Section II. Environmental factors, ecological reconstruction, human impact Research article
_pp. 83 – 90_ **doi: 10.7427/DDI.20.13**

13. Comparative analysis of results of processing the phytoplankton samples collected during Joint Danube Delta Survey (JDDS)

ALEXANDROV Borys

Institute of Biology of the Southern Seas, National Academy of Sciences of Ukraine, 37 Pushkinskaya Street, 65 011 Odessa, Ukraine; e-mail: borys.aleksandrov@gmail.com

ABSTRACT. The paper includes information on the comparative analysis of the results of processing the same phytoplankton samples by specialists from Moldova, Romania and Ukraine. Samples were collected in 16 stations of different parts of the Danube Delta, which included lakes, natural branches (arms) and artificial channels. The field-survey was carried out between 27 September and 4 October 2011. Quantitative results of investigations were used for establishing the water quality (saprobic index). Totally there have been registered 226 species from 7 Orders. Only 14 species (6%) was identified by experts of all three countries. Lowest number of species was found in samples from Kilia and Tulcea arms, maximum number of species was found in samples from Lebedei Lake (Romania). Highest concentration of phytoplankton was found in Izak and Lebedei Lakes (Romania), minimal biomass was registered in Kilia arm (branch of Danube River) near Reni and Bystroe arm. Distribution of chlorophyll-a confirmed peculiarity of biomass distribution. Most stations have mesotrophic and eutrophic levels. Materials presented by experts did not enable us to prepare more detailed analysis of the obtained results. However general peculiarity of phytoplankton distribution and water quality were determined at the same time. Maximal quantitative development of phytoplankton was registered in lakes as compared to the highly dynamic branches of the Danube River. High biomass of phytoplankton is the indicator of the bad ecological conditions of aquatic ecosystems. Our advise is to repeat the joint researches in order to provide better laboratory reproducibility and intercalibration of biological monitoring of phytoplankton.

Key words: biological monitoring, water quality, phytoplankton, Danube Delta

INTRODUCTION

The JDDS have been considered as a monitoring exercise, which provided a homogeneous and harmonized data for the three countries (Moldova, Romania and Ukraine) with unified approach and methodology. The results of this exercise are very necessary for harmonization of the monitoring systems at the sub-basin level.

Selection of sampling sites has based on water body delineation and includes rivers (Danube and Prut), Danube arms and inlet lakes.

Analysis of the samples has been performed by laboratories in each country based on harmonized data set.

MATERIALS AND METHODS

Sampling

The quantitative samples of phytoplankton were picked up during a joint international (Moldova, Romania and Ukraine) ecological expedition in the Danube Delta from 27 September to 4 October 2011. Samples of water (1 l volume) were taken from upper layer. Totally were taken 15 - 16 samples of phytoplankton.

Complex JDDS stations were: **1** – Prut river, Giurgiulesti; **2** – Reni; **3** – Cheatal Izmail; **4** – Izmail; **5** – Kilia; **6** – Vilkovo; **7** – Bystroe; **8** – Tulcea, Mila 35; **9** – Mila 23; **10** – Sulina; **11** – St. George, Uzlina; **12 -** St. George; **13** – Erenciuc Lake; **14** – Uzlina Lake; **15** – Isak Lake, **16** – Lebedei Lake.

Samples were collected both in the middle of the Danube River and on the right and left banks of the river. In case of the Danube lakes the measurements were performed in five sample points of each of the investigated sites. The integrated quantitative phytoplankton sample was taken as a result of mixing equal volume of three or five samples from each area.

Identification of phytoplankton species have been carried out using light compound microscope with magnification from 40X up to 400X.

The abundance and diversity of phytoplankton were established using Hloubka 0,10 mm – 100 mm^2 counting chamber (Romania) [***6***] and 0,04 ml-Naumann counting chamber (Ukraine) [***2***]. There was no information about counting chamber in Moldavia report [***1***]. Calculation of the phytoplankton cells number was carried out with 0,04 ml-Naumann counting chamber. During identification of unicellular algae and processing samples the measurements of length and diameter the cells were performed all the time for further calculation of phytoplankton biomass. According Romanian methodology phytoplankton biomass has measured directly in the water on the base on simultaneously records of chlorophyll-a concentration by submersible spectrophotometer ([***5***]; [***6***]).

