SAND DWELLING CILIATES OF SOUTH WALES

by

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Résumé

Cinquante-six espèces de Ciliés psammobiontes récoltées au niveau de deux rivages du Sud du Pays de Galles entre les mois de mars 1979 et février 1980 sont décrites. Une clef est donnée pour l'identification des espèces du genre *Tracheloraphis* identifiées à ce jour.

Introduction

A survey of the psammobiotic ciliates of two sea-shores in South Wales revealed fifty six species. All occur in the intertidal sand of Swansea Bay (mean grain size 0.25mm, organic carbon content 0.07 percent), or Oxwich Bay, Nicholaston (mean grain size 0.34mm, organic carbon content 0.06 percent). The ciliates were extracted using the sea-water ice technique of Uhlig (Uhlig, Thiel and Gray 1973). They were stained with either Delamater's basic fuchsin (Delamater, 1948), Chatton and Lwoff's modified silver staining technique (Corliss, 1953) or Bodian modified protargol technique (Dragesco, 1962; Dragesco and Njiné, 1971).

The survey resulted in the identification of the following species (1, found in Swansea Bay; 2, found at Nicholaston).

1,2 *Coleps pulcher* Spiegel, 1926
1,2 *C. similis* Kahl, 1933
2 *Pseudoprorodon arenicola* Kahl, 1933
1 *Prorodon binucleatus* v. Buddenbrock, 1920
1(?) *P. multinucleatus* Dragesco
1,2 *P. morgani* Kahl, 1930
1,2 *Lacrymaria acuta* Kahl, 1933
1,2 *L. coronata* Claparède and Lachmann, 1858
1,2 *Litonotus anguilla* Kahl, 1930
2(?) *Loxophyllum asetosum* Burkovsky, 1970
1 *L. verrucosum* (Stokes, 1893)
1 *L. kahli* Dragesco, 1960
1 *Tracheloraphis bodiani* Dragesco, 1963
1,2 *Tr. dogieli* (Raikov, 1953)
1,2 *Tr. incaudatus* (Kahl, 1933)
1,2 *Tr. incaudatus* f. *quadrimicronucleata* Raikov and Kovaljeva, 1968
1 *Tr. kahli* Raikov, 1962
1 *Tr. margaritatus* (Kahl, 1933)
1 *Tr. prenanti*, f. *oligocineta* Raikov and Kovaljeva, 1968
1,2 *Tr. serratus* Raikov and Kovaljeva, 1968
1 *Tr. teissieri* Dragesco, 1960
1,2 *Tracheloraphis indistinctus* nov. spec.
1,2 *Tracheloraphis niveus* nov. spec.

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1,2 *Tracheloraphis hamatus* nov. spec.
1,2 *Tracheloraphis ditis* nov. spec.
1,2 *Tracheloraphis conformis* nov. spec.
1 *Trachelonema binucleata* Agamaliev, 1966
1,2 *T. oligostriata* Raikov, 1962
1 *Kentrophoros latum* Raikov, 1962
1 *K. fasciclatum* Sauerbrey, 1928
1 *Kentrophoros canalis* nov. spec.
1 *Remanella faurei* Dragesco, 1953
1 *R. granulosa* Kahl, 1933
1(?) *R. levii* Dragesco, 1960
1 *R. margatifera* Kahl, 1933
1,2 *R. multinucleata* Kahl, 1933
1,2 *R. rugosa* Kahl, 1933
1 *R. swedmarki* Dragesco, 1960
1,2 *R. trichocystus* Dragesco
1 *Geleia nigriceps* Kahl, 1933
1 *Ciliofaurea ornata* Dragesco, 1954
1 *C. mirabilis* Dragesco, 1954
1,2 *Coelosomides marina* Anigstein, 1912
1,2 *Chilodontopsis vorax* (Stokes, 1894)
1 *Chlamydodon triquetrus* Muller, 1786
1 *C. triquetrus* var. *major*
2 *Pseudocohnilembus marinus* Thompson, 1966
2 *Blepharisma greyii* Hartwig and Parker 1977
1,2 *Condolystoma arenarium* Spiegel, 1926
1,2 *C. fjeldi* Hartwig, 1973
1,2 *C. remanei* Spiegel, 1928
1 *C. tenuis* Fauré-Fremiet, 1958
1(?) *Peritromus californicus* Kirby, 1934
1 *P. faurei* Kahl, 1932
1 *P. tetramacronucleatus* Ozaki and Yagiu 1941
1,2(?)*Euplotes balteatus* (Dujardin, 1842)

The question marks indicate either an identification that is to some degree at odds with the original description or else an identification that has been made from one slide only. The section which follows contains detailed descriptions of the species listed above. Following each description, references are given containing either a description of that species or records of the presence of that species.

The classification is that of Levine *et al.* (1980).

Phylum CILIOPHORA Doflein, 1901

Class Kinetofragminophora de Puytorac, Batisse, Bahatier, Corliss, Deroux, Didier, Dragesco, Fryd-Versavel, Grain, Grolière, Hovasse, Iftode, Laval, Roque, Savoie and Tuffrau, 1974.

Subclass GYMNOSTOMATIA Butschli, 1889.

Order PROSTOMATIDA Schewiakoff, 1896

Coleps pulcher Spiegel, 1926

The free swimming animal has a spiralling motion which reveals its oval cross section. The body is divisible into two parts; the anterior is opaque due to cytoplasmic inclusions whilst the posterior is hyaline. One sample from Swansea was found to be red due to the colour of these inclusions.

The plates within the cytoplasm correspond with the diagrams of Kahl (1930-1935). The macronucleus is large, round and slightly anterior to the midpoint. There is a long caudal cilium around which are arranged seven points, four of which are in a square arrangement and the remaining three on the edge of the flattened side in a two and one arrangement. Average length 50μm.

Agamaliev (1974), Bock (1952a), Borror (1962; 1963), Dragesco (1953; 1960; 1965), Fauré-Fremiet (1950), Hartwig (1973a; 1973b; 1974), Hartwig and Parker (1977), Kahl (1930-1935), Kovaljeva (1967), Kovaljeva and Golemansky (1979), Nobili (1957), Noland (1937), Raikov (1960), Spiegel (1926), Vacelet (1961b).

Coleps similis Kahl, 1933

This species is ellipsoid in cross section, though this is not so pronounced as in *C. pulcher*. The cytoplasm is opaque throughout. The plates of the cytoplasm correspond with those described by Kahl (1930-1935). There is a caudal cilium. Average length 50μm.

Agamaliev (1970), Bock (1952a), Burkovsky (1970a). Czapik and Jordan (1976), Dragesco (1953), Hartwig (1973b, 1974), Kahl (1930-1935), Kovaljeva and Golemansky (1979).

Pseudoprorodon arenicola Kahl, 1933

A very long slow-moving voluminous ciliate. There are approximately one hundred and forty kineties. The cytopharyngeal apparatus is composed of short rods. A large terminal contractile vacuole was observed in all specimens, whilst satellite vacuoles along the body were observed in one example only. The nuclear material consists of between twenty-four and twenty-nine moniliform macronuclei. The micronuclei are small and irregular in shape, they number approximately forty. Length between 650 and 750μm.

Agamaliev (1967a), Bock (1952a, 1952b), Dragesco (1960), Fauré-Fremiet (1950), Fjeld (1955), Hartwig (1973a, 1973b, 1974), Hartwig and Parker (1977), Kahl (1933), Kovaljeva (1967), Kovaljeva and Golemansky (1979), Raikov (1960, 1962), Vacelet (1961a, 1961b).

(?) *Prorodon binucleatus* v. Buddenbrock, 1920 (Fig. I, 1)

One example of this ciliate was stained with nigrosin. The nuclear material consists of two slightly oval macronuclei, 9 by 7.5μm, in close contact. The micronucleus was not observed. There are approximately fifty-five kineties which, at the anterior at least, are cross striated with a series of lines at right angles to the kineties. The cytostome is apical and has a group of rods making up the cytopharyngeal apparatus. There is a terminal contractile vacuole. Length 200μm.

Agamaliev (1966a, 1968, 1970), Buddenbrock (1920), Burkovsky (1970a, 1970b, 1970e), Dragesco (1965).

(?) *Prorodon multinucleatus* Dragesco, 1960 (Fig. I, 2)

A single example of this ciliate was stained. The nuclear material consists of twelve spherical macronuclei, between 4 and

4.5μm in diameter with four comparatively large micronuclei, 2μm in diameter. The nuclei are concentrated in the central region unlike the diagram given by Dragesco (1960). There are approximately forty kineties. The apical opening is a slit which has no rods associated with it. There is one terminal contractile vacuole. The length of the individual was 200μm. Dragesco (1960), Kovaljeva and Golemansky (1979), Petran (1967, 1968).

