The Baltic Sea Project

The 22nd International Environmental Camp School of Meri-Pori Upper Secondary
Finland 24.-29.4.2015

Program for the 22nd International Camp School 2015

Friday April 24

Arrival, taking lodgings at school

Saturday April 25

Introduction to the environmental Meri-Pori Upper Secondary and the camp school

The participating schools present themselves

Sightseeing in Pori City centrum, seeing around, shopping etc

Lecture about the environment in Pori, Nature House Arkki

Evening program at school
Participants' own activities

Sunday April 26

Reports about the environmental studies of Meri-Pori Upper Secondary

Environmental measurements:
- Chemical water analysis
- Bird watching

Monday April 27

In Huntsman industrial plant the participants get acquainted with the laboratories and the use of the x-ray fluorescence method in the analysis of the total sulphur content of pine needles.

Kirrinsanta Windpower Centre
Fortum Coal Power Plant

Program in Reposaari,
Teachers' meeting
Students visiting Finnish homes

Tuesday April 28

TVO nuclear power plant in Olkiluoto, Eurajoki

Working party in the Säkylänharju (military area)

Closing Ceremony

Wednesday April 29

Departure

Our camp school has been supported by *the National Board of Education*, *Huntsman Pigments*, *TVO*, *Fortum Power and Heat Oy*, *Pori Energia* and *the town of Pori*.

Participants

Finland

Katri Ylitalo
Hanna Numminen
Anne Kettunen
Karri Jutila
Anja Hokajärvi
Mikko Pajunen

Emilia Aalto
Anni Heininen
Aleksi Jussila
Juho Kallio
Ilari Kalliomäki
Matti Wiro

Poland

Malgorzata Fedor-Kubas
Andrzej Szostek

Kacper Kanturski
Maciej Mach
Monika Wolak
Aleksandra Prus

Estonia

Helgi Muoni
Tiina Söber

Alli Paukson
Alex Savolainen
Hannes Kristjan Rosenthal
Silver Tabo

Katrin Kello
Pilleriin Jukk

Measurement day

Introduction

We studied water quality and birds of the area of the River Kokemäenjoki, Lake Enäjärvi and Yyteri seashore.

Measuring points are marked on the map.

Observing places

1. The River Kokemäenjoki

The basin of the River Kokemäenjoki is the fourth largest in Finland. It gathers waters from a 30000 km^2 area.

About 130 000 people live in the river area. There are a lot of factories, power stations, fields and some forest. Nowadays the river, however, gets a lot less sewage and fertilisers than before. Therefore the stock of fish on the river has recovered. But still there are some fertilisers entering the river. Because of the industrial pollution of the previous decades, there are also heavy metals, such as mercury, still remaining in the bottom of the river. Predatory fish, such as pike and perch, may
therefore have high heavy metal contents.

The delta of the River Kokemäenjoki forms one of the finest estuaries in Finland. It is a labyrinth of islets and damp places, which is the habitat of versatile vegetation and animals. Our sampling place was on the shore of the delta of the river. This means that the water is shallow streaming slowly, which causes high sedimentation and therefore produces a mud bottom.

2. Lake Enäjärvi

Enäjärvi is a small lake near our school. It is one of the most extraordinary lakes in our country for its flora and fowl, because it is a representative of the Central European Potamogeton type. In the 1700's it was a gulf of the sea, which then, due to the rising of the earth (70 cm/100 years), was separated from the sea. Its length is 1,2 km, breadth 300 m and the average depth only 70 cm. The water is brown and its nutrient content is relatively high. The lake is the nesting area of hundreds of aquatic birds and gulls.

3. The Alluvial Land of Yyteri

Yyteri is an almost four kilometres long sandy beach and after the sandy area there are several kilometres of alluvial land.

Yyteri is located on the western coast of Meri-Pori. Our sampling place was on the alluvial land, where the shore water is shallow, the streaming of the water slow, and sedimentation high. It is a place where migrating waders and other aquatic birds have their resting area.

