

STUDIES ON CILIATES OF THE FAMILY ANCISTROCOMIDAE
CHATTON AND LWOFF (ORDER HOLOTRICHA, SUBORDER
THIGMOTRICHA). II. HYPOCOMIDES MYTILI CHATTON
AND LWOFF, HYPOCOMIDES BOTULAE SP. NOV.,
HYPOCOMIDES PARVA SP. NOV., HYPOCOMIDES
KELLIAE SP. NOV., AND INSIGNICOMA
VENUSTA GEN. NOV., SP. NOV.

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INTRODUCTION

The genus *Hypocomides* was proposed by Chatton and Lwoff (1922a) to include two species: *Hypocomides mytili*, from *Mytilus edulis* L., and *H. modiolariae*, from *Modiolaria marmorata* (Forbes). These authors gave no formal diagnosis of the genus *Hypocomides*, however, and their incomplete descriptions of the two species are not supplemented by illustrations. They did not designate either species as the genotype. In 1926 Chatton and Lwoff published a preliminary diagnosis, again without illustrations, of a third species of *Hypocomides*, *H. zyrphaeae*, from *Zirfaea crispata* (L.). It was largely on the basis of their description of *H. zyrphaeae* that Raabe (1938) was led to suppose that one of the ciliates which he found parasitizing the gills of *Mytilus edulis* was *H. mytili*. He could not identify on this ciliate, however, a structure to which Chatton and Lwoff referred as the "vestige de frange adorale" and which according to them is in *H. mytili* "constitué seulement par une dizaine de grands cils." This "vestige de frange adorale" is supposed to be better developed in *H. modiolariae* than in *H. mytili*. In *H. zyrphaeae* it is represented, according to Chatton and Lwoff, by "une touffe de cils." The position of the "vestige de frange adorale" in relation to other ciliary structures in these three species of *Hypocomides* is entirely unclear.

On a ciliate which I have studied from *Mytilus edulis* from San Francisco Bay and which conforms in most respects to the description given by Raabe of the form considered by him to be *H. mytili*, I have been unable to detect such a "vestige de frange adorale." The brief notes on the morphology of *H. mytili* to be found in the papers of Chatton and Lwoff in which mention is made of this species (1922a, 1922b, 1924) are not entirely consistent, and it is altogether possible that, as Raabe has pointed out, these authors used the term "vestige de frange adorale" to indicate only a short segment of the distal portion of one of the longer ciliary rows on the right side of the body, which Raabe suggested may be homologous with the two rows bordering the peristomal groove of ciliates of the family Ancistrumidae. It is quite evident from the brief description of *H. zyrphaeae*, however, that the "vestige de frange adorale" of this species is entirely separate from the two long rows on the right. Perhaps *H. mytili* and *H. modiolariae* are not actually congeneric with *H. zyrphaeae*, but this remains to be seen. At any rate, unless it can be established

with certainty that the ciliate described by Chatton and Lwoff as *Hypocomides mytili* is not identical with the species thought by Raabe to be *H. mytili*, it seems best to consider the form studied by Raabe to be *H. mytili* and to refer related forms to the same genus.

In the present paper I will give a description of the ciliate from *Mytilus edulis* which I consider to be *H. mytili*, and will add three new species to the genus *Hypocomides*: *H. botulae* sp. nov. and *H. parva* sp. nov., from the gills and palps of the rock-boring pelecypod, *Botula californiensis* (Philippi), and *H. kelliae* sp. nov., from *Kellia laperousii* Deshayes, a small nestling clam which is frequently encountered in the excavations made in rocks by other molluscs. Another very interesting ancistrocomid ciliate from *Botula californiensis* will be described herein as *Insigni-coma venusta* gen. nov., sp. nov.

HYPOCOMIDES MYTILI CHATTON AND LWOFF

(Fig. 1; Plate I, Fig. 1)

The body is elongated and somewhat flattened dorso-ventrally. The ciliary system, to be described presently, is disposed for the most part on the shallow concavity occupying the anterior three-fifths of the ventral surface; the dorsal surface and that part of the ventral surface posterior to the ciliary area are convex. The anterior portion of the left margin is usually not quite so rounded as the right margin, and appears typically to be weakly indented. The body is widest near the middle and rounded posteriorly. Thirty living individuals taken at random ranged in length from 34 μ to 48 μ , in width from 16 μ to 22 μ , and in thickness from 13 μ to 18 μ , averaging about 40 μ by 18 μ by 14.5 μ .

