UNIVERSITÉ DE GENÈVE
INSTITUT DES SCIENCES DE L'ENVIRONNEMENT

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UNIVERSITÉ DE LORRAINE

Odessa State Environmental University

NEAR 4 International Summer School

Water related issues in the Odessa region - Danube Delta, Ukraine

September 10th - 18th, 2012

Organizers:
N. Berlinsky - J.-L. Loizeau - D. Vignati



With the financial support of

UNIVERSITÉ DE GENÈVE

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Fonds national suisse
Schweizerischer Nationalfonds
Fondo nazionale svizzero
Swiss National Science Foundation

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Swiss Academy of Sciences
Akademie der Naturwissenschaften
Accademia di scienze naturali
Académie des sciences naturelles

NEAR 4

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1. GENERAL INFORMATION

Summer School Overview

The summer schools of the MUSE aim at providing the participants with a theoretical-practical overview of selected environmental problems of general public interest. The course searches for an integrated environmental, economical and social approach to selected problems and ought to allow the students to perform practical work on selected scientific aspects.

The programme includes lectures on various topics given by local experts and invited scholars. Lectures will be integrated, whenever possible, with direct observations by means of site visits or practical field/ laboratory work. An active participation of the students, along with scientific and cultural exchanges between students and teachers from various countries are the priorities of the summer school.

Selected topics presented and discussed during the summer school include:

- General information on the Odessa region, the Danube delta and the NW Black Sea
- Water management in the Odessa region (drinking and waste water management)
- Impact of climate change on water resources, coastal erosion
- Socio-economical implications and transboundary issues in the management of the Danube delta.

Participating Institutions

Faculty of Environmental Sciences , Odessa State Environmental University, Ukraine

Institut F.-A. Forel, Earth and Environmental Sciences Section / Environmental Sciences Institute, University of Geneva, Switzerland

Laboratoire des interactions écotoxicologie, biodiversité, écosystèmes, University of Lorraine, CNRS UMR 7146, France

School of Biological, Earth and Environmental Sciences, University College Cork, Ireland

Faculty of Ecology , Kharkiv Karazine National University, Ukraine

Faculty of Geology, Moldova State University, Moldova

Geology Institute of Azerbaijan, National Academy of Sciences, Azerbaijan

St Andree University of Patriarchate of Georgia, Georgia

GeoEcoMar, Ministry of Scientific Research, Romania

Faculty of Geology and Geophysics, University of Bucharest, Romania

Faculty of Environmental Sciences, Babes-Bolyai University of Cluj-Napoca, Romania

Institute of Water Supply and Environmental Sciences, Cracow University of Technology, Poland

Evaluation criteria

NOTE: the following criteria concern the students from the University of Geneva. Students from other institutions should check with their own supervisors for the applicability of the following criteria.

Each evening, a “summary of the day” will have to be prepared by students organized in groups. The presentation of this summary and the following discussion will account for 50 % of the final mark.

The proficiency of each participant will be INDIVIDUALLY evaluated at the end of the summer school by means of a written essay (to be submitted in English or French).

A list of possible questions for the exam will be circulated early during the week. The questions will address both the content of the didactic material distributed during the school and the issues dealt with in lectures and in the field. Just before the beginning of the exam, each student will randomly draw one of the questions from the list.

The essay (2–3 pages) must be returned to the accompanying teachers. The results of the evaluation will be communicated before the official closing of the school.

The essay will account for 50% of the final mark.

Summary of the day

(Instructions to students)

The objective of this activity is to train students to condense the relevant information from the “ensemble” of lectures, field trips and exercises at the end of each day. Fixing “what has been learnt” at the end of a hard day of work facilitates long-term retention of key information and maximizes the didactic results of the entire field trip.

The duration planned for this activity is approximately 30–45 minutes. We expect the typical layout of a “summary” to be as follows:

10–15 minutes: presentation by students

- Short summary of what has practically been done during the day **and why** (5 minutes)
- Discussion of the relevance of the daily activities for the management and environmental problems of the Danube Delta and for global/general environmental issues.

10–15 minutes: questions by the accompanying teachers on the content of the presentation and, if applicable, on general aspects of environmental issues examined during the MUSE courses and mentioned during the presentation

10–15 minutes: final discussion with all the participants about the scientific aspects of the daily activities, doubts, clarification and so on.

People responsible for the summary of each day should organize themselves so that each one will speak and animate the summary for approximately the same time. Note that marks for the summary will be given individually.

Language for this activity: English

Field work and accommodation material checklist

A substantial time of the summer school will be dedicated to field excursion and exercises.

Students are requested to bring the following material, in addition to their personal belongings.

- ☐ Field book to take notes in the field …
- ☐ Pocket calculator / personal computer (with plug adapter)
- ☐ Binoculars for bird watching (8x or 10x)
- ☐ Bird guidebook (if possible)
- ☐ Personal laptop (if possible)
- ☐ Hand lens, magnifying glass (8x-10x)
- ☐ Ruler and square
- ☐ Hat or cap, sunscreen, sunglass
- ☐ Clothes adapted to field work (muddy, hot, cold, wet, … environments)
- ☐ Raincoat
- ☐ Waterproof walking shoes
- ☐ Mosquito repellent
- ☐ Bath towel, air-dryer (if necessary)

Practical information

Accommodation place in the Danube delta

In Odessa: : Lvovskaya St. 15, Hotel of Ecological (Environmental) University
(улица Львовская 15, отель экологического университета)

In the Delta: Hotel Meliorator, Primorskoe, Ukraine

Emergency cellular phone numbers:

Nikolai Berlinsky +380 674 828 143

Jean-Luc Loizeau +41 79 607 88 93

Normally, weather should be pleasant, but check weather forecast before departure at:

http://www.bbc.co.uk/weather/5day.shtml?world=0167

Ukrainian currency : Ukrainian Hryvnia (UAH)

Change rate (31.08.12):

1 € = 10 Hryvnia - 1 Hryvnia = 0.10 €

1 Swiss Franc = 8.36 Hryvnia - 1 Hryvnia = 0.12 Swiss Franc

Participants to the Summer School

This picture gallery should help you to associate name and face!

Your Teachers and Assistants


Nikolai Berlinsky


Davide Vignati


Jean-Luc Loizeau


Elmira Alyieva


Debbie Chapman


Elena Gascon Diez

Ivetta Krivitskaya


Ewa Szalinska

Andrian Delinschi


Janusz Dominik

Giorgi Ghambashidze


Davide Girgvliani


Neil Graham


Dadash Huseynov

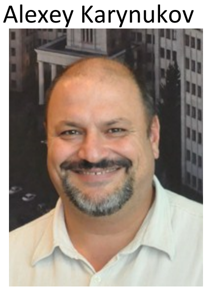
Alexey Karynukov


Radu Mihaiescu

Vitalie Sochirca

Adrian Stanica


Richard Thomas


Viorel Ungueranu


Andrey Volkov

Anatoly Polischuk

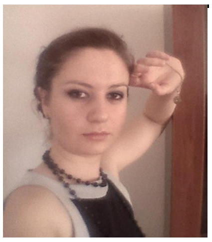
Vladimir Goltsov

Oleg Grib

Tamerlan Safranov

Vladimir Egoraschenko

Students:



Fidan Aslanzada
Joanna Bubka
Michèle Forestier
Nino Katcharava
Elena Katurusha

Alla Konkova
Veronica Korobier
Elena Musteate
Svetlana Nosik
Clémentine Pestrimaux

Andrea Pop
Corinna Stich
Marie-Caroline Tiffay
Yulia Tomashpolskaya

Agnieszka Truty
Roxane Villaz
Bogdan Alexandrescu
Aurelian Bud
Marina Calin

Marc Fasel
Vitalii Fylenko
Artem Gluhoveorov
Zurab Gogoladze
Gabriel Iordache

Giorgi Maisurade
Tofig Rashidov
Sebastian Rico Chinchilla
Igor Rosca
Iuliu Vescan

The Cyrillic Alphabet

Maj / Upper	Min /Lower	Nom / Name	Pronon-ciation (français)	Prononciation (English)	transcrip-tion (français)
А	а	*a*	a	"A" as in **c**at	a
Б	б	*be*	b	"B" as in **b**oy	b
В	в	*ve*	v	"V" as in **v**an	v
Г	г	*ge*	g dur	"G" as in **g**irl	g
Д	д	*de*	d	"D" as in **d**og	d
Е	е	*je*	yè	"Ye" as in **ye**ll	e, ie, ye
Ё	ё	*jo*	yo	"Yo" as in **yo**ga	ё, o, yo
Ж	ж	*že*	j	"Zh" as in a**z**ure	j
З	з	*ze*	z	"Z" as in **z**ero	z
И	и	*i*	i	"Ē" as in b**ee**	i
Й		*i bref*	y	"Y" at the end of a word as a dipthong, as in toy (ой) or high (ай	y
К	к	*ka*	k	"K" as in **k**id	k
Л	л	*el*	l	"L" as in **l**ives	l
М	м	*em*	m	M" as in **m**anager	m
Н	н	*en*	n	"N" as in **n**ero	n
О	о	*o*	o	"O" as in **o**pen	o
П	п	*pe*	p	"P" as in **p**en	p
Р	р	*er*	r roulé	"R" as in **r**eading	r
С	с	*es*	s dur	"S" as in **s**yrup	s
Т	т	*te*	t	"T" as in **t**eeming	t
У	у	*u*	ou	"U" as in f**oo**d or r**u**de	ou, u