Water Research

Guiding teachers
Anja Hokajärvi
Anne Kettunen

Participants

Poland

Malgorzata Fedor-Kubas
Andrzej Szostek

Kacper Kanturski
Maciej Mach
Monika Wolak

Estonia

Helgi Muoni

Alli Paukson
Alex Savolainen

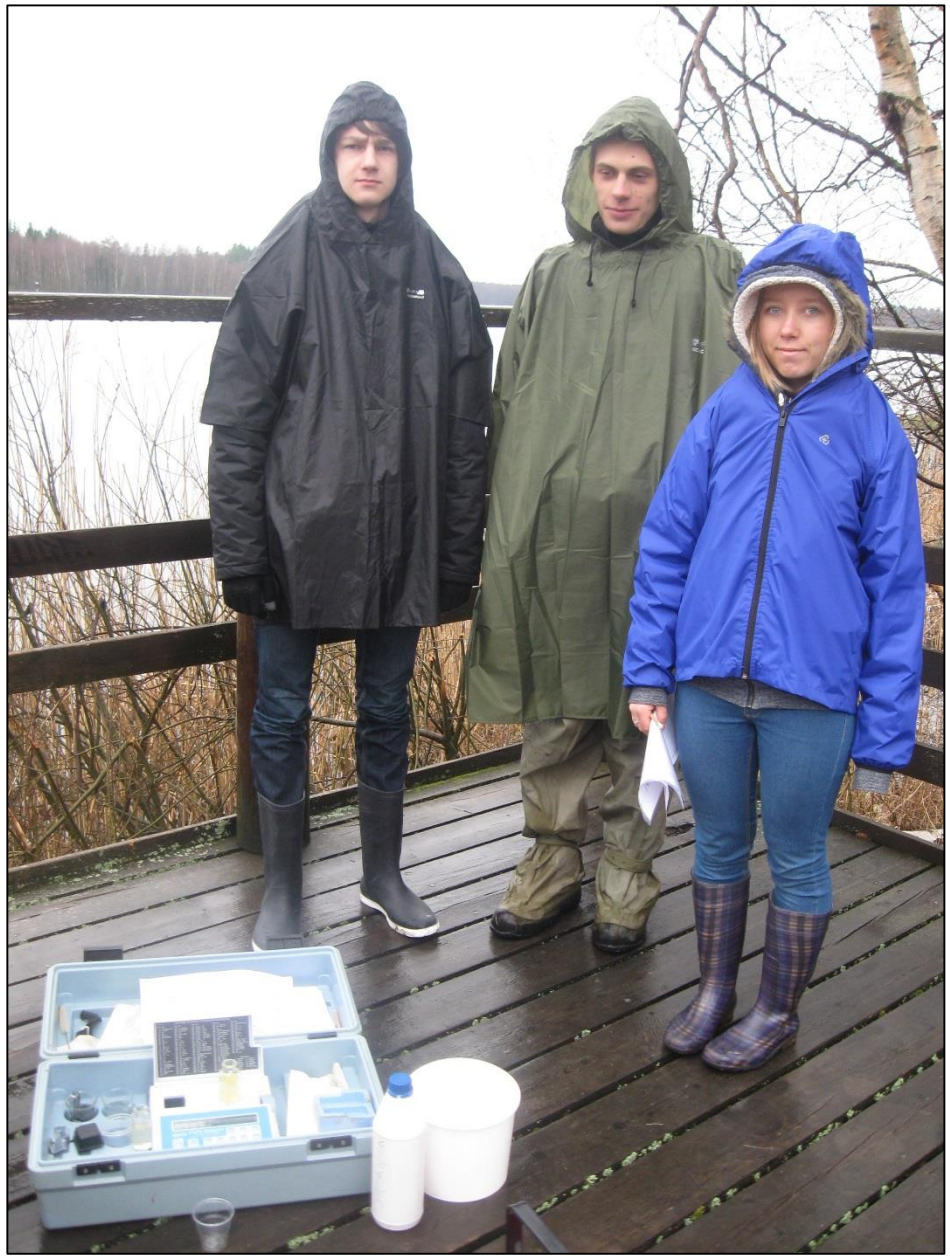
Katrin Kello
Pilleriin Jukk

Finland

Emilia Aalto
Anni Heininen

Many factors have impact on the water quality - for instance ground, bedrock, vegetation and man. In densely populated areas the influence of man is great. The influence of man becomes apparent in the pollution and over-fertilization of water.

The quality of water can be studied in many ways.
The aim of our water research was to study the
water samples by chemical measuring of the water quality.



Water analysis

We determined the temperature, conductivity, and TDS (total dissolved solids) by Hach Conductivity/TDS meter. The contents of iron, nitrates, nitrites and phosphates we measured spectrometrically by the Hach DREL 2000 spectrophotometer at the sampling places.
The pH-values were measured by pH-meter and free oxygen with Hach oxygen meter.

