SOME ASPECTS REGARDING TAXONOMICAL UNITS IN THE COMPOSITION OF CILIATES FAUNA CONTAINED IN THE MARINE AND FRESH WATER SEDIMENTS OF NATURAL AND ARTIFICIAL ECOSYSTEMS OF NATURAL SCIENCE MUSEUM COMPLEX CONSTANȚA

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Abstract. The ciliates represent a very important group of cellular protozoans dominating the metazoans by species richness and density. Our preoccupations in the field of ciliates started in college years, but systematic researches about qualitative composition of ciliates and their ecology – started in 1997 and continues today. There were found 59 species of ciliates, most of them belonging to the class Kinetofragminophora (PUYTORAC et al., 1974). The species were found in the sediments of paramarine interconnected lakes Siutghiol and Tăbăcărie, in the mediolitoral sands of the Romanian Black Sea coast – Faleza Nord station, as well as in covered basins of Dolfinarium.

Keywords: ciliates, taxonomy, sediments.

Rezumat. Câteva aspecte privind ponderea diferitelor categorii taxonomice ale ciliatelor din sedimentele ecosistemelor naturale şi artificiale aflate în incinta Complexului Muzeal de Ştiinţe ale Naturii Constanţa. Ciliatele reprezintă un grup aparte de protozoare care domină metazoarele prin bogăţia de specii şi densitate. Preocupările noastre în domeniul ciliatelor datează din anii studenţiei dar cercetările sistematice asupra compoziţiei calitative şi ecologiei ciliatelor datează din 1997 şi continuă şi în prezent. Au fost identificate 59 de specii de ciliate în sedimentele lacurilor paramarine interconectate Siutghiol şi Tăbăcărie, în nisipurile mediolitorale ale coastei româneşti a Mării Negre – staţia Faleza Nord – precum şi în bazinele acoperite de la Delfinariu, majoritatea lor aparţinând clasei Kinetofragminophora (PUYTORAC et al., 1974).

Cuvinte cheie: ciliate, taxonomie, sedimente.

INTRODUCTION

The ciliates represent a very important group of protozoan cells dominating the metazoans by the species richness and density. Our preoccupation in the field of benthic ciliates has started in college – the main purpose being to establish the qualitative composition of ciliates fauna (DUMITRACHE-KERKMANN, 1998, 2003).

In recent years, research studies – concerning the ciliates of paramarine lakes Siutghiol and Tăbăcărie (DUMITRACHE-KERKMANN, 2004) have been supplemented by researches about ciliates living in salt water in some artificial ecosystems such as the covered basins of the Dolphinarium Constanța. Most of our scientific articles were dedicated to different ecological aspects of marine and freshwater ciliates; it is well known that the different species of ciliates are important bioindicators of water quality.

The present scientific paper contains a taxonomical analysis of ciliates species identified into the sediments of paramarine lakes and covered basins of the Dolphinarium. The taxonomic system used in this paper is according to that used by the European protozoologists (DRAGESCO & DRAGESCO-KERNEIS, 1986).

MATERIAL AND METHODS

Since 1997 I have systematically collected samples containing sediments and water from different ecosystems: sediments from shallow areas of Tăbăcărie and Siutghiol Lakes, the Romanian Black sea coast – Faleza Nord. Since 2009 there have been collected other samples resulted from the covered basins of the Dolphinarium Constanța containing epibiosis from the walls and a sedimentary mixture from the bottom (fragments of macrophytic algae and of various origin sand marks) collected by the diver on the occasion of regular hygienic activities. This research about the qualitative composition and ecology of ciliates from different ecosystems continues today.

After collecting, the samples were transferred from collecting recipients to Petri dishes to undergo the first examination with the binocular loop; this stage has been followed by the second examination with the microscope.

The examination stage has been followed by that of sediment separation by different methods (Webb, Uhlig) according to the degree of fragility of the species from the samples composition and aimed scope (UHLIG, 1964, 1966; WEBB, 1956).

Reduction of speed of the ciliates has been executed with the help of several anaesthetic mixtures some containing a mixture of sleeping pills for human use.

The diagnosis has been established for some species on fresh sampled material; in other cases, vital colorants were used such as acetyl methyl green and finally some species required the application of techniques for the receipt of permanent preparations Chatton-Lwoff and Bodian (WILBERT version) (1986).

Species diagnosis was made using the reference scientific works of FOISSNER and DRAGESCO (DRAGESO & DRAGESCO-KERNEIS, 1986; FOISSNER, 1996; BERGER et al., 1997).

