1. Interim Report

Investigation of water quality in Großefehn

Profilkurs 8G „Mensch & Natur“, KGS Großefehn

Contents

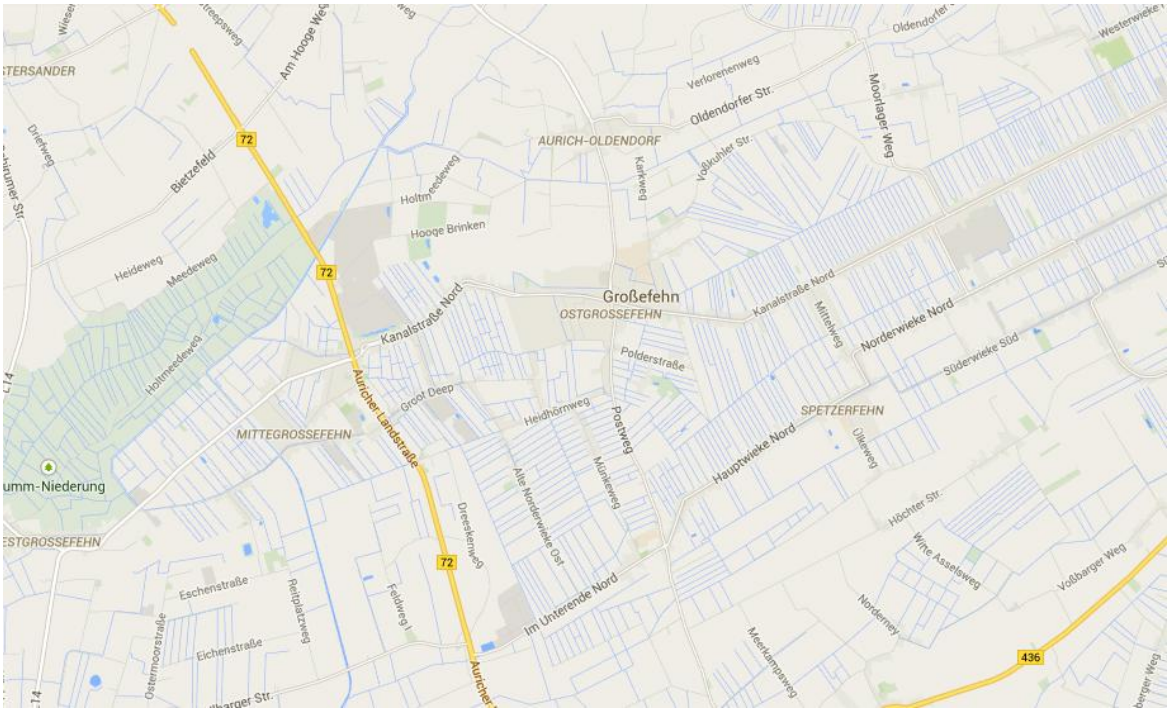
Introduction

“Drinking water is the most controlled food, because we can´t drink water without the knowledge of the compounds, solved in it.” This is the motto of the European school project "Euro - Water", which is coordinated by the Alexander von Humboldt school, Wittmund (GER) and the Dollard College, Oude Pekela (NL).
The KGS Großefehn is partner in this school project. Within the scope of the profile “Mensch und Natur” schoolgirls and schoolboys of 8 grammar school should compile different aspects on the subject „Our drinking water“.

In a first step a "Water-Footprint" was provided, in which the water consumption „per head“ should be determined, i.e. by surveys and measurements. Besides, it was not only about the "direct" water consumption, which can be measured about the water clock, but also about the "indirect" water consumption. We use this so-called "virtual water“ e.g., in the form of food, it is required during the production of food, clothes or technical devices.

This first interim report deals with the second phase of the project in which the schoolgirls and schoolboys examined in different test locations, in the surroundings of Großefehn, water samples on different ingredients. In total ten chemical parameters (metals, nutrients, whole hardness & oxygen-concentration) were analysed and compared to the suitable valid European limit values. For the appraisal of the biological water goodness, the schoolgirls and schoolboys have examined the Mirkrofauna (insects & limnoplankton) and could arrange the examined waters with the use of the german index of saprobial organisms. A final assessment of the measured data and a classification of the different waters will occur in the second school half-year in 2014/2015.

Location of sampling



Drain at „Okko`s Haus“ (A)

Coordinates: 53,4°N/7,55°O

Type of ater body: drain

Location of sampling:

Results of water analysis:

Chemistry

O_2-content	Fe	Al	Cu	Cl	P	Nitrate	Nitrite	NH_4	Carbonate
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	°d
10,00	0,50	0,40	0,00	40,00	-	7,00	0,70	-	-

„Lars Fischteich“ (B)

Coordinates: 53,4°N 7,65°O

Type of water body : Pont

Location of sampling:

Results of water analysis:

Biology

Name	Synonymous	Class	Indicator
Koi	*Cyprinus carpio*	Fish	-
Siberian sturgeon	*Acipenser baerii*	*Fish*	-

Chemistry

O_2-content	Fe	Al	Cu	Cl	P	Nitrate	Nitrite	NH_4	Carbonate
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	°d
0,00	0,00	0,10	0,00	60,00	0,00	0,00	0,00	0,50	13,00

Löschteich (KGS) (C)

Coordinates: 53,4°N 7,65°O

Type of water body : Pont

Location of sampling:

Results of water analysis:

Biology

Name	Synonymous	Class	Indicator
Dragon fly	*Aeshna juncea*	Insect	II
Common water strider	*Gerris lacustris*	Insect	-
Diving beetle	*Hyphydrus ovatus*	Insect	II
Colorless Levitation Cyclops	*Eudiaptomus gracilis*	Copepod	I-II
Common Copepod	*Macrocyclops fuscus*	Copepod	II
Water Flea	*Heterocypris incongruens*	Cladocera	II
Water Flea	*Simocephalus vetulus*	Cladocera	II

Chemistry

O_2-content	Fe	Al	Cu	Cl	P	Nitrate	Nitrite	NH_4	Carbonate
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	°d
2,00	0,30	7,00	0,00	7,00	0,00	0,00	0,00	0,50	2,00

Hundeteich KGS (D)

Coordinates: 53.4N°/7.61°O

Type of ater body: Pont

Location of sampling:

Results of water analysis:

Biology

Name	Synonymous	Class	Indicator
Colorless Levitation Cyclops	Eudiaptomus gracilis	Copepod	I-II
Water Flea	Sida crystallina	Cladocera	I-II
Water Flea	Daphnia pulex	Cladocera	III

Chemistry

O_2-content	Fe	Al	Cu	Cl	P	Nitrate	Nitrite	NH_4	Carbonate
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	°d
0,00	0,30	0,00	0,00	12,00	0,00	0,00	0,10	2,50	4,00

Drain (KGS) (E)

Coordinates: 53.4N/7.61O

Type of water body : Drain

Location of sampling:

Results of water analysis:

Biology

Name	Synonymous	Class	Indicator
Water Scorpion	Nepa Rupra	Insect	II
Diving bell spider	Argyroneta aquatica	Arachnid	II
Common Cyclops	Cyclops strenuus	Copepod	II
Colorless Levitation Cyclops	Eudiaptomus gracilis	Copepod	I-II
Dark Giant Cyclops	Macrocyclops fuscus	Copepod	II
Water Flea	Eurycerus lamellatus	Cladocera	II
Water Flea	Simocephalus vetulus	Cladocera	II

Chemistry

O_2-content	Fe	Al	Cu	Cl	P	Nitrate	Nitrite	NH_4	Carbonate
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	°d
6,00	>1,00	0,00	0,00	20,00	0,70	0,00	0,03	1,00	5,00

Rainwater (F)

Coordinates: none

Type of water body: not defined

Location of sampling:

Results of water analysis:

Chemistry

O_2-content	Fe	Al	Cu	Cl	P	Nitrate	Nitrite	NH_4	Carbonate
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	°d
4,00	0,00	0,50	0,00	2,00	0,10	0,10	0,07	0,40	3,50

Drain at the trail (G)

Coordinates: 53,35°N 7,6°O

Type of ater body: Drain

Location of sampling:

Results of water analysis:

