



**WHEN NATURE GAVE US SO MUCH WEALTH
IT IS OUR DUTY TO PRESERVE IT FOR FUTURE GENERATIONS**

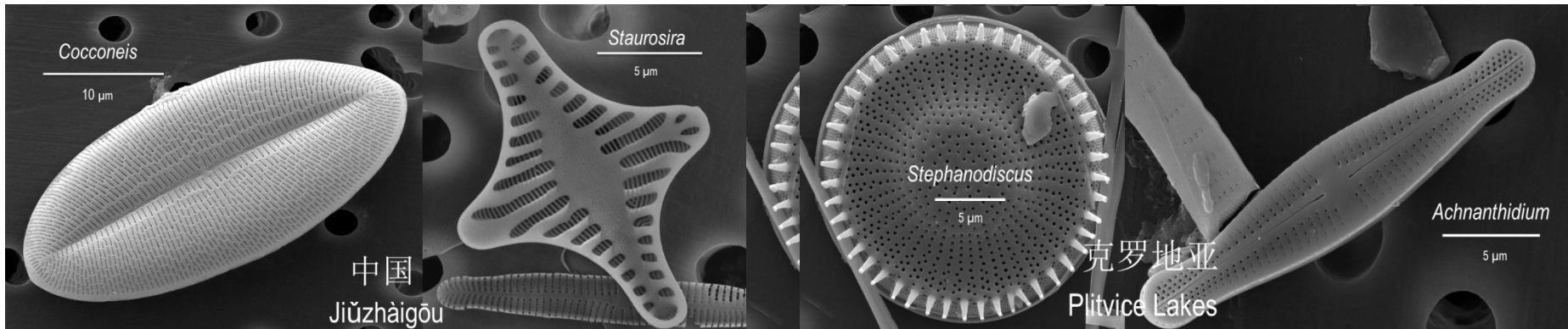


中国科学院成都生物研究所
CHENGDU INSTITUTE OF BIOLOGY, CHINESE ACADEMY OF SCIENCES



UNIVERSITY OF ZAGREB, FACULTY OF SCIENCE, DEPARTMENT OF BIOLOGY, CROATIA

Diatoms - ecological status indicators of Jiuzhaigou Valley



Chinese Team Coordinator
Prof. Sun Geng, PhD

Croatian Team Coordinator
Prof. Anđelka Plenković Moraj, PhD



- University of Zagreb was established on September 23, 1669 (the oldest university in South-Eastern Europe)
- consists of 29 faculties, three art academies and the Centre for Croatian Studies
- strongly research-oriented institution, contributing with over 50 percent to the total research output of the Croatia

FACULTY OF SCIENCE University of Zagreb



URL: www.pmf.hr



- founded in 1946
- includes Biology, Geology, Physics, Chemistry, Geophysics, Mathematics and Geography
- 2 computer centers, the Seismological Service, 2 meteorological stations, the Croatian Time Service and the Botanical garden.



**University of Zagreb
Faculty of Science
Department of Biology**

**Botany, Zoology, Animal Physiology,
Molecular Biology and Microbiology**

- 66 professors
- 45 research assistants
- 10 professional co-worker
- 12 technicians
- 10 non-teaching staff
- 11 support staff
- 30 botanical garden staff

1200 STUDENTS



• Apothecary garden and the renewed exhibition pavilion (1891)

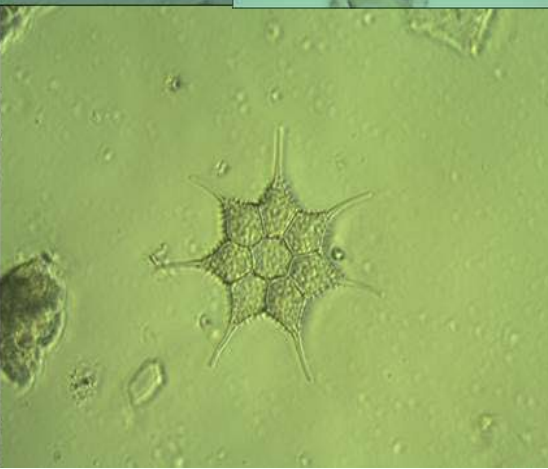
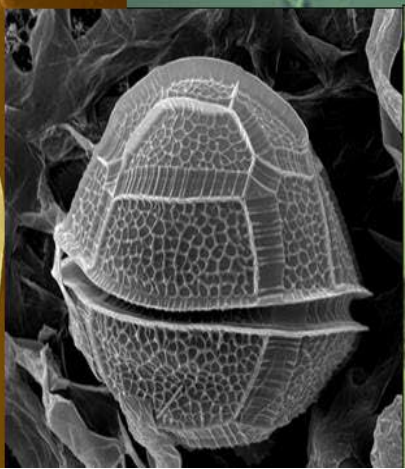
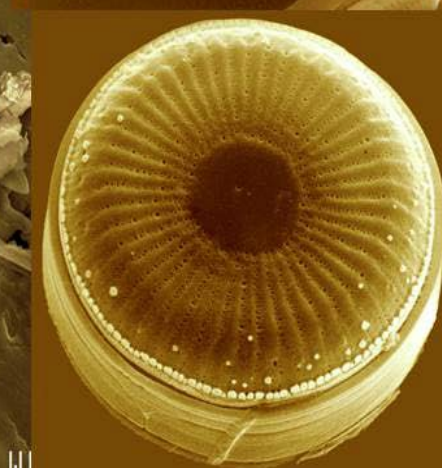
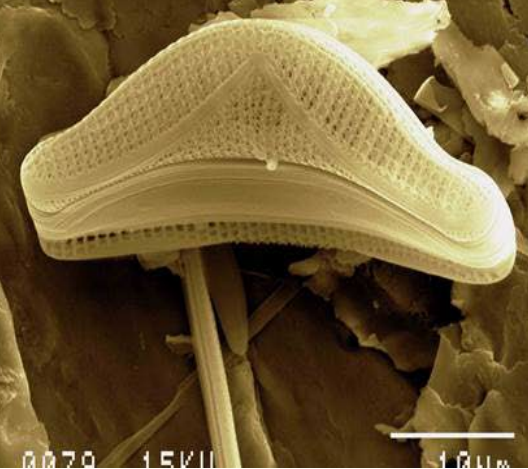
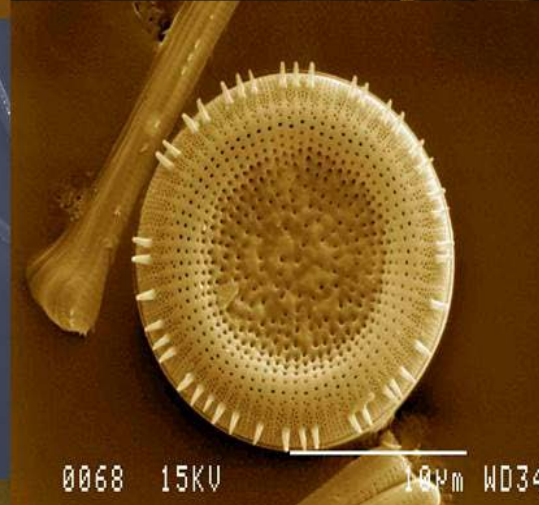
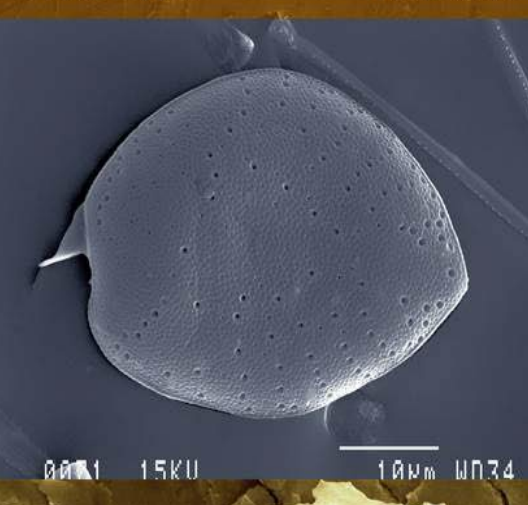
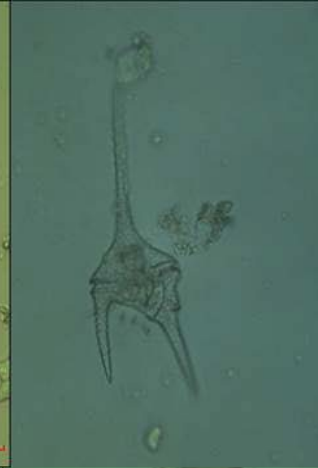
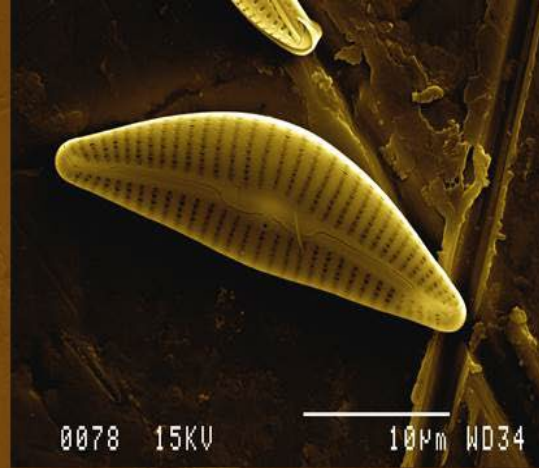
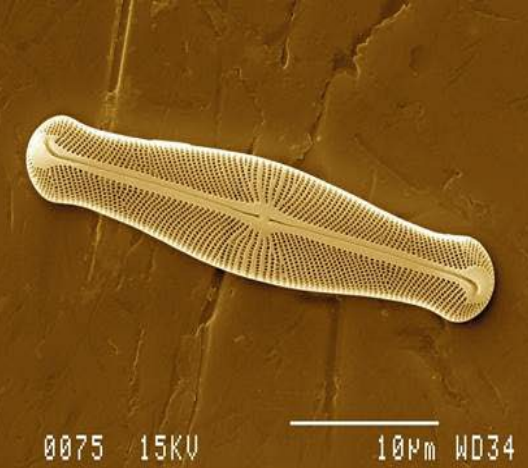


Garden activities:
research
education
horticulture



Education and *ex situ* conservation in 122 years old Botanical Garden in Croatia





- The term *algae* represents a large group of different organisms from.
- Although they have historically been regarded as simple plant-like organisms that are usually photosynthetic and aquatic, and are generally classified in to kingdom *Protista*, rather than Plantae because they do not have true roots, stems, leaves, vascular tissue and have simple reproductive structures.
- Algae are simple organisms that can range from the microscopic (microalgae), to large seaweeds (macroalgae), such as giant kelp more than one hundred feet in length. Most microalgae grow through photosynthesis (converting sunlight, CO₂ and a few nutrients, including nitrogen and phosphorous, into material known as biomass). This is called “autotrophic” growth. Other algae can grow in the dark using sugar or starch (called “heterotrophic” growth), or even combine both growth modes (called “mixotrophic” growth).

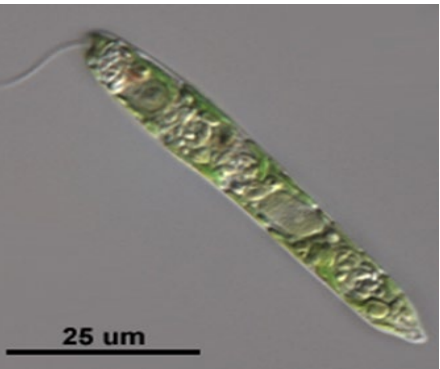
The various types of algae play significant roles in ecology of each ecosystem. Microscopic forms that live suspended in the water column (called phytoplankton) or attached to different type of submerged substratum (called phytobenthos /periphyton) provide the food base for most aquatic food chains and they produce about 70 percent of all the air we breathe.

Algae can be found just about everywhere where there is light with which to photosynthesis and where water is available for reproduction. If life exists elsewhere in our solar system, an alga-like organism is among the most likely to be found.

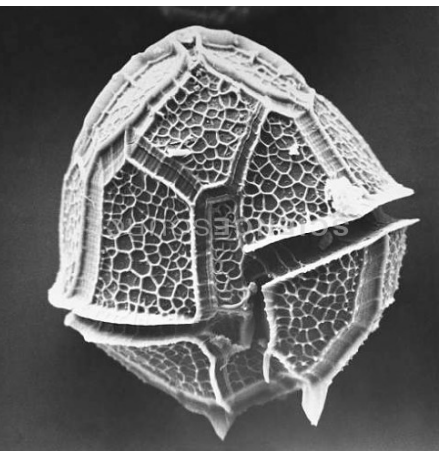
Algae are regular used as indicators of water quality for several reasons: they are easy to collect by way of well-established sampling techniques, a significant number are ubiquitous, short generation time (one to several days) and nutrient uptake directly from the water column allow them to act as initial indicators of the impacts of changing nutrient conditions on freshwater ecosystems, etc.



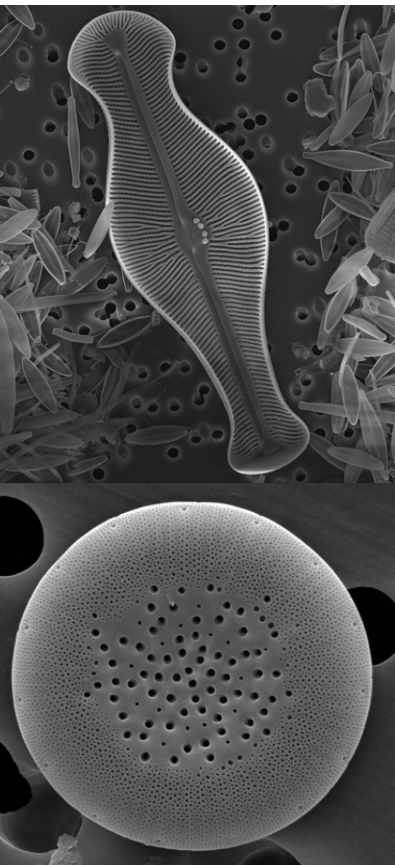
CYANOBACTERIA - one of the oldest groups of known organisms existed for about 3.5 billion years, from Precambrian times, and played a significant role in oxygen accumulation in the Earth's early atmosphere making it fit for the survival of aerobic life-forms.



