ECOLOGICAL STATE OF THE RIVER DANUBE ECOSYSTEMS IN 1995

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Abstract. On the basis of more than 300 samples of water, sediments, phytoplankton, zooplankton and benthos, the paper presents the results concerning the actual state of biodiversity and organisms distribution in the lower (Romanian) sector of the Danube Rive. Comparing the results with data from literature, the authors conclude that the Danubian ecosystems recently studied are strongly affected, being characterized by low diversity, quantitative scarcity, patchness distribution of populations and presence of only 2-3 dominant forms, both in plankton and benthos. Very few "islands" of higher diversity and bundance have been signaled. The occurance in some places of rich populations of Bivalvae proves that the filtering activity and self-purification of water capacity of the Danubian ecosystem are still high, especially in the Iron Gates and Delta sectors. The researches stressed out the need of a permanent survey as a major duty for a better management and sustainable use of the River Danube.

Key words: The River Danube, ecosystems, biodiversity, quantitative distribution, chlorophyll, phytoplankton, zooplankton, benthos.

INTRODUCTION

The information on the biodiversity of the Romanian sector of the Danube began to appear in the second half of the 19th century, but the basic knowledge was formed only in the second half of our century. In the monographic study "Limnology of the Romanian sector of the Danube" published under the aegis of the Romanian Academy in 1967, the first syntheses were made concerning the phytoplankton, zooplankton, benthos and nekton; the paper mentions over 160 Romanian bibliographical titles out of which 51.9% were published in the 1960s and 22.8% in the '50s.

The papers appeared after 1960 contain a great amount of data about the phytoplankton in the Danube, in a series of lakes along the Danube or in the Danube Delta (Oltean, Popescu; Oltean and Cristea - 1960; Busnită, Brezeanu, and Prunescu-Arion; Busnită, Enăceanu and Brezeanu - 1961; Brezeanu and Prunescu-Arion; Popescu, Prunescu-Arion and Drăgăsanu; Prunescu-Arion and Elian - 1962; Popescu - 1963; Enăceanu - 1964;etc.). Although the flowing tributaries of the Danube were less studied, there are however data for the rivers Cerna (Popescu, Prunescu-Arion and Drăgăsanu, 1962), Jiu and Olt (Busnită, Brezeanu and Prunescu-Arion, 1961), Arges (Busnită, Enăceanu and Brezeanu, 1961) etc.

The researches concerning the phytoplankton lead to the conclusion that in the waters of the Danube, in its lakes and in the Danube Delta 605 taxonomic units had been registred (75 Cyanobacteria, 31 Flagellatae, 9 Dinoflagelatae, 131 Clorophyceae, 13 Heterocontae, 52 Conjugatae, 4 Characeae and 290 Diatomeae), out of which 269 species were found only in the main course of the river (including Sulina and Sf. Gheorghe distributaires (Oltean, 1967). From an ecological point of view the phytoplankton of the Danubian main course appears as a mosaic of species belonging to various categories:

– euplanktonic river species (*Melosira granulata, Stephnodiscus hantzschii, Cyclotella meneghiniana, C. kutzingiana, Fragillaria crotonensis, Asterionella formosa, Nitzschia actinostroides,* etc.);
– euplanktonic lacustric species, which appears frequently in the Danube owing to the water circulation from the lakes (*Tabellaria fenestrata, Synedra acus* var. *angustissima, Diatoma elongatum, Cymotopleura solea, Surirella robusta* var. *splendida,* etc.);
– pseudoplanktonic species which belong in fact to microphytobentos or periphyton (*Diatoma vulgare, Synedra acus, S. ulna, Nitzschia sigmoidea, N. vermicularis)*;
– accidental species which appear in phytoplancton quite at random.

As far as the zooplankton is concerned, although Gr. Antipa revealed even in 1912 the abundance of organisms in the Danube River water and their importance as source of food for fishes and their juveniles in the lakes of the easily flooded zones, complex ecological changes practically began only in the latter part of the 1950s in accordance with a protocol devised by the international team for the limnologic study of the Danube (Busnită and Enăceanu, 1958; Busnită,1961; Brezeanu and Prunescu-Arion, 1962; Popescu, 1963; Popescu, 1960; Enăceanu, 1964, etc.). In consequence of the researches

between 1968 - 1962 the number of the zooplanktonic taxonomic units in the Danube River water was up to 155 species belonging to the classes Protozoa, Rotatoria, Copepoda and Cladocera. The number of species varies from one sector of Danube to another, but upstream the diversity is lower (27 taxonomic units between km 1.48 and km 931) than in the middle sector (106 taxonomic units between km 931 and km 170) or downstream (67 species on the Sulina distributary)(Enăceanu, 1967).

The first references about the benthic fauna in the Romanian sector of the Danube were made for Mysidae (Băcescu, 1935, 1937, 1938) and sedentary polychaetes (Motas and Băcescu, 1938). M. Băcescu continued his benthonic studies at the Iron Gates from 1944 - 1948.

The researches carried out by Cărăusu (1943), Cărăusu, Dobreanu and Manolache (1955), Grossu (1943, 1955, 1963), Motas and Soarec - Tanasachi (1963), Prunescu-Arion (1960), Motilică (1958), Popescu et. al., (1964, 1966), etc., have completed the list of the Danubian benthic fauna, underlining at the same time its importance as trophic basis in different sectors of the river (Popescu and Prunescu-Arion, 1961; Enăceanu and Brezeanu, 1964; Prunescu-Arion and Elian, 1964; Brezeanu and Popescu - Marinescu, 1965; Popescu and Munteanu, 1962; Brezeanu and Prunescu-Arion, 1962; Popescu, 1963; etc).

The studies carried out in the '50s and '60s recorded 336 systematic elements of the benthic fauna (the Nematodes, Nemertins, etc., were not established to the species); as a rule, an increase in the number of species has been registered from upstream (141 species) down to the river mouth at the Black Sea (226 species).

The highest diversity was registered for Oligochaeta (52 species - 15.5%), Gastropoda (47 species - 14%), Bivalvia (38 species - 11.3%), Amphipoda (24 species - 7.1%), Chironomida (65 species - 19.3%), etc.

It is well known that the Danube is the most representative basin as far as European ichthyofauna is concerned: 83 native species and 9 alien ones. The lower sector is inhabited by 65 species, 75% of which form the object of the economic and game fishery. In the past few decades important changes have occurred within Danubian ichthyofauna; these modifications, analysed for the Danube Delta (Gomoiu and Munteanu, 1991) but which can be extended for the whole Romanian sector of the Danube, are as follows:

- the fish production and productivity are continuously decreasing;
- the drastic decrease, sometimes to extinction of the sturgeon and carp populations;
- the pike and zander populations are menaced to be continuously diminished;
- the populations of the bream and especially of the crucian carp - the opportunistic forms, have become dominant.

This preliminary study intends to describe the ecological state of the main river communities under specific conditions, considering that the species composition and their quantities (densities and biomasses) represent synthetic estimates of the Danubian biota response to various ecological pressures and impact. This methodological approach is well known; under the impact the natural communities change their structural organisation and functioning. As a rule, species composition being affected the community becomes simplified, dominated by the most resistant or by the opportunistic species.

For the phyto- and zoo-plankton as well as for zoobenthos the basic criteria to estimate the state of communities in the lower (Romanian) sector of the Danube River were the species composition, number of species and their abundance, as well as derivative structural parameters like species diversity, evenness, dominance, etc., within the association. Some parameters of the phytoplankton (photosynthetical pigments content), the suspended solids and their rations or correlation were also employed in the ecological assessment.

In addition, the monthly dynamics of the phytoplankton and benthos communities at Călărasi transect should explain the intensity and extent of the impacts open riverine biota.

1. MATERIAL AND WORKING METHODS

Biological samples were taken from 48 transects; a total of 73 biological stations were sampled (Appendix I), as follows:

- 54 stations for photosynthetic pigments (Chlorophyll) – 131 samples;
- 49 stations for phytoplankton – 49 samples;
- 46 stations for zooplankton – 101 samples;
- 58 stations for zoobenthos – 58 samples.

The sampling methods as well as the laboratory processing techniques of different biological samples will be presented bellow.

1.1. Chlorophyll

Water samples for chlorophyll analyses were collected with a plastic bucket, at 54 surface stations (Appendix I). 49 stations were located along the Danube River, 3 at the mouths of some of the most important tributaries and two of them on the Danube - Black Sea Canal. In 40 of these

stations the water column was sampled as well, with the help of 2 l Go-Flo bottles. Usually, two depth samples were collected in these stations, one from the intermediate layer and the second at twice the depth of the first one.

Between 125 and 1000 ml of homogenised water, depending on the suspended matter content, was filtrated on a 4.7 cm diameter Millipore filtration unit, using fiber glass Gelman filters. To prevent acidification of the filters a few drops of a 1% $MgCO_3$ suspension were added during filtration. The filters were packed in aluminium foil and stored deep frozen, immediately after filtration, until subsequent analyses at the central laboratory.

The method outlined by Parsons et al. (1984), adapted to the technical possibilities of our laboratory, was used to analyse the chlorophylls. After thawing, the filters were grounded with 90% acetone, in a glass mortar, transferred in a 50 ml centrifuge tube and, after a thorough shaking, allowed to stand overnight with about 20 ml of 90% acetone. The next day the content of each tube was brought to 30 ml, homogenised and centrifuged for 10 minutes at 4500 rpm.

The supernatant was decanted in a 25 ml, 1" path length spectrophotometer cuvette and extinctions measured at 750, 664, 647 and 630 nm, on a Hach DREL 2000 spectrophotometer. The use of a greater dilution volume and of a shorter path length spectrophotometer cuvette than those recommended by the method did not affect the analyses, the contents being usually much greater than the reported detection limit (Parsons et al., 1984), with one exception for Chlorophyll B and four for Chlorophyll C, when the respective amounts were under the detection limit of the used method.

Calculation of the amount of chlorophyll pigments was performed using the equations of the same authors (Parsons et al., 1984).

The total number of samples - 131, collected in 1995 in 58 stations along the Danube River at different depths of water has been analysed. Statistical parameters of the distributions of chlorophyll pigments are also calculated (Table 1).

Table 1. Chlorophylls ($\mu g.l^{-1}$) in the lower Danube River waters in June 1995. General statistics

Component	Depth	n	X_{min}	X_{max}	$\overline{X}$	s	M_d	C_V%
Chlorophyll A	Surface	57	1.71	42.61	11.26	7.340	10.48	65.20
	Intermediate	33	2.31	23.46	11.36	6.818	11.17	60.02
	Bottom	41	1.93	23.60	12.33	6.664	12.81	54.05
	Overall	131	1.71	42.61	11.62	6.970	11.57	59.98
Chlorophyll B	Surface	57	0.53	17.98	4.11	2.896	3.55	70.54
	Intermediate	33	0.71	9.42	4.13	2.571	3.28	62.19
	Bottom	41	Nl	9.84	4.65	2.526	5.03	54.35
	Overall	131	Nl	17.98	4.28	2.700	4.00	62.94
Chlorophyll C	Surface	57	Nl	6.20	1.73	1.002	1.72	57.94
	Intermediate	33	0.09	5.57	2.06	1.451	1.81	70.55
	Bottom	41	Nl	8.60	2.40	1.774	2.08	73.75
	Overall	131	Nl	8.60	2.02	1.416	1.83	69.98

Note: For statistical computation the concentrations of the not identified chlorophyll pigments were considered as equal with 0.0001 $\mu g.l^{-1}$.

Significance of notations:
- n – sample size;
- X_{min}, X_{max} – limits of the variation range;
- $\overline{X}$ – mean of the component;
- s – standard deviation;
- M_d – median of the concentrarions;
- Cv – coefficient of variation;
- Nl – Not detected

1.2. Phytoplankton

In 48 stations phytoplankton samples were collected from the surface of water (Appendix I), as a rule 500 cm^3 of sample being stored and preserved with neutralised formaldehyde 4% in plastic containers. In one station (Calarasi) 28 supplimentary samples have been collected in August '95, September '95, October '95, November '95, January '96, April '96; in each month 5 samples across the Danube River, at 25 m, 150 m, 300 m from the Romanian bank and at 50 m and 100 m from Bulgarian bank. All the 76 samples were analysed using sedimentation method, identifying and counting all algal cells at the inverse microscope. Phytoplankton biomass was determined by using the standard tables of weights (cell volumes multiplied by the density of cell content, always considered 1).

1.3. Zooplankton

During the Danube Cruise the zooplankton samples were collected by using a 25 µm mesh net with a rectangular opening of 1.000 cm^2 (25 x 40 cm) and a 10 l plastic bottle. Horizontal hauls from the surface water layer were obtained by gently pulling the net on 4 m in 60 s. In the case of strong currents the bucket was used: 100 l (10 buckets) water were filtered through the some net. Vertical hauls in the water column were performed using a 95µm mesh mini-net with a circular opening of 115 sq.cm. All the zooplankton samples were also preserved in buffered formaline. A total

number of 98 samples were collected during the Danube expedition (Appendix I).

Laboratory analyses of zooplankton samples consist in the following sequences:

- concentration of the samples;
- assessment of specific composition of the samples – determination of the populations' structure;
- counting all the organisms under microscope; by species, size classes, stages of development or sex groups;
- calculating densities and biomass (using standard tables with wet fresh weight).

1.4. Zoobenthos

Benthos samples were collected with a box-corer of 200 cm² (1/50 m^2) surface. The material (sediments and living organisms) was preserved with 4% formaline and stored in plastic bags doubled by cloth bags.

Laboratory analyses of the zoobenthos samples were carried out according to the usual methodology of benthos studies:

- the content of each plastic bag was discharged (for a short interval – 30-60 minutes) into a plastic basin containig top filtered water; this operation was done in order to soften the material and to prevent the possible damaging effects of the water jet on the tiny meiobenthic organisms during the washing;
- washing of the sample through two sieves – 1 mm and 0.1 mm mesh size in order to remove the mud and to separate macro- and meiozoobenthos; washing was done slowly, stirring very gently by hand to prevent damaging or loss of animals, and using a single fresh (tap) water jet from a low pressure hose; the sieve was gently shaken in water so that a flow occured from below and thus the animals were obtained in good conditions;
- all the material retained by the sieves was examined by the binocular microscope; all animals were extracted and the species or group of species were identified and counted (in order to determine the density of populations); the larger organisms were measured and weighed (for size class, structure and biomass); for smaller organisms, the average wet weights inscribed in standard tables were used to calculate the biomass.

2. DATA PROCESSING

Beside the usual statistical parameters, the data concerning the structure of phytoplankton, zooplankton or zoobenthos populations were totally or partially processed; in order to characterise the living organism associations in the Danube River, the following parameters had to be calculated:

1. **Number of occurrence** in stations for each species/organisms (abbreviated usually **Nocc)**;
2. **Constancy (C%)** - or continuity of appearance indicating the frequency of the species in the studied area or associations;
3. **Abundance (A)** - Total number of individuals counted on all stations/plots, or absolute number of the individuals of a certain species or group of species in an association;
4. **Dominancy (D%)** - or relative abundance, indicating the percentage of the number of the individuals belonging to a species or to a group of species from the total number of all species individuals in the samples from the studied area;
5. **Index of ecological significance (W)** - representing the relation between the constancy and abundance (density or biomas) was used to rank the species in the community or association, according to the decreasing importance in the system;
6. **Index of similarity (Sörensen) (Ss)** - reflects the degree of resemblance between the biocenoses from different stations;
7. **Index of coenotic affinity (Jaccard) (q)** - reflects the specific features of the biocenosis, permitting the assessment of affinities between species and characteristic species having the role of indicators;
8. **Indices of diversity (H), equitability (Eq and E'q) and informational energy (E'):**

$$H = -\sum p_i * \log_2 p_i$$

where:

- p_i – concentration (D or B) of each species (taxon) in the sample conceived as probability, that is:

$$p_i = N_i/N$$

with:

- N_i – number or biomass of the species individuals, and
- N – number or biomass of all individuals from the sample belonging to all species;

$$Eq = (e^{H-1})/(S-1)$$

where:

- S – number of all species in the sample;

$$E'q = H/H_{max}$$

where:

- H_{max} – index of the maximum diversity in the sample ($H_{max} = \log_2 S$);

$$E = \sum p_i^2$$

where:

For other parameters explanation will be given where necessary.

Using the biomass and density data, ecological index and parameters were calculated, not only for the entire Romanian sector of the Danube, but also for the various zones (established as a result of their physical-chemical, morphologic and biologic characters); for a better interpretation data have been represented in charts (for density and biomass).

The results of researches carried out in June 1995 in the lower (Romanian) sector of the Danube River, refering to the biota-chlorophyll, phyto and zooplankton, and benthos, will be presented and discussed in this paper according to the following manner:

***general view on the whole investigated Romanian Sector of the River course;**

***sectorial view taking into consideration different zones of the lower Danube namely:**

- **Iron Gates I** zone – 125.2 km (between Km 1072.4 and Km 947.2) covering the first reservoir at the Iron Gates; water discharge Q = 6555 $m^3.s^{-1}$ at a mean velocity of 0.57 $m.s^{-1}$; river inputs: Cerna;
- **Iron Gates II** zone – 81.2 km (between Km 947.2 and Km 866); water discharge Q = 7333 $m^3.s^{-1}$ at an average velocity of 0.87 $m.s^{-1}$; river inputs: Topolnita;
- **Middle zone I** – 242 Km (between Km 866 - Iron Gates zone II and Km 624 - Corabia) water discharge Q = 7863 $m^3.s^{-1}$ at an average velocity of 1.09 $m.s^{-1}$; river: Jiu;
- **Middle zone II** – 249 km (between Km 624 - Corabia and Km 375 - Călărasi); water discharge Q = 8378 $m^3.s^{-1}$, and average velocity of 1.95 $m.s^{-1}$; river inputs: Olt, Vedea, Arges;
- **Marshes zone** – 293 Km (between Km 375 - Călărasi - Km 85 - Mile 54+500); rivers inputs: Ialomita, Siret, Prut;
- **Danube Delta zone** – including the three distributaries (arms) of the Danube River: Chilia distributary (length 115 Km, Q = 3910 $m^3.s^{-1}$ and velocity 0.829 $m.s^{-1}$), Sulina distributary (length - 64 Km, Q = 1657 $m^3.s^{-1}$ and velocity 0.829 $m.s^{-1}$) and Sf. Gheorghe (St. George: length 108 Km, Q = 2130 $m^3.s^{-1}$ and velocity 0.867 $m.s^{-1}$).

***local/special view, taking into consideration only individual stations.**

3. RESULTS AND DISCUSSION.

3.1. Biota - chlorophyll, phyto- and zooplankton in the lower (Romanian) sector of the Danube River in June 1995

3.1.1. Phytoplankton pigments - Chlorophyll

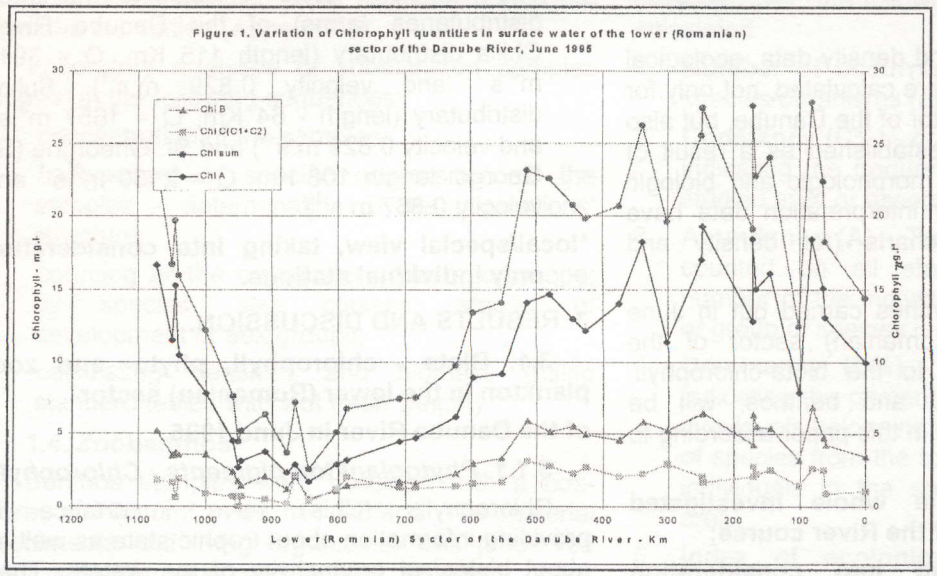
Chlorophylls (Chls) have importance in providing information about trophic state as well as about biological productivity of the waters. Their ratios together with the amount of particulate organic matter have also ecological value being a relative measure for the level of the functioning of the phytoplankton community. In June 1995, 131 water samples were analysed for chlorophyll (Appendix I). The distribution of photosynthetic pigment in the water varies along the investigated sector of the River Danube, the lowest values of concentration being registered between Km 950 and Km 600 (entire Iron Gates II zone) (Fig. 1) and the highest ones downstream and at Iron Gates I Reservoir. The distribution of Chlorophylls concentrations within river width and depth were also uneven, but on an average in June 1995 Chls had the following concentrations: 11.62 µg **ChlA** l^{-1}, 4.28 µg **ChlB** l^{-1} and 2.02 µg **ChlC** l^{-1} (Table 1). The concentrations of the basic photosynthetic pigment - **ChlA** are well correlated with **ChlB** and **ChlcC** as well as with the suspended solids containing not only particulate organic matter, but also fine mineral particle in suspension (Fig. 2).

Some statistical parameters of the **ChlA** in surface water from different zones of the investigated sector of the River Danube in June

Table 2. Some statistical parameters of the Chl A concentration in the surface water from different zones of the investigation course of River Danube in June 1995

Zones	Mean	SD	S V	Min.	Max.	n	CL (95.00%)
Whole studied sector	10.73	5.42	29.42	1.71	19.36	43	1.62
Iron Gates I	9.03	5.40	29.13	2.70	16.69	8	3.74
Iron Gates II	2.99	0.71	0.50	2.33	3.74	3	0.80
Middle zone I	3.85	1.57	2.46	1.71	6.15	6	1.26
Midlle zone II	12.01	2.46	6.03	8.92	14.66	6	1.96
Marshes zone	15.36	3.58	12.78	7.82	19.36	11	2.11
Danube Delta arms	12.88	3.30	10.89	8.92	18.92	9	2.16

Note: SD – Standard Deviation;
SV – Sample Variance;
n – number of appearance;
CL – Confidence Level;



1995 (Table 2) point - out that the largest variations of concentrations was recorded in the Iron Gates I zone (max/min. = 6.2), where there were both lotic and lentic conditions; in the zones where the conditions are relativly constant the ratio between maximum and minimum concentrations are much lower (e.g., 1.6 at the Iron Gates II, where the **Chls** have very low concentration and at the Middle zone II).

On the basis of the data recorded in June 1995, the Chls concentrations can meet one of the following major situations:

*–high concentrations – high variations: diversity of conditions;

*–low concentrations – low variations: severe but stable conditions (ecological pressure is high and relatively constant);

*–high concentrations – low variations: good and stable condition for phytoplankton development.

Downstream of Iron Gates II the concentrations of Chls are slightly increasing.

Photosynthetic pigment concentrations are very well correlated with phytoplankton biomasses (Fig. 3).

3.1.2. Phytoplankton

In June 1995 in the lower (Romanian) sector of the River Danube 153 species were recorded (Appendix II) which can be grouped in the following taxonomic categories:

- Cyanobacteria 20 species – 13.07%
- Euglenophyceae 11 species – 7.19%
- Pyrophyceae 5 species – 3.27%
- Heteroconteae 1 specie – 0.65%
- Bacillariophyceae 75 species – 49.02%
- Chlorophyceae 41 species – 26.80%

If the species recorded during the monthly monitoring at Călărasi profile, other than those listed during the June '95 campaign are added, then the total number of phytoplankters present in the lower sector of the River Danube in 1995 is 197, as follows:

- Cyanobacteria 24 species – 12.18%
- Euglenophyceae 11 species – 5.58%
- Pyrophyceae 6 species – 3.05%
- Heteroconteae 1 specie – 0.51%
- Bacillariophyceae 99 species – 50.25%
- Chlorophyceae 56 species – 28.43%

Only the primary list of species (Appendix II) will be taken into consideration below when the discussion of results is made.

Fig. 2. Chlorophyll – Correlations

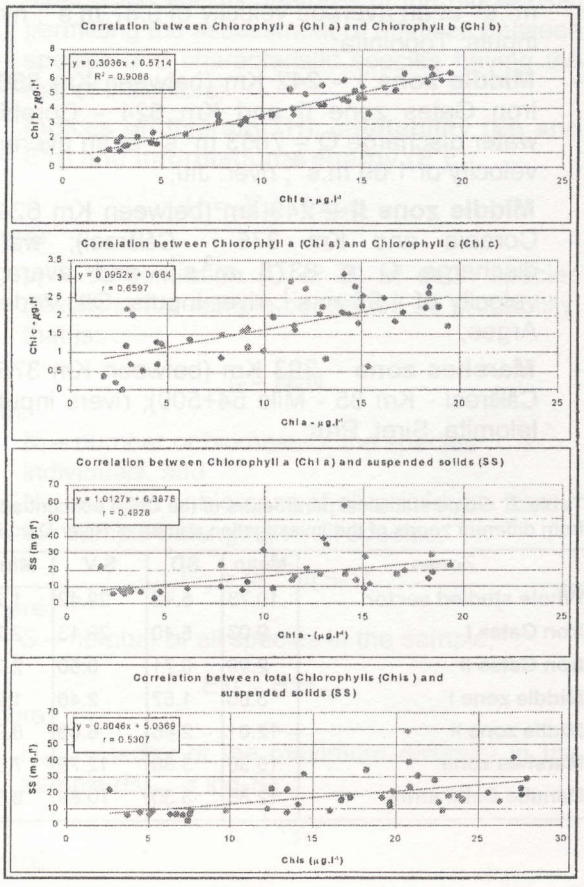
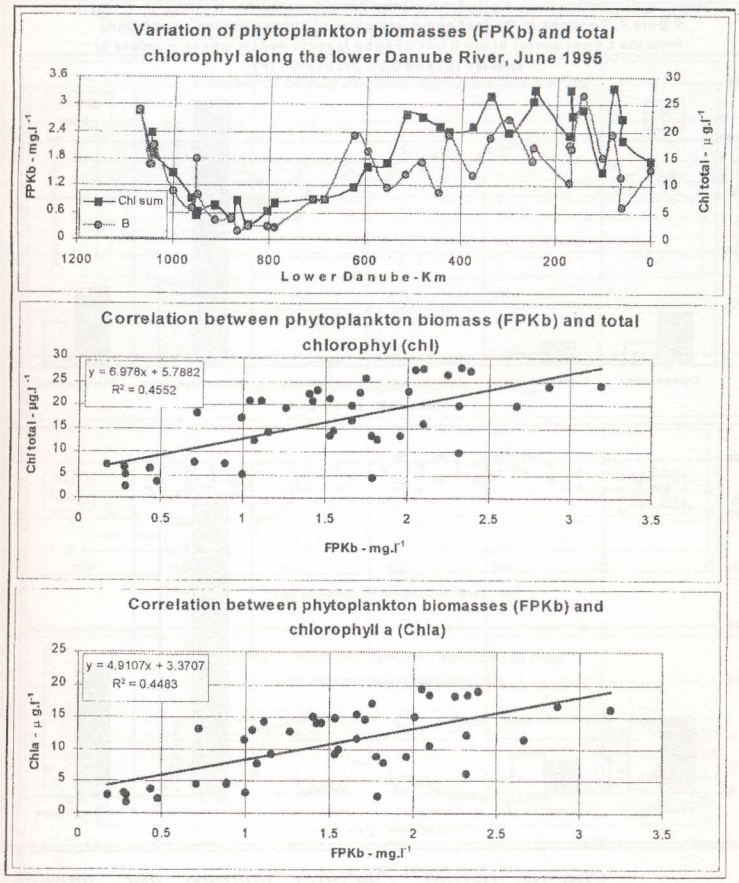


Fig. 3. Phytoplankton and Chlorophyll



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In comparison with historical data (Oltean, 1967) the number of species recorded in 1995 represents about 40% of those existing in 1960s (Fig. 4). Many species are very rare and their occurrence can be registered only in one or two stations (Fig. 5); the most common species having a high frequency in the lower (Romanian) sector of the River Danube are: *Trachelomonas verrucosa* and *T. volvocina* among Euglenophyceae, *Dactylococcopsis acicularis* and *Oscillatoria tenuis* among the Cyanobacteria, *Cyclotella chetoceras, C. kutzingiana, C. meneghiniana, Asterionella formosa, A. acus, Nitzschia palea, N. acicularis,* etc. among the Bacillariophyceae, *Actinastrum hantzschii* and *Chlorella vulgaris* among the Chlorophyceae, etc. (Appendix II) .