A spectrophotometer consists of two instruments, namely a *spectrometer* for producing light of any selected color (wavelength), and a *photometer* for measuring the intensity of light. The instruments are arranged so that liquid in a cuvette can be placed between the spectrometer beam and the photometer. The amount of light passing through the tube is measured by the photometer. The photometer delivers a voltage signal to a display device, normally a galvanometer. The signal changes as the amount of light absorbed by the liquid changes. If development of color is linked to the concentration of a substance in the solution, that concentration can be measured by determining the extent of absorption of light at the appropriate wavelength.

Conductivity is a measure of the ability of water to pass an electrical current. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions (ions that carry a

negative charge) or sodium, magnesium, calcium, iron, and aluminum cations (ions that carry a positive charge). Organic compounds like oil, phenol, alcohol, and sugar do not conduct electrical current very well and therefore have a low conductivity when in water. Conductivity is also affected by temperature: the warmer the water, the higher the conductivity. The basic unit of measurement of conductivity is the siemens. Conductivity is measured in milli- or microsiemens per centimeter (mS/cm, µS/cm). Conductivity is measured with a probe and a meter. Voltage is applied between two electrodes in a probe immersed in the sample water. The drop in voltage caused by the resistance of the water is used to calculate the conductivity per centimeter. The meter converts the probe measurement to µS/cm
and displays the result for the user. Some conductivity meters can also be used to
test for total dissolved solids and salinity.

The pH probe measures pH as the concentration of hydrogen ions surrounding a thin-walled glass bulb at its tip. The probe produces a small voltage (about 0.06 volt per pH unit) that is measured and displayed as pH units by the meter. pH meter is nothing else but precise voltmeter, connected to the pH electrode, and scaled in such a way that it displays not the measured potential, but ready pH value.

Dissolved oxygen analysis measures the amount of gaseous oxygen (O_2) dissolved in an aqueous solution. Oxygen gets into water by diffusion from the surrounding air, by aeration (rapid movement), and as a side product of photosynthesis. When performing the dissolved oxygen test, only grab samples should be used, and the analysis should be performed immediately. Therefore, this is a field test that should be performed on site. Total dissolved gas concentrations in water should not exceed 110 percent. Concentrations above this level can be harmful to aquatic life. Adequate dissolved oxygen is necessary for good water quality. Oxygen is a necessary element to all forms of life.

Chemical water analysis

The 22nd International Camp School of Meri-Pori Upper Secondary

26.4.2015	**Yyteri Sea**	**Lake Enäjarvi**	**Kokemäenjoki River**
Temperature (°C)	7,3	8,2	7,3
pH	8	6,8	7,7
Conductivity mS/cm	7,37	0,22	0,095
TDS g/l	3,71	0,11	0,048
Fe mg/l	0,33	2,61	0,4
NO_3^- mg/l	0,0	0,6	0,0
NO_2^- mg/l	0,003	0,009	0,006
PO_4^{3-} mg/l	0,05	0,01	0,0
O_2 (free) mg/l	11,4	1,3	9,7
Percentage of oxygen saturation (%)	95,8	11,3	82,7

The conclusions

The water quality of the river Kokemäenjoki

In the river water, the content of phosphates (0,0 mg/l) was rather low. Usually in springtime waters have bought phosphates from riverside agricultural fields to the river. In addition the sampling place on the muddy delta area of The Kokemäenjoki river contains some amount of phosphates, too.
The phosphorus compounds that are brought by rivers to the Baltic Sea, are very dangerous. As to the algae growth, the content of phosphorus is the most important factor and that's why the increase of phosphorus will cause an increase of algae and the danger of poisonous algal blooming.
The content of nitrates in the river water was also very low (0,0 mg/l). The main source of nitrates in river water are the riverside agricultural fields. In addition the waste water treatment plants along the river still have a lot of work to do in order to have a better purification ratio for nitrates.

Fortunately there in Pori area many municipalities has combined their waste water treatment plants to one big Luotsinmäki refinery that has very straight orders in purification. The purification there is nowadays excellent, last year the efficiency of purification 81 % (the limit is > 70 %).
The content of nitrites (0,006 mg/l) was quite high. This must be due to the muddy bottom.
The iron content is rather high because of the humus that the river has brought and left to the delta area of the river Kokemäenjoki.
The percentage of oxygen saturation in the surface water was 82,7 %.