Maj / Upper	Min /Lower	Nom / Name	Pronon-ciation (français)	Prononciation (English)	transcrip-tion (français)
Ф	ф	*ef*	f	"F" as in **f**reedom	f
Х	х	*ha*	*ch* allemand, *kh* arabe, *j* espagnol	"Kh" as in **kh**an	h, kh, x
Ц	ц	*ce*	ts	"Ts" as in **ts**ar	ts
Ч	ч	*če*	tch	"Ch" as in **ch**erry	tch
Ш	ш	*ša*	ch	"Sh" as in **sh**ell	ch
Щ	щ	*šča*	ch *mouil-*	""Sch"(soft English "Sh") as	chtch, shh
Ъ	ъ	*signe dur* твёрдый	*muet*	Hard Sign(no English Equivalent)	
Ы	ы	y (*jery*, еры)	i tendu	"Y" or "I"(as an ending) as in cher**ie**, or shore "Ĭ" as in	y
Ь	ь	*signe mou*		Soft Sign(no English Equivalent)	'
Э	э	*è renversé*	è	"Ě" as in **e**very	e
Ю	ю	ju	you	"Yu" as in **you**	iou, ju,
Я	я	ja	ya	"Yo" as in **yo**nder or "Ya" as in **ya**hoo	ia, ja, ya
І	і	i	i long		
Ї	ї	i	i court		

2. PROGRAMME

Monday 10th

Arrival of participants
Overnight in Odessa

Tuesday 11th

8:00 *Breakfast*
09:00 Opening ceremony NEAR 4 summer school
Welcome (N. Berlinsky, D. Vignati, J.-L. Loizeau)
Address from Prof. S. Stepanenko, the Rector of the Odessa Sate Environmental University
Address from Mr. Rzhepishevsky, Director of the Odessa Branch of Ministry of Foreign Affairs
09:30 Introduction to the NEAR Summer School (J.-L. Loizeau, D. Vignati)
09:50 Valuing water resources: the water footprint concept (D. Chapman)
10:35 The Odessa region- Black Sea - Ukrainian Danube delta (N. Berlinsky)
11:05 *Coffee break*
11:30 Quality and Quantity Estimation of Water Resources of Odessa Region (A. Volkov)
12:15 Human Impact on aquatic Environments 1 (E. Szalinska)
13:00 *Lunch*
14:15 Human Impact on aquatic Environments 2 (E. Szalinska)
15:00 Impact of climate change to water quantity and quality in the Black Sea watershed (I. Krivitskaya)
15:45 *Coffee break*
16:15 River Basin Management Plans in Romania (R. Mihaiescu)
17:00 The water's way in Republic of Moldova between "source - consumer - discharge" (I. Rosca)
17:45 End of presentations
19:00 Summary of the day
20:00 *Dinner*
Overnight in Odessa

Wednesday 12th

08:00 *Breakfast*
09:00 Water supply of Odessa metropolitan area. History, current status, problems and prospects. (A. Polischuk, Infox Vodocanal Odessa, T.A. Safranov, OSEU)
09:45 *Transfer to Dniester River*
11:00 Visit of the pumping station at Belyevka village (Mr V. Goltsov, chief engineer of Vodocanal)
13:00 *Lunch at Mayaki village, University student camp*
14:00 Field practical in groups
17:00 *Return trip to Odessa*
18:00 *Arrival to Hotel*
19:00 Summary of the day
20:00 *Dinner*
Overnight in Odessa

Thursday 13th

08:00 *Breakfast*
09:00 Deltaic systems: definition, classification, river-mouth processes, facies model (E. Aliyeva)
09:45 Coastal morphology (A. Stanica)

10:15 Genesis and evolution of the Danube Delta (V. Ungureanu)
10:45 *Coffee break*
11:15 Risk assessment of contaminants in aquatic environments (D. Vignati)
12:00 The Danube Delta as a filter of contaminants (A. Karynukov)
13:00 *Lunch*
14:15 Trip to Danube Delta
18:00 Arrival at Primorskoe
19:00 Summary of the day
20:00 *Dinner at hotel "Meliorator"*
21:00 Introduction to bird watching - bird census exercise (J.-L. Loizeau) (30 min)
Overnight in Primorskoe

Friday 14th
08:00 *Breakfast*
08:30 *Departure to Vilkovo by bus*
09:00 Boat trip in the Danube Delta - Black Sea coast, visits and practical
Bird watching – initiation to bird census
Delta morphology
Measurements of water quality parameters
13:00 *Lunch on the island Pelican station*
14:00 Boat trip in the Danube Delta - Black Sea coast, visits and practical
Coastal processes – sedimentation – erosion
Measurements of water quality parameters
17:00 *Return to Vilkovo*
17:30 *Departure to Primorskoe*
19:00 Summary of the day
20:00 *Dinner at hotel "Meliorator"*
Overnight in Primorskoe

Saturday 15th
08:00 *Breakfast*
08:30 Delta evolution under rapid sea level change -example of the Kura river delta in the Caspian Sea (E. Aliyeva)
09:15 Effects of storm surges on urban environment (A. Stanica)
10:00 *Coffee break*
10:20 Sea level change in NW Black sea coast in modern period (N. Berlinski)
11:05 Sasic liman (V. Egoraschenko, head of Department of Ukr. Yuzh. Hiprovohoz)
12:30 *Lunch at hotel "Meliorator"*
13:30 *Departure to Vilkovo by bus*
14:00 Field practical Liman Sasik (guided by V. Egoraschenko)
Measurements of water quality parameters
17:30 *Return to hotel*
19:00 Summary of the day
20:00 *Dinner at hotel "Meliorator"*
Overnight in Primorskoe

Sunday 16th
08:00 *Breakfast*
08:30 *Departure to Odessa by bus*
13:00 *Arrival at Odessa*

13:30 *Lunch*
14:30 *Free time - Visit of the city*
Free Dinner (no dinner organized by the summer school)
Overnight in Odessa

Monday 17th
08:00 *Breakfast*
09:00 Water is weird – humanity is strange (J. Dominik)
09:45 Calculating the value of water: the water footprint concept (D. Chapman)
10:30 *Coffee break*
11:00 Final exam
13:00 *Lunch*
14:00 Free time
17:00 Closing ceremony
20:00 *Dinner*
Overnight in Odessa

Tuesday 18th
08:00 *Breakfast*
Departure of participants depending on individual schedule

3. LECTURE ABSTRACTS

Valuing water resources: the water footprint concept

Debbie Chapman
School of Biological, Earth and Environmental Sciences, University College Cork

Water is a valuable natural resource that sustains all life on earth and is essential for human health and socio-economic development. Everyone needs water every day of their lives for drinking, cooking, hygiene and other domestic activities but, unfortunately, the water that is required for day-to-day needs is not equally distributed around the world and not everyone has enough for their basic requirements. Most people are aware of the water that they use every day, i.e. the "real" water that is visible and runs from a tap or can be carried in a container but do not realise just how much they use every day. Daily domestic use of water varies from about 50 litres per person in the developing world to more than 150 litres in more developed countries. In addition to this visible water, there is water that is "hidden" in the products that are used on a daily basis or consumed in the daily diet. This "unseen" water is known as "virtual" water. Some common articles that are used daily require large amounts of water for their production, such as leather shoes, tee-shirts and paper. Similarly some favourite foods require a lot of water for their production, such as beef burgers. The total amount of water used to produce any individual item can be termed its water footprint. Individuals can also have water footprints that combine "real" and "virtual" water use. Taking this idea even further, whole nations or commercial businesses can also have water footprints.

Countries that export goods with a high water content or large water footprint are effectively trading their virtual water resources, sometimes with serious consequences for their own scarce water resources. For example, water-scarce countries sometimes rely heavily on unsustainable irrigation to produce their export goods, leading to long-term issues with the quality and availability of their own water resources. Often, these water demanding products are sold to richer countries where water is plentiful.

The concept of water footprints allows comparisons to be made between countries, products and activities, of the amount of real and virtual water they each use. Calculating your own water footprint can lead to greater awareness of how much water you use and whether you can modify your lifestyle to save water. On a broader scale, water footprints are also useful for encouraging conservation of water, such as within a business or manufacturing process, or at the local and regional level where water resources are scarce.

During this lecture the principles of calculating water consumption and water footprints will be explained and examples will be given where the concept has been used to reduce water use and raise awareness of the consequences of trading virtual water. The associated practical activity will be to calculate individual water footprints and to make national and regional comparisons of water footprints.

Further information

http://www.waterfootprint.org/?page=files/home
http://www.waterfootprint.org/?page=cal/waterfootprintcalculator_indv
http://www.waterfootprintkemira.com/meter

The Odessa region - Black Sea - Ukrainian Danube delta

Nikolai Berlinsky
Odessa State Environmental University

Odessa was founded in 1794 on the place of old Turkish fort – Khadzhibey. Population in Odessa is 1 008 200. It is the third city in Ukraine after Kiev and Kharkov. At present in the area of Big Odessa there are three ports: Odessa, Yuzhny and Illichevsk. There are a lot of limans (natural lagoons occasionally open to the sea) round the city. One of the Khadzhibey liman is reservoir for the city wastewater.