On the average, in each station/sample can be found 24 taxonomic units; the lowest number of species in the phytoplankton populations were recorded in the sector downstream of Iron Gates II (St. D 7716), were only 8 species form an association dominated by *Trachelomonas volvocina* and *T. verrucosa*. In the richest stations up to 37 species can be counted (St. D 7753, St. D 7754) the structure of phytoplanktonic association consisting of 1-2 species of Cyanobacteria, 2 common species of Euglenophycea (*Trachelomonas verrucosa* and *T. volvocina*), up to 25 species of Bacillariophyceae, up to 9 species of Chlorophyceae etc.Danubian phytoplankton samples studied in 1995 are mostly heterogeneous; only in three cases the resemblance between phytoplanktonic communities is better, the index of similarity being greater than 75%. Similitude of the specific structure of phytoplankton populations from different sectors of the lower Danube Delta is as follows:

– 65% between the two extreme zones, Iron Gates I and Danube Delta, and between the two adjacent middle zones (Km 866 – Km 624 Corabia and Km 624 – Km 375, Calarasi);

– the phytoplanktonic populations from the middle zones are similar to those from the next zone downstream (Marshes zone) in a proportion of 63 – 64%;

– the last zone Iron Gates II is connected with the other zones already presented only in a proportion of 46%. (Table 3).

a. If the populations of the taxonomic groups are taken into consideration, then we can observe the similitude among different sectors varies from one group to another, better resemblance being observed between Iron Gates I and Danube Delta and Iron gates II - Middle zone II - Marshes zone for Cyanobacteria, among almost all sector for Bacyllariophyta and between Middle zone II - Marshes zone for Chlorophyceae (Table 3).Resemblance of phytoplanktonic populations from different sectors of lower Danube River is given by 91 species, as out of 153 taxonomic units recorded (Appendix II), 11 forms were found only in tributary rivers and 51 forms are grouped strictly in different sectors, as follows:

a. species found only in the Iron Gates I: *Merismopedia glauca, Oscillatoria chalybea,*

Phormidium molle, *Peridium cinctum*, *Surirella linearis*, *Ankistrodesmus longissimus*, *Penium minutum*;

b. species found only in the Iron Gates II: *Cosmarium reniforme*;

c. species found only in the Middle zone I: *Cylindrospherum maius*, *Gomphospheria aponina*, *Eunotia lunaris*, *Crucigenia fenestrata*, *Scenedesmus bicaudatus*, *Scenedesmus quadricauda* var. *maximus*, *Surirella ovata*;

d. species found only in the Middle zone II: *Achnanthes inflata*, *Achnanthes microcephala*, *Eunotia tridentula*, *Hantzschia amphioxys*, *Nitzschia lorenziana* var. *subtilis*, *Surirella linearis* var. *constricta*, *Synedra affinis*, *Synedra nana*, *Synedra ulna* var. *oxynhynchum*, *Chodatella longiseta*, *Pediastrum duplex*;

e. species found only in the Marshes zone: *Merismopedia tenuissima*, *Microcystis flos-aquae*, *Oscillatoria limosa*, *Euglena intermedia*, *Ceratoneis arcus*, *Gyrosigma scalproides*, *Melosira angustissima*, *Melosira varians*, *Nitzschia filiformis*, *Nitzschia hungarica*, *Surirella ovata*, *Ankistrodesmus falcatus*, *Chodatella quadriseta*, *Closterium gracile*, *Oocystis naegeli*, *Tetrastrum staurogeniaeforme*;

f. species found only in the Danube Delta zone: *Aphanizomenon flos-aquae*, *Microcystis aeruginosa*, *Oscillatoria formosa*, *Euglena pisciformis*, *Melosira italica*, *Nitzschia tryblionella*, *Coelastrum microporum*;

g. species found only in the tributary rivers: *Euglena gracilis*, *Euglena oxyuris*, *Euglena viridis*, *Phacus pyrum*, *Diatoma vulgare* var. *linearis*, *Navicula rhynchocephala*, *Neidium productum*, *Eudorina elegans*, *Golenkinia radiata*, *Pediastrum duplex* var. *reticulatum*, *Scenedesmus acuminatus tortuosus*.

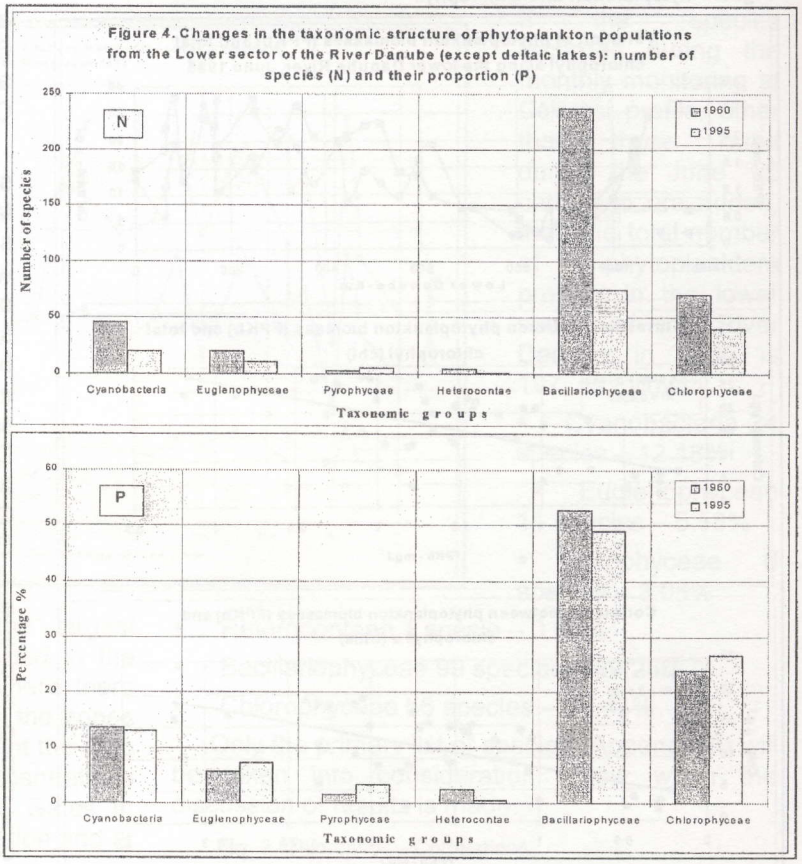


Figure 4. Changes in the taxonomic structure of phytoplankton populations from the Lower sector of the River Danube (except deltaic lakes): number of species (N) and their proportion (P)

The quantitative aspect of the phytoplankton populations will be discussed using some analytical and synthetical indices. The index of diversity, reflecting in a concentrated form the relation between the number of species and their abundance, gives emphasis to low and slightly variable values of phytoplankton populations; the lowest indices of diversity were calculated for the Iron gates II zone (Fig. 6).

Constancy (C%) index which points out that few species have a frequency higher than 50%, in correlation with the abundance (A) permits the calculation of ecological significance index (W), and then the rank of each species into the community association.

In the whole investigated sector of the Danube River, out of 153 species, only 19 (12.4%) have a frequency higher than 50% and 7 species (4.6%) a frequency ranging between 25 - 50%.

The first 12 species ranked in

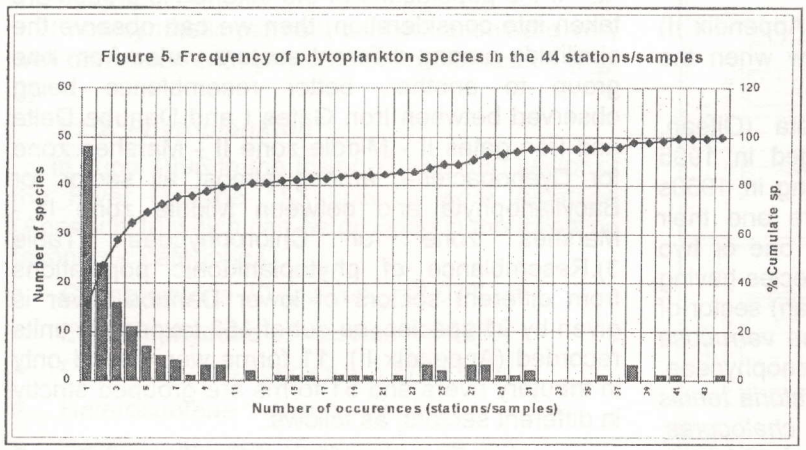
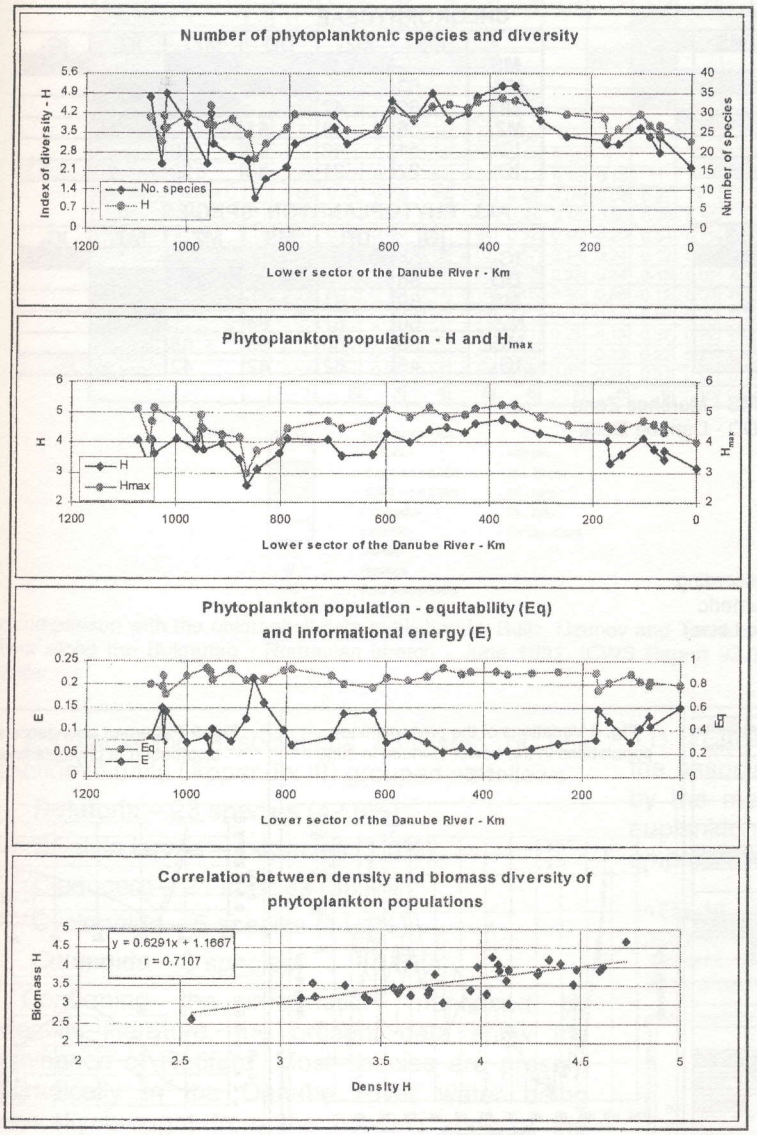


Figure 5. Frequency of phytoplankton species in the 44 stations/samples

Fig. 6 Variation of phytoplanktonic population diversity in the lower Sector of the Danube River in June 1995



accordance with their ecological significance totalize more than 62% of density and biomass. The following 8 species hold a rank both in number and weight: *Cyclotella chaetoceras* (rank 1 in densities → rank 1 in biomasses), *Trachelomonas volvocina* (2→7), *Ciclotella kützingiana* (3→6), *Trachelomonas verrucosa* (4→2), *Actinastrum hantschi* (5→8), *Cyclotela meneghiniana* (7→12), *Asterionella formosa* (8→4) and *Asterionella gracillima* (11→11); *Cyclotella operculata* (rank 6), *Cyclotella glomerata* (9), *Chlorella vulgaris* (10) and *Nitzschia palea* (12) are also ranked among the first 12 species significant for densities and *Melosira granulata* (3), *Tribonema ulotrichoides* (5), *Nitzschia actinastroides* (9) and *Melosira granulata* var. *angustissima* (10) for biomasses.

Taking into consideration the sector of the lower Danube River, new species, besides the 16 ones mentioned at the general ranking, enter the classification (*Synedra ulna*, *Oscillatoria tenuis*, *Cyclotella comta*, *Elakatothrix linearis* etc.); grouped in taxonomic categories, the first five ranked phytoplanktonic species in different sectors illustrate very clearly their ecological importance (Fig. 7). In the Iron Gates I and Danube Delta zones the most significant group is Bacillariophyta, Cyanobacteria are representative for Iron Gates II, while the Euglenophyta are dominant in Iron Gates II, and the Middle zone (Fig. 7).

Phytoplankton abundance in the lower Danube River waters determined in June 1995 is sufficiently low, on an average 455 cell.l^{-1}, varying between 45-1.324 cell.l^{-1}, (Fig. 8); the dominant group is Bacillariophyta (12-990 cell.l^{-1}), followed in order by Cyanophyta (4-258 cell.l^{-1}), Euglenophyta (0.0-239cell.l^{-1}), Cyanobacteria (0.0-60.0 cell.l^{-1}), Heteroconta (0.0-28.0 cell.l^{-1}) and Pyrophyta (0.0-8.0 cell.l^{-1}). The biomasses are also reduced varying between 0.18-3.19 mg.l^{-1} (Fig. 8).

As a rule, the highest values of total phytoplankton are recorded in the Iron Gates I Reservoir, and the next downstream zone, where the maxima of Cyanobacteria occur; the richest populations of primary producers are developing in the zone of marshes, downstream of Calarasi (Fig. 9).

Some information on the relationship between different components (photosynthetic pigments, taxonomic groups) or different parameters of phytoplankton could be obtained from the correlation coefficients (Table 4). The total biomass of phytoplankton is the most representative parameter, having significant correlations with chlorophyll (A, B and total), total phytoplankton density, number of Heterocontae, Bacillariophyceae and Chlorophyceae, weight of Bacillariophyta and Chlorophyceae.

3.1.3. Zooplankton

In the lower (Romanian) sector of the Danube River in June 1995 the zooplankton was investigated by collecting and processing 101 samples taken mostly from the surface layer of the water.

Table 3. Similarity (>60%) of phytoplanktonic populations from different zones of the lower sector of the River Danube in June 1995

CYANOBACTERIA

	IG_1	DD	IG_2	MZ_2	MZ_1	MS
IG_1						
DD	63					
IG_2	27	33				
MZ_2	46	50	67			
MZ_1	35	25	60	40		
MS	14	15	28	18	18	

CHLOROPHYCEAE

	MS	MZ_2	DD	MZ_1	IG_1	IG_2
MS						
MZ_2	63					
DD	60	47				
MZ_1	56	48	51			
IG_1	51	48	52	40		
IG_2	27	21	38	30	20	

BACILLARIOPHYCEAE

	DD	MZ_1	IG_1	MS	MZ_2	IG_2
DD						
MZ_1	76					
IG_1	70	74				
MS	67	73	68			
MZ_2	59	65	65	65		
IG_2	64	55	59	47	44	

ALL PHYTOPLANKTON SPECIES

	IG_1	DD	MS	MZ_2	MZ_1	IG_2
IG_1						
DD	65					
MS	60	61				
MZ_2	60	57	64			
MZ_1	58	60	63	65		
IG_2	45	52	42	42		

Abreviations: IG_1 - Iron Gates I; IG_2 - Iron Gates II; MZ_1 - Middle Zone I; MZ_2 - Middle Zone II; MS - Marshes Zone; DD - Danube Delta

Fig. 7. The first five phytoplanktonic species ranked according to their ecological importance (W) and their relative numeric dominance (summend by taxonomic groups) (D) of the Lower Danube sectors

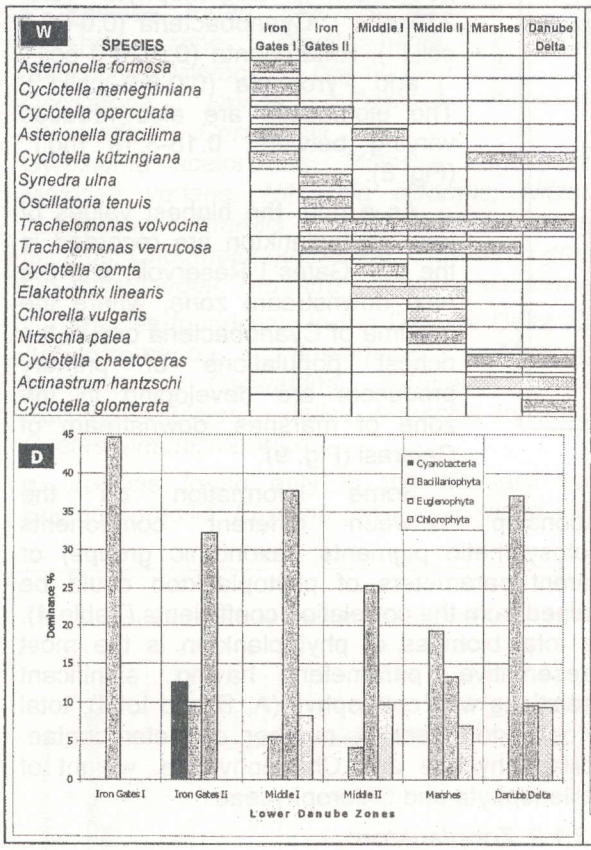


Fig. 8 Variations of the phytoplankton populations in the Lower Danube in June 1995

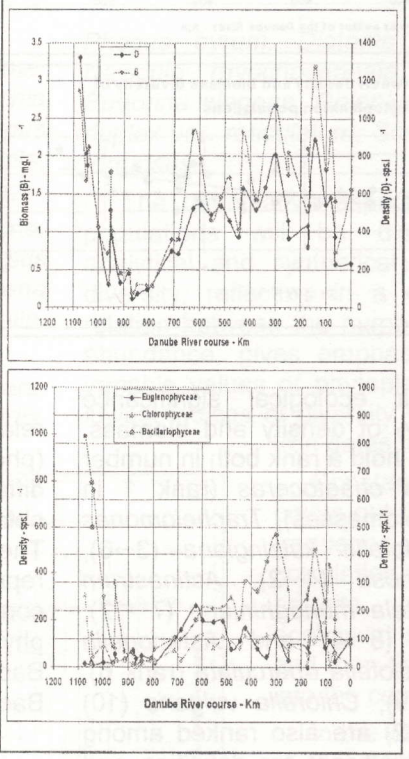


Fig. 9 Pattern of abundance and distribution of phytoplankton

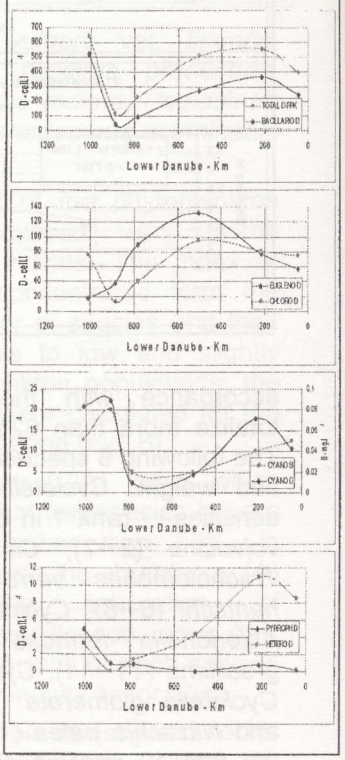


Table 4. Phytoplankton coefficients of correlation

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
Chlorophyll A	1	1																			1
Chlorophyll B	2	0.95	1																		2
Chl C(C1+C2)	3	0.66	0.74	1																	3
Chl total	4	0.99	0.98	0.74	1																4
Phytoplankton D	5	0.54	0.49	0.36	0.53	1															5
Cyanophyceae D	6	0.16	0.17	-0.08	0.15	0.49	1														6
Euglenophyceae D	7	0.09	0.14	0.29	0.13	0.23	-0.08	1													7
Pyrophyceae D	8	-0.35	-0.31	-0.40	-0.36	-0.21	-0.13	-0.36	1												8
Heterokontae D	9	0.44	0.42	0.32	0.44	0.35	0.12	0.15	-0.15	1											9
Bacillariophyceae D	10	0.50	0.44	0.29	0.49	0.94	0.46	-0.04	-0.08	0.27	1										10
Chlorophyceae D	11	0.40	0.37	0.26	0.39	0.68	0.33	0.18	-0.30	0.28	0.50	1									11
Phytoplankton B	12	0.67	0.66	0.49	0.67	0.84	0.32	0.40	-0.20	0.54	0.73	0.58	1								12
Cyanophyceae B	13	-0.17	-0.12	-0.33	-0.18	0.03	0.57	-0.14	0.24	-0.12	0.03	0.03	-0.03	1							13
Euglenophyceae B	14	0.10	0.12	0.27	0.13	0.23	-0.09	0.93	-0.34	0.18	-0.02	0.15	0.42	-0.21	1						14
Pyrophyceae B	15	-0.14	-0.12	-0.18	-0.14	-0.16	-0.18	-0.38	0.88	-0.12	0.00	-0.33	-0.08	0.08	-0.35	1					15
Heterokontae B	16	0.45	0.41	0.31	0.45	0.26	0.11	0.06	-0.15	0.88	0.20	0.23	0.45	-0.15	0.11	-0.07	1				16
Bacillariophyceae B	17	0.61	0.62	0.46	0.62	0.86	0.31	0.25	-0.13	0.37	0.82	0.50	0.93	-0.01	0.25	0.02	0.23	1			17
Chlorophyceae B	18	0.49	0.41	0.16	0.46	0.42	0.26	0.06	-0.23	0.22	0.31	0.65	0.50	-0.01	0.05	-0.26	0.24	0.32	1		18
SS (mg/l)	19	0.54	0.51	0.28	0.53	0.10	0.02	0.07	-0.26	0.21	0.07	0.13	0.20	-0.14	0.06	-0.17	0.13	0.13	0.35	1	19
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	

Note: n = 43

	Confidence limits
r > 0.49	- >99.9%
0.394 < r < 0.490	- 99 - 99.9%
0.305 < r < 0.393	- 95 - 99%
r - negative	- 95 - 99%
r < 0.393	- not significant
D	Density
B	Biomass
SS	Solid suspensions

In comparison with the chlorophyll data published by Buijs, Uzunov and Tzankov in April 1992 (Water quality profile of the Danube River along the Bulgarian - Romanian stretch - June 1991, ICWS Report 92.01, Amsterdam), the present data, are sufficiently similar.

Zooplanktonic associations consisted of 554 taxonomic units (Appendix III) grouped as follows:

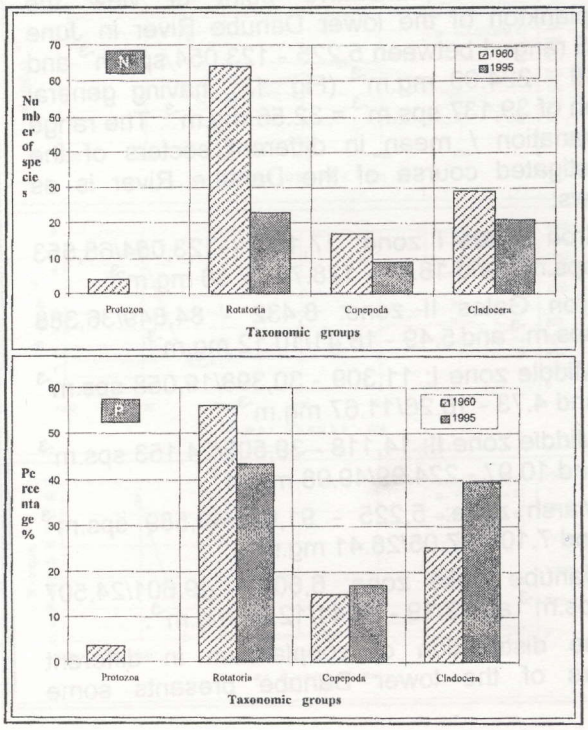
- Rotatoria – 23 species (42.6%);
- Bivalvia larvae – 1 species (1.8%);
- Cladocera – 21 species (38.9%);
- Cyclopoida – 6 species (11.1%);
- Calanoida – 3 species (5.6%).

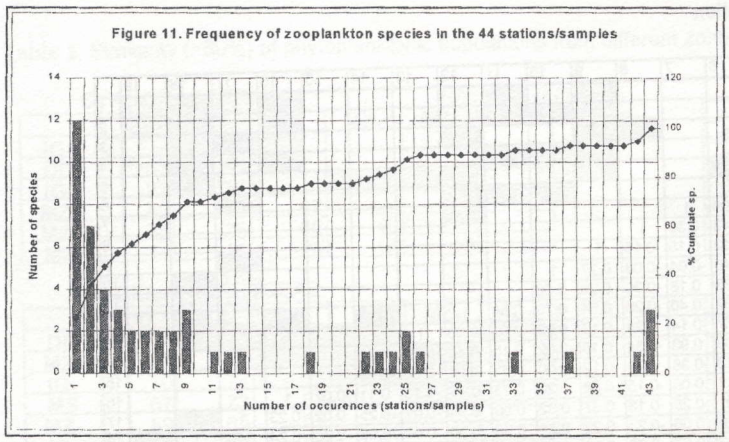
Confirming the information mentioned by scientific literature, the present data show the dominance of Rotifera. Most species are present sporadically in the Danube River water being generally brought from the flooding zone of the River. There are some species common for the whole lower course of the Danube River: *Brachionus calyciflorus f. amphiceros, B. c. var. dorcas, Asplanchna herricki, Keratella quadrata* and *K. cochlearis*.

The actual qualitative structure of zooplankton associations compared with that mentioned in the literature 30 years ago (Enăceanu, 1967) is much modified, the general diversity being very low, less than half of that existing ones in 1960 (Fig. 10). The most important losses are in the Rotatoria group, where almost 2/3 of the species were not seen in 1995. The effect of these losses is the change in the proportion of different taxonomic groups; in 1995 the proportion of Cladocera and Copepoda is higher than in 1960s (Fig. 10).

The most important part of the zooplankton taxonomic units have a very low frequency, being found in 1 - 5 places along the lower Danube (Fig. 11); in this case there is a sufficient uniformity in the associations which are dominated everywhere by the meroplanktonic larvae of Bivalvia and by euplanktonic forms *Brachionus calyciflorus f. amphiceros* and *Acanthocyclops bisetosus*; the

Fig. 10 Changes in the taxonomic structure of zooplankton populations from the Lower Danube (except deltaic lakes): number of species (N) and their proportion (P)





number of Rotatoria is high and represents sometime approximately 90% from the population (Fig. 12).

According to the data published by Buijs et al.(1992) in June 1991, the zooplankton of the lower Danube River encompassed by Km 834 and Km 375 consisted of 31 taxa, the Rotatoria and Copepoda prevailing. The authors mention that the species composition at that time was richer than in May 1990 (Pehlivanov, 1991) indicating better trophic conditions. Now, in our turn in June 1995 we found a "richer" diversity in zooplankton populations than in June 1991 (in the some sector 32 taxa, but 6 species are not common in 1991 and 1995). Can we say that the ecological conditions in the Danube have become better? No, we do not think so; even if the number of species is a bit higher, the low occurrence of many forms and the strong dominance of few species are symptoms of a maladive planktonic system.

From the quantitative point of view the zooplankton of the lower Danube River in June 1995 ranged between 5,225 - 123,054 sps.m^{-3} and 2. 19 - 224.99 mg.m^{-3} (Fig. 13), having general mean of 39,137 sps.m^{-3} = 32.56 mg.m^{-3}. The range of variation / mean in different sectors of the investigated course of the Danube River is as follows:

- Iron Gates I zone: 17,100 - 123,054/68,553 sps.m^{-3} and 18.64 - 128.76/72.36 mg.m^{-3};
- Iron Gates II zone: 8,432 - 84,849/36,388 sps.m^{-3} and 5.49 - 18.41/10.12 mg.m^{-3};
- Middle zone I: 11,309 - 30,398/19,058 sps.m^{-3} and 4.73 - 18.26/11.67 mg.m^{-3};
- Middle zone II: 14,118 - 39,502/24,153 sps.m^{-3} and 10.97 - 224.99/49.98 mg.m^{-3};
- Marsh zone: 5,225 - 91,620/49,589 sps.m^{-3} and 7.10 - 47.05/28.41 mg.m^{-3};
- Danube Delta zone: 6,609 - 49.601/24,507 sps.m^{-3} and 2.19 - 24.41/12.04 mg.m^{-3}.

The distribution of zooplankton in different sectors of the lower Danube presents some features which are very well illustrated by the average curves of variation (Fig. 14) as follows:

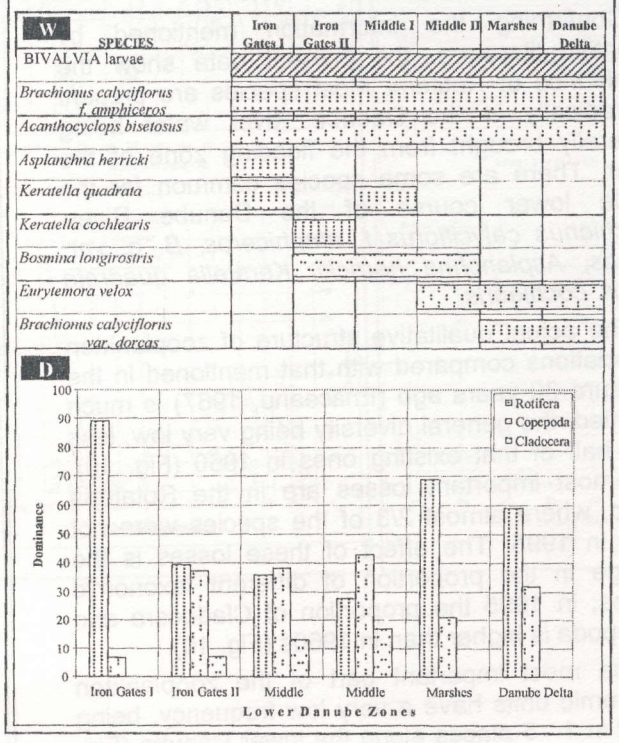
– Rotatoria and Copepoda have the most numerous populations in the Iron Gates I and Marsh (Calarasi – Braila) sectors;

– Cladocera populations generally decreases downstream in the Iron Gates I sector.

Although the densities and biomasses recorded in June 1995 are higher than those found by Buijs et al. (1992) in 1991 in the some sector (600 - 20,120/9.340 sps.m^{-3} us 11,309 - 39,502/21,532 sps.m^{-3}) they are very low in comparison with the situation recorded between 1958 - 1952, that is the densities were in 1955 lower, approximately 30 times smaller for Rotatoria, 23 times for Cladocera and 35 times for Copepoda; on an average the biomass of zooplankton in June 1995 was 32.56 mg.m^{-3}, while in 1958 was 2.055 mg.m^{-3}, that is 63 times higher.

Generally, due to the small number of species in the stations (ranging between 3 - 17 with a mean of 10 species per sample) and the strong domination of a few forms, the common, opportunistic ones, the diversity of zooplanktonic

Fig. 12 The first five zooplanktonic species ranked according to their ecological importance (W) and their relative (Bivalvia larvae excluded) numeric dominance (summed by taxonomic groups) (D) of the Lower Danube sectors.



populations is low (Fig. 15); the index of diversity computed for densities is usually smaller than that of biomasses, e.g. at the stations D 7803, where 17 species (H_{max} = 4.087) form the zooplanktonic association, H = 0.202 for density and H = 1.196 for biomass and at the station D 7772, where there are only 3 species (H_{max} = 1.585), H = 0.782 for density and H = 1.215 for biomass. Likewise the equitability within the zooplanktonic population is lower than that of the phytoplankton populations for both density and biomass (Fig. 15). General tendency of the planktonic population diversity is decreasing downstream.

Low diversity and very few dominants maintain a sufficient resemblance between the zooplanktonic associations from different sectors, a sort of uniformity; the analysed situation reveals the fact that in 5% of cases similarity was over 75%, in 58% of cases, 50 - 75%, in 22% of cases 35 - 55% and in 14% of cases the index of similarity was below 35%.

