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THE STATE OF THE PHYTOPLANKTON IN THE EASTERN PART OF THE GULF OF FINLAND IN NOVEMBER 1990 AND 1991

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Abstract. During the expedition to the eastern part of the Gulf of Finland in November 1990 and 1991, the data on the temperature, salinity, content of nutrients and chlorophyll *a*, phytoplankton species composition, number of cells and biomass of phytoplankton were collected. The concentration of nutrients was the highest in the inner part of the Neva Estuary. The difference in the content of nitrogen compounds between eastern and western part of the study area was greater than the difference in the content of phosphorus compounds. There were 55 taxa determined in the phytoplankton of the eastern part of the Gulf of Finland. The biomass was distributed quite evenly and was considerably higher only at one — the easternmost — sampling station. The blue-green alga *Aphanizomenon flos-aquae* was the dominant species at almost all sampling stations. The blue-green algae formed about 60% of the biomass in the inner part of the Neva Estuary.

Key words: phytoplankton, chlorophyll *a*, nutrients, the blue-green algae, eutrophication, the Gulf of Finland.

MATERIAL AND METHODS

During the expedition of the research vessel "Livonia" on the 07—08 of November 1990, 3 sampling stations and on the 20—25 November 1991, 13 sampling stations situated in the eastern part of the Gulf of Finland, were visited (Fig. 1). Data on the water temperature, salinity, content of nutrients, content of chlorophyll *a*, phytoplankton species composition, number of phytoplankton cells and biomass, were gathered (Table 1). The temperature of water and salinity were determined with the aid of Neil-Brown CTD-sound. The nutrients were analysed according to Koroleff (1976) on board of the research vessel, using the autoanalyser "Akea". The content of chlorophyll *a* was determined according to the method approved by BMB (Guidelines . . . II, 1984). The phytoplankton samples were gathered from the surface layer (0—1 m). The phytoplankton species were determined, using the microscope "Amplival", and the cells of algae were counted by the Utermöhl (1958) technique, using the inverted microscope "Diavert". Cell numbers were converted to biomass by the formulas described by Melvasalo et al. (1973) and Edler (1979). The list of the species of phytoplankton was composed according to the Christensen's nomenclature (Edler et al., 1984) (Table 2). The changes in the nomenclature accepted during recent years (Tikkanen, Willen, 1992) are given in the brackets.

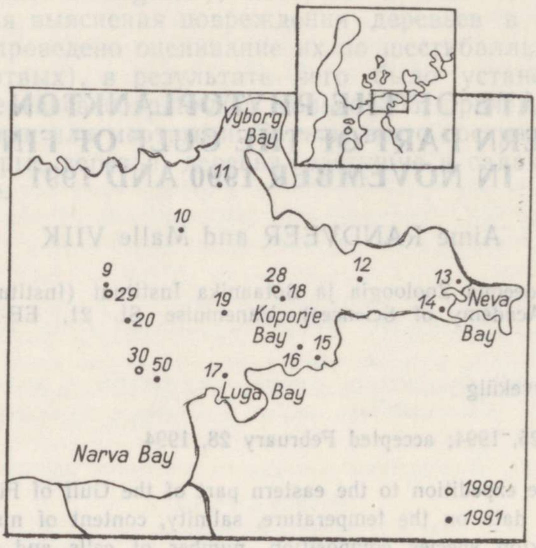

Fig. 1. The sampling stations in the eastern part of the Gulf of Finland.

