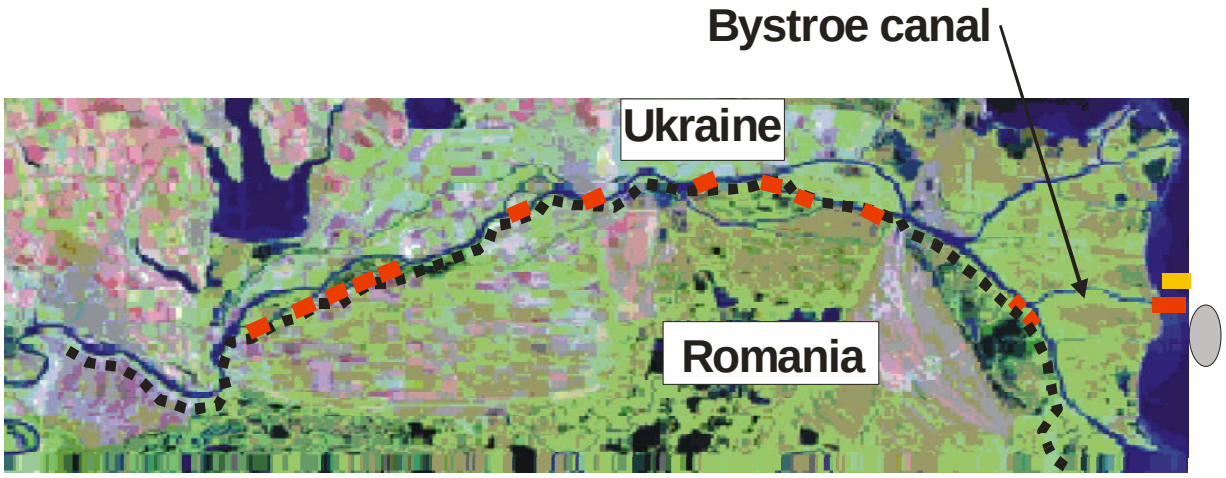
MINISTRY OF ENVIRONMENT AND WATER MANAGEMENT
DANUBE DELTA NATIONAL INSTITUTE
FOR RESEARCH & DEVELOPMENT

165, Babadag Street, 820112 Tulcea, Romania
Tel: (+40-240) 531520/524546; Fax: (+40-240) 533547
E-mail:<office@indd.tim.ro>



ADDITIONAL INFORMATION REQUESTED FOR THE THIRD MEETING OF THE INQUIRY COMMISSION ON THE LIKELY SIGNIFICANT TRANSBOUNDARY IMPACT OF THE UKRAINIAN DEEP-WATER NAVIGATION CANAL DANUBE-BLACK SEA IN THE CONTEXT OF ESPOO CONVENTION, 1991

Author: Dr. Mircea Staras
Danube Delta National Institute
Tulcea, Romania

October 2005

Additional information requested for the meeting of the Inquiry Commission
Third meeting, Geneva, 28 October 2005

1. Adoption of the proposed agenda (by the commission)

2. Update of the situation regarding the construction of the canal
The only available information is that works for building the navigation canal was stopped in the end of September. There are not available information on the status of the accomplished works.

3. Review of available information regarding the environmental impacts
New scientific information

The Romanian Institute for Marine Geology and Geo-ecology provided data on benthic communities resulted from an international survey conducted in 2003 in the N-W part of the Black Sea. The data could serve as reference status before execution works (Annex 3.1).
The area of dumping was a valuable habitat for benthic fauna. A comparison with data resulted from Ukrainian monitoring programme in 2005 would be useful for the Commission.

A scientific paper on the likely impact of Bystroe canal has been published in May 2005 by Dr.Tatiana Kotenko from Schmalhausen Institute of Zoology of the National Academy of Science of Ukraine:

,,Nature conservation and shipping in the Danube Delta and Biosphere Reserve (Ukraine): weighing ecological values against economic interests, Large Rivers Vol.15, No.1-4, Arch.Hydrobiol. Suppl.155/1-4, p.693-713. (Annex 3.2)

The above paper was nominated as ,,*in press"* in the reference list of the Documentation on the likely significant transboundary impact of the Ukrainian deep-water navigation canal submitted by the Romanian expert in feb.2005.
The paper is available, supporting the Romanian statements no. 2 on dumping effects, no.3 on migratory fish, no. 4 on socio-economics issues and no. 5 on migratory birds.

4. Situation in the Danube Delta (Romania) after the disastrous floods of the last month

4.1. Hydrology

The water level regime has recorded maximum values or close to them starting from March-April and not only in September.
The water discharge of the Danube River recorded accordingly high values: 11500-11600 m^3 /s in April-May, comparing to the average of 6570 m^3 /s for 1921-1990 period. This value represents the highest water discharge in the last 35 years (Tulcea station, km 39 upstream Black Sea).

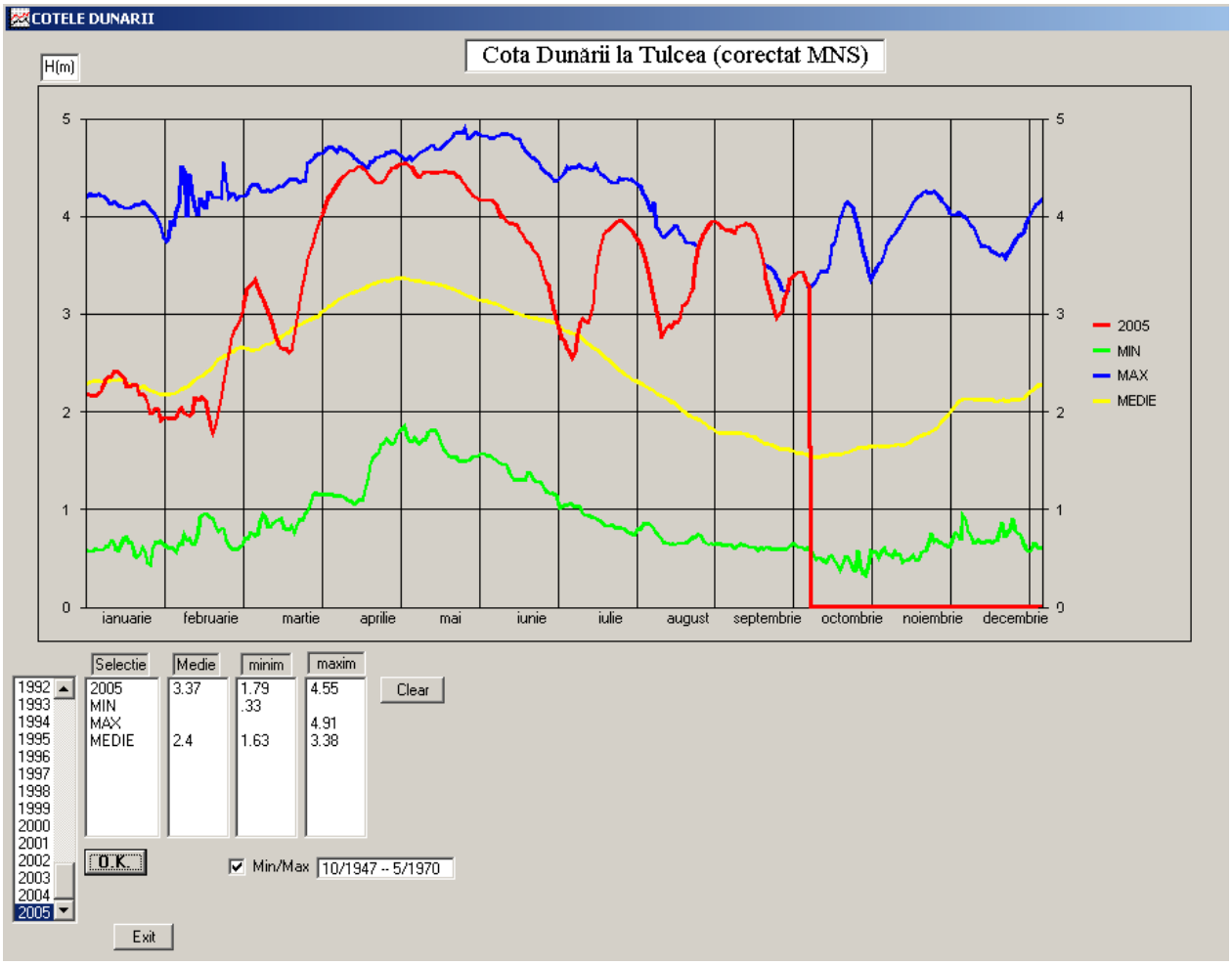


Fig. 4.1. Monthly water level variation of Danube River at Tulcea station (km 39)
The monthly minimum, average and maximum are derived from 1932-2005 data series, at the beginning of the delta, referring to the Black Sea.
It is obvious the water levels in September and October (first week) succeeded the historical maximum values.

4.2. Water chemistry

The water quality is monthly monitored in the Danube and Delta by Danube Delta National Institute (fig. 4.2). A general remark: as a result of floods recorded in Danube River basin and mainly in Romania, the chemical compounds and wastes from agriculture lands, villages were washed out and transported downstream toward the delta. The contents of nutrients (mainly phosphorous) and some heavy metals (Zn) increased during summer, and have recorded

higher values comparing to previous years (fig. 4.3), probably due to flooding of agriculture areas.
In term of discharge, the amounts of nutrients and some heavy metals recorded higher values during flood period comparing to years 2003-2004 (fig.4.4; 4.5; 4.6; 4.7).
The values of other chemical compounds varied in the range of the limits of the last years.