From the analysis of the index of affinity we found that the many species of the zooplankton community in the lower Danube River waters are "independent"; only in 2.5 of the analysed cases the affinity was greater of 50% the main pairs of involved species being as follows:

- *Filinia comta* - *Brachionus diversicornis* var. *homoceros* (100);
- *Scapholeberis kingi* - *Pleuroxus laevis* (100);
- *Eurytemora velox* - *Acanthocyclops bisetosus* (91);
- *Acanthocyclops crassicaudas* - *Brachionus leydigi* var. *rotundus* (100).

The zooplankton populations are rather well correlated with those of the total phytoplankton (Table 5); the overlap of the curves for quantitative variations of planktonic populations found in June 1995 along the lower sector of the Danube River clearly illustrated that the curve of phytoplankton density is more or less parallel with that of zooplankton density (the two populations have a better numerical correlation), while the curves of biomasses have different patterns of variations (Fig. 16). It is worth to mention that the zooplankt

Fig. 13 Quantitative variations of the zooplankton populations in lower (Romanian) sector of the River Danube in June 1995

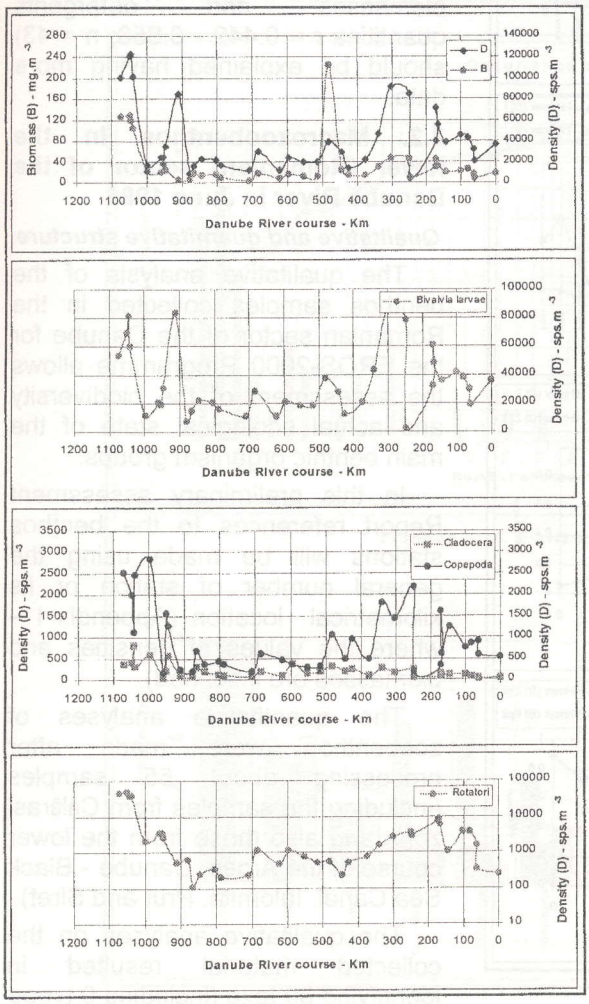


Fig. 14 Patterns of abundance and distribution of zooplankton in the Romanian sector of the River Danube in June 1995

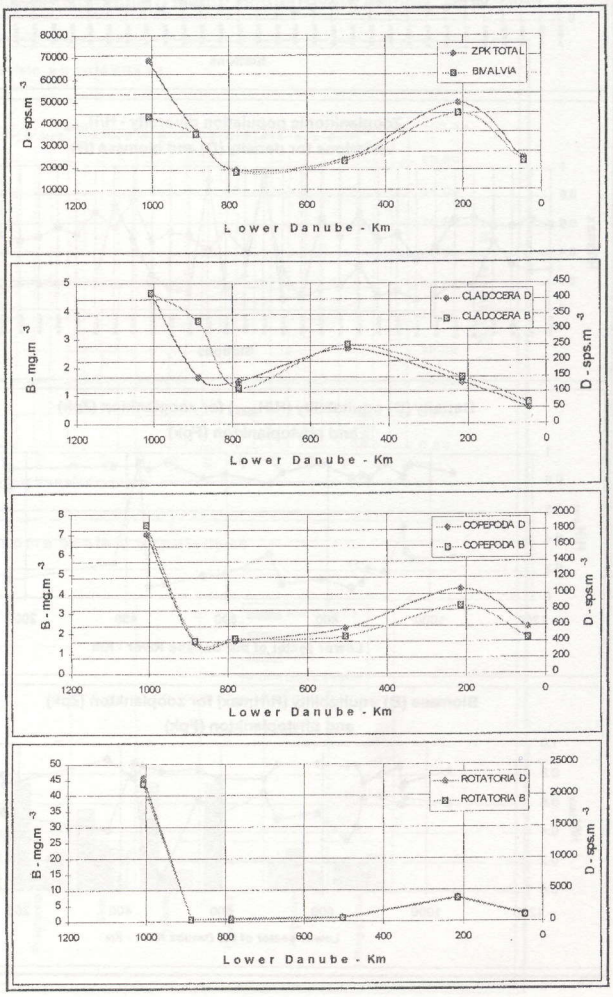


Table 5 Zooplankton coefficients of correlation

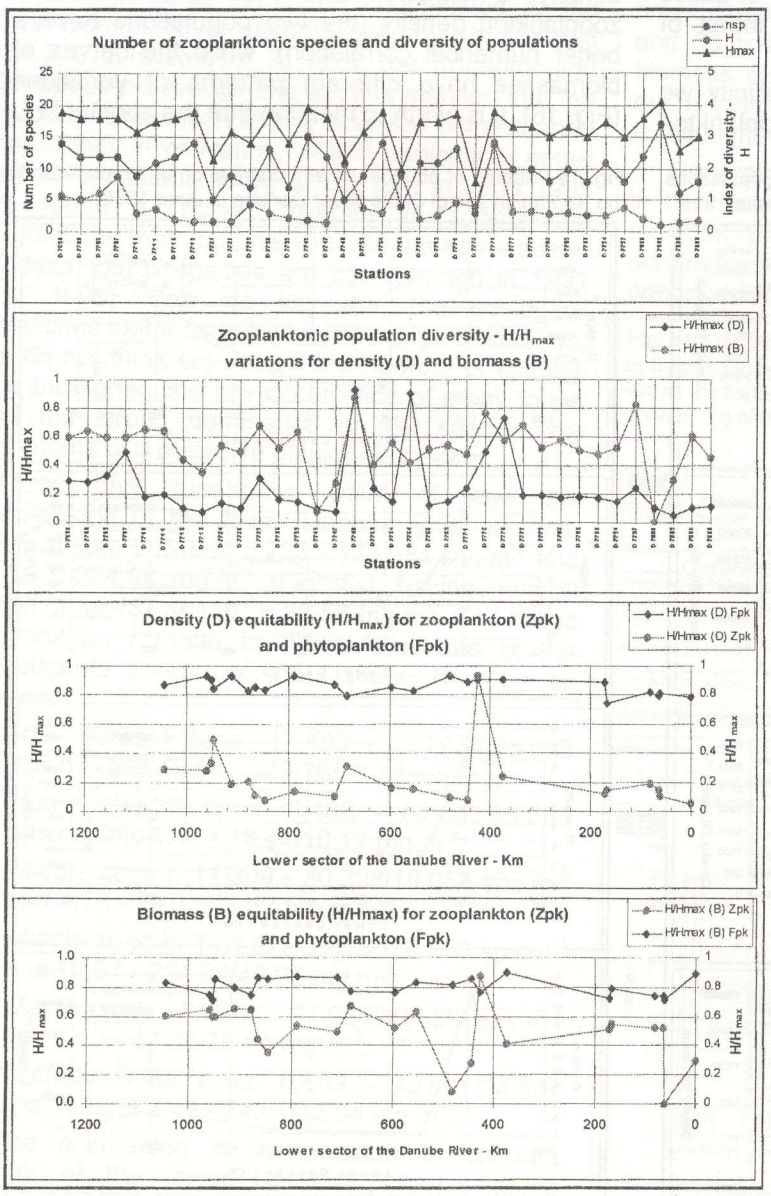
		1	2	3	4	5	6	7	8	9	
Phytoplankton D	1	1									1
Phytoplankton B	2	0.84	1								2
Zooplankton D	3	0.54	0.35	1							3
Zooplankton B	4	0.48	0.29	0.63	1						4
Rotatoria D	5	0.62	0.29	0.79	0.66	1					5
Bivalvia D	6	0.40	0.31	0.94	0.50	0.54	1				6
Cladocera D	7	0.33	0.07	0.49	0.54	0.55	0.36	1			7
Copepoda	8	0.54	0.42	0.60	0.52	0.56	0.50	0.59	1		8
Detergents	9	0.06	0.05	-0.03	0.44	-0.09	0.00	0.07	0.05	1	9
		1	2	3	4	5	6	7	8	9	

Note: n = 43

D
B

Confidence limits
$r > 0.49$ – >99.9%
$0.394 < r < 0.490$ – 99 – 99.9%
$0.305 < r < 0.393$ – 95 – 99%
$r < 0.393$ – not significant
Density
Biomass

Fig. 15 Zooplankton population diversity



zooplankton densities are better correlated with the densities of Bacillariophyta ($r = 0.696$; $n = 43$) and they have negative correlation with Euglenophyta densities ($r = -0.307$; $n = 43$). The sufficiently strong correlation between zooplankton (especially Rotatoria) biomasses and detergents quantities $r = 0.442 - 0.653$; $n = 43$) should be explained having more data.

3.2. Macrozoobenthos in the lower (Romanian) sector of the Danube River in June 1995

Qualitative and quantitative structure

The qualitative analysis of the benthos samples collected in the Romanian sector of the Danube for the EROS-2000 Programme allows the assessment of the biodiversity and actual ecological state of the main benthic organism groups.

In this preliminary assessment Report references to the benthos stations will be made using the general number of station or its kilometrical location (Appendix I – where the values of densities and biomasses are inscribed).

The quantitative analyses of zoobenthos were made after processing about 55 samples (including the samples from Călărasi zone and also those from the lower course of the Arges, Danube - Black Sea Canal, Ialomita, Prut and Siret).

The qualitative analyses on the collected material resulted in identifying 39 taxa (including 9 types

Fig. 16 Variations of phytoplankton (FPK) and zooplankton (ZPK) densities (D) and biomasses (B) along the lower Danube River in June 1995

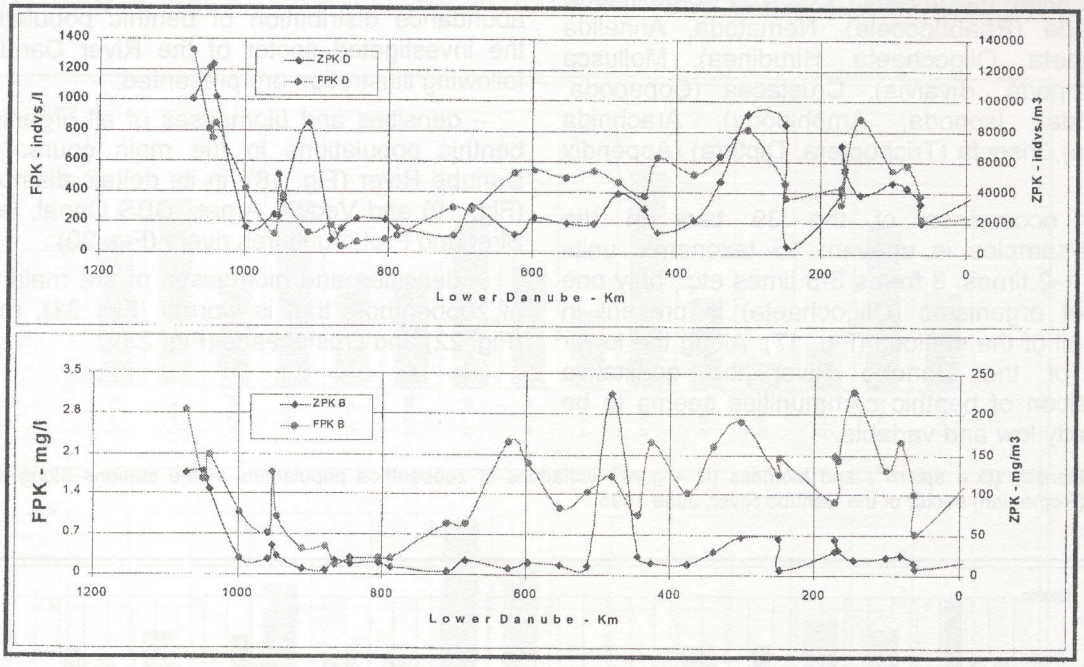
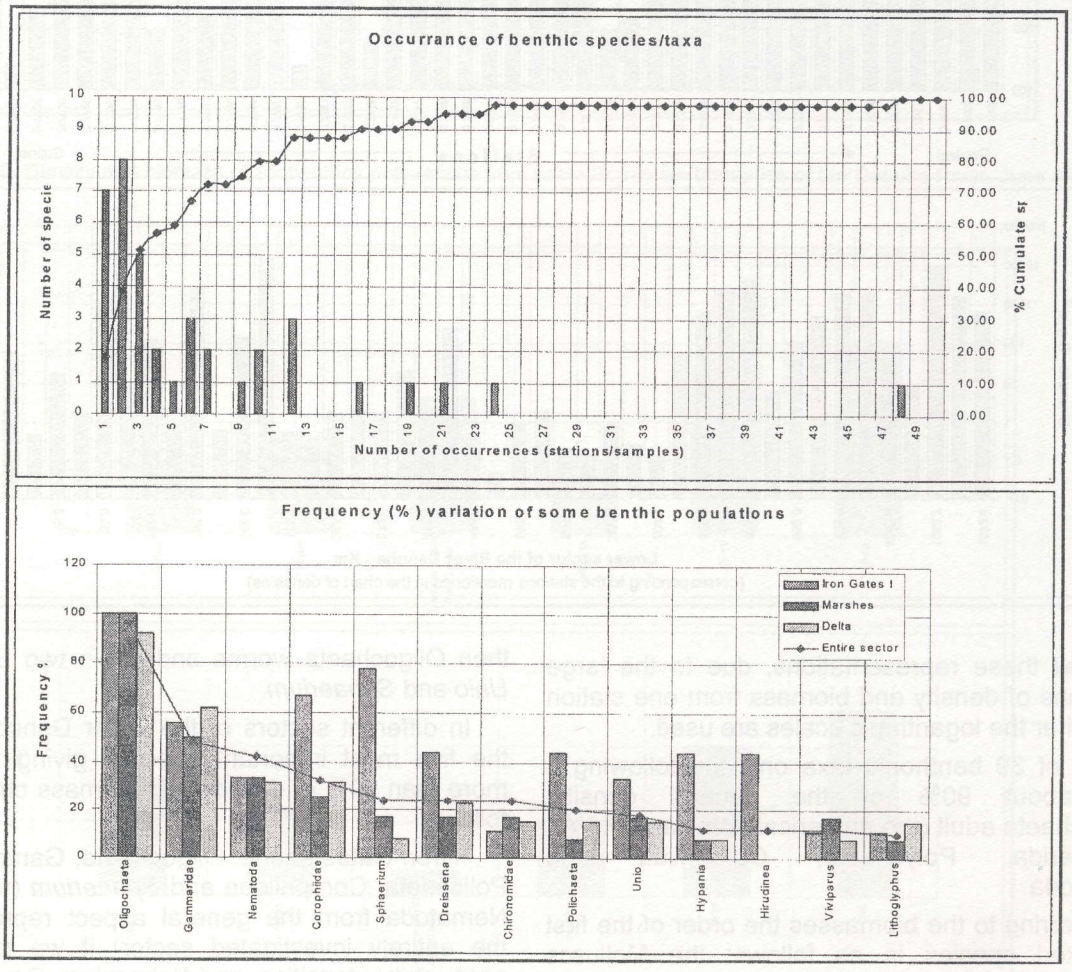


Fig. 17 Frequency of zoobenthos populations along the lower (Romanian) sector of the River Danube, June 1995



of developmental stages of some taxa) belonging to the following groups: Protozoa-Foraminifera, Turbellaria (Rhabdocoela), Nematoda, Annelida (Polychaeta, Oligochaeta, Hirudinea), Mollusca (Gasteropoda, Bivalvia), Crustacea (Copepoda, Ostracoda, Isopoda, Amphipoda), Arachnida (Acarina), Insecta (Trichoptera, Diptera) (Appendix IV).

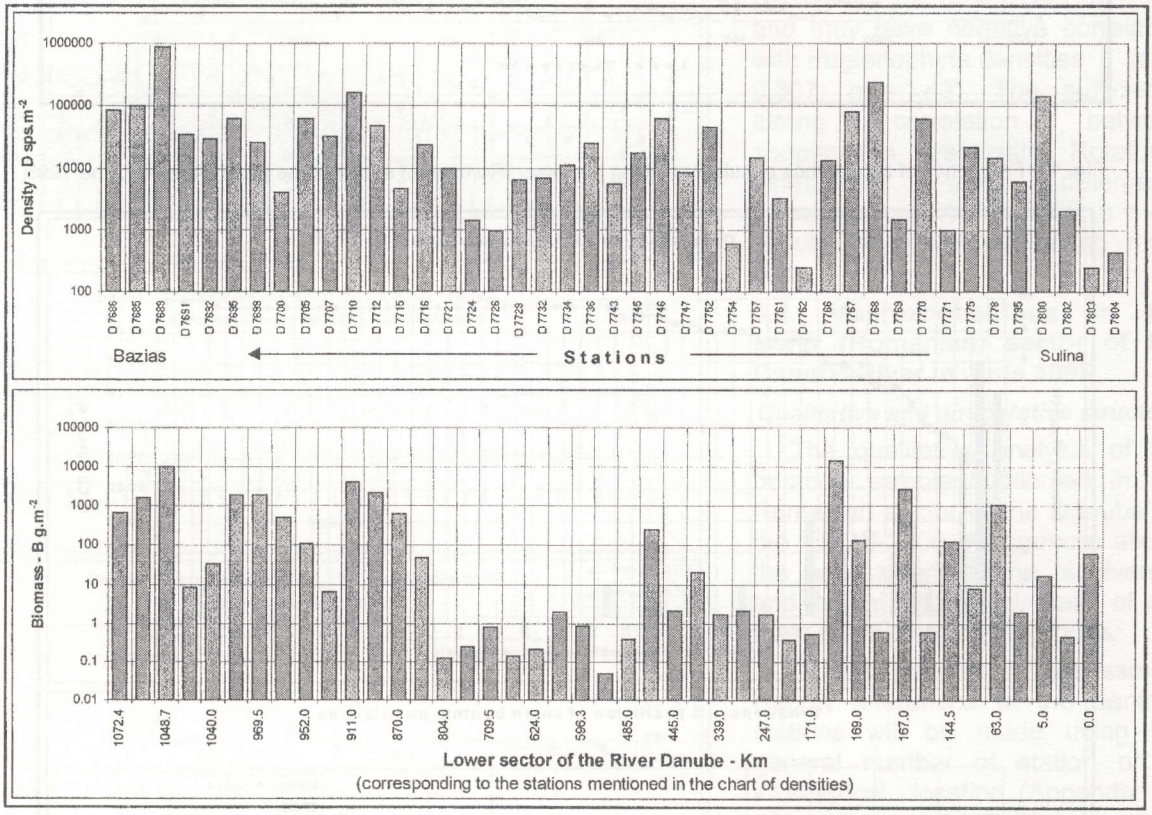
The occurrence of the 39 taxa in the stations/samples is uneven: 15 taxonomic units appear 1-2 times, 8 forms 3-5 times etc.; only one group of organisms (Oligochaeta) is present in almost all of the stations (Fig. 17). Along the lower sector of the Danube River the qualitative composition of benthic communities seems to be sufficiently low and variable.

The quantitative structure is also very variable. In order to have an integrated view upon the abundance distribution of benthic populations in the investigated sector of the River Danube the following illustration are presented:

– densities and biomasses of all organisms of benthic populations in the main course of the Danube River (Fig. 18), in its deltaic distributaires (Fig. 19) and Vedea, Arges, DBS Canal, Ialomita, Siret and Prut tributaires rivers (Fig. 20);

– densities and biomasses of the main groups of zoobenthos, that is worms (Fig. 21), molluscs (Fig. 22) and crustaceans (Fig. 23).

Fig. 18 Density (D – sps.m^{-2}) and biomass (B – g.m^{-2}) variations of zoobenthos populations in the stations along the lower (Romanian) sector of the Danube River, June 1995



In all these representations, due to the large variations of density and biomass from one station to another the logarithmic scales are used.

Out of 39 benthonic taxa only the following 5 give about 90% of the general density: Olygochaeta adult (the numerical dominant - 45%), Gammarida, Polychaeta, Corophiida and Nematoda.

Referring to the biomasses the order of the first 5 ranked species is as follows: the Molluscs *Dreissena polymorpha and Lithogliphus naticoides,* then Oligochaeta worms and again two Bivalve - *Unio* and *Sphaerium.*

In different sectors of the lower Danube River the five most important species, giving together more than 90% of density and biomass change as follows:

– Iron Gates I zone: Oligochaeta, Gammaridae, Polichaeta, Corophiidae and *Sphaerium* (replacing Nematoda from the general aspect representing the entirely investigated sector) if we take into account the densities, and *Sphaerium, Dreissena,*

Fig. 19 Density and biomass of zoobenthos populations from the Danube River distributaries (Danube Delta), June 1995

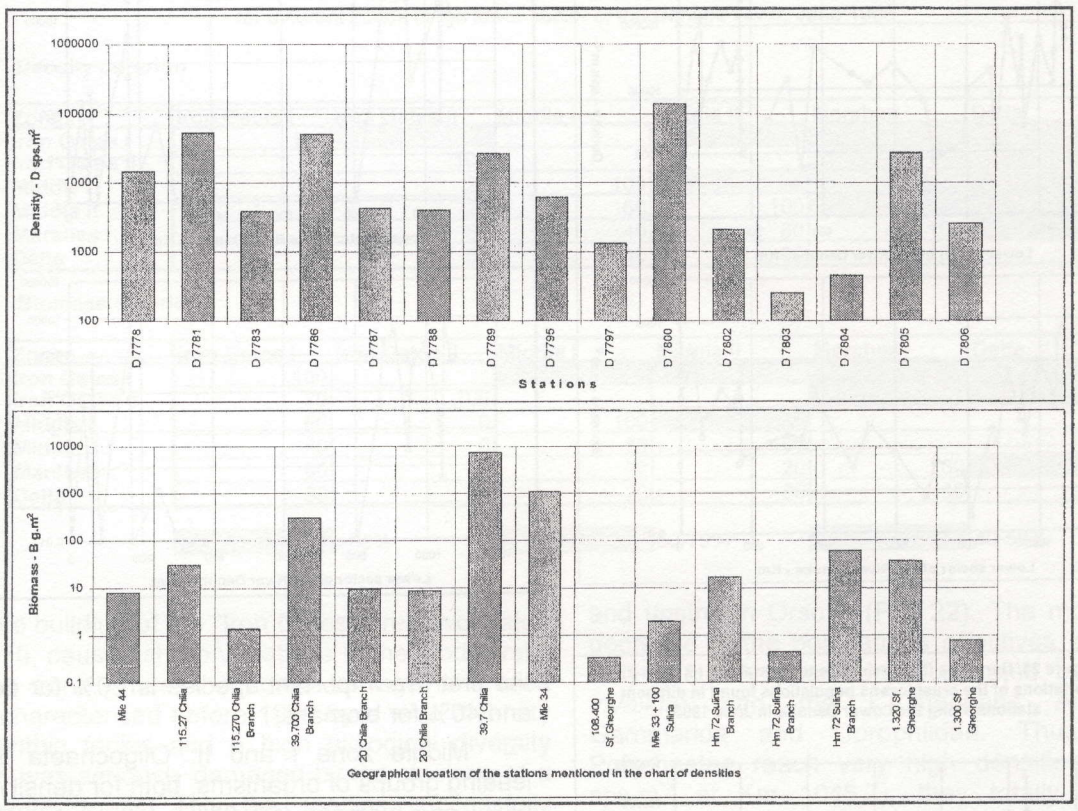


Fig. 20 Density and biomass of zoobenthos populations from some Romanian tributaries of the Danube River, June 1995

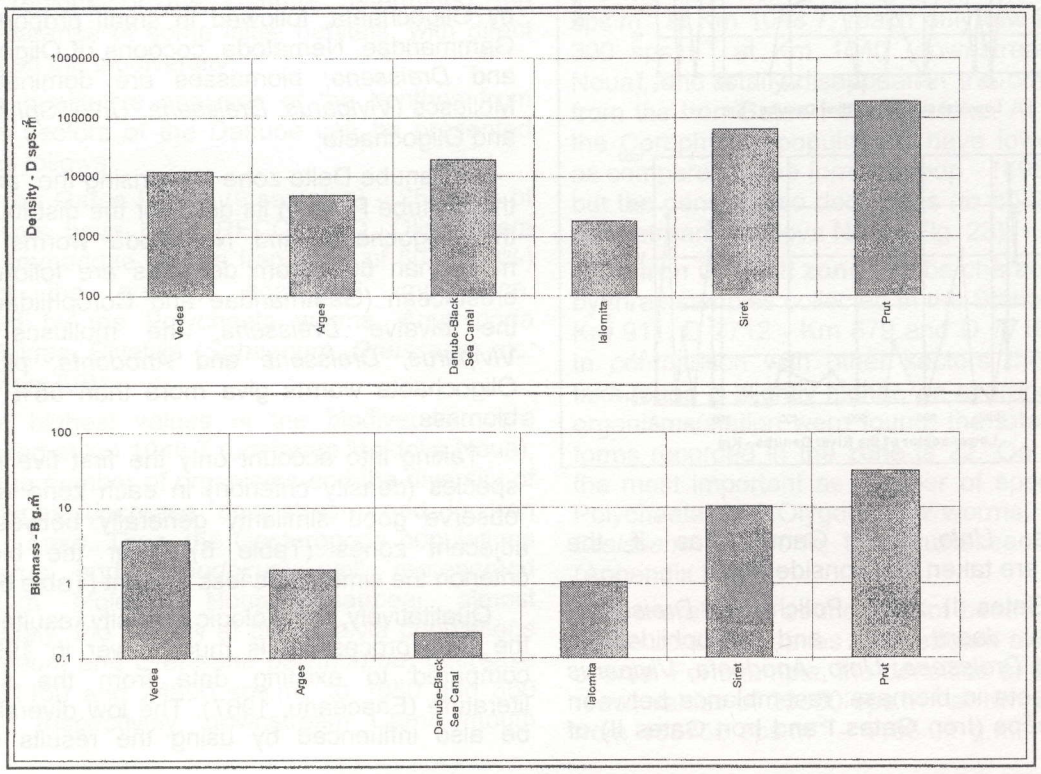


Figure 21. Densities (D - sps.m-2) and biomasses (B - g.m-2) variations of the worms populations found in different stations along the Lower Danube in June 1995

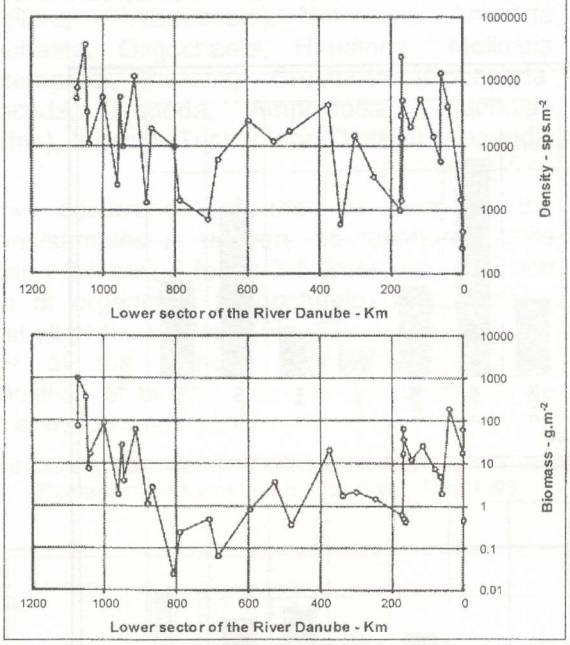


Figure 22. Densities (D - sps.m-2) and biomasses (B - g.m-2) variations of the molluscs populations found in different stations along the Lower Danube in June 1995

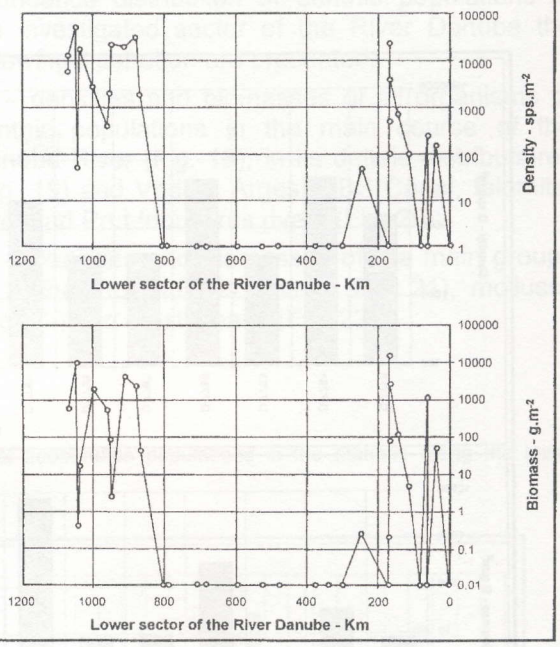
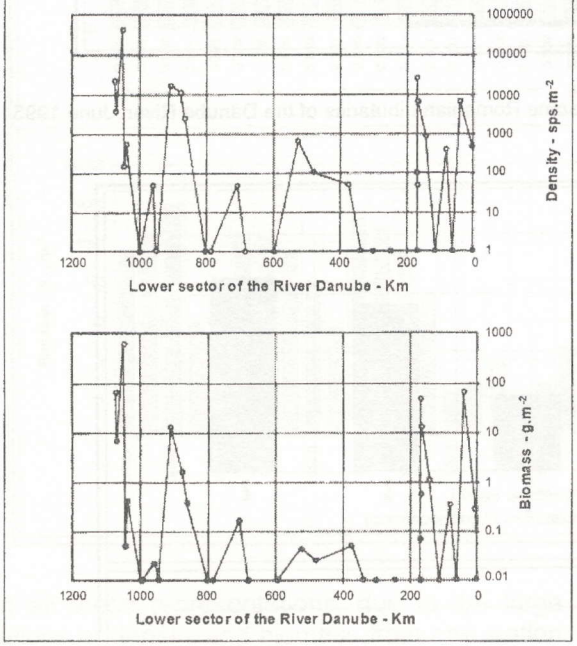


Figure 23. Densities (D - sps.m-2) and biomasses (B - g.m-2) variations of the crustaceans populations found in different stations along the Lower Danube in June 1995



Oligochaeta, *Unio,* and Gammaridae if the biomasses are taken into consideration;

– Iron Gates II zone: Polichaeta, *Dreissena,* Oligochaeta, *Jaera sarsi*, and Corophiidae in density and *Dreissena*, *Unio*, *Anodonta*, *Viviparus* and Polichaeta in biomass; resemblance between the two groups (Iron Gates I and Iron Gates II) of the first five important species is 60% for density and 40% for biomass;

– Middle zone I and II: Oligochaeta is the leading groups of organisms, both for density (50–95%) and biomass (60–98%); followed by other, less important groups – Nematoda, Gammaridae etc., but no Mollusks;

– Marches zone: numerical dominant is given by Oligochaeta, followed in small proportion by Gammaridae, Nematoda, cocoons of Oligochaeta and *Dreissena;* biomasses are dominated by Molluscs (*Viviparus, Dreissena, Unio, Sphaerium*) and Oligochaeta;

– Danube Delta zone comprising the "arms" of the Danube River in its delta, or the distributaries: the Oligochaeta and Nematoda worms giving more than 80% from densities are followed by crustacean (Gammaridae and Corophiidae) and the bivalve *Dreissena;* the molluscs *Unio, Viviparus, Dreissena* and *Anodonta*, plus the Oligochaeta worms give more than 95% of the biomass.