RESULTS AND DISCUSSIONS

Psamophilious ciliates identified by us since 1997 include 205 species belonging to 38 families; 140 of them have been identified in the sediments of paramarine lakes Siutghiol and Tabacarie and the lakes from the Danube Delta.

Table 1 presents the taxonomic index of ciliates which were identified in sediments of interconnected lakes Tăbăcărie and Siutghiol and in the sediments of the covered basins of the Dolphinarium Constanța and in the coastal sands of Faleza Nord station (Black Sea).The last species were presented in another recent scientific paper (KERKMANN, 2010).

These 59 species belong to three classes: Kinetofragminophora (PUYTORAC et al., 1974), Oligohymenophora (PUYTORAC et al., 1974) and Polyhymenophora (JANKOWSKI, 1967 in DRAGESCO & DRAGESCO-KERNEIS, 1986).

The first class, Kinetofragminophora (PUYTORAC et al., 1974), includes ciliates whose oral cilia cannot be differentiated from somatic cilia. In this class, the Kariorelictida ciliates are very interesting protozoans with relict status. They once inhabited sands of the ancient Tethys Sea. This is the best represented class considering that 48% of all identified species belong to it.

The next evolutionary step is represented by the class Oligohymenophora (PUYTORAC et al., 1974), (21.5 % of all identified species) whose oral cilia show various degrees of differentiation from the somatic cilia. Ciliates of the third class - Polyhymenophora (JANKOWSKI, 1967 in DRAGESO & DRAGESCO-KERNEIS, 1986) – 30.5% of total species- is the most evolved class as oral cilia are well differentiated from the somatic cilia and present a very complicated structure.

The Class Kinetofragminophora (PUYTORAC et al., 1974) is on the first place in terms of contained subclasses compared with the other two classes – Oligohymenophora (PUYTORAC et al., 1974) and Polyhymenophora (JANKOWSKI, 1967 in DRAGESO & DRAGESCO-KERNEIS, 1986) containing each only one subclass. The same situation is for the orders that belong to each subclass of ciliates (in order of their evolution 6, 2 and 4.)

Although they are primitive on the evolutionary scale, the ciliates belonging to the class Kinetofragminophora (PUYTORAC et al., 1974) present taxonomic heterogeneity, as the 28 species it includes belong to 28 families.

The Class Kinetofragminophora is also on the first place as number of subclasses (3) compared to the next classes that include only one subclass. We mention the same situation in the case of the orders that compose each class, which according to their evolution are 6, 2 respectively 4.

Even if they are primitive on the evolution scale, the ciliates belonging to Kinetofragminophora Class present taxonomic heterogeneity. The 28 species belong to 11 families. Oligohymenophora Class includes only 8 families (one more for the most evolved class of the ciliates).

The Class Kinetofragminophora contains 3 families with a greater number of species compared to the others (5), while the next classes include only one family with seven species; paramecium ciliates are important indicators of the environment quality. At the opposite pole, we mention the families Spathididae and Aspidiscidae represented by a single species each.

Table 1. Taxonomic index of psamophilious ciliates of Dobrogea.
Tabel 1. Indexul taxonomic al ciliatelor psamofile din Dobrogea.

