

~ ESPOO INQUIRY COMMISSION ~

Bystre canal development: potential impact on birds

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1 TASK DEFINITION

- To review submissions to the Inquiry Commission in relation to the consequences for bird habitats and populations arising from further Bystre canal development.
- To provide an overview the body of relevant research findings that have characterised and quantified bird responses to human activities.
- To evaluate the consequences for bird habitats and populations arising from specific activities within the Bystre canal development.

2 APPROACH

- Define terms and concepts.
- Use terms and concepts to establish evaluation framework.
- Identify key evaluation questions.
- Identify specific human activities within Bystre canal development and relate to likely bird responses.

3 TERMINOLOGY & KEY CONCEPTS

3.1 Definition of transboundary impact to birds

Quantitative and qualitative assessments of the outcome of human activities on birds requires a clear definition of terms in relation to the word 'impact'.

In the provisions of the ESPOO Convention, "Impact" is defined as:

"...any effect caused by a proposed activity on the environment including human health and safety, flora, fauna, soil, air, water, climate, landscape and historical monuments or other physical structures or the interaction among these factors; it also includes effects on cultural heritage or socio-economic conditions resulting from alterations to those factors."

"Transboundary impact" is defined as:

"...any impact, not exclusively of a global nature, within an area under the jurisdiction of a Party caused by a proposed activity the physical origin of which is situated wholly or in part within the area under the jurisdiction of another Party."

3.2 Ecological effects and ecological impacts on birds

In this report, two other important related terms are also used: ecological effect and ecological impact. In this case, an ecological effect on a bird is defined as:

'Any noticeable change in behaviour, physical or chemical state brought about by an external influence.'

An example of an effect would therefore be:

- Temporary cessation of feeding.
- Increased stress levels (raised hormonal activity in body).
- Moving away (swimming or flying) from external influence (e.g. physical disturbance).

Ecological effects are therefore largely behavioural responses to external perturbation, tend to be of short temporal duration, and generally do not change an individual's reproductive success or survival probability.

An ecological impact is said to have occurred when an external influence has resulted in a measurable change in an individual's survival or breeding output. Hence, ecological impacts result in population change (see next section), and have implications over longer temporal durations. They include:

- Failure to nest.
- Abandonment of clutch or nest site.
- Increased predation of juveniles or adults.

Ecological effects are relatively 'visible', and importantly, bird responses can often be linked to a particular anthropogenic cause. In contrast, ecological impacts may only become apparent as a result of long-term biological monitoring, and the demonstration of *causal* links between an impact and a specific human activity can be extremely difficult to achieve.

3.3 Bird populations

It is important to clarify the term 'bird population' as it is regularly used in a number of contexts associated with the Bystre canal enquiry, and has particular relevance in an assessment of *transboundary* issues. The key point is that a population can be considered at a number of scales. For example, at large spatial extents (e.g. flyway level), a population can be seen as:

"A distinct assemblage of individuals which does not experience significant emigration or immigration."

This is not the same as a sub-species, in which 'isolation' occurs to a degree which generates clear genetic separation within a species.

At smaller spatial extents, breeding birds in the Danube delta could be considered a population in that they are 'contained' (to a degree) within landscape boundaries, and may therefore be considered 'isolated'. This concept is important when considering significant transboundary changes to favourable status (see Section 3.5), because such assessments are based on impacts to populations. Wintering birds are often termed as being a population, but such site 'populations' are far more fluid, i.e. there is a lot of interchange and turnover, and in this context it is perhaps harder to delineate a Danube wintering bird population. However, the birds are part of a flyway population for which the country occupied by the species will have international responsibility. Again, this is important when considering significant transboundary impacts.

3.4 Predictions and criteria in relation to the term 'significant'

The distinction between ecological effect and impact presented above, provides an underlying framework for the evaluation of the consequences of human activities outlined in this report. It also explicitly attempts to address two key issues highlighted within text from the ESPOO Convention.

First:

"In the biotic world predictions are more difficult because relationships are complex and the speed of adaptation is variable for different organisms. Normally, reduction or extension of areas of habitats may be a qualitative indication of the order of magnitude of the change due to an human interference, but a quantitative prediction is extremely difficult."

And second:

“Criteria on the ‘significance’ of any impact should be set in a general decision-making framework. In some cases, it may be possible to establish generally acceptable criteria on significance. In most cases, however, the decision that an adverse transboundary impact is likely to be significant, would be based on a comprehensive consideration of the characteristics of the activity and its possible impact. An element of judgement would always be present.” It is noted here that “judgement” implies an undefined uncertainty; it is based on experience(s) from other, more or less similar areas or phenomena.”

Using the conceptual framework of ecological effects and impacts also has particular relevance when referring to migratory species, and the ESPOO Convention text states that in relation to the practical application of the convention:

“activities that can make long-range impacts in transboundary context include activities potentially affecting migratory species “.

3.5 Ecological integrity & favourable condition

Using the conceptual framework outlined above, in this report potential significant impact has been evaluated in terms of:

- Changes to the ecological ‘integrity’ of the site.
- Changes to the conservation status of habitats or species within the site.

The term integrity is used to describe the coherence of a site’s ecological structure and function, that enables it to sustain the complex of habitats and levels of populations of species considered to be at a ‘baseline’ level. Any changes to a site or population arising from a proposed human activity that is likely to move the baseline conditions further from that which constitutes ‘integrity’ for that system is said to have altered the site’s or population’s ‘favourable condition’.

For many sites, including the Danube delta, a baseline condition has not been fully described. For this report, **favourable condition** therefore means:

‘No further departure of the site or population from current species diversity, abundance and distribution, or ecosystem processes as a result of the activities associated with the canal development.’

It is however, accepted that some ecosystem elements (including birds) may already be declining for reasons other than the canal development. It is also assumed that in cases of reasonable doubt about the potential impacts of human activities on biological systems, that a ‘**precautionary**’ approach will always be taken.

3.6 Definition of ‘site’

One key difficulty in this assessment has been to define what constitutes the ‘site’. For this report, given its specific reference to transboundary issues, the **site** is spatially referenced to:

‘The habitats and ecosystems of any area within Romanian territory where ecological impact can be shown.’

However, for wintering populations a transboundary impact might affect birds from other countries. It has also been assumed that all biological systems have a certain ‘**buffer**’ (e.g. relief of density dependence in bird populations), in terms of their resilience to changes that can occur before integrity is compromised.

3.7 Human activities and their influence on birds

All human activities causes some degree of environmental perturbation, and these can occur over a range of spatial and temporal scales i.e. short to long term, low to high level, close to

distant, *etc.* The consequences of human activities on birds can be **direct** (e.g. noise causing individuals to seek cover), or **indirect** (e.g. siltation changing prey availability), and the severity of the perturbation determines whether it causes an ecological effect or impact (section 3). Additionally, the consequences of human activities can be classified into four broad areas:

(i) Habitat loss

- Loss of habitat in a single large area.
- Loss of habitat in a many smaller areas (fragmentation).