(?) *Prorodon morgani* Kahl, 1930

The body form is blunt at the anterior pole and slightly pointed at the posterior pole. The macronucleus is oval, measuring 16-22 by 7-10μm. If the micronucleus was observed it was immediately adjacent and slightly ellipsoid, measuring 3.5μm. There are between thirty eight and forty kineties which are bipolar. The cytostome is apical with a well developed cytopharyngeal apparatus.

Agamaliev (1966a), Burkovsky (1970a), Dragesco (1960), Hartwig and Parker (1977), Kahl (1930-1935), Lackey and Lackey (1963), de Morgans (1926), Rao (1969), Rao and Ganapati (1968).

Lacrymaria acuta Kahl, 1933

There are between twenty eight and thirty spiralling kineties. The contractile vacuole is small and located near the posterior. There are one macronucleus and one micronucleus near the centre of the cell. Average length 200μm.

Dragesco (1960), Hartwig (1974), Kahl (1930-1935).

Lacrymaria coronata Claparède and Lachmann, 1858

There are between eighteen and twenty three slightly spiralling kineties. One oval macronucleus which is located in the middle of the ciliate. There is a terminal contractile vacuole. Size varies between 90 and 150μm.

Agamaliev (1966a, 1967a, 1967b, 1968, 1970, 1972, 1973, 1974), Bock (1952b), Burkovsky (1967, 1968, 1970a, 1970b, 1970c), Claparède and Lachmann (1858), Czapik and Jordan (1976), Dragesco (1953, 1960, 1965), Fauré-Fremiet (1924), Gourret and Roesser (1888), Hamburger and Buddenbrock (1911), Hartwig (1974), Hartwig and Parker (1977), Jones (1974), Kovaljeva and Golemansky (1979), Maupas (1883), Petran (1967, 1968), Raikov and Kovaljeva (1968).

Order PLEUROSTOMATIDA Schewiakoff, 1896

Litonotus anguilla Kahl, 1930

When observed under the dissecting microscope this species resembled *Trachelonema oligostriata* in gross body form. The body form remained constant as an elongate form. There are two slightly ovoid macronuclei, 9-12μm, with a very small macronucleus between them. There are approximately twelve kineties. The contractile

vacuole was often triangular in shape, it was positioned at the end of the central body region just before it narrowed into the tail region. The length varied between 145 and 160μm.

Burkovsky (1970a, 1970c), Czapik and Jordan (1976), Dragesco (1960, 1965), Kahl (1930-1935).

(?) *Loxophyllum asetosum* Burkovsky, 1970a (Fig. I, 3)

One example of this ciliate was stained. There are six macronuclei varying in size between 4 and 10μm. The micronuclei were not observed. Six contractile vacuoles are arranged down the dorsal side. On the right side of the animal there are thirty two kineties and on the left there are twenty seven kineties. The shape of the ciliate approximates to that given in Burkovsky (1970d); however, the ends are more rounded in the stained example. Unfortunately the cytostome was not clearly visible, nor were the 'pronounced' kineties associated with it. The trichocysts described as being present on the ventral and dorsal surfaces are present. Length 160μm.

Burkovsky (1970a, 1970d, 1970e).

Loxophyllum verrucosum (Stokes, 1894)

The number of macronuclei varied between four and seven amongst the specimens studied, they are of a distinct spherical shape between 6 and 11 μm in diameter. They are arranged in an irregular line. The number of observed macronuclei was between one and five. The one to six contractile vacuoles are arranged dorsally. The number of kineties is between thirty-five and forty. Length of between 110 and 190μm.

Bock (1952b), Czapik and Jordan (1976), Dragesco (1965), Hartwig (1974).

Loxophyllum kahli Dragesco, 1960

One example of this ciliate was stained; the seventeen macronuclei of approximately spherical shape, measured between 3 and 4.5μm. The micronuclei were not observed. The twenty-four kineties are located on the right side. The two contractile vacuoles are located on the dorsal side. Length 155μm.

Dragesco (1960), Kovaljeva (1966), Kovaljeva and Golemansky (1979).

Order KARYOLECTIDA

Tracheloraphis bodiani Dragesco, 1963 (Fig. I, 4)

One example of this ciliate was stained with nigrosin (Borror, 1968). The nuclear material is a group of closely associated macronuclei surrounding the micronuclei, the arrangement measuring 11μm across. There are six slightly ellipsoid macronuclei with a long axis measuring 5.5μm, which surround the two micronuclei of 2μm, the whole forming a capsule. The eleven kineties show the dual

arrangement typical of this species. The globerulus zone covers the equivalent of the area covered by two kineties. In the oral region the structure of the apical opening is obscured by the presence of granules. The posterior ending is pointed. Length, 250μm.

Dragesco (1960), Kattar (1970).

Tracheloraphis dogieli (Raikov, 1957)

This large brown ciliate was found repeatedly. The macronuclei have the typical structure shown in Raikov (1962). They measure between 11 and 16μm, average 14μm; the micronuclei measure between 5 and 10 μm, average 8 μm. There are between four and fifty seven macronuclei and the number of micronuclei is between one and seventeen. The kineties occasionally fuse to form a 'bottle neck' arrangement; there are between twenty nine and thirty eight, average thirty four. The globerulus zone occupies the equivalent of approximately eight kineties. Length of between 700 and 2 000μm, averaging 1 200μm.

One specimen corresponded in all respects to the type description (Raikov 1957), except that the macronuclei were arranged in a two to one arrangement with the micronuclei. There were four macronuclei and two micronuclei, twenty four kineties and the globerulus zone occupied the equivalent of eight kineties.

Burkovsky (1970a, 1970b, 1970e), Dragesco (1963), Kovaljeva (1966, 1967), Kovaljeva and Golemansky (1979), Petran (1967, 1968), Raikov (1957, 1960, 1962, 1963), Raikov and Golemansky (1979).

Tracheloraphis incaudatus (Kahl, 1933)

Specimens collected in South Wales agreed with the description given by Dragesco (1960). The nuclear material consists of six to eight macronuclei associated in a group surrounding the two small micronuclei. There are between twenty eight and thirty two kineties, with a globerulus zone occupying the equivalent of two to three kineties. Length between 400 and 800μm, with an average of 600μm.

Agamaliev (1967a, 1967b, 1970), Bock (1952b), Burkovsky (1968, 1970a, 1970b, 1970e, 1971), Czapik and Jordan (1976), Dragesco (1960), Fjeld (1955), Hartwig (1974), Hartwig and Parker (1977), Kovaljeva (1966), Kovaljeva and Golemansky (1979), Nobili (1957), Petran (1967, 1968), Raikov (1962, 1963), Raikov and Kovaljeva (1968), Rao and Ganapati (1968).

Tracheloraphis incaudatus f. *quadrimicronucleata* Raikov and Kovaljeva, 1968.

The number of kineties lies between twenty two and twenty seven. The globerulus zone occupies the equivalent of two to three kineties. The nuclear group contains between six and eight macronuclei of 7μm diameter and four micronuclei of 2μm diameter. The length across the nuclear body is 15μm. Length of this ciliate was between 350 and 800μm, averaging 500μm.

Raikov and Kovaljeva (1968).