The water quality of Lake Enäjärvi

Enäjärvi is an eutrophic lake with a relatively high pH-value. The pH of this year was quite normal, 8,2. Usually the Finnish lakes have significantly smaller pH-values The effect of calcium carbonates in the soil of Enäjärvi area is rising up the pH. On the other hand the great amount of humus in the muddy bottom is trying to lower this value.
There is really a great amount of biomass (1 m thick mud layer) in the bottom of Lake Enäjärvi. From that background, the measured big amount of nitrates (0,6 mg/l) is quite understandable.
The amount of free oxygen (11,3 %) was extremely low. The spring has been quite cold so the growth of plants and algae and photosynthesis activity has not started.
The humus decaying processes are going on in the bottom mud and that can be seen in the concentration of nitrites: 0,009 mg/l.
The soil of Enäjärvi area is old sea bottom and so it has high amounts of iron. The great amount of humus in the bottom of the lake and in coastal moss areas is also a reason to the high iron content: 2,61 mg/l.

The water quality of the Yyteri alluvial land

The shallow water of Yyteri alluvial land and lack of strong streamings allow great sedimentation. Still the sandy bottom seems to stay rather clean, but below the sand surface there is mud. Coastline and the areas near the coast contain still bigger amounts of biomass. The nutrients of the biomass that winds and waves have brought may stay in the area. In spring and autumn time huge amounts of geese overnight at this area, and they have a rather big influence on the water by fertilising it. But depending on winds, the water can be cleaner open sea water or more fertilized coastal water.

Our results show 0,0 mg/l nitrates, 0,003 nitrites and 0,05 mg/l phosphates. As to been measured from sea samples these last values are high. Coastal waters seem to have stayed now in the area.

The measured content of free oxygen was rather high in seawater, 95,8 %. Large areas of shallow water allow free oxygen to dissolve efficiently from the air into a relatively small volume of water. Winds and waves mix small air bubbles into the water, so there is no wonder that oxygen content was this high.

The high content of salinity, high conductivity and relatively high pH values are natural things in sea water samples. Seawater is salty and has good buffering compounds like hydrogen carbonates against acidification. So the measured this year´s pH value of 7,3 seems quite normal.

When humus particles are decayed they create ammonia, and ammonia turns to nitrites. Nitrites turn to nitrates in a short time, and that is why, we do not usually find any big amounts of nitrites.

The bottom of the sea area seemed to be relatively clean sand but below a very thin sandlayer there was thick layer of mud, so the measured content of nitrites (0,003 mg/l) is understandable.

The amount of iron was quite small compared with last year’s result, but we have earlier got also high values. On measurement day the sea level was + 8 cm.

Results from last year's camp school

29.5.2014	**Yyteri Sea**	**Enäjarvi Lake**	**Kokemäenjoki River**
Temperature (°C)	13,0	15,0	14,6
pH	7,9	7,5	8,3
Conductivity mS/cm	9,25	0,276	0,103
TDS g/l	4,6	0,136	0,057
Fe mg/l	2,16	2,61	0,59
NO_3^- mg/l	0,1	0,6	0,7
NO_2^- mg/l	0,011	0,031	0,039
PO_4^{3-} mg/l	0,09	0,52	0,05
O_2 (free) mg/l	9,9	7,1	9,8
Percentage of oxygen saturation (%)	94,4	71,5	96,4

Bird watching

Guiding teacher
Hanna Numminen
Karri "Scops" Jutila

Participants

Finland

Aleksi Jussila
Juho Kallio
Ilari Kalliomäki
Matti Wiro

Estonia

Hannes-Kristjan Rosenthal
Tiina Söber
Silver Tabo

Poland

Aleksandra Prus

Background

Bird group observed bird species in three locations: Kokemäenjoki river delta (Metsämaa boardwalk), lake Enäjärvi and Yyteri alluvial seashore. Located only few kilometres away of each other they represent different waterbeds. The day was rainy and cool.

Results

We observed total 57 birds, which is the second best result in the 22 year history of MPL camp schools. (* means that only waterfowl was count).
A special thing in this year's camp school was that it was organised in late April, whereas earlier it has been one month later.

Year	Number of Species
1995	26
1997	27
1998	*27
1999	*18
2000	67
2001	52
2002	36
2003	27
2004	41
2005	47
2006	52
2007	51
2008	43
2009	52
2010	43
2011	55
2012	46
2013	44
2014	56
2015	57

Metsämaa boat harbour is on the southern shore of the River Kokemäenjoki delta. Large reedbeds spread over the largest river delta of Fennoscandia: this delta spreads seawards about thirty metres annually. That creates important breeding area for gulls and waterfowl.