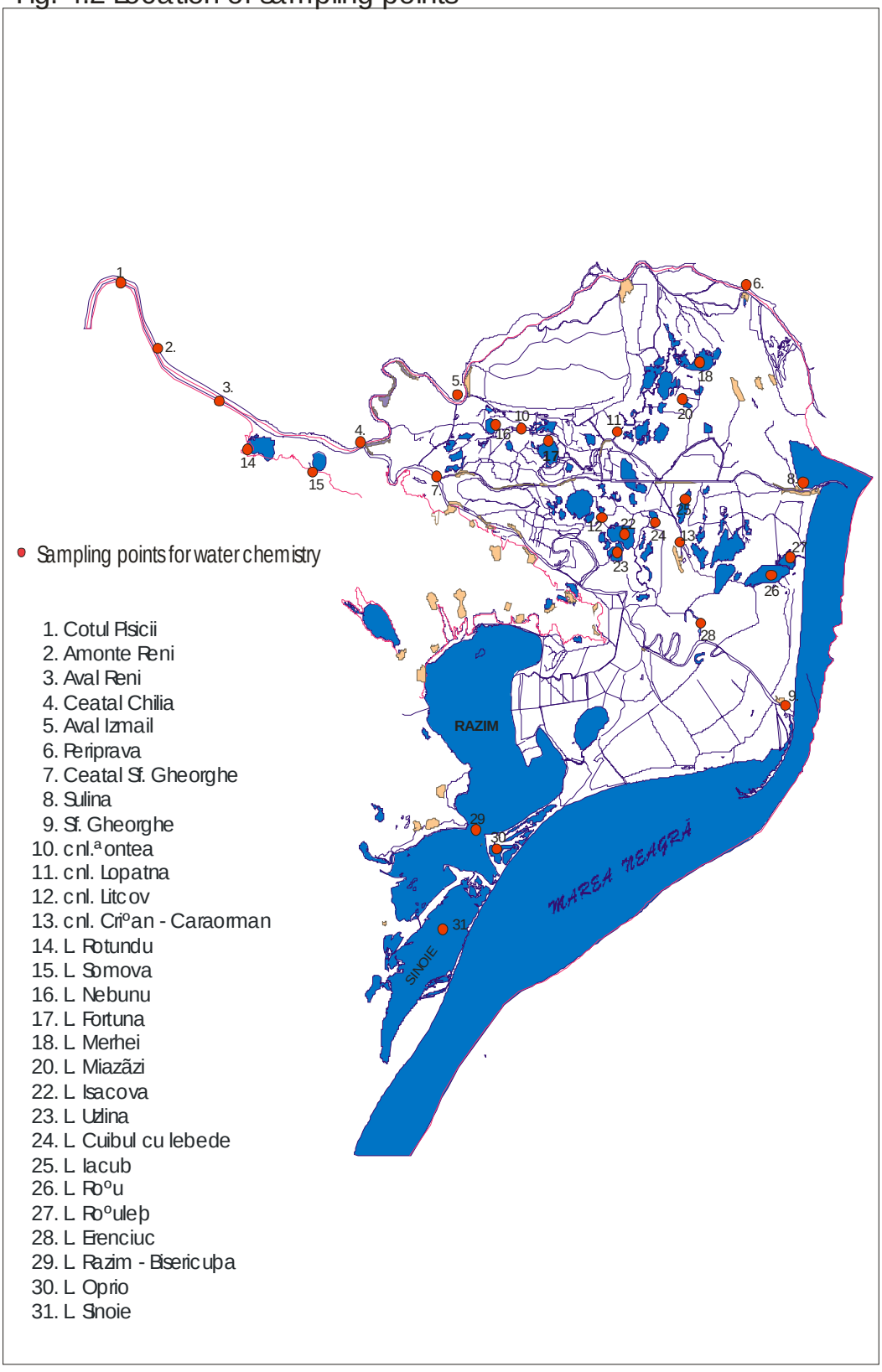
4.3. Settlements

A number of 25 settlements are located in the Danube Delta with a total number of about 14 000 inhabitants. Almost all villages are defended by surrounding dams, 12 houses have been affected by flooding. The large natural wetlands around villages played the role of huge reservoirs for temporary water storage and the drainage was very active because of the proximity of the Sea.

4.4. Flora and fauna

The fish populations which represent the main resource for inhabitants benefits from high water level in spring-summer, because the spawning and nursing areas are larger. The more active flushing removes the organic compounds from the aquatic habitats and prevents anoxic conditions in summer.
A part of the bird species which nest on aquatic vegetation or terrestrial land suffered from floods. They repeated laying eggs after flooding and their chickens recorded a late development.
The hunting season was postponed with 2 month firstly due to this reason and than hunting was totally prohibited due to the two cases of wild birds with aviary flu, one inside the delta.
The ornithologists were concerned by the possible effects of an early winter, but no negative effects occurred so far in this respect.

Fig. 4.2 Location of sampling points



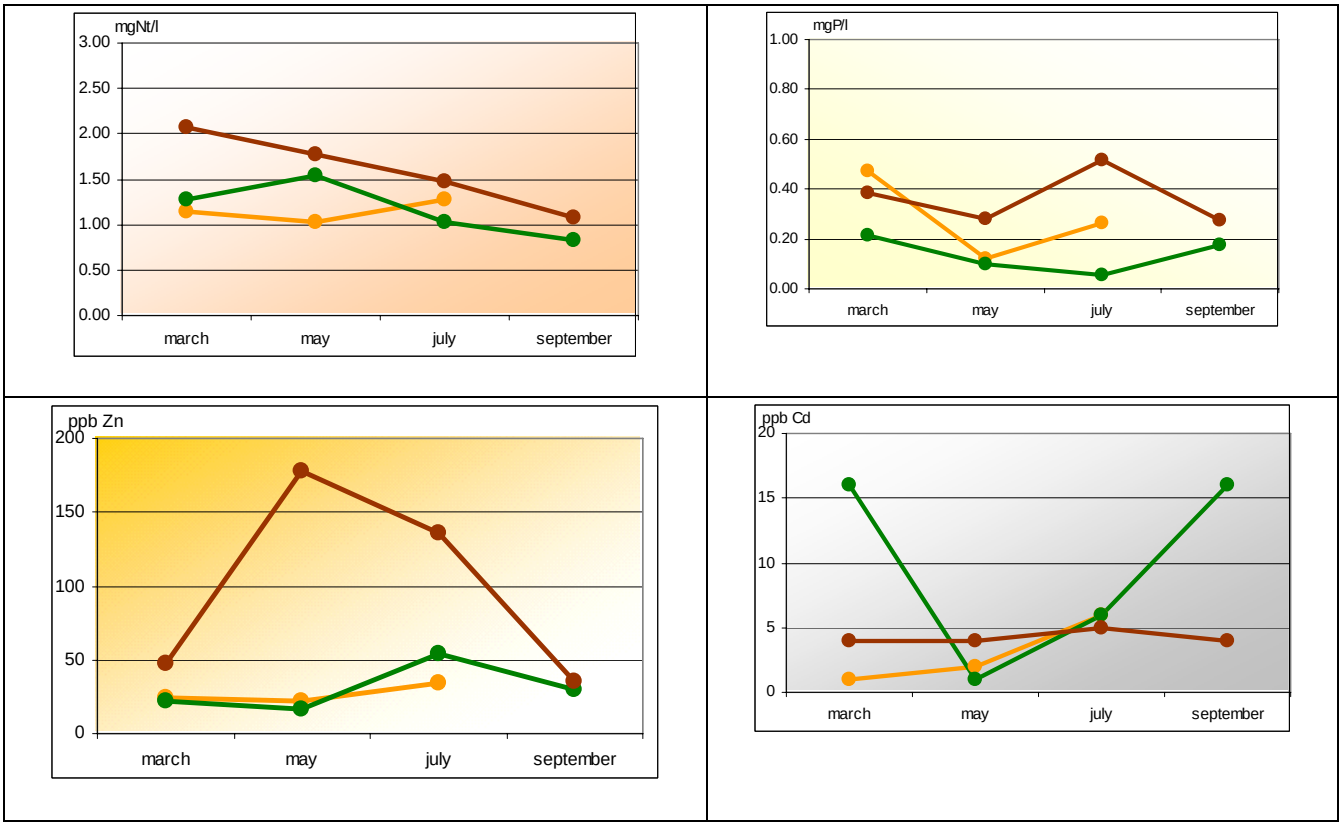


Fig. 4.3. Concentrations of some chemical compounds, Chilia fork section
yellow: 2003; green: 2004; red: 2005

