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PHYTOPLANKTON OF THE STOUDEN KLADENETS RESERVOIR (EASTERN RHODOPE MOUNTAINS, BULGARIA)

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ABSTRACT

The subject of the research was to determine the taxonomic composition, species richness and abundance of the summer phytoplankton in the Stouden Kladenets Reservo ir (the eastern Rhodope Mountains, Bulgaria). A total of 30 taxa were found, belonging to 6 Divisions: Cyanoprokaryota – 3, Chlorophyta – 14, Zygnemaphyta – 3, Chrysophyta – 1, Euglenophyta – 3 and Bacillariophyta – 6. The Divisions Chlorophyta (46,7%) and Bacillariophyta (20,0%) turned out to have the largest relative species richness in the floristic composition. The species' richness, density and biomass of the phytoplankton increase in the direction from the dam wall towards the tail end of the reservoir. On the basis of the species' composition, species richness and abundance of the phytoplankton, the Stouden Kladenets Reservoir aquatory (aquatic territory) can be divided into two zones, substan-

tially differing in water quality. The open reservoir water is oligotrophic, with signs of mesotrophy, whereas in the tail part there is strong eutrophication and algae bloom.

Key words: *phytoplankton, taxonomic composition, abundance, reservoir, trophic state*

INTRODUCTION

Phytoplankton's importance as one of the key indicators for assessing the ecological status of stagnant water is well-known and widely recognised all over the world (Rojo, 1998; Beshkova et al., 2007). The monitoring of the phytoplankton structure enables the assessment of the present situation and the prediction of possible changes in the ecosystems at very early stages (Stoyneva, Michev, 1996).

The comparative research of phytoplankton in lakes of different trophic status, as well as the study of phytoplankton in one and the same lake over a period of time, show how trophic changes influence its species composition, seasonal succession and productivity (Trifonova, 1989; Dasí et al., 1998; Leitão, Léglize, 2000; Negro et al., 2000; Romero et al., 2002; Naselli-Flores, Barone, 2007). Such comparative studies of the structural parameters and quantitative characteristics of phytoplankton are rare for Bulgarian lakes and reservoirs. Some of them are research on the Srebarna Lake (Stoyneva, 1998a), on some lakes of the Black Sea Bulgarian coast (Stoyneva, 2000a; Kalchev et al., 2002), on high mountain lakes in the Rila Mountains (Beshkova, 2000; Naidenow, Beshkova, 2000; Kalchev et al., 2004) and on some reservoirs (Kalchev, Botev, 2005; Beshkova, Saiz, 2006).

Data about reservoir phytoplankton are still scanty as to information about the species composition and/or dominant species (Beshkova et al., 2007). The survey of available data showed that, from the perspective of the EU Water Framework Directive (EU, 2000), the level of research on the phytoplankton in Bulgarian reservoirs is unsatisfactory. There are data for 28 out of a total of 120 reservoirs to be categorised according to the Ministry of Environment and Water (Beshkova et al., 2007).

The Stouden Kladenets Reservoir falls within the group of scantily researched reservoirs. In the early stage of its exploitation there was research only on the zooplankton (Naidenow, 1962, 1964) and zoobenthos (Dimitrov, 1962). A long period of research inactivity followed until 1993, when a hydrobiological monitoring network started functioning, covering the river Arda basin, with about 150 sampling points. The limitations of this monitoring lie in the fact that sampling points are mostly in the river sections. No routine monitoring of the biological components has been done for the Kurdzhali, Stouden Kladenets and Ivailovgrad reservoirs. The stations for physico-chemical monitoring were located only at the dam walls and tail ends. The species composition and quantitative characteristics of the Stouden Kladenets reservoir phytoplankton have not been the sole objects of research so far.

Our research aimed at setting up monitoring studies of the Stouden Kladenets reservoir phytoplankton as an important biological component for water quality assessment. The species' composition, species richness, horizontal distribution and quantitative characteristics of the phytoplankton were analysed. This research is part of the monitoring studies of surface water quality in the Arda river basin, under the PHARE/BG 2003/005-630,05 project.

