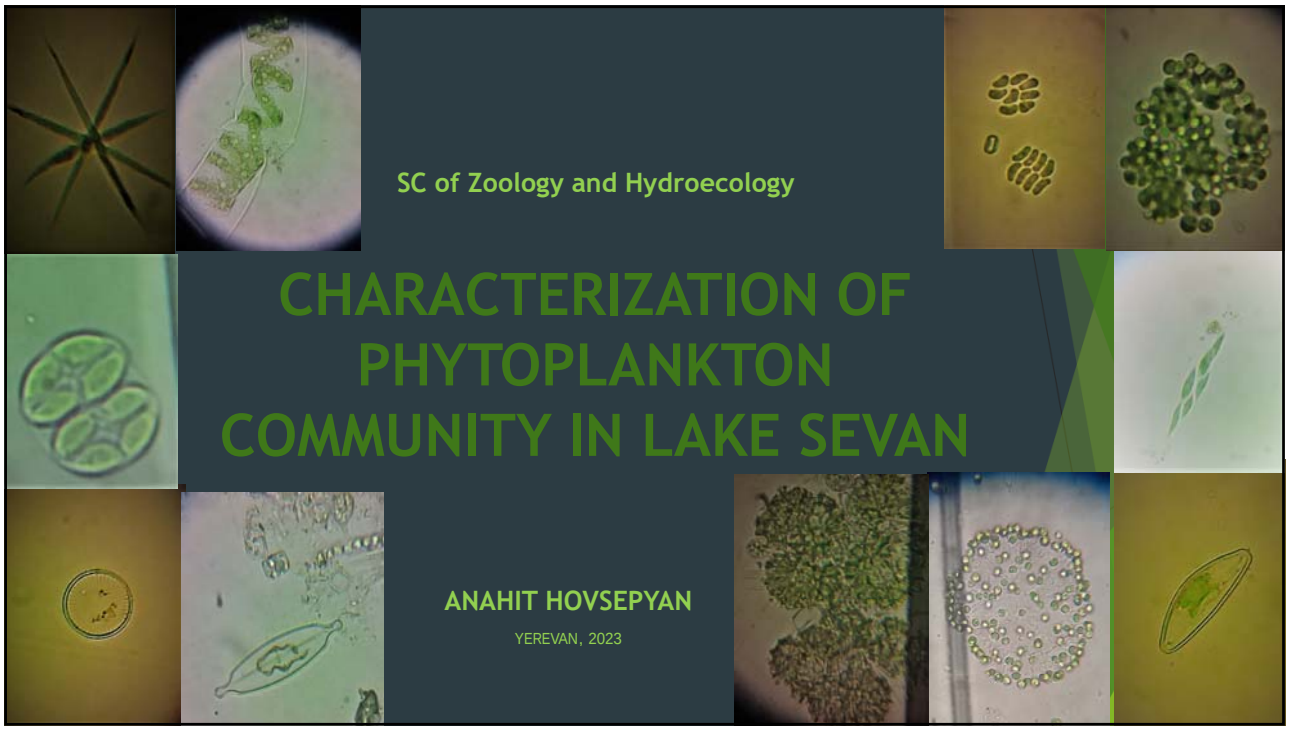


2020-2022: *Biodiversity features*

- Tendency in growth of the total number of phytoplankton community species;
- Species succession in almost all phytoplankton groups;
- Recording of a new algal phylum representatives in the phytoplankton community: **Raphidophyta**;
- Significant increase in the number of representatives of algal groups which were not typical of the lake community: **Euglenophyta**, **Cryptophyta**, **Dinophyta**, **Chrysophyta**.
- Essential contribution of "in-between" as well as of benthic, epiphyte forms in the quality structure of the lake phytoplankton community.

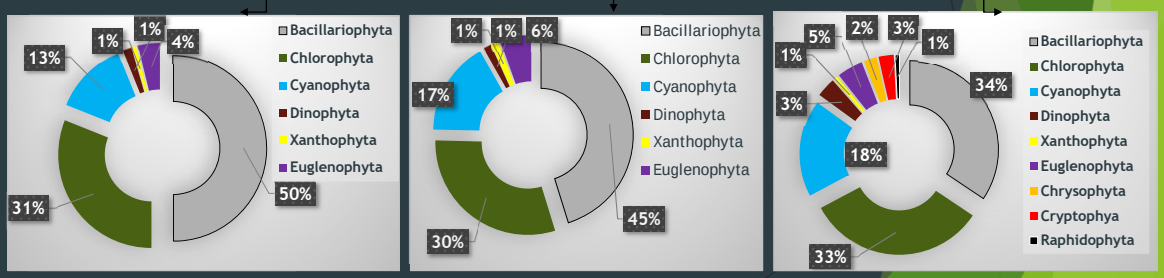
2020-2022

253 Algal Taxa

- Bacillariophya - 87
- Chlorophya - 83
- Cyanophya - 45
- Euglenophya - 12
- Dinophya - 9
- Cryptophya - 7
- Chrysophya - 6
- Raphidophya - 2
- Xanthophya - 2

