WETLANDS INTERNATIONAL

Directory of Azov-Black Sea Coastal Wetlands

Kyiv–2003

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CONTENTS

EDITORIAL AND ACKNOWLEDGEMENTS

This Directory is based on the national reports prepared for the Wetlands International project 'The Importance of Black Sea Coastal Wetlands in Particular for Migratory Waterbirds', sponsored by the Netherlands Ministry of Agriculture, Nature Management and Fisheries. At the seminar of the same name, held in February 2000 in Odessa, Ukraine, national co-ordinators (leaders of national experts' groups) were identified. They were responsible for the preparation of the national reports on inventories of Black Sea coastal wetlands. The latter were presented and discussed at the following international workshop 'Conservation, Restoration and Wise-use of Wetlands and Wetlands Resources along the Black Sea Coast' held in September 2000 in Odessa.

First and foremost, we acknowledge with pleasure the huge debt of gratitude we owe to the very responsible and conscientious Gennadiy Marushevsky, an international co-ordinator, who communicated with national co-ordinators and teams, compiled information, edited all articles and provided the final shape of the Directory.

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INTRODUCTION

by
Gennadiy Marushevsky, Black Sea Programme of Wetlands International, Ukraine

The Black and Azov Seas are almost completely enclosed waterbodies bordered by six countries: Bulgaria, Georgia, Romania, Russia, Turkey and Ukraine. The Black Sea has an area of 422,000 km^2 and a total volume of 537,000 km^3, three quarters of which is between 200 and 2,200 m deep and permanently anoxic. The only extensive shallow areas (< 200 m) are on the northwestern shelf, which is fed by the Rivers Danube, Dniestr (Dniester) and Dnipro (Dnieper). The Azov Sea, fed by the Rivers Don and Kuban, has an area of 38,000 km^2; its average depth is 8 m and maximum no more than 14 m.

The Black Sea is the only warm-water marine environmental resource for Eastern Europe and until quite recently was home to fisheries that were five times richer than those of the neighbouring Mediterranean (UNDP/UNEP/WB 1993). The Azov Sea, due to its shallowness, warmth and mix of waters, was once the most productive sea in the world for fisheries. In the 1930s, the total fish catch was 300,000 tonnes, including more than 160,000 tonnes of valuable fish species. In terms of fish productivity, the Azov Sea exceeded the Caspian Sea by a factor of six and the Black Sea by a factor of 25. Due to the significant decrease of freshwater drainage into the Black and Azov Seas (as a result of dam construction and use of river water for industry and agriculture), the salinity of the two seas has increased (the salinity of the Black Sea from 16-18‰ to 18-20‰, of the Azov Sea from 11-12‰ to 14‰), the plankton biomass has decreased and fish stocks have declined significantly.

The Black Sea is now among the most polluted waterbodies on earth. With its drainage basin of 17 countries – five times the area of the sea itself – the Black Sea is affected by the activities of about 165 million people. Industrial and agricultural pollution, both on the shores of the sea itself and from inflowing rivers, combined with the sea's being virtually enclosed, which reduces flushing capacity, has resulted in significant pollution and eutrophication. The quantity of mineral fertilisers entering the Black Sea via river water has increased ten-fold in the past 20-25 years. The Danube alone adds 60,000 tonnes of phosphates and 340,000 tonnes of nitrates annually (Alexandrov 1998). To combat the degradation of the Black Sea, conservation efforts must address both the direct pollution and the degradation of wetlands within the catchment.

The Black Sea coastal wetlands serve as natural filters, trapping pollutants and sediments from rivers. These wetlands are threatened by development, deforestation, unregulated house-building, pollution from agriculture, and discharges from industrial plants. Continuing degradation of these wetlands could eliminate an important natural buffer between the polluted rivers and the Black Sea. The coastal wetlands are very important for ecological processes as well as for their rich flora and fauna. The Black Sea coastal wetlands support a rich and globally significant diversity of habitats and species. These wetlands include habitats such as reed-dominated marshes, forest riverine flood plains, inland lakes and lagoons, limans, deltas, coastal lagoons and bays, silt and sand flats, as well as artificial wetlands such as fish ponds, rice paddies and salt ponds.

Although the Black Sea coastal wetlands are of vital importance for both human society and wildlife, because of extensive human activity they are amongst the most threatened habitats. The large network of diverse and distinctive coastal wetlands in the Black Sea region belongs to an intricate system of marine, riverine and steppe environments. This network of wetlands is of utmost importance for millions of migratory waterbirds in the East African and Mediterranean flyways and plays therefore a key role in the African-Eurasian Waterbird Agreement (AEWA, under the Bonn Convention). Despite their considerable deterioration in size and quality over the last few decades, these wetlands maintain extensive areas of relatively high ecological integrity.

The largest Black Sea wetlands are found in the coastal lowlands of Romania, Russia and Ukraine, where the massive catchments of the Rivers Danube, Dniestr, Dnipro, Don and Kuban support the river deltas. In contrast, the Black Sea wetlands of Bulgaria, Turkey and Georgia tend to be much smaller and have much smaller catchments, reflecting the mountainous hinterlands of these countries. The ten largest wetlands of the region are shown in Figure 1.

An inventory of wetland resources is a prerequisite for the determination of conservation and management priorities, and for the successful integration of wetland conservation interests into water and land-use planning

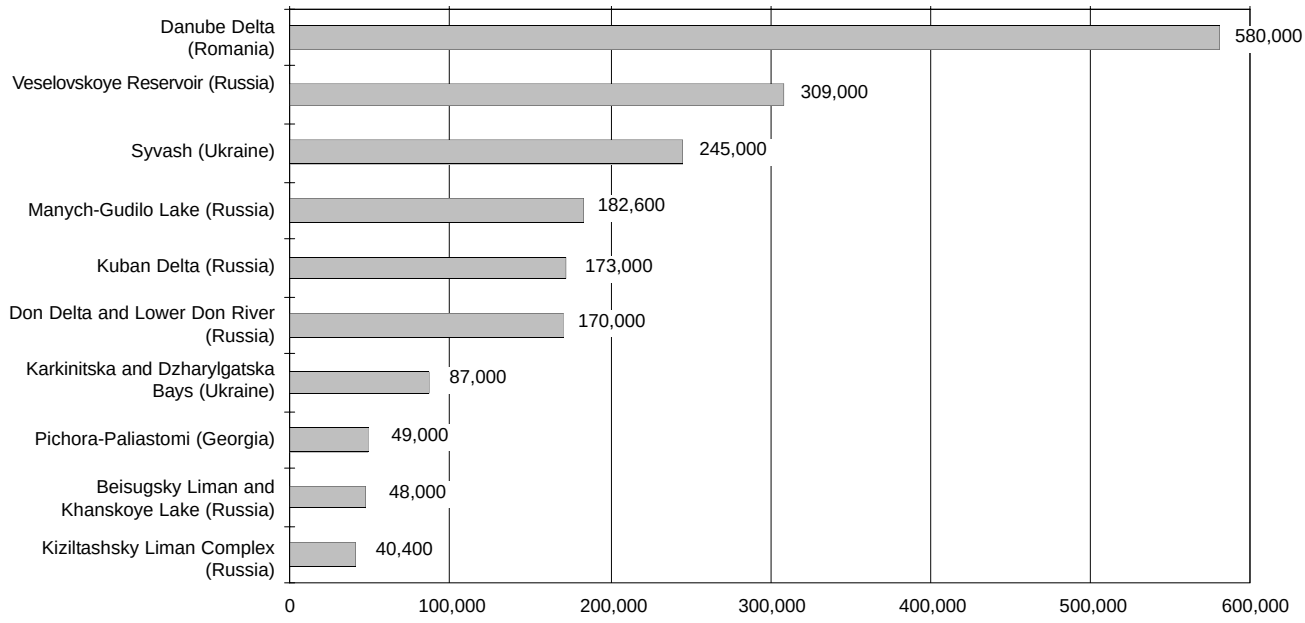


Figure 1. The ten largest wetlands of the Azov-Black Sea region (area in ha)

frameworks. Inventories provide a basis for the assessment of wetland resources at local, national and international levels, information on human activities and on the benefits of wetlands. Additionally, they may serve as a baseline for monitoring changes in ecological character, including changes in wetland area. Wetland inventories should be seen as an evolving process, starting with a compilation of existing information, which can be developed as more comprehensive data are gathered. Wetland inventories should be updated regularly.

A number of international lists and directories of wetlands covering the Black Sea region have been published during the last 30 years. The Mar List (Olney 1965) and the Directory of Western Palearctic Wetlands (Carp 1980) were extremely limited in their coverage of the Black Sea wetlands. In 1989 the results of a survey of Important Bird Areas (IBAs) in Europe, conducted by ICBP (now BirdLife International) and IWRB (now Wetlands International), was published (Grimmett and Jones 1989). This provided basic information on the bird habitats of the region, including information on the most important wetlands and waterbirds. The second Pan-European IBA inventory was published in 2000 (Heath and Evans 2000).

More detailed information is available for the Black Sea wetlands that have been designated as Ramsar sites. These sites are described in *A Directory of Wetlands of International Importance*, which was first produced in draft form for the Second Conference of the Contracting Parties to the Ramsar Convention (CoP) in Groningen, the Netherlands, in 1984, and has since appeared in revised and updated versions at the subsequent CoPs. The last inventory of Ramsar sites was published for the 7th Meeting of the COPs, which was held in San Jose, Costa Rica, in 1999 (Frazier 1999a). An excerpt from this publication – *Wetlands of International Importance of Ukraine* – was published by the Ukrainian Programme Office of Wetlands International – AEME (Frazier 2000).

The most comprehensive overview of the Black Sea wetlands and a preliminary action plan for wetland conservation was prepared by IWRB (Wilson and Moser 1994). It promoted further development of inventories of Black Sea wetlands. In 1996, the European Commission funded the project 'TACIS Support for the Implementation of the Black Sea Wetland Conservation Action Plan', which concentrated on the completion of the existing partial inventories, including wetland sites of international and national importance in the Black Sea basin in Moldova, Ukraine, Russia and Georgia. The final report included detailed information on 48 coastal wetlands of these four countries (Lansdown 1996).

In 1999 Wetlands International initiated the project 'The Importance of Black Sea Coastal Wetlands in Particular for Migratory Waterbirds', sponsored by the Netherlands Ministry of Agriculture, Nature Management and Fisheries. The project focused on the shortage of baseline information on Black Sea coastal wetlands, and in

particular on waterbirds, and the lack of co-operation between wetland and waterbird experts in the countries bordering the Black Sea. Data for the inventory were brought together during the period between workshops held by Wetlands International in Odessa, Ukraine, on 10-11 February 2000 and 26-27 September 2000. This directory is a version of the full data set.

The aims of the inventory were:
a. to identify where the wetlands are and which are the priority sites for conservation;
b. to identify the functions of each wetland and its ecological, social and cultural values (and uses);
c. to monitor changes in the extent and quality of wetlands that have occurred, are occurring or are likely to occur and to identify ways in which these changes might be addressed;
d. to provide a tool for the protection and sustainable utilisation of wetlands and associated coastal habitats, both at policy and management levels;
e. to permit comparison of wetlands at national and international levels;
f. to provide information to assist in raising public awareness of the value of wetlands;
g. to assess the success of policies affecting wetlands, including management and restoration programmes.

A Directory of Black Sea Coastal Wetlands follows a format similar to that of earlier wetland directories. The greater part of the Directory consists of a series of national reports. Each begins with an introduction, categories for which were agreed with national co-ordinators. Each introduction includes general information about the country (area, population, neighbouring countries, climate, biogeographical zoning, administrative division, etc.), general description of coastal wetlands (location, area, status, protected areas, occurrence of threatened taxa in key sites, etc.), information on legislative and institutional bases for wetland conservation and research as well as organisations involved with wetlands. Then follows a series of accounts of wetlands. The Directory includes all Black Sea coastal wetlands of international importance (according to the Ramsar criteria) and of national importance. Wetlands of national importance were identified for inclusion by experts of each national team, as far as each country has its own rules and criteria for definition of such wetlands. Within each country, the sites follow the order selected by the national experts. The site descriptions include basic information on location, area, altitude, wetland type, physical features (geology, geomorphology and soils; hydrology; water quality; climate), principal vegetation, conservation measures taken and proposed, land use and possible changes in land use, disturbances and threats, economic and social values, fauna, special floristic values, research facilities, public awareness and education, and criteria for inclusion.

The national teams were requested to submit data sheets for each site under a standard list of headings. The following notes are intended to explain the application of some of the headings:

Wetland type: Where feasible, a series of codes are provided, indicating the types of wetland habitat present (Annex 1).

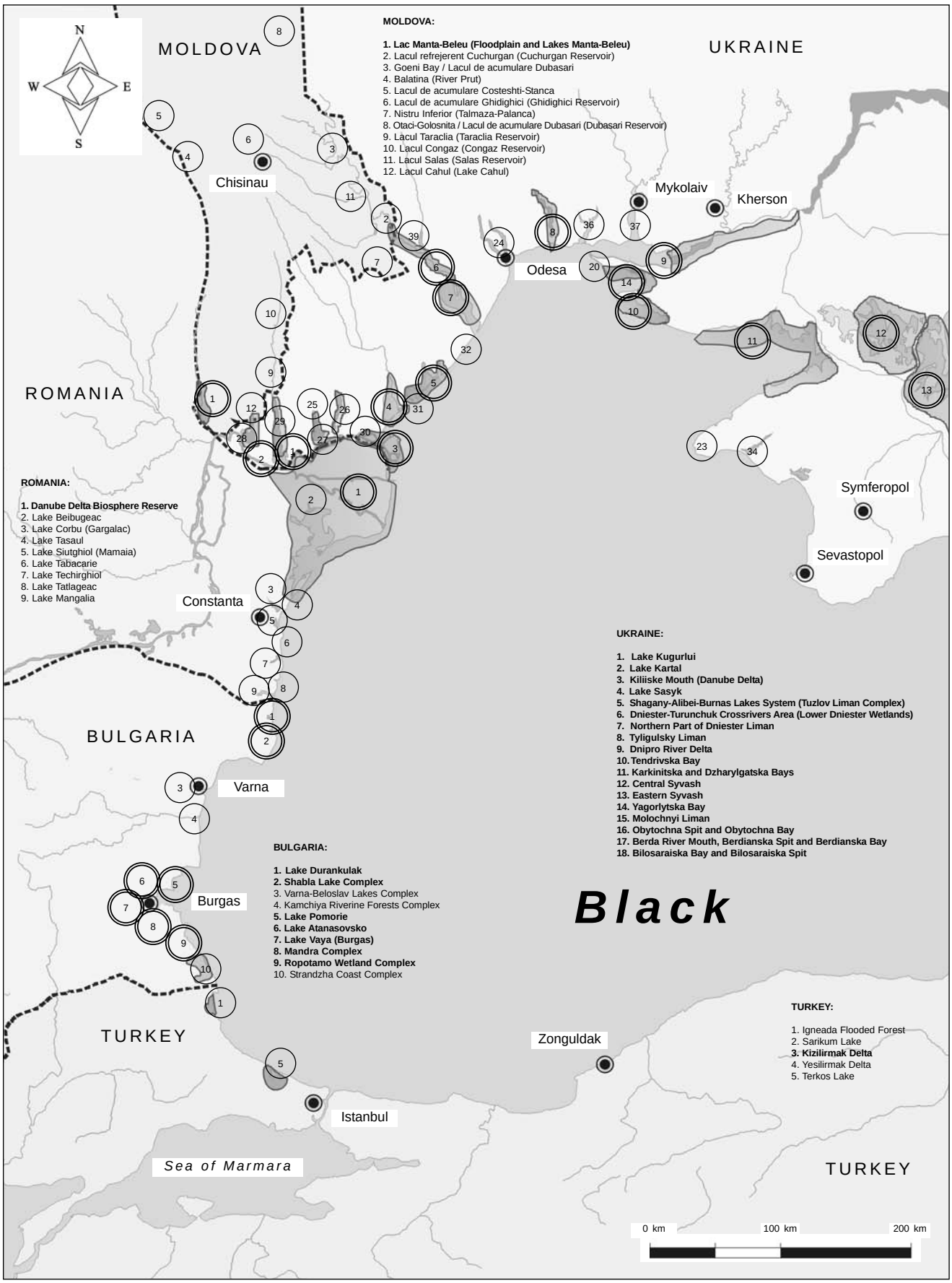
Other hydrologically linked wetlands: This heading has not generally been used in previous wetland inventories. It is intended to highlight the connectedness both of sites described and nearby wetlands of lower conservation value.

Criteria for inclusion: This is a reference to the criterion or criteria that justify the inclusion of a site in the inventory. The criteria referred to are those adopted under Article 2 of the Ramsar Convention (Annex 2).

The term 'wetland' is used here in the sense defined in the text of the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (the Ramsar Convention). Thus wetlands are 'areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres'. Exclusively marine systems have been excluded from this inventory.

To support inventory data and show the location of the described sites, three types of maps have been included in the Directory: general map for the Black Sea region (Map 1), general map for each country and maps of sites. For reasons of space, it has not been possible to include detailed maps of each site.

Overview of the Black Sea coastal wetlands included in the Directory



Map 1. The Azov-Black Sea coastal wetlands (numbers correspond with the numbers in the text and tables).


UKRAINE
Mariupol
Berdyansk
Rostov-na-Donu
Azov Sea
RUSSIA
Kerch
Novorossiysk
Sochi
Sukhumi
GEORGIA
Sea
Sinop
Samsun
Trabzon
TURKEY
Batumi
RUSSIA:
1. Kuban Delta
2. Kiziltashsky Liman Complex
3. Beisugsky Liman and Lake Khanskoe
4. Yeisky Liman
5. Veselovskoye Reservoir
6. Manych-Gudilo Lake
7. Don Delta and Lower River Don
8. Dinskoy Bay
9. Beglitskaya Spit
10. Shabelskaya Spit
19. Kryva Bay and Kryva Spit
20. Kinburnska Spit
21. Utluksky Liman
22. Lake Aktash with Astanino Plavni
23. Coast from Chornomorske to Cape Uret
24. Kuyalnytsky Liman
25. Lakes Katlabukh and Safyany
26. Lake Kytay
27. Izmail Islands
28. Lake Kahul
29. Lake Yalpug
30. Zhebriyanski Plavni
31. Dzhantsheiski Lakes
32. Budaksky Estuary
33. Cuchurgan Estuary
34. Lake Donuzlav
35. Coast near Cape Opuk
36. Berezansky Liman
37. Plavni of the Southern Bug River
GEORGIA:
1. Chorokhi Delta (Wetlands of Kakhabery lowland)
2. Ispani Mires
3. Laituri
4. Supsa-Natanebi
5. Pichora-Paliastomi
6. Nabada (Chaladidi-Poti part of the Kolkheti wetlands)
7. Churia (Tikori-Churia part of the Kolkheti wetlands)
8. Onaria
9. Vazisubani and Narionali
10. Lanchkhuti Marshes
11. Northern Kolkheti Wetlands
Legend:
– Ramsar site
– wetland
– state boundary
– site border
– site area

Table 1. Overview of the Black Sea coastal wetlands included in the Directory

Country	Wetlands				Ramsar sites			
	Number	Area (ha)	Protected area (ha)	Protected area, %	Number	Area (ha)	Protected area (ha)	Protected area, %
Bulgaria	10	24,209	9,100	38	7	12,026	4,931	41
Georgia	11	95,986	34,758	36	2 (4)*	73,040	34,223	47
Moldova	12	41,277	9,185	22	1	9,210	1,691	18
Romania	9	586,718	580,000	99	1	580,000	580,000	100
Russia	10	955,314	96,605	10	4 (3)**	664,600	85,591	13
Turkey	5	47,378	33,648	71	1	21,700	16,110	74
Ukraine	37	735,490	336,102	46	19	593,000	297,611	50
Total	**94**	**2,486,372**	**1,099,398**	**44**	**35**	**1,953,576**	**1,020,157**	**52**

*Notes: * – Three sites (Pichora-Paliastomi, Nabada and Churia) are parts of one Ramsar site;*
*** – The Kuban Delta includes two Ramsar sites.*

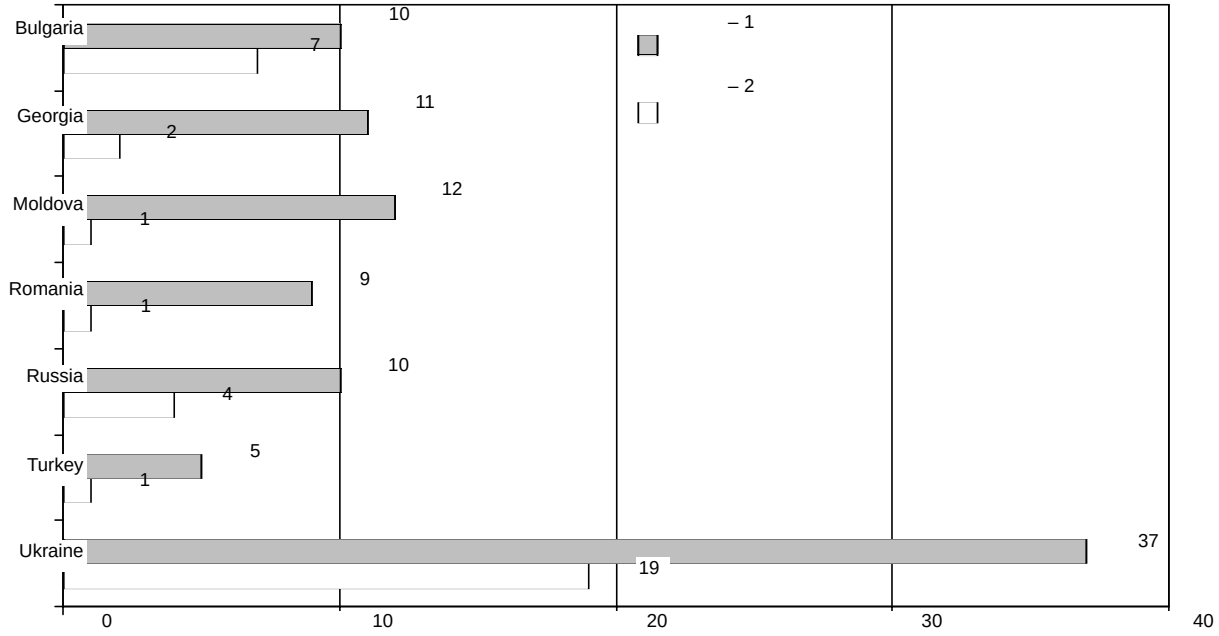


Figure 2. Distribution of the wetlands included in the Directory and the Ramsar sites (1 – total number; 2 – number of Ramsar sites)

The Directory includes information on 94 wetlands with a total area of 2,486,372 ha (see Table 1). Thirty-eight (38.4) percent of the total area of Black Sea wetlands are in Russia, 29.6% in Ukraine, 23.6% in Romania and the remaining 8.4% in Bulgaria, Georgia, Moldova and Turkey (Figure 3).

Thirty-five Black Sea coastal wetlands, totalling 1,953,576 ha, are of international importance and are designated as Ramsar sites.

In 1975, five Ramsar sites were designated in the Black Sea region: Arkutino in Bulgaria (97 ha) and Sivash Bay, Yagorlytska and Tendra Bays, Karkinitska Bay, and Dunaiski Plavni (the Danube Delta) in Ukraine, as a part of the USSR, with a total area of 211,051 ha.

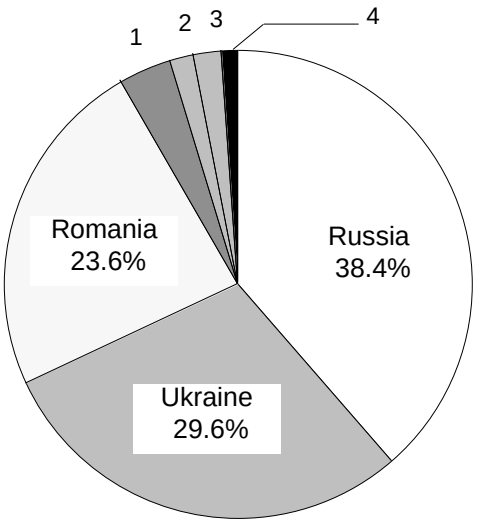


Figure 3. Wetland area (%) per country: 1 – Georgia (3.9%); 2 – Moldova (1.7%); 3 – Turkey (1.9%); 4 – Bulgaria (1.0%)

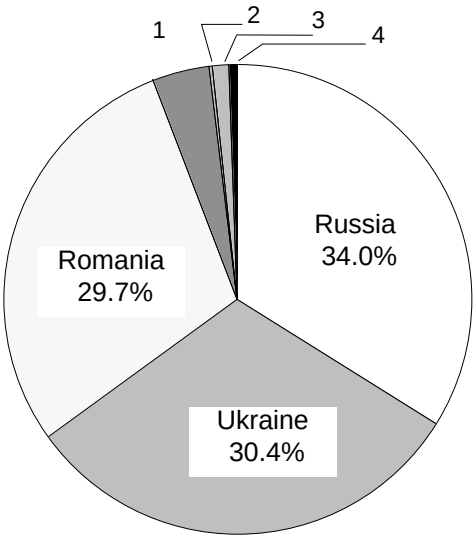


Figure 4. Ramsar sites area (%) per country: 1 – Georgia (3.7%); 2 – Moldova (0.5%); 3 – Turkey (1.1%); 4 – Bulgaria (0.6%)

In 1986, Atanasovsko and Durankulak Lake in Bulgaria were designated as Ramsar sites. In the 1990s, the number of Black Sea Ramsar sites increased significantly. The following wetlands were designated: Danube Delta in 1991 (Romania); Lake Shabla in 1996 (Bulgaria); the Kolkheti Lowlands and Ispani II in 1997 (Georgia); Kizilirmak Delta in 1998 (Turkey), Manta-Beleu in 2000 (Moldova); Lake Pomorie, Lake Vaya and Poda Lagoon (in Mandra Complex) in 2002 (Bulgaria).

In 1994, the Government of the Russian Federation confirmed Ramsar status for the three sites remaining after the break-up of the USSR and designated 32 additional sites as wetlands of international importance. Four of the 35 Ramsar sites are located in the Azov-Black Sea region (Kuban Delta – 2 sites, Veselovskoye Reservoir and Lake Manych-Gudilo). In 1996, independent Ukraine joined the Ramsar Convention. Twenty-two wetlands were designated as Ramsar sites, 19 of which are located in the Azov-Black Sea coastal zone. The proportion (%) of Ramsar sites per country is shown in Figure 4.

Glossary

Within the text of the inventory the following words have been retained for one or more of three reasons:

1. They form part of a site name;
2. They have a precise meaning in their language of origin that may be important for anyone familiar with the language in understanding the precise nature of the site; or
3. The editor has found no suitable or precise English equivalent.

chernozyom/chernozem soils	– black earth soils
kosa	– spit/sandy peninsula
krivaja/kryva	– curved
liman	– natural, shallow lagoons, mainly coastal; a coastal lagoon with a salinity gradient
loess	– unconsolidated, wind-deposited sediment
plavny/plavni	– area flooded for long periods or located in shallow water in deltas and bays that are covered by reeds or other similar plant species
solonchak	– salt-marsh

solonchak soils	– saline soils
solonetz soils	– alkaline soils
zakaznik	– Game Reserve (Russia/Ukraine)/reserve, where small or medium-sized natural ecosystems remain (zakazniks are accessible to owners and users).
zapovednik	– Nature Reserve (Russia/Ukraine) (the Zapovednik Administration is the only land user).

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Odessa-2000 Declaration on the Wetlands of the Black and Azov Seas

During the workshop 'Conservation, restoration and wise-use of wetlands and wetland resources along the Black Sea coast', held on 26-27 September 2000 in Odessa, Ukraine, 35 regional and international wetland and waterbird experts representing wetland conservation organisations in Bulgaria, Georgia, Moldova, the Netherlands, Romania, Russia, Switzerland, Turkey, Ukraine and United Kingdom discussed future co-operation in the field of conservation, restoration and sustainable use of wetlands along the coast of the Black and Azov Seas. The workshop was organised by Wetlands International and financed by the Ministry of Agriculture, Nature Management and Fisheries of The Netherlands.

The participants of the workshop:

Recognising that the biological diversity of the coastal wetlands of the Black and Azov Seas represents a natural and cultural heritage of exceptional international interest, which should be conserved and sustainably used for present and future generations;

Noting that there has been massive loss and degradation of these ecosystems, which continues today, throughout the Black Sea basin;

Taking into account:
- the adoption of the Bucharest Convention on 'The Protection of the Black Sea against Pollution' in 1992;
- the adoption of the Odessa Ministerial Declaration on the protection of the Black Sea Environment (1993) which reaffirmed the priorities of the 1992 Bucharest Convention and confirmed the Ministries commitment to integrated management and sustainable development of coastal areas and the marine environment;
- the adoption of Resolution VII.22 of the 7th Conference of the Parties to the Ramsar Convention (Costa Rica, 1999) concerning the collaborative structure for Mediterranean wetlands which recognises the MedWet Initiative as a model of regional collaboration, based on endogenous effort and a wide participation of all sectors;
- the development of a second phase of the Black Sea Environmental Programme aiming at decreasing the nutrient input in the Black Sea;
- the actions which already have been taken to implement the Preliminary Action Plan for the conservation of coastal wetlands of the Black and Azov Seas, as published in the 1994 IWRB report 'Conservation of Black Sea Wetlands: a review and preliminary action plan', and
- the importance of the coastal wetlands of the Black and Azov Seas for large populations of migrating waterbirds in relation to the African Eurasian Waterbird Agreement (AEWA),

unanimously concluded:
- that activities on the conservation and sustainable use of the coastal wetlands of the Black and Azov Seas should be promoted and expanded in a co-ordinated and programmatic approach;
- that inter-regional co-operation on wetland conservation, restoration and wise use should be enhanced in the Black and Azov Seas region;
- that these activities and this co-operation should take place in relation with ongoing projects and programmes and within the framework of the Ramsar Convention, the Bucharest Convention, the African Eurasian Waterbird Agreement (AEWA) and other international agreements and conventions;
- that establishment of a wetlands conservation initiative for the Black and Azov Seas is urgently needed;
- that the governments of the countries bordering the Black and Azov Seas as well as all other stakeholders should have an active role in this new regional wetland conservation initiative;

and recommended that:
- Wetlands International should take the lead in initiating this Initiative.

Furthermore, the participants of the workshop invite the international community, in particular the Global Environmental Facility and its Implementing Agencies (World Bank, UNDP and UNEP), the European Union, the Ramsar Convention, the MedWet Initiative, the governments of the Black and Azov Seas countries and the Council of Europe to:
- support the creation of the ‘Black and Azov Seas Wetlands Initiative’, comparable to the MedWet Initiative;
- support new and ongoing projects and programmes in the Black and Azov Seas region in the field of conservation, restoration and sustainable use of coastal wetlands, especially the establishment and implementation of National Wetland Strategies and Action Plans;
- support transboundary co-operation and the exchange of information and expertise throughout the region to enhance the capacity for wetland conservation.

Odessa, Ukraine
27 September 2000

BULGARIA

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INTRODUCTION

There are over 27,000 ha of natural lakes and marshes, artificial wetlands, fishponds, salt pans, pits, etc. along the Bulgarian coast of the Black Sea. Their great significance for biodiversity conservation began to be recognised in the 1970s, when parts of Lakes Atanasovsko and Vaya were designated as protected sites and Arkutino Marsh was designated as a Ramsar site.

Important progress was made in the 1980s with the designation of almost all the wetlands as protected areas. During that time Lakes Atanasovsko and Durankulak were added to the list of Bulgarian Ramsar sites; subsequently Lake Shabla was also included. At present, only some of the bigger lakes, such as Lakes Pomorie, Vaya and Mandra, remain partly unprotected.

All these conservation measures form part of the ecological strategy of the Ministry of Environment and Waters (MoEW), which, according to national nature conservation legislation, is responsible for the management of protected areas.

The MoEW's nature conservation policy and strategy are presented in detail in the three-volume publication, National Biodiversity Strategy in Bulgaria. In 1993, the same ministry compiled a national plan for the conservation of the most important wetlands in Bulgaria. In 1999, a national plan for the protection of biodiversity was compiled, in which the Black Sea wetlands occupy an important position.

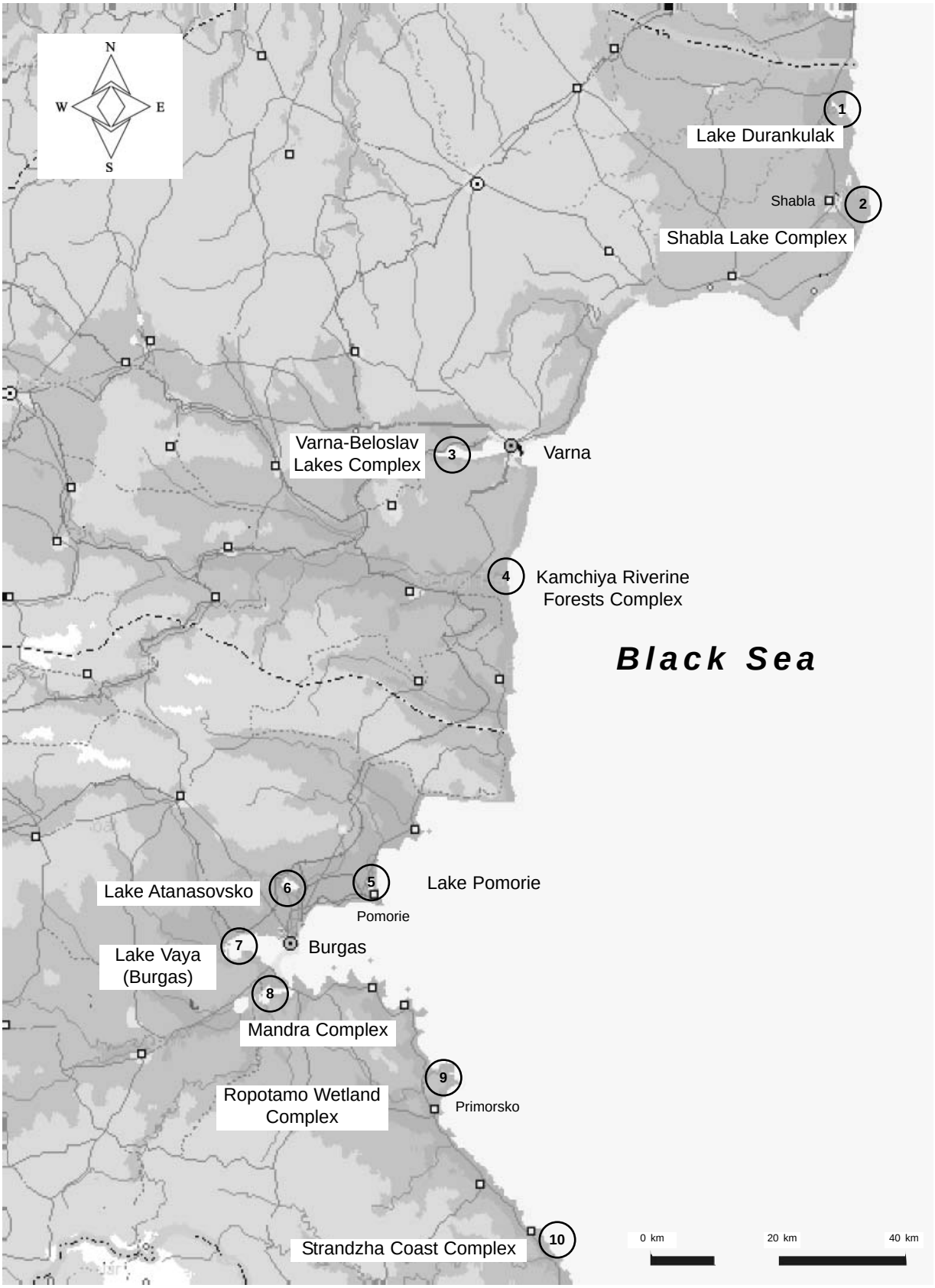
The elaboration and approval in 1998 of the new Protected Areas Act marked a new milestone in nature conservation in Bulgaria. In 1999, the MoEW published the regulations for preparation of management plans for protected areas.

The National Biodiversity Conservation Strategy (approved recently by the government) identifies the Bulgarian Black Sea coast as one of the areas of highest conservation value in the country.

Since 1996, thanks to the support of the Bulgarian-Swiss Biodiversity Conservation Programme (BSBCP), large-scale studies of the Bulgarian Black Sea coastal wetlands have been carried out. Eight of the ten coastal wetlands included in Wilson & Moser (1994) have been well studied. For six of these wetlands (Lake Durankulak, Lake Shabla, Kamchiya Reserve, Lake Atanasovsko, Poda Lagoon – part of Lake Mandra, and Ropotamo Reserve), management plans have been prepared and two of them (Durankulak and Poda) were already approved by the MoEW. The scientific information included in the present report has been collected with the financial support of BSBCP.

For the Strandzha Coast (the mouths of the Rivers Veleka and Silistar), a management plan has been adopted through the Monaco Project.

The MoEW has created a National Ramsar Committee. In terms of wetland protection, Bulgaria is moving in a positive direction, yet many of the protected areas are managed by agencies that do not have an environment protection mandate (e.g. Forestry Committee and Ministry of Health). The MoEW plans to establish a single independent agency for internationally important protected areas. Control and administration of the regional inspectorate capacity of the MoEW needs to be increased. The Bulgarian Society for the Protection of Birds (BSPB) has been given the responsibility for managing two wetlands (Poda and Yatata).



Map 1. The Black Sea coastal wetlands of Bulgaria (numbers correspond with the numbers in the text and table 1)

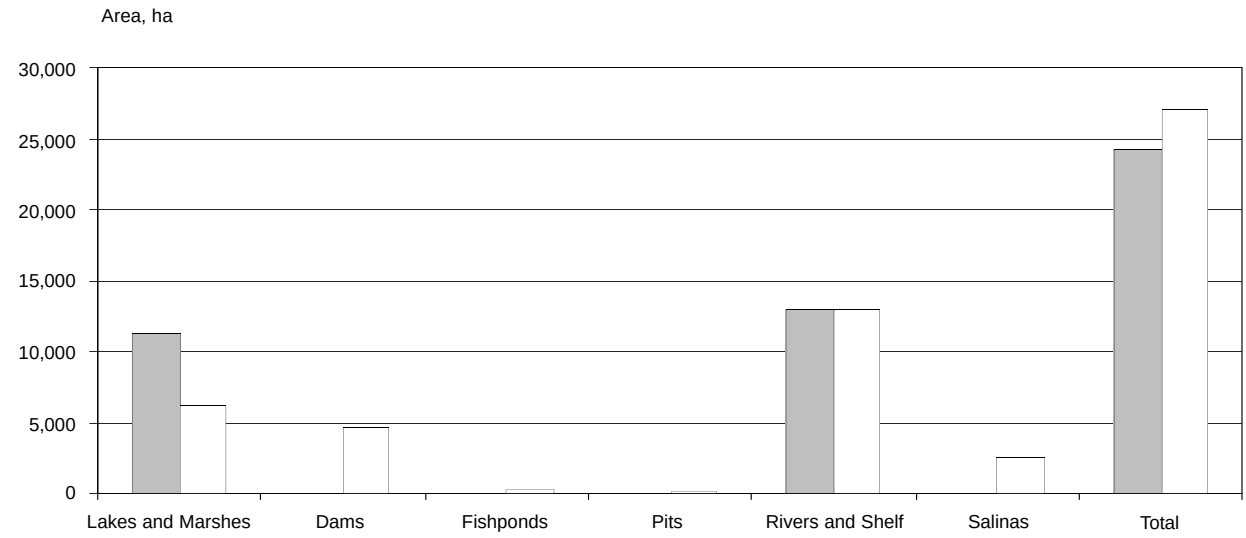


Figure 1. Long-term Changes in the Bulgarian Black Sea Wetlands in the 20th century (striped columns – Bonchev, 1929; white columns – present Directory)

Bulgaria has signed the Ramsar, Bern, Biological Diversity, World Heritage, CITES and Bucharest Conventions and the Odessa Declaration; the Bonn Convention and AEWA agreement have also been signed, and were ratified on 03.08.1999 (State Gazette, number 69/1999) in force 03.11.1999. The country has a new Protected Areas Act since 1998, which defines protected areas, their categories and regime. An Act on Biodiversity Conservation was approved by the Parliament and published in the State Gazette 77/2002. The 1982 Game and Hunting Law addressed hunting regulations and the 1991 Law for the Environment addressed environmental impact assessment. The main threats – including pollution, dam construction, eutrophication and urbanisation – need to be addressed, as does the need for normalisation of the water regimes for the wetland sites that have been altered by dams in their catchments, in particular the flooded forests of Kamchiya and Ropotamo.

General Comments

There are 26 firths (limans) and five lagoons along the coast of the Black Sea. The total area of natural water bodies that they encompass has decreased from 11,280 ha at the beginning of the 20th century to 6,282 ha at the end of the century, a loss of 5,000 ha. The marshes at Staro Oryakhovo and Tunkovo villages, which totalled 1,720 ha, have been drained and thus lost as wetlands. Lake Mandra (1,611 ha) has been turned into a reservoir with an area of 3,884 ha. Lakes Pomorie and Atanasovsko have been transformed into salinas with an enlarged area of 2,540 ha. New artificial wetlands have appeared, such as reservoirs (Yasna Polyana, Akheloy, Orizare), fishponds (Vaya, Cherni Vrukh) and pits (Sunny Beach, around Lakes Mandra and Atanasovsko).

Due to these significant changes, the total area of all types of wetlands (natural and artificial) along the Black Sea coast has increased from 24,269 ha (including the shelf strip, 378 km long and 200 m wide, with a total area of 7,560 ha) to about 27,000 ha.

The long-term changes in Bulgarian Black Sea wetlands that occurred during the 20th century are shown in the Figure 1. The graph shows that today the wetland type with the largest area is 'River Mouths & Shelf', of which the shelf comprises 7,560 ha. Unfortunately this area has not yet been surveyed very comprehensively and further research is needed.

The main features of Black Sea sites are showed in the table 1, following the coast from north to south.

Occurrence of threatened taxa at sites included in the inventory

All taxa listed in Table 2 are included in either in the Red Data Book (RDB) of Bulgaria or in the 2000 IUCN Red List of Threatened Species, 2000. This list may not be comprehensive for individual sites as it is dependent upon the availability of data.

Table 1. Overview of the coastal wetlands of Bulgaria

No	Site	Region	Area (ha)	Protected area (ha)	IBA (ha)	Corine site (ha)
1	Lake Durankulak (Ramsar site)	Dobrich	446	350	2,043	800
2	Shabla Lake Complex (Ramsar site)	Dobrich	755	510	3,100	1,430
3	Varna - Beloslav Lakes Complex	Varna	3,000	279	2,454	2,800
4	Kamchiya Riverine Forests Complex	Varna	3,000	1,215	3,000	1,363
5	Lake Pomorie (Ramsar site, 814 ha)	Burgas	850	760	850	650
6	Lake Atanasovsko (Ramsar site, 1,404 ha)	Burgas	1,690	1,690	1,950	1,700
7	Lake Vaya (Ramsar site)	Burgas	2,800	379	2,800	2,800
8	Mandra Complex (with Poda as Ramsar site, 307 ha)	Burgas	3,884	412	2,270	3,300
9	Ropotamo Wetland Complex (Ramsar site): – Alepu Marsh – Arkutino Marsh – Ropotamo River Mouth – Stomoplo Marsh – Dyavolsko Marsh – Velyov Vir Reserve – Ropotamo Rese rve	Burgas	5,500	1,221 166.7 97 67 40 13.6 1,000.7	4,800	5,685
10	Strandzha Coast Complex	Burgas	2,284	2,284	2,284	2,284
	Total		**24,209**	**9,100 (37,6%)**	**25,551**	**22,812**

Table 2. Occurrence of threatened taxa at sites included in the inventory

Scientific name	IUCN Red List	RDB of Bulgaria	Site									
			1	2	3	4	5	6	7	8	9	10
Mammals												
Barbastella barbastellus	VU A2c					√						
Cricetulus migratorius	LR/nt	*									√	
Dryomys nitedula	LR/nt			√		√					√	√
Glis glis	LR/nt			√		√					√	√
Lutra lutra	VU A2cde	* *	√	√		√		√	√	√	√	√
Mesocricetus newtoni	VU D2	*	√	√							√	
Micromys minutus	LR/nt		√	√		√			√		√	√
Microtus quentheri	LR/nt											
Miniopterus schreibersi	LR/nt											
Monachus monachus	CR C2a	* * *	√									
Mus spicilegus	LR/nt		√	√								
Muscardinus avellanarius	LR/nt					√						√
Myomimus roachi	VU D2	*									√	
Myotis bechsteini	VU A2c					√						√
Myotis capaccinii	VU A2c	*			√						√	
Myotis emarginatus	VU A2c	*									√	
Myotis myotis	LR/nt										√	
Nannospalax leucodon	VU D2		√	√							√	
Nyctalus lasiopterus	LR/nt											√
Nyctalus leisleri	LR/nt											√
Phocoena phocoena (Black Sea stock)	VU A1c, C1+2b	* *				√					√	

Continuation of Table 2

Scientific name	IUCN Red List	RDB of Bulgaria	Site									
			1	2	3	4	5	6	7	8	9	10
Rhinolophus blasii	LR/nt										√	
Rhinolophus euryale	VU A2c										√	
Rhinolophus ferrum -equinum	LR/nt				√						√	
Rhinolophus hipposideros	VU A2c					√						
Sciurus vulgaris	LR/nt			√							√	
Sicista subtilis	LR/nt	*	√	√								
Spermophilus citellus	VU A1c		√	√				√			√	√
Tursiops truncatus	DD	*				√					√	
Vormela peregusna ssp. *peregusna*	VU A1cd	**	√	√								
Birds		**										
Acrocephalus paludicola	VU A1c+2c							√				√
Anser erythropus	VU A1acd+2bcd	**	√	√				√				
Aquila clanga	VU C1	*	√	√				√			√	
Aquila heliaca	VU C1	**						√				√
Aythya nyroca	LR/nt	**	√	√	√	√	√	√	√	√	√	√
Branta ruficollis	VU B1+2c	**	√	√		√		√	√	√		
Circus macrourus	LR/nt	*	√	√			√	√				
Crex crex	VU A2c	**	√	√		√		√	√	√	√	√
Falco naumanni	VUA1bce +2bce	**						√				
Gallinago media	LR/nt	*						√				
Haliaeetus albicilla	LR/nt	**	√	√				√	√	√	√	√
Numenius tenuirostris	CR C2b, D							√		√		
Otis tarda	VU A2c	**	√									
Oxyura leucocephala	EN A1acde	*	√		√		√	√	√	√		
Pelecanus crispus	LR/cd	**	√	√	√	√	√	√	√	√	√	
Phalacrocorax pygmaeus	LR/nt	**	√	√	√	√	√	√	√	√	√	√
Reptiles												
Elaphe situla	DD	**									√	
Emys orbicularis	LR/nt		√	√	√	√	√	√	√	√	√	√
Testudo graeca	VU A1cd		√	√	√	√	√	√	√	√	√	√
Testudo hermanni	LR/nt					√	√	√	√	√	√	√
Amphibians												
Bombina bombina	LR/cd		√					√	√	√	√	
Hyla arborea	LR/nt		√	√	√	√	√	√	√	√	√	√
Triturus cristatus	LR/cd				√	√		√			√	
Fish												
Alosa pontica	DD				√						√	
Aspius aspius	DD					√						
Atherina boyeri	DD	**				√	√	√	√	√	√	√
Benthophiloides brauneri	DD	**		√								
Carassius carassius (European sub-population)	LR/nt					√		?				
Chalcalburnus chalcoides	DD	**				√				√	√	√

Continuation of Table 2

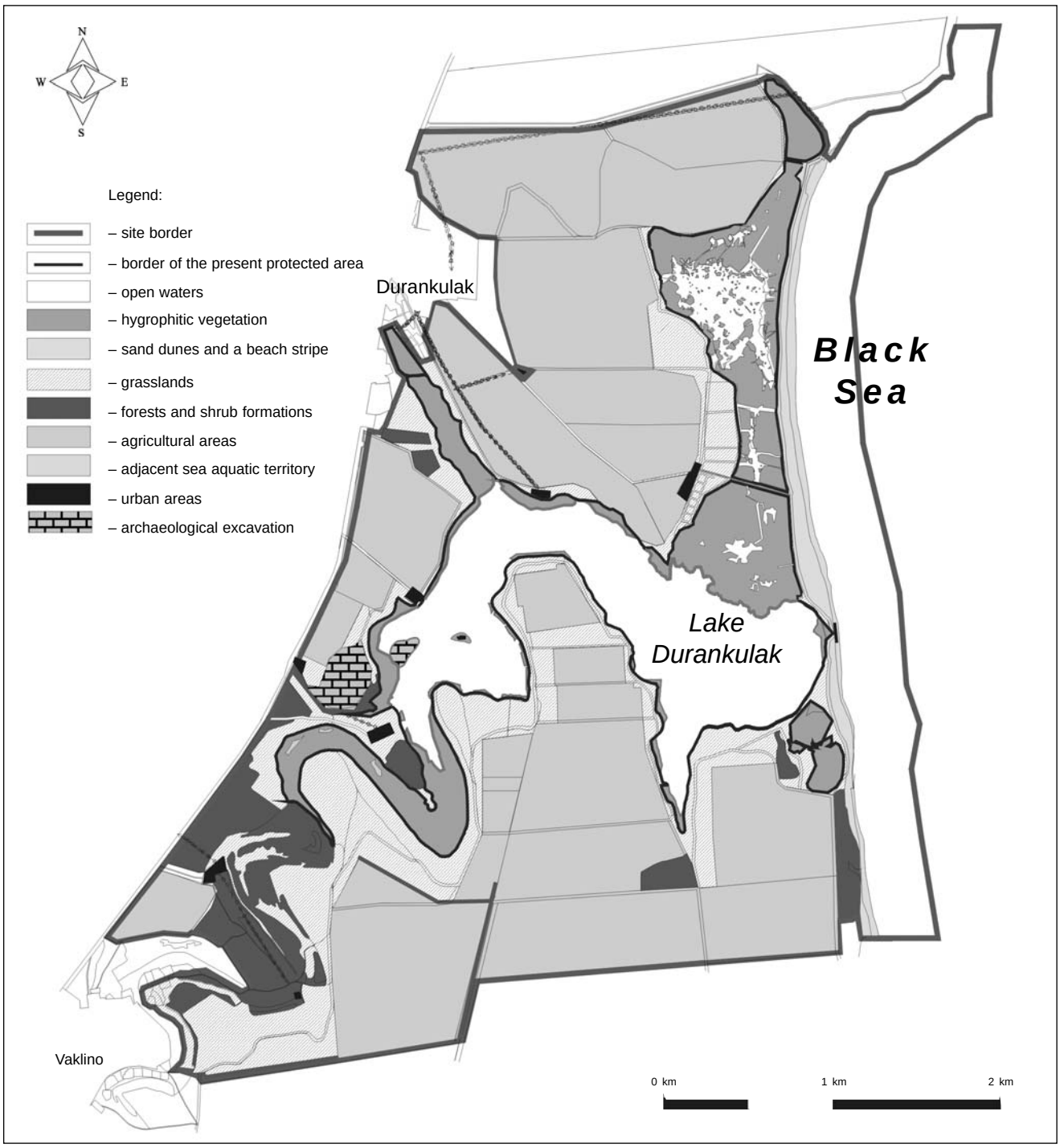
Scientific name	IUCN Red List	RDB of Bulgaria	Site									
			1	2	3	4	5	6	7	8	9	10
Clupeonella cultriventris	DD	* *		√								
Cobitis strumicae	DD					√		√				
Cyprinus carpio	DD	* *									√	√
Hippocampus ramulosus	DD									√		
Leuciscus borysthenicus	DD					√					√	√
Mesogobius batrachocephalus	DD										√	
Misgurnus fossilis	LR/nt			√								
Neogobius fluviatilis	DD					√			√	√	√	√
Neogobius gymnotrachelus	DD			√		√				√	√	√
Neogobius melanostomus	DD			√	√	√				√	√	√
Rutilus frisii	DD											√
Sabanejewia aurata	DD					√						
Syngnathus abaster	DD		√	√	√	√		√	√	√	√	√
Zosterisessor ophiocephalus	DD				√					√	√	√
Invertebrates												
Astacus astacus	VU B2bce +3bcd										√	√
Carabus intricatus	LR/nt		√	√	√	√	√	√	√	√	√	√
Coenagrion mercuriale	VU A2c					√						√
Eriogaster catax	DD											
Formica pratensis var. *nigricans*	LR/nt			√							√	
Hirudo medicinalis	LR/nt		√	√		√			√	√	√	√
Lycaena ottomanus	VU A1ac								√	√		√
Maculinea arion	LR/nt								√		√	√
Niphargus valachicus/bulgaricus	VU B1+2bcde										√	
Platyla orthostoma	DD										√	√
Proserpinus proserpina	DD								√			
Pseudanodonta complanata	LR/nt		√	√								√
Rosalia alpina	VU A1ac										√	√
Saga pedo	VU B1+2bd											
Troglocaris anophthalmus	VU B1+2cde											
Unio crassus	LR/nt											√
Viviparus acerosus	LR/nt											
Plants												
Leucojum aestivum						√					√	
Orchis elegans								√		√		
Salvinia natans						√					√	
Trachomitum venetum		* *					√			√		
Trapa natans s.l.		*								√	√	
Typha shuttleworthii		*	√	√								

*Note: The species included in the RDB of Bulgaria are indicated as: * – rare, ** – endangered, *** – extinct.*

SITE ACCOUNTS

1. Lake Durankulak

Location: 43°30'N, 28°33'E, UTM grid PJ 23. The site is situated in the northeasternmost part of Bulgaria, 6 km south of the Bulgarian-Romanian border and 15 km north of the town of Shabla, Varna District.
Area: 446 ha (total area of natural complex 2,043 ha).
Altitude: 0.09 (0.6) – 15 m above sea level.
Wetland type: A, E, J, O.
Other hydrologically linked wetlands: The Black Sea.
Description of site: This is a freshwater-brackishwater lake situated in a former river valley, which is why the lake has a specific 'S' shape. It is separated into two parts – the main area in the south and a smaller area in the north called Eagle Marsh. The openwater surface covers 253 ha, and 193 ha are covered by emergent aquatic vegetation. The southern part has a maximum water depth of 4 m and Eagle Marsh has a maximum depth of 1.5 m. Two small islands are located in the southern part. Between the lake and the sea lies a 5-km long strip of sand dunes and beach. The intrusion of marine waters into the lake has been recorded. According to it organic profile, the lake is defined as a eutrophic-hypertrophic wetland, and algal blooms are a common phenomenon. The site is surrounded by arable land and natural grasslands (steppes).
Principal vegetation: There are some 193 ha of reed-beds, where the following plant species are found: *Phragmites australis, Typha angustifolia, T. latifolia, Bolboschoenus maritimus, Juncus gerardii, J. maritimus, Schoenoplectus lacustris, Butomus umbellatus,* etc. A separate community of *Schoenoplectus triqueter* is present in Eagle Marsh. In shallow parts, there is a rich diversity of submerged vegetation: *Potamogeton natans, P. pectinatus, P. crispus, Ceratophyllum demersum, Myriophyllum spicatum, Utricularia vulgaris, Ranunculus aquatilis, Lemna minor* and *L. trisulca*. Sand dunes and beaches are covered by specific vegetation: *Eryngium maritimum, Salsola soda, Euphorbia seguieriana, Bromus sterilis, Leymus arenarius, Ammophila arenaria, Festuca vaginata, Plantago arenaria, Vulpia myuros, Holoschoenus vulgaris, J. gerardii,* etc.
Conservation measures taken: In 1980, a part of the wetland covering 350 ha was designated as a protected area – Durankulak Nature Monument. The lake has been a Ramsar site since 1984. The entire area of the 2,043-ha nature complex fulfils BirdLife International criteria and is designated as an Important Bird Area since 1997. A CORINE Site No 88 in the Bulgarian CORINE list. A Management Plan for Lake Durankulak has been elaborated within the framework of the BSBCP and approved by MoEW.
Conservation measures proposed: Expansion of the area under protection to cover all the 2,043 ha; the category of protection should be changed to 'Managed Reserve' and the site should be part of the proposed Dobrudzha Coastal Nature Park. The Management Plan for Lake Durankulak proposes a wide range of conservation measures focused on habitats and species.
Land use: Within the wetland: small-scale water abstraction, commercial fishing and collecting of crayfish, angling, cattle grazing, small-scale reed cutting. Within the watershed close to the wetland: large-scale water abstraction, intensive agriculture, livestock breeding, intensive hunting, small-scale forestry and recreational activities (camping areas).
Possible changes in land use: Expansion of human presence within and close to the lake, mainly tourists, hunters and anglers; improvement and expansion of infrastructure to cater for their recreational needs.
Disturbances and threats: Damage to the aquatic balance of the wetland due to the over-abstraction of water, and separation of Eagle Marsh from the main body of the lake by a dyke. High concentration of organic substances (nitrogen and phosphorus) in the wetland due to intensive agricultural activities; incorrect storage of fertilisers within the watershed of the lake; intensive livestock breeding in the watershed; absence of sewerage systems in the settlements within the watershed, etc. Unregulated fishing, angling, grazing, illegal hunting and sand extraction and other violations of conservation laws. Free movement of tourists along the coast.
Economic and social values: Local supply of water for communal needs and irrigation by groundwater from the watershed. Limited local value for fish and crayfish food supply, cattle grazing. Potential for large-scale commercial harvest of reed. Recreational activities such as angling, birdwatching tourism, marine tourism in summer. On the large island in the lake, ancient settlements have been discovered that were inhabited between the 4th millennium BC and 10th millennium AD by various tribes. This archaeological site is of outstanding importance at a European level.
Fauna: Mammals: 41 species of large and small mammals: *Talpa europaea, Sorex minutus, Crocidura leucodon, Cr. suaveolens, Mus spicilegus, Apodemus* sp.*, Micromys minutus, Arvicola terrestris, Lepus europaeus, Mesocricetus newtoni, Spermophilus citellus, Lutra lutra, Canis aureus, Mustela nivalis, Martes foina, Vormela peregusna, Sus scrofa, Capreolus capreolus, Cervus elaphus,* etc. Birds: Lake Durankulak is an important site for breeding, migrating and wintering birds species amongst which are several globally endangered species:



Map 2. The main biotopes of Lake Durankulak

Oxyura leucocephala, Branta ruficollis and *Anser erythropus.* The wetland regularly supports 20,000-100,000 waterbirds. To date, 254 bird species have been recorded in the lake area. Reptiles: 8 species: *Emys orbicularis, Testudo graeca, Podarcis taurica, Lacerta viridis, Natrix natrix, N. tessellata, Vipera ammodytes* and *Coluber caspius.* Amphibians: 7 species: *Bombina bombina, Rana ridibunda, R. dalmatina, Hyla arborea, Bufo viridis, Pelobates syriacus balcanicus, P. fuscus.* Fish: 17 resident species, including *Cyprinus carpio, Silurus glanis, Pungitius platigaster, Gasterosteus aculeatus, Neogobius platyrostris, Knipowitschia caucasica, Proterorhinus marmoratus, Syngnathus abaster, Ctenopharyngodon idella, Hypophthalmichthys molitrix, Gambusia holbrooki, Rutilus rutilus, Scardinius erythrophthalmus, Perca fluviatilis* and *Sander lucioperca.* Invertebrates: *Astacus leptodactylus, Chaetogammarus ishnus major, Pontogammarus rubostoides, Dikerogammarus villo-*

sus, etc.

Special floristic values: The community of *Schoenoplectus triqueter* is the largest in Bulgaria. Amongst aquatic emergent vegetation, key species are *Triglochin maritima* and *Juncus ranarius;* and amongst submerged vegetation *Utricularia vulgaris.* Some key 15 species have been recorded on the sand dunes, the most valuable of which are *Centaurea arenaria, Festuca vaginata, Linum tauricum* ssp. *bulgaricum, Trifolium alexandrinum, Verbascum purpureum, Argusia sibirica* and *Bassia hirsuta.* Some of these are Balkan endemic species.

Research facilities: Only a minor scientific research has been carried out in the area of the lake in the past few decades. Once a year since 1977, a waterbird census has been carried out as a part of Wetlands International's Western Palearctic Project (Michev & Profirov 2003). A monthly census of waterbirds was carried out between the winters of 1991–1992 and 1993–1994 by the Institute of Zoology of the Bulgarian Academy of Sciences (BAS). In 1992–1994, the consultants Geovodingenering Ltd. carried out an investigation of the hydrological conditions in Lake Durankulak, commissioned by the MoEW. Water-level and temperature were recorded by BAS between the 1950s and 1997. Since 1995, research has been carried out into the biotic and abiotic components of the lake within the framework of the BSBCP. The Bulgarian Society for the Protection of Birds is undertaking ornithological monitoring and detailed research on wintering geese.

Table 3. Waterbird populations at Lake Durankulak

Species	Breeding pairs (max)	Non-breeding individuals (max)
Acrocephalus agricola	14	
Anas platyrhynchos	10	42,418
Anser albifrons		97,875
Anser anser	2	1,000
Anser erythropus		1
Aythya nyroca	20	100
Botaurus stellaris	1-2	8-10
Branta ruficollis		39,233
Burhinus oedicnemus	6	
Charadrius alexandrinus	17	9
Circus aeruginosus	4	40
Circus cyaneus		50
Cygnus cygnus		74
Cygnus olor	2	460
Fulica atra	30	13,225
Glareola pratincola	14	10
Ixobrychus minutus	17	
Larus canus		4,350
Larus melanocephal us		3,200
Oxyura leucocephala		214
Pelecanus onocrotalus		1,200
Phalacrocorax pygmaeus		950
Plegadis falcinellus		123
Sterna albifrons	20	

Public awareness and education: A new Information and Nature Conservation Centre was built by the Foundation "Le Balkan-Bulgaria" at the western bank of the lake.

Criteria for inclusion: 1, 2, 3, 4, 5, 6 and 7.

2. Shabla Lake Complex

Location: 43°30'N, 28°35'E, UTM grid PJ 22. Dobrich District, Shabla Municipality, 3.5-5 km northeast of Shabla.

Area: 755 ha.

Altitude: 0.0-10.0 m above sea level.

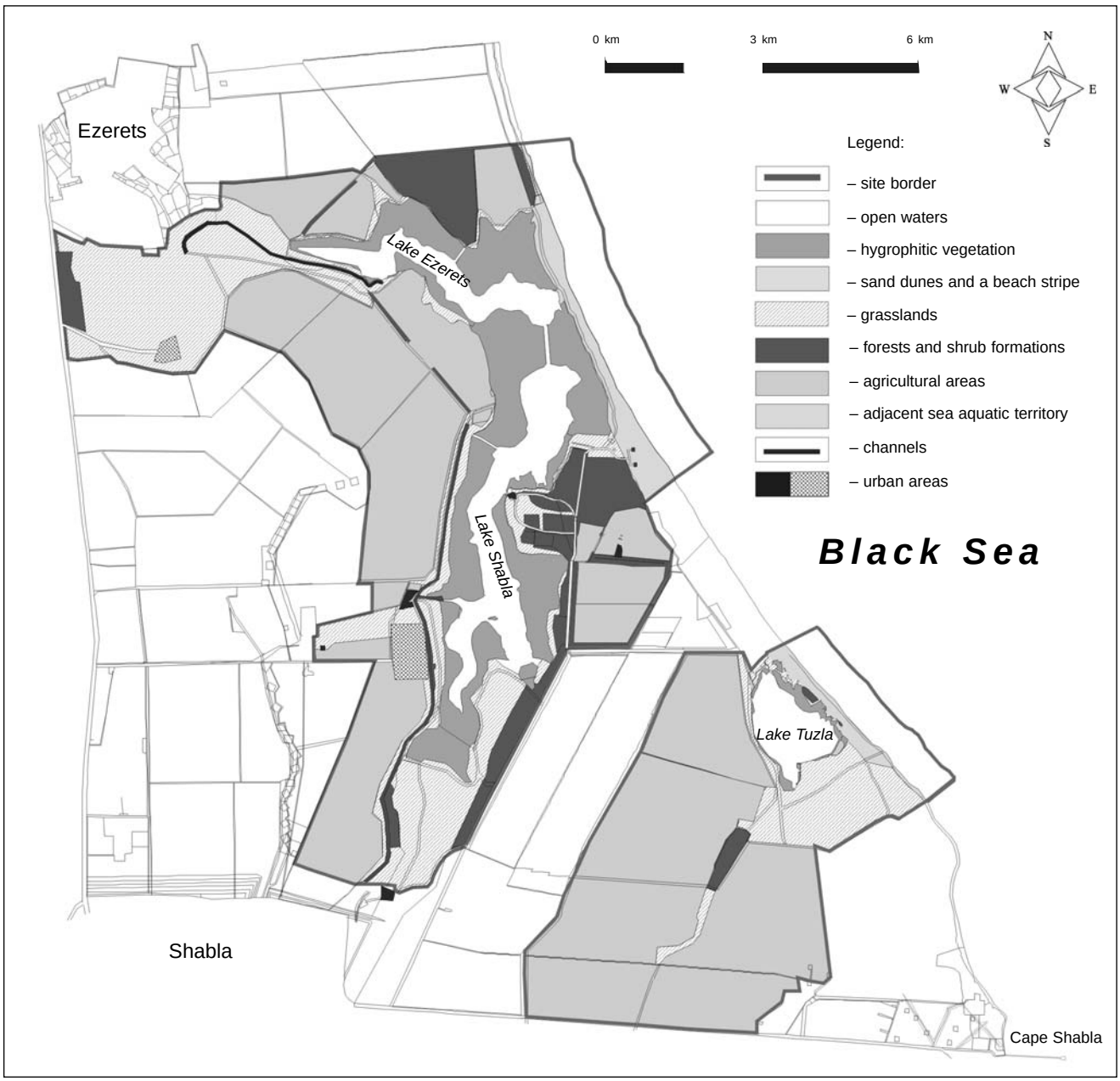
Wetland type: A, E, J, O, Q.

Other hydrologically linked wetlands: The Black Sea.

Description of site: The lake complex covers: the coastal limans, Shabla and Ezerets (255 ha, incl. fringing vegetation), which are connected by a canal, and the coastal saline lake, Shabla Tuzla (30 ha, including fringing vegetation); sand dunes, separating the lakes from the sea; marine areas; grass communities; arable lands; forest plantations.

Water quality: The waters of Lakes Shabla and Ezerets are fresh, hydrocarbonatic-chloride (chloride salinity 0.47‰), with a high concentration of total dissolved solids (0.724-0.915 g/l). The waters are strongly buffered at average pH 8.6. Both lakes are eutrophic-hypertrophic, according to the quantities of biogens and organic matter in the waters, resulting in dramatic fluctuations in phytoplankton productivity. Lake Shabla Tuzla is a saline-hypersaline shallow lake (S_{Cl} = 12-100‰).

Principal vegetation: Fringing vegetation: *Phragmites australis* is mono-dominant, plus mixed communities of *Typha angustifolia, T. latifolia, T. laxmannii, Carex riparia* and *Bolboschoenus maritimus.* Sand dunes: main associations: *Eryngium maritimum* + *Salsola soda, Ammophila arenaria* + *Leymus arenarius, Centaurea*



Map 3. The main biotopes of the Shabla Lake Complex

arenaria + Silene thymifolia. Grasslands: *Agropyron elongatum + Hordeum murinum.*

Conservation measures taken: Designated as a Ramsar site (comprising 400 ha of the total area of the Shabla complex), Protected Site (510 ha) according to national legislation, and Important Bird Area (3,100 ha, including adjacent areas). A CORINE Site No 87 in the Bulgarian CORINE list. A management plan was prepared by the BSBCP in 1998. Regular monitoring of water level, water quality, phytoplankton, zooplankton, zoobenthos communities and breeding and wintering birds. Water regimes improved.

Conservation measures proposed: Enlargement of the Protected Site and the area of the Ramsar site. The degradation processes in the lakes' ecosystems should be reduced. Habitat management; regulation of hunting and fishing activities; establishment of ecotourism and education facilities.

Land use: The main land uses within the site involve fishing, agriculture (including stock-breeding), recreation, water pumping for irrigation purposes. Hunting in the adjacent areas.

Possible changes in land use: None expected.

Disturbances and threats: Current pumping of open and underground waters for drinking water and irrigation.

Pollution of the lakes with biogens and organic matter by agricultural activities in surrounding areas and sewage-water. Poaching by hunters and fishermen. Unregulated grazing of domestic animals within the site.
Economic and social values: Important for scientific research, ecotourism, environmental education, recreation and fishing. On the lake's western bank there is a government residence with a special regime for visitors.
Fauna: Mammals: Represented by 32 species, including a very stable population of *Lutra lutra.* Birds: Birds are the most diverse component. About 250 bird species have been recorded in the area, 96 of which are breeding species. Nationally important breeding populations of *Circus aeruginosus, Charadrius alexandrinus, Acrocephalus agricola,* etc. The numbers of 8 species of birds that concentrate at the site during wintering and migration fulfil the criteria of the Ramsar Convention: *Phalacrocorax pygmaeus, Ciconia ciconia, Platalea leucorodia, Cygnus cygnus, Anser albifrons, A. anser, Branta ruficollis,* and *Anas platyrhynchos.* The wetlands regularly support more than 20,000 waterbirds. Wintering and migrating species included in the IUCN Red List as threatened with extinction: *B. ruficollis, A. erythropus, Oxyura leucocephala, Aquila clanga, Crex crex* and *Pelecanus crispus.* 42 of the bird species are included in the RDB of Bulgaria. Reptiles: 6 species including *Emys orbicularis, Natrix natrix* and *N. tessellata.* Amphibians: 5 species including *Rana ridibunda, Bufo viridis* and *Pelobates syriacus* (included in the RDB of Bulgaria). Fish: 29 species mainly from the Cyprinidae and Gobiidae families. 6 species of fish are included in the RDB of Bulgaria. The site is the only habitat in Bulgaria of *Clupeonella cultriventris, Benthophiloides brauneri* and *Knipowitschia longicaudata.* Invertebrates: There is a stable population of *Astacus leptodactylus* in the lake.
Special floristic values: Two Bulgarian endemics: *Seseli rhodopeanum,* included also in the European Red List, and *Linum tauricum* ssp*. bulgaricum.* Three Balkan endemics: *Bupleurum apiculatum, Hypecoum ponticum* and *Silene thymifolia.* Nationally threatened species: *Cladium mariscus, Euphorbia lucida* and *Goniolimon besserianum.*
Research facilities: A number of studies have been carried out on most of the biotic and abiotic components of the site by the BSBCP (within the framework of preparing the management plan for the wetland). The Bulgarian Society for the Protection of Birds conducts the bird monitoring studies and detailed surveys of the ecology of the wintering goose populations.
Public awareness and education: Conservation education is carried out with the local schools. Information about the site is provided through information panels and distributing printed materials (posters, leaflets, newsletters, etc.).
Criteria for inclusion: 1, 2, 5, 6 and 8.