The main problem of the shallow water of the Black Sea Northwestern shelf is near bottom hypoxia as a result of the anthropogenic eutrophication (overflow of nutrient input with Danube, Dnieper and Dniester a runoff)

The Danube is the biggest river in the region with water run – off about 200 cubic km per year. Danube delta is located on the territory of two countries Ukraine – in the north and Romania – in the south. The Ukrainian part of delta has 1240 km^2 (approximately 22 % from the common area) the other part is Romanian. Common area of the Danube estuary is about 7000 km^2. Estuary parts of river, occupying the intermediate position between the river basins and receiving reservoirs, are so called specific "border zones" geoecosystems rich in water, land, and biological recourses.

The Danube fresh water influence over northwestern part of the Black Sea is very strong. This influence is marked in Romanian and Bulgarian shelf and sometimes it spreads up to Bosporus. In full water year the area of the Danube influence occupies 70 % of northwestern part of the Black Sea. In poor water year this area decrease up to 20 – 30 %. The total area of the Danube direct influence on the Black Sea, defined according to area of freshwater phytoplankton presence is not less than 10^5 km. Before eutrophication of the Danube runoff (50-60s) into the sea have been annually discharged up to 940 10^3 ton per year of the dissolved mineral compounds of N, P and Si and discharge of organic compounds was insignificant. During the period of intensive eutrophication of the Danube waters (70-80s) into the sea have been discharged nearly 3 times more of mineral compounds of N and P and 1,6 times more of organic compounds. During this period at the surface layer were recorded the water "blooms" caused by intensive development of phytoplankton – algae "blooms". The dissolved oxygen concentrations at this area were 150 – 200 % of saturation and pH – 8.6 – 9.3. The total phytoplankton biomass was more than 400.000 tons on an area about 40.000 km^2 during the summer period. Under condition of density and temperature stratification of water masses in summer time decay of dead phytoplankton leads to oxygen lack – near bottom hypoxia. Hypoxia is the consequence of anthropogenic eutrophication of the sea and leads to mass mortality of the bottom organisms. In average, almost half of the area of the Romanian continental shelf bottoms down to 30 m depth was annually affected by mortalities of benthic organisms during 1972 – 1981. In 1973 – 1990 in northwestern part of the Black Sea the zone of hypoxia occupied 3500 – 40000 km^2. It has caused the mass mortality of 60 billion tons of bottom animals and 5 billion tons of fish, especially juvenile.

At present nutrient input from the Danube decreased because of decreased agricultural activities in watershed. But during 40 year long period nutrient accumulated in sediment. The higher values of nutrient in bottom sediments have been marked. In summer period under law oxygen condition in near the bottom layer nutrient get out from sediments and provokes eutrophication process.

Quality and Quantity Estimation of Water Resources of Odessa Region

Andrey Volkov
Odessa State Environmental University

The Odessa region is located in the Southern part of Ukraine. The Odessa region area is 33 300 sq.km. and that is 5.5% of Ukraine area. Odessa region includes 26 districts, 7 towns, 33 small towns and 1127 villages. By 1 Oct. 2010 the population of Odessa region was 2.4 mln. The Northern part of the region is situated in the forest-steppe zone and the Southern is in the steppe zone. The soils are humus. Annual temperature is in the interval +8,2 ^{o}C - +10,8 ^{o}C.

The location, climate and Black Sea coast make prosperous environment for development of different economic sectors. From the other hand these conditions lead to increasing of anthropogenic impacts on the regions eco-systems.

Water resources are very vital part of the environment so quality and quantity estimation of water resources are very significant issue. In general Odessa region's hydrographic network contains basins of several rivers: Danube (24%), Dniester (16%), Uzhny Bug (8%). The total runoff is 387 400 cubic m. It is the biggest figures in Ukraine. From the other hand local flow is less then in other Ukrainian regions.

It is possible to describe water quality by two sides it should include conditions of surface water and ground water. River network of Odessa region includes basins of the three rivers mentioned above and about 200 small rivers. Along the sea coast there are a lot of freshwater and salt lakes and firths (limans). Ground water in the region belongs to Cenozoic aquifer. (основной водоносный горизонт кайнозойский)

Water quality can be described with some indexes that indicate mineralization, tropho-saprobiological and toxic pollution. The highest mineralization level was measured in Kuialnitskiy, Hadzhibeevskiy firths (liman – local names) and in the of Sasik Lake. Toxic tropho-saprobiological indexes of water correspond to the second and the third quality classes (the first class is the best quality, the fifth - is the worst) that means the water quality in the Odessa region is satisfactorily.

The water supply in Odessa city depends on water level at Dniester River and has annual periodicity. Water level is been measuring at “Maiyki” (it is not far from Odessa city) for example you can see average daily water levels. For example in 2009 high water levels were registered in April – May and low water levels were registered in August – October. As for majority indexes Dniester water quality corresponded to the second quality class it means that the fresh water supply needs prior purification.

Daily average water levels of the Dniester river in 2008 was showed. High water is appropriate to Jul. – Aug. 2008. During that time it was registered low water quality levels. It is also important to mention that cascade of water storage basin is a buffer from one hand but each water storage basin is a source of secondary pollution from other.

The ground water is more protected from the different anthropogenic impacts in comparing with surface water bodies. It is gives some advantages for usage ground water as fresh water supply. The assessment of ground water is more difficult in comparison to surface water. So it is necessary to distinguish ground water into two categories: potential supplies and exploited supplies. The surface and ground water supply in the Odessa region are distributed irregularly as well as. The reason is the Odessa region has various geological structures. The assessment of potential water supplies of Ukraine is about 0.19 m^3/day per capita. Zoning of the Odessa region by potential ground water supply was done. Distribution of exploited water supplies is shown.

As you can see analysis has revealed that Southern part of the region including Odessa city had better exploited but worst potential ground water supply.

The wastewater amount (2009) was about 303.4 mln. m^3. The pollution comes to water bodies mainly from municipal sector that was about 53.2% of total wastewater amount. Contamination of surface and ground water reflects on the Black Sea. About 82.7 mln. m^3 of the Odessa city sewage comes to Black Sea without proper purification. Unfortunately centralized wastewater management system functioned in a proper way only in 45.1% of towns in the Odessa region according to 2010 statistical survey.

In conclusion it would be vital to mention the Odessa region has quite decent water supply. Water management must be based on complex water quality estimation.

Human impacts on aquatic environments

Ewa Szalinska

Institute of Water Supply and Environmental Sciences, Cracow University of Technology, Poland

Human impacts on aquatic ecosystems can result from pollution, changes to the landscape or hydrological systems, and larger-scale impacts such as global climate change. The complexity of aquatic ecosystems and the linkages within them can make the effect of disturbances on them difficult to predict. These linkages mean that damage to one component of the ecosystem can lead to impacts on other ecosystem components. Increasing our understanding of aquatic ecosystems can lead to better practices that minimize impacts on aquatic environments.

The tendency of human activities to affect aquatic environments stems from the fact that human beings cannot live without water. Apart from its impact on human existence, water is also essential for use in many developmental projects and transportation. Hydrologic manipulation is perhaps the most obvious form of interference in natural systems. It has adverse consequences that either were not appreciated earlier, or to which increasing importance has gradually been attached as a result of changes in societal attitudes. Physical degradation of aquatic environments is also pervasive, and destructive of many of the potential values of aquatic environments.

To address selected effects of human activities the presentation focuses on: wastewater discharge and

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Impact of climate change to water quantity and quality in the Black Sea watershed

Ivetta Krivitskaya

Department of Ecological Safety and Environmental Education, School of Ecology, V.N. Karazin Kharkiv National University

The problem of global change has become one of the major problems of the late XX - early XXI centuries. Climate change causes significant impacts and consequences for water resources. Some of these consequences are already visible. Water resources are vulnerable and may be a subject for significant impacts from climate change, with vast implications for human society and ecosystem.

Climate change causes alterations in water circulation in the Black Sea. Because of the warming and the weakening of the winds, powerful circular current is replaced by separate small-sized eddies that mix the coastal waters, "ventilate" costal area and redistribute pollution.

During the lecture it is planned to deal the following issues:

1. History of changes in the Black sea ecosystem. System “Azov Sea – Black Sea – Mediterranean Sea”.
2. Key rivers of the Ukrainian coast.
3. Dynamics of qualitative and quantitative characteristics of rivers, inflowing the Black Sea from the Ukrainian coast.
4. Prognosis of changes in the Black sea watershed.

River Basin Management Plans in Romania

Radu Mihaiescu
Faculty of Environmental Sciences and Engineering
Babes-Bolyai University of Cluj-Napoca, Romania

Sustainable use and development of watersheds become a major target of the national, European and global strategies and policies for sustainable development.

Water Resources Management implies a set of measures (structural and non-structural) and actions that have to be completed to satisfy water needs including both the ecosystem and the human requirements (Grigg, 1999). From general to particular, different sets of measures were applied in the management of watersheds by the EU countries. It becomes obvious that a general applied set of legislative measures should be applied on a large scale in order to improve the results. The Water framework directive of the European Union (WFD) represents a milestone in the history of water polices in Europe. The directive establishes a common framework for the sustainable and integrated management of all waters. It covers groundwater, inland surface waters, transitional waters and coastal waters and requires that all impact factors as well as economic implications are taken into account. The ultimate objective of the Directive is to achieve good status of all water bodies in the EU member states and associated states by 2015. The defining of the good status is based on a new concept of ecological quality which takes into consideration the biological, chemical and physical characteristics of water. For underground waters it includes the quantitative status. The key factor of water framework directive is „*integration*" which takes into consideration all natural and anthropic factors which can influence the quantity and quality of water resources (Mihaiescu and Mihaiescu, 2009).

