

PRELIMINARY DATA REGARDING THE QUALITATIVE COMPOSITION OF CILIATES FAUNA FROM THE MURAT RIVER (AĞRI REGION, TURKEY)

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Abstract. The Murat River (in Turkish Murat Nehri, Murat Suyu or Murat Irmağı) is the eastern branch of the Euphrates. A documentation activity about the Murat River started in September 2011; so far, there have been identified 25 ciliate species in the sediments of the Murat River, as well as on the artificial substrates like polystyrene. This direction of research is new and original, as there have not been written any scientific papers especially dedicated to this ecosystem and the artificial immersed substrates in Turkey so far. It was applied a new method of ciliate sampling named Fukuda and the results are quite encouraging.

Keywords: the Murat River, Turkey, ciliates, artificial substratum, taxonomy.

Rezumat. Date preliminare privind compoziția calitativă a faunei de ciliate din Râul Murat (regiunea Ağrı Turcia). Râul Murat (în limba turcă Murat Nehri, Murat Suyu sau Murat Irmağı) este ramura estică a Eufratului. În septembrie 2011 am inițiat o activitate de documentare; până în prezent am identificat 25 specii de ciliate în sedimentele râului Murat ca și pe substraturile artificiale de tipul polistirenului. Această direcție de cercetare este nouă și originală, nu am găsit în Turcia lucrări științifice dedicate acestui ecosistem și substraturilor artificiale. Am utilizat o nouă metodă de colectare a ciliatelor numită Fukuda, cu rezultate încurajatoare.

Cuvinte cheie: Râul Murat, Turcia, ciliate, substrat artificial, taxonomie.

INTRODUCTION

The Murat River (in Turkish Murat Nehri, Murat Suyu or Murat Irmağı) is the eastern branch of the Euphrates and it springs near the small town Doğubeyazıt. Ağrı city, is the capital of the region with the same name, and is located in eastern Anatolia; in year 2008, the population of this city was officially estimated to 91,817 inhabitants (WIKIPEDIA).

The documentation activity about the Murat River started in September 2011; if we found some information about the geological structure and sediments (DEMİR *et al.*, 2008), there are only few data about the Murat River biodiversity, such as the parasitic complex of few fish species (ASLAN, 2009); the project about the Murat River dam contains some information about the phytocoenosis of the banks, as well as about certain species of vertebrates, which live in the region of the Murat River (EKOTEK, 2009).

The research studies, which were initiated to establish the qualitative composition of the Murat River ciliofauna, are original; the freshwater ciliate fauna of Turkey was investigated by Çapar without explicit reference to the Murat River. Seven of the identified species are common with the ones proposed by Çapar (ÇAPAR, 2007).

We did not find any scientific papers about the values of the abiotic factors of the river water. The mean annual temperature of the Murat River is 6.1°C; one third of the year the Murat River is covered by snow. The economy of the region is represented by two bakeries, a sugar factory, two brick workshops; the inhabitants' traditional occupations are agriculture and livestock (EKOTEK, 2008). Despite the fact the project contains a special section dedicated to an experimental facility for wastewater treatment (approximately 150 l/day/inhabitant) (EKOTEK, 2008), our observations in the field indicated that the city sewerage system discharges directly into the Murat River, upstream the dam; moreover, the pipes for wastewater generated by various sources of pollution discharge directly into the river (in the town region).

MATERIAL AND METHODS

Between September 2011 and January 2012 I collected (two times every month) samples from the shallow areas of the Murat River (the first centimetres of the surface, five samples for each station). I established one station near Ağrı City's Bridge (into the town) and the second in front of the airport, at the junction of the sewerage system with the Murat River (Photos 1-3). Besides the classical method of samples collection, Fauré – Fremiet and Dragesco (DRAGESCO & DRAGESCO-KERNÉIS, 1986), I used Fukuda's Method with good results for the first time (BLATERRER, 2005). The collected samples contained water and sand - muddy sediments; for the first time I examined the ciliates living on the artificial immersed surfaces like polystyrene pieces (Photo 4). The water temperature registered in the sampling days oscillated between - 1 and 1°C.

