KALME VALSTS PĒTIJUMU PROGRAMMA KLIMATA MAIŅAS IETEKME UZ LATVIJAS ŪDEŅU VIDI

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CLIMATE DRIVEN CHANGES ON PHYTOPLANKTON COMMUNITIES STRUCTURE AND ALGAE SPECIES SEASONAL DEVELOPMENT IN LATVIA'S FRESHWATERS

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Last decades of mild winters warming had considerably effects on the development of phytoplankton communities in Latvia's freshwaters (Fig.1, 4).

Because of phytoplankton species composition respond very rapidly to changes in their environment, it was stated that water temperature, light as well as level of water and amount of nutrients are factors determining phytoplankton species diversity (Fig. 1,2,3,4, 5).

Numbers of individuals and biomass rate no only in Latvia's lentic waters as well as in the biggest freshwater bodies - Daugava River 3 Hydro Power Plant reservoirs.

In the case of Cyanobacterial biomasses also the water temperature para-meters had a significant effect: highest biomass values of *Microcystis* spp., *Anabaena* spp. in Latvia's lentic environments are stated in last week of July and in August.

In most of Latvia's freshwaters phytoplankton succession can be interpreted in terms of r- and k-strategies: r-strategists dominate in the early phase of succession.
Summer growth starts with a dominance of *Cryptomonas* spp. and *Pandorina morum* and in very high amount small flagellates. Long term phytoplankton oservations shows development of *Cryptomonas* sp in lentic freshwaters (Fig.11, 13)

It is difficult to explain expansion of the large nuisance alga *Gonyostomum semen* caused by climate driven changes. More than 20 years ago *G. semen* was considered as rare species for Latvia. Last 5 years this species are common not only in dystrophic and dyseutrophic lakes in high mass (more than 30mg/l) but also in macrophyte type lakes and ponds (Fig.10).

Salaca River hydrobiological monitoring is performed from 1982 till - nowadays

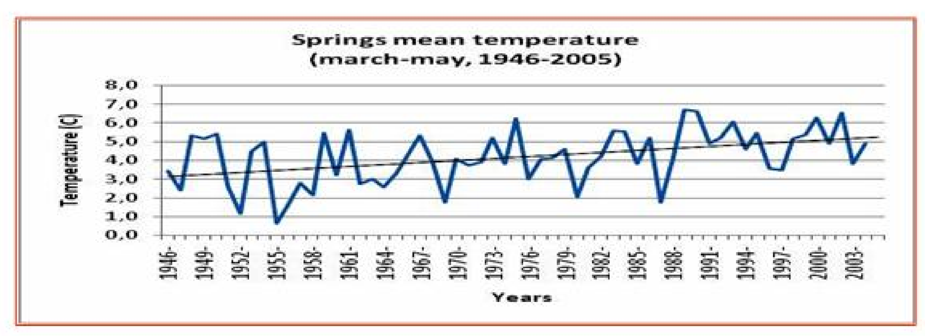

Fig1. Long-term trend of annual mean air temperature in the basin of the River Salaca (data of LEGMA).

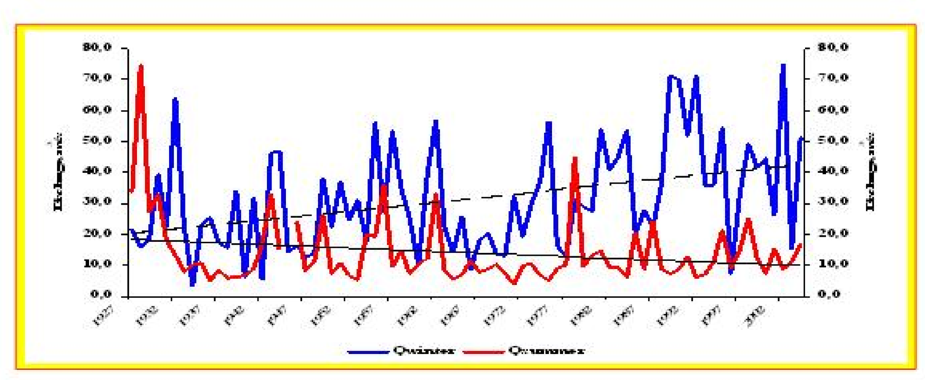

Fig. 2. Long-term trends of water discharge in winter and summer seasons of the River Salaca (data of LEGMA)