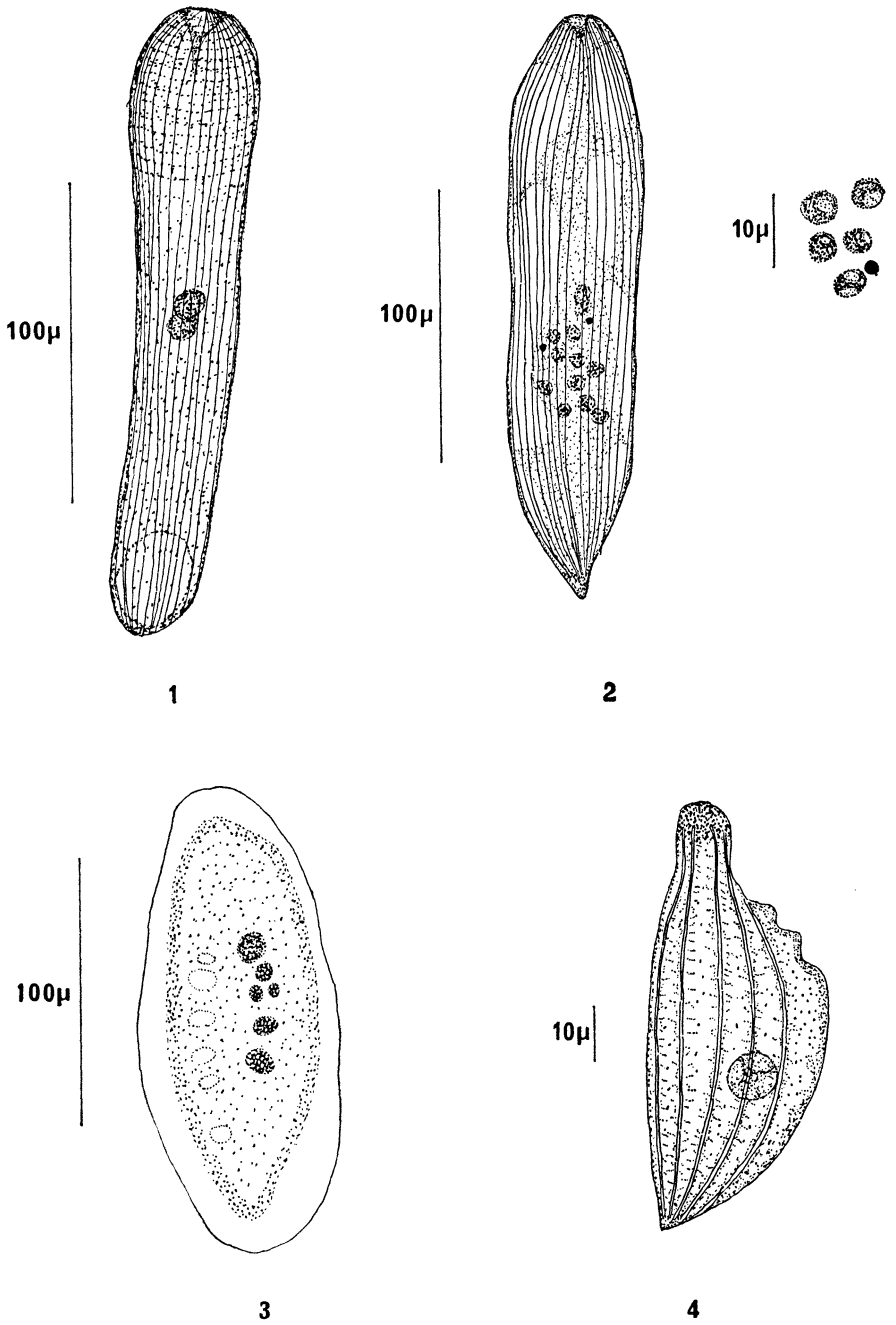

FIG. I

1. *Prorodon binucleatus.*
2. *P. multinucleatus* with five macronuclei and one micronucleus.
3. *Loxophyllum asetosum* (?)
4. *Tracheloraphis bodiani.*

N.B. : in every figures, all specimens are drawn in fixed condition.

Tracheloraphis kahli Raikov, 1962

There are between nineteen and twenty nine kineties, average twenty four. The globerulus zone occupies the equivalent of four or five kineties. On fixing, plications can be seen between the kineties. The number of nuclear complexes lies between two and ten, measuring 10 to 12μm across. In each complex there are usually two micronuclei, though there may be three or four. When the nuclear complexes fragment there are between six to eight macronuclei. Length of between 400 and 1 200μm, averaging 800μm.

Burkovsky (1968, 1970a, 1970b, 1970e), Czapik and Jordan (1976), Dragesco (1960, 1963), Hartwig (1973a, 1973b, 1974), Kovaljeva and Golemansky (1979), de Morgans (1926), Raikov (1962).

Tracheloraphis margaritatus (Kahl, 1933)

One example of this ciliate was stained; there are twenty kineties, with a globerulus zone equivalent to eight kineties. There are thirty three macronuclei of between 2.5 and 5μm. They have a slightly distorted spherical shape usually with one large nucleoli and smaller nucleoli present. The macronuclei measure 2μm in diameter and there are ten distributed throughout the length of the cytoplasm. This ciliate was brown in life, measuring 650μm in length.

Agamaliev (1974), Bock (1952a, 1952b), Burkovsky (1968, 1970a, 1970b, 1970e), Czapik and Jordan (1976), Dragesco (1963), Hartwig (1974), Kovaljeva and Golemansky (1979), Petran (1967, 1968), Raikov (1957, 1962).

Tracheloraphis prenanti f. *oligocineata* Raikov and Kovaljeva 1968

The number of kineties varies between fifteen and eighteen and the globerulus zone occupies the equivalent of six to eight kineties. The interkinetal mucocysts are prominent. The nuclear complex is made up of between six and eight macronuclei of diameter between 5 and 7μm. The two micronuclei were always located in the centre of the fused complex and measure 2μm in diameter. The size of the complex varies between 14 and 17μm. The ciliate measures between 700 and 1 200μm in length, averaging 900μm.

Agamaliev (1966a, 1967), Dragesco (1960), Hartwig and Parker (1977), Kovaljeva (1966, 1967), Raikov (1963), Raikov and Kovaljeva (1968).

Tracheloraphis serratus Raikov and Kovaljeva, 1968 (Fig. II)

The number of kineties varies between thirty four and forty, the globerulus zone occupying an area equivalent to between three and five kineties. Approximately fifteen kineties originate and terminate against the globerulus zone. There are pronounced ectoplasmic plications between the kineties, which have mucocysts associated with them. There are also numerous mucocysts associated with the globerulus zone. The nuclear group is not as loosely associated as is shown in the type description (Raikov and Kovaljeva 1968). There are between eight and fifteen macronuclei measuring between 5 and 7μm

in diameter. They usually contain three nucleoli and one poorly stained proteinaceous crystalloid. There are usually two micronuclei of 3μm diameter; one specimen examined had four micronuclei. Body length was between 700 and 1 500μm with an average of 1 000μm.

Raikov and Kovaljeva (1968).

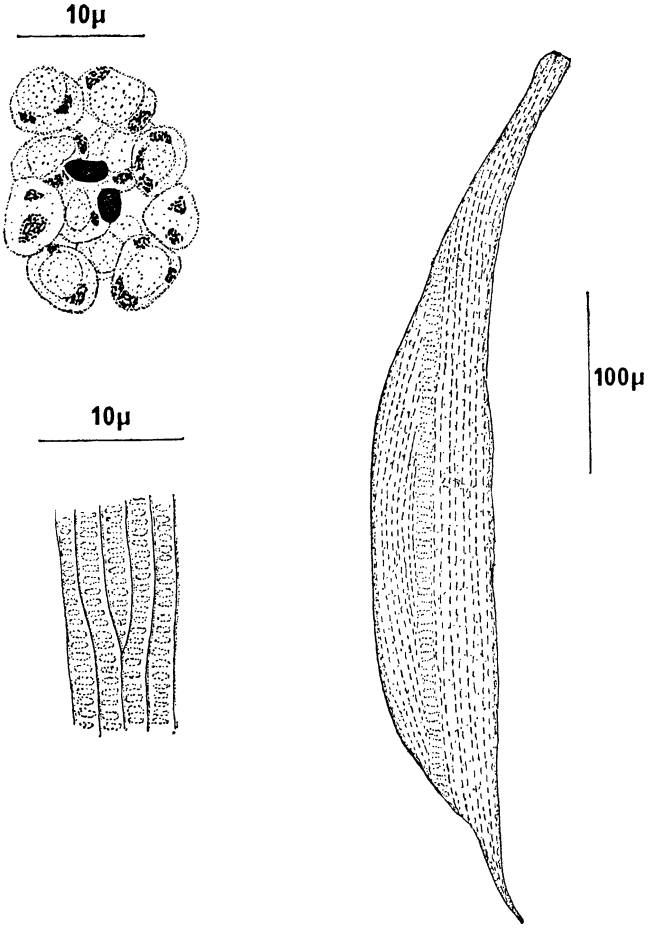

FIG. II

T. serratus with nuclear group and five kineties showing 'bottle necking'.

Tracheloraphis teissieri Dragesco, 1960

This long brown ciliate is recognisable beneath the dissecting microscope under incident light due to its brown colour, white inclusions in the oral region, its thigmotaxis and its tendency to remain immobile in a tight spiral.

There are between ten and twelve kineties and a wide globerulus zone which occupies the equivalent of six to eight kineties.

The nuclear material is spread throughout the length of the ciliate and consists of between four and twenty nine macronuclei

measuring between 4.5 and 5.5μm. There are between two and nine micronuclei, averaging five; they are consistently larger than the macronuclei and measure between 6 and 6.5μm. The macronuclei have between one and three nucleoli. When there is one nucleous it tends to be large whilst, when there are two or three, they are smaller. Developing macronuclei with no nucleoli are often present and they tend to be in close proximity to the macronucleus; they are 6.5μm in diameter. Length varies between 250 and 1 000μm, averaging 700μm.

Agamaliev (1966, 1967a, 1967b, 1968, 1972), Burkovsky (1970a, 1970b, 1970e), Dragesco (1960, 1963, 1965), Kovaljeva (1966), Kovaljeva and Golmansky (1979), Raikov (1962).

T. indistinctus nov. spec. (Wright, 1982)

T. niveus nov. spec. (Wright, 1982)

T. hamatus nov. spec. (Wright, 1982)

T. ditis nov. spec. (Wright, 1982)

T. conformis nov. spec. (Wright, 1982)

Trachelonema binucleata Agamaliev, 1966

This ciliate is brown in life, the examples stained have between six and eight kineties. The nuclei are arranged as two macronuclei with a micronucleus between in the centre of the ciliate. Overall length between 200 and 280μm.

Agamaliev (1966b, 1967a, 1970, 1972).