Taking into account only the first five ranked species (density criterion) in each zone we can observe good similarity generally between the adjacent zones (Table 6); after the biomass criterion the similarity is less evident (Table 6).

Qualitatively, the biologic diversity resulted from the data processing is much lower in 1995, as compared to existing data from the specific literature (Enaceanu, 1967). The low diversity can be also influenced by using the results of the

samples collected in only one month (June1995). In addition, determinations are not yet finalised for some zoobenthic groups (Oligochaeta, Crustacea Amphipoda and Chironomida - groups characterised by a wide diversity in the Romanian Sector of the Danube).

Table 6 Similarities (%) between the associations of the first five ranked species for different zones of the lower sector of the Danube River, June 1995

Density criterion

Zones	Iron Gates I	Iron Gates II	Middle I	Middle II	Marshes	Delta
Iron Gates I	100					
Iron Gates II	60	100				
Middle I	20	20	100			
Middle II	40	20	60	100		
Marshes	60	60	40	60	100	
Delta	60	60	40	60	100	100

Biomass criterion

Zones	Iron Gates I	Iron Gates II	Middle I	Middle II	Marshes	Delta
Iron Gates I	100					
Iron Gates II	20	100				
Middle I	*60*	*0*	*100*			
Middle II	40	0	80	100		
Marshes	80	60	20	20	100	
Delta	60	80	20	20	80	100

>80% 60-79% 40-59%

The building of the "Iron Gates I" reservoir lake, in 1970, caused sharp variations in the biodiversity of this zone. Thus, the actual barrage lake area was characterised before 1970 by a wide diversity of benthic facies and a high biological diversity which was seriously damaged by the stocking of a big water mass; only the species successfully supporting a lower concentration of oxygen and a high uniformity of the bottom could survive. In addition, damming and desiccations carried out in some regions of the Danube determined the disappearance of some initial habitats, with direct effects on the biodiversity.

The qualitative analyses of the benthos from various sectors of the Danube can be presented such as follows:

① **Iron Gates I zone** (9 samples) – 25 types of organisms have been RECORDED. Oligochaeta and Gammaridae (with a frequency of 50 - 100%) present the greatest ecological importance, followed by the Polychaeta worms, Amphipoda Corophiidae, Bivalvia (*Sphaerium, Dreissena*) etc. (Appendix IVB).

The highest values of the biodiversity were registered at km 1048.7 (upstream Moldova Noua), while the number of organisms and the diversity of their types decrease downstream and in Iron Gates I Lake. Thus, the Gasteropoda populations (*Viviparus* and *Theodoxus*) well represented upstream Moldova Noua, disappear almost completely; the density of the Bivalvia populations (*Sphaerium* and *Dreissena polymorpha*) decrease from 21150 and 24600 sps.m^{-2} to 1950 and 350 sps.m^{-2} respectively, downstream Cerna mouth and upstream Orsova (Fig. 22). The most drastic decrease in the populations effectives affects the Polychaeta Ampharetida (dominated by *Hypania invalida*) and the Crustaceans Amphipoda, Gammarida and Corophiidae. Thus, if the Polychaetae reach very high densities (320500 sps.m^{-2} at Km 1048.7), they totally disappear upstream Orsova (Km 959.5), but the density rises again downstream Cerna mouth (Km 952) up to 38200 sps.m^{-2}. The Amphipoda Gammarida populations, with very high densities of 284950 sps.m^{-2} at Km 1048.7, reach only few individuals - 300 sps.m^{-2} at Km 1040 (downstream Moldova Noua), and totally disappear in the other samples from the Iron Gates I barrage lake. At km 1048.7, the Corophiidae populations have lower densities as compared to the former group - 149800 sps.m^{-2}, but the density also decreases (to 50-250 sps.m^{-2}) downstream Moldova Noua (Fig. 23).

② **Iron Gates II zone** can be characterised only by three samples collected in the Stations D 7710 - Km 911, D 7712 - Km 879 and D 7716 - Km 866. In comparison with other sectors the number a taxa found is slightly higher, on average 9 types of organisms/station were found; the total number of forms recorded in the zone is 22. On an average the most important as number of specimens are: Polychaeta and Olygochaeta worms, the Bivalve *Dreissena polymorfa,* the Crustacean Amphipoda (Appendix IVC).

Generally the abundance of benthic organisms of the zone decreases downstream along the river course. For example, the densities and biomasses reach values of 23300 sps.m^{-2} at Km 866, starting from 158750 sps.m^{-2} - 4156.01 g.m^{-2} at Km 911.

The most important species in the Iron Gates II zone are *Dreissena polymorpha,* which can have densities of 167500 - 32350 sps.m^{-2} and biomasses of 738.55 - 1083.06 g.m^{-2}, *Unio* (50 - 250 sps.m^{-2} and 1050.00 - 1480.00 g.m^{-2}), *Anodonta* (in a single station - D 7710, 250 sps.m^{-2} and 1580.00 g.m^{-2}).

③ **Middle zone I** - Iron Gates II - Corabia Sector (4 samples) is characterised by a low biodiversity, only 9 types of organisms being noticed (Appendix IV D).

Downstream Iron Gates dam Oligochaeta and Nematoda are the only groups remaining constantly represented, but the density of their populations varies significantly: 0-8050 sps.m^{-2} for Nematoda and 400-6150 sps.m^{-2} for Oligochaeta. For the rest of benthic organisms recorded in the Iron Gates II - Corabia sector, the densities, as well as the biomasses are very low - 50 sps.m^{-2} for Hirudinea cocoons, Gammaridae, Insecta adult and Aranea, then 150-200 sps.m^{-2} for Chironomida larvae and Ceratopogonidae larvae.

④ **Middle zone II** - Corabia - Călărasi Sector (4 samples) - the biodiversity shows low values; 9 types of organisms were identified, the dominant group being also Oligochaeta (100%) (Appendix IV E). This sector is characterised by a low biodiversity. Oligochaeta is the only constantly present group, with densities between 5300 sps.m^{-2} (at Km 445 - upstream Arges mouth) and 61250 sps.m^{-2} (km 481 - downstream Giurgiu). The fauna identified at Km 586.3 - downstream Olt mouth and Turnu Magurele is extremely poor - there were noticed only Oligochaeta (24900 sps.m^{-2}) and Diptera Ceratopogonida (100 sps.m^{-2}), and also at Km 515, downstream Vedea mouth - only Oligochaeta (5550 sps.m^{-2}).

In the samples collected in Olt and Vedea Rivers, just before the confluence with the Danube, Ostracoda and Copepoda populations appear, but they are absent in the Danube channel.

⑤ **The Marshes zone** (12 samples) - shows an increasing number of benthic taxa, 21 types of organisms being identified. The Oligochaeta (100%) and Amphipoda Gammarida (50%) are dominant (Appendix IV F).

Except for a small zone situated at Km 167 - downstream Braila where the biodiversity is high enough, the entire sector is characterised by a poor benthic fauna, dominated by Oligochaeta populations. Oligochaeta worms are present in all samples with densities between 3300 sps.m^{-2} (Km 247 - downstream Hârsova) and 28100 sps.m^{-2} (Km 167). At Km 247 fauna is extremely poor, organisms being almost totally absent. At Km 171 - upstream Braila the Amphipoda populations reappear and Gammarida show increasing densities (18600 sps.m^{-2} at Km 167) while at Km 167 the Gasteropods and Bivalves reach again high densities (*Dreissena polymorpha* - 14300 sps.m^{-2} and 4599.16 g.m^{-2}, *Lithoglyphus sp.* - 4650 sps.m^{-2} and 129.48 g.m^{-2}, *Viviparus* - 3450 sps.m^{-2} and 8750.38 g.m^{-2}).

One sample from the station D 7767 (Km 167, downstream Braila) is one of the richest benthic sample (having a total population of 78900 sps.m^{-2} and 14.31326 Kg.m^{-2}!!!).

The fauna from the samples collected in the lower zones of Siret and Prut is relatively similar to the fauna from the Danube channel, the only remarkable difference being the presence of a significant Copepoda population in Siret River (11550 sps.m^{-2}). Oligochaets are also dominant in these samples (37600 sps.m^{-2} in Siret River and 159400 sps.m^{-2} in Prut River).

⑥ **Danube Delta Sector** (13 samples) - is the zone with the highest biodiversity, 22 types of organisms being identified. Oligochaeta are the most commune everywhere, (87.5%), followed by Amphipoda Gammarida and Nematoda (Appendix IV G).

In spite of the relative high number of taxa on the Danube River distributary the data resulted from the sample processing indicated a relatively poor benthic fauna in this sector. Thus, in the samples collected from Chilia distributary Oligochaets are dominant, with densities between 42050 sps.m^{-2} at Km 39.7 - downstream Chilia, and 4750 sps.m^{-2} at Km 20 - upstream Valcov. Biodiversity increases downstream at Km 20 being noticed Amphipoda, Gammarida and Mollusca Bivalvia populations (such as *Dreissena polymorpha* (2450 sps.m^{-2}) and *Viviparus viviparus* (1400 sps.m^{-2}).

On Sulina distributary the fauna is even poorer, dominated by Nematods and Oligochaets; only in the mouth zone populations of Polychaeta - Nereida (1200 sps.m^{-2}), Amphipoda Gammarida and Corophiida (450 sps.m^{-2}) and Trichoptera-larvae (150 sps.m^{-2}) are identified.

The comparative analyses of the zoobenthos samples from the 6 Danube sectors (Table 7) indicate the following important aspects:

* the highest mean density (143811 sps.m^{-2}) is recorded in the Iron Gates I sector;

* minimum of density (250 sps.m^{-2}) is observed in the Danube Delta sector;

* maximum of density (866200 sps.m^{-2}) is registered in the Iron Gates I sector;

* the highest mean biomass (2155.56 g.m^{-2}) - Iron Gates II sector;

* minimum of biomass (0.12 g.m^{-2}) - Middle Zone I;

* maximum of biomass (14313.30 g.m^{-2}) - Marshes Zone (Ialomita and Braila marshes);

* the highest mean number of species per sample/station (13.1) - Iron Gates II zone;

* the lowest number of species per sample (1) - Marshes and Danube Delta zone;

* the highest number of species per sample (15) - Marshes and Danube Delta zone.

Table 7 Some statistical data on the abundance of zoobenthos in different zones along the lower (Romanian) sector of the Danube River, June 1995

Sector	Density sps.m^{-2}			Biomass g.m^{-2}			Number of species			n
	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	
Iron Gates I	143811	4100	886200	1699.38	6.50	10354.33	7.8	4	13	9
Iron Gates II	76050	23300	158750	2155.56	47.95	4156.36	13.1	12	14	3
Middle I	4650	950	9850	0.33	0.12	0.81	3.8	2	6	4
Middle II	20920	4900	45300	5.38	0.39	20.39	3.8	2	6	5
Marshes	48144	600	238900	1086.86	0.22	14313.30	4.7	1	15	16
Delta	20404	250	137300	674.88	0.34	7228.93	4.4	1	15	13

The poorest benthic zoocoenoses in the Danube are those from Iron Gates II - Corabia Sector. Corabia - Calarasi Sector is quite similar to the former one, however a slightly increasing biodiversity was determined.

The biodiversity of the zoobentic organisms in the Marshes Sector, between Iron Gates II and Corabia, cannot be compared to the previous one, because most of the marshes on the flooding plain were desiccated, others being integrated in the Iron Gates II reservoir lake. Lower (Romanian) sector of the River Danube in June 1995 could be characterised in short by the following parameters:

* total taxonomic units; 39 (including developmental stages for six forms);

* number of taxonomic units per samples/stations: 5.5 (1 - 15);

* density: – mean 53624 sps.m^{-2} (250 - 886200 sps.m^{-2});

– first five ranked taxa with high ecological importance: Oligochaeta, Gammaridae, Polychaeta, Corophiidae and Nematoda;

* biomass: – mean 959.05 g.m^{-2} (0.12 - 14313.30 g.m^{-2});

– first five ranked taxa with high ecological importance: *Dreissena polymorpha, Lithoglyphus naticoides,* Oligochaeta, *Unio* and *Sphaerium.*

The most important taxa present as leading or dominant form in density/biomass in all or some sectors of the lower Danube River are as follows:

*– Oligochaeta	6/5
*– Nematoda	4/0
*– Gammaridae	4/3
*– *Dreissena*	3/4
*– *Unio*	0/4
*– Corophiidae	3/0
*– Polychaeta	2/1
*– *Viviparus*	0/3
*– *Sphaerium*	1/2
*– *Anodonta*	0/2

This list proves that only 10 taxa out of 39 give up to 77 % of the total density or up to 80% of the total biomass of the benthic organisms.

In conclusion, among the identified groups of organisms, the Oligochaeta dominate in terms of density along the Romanian sector of the Danube - namely Oligochaeta Tubificiidae and Enchitreidae, followed by Amphipoda (Gammaridae and Corophiidae); when the biomass is considered, the dominant species are bivalves - *Unio sp., Dreissena polymorpha, Anodonta sp., Sphaerium* and gasteropodes *Viviparus viviparus* and *Lithoglyphus naticoides.*

If we consider the distribution of organisms along the Danube, we can conclude that the Oligochaeta are dominant all along the sector, while the crustaceans and molluscs develop important populations in density and biomass only in the Danube Delta zone and in the Iron Gates I.

Average density and biomass of the zoobenthic populations in different zones along the lower (Romanian) sector of the Danube River (Fig. 24) reveal the following tendency of variation:

– a general decreasing of the densities from upstream to downstream with a evident fall in the Middle zone Iron Gates II - Corabia;

– high biomasses in the extreme zones – Iron Gates I and II and Marshes and Danube Delta zones.

An attempt of correlation of average density of water discharges in the some lower (Romanian) sector of the Danube River (Fig. 25) was not satisfactory.

Figure 24. Average density and biomass variations of the zoobenthic populations in different zones alond the lower Danube, June 1995

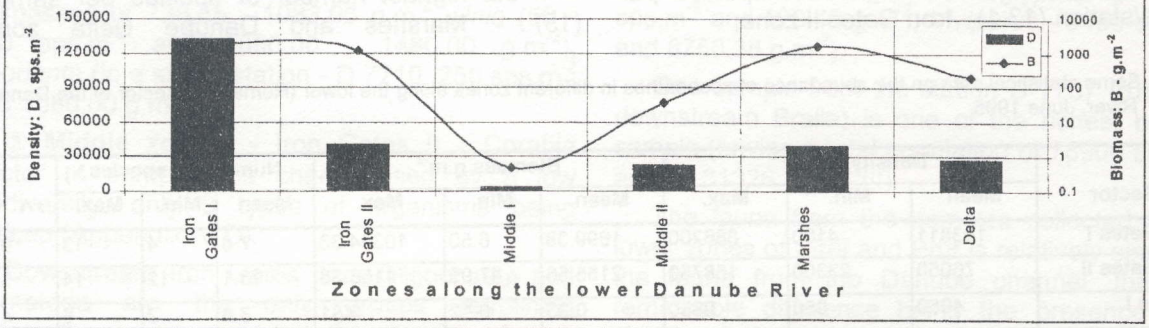
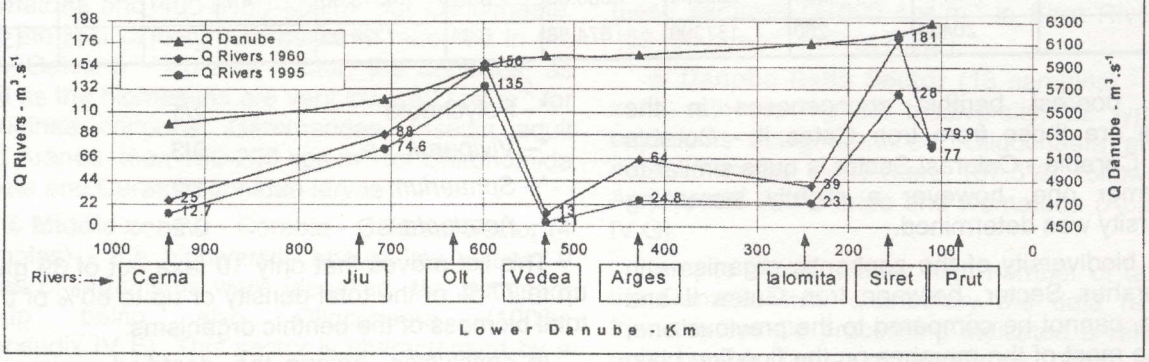


Figure 25. Variations of water discharges in the lower (Romanian) sector of the River Danube: Q Danube and Q Rivers 1960 multiannual average values exfor 1967; Q Rivers 1995 - average values in 1995



Remarks on Ponto - Caspian Relicts

Among the identified species the group of Ponto-Caspian relicts is of special importance from a scientific and ecological point of view, with the *Hypania invalida* and *Hypaniola kowalevskii* worms and *Dikerogammarus and Corophium* crustaceans in the foreground.

Hypania could be found only isolated before creating the lake at the Iron Gates I. Later, in 1972, this species increased tremendously on the benthic facies of the new lake reaching a biomass of 287.749 g. m^{-2} . In 1995 in the same zone *H. invalida* continued to develop important populations, the registred maximum biomass being 201.427 g. m^{-2}.

Crustaceans - Amphipoda (Gammaridae and Corophiidae) - still maintain numerous populations in the zone of the accumulation lake Iron Gates I and the Danube Delta zone; as for the Gammaridae mention must be made of the fact that the density of 284950 sps.m^{-2} and the biomass of 481.91 g.m^{-2} established at km. 1.48.7 in June 1995 represent the highest values for these amphipods, not only in the lake Iron Gates I, but also along the whole Romanian sector of the Danube.

3.3. Some remarks on the dynamics of the ecosystem population from the Călărasi zone

3.3.1. Planktonic community

A monitoring program for the Călărasi zone was established and, depending on the meteorological conditions, in August, September, October and November 1995 and January and April 1996, samples of plankton and benthos were collected at the Km 375.

The results obtained, by using the same methodology already presented in this report, should be considered preliminary, the period of investigation being too short. In order to have a general idea on the abundance and variations of planktonic and benthic populations from the Călărasi area the following aspects will be presented below:

– average abundance of pkytoplankton (Appendix V);
– average abundance of zoobenthos (Table 8);
– monthly variations of phytoplankton across the river transect (Fig. 26);
– monthly variation of average quantities of phytoplankton (Fig. 27);
– dendrogrames of similitude between planktonic populations collected in different months (Fig. 28);
– monthly variations of zoobenthos taking into account the total population and separately the

population divided in macro- and meio- (according to the methodology of sample processing) (Fig. 29);

– monthly variations of the abundance of the worms, crustaceans and other organisms populations (Fig. 30);

Table 8 Average densities (D – sps.m^{-2}) and biomasses (B – g.m^{-2}) of zoobenthic organisms recorded between June '95 – January '96 in Calarasi sector of the Danube River

No. Crt.	SPECIES	No.occ	F%	A	Davg sps.m^{-2}	Deco sps.m^{-2}	Dom	W	Rk	A	Bavg g.m^{-2}	Beco g.m^{-2}	Dom	W	Rk
1	Foraminifers	1	20	20574	4114.8	20574	10.707	286.873	2	0.0010	0.0002	0.0010	0.001	0.064	11
2	Nematoda	1	20	4064	812.8	4064	2.115	127.499	3	0.0028	0.0006	0.0028	0.004	0.107	10
3	Oligochaeta	5	100	161036	32207	32207	83.807	1794.636	1	75.5587	15.1117	15.1117	97.286	38.874	1
4	Oligochaeta cocons	1	20	1460.5	292.1	1460.5	0.760	76.433	7	0.4382	0.0876	0.4382	0.564	1.324	4
5	Caryophilleidae (free larvae)	1	20	254	50.8	254	0.132	31.875	8	0.0381	0.0076	0.0381	0.049	0.390	8
6	Gammaridae	1	20	127	25.4	127	0.066	22.539	9	0.1270	0.0254	0.1270	0.164	0.713	7
7	Chironomidae	2	40	1397	279.4	698.5	0.727	105.717	5	0.3048	0.0610	0.1524	0.392	1.562	3
8	Chironomidae larvae	2	40	1270	254	635	0.661	100.797	6	0.0889	0.0178	0.0445	0.114	0.843	6
9	Odonata larvae	1	20	63.5	12.7	63.5	0.033	15.937	11	0.9525	0.1905	0.9525	1.226	1.952	2
10	Ceratopogonidae	2	40	1778	355.6	889	0.925	119.264	4	0.1422	0.0284	0.0711	0.183	1.067	5
11	Eggs var.	1	20	127	25.4	127	0.066	22.539	10	0.0127	0.0025	0.0127	0.016	0.225	9
	TOTAL				38430						15.5334				
	Worms				33312						15.1999				
	Molluscs				0						0.0000				
	Crustaceans				76.2						0.0330				
	Varia				5041.9						0.3004				

The main results of the investigations carried out in the Călărasi sector of the Danube River are represented as follows:

1 - Phytoplankton communities flowing downstream at Călărasi between June 1995 - April 1996 consisted of 153 species (Appendix V), as follows:

Cyanobacteria – 15 species (9.8%) (–5);
Euglenophyceae – 5 species (3.3%) (–6);
Pyrrophyceae – 4 species (2.6%) (–1);
Heterocontae – 1 species (0.6%);
Bacillariophyceae – 86 species (56.2%) (+11);
Chlorophyceae – 42 species (27.5 %) (+1).

The total number of species is the same with the one registered for the whole lower sector of the Danube River in June '95 (see chapter 3.1.2.), but there are some changes (see above marked with plus or minus in the brackets); more than 40 new species were recorded along the time, indicating probably the seasonality of some forms. The new species are as follows:

CYANOBACTERIA

Chroococcus limneticus
Chroococcus dispersus
Nostoc commune
Oscillatoria lacustris

PYRROPHYCEAE

Peridinium polonicum

BACILLARIOPHYCEAE

Attheya zachariasi
Cymbella affinis
Cymbella microcephala
Cymbella parva
Fragilaria intermedia
Gomphonema constrictum
Gomphonema constrictum var. capitata
Gomphonema intricatum
Gyrosigma attenuatum
Gyrosigma kutzingi
Mastogloia smithi
Melosira angustissima
Melosira binderana
Melosira distans
Navicula atomus
Navicula pupula
Neidium affinis
Nitzschia angustata
Nitzschia vitrea
Pinnularia gibba
Pinnularia subcapitata
Rhizosolenia eriensis
Rhizosolenia longiseta
Surirella didyma
Synedra ulna var. aequalis

CHLOROPHYCEAE

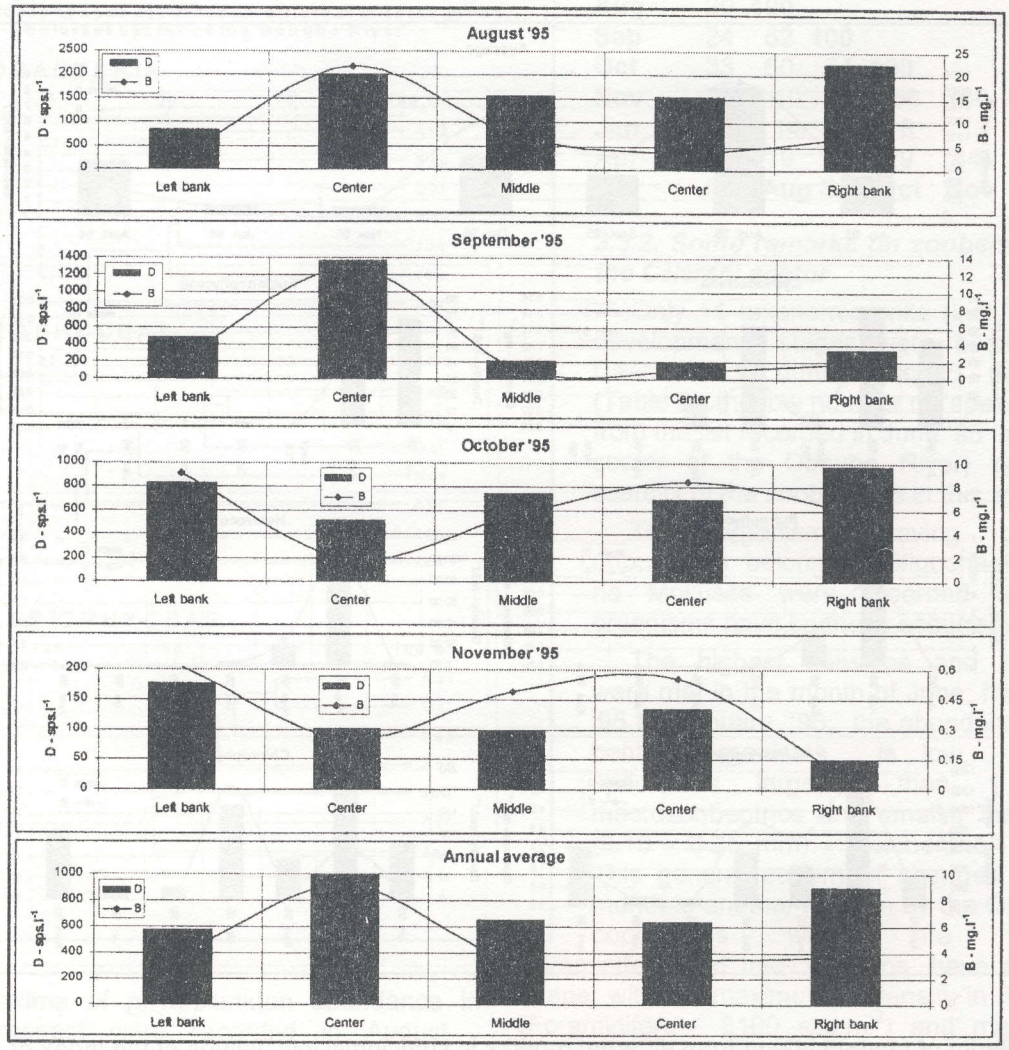
Acanthosphaera zachariaris
Elakatothrix gelatinosa

Ankistrodesmus nitzschioides
Closterium dianae
Closterium kutzingii
Crucigenia rectangularis
Crucigenia tetrapedia
Desmidium swartzi
Mycrospora quadrata
Pediastrum simplex
Pediastrum tetras
Scenedesmus granulatus
Sphaerozosma vertebratum
Ulothrix tenuissima

Permanently present in the samples, having a maximum constancy are only 10 species (*Trachelomonas verrucosa, Achnanthes minutissima, Cyclotella chaetoceras, C. kutzingiana, C. meneghiniana, C. operculata, Nitzschia palea, Synedra acus, S. ulna* and *Chlorella vulgaris*); half of these phytoplankters are very common along the entire course of the lower Danube being ranked among the first seven species with high ecological importance as concerns their density and biomass. The list of the first 10 species dominant in plankton associations in different months comprises 31 species, out of which only 11 species hold the first three places, as follows:

	Jun-95	Aug-95	Sep-95	Oct-95	Nov-95	Jan-96	Apr-96
Dactylococcopsis acicularis	**7**	**15**	27	**11**	45	48	58
Trachelomonas verrucosa	**4**	22	42	36	50	**11**	37
Trachelomonas volvocina	**3**	**14**	43	78	72	39	25
Tribonema ulotrichoides	23	**7**	**11**	28	77	65	76
Achnanthes exilis	58	87	69	29	**9**	**7**	**14**
Achnanthes minutissima	**14**	37	**20**	**15**	**2**	**6**	**8**
Asterionella formosa	34	89	33	33	**13**	**9**	**7**
Asterionella gracillima	**15**	62	71	85	**7**	26	**11**
Cyclotella chaetoceras	**12**	**3**	**1**	**3**	23	**16**	32
Cyclotella glomerata	**1**	**1**	**2**	**1**	51	68	39
Cyclotella kützingiana	**2**	**5**	**4**	**8**	**20**	**5**	**9**
Cyclotella melosiroides	62	91	74	**4**	83	69	81
Cyclotella meneghiniana	**5**	**11**	**9**	**6**	**16**	**3**	**17**
Cyclotella operculata	**6**	**4**	21	**2**	**1**	**1**	**1**
Cyclotella stelligera	63	**2**	**7**	**13**	**15**	**4**	**2**
Melosira granulata	26	**20**	**10**	**5**	102	**18**	94
Melosira granulata var. angustissima	**19**	**6**	**3**	37	**17**	**10**	95
Melosira italica	87	111	**5**	106	103	84	22
Nitzschia actinastroides	**16**	**8**	**19**	38	109	91	103
Nitzschia angustata	98	120	110	118	**10**	92	104
Nitzschia palea	**17**	24	**13**	**10**	**5**	**8**	**4**
Nitzschia recta	**20**	**18**	**16**	25	**18**	94	**10**
Stephanodiscus astraea	28	**10**	**14**	**17**	121	104	111
Stephanodiscus hantzschi	110	130	**8**	**20**	**14**	105	112
Synedra acus	37	39	**18**	**16**	**6**	**19**	**6**
Synedra ulna	29	**12**	**12**	23	**3**	**20**	**5**
Actinastrum hantzschi	**10**	**19**	130	49	125	114	117
Chlamydomonas ovalis	123	27	**15**	50	**8**	120	**12**
Chlorella vulgaris	**8**	**9**	**6**	**9**	**4**	**2**	**3**
Elakatothrix linearis	**9**	**16**	28	**18**	136	130	130
Ulothrix zonata	151	29	**17**	**7**	153	151	151

Fig. 26 Monthly variations of phytoplanktonic community from the station Calarasi – Km 375 on the lower sector of the Danube River



It is worth mentioning that among the phytoplanktonic species some are indicators for pollution (Kobayasi and Mayama, 1982, 1989), as follows:

– intolerant to pollution: *Asterionella formosa* (C - 85.7%, Rk 21/30), *Fragilaria crotonensis* (C - 42.8%, Rk 70/34);

– tolerant to high pollution: *Achnanthes minutissima* (C - 100.0%, Rk 11/35), *Nitzschia palea* (C - 100.0%, Rk 9/24), *Diatoma vulgare* (C - 57.1%, Rk 33/40);

– tolerant to low pollution level: *Cyclotella meneghiniana* (C - 100.0%, Rk 7/8), *Melosira granulata* (C - 71.4%, Rk 13/1), *Synedra ulna* (C - 100.0%, Rk 10/9).