The anterior end of the body is provided with a short contractile 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. This tentacle is continuous with an internal tubular canal which can usually be traced in fixed specimens stained with iron hematoxylin for about one-half the length of the body. The canal nearly always appears to be widest in its anterior portion and to be directed obliquely toward the right side of the body as it extends posteriorly.

The cilia of *H. mytili* are about 9 μ in length and are markedly thigmotactic, especially near the anterior end of the body. The ciliary system consists of three separate complexes. The central complex, occupying the middle and right portions of the ventral anterior concavity, consists of seven rows, the one nearest the right being the shortest (one-third to two-fifths the length of the body), the other rows becoming progressively longer toward the left. The sixth and seventh rows are usually approximately one-half the length of the body; in some specimens the seventh row is appreciably shorter than the sixth. To the right of the central complex are two long rows, each about one-half the length of the body. Both these rows originate on the dorsal surface close to the left margin a short distance behind the level of origin of the rows of the central complex and curve ventrally as they extend posteriorly. To the left of the central complex is a series of eight rows which usually are more closely-set than those making up the central complex. The innermost row, which originates on the left margin of the body near the base of the suctorial tentacle, is the shortest, and terminates at a point about one-third the distance from the anterior end of the body to the posterior end. The remaining rows become pro-

gressively longer and originate progressively more dorsally and posteriorly, curving ventrally as they extend backward. The outer row of this complex is usually the longest and terminates at a point nearly opposite the point of termination of the outer of the two rows constituting the complex on the right.

According to Raabe, the three ciliary complexes of *H. mytili* are much more distinctly separated than I have observed them to be. Raabe also stated that variations in the number of ciliary rows in the central and left complexes are correlated with two well-differentiated size races: form *minor* ($17\ \mu$ to $26\ \mu$ in length) and form *major* ($26\ \mu$ to $36\ \mu$ in length). I have noted no tendency for the ciliates I consider to belong to this species to be segregated into distinct size races and have seen no examples of *H. mytili* which were in life as small as those assigned to the form *minor* by Raabe. Although I have observed few deviations from the typical number of ciliary rows, it may be of interest to record here the fact that frequently some

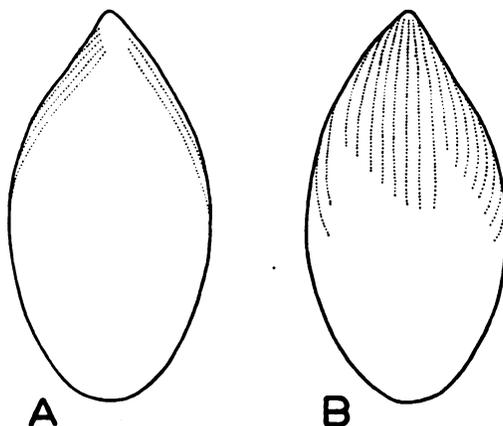


FIGURE 1. *Hypocomides mytili* Chatton and Lwoff. Distribution of ciliary rows, somewhat diagrammatic.¹ A, dorsal aspect; B, ventral aspect.

of the rows of the left complex, particularly the first and second rows, do not stain as well with hematoxylin or impregnate as well with activated silver albumose (protargol) as do the rows of the central and right complexes, and hence may easily escape detection.

The cytoplasm is colorless and contains numerous lipid droplets in addition to food inclusions. Several larger food vacuoles are sometimes observed in the posterior part of the body. The contractile vacuole is centrally located² and opens to the exterior on the ventral surface. I have observed no permanent opening in the pellicle.

The macronucleus is usually ovoid, sometimes sausage-shaped; more rarely it is spherical, although Raabe considered the macronucleus of *H. mytili* to be typically

¹ All text figures illustrating this paper are based on camera lucida drawings of individuals fixed in Schaudinn's fluid and impregnated with activated protein silver (protargol).

² Raabe stated that the contractile vacuole of *H. mytili* is to be found in a vacuolated area in the posterior part of the body behind the macronucleus. Perhaps his observation was based on specimens which were undergoing degenerative vacuolization and in which the contractile vacuole was not conspicuous. In all normal individuals which I have examined its position was central.

spherical. It is situated dorsally in the posterior half of the body with its longitudinal axis placed obliquely to the longitudinal axis of the body. In fixed and stained preparations the chromatin appears to be aggregated into a dense reticulum enclosing vacuole-like clear spaces of varying size. In fifteen individuals fixed in Schaudinn's fluid and stained by the Feulgen nuclear reaction the macronucleus ranged in length from $9\ \mu$ to $13.2\ \mu$ and in width from $4.4\ \mu$ to $6.9\ \mu$.

