustrating this paper are based on camera lucida drawings of individuals fixed in Schaudinn's fluid and impregnated with activated silver albumose (protargol).

of the clams and apparently believed it to be unattached and to feed as a gymnosome, by producing a current in the medium by means of vigorous ciliary activity which carries food particles to the mouth. They stated that they observed a few instances of food taking, in which "debris containing bacteria enters the mouth and moves along the cytopharynx, forming little globules which continue back and aggregate in the large food vacuoles which distend the posterior part of the body." They stated further that "stained specimens show some vacuoles containing broken-up nuclear material similar to that of the epithelial cells which are removed when the fluid is taken from the clam." I have not observed any instances of ingestion of food such as that described by Kofoed and Bush, and although I admit it is perhaps possible for the ciliates to ingest food in this manner, I believe that they are primarily branchial parasites which feed by means of the suctorial tentacle.

The cilia of *A. pelseneeri* are disposed on the ventral, lateral, and dorso-lateral surfaces of the body in longitudinal rows originating at the anterior end. In all individuals which I examined carefully the number of ciliary rows was fourteen, but Raabe stated that in some specimens there are but thirteen rows. According to Raabe the ciliary system is composed of three separate complexes, the first consisting of eight or nine rows spiralling from the left side of the body toward the right and terminating progressively more posteriorly on the ventral surface, the second consisting of two approximately meridional rows situated on the central part of the ventral surface, and the third consisting of three rows spiralling from the right side of the body toward the left and terminating on the ventral surface. After studying a large number of the ciliates from *Mya arenaria* and *Macoma inconspicua* I cannot agree with Raabe on this matter. The ciliary rows appear collectively to form a single complex. There are usually five approximately equal rows about two-thirds the length of the body occupying the central portion of the ventral surface; these are bounded on the right by three progressively longer and more widely-spaced rows and on the left by six progressively longer and more widely-spaced rows. In some specimens the number of longer rows on the left side is greater than six, in which case the number of approximately equal and more or less meridional rows is proportionately decreased. Some of the outer rows on either side of the body, which originate on the lateral margins or on the dorsal surface, curve ventrally as they extend posteriorly, but the last two rows on the left side and the last row on the right side are typically dorso-lateral in position over their entire length. The outermost row on either side extends almost to the posterior tip of the body. Kofoed and Bush stated that the ciliary rows of "*Parachaenia myae*" may unite with one another, but I have never observed this to be the case, although in some seriously shrunk fixed individuals a few of the rows converge in such a way that they appear to be united.

In one of the illustrations accompanying the first of Raabe's papers in which there is a detailed discussion of *A. pelseneeri* (1934) the outermost ciliary row on the right side of the body is shown to originate as far anteriorly as the more central rows, while the outer three or four rows on the left side are shown to originate progressively more posteriorly. According to my own observations, however, the outermost row on the right side originates at about the same level as the last row on the left side. In all suitably impregnated individuals which I have studied the eighth row from the right side originates a little posterior to the level of origin of the adjacent ventral rows.

The cilia of *A. pelseneeri* are 8μ to 10μ in length. Those at the anterior end of the body are usually the more active and may be employed for thigmotactic attachment. Kofoed and Bush stated that the cilia of the "dorso-bilateral region" of "*Parachaenia myae*" are about 20μ long near the anterior end, becoming somewhat shorter posteriorly; the cilia of the ventral surface, on the other hand, were said by them to be about one-half the length of those of the dorso-bilateral area. I have noted, however, no significant disparity between the lengths of the cilia of various parts of the ciliary system. When dissociated from the host the ciliate swims energetically, rotating on its longitudinal axis or swaying from side to side.

In the original description of *A. pelseneeri* given by Chatton and Lwoff reference is made to a "frange peristomienne" which they supposed corresponded to the peristomal fringe of cilia in species of *Ancistruma*. In his paper of 1934, Raabe described a short (approximately 13μ long) row of basal granules lying in a dorsal anterior depression just above the anterior part of the internal tubular canal which he thought may represent the "frange peristomienne" described by Chatton and Lwoff. In his paper of 1938, however, Raabe stated that on certain of his preparations of this ciliate he could distinguish a row of basal granules such as he described in 1934, but did not refer to it as the peristomal fringe, and suggested that Chatton and Lwoff may have mistaken the stained outline of the internal tubular canal for a row of basal granules homologous with those of the peristomal fringe of ancistrumid ciliates. In my study of living, stained, and impregnated individuals of the ciliate I believe to be *A. pelseneeri* I have found no evidence whatever of a dorsal anterior depression or a row of basal granules such as that described by Raabe.