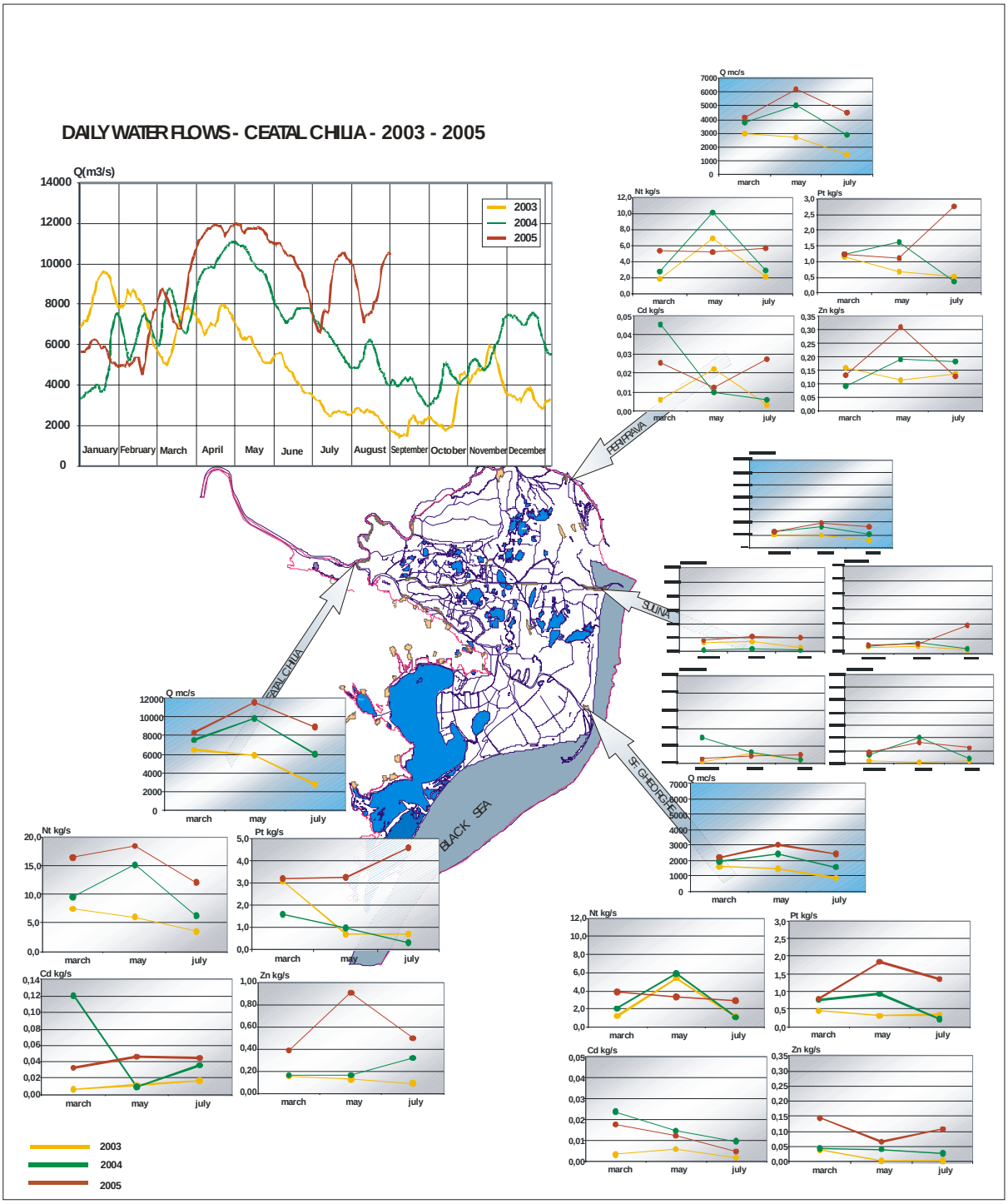


Fig.4.4. Water, nutrients and some heavy metals discharge in Danube, 2003-2005

Fig. 4.5. Danube and canals - mineral nitrogen, seasonal values, 2005

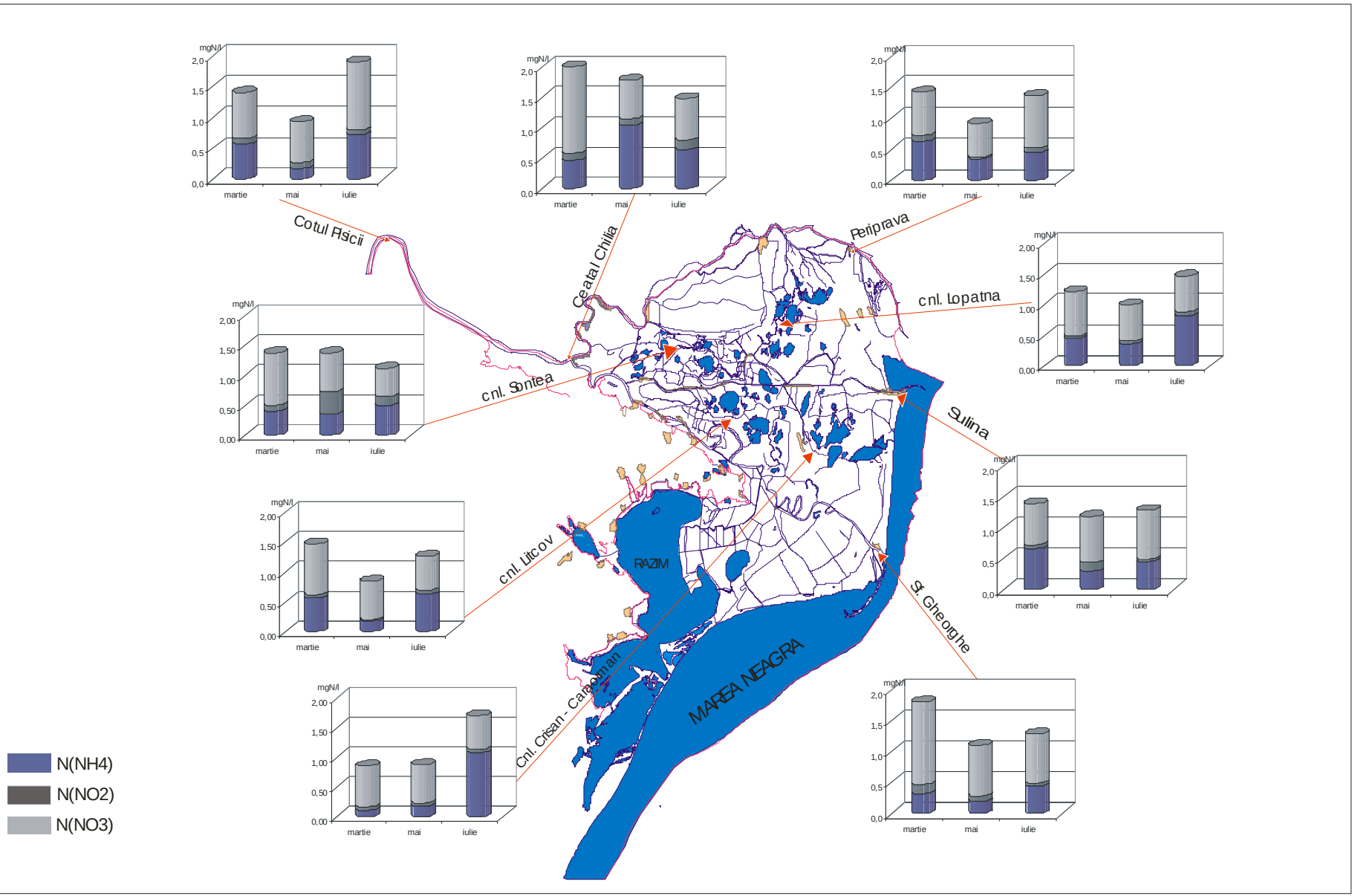


Fig. 4.6. Danube and canals - Total phosphorous, seasonal values, 2005

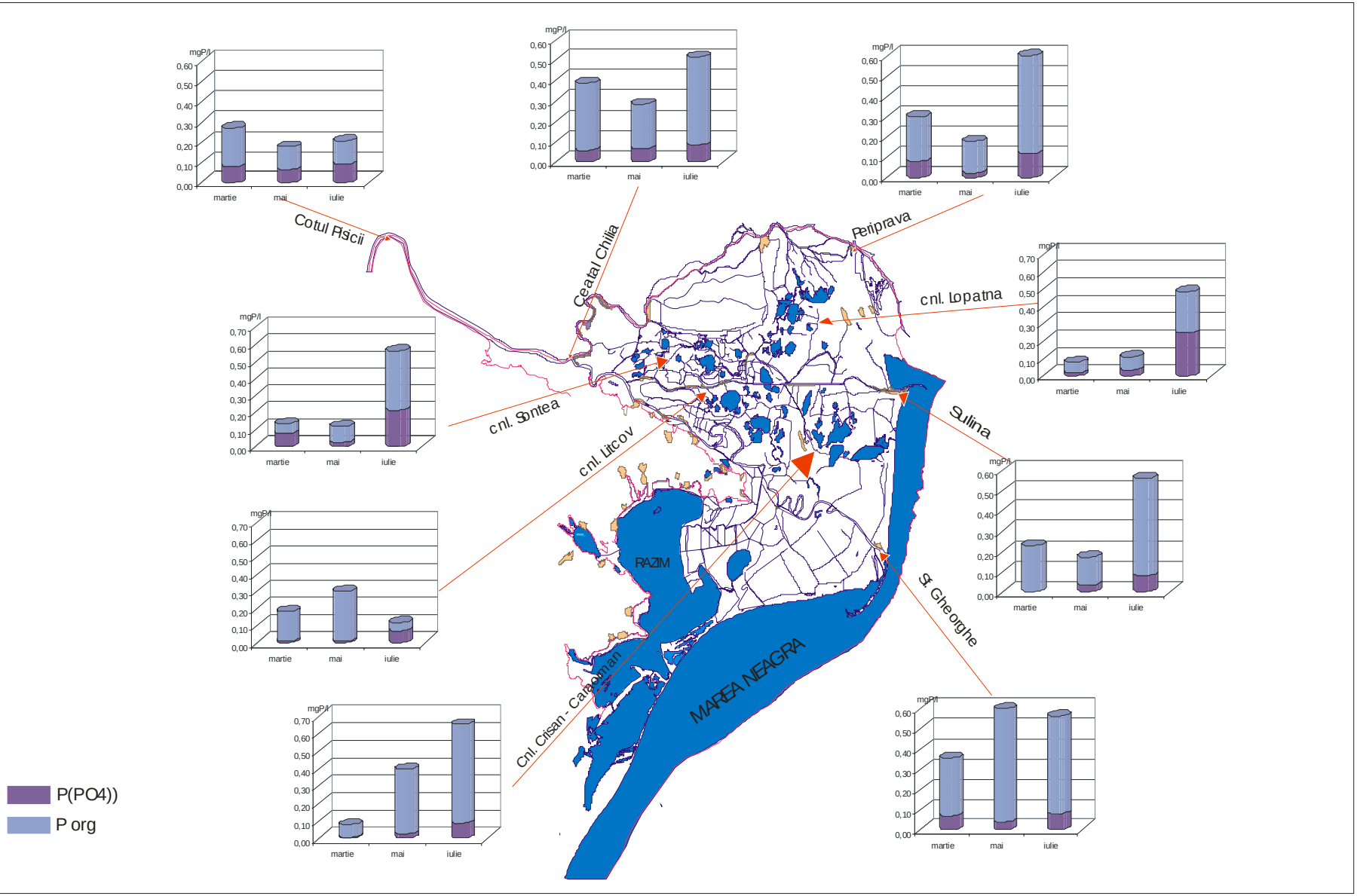
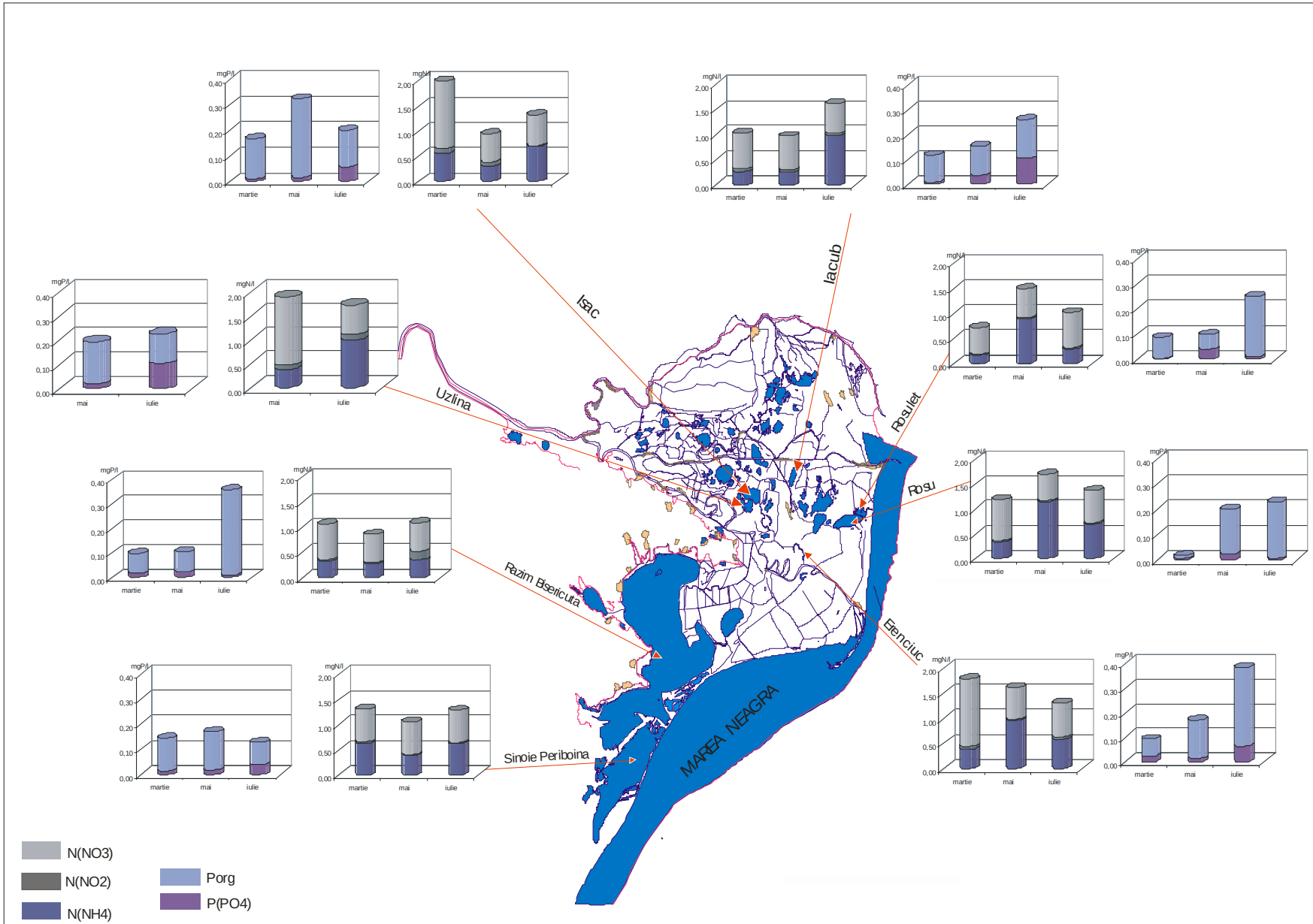
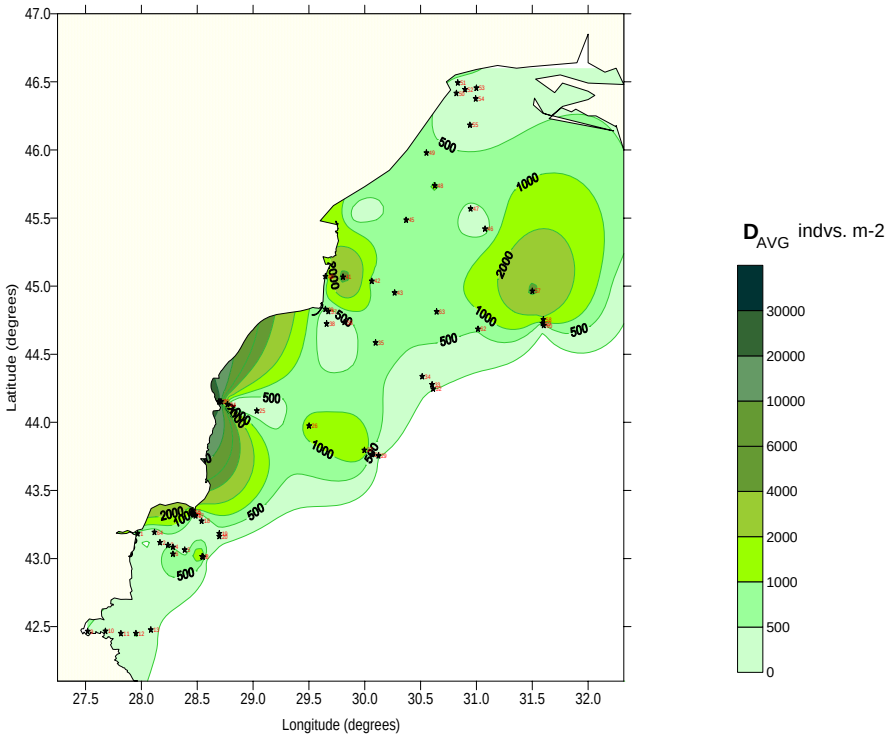