RESULTS

The temperature of the water varied from 3.1 °C in the easternmost part of the study area near Kotlin island to 7.0 °C in the open sea in Narva region (Table 1). The lowest salinity, 0.5‰, was also registered in the easternmost part of the study area and it increased gradually to 4.8‰ (in 1990 4.1—5.3‰) in Narva region (Table 1). The salinity at the 13th sampling station is under the strong influence of the fresh water from the River Neva. It is worth mentioning that the eastern part of the Gulf of Finland is very shallow (Table 1). The content of the nutrients was the highest at the stations of the inner part of the Neva Estuary. The difference in the content of nitrogen compounds between the eastern part and the western part of the study area was greater than the difference in the content of phosphorus compounds in 1991. The water was mixed up, there was no remarkable difference in the temperature of water, its salinity, content of inorganic nitrogen and phosphorus and in the content of total nitrogen and phosphorus between both the surface and the bottom layer in the investigated area. The N:P-ratio was higher (10—13) in the eastern part and lower (4—6) in the southwestern part of the area. The content of chlorophyll *a* varied from 0.8 to 2.4 μg/l (Fig. 2). The lowest values of chlorophyll *a* were in Vyborg region. Higher chlorophyll *a* values were registered at the open sea (2.2 and 2.4 μg/l) and in the eastern part of the area near Kotlin Island (1.8 and 1.9 μg/l).

Table 1

Data on the environmental factors and the value of Shannon-Wiener index (H) in the Gulf of Finland in November 1990 and 1991 (s — surface layer, b — bottom layer)

Station	Coordinates	Depth, m	Temperature, °C		Salinity, ‰		PO_4—P, µg/l		Tot—P, µg/l		NO_3—N+ +NO_2—N, µg/l		Tot—N, µg/l		N:P-ratio		H
			s	b	s	b	s	b	s	b	s	b	s	b	s	b	
							1990 November 07—08										
29	60°07′ 27°29′	53	5.1	3,9	5,3	7,0	14	42	21	47	74	132	294	344	5	3	—
30	59°55′ 27°39′	50	4,9	3,9	5,2	6,7	15	56	25	57	88	149	298	378	6	3	—
28	60°06′ 28°48′	34	4,5	5,2	4,1	5,2	20	20	23	25	180	106	428	347	9	5	3,4
							1991 November 20—25										
9	60°12′ 27°29′	60	6,7	7,1	4,3	4,8	19	22	23	25	130	125	386	382	7	4	3,5
20	60°05′ 27°32′	60	6,7	4,9	4,4	5,9	22	41	29	41	137	170	328	315	6	4	2,2
50	59°46′ 27°49′	20	6,1	6,1	4,7	4,9	24	24	39	40	112	112	357	357	5	5	2,6
10	60°15′ 27°60′	32	7,0	6,8	3,8	3,9	24	24	27	26	165	161	458	437	7	7	2,6
19	60°07′ 28°04′	50	6,0	6,2	4,3	4,5	24	27	30	32	143	126	349	315	6	5	2,9
17	59°45′ 28°14′	23	5,6	5,6	4,6	4,6	30	28	44	43	113	106	398	378	4	4	—
11	60°23′ 28°15′	37	6,6	7,0	3,7	3,9	25	26	27	29	173	165	454	441	7	6	3,0
18	60°06′ 28°48′	37	5,8	6,3	3,0	3,4	41	31	47	38	294	206	512	416	7	7	2,5
16	59°52′ 28°42′	27	6,1	6,2	3,5	3,5	27	25	41	43	182	188	434	447	7	8	2,9
15	59°52′ 28°53′	18	5,8	—	3,4	—	—	—	—	—	—	—	—	—	—	—	3,1
12	60°04′ 29°08′	30	4,8	6,8	1,8	3,4	34	25	35	28	358	193	432	458	10	8	—
14	60°04′ 29°23′	23	4,4	6,3	1,5	2,6	33	29	35	33	354	258	648	536	11	9	2,4
13	60°06′ 29°44′	14	3,1	3,2	0,5	0,6	33	33	38	43	421	424	837	791	13	13	2,4

Tabel 2

The list of species of phytoplankton of the eastern part of the Gulf of Finland in November 1990 and 1991