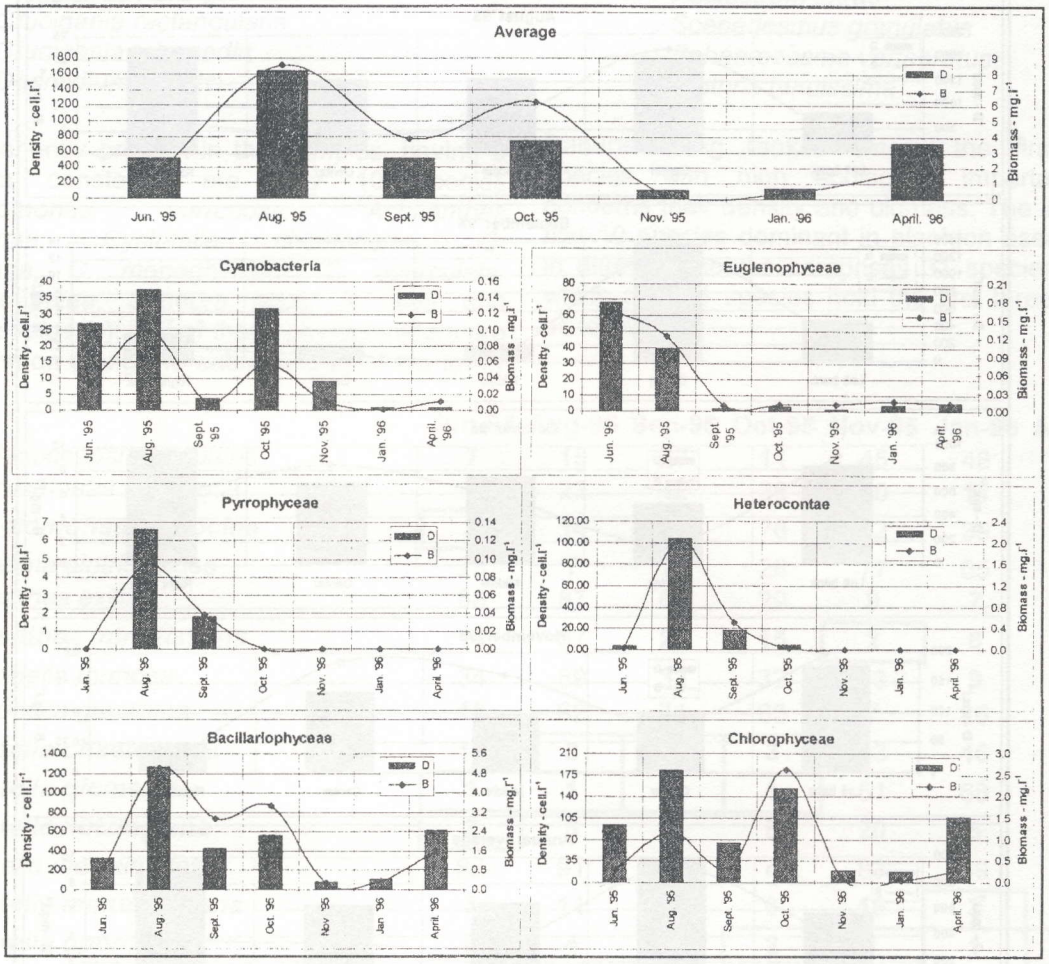
The qualitative and quantitative distribution of phytoplankton is uneven and variable in time. If we refer to the samples collected at the same date, in five points across the River at different distances from the left bank (one near the left bank - LB, one in the centre - C, one near the right bank - RB and two - M_1, M_2 in the middle of LB - C and C - RB) we can usually observe a weak resemblance between them, the phytoplanktonic populations having a heterogeneous distribution. For example, taking into account only the Cyanobacteria, even dissimilarities can be observed in 60% of the cases, as it can be noticed from the matrix of sample similitude in different months:

AUGUST					
LB	100				
M_1	25	100			
C	36	28	100		
M_2	28	0	33	100	
RB	20	0	34	40	100
	LB	M_1	C	M_2	RB

OCTOBER					
LB	100				
M_1	33	100			
C	80	40	100		
M_2	100	33	80	100	
RB	80	40	100	40	100
	LB	M_1	C	M_2	RB

NOVEMBER					
LB	100				
M_1	63	100			
C	40	0	100		
M_2	33	0	80	100	
RB	0	0	0	100	100
	LB	M_1	C	M_2	RB

Fig. 27 Monthly variations of average quantities of phytoplankton from the Station Calarasi – Km 378 on the lower sector of the Danube River



The similarity of phytoplankton from different months is sufficiently low, values of the index of similarity within the main taxonomic groups being as follows:

CYANOBACTERIA

	Jun	Aug	Sep	Oct	Nov	Jan	Apr
Jun	**100**						
Aug	31	**100**					
Sep	33	53	**100**				
Oct	57	50	22	**100**			
Nov	44	44	18	83	**100**		
Jan	50	51	0	57	44	**100**	
Apr	50	15	0	28	44	50	**100**

EUGLENOPHYTA

	Jun	Aug	Sep	Oct	Nov	Jan	Apr
Jun	**100**						
Aug	86	**100**					
Sep	40	50	**100**				
Oct	57	67	50	**100**			
Nov	86	100	50	67	**100**		
Jan	67	80	67	40	80	**100**	
Apr	50	15	0	28	44	50	**100**

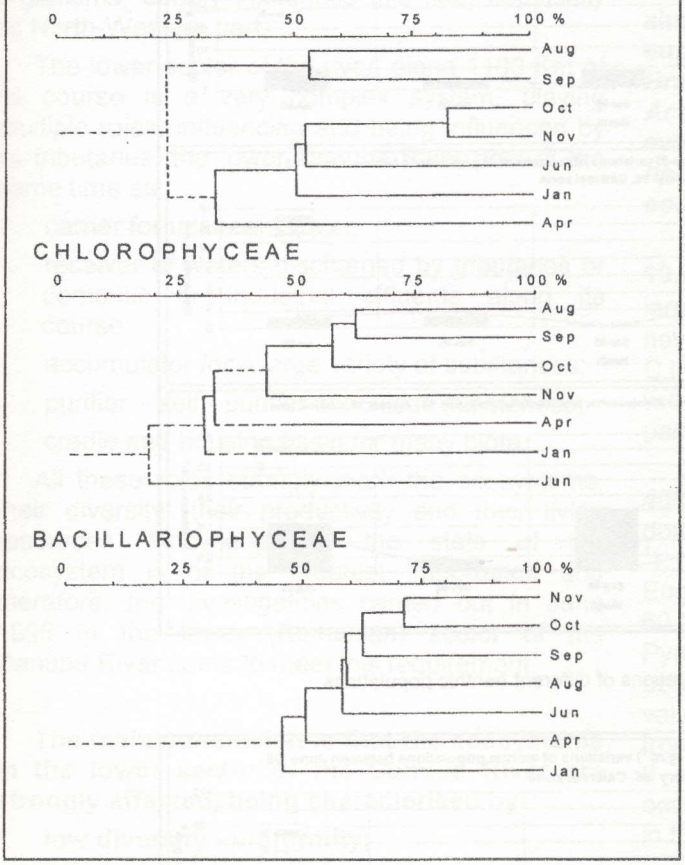
BACILLARIOPHYTA

	Jun	Aug	Sep	Oct	Nov	Jan	Apr
Jun	**100**						
Aug	66	**100**					
Sep	69	67	**100**				
Oct	58	54	69	**100**			
Nov	47	47	54	71	**100**		
Jan	48	51	45	50	57	**100**	
Apr	45	46	49	50	61	45	**100**

PYRROPHYTA

	Jun	Aug	Sep	Oct	Nov	Jan	Apr
Jun	**100**						
Aug	**40**	**100**					
Sep	0	0	**100**				
Oct	0	0	0	**100**			
Nov	0	0	0	0	**100**		
Jan	0	0	0	0	0	**100**	
Apr	0	0	0	0	0	0	**100**

Figure 28. Dendrograms of similitude between planktonic populations of Cyanobacteria, Bacillariophyceae and Chlorophyceae recorded in different months in the Calarasi sector of the Danube River



The maxima of phytoplankton abundance in Călărasi transect were recorded in August - September in the point M1 and in October - November in the point M_2 (at the 2/5 and respectively 4/5 from the left bank of the River course), but on an average densities increase from the zone of the left bank (where there are approximately 600 cell.l^{-1}) to the near central zone, then decrease, to the centre to a limit which is constant, from the centre of the River to its right bank (Fig. 26).

Within the quantitative variations of the phytoplankton in general two maxima (August and October '95) and two minima (November '95 - January '96) were recorded (Fig. 27).

The monthly samples from Călărasi transect enriched the list of phytoplanktonic species registered in June '95 in the lower sector of the Danube River and this is an important positive aspect; at the same time they proved that the quantities of planktonic communities vary in one month along 1000 kms-of the lower sector of the River.

CHLOROPHYTA

Jun	**100**						
Aug	29	**100**					
Sep	24	62	**100**				
Oct	33	60	54	**100**			
Nov	30	40	32	56	**100**		
Jan	22	14	20	8	13	**100**	
Apr	33	19	26	29	44	29	**100**
	Jun	**Aug**	**Sep**	**Oct**	**Nov**	**Jan**	**Apr**

3.3.2. Some remarks on zoobenthos from the Călărasi sector

Only 11 taxonomic units (including three developmental stages) were recorded in the Călărasi sector during June '95 - January '96 (Table 8); the low number of "species" (28%) from the list recorded in June '95 in the lower sector of the Danube River) proves the scarcity of the zoobenthos in this zone.

The organisms having permanent populations belong to Oligochaeta worms; no Molluscs were recorded and other organisms have sporadic occurrence.

The highest densities and biomasses were met in the month of June; from August '95 to January '96; the abundance of the benthic organisms is low, both for specimens larger than 1 mm - macrozoobenthos and smaller than 1 mm. (0.10 - 0.25 mm) - meiobenthos (Fig. 29). This general pattern of changes from one month to another is given by the Oligochaeta populations which are dominant; Foraminifera and Insecta forms, have a different shape; with the maximum of density in September (Foraminifera - 8100 sps.m^{-2}) and maximum of biomass in August (Odonata larvae - 0.375 g.m^{-2} and Chironomida - 0.131 g.m^{-2}) (Fig. 30).

In conclusion, the benthic populations in the Călărasi sector of the Danube River were very poor, both as diversity and abundance; although 5 species having the highest ecological importance are selected to illustrate the general state of benthos, only Oligochaeta present significance (Fig. 30). Why is the Danube River ecosystem in the Călărasi sector so poor? It is difficult to give for the moment a satisfactory answer. It is known that upstream Călărasi sector the River Arges discharges its polluted waters and bottom sediments (highest concentrations for some heavy metals - Cr, Cu, Zn, Se, Hg, etc.); this could be a very important factor for disturbances.

For the future the location for monthly monitoring should be changed at another sector less affected at the bottom level.

Fig. 29 Quantitative variations of zoobenthos (total and divided in macro- and meio-benthos)

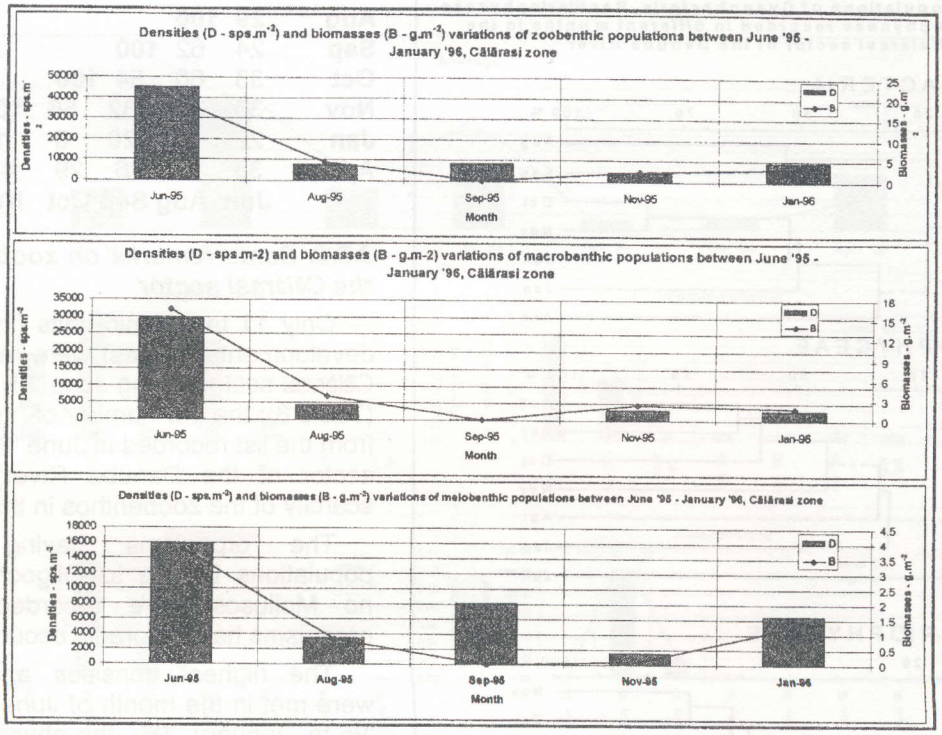
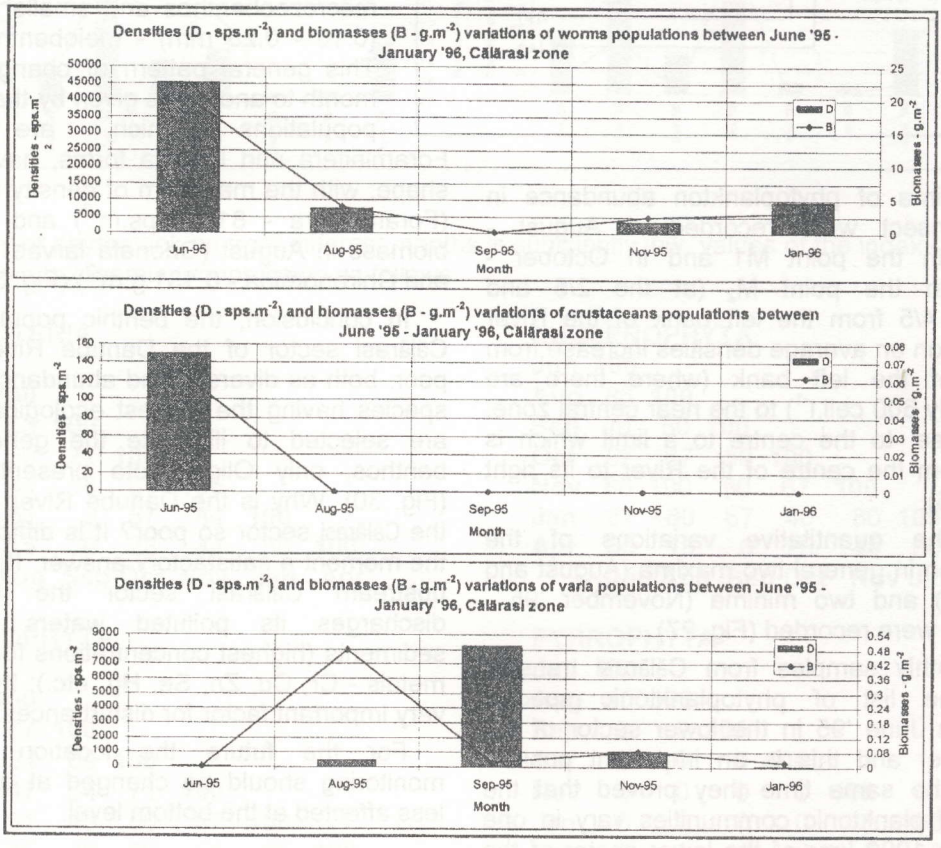


Fig. 30 Quantitative variations of different benthic populations



CONCLUSIONS

The Danube River discharging into the Black Sea water and sediments, and together with them mineral and organic compounds, living and death organisms, deeply influences this sea, especially its North-Western part.

The lower sector of the river, along 1100 Km of its course is a very complex system, playing multiple roles, influencing and being influenced by its tributaries; the lower Danube River acts at the same time as:

- carrier for upstream water;
- receiver of waters discharged by tributaries or domestic or industrial effluents along its course;
- accumulator for a large variety of substances;
- purifier – self - purifier of noxious substances;
- cradle and housing basin for many biota.

All these roles strongly mark the ecosystems, their diversity, their productivity and their living resources. Knowledge of the state of the ecosystem is of the greatest importance and therefore, the investigations carried out in June 1995 in the lower (Romanian) sector of the Danube River come to meet this requirement.

The main conclusion is that the ecosystems in the lower sector of the Danube River are strongly affected, being characterised by:

* **low diversity - uniformity;**
* **patchness distribution of the population;**
* **quantitative scarcity in more than 50% of the biotopes;**
* **general dominance of 2-3 forms, both in plankton and benthos;**
* **existence of very few "islands" of higher diversity and abundance.**

To sum up the results, the 1995 researches lead to the following conclusions:

1. Biodiversity is much lower in 1995 than in 1960, both for phytoplankton and zooplankton.

➢ **Phytoplankton** community consisted of **153 species**; **the number of species recorded in 1995 represents about 40% of those existing in 1960.** The most numerous phytoplanktonic species (up to 80) were recorded in the Marshes ("swamp") zone between Calarasi and Braila. **Only 16 species** out of 153 recorded **present high ecological importance**, the most common being the euplanktonic forms ***Asterionella formosa, Cyclotella meneghiniana*** in the Iron Gates I sector, then ***Synedra ulna*** and ***Oscillatoria tenuis*** in the Iron Gates II sector, ***Cyclotella comta*** in the middle zone I, ***Chlorella vulgaris*** and ***Nitzschia palea*** in the middle zone II etc.

➢ **Zooplanktonic** associations consisted of **53 taxonomic units**, dominated by Rotatoria (43%), Cladocera (40%) and Copepoda (17%), being **almost uniform** in all sectors. Only **8 euplanktonic species are dominant**; ***Brachionus calyciflorus f. amphiceros*** and ***Acanthocyclops bisetosus*** are present everywhere along the Lower Danube, ***Asplanchna herricki*** only in the Iron Gates I sector, ***Keratella cochlearis*** in the Iron Gates II sector.

2. Chlorophyll A had an average value of **10.63 $\mu g.l^{-1}$** but the limits of variations range are large **(1.71-19.36 $\mu g.l^{-1}$)**; the chlorophyll B and C have their value (3.83 μgChl $B.l^{-1}$ and 1.69 μgChl $C.l^{-1}$). Quantities of chlorophyll are well correlated with phytoplankton masses (r=0.675, n=43), in particular with those of Bacillariophyta.

3. Phytoplankton abundance is on the average **455 cell.l^{-1}**, varying between **45-1,324 cell.l^{-1}**; the dominant groups are Bacillariophyta (12-990 cell.l^{-1}), followed by Chlorophyta (4-258 cell.l^{-1}), Euglenophyta (0.0-239 cell.l^{-1}), Cyanobacteria (0.0-60.0 cell.l^{-1}), Heteroconta (0.0-28.0 cell.l^{-1}) and Pyrophyta (0.0-8 cell.l^{-1}). The biomasses vary between **0.18-3.19 mg.l^{-1}**; as a rule the highest values of total phytoplankton are recorded in the Iron Gates I sector and the lowest in the Iron Gates II sector, where the maxima of Cyanobacteria occur. The richest phytoplankton usually develops in the zone of marshes, downstream of Călărasi.

4. Zooplankton abundances range between **5,225-123,054 sps.m^{-3}**; the average values are **39,137 sps.m^{-3}** - total zooplankton, 32,405 sps.m^{-3} - Bivalvia larvae, 5,666 sps.m^{-3} - Rotifera, 882 sps.m^{-3} - Cyclopoida and 185 sps.m^{-3} - Calanoida. The **biomasses of zooplankton are dominated by Rotifera** - on the average 16.36 mg.m^{-3} out of 32.56 mg.m^{-3} representing the total.

The distribution of zooplankton in different sector of the Lower Danube presents the following features:

- Rotifera and Copepoda have the most numerous populations in the Iron Gates I and marshes (Călărasi - Braila) sectors;
- Cladocera populations generally decrease downstream Iron Gates I sector.

The zooplankton populations are fairly well correlated with those of the total phytoplankton dominated by Bacillariophyta (r=0.54, n=43).

5. Specific diversity of the zoobenthic associations recorded in June 1995 along the lower course of the Danube River **is very low**. Only **39 types of organisms** (including besides the superspecific units, nine developmental stages of some species - cocoons of Oligochaeta; eggs of

Hirudinea or Gastropoda, Chironomidae larvae, pupae etc. **Uniformity in benthos population** is given by high frequency and density of **Oligochaeta; Nematod worms and Gammaridae** crustaceans; species having higher biomasses (*Dreissena, Sphaerium, Unio* etc.) are present only in some zones.

6. Zoobenthos abundance was on an average **53,624 sps.m^{-2}** varying between **250 - 886,200 sps.m^{-2}** (Oligochaeta - 24,618 sps.m^{-2}, Polychaeta - 9,287 sps.m^{-2}, Gammaridae 7,263 sps.m^{-2}, Corophiidae - 3,481 sps.m^{-2} etc). The biomasses vary between **0.124 - 14,313.3 g.m^{-2}** having a general mean of **960.11 g.m^{-2}** (high average biomass is given mainly by Molluscs: *Anodonta* 53.82 g.m^{-2}, *Sphaerium* 73.63 g.m^{-2} etc.

➢ **The benthic associations** have a **heterogenous, patchness** and **uneven distribution** along the lower course of the Danube River; the poorest sectors extend between Km 866 (Iron Gates II) and Km 375 (Călărasi sector), that is about 45% of the investigated river course, where important polluted tributaries (Jiu, Olt, Arges) discharge their waters; in this sector maxima of biomasses are not higher than 20.39 g.m^{-2}. The average values of abundance reveal that, **generally, densities decrease from upstream to downstream with a dramatic fall in the sector receiving tributaries**; the most important **biomasses are developed in the Iron Gates reservoirs and Ialomita - Brăila Marshes**.

7. The occurrence in some places of rich populations of Bivalves, particularly *Dreissena polimorpha,* which are good suspension feeder species (Vadineanu, Taleb, Moctar, 1991-1992), represents a positive aspect that proves that the **capacity of the Danubian ecosystem for filtering activity and self purification of water is still high**, particulary in the Iron Gates and Delta sectors.

8. The **"biovolumes" discharged** (in June 1995) **by the Danube River** (7.245 m^3.s^{-1} average water flow) **into the Black Sea** were as follows (rounded values):

– **950 tons.day^{-1} of phytoplankton**;

– **20 tons.day^{-1} of zooplankton**.

If the **solid suspensions** (particulate inorganic and organic matter, larger than 0.45 μm) are taken into consideration, the quantities of matter discharged into the Black Sea by the River could be of **11,000 tons.day^{-1}**; phytoplankton and zooplankton biovolumes represent 8.9% and respectively 0.2 % of the solid suspension discharge.

Using the same average values for water discharge, taking into account more elements of the water composition and extending the data obtained in June to the whole year, the following figures can be calculated:

- phytoplankton: $350*10^3$ tons.year^{-1};
- zooplankton: $7*10^3$ tons.year^{-1};
- solid suspensions: $4,000*10^3$ tons.year^{-1};
- NO_3: $52,000*10^3$ tons.year^{-1};
- PO_4: $28*10^3$ tons.year^{-1};
- Cu: $2*10^3$ tons.year^{-1};
- Ni: $0.5*10^3$ tons.year^{-1};
- Fe: $140*10^3$ tons.year^{-1};
- Mn: $10*10^3$ tons.year^{-1};
- As: $3*10^3$ tons.year^{-1}.

9. The researches must be continued, the permanent survey being a major duty for a better management and sustainable use of the River Danube.

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Appendix I List of biological samples collected in the lower (Romanian) Sector of the Danube River during the EROS-2000 cruise, June 1995

Crt. No.	Station No.	Station location Km / Mile (from the Black Sea)	Water depth - m	Station positioning from left bank m	Data	Number of samples			Macrozoobenthos	
						Chlorophyll	Phytoplankton	Zooplankton	D - sps.m^{-2}	B - g.m^{-2}
1	D 7686	1072.4	11.00	440	5. 06. 1995	1	1	1	84700	681.870
2	D 7685	1070.4							99950	1630.000
3	D 7689	1048.7	18.30	360	6. 06. 1995	1	1	1	886200	10407.830
4	D 7690	1044.5	8.80	420	6. 06. 1995	1	1	1		
5	D 7691	1044	6.00	70	6. 06. 1995				34250	8.374
6	D 7692	1040	6.00	70	6. 06. 1995	1	1	1	29450	34.123
7	D 7695	999	15.80	40	7. 06. 1995	1	1	4	60950	1941.363
8	D 7699	969.5	11.80	940	7. 06. 1995	3			25530	1952.431
9	D 7700	959.5	9.80	900	8. 06. 1995	3	1	4	4100	526.055
10	D 7705	952	25.30	500	8. 06. 1995	3	1	3	62150	111.840
11	D 7707	947.2	25.80	620	8. 06. 1995	3	1	1	32050	6.500
12	D 7710	911	9.80	150	9. 06. 1995	3	1	1	158750	4156.009
13	D 7711	879			9. 06. 1995	1	1	1		
14	D 7712	879			9. 06. 1995	1			46100	2262.386
15	D 7715	870							4600	643.730
16	D 7716	866	20.00	330	10. 06. 195	3	1	1	23200	47.962
17	D 7719	845	20.60	280	10. 06. 1995	3	1	1		
18	D 7721	804	10.20	550	10. 06. 1995	3	1		9850	0.124
19	D 7724	788.2	11.80	330	11. 06. 1995	3	1	1	1450	0.241
20	D 7726	709.5	8.90	110	11. 06. 1995	1	1	1	950	0.805
21	D 7729	684	7.80	670	11. 06. 1995	3	1	1	6350	0.136
22	D 7731	624			12. 06. 1995		1	1		
23	D 7732	624	11.80	480	12. 06. 1995	3	1	1	7050	0.218
24	D 7734	604.7	2.70	50	12. 06. 1995	1			11350	2.008
25	D 7736	596.3	12.10	380	12. 06. 1995	3	1		25000	0.855
26	D 7739	553	10.30	440	13. 06. 1995	3	1	1		
27	D 7741	526.5	3.50	30	13. 06. 1995	1			12500	3.726
28	D 7743	515	12.60	230	13. 06. 1995	3	1	1	5550	0.050
29	D 7745	485	14.00	290	15. 06.1995	3	1	1	16900	0.389
30	D 7746	481			15. 06.1995				61550	262.520
31	D 7747	445	4.80	710	15. 06. 1995	2	1	1	8400	2.104
32	D 7748	Arges	3.00	50	16. 06. 1995	1	1	1	4900	1.540
33	D 7750	426	8.30	300	16. 06. 1995	2	1	1		
34	D 7752	375			16. 06. 1995				45300	20.385
35	D 7753	375	14.30	270	16. 06. 1995	3	1	1		
36	D 7754	68.100 Borcea	6.80	70	16. 06. 1995		1		600	1.765
37	D 7755	68.100 Borcea	6.80	70	16. 06. 1995	1		1		

Appendix I List of biological samples collected in the lower (Romanian) Sector of the Danube River during the EROS-2000 cruise, June 1995

Crt. No.	Station No.	Station location Km / Mile (from the Black Sea)	Water depth - m	Station positioning from left bank m	Data	Number of samples			Macrozoobenthos	
						Chlorophyll	Phytoplankton	Zooplankton	D - sps.m^{-2}	B - g.m^{-2}
38	D 7757	301	10.40	180	17. 06.1995	3	1	1	14500	2.165
39	D 7759	Danube-Black Sea Channel	9.80	40	17. 06. 1995	3	1	4	19050	0.218
40	D 7761	247	13.30	160	17. 06. 1995	2	1	1	3350	1.765
41	D 7762	245			17. 06. 1995				250	0.375
42	D 7763	1 Borcea Branch	17.80	140	17. 06. 1995	3	1	1		
43	D 7764	Ialomita	3.20	100	17. 06. 1995	1	1	1	1800	1.035
44	D 7766	171	26.50	190	18. 06. 1995	3	1	1	13150	0.540
45	D 7767	170	26.50	190	18. 06. 1995				78900	14313.298
46	D 7768	169							238900	139.888
47	D 7769	167	18.00	340	18. 06. 1995	3	1	1	1500	0.600
48	D 7770	167	7.80	130	18. 06. 1995				61150	2721.726
49	D 7771	4+500 Macin Branch	7.80	130	18. 06. 1995	3	1	1	1000	0.590
50	D 7772	Siret	5.80	50	20.06. 1995	3	1	1	63450	10.260
51	D 7774	Mile 78	19.30	250	20. 06. 1995	3	1	1		
52	D 7775	Mile 78	4.50	20	20. 06. 1995				21450	126.205
53	D 7776		4.50	20	20. 06. 1995	1	1	1	182600	31.050
54	D 7777	Mile54+500	6.80	400	20. 06. 1995	2	1	1		
55	D 7778	Mile 44			21. 06.1995				14500	7.976
56	D 7779	Mile 44	32.30	200	21. 06.1995	3	1	1		
57	D 7781	115+270 Chilia Branch							53400	30.620
58	D 7783	115+270 Chilia Branch	9.80	210	21. 06. 1995	3	1	1	3850	1.352
59	D 7785	39.700 Chilia Branch	15.60	150	21. 06. 1995	2	1	1		
60	D 7786	39.700 Chilia Branch	15.60	150	21. 06. 1995	1			49600	308.200
61	D 7787	20 Chilia Branch	15.60	150	21. 06. 1995				4150	9.755
62	D 7788	20 Chilia Branch	11.50	270	21. 06. 1995	3	1	1	3900	8.870
63	D 7789	20 Chilia Branch							26250	7228.931
64	D 7794	Mile 34			23. 06. 1995	3	1	1		
65	D 7795	Mile 34			23. 06. 1995				6150	1097.182
66	D 7797	108.400 Sf.Gheorghe	13.00	160	23. 06. 1995	3	1	1	1300	0.345
67	D 7800	Mile 33+1000 Sulina Br.			23. 06. 1995	2	1	1	137300	1.990
68	D 7802	Hm 72 Sulina Branch			24. 06. 1995	1			2050	17.407
69	D 7803	Hm 72 Sulina Branch			24. 06. 1995	3	1	1	250	0.450
70	D 7804	Hm 72 Sulina Branch			26. 06. 1995				450	61.200
71	D 7805	1.320 Sf. Gheorghe			26. 06. 1995				27200	36.920
72	D 7806	1.300 Sf. Gheorghe	6.30	240	26. 06. 1995	3	1	1	2600	0.800
73	D 7808	0+200			26. 06. 1995	1	1			