Table 4. Waterbird populations at the Shabla Lake Complex

Species	Breeding pairs	Non-breeding individuals
Anas platyrhynchos	5-10	62,210
Anser albifrons		193,873
Anser anser		880
Anser erythropus		2
Aythya ferina	1-3	3,500
Aythya nyroca	1-3	90
Branta ruficollis		55,845
Charadrius alexandrinus	10-15	6
Ciconia ciconia		6,500
Circus aeruginosus	2-4	40
Circus cyaneus		50
Cygnus cygnus		260
Fulica atra	20	9,210
Ixobrychus minutus	10-15	
Larus canus		3,040
Larus melanocephalus		4,200
Oxyura leucocephala		11
Phalacrocorax pygmaeus		400

3. Varna-Beloslav Lakes Complex

Location: 43°10'N-43°13'N, 27°39'E-27°54'E, UTM grid NH 68,78, 88. The complex is situated in Varna District and within three administrative regions: the municipalities of Varna, Beloslav and Devnya. Lake Varna is bordered on the northwest by the town of Varna. Lake Beloslav is situated west of the town of Beloslav, and the Yatata area lies east of Beloslav.
Area: 4,300 ha (3,000 ha wetlands).
Altitude: 0-78 m above sea level.
Wetland type: A, E, F, K, O, Tr, 8, 9.
Other hydrologically linked wetlands: The Black Sea, Rivers Provadiyska and Devnenska.
Description of site: The lakes complex consists of three major water bodies (Lakes Varna and Beloslav and Yatata artificial wetland) and several smaller freshwater and saline-water marshes and springs. At the beginning of the 20th century, Lakes Varna and Beloslav were freshwater wetlands situated in a former river valley. In the

east of Lake Varna there was a small outflow to the Black Sea through the River Varna. Between the lakes was an area of marshland, and a small river flowed from Beloslav to Lake Varna. The west of Lake Beloslav was fed with fresh water by the Rivers Provadiyska and Devnenska, and the wetland had a rich freshwater flora. Between 1909 and 1976, two canals were dug between Lake Varna and the Black Sea and one canal was dug between the lakes, which considerably altered the hydrology of the Varna-Beloslav Lakes Complex. The two lakes have been transformed into a marine ecosystem with water salinity of approximately 16‰, which is similar to that in Varna Bay. In summer, there is a total oxygen deficit in Lake Varna from a depth of 10 m to the lake-bed. In bottom-water layers, H_2S is present, formed by organic decomposition and bacterial sulphate reduction; this causes the death of organisms. In Lake Beloslav, a total oxygen deficit has not been recorded, but some influx of H_2S from Lake Varna has been identified. Very high concentrations of phosphorus and nitrogen are present in both lakes, decreasing gradually from the west of Lake Beloslav to the east of Lake Varna. The pollutants are discharged by the Devnya Chemical Complex, located near Lake Beloslav. Both wetlands are exposed to major industrial and urban pressure, causing severe organic and inorganic pollution. Algal blooms are regular phenomena. Lakes Varna and Beloslav may be defined as hypertrophic wetlands. The water surface of Lake Varna covers *c*. 1,740 ha, maximum depth 19 m, mean depth 9.5 m; while the surface area of Lake Beloslav is just *c*. 390 ha, maximum depth 3.5 m, mean depth 2.3 m. The Yatata artificial wetland has been in existence since the beginning of the 1970s, when the southwestern bay of Lake Varna was filled to above lake level with material dredged from the canal between Lakes Varna and Beloslav. The Waste Waters Treatment Station of the town of Beloslav began pouring out treated sewage water at the same place, and thus Yatata was created. It is a shallow, freshwater marsh with a water surface of *c*. 20 ha. It is a hypertrophic wetland with heavy algal blooms.

Principal vegetation: Two larger reed-beds (up to 100 and 250 ha) and several discrete smaller reed-beds in different parts of the wetland as well as several halophyte communities. The plant species present include *Phragmites australis, Typha latifolia, T. angustifolia, Salicornia europaea, Limonium gmelinii, Juncus maritimus, Schoenoplectus lacustris* and *Tamarix tetrandra.*

Conservation measures taken: The Yatata artificial wetland and surrounding areas (total area 154 ha) were designated in 1987 as a protected natural area – the Yatata Natural Monument. In the north of Lake Varna, the reed-bed and an aquatic area totalling 125.1 ha were designated in 1995 as the Kazashko Natural Protected Area. The lakes are designated as two separate IBAs. The Yatata Natural Monument is identified as an Important Bird Area according to the BirdLife International criteria. A CORINE Site No 83 in the Bulgarian CORINE list.

Conservation measures proposed: There is a proposal for declaring the wetland as a Ramsar site and candidate for the Montreux Record of the Ramsar Convention.

Land use: Mainly industrial: Harbours, navigation, shipyards, chemical industry, thermal power station, and outlet for purified wastewaters. Utilisation of living natural resources: fishing, livestock breeding, hunting, mussel collection. Recreation: yachting harbours, sailing. Urbanisation: the city of Varna and several smaller settlements are situated around the wetland.

Possible changes in land use: Expansion of industrial development leading to the loss of all natural habitats.

Disturbances and threats: Strong industrial and urban pressure leading to severe organic and inorganic pollution, habitat degradation, species extinction, etc. Non-regulated hunting, net fishing and angling.

Economic and social values: The wetland is of major importance for several branches of national industry. It has local value as a source of fish-food; potential for commercial harvest of reed; recreational activities such as sailing and angling, birdwatching tourism. It provides local hunters with suitable sites for waterfowl hunting, and would be a good site to develop environmental education. The area of both lakes has very high archaeological value, being populated since the 7th millennium BC. A necropolis containing many gold artefacts dating from the 4th millennium BC was discovered in the 1970s.

Fauna: Mammals: *Erinaceus europaeus, Talpa*

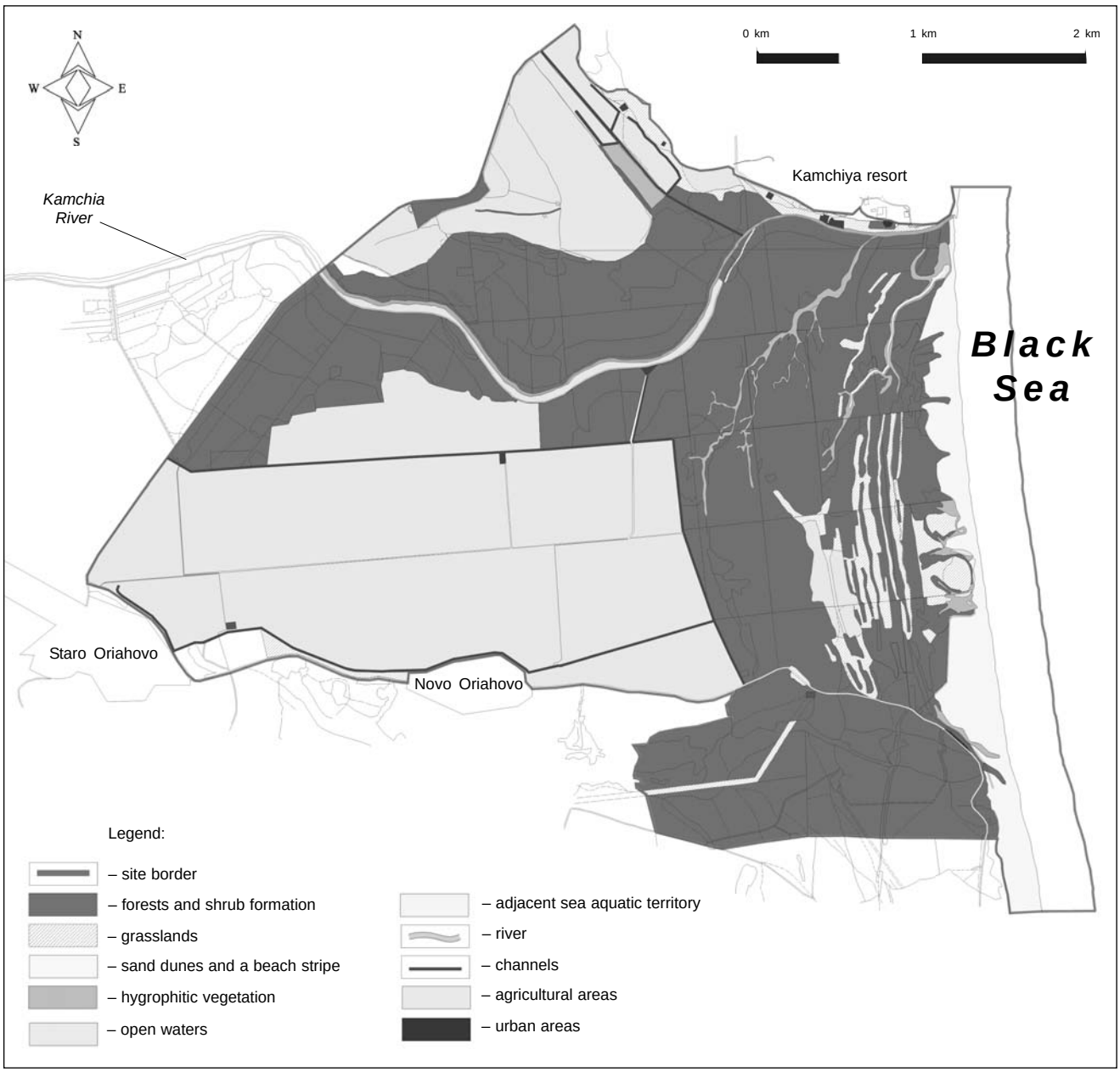
Table 5. Waterbird populations at the Varna-Beloslav Lakes Complex

Species	Breeding pairs (max)	Non-breeding individuals (max)
Aythya ferina		10,240
Aythya fuligula		2,796
Ciconia ciconia	4	50,000
Cygnus cygnus		168
Cygnus olor		500
Egretta alba		35
Fulica atra	?	13,820
Himantopus himantopus	79	300
Mergus albellu s		291
Oxyura leucocephala		3
Pelecanus onocrotalus		300
Phalacrocorax pygmaeus		1,200
Platalea leucorodia		90
Plegadis falcinellus		75
Podiceps cristatus	?	940
Recurvirostra avosetta	15	52

europaea, Neomis fodiens, Lepus europaeus, Spermophilus citellus, Myocastor coypus, Canis aureus, Vulpes vulpes, Mustela nivalis, Martes foina, Meles meles, Capreolus capreolus, Delphinus delphis, Phocoena phocoena, etc. Birds: The Varna-Beloslav Lakes Complex is important for *Himantopus himantopus* and *Recurvirostra avosetta* during the breeding season. During the migration and wintering seasons, it is an important site for many more bird species and regularly supports 20,000-30,000 waterbirds. A total of 205 bird species have been recorded in the area of the Complex. Reptiles: Include *Emys orbicularis, Testudo graeca, T. hermanni, Lacerta viridis, Natrix natrix, N. tessellata, Vipera ammodytes, Coluber caspius* and *Elaphe longissima.* Amphibians: *Rana ridibunda, Hyla arborea, Bufo viridis, Pelobates syriacus balcanicus,* etc. Fish: 16 resident and 19 non-resident species: *Platichtys flesus, Atherina boyeri, Engraulis encrasicholus ponticus, Neogobius melanostomus, Gobius niger,* other Gobiidae, some Syngnathidae, some Mugilidae, etc.
Special floristic values: Not known. A survey is necessary.
Research facilities: Several studies have been carried out by the Institute of Oceanology and the Institute of Fishery. Once a year since 1977 a waterbird census has been undertaken as part of Wetlands International's 'International Waterbird Census'; this is ongoing. A monthly census of waterbirds was carried out between the winters of 1991–1992 and 1993–1994 by the Institute of Zoology of the Bulgarian Academy of Sciences (BAS). Monitoring is carried out by the Regional Inspectorate of Environment and Waters and the Bulgarian Society for the Protection of Birds.
Criteria for inclusion: 5, 6 and 8.

4. Kamchiya Riverine Forests Complex

Location: 43°01'N, 27°51'E; UTM grid NH 76. Varna District, Dolni Tchiflik Municipality. 25 km south of Varna.
Area: 3,000 ha.
Altitude: 0.0–10.0 m above sea level.
Wetland type: A, E, Xf, 4.
Other hydrologically linked wetlands: River Kamchiya and Black Sea.
Description of site: The complex includes seasonally flooded riverine forests (1,200 ha) around the mouth of the River Kamchiya (flowing into the Black Sea); managed forests on non-flooded areas; marshes, including oxbow-type swamps; sand dunes; marine area; grass communities and shrubs; seasonally flooded arable lands (most established on a former marsh – about 500 ha); forest plantations.
Principal vegetation: Seasonally flooded riverine forests composed of *Fraxinus oxycarpa* (dominant tree species), *Quercus pedunciliflora, Ulmus glabra, Alnus glutinosa* in combination with 6 species of liana (*Clematis vitalba, Periploca graeca, Smilax excelsa, Vitis sylvestris,* etc.) and shrub layer. Marshlands: *Phragmites australis* mono-dominant and in mixed communities with *Typha angustifolia, T. latifolia, Sparganium erectum* and *Glyceria aquatica.* Sand dunes: main associations: *Eryngium maritimum + Salsola ruthenica, Ammophila arenaria + Leymus arenarius, Centaurea arenaria + Silene thymifolia.*
Conservation measures taken: The Kamchiya Strict Nature Reserve (842 ha, comprising only flooded forests) with a buffer zone (230 ha) and the Kamchiyski Piasutsi Protected Site (373 ha, covering a small part of the flooded forests and all the sand dunes and marshes) have been designated according to national legislation. It is an Important Bird Area (3,000 ha). A CORINE Site No 82 in the Bulgarian CORINE list. The water level, breeding and wintering birds and the *Stereonichus fraxini* population are monitored.
Conservation measures proposed: Enlargement of the protected areas. Proper removal of deep drills for oil and gas. Improvement to the water regime in the forest ecosystems. Habitat management should be aimed at removing the forest plantations and restoring flooded forests and sand dunes. Regulation of hunting and fishing activities. The main components – underground waters, forest vegetation, etc – should be monitored. Establishment of ecotourism and educational facilities. A Management Plan is in a process of developing by the BSBCP.
Land use: The main land uses (outside the reserve) involve sustainable forestry, fishing, agriculture (incl. stockbreeding), recreation; hunting in the non-protected areas.
Possible changes in land use: Not known.
Disturbances and threats: The building of hydro-technical infrastructure (reservoirs, water-supply systems) in the Kamchiya watershed and a drainage system in the vicinity of the reserve severely limits the flow of the natural aquatic resources necessary for the normal development of the forest ecosystems. Inadequately-capped deep drills for oil and gas in the region of the flooded forests cause the unobstructed flow of hyper-saline waters from the lower depths into the freshwater aquifer. Poaching by hunters and fishermen. Established pine plantations on a part of the sand dunes.
Economic and social values: The site is important for scientific research, ecotourism, environmental education, recreation and fishing. The site would be a very appropriate place to establish a biosphere reserve that



Map 4. The main biotopes of the Kamchiya Riverine Forests Complex

complied fully with the requirements of the UNESCO 'Man & Biosphere' Programme.

Fauna. Mammals: Represented by 26 species, including a stable population of *Lutra lutra. Canis aureus* is very typical. Birds: About 250 bird species recorded, including 90 nesting species. *Fringilla coelebs* and *Erithacus rubecula* predominate in the forest biotopes. The local breeding populations of *Dendrocopos medius* (60–70 pairs) and *Ficedula semitorquata* (230 pairs) are of European importance. Nationally important site for breeding of *Aquila pomarina, Ciconia nigra* and *Lanius collurio.* The temporarily flooded arable lands and the marine areas are impor-

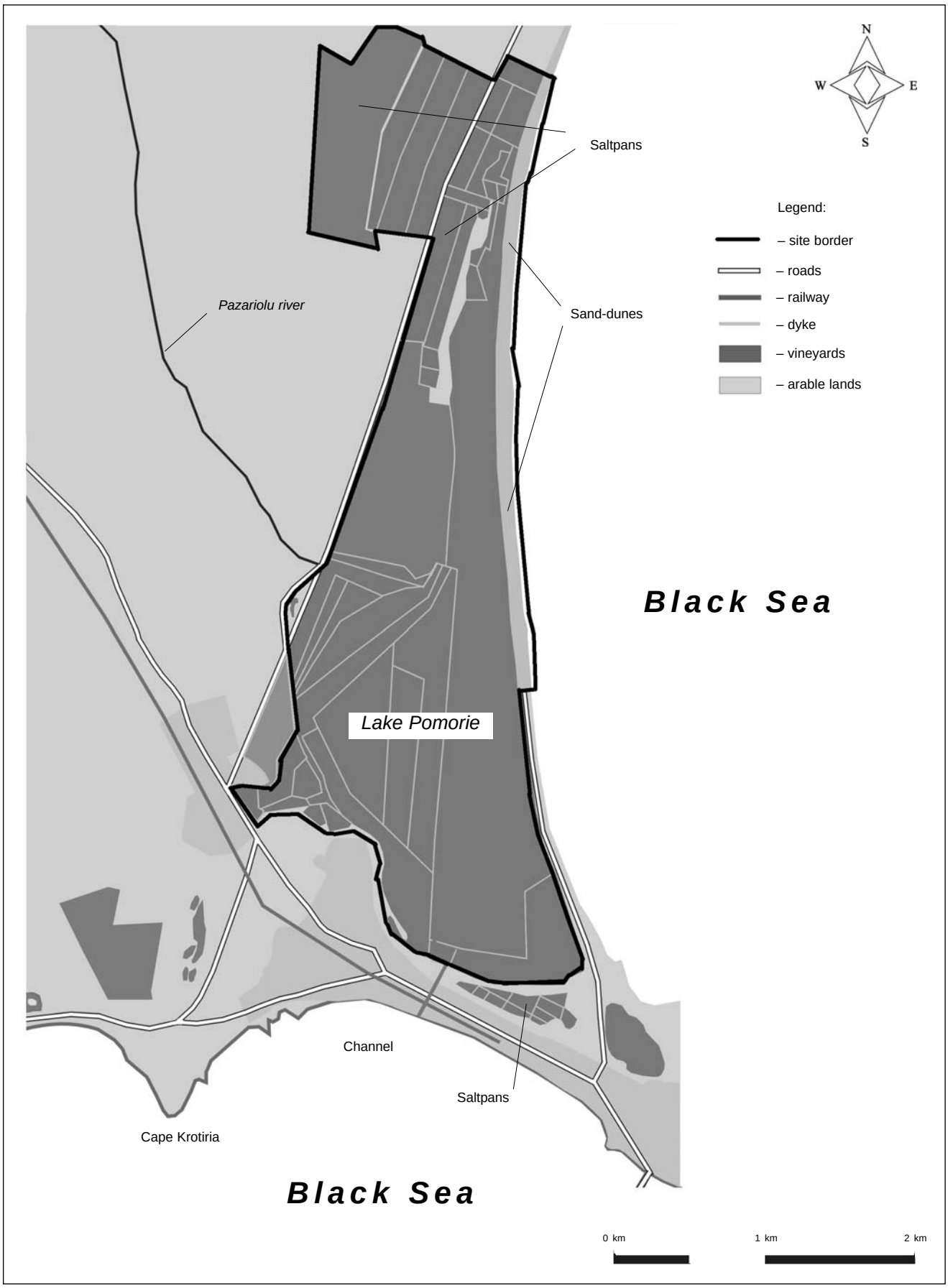
Table 6. Waterbird populations at the Kamchiya Riverine Forests Complex

Species	Breeding pairs	Non-breeding individuals
Aythya ferina		3,260
Botaurus stellaris		2-5
Branta ruficollis		15-20
Chlidonias leucopterus		420-460
Ciconia ciconia		60,000
Ciconia nigra	1-2	400-600
Cygnus cygnus		170
Himantopus himantopus		160-200
Phalacrocorax pygmaeus		50

tant for migrating birds and as wintering sites for *Cygnus cygnus* and the globally threatened *Branta ruficollis.* 58 of the bird species recorded are included in the RDB of Bulgaria. Reptiles: 13 species including *Emys orbicularis, Natrix natrix, N. tessellata* and *Elaphe longissima.* Amphibians: 8 species including *Rana ridibunda, R. dalmatina, Bombina bombina, Hyla arborea* and *Pelobates syriacus* (included in the RDB of Bulgaria), etc. Fish: 15 species in the marshes, mainly from the *Cyprinidae* family; 4 included in the RDB of Bulgaria. Invertebrates: *Stereonichus fraxini* is a key representative of the invertebrate fauna: it is related trophically to *Fraxinus oxycarpa.* It is an important indicator for the ecological conditions and the state of the riverine forests.
Special floristic values: Two Bulgarian endemics, *Cardamine tuberosa* and *Linum tauricum* ssp*. bulgaricum;* 4 Balkan endemics, *Astragalus haarbachii, Verbascum purpureum, Silene frivaldskiana* and *S. thymifolia;* and nationally threatened species, *Leucojum aestivum* and *Euphorbia lucida,* are recorded at the Complex.
Research facilities: A number of studies were carried out on most of the biotic and abiotic components of the site by the BSBCP during the preparation of a management plan for the wetland.
Public awareness and education: A little conservation education has been carried out, mainly with students from the Varna and Sofia Forestry University. Information about the site is provided only through distributing printed materials (leaflets, newsletters) issued by the BSBCP and Bulgarian-Swiss Forestry Program (BSFP).
Criteria for inclusion: 1, 2 and 3.

5. Lake Pomorie

Location: 42°35'N, 27°37'E; UTM grid NH 51. On the Black Sea coast, close to Burgas Bay and the town of Pomorie (19,000 inhabitants).
Area: 850 ha (lake area), 760 ha nominated as protected territory under a new decree.
Altitude: 0 m above sea level.
Wetland type: E, J, 5, 6, 9.
Other hydrologically linked wetlands: Burgas Bay, on the Black Sea. There is a canal connecting the lake to the sea.
Description of site: Pomorie is a hypersaline lake situated near the coastline, divided into two parts by the Burgas-Varna road. The western part comprises new salt pans; the eastern part is divided into two parts by a dyke. This is an important hypersaline, coastal lagoon (850 ha) with salt pans, which is presently unprotected. Salt is extracted by Pomorie Salinas Ltd., and there is an abandoned fish and mariculture factory; a nearby health resort markets the Pomorie mud for medicinal purposes. Pollution has affected the fishing, the mud and the birds, which foraged in the mud. Salt production is active but is changing the character of the area, thus appropriate management is required. The area has a diverse avifauna, particularly during the breeding season and migration.
Principal vegetation: According to the CORINE Biotope Habitat Types classification, the lake belongs to type 15: Coastal and halophytic communities – salt marshes, salt steppes, salt scrubs, salt forests; type 23: Standing brackish and salt water; and type 53: Water fringe vegetation.
Land tenure: The protected area is partly state and partly private property, managed by Pomorie Salinas Ltd. and a co-operative of private owners. It is surrounded by plots of land that are either private or the property of Pomorie Municipality.
Conservation measures taken: Pomorie Lake has been assigned the status of protected site (760.8 ha) since January 2001; it has been designated an IBA Site of national importance since 1997 and a CORINE Site No 78 in the Bulgarian CORINE list. In 2002, it has been declared as a new Ramsar site (under No 1229) with area of 814 ha, which includes also the Akheloy River Mouth.
Land use: The site is used for salt production. Evaporation takes place over the whole area and there is no human activity at all. The surrounding area is used as arable land: vineyards for wine & brandy manufacture. The town of Pomorie is situated close to the site.
Possible changes in land use: Not known.
Disturbances and threats: Repairing of the old dykes and building of new ones; the limited size of the canal (at the site); air pollution (around the site).
Economic and social values: The lake is used traditionally as unique Salinas for two thousand years. It provides excellent conditions for medicine treatments with curative mud. Several sanatoriums and National Physiotherapy Centre have been built in the surroundings of the lake. A new Rehabilitation Centre for disabled persons was opened in 2001. There are no agricultural and forestry activities within the site. The lake itself is visited by bird watchers, bird photographers, scientists, ringers and nature lovers. Hunting is strictly prohibited in the protected area; nevertheless during the hunting season there is some hunting pressure. There are no pre-



Map 5. Lake Pomorie

cise figures for the negative impact on the bird populations.

Fauna: Relatively well studied. Mammals: Only three species of large mammals occur on the reserve and the adjacent areas: fox, weasel and wild boar. Birds: 248 species have been recorded, 70 of which are included in the RDB of Bulgaria. The lake has international importance for migrating and wintering birds such as *Phalacrocorax carbo, P. pygmaeus, Tadorna tadorna, Cygnus olor, Recurvirostra avosetta* and *Sterna sandvicensis.* The lake ranks as second in importance in Bulgaria for breeding birds (*R. avosetta* and *S. sandvicensis*). Amphibians and Reptiles: 5 species of amphibians and 5 reptiles occur here. Two of these species, *Ophisaurus apodus* and *Elaphe longissima,* are listed in the RDB of Bulgaria as threatened species. Fish: 3 species have been recorded in the lake: *Knipowitschia caucasica, Gasterosteus aculeatus* and *Atherina boyeri,* all three species are listed in the RDB of Bulgaria.

Special floristic values: Several species included in the RDB of Bulgaria occur here, including *Trachomitum venetum* (the largest Bulgarian population), *Lactuca tatarica* and *Artemisia maritima*.

Research facilities: Not available.

Public awareness and education: Conservation education has been developed mainly by the Green Balkan Federation and Pomorie Municipality. International camps for students are held regularly in autumn, devoted to management activities at the lake. As a result, several artificial islands have been built, which have attracted 400 breeding pairs of *Sterna sandvicensis.* A 'Museum of Salt' was opened in 2002 with financial support from the EU PHARE programme's project "All About Salt". In the last several years, a lot of brochures, post cards and posters, devoted to Lake Pomorie have been published.

Criteria for inclusion: 1, 4 and 6.

Table 7. Waterbird populations at Lake Pomorie (1996-2000)

Species	Breeding pairs	Non-breeding individuals
Anas clypeata		100-200
Anas platyrhynchos		450-880
Anser albifrons		80-180
Aythya ferina		2,300-5,000
Aythya fuligula		900-4,500
Calidris ferruginea		350-4,500
Cygnus olor		230-1,000
Egretta alba		10-25
Egretta garzetta		140-180
Fulica atra		5,200-10,500
Himantopus himantopus	10	100-150
Larus melanocephalus		900-2,600
Limosa limosa		20-500
Pelecanus onocrotalus		10-100
Phalacrocorax carbo		570-1,000
Phalacrocorax pygmaeus		10-200
Philomachus pugnax		300-800
Platalea leucorodia		10-50
Recurvirostra avosetta	34-64	260-1,000
Sterna albifrons	8	15-30
Sterna hirundo	20-30	15-100
Sterna sandvicensis	173	170-1,800
Tadorna tadorna	5	500-630
Tringa stagnatilis		30-600
Tringa totanus		600-1,000

6. Lake Atanasovsko

Location: 42°35'N, 27°28'E; UTM grid NH 30, NH 31. On the Black Sea coast, close to Bourgas Bay and the town of Burgas (250,000 inhabitants).

Area: 1,690 ha (lake area), 1,050 ha (reserve), 900 ha (buffer zone); only the reserve has been designated as a Ramsar Site.

Altitude: 0-1.5 m below sea level.

Wetland type: E, J, Ts, 5, 6, 7, 9.

Other hydrologically linked wetlands: Burgas Bay, on the Black Sea. A canal divides the two water bodies.

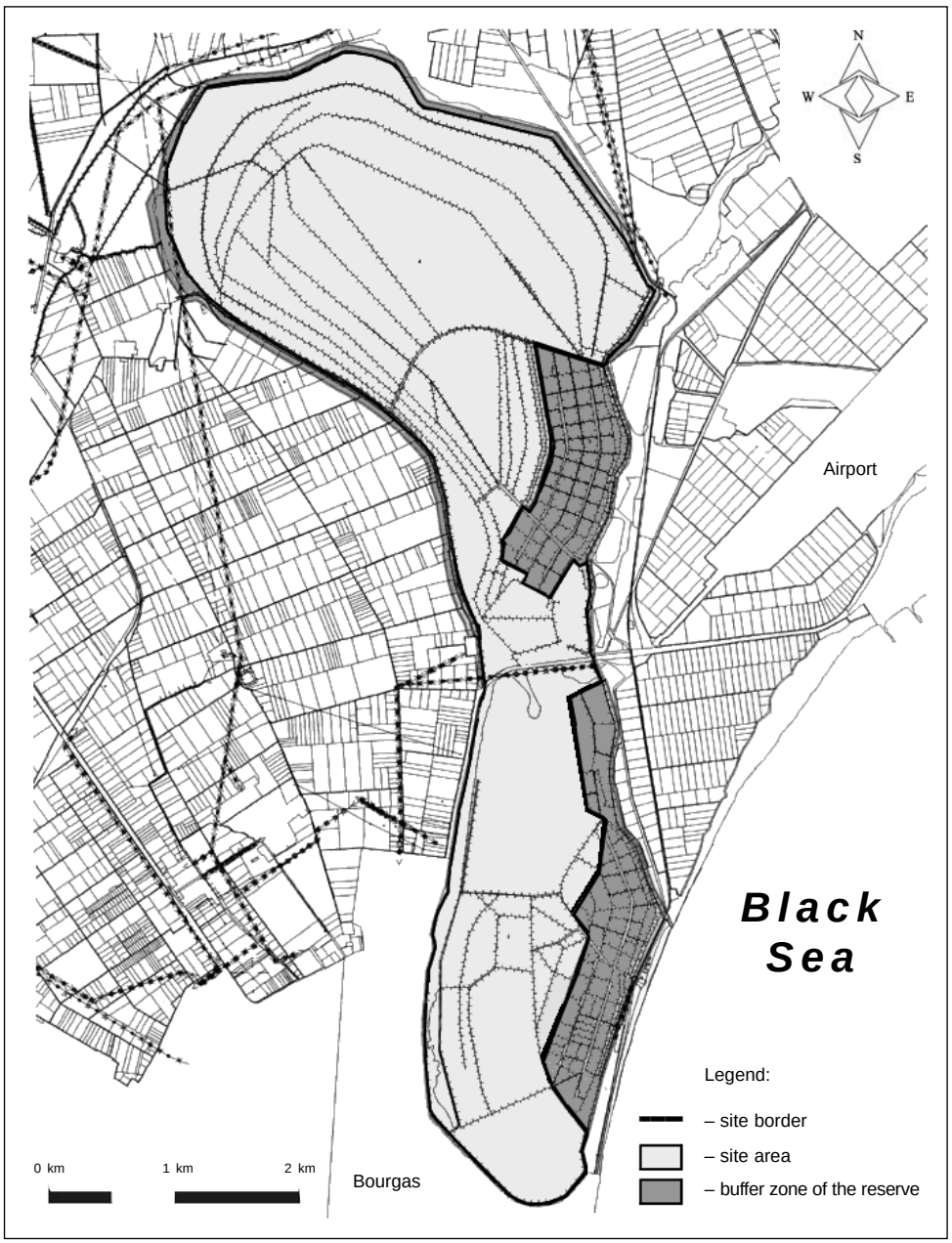
Description of site: Atanasovsko is a hypersaline lake near the coast, divided into two by the Burgas-Varna road. The northern part is similar to an estuary and has been designated as a nature reserve since 1980. The southern part forms a buffer zone of the reserve, and there is also a buffer zone around the other parts of the reserve. Both parts of the lake have been salt pans since 1906. The lake lies about 1 m below sea level. Small freshwater marshes, together with a system of canals overgrown with marsh vegetation, surround the lake. The fresh water from the catchment area of the lake is collected in a circular canal during November-April and flows into the sea. The eastern part of this canal also supplies the salt-works with seawater from Burgas Bay during May-October. Thus the water in the canal is fresh during the first half of the year and saline during the second half of the year.

Principal vegetation: According to the CORINE Biotope Habitat Types classification, the lake belongs to type

15: Coastal and halophytic communities – salt marshes, salt steppes, salt scrubs, salt forests (12% of the total area), type 23: Standing brackish and salt water (80%) and type 53: Water fringe vegetation (8%).

Land tenure: The reserve is an exclusive state property and is managed by the MoEW. It is surrounded by plots of land that are either private or the property of Burgas Municipality.

Conservation measures taken: The northern part of the lake has been designated as a nature reserve (State Gazette, No. 70/1980) with the following regime: "…all activities that disturb the original character of nature in the reserve are prohibited, with the exception of excavation of curative mud in the north-eastern part of the lake..." In 1999, the northern part of the lake was re-categorised as a maintained reserve according to the new Protected Areas Act (State Gazette, No. 99/1999) with some activities permitted until the management plan for Lake Atanasovsko is approved. The southern part of Lake Atanasovsko, together with a belt of about 200 m around the northern part, has been designated as a buffer zone of the reserve (State Gazette, No. 85/1981). The reserve has been designated as a Ramsar site since 28.11.84: No. 292 and enlarged to 1,404 ha in year 2002; as an Important Bird Area since 1989; as a Globally Important Area since 1997; as a CORINE Site No. 77 in the Bulgarian CORINE list; and as a protected area of international importance (State Gazette, number 97/1993). According to the Bulgarian Constitution, such areas are exclusive state property. Lake Atanasovsko has been designated by the Ministry of the Health as a place with significant stores of curative mud. It is included in the so-called 'Zone A', with a very strict management regime.



Map 6. Lake Atanasovsko

Conservation measures proposed: Sets of such measures have been listed in the reserve's Management plan, which is prepared by BSBCP and is in a process of approval by MoEW.

Land use: The site is used for salt production; evaporation takes place over the whole area of the reserve and there is no human activity. The surrounding area is used as arable land, an industrial zone, (including Burgas Airport), the 'Cherno more' mine, etc.

Possible changes in land use: Not known.

Disturbances and threats: At the site: repairing of the old dykes and building of new ones; water pollution of the surrounding canal. Around the site: air pollution.

Economic and social values: There are no agricultural or forestry activities within the site. The lake itself is visited by bird watchers, bird photographers, scientists, ringers and nature lovers (often without permission, mainly in spring, summer and autumn). Hunting is strictly prohibited in the reserve and its buffer zone; nevertheless during the hunting season there is some hunting pressure, especially in the northern parts of the reserve. There are no exact figures for the negative influence upon the bird populations. Today, there is no fishing activity in Lake Atanasovsko. According to some data, the lake was used for fishing until the Second World War. After 1995, sport fishing began in the freshwater pond in the northeast of the buffer zone, where some fish species have appeared since the pollution was removed. Poachers take an unknown quantity of brine-shrimp eggs each year. The site does not have archaeological remains of religious importance.

Table 8. Waterbird populations at Lake Atanasovsko (1996-2000)

Species	Breeding pairs	Non-breeding individuals
Anas acuta		200-1,100
Anas clypeata		1,000-2,550
Anas platyrhynchos		4,600-7,900
Anser albifrons		5,500-16,000
Aythya ferina		1,000-3,080
Branta ruficollis		400-1,200
Calidris ferruginea		800-1,200
Cygnus olor		350-770
Egretta alba		30-85
Egretta garzetta		150-300
Fulica atra		900-11,200
Glareola pratincola	12	
Himantopus himantopus	38	100-420
Larus genei		250-740
Larus melanocephalus	20-80	70-2,100
Limosa limosa		120-500
Pelecanus crispus		210-380
Pelecanus onocrotalus		850-6,000
Phalacrocorax carbo		30-300
Phalacrocorax pygmaeus		70-600
Philomachus pugnax		150-2,000
Platalea leucorodia		70-190
Plegadis falcinellus		30-230
Recurvirostra avosetta	430	280-3,100
Sterna albifrons	15-34	70-550
Sterna hirundo	9-382	400-760
Sterna sandvicensis	113-132	50-400
Tadorna ferruginea		17-30
Tadorna tadorna	3	1,000-2,800
Tringa stagnatilis		70-620
Tringa totanus		1,000-2,400
Vanellus vanellus	10	100-470

Fauna: Relatively well studied. Mammals: 33 mammal species have been recorded at Lake Atanasovsko. Three species are of particular interest from the point of view of protection of species diversity: *Suncus etruscus, Microtus guentheri* and *Spermophilus citellus.* Only three species of large mammals are resident in the reserve and adjacent areas: *Vulpes vulpes, Mustela nivalis* and *Sus scrofa.* Birds: The populations here are the richest and best studied in Bulgaria: 316 species have been recorded, including 85 breeding species. The results of long-term studies of the autumn migration show that Lake Atanasovsko ranks first in Europe in the migration of *Pelecanus crispus, P. onocrotalus, Circus aeruginosus* and *Falco vespertinus,* and occupies second place for the migration of *Aquila pomarina.* The peak numbers of birds on autumn migration over Lake Atanasovsko for the period 1978-1994 are up to 60,000 raptors and up to 240,000 pelicans, storks and cranes. These birds originate from the eastern half of the European continent. Lake Atanasovsko is the site with the highest species diversity of birds in Bulgaria, and the site with the highest number of bird species listed in the RDB of Bulgaria. The lake has the highest breeding numbers in Bulgaria of *Recurvirostra avosetta, Himantopus himantopus, Sterna albifrons* and *S. hirundo.* It is a unique breeding site in Bulgaria for *Larus melanocephala, L. genei, Gelochelidon nilotica* and *Sterna sandvicensis.* The site also records the highest numbers in Europe of migratory species such as *Pelecanus onocrotalus, P. crispus, C. aeruginosus,* and *Falco vespertinus.* The site has the highest midwinter numbers in Bulgaria of *Tadorna tadorna.* Fish: 16 species have been recorded in the site, 4 of which appear in the RDB of Bulgaria. Amphibians and Reptiles: 7 amphibians and 8 reptiles occur there. Two of these species, *Ophisaurus apodus* and *Elaphe longissima,* are listed in the RDB of Bulgaria as threatened.

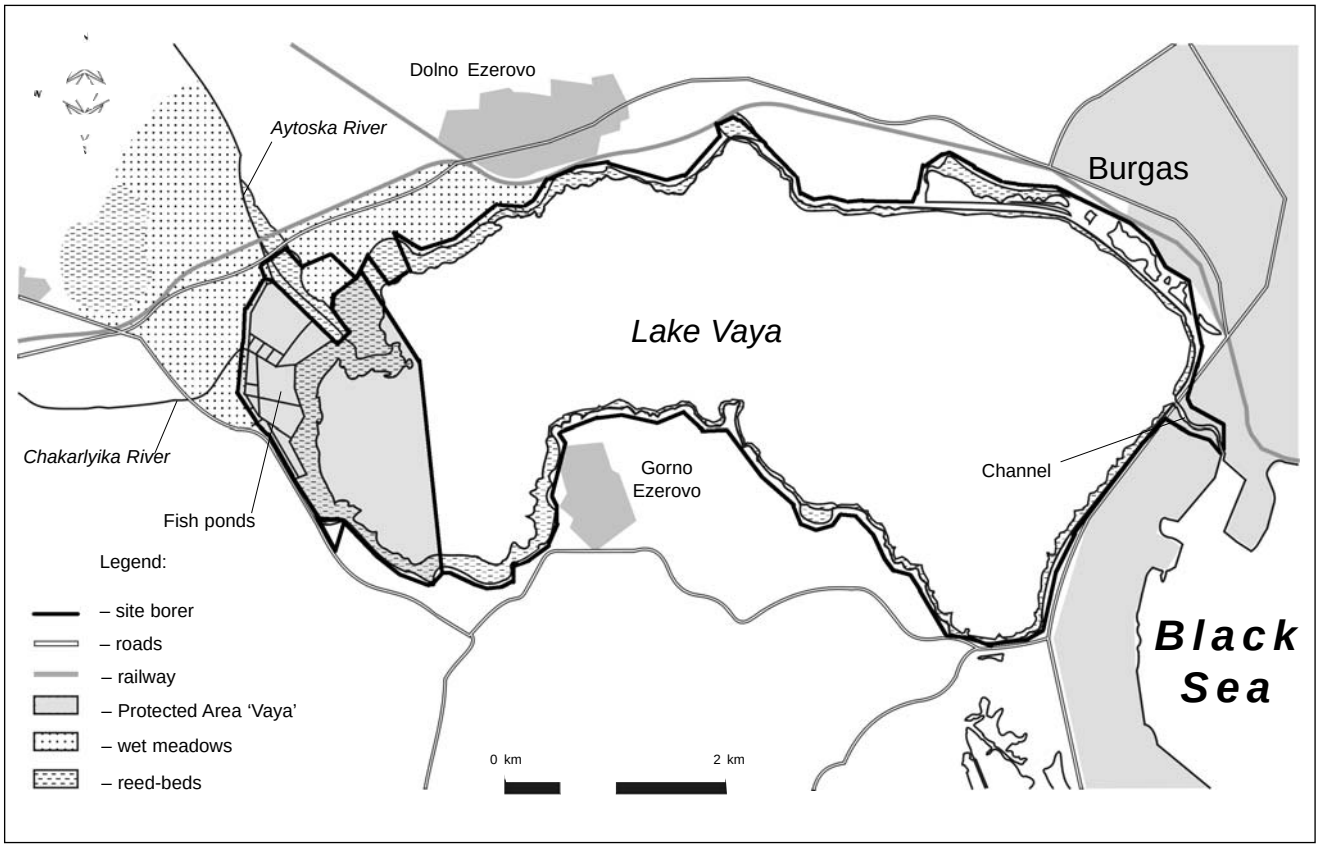
Special floristic values: More than 233 species of higher plants are established around Lake Atanasovsko. *Salicornia herbacea, S. europaea, Suaeda maritima, Phragmites australis, Typha angustifolia, Vicia campestris* and *Artemisia maritima* dominate among vascular plants. The following plant species included in the RDB of Bulgaria have been recorded at the lake: *Parapholis incurva, Gypsophila trichotoma, Silene euxina, Halimione pedunculata, H. portulacoides, Petrosimonia brachiata* and *Suaeda heterophyla.*

Research facilities: There has been a Field Station of the Central Laboratory for General Ecology of the

Bulgarian Academy of Sciences at the lake since 1978 with facilities to observe the migration of soaring birds.
Public awareness and education: Conservation education has been developed mainly by the Central Laboratory for General Ecology and BSBCP, which organise regular autumn camps for students, devoted to management activities in the lake, identification and counting of soaring birds, etc. Recently a hide for bird-watching was built and opened in the southern part of the lake.
Criteria for inclusion: 1, 4 and 6.

7. Lake Vaya (Burgas)

Location: 42°30'N, 27°25'E. UTM grid: NH20, NH 30. On the Black Sea coast, west of Burgas town, close to Burgas Bay. Situated between Lakes Atanasovsko and Mandra.
Area: 2,800 ha, of which 379 ha are protected (Vaya Protected Area).
Altitude: 0.1–0.2 m above sea level.
Wetland type: F, O, Ts.
Other hydrologically linked wetlands: Komlushka Valley and Mandra Dam.
Description of site: The largest Bulgarian Black Sea coastal lake, an open firth (liman) of Pleistocene origin. The lake is *c*. 20 million m^3 in volume, with a surface area of 27.6 km^2. Lake Vaya is shallow, with an insignificant depth of 0.5-1.2 m overall but reaching 1.8 m in a few places in the middle of the lake. The lake is 9.6-km long, with a maximum width of 4.7 km, narrowing for a distance of *c*. 2.3 km in the middle of its length. The rocky north and south coasts are higher than the east and west coasts. The bottom of the lake is almost completely uniform, filled and levelled with liquid grey-black mud, rich in large, rough detritus. The thickness of the mud is significant, reaching 17 m in the central parts of the lake. The catchment area (1,050 km^2) includes the valleys of three rivers: Aytoska (32 km), Chakarliyska (25 km) and Sanardere (12 km), all of which flow into the westernmost part of the lake. The inflow of fresh water in the summer cannot compensate for the evaporation. The water level varies from year to year, as well as from season to season, with average annual fluctuation of about



Map 7. Lake Vaya (Burgas)

40-60 cm. The salinity of the lake changes seasonally, with a maximum of about 200 mg/l Cl^- in August-early September. The alkalinity is on average 5.45-6.70 mgekv/l.; pH is 8.9-9.5. In summer and at the beginning of autumn, in some cases a significant O_2 deficit is recorded. The temperature of the lake undergoes heavy seasonal fluctuations (up to 32°C). Most winters, the lake is frozen for a periods of 5-10 days.

Principal vegetation: Associations of *Phragmites australis, Typha angustifolia* and *T. latifolia* occupy a significant area on the western and northwestern shores. Along the lake, swampy meadows and halophytic plant communities are present, dominated by *Puccinellia convoluta,* as well as mezoxerothermic grasslands, dominated by *Poa bulbosa, Lolium perenne* and arable lands (Bondev 1991). Despite the insignificant depth of the lake, there is no submerged vegetation apart from patches of *Potamogeton pectinatus* in the north, west and east of the lake. Totally of 91 plant species for the lake have been described.

Land tenure: The lake is exclusive state property. Vaya Protected Site is situated on the land of Dolno Ezerovo and Gorno Ezerovo villages, Burgas District. The protected area includes:

– Terrestrial: state lands of the land-partitioning plan of the villages Dolno Ezerovo and Gorno Ezerovo – total area 195,354 ha.
– Part of the aquatic area: state property (184 ha).

Conservation measures taken: The Western Part of Lake Vaya with a total area of 75 ha has been designated as a protected site. In 1997, by Decree of the MoEW, the protected site was enlarged to a total of 379 ha (State Gazette No 122/1997). Lake Vaya is an Important Bird Area since 1989; and a Globally Important Area since 1997; a CORINE Site No 76 in the Bulgarian CORINE list. In 2002, Lake Vaya (incl. the protected area) is defined as a Ramsar Site under No 1230. An Interim Management Plan is in a process of preparation (BSBCP). Artificial platforms to attract pelicans to breed have been built in reed-beds on the Protected Site (BSBCP). Signs have been set up to mark Vaya Protected Area (BSBCP).

Conservation measures proposed: The artificial platforms should continue to be managed with the aim of attracting pelicans to breed (BSBCP). Reed-bed management is required (especially in the western part of the lake). A restoration of the canal connecting the lake with Black Sea should by made as soon as possible.

Land use: The main activities are fishing, sand extraction; farming, agriculture and stock-breeding on the adjacent grounds.

Possible changes in land use: Not known.

Disturbances and threats: Since an oil refinery was built in 1963 in the vicinity of the lake, the natural landscape has been changed. The lack of suitable purifying installations in the years after 1963 (up to the 1970s) led to significant pollution of the lake, with a variety of waste oils entering the lake together with waste water through the River Aytoska. The land surrounding the lake has been heavily affected and polluted. In the west of the lake (the most important waterbird habitat) a fish farm was built that no longer functions. There is hunting in adjacent areas.

Economic and social values: The lake is important for fishery: *Carassius gibelio* and *Cyprinus carpio* are the species of economic value today. In the past, because the ecological conditions were unstable, fisheries' yields varied. In periods of high salinity, ñarp *Cyprinus carpio* was not present in the lake and the fishery yield did not usually exceed 380 tonnes. Up to 30 t/year of prawn *Leander adspersa* were also caught in the past. Today the most economically valuable species is mainly *Carassius gibelio* – with a catch of *c*. 300 t/year.

Fauna: The eutrophic character of the lake has a strong influence on aquatic organisms, and is one of the reasons for the periodic death of a number of animal and plant species. Shallowness and the uniformity of the lake bottom cause the benthos

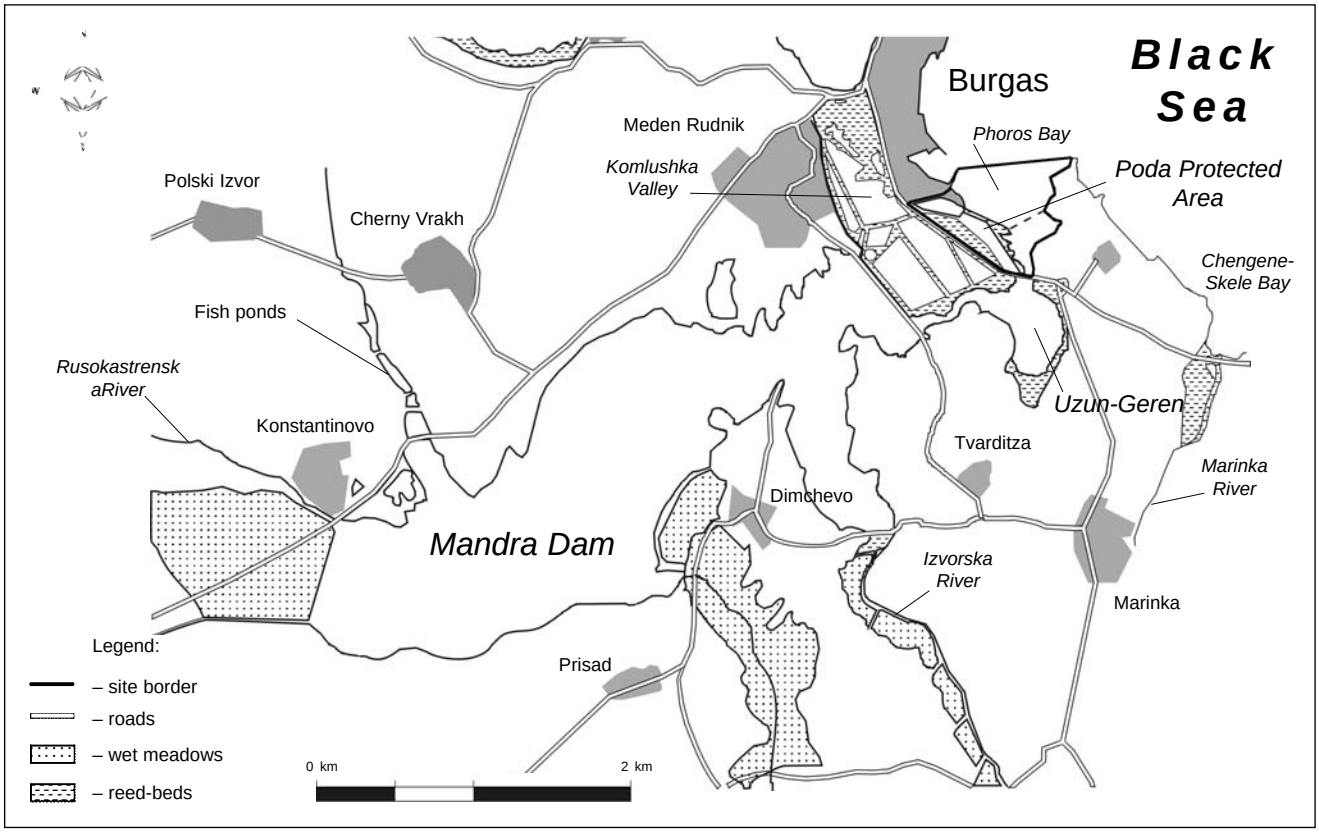
Table 9. Waterbird populations at Lake Burgas (1996-2000)

Species	Breeding pairs	Non-breeding individuals
Anas clypeata		1,000-6,800
Anas platyrhynchos		5,400-13,800
Anser albifrons		39,000-80,000
Ardea purpurea	6	5-15
Ardeola ralloides	35	50-100
Aythya ferina	8	13,000-16,800
Aythya fuligula		5,500-6,800
Aythya nyroca	1	13
Branta ruficollis		500-6,400
Egretta alba	1-2	300-650
Egretta garzetta	5-10	50-120
Fulica atra		2,000-2,400
Nycticorax nycticorax	15-30	100-300
Oxyura leucocephala		170-2,230
Pelecanus crispus		100-320
Pelecanus onocrotalus		900-5,500
Phalacrocorax carbo	150-350	1,200-7,700
Phalacrocorax pygmaeus		700-7,300
Platalea leucorodia		20-70
Plegadis falcinellus		50-150
Sterna hirundo		150-300
Tadorna tadorna		180-570
Vanellus vanellus	10-20	50-200

and plankton to be uniform and promote mass development of certain species. Mammals: The mammal fauna is not well studied. *Lutra lutra* is listed in the RDB of Bulgaria. Birds: 260 species recorded, 8 of which are globally threatened: *Phalacrocorax pygmaeus, Pelecanus crispus, Branta ruficollis, Aythya nyroca, Oxyura leucocephala, Milvus milvus, Falco naumanni* and *Crex crex.* The total includes 70 breeding species. 84 species are listed under SPEC, more than 60 species are included in the RDB of Bulgaria. Lake Vaya is an important staging site for birds migrating along the Black Sea coast. It is a site of international importance for wintering waterbirds, regularly supporting 60,000-100,000 waterbirds. The lake is especially important as a wintering habitat for several globally threatened species: *Phalacrocorax pygmaeus, Pelecanus crispus* (more than 450 individuals regularly recorded), *Branta ruficollis* and *Oxyura leucocephala,* the latter with over 2000 individuals recorded regularly in recent years. The lake provides important wintering grounds for *Anser albifrons, Branta ruficollis, Aythya ferina* and *A. fuligula.* It is a breeding site for *Aythya nyroca* and *Anas strepera.* Until the 1970s, a large colony of breeding *Phalacrocorax pygmaeus, Platalea leucorodia, Plegadis falcinellus* and herons were found in reed-beds on the western shore of the lake. Vaya is the most important of the lakes around Burgas as a foraging site for the migrating *Pelecanus onocrotalus,* wintering *P. crispus* and *Oxyura leucocephala.* It is also a 'bottleneck' area for a number of migrating raptors and soaring waterbirds: *Pelecanus onocrotalus, P. crispus, Ciconia ciconia,* and *C. nigra.* A Potential Ramsar site. The Amphibian and Reptile fauna are not well studied. Two species included in the RDB of Bulgaria have been recorded: *Elaphe longissima* and *Ophisaurus apodus.* Fish: Until the 1970s, the fish fauna consisted of 35 species, most of marine origin. Subsequently, with the changes in the hydrological regime and water quality, the majority of the marine species have disappeared. 11 fish species were recorded in 1999-2000 under BSBCP's Burgas Wetland Project. One of these species, *Anguilla anguilla,* is listed in the RDB of Bulgaria. *Neogobius fluviatilis* is listed under the Bern Convention and is on the 2000 IUCN Red List (S. Mikhov, in litt.). Invertebrates: Ivanov *et al.* (1964) records over 60 invertebrate species.
Special floristic value: Of the species included in the RDB of Bulgaria, the following have been recorded at Lake Vaya: *Silene euxina, Polycnemum heuffelii, Acanthus spinosus, Heptaptera triquetra, Erodium hoefftianum, Halimione portulacoides, H. pedunculata, Gypsophila trichotoma, Phalaris tuberosa* and *Saccharum ravennae.*
Research facilities: An observation hide for waterbirds has been built in the Vaya Protected Site.
Public awareness and education: Bird observation point and boat quay on the lake's bank at the village of Dolno Ezerovo were built recently.
Criteria for inclusion: 1, 5, 6 and 8.

8. Mandra Complex

Location: 42°25'N, 27°23'E; UTM grid: NG29, NG 39. On the Black Sea coast, 1 km south of the town of Burgas, close to Burgas Bay. The most southerly of the Burgas Lakes.
Area: Mandra Dam-Poda Lagoon Complex: 2,270 ha (1,400 ha – openwater area), 251.7 ha protected (Poda protected area – 100.7 ha; The Estuary of the River Izvorska protected area – 151.0 ha); Chengene-Skele: 160 ha, protected site.
Altitude: Mandra Dam – 3 m above sea level, Poda – 0 m, and Chengene-Skele – 0 m.
Wetland type: D, E, F, J, 1, 6, 7, 8.
Other hydrologically linked wetlands: Komlushka Valley, Poda Lagoon and Lake Vaya.
Description of site: Mandra Dam: 3 km south of the district centre, Burgas. In 1934, a dyke was built in the southwest of the lake, leading to a significant increase in the size of the lake. The lake was a brackish basin, very shallow and silted in the southwest. In 1962, most of Lake Mandra was dammed, forming the largest openwater area in the country – 36.11 km^2 – with a mean depth of *c.* 3.9 m, since when the water in the basin has become fresh and strongly eutrophic in character. The lake is periodically connected with Lake Vaya through the swampy Valley of Komlushka. The bottom of Mandra Dam is of clay-mud. Four relatively full rivers enter the lake: Sredetzka (Mandra), Rusokastrenska, Fakyiska and Izvorska. The shores along the length of the lake are hilly, whereas near the Black Sea and in the southwest the shores are flat. The depth in the northeast is *c*. 3-5 m. The dam usually freezes in winter for a periods of 5-10 days. Fishponds near the village of Cherny Vrakh and cascade fishponds near Burgas are also included in the Complex. Uzun-Geren: A shallow (average 0.8-1.5 m) brackish remnant basin of the former Lake Mandra, connected to the Black Sea by a natural channel. The depth of the channel is on average 1 m, falling to 4.5 m near the sea (under the bridge on the main Burgas-Sozopol road), with an average width of *c*. 30 m. Poda: Brackish-freshwater lagoon, between Uzun-Geren and the sea. Chengene-Skele: A sea bay and the estuary of the River Marinka, 10 km south of Burgas.
Principal vegetation: Mandra Dam: The shore is covered with scarce areas of *Phragmites australis, Typha*



Map 8. The Mandra Complex

angustifolia, and *T. latifolia.* Along the northwestern and eastern parts of the lake, mesophytic meadows are distributed with a predominance of *Festuca pratensis* and *Poa sylvicola;* halophytic grass communities dominated by *Puccinellia convoluta;* scrubs dominated by *Paliurus spina-christi;* arable lands. On the south coast, forests dominated by *Quercus pedunculiflora, Q. robur* and *Acer campestre* are found (Bondev 1991). Poda Lagoon is occupied mainly by *Phragmites australis* and *Typha* sp. Communities of *Bolboschoenus maritimus, Juncus maritimus, Artemisia santonicum* are often formed with *Phragmites australis* and *Typha* sp. In the shallow saltwater areas, *Salicornia europaea* is characteristic, while on the strip of sand *Leymus racemosus* is found. Uzun-Geren: The majority of the shore is occupied by *P. australis* and *Typha* sp*. Quercus* sp*.* forest occurs on the hilly west coast. Chengene-Skele: An estuary of the River Marinka has extensive reed-bed (*P. australis*) areas, *Typha angustifolia* and *Schoenoplectus lacustris.* The bottom of the bay is shallow (10-30 cm), covered by mud. Trees and bushes (mainly *Carpinus orientalis*) cover the sides of the river valley, and there are Mediterranean elements (*Colutea arborescens*) (Bondev 1991).

Land tenure: Mandra Dam, and the adjacent protected sites are exclusive state property.

Conservation measures taken: MoEW closed down the town dump at the northeastern end of the lake. The Lukoil-Nephtochim-Burgas Company has taken measures to prevent petrol products leaking from petrol pipelines. Under the BSBCP, a Nature Conservation Centre 'Poda' has been built in the protected area, managed by the Bulgarian Society for the Protection of Birds (BSPB). The Poda Protected Area is managed by BSPB: boundaries are marked and there is joint control with RIOSW-Burgas; illegally settled agricultural areas and hunting hides have been removed; concrete barriers have been put in place to reduce illegal entry into the protected area; there are educational excursions in the area; a Management plan for the protected site has been approved by the MoEW; artificial islands have been constructed to attract birds to breeding and stage; a watch-tower has been built in the area; the protected area is monitored. Poda with Foros Bay is declared recently as Ramsar Site under No 1228. Chengene-Skele has been provided with information panels.

Conservation measures proposed: Enlargement of Poda Protected Area. The owners of the oil pipelines that pass through the Protected Area should be obliged to increase the security of these installations. Reed-bed management (in the westernmost parts of Poda): new water bodies should be created. A study should be made of

the possibilities and measures taken to taken to restore the breeding colony of *Pelecanus onocrotalus* (in Uzun-Geren). Chengene-Skele: A management plan should be prepared and reed-bed management undertaken. The whole Mandra Complex should be designated as a Ramsar site.

Land use: Fishery; hunting in unprotected wetlands of the Complex; farming, agriculture and stock-breeding on the adjacent grounds.

Possible changes in land use: Not known.

Disturbances and threats: The Complex is a subject to intensive human impact because of the close proximity of Burgas town. The contamination of the habitats by oil products from the Lukoil-Neftochim-Burgas oxidising pools remains a threat for certain bird species, especially for both *P. onocrotalus* and *P. crispus,* as well as for *P. pygmaeus, Platalea leucorodia,* herons, gulls, etc. There is illegal hunting and fishing in the Estuary of River Izvorska Protected Areas, as well as in the Chengene-Skele. There is a possibility of pollution from damage to the oil pipelines that pass through the Poda Protected Area and Chengene-Skele.

Economic and social values: In the past, about 170 t/year of fish were caught, and there was also a good harvest of *Astacus fluviatilis* and *Leander adspersa* in Lake Mandra. Recently, the dam has become important for fishing. The main species of economic value are *Carassius gibelio, Rutilus rutilus, Abramis brama* and *Sander lucioperca.* The area supplies water for the Lukoil-Nephtochim-Burgas Company, as well as for irrigation. Poda is important for environmental education of local people and is an ecotourism centre. Mandra Dam is an important site of historical significance (Roman period). There is a recreational beach near Chengene-Skele.

Table 10. Waterbird populations at the Mandra Complex (1996-2000)

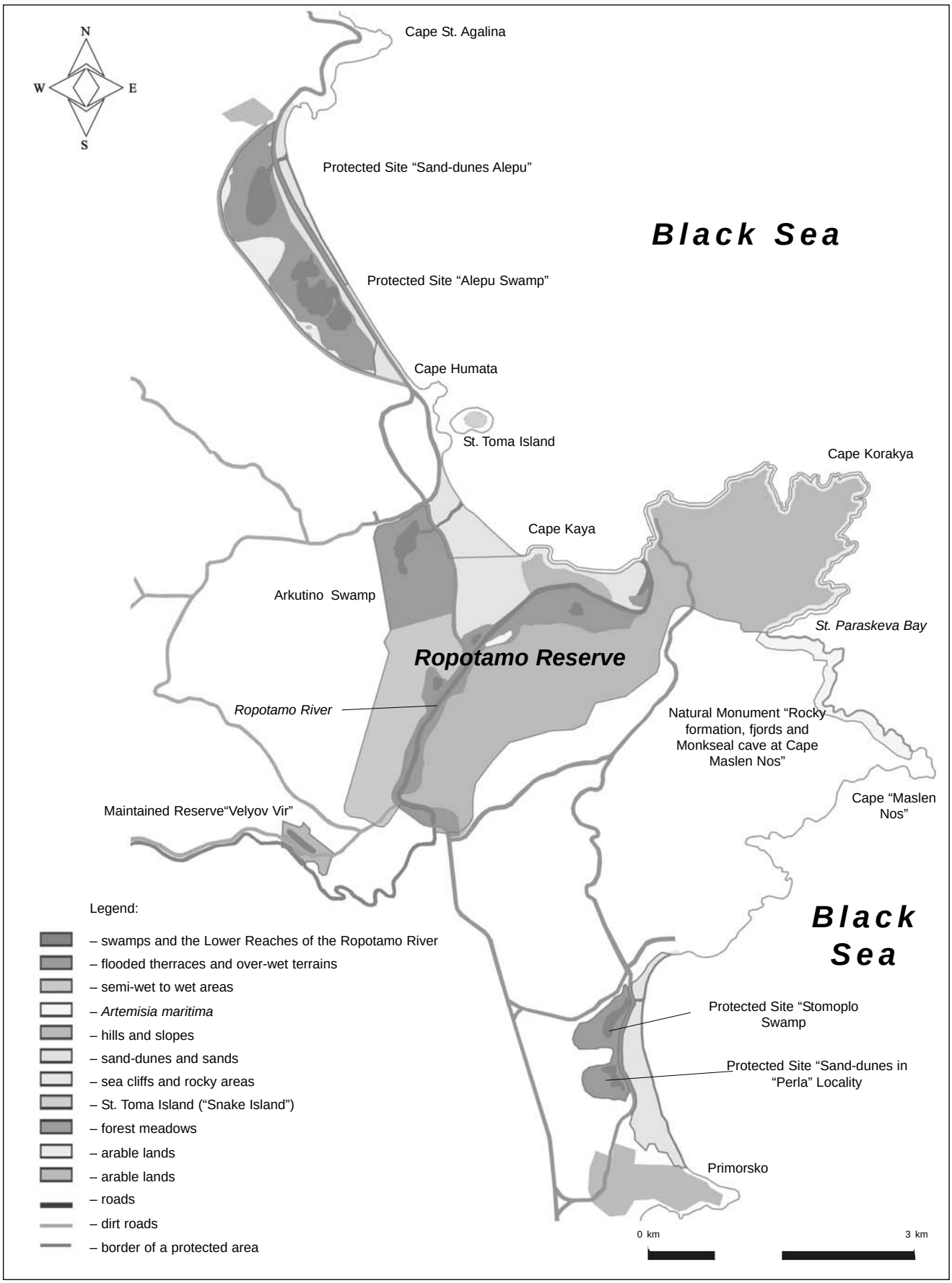
Species	Breeding pairs	Non-breeding individuals
Anas clypeata		2,300-3,400
Anas platyrhynchos	7	2,200-11,800
Anser albifrons		30,000-61,000
Ardea purpurea	15	10-20
Ardeola ralloides	6	50-100
Aythya ferina	6	10,000-13,000
Aythya fuligula		2,000-4,700
Aythya nyroca	2	30-110
Branta ruficollis		2,000-16,800
Cygnus bewickii		16-84
Cygnus cygnus		50-210
Cygnus olor	1	100-160
Egretta alba		230-450
Egretta garzetta	40	100-200
Fulica atra		4,000-8,600
Himantopus himantopus	8	30-50
Larus melanocephalus		600-1,500
Nycticorax nycticorax	20	100-200
Oxyura leucocephala		10-400
Pelecanus crispus		240-350
Pelecanus onocrotalus		200-800
Phalacrocorax carbo	162-216	1,800-11,000
Phalacrocorax pygmaeus		1,200-3,200
Platalea leucorodia	30-37	70-110
Plegadis falcinellus	10	30-70
Sterna albifrons	22	10-50
Sterna hirundo	140	70-250
Sterna sandvicensis		100-300
Tadorna ferruginea	2	10-20
Tadorna tadorna	3	70-640

Fauna: Mammals: *Martes martes* and *Lutra lutra* are included in the RDB of Bulgaria. Poda is one of the very few places in Bulgaria where *Suncus etruscus* has been recorded. Birds: 270 species have been recorded in the Complex, 74 of which are listed in the RDB of Bulgaria. 127 species are of European Conservation Concern (SPEC categories). 9 globally threatened species have been recorded: *Phalacrocorax pygmaeus, Pelecanus crispus, Branta ruficollis, Aythya nyroca, Oxyura leucocephala, Milvus milvus, Falco naumanni, Crex crex* and *Numenius tenuirostris.* The wetlands of the Mandra Complex are of international importance for their migrating and wintering waterbirds, supporting 80,000–100,000 wintering waterbirds. Mandra Dam is especially important as a wintering habitat for the globally threatened *Phalacrocorax pygmaeus, Pelecanus crispus, Branta ruficollis* and *Oxyura leucocephala,* as well as for *Cygnus cygnus, Anser albifrons, Aythya ferina* and *A. fuligula.* The Complex is a breeding site for *Aythya nyroca* and *Anas strepera.* Lake Mandra was the last recorded breeding site for the *Pelecanus onocrotalus* in the country; after the lake was transformed into a dam, the increased water level flooded their nesting sites. Poda is important for breeding colonies of *Platalea leucorodia, Plegadis falcinellus* and herons. Chengene-Skele is one of the very few places in the country where *Nycticorax tenuirostris* is recorded. It is important for *Phalacrocorax pygmaeus* and *Plegadis falcinellus,* as well as for wading species on migration. The Mandra Complex is a 'bottleneck' area for a number of migrating raptors and soaring waterbirds (*Pelecanus onocrotalus, P. crispus, Ciconia ciconia, C. nigra,* etc.). A potential Ramsar site. Amphibians and Reptiles: 4 species included in the RDB of Bulgaria: *Pelobates syriacus, Ophisaurus apodus, Elaphe longissima* and *E. quatuorlineata* sauromates. Fish: In 1999-2000, 24 fish species were recorded in the Mandra-Uzun-Geren-Poda area during surveys for BSBCP's Burgas Wetland Project, 4 of which are included in the RDB of Bulgaria, 5 are

listed under the Bern Convention and 4 in the 1996 IUCN Red List; one species is included in Directive 92/43 of the Council of the EU. The populations of conservation priority are *Chalcalburnus chalcoides, Vimba vimba* and *Neogobius fluviatilis.* In Chengene-Skele, *Pungitius platygaster* and *Proterorhinus marmoratus* are dependent on protection (S. Mikhov, in litt.). Invertebrates: Over 60 invertebrate species are listed by Ivanov *et al*. (1964).
Special floristic value: Of the species included in the RDB of Bulgaria, *Silene euxina* and *Gypsophila trichotoma* have been recorded.
Research facilities: Monitoring of waters, plants and animals, organized by BPSPB.
Public awareness and education: There is a well functioning Nature Conservation Centre of BSPB at Poda with over 20,000 visitors for 2002.
Criteria for inclusion: 1, 5, 6 and 8.