Saprobic index

For identification of water quality and saprobity index there was used the method of Pantle and Buck [***3***] in Moldova report. But there were no results of this analysis in Moldova and Romania reports. The results of the specialists from Ukraine base on some phytoplankton indicators that reflected ecological state of aquatic ecosystem, their saprobic index: total abundance and biomass of phytoplankton, abundance of diatoms and bluegreen algae [***4***].

RESULTS AND DISCUSSION

Species composition

As a result of processing of phytoplankton samples from the Danube Delta (including channels and internal lakes) there have been recorded 226 species from 7 Orders: Cyanophyta - 39, Bacillariophyta - 60, Dinophyta - 8, Cryptophyta - 4, Chlorophyta - 85, Chrysophyta - 2 and Euglenophyta – 28 (**Table 1**). Based on bibliographical analysis, a list of 325 species recorded in Danube River for the last ten years was placed in Romania report [***6***]. During the investigation that took place in the frame of Project “Joint environmental monitoring, assessment and exchange of information for integrated management of the Danube delta region” minimal species number have been registered in Kilia and Tulcha arms (st. 4, 6, 7, 8), maximal species number have been registered on Lebedei Lake (st. 16). Maximal diversity had the Orders Bacillariophyta and Chlorophyta.

Table 1.

Number of species recorded by experts from different countries.

Order	Totaly	Moldova	Romania	Ukraine
Bacillariophyta	60	31	7	36
Chlorophyta	85	41	18	55
Cryptophyta	4	0	2	3
Chrysophyta	2	0	0	2
Cyanophyta	39	12	9	32
Dinophyta	8	1	0	8
Euglenophyta	28	20	6	11
TOTALY	**226**	**105**	**42**	**147**

In the same samples only 13 species (out of the 226 species) where identified by the specialists from all countries (**Table 3**). But there were no the same mass (dominant) species, that reflect the differences in their identification or abundance measuring by different specialists (**Table 4**).

Quantitative characteristics

Because there were only biomass (from quantitative characteristics) of phytoplankton in the report of the Romanian specialists, there was not possible to compare results of determination phytoplankton abundance. Generally, there was found the same regularity as in plankton algae biodiversity. Maximal concentration of phytoplankton was found in Isak and Lebedei Lakes (st. 15, 16), minimal biomass was registered in Kilia arm (branch of the Danube River) near Reni (st. 2) and in Bystroe arm (st. 7). Distribution of chlorophyll-a confirmed the peculiarity of biomass distribution describe above (**Table 5**).

Comparison of the results of processing the same samples collected during JDDS exercise by the specialists from Moldova and Ukraine shows minimal difference in investigation of qualitative composition of phytoplankton and more high distinction in quantitative characteristics (for abundance - two times an average; for biomass - three times) (**Table 6**).

Regarding the result of biomass determination it is necessary to mention the lack of coincidence of dominant groups of phytoplankton. Green algae (Chlorophyta) absolutely prevailed according to the data of Moldavian specialists, while the blue-green algae (Cyanophyta) prevailed according to the data of Ukrainean specialists. Large distinctions at determination of specific composition of phytoplankton are marked in distribution of diatoms (**Fig. 1**).

Identification of the water quality

Unfortunately only specialists from Ukraine provided the results of ranging of investigated stations on the degree of trophycity. But on the base of data prepared by experts from Moldova it has been possible to analyze water quality on the same methodology [***4***] and to compare the results. The determinations of water quality with the same manner and comparisons the results allowed to obtain some conclusions:

1. More sensible indicator of determination of water quality is phytoplankton biomass. It allowed ranging the investigation stations in all ranges of quality index.
2. Most of the stations were characterized by the mesotrophic and eutrophic levels.
3. The best conditions of aquatic ecosystem were registered in Bystroe arm (Kiliya branch of the Danube River) the worst conditions were founded in Lebedei Lake (**Table 7**).

Table 2.

Comparative characteristic of species composition of phytoplankton investigated by experts from different countries.