Biology

Name	Synonymous	Class	Indicator
Carp	*Cyprinus carpio*	Fish	-
Pike	*Esox lucius*	Fish	-
Commonm Rudd	*Scardinius erythrophthalmus*	Fish	-
Common Roach	*Rutilus rutilus*	Fish	-

Chemistry

O_2-content	Fe	Al	Cu	Cl	P	Nitrate	Nitrite	NH_4	Carbonate
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	°d
4,00	0,00	0,00	0,00	50,00	0,50	15,00	0,15	>3,0	0,00

„Mirko's Teich" (H)

Coordinates: 53.4N°/7.635°O

Type of water body: Pont

Location of sampling:

Results of water analysis:

Biology

Name	Synonymous	Class	Indicator
Freshwater Jellyfish	*Craspedacusta sowerbyi*	Jellyfish	II

Chemistry

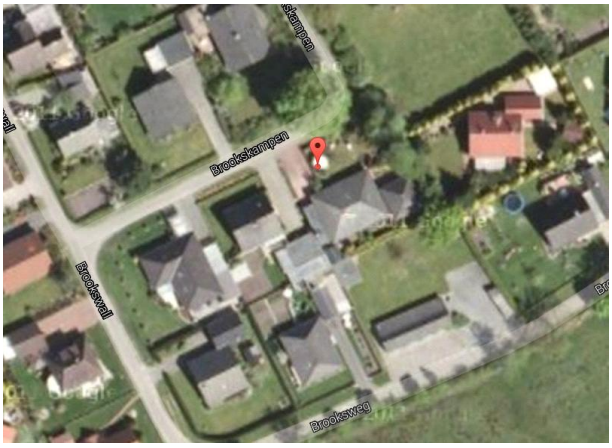
O_2-content	Fe	Al	Cu	Cl	P	Nitrate	Nitrite	NH_4	Carbonate
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	°d
0,00	0,50	0,00	0,00	1,00	0,00	0,00	0,00	0,00	4,00

„Nachbars Teich“ (I)

Coordinates: 53.43°N/7.56°O

Type of water body: Pont

Location of sampling:



Results of water analysis:

Biology

Name	Synonymous	Class	Indicator
Koi	*Cyprinus carpio*	Fish	-

Chemistry

O_2-content	Fe	Al	Cu	Cl	P	Nitrate	Nitrite	NH_4	Carbonate
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	°d
0,00	0,04	0,00	0,00	9,50	0,00	0,00	0,03	0,00	3,00

Drinking water (J)

Coordinates: 53,4N/7,760O

Type of water body: Groundwater

Location of sampling:

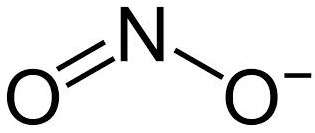
Results of water analysis:

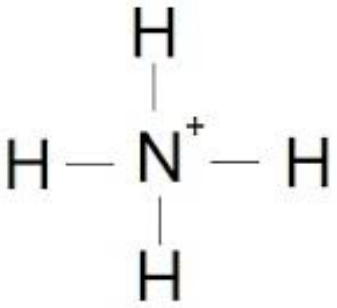
Chemistry

O_2-content	Fe	Al	Cu	Cl	P	Nitrate	Nitrite	NH_4	Carbonate
mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	°d
1,00	0,07	0,00	0,50	12,00	0,40	0,00	0,00	0,00	6,00

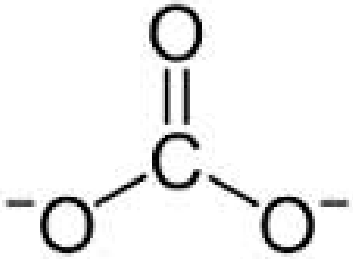
Chemical Parameters

Aluminium
13
Al
27,0

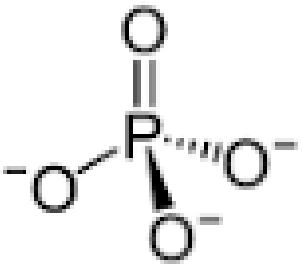




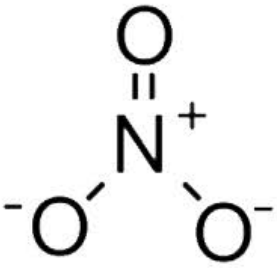
Iron
26
Fe
55,8



Copper
29
Cu
63,5



Oxygen
8
O
16,0



Chlorine
17
Cl
35,5

The students should examine different waters types, which they find in the closer surroundings of their school. In this connection it was important to argue with single parameters which influence the quality of the water. Hence, the following chemical parameters were analyzed: Metals (aluminium, iron & copper), nutrients (ammonium, nitrate, nitrite & phosphate), as well as chloride, the hardness and the respective oxygen salary.

All investigations were carried out with Viscolor©, Fa. Hedinger GmbH & Co. KG, Stuttgart.

The limit values for the various parameters, the following dates were fixed:

Parameter		**Euro Norm Drinking Water**	**Euro Norm Surface Water**
Ammonium		0,5 (0,05) mg/l	0,5 mg/l
Iron		0,2 mg/l	
Nitrate	At high concentrations it acts on the intestinal mucosa and the thyroid.	50 (25) mg/l	11 mg/l
Nitrite	Toxic > nitrate	0,50 mg/l	
Phosphate		(6,7 mg/l)	6,95 (0,56) mg/l
Oxygen		< 75%	
Chloride		250 mg/l	
Copper	Poisoning with vomiting, liver pain and as a result of cirrhosis of the liver.	2,0 mg/l	
Aluminium	Blood anemia, impairment of bone metabolism, arthritis, diseases of the nervous system.	0,2 mg/l	

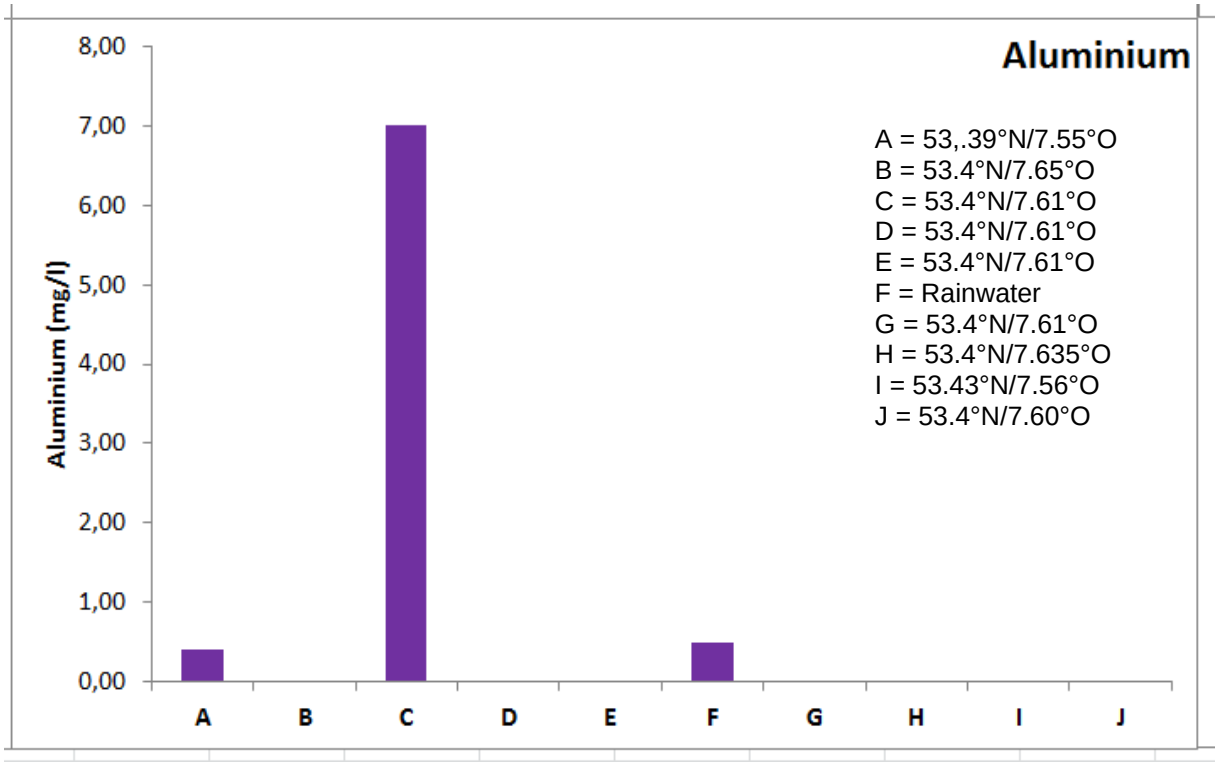
Aluminium

Use: Aluminum is used for the construction of aircraft, automobiles and railroadcars. It is also used for beverage cans, pots and pans.