The spherical micronucleus is ordinarily situated near the middle of the body anterior to the macronucleus, although sometimes it is seen to lie to one side of the macronucleus. The chromatin appears in most fixed and stained specimens to be homogeneous, although in some it is aggregated into vague peripheral granules or strands. In fifteen individuals fixed in Schaudinn's fluid and stained by the Feulgen reaction the diameter of the micronucleus ranged from $2.7\ \mu$ to $4\ \mu$.

I found *Hypocomides mytili* to be present in large numbers on the gills and palps of about 80 per cent of the specimens of *Mytilus edulis* which I examined from various localities in San Francisco Bay. It is sometimes the only ciliate infesting the mussels, but more commonly it is associated with *Crebricoma carinata* (Raabe) and *Ancistruma mytili* (Quennerstedt).

Hypocomides mytili Chatton and Lwoff

Diagnosis: Length $34\ \mu$ – $48\ \mu$ (according to Raabe $17\ \mu$ to $36\ \mu$), average about $40\ \mu$; width $16\ \mu$ – $22\ \mu$, average about $18\ \mu$; thickness $13\ \mu$ – $18\ \mu$, average about $14.5\ \mu$. The central ciliary complex is composed of seven rows (according to Raabe seven or eight rows) which are one-third to one-half the length of the body, becoming progressively longer toward the left side; the right complex consists of two rows, each about one-half the length of the body; the left complex consists of eight closely-set rows (according to Raabe five [?] or six rows) one-third to one-half the length of the body. The contractile vacuole is central and opens to the exterior on the ventral surface. The macronucleus is typically ovoid or sausage-shaped, rarely spherical. The micronucleus is spherical. Parasitic on the epithelium of the gills and palps of *Mytilus edulis* L. (Roscoff [Chatton and Lwoff]; Hel [Raabe]; San Francisco Bay, California).

HYPOCOMIDES BOTULAE SP. NOV.

(Fig. 2; Plate 1, Fig. 2)

The body is elongated, narrowed anteriorly, and somewhat flattened dorso-ventrally. The ciliary system, to be described presently, is disposed for the most part on the shallow concavity occupying the anterior one-half of the ventral surface; the dorsal surface and that part of the ventral surface posterior to the ciliary area are convex. The anterior portion of the left margin is usually less rounded than the right margin and appears typically to be weakly indented. The body is widest near the middle and rounded posteriorly. Twenty living individuals taken at random ranged in length from $31\ \mu$ to $39\ \mu$, in width from $14\ \mu$ to $17\ \mu$, and in thickness from $12\ \mu$ to $14\ \mu$, averaging about $33\ \mu$ by $15\ \mu$ by $13\ \mu$.

The anterior end is provided with a contractile suctorial tentacle continuous with an internal tubular canal which can usually be traced in fixed specimens stained with iron hematoxylin for a distance equal to about three-fifths the length of the body.

In most individuals the canal appears to be directed obliquely toward the right side of the body.

The cilia are about $8\ \mu$ to $9\ \mu$ in length and are markedly thigmotactic, particularly near the base of the suctorial tentacle. The ciliary system consists of three separate complexes. The central complex, occupying the larger part of the ventral anterior concavity, consists of eleven rows about one-half the length of the body which become progressively longer toward the left side. To the right of the central complex are two longer rows which originate on the dorsal surface close to the right margin a little behind the level of origin of the rows of the central complex and curve downward as they extend posteriorly. Each of the two rows is about three-fifths the length of the body. To the left of the central complex is a series of eleven rather closely-set rows which originate on the left lateral margin and the dorsal surface on the left side and curve ventrally as they extend posteriorly. These

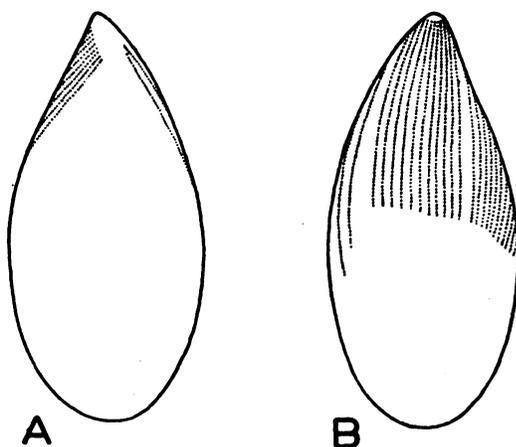


FIGURE 2. *Hypocomides botulae* sp. nov. Distribution of ciliary rows, somewhat diagrammatic. A, dorsal aspect; B, ventral aspect.

rows are about one-half the length of the body and originate and terminate progressively more posteriorly.