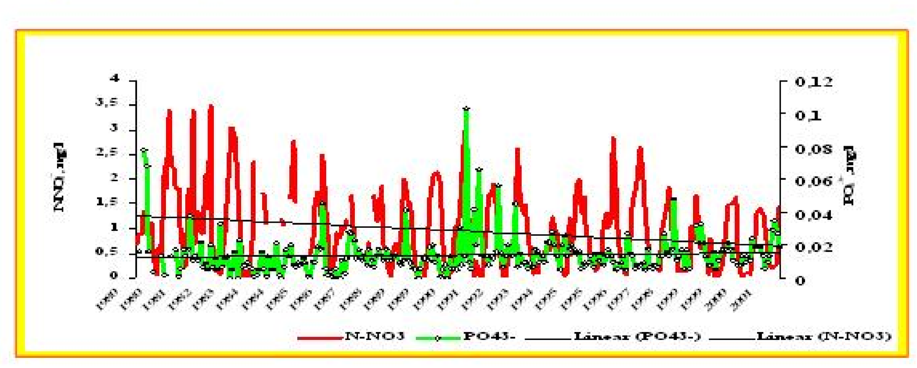

Fig.3. Long term trend of the nutrients (mean monthly data, of LEGMA) of the lower Salaca.

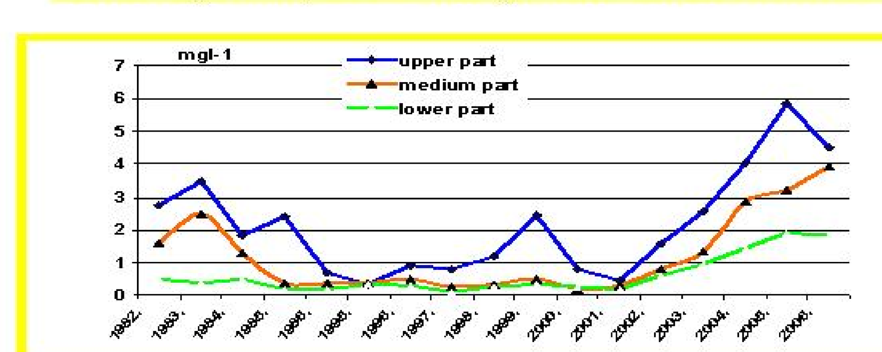

Fig.4. Long term changes of phytoplankton (biomass $mg\ l^{-1}$) in the River Salaca upper part (outflow), medium part and lower part.

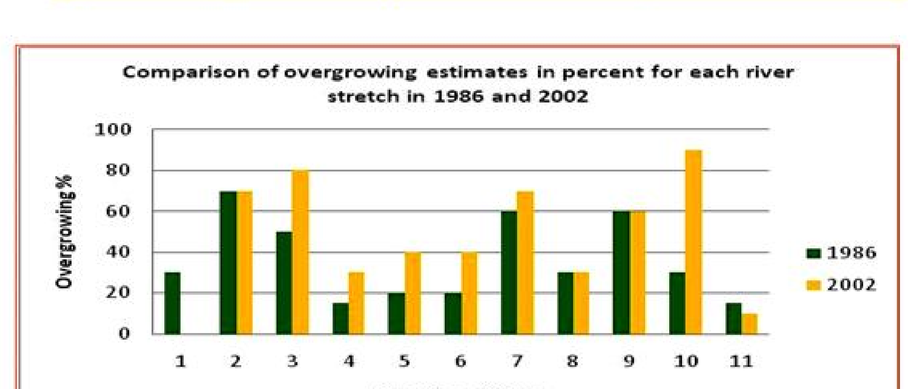

Fig 5.. Changes in degree of overgrowing of the River Salaca (according L.Grinberga, 2007).