Origin: Aluminum often under the earth's crust. It also occurs in water, but only in small quantities.

Limits: 0.2 mg/l.

Impact to the human organism: When human takes too much aluminum, clog pores and sweat glands die. But it can also cause breast cancer.



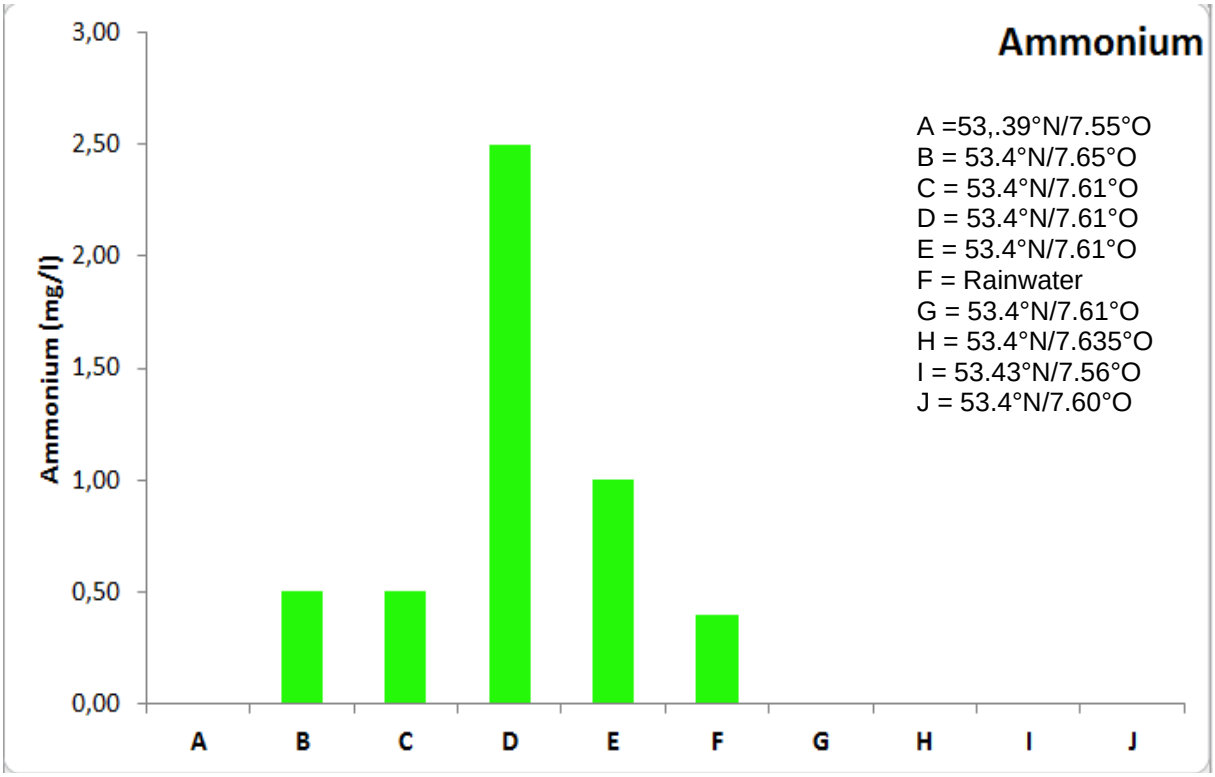
Ammonium

Use: Salts of ammonium are the main compounds of the anorganic chemical industry. They are mostly used as fertilizers and produced in millions of tons sometimes they are used to build batteries and colouring.

Origin: Ammonium can be found in the nature and it would excreded for example by fish.

Limits: 0.5 mg/l.

Impact to the human organism: Via protein surplus cells will be poisoned and killed.

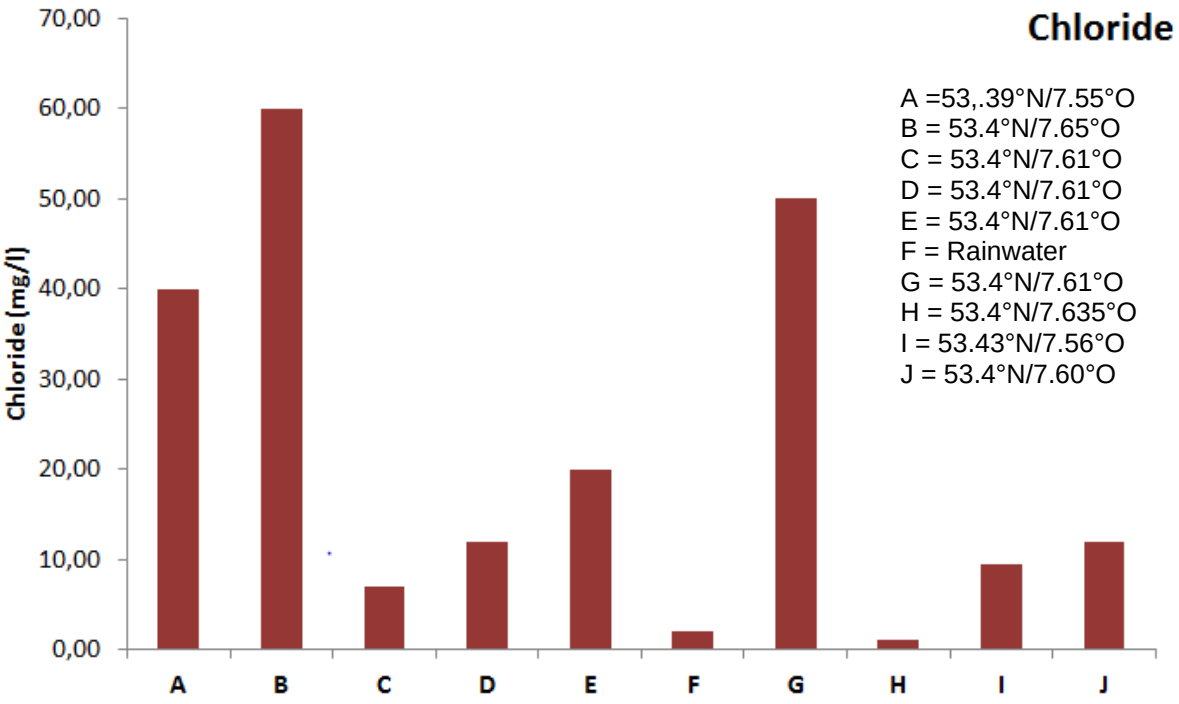


Chloride

Use: Chlorides are used for example to clean the water in a pool. **Origin:** The chlorides are in salt, which is scattered in the winter on the road to against the ice. This then dissolves in the water and then passes into the nearest body of water.

Limits: 250mg/l.

Impact to the human organism: Chlorides cause coughing, chest pain and accumulating water in the lungs, this can kill someone.