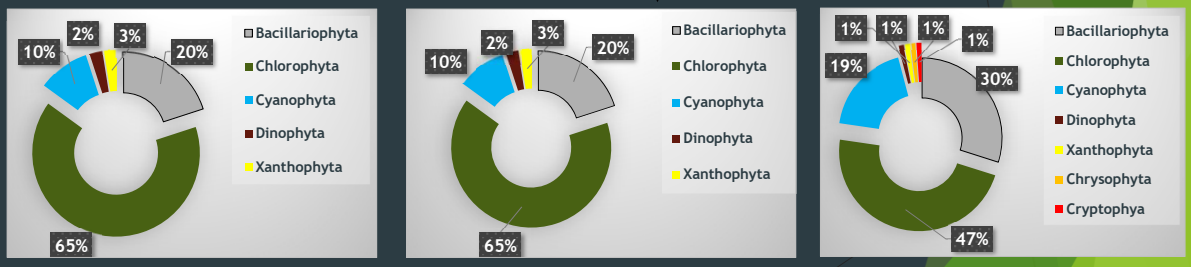
2010-2022: *Changes in Phytoplankton Taxonomic Composition in the Period of Water Level Raise*

	PERIODS		
NUMBER OF SPECIES	2010-2014	2015-2019	2020-2022
	132	148	253



1939-1981: *Historical Review of Phytoplankton Biodiversity Variations*

	PERIODS		
NUMBER OF SPECIES	1939-1947	1956-1958	1979-1981
	58	64	97



2020-2022: *New Recordings*

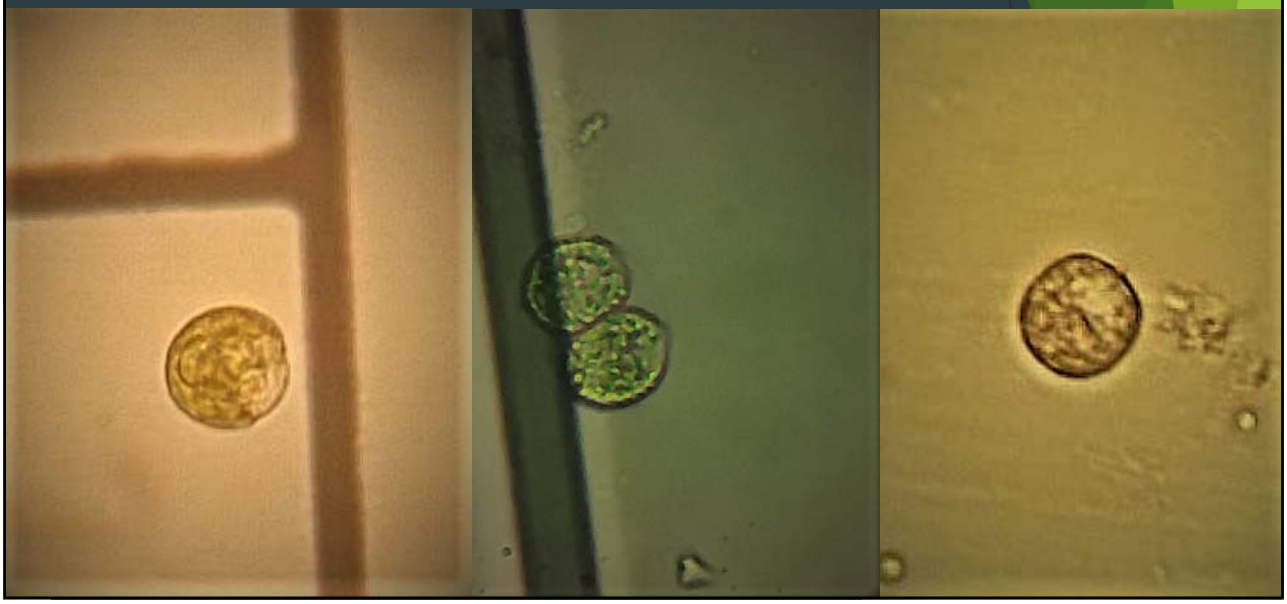
Phylum	New species	Before recorded in other biotopes of the lake
Bacillariophyta	8	7
Chlorophyta	30	9
Cyanophyta	12	9
Euglenophyta	6	4
Cryptophyta	6	5
Chrysophyta	6	2
Dinophyta	6	5
Xantophyta	1	–
Raphydophyta	2	1


SPECIES NOT IDENTIFIED
Westellopsis sp.?
Chrysamoeba sp.?


Cyclotella meneghiniana

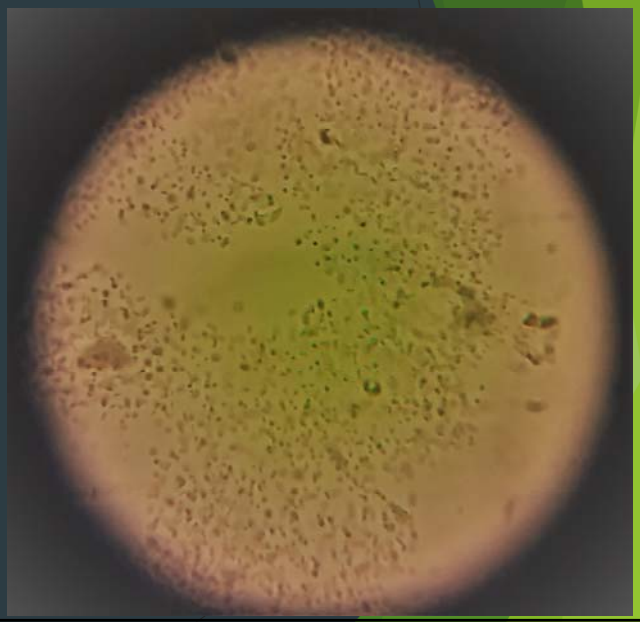
Ochromonas danica

Carteria spp.