Taxon	1990	1991
1	2	3
Ph. *CYANOPHYTA*		
Cl. *Nostocophyceae*		
O. *Chroococcales*		
1. *Gomphosphaeria lacustris* var. *compacta* Lemmermann (*Woronichinia compacta* (Lemmermann) Komárek & Hindak)	+	+
2. *Merismopedia warmingiana* Lagerheim	+	+
3. *Microcystis reinboldii* (Richter) Forti	—	+
O. *Nostocales*		
4. *Anabaena* cf. *flos-aquae* (Lyngbye) Brébisson	—	+
5. *Aphanizomenon flos-aquae* (L.) Ralfs ex Bornet & Flahault	+	+
6. *Lyngbya limnetica* Lemmermann *(Planctolyngbya subtilis* (W. WEST) Anagnostidis & Komarek)	—	+
7. *Nodularia spumigena* Mertens ex Bornet & Flahault	—	+
8. *Oscillatoria limnetica* Lemmermann (*Pseudanabaena limnetica* (Lemmermann) Komarek)	—	+
9. *O. planctonica* Woloszyńska (*Limnothrix planctonica* (Woloszyńska) Meffert)	—	+
10. *O. tenuis* C. A. Agardh ex Gomont	+	+
Ph. *CRYPTOPHYTA*		
Cl. *Cryptophyceae*		
O. *Cryptomonadales*		
11. *Cryptomonas* cf. erosa Ehrenberg	+	+
12. *Cryptomonas* sp. (L=25μ; l=8μ)	+	+
13. *Cryptomonas* sp. (L=6—8μ; l=4)	—	+
Ph. *DINOPHYTA*		
Cl. *Dinophycea*		
O. *Dinophysiales*		
14. *Dinophysis acuminata* Claparéde & Lachmann	+	+
O. *Gymnodiniales*		
15. *Gymnodinium lantzschii* Utermöhl	—	+
16. *Gymnodinium* sp. (L=20—24μ, l=8)	+	+
17. *Katodinium rotundatum* (Lohmann) Fott	—	+
O. *Peridiniales*		
18. *Gonyaulax catenata* (Levander) Kofoid (*Peridiniella catenata* (Levander) Balech)	—	+

1	2	3
O. *Ebriales*		
19. *Ebria tripartita* (Schumann) Lemmermann	+	+
Ph. *CHRYSOPHYTA*		
Cl. *Diatomophyceae* (Bacillariophyceae)		
O. *Eupodiscales*		
20. *Chaetoceros holsaticus* Schütt	—	+
21. *C. subtilis* Cleve	+	+
22. *C. wighamii* Brightwell	+	+
23. *Coscinodiscus* granii Gough	+	+
24. *Cyclotella* sp. (Ø 20μ)	+	+
25. *Melosira arctica* (Ehrenberg) Dickie	+	+
26. *M. islandica* var. *helvetica* O. Müller	—	+
27. *M. nummuloides* (Dillwyn) C. A. Agardh	—	+
28. *M. varians* C. A. Agardh	—	+
29. *Melosira* sp.	+	—
30. *Skeletonema costatum* (Greville) Cleve	+	+
31. *Thalasssiosira baltica* (Grunow) Ostenfeld	+	+
32. *T. levanderi* Van Goor		
O. *Bacillariales*		
33. *Achnanthes taeniata* Grunow	—	+
34. *Asterionella formosa* Hassal	—	+
35. *Diatoma elongatum* (Lyngbye) C. A. Agardh (*Diatoma tenuis* Agardh)	+	—
36. *Nitzschia acicularis* W. Smith	—	+
37. *Rhoicosphenia abbreviata* (C. A. Agardh) Lange-Bertalot	—	+
Ph. *EUGLENOPHYTA*		
Cl. *Euglenophyceae*		
O. *Euglenales*		
38. *Eutreptiella* sp.	—	+
Ph. *CHLOROPHYTA*		
Cl. *Prasinophyceae*		
O. *Pyramimonadales*		
39. *Pyramimonas* sp.	+	+
Cl. *Chlorophyceae*		
O. *Chlorococcales*		
40. *Ankistrodesmus falcatus* (Corda) Ralfs	+	+
41. *Botryococcus braunii* Kützing	—	+
42. *Coelastrum astroideum* De Notaris	—	+
43. *C. microporum* Nägeli	—	+
44. *Monoraphidium contortum* (Thuret) Komáková — Legnerova	+	+
45. *Oocystis borgei* Snow	—	+