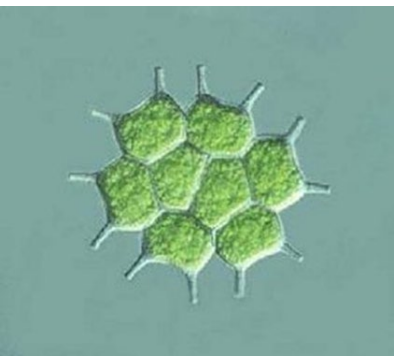
EUGLENOPHYTA - a small phylum consisting of mostly unicellular aquatic algae. Some contain chloroplasts with the photosynthetic pigments; others are heterotrophic and can ingest or absorb their food.



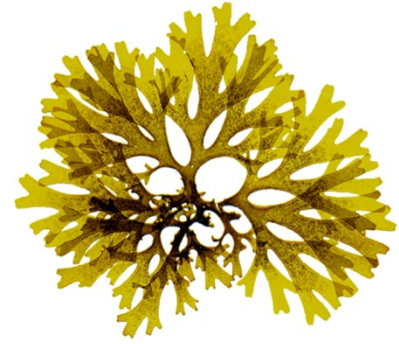
DINOFLAGELLATA - large group of flagellate protistis. They are important constituents of plankton, and as such are primary food sources in warmer oceans. Many forms are phosphorescent; they are largely responsible for the phosphorescence visible at night in tropical seas.



DIATOMS are unicellular organisms characterized by a silica shell of often intricate and beautiful sculpturing. When aquatic diatoms die they drop to the bottom and form the material known as diatomaceous earth. Diatoms can occur in a more compact form as a soft, chalky, lightweight rock, called diatomite. Diatomite is used as an insulating material against both heat and sound, in making dynamite and other explosives, and for filters, abrasives, and similar products. Diatoms have deposited most of the earth's limestone, and much petroleum is of diatom origin.



CHLOROPHYTA/CHAROPHYTA consisting of the photosynthetic organism commonly known as green algae. It is generally accepted that early chlorophytes gave rise to the plants.



PHAEOPHYTA consisting of those organisms commonly called brown algae. With only a few exceptions, brown algae are marine, growing in the colder oceans of the world.



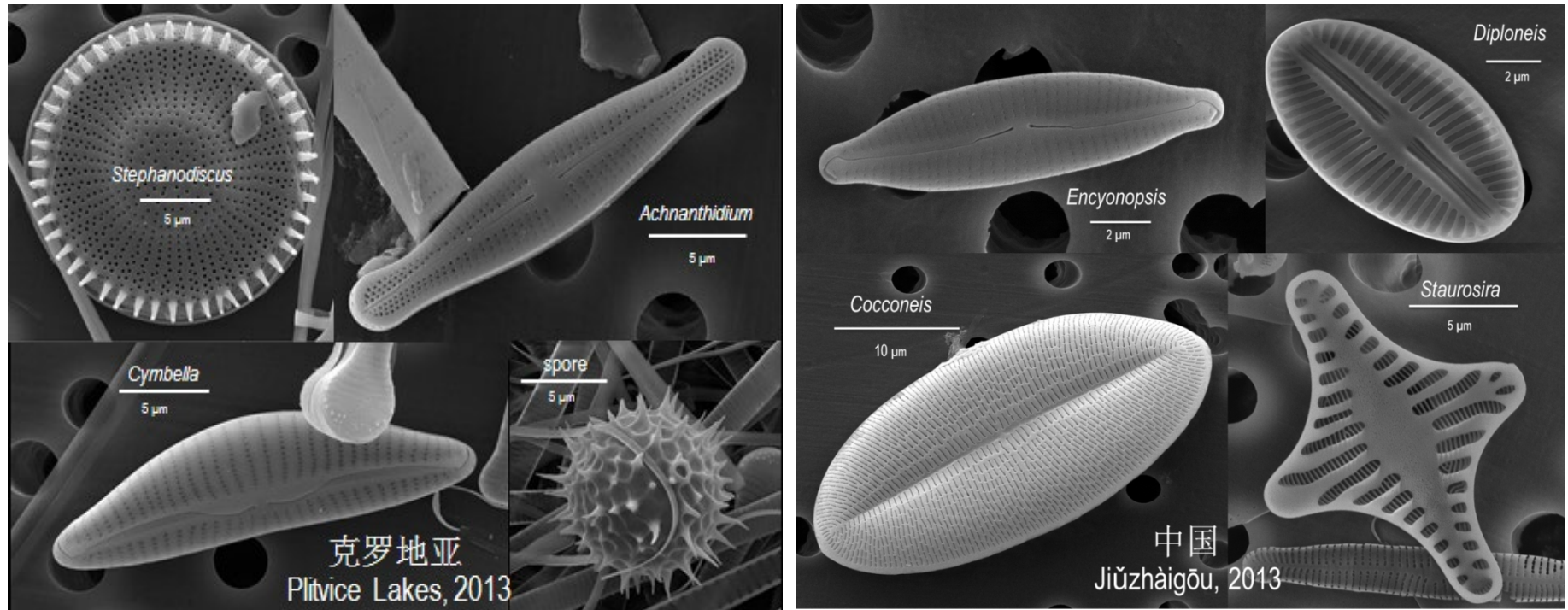
RHODOPHYTA consisting of the photosynthetic organisms commonly known as red algae. and are most common in warm-temperate and tropical climates, where they may occur at greater depths than any other photosynthetic organisms. Most of the coralline algae, which secrete calcium carbonate play a major role in building reefs, and they are a traditional part of oriental cuisine.



2009./2011. "Biodiversity and ecology of phytoplankton communities in Lake Jiuzhaigou Valley (China) and National Park Plitvice Lakes (Croatia)"

2011./2013. "Application of phytobenthos in water quality assessment in karstic waters of Croatia and China"

Why algae were the main focus of those projects?



Algal properties: small size, easy to collect, fast growth, etc. make them suitable model organisms for ecological topics in water quality, environmental protection and sustainable development.

A one year climate cycle, during which land plants usually complete one life cycle, is sufficient for algae turnover in the order of 100 times.



Chengdu Institute of Biology
Chinese Academy of Sciences



Jiuzhaigou Valley



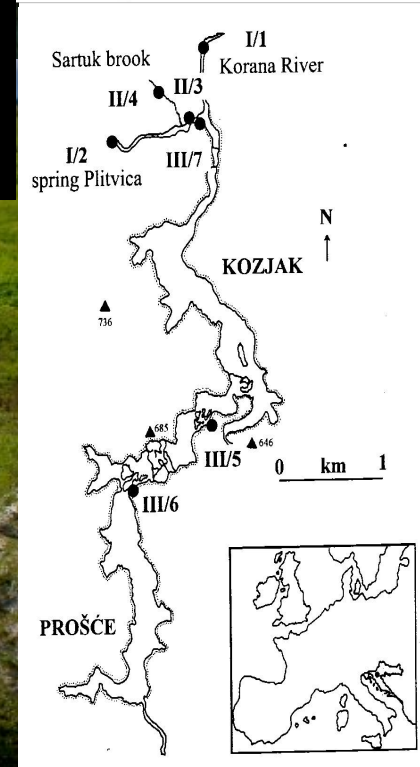
University of Zagreb, Faculty of Science,
Department of Biology



Plitvice Lakes National Park



Each projects participant conduct the same type of investigation in their country according to national relevant methodology and place of investigation.



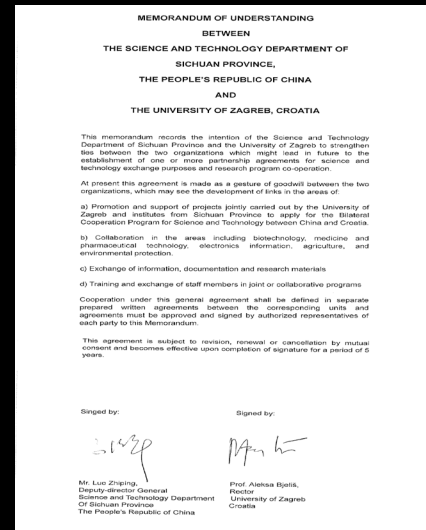


At the end of each project bilateral exchange was conduct





implementation and applicability of EU methodology and technology in fields related to nature conservation, ecosystem management and sustainable development of world natural heritage sites



June, 2011

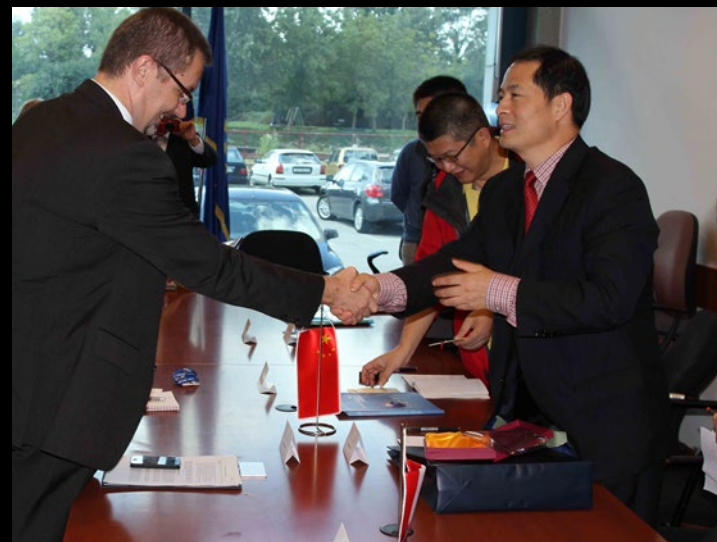


Mr Luo Zhiping, Deputy-director General, STDSP lead Sichuan delegation

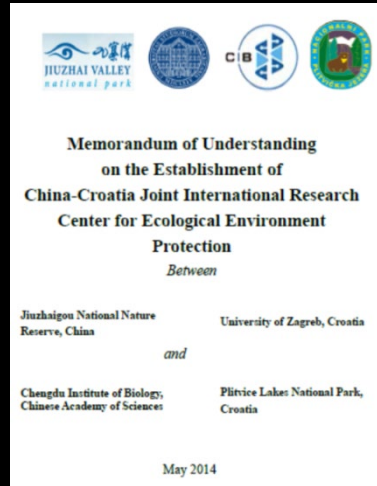
As part of the mentioned events and China-Croatia exchange of experience in environmental protection and sustainable development, in September 2013, Sichuan delegation led by Mr Zhou Menglin Deputy Director-General STDSP visited Croatia and very successful and fruitful meetings with representatives of UNIZG, Croatian Ministry of Science, Education and Sports were held.



University of Zagreb



Ministry of Science,
Education and Sports



on May 24, 2014 a high-level delegation by central government of the People's Republic of China led by vice premier h.e. Liu Yandong, visit Croatia and attend in the unveiling ceremony of establishing "China-Croatia Joint International Research Center for Ecological Environment Protection", which aims to bridge joint research staffs and organizations between our counties.





There are water, lakes, waterfalls and forest elsewhere,
but Jiuzhaigou and Plitvice Lakes are unique.
They simply must be seen!