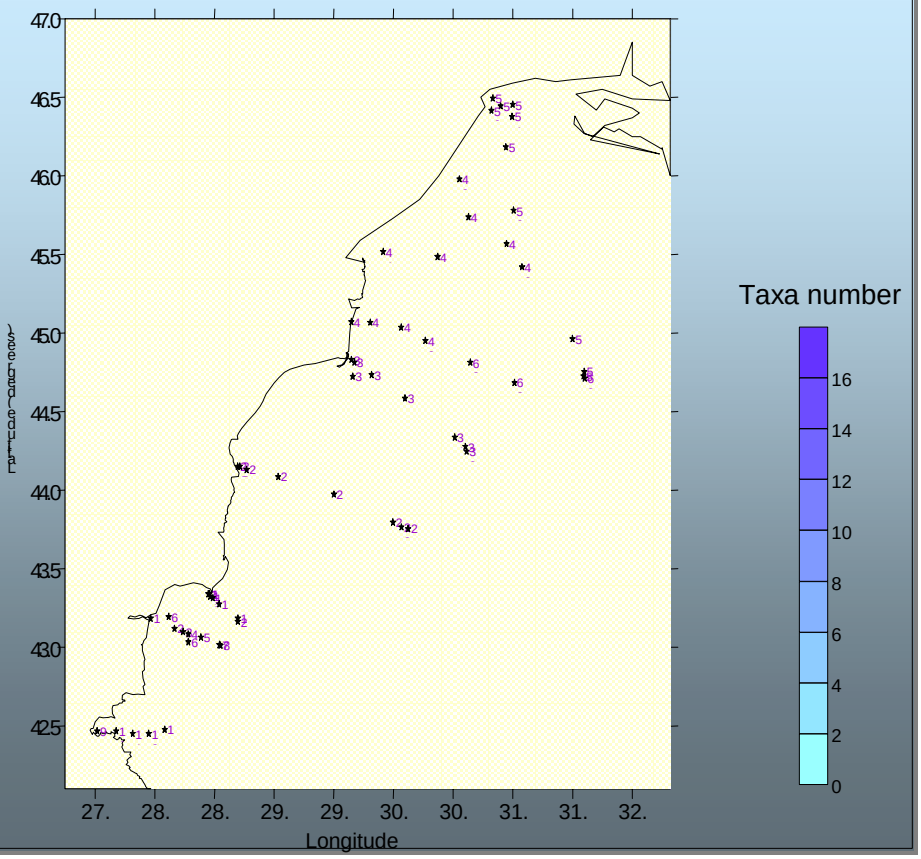
Fig. 4.7. Lakes, mineral nitrogen and total phosphorous - seasonal values, 2005



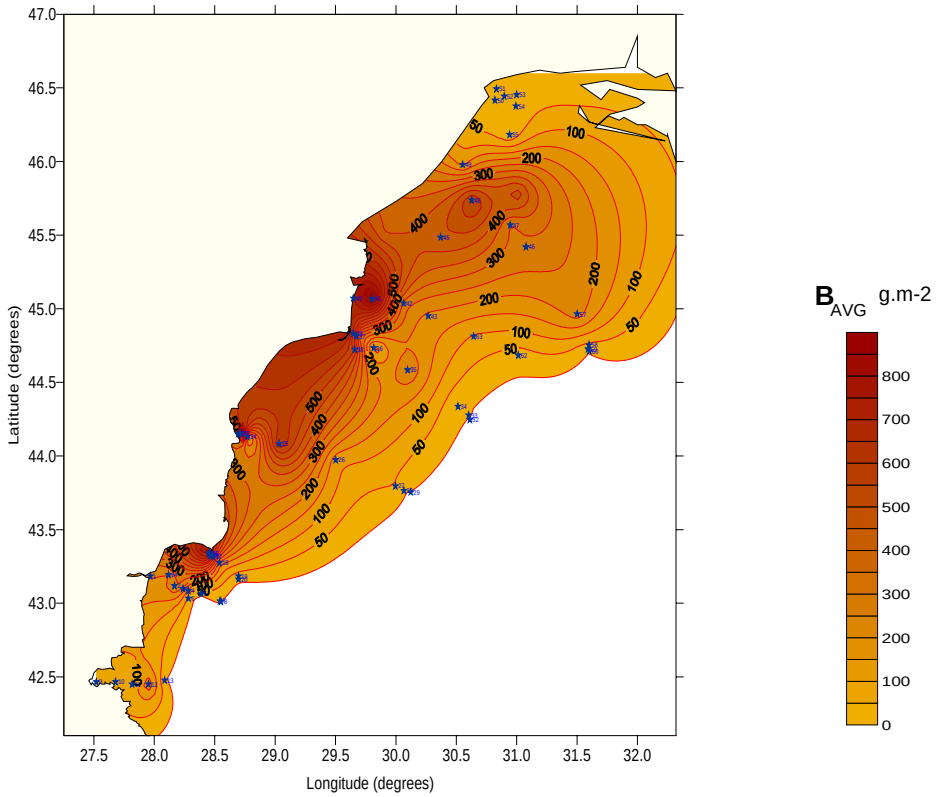
D. Mollusca



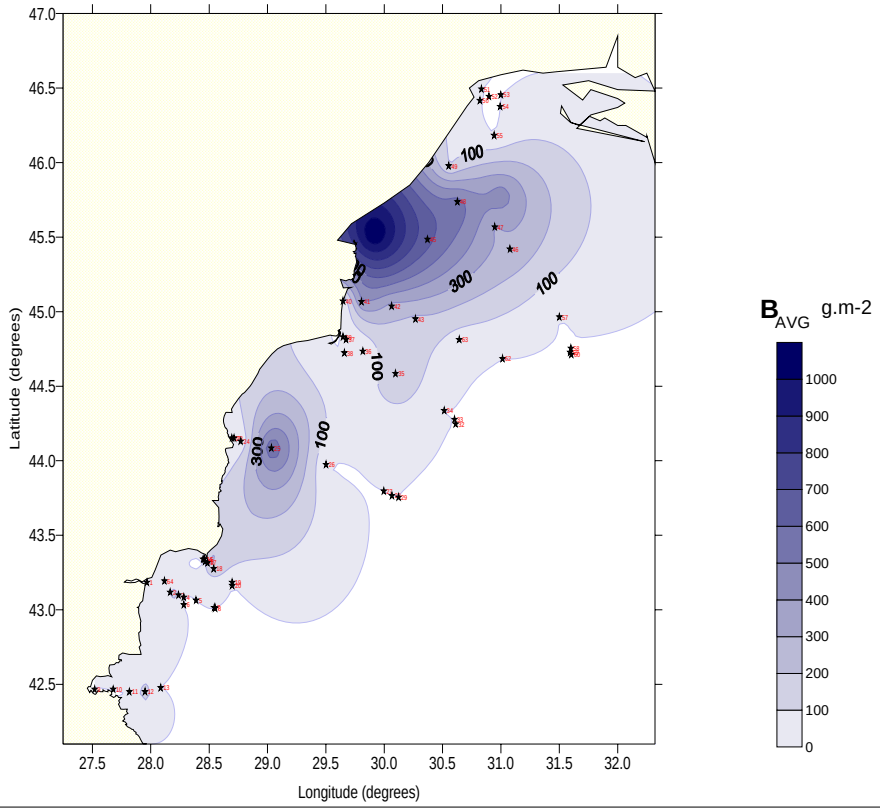
N.sp. Mollusca



B. Mollusca



B. Mytilus



Large Rivers Vol.15, No.1-4
Arch.Hydrobiol. Suppl.155/1-4, p.693-713, Mai 2005

Nature conservation and shipping in the Danube Delta and Biosphere Reserve (Ukraine): weighing ecological values against economic interests

Tatiana Kotenko

Schmalhausen Institute of Zoology of the National Academy of Sciences of Ukraine
Vul. B. Khmelnyts'kogo, 15, Kyiv-30, MSP 01601, Ukraine.
E-mail: kotenko@iz.freenet.kiev.ua

Abstract: Conservation and protection of river reaches, where high ecological status still has been preserved, is economically much more reasonable than rehabilitation of heavily modified ones. The Danube Delta represents a unique wetland with rich biodiversity and relatively natural conditions. In Ukraine the ecologically most valuable part of this wetland has been protected within the Danube Biosphere Reserve (DBR), which is approved by UNESCO. The functional zoning of DBR and its management plan were officially approved. During 20th century more than 10 variants for a shipping canal from the Danube to the Black Sea have been proposed for the Ukrainian part of the Danube Delta. In this paper these alternatives are summarised for their navigational advantages, economic expedience and ecological impact. The Ukrainian Ministry of Transport decided to construct a deep shipping lane along the Bystre Branch of the Danube i.e. through the strictly protected zone of DBR. The Bystre Branch shipping lane project contradicted national law and international commitments of Ukraine and was assessed by the National Academy of Sciences of Ukraine as very harmful for the Danube Delta and the Black Sea ecosystems. In spite of all objections and active resistance of numerous environmental and scientific organisations, the Ukrainian government approved this variant in 2003, where after in 2004 the President declared changing the boundaries and zoning of DBR. The construction started in May 2004. Its implementation will jeopardise all or most long-term management objectives envisaged for DBR and the feasibility of ecological rehabilitation of DBR ecosystems will considerably be restricted. Creating a precedent of destroying a reserve with the highest protective status in the country, the Ukrainian government undermines the future of nature conservation in Ukraine.
Keywords: Danube Delta, Ukraine, biosphere reserve, biodiversity, conservation, rehabilitation, shipping, impact assessment