From the same stations, I collected small pieces of polystyrene immersed in water regularly; the biofilm from the surface coming into direct contact with water was then deposited on Petri dishes after being razed with a cutter together with the first fine layer of polystyrene that had adhered to the lower part; the whole assembly was then moisturized with distilled water in order to prevent the development of new species that had not been previously identified on the initial substratum. The Petri dishes were left in laboratory for one day and then the ciliate species were determined (Photo 4).

The separation of ciliates from sediments was made using Uhlig and Webb methods (UHLIG, 1964; WEBB, 1956). For some species the diagnosis was established on fresh collected material. Other ciliates were subjected to vital coloration with methyl green and haematoxylin (DRAGESCO & DRAGESCO-KERNÉIS, 1986). The systematic arrangement of species is according to Puytorac, Corliss and Levine's system (DRAGESCO & DRAGESCO-KERNÉIS, 1986).



Photo 1. First station for sample collection – Big Bridge Agri City. / Foto 1. Prima stație de colectare – Podul orașului Agri (original).



Photo 2. Second station for sample collection – wastewater discharge system – the Murat River). / Foto 2. A doua stație de colectare a probelor – sistemul de deversare a apelor uzate în râul Murat (original).



Photo 3. First station for sample collection – details of sediments. / Foto 3. Prima stație de colectare a probelor – detaliu al sedimentelor (original).



Photo 4. Artificial surfaces prepared in laboratory for examination. / Foto 4. Substraturi artificiale pregătite pentru examinare în laborator (original).

RESULTS AND DISCUSSIONS

After the examination of the samples collected from the Murat River, there were identified twenty five forms; out of these, eleven ciliate species were identified only to genus (Table 1). Seven of them are common with the list proposed by Çapar for Turkey's freshwater fauna (ÇAPAR, 2007).

Nineteen ciliate species were found into the sediments of the river shallow area; the representatives of 9 species were found in the biofilm covering the analysed artificial substrates from polystyrene immersed pieces. It is very interesting to note that among the species identified till now, only four are common to these two different biotopes (sediments and polystyrene pieces); the completion of such taxonomic information on species ecology will also provide the necessary explanations.

Their distribution according to the taxonomical category they belong to, according to the mentioned classification, is relatively balanced. The less evolved ciliate forms, which display cytostomial cilia non differentiated from the somatic cilia (belonging to **Kinetofragminophora** class) represents 36% of all species, holding the same percentage as the most evolved class **Polyhymenophora**, whose cytostomial cilia suffered various specialization degree (DRAGESCO & DRAGESCO-KERNÉIS, 1986) during the evolution process. **Oligohymenophora** represents only 28% of all species (Fig. 1).

Of the 9 ciliate species identified in the organic pellicle of polystyrene pieces, only 3 belong to the class **Kinetofragminophora**; one possible explanation could be that evolved forms like oligo- and polyhymenophores, having different cytostomial structures, availability for various food sources, registered greater chances of adaptability to this artificial biotope.

Table 1. Ciliates from the sediments and artificial surfaces on the Murat River (Ağrı region).

Tabel 1. Ciliate din sedimentele și substratul artificial în Râul Murat (regiunea Agri).

