

582.2

1, . . . 2, . . . 2, . . . 3, . . . 1

1
 , - , - ,52900 - ,

2 - . . . ,

01001 , . . . ,2,

3 - , , ,

SY23 3DA, ,

() . 2.

(BSS), (NBS)
 (TTSS),
 24-

() . 1
 . 2

BSS , NBS TTSS
 (TTSS),
 (1 .) . (2 .),
 () .

(BSS) (N S),

" "

(TTSS) (Kamenir et al., 2006).

(BSS),

(N S)

(TTSS)

-

(. 1),
(. 2),
(. ,).

(Mikhailyuk et al., 2008).

(

2 (V, 4³)

Oscillatoria Vauch., *Anabaena* Bory ex Born. et Flah., *Aphanizomenon* Morr. ex Born. et Flah.

(OTU) (Sneath, Sokal, 1973).

4³, 8-16³,
(131000³).

$\lg V_{xx}$, $xx -$ [, $\lg V$ 1,20
 $\lg_{10} V (^3) = 1,20$, .e. >8 16³].

0,60

V = 4,

$\lg_{10}(4) = 0,60$,

(lg $V = 0,30$) (Kamenir et al., 2006).
-
10- () - D .
 D^2 20 / / (Sieburth
et al., 1978).

12- ,
(Mikhailyuk et al., 2008).

-
(BSS)
(Sheldon et al., 1972).

(NBS),
BSS (Platt, Denman, 1978).

OTU
TTSS (Kamenir et al., 2006). OTU,
, OTU
(, 1981; Smith
et al., 2004). TTSS

() OTU,

Histogram Crosstab ,

TTSSyy, yy ,

TTSS01 TTSS .

() -

TTSS- (Kamenir et al., 2006). -

SPSS 13.0 (SPSS

Inc., , IL 60606,).

(BSS)

(. 1).

. BSS . 1 1-

1100-1500 ³ (lg $V = 3,31$). -

Stephanodiscus hantzschii

. 1.

(BSS) . 1

2-

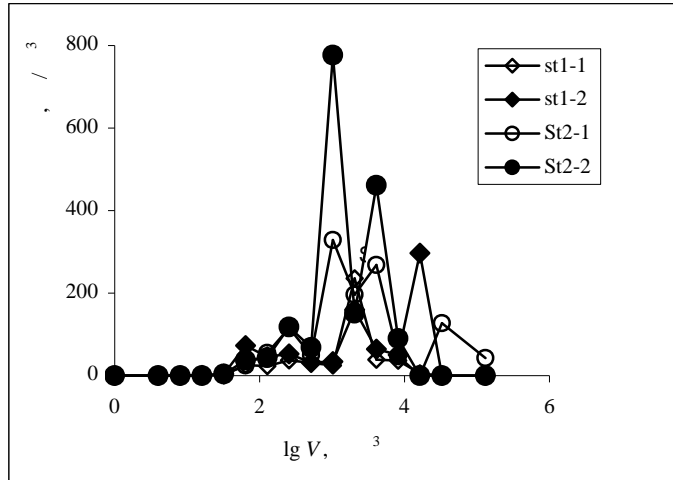
$\lg V = 3,31$

40-

60 ³ ($\lg V = 1,81$) 10600 ³ ($\lg V = 4,21$).

Microcystis aeruginosa, – *Anabaena flos-aque*

. 1



. 1.

(
(St1 St2)

12-

(BSS) . 2

130-

240 ³ ($\lg V = 2,41$),

Cyclotella stelligera,
Chlorella vulgaris, *Coelastrum indicum*, *Desmodesmus denticulatus* *Tetraedron*
caudatum,

() 530-970 ³ ($\lg V = 3,01$),

(*Oscillatoria splendida*, *O. acutissima* *Pseudoanabaena catenata*),

(*Synedra acus*, *Diatoma tenue*,

Asterionella formosa),

(*Mallomonopsis* sp.).