Lake Enäjärvi is a nutrient-rich lake. Few centuries ago it was a bay along Bothnian Sea, which due to land uplift became a freshwater lake. Last century it was used as a dumping site and in the 1970's there bred several thousand pairs of black-headed gulls *(Larus ridibundus)*. The gulls also gave shelter to waterfowl on the lake. In the 1990's this gull colony rapidly vanished but since that a smaller colony returned on the lake. There are three bird observation towers or decks and a nature trail around the lake.

Yyteri alluvial seashore is a sandflat spreading along the coast of Bothnian Sea. The area attracts shorebirds and waterfowl during spring and autumn migration. A typical bird for this area is shelduck *(Tadorna tadorna)*. Nowadays the meadow area is kept down by annual working partys in order to maintain endangered population of dunlin subspecies *(Calidris alpina schinzii)*. Yyteri is nationally popular among birders, there are two bird towers, and walking on meadow and sand is now regulated to ensure breeding & resting peace to birds. Town of Pori continues building new trails on this area.

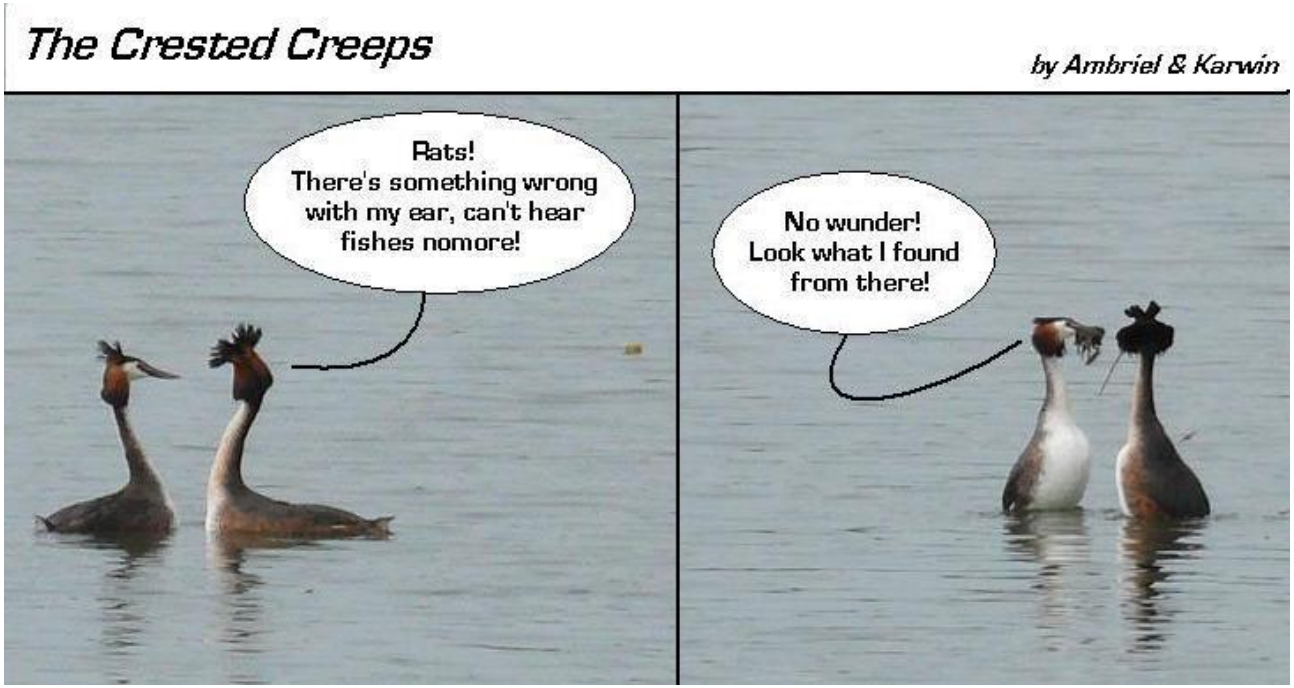
Birds 2015 (**bold** species are new to camp school history)