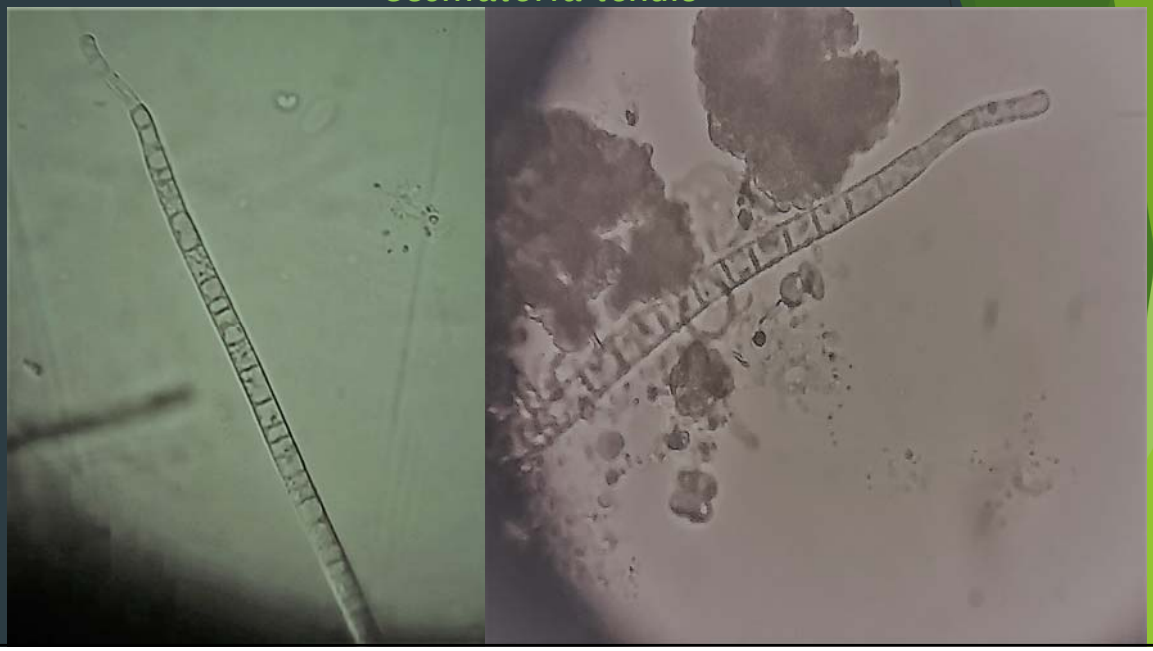
Aphanizomenon issatschenkoi

Aphanocapsa holsatica



Chroococcus turgidus

Oscillatoria tenuis



Vacuolaria sp.

Synura sp.

INDICATOR VALUES OF PHYTOPLANKTON COMMUNITY BY SEVERAL PARAMETERS DURING THE PERIOD OF THE LAKE WATER LEVEL RAISE

	2010-2014	2015-2019	2020-2022
HALOBICITY			
Oligohalobe-indifferents	69	66	89
Oligohalobe-halophiles	14	16	21
Oligohalobe-halophobes	5	4	7
Mesohalobes	7	6	2
Oligohalobes	2	2	2
Polyhalobes	0	1	0
Total	**97 (73.5%)**	**95 (64%)**	**121 (48%)**

INDICATOR VALUES OF PHYTOPLANKTON COMMUNITY BY SEVERAL PARAMETERS DURING THE PERIOD OF THE LAKE WATER LEVEL RAISE

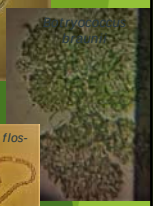
	2010-2014	2015-2019	2020-2022
SAPROBITY DEGREE			
Xenosaprobes	6	7	8
x-oligosaprobes	2	2	3
x-β-mesosaprobes	2	1	4
Oligosaprobes	9	11	16
o-xenosaprobes	4	4	6
o-α-mesosaprobes	7	4	19
o-β-mesosaprobes	14	16	24
β-mesosaprobes	25	28	50
β-o-mesosaprobes	12	12	21
β-α-mesosaprobes	7	8	9
α-β mesosaprobes	6	7	7
α-mesosaprobes	0	1	4
Polysaprobes	1	1	1
Total	**95 (72%)**	**102 (69%)**	**172 (68%)**

INDICATOR VALUES OF PHYTOPLANKTON COMMUNITY BY SEVERAL PARAMETERS DURING THE PERIOD OF THE LAKE WATER LEVEL RAISE

	2010-2014	2015-2019	2020-2022
ECOLOGO-GEOGRAPHICAL DISTRIBUTION			
Cosmopolitan	99	102	152
Arcto-alpine	2	2	2
Boreal	0	2	4
Holarctic	3	3	7
Holarctic, paleotropical	1	0	1
Alpine, Cosmopolitan	1	1	2
Total	*106* (80.3%)	*110* (74.3%)	*168* (66.4%)
HABITAT / ECOLOGICAL ZONE			
Planktonic	32	33	57
Benthic	32	39	42
Planktonic-benthic	44	41	73
Benthic-soil	1	2	6
Planktonic-soil	0	1	0
Epiphytes	1	1	0
Planktonic-benthic, soil	1	1	6
Soil	0	1	0
Total	*111* (84%)	*119* (80.4%)	*184* (72.7%)