Appendix II Phytoplankton - species found in June 1995 in the lower (Romanian) sector of the Danube River and the main characteristics of populations

Crt. no.	Species			Densities						Biomass						Crt. no.
		No	F%	A	Dmed	Deco	D%	W	Rk	A	Bmed	Beco	D%	W	Rk	
	CYANOBACTERIA															
1	*Anabaena constricta* (Szafer) Geitler	3	6.25	18	0.38	6.00	0.081	1.125	70	0.234	0.005	0.078	0.321	0.015	45	1
2	*Aphanizomenon flos-aquae* (L.) Ralfs	3	6.25	10	0.21	3.33	0.045	0.625	79	0.122	0.003	0.041	0.167	0.008	60	2
3	*Cylindrosphemum maius* Kützing	1	2.08	1	0.02	1.00	0.004	0.021	151	0.013	0.000	0.013	0.018	0.000	119	3
4	*Dactylococcopsis acicularis* Lemm.	25	52.08	266	5.54	10.64	1.190	138.542	23	0.222	0.005	0.009	0.305	0.116	28	4
5	*Dactylococcopsis irregularis* G.M. Smith	6	12.50	85	1.77	14.17	0.380	10.625	40	0.028	0.001	0.005	0.038	0.004	69	5
6	*Dactylococcopsis rhaphidioides* Hansgirg	2	4.17	16	0.33	8.00	0.072	0.667	78	0.006	0.000	0.003	0.008	0.000	120	6
7	*Gomphospheria aponina* Kützing	1	2.08	4	0.08	4.00	0.018	0.083	113	0.02	0.000	0.020	0.027	0.000	121	7
8	*Gomphospheria lacustris* Chodat	2	4.17	10	0.21	5.00	0.045	0.417	87	0.098	0.002	0.049	0.134	0.004	70	8
9	*Lyngbya limnetica* Lemm.	3	6.25	9	0.19	3.00	0.040	0.563	82	0.055	0.001	0.018	0.075	0.003	78	9
10	*Merismopedia glauca* (Ehr.) Nägeli	1	2.08	8	0.17	8.00	0.036	0.167	106	0.008	0.000	0.008	0.011	0.000	122	10
11	*Merismopedia tenuissima* Lemm.	1	2.08	4	0.08	4.00	0.018	0.083	114	0.006	0.000	0.006	0.008	0.000	123	11
12	*Microcystis aeruginosa* Kützing	2	4.17	15	0.31	7.50	0.067	0.625	80	0.042	0.001	0.021	0.058	0.002	86	12
13	*Microcystis flos-aquae* (Wittrock) Kirchner	1	2.08	4	0.08	4.00	0.018	0.083	115	0.016	0.000	0.016	0.022	0.000	124	13
14	*Oscillatoria chalybea* Mertens	4	8.33	10	0.21	2.50	0.045	0.833	73	0.155	0.003	0.039	0.213	0.013	47	14
15	*Oscillatoria formosa* Bory	4	8.33	22	0.46	5.50	0.098	1.833	57	0.473	0.010	0.118	0.649	0.039	35	15
16	*Oscillatoria limosa* Kützing	1	2.08	7	0.15	7.00	0.031	0.146	111	0.067	0.001	0.067	0.092	0.001	98	16
17	*Oscillatoria minima* Gicklhorn	6	12.50	54	1.13	9.00	0.242	6.750	43	0.069	0.001	0.012	0.095	0.009	55	17
18	*Oscillatoria planctonica* Woloszinska	3	6.25	6	0.13	2.00	0.027	0.375	90	0.035	0.001	0.012	0.048	0.002	87	18
19	*Oscillatoria tenuis* Agardh	25	52.08	293	6.10	11.72	1.310	152.604	19	1.582	0.033	0.063	2.171	0.824	13	19
20	*Phormidium molle* (Kütz.) Gomont	1	2.08	2	0.04	2.00	0.009	0.042	143	0.01	0.000	0.010	0.014	0.000	125	20
	EUGLENOPHYCEAE															
21	*Colacium simplex* H.P.	2	4.17	4	0.08	2.00	0.018	0.167	107	0.011	0.000	0.006	0.015	0.000	126	21
22	*Euglena acus* Ehrb.	1	2.08	4	0.08	4.00	0.018	0.083	116	0.04	0.001	0.040	0.055	0.001	99	22
23	*Euglena gracilis* Klebs	1	2.08	8	0.17	8.00	0.036	0.167	108	0.048	0.001	0.048	0.066	0.001	100	23
24	*Euglena intermedia* (Klebs) Schmitz	1	2.08	4	0.08	4.00	0.018	0.083	117	0.16	0.003	0.160	0.220	0.003	79	24
25	*Euglena oxyuris* Schmarda	1	2.08	3	0.06	3.00	0.013	0.062	136	0.06	0.001	0.060	0.082	0.001	101	25
26	*Euglena pisciformis* Klebs	3	6.25	6	0.13	2.00	0.027	0.375	91	0.046	0.001	0.015	0.063	0.003	80	26
27	*Euglena viridis* Ehrb.	1	2.08	3	0.06	3.00	0.013	0.062	137	0.09	0.002	0.090	0.123	0.002	88	27
28	*Phacus pyrum* (E.) Stein	1	2.08	3	0.06	3.00	0.013	0.062	138	0.016	0.000	0.016	0.022	0.000	127	28
29	*Trachelomonas oblonga* Lemm.	9	18.75	68	1.42	7.56	0.304	12.750	38	0.224	0.005	0.025	0.307	0.042	34	29
30	*Trachelomonas verrucosa* Stokes	44	91.67	1480	30.83	33.64	6.619	1356.667	4	4.719	0.098	0.107	6.474	4.326	2	30
31	*Trachelomonas volvocina* Ehrenb.	41	85.42	1607	33.48	39.20	7.187	1372.646	2	3.164	0.066	0.077	4.341	2.703	7	31

Appendix II Phytoplankton - species found in June 1995 in the lower (Romanian) sector of the Danube River and the main characteristics of populations

Crt.	Species			Densities						Biomass						Crt.
no.		No	F%	A	Dmed	Deco	D%	W	Rk	A	Bmed	Beco	D%	W	Rk	no.
	PYRROPHYCEAE															
32	*Cryptomonas errosa* Ehrenb.	3	6.25	9	0.19	3.00	0.040	0.563	83	0.061	0.001	0.020	0.084	0.004	71	32
33	*Gymnodinium excavatum* Nygaard	1	2.08	4	0.08	4.00	0.018	0.083	118	0.032	0.001	0.032	0.044	0.001	102	33
34	*Gymnodinium neglectum* (Schill.) Lind.	7	14.58	32	0.67	4.57	0.143	4.667	46	0.549	0.011	0.078	0.753	0.080	32	34
35	*Peridium cinctum* (Müll.) Ehrenb.	1	2.08	2	0.04	2.00	0.009	0.042	144	0.01	0.000	0.010	0.014	0.000	128	35
36	*Peridinium pygmaeum* Lindem.	2	4.17	6	0.13	3.00	0.027	0.250	97	0.042	0.001	0.021	0.058	0.002	89	36
	HETEROKONTAE															
37	*Tribonema ulotrichoides* Pasch.	28	58.33	309	6.44	11.04	1.382	180.250	17	5.148	0.107	0.184	7.063	3.003	5	37
	BACILLARIOPHYCEAE															
38	*Achnanthes clevei* Grunow	12	25.00	132	2.75	11.00	0.590	33.000	32	0.088	0.002	0.007	0.121	0.022	42	38
39	*Achnanthes exilis* Kützing	15	31.25	123	2.56	8.20	0.550	38.438	30	0.092	0.002	0.006	0.126	0.029	40	39
40	*Achnanthes inflata* Kützing	1	2.08	3	0.06	3.00	0.013	0.062	139	0.003	0.000	0.003	0.004	0.000	129	40
41	*Achnanthes microcephala* Kützing	2	4.17	10	0.21	5.00	0.045	0.417	88	0.006	0.000	0.003	0.008	0.000	130	41
42	*Achnanthes minutissima* Kützing	28	58.33	449	9.35	16.04	2.008	261.917	15	0.267	0.006	0.010	0.366	0.156	26	42
43	*Amphora ovalis* Kützing	2	4.17	6	0.13	3.00	0.027	0.250	98	0.022	0.000	0.011	0.030	0.001	103	43
44	*Asterionella formosa* Hassall	38	79.17	748	15.58	19.68	3.345	592.167	8	3.944	0.082	0.104	5.411	3.122	4	44
45	*Asterionella gracillima* (Hantz.) Heiberg	38	79.17	531	11.06	13.97	2.375	420.375	11	1.712	0.036	0.045	2.349	1.355	11	45
46	*Caloneis silicula* (Ehr.) Cleve	3	6.25	8	0.17	2.67	0.036	0.500	85	0.027	0.001	0.009	0.037	0.002	90	46
47	*Ceratoneis arcus* Kützing	1	2.08	4	0.08	4.00	0.018	0.083	119	0.012	0.000	0.012	0.016	0.000	131	47
48	*Cocconeis placentula* Ehrenb.	7	14.58	25	0.52	3.57	0.112	3.646	50	0.06	0.001	0.009	0.082	0.009	56	48
49	*Cyclotella chaetoceras* Lemm.	40	83.33	1935	40.31	48.38	8.654	1612.500	1	7.529	0.157	0.188	10.330	6.274	1	49
50	*Cyclotella comta* (Ehr.) Kütz.	9	18.75	201	4.19	22.33	0.899	37.688	31	0.359	0.007	0.040	0.493	0.067	33	50
51	*Cyclotella glomerata* Bachmann	20	41.67	1142	23.79	57.10	5.107	475.833	9	1.242	0.026	0.062	1.704	0.518	16	51
52	*Cyclotella kützingiana* Thwaites	38	79.17	1724	35.92	45.37	7.710	1364.833	3	3.572	0.074	0.094	4.901	2.828	6	52
53	*Cyclotella melosiroides* (Kirch.) Lemm.	5	10.42	155	3.23	31.00	0.693	16.146	34	0.249	0.005	0.050	0.342	0.026	41	53
54	*Cyclotella meneghiniana* Kützing	30	62.50	954	19.88	31.80	4.267	596.250	7	1.748	0.036	0.058	2.398	1.093	12	54
55	*Cyclotella operculata* (Ag.) Kützing	24	50.00	1334	27.79	55.58	5.966	667.000	6	1.362	0.028	0.057	1.869	0.681	14	55
56	*Cyclotella stelligera* Cl. v. Grun.	16	33.33	435	9.06	27.19	1.945	145.000	21	0.546	0.011	0.034	0.749	0.182	24	56
57	*Cymbella cistula* (Hempr.) Grun.	6	12.50	23	0.48	3.83	0.103	2.875	54	0.032	0.001	0.005	0.044	0.004	72	57
58	*Cymbella cymbiformis* (Kütz.) v. Heurk	5	10.42	31	0.65	6.20	0.139	3.229	52	0.088	0.002	0.018	0.121	0.009	57	58
59	*Cymbella prostrata* (Berkeley) Cleve	3	6.25	14	0.29	4.67	0.063	0.875	72	0.028	0.001	0.009	0.038	0.002	91	59
60	*Cymatopleura solea* (Breb.) W. Smith	1	2.08	4	0.08	4.00	0.018	0.083	120	0.032	0.001	0.032	0.044	0.001	104	60
61	*Cymatopleura solea var. apiculata* (W. Sm.) Ralfs	2	4.17	4	0.08	2.00	0.018	0.167	109	0.082	0.002	0.041	0.113	0.003	81	61
62	*Diatoma elongatum* Agardth	12	25.00	348	7.25	29.00	1.556	87.000	28	1.023	0.021	0.085	1.404	0.256	22	62
63	*Diatoma vulgare* Bory	5	10.42	24	0.50	4.80	0.107	2.500	55	0.074	0.002	0.015	0.102	0.008	61	63

Appendix II Phytoplankton - species found in June 1995 in the lower (Romanian) sector of the Danube River and the main characteristics of populations

Crt.	*Species*			Densities						Biomass						Crt.
no.		No	F%	A	Dmed	Deco	D%	W	Rk	A	Bmed	Beco	D%	W	Rk	no.
64	*Diatoma vulgare var.linearis* Grunow	1	2.08	4	0.08	4.00	0.018	0.083	121	0.016	0.000	0.016	0.022	0.000	132	64
65	*Eunotia lunaris* (Ehr.) Grunow	1	2.08	1	0.02	1.00	0.004	0.021	152	0.006	0.000	0.006	0.008	0.000	133	65
66	*Eunotia tridentula* Ehrenberg	1	2.08	4	0.08	4.00	0.018	0.083	122	0.012	0.000	0.012	0.016	0.000	134	66
67	*Fragilaria crotonensis* Kitton	10	20.83	54	1.13	5.40	0.242	11.250	39	1.331	0.028	0.133	1.826	0.277	20	67
68	*Frustulia rhomboides* (Ehr.) de Toni	2	4.17	6	0.13	3.00	0.027	0.250	99	0.104	0.002	0.052	0.143	0.004	73	68
69	*Gomphonema olivaceum* (Lyngb.) Kütz.	1	2.08	4	0.08	4.00	0.018	0.083	123	0.012	0.000	0.012	0.016	0.000	135	69
70	*Gomphonema ventricosum* Gregory	4	8.33	18	0.38	4.50	0.081	1.500	64	0.038	0.001	0.010	0.052	0.003	82	70
71	*Gyrosigma acuminatum* (Kütz.) Rabh.	1	2.08	4	0.08	4.00	0.018	0.083	124	0.08	0.002	0.080	0.110	0.002	92	71
72	*Gyrosigma scalproides* (Rabh.) Cleve	2	4.17	8	0.17	4.00	0.036	0.333	92	0.1	0.002	0.050	0.137	0.004	74	72
73	*Hantzschia amphioxys* (Ehr.) Grun.	3	6.25	29	0.60	9.67	0.130	1.813	58	0.178	0.004	0.059	0.244	0.011	52	73
74	*Mastogloia brauni* Grunov	4	8.33	16	0.33	4.00	0.072	1.333	67	0.111	0.002	0.028	0.152	0.009	58	74
75	*Melosira angustissima*	1	2.08	9	0.19	9.00	0.040	0.188	105	0.126	0.003	0.126	0.173	0.003	83	75
76	*Melosira granulata* (Ehr.) Ralfs	31	64.58	251	5.23	8.10	1.123	162.104	18	6.018	0.125	0.194	8.257	3.887	3	76
77	*Melosira granulata var. angustissima* Müll.	22	45.83	266	5.54	12.09	1.190	121.917	25	3.997	0.083	0.182	5.484	1.832	10	77
78	*Melosira italica* (Ehr.) Kützing	1	2.08	4	0.08	4.00	0.018	0.083	125	0.088	0.002	0.088	0.121	0.002	93	78
79	*Melosira varians* C. A. Ag.	1	2.08	2	0.04	2.00	0.009	0.042	145	0.036	0.001	0.036	0.049	0.001	105	79
80	*Navicula cincta* (Ehr.) Kützing	8	16.67	44	0.92	5.50	0.197	7.333	42	0.094	0.002	0.012	0.129	0.016	44	80
81	*Navicula cryptocephala* Kützing	3	6.25	27	0.56	9.00	0.121	1.688	59	0.039	0.001	0.013	0.054	0.002	94	81
82	*Navicula placentula* (Ehr.) Grunow	2	4.17	10	0.21	5.00	0.045	0.417	89	0.017	0.000	0.008	0.023	0.001	106	82
83	*Navicula rhynchocephala* Kützing	1	2.08	4	0.08	4.00	0.018	0.083	126	0.012	0.000	0.012	0.016	0.000	136	83
84	*Neidium iridis* (Ehr.) Cleve	10	20.83	64	1.33	6.40	0.286	13.333	37	0.819	0.017	0.082	1.124	0.171	25	84
85	*Neidium productum* (W. Smith) Cleve	1	2.08	5	0.10	5.00	0.022	0.104	112	0.07	0.001	0.070	0.096	0.001	107	85
86	*Nitzschia acicularis* W. Smith	28	58.33	560	11.67	20.00	2.504	326.667	13	0.754	0.016	0.027	1.034	0.440	17	86
87	*Nitzschia actinastroides* (Lemm.) van Goor	27	56.25	375	7.81	13.89	1.677	210.938	16	4.504	0.094	0.167	6.180	2.534	9	87
88	*Nitzschia dissipata* (Kütz.) Grun.	7	14.58	45	0.94	6.43	0.201	6.563	44	0.082	0.002	0.012	0.113	0.012	50	88
89	*Nitzschia filiformis* (W. Smith) Hust.	2	4.17	14	0.29	7.00	0.063	0.583	81	0.03	0.001	0.015	0.041	0.001	108	89
90	*Nitzschia gracilis* Hantzsch	4	8.33	35	0.73	8.75	0.157	2.917	53	0.041	0.001	0.010	0.056	0.003	84	90
91	*Nitzschia hungarica* Grunow	2	4.17	185	3.85	92.50	0.827	7.708	41	0.252	0.005	0.126	0.346	0.010	53	91
92	*Nitzschia linearis* W. Smith	4	8.33	12	0.25	3.00	0.054	1.000	71	0.051	0.001	0.013	0.070	0.004	75	92
93	*Nitzschia lorenziana var. subtilis* Grun.	1	2.08	4	0.08	4.00	0.018	0.083	127	0.04	0.001	0.040	0.055	0.001	109	93
94	*Nitzschia palea* (Kütz.) W. Smith	29	60.42	692	14.42	23.86	3.095	418.083	12	0.504	0.010	0.017	0.691	0.305	19	94
95	*Nitzschia recta* Hantzsch	18	37.50	148	3.08	8.22	0.662	55.500	29	0.354	0.007	0.020	0.486	0.133	27	95
96	*Nitzschia sigmoidea* (Ehr.) W. Smith	3	6.25	12	0.25	4.00	0.054	0.750	75	0.166	0.003	0.055	0.228	0.010	54	96
97	*Nitzschia subtilis* Kützing	2	4.17	8	0.17	4.00	0.036	0.333	93	0.028	0.001	0.014	0.038	0.001	110	97
98	*Nitzschia tryblionella* Hantzsch	2	4.17	38	0.79	19.00	0.170	1.583	61	0.098	0.002	0.049	0.134	0.004	76	98

Appendix II Phytoplankton - species found in June 1995 in the lower (Romanian) sector of the Danube River and the main characteristics of populations

Crt.	*Species*			Densities						Biomass						Crt.
no.		No	F%	A	Dmed	Deco	D%	W	Rk	A	Bmed	Beco	D%	W	Rk	no.
99	*Nitzschia tryblionella var. levidensis* (W. Sm.) Grun.	2	4.17	5	0.10	2.50	0.022	0.208	104	0.02	0.000	0.010	0.027	0.001	111	99
100	*Rhoicosphenia curvata* (Kütz.) Grun.	3	6.25	11	0.23	3.67	0.049	0.688	77	0.016	0.000	0.005	0.022	0.001	112	100
101	*Stephanodiscus astraea* (Ehr.) Grun.	24	50.00	289	6.02	12.04	1.292	144.500	22	1.139	0.024	0.047	1.563	0.569	15	101
102	*Stephanodiscus hantzschi* Grun.	3	6.25	25	0.52	8.33	0.112	1.563	63	0.075	0.002	0.025	0.103	0.005	67	102
103	*Surirella linearis* W. Smith	1	2.08	4	0.08	4.00	0.018	0.083	128	0.24	0.005	0.240	0.329	0.005	68	103
104	*Surirella linearis var. constricta* (Ehr.) Grun.	1	2.08	4	0.08	4.00	0.018	0.083	129	0.12	0.003	0.120	0.165	0.002	95	104
105	*Surirella ovata* Kützing	3	6.25	9	0.19	3.00	0.040	0.563	84	0.035	0.001	0.012	0.048	0.002	96	105
106	*Synedra acus* Kützing	31	64.58	445	9.27	14.36	1.990	287.396	14	0.322	0.007	0.010	0.442	0.208	23	106
107	*Synedra acus var. angustissima* Grun.	7	14.58	33	0.69	4.71	0.148	4.813	45	0.089	0.002	0.013	0.122	0.013	48	107
108	*Synedra affinis* Kützing	2	4.17	98	2.04	49.00	0.438	4.083	49	0.202	0.004	0.101	0.277	0.008	62	108
109	*Synedra nana* Meister	1	2.08	8	0.17	8.00	0.036	0.167	110	0.003	0.000	0.003	0.004	0.000	137	109
110	*Synedra ulna* (Nitzsch) Ehr.	27	56.25	261	5.44	9.67	1.167	146.813	20	0.737	0.015	0.027	1.011	0.415	18	110
111	*Synedra ulna var. danica* (Kütz.) Grun.	2	4.17	6	0.13	3.00	0.027	0.250	100	0.018	0.000	0.009	0.025	0.001	113	111
112	*Synedra ulna var. oxynhynchus* (Kütz.) v. Heurek	1	2.08	4	0.08	4.00	0.018	0.083	130	0.012	0.000	0.012	0.016	0.000	138	112
	CHLOROPHYCEAE															
113	*Actinastrum hantzschi* Lagerheim	36	75.00	1094	22.79	30.39	4.893	820.500	5	3.601	0.075	0.100	4.941	2.701	8	113
114	*Ankistrodesmus falcatus* (Corda) Ralfs	1	2.08	16	0.33	16.00	0.072	0.333	94	0.01	0.000	0.010	0.014	0.000	139	114
115	*Ankistrodesmus falcatus var. acicularis* (A. Br.) G.S. West	24	50.00	277	5.77	11.54	1.239	138.500	24	0.18	0.004	0.008	0.247	0.090	31	115
116	*Ankistrodesmus falcatus var. mirabile* W. v. G.S. West	9	18.75	122	2.54	13.56	0.546	22.875	33	0.066	0.001	0.007	0.091	0.012	51	116
117	*Ankistrodesmus longissimus* (Lemm.) Wille	2	4.17	7	0.15	3.50	0.031	0.292	96	0.008	0.000	0.004	0.011	0.000	140	117
118	*Asterococcus superbus* Scherffel	6	12.50	37	0.77	6.17	0.165	4.625	47	0.109	0.002	0.018	0.150	0.014	46	118
119	*Chlamydomonas ovalis* Pascher	5	10.42	138	2.88	27.60	0.617	14.375	36	0.209	0.004	0.042	0.287	0.022	43	119
120	*Chlorella vulgaris* Beyerinck	27	56.25	751	15.65	27.82	3.359	422.438	10	0.489	0.010	0.018	0.671	0.275	21	120
121	*Chodatella longiseta* Lemmermann	2	4.17	8	0.17	4.00	0.036	0.333	95	0.012	0.000	0.006	0.016	0.000	141	121
122	*Chodatella quadriseta* Lemmermann	2	4.17	6	0.13	3.00	0.027	0.250	101	0.016	0.000	0.008	0.022	0.001	114	122
123	*Closterium gracile* Bréb.	1	2.08	3	0.06	3.00	0.013	0.062	140	0.01	0.000	0.010	0.014	0.000	142	123
124	*Closterium pronum* Bréb.	6	12.50	19	0.40	3.17	0.085	2.375	56	0.057	0.001	0.010	0.078	0.007	64	124
125	*Closterium strigosum* Bréb.	4	8.33	15	0.31	3.75	0.067	1.250	69	0.375	0.008	0.094	0.515	0.031	38	125
126	*Coelastrum microporum* Naegeli	1	2.08	2	0.04	2.00	0.009	0.042	146	0.02	0.000	0.020	0.027	0.000	143	126
127	*Cosmarium reniforme* (Ralfs) Arch.	1	2.08	1	0.02	1.00	0.004	0.021	153	0.003	0.000	0.003	0.004	0.000	144	127
128	*Crucigenia fenestrata* Schmidle	1	2.08	3	0.06	3.00	0.013	0.062	141	0.015	0.000	0.015	0.021	0.000	145	128
129	*Elakatothrix linearis* Pascher	14	29.17	333	6.94	23.79	1.489	97.125	27	0.391	0.008	0.028	0.536	0.114	29	129
130	*Eudorina elegans* Ehrb.	1	2.08	2	0.04	2.00	0.009	0.042	147	0.04	0.001	0.040	0.055	0.001	115	130
131	*Golenkinia radiata* Chodat	1	2.08	2	0.04	2.00	0.009	0.042	148	0.008	0.000	0.008	0.011	0.000	146	131
132	*Oocystis naegeli* Al. Br.	1	2.08	2	0.04	2.00	0.009	0.042	149	0.006	0.000	0.006	0.008	0.000	147	132

Appendix II Phytoplankton - species found in June 1995 in the lower (Romanian) sector of the Danube River and the main characteristics of populations

Crt. no.	*Species*			Densities						Biomass						Crt. no.
		No	F%	A	Dmed	Deco	D%	W	Rk	A	Bmed	Beco	D%	W	Rk	
133	*Pandorina morum* (Müller) Bory	5	10.42	14	0.29	2.80	0.063	1.458	65	0.35	0.007	0.070	0.480	0.036	37	133
134	*Pediastrum boryanum* (Turin) Menegh.	4	8.33	16	0.33	4.00	0.072	1.333	68	0.356	0.007	0.089	0.488	0.030	39	134
135	*Pediastrum duplex* Meyen	1	2.08	4	0.08	4.00	0.018	0.083	131	0.008	0.000	0.008	0.011	0.000	148	135
136	*Pediastrum duplex var. reticulatum* Al. Br.	2	4.17	12	0.25	6.00	0.054	0.500	86	0.136	0.003	0.068	0.187	0.006	66	136
137	*Penium minutum* (Ralfs) Cleve	1	2.08	4	0.08	4.00	0.018	0.083	132	0.06	0.001	0.060	0.082	0.001	116	137
138	*Protococcus viridis* Agardh	2	4.17	6	0.13	3.00	0.027	0.250	102	0.013	0.000	0.007	0.018	0.001	117	138
139	*Richteriella botryoides* (Schm.) Lemm.	2	4.17	6	0.13	3.00	0.027	0.250	103	0.012	0.000	0.006	0.016	0.000	149	139
140	*Scenedesmus acuminatus* (Lagerh.) Chod.	5	10.42	32	0.67	6.40	0.143	3.333	51	0.077	0.002	0.015	0.106	0.008	63	140
141	*Scenedesmus acuminatus fo. tortuosus* (Skuja) Uherov	1	2.08	4	0.08	4.00	0.018	0.083	133	0.006	0.000	0.006	0.008	0.000	150	141
142	*Scenedesmus bicaudatus* (Hansg.) Chod.	1	2.08	2	0.04	2.00	0.009	0.042	150	0.006	0.000	0.006	0.008	0.000	151	142
143	*Scenedesmus carinatus* (Lemm.) Chod.	3	6.25	13	0.27	4.33	0.058	0.813	74	0.055	0.001	0.018	0.075	0.003	85	143
144	*Scenedesmus ecornis* (Ralfs) Chod.	4	8.33	20	0.42	5.00	0.089	1.667	60	0.02	0.000	0.005	0.027	0.002	97	144
145	*Scenedesmus intermedius* Chodat	3	6.25	22	0.46	7.33	0.098	1.375	66	0.066	0.001	0.022	0.091	0.004	77	145
146	*Scenedesmus opoliensis* P. Richt.	4	8.33	19	0.40	4.75	0.085	1.583	62	0.08	0.002	0.020	0.110	0.007	65	146
147	*Scenedesmus quadricauda* (Turp.) Bréb.	19	39.58	285	5.94	15.00	1.275	112.813	26	0.288	0.006	0.016	0.395	0.108	30	147
148	*Scenedesmus quadricauda var. maximus* W.v. G. S. West	1	2.08	4	0.08	4.00	0.018	0.083	134	0.032	0.001	0.032	0.044	0.001	118	148
149	*Selenastrum gracile* Reinsch	10	20.83	73	1.52	7.30	0.326	15.208	35	0.044	0.001	0.004	0.060	0.009	59	149
150	*Surirella ovata* (Kützing)	1	2.08	3	0.06	3.00	0.013	0.062	142	0.008	0.000	0.008	0.011	0.000	152	150
151	*Tetrastrum staurogeniaeforme* (Schroed.) Lemm.	1	2.08	4	0.08	4.00	0.018	0.083	135	0.004	0.000	0.004	0.005	0.000	153	151
152	*Ulothrix zonata* Kützing	5	10.42	43	0.90	8.60	0.192	4.479	48	0.368	0.008	0.074	0.505	0.038	36	152
153	*Zignema sp.* Agardh	4	8.33	9	0.19	2.25	0.040	0.750	76	0.156	0.003	0.039	0.214	0.013	49	153
					Dmed	Dmed %					Bmed	Bmed %				
	CYANOBACTERIA				17.58	3.77					0.07	4.44				
	EUGLENOPHYCEAE				66.46	14.27					0.18	11.79				
	PYRROPHYCEAE				1.11	0.24					0.01	0.93				
	HETEROKONTAE				6.44	1.38					0.11	7.09				
	BACILLARIOPHYCEAE				302.73	64.99					0.99	65.36				
	CHLOROPHYCEAE				71.53	15.35					0.16	10.40				
	SUM				465.85	100.00					1.51	100.00				

Appendix III Zooplankton - species found in June 1995 in the lower (Romanian) sector of the Danube River and the characteristics of populations