Phytoplankton succession in Daugava River HPP reservoirs consisted of spring diatom development, followed by a period with a relatively low phytoplankton biomass dominated by green algae and low density of diatoms (Fig.6,7) The greatest phytoplankton biomass in Riga reservoir, which consisted of algal blooms of *Microcystis spp.*, was observed in summer, characterized by lower discharge of water (Fig. 8, 9) . High cyanobacterial biomass was recorded in August 1999, which was attributed to water temperatures higher than 27°C in July and Augut (Fig. 12). In Plavinu reservoir the highest number of cells, mainly belonging to species of Cyanophyta, Cryptophyta, Bacillariophyta and Chlorophyta.

Fig. 6. Daugava River near by capital of Latvia Riga

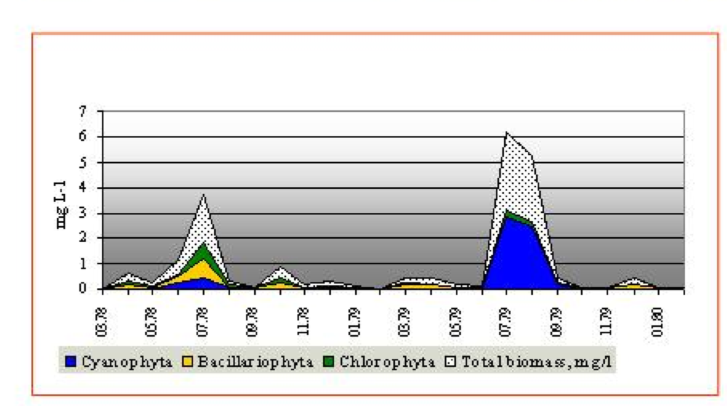

Fig 7. Phytoplankton succession in Riga Reservoir

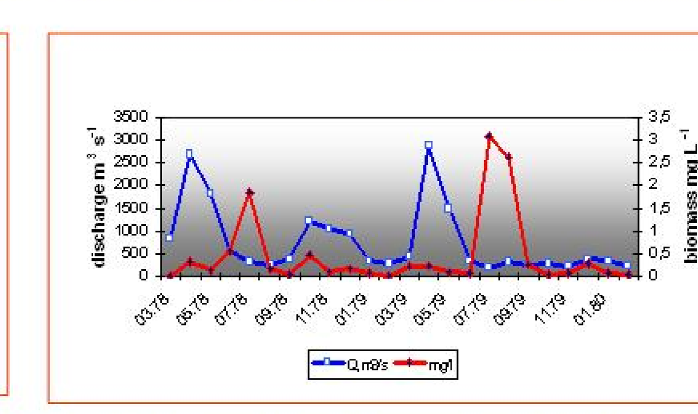

Fig. 8. Relationships between phytoplankton total biomass mg/l and water discharge m^3/sec in Riga Reservoir

Fig. 9. Riga HPP Reservoir

Microcystis "blooms"

Enhanced temperature above 27°C in July and August 1999 was the main reason for extensive cyanobacterial bloom by mixed composition dominated by Microcystis species (mainly *M. aeruginosa, M. wessenbergii, M.viridis*). Mean July ñ August temperature for Daugava reservoirs is 21-22.20C. The maximum of phytoplankton biomass more than 85 mg L-1 was recorded in August 1999 in the lower Reservoir of Daugava River HPP Cascade (Fig. 12) .