9. Ropotamo Wetland Complex

Location: 42°19', 27°45'E; UTM grid NG 68. Burgas District, Primorsko Community, Sozopol Community. Nearest towns: Primorsko and Sozopol. About 50 km south of the District Centre, Burgas. The protected areas of the Ropotamo Complex are bordered to the east by the Black Sea, to the west by the central water-main for the South Black Sea coastal area and a high-voltage power line, to the north by Dyuni Holiday Village and to the south by the town of Primorsko.
Area: 5,500 ha. The Ropotamo Reserve, including Arkutino Marsh and the Estuary of the River Ropotamo wetlands: 1,000.7 ha, NG 68. Velyov Vir Maintained Reserve: 13.6 ha, NG 58. Alepu Marsh Natural Monument: 166.7 ha, NG 58, 59. Stomoplo Marsh Protected Area: 40.0 ha, NG 68.
Altitude: 0-100 m above sea level.
Wetland type: A, D, E, F, J, Q, W, Xf, Tr.
Other hydrologically linked wetlands: The Black Sea.
Description of site: 7 protected areas, formally united as the Ropotamo Complex. The complex comprises the wetland sites: 1. Estuary of the River Ropotamo. Includes the final 7 km of the river before it reaches the sea. The only large river in the Complex, with a length of 48.5 km and catchment area of 248.7 km^2. Annual surface run off 3-5 (l/s)/km^2 (winter 1.0-1.5 (l/s)/km^2; spring 1.0-2.5 (l/s)/km^2; summer below 0.4 (l/s)/km^2; autumn 0.5-1.0 (l/s)/km^2). The high-water period lasts about 4 months. There is less than 100 t/km/year of floating silt. 2. Arkutino Swamp. Freshwater lagoon, with a total area of 1.16 km^2, and open water area of 0.03 km^2. Minimum depth: *c.* 0.5 m. In continuously dry periods, the swamp dries up completely. In periods of high water, the water flows into the sea through a natural channel. Seawater does not intrude into the swamp, and thus does not affect the salinity of the wetland. 3. Alepu Marsh 50-100 m in width and separated from the sea by a sandbar; average depth *c.* 1 m (0.8-2.0 m), catchment area 10-12 km^2. When the water level is low, the connection between the northern and southern parts of the swamp is exposed, dividing the swamp into two separate water bodies. The natural connection of the basin with the sea is facilitated by a small sluice. Seawater can cross the sandbar only during low or reverse hydraulic gradients. 4. Stomoplo Marsh. Situated *c*. 50-100 m west of the sea, the marsh is separated from the sea by a strip of sand and dunes. Openwater area *c*. 0.6 km^2; catchment area 6 km^2. A canal with a sluice gate connects the marsh to the sea. The water level in the marsh fluctuates by up to 0.7 m. A dyke divides the wetland into two parts – north and south, but when the water level is increased the two parts of the swamp may be connected hydrologically.
Principal vegetation: Ropotamo Reserve: Arkutino Marsh: Associations of *Nymphaea alba, Typha angustifolia, Phragmites australis, Carex riparia, Salvinia natans, Sparganium erectum, Hydrocharis morsus-ranae, Lemna* sp., *Wolffia arrhiza* and *Salix cinerea.* Ropotamo River Mouth: Associations of *P. australis, T. angustifolia, Elytrigia elongata, Salicornia europaea, Puccinellia distans, Artemisia maritima, Beckmannia eruciformis, Juncus maritimus, S. cinerea, Tamarix pallasi* and *Zostera noltii.* The remainder of the reserve (forests, dunes, rocky coast): Associations of *Fraxinus oxycarpa* with *Ulmus minor* and *Acer campestre, A. tataricum, Quercus pedunculiflora, Carpinus betulus* and lianas: *Smilax excelsa, Periploca graeca, Clematis vitalba, Vitis sylvestris, Calystegia sepium, Humulus lupulus, Hedera helix; Quercus frainetto* and *Q. cerris* with *Carpinus orientalis, Crataegus monogyna, Cornus mas, Poa nemoralis* and *Dactylis glomerata.* Sub-mediterranean elements: *Physospermum cornubiense, Lathyrus niger, Lychnis coronaria* and *Heptaptera triquetra.* Associations of *Phillyrea latifolia.* Alepu and Stomoplo Marshes: Associations of *Phragmites australis, Typha angustifolia, T. latifolia, Trapa natans, Sylvia natans, Juncus gerardii, Ceratophyllum demersum, Salix cinerea, Sparganium erectum, Utricularia australis, Wolffia arrhiza* and *Lemna trisulca.* Alepu and Perla Sand Dunes: Associations of *Ammophila arenaria, Secale sylvestris, Peucedanum arenarium, Jurinea albicaulis* ssp*. kilaea, Silene thymifolia, Medicago marina, Pancratium maritimum, Cionura erecta* and *Aurinia uechtrtziana.*



Map 9. The Ropotamo Complex

Land tenure: The Ropotamo Reserve and Velyov Vir Maintained Reserve are exclusive state property, while the Alepu and Stomoplo Marshes are public state property.
Conservation measures taken: The Ropotamo Complex is a CORINE place (No 73 in the Bulgarian List) and an Global IBA site. The Ropotamo Reserve is included in the UN List of National Parks and Protected Areas. Ropotamo Reserve and Alepu Natural Monument have been designated as Areas of International Importance according to Bulgarian legislation. Stomoplo Marsh is a Protected Area of National Importance. Arkutino Swamp has been a Ramsar site since 1976. Alepu Marsh is an IBA. All protected areas in the Complex are marked with signs (BSBCP). Recently the whole Ropotamo Complex was designated as a Ramsar Site. A management plan for all protected areas in the Ropotamo Complex (BSBCP) is in its final stages. The management body for the Ropotamo Complex has been set up in the Regional Inspectorate of the Environment and Waters – Burgas. The 'Burgas Wetlands Project' (BSBCP) monitoring team organises and carries out ornithological and other monitoring activities. The managing organisations are as follows: Ropotamo Reserve: MoEW. Velyov Vir Maintained Reserve: MoEW. Alepu Marsh Natural Monument and Stomoplo Marsh Protected Area: The majority of the land, which is wetland, is state property. The District Governor is responsible for the management of the protected areas.
Conservation measures proposed: Measures proposed under the management plan for the improvement of the wetlands in the complex, Arkutino, Alepu, Stomoplo Marsh, as well as for areas such as Dyavolsko Marsh, should be undertaken. The monitoring activities in the Ropotamo Complex wetlands should continue organised by MoEW with the financial assistance of the BSBCP).
Land use: A part of the Alepu Marsh Natural Site is arable land. Since 1990, this area has not been cultivated.
Possible changes in land use: It is possible that certain protected areas may be allocated under concessions.
Disturbances and threats: There are not enough guards for the Alepu Marsh and Stomoplo Marsh protected sites. Heavy tourist influence in the summer season. Illegally built barracks near the estuary of the River Ropotamo. The channels in the Ropotamo River estuary have changed since concrete quays were built along the coast. Arkutino Swamp and the aquatic area of Velyov Vir Maintained Reserve dry out in some years, which is a threat to the rare fish and amphibians that inhabit them. Illegal fishing in the sea area along the coast of the complex, as well as in Alepu Marsh. Increasing eutrophication in Stomoplo and Arkutino Swamps. In the recent past, a drainage system was built northwest of Alepu, reducing the openwater area of the swamp. The drainage system no longer used, but continues to drain the northeastern part of the swamp.
Economic and social values: Recreation: the protected areas in the complex are amongst the most heavily visited natural sites in the country. Boat tours are organised along the River Ropotamo and to Velyov Vir Maintained Reserve. Fishery – offshore and in Stomoplo Marsh. Coastal beaches, resorts.
Fauna: Mammals: 21 species have been recorded in the Complex, 7 of which are included in the IUCN Red List (1996) as 'vulnerable': *Rhinolophus hipposideros, R. euryale, R. blasii, Myotis bechsteini, M. emarginatus, M. capaccinii* and *Nannospalax leucodon,* or 'critically endangered': *Monachus monachus.* 7 species are included in the European Red Data List. 14 species are protected under the Bern Convention. 10 species are included in the RDB of Bulgaria. Birds: 260 species of birds have been recorded in the complex. 73 species are included in the RDB of Bulgaria, including 21 rare species (6 breeding) and 46 endangered species (22 breeding). 226 species are protected by Order No. 729/1986 of the MoEW (123 breeding species). The complex is a breeding site for *Podiceps cristatus, P. grisegena, Ixobrychus minutus, Nycticorax nycticorax, Egretta garzetta, Ardea cinerea, A. purpurea, Cygnus olor, Anas querquedula, Aythya nyroca, Porzana parva*, etc. The Ropotamo Complex is one of two breeding sites for *Haliaetus albicilla* on the Bulgarian Black Sea coast. It is a 'bottleneck' area for migrating birds, especially for *Ciconia ciconia* (over 10,000). Reptiles and Amphibians: The Ropotamo Complex is one of the three richest regions in Bulgaria for reptile and amphibian species. 32 species have been recorded: 9 amphibians and 23 reptiles. Of these, 6 species are protected by Order No. 729/1986 of the MoEW; 15 species are protected under the Bern Convention; 2 species are included in the European Red List; 6 species are included in the World Red Data Book. The complex supports Europe's northernmost site for *Coluber rubriceps*. Reptiles: *Testudo graeca graeca, T. hermanni boettgeri, Emys orbicularis, Caretta caretta, Cyrtodactylus kotschyi, Ophisaurus apodus thracius, Lacerta taurica, L. viridis, L. pratincola, L. trilineata, Ablepharus kitaibelii, Typhlops vermicularis vermicularis, Natrix natrix, N. tessellata, Coluber jugularis, C. rubriceps thracius, Elaphe longissima longissima, E. quatuorlineata sauromates, E. situla, Malpolon monspessulanus* and *Vipera ammodytes*. Amphibians: *Triturus vulgaris, T. cristatus, Bombina bombina, Bufo bufo, B. viridis, Hyla arborea, Pelobates syriacus balcanicus, Rana ridibunda* and *R. dalmatina*. Fish: 55 species are recorded in the wetlands of the Ropotamo Complex. Four species, with different levels of endemism, inhabit the River Ropotamo; 5 are included in the RDB of Bulgaria as 'threatened'. River Ropotamo (estuary): The species composition, numbers and distribution of transitory inhabitants in the firth are quite variable. Of the residents, freshwater fish predominate (15 species). Four species (*Alosa caspia bulgarica, Chalcalburnus chalcoides, Atherina boyeri* and *Gasterosteus aculeatus*) are included in the RDB of Bulgaria as 'threatened'. In the liman of the River

Ropotamo, the families Mugilidae and Atherinidae are the most permanent and numerous. The highest species diversity is found in the lowest zone of the liman, near the sea. From April to September, *Alosa pontica, A. caspia bulgarica* and *Anguilla anguilla* enter the liman but they remain rare species. Arkutino Swamp: Most numerous are *Gasterosteus aculeatus* and *Gambusia holbrooki.* Velyov Vir Maintained Reserve: *Leucaspius delineatus* and *Gasterosteus aculeatus* are included in the RDB of Bulgaria. Alepu Marsh: *Scardinius erythrophthalmus, Carassius gibelio, Cyprinus carpio, Gasterosteus aculeatus, Gambusia holbrooki* and *Perca fluviatilis.* Stomoplo Marsh: *Cyprinus carpio, Tinca tinca, Pseudorasbora parva, Gambusia holbrooki* and *Lepomis gibbosus*. Invertebrates: Amongst the rare, endemic and relict species in the complex are the following: endemic species – *Bulgarica varnensis, Helicella spiruloides, Orcula zilchi, Pelethiphis anoxiae, Paraleptophlebia lacustris, Bembidon rivulare euxinum, Laemostenus cimmerius weiratheri* and *Microlestes apterus*; relict species – *Laura cylindracea* and *Oxychilus urbanskii.*

Table 11. Waterbird populations at the Ropotamo Wetland Complex (1996-2000)

Species	Breeding pairs	Non-breeding individuals
Anas crecca		400-600
Anas querquedula		100-300
Anas strepera	1-3	20-30
Ardea cinerea	15-25	100-180
Ardea purpurea	5-15	30-60
Ardeola ralloides		20-30
Aythya ferina		1,000-5,200
Aythya fuligula		1,000-4,600
Aythya nyroca	1-3	2-7
Botaurus stellaris		5-10
Charadrius alexandrinus		10-20
Charadrius dubius	15-20	20-35
Chlidonias hybrida		30-90
Chlidonias leucopterus		60-80
Chlidonias niger		15-40
Cygnus olor	3	30-170
Egretta alba		20-30
Egretta garzetta	10-15	100-200
Fulica atra		5,365
Haematopus ostralegus		10-40
Ixobrychus minutus	10-15	20-30
Mergus albellus		10-65
Netta rufina		20-48
Nycticorax nycticorax	5-15	50-80
Pelecanus crispus		20-100
Pelecanus onocrotalus		100-500
Phalacrocorax pygmaeus		50-100
Platalea leucorodia		80-135
Plegadis falcinellus		30-100
Podiceps grisegena	1-2	5-10
Porzana parva	10-20	
Porzana porzana	10-15	

Special floristic values: A unique area in terms of national biodiversity. Riverine-type forests are typical for the complex and unique for Europe. 11% of all the species included in the RDB of Bulgaria are recorded in the complex (17 – 'rare', 11 – 'endangered'). Five species are Bulgarian endemics: *Verbascum glanduligerum, Silene frivaldskyana, Opopanax bulgaricum, Pyrus elaeagrifolia* ssp. *bulgarica*, 12 are Balkan endemics, and 22 are relict species. Other species of interest include *Crocus olivieri, Tulipa hageri, Pancratium maritimum, Leucojum aestivum* and *Nymphaea alba.* 39 higher aquatic plant species have been recorded in the wetlands of the complex – about 20% of all known species for Bulgaria. Five species are included in the RDB of Bulgaria, of which three are 'threatened' (*Nuphar lutea, Nymphaea alba, Trapa natans s.l.*) and two are 'rare' (*Wolffia arrhiza, Utricularia australis*). Other key species include *Zostera noltii, Potamogeton acutifolius* and *Artemisia maritima.*

Research facilities: Not available.

Public awareness and education: In 2002, a Nature Conservation and Visitor Centre was built and opened in the vicinity of the complex. It is managed by MoEW.

Criteria for inclusion: 3 and 6.

10. Strandzha Coast Complex

Location: 42°04'N, 27°59'E. Burgas District, Municipality of Tzarevo. The nearest settlements are Sinemoretz village and the town of Achtopol. The area is bordered to the east by the Black Sea; the west by the power line passing along the bridge across the River Veleka and the road to the state border with Turkey; to the north by the border of the Mouth of the River Veleka Protected Area; to the south by the state border with Turkey.

Area: 2,284 ha.

Altitude: 0-20 m above sea level.

Wetland type: A, D, E, F, J, M, P, Tp, Ts, Xf.

Other hydrologically linked wetlands: The Black Sea and catchments of the Rivers Veleka and Silistar.

Description of site: This is a relatively undisturbed area between the Rivers Veleka and Resovska close to the Turkish border. The site includes the lower reaches of two rivers – Veleka and Silistar, which flow into the Black Sea in the southeasternmost part of Bulgaria, together with the shore, adjacent flooded forests, wetlands, grasslands and oak forests. Rocky cliffs and sand beaches with typical vegetation are located along the shore. The river mouths are overgrown with fringing vegetation and reeds and are surrounded by wet and seasonally flooded areas. Flooded forests are found along the River Veleka close to its mouth. The area is rich in different types of habitats, some of which are very specific to the region.

Water quality: There is no detailed information about the water quality; in general, it is good.

Table 12. Waterbird populations at the Strandzha Coast Complex (1996-2000)

Species	Non-breeding individuals (max)
Aythya nyroca	+
Ciconia ciconia	> 33,000
Cygnus olor	20
Egretta alba	3
Fulica atra	530
Gavia arctica	5
Pelecanus crispus	+
Pelecanus onocrotalus	> 500
Phalacrocorax carbo	90
Phalacrocorax pygmaeus	5
Podiceps nigricollis	340

Principal vegetation: The biodiversity of the plant communities is highly dependent on the diversity of habitats represented. Sand beaches and dune vegetation – composed of 32 plant species including *Pancratium maritimum, Silene euxina, Stachys maritima, Calystegia soldanella.* Rocky cliff vegetation – poor vegetation including *Crithmum maritimum, Ficus carica, Limonium gmelinii;* in higher places composed of *Silene compacta, Achillea clypeolata, Geranium sanguineum,* as well as *Laser trilobum* and *Cionura erecta.* Wetland habitats include streams overgrown with flooded forests, lagoons with fringing vegetation, river mouths. Flooded forests are represented by *Salix alba, Populus nigra, Alnus glutinosa, Clematis vitalba,* etc. The water fringe vegetation is dominated by *Phragmites, Juncus, Typha, Carex, Schoenoplectus,* etc. *Nuphar lutea* is typical of the aquatic vegetation.

Conservation measures taken: Two protected areas – Mouth of the River Veleka (1,511 ha) and Silistar (773 ha) – were created in 1992. The area is a part of the Strandzha Nature Park (100,000 ha), created in 1995, which is also an IBA and a CORINE Site. A management plan for the area was prepared in 1996. The site is included in the National Action Plan for the Conservation of the Most Important Wetlands in Bulgaria.

Conservation measures proposed: Restriction of visits in the protected areas during the breeding season and particularly in sand dunes. Implementation of the measures proposed by the management plan for maintaining the natural condition of the wetlands and sustainable use of fish resources. Planning and control of extensive and nature-oriented tourism. Education and training of local people to maintain the traditional and nature-friendly agricultural practices. Detailed study of the biodiversity and monitoring of key species and habitats.

Land use: The main use of the area is for conservation purposes, but forestry, animal breeding, agriculture (production of vegetables), recreation and tourism also occur.

Possible changes of land use: Tourism will become more intensive in the future, and related to this the development of vegetable and livestock production will also increase.

Disturbances and threats: Disturbance caused by the intensification of tourism is the main threat to the fauna, especially the birds. The increase in tourism may also cause pollution and destroy beach and riverine habitats. Overexploitation of fish resources and marine pollution are other threats affecting the site. One potential threat to the River Veleka is a change of water regime due to building activities in the catchment area.

Economic and social values: The area is suitable for development of extensive ecotourism, livestock and growing of vegetables. Fishery and forestry are well developed. The area is lightly populated, with a high average age of the local people. The nearest villages – Sinemoretz and Ahtopol – are used mainly in the summer.

Fauna: 276 vertebrates have been recorded in the area. Mammals: One of the most rare and threatened mammals recorded on the shore is *Monachus monachus.* 14 species of mammals recorded in the area are included in App. II of the Bern Convention. Birds: 195 species breed, migrate through or winter in the area. 137 species are included in App. II of the Bern Convention and three globally threatened species, *Phalacrocorax pygmaeus, Aythya nyroca* and *Pelecanus crispus,* occur regularly in the area during migration or in winter. The site is situated on the main migration route, Via Pontica. The area is an important staging site for herons (*Ardea cinerea, Egretta garzetta*). Large flocks of *Ciconia ciconia* and *Pelecanus onocrotalus* pass through the area during migration. Fish: More than 30 fish species occur, including *Alosa caspia bulgarica, Chalcalburnus chalcoides, Rutilus frisii, Rhodeus sericeus amarus, Cobitis taenia, Alburnoides bipunctatus* and *Syngnathus abaster,* all of which are included in App. II of the Bern Convention. One amphibian and 2 reptile species that occur in the area are also listed in App. II of the Bern Convention. Invertebrates: There have been no detailed

studies of invertebrates. The area is populated by 205 rare insect species, 89 endemics and 1 relict insect species.

Special floristic values: In recent years 556 plant species have been recorded in the area. Many of these are rare, vulnerable and threatened species included in the RDB of Bulgaria, such as *Pancratium maritimum, Stachys maritima, Calystegia soldanella* and *Geranium sanguineum.* Most of these species are typical for sand beaches and grasslands, but some are typical aquatic plants, e.g. *Nuphar lutea.*

Research facilities: The area is not very well studied. A little research has been undertaken on birds and plants.

Public awareness and education: Conservation education is provided by the management body of Strandzha Nature Park.

Criteria for inclusion: 1, 2, 4 and 7.

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GEORGIA

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INTRODUCTION

Georgia is located in the western and central parts of the Caucasus, between 41°07'N-43°35'N and 40°04'E-46°44'E. Georgia is 275 km from north to south and 560 km from west to east, with an overall area of 70,000 km^2. The total length of the country's borders is 1,970 km, and the immediately neighbouring countries are Azerbaijan, Armenia, Russian Federation and Turkey. More distant neighbours include Bulgaria, Romania, Ukraine, Turkmenistan, Kazakhstan, Iran, Iraq and Syria. Georgia lies on the ancient crossroads of Europe and Asia, which is known as the Caucasian Isthmus. According to a recent census, Georgia has a population of 5.74 million. In area, Georgia is the 118th-largest of the world's 200 countries; it is the 21st-largest country in Europe and has Europe's 23rd-largest population – a larger population than developed countries such as Finland, Denmark, Norway, etc. By area, population and physico-geographical conditions, Georgia is very similar to European countries such as Austria and Switzerland.

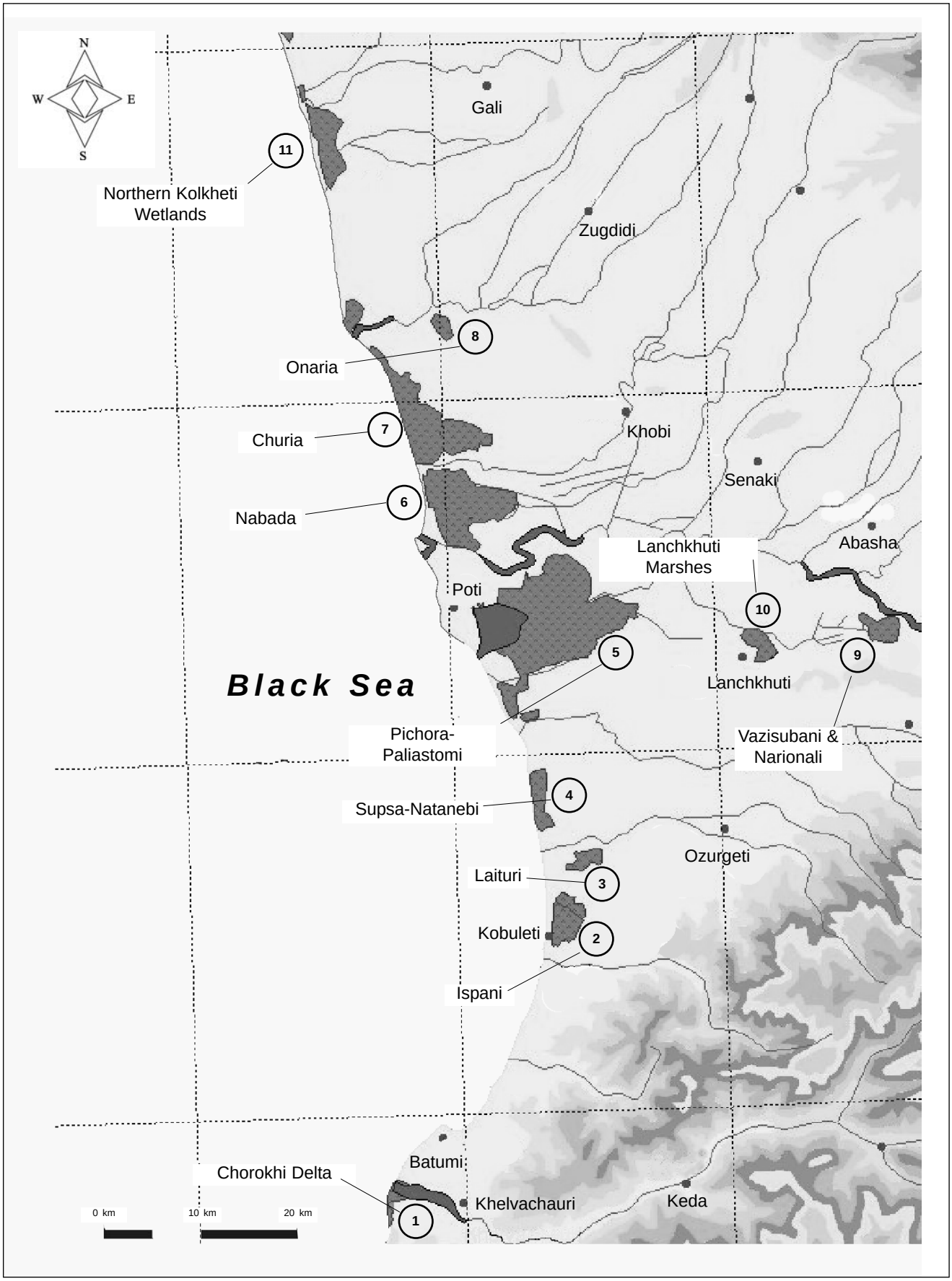
After the foundation of the Soviet Union, two autonomous republics were created – Abkhazia and Ajara – together with one autonomous region (the so-called South Osetia), and 63 administrative areas. Having become independent, the country is now successfully implementing a historical-geographical provincial and administrative system. The provinces are Tbilisi, Abkhazia, Ajaria, Samegrelo, Guria, Svaneti, Racha-Lechkhumi, Imereti, Meskheti, Javakheti, Kartli, Highland of the East Georgia (Khevsureti, Pshavi, Mtiuleti, Khevi, Tusheti), Kakheti.

The state language is Georgian related to the Caucasian languages, particularly Iberian-Caucasian (Kartveli group). The Georgian alphabet is an independent type, genetically related to the variety of the Eastern-Arameian writing. Unlike the Arameian, the Georgia writing is read from the left to the right. The ancient writings date back to 5 century A.D.

At the moment the country witnesses the new stage in the implementation of the President's Project "The Great Silk Road", which is an extremely vital for independence strengthening and economic revival. At this stage particularly important is the international strategic project TRACECA-2000 that is launched to construct the Europe-Caucasus-Asia transport system and to integrate the Caucasian and Central Asian countries into the European structure. The country's favorable geo-political location and intellectual potential will form a basis for the involvement of Georgia in the world's division of labour. The TRACECA Programme will provide Georgia with transport system; other projects on the first terminal constructions are now under way such as the Kulevi Port, Anaklia Port, etc. The TRACECA Project is expanding beyond the framework of 10-12 countries attracting attention of such countries like China and Japan. The Chinese participate in the project Lianungan-Rotterdam. The construction of the TRACECA connecting railway line in China is under completion. It will be connected to the line in Uzbekistan and Kirgizstan. The largest railway transport system Lianungan-Caucasus-Rotterdam is a unique in the world's practice.

Georgia is a mountainous country, with 54% of its area covered by mountains, 33% by foothills and hills, and only 13% by plains. Altitudinally, the land is fairly evenly distributed; the average altitude is 1,230 m. In the north, there are ridges of the Great Caucasus, at a height 4,400-5,000 m (maximum 5,068 m), whereas in the south, the Small Caucasus rise to 2,000-3,300 m only. Between the ridges of the Great and Small Caucasus lies a plateau comprising the wet, subtropical Kolkheti and relatively dry eastern Georgia. The two regions are divided by the small Likhi Ridge, which separates the two climate types.

Climatically Georgia lies at the junction of the subtropical and temperate climate zones. The border between them runs along the Main Caucasian ridge, Cavcasioni. In January the highest temperatures are experienced on the Kolkheti Lowlands and in the adjacent foothills, where the temperature can reach 4-6°C. Particularly



Map 1. The Black Sea coastal wetlands of Georgia (numbers correspond with the numbers in the text and table 1)

warm weather occurs in Batumi, +7.2°C. The mild winters in west Georgia are determined by the proximity of the Black Sea. In east Georgia the winter is colder, the temperature in valleys falls to –1 to +1°C in January. The low temperatures are connected with the more frequent invasion of cold air masses related to the Siberian anti-cyclone. The temperature drops with altitude. The nil-isotherm lies at an altitude of 500-1,000 m, therefore, in January all high altitudes experience temperatures below zero.

Annual average humidity in the Kolkheti Lowland is 80-82% and in eastern Georgia 60%. The distribution of atmospheric precipitation over Georgia is characterised by sharp contrasts: in the west, precipitation is much more intensive than in the east. The 'precipitation pole' is Mt Mtirala, in the suburbs of Batumi, with annual precipitation of 3,500-4,000 mm. In Sukhumi the annual average precipitation is 1,500 mm, and in Batumi itself 2,500-2,700 mm. Generally Georgia may be described as a wet country, as almost half of the country receives more than 1,000 mm of rain per year, however there are dry areas in east Georgia, such as Gardabani and Eldari, where the precipitation is only 375 mm.

Georgia, as a mountainous country, has a distinct layered structure. With rise in altitude the climate, soil-vegetation cover and character and intensity of geo-morphological processes change. Based on the altitudinal layers of relief and bio-geographic zoning the following landscape can be distinguished:

- Kolkheti humid-subtropical valley forest landscape;
- Kolkheti moderate-humid subtropical valley forest landscape;
- Iveri moderate-dry subtropical valley steppe landscape;
- Eldari dry subtropical valley semi-arid landscape;
- Kolkheti humid-moderately warm highland forest landscape;
- Trans-Caucasian moderately humid and warm low-mountainous forest landscape;
- Trans-Caucasian humid and moderately-warm mid-mountainous forest landscape;
- Caucasian humid and cold sub-alpine and alpine landscape.

Georgia is rich in wetlands, in both the lowlands and the highlands (many lakes and other wetlands are located on the Javakheti plateau). The most important wetlands are those situated in the coastal area, which provide natural interaction between the sea and the land in Western Georgia. They play an important buffer role, alleviating the negative impact of agriculture, industry, forestry and urbanisation on the marine environment. The Georgian Black Sea coast stretches for 315 km. The wetland chain starts in the Samurzakano plain in Abkhazia, runs along the Kolkheti Lowland and ends on the southern bank of the River Chorokhi, in the Kakhabery lowland, Ajara.

The Kolkheti Lowland is bordered to the north and south by the hilly foothills of the Great and Small Caucasus. Together with the Likhi Ridge, which connects them, they form a gigantic mountainous amphitheatre, open in the west to the Black Sea and playing an important role in climate formation in Georgia. In the west, the eastern coast of the Black Sea abuts the Kolkheti Lowland.

The Kolkheti alluvial plain is formed by late Quaternary (continental and marine) sediments. It is a lowland created by river, marine and lake-marsh accretion under conditions of constant immersion and fluctuations of the erosive Black Sea shore and arrival from the Great Caucasus and Meskheti Ridges of deposition material. The modern relief of the Kolkheti Lowland reflects to a great extent the dynamic balance of the geo-morphological processes – on the one hand, immersion, on the other, accretion of the deposits washed down from the mountains. Two bore-holes drilled in the coastal area of Kolkheti to a depth of 62-65 m exposed a peat layer dated at 31,000 years old by radio-carbon analysis. As peat is formed on the surface, its presence at a depth of 60 m and more gives an immersion speed of *c*. 2 mm/year.

Large-scale atmospheric circulation, which forms the climate of the Georgian Black Sea coast, is mainly determined by its location with respect to the main centres of air-mass formation – the Mediterranean Sea (humid air masses), European landmass and various parts of Asia (dry continental air). All circulation processes and weather conditions connected with them can be divided into four types: western, eastern, anti-cyclone state and wave disturbances from the south.

The occasional intrusion of humid, unstable masses from the west, at any time of year, the low altitude of the area and the character of the underlying surface (swampy soils, abundant vegetation and dense river network) favour the humid sub-tropical climate with mild warm winters and hot summers. The annual average tempera-

Table. 1. Overview of the coastal wetlands of Georgia

No	Site	District	Area (ha)	Status	Protected area (ha)
1	Chorokhi Delta	Ajara	200	National	No
2	Ispani:	Ajara	1,900		
	– Ispani I		(830)	National	No
	– Ispani II		(640)	Ramsar	640
	– Ispani III		(430)	National	No
3	Laituri	Guria	100	National	No
4	Supsa-Natanebi	Guria	1,500	National	No
5	Pichora-Paliastomi	Guria-Samegrelo	49,000	Ramsar *	23,210 **
6	Nabada	Samegrelo	14,400	Ramsar *	6,150
7	Churia	Samegrelo	9,000	Ramsar *	4,223
8	Onaria	Samegrelo	225	National	No
	Tsivi-Tekhuri	Samegrelo	805	National	220 **
	Abasha-Tskhenistskali	Samegrelo-Imereti	750	National	130 **
9	Vazisubani	Imereti	244	National	No
	Narionali	Imereti-Guria	332	National	185 **
10	Lanchkhuti Marshes:	Guria	500	National	No
	– Kveshenati		(100)		
	– Morchkhili		(150)		
	– Chvintisgeli		(140)		
	– Jinistba		(110)		
11	Northern Kolkheti Wetlands:	Abkhazia	17,030	National	No
	– Nakargali		(2,100)		
	– Pichora-Kvishoni		(1,410)		
	– Gagida		(11,700)		
	– Meore-Gudava		(150)		
	– Jakobi		(1,670)		
		Total:	**95,986**		**34,758 (36%)**

*Notes: * – Tree sites (Pichora-Paliostomi, Nabada and Churia) are parts of one Ramsar site.*
*** – Part of the Kolkheti National Park territory.*

ture is 13-15°C, in summer (June-August) 22-24°C, January temperatures vary within 3-6°C. The maximum temperature is 15-20°C. The absolute minimum temperature is –10 to –15 °C, the variations depending on relief form rather than on distance from the sea (Gogishvili, 1974).

The maximum annual precipitation is 2,700 mm, minimum 1,300 mm, with the minimum rainfall in May and maximum in October-November. In winter, precipitation is long-lasting; in summer, it is accompanied by thunder. The precipitation and air humidity regime in the coastal parts of the Kakhabery and Kolkheti Lowlands can be characterised in the following way:

- average number of rainy and snowy days: 173; annual precipitation 1,610-2,350 mm, with maximum in June-November;
- precipitation in years of high precipitation: 2,200-2,700 mm; in years of low preciptiation: 1,300-1,900 mm;
- annual average evaporation 950 mm; total evaporation in high water year 1,100 mm; in low water year 650 mm.

Thundercloud intensity for the coast is 95-110 hours annually (The climate of Georgia, 1971. Weather forecast, 1983).

The Kolkheti Lowland is sinking at a speed of *c.* 2 mm/year (2 m in 1,000 years). This speed is typical for the area of the Rioni Mouth and Lake Paliastomi. It is believed that at the River Pichora, where the submergence axis lies, the speed is higher. At present there is a distinct process of land submergence and sea level rise; the speed of both these processes is increasing sharply due to anthropogenic factors. Today the submersion speed of the coastal area in the Khobi River mouth is 2-3 mm per year; however there is a danger that after the new oil terminal (see Site 6, Nabada, below) is in operation this rate will increase dramatically. This could be caused by the weight of the terminal: the weakly connected deposits with their admixture of peat will start to consolidate

intensively. Such a phenomenon is taking place in Poti, where, unlike anywhere else on the Kolkheti Lowland, the land is sinking at a record speed of 6.0-6.5 mm per year (Janelidze, 1989).

The Kolkheti Lowland is a young formation. The marshes were created by intensive overgrowing of waterbodies: during the Holocene marine transgression, when the climate was humid sub-tropical, the waterbodies accumulated abundant phyto-mass. Decomposition of this mass during periods of excessive humidity was very slow. As a result, peat bogs were formed, which are estimated to be 6,000-7,000 years old, based on radiocarbon analysis (Djanelidze 1980). The peat formation and bog creation continues today: it can be observed in Lakes Imnati, Partotskali, Bebesiri, etc.

The coastal wetlands occupy over 160 km. They are at their widest where they are crossed by the Rivers Rioni and Pichora. The width of the waterlogged zone along the River Pichora is 35 km, whereas in the Abkhazian part of the lowland it does not exceed 9-10 km. The climate in the area between Sukhumi and Batumi is a combination of moderately humid and humid sub-tropical. Masses of wet air come in from the Black Sea, and the Great Caucasian Ridge protects the Kolkheti from the cold arctic air from the north.

The Kolkheti Lowland has a branched river network, the rivers varying in their morphology and feeding and catchment capacities. Over 150 large and small rivers with their numerous tributaries discharge into the Black Sea in West Georgia. The rivers are extremely important for the Kolkheti wetlands, especially the large rivers such as the Galidzga, Inguri, Tikori, Churia, Rioni, Pichora, Khobi, Natanebi, Supsa, Chorokhi.

Some 40 lakes are located in Kolkheti, the largest being Lake Paliastomi (1,820 ha); there are also lagoons, estuaries and lakes among the dunes and former river-beds. On the Kolkheti Lowland and where it rises to become foothills are seven storage ponds with the total area 10,000 and 12 fish farms with a total area of 1,500 ha. On the coast in Kobuleti, between the mouths of the Rivers Supsa, Rioni, Khobi and Inguri, lie peat bogs. The Imnati, Tskhoustskali, Nabada and Churia peat bogs have depth of 11-12 m and have an important function as natural filters, which prevent both the flow of nutrients and other agricultural pollutants to the sea and the intrusion of sea water into fresh water and agricultural land. Alluvial wetlands and peat lands are widely distributed in the Kolkheti grass and woodland marshes. The vast territory of the coastal part of Kolkheti is dominated by aquatic and marsh vegetation. The region has wide geo-biocoenosis diversity. It supports a number of relict, endemic and adventive species.

The Kolkheti Lowland is an important refuge for a wide range of fauna, especially for migratory waterbirds and raptors, mammals, reptiles and amphibians, fish and invertebrates. Over 80 fish species occur here, including five sturgeon species (beluga, sevryuga, spine, Kolkheti sturgeon, Atlantic sturgeon), Black Sea salmon, brook trout, eel, mullets, sander, vegetarian fish of the Chinese complex, etc. An important indicator of the environmental health of the wetlands is the presence of Colchian crayfish *Astacus colchicus* and Colchian river-crab *Eriocheir colchicus.* Important routes for migratory birds from the northern countries and Arctic cross the area. The coastal wetlands of Georgia serve the migrants as 'filling stations'.

Despite their important role, most of the Kolkheti wetlands, apart from the lowest-lying areas described above, have been drained. Over 70,000 ha have been reclaimed for agriculture and urbanisation. The main causes of wetland degradation are drainage, deforestation, peat extraction and over-fishing.

General Description of Coastal Wetlands

Georgian coastal wetlands are often considered as a single complex, however they may be split into three main areas, which can be further sub-divided into a total of 23 wetlands with different degrees of saturation and corresponding habitats. Eleven wetlands are of international or national importance and described in this report.

1. **Southern Kolkheti wetlands** occupy the area between the River Natanebi and the end of the southern bank of the River Chorokhi, including the estuary and mouth. They include Chorokhi Delta (1), Ispani (2) and Laituri (3).
2. **Central Kolkheti wetlands**, between the Rivers Inguri and Natanebi, stretch in the east from the sea to the town of Samtredia. They include Supsa-Natanebi (4), Pichora-Paliastomi (5), Nabada (6), Churia (7), Onaria (8), Narionali and Vazisubani (9) and the Lanchkhuti Marshes (Kveshenati, Morchkhili, Chvintisgeli, Jinistba) (10).
3. **Northern Kolkheti wetlands** (11) include the area from the River Galidzga to the River Inguri and from the

coast to the Ochamchiri-Zugdidi motorway.

According to Jaoshvili, Ukleba and Gigineishvili (monograph 'Kolkheti Lowland', 1990), the total wetland area is 220,000 ha, i.e. 22.5% of the total area of the Kolkheti Lowlands or 3.2% of the whole area of Georgia. To this can be added the 2,100 ha of wetlands located in the valley of the River Chorokhi in the Kakhabery lowland. The majority of this area (*c*. 1,960 ha) has been drained and cultivated, including a 1,093 ha area of agricultural lands.

The most important sites in the central part of the Kolkheti Lowland are Churia, Nabada and Pichora-Paliastomi mires (total area *c.* 72,400 ha). The lowest-lying parts of the most waterlogged sites, from Chorokhi to Ochamchiri, are bordered by the Black Sea. The lowland is a plain, the rivers falling very little, thus the natural drainage is very slow and wetland formation is rather active. An important factor in the formation of the coastal wetlands is the low gradient of the land.

In 1992, WWF-Georgia identified the Kolkheti and Kobuleti wetlands as one of seven potential National Parks in Georgia. In 1994, with the support of the World Bank Integrated Coastal Zone Management Program (ICZM), the Kolkheti National Park Management Project was developed. In 1996, a framework law on the establishment of the National Parks System became effective, which meant that the Kolkheti National Park could finally be established. The law requires formulation of a separate law covering administrative and other issues for each National Park. The Law 'Establishment and Management of the Kolkheti Protected Areas' was adopted by Parliament in December 1998. The central Kolkheti areas of Pichora-Paliastomi, Nabada and Churia, together with the Kobuleti wetlands (Ispani II, sphagnum bog) – a total area of 34,223 ha – were designated as Ramsar sites on 7 June 1997.

The Kolkheti National Park (or the 'National Park of the Kolkheti Lowlands') lies on the Black Sea coast, bordered to the south by the River Supsa and a band of the Guria Foothills, to the north by the Inguri River gorge, and to the west by the coast of the Black Sea. The National Park stretches for 18-28 km inland to the east. Together with the marine biosphere reserve (8 km wide), it covers an area of *c*. 54,773 ha. Due to the severely limited drainage of the surface waters, the low filtration capacity of soils and heavy precipitation, over the past 6,000 years a significant area of the park has experienced intensive waterlogging. Within the park, the continuous peat horizon in the Imnati, Shavtskala, Nabada and Churia marshes rises to a height of 6-12 m. These peat bogs represent natural filtering systems that absorb large quantities of water, purify it and return it to the rivers and Lake Paliastomi. There are highland, lowland and transitional swamps in the National Park.

Kobuleti Protected Area covers 770 ha; it is located on the Black Sea coast near the town of Kobuleti. It also has Ramsar status and forms part of the Kolkheti wetlands complex. At present the majority of the area included in the National Park comprises undamaged wetlands, which are not used for agriculture, however most of the areas lying on the edge of the park suffer human impact.

Occurrence of Threatened Taxa in Key Sites

The table 2 lists the relict, rare and endangered species of flora and fauna occurring in the key sites in the Kolkheti and Kakhaberi wetlands and requiring special conservation measures through the protection of typical biotopes, allocation of protected areas within the habitat, special attention within the national park and/or reserve, and the implementaion of public education and awareness measures, etc.

For the taxa listed in table the information of their presence in the Red Data Book (RDB) of Georgia and the 2000 IUCN Red List of Threatened Species is given. This list may not be comprehensive for individval sites as they are dependent upon data availbility.

The species, included in the RDB of Georgia are divided into such categories: RDB category I – disappearing species and/or species surviving in inaccessible areas; RDB category II – endangered species; RDB category III – rare species.

Wetland Research

Table 2. Occurrence of threatened taxa in key sites

Scientific name	IUCN Red List	Georgian RDB	Site										
			1	2	3	4	5	6	7	8	9	10	11
Mammals													
Delphinus delphis	NE		√			√	√	√	√				√
Felis lynx orientalis	NE	II		√	√	√			√				
Lutra lutra	VU A2cde	II					√	√	√				
Microtus majori	NE						√	√	√				
Miniopterus schreibersi	LR/nt	III	√	√									
Myotis bechsteini	VU A2c	III	√				√	√	√			√	
Nyctalus leisleri	LR/nt	III					√	√	√				√
Phocoena phocoena	VU A1c, C1+2b		√				√	√	√				√
Rhinolophus mehelyi	VU A2c	III					√	√	√			√	
Sorex raddei	NE	III					√	√	√				
Tursiops truncatus	DD		√				√	√	√				√
Ursus arctos	EX						√	√	√				√
Birds													
Anser erythropus	VU A1acd +2bcd						√				√		
Ciconia nigra	NE	I	√	√			√				√		
Crex crex	VU A2c		√	√			√				√		
Cygnus cygnus	NE	III	√	√			√	√	√				
Egretta alba	NE	III	√	√		√	√	√	√				
Egretta garzetta	NE	III	√	√		√	√	√	√				
Falco peregrinus	NE	II	√				√	√					
Grus grus	NE	II											
Haliaeetus albicilla	LR/nt	I					√						
Pandion haliaetus	NE	II					√						
Pelecanus crispus	LR/cd						√						
Phalacrocorax pygmaeus	LR/nt						√						
Reptiles													
Elaphe longissima	NE	III	√	√			√	√					
Natrix megalocephala	VU A1d +C1		√	√			√	√	√				
Amphibians													
Mertensiella caucasica	VU B1+2c	II	√	√									√
Pelodytes caucasicus	DD	II	√	√	√		√				√		
Triturus vittatus	NE	II	√	√		√	√						
Fish													
Acipenser queldenstadtii	EN A2d		√			√	√	√	√				
Acipenser nudiventris	EN Aacde +2d		√				√			√			
Acipenser stellatus	EN A2d		√	√			√	√					√
Acipenser sturio	CR A2d	I					√	√	√				√
Alosa caspia palaeostomi	NE						√	√					
Anguilla anguilla	NE		√	√				√	√				√
Callionymus festivus	NE		√					√	√				√
Callionymus lyra	NE		√					√	√				
Huso huso	EN A1acde +2d		√					√	√				√
Morone labrax	NE		√				√						√

Continuation of Table 2

Scientific name	IUCN Red List	Georgian RDB	Site										
			1	2	3	4	5	6	7	8	9	10	11
Proterorhinus marmoratus	NE		√					√	√				√
Salmo trutta labrax	NE		√	√									√
Sparus auratus	NE		√					√	√				√
Stizostedion lucioperca	NE						√	√					√
Plants													
Asparagus littoralis						√	√	√	√				
Carex lasiocarpa			√	√			√	√	√		√		
Cladium mariscus							√	√	√				
Drosera rotundifolia		III	√	√			√	√					
Glaucium flavum			√	√	√		√	√					
Hibiscus ponticus						√	√						
Iris pseudacorus			√	√	√	√	√	√	√	√	√		
Kosteletzkya pentacarpa						√							
Lycopodium inundatum			√	√			√						
Molinia littoralis		III	√	√			√	√	√				
Nuphar lutea		III	√	√			√						
Nymphaea colchica		III	√	√			√	√					
Osmunda regalis		III		√			√		√				
Pancratium maritium		III				√		√	√				
Pterocarya pterocarpa		III					√	√	√				
Quercus imeretina		III	√				√	√	√				
Rhododendron luteum			√	√			√						
Rhododendron ponticum			√	√			√						
Ruscus colchicus			√					√	√				
Salvinia natans							√	√					
Trapa colchica		III	√	√			√	√			√		
Trapa maleevii		III	√										

The Kolkheti wetlands have long attracted the attention of researchers, and more than 100 scientific studies have been published. Of these, the most significant are 'The Black Sea Wetlands and Their Agricultural Development' (Vasilevsky 1918); 'Study of Peat Bogs in the Trans Caucasus' (Dokturovsky 1936); 'Kolkheti Lowlands' (Georgian Academy of Sciences 1990); and 'Kolkheti Wetlands Conservation and Management Policy and Strategy' (R. Goradze, I. Goradze & van Maanen 2000).

New ecosystem research on the Georgian wetlands, aimed at their conservation, management and sustainable use, began in the Black Sea Ecology and Fisheries Institute, Black Sea Biodiversity Activity Centre, in early 1998 under the TACIS Black Sea Biodiversity Conservation Programme, with technical and scientific assistance from the Halcrow Group Ltd. Until recently, wetland monitoring has not been carried out in Georgia, but the first steps are now being taken.

Legislative Framework

The following environmental laws have been adopted in Georgia: The Soil Protection Law, 1994; Law on Protection of Plants from Pest Organisms, 1994; Tourism and Resorts Law, 1997; Law on Transit, Carriage and Import of Wastes in Georgia, 1995; Law on Environment Protection, 1996; Law on Minerals, 1996; Law on

Fauna, 1996; Law on the Protected Territory System, 1996; Law on Environmental Permissions, 1996; Law on State Ecological Expertise, 1996; Water Law, 1997; Law on Atmospheric Air, 1997; Law on Establishment and Management of Kolkheti Protected Areas, 1999.

The Republic of Georgia is actively moving towards ratification of international conventions related to environmental protection, among which the most important are: CLC (Civil Liability Convention), 1969 (year of ratification); Ramsar Convention, 1997; Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1993; MARPOL – International Convention for the Prevention of Pollution in the Sea, 1993; UN Convention to Combat Desertification, 1984; Convention on Biological Diversity, 1992; Bucharest Convention on Protection of the Black Sea against Pollution, 1993; Odessa Ministerial Declaration on the Protection of the Black Sea, 1993; Bonn Convention, 1997.

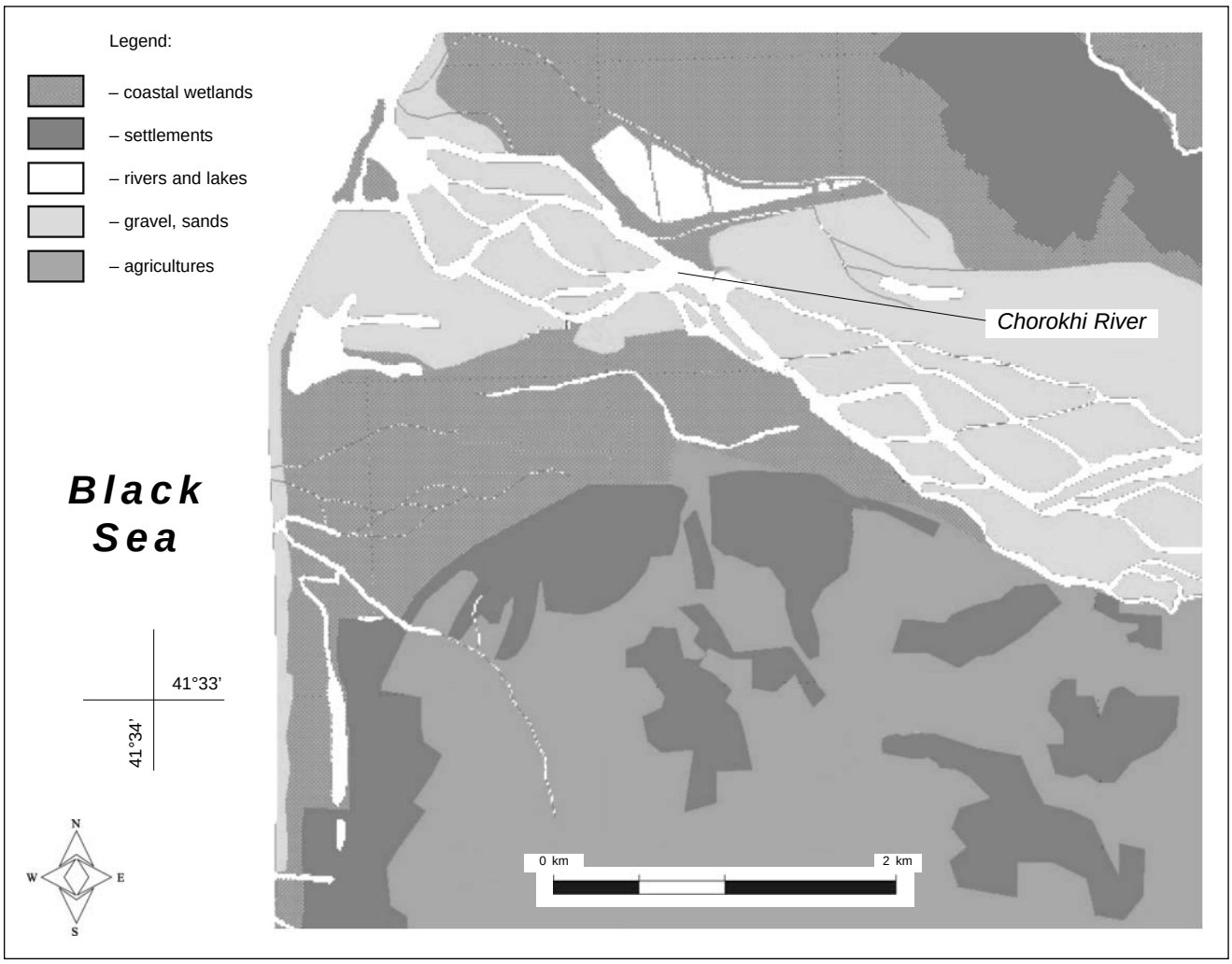
Organisations Involved in Wetlands Study and Conservation

- The Black Sea Fisheries and Ecology Institute, Regional Centre for Black Sea Diversity Protection. The Georgian wetlands team studies wetlands ecosystem, biodiversity, conservation strategy and policy development, development of sustainable-use principles, environmental education and public participation.
- Ministry of Environment and Natural Resources. The ICZM Centre established at the Ministry deals with the development of the ICZM Plan for Georgia and Management Plan for Protected Areas of Kolkhida. Zenith Gamma Consulting, attached to the Ministry of Environment in Tbilisi, deals with preliminary environmental assessment (Nabada is one of the largest protected areas of the Kolkheti wetlands) for the new oil terminal in the area of the Khobi River mouth (Terminal-2000 Project).
- Georgian Academy of Sciences (including Institute of Botany and Institute of Zoology) – establishment of protected areas in Georgia and management implementation.
- WWF-Georgia branch – development of the Management Plan for the Kolkheti National Park and Kobuleti Reserves.
- Vakhushti Bagrationi Institute of Geography, Georgian Academy of Sciences, has prepared the main materials for the creation of the System-Geographic Centre for the Conservation of Wildlife – conservation of rare birds and animals, use of satellite survey with small radio receivers tagging of species, for example a bird *Gypaetus barbatus*.
- NACRES – protection of rare and endangered species.
- NGO 'Small Academia' – environmental education.
- Black Sea Eco-Academy – environmental education.
- The Tbilisi map production plant has begun to produce the System-Geographic Atlas of the Kolkheti Lowlands.

SITE ACCOUNTS

1. Chorokhi Delta

Location: The site is located on both banks of the Chorokhi Delta, starting from the coastal dunes and stretching to the settlement of Gonio on the left bank and the settlement of Angisa on the right bank, 5 km from Batumi.
Area: *c*. 150-200 ha.
Altitude: –0.5 to 6 m above sea level.
Wetland type: F, E, K, L, M, N, R, Y, 1, 4, 9.
Other hydrologically linked wetlands: The formation of the wetlands is closely linked to the fast-flowing River Chorokhi, which runs through the middle; in the west they are bordered by the sea. Most of the wetlands have been reclaimed for agricultural development.
Description of site: The wetlands of the Chorokhi Delta are mostly degraded as result of anthropogenic impact, however some fragments remain intact. The site comprises the wide Chorokhi Delta: the estuary; the low-lying, undulating plain on both sides of the river, which is seasonally flooded by both salt and fresh water; small lakes and ponds; freshwater springs; grass and shrub marshes dominated by rush-reedmace thickets; artificial fish ponds (35 ha) and canals. The wetlands range from 0.5 km to 2 km in width.
Principal vegetation: *Typhetum, Juncetum, Hippophaeta*, secondary meadows.



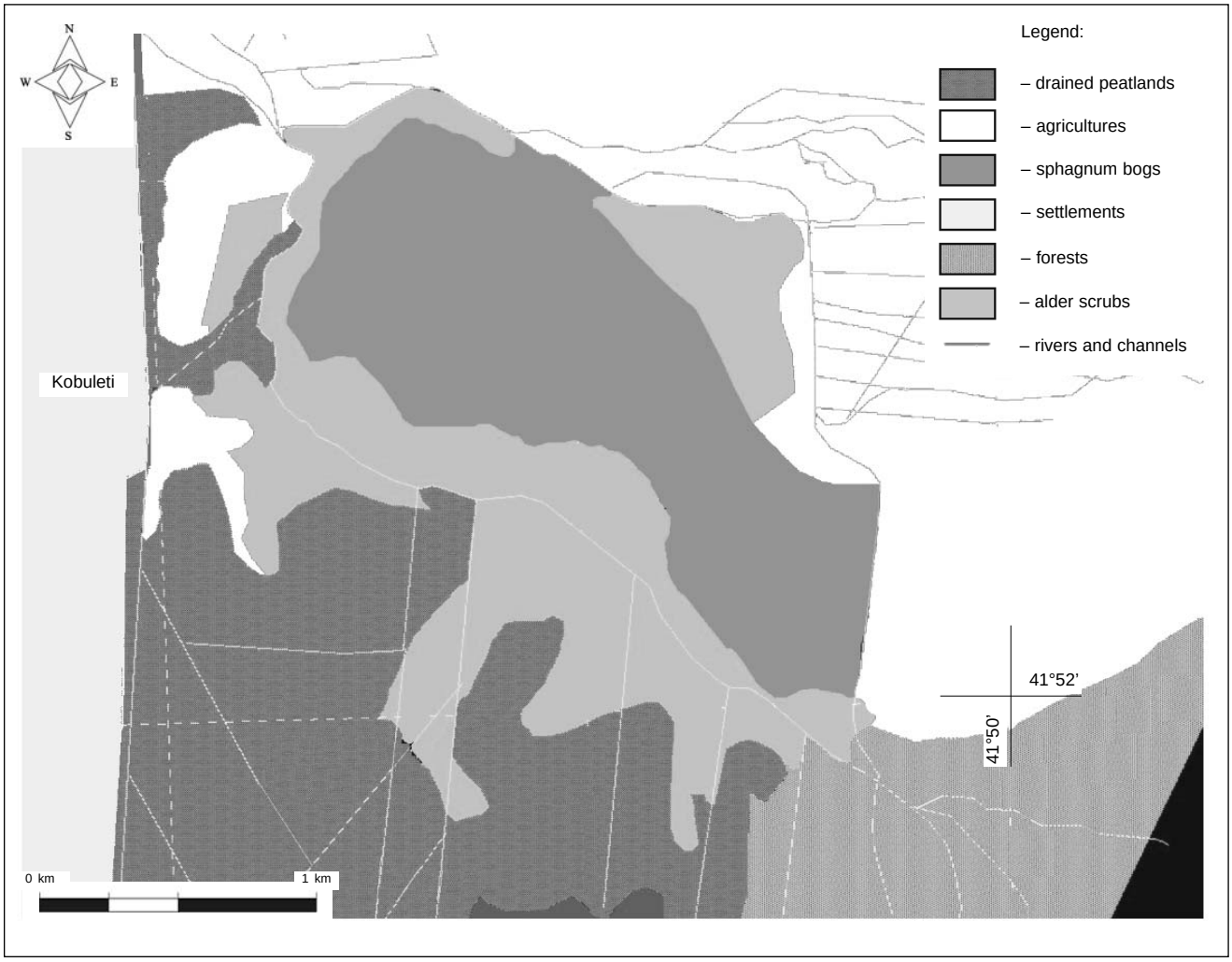
Map 2. The Chorokhi Delta (Wetlands of Kakhabery Lowland)

Land tenure: State owned, partly co-operative ownership.
Conservation measures taken: None.
Conservation measures proposed: Creation of protected area (about 100 ha) – the Chorokhi Reserve.
Land use: The reservoirs have been used for fish breeding and fishing; hunting; farming – maize growing, pasturing; extraction of construction materials; military firing range; city waste tips; airport development
Possible changes in land use: There are plans for significant development of the airport in the area. Fishpond rehabilitation, creation of fish farms, separate trade terminal development and further urbanisation plans.
Disturbances and threats: Wetland drainage and land reclamation for urbanisation, airport construction and agricultural development.
Economic and social values: Fish culture and fishing, pasturing, hunting, berry-gathering (sea-buckthorn), hay-making, collection of medicinal plants. The site is very important for waterfowl and migratory birds. It supports rare Colchic relict plants, medicinal plants, endemic amphibians and reptilies. The abandoned pond complex could be turned into a recreation park.
Fauna: Mammals: *Meles meles, Mustela nivalis, Canis aureus,* many small mammals – rodents, moles and Chiroptera. Birds: 30 wintering species have been recorded within the site including *Gavia stellata, G. arctica, Podiceps grisegena, P. nigricollis, Egretta garzetta, Anas platyrhynchos, A. clypeata, A. crecca* and *A. querquedula*; 39 breeding species including *Ixobrychus minutus, Botaurus stellaris* and *Alcedo atthis*; 50 migratory species including *Ardea purpurea, Anser albifrons, Glareola nordmanni* and *Numenius arquata*; 30 vagrant species, including *Ardeola ralloides, Anser anser, Charadrius alexandrinus* and *Himantopus himantopus.* Amphibians and Reptiles: *Hyla arborea, Elaphe longissima, Rana ridibunda, Lacerta rudis, Triturus vulgaris, Natrix natrix* and *N. tessellata.*
Special floristic values: *Marsilea quadrifolia, Trapa colchica, Phragmites australis, Potamogeton natans,*

Lemna minor, Typha angustifolia, Hippophae rhamnoides, Ficus carica, Tamarix tetrandra, Alisma plantago, Betonica officinalis, Galega officinalis, Juncus compressus, etc.
Research facilities: Since 1998, the Regional Biodiversity Activity Centre, Black Sea Ecology and Fisheries Institute, funded by TACIS and in co-operation with scientists from Halcrow, ICWS (International Centre for Water Studies in the Netherlands) has been carrying out wetland research in the Chorokhi Delta and developing measures for their protection and sustainable use

2. Ispani Mires

Location: 41°47'49"N, 41°50'33"E. Ispani Mires are located in the southernmost part of the Kolkheti plain, in the Autonomous Republic of Ajara, between Kobuleti to the west and Ochkhamuri to the east. In the south they are bordered by the Samtredia-Batumi railway line, in the north by Laituri Marsh and in the northwest by the River Choloki. Ispani Mires are the lowest-lying part of the Kolkheti wetlands.
Area: 1,900 ha.
Altitude: 1-8 m above sea level.
Wetland type: U – 46%, Xp – 22%, N – 11%, 4 – 22%, 9 – 9%.
Other hydrologically linked wetlands: Ispani mires are located 400-500 m from the coast and to the north and northwest are bordered by Laituri Marsh and the River Choloki, which plays an important role in marsh formation.
Description of site: Ispani comprises three different sites: Ispani I, Ispani II and Ispani III. (Note: Ispani III is an unofficial name for the northwestern part of Ispani wetlands, to distinguish it from Ispani I and II within this document.) Ispani I has mostly been drained and developed for industry; Ispani II has a relief of *Sphagnum* domes. The boundary between them runs from the mouth of the Rivers Shavi Gele and Togoni east along the River Togoni. Ispani II has an area of 640 ha. It is an ombrotrophic bog; partial drainage has resulted in slight degradation of the western and eastern areas. The southern and eastern parts of Ispani II are edged by *Sphagnum-Alnus barbata* habitats on which *Sphagnum* domes with a height of 60-100 cm occur, which is quite rare – not only for Georgian wetlands. The domes are formed mainly of *S. imbricatum* and *S. papilosum.* The surface geology and geomorphology are dominated by raised peat bogs, however other deposits include clay-bearing silts derived from swamps and lake detritus. 9-14 m of peat overlies organic lake and river deposits, where the deeper layers were laid down 4,480 years ago. Ispani III is distinguished from Ispani II by its low-lying, severely drained relief and dominant rush vegetation cover (*Juncus* sp.). The northern part of Ispani III is drained and mainly reclaimed for orchards, maize fields and kitchen gardens.
Climate: Ispani lies in the marine humid sub-tropical region of western Georgia. The absolute humidity of the air is 13.9% and relative humidity 81%. The total annual precipitation averages 1,700-2,500 mm. The average temperature is 14-15°C; minimum –2°C, maximum 41°C. Heavy rain plays an important role in the waterlogging process. The monthly rainfall is very high in Kolkheti: in Poti it reaches 553 mm in June, in Natanebi 621 mm in October. However the highest monthly rainfall is recorded for the Ajarian coast. In Chakvi, 5 km from Kobuleti (Ispani), it amounts to 690 mm (September), 724 mm in October and 609 mm in November. The heavy rain was one of the factors in the formation of ombrogenous peat bogs in Kolkheti.
Principal vegetation: *Sphagnum* bogs, *Alnetum, Juncetum*, *Caricetum*.
Land tenure: State-owned, excluding some parts used temporarily by private owners.
Conservation measures taken: Almost none, apart from the fact that the land is state-owned and is not in permanent use.
Conservation measures proposed: This site will be included within the proposed Kobuleti Reserve.
Land use: Activities occur mainly in Ispani I, which supports agriculture, pasturing, tea plantations, forestry, fish ponds and some urban development.
Possible changes in land use: Expansion of urban development, airport construction, cattle farms and reclamation of wetlands for agricultural development.
Disturbances and threats: The main threats are wetland drainage, agricultural and urban development, intensive grazing and peat mining.
Economic and social values: Ecotourism, pasturing, hunting, hay-making, logging, fisheries, gathering of medicinal plants, peat mining, presence of valuable ombrogenous peat, importance for scientific research (Dutch and German scientists are working here). There is a Bronze Age settlement within the site, and interesting findings have been made under the thick peat layer. Kobuleti Reserve is being established at the site. Coastal resorts are important for health and recreation.
Fauna: Mammals: The site supports species such as *Lutra lutra;* an abundance of *Meles meles, Martes foina,*



Map 3. Ispani Mires

Mustela nivalis, Myocastor coypus, many jackals; in winter *Vulpes vulpes* and *Felis silvestris* occur. Small mammals are quite abundant. Birds: All three sites are important for migrant waterbirds, such as *Anas strepera, Anser anser, Melanitta fusca* and *Netta rufina,* as well as breeding species such as *Accipiter nisus, Ardea cinerea, Circus aeruginosus, Egretta garzetta, Gallinago gallinago, Lymnocryptes minimus* and *Scolopax rusticola.* The *Sphagnum* bogs serve as a good refuge for roosting and foraging migrant birds, as hunters avoid entering these places in order not to be sucked in the deep, water-filled, grass-covered holes. Such holes are abundant at all three sites, particularly at Ispani II. Reptiles and amphibians: Fairly abundant; 2 newt species are noteworthy: *Triturus vulgaris* and *T. cristatus.* Fish: *Silurus glanis, Leuciscus cephalus* and *Cyprinus carpio.* The various habitats support quite large numbers of invertebrates.

Special floristic values: *Castanea sativa, Drosera rotundifolia, Molinia littoralis, Lycopodium inundatum, Osmunda regalis, Pinus pinaster, Nuphar lutea, Nymphaea colchica, Rhamphicarpa medwedewii, Solidago turfosa, Rhododendron ponticum, R. luteum.*

Research facilities: Since 1998, the Regional Biodiversity Activity Centre, in co-operation with scientists from Halcrow, ICWS and the Institute of Botany in Greysfald (Germany), has been carrying out ecosystem, floristic and faunal research in Ispani, as well as conducting a special study of the peat and its genesis. The Kobuleti Reserve is in the process of being established.

Criteria for inclusion: 1, 2, 3 and 4.

3. Laituri

Location: The site is located in the Kobuleti area in the basin of the River Sharistskali – a right tributary of the River Choloki.
Area: 100 ha.
Altitude: 5-15 m above sea level.
Wetland type: Ts, W, Xp, 4, 9.
Other hydrologically linked wetlands: The site is connected to the River Choloki through the River Sharistskali; in the south it is bordered by the Kobuleti marshes.
Description of site: Seasonal intermittent freshwater marshes, pools, grassy, grass-bush and woodland marshes, seasonal agricultural fields and drained degraded areas. Water volume: 1.6 million m^3.
Principal vegetation: *Juncetum-Caricetum,* Alder, secondary meadow.
Land tenure: State-owned, co-operative and temporary private ownership.
Conservation measures taken: Almost none to date; the state-owned area is partly protected.
Conservation measures proposed: None to date.
Land use: Open ponds are used for fishing and fish culture, land for agriculture – maize, sorghum; kitchen gardens, orchards, pasturing; building.
Possible changes in land use: Wetland drainage and reclamation for agricultural development.
Disturbances and threats: Massive drainage and wetland reclamation for agricultural development and housing construction.
Economic and social values: Pasturing, hay-making, freshwater reserves, fisheries, hunting, importance for waterfowl, migratory and breeding birds, gathering of berries and medicinal plants, etc.
Fauna: Similar to Ispani; the sites are linked.
Special floristic value: *Smilax excelsa, Alnus barbata, Typha angustifolia, Iris pseudacorus, Salix caprea, Carpinus caucasica, Duchesnea indica.*
Research facilities: The first steps are now being taken.

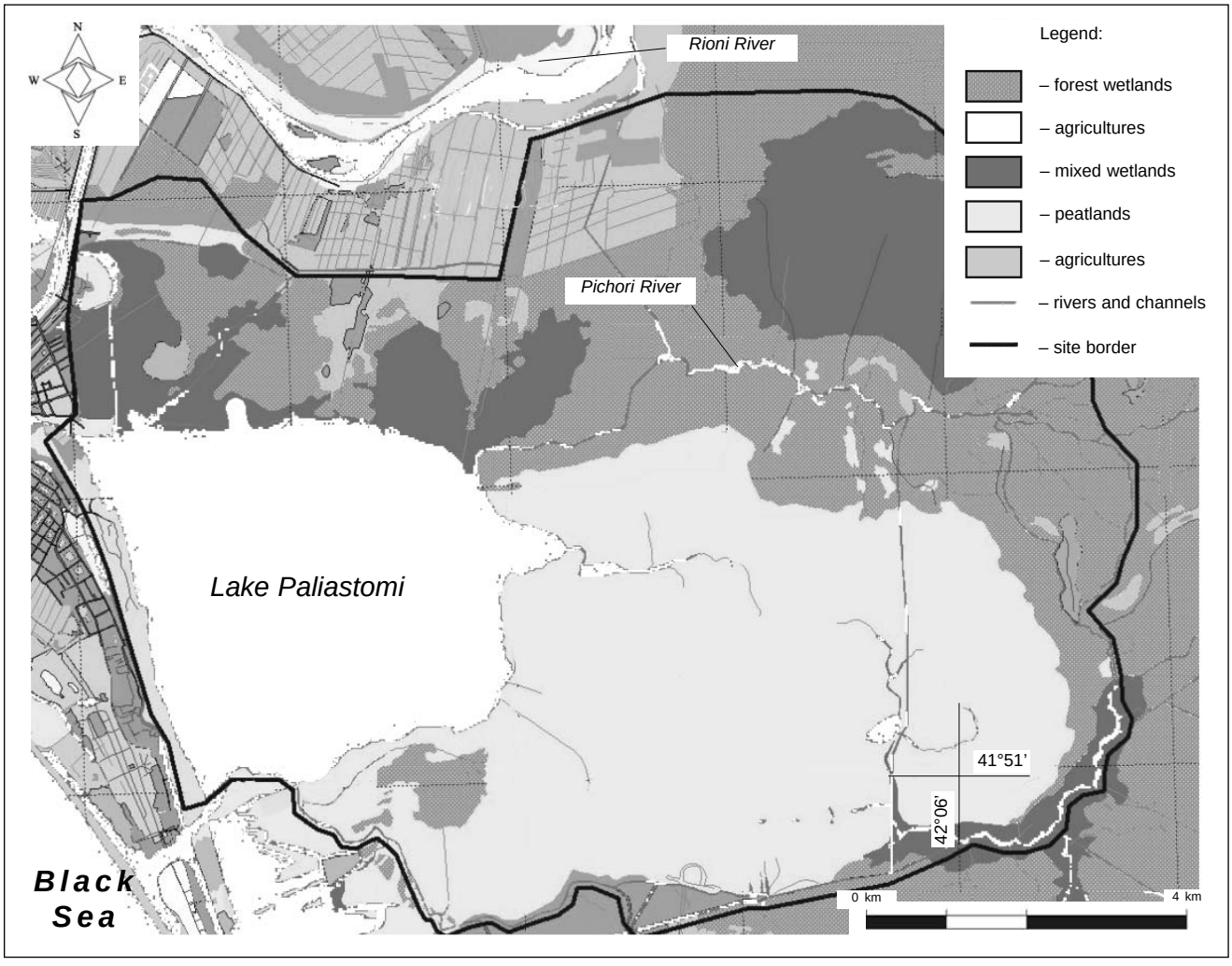
4. Supsa-Natanebi

Location: The site comprises the area between the lower reaches of the Rivers Supsa and Natanebi. To the west it is bordered by the coastline and to the east by the Samtredia-Batumi railway.
Area: 1,500 ha.
Altitude: 1-20 m above sea level.
Wetland type: M, P, Tp, W, Xf.
Other hydrologically linked wetlands: The site is partly connected to the Pichora-Paliastomi marshes.
Description of site: Along with two river estuaries with a wide water table, the site covers a large area of permanent and seasonal flowing and stagnant reservoirs, lakes, flooded meadows, marshes, pools, swamps on inorganic soils, shrub-dominated and tree-dominated wetlands and swamp forest. The site includes about 200 ha of fishponds and seasonally flooded agricultural lands. The site is partly drained and reclaimed for agricultural development. Water volume: 20.2 million m^3.
Principal vegetation: *Alnus* woodland with various grasses, *Juncus, Typhetum, Juncetum,* secondary meadow.
Land tenure: State, co-operative, private ownership, leased.
Conservation measures taken: Almost none, apart from the fact that the state-owned land cannot be used for other purposes.
Conservation measures proposed: None to date.
Land use: The ponds are used for fishing and fish culture. Most of the site is used for agriculture (tea, citrus, vine growing), hunting, pasturing, road and house construction and oil terminal development.
Possible changes in land use: Further wetland drainage and reclamation for agricultural development.
Disturbances and threats: The determination of the Ministry of Agriculture and Food to reclaim wetlands for agricultural development.
Economic and social values: Fisheries, forestry, agriculture, hunting, pasturing, hay-making, recreation, oil pipeline and oil terminal, etc.
Fauna: Mammals: *Meles meles, Canis aureus, Mustela nivalis, Martes foina, Lutra lutra, Myocastor coypus, Lepus capensis, Felis silvestris, Rattus rattus, R. norvegicus.* Birds: About 50 species of wintering birds, including *Gavia arctica, Ardea cinerea, Egretta alba, Anser albifrons, Tadorna tadorna, Anas strepera, A. crecca, Bucephala clangula, Sterna sandvicensis, Circus aeruginosus.* Fish: Acipenseridae, Mugilidae, Cyprinidae, Percidae, Citharidae.

Special floristic values: *Alnus barbata, Rubus discolor, Paspalum thunbergii, P. paspaloides, Microstegium imberbis, Juncus lampocarpus, Iris pseudacorus, Senecio erraticus, Hydrocotyle vulgaris.*

5. Pichora-Paliastomi

Location: 42°07'28"N, 41°50'34"E. The site is located in the Pichora River basin and is the widest part of the Kolkheti wetlands. It is bounded to the north by the lower reaches of the River Rioni; to the south by the Samtredia-Batumi railway; to the west by coastal dunes and the banks of Lake Paliastomi. To the east it stretches as far as the village of Tsalikari.
Area: 49,000 ha.
Altitude: –0.3 to 2 m above sea level.
Wetland type: J, M, O, P, Ts, U, Xp, Xf, 4, 7, 9.
Other hydrologically linked wetlands: The site is linked hydrologically to Lake Paliastomi (through the River Pichora and main canals and channels; canals were built for drainage and passing of vessels, and channels originated later as a result of peat and ground extraction), River Rioni and, partly, to the Supsa-Natanebi site.
Description of site: The site is the largest and lowest-lying part of the Kolkheti wetlands, with the deepest mires (over 12 m). Imnati Mire, in the east, has a 12-m thick peat layer. To the east of Lake Paliastomi the bed of the River Pichora is 12 m deep. The site also holds the largest volume of water (1,328 km^3). To the south of the River Pichora, there are relict meanders of the Paleo-Rioni. Tsamchkhuri and Imnati marshes are characterised by their convex dome relief. Lake Paliastomi used to be considered highly productive, with an annual catch of



Map 4. Pichora-Paliastomi

40-50 tonnes of commercially valuable fish. In the past few decades the productivity of lake has declined dramatically, as the death of most of the plankton and benthos has impoverished it as a food base of value. As a result, by the early 1970s the productivity had fallen to 4-5 t/year.