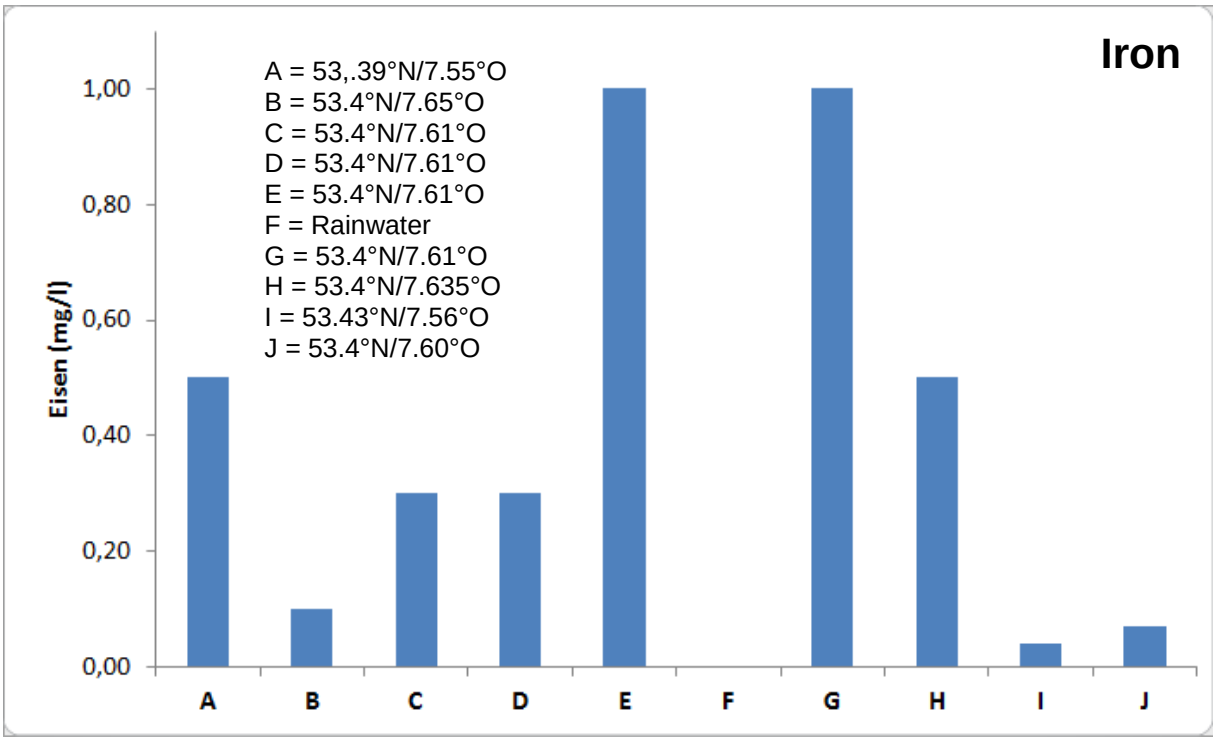
Iron

Use: Iron is the main constituent of steel. It is also used for magnetism. Pure iron powder is also used in the chemical. It can be found in cars, bridges, machineries or house building. In close iron is in nearly all areas of our life.

Origin: It can come in supernova explosions than meteor on the earth. Normal manner it is to see the earth. Iron is in the earth sheath 4.7%, 5.63% earth's crust and included in water.

Limits: 0.2mg/l.

Impact to the human organism : Iron shall ensure that the blood will supplied with enough oxygen. It can be lead to tissue damage or signs of toxicity in heart, pituitary gland, liver and the joints.



Hardness

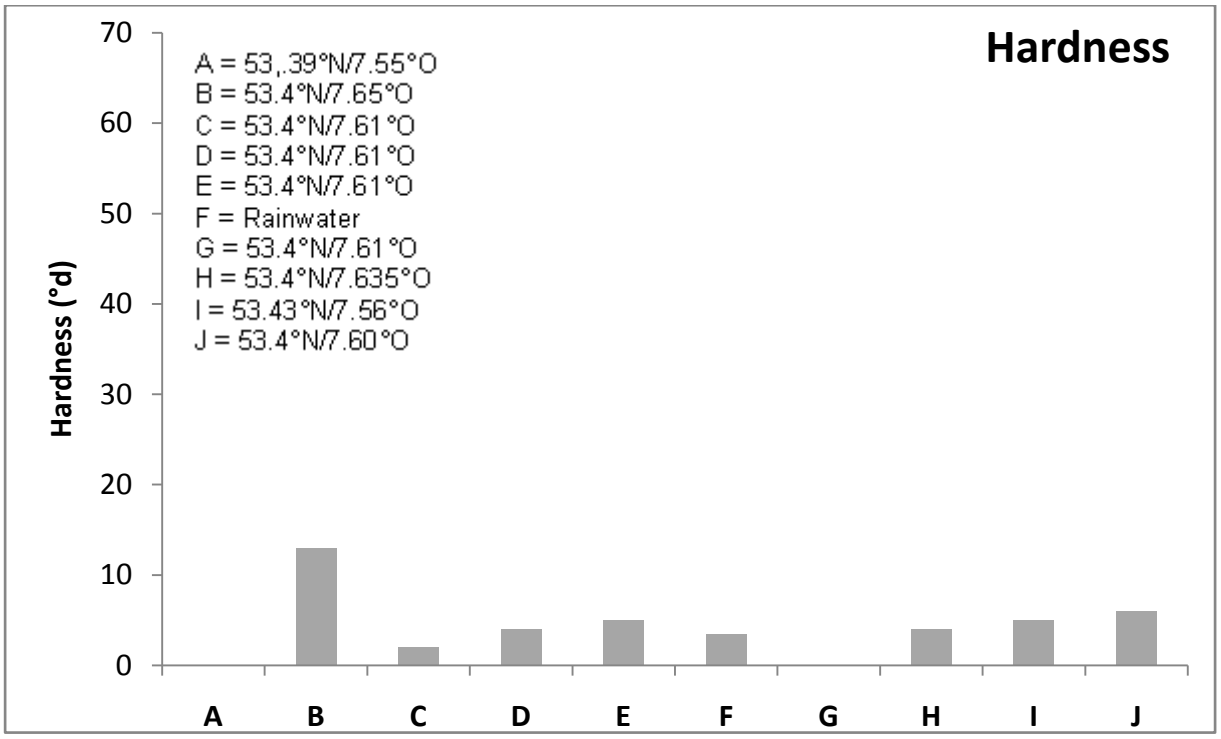
Definition: The total hardness refers to the ions that are dissolved in water. It is defined as “the temporary hardness” (Carbonate) and the “permanent hardness” (Non- Carbonate).

Calculation of total hardness: Hardness = (Ca * 1.4 + Mg * 2.307) / 10.

Impact: “Hard” water causes calcification of the water pipes. These calcifications increase the need of washing-up liquids and can change as much the flavor of the water. It leads to calcifications of household appliances. Soft water is good if you have to heat water. But it is not so good for washing hands because the soap can be solved not so good.

Classification:

Niveau	Hardness	°dh
1 (soft)	<1,3	0-7
2 (moderate)	1,3-2,5	7 -14
3 (hard)	2,5-3,8	14-21
4 (very hard)	3,8>	>21