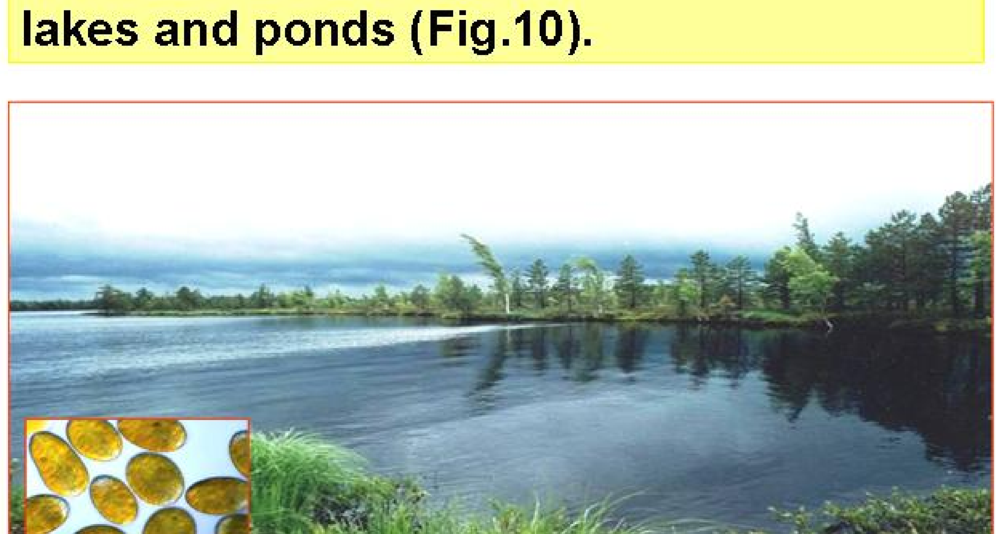

Fig.10. Dystrophic lake Veigantu in Teichi Nature Reserve

Fig. 11.Eutrophic lake Damjapurva – under heavy anthrophogenic impact from Riga city

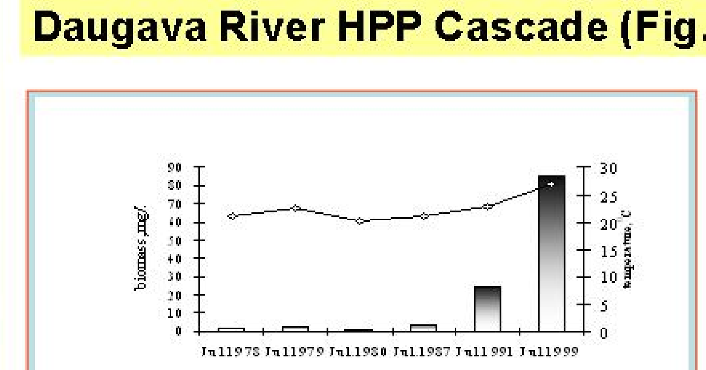

Fig. 12. Max. Cyanobacterial biomass (mg/l) observed In Daugava HPP Reservoirs

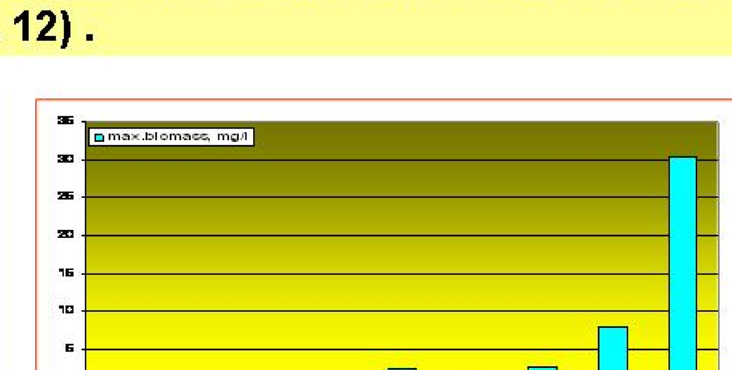

Fig. 13. Highest observed biomass (mg/l) of Cryptophytes in Latvia's freshwaters

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