Reservoir description

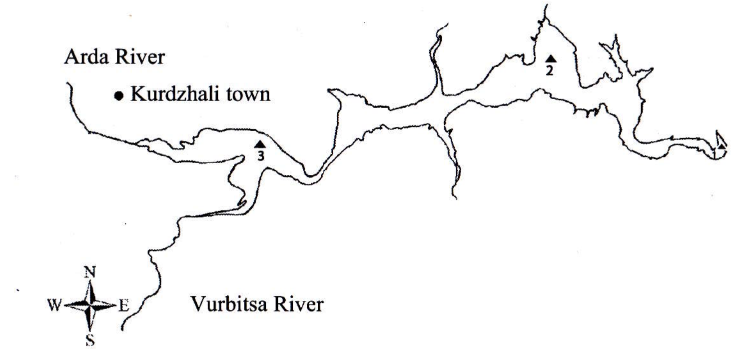
The Arda river is regulated by the building of three reservoirs, joined in a cascade – Kurdzhali Reservoir, Stouden Kladenets Reservoir and Ivailovgrad Reservoir. The Stouden Kladenets Reservoir is the second in the „Dolna Arda" cascade, after Kurdzhali Reservoir.

According to data by Stoyneva, Michev (2007), the Stouden Kladenets Reservoir is situated in the eastern Rhodope Mountains between the town of Kurdzhali and the village of Stouden Kladenets. It was created in an Arda river rocky gorge with vertical rocks and steep banks, covered with scanty vegetation. Building of the dam started in 1955 and lasted two years, and its utilisation started in 1958. It is fed by the river Arda, its tributary, the river Vurbitsa, the rivulets Perperek and Buyukdere, the Kurdzhali reservoir and several microreservoirs (e. g. Visoka Polyana). The length of the Stouden Kladenets Reservoir is over 27 km, the surface area is 2560 ha, and the water volume reaches 489 mln/m^3. The reservoir's maximum depth at the wall is 65 (57) m, and the average depth about 20-30 m. The reservoir's water is used chiefly for electricity production and, in a more limited range, for fishing and recreation.

MATERIAL AND METHODS

Phytoplankton samples were collected from the surface layer of the Stouden Kladenets Reservoir in Meyer bottles (of 1l) twice in the summer (July and September, 2006). Sample collection took place at three stations, evenly distributed along the Reservoir (Fig. 1).

Fig. 1. *Map of the Stouden Kladenets Reservoir, with locations of the sampling stations: no. 1, dam wall; no. 2, middle of Reservoir; no. 3, Reservoir tail end, river Arda inlet*



The location of the stations is shown in Table 1, along with some physical and chemical variables. A total of six qualitative and six quantitative samples was collected, processed and analysed.

The phytoplankton species structure was determined in parallel from fresh and conserved (in 4% formol) samples, with a Carl Zeiss – Ergaval light microscope (400×), and listed down systematically (Table 2).

The quantitative processing of phytoplankton followed the Protocol for Phytoplankton Counting (prEN 15204, 2005). The quantity was determined by cell counting with a PZO Poland inverted microscope (100× and 400×). In order to calculate the total phytoplankton biomass in each sample, the biomasses of the separate populations were summed together. Species cell volumes were borrowed from tables of freshwater phytoplankton (Fedorov, 1979), or calculated directly for separate species using the stereometric method (CEN tc230 wg2 tg3, 2006). Chlorophyll *a* was filtered trough Whathman glass fiber filters, extracted in acetone, measured with a spectrophotometer and calculated after Fedorov (1979).

Table 1. *Sampling stations, physical and chemical variables in the surface water of the Stouden Kladenets Reservoir investigated in the summer (July-September) of 2006. Temperature (°C); Secchi depth (m); Oxy – dissolved oxygen (mg/l); OxyS – oxygen saturation (%); Con25 – conductivity (µS/cm 25 °C); ORP – oxydation reduction potential (mV)*