Kofoed and Bush described internal fibrillar structures, which they believed to represent elements of the neuromotor system, extending for a short distance posteriorly from an annular commissure ("cytostomal ring") around the "cytostome." One of the fibrils was said by them to pass along the internal tubular canal ("cytopharynx") to a slight thickening on the surface of the canal, then "towards the dorsal surface where it joins a relatively large granule which is closely associated with the mid-dorsal ciliary fibril." They stated further that "from points of the cytostomal ring on the ventral side, two fibrils are given off which soon unite and continue as a slender thread along the ventral surface of the cytopharynx." I have been unable to detect any structures in *A. pelseneeri* which might be construed as elements of a neuromotor system, but perhaps it is a siderophilic fibril-like structure of the type that Kofoed and Bush described that Raabe may have thought to represent a series of basal granules. The "cytostomal ring" around the "cytopharynx" was stated by Kofoed and Bush to be connected with the longitudinal ciliary rows,

EXPLANATION OF PLATE I

FIGURE 1. *Ancistrocoma pelseneeri* Chatton and Lwoff (from *Mya arenaria*). Ventral aspect. Heidenhain's "susa" fixative-iron hematoxylin. $\times 1,680$.

FIGURE 2. *Ancistrocoma pelseneeri* Chatton and Lwoff (from *Macoma inconspicua*). Lateral aspect from left side, from life.

FIGURE 3. *Ancistrocoma dissimilis* sp. nov. Ventral aspect. Schaudinn's fixative-iron hematoxylin. $\times 1,680$.

FIGURE 4. *Hypocomagalma pholadidis* sp. nov. Dorsal aspect. Schaudinn's fixative-iron hematoxylin. $\times 1,260$.

FIGURE 5. *Hypocomagalma pholadidis* sp. nov. Ventral aspect. Schaudinn's fixative-iron hematoxylin. $\times 1,260$.

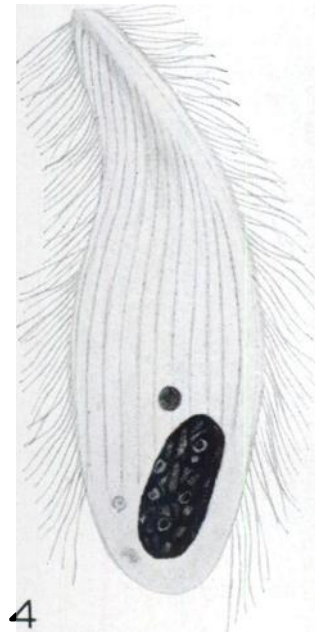
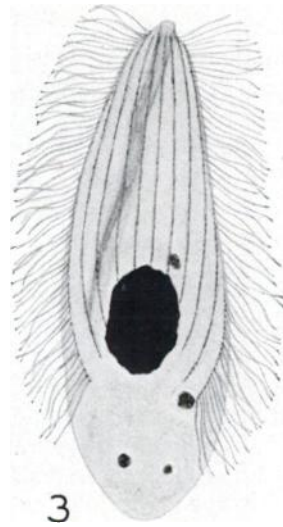
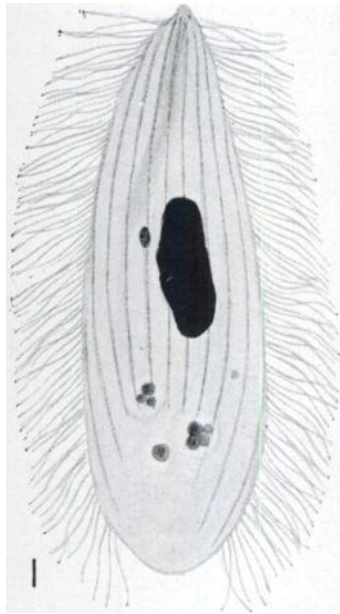


PLATE I

but I have not observed this to be the case in *A. pelseneeri*. As has been pointed out above, some of the rows do not originate as close to the base of the suctorial tentacle as others. It is possible that the structure referred to by Kofoid and Bush as the "cytostomal ring" represents the siderophilic anterior edge of the contracted suctorial tentacle.