(ii) Habitat degradation

- Structural changes e.g. availability of sites for breeding, feeding, roosting, *etc.*
- Changes in biotic quality e.g. food density and range.
- Changes in abiotic quality e.g. water levels and regimes.
- Addition of materials and chemicals e.g. siltation, pollutants, nutrients, *etc.*

(iii) Disturbance

Although classified separately in this report, disturbance can also be regarded as a special transient case of habitat degradation or loss. Habitat loss through disturbance occurs where a habitat (or site) remains physically suitable, but cannot be occupied or utilised because of the disturbance. Some bird species will ameliorate their response to disturbance if it is presented frequently and for prolonged periods. This phenomenon is known as habituation.

There are three main classes of disturbance:

- Visual e.g. proximity of humans, or moving mechanical object (vehicle, boat, *etc.*)
- Noise
- Physical e.g. wash from boat.

(iv) Lethal removal

- Hunting or sport shooting

3.8 Variation in bird responses to human activity

Bird responses to human activities are not constant, but vary in relation to the nature, frequency, and magnitude of the human activity. This compounds the already difficult task of trying to 'predict' bird responses to a particular development. It is important to recognise that there will be response variation as a result of factors associated with the site and the particular birds involved i.e. the focus should not just be on the human activity in isolation. The following are the key factors determining bird responses to human activities.

- **Habitat use:** bird responses to human activities will change in relation to their 'use' of a particular area e.g. whether the birds are feeding, moulting, roosting, sheltering, *etc.*
- **Food availability:** birds will respond differently to human activity near large areas of high quality food compared to responses of birds using small areas of lower quality food.
- **Breeding status:** some breeding birds are more tenacious in the face of human activity, whilst some species are *more* susceptible to disturbance at this time.
- **Species:** some species are able to live in close association with human activities, whilst others are highly sensitive to anthropogenic influences.
- **Density:** the number of individuals per unit area (of the same or different species), changes bird responses to human activity. This is a function of different levels of competition, as well as the safety-in-numbers effect.

- **Climate:** climate influences the energetic requirements of a bird, and this in turn will alter its responses to human influences.
- **Alternative sites:** birds develop a knowledge of the ecological units they utilise for different activities (feeding, roosting, loafing, etc). Response to human influences will vary in relation to the availability, size, occupancy, and distance of alternative sites.
- **Habituation & experience:** many birds ameliorate their responses in relation to the duration of a human activity (habituation), or as a result of a birds previous 'experience' of the activity's likely consequences.
- **Site characteristics:** both the horizontal and vertical physical structure of a site (in relation to 'refuges'), and its visual 'openness', will alter bird responses to human activities.

In addition to the above, there will be considerable **temporal** variation in bird responses to human activity (e.g. variation within a day, between months or years, etc). These are due to changes in the birds resulting from altering light:dark ratios, climate, density, and site characteristics.

Whilst these issues may confound detailed predications of bird responses in relation to fine-scale changes in distribution and abundance, there is sufficient knowledge from a wide variety of cases around the world to permit valid broad-brush judgements of the likely responses of birds to the human activities proposed in relation to the Bystre Canal.

4 BYSTROE BIRD ISSUES

The submissions by the Romanian party to the Inquiry Commission contains two core issues relating to impacts on birds. One of these is a '**general**' concern, whilst the other involves two '**specific**' cases.

4.1 General concerns in relation to the impact of the Bystre development

Much of the presented Romanian (and some Ukrainian) text outlines the avian importance of the Danube delta region as a whole, with frequent references to the numbers, variety, and conservation importance of the species present. These 'general' expressions of worth and importance, are supported by a substantial body of avian monitoring work, including a major survey of colonial waterbirds across the delta by a Dutch team in 2001 and 2002. Although taxonomically narrow in comparison to the number of bird species found in the delta, the latter survey highlighted its international status, and therefore need for extreme caution in relation to any proposed human activities in the region.

However, the *transboundary* nature of potential impacts on birds are not clearly articulated in the texts relating to birds, and certainly do not present sufficient detail upon which an evaluation of potential impact could be made. In particular, there has been no attempt to link specific activities associated with the development and operation of the canal with specific potential impacts on birds. The message seems to be that any development within the delta will have major impacts in relation to birds and their habitats. The following text provides a good example of this type of general report:

"One of the negative effects will be on the populations of migrating birds for which the area is one of the most important staging sites in the whole of the Palaearctic region. In total, more than 20,000 pairs of waterfowl breed in the Danube Delta including Common Tern, Sandwich Tern, and Little Tern, Coot, Mallard, Red-crested Pochard, Night Heron, Glossy Ibis, Grey Heron Ardea cinerea,etc., etc, etc.,..... The part of the delta between the estuaries of the Bystre and Vostochne is one of the most important wader habitats in the Danube region and a key habitat for many other waterfowl."

In addition to a substantial number of breeding birds, the Delta area supports extremely large numbers of wintering birds:

“..... winter with counts of 500,000 white-fronted goose up to 500 lesser white-fronted goose, 45,000 red-breasted goose (a globally threatened species with almost 95% of the world wintering population present here), 150,000 teal, 200,000 mallard, 14,000 pintail, 40,000 shoveler, 32,400 red-crested pochard, 970,000 pochard, 13,000 ferruginous duck, and 1,500 red-breasted merganser.”

The most detailed Romanian information on how the canal will potentially impact birds is:

“The proposed navigation canal will affect the banks where there are 223 birds species, 5 of them listed in the European Red Book and 31 of them listed in the Ukrainian Red Book; the building of the canal and the navigation will lead to the destruction of the nesting areas and will worsen the living condition for birds, as well as the loss of the resting, feeding and wintering areas.”

A long and comprehensive list of migratory birds in the Bystre area was also submitted. However, the list does not provide useful information in terms of specific areas used within the site or the ecological relationships between birds and particular habitats. The text merely states that the species listed were:

“....migratory birds passing Bystre area...”

4.2 NGO viewpoints mirror Romanian general concerns

The Bystre canal development has also given rise to a considerable volume of written material from the NGO sector, much of which is readily available in electronic format. As with the Romanian texts, much of this material merely highlights the high international status of the delta, and raises similar general concerns about any new human activity. Similarly, the specifics of the concerns are not presented, and the texts often refer to the diversity and numbers of birds from within the whole delta, rather than specific to the Bystre area.