Station no.	Date	GPS coordin. N, E	T (°C)	S. d. (m)	Oxy (mg/l)	OxyS (%)	pH	Cond25 (µS/cm 25 °C)	ORP (mV)
№ 1 (Dam wall)	27,7,06	219 m 41°37'14" 25°38'18"	25,7	4,40	7,12	96,3	8,73	235,0	134
	27,9,06	217 m 41°37'06" 25°38'15"	20,6	3,20	8,31	95,0	7,99	245,0	217
№ 2 (Middle of reservoir)	27,7,06	222 m 41°39'13" 25°34'05"	25,4	4,20	8,3	104,3	8,62	239,0	103
	27,9,06	222 m 41°39'13" 25°34'05"	20,4	3,20	8,16	91,7	7,95	250,0	184
№ 3 (Reservoir tail end)	27,7,06	223 m 41°37'41" 25°25'33"	24,8	3,10	8,3	102,0	8,64	249,0	4
	27,9,06	221 m 41°37'38" 25°25'30"	18,8	1,20	10,78	120,5	8,50	257,0	192

RESULTS

Species composition of the phytoplankton

In the July phytoplankton samples, we found a total of 24 taxa (Table 2). The largest relative species richness was that of the green algae

(Chlorophyta, 50,0%), followed by the diatom algae (Bacillariophyta, 25,0%) (Fig. 2). The blue-green algae (Cyanoprokaryota, 8,3 %) and the Euglena ones (Euglenophyta, 8,3%) were less represented.

Fig. 2. *Relative number of algal species (%) in the Stouden Kladenets Reservoir (July and September 2006)*

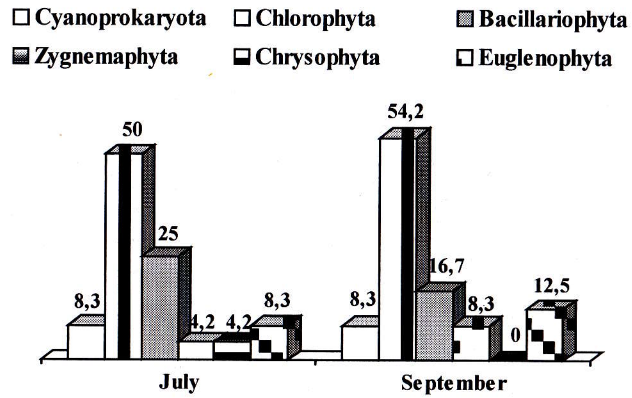


Table 2. *Species composition of the phytoplankton in the Stouden Kladenets Reservoir (July and September 2006)*

Taxon	Stations no. 1		2		3	
	July	Sept	July	Sept	July	Sept
Cyanoprokaryota						
Chroococcus disperses (Keissl.) Lemm.					+	
Oscillatoria limnetica Lemm.	+	+	+	+	+	+
Phormidium cincinnatum Itzigsohn		+				
Chlorophyta						
Ankistrodesmus gracilis (Reinsch) Korš.	+		+	+	+	+
Chloromonas infirma (Gerloff) Silva						+
Lagerheimia genevensis (Chod.) Chod.					+	+
Monoraphidium contortum (Thur.) Komárk. -Legn.		+		+	+	+

Monoraphidium minutum (Näg.) Komárk. -Legn.	+	+	+	+	+	+
Monoraphidium pusillum (Printz) Komárk. -Legn.		+		+	+	+
Radiococcus planktonicus Lund.	+	+	+	+	+	+
Scenedesmus bicaudatus Dedus.				+	+	+
Scenedesmus ecornis (Ehrenb.) Chod.	+		+	+	+	+
Scenedesmus obliquus (Turp.) Kütz.	+	+	+	+	+	+
Siderocelis ornata (Fott) Fott	+	+	+	+	+	+
Sphaerellopsis aulata (Pascher) Gerloff					+	+
Tetrastrum elegans Playf.						+
Tetrastrum staurogeniaeforme (Schröd.) Lemm.					+	
Zygnemaphyta						
Cosmarium laeve Rabenh.				+		
Cosmarium sp.	+		+		+	
Zygnema stagnale (Hassall) Kütz.		+		+		
Chrysophyta						
Chromulina rosanoffii (Woron.) Bütschli	+		+		+	
Bacillariophyta						
Attheya zachariasii Brun.			+			
Achnanthes minutissima Kütz.	+	+	+	+	+	+
Cymbella sp.					+	
Fragilaria sp.	+	+	+	+	+	+
Gomphonema sp.	+					+
Melosira granulata (Ehrenb.) Ralfs					+	+
Euglenophyta						
Euglena acus Ehrenb.						+
Euglena chlamydophora Mainx					+	+
Trachelomonas sp.		+		+	+	+
Most frequent (mass) species						