1	2	3
46. *O. lacustris* Chodat	+	+
47. *Pediastrum boryanum* (Turpin) Meneghini	—	+
48. *P. duplex* Meyen	—	+
49. *P. tetras* (Ehrenberg) Ralfs	—	+
50. *Scenedesmus acuminatus* (Lagerheim) Chodat	—	+
51. *S. communis Hegewald* (*S. quadricauda*) (Turpin) Brébisson)	—	+
52. *S. opoliensis* P. Richter	+	+
53. *Shroederia setigera* (Schröder) Lemmermann	—	+
54. *Tetraedron minimum* (A, Braun) Hansgirg	+	—
O. *Zygnematales*		
55. *Mougeotia* sp. (l=5—10μ)	—	+

There were 55 taxa determined in the phytoplankton of the eastern part of the Gulf of Finland. The phytoplankton species list is built up of 10 taxa from phylum *Cyanophyta*, 3 taxa from *Cryptophyta*, 6 taxa from *Dinophyta*, 18 taxa from *Chrysophyta*, 1 taxon from *Euglenophyta* and 17 taxa from *Chlorophyta* (Table 2). The biomass of the phytoplankton was distributed quite evenly and varied from 0.12—0.15 mg/l at most of the sampling stations (Fig. 2). A noticeably higher biomass of the phytoplankton, 0.29 mg/l, was registered at the easternmost sampling station situated north of the Kotlin Island. In Koporje Bay the biomass of the phytoplankton was 0.07—0.08 mg/l which is somewhat lower than the general level. The number of the phytoplankton cells ranged from 110 000 to 260 000 cells/l. Lower values were registered at the open sea. In 1990 the biomass and the number of cells of the phytoplankton were 0.20 mg/l and 0.23 cells/l.

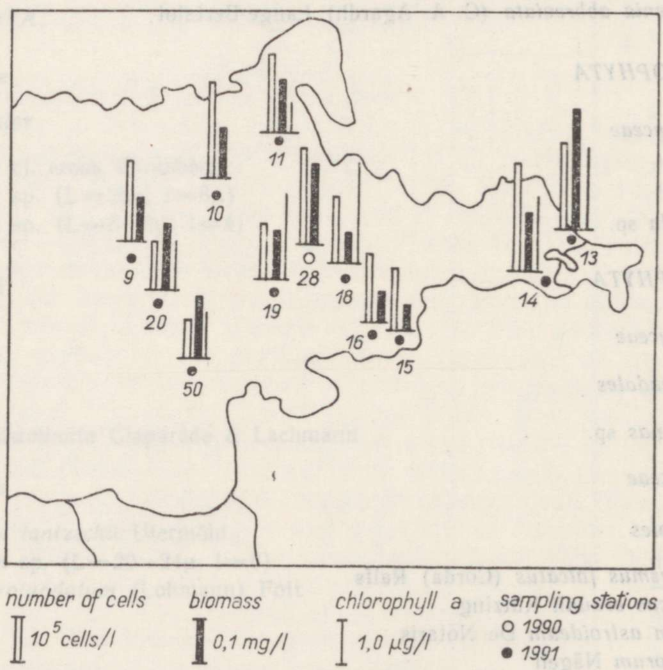

Fig. 2. The number of cells, the biomass of the phytoplankton and the content of chlorophyll *a* in the eastern part of the Gulf of Finland.