The cytoplasm is colorless and contains numerous small refractile granules of a lipoid substance. In the posterior part of the body there are in addition to typical food vacuoles containing ingested fragments of epithelial cells one or more large vacuoles containing globular masses usually of a dense, homogeneous character. Raabe referred to this type of vacuole as "Konkrementenvacuole" and suggested that since he observed the internal tubular canal to terminate very near the "Konkrementenvacuole" the material within the vacuole may represent an accumulation of waste material which was not digested and absorbed as the ingested food material passed backward down the canal. It is quite true that these concretment vacuoles do not resemble the typical food vacuoles of most other ancistrocomid ciliates which I have studied. It would be interesting to determine whether or not digestion and absorption take place in the internal tubular canal, and how the material in the concretment vacuole, if it represents undigested wastes, is gotten rid of by the ciliate.

The macronucleus is usually sausage-shaped, rarely ovoid, and typically is situated dorsally near the middle of the body. In some fixed specimens stained with iron hematoxylin the chromatin appears to be distributed in irregular masses scattered through the macronuclear material; in other iron hematoxylin preparations and in most specimens stained by the Feulgen reaction the chromatin is aggregated into a dense reticulum enclosing vacuole-like clear spaces. In twenty individuals from *Mya arenaria* fixed in Schaudinn's fluid and stained by the Feulgen reaction the macronucleus ranged in length from $11\ \mu$ to $16\ \mu$ and in width from $4\ \mu$ to $7\ \mu$.

The micronucleus is ovoid, fusiform, or sausage-shaped, and usually is seen to lie to the right of the macronucleus. In fixed and stained specimens the chromatin is ordinarily aggregated into granules. In twenty individuals from *Mya arenaria* fixed in Schaudinn's fluid and stained by the Feulgen reaction the micronucleus ranged in size from $1.2\ \mu$ by $3\ \mu$ to $2.1\ \mu$ by $3.2\ \mu$.

Ancistrocoma pelseneeri is very common in *Mya arenaria* in all localities in San Francisco Bay where I have collected this mollusc. I have found it to be present, although usually in smaller numbers, also in *Cryptomya californica*, *Macoma inconspicua*, *M. nasuta*, and *M. irus* from several localities in San Francisco Bay, and in *Macoma secta* from Tomales Bay. It is peculiar that this ciliate was not recorded by Raabe from *Mya arenaria* at the marine biological station at Hel. Raabe listed *Sphenophyra dosinia* Chatton and Lwoff, *Hypocomidium granum* Raabe, and a species of *Ancistruma* which he provisionally referred to *A. cyclidioides* (Issel), from *M. arenaria*. I have found *S. dosinia* in a small percentage of *M. arenaria* and in a fairly large percentage of *Cryptomya californica* from San Francisco Bay. I have also found in *M. arenaria* the ciliate thought by Raabe to be *A. cyclidioides*, but not *Hypocomidium granum*.

Ancistrocoma pelseneeri Chatton and Lwoff (= *Parachaenia myae* Kofoid and Bush)

Diagnosis: Length $50\ \mu$ – $83\ \mu$ (according to Kofoid and Bush $40\ \mu$ – $100\ \mu$), average about $62\ \mu$; width $14\ \mu$ – $20\ \mu$, average about $16\ \mu$; thickness $11\ \mu$ – $16\ \mu$, average

about $12.5\ \mu$. The ciliary rows are fourteen (according to Raabe thirteen or fourteen) in number and are distributed on the ventral, lateral, and dorso-lateral surfaces of the body. There are usually five approximately equal rows about two-thirds the length of the body on the ventral surface, bounded on the right by three progressively longer and more widely-spaced rows and on the left by six progressively longer and more widely-spaced rows. The outermost row on either side extends almost to the posterior tip of the body. The more central rows originate close to the base of the suctorial tentacle, while the several outer rows on either side originate progressively more posteriorly on the lateral margins and the dorsal surface. Some of these rows curve ventrally as they extend posteriorly, but the two outer rows on the left side and the outermost row on the right side are typically dorso-lateral in position over their entire length. The macronucleus is usually sausage-shaped. The micronucleus is ovoid, fusiform, or sausage-shaped. Parasitic on the epithelium of the gills and palps of *Macoma balthica* (L.) (Wimereux [Chatton and Lwoff] ; Hel [Raabe]) ; *Macoma inconspicua* Broderip and Sowerby, *Macoma nasuta* (Conrad), *Macoma irus* (Hanley), *Cryptomya californica* (Conrad) (San Francisco Bay, California) ; *Macoma secta* (Conrad) (Tomales Bay, California) ; *Mya arenaria* L. (Tomales Bay [Kofoed and Bush] ; San Francisco Bay).