Trachelonema oligostriata Raikov, 1962

This ciliate has a long drawn out tail and 'neck' region, the tail is slightly hooked. It is transparent with a slightly developed apical region.

There are six kineties. The nuclear material is very characteristic, being arranged in groups of two macronuclei with one micronucleus between, distributed throughout the length of the ciliate. There are between two and eight of these groups. Length lies between 200 and 600μm, averaging 350μm.

Agamaliev (1966, 1967a, 1967b, 1970, 1972, 1973, 1974b), Borror (1972), Burkovsky (1968, 1970a, 1970b, 1970e, 1971), Czapik and Jordan (1976), Dragesco (1963), Hartwig (1973a, 1973b, 1974), Kattar (1970), Raikov (1962, 1963), Raikov and Kovaljeva (1968).

Kentrophoros latum Raikov, 1962

One specimen of this ciliate was stained. The number of kineties was obscured by the covering of the ectosymbiotic bacteria which measure 0.5 by 5μm. The ridge down the centre of the body has located in it the nuclear material. This consists of a complex con-

taining two micronuclei of 3.5μm diameter, surrounding these are nucleoli and chromatin bodies. The complex measures 10μm across and overall length is 600μm.

Burkovsky (1968, 1970a, 1970e), Kovaljeva (1967), Raikov (1962, 1974).

Kentrophoros fascialatum Sauerbrey, 1928

Only one specimen of this ciliate was obtained. There are six bi-polar kineties. The anterior and posterior endings of the ciliate are rounded. The nuclear material consists of two macronuclei with a single micronuclei between, they are spaced at 15μm intervals in the fixed ciliate, which is 200μm long. The macronuclei measure 4μm along their longest axis, the micronuclei are ellipsoid and measure 2μm along their longest axis.

Agamaliev (1971), Bock (1952b), Borror (1962), Burkovsky (1968, 1970a, 1970e), Czapik and Jordan (1976), Dragesco (1953, 1960, 1965), Fauré-Fremiet (1950), Fjeld (1955), Hartwig (1973a, 1973b, 1974), Kattar (1970), Kovaljeva and Golemansky (1979), Nobili (1957), Noland (1937), Petran (1967, 1968), Raikov (1962, 1963), Raikov and Kovaljeva (1968), Sauerbrey (1928).

K. canalis nov. spec. (Wright, 1982)

Remanella faurei Dragesco, 1953

One example of this ciliate was fixed. There are twenty kineties, four complex Muller's Corpuscles which are distributed throughout the length of the ciliate on the dorsal side. There are ten macronuclei, 6μm in diameter, associated in pairs, each pair having a single associated micronucleus. The micronuclei are 3.5μm in diameter. There is no 'beak' like projection at the anterior nor is there a hooked tail (Hartwig 1973a). This ciliate measures 600μm.

Dragesco (1953, 1960), Hartwig (1973a, 1973b, 1974), Kovaljeva and Golemansky (1979), Petran (1963, 1967, 1968).

Remanella granulosa Kahl, 1933

One specimen was stained. There are twenty kineties, two complex Muller's Corpuscles. The macronucleus typically contains a large nucleolus. There is a pigmented area associated with the mouth.

Agamaliev (1966, 1967a, 1972), Bock (1952b), Burkovsky (1968, 1970a, 1970e, 1971), Dragesco (1960, 1965), Hartwig (1974), Kattar (1970), Kovaljeva (1966, 1967), Kovaljeva and Golemansky (1979), Petran (1968), Raikov (1960, 1962, 1963), Raikov and Kovaljeva (1968).

(?) *Remanella levii* Dragesco, 1960

One specimen of this ciliate was fixed. There are approximately twenty kineties and at least one complex Muller's Corpuscle. There are four macronuclei of 11μm diameter. Each macronucleus contains

two or three large nucleoli with very small chromatin bodies. The tail is not elongate. There is some pigmentation associated with the mouth. The length of this ciliate was 600μm.

Dragesco (1960).

Remanella margatifera Kahl, 1933

There are between ten and thirteen kineties and two to five simple Muller's Corpuscles. The macronuclei are spherical and are 4μm in diameter. The length lies between 100 and 140μm, averaging 120μm.

Agamaliev (1967a, 1974), Bock (1952a, 1952b), Burkovsky (1968, 1970a, 1970e, 1971), Dragesco (1960, 1965), Hartwig (1974), Hartwig and Parker (1977), Kattar (1970), Kovaljeva and Golemansky (1979), Petran (1967, 1968), Raikov (1963), Raikov and Kovaljeva (1968), Rao and Ganapati (1968).

Remanella multinucleata Kahl, 1933

There are between twenty and twenty two kineties. When the full number of complex Muller's Corpuscles is observed, there are between five and six. The number of macronuclei is between nine and thirteen and the number of micronuclei between two and seven. The length of this ciliate lies between 600 and 800μm, average 650μm.

Bock (1952b), Dragesco (1953, 1960, 1963, 1965) Fauré-Fremiet (1950), Hartwig (1973a, 1973b, 1974), Kahl (1930-1935), Kattar (1970), Kovaljeva (1966), Kovaljeva and Golemansky (1979), Nobili (1957), Petran (1967, 1968), Raikov (1962).

Remanella rugosa Kahl, 1933

There are between thirteen and fifteen kineties and three to eight complex Muller's Corpuscles. There are usually two macronuclei and occasionally three, the micronucleus lies between the macronuclei. This ciliate measures between 180 and 300μm.

Agamaliev (1966, 1967a, 1967b, 1970, 1972, 1973, 1974), Bock (1952b), Borror (1962, 1963), Burkovsky (1968, 1970a, 1970e, 1971), Dragesco (1953, 1960, 1965), Hartwig (1973a, 1973b, 1974), Hartwig and Parker (1977), Kahl (1930-1935), Kattar (1970), Kovaljeva (1966, 1967), Kovaljeva and Golemansky (1979), Nobili (1957), Petran (1963, 1967), Raikov (1960, 1962, 1963), Raikov and Kovaljeva (1968), Rao and Ganapati (1968).

Remanella swedmarki Dragesco, 1960

The number of kineties is between sixteen and eighteen kineties. There are between five and nine simple Muller's Corpuscles. The macronuclei are round and there are between five and twelve. There are between two and six micronuclei. This ciliate measures between 90 and 230μm, averaging 200μm.

Dragesco (1960, 1963), Kattar (1970).

Remanella trichocystus Dragesco 1954a

There are between eighteen and twenty two kineties. The Muller's Corpuscles are complex and there are four to six. The nuclear material consists of two macronuclei with one micronucleus between. The macronuclei have a diameter between 10 and 14μm. The macronuclei have two to four nucleoli with two or three chromatin bodies. The micronucleus is 4μm in diameter. This ciliate measures between 210 and 500μm, averaging 300μm.

Dragesco (1954a, 1960), Nobili (1957).

Geleia nigriceps Kahl, 1933

This large brown ciliate has a rounded anterior and a bluntly pointed posterior. There are between thirty four and thirty eight kineties. There are two macronuclei and one micronucleus. This ciliate measures between 320 and 700μm, averaging 500μm.

Bock (1952b), Burkovsky (1970a, 1970b, 1970e), Dragesco (1960), Fjeld (1955), Hartwig (1973a, 1973b, 1974), Hartwig, Gluth and Wieser (1977), Kovaljeva (1966, 1967), Kovaljeva and Golemansky (1979), Petran (1968), Raikov (1960, 1962, 1963), Raikov and Kovaljeva (1968).

Ciliofaurea ornata Dragesco, 1954b

One specimen was fixed. There are nineteen kineties, one contractile vacuole, two macronuclei and one micronucleus. The macronuclei consist of a large nucleolus with chromatin bodies on its periphery. They are 3.5μm in diameter, the micronucleus is 1.5μm in diameter. On the non ciliated surface there are numerous 'toadstool' like projections approximately 0.5μm in height. The pharynx was not observed.

Dragesco (1954b, 1960, 1965).

Ciliofaurea mirabilis Dragesco, 1954b

This thigmotactic ciliate was observed on numerous occasions. There are between twelve and thirteen kineties. The macronuclei measure 3μm in diameter and there are between six and twelve. The micronuclei measure 2μm in diameter and number between two and six. No contractile vacuoles were observed. The overall length is between 100 and 120μm.

Dragesco (1953, 1954b, 1960), Hartwig (1973a, 1973b, 1974), Hartwig and Parker (1977), Vacelet (1961a, 1961b).

Subclass VESTIBULIFERA de Puytorac *et al.*, 1974

Order TRICHOSTOMATIDA Butschli, 1889

Coelosomides marina Anigstein, 1912

In life, this ciliate is transparent. The oval macronucleus is located centrally. There are approximately forty kineties. The average length is 200μm.

Agamaliev (1967a, 1967b), Anigstein (1912), Dragesco (1960), Fauré-Fremiet (1950), Kattar (1970), Kovaljeva and Golemansky (1979), Rao and Ganapati (1968).