4.3 Specific Romanian concerns: two recent Bystre incidents

In addition to the general concerns outlined in the previous section, the Romanian texts also raise two problems *specifically* associated with the Bystre region. The first of these was an accident where a dredger ran aground and overturned during a storm. Pipes from a sand removal platform belonging to the contracted German company Moebius were also thrown onto the spit close to the mouth of the Bystre. This incident is cited as demonstrating the dangers of likely shipping accidents and their potential for a serious primary pollution incident.

The second incident involved the abandonment of Tern colonies on Ptichya Island. The following text describes the situation and highlights the key Romanian issues:

“On July 16 the joint group recorded the following: on the location of two large Sandwich tern colonies (previously recorded 950 and 430 nests at June 28) and one common tern colony (120 nests recorded at the same date) remains of many hundreds of tern eggs were found. The egg damage shows that no chicks appeared. The chicks were expected to come out of the eggs around July 20. No grown up birds were present - the colony abandoned the Ptichya (the Bird) spit. The most possible cause of the colony vanishing was overwhelming disturbance coming from dredging fleet and service scooters working at the Bystre estuary. Official Ukrainian explanation: “it was a colony of ducks and due to a very severe storm everything were washed off the island by waves”. Ducks do not nest on Ptichya Island but species of tern, strictly protected by Bern Convention, some of them unique in the transboundary Biosphere Reserve. Question: why the egg shells were not washed out

by waves? According to Ukrainian NGO's and the Ukrainian scientists from Danube Biosphere Reserve-Vilkovo, Ptichya colony was destroyed by noise disturbance from dredging activities (WWF film), even the dredge crew stated that birds never nested on island."

The Romanian conclusion arising from these specific incidences (disputed by the Ukrainians) was summarised in the material presented to the commission as follows:

Conclusion: very likely significant transboundary impact on migratory strictly protected birds and other strictly protected animals.

And...

Statement 5: very likely significant transboundary impact on biodiversity by habitat loss of strictly protected migratory birds

4.4 Ukrainian responses

"Similarly to other spits, the Ptichya spit represents a 'temporary' formation, emerging at a certain stage of delta development in order to merge with an advancing coastline within a span of several decades. The Ptichya spit admittedly emerged in 1996, and satellite image taken in 2001 showed the progressive advancement of north- and south-western ends of spit in the direction of the Kubansky island, being an obvious graphic illustration of an approaching merge of this spit with the coastline. The presence of DNWR structures/components (seaward access canal and protective dam) might help slow down the sedimentation process in the NW end and thereby extend the lifetime of this spit as a safe nesting grounds for protected bird's. If necessary, special provision can be made for maintaining a sufficient interval between the spit and coastline so that to protect the spit against the invasion of predators."

And:

"The operating agency takes all measures necessary to take account to the maximum possible extent of environmental requirements in carrying out its dredging operations in order to minimize the disturbance to birds inhabiting the Ptashyna Spit. It has installed the restricting buoys to prevent navigation of smaller vessels within 150 m shoreline strip extending along the Ptashyna Spit."

And:

"Annex 27: The Ptashyna Spit (Island) has been actively growing in the recent years, showing a tendency of merging with the nearest coast. This would undermine its value and role of being a safe habitat for nesting birds. Therefore the protective dam has an additional environmental function of maintaining the current state and stability of the Ptashyna Island by controlling/preventing erosion processes."

Furthermore:

"No obvious cause-effect relationship between the dredging operations and nesting failure in 2004 was established, therefore it cannot be concluded with confidence that the move of bird colony to the southern part of the Ptashyna Spit in 2005 was caused by the dredging-related disturbance to birds in 2004, rather than by natural events that occurred in 2004 (e.g. storm).

It is our view that the first and foremost concern for the Inquiry Commission is to examine the impact of navigation route on the general condition and state of protected bird communities within the Danube Biosphere Reserve, rather than the change in their migration pattern from year to year. Just to reconfirm, the monitoring results indicate that the number and distribution of birds within the Ukrainian part of the Danube Delta in 2005 were within the historical averages.

The history of the Ptashyna Spit as a nesting bird habitat has spanned a rather short period in the past and is not expected to extend beyond the time in the future when it will have merged with the nearest coast as a result of delta development and thus become accessible for predators.

In any case, the evolving delta itself 'takes care' of continuing to function as a major habitat for birds through the formation of new spits. For example, it is expected that a new spit, named Nova Zemlia (New Land, see Figure 1 below), which has been formed at the Starostambulsky Branch mouth at 1 km distance from the coast, will have a longer lifecycle. This spit has already proved attractive for a multi-thousand colony of nesting birds. The available nesting capacity is more than sufficient to accommodate the loss of the Ptashyna Spit, while the nesting ultimate success and efficiency of nesting effort solely depends upon the Romanian party, because the strengthening of the Sulina Channel has the potential for adverse impact on the reproduction of birds in this area. "

And lastly...

"The assessment of the DNC creation on separate environment components testifies that, taking into account the measures to ensure normative condition of environment and ecological safety, stipulated by the project, residual effects are limited in scale to the territories, directly adjacent to the track, which are attributed to the zone of man-made landscapes. This is acceptable according to the existing environmental legislation. Construction and operation of the navigable channel will not lead to changes in number and species composition of the DBR biota. Biotic groupings of the Bystre distributary area, including rarity species and aggregations, are not unique for the DBR, they are widespread within the boundaries of its territory. That is why certain local successions of vegetative aggregations and partial migration of animals from the distributary itself and its riverside, that may happen in connection with the DNC creation, do not pose a threat to preservation of the reserve biodiversity, to existence of rare and especially valuable representatives of plant and animal kingdom on its territory, in particular."

4.5 Specific Bystre bird information

The Danube delta is Europe's largest remaining expanse of wetland habitats. Its size makes direct quantitative assessment of species numbers and distribution a difficult task. However, over the past fifteen years, a range of specific bird surveys have been undertaken, and a number of these have included the Bystre area. These are in addition to more general records of birds kept by Romanian and Ukrainian NGOs, academics and government agencies.

The Danube has two Important Bird Area (IBA) designations from Birdlife International (one in Romania and one in Ukraine), and bird surveys were conducted as part of these designations. There is also a designated Ramsar site at the Kyliiske Mouth (formerly Dunai Plavni), for which some specific bird surveys were conducted. As previously mentioned, in 2001-2002 an extensive survey of the entire delta was undertaken to look at the numbers and breeding-feeding distribution of colonial nesting waterbirds (pelicans, herons, ibises, spoonbills, cormorants). Most of the species maps arising from this work show breeding and feeding areas away from the Bystre area. However, a number are relevant to the Bystre enquiry and are shown in Appendix 1.