Hydrology: Lake Paliastomi is separated from the sea by a sand-bar, 300-400 m wide and 2 m high. The lakes suffer from sedimentation and dense vegetation growth. In wetter areas, the rivers are controlled by flood banks. The rivers (Pichora, Tkhorika, etc) and lakes (Paliastomi, Imnati, Maltakva, etc.) receive water from a large catchment and water levels fluctuate between 0.2-0.7 m in marshes, 0.5-3 m in lakes and 1-21 m in rivers. Until 1924, Lake Paliastomi was a fresh-water lake: the water flowed from the lake through the River Kaparchina, which originates near the northwest bank of the lake. Leaving the lake, the river turns sharply to the south, runs almost parallel to the west bank and discharges into the sea 11 km from its source. Since the capacity of the River Kaparchina was too small to drain all the floodwater from the lake effectively, the level of Lake Paliastomi rose quickly during heavy rain and flooded about 40 km^2 of the area, including the southeastern part of the city of Poti. To protect Poti from periodic flooding, in 1924 a canal was built to connect the southwestern part of the lake with the sea. Over a period of time, powerful storms eroded the canal and it was replaced by a strait, 1.5 km long, 140-150 m wide and 3-4 m deep. Sea water freely enters the lake through this strait during heavy storms, and this has salinised the lake: before the strait was excavated, salinity in the lake was 1‰; today it is 12-13‰.

Principal vegetation: *Sphagnum* bog, Alder, Colchic forest, *Juncetum-Caricetum, Phragmitetum-Typhetum.*

Land tenure: Apart from some small drained fields and meadows used by local people for agricultural purposes, Lake Paliastomi and the Pichora-Paliastomi wetlands are state-owned.

Conservation measures taken: Since 1935, 500 ha within the site, on the right bank of the River Pichora, have been protected as the Kolkheti State Nature Reserve.

Conservation measures proposed: The site falls within the proposed Kolkheti National Park. To restore the former hydrodynamic regime and ecological status of Lake Paliastomi, the artificial strait that links that lake to the sea should be closed off at both ends.

Land use: Open reservoirs and canals are used for fisheries. Drained land is used for agriculture (including cereals and beans), pasturing and hay-making; the woodland marshes are used in forestry; the canals and adjacent areas are used for gathering medicinal plants and berries.

Possible changes in land use: There are plans to block the connection between the sea and Lake Paliastomi because of the increased salinity of the lake and the impoverishment of the lake fauna; there are also plans to dredge sediment from parts of the lake. Georgian specialists in land-reclamation are developing a project to dredge silt and excessive vegetation from the lake, however if the law on the Kolkheti National Park is to be effective it should be suggested that all activities be carried out according to the National Park Plan.

Disturbances and threats: Existing threats include tree felling, renewal of peat extraction, reconstruction of Poti Port, over-fishing and water-borne traffic development.

Economic and social values: Fisheries and fish breeding, forestry, agricultural development, medicinal plants, peat extraction, hunting. The site is a valuable refuge for waterfowl, including migratory and breeding birds, and supports faunal diversity. The wetlands are very important for storage of floodwater and form a buffer against coastal erosion.

Fauna: Mammals: 16 species of large mammals, including *Lutra lutra, Myocastor coypus, Felis silvestris, Lepus capensis, Martes foina, Mustela nivalis, Meles meles, Canis aureus, Lutreola lutreola* and *Vormela peregusna.* Small mammals: *Crocidura suaveolens, Mus musculus, Apodemus sylvaticus, A. agrarius, Neomys fodiens, Rattus rattus, R. norvegicus,* etc. Birds: About 200 bird species have been observed, including *Anser erythropus, Mergus albellus, M. merganser, M. serrator, Circus pygargus, Glareola pratincola, G. nordmanni, Circus macrourus, Crex crex, Pelecanus crispus, Haliaeetus albicilla, Ardeola ralloides, Anas strepera, Anser albifrons.* Reptiles: The herpetofauna is diverse, especially abundant is *Emys orbicularis*. Fish: About 85 fish species have been recorded, including *Huso huso, Acipenser stellatus, Anguilla anguilla, Alosa kessleri, Abramis brama, Aristichthys nobilis, Ctenopharyngodon idella, Mugil cephalus, M. auratus, M. saliens, M. so-iuy, Stizostedion lucioperca* and *Platichthys flesus.* Invertebrates, as well as other taxa, require further monitoring.

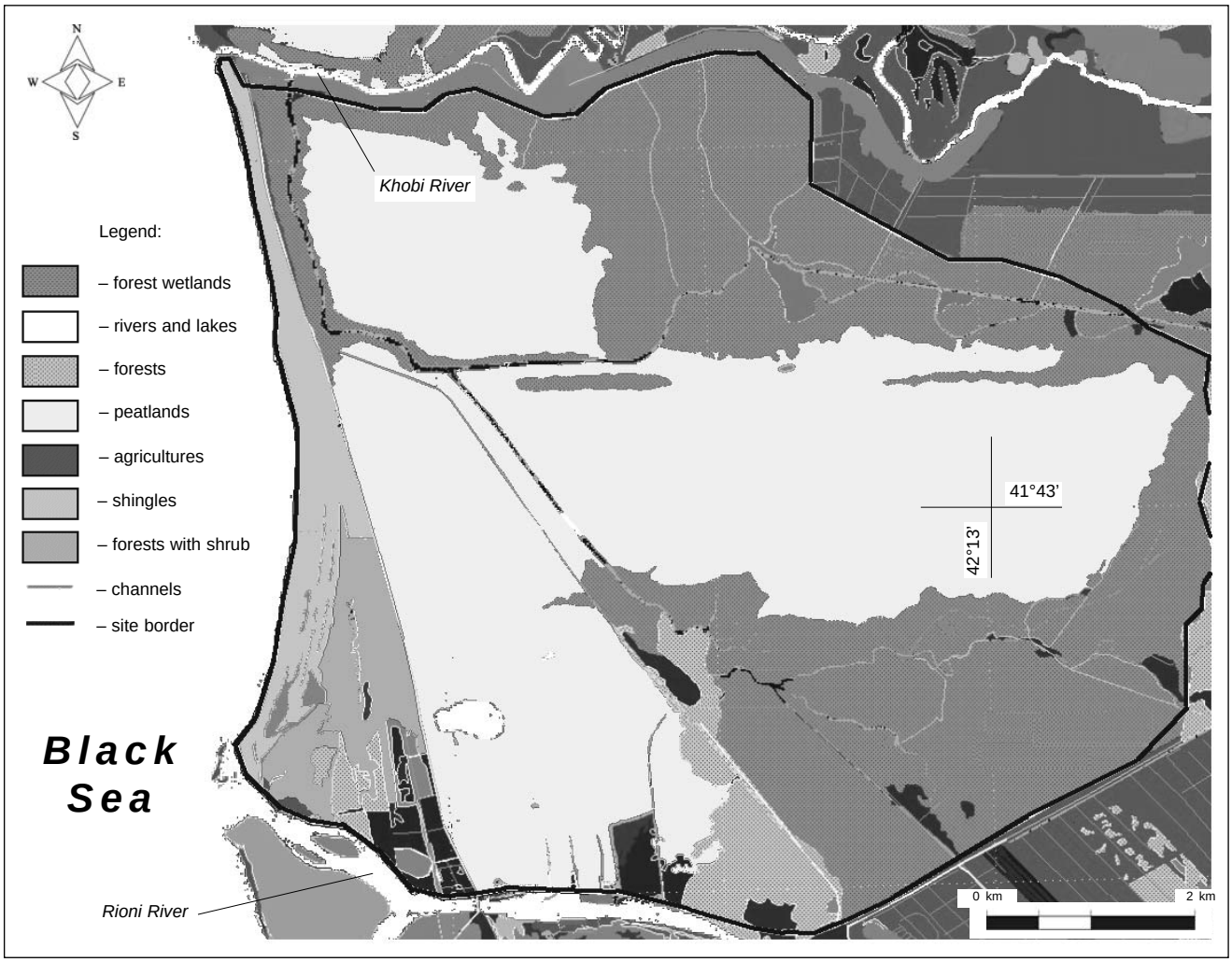
Special floristic values: *Sphagnum cymbifolium, Drosera rotundifolia, Pterocarya pterocarpa, Quercus imeretina, Hedera colchica, Rubus discolor, Sparganium neglectum, Hydrocharis morsus-ranae, Elodea canadensis, Ceratophyllum demersum, Scirpus tabernaemontani, Sagittaria sagittifolia, Nymphaea colchica, Phragmites australis, Typha angustifolia, Ulex europaeus, Gomphocarpus fruticosus.*

Research facilities: The Wetlands Team from the Black Sea Biodiversity Activity Centre began research activities in 1999.

Criteria for inclusion: 1, 2, 3, 4 and 5.

6. Nabada (Wetlands of Central Kolkheti)

Location: 42°14'23"N, 41°42'01"E. The site is located between the lower reaches of the Rivers Rioni and Khobi. To the west it is bordered by the Black Sea and dune bars.
Area: 14,400 ha.
Altitude: –0.3 to 5 m above sea level.
Wetland type: A, E, K, L, M, O, Tp, Ts, U, W, Xf, Xp, 4, 7, 9.
Other hydrologically linked wetlands: The site is linked hydrologically to the Pichora-Paliastomi wetlands through the Rivers Rioni and Pichora, Lake Paliastomi and numerous large canals and reservoirs. The canals were formed as a result of peat extraction.
Description of site: Most of the site (5,000 ha) is occupied by impenetrable peat-tussock mires; there are also areas of relict Colchic forest, and the coastal zone is occupied by numerous lagoons harbouring endemic flora. The site includes the Kulevi site, where the River Khobi flows into the sea and where the construction of a huge port and oil terminal has begun (despite the area's being a Ramsar site, and the presence of 50 ha of forest and artificial pine forest from Poti to Kulevi); the Rioni Delta and Rioni and Khobi estuaries. The site is dissected by numerous canals, the result of peat extraction, and is partly drained, changing the character of the wetlands.
Principal vegetation: Grassy-*Sphagnum,* Alder, forested peatlands, relict mixed Colchic forest.
Land tenure: Waterlogged areas and openwater reservoirs are owned by the state (Ministry of Environment, Ministry of Forestry); drained and cultivated areas belong mainly to the Ministry of Food and Agriculture. Some small areas are privately owned.
Conservation measures taken: None, despite the fact that the land is state owned.

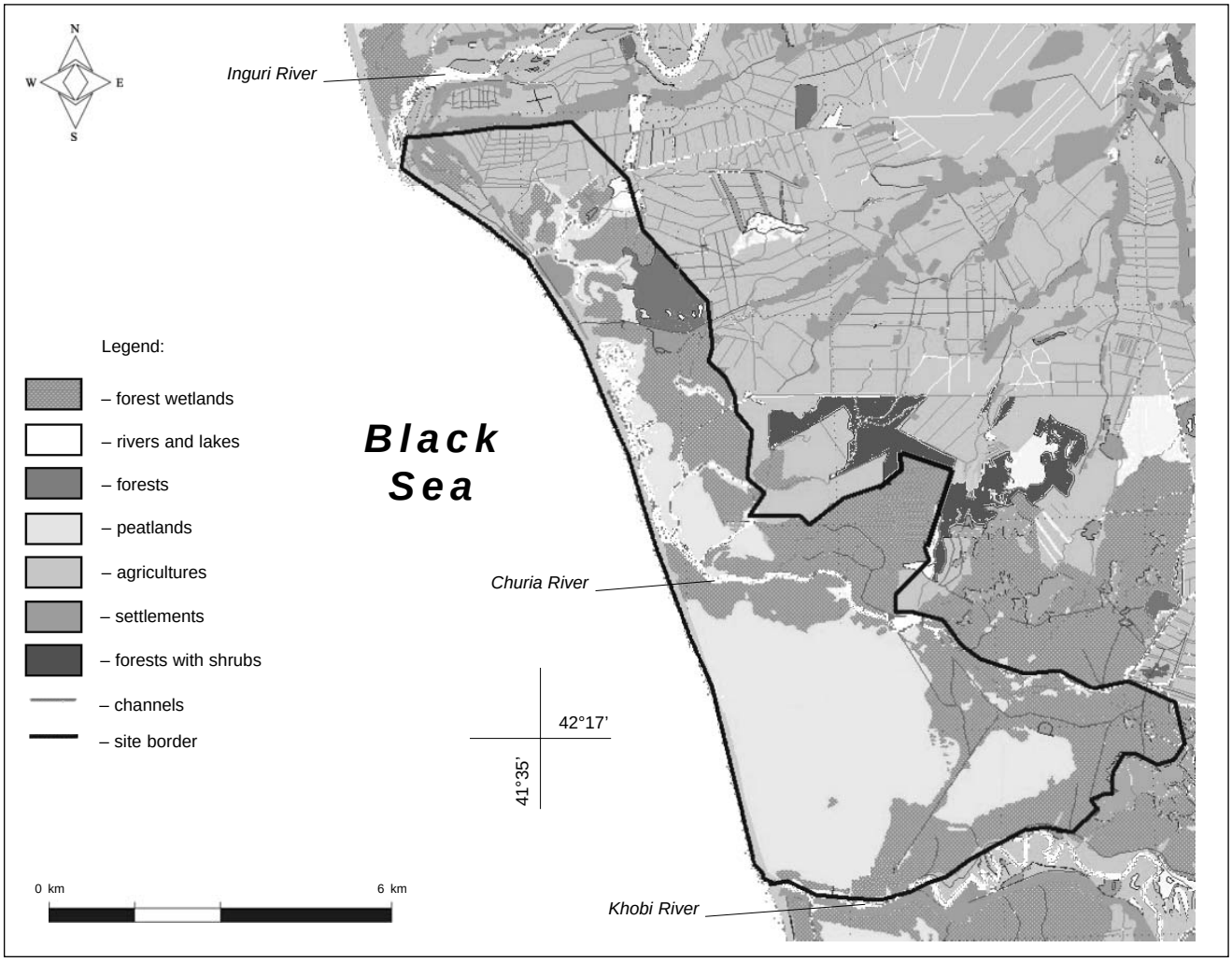


Map 5. Nabada (Chaladidi-Poti part of the Kolkheti Wetlands)

Conservation measures proposed: The site lies within Kolkheti National Park.
Land use: Open-waters (lakes, rivers, canals, estuaries, etc.) are used for fisheries and shipping; grassy meadows and drained wetland areas, not suitable for agriculture, are used for pasturing and hay-making. Impenetrable marshes and forests are used for hunting, as are large part of the grassy-bushy marshes not far from Kulevi, which for many years was used to be a military firing range. A great deal of military debris was scattered around and used as targets during military exercises. Until recently the area was closed, however this saved the Kolkheti forests from felling and destruction, although some signs of damage from the military exercises can still be observed. Some of the reclaimed areas at the edge of the marshes are used for agriculture and urban development.
Possible change in land use: In Kulevi and the Khobi Delta, construction of a large seaport has started, together with a large oil terminal. On the coast between Poti and Kulevi, the infrastructure (a railway line, housing, roads, etc.) for the port and terminal is under construction. The construction site is located to the north from the port of Poti, 12 km away and to the west of the town of Khobi, 12 km away. The Terminal territory is situated on the Black Sea coast, on both sides of mouth of river Khobistskali. 17.11 ha are on the right side and 79.32 ha on the left side. Right side is swampy except the narrow riverbank line (app. 50-70 m). Right side of canal Tsiva (left bank of Khobistskali) is also swampy. The project of terminal construction includes drainage of about 100 ha of wetlands, rising of ground level, placing of tarmac, construction of railway line, changing of river bank shape and building of series of engineering schemes. As a result of such activities the following negative environmental consequences are foreseen: changing of landscapes and typical ecosystems; contamination of wildlife habitats as a result of wastes and severage water discharger in the River Khobi and other water bodies; potential damage to the typical ecosystems through oil spillage into the swamp, river and sea-waters and soil, during the contingencies.
Disturbances and threats: Tree felling (damage to relict Colchic forest), wetland drainage, reclamation of 200 ha of wetlands for urban development; change in flora and fauna; oil pollution.
Economic and social values: Fisheries, hunting, forestry, agriculture, pasturing, hay-making, gathering of medicinal plants, bee-keeping, etc. Located in the coastal area, the *Sphagnum*-grassy bogs serve as a buffer, protecting the area from flooding and erosion, storing excessive nutrients and other pollutants, and having an important ecological function. Wetlands are important for migratory, wintering and breeding birds.
Fauna: Rather rich and diverse. Mammals: Small and large mammals, including *Meles meles, Canis aureus, Mustela nivalis, Felis lynx, Martes foina, Lepus capensis, Lutra lutra, Lutreola lutreola, Myocastor coypus, Felis silvestris, Talpa caucasica, Crocidura suaveolens, Neomys fodens, Apodemus agrarius, A. sylvaticus* and *Mus musculus.* Birds: Over 200 bird species, including migratory, wintering and breeding waterbirds, including *Anas crecca, A. strepera, Anser albifrons, A. anser, A. erythropus, A. fabalis, Buteo rufinus, Ciconia ciconia, C. nigra, Circus cyaneus, C. macrourus, C. aeruginosus, C. pygargus, Crex crex, Egretta alba, E. garzetta, Falco tinnunculus, Gavia arctica, G. stellata, Grus grus, Oenanthe isabellina, Pandion haliaetus, Porzana parva, P. porzana, P. pusilla,* etc. Reptiles and Amphibians: *Triturus vulgaris, T. v. lantzi, Hyla arborea, Bufo bufo, Rana ridibunda, Emys orbicularis, Lacerta agilis, L. strigata, Natrix natrix, N. tessellata, Elaphe longissima, Coromella austriaca.* Over 100 fish species, including *Huso huso, Acipenser stellatus, A. gueldenstaedtii, A. colchicus, A. nudiventris, A. sturio* (endangered species), *Abramis brama, Salmo trutta labrax, Chondrostoma colchicum, Cyprinus carpio, Esox lucius, Perca fluviatilis, Silurus glanis, Rutilus rutilus* and *Vimba vimba tenella.*
Special floristic values: *Sphagnum cymbifolium, Molinia littoralis, Rhynchospora alba, Carex riparia, Orchis palustris, Potentilla erecta, Menyanthes trifoliata, Nymphaea alba, Nuphar lutea, Pterocarya pterocarpa, Ficus carica, Cladium mariscus, Phragmites australis, Juncus acutus, Solanum nigrum, Osmunda regalis.*
Research facilities: Since 1999, the Black Sea Biodiversity Activity Centre has studied the site.
Criteria for inclusion: 1, 2, 3 and 4.

7. Churia (Tikori-Churia part of the Kolkheti wetlands)

Location: 42°20'44"N, 41°39'24"E. The site is located between the Rivers Inguri and Khobi and the Black Sea.
Area: 9,000 ha.
Altitude: 0-5 m above sea level.
Wetland type: A, B, E, F, H, J, K, L, M, N, Sp, Ss, Ts, U, Xp, Xf, Y, 4, 7, 9.
Other hydrologically linked wetlands: The site is linked hydrologically to the River Inguri; in the south it is bordered by the River Khobi and connected to the Nabada marshes.
Description of site: The site is located on a flat plain. In the west it is bordered by the coast and stretches into the sea for a distance of 1-1.5 km at a depth of 1-6 m. The sea is separated from the wetland by a flat sand/sand-



Map 6. Churia (Tikori-Churia part of Kolkheti Wetlands)

gravel bar of 0.8-2 m height, therefore a fairly wide coastal area is often flooded by sea water. The marshy valley is dissected by the natural and artificial banks and dams of rivers and canals. The site is characterised by its dense river system, including large rivers such as the Khobi and Inguri, which rarely flood. Small and medium-sized rivers, such as the Ochkhamuri, Munchia, Churia, Tikori, etc. play an important role in marsh formation. The volume of water in the site is 0.0648 km^3, marsh depth 1.5 m. The site is characterised by vast peat areas and various relict and endemic species of flora and fauna. It is occupied mostly (6,500 ha) by wet Alder woodland; 2,500 ha is treeless. The site has undergone changes due to drainage and peat extraction.

Principal vegetation: Fen vegetation, Alder, Colchic forest, *Juncetum-Caricetum, Phragmitetum-Typhetum, Cladietum.*

Land tenure: Openwater reservoirs, waterlogged land and marshes are state-owned; only the drained and cultivated areas (up to 25%) are privately owned as homesteads and small farming areas (the so-called 'Dikha-Gudzuba', which used to be formed either naturally as a result of intensive growth of wetland vegetation, or artificially by reclaiming an area). This was one of the most common ways making land suitable to farm on before the Soviet era in Kolkheti.

Conservation measures taken: None.

Conservation measures proposed: The site is included in the proposed Kolkheti National Park.

Land use: Openwater reservoirs are used for fisheries, stagnant shallow reservoirs for buffalo pasturing, and drained areas and grassy meadows for farming, pasturing and hay-making. Impenetrable marshes and woodland are used for hunting; drained areas are reclaimed for agriculture.

Possible changes in land use: In Anaklia, in the Inguri Delta, a large port is under construction. This will be accompanied by the construction of new transport communications and relevant infrastructure, which will cause dramatic changes in land use and wetland degradation.

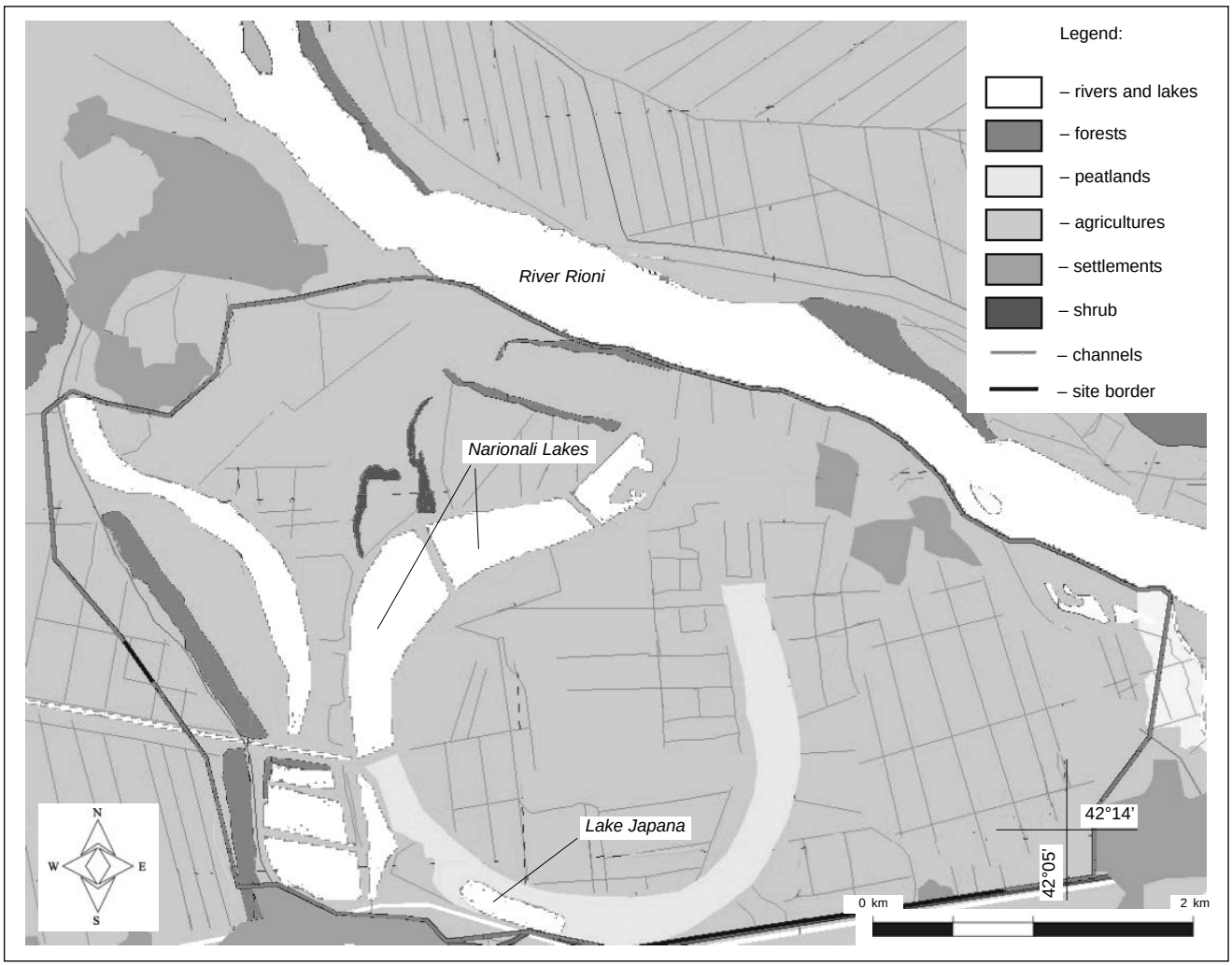
Disturbances and threats: Changes to the bed of the River Inguri, wetland drainage, destruction of part of the coastal biocoenosis, change in the wetland water regime, flora and fauna, etc.
Economic and social values: Fisheries, hunting, forestry, agriculture, bee-keeping, hay-making, collection of medicinal plants, peat extraction, important ecological function – forming a buffer between the land and sea; important habitat for many species of flora and fauna, including endangered species.
Fauna: Mammals: Species composition of large and small mammals is very similar to Nabada, but *Felis lynx, F. silvestris, Lepus capensis, Meles meles* and *Capreolus capreolus* are more numerous, and *Lutra lutra* is less common; small mammals are very abundant. Birds: The bird species composition is very similar to Nabada, but numbers are not precisely known: the study has just begun. The following species may be noted: *Anser erythropus, A. anser, Mergus merganser, M. serrator, M. albellus, Circus pygargus, C. macrourus, C. cyaneus, Glareola pratincola, G. nordmanni, Crex crex, Pelecanus crispus, Haliaeetus albicilla, Anas strepera, A. crecca, Anser fabalis, Ciconia ciconia, C. nigra, Egretta garzetta, Falco tinnunculus, Gavia stellata, Grus grus, Oenanthe isabellina, Pandion haliaetus, Porzana porzana, P. pusilla, Sterna albifrons,* etc. Fish: Over 90 fish species, including 4 sturgeon species: *Acipenser sturio* is endangered, *Salmo trutta labrax, Chondrostoma colchicum, Cyprinus carpio, Esox lucius, Perca fluviatilis, Silurus glanis, Rutilus rutilus, Mugil cephalus, M. auratus, M. so-iuy,* etc.
Special floristic values: *Glaucium flavum, Solanum nigrum, Pinus pinaster, Smilax excelsa, Rubus discolor, Malva sylvestris, Aira capillaris, Molinia caerulea, Cladium mariscus, Osmunda regalis, Asparagus littoralis, Pterocarya pterocarpa, Drosera rotundifolia, Quercus imeretina, Hedera colchica, Juncus acutus, Carex riparia, Orchis palustris, Potentilla erecta, Alnus barbata, Ficus carica, Carex lasiocarpa,* etc.
Research facilities: The Black Sea Biodiversity Protection Activity Centre started research in 1999.
Criteria for inclusion: 1, 2, 3 and 4.

8. Onaria

Location: The site is located in the eastern part of the Tikori-Churia area, to the south of the town of Zugdidi, between the Rivers Chkhoushi and Djumi.
Area: 225 ha.
Altitude: Average 45 m above sea level.
Wetland type: W, U, Xf, 4, 9.
Other hydrologically linked wetlands: The site is connected to the Tikori-Churia area by canals.
Description of site: The site relief is characterised by gradual elevation from the centre to the outlying parts. The altitude variation of 35-45 m increases at the edges to 50-60 m. There are some drainage canals and the edges of the wetlands are partly drained. Wetland depth is 1.5 m.
Principal vegetation: The site used to be covered by Alder forests, which are now almost completely felled. Alder bushes now dominate. *Alnus barbata, Carpinus caucasica, Juncus acutus, Carex lasiocarpa, Sambucus nigra, Typha latifolia.*
Special floristic values: *Carpinus caucasica, Salix caprea, Sparganium neglectum, Duchesnea indica, Hydrocotyle vulgaris.*
Research facilities: Research activities are just being initiated.
Criteria for inclusion: No information.

9. Vazisubani and Narionali

Location: 42°03'45"-42°11'16"N, 42°10'19"-42°07'30"E. The site is located on the left bank of the River Rioni.
Area: 576 ha (Narionali: 332 ha, Vazisubani: 244 ha).
Altitude: Narionali: 15-16 m, Vazisubani: 16-17 m above sea level.
Wetland type: M, N, O, R, Tp, W, Xp, 2, 4, 9.
Other hydrologically linked wetlands: The site is linked to the River Rioni and its tributary, the Khevistskali, through the main canals.
Description of site: The wetlands are located on a plain slightly inclined to the southwest towards the River Rioni. Vazisubani lies in the middle of a triangle formed by the Rioni, its left tributary – the Khevistskali and Big Narionali Lake (Japana). To the east the site is bordered by the Samtredia-Batumi railway line. The Narionali site is a continuation of the Vazisubani site and is located around Big Narionali Lake (Japana), in the suburbs of the villages of Japana, Gulekari and Ketilari, and along the Rioni as far as (another) Lake Narionali. The lakes in the river oxbow



Map 7. Vazisubani and Narionali

around Big Narionali Lake are called the Small Narionali. In the 1950s, the Japana fish farm was built here and included another two ponds, Japana-1 and Japana-2 (with areas of 40 and 20 ha respectively), separated from Japana Lake. The total area of the fish farm is 140 ha, however the farm no longer operates and the ponds turning into marshes. The wetlands were formed as a result of changes in the bed of the River Rioni and include bends, clayey areas, swamps and peat bogs. The Narionali soils are mainly alluvial with a high humus content.

Climate: Humid-sub-tropical. The average temperature in January is 4°C, in July 23°C; average precipitation is 1,500-1,700 mm.

Principal vegetation: Alder, *Juncetum, Caricetum, Phragmitetum, Iricetum, Typhetum.*

Land tenure: Openwater reservoirs and some of the ponds and marshy areas are state-owned. Drained and cultivated areas are owned by the state, private owners and co-operatives.

Conservation measures taken: The Katsoburi area and one of the Narionali lakes (about 50 ha) are included in the Kolkheti National Park.

Land use: A significant part of Vazisubani and small parts of Narionali were drained and cultivated long ago for agricultural development (vine-growing, maize and bean plantations, kitchen gardens), pasturing, hay-making and housing. Ponds and lakes are used for fish culture and fishing. The land rich in humus is used for growing volatile-oil bearing crops on a commercial scale.

Possible changes in land use: Purchasing by private owners and associations.

Disturbances and threats: Intensive grazing, tree felling, intensive hunting and fishing.

Economic and social values: Agriculture, fish culture and fisheries, hunting, forestry, farming, collection of medicinal plants, unique habitat for waterfowl and migratory and wintering birds.

Fauna: Mammals: *Lutra lutra, Meles meles, Mustela nivalis, Martes foina, Canis aureus, Myocastor coypus, Lepus*

capensis, Felis silvestris, F. lynx, Capreolus capreolus, etc. Many small rodents, moles and bats. Birds: Over 210 bird species, including *Anser albifrons, Anas strepera, A. crecca, A. acuta, A. penelope, Aythya ferina, A. fuligula, Bucephala clangula, Vanellus vanellus, Gallinago gallinago, Botaurus stellaris, Carduelis carduelis, Coturnix coturnix, Emberiza citrinella, Fringilla coelebs, Motacilla flava, Nycticorax nycticorax, Podiceps grisegena, Streptopelia turtur, Turdus merula,* etc. Reptiles and Amphibians: *Emys orbicularis, Hyla arborea, Lacerta derjugini, L. parvula, Natrix tessellata, N. megalocephala, Rana ridibunda.* Fish: About 60 fish species, including *Cyprinus carpio, Hypophthalmichthys molitrix, Ctenopharyngodon idella, Aristichthys nobilis, Esox lucius, Perca fluviatilis, Silurus glanis, Chondrostoma colchicus, Leuciscus cephalus, Alburnus alburnus, Barbus tauricus* and *Acipenser guldenstaedtii.*
Special floristic values: *Trapa colchica, Rhamphicarpa medwedewii, Phragmites australis, Typha angustifolia, T. latifolia, Senecio erraticus, Iris pseudacorus, Juncus lampocarpus.*
Research facilities: The Black Sea Biodiversity Protection Activity Centre in Batumi started ecosystem and biodiversity research in 1998.
Criteria for inclusion: 1, 2, 3 and 4.

10. Lanchkhuti Marshes

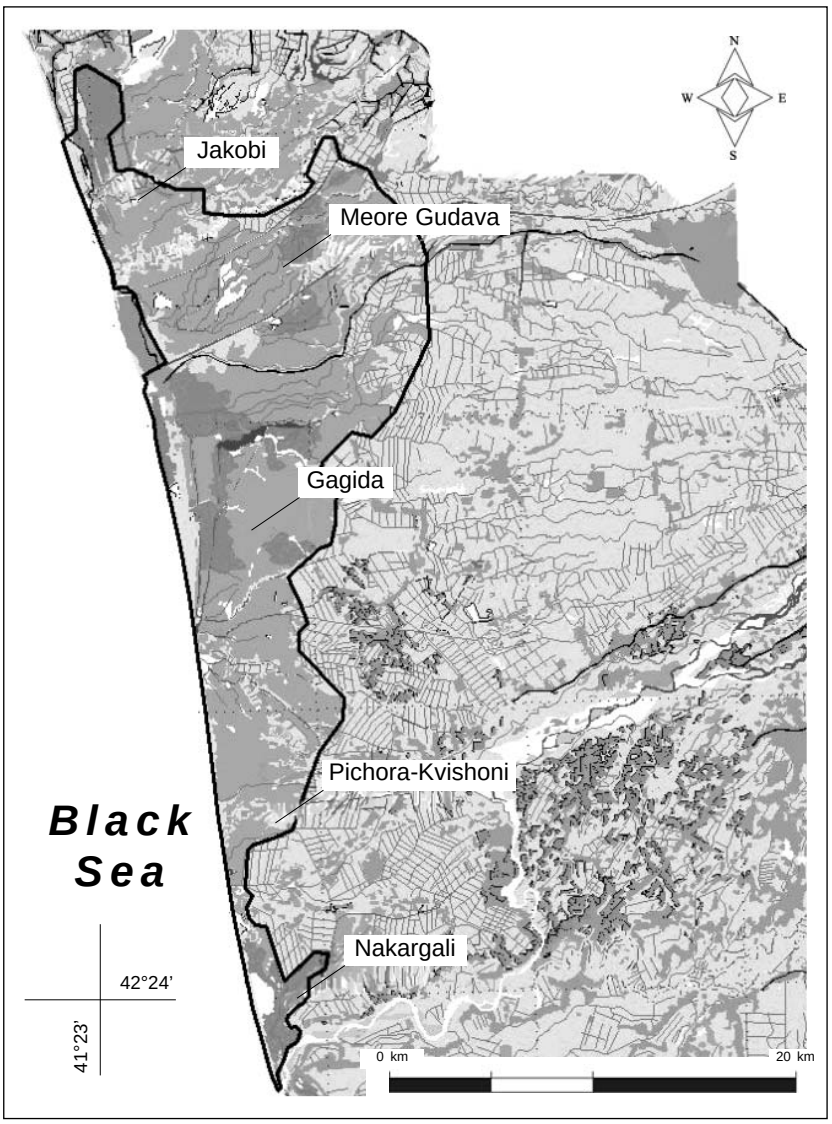
Location: The name 'Lanchkhuti Marshes' covers four small wetlands, located to the north and northeast of the town of Lanchkhuti.
Area: *c*. 500 ha including the Kveshenati site, with an area of 100 ha, depth up to 1 m, water volume 0.8 million m^3 ; the Morchkhili site, with an area of 150 ha, depth 1 m, water volume 0.9 million m^3; the Chvintisgeli site, with an area of 140 ha, water volume 1.12 million m^3; and the Jinistba site, with an area 110 ha, depth 0.9 m and 0.79 million m^3.
Altitude: The Jinistba site is located at a height of 10 m above sea level; Kveshenati, Morchkhili and Chvintisgeli lie at 8-9 m above sea level.
Other hydrologically linked wetlands: Three small rivers flow across the Lanchkhuti wetlands: the Kveshenati, Morchkhili and Chvintisgeli. At the fourth site there is a small lake – Jinistba. These waters are the main factors in wetland formation and determine differing characters of the sites.
Wetland type: M, N, O, Tp, Ts, U, 4, 7, 9.
Description of site: The four wetlands differ in their degree of waterlogging, biodiversity and coenosis. The Kveshenati site is located on both banks of the River Kveshenati, to the northeast of the town of Lanchkhuti. This is a plain covered with mounds and drainage canals, with a predominantly grassy-bush vegetation and small agricultural farms. The Morchkhili site is located on both banks of the River Morchkhila to the northeast of the town of Lanchkhuti. The site relief is undulating, with boggy/grass-boggy vegetation dominant. Some of the drainage canals are no longer functional and the wetlands are now being rehabilitated. The Chvintisgeli site is located on both banks of the River Chvintisgeli, to the north of the town of Lanchkhuti. The site is affected by drainage through numerous drainage canals. Grass-bush vegetation prevails, as well as scattered fragmented agricultural lands and small ponds. The Jinistba site is located around Lake Jinistba, not far from the town of Lanchkhuti. The site is a plain, slightly raised around the lake. Anthropogenic impact on the landscape is seen in the form of small pits and elevations, ponds and settlements. In general, the Lanchkhuti wetlands may be described as an accreted lowland plain with wet meadows, marshes and saturated sites, silt-marsh, peat and podzol soils.
Hydrology: The wetlands are related to the old meanders of the River Rioni. Research into the ancient beds of the Rioni has shown that the river used to run within the Guria region, some 7-8 km to the south of the modern bed. The remains of the Paleo-Rioni, in the form of meanders, survive over a distance of 25 km from the village of Kvemo-Chibati, where they appear out of the alluvium-proluvium band of the Meskheti foothills, to the eastern edge of the Imnati marshes, where they are hidden. Among such meanders of the old southern bed of the Rioni it is worth noting the 5-km Chibati glade, which lies to the north of the village of Jurkveti (Lanchkhuti area) and 4 sites in the Lanchkhuti marshes (Jaoshvili, Ukleba and Gigineishvili, 1990).
Principal vegetation: *Juncetum, Caricetum,* secondary meadow, *Phragmitetum, Typhetum, Iricetum/Typhetum,* Alder – generally represented by bushes. Vegetation of the open meadows: *Paspalum digitaria* and *P. dilatatum.* Bushes: *Rubus* sp. and *Salix* sp. The marsh vegetation is dominated by *Carex riparia, Phragmites australis, Juncus inflexus, J. effusus, Trifolium repens* and *Salix micas, Alnus barbata,* etc.
Land tenure: Open waters – lakes, rivers, boggy and saturated, undrained sites are state-owned. The cultivated agricultural farms and gardens and small fish farms are privately owned.
Conservation measures taken: Boggy sites belong to the state and are partly protected; the privately-owned

sites require environmental assessment.
Conservation measures proposed: None to date.
Land use: Drained and cultivated land is used for housing, agricultural development, pasturing, hay-making, creation of agricultural lands, parks and gardens. The open ponds are used for fishing and fish culture, aquaculture and buffalo pasturing.
Possible changes in land use: Further drainage, change in land ownership, privatisation and cultivation.
Economic and social values: Agriculture, fisheries, aquaculture, hunting, logging, farming, hay-making, pasturing, collection of berries and medicinal plants, housing, wintering of migrating birds. Eco-tourism, freshwater purification. Refuge for many species.
Fauna: Mammals: *Meles meles, Martes foina, Canis aureus, Mustela nivalis, Lutra lutra, Myocastor coypus, Lepus capensis, Felis silvestris, F. lynx, Capreolus capreolus, Vulpes vulpes, Lutreola lutreola.* Quite a few small mammals, including *Crocidura suaveolens, Neomys fodiens, Sorex araneus, Apodemus sylvaticus, Rattus rattus, R. norvegicus, Rhinolophus blasii, Pipistrellus* sp., etc. Birds: *c*. 185 waterfowl species and migrating species have been recorded including *Ardea purpurea, A. cinerea, Ciconia nigra, Circus aeruginosus, Crex crex, Egretta alba, E. garzetta, Anser albifrons, A. anser, Anas strepera, A. crecca, A. platyrhynchos, A. acuta, A. penelope, Aythya ferina, A. fuligula, Bucephala clangula, Vanellus vanellus, Gallinago gallinago, Botaurus stellaris, Carduelis carduelis, Coturnix coturnix, Delichon urbica, Hieraaetus pennatus, Haliaeetus albicilla, Pandion haliaetus, Dendrocopos major, D. minor, Emberiza citrinella, Fringilla coelebs, Cygnus cygnus, Fulica atra, Gallinula chloropus, Hirundo rustica, Motacilla flava, Nycticorax nycticorax, Parus major, Passer domesticus, Phasianus colchicus, Podiceps grisegena, P. ruficollis, Streptopelia turtur, Turdus merula, Aquila clanga, Branta ruficollis, Falco cherrug,* etc. Reptiles: *Natrix natrix, N. tessellata, Emys orbicularis,* etc. Amphibians: *Hyla arborea, Rana ridibunda, Lacerta rudis, Triturus vulgaris.* Fish: About 72 species including *Cyprinus carpio, Abramis brama, Aristichthys nobilis, Esox lucius, Perca fluviatilis, Chondrostoma colchicum, Silurus glanis, Rutilus rutilus, Carassius carassius, C. auratus, Leuciscus cephalus, Vimba vimba tenella,* etc. All the above-mentioned fish species are of commercial value.
Special floristic values: *Phragmites australis, Salix carpea, Trapa colchica, Hydrocotyle vulgaris, Alnus barbata, Juncus acutus, Carex lasiocarpa, Rhamphicarpa medwedewii, Typha angustifolia, Senecio erraticus, Iris pseudacorus,* etc.
Research facilities: The Lanchkhuti wetlands ecosystem and their biodiversity have been studied since 1999 by the Regional Centre on Biodiversity Protection, Black Sea Fisheries and the Ecology Institute.

11. Northern Kolkheti Wetlands

Location: 41°29'-41°35'N, 42°25'-42°39'E. The Northern Kolkheti wetlands are located between the Rivers Inguri and Galidzga and stretch from the coast to the Zugdidi-Ochamchire motorway.
Area: 17,000 ha (Jakobi: 1,670 ha, Meore-Gudava: 150 ha, Gagida: 11,700 ha, Pichora-Kvishoni: 1,410 ha, Nakargali: 2,100 ha).
Altitude: 2.5 m, range from –0.5 to 15 m above sea level.
Wetland type: E, H, I, J, K, L, M, Q, R, U, W, Xf, Xp, Y, Z, 2, 4, 9.
Other hydrologically linked wetlands: None.
Description of site: The area may be divided into five sites, from the north to the south: 1) Jakobi wetlands between the Rivers Galidzga and Okumi, on both banks of the River Jakobi; 2) Meore-Gudava wetlands between the coast in the west and dunes in the east; 3) Gagida wetlands, between Big Eristskali River in the north and the Okvinare in the south; 4) Pichora-Kvishoni wetlands, which occupy the southwest of Gali District; and 5) Nakargali wetlands, lying in the lowest part of the Samurzakano plain, between the coast and the mouth of the River Inguri. The wetlands lie between Ochamchire and Anaklia, on the Samurzakano Plain. This area includes two terraces: the upper terrace extends 5-10 km inland from the sea and is divided by a number of incised river valleys. There are few wetlands on the upper terrace. The lower terrace receives water from the upper, which is then retained by a 1-2 km wide band of dunes 4-6 m above sea level, which has led to development of a large wetland complex. There are two types of wetland on the lower terrace: one was formed through vegetative succession on once-open lakes, the other formed in river floodplains.
Principal vegetation: Alder, *Juncetum, Caricetum, Typhetum,* secondary meadows and open waterbodies.
Land tenure: Mostly state-owned; partly private – mainly the drained sites (15-25%).
Conservation measures taken: None.
Conservation measures proposed: None to date. Protected areas should be established as a matter of urgency.
Land use: Agriculture and forestry, pasturing, hay-making, housing and recreation, fishing.

Possible changes in land use: Drainage for agricultural development and recreation.
Disturbances and threats: Increased anthropogenic pressure, pollution from domestic waste and sewage, lack of control.
Economic and social values: Agriculture, forestry, hunting, haymaking and pasturing, tourism and recreation, important habitat for waterfowl and migratory and wintering birds.
Fauna: Mammals: *Lutra lutra, Meles meles, Mustela nivalis, Martes foina, Canis aureus, Myocastor coypus, Lepus capensis, Felis silvestris, Capreolus capreolus, Vulpes vulpes,* etc. Many small mammals. Birds: *Anas acuta, A. crecca, A. penelope, A. querquedula, A. strepera, Ardea purpurea, Crex crex, Netta rufina, Phalacrocorax pygmaeus, Phasianus colchicus, Nycticorax nycticorax* etc. Herpetofauna: *Triturus cristatus, T. vulgaris.* Fish: *C*. 100 fresh and brackishwater fish species, including *Huso huso, Acipenser stellatus, A. nudiventris. A. gueldenstaedtii colchicus, A. sturio (rare), Silurus glanis, Salmo trutta labrax, S. t. morfa fario, Cyprinus carpio, Leuciscus cephalus, Mugil cephalus, M. auratus, M. so-iuy* and *Alosa kessleri.*



Map 8. Nothern Kolkheti Wetlands

Special floristic values: *Alnus barbata, Salix caprea, S. alba, Pterocarya pterocarpa, Smilax excelsa, Viburnum opulus, Juncus acutus, J. leersii, Artemisia absinthium, A. vulgaris, Paspalum thunbergii, Polygonum thunbergii, Typha angustifolia, T. latifolia*
Research facilities: The Black Sea Biodiversity Protection Activity Centre in Batumi is making efforts to carry out scientific field visits to the Abkhazian wetlands.

List of Organisations Historically Involved in Studies of the Kolkheti Wetlands with the Titles of their Studies/Publications

1. **Russian Land-owning Society:**
   Kolkheti Vegetation review, 1896. Statistical data about land-ownership in 5 districts of Trans-Caucasus area.
2. **MIEBGK (Moscow Institute of Socio-Economic Study of Peasants):**
   Socio-economic study of peasants in Senaki and Zugdidi 'Uyezd', 1886.
3. **ZakOIIVKh (Trans-Caucasian Section of the Irrigation and Water Resources Institute):**
   Geo-botanical review of western areas of Georgia, 1931; Elements of water and thermal balance of Kolkheti Lowland.
4. **Kolkheti Test Station:**
   Rioni lowland vegetation, 1929.
5. **VNIChISK (Soviet Scientific Research Institute of Tea and Subtropical Resources):**

The Vegetation of Kolkheti Lowland, 1951.

6. **TsUEGMS (Central Agency of Natural Geography of Perennial Sub-tropics, Leningrad):**
   Climatic characterisation of perennial sub-tropical vegetation. Materials on agro-climatic zoning of sub-tropics of USSR, 1936.
7. **Institute of Geography of Academy of Sciences of USSR:**
   Materials on study of Trans-Caucasus peatlands, 1936.
   Physical-geographical characterisation of Trans-Caucasus, 1940
   Fluctuation of Black Sea – Caspian Sea Levels in the Holocene, 1960.
8. **Scientific-Amelioration Institute:**
   Methods of amelioration of swamps and wetlands in the wet sub-tropics, 1960.
   Botanical-geographical review of Rioni lowland, 1923.
   Amelioration and agricultural exploitation of Kolkheti Lowland, 1974.
9. **Moscow State University:**
   Physical geography of Kolkheti, 1950.
   Kolkhian flora, 1961.
   Engineering Geology, 1978.
   Study of floating particle discharge of Kolkheti Lowland rivers and their role in drainage of wet forests, 1983.
   Anthropogenic changes in the mountainous landscapes of Caucasus, 1977.
10. **Academy of Sciences of Georgia:**
    Study of the Kolkheti Lowland evaporation area, 1983.
    Engineering-geological state of the Kolkheti shelf in connection with problems of underwater extraction of magnetite sands, 1978.
    About the Sediments on Kolkheti Lowland, 1981.
    Economical-geographical characteristics of Poti, 1956.
    On calculation of precipitation fall probabilities in Kolkheti, 1978.
    Has elaborated scientific prerequisites for drainage and exploitation of Kolkheti Lowland; studied natural conditions and resources, issues of evolution of economic usage of Kolkheti.
11. **Academy of Sciences of USSR:**
    Climatic justification of tea and citrus planting in Kolkheti, 1983;
    Constructional-geographical problems of Kolkheti Lowland, 1982.
    History of forests and palaeo-geography of USSR in the Holocene, Palaeo-geography of Kolkheti, 1957.
12. **Institute of Botany of Academy of Sciences of Georgia:**
    Main phyto-landscapes of coastal lowlands of South Abkhazia, 1948.
    Adventive flora of Abkhazia, 1977.
    Weed plants of Abkhazia.
13. **Geographical Society of Georgia:**
    Kolkheti vegetation review, 1939
14. **Vakhushti Bagrationi Institute of Geography of Georgian Academy of Sciences:**
    Palaeo-geography of Georgia in the Holocene, 1980.
    Batumi: Economical-geographical review, 1966.
    Current state of and expected changes in vegetation of Kolkheti Lowland, 1981.
    Modern landscapes of Kolkheti wetlands and their agricultural importance, 1981.
    Survey of soil-forming processes in the conditions of wet sub-tropics of Kolkheti, 1982.
    History of drainage of Kolkheti Lowland, 1982.
    Vegetation cover of Kolkheti and anthropogenic changes, 1983.
    Anthropogenic landscapes of Georgia, 1983.
    River discharges and beach-formation on the Black Sea coast of Georgia, 1986.
15. **Janelidze Institute of Geology, Sector of Hydrology and Engineering Geology:**
    Characteristics of floating discharges and sediment in the River Inguri basin, 1976.
    Engineering geological conditions of Kolkheti Shelf, 1978.
    The impact of water-regime on chemical-mineral content of clay in Kolkheti Lowland, 1984.
    Survey of regularities in the formation of hydrological and engineering-geological conditions, 1984.
16. **Hydro-meteorological Centre, Leningrad:**
    Balance of soil moisture, 1958.
    Radiation and thermal regime of territory of Georgia. Prognosis of hydro-meteorological conditions of Kolkheti Lowland after drainage, 1983.

Radiation Balance of Kolkheti.

17. **Institute of Zoology of Georgian Academy of Sciences:**
Was actively involved in producing materials for publication of Monograph: 'Kolkheti Lowland: Scientific pre-requisites for its usage', 1990. Participates in preparation of materials for Environmental Impact Assessment for the construction of the new oil terminal in the River Khobi mouth area, village of Kulevi.
18. **ZakNIIGMI (Trans-Caucasian Scientific Research Institute of Hydro-meteorology):**
Climate and climatic resources of Georgia, 1971.
Peculiarities of atmospheric circulation processes and associated weather conditions in Kolkheti Lowland, 1968.
Elements of water and thermal balance of Kolkheti Lowland, 1975.
Climate and climatic resources of Georgia, 1981.
Flow of water and discharges in Kolkheti Lowland, 1978.
19. **Tbilisi State University:**
Beach dynamics of the Georgian Black Sea coast.
20. **Georgian Institute of Agriculture:**
Agricultural usage of Kolkheti Lowland, 1985-1989.

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Table 3. Plants occurring in the Kolkheti Wetlands of Western Georgia, ordered by species name (compiler: Izolda Matchutadze)

1. *Acorus calamus*	38. *Duchesnea indica*	75. *Pancratium maritimum*	112. *Sagittaria platyphylla*
2. *Alisma plantago-aquatica*	39. *Echinochloa crus-galli*	76. *Paspalum digitaria*	113. *Sagittaria trifolia*
3. *Alnus barbata*	40. *Echium plantagineum*	77. *Paspalum paspaloides*	114. *Salix caprea*
4. *Ammannia arenaria*	41. *Eleocharis palustris*	78. *Paspalum thunbergii*	115. *Saururus cernuus*
5. *Ammannia verticillata*	42. *Elodea canadensis*	79. *Periploca graeca*	116. *Schoenoplectus juncoides*
6. *Artemisia absinthium*	43. *Epilobium parviflorum*	80. *Petasites albus*	117. *Schoenoplectus lacustris*
7. *Barbarea arcuata*	44. *Epilobium tetragonum*	81. *Physalis ixocarpa*	118. *Schoenoplectus mucronatus*
8. *Bidens cernua*	45. *Equisetum palustre*	82. *Plantago major*	119. *Schoenoplectus triqueter*
9. *Bidens tripartita*	46. *Equisetum ramosissimum*	83. *Poa trivialis*	120. *Sedum hispanicum*
10. *Bolboschoenus maritimus*	47. *Erigeron bonariensis*	84. *Polygonum alatum*	121. *Senecio erraticus*
11. *Bulbostylis tenerrima*	48. *Euphorbia palustris*	85. *Polygonum hydropiper*	122. *Senecio vernalis*
12. *Butomus umbellatus*	49. *Euphorbia stricta*	86. *Polygonum nodosum*	123. *Siella erecta*
13. *Callitriche stagnalis*	50. *Frangula alnus*	87. *Polygonum perfoliatum*	124. *Smilax excelsa*
14. *Callitriche verna*	51. *Galega officinalis*	88. *Polygonum persicaria*	125. *Solidago turfosa*
15. *Capsella bursa-pastoris*	52. *Galinsoga parviflora*	89. *Polygonum posumbu*	126. *Sparganium neglectum*
16. *Cardamine parviflora*	53. *Galium elongatum*	90. *Polygonum thunbergii*	127. *Spirodela polyrrhiza*
17. *Cardamine tenera*	54. *Glechoma hederacea*	91. *Polypodium vulgare*	128. *Stachys palustris*
18. *Carex acutiformis*	55. *Hauttuynia cordata*	92. *Potamogeton crispus*	129. *Succisa pratensis*
19. *Carex elata*	56. *Juncus effusus*	93. *Potamogeton natans*	130. *Taraxacum officinale*
20. *Carex elongata*	57. *Juncus lampocarpus*	94. *Potamogeton pectinatus*	131. *Thelypteris palustris*
21. *Carex lasiocarpa*	58. *Juncus tenuis*	95. *Prunella vulgaris*	132. *Tradescantia virginiana*
22. *Carex otrubae*	59. *Kyllinga gracillima*	96. *Pterocarya pterocarpa*	133. *Trapa colchica*
23. *Carex pendula*	60. *Lemna minor*	97. *Punica granatum*	134. *Trapa maleevii*
24. *Catabrosa aquatica*	61. *Leucojum aestivum*	98. *Pycreus colchicus*	135. *Trifolium fragiferum*
25. *Ceratophyllum demersum*	62. *Lindernia procumbens*	99. *Pycreus flavescens*	136. *Trifolium pratense*
26. *Cladium mariscus*	63. *Lonicera caprifolium*	100. *Pycreus globosus*	137. *Typha angustifolia*
27. *Clematis vitalba*	64. *Lotus palustris*	101. *Pycreus korshinskyi*	138. *Typha latifolia*
28. *Commelina communis*	65. *Lotus tenuis*	102. *Ranunculus lingua*	139. *Urtica dioica*
29. *Conyzanthus graminifolius*	66. *Marsilea quadrifolia*	103. *Ranunculus sceleratus*	140. *Urticularia minor*
30. *Cyperus aureus*	67. *Menyanthes trifoliata*	104. *Rhamphicarpa medwedewii*	141. *Vaccinium arctostaphylos*
31. *Cyperus badius*	68. *Microstegium imberbe*	105. *Rhynchospora alba*	142. *Verbascum thapsus*
32. *Cyperus difformis*	69. *Molinia littoralis*	106. *Rhynchospora caucasica*	143. *Verbena officinalis*
33. *Cyperus longus*	70. *Myriophyllum spicatum*	107. *Rubus anatolicus*	144. *Veronica anagallis-aquatica*
34. *Datura stramonium*	71. *Myriophyllum verticillatum*	108. *Rubus hirtus*	145. *Veronica beccabunga*
35. *Daucus carota*	72. *Nuphar lutea*	109. *Rumex crispus*	146. *Vicia dasycarpa*
36. *Dianthus* sp.	73. *Nymphaea candida*	110. *Rumex pulcher*	147. *Vinca minor*
37. *Drosera rotundifolia*	74. *Osmunda regalis*	111. *Ruscus ponticus*	148. *Zostera marina*

Threatened plant species	**Adventive plant species**	**Medicinal plant species**
1 *Carex lasiocarpa*	1 *Commelina communis*	1 *Acorus calamus*
2 *Cladium mariscus*	2 *Cyperus difformis*	2 *Alnus barbata*
3 *Drosera rotundifolia*	3 *Digitaria ischaemum*	3 *Artemisia absinthium*
4 *Hibiscus ponticus*	4 *Elodea canadensis*	4 *Bidens tripartita*
5 *Imperata cylindrica*	5 *Elsholtzia ciliata*	5 *Drosera rotundifolia*
6 *Juncus acutus*	6 *Hydrocotyle maritima*	6 *Frangula alnus*
7 *Juncus maritimus*	7 *Hydrocotyle vulgaris*	7 *Galega officinalis*
8 *Marsilea quadrifolia*	8 *Juncus tenuis*	8 *Glechoma hederacea*
9 *Osmunda regalis*	9 *Kyllinga gracillima*	9 *Glycyrrhiza glabra*
10 *Thelypteris palustris*	10 *Lindernia procumbens*	10 *Gnaphalium uliginosum*
	11 *Microstegium imberbe*	11 *Juncus* sp.
	12 *Microstegium japonicum*	12 *Lythrum salicaria*
	13 *Paspalum digitaria*	13 *Mentha pulegium*
	14 *Paspalum thunbergii*	14 *Menyanthes trifoliata*
	15 *Polygonum alatum*	15 *Nuphar lutea*
	16 *Polygonum hydropiper*	16 *Petasites albus*
	17 *Polygonum perfoliatum*	17 *Phytolacca americana*
	18 *Polygonum posumbu*	18 *Polygonum hydropiper*
	19 *Polygonum thunbergii*	19 *Punica granatum*
	20 *Pycreus korshinskyi*	20 *Sambucus ebulus*
	21 *Sagittaria platyphylla*	21 *Sambucus nigra*
	22 *Tradescantia virginiana*	22 *Symphytum officinale*
	23 *Vinca minor*	23 *Vaccinium arctostaphylos*
		24 *Verbena officinalis*
		25 *Viburnum opulus*

Table 4. Occurrence of plant species in key sites

Plant species	Site								
	1	2	3	4	5	6	7	8	9
Rare species									
Acorus calamus					√				
Crataegus microcarpa	√								
Hedera colchica	√		√	√	√				
Hydrocharis morsus-ranae					√	√		√	
Juncus leersii	√								
Lythrum salicaria	√	√			√	√			
Marsilea quadrifolia		√							
Menyanthes trifoliata	√				√	√			
Phragmites australis	√	√			√	√	√	√	√
Rhamnus frangula	√				√				
Rhamphicarpa medwedewii	√								√
Rhynchospora alba	√				√	√	√		
Sagittaria sagittifolia					√				
Salix caprea	√	√						√	√
Scirpus tabernaemontani					√				
Sparganium neglectum	√	√			√				√
Sphagnum imbricatum	√								
Trapa natans s.l.		√							√
Typha latifolia	√	√	√	√	√	√	√	√	√
Vaccinium arctostaphylos	√				√				
Relict species									
Thelypteris palustris	√								
Zelkova carpinifolia					√				

Table 5. Occurrence of adventive plant species in key sites

Plant species	1	2	3	4	5	6	7	8	9	11
Callicarpa japonica	√									
Conyzanthus graminiifolius	√	√								
Eupatorium cannabinum	√	√	√	√			√	√		
Hydrocotyle ramiflora	√	√	√	√	√	√	√	√	√	√
Hydrocotyle vulgaris	√	√	√	√	√	√	√	√	√	√
Hypericum mutilum	√				√					
Juncellus serotinus	√	√							√	√
Juncus articulatus										
Lonicera japonica	√	√					√			
Microstegium japonicum	√	√	√	√				√		
Miscanthus sinensis	√	√	√							
Paspalum paspaloides	√	√	√	√			√	√	√	
Paspalum thunbergii	√	√	√	√	√	√	√	√	√	√
Phytolacca americana		√	√	√			√	√	√	√
Polygonum perfoliatum	√	√	√				√	√		
Polygonum thunbergii	√	√	√	√	√	√	√	√	√	√
Rumex acetosella		√	√					√	√	√
Spiraea japonica	√									
Sporobolus fertilis	√		√				√	√	√	√

Table 6. Birds occurring in Georgian Black Sea coastal wetlands (Kolkheti including inshore areas) ordered by species name (Compilers: Erwin van Maanen and Alexander Gavasheleshvili)

1. *Accipiter brevipes*
2. *Accipiter gentilis*
3. *Accipiter nisus*
4. *Acrocephalus agricola*
5. *Acrocephalus arundinaceus*
6. *Acrocephalus dumetorum*
7. *Acrocephalus melanopogon*
8. *Acrocephalus palustris*
9. *Acrocephalus schoenobaenus*
10. *Acrocephalus scirpaceus*
11. *Actitis hypoleucos*
12. *Aegithalos caudatus*
13. *Alauda arvensis*
14. *Alcedo atthis*
15. *Anas acuta*
16. *Anas clypeata*
17. *Anas crecca*
18. *Anas penelope*
19. *Anas platyrhynchos*
20. *Anas querquedula*
21. *Anas strepera*
22. *Anser albifrons*
23. *Anser anser*
24. *Anthropoides virgo*
25. *Anthus campestris*
26. *Anthus cervinus*
27. *Anthus pratensis*
28. *Anthus spinoletta*
29. *Anthus trivialis*
30. *Apus pallidus*
31. *Aquila chrysaetos*
32. *Aquila clanga*
33. *Aquila heliaca*
34. *Ardea cinerea*
35. *Ardea purpurea*
36. *Ardeola ralloides*
37. *Asio flammeus*
38. *Asio otus*
39. *Athene noctua*
40. *Aythya ferina*
41. *Aythya fuligula*
42. *Aythya marila*
43. *Aythya nyroca*
44. *Bombycilla garrulus*
45. *Botaurus stellaris*
46. *Bubo bubo*
47. *Bucephala clangula*
48. *Burhinus oedicnemus*
49. *Buteo buteo*
50. *Buteo buteo vulpinus*
51. *Buteo lagopus*
52. *Buteo rufinus*
53. *Calandrella brachydactyla*
54. *Calandrella rufescens*
55. *Calcarius lapponicus*
56. *Calidris alpina*
57. *Calidris canutus*
58. *Calidris ferruginea*
59. *Calidris minuta*
60. *Caprimulgus europaeus*
61. *Carduelis cannabina*
62. *Carduelis carduelis*
63. *Carduelis chloris*
64. *Carduelis flammea*
65. *Carduelis flavirostris*
66. *Carduelis spinus*
67. *Carpodacus erythrinus*
68. *Certhia familiaris*
69. *Cettia cetti*
70. *Charadrius alexandrinus*
71. *Charadrius asiaticus*
72. *Charadrius dubius*
73. *Charadrius morinellus*
74. *Chlidonias hybrida*
75. *Chlidonias leucopterus*
76. *Chlidonias niger*
77. *Ciconia ciconia*
78. *Ciconia nigra*
79. *Cinclus cinclus*
80. *Circaetus gallicus*
81. *Circus aeruginosus*
82. *Circus cyaneus*
83. *Circus macrourus*
84. *Circus pygargus*
85. *Coccothraustes coccothraustes*
86. *Columba livia*
87. *Columba oenas*
88. *Columba palumbus*
89. *Coracias garrulus*
90. *Corvus corax*
91. *Corvus corone cornix*
92. *Corvus frugilegus*
93. *Coturnix coturnix*
94. *Cuculus canorus*
95. *Cygnus cygnus*
96. *Cygnus olor*
97. *Delichon urbica*
98. *Dendrocopos leucotos*
99. *Dendrocopos major*
100. *Dendrocopos medius*
101. *Dendrocopos minor*
102. *Dendrocopos syriacus*
103. *Dryocopus martius*
104. *Egretta alba*
105. *Egretta garzetta*
106. *Emberiza cia*
107. *Emberiza citrinella*
108. *Emberiza hortulana*
109. *Emberiza melanocephala*
110. *Emberiza schoeniclus*
111. *Eremophila alpestris*
112. *Erithacus rubecula*
113. *Falco cherrug*
114. *Falco columbarius*
115. *Falco naumanni*
116. *Falco peregrinus*
117. *Falco subbuteo*
118. *Falco tinnunculus*
119. *Falco vespertinus*
120. *Ficedula albicollis*
121. *Ficedula hypoleuca*
122. *Ficedula parva*
123. *Ficedula semitorquata*
124. *Fringilla coelebs*
125. *Fringilla montifringilla*
126. *Fulica atra*
127. *Galerida cristata*
128. *Gallinula chloropus*
129. *Gallinago gallinago*
130. *Garrulus glandarius*
131. *Gavia arctica*
132. *Gavia stellata*
133. *Gelochelidon nilotica*
134. *Glareola nordmanni*
135. *Glareola pratincola*
136. *Grus grus*
137. *Haematopus ostralegus*
138. *Haliaeetus albicilla*
139. *Hieraaetus pennatus*
140. *Hippolais caligata*
141. *Hippolais pallida*
142. *Hirundo rustica*
143. *Ixobrychus minutus*
144. *Jynx torquilla*
145. *Lanius collurio*
146. *Lanius excubitor*
147. *Lanius minor*
148. *Lanius senator*
149. *Larus audouinii*
150. *Larus cachinnans*
151. *Larus canus*
152. *Larus genei*
153. *Larus ichthyaetus*
154. *Larus melanocephalus*
155. *Larus minutus*
156. *Larus ridibundus*
157. *Locustella fluviatilis*
158. *Locustella luscinioides*
159. *Locustella naevia*
160. *Lullula arborea*
161. *Luscinia luscinia*
162. *Luscinia megarhynchos*
163. *Luscinia svecica*
164. *Melanitta fusca*
165. *Melanocorypha bimaculata*
166. *Mergus albellus*
167. *Mergus merganser*
168. *Mergus serrator*
169. *Merops apiaster*
170. *Miliaria calandra*
171. *Milvus migrans*
172. *Monticola saxatilis*
173. *Monticola solitarius*
174. *Motacilla alba*
175. *Motacilla cinerea*
176. *Motacilla citreola*
177. *Motacilla flava*
178. *Muscicapa striata*
179. *Netta rufina*
180. *Numenius arquata*
181. *Nycticorax nycticorax*
182. *Oenanthe hispanica*
183. *Oenanthe isabellina*
184. *Oenanthe oenanthe*
185. *Oenanthe pleschanka*
186. *Oriolus oriolus*
187. *Otus scops*
188. *Oxyura leucocephala*
189. *Pandion haliaetus*
190. *Panurus biarmicus*
191. *Parus ater*
192. *Parus caeruleus*
193. *Parus lugubris*
194. *Parus major*
195. *Parus palustris*
196. *Passer domesticus*
197. *Passer montanus*
198. *Pelecanus crispus*
199. *Pelecanus onocrotalus*
200. *Perdix perdix*
201. *Pernis apivorus*
202. *Petronia petronia*
203. *Phalacrocorax carbo*
204. *Phalacrocorax pygmaeus*
205. *Phasianus colchicus colchicus*
206. *Philomachus pugnax*
207. *Phoenicurus ochruros*
208. *Phoenicurus phoenicurus*
209. *Phylloscopus borealis*
210. *Phylloscopus collybita*
211. *Phylloscopus inornatus*
212. *Phylloscopus nitidus*
213. *Phylloscopus sibilatrix*
214. *Phylloscopus trochiloides*
215. *Phylloscopus trochilus*
216. *Picus viridis*
217. *Platalea leucorodia*
218. *Plectrophenax nivalis*
219. *Plegadis falcinellus*
220. *Pluvialis squatarola*
221. *Podiceps auritus*
222. *Podiceps cristatus*
223. *Podiceps grisegena*
224. *Podiceps nigricollis*
225. *Podiceps ruficollis*
226. *Porzana parva*
227. *Porzana porzana*
228. *Prunella ocularis*
229. *Ptyonoprogne rupestris*
230. *Puffinus yelkouan*
231. *Pyrrhocorax graculus*
232. *Pyrrhocorax pyrrhocorax*
233. *Pyrrhula pyrrhula*
234. *Rallus aquaticus*
235. *Recurvirostra avosetta*
236. *Regulus ignicappilus*
237. *Regulus regulus*
238. *Remiz pendulinus*
239. *Riparia riparia*
240. *Saxicola rubetra*
241. *Saxicola torquata*
242. *Scolopax rusticola*
243. *Serinus serinus*
244. *Sitta europaea*
245. *Sitta krueperi*
246. *Sitta neumayer*
247. *Stercorarius pomarinus*
248. *Sterna albifrons*
249. *Sterna caspia*
250. *Sterna hirundo*
251. *Sterna sandvicensis*
252. *Streptopelia decaocto*
253. *Streptopelia senegalensis*
254. *Streptopelia turtur*
255. *Strix aluco caucasica*
256. *Sturnus roseus*
257. *Sturnus vulgaris*
258. *Sylvia atricapilla*
259. *Sylvia borin*
260. *Sylvia communis*
261. *Sylvia curruca*
262. *Sylvia hortensis*
263. *Sylvia nisoria*
264. *Tadorna ferruginea*
265. *Tadorna tadorna*
266. *Tichodroma muraria*
267. *Tringa erythropus*
268. *Tringa glareola*
269. *Tringa ochropus*
270. *Tringa totanus*
271. *Turdus iliacus*
272. *Turdus merula*
273. *Turdus pilaris*
274. *Turdus torquatus*
275. *Turdus viscivorus*
276. *Upupa epops*
277. *Vanellus vanellus*

Table 7. Mammals occurring in Georgian Black Sea coastal wetlands (Kolkheti) ordered by species name

1. *Apodemus agrarius*	19. *Martes foina*	37. *Nyctalus maximus*
2. *Apodemus flavicollis*	20. *Meles meles*	38. *Nyctalus noctula*
3. *Apodemus mystacinus*	21. *Microtus arvalis*	39. *Pipistrellus pipistrellus*
4. *Apodemus sylvaticus*	22. *Microtus majori*	40. *Pipistrellus savii*
5. *Arvicola terrestris*	23. *Microtus subterraneus*	41. *Plecotus auritus*
6. *Barbastella barbastella*	24. *Miniopterus shreibersii*	42. *Rattus norvegicus*
7. *Canis aureus*	25. *Mus musculus*	43. *Rattus rattus*
8. *Capreolus capreolus*	26. *Muscardinus avellanarius*	44. *Rhinolophus ferrum-equinum*
9. *Cricetulus migratorius*	27. *Mustela nivalis*	45. *Rhinolophus hipposideros*
10. *Crocidura leucodon*	28. *Myocastor coypus*	46. *Rhinolophus mehelyi*
11. *Crocidura russula*	29. *Myotis bechsteini*	47. *Sciurus vulgaris*
12. *Crocidura suaveolens*	30. *Myotis myctacinus*	48. *Sicista caucasica*
13. *Erinaceus auritus*	31. *Myotis nattereri*	49. *Talpa caeca*
14. *Erinaceus europaeus*	32. *Myotis oxygnathus*	50. *Talpa caucasica*
15. *Felis silvestris*	33. *Neomys fodiens*	51. *Talpa minima*
16. *Lepus capensis*	34. *Neomys fodiens*	52. *Vespertilio murinus*
17. *Lutra lutra*	35. *Neosciurus carolinensis*	53. *Vespertilio serotinus*
18. *Lynx lynx*	36. *Nyctalus leisleri*	54. *Vulpes vulpes*

Table 8. Amphibians occurring in Georgian Black Sea coastal wetlands (Kolkheti) ordered by species name (Compiler: Dr. Dato Tarknishvili)

1. *Bufo bufo verrucosissimus*	9. *Rana macrocnemis*
2. *Bufo viridis*	10. *Rana ridibunda ridibunda*
3. *Hyla arborea shelkownikowi* (subspecies endemic to Caucasus)	11. *Triturus karelinii*
4. *Hyla savignyi*	12. *Triturus vittatus*
5. *Mertensiella caucasica* (Caucasian Salamander)	13. *Triturus vittatus ophryticus*
6. *Mertensiella caucasica janashvilii* (Adjarian population)	14. *Triturus vulgaris*
7. *Pelobates syriacus*	15. *Triturus vulgaris* (neotenic form)
8. *Pelodytes caucasicus* (Caucasian Parsley Frog)	16. *Triturus vulgaris lantzi* (endemic subspecies)

Table 9. Reptiles occurring in the Georgian Black Sea river basin (Kolkheti) ordered by species name (Compiler: Dr. Dato Tarknishvili)

1. *Anguis fragilis*	14. *Lacerta mixta*
2. *Coluber jugularis caspius* (Abkhazia, Krasnodar region)	15. *Lacerta parvula*
3. *Coluber najadum* (Abkhazia, Krasnodar region)	16. *Lacerta praticola*
4. *Coronella austriaca*	17. *Lacerta rudis* (mountains of Adjaria and adjacent Turkey)
5. *Elaphe hohenackeri* (sporadically encountered; reported for Batumi)	18. *Lacerta saxicola*
6. *Elaphe longissima* (widespread)	19. *Lacerta strigata*
7. *Emys orbicularis*	20. *Lacerta trilineata media*
8. *Lacerta agilis agilis* (widespread)	21. *Natrix natrix scutata*
9. *Lacerta agilis brevicaudata*	22. *Natrix tessellata*
10. *Lacerta agilis grusinica*	23. *Ophisaurus apodus* (Abkhazia, Krasnodar region)
11. *Lacerta caucasica*	24. *Testudo graeca* (only in Abkhasia, critically endangered)
12. *Lacerta clarkorum* (mountains of Adjaria and adjacent Turkey)	25. *Vipera dinniki* (subalpine)
13. *Lacerta derjugini*	26. *Vipera kaznakovi* (mountain forest belt)

Table 10. Fishes occurring in Georgian Black Sea river basin (Kolkheti) and littoral zone of Black Sea given in systematic order, excluding littoral zone of Black Sea (Compiler: Rezo Goradze)

1. *Lampetra mariae Berg*	36. *Alburnus alburnus (Linne)*	71. *Diplodus annularis (Linne)*
2. *Squalus acanthias Linne*	37. *Alburnus charusini Herzenstein*	72. *Puntazzo puntazzo (Cetti)*
3. *Raja clavata Linne*	38. *Alburnoides bipunctatus fasciatus (Nordmann)*	73. *Spicara smaris (Linne)*
4. *Dasyatis pastinaca (Linne)*	39. *Blicca bjoerkna (Linne)*	74. *Mullus barbatus ponticus Essipov*
5. *Huso huso Linne*	40. *Abramis brama Linne*	75. *Symphodus (Crenilabrus) tinca (Linne)*
6. *Acipenser nudiventris (Lovetzky)*	41. *Vimba vimba tenella (Nordmann)*	76. *Trachinus draco Linne*
7. *Acipenser guldenstadti var colchicus Marti*	42. *Rhodeus sericeus amarus (Bloch)*	77. *Uranoscopus scaber Linne*
8. *Acipenser sturio Linne*	43. *Carassius auratus gibelio (Bloch)*	78. *Ophidion rochei Muller*
9. *Acipenser stellatus Pallas*	44. *Carassius carassius morpha (Linne)*	79. *Gymnammodytes cicerellus (Refinesque)*
10. *Sprattus sprattus phalericus (Risso)*	45. *Cyprinus carpio Linne*	80. *Callionymus rissoi Le Sueur*
11. *Clupeonella cultriventris cultiventris (Nordmann)*	46. *Aristichthys nobilis (Richardson)*	81. *Callionymus pusillus Delaroche*
12. *Alosa caspia palaeostomi (Sadowsky)*	47. *Hypophthalmichthys molitrix (Valenciennes)*	82. *Callionymus lyra Linne*
13. *Alosa caspia tanaica (Grimm)*	48. *Cobitis taenia satunini Gladkov*	83. *Euthynnus alleteratus (Rafinesque)*
14. *Alosa kessleri pontica (Eichwald)*	49. *Silurus glanis Linne*	84. *Scomber scombrus Linne*
15. *Engraulis encrasicholus (Linne)*	50. *Anguilla anguilla (Linne)*	85. *Pomatoschistus caucasicus Kawrajsky*
16. *Salmo trutta labrax (Pallas)*	51. *Belone belone euxini Gunther*	86. *Pomatoschistus marmoratus (Risso)*
17. *Salmo trutta morpha fario Linne*	52. *Gaidropsarus mediterraneus (Linne)*	87. *Knipowitschia georghievi Pinchuk*
18. *Salmo irideus Gibbons*	53. *Gasterosteus aculeatus Linne*	88. *Neogobius gymnotrachelus (Kessler)*
19. *Esox lucius Linne*	54. *Nerophis ophidion (Linne)*	89. *Neogobius melanostomus (Pallas)*
20. *Rutilus rutilus (Linne)*	55. *Syngnathus abaster Risso*	90. *Neogobius kessleri Gunther*
21. *Rutilus rutilus heckeli (Nordmann)*	56. *Hippocampus ramulosus Leach*	91. *Neogobius syrman (Nordmann)*
22. *Rutilus frisii (Nordmann)*	57. *Gambusia affinis holbrocki (Girardi)*	92. *Neogobius ratan (Nordmann)*
23. *Leuciscus cephalus orientalis Nordmann*	58. *Mugil cephalus (Linne)*	93. *Neogobius cephalarges (Pallas)*
24. *Leuciscus borysthenicus (Kessler)*	59. *Liza aurata (Risso)*	94. *Neogobius fluviatilis (Pallas)*
25. *Phoxinus phoxinus colchicus Berg*	60. *Liza saliens (Risso)*	95. *Neogobius platyrostris constructor (Pallas)*
26. *Mylopharingodon piceus (Richardson)*	61. *Mugil so-iuy Basilewsky*	96. *Gobius niger Linne*
27. *Scardinius erythrophthalmus (Linne)*	62. *Atherina boyeri Risso*	97. *Proterorhinus marmoratus (Pallas)*
28. *Ctenopharyngodon idella (Valenciennes)*	63. *Dicentrarchus labrax (Linne)*	98. *Scorpaena porcus Linne*
29. *Aspius aspius (Linne)*	64. *Serranus scriba (Linne)*	99. *Trigla lucerna Linne*
30. *Tinca tinca (Linne)*	65. *Stizostedion (lucioperca) lucioperca (Linne)*	100. *Eutrigla gurnardus (Linne)*
31. *Chondrostoma colchicum (Kessler)*	66. *Perca fluviatilis (Linne)*	101. *Psetta maeotica (Pallas)*
32. *Gobio gobio lepidolaemus natio caucasicus Kamensky*	67. *Pomatomus saltatrix (Linne)*	102. *Platichthys flesus luscus (Pallas)*
33. *Capoeta (Varicorhinus) sieboldi (Steindachner)*	68. *Trachurus mediterraneus ponticus Aleev*	103. *Solea nasuta (Pallas)*
34. *Barbus tauricus escherichi Steindachner*	69. *Sciaena umbra Linne*	
35. *Chalcalburnus chalcoides derjugini (Berg)*	70. *Umbrina cirrosa (Linne)*	

MOLDOVA

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INTRODUCTION

Moldova is not a coastal state, however its major wetlands lie on the Rivers Prut and Dniester, which flow through part of Ukraine and discharge into the Black Sea. Sites such as Manta-Beleu, Talmaza-Palanka, Cuchurgan Reservoir and the upper part of Lake Cahul are situated mainly within the 100-km coastal zone of the Black Sea and are integral parts of the coastal ecosystems. Twelve Moldovan wetlands are included in the inventory, covering a total area of *c.* 41,277 ha.