established in 1949



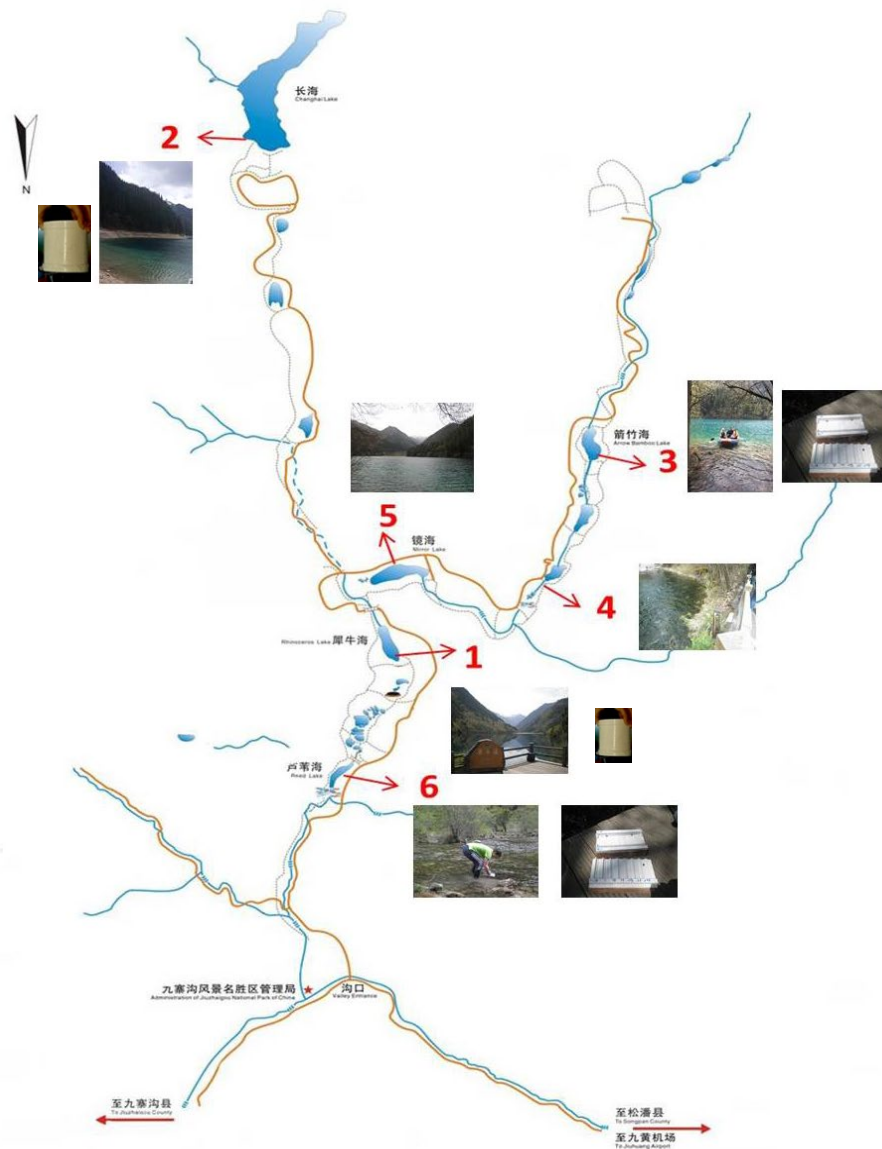


Specific geological and hydrological phenomenon

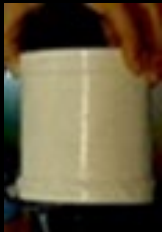


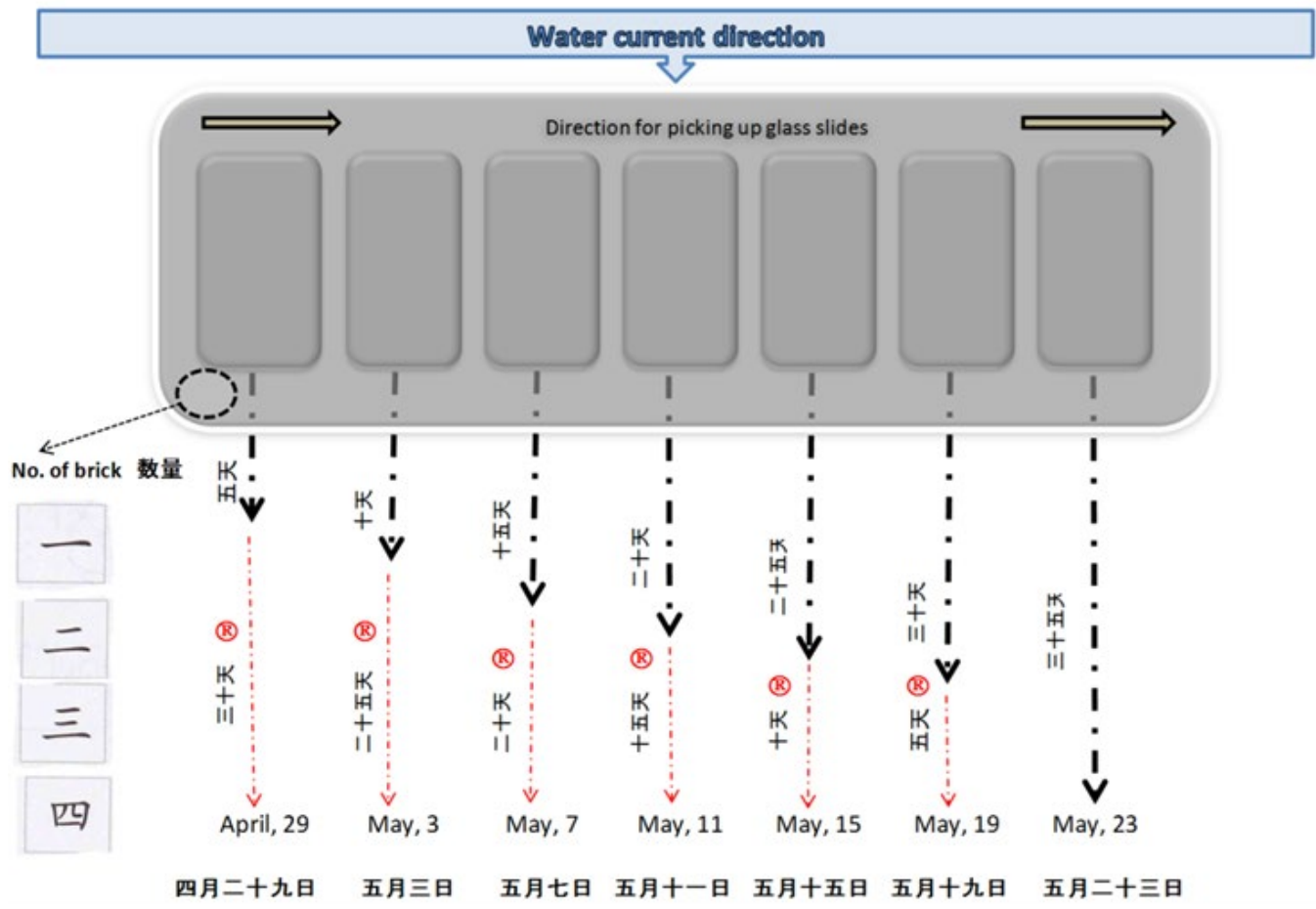
Consists of 16 lakes, which gradually blend into one another in a long series of more than 5000 m





location of the sampling sites in the branch of NP Jiuzhaigou (1= Rhinoceros Lake, 2=Long Lake, 3= Arrow Bamboo Lake, 4= Mirror Lake, 5= The Peacock Riverbed, and 6= Reed Lake)





Scheme of experimental artificial plate with microscopic gasses during the sampling time





Status	Code	
High		} "Reference condition" Acceptable ecological condition
Good		
Moderate		} Action needed for achieving acceptable ecological status
Poor		
Bad		

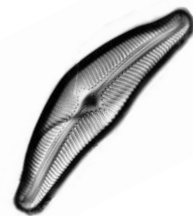
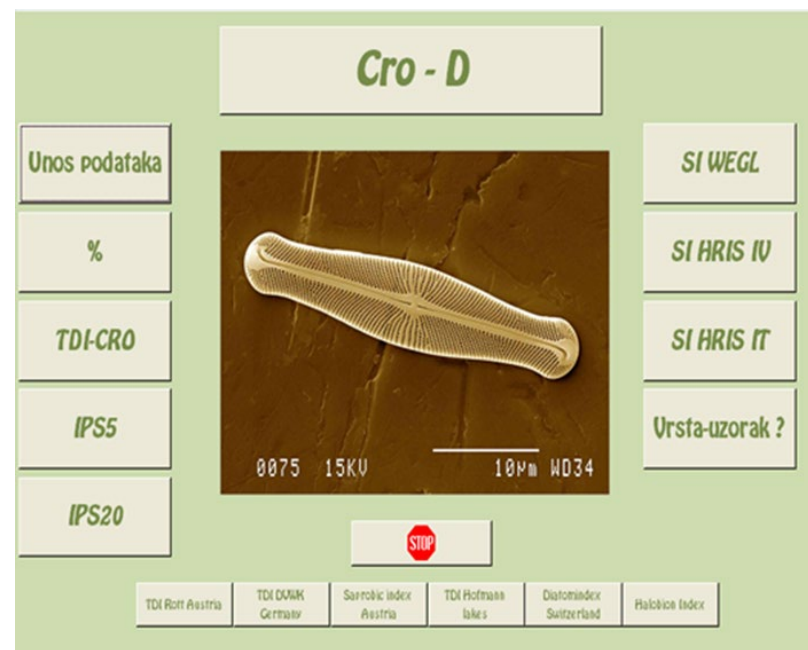
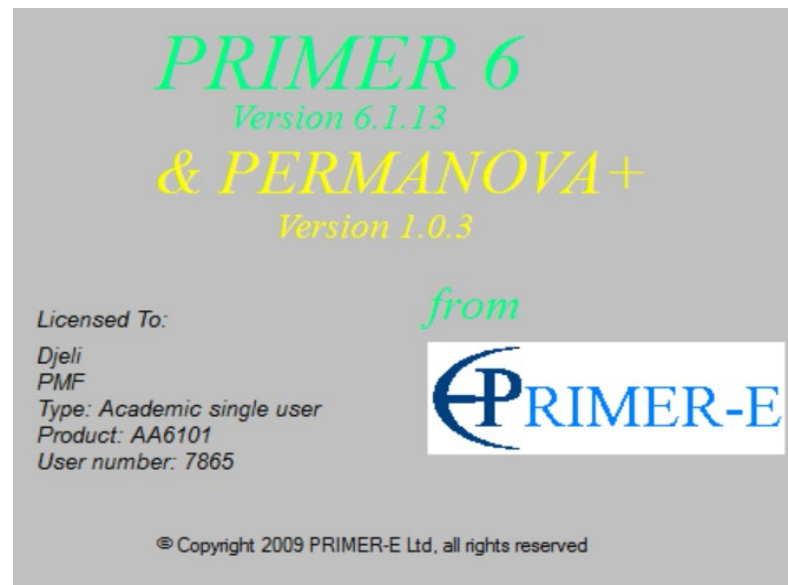
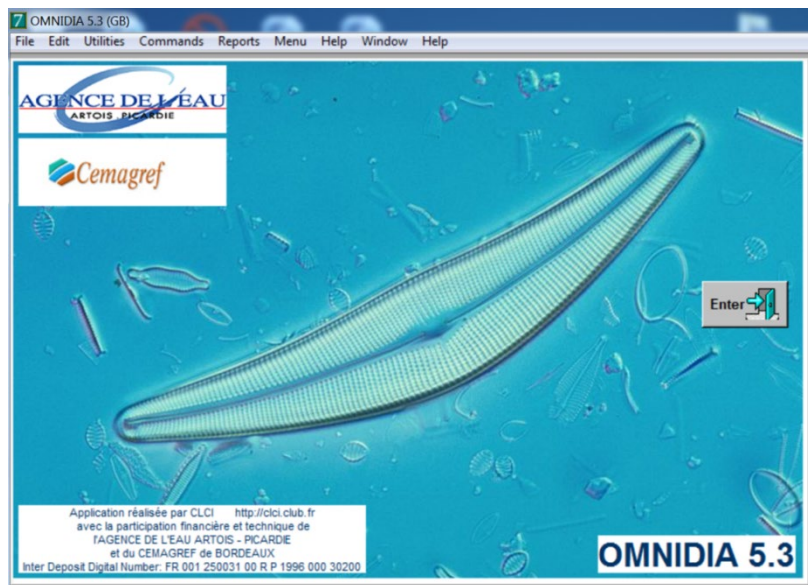
- The WFD is the most important legislation for water management in the EU. It aims to develop a broadly applicable strategy for managing ground and surface water bodies in terms of their protection and sustainable development.
- Classification of the ecological status of water resources is carried out on the basis of biological, hydromorphological and physico-chemical elements. Biological quality elements (BQEs) used to assess the ecological status of water bodies are: phytoplankton, phytobenthos, macrophytes, macrozoobenthos and fish.



indicator value TOLERANCE	indicator weight SENSITIVITY
decimal numbers	integer numbers
1-5	1-5
1 = good indicator, tolerates low concentrations of nutrients	1= wide sensitivity range, weak indicator
5= bad indicator, tolerates high concentrations of nutrients	5= narrow sensitivity range, very good indicator



Most of diatom species indices used in the calculation/equation is assigned two values: the first value reflects the tolerance or affinity of the diatom to a certain water quality (good or bad) while the second value indicates how strong (or weak) the relationship is.



The identification of diatom species was performed with a light microscope Leicka DMLB at CIB,CAS

The diatoms were identified to at the lowest taxonomical level according to the relevant literature

INVENTORIES

Analysis: Validated

SLIDE N°: 1

Date: 29/05/2015

Basin: _____

River: _____

Site: _____

Hydrologic code: _____

Distance/source: _____

Temperature: _____

GPS-N: _____

Lambert II-X: _____

Particularities: _____

Other labels...: _____

Species | **Abundance**

ADMI	154
CPLA	28
NASP	24
NRAD	26
SULN	26

INDICES

INDICES	IDAP	4.69	SHE	5.69	IPS	4.49	IDSE/5	3.85	TDV/100	35.3	IDP	II	1.64
	EPL-D	0.62	DI-CH	3.74	SLA	1.16	IDG	4.07	%PT		ROTT troph.		1.89
	IBD	5.29	WAT	85.2	DES	3.83	CEE	8.80	LOBO	3.82	ROTT sap.		1.71

ANALYSIS

(abundance/1000) | 1 | 29/05/2015

Slide N°	1	2	3	4	5	6	7		
Dat								3	neutrophile
Bas								2	douces à légèrement saumâtres
Riv								2	N-autotrophe tolérant
Sit								1	élevée
Hydrologic cod								2	Béta-mésosaprobe
Distance/sourc								7	indifférent
Temperatur								3	subaériens
Sampling code									

Particularities

Lange-Bertalot 1979

	1	2	3	4	5	6		
Other labels...	101	0	0	0	705	0	5	more sensible (abundant)

Quality notes/20

Hofmann 1994

	0	1	2	3	4	5	6	7	8	9
Trophie	93	0	0	0	0	0	907	0	0	
Saprobie	93	0	0	209	0	597	0	0	101	0

INDICES

Ecologic value: HÅKANSSON et DENYS LOUIS LECLERCQ

Print Exit

QUALITY NOTES / 20

IPS	SLA	DESCY	IDSE/5	GENRE	CEE	SHE	WAT	IDAP	TDI	IBD	DI-C	EPL-D
17.6	14.5	14.5	3.85	15.6	17.7	15.9	17.2	18.5	35.3	16.6	12.6	17.1