One of the more detailed Romanian texts on the number of birds potentially impacted by the Bystre canal is:

"According to the Reports for Impact Assessment issued by the Ministry of Ecology and Natural Resources in 2002 and 2003, out of 257 species of birds, 245 species are affected by the new Bystre canal and up to 5600 couples [=pairs] of birds nest in Bystre canal area. Valued and strictly protected migratory birds nests on the island

located in the area of dredging. Gull-billed Tern- strictly protected by Bern Convention) nested in the last years on the small islands at the mouth of the Bystre canal only, Sandwich tern nested in the last years in two places, one at Bystre mouth (Platteeuw et al., 2004). Pied avocet -strictly protected by Bern Convention) population nests in both part of the Danube Delta but the main feeding area of Pied Avocet are located at the mouth of Bystre canal (Platteeuw et al., 2004). The Ukrainian reports clearly stated the impact of dredging on benthic fauna- the basic food for Avocet.”

4.6 Romanian assessment of potential impacts on birds

The texts submitted to the inquiry commission are not specific in terms of the Romanian view of potential **direct** impacts on birds, but are couched in very general terms such as:

“The construction will also have such negative ecological consequences as:

- *Effect on nesting and breeding conditions of bird species;*
- *Increased noise pollution in 5 km zone around canal, and negative influences on the fauna of the reserve.”*

By inference, other areas of the text imply an **indirect** effect on birds:

“The construction will also have such negative ecological consequences as:

- *Effect on the hydrological balance of the delta;*
- *Increased probability of oil product pollution of the estuary;*
- *Damage to the habitat, spawning condition and feeding base of the majority of the fish species dwelling in this area (including the Danube herring)*
- *Negative changes in plant communities (including danger of invasive species and eutrophication).”*

Also:

“The hydrotechnical works for navigation have the biggest impact because [they] affect the entire deltaic biome...”

And:

“The setting up of a navigable channel in the central part of the Ukrainian Delta – Bystre – by the increasing of the water flow will affect not only the natural habitats from neighboring, but also on large scale, including the Danube Delta Biosphere Reserve.”

Further:

“As a result of the changes into the aquatic habitats firstly it is possible to disappear the pelican colonies from Hrecisca-Buhaiova, and other poly-specific colonies of egrets, herons, spoonbills, glossy ibis, and cormorants. “

4.7 Proposed Ukrainian mitigation measures in relation to birds

- *“Termination of construction and repair-and-renewal operations in the section of the sea approach channel and in the area of the Bystry distributary source during birds’ nesting period.”*
- *“Speed reduction of the vessels’ passage along the Bystry distributary to 7 knots.”*
- *“Dispersal of mechanization means, adjustment of their power, variation of their work simultaneity.”*
- *“The ban to sound vessels’ blasts, the ban to transmit music to the deck during the vessels’ passage along the DBR territory, restriction, when possible, for the vessels passage along the Bystry distributary to day-time.”*

Also...

The damage associated with disturbance factors for birds in the sand-bar area during the period of carrying out construction work and during vessels' passage along the Bystry distributary may be compensated by means of implementing measures to increase capacity of the adjoining areas of the reserve for this group of animals by a well thought of hydro- and phytomelioration of the most degraded grounds. In the opinion of the DBR staff, taking into account a high mobility of birds and movement of many colonial species within large territorial bounds, it would be advisable to direct the bulk of compensation funds at ecological reconstruction of the Steptsovsko-Zhebrianovsliye plavni, namely:

- *at clearing the existing water ducts and building new ones for the purpose of increasing watering degraded grounds of plavni;*
- *at mosaic withdrawal of excessively accumulated organic mass of reed with a view to improve water cycle conditions and prevent the development of putrescent processes.*

5 KEY EVALUATION QUESTIONS

There are three key questions that need to be addressed in relation to *significant transboundary* impacts of the Bystre Canal on birds:

- **Evaluation question 1**

Will the Bystre canal development move Romanian bird habitats from favourable to unfavourable ecological condition ?

- **Evaluation question 2**

Will the Bystre canal development induce changes to the size, extent and viability of bird populations associated with Romanian (and/or other) territories ?

- **Evaluation question 3**

What is the likelihood of these changes occurring ?

These questions have been addressed by integrating a list of specific activities associated with the canal development, and the conceptual framework outlined in Section 3. The results are shown in the table below. As defined in Section 3, the impacts are evaluated as either:

- Permanent or transient.
- Direct or indirect.
- Transboundary or not transboundary.
- Probable, improbable or uncertain.
- Local or widespread.

OPERATIONAL AIM	OPERATIONAL ACTIVITY	POTENTIAL CONSEQUENCES FOR BIRDS AND/OR BIRD HABITATS	<ul style="list-style-type: none"> • IMPACT DURATION • DIRECT or INDIRECT • TRANSBOUNDARY IMPACT ? 	<ul style="list-style-type: none"> • IMPACT LIKELIHOOD • IMPACT SPATIAL EXTENT • IMPACT SIGNIFICANCE • COMMENTS
1. Dredging & widening of canal	Removal of sandbar material, sils and river edges, construction of bank protection measures	Habitat loss by physical removal	<ul style="list-style-type: none"> • Permanent • Direct • Transboundary 	<ul style="list-style-type: none"> • Probable • Local and restricted • Significant • Impact largely restricted to immediate vicinity of river banks. Further direct or indirect (siltation) removal of material from offshore sandbar will have major impact on a large number of breeding individuals of International, but involving only a few species (mainly terns). These ecologically utilise both Ukrainian and Romanian habitats (i.e. feed over wide area) and the issue is therefore transboundary. This will also have potential for impact on migratory wintering waterbirds in terms of a reduction in habitat availability. However, see Section 4.7 and 6 (below) in relation to mitigation measures.
		Habitat loss by hydrological changes (water levels, regimes, volumes)	<ul style="list-style-type: none"> • Permanent & transient • Direct • Transboundary 	<ul style="list-style-type: none"> • Probable - <i>if</i> conditions realised (see comments below) • Widespread • Significant • This is perhaps the impact of greatest concern to the wider DBR. However, it will only occur if the dredging activity results in major hydrological changes over wide areas. This is something that must be referenced to the hydrological evaluation found elsewhere in this report. The impact would transboundary and impact both breeding and migratory wintering birds of international importance.

		<p>Reduction in food availability by changes to invertebrates or fish communities</p>	<ul style="list-style-type: none"> • Permanent & transient • Indirect • Transboundary 	<ul style="list-style-type: none"> • Probable - <i>if</i> conditions realised (see comments below) • Widespread • Significant • This is perhaps the impact of second greatest concern to the wider DBR. However, it will only occur if the dredging activity results in major hydrological changes over wide areas. This is something that must be referenced to the hydrological evaluation found elsewhere in this report. The impact would transboundary and impact both breeding and migratory wintering birds of international importance.
		<p>Exposure to terrestrial predators resulting from siltation of the area between the spit and the 'mainland'.</p>	<ul style="list-style-type: none"> • Permanent • Direct • Transboundary 	<ul style="list-style-type: none"> • Probable - <i>if</i> conditions realised (see comments below) • Significant • There are conflicting views as to whether this will occur as it depends on the siltation of the area between the spit and the 'mainland'. The matter needs to be referred to the relevant hydrology expert. A view should also be sought as to whether natural 'background' siltation rates will be enhanced (Romanian view) or impeded (Ukrainian view) by the proposed development works.