Species	MD	RO	UA
Bacillariophyta			
Amphora hyalina Kütz.			+
Aulacoseira ambigua (Grun.) Sim.			+
A. granulata Greg.	+	+	+
A. granulata var. *angustissima* (O.F.Müll.) Sim.			+
A. islandica (O.Müll.) Sim.			+
A. italica (Ehr.) Sim.	+	+	+
Aulacoseira sp.			+
Caloneis permagna (J.W.Bailey) Cleve	+		
Cocconeis pediculus	+		
Ceratoneis arcus (Ehr.) Kütz.	+		
Cyclotella bodanica Eulen. in Grun.			+
C. glomerata H.Bach.			+
C. küetzingiana Thw.			+
C. meneghiniana Kütz.		+	+
C. melosiroides (Kirch.) Lemm.			+
C. planktonica Brun.			+
Cyclotella sp. (8,7-5,8 µkm)			+
Cyclotella sp. (17,4 µkm)	+		+
Cymatopleura solea	+		
Cymbella tumida	+		
C.lanceolata	+		
C. ventricosa	+		
Didymosphenia geminata	+		
Diploneis notabilis (Grev.) Cl.			+
Gomphonema olivaceum	+		
Gyrosigma acuminatum	+		
Melosira moniliformis (O. Müll.) Ag.			+
M. varians C.Agardh	+	+	
Navicula cryptocephala Kütz.	+		+
Navicula sp.	+		
Nitzschia holsatica Hustedt	+		+
N. palea (Kütz.) W.Smith			+
N. rhynchocephala	+		
N. sigma	+		
N. sigmoidea (Nitzs.) W.Smith	+		+
Nitzschia tryblionella	+		
Nitzschia sp.	+		
Paralia sulcata (Her.) Cl.			+
Pinnularia viridis	+		
Rhoicosphenia abbreviata (Ag.) L.-B.	+		+
Skeletonema costatum (Grev) Cl.			+
S. potamos (Web.) Hasle in Hasle et Evensen		+	
S. subsalsum (A. Cl.) Bethge			+
Stephanodiscus astraea (Ehr.) Grun	+		+
S. hantzschii Grun.	+	+	+
Surirella ovata	+		
S. ovalis	+		
Synedra acus	+		
S. actinastroides	+		
S. gaillonii (Bory de Saint-Vinc.) Ehr.			+
S. fasciculata (Agar.) Kütz.			+
S. fasciculata var. *fasciculata* (Kütz.) Grun.			+
S. ulna	+		
Thalassiosira baltica (Grun.) Ostf.			+
T. guillardii Hasle			+
T. lacustris (Grun.) Hasle			+
T. parva Pr.-Lavr.			+
T. pseudonana Hasle et Heimdal			+
Thalassiosira weissflogii (Grun.) Fryxell et Hasle		+	
Thalassiosira sp. (23,2 µkm)			+