Waterbodies cover about 1% of Moldova. The average rainfall values are 560 mm in the north and 370 mm in the south; the variation in annual rainfall norms is 400% or more. Two of seven rivers of moderate length are drying up to a significant extent, as are many of the *c.* 3,000 small rivers and streams, especially in the south. Small rivers tend to be bordered by forest within woodlands only but stripped mainly.

The waters of the Rivers Dniester and Prut are mostly moderately polluted (2nd class), but in some sectors the quality falls as low as 3rd class (polluted) and 4th class (very polluted) – in the Prut, for example. This applies also to small rivers, which are polluted by nitrates. The beds of the various basins are usually very muddy, and eutrophication causes corresponding vegetation growth. Native wetland biocoenoses have been largely destroyed by drainage, damming, etc.

However, some wetland sites still harbour great biodiversity, especially when the adjacent terrestrial habitats are taken into consideration. In essence, two of the 12 sites listed (Talmaza-Palanca and Cuchurgan Reservoir) are of international importance and meet the requirements of the Ramsar Convention, as does Manta-Beleu, which was designated as a Ramsar site in 2000. The remaining nine sites are of national importance, however infor-

Table 1. Overview of the wetlands of Moldova

No	Site	Region	Area (ha)	Protected area (ha)
1	Lac Manta - Beleu (Ramsar site)	Cahul Uezd	9,210	1,691
2	Lacul refrejerent Cuchurgan	Slobozia District *	6,200	None
3	Goeni Bay (Lacul de acumulare Dubasari)	Dubasari District *	1,147	836
4	Balatina (River P rut)	Balti Uezd	9,000	6,000
5	Lacul de acumulare Costeshti - Stanca (Costeshti -Stanca Reservoir)	Edinet Uezd	5,900	None
6	Lacul de acumulare Ghidighici	Chisinau Uezd	900	None
7	Nistru Inferior (Talmaza - Palanca)	Tighina Uezd	5,600	358
8	Otaci -Golosnita (L acul de acumulare Dubasari)	Edinet Uezd and Dubasari District	1,400	300
9	Lacul Taraclia	Taraclia Uezd	550	None
10	Lacul Congaz	Gagauzia **	500	None
11	Lacul Salas	Chisinau Uezd	330	None
12	Lacul Cahul	Gagauzia **	540	None
		Total	**41,277**	**9,185 (22%)**

*N o t e s : * – Region of Transdniestria; ** – autonomous territorial unit*

Map 1. The wetlands of Moldova (numbers correspond with the numbers in the text and table 1)

mation on them is very sparse. At present, five wetlands are under some form of statutory protection over some parts of their area, but only two of these (Goeni Bay and Balatina) are almost fully protected.

The following institutions are involved in wetland conservation in Moldova:

- Central Environmental Bodies: responsible for site inspection, development and enforcement of legislation linked to wetland conservation, landowners of scientific reserves. State Forestry Service: responsible for the main scientific reserves and main forested areas. Local Authorities: responsible for status support in protected areas (besides scientific reserves), ownership of some forested areas and other areas in the riparian zones.
- Institute of Zoology, Academy of Sciences of Moldova: responsible for development of scientific bases for wetland protection and management;
- Research Fishery Station: responsible for scientific policy for fisheries;
- Society of Hunters and Anglers of Moldova: responsible for management of amateur fishery in some wetlands, in accordance with the legislation and based on scientific recommendations;
- BIOTICA Ecological Society: NGO of professionals in biodiversity conservation, specialising in aquatic and wetland life as well as in drafting environmental legislation, focal point of Ramsar Convention.

Occurrence of threatened taxa at sites included in the inventory

All taxa listed in the table are included in the 2000 IUCN Red List of Threatened Species or the Red Data Book (RDB) of Moldova. The list may not be comprehensive for individual sites as it is dependent upon data availability; only the most characteristic or threatened species are included.

Table 2. Occurrence of threatened taxa at sites included in the inventory

Scientific name	IUCN Red List	RDB of Moldova	Site											
			1	2	3	4	5	6	7	8	9	10	11	12
Mammals														
Felis silvestris	VU A1de+2e	EN	√			√			√					
*Lutra lutra**	VU A2cde	CR	√			√			√	√				
*Mustela lutreola**	EN A1ace	CR	√			√			√					
*Myotis bechst einii**									√					
*Myotis dasycneme**	VU A2c	VU							√					
*Nyctalus lasiopterus**	LR/nt	CR							√					
Birds														
Aquila pomarina	NE	CR	√	√		√			√					
Ardea purpurea	VU A2ac	VU	√						√					
Ardeola ralloides	VU A2ac	VU	√	√					√					
Aythya nyroca	LR/nt		√	√	√	√	√	√	√				√	
Ciconia nigra	VU B2a	CR	√			√			√					
Circus cyaneus	LR/nt	EN	√				√		√					
Crex crex	VU A2c			√		√			√					
Cygnus cygnus	LR/nt	VU	√	√					√					
Cygnus olor	NE	VU	√	√	√		√	√	√	√	√	√	√	
Egretta alba	VU A1a	CR	√	√					√				√	
Haematopus ostralegus	NE	NE	√	√							√			
*Haliaeetus albicilla**	LR/nt	CR	√	√					√					
Hieraaetus pennatus	NE	CR	√	√		√			√	√				
Himantopus himantopus	VU D2								√		√			
Pandion haliaetus	NE	CR	√	√	√				√				√	
Pelecanus cr ispus	LR/cd	VU	√								√			
Pelecanus onocrotalus	VU C1	VU	√						√		√			
Pernis apivorus	NE	EN	√	√		√			√					
*Phalacrocorax pygmaeus**	LR/nt	VU	√						√		√			

Continuation of Table 2

Scientific name	IUCN Red List	RDB of Moldova	Site											
			1	2	3	4	5	6	7	8	9	10	11	12
Picus viridis	NE	EN								√				
Platalea leucorodia	EN A1ac	CR	√	√					√					
Plegadis falcinellus	LR/nt	CR	√	√					√					
Recurvirostra avosetta	VU A1c	VU	√								√			
Reptiles														
Coluber jugularis	NE	EN	√		√		√			√				
Coronella austriaca	DD	VU			√	√				√				
Elaphe longissima	NE	EN			√	√				√				
Amphibians														
Emys orbicularis	LR/nt	VU	√	√	√	√	√		√					
Pelobates fuscus	EN A1c, B1+2cd	VU	√	√		√			√					
Triturus vulgaris	DD						√							
Fish														
Acipenser gueldenstaedtii colchicus	EN A1acde	EN							√					
A. nudiventris	EN A1 acde+2d		√						√					
A. stellatus	EN A2d	EN							√					
Eudontomyzon mariae	DD	VU	√			√	√		√					
Hucho hucho	EN A2bcde, B1+2bce	VU	√											√
*Huso huso**	EN A1 acde+2d	EN							√					
Leuciscus idus	NE	VU	√	√	√	√	√	√	√	√				√
*Umbra krameri**	VU A1ace	CR	√	√					√					
Zingel streber	VU A1ce +2ce	VU	√			√	√							
Zingel zingel	VU A1ce +2c e	VU	√			√	√		√	√				
Insects (Odonata)														
Coenagrion mercuriale	VU A2c								√					
Stylurus flavipes	NE								√					
Plants														
Aldrovanda vesiculosa									√					
Centaurea iberica			√											
Lilium candidum			√											
Limosella aquatica			√											
Nuphar lutea		CR	√						√					
Nymphaea alba		CR	√	√					√					
Ornithogallum flavescens		VU						√						
Sagittaria sagittifolia						√								
Salvinia natans		CR	√	√		√			√					
Stratiotes aloides			√											
Thelypteris palustris		EN	√											
Trapa natans s.l.		CR	√	√					√					
Vallisneria spiralis		EN	√						√					
Viola tanaitica					√			√						
Vitis sylvestris		CR	√			√			√					

** – indicates inclusion in the IUCN Red Lists (Economic Commission for Europe 1991)*

SITE ACCOUNTS

1. Lac Manta-Beleu (Floodplain and Lakes Manta-Beleu)

Location: Beleu Floodplain: 45°36'N, 28°08'E. Manta Floodplain: 45°51'47''N, 28°11'40''E. The wetland is situated in the Prut Valley. It extends from Cahul town to Slobozia Mare village (11 km from the mouth of the River Prut), 150 km from Chisinau.
Area: 9,210 ha.
Altitude: 2.9-10 m above sea level, average 6.5 m.
Wetland type: M, N, O, P, Xf; 1, 3, 4, and 9 (Ramsar).
Other hydrologically linked wetlands: The Rivers Danube and Prut with related sites, Balatina (4), Costeshti-Stanca Reservoir (5).
Description of site: The site includes 2 core areas. The Prutul de Jos Scientific Reserve (1,691 ha) covers Lake Beleu (area fluctuates between 500 and 950 ha), wet meadows mainly between the lake and the River Prut, reed-beds bounded by a canal and wet willow forest to the north, replaced by drier, shrub-dominated woods near the river. The Manta site includes aquaculture ponds (1,589 ha), connected natural lakes (265,208 ha) and some waterbodies of smaller area with meadows and bogs between them and the river. The riverbanks are covered here by sparse tree growth. Core areas are united by the river and a narrow valley with bogs and drained arable lands, which have largely been abandoned recently and are now used for grazing. The complex is of natural origin, with some modification through human activities. Unique in Moldova, it is connected with the Danube wetlands both in its landscape and biology. The wetland plays an important role in groundwater discharge, flood control, sediment trapping, and as a biological filter.
Climate: The climate of the site is largely dictated by the Black Sea. Winters are generally mild, although frosts can occur throughout the winter. Average snow thickness is 10 cm, with mean cover duration of 30-40 days. Snow melt starts in early March. In spring, warm weather is stable with high temperatures up to 22°C and cloudless skies. Early summer is characterised by torrential rains, becoming dry later. Autumn is warm until November, with light rain. The prevailing winds are from the north and east, with average velocity of 2-5 m/s. Annual precipitation is less than 400 mm. In dry years, up to 45.7% of annual rainfall occurs in the spring, with 22.9% in summer, 18.4% in the autumn, and 13% in the winter.
Physical features: The surface geology is predominantly Quaternary (lower strata are formed by Upper-Pliocene deposits), mainly alluvial clays with beds of shingle, gravel and sand. The geomorphology is represented by Holocene floodplains. The riverbed is rather sinuous, mainly 60-80 m in width and 2-4 m in depth. The lake depths are generally 1-1.5 m, maximum 2 m. Floodplain-meadow soils dominate; trace elements in soils: Cu – 25-30 mg/kg, Zn – 40-50 mg/kg, Ni – 20-25 mg/kg, Co – 8-10 mg/kg, Mo – 3-4 mg/kg, and J – 4-5 mg/kg.
Hydrology: River discharge varies from 37.5-142 m^3, with 36.6% in spring and summer, 14.5% in autumn, and 12.3% in winter. All lakes are mainly spring-fed; the water balance is maintained by the Danube floods. The water table in the river valley is 0.5-1 m below ground level, therefore inflow into the Manta Lakes is supplemented from the River Prut by pumping for the fish farms. Once, in 1991, Lake Beleu dried up completely. River regulation for the Costeshti engineering system worsens the water deficit in dry years. Water levels in the lakes fluctuate from 0.5 m (Beleu) to 2.7 m (Manta floodplain). According to some data, an attempt to provide Lake Beleu with water by digging a canal has led to silting.
Water quality: The water is fresh, with a preponderance of hydrocarbonate ions. Average annual water temperature in the basins is 11.8°C, with a maximum of 23.7°C in August. Turbidity: from 1.1% to 11-44%. Suspended solids: 13-40 mg/l. Dissolved oxygen – 56-100%, pH – 7.38-8.85. Water quality is determined mainly by discharge regulation, inflow of sewage and natural processes. Contaminants, such as zinc and copper, sometimes exceed the maximum levels permitted by the Moldovan Government. Organochlorine-based pesticides and other toxins are found in the River Prut. Large quantities of wastewater entering the river at its confluence with the River Jija constrain its self-cleansing capacity.
Principal vegetation: Aquatic (unrooted submerged, floating and rooted) vegetation is the most diverse. It forms 19 associations: *Nymphoidetum* – 5, *Ceratophylletum* – 3, *Lemnetum* – 3, *Potamogetum* – 3, *Trapetum* – 2, *Nymphaetum* – 2. Reed-beds are represented mainly by *Phragmiteta australis* and *Typheta angustifolia,* but *Scirpeta lacustris, Bolboschoeneta maritima, Glyceriata maximae,* 6 *Phragmitetum* and 3 *Typhetum associations* are also present. Associations contain 5-10 species each. Meadows are formed by 10 associations: *Agrostidetum* – 5, *Elytrigietum* – 2, *Junceta, Potentillosum* and *Bolboschoenetum. Polygonum persicaria* and *P. hydropiper* fill disturbed waterlogged places. Tree stands are of *Saliceta (Salix alba, S. fragilis, S. viminalis, S. triandra). Populus alba, P. nigra* and *Ulmus laevis* are rare. The most widespread shrubs are *Rubus caesius, Sambucus nigra, Swida sanguinea, Ligustrum vulgare* and *Euonymus europaea.* Climbing plants include *Vitis sylvestris* and *Humulus lupulus.*

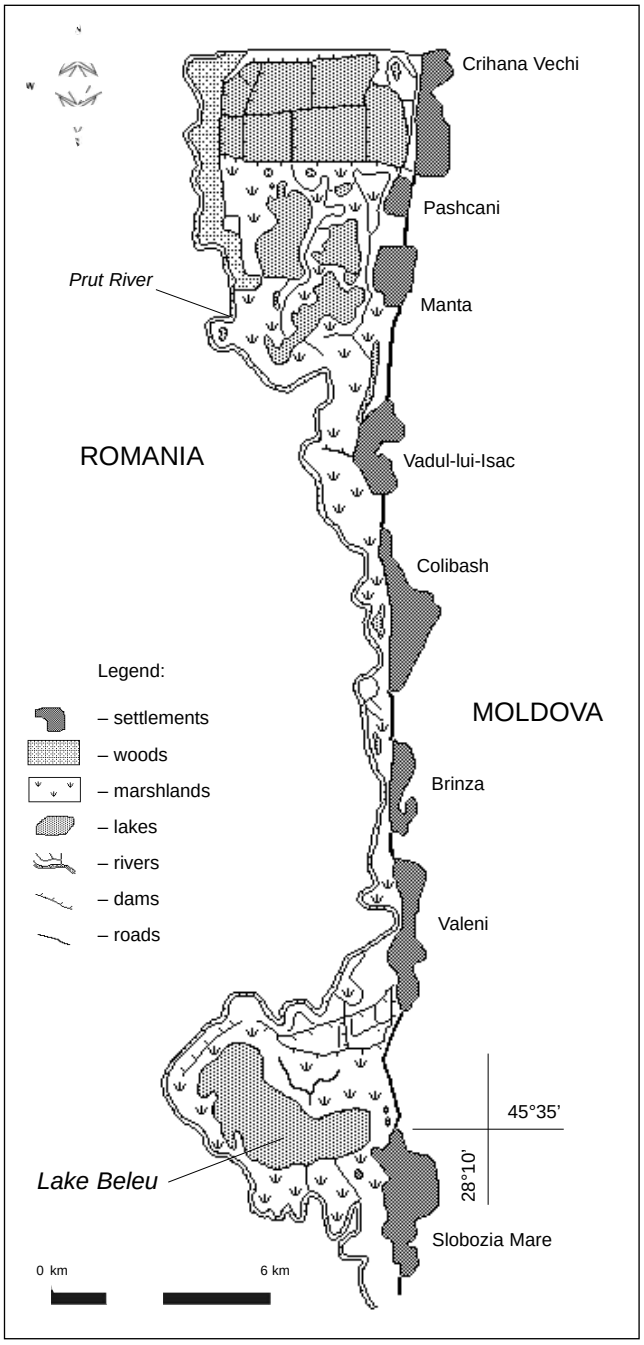
Phragmites australis, Typha angustifolia and *Carex riparia*, as well as *Elytrigia repens* in elevated areas, dominate in forest grass cover. In total, these species comprise seven common forest associations.

Land tenure: Mainly state and local community-owned lands. Drained areas are in a transitional stage between collective and private ownership. The fish farms are now in private ownership.

Conservation measures taken: The Prutul de Jos Scientific Reserve (1,691 ha) was created in 1991 with a 1.5 km wide protective zone around it to reduce the impact of economic activities. A management plan through to 2005 has been prepared, which includes research into the ecology, productivity and functioning of natural communities and the response of the site to the cessation of human activities. However, the whole site has suffered degradation because of increased access following relaxation of the border with Romania, especially due to pasturing and illegal tree cutting.

Conservation measures proposed: The site is in the area designated as the first Ramsar wetland of Moldova (2000) with a total area of 19,152 ha. It includes upper river terraces, sometimes intersected by ravines, and dry arable lands degraded through pasturing, a little anti-erosion planting, and forests. There is a plan to create a national park or biosphere reserve.

Land use: The wetland complex contains natural lakes – about 3,800 ha, aquaculture ponds – 1,569 ha, swamps and marshes – 1,300 ha, woodland – up to 700 ha, and legally-designated pastures – 1,100 ha. Drained arable lands covering at least 780 ha are partly abandoned and used for grazing. The land of the reserve is not being used according to its legal designation. Most of the adjacent area is under agriculture, including field crops, vineyards and pastures.



Map 2. The Floodplain and Lakes Manta-Beleu

Management: The Central Environmental Protection Body of the Republic of Moldova is responsible for site management, under the jurisdiction of the Moldova Cahul District Authorities. Although the Central Environmental Protection Body is the landholder in Scientific Reserves and is responsible for them, management is undertaken through the central body for forest service.

Possible changes in land use: The main change in land use is likely to be caused by waterlogging in drained agricultural land that is now neglected and intensification of grazing.

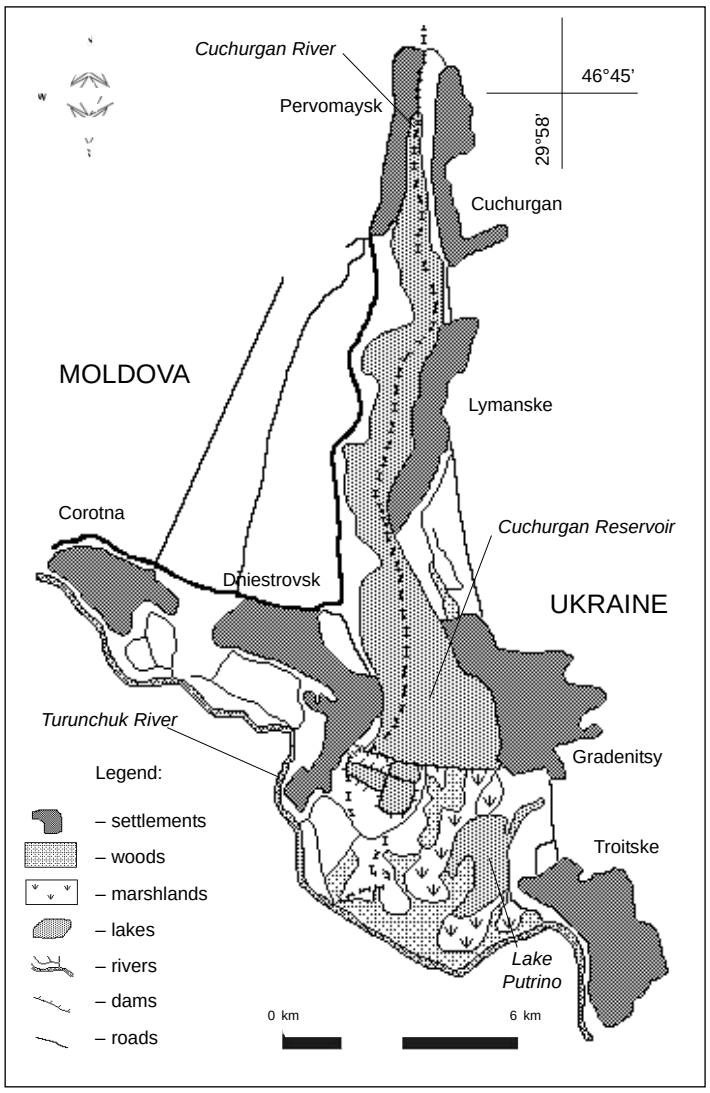
Disturbances and threats: Former human activities in the floodplain such as land reclamation through drainage, irrigation, etc. Water imbalance owing to inadequate ecological management of the river, and its irreversible consequences. External chemical pollution and siltation brought in by river water. Salinisation, alluvial deposits due to massive erosion on high terraces. Overgrazing, much illegal fishing (including in the protected area), forest cutting, and hunting. Faecal pollution of subterranean water from pasturing and the nearest settlements. Possible impact of fertilisers and pesticides from arable lands (in the event of economic recovery) which enter natural water bodies though drainage systems. Changes in land use away from aquaculture and conse-

quent worsening of the water supply deficit.
Economic and social values: The site is important for fishery. Both legal and illegal fishing play a significant role in the local economy. The agricultural value of the drained areas is decreasing in the current economic situation. Benefits from reed-bed usage may be restored through new uses and traditional crafts. The area includes mineral springs supporting a spa. The site has potential for the creation of a National Park or Biosphere Reserve.
Fauna: Mammals: 37 species including *Lutra lutra, Mustela lutreola, M. erminea, Felis silvestris* and *Crocidura suaveolens.* Birds: Of 203 bird species recorded (23 of which are included in the RDB of Moldova), 139 nest regularly at the site, e.g. *Aythya nyroca, Ciconia ciconia, Hieraaetus pennatus, Phalacrocorax pygmaeus,* some nest occasionally, e.g. *Aquila pomarina, Ardeola ralloides, Asio flammeus, Cygnus olor, Ciconia nigra, Dryocopus martius, Egretta alba, Pernis apivorus, Platalea leucorodia,* and *Plegadis falcinellus.* 36 species are transitory, including *Anser erythropus, Branta ruficollis, Circus pygargus, C. cyaneus, Cygnus cygnus, Columba oenas, Haliaeetus albicilla, Pandion haliaetus,* etc. Most species regularly visit the site to forage, e.g. *Pelecanus onocrotalus, P. crispus, Egretta alba; Phoenicopterus ruber* and *Haematopus ostralegus* are recorded occasionally. Reptiles: 5 species including *Emys orbicularis, Coluber jugularis, Coronella austriaca, Natrix tessellata.* Amphibians: 9 species including *Bombina bombina, Pelobates fuscus, Triturus cristatus.* Fish: 47–50 species, 24 inhabit lakes and channels; up to 20 species are protected in various ways, including *Acipenser ruthenus, Hucho hucho, Leuciscus idus, Lota lota, Umbra krameri, Zingel zingel. Eudontomyzon mariae* (Cyclostomata) is found also. Species that form the main catch are *Abramis brama, Cyprinus carpio, Lucioperca lucioperca* and *Silurus glanis.* Known aquatic invertebrates are represented by Rotatoria – 33, Cladocera – 29, Copepoda – 17, Chironomidae (Insecta: Diptera) – 17, Mollusca – 10, Oligochaeta – 8, Hirudinoidea – 3 species (zooplankton – 79, benthos – 38).
Special floristic values: The flora comprises 160 vascular species including 12 aquatic (unrooted submerged, floating and rooted) species. The emergent vegetation includes 50 species of higher plants of 26 families. The site supports the following species listed in the RDB of Plants of Moldova: *Limosella aquatica, Nuphar lutea, Nymphaea alba, Salvinia natans, Stratiotes aloides, Thelypteris palustris, Trapa natans s.l., Vallisneria spiralis* and *Vitis sylvestris.*
Research facilities: Research into fish populations, productivity, water quality and water, as well as faunal (mainly vertebrates) and floristic studies have been carried out by the Institutes of Zoology and Botany of the Academy of Sciences and also by the Fish Research Station. At present research is carried out only sporadically.
Public awareness and education: Little specific work is done by the state. Some environmental NGOs are working in the district and villages, but their activity is connected mainly with improving the environment around settlements.
Criteria for inclusion: 2 and 3.

2. Lacul refregirent Cuchurgan (Cuchurgan Reservoir)

Location: 46°36'N, 29°49'E. Situated on the border with Ukraine, in the valley of the River Turunchuk (a branch of the Dniester) at the mouth of the River Cuchurgan, in Slobozia sector, 60 km from Odessa. The site stretches from the town of Pervomaysk to the village of Nezavertaylovka along the Moldovan-Ukrainian state border, but the reservoir is mainly on Moldovan territory.
Area: 6,200 ha.
Altitude: 3-23 m above sea level, average 10 m.
Wetland type: M, N, O, 6, 3, 9 (Ramsar).
Other hydrologically linked wetlands: The Lower Dniester site and the Dniester Estuary wetlands.
Description of site: The site includes the River Cuchurgan with riparian marshes; the Cuchurgan Reservoir, created in 1964 to cool water at the Moldovan electric power station and situated on the site of a lagoon of the same name; the floodplain with forest; and Lake Putrino, surrounding reed-beds and connecting streams, bordered by a section of the River Turunchuk with adjacent marshes. A significant part of the reservoir is covered by semi-submerged vegetation with streams and sheltered pools. The main forest tract of almost 1,500 ha borders the reservoir dam. It is crossed by narrow channels and what is left of the lower Cuchurgan. Lake Putrino is very silted and overgrown with reed-beds. Part of the floodplain has been dammed for agriculture.
Climate: The proximity to the Black Sea modifies climatic conditions. Average data: annual temperature 9–10°C (minimum –29°C, maximum 38°C); annual rainfall *c.* 450 mm, with 300–350 mm between April and November; atmospheric humidity in July is in excess of 12 millibars. The prevailing winds are from the northwest and southeast, with average velocity of 2–5 m/s. Average snow thickness is 10 cm, with a mean duration of cover of 30–40 days.

Physical features: The Sarmatian stage of Neogenic deposits is represented by limestones, clays and sands. The surface geology is predominantly Quaternary. Before the creation of the reservoir, the lagoon was about 14 x 0.5-3 km, with an average depth of 2.2 m. The reservoir was created through the construction of eight dams, with a total length of 7 km, and sluices to control flow. Today its length fluctuates between 14 km and 20 km with an average width of 3 km; area *c*. 2,700 ha; average depth *c.* 3 m, maximum 9-10 m. Lake Putrino is 0.3-1.0 m deep. The channel of the River Turunchuk is meandering and weakly branched; it varies from 34 m to 270 m in width, but is mainly 60-75 m; its depth is mainly 5–7 m, but in some places it is 10-13 m deep. Flow velocity is 0.5-1.0 m/s. The riverbed is covered with silt and sand. Surrounding soils are predominantly chernozems, some of which are partially washed out, but the floodplain is covered by floodplain-meadow soils. Trace elements: Cu – 25-45 mg/kg, Zn – 40–50 mg/kg, Ni – 20-25 mg/kg, Co – 6-10 mg/kg, K – 2.3-2.6 mg/kg, and P – 0.21-0.25 mg/kg.



Map 3. Lacul refrejerent Cuchurgan

Hydrology: The catchment of the reservoir is over 70,000 km^2, mainly involving the Rivers Turunchuk and Cuchurgan. Its creation resulted in lower groundwater levels and loss of flow to some arms of the river. The functioning of the reservoir requires periodic water consumption and discharge through the River Turunchuk. The area of the current floodplain is dependent upon the River Dniester, which is in turn influenced by the Novodnestrovsk and Dniester Reservoirs.

Water quality: Discharge of heated water has raised temperatures: 13.5-19.6°C. Dissolved oxygen content is 7.8-13.5 mg/l, total nitrogen – 1.41-1.82 mg/l, phosphorus – 0.15-0.17 mg/l, and organic substances – 20.5-31.8 mg/l. Surface water mineralisation within the reservoir is 900-1850 mg/l and belongs to the sulphate-chloride class of sodium-magnesium group II. Mineralisation of the River Cuchurgan water is about 3,000 mg/l.

Principal vegetation: Reed-beds dominate the shoreline, mainly 1.5–2 m to 3–4 m in width, being represented by formations of *Phragmites australis, Typha angustifolia,* and *Schoenoplectus lacustris.* Open waters between reed-beds are often occupied by formations of *Potamogeton lucens* and *Butomus umbellatus.* Open water is also used by associations of *Potamogeton perfoliatus, P. crispus, Myriophyllum spicatum, Ceratophyllum demersum, Nymphoides peltata,* rarely *Nymphaea alba. Salvinia natans, Spirodela polyrrhyza, Hydrocharis morsus-ranae, Lemna trisulca,* and *L. minor* sometimes cover the water surface. Beginning in the 1970s, the area occupied by aquatic vegetation declined significantly; the process reversed in the 1980s when the temperature level rose. The area of reed-beds remained much the same, but the submerged vegetation spread during the 1990s despite the temperature's falling due to the lowing of the power load at the electricity station. The banks of the reservoir are covered mainly by a narrow band of grassy associations of weedy steppe vegetation with the addition of clumps of *Elaeagnus angustifolia* on the left bank. The main area of forest comprises a stand of the rare *Populus nigra*, almost deprived of understorey on the edge adjacent to the dam and close to Gradenitsy village. Forest areas along the River Turunchuk consist of simple communities of *Salix alba,* which acquires a brushy form in stable flooded sites. Floodplain reed-beds comprised of *Phragmites australis* and *Typha angustifolia* associations with shrubby *Salix* ssp. are found in a few elevated places. There is no

information on bogs near the River Cuchurgan.
Land tenure: The site is mainly state-owned with drained lands under collective farm ownership.
Conservation measures taken: None.
Conservation measures proposed: The site has been proposed as a seasonal zakaznik, for the protection of migrant and wintering waders and wildfowl. Protection of the site must include control of fishing, recreation and land reclamation.
Land use: Besides functioning as a cooling pond, the reservoir used to be an important place for commercial fishing; it partly lost this significance over the past decade because of heavy poaching. In addition, the site is used for hunting. The bank near Dniestrovsk town is a recreation zone. Surrounding lands are under agriculture, and the reservoir plays a role in irrigation. Near the south of reservoir, an area of land is occupied by an ash dump for the power station.
Possible changes in land use: The only probable change is waterlogging of the drained land.
Disturbances and threats: The creation of the reservoir resulted in modification of valuable natural communities but formed favourable conditions for nesting and overwintering of large numbers of waterbirds as well as for a significant amount of fishing. However, the use of coal led to water and soil pollution, and the increase in power generation at the station caused heat pollution and the danger of water mineralisation. In combination with raised nutrient levels from agricultural run-off, this has resulted in eutrophication of the water body, loss of some rare species, and an increase in the incidence of algal blooms. The growth of biological production occurred as another side effect. The site is also threatened by over-fishing, traffic pressure, etc. The main threat comes from further water mineralisation, despite the current constraint of heat pollution. Ukrainian environmental bodies halted the discharge of water into the River Turunchuk to avoid water pollution in the Dniester. The lack of discharge artificial water exchange via a sluice using slice could lead to the critical mineralisation and biological death of the water body, however, heavy pollution from the reservoir will be increased through natural discharge. Some areas in the floodplain have been dammed and Lake Dickuly has been drained for agriculture instead of being left together with wet meadows, which attracted numerous water birds.
Economic and social values: The site is of great value for fishing, hunting, and recreation for the local population and residents of Tiraspol town, and for scientific research and education.
Fauna: Mammals: 31 species, including *Mustela erminea.* Birds: Among 190 bird species recorded, 120 nest, including *Ardeola ralloides, Aythya nyroca, Botaurus stellaris, Crex crex, Cygnus olor.* 38 species, such as *Aquila clanga, A. pomarina, Egretta alba, Branta ruficollis, Falco cherrug, Haliaeetus albicilla, Hieraaetus pennatus, Pandion haliaetus, Pernis apivorus, Plegadis falcinellus, Platalea leucorodia, Sterna caspia* and *Tringa stagnitilis* use the site to stage on migration. The number of wintering birds fluctuates between 15,000-20,000 individuals, depending on the artificial heating of the water, severity of the winter and common trends in waterbirds populations. Reptiles: 4 species, including *Emys orbicularis.* Amphibians: 8 species, including *Pelobates fuscus.* Fish: The reservoir and its connected water bodies (apart from Turunchuk) harbour 46 fish species including *Leuciscus idus* and *Umbra krameri;* the population of *U. krameri* is the largest in the region. *Aristichthys nobilis, Hypophthalmichthys molitrix, Ctenopharyngodon idella* and *Ictalurus punctatus* have been introduced here. *Pseudorasbora parva* is a recent newcomer whereas *Atherina mochon pontica* has been established for some time, reflecting the changes in water mineralisation. The fish species in the River Turunchuk are the same as in the Lower Dniester. Invertebrates: The phytoplankton includes 142 species (109 in the past), free-living Protozoa – 119 (245), zooplankton (Rotatoria, Copepoda, Cladocera, Harpacticoidea) – 100 (134), zoobenthos – 168 (200 in the past). The macrozoobenthos contains: Oligochaeta – 60, Mollusca – 54 (characteristic of the Ponto-Caspian region), Crustacea – 31, Chironomidae – 96, other insects – 33, other groups – 72 species.
Special floristic values: 108 species of macrophytes have been recorded in the reservoir system, 19 of which are submerged, 33 marginal and 44 terrestrial. *Nymphaea alba* and *Trapa natans s.l.* have probably disappeared in the reservoir but remain in the floodplain.
Research facilities: The Moldovan Institute of Zoology of the Academy of Sciences carries out research, as do Tiraspol University and the Ecological Centre.
Management: The Moldovan part of the site is managed by the Transdniestrian Central Environmental Body under the Slobozia Sector Authorities.
Criteria for inclusion: 2 and 5.

3. Goeni Bay/Lacul de acumulare Dubasari

Location: 47°23'N, 29°10'E. Near Goeni village in Dubasari District, Transdniestria.
Area: 1,147 ha, water surface 23.5%.

Altitude: 38-140 m above sea level.
Wetland type: M, N, Tp, Ts, 6.
Other hydrologically linked wetlands: The main part of the Dubasari Reservoir (8) and a small tributary.
Description of site: The site was previously known as Yagorlyk Bay. It includes a flooded canyon with steep river banks, connected to the reservoir by a channel, and the mouth of the River Yagorlyk, surrounded by high, steep limestone terrace slopes with semi-arid grassy associations, sometimes on stony screes.
Principal vegetation: Major growth of higher aquatic vegetation and reed-beds along the mouth of the River Yagorlyk and in the riverbed; steppe and semi-arid specific limestone-grass associations and forest planting on slopes; small weedy meadows.
Land tenure: State owned.
Conservation measures taken: The main part of the site is occupied by the Yagorlyk Scientific Reserve.
Conservation measures proposed: None.
Land use: The site is used mainly for conservation and fishing.
Possible changes in land use: None.
Disturbances and threats: There is serious water pollution due to intensive fish breeding in adjacent waters as well as organic contamination through the River Yagorlyk from livestock farms; illegal tree cutting and grazing, but fishing retains special importance.
Economic and social values: The site is of national economic value (spawning area).
Fauna: Mammals: 26 species, e.g. *Citellus citellus* and *Mustela erminea.* Birds: 121 species, 54 of which nest, e.g. *Cygnus olor,* but only 21 are waterfowl species. *Anser anser, A. albifrons, A. erythropus, Anas penelope, Aythya nyroca* and *Pandion haliaetus* use the site on migration. Reptiles: *Coluber jugularis, Coronella austriaca, Elaphe longissima, Emys orbicularis.* Fish: 38 species.
Special floristic values: 719 species of higher vascular plants are endemic, e.g. *Genista tetragona, Koeleria moldavica;* other rare species recorded include *Astragalus pubiflorus, Crocus reticulatus, Doronicum hungaricum, Jurinea stoechadifolia, Linum linearifolium.*
Research facilities: The staff of the reserve undertake research.
Criteria for inclusion: 2 and 3. IBA criterion B1i.

4. Balatina (River Prut)

Location: 47°40'N, 27°20'E. The valley of the River Prut near the villages of Cobani and Balatina, Uezd Balti.
Area: 9,000 ha.
Altitude: 49-100 m above sea level.
Wetland type: M, N, Tp, Ts, Xf, 4.
Other hydrologically linked wetlands: The River Prut, Costeshti-Stanca Reservoir (5).
Description of site: The site comprises forest tracts and floodplain meadows, old beds and active channels of the River Prut; streams and small lakes along part of the floodplain of the River Prut; small villages and cultivated land.
Principal vegetation: The principal habitat is 100-year old floodplain woodland, dominated by *Quercus robur* and *Pyrus communis.* The site also includes reed-beds (*Phragmites australis*) and plots of semi-arid vegetation.
Land tenure: Mainly state lands, but also private and public (under local authorities).
Conservation measures taken: The site includes the Padurea Domneasca Scientific Reserve (6,000 ha). Human activity is limited by the existence of water protection legislation, but this relates mainly to the 100-m wide riparian zone. The riverside is protected partly by special laws relating to the national border.
Conservation measures proposed: Justification of water protection legislation.
Land use: Mainly conservation and fishing, but also forestry, grazing and arable cultivation.
Possible changes in land use: No changes likely, other than a decrease in grazing pressure and strengthening of protective legislation or development of the protection regime.
Disturbances and threats: The area is one of floral instability, and serious expansion of the alien *Acer americana* is occurring; flood deficit because of river management, illegal land cultivation and poaching impact upon the site.
Economic and social values: The site is of potential national importance for both social and economic uses in addition to its conservation value.
Fauna: Insufficient data. Mammals: 42 species, e.g. *Crocidura leucodon, Felis silvestris, Lutra lutra, Lutreola lutreola, Martes martes, Mustela erminea.* Birds: 159 species, 107 of which nest, including *Anser erythropus, Aquila pomarina, Aythya nyroca, Hieraaetus pennatus, Ciconia nigra, Crex crex, Pernis apivorus.* Amphibians and reptiles: 15 species, e.g. *Pelobates fuscus, Coronella austriaca, Elaphe longissima, Emys orbicularis.*
Special floristic values: 575 vascular species have been recorded, including *Salvinia natans, Sagittaria sagit-*

tifolia, Dentaria glandulosa, Ophioglossum vulgatum and *Vitis sylvestris.*
Research facilities: None.
Criteria for inclusion: The area is of national importance for biodiversity conservation. IBA criteria Ai, B2, B3.

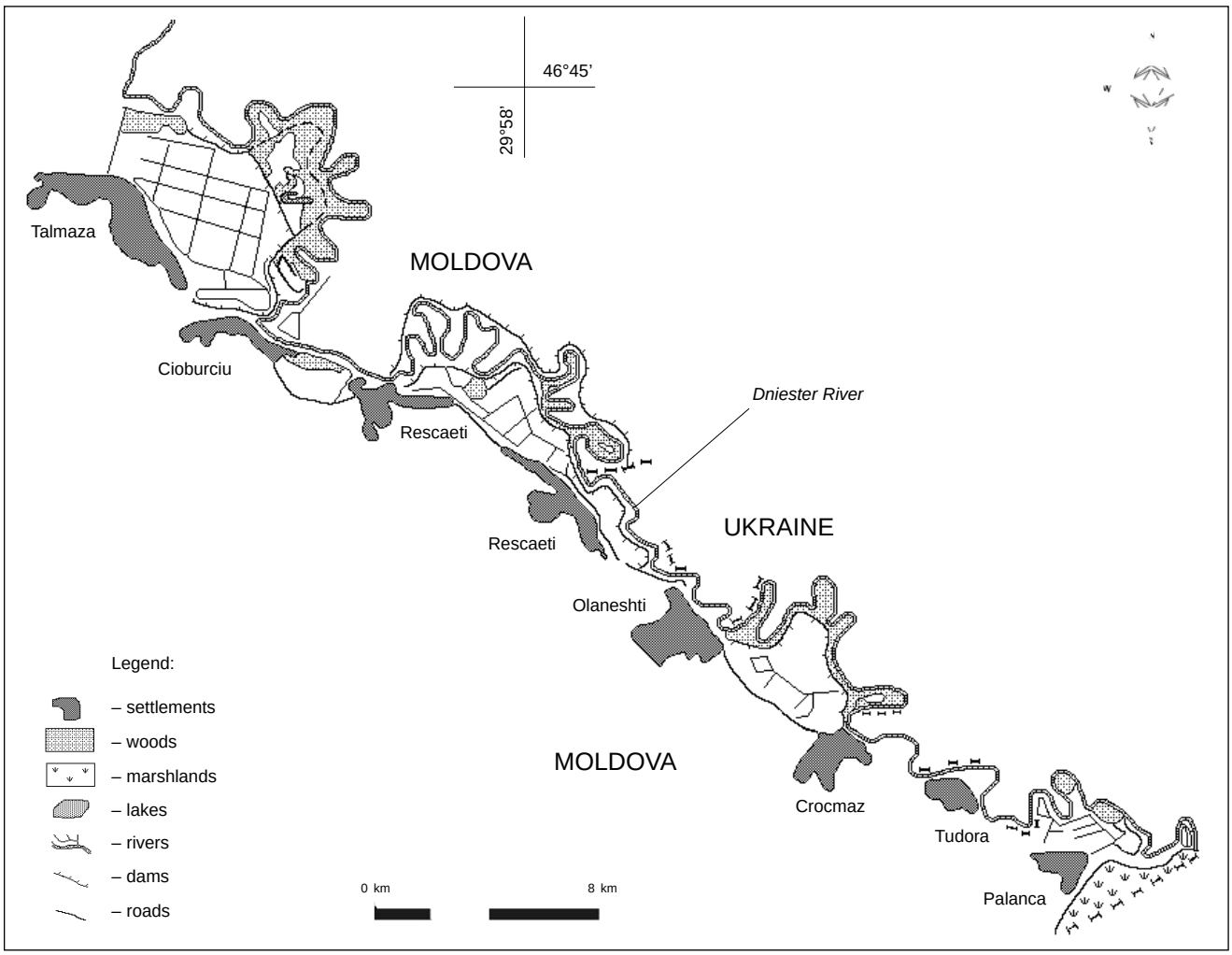
5. Lacul de acumulare Costeshti-Stanca

Location: 47°53'N, 27°12'E. Part of the valley of the River Prut, Uezd Edinet.
Area: 5,900 ha.
Altitude: 90-100 m above sea level.
Wetland type: M, 6.
Other hydrologically linked wetlands: River Prut, Balatina (4).
Description of site: The site includes a reservoir up to 20 m deep, surrounded by stony banks.
Principal vegetation: The site includes mainly openwater, marginal communities.
Land tenure: Mainly state ownership; neighbouring lands are mostly privately owned.
Conservation measures taken: None.
Conservation measures proposed: Justification of water protection legislation.
Land use: The reservoir is used for fishing and irrigation, adjacent lands are arable.
Possible changes in land use: No information.
Disturbances and threats: Poaching: fish resources are being undermined.
Economic and social values: An important site for fishing, but its significance is diminishing.
Fauna: Strong data deficit. Mammals: *Lutra lutra, Lutreola lutreola, Martes martes,* and *Mustela erminea.* Birds: Waders include the principal 20 species on the Bonn Convention checklist. *Cygnus olor* breeds. The main conservation value of the site lies in its importance as a stopover for migrant waterbirds such as *Aythya nyroca* and *Anser erythropus,* etc. Amphibians: *Triturus vulgaris.* Fish: *Vimba vimba.*
Special floristic values: No information.
Research facilities: None.
Criteria for inclusion: IBA criterion B1i.

6. Lacul de acumulare Ghidighici (Ghidighici Reservoir)

Location: 47°06'N, 28°42'E. In the central sector of the valley of the River Bic, Uezd Chisinau.
Area: 900 ha.
Altitude: 65-75 m above sea level.
Wetland type: M, Tp, 6.
Other hydrologically linked wetlands: The River Bic and possibly Lacul Salas (9).
Description of site: The site includes a reservoir linked to coastal flats and reed-beds on the river margins as it enters the reservoir.
Principal vegetation: The site involves a complex of open water, riparian fringes and low-lying coastal vegetation, partly afforested.
Land tenure: The reservoir is state property; banks are mainly municipal property.
Conservation measures taken: Human activity is limited by water protection legislation, principally relating to the 100-m wide riparian zone.
Conservation measures proposed: Justification of water protection legislation.
Land use: The reservoir is used for fishing; surrounding lands are under arable agriculture, anti-erosion planting and pasture. A recreation zone (beach, facilities, park) along the reservoir includes semi-natural habitats.
Possible changes in land use: No information.
Disturbances and threats: No information.
Economic and social values: The site is of significant social value.
Fauna: Strong data deficit. Large numbers of waterbirds occur on migration; 8 species on the Bonn Convention checklist have been recorded, e.g. *Aythya nyroca, Cygnus olor.*
Special floristic values: Strong data deficit; the site supports rare and vulnerable plant species such as *Ornithogalum flavescens.*
Research facilities: None.
Criteria for inclusion: The site can provide waterbirds with rich foraging resources, IBA criterion B1i.

7. Nistru Inferior (Talmaza-Palanca)



Map 4. The Nistru Inferior (Talmaza-Palanca)

Location: 46°24'-46°39'N, 29°40'-30°09'E. Meandering zone in the mouth of the Lower Dniester, situated in Tighina Uezd and extending for 140 km along the river.
Area: *c*. 5,600 ha.
Altitude: 3-22 m above sea level.
Wetland type: M, O, P, Tp, Ts, W, Xf, 1, 3, 4, and 9.
Other hydrologically linked wetlands: Sites related to the River Dniester, including the Cuchurgan site and the Dniester Estuary.
Description of site: A complex of relict habitats of the River Dniester floodplain, united by the river; a protective bund and a channel, formed after construction of the state's flood-prevention dam. The core of the area is the Talmaza Wetland of *c.* 1,200 ha, containing forest tracts with many glades, a lake (24 ha), a connected loop of the old river-bed, permanent and seasonal channels, and pools, bogs, meadows and parcels of abandoned arable land. Along the river, the site is comprised of woods and old forest planting, extensive shallow pools, degraded illegal pasture-meadows, meadows, bogs and waterlogged, stunted trees. There are aquaculture ponds along the right bank. The river goes through *c.* 30 meanders, many of which are semi- or almost completely closed. Some river loops contain orchards and fields, most of which are accompanied by bands of forest. The Talmaza Wetland includes a Resource Soil Reserve (200 ha); Nature Reserves – Olaneshti Forest (108 ha) and Togai Bog (50 ha) – are situated in two of the meanders. The left bank is protected mainly by the forest belt but the other valley is occupied by cultivated fields up to the Moldovan-Ukrainian border. The river contains areas of pelagic and river-bed spawning places within the boundaries of the site.
Climate: Average data: annual temperature 9-10°C (minimum –29°C, maximum 38°C); annual rainfall

c. 450 mm, *c.* 300 mm falling between April and November. The prevailing winds are from the northwest and southeast, with average velocity of 2-5 m/s. Average snow thickness is 10 cm, with mean cover duration of 30-40 days. Ice cover on the river averages 4-15 days.

Physical features: The north of the site was formed during the Sarmatian stage of Neogenic deposits, represented by limestones, clays and sands; the south is from the Pontic stage of Neogenic deposits, with a predominance of clays and sands. The surface geology is predominantly Quaternary. The Lower Dniester River bed has a width of 100-200 m; depths in shoals of 1.6-2.5 m, in reaches 4.0-8.0 to 16 m. The Talmaza Wetland contains the V-shaped Lake Adana, 2.4 km in length and 100 m in width. The old river-bed has a length of 2.5 km; width up to 40 m; depth up to 4 m; it is partly connected to the main stream. Different kinds of floodplain-meadow soils predominate; carbonate meadow chernozem, meadow and silty-marshy soils are found in the Resource Reserve.

Hydrology: River velocity is 0.2-0.4 m/sec, in shoals 0.5-0.9 m/sec. The river and floodplain are fed mainly by snow water in spring, rainfall in May-October, and groundwater during the cool season. Depending on the character of the recharge flood, the low-water period is unclear most years. There are three types of years: with dominant spring floods and sparse floods later; with an absence of spring floods and prevalence of summer floods; with a constant flood of equal height during spring, summer and autumn. The maximum spring water level in an average low flow period is 4.5-5.8 m, the water rising 0.4-6.2 m/24 hours. Normally 3-5 floods occur each summer and autumn, (sometimes as many as 12-15), with an average length of 10-15 and maximum of 55 days. However, the number of floods decreases to 1-2 in dry years. The pattern of water discharge depends on the management of the Novodnestrovsk Reservoir in Ukraine.

Water quality: The waters of the Lower Dniester are attributed to hydrocarbonate class II with mineralisation 395-638 mg/l and dissolved oxygen content of not less than 88.4%. Average content of suspended substances was 180-420 mg/l in the past but is now about 29.5 mg/l. Contamination by organic and other nitrogen-containing substances, phenols, oil products and metals takes place, especially below the town of Bender. The destruction of organic substances slows between Bender and main river fragment included in the site.

Principal vegetation: There are three forest types. *Populus alba* is found in six stands. *Populus alba* and *P. nigra* dominate in native stands with an admixture of *Quercus robur, Salix alba, Fraxinus excelsior* and *Ulmus laevis.* The ratio of main species that form woodland varies strongly. Tree stands completely lacking *P. alba* and single *Salix* sp., or including only *P. alba* and *F. excelsior,* or of *F. excelsior* exclusively have been recorded. Dominant associations are *P. (alba) rubosum (caesii)* and *F. (excelsior)-P. (alba) ulmosum.* Forests of *S. alba,* mainly *S. (alba) rubosum,* and *S. undulatum* or *S. (alba) undulatum,* include often shrubby *S. triandra* and *S. purpurea.* There are full successive rows and communities with normal structural-functional links, as distinct from common Moldovan forests; very old native wood plots are also conserved. Meadows are represented by true meadows (9 formations), waterlogged meadows including grassy marshes (22), secondary salt-meadows (3), e.g. *Phleum pratense, Poa pratensis, Elytrigia repens* and *Agrostis gigantea* with a notable proportion of dicotyledonous herbs, various *Cariceta, Junceta* and *Puccinellieta.* Aquatic vegetation is determined by the presence of 5 of 9 biotope types of the Lower Dniester, with their corresponding ecosystems. The background of boggy vegetation is formed by *Phragmites australis* and *Typha angustifolia* with a substantial proportion of *Butomus umbellatus, Alisma plantago-aquatica, Carex pseudocyperus* and *Potamogeton* ssp.

Land tenure: The main owners are the state and public communities. Dammed and drained agricultural lands are privately owned and under individual and collective management.

Conservation measures taken: The above-mentioned reserves are under state protection, which at present is mainly symbolic. A certain level of protection has been afforded to the woodlands.

Conservation measures proposed: The creation of a Lower Dniester National Park is proposed. It would cover 50,000 ha and form an ecological network uniting wetlands with upland forests through the planting of corridors and restoration of the natural ecosystem, especially of floodland. The network would integrate natural areas of Moldova and Ukraine.

Land use: Woodlands are used mainly for forestry by the State Forestry Service and also by local communities. Semi-legal pasturing takes place on grassy and partly-wooded areas; such usage predominates. Fishponds, arable fields and orchards occupy smaller areas. Illegal arable cultivation has been noted. Fishery and agriculture are no longer intensive. Legal and semi-legal fishing and hunting occur. Many drained arable lands border the site along the flood-prevention dam. Settlements are mainly outside the designated zone but sometimes (Cioburciu Village) penetrate into the site. At present, recreational use is limited mostly to the local population. Traditional water tourism takes places in the Talmaza Wetland, where the river divides.

Possible changes in land use: Changes should be determined by the creation of strict protected zones, substitution of grazing by hay-making, restoration of meadow spawning in two isolated meanders, development of tourism and local crafts, etc., as a consequence of the creation of the National Park. The rehabilitation of natural ecosystems is expected to increase in some adjacent territories if the drainage system continues to decline.

Amendments to the Law on Water-Protection Zones and Bands of Rivers and Water Bodies, which are currently in process, provide stricter and clearer restrictions on land use.

Disturbances and threats: The current situation has been brought about by the damming of the valley of the Dniester and the consequent almost total loss of natural processes to agricultural development; large areas of important meadow spawning grounds have been lost. This has been accompanied by the removal of some lowland forest tracts, however many riverside forests have been planted. The conservation of native forests has been poorly managed. The dam system causes the drying out of habitat in the Talmaza Wetland in years of low flow and waterlogging in high floods, as the dams prevent normal water discharge from flooded areas. Both provoke the degradation of terrestrial, aquatic and intermediate ecosystems. All the problems affecting the River Dniester impact on the aquatic ecosystems of the site (water pollution, discharge violations, destruction of gravel riverbed, etc). Major disturbance is caused by grazing, which degrades grassland. The impact of chemical residues from agriculture is low at present, but this threat could revive. Various poaching activities take place, primarily illegal fishing. However, in national terms, pressure on the fauna is relatively low.
Economic and social values: The site is of national value for forestry, including the important remaining spawning places. The site's cultural value is well recognised by the local population within the context of conservation. Fishing is the traditional occupation, but recreation is increasing.
Fauna: Mammals: 35 species. e.g. *Felis silvestris, Lutra lutra, Mustela erminea, M. lutreola, Myotis dasycneme, M. daubentoni* and *Nyctalus noctula. Meles meles* is numerous. Birds: 188 bird species have been recorded, including 95 breeding species: *Ardea purpurea, Ardeola ralloides, Aythya nyroca, Ciconia nigra, Circus aeruginosus, Crex crex, Cygnus olor, Egretta alba, Falco vespertinus, Hieraaetus pennatus* and *Phalacrocorax pygmaeus,* and 93 seasonal migrants including *Aquila clanga, Branta ruficollis, Cygnus cygnus, Falco cherrug, Hieraaetus albicilla, Pandion haliaetus* and *Sterna caspia,* or visitors: *Plegadis falcinellus* – flocks of 200-300 birds when foraging, *Pelecanus crispus,* etc. The numbers of recorded and breeding species have not been finalised. Many birds from wetlands in Ukraine feed here on shoals and pools. The Talmaza Wetland is an important site for transboundary migrants: the locality is the only important mass staging and foraging site on their flyway, being *c.* 250 km from the Middle Dniester. It is one of the few places in Moldova where large aggregations of moulting waterbirds are recorded. Amphibians: 8 species (*Pelobates fuscus, Rana arvalis*). Reptiles: 5 species (*Emys orbicularis*), the checklists are incomplete. Fish: 70 species, 30 of which have protected status, e.g. *Anguilla anguilla, Huso huso, Umbra krameri, Leuciscus idus, Rutilus frisii, Zingel zingel* and *Eudontomyzon mariae* (Cyclostomata). Insects: include *Coenagrion mercuriale, Gomphus flavipes* (Odonata), *Aromia moschata, Lucanus cervus,* (Coleoptera) *Callimorpha quadripunctaria, Saturnia pyri* (Lepidoptera), *Bombus argillaceus, Scolia hirta, S. maculata* and *Xylocopa valga* (Hymenoptera). Dragonflies number 32 species, i.e. 89% of known and 60% of expected species in Moldova.
Special floristic values: The site supports 1,300 algae species and subspecies. Diversity is conserved mainly in the Talmaza Wetland. The 'families: genera: species' ratio is 1:4:10, which testifies to high specificity. The vascular flora includes *c.* 300 species (*Aldrovanda vesiculosa, Carex secalina, Nymphaea alba, Salvinia natans, Trapa natans s.l., Zostera marina,* etc.).
Research facilities: There are no permanent research facilities. The most recent study (1998-1990) was conducted by the BIOTICA Ecological Society, funded by a grant from the MacArthur Foundation.
Criteria for inclusion: 1, 2, 3 and 5.

8. Otaci-Golosnita/Lacul de acumulare Dubasari (Dubasari Reservoir)

Location: The middle sector of the River Dniester beginning at the town of Otaci (48°27'N, 27°48'E) and downstream, including the upper part of Dubasari Reservoir near Golosnita village (48°15'N, 28°10'E), in Uezd Edinet and Dubasari District, Transdniestria.
Area: c. 1,400 ha of water surface (about 70%) and river canyon.
Altitude: Upper section: 60-200 m above sea level; lower section, 50-184 m.
Wetland type: M, Xf, 6.
Other hydrologically linked wetland: Dubasari Reservoir.
Description of site: The site comprises open water (stream and backwaters), reed-beds, shingle and sand banks; riversides are rocky, high and steep for a long distance, covered mainly by forest and grassy vegetation.
Principal vegetation: The riverbed is being progressively overgrown by higher aquatic and sometimes (along bunds) semi-aquatic vegetation. Terrestrial habitats are represented by woodlands, steppe and specific limestone-grass associations – including endemic species, impoverished pastures and transitional communities.

Land tenure: State-owned.
Conservation measures taken: Some areas of the river banks are protected, but this protection is largely symbolic. Human activity is limited by water protection legislation, but this is restricted mainly to the 100-m riparian zone.
Conservation measures proposed: Justification of water protection legislation.
Land use: Grazing on riverbanks, fishing in the river.
Possible changes in land use: Changes are unlikely, other than a decrease in grazing pressure and the strengthening of protective legislation.
Disturbances and threats: Construction of the Novodnestrovsk Dam and Hydroelectric Power Station resulted in drastic water level fluctuations and temperature changes. The water became too cool during the vegetation-growth period and too warm during winter, modifying the microclimate along a stretch of the river canyon. This causes degradation of fish communities, overgrowth of aquatic vascular vegetation, favourable conditions for waterbirds to overwinter, and sometimes accelerated destruction of the limestone surface on slopes that are important for the specific limestone-grass associations. The site may be threatened by recreation pressure, overgrazing and agricultural intensification.
Economic and social values: The site is of national economic and social value in addition to its conservation value.
Fauna: Strong data deficit. The following rare or vulnerable species have been recorded: Mammals: *Citellus citellus, Lutra lutra, Mustela erminea.* Birds: *Picus viridis, Hieraaetus pennatus,* and *Cygnus olor.* Waterbirds include about 20 dominant species, especially herons. *Aythya nyroca, Anser erythropus* and other wildfowl occur on migration. Reptiles: The following rare or vulnerable species have been recorded: *Elaphe longissima, Coluber jugularis* and *Coronella austriaca.*
Special floristic values: Insufficient data, as the flora have not been inventoried adequately. However, more than 500 vascular plant species have been recorded here (472 species in the Rudi-Arioneshti Landscape Reserve). The site supports many rare species such as *Galanthus nivalis, Hepatica nobilis, Gymnocarpium robertianum, Scopolia carniolica, Phyllitis scolopendrium, Chamerion dodonaei, Adonis vernalis, Pulsatilla montana, P. grandis, Athyrium filix-femina, Melittis melissophyllum, Cephalanthera damasonium* and *Dryopteris cartusiana.*
Research facilities: None.
Criteria for inclusion: The area is of national importance both for its socio-economic value and for biodiversity conservation. IBA criterion B2.

9. Lacul Taraclia (Taraclia Reservoir)

Location: 45°56'N, 28°37'E. The Uezd Taraclia is in Balabana village in southern Moldova.
Area: 550 ha.
Altitude: 18 m above sea level.
Wetland type: N, 6.
Other hydrologically linked wetlands: River Yalpug and Congaz Reservoir (10).
Description of site: A reservoir in the Yalpug valley in an agricultural landscape.
Principal vegetation: The site comprises mainly openwater, marginal communities and halophyte meadows.
Land tenure: State-owned.
Conservation measures taken: None.
Conservation measures proposed: None.
Land use: The only information available relates to fishery use on the reservoir.
Possible changes in land use: No information.
Disturbances and threats: No information.
Economic and social values: The site supports an important fishery.
Fauna: Strong data deficit. The following species have been recorded, mainly during foraging and seasonal migrations: *Pelecanus crispus, P. onocrotalus, Phalacrocorax pygmaeus, Cygnus olor, Recurvirostra avosetta, Himantopus himantopus,* and *Haematopus ostralegus.*
Special floristic values: No information; old data are now invalid.
Research facilities: None.
Criteria for inclusion: IBA criteria B1i, B2.

10. Lacul Congaz (Congaz Reservoir)

Location: 46°07'N, 28°37'E. In the valley of the River Yalpug, upstream of the Taraclia Reservoir, in the Gagauzian Autonomous Territorial Unit.
Area: 500 ha.
Altitude: 38-40 m above sea level.
Wetland type: N, 6.
Other hydrologically linked wetlands: River Yalpug and Taraclia Reservoir (9).
Description of site: A reservoir in the Yalpug valley.
Principal vegetation: The site comprises predominantly open water and marginal communities, halophyte meadows.
Land tenure: State-owned.
Conservation measures taken: None.
Conservation measures proposed: None.
Land use: No information.
Possible changes in land use: None known.
Disturbances and threats: No information.
Economic and social values: No information.
Fauna: Lack of information. *Cygnus olor* and *Pelecanus onocrotalus* have been recorded.
Special floristic values: No information, old data are now invalid.
Research facilities: None.
Criteria for inclusion: IBA criterion B1i.

11. Lacul Salas (Salas Reservoir)

Location: 46°54'N, 29°25'E. The valley of the River Bic, near the confluence with the River Dniester, Uezd Chisinau.
Area: 330 ha.
Altitude: 17-20 m above sea level.
Wetland type: M, 1.
Other hydrologically linked wetlands: The Rivers Bic and Dniester, Ghidighici Reservoir.
Description of site: A reservoir, with fish farms, channels and connected bog with associated wetland vegetation.
Principal vegetation: No information.
Land tenure: State and private (fish farms).
Conservation measures taken: None.
Conservation measures proposed: None known.
Land use: The site comprises open water, including fishponds.
Possible changes in land use: No information.
Disturbances and threats: Lack of information. The water of the River Bic is heavily polluted.
Economic and social values: The site is of social and economic value in addition to its conservation value.
Fauna: Insufficient data. The site is of importance for migrant waterbirds and breeding *Cygnus olor*, in addition to other rare and vulnerable animals. *Aythya nyroca, Pandion haliaetus* and *Egretta alba* occur during migration.
Special floristic values: No information.
Research facilities: None.
Criteria for inclusion: IBA criterion B1i.

12. Lacul Cahul (Lake Cahul)

Location: 45°33'27"N, 28°27'E. Southern sector of the Moldavan-Ukrainian site, in the floodplain of the lower River Cahul and upper Lake Cahul (on the border of Moldova). The site is in the Gagauzian Autonomous Territory, 170 km from Chisinau.
Area: 540 ha.
Altitude: 3 m above sea level on Lake Cahul and 10 m near Etulia village.
Wetland type: L, N, O-R, Tp, 3, 9.
Other hydrologically linked wetland: The River Danube.
Description of site: The site comprises the seasonal part of a permanent lake with the adjacent part of a sea-

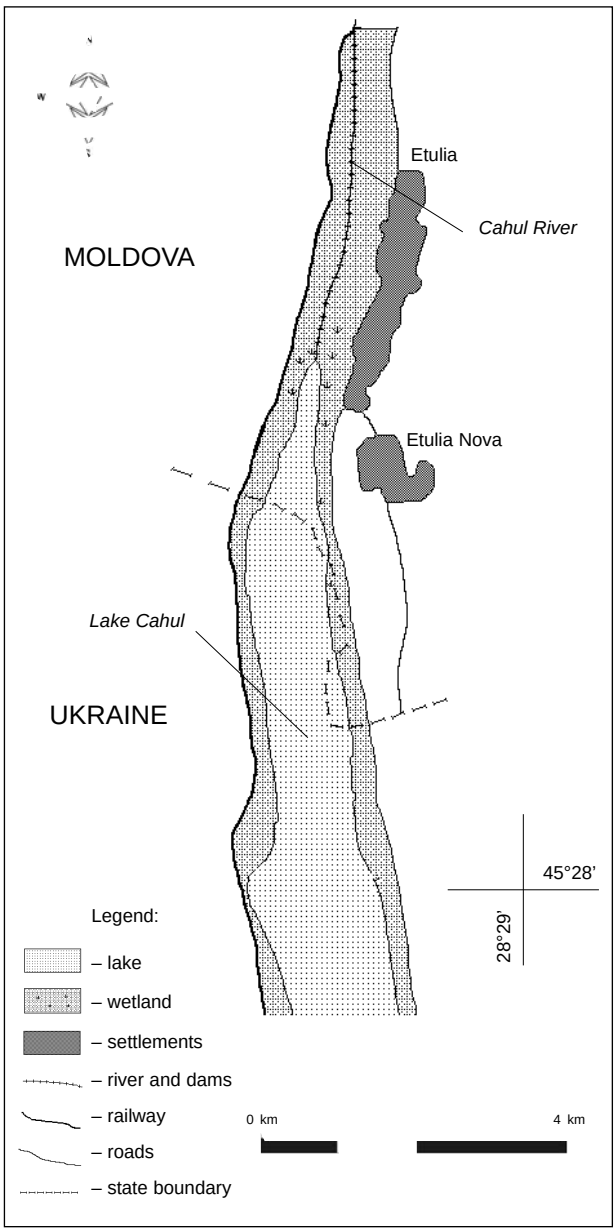
sonal river and surrounding reed-beds. Natural wetlands have been drained for agriculture. Near Etulia Village, a system of deep ravines meets the valley. It has paleontological importance and includes the 10-ha Geological Natural Memorial. The site is *c*. 13 km in length.