No.	Class	Subclass	Order	Suborder	Family	Species
1	**Kinetofragminophora**	Gymnostomata	Prostomatida	Prostomatina	Holophryidae	***Holophrya simplex*** SCHEWIAKOFF, 1893
2	**Kinetofragminophora**	Gymnostomata	Prostomatida	Prostomatina	Holophryidae	***Holophrya ovum*** SCHEWIAKOFF, 1893
3	**Kinetofragminophora**	Gymnostomata	Prostomatida	Prostomatina	Holophryidae	***Holophrya nigricans*** LAUTERBORN, 1894
4	**Kinetofragminophora**	Gymnostomata	Prostomatida	Prostomatina	Holophryidae	***Holophrya sp.2***
5	**Kinetofragminophora**	Gymnostomata	Prostomatida	Prostomatina	Holophryidae	***Urotricha globosa*** CLAPAREDE et LACHMANN, 1857
6	**Kinetofragminophora**	Gymnostomata	Prostomatida	Prorodontina	Prorodontidae	***Prorodon marinus*** CLAPAREDE et LACHMANN, 1858
7	**Kinetofragminophora**	Gymnostomata	Prostomatida	Prorodontina	Prorodontidae	***Prorodon teres*** EHRENBERG, 1838
8	**Kinetofragminophora**	Gymnostomata	Prostomatida	Prorodontina	Prorodontidae	***Plagiocampa rouxi*** KAHL, 1930
9	**Kinetofragminophora**	Gymnostomata	Prostomatida	Prorodontina	Colepidae	***Coleps hirtus*** NITZSCH, 1817
10	**Kinetofragminophora**	Gymnostomata	Prostomatida	Prorodontina	Colepidae	***Coleps spetai*** KAHL, 1930
11	**Kinetofragminophora**	Gymnostomata	Prostomatida	Prorodontina	Colepidae	***Lagynophrya acuminata*** KAHL, 1930
12	**Kinetofragminophora**	Gymnostomata	Prostomatida	Prorodontina	Colepidae	***Lagynophrya rostrata*** KAHL, 1930
13	**Kinetofragminophora**	Gymnostomata	Prostomatida	Prorodontina	Colepidae	***Phithothorax processus*** KAHL, 1931
14	**Kinetofragminophora**	Gymnostomata	Prostomatida	Haptorina	Enchelyidae	***Enchelyodon elegans*** KAHL, 1930
15	**Kinetofragminophora**	Gymnostomata	Prostomatida	Haptorina	Enchelyidae	***Lacrymaria coronata*** CLAPAREDE et LACHMANN, 1858
16	**Kinetofragminophora**	Gymnostomata	Prostomatida	Haptorina	Enchelyidae	***Lacrymaria acuta*** KAHL, 1930
17	**Kinetofragminophora**	Gymnostomata	Prostomatida	Haptorina	Enchelyidae	***Lacrymaria olor*** MÜLLER, 1788
18	**Kinetofragminophora**	Gymnostomata	Prostomatida	Haptorina	Enchelyidae	***Trachelophyllum sigmoides*** KAHL, 1931
19	**Kinetofragminophora**	Gymnostomata	Prostomatida	Haptorina	Spathididae	***Spathidium*** sp.