The cytoplasm is colorless and contains numerous lipid droplets in addition to food inclusions. I have not seen any large food vacuoles in this species. The contractile vacuole, situated near the middle of the body, opens to the exterior on the ventral surface.

The macronucleus is ovoid to sausage-shaped and is situated in the posterior half of the body. Its longitudinal axis is usually placed obliquely to the longitudinal axis of the body. In fixed and stained preparations the chromatin is aggregated into a dense reticulum. Vacuole-like clear spaces of varying size are sometimes apparent near the periphery. In ten individuals fixed in Schaudinn's fluid and stained by the Feulgen reaction the macronucleus ranged in length from $9\ \mu$ to $13\ \mu$ and in width from $4.3\ \mu$ to $7\ \mu$.

The micronucleus is spherical and is situated dorsally near the middle of the body. The chromatin appears to be homogeneous in fixed specimens. In ten individuals

fixed in Schaudinn's fluid and stained by the Feulgen reaction the diameter of the micronucleus ranged from 2.4μ to 3.2μ .

Hypocomides botulae was present in small numbers on the gills and palps of twelve of the thirty-four specimens of *Botula californiensis* which I examined from localities near Moss Beach, California. It is sometimes found in association with *Hypocomides parva* and *Insignicoma venusta*. No specimens of *Botula falcata* (Gould) which I examined from the same localities were parasitized by these or any other ciliates.

Hypocomides botulae sp. nov.

Diagnosis: Length 31μ – 39μ , average about 33μ ; width 14μ – 17μ , average about 15μ ; thickness 12μ – 14μ , average about 13μ . The central ciliary complex consists of eleven rows each about one-half the length of the body; the right complex is composed of two rows about three-fifths the length of the body; the left complex consists of eleven closely-set rows about one-half the length of the body. The macronucleus is ovoid to sausage-shaped. The micronucleus is spherical. Parasitic on the gills and palps of *Botula californiensis* (Philippi) (Moss Beach, California). Syntypes are in the collection of the author.

HYPCOMIDES PARVA SP. NOV.

(Fig. 3; Plate I, Fig. 3)

The body is elongated, narrowed anteriorly, and somewhat flattened dorso-ventrally. The ciliary system, to be described presently, is disposed for the most part on the shallow concavity occupying the anterior two-fifths of the ventral surface; the dorsal surface and that part of the ventral surface posterior to the ciliary area are convex. The anterior half of the left margin is usually not so rounded as the right margin, and appears typically to be nearly straight or weakly indented. The body is widest near the middle and rounded posteriorly. Twenty-five living individuals taken at random ranged in length from 21μ to 29μ , in width from 10μ to 13μ , and in thickness from 8μ to 11μ , averaging about 26μ by 12μ by 10μ .

The anterior end of the body is provided with a short contractile suctorial tentacle continuous with an internal tubular canal. The canal is usually directed obliquely toward the right side and can be traced in most fixed specimens stained with iron hematoxylin for about one-half the length of the body.

The cilia of *Hypocomides parva* are about 6μ to 7μ long and are strongly thigmotactic, particularly near the base of the suctorial tentacle. The ciliary system consists of three separate complexes. The central complex, which occupies the larger part of the concave depression on the anterior part of the ventral surface, consists of eight rows which are about two-fifths the length of the body. To the right of this complex are two longer rows which originate on the dorsal surface close to the right margin behind the level of origin of the rows that constitute the central complex. Each of these rows is about three-fifths the length of the body and curves ventrally as it extends posteriorly. The outer row originates and terminates the more posteriorly. To the left of the central complex is a series of eight rows which originate on the left lateral margin and on the left side of the dorsal surface and curve ventrally as they extend backward. These rows are about two-fifths the length of the body and originate and terminate progressively more posteriorly. The outermost

row, however, is somewhat shorter than the other rows and is usually seen to terminate a little anterior to the point of termination of the seventh row.

The cytoplasm is colorless and contains numerous small lipoid droplets and food inclusions. I have distinguished no large food vacuoles in this species. The contractile vacuole is situated near the middle of the body and opens to the exterior on the ventral surface.