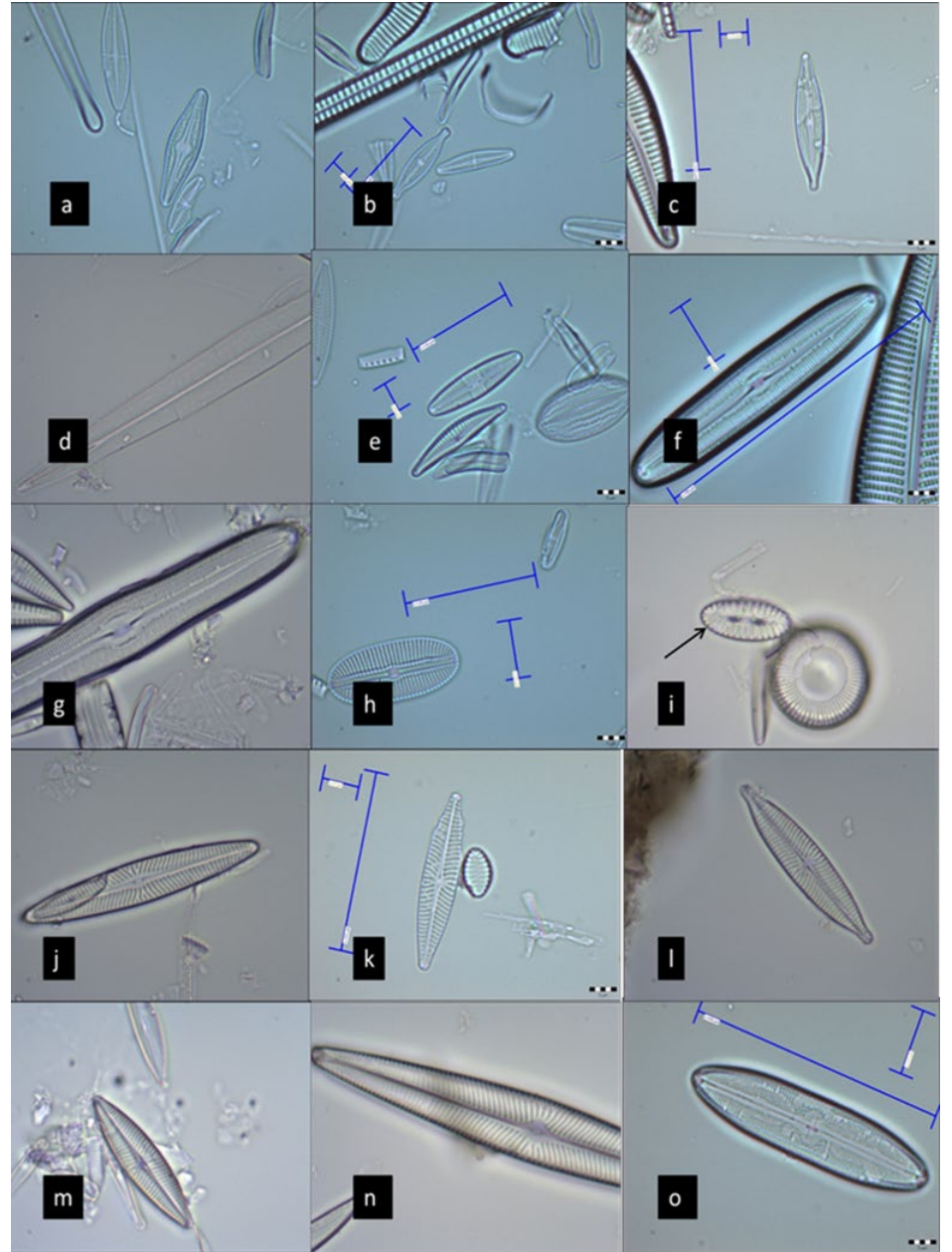
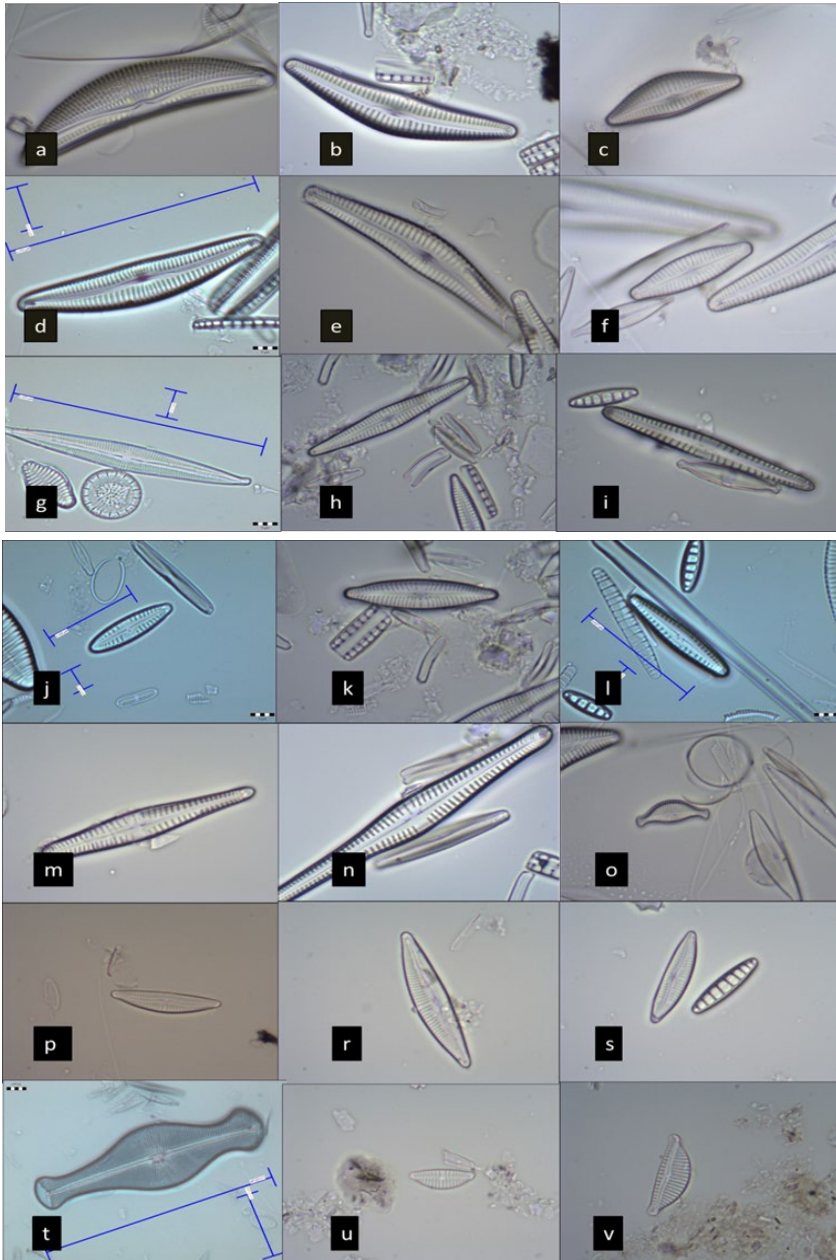
100.00	80.00	80.00	80.00	100.00	80.00	80.00	40.00	80.00	80.00	80.00	80.00	100.00
258	234	234	234	258	234	234	182	234	234	234	234	258

Number of species 5

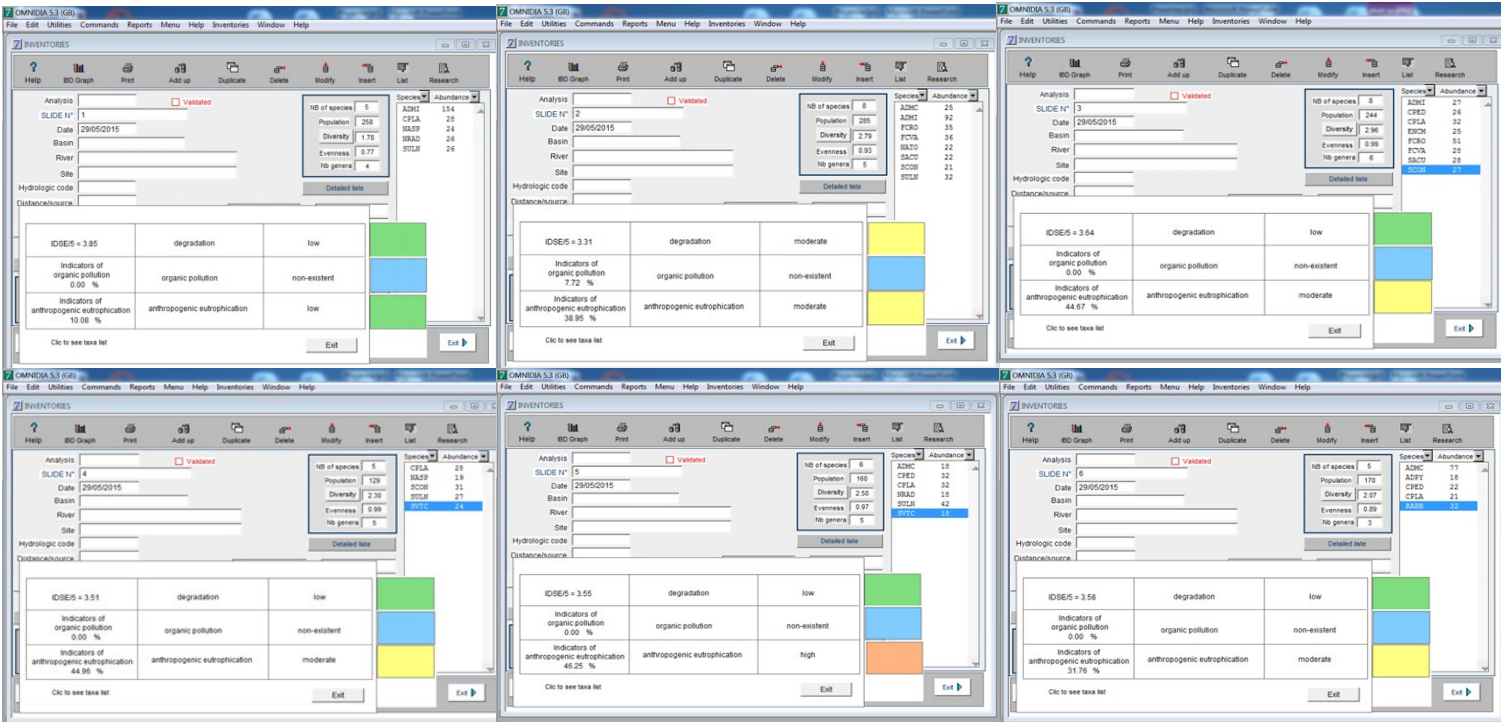
Population 258

Diversity	1.78
Evenness	0.77

	IDP	LOBO	SID	TID
	12.2	18.9	15.2	11.6
% Tot	40.00	80.00	80.00	80.00
	54	234	234	234



107 diatoms (Cymbella/Encyonema, Fragilaria)



- 1 *Achnanthydium microcephalum* Kützing
- 2 *Achnanthydium minutissimum* (Kützing) Czarnecki
- 3 *Achnanthydium pyrenaicum* (Hustedt) H.Kobayasi
- 4 *Cocconeis pediculus* Ehrenberg
- 5 *Cocconeis placentula* Ehrenberg
- 6 *Encyonopsis microcephala* (Grunow) Krammer
- 7 *Fragilaria capucina* var. *vaucheriae* (Kützing) Lange-Bertalot
- 8 *Fragilaria crotonensis* Kitton
- 9 *Navicula radiosa* Kützing
- 10 *Navicula* sp.
- 11 *Planothidium* sp.
- 12 *Rhoicosphenia abbreviata* (C.Agardh) Lange-Bertalot
- 13 *Sellaphora* sp.
- 14 *Staurosira* sp.
- 15 *Synedra acus* Kützing
- 16 *Synedra ulna* (Nitzsch) Ehrenberg

abundance \geq 5%



7 OMNIDIA 5.3 (GB)

File Edit Utilities Commands Reports Menu Help Inventories Window Help

7 INVENTORIES

Help IBD Graph Print Add up Duplicate Delete Modify Insert List Research

Analysis Validated

SLIDE N° 232

Date 29/05/2015

Basin JUIZHAIGO

River

Site

Hydrologic code

Distance/source

NB of species 16

Population 1064

Diversity 3.78

Evenness 0.95

Nb genera 9

Detailed liste

Species Abundance

ADMC	120
ADMI	119
ADPY	18
CPED	80
CPLA	113
ENCM	25
FCRO	86
FCVA	64
NASP	43
NATO	22
NRAD	44
RABB	

IDSE/5 = 3.51	degradation	low
Indicators of organic pollution 2.07 %	organic pollution	non-existent
Indicators of anthropogenic eutrophication 40.60 %	anthropogenic eutrophication	moderate

Clic to see taxa list

Exit

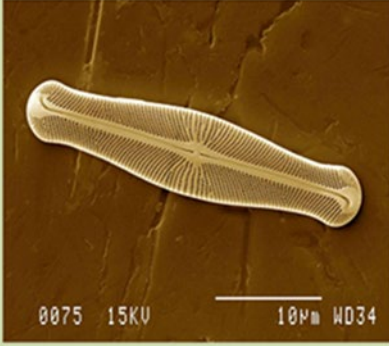
Exit

TAXA	ROTT _{Trophy}		ROTT _{Saprobity}	
	T	C	T	C
indicator value TOLERANCE			indicator weight SENSITIVITY	
decimal numbers			integer numbers	
1-5			1-5 S = 25%	
1 = good indicator, tolerates low concentrations of nutrients			1= wide sensitivity range, weak indicator	
5= bad indicator, tolerates high concentrations of nutrients			5= narrow sensitivity range, very good indicator	

SACU	1.8	2		
SCON	2.3	2	1.4	3
SULN	3.5	4	3.2	1
SVTC	0.5	3		

TAXA	ROTT _{Trophy}		ROTT _{Saprobity}		TID _{CRO}		SI _{CRO}	
	T	S	T	S	T	S	T	S
ADMI	1.2	1	1.7	1	2.5	2	2.2	1
ADPY	1.3	1	1.4	3	1.0	1	1.3	2
CPED	2.6	2					1.8	2
CPLA	2.6	2					1.8	2
ENCM	1.2	1					1.8	3
FCRO							2.0	3
FCVA	1.8	1					2.0	2
NASP							2.0	1
NATO	2.8	3					2.1	2
NRAD	0.6	3					2.1	2
RABB	2.9	2					2.1	2
SACU	1.8	2			2.1	2	2.2	2
SCON	2.3	2	1.4	3	2.0	1	1.7	2
SULN	3.5	4	3.2	1	2.1	2	2.2	2
SVTC	0.5	3			2.6	1	2.2	2

Cro - D



Unos podataka

%

TDI-CRO

IPSS

IPS20

SI WEGL

SI HRIS IV

SI HRIS IT

Ursta-uzorak ?