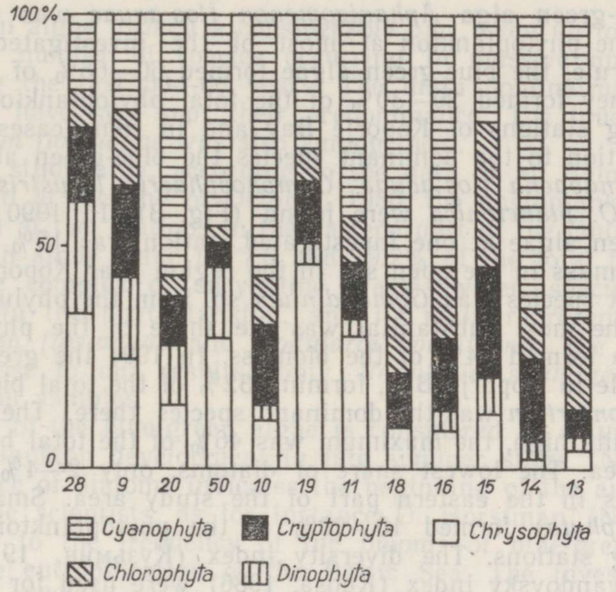

Fig. 3. The share of different taxonomical groups as percentage of the phytoplankton biomass in 1990 (station 28) and in 1991.

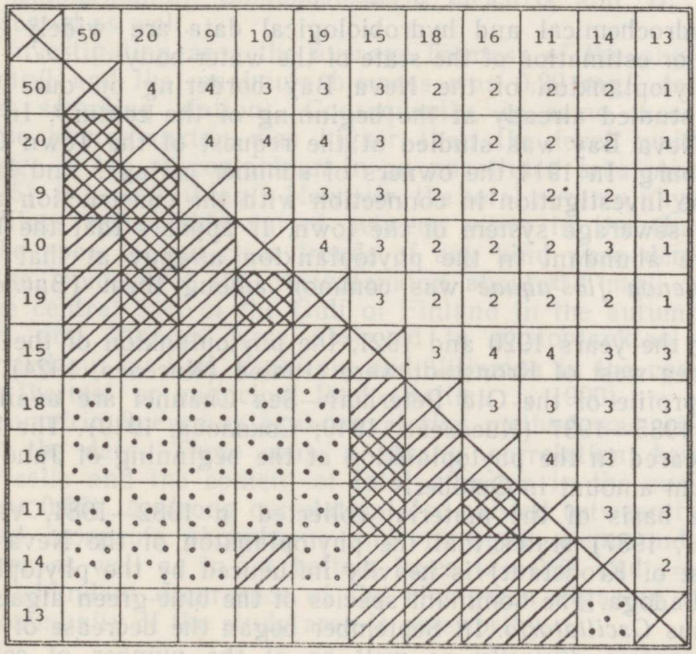

Fig. 4. The number of dominant taxa common to the sample pairs.

The blue-green alga *Aphanizomenon flos-aquae* was the dominant species in the phytoplankton at most of the investigated stations in 1991. As a rule, the blue-green algae formed 60—65% of the total biomass, but they formed 20—30% of the total phytoplankton biomass at the sampling stations of Koporje Bay and in some cases at the open sea. In addition to the dominant species the blue-green algae *Lyngbya limnetica*, *Anabaena flos-aquae*, *Gomphosphaeria lacustris*, *Oscillatoria tenuis* and *O. planctonica* were found (Fig. 3). In 1990 the share of the blue-green algae at one investigated station was 15% of the phytoplankton biomass in the open sea in the region near Koporje Bay where the dominant species was *Gymnodinium* sp. from the phylum *Dinophyta*. That year the most substantial was the share of the phylum *Chrysophyta*, which formed 34% of the biomass. In 1991 the green algae had a leading role in Koporje Bay, forming 32% of the total biomass. *Monoraphidium contortum* was the dominant species there. The role of diatoms was quite high, the maximum was 46% of the total biomass in the open sea area. The lowest share of diatoms, only 2—4% of the total biomass, was in the eastern part of the study area. Small flagellates (Ph. *Cryptophyta*) formed 10—20% of the phytoplankton biomass at all sampling stations. The diversity index (Кузьмин, 1975) and the modified Levandovsky index (Kuosa, 1986) were used for estimation of the spatial changes of the phytoplankton species composition. The diversity index varied from 2.2—3.5 (Table 1). It was the lowest in the inner part of the Neva Estuary. The modified Levandovsky index enabled to show the difference of the phytoplankton species composition between the inner part of the Neva Estuary and the open sea area (Fig. 4).