Species	MD	RO	UA
Chlorophyta			
Actinastrum hantzschii Lagerh.	+		+
A. hantzschii Lagerh. var. *hantzschii*			+
Ankistrodesmus angustus	+		
A. longissimus	+		
Binuclearia tatrana	+		
Dicellula planktonica Swir.			+
Dictyochlorella globosa P.C.Silva			+
Dictyosphaerium pulchellum	+	+	
Chlorella vulgaris Beijer.			+
Coenococcus planktonicus Korsch.			+
Coenocystis subcylindrica Korsch.			+
Coenochloris fottii (Hind.) Tsar.			+
Coelastrum microporum	+	+	
C. pseudomicroporum Korsch.			+
Coelastrum sphaericum Näg.	+	+	+
Cosmarium margaritiferum	+		
Cosmarium sp.		+	
Closteriopsis longissima (Lemm.) Lemm.			+
Closterium acerose	+		
Closterium sp.		+	
Crucigenia apiculata	+		
C. irregularis	+		
C. quadrata	+	+	
C. tetrapedia (Kirchn.) Kunt.			+
Fernandinella alpina	+		
Franceia tenuispina Korsh.			+
Golenkinia radiata Chod.			+
Golenkiniopsis parvula (Woronich.) Korsh.			+
G. solitaria (Korsh.) Korsh.			+
Kirchneriella lunaris (Kirchn.) Möb.	+		+
K. obesa	+		
Lagerheimia genevensis (Chod.) Chod.			+
Lagerheimia subglobosa Lemm.			+
Micractinium pusillum Fres.			+
Monoraphidium arcuatum (Korsh.) Hind.	+		+
M. komarkovae Nyg.	+		+
Oocystis borgei Snow.			+
O. lacustris	+	+	
O.rhomboideae Fott			+
Palmodictyon varium (Nägeli) Lemm.			+
Pandorina morum	+	+	
Pediastrum boryanum (Turp.) Menegh.	+	+	+
P. duplex Meyen	+		+
P. tetras (Her.) Ralfs			+
P.simplex var *.simplex*	+	+	+
Phacotus coccifer	+		
Quadricoccus ellipticus Hort.			+
Scenedesmus acuminatus (Lag.) Chod.	+	+	+
S. acuminatus f. *tortuosus* (Skuja) Korsh.			+
S. acuminatus var. *briseriatus* Rein.			+
Scenedesmus acuminatus var. *elongatus* G.M.Smith			+
S. acutus Meyen			+
S. arcuatus v.platydiscus	+		
S. acuminatus v.biseriatus	+		
S. acuminatus v.elongatus	+		
S. bicaudatus		+	
S. bijugatus	+	+	
S. columnatus Hortob.			+
S. curvatus	+		
S. falcatus Chod.			+

Table 2.
(continuation from the previous page)

Species	MD	RO	UA
S. magnus Meyen			+
S. oahuensis (Lemm.) G.M.Smith			+
S. obliquus	+		
S.obliquus v.alternans	+		
S. obtusus Meyen			+
S. opoliensis P.G.Rich.	+		+
S. polyglobulus Hort.			+
S. protuberans F.E.Fritsch et M.F.Rich	+	+	+
S. helveticus Chod.			+
S. quadricauda (Turp.) Breb.	+	+	+
S. quadricauda (Turp.) Breb. var. *quadricauda*			+
S. spinosus Chod.			+
Schroederia setigera (Schröd.) Lemm.	+		+
Spirogyra maior		+	
Sphaerocystis planctonica (Korsh.) Bour.			+
Staurodesmus quadriferus	+		
Tetraedron caudatum (Corda) Hans.		+	+
T. incus (Teil.) G.M. Smith	+		+
T. triangulare Korsh.			+
Tetrastrum staurogeniaeforme (Schröd.) Lemm.		+	+
T. glabrum	+		
T. elegans	+		
Treubaria euryacantha (Schm.) Korsh.			+
T. triappendiculata Bern.			+
Ulothryx zonata	+		
Cryptophyta			
Cryptomonas dangeardi A.Holl.			+
C. erosa Ehr.		+	+
Cryptomonas sp.			+
Komma caudata		+	
Chrysophyta			
Cryptochrysis minor G.Nyg.			+
Chromulina nebulosa Cienk.			+
Cyanophyta			
Anabaena hassallii (Kütz.) Wittr.			+
A. spiroides Kleb.	+	+	+
A. flos-aquae (Lyngb.) Breb.			+
A. affinis Lemm.			+
Anabaena sp.	+		
Aphanizomenon flos-aquae (L.) Ralfs	+		+
Aphanizomenon elenkinii	+		
A. issatschenkoi Ussac.		+	+
Anabaenopsis elenkinii V. Mill		+	+
Aphanocapsa planctonica (G.M.Smith) Komárek et Anag.			+
Aphanothece sp.			+
Chroococcus sp.		+	
Gleocapsa minor (Kütz.) Hollerb.			+
G. minima (Keissl.) Hollerb.			+
G. turgida (Kütz.) Hollerb.	+		+
Gomphosphaeria lacustris	+		
Merismopedia minima G. Beck.			+
M. minutissima		+	
M. glauca (Ehr.) Kütz.			+
M. punctata Meyen			+
M. tenuissima Lemm.	+		+
Microcystis aeruginosa (Kütz.) Kütz.	+		+
Microcystis pulverea (Wood) Forti in De Toni	+	+	+
Oscillatoria amphibia C.Agar. ex Gom.			+
Oscillatoria limosa C.Agardh			+
O. granulata Gard.			+
O. limnetica Lemm.			+