No	Class	Subclass	Order	Suborder	Family	Species	1	2
1	Kinetofragminophora	Gymnostomata	Prostomatida	Prostomatina	Holophryidae	<i>Urotricha globosa</i> CLAPAREDE et LACHMANN, 1857	+	-
2	Kinetofragminophora	Gymnostomata	Prostomatida	Prostomatina	Holophryidae	<i>Urotricha</i> sp.	+	-
3	Kinetofragminophora	Gymnostomata	Prostomatida	Prorodontina	Prorodontidae	<i>Prorodon</i> sp.	-	+
4	Kinetofragminophora	Gymnostomata	Prostomatida	Prorodontina	Prorodontidae	<i>Plagiocampa rouxi</i> KAHL, 1932	-	+
5	Kinetofragminophora	Gymnostomata	Prostomatida	Prorodontina	Colepidae	<i>Coleps</i> sp.	+	-
6	Kinetofragminophora	Gymnostomata	Prostomatida	Prorodontina	Colepidae	<i>Lagnophrya rostrata</i> KAHL, 1930	-	-
7	Kinetofragminophora	Gymnostomata	Pleurostomatida	Haptorina	Amphileptidae	<i>Lionotus lamella</i> (EHRENBERG, 1838) SCHEWIAKOFF, 1896	-	+
8	Kinetofragminophora	Gymnostomata	Pleurostomatida	Haptorina	Amphileptidae	<i>Loxophyllum</i> sp.	+	-
9	Kinetofragminophora	Vestibulifera	Trichostomatida	-	Plagiopylidae	<i>Plagiolya nasuta</i> STEIN, 1860	+	-
10	Oligohymenophora	Hymenostomata	Hymenostomatina	Tetrahymenina	Etrahymenidae	<i>Colpidium colpoda</i> (LOSANA, 1829) STEIN, 1860	+	-
11	Oligohymenophora	Hymenostomata	Hymenostomatina	Peniculina	Paramecidae	<i>Dexiostoma campylum</i> (FOCKE, 1836) DUJ. 1841	+	-
12	Oligohymenophora	Hymenostomata	Hymenostomatina	Peniculina	Paramecidae	<i>Paramecium</i> cf. <i>aurelia</i> EHRENBERG, 1838	+	-
13	Oligohymenophora	Hymenostomata	Hymenostomatina	Peniculina	Paramecidae	<i>Paramecium caudatum</i> EHRENBERG, 1838	+	-
14	Oligohymenophora	Hymenostomata	Hymenostomatina	Peniculina	Paramecidae	<i>Paramecium putrinum</i> HILL, 1752	+	-
15	Oligohymenophora	Hymenostomata	Scuticociliatida	Philasterina	Uronematidae	<i>Uronema nigricans</i> (MÜLLER, 1786) FLORENTIN, 1901	-	+
16	Oligohymenophora	Peritricha	Peritrichida	Sessilina	Vorticellidae	<i>Vorticella campanula</i> EHRENBERG, 1833	+	+
17	Polyhymenophora	Spirotricha	Heterotrichida	Heterotrichina	Spirostomidae	<i>Spirostomum teres</i> CLAPAREDE et LACHMANN, 1858-1859	+	-
18	Polyhymenophora	Spirotricha	Heterotrichida	Heterotrichina	Metopidae	<i>Metopus</i> sp. ¹	+	-
19	Polyhymenophora	Spirotricha	Hypotrichida	Stichotrichina	Holostichidae	<i>Holosticha</i> sp.	+	+
20	Polyhymenophora	Spirotricha	Hypotrichida	Sporadotrichina	Oxytrichidae	<i>Oxytricha saprobia</i> (<i>pelionella</i>) (?) O. F. MÜLLER, 1786	+	+
21	Polyhymenophora	Spirotricha	Hypotrichida	Sporadotrichina	Oxytrichidae	<i>Oxytricha</i> sp. ¹	-	+
22	Polyhymenophora	Spirotricha	Hypotrichida	Sporadotrichina	Oxytrichidae	<i>Oxytricha</i> sp. ²	+	-
23	Polyhymenophora	Spirotricha	Hypotrichida	Sporadotrichina	Oxytrichidae	<i>Stylonychia</i> sp.	+	+
24	Polyhymenophora	Spirotricha	Hypotrichida	Sporadotrichina	Euplotidae	<i>Euplotes</i> sp. ¹	+	-
25	Polyhymenophora	Spirotricha	Hypotrichida	Sporadotrichina	Aspidiscidae	<i>Aspidisca</i> sp.	+	-

Legend: ¹ Ciliates identified into the Murat River sediments; ² Ciliates identified on the artificial surfaces