The macronucleus is typically ovoid, sometimes spherical, rarely sausage-shaped. It is situated in the posterior half of the body with its longitudinal axis usually placed obliquely to the longitudinal axis of the body. In fixed and stained preparations the chromatin appears to be aggregated into a dense reticulum enclosing a few vacuole-like clear spaces of varying size. These are most prominent near the periphery. In ten individuals fixed in Schaudinn's fluid and stained by the Feulgen reaction the macronucleus ranged in length from $4.2\ \mu$ to $8.2\ \mu$ and in width from $4.2\ \mu$ to $5.3\ \mu$.

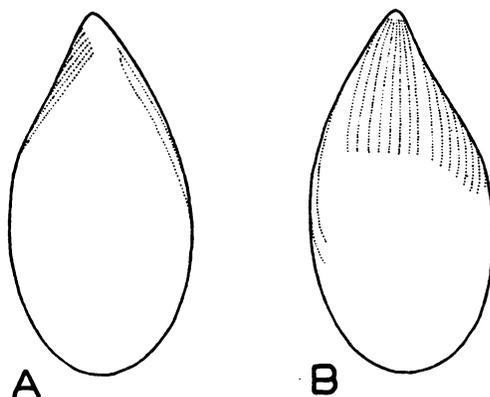


FIGURE 3. *Hypocomides parva* sp. nov. Distribution of ciliary rows, somewhat diagrammatic. A, dorsal aspect; B, ventral aspect.

The micronucleus is usually spherical and is situated dorsally a short distance anterior to or to one side of the macronucleus. Sometimes it is located as far anteriorly as the middle of the body. In fixed and stained preparations the chromatin of the micronucleus appears to be homogeneous. In ten individuals fixed in Schaudinn's fluid and stained by the Feulgen reaction the diameter of the micronucleus ranged from $1.9\ \mu$ to $2.3\ \mu$.

Hypocomides parva was present on the gills and palps of nineteen of the thirty-four individuals of *Botula californiensis* which I examined from localities near Moss Beach, California. It is sometimes associated with *H. botulae* and *Insignicoma venusta*. In my experience it is the most common species of ciliate parasitizing this mollusc.

Hypocomides parva sp. nov.

Diagnosis: Length $21\ \mu$ – $29\ \mu$, average about $26\ \mu$; width $10\ \mu$ – $13\ \mu$, average about $12\ \mu$; thickness $8\ \mu$ – $11\ \mu$, average about $10\ \mu$. The central ciliary complex comprises eight approximately equal rows about two-fifths the length of the body;

the right complex consists of two rows about three-fifths the length of the body; the left complex consists of eight rows, each about two-fifths the length of the body, the eighth row being usually somewhat shorter than the others. The macronucleus is typically ovoid. The micronucleus is spherical. Parasitic on the gills and palps of *Botula californiensis* (Philippi) (Moss Beach, California). Syntypes are in the collection of the author.

HYPOCOMIDES KELLIAE SP. NOV.

(Fig. 4; Plate I, Fig. 4)

The body is elongated, narrowed anteriorly, and somewhat flattened dorso-ventrally. The ciliary system, to be described presently, is disposed for the most part on the shallow concavity occupying the anterior one-third of the ventral sur-

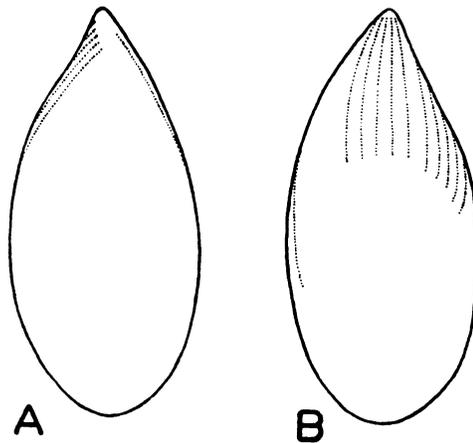


FIGURE 4. *Hypocomides kelliae* sp. nov. Distribution of ciliary rows, somewhat diagrammatic. A, dorsal aspect; B, ventral aspect.

face; the dorsal surface and that part of the ventral surface posterior to the ciliary area are convex. The anterior half of the left margin is not as rounded as the right margin, and typically is nearly straight or weakly indented. The body is widest near the middle and rounded posteriorly. Twenty living individuals taken at random ranged in length from $31\ \mu$ to $37\ \mu$, in width from $13\ \mu$ to $15\ \mu$, and in thickness from $11\ \mu$ to $13\ \mu$, averaging about $33\ \mu$ by $14\ \mu$ by $12\ \mu$.

The anterior end is provided with a contractile suctorial tentacle continuous with an internal tubular canal. The canal is usually directed toward the right side of the body as it extends posteriorly. It can be traced in most fixed individuals stained with iron hematoxylin for about three-fifths the length of the body.