Climate: The site is influenced significantly by the proximity of the Black Sea and prevalence of westerly winds. Average annual temperature is 10°C (minimum –27°C, maximum 40°C); annual rainfall is *c.* 400 mm. The prevailing winds are from the northwest and southeast, with average velocity of 2-5 m/s. Average snow thickness is less than 10 cm, with duration of cover up to 30 days; stable cover is noted in 20-30% of winters. The soil rarely freezes, however it can freeze to a depth of 1 m. Snow melt begins in March and takes about 10 days. The summer is dry with an average temperature of 25-30°C. Autumn is long and warm. In dry years, 45.7% of floods take place in spring, 22.9% in summer, 18.4% in autumn and 13% in winter.

Physical features: The geological structure is formed by deposits of a Novorossiysk sub-layer of the Lower Pliocene (clays, sands and limestones), and also by Quaternary deposits of modern alluvium.

Geomorphology: The surface is generally even, with hollows of mainly waterlogged or silted riverbeds. The maximum width of the floodplain is 1.2 km near the river mouth. The main riverbed has been straightened and partly dammed. Floodplain-meadow soils have a humus content of 2-5% and increased quantity of sulphates and chlorates. The lake is shallow with maximum depth 1.7-1.8 m on the Ukrainian side; the lake bed is covered by silt over 80% of its area.

Hydrology: The lake is the remainder of an ancient estuary of the River Danube, fed mainly by floodwater from the Danube and additionally from the weakly flowing and sometimes seasonal River Cahul. Surface and subterranean streams are important. The surface area of the lake varies greatly and the upper (Moldovan) side often dries out.



Map 5. Lake Cahul

Water quality: In autumn, water transparency is minimal: 15-20 cm in the upper lake and 30-50 cm in other parts, but in summer transparency is maximal at 35-50 cm and 60-80 cm respectively. The hydrochemical content varies greatly between the upper and main (lower) areas of the lake: CO^{-3} + HCO^{-3} – 174-201 mg/l and 133-177 mg/l, SO^{-4} – 78.2-85.3 mg/l and 10.1-14.0 mg/l, Ca^{+2} – 45.1-52.1 mg/l and 35.8-46.0 mg/l, Mg^{+2} – 22.5-27.0 mg/l and 17.6-26.1 mg/l, Na^{+} + K^{+} – 34.0-61.5 mg/l and 30.0-58 mg/l with total mineralisation 417-486 mg/l and 310-464 mg/l. The oxygen content is similar, respectively 7.98-13.26 mg/l and 8.18-12.09 mg/l.

Principal vegetation: The indigenous vegetation of the river valley and lake has been greatly altered. Terrestrial vegetation is conserved on sparse fragments along the river near the lake – a meadow association *Agrostis (stolonifera) trifoliosum (repens)* with a strong admixture of weeds. The edge of the lake (about 800 ha), 125 ha of which is on Moldovan territory, is covered by vascular aquatic vegetation. Reed-beds are formed mainly of *Phragmites (australis)* and *Typha (angustifolia)* (88 ha), but communities with a dominance of *T. angustifolia* (16 ha) or *Schoenoplectus lacustris* (10 ha) are also found. *Potamogeton pectinatus* is widespread in the upper part of the lake.

Land tenure: The water body is in state ownership; the arable lands are in collective farm ownership.

Conservation measures taken: The area of the Geological Natural Memorial (10 ha) is under the symbolic state protection of local authorities.
Conservation measures proposed: The site will be recognised as a national core area in the Ecological Network of Moldova, with corresponding protection regime.
Land use: Drained lands are under arable cultivation; the drainage system is largely maintained. Fishing also occurs. Uncultivated areas are grazed intensively.
Possible changes in land use: Low probability.
Disturbances and threats: The original natural wetland has been converted for agricultural development. Chemical pollution from agricultural land is not at threat at present, but considerable erosion is caused by flood-waters. The return of chemical pollution (fertilisers, pesticides) is a potential threat.
Economic and social values: Values are determined by agricultural output and fish products for the local community. Paleontological fossils found in ravines are of scientific significance.
Fauna: There are no data on either avifauna or terrestrial fauna. Fish: 34 species including *Hucho hucho,* entering from the Danube, and *Leuciscus idus.* Species numbers had declined severely by the end of the 1990s compared to 1960–1970. Invertebrates: Zooplankton: 180 taxa (Rotatoria – 71.5%, Cladocera – 15%, Copepoda – 14.5%; Copepoda are the most numerous at 105,000–107,000 individuals per m^3.) Macrozoobentos: 69 taxa: (Chironomidae – 25, Oligochaeta – 16, higher Crustacea – 14, Mollusca – 8). The following species listed in the RDB of Moldova are present: Mollusca – 2 (*Hypanis pontica, H. colorata*); Crustacea – *Paramysis baeri bispinoza,* with a population density of 210 individuals/m^2 comprising more than 25% of the Moldovan population.
Special floristic values: Insufficient information. Besides association-forming species, *Butomus umbellatus, Agrostis stolonifera, Veronica anagallis-aquatica, V. anagalloides, Eleocharis palustris, Polygonum hydropiper, Iris pseudacorus, Scirpus lacustris, S. tabernaemontani* are present. Phytoplankton: 173 taxa, with an average biomass of 2.4 g/m^3.
Research facilities: None.
Criteria for inclusion: The site is recognised as being of national importance for supporting more than 25% of Moldova's population of the endangered species *Paramysis baeri* and for being one of four known sites of species listed in the RDB of Moldova such as *P. baeri, Hypanis pontica* and *H. colorata.*

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ROMANIA

by

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INTRODUCTION

Romania is situated in the southeast of Europe and has an area of 238,391 km^2; it is the 80th-largest country in the world. It is bordered by Ukraine to the north and southeast, Moldova to the east and northeast, Bulgaria to the south, Yugoslavia to the southwest and Hungary to the west. In 1993 the population was 22,789,000.

Between the Black Sea coast and the Carpathian peaks (2,543 m above sea level) there is a wide range of vegetation types and plant associations. Forests cover about 27% of the land area – *Quercus* predominates up to *c.* 800 m, with *Fagus* between 800 m and 1,400 m, *Picea* between 1,400 m and 1,800 m and dwarf *Pinus* above the tree line. At the highest altitudes, sub-alpine grassland is found. Cultivation has, to a large degree, replaced natural vegetation in the foothills and plain regions. Approximately 62% of Romania's land area is under agriculture, including arable land, pasture and hay-meadows, and perennial crops (orchards and vineyards). Plantations comprise mainly *Picea, Pinus* and *Robinia.*

According to the National Strategy for Environment Protection, launched in 1996 by the Ministry of Waters, Forests and Environmental Protection (MWFEP), only about 3.7% of Romania's total area is covered by water. The wetlands consist of:

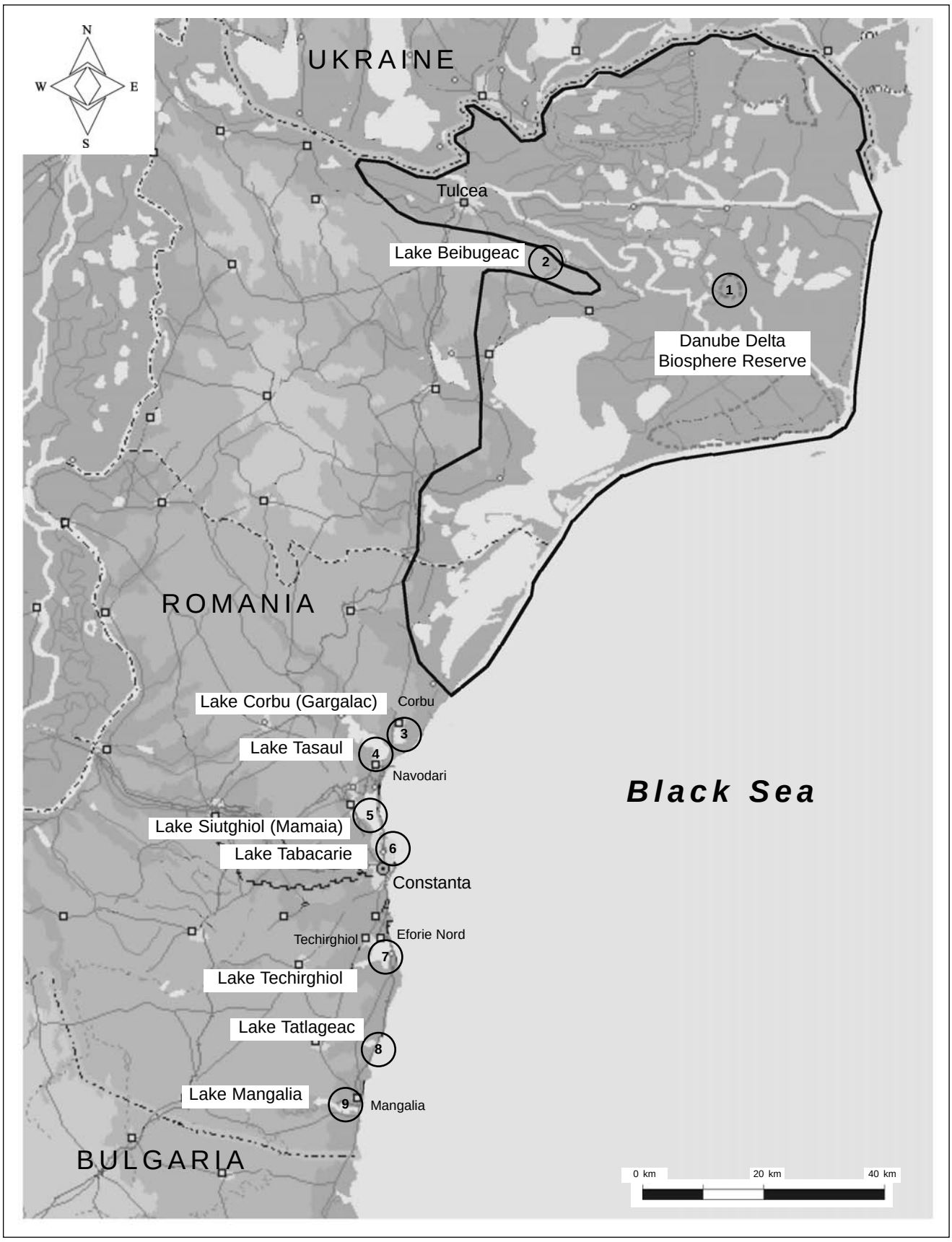
- rivers, over 118,000 km;
- natural lakes, over 2,300, including lakes along the coast of the Black Sea and lakes forming part of the Danube Delta;
- artificial lakes, over 1,500, including fish-ponds;
- Black Sea coast, 245 km.

An inventory of wetlands (including detailed maps) was begun by MWFEP in 1997 to identify the sites that have potential for inclusion in the Ramsar list. The project is co-ordinated by the Danube Delta National Institute in collaboration with other governmental and non-governmental institutes and organisations, both national and international. Based on a standard inventory method, about 150 wetland areas were described with a view to completing the national database of the wetlands in Romania. This inventory also includes the important wetlands along the Black Sea coast. The most important wetlands will be included in a network of green corridors at both national and regional levels. 'The Lower Danube Green Corridor' Project, launched in June 2000 in co-operation with the World Wide Fund for Nature (WWF) by Romania, Bulgaria, Republic of Moldova and Ukraine, is one of the most important regional initiatives; it aims to create a network of protected wetlands and to restore damaged wetlands in the Danube River Floodplain and Danube Delta.

The Romanian Ornithological Society identified 44 Important Bird Areas (IBAs), covering a total area of 6,557 km^2, representing about 3% of the country's terrestrial area. The sites are not uniformly distributed, the majority being wetlands found along the Danube and other river corridors; they include wetlands located along the coast of the Black Sea.

The coastal wetlands are distributed along the 245-km length of the Romanian Black Sea coast. They form a landscape element that is both contrasting – in this steppe zone with its semi-arid climate – and interesting, because these lakes are highly diverse.

* Danube Delta includes: the Danube Delta, Razim-Sinoie Lakes Complex, Isaccea-Tulcea floodplain, Saraturi-



Map 1. The Black Sea coastal wetlands of Romania (numbers correspond with the numbers in the text and table 1)

Table 1. Overview of the coastal wetlands of Romania

No	Site	District	Area (ha)	Protected status
1	Danube Delta *(DD)	Tulcea	580,000	Biosphere Reserve. RAMSAR Site. World Heritage Site. IBA
2	Lake Beibugeac	Tulcea	180	Proposed as RAMSAR Site. It is placed on the migration ways of the birds populatio ns. IBA
3	Lake Corbu (Gargalac)	Constanta	530	Proposed as RAMSAR Site. It is placed on the migration ways of the birds populations
4	Lake Tasaul	Constanta	2,335	Proposed as RAMSAR Site. It is placed on the migration ways of the birds populations. IB A
5	Lake Siutghiol (Mamaia)	Constanta	1,960	Proposed as RAMSAR Site. It is placed on the migration ways of the birds populations. IBA
6	Lake Tabacarie	Constanta	95	Proposed as RAMSAR Site. It is placed on the migration ways of the birds populations
7	Lake Techirghiol	Constanta	1,161	Proposed as RAMSAR Site. It is placed on the migration ways of the birds populations. IBA
8	Lake Tatlageac	Constanta	141	Proposed as RAMSAR Site. It is placed on the migration ways of the birds populations
9.	Lake M angalia	Constanta	316	Proposed as RAMSAR Site. It is placed on the migration ways of the birds populations.
		Total	**586,718**	**580,000 (99%)**

Murighiol Lake, Chituc Black Sea coast.

Lake Corbu (Gargalac) (3) and Lake Tasaul (4) are considered as components of a Tasaul-Gargalac complex.

Occurrence of threatened taxa at sites included in the inventory

All the taxa listed in the table are included in the Red List for the Danube Delta or the 2000 IUCN Red List of Threatened Species. The list may not be comprehensive for individual sites as it depends upon the availability of data.

SITE ACCOUNTS

Table 2. Occurrence of threatened taxa at sites included in the inventory

Scientific name	IUCN Red List	DD Red List*	Site								
			1	2	3	4	5	6	7	8	9
Mammals											
Lutra lutra	VUA2cd	V	√	√	√	√	√	√	√	√	√
Mesocricetus newtoni	VUC2	E	√								
Mustela lutreola	VUA2cd	V	√								
Birds											
Ardeola ralloides	VUA2ac	V	√								
Alcedo atthis	LR(nt)	V	√							√	
Ardea purpurea	VUA2ac	V	√								
Aythya nyroca	CRA1ad	V	√	√							
Branta ruficollis	VUB1	V	√	√	√				√	√	
Botaurus stellaris	LR(nt)	K	√								
Capella media	LR(nt)	V	√								
Chlidonias hybrida	VUC1	V	√								
Chlidonias niger	VUA1a	V	√								
Ciconia ciconia	VUA1c	V	√				√				
Ciconia nigra	VUB2a	R	√								
Cygnus cygnus	LR(nt)	NT	√	√					√		
Circus aeruginosus	LR(nt)	V	√								
Circus cyaneus	LR(nt)	V	√								
Egretta alba	VUA1a	V	√		√	√	√	√		√	
Egretta garzetta	VUA1ac	V	√		√					√	
Gavia immer	LR(nt)	R	√								
Gavia arctica	LR(nt)	R	√								
Gelochelidon nilotica	VUA2c	V	√								
Glareola pratincola	VUA1ac	V	√								
Haliaeetus albicilla	LR(nt)	R	√								
Himantopus himantopus	VUD2	V	√	√							
Ixobrychus minutus	LR(nt)	V	√			√					
Larus melanocephalus	VUD2	V	√								
Limosa limosa	LR(nt)	V	√								√
Mergus albellus	LR(nt)	V	√								
Numenius tenuirostris	CRC2b	K	√								
Nycticorax nycticorax	LR(nt)	V	√								
Oxyura leucocephala	ENA1ac	E						√	√	√	
Pelecanus onocrotalus	VUC1	V	√		√	√	√				
Pelecanus crispus	VUD2	E	√	√	√	√					
Platalea leucorodia	ENA1ac	V	√				√			√	
Phalacrocorax pygmaeus	VUB2ac	V	√		√				√		
Plegadis falcinellus	LR(nt)	V	√								
Podiceps auritus	LR(nt)	V	√								
Podiceps nigricollis	VUA1a	V									
Porzana porzana	LR(nt)	V						√			
Recurvirostra avosetta	VUA1c	V	√	√						√	
Sterna albifrons	LR(nt)	V	√								
Sterna caspia	LR(nt)	V	√								
Sterna sandvicensis	LR(nt)	V	√								

Continuation of Table 2

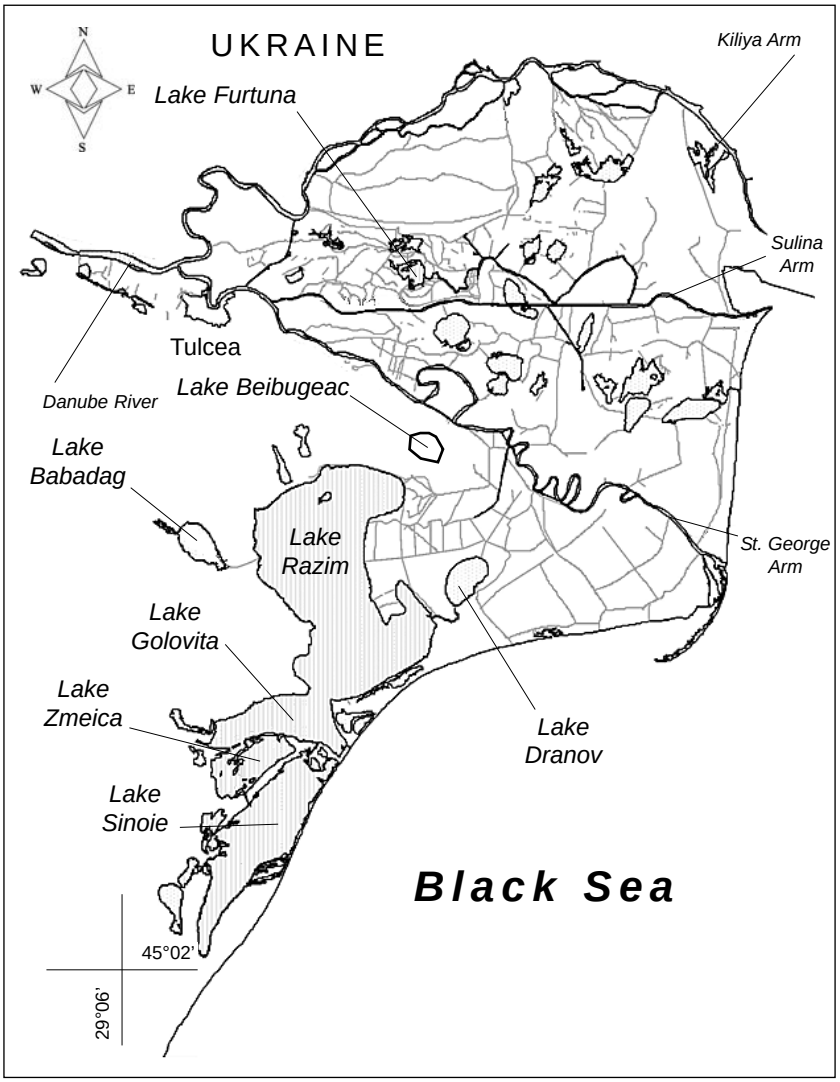
Scientific name	IUCN Red List	DD Red List*	Site								
			1	2	3	4	5	6	7	8	9
Tadorna ferruginea	VUA1c	R	√								
Tadorna tadorna	VUA1c	V	√				√				
Vanellus vanellus	LR(nt)	V	√								√
Reptiles											
Coluber caspius	ENA1c	V	√								
Coronella austriaca austriaca	DD	V	√								
Emys orbicularis	LR(nt)	V	√		√	√	√	√	√	√	√
Eremias arguta deserti	DD	V	√								
Lacerta trilineata dobrogica	DD	NT	√		√	√	√	√	√	√	√
Testudo graeca ibera	VUA1c	V	√								
Vipera ursinii renardi	VUA1c	V	√								
Fish											
Acipenser queldenstaedtii colchicus	ENA2d	V	√								
Acipenser ruthenus ruthenus	VUA1cd	E	√								
Acipenser stellatus stellatus	EnA2d	V	√								
Carassius carassius carassius	LR(nt)	V	√		√	√	√	√	√	√	√
Huso huso	EnA2d	V	√								
Knipowitschia cameliae (endemic)	DD	E	√								
Invertebrates											
Adacna fragilis	NE	V	√								
Hypanis plicata relicta	DD	V	√								
Monodacna colorata	NE	V	√								
Monodacna pontica	NE	V	√								
Isophya dobrogensis	DD	V	√								
Endemic species											
Diacrisia chryson deltaica	DD	NT	√								
Hypanis plicata relicta	DD	V	√								
Isophya dobrogensis	DD	V	√								
Pseudamnicola dobrogica	DD	K	√								
Pseudamnicola penchinati	NE	K	√								
Pseudamnicola razelmiana	DD	K	√								

1 .

*Note: * The Red List of the Danube Delta Biosphere Reserve identified 825 species including: 382 species of vascular plants, 15 species of molluscs, 12 species of insects, 59 species of fish, 10 species of amphibians, 11 species of reptiles, 308 species of birds and 28 species of mammals.*
E = endangered; V = vulnerable species; K = insufficiently known; nt = not threatened.

Danube Delta Biosphere Reserve

Location: The Danube Delta Biosphere Reserve is located between 28°10'E, 29°42'E, 45°27'N and 44°20'N. The site covers the entire Romanian part of the Danube Delta, from a few kilometres upstream of the city of Tulcea to the Black Sea coast. The northern part of the site adjoins the border with Ukraine (adjacent or close to the Ukrainian Ramsar sites Kiliiske Mouth, Yagorlytska Bay, Tendrivska Bay and the Ukrainian Danube Delta Biosphere Reserve).
Area: 580,000 ha.
Altitude: 0-12 m above sea level.
Wetland type: F, E, L, M, O, P, Tp, Ts, W, Xf, A, J, K (dominant type listed first).
Other hydrologically linked wetlands: The Lower Danube River Lakes (Kagul, Kugurlui, etc.), the Danube Biosphere Reserve–Ukraine.
Water quality: Until the mid-1970s, the waterbodies in the Danube Delta could be classified as mesotrophic since the nutrient load was fairly low. The water was clear; macrophytes were abundant and provided shelter for the predatory pike. The extended vegetation near the embankments provided breeding and nursery sites for tench and pike. After the mid-1970s, the phosphorus load increased gradually until it reached the very high level of 0.1-0.15 mg/litre. The water turned green because of the high quantity of algae present; oxygen deficits rose and fish mortality was observed. The turbidity of the water reduced the penetration of sunlight so the submerged vegetation disappeared. The water system favoured by pike and tench was destroyed, and bream, roach, Prussian carp (in small numbers) and zander became dominant in the system. This represents a new level of ecological equilibrium that will be as expensive to preserve as it was to achieve.
Principal vegetation: The rich aquatic flora includes species such as *Trapa natans s.l., Salvinia natans, Nymphoides peltata, Vallisneria spiralis, Sagittaria sagittifolia, Sparganium ramosum, Phragmites australis, Typha* ssp., *Schoenoplectus lacustris* and *Carex* ssp. The levee forests (mainly in the fluvial zone) are dominated by *Salix alba, S. fragilis, Populus alba* and *P. canescens.*
Conservation measures taken: The Danube Delta, Razim-Sinoie complex, Chituc Black Sea coast and other components (Somova-Parches complex, Lake Saraturi-Murighiol, the marine buffer zone to a depth of 20 m) form the 580,000-ha Danube Delta Biosphere Reserve.
Land use: Although the human population of the Romanian part of the delta has fallen noticeably in the past few decades, there are many scattered villages whose inhabitants have developed unique cultural links with the delta ecosystem. Human activities in the delta include fishing (the Danube Delta & Razim-



Map 2. The Danube Delta Biosphere Reserve

Sinoie Complex account for half of Romania's freshwater fish harvest), reed harvesting, forestry, small-scale cultivation and tourism.
Possible changes in land use: None known.
Disturbance and threats: The main threats are from drainage, canalisation and dredging, wetland infilling and pollution. Additional threats include over-fishing, disturbance from boat traffic, reed-bed fires, grazing and other agricultural practices.
Economic and social value: The Danube Delta Biosphere Reserve has important economic and social value. The economic potential is based mainly on the use of the natural resources: fish, reed, land for agriculture, pasture for cattle breeding and the landscape.
Fauna: The Danube Delta Biosphere Reserve supports a rich fauna of about 3,800 species; fish fauna (75 species representing 22 families), bird populations (about 325 species) and several mammals (e.g. *Mustela lutreola, Lutra lutra* and *Felis silvestris*) are the most important.
Special floristic values: The rich aquatic flora includes species such as *Trapa natans s.l., Salvinia natans, Angelica palustris, Aldrovanda vesiculosa, Polygonum mesembricum* (E), *Ornithogalum oreoides* (E), *O. amphibolum* (E), *Centaurea pontica* (E), and *C. jankae* (E).
Research facilities: The Danube Delta National Research Institute, in collaboration with other national and international institutes, is performing studies in the area.
Public awareness and education: A strategy for public awareness and ecological education for the Danube Delta Biosphere Reserve is being implemented. Posters and brochures presenting the Danube Delta and its flora and fauna have been printed. Educational activities are organised in schools.
Criteria for inclusion: 1, 2, 3, 4, 5 and 6.

Table 3. Waterbird populations in the Danube Delta Biosphere Reserve

Species	Breeding pairs	Non-breeding individuals
Ardeola ralloides	1,800	2,700
Ardea purpurea	250	350
Branta ruficollis		7,000
Botaurus stellaris	400	
Capella media		300-400
Chlidonias hybrida	1,200	10,000
Chlidonias niger	300	
Ciconia ciconia	70	
Ciconia nigra		300
Circus aeruginosus	35	
Circus cyaneus		60
Cygnus cygnus		1,750
Egretta alba	360	
Egretta garzetta	1,500	
Gavia immer		2-4
Gavia arctica		200
Gelochelidon nilotica		20
Glareola pratincola	40	
Haliaeetus albicilla	12	
Himantopus himantopus	250	
Ixobrychus minutus	1,200	
Larus melanocephalus	300	
Mergus albellus	8	1,500
Numenius tenuirostris		3
Nycticorax nycticorax	4,000	300
Pelecanus onocrotalus	4,000	3,000
Pelecanus crispus	80	100
Platalea leucorodia	150	
Phalacrocorax pygmaeus	4,000	700
Plegadis falcinellus	2,600	600
Recurvirostra avosetta	70	
Sterna albifrons	40	300
Sterna caspia		70
Sterna sandvicensis		300
Tadorna ferruginea		40
Tadorna tadorna	20	

2. Lake Beibugeac

Location: 45°02'N, 29°06'E. Lake Beibugeac is situated in the south of the Danube Delta.
Area: 180 ha.
Altitude: 6-8 m above sea level.
Wetland type: Q.
Other hydrologically linked wetlands: None.
Description of site: A shallow brackish lake with a maximum depth of 1.5 m. The water level and lake area vary considerably depending upon the amount of rainfall.
Water quality: Standing brackish and salt water.
Principal vegetation: Along the western shore there is a narrow fringe of reed (*Phragmites*).
Conservation measures taken: No special conservation measures have been taken.
Conservation measured proposed: None.
Land use: The lake has no specific economic use.
Possible changes in land use: Increase in agricultural activity and potential resultant nutrient impact around

the lake.

Disturbance and threats: There is limited human disturbance to the birds. Grazing animals may disturb nests around the edge of the lake, and there is pollution from nutrients leaching from the surrounding agricultural land.

Economic and social value: No specific economic value.

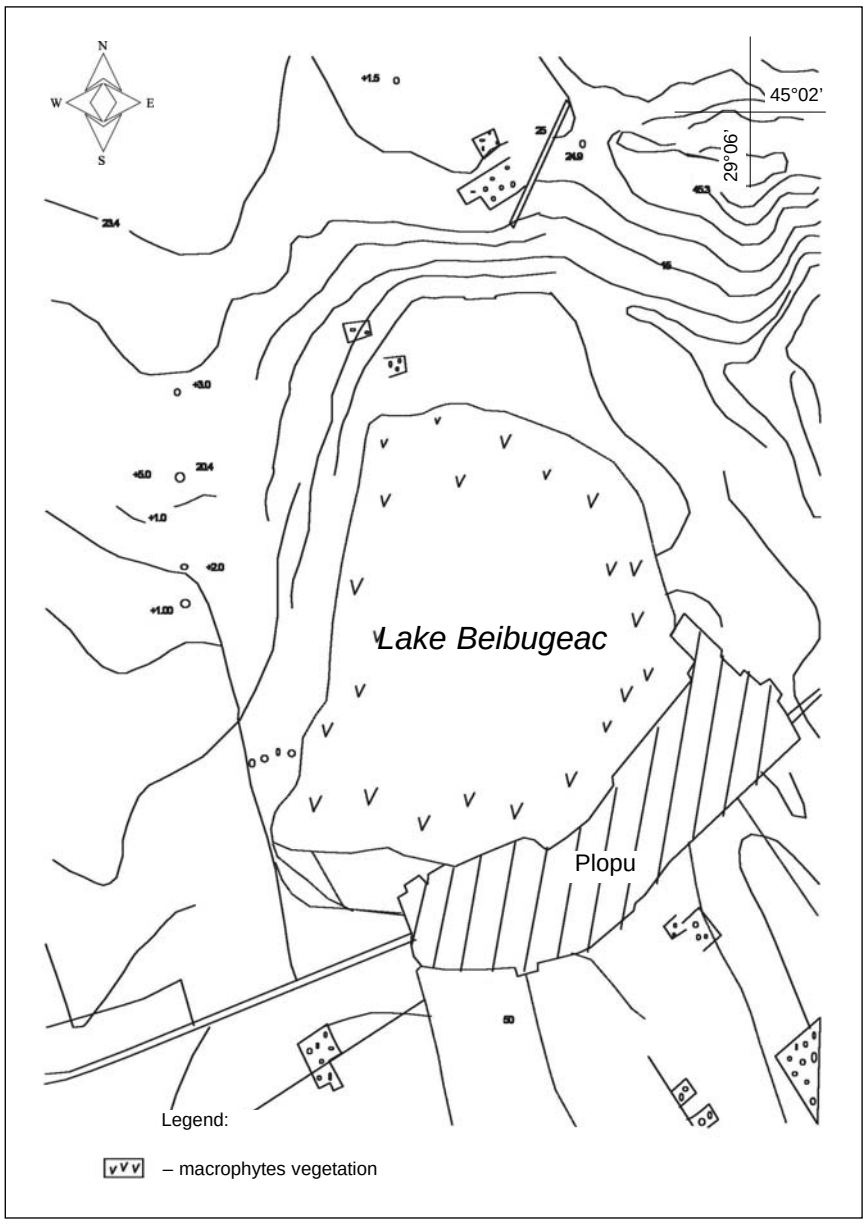
Fauna: Lake Beibugeac is an important wintering site for Anatidae and also a breeding site for waders including *Himantopus himantopus* and *Recurvirostra avosetta.* Passage species of global conservation concern that do not meet IBA criteria: *Pelecanus crispus* and *Aythya nyroca.*

Special floristic values: No information.

Research facilities: The Romanian Ornithological Society and other NGOs are involved in small inventory or monitoring projects.

Public awareness and education: No special public awareness and education activities have been developed.

Criteria for inclusion: 2 and 3.



Map 3. Lake Beibugeac

3. Lake Corbu (Gargalac)

Location: 44°22'N, 28°48'E. Lake Corbu is situated north of Lake Tasaul, near Midia Cape, in the ancient Constanta Bay.

Area: 530 ha

Altitude: 0.9-2.0 m above sea level.

Wetland type: O.

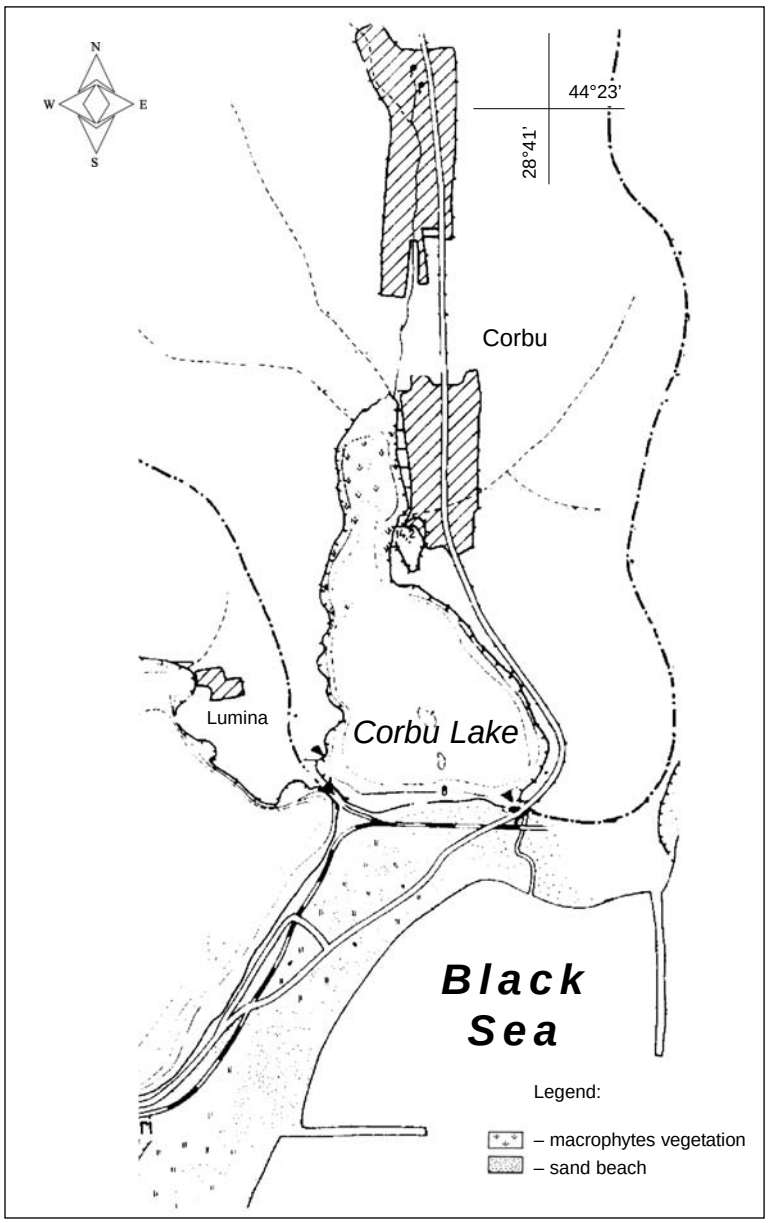
Other hydrologically linked wetlands: None.

Description of site: Lake Corbu lies in the estuary of the River Corbu. Its 5-m high banks, shaped like sea walls, are formed of loess soils. It lies 2.5 km from the coast of the Black Sea. When the water level in the lake is 90 cm above the level of the Black Sea, Lake Corbu has the following characteristics: surface 530 ha, length 4.4 km, average width 1.2 km, average height 1.45 m (maximum 2.2 m) and volume *c*. 7,700,000 m^3. Its catchment area is *c.* 171 km^2, 36 km^2 belonging to the Corbu River valley, the main permanent tributary.

Table 4. Waterbird populations at Lake Beibugeac

Species	Breeding pairs	Non-breeding individuals
Anser albifrons		8,000
Anser anser	3	1,200
Aythya nyroca	6	40
Branta ruficollis		1,500
Cygnus cygnus		600
Himantopus himantopus	20	10
Pelecanus crispus		12
Recurvirostra avosetta	17	5

Water quality: No information.
Principal vegetation: Fish-farm technology requires different water levels in the lake, and this determines the two main reed species (*Phragmites australis* and *Typha angustifolia*), which are found in isolated patches on the banks and in a compact area in front of the Tasaul Dam. *Myriophyllum spicatum,* which is weakly developed, is typical of the submerged vegetation.
Conservation measures taken: No specific conservation measures have been taken.
Conservation measured proposed: None.
Land use: Between 1964 and 1984, when the lake was designated as a fishery farm, fish biodiversity declined from 16 to 4 fish species: *Cyprinus carpio, Carassius auratus gibelio, Aristichthys nobilis* and *Ctenopharyngodon idella.*
Possible changes in land use: No important changes in the use of the lake are foreseen.
Disturbance and threats: The fluctuating water levels and the fishing technology have destroyed the majority of the wild fauna and flora. The Chinese species *Hypophtalmichthys molitrix* and *Ctenofaryngodon idella* were not compatible with the native species.
Economic and social value: The lake produces fish and also supports the economically valuable activities of fish farming and tourism for sport fishing and recreation.
Fauna: Threatened species included in the RDB of Romania, such as *Podiceps cristatus, Pelecanus crispus, Ardea alba, A. cinerea* and *Cygnus olor,* can be found at the lake. The lake offers optimal feeding conditions for numerous bird species. In autumn *Pelecanus onocrotalus, Phalacrocorax pygmaeus, Egretta garzetta, C. olor, Anser anser* and from November *A. albifrons* and *Branta ruficollis* are recorded.
Special floristic values: No information.
Public awareness and education: No special public awareness and education activities have been developed.
Research facilities: The Romanian Ornithological Society and other NGOs are involved in small inventory or monitoring projects.
Criteria for inclusion: 2 and 3.



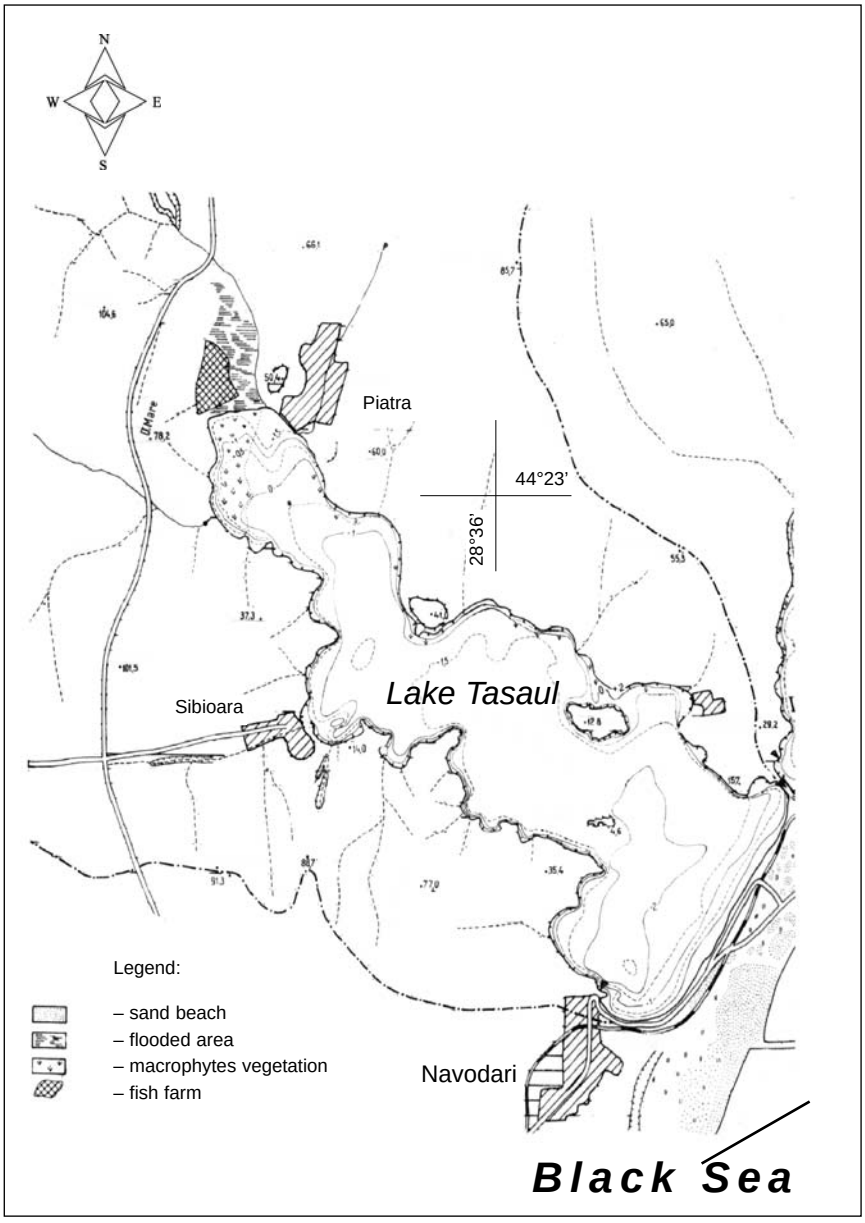
Map 4. Lake Corbu (Gargalac)

Table 5. Waterbird populations at Lake Corbu (Gargalac)

Species	Breeding pairs	Non-breeding individuals
Anser albifrons		3,000
Anser anser		30
Ardea cinerea		20
Branta ruficollis		700
Cygnus olor		40
Egretta alba		5
Egretta garzetta		6
Pelecanus crispus		10
Pelecanus onocrotalus		800
Phalacrocorax pygmaeus		300
Podiceps cristatus	16	8

4. Lake Tasaul

Location: 44°21'N, 28°34'E. Lake Tasaul is situated in the south of Cape Midia, north of the town of Navodari, at the lower end of the Casimcea River.
Area: 1,830 ha.
Altitude: 1-10 m above sea level.
Wetland type: O.
Other hydrologically linked wetlands: None.
Description of site: Lake Tasaul is a 'liman'; it is long and sinuous in shape. There are two islands: Ada Island is formed of calcareous rock and has a surface area of 30.3 ha and maximum height of 12.8 m. Ostrov Island is formed by green shale: it has a surface area of 3 ha and maximum height of 4.6 m. Lake Tasaul is the largest coastal lake in the south of Cape Midia. The lake has a total surface area of 2,335 ha (at an average water level of 1.24 m), length *c.* 9.5 km, average width *c.* 2.0 km, average height *c*. 2.4 m (maximum 3.75 m) and volume 57,000,000 m^3. The catchment area is about 872 km^2, Casimcea Valley representing the main permanent tributary. The constant water level of the lake is determined by human intervention: originally the water flowed from Lake Siutghiol, and there was a subterranean channel that introduced *c*. 15,500,000 m^3/year. Later, the dams that directed the flow to Black Sea determined a higher water level (0.8 m), and higher volume (11,000,000 m^3).
Water quality: No information.
Principal vegetation: Macrophytes are represented by swamp vegetation, mainly *Phragmites australis;* small areas of *Typha angustifolia* are also found. The reed-beds cover a large area at the end of the lake near Mihail Kogalniceanu village, the fish farm and Luminita village. A discontinuous band of reed also covers the lakeshore. Submerged vegetation is represented by *Myriophyllum spicatum,* moderately developed.
Conservation measures taken: No specific conservation measures have been taken.
Conservation measured proposed: None.
Land use: The main activities at Lake Tasaul are commercial and traditional fishing, and angling. The southern banks are dry and the green shales are exploited by the state. The northern banks are fertile and good for agriculture.
Possible changes in land use: No important changes are anticipated.
Disturbance and threats: The water quality is determined by potential pollution sources. Until



Map 5. Lake Tasaul

the 1970s, acidic subterranean water discharged by the Navodari Petrochemical Factory caused mortality of fish stocks. The measures taken to prevent pollution solved this problem, but in the neighbourhood of the lake there are other potential pollution sources such as Sibioara Zootechnical Farm, Navodari Summer Camp, and Navodari Cleaning and Purifying Waterworks.

Economic and social value: The main activities at Lake Tasaul are commercial fishing and angling. The green shales on the dry southern banks are exploited by the state, whereas the fertile northern banks are used for agriculture. The end of the lake where the level of water is low is the site of a fish-breeding farm. The water from the lake is used as the drinking water supply for the town of Navodari, agricultural irrigation and industrial activities.

Table 6. Waterbird populations at Lake Tasaul

Species	Breeding pairs	Non-breeding individuals
Anas platyrhynchos	26	700
Ardea cinerea		15
Aythya ferina	4	2,000
Egretta alba		8
Ixobrychus minutus	2	
Pelecanus crispus		30
Pelecanus onocrotalus		170
Phalacrocorax carbo		850
Phalacrocorax pygmaeus		250
Tadoma tadoma		28

Fauna: The islands and the reed thickets are breeding sites for water birds. *Pelecanus onocrotalus, P. crispus, Phalacrocorax carbo, Platalea leucorodia, Cygnus olor, Ardea cinerea, Egretta alba, Anas platyrhynchos* and *Tadorna tadorna* are the most important protected species encountered in the area. Many of the lake's fish species are included in the RDB of Romania as 'threatened'; they include *Aspius aspius, Silurus glanis, Gobius fluviatilis, Gobius kessleri* and *Proterorhinus marmoratus.* The variety of habitats is enhanced by the presence of the two islands, with their large surface areas and areas with typical aquatic vegetation. The lake's submerged vegetation offers ideal conditions for fish-eating birds such as *Pelecanus crispus, Phalacrocorax carbo* and *P. pygmaeus* and for Anatidae species. In reed-bed areas, *Aythya ferina, Anas platyrhynchos, Ixobrychus minutus* and *Cygnus olor* nest, and pairs of *Tadorna tadorna* can be seen around the islands. During the spring and autumn migration, there are important numbers of ducks, cormorants and gulls.

Special floristic values: No information.

Public awareness and education: No special public awareness and education activities have been developed.

Research facilities: The Romanian Ornithological Society and other NGOs are involved in small inventory or monitoring projects.

Criteria for inclusion: 2, 3 and 7.

5. Lake Siutghiol (Mamaia)

Location: 44°16'N, 28°36'E. Lake Siutghiol is situated to the north of the town of Constanta and to the west of the Black Sea beach resort of Mamaia, in the ancient bay of Valea Neagra.

Area: 1,960 ha.

Altitude: 1-10 m above sea level.

Wetland type: O.

Other hydrologically linked wetlands: Lake Tabacarie.

Description of site: Lake Siutghiol is a typical marine lagoon, sinuous in shape. The cliff on the landward side is sinuous and is formed of calcareous rock whereas the seaward cliff is straight and lower. There is one island, Ovidiu, of calcareous rock with a surface area of 8 ha and maximum height of 4.9 m. Lake Siutghiol has a total surface area of 1,960 ha at an average water level of 2.20 m, maximum depth of *c.* 17.5 m, average depth of *c.* 4.75 m, and volume of *c.* 91,000,000 m^3. The catchment area is *c.* 92 km^2 and is formed by the Mamaia, Carierei, Caragea and Cismelei valleys and the main Valea Neagra (18.9 km^2).

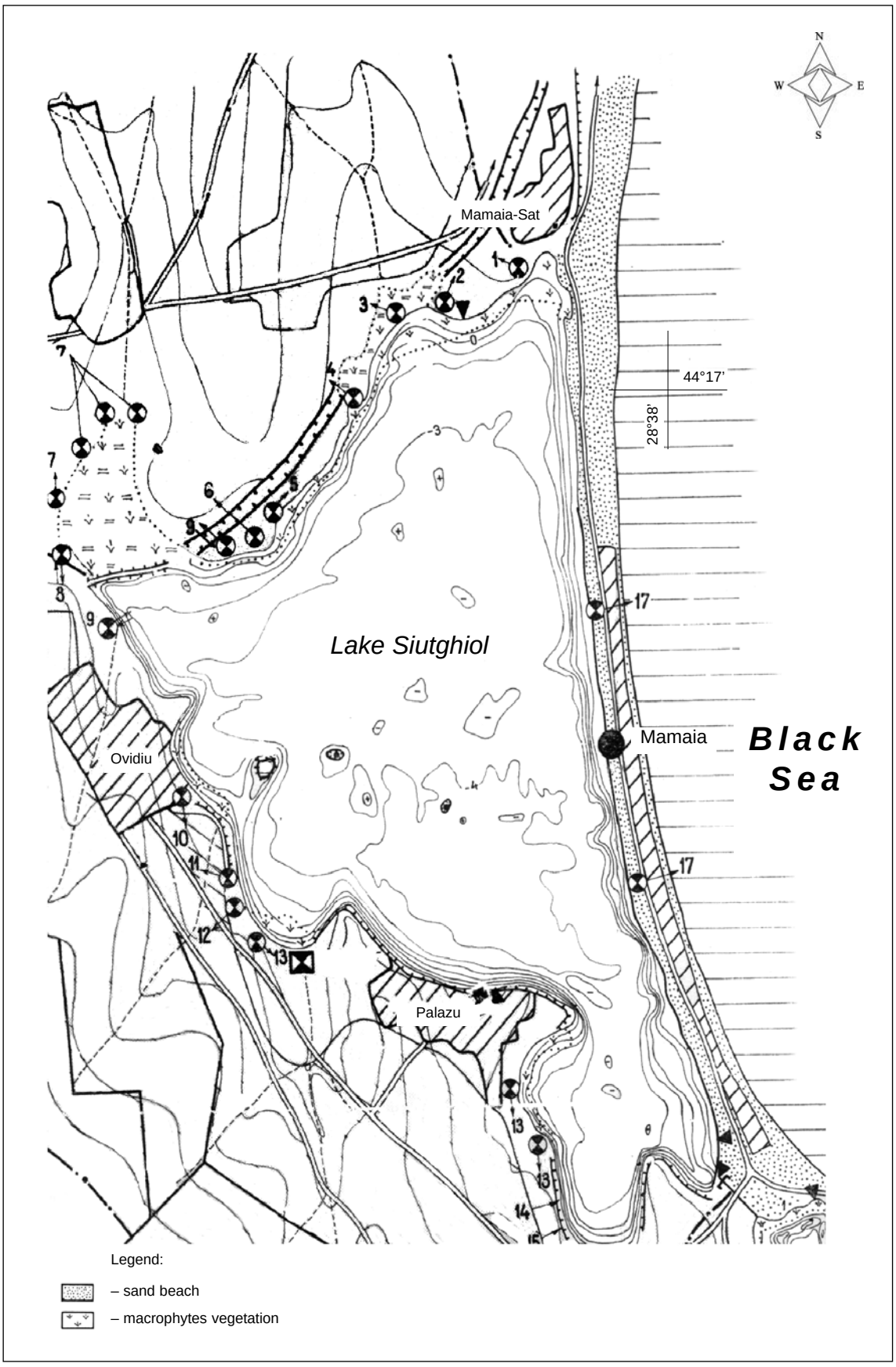
Water quality: No information.

Principal vegetation: Wetland vegetation comprises mainly the macrophyte *Phragmites australis,* which covers *c.* 50% of the lake shore. *P. australis* and smaller proportions of *Typha angustifolia, Scirpus lacustris* and *Carex* sp. cover large areas of Cogialei and Mamaia Bays. In the areas, where the banks are steep, vegetation is absent. Submerged vegetation is represented by *Potamogeton crispus, Vallisneria spiralis* and *Chara* sp., which until 1980 covered 80% of the lake surface. There is a large number of freshwater and marine fish species.

Conservation measures taken: No special conservation measures have been taken.

Conservation measured proposed: None.

Land use: The lake is used mainly for recreation for water sports and sport fishing, and for fish farming.



Map 6. Lake Siutghiol (Mamaia)

Possible changes in land use: No important changes are anticipated.
Disturbance and threats: The dams of the former route of the canal Danube-Black Sea (abandoned in the 1950s) affected an important fish spawning and breeding areas from the north-western part of the lake. These dams and the overfishing in the lake affected the fish stocks. On the other hand, overstocking the lake with Asian cyprinids was very damaging for local species.
Economic and social value: Lake Siutghiol is an important source of drinking water for local people, and for industrial and agricultural activities. A subterranean aquifer provides water to the town of Constanta and in the future will be useful as water supply for other towns on the shore of the Black Sea. Angling and watersports are other activities of economic value. Near the Ovidiu Thermo-Electric Power Station, the lake is used as a fish-breeding farm to produce fish fry for the local fish-farms.
Fauna: The lake is a breeding, nesting, feeding and migration area for a large number of birds included in the RDB of Romania, including *Pelecanus onocrotalus, Platalea leucorodia, Egretta alba, Ciconia ciconia, Phalacrocorax carbo, Cygnus olor, Ardea cinerea, Plegadis falcinellus* and *Tadorna tadorna.* The lake is an important refuge for many species on migration. In mild winters there are many *Fulica atra, Phalacrocorax pygmaeus* and *Mergus albellus.* In spring *Larus minutus, Chlidonias nigra* and *C. hybrida* forage at the lake. Many fish species included in the RDB of Romania as 'threatened' have been recorded, including *Pomatoschistus microps, Pungilius platigaster, Silurus glanis, Gobius fluviatilis* and *G. kessleri.*

Table 7. Waterbird populations at Lake Siutghiol

Species	Non-breeding individuals
Ardea cinerea	14
Chlidonias hybrida	150
Chlidonias nigra	100
Ciconia ciconia	5
Cygnus olor	200
Egretta alba	6
Larus minutus	2,000
Pelecanus onocrotalus	70
Phalacrocorax carbo	600
Platalea leucorodia	20
Plegadis falcinellus	40
Tadorna tadorna	3

Special floristic values: No information.
Public awareness and education: No special public awareness and education activities have been developed.
Research facilities: The Romanian Ornithological Society and other NGOs are involved in small inventory or monitoring projects.
Criteria for inclusion: 2, 3 and 7.

6. Lake Tabacarie

Location: 44°13'N, 28°38'E. Lake Tabacarie is situated to the north of the town of Constanta and to the south of Lake Siutghiol.
Area: 95 ha.
Altitude: 1-6.15 m above sea level.
Wetland type: O.
Other hydrologically linked wetlands: Lake Siutghiol.
Description of site: Lake Tabacarie is a marine liman. It is rectangular in shape, with low banks. Lake Tabacarie has a surface area of 95 ha, maximum depth 6.4 m, average depth 2.3 m, and volume of 1.9 million m^3. It forms a natural basin to drain the residual waters and rainwater collected by the sewerage system of Constanta. The lake is superficially fed from the catchment, through a channel from Lake Siutghiol; excess water is drained into the sea through a dam. The water-level regime is influenced by human activities and it is difficult to make a connection between the modifications to the inflow sources and the variations in water level.
Water quality: No information.
Principal vegetation: A belt of paludal flora, represented by *Phragmites australis* and *Typha angustifolia,* borders low, un-dyked banks. Undeveloped submerged vegetation consists of associations of *Myriophyllum spicatum* and *Potamogeton crispus.*
Conservation measures taken: No special conservation measures have been taken.
Conservation measured proposed: None.
Land use: The lake is used for watersports and there are several sailing clubs. In summer, many rowing races are held on the lake.
Possible changes in land use: No important changes in use are anticipated.
Disturbance and threats: Until 1980, Lake Tabacarie was covered by vegetation. In order to drain the lake, a dam was built in the northwest to drain a large area covered by reeds *Phragmites australis, Typha angustifolia*

and *Scirpus lacustris,* and this destroyed the most important area for fish reproduction. The almost completely dyked banks and intense pollution that accelerated the eutrophication process have virtually destroyed the wild flora and fauna. During the summer massive blooms of phytoplankton, which cause fish mortality, are frequent.

Economic and social value: The waters of Lake Tabacarie are used for industrial water supply and irrigation. The lake is used mainly as a recreation area for Constanta town. There is also recreational use for water sports, especially in summer.

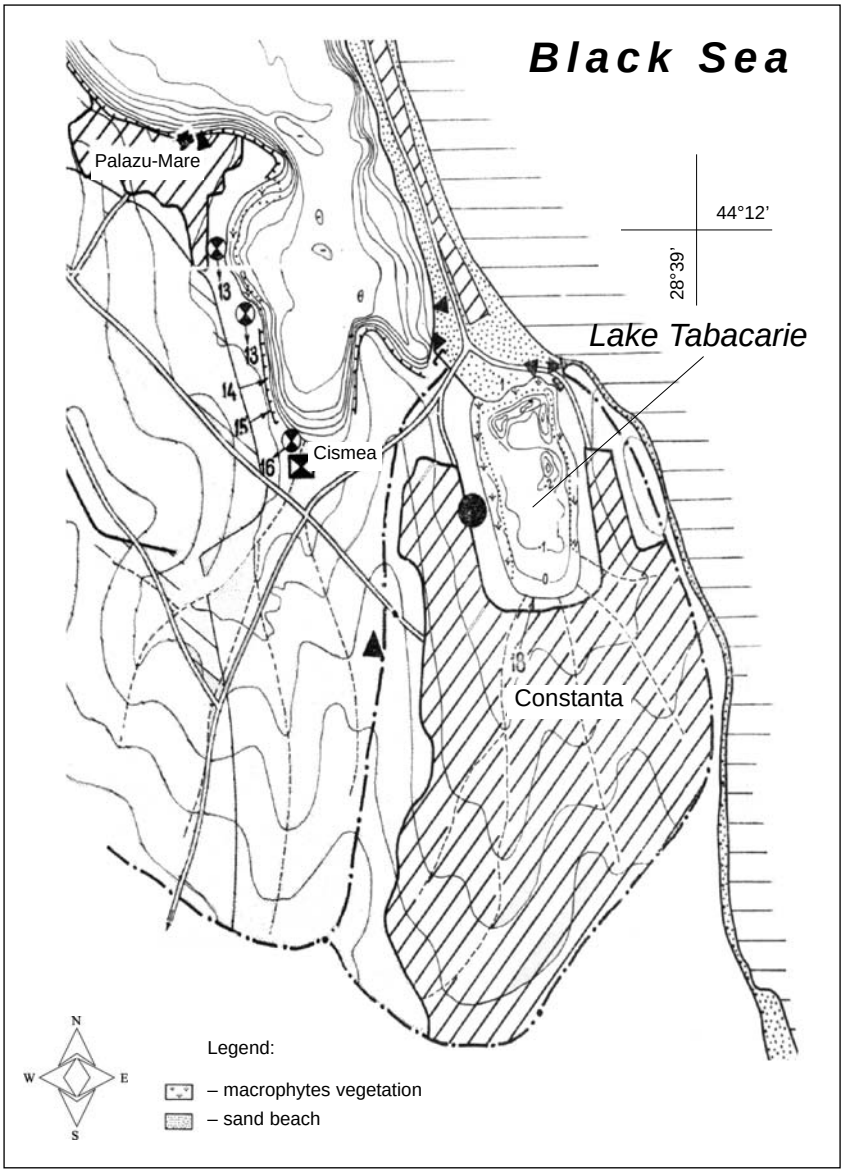
Fauna: *Larus ridibundus* and *Cygnus olor* are encountered occasionally, and during the winter rare species such as *Oxyura leucocephala* have been recorded. Species such as *Larus minutus, L. fuscus, Fulica atra, Porzana porzana* and *Egretta alba* have been recorded on migration.

Special floristic values: No information.

Public awareness and education: No special public awareness and education activities have been developed.

Research facilities: The Romanian Ornithological Society and other NGOs are involved in small inventory or monitoring projects.

Criteria for inclusion: 3.



Map 7. Lake Tabacarie

Table 8. Waterbird populations at Lake Tabacarie

Species	Non-breeding individuals
Cygnus olor	30
Egretta alba	17
Fulica atra	400
Larus fuscus	6
Larus minutus	1,500
Larus ridibundus	250
Oxyura leucocephala	2
Porzana porzana	3

7. Lake Techirghiol

Location: 44°02'N, 28°37'E. The lake is situated to the south of the town of Techirghiol, at the confluence of the Tuzla, Techirghiol and Carlichioi valleys.

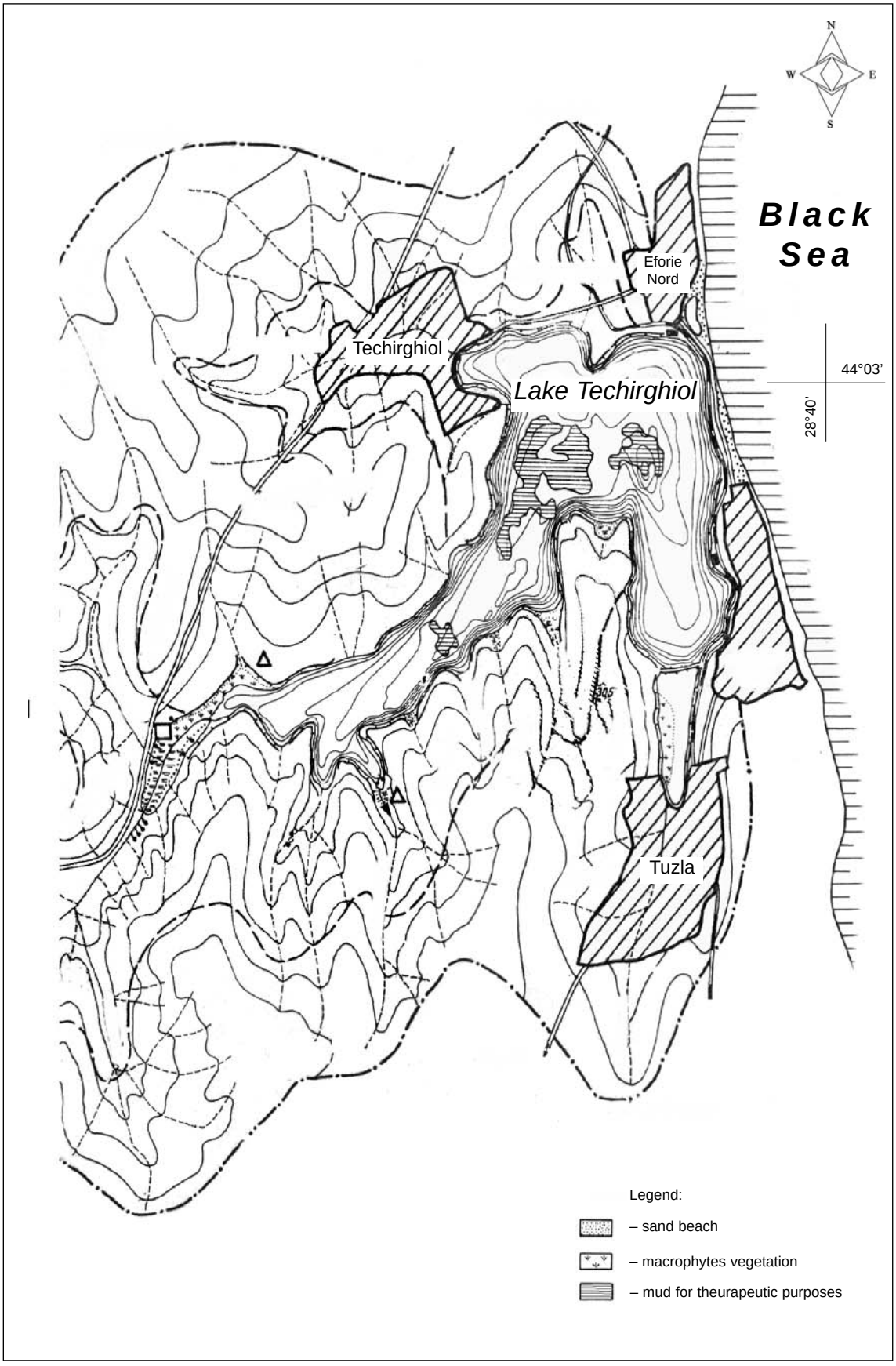
Area: 1,161 ha.

Altitude: 0.60-9.75 m above sea level.

Wetland type: Q.

Other hydrologically linked wetlands: None.

Description of site: Lake Techirghiol is a marine liman with a slightly sinuous shape. High limestone plains slope down to the shores surrounding the lake, which are dissected by short tributary valleys that form several bays. Lake Techirghiol has an area of 1,161 ha, maximum depth 9.75 m, average depth 3.6 m, and volume of *c.* 41.8 million m^3. The lake is 7.75 km long, with a maximum width of 4.4 km on the



Map 8. Lake Techirghiol

seaward side, including Lake Tuzla. The catchment area of the lake, *c*. 185.5 km^2, is formed by the Techirghiol, Carlichioi and Tuzla valleys, the first two being the most important. Lake Techirghiol is the only lake on the Romanian coast that does not connect with the Black Sea, however there may be a subterranean connection between the sea and the lake. Lake Techirgiol's being cut off from the sea has contributed to its increase in salinity (about 60 g/l) and the decline of the water table to below sea level because of local climatic conditions. The high salinity and that fact that the water strata are continuously mixed by the wind (making vertical stratification impossible) make it difficult for the lake to freeze in the winter – even at –2 to –4°C – especially in the middle of the lake.

Water quality: No information.

Principal vegetation: Because of the lake's high salinity only euryhaline species can survive, the characteristic of the flora being the lack of higher species. Apart from the areas with a freshwater intake, where clusters of macrophytes grow, the lake vegetation is comprised almost exclusively of algae – especially *Cladophora crystalline* – and bacteria.

Conservation measures taken: No special conservation measures have been taken.

Conservation measured proposed: None.

Land use: Lake Techirghiol is used mainly for its therapeutic mud and water.

Possible changes in land use: No important changes are planned.

Disturbance and threats: The development of the surrounding irrigation systems has caused important changes in the natural conditions: increase in the water table of the lake, reduction of salinity (52%), and interruption of the regeneration process of the existing reserve of mud.

Economic and social value: Lake Techirghiol is one of Romania's most important lakes because of its reserve of therapeutically valuable mud and water. There are three bathing establishments around the lake – Techirghiol, Eforie Sud and Eforie Nord, which is also open in winter.

Fauna: The fauna is dominated – both in species number and type – by infusoria, however there are also some macrofaunal species such as dipterans and Oligochetae, and particularly the phylopod crustacean *Artemia salina,* which, together with *Cladophora,* contribute to the formation of the therapeutic mud. Other representatives of major interest in the microfauna are the circumpontic chironomid, *Haliaella taurica,* its larva giving the mud its plastic quality. The water of the lake does not freeze because of its high dissolved salt content, so there are optimal conditions for birds to overwinter. There are good forage resources on the surrounding fields: in winter large populations of *Anser albifrons* and *Branta ruficollis* are recorded, and internationally or nationally protected species such as *Phalacrocorax pygmaeus, Cygnus cygnus, Oxyura leucocephala* and *Larus minutus* are also encountered.

Special floristic values: No information.

Public awareness and education: No special public awareness and education activities have been developed.

Research facilities: The Romanian Ornithological Society and other NGOs are involved in small inventory or monitoring projects.

Criteria: 1 and 3.

Table 9. Waterbird populations at Lake Techirghiol

Species	Non-breeding individuals
Anser albifrons	20,000
Branta ruficollis	7,000
Cygnus cygnus	40
Larus minutus	5,200
Oxyura leucocephala	800
Phalacrocorax pygmaeus	800

8. Lake Tatlageac

Location: Lake Tatlageac is situated south of the village of Costinesti, on the lower sector of the Tatlageacul Mic River (valley).

Area: 141 ha.

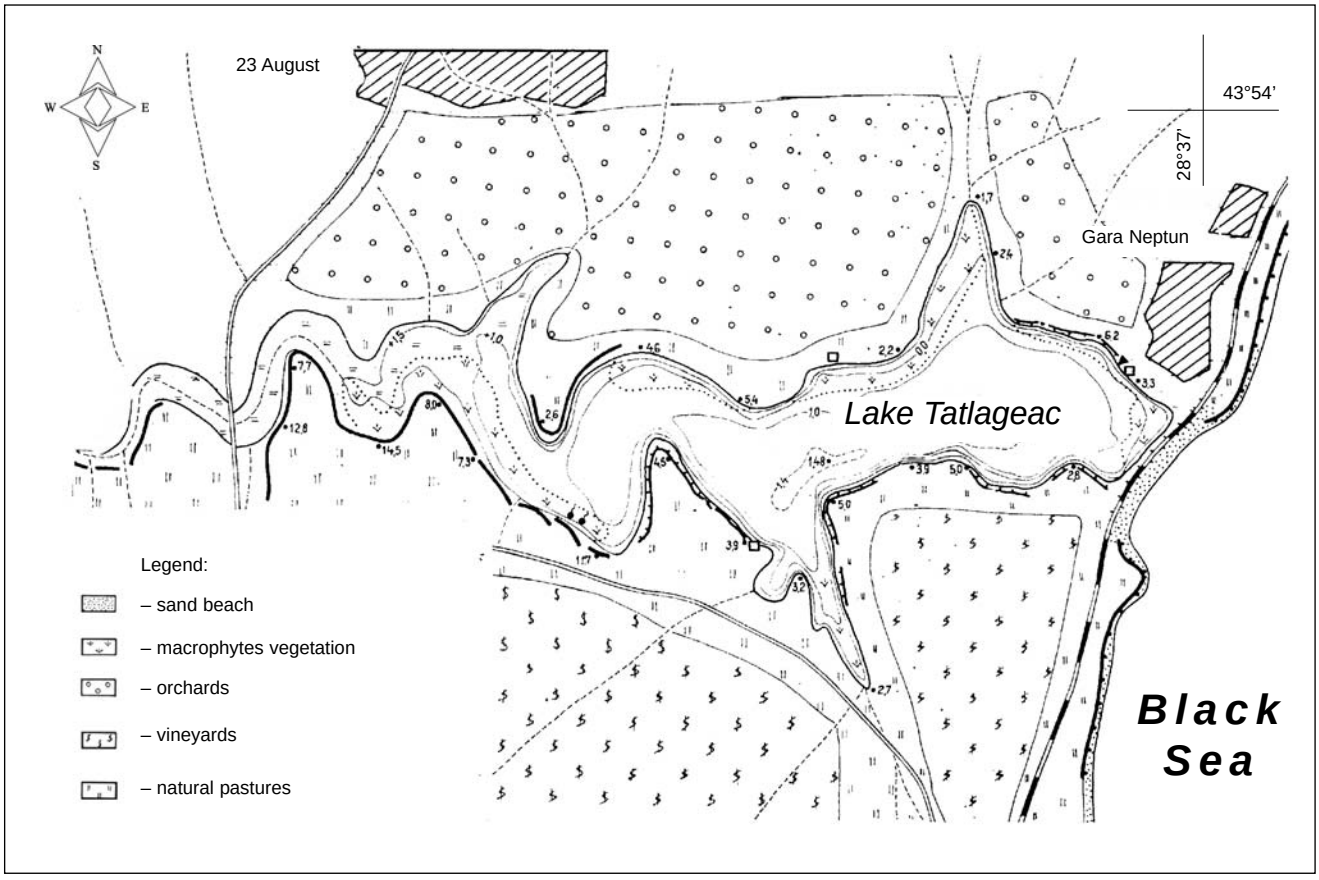
Altitude: 0-4 m above sea level.

Wetland type: O.

Other hydrologically linked wetlands: None.