Introduction

Humans have heavily modified many rivers in the world (PETT et al. 1989; DYNESIUS & NILSSON 1994; TOCKNER & STANFORD 2002). Land use changes in the upstream basin and regulation measures along the river channels have been primarily driven by economic motives and objectives, such as flood protection, shipping, power generation, water use, or agriculture. These modifications, however, have caused a dramatic degradation of the ecological functioning and integrity of rivers: water pollution has increased, reservoir dams interrupt the longitudinal river continuum and modify the discharge regime, levees reduce the natural flood pulse across the floodplain, canalisation of channels and artificially fixed banks prevent lateral erosion and rejuvenation of floodplains, and floodplains have been reclaimed and cultivated. Nonetheless, the economic gains were considered much higher and much more important than the ecological losses, while in many cases the loss of ecological values was not an issue for consideration in the design.
With the increased understanding of river ecosystems importance and the awareness of their ecological condition, the need for ecological rehabilitation of heavily modified rivers has arisen, and has been approved in numerous river acts and legislation, with the European Water framework Directive as recent example (EC 2000). It has been widely acknowledged that restoration of modified rivers to the pristine situation is not realistic. Restoration projects now have to be designed and implemented within - mostly nonnegotiable - boundary conditions of economic functions, since large-scale river restoration often would imply huge cost for the rivers' economic functioning. Furthermore, few countries are willing and able to reserve large budgets for ecological restoration per se, if this does not yield other in this case socio-economic benefits. Therefore,

rehabilitation projects are now mostly undertaken in those river reaches where they will not hamper other functions, or the plans aim at designs with win-win solutions for other functions (e.g. safety, recreation), even if the ecological benefits alone would be high already.
Regarding the effort needed to rehabilitate heavily modified rivers, conservation and protection of river reaches where high ecological status still has been preserved may be much more effective. However, even in those situations, there may be pressure by economic users, such as power generation or shipping, against conservation of the (semi-)pristine status of the river. To decide in such situation whether a river reach should be conserved or (economically) developed, the costs of ecologic losses have to be weighed against the economic benefits. Even if environmental impact assessments are undertaken that sincerely consider ecological aspects of different modification alternatives, the essential point is that 'hard' and direct economic benefits must be weighed against 'soft' and long-term (biodiversity, sustainability, resilience) ecologic values. Regarding the differences in units of valuation and the time horizon at which cost and benefits may be experienced by society, as well as the different interests and political power among the involved stakeholders, it remains uncertain that even very high ecological values may outweigh economic interests. In the present paper we illustrate the nature-economy conflict by means of a case study for the Ukrainian part of the Danube Delta that is not only of local but also of global ecological importance.

Ecological values of the Danube Delta

The Danube Delta is one of the largest deltas in the world and the second largest delta in Europe. The age of its oldest parts is 10–13 thousand years; the secondary delta of the Kilia Branch is the youngest part. The latter's formation started about 300–400 years ago and is still in progress: the shore advances 40–80 m per year into the sea, and one can observe processes of delta formation and land colonisation by plants and animals. The Danube Delta hosts well-preserved natural ecosystems and is characterised by a great variety of wetland types and landscape forms, a very high bio-productivity, and supports many animal and plant species in great abundance. It is an area of large seasonal populations of water birds and an important bird nesting site, as well as breeding site for many fish species. It is the largest site in Europe supporting many species of threatened amphibians. For many species of plants and animals the Danube River and the coastal zone of its delta serve as important biological corridors. In this region different faunas and floras are found together. Owing to the high abundance of populations of many red-list species, the Danube Delta is extremely important for their conservation (IUCN 1992; WILSON & MOSER 1994; SHELYAG-SOSONKO, 1999; KOTENKO & KOVTUN, 2002). These characteristics render the delta one of the important areas of endemism in Europe and a global-scale biodiversity centre. It therefore has achieved the status of a UNESCO World Heritage site, a Ramsar wetland of international importance and has been attributed to one of 200 most valuable and rich in biodiversity areas of the world i.e. the Global 200 (OLSON et al. 2000).

Protective status of the Ukrainian part of the Danube Delta

The unique and high ecological value of the Danube Delta has been confirmed by national and international legislation and declarations. Problems of conservation of the Danube Delta wildlife and protection of the Danube and the Black Sea against pollution are directly concerned with more than 20 conventions, agreements, strategies and declarations, which Ukraine ratified or joined.
The Ukrainian government recognised the value of the Danube Delta ecosystem and the necessity of its protection by declaring some parts as a state reserve in the years 1973–1981. The secondary delta of the Kilia Branch also received official protection as a Ramsar site. In 1998 the Danube Biosphere Reserve (DBR) was officially established (Table 1). The DBR territory was divided into four functional zones (Fig. 1, Table 2). According to the law "On Nature-Reserve Fund of Ukraine" (1992), all nature reserves and strictly protected zones of biosphere reserves and national nature parks are state property, should be strictly protected and cannot be used for any economic activity. The Water Code of Ukraine (1995) also declares that no activities may be undertaken within protected water bodies other than those for nature protection.
Numerous threatened species are also officially protected by a special decree of the Supreme Soviet of Ukraine (1992) and a law (2002) "On the Red Data Book of Ukraine". DBR supports 21 species of vascular plants, included to the national Red Data Book, and over 125 species of vertebrate animals, insects and crustaceans, included in national, European and IUCN red lists, inhabit the reserve permanently or periodically (SHCHERBAK 1994; SHELYAG-SOSONKO 1996, 1999; KOTENKO & KOVTUN 2002). Threatened commercial fish species have been additionally protected by the Rules for fishing in the Black Sea basin (1983). Furthermore, the Danube Delta takes an important place in the Ukraine National Biodiversity Conservation Strategy and the National Ecological Network. The Ukrainian DBR has also been integrated with the Romanian Danube Delta Biosphere Reserve (established in 1990 with total area 580,000 ha) into a

bilateral transboundary Romanian-Ukrainian biosphere reserve “The Danube Delta”. In 1999 DBR received an official UNESCO certificate, being included to the global network of biosphere reserves. Thus, DBR was under strong national and international protection.

Ecological management objectives for the Danube Biosphere Reserve

As a result of a scientific research program, in 1996–1998 management plans were prepared for the specific areas (secondary delta of the Kilia Branch, Stentsivsko-Zhebrianski Plavni, Yermakov Island and Zhebrianske Pasmo) and summarised in a management plan for the whole DBR (SHELYAG-SOSONKO, 1999; VOLOSHKEVICH et al., 1999). In 1998, the Ukrainian Ministry for Environmental Protection and Nuclear Safety approved it as an official document for managing DBR. General long-term objectives are shown in table 3. Long-term objectives for individual areas were proposed taking their specificity into account – namely their present ecological condition and economic use, biodiversity value, prehistory, need and potential for restoration (Table 4). A functional zoning of DBR was considered as a main tool to combine ecological and economic needs for attaining the sustainable development of the region.

Shipping canals

Description of alternatives
Over about 150 years numerous plans have been proposed for the construction of shipping lanes through the Danube Delta. For the Ukrainian part at least 13 different projects have been proposed, of which some have been realised in the past (ZIZAK, 1997, 2001; RICHTRANSPOEKT 1997, 2001, 2002a, 2002b, 2002c). In 1900, a shipping lane through the Polunochne Branch was constructed, that soon silted up. In 1918 a canal was dug in the mouth of the Ochakivske Branch, but this also silted-up rapidly. In recent years, different routes for a shipping lane have been discussed as possible solutions. Table 5 summarises the most important projects considered. They are shown in Fig. 1.

Navigational and economic benefits and drawbacks
From the point of view of navigation, the best alternative would be the Starostambulske Branch (alternative 5), because it has no sharp turns, and it is wide enough for bi-directional navigation (Table 6). The other lanes and canals are unidirectional – at least over a short section. The desired ship draught of 7.2 m is envisaged in alternatives 5–10 and can be reached in alternative 1. Options 2b and 4 supports 6.3-m draught, canals 2a and 3 are too shallow. In addition, the design of the last one is difficult for navigation. The Tsyganske Branch (alternative 6) has a small turning radius at its entrance, but its outlet has the best conditions for constructing and maintaining a sea approach channel and is naturally protected. Shipping lanes, that use the Prorva Branch (alternatives 2a, 2b and 3), have the turning radius 400 m while entering the Ochakivske Branch. In addition, alternatives 2–4 have unfavourable distant prospects, because the Ochakivska system of the Danube Delta branches is now in the stage of dying.
From economic point of view the cheapest are options 2a and 3, but these canals are too shallow (Table 6). Sluiced canals of alternatives 8–10 are expensive, but need the least maintenance dredging. Option 4 needs moderate dredging and is less expensive than other sluiced canals, but is not deep enough. The worst is the Prorva canal deepening project (alternative 2b), as it is expensive, involves a large volume of initial dredging, and the canal will remain not deep enough in spite of the largest maintenance dredging. Shipping lanes of alternatives 5–7 will require intermediate costs, initial and maintenance dredging. The first stage of any of the last three alternatives can be put into operation within few months, full construction in 1–2 years, while the functioning of expensive sluiced canals can start at least within 4–5 years. Advantages and shortcomings of alternatives are given in Table 6.

Hydrological and ecological consequences
From an ecological perspective, alternatives 1–4 and 8–10 are the best, because they avoid the strictly protected zones of DBR. Of these canals 1 and 8–10 will run outside the active part of the Danube Delta, what will minimise the interference in natural deltaic processes. Alternatives 2, 3 and, partially, 4 run within existing shipping ways, along already modified banks, while no. 10 runs along an existing non-shipping canal, using one of its embankments thereby reducing wetland damage. Alternatives 8 and 9 will have a negative impact on the rich biodiversity of Zhebrianske Pasmo and Bay. These options and alternative 1 will affect the Prymorske resort, while option 10 will affect the biodiversity of Stentsivsko-Zhebrianski Plavni and Sasyk Lake. Alternatives 5–7 cross the strictly protected zone of the UNESCO biosphere reserve and are situated in the most active part of the delta, disturbing natural hydrological and morphological processes. Of all alternatives the Bystre Branch shipping lane (BBSL, option 7) has the longest way within the strictly protected

zone crossing its central part. It furthermore needs high maintenance dredging, and has a huge problem to construct a new seaport and means of communication (Table 6).

Ecological impact of the Bystre Branch shipping lane

In practice, the actual choice for constructing a shipping lane seems not based on a thorough ecological assessment, while in the selection procedure of possible options ecological implications seem to be of less weight than other, political and economic, arguments.

All considered projects envisage the construction of a shipping lane across different parts of DBR (Fig. 1). After a short analysis of some alternatives, "Richtransproekt" has chosen the shipping lanes along the Starostambulske or Tsyganske branches (alternatives 5 and 6) (RICHTRANSPROEKT 1997). As these lanes would cross a strictly protected zone over several kilometres, they received a negative estimate for their impact on the DBR ecosystem, with emphasis on inadmissibility of violating the current legislation of Ukraine and international commitments of the country. Therefore, "Richtransproekt" concentrated its efforts on the Bystre Branch (alternative 7) (RICHTRANSPROEKT 2001). Remarkably, this shipping lane alternative also would cross the strictly protected zone and was thus assessed equally harmful. Instead of acknowledging the ecological value of protected areas and looking for less harmful alternatives, since 2001 all official activities were focused on receiving positive conclusion of the state ecological expertise on BBSL project, as well as on revising the zoning and boundaries of the biosphere reserve to accommodate this alternative (Table 7). Creating the precedent of destroying a reserve with the highest protective status in the country, the Ukrainian government subjects the future of nature conservation in Ukraine to the great danger.