STOP

TDI Rott Austria

TDI DANK Gernater

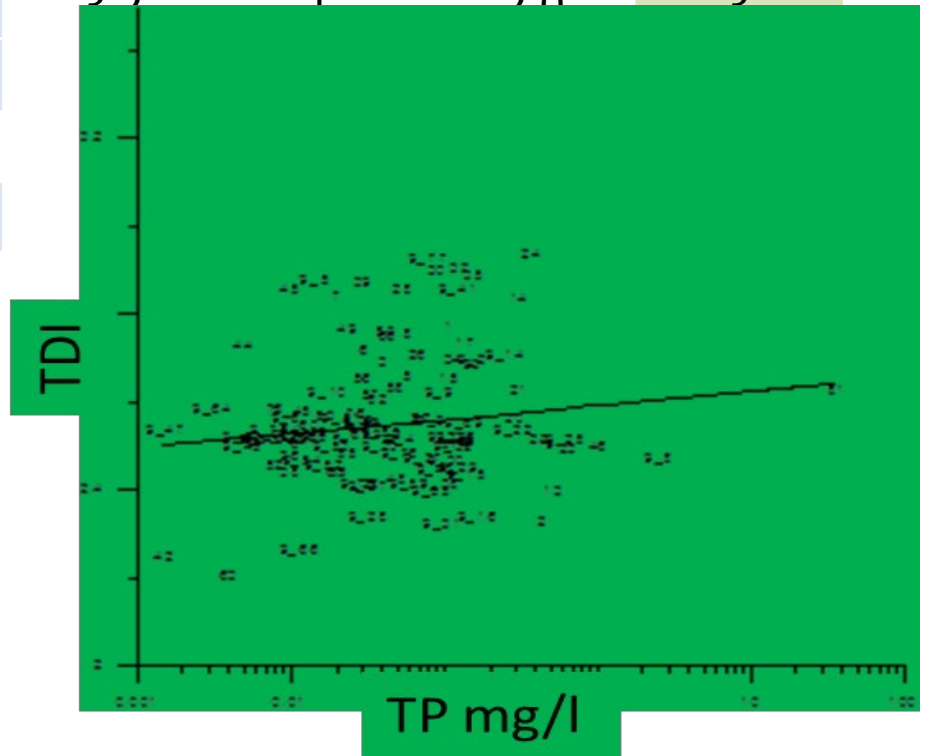
Saprobic Index Austria

TDI Hofmann lakes

Diatomindex Switzerland

Hablicic Index

TAXA	ROTT _{Trophy}		ROTT _{Saprobity}		TID _{CRO}		SI _{CRO}	
	T	S	T	S	T	S	T	S
ADMI	1.2	1	1.7	1	2.5	2	2.2	1
ADPY	1.3	1	1.4	3	1.0	1	1.3	2
CPED	2.6	2	2.0	3	2.5	1	1.8	2
CPLA	2.6	2	1.8	2	2.5	2	1.8	2
ENCM	1.2	1	1.2	4	2.2	1	1.8	3
FCRO			1.4	3	2.2	1	2.0	2
FCVA	1.8	1	2.5	2				
NASP								
NATO	2.8	3	3.4	2				
NRAD	0.6	3	1.3	4				
RABB	2.9	2	2.1	4				
SACU	1.8	2						
SCON	2.3	2	1.4	3				
SULN	3.5	4	3.2	1				
SVTC	0.5	3						



The Trophic Status Module assesses nutrient and The Saprobic Status Module assesses organic load.

ecological status	TID _{RH}
Very good	≤2,3
Good	≤2,6
Moderate	≤3,1
Bad	≤3,3
Very bad	>3,3

ecological status	SI _{HRIS}
Very good	≤1,5
Good	≤2,0
Moderate	≤2,5
Bad	≤3,0
Very bad	≤3,5

$$SI = \frac{\sum_{i=1}^n s_i \cdot h_i}{\sum_{i=1}^n h_i}$$

si - value for each indicator species
hi - abundance of occurrence for each species
n - number of species

TID_{CRO}

1.0

ROTT_{Trophy}

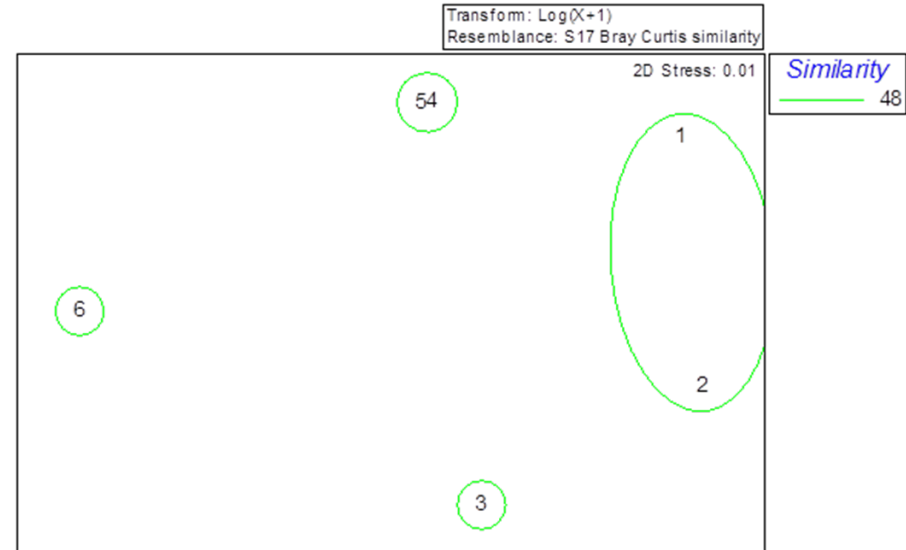
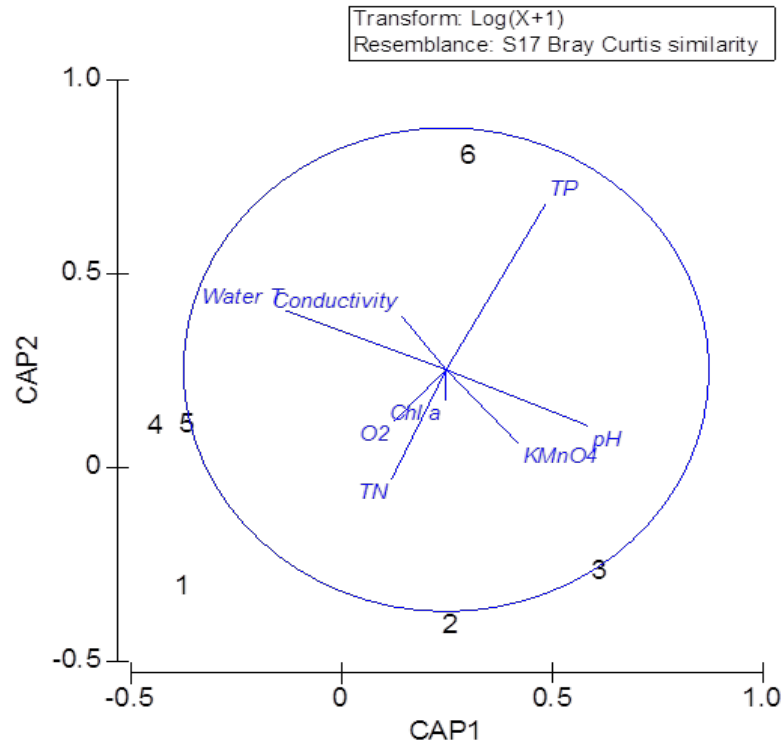
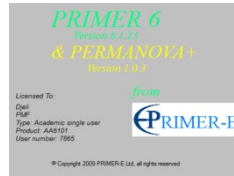
2.7

SI_{CRO}

1.9

ROTT_{Saprobity}

2.6



1= Rhinoceros Lake, 2=Long Lake, 3= Arrow Bamboo Lake, 4= Mirror Lake, 5= The Peacock Riverbed, 6= Reed Lake

Using PRIMER 6 software for CAP analysis that allocates physical and chemical parameters and Non metric multidimensional scaling based of species abundance shows a difference affiliations of establish diatom communities on each location to measured parameters and grouping samples in 4 distinct groups which points out to the uniqueness of investigated area.

The aim of project was to provide a firm foundation for subsequent more detailed assessment of wider usage in ecological valorization of water resources, education of personnel in concordance to long-term strategy for development of investigations and environmental protection.

Results presents a global overview of freshwater algae biodiversity in NP Jiuzhaigou Valley and only preliminary ecological status of water quality assessment according to diatoms, with aim to strengthen ecological valorization of Jiuzhaigou Valley water quality management.

Plan for the future - to develop a stronger framework of co-operation between China and Croatia and to be more effective in the future investigations of monitoring techniques based on the ecosystem services, modernizing applicable methods in ecological valorization of water resources and landscape design in order to generate indices of their importance in concordance to long-term strategy for development of investigations and environmental protection .

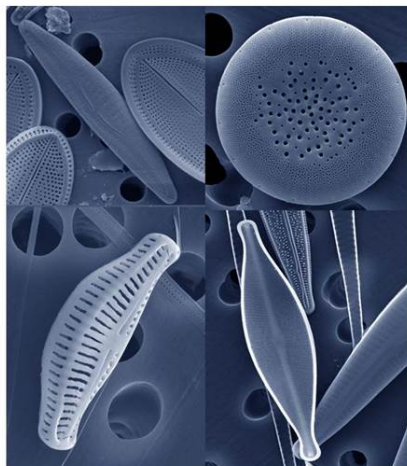


中国科学院成都生物研究所
CHENGDU INSTITUTE OF BIOLOGY, CHINESE ACADEMY OF SCIENCES

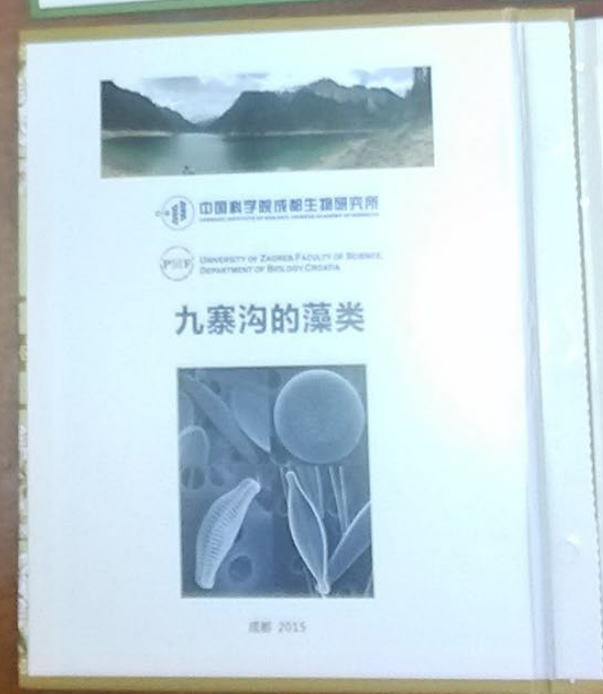
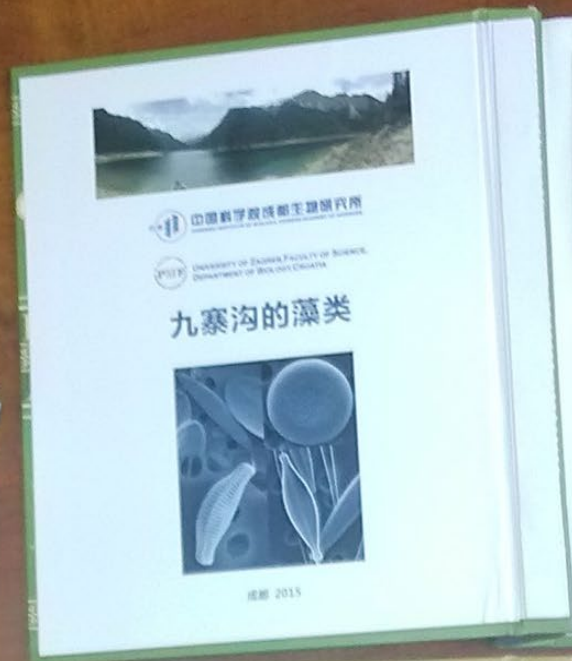
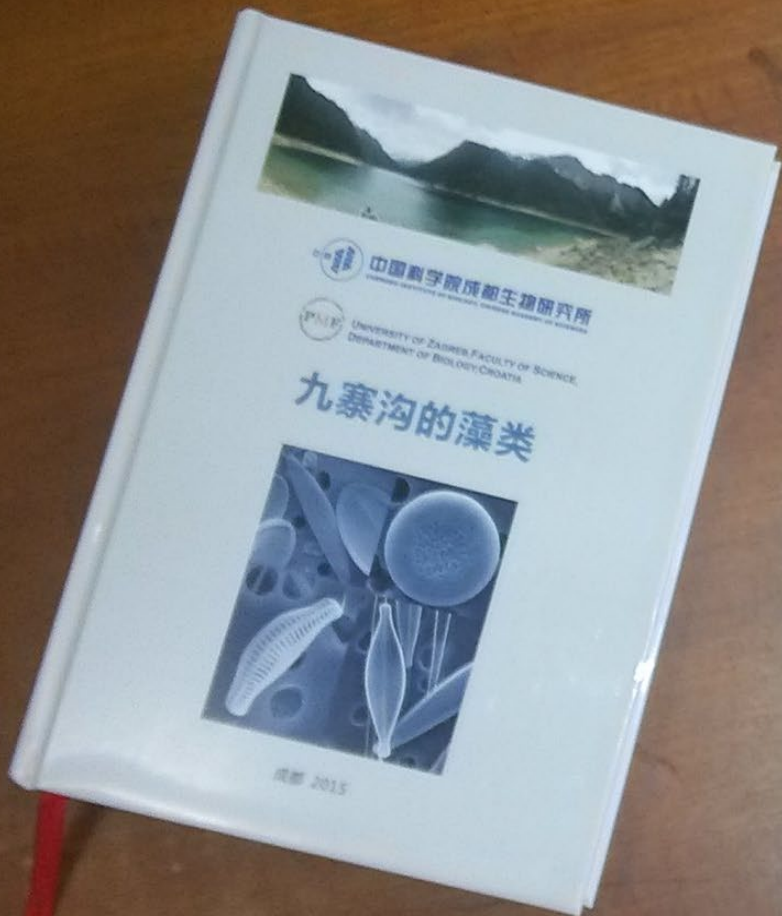