The thigmotactic cilia of *H. kelliae* are about $8\ \mu$ or $9\ \mu$ in length. The ciliary system is composed of three separate complexes. The central complex, occupying the larger part of the anterior ventral depression, consists of five equal rows about one-third the length of the body. To the right of this system is a single long row about two-thirds the length of the body. This row originates on the dorsal surface

close to the right margin a little behind the level of origin of the central rows and curves ventrally as it extends posteriorly. To the left of the central complex is a series of five rows, one-third the length of the body, which originate on the left lateral margin or dorsal surface on the left side and curve ventrally as they extend posteriorly. These rows originate and terminate progressively more posteriorly.

The cytoplasm is colorless and contains numerous small lipid droplets and food inclusions. I have observed no large food vacuoles in this species. The contractile vacuole is situated near the middle of the body and opens to the exterior on the ventral surface.

The macronucleus is ovoid or sausage-shaped, usually about two times as long as wide. It is situated in the posterior half of the body with its longitudinal axis placed obliquely to the longitudinal axis of the body. In fixed and stained preparations the chromatin appears to be organized into a very dense reticulum which sometimes is seen to enclose vacuole-like clear spaces of varying size. These are more evident near the periphery. In ten individuals fixed in Schaudinn's fluid and stained by the Feulgen reaction the macronucleus ranged in length from 7.8μ to 14μ and in width from 3.9μ to 7μ .

The micronucleus varies in shape from spherical to ovoid; typically it is ovoid. It is usually situated dorsally a short distance anterior to the middle of the body or to one side of the anterior part of the macronucleus. In most fixed and stained individuals of *H. kelliae* the chromatin of the micronucleus is aggregated into deeply-staining peripheral strands. In ten specimens fixed in Schaudinn's fluid and stained by the Feulgen reaction the micronucleus ranged in size from 1.9μ by 1.5μ to 2.3μ by 1.9μ .

Hypocomides kelliae was present in nine of the twenty-eight individuals of *Kellia lapeousii* which I examined from localities near Moss Beach, California. Also associated with this mollusc is a small ancistrumid ciliate which it may be possible for me to describe in a subsequent paper.

Hypocomides kelliae sp. nov.

Diagnosis: Length 31μ – 37μ , average about 33μ ; width 13μ – 15μ , average about 14μ ; thickness 11μ – 13μ , average about 12μ . The central ciliary complex consists of five rows about one-third the length of the body; the right complex consists of a single row about two-thirds the length of the body; the left complex consists of five rows about one-third the length of the body. The macronucleus is ovoid or sausage-shaped. The micronucleus is typically ovoid. Parasitic on the epithelium of the gills and palps of *Kellia lapeousii* Deshayes (Moss Beach, California). Syntypes are in the collection of the author.

INSIGNICOMA VENUSTA GEN. NOV., SP. NOV.

(Fig. 5; Plate I, Fig. 5)

The body is elongated, narrowed anteriorly, and somewhat flattened dorso-ventrally. The anterior one-half of the ventral surface, on which the major part of the ciliary system is disposed, is weakly concave; the dorsal surface and that part of the ventral surface posterior to the ciliary area are convex. The anterior half of the left margin is usually not so rounded as the right margin and typically is nearly straight or slightly indented. The body is widest near the middle and rounded poste-

riorly. Twenty-five living individuals taken at random ranged in length from $42\ \mu$ to $52\ \mu$, in width from $18\ \mu$ to $21\ \mu$, and in thickness from $15\ \mu$ to $18\ \mu$, averaging about $48\ \mu$ by $20\ \mu$ by $17\ \mu$.

The anterior end of the body is provided with a contractile suctorial tentacle continuous with an internal tubular canal. In most fixed specimens stained with iron hematoxylin the canal can be traced for about three-fifths the length of the body. It usually appears to be directed obliquely toward the right side.