	Operation of machinery i.e. disturbance by noise, visual, physical means	Exclusion from habitats resulting in reduction in feeding intake, breeding output, change in moulting and loafing areas	<ul style="list-style-type: none"> • Transient • Direct • Transboundary 	<ul style="list-style-type: none"> • Probable • Local and restricted • Significant • Distance over which direct disturbance will cause exclusion is likely to be small, restricted to a small number of species, and some bird groups may display a degree of habituation in the longer term. However, for terns on the sand spit, the population level impacts will potentially be severe. The impact would transboundary and impact both breeding and migratory wintering birds of international importance.
		Increased density at alternative sites	<ul style="list-style-type: none"> • Transient • Indirect • Transboundary 	<ul style="list-style-type: none"> • Probable • Local and restricted • Significant • For most breeding species this will not be an issue, as it will impact only a small number of individuals (relative to total DBR population), and most habitats will have some scope for increased bird densities. However, particularly for terns on the sand spits, movement away from area to other colonies could be a potentially negative impact if those colonies are approaching carrying capacity. It is also potentially more serious for wintering waterbirds.
2. Terrestrial accommodation of dredged spoil (21ha of land)	Placement of material at designated sites	Habitat loss by covering	<ul style="list-style-type: none"> • Permanent • Direct • Transboundary 	<ul style="list-style-type: none"> • Probable - <i>if</i> conditions realised (see comments below) • Local and restricted • Significant • Likely to result in very small decrease in local breeding species – need for surveys to find out which species involved and to ensure that it does not include rare, endangered or sensitive protected species. The Ukrainian texts suggest that the dump sites are on 'degraded' land. This will need to be confirmed.

	Operation of machinery i.e. disturbance by noise, visual, physical means	Exclusion from habitats for feeding, breeding, moulting, loafing	<ul style="list-style-type: none"> • Permanent • Direct • Transboundary 	<ul style="list-style-type: none"> • Probable • Local and restricted • Significant • Likely to result in exclusion for very local breeding species – need for surveys to find out which species involved and to ensure that it does not include rare, endangered or sensitive protected species.
		Reduction in breeding output and feeding intake	<ul style="list-style-type: none"> • Transient • Direct • Transboundary 	<ul style="list-style-type: none"> • Probable • Local and restricted • Significant • Likely to result in small decrease in output and feeding intake for very local breeding species – need for surveys to find out which species involved and to ensure that it does not include rare, endangered or sensitive protected species.
		Increased density at alternative sites	<ul style="list-style-type: none"> • Transient • Indirect • Transboundary 	<ul style="list-style-type: none"> • Probable • Local and restricted • Significant • For most species this will not be an issue, as it will impact only a small number of individuals (relative to total DBR population), and most habitats will have some scope for increased bird densities.
3. Shipping traffic	Low intensity (general) shipping pollution	Habitat degradation	<ul style="list-style-type: none"> • Transient • Indirect • Transboundary 	<ul style="list-style-type: none"> • Probable • Widespread • Significant • Large volume of scientific evidence to suggest general shipping activity causes some pollution, and shipping accident has already occurred. However, impact of normal background pollution will not have major impact on bird populations.

	High intensity pollution event (accident)	Habitat degradation	<ul style="list-style-type: none"> • Transient • Direct and indirect (i.e. long term effects) • Transboundary 	<ul style="list-style-type: none"> • Uncertain • Widespread • Significant • A single local pollution event (e.g. oil spill) could have major impact for species like terns where number of breeding sites are few, but numbers are large and close to Bystre canal operations.
	Boat noise, visibility & wash	Habitat degradation	<ul style="list-style-type: none"> • Permanent • Direct • Transboundary 	<ul style="list-style-type: none"> • Probable • Relatively small • Significant • Distance over which impact will occur is likely to be small, and some groups will probably display a degree of habituation in the longer term. However, for terns on the sand spit, the population level impacts will potentially be severe. The proposed Ukrainian mitigation measures suggest regulating boat speed in the Bystre canal area to a maximum of 7 knots. The true reduction in impact of this measure will need to be discussed with relevant riparian habitat experts. There will also be need to check that this will not increase likelihood of accidents resulting from low avoidance maneuverability by slow moving vessels.
4. Maintenance of canal	All of the above	All of the above	<ul style="list-style-type: none"> • All of the above 	<ul style="list-style-type: none"> • All of the above

FURTHER CONSIDERATIONS FOR THE INQUIRY COMMISSION

Several further issues are of note:

5.1 Specific bird related concerns with hydrology & hydromorphology

There are three main concerns in relation to hydrology from the bird population perspective:

- Will changes to river flow volumes/speed generate spatial and temporal changes to water regimes in wetlands outwith the river. This could have major implications for habitat types and invertebrate/fish prey populations.
- Will changes to river flow volumes change sedimentation in wetlands outwith the river and in the Black Sea (sand spit) area.
- Will 'engineered' edges to the canal be created, thereby preventing outflow of water from the river to associated wetlands.

5.2 Biological nature of 'transboundary' effects for birds

For birds, the definition of transboundary has a specific element that needs to be presented in this report. The *direct* physical impacts such as the removal of a breeding sand bar are self evident. However, a secondary issue arises in relation to the wider *ecological* use of sites. This occurs when, for example, a breeding bird population in Romania ecologically utilises habitats in Ukraine e.g. breeds on one side of the river but utilises feed resources on the other. In this sense, a change to those feeding habitats is transboundary. Equally, if the reverse were true, i.e. Ukrainian breeding birds utilising resources on Romanian territory, this too could be considered transboundary, as under international conventions (Ramsar, Birds Directive, *etc.*) the Romanians would be 'responsible' for the birds utilising their territory even if not breeding there.

5.3 The danger of 'small' effects

Some of the potential 'significant' transboundary impacts listed in the table above may be considered to be 'small' in terms of the number of birds they affect, and the spatial and temporal extents over which they operate. For bird species, these 'small' effects must be treated with extreme caution and utilising the precautionary principle. This is because (a) history tells us that for populations, numerical size does not provide protection from environmental change, and (b) some bird populations, although currently viable, can be subject to many 'unseen' pressures, and a small new effect can precipitate great problems. The children's story of *Who Sank The Boat* is useful here. It describes a small boat in a river. First of all an elephant gets in and the boat sits lower in the water. Then a dog gets in, and the boat goes down some more. And then a mouse gets in and the water is up to the top of the boat. And then a flea gets in and the boat sinks. The question is: who sank the boat? Although perhaps a strange story for such a serious issues as the Danube Delta, the point is made that apparently 'small' environmental changes can have big effects and should be treated with caution.