2, 1- 2- - 2500-3990 ³ (lg V = 3,61), . 2

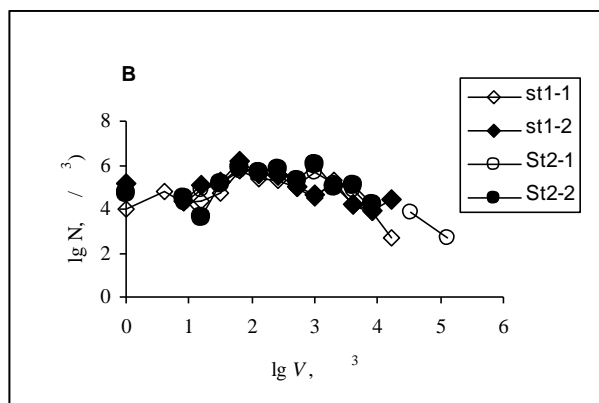
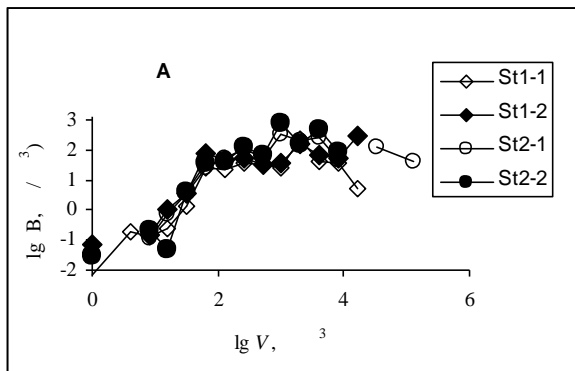
Oscillatoria agardhii,
- *Cryptomonas borealis*.

(BSS) . 2

17000-28800 ³ (lg V = 4,52).

Gymnodinium sp.

(2004 .)



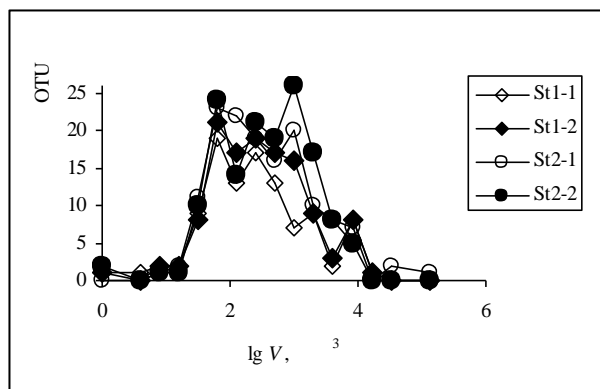
. 2. -lg-lg

NBS.

(-),

; -

BSS-
 , lg-lg (-)
)
 (. 2). ,
 ,
 (NBS), (/ ³)
 ,
 (BSS) (. . 1),
 lg-lg
 . 2 2-
 . 2 lg V = 3,0 lg V > 4. -
 . 1 2-
 lg V = 1,20; 1,81.
 - ()
 (TTSS) (. 3).
 ,
 TTSS . 2 (. . 3)
 (lg V = 2,41-3,61, 130-3500 ³).
 TTSS- ()
 (OTU), -
 ,
 (V, ³) OTU.
 TTSS . 1 . 2 2-
 TTSS . 1 1-
 lg V =
 2,41-3,31.



. 3. (TTSS) -

2-
 :
 - lg V = 2,41 3,91.
 (lg V > 4,21),
 BSS NBS (. . 1, 2).
 . 3, TTSS- , . .
 , ,
 ,
 (lg V = 1,81)
Desmodesmus (Chod.) An.,
Coelastrum Näg. *Monoraphidium* Kom.-Legn.,
 . 2.
) (lg V = 2,41)
Cyclotella Kütz., *Navicula* Bory, *Nitzschia* Hass., *Coelastrum*
Tetraedron Kütz. (lg V
 = 3,01)
Oscillatoria, *Pseudoanabaena* Lauterb., *Diatoma* Bory emend. Heiberg., *Asterionella*
 Hass. *Synedra* Ehr.
 , .2.
 , (. . 1-3)
 (
 3),
 (BSS), (NBS) (TTSS).
 - (Kamenir et
 al., 2006) (. 4).
 lg V,
 , c .
 ()
 TTSS (. . 4).
 (150-250),
 2-3 (65-90).
 -
 (, , 1996, 2000).
 TTSS
 , , lg V = 1,81
 ,

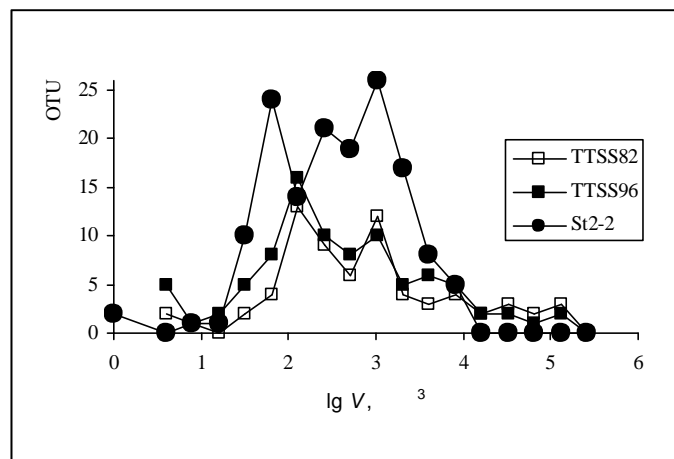
lg V = 2,11.