Most frequently were encountered throughout the reservoir aquatory the blue-green alga *Oscillatoria limnetica* Lemm. and the green algae *Monoraphidium minutum* (Näg.) Komárk. -Legn. and *Radiococcus planktonicus* Lund. (Table 2). Only in the open reservoir (stations nos.1 and 2) they are joined by the diatom algae *Achnanthes minutissima* Kütz. and

Fragilaria sp. They leave the leading group of species at the tail end of the reservoir (station no. 3), to be replaced by the green algae *Siderocelis ornata* (Fott) Fott and *Sphaerellopsis aulata* (Pascher) Gerloff.

Out of the three research stations, station no. 3, located at the reservoir tail end, produced the largest number of phytoplankton species (Table 2). There we found 22 out of the 24 species for the whole reservoir. At station no. 1 by the dam wall and station no. 2 in the middle of the reservoir, the species richness was about twice as poor (13 and 12 species respectively).

In September we also found 24 phytoplankton species (Table 2). Compared with July, the relative number of species by systematic groups remained almost unchanged (Fig. 2). Most species richness were the green algae (54,2%), followed by the diatom algae (16,7%). The number of taxa common for the two months was 18 (75,0%), which shows that the phytoplankton species composition was not much influenced during the research period.

In the open reservoir (stations nos. 1 and 2), still most abundant were the green algae *Monoraphidium minutum* and *Radiococcus planktonicus* and the diatom alga *Achnanthes minutissima* (Table 2). The blue-green alga *Oscillatoria limnetica* and the diatom alga *Fragilaria* sp. dropped out of the most-frequently encountered species group. At the tail end of the reservoir (station no. 3), the leading complex of phytoplankton species was richer (Table 2). The encountered in July green algae *Monoraphidium minutum*, *Siderocelis ornata* and *Sphaerellopsis aulata* were joined in September by some more green algae species: *Ankistrodesmus gracilis* (Reinsch) Korš., *Chloromonas infirma* (Gerloff) Silva, *Lagerheimia genevensis* (Chod.) Chod. and *Scenedesmus obliquus* (Turp.) Kütz.

In horizontal direction across the reservoir aquatory in September, too, the species richness grew in the direction from the dam wall (station no. 1, where 12 species were found) towards the tail end (station no. 3, 21 species).

Quantitative characteristics of the phytoplankton (density, biomass and chlorophyll *a*)

In July, the phytoplankton density varied within a wide range from 4,07X10^{6} cells/l to 37,71X10^{6} cells/l (Fig. 3). The density values for the open reservoir (stations nos. 1 and 2) were close to each other (4,07X10^{6} cells/l and 4,9X10^{6} cells/l respectively), whereas at the reservoir tail end (station no. 3), the phytoplankton density was about nine times higher (37,71X10^{6} cells/l).

At station no. 1, the highest relative density was that of the blue-green algae (47,6%), followed by the diatom algae (39,1%) (Fig. 4). At stations nos. 2 and 3, the largest percentage of total numbers was that of the green algae (47,4% and 57,4%).

The phytoplankton biomass values at the stations follow the density distribution (Fig. 3). In the open reservoir (stations nos. 1 and 2), biomass varied insignificantly (0,86 mg/l and 0,95 mg/l respectively), whereas at the reservoir tail end (station no. 3) it was over 7 times greater (6,96 mg/l) (Fig. 3).

At stations nos. 1 and 2, diatom algae and green algae have the highest percentage share in the biomass (Fig. 5). At the dam wall (station no. 1), the diatom algae (*Achnanthes minutissima* and *Fragilaria* sp.) comprise 76,8% of the total biomass, whereas the green algae (*Monoraphidium minutum* and *Radiococcus planktonicus*) comprise only 14,5%. Despite the high relative density of the blue-green algae (47,6%) at this station (represented by the species *Oscillatoria limnetica*), they have an insignificant share (8,7%) in the total biomass, because of its small size. In the centre of the reservoir (station no. 2), dominant in the total biomass were the same species of diatom and green algae.