Species	MD	RO	UA
O. kisselevii Anis.			+
O. planctonica Wolosz.	+		+
O. tenuis Ag.			+
O. geminata Schw.			+
O.ukrainica Vladim.			+
O. woronichinii Anissim.			+
Oscillatoria sp.	+	+	+
Phomidium sp.		+	
Plancthotrix agardhii		+	
Romeria elegans Wolosz.			+
Romeria leopoliensis	+		
Spirulina laxissima G.S. West			+
Dinophyta			
Ceratium hirundinella (Müll.) Duj.			+
Glenodinium berolinense (Lemm.) Lind.			+
G. berolinense var. *apiculatum* Lemm.			+
Gymnodinium sp. (17,4-23,2 µkm)			+
Peridinium latum Pauls.			+
Peridinium cinctum (O.F.Müll.) Ehr.			+
P. wisconsinense Eddy			+
Peridinium sp. (40 µkm)	+		+
Euglenophyta			
Euglena acus (O.F.Müll.) Ehr.	+	+	+
E. caudatata	+	+	
E. granulata var. *polymorpha* (Dang.) Pop.			+
E. longicauda	+		
E. oblonga F.Schm.	+		+
E. oxyuris	+		
E. pavlovskoensis (Elen. et Polj.) Pop.			+
E. polymorpha	+		
E. texta	+		
E. trypteris	+		
E. vagans Defl.			+
E. viridis Ehr.			+
Euglena sp.	+		
Lepocinclis ovum	+		
Phacus arnoldii	+		
P. longicauda	+	+	
P. mirabilis Pochm.			+
P. orbicularis K.Hübn.	+		+
P. pyrum (Ehr.) W.Archer			+
P.longicauda (Ehr.) Duj.	+		+
Strombomonas acuminata	+		
S. fluviatilis	+		
Strombomonas sp.		+	
Trachelomonas hispida	+		
T. planctonica Svir.	+	+	+
T. verrucosa			
T. volvocina	+	+	
Trachelomonas sp.	+		

MD – Moldova
RO – Romania
UA - Ukraine

Table 3

List of common phytoplankton species were registered by specialists from Lower Danube countries (Moldova, Romania and Ukraine) during JDDS exercise (27 September – 4 October 2011)

Bacillariophyta	*S. quadricauda* (Turp.) Breb.
Aulacoseira granulata Greg.	
A.italica (Ehr.) Sim.	**Cyanophyta**
Stephanodiscus hantzschii Grun.	*Anabaena spiroides* Kleb.
	Microcystis pulverea (Wood) Forti in De Toni
Chlorophyta	*Oscillatoria* sp.
Coelastrum sphaericum Näg.	
Pediastrum boryanum (Turp.) Menegh.	**Euglenophyta**
P. simplex var *.simplex*	
Scenedesmus acuminatus (Lag.) Chod.	*Euglena acus* (O.F.Müll.) Ehr.
S. protuberans F.E.Fritsch et M.F.Rich	*Trachelomonas planctonica* Svir.

Table 4

Comparative characteristics of dominant species recorded in phytoplankton samples by the specialists of different countries

No.	Order	Species	Frequency of registration,%	Average number, 10^3 cells/l
MOLDOVA				
1	Cyanophyta	*Oscillatoria* sp.*	100	64
2	Euglenophyta	*Euglena* sp.	100	39
3	Bacillariophyta	*Nitzschia* sp.	93,7	30
4	Euglenophyta	*Euglena acus**	75,0	31
5	Bacillariophyta	*Stephanodiscus astraea*	75,0	71
6	Chlorophyta	*Scenedesmus quadricauda**	75,0	613
UKRAINE				
1	Bacillariophyta	*Skeletonema subsalsum*	93,3	247
2	Bacillariophyta	*Stephanodiscus hantzschii*	73,3	130
3	Bacillariophyta	*Thalassiosira parva*	73,3	35

Note. * - Common phytoplankton species in lists of Moldova, Romania and Ukraine specialists.