Crt. no.	Species	Nocc	F%	Densities						Biomass						Crt. no.
				A	Dmed	Deco	D%	W	Rk	A	Bmed	Beco	D%	W	Rk	
	ROTATORIA				ex.m^{-3}	ex.m^{-3}					mg.m^{-3}	mg.m^{-3}				
1	*Asplanchna herricki*	24	55.8	3818	88.791	159.083	0.227	70.40	8	35.88	0.835	1.495	2.563	6.82	7	1
2	*Brachionus bennini*	9	20.9	698	16.233	77.556	0.041	18.43	13	1.26	0.029	0.140	0.090	0.78	17	2
3	*Brachionus calyciflorus f. amphiceros*	37	86.0	196187	4562.488	5302.351	11.658	626.57	2	353.14	8.212	9.544	25.223	26.58	2	3
4	*Brachionus calyciflorus var. dorcas*	23	53.5	24675	573.837	1072.826	1.466	175.20	4	44.42	1.033	1.931	3.172	7.43	6	4
5	*Brachionus diversicornis*	6	14.0	163	3.791	27.167	0.010	7.27	18	0.29	0.007	0.049	0.021	0.31	23	5
6	*Brachionus leydigi var. rotundus*	2	4.7	6	0.140	3.000	0.000	0.81	41	0.01	0.000	0.005	0.001	0.03	49	6
7	*Brachionus quadridentatus var. brevispinus*	25	58.1	1922	44.698	76.880	0.114	50.98	10	3.46	0.080	0.138	0.247	2.16	12	7
8	*Brachionus quadridentatus var. cluniorbicularis*	1	2.3	5	0.116	5.000	0.000	0.52	47	0.01	0.000	0.009	0.001	0.02	51	8
9	*Brachionus quadridentatus var. rhenenus*	1	2.3	5	0.116	5.000	0.000	0.52	48	0.01	0.000	0.009	0.001	0.02	52	9
10	*Brachionus urceolaris var. sericus*	4	9.3	244	5.674	61.000	0.014	7.27	19	0.44	0.010	0.110	0.031	0.31	24	10
11	*Cephalodella sp.*	9	20.9	574	13.349	63.778	0.034	16.72	15	0.98	0.023	0.108	0.070	0.69	18	11
12	*Filinia longiseta*	1	2.3	150	3.488	150.000	0.009	2.85	26	0.20	0.005	0.195	0.014	0.10	36	12
13	*Filinia limnetica*	6	14.0	107	2.488	17.833	0.006	5.89	20	0.14	0.003	0.023	0.010	0.21	29	13
14	*Filinia passa*	3	7.0	35	0.814	11.667	0.002	2.38	28	0.05	0.001	0.015	0.003	0.09	38	14
15	*Keratella cochlearis*	22	51.2	2873	66.814	130.591	0.171	58.47	9	3.73	0.087	0.170	0.267	2.11	13	15
16	*Keratella quadrata*	33	76.7	11428	265.767	346.303	0.679	142.81	5	14.86	0.345	0.450	1.061	5.15	8	16
17	*Lecane sp.*	5	11.6	92	2.140	18.400	0.005	4.99	22	0.21	0.005	0.042	0.015	0.24	27	17
18	*Lecane lunaris*	1	2.3	15	0.349	15.000	0.001	0.90	38	0.03	0.001	0.035	0.002	0.04	47	18
19	*Lepadella rhomboides*	2	4.7	17	0.395	8.500	0.001	1.36	33	0.02	0.000	0.010	0.001	0.05	46	19
20	*Mytilina ventralis*	2	4.7	6	0.140	3.000	0.000	0.81	42	0.01	0.000	0.007	0.001	0.04	48	20
21	*Platyas patulus*	1	2.3	15	0.349	15.000	0.001	0.90	39	0.00	0.000	0.003	0.000	0.01	54	21
22	*Polyarthra remata*	18	41.9	565	13.140	31.389	0.034	23.45	12	0.17	0.004	0.009	0.012	0.41	22	22
23	*Tetramastix opoliensis*	4	9.3	25	0.581	6.250	0.001	2.33	30	0.03	0.001	0.008	0.002	0.08	39	23
	BIVALVIA															
24	*BIVALVIA larvae*	43	100.0	1393406	32404.791	32404.791	82.798	1800.13	1	703.35	16.357	16.357	50.237	40.44	1	24
	CLADOCERA															
25	*Acroperus angustatus*	1	2.3	1	0.023	1.000	0.000	0.23	51	0.07	0.002	0.070	0.005	0.06	44	25
26	*Alona guttata guttata*	7	16.3	9	0.209	1.286	0.001	1.85	32	0.08	0.002	0.012	0.006	0.18	31	26
27	*Alona quadrangularis*	2	4.7	4	0.093	2.000	0.000	0.66	45	0.04	0.001	0.018	0.003	0.06	43	27
28	*Bosmina coregoni coregoni*	1	2.3	23	0.535	23.000	0.001	1.12	36	0.21	0.005	0.207	0.015	0.11	34	28
29	*Bosmina longirostris*	43	100.0	6566.5	152.709	152.709	0.390	123.58	6	59.10	1.374	1.374	4.221	11.72	4	29

Appendix III Zooplankton - species found in June 1995 in the lower (Romanian) sector of the Danube River and the characteristics of populations

Crt. no.	Species	Nocc	F%	Densities						Biomass						Crt. no.
				A	Dmed	Deco	D%	W	Rk	A	Bmed	Beco	D%	W	Rk	
30	*Ceriodaphnia pulchella*	11	25.6	41	0.953	3.727	0.002	4.94	23	1.64	0.038	0.149	0.117	0.99	15	30
31	*Ceriodaphnia reticulata*	4	9.3	7	0.163	1.750	0.000	1.23	35	0.28	0.007	0.070	0.020	0.25	26	31
32	*Chydorus sphaericus*	25	58.1	517	12.023	20.680	0.031	26.44	11	4.65	0.108	0.186	0.332	2.51	11	32
33	*Daphnia cucullata*	9	20.9	68	1.581	7.556	0.004	5.75	21	3.26	0.076	0.363	0.233	1.26	14	33
34	*Daphnia galeata galeata*	26	60.5	172	4.000	6.615	0.010	15.55	16	8.26	0.192	0.318	0.590	3.41	10	34
35	*Disparalona rostrata rostrata*	8	18.6	33	0.767	4.125	0.002	3.78	25	0.43	0.010	0.054	0.031	0.43	21	35
36	*Eurycercus lamellatus*	1	2.3	1	0.023	1.000	0.000	0.23	52	0.10	0.002	0.100	0.007	0.07	41	36
37	*Ilyocryptus agilis*	1	2.3	1	0.023	1.000	0.000	0.23	53	0.02	0.000	0.020	0.001	0.03	50	37
38	*Leydigia leydigi*	9	20.9	15	0.349	1.667	0.001	2.70	27	0.15	0.003	0.017	0.011	0.27	25	38
39	*Pleuroxus laevis laevis*	3	7.0	6	0.140	2.000	0.000	0.99	37	0.05	0.001	0.018	0.004	0.09	37	39
40	*Pleuroxus aduncus aduncus*	1	2.3	5	0.116	5.000	0.000	0.52	49	0.05	0.001	0.045	0.003	0.05	45	40
41	*Pleuroxus uncinatus uncinatus*	3	7.0	10	0.233	3.333	0.001	1.27	34	0.09	0.002	0.030	0.006	0.12	33	41
42	*Macrothrix laticornis.*	2	4.7	2	0.047	1.000	0.000	0.47	50	0.05	0.001	0.026	0.004	0.07	40	42
43	*Scapholeberis kingi*	3	7.0	5	0.116	1.667	0.000	0.90	40	0.20	0.005	0.067	0.014	0.18	30	43
44	*Scapholeberis mucronata*	12	27.9	457	10.628	38.083	0.027	17.22	14	18.28	0.425	1.523	1.306	3.44	9	44
45	*Simocephalus vetulus*	7	16.3	11	0.256	1.571	0.001	2.04	31	0.88	0.020	0.126	0.063	0.58	20	45
	CYCLOPOIDA															
46	*Acanthocyclops bisetosus*	43	100.0	33757	785.047	785.047	2.006	280.19	3	100.94	2.347	2.347	7.209	15.32	3	46
47	*Acanthocyclops crassicaudis*	1	2.3	1	0.023	1.000	0.000	0.23	54	0.00	0.000	0.004	0.000	0.01	53	47
48	*Acanthocyclops viridis*	2	4.7	3	0.070	1.500	0.000	0.57	46	0.10	0.002	0.049	0.007	0.10	35	48
49	*Cyclops rubens rubens*	5	11.6	21	0.488	4.200	0.001	2.38	29	0.17	0.004	0.034	0.012	0.22	28	49
50	*Cyclops vicinus vicinus*	1	2.3	9	0.209	9.000	0.001	0.70	43	0.07	0.002	0.074	0.005	0.06	42	50
51	*Eucyclops serrulatus serrulatus*	8	18.6	163	3.791	20.375	0.010	8.40	17	0.93	0.022	0.117	0.067	0.64	19	51
	CALANOIDA															
52	*Calanipeda aquae dulcis*	2	4.7	4.5	0.105	2.250	0.000	0.70	44	0.15	0.003	0.074	0.010	0.13	32	52
53	*Eurytemora velox*	42	97.7	3915.5	91.058	93.226	0.233	94.31	7	36.14	0.840	0.860	2.581	9.06	5	53
54	*Eudiaptomus gracilis*	13	30.2	34	0.791	2.615	0.002	4.89	24	0.99	0.023	0.076	0.071	0.83	16	54
					D med	**D med %**					**B med**	**B med %**				
	Rotatoria				5665.70	14.48					10.68	32.80				
	Bivalvia				32404.79	82.80					16.36	50.24				
	Cladocera				184.99	0.47					2.28	7.01				
	Copepoda				881.58	2.25					3.24	9.95				
	Zooplankton total				39137.06	100.00					32.56	100.00				

Appendix IV. Main Characteristics of zoobenthos populations from the lower (Romanian) sector of the River Danube, June 1995

11A. Entire investigated sector

	Species	Nocc	F%	Densities D - sps.m^{-2}						Biomasses B - g.m^{-2}					
				A	Davg	Deco	D%	W	Rk	A	Bavg	Beco	D%	W	Rk
1	Hydroidae	1	2	250	5.0	250.000	0.009	3.162	33	0.015	0.000	0.015	0.000	0.024	36
2	Turbellaria	3	6	550	11.0	183.333	0.021	8.124	24	0.386	0.008	0.129	0.001	0.224	26
3	Rhabdocoella	3	6	650	13.0	216.667	0.024	8.832	23	0.065	0.001	0.022	0.000	0.092	29
4	Nematoda var.	21	42	132600	2652.0	6314.286	4.946	333.742	5	0.304	0.006	0.014	0.001	0.526	20
5	Nereidae	3	6	1700	34.0	566.667	0.063	14.283	21	78.370	1.567	26.123	0.163	3.197	14
6	*Hypania invalida*	6	12	9250	185.0	1541.667	0.345	47.117	11	6.340	0.127	1.057	0.013	1.286	16
7	Polychaeta (Ampharetidae)	10	20	464350	9287.0	46435.000	17.319	430.976	3	272.198	5.444	5.444	0.567	24.326	7
8	Oligochaeta var.	48	96	1230900	24618.0	25643.750	45.909	1537.312	1	1866.561	37.331	38.887	3.888	62.413	3
9	Oligochaeta cocoons	19	38	42400	848.0	2231.579	1.581	179.510	7	12.692	0.254	0.668	0.026	3.238	13
10	Hirudinea var.	6	12	4100	82.0	683.333	0.153	31.369	16	72.565	1.451	12.094	0.151	4.351	12
11	Hirudinea eggs	2	4	100	2.0	50.000	0.004	2.828	34	0.085	0.002	0.043	0.000	0.086	31
12	*Theodoxus transversalis*	3	6	450	9.0	150.000	0.017	7.348	26	16.395	0.328	5.465	0.034	1.462	15
13	*Theodoxus danubialis*	2	4	100	2.0	50.000	0.004	2.828	35	6.895	0.138	3.448	0.014	0.774	19
14	*Viviparus*	6	12	6200	124.0	1033.333	0.231	38.575	12	15557.810	311.156	2592.968	32.408	63.707	2
15	*Lithoglyphus naticoides*	5	10	5250	105.0	1050.000	0.196	32.404	15	151.760	3.035	30.352	0.316	5.744	11
16	Gastropoda var.	10	20	10500	210.0	1050.000	0.392	64.807	10	830.155	16.603	83.016	1.729	18.998	8
17	Gastropoda eggs	1	2	150	3.0	150.000	0.006	2.449	36	0.055	0.001	0.055	0.000	0.049	33
18	*Anodonta* sp.	2	4	300	6.0	150.000	0.011	4.899	28	2691.060	53.821	1345.530	5.606	15.297	9
19	*Unio* sp.	9	18	750	15.0	83.333	0.028	16.432	20	9085.145	181.703	1009.461	18.925	59.624	4
20	*Sphaerium* sp.	12	24	44550	891.0	3712.500	1.662	146.233	8	3683.280	73.666	306.940	7.673	43.837	5
21	*Sphaerium veligeres*	1	2	21250	425.0	21250.000	0.793	29.155	18	2.125	0.043	2.125	0.004	0.304	23
22	*Dreissena polymorpha*	12	24	95150	1903.0	7929.167	3.549	213.710	6	12781.740	255.635	1065.145	26.626	81.662	1
23	Bivalvia larvae	2	4	17550	351.0	8775.000	0.655	37.470	13	0.007	0.000	0.003	0.000	0.024	37
24	Copepoda	2	4	12200	244.0	6100.000	0.455	31.241	17	0.623	0.012	0.311	0.001	0.233	25
25	Ostracoda	1	2	600	12.0	600.000	0.022	4.899	29	0.012	0.000	0.012	0.000	0.023	38
26	*Jaera sarsi*	7	14	35100	702.0	5014.286	1.309	99.136	9	2.200	0.044	0.314	0.005	0.818	18
27	Corofiidae var.	16	32	174050	3481.0	10878.125	6.492	333.754	4	166.622	3.332	10.414	0.347	10.766	10
28	Gammaridae var.	24	48	363150	7263.0	15131.250	13.545	590.444	2	715.867	14.317	29.828	1.491	27.331	6
29	Chironomidae	4	8	700	14.0	175.000	0.026	10.583	22	0.445	0.009	0.111	0.001	0.278	24
30	Chironomidae larvae	12	24	2250	45.0	187.500	0.084	32.863	14	1.613	0.032	0.134	0.003	0.917	17
31	Chironomidae pupae	3	6	150	3.0	50.000	0.006	4.243	31	0.078	0.002	0.026	0.000	0.101	28
32	Trichoptera larvae	4	8	300	6.0	75.000	0.011	6.928	27	0.715	0.014	0.179	0.001	0.353	22
33	Insecta var.	2	4	750	15.0	375.000	0.028	7.746	25	0.515	0.010	0.258	0.001	0.212	27
34	Hidracarina	1	2	50	1.0	50.000	0.002	1.414	38	0.003	0.000	0.003	0.000	0.010	39
35	Ceratopogonidae	2	4	250	5.0	125.000	0.009	4.472	30	0.095	0.002	0.048	0.000	0.091	30
36	Ceratopogonidae larvae	2	4	200	4.0	100.000	0.007	4.000	32	0.045	0.001	0.023	0.000	0.063	32
37	Aranea	1	2	50	1.0	50.000	0.002	1.414	39	0.050	0.001	0.050	0.000	0.047	34
38	Caryophillleidae larvae	1	2	100	2.0	100.000	0.004	2.000	37	0.015	0.000	0.015	0.000	0.026	35
39	Eggs var.	7	14	2200	44.0	314.286	0.082	24.819	19	0.71	0.014	0.101	0.001	0.465	21
	Total				**53623.0**						**960.112**				

Appendix IV. Main Characteristics of zoobenthos populations from the lower (Romanian) sector of the River Danube, June 1995

11B. Iron Gates I zone

	Species	Nocc	F%	Densities D - sps.m^{-2}						Biomasses B - g.m^{-2}					
				A	Davg	Deco	D%	W	Rk	A	Bavg	Beco	D%	W	Rk
3	Rhabdocoella	1	11.11	50	5.6	50.0	0.004	7.857	21	0.003	0.000	0.003	0.000	0.056	24
4	Nematoda var.	3	33.33	16800	1866.7	5600.0	1.298	249.444	7	0.032	0.004	0.011	0.000	0.347	21
6	*Hypania invalida*	4	44.44	8950	994.4	2237.5	0.691	210.232	8	5.955	0.662	1.489	0.039	5.423	11
7	Polychaeta (Ampharetidae)	4	44.44	364750	40527.8	91187.5	28.181	1342.101	3	217.598	24.178	54.399	1.423	32.780	7
8	Oligochaeta var.	9	100.00	306400	34044.4	34044.4	23.673	1845.114	1	1398.853	155.428	155.428	9.146	124.671	3
9	Oligochaeta cocoons	4	44.44	6350	705.6	1587.5	0.491	177.082	9	2.112	0.235	0.528	0.014	3.229	12
10	Hirudinea var.	4	44.44	3700	411.1	925.0	0.286	135.173	13	22.305	2.478	5.576	0.146	10.495	10
11	Hirudinea eggs	1	11.11	50	5.6	50.0	0.004	7.857	22	0.075	0.008	0.075	0.000	0.304	22
12	*Theodoxus transversalis*	1	11.11	50	5.6	50.0	0.004	7.857	23	5.500	0.611	5.500	0.036	2.606	13
13	*Theodoxus danubialis*	1	11.11	50	5.6	50.0	0.004	7.857	24	5.495	0.611	5.495	0.036	2.605	14
14	*Viviparus*	1	11.11	100	11.1	100.0	0.008	11.111	20	467.765	51.974	467.765	3.058	24.031	9
15	*Lithoglyphus naticoides*	1	11.11	50	5.6	50.0	0.004	7.857	25	0.400	0.044	0.400	0.003	0.703	18
16	Gastropoda var.	3	33.33	8300	922.2	2766.7	0.641	175.330	10	630.415	70.046	210.138	4.122	48.320	6
19	*Unio* sp.	3	33.33	150	16.7	50.0	0.012	23.570	17	3777.380	419.709	1259.127	24.698	118.281	4
20	*Sphaerium* sp.	7	77.78	39550	4394.4	5650.0	3.056	584.628	5	3040.385	337.821	434.341	19.879	162.095	1
21	*Sphaerium veligeres*	1	11.11	21250	2361.1	21250.0	1.642	161.971	11	2.125	0.236	2.125	0.014	1.620	15
22	*Dreissena polymorpha*	4	44.44	27100	3011.1	6775.0	2.094	365.824	6	5025.900	558.433	1256.475	32.861	157.541	2
23	Bivalvia larvae	1	11.11	17500	1944.4	17500.0	1.352	146.986	12	0.002	0.000	0.002	0.000	0.046	25
26	*Jaera sarsi*	1	11.11	9500	1055.6	9500.0	0.734	108.298	14	0.209	0.023	0.209	0.001	0.508	19
27	Corofiidae var.	6	66.67	153100	17011.1	25516.7	11.829	1064.929	4	144.572	16.064	24.095	0.945	32.725	8
28	Gammaridae var.	5	55.56	308600	34288.9	61720.0	23.843	1380.195	2	546.377	60.709	109.275	3.572	58.075	5
29	Chironomidae	1	11.11	200	22.2	200.0	0.015	15.713	18	0.125	0.014	0.125	0.001	0.393	20
30	Chironomidae larvae	1	11.11	150	16.7	150.0	0.012	13.608	19	0.020	0.002	0.020	0.000	0.157	23
33	Insecta var.	1	11.11	700	77.8	700.0	0.054	29.397	16	0.500	0.056	0.500	0.003	0.786	17
39	Eggs var.	2	22.22	900	100.0	450.0	0.070	47.140	15	0.355	0.039	0.178	0.002	0.936	16
	Total				**143811.1**						**1699.384**				

Appendix IV. Main Characteristics of zoobenthos populations from the lower (Romanian) sector of the River Danube, June 1995

11C. Iron Gates II zone

	Species	Nocc	F%	Densities D - sps.m^{-2}						Biomasses B - g.m^{-2}					
				A	Davg	Deco	D%	W	Rk	A	Bavg	Beco	D%	W	Rk
1	Hydroidae	1	33.300	250.000	83.330	250.000	0.110	52.705	18	0.015	0.005	0.015	0.000	0.408	19
2	Turbellaria	3	100.000	550.000	183.330	183.330	0.241	135.401	10	0.386	0.129	0.129	0.006	3.587	13
3	Rhabdocoella	1	33.300	300.000	100.000	300.000	0.132	57.735	16	0.050	0.017	0.050	0.001	0.745	18
4	Nematoda var.	2	66.700	2100.000	700.000	1050.000	0.921	216.025	8	0.004	0.001	0.002	0.000	0.307	22
7	Polychaeta (Ampharetidae)	3	10.000	99050.000	33016.670	33016.670	43.424	1817.049	1	54.080	18.027	18.027	0.836	42.458	5
8	Oligochaeta var.	2	6.700	36700.000	12233.330	18350.000	16.089	903.081	3	12.510	4.170	6.255	0.193	16.673	8
9	Oligochaeta cocoons	2	66.700	2750.000	916.670	1375.000	1.206	247.207	7	1.790	0.597	0.895	0.028	6.307	12
10	Hirudinea var.	2	66.700	400.000	133.330	200.000	0.175	94.281	11	0.260	0.087	0.130	0.004	2.404	15
14	*Viviparus*	2	66.700	200.000	66.670	100.000	0.088	66.667	15	261.285	87.095	130.643	4.040	76.199	4
16	Gastropoda var.	1	33.300	300.000	100.000	300.000	0.132	57.735	17	38.150	12.717	38.150	0.590	20.589	7
18	*Anodonta*	1	33.300	250.000	83.330	250.000	0.110	52.705	19	1580.000	526.667	1580.000	24.433	132.497	3
19	*Unio sp.*	2	66.700	30.000	100.000	150.000	0.132	81.650	12	2530.000	843.333	1265.000	39.124	237.112	2
20	*Sphaerium sp.*	1	33.300	1850.000	616.670	1850.000	0.811	143.372	9	103.650	34.550	103.650	1.603	33.936	6
22	*Dreissena polymorpha*	3	100.000	50950.000	16983.330	16983.330	22.337	1303.201	2	1868.205	622.735	622.735	28.890	249.547	1
25	Ostracoda	1	33.300	600.000	20.000	600.000	0.263	81.650	13	0.012	0.004	0.012	0.000	0.365	21
26	*Jaera sarsi*	3	100.000	20850.000	6950.000	6950.000	9.141	833.667	4	1.870	0.623	0.623	0.029	7.894	11
27	Corophiidae var.	3	100.000	4350.000	1450.000	1450.000	1.907	380.789	5	2.200	0.733	0.733	0.034	8.563	10
28	Gammaridae var.	2	66.700	5900.000	1966.670	2950.000	2.587	362.093	6	11.270	3.757	5.635	0.174	15.825	9
29	Chironomidae var.	1	33.300	50.000	16.670	50.000	0.022	23.750	20	0.135	0.045	0.135	0.002	1.225	17
30	Chironomidae larvae	2	66.700	300.000	100.000	150.000	0.132	81.650	14	0.565	0.188	0.283	0.009	3.543	14
31	Chironomidae pupae	1	33.300	50.000	16.670	50.000	0.022	23.570	21	0.015	0.005	0.015	0.000	0.408	20
39	Eggs var.	1	33.300	50.000	16.670	50.000	0.022	23.570	22	0.240	0.080	0.240	0.004	1.633	16
	Total				**76033.330**						**2155.564**				

11D. Middle zone I: Iron Gates II - Corabia

	Species	Nocc	F%	Densities D - sps.m^{-2}						Biomasses B - g.m^{-2}					
				A	Davg	Deco	D%	W	Rk	A	Bavg	Beco	D%	W	Rk
3	Nematoda var.	3	75	8550	2137.5	2850	45.968	400.390	2	0.0088	0.0020	0.0029	0.6740	0.4060	7
7	Oligochaeta var.	4	10	9350	2337.5	2337.5	50.269	483.477	1	0.8075	0.2019	0.2019	61.8140	4.4930	1
10	Hirudinea eggs	1	25	50	12.5	50	0.269	17.678	6	0.0100	0.0025	0.0100	0.7660	0.2500	9
27	Gammaridae var.	1	25	50	12.5	50	0.269	17.678	7	0.1750	0.0438	0.1750	13.3970	1.0460	2
29	Chironomidae larvae	1	25	150	37.5	150	0.806	30.619	4	0.1200	0.0300	0.1200	9.1870	0.8660	3
33	Insecta var.	1	25	50	12.5	50	0.269	17.678	8	0.0150	0.0038	0.0150	1.1480	0.3060	8
35	Ceratopogonidae	1	25	150	37.5	150	0.806	30.619	5	0.0750	0.0188	0.0750	5.7420	0.6850	5
36	Ceratopogonidae larvae	2	50	200	50	100	1.075	50.000	3	0.0450	0.0113	0.0225	3.4450	0.7500	4
37	Aranea	1	25	50	12.5	50	0.269	17.678	9	0.0500	0.0125	0.0500	3.8280	0.5590	6
	Total				**4650**						**0.3266**				

Appendix IV. Main Characteristics of zoobenthos populations from the lower (Romanian) sector of the River Danube, June 1995

11E. Middle zone II: Corabia - Calarasi

	Species	Nocc	F%	Densities D - sps.m^{-2}						Biomasses B - g.m^{-2}					
				A	Davg	Deco	D%	W	Rk	A	Bavg	Beco	D%	W	Rk
3	Nematoda var.	2	50	2750	687.5	1375	2.7583	185.400	2	0.0031	0.0008	0.0016	0.012	0.197	9
7	Oligochaeta var	4	100	94650	23663	23663	94.9348	1538.300	1	24.9385	6.2346	6.2346	98.374	24.969	1
8	Oligochaeta cocoons	1	25	1150	287.5	1150	1.1535	84.779	3	0.2300	0.0575	0.2300	0.917	1.199	2
23	Copepoda	1	25	650	162.5	650	0.6520	63.738	4	0.0450	0.0113	0.0450	0.178	0.53	4
27	Gammaridae var.	2	50	150	37.5	75	0.1505	43.301	5	0.0750	0.0188	0.0375	0.296	0.968	3
29	Chironomidae laae	2	50	100	25	50	0.1003	35.355	6	0.0090	0.0023	0.0045	0.036	0.335	6
35	Ceratopogonidae	1	25	100	25	100	0.1003	25.000	7	0.0200	0.0050	0.0200	0.079	0.354	5
38	Caryophilleidae larvae	1	25	100	25	100	0.1003	25.000	8	0.0150	0.0038	0.0150	0.059	0.306	7
39	Eggs var.	1	25	50	12.5	50	0.0502	17.678	9	0.0150	0.0038	0.0150	0.059	0.306	8
	Total				**24925**						**6.3377**				

11F. Marshes zone

	Species	Nocc	F%	Densities D - sps.m^{-2}						Biomasses B - g.m^{-2}					
				A	Davg	Deco	D%	W	Rk	A	Bavg	Beco	D%	W	Rk
3	Rhabdocoella	1	8.3	300	25.00	300.00	0.060	14.434	14	0.012	0.001	0.012	0.000	0.091	21
4	Nematoda var.	4	33.3	22000	1833.33	5500.00	4.372	247.207	3	0.026	0.002	0.006	0.000	0.268	18
6	*Hypania invalida*		8.3	250	20.83	250.00	0.050	13.176	16	0.335	0.028	0.335	0.002	0.482	15
7	Polychaeta (Ampharetidae)	1	8.3	100	8.33	100.00	0.020	8.333	19	0.135	0.011	0.135	0.001	0.306	17
8	Ologochaeta var.	12	100.0	403300	33608.33	33608.33	80.147	1833.258	1	163.538	13.628	13.628	0.943	36.916	3
9	Oligochaeta cocoons	5	41.7	13000	1083.33	2600.00	2.583	212.459	4	3.385	0.282	0.677	0.020	3.428	9
12	*Theodoxus transversalis*	1	8.3	250	20.83	250.00	0.050	13.176	17	7.000	0.583	7.000	0.040	2.205	11
13	*Theodoxus danubialis*	1	8.3	50	4.17	50.00	0.010	5.893	21	1.400	0.117	1.400	0.008	0.986	12
14	*Viviparus*	2	16.7	4500	375.00	2250.00	0.894	79.057	8	10950.385	912.532	5475.193	63.125	123.324	1
15	*Lithoglyphus naticoides*	1	8.3	4650	387.50	4650.00	0.924	56.826	11	129.485	10.790	129.485	0.746	9.483	8
16	Gastropoda var.	6	50.0	1900	158.33	316.67	0.378	88.976	7	161.590	13.466	26.932	0.932	25.948	6
19	*Unio sp.*	2	16.7	150	12.50	75.00	0.030	14.434	15	757.715	63.143	378.858	4.368	32.440	4
20	*Sphaerium sp.*	2	16.7	2900	241.67	1450.00	0.576	63.456	10	499.985	41.665	249.993	2.882	26.352	5
22	*Dreissena polymorpha*	2	16.7	14400	1200.00	7200.00	2.862	141.421	5	4608.900	384.075	2304.450	26.569	80.008	2
26	*Jaera sarsi*	2	16.7	4300	358.33	2150.00	0.855	77.280	9	0.111	0.009	0.056	0.001	0.393	16
27	Corophiidae var.	3	25.0	4350	362.50	1450.00	0.864	95.197	6	3.895	0.325	1.298	0.022	2.849	10
28	Gammaridae var.	6	50.0	25350	2112.50	4225.00	5.038	325.000	2	58.815	4.901	9.803	0.339	15.654	7
29	Chironomidae var.	2	16.7	450	37.50	225.00	0.089	25.000	12	0.185	0.015	0.093	0.001	0.507	14
30	Chironomidae larvae	1	8.3	10	8.33	100.00	0.020	8.330	20	0.016	0.001	0.016	0.000	0.105	19
32	Trichoptera larvae	2	16.7	100	8.33	50.00	0.020	11.785	18	0.210	0.018	0.105	0.001	0.540	13
39	Eggs var.	1	8.3	800	66.67	800.00	0.159	23.570	13	0.015	0.001	0.015	0.000	0.102	20
	Total				**41933.33**						**1445.595**				

Appendix IV. Main Characteristics of zoobenthos populations from the lower (Romanian) sector of the River Danube, June 1995