Fig. 3. *Quantitative characteristics of the phytoplankton in the Stouden Kladenets Reservoir (July 2006)*

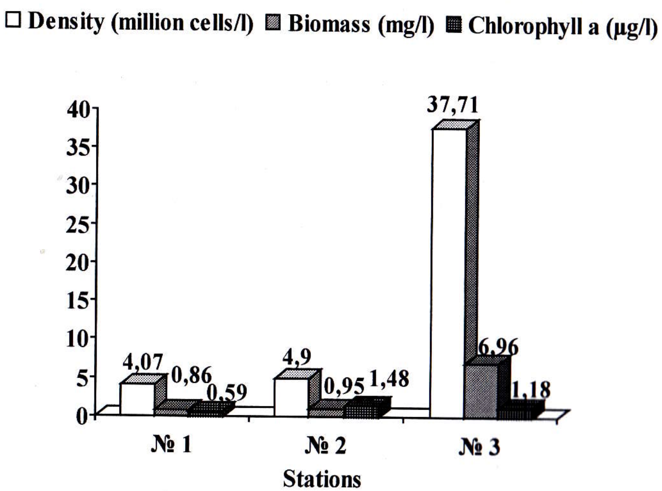
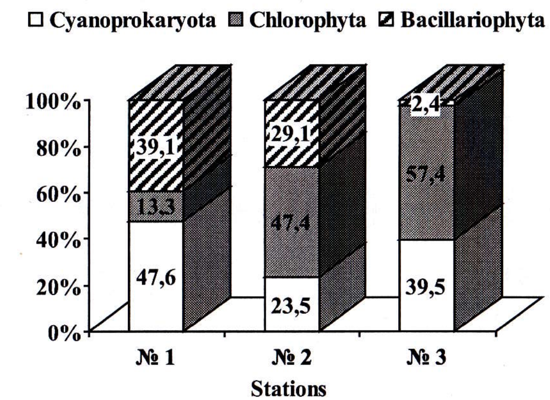
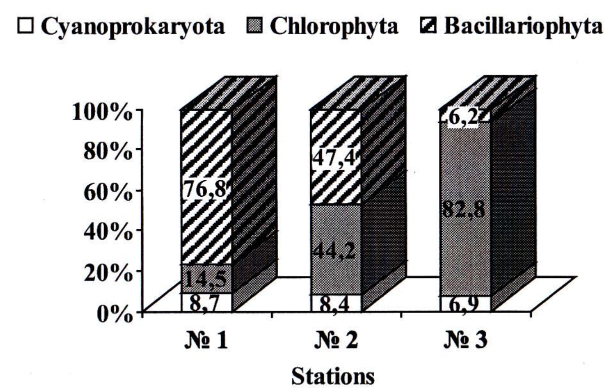


Fig. 4. *Relative share (%) of the different taxonomic groups in the phytoplankton total density (July 2006)*



However, compared to the dam wall, the green algae share in the total biomass increased (44,2%) at the expense of the diatom algae share, which decreased to 47,4% (Fig. 5).

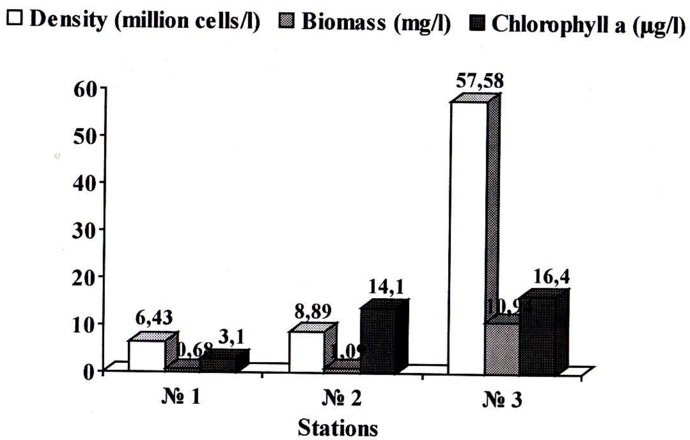
Fig. 5. *Relative share (%) of the different taxonomic groups in the phytoplankton total biomass (July 2006)*



This tendency was strongest at the reservoir tail end, where the biomass' predominant part (82,8%) was formed by green chlorococcic algae, mostly by the species *Siderocelis ornata*. Its biomass reached 5,04 mg/l (72,4% of the total biomass).