UNIVERSITY OF ZAGREB, FACULTY OF SCIENCE, DEPARTMENT OF BIOLOGY, CROATIA

九寨沟的硅藻



成都, 2015





Chengdu Institute of Biology, Chinese Academy of Science, China



University of Zagreb, Faculty of Science, Department of Biology, Croatia

Chapter 1

CAS President' s International Fellowship Initiative (PIFI)

2015

Prof. Anđelka Plenković-Morač, PhD

Given check list of algal species from Jiuzhaigou Valley consists of several data sets: data given by authority of National park, published at the web page of National Park (418 species include), of two previous bilateral China-Croatia projects, and as result of project *Diatoms - ecological status indicators of Jiuzhaigou Valley*, financed by CAS President's International Fellowship Initiative (PIFI) for 2015. Up today, integrated list from available data sets consist of 649 algal species recorded for Jiuzhaigou Valley. All species Latin names were checked and revised according to AlgaeBASE, the main algology database obligatory used in EU. Recording algal species belongs to next Phyla: cyanobacteria (or green-blue algae - 128 species), Dinophyta (7 species), Euglenophyta (2 species), Rhodophyta (3 species), Ochrophyta (classes *Chrysophyceae*-5 species; *Bacillariophyceae*- 299 species, *Coccinodiscophyceae*- 16 species, and *Fragilariophyceae*- 72 species); Chlorophyta (48 species), and Charophyta (69 species). According to the number of species in Jiuzhaigou National Park, predominant are diatoms, and subdominant are blue-green, and green algae. Beside the check list of algal species, a photo album with more than 200 microphotographs of diatoms from Jiuzhaigou National Park and an Algae DataBase (Excel file) for Jiuzhaigou Valley was established too. Algae DataBase consist of detail taxonomic categories for each of 649 algal species recorded for National Park (including current status of the name), 168 pictures hyperlinked to corresponding species, and 141 hyperlinked references (books and articles) where the certain species was published.

*Check list of
algal species
and
AlgaeDataBase
- Jiuzhai Valley*

CONTENT

CHAPTER 1.

ALGAE

General characteristics, taxonomy and ecology of algae	1
Check list of algal species – Jiuzhai Valley	10

CHAPTER 2.

DIATOM SPECIES - Identification key

Introduction	1
Taxa by morphology	6
Shapes	303
Glossary	316

CHAPTER 1.

ALGAE

General characteristics, taxonomy and ecology of algae

oceans to fresh water to bare rock to soil. Some cyanobacterial species are highly toxic and others non-toxic. All blue-green algae however, contain lipopolysaccharides, which act as contact irritants. Blue-green algal blooms are natural phenomena and while it is not exactly clear what triggers a bloom, excess human sources of nutrients such as fertilizers and sewage certainly can increase the intensity of blooms (i.e. greater number of algae).

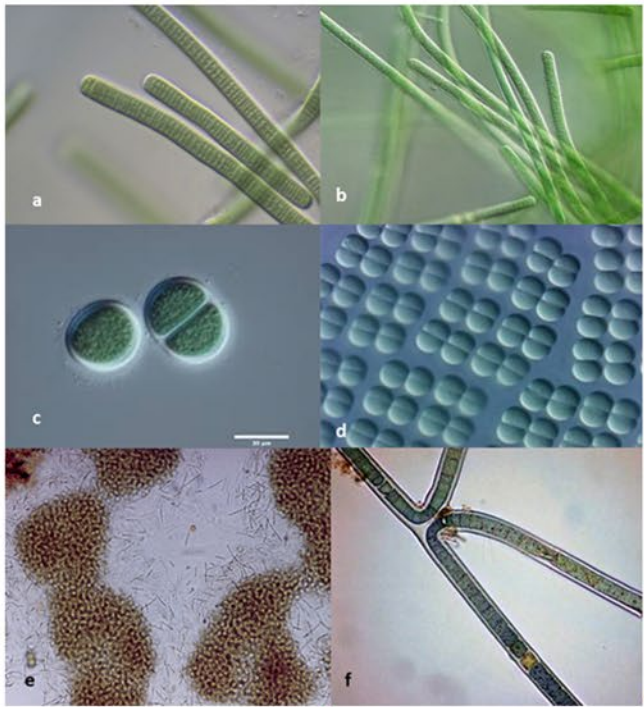


Figure 1. Cyanobacteria: a) *Oscillatoria tenuis*, b) *Phormidium* sp., c) *Chroococcus turgidus*, d) *Merismopedia punctata*, e) *Microcystis aeruginosa*, f) *Scytonema* sp.

•→ **EUGLENOPHYTA** (Fig. 2): small phylum consisting of mostly unicellular aquatic algae. Some euglenoids contain chloroplasts with the photosynthetic pigments; others are heterotrophic and can ingest or absorb their food. Reproduction occurs by longitudinal cell division. Most live in freshwater. The most characteristic genus is *Euglena*, common in ponds and pools, especially when the water has been polluted by runoff from fields or lawns on which fertilizers have been used. There are approximately 1000 species of euglenoids.

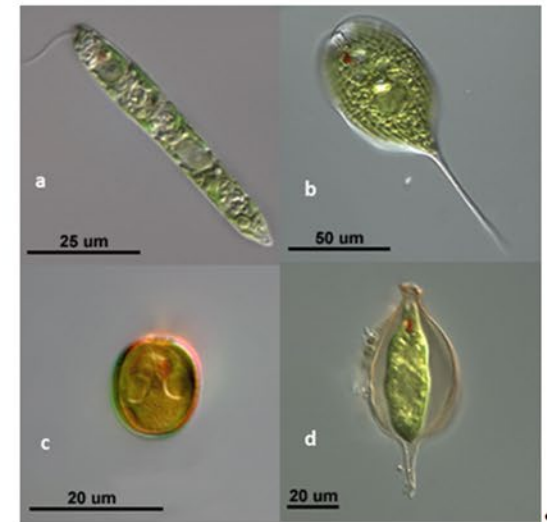


Figure 2. Euglenophyta: a) *Euglena gracilis*, b) *Phacus longicauda*, c) *Trachelomonas volvocina*, d) *Strombomonas* sp.

•→ **DINOFAGELLATA** (Fig. 3) large group of flagellate protists. Some species are heterotrophic, but many are photosynthetic organisms containing chlorophyll. Various other pigments may mask the green of these chlorophylls. Other species are

Check list of algal species - Jiuzhai Valley

Table 1: Check list of algal species - NP Jiuzhaigou Valley

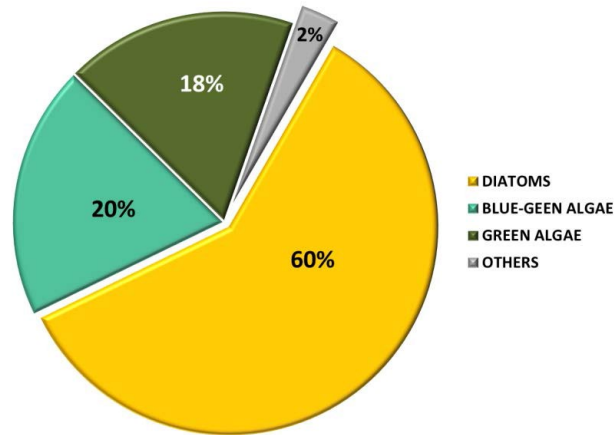

T A X A	Current status of name
Empire: PROKARYOTA	
Kingdom: MONERA	
Phylum: Cyanobacteria	
Class: Cyanophyceae	
Subclass: Nostocophycidae	
Order: Nostocales	
Family: Microchaetaceae	
Genus: Tolypothrix	
<i>Tolypothrix byssoidea</i> Kirchner	✓
<i>Tolypothrix lanata</i> Wartmann	✓
<i>Tolypothrix</i> sp.	✓
Family: Nostocaceae	
Genus: Nostoc	
<i>Nostoc linckia</i> Bornet	✓
<i>Nostoc minutum</i> Desmazières	<i>Nostoc commune</i> Vaucher
<i>Nostoc muscorum</i> C.Agardh	✓
<i>Nostoc punctiforme</i> Hariot	✓
Family: Rivulariaceae	
Genus: Calothrix	
<i>Calothrix epiphytica</i> West & G.S.West	✓
<i>Calothrix fusca</i> Bornet & Flahault	✓
<i>Calothrix gracilis</i> Wolke	✓
Genus: Dichothrix	
<i>Dichothrix gypsophila</i> Bornet & Flahault	✓
<i>Dichothrix handelii</i> Skuja	✓
<i>Dichothrix sacconemoides</i> C.-C.Jao & Y.-Y.Li	✓
Genus: Gloeotrichia	
<i>Gloeotrichia natans</i> Rabenhorst	✓
Genus: Microchaete	
<i>Microchaete uberrima</i> N.Carte	<i>Microchaete grisea</i> Thuret
Genus: Rivularia	
<i>Rivularia beccariana</i> Bornet & Flahault	✓
<i>Rivularia jaoi</i> H.-J.Chu	✓
Family: Scytonemataceae	
Genus: Petalonema	
<i>Petalonema alatum</i> (Borzi) Correns	✓
<i>Petalonema crustaceum</i> Kirchner	✓
Genus: Scytonema	
<i>Scytonema crispum</i> Bornet	✓
<i>Scytonema hofmannii</i> C.Agardh	✓
<i>Scytonema myochitrus</i> C.Agardh	✓
Subclass: Oscillatoriothycidae	
Order: Chroococcales	
Family: Chroococcaceae	
Genus: Astero caps a	
<i>Astero caps a changbaishanensis</i> Wang	✓

consists of several data sets:

- data given by authority of National park, published at the web page of National Park
- of two previous bilateral China-Croatia projects
- as result of project Diatoms - ecological status indicators of Jiuzhaigou Valley


Up today, integrated list, from available data sets, consist of 649 algal species recorded for Jiuzhaigou Valley.

All species Latin names were checked and revised according to AlgaeBASE (main algology database for terrestrial, marine and freshwater organisms, obligatory used in EU).

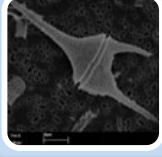
CYANOBACTERIA - 128 species

- No. of genus = 35
- *Chroococcus* - 20 species




RHODOPHYTA - 3 species

- No. of genus = 2
- 3 species




DINOPHYTA - 7 species

- No. of genus = 4
- 3 species




CHRYSOPHYCEAE - 5 species

- No. of genus = 2
- 5 species



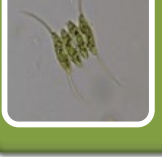
EUGLENOPHYTA - 2 species

- No. of genus = 2
- 2 species




BACILARIOPHYCEAE - 387 species

- No. of genus = 76
- *Cymbella* - 46 species



CHLOROPHYTA - 48 species

- No. of genus = 24
- *Scenedesmus* - 7 species



CHAROPHYTA - 69 species

- No. of genus = 16
- *Cosmarium* - 20 species



Chengdu Institute of Biology, Chinese Academy of Science, China

Chapter 2



University of Zagreb, Faculty of Science, Department of Biology, Croatia

CONTENT

CHAPTER 1.

ALGAE

General characteristics, taxonomy and ecology of algae	1
Check list of algal species – Jiuzhai Valley	10

CHAPTER 2.

DIATOM SPECIES - Identification key

Introduction	1
Taxa by morphology	6
Shapes	303
Glossary	316

CAS President' s International Fellowship Initiative (PIFI)

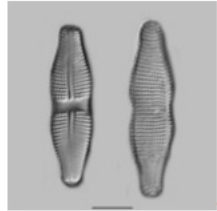
2015

Prof. Anđelka Plenković-Moraj, PhD

Composition and abundance of diatom species are well known to reflect the biotic conditions of freshwater ecosystems. Together with aquatic invertebrates or "bugs" and fish, diatoms are an indispensable component for environmental monitoring and assessment programs, especially in Water Quality Assessments. Diatoms are sensitive to human impacts on watersheds and the condition of diatom populations reflects the aquatic ecosystem response to environmental stress. This identification key to the genera of diatoms is provided, along with guides to the identification of the most common species within the larger genera, and users should find here sufficient information. This book is compilation of several free on-line identification keys (e.g. Diatom Ecological Database M. Kelly 2000: Field Studies, 9).