The development of River Basin Management Plans (RBMPs) is a central element within the WFD process. RBMPs are to provide a detailed account of how specific environmental objectives for the river basin (including groundwater) are to be achieved within a given time frame and should contain:

- an overall analysis of the river basin characteristics
- a review of the impact of human activities on the status of waters (in terms of both quantity and quality) and ecosystems in the basin
- an assessment of existing legislation and shortcomings in meeting the WFD objectives, including a set of measures to address these shortcomings
- the perceived involvement of the public in an open planning process
- a ‘combined approach’ of Emission Limit Values (e.g. discharge concentrations) and water quality standards (e.g. the quality of waters receiving effluents)
- an economic analysis of water (use) within the river basin, identifying means of cost recovery.
- (biological) monitoring strategy and approach to be able to determine present ecological status and monitor if planned measures will have the expected impact on identified water bodies.

The WFD sets out a clear deadlines for each of the requirements which adds up to an ambitious overall timetable, finalized in 2016 with the achievement of good quality status for all water bodies.

Romania engaged to implement the WFD simultaneously with the other EU member states. Under the coordination of the International Commission for Danube River Protection (ICPDR), Romania contribute along the other riverine states in the realization of the Danube watershed management plan which represents a common view of the sustainable management activities in the whole Danube watershed. Water Framework Directive was transposed in Romanian legislation through the Law no. 310/2004 regarding modification and completion of the Water Law no. 107/1996. As a result were elaborated 11 River basin management plans. In 2010 the National Management Plan, Synthesis of the 11 RBMPs, (have been posted on NAAR and MEF websites) were subject of the SEA procedure. The NMP was approved by GD 80/2011. The NMP was submitted and reported to the European Commission in specified time according the WFD timetable. The implementation of WFD in Romania is a continuous and greatly important activity, a step-by-step achievement, involving significant human and financial resources, requiring co-ordination of the all involved parts at international, national and river basin level.

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http://www.mmediu.ro/vechi/departament_ape/gospodarirea_apelor/cooperare_internationala/sintezaPMversiune1-SEA.pdf

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The water's way in Republic of Moldova between "source - consumer - discharge"

Vitalie Sochircă, Andrian Delinschi

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Evocation / Motivating students: What is the source of water consumed by participants of the summer school in Odessa? (*method:* brainstorming)

Moldova's water sources: surface and groundwater reserves characteristics, spatial distribution, quality (*method:* maps and graphs analysis).

Water consumption in Moldova: types of water (drinking, industrial); categories of consumers (household, agriculture, etc.). Spatial distribution, SWOT analysis of water consumption (*method:* group work, maps and graphs analysis).

Drainage and water treatment in Moldova: characteristics of the drainage and water/wastewater treatment system (organized and unorganized), current status and problem situation (*method:* case studies, solving problem situation).

Conclusions and solutions (*method:* discussion, debate).

Subject field exercises: Dniester water status (*method:* observation, collecting water samples, water status assessment, conclusions and proposals).

Water supply of Odessa metropolitan area. History, current status, problems and prospects.

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[1] Co Ltd «Infox», branch «Infoxvodokanal»
[2] Odessa State Environmental University

The history of Odessa water supply since the founding of the city is shown. The first sources of water used: artificial water wells, a number of ground water sources on the coast named fountains, cisterns - special underground tanks to collect rainwater from the roofs and merchant Kovalevsky`s plumbing. Commissioning of the first aqueduct in Odessa was in 1873. In the coming years the water supply increased but at the beginning of the 21st century – decreased.

The current state of the centralized water supply of Odessa metropolitan area is displayed. The characteristics of the source water of the Dniester River, and the situation in Ukraine as a whole are discussed. The basic flow sheet of the treatment plant "Dniester" is shown.

The history of the quality control of drinking water in Odessa is shown: such as the Brussels Congress of physician's standards and Russian physiologist Erisman, the first national standards of the Soviet Union. Today's demands on the quality of drinking water in Ukraine, the basic principles, a comparison with other standards in the world, similarities and difference are shown.

It is shown that the quality of the river water (Dniester River) and drinking water after the water-purifying station "Dniester" satisfies regulatory requirements. Some problems of river water: The phenomenon of «blooming» the high concentrations of nutrient are studied.

It is shown the alternative sources of underground water in Odessa - pump-room systems corresponding technology used in water treatment in comparison with tap water. Estimation of drinking water cost by different methods has been done.

The state program "Drinking Water of Ukraine on 2006-2020 years " is represented. The necessary changes in this program as an example of technical, technological, financial conditions of the Odessa Vodokanal have been marked. There is increasing of drinking water cost in Ukraine and in the World and decreasing of consumption. The main problems of the program are shown.

In conclusion, there is the authors' opinion about the necessary arrangements for receiving good quality drinking water.

Deltaic systems: definition, classification, river-mouth processes, facies model

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The mouths of the rivers may be places where the accumulation of detritus brought down by the flow forms a sediment body that builds out into the sea or a lake (Nichols, 2009). The overall delta environment is subdivided into several subenvironments, each of which is characterized by its own facies association and architecture. There are several delta classifications, based either on the position relative to shelf break and grain size or delta-face slope and dominant grain size or relative importance of fluvial, wave and tidal process.

Shape of the deltas and facies relationship are influenced by energy of the river flow, waves, tidal currents, longshore drifts, amount and grain size of the sediments supplied by the river and depth of the water.

An estuary is often defined as a drowned river valley. There is a mixture of fresh and marine water and accumulation of sediments without any built –out into the sea.

In an estuary, there is a net movement of sediment landward (transgressive). This contrasts with deltas in which sediment moves seaward (regressive). Tide and wave-dominated estuaries are defined.

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Main notions regarding beach morphology

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2 Faculty of Geology and Geophysics, University of Bucharest, Romania

Definitions

The beach is a stripe of land consisting of unconsolidated littoral accumulations of sediments (mainly sands or gravels) that covers most of the shore. Predominant sediments generally are quartz grains, but there can also be found (sometimes in relevant quantities) also shells and shell fragments, limestone fragments and volcanic grains, etc.

The **shoreline** is the contact line between the land and the marine surface.

The **shore** is the relatively narrow zone separated by the low tide and the most advanced point landwards, continuously subject to water action.

Beach zones in transverse section :

1. The **dune zone** – is constituted of unconsolidated sediments – mainly sand accumulations formed mainly by the wind, that also is the main transport factor. The action of the sea waves is manifested very seldom, mainly during very strong gales. Many dunes are generally fixed by vegetation.

2. **Backshor**e – area situated from the berm crest inshore, to the dune zone. It is a surface that generally dips inshore.

3. **Foreshore** – surface dipping seawards.

The limit between the backshore and the foreshore marking the slope break is called the **berm crest**.

The landwards, generally more abrupt, part of the foreshore is an area with at least three morphological aspects:

more or less planar area generally dipping with a low angle from the berm crest seawards, known as the *beach face*;

irregular beach face, formed by rhythmical series of large gulfs and sharp capes, known as *beach cusps*. According to the energy of the hydrodynamic factors (waves, currents), the cusps` dimensions vary from meters to tens of meters and heights of centimeters to meters;

beach scarps, formed when the water erodes the existing beach face.

The foreshore part with a low slope that is generally placed under water, but that can be emerged during low tide is known as the *low tide terrace*.

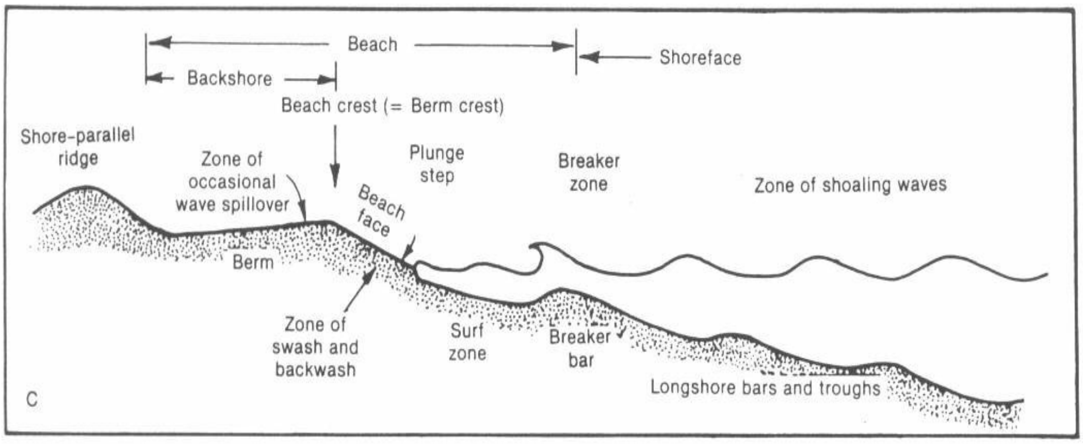

Figure 1: Beach zones in transverse section (from Friedman et al., 1992)

States of the beaches as result of their interaction with the waves:

Dissipative beaches are made by low height waves that move on a low slope foreshore. The breaker waves form a submerged sediment bar in the breaker zone.