Ecological assessment revealed serious negative impact of BBSL construction on ecosystems of DBR and adjacent sea aquatory (ROMANENKO 2002). Its realisation would greatly influence hydrological, sediment and hydrochemical regimes of the Ukrainian part of the Danube Delta, the hydrodynamic and morphodynamic processes in the secondary delta of the Kilia Branch, and the hydrochemical condition of the adjacent coastal zone of the Black Sea. Furthermore, it will cause heavy pollution and eutrophication of the Danube water and adjacent aquatory of the Black Sea arising from dredged bottom sediments. Many habitats of threatened and endemic species of animals and plants are expected to be completely destroyed or essentially modified.

Opening the bar and deepening the channel of the Bystre Branch will cause the redistribution of the river discharge and deposits, the decrease of discharge in the Starostambulske, Ochakivske and other large branches, the gradual disappearance of some small branches and streamlets, and the reduction of water reserves in wetlands adjacent to the branches (see MIKHAILOV at al., 1977; MIKHAILOV, 2001). This will lead to overgrowing of inner lakes and converting them into reed marshes. Finally, the cardinal changes of the front edge of the delta may take place. Though the general principles of the Danube Delta functioning are generally well understood (ZENKOVICH 1956; SHUISKY, 1984), the precise hydrological and morphodynamic consequences of BBSL cannot be exactly predicted.

According to calculations based on field analysis, 5.14 million m^3 of dredged river sediments will contain 7548.5 tons of oil products, 8.2 tons of polycyclic aromatic carbohydrates (PAC have high carcinogenic activity), 263.8 kg of DDT and its metabolites, as well as heavy metals (including 23.1 tons of very toxic cadmium), radioactive caesium etc. 2.33 million m^3 of sediments dredged in the bar part and 1.17 million m^3 of sediments of annual maintenance dredging will additionally contribute to this pollution (ROMANENKO 2002). A large portion of these dangerous toxic substances will enter the water and pollute riverine and coastal marine ecosystems. Around the submarine dump concentration of oil products in water is expected to greatly exceed tolerance levels in fish. The envisaged land dump (up to 6 million m^3) on Yermakov Island of DBR will be a permanent source of pollution. To summarise, water pollution may create a large problem of safe water for drinking, irrigation and fish industry (with relevant economic losses and social consequences). Experience received from the Prorva demonstrates that permanent dredging causes irreversible changes in aquatic coenoses. Full restoration of bottom communities will be impossible. Among all branches in the secondary delta of the Kilia Branch the highest zoobenthos diversity is observed in the Bystre, the lowest (4 times lower) in the Prorva. The same fate will have the Bystre ecosystem after BBSL construction, which envisages disturbing 4.5 km^2 of river and sea bottom (ROMANENKO 2002).

Usually the water in the Bystre keeps fresh from the surface to the bottom due to the strong river flow and the presence of a bar in the sea against the branch mouth. After deepening the river channel and opening the bar, 1 km (in summer) to 1.5 km (in winter) of the Bystre lower reaches will be exposed to the permanent salt-water intrusion, and periodical intrusion up to 9 km of the branch length will be relatively common.

On Yermakov Island, an area of 8 km long and 500–600 m wide will be occupied by permanent dump for dredged bottom sediments. Natural habitats on that area will turn into a sand desert (on the first stage) and then into thickets of weeds (later on), as it happened on the banks of the Prorva Branch. Ruderal

vegetation will substitute the natural types in all sites of construction activities. The impact of anthropogenic vegetation on remnants of natural vegetation may have similar destructive character.

Within the delta of the Kilia Branch, the zone impacted by BBSL is the richest in species of plants, insects and vertebrates. In DBR, the Bystre region has the richest avifauna. It supports 245 bird species (95% of the DBR avifauna), including 36 (86%) red lists species. Up to 5600 pairs nest here. Because the Bystre has high flow rates, rare rheophilous fish species (they are included to the Red Data Book of Ukraine and are mostly endemic) occur more often in the Bystre than in other branches. A significant portion of juvenile sturgeons descends by this branch. The Danube is the last river of the Black Sea basin where natural spawning of migratory sturgeons takes place. Because the Bystre Branch carries much water, it is attractive for Pontic shad (*Alosa pontica* (Eichwald)) during its spawning migration, and is one of the main branches for descending passively drifting shad larvae from the Danube to the Black Sea. The Bystre characteristics favour the Pontic shad fishing: its average catch in this branch comprised about 20% of all catches of this valuable commercial species in the delta of the Kilia Branch (SHELYAG-SOSONKO 1999; KOTENKO 2002; KOTENKO & KOVTUN 2002; ROMANENKO 2002). In this secondary delta, most species of amphibians, reptiles and mammals prefer fluvial and marine levees and lakes. These very lakes and natural levees serve as biodiversity centres under conditions of vast areas of continuous thickets of reed, cattails and sedges. Birds greatly depend also on sand spits and littoral shallows, while fish depends on shallows, lakes and river branches. BBSL construction will destroy or significantly transform just those ecosystems for the protection of which DBR has been established.

Discussion and conclusions

According to NASU (ROMANENKO 2002) sluiced canals by alternatives 4 or 10 seem to be ecologically the least harmful, and the Connective Canal (alternative 3) can be used as a temporary solution for the period of sluiced canal construction. Two experts of UNESCO MAB Programme and Ramsar Convention Bureau have chosen alternatives 3, 8 and 9. Although both NASU and foreign experts pointed out that Bystre Branch option was ecologically the worst and would have the largest negative environmental impact on the Danube Delta and the Black Sea, their opinions were not taken into consideration by the Ukrainian government. A campaign of public awareness, raised by environmental NGOs, DBR authority, NASU and international nature conservation organisations, did not lead to abandonment of the chosen project, but only caused a temporary postponement of the construction process.

The Danube delta case may illustrate here, that legislation and international recognition of high ecological values of an area may not a-priori guarantee its protection. In situations where major economic, financial and political interests are at sake, there is the risk of introducing sectorial style of river management. In the Danube Delta example, national economic interests of navigation, institutional interests (Ministry of Transport of Ukraine) and financial interests of influential high-ranking persons and companies have got control on the decision process of the policy makers. Instead of seeking integrated solutions, or evaluating the effects of different options, the decision to construct a shipping lane and the selected location of it were solely driven by economic interests. In such a situation, even the highest possible ecological valuation of an area, embedded in national and international legislation and protection acts, appears to be considered irrelevant.

The question that remains is: how to express the ecological value of an area such that it can be weighed against monetary and economic arguments. Apparently, there is a mismatch between shorter-term and direct economic interests and the longer-term more indirect ecological and, finally, economic values of an area.

Acknowledgements

I am deeply gratitude to I. Golovina (“Richtransproekt”, Kyiv), V. Zizak (“Proektgidrobud”, Odesa), V. Zhukinsky and A. Lyashenko (Institute of Hydrobiology, Kyiv), A. Kotenko (Schmalhausen Institute of Zoology, Kyiv), V. Voloshyn (the NASU Presidium, Kyiv), S. Shaparenko (Pechenigy environmental group, Kharkiv), V. Boreiko (Kyiv Ecological and Cultural Centre, Kyiv), O. Voloshkevich (the Danube Biosphere Reserve, Vylkove) for consultations and documentation. I highly appreciate the help of Tom Buijse (RIZA, Lelystad) and Hans Middelkoop (Utrecht University) for useful comments and revising my manuscript.

References

DYNESIUS M. & NILSSON C. (1994): Fragmentation and flow regulation of river systems in the northern third of the world. – Science **266:** 753–762.

EC (2000): Water Framework Directive. Directive 2000/60/EC of the European Parliament and the Council establishing a framework for community action in the field of water policy. 23 October 2000.

IUCN (1992): Environmental status reports. Volume four: Conservation status of the Danube Delta. – IUCN, 107 pp.

KOTENKO, A. G. (2002): Assessment of the impact of constructing and exploiting the shipping lane the Danube – the Black Sea through the Bystre Branch on the composition and population numbers of terrestrial and amphibious invertebrates of different taxons. – Schmalhausen Institute of Zoology, Kyiv, 23 pp. (in Ukrainian).

KOTENKO, T. I. & KOVTUN, M. F. (2002): Assessment of the impact of constructing and exploiting the shipping lane the Danube – the Black Sea through the Bystre Branch on amphibians, reptiles and mammals of the Danube Biosphere Reserve. – Schmalhausen Institute of Zoology, Kyiv, 23 pp. (in Ukrainian).

MIKHAILOV, V. N. (2001): The conclusion on the question of choosing the route of a deep shipping lane the Danube – the Black Sea in the Ukrainian portion of the delta. – UkrSCES, Odesa, 6 pp. (in Russian).

MIKHAILOV, V. N., ROGOV, M. M., MAKAROVA, T. A. & POLONSKY V. F. (1977): The dynamics of the hydrographic network of nontidal river mouths. – Gidrometeoizdat, Moskva, 294 pp. (in Russian).

OLSON, D. M., DINERSTEIN, E., ABELL, R., ALLNUTT, T., CARPENTER, C., MCCLENACHAN, L., D'AMICO, J., HURLEY, P., KASSEM, K., STRAND, H., TAYE, M., & THIEME, M. (2000): The global 200: a representation approach to conserving the earth's distinctive ecoregions. – World Wildlife Fund, Washington, 179 pp.

PETTS G.E., MÖLLER H. & ROUX A.L. [eds.] (1989): Historical change of large alluvial rivers: Western Europe. –John Wiley & Sons Ltd, Chichester, 355 pp.

RICHTRANSPROEKT (1997): Creation of the deep shipping lane through the Starostambulske Branch of the Danube River. Technical-economic grounds for investments. – Richtransproekt, Kiev (in Russian).

RICHTRANSPROEKT (2001): Creation of a deep shipping lane the Danube – the Black Sea in the Ukrainian part of the delta. Technical-economic grounds for investments. In 10 volumes. – Richtransproekt, Kiev (in Russian).

RICHTRANSPROEKT (2002a): Creation of a deep shipping lane the Danube – the Black Sea in the Ukrainian part of the delta. Technical-economic grounds for investments. Volume 11. A shipping lane variant along the route the Solomoniv Branch – the Zhebrianska Bay. – Richtransproekt, Kiev, 70 pp. (in Russian).

RICHTRANSPROEKT (2002b): On the creation of a deep shipping lane the Danube – the Black Sea in the Ukrainian part of the delta. Report. – Richtransproekt, Kyiv, 16 pp. (in Ukrainian).

RICHTRANSPROEKT (2002c): Short characteristic of variants of creating a deep shipping lane the Danube – the Black Sea in the Ukrainian part of the delta. – Richtransproekt, Kiev, 4 pp. (in Russian).

ROMANENKO, V. D. (2002): Ecological assessment of project variants (at the stage of TEG of investments) of creating a deep shipping lane from the Danube to the Black Sea in the Ukrainian part of the delta. Report. – NASU, Kyiv, 212 pp. (in Ukrainian).

SHCHERBAK, N. N. (ed.) (1994): Red Data Book of Ukraine. Animal kingdom. – Ukrayins'ka Encyclopediya, Kyiv, 564 pp. (in Ukrainian).