The ciliary system consists of four separate complexes. Two long, widely-spaced rows on the right side of the body originate on the dorsal surface close to the right margin at the anterior end and are about two-thirds the length of the body. They curve ventrally as they extend posteriorly. A central complex of fourteen or fifteen

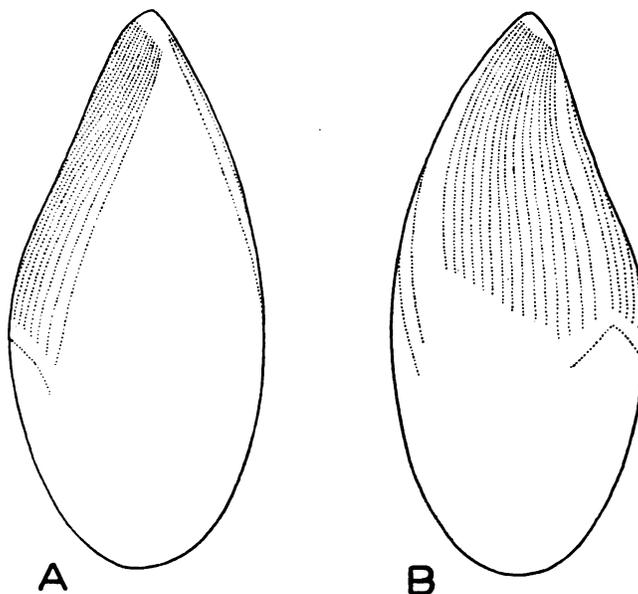


FIGURE 5. *Insignicoma venusta* gen. nov., sp. nov. Distribution of ciliary rows, somewhat diagrammatic. A, dorsal aspect; B, ventral aspect.

rows occupies the larger part of the ventral anterior depression. These rows are on the average about one-half the length of the body and originate progressively more posteriorly toward the left side. The outer two or three rows on the left, however, do not usually terminate quite so far posteriorly as the twelfth row. The rows of this complex are usually a little more closely-set on the right side than on the left. To the left of the central complex is a series of sixteen or seventeen rows about one-half the length of the body which with the exception of the outer three or four rows are very closely-set. The innermost row originates on the left lateral margin near the base of the suctorial tentacle; the remaining rows originate progressively more dorsally and posteriorly. The distal portions of several of the inner rows of this complex are usually visible on the left side of the ventral surface. Posterior to the middle of the body on the left side is a nearly V-shaped series of cilia which originates

on the ventral surface in the posterior third of the body, extends anteriorly and to the left to a point a short distance behind the distal portion of the gap separating the central and left ciliary complexes, then bends abruptly backward and dorsally. The cilia of this fourth complex are about $12\ \mu$ to $14\ \mu$ in length. The cilia of the other rows are about $8\ \mu$ or $9\ \mu$ in length and strongly thigmotactic, especially near the base of the suctorial tentacle.

The cytoplasm is colorless and contains numerous small lipid droplets in addition to food inclusions. A few larger food vacuoles are sometimes observed near the posterior end. The contractile vacuole is situated near the middle of the body and opens to the exterior on the ventral surface.

The macronucleus is ovoid or sausage-shaped and is situated in the posterior half of the body with its longitudinal axis usually placed obliquely to the longitudinal axis of the body. In fixed and stained preparations the chromatin appears to be aggregated into a dense reticulum enclosing vacuole-like clear spaces of varying sizes. These are most prominent near the periphery. In ten individuals fixed in Schaudinn's fluid and stained by the Feulgen reaction the macronucleus ranged in length from $12\ \mu$ to $17\ \mu$ and in width from $4.4\ \mu$ to $9\ \mu$.

The spherical micronucleus is commonly situated dorsally a short distance anterior to or to one side of the macronucleus. In fixed and stained preparations the chromatin appears to be homogeneous. 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 $4\ \mu$.

Insignicoma venusta was found to parasitize the gills and palps of nine of the thirty-four specimens of *Botula californiensis* which I collected at localities near Moss Beach, California.

Insignicoma gen. nov.

Diagnosis: The body is elongated and somewhat flattened dorso-ventrally. The anterior end of the body is narrowed and provided with a contractile suctorial tentacle continuous with an internal tubular canal. The ciliary system consists of four separate complexes. The central complex, occupying the major portion of the shallow concavity on the anterior one-half of the ventral surface, is bounded on the right by a small number of widely-spaced rows which curve ventrally as they extend posteriorly; to the left of the central complex is a series of closely-set rows about one-half the length of the body which originate progressively more posteriorly on the left lateral margin and dorsal surface on the left side and curve ventrally as they extend backward; the fourth complex consists of a V-shaped series of long cilia which lies immediately behind the distal portion of the gap separating the central and left ciliary complexes. The contractile vacuole is central and opens to the exterior

PLATE I

All figures have been drawn with the aid of a camera lucida from specimens fixed in Schaudinn's fluid and stained with iron hematoxylin. $\times 1870$.

FIGURE 1. *Hypocomides mytili* Chatton and Lwoff. Ventral aspect.