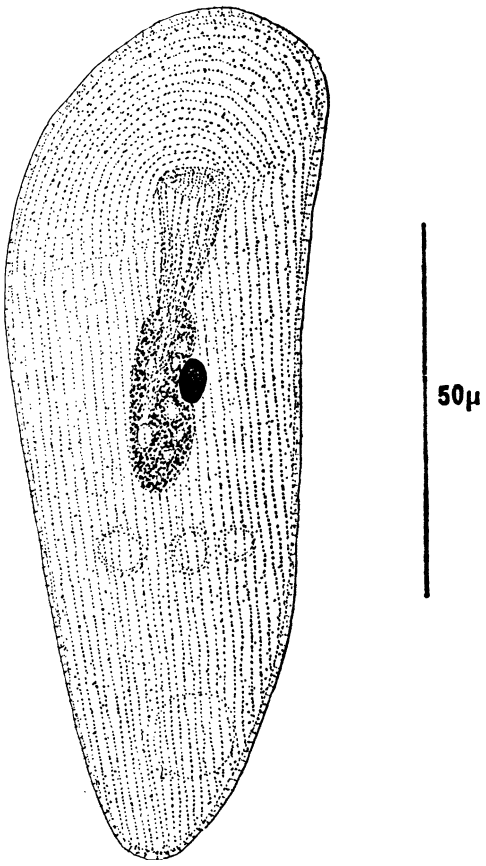

FIG. III
Chilodontopsis vorax.

Order SYNHYMENIIDA de Puytorac *et al.*, 1974

Chilodontopsis vorax (Stokes) (Fig. III)

This species has a large number of kineties, between 80 and 100 in those found at Swansea Bay. The hypostomial frange is not very evident in the specimens stained for nuclear structure. The macronucleus is an elongate oval with a slight indentation associated with the micronucleus, which is intimately associated with the macronucleus. The contractile vacuoles did not appear to be present in all the specimens examined; generally there was one contractile vacuole located toward the posterior. The cytopharyngeal apparatus is prominent and elongate, reaching for some way into the cytoplasm. The ciliate when observed in life was very transparent and not particularly active. The size ranged between 140 and 220µm.

Agamaliev (1967a, 1967b, 1970, 1972, 1974), Borror (1962), Burkovsky (1970a, 1970e), Dragesco (1960).

Order CYRTOPHORIDIA Fauré-Fremiet *in* Corliss 1956

Chlamydodon triquetrus Müller, 1786

This species was found occasionally and was recognisable by its green coloration and peculiar internal structure. There were between thirty five and forty five kineties.

Agamaliev (1967a, 1972, 1974), Bock (1952b), Borror (1962, 1963, 1972), Burkovsky (1970a, 1970e), Dragesco (1963, 1965), Hamburger and Buddenbrock (1911), Hartwig (1973a, 1973b, 1974), Hartwig and Parker (1977), Kahl (1930-1935), Kattar (1970), Kovaljeva (1967), Raikov (1960, 1962), Sauerbrey (1928).

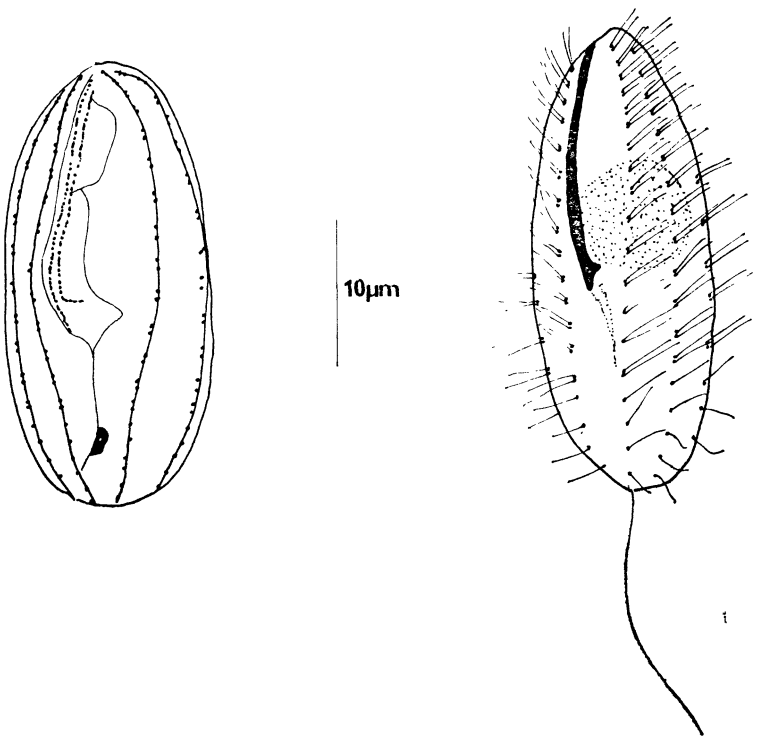

FIG. IV

Pseudocohnilembus marinus, wet silver and protargol preparations.

Chlamydodon triquetrus var. Kahl, 1931

This large species was green in colour and corresponded with the description given in Kahl (1930-1935). In the stained specimens there were between thirty five and forty kineties. Size ranged between 210 and 220µm.

Burkovsky (1970a, 1970e), Kahl (1930-1935), Ozaki and Yagui (1941).

Class OLIGOHYMENOPHORA de Puytorac *et al.*, 1974

Subclass HYMENOSTOMATIA Delage and Hérouard 1896

Order SCUTICOCILIATIDA Small 1967

Pseudocohnilembus marinus Thompson, 1966 (Fig. IV)

This small ciliate was cultured with marine broth inoculated with sea water. The number of kineties was constant at eight. The buccal cavity extends for two thirds of the body length. On the right edge there are two membranelles. Associated with the buccal cavity there are argentophilic fibrils which extend below the buccal cavity as a director meridian on which lies the cytoproct. At the base of the third kinety, counting the first as being on the immediate right of the buccal cavity, is located the contractile vacuole pore. Staining with the Protargol method revealed the number of cilia along the kineties; this is usually twenty two. There is a long caudal cilium. The apical region lacks ciliation. Protargol staining revealed clearly that the two buccal membranelles did not terminate at the same point posteriorly; rather, the outer membrane extended for a further 3 or 4μm. The macronuclei are round and measure 6μm in diameter. The nuclei and cilia could be stained temporarly with opal blue and phloxinrhodamin. Overall length was 30μm.

Thompson (1966), Borror (1972).

Class POLYHYMENOPHOREA Jankowski, 1967

Subclass SPIROTRICHIA Butschli, 1889

Order HETEROTRICHIDA Stein, 1859

Blepharisma greyii Hartwig and Parker 1977

This thigmotactic transparent ciliate has between fifteen and sixteen kineties. The body length to width ratio was approximately 7:1. The peristome extends for almost two thirds of the body length. Arising just anterior to the mid point of the peristome there are a group of very long membranelles. The nuclei are distributed almost throughout the length of the body in a longitudinal arrangement that may have three rows. The nuclei are round, vacuolate and measure between 2 and 3.5μm in diameter. In the two examples that were fixed there are between eighty five and eighty eight macronuclei. Lengths were 200 and 250μm.

Hartwig and Parker (1977).

Condylostoma arenarium Spiegel, 1926

This ciliate has between twenty two and twenty eight kineties, averaging twenty six. There are plications between the kineties. The nuclear material consists of between eight and sixteen macro-

nuclei arranged longitudinally. Length was between 200 and 500μm average 350μm.

Agamaliev (1966a, 1967a, 1970, 1972, 1973, 1974), Bock (1952a, 1952b), Borror (1962, 1963, 1972), Burkovsky (1970a, 1970b, 1970e). Dragesco (1953, 1960, 1962, 1963, 1965), Elliot and Bamforth (1975), Hartwig (1973a, 1973b, 1974), Hartwig and Parker (1977), Kattar (1970), Kiesselbach (1935), Kovaljeva (1966, 1967), Kovaljeva and Golemansky (1979), Nobili (1957), Petran (1963, 1967, 1968), Raikov (1960, 1962, 1963), Raikov and Kovaljeva (1968), Rao and Ganapati (1968), Spiegel (1926), Villeneuve-Brachon (1940).