Regarding the distribution of ciliates to subclasses, most species belong to spirotrichides, evolved forms with differentiated and specialized cilia (36% - Fig. 2); however, even the less evolved forms show a good adaptation to the conditions of the two biotopes (gymnostomates 32%); the intermediary forms like hymenostomes represent 24% of the total number of species. A similar situation is represented by the distribution of species on taxonomical orders (Fig. 3); on the first place there are hypotrichides, which represent 27% of the species, followed by prostomatides (24%) and hymenostomatides (20%); the other orders are represented by less important categories. In terms of the distribution of ciliates on suborders, 26% of them belong to the suborder Sporadotrichina. Concerning the appurtenance of ciliates to different families, there is greater heterogeneity; the dominant family is Oxytrichidae EHRBG., 1838 respectively Paramecidae Dujardin, 1840 (Table 1). The most frequent ciliate species from the Murat River sediments are: *Urotricha globosa* CLAPAREDE et LACHMANN, 1857; *Colpidium colpoda* (LOSANA, 1829) STEIN, 1860; *Paramecium putrinum* HILL, 1752 and from the artificial surfaces *Plagiocampa rouxi* KAHL, 1932.

CONCLUSIONS

Thus, according to the analyses of the samples taken from the sediments of the Murat River and the immersed artificial surfaces, we came to the following conclusions:

1. The inventory of ciliate fauna belonging to this ecosystem represents a new and original direction, as we have not found any scientific works referring strictly to the Murat River; moreover, the approach of ciliate fauna developing on artificial substrata is generally less studied.

2. The qualitative composition of ciliate fauna from the Murat River displays 25 forms so far.

3. These forms belong taxonomically to three classes: **Kinetofragminophora**, **Oligohymenophora** and **Polyhymenophora**.

4. The most frequent ciliate species which were found into the Murat River are: *Urotricha globosa* CLAPAREDE et LACHMANN, 1857; *Colpidium colpoda* (LOSANA, 1829) STEIN, 1860; *Paramecium putrinum* HILL, 1752; *Plagiocampa rouxi* KAHL, 1932.

5. According to the analysis of the obtained data, it seems that the most successful adaptation to the abiotic conditions induced by this ecosystem is registered by those forms which are at the extreme poles of ciliate evolution – the primitive forms with less differentiated cilia (Kinetofragminophoras) and the most evolved forms (polyhymenophores) (Fig. 1).

The results obtained so far encourage us to continue the research in this direction and the qualitative information will be completed with quantitative information and ecological data about the ciliates from the Murat River.

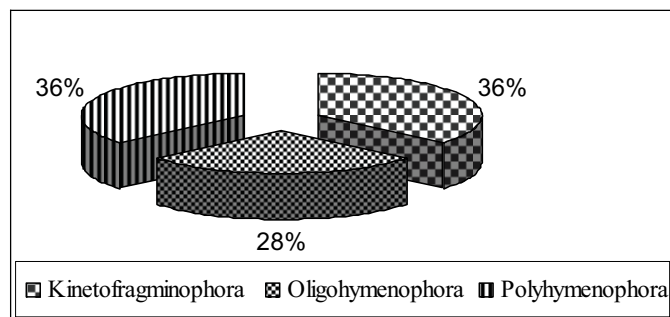


Figure 1. Qualitative composition of the ciliates from the Murat River – Class. / Figura 1. Compoziția calitativă a ciliatelor din Râul Murat – Clase.

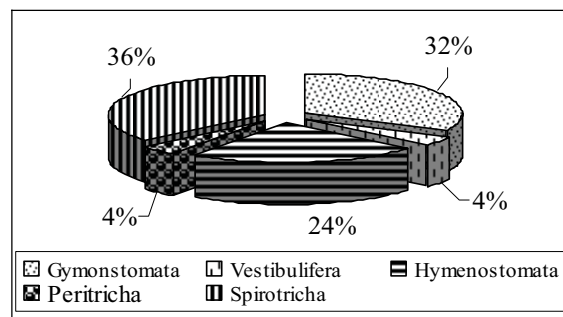


Figure 2. Qualitative spectrum of the ciliates from the Murat River – Subclass. / Figura 2. Spectrul calitativ al ciliatelor din Râul Murat – Subclase.