DISCUSSION

The hydrochemical and hydrobiological data are widely used and combined for estimation of the state of the water-body.

The phytoplankton of the Neva Bay bordering on our study area had been studied already at the beginning of the century. In 1911 and 1912 the Neva Bay was studied at the request of the Town Council of St. Petersburg. In 1914 the owners of summer cottages and landowners ordered the investigation in connection with the construction and building of the sewerage system of the town. It appears that the blue-green algae were abundant in the phytoplankton already at that time, and *Aphanizomenon flos-aquae* was common among them (Вислоух, 1913, 1921).

During the years 1920 and 1921, the phytoplankton of the Neva Bay and the area west of Kronstadt were studied (Киселев, 1924). The data from the profile of the Old Peterhoff—Sea Channel are available from the years 1935—1937 (Киселева, 1949; Соколова, 1949). The blue-green algae appeared in the phytoplankton at the beginning of June and were at maximum amount in October.

On the basis of the material collected in 1982—1984, V. Nikulina (Никулина, 1987) states that the phytoplankton of the Neva Bay (the region east of Kronstadt) is heavily influenced by the phytoplankton of the Lake Ladoga. The dominant species of the blue-green algae belonged to the genus *Oscillatoria*. In September began the decrease of the phytoplankton species diversity as well as of the number of cells of the phytoplankton in all algal groups. The unification of the phytoplankton biomass to the level of 0.6 mg/l took place all over the whole Neva Bay.

The blue-green algae formed a considerable part, even up to 50% of the biomass. The number of species occurring in massive quantities has grown during the last 50—60 years. The main dominating species of Lake Ladoga have still kept their predominance. The blue-green alga *Aphanizomenon flos-aquae* was also among them.

As to our study area, according to the data of M. Balode (Балоде, 1990) collected at the end of October, 1980, the phytoplankton biomass was 0.02 mg/l at two stations in the eastern part of the Gulf of Finland. The blue-green algae made up 7.6 and 19.2% of the total biomass, respectively. The complex of euryhaline brackishwater species had the leading role in the phytoplankton, and its main representatives were *Aphanizomenon flos-aquae* and *Nodularia spumigena*. The quantitative data were close to our results, only *Nodularia spumigena* did not dominate in our samples.

The bloom of the blue-green algae is considered as a typical feature of the phytoplankton development in late summer stage (Niemi, 1975). The appearance of diatoms indicates the beginning of the autumn stage. However, some scientists, as for instance U. Horstman (Niemi, 1975), have referred to the frequency of the blooms of blue-green algae as a sign of the eutrophication of the Baltic Sea. The investigations at the end of the 1980s have shown that the eutrophication is on the highest level in Finnish coastal waters in the eastern part of the Gulf of Finland. Troublesome blue-green algal blooms have been observed occasionally, especially during late summers and autumns. The primary and immediate eutrophying effects of the heavily loaded Neva-Leningrad (St. Petersburg) region seemed to cover the waters east of the Island Seskar (Pitkänen et al, 1991).

In late summer of 1989 (Pitkänen et al., manuscript) 80% of the high biomass, 3.5 g/m³ in maximum was caused by the blue-green algae in the easternmost part of the Gulf of Finland. The dominant species was *Oscillatoria agardhii*, but in addition to it *Aphanizomenon flos-aquae*, *Anabaena lemmermannii*, *Comphosphaeria lacustris* and *G. compacta* were represented as well.