DIATOM SPECIES Identification key

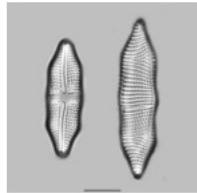
Morphology, ecology, physiology, habitats, adaptation, classification



Achnanthes coarctata

1. → Valve margin biundulate
2. → Raphe valve with central fascia
3. → Areolae distinct
4. → Rapheless valve with eccentric axial area

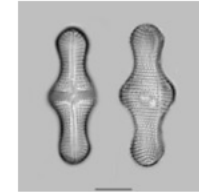
Monoraphid - Valves have biundulate margins, with a central constriction. The raphe valve face has a broad, central fascia. The fascia may be asymmetric. The rapheless valve has a narrow, eccentric axial area. Striae are uniseriate and distinctly punctate.



Achnanthes feiinophila

1. → Valves triundulate
2. → Ends cuneate
3. → Proximal raphe ends deflected slightly
4. → Rapheless valve with eccentric axial area

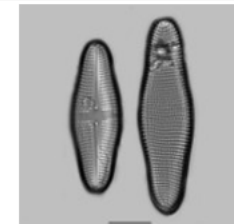
Monoraphid - Valves are distinctly triundulate in large specimens, becoming less triundulate and more lanceolate in smaller valves. The valve ends are narrow and cuneate. The raphe valve has a narrow axial area and a rectangular central area, extending to the valve margin. The proximal raphe ends are slightly unilaterally deflected slightly. The rapheless valve has an eccentric axial area. Striae are punctate and radiate throughout the raphe valve. Striae on the rapheless valve are parallel in the center, becoming radiate and curved at the ends. Prijelom stranice.....



Achnanthes inflata

1. → Valve margin triundulate
2. → Raphe valve with central fascia
3. → Areolae distinct
4. → Rapheless valve with eccentric axial area

Monoraphid - Valves are broad, with triundulate margins. The raphe valve face has a broad, central fascia. The rapheless valve has a narrow, eccentric axial area that crosses one side of the central undulation. Areolae are uniseriate and distinctly punctate.



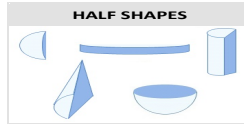
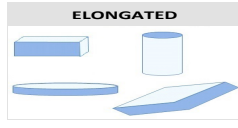
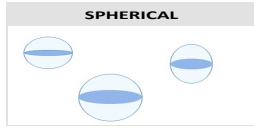
Achnanthes longboardia

1. → Valves lanceolate
2. → Raphe valve with laterally expanded central area
3. → Rapheless valve with eccentric axial area
4. → Ends broadly rounded

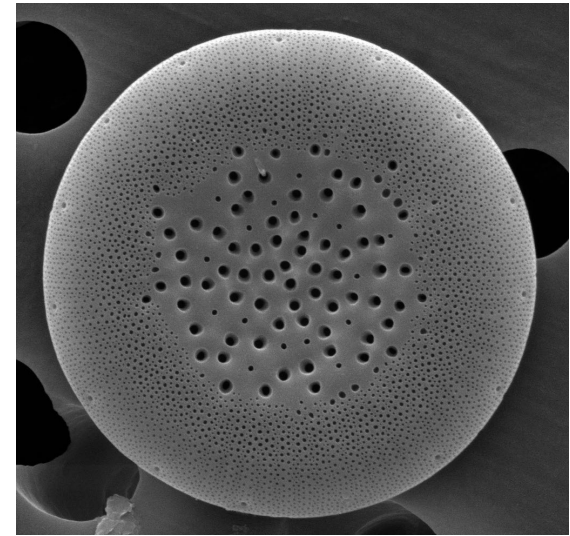
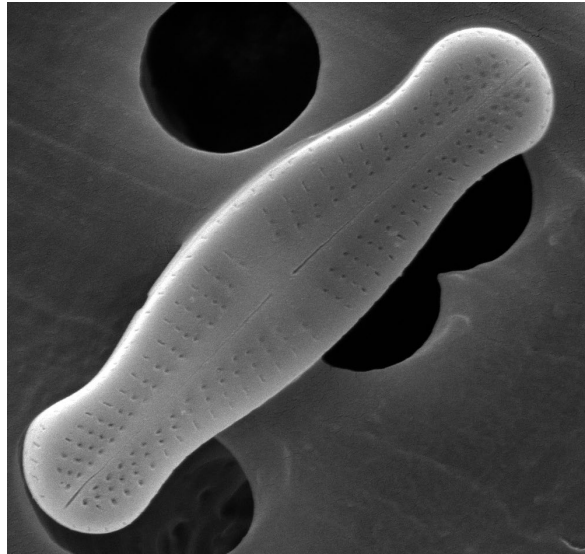
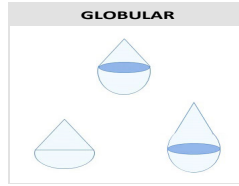
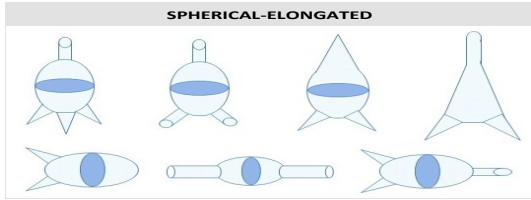
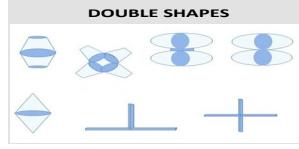
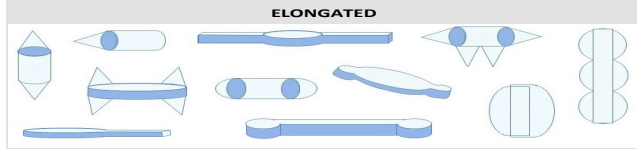
Monoraphid - Valves lanceolate, slightly swollen near the center, with broadly rounded ends. The raphe valve has a narrow axial area and wide central area, expanded laterally to the valve margins. The proximal raphe ends are slightly deflected in the same direction. The rapheless valve has an axial area positioned near the valve margin.

..... Prijelom stranice.....

SHAPES

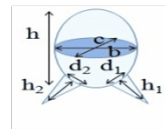


COMPLEX SHAPES



30

Ellipsoid + 2 Cones

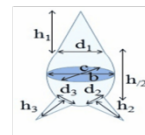


$$A = \frac{\pi}{4}(b+c) \left[\left(\frac{b+c}{2} \right) + \frac{2h^2}{\sqrt{4h^2 - (b+c)^2}} \sin^{-1} \frac{\sqrt{4h^2 - (b+c)^2}}{2h} \right] + \frac{\pi}{4}d_1(\sqrt{d_1^2 + 4h_1^2} - d_1) + \frac{\pi}{4}d_2(\sqrt{d_2^2 + 4h_2^2} - d_2)$$

$$V = \frac{\pi}{6}bch + \frac{\pi}{12}d_1^2h_1 + \frac{\pi}{12}d_2^2h_2$$

31

Half ellipsoid + 3 Cones

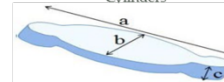


$$A = \frac{1}{2} \left\{ \frac{\pi}{4}(b+c) \left[\left(\frac{b+c}{2} \right) + \frac{2h^2}{\sqrt{4h^2 - (b+c)^2}} \sin^{-1} \frac{\sqrt{4h^2 - (b+c)^2}}{2h} \right] \right\} + \frac{\pi}{4}d_1(\sqrt{d_1^2 + 4h_1^2} - d_1) + \frac{\pi}{4}d_2(\sqrt{d_2^2 + 4h_2^2} - d_2) + \frac{\pi}{4}d_3(\sqrt{d_3^2 + 4h_3^2} - d_3)$$

$$V = \left(\frac{\pi}{12}bch \right) + \left(\frac{\pi}{12}d_1^2h_1 \right) + \left(\frac{\pi}{12}d_2^2h_2 \right) + \left(\frac{\pi}{12}d_3^2h_3 \right)$$

32

Prism on elliptical base + 2 Cylinders

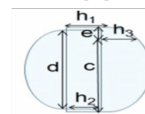


$$A \approx \frac{\pi}{2} [(a b) + (b c) + (a c)]$$

$$V \approx \frac{\pi}{4} abc$$

33

Cylinder with asymmetric bulging sides



$$A = \text{under construction}$$

$$V = \frac{\pi}{8} d^2 (h_1 + h_2) + \pi h_3 \sqrt{c e} \left(\frac{2}{3} e + \frac{1}{3} c \right)$$

- an e-version of Algae DataBase for Jiuzhaigou Valley is under construction
- it consists of detail taxonomic categories for each of 649 algal species recorded for National Park (including current status of the name), 168 pictures hyperlinked to corresponding species, and 141 hyperlinked references (books and articles) where the certain species was published

Algal DataBase - Microsoft Excel

Calibri 11

Uvjetno oblikovanje, Oblikuj kao tablicu, Stilovi ćelija, Umetni, Izbriši, Oblikuj, Automatski zbroj, Ispuni, Očisti, Sortiraj i Pronadi i filtriraj + odaberi