Reflective beaches are made by high waves that move on an abrupt slope foreshore.

The connection between the two states is made by the *Transition beaches* (in various states).

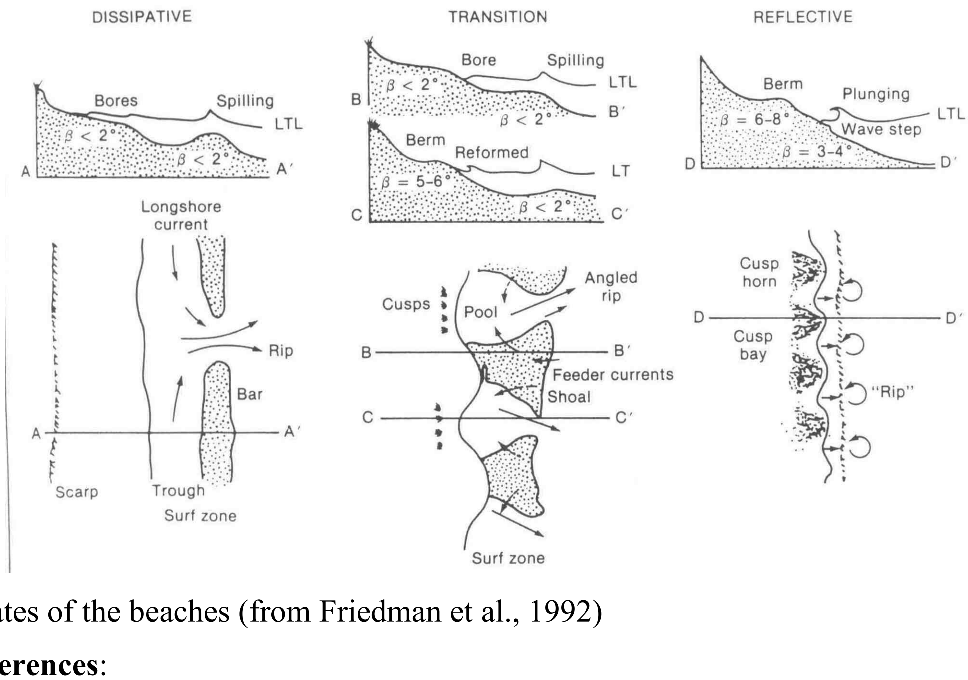

Figure 2: States of the beaches (from Friedman et al., 1992)

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Risk assessment of contaminants in aquatic environments

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Risk assessment is a complex process and has at least three components: hazard identification, dose-response analysis and exposure quantification. Hazard identification describes the type of effect (for example death or reduced growth) that an organism can experience when exposed to a contaminant. Dose-response analysis describes the probability of observing that effect at different doses of the contaminant; while exposure quantification considers the probability of an organism to get in contact with that contaminant. A very hazardous substance can therefore pose a small risk if it has very little probability of coming into contact with the target organisms.
Information on hazard and risk assessment is translated into environmental law in the form of Environmental Quality Standards (EQS). In aquatic systems, EQS can be established for the water column, bed sediments or living organisms. If, during environmental monitoring programs, concentrations of a contaminant are higher than the corresponding EQS, that contaminant may pose a risk to the environment and further studies, or action, are needed.
In reality, information for determining the EQS is not always complete and some assumptions are made to calculate them. Environmental expert must know these assumptions very well to avoid making wrong conclusions about the risks from contaminants in aquatic environments. The typical procedure (and the assumptions) for establishing an EQS will be illustrated for the case of mercury (Hg), a priority contaminant of global concern. The potential difficulties in applying EQS will also be presented with practical examples.

The Danube Delta as a filter of contaminants

Alexey Karynukov

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The key task of the lecture “The Danube delta as a filter of contaminants” is to familiarize students with problems of the most valuable and well-preserved coastal zone of protected area Danube Biosphere Reserve. This area and similar reserve, located on the Romanian territory, are considered as bi -lateral biosphere wetland reserve. Danube Delta has the international status.

In the framework of the lecture the following issues will be covered:
Impact of the Danube Delta wetlands on the processes of natural filtration from solid particles, organic and chemical compounds, contributing to natural self-purification process;
- Drinking water supply for settlements;
- Danube Delta as a barrier for pollutants incoming to down-stream waters.

Effects of storm surges on coastal urban environment

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Rapid shoreline retreat of beaches due to storm surges has always been a significant aspect of short-term coastal dynamics. These motions – inland retreat during storms and swift accumulation offshore in calmer periods after storms - have been the natural way in which the land interacts with the sea along the coasts. In case of sandy beaches not touched by humans, this rapid retreat has not been considered as a threat, due to the fact that beaches have the space to readjust to the new conditions.
In many places this natural situation has been abruptly changed by humans, which have built settlements such as villages, towns, cities and touristic resorts in the close vicinity of the beach – and many times even on the beach. The last centuries witnessed a demographic explosion along the coasts on all continents. Most of the mega-cities from the beginning of the XXI- th Century, as well as smaller towns and villages gather more than half of the world`s population in the vicinity of the sea.
What happens in this case? First, beaches are squeezed between the sea advancing towards inland during storms, and the inland limit, no more open but fixed by settlements, roads, fixed infrastructure works, etc. Therefore if a beach in natural state has enough space to retreat during storms and then slowly advance after storms, this is not the case when looking at tourist or urban beaches. Another impact related to the fact that most of the residential and infrastructure development has been done on former dune zones, extremely important sediment reservoirs. As dunes are gone, so is a significant source of sediments, naturally helping the beaches to return to their natural position.
Therefore the development of human settlements (from mega-cities to tourist resorts) in the close vicinity of the sea significantly, by placing a rigid inland limit, affects the coastal environment by drastically diminishing the beaches` natural capacity of readjustment. In a small number of years this leads to the fact that storm waves may affect the coastal urban infrastructure and buildings - thus the risk of flooding increases drastically.
Recent years have witnessed a significant number of very strong storms and hurricanes which had generated important losses on coastal settlements. But if the situation is worse than decades ago, this may be blamed on possible stronger storms, but also on the fact that humans have moved too close to the sea, cutting many beaches any possibility to naturally react and survive.
Probably the best known case is the impact of hurricane Katrina on the coastal town of New Orleans from August 2005. Katrina was one of the five deadliest hurricanes in the US history. Among recorded Atlantic hurricanes, Katrina was the sixth strongest overall. According to the official figures, at least 1,836 people died in the actual hurricane and in the subsequent floods, making it the deadliest U.S. hurricane since the 1928. Property damage was estimated by official reports at US$81 billion (2005 USD) (Knabb et al., 2006).
Katrina is unfortunately just one of the many cases of extreme storms and related surges hitting urban coastal environments, as these events occur yearly and worldwide. The Black Sea has not been a stranger to this, its strong storms hitting sometimes with damaging effects the cities built on its coasts.
And what about the future? It is very likely that flood risks will increase in coastal cities in the next years, because of demographic, socio-economic, and environmental trends (Webster et al. 2005; Nicholls et al. 2007). Moreover, urbanization and population in these areas are still growing at a very rapid pace, driven by economic opportunities and the development of international trade.
If climate change might mean stronger storms, interventions must look at the receptor of the storm surges, i.e. the beaches. Specific and adequate protection works must be designed and built in order to cope with these challenges.

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Delta evolution under rapid sea level change exemple of the Kura River Delta in the Caspian Sea

Elmira Aliyeva[1], Salomon Kroonenberg[2], Marc de Batist[3], Robert Hoogendoor[2], Dadash Huseynov[1], Speranta Popescu[4], Nikolay Kasimov[5], Michail Lychagin[5], Jean-Pierre Suc[4]

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Overview of the morphology of the Kura delta

The modern Kura delta is located in southwest Caspian Sea. The delta is the fluvial dominated with some wave influence at its northern edge. The subaerial Kura delta is elongated cuspate and slightly lobate. It measures 40 km between the apex and the tip of the delta, and is 55 km wide at its widest point. The NW-SE Kura River distributes its sediment load through three channels oriented North, East and South. At present, the Eastern channel is not active and sediments are mostly concentrated in the South channel. The north flank of the delta is composed of a barrier lagoon complex. The east and south flank of the delta are delta front marsh environments, typical for a fluvial dominated delta. The offshore Kura delta is divided into three areas 1) the southern delta slope, 2) the northeastern slope, and 3) the mudvolcano located in the northeast of our research area. The southern slope has a low gradient. The northeastern delta slope area comprising the shallow subaquous and sloping delta, and the prodelta, the distal offshore delta, where basinal processes govern sedimentation completely. Morphology of the delta slopes here demonstrates classic clinoform geometry.

Methodology

Three field campaigns were organised to acquire the necessary data.

During these field works 18 offshore sparker profiles were shot in lines parallel and perpendicular to the delta contours, 40 hand augerings up to 7 m depth were made in the onshore delta, offshore 14 piston cores down to 3 m and 8 wells down to 20 m were drilled. A number of laboratory analysis comprising of grain size analysis, petrography, chemical analysis of organic matter, biostratigraphical analysis (ostracod, foraminifera, mollusc and diatom), and absolute dating using 210Pb and 14C analysis has been done.