2020-2022: *Dominant Species*

Species	Habitat	Halobicity	Distribution	Saprobity
**Cyclotella meneghiniana*	P-B	hl	k	o-α
**Stephanodiscus astraea*	P	i	k	β
Actinastrum hantzschii	P-B	i	k	β
Ankistrodesmus angustus	P	i	k	-
Ankyra spp.	P	-	Ha	β
**Binuclearia (Planctonema) lauterbornii*	-	-	-	-
**Botryococcus braunii*	P-B	i	k	o-β
**Carteria spp. (C. globosa + C. klebsii)*	P	-	-, k	α-β, β
Dictyosphaerium ehrenbergianum	P-B	-, i	Ha	o-β
Chlamydomonas debaryana (Edaphochlamys debaryana)	P	-	-	α
Monoraphidium spp. (M. arcuatum + M. contortum)	P-B	-	k	β
Oocystis lacustris	P-B	hl	k	β-o
Sphaerocystis schroeteri	P	i	k	β-o
Westella botryoides	P	-	k	β
Aphanocapsa holsatica Lemm.	P	i	k	o
Aphanothece clathrata	P	hl	k	β
Aphanothece stagnina	P-B	hl	k	β-α
Aphanizomenon flos-aquae	P	hl	k	β
**Chroococcus turgidus*	P-B,S	hl	-	o
**Dolichospermum (Anabaena) flos-aquae*	P	i	k	β
**Trachelomonas hispida*	P-B	i	k	β
**Ochromonas danica*	-	-	-	-
Chroomonas acuta	P	i	k	β



* - dominance by biomass

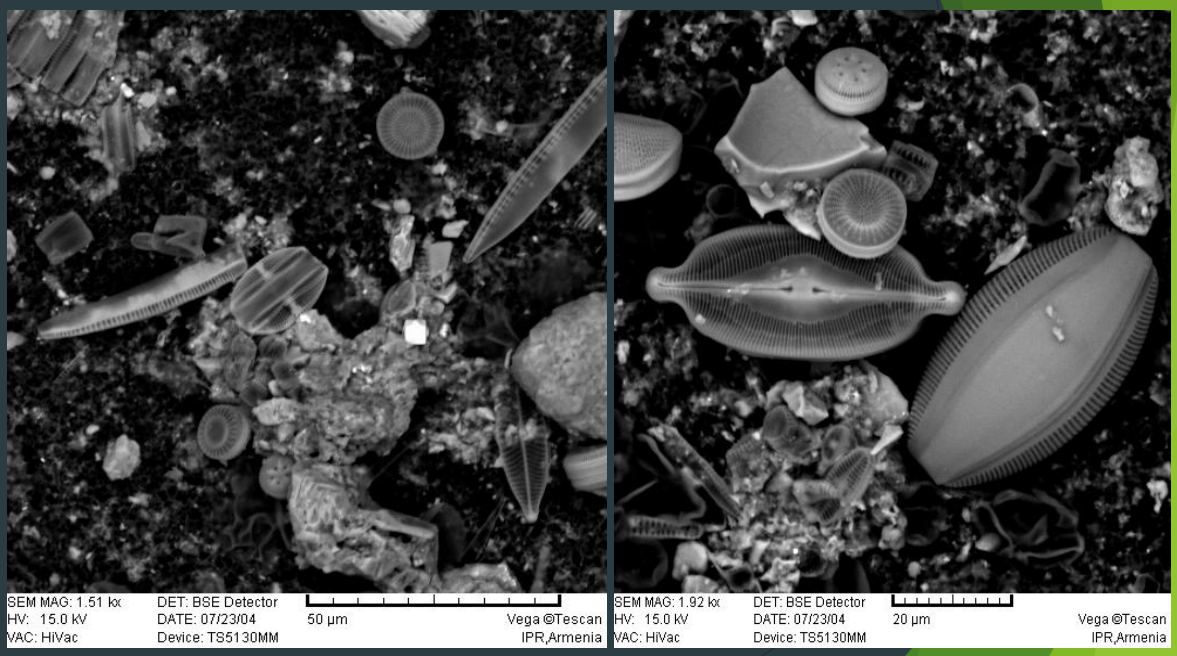
P – planktonic
P-B – planktonic-benthic
P-B, S – planktonic-benthic, soil
i – oligohalobe-indifferent
hl – oligohalobe-halophile