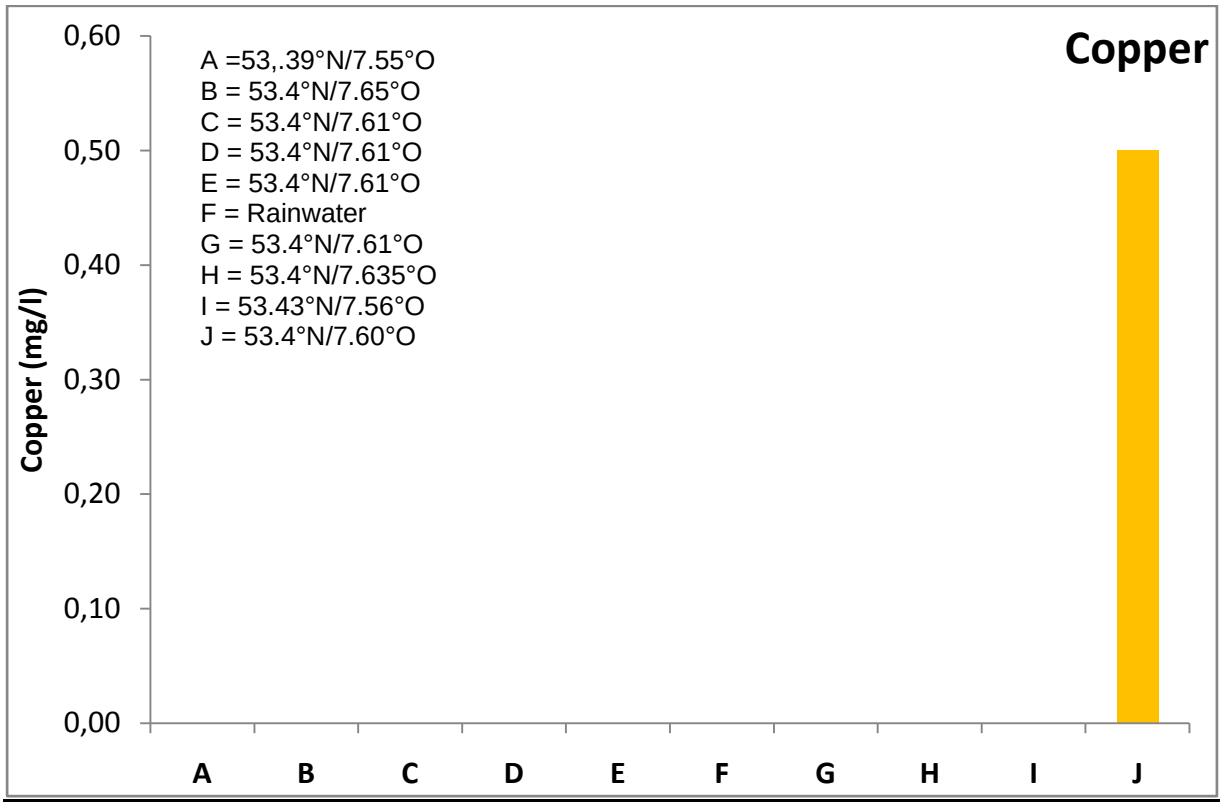
Copper

Use: Copper is used for pipes, coins, power cable, pots and the roof construction. It is found in almost every part of industry.

Origin: Copper has set itself firmly in the rock and is released by the water from the rock. Then it dissolves in water.

Limits: 2:0 mg/l.

Impact to the human organism: It is used in energy production, is required for the construction of the blood, for the formation of melanin (melanin, are reddish, brown or black pigments, which cause the color of the hair, eyes, skin and feathers). Copper also helps in building the immune system.



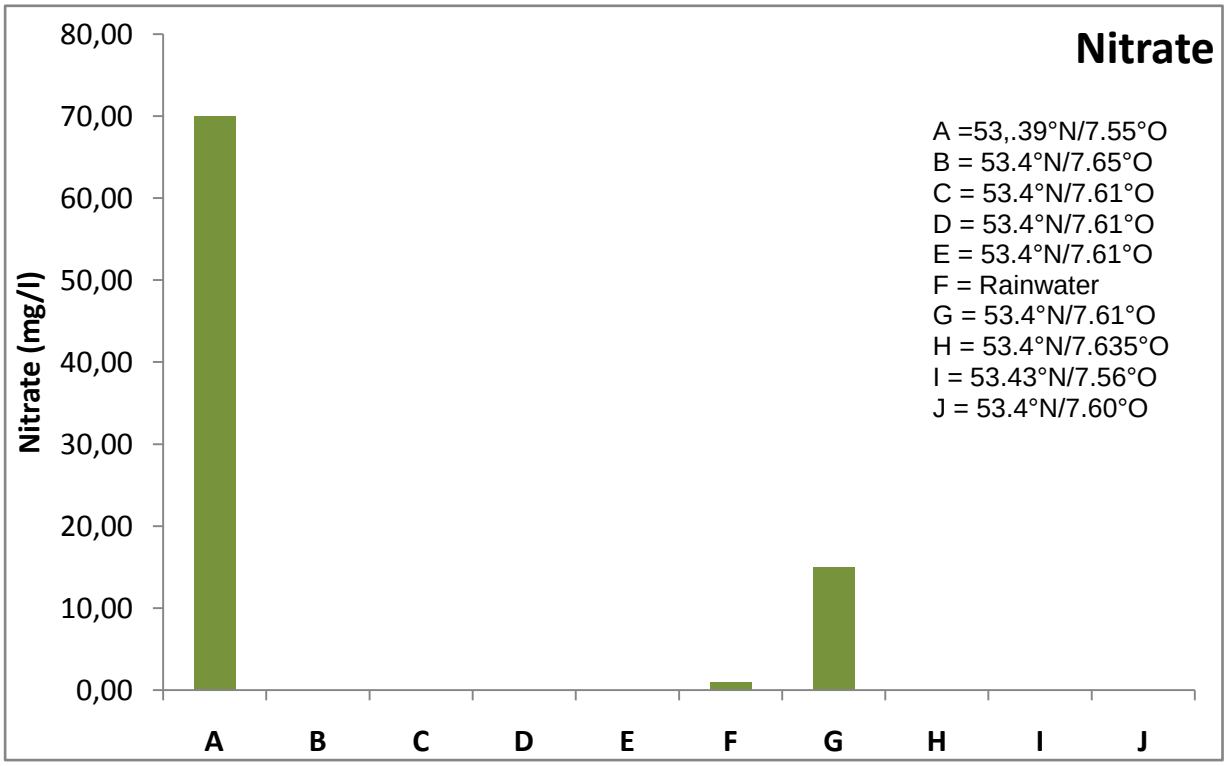
Nitrate

Use: Nitrate is used very much in the agriculture. The farmers are bringing it on the fields, about the rain it gets into our groundwater and so it comes in our drinking water.

Origin: Nitrate is used at fertilizer and oxygen donor. Because nitrate contains a lot of oxygen, it is also used in black powder (potassium nitrate) and it is used for lighting effects in the pyrotechnics.

Limits:
- Germany = 50 mg/l
- Switzerland = 25 mg/l
- Austria = 50 mg/l

Impact to the human organism : Nitrate interferes with the transport of oxygen**.**



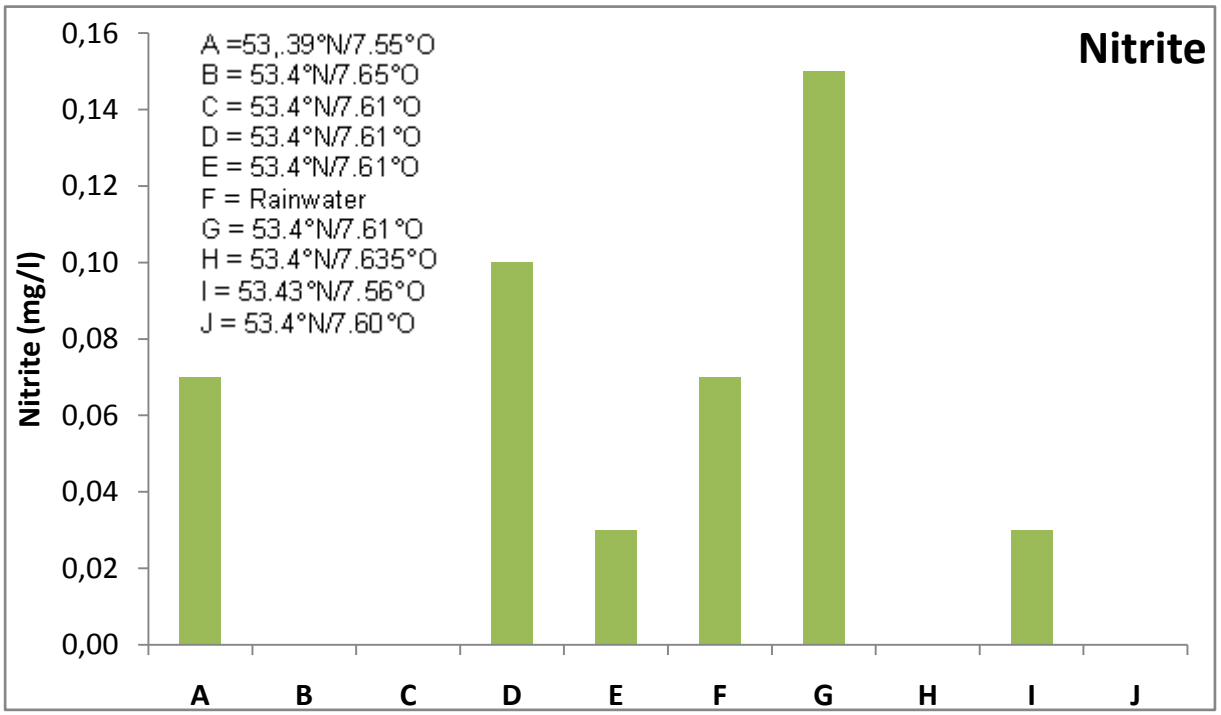
Nitrite

Use: As food additives, nitrites may be used as color stabilizers in the form of potassium (E 249) and sodium nitrite (E 250). In sausage production, the use of nitrites is required, because it prevents the development of highly dangerous botulism bacterium *Clostridium botulinum*.