Main results

The augered profiles in the onshore part of the delta often show a similar sequence. Almost all have a dark grey stiff clay at the bottom of the sequence followed by an interval with one or rarely two very fine silty sand horizons not exceeding 1.5 m in thickness, then laminated or thinly bedded clays, and a brownish oxidised clay soil at the top. The offshore delta's Holocene sediments consist up to at least 20 m depth of thinly bedded silty clays and laminated dark grey clays Locally sand and shell-rich horizons occur.

The data have given a concise insight in the development of the delta during the last ~1500 years. They show at least three and possible four phases of delta progradation during highstands of the Caspian Sea, interrupted by erosional phases during lowstands, recognisable in the sparker profiles as prominent reflectors. The first phase is represented by reddened fluvial clays (Regressive Systems Tract, RST1) possibly affected by soil formation during a lowstand at –80 m absolute depth (Sequence Boundary, SB1) (fig.1). These are overlain by several metres of laminated clays and silts, 14C dated at >1400-900 BP on shelly intervals, and shown by microfauna to have deposited in a shallowing sea (RST2). This succession is truncated by the prominent SB2 reflector, corresponding to a lowstand at about –48m absolute depth and correlated with the 11th century Derbent Regression known from historical and archaeological data. It is overlain by another metres-thick succession of laminated deltaic clays and silts, passing locally to organic clays with fluvial diatom assemblages (RST3). This horizon is also truncated by an erosional event, SB3, probably related to a lowstand in the 16th century. During the Little Ice age highstand the Kura River was diverted southwards to the Qizilağaç Bay. The last phase RST4 is represented by the formation of the modern Kura delta dated using 210Pb as having also been deposited during the last 200 years. Onshore delta consists of progradational sequences of channel-levee sands and floodplain silts and clays deposited during gradual sea-level fall and overlain by clays and silts reflecting the last phase of rapid sea- level rise since 1977. Overall sedimentation rates in the delta determined by 210Pb methods range between 1.5-3.0 cm/year.

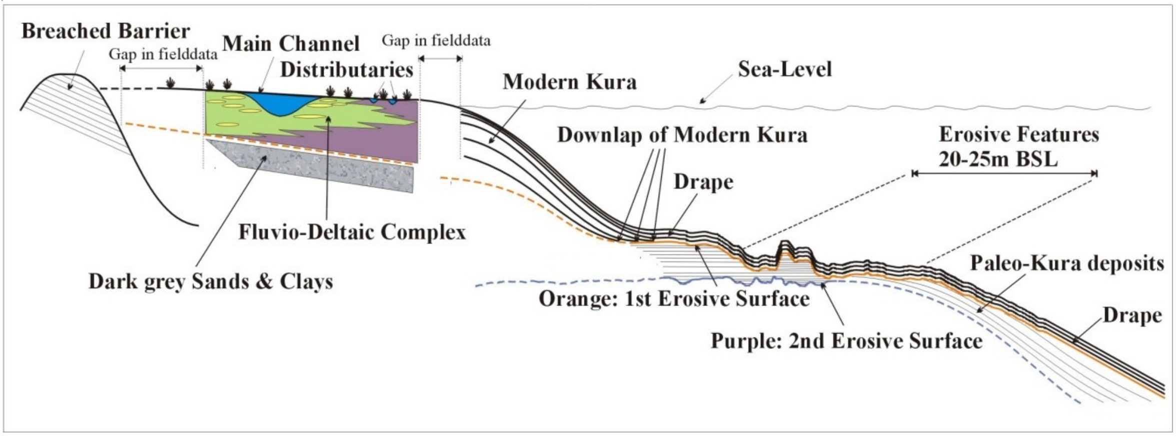


Fig.1. Overview of onshore-offshore Kura river delta

The amount of Corg in the upper part of the section in the Caspian Sea adjacent to river Kura delta varies from 0.2 to 1.22 % with median values 0.6-0.8 %. It demonstrates that in the sediments deposited accordingly Pb210 data during Caspian Sea high stand in 1929 (core interval 120-125 cm) the minimum of Corg content is localised near the mouth of the active southern channel of the Kura River and coincides with minimum of clay fraction. At the same time the maximum of organic matter content locates near the mouth of eastern channel which was inactive that time. Such C_{org} spatial distribution is caused by, the first, location of prodelta, which is the most favourable area for organic matter fossilization and accumulation, and, second, the high turbulence of the water mass and a high amount of oxygen in the water near the river mouth. These factors are unfavourable for the accumulation, burial and fossilisation of both marine and continental organic matter. Further south-eastwards and eastwards Corg content increases. So, the areas with low Corg could be related to river mouths. In section 60-65 cm (Caspian Sea low stand in 1977) the area of minimum Corg is located at the north near the north-eastern distributary. This indicates high activity of this distributary during Caspian Sea fall. The area of C_{org} minimum extends covering also the mouth of main channel and eastern part of the delta. C_{org} maximum shifts toward the basin coinciding with maximum clay fraction. In section 20-45 cm (Caspian Sea high stand in 1995) the minimum of Corg contents is confined to the mouth of main channel.

Conclusions

The data received show the high frequency cyclicity in the Caspian Sea level fluctuations during Late Holocene which led to rapid change in the depositional environment, spatial distribution of sediments and morphology of the Kura river delta. Distribution of organic matter also displays the strong time dependence reflecting depositional history of the delta.

Sea level change in Northwestern Black sea coast in modern period

Nikolai Berlinsky

Odessa State Environmental University

General Information on Odessa region, the Danube delta and the NW Black Sea.

At present time one of the key problems is climate change. During 1880–2010 these changes were made at the Black sea area. During the last 130 years the average (climatic) temperature of the atmosphere's surface layer has increased by 0.9 ºC.

Growth of storm activity in the end of 21st century is linked with the air temperature rise and air circulation intensity. As a result is average annual temperature of the over land air grows: during last 100 years it increased by 0.5 ºC in the northern semi sphere, especially from the middle of 60's of the 20th century. This tendency take place on the Northern coast of the Black sea as well. At present the Black sea water balance is significant positive which secures the average rate of the sea level rise by 2.7 mm year^{-1}. If such tendencies of the level change along the shore composed by low–durable deposits and soft sedimentary rocks remain in future in the end of 21th century the level magnitude can become higher than 1.0–1.5 m in comparison with mark of 1985.

It is possible that the years with increased rising and lowering of the land, and sea level in Odessa, as well as at some points in equatorial Pacific and Atlantic Oceans and in the Caspian Sea is probably connected with the period of El Niño. It is important to note that researchers in the field of meteorology have long suggested the existence of a definite connection between the activity of tectonic processes (volcanic eruptions, earthquakes) and El Niño.

Water is weird - humanity is strange

Janusz Dominik
Institut F.-A. Forel, Université de Genève

Human body contains about 60 percent of water by weight. Apart from sustaining metabolic processes, water is involved in maintaining the hydro-electrolytic, acid-base and thermal balances of our bodies. A loss of water equivalent to about 10 percent of body weight means death. That is why we all instinctively care about water and why the access to drinking water is a fundamental human right. The central role of water as life supporting liquid was always obvious to humans and found its expression in beliefs, religions, philosophy and art.

Water proprieties were, and still are, a big puzzle for science. Water in living cells has particular features and we just start to discover its active participation in the structure of biological molecules such as proteins. It seems that water is an indispensable component of any form of life we can imagine. That is why the NASA's search for life in extraterrestrial worlds is governed by the « following water » principle. Water is also a potentially fabulous fuel or more precisely an energy carrier, which promises efficient use of primary resources, such as solar or geothermal energy.

Because the most common and mysterious liquid is still weird from scientific point of view, it became a preferable object of pseudo-scientific theories and myths. « Water memory » and ice crystals responsive to prayers and music are just two the most striking examples of the excess of imagination.

Natural beauty of water in its all three states inspires artists. Riverbanks, lake- and seashores attract people searching for recreation, rest, calm and fun. Water is happiness.

So, why we treat water bodies so badly? What kind of a blind folly drives us to use rivers as the evacuation pipes for all the waste of our society? Why instead of living in harmony with water we are trying to fight against it, possibly winning a few battles but heading a severe defeat of the war we just cannot win? These are good questions for philosophers, engineers, businessmen, and our leaders, and for all of us - composed in 60 percent of water.

4. PRACTICAL EXERCISE DIRECTIVES

During the Summer School, students are involved in practical works as much as possible. Students should organize themselves in 6 groups (4 or 5 people). Each group will participate to the different activity according to the table below.

Groups' rotation by Activities

	Days			
Group	**12.09.2012 (afternoon)**	**14.09.2012 (morning)**	**14.09.2012 (afternoon)**	**15.09.2012 (afternoon)**
1	A6 + A1	B1/B2	A5 + A2	A4 + A3
2	A5 + A2	B1/B2	A4 + A3	A6 + A1
3	A4 + A3	B1/B2	A6 + A1	A2 + A5
4	A3 + A4	B1/B2	A2 + A5	A1 + A6
5	A2 + A5	B1/B2	A1 + A6	A3 + A4
6	A1 + A6	B1/B2	A3 + A4	A5 + A2

Activity A1: Water movement (Nikolai Berlinsky and coll.)