k – cosmopolitan
Ha – Holarctic

o-α-mesosaprobe
ß- mesosaprobe
α-ß-mesosaprobe
ß-o-mesosaprobe
ß-α-mesosaprobe

2020-2022: *Annual Variations of Algal Species*

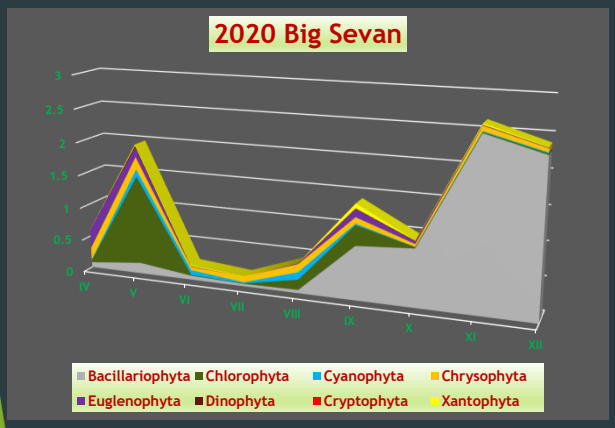
Year / Species	2020	2021	2022
Chlamydomonas debaryana	-	+	+
Scenedesmus disciformis	+	-	-
Pleurocapsa sp.	+	-	+
Hapalasiphon hibernicus	+	-	-
Chamaesiphon incrustans	+	-	-
Chroococcus turgidus	-	+	+
Aphanizomenon issatchenkoi	+	-	-
Lepocynclis sp.	-	+	+
Cryptoglena pigra	-	+	+
Cystodinium sp.	-	+	+
Chrysococcus rufescens	-	-	+
Chrysamoeba sp.	-	+	-
Cryptomonas marssonii	-	-	+
Cryptomonas spp.	-	+	+
Chroomonas spp.	-	+	+
Carteria spp.	-	+	+
Botrydiopsis arrhyza	+	+	-…

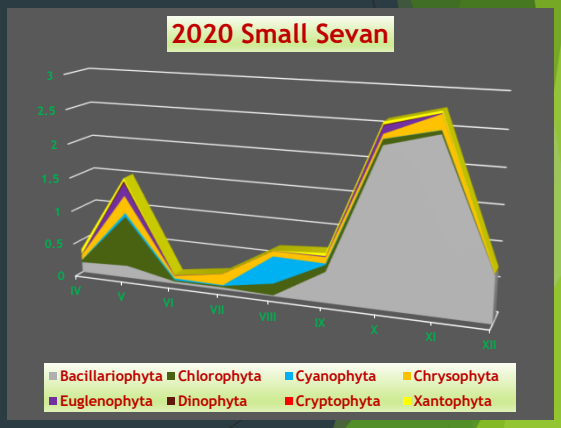


2020-2022: *Quantitative Development of Phytoplankton Community*

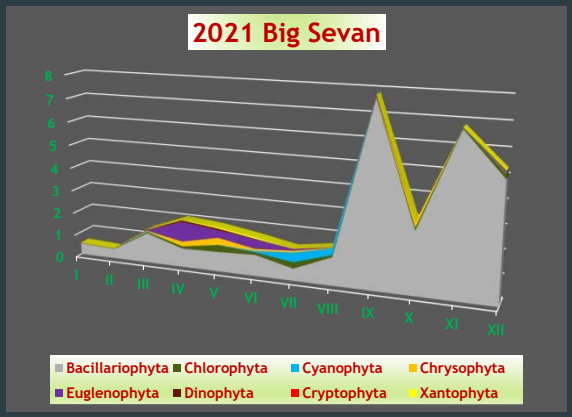
- In annual dynamics, maximum development occurs in the autumn-winter period;
- A change in the dominant complex occurred due to the massive development of the diatom species *Cyclotella meneghiniana*, which is unusual for the pelagic zone of the lake;
- On an annual basis, there is a tendency for the quantitative prevalence of diatoms;
- There is a trend towards an increase in the annual biomass value of the phytoplankton community compared to recent years (starting from 2011);
- There are annual blooms with cyanobacterial species that are indicators of eutrophication.

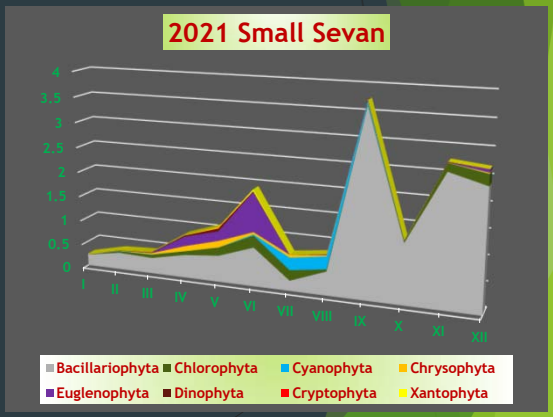
2020-2022: *Annual Dynamics of the Phytoplankton Biomass*



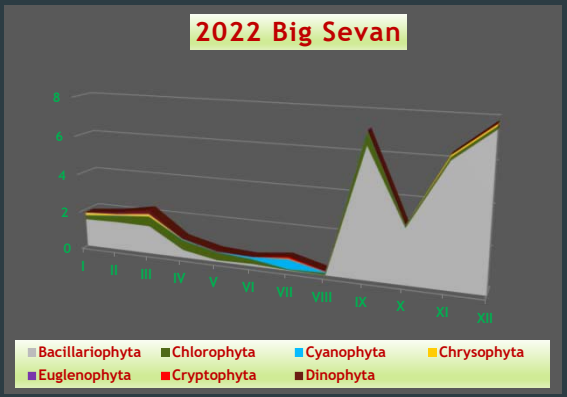


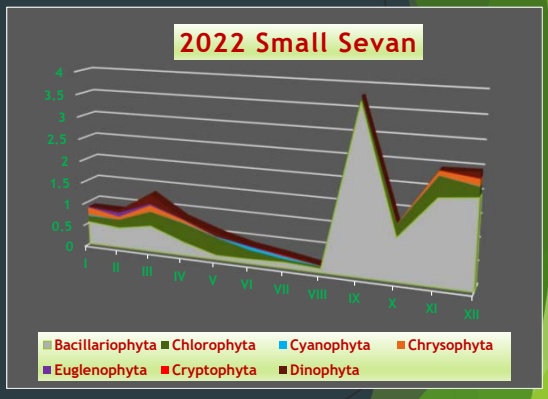
2020-2022: *Annual Dynamics of the Phytoplankton Biomass*