Origin: Nitrite arises from Fertilizer, of reaching of soil and in the fertilizer nitrate is included. And in the nitrate are Nitrite bacteria and this come in to the phreatic water. Because nitrite is water soluble.

Limits: 0.50 mg/l

Impact to the human organism: When you have to much nitrite in your body you can get the blue disease (only babies up to the 6 months). When you have the blue disease, your body is a little bit blue, because the blood pigments are blocked.



Phosphate

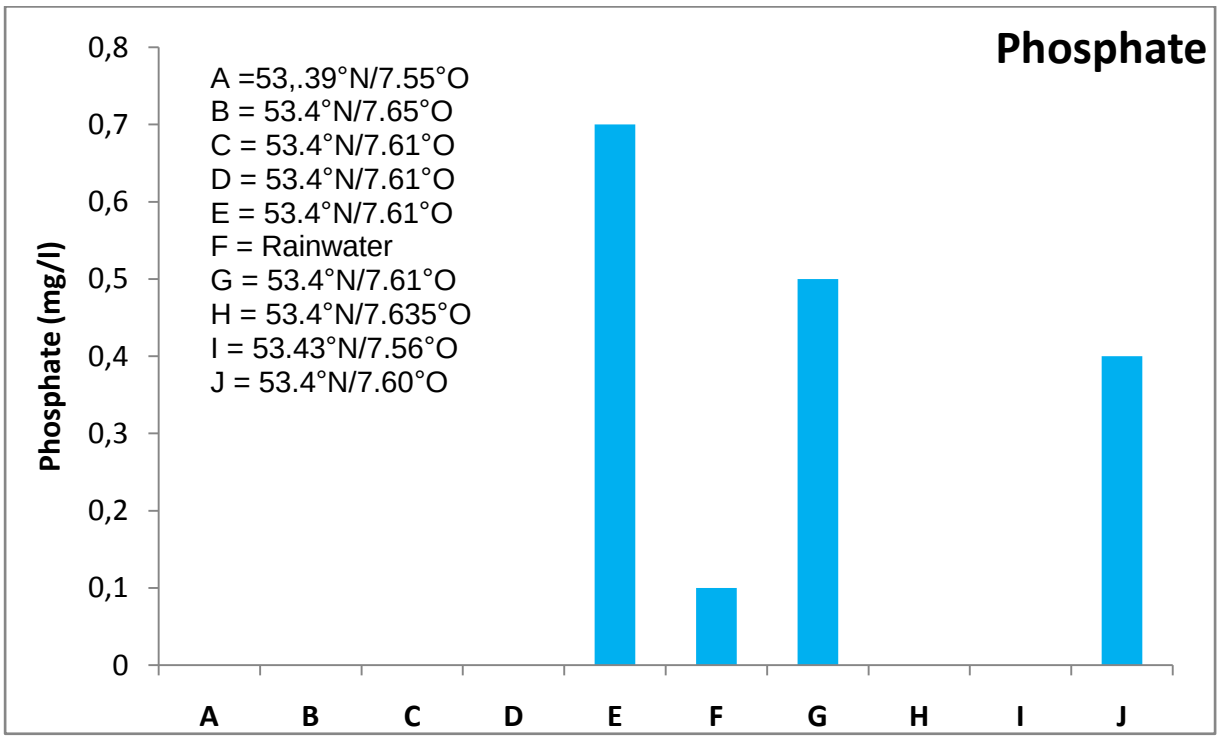
Use: The principal amount of phosphates is used as fertilizers (see Sperphosphate). The suitability of phosphates for fertilizer was discovered by chance: fell in the iron and steel production by the Thomas process as a by-product of the phosphate-rich Thomas flour, which turned out to be an excellent fertilizer.

Erosion of agricultural land phosphates enter bound to clay minerals in rivers and lakes and from there into the seas. In limnic and marine ecosystems they contribute significantly to eutrophication. Phosphates include a trigger of blue-green algae blooms (Cyanobakteria).

Origin: Phosphates produced during metabolic processes as an intermediate product and are essential for the development and utilization of body energy.

Limit: 5.65 mg/l guideline value 0.56 mg/l.

Impact to the human organism: Phosphate is not good for the body, for the human and animal immune system is phosphate a poison. It is also in food. Physicians require a quantitative indication of phosphate in food.



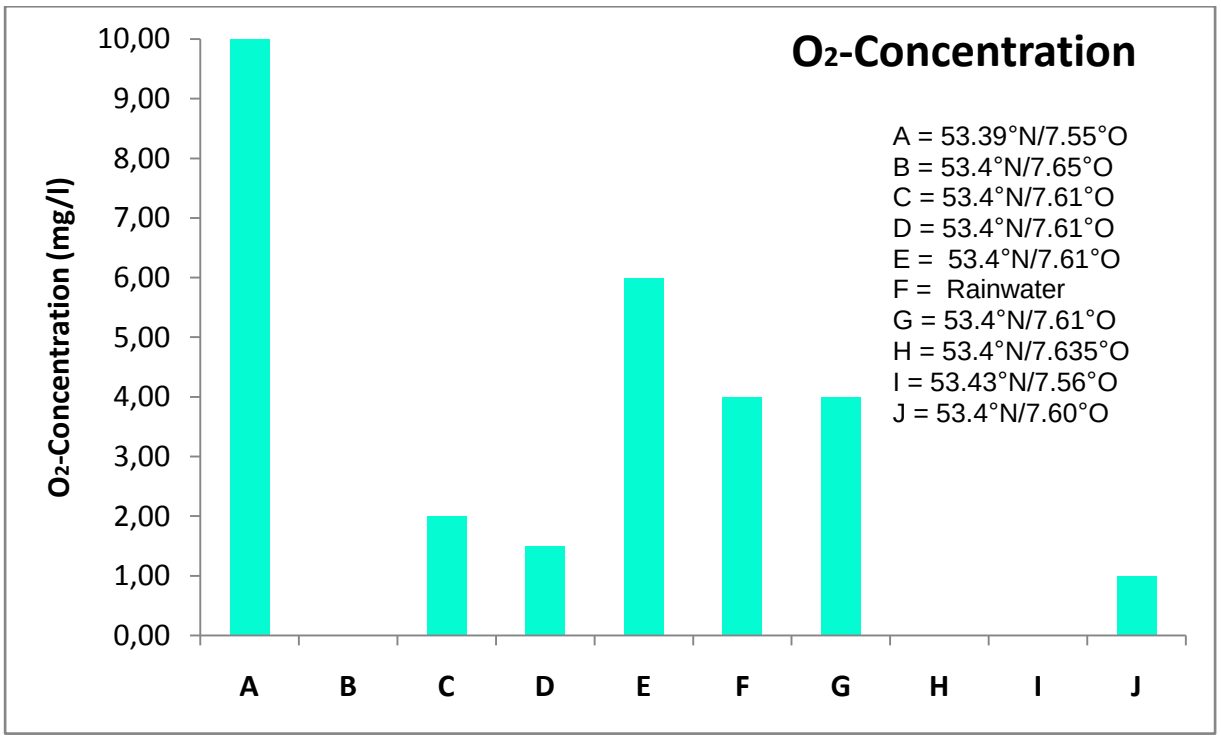
Oxygen

Origin: Oxygen comes from the air and activities of the plant into the water.