In September, phytoplankton density varied from 6,43X10^6 cells/l to 57,58X10^6 cells/l, the biomass from 0,68 to 10,94 mg/l, and the quantity of chlorophyll *a* from 3,1 to 16,4 µg/l (Fig. 6).

Fig. 6. *Quantitative characteristics of the phytoplankton in the Stouden Kladenets Reservoir (September 2006)*



These values denote stronger quantitative algae development in September as compared to July. In September, likewise, the values for the density and biomass in the open reservoir were close to each other, whereas at the tail end they considerably devisted (Fig. 6). Compared to the dam wall (station no. 1), phytoplankton density at the reservoir tail end (station no. 3) was nine times higher, and phytoplankton biomass 16 times larger.

As regards the predominance of individual species, at the dam wall (station no. 1), the diatom alga *Achnanthes minutissima* had a strong quantitative development (density 4,37X10^6 cells/l, biomass 0,39 mg/l). In the centre of the reservoir (station no. 2), it was joined by the green algae *Radiococcus planktonicus* (density 1,25X10^6 cells/l, biomass 0,14 mg/l) and *Monoraphidium minutum* (density 1,08X10^6 cells/l, biomass 0,12 mg/l). At the reservoir tail end (station no. 3), the green algae *Siderocelis ornata* (density 33,14X10^6 cells/l, biomass 5,96 mg/l) and *Sphaerellopsis aulata* (density 2,18X10^6 cells/l, biomass 1,96 mg/l) were predominant.

In September, the largest relative share in the total density and biomass was again that of the diatom and green algae (Figs 7, 8). The tendency towards a gradual displacement of the diatom algae by the green algae in the direction from the dam wall towards the reservoir tail end, was evident again. At the dam wall (station no. 1), diatom algae constituted 71,3% of the density, whereas at the reservoir tail end (station no. 3), their share decreased to 4,9%. Inversely, at the dam wall, green algae comprised only 26,4% of total density, whereas at the reservoir tail end, their share reached 84,5% (Fig. 7). As regards the biomass, the figures are even more indicative (Fig. 8). At the dam wall, green algae comprised only 27,9% of the total biomass, whereas at the reservoir tail end, their share in the total biomass was 93,8%.

Fig. 7. *Relative share (%) of the different taxonomic groups in the phytoplankton total density (September 2006)*

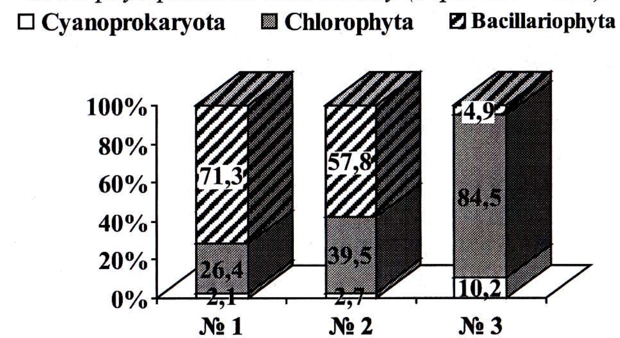
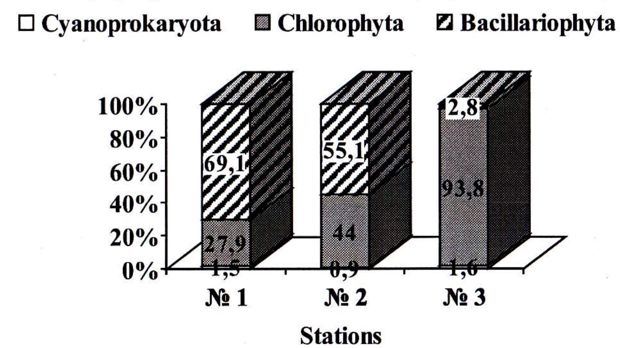


Fig. 8. *Relative share (%) of the different taxonomic groups in the phytoplankton total biomass (September 2006)*