TTSS
(lg V = 3,01)

(TTSS)

90000³,

100000³ (. . .4).



. 4.

(TTSS)

. 2 (St-2) TTSS

() (

- TTSS82 TTSS96

(Kamenir et al., 2006)

(Mikhailyuk et al., 2008),

0,15 / ³PO₄³⁻ 1,23 / ³NH₄, 0,19

1,61

1³ (Zohary et al., 2000; Zohary, 2004).

TTSS

(lg V, 3)

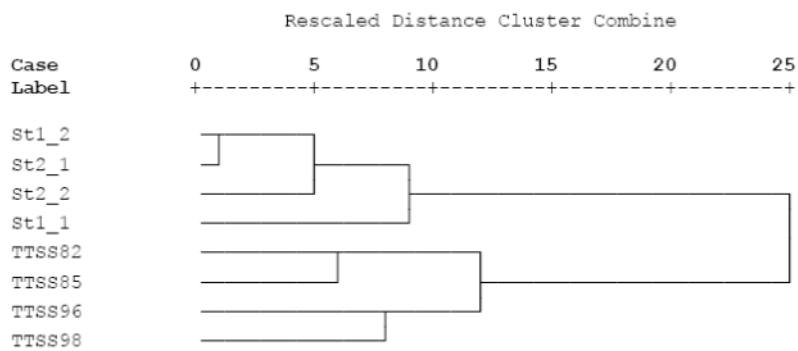
lg V	OTU	(OTU)	V
0.00	2	<i>Merismopedia tenuissima</i> Lemm.	0.70
0.60	1	<i>Microcystis pulvereae</i> (Wood) Forti emend. Elenk.	3.05
0.90	2	<i>Monoraphidium contortum</i> (Thur.) Kom.-Legn.	6.27
		<i>Tetrastrum elegans</i> Playf.	5.56
1.20	3	<i>Chroococcus minor</i> (Kütz.) Hollerb.	14.13
		<i>Snowella lacustris</i> (Chod.) Komárek et Hindák	8.38
		<i>Oscillatoria amphibia</i> J. Agardh ex Gomont	12.54
1.51	15	<i>Desmodesmus armatus</i> (Chod.) Hegew. var. <i>bicaudatus</i> (Gugl.) Hegew.	30.44
		<i>Dictyosphaerium chlorelloides</i> (Naum.) Kom. et Perm.	25.66
		<i>Kephyrion moniliferum</i> (Schmid) Bourr.	30.14
		<i>Lagerheimia genevensis</i> (Chod.) Chod.	31.36
		<i>Nephrochlamys rostrata</i> Nyg. et al.	25.09
		<i>Phormidium mucicola</i> Hub.-Pest. et Naum.	17.44
		<i>Pseudodidymocystis planctonica</i> (Korsch.) Hegew. et Deason	31.36
		<i>Raphidocelis subcapitata</i> (Korsch.) Nyg. et al.	18
1.81	41	<i>Tetrastrum staurogeniaeforme</i> (Schröd.) Lemm.	18.83
		<i>Choricystis minor</i> (Skuja) Fott	53.25
		<i>Chromulina</i> sp.	62.83
		<i>Chroomonas acuta</i> Uterm.	38.79
		<i>Coelastrum reticulatum</i> (Dang.) Senn	50.97
		<i>Desmodesmus armatus</i> (Chod.) Hegew.	60.29
		<i>D. armatus</i> (Chod.) Hegew. var. <i>spinus</i> (Fritsch et Rich) Hegew.	54.18
		<i>D. brasiliensis</i> (Bohl.) Hegew.	62.72
		<i>D. communis</i> (Hegew.) Hegew.	50.16
		<i>D. costato-granulatus</i> (Skuja) Hegew.	47.33
		<i>D. grahneisii</i> (Heynig) Hegew.	47.18
		<i>D. granulatus</i> (W. et G.S. West) Tsar.	47.16
		<i>Kephyrion inconstans</i> (W.G.G. Schmid) Bourr.	43.55
		<i>K. rubri-claustri</i> W. Conrad	62.88
		<i>Microcystis aeruginosa</i> (Kütz.) Kütz.	50.97
		<i>Monoraphidium griffithii</i> (Berk.) Kom.-Legn. in Fott	54.45
		<i>Monoraphidium minutum</i> (Näg.) Kom.-Legn. in Fott	37.63
		<i>Nitzschia fonticola</i> Grun. in Cl. et Müll.	48