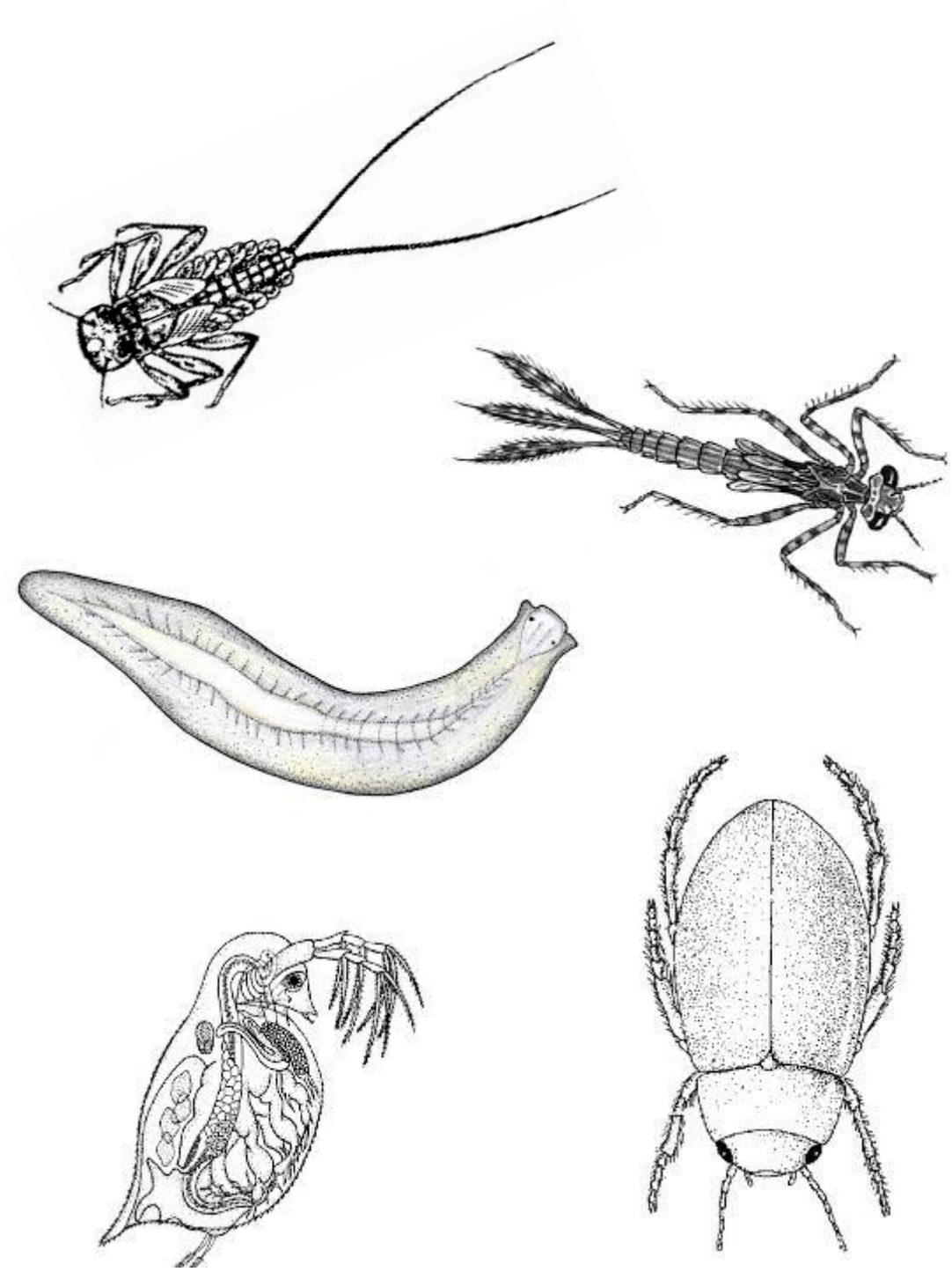
Limit: Most aquatic organisms require a minimum concentration for life. The saturation value is at 0 ° C 14.6 mg O_2/l and decreases at 20 ° C to 9.1 mg O_2/l. The fish critical concentration is reached at values less than 4 mg/l. In the drinking water of oxygen primarily for protective layer formation on the inner wall of metallic pipes is low oxygen levels are 6-8 mg l.

Environment: Almost all living “things” on earth need oxygen to live. 21% of the air is oxygen. By oxygen, there are many chemical reactions in the environment, such as stainless (for example iron). Also water is containing oxygen.

Impact to the human organism: The effect is positive, because every human being needs oxygen to breathe. However, it must be pure oxygen, because in the air and only 21% contained.



Biological Parameters



The german saprobic system (gr. *saprós*: rotten, *bios*: life) is a system for determining the biological pollution of rivers and water quality classification into classes based on the saprobic index. For this the mikrofauna, discovered in the watersamples (different types of protozoa, small crustaceans and insect larvae), are used as bioindicators.

A bioindicator is an organism that responds to environmental influences with changes his life functions or substances attaches or incorporates into the organism. These environmental influences are often caused by human activities. The response to specific stresses, as well as location and environmental conditions, such as moisture, light, heat, pH, nutrient material conditions of soil, water or air pollution is used in environmental monitoring

With the saprobic system the load of a stream with organic, easily degradable, oxygen-depleting substances from domestic wastewater is measured. Other water pollution are not indexed. These are e.g. burdens with toxic substances (heavy metals, pesticides), pollution with mineral nutrients, water acidification, thermal stress, exposure to structural degradation (river development) and by changing the hydraulic (low drawdown and desiccation phases, increased flood peaks by channel reductions).

For some of these loads own indication systems have been established which can be used in addition to the water monitoring. In the assessment of watercourses for the European Water Framework Directive an extended assessment system was set up (Perlodes).

Saprobic-Index	Degree of organic pollution	Water quality class
1,0 < 1,5	unloaded	**I**
1,5 < 1,8	low	**I-II**
1,8 < 2,3	moderate	**II**
2,3 < 2,7	critical	**II-III**
2,7 < 3,2	strong	**III**
3,2 < 3,5	very strong	**III-IV**
3,5 < 4,0	excessively	**IV**

Common water flea

(Daphnia pulex)

Family: Cladocera

Way of life: Depending on the season waterfleas occur in nature often in large numbers and are an important food source for fishes. They mainly inhabit standing waters. Even in small ponds, that exist only a few months in the year, some waterflea species develop from "resting eggs" that are buried in the soil or were blown away by the wind.

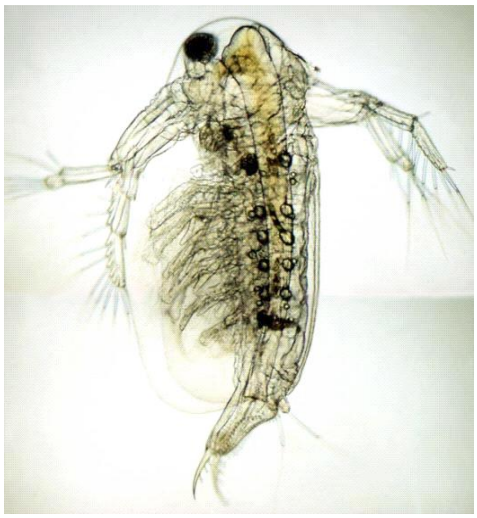
Bioindicator: Class II

Location: 53.4N/7.61O

Cristal water flea

(Sida crystallina)

Family: Cladocera



Way of life: The crystal water flea lives frequently along the banks of lakes and ponds with clear water. It likes to attach itself in the neck of water plants with his adhesiv organ. It also can swim fast (it does rarely). Mostly it hatches out even at 6-7 °C and can be found until November. It places its resting eggs without further protection to water.

Bioindicator: Class I-II

Location: 53.4N/7.61O

Broad tailed water flea

(Eurycerus lamellatus)

Family: Cladocera

Way of life: The very fast floating water flea is also found in winter under the ice. Even in winter it has eggs in his brood pouch. The eggs developevery slowl.

Bioindicator: Class II

Location: 53.4N/7.61O

Flathead water flea

(Simocephalus vetulus)

Family: Cladocera

Way of life: The Flathead water flea occurs frequently in the riparian zones of all waters. It feeds on algae.