Scientific name	**English name**	**Finnish name**	**Delta**	**Enäjärvi**	**Yyteri**
Alauda arvensis	Skylark	Kiuru			X
Anas acuta	Pintail	Jouhisorsa			X
Anas clypeata	Shoveler	Lapasorsa			X
Anas crecca	Teal	Tavi	X	X	X
Anas penelope	Wigeon	Haapana			X
Anas platyrhynchos	Mallard	Sinisorsa	X		X
Anas querquedula	Garganey	Heinätavi			X
Anser anser	**Greylag goose**	**Merihanhi**			**X**
Anthus pratensis	Meadow pipit	Niittykirvinen			X
Anthus trivialis	Wood pipit	Metsäkirvinen			X
Ardea cinerea	Grey heron	Harmaahaikara	X	X	
Aythya fuligula	Tufted duck	Tukkasotka	X		
Bombycilla garrulus	**Waxwing**	**Tilhi**			**X**
Bonasa bonasia	**Hazel grouse**	**Pyy**		**X**	
Botaurus stellaris	Bittern	Kaulushaikara			X
Branta leucopsis	**Barnacle goose**	**Valkoposkihanhi**			**X**
Bucephala clangula	Goldeneye	Telkkä	X	X	
Calidris alpina	Dunlin	Suosirri			X
Carduelis spinus	Siskin	Vihervarpunen	X		X
Charadrius hiaticula	Ringed plover	Tylli			X
Certhia familiaris	Treecreeper	Puukiipijä	X		X
Corvus corax	**Raven**	**Korppi**			**X**
Corvus corone	Hooded crow	Varis		X	
Cygnus cygnus	Whooper swan	Laulujoutsen	X		X
Cygnus olor	Mute swan	Kyhmyjoutsen	X	X	
Emberiza citrinella	Yellowhammer	Keltasirkku			X
Emberiza schoeniclus	Reed bunting	Pajusirkku	X	X	X
Erithacus rubecula	Robin	Punarinta	X	X	X
Fringilla coelebs	Chaffinch	Peippo	X		X
Fulica atra	Coot	Nokikana		X	

Gallinago gallinago	Common snipe	Taivaanvuohi			X
Gavia arctica	Black-throated diver	Kuikka			X
Larus argentatus	Herring gull	Harmaalokki	X	X	X
Larus canus	Common gull	Kalalokki	X	X	X
Larus minutus	Little gull	Pikkulokki			X
Larus ridibundus	Black-headed gull	Naurulokki	X	X	X
Limosa limosa	Bar-tailed godwit	Punakuiri			X
Mergus albellus	Smew	Uivelo	X		
Mergus merganser	Goosander	Isokoskelo	X	X	X
Motacilla alba	Pied wagtail	Västäräkki			X
Numenius arquata	**Curlew**	**Kuovi**			**X**
Parus ater	Coal tit	Kuusitiainen		X	
Parus caeruleus	Blue tit	Sinitiainen	X	X	
Parus major	Great tit	Talitiainen	X	X	X
Podiceps cristatus	Great crested grebe	Silkkiuikku	X	X	
Prunella modularis	Dunnock	Rautiainen		X	X
Sterna caspia	Caspian tern	Räyskä			X
Sterna hirundo	Common tern	Kalatiira		X	
Tadorna tadorna	Ruddy shelduck	Ristisorsa			X
Tringa nebularia	**Greenshank**	**Valkoviklo**			**X**
Tringa ochropus	Green sandpiper	Metsäviklo			X
Tringa totanus	Common redshank	Punajalkaviklo			X
Turdus merula	Blackbird	Mustarastas	X		X
Turdus philomelis	Song thrush	Laulurastas			X
Turdus pilaris	Fieldfare	Räkättirastas		X	
Vanellus vanellus	Lapwing	Töyhtöhyyppä			X
Summa summarum	**Sum**	**Summa**	**21**	**20**	**43**

According to this quick study on birds in Pori, the best birding location was Yyteri seashore. The river delta site used to have plenty of open water, but now it is getting overgrown by reed *(Phragmites australis)*, and it is more difficult to see ducks and geese there. Luckily, as the campschool was now organised one month earlier than usual, new vegetation had not emerged yet. Today's weather also had an impact on the bird results: During delta destination we enjoyed constant rain and telescopes kept on getting wet. In Enäjärvi we observed from a sheltered hide - which on the other had had been partially destroyed by local aporiginals. On Yyteri sandflats we observed water only on the sea.

Most widespread bird species were teal, reed bunting, robin, black-headed gull, herring gull, common gull, goosander and great tit. According to bird counts in Finland, the most common species are willow warbler, chaffinch and redwing. This year we also observed six new species for the camp school bird list: on Enäjärvi lakeshore forest we heard a hideous hazel grouse whistling and in Yyteri we observed raven, barnacle goose, greenshank and flocks of migrating waxwings, greylag geese and curlews.



Other camp school activities

Thank you everyone!

Meri-Pori Upper Secondary
Rieskalantie
FI-28800 Pori

tel. +358 2 6353836
firstname.lastname@edupori.fi