Activity A2: Water characteristics profiles (Jean-Luc Loizeau)

Activity A3: Water chemistry 1 (Elena Gascon Diez)

Activity A4: Water chemistry 2 (Davide Vignati)

Activity A5: Sedimentology (Janusz Dominik / Adrian Stanica / Neil Graham)

Activity A6: Water footprint (Debbie Chapman)

Activity B1: Bird watching (Michael Zhmud / Jean-Luc Loizeau)

Activity B2: Coastal processes (Adrian Stanica /Viorel Ungureanu)

'A-type' activities will last about 75 minutes including an introductory explanation of the aim of the activity, the methods, the practical work, the result collection and interpretation.

'B-type' activities will take the form of group excursions with discussion of relevant aspects led by the tutors according to actual field conditions.

Field Activities: Sample Data Form Group #:

Sample identification num-		Site description and esti-	
Name of sampling site:		Water depth:	
GPS Coordinates:		Sampling method (from	
Name of sampling operator		Weather conditions (wind,	
Date and time of collection:			

Sample identification num-		Site description and esti-	
Name of sampling site:		Water depth:	
GPS Coordinates:		Sampling method (from	
Name of sampling operator		Weather conditions (wind,	
Date and time of collection:			

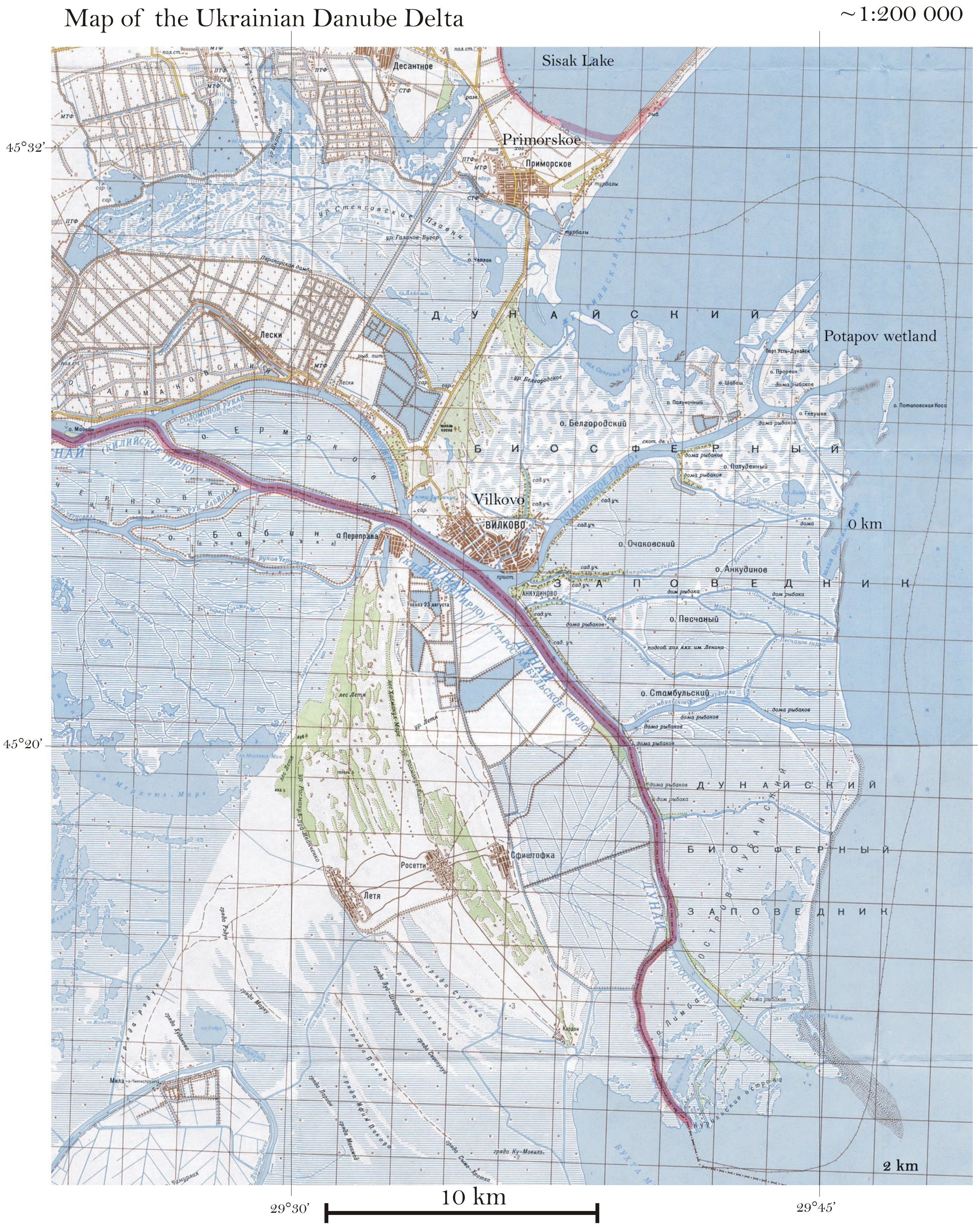
Sample identification num-		Site description and esti-	
Name of sampling site:		Water depth:	
GPS Coordinates:		Sampling method (from	
Name of sampling operator		Weather conditions (wind,	
Date and time of collection:			

Sample identification num-		Site description and esti-	
Name of sampling site:		Water depth:	
GPS Coordinates:		Sampling method (from	
Name of sampling operator		Weather conditions (wind,	
Date and time of collection:			

Sample identification num-		Site description and esti-	
Name of sampling site:		Water depth:	
GPS Coordinates:		Sampling method (from	
Name of sampling operator		Weather conditions (wind,	
Date and time of collection:			

Map of the Mayaki - Belyevka area -Маяки - беляевка **(Dniester area)**

Maps of the Ukrainian Danube Delta




Sisak Lake
Primorskoe
Приморское
Potapov wetland
Vilkovo
ВИЛКОВО
0 km
Д У Н А Й С К И Й
Б И О С Ф Е Р Н Ы Й
З А П О В Е Д Н И К
о. Белгородский
о. Очаковский
о. Анкудинов
о. Полуночный
о. Полуденный
о. Потаповская Коса
Порт Усть-Дунайск
АНКУДИНОВО
45°32'
45°24'
29°35'
29°45'
5 km
~1:120 000

Directives for activity A1: Water movement

(Tutor: Nikolai Berlinsky)

Goal: to show the important role of water dynamic process in the river and in the sea as well.
The result of water redistribution in the delta arms may be positive and negative.
All hydrological constructions must be done according hydrological regime.

Practical field measurements (from the boat where applicable):

1. Current meter measurements,
2. Bathometer (water sampler)
3. Temperature and salinity profiles in estuary (salinity cline intrusion)

Discussion:
Significance of hydro-meteorological factors in aquatic systems
Water level – example of catastrophic level increasing in winter time in Danube
The role of artificial water pools

Directives for activity A2

(Tutor: Jean-Luc Loizeau)

Aim of the activity: There are feedback loops between physical, chemical and biological processes taking place in a water column. Relatively simple measurements of water parameters such a as temperature, conductivity (salinity), pH, and dissolved oxygen (D.O.) can be performed to give insight in these processes: salt intrusion, wastewater effluent discharge, enhanced primary productivity, organic matter mineralization.

Method: Vertical profile of selected parameters will be measured in the various environment encountered in the delta (river, lake, river-sea interface, …). Measurements will be performed using a YSI multiparameter profiler. Sensitive to change electrodes (conductivity, pH, D.O.) have to be calibrated before each measurement day. Water depth is evaluated by measuring the length of the cable in the water (drift has to be evaluated).

Expected student output

For each site (precisely identified in space and time) , profiles of the four parameters vs. depth (or time) have to be obtained and interpreted in term of physical, chemical and biological processes, active in the water column. The hydrological conditions at the time of measurement have to be taken into account in interpreting data. Comparison between the different environments will be completed as data are collected.

Directives for activity A3

(Tutor: Elena Gascon Diez)

Aim of the activity:

to measure major dissolved elements (Ca^{2+}, Mg^{2+}, Cl^{-}) concentrations, alkalinity, dissolved O_2 concentration and in lotic (Danube, Dniestr) and lentic (Liman Sasik) systems,

to understand how and why the relative proportion of these dissolved elements varies between these locations,

to evaluate the water quality and drinkability at the various locations and understand its risk for local population.

to compare archive data from low and high water, river and lakes.

Methods:

All basic water chemistry determinations are performed using a reflectometer and chemical analysis kits (alkalinity, O_2-Winkler; Merck kits).

The measurement of dissolved major elements concentrations (Ca^{2+}, Mg^{2+}, $^{-}$) is performed with a reflectometric method using reactive strips for each element.

Cl^{-} will be measured by spectrophotometry (HACH) after field activity.

Alkalinity and dissolved oxygen are measured using standard Merck kits.

Expected student output: For each sample, students should fill in the results' table (see below). They should also provide a written comment on the significance of the results on the basis of their general knowledge of water quality and cycling and of the on-site discussion with the tutor.