In our investigation area the average biomass of the phytoplankton was 0.13 mg/l and the maximum biomass was 0.29 mg/l (at one, the easternmost sampling station). Consequently, in some cases the biomass of the phytoplankton was higher than the level typical to the autumn stage of the phytoplankton in an unpolluted area. According to Niemi (1975), it is <0.10 mg/l. However, the total autumn phytoplankton biomass values remarkably varied between years in the Gulf of Finland. In the open sea no clear trends of any kind were demonstrated, although the biomass of the phytoplankton about 0.4 mg/l was registered in the central part of the Gulf of Finland in the autumn of 1988. The trends and changes were observed in phytoplankton long-term studies carried out by Ilus, Keskitalo and Viljamaa in the coastal areas exposed to thermal or municipal load (Baltic..., 1990).

Non-parametric Spearman rank correlation method was used for the analysis of the data. There was a strong correlation between the number of cells and the content of total nitrogen in the surface layer ($r=0.76$, $\alpha<0.05$). A strong correlation also existed between the content of dissolved inorganic phosphorus and nitrogen compounds in the surface layer as well as in the bottom layer ($r=0.88$ and $r=0.79$).

A quite abundant occurrence of the blue-green algae in the phytoplankton community of the study area is noteworthy.

REFERENCES

Baltic Marine Environment Protection Commission — Helsinki Commission. 1990. Second Periodic Assessment of the State of the Marine environment of the Baltic Sea, 1984—1988, Background Document. — Baltic Sea Environ. Proc., 35 B.

Edler, L. (ed.). 1979. Recommendations for marine biological studies in the Baltic Sea. Phytoplankton and chlorophyll. — The Baltic Marine Biologists Publication, 5.

Edler, L., Hällfors, G., Niemi, A. 1984. A preliminary check-list of the phytoplankton of the Baltic Sea. — Acta Bot. Fennica, 128, 1—26.

Guidelines for the Baltic monitoring programme. II. 1984. Baltic Marine Environment Protection Commission. Helsinki Commission, Helsinki, 15—21.

Koroleff, F. 1976. Methods of chemical analysis. — In: Grasshoff, K. (ed.). Methods of seawater analysis. Verlag chemie, Weinheim — New York, 125—173.

Kuosa, H. 1986. The phytoplankton of a small brackish-water bay, Tvärminne Byviken, southern Finland. — Ophelia, Suppl. 4, 119—128.

Melvasalo, T., Viljamaa, H., Huttunen, M. 1973. Planktonanalyysimenetelmät vuosina 1966—1972. — Vesienuojelulaboratorin tiedonantoja, 5, 1—12.

Niemi, A. 1975. Ecology of phytoplankton in the Tvärminne area, SW coast of Finland. II. Primary production and environmental conditions in the archipelago and the sea zone. — Acta Bot. Fennica, 105, 1—73.

Pitkänen, H., Kangas, P., Miettinen, V., Kauppila, P. 1991. The state of the Finnish coastal waters in the late 1980s. HELCOM, Interim Report on the State of the Coastal Waters of the Baltic Sea. — Baltic Sea Environ. Proc., 40, 37—49.

Pitkänen, H., Tamminen, T., Kangas, P., Huttula, T., Kivi, K., Kuosa, H., Sarkkula, J., Eloheimo, K., Kauppila, P., Skakalsky, B. 1991. Late summer trophic conditions in the northeast Gulf of Finland and the River Neva Estuary, the Baltic Sea. Manuscript submitted to Estuarine, Coastal and Shelf Science.

Tikkanen, T., Willen, T. 1992. Växtplanktonflora. Eskilstuna.

Utermöhl, H. 1958. Zur Vervollkommnung der quantitativen Phytoplankton Methodik. — Intern. Vereinigung für theoretische und angewandte Limnologie, 9, 1—3.

Балоде М. 1990. Пространственное распределение планктонных водорослей открытой части Балтийского моря и Финского залива в сентябре—октябре 1980 г. Серия 4 «Биология Балтийского моря». Планктон Балтийского моря. Зинатне, Рига, 77—91.