DISCUSSION

As deduced from the results, a total of 30 phytoplankton taxa were found in the samples from the Stouden Kladenets Reservoir, belonging to 6 divisions: Cyanoprokaryota – 3, Chlorophyta – 14, Zygnemaphyta – 3, Chrysophyta – 1, Euglenophyta – 3 and Bacillariophyta – 6 (Table 2). The greatest relative species richness in the floristic composition was that of the divisions Chlorophyta (46,7%) and Bacillariophyta (20,0%). Cyanoprokaryota, Euglenophyta and Zygnemaphyta had a relatively lower species richness (10,0% each) (Fig. 2). The dominant role of the green algae in the summer phytoplankton has been established for other Bulgarian and Mediterranean lakes and reservoirs as well (Saiz, 1987; Beshkova, Botev, 1994; Beshkova, 1998; Stoyneva, 2000a; Ziller et al., 2000; Romero et al., 2002).

The Stouden Kladenets Reservoir is interesting for the great difference in the horizontal phytoplankton distribution. Throughout the reservoir aquatory, the species richness increased in the direction from the dam wall (station no. 1) towards the reservoir tail end (station no. 3). This regularity was common for both the months of research (Table 2). The increase of species richness in the river Arda – Stouden Kladenets Reservoir ecotone was expected, as deduced from similar phytoplankton research in other Bulgarian reservoirs (Saiz, 1987; Belkinova et al., 2007).

The phytoplankton quantitative characteristics also showed substantial differences between the stations in the open reservoir (the dam wall and the reservoir centre) and its tail end (Figs 3, 6). During the two research months, the water in the open reservoir (stations nos. 1 and 2) had a high transparency (over 3 m) (Table 1), the average biomass did not exceed 0,9 mg/l (Figs 3, 6), over 50% of the density and biomass being on behalf of the diatom algae (Figs 5, 7, 8). Such a phytoplankton state is typical for an oligotrophic water basin with signs of mesotrophy (Trifonova, 1986). At the same time, water transparency at the reservoir tail end was considerably lower (1,0 m) (Table 1). At the same station, phytoplankton biomass was over 7 times higher than those at the dam wall and the reservoir centre (Fig. 3). In September, the differences were even more indicative (Fig. 6). The biomass at the reservoir tail end was over 10 times higher than that in the open reservoir. For both the months of research, the biomass at that station (No. 3) averaged 9,0 mg/l. According to the Trifonova's (1986) criterium for trophic status, the Stouden Kladenets Reservoir's tail end falls into the eutrophy trophic type. The strong eutrophication at that station was also confirmed by the change of the quantitatively dominant phytoplankton group. At the Stouden Kladenets Reservoir tail end, diatom algae were displaced by green chlorococcic algae, which comprised 82,8% (July) and 93,8% (September), respectively, of the total phytoplankton biomass (Figs 5, 8). This dominance of green chlorococcic algae along with the prolonged algae bloom are typical for the eutrophic and hypertrophic lakes (Trifonova, 1986; Dasí et al., 1998). Because of the high biogene saturation, the phytoplankton populations' density remains high throughout the vegetation period and is limited only by the light conditions (Naselli-Flores, Barone, 1998; Naselli-Flores, 2000).

Our results confirm that at the Stouden Kladenets Reservoir tail end there is prolonged bloom of the green alga *Siderocelis ornata* (Fott) Fott. In July, its density was 18,68X10^6 cells/l, and in September it was even higher (33,14X10 cells/l). Its mass growth at the reservoir tail end is an indication for an influx of waste water, which saturates the station's locale both with biogenic elements and organic matter. According to data by Wasser et al. (1989), *Siderocelis ornata* is an indicator of β-mesosaprobic conditions with a high indicative weight. This species is widespread in Europe lakes' plankton, but is frequently missed out because of the fact that it appears as single, small-sized cells (Komárek, Fott, 1983). For Bulgaria, the species is rarely mentioned in the Srebarna lake (Stoyneva, 1998b) and the lakes Durankulak, Atanasovsko and Ezerets (Stoyneva, 2000 a,b).