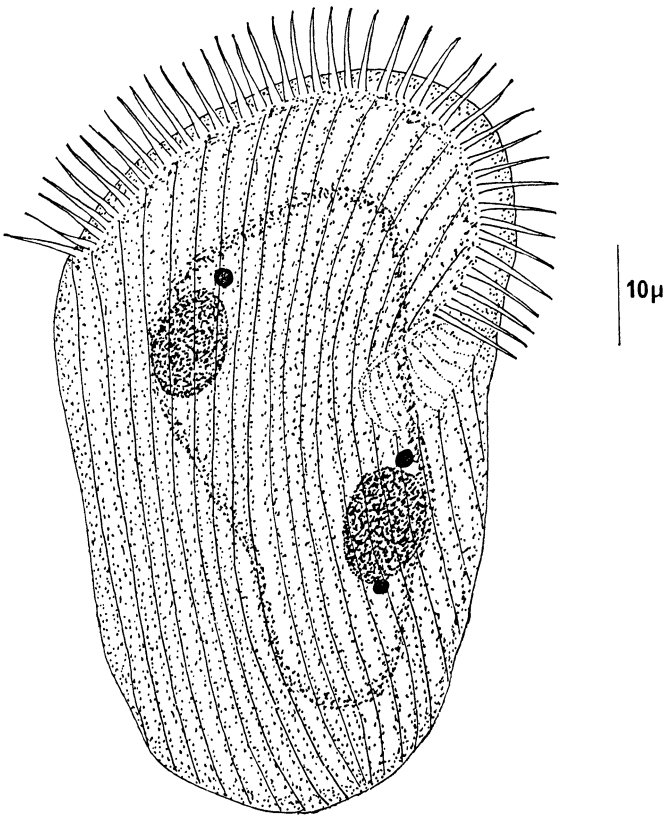

FIG. V
Peritromus californicus.

Condylostoma fjeldi Hartwig, 1973a

The tail of this species is long and drawn out, the body of the ciliate was only observed in a contracted state. There were between twenty eight and thirty two kineties, between which there were irregularly arranged mucocysts. There are very large numbers of slightly ovoid macronuclei measuring between 3.5 and 4.5μm. They are arranged in an irregular fashion throughout the body of the

cytoplasm. They number between one hundred and seven and two hundred and ten. Length between 300 and 700μm.

Fjeld (1955), Hartwig (1973a, 1973b, 1974), Hartwig and Parker (1977).

Condylostoma remanei Spiegel, 1926

There are between twenty two and twenty eight kineties. The nuclear material consists of between four and fourteen longitudinally arranged macronuclei which measure between 7 and 10μm. The micronuclei measure 1.5μm and number between four and ten. Length between 220 and 450μm, averaging 300μm.

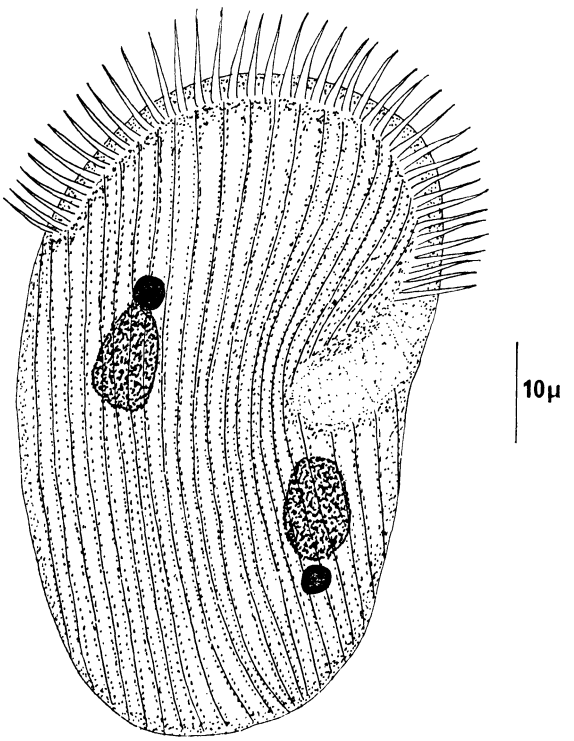

FIG. VI
P. faurei.

Agamaliev (1967a, 1967b, 1970, 1974), Bock (1952b), Borror (1962), Burkovsky (1970a, 1970b, 1970e), Czapik and Jordan (1976), Dragesco (1953, 1960, 1963), Fauré-Fremiet (1950), Fjeld (1955), Hartwig (1973a, 1973b, 1974), Hartwig and Parker (1977), Kattar (1970), Kovaljeva (1966, 1967), Kovaljeva and Golemansky (1979), Nobili (1957), Petran (1967, 1968), Raikov (1960, 1962, 1963), Raikov and Kovaljeva (1968), Spiegel (1926), Villeneuve-Brachon (1940).

Condylostoma tenuis Fauré-Fremiet, 1958

This species is bright green in life due to the presence of symbiotic algae. One specimen was fixed. There are twenty one kineties, eight moniliform macronuclei which measure 9μm in diameter. Length 400μm.

Dragesco (1963), Fauré-Fremiet (1958), Hartwig and Parker (1977), Kattar (1970).

(?) *Peritromus californicus* Kirby, 1934 (Fig. V)

One example of this ciliate was fixed. The peristome occupies 40 per cent of the body length. There are approximately twenty

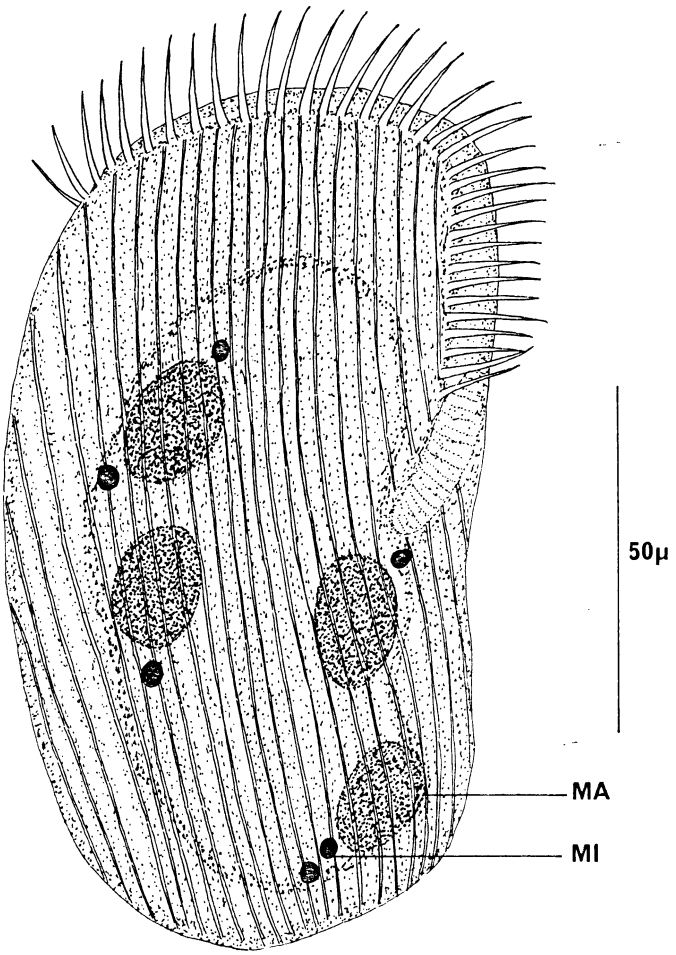

FIG. VII
P. tetramacronucleatus.

kineties. The two macronuclei are slightly ovoid with a maximum of 6μm. The three micronuclei measure 1μm in diameter and are in close proximity to the macronuclei. This example differs from the description given by Kirby (1934) in that the macronuclei are slightly ovoid as opposed to being round, also the micronuclei are small. Length, 90μm.

Hartwig and Parker (1977), Kirby (1934).

Peritromus faurei Kahl, 1932 (Fig. VI)

There are between nineteen and twenty three kineties. The peristome extends for 40 per cent of the body length. The nuclei consist of two macronuclei that are ovoid, maximum axis 5.5 to 7μm. In close proximity to or in contact with each macronucleus there is one spherical micronucleus. The overall length is between 70 and 80μm.

Agamaliev (1966, 1967a, 1968, 1972, 1974), Bock (1952b), Borror (1962, 1963, 1972), Burkovsky (1970a, 1970b, 1970e), Dragesco (1953,