ANCISTROCOMA DISSIMILIS SP. NOV.

(Figure 2 ; Plate I, Fig. 3)

The body is elongated, attenuated anteriorly, and somewhat flattened dorso-ventrally. The ciliary system, to be described presently, is disposed for the most part on the incurved and slightly concave ventral surface. The body is widest and thickest in its posterior third and rounded posteriorly. Twenty living individuals taken at random ranged in length from $33\ \mu$ to $51\ \mu$, in width from $10\ \mu$ to $14.5\ \mu$, and in thickness from $8\ \mu$ to $12\ \mu$, averaging about $44\ \mu$ by $13\ \mu$ by $10\ \mu$.

The anterior end is provided with a contractile suctorial tentacle continuous with an internal tubular canal. The canal is directed at first dorsally and then ventrally and obliquely toward the right side of the body. In fixed specimens stained with iron hematoxylin it can usually be traced posteriorly for about one-half the length of the body.

The cilia of *A. dissimilis* are $7\ \mu$ to $8\ \mu$ in length and are disposed in longitudinal rows originating at the anterior end. The typical number of ciliary rows is eleven, but specimens with twelve rows are not uncommon, and I have seen some with fourteen rows. There are usually five approximately equal rows about three-fifths the length of the body occupying the central portion of the ventral surface ; these are bounded on either side by three progressively longer rows, the outermost rows being three-fourths to four-fifths the length of the body. In specimens having twelve ciliary rows there are four longer rows on the left side instead of three ; in specimens having fourteen rows there are four longer rows on the right side and five longer rows on the left. In some cases, particularly if the number of ciliary rows exceeds eleven, the five central rows are of unequal length, becoming progressively longer from right to left. One or two of the outer rows on either side originate on the lateral margin or the dorsal surface, usually a short distance posterior to the level of origin of the other rows. These rows curve ventrally and inward as they extend posteriorly, so that at least their distal portions are visible in ventral view.

The cytoplasm is colorless and contains numerous small refractile granules of a lipoid substance in addition to food inclusions. One or more larger food vacuoles are usually present in the posterior part of the body. The contractile vacuole lies near the middle of the body and opens to the exterior on the ventral surface.

The macronucleus is ovoid and situated dorsally near the middle of the body. In fixed and stained preparations the outline of the macronucleus is nearly always very irregular and the chromatin appears to be aggregated into a dense reticulum enclosing vacuole-like clear spaces of varying size. In twenty individuals fixed in Schaudinn's fluid and stained with iron hematoxylin the macronucleus ranged in length from $6.8\ \mu$ to $13.7\ \mu$ and in width from $5.4\ \mu$ to $7.2\ \mu$.

The micronucleus is typically ovoid, rarely spherical, and commonly is situated a short distance anterior to or to one side of the macronucleus. In fixed and stained

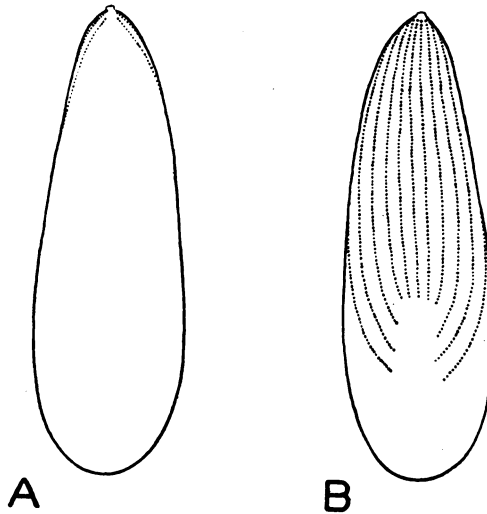


FIGURE 2. *Ancistrocoma dissimilis* sp. nov. Distribution of ciliary rows, somewhat diagrammatic. A, dorsal aspect; B, ventral aspect.

preparations the chromatin appears to be dispersed in granules of varying size. In twenty individuals fixed in Schaudinn's fluid and stained with iron hematoxylin the micronucleus ranged in size from $2.2\ \mu$ by $2.4\ \mu$ to $2.2\ \mu$ by $3.2\ \mu$.