The considerable differences found by us in the phytoplankton quantitative characteristics in the open Stouden Kladenets reservoir and the reservoir tail end cannot be explained only by the ecotone effect. In an analogical research of ours on the Kurdzhali reservoir phytoplankton, only a slight increase of the density and biomass in the ecotone with the river Arda was found (Belkinova et al., 2007). In the Stouden Kladenets Reservoir, there were considerable differences in the phytoplankton density and biomass at the reservoir tail end, when compared with the rest of its aquatory (Figs 3, 6). It is obvious that there are sources of anthropogenic pollution at the reservoir tail end.

The river Arda is the basic waste water disposal location for the town of Kurdzhali, after which the river flows into the Stouden Kladenets Reservoir. The domestic waste water flows directly into the reservoir. Also, for a period of 40 years, waste water from the „Lead and Zinc Complex PLC – Kurdzhali", contaminated with heavy metals, was fed without prior purification into the Stouden Kladenets Reservoir tail end. Since 1995, a purification station has been functioning for the PLC Complex's industrial waste water. The river Arda basin monitoring, going on since 1993, and the research of 2006 showed pollution of the Stouden Kladenets Reservoir tail end with the heavy metals zinc, cadmium and lead, above the critical levels (PHARE/BG 2003/005-

630,05, unpubl.). The study of the algal flora at inflows of mining water showed that the heavy metals lower the species diversity and productivity of the phytoplankton communities, the blue-green and the diatom algae being generally less stable than the green algae representatives (South, Whittick, 1990). Having in mind these data, an interesting fact is the prolonged bloom of the green alga *Siderocelis ornata* at the reservoir tail end. This is probably due to this species' resistance, acquired by described mechanisms for heavy metal tolerance (Stokes, 1981, 1983; Dimitrova et al., 2007).

CONCLUSION

As a result of our research on the Stouden Kladenets Reservoir phytoplankton, we can summarise, that its aquatory can be divided into two parts, substantially differing in water quality. In the open reservoir, the water is oligotrophic, with signs of mesotrophy, whereas in the tail part there is a strong eutrophication and prolonged algal bloom.

Phytoplankton monitoring should be continued, as it is obvious that there is a problem with the water quality at the reservoir tail end, resulting from the lack of processing of the household-waste water and probably from inefficiency of the purification station of the „Lead and Zinc Complex PLC – Kurdzhali". They are expressed by accumulation of heavy metals and eutrophication (algal bloom). The solution of the anthropogenic eutrophication problem of the water basins is one of the priorities of the EU water preservation (Directive 2000/60/EC; Council Direcrive 91/271/EEC) (Traykov, 2005). Besides, the Stouden Kladenets Reservoir has been included in the list of most representative sites with respect to biodiversity in Bulgaria, according to Michev, Iankov (1993) and is also included in the Appendix 1 ' List of Complex and Significant Reservoirs' of Water Act (State Gazette No 67/1999) (Stoyneva, Michev, 2007).

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ИЗСЛЕДВАНИЯ ВЪРХУ ФИТОПЛАНКТОНА НА ЯЗОВИР „СТУДЕН КЛАДЕНЕЦ" (ИЗТОЧНИ РОДОПИ, БЪЛГАРИЯ)

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РЕЗЮМЕ

Изследван е видовият състав и обилието на летния фитопланктон в язовир „Студен кладенец". Установени са общо 30 вида, които принадлежат към 6 отдела: Cyanoprokaryota – 3, Chlorophyta – 14, Zygnemaphyta – 3, Chrysophyta – 1, Euglenophyta – 3, и Bacillariophyta – 6 вида. С най-голямо относително обилие във флористичния състав са отделите Chlorophyta (46,7%) и Bacillariophyta (20,0%). Видовото богатство и количественото развитие на фитопланктона нарастват в посока от язовирната стена към опашната част на язовира. Въз основа на видовия състав и обилието на фитопланктона акваторията на язовир „Студен кладенец" може да бъде разделена на две зони, които съществено се различават по качество на водата. В откритият язовир водите са олиготрофни с признаци на мезотрофия, докато в опашната част има силно еутрофизиране и водораслов „цъфтеж".

Ключови думи: *фитопланктон, таксономичен състав, обилие, язовир, трофично състояние.*