11G. Danube Delta zone

	Species	Nocc	F%	Densities D - sps.m^{-2}						Biomasses B - g.m^{-2}					
				A	Davg	Deco	D%	W	Rk	A	Bavg	Beco	D%	W	Rk
4	Nematoda var.	4	30.77	56600	4353.85	14150.00	21.338	366.012	2	0.165	0.013	0.041	0.002	0.625	15
5	Nereidae	3	23.08	1700	130.77	566.67	0.641	54.934	7	78.370	6.028	26.123	0.893	11.795	7
6	*Hypania invalida*	1	7.69	50	3.85	50.00	0.019	0.439	19	0.050	0.004	0.050	0.001	0.172	19
7	Polychaeta (Ampharetidae)	2	15.38	450	34.62	225.00	0.170	23.077	9	0.385	0.030	0.193	0.004	0.675	14
8	Oligochaeta var.	12	92.31	162900	12530.77	13575.00	61.414	1075.494	1	229.450	17.650	19.121	2.615	40.364	4
9	Oligochaeta cocoons	3	23.08	1850	142.31	616.67	0.697	57.306	6	1.130	0.087	0.377	0.013	1.416	12
12	*Theodoxus transversalis*	1	7.69	150	1.54	150.00	0.057	9.421	16	3.895	0.300	3.895	0.044	1.518	11
14	*Viviparus*	1	7.69	1400	107.69	1400.00	0.528	28.782	8	3878.375	298.337	3878.375	44.206	47.905	2
15	*Lithoglyphus naticoides*	2	15.38	200	15.38	100.00	0.075	15.385	12	20.625	1.587	10.313	0.235	4.940	9
17	Gastropoda eggs	1	7.69	150	11.54	150.00	0.057	9.421	17	0.055	0.004	0.055	0.001	0.180	18
18	Anodonta	1	7.69	50	3.85	50.00	0.019	5.439	20	1111.060	85.466	1111.060	12.664	25.640	5
19	*Unio sp.*	2	15.38	150	11.54	75.00	0.057	13.323	14	2020.050	155.388	1010.025	23.025	48.894	1
20	*Sphaerium sp.*	1	7.69	150	11.54	150.00	0.057	9.421	18	38.760	2.982	38.760	0.442	4.789	10
22	*Dreissena polymorpha*	3	23.08	2700	207.69	900.00	1.018	69.231	5	1278.735	98.364	426.245	14.575	47.644	3
23	Bivalvia larvae	1	7.69	50	3.85	50.00	0.019	5.439	21	0.005	0.000	0.005	0.000	0.054	22
26	*Jaera sarsi*	1	7.69	450	34.62	450.00	0.170	16.318	11	0.011	0.001	0.011	0.000	0.079	21
27	Corophiidae var.	4	30.77	12250	942.31	3062.50	4.618	170.276	4	15.955	1.227	3.989	0.182	6.145	8
28	Gammaridae var,	8	61.54	23100	1776.92	2887.50	8.709	330.680	3	95.655	7.358	11.957	1.090	21.279	6
30	Chironomidae larvae	2	15.38	450	34.62	225.00	0.170	23.077	10	0.075	0.006	0.038	0.001	0.298	16
31	Chironomidae pupae	1	7.69	50	3.85	50.00	0.019	5.439	22	0.060	0.005	0.060	0.001	0.188	17
32	Trichoptera larvae	2	15.38	200	15.38	100.00	0.075	15.385	13	0.505	0.039	0.253	0.006	0.773	13
39	Eggs var.	1	7.69	200	15.38	200.00	0.075	10.879	15	0.030	0.002	0.030	0.000	0.133	20
	Total				**20403.85**						**674.877**				

Appendix V Average abundance of phytoplankton populations recorded in Calarasi sector of the Danube River between June 1995 - April 1996

Crt. no.	Species	Nocc	F%	Densities						Biomasses						Crt. no.
				A	Dmed	Deco	D%	W	Rk	A	Bmed	Beco	D%	W	Rk	
	CYANOBACTERIA				sps.l^{-1}	sps.l^{-1}					mg.l^{-1}	mg.l^{-1}				
1	*Chlorococcus limneticus*	1	14.286	1.80	0.257	1.800	0.041	1.917	103	0.010	0.001	0.010	0.044	0.143	102	1
2	*Chlorococcus dispersus*	1	14.286	0.60	0.086	0.600	0.014	1.107	132	0.003	0.000	0.003	0.012	0.076	135	2
3	*Dactylococcopsis acicularis*	5	71.429	70.20	10.029	14.040	1.616	26.764	17	0.064	0.009	0.013	0.283	0.811	36	3
4	*Dactylococcopsis irregularis*	3	42.857	7.80	1.114	2.600	0.180	6.911	48	0.003	0.000	0.001	0.012	0.131	106	4
5	*Dactylococcopsis rhaphidioides*	2	28.571	4.40	0.629	2.200	0.101	4.238	71	0.002	0.000	0.001	0.010	0.095	126	5
6	*Gomphospheria lacustris*	2	28.571	1.40	0.200	0.700	0.032	2.390	91	0.006	0.001	0.003	0.026	0.156	98	6
7	*Lyngbya limnetica*	2	28.571	1.40	0.200	0.700	0.032	2.390	92	0.014	0.002	0.007	0.063	0.242	75	7
8	*Microcystis aeruginosa*	2	28.571	1.20	0.171	0.600	0.028	2.213	99	0.004	0.001	0.002	0.018	0.128	107	8
9	*Nostoc commune*	1	14.286	0.80	0.114	0.800	0.018	1.278	120	0.001	0.000	0.001	0.004	0.045	148	9
10	*Microcystis flos-aquae*	1	14.286	0.40	0.057	0.400	0.009	0.904	143	0.001	0.000	0.001	0.003	0.035	151	10
11	*Oscillatoria formosa*	1	14.286	0.60	0.086	0.600	0.014	1.107	133	0.003	0.000	0.003	0.013	0.078	132	11
12	*Oscillatoria lacustris*	1	14.286	0.50	0.071	0.500	0.012	1.010	139	0.008	0.001	0.008	0.033	0.124	112	12
13	*Oscillatoria limosa*	1	14.286	1.20	0.171	1.200	0.028	1.565	112	0.017	0.002	0.017	0.074	0.185	88	13
14	*Oscillatoria minima*	4	57.143	4.75	0.679	1.188	0.109	6.227	54	0.008	0.001	0.002	0.034	0.251	72	14
15	*Oscillatoria tenuis*	6	85.714	13.55	1.936	2.258	0.312	12.881	35	0.079	0.011	0.013	0.348	0.985	30	15
	EUGLENOPHYCEAE															
16	*Euglena acus*	1	14.286	0.40	0.057	0.400	0.009	0.904	144	0.008	0.001	0.008	0.035	0.128	108	16
17	*Phacus pyrum*	1	14.286	0.60	0.086	0.600	0.014	1.107	134	0.003	0.000	0.003	0.013	0.078	133	17
18	*Trachelomonas oblonga*	4	57.143	2.90	0.414	0.725	0.067	4.866	68	0.012	0.002	0.003	0.054	0.316	63	18
19	*Trachelomonas verrucosa*	7	100.000	50.85	7.264	7.264	1.171	26.952	16	0.184	0.026	0.026	0.810	1.622	16	19
20	*Trachelomonas volvocina*	5	71.429	67.30	9.614	13.460	1.549	26.206	19	0.146	0.021	0.029	0.642	1.221	22	20
	PYRROPHYCEAE															
21	*Gymnodinium excavatum*	1	14.286	4.00	0.571	4.000	0.092	2.857	81	0.042	0.006	0.042	0.185	0.293	67	21
22	*Gymnodinium neglectum*	2	28.571	3.20	0.457	1.600	0.074	3.614	76	0.061	0.009	0.031	0.268	0.499	48	22
23	*Peridium cinctum*	1	14.286	0.40	0.057	0.400	0.009	0.904	145	0.013	0.002	0.013	0.056	0.162	97	23
24	*Peridinium polonicum*	1	14.286	0.80	0.114	0.800	0.018	1.278	121	0.016	0.002	0.016	0.070	0.181	89	24
	HETEROCONTAE															
25	*Tribonema ulotrichoides*	4	57.143	131.00	18.714	32.750	3.016	32.701	12	2.608	0.373	0.652	11.459	4.614	3	25
	BACILLARIOPHYCEAE															
26	*Achnanthes clevei*	3	42.857	9.45	1.350	3.150	0.218	7.606	46	0.007	0.001	0.002	0.032	0.212	85	26

Appendix V Average abundance of phytoplankton populations recorded in Calarasi sector of the Danube River between June 1995 - April 1996

Crt. no.	Species	Nocc	F%	Densities						Biomasses						Crt. no.
				A	Dmed	Deco	D%	W	Rk	A	Bmed	Beco	D%	W	Rk	
27	*Achnanthes exilis*	4	57.143	29.25	4.179	7.313	0.673	15.452	29	0.023	0.003	0.006	0.101	0.433	52	27
28	*Achnanthes microcephala*	1	14.286	2.50	0.357	2.500	0.058	2.259	98	0.001	0.000	0.001	0.005	0.051	146	28
29	*Achnanthes minutissima*	7	100.000	80.95	11.564	11.564	1.863	34.006	11	0.051	0.007	0.007	0.223	0.852	35	29
30	*Asterionella formosa*	6	85.714	47.05	6.721	7.842	1.083	24.003	21	0.255	0.036	0.042	1.120	1.767	15	30
31	*Asterionella gracillima*	5	71.429	39.60	5.657	7.920	0.912	20.102	25	0.089	0.013	0.018	0.390	0.951	31	31
32	*Attheya zachariasi*	1	14.286	1.00	0.143	1.000	0.023	1.429	114	0.007	0.001	0.007	0.031	0.120	116	32
33	*Ceratoneis arcus*	3	42.857	7.80	1.114	2.600	0.180	6.911	49	0.027	0.004	0.009	0.116	0.403	54	33
34	*Cocconeis placentula*	4	57.143	4.65	0.664	1.163	0.107	6.161	55	0.012	0.002	0.003	0.051	0.307	65	34
35	*Cyclotella chaetoceras*	7	100.000	293.85	41.979	41.979	6.764	64.791	3	1.186	0.169	0.169	5.212	4.117	4	35
36	*Cyclotella comta*	3	42.857	27.60	3.943	9.200	0.635	12.999	34	0.072	0.010	0.024	0.318	0.666	41	36
37	*Cyclotella glomerata*	6	85.714	494.80	70.686	82.467	11.390	77.838	1	0.971	0.139	0.162	4.265	3.448	6	37
38	*Cyclotella kützingiana*	7	100.000	273.95	39.136	39.136	6.306	62.559	4	0.627	0.090	0.090	2.756	2.993	7	38
39	*Cyclotella melosiroides*	1	14.286	55.40	7.914	55.400	1.275	10.633	38	0.618	0.088	0.618	2.717	1.123	23	39
40	*Cyclotella meneghiniana*	7	100.000	165.60	23.657	23.657	3.812	48.639	7	0.529	0.076	0.076	2.324	2.749	8	40
41	*Cyclotella operculata*	7	100.000	374.75	53.536	53.536	8.626	73.168	2	0.406	0.058	0.058	1.785	2.409	11	41
42	*Cyclotella stelligera*	6	85.714	303.40	43.343	50.567	6.984	60.952	5	0.444	0.063	0.074	1.951	2.332	12	42
43	*Cymbella affinis*	1	14.286	1.50	0.214	1.500	0.035	1.750	109	0.004	0.001	0.004	0.016	0.087	127	43
44	*Cymbella cistula*	3	42.857	5.40	0.771	1.800	0.124	5.750	59	0.011	0.002	0.004	0.047	0.255	71	44
45	*Cymbella cymbiformis*	1	14.286	1.00	0.143	1.000	0.023	1.429	115	0.005	0.001	0.005	0.022	0.101	122	45
46	*Cymbella microcephala*	1	14.286	3.00	0.429	3.000	0.069	2.474	89	0.008	0.001	0.008	0.033	0.124	113	46
47	*Cymbella parva*	1	14.286	0.75	0.107	0.750	0.017	1.237	127	0.003	0.000	0.003	0.013	0.078	134	47
48	*Cymbella prostrata*	1	14.286	1.00	0.143	1.000	0.023	1.429	116	0.005	0.001	0.005	0.022	0.101	123	48
49	*Cymatopleura solea*	4	57.143	3.10	0.443	0.775	0.071	5.031	67	0.101	0.014	0.025	0.444	0.908	32	49
50	*Diatoma elongatum*	4	57.143	29.90	4.271	7.475	0.688	15.623	28	0.032	0.005	0.008	0.141	0.513	47	50
51	*Diatoma vulgare*	4	57.143	20.95	2.993	5.238	0.482	13.077	33	0.056	0.008	0.014	0.246	0.677	40	51
52	*Eunotia lunaris*	2	28.571	1.00	0.143	0.500	0.023	2.020	100	0.007	0.001	0.004	0.033	0.174	92	52
53	*Fragilaria intermedia*	1	14.286	1.00	0.143	1.000	0.023	1.429	117	0.049	0.007	0.049	0.215	0.316	62	53
54	*Fragilaria crotonensis*	3	42.857	2.95	0.421	0.983	0.068	4.250	70	0.119	0.017	0.040	0.524	0.855	34	54
55	*Gomphonema constrictum*	1	14.286	0.75	0.107	0.750	0.017	1.237	128	0.002	0.000	0.002	0.010	0.068	138	55
56	*Gomphonema constrictum var. capitata*	1	14.286	0.50	0.071	0.500	0.012	1.010	140	0.001	0.000	0.001	0.005	0.051	147	56
57	*Gomphonema olivaceum*	1	14.286	0.50	0.071	0.500	0.012	1.010	141	0.003	0.000	0.003	0.011	0.071	136	57

Appendix V Average abundance of phytoplankton populations recorded in Calarasi sector of the Danube River between June 1995 - April 1996

Crt. no.	Species	Nocc	F%	Densities						Biomasses						Crt. no.
				A	Dmed	Deco	D%	W	Rk	A	Bmed	Beco	D%	W	Rk	
58	*Gomphonema ventricosum*	2	28.571	7.50	1.071	3.750	0.173	5.533	63	0.013	0.002	0.007	0.057	0.230	79	58
59	*Gomphonema intricatum*	2	28.571	2.25	0.321	1.125	0.052	3.030	79	0.009	0.001	0.004	0.038	0.189	87	59
60	*Gyrosigma acuminatum*	2	28.571	1.55	0.221	0.775	0.036	2.515	88	0.031	0.004	0.016	0.136	0.356	59	60
61	*Gyrosigma attenuatum*	1	14.286	0.60	0.086	0.600	0.014	1.107	135	0.010	0.001	0.010	0.042	0.140	105	61
62	*Gyrosigma kutzingi*	1	14.286	0.40	0.057	0.400	0.009	0.904	146	0.006	0.001	0.006	0.027	0.112	118	62
63	*Hantzschia amphioxys*	1	14.286	0.75	0.107	0.750	0.017	1.237	129	0.008	0.001	0.008	0.033	0.124	114	63
64	*Mastogloia brauni*	2	28.571	1.40	0.200	0.700	0.032	2.390	93	0.004	0.001	0.002	0.018	0.128	109	64
65	*Mastogloia smithi*	1	14.286	0.40	0.057	0.400	0.009	0.904	147	0.002	0.000	0.002	0.007	0.057	144	65
66	*Melosira binderana*	1	14.286	0.25	0.036	0.250	0.006	0.714	152	0.002	0.000	0.002	0.010	0.068	139	66
67	*Melosira granulata*	5	71.429	93.25	13.321	18.650	2.147	30.847	13	2.800	0.400	0.560	12.301	5.345	1	67
68	*Melosira granulata var. angustissima*	6	85.714	172.75	24.679	28.792	3.977	45.992	8	2.147	0.307	0.358	9.435	5.128	2	68
69	*Melosira italica*	2	28.571	35.20	5.029	17.600	0.810	11.986	36	0.466	0.067	0.233	2.047	1.379	20	69
70	*Melosira varians*	1	14.286	2.00	0.286	2.000	0.046	2.020	101	0.036	0.005	0.036	0.158	0.271	70	70
71	*Melosira distans*	1	14.286	33.80	4.829	33.800	0.778	8.305	44	0.873	0.125	0.873	3.837	1.335	21	71
72	*Navicula atomus*	1	14.286	0.75	0.107	0.750	0.017	1.237	130	0.001	0.000	0.001	0.002	0.032	152	72
73	*Navicula cincta*	3	42.857	6.40	0.914	2.133	0.147	6.260	53	0.017	0.002	0.006	0.073	0.319	61	73
74	*Navicula cryptocephala*	3	42.857	3.10	0.443	1.033	0.071	4.357	69	0.008	0.001	0.003	0.033	0.215	84	74
75	*Navicula placentula*	3	42.857	4.15	0.593	1.383	0.096	5.041	66	0.016	0.002	0.005	0.068	0.308	64	75
76	*Navicula pupula*	1	14.286	1.50	0.214	1.500	0.035	1.750	110	0.002	0.000	0.002	0.009	0.064	140	76
77	*Navicula rhynchocephala*	1	14.286	0.80	0.114	0.800	0.018	1.278	122	0.002	0.000	0.002	0.009	0.064	141	77
78	*Neidium affinis*	1	14.286	0.75	0.107	0.750	0.017	1.237	131	0.006	0.001	0.006	0.026	0.111	119	78
79	*Neidium iridis*	3	42.857	13.00	1.857	4.333	0.299	8.921	41	0.171	0.024	0.057	0.749	1.022	27	79
80	*Neidium productum*	2	28.571	7.05	1.007	3.525	0.162	5.364	64	0.055	0.008	0.027	0.240	0.473	49	80
81	*Nitzschia acicularis*	6	85.714	35.10	5.014	5.850	0.808	20.732	23	0.080	0.011	0.013	0.350	0.988	29	81
82	*Nitzschia actinastroides*	4	57.143	85.00	12.143	21.250	1.957	26.342	18	0.303	0.043	0.076	1.331	1.573	17	82
83	*Nitzschia angustata*	1	14.286	2.80	0.400	2.800	0.064	2.390	94	0.008	0.001	0.008	0.033	0.125	111	83
84	*Nitzschia dissipata*	4	57.143	8.60	1.229	2.150	0.198	8.379	43	0.022	0.003	0.006	0.098	0.426	53	84
85	*Nitzschia gracilis*	1	14.286	1.80	0.257	1.800	0.041	1.917	104	0.004	0.001	0.004	0.016	0.086	128	85
86	*Nitzschia linearis*	4	57.143	4.55	0.650	1.138	0.105	6.094	56	0.024	0.003	0.006	0.107	0.445	51	86
87	*Nitzschia lorenziana*	1	14.286	1.00	0.143	1.000	0.023	1.429	118	0.005	0.001	0.005	0.022	0.101	124	87
88	*Nitzschia palea*	7	100.000	115.85	16.550	16.550	2.667	40.682	9	0.085	0.012	0.012	0.372	1.100	24	88

Appendix V Average abundance of phytoplankton populations recorded in Calarasi sector of the Danube River between June 1995 - April 1996

Crt. no.	Species	Nocc	F%	Densities						Biomasses						Crt. no.
				A	Dmed	Deco	D%	W	Rk	A	Bmed	Beco	D%	W	Rk	
89	*Nitzschia recta*	6	85.714	60.60	8.657	10.100	1.395	27.240	15	0.178	0.025	0.030	0.783	1.478	18	89
90	*Nitzschia sigmoidea*	1	14.286	2.75	0.393	2.750	0.063	2.369	97	0.028	0.004	0.028	0.121	0.237	78	90
91	*Nitzschia subtilis*	2	28.571	11.00	1.571	5.500	0.253	6.701	50	0.030	0.004	0.015	0.132	0.350	60	91
92	*Nitzschia tryblionella var. levidensis*	1	14.286	0.80	0.114	0.800	0.018	1.278	123	0.003	0.000	0.003	0.014	0.081	131	92
93	*Nitzschia vitrea*	1	14.286	0.40	0.057	0.400	0.009	0.904	148	0.006	0.001	0.006	0.026	0.111	120	93
94	*Pinnularia gibba*	1	14.286	3.50	0.500	3.500	0.081	2.673	86	0.063	0.009	0.063	0.277	0.359	57	94
95	*Pinnularia subcapitata*	1	14.286	3.75	0.536	3.750	0.086	2.766	84	0.012	0.002	0.012	0.053	0.156	99	95
96	*Rhizosolenia eriensis*	1	14.286	0.50	0.071	0.500	0.012	1.010	142	0.001	0.000	0.001	0.003	0.039	150	96
97	*Rhizosolenia longiseta*	1	14.286	1.20	0.171	1.200	0.028	1.565	113	0.004	0.001	0.004	0.016	0.086	129	97
98	*Rhoicosphenia curvata*	1	14.286	4.50	0.643	4.500	0.104	3.030	80	0.006	0.001	0.006	0.027	0.113	117	98
99	*Stephanodiscus astraea*	4	57.143	73.40	10.486	18.350	1.690	24.478	20	0.454	0.065	0.113	1.994	1.925	14	99
100	*Stephanodiscus hantzschi*	3	42.857	33.80	4.829	11.267	0.778	14.385	32	0.070	0.010	0.023	0.308	0.655	42	100
101	*Surirella didyma*	1	14.286	1.00	0.143	1.000	0.023	1.429	119	0.015	0.002	0.015	0.066	0.175	91	101
102	*Surirella linearis*	1	14.286	0.40	0.057	0.400	0.009	0.904	149	0.010	0.001	0.010	0.044	0.143	103	102
103	*Surirella linearis var. constricta*	2	28.571	1.40	0.200	0.700	0.032	2.390	95	0.070	0.010	0.035	0.308	0.535	46	103
104	*Surirella ovata*	4	57.143	3.90	0.557	0.975	0.090	5.642	60	0.046	0.007	0.011	0.201	0.611	44	104
105	*Synedra acus*	7	100.000	64.25	9.179	9.179	1.479	30.296	14	0.080	0.011	0.011	0.351	1.069	26	105
106	*Synedra acus var. angustissima*	3	42.857	2.60	0.371	0.867	0.060	3.990	73	0.010	0.001	0.003	0.044	0.247	73	106
107	*Synedra affinis*	3	42.857	5.70	0.814	1.900	0.131	5.907	58	0.021	0.003	0.007	0.092	0.358	58	107
108	*Synedra nana*	4	57.143	10.00	1.429	2.500	0.230	9.035	40	0.003	0.000	0.001	0.015	0.168	95	108
109	*Synedra ulna*	7	100.000	112.70	16.100	16.100	2.594	40.125	10	0.514	0.073	0.073	2.257	2.709	9	109
110	*Synedra ulna var. donica*	1	14.286	4.00	0.571	4.000	0.092	2.857	82	0.012	0.002	0.012	0.053	0.156	100	110
111	*Synedra ulna var. aequalis*	2	28.571	0.80	0.114	0.400	0.018	1.807	106	0.004	0.001	0.002	0.016	0.121	115	111
	CHLOROPHYCEAE															
112	*Actinastrum hantzschi*	3	42.857	37.80	5.400	12.600	0.870	15.213	31	0.100	0.014	0.033	0.439	0.782	38	112
113	*Acanthosphaera zachariaris*	1	14.286	0.40	0.057	0.400	0.009	0.904	150	0.002	0.000	0.002	0.007	0.057	145	113
114	*Ankistrodesmus falcatus*	2	28.571	3.80	0.543	1.900	0.087	3.938	74	0.007	0.001	0.004	0.031	0.170	94	114
115	*Ankistrodesmus falcatus var. acicularis*	5	71.429	39.30	5.614	7.860	0.905	20.025	26	0.035	0.005	0.007	0.153	0.597	45	115
116	*Ankistrodesmus falcatus var. mirabile*	3	42.857	13.00	1.857	4.333	0.299	8.921	42	0.008	0.001	0.003	0.035	0.221	81	116
117	*Ankistrodesmus nitzschioides*	1	14.286	0.80	0.114	0.800	0.018	1.278	124	0.002	0.000	0.002	0.011	0.070	137	117
118	*Asterococcus superbus*	3	42.857	16.30	2.329	5.433	0.375	9.990	39	0.069	0.010	0.023	0.301	0.648	43	118

Appendix V Average abundance of phytoplankton populations recorded in Calarasi sector of the Danube River between June 1995 - April 1996

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				A	Dmed	Deco	D%	W	Rk	A	Bmed	Beco	D%	W	Rk	
119	*Chlamydomonas ovalis*	5	71.429	39.85	5.693	7.970	0.917	20.165	24	0.055	0.008	0.011	0.241	0.749	39	119
120	*Chlorella vulgaris*	7	100.000	229.65	32.807	32.807	5.286	57.278	6	0.379	0.054	0.054	1.666	2.328	13	120
121	*Closterium dianae*	1	14.286	0.60	0.086	0.600	0.014	1.107	136	0.001	0.000	0.001	0.004	0.045	149	121
122	*Closterium gracile*	1	14.286	3.00	0.429	3.000	0.069	2.474	90	0.010	0.001	0.010	0.044	0.143	104	122
123	*Closterium kutzingii*	1	14.286	0.60	0.086	0.600	0.014	1.107	137	0.012	0.002	0.012	0.053	0.156	101	123
124	*Closterium pronum*	3	42.857	1.70	0.243	0.567	0.039	3.226	77	0.008	0.001	0.003	0.034	0.219	83	124
125	*Coelastrum microporum*	2	28.571	8.80	1.257	4.400	0.203	5.993	57	0.032	0.005	0.016	0.141	0.361	56	125
126	*Crucigenia rectangularis*	1	14.286	0.20	0.029	0.200	0.005	0.639	153	0.000	0.000	0.000	0.001	0.020	153	126
127	*Crucigenia tetrapedia*	1	14.286	0.80	0.114	0.800	0.018	1.278	125	0.002	0.000	0.002	0.009	0.064	142	127
128	*Desmidium swartzi*	1	14.286	3.20	0.457	3.200	0.074	2.556	87	0.045	0.006	0.045	0.197	0.302	66	128
129	*Elakatothrix gelatinosa*	3	42.857	10.20	1.457	3.400	0.235	7.902	45	0.013	0.002	0.004	0.057	0.282	68	129
130	*Elakatothrix linearis*	4	57.143	53.60	7.657	13.400	1.234	20.918	22	0.077	0.011	0.019	0.337	0.792	37	130
131	*Eudorina elegans*	1	14.286	1.60	0.229	1.600	0.037	1.807	107	0.028	0.004	0.028	0.123	0.239	76	131
132	*Mycrospora quadrata*	1	14.286	1.60	0.229	1.600	0.037	1.807	108	0.024	0.003	0.024	0.104	0.219	82	132
133	*Oocystis naegeli*	2	28.571	3.40	0.486	1.700	0.078	3.725	75	0.019	0.003	0.010	0.085	0.281	69	133
134	*Pandorina morum*	3	42.857	8.60	1.229	2.867	0.198	7.256	47	0.316	0.045	0.105	1.388	1.391	19	134
135	*Pediastrum boryanum*	3	42.857	5.20	0.743	1.733	0.120	5.642	61	0.128	0.018	0.043	0.562	0.885	33	135
136	*Pediastrum duplex*	1	14.286	1.80	0.257	1.800	0.041	1.917	105	0.013	0.002	0.013	0.059	0.165	96	136
137	*Pediastrum duplex var. reticulatum*	3	42.857	4.60	0.657	1.533	0.106	5.307	65	0.160	0.023	0.053	0.705	0.991	28	137
138	*Pediastrum simplex*	1	14.286	0.60	0.086	0.600	0.014	1.107	138	0.030	0.004	0.030	0.132	0.247	74	138
139	*Pediastrum tetras*	1	14.286	0.40	0.057	0.400	0.009	0.904	151	0.005	0.001	0.005	0.021	0.099	125	139
140	*Protococcus viridis*	1	14.286	4.80	0.686	4.800	0.110	3.130	78	0.014	0.002	0.014	0.063	0.171	93	140
141	*Richteriella botryoides*	3	42.857	2.80	0.400	0.933	0.064	4.140	72	0.009	0.001	0.003	0.040	0.237	77	141
142	*Scenedesmus acuminatus*	2	28.571	1.40	0.200	0.700	0.032	2.390	96	0.004	0.001	0.002	0.018	0.128	110	142
143	*Scenedesmus granulatus*	1	14.286	1.40	0.200	1.400	0.032	1.690	111	0.002	0.000	0.002	0.009	0.064	143	143
144	*Scenedesmus ecornis*	2	28.571	1.80	0.257	0.900	0.041	2.711	85	0.002	0.000	0.001	0.008	0.086	130	144
145	*Scenedesmus ecornis var. disciformis*	1	14.286	2.00	0.286	2.000	0.046	2.020	102	0.006	0.001	0.006	0.026	0.111	121	145
146	*Scenedesmus intermedius*	4	57.143	5.00	0.714	1.250	0.115	6.389	52	0.020	0.003	0.005	0.087	0.402	55	146
147	*Scenedesmus opoliensis*	1	14.286	3.80	0.543	3.800	0.087	2.785	83	0.018	0.003	0.018	0.078	0.191	86	147
148	*Scenedesmus quadricauda*	4	57.143	16.60	2.371	4.150	0.382	11.641	37	0.025	0.004	0.006	0.112	0.455	50	148
149	*Selenastrum gracile*	3	42.857	5.20	0.743	1.733	0.120	5.642	62	0.009	0.001	0.003	0.038	0.229	80	149

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				A	Dmed	Deco	D%	W	Rk	A	Bmed	Beco	D%	W	Rk	
150	*Sphaerozosma vertebratum*	1	14.286	20.60	2.943	20.600	0.474	6.484	51	0.589	0.084	0.589	2.588	1.096	25	150
151	*Ulothrix zonata*	3	42.857	53.60	7.657	17.867	1.234	18.115	27	1.104	0.158	0.368	4.852	2.600	10	151
152	*Ulothrix tenuissima*	1	14.286	0.80	0.114	0.800	0.018	1.278	126	0.015	0.002	0.015	0.067	0.176	90	152
153	*Zignema sp.*	4	57.143	28.80	4.114	7.200	0.663	15.333	30	1.465	0.209	0.366	6.438	3.458	5	153
	CYANOBACTERIA				15.800						0.032					
	EUGLENOPHYCEAE				17.436						0.051					
	PYRROPHYCEAE				1.200						0.019					
	HETEROCONTAE				18.714						0.373					
	BACILLARIOPHYCEAE				476.021						2.083					
	CHLOROPHYCEAE				91.429						0.695					
	TOTAL				620.600						3.251					