Description of site: Lake Tatlageac is a typical marine liman, its fairly sinuous shape caused by the main meander of the River Tatlageacul Mic and also by bays that penetrate deep into the tributary valleys. The lake is bordered by gentle limestone slopes, covered with loess, that rise to a height of more than 20 m. Lake Tatlageac has a surface area of 141 ha, maximum depth of *c.* 1.6 m and volume of *c.* 2.2 million m^3. The lake is *c.* 4.4 km long with an average width of 0.2 km. In the south the banks are tall and steep, forming a cliff of sarmatian limestone. The catchment area covers about 129 km^2, comprising principally the Tatlageac valley, which contributes a modest inflow at 16 l/sec, the principal source being groundwater, from sarmatian limestone, at 53 l/sec. To avoid water loss to irrigation and fish-farming, the connection between the lake and the Black Sea has been

closed.
Water quality: No information.
Principal vegetation: At the upper end of the lake there is a large area covered by aquatic vegetation that grades from *Phragmites australis* and *Scirpus lacustris* to *Stratiotes aloides* and river meadow grasses, reflecting the intense obstruction caused by sediments brought down the main valley. Within the borders of the lake there is dense vegetation formed by a 10-15 m band of *Phragmites australis,* which covers large areas of the bays.
Conservation measures taken: No special conservation measures have been taken.
Conservation measured proposed: None.
Land use: Fish farming, which includes a modern fish nursery, is the main economic activity at the lake. The lake water is used for irrigation and there is small-scale sport fishing. The fertile areas surrounding the lake are cultivated with orchards and vineyards.
Possible changes in land use: No important changes are anticipated.
Disturbance and threats: Controlling the water level of the lake and clearing the dense vegetation has destroyed the diversity of flora and fauna. The destruction of natural fish spawning areas, closing the drainage canals from the lake to the sea where the euryhaline species penetrated into the lake, and over-fishing have destroyed the fish diversity in the lake.
Economic and social value: Fish farming, including a modern fish nursery, irrigation and sport fishing. The fertile surrounding banks are cultivated with orchards and vineyards.
Fauna: Birds: Lake Tatlageac is an important nesting area for some waterbird species included in the RDB of Romania: *Ardea cinerea, Egretta alba, Platalea leucorodia, Cygnus olor, Podiceps cristatus* and *Alcedo atthis.* The habitats are suitable for feeding and reproduction but fishing activities cause disturbance to the birds. Heron species, *Egretta garzetta, Nycticorax nycticorax* and *Ardea cinerea,* occur on migration, and in summer species such as *Larus cachinnans, L. ridibundus, Sterna hirundo, S. albifrons* and *Tringa totanus* have been recorded. Fish: The fish diversity of the lake was affected by the conversion of the lake into a fish nursery. Four species from the Cyprinidae family (*Cyprinus carpio, Aristichthys nobilis, Ctenopharyngodon idella* and *Carassius auratus gibelio*) replaced the existing 17 wild fish species.



Map 9. Lake Tatlageac

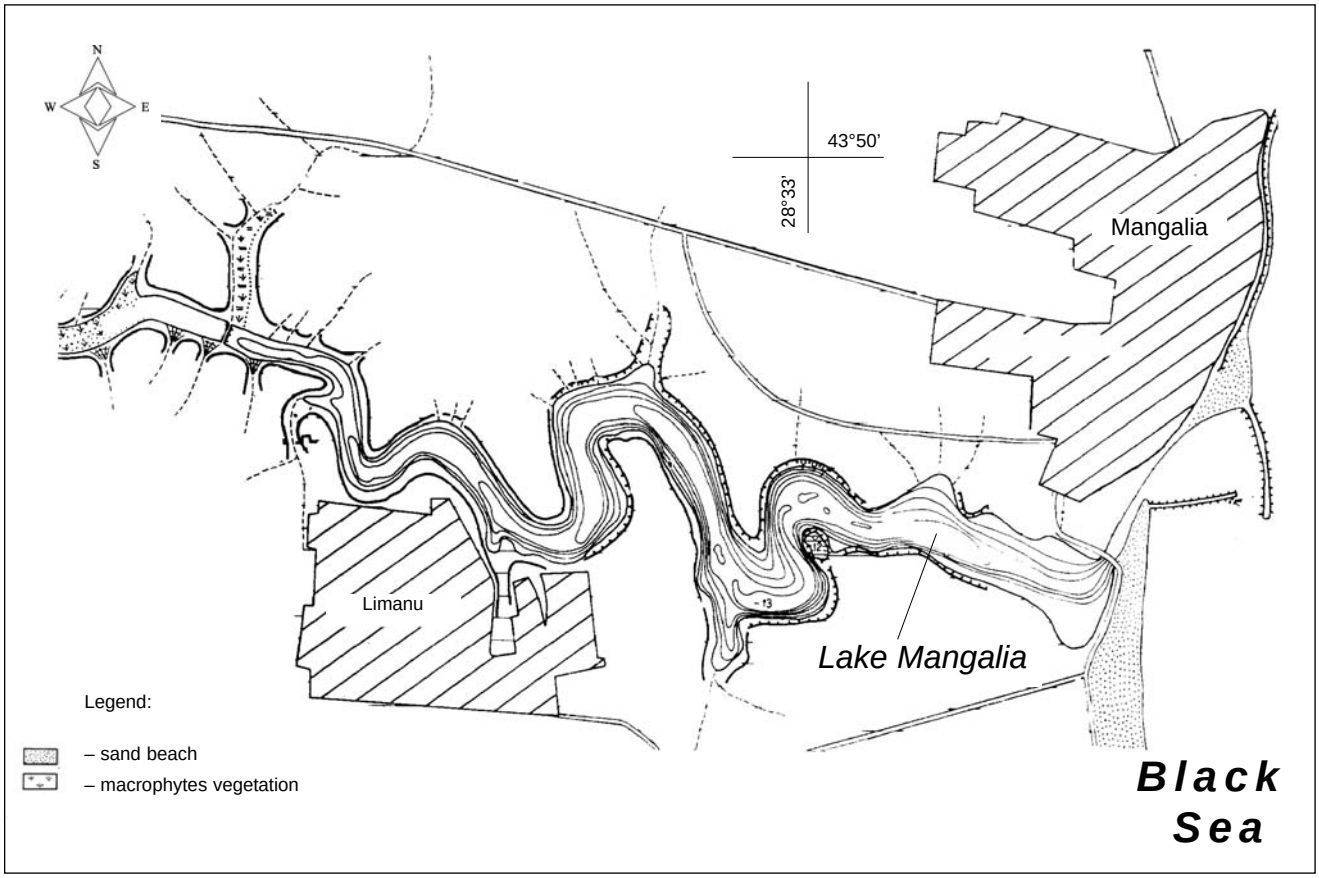
Special floristic values: No information.
Public awareness and education: No special public awareness and education activities have been developed.
Research facilities: The Romanian Ornithological Society and other NGOs are involved in small inventory or monitoring projects.
Criteria for inclusion: 1 and 3.

Table 10. Waterbird populations at Lake Tatlageac

Species	Non-breeding individuals
Alcedo atthis	5
Ardea cinerea	4
Cygnus olor	30
Egretta alba	22
Egretta garzetta	80
Larus cachinnans	2,000
Larus ridibundus	1,200
Nycticorax nycticorax	600
Platalea leucorodia	30
Podiceps cristatus	6
Sterna albifrons	20
Sterna hirundo	300
Tringa totanus	320

9. Lake Mangalia

Location: Lake Mangalia is situated to the south of the town of Mangalia, near the Bulgarian border, on the lower sector of a river whose name changes according to the nearest locality – Mangalia, Valea Arsa, Albesti, Lumina, etc.
Area: 316 ha.
Altitude: 0-5 m above sea level.
Wetland type: O.
Other hydrologically linked wetlands: None.
Description of site: Lake Mangalia is a marine liman formed in a strongly meandered valley flooded by seawater. The lake was separated from the sea by a natural sandbank (peresip) of *c.* 40 m maximum height that was crossed by a channel connecting the lake with the sea. In 1953, the sandbank was breached and the lake became an open bay. Subsequently Mangalia Bay was separated into three smaller lakes: Lake Mangalia, Limanu fish pond and Hagieni fish pond. The total surface area of the lakes system is 316 ha, length 9.5 km, average width 0.3 km (max. 0.8 km), average depth 6 m (maximum 13 m on the shoreward side of the lake) with a volume of *c.* 16.48 million m^3. The catchment area of the lake complex system is 784 km^2, distributed both in Romania (about 278 km^2) and Bulgaria. Because of its strong connection with the Black Sea, Lake Mangalia lacks other lacustrine hydrological characteristics. Recently, sources of warm, sulphurous water (22°C) have been discovered near the lake.
Water quality: No information.
Principal vegetation: The Mangalia valley at the confluence with Valea Arsa is covered by a compact, uniform macrophyte association because of its shallower, fresh water dominated by reed-beds (*Phragmites australis*, var. *typica* and var. *rivularis*). The submerged vegetation is connected to the alluvial substrate and is represented by associations of *Zannichellia* and *Zostera.*
Conservation measures taken: No special conservation measures have been taken.
Conservation measured proposed: None.
Land use: Within Lake Mangalia, on the Balar valley, two ponds, Hagieni and Limanu, have been dammed to prohibit access of sea water and used for fish farming and irrigation. Sport fishing is also practised in the complex. The limestone slopes are abrupt and closely follow the edge of the lake at a height of 25 m. A shallow area behind Limanu pond has been converted into a fish nursery to stock the two ponds.
Possible changes in land use: No important changes are anticipated.
Disturbance and threats: Transforming Lake Mangalia into a marine bay replaced the freshwater flora and fauna with marine species. The use of the ponds for fish farming controlled the wild fauna and flora and diminished the number of species. The introduction of commercial species has had a negative impact on the indigenous species.
Economic and social value: Fish farming, irrigation and sport fishing are of economic value.
Fauna: Birds: Because of its direct connection with sea and subterranean water sources, Lake Mangalia never freezes, offering good wintering conditions for many aquatic birds. Many species winter at the lake, some of which are included in the RDB of Romania: *Cygnus olor, Podiceps cristatus, Anas platyrhynchos, Tadorna tadorna. C. olor, T. tadorna, Egretta alba* and *Recurvirostra avosetta* are legally protected. In winter, when the Danube Delta Lakes and Lake Razim-Sinoie are frozen, large aggregations of Anser albifrons and *Branta ruficollis* are found here. In spring and in autumn, during the migration period, species such as *Philomachus pugnax, Vanellus vanellus, Calidris minuta, Limosa limosa,* etc. are recorded. Fish: The important fish species belong to the Cyprinidae and Percidae families and to the Chinese complex, *Hypophthalmichthys molitrix* and *Ctenopharyngodon idella.* The open connection with the sea created favourable conditions for marine fish species, especially species of the Gobiidae, Mugilidae and Atherinidae families. The salinisation of Lake Mangalia permitted the access of many species, e.g. *Alosa alosa, Syngnathus nigrolineatus, Gobius syrman,* and *Gobius ophiocephalus,* that enjoy strict legal protection



Map 10. Lake Mangalia

Special floristic values: No information.
Public awareness and education: No special public awareness and education activities have been developed.
Research facilities: The Romanian Ornithological Society and other NGOs are involved in small inventory or monitoring projects.
Criteria for inclusion: 2 and 3.

Table 11. Waterbird populations at Lake Mangalia

Species	Non-breeding individuals
Anas platyrhynchos	200
Anser albifrons	600
Branta ruficollis	300
Calidris minuta	200
Cygnus olor	35
Egretta alba	20
Limosa limosa	80
Philomachus pugnax	700
Podiceps cristatus	20
Recurvirostra avosetta	60
Vanellus vanellus	30

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RUSSIA

by

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INTRODUCTION

Russia is one of the richest countries of the world in terms of natural resources, and contains a great number of wetland resources. There are about 120,000 rivers with a total length of 2.3 million km and about 2 million lakes totalling 370,000 km^2; marshes cover 1.8 million km^2. The overall length of the coastline is about 60,000 km. The importance of Russian wetlands in terms of biospheric processes and conservation of biodiversity for Eurasia is extremely high, and hard to overestimate.

Thirty-five Russian wetlands, totalling 10.7 million ha, are of international importance and are designated as Ramsar sites. There is additional information on 166 Russian wetlands that are listed in the Ramsar Shadow list (Amirkhanov 2000; Krivenko, Vinogradov 2000).

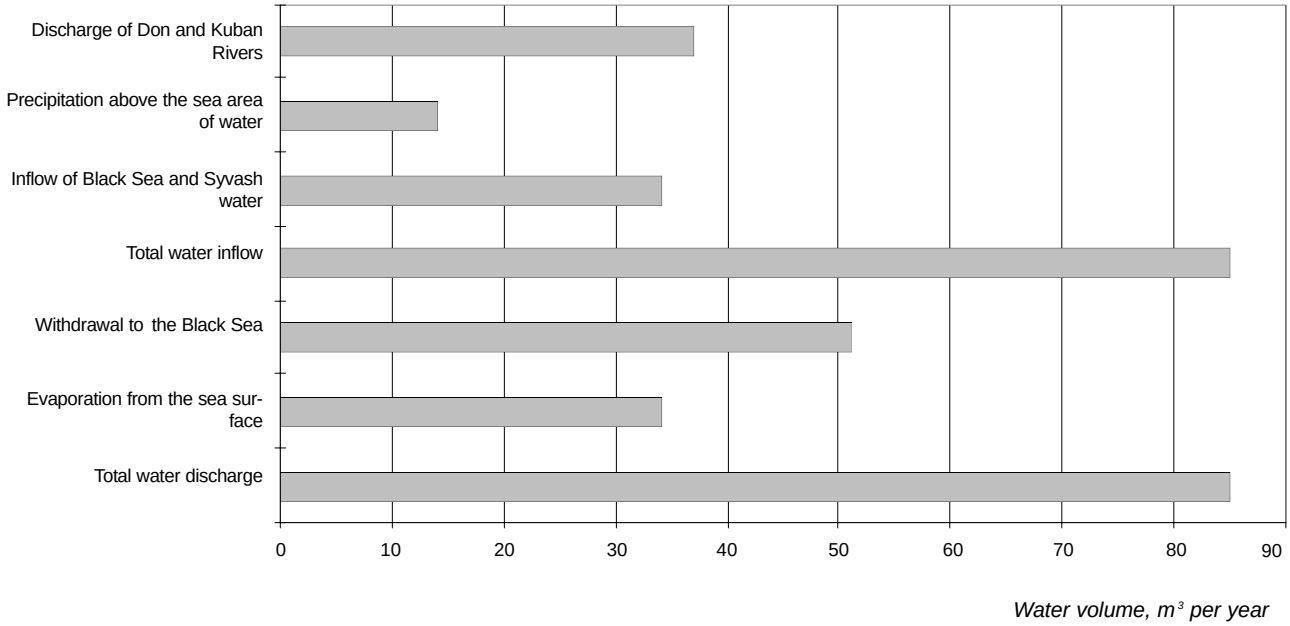
Four of the 35 Ramsar sites are located in the south of Russia in the Azov-Black Sea region. The islands still harbour bird colonies, and the area provides habitats for birds on local summer migration and for wintering birds, and is on the most important flyways for migrating waterbirds and other species.

The Russian Black Sea coastal zone includes the coast of the Azov Sea and the Black Sea coast south to the border with Georgia; to the west it borders the wetlands of Ukraine (Donetsk Oblast and Crimea). The principal wetlands of the Krasnodar Krai are located along the eastern coast of the Azov Sea. In the north, they are situated on the border of the platform of the Kuban Plain (Shabelskaya Spit and Yeisky Liman). A little further to the south, the plain becomes the Pre-Kuban lowland, which is crossed by steppe rivers (Chelbas, Beisug, Kochety, Kirpili and others) and further south still there are channels, canals, dykes and the River Kuban. Two wetlands are situated on the shores of the Black Sea among the hills and ridges of the Taman Peninsula.

Low spurs of the Donetsk range (376 m) protect wetlands of the Rostov Oblast in the north. To the northeast, east and southeast are lower hills of the Don and Salsko-Manych ranges (237 m and 170 m high respectively). Further to the south, the line of wetlands crosses the Kumo-Manych valley, which once linked the Azov and Caspian Seas and now coincides with the border of the Kalmyck Republic: an area of steppe and semi-desert. Continuing along the floodplains of the Rivers Don and Manych, the border of the wetlands reaches Taganrog Bay.

The wetlands of the southern region of Russia stretch from north to south and east to west of the vast territory. Thus, according to geobotanical zoning, some of them lie in the Eurasian steppe region of the Eastern-European province of the Don, Priazov and Azov-Kuban Districts, while others lie in the Mediterranean region of the Crimea-Novorossiysk province of Kerch-Taman district (Litvinskaya 1996). Shiffers (1953) and later Tembotov (1972) assign these wetlands to the Western Caucasus or Kuban zonal sub-type. In terms of zoning the avifauna of the Rivers Don and Manych and coast of the Azov Sea, Voinstvenskyi (1960) and Belik (1996, 1998) include the wetlands in the Pre-Caucasus province of the Sahara-Gobi sub-region.

The geomorphology and hydrology of the region determine the character and distribution of wetlands in the Russian Black Sea coastal zone. For the most part, rivers originate in the Caucasus and wetlands develop only in lower-lying areas such as the flat plains of western Ciscaucasia, where the River Kuban and smaller rivers such as the Yeya, Chelbas and Beisug enter the Azov Sea. Along the coast there is an extensive network of floodplains, deltas, limans and lagoons, supporting high biological diversity. The Manych valley is closely linked to the Black Sea region; it is a chain of water bodies along a channel that originally connected the Black Sea to the Caspian.



Since the 1940s the Manych Reservoirs have received fresh water from the River Kuban via the Nevinnomysk
Figure 1. The water balance of the Azov Sea

Canal and so have been linked to the hydrological system of the Black Sea Basin. Today the wetlands of the Manych Valley are represented by large reservoirs characterised by a rich, sometimes relict, biodiversity. The Black Sea coastal areas of Russia also include the Lower Don, which also flows into the Azov Sea, developing a small deltaic complex that supports a high biodiversity.

Coastal areas of the Azov Sea have been subject to extensive economic development, in particular fishing, aquaculture and agriculture, collectively affecting the quality of this unique, shallow inland sea. This has led to degradation of marine and coastal biodiversity and fisheries reproduction.

An initial inventory of Russian wetlands of the Azov-Black Sea region has been carried out. Three wetlands are of international importance: Kuban Delta*, Veselovskoe Reservoir and Lake Manych-Gudilo. Two wetlands – the Lower Don and Kiziltashsky Liman Complex – are on the list of wetlands to be accepted as wetlands of international importance. The remaining three wetlands – Beisugsky Liman and Lake Khanskoye, Dinskoy and Yeisky Limans – are of national importance (Gineev 1997; Gineev, Krivenko 1998; Kazakov 1998; Krivenko & Gineev 1999; Krivenko, Gineev, Emtyl, Lokhman 1999; Gineev, Krivenko 2000; Gineev, Krivenko, Emtyl 2000; Gineev, Emtyl, Krivenko 2000; Kazakov 2000; Vinogradov 1999, 2000). Beglitskaya and Shabelskaya Spits, of regional importance, are described for the first time.

The majority of these wetlands (seven wetlands) are situated in the eastern and northeastern regions of the Azov Sea, and the volume of water they hold is closely connected to the water balance of the Azov Sea. The Kiziltashsky Liman Complex is located on the north coast of the Black Sea; Lake Manych-Gudilo and Veselovskoye Reservoir are located in the Manych River valley. The wetlands of the Pre-Caucasus region, with their rich terrestrial and aquatic vegetation, offer different habitat types with favourable conditions for birds to breed and to stage on migration. This is one of the strongest migratory corridors, and some birds overwinter. Wetlands are of great importance for fish-spawning and fish-farming, and for fisheries. The use of the wetlands

* There are in fact two wetlands: the group of wetlands between the Kuban and Protoka Rivers, which include a large part of the Priazovsky State Reserve, and the Akhtaro-Grivenskaya liman system of the eastern Azov region (decree of the Russian Authorities dated 13.09.94, No. 1050). This is an integral part of the modern Kuban Delta and has been formally divided into two. Thus these two Ramsar wetlands are grouped under the name Kuban Delta.

for recreation and health resorts is not yet fully developed.

The present-day wetlands of the Western Pre-Caucasus region and Rostov Oblast belong to two ecosystems: a natural system along the coast and a man-made system (rice fields, Veselovskoe and Proletarskoe Reservoirs, extensive irrigation network, etc.) (Gineev 1989, 1997). Natural ecosystems along the coast are also being converted: e.g. in the Kuban Delta, ponds – including hatchery and nursery ponds – cover an area of 56,000 ha. Fluctuations in water level (discharge and recharge) are artificially controlled.

Overview of the coastal wetlands of Russia

Although only 10 sites are described in this inventory, they occupy a total of 955,314 ha and are effectively parts of a massive wetland complex of extremely high international importance. Most of these wetlands do not enjoy total protection, however some are partly protected; the remainder have no official protected status, but many are managed and protected by local and national hunting organisations.

Table 1. Overview of the coastal wetlands of Russia

No	Site	Region	Area (ha)	Protected area (ha)
1	Kuban Delta *	Krasnodar Krai	173,000	53,400
2	Kiziltashsky Liman Complex	Krasnodar Krai	40,400	None
3	Beisugsky Liman and Lake Khanskoye	Krasnodar Krai	48,000	None
4	Yeisky Liman	Krasnodar Krai	25,600	None
5	Veselovskoye Reservoir *	Rostov Oblast	309,000	None
6	Lake Manych -Gudilo *	Kalmykia, Stavropol and Rostov Oblasts	182,600	32,191
7	Don Delta and Lower River Don	Rostov Oblast	170,000	5,000
8	Dinskoy Bay	Krasnodar Krai	5,000	5,000
9	Beglitskaya Spi t	Rostov Oblast	1,014	1,014
10	Shabelskaya Spit	Krasnodar Krai	700	None
		Total	**955,314**	**96,605 (10%)**

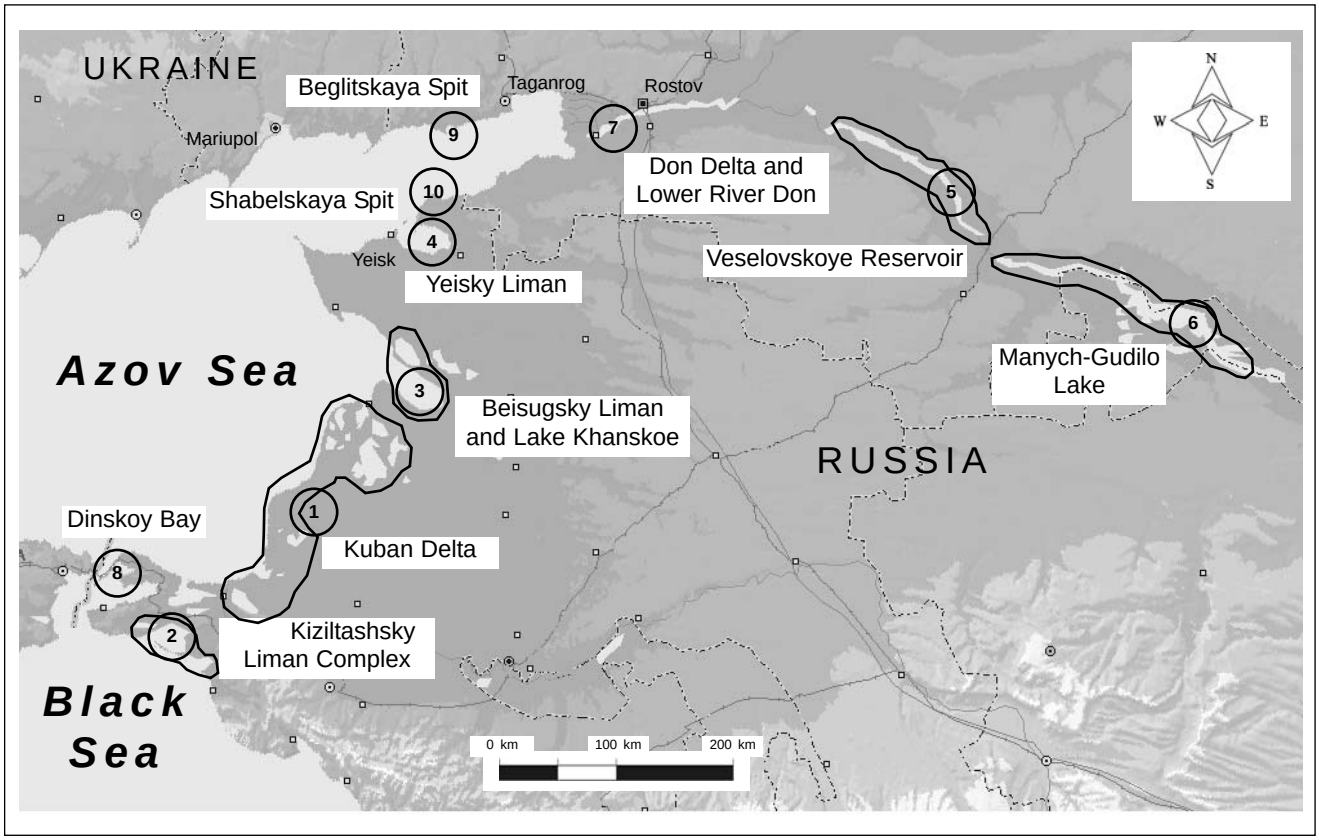
*Note: * Ramsar sites (the Kuban Delta includes two Ramsar sites)*

Wetland Conservation

The management and conservation of the Black Sea wetlands is undertaken by the regional authorities of the Krasnodar Krai, Stavropol Krai, Rostov Oblast and Kalmyk Republic. There are two major types of conservation body in each region. The first type is represented by regional departments of the Federal Ministry of Environmental Protection and Natural Resources. These bodies are responsible for protection and monitoring of endangered species. The second level involves sectoral agencies, responsible for the status, conservation and wise use of natural resources of commercial value. The hunting management offices are responsible for game species including fish stocks; forestry management offices are responsible for forest resources. At the federal level, these bodies come under the relevant federal structures: Department for Conservation and Wise Use of Game Animals of the Ministry of Agriculture, National Committee for Fishery Resources and National Committee for Forestry. Under current legislation, both types of conservation body are subordinate to regional administrations.

Legislative Framework

The use of land and water resources – including Ramsar wetlands – is regulated by federal water, forest and land laws and a number of acts. All Russian Federation laws presume the priority of international law and require firstly that the rules of international treaties be observed. The relevant regional laws have to be applied in conjunction with federal and international laws, although this practice is not widely observed. In the list appended to the federal law 'The Most Protected Natural Territories', the definition of 'wetland' is absent; the term 'wetland' is also not



Map 1. The Black Sea coastal wetlands of Russia (numbers correspond with the numbers in the text and table 1)

defined in the law of the Russian Federation, 'Protection of the Environment'. This is a great drawback of the legislation on nature protection and, despite the international importance of these wetlands, it makes it difficult to find solutions to problems connected with wetland management and conservation. The results of the inventory and analysis of existing regional legislation bear witness to the fact that it is still very imperfect.

As described above, according to the decree of the Government of the Russian Federation four wetlands appear on the Ramsar list. A special regime for the conservation and use of natural resources, e.g. the Kuban Delta Ramsar site, has additionally been approved by decree of the Head of the Authorities of the Krasnodar Krai, signed in 24.07.95, No. 413, however this document does not restrict the use of the site. According to existing legislation, the government can bring pressure to bear on business/industrial users of wetlands. For example, the government can support industrial development with environmentally-friendly technologies that minimise adverse effects on the environment by introducing privilege-taxing (fishing, hunting) and conversely increase dues when industry breaks the law.

Both commercial and amateur fishing and hunting on the wetlands of the region – including Ramsar wetlands – are regulated by the federal regulations for fishing, 'Regulations for Amateur and Sport Fishing in Waterbodies of the Krasnodar Krai and Rostov Oblast', and 'Rules for Hunting on the Land of Private Businesses'. Through legislative meetings, regional authorities license the activities of all users of the Ramsar sites and adopt regulations and laws. In addition to the law on 'Territories of special protection' of the Krasnodar Krai and Rostov Oblast, it is necessary to define both 'wetlands of international importance' and how they are organised, details of their legal status, and protection regime. It is necessary to add 'Methods for Damage Assessment'.

Economic Framework

It is important for the current process of taking environmental issues into economic consideration that legislation is adhered to, i.e. legislation must be observed and should promote improvement of the environment. Specialised nature protection regulatory bodies are able to ensure that laws are observed. To conserve wetlands it is necessary to use economic tools in parallel with legislation. Thus, for efficient conservation and limitation of economic

activities in wetlands of international importance the increased coefficient 1.5 for compensation for damage caused to the fauna should be introduced. Part of this compensation can be directed to the conservation of wetlands. To estimate this effectively, it is important to know the economic value of global faunal resources based on population figures. However to obtain all the necessary information is very difficult: the availability and quality of data are very uneven and there are no standards by which to make estimates.

The need to estimate natural resources in the south of Russia is urgent, since natural areas are being converted rapidly here (Gineev 1985, 1997). Had there been such a system, it is unlikely that rice growing would have been introduced. The second urgent need is for a method to assess damage caused to nature and further compensation. The damage can be caused whilst building, rehabilitating or expanding enterprises located in reed-beds. The third problem of international importance is the sustainable use of waterfowl populations in the different countries where they breed or migrate. The size of the bag quota should be dependent on the importance of wetlands in the reproduction and conservation of the species. The exploitation of migratory populations of waterfowl should be managed and based on principles of economic expediency and conservation of birds.

Wetland Research

The fauna of the southern region of Russia is very interesting: the avifauna is especially rich and diverse and has long attracted the attention of scientists. The first description of 63 bird species was made in the second half of the 18th century when General Rigelman (1768) described the fortress of St. Dmitriy Donskoy (modern Rostov-on-Don). Subsequently, Gmelin (1771) and Pallas (1793-94) travelled in the south of Russia.

Ptushenko studied the avifauna of the Eastern Azov region during 1909-1922 and then intermittently until 1939 (Ptushenko 1915, 1939). Alferaki (1910) wrote some very interesting hunter's notes and reminiscences about birds of Taganrog Bay and the River Don. At the same time, under supervision of A.A. Brauner, a student of Odessa University, Sarandinaki (1909), made a collection of 220 skins and gave the fullest review to date of the birds of the lower Don and Manych Rivers. Lerh studied the lower Don and Western Manych Rivers at the end of the 1920-30s and after 1945. In 1940, he published an article 'Birds' in the collection 'Nature of Rostov Oblast'.

The first detailed list of birds of the Kuban Delta was written by Kistyakovskiy (1932). Bird researchers were most active in the 1950s: in the Rostov Oblast – Oleinikov (1953), Oleinikov et al. (1973); in the Krasnodar Krai – Ochapovskiy (1962, 1963, 1965, 1967); Vinokurov (1960, 1962), and subsequently Lomadze (1967, 1973) studied fish-eating birds. Together with studies of other fauna, researchers paid much attention to the distribution, numbers, breeding and migrations of birds (Kischinskiy 1960).

At the beginning of the 20th century, Satunin undertook zoological and faunal research (1902, 1907,1912). Puzanov (1927) studied the zoogeography of the Taman Peninsula. Varshavskiy (1965) studied the long-term impact of human activities on birds.

In the 1960-70s, ornithologists were attracted by the problem of economic assessment of Anseriformes populations during wintering and migration, and continued to gather material on species composition. Ornithologists from Rostov University (Oleyinikov, Minoranskiy, Kazakov, Yazykovoy et al.) made an especially important contribution to studies of Anseriformes. Staff of the Southern Department (SD) and Head Department of the Russian Research Institute of Game Management and Fur Farming (VNIIOZ), Braude, Vengerov, Bakeev, Gineev, Kostoglod (1967-1972), and later Krivenko, from the Institute of Nature Conservation (1972-1977), carried out almost annual censuses of wintering Anseriformes and occasionally of breeding birds.

The next stage of research began at the end of the 1980s, when scientists from Kuban University started to organise expeditions and integrated studies of waterbodies. They made parallel studies of plant associations, fauna, geomorphology, the toxicological state of the ecosystems, etc. Rare and endangered species of plants and animals, and cadastral characteristics of the fauna were of special interest (Rostov State University, Rostov Pedagogical University, Azov and Krasnodar Research Institutes of Pond Fishery, SD VNIIOZ Academy of Agricultural Sciences Russia – AASR).

Since 1995, staff of SD VNIIOZ AASR have carried out regular research in the reed-beds of the River Kuban to

estimate the damage caused by conversion of wetlands. At the same time, the state of rare and endangered species of animals and breeding waterbirds was studied and an economic estimate of faunal resources was made. The research resulted in the 'Methodical Recommendations on Estimation of Damage Caused to Wildlife Resources (Environment) in Wetlands of the Eastern Azov Region' (Krasnodar 1997). The document was approved by the Head of the State Committee on Nature Protection, and agreement was reached with the Head of the Hunting Department in the Krasnodar Krai (Gineev 2000).

Occurrence of Threatened Taxa at Sites Included in the Inventory

All taxa listed in the table 2 are included in the Russian Red Data Book (RDB) and the 2000 IUCN Red List of Threatened Species. This list may not be comprehensive for individual sites as they are dependent upon data availability.

The species, included in the Russian RDB are divided into such categories: RDB category 1 – endangered species; RDB category 2 – vulnerable species; RDB category 3 – rare species; RDB category 4 – species vith uncertain status; RDB category 5 – restoring species.

SITE ACCOUNTS

1. Kuban Delta

Location: 45°42'N, 37°45'E. The site extends along the east coast of the Azov Sea from Temryuk to Primorsko-Akhtarsk. The site is located 142 km northwest of the city of Krasnodar and 3-56 km from the district centres of Primorsko-Akhtarsk, Slavyansk-on-Kuban and Temryuk. Its southern boundary follows the shore of the Kurchansky Liman, including the Kuban Delta, to the Azov Sea. The site is 105.4 km in length, 4.7-17.2 km in width, and follows the coast up to the mid-point of the Akhtarsky Liman. The southeastern border reaches the village of Sadki, including Kirpilsky Liman. To the east, reed-beds border the site at Grechanaya gully and the River Kirpili; the remainder of the east of the site is bordered by rice-growing systems (channels, ditches, rice fields, roads, etc.)
Area: 173,000 ha.
Altitude: 0.4-38 m above sea level.
Wetland type: A, F, J, K, M, O, Q, Ts, 1, 2, 3, 4, 6, 9.
Description of site: Coastal shallow sites with open and closed bays, the Kuban Delta with limans, lakes connected by channels, ditches, irrigation canals, and parts of rice fields.
Other hydrologically linked wetlands: The site borders the Kiziltashsky Liman Complex to the south (26-30km from the site), rice fields to the east, the saline Akhtarsky Lakes to the north and beyond these Beisugsky Liman and Lake Khanskoye (20-30 km from the site).
Climate: The area has a mild, moderate-continental climate, dominated by two atmospheric currents: northeastern (continental) and southwestern (marine). The mean annual air temperature ranges from 10.3°C to 10.9°C. In January (the coldest month), the mean air temperature is between –1.6° and –3.1°C, with a minimum of –21.6°C. In July, the mean temperature is between 22.8°C and 23.8°C. The period when the temperature is above zero lasts for 205-228 days. Annual precipitation is between 332 mm and 638 mm. The ice period lasts 30-102 days; the thickness of the ice cover reaches 50 cm in cold winters, with an average of 25-30 cm. The earliest recorded date at which the waterbodies have frozen over is 16 November, and the latest recorded date of snow melt is 23 March (1954).
Hydrology: Water sources: the River Kuban (1.4 km^3/year), waters draining from rice fields (1.63 km^3/year), and precipitation (1.69 km^3/year). Changes in the water level are observed in cycles of 3, 5, 8 and 12 years (Borisov 1978). The natural hydrological regime of the Kuban is characterised by inter-decadal and hundred-year cyclical changes. The highest-ever water level was recorded at the end of the 1990s-beginning of 2000. Seasonal changes in water level in spring and summer are caused by snow and glacial melt; during this period there may be up to 6-7 floods associated with heavy rains. The water level decreases in autumn and winter, as well as in summer as water is diverted to irrigation channels. Variations in water level may also be a result of winds from the sea.
Water quality: The coastal areas and lagoons are characterised by a salinity range of 2‰ to 11.3‰, in the foredelta from 0.91‰ to 7.0‰, in other types of wetlands from 0.9‰ to 3.6‰. The water in the limans is of the chloride-sodium class of type III (Alekin 1980). The concentration of oxygen in the limans is 6.8-8.2 mg/l; in reed-beds

Table 2. Occurrence of threatened taxa at sites included in the inventory

Scientific name	IUCN Red List	Russian RDB	Site									
			1	2	3	4	5	6	7	8	9	10
Mammals												
Canis lupus	NE				√	√	√					
Lutra lutra ssp. meridionalis	VU A2cde	3	√		√	√		√				
Mustela lutreola	EN A1ace	1	√				√		√			
Nyctalus lasiopterus	LR/nt	3		√					√			
Nyctalus noctula	NE		√		√	√	√	√	√	√		
Vormela peregusna	VU A1cd	1	√		√	√	√	√				
Birds												
Accipiter brevipes	NE	3				√			√			
Anser erythropus	VU A1acd +2bcd	2	√		√	√	√	√	√	√		
Anthropoides virgo	NE					√	√	√				
Aquila chrysaetos	NE					√	√		√			
Aquila clanga	VU C1								√			
Aquila heliaca	VU C1						√		√			
Aquila pomarina	NE					√			√			
Aquila rapax	NE					√	√	√	√			
Aythya nyroca	LR/nt	2	√	√	√		√	√	√	√	√	
Branta ruficollis	VU B1+2c	3	√		√	√	√	√	√		√	
Burhinus oedicnemus	NE	4	√	√		√	√	√		√		
Bubo bubo	NE	2						√	√			
Buteo rufinus	NE					√						
Charadrius alexandrinus	NE		√	√			√	√	√	√	√	√
Ciconia nigra	VU B2a	3	√				√		√			
Circaetus gallicus	NE					√	√		√	√		
Crex crex	VU A2c								√			
Cygnus bewickii	NE								√		√	
Falco cherrug	NE					√			√			
Falco naumanni	VU A1bce +2bce	1						√				
Falco peregrinus	NE	2				√	√	√	√	√		
Gelochelidon nilotica	NE			√	√			√		√	√	
Glareola nordmanni	DD	2	√	√		√	√	√	√	√	√	
Glareola pratincola	VU A1ac			√			√	√	√	√	√	√
Haematopus ostralegus	NE	3	√	√	√				√	√	√	
Haliaeetus albicilla	LR/nt		√			√	√	√	√	√	√	
Himantopus himantopus	VU D2	3	√	√	√	√	√	√	√	√	√	√
Hydroprogne tschegrava	NE	3		√	√			√				
Larus genei	NE			√	√	√		√		√	√	√
Larus ichthyaetus	NE	5	√	√	√	√	√	√	√	√	√	√
Larus melanocephalus	NE			√	√	√	√	√		√	√	
Numenius arquata	NE	2	√	√			√	√	√	√	√	√
Numenius tenuirostris	CR C2b, D								√			
Otis tarda	VU A2c	3	√		√		√	√	√			
Oxyura leucocephala	EN A1acde	1	√	√	√	√	√	√		√		
Pandion haliaetus	NE	3	√			√	√		√		√	
Pelecanus crispus	LR/cd	2	√	√	√	√		√				
Pelecanus onocrotalus	VU C1	1	√		√	√		√		√		
Phalacrocorax pygmaeus	LR/nt	2	√									

Continuation of Table 2

Scientific name	IUCN Red List	Russian RDB	Site									
			1	2	3	4	5	6	7	8	9	10
Phoenicopterus roseus	NE					√		√				
Platalea leucorodia	EN A1ac	2	√		√	√	√	√	√			√
Plegadis falcinellus	LR/nt	3	√			√	√	√	√	√		
Recurvirostra avosetta	VU A1c	3	√	√	√		√	√	√	√	√	√
Sterna albifrons	NE	2	√	√	√		√	√	√	√	√	√
Sterna sandvicensis	NE		√	√	√	√				√	√	
Tadorna tadorna	NE		√	√	√	√	√	√	√	√	√	√
Tetrax tetrax	LR/nt		√			√	√	√				
Reptiles												
Coluber jugularis	NE			√					√	√	√	
Elaphe quatuorlineata	NE			√						√		
Eremias arguta	NE			√	√	√				√	√	
Fish												
Acipenser sturio	CR A2d								√		√	
Invertebrates												
Bombus argillaceus	NE			√						√		
Bradyporus multituberculatus	NE			√						√		
Carabus bessarabicus	NE							√				
Carabus hungaricus	NE		√					√				
Megachila rotundata	NE		√		√	√		√		√		
Saga pedo	VU B1+2bd			√					√	√		
Scolia hirta	NE		√	√				√		√		
Plants												
Acorus calamus			√						√			
Adonis flammea				√	√			√		√		
Adonis vernalis				√	√	√				√		
Aldrovanda vesiculosa			√					√				
Allium savranicum									√			
Althenia filiformis							√					
Amygdalus nana				√	√	√		√	√	√		
Apera maritima				√								
Artemisia salsoloides				√						√		
Asparagus tenuifolius							√		√			
Astragalus tanaiticus									√			
Bellevalia sarmatica			√	√				√		√		
Bupleurum aureum			√									
Cakile euxina									√		√	
Caltha palustris									√			
Carex hordeistichos									√			
Centaurium formosum			√									
Ceratophyllum tanaiticum									√			
Cladium martii			√									
Crambe koktebelica							√					
Crambe maritima									√		√	√
Crambe pontica					√							
Crambe steveniana				√	√					√		
Delphinium puniceum								√				
Dipsacus gmelinii									√			

Continuation of Table 2

Scientific name	IUCN Red List	Russian RDB	Site									
			1	2	3	4	5	6	7	8	9	10
Elytrigia stipifolia (endemic)				√								
Erodium maritimum				√								
Erodium stevenii				√						√		
Eryngium maritimum					√			√	√		√	
Fritillaria meleagroides									√			
Gladiolus tenuis									√			
Glaucium flavum			√	√						√		
Goniolimon tataricum				√								
Hippurus vulgaris			√									
Iris notha					√							
Iris pumila					√			√				
Limonium caspium				√								
Limonium meyeri				√								
Linaria subulosa				√								
Marsilea quadrifolia			√		√							
Matricaria matricarioides			√									
Najas marina			√									
Najas minor			√									
Nelumbo nucifera			√									
Nuphar lutea			√						√			
Nymphaea alba									√			
Nymphaea candida			√									
Nymphoides peltata									√			
Paeonia tenuifolia								√				
Papaver nudicaulis			√									
Peganum harmala			√									
Polygonum aschersonianum			√									
Rhaponticum salinum			√		√			√				
Salvinia natans			√				√		√			
Sternbergia colchiciflora				√								
Stipa borysthenica									√			
Stipa pennata				√						√		
Stipa ucrainica							√					
Stipa zalesskii							√					
Trapa maeotica			√									
Tulipa biebersteiniana							√		√			
Tulipa schrenkii							√	√				
Valeriana officinalis									√			
Vallisneria spiralis			√				√		√			
Verbascum ovalifolium				√								

– 1.2-1.6 mg/l; oxidisability is 23 mg/l, concentration of hydrogen sulphide is 0.1-0.2 mg/l.

Geology, geomorphology and soils: The delta is formed by Quaternary loam deposits, where alevrits and alevrit silt dominate, bound by ground mussel shell. The coast and marine coastal shoals consist of shingle, sand and clay sediments. Clay with a 10-20 cm layer of silt predominates in the soils of the fore-delta, bottom of limans and depressions. Coastal and marsh saline soils are carbonate. Soils of the brackish wetlands are humus-clay, silt-clay-peat and silt-peat. Alluvial marshy-meadow and marshy-meadow-peat soils dominate in receiving water bodies of the delta (Blazhniy 1971; Red'kin, Yanchkovsky 1978). Typical rice soils represent the group of anthropogenic soils. In general, the coast and reed-beds have a flat relief formed by the influence of two opposing phenomena – the surge of sea waters and flow of river waters. The liman depressions were formed and their northwest-southeast orientation was determined by these two processes.

Principal vegetation: Aquatic-meadow vegetation predominates in the delta. There are 780 plant species of 326 genera and 87 families. Halophytic, meadow-steppe, solonchak and psammophytic associations have been found here (Tilba, Nagalevskiy 1989). The most interesting and valuable species are the relict species *Nelumbo nucifera, Aldrovanda vesiculosa* and *Trapa maeotica.* These are included in the Russian RDB, which contains 18 species of flora. Of the 780 species, 11 are trees, 21 are bushes and more than 748 are grass species. Four types of habitats are described for the Kuban Delta: marine, coastal (fore-delta), barrier (or intermediate, with brackish water), and freshwater and desalinated habitats (Gineev 1997, 2000).

Land tenure: The land is owned by 40 legitimate land-owners with the participation of about 150 tenants. Main land users are fish hatcheries, nurseries and farms, joint-stock companies, water management offices, agricultural (collective) farms, rural and rayon administrations, forestry enterprises, etc.

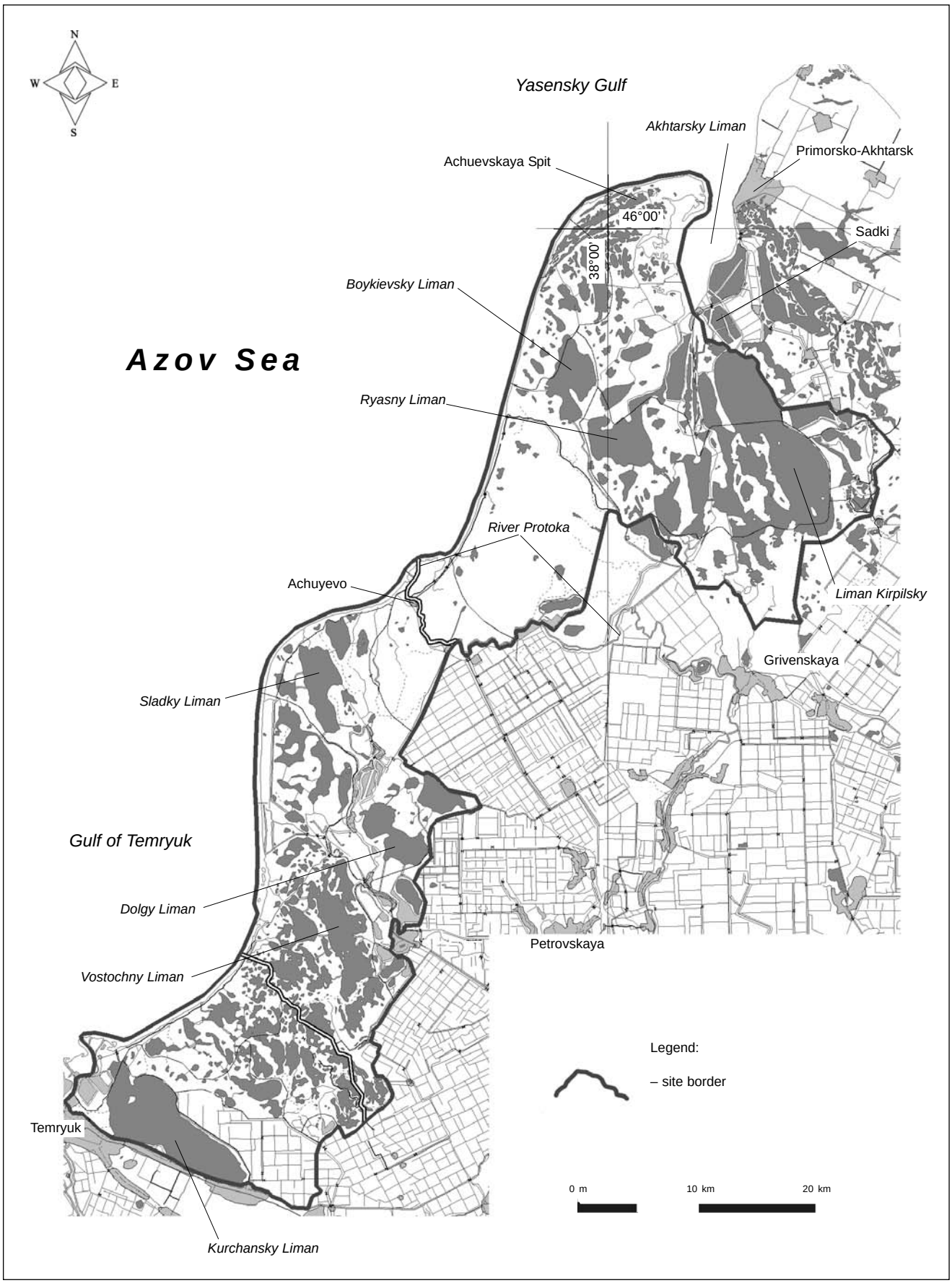
Conservation measures taken: There are two Ramsar sites in the Kuban Delta: the group of limans between the Kuban and Protoka Rivers (88,400 ha) and the Akhtaro-Grivenskaya Liman Complex (84,600 ha). The former includes the Priazovsky Federal Zoological Game Reserve (37,800 ha), established in 1955. The Sadki Reserve (92,000 ha) was established by Decree No. 572-p of the Federal Government of the Russian Federation, adopted on 23 February 1994; the borders of this reserve should be defined by the year 2004. Two wetland sites overgrown with *Nelumbo nucifera* are nature monuments of local importance (2.5 ha, Primorsko-Akhtarskiy Rayon). Within the site, there are 8 game reserves and one zakaznik of federal importance. The staff include 63 forest rangers, 25 fishery inspectors and 571 public fishery inspectors.

Conservation measures proposed: The establishment of a strictly protected zone: a strip 1-km wide along the coast (300 m aquatic area and 700 m of the shore). An investigation into the feasibility of establishing a marine zakaznik near the Achuevskaya Spit. The organisation of two stationary SD VNIIOZ AASR sites to monitor biodiversity and population changes (Achuevskaya Spit and Big Komkovatyi Liman). The reduction of pesticide application by using advanced rice-growing methods. The development of forest shelter belts around water bodies, thereby helping to decrease the amount of nutrients reaching wetlands in run-off from adjacent farmlands.

Land use: Agriculture: Grazing (6 farms) and mowing are traditionally carried out. With the closure of large cattle-breeding collective farms, mowing has decreased and no longer plays an important role in the decline of biodiversity. In the past, reeds were used for heating and thatching, today most farms are heated using bottled gas and other materials are used for roofing. Reeds are not used widely. Fishery: There are 13 fish farms (covering 38,400 ha) in the delta. Amateur fishing is also on the increase, however only sport fishing with rod and line is allowed. Waterfowl hunting: Hunting is permitted from 20 September to 20 December. It is considered to have little effect on wildfowl populations. Forestry: The total forested area is 4,600 ha. Forestry is used for coastal protection, soil stabilisation, windbreaks and logging. Recreation: Waterfowl hunting and fishing are the most widespread forms of recreation, with the potential to cater for *c*. 200,000-250,000 people. The recreational pressure is concentrated in resorts (near the towns of Eisk, Temryuk and Primorsko-Akhtarsk), and is relatively low.

Possible changes in land use: Increasing recreational use of the seashore and fish and game resources. At the same time, part of the wetlands will be used to locate facilities and equipment for the gas exploration industry.

Disturbances and threats: As well as constant human impacts there are seasonal natural factors (Gineev 1997). Human impacts: Seismic exporation for gas fields. Construction of platforms for drilling devices. Use of water for irrigation: discharge of water contaminated with pesticides and fertilisers exceeding the maximum allowable concentrations by a factor of 3.4-6.5. Run-off of nitrogen-based fertilisers leading to eutrophication. In 1988-1997, 1,339-3,058 million m^3 water contaminated with pesticides (22.1-40.3%) was washed into limans, on average 2,161 million m^3. Poorly purified sewage (0.3 km^3/year) from housing and utility services and industry also leads to eutrophication. Pollution by oil-based products (2.4-22.8 maximum allowable concentrations) and heavy metals (copper and zinc – 0.3 mg/l, lead – 0.02 mg/l, cadmium – 0.003 mg/l) is extremely damaging to the ecosystems. According to the preliminary data, 2,500 motor boats and 3,000 rowing boats and kayaks are registered at the site. Natural factors: Surge floods have catastrophic consequences. Floods, caused by storms



Map 2. The Kuban Delta

and long-term southwesterly (sometimes northwesterly) winds from the sea, have inundated the Kuban Delta to a depth of 2-3 m; major floods occurred in 1739, 1831, 1892, 1914 and 1969. Saltwaters penetrate the River Kuban for a distance of up to 70 km and increase the salinity in limans to 10-12‰. Spring floods usually cause massive destruction of waterbird colonies and death of hatchlings and other animals. Cold snaps with snowfall and formation of ice cover lead to high mortality of waterbirds. Strong, long-lasting winds in the periods when ice covers the waterbodies cause massive fish mortality due to oxygen deficit.

Economic and social values: The Russian fish-farming industry developed in the Kuban Delta. Much experience in terms of fish farming, introduction of fish, flood protection, rational use and conservation of delta resources has been accumulated. There are no special criteria to evaluate the economic value of wildlife or damage to the fauna. Tariffs (such as the minimum level of salary in Russia – about $ 6.3) confirmed by the Russian Government have been used to assess the main biological resources of the Kuban Delta. The value calculated for the wildlife resources is US$ 6.3 billion. The value of 1 km^2 of wetland is about US$ 3.5 million. Fish comprise *c.* 62.3% of the resource value, amphibians and reptiles comprise *c*. 36.5%, and birds and mammals 0.8%. The most numerous components are hydrobionts and water-dependent animals (amphibians – 35.8%). More than 1,500 tonnes of fish are caught at the site annually. About 100,000 people hunt waterbirds each year; more than 200,000 people go fishing. There are many recreation facilities and hunters' and fishermen's houses at the site.

Fauna: Mammals: 39 mammal species, varying in number from 742,100 to 991,400 individuals, 4 of which are endangered or rare. Birds: 180 bird species have been recorded: 123 species occur in marine habitats, 131 occur on the fore-delta, 143 in brackishwater habitats, and 141 in freshwater habitats. The overall number of breeding birds is 376,800 pairs. During the post-breeding period there are 2.2 million individuals, 84,000 local summer migrants, 3.7 million migrating and 1.6 million wintering birds. Among the waterbirds, Anseriformes (from 15,000 to 94,200 pairs, up to 2.1 million migrating individuals, up to 3,000 breeding pairs, and 1,500 local summer migrants), Rallidae (71,200 individuals), Charadriiformes (40,000 individuals), Laridae (8,500 individuals) and Ciconiiformes (1,050 pairs) are most abundant. The productivity of waterbirds and other animal species depends on plant succession and water level. Thus, the burning of reed-beds in 1998 and 1999 promoted nesting of *Anser anser* in 2000, the number of individuals increasing from some hundreds to 3,000 pairs. Amphibians: 4-5 amphibian species (calculated at 8.2-23.0 million individuals), 8 *Squamata* species (124,600-1,045,100 indi-

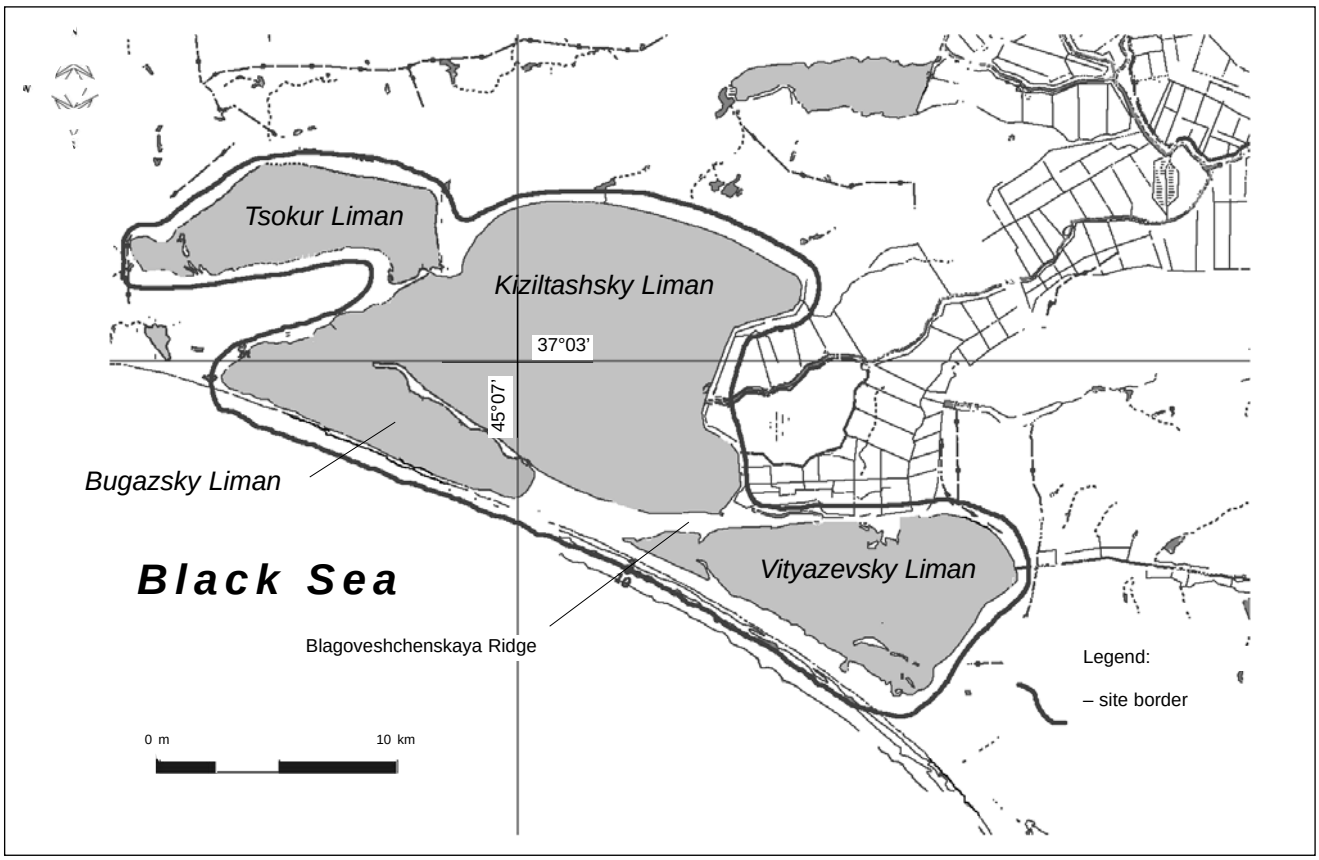
Table 3. Waterbird populations at the Kuban Delta

Species	No. pairs	Species	No. pairs
Anser erythropus	up to 200 migratory birds	*Larus ichthyaetus*	20-100
Anthropoides virgo	occurs on migration	*Larus ridibundus*	50
Ardea cinerea	804	*Numenius arquata*	1
Ardea purpurea	1,505	*Nycticorax nycticorax*	60
Ardeola ralloides	362	*Otis tetrax*	migration
Aythya nyroca	1,000	*Oxyura leucocephala*	1
Botaurus stellaris	260	*Pelecanus crispus*	up to 50 birds
Burhinus oedicnemus	up to 4	*Pelecanus onocrotalus*	migration
Chlidonias leucopterus	355	*Phalacrocorax carbo*	up to 740 & 32,650 migratory
Chlidonias niger	660-670	*Platalea leucorodia*	10-350
Cygnus olor	250	*Plegadis falcinellus*	1,200-3,000 birds
Egretta alba	202-227	*Podiceps cristatus*	83
Egretta garzetta	320	*Podiceps grisegena*	22
Fulica atra	40,000	*Podiceps nigricollis*	15
Glareola pratincola	10-500	*Recurvirostra avosetta*	420
Haematopus ostralegus	3-10	*Sterna albifrons*	50-500
Haliaeetus albicilla	up to 10 wintering birds	*Sterna hirundo*	up to 600
Himantopus himantopus	up to 240	*Sterna sandvicensis*	up to 40
Ixobrychus minutus	180	*Tadorna tadorna*	up to 50
Larus argentatus	420-470	*Tringa totanus*	1200
Larus cachinnans	up to 500		

viduals) and *Emys orbicularis* (5,600-11,200 individuals). All these animals are diet items for some birds and mammals. Fish: The diversity and abundance of forage species results in a high diversity of fish. 82 fish species have been recorded. 80% of *Lucioperca lucioperca* and almost all *Rutilus rutilus gectila* reproduce here. Coastal waters of the Azov Sea are inhabited by 59 species, the Ahtaro-Grivenskaya liman system (brackish wetland) by 52, Chernoyerkovsko-Sladkovskaya and Zhesterskaya liman systems (freshwater wetlands) by 47 species, Kulikovsko-Kurchanskaya liman system (mixed water sources) by 45 species. On average, 2,100 tonnes of fish are caught here annually. According to calculations, the number of fish of all age populations is about 1 million individuals. Invertebrates: Insects (more than 2,000 species) have not been well studied, however they are numerous and are diet items for birds and reptiles. In the Azov Sea basin, 859 species of hydrobionts of 12 types, 33 classes, 85 orders, 216 families and 388 genera have been recorded. They are classified as Mediterranean, brackish and freshwater faunal complexes (Chikhachev, Zakutsky 1989). The relative abundance of animal species is determined by 200 alga species. The average number of phytoplankton is 1,376,300 individuals/m^3; with an average biomass of 413-4,024 individuals/m^3. There are 25-50 zooplankton species and 50 zoobenthos species and forms. The average biomass of soft zoobenthos is 1.0 g/m^3 and molluscs 4.7 g/m^3. *Astacum leptodactylus* is common in limans, with a population density of 345 individuals/ha. Overall stocks total 480 tonnes, and the catch limit is 49 tonnes.
Special floristic values: 150 species of medicinal plants and 70 plants used as dyes have been recorded on ridges and levees. A number of rare and endangered plants occur in the delta, 21 these are listed in the Russian RDB and in the RDB of the Krasnodar Krai. These are: *Nelumbo nucifera, Rhaponticum salinum, Cladium martii, Aldrovanda vesiculosa, Bellevalia sarmatica, Nuphar lutea, Glaucium flavum, Trapa maeotica, Matricaria matricarioides, Acorus calamus, Nymphaea candida, Marsilea quadrifolia, Papaver nudicaulis, Salvinia natans, Bupleurum aureum, Hippuris vulgaris, Centaurium formosa, Peganum harmala, Polygonum aschersonianum, Najas minor* and *N. marina.*
Research facilities: The first research into the fauna of the Eastern Azov was carried out by Prof. Krynitsky and published by Kalinichenko in 1835. Bogdanov published 'Birds of the Caucasus' in 1879. Research on flora has been carried since the 1950s (Bush 1946; Shiffers 1956; Kosenko 1970; Shekhov 1971). Vinokurov (1959, 1960, 1965), Oleinikov (1966, 1972, 1973) and Ochapovskiy (1965, 1967, 1971) contributed to avifaunal research. Mid-winter counts of waterbirds have been conducted regularly since the 1960s (Isakov 1965, 1972; Krivenko 1977). Zoologists from Rostov and Kuban State Universities as well as researchers from the Southern Department of the Russian Research Institute of Game Management and Fur Farming (VNIIOZ) carry out research at the site.
Criteria for inclusion: 1, 2, 3 and 5.

2. Kiziltashsky Liman Complex

Location: 45°07'N, 37°03'E. In the Krasnodar Krai, in the south of the Taman Peninsula, 188 km west of the city of Krasnodar and 8-23 km from the towns of Anapa and Temryuk (rayon centres).
Area: 40,400 ha.
Altitude: 0-120 m above sea level.
Wetland type: E, J.
Other hydrologically linked wetlands: The Black Sea borders the site to the southwest and the Akhtanizovsky limans lie 7 km north of the site, while the River Kuban and Temryuksky Bay lie to the east. Small rivers such as the Yakushkino Girlo, Dzhiga, Krivoi Erik, Cherkesski Erik and Gostagaika enter the site from the east.
Description of site: A group of shallow brackishwater bodies separated from the Black Sea by a narrow sand spit with grassy dunes. Channels connect the Kiziltashsky, Bugazsky and Tsokur limans to each other; Kiziltashsky and Bugazsky limans are connected to the sea. The Blagoveshchenskaya Ridge separates Vityazevsky and Kiziltashsky limans. The water salinity is 2 to 3 times higher in the limans than in the Azov Sea and 1.05 to 4.2 times higher than in the Black Sea. As a result of the change in salinity, there has also been a change in the flora and fauna, both in the limans themselves and in the adjacent areas. The wetlands used to be part of the Kuban Delta and earlier, around 500 BC, there were several islands where the Taman Peninsula lies today. Over time, high sediment discharge has reduced the depth of the water bodies. At the beginning of the 19th century, a canal was built diverting water from the River Kuban to another group of limans in the north of the peninsula, leading to a considerable increase in salinity in the site. In the 1950s, a fish farm (predominately for Mugilidae) was created, with fresh and salt water pumped into the limans from canals, and dykes were built on spits to separate the limans from the sea.
Climate: The area has a steppe climate: summer is dry and hot and annual precipitation is 350-420 mm with



Map 3. The Kiziltashsky Liman Complex

most rain falling in winter. The mean annual air temperature is 11.2-11.9°C. In the coldest month, the mean air temperature is 1.1°C, with a minimum of –28°C. In the hottest month, the mean temperature ranges from 22°-27°C with a maximum of 35°C. The temperature is generally above zero for 210-230 days per year, while ice cover rarely lasts long. Eastern winds predominate in winter and autumn (5-8 m/sec), and western winds in spring and summer (2-6 m/sec), with 20-25 very windy days per year.

Hydrology: Water in the limans derives mainly from precipitation, rivers and the sea. Evaporation rates are very high, with a water loss of up to 0.25 km^3 of the total water volume of 0.3 km^3; consequently in summer the depth of the limans is greatly reduced, changing their size and shape, while Lake Solenoye and most of the rivers often dry out. The tidal range is less than 10 cm, however in autumn and winter strong winds drive seawater into the lagoons. The rivers entering the limans have a catchment of 250 km^2, with a total volume of 0.013 km^3. The limans also receive 0.22 km^3 of water annually from the River Kuban; 0.22 km^3 of water per year is diverted from the River Kuban through the Yakushkino Girlo canal to fish farms.

Water quality: The lagoons are characterised by high variation in salinity e.g. 39.5-50‰ in Bugazsky Liman and 29-58‰ in Kiziltashsky Liman. Salinity is higher in the shallow, still waters. The highest recorded salinity (82.5‰) was in the western part of the Tsokur Liman in August, the lowest (18‰) in the mouths of the River Gostagaika and the canal diverting water from the River Kuban. Water transparency is 1.5 m (to the bed) in Bugazsky Liman; 0.6-0.7 m (at a depth of 1.5-2.5 m) in Kiziltashsky Liman; and 0.7-0.9 m (at a depth of 1.7-2.0 m) in Tsokur Liman. When the limans become overgrown, transparency reduces by 80%. pH is 8.0-8.2 in spring and gradually increases in summer; nutrient concentrations are not high. Oxygen content is 16-20 mg/l during daylight hours and 7.4-8.6 mg/l at night.

Geology, geomorphology and soils: The geomorphology of the site has a number of peculiarities. The Taman region typically contains Neogenic sand, clay and loam deposits. The western part of the area is of Pliocene-Quaternary structure and the eastern part (Kiziltashsky Liman) is composed of alluvial sediments at the interface between the lower delta area and the Taman highlands (Valkov *et al.* 1996). The folded mountains are composed of Tertiary marine clays. Ridges and mounds with mud volcanoes are characteristic features of the relief, as are sand and shell spits. The limans are shallow, with a mean depth of 1 m and silt beds. Soils are represented by loam, sand and shell limestone. There are three horizons in the soil profile: over-solonetz, solonetz

(alkaline soils) and saline (carbonates, gypsum and easily soluble salts). In the solonetz profile, there is considerable sodium (> 15%) and magnesium (> 40%), pH is 7.5-10.0. Usually, in the lower solonetz layers, there are large quantities of toxic salts; chlorides and sulphates dominate. The humus content is 1.3-6.4%: nitrogen 0.09-0.28%, sodium 1.9-18.8%. Soda marine solonchaks are common along the shore. The content of salts in the upper layer is 5-11%, humus 1.3-4%, pH 7.4-8.0. The calcium carbonate content is 15-20%; coquina is found in places in the upper levels.

Principal vegetation: The site comprises a system of shallow brackish and saline waters within which two groups of waterbodies have been identified (Gineev 1985, 1989). Coastal wetlands (lagoon limans) cover 34,800 ha (86.2% of the total area) and contain a number of islands. A total of 64 species of flowering plants has been recorded on islands of the Golenkaya group (Kassanelly, Nagalevsky 1994). In low-lying areas, hydrophytes and halophytes occur, including *Halocnemum strobilaceum, Salicornia* ssp., *Suaeda prostrata, Petrosimonia brachiata, Lythrum tribracteatum, Cakile euxina, Polygonum salsugineum, Camphorosma monspeliaca* and *Lepidium crassifolium.* Higher ground supports species such as *Chenopodium album, C. rubrum, Atriplex nitens, Melilotus albus* and *Rapistrum rugosum.* The limans support fairly species-poor communities with *Ruppia cirrhosa (R. spiralis)* and *Zostera marina* covering up to 80-90% of the areas of smaller limans (Tsokur and Bugaz). *Rhizoclonium* and *Enteromorpha* are the most abundant algae. Lagoon shores are dominated by halophytic herbs and grasses. Sandy shores tend to support *Leymus arenarius, Cakile euxina* and *Glycyrrhiza glabra.* Further inland, in the west of the area, are steppe communities dominated by grasses and *Artemisia* ssp., while to the east and north are steppes with herbs, grasses (such as *Festuca sulcata* and *Stipa* sp.) and agricultural fields. Marine wetlands cover 5,600 ha (13.8%) of the total area of the site. Some shores support stands of *Phragmites australis,* however the most abundant communities are solonchak associations, including *Cakile euxina, Tragopogon brevirostris* and *Crambe pontica.* Along the shores of the limans, psammophytous steppe species such as *Stipa arenosa* are found as well as associations with species such as *Stipa pennata* and *S. capillata* (Litvinskaya 1994). The only forests within the site are planted shelter belts.

Land tenure: The site is state property and is protected as the state border.

Conservation measures taken: The site is included in the protected borderland zone with frontier guards and fish-farm staff collaborating on protection of the limans. Part of the site is included in the hunting zakaznik of local importance.

Conservation measures proposed: A strict nature reserve has been proposed, centred on the town of Temryuk (or Taman), and including the Kiziltashsky Limans as an ornithologically important site. Islands are isolated sites for breeding waterbirds (more than 17,000 nests), which are generally inaccessible to the local population. There is a need to prohibit the setting of fishing tackle near habitats of rare and threatened species during the breeding season. The site is included in the Ramsar Shadow List of the Russian Federation.

Land use: The shores of the liman generally support pasture or hay fields. There are vineyards and gardens in the areas adjacent to the site to the north and west. The eastern areas are used for irrigated agriculture. Eight cattle-breeding farms are located near the lagoons. Fish farming involving Mugilidae is an important activity in the wetlands, but does not contribute to commercial fishery. Recreational pressure is low, although there are a few resorts and campsites.

Possible changes in land use: A proposal has been made to establish a port.

Disturbances and threats: The most important threat involves secondary impacts arising from the proposed port, particularly risk of oil and sewage pollution of the limans. There is an important local harvest of *Larus argentatus* eggs for pig food and it is likely that the eggs of threatened species such as *L. ichthyaetus* and *Hydroprogne caspia* may be taken incidentally.

Economic and social values: The site is the only place in Russia where Mugilidae hatcheries have been developed. There are reserves of mud, of value for medicinal purposes. There are a few holiday bases and resorts on Vityazevskaya and Bugazskaya Spits, visited by 1,500 people a year. The conversion of freshwater wetlands into brackish wetlands without loss in productivity can be regarded as a good experiment in managing wetland ecosystems by speeding up their succession.