SHELYAG-SOSONKO, YU. R. (ed.) (1996): Red Data Book of Ukraine. Vegetable kingdom. – Ukrayins'ka Encyclopediya, Kyiv, 608 pp. (in Ukrainian).

SHELYAG-SOSONKO, YU. R. (ed.) (1999): Biodiversity of the Danube Biosphere Reserve, protection and management. – Naukova Dumka, Kyiv, 704 pp. (in Ukrainian).

SHUISKY, YU. D. (1984): The dynamics of the sea edge of the Kilia Delta of the Danube. – Hydrology of river mouths. (Ed. S. S. Baidin). Trudy gos. okeanografich. in-ta, 172. – Gidrometeoizdat, Moskva (in Russian).

TOCKNER, K. & STANFORD, J. A. (2002): Riverine floodplains: present state and future trend. – Environmental Conservation 29: 308–330.

VOLOSHKEVICH, O., ZHMUD, M. & TYTAR, V. (1999): The Danube Biosphere Reserve. Management plan. – Kyiv; Vylkove, 62 pp. (in Ukrainian).

WILSON, A. M. & MOSER, M. E. (1994): Conservation of Black Sea wetlands. A review and preliminary action plan. – International Waterfowl and Wetlands Research Bureau, Slimbridge, 76 pp.

ZENKOVICH, V. P. (1956): The Danube Delta enigma. – Priroda 3: 86–90 (in Russian).

ZHMUD, M. YE. (1998): The present-day conditions of the wetlands in the Ukrainian Danube Delta. – Nijland, H.J. (ed.): Dealing with nature in deltas: 143–156. Institute for Inland Water Management and Wastewater Treatment RIZA, Lelystad

ZIZAK, V. (1997): Constructing a new canal will allow to solve the problem ... – Shipping of Ukraine, 5/6: 27–29 (in Russian).

ZIZAK, V. P. (2001): History with geography, or searching an optimal solution for the connection of the Danube to the sea. – Proektgidrostroy, Odessa, 26 pp. (in Russian).

Table 1. History of protecting the Ukrainian part of the Danube Delta.

Year	Name	Territory	Total area (ha)	Wetlands (ha)	Sea aquatory (ha)	Comments
1973	Danube branch of the Chornomorsky (= the Black Sea) State Reserve	Maritime zone of the secondary delta of the Kilia Branch	7758	3158	4600	Approved by the Decree of the Council of Ministers of the Ukrainian SSR under the jurisdiction of the Academy of Sciences of the Ukrainian SSR.
1978	The same	The same + adjacent areas	14 851	9251	5600	Extending the area of the reserve branch.
1981	State Reserve “Dunaiski Plavni” (= the Danube Wetlands)	The same	idem	idem	idem	The site became a separate reserve.
1992	Nature reserve “Dunaiski Plavni”	The same	idem	idem	idem	New official name for the reserve. Adoption of the Law “On Nature-Reserve Fund of Ukraine”.
1995	Ramsar site Kyliyske Gyrlo (= the Kilia Branch)	The secondary delta of the Kilia Branch	32800			Approved by the Decree of the Cabinet of Ministers of Ukraine as a wetland of internationa importance (in 1975 the area was already approved as a Ramsar site by the USSR Council of Ministers). Decree o 1999 prohibited a number o economic activities in Ramsa sites.
1998	Danube Biosphere Reserve	Nature Reserve “Dunaiski Plavni” and adjacent areas	46 403	39513	6890	Approved by the President of Ukraine under the jurisdiction of the National Academy of Sciences of Ukraine. Former nature reserve area became a strictly protected zone of the biosphere reserve.

Table 2. Territorial structure of the Danube Biosphere Reserve (according to the Decree of the President of Ukraine of 10.08.1998 N 861/98 and “Statute of the Danube Biosphere Reserve”).

Zones	Territories	Area (ha)
1. Strictly protected zone including lakes, waterways and a strip of the Black Sea; granted for DBR for permanent land use with exception of lands from other land users		
1.1 Strictly protected zone	The Secondary Delta of the Kilia Branch within the former Nature Reserve “Dunaiski Plavni”	14851
1.2 Zone of regulated strict protection	Stentsivsko-Zhebrianski Plavni	7811
2. Other zones included in DBR without exception of lands from other land users		
2.1 Buffer zone	A strip of the Black Sea, the southern part of the Zhebrianska Bay, wetlands east of the Zhebrianske Pasmo marine levee and west of the strictly protected zone, as well as the southern part of Yermakov Island	19687

2.2 Zone of anthropogenic landscapes	Zhebrianske Pasmo, fish ponds, northern part of Yermakov Island, as well as gardens and pastures surrounding Vylkove town and situated along fluvial levees of some Danube branches	4054
TOTAL		46403

Table 3. Management objectives for the Danube Biosphere Reserve (adjusted after ZHMUD 1998; SHELYAG-SOSONKO 1999; VOLOSHKEVICH et al. 1999).

General long-term objectives	Operational objectives (selected and generalised)
1. To ensure a maximally natural course of the deltaic processes and conserve biodiversity in the context of sustainable development of the region	1.1 Not to interfere in natural deltaic hydrological and morphological processes; 1.2 To protect rare, declining and endemic species and their habitats; 1.3 To maintain high biodiversity and natural resources potential, with special attention to migratory water birds and fish; 1.4 To carry out ecological restoration of DBR areas and naturalisation of forest plantations on fluvial levees.
2. To ensure long-term development of the Danube Delta in the interests of nature conservation and improvement of the local people life quality	2.1 To promote traditional use of natural resources; 2.2 To develop new kinds of economic activities friendly to the nature (ecotourism).

Table 4. Long-term objectives for various areas of the Danube Biosphere Reserve (adjusted after SHELYAG-SOSONKO 1999; VOLOSHKEVICH et al. 1999).

Area	Zones	Long-term objectives
The secondary delta of the Kilia Branch	Strictly protected zone (1) and combination of a zone of anthropogenic landscapes and a buffer zone (2)	1. To conserve biodiversity and maintain maximal naturalness of the delta formation processes. 2. To maintain ecological and economic potential of wetlands under conditions of wise and restricted use of natural resources.
Stentsivsko-Zhebrianski Plavni	Zone of regulated strict protection	To restore and maintain this floodplain wetland as a comparatively stable mosaic reed bed with shallow lakes and waterways, maximally leaning upon natural processes of wetland functioning, while maintaining its natural and economic potentials.
Yermakov Island	Combination of a zone of anthropogenic landscapes and a buffer zone	To ensure the stable functioning of the island ecosystem given maximal maintenance of biodiversity, ecological carrying capacity and economic potential of the site under conditions of partially regulated water regime and wise use of natural resources.
Zhebrianske Pasmo	Zone of anthropogenic landscapes	To ensure the stable functioning of natural and anthropogenic ecosystems of the marine levee given restoration and conservation of biodiversity under condition of operating forestry and wise use of natural resources.
Fish ponds area	Zone of anthropogenic landscapes	To restore floodplain wetlands for the wise use of its natural and economic potential.

Table 5. Description of shipping lane alternatives for the Ukrainian part of the Danube Delta (summary from ZIZAK, 1997, 2001; RICHTRANSPOEKT 1997, 2001, 2002a, 2002b, 2002c). Numbers refer to Fig. 1.

No.	Description
1	A sluiced canal from the Solomoniv Branch to the Zhebrianska Bay through the Stentsivsko-Zhebrianski Plavni, proposed already in 1904 by CHEKHOVICH. Length: 11 km (without considering an approach channel), with a 140 m long sluice before entering the Zhebrianska Bay. Building a seaport near Prymorske was envisaged. The construction of this canal was not started because of its high cost and due to the unstable political situation in the country.

2 In 1957 in the mouth of the Prorva Branch an experimental canal was made for ships with about 4.0-m draught. The canal demanded extensive dredging during its entire lifetime. After 1995 it gradually silted-up. Two projects are proposed: 2a – restoration up to 4.5-m draught (estimated cost 2.8 million USD) and 2b – deepening the canal to ensure 6.3-m draught (estimated cost 49–59 million USD). Variant 2b requires consolidation of banks and prolonging dikes into the sea.

3 In the mouth of the declining Shabash Branch on the southern coast of the Zhebrianska Bay the construction of the Ust-Dunaisk seaport for handling lighter carrying ships was finished in 1977. A narrow connective canal, which was designed as a provisional technological canal, later became an 80–100 m wide and about 4 m deep waterway, carrying a lot of sediments to the Zhebrianska Bay. Consequently, the bay has become shallower. In 1997 a project to deepen (5.3 m) and widen (40 m at the bottom) the connective canal was proposed, together with technical constructions to prevent silting-up of the canal and bay. Estimated cost: 2.5–3 million USD.

4 A sluiced canal 6 km long from the Ochakivske Branch to the Ust-Dunaisk seaport, proposed by "ChornomorNDIproekt" in 1989. This variant is much more progressive in comparison to the previous ones, since it includes sluices that are better able to resist silting up. This canal was designed for ships with draught up to 6.25 m. It was approved by all ministries, but later was considered to be too expensive under the situation of economic crisis in the country. Estimated cost: 40–100 million USD.

5 A deep shipping lane through the Starostambulske Branch, proposed by "Richtransproekt" in 1997. This lane envisages a ship draught 7.2 m and has such parameters: 8.1-m depth and 120-m bottom width for the river channel, and respectively 8.4 and 100 m – for a 3.2-km approach channel across the sea bar. To protect the approach channel against silting, the construction of simple dumps on each side of the canal is envisaged. The main constructive problem is to make an opening through a 1.9-km long stony underwater dike, built by Romania in 1943 to reduce silting up the Sulina mouth and for military purposes. Estimated cost: 27 million USD.

6 As a variant of the previous project a deep shipping lane through the Starostambulske Branch with the entrance through the Tsyganske Branch was proposed by "Richtransproekt" in 1997. It has a similar design and cost as alternative 5. The difference is that the bottom width of the shipping lane within the Tsyganske Branch is 60 m, the turning radius at the entrance to the branch from the Starostambulske Branch is only 400 m and the length of the approach channel is 2.1 km, because the Tsyganske Branch outlet has the narrowest bar with the steepest slope to the sea. This variant requires bank consolidation and construction of underwater dumps-slopes along the approach channel. Estimated cost: 27 million USD.

7 A deep shipping lane through the Novostambulske (Bystre) Branch, proposed by "Richtransproekt" in 2001. This lane supports 7.2-m draught and envisages for 10 km of the Bystre Branch a guaranteed depth of 8.1 m and a bottom width of 60 m, and correspondingly 8.4 and 100 m – for the 3.1 km long approach channel. A jet-directing dike at the branch entrance, 13 spur dikes with bank consolidation along the branch and two dikes in its outlet to prevent silting-up of the approach channel are needed. This project will require substantial dredging efforts. The alternative envisages the future construction of a seaport in the Bystre Branch mouth. Estimated cost: 30 million USD.

8 A 9.1-km long sluiced canal from the Solomoniv Branch to the Zhebrianska Bay across the Zhebrianske Pasmo marine levee, proposed by ZIZAK in 1997 and improved in 2002. The main part of the canal is 5.5 km long, 8.5 m deep and has 60-m bottom width, while the whole canal comprises two sluices, a basin for passing ships, and an approach channel 3 km long. A big seaport would occupy adjacent lands. As the projected canal and seaport would involve areas rich in endemic and threatened species, the projected route has been shifted. The adapted design will, in addition, reduce the required volumes of sand dredging. As a private sponsor has been found, the societal cost of this alternative will be low. Estimated cost: 110 million USD.