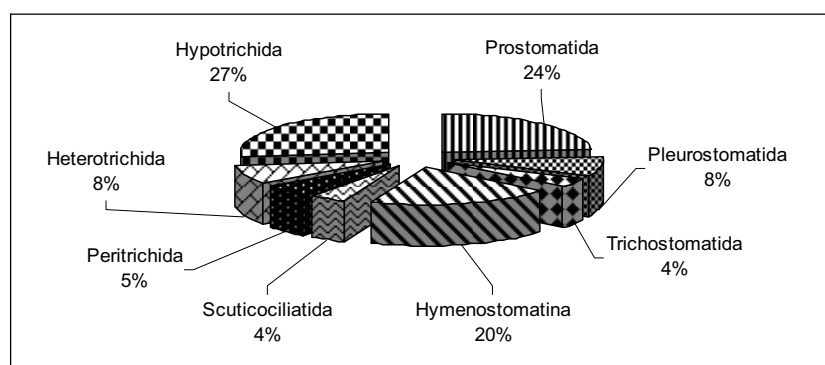


Figure 3. Qualitative spectrum of the ciliates from the Murat River – Order. / Figura 3. Spectrul calitativ al ciliatelor din Râul Murat – Ordine.

REFERENCES

- ASLAN B. 2009. *Ağrı ili Murat Nehri ile Erzurum ili Aras Nehrin'den yakalanan bazı balıkların Endohelmintlerinin araştırılması*. Yüksek Lisans Tezi. Erzurum: 1-59.
- BLATERER H. 2005. *Ökologische und taxonomische Studien über Ciliaten (Protozoa – Ciliophora) aus Fließgewässern und Böden mit besonderer Berücksichtigung der indicatorarten des Saprobiensystems*. Dissertation zur Erlangung des Doktorgrades an der Naturwissenschaftlichen Fakultät der Universität Salzburg: 1-49.
- ÇAPAR S. 2007. *Checklist for Ciliate Species (Protozoa, Ciliophora) Living in Turkish Inland Waters and Flooded Zones*. Journal of Fisheries & Aquatic Sciences. Ege University Press: 24(1-2): 207-212. Available online: http://jfas.ege.edu.tr/pdf/2007-1-2/37_Capar_24_1-2_2007.pdf.
- DEMİR T., SEYREK A., GUILLOU H., SCEILLET S., WESTWAY R., BRIDGLAND D. 2008. *Preservation by basalt of a staircase of latest Pliocene terraces of the River Murat in eastern Turkey: evidence for rapid uplift of the eastern Anatolian Plateau*. Global and Planetary Change. 68: 254-269. Available online at: <http://www.sciencedirect.com/science/article/pii/S0921818109000617> (Accessed: February 28, 2012).
- DRAGESCO J. & DRAGESCO - KERNÉIS, A 1986. *Écologie des Ciliés. Ciliés libres de l'Afrique intertropical (introduction à la connaissance et à l'étude des Ciliés)*. Faune Tropical, ORSSTOM, Paris. 26: 91-95.
- UHLIG G. 1964. *Eine einfache Methode zur Extraction der vagilen, Mesopsammeln*, Mikrofauna. Helgol. Wiss. Meeresunters. 11: 178-185.
- WEBB M. G. 1956. *An ecological study of brackish water ciliate*. Journal of Animal Ecology, published by British Ecological Society. 25: 148-175.
- ***. EKOTEK 2008. *Yağmur Barajı ve Hes Projesi* 1-81. Available online at: http://www2.cedgm.gov.tr/cedsureci/ced_basvuru_dosyasi/465_ptd.pdf (Accessed: February 28, 2012).
- ***. WIKIPEDIA1-Available online at: http://en.wikipedia.org/wiki/A%C4%9Fr%C4%B1_Province (Accessed: February 28, 2012).

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