A	B	C	D	E	F	G	H	I	J	K	L
Empire	Kingdom	Phylum	Class	Subclass	Order	Family	Genus	Species	Current status of name	Published in:	Key references
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa alpina Nitzsch		Rabenhorst, L. (1865). Flora europaea algarum aquae dulcis et submarinae. Sectio I. Algae phycocromaceae completens. pp. 1-319. 71 Fas. Lipsiae (Leipzig). Apud Eduardum Kummerum.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa atrata Kützting		Kützting, P.T. (1843). Phycologia generalis oder Anatomie, Physiologie und Systemkunde der Taneen. Mit 80 farbige gedruckten Tafeln, berechnet und gravirt vom Verfasser. pp. Ieart II. (I-xxvii). West. W. & West. G.S. (1844). On some freshwater algae from the West Indies. Journal of the Linnean Society of London. Botany 30: 244-280. pp. XIII-XIV.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa gigas West & G.S. West		Kützting, P.T. (1849). Species algarum. pp. 131-132. Lipsiae (Leipzig). F.A. Brockhaus.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa imitatus Lemmermann		Kützting, P.T. (1847). Diagenosen und Bemerkungen zu neuen oder kritischen Algen. Botanische Zeitung 5: 1-5, 22-25, 33-36, 52-55, 164-167, 177-180, 193-198, 219-225.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa murina Kützting		Gardner, N.L. (1927). On a collection of Myxophyceae from Fukien Province, China. University of California Publications in Botany 1(4): 1-20. pp. 1-5.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa montana Kützting	Gloeocapsa atrata Kützting	Kützting, P.T. (1847). Tabulae phycologicae oder Abbildungen der Taneen. Vol. I. fasc. 3-5. pp. 27-36. pp. 21-50. Nordhausen. Gedruckt auf Kosten des Verfassers (in commission bei W. Kuhn).	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa murina Kützting	NOT FOUND IN AlgaeBASE		
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa nigrescens Nägeli		Rabenhorst, L. (1865). Flora europaea algarum aquae dulcis et submarinae. Sectio I. Algae phycocromaceae completens. pp. 1-319. 71 Fas. Lipsiae (Leipzig). Apud Eduardum Kummerum.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa rotula (Harvey) Lemmermann		Lemmermann, E. (1907). Algen (Sclerophyceen, Flagellaten, Peridinieen). In: Kryptogamenflora der Mark Brandenburg und anersandere Gebiete herausgegeben von dem Botanischen Verein d.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa rupestris Kützting		Kützting, P.T. (1847). Tabulae phycologicae oder Abbildungen der Taneen. Vol. I. fasc. 3-5. pp. 27-36. pp. 21-50. Nordhausen. Gedruckt auf Kosten des Verfassers (in commission bei W. Kuhn).	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa sanguinea (C.Agricola) Kützting		Kützting, P.T. (1843). Phycologia generalis oder Anatomie, Physiologie und Systemkunde der Taneen. Mit 80 farbige gedruckten Tafeln, berechnet und gravirt vom Verfasser. pp. Ieart II. (I-xxvii). West. W. & West. G.S.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa stegophila (H. Grönbl.) Rabenhörst		Rabenhorst, L. (1865). Kryptogamen-Flora von Sachsen, Ober-Lausitz, Thüringen und Nord-Böhmen, mit Berücksichtigung der benachbarten Länder. erste Abtheilung. Algen im westlichen Sinne.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa stegophila var. <i>stricta</i> C.B.Rao		Gardner, N.L. (1927). New Myxophyceae from Burma. Memoirs of the New York Botanical Garden 7: 1-144. pp. 1-23.	Deshrachary, T.V. (1959). Cyanophyta. pp. 11-14. 11-686. pp. 1-139. N.
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Chroococcus	Chroococcus cubicus N.L.Gardner		Lemmermann, E. (1904). Das Diatom schwebeliche Gräser. Annu. Bot. Botany 2(1): 1-205.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Chroococcus	Chroococcus dispersus (Kützting) Lemmermann		Smith, G.M. (1920). Photophysiology of the Inland Lakes of Wisconsin. Part I. Myxophyceae, Phaeocystaceae, and Chlorophyceae exclusive of the Desmidiaceae. Bulletin of the Wis.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Chroococcus	Chroococcus dispersus var. <i>minor</i> G.M.Smith		Gardner, N.L. (1927). New Myxophyceae from Burma. Memoirs of the New York Botanical Garden 7: 1-144. pp. 1-23.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Chroococcus	Chroococcus murina N.L.Gardner		Lemmermann, E. (1898). Beiträge zur Kenntnis der Planktonalgen. I. Beschreibung neuer Formen. Botanisches Centralblatt 76: 150-156.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Chroococcus	Chroococcus imitatus var. <i>multicellulatus</i> H.-J. Chu		Chu, H.-J. (1952). Some new Myxophyceae from Szechwan province, China. Ohio Journal of Science 5: 84-101.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Chroococcus	Chroococcus litophyllus Erenowicz		Erenowicz, A. (1925). Ulovnika vegetacija vanevanskej dolomitske u Hrvatskoj. La vegetation lithophylus sur les calcaires et les dolomites en Croatie. Acta Botanica Institutu Botanici Universitatis Z.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Chroococcus	Chroococcus micrococcus (Kützting) Rabenhörst		Rabenhorst, L. (1865). Kryptogamen-Flora von Sachsen, Ober-Lausitz, Thüringen und Nord-Böhmen, mit Berücksichtigung der benachbarten Länder. erste Abtheilung. Algen im westlichen Sinne.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Chroococcus	Chroococcus minor (Kützting) Nägeli		Nägeli, C. (1849). Gattungen einzelner Algen, phycologisch und systematisch bearbeitet. Neue Denkschriften der Allg. Schweizerischen Gesellschaft für die Gesamten Naturwissenschaften 1.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Chroococcus	Chroococcus minutus (Kützting) Nägeli		Nägeli, C. (1849). Gattungen einzelner Algen, phycologisch und systematisch bearbeitet. Neue Denkschriften der Allg. Schweizerischen Gesellschaft für die Gesamten Naturwissenschaften 1.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Chroococcus	Chroococcus pelliculosus Nägeli		Nägeli, C. (1849). Gattungen einzelner Algen, phycologisch und systematisch bearbeitet. Neue Denkschriften der Allg. Schweizerischen Gesellschaft für die Gesamten Naturwissenschaften 1.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Chroococcus	Chroococcus schizodermatous West		West, W. (1892). Algae of the English Lake District. Journal of the Royal Microscopical Society, London 1892: 713-748. pls IX, X (16 figs).	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Chroococcus	Chroococcus splendens C.-Claud		Jao, C.-C. (1944). Studies on the fresh-water algae of China. XIII. New Myxophyceae from Kuangsi. Sinensia 15: 75-90. pp. 1, 2.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Chroococcus	Chroococcus texas (Kirchner) Hieronymus		Hieronymus, G. (1892). Beiträge zur Morphologie und Biologie der Algen. Beiträge zur Biologie der Pflanzen 5: 461-492, pls XVII, XVIII.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Chroococcus	Chroococcus turgidus (Kützting) Nägeli		Nägeli, C. (1849). Gattungen einzelner Algen, phycologisch und systematisch bearbeitet. Neue Denkschriften der Allg. Schweizerischen Gesellschaft für die Gesamten Naturwissenschaften 1.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Chroococcus	Chroococcus turgidus var. <i>solitorius</i> G.Hose			
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Chroococcus	Chroococcus turgidus var. <i>minor</i> G.M. Smith	NOT FOUND IN AlgaeBASE		
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Chroococcus	Chroococcus funicularis (Nägeli) Hierang		Hierang, A. (1887). Phycologische und algologische Studien. pp. 1-187. Berichtungen. 4. p. 184. (Pflanzl. Buchdruckerei: Alga, L. Burmann, Verlag von Franz Beseney.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Chroococcus	Chroococcus varius A.Braun		Rabenhorst, L. (1876). Die Algen Europa's. Vol. Decades 146-148 pp. 2451-2480. Dresden.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Chroococcus	Chroococcus wazleri J.S. Petersen		Petersen, J.S. (1925). The freshwater Cyanophyceae of Iceland. Arbogdar for det Botaniske Hus i København 10(17): 251-324.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Synechococcales	Melamoniopales	Melamoniopales	Melamoniopsis	Melamoniopsis alpina A.Braun		Kützting, P.T. (1849). Species algarum. pp. 131-132. Lipsiae (Leipzig). F.A. Brockhaus.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Synechococcales	Melamoniopales	Melamoniopales	Melamoniopsis	Melamoniopsis alpina (Braun) Kützting		Kützting, P.T. (1845). Phycologia germanica, d. i. Deutschlands Algen in bunden. Beschreibungen. Nebst einer Anleitung zum Untersuchen und Bestimmen dieser Gewächse für Anfänger. pp. 1-139. N.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Synechococcales	Melamoniopales	Melamoniopales	Melamoniopsis	Melamoniopsis minima G.Beck			
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Synechococcales	Melamoniopales	Melamoniopales	Melamoniopsis	Melamoniopsis pulchella (Nägeli)			
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Synechococcales	Melamoniopales	Melamoniopales	Melamoniopsis	Melamoniopsis tenuis Lemmermann		Mayen, P.J.P. (1889). Neues system der pflanzen-phycologischen Dritter band. pp. 1-157. Plats X-VI. Berlin, Heude und Spemannsche Buchhandlung (J. Neuberger).	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Synechococcales	Melamoniopales	Melamoniopales	Gomphosphaeria	Gomphosphaeria apertina Kützting		Lemmermann, E. (1898). Der grosse Westfälische Binnensee. Eine biologische Studie. Fortschrittsberichte aus der Biologischen Station zu Pflon 6: 166-205. 4. fasc. 2. map. pl. V.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Synechococcales	Melamoniopales	Melamoniopales	Gomphosphaeria	Gomphosphaeria apertina var. <i>confinis</i> Wolle		Kützting, P.T. (1848). Algen in aqua dulcis germanicae. Pars III. pp. 11-21. Hols Essingen (Hols) in commission G.A. Schwabacher & Co.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Synechococcales	Ceoliosphaeriales	Ceoliosphaeriales	Ceoliosphaera	Ceoliosphaera lacustris (Chodat) Komárek & Hindák		Wolle, F. (1882). Fresh-water algae. V. Bulletin of the Torrey Botanical Club 5(3): 25-50.	
Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Synechococcales	Ceoliosphaeriales	Ceoliosphaeriales	Ceoliosphaera	Ceoliosphaera lacustris (Chodat) Komárek & Hindák		Komárek, J. & Hindák, F. (1988). Taxonomic review of natural populations of the cyanophytes from the Gomphosphaeria-complex. Algological Studies/Archiv für Hydrobiologie, Supplement 1.	

Database

40%

4:12

25.5.2015.



- an e-version of Algae DataBase for Jiuzhaigou Valley was established
- it consists of detail taxonomic categories for each of 649 algal species recorded to National Park (including current status of the name), 168 pictures hyperlinked to corresponding species, and 141 hyperlinked references (books and articles) where the certain species was published

Algal DataBase - Microsoft Excel

Calibri 11

Uvjetno oblikovanje, Oblikuj kao tablicu, Stilovi ćelija, Umetni, Izbriši, Oblikuj, Automatski zbroj, Ispuni, Očisti, Sortiraj i Pronadi i filtriraj, Uredivanje

A	B	C	D	E	F	G	H	I	J	K	L
Empire	Kingdom	Phylum	Class	Subclass	Order	Family	Genus	Species	Current status of name	Published in:	Key references
1	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa alpina Nitzsch		Rabenhorst, L. (1865). Flora europaea algarum aquae dulcis et submarinae. Sectio I. Algae phycocromaceae completens. pp. 1-319. 71 Fas. Lipsiae (Leipzig). Apud Eduardum Kummerum.
2	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa atrata Kützting		Kützting, F.T. (1843). Phycologia generalis oder Anatomie, Physiologie und Systemkunde der Taneen. Mit 80 farbige reduckirten Tafeln, berechnet und gravirt vom Verfasser. pp. 164-11. (I-XXIII). West. W. & West. G. S. (1844). On some freshwater algae from the West Indies. Journal of the Linnean Society of London. Botany. 30: 244-280. pls XIII-XIV.
3	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa gigas West & G.S. West		
4	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa kütztingiana Nägeli		Kützting, F.T. (1849). Species algarum. pp. 11-11-212. Lipsiae (Leipzig). F.A. Brockhaus.
5	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa magna (Brébisson) Kützting		Kützting, F.T. (1849). Species algarum. pp. 11-11-212. Lipsiae (Leipzig). F.A. Brockhaus.
6	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa minuta N.L.Gardner		Gardner, N.L. (1927). A collection of Myxophyceae from Fukien Province, China. University of California Publications in Botany 14(1): 1-20. pls 1-5.
7	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa montana Kützting	Gloeocapsa atrata Kützting	Kützting, F.T. (1847). Tabulae phycologicae oder Abbildungen der Taneen. Vol. I. fasc. 3-9. pp. 27-36. pls 21-50. Nordhausen. Gedruckt auf Kosten des Verfassers. In commission bei W. Kitzling.
8	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa murina Kützting	NOT FOUND IN ALGEBASE	
9	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa nitzschii Kützting		
10	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa nigrescens Nägeli		Rabenhorst, L. (1865). Flora europaea algarum aquae dulcis et submarinae. Sectio I. Algae phycocromaceae completens. pp. 1-319. 71 Fas. Lipsiae (Leipzig). Apud Eduardum Kummerum.
11	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa rorarii (Harvey) Lemmermann		Lemmermann, E. (1907). Algen (Sclerophyceen, Flagellaten, Peridinieen). In: Kryptogamenflora der Mark Brandenburg und anersandere Gebiete herausgegeben von dem Botanischen Verein der Provinz Brandenburg. Berlin. 1-100.
12	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa rupestris Kützting		Kützting, F.T. (1847). Tabulae phycologicae oder Abbildungen der Taneen. Vol. I. fasc. 3-9. pp. 27-36. pls 21-50. Nordhausen. Gedruckt auf Kosten des Verfassers. In commission bei W. Kitzling.
13	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa sanguinea (C.Agricola) Kützting		Rabenhorst, L. (1865). Kryptogamen-Flora von Sachsen, Ober-Sachsen, Thüringen und Nord-Böhmen, mit Berücksichtigung der benachbarten Länder. erste Abtheilung. Algen im westlichen Sinne.
14	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa stegophila (H. Grönbl.) Rabenhörst		DeSachary, T.V. (1959). Cyanophyta. pp. 11-11-686. pls 1-139. N.Y.
15	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa stegophila var. <i>stricta</i> C.B.Rao		
16	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa subulosa N.L.Gardner		Gardner, N.L. (1927). New Myxophyceae from Burma. Memoirs of the New York Botanical Garden 7: 1-144. pls 1-23.
17	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa dispersa (Kützling) Lemmermann		Lemmermann, E. (1904). Das Verhalten schweblicher Grönblatter. Annu. für Botanik 2(1): 1-205.
18	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa dispersa var. <i>minor</i> G.M. Smith		Smith, G.M. (1920). Phytogeography of the Inland Lakes of Wisconsin. Part I. Myxophyceae, Phaeocystaceae, Heterokontaceae, and Chlorophyceae exclusive of the Desmidiaceae. Bulletin of the Wisconsin Botanical Garden 7: 1-144. pls 1-23.
19	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa murina N.L.Gardner		Gardner, N.L. (1927). New Myxophyceae from Burma. Memoirs of the New York Botanical Garden 7: 1-144. pls 1-23.
20	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa murina N.L.Gardner		Lemmermann, E. (1898). Beiträge zur Kenntnis der Planktonalgen. I. Beschreibung neuer Formen. Botanisches Centralblatt 76: 150-156.
21	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		Chu, H.-J. (1952). Some new Myxophyceae from Szechwan province, China. Ohio Journal of Science 5: 84-101.
22	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		Ergovic, A. (1925). Uloviška vegetacija varencaša u dolomitu u Hrvatskoj. La vegetation lithophyte sur les calcaires et les dolomites en Croatie. Acta Botanica Institutu Botanici Universitatis Zagreb. 1: 1-100.
23	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		Rabenhorst, L. (1865). Kryptogamen-Flora von Sachsen, Ober-Sachsen, Thüringen und Nord-Böhmen, mit Berücksichtigung der benachbarten Länder. erste Abtheilung. Algen im westlichen Sinne.
24	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		Nägeli, C. (1849). Gattungen einzelliger Algen, phycologisch und systematisch bearbeitet. Neue Denkschriften der Allg. Schweizerischen Gesellschaft für die Gesamten Naturwissenschaften 1: 1-100.
25	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		Nägeli, C. (1849). Gattungen einzelliger Algen, phycologisch und systematisch bearbeitet. Neue Denkschriften der Allg. Schweizerischen Gesellschaft für die Gesamten Naturwissenschaften 1: 1-100.
26	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		Nägeli, C. (1849). Gattungen einzelliger Algen, phycologisch und systematisch bearbeitet. Neue Denkschriften der Allg. Schweizerischen Gesellschaft für die Gesamten Naturwissenschaften 1: 1-100.
27	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		West, W. (1892). Algae of the English Lake District. Journal of the Royal Microscopical Society, London 1892: 713-748. pls IX, X (16 figs).
28	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		Jao, C.-C. (1944). Studies on the fresh-water algae of China. XIII. New Myxophyceae from Kuang-Sien. Sinensia 15: 75-90. pls 1, 2.
29	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		Hieronymus, G. (1892). Beiträge zur Morphologie und Biologie der Algen. Beiträge zur Biologie der Pflanzen 5: 461-492, pls XVII, XVIII.
30	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		Nägeli, C. (1849). Gattungen einzelliger Algen, phycologisch und systematisch bearbeitet. Neue Denkschriften der Allg. Schweizerischen Gesellschaft für die Gesamten Naturwissenschaften 1: 1-100.
31	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		DeSachary, T.V. (1959). Cyanophyta. pp. 11-11-686. pls 1-139. N.Y.
32	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		
33	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		
34	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		
35	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		
36	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		
37	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		
38	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		
39	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		
40	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		
41	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		
42	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		
43	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		
44	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		
45	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		
46	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		
47	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		
48	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		
49	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		
50	Prokaryota	Eubacteria	Cyanobacteria	Cyanophyceae	Oscillatoriothycidales	Chroococcales	Microcystaceae	Gloeocapsa	Gloeocapsa immetata var. <i>multicellulosa</i> H.-J. Chu		

Database

4:12 25.5.2015.

Die kieselschaligen
Bacillarien oder Diatomeen.

Bearbeitet
von
Dr. Friedrich Traugott Kützing,
Professor bei der Hochschule zu Nordhausen.

(Mit 30 vom Verfasser gezeichneten Tafeln.)

NORDHAUSEN, 1844.
Zu finden bei W. Köhne.

Digitized by Google





Xièxiè nín de guānzhù