9 A sluiced canal similar to the previous one was proposed by "Richtransproekt" in 2002 on demand of NASU as an alternative for the Bystre Branch shipping lane. As the projected canal route was harmful to the valuable natural areas, it was later shifted to save most parts of Zhebrianske Pasmo, spits of Zhebrianska Kosa and Baklanyachy (= Cormorant) Island. According to the last version, the southern entry is designed at the

confluence of the Kilia and Solomoniv branches, the northern is with an extended approach channel. The 10-km canal is 8.7 m deep, 60 m wide at the bottom, and is embanked over 8.7 km. The total width of the canal with dikes is 225 m. The project furthermore includes an outer harbour, a 300-m long and 37-m wide sluice, and a 5 km long, 9.1 m deep and 100 m wide sea approach channel. Estimated cost: 166 million USD. All variants of alternatives 9 and 10 need the construction of a high bridge or a tunnel for the Vylkove–Prymorske road, and envisage the future construction of a large seaport near Prymorske.

10 A deep sluiced canal using the route of the existing non-shipping canal the Danube – Lake Sasyk, which was built in 1978 and is about 14 km long, 5 m deep and 100 m wide (over the surface). To minimise wetland damage, the use of the right (eastern) dike of the existing canal is envisaged. It is necessary to dike a west-southern corner of Sasyk, to cross a lake barrier bar by a sluice, and to construct a high bridge or a tunnel for the road Desantne–Prymorske. The canal is the longest of all proposed sluiced canals (total length is about 30 km), but avoids the active part of the delta and allows building a large seaport as well as necessary transport communications in relatively stable hydrological conditions. Estimated cost: 180 million USD.

Table 6. Expected economic and ecological advantages and shortcomings of the various shipping lane construction projects (summary from ZIZAK, 1997, 2001; RICHTRANSPROEKT 1997, 2001, 2002a; 2002b, 2002c). ID = initial dredging; MD = maintenance dredging.

No	Advantages		Shortcomings and problems	
	Navigational, technical and economic	Hydrological and ecological	Navigational, technical and economic	Hydrological and ecological
1	Canal can support 7.2 m ship draught; medium MD; possible seaport with all means of communication near Prymorske.	Canal runs outside the DBR strictly protected zone and outside the active part of the delta (no interference in its natural processes).	High ID; high cost and long duration of canal construction; sluice, bridges or tunnels are required.	Disturbance of hydrological regime and negative impact on biodiversity of Zhebrianski Plavni and ecological condition of Prymorske resort; problem of soil depositing.
2a	Low ID; low cost and duration of canal construction; existing Ust-Dunaisk seaport can be used.	Outside the DBR strictly protected zone; existing canal route is used.	Small depth; high MD; Small turning radius at the entrance to the Ochakivske Branch.	Through the active part of the delta. The Ochakivska system of branches dies off, Eastern part of the Zhebrianska Bay silts up. Pollution and negative impact on the ecosystem of adjacent coastal zone.
2b	Existing Ust-Dunaisk seaport can be used.	As 2a.	As 2a, in addition: 6.3 m ship draught; high ID, very high MD; bank consolidation and prolonging dikes into the sea; high cost of canal construction.	As 2a, but expected pollution and negative impact on marine ecosystem is higher.
3	As 2a, but only medium MD.	As 2b.	As 2a, but: MD is less; special water gate and jet directing dike; passing ships need to be towed.	As 2a, but negative ecological impact is less because of reduced silting up both this canal and the Zhebrianska Bay.
4	As 2b, but with medium ID and MD.	Outside the DBR strictly protected zone.	High cost of canal construction; 6.25 m ship draught; regular dredging at Vylkove rift; a sluice; bank consolidation.	As 3.
5	7.2 m ship draught and bidirectional shipping except for 3 km in the bar part; medium ID and MD; short duration and medium cost of canal construction.	Steep fall of isobaths at the depths till 20 m.	No perspective for a seaport; absence of all necessary communication means; high MD in future. Problem to open the stony underwater dike; interference with Sulina Canal (Romania) through siltation.	Through the DBR strictly protected zone and the active part of the delta: large negative impact on biodiversity and disturbance of natural hydrological and morphological processes. The Starostambulske Branch silts up; pollution from dredged sediments; breach with Ukrainian law and international commitments concerning nature protection.

6	As 5, but with naturally protected entrance from the sea and without a problem with stony underwater dike.	As 5, in addition: the narrowest and steepest bar, comparatively small siltation (most sediments are transported to the sea by the Starostambulske Branch)	As 5, but with small turning radius at the entrance to the Tsyganske Branch; unidirectional shipping for 5 km of the Tsyganske Branch and bar; bank consolidation.	As 5.
7	7.2 m ship draught; medium ID and MD; short duration and medium cost of canal construction; possible seaport.	Activation of the Bystre Branch; little delta growth here.	High MD in future; necessity to build a seaport; hardly possible to build communication means. Jet-directing dike, 13 spur dikes, stony dike to protect outlet.	As 5, but: the Bystre Branch is developing with increasing water and silt discharge. Slowly increasing depth till 20 m and significant along-coast sand drifting.
8	7.2 m ship draught; medium MD; possible seaport with all communication means near Prymorske.	Outside the DBR strictly protected zone and the active part of the delta.	High ID; high cost and long duration of canal construction; necessity to increase the turning radius; bridges or tunnels, basin for ships, jet-directing spur dike, enclosing dikes and two sluices.	Uncertain regime of the Zhebrianska Bay; damage to forest plantations; negative impact on biodiversity of Zhebrianske Pasmo and Bay and on ecological condition of Prymorske resort; problem of soil depositing.
9	As 8.	As 8.	As 8, but: an outer harbour with wave protecting dike, banks consolidation and a sluice.	As 8
10	7.2 m ship draught; possibility to use existing dike of non-shipping canal; possible harbour in Sasyk and a seaport with communication means near Prymorske.	As 8 and 9, but: using existing dike reduces wetland damage.	Very high ID; long duration and very high cost of canal construction; diking the west-southern corner of Sasyk Lake; cutting through the barrier; sluice, bridges or tunnels.	Negative impact on biodiversity of Stentsivsko-Zhebrianski Plavni; uncertain consequences for ecological state of Sasyk Lake; big problem of soil depositing.

Table 7. Selected decisions and proposals made on the Danube Biosphere Reserve and the Bystre Branch shipping lane construction in 2001–2004.

Date	Document	Decisions, proposals or conclusions
December 14, 2001	Conclusion of the State Ecological Expertise on technical-economic grounds (TEG) for investments in construction of BBSL	The shipping lane project should be modified and corrected because it will have negative impact on DBR and does not correspond with Ukrainian legislation and international agreements.
September 2002	Report on ecological assessment of two shipping lane alternatives, made by 23 experts of NASU (ROMANENKO 2002)	Alternative 7 (BBSL) is inadmissible from ecological and legal viewpoints; alternative 9 will also have great negative impact on biodiversity. Other options should be assessed to find the optimal solution. Options 4 or 10 seem to be the most expedient.
November 2002	Draft decree of the President of Ukraine on reorganisation of the DBR territory (prepared by the Ministry of Transport of Ukraine)	Amongst other, the exclusion of 5600 ha of the DBR area was proposed to accommodate BBSL construction.
June 10, 2003	Decree of the President of Ukraine No 502	Corrections to the President's Decree of 10.08.1998 No 861/98, according to which river branches and lakes should be excluded of DBR.
July 10, 2003	Conclusion of the State Ecological Expertise No 105, based on ecological assessment of two shipping lane alternatives, made by 3 experts of Kyiv National University	According to this Conclusion, approved by the Ministry of Ecology and Natural Resources of Ukraine (MENRU), the BBSL alternative was recommended as the most expedient from ecological, economic, technical and hydrological standpoints.
August 5, 2003	Draft decree of the President of Ukraine on reorganisation of the DBR territory (prepared by the Ministry of Transport of Ukraine)	Re-establishing of DBR was proposed, with changed borders, new zoning and another subordination. The strictly protected zone was proposed to be reduced almost 10 times.
October 13, 2003	Order of the Prime Minister of Ukraine No 598-r	1) TEG for BBSL was officially approved; 2) a state enterprise "Delta-Lotsman" was allowed to start urgent works before the approval of project-estimate documentation (later this was annulled under the pressure of public opinion).
October 27–31, 2003	Visit of experts of UNESCO MAB programme and Ramsar Convention bureau to Ukraine	BBSL option will have the largest negative environmental impact in comparison to considered options 3 and 9. Option 3 seems reasonable for a short perspective, option 9 – for a long perspective.
November 24, 2003	Decision of Odesa Economic Court on the action, sued by Vylkove Town Council against Kilia District Council	The court declared the DBR State Land Certificate for permanent land use to be invalid. This decision is now under consideration by the Supreme Court of Ukraine.
February 2, 2004	Decree of the President of Ukraine No 117/2004 "On extension of the territory of the Danube Biosphere Reserve"	The decree declares changing of DBR boundaries and zoning taking into account needs of water transport. Words "strictly protected zone" were completely excluded.

February 10, 2004	Decision of Kyiv Economic Court on the action, sued by "Ecopravo-Lviv" Charitable Foundation against MEPU	Conclusion of the State Ecological Expertise No 105 was recognised as invalid due to violations of the Ukraine Law "On Ecological Expertise".
April 5, 2004	Ecological assessment of BBSL project, made by a large expert group of Kyiv National University	Many questions were considered as requiring clarification or additional field study, without which a positive conclusion cannot be made.
April 19, 2004	Conclusion of the State Ecological Expertise No 191, based on ecological assessment of BBSL project, made by Kharkiv National University	General estimation of the project was positive, its realisation was declared as ecologically admissible.
May 11, 2004		Official ceremony of the start of the BBSL construction.

Fig. 1. Schematic map of the Danube Biosphere Reserve with different proposed variants of shipping lanes and canals in the Ukrainian part of the Danube Delta (modified after RICHTRANSPROEKT 2002b). Boundaries: a – biosphere reserve; b – zone of anthropogenic landscapes; c – strictly protected zone; d – zone of regulated strict protection. The rest of the reserve area belongs to the buffer zone. e – settlements, fishermen points, summer houses; f – roads; g – routes of shipping lanes and canals; h – Ust-Dunaisk sea port. 11 – existing water supplying canal the Danube (the Solomoniv Branch) – Lake Sasyk; 12 – a marine levee Zhebrianske Pasmo; 13 – fish ponds.
Shipping lanes and canals (1–10), short names: 1 – Chekhovich's sluiced canal; 2 – Prorva canal; 3 – Connective canal; 4 – Ochakivsky sluiced canal; 5 – the Starostambulske Branch shipping lane; 6 – the Tsyganske Branch shipping lane; 7 – the Bystre Branch shipping lane; 8 – Zizak's Zhebriansky sluiced canal; 9 – Zhebriansky sluiced canal of "Richtransproekt"; 10 – Sasyksky sluiced canal.
(Map shown in the original issue only: Large Rivers Vol.15, No.1-4, Arch.Hydrobiol. Suppl.155/1-4, p.693-713, Mai 2005