5.4 Future responsibilities

The Commission should also consider the potential for future transboundary impacts arising from the canal development. For example, there may be longer terms impacts of creating additional infra-structure because it will allow other developments to occur i.e. it might be the thin edge of a wedge.

5.5 Natural background evolution of the delta region

There have been a number of statements put forward in relation to the potential impacts of the Bystre development that suggest that they merely reflect losses that will occur through natural processes, and which will be 'balanced' by natural gains (e.g. the sand bar area and the creation

of new sand bars by sedimentation). This should be treated with extreme caution in relation to providing mitigation for any current anthropogenic effects. The determination of whether a significant transboundary impact will arise from the Bystre development is a separate issue to the context of the changes that will occur.

6 CONCLUSIONS

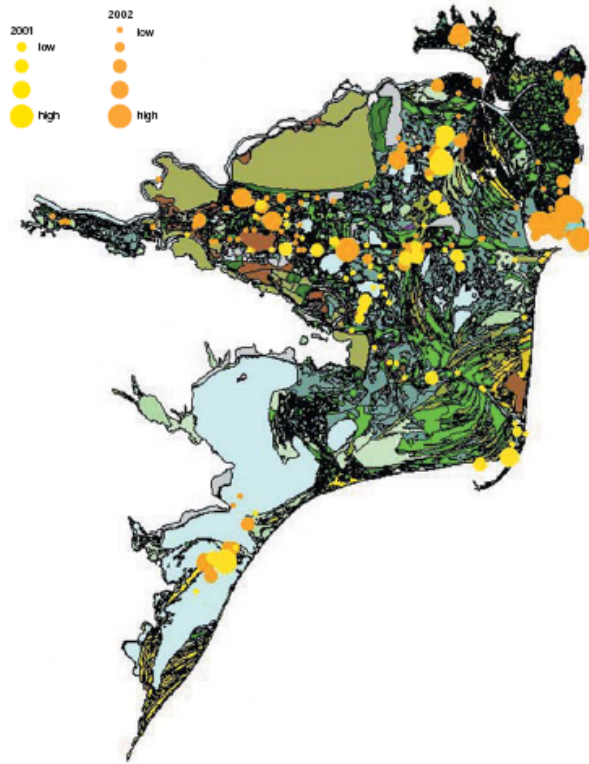
- The breeding and wintering populations of birds in the Danube delta (refer to definitions in Section 3.3), are of international importance. The
- There is a considerable body of research-based evidence in relation to the consequences of habitat loss, degradation and disturbance to birds. Although not obtained directly from research in the Bystre canal area, this type of knowledge nevertheless permits a general evaluation of likely consequences of the proposed human activities in the Bystre canal development, as well as an assessment of their likelihood of occurrence.
- This knowledge of the bird-related consequences of human actions, has been integrated with the underlying principles of EIA, to construct a 'conceptual framework' for the assessment made in this report. Using this framework, it is suggested that the operational activities associated with future development and ongoing canal maintenance will have a high likelihood of resulting in the following:
 1. A change to the favourable status (as defined in Section 3.5) of Romanian and Ukrainian bird habitats, and thus a significant transboundary impact (as defined in Section 3.1). However, this will only occur over wide spatial extents and in the long term *if* further canal developments cause major hydrological changes. If changes to hydrology are predicted, there should be consultation with wetland habitat, fish and invertebrate experts to evaluate the specific likely impacts, and then this can be linked to the bird impact assessment.
 2. A changes to the size and viability of some breeding bird populations (and thus by definition a significant transboundary impact). However, this will only effect a wide range of species over a wide spatial extent if the canal causes major hydrological changes. Nevertheless, in the case of tern species, a significant impact has already occurred and continued development activities are extremely likely to worsen the previously inflicted impact. Any mitigation measures for changes to the sandbar spit (i.e. to undertake measures to increase the area of the reserve), should be tested *prior* to further development i.e. work to increase the spit's area could be undertaken *before* commencing canal development, to see if birds will occupy newly 'created' area.
 3. Result in changes to the current availability of habitats and food resources for wintering bird populations (and thus by definition have a significant transboundary impact). However, this will only effect a wide range of species over a wide spatial extent if the canal causes major hydrological changes.
- Given the international importance and known sensitivity of birds breeding and wintering in the Danube region, a precautionary principle must always be invoked within all decision making processes.
- With specific reference to activities causing noise or visual disturbance (see table above), the main period of disturbance-sensitivity for breeding bird is from the beginning of April to mid-June, and for wintering birds from mid-October to mid-February. Activities causing noise or visual disturbance during these times should avoided.

- These conclusions **must** be linked to the Inquiry Commission's hydrological report, to assess the potential spatial extent of changes to water regimes, water volumes, and sediments arising from the Bystre canal development. This is key to evaluating the potential extent and significance of the bird impacts resulting from by the component development activities.
- It is strongly recommended that a long-term biological monitoring scheme needs to be established in the region. This must not merely be 'survey' based, and should look at birds as well as their food resources and habitats.