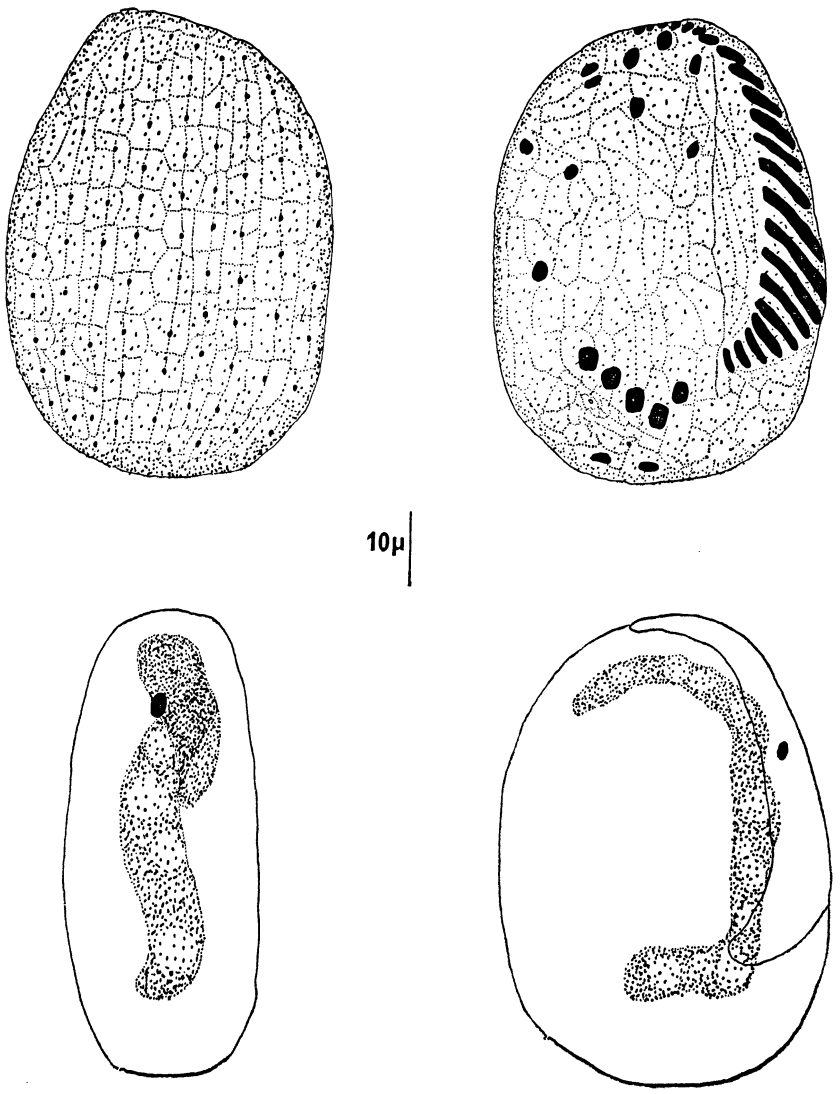

FIG. VIII

Euplotes balteatus, silver line system and nuclear arrangement.

1960), Fjeld (1955), Hartwig (1973a, 1973b, 1974), Jones (1974), Kovaljeva and Golemansky (1979), Raikov (1962, 1963), Vacelet (1961).

Peritromus tetramacronuleatus Ozaki and Yagui, 1941 (Fig. VII)

Two specimens were fixed. Transparent in life and very thigmotactic. There are between twenty five and twenty seven kineties which are prominent and concentrated to the left of the mid-line when they reach the posterior and margin. Most of the dorsal surface is covered by a low protruberance.

The nuclear material is located in this protruberance and consists of four large oval macronuclei, arranged in two pairs. The longest axis of the macronuclei measures between 11 and 16μm. The right hand pair is located more anteriorly than the left hand pair. There are six micronuclei, measuring 2μm in diameter, loosely associated with the macronuclei. The peristome extends for 50 per cent of the body length. Length between 160 and 210μm.

Ozaki and Yagui (1941).

Order HYPOTRICHIDA Stein, 1859

Euplotes balteatus (Dujardin, 1841) (Fig. VIII)

There are ten fronto-ventral, five transverse and four caudal cirri. The adoral zone of membranelles is made up of twenty five membranelles and is equivalent in length to 66 per cent of the total body length. There are nine dorso-lateral kineties.

The silver line system of the ventral side agrees well with the diagrams given by Burkovsky (1970c) and Tuffrau (1964). In Burkovsky (1970c) especially, the 'boxes' formed by the silver line system of the central side are elongate, particularly above and to the left of cirrus IV 1 (Wallengreen 1900). The cirri IV 2 and IV 3 are very closely associated which agrees well with Burkovsky (1970c), Agamaliev (1968) and Borror (1963). The number of fronto-ventral and transverse cirri is consistent at ten and five respectively (Agamaliev 1968, Burkovsky 1970c, Borror 1963, Dragesco 1963, Hartwig and Parker 1977). The number of caudal cirri varies between three and five, but is most often four. The number of membranelles is low compared to that given by previous authors (see summary given in Hartwig and Parker 1977), and is constant at twenty five.

The silver line system of the dorsal side is made up of nine dorso-lateral kineties which have approximately ten cilia or bristles. Surrounding each of the cilia is a four to six-sided shape which is in contact with a similar shape on all sides. Passing through the cilia is a part of the silver line system. Therefore there is an alternating kinety silver line system.

The macronucleus is 'ϟ' shape and the small micronucleus is located at the anterior left in close association with the macronucleus.

Agamaliev (1967a, 1968, 1970, 1972, 1973, 1974a, 1974b), Berger (1965), Bock (1952b), Borror (1963), Burkovsky (1970a, 1970b, 1970c,

1970e), Dragesco (1963), Detchva (1977), Dujardin (1841), Hartwig (1974), Kahl (1930-1935), Nobili (1957), Tuffrau (1964), Vacelet (1961a).

Key to the genus *TRACHELORAPHIS*

The figures given in square brackets refer to the characteristics of the species as revealed by this survey.

Roman numerals refer to the occurrence of a species twice within the key due to differing descriptions.

1	A	The ' tail' ends as point	15
	B	The 'tail' ending is round	2
2(1)	A	There is only one group of nuclei	5
	B	They are either several groups of nuclei, or the nuclei are individually arranged throughout the ciliate.	3
3(2)	A	The nuclei are arranged individually in a longitudinal row, 1 000-1 500µm, 34-40 kineties (K), globerulus zone (G.Z.) 2K, 11-43 macronuclei (mac), 4-16 micronuclei (mic), milky white in life ..... *T. crassus* Raikov, 1963	
	B	The nuclei are arranged in two or more groups	4
4(3)	A	There are only two nuclear groups, 500-600µm, 28-30K, G.Z. 4K, two nuclear complexes with 4 mic in centre. ..... *T. dicaryon* Raikov, 1963	
	B	There are between 28 and 78 groups of nuclei, 850-2 775µm, 65-100K, G.Z. 1K, each nuclear group contains 4 mac and 2 mic, brown in life ..... *T. augustiviatatus* Borror, 1963	
5(2)	A	Having 32K or less	8
	B	Having 36K or more	6
6(5)	A	Colourless in incident light, nuclei in a capsule, 500µm, 40K, G.Z. 2-3K, 4 mac and 2 mic. ..... *T. monocaryon* Dragesco, 1965	
	B	Milky white in incident light	7
7(6)	A	Nuclei in a capsule with usually 8 mac and 4 mic, or occasionally 4 mac and 2 mic, 850-1 500µm, 40K, G.Z. 2K. Mineral granules obscure the oral structure, single row of mucocysts in interkinetic spaces. ..... *T. lacteus* Raikov and Kovaljeva, 1968	
	B	Nuclei in a group, 4 mac and 2 mic, 600-1 500µm, 36-47(43)K, G.Z. 1K. ..... *T. niveus* nov. spec.	
8(5)	A	Having 16K or more	11
	B	Having 14K or less	9
9(8)	A	Colourless in life	10
	B	Brown in life, 400-800µm, 12-13K, G.Z. equivalent to 1/6 or less of surface. 4 mac and 2 mic in a loosely associated group. ..... *T. swedmarki* Dragesco, 1960 I	
10(9)	A	The nuclei are loosely associated in a group, 400-800µm, 12-13K, G.Z. equivalent to approximately 1/6 of surface, 4-6 mac, 2 mic (1 example with 14K, 450, 8 mac in a capsule, Dragesco (1960)), colourless or yellow ..... *T. gracilis* Dragesco, 1960	
	B	The nuclei are very closely associated, 300-700(450)µm, 11-14K, G.Z. 1-2K, 4 mac and 2 mic, always colourless. .. *T. conformis* nov. spec.	
11(8)	A	Nuclei are in a capsule or complex	13
	B	Nuclei are in a group	12
12(11)	A	Brown in life, 400-800µm, 20-28K, G.Z. 3-4K, 4 mac and 2 mic, the macronuclei often contain proteinacious crystalloids .... *T. swedmarki* Dragesco, 1960 I (Raikov and Kovaljeva, 1968)	
	B	Colourless in life, 300-800µm, 18-22K, G.Z. 1K, 4-6(4) mac. 2 mic. ..... *T. ditis* nov. spec.	