I found *Ancistrocoma dissimilis* to be present on the gills and palps of twenty-one of thirty-six specimens of *Pholadidea penita* which I examined from localities near Moss Beach, California. It is sometimes found in association with *Hypocomagalma pholadidis*. In some individuals of *P. penita* I have encountered a ciliate of the genus *Sphenophrya* which I hope to describe in a later paper and a species of *Boveria* which may also be new.

Ancistrocoma dissimilis sp. nov.

Diagnosis: Length $33\ \mu$ – $51\ \mu$, average about $44\ \mu$; width $10\ \mu$ – $14.5\ \mu$, average about $13\ \mu$; thickness $8\ \mu$ – $12\ \mu$, average about $10\ \mu$. The ciliary rows are eleven to fourteen (typically eleven) in number and are distributed for the most part on the

ventral surface and lateral margins of the body. Most of the rows originate on the ventral surface close to the base of the suctorial tentacle, while one or two outer rows on either side originate on the lateral margin or the dorsal surface and curve ventrally and inward as they extend posteriorly. There are usually five approximately equal rows about three-fifths the length of the body bounded on the right by three progressively longer rows and on the left by four progressively longer rows. The outermost row on either side is three-fourths to four-fifths the length of the body. The macronucleus is ovoid. The micronucleus is typically ovoid. Parasitic on the gills and palps of *Pholadidea penita* (Conrad) (Moss Beach, California). Syntypes are in the collection of the author.

HYPOCOMAGALMA PHOLADIDIS SP. NOV.

(Figure 3; Plate I, Figs. 4, 5)

The body is elongated, strongly attenuated anteriorly, and markedly asymmetrical. The anterior end is deflected toward the left and bent ventrally. The dorso-ventral flattening characteristic of most ancistrocomid ciliates is not conspicuous in this species. As viewed from the posterior end the body appears in its middle and posterior portions to be almost as thick as wide. In its anterior third the body is nearly round in cross section. Most fixed specimens are considerably distorted and compressed in such a way that they appear to be widest near the middle. Twenty living individuals taken at random ranged in length from $63\ \mu$ to $89\ \mu$, in width from $18\ \mu$ to $25\ \mu$, and in thickness from $16\ \mu$ to $21\ \mu$, averaging about $76\ \mu$ by $22\ \mu$ by $19\ \mu$.

The anterior end is provided with a contractile suctorial tentacle continuous with an internal tubular canal. The canal can usually be traced in fixed specimens stained with iron hematoxylin down the middle of the attenuated anterior part of the body and then obliquely toward the right side. I have not succeeded in demonstrating the course of the canal beyond the anterior one-third of the body.

The cilia of *Hypocomagalma pholadidis* are approximately $9\ \mu$ to $10\ \mu$ in length. The ciliary system consists of twenty-four or twenty-five longitudinal rows. The body is almost completely invested by cilia except for a cilia-free "cap" at the posterior end. Two rows on the right side of the body usually appear to be set apart from the others, but in some specimens the spacing between these rows and the adjacent rows on either side is not significantly wider than the spacing between some of the other rows. Perhaps these two rows are homologous with the one or two rows constituting the right ciliary complex of *Crebricoma carinata* (Raabe), *Insignicoma venusta* Kozloff, and species of *Hypocomides*. They originate near the base of the suctorial tentacle on the right margin or the dorsal surface close to the right margin and curve ventrally and to the left as they extend backward. The outer row, as seen in ventral view, is the longer and extends almost to the posterior end of the body. The inner row terminates a short distance more anteriorly than the outer row, but is conspicuously longer than the first of the next series of rows, which usually is about two-thirds the length of the body. The first eight to ten rows to the left of the two longer rows all originate at about the same level on the ventral surface close to the base of the suctorial tentacle. The remaining rows, which are disposed along the left margin of the body and on the dorsal surface, originate progressively more posteriorly. The tenth or eleventh row of this complex is usually the longest, although some of the shorter rows on the dorsal surface

may terminate more posteriorly. The last ciliary row on the right side of the dorsal surface is always the shortest row, originating at a point about one-third the distance from the anterior end of the body to the posterior end and terminating at a point about three-fourths or four-fifths the distance from the anterior end to the posterior end.