Table 5

Ranking of research stations on the base of phytoplankton biomass ($mg \cdot l^{-1}$) identified by the specialists of different countries and chlorophyll-a concentration ($\mu g \cdot l^{-1}$)*

MOLDOVA		ROMANIA**		UKRAINE		Chlorophyll-a	
JDDS 13	22392	JDDS 16	138	JDDS 16	103132	JDDS 16	25,66
JDDS 16	10985	JDDS 15	53	JDDS 14	22711	JDDS 15	15,78
JDDS 15	7511	JDDS 13	22	JDDS 15	14684	JDDS 13	8,88
JDDS 5	2199	JDDS 9	7	JDDS 5	4469	JDDS 11	7,10
JDDS 6	2011	JDDS 11	5,2	JDDS 11	3498	JDDS 8	6,91
JDDS 14	1757	JDDS 14	5	JDDS 9	2393	JDDS 3	6,71
JDDS 11	1328	JDDS 12	4,4	JDDS 8	1703	JDDS 6	6,71
JDDS 9	1180	JDDS 10	4	JDDS 4	1636	JDDS 10	6,61
JDDS 12	1151	JDDS 8	3,7	JDDS 3	1355	JDDS 5	5,92
JDDS 3	1088			JDDS 10	1355	JDDS 14	5,92
JDDS 7	1054			JDDS 2	699	JDDS 9	5,72
JDDS 8	1049			JDDS 6	506	JDDS 4	5,52
JDDS 10	916			JDDS 12	472	JDDS 7	5,52
JDDS 1	774			JDDS 13	238	JDDS 12	5,43
JDDS 2	444			JDDS 7	83	JDDS 2	4,74
JDDS 4	379					JDDS 1	3,95

Note. * - Data on chlorophyll-a concentration have taken from Lalovitcaia & Gudzi, 2012 [***1***]; ** - The values of biomass are taken only those that resulted in a report [***6***] and probably are modified in chlorophyll-a concentration ($\mu g \cdot l^{-1}$).
JDDS stations: **1** – Prut river, Giurgiulesti; **2** – Reni; **3** – Cheatal Izmail; **4** – Izmail; **5** – Kilia; **6** – Vilkovo; **7** – Bystroe; **8** – Tulcea, Mila 35; **9** – Mila 23; **10** – Sulina; **11** – St. George, Uzlina; **12 -** St. George; **13** – Erenciuc Lake; **14** – Uzlina Lake; **15** – Isak Lake, **16** – Lebedei Lake.

Table 6

Comparison results of qualitative (total number of species) and quantitative (total abundance and biomass) characteristics of phytoplankton on investigated stations, analysed by experts from Moldova and Ukraine

Stations	Number of species		Abundance, 10^3 cells/l		Biomass, mg/m^3	
	Moldova	Ukraine	Moldova	Ukraine	Moldova	Ukraine
JDDS 1	18		480		774	
JDDS 2	13	22	500	466	444	699
JDDS 3	14	20	530	841	1088	1355
JDDS 4	12	25	360	1074	379	1637
JDDS 5	17	21	1400	2145	2199	4469
JDDS 6	18	10	1440	302	2011	506
JDDS 7	15	7	980	38	1054	83
JDDS 8	12	24	860	2118	1049	1703
JDDS 9	16	26	740	1209	1180	2393
JDDS 10	15	23	540	889	916	1355
JDDS 11	14	33	520	1625	1328	3498
JDDS 12	17	11	780	289	1151	472
JDDS13	24	10	31340	167	22392	238
JDDS 14	23	24	1104	18770	1757	22711
JDDS 15	44	28	8680	32087	7511	14685
JDDS 16	42	38	44360	130128	10985	103132
Average	**19,6**	**21,5**	**6276**	**12810**	**3514**	**10596**

Note. JDDS stations: **1** – Prut river, Giurgiulesti; **2** – Reni; **3** – Cheatal Izmail; **4** – Izmail; **5** – Kilia; **6** – Vilkovo; **7** – Bystroe; **8** – Tulcea, Mila 35; **9** – Mila 23; **10** – Sulina; **11** – St. George, Uzlina; **12 -** St. George; **13** – Erenciuc Lake; **14** – Uzlina Lake; **15** – Isak Lake, **16** – Lebedei Lake.