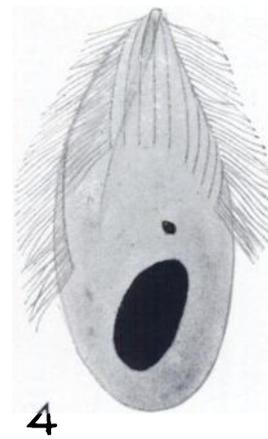
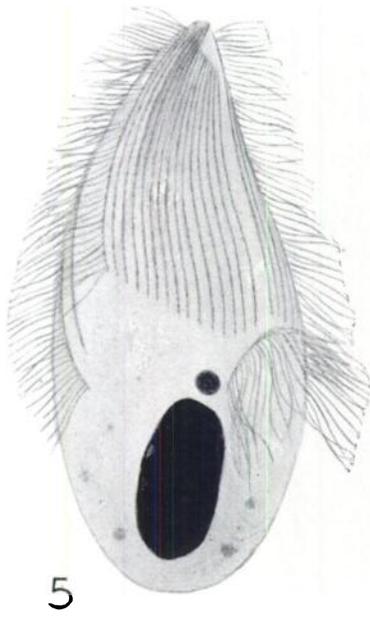
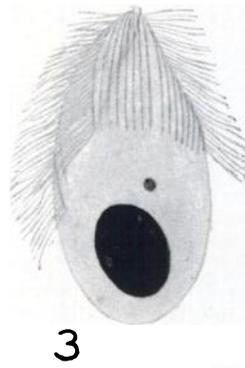
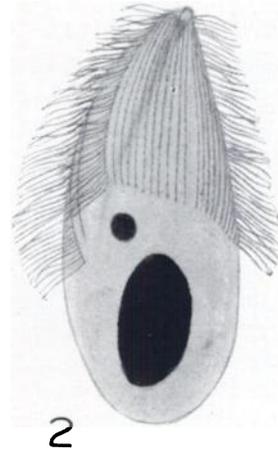
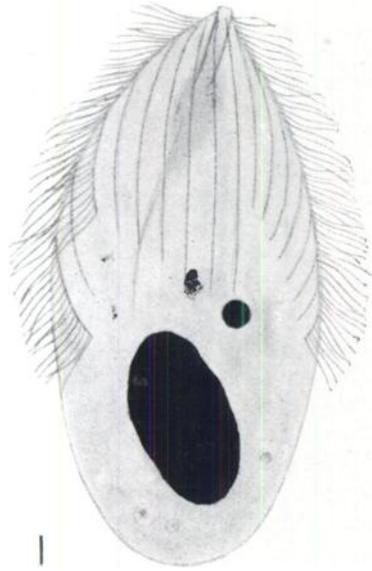
FIGURE 2. *Hypocomides botulae* sp. nov. Ventral aspect.

FIGURE 3. *Hypocomides parva* sp. nov. Ventral aspect.

FIGURE 4. *Hypocomides kelliie* sp. nov. Ventral aspect.

FIGURE 5. *Insignicoma venusta* gen. nov., sp. nov. Ventral aspect.

PLATE I



on the ventral surface; there is no permanent opening in the pellicle. Genotype: *Insignicoma venusta* gen. nov., sp. nov.

Insignicoma venusta gen. nov., sp. nov.

Diagnosis: Length 42 μ –52 μ , average about 48 μ ; width 18 μ –21 μ , average about 20 μ ; thickness 15 μ –18 μ , average about 17 μ . The central ciliary complex consists of fifteen (rarely fourteen) rows about one-half the length of the body which originate progressively more posteriorly toward the left side; the right complex consists of two widely-spaced rows about two-thirds the length of the body which originate on the dorsal surface close to the left margin and curve ventrally as they extend posteriorly; the left complex consists of sixteen or seventeen closely-set rows about one-half the length of the body which originate progressively more posteriorly on the left margin and dorsal surface on the left side and curve ventrally as they extend posteriorly; the V-shaped series of cilia constituting the fourth complex originates on the ventral surface in the posterior third of the body, extends anteriorly and to the left to a point a short distance behind the distal portion of the gap separating the central and left ciliary complexes, then bends abruptly backward and dorsally. The cilia of the fourth complex are approximately 12 μ –14 μ in length; those of the other three complexes are approximately 8 μ –9 μ in length. The macronucleus is ovoid or sausage-shaped; the micronucleus is spherical. Parasitic on the gills and palps of *Botula californiensis* (Philippi) (Moss Beach, California). Syntypes are in the collection of the author.

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