		<i>N. pusilla</i> Grun.	48.13
		<i>Planothidium lanceolata</i> (Bréb. in Kütz.) Round et Bukht. var. <i>elliptica</i> (Cl.) Bukht.	45.62
		<i>Tetrastrum triangulare</i> Chod.	44.6
2.11	33	<i>Achnantheidium minutissima</i> (Kütz.) Czarn.	78.73
		<i>Acutodesmus dimorphus</i> (Turp.) Tsar.	95.83
		<i>Aulacoseira granulata</i> (Ehr.) Sim. var. <i>angustissima</i> (O. Müll.) Hust.	112.9
		<i>A. italica</i> (Ehr.) Sim.	112.28
		<i>Coelastrum microporum</i> Näg. in A. Br.	65.45
		<i>Desmodesmus abundans</i> (Kirchn.) Hegew.	89.2
		<i>D. serratus</i> (Corda) An et al.	108.91
2.11	33	<i>Golenkiniopsis parvula</i> (Woronikh.) Korsch.	87.12
		<i>Micractinium pusillum</i> Fres.	87.11
		<i>Ochromonas</i> sp.	91.63
		<i>Stephanodiscus minutulus</i> (Kütz.) Cl. et Möll.	99.79
		<i>Synedra acus</i> Kütz. var. <i>radians</i> (Kütz.) Hust.	77.76
2.41	35	<i>Amphora pediculus</i> (Kütz.) Grun. in A.S. et al.	141.40
		<i>Chlorella vulgaris</i> Beijer.	130.92
		<i>Chrysococcus biporus</i> Skuja	137.26
		<i>Coelastrum indicum</i> Turn.	220.89
		<i>Cyclotella stelligera</i> Cl. et Grun. in Cl.	204.28
		<i>Desmodesmus denticulatus</i> (Lagerh.) An, Friedl et Hegew.	166.31
		<i>D. opoliensis</i> (P. Richt.) Hegew.	178.41
		<i>Microcystis wesenbergii</i> (Komárek) Komárek	143.79
		<i>Navicula cryptocephala</i> Kütz.	217.5
		<i>Nitzschia acicularis</i> (Kütz.) W. Sm.	188.17
		<i>Oocystis lacustris</i> Chod.	142.67
		<i>Placoneis elginensis</i> (Greg.) Cox f. <i>exigua</i> (Greg.) Bukht.	190.58
		<i>Planothidium delicatula</i> (Kütz.) Round et Bukht.	174.27
		<i>Staurosirella pinnata</i> (Ehr.) Will. et Round	240
		<i>Tetraedron caudatum</i> (Corda) Hansg.	192.03
		<i>T. minimum</i> (A. Br.) Hansg.	232.31
2.71	33	<i>Achnanthes hungarica</i> Grun. in Cl. et Grun.	334.5
		<i>Chlamydomonas globosa</i> Snow	434.89
		<i>Ch. pseudopertusa</i> Ettl	465.31
		<i>Ch. reinhardtii</i> Dang.	335.46
		<i>Cryptomonas</i> sp. 1	362.58
		<i>Cyclostephanos dubius</i> (Fricke) Round	282.74
		<i>Cyclotella meneghiniana</i> Kütz.	293.15