(see overleaf for results' table)

Activity A3

Summary of results

Date:

Group:

Sampling environment:

Location (GPS point) :

Sample code	Mg^{2+} (mg L^{-1})	Ca^{2+} (mg L^{-1})	Cl^{-} (mg L^{-1})	pH	Dissolved O_2 (mg L^{-1})	Alkalinity

Comments on the range of basic chemical species in solution:

Comments on the comparison with previous data (other locations):

Comments on the salinity:

Directives for activity A4

(Tutor: Davide Vignati)

Aim of the activity:

to measure the concentration of $N\text{-}NH_4$ (ammonium nitrogen), $N\text{-}NO_3$ (nitrate nitrogen) in lotic (Danube, Dniestr) and lentic (Liman Sasik) systems,

To understand how the relative proportion of $N\text{-}NH_4$ and $N\text{-}NO_3$ varies depending on the redox state of the system,

To calculate the N/P ratio at the various locations and understand its significance for the development of plankton.

Methods: all determinations are performed by spectrophotometry. Specific reagents are added to each water sample and, in the present of the analyte of interest, the sample assumes a typical colour. Before each determination, the spectrophotometer is reset using a blank prepared with deionized water. The absorbance of the sample is then measured and, thanks to an internal calibration, the result is returned in mg/L of $N\text{-}NH_4$, $N\text{-}NO_3$ or $P\text{-}PO_4$.

Expected student output: for each sample, students should fill in the results' table (see below) and calculate the relative percentage abundances of $N\text{-}NO_3$ vs. $N\text{-}NH_4$ and the N/P ratios. They should also provide a written comment on the significance of the results on the basis of their general knowledge of nutrient sources and cycling and of the on-site discussion with the tutor.

(see overleaf for results' table)

Activity A4

Summary of results

Date:

Group:

Sampling environment:

Sample code	$N\text{-}NH_4$ (mg L^{-1})	$N\text{-}NO_3$ (mg L^{-1})	$N\text{-}NO_3$ (%)*	$P\text{-}PO_4$ (mg L^{-1})	N / P$

* Percentage abundance of $N\text{-}NO_3$ with respect to the sum of the two N forms

$ N is meant as the sum of $N\text{-}NH_4$ and $N\text{-}NO_3$

Comments on redox conditions:

Comments on N / P ratio:

Comments on N and P distribution across sampling sites:

Directives for activity A5

(Tutor: J. Dominik / Adrian Stanica / Richard Thomas)

Aim of the activity:

learn to relate main qualitative macroscopic sediment features to their depositional environment and understand how this relation may influence the strategy for sediment sampling and the result interpretation in pollution studies.

Note: content of this activity may slightly differ depending on the studied environment.

Methods and contents

Short discussion on the goal of sediment sampling and sampling methods and field notes,

Sediment sampling with grab sampler at various locations, the river/sea interface (flocculation area) and sand depositional area,

Sediment sampling by coring,

Macroscopic sediment description, photos, wet sieving, drying,

Water content measurements

Observations of coarse fraction.

Expected student output:

Provide and understand the significance of sediment description: texture, consistency (water content), homogeneity, colour, odour, presence of organisms and organic debris, HCl reaction.

Fore detailed information and field work, see the provided document “Soft sediment observation.pdf”

Directives for activity A6 Water footprint

(Tutor: Debbie Chapman)

Aim of the activity:

To illustrate the difference between real water use and the water footprint of individuals from different countries

Methods and contents

Each student will estimate their domestic water use and calculate their individual water footprint using a simplified water footprint calculator on the worksheets provided. National and product water footprint data will be provided to aid calculation in combination with personal experience and estimated water use. Access to a calculator would be an advantage.

Expected student output:

Each student will have values for their individual domestic water use and water footprint. The group data will be compiled to produce a table of water footprints by nationality. Students should comment on possible reasons for any national differences observed and potential options for improving water footprints.

Directives for activity B1 Bird Watching

(Tutors: M. Zhmud / J.-L. Loizeau)

The Danube delta is the second largest wetlands in Europe with a total area of 580’700 ha (including the Razelm-Sinoe lake complex), shared by Romania (80 per cent of the surface) and Ukraine (20 per cent). According to Munteanu (2006), 316 bird species have been observed in the whole Danube Delta, including 170 regularly breeding species. Many species have a population of international importance on the European and world levels, including pygmy cormorant (*Phalacocrorax pygmeus*), red-breasted goose (*Branta ruficollis),* white pelican (*Pelecanus onocrotalus*), dalmatian pelican (*Pelecanus crispus*), night heron (*Nycticorax nycticorax),* the squacco heron (*Ardeola ralloides*), little egret (*Egretta garzetta*), great white egret (*Egretta alba*), purple heron (*Ardea purpurea*), glossy ibis (*Plegadis falcinellus*), Spoonbill (*Platalea leucorodia*), white-tailed eagle (*Haliaeetus albicilla*), and marsh harrier (*Circus aeruginosus*).
In the Ukrainian part of the delta, 263 bird species have been recorded, corresponding to 78 percent of all the species in the Danube Delta, and 62 per cent of the species recorded in Ukraine as a whole.

Aim of the activity:
To experience how to establish a bird census by identifying and counting most common large bird species .

Material and method:
Material is essentially binoculars, bird field guides, and notebook. A first step will be a identification phase (presentation of criterion for identification). Then students will identify and count birds along a defined river length.

Expected output:
Determination of the density population of the various observed species along a defined river reach. Localization of density “hot-spot” along the river.

Short illustrated bird guide

with probability of observation during field excursion in the Northern Part of the Ukrainian Danube Delta

Keys

Scientific name English name French name Russian name Romanian name Length and Wingspan Probability of observation (+, ++, +++)	Drawing (source: mainly Svensson et al 1999, Le guide Ornitho).	Picture: mainly from www.oiseaux.net

Example

Plegadis falcinellus
Glossy Ibis
Ibis falcinelle
Каравайка
Tigănus

L 55-65 cm W 88-105 cm
+

Birds are presented following the systematic classification

The full list of European birds with translation in many languages is provided as an extra Excel file (Bird name glossayry.xls).

Ardeola ralloides
Squacco Heron
Crabier chevelu
Желтая цапля
Stărc galben

L 40-49 cm W 71-80cm

+++

Egretta alba
Great White Egret
Grande aigrette
ББЦ
Egretă mare

L 85-100 cm W 143-169cm

+++

Egretta garzetta
Little Egret
Aigrette garzette
МБЦ
Egretă mică

L 55-65 cm W 88-106 cm

+++

Ardea cinerea
Grey heron
Héron cendré
Серая цапля
Stărc cenuşiu

L 84-102 cm W 155-175 cm

+++

Cygnus olor
Mute Swan
Cygne tuberculé
Шипун
Lebădă cucuită

L 140-160 cm W 200-240 cm

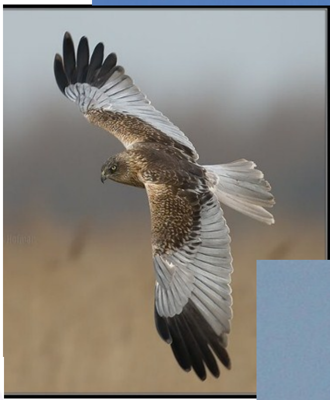
+++

Haliaeetus albicilla
White-tailed Eagle
Pygargue à queue blanche
Белохвост
Codalb

L 76-94 W 190-240 cm
+


Circus aeruginosus
Marsh Harrier
Busard des roseaux
Болотный лунь
Herete de stuf

L 43-55 cm W 115-140 cm
++

Falco subbuteo
Hobby
Faucon hobereau
Чеглок
Şoimul rândunelelor

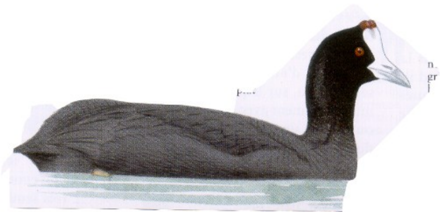
L 29-35 cm W 70-84 cm
++


Gallinula chloropus
Moorhen
Gallinule poule d'eau
Камышница
Găinuşă de baltă

L 21-37 cm
++


Fulicula atra
Coot
Foulque macroule
Лысуха
Lişiţă

L 36-42 cm
+++




Haematopus ostralegus
Oystercatcher
Huîtrier pie
Кулик-сорока
Scoicar
L 39-44 cm W 72-83 cm

++


Larus ridibundus
Black- headed Gull
Mouette rieuse
Озерная чайка
Pescăruş râzător

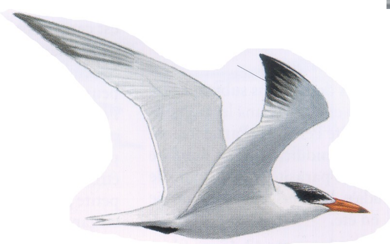
L 35-39 cm W 86-99 cm
+++


Larus cachinnans
Yellow-legged Herring Gull
Goéland leucophée
Хохотунья
Pescăruş argintiu?

L 52-58 cm W 120-140 cm
+++


Sterna caspia
Caspian Tern
Sterne caspienne
Чеграва
Pescăriţă mare

L 48-55 cm W 96-111 cm
++




Sterna sandvicensis
Sandwich Tern
Sterne caugek
Пестроносая крачка
Chiră de mare

L 37-43 cm W 85-97 cm
+++


Sterna hirundo
Common Tern
Sterne pierregarin
Речная крачка
Chiră de baltă

L 34-37 cm W 70-80 cm
+++


Coracias garrulus
Roller
Rollier d'Europe
Сизоворонка
Dumvraveanca

L 29-32 cm W 52-58 cm
+