Bioindicator: Class II

Location: 53.4N/7.61O

Common cyclops

(Cyclops strenuus)

Family: Copepoda

Way of life: The adults are predators of rotifers and small crustaceans. For reproduction, the male grasps the female with the right antenna. The rear leg pairs carry a seed capsule for genital opening of the female. By swelling of the capsule, the seed is pressed out and passes to the eggs. After mating, the females carry two packages with eggs with often more than 100 eggs. Within a month, the larvae develop over 11-12 stages to adults. The common cyclops swims between water plants and in the open water of ponds, e.g. in ponds and puddles. The cyclops provides for the fish is an important food because they multiply, especially in winter, when other food is scarce life.

Bioindicator: Class II

Location: 53.4N/7.61O

Dark cyclops

(Macrocyclops fuscus)

Family: Copepoda

Way of life The adults are predators. They eat small crustaceans and rotifers. The females carry two egg sacs. The larvae develop through five larval stages to the finished animal.

Bioindicator: Class II

Location: 53.4N/7.61O

Colorless cyclops

(Eudiaptomus gracilis)

Family: Copepoda

Way of life: The colorless hover cancer depends on its antennas in the water. Every few seconds, the cancer wins by a stroke of his oar legs back the missing height. The antennas are applied. In addition to this movement, the colorless hover cancer can glide slowly in elegant curves then. They can be a year old. They usually mate in the time of melt. After mating, the females wear a package with eggs.

Bioindicator: Class I-II

Location: 53.4N/7.61O

Common mosquito

(Culex pipiens)

Family: Mosquito

Way of life: Female mosquitoes feed on nectar-like juices and blood of mammals and birds. Males feed only on nectar and plant juices. After mate the "female" needs proteins which are found only in blood, therefore blood is important for reproduction. Mosquitoes perceive body heat, exhaled water vapor, CO_2 smell of sweat and other animal and human odors. If the source is found for blood, their compound eyes are used for landing. Mosquitoes are often in swarms, which consist mainly of males. If a female is in the swarm, it this recognized by the males at the lower flight of the females (circa. 350 Hertz). The males pounce formally on the female. Together, they sink to the bottom, where then also held the pairing that takes only a few seconds.

Bioindicator: Class II

Location: 53.4N/7.61O

Common water strider

(Gerris Lacustris)

Family: Water strider (*Gerridae*)

Way of life: The common water strider can occur together with almost all other species of the genus in the aquatic environment. A dense aerated fur on the body underside prevents sticking with water and enables movement on the water with the help of the surface tension. The animals bobbing sliding, but can also make long jumps. They feed exclusively predatory from living or dead, fallen into the water insects that are taken with the short front legs and then sucked out with the proboscis. Two generations are trained per year. The newborn, which have emerged from the middle of July, take a break and often overwinter far from their home waters ashore in leaf litter, under bark or stones. Only in the spring of next year, they are mating. The eggs are distributed in many months individually or together attached just under the water with a black juice or acid to plants and the like.

Bioindicator: Class II

Location: 53.4N/7.61O

Ball floater

(Hyphydrusovatus)

Familie: Insect (water-beetle)

Way of life: The ball floater has as many water beetles, a small air bubble. Thus he can survive under ice cover in winter, because the bladder is his air supply. The imago (parents) and the larva of the ball floater eat mainly insect larvae, isopods and copepods. In early summer and summer the female lays eggs, separately from water plants. The larvae develop during 6-8 weeks. The larvae of the ball floater can swim well. The front horn is used to crash their swag.

Bioindicator: Class II

Location: 53.4N/7.61O

Freshwater jellyfish

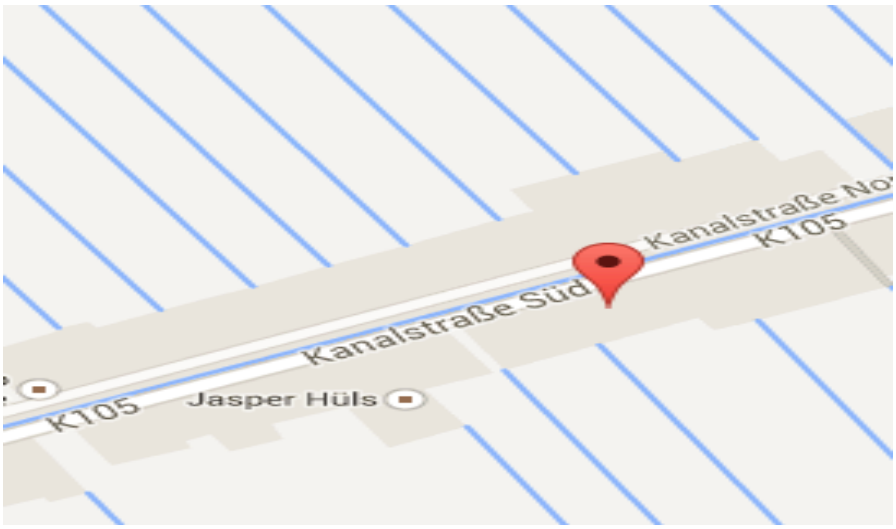
(Craspedacusta sowerbii)

Family: Jellyfish (*Limnomedusae*)

Way of life: The freshwater jellyfish likes more oligotrofic lakes, so nutrient-poor lakes. But some reports demonstrate that the freshwaterjellyfish is found also in mesotrophic waters. Best temperatures for the freshwater jellyfish are between19 and 25C°. If temperatures decrease less than 10 C°, the jellyfish changes to a different body, by contracting to a ball. The freshwater jellyfish eats probably little worms or it harms fish- and amphibian larvae.

Bioindicator: Class II

Location: 53.4N/7.61O



Common hawker

(Aeshnajuncea)

Family: Dragonfly (*Aeshnidae*)

Way of life: The common hawker is active from July to September and can be found primarily in moor waters. Especially in the late afternoon of sunny days you find the little males barking on trunks. Like most noble dragonflies the common walker is a persevering flyer. They often patrol along the shores or moats where they look actively for female. On this occasion, the common hawker often goes over in "shaking-flight". If a female is detected, it is seized immediately in the flight.

Bioindicator: Class II

Location: 53.4N/7.61O

Water scorpion

(Nepa Cinerea)

Family: *Insects (Nepidae)*

Way of life: Preferred habitat is near shore shallow water standing or slow-flowing, muddy waters. Water scorpions sitting on water-plants, in the mud or on old leaves, waiting for prey. For prey spectrum includes water fleas, water insect larvae to young small fish and larvae of amphibians. A prey animal approaches its prey legs, their feet folded quickly in the direction of the lower leg and the victim is trapped. The animals bite the prey with their proboscis mouth and suck it out then. The breathing tube is always kept within reach of the water surface. It is rare that water scorpions reside in deeper areas of water or on land. If they do not residences or rest, they move mostly in border crossing stalking on the flat ground away.

Bioindicator: Class II

Location: 53.4N/7.61O

Waterspider

(Agryroneta aquatica)

Family: Spiders

Way of life: The unusual habitat for a spider she opens up by collecting the breath required under a tightly woven network in the riparian zone. For the air Get the spider stretches her back legs and part of her abdomen from the water and dive under very jerky again. She takes a bubble, which is caught between the hair and the legs and abdomen silvery surrounds, with down. At a signal the threads she runs to her nest and wanders there, the air bubble in their "diving bells" from. There are 'eating, living, molting and reproduction bells. The bubbles last for several weeks or months. Water spiders live in planting rich, stagnant waters. Most common in bog ponds, in ditches and ponds. Very often in north german moors.

Bioindicator: Class II

Location: 53.4N/7.61O

Literature

- https://www.google.de
- http://www.wikipedia.de
- https://www.google.de/maps
- Helmut Schwab: „Süßwassertiere“, Klett-Verlag, Stuttgart
- https://translate.google.com/

The profile „Mensch & Natur“ (8G)

Tabea Buhr
Jasper De Wall
Okko De Wall
Marcel Dirks
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Julian Kleff
Rainer Leerhoff
Gesa Neuhaus
Lars Röseler
Lukas Schlömer
Tobias Thielke
Ole Ubben
Jannik Wiese
Lea Wieting

„EURO-Water-Administrators“

Laura Cramer
Michael Frahm
Lasse Moritz
Inken Schulte

Profile-supervisors

Jörn Haase
Dr. Dirk Wübben