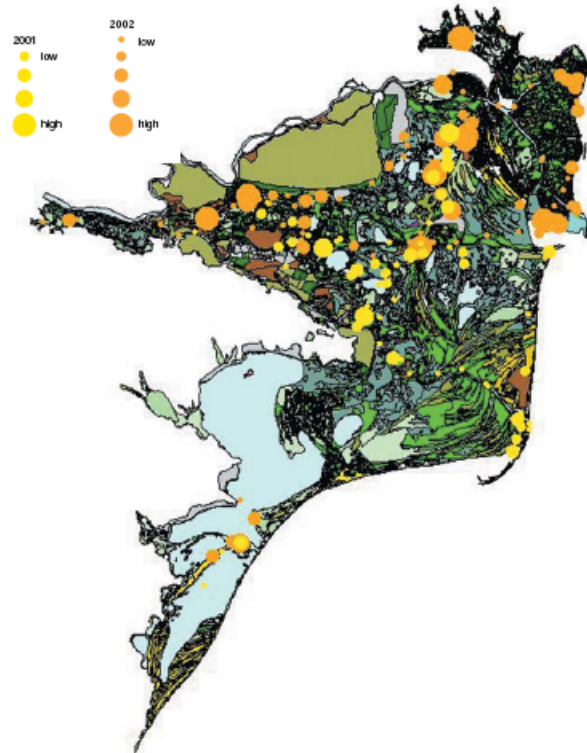
7 APPENDICES

7.1 Feeding and breeding distributions of Danube colonial waterbirds

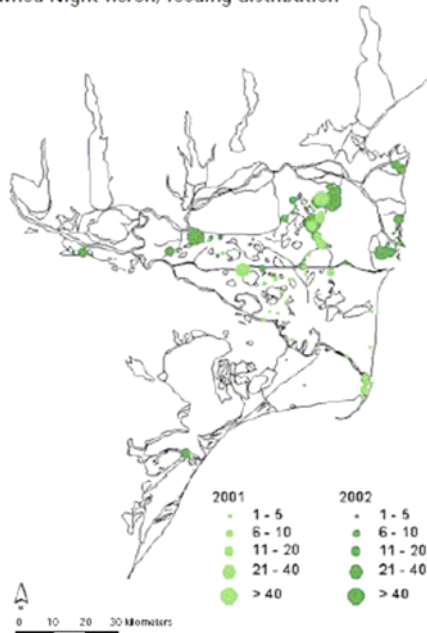
Preferred feeding sites for pelicans and cormorants



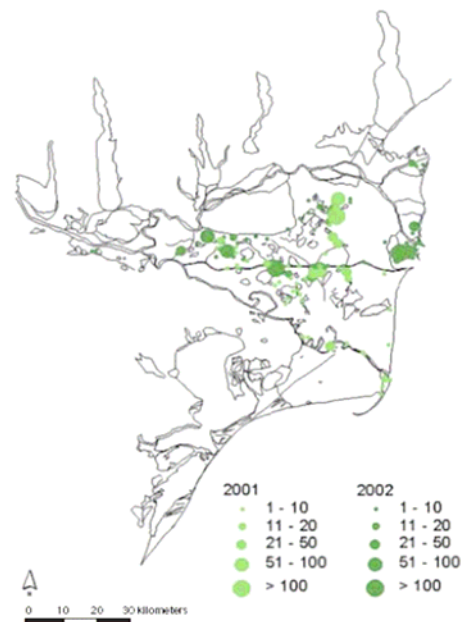
Preferred feeding sites for herons



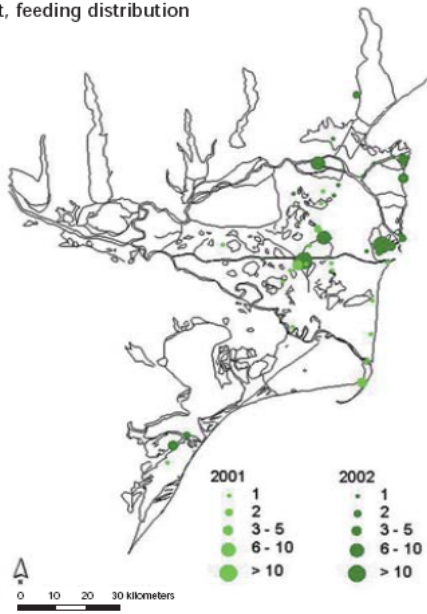
Black-crowned Night-heron, feeding distribution