		<i>Fragilariforma constricta</i> (Ehr.) Will. et Round	400
		<i>Golenkiniopsis solitaria</i> (Korsch.) Korsch.	268.08
		<i>Nitzschia palea</i> (Kütz.) W.Sm.	304.43
		<i>Tetraedron minimum</i> (A.Br.) var. <i>apiculato-scorbiculatum</i> (Reinsch) Skuja	425.36
3.01	35	<i>Asterionella formosa</i> Hass.	967.56
		<i>Cryptomonas marssonii</i> Skuja	616.91
		<i>Cryptomonas</i> sp. 2	716.77
		<i>Cryptomonas</i> sp. 4	1015.99
		<i>Diatoma tenue</i> Ag.	750.68
		<i>Dinobryon divergens</i> Imhof	802.84
		<i>Franciaia tenuispina</i> Korsch.	837.76
3.01	35	<i>Mallomonopsis</i> sp.	708.44
		<i>Oocystis borgei</i> Snow	535.23
		<i>Oscillatoria acutissima</i> Kuff.	774.19
		<i>O. geminata</i> Menegh. ex Gomont	677.4
		<i>O. splendida</i> Grev. ex Gomont	744.87
		<i>Pseudoanabaena catenata</i> Lauterborn	912.32
		<i>Rhoicosphenia abbreviata</i> (Ag.) L.-B.	551.95
		<i>Siderocystopsis punctifera</i> (Boloch.) Hegew. et Schnepf	846.75
		<i>Synedra acus</i> Kütz.	608.4
3.31	22	<i>Chilomonas paramaecium</i> Ehr.	1475.71
		<i>Chlamydomonas</i> sp. 2	1192.37
		<i>Cyclotella radiosa</i> (Grun.) Lemm.	1534.42
		<i>Navicula radiosa</i> Kütz.	1916.64
		<i>Stephanodiscus hantzschii</i> Grun. in Cl. et Grun.	1094.78
		<i>Synedra ulna</i> (Nitzsch) Ehr.	1248.87
		<i>Trachelomonas hispida</i> (Perty) F.F. Stein	1415.81
3.61	12	<i>Aulacoseira granulata</i> (Ehr.) Sim.	2529.79
		<i>Cocconeis placentula</i> Ehr.	3126.77
		<i>Cryptomonas borealis</i> Skuja	3995.5
		<i>Oscillatoria agardhii</i> Gomont	3463.3
3.91	13	<i>Aphanizomenon flos-aquae</i> (L.) Ralfs	4280.43
		<i>Chlamydomonas monadina</i> Stein	5283.29
		<i>Diatoma vulgare</i> Bory	7762.34
		<i>Gymnodinium</i> sp. 1	6064.22
		<i>Gymnodinium</i> sp. 2	7238.25
		<i>Melosira varians</i> Ag.	4281.82
		<i>Peridiniopsis quadridens</i> (F. Stein) Bourr.	5296.54

		<i>Peridinium</i> sp. 1	5296.43
4.21	1	<i>Anabaena flos-aquae</i> Bréb.	10609.00
4.52	2	<i>Euglena spirogyra</i> Ehr.	28821.43
		<i>Gymnodinium</i> sp. 3	17137.03
5.12	1	<i>Ceratium hirundinella</i> (O. Müll.) Bergh.	83455.52

4). (Kamenir et al., 2006) (5), (r) r = 0,868-0,975 ; TTSS r = 0,635 SPSS (n = 19).



5. TTSS (: Kamenir et al., 2006)

(r > 0,63), TTSS- (r) r = 0,868-0,975. (r = 0,868) St1-1 (. 1, 1-) St2-2 (. 2, 2-), (. . 3).

$\lg V = 3,01$

(. . . 2-4).

(Kamenir, 2007).

(. . .),

„ . . . ”,

TTSS-

(BSS),

(NBS)

(TTSS),

24

$\lg V = 3,01$

03-51-6196.

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THE EFFECTS OF ANTHROPOGENIC POLLUTION ON THE KANEV RESERVOIR (UKRAINE) PHYTOPLANKTON. 2. COMPARISON OF SIZE SPECTRUM PATTERNS

The results of a comparative study of the phytoplankton assemblage structure in two parts of the Kanev Reservoir, characterized by different levels of urban pollution, are presented. Analysis of pattern variability for several types of size spectra, namely the biomass size spectrum (BSS), the normalized biomass size spectrum (NBS) and the traditional taxonomic size spectrum (TTSS), was performed on the basis of a dataset produced by routine monitoring during a 24-month period at two stations in the Kanev Reservoir (Ukraine). Station 1 was situated in a relatively pure riverine part of the reservoir, whereas station 2 was located further down, at the mouth of the Syrets River, which carries the outflow of Kiev sewage. Both stations were characterized by markedly different phytoplankton composition and dynamics. While the BSS curves were very different, the annual NBS and TTSS curves exhibited a similar general pattern, with some differences evidenced in the fine structure of each spectrum. The obtained indices of the traditional taxonomic size spectrum (TTSS) that characterize the state of phytoplankton in a relatively pure area of the Kanev Reservoir (st. 1) and in st. 2, which was contaminated by urban drains of Kiev sewage at the mouth of the Syrets River, are compared with the same indices of a clean fresh-water reservoir, in particular Lake Kinneret (Israel). The impact of this urban pollution, as evidenced through the deformations of the size spectrum patterns, is discussed in detail.

Keywords: phytoplankton, anthropogenic pollution, size-frequency distribution, size spectra.

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