No.	Class	Subclass	Order	Suborder	Family	Species
20	**Kinetofragminophora**	Gymnostomata	Prostomatida	Haptorina	Didiniidae	***Didinium nasutum*** MÜLLER, 1786
21	**Kinetofragminophora**	Gymnostomata	Pleurostomatida	Haptorina	Amphileptidae	***Lionotus lamella*** EHRENBERG, 1838, SCHEWIAKOFF, 1896
22	**Kinetofragminophora**	Gymnostomata	Pleurostomatida	Haptorina	Amphileptidae	***Lionotus fasciola*** EHRENBERG, 1838
23	**Kinetofragminophora**	Incertae Sedis	Kariorelictida	-	Loxodidae	***Loxodes striatus*** ENGELMANN, 1862
24	**Kinetofragminophora**	Vestibulifera	Trichostomatida	-	Plagiopylidae	***Plagioyla nasuta*** STEIN, 1860
25	**Kinetofragminophora**	Vestibulifera	Colpodida	Colpodina	Colpodidae	***Bresslaua*** sp.
26	**Kinetofragminophora**	Vestibulifera	Colpodida	Colpodina	Colpodidae	***Colpoda cucullus*** MÜLLER, 1786
27	**Kinetofragminophora**	Vestibulifera	Colpodida	Colpodina	Colpodidae	***Colpoda steinii*** KAHL, 1935
28	**Kinetofragminophora**	Hypostomata	Nassulida	Nassulina	Nassulidae	***Nassula picta*** EHRENBERG, 1833
29	**Oligohymenophora**	Hymenostomata	Hymenostomatina	Tetrahymenina	Tetrahymenidae	***Tetrahymena cf. pyriformis*** EHRENBERG, 1830, LWOFF, 1947
30	**Oligohymenophora**	Hymenostomata	Hymenostomatina	Ophryoglenina	Ophryoglenidae	***Ophryoglena atra*** EHRENBERG, 1831
31	**Oligohymenophora**	Hymenostomata	Hymenostomatina	Peniculina	Paramecidae	***Dexiostoma campylum*** FOCKE, 1836 DUJ. 1841
32	**Oligohymenophora**	Hymenostomata	Hymenostomatina	Peniculina	Paramecidae	***Paramecium cf. aurelia*** EHRENBERG, 1838,
33	**Oligohymenophora**	Hymenostomata	Hymenostomatina	Peniculina	Paramecidae	***Paramecium caudatum*** EHRENBERG, 1838
34	**Oligohymenophora**	Hymenostomata	Hymenostomatina	Peniculina	Paramecidae	***Paramecium putrinum*** HILL, 1752
35	**Oligohymenophora**	Hymenostomata	Hymenostomatina	Peniculina	Paramecidae	***Paramecium trichium*** HILL, 1752
36	**Oligohymenophora**	Hymenostomata	Hymenostomatina	Peniculina	Paramecidae	***Paramecium*** sp.
37	**Oligohymenophora**	Hymenostomata	Hymenostomatina	Peniculina	Lembadionidae	***Lembadion bullinum*** PERTY, 1852
38	**Oligohymenophora**	Hymenostomata	Scuticociliatida	Philasterina	Uronematidae	***Uronema marinum*** DUJARDIN, 1841
39	**Oligohymenophora**	Hymenostomata	Scuticociliatida	Philasterina	Uronematidae	***Uronema nigricans*** MÜLLER, 1786, FLORENTIN, 1901
40	**Oligohymenophora**	Hymenostomata	Scuticociliatida	Pleuronematina	Pleuronematidae	***Pleuronema marinum*** DUJARDIN, 1841
41	**Oligohymenophora**	Hymenostomata	Scuticociliatida	Pleuronematina	Cyclidiidae	***Cyclidium glaucoma*** MÜLLER, 1786
42	**Polyhymenophora**	Spirotricha	Heterotrichida	Heterotrichina	Spirostomidae	***Spirostomum teres*** CLAPAREDE et LACHMANN, 1858-1859
43	**Polyhymenophora**	Spirotricha	Heterotrichida	Heterotrichina	Etopidae	***Metopus*** sp. 2
44	**Polyhymenophora**	Spirotricha	Heterotrichida	Heterotrichina	Condylostomatidae	***Condyostoma remanei*** SPIEGEL, 1928
45	**Polyhymenophora**	Spirotricha	Odontostomatida	Heterotrichina	Epalxellidae	***Saprodinium*** sp.
46	**Polyhymenophora**	Spirotricha	Oligotrichida	Oligotrichina	Strombidiidae	***Strombidium arenicola*** DRAGESCO, 1960
47	**Polyhymenophora**	Spirotricha	Oligotrichida	Oligotrichina	Strombidiidae	***Strombidium sauerbrayae*** KAHL, 1930
48	**Polyhymenophora**	Spirotricha	Oligotrichida	Oligotrichina	Strombidiidae	***Strombidium viride*** FOISSNER, 1986
49	**Polyhymenophora**	Spirotricha	Hypotrichida	Stichotrichina	Strongylidiidae	***Strongylidium arenicolus*** DRAGESCO, 1960
50	**Polyhymenophora**	Spirotricha	Hypotrichida	Sporadotrichina	Oxytrichidae	***Uroleptus*** sp.
51	**Polyhymenophora**	Spirotricha	Hypotrichida	Sporadotrichina	Oxytrichidae	***Paruroleptus*** sp.
52	**Polyhymenophora**	Spirotricha	Hypotrichida	Sporadotrichina	Oxytrichidae	***Oxytricha gibba*** MÜLLER, 1786
53	**Polyhymenophora**	Spirotricha	Hypotrichida	Sporadotrichina	Oxytrichidae	***Oxytricha*** sp.1
54	**Polyhymenophora**	Spirotricha	Hypotrichida	Sporadotrichina	Euplotidae	***Euplotes patella*** MÜLLER, 1786, EHRENBERG, 1838
55	**Polyhymenophora**	Spirotricha	Hypotrichida	Sporadotrichina	Euplotidae	***Euplotes*** sp.1
56	**Polyhymenophora**	Spirotricha	Hypotrichida	Sporadotrichina	Euplotidae	***Euplotes*** sp.6
57	**Polyhymenophora**	Spirotricha	Hypotrichida	Sporadotrichina	Euplotidae	***Diophrys scutum*** DUJARDIN, 1841
58	**Polyhymenophora**	Spirotricha	Hypotrichida	Sporadotrichina	Euplotidae	***Uronychia transfuga*** MÜLLER, 1786
59	**Polyhymenophora**	Spirotricha	Hypotrichida	Sporadotrichina	Aspidiscidae	***Aspidisca*** sp.
60	**3**	**5**	**12**	**15**	**27**	***59***

CONCLUSIONS

Ciliates belonging to the class Kinetofragminophora (PUYTORAC et al., 1974) have succeeded to survive due to their robustness, capacity of adaptation and maintenance of sediment ecosystems with salt regime and varied natural or artificial origin.

The subject is interesting and needs further researches.

ACKNOWLEDGEMENTS

The author of the paper expresses her thanks to the management of the Museum Complex of Nature Sciences represented by the General Manager Eng. Adrian Mănăstireanu who approved and facilitated the research programme.

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Received: March 25, 2011
Accepted: July 1, 2011