Вислоух С. М. 1913. Предварительные данные биологических исследований Невской губы за период с 1 августа по 1 декабря 1911 г. — In: Мат. по исследованию воды Невской губы в санитарном отношении. А. За период времени с июня по ноябрь 1911 г. Санкт-Петербург, 47—52.

Вислоух С. М. 1921. К познанию микроорганизмов Невской губы. — Изв. Российск. гидролог. ин-та, Петроград, 1—3, 83—96.

Киселев И. А. 1924. Фитопланктон Невской губы и восточной части Финского залива. — In: Исследования реки Невы и ее бассейна, вып. 2. Ленинград, 1—54.

Киселева Е. И. 1949. Исследования фитопланктона юго-западной части Невской губы за период 1935—1937 гг. — Уч. зап.. ЛГУ. Сер. биол. н., вып. 21, 142—177.

Кузьмин Г. В. 1975. Видовой состав и обилие. — In: Методика изучения биогеоценозов внутренних водоемов. Наука, Москва, 73—87.

Никулина В. Н. 1987. Динамика численности и биомассы фитопланктона. — In: Невская губа. Гидробиологические исследования. Тр. Зоол. ин-та АН СССР, **151**, 14—29.

Соколова М. Ф. 1949. Количественный учет планктона открытого и прибрежного районов Невской губы. — Уч. зап. ЛГУ. Сер. биол. н., вып. 21, 126, 67—105.

FÜTOPLANKTON SOOME LAHE IDAOSAS 1990. JA 1991. AASTA NOVEMBRIS

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Ekspeditsioonidel Soome lahe idaossa 1990. ja 1991. aasta novembris tehti uurimistöid 13 proovipunktis. Andmeid koguti vee temperatuuri, soolsuse, biogeenide ja klorofüll *a* sisalduse ning fütoplanktoni liigilise koosseisu, arvukuse ja biomassi kohta. Vee biogeenidesisaldus oli kõige suurem Neeva lahe siseosas. Ilmnes, et uuritud ala lääne- ja idaosa erinesid rohkem vee lämmastikuühendite sisalduse poolest kui fosforiühendite sisalduse poolest. Soome lahe idaosa fütoplanktonist määrati 55 liiki. Fütoplanktoni biomass oli jaotunud küllaltki ühtlaselt varieerudes vahemikus 0,12—0,15 mg/l. Tunduvalt suurem (0,29 mg/l) oli biomass vaid kõige idapoolsemas, Neeva lahe siseosas asuvas proovipunktis. Peaaegu kõigis proovipunktides domineeris sinivetikas *Aphanizomenon flos-aquae*. Sinivetikad moodustasid Neeva lahe siseosas ligikaudu 60% fütoplanktoni biomassist.

ФИТОПЛАНКТОН ВОСТОЧНОЙ ЧАСТИ ФИНСКОГО ЗАЛИВА В НОЯБРЕ 1990 И 1991 ГОДОВ

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Во время экспедиций 1990 и 1991 годов были проведены исследования на 13 станциях, расположенных в восточной части Финского залива. Были получены данные о температуре воды, солености, содержании биогенов и хлорофилле *а*, а также о видовом составе, численности и биомассе фитопланктона. Выяснилось, что западная и восточная части изучаемого региона по содержанию соединений азота различались больше, чем по содержанию соединений фосфора.

Фитопланктон восточной части Финского залива состоял из 55 видов. Биомасса фитопланктона распределялась довольно ровно, варьируя от 0,12 до 0,15 мг/л. Только на самой восточной станции, находившейся в Невском заливе, биомасса фитопланктона была гораздо выше — 0,29 мг/л. Синезеленая водоросль *Aphanizomenon flos-aquae* доминировала почти на всех станциях. В центральной части Невского залива синезеленые водоросли составляли около 60% общей биомассы.