The cytoplasm is colorless and contains numerous small refractile granules of a lipoid substance in addition to food inclusions. One or more larger food vacuoles containing fragments of cells from the epithelial tissues of the gills or palps of the host are usually evident in the posterior part of the body. The contractile vacuole when single, is located near the middle of the body and opens to the exterior on the ventral surface. In a larger percentage of the living specimens of *H. pholadidis*, which I examined there were two or more contractile vacuoles scattered through

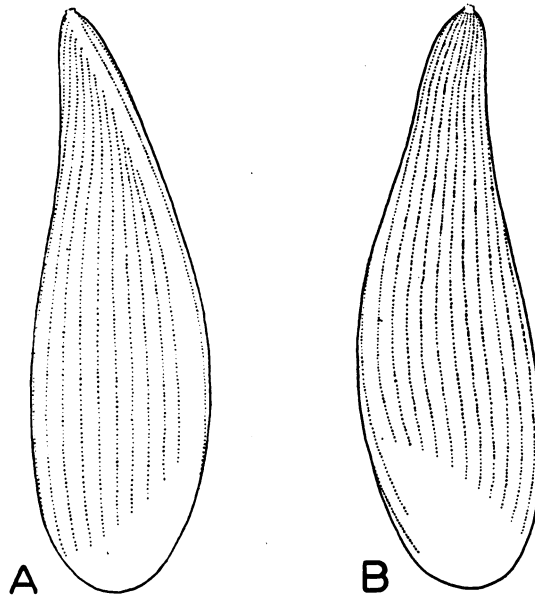


FIGURE 3. *Hypocomagalma pholadidis* sp. nov. Distribution of ciliary rows, somewhat diagrammatic. A, dorsal aspect; B, ventral aspect.

the body which emptied their contents to the exterior on the ventral surface. In a large percentage of the living specimens of *H. pholadidis* which I examined there were two or more contractile vacuoles scattered through the body which emptied their contents to the exterior independently of one another. Jarocki and Raab (1932) reported that in *H. dreissenae* the contractile vacuole was sometimes single but that in some specimens there were several smaller ones.

The macronucleus typically is sausage-shaped and lies in the posterior third of the body, its longitudinal axis placed obliquely to the longitudinal axis of the body. In light iron hematoxylin preparations and in specimens stained by the Feulgen reaction the chromatin of the macronucleus appears to be aggregated into a dense reticulum enclosing vacuole-like spaces which frequently contain globular masses of deeply-staining material. In ten individuals fixed in Schaudinn's fluid and

stained by the Feulgen reaction the macronucleus ranged in length from $12.5\ \mu$ to $20\ \mu$ and in width from $5\ \mu$ to $8.9\ \mu$.

The micronucleus is spherical and usually is situated a short distance anterior to or to one side of the macronucleus. In most fixed and stained preparations the chromatin appears to be homogeneous, although in some the chromatin appears to be in part aggregated into granules or peripheral strands. In ten individuals fixed in Schaudinn's fluid and stained by the Feulgen reaction the diameter of the micronucleus ranged from $2.4\ \mu$ to $3.3\ \mu$.

I found *Hypocomagalma pholadidis* to be present on the gills and palps of twenty-eight of thirty-six specimens of *Pholadidea penita* which I examined from localities near Moss Beach, California. When the ciliate is dissociated from the host it swims erratically, usually rotating on its longitudinal axis and tracing wide arcs with its attenuated anterior end. The cilia of the anterior half of the body are more active than those of the posterior half and are sometimes observed to beat metachronously. The ventral cilia near the base of the suctorial tentacle are markedly thigmotactic.

Hypocomagalma pholadidis sp. nov.

Diagnosis: Length $63\ \mu$ – $89\ \mu$, average about $76\ \mu$; width $18\ \mu$ – $25\ \mu$, average about $22\ \mu$; thickness $16\ \mu$ – $21\ \mu$, average about $19\ \mu$. The anterior end of the body is attenuated, conspicuously deflected toward the left, and bent ventrally. The ciliary system consists of twenty-four or twenty-five rows. Two long rows on the right side of the body appear in most specimens to be set apart from the remaining rows; these two rows originate near the base of the suctorial tentacle and extend almost to the posterior end of the body. The first eight to ten rows to the left of these two longer rows originate at about the same level on the ventral surface, while the remaining rows, disposed along the left lateral margin and the dorsal surface, originate progressively more posteriorly. The contractile vacuole may be single or represented by several independent vacuoles opening to the exterior on the ventral surface. The macronucleus is sausage-shaped. The micronucleus is spherical. Parasitic on the epithelium of the gills and palps of *Pholadidea penita* (Conrad) (Moss Beach, California). Syntypes are in the collection of the author.

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