CONCLUSIONS

Unfortunately, the materials presented by the experts did not enable to prepare more detailed analysis of the obtained results. However general peculiarity of phytoplankton distribution and water quality were determined at the same time. Maximal quantitative development of phytoplankton was registered in lakes as compared to the highly dynamic branches of the Danube River. High biomass of phytoplankton is the indicator of the bad ecological conditions of aquatic ecosystems. The worst water quality was found in Lebedei Lake. Diatoms and green algae were dominant Orders with maximal numbers of recorded species. In the future, during similar investigations, special attention will be necessary to pay to the sampling methodology. For complex investigations (intercalibration) it is necessary to collect one sample in each site and with the help of the splitter divided this sample on equal subsamples according the number of participants involved into the intercalibration process. Special attention must be payd to methodology of biomass determination (accuracy of abundance identification, measuring the average volume of the cells etc.). In future comparative investigations it will be inadmissibly to use different methods of biomass calculation, for example with the help of the cells abundance and chlorophyll-a concentration. During identification of species composition of phytoplankton it will be very useful to take photo of the mass species to check precision of species identification.

ACKNOWLEDGEMENTS. Author especially thanks Dr. D. A. Nesterova and Dr. L. M. Terenko senior scientistss of Odessa Branch Institute of Biology of the Southern Seas, National Academy of Sciences of Ukraine for processing of phytoplankton samples.

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Manuscript received: 15 II. 2014 / Peer-reviewed: IV. – V. 2014 / Accepted: VI. 2014 / On-line: VI. 2014 / Printed: XII. 2014