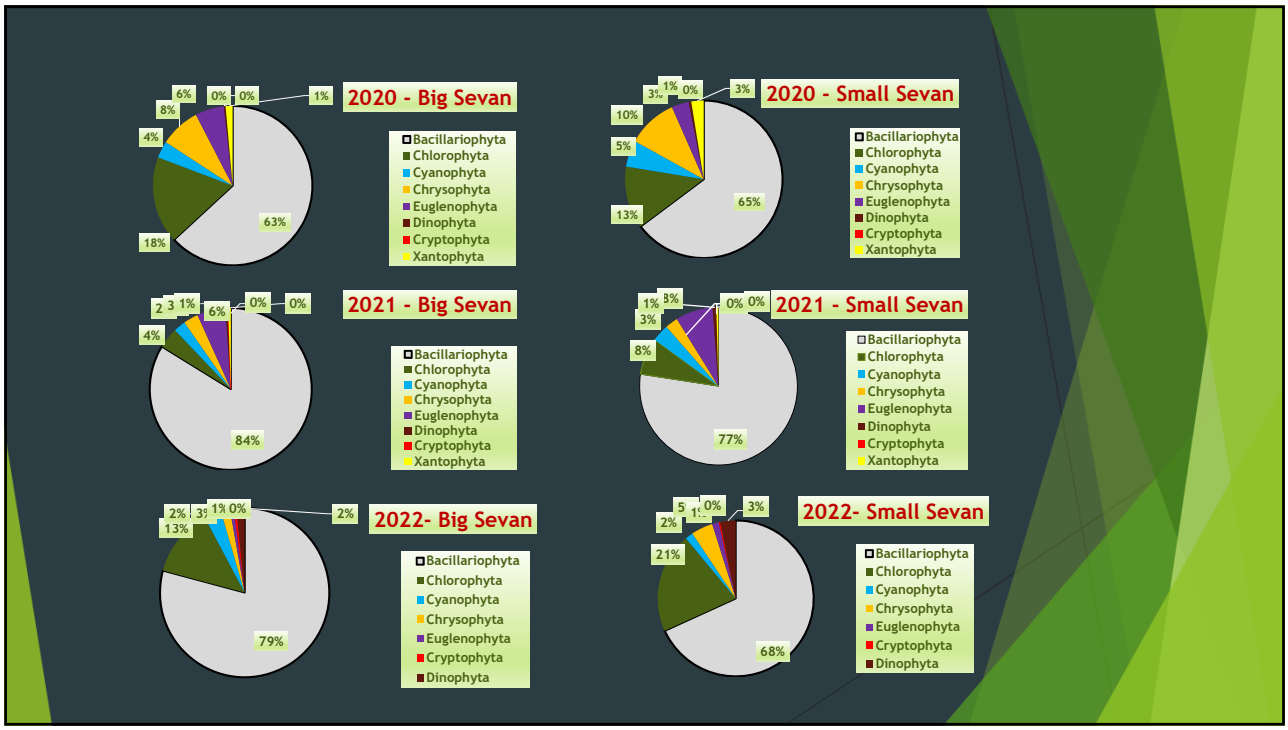


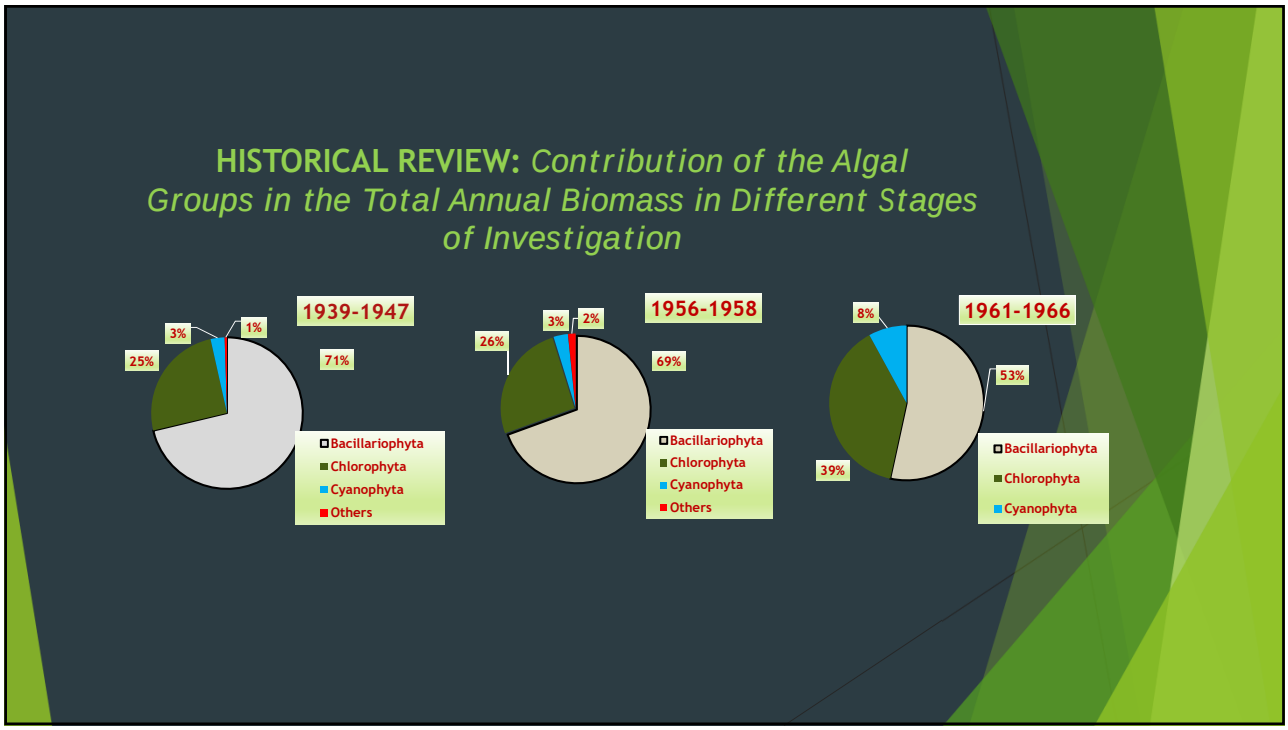


2020-2022: *Annual Dynamics of the Phytoplankton Biomass*

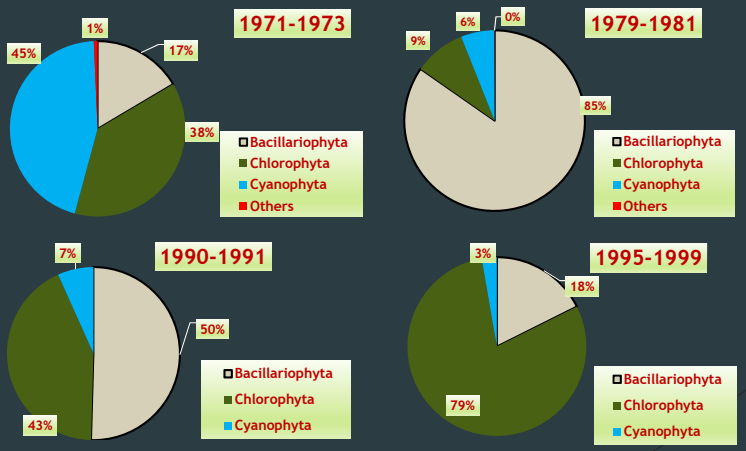




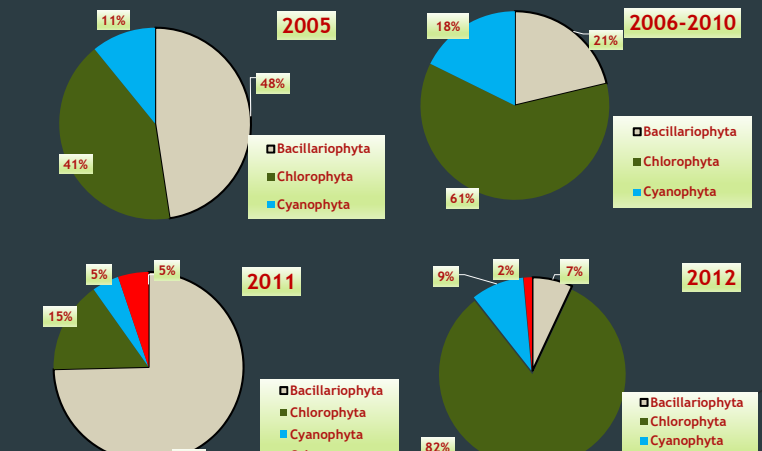

2020 - Big Sevan
63%
18%
4%
8%
6%
0%
0%
1%
Bacillariophyta
Chlorophyta
Cyanophyta
Chrysophyta
Euglenophyta
Dinophyta
Cryptophyta
Xantophyta
2020 - Small Sevan
65%
13%
5%
10%
3%
1%
0%
3%
Bacillariophyta
Chlorophyta
Cyanophyta
Chrysophyta
Euglenophyta
Dinophyta
Cryptophyta
Xantophyta
2021 - Big Sevan
84%
4%
6%
0%
0%
Bacillariophyta
Chlorophyta
Cyanophyta
Chrysophyta
Euglenophyta
Dinophyta
Cryptophyta
Xantophyta
2021 - Small Sevan
77%
8%
3%
1%
8%
0%
0%
Bacillariophyta
Chlorophyta
Cyanophyta
Chrysophyta
Euglenophyta
Dinophyta
Cryptophyta
Xantophyta
2022- Big Sevan
79%
13%
2%
1%
0%
2%
Bacillariophyta
Chlorophyta
Cyanophyta
Chrysophyta
Euglenophyta
Cryptophyta
Dinophyta
2022- Small Sevan
68%
21%
2%
0%
3%
Bacillariophyta
Chlorophyta
Cyanophyta
Chrysophyta
Euglenophyta
Cryptophyta
Dinophyta