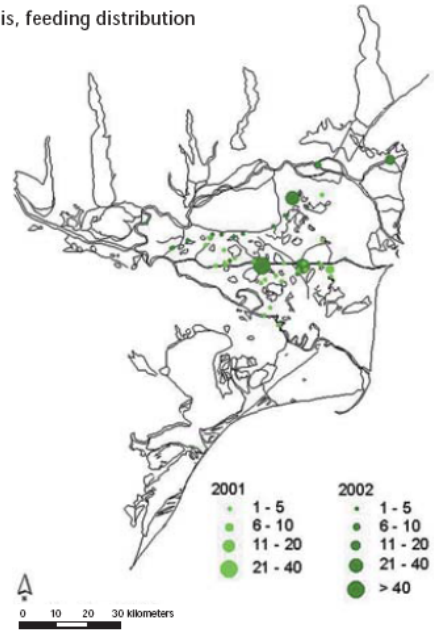
Pygmy Cormorant, feeding distribution



Great Egret, feeding distribution



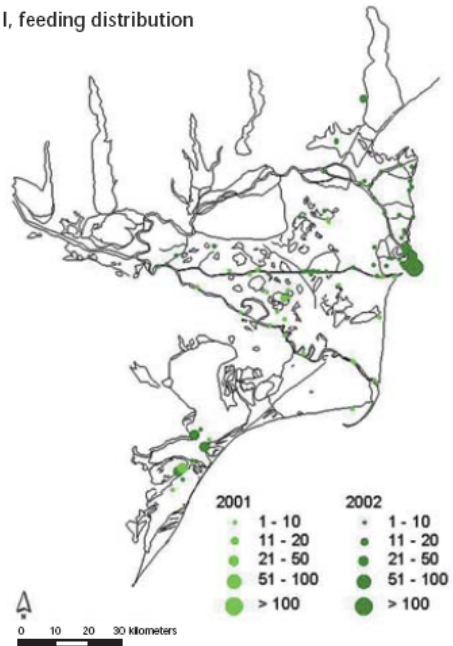
Glossy Ibis, feeding distribution



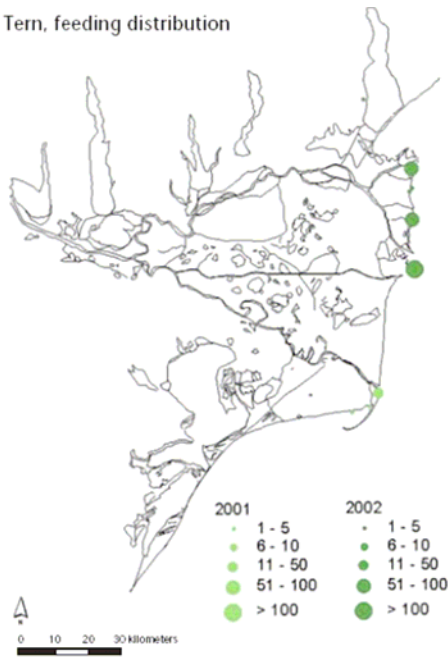
Pied Avocet, feeding distribution



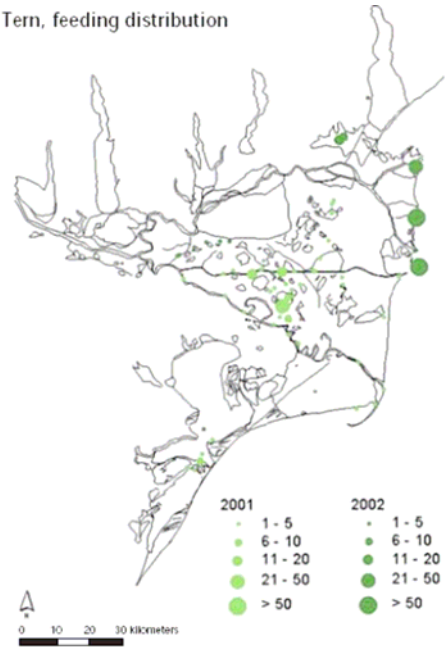
Pontic Gull, feeding distribution



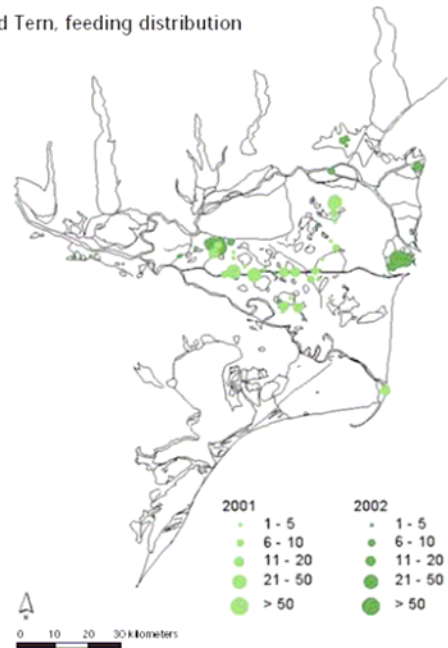
Sandwich Tern, feeding distribution



Common Tern, feeding distribution



Whiskered Tern, feeding distribution

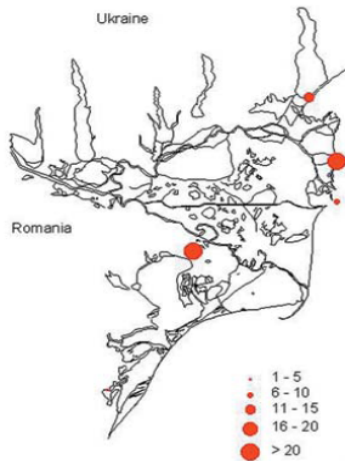


Breeding distribution in Delta

Pied Avocet, 2001

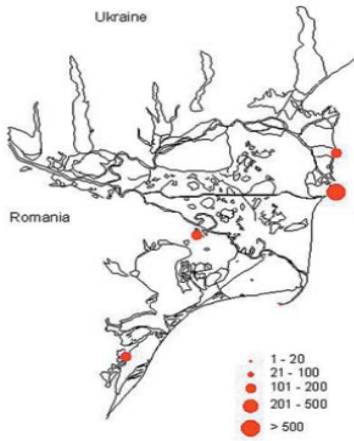


Pied Avocet, 2002

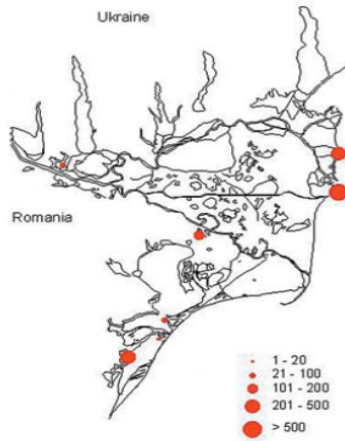


Breeding distribution in Delta

Pontic Gull, 2001

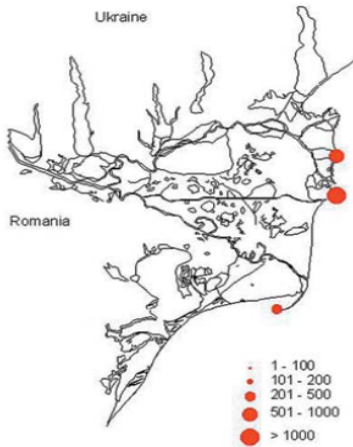


Pontic Gull, 2002



Breeding distribution in Delta

Sandwich Tern, 2001

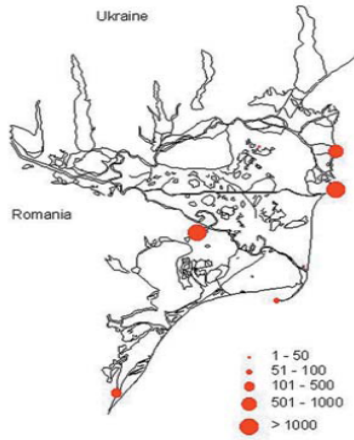


Sandwich Tern, 2002

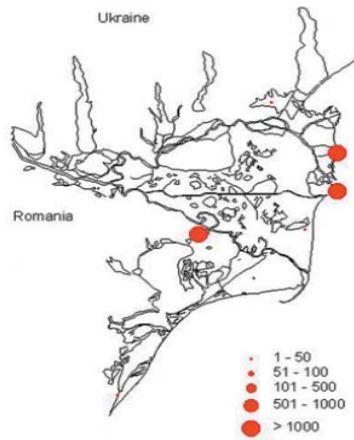


Breeding distribution in Delta

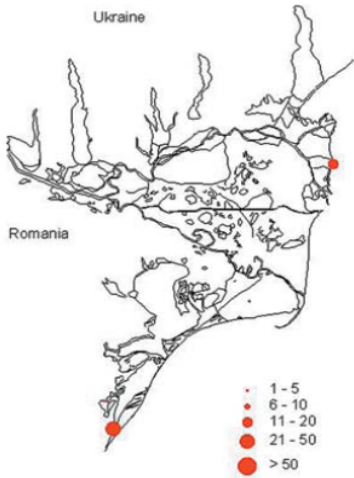
Common Tern, 2001



Common Tern, 2002



Little Tern, 2001

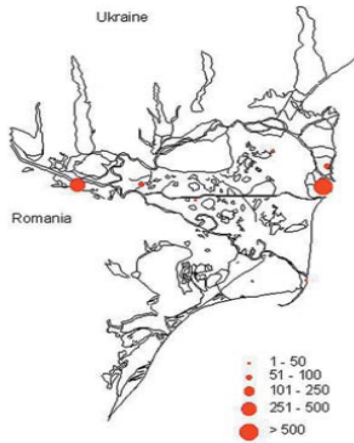


Little Tern, 2002

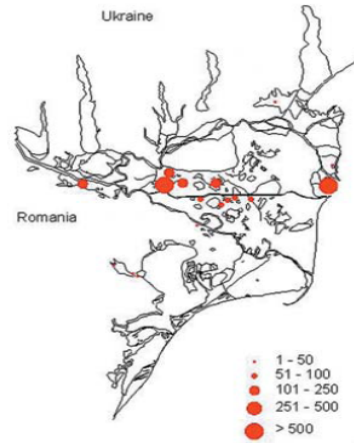


Breeding distribution in Delta

Whiskered Tern, 2001



Whiskered Tern, 2002



Gull-billed Tern, 2001



Gull-billed Tern, 2002