13(11)A Having 6 mac or more in a complex or closely associated group 14

B Having 4 mac in a capsule, 400-600μm, 16-20K, G.Z. 3-4K, 4 mac with polygonal nucleoli, 2 mic. ..... *T. stephani* Dragesco, 1965

14(13)A Having 2 mic, 400-650μm, 28-32K, G.Z. 4K or less, nuclear material in a complex, on fragmentation there are 6-8 mac.
[28-32K, G.Z. 2-3K, 6-8 mac, 2 mic, 400-800μm]
T. incaudatus (Kahl, 1930) Dragesco 1960; (Raikov and Kovaljeva, 1968)

B Having 4 mic, 400-650μm, 24-30K, G.Z. 4K or less. Nuclei are either in a complex or else there are 6-8 mac on fragmentation.
[22-27K, G.Z. 2-3K, 6-8 mac, 4 mic, 350-800μm].
.... *T. incaudatus* f. *quadrimicronucleata* Raikov and Kovaljeva, 1968

15(1)A Having 1 nuclear association 27

B There are either several groups of nuclei, or the nuclei are individually arranged throughout the ciliate 16

16(15)A The nuclei are associated in groups 20

B The nuclei are scattered throughout the cytoplasm although they may be in contact with an adjacent nucleus 17

17(16)A Occurring in hypersaline conditions (82 per 1 000), 285-500 (350μm), approximately 40K, G.Z. 8-10K, 15-43(29) mac and 3-7 mic, nuclear material distributed throughout cytoplasm. .....
..... *T. haloetes* Borror, 1973

B Not occurring in hypersaline conditions 18

18(17)A Having 12K or less, 500-900μm, 9-12K, large G.Z., 18-26 mac, 6-8 mic, nuclear material distributed throughout cytoplasm, brown in life.
[10-12K, G.Z. 6-8K, 4-29 mac, 2-9 mic, 250-1 000μm].
..... *T. teissieri* Dragesco, 1960

B Having 25K or more 19

19(18)A Having between 36 and 60K, 800-2 000μm, 36-60K, G.Z. equivalent to 1/6 of surface, 6-28 mac, 2-17 mic, brown in life.
[29-38(34)K, G.Z. 8K, 4-57 mac, 1-17 mic].
..... *T. dogieli* (Raikov, 1957) (Raikov, 1962)

B Having between 25 and 30K, 400-1 500μm, 25-30K, G.Z. 10K, 9-35 mac, 2-29 mic, brown in life.
[22K, G.Z. 8K, 33 mac, 10 mic, 650μm].
..... *T. margaritatus* (Kahl, 1933) (Raikov, 1962)

20(16)A More than two groups of nuclei 23

B Two groups of nuclei 21

21(20)A More than 1 mic associated with every group of nuclei 22

B Only 1 mic associated with a group of nuclei, 1 500+μm, 5 mac, 2 mic, each micronucleus occurs in a separate group of nuclei.
..... *T. hyalinum* Dragesco, 1960

22(21)A Having 22-25K, 600-1 000μm, 22-25(24)K, G.Z. 4-5K or 1/6 of surface. Each complex usually has 4 mac but may have 2-3 mic. The mac are fused to form a complex.
[19-29(24)K, G.Z. 4-5K, 2-10 complexes, 2-4(2)mic, 400-1 200μm].
..... *T. kahli* Raikov, 1962 II

B Having 16K, 600-800μm, G.Z. up to 6K, two of nuclei containing 6 mac and 2 mic. ..... *T. similis* Raikov and Kovaljeva, 1968

23(20)A Having 38K or less 24

B Having 38K or more 25

24(23)A Nuclear groups contain 2 mac and 1 mic. Approximately 1 500μm, 36K, G.Z. 6K, 10-15 nuclear groups, yellowish in life.
..... *T. flexuosus* Raikov and Kovaljeva, 1968

B Nuclear groups made up of 4 mac and 2 mic, 30-38(32)K, G.Z. 6K, 5-27 groups of 4 mac and 2 mic.
..... *T. caudatus* Dragesco and Raikov 1966 III (Raikov and Kovaljeva 1968)

C Nuclear groups made up of more than 4 mac on fragmentation with 4(2-3) mic, 22-25 (24) K, G.Z. 4-5K or 1/6 of surface
..... *T. kahli* Raikov, 1962 II

25(23)A Brown in life 26

B Colourless in life, 1 500-1 800μm, 44-52(48)K, G.Z. 2K. 6-17 nuclear

groups of usually 4 mac and 2 mic, groups of 2:1, 6:3, 8:4 and 12:6 have been recorded. ..... *T. discolor* Raikov, 1962

26(25)A The macronuclei are fused to form a complex, 1 000-2 200μm, 44-58K, G.Z. small, 16-20 nuclear complexes. ..... *T. fasciolatus* (Sauerbrey, 1928) (Dragesco, 1960)

B Nuclear material in groups of 4 mac and 2 mic, 1 000-2 500μm, 38-44(40)K, G.Z. 3-5K, 7-50 groups of nuclei. ..... *T. caudatus* Dragesco and Raikov 1966 III

27(15)A Having 37K or less 32

B Having 39K or more 28

28(27)A Having 60K or less 29

B Having approximately 70K, 1 500μm, G.Z. 3K or less, 1 nuclear group with 2-6 mac and 1-2 mic. ..... *T. vermiformis* Raikov, 1962

29(28)A Having 8 mac or more 31

B Having 6 mac or less 30

30(29)A Brown in life, 1 000μm, 40K, G.Z. is invaginated, 5-6 mac and 2 mic ..... *T. remanei* Dragesco, 1960 (Raikov and Kovaljeva 1968)

B Colourless in life, 600-1 200μm, 39-47K, G.Z. 1K. 4 mac and 2 mic. ..... *T. indistinctus* nov. spec.

31(29)A 12 mac or less in the nuclear group, 750-1 500μm, 40-43K, G.Z. 3-5K with a zig-zag throughout its length due to the ordered positioning of mucocysts. 8-12 mac, 2 mic. [34-40K, G.Z. 3-5K, 8-15 mac, 2(4) mic 700-1 500μm]. ..... *T. serratus* Raikov and Kovaljeva, 1968

B 16 mac or more, 2 000-3 000μm, 42-60 (50-55)K, G.Z. 2-3K. 16-22 mac and 1-3(2) mic. .... *T. totevi* Kovaljeva and Golemansky 1979

32(27)A G.Z. 6K or less 41

B G.Z. 6K or more 33

33(32)A 26K or less 35

B 28K or more

34(33)A 28-30K, 1 300-2 000μm, large central nuclear capsule made up of 12 mac, 2-5 mic, brown in life. ..... *T. drachi* Dragesco, 1960

B 31-37K, 257-2 080μm, 7-11 mac and 2 mic, brown in life. ..... *T. drachantoides* Bullington, 1940 (Borror, 1963)

35(33)A G.Z. 10K or less 36
G.Z. 14K or nearly half the surface, 400μm, 18-20K, 6 mac and 1 mic ..... *T. griseus* (Kahl, 1933) (Dragesco, 1960)

36(35)A 20K or more 40

B 18K or less 37

37(36)A Nuclear material in a fused complex, which on fragmentation contains 6 mac or more 39

B 4 mac that are individual 38

38(37)A 14-18K, 550-700μm, 14-18K, G.Z. 6K or 1/3 or surface, 4 mac, light brown. ..... *T. africanus* Dragesco, 1965

B 10-13K, 300-900 (450)μm, 10-13K, G.Z. 8-10K, 1 nuclear group of 4 very closely associated macronuclei, 2 mic. .. *T. hamatus* nov. spec.

39(37)A 4 mic or more, 400-600μm, 13-17(14)K, G.Z. 6K, up to 8 mic. ..... *T. sarmaticus* Agamaliev and Kovaljeva, 1966 (Agamaliev 1966c)

B 2 mic, 500-1 000μm. 14-18(16)K, G.Z. 6-8K, 1 nuclear complex that occasionally fragments to reveal 6-8 mac. [15-18K, G.Z. 6-8K, complex of 6-8 mac, 2 mic, 700-1 200μm]. ..... *T. prenanti* f. *oligocineata* Raikov and Kovaljeva, 1968

40(36)A 5 mic or more, 600-1 300μm, 22-26(24)K, G.Z. 6-8K, 1 nuclear complex that contains 5-8(6) mic. ..... *T. phoenicopterus* (Cohn, 1866) (Raikov 1962)

B 2 mic, 800-1 600μm, 20-26(24)K, G.Z. 6-8K, 1 nuclear complex that may fragment to reveal 16-20 mac. ..... *T. prenanti* f. *multicineata* Raikov and Kovaljeva, 1968

41(32)A 26K or more 43

B 14K or less 42

42(41)A 12-14K, 500-700μm, G.Z. 2-3K, 1 nuclear complex that may fragment, 2 mic. ..... *T. striatus* Raikov, 1962

B 10K, 400-600μm, G.Z. 2K or less, 1 nuclear capsule containing 6 mac and 1-2 mic. ..... *T. bodiani* Dragesco, 1963

43(41)A G.Z. narrow, 2K wide, in life the G.Z. appears green, 1 300μm. 26-28K, G.Z. 2K, 1 nuclear capsule containing 6 mac. ..... *T. arogi* (Dragesco, 1953) (Dragesco, 1960)

43(41)B G.Z. 4-5K, 600-1 200μm, 23-32K, 1 nuclear group made up to 4-6 mac and 2 mic. ..... *T. drachi* f. *bimicronucleata* Raikov, 1962

The descriptions used are the type descriptions unless there is a reference given after the specific name in brackets, the description is then taken from that reference.

Summary

Fifty six species of psammobiotic ciliates occurring on two shores in South Wales between March 1979 and February 1980 are described. A key to the genus *Tracheloraphis* species as at present recognised is also given.

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