HISTORICAL REVIEW: Contribution of the Algal Groups in the Total Annual Biomass in Different Stages of Investigation
1939-1947
71%
25%
3%
1%
Bacillariophyta
Chlorophyta
Cyanophyta
Others
1956-1958
69%
26%
3%
2%
Bacillariophyta
Chlorophyta
Cyanophyta
Others
1961-1966
53%
39%
8%
Bacillariophyta
Chlorophyta
Cyanophyta

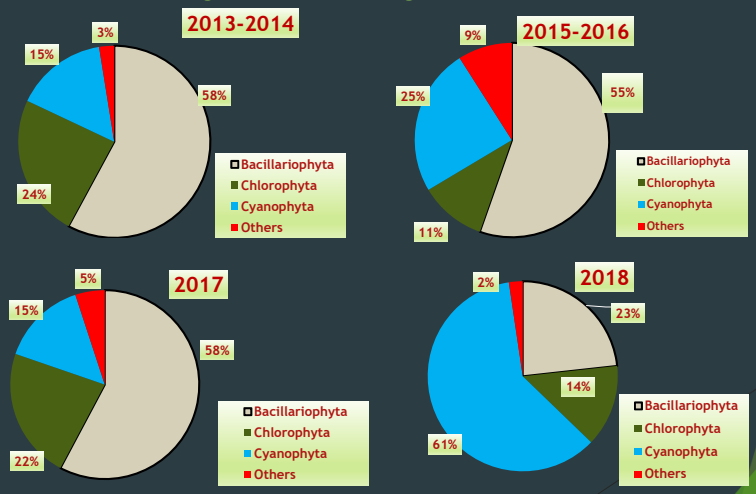
HISTORICAL REVIEW: *Contribution of the Algal Groups in the Total Annual Biomass in Different Stages of Investigation*



HISTORICAL REVIEW: *Contribution of the Algal Groups in the Total Annual Biomass in Different Stages of Investigation*



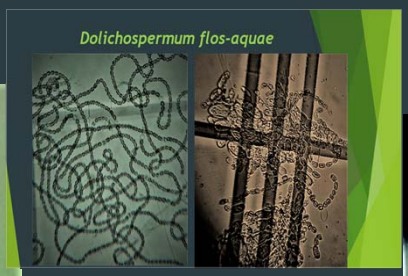
HISTORICAL REVIEW: *Contribution of the Algal Groups in the Total Annual Biomass in Different Stages of Investigation*

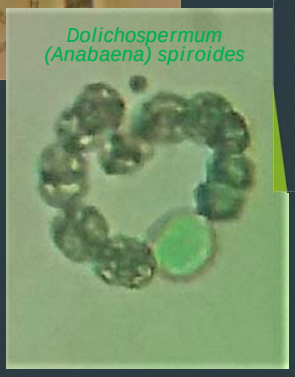


DYNAMICS OF BIOMASS OF THE PHYTOPLANKTON OF LAKE SEVAN DURING DIFFERENT PERIODS OF INVESTIGATION

2020-2022: *Water Bloom with Cyanobacteria*

Became annually repeating phenomenon !!!





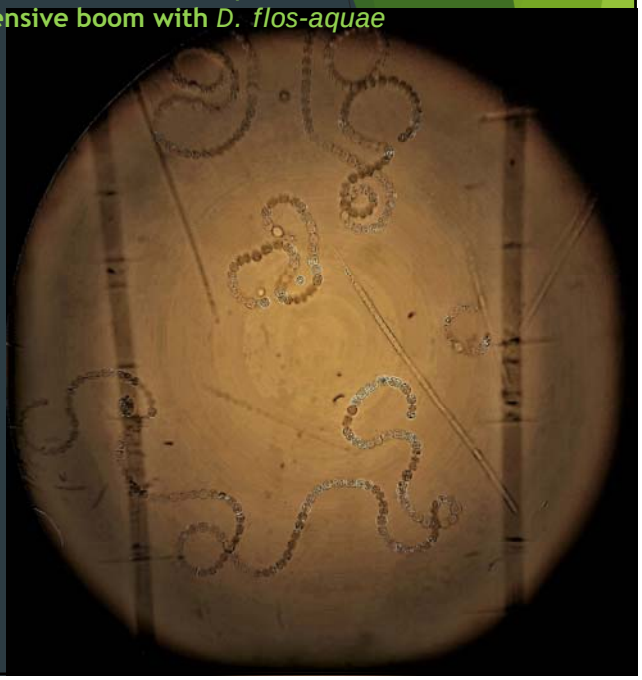
WATER BLOOM WITH CYANOBACTERIA:

Historical Review

Year	Species
1964-1972	*Dolichospermum (Anabaena) spp. (D. flos-aquae + D. lemmermanii)*
1974-1976	*Aphanizomenon flos-aquae*
2006	*Aphanizomenon flos-aquae*
2016 till present	*Dolichospermum spp.*

Dolichospermum flos-aquae

Dolichospermum spp. and *Aphanizomenon flos-aquae* in Big Sevan in August, 2022 after intensive boom with *D. flos-aquae*




THANK YOU
SUZUKI