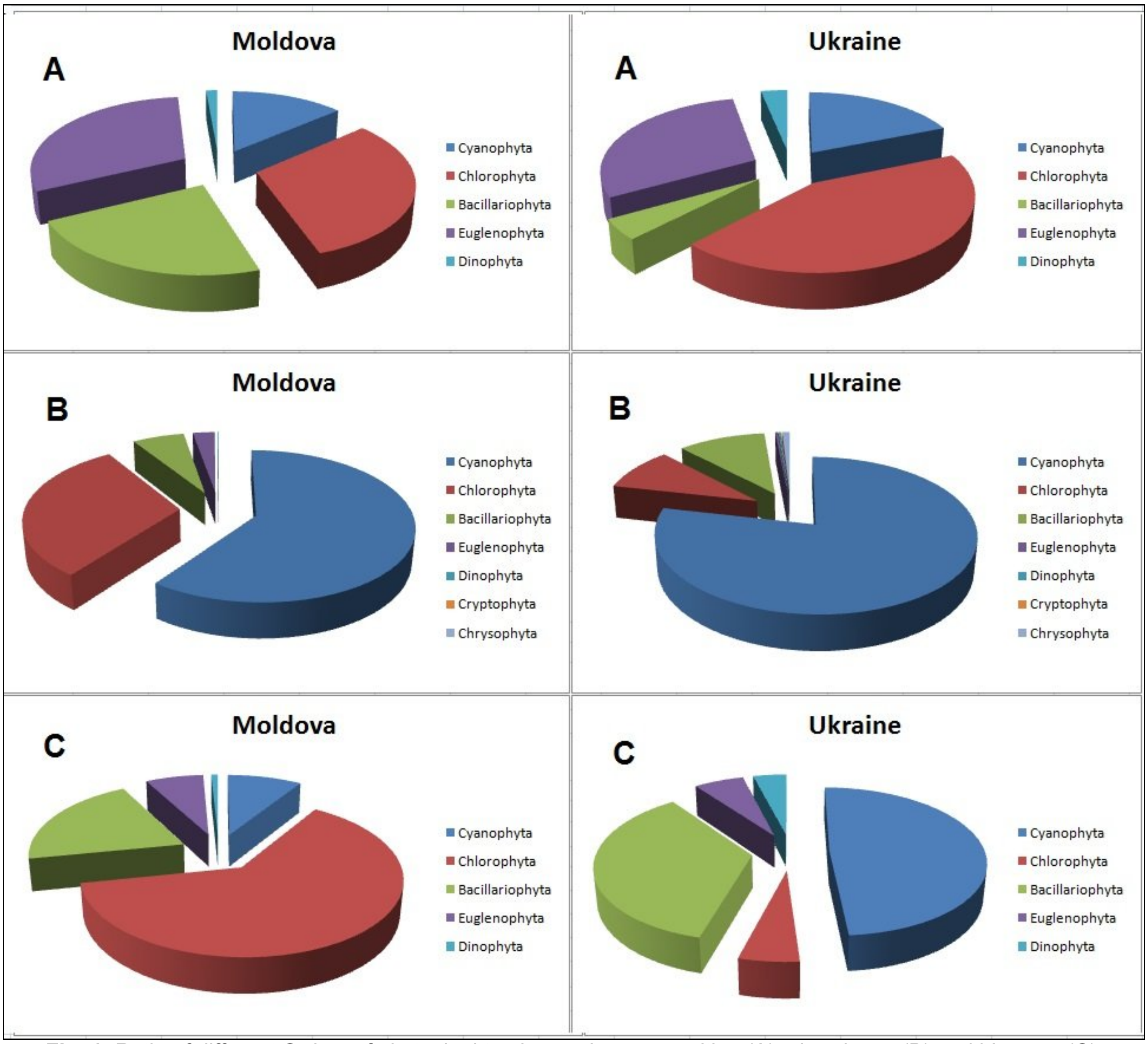

Fig. 1. Ratio of different Orders of phytoplankton in species composition (A), abundance (B) and biomass (C).

Table 7

Water quality and trophic conditions in investigated areas according to quantitative characteristics of phytoplankton and Chlorophyll-a concentration**

Stations***	Abundance, 10^3 cells/l		Biomass, mg/m^3		Chlorophyll-a concentration, µg/l
	Moldova	Ukraine	Moldova	Ukraine	
JDDS **1**	480		774		3,95
JDDS **2**	500	466	444	699	4,74
JDDS **3**	530	841	1088	1355	6,71
JDDS **4**	360	1074	379	1637	5,52
JDDS **5**	1400	2145	2199	4469	5,92
JDDS **6**	1440	302	2011	506	6,71
JDDS **7**	980	38	1054	83	5,52
JDDS **8**	860	2118	1049	1703	6,91
JDDS **9**	740	1209	1180	2393	5,72
JDDS **10**	540	889	916	1355	6,61
JDDS **11**	520	1625*	1328	3498	7,10
JDDS **12**	780	289	1151	472	5,43
JDDS **13**	31340*	167	22392	238	8,88
JDDS **14**	1104	18770*	1757	22711	5,92
JDDS **15**	8680	32087*	7511	14685	15,78
JDDS **16**	44360*	130128*	10985	103132	25,66

Note. * - Blue-green algae domination;
** - Water quality and trophic conditions are according to Oksiyuk et al., 1994 [*4*] (see **Table 8**);
***JDDS stations: **1** – Prut river, Giurgiulesti; **2** – Reni; **3** – Cheatal Izmail; **4** – Izmail; **5** – Kilia; **6** – Vilkovo; **7** – Bystroe; **8** – Tulcea, Mila 35; **9** – Mila 23; **10** – Sulina; **11** – St. George, Uzlina; **12** - St. George; **13** – Erenciuc Lake; **14** – Uzlina Lake; **15** – Isak Lake, **16** – Lebedei Lake.

Table 8

Water quality and trophic conditions, according to Oksiyuk et al., 1994 [*4*]

Water quality	Trophic condition	Abundance, 10^3 cells/l		Biomass, mg/m^3	Chlorophyll-a concentration, µg/l
		Mix composition	Blue-green algae domination		
High	Oligotrophic	<50	<500	100-500	3-7
Good	Mesotrophic	60-500	510-5000	600-2000	8-20
Moderate	Eutrophic	510-5000	5010-50000	2100-10000	21-75
Poor	Polytrophic	5010-10000	50010-100000	10100-50000	76-150
Bad	Hypertrophic	>10000	>100000	>50100	>151