Fauna: Mammals: The most numerous mammal species are estimated populations of 15-18 *Nyctereutes procyonoides,* 50-67 *Lepus europaeus,* 5-7 *Vulpes vulpes,* 3-4 *Meles meles* and 4-5 *Canis aureus.* Rare and endangered mammals that live in or visit the lagoons include *Tursiops truncatus* ssp. *ponticus* and *Nyctalus lasiopterus.* Birds: 189 bird species have been recorded. Spring migration takes place in February-May and autumn migration in August-December. A total of 500,000 birds are estimated to migrate through the site. Migrating waterfowl use the coastal shallows as stopover sites and as refuges in autumn when the hunting season starts in adjacent areas. Coastal wetlands provide nesting habitats for 21 wetland species, in particular Laridae, *Phalacrocorax carbo, Tadorna tadorna* and waders. In 1995, *Phalacrocorax carbo* built their nests with *Chenopodium album, Atriplex nitens* and *Melilotus alba,* but in 1996 nests were constructed mainly with *Phragmites australis* (including the

roots), which has resulted in a reduction in the density of reeds around the colonies. Non-breeding *Egretta alba, E. garzetta, Ardea cinerea, Anas querquedula* and *Cygnus olor,* some of which may moult in the area, use the site. Wintering birds begin to arrive at the site in late August, with 15,000-20,000 geese and ducks on the limans. Anatidae comprise 42%, diving ducks 36% and swans 17% of a total estimated wintering waterfowl population of 200,000 individuals. It is the southernmost breeding site for colonial waterbirds in Russia and an important wintering area that lies on a major waterfowl migration route. 11 species of bird are listed in the Russian RDB and in the IUCN Red Data Book. Most of these are breeding species, however non-breeding RDB species include *Pelecanus crispus* and *Plegadis falcinellus.* Reptiles: 3 species (*Eremias arguta, Coluber jugularis* and *Elaphe quatuorlineata*) are listed in the Russian RDB. Fish: Before its conversion to saline wetlands, the Kiziltashsky Liman Complex supported 65 species of fish; this has now decreased to 45 species. Invertebrates: *Mytilus galloprovincialis, Mytilaster lineatus, Carcinus maenas, Pachygrapsus marmoratus, Neomysis integer* and *Sirlella jaltensis* are abundant in saline water. Dragonflies are common, including *Anax* ssp. and *Aeschna juncea.* 12 species of terrestrial invertebrates are considered rare and endangered. Invertebrate species listed in the Russian RDB include *Bombus argillaceus, Saga pedo* and *Bradyporus multituberculatus.*

Table 4. Waterbird populations at the Kiziltashsky Liman Complex

Species	Number
Anseriformes	up to 250,000 migrating birds
Burhinus oedicnemus	2-10 pairs
Charadrius alexandrinus	30 birds
Cygnus olor	up to 500 wintering birds
Fulica atra	up to 10,000-15,000 birds
Gelochelidon nilotica	50-100 pairs
Glareola nordmanni	10-20 birds
Glareola pratincola	10-50 birds
Haliaeetus albicilla	migration
Himantopus himantopus	20-100 pairs
Hydroprogne tchegrava	100-300 pairs
Larus cachinnans	4,500-8,500 pairs
Larus genei	100-500 birds
Larus ichthyaetus	50-700 pairs
Larus melanocephalus	3-100 pairs
Oxyura leucocephala	3-4 birds
Pelecanus crispus	2-6 pairs
Pelecanus onocrotalus	up to 2 birds
Phalacrocorax carbo	1,500-2,000 pairs
Platalea leucorodia	75 birds
Plegadis falcinellus	15 birds
Recurvirostra avosetta	20-300 pairs
Sterna albifrons	25-250
Sterna hirundo	2,400-4,000 pairs
Sterna sandvicensis	200-2,000 pairs
Tadorna tadorna	up to 150 pairs
Tringa totanus	3,000 birds

Special floristic values: 225 species of halophytes of 138 genera and 34 families have been recorded. Of these, 12 are listed in the Russian RDB and in the Red Data Book of the Krasnodar Krai. These are: *Sternbergia colchiciflora, Artemisia salsoloides, Crambe steveniana, Erodium maritimum, E. stevenii, Bellevalia sarmatica, Glaucium flavum, Stipa pennata, Adonis flammea, A. vernalis, Amygdalus nana* and *Elytrigia stipifolia.* Botanists from Kuban University have identified another 13 species in need of protection. There are 4 allochthonous (non-indigenous) endemic species among the halophytes: *Limonium meyeri, L. caspium, Goniolimon tataricum* and *Apera maritima.* Facultative halophytes include endemics such as *Linaria subulosa* (endemic to Crimea-Novorossiisk province) and *Verbascum ovalifolium* (Nagalevsky 1991).

Research facilities: Kishchinsky published the first detailed description of the avifauna of the limans in 1959. Further investigations (The Eastern Azov, 1989; Steppe, 1993; Limans and Plavni, 1994; and Taman, 1995) were carried out by biologists from Kuban University. There has been no regular monitoring of waterfowl populations in the area to date. The Krasnodar Research Institute of Pond Fishery is responsible for fisheries research. The Southern Department of Russian Research Institute of Game Management and Fur Farming (VNIIOZ) carries out research on game species.

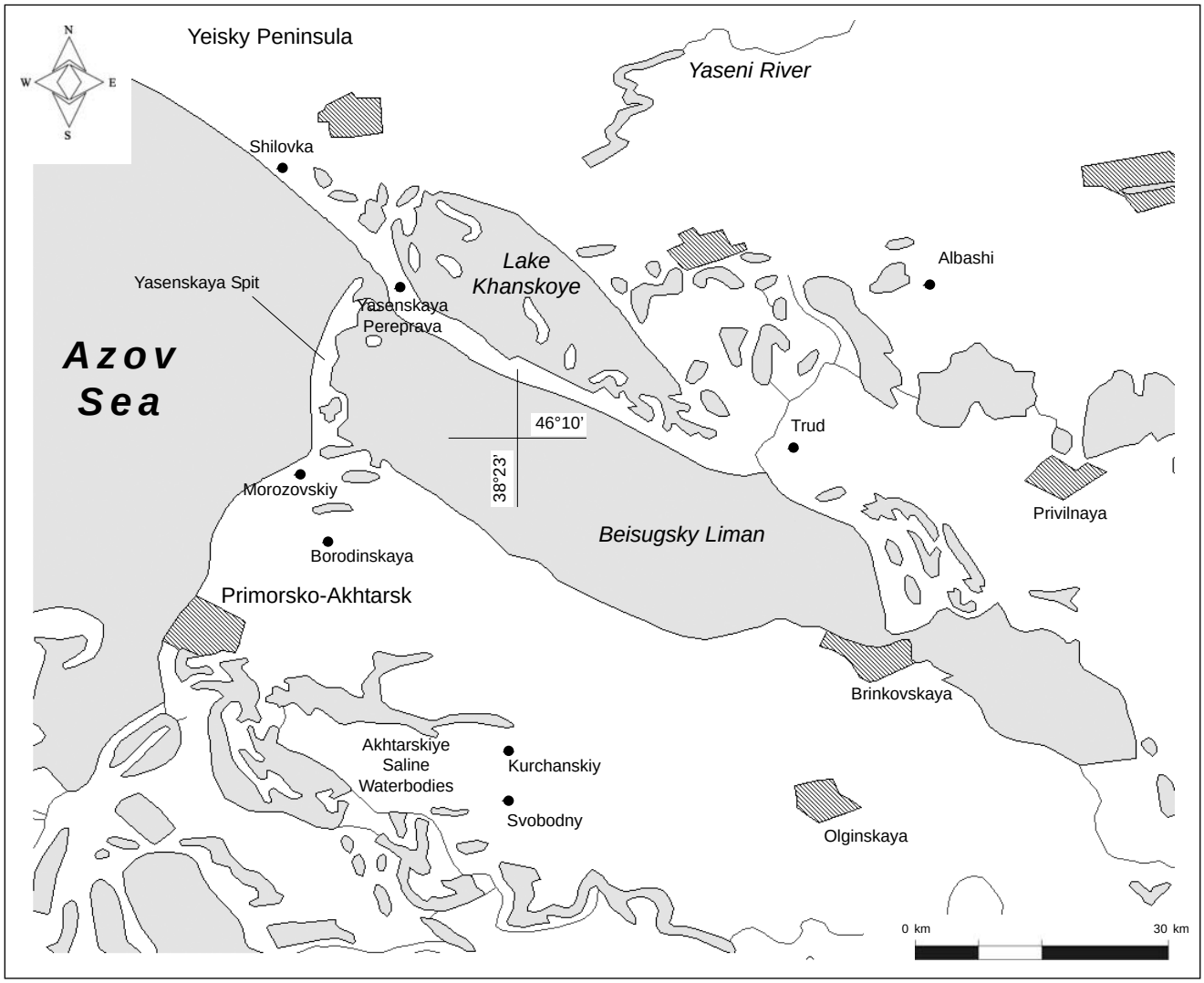
Public awareness and education: There has been no great effort to increase public awareness of the ecology and conservation value of the site because of its location on the Russian border. However, this is changing and there is an increasing number of films and publications aimed at raising public awareness about wetlands.

Criteria for inclusion: 1, 2, 3, 4 and 5.

3. Beisugsky Liman and Lake Khanskoye

Location: 46°10'N, 38°23'E. The site is located in the northwest of the Krasnodar Krai, on the Azov Sea coast,

185 km northwest of the city of Krasnodar, 22 km northeast of the town of Primorsko-Akhtarsk and 60 km southeast of the town of Yeisk.
Area: 48,000 ha.
Altitude: 0.2-19.6 m above sea level.
Wetland type: K, J, H, E.
Other hydrologically linked wetlands: Beisugsky Reservoir, Beisugsky and Chelbassky Plavni border the wetland to the east and northwest, the floodplain of the Yaseni River and Yasensky Bay to the west, Yeiskyi Peninsula to the north, and to the south Achtarskiye saline waterbodies at a distance 10 km from the plain.
Description of site: Beisugsky Liman is the largest freshwater lagoon in the eastern Azov Sea, with an area of 27,200 ha. The area of Lake Khanskoye is 8,000 ha. Yasenskaya Spit (12 km long) separates Beisugsky Liman from the Azov Sea. Exchange of water with the sea takes place through two channels. Northeastern coasts of the wetlands are low; small channels connect them with the system of small lakes. Lake Khanskoye is full of islands and sand spits with reed growth. The site has habitats for breeding, moulting and wintering waterbirds.
Climate: Climate is moderate continental. Annual precipitation is 500-600 mm. Brief heavy rains are frequent in June and July. Autumn and winter are characterised by easterly winds with speeds of 5-8 m/sec. Mean annual temperature is 10°C, mean winter temperature is –5 to –10°C (minimum –28°C, maximum 9°C), mean summer temperature is 21-27°C (maximum 39°C).
Hydrology: The total volume of Beisugsky Liman and Lake Khanskoye is over 0.06 km^3. Estimated annual water budget for Beisugsky Liman and Lake Khanskoye: water losses 0.032 km^3 (evaporation) and 0.015 km^3 (discharge to the sea); water gains 0.015 km^3 (river run-off), 0.013 km^3 (precipitation) and 0.019 km^3 (inflow from



Map 4. Beisugsky Liman and Lake Khanskoye

the sea). The water level depends on the water balance of the Azov Sea. The Beisug and Chelbas Rivers flow into Beisugsky Liman; Albashy and Yaseni Rivers flow to Lake Khanskoye. Water from all these rivers is used for irrigation, thus water from the River Albashi hardly reaches the lake; River Chelbas (length 923 km, catchment area 1,062,000 ha) contributes little because 120 fish ponds are situated along it, and there are 208 fish ponds on the River Beisug. The river mouth areas are prone to flooding due to strong winds from the sea; the amplitude of oscillations is varing by up to 3 m.

Water quality: Beisugsky Liman is characterised by a variable salinity from almost fresh water to 12‰. Oxygen content (4.8-7.2 mg/l) varies seasonally and depends on depth. Nutrients: phosphorus content 37.8-73.4 mg/m^3, nitrogen 620-690 mg/m^3, silicic acid 700-800 mg/m^3. Mean depth of the lake is 0.6 m, of the liman 1.7 m. Near the mouth of the Yaseni River the liman is 2.0-2.5 m deep, and 4-5 m deep in its centre. The dominant ions are Cl, Na, SO_2. Salinity in Lake Khanskoye increases in summer and decreases in autumn and winter. Steppe rivers have little influence on its salinity. The bottom of the lake is covered with silt and coquina and is very viscous.

Geology, geomorphology and soils: Beisugsky Liman and the eastern part of Lake Khanskoye belong to the Beisug-Chelbassky geomorphologic region of the Azov tectonic depression. The western part of the Lake Khanskoye is situated on the Kuban platform. The eastern part is formed by river alluvium. Low spits between Beisugsky Liman and Lake Khanskoye are composed of sand and shell limestone. The northeastern shore of the lake and southeastern shore of the liman are precipitous clay terrace scarps of the Kuban plain. The northeast the shore of the lake is indented with ravines and the valleys of the Yaseni and Albashy Rivers. These valleys are wide, with gently sloping sides and Upper and Middle Quaternary terraces. The beds of the waterbodies are flat, with depressions. Beisug Liman resulted from transgressions of the sea at the mouth of the River Beisug. Lake Khanskoye was a bay of the Azov Sea and connected with Beisugsky Liman. Soils in steppe river basins are hydromorphic. There are meadow and chernozem soils on high banks, where concentration of phosphorus and trace metals (Zn, Cu, Mn) are low. Solonchaks are frequent along the coast; their humus horizon is thin (10-20 cm). Peatland solonchaks occur on the edges of the lagoon, ravine bottoms and on low-lying land. Solod (leached, formerly saline) soils are found in depressions also. Salt content is 0.07%, pH is 5.7.

Principal vegetation: The site supports almost 700 plant species of which 60 species are officinal, 69 contain essential oils and 120 are nectarous. *Ruppia maritima* and *R. cirrhosa (R. spiralis)* grow in shallow waters; the most abundant species in brackish waterbodies are *Typha angustifolia, Potamogeton pectinatus, Myriophyllum verticillatum* and *Bolboschoenus maritimus. Phragmites australis* dominates in permanently wet plots; its mean productivity is 10.5-28 t/ha. Vegetation on the islands is represented mainly by halophytes such as *Salicornia europaea, Cakile euxina, Polygonum salsugineum, Chenopodium album* and *C. rubrum.* Coastal zone vegetation includes the following associations: *Salicornia-Goniolimon, Salicornia-Tripolium* and *Artemisia-Limonium*. Trees have been planted for shelter among the fields, and Yasenskaya and Pereprava Spits (total area 1,884 ha) have been forested (552.5 ha).

Land tenure: The openwater areas are state-owned. Coastal areas are owned by collective and state agricultural farms; forestry farms own a 1,884 ha area on Yasenskaya and Pereprava Spits and the military authorities own part of the shore of Lake Khanskoye.

Conservation measures taken: The Military Society of Hunters and Fishermen has a farm with restricted access, which is situated at Lake Khanskoye. Staff of the society, two rangers from the local hunting management office and volunteer inspectors guard the territory. Inspectors from the fishery management office are responsible for protection of the waterbodies; up to 150 volunteers assist them during the spawning period.

Conservation measures proposed: Pereprava and Yasenskaya Spits and the islands of Lake Khanskoye have been proposed for protection. It is also proposed to create a 1-km wide protective zone along the Azov Sea shore; this would be an extension of a similar zone proposed for the Kuban Delta and Yeisky Liman. To protect island populations of rare and threatened breeding waterbirds it is necessary to restrict fishing in the breeding period. On Pereprava and Yasenskaya Spits forests have been planted; two protected forest areas have been established that will be a part of planned reserve.

Land use: The higher areas of the site are used for growing cereals and fodder crops, the lowlands for pastures and hay meadows. There are five cattle-breeding farms around the site. Fishing is common in shallow water and in Beisugsky Liman. Wildfowling is permitted over the whole site, and is controlled by the Military Society of Hunters and Fishermen.

Possible changes in land use: Mud extraction, drainage works, water diversion, and poaching of fish, birds and mammals are expected.

Disturbances and threats: The most significant threat to the site is from increasing salinity of the lagoon water. Recreation, particularly involving motor boats and cars, may disturb bird colonies and other wildlife.

Economic and social values: There are reserves of mud, which are used for medicinal purposes in several

resorts. There are a few holiday sites, camp sites and resorts in the area and 958 boats have been registered in the wetlands. Other recreational activities include sport fishing, by up to 500 people, and wildfowling. The site includes a few burial mounds, which are of archaeological importance.

Fauna: Mammals: The most valuable mammal species are rare *Mustela lutreola, Vormela peregusna* and *Lutreola l. caucasicus.* Birds: Fourteen species of bird recorded on the site are listed in the IUCN Red Data Book and the Russian RDB and in the Red Data Book of the Krasnodar Krai. In recent years *Otis tarda* has been recorded here in winter and *Anser anser* have been recorded in summer during the moult. 41 species breed in the wetland. Migrants number 0.5-0.7 million individuals. Sandpipers are abundant in shallow waters: *Charadrius dubius, C. alexandrinus, Tringa ochropus, T. totanus.* Reptiles: *Vipera ursini,* a rare snake, is found here.

Special floristic values: 10 plant species are listed in the Russian RDB and in the RDB of the Krasnodar Krai: *Adonis flammea, A. vernalis, Amygdalus nana, Crambe pontica, C. steveniana, Eryngium maritimum, Iris notha, I. pumila, Marsilea quadrifolia* and *Rhaponticum salinum.* Further 8 species are to be added to the list. There are 4 allochthonous (non-indigenous) endemic species among the halophytes: *Limonium meyeri, L. caspium, Goniolimon tataricum* and *Apera maritima.* Facultative halophytes include endemics *Lunaria subulosa* and *Verbascum ovalifolium.*

Research facilities: Fish resources have been studied by researchers from the Krasnodar Research Institute of Pond Fishery. Kuban State University is responsible for ecosystem research and the Southern Department of Russian Research Institute of Game Management and Fur Farming (VNIIOZ) carries out research into game species.

Table 5. Waterbird populations at Beisugsky Liman and Lake Khanskoye (1989-1996)

Species	Number
Anseriformes	0.1-0.45 million birds
Anser anser	1,000-2,000 birds
Anser erythropus	up to 50 birds
Aythya nyroca	nests occasionally
Branta ruficollis	up to 100 birds
Burhinus oedicnemus	up to 4 pairs
Ciconiiformes	up to 900 pairs
Cygnus olor	50-150 pairs
Fulica atra	up to 250,000
Gelochelidon nilotica	25-150 pairs
Glareola pratincola	50-100 birds
Haematopus ostralegus	up to 10 pairs
Haliaeetus albicilla	3-5 birds
Himantopus himantopus	25-250 pairs
Hydroprogne tchegrava	200-1,900 pairs
Larus cachinnans	1,250-4,000 pairs
Larus genei	300-700 pairs
Larus ichthyaetus	250-3,000 pairs
Larus melanocephalus	400 pairs
Otis tarda	1-3 pairs
Oxyura leucocephala	occasional
Pelecanus crispus	57-70 pairs
Phalacrocorax carbo	up to 400-1,000 pairs
Platalea leucorodia	up to 10 pairs
Plegadis falcinellus	50-100 pairs
Recurvirostra avosetta	50-250 pairs
Sterna albifrons	40-100 pairs
Sterna hirundo	1,260-3,000 pairs
Sterna sandvicensis	205-600 pairs
Tadorna tadorna	50-100 pairs
Tringa totanus	20-50 pairs

Public awareness and education: Local committees for environmental conservation and natural resources and NGOs (local departments of the Society for Nature Conservation) have organised several conferences on nature conservation in the area and published the proceedings.

Criteria for inclusion: 1, 2 and 5.

4. Yeisky Liman

Location: 46°42'N, 38°27'E. The site is located in the Krasnodar Krai, 238 km northwest of the city of Krasnodar. The town of Yeisk is situated on the shore of the liman.

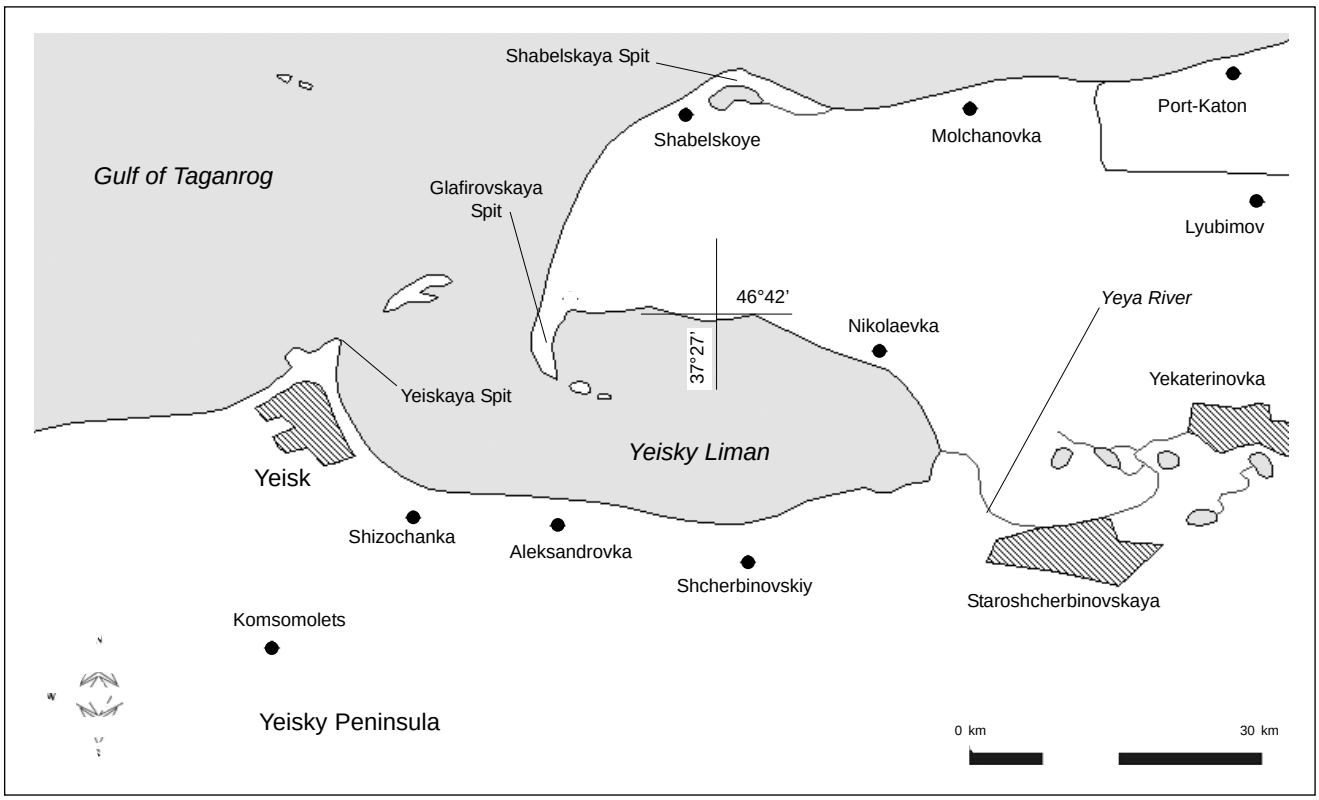
Area: 28,400 ha.

Altitude: 0.6-31.6 above sea level.

Wetland type: I, E.

Other hydrologically linked wetlands: The Gulf of Taganrog borders the site to the west; plavni of the Yeya River with a fish farming hatchery and nursery ponds lie to the east.

Description of site: Yeisky Liman is a large, elliptical, saline, open waterbody about 24 km long and 12.5 km wide. Two groups of islands are located in the liman. They are very suitable for breeding, moulting and roosting



Map 5. Yeisky Liman and Shabelskaya Spit

waterbirds. The coastal zone is used by humans and, excluding spits, is not of great value for birds. Shabelskaya Spit is located to the north; Yeisky Peninsula to the south.

Climate: The area has a moderate continental climate, mean annual temperature 9.7°C; the warmest temperatures are 22-28°C (maximum 38°C); the coolest are –5 to –12°C (minimum –30°C). Annual precipitation is 430-480 mm. Ice cover is generally 28-35 cm (maximum 50 cm). The liman freezes in winter.

Hydrology: The waterbody is 0.36 km^3 in volume. The water budget of the Azov Sea influences that of Yeisky Liman. The maximum variation in water level is 69 cm; water levels are higher in May, and lower in October-December. Westerly and southeasterly winds cause upwellings of up to 3 m. Originally the liman was fed by the River Yeya, which is 311.4 km in length with a catchment area of 8,650 km^2. Its three major tributaries, the Kugo-Yeya, Kavalerka and Sosyka, and the smaller Rivers Ternovaya and Veselaya have a total length of *c*. 350 km. The construction of 437 dams and fishponds (70 ha) on the lower reaches of the river has dramatically reduced the amount of water that reaches the liman. River water enters the wetland only during floods.

Water quality: Visibility in most parts of the liman is 100%, decreasing only in the lowest zones. Seawater (salt concentration of 0.42 g/kg^{-1}) enters the liman; salinity decreases in summer and increases in winter up to 5-8‰. Average concentration of biogenic elements: phosphorus 71.4 mg/m^3, nitrogen 900-990 mg/m^3, silicic acid 710-750 mg/m^3.

Geology, geomorphology and soils: Yeisky Liman is classified as belonging to the platform region of the Kuban Valley. It has a basal complex of Palaeozoic, Mesozoic, Paleocenic and Neogenic rocks at a depth of 1-4 km. Spits of shell, sand and coquina up to 1.5 m high and 4.5-6.8 km long stretch along the western part of the site. Two shallow water zones and two flat islands have formed as a result of accretional and alluvial processes between Yeya and Glafirovskaya Spits. Soils are intrazonal or hydromorphological. Soil salinity varies but is usually high: dominant salts are sulphates and chlorides; pH is alkaline (7.1-7.8) on the surface and acid (8.2-8.4) in the lower strata. Concentrations of compounds of P, Mg, Zn and Cu are low.

Principal vegetation: 131 genera of 38 families of halophytes have been recorded at the site. Two vegetation types – marine and coastal – have been described (Gineev 1997). Submerged vegetation in both groups is represented by *Zostera marina, Ruppia maritima* and *R. cirrhosa (R. spiralis).* Vegetation is absent or very rare in coastal coquina shallows and in the tidal zones, which are in the process of forming phytocoenoses. Psammophytes grow in sand and shell limestone beaches. *Phragmites australis* dominates in silt soils and coastal waterbodies in stands 300-400 m wide and 2-2.5 km long; density is 130 stems/m^2, productivity is 16,000 kg/ha. Further inland *Salicornia*

europaea, Petrosimonia oppositifolia, Limonium caspium, Aeluropus feluropus and *Artemisia maritima* dominate.

Land tenure: The liman, including open water and the shore, is federal property. The remainder of the area is owned by agricultural organisations and other resource users with collective proprietary rights.

Conservation measures taken: Regional committees on protection of the environment, fishery and hunters inspectors guard the territory.

Conservation measures proposed: It is proposed to establish a 1-km wide protective zone along the edge of the sea as a 'migration corridor'. The site will be connected by the same corridor to Beysug Liman and the Kuban Delta. It is necessary to restrict the setting of fishing tackle and access to the islands of Yeisky Gulf during the breeding season.

Land use: Commercial and amateur fishing take place in the wetland, which is rented by fish farms. Wildfowling is authorised for one week in spring (ducks only) and three days a week in autumn and winter (between 20 September and 20 December, with strict bag limits of 2 geese and 10 ducks (or *Fulica atra*) per day and an annual bag of 300-500 geese and ducks).

Possible changes in land use: No changes are expected in the near future.

Disturbances and threats: Strong winds have a negative impact on the site. Fish mortality occurs in winter when the waterbody is frozen over and in summer due to high temperatures. Some 1,500 hunters and 3,000 fishermen visit the site: they use 1,260 motor boats and 370 rowboats and other vessels. Oil pollution from foreign ships visiting the port of Yeisky has increased.

Table 6. Waterbird populations at Yeisky Liman (1989-1999)

Species	Number of pairs
Anas platyrhynchos	up to 2,000 birds
Anseriformes	200,000 birds in winter
Anser albifrons	150-300 birds
Anser anser	300-2500 birds
Anser erythropus	up to 500 birds
Anthropoides virgo	migration
Aythya ferina	2,000-5,000 birds
Aythya marila	300 birds
Aythya nyroca	200-300 birds
Branta ruficollis	50-200 birds
Burhinus oedicnemus	up to 4
Cygnus olor	up to 200 in winter
Glareola pratincola	50-100 birds
Haliaeetus albicilla	2-4 birds
Hydroprogne tchegrava	200-450
Larus cachinnans	500-5,700
Larus genei	100-1,000 birds
Larus ichthyaetus	100-750
Larus melanocephalus	150-1,000
Otis tarda	up to 500 birds in winter
Oxyura leucocephala	2-10 birds
Pelecanus crispus	migration
Phalacrocorax carbo	150-1,500
Platalea leucorodia	up to 10 birds
Sterna albifrons	150-300
Sterna hirundo	300-2,000
Sterna sandvicensis	100-1,100
Tadorna tadorna	150-200

Economic and social values: The town of Yeisk is a popular resort for mineral water and mud cures. It is an important Kuban cultural centre with historical museum, parks, theatres, etc; the liman makes it unique. The liman is important for fish-farming. Waterbirds both breed and overwinter on Green Islands and islands that separate the liman from Taganrog Gulf.

Fauna: Mammals: Rare native mammals have been recorded at the site, including *Vormela peregusna, Lutra lutra* ssp. *meridionalis* and *Nyctalus lasiopterus.* Game species *Lepus europaeus, Nyctereutes procyonoides, Ondatra zibethica, Arvicola terrestris* and *Vulpes vulpes* are quite numerous. Birds: *Aquila rapax* is encountered occasionally.

Special floristic values: 131 genera of 38 families of halophyte have been recorded in the site (Nagalevsky 1989). However, the natural vegetation of the site has been much altered by agriculture. Rare and endangered species include *Aldrovanda vesiculosa, Rhaponticum salinum, Iris pumila, Delphinium puniceum, Amygdalus nana, Adonis flammea, Bellevalia sarmatica, Tulipa schrenkii* and *Paeonia tenuifolia.*

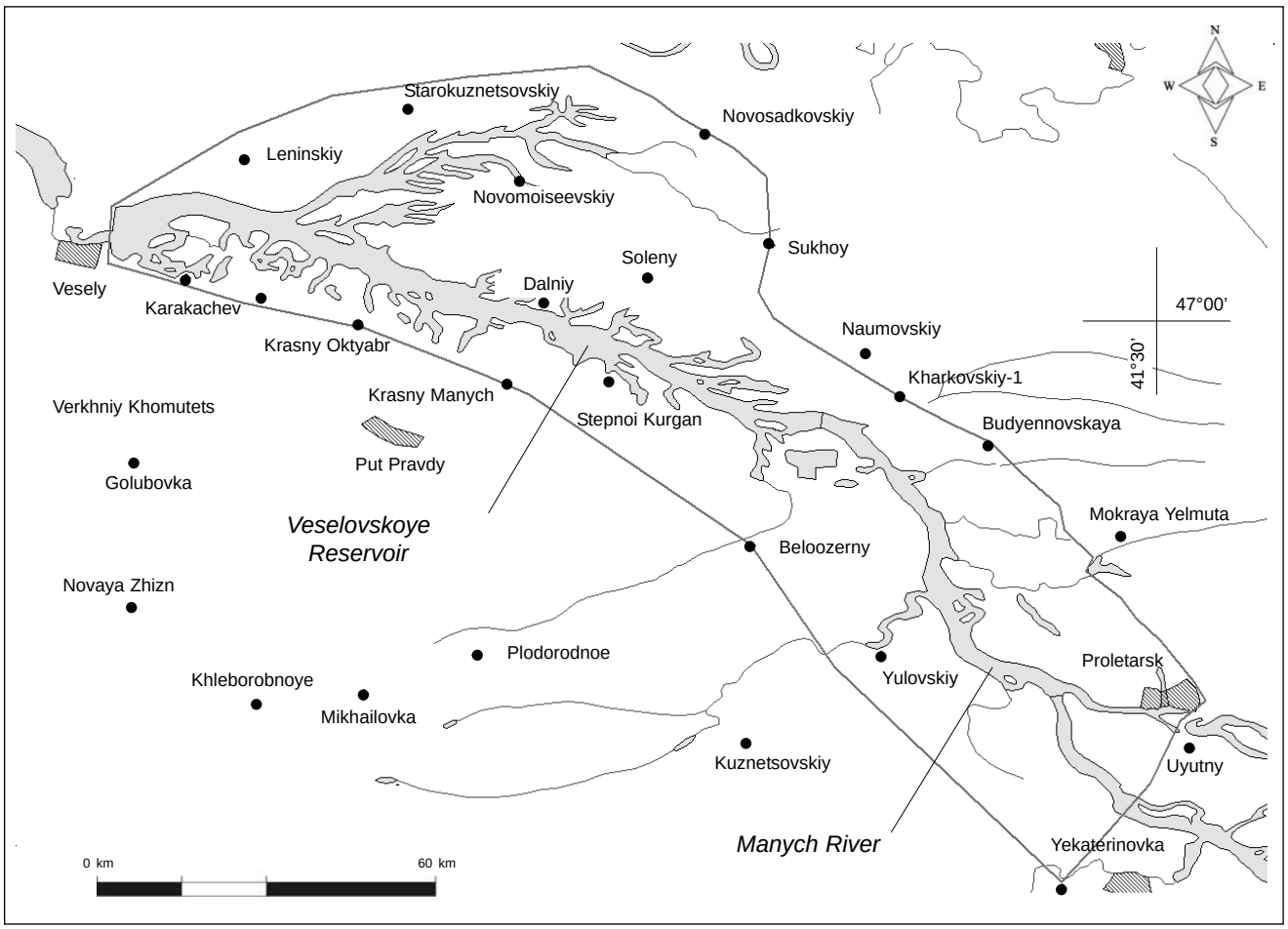
Research facilities: Most wildlife monitoring in the site has been restricted to game species and has been carried out by the Southern Department of the Russian Research Institute of Game Management and Fur Farming (VNIIOZ). Kuban University has made a major contribution to our knowledge of the area and the Krasnodar branch of the Research Institute of Pond Fishery has carried out research on fish populations.

Public awareness and education: The main sources of information on Yeisky Liman in the educational literature are Navozova (1955); Korovin (1974); Kuban University collections of 1988-1990, 1992, 1994 and 1995; and the Krasnodar Krai Game Records of 1992. There is a natural history museum in Yeisk, which is strongly orientated towards education.

Criteria for inclusion: 1, 2 and 3.

5. Veselovskoye Reservoir

Location: 47°00'N, 41°30'E. In the Rostov Oblast, 65 km east-southeast of the city of Rostov, situated in the Kuma-Manych depression between the Rivers Don to the northwest and Bolshoi Egorlyk to the southeast. The northern and southern borders have been established at a distance of 1-25 km from the shore. To the south, the site is bounded by the Stavropol plateau slopes and the Azov-Manych watershed.
Area: 309,000 ha.
Altitude: 4 m above sea level (West Manych River mouth 1-2 m, Proletarskaya Dam 5-6 m).
Wetland type: O, 3, 1.
Other hydrologically linked wetlands: The River Don lies to the west; Proletarskoe Reservoir and Lake Manych-Gudilo lie at a short distance to the east.
Description of site: The western part of the Manych depression was originally a channel connecting the Black and Caspian Seas. The site comprises a chain of reservoirs with numerous limans and shallow bays located in the West Manych River valley, and rice fields and ponds. It includes a total of 35,000 ha of open water, 5,000 ha in the 65-km long Ust-Manych Reservoir and 30,000 ha in the 100-km long, 1-4 km wide Veselovskoye Reservoir, which occupies 13% of the total area of the site. The site also includes extensive floodplains with small lakes and ponds. The reservoirs lie within the catchment of the River Don and have a significant effect on the salinity and hydrological regime of the Gulf of Taganrog. When the reservoirs were created in the 1930s, they bordered the Novo-Manych Dam to the east. Later, the Proletarskaya Dam was built downstream, and this has become the easternmost point of the Veselovskoye Reservoir. Between the two dams there is a 20-km freshwater channel. The largely indented shoreline is 580 km long. There are a few islands located mainly near the inlets of limans.
Climate: The area has a temperate continental climate, with frequent droughts and dry winds, and borders an extensive arid region to the east. The prevailing wind is southeasterly in summer and easterly in winter, with up to 40 days with dry winds per year. Annual precipitation is 200-600 mm, with the maximum in June and minimum in January. Annual mean air temperature is 8-9°C: 7-9°C in spring, 21-24°C in summer, 7-11°C in autumn and 8-9°C in winter. Winter air temperatures vary considerably. Ice cover develops in late November, often failing during thaws in December but with the main thaw between the 5th and 15th March. Snow cover is generally 6-7 cm deep.
Hydrology: Until the construction of the dams along the River Manych, the site involved a chain of limans connected by narrow channels. The middle reaches of the river included more than ten 2-8 km long limans, fed by snow, rain and underground water. The depth and area of these limans varied considerably, with floods from snowmelt in spring and rapid drying out in summer, leaving only scattered pools. In some springs, seawater travelled hundreds of kilometres up the River Manych (Saldatov 1972). A project began in the 1930s to link the Black and Caspian Seas via the Manych Waterway, including construction of the Veselovskoye Reservoir in 1932 and the Ust-Manych and Proletarskoye Reservoirs in 1936. Fresh water for the reservoirs was initially drawn from the River Kuban via the Nevinnomysk canal (completed in 1948) and then from the Don via the Donskoi Canal (completed in 1956). The Veselovskoye and Proletarskoye Reservoirs are separated by the Novo-Manych and Proletarskaya Dams; a hydroelectric power plant was built on the Proletarskaya Dam in 1952. The Bolshoi Egorlyk River discharges into the Kazinkya Channel between the dams, this then discharges into Veselovskoye Reservoir via the Proletarskaya Hydro. Originally the area received most of its water from the Bolshoi Egorlyk (with a catchment area of 14,800 km^2) and Sredniy Egorlyk (2,270 km^2) Rivers. The water level varies between 9.4 and 9.9 cm and up to 50-60 cm in windy weather. The Ust-Manych Reservoir is in a low, flat valley on the lower reaches of the West Manych River and its tributary the River Podpolny. There are three large limans – Shakhaevsky, Zapadensky and Peschany – which are interconnected and connected to the West Manych River by channels. The catchment of Veselovskoye Reservoir is enclosed by the Salo-Manych hills in the north, with a few small flat-bottomed valleys of the Cheprak, Elmuta, Burgusta, Surguchevka, Bolshaya Sadkovka and Malaya Sadkovka streams. Water from the Veselovskoye Reservoir is diverted to the Azovsky irrigation canal. The remaining rice growing systems receive water from the Donskoy canal.
Water quality: Before construction of the reservoirs and introduction of freshwater from the Rivers Kuban and Don, salinity in the lakes was < 20 g/l and the dominant ions were sodium and sulphate, although in some years chloride concentrations were higher (Gorokhova & Shumkov 1957). Introduction of fresh water resulted in a dramatic decline in salinity, with an annual salt concentration in the Bolshoi Egorlyk River of 2.5-7.8‰ or even 10-15‰ in particularly dry years, declining to 0.32‰ in 1952. Similarly, in the Veselovskaya Dam, salinity was 11‰ in 1948, declining to 1.95‰ in 1951 but stabilising at 1.10-1.46‰ from 1952-1955. The most saline area at pre-



Map 6. The Veselovskoye Reservoir

sent is the shallow eastern part of Veselovskoye Reservoir, where the bed is underlain by solonchak soils and salinity may be as high as 6.22‰. After introduction of water from the River Kuban, sodium, sulphate and calcium became the dominant salts, and nutrient concentrations in the Manych wetlands decreased sharply (Kruglova 1962).

Geology, geomorphology and soils: The modern geomorphology was formed in the period of Lower Khvalynsk (Late Pleistocene) expansion of the Caspian Sea (Popov 1955; Nikolaev 1956). The shore of Veselovskoye Reservoir is mainly steep although the upper parts of bays and the mouths of streams have gently sloping banks with saline soils. The northern shore of Ust-Manych Reservoir is precipitous, up to 10 m high near the dams, and 1-5 m in the middle. In the steppes between the River Don and the town of Salsk, hard geology is represented by loess-like rocks and the alluvial deposits from the Don. The overlying layer of southern and Azov chernozem soils is thin, with a high salt content (Gavrilyuk 1952). Chestnut soils and solonchaks, with varying salt content, occur in the southeast of the area. There are meadow and marshy soils in low-lying valleys. These soils are mostly wet and slightly clayey, resembling chernozems, with medium salt concentrations (Kruglova 1962). The bottom of the reservoir is formed by Tertiary and Quaternary marine and continental sediments (Chebotarev 1936).

Principal vegetation: Changes in the salinity of the water following construction of the reservoirs led to corresponding changes in the flora with an overall increase in the number of species by a factor of three. About 30 species of water plant are found in Ust-Manych Reservoir, including *Phragmites australis, Bolboschoenus maritimus, Typha angustifolia, T. latifolia, Scirpus lacustris, Potamogeton crispus, P. perfoliatus, P. pectinatus, Zannichellia* sp., *Myriophyllum* sp., *Ceratophyllum* sp., *Najas* sp., *Polygonum* sp., *Lemna minor* and *Cladophora* sp. In the first years following the decline in salinity, *Chara, Myriophyllum* and *Potamogeton* disappeared, subsequently reappearing in shallow brackish limans. *Phragmites australis* was the most tolerant to the changes, moving toward the new shore and developing a littoral belt. Before desalination, the phytoplankton composition numbered 123 species; this declined to 42 in the first years after the diversion, then increased again to 87

(Kruglova 1962). Differences in elevation, area and micro-relief of the islands as well as yearly and seasonal changes in inundation and salinity determine the distribution and abundance of different successional stages of vegetation. Islands more than 2 m above high water are generally larger than the other island types (*c*. 100 ha); they support grassland and are used for grazing and agriculture, including cereals. Islands 1-2 m above high water level are mainly small, covered by meadow and steppe vegetation with reed-beds along the water edge. Vegetation on islands less than 1.0 m above high water is characterised by halophytes and *Phragmites australis.* The southern coast has an extensive littoral belt of *P. australis* which may be up to 1 km wide in the lower part of the reservoir, although in places *Salix alba* has been planted along the shore. On more gently sloping shores, steppe species such as *Artemisia, Juncus* and *Tripolium* ssp. occur. Vegetation on alkaline soils is characterised by *Salsola* sp., *Atriplex verrucifera* and *Limonium gmelinii.* Two forests have been planted within the area: Dubrava forest covers 600 ha and is on the southern shore near the village of Dalnii; Dubki forest covers 800 ha and is on the right bank of the Bolshaya Sadkovka ravine. The main species planted are *Quercus* sp., *Ulmus minor, Salix alba* and *Swida sanguinea.* Most of the rice fields have been abandoned and are used for hay or are overgrown with *Phragmites australis.* Field drains and ditches support a varied aquatic flora, including *Lemna* ssp., *Hydrocharis morsus-ranae, Salvinia* and *Typha* ssp. Marshes, located on the fluvial terraces above the Manych floodplain, are dominated by *Phragmites australis* developing associations including *Typha angustifolia, T. latifolia* and *Scirpus lacustris;* herbs are represented by species such as *Sparganium erectum, Butomus umbellatus* and *Alisma plantago-aquatica.* In the halophyte communities on saline soils, *Bolboschoenus maritimus* dominates the wetland vegetation with *Tripolium vulgare* and other herbs. Species that occur in wet meadows include *Typhoides arundinacea, Beckmannia eruciformis, Tripolium vulgare, Suaeda altissima* and *Salicornia herbacea* (Gorbachev 1974).

Land tenure: For the most part, land adjacent to the reservoirs is owned by resource users, such as state and collective farms, fishery and forestry enterprises, joint-stock companies and water management offices. The Volga-Don Basin Management Office is responsible for openwater areas.

Conservation measures taken: The reservoirs and all adjacent lands are allocated to hunting and fishing societies. The eastern part of the Veselovskoye reservoir, which is the most important for migrating and wintering waterfowl, is managed by the Rostov Hunting Society.

Conservation measures proposed: Reduction of the quantity of pesticides applied to the area, through improvements in rice agriculture. Development of a management programme for the reservoirs, including water use, water levels of the Ust-Manych Reservoir and conservation of all natural resources. Extension of West Manych Ramsar Site to include all the wetlands described here.

Land use: The land is used mainly for rice fields, pasture, hay and activities based around the reservoirs. The site supports a total of 50,000 ha of rice fields, mainly on the northern coast and in the east of the southern coast of Veselovskoye Reservoir. Grazing traditionally takes place on the islands and near the reservoirs. The area of active, irrigated rice and hay meadows and the total number of stock has decreased in recent years. Wildfowling is permitted for 3 days per week from late September to the end of November, with set bag limits. Areas surrounding the site are mainly arable.

Possible changes in land use: Due to the present economic depression, the reservoirs are less heavily used for water transport and fishery. The reduction in area of rice fields has resulted in a decrease in water pollution from pesticides and fertilisers.

Disturbances and threats: The reservoirs are polluted with pesticides that enter in run-off from agricultural land. As a result, the populations of *Cyprinus carpio* and Astacidae have greatly decreased. The amount of fresh water diverted from the Kuban and Don is likely to decrease in the near future, which will result in an increase in salinity of the waters.

Economic and social values: The economic value of the fishing industry used to be very high, with annual catches reaching 15,000 tonnes. Following the change in salinity, catches decreased by a factor of ten. The area has good potential for the development of outdoor recreation, ecotourism and health resorts.

Fauna: Mammals: *Arvicola terrestris, Canis lupus, Capreolus capreolus, Lepus europaeus, Martes foina, Meles meles, Mustela eversmanni, M. lutreola, M. putorius, Nyctalus noctula, Nyctereutes procyonoides, Sus scrofa, Vormela peregusna, Vulpes corsac* and *V. vulpes.* Reed-beds provide important refuges for *S. scrofa, M. lutreola, N. procyonoides* and *A. terrestris.* Species listed in the IUCN Red Data Book and the Russian RDB include 4 mammals and 28 birds. Birds: The site is of great importance for breeding birds, including *Anas strepera, Ardeola ralloides, Aythya nyroca, Botaurus stellaris, Charadrius alexandrinus, Chlidonias hybrida, Circus aeruginosus, Corvus cornix, Fulica atra, Gallinula chloropus, Glareola nordmanni, G. pratincola, Himantopus himantopus, Ixobrychus minutus, Larus cachinnans, Luscinia svecica, Netta rufina, Podiceps cristatus, P. grisegena, Sterna albifrons, S. hirundo, Tadorna tadorna, Tringa totanus, Vanellus vanellus,* etc. The valley of the Western Manych lies on the migration route connecting breeding grounds in Western Siberia with the main wintering

grounds in the European part of Russia with the Black Sea, the Mediterranean, the Middle East and Northern and Eastern Africa. It is one of the most important staging areas in Russia, particularly for geese. Spring migration begins in late February and continues until the end of April, with many birds staying to breed. Passage migrants usually dominate autumn migration, however in some years ducks and geese stay until the lakes start to freeze. During migration, bird numbers can exceed 3,000/km^2, however by June this decreases to 350/km^2 and in July, when the rice is mature, this declines to not more than 60-80 individuals. The most abundant ducks are *Anas platyrhynchos, Aythya ferina* and *A. fuligula,* with fewer *Anas penelope, A. querquedula* and *A. acuta* and only very small numbers of *Mergus merganser, M. albellus, Bucephala clangula, Netta rufina, Anas clypeata, Tadorna tadorna* and *T. ferruginea.* Very numerous are *Fulica atra, Philomachus pugnax, Calidris alpina, C. ferruginea, C. minuta, Pluvialis squatarola, Vanellus vanellus, Larus cachinnans, L. ridibundus, L. minutus, Sterna hirundo* and *Chlidonias* sp. Rare species such as *Larus ichthyaetus, L. genei, L. melanocephalus* and *Sterna albifrons* also occur. Small flocks totalling 300-400 *Grus grus* are regularly observed on the southern shore in April. Rare and endangered spring migrants include *Otis tarda, Tetrax tetrax, Ciconia nigra, Himantopus himantopus, Recurvirostra avosetta, Aquila rapax, A. heliaca* and *Circaetus gallicus.* The reservoirs are not very important for moulting birds, although male *A. platyrhynchos* and locally breeding *Anser anser* concentrate at the Veselovskoye Reservoir from adjacent areas. The total number of wintering waterbirds may exceed 50,000 individuals. Raptors *Aquila rapax, A. heliaca, Falco peregrinus, Pandion haliaetus* and *Circaetus gallicus* occur on migration and *A. chrysaetos* occurs in winter. *Ciconia nigra, Oxyura leucocephala* and *Burhinus oedicnemus* occur on migration. Amphibians and reptiles include *Rana ridibunda, Emys orbicularis, Natrix natrix* and *N. tessellata.* Fish: 30 species of fish have been recorded in the reservoirs, including *Cyprinus carpio, Lucioperca lucioperca* and *Abramis brama.* After the decline in salinity and construction of rice fields, the fish population decreased considerably. There is some restocking of juvenile freshwater fish in the reservoirs each year.

Table 7. 1990-1991 counts for breeding birds at the Veselovskoye and Ust-Manych Reservoirs

Species	No. pairs	Species	No. pairs
Anas platyrhynchos	2,500-3,000	*Egretta alba*	400-500
Anas querquedula	150-300	*Egretta garzetta*	500-600
Anser anser	800-900	*Himantopus himantopus*	50-70
Ardea cinerea	1,000	*Nycticorax nycticorax*	250-300
Ardea purpurea	150-200	*Platalea leucorodia*	200
Aythya ferina	200-400	*Plegadis falcinellus*	300
Cygnus olor	25-30	*Recurvirostra avosetta*	30

Table. 8 Waterbird populations at the Veselovskoye and Ust-Manych Reservoirs

Species	Number
Anas platyrhynchos	10,000-22,000 migratory birds 30,000 wintering birds
Anseriformes	3,700-4,600 breeding birds, 1.5-3 million migratory birds, more than 50,000 wintering birds
Anser albifrons	240,000 migratory birds 6,000-8,000 wintering birds
Anser anser	15,000-40,000 migratory birds up to 9,000 wintering birds
Branta ruficollis	100-2,500 (in spring) 5,000-10,000 (to 25,000) in autumn
Ciconiiformes	2,300-2,600 pairs
Cygnus cygnus, C. olor	3,500-4,500 migratory birds
Haliaeetus albicilla	1 nesting, up to 10 wintering and 30-40 migratory birds
Tadorna tadorna	up to 100 birds

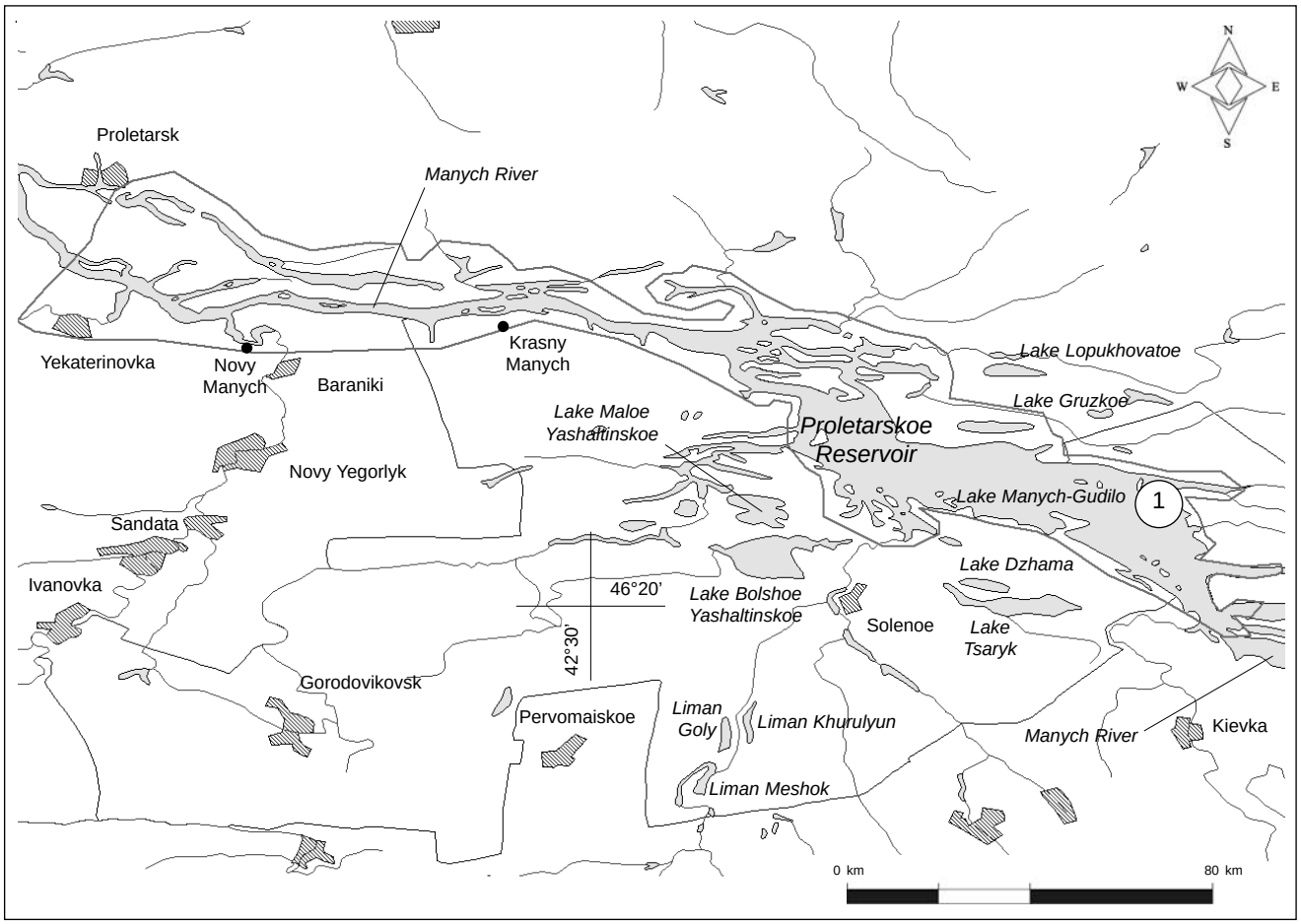
Special floristic values: Rare and endangered plant species include *Salvinia natans, Crambe koktebelica, Vallisneria spiralis, Althenia filiformis, Fritillaria meleagroides, Tulipa biebersteiniana, T. schrenkii, Asparagus tenuifolia, Stipa zalesskii, S. ucrainica* (Zozulin & Fedyaeva 1986).

Research facilities: Research into the ecology of the Manych began with publications by Pallas (1788), Ber (1856) and Barbot de Marni, Kryzhin and Kostenkov (1861). Detailed studies include: soils and vegetation – Krasnov (1886), Pachossky (1892), Prasolov (1910) and Polynov (1914); ichthyology – Syrovatsky (1941 and 1951); phytoplankton – Mikhaiilovsky (1949); zooplankton – Kharin (1948); benthos – Mordukhai-Boltosky (1948), aquatic vegetation – Pashkov (1948); ornithology – Fertikov & Krivenko (1978), Gavrilin et al. (1980), Kazakov et al. (1981 and 1990), Kazakov, Lomadze & Goncharov (1980, 1986, 1987 and 1988), Krivenko et al. (1978), Oleinikov & Danilova (1958), Oleinikov (1953), Oleinikov et al. (1973) and Yazykova (1973).

Public awareness and education: The principal organisations currently involved in education and public awareness in the area are the University of Rostov and other local scientific and environmental organisations. The most important publications on the site are 'The Nature of Rostov Oblast', 'Natural resources of the Northern Caucasus' and 'Rare animals of the Rostov Oblast'.
Criteria for inclusion: 1, 3, 5 and 6.

6. Lake Manych-Gudilo

Location: 44°36'N, 42°50'E. The site is located 70-90 km west-southwest of the city of Elista, the capital of Kalmykia. It is situated in the Kuma-Manych depression between the mouths of the Rivers Bolshoi Egorlyk in the northwest and Kalaus in the southeast. The coast of Lake Manych, which is separated from the Proletarskoye Reservoir by a dam, forms the northwestern and western borders of the wetland. The railway running across the East Manych valley forms the southeastern border. The northern and southern borders have been established at a distance of 1-5 km from the lake complex. The area is divided into three almost equal parts between Kalmykia, Stavropol Krai and Rostov Oblast.
Area: 182,600 ha.
Altitude: 8 m above sea level.
Wetland type: Q.
Other hydrologically linked wetlands: Veselovskoye Reservoir is located nearby to the west.
Description of site: The site comprises a saline lake with numerous islands and shallows in a deep depression. Manych-Gudilo is the largest lake of Ciscaucasia and has a unique hydrological regime. The width of the lake ranges from 1.5-2 to 7-10 km. The deepest central part of Lake Manych-Gudilo is 5-8 m deep, but for the most part the waters are 0.5-2 m deep. Islands vary in area from several to a few hundred hectares. In periods



Map 7. Lake Manych-Gudilo (1 – Ornithological Reserve within the Chernyje Zemli Reserve)

of low water, the number of these islands increases significantly.

Climate: The area has a temperate continental climate. Winters are mainly cloudy, with heavy snow, while summers are hot, with frequent droughts, dry winds and low cloud. Annual precipitation varies from 300 to 400 mm. The prevailing wind direction is southerly or southeasterly, rarely westerly. The entire openwater surface freezes over only once in three years and this tends to last from December until late February or early March. Annual mean air temperature is 8-9°C: 7-9°C in spring, 21-24°C in summer, 7-11°C in autumn and 8-9°C in winter.

Hydrology: The hydrological regime of wetlands in this region is subject to cyclical changes. Due to the shallow depths and flattened surface of the valley, long-term changes in inundation of the wetlands determine the hydrological situation for the whole region. In years with high water levels, the Manych complex becomes a single large water body with variable salinity from freshwater to hyper-saline. In years of low inundation, the complex becomes a chain of separate or partly connected salt lakes that sometimes dry out. In spite of the construction of dams along the River Manych, the lakes of Manych-Gudilo still show large fluctuations in salinity and inundation caused by both natural and anthropogenic factors. Generally, water levels fluctuate by up to 1.5 m over a period of a few years, increasing to 2 m in the eastern, quite narrow and shallow part of the Manych due to strong winds. Seasonal fluctuation in water levels is generally < 0.5-0.6 m.

Water quality: The salt content in the water increases from west to east, with a maximum of 17-30‰ in the central part of East Manych Lake. In the 1970s and 1980s, the Manych wetlands were subjected to considerable agricultural pollution from pesticides and fertilisers applied in the Stavropol Krai.

Geology, geomorphology and soils: The Manych depression, located between the high right bank of the River Volga, the Ergeny highlands to the north and the Stavropol highlands to the south, is an ancient channel, *c*. 500-km long, which used to connect the Azov and Caspian lowlands. The alternate expansion and contraction of the Black and Caspian Seas, which were connected through the Manych channel over prolonged periods, has resulted in a complicated relief in the Manych area, particularly in the great number of straits and islands. The geomorphology of the Manych valley was formed during the Late Pleistocene expansion. The banks of water bodies and islands are generally composed of clays, while soil cover is mainly chernozems.

Principal vegetation: Islands over 2 m above high water support plant communities dominated by herb-forb associations. Islands 1-2 m above high water support the most diverse vegetation, which is strongly linked to fluctuations in inundation and salinity with resulting variation from mixed herb and forb communities to single-species associations of *Elytrigia* or *Atriplex* sp. Islands less than 1 m above high water support vegetation characterised by disturbed halophilous (*Salicornia* sp. and *Suaeda* sp.) or meso-xerophilous communities (*Sisymbrium* sp., *Vitex* sp. and *Atriplex* sp.) (Linkov 1983). Ruderal communities dominate vegetation on islands that support large waterbird colonies. Shallow water supports dense stands of *Zannichellia* sp., *Ruppia* sp., *Potamogeton filiformis* and *P. pectinatus, Vaucheria, Chara* and Cladophoraceae. Low-lying shores support relatively intact semi-desert and steppe communities with chestnut and chernozem soils; the vegetation is dominated by grasses, herbs and *Artemisia* sp. There is some cultivation of cereals and other crops. *Phragmites australis* beds occur as dense reed-beds or fringing stands in some bays and at the southeastern edge of the East Manych Lake. The vegetation of the Manych area is characterised by sagebrush-fescue-feather grass and sagebrush-fescue steppes of the Caspian Sea coast and Kazakhstan. On the islands and shores, ruderals such as *Poa bulbosa, Bromus* sp., *Lappula* sp. and *Eragrostis* sp. are widespread, with halophytes such as *Salicornia* sp. and *Suaeda* sp.

Land tenure: Openwater areas and the islands of Lake Manych-Gudilo are owned by the Chernyje Zemli and Rostovsky Reserves and are national property. The remainder of the site is owned by resource users with collective proprietary rights. The reserves are managed by the administrations of the State Nature Reserves, under the jurisdiction of the Ministry of Environment Protection and Natural Resources, while local authorities and the Society of Hunters and Fishermen manage the remainder. The hunting grounds are under the jurisdiction of the Department of Hunting Management.

Conservation measures taken: A zakaznik was established in 1975, covering an area of 50,000 ha (including one third of the water area of Lake Manych-Gudilo and some adjacent areas). This was designated as a Ramsar site in 1994. Within the zakaznik economic activity is not limited on the shores, but open water and islands are under strict protection. In 1990, 27,600 ha of the open water within the game reserve was included in the Chernyje Zemli Reserve, which carries the highest level of nature protection. Furthermore, in 1995 the Rostovskiy Reserve (9,465 ha) was established nearby. The Kalmyk and Stavropol parts of East Manych Lake are mostly managed by the Society of Hunters and Fishermen, who impose strict controls on visitors.

Conservation measures proposed: The Federal Nature Reserve should be extended to include the openwater areas of Manych-Gudilo and East Manych Lakes and converted to a reserve. There is also a need to build artificial islands in Kirista, Dolgenkii, Lopilovskii and Dzenzi Bays and include a 5-km strip along these bays in the strictly protected area. The whole 150,000 ha wetland area should be included within the Ramsar Site. The

part of the lake that belongs to Stavropol Territory (about 70,000 ha) needs better protection. It has been included in the Ramsar Shadow List.

Land use: Most of the lake shores are given over to pasture, and a herd of 50-100 horses is maintained on the largest island, Madyk. Members of the same herd of wild horses (mustangs) live on Vodyanoi Island in the Rostovsky Reserve. Wildfowling is permitted for 2.5 months in autumn and sometimes for a few days in spring, but is rigorously controlled, particularly in spring. There is high potential for ecotourism, based mainly around bird watching, however to date this has been little developed – partly due to a lack of funds and trained staff. Visits to breeding bird colonies are occasionally organised for students from the cities of Rostov-on-Don, Elista and Stavropol.

Table 9. Populations of breeding colonial waterbirds

Species	No. pairs				
	1972	1974	1980	1989	1991
Ardea cinerea	60	70	150	180	100
Larus cachinnans	1,400	1,300	3,200	5,300	490
Larus genei	5,600	–	–	–	–
Larus ichthyaetus	1,000	500	900	600	800
Larus melanocephalus	13,500		–	–	–
Pelecanus crispus	60	20	50	100	120
Pelecanus onocrotalus	50	90	120	240	300
Platalea leucorodia	300	300	400	600	800

Possible changes in land use: Recreational pressure may increase due to the expected development of special recreation zones with appropriate facilities, as well as sport hunting and ecotourism. The Manych is likely to be opened up for water transportation, which may disturb breeding birds.

Disturbances and threats: The main threats to the site are water discharges from irrigation systems in spring and summer. This may lead to higher floods, exacerbating shoreline erosion and the loss of nests in many colonies of Laridae, Pelecaniformes and Ciconiiformes.

Table 10. Breeding waterfowl population – species percentages

Anas strepera	37.3
Anas platyrhynchos	30.0
Netta rufina	9.5
Aythya fuligula	3.2-3.5
Tadorna tadorna	3.2-3.5
Anas acuta	1.5
Anas clypeata	0.2-0.5
Anser anser	0.2-0.5
Aythya nyroca	0.2-0.5
Cygnus olor	0.2-0.5
Tadorna ferruginea	0.2-0.5

Economic and social values: The Manych depression (Kuma-Manych Basin) lies on the biogeographical boundary between Europe and Asia. It is an important site on the world archaeological map: there are several kurgans (burial mounds) of the Scythian-Sarmatian period.

Table 11. Waterbird populations at Lake Manych-Gudilo

Species	Number
Anseriformes	up to 300 nesting pairs 3,500,000 migratory birds
Anser erythropus	up to 10,000 migratory birds
Anthropoides virgo	on migration
Branta ruficollis	8,000-20,000 birds
Burhinus oedicnemus	a few
Ciconiiformes	500 pairs
Himantopus himantopus	100-500 pairs
Otis tarda	10-20 pairs
Oxyura leucocephala	a few breeding pairs, up to 1,000 migratory birds
Plegadis falcinellus	50 pairs
Recurvirostra avosetta	100 pairs
Tetrax tetrax	15-20 pairs

Fauna: Mammals: *Canis lupus* and occasionally *Saiga tatarica* occur in the site. Adjacent areas support at least 200 *Vulpes vulpes, V. corsac,* over 100 *Nyctereutes procyonoides,* at least 300 *Lepus europaeus* and *Mustela putorius. Ondatra zibethicus* occurs in the southeast of East Manych Lake. Rare species recorded on the site include *Vormela peregusna, Lutra lutra, Meles meles* and *Hemiechinus auritus.* Three endangered mammal species have been recorded. Birds: The site is located on the main migration route in Eurasia, connecting Western Siberia, Taimyr and Kazakhstan with the Near and Middle East and northern and eastern Africa. It is the largest staging area in Russia for geese. Approximately 1.5 million ducks and 400,000 geese (Linkov 1989) pass through the site in spring. The most abundant Anseriformes are *Anser albifrons, Anas platyrhynchos, A. acuta, A. strepera, A. clypeata, Aythya ferina* and *A. fuligula.* Spring migration starts in late February – early March, with numbers peaking in late March – early April. In general, spring migrants remain on the site for a short period only. However in some years *Branta ruficollis, Anser albifrons* and *A. erythropus* may remain on the lakes until early or mid-May. All three European species of swan occur, together with waders such as

Philomachus pugnax, Pluvialis squatarola, Phalaropus lobatus and gulls and terns. Autumn migration is equally important, with up to 3 million duck and 500,000 geese. Other species that are common in most years include *Bucephala clangula, Mergus merganser, M. albellus, Anas crecca, A. querquedula* and *A. penelope.* The site is also important for breeding waterbirds, with large colonies of *Platalea leucorodia, Pelecanus onocrotalus, P. crispus, Phalacrocorax carbo* and *Larus ichthyaetus.* Breeding numbers of Anatidae vary from 150-300 pairs depending on both natural and anthropogenic factors. Migrants include most of the world population of *Oxyura leucocephala* (Krivenko *et al.* 1980). 31 endangered bird species have been recorded. Reptiles: The most abundant reptile species are *Chelonia* sp., *Vipera ursini, Eryx miliaris, Elaphe dione, Natrix natrix* and *N. tessellata.* Fish: Species *Cyprinus carpio, Rutilus rutilus, Scardinius erythrophthalmus* and *Lucioperca lucioperca* are common. Invertebrates: In summer, there is a very productive development of zooplankton and benthos in the shallows. The zooplankton population (*c*. 50 species) is composed of Crustaceans, Copepoda and Cladocera. Zooplankton biomass may reach 50 g/m^2 and benthic biomass 40 g/m^2.

Special floristic values: Species listed in the Russian RDB include *Tulipa gesneriana, T. biebersteiniana, Ornithogalum fischeri* and *Centaurea taliewii.*

Research facilities: Regular research has been carried out since 1972 (Linkov 1978, 1983, 1988, 1992 and 1994; Krivenko 1981 and 1991).

Public awareness and education: These are addressed through publication of posters and leaflets and production of television films.

Criteria for inclusion: 1, 3, 5 and 6.

7. Don Delta and Lower River Don

Location: 47°37'N, 40°30'E. The site comprises the Lower Don valley and is located between Taganrog Bay on the Azov Sea and the town of Semikarakorsk. The first fluvial terrace above the floodplain serves as the northern boundary. To the south, the site borders the River Podpolnaya, Azovsky irrigation canal and the road between the towns of Bataisk and Azov and the village of Kagalnik.

Area: 170,000 ha, including 54,800 ha of the Don Delta.

Altitude: 0-10 m above sea level.

Wetland type: L, J, P, 1.

Other hydrologically linked wetlands: The Azov Sea is situated to the west and Veselovskoye Reservoir to southeast.

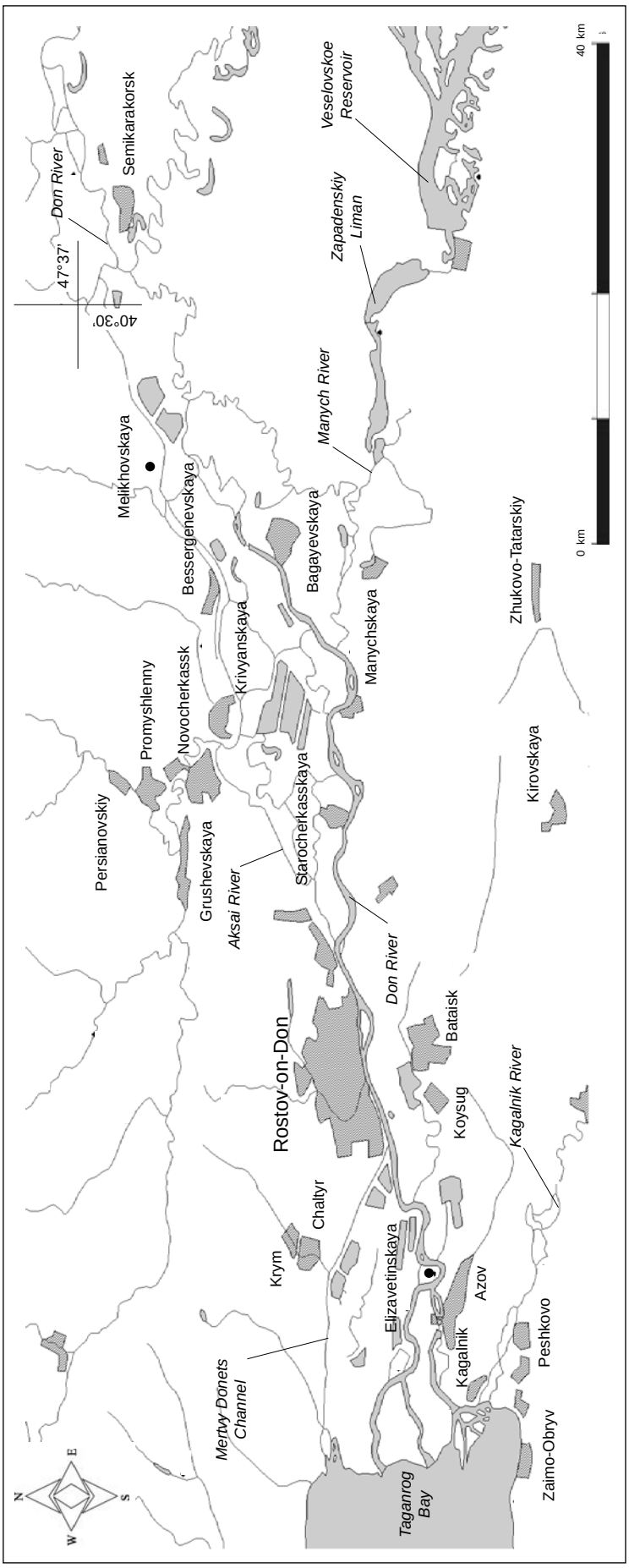
Description of site: The site comprises the lower navigable part and delta of the River Don with smaller floodplain rivers and lakes, which developed in the ancient riverbed of the Paleo-Don. The Don Delta is situated between the cities of Rostov and Bataisk to the east and Taganrog Bay to the west. The Mertvy Donets channel forms the northern border and the Don the southern border of this part of the wetland complex. The Delta extends for 30 km from east to west and stretches for 24 km along the edge of the bay. It has a total area of 55,000 ha, including 34,000 ha in the area formed by the Mertvy Donets and the Don (Gargopa *et al*. 1980). Much of the site is covered by wetlands, including channels, freshwater and saline lakes and 150 oxbow lakes in the Lower Don floodplain. There are extensive floodplain areas of the Lower Don to the east of the cities of Bataisk and Rostov, and the most important habitats are close to the town of Semikarakorsk. The floodplain is 10 km wide near the village of Melikhovskaya and 20 km wide near the town of Novocherkassk. After construction of the Tsimlyansky Dam, the rate of change within the delta declined considerably (Simonov 1989), large parts of the floodplain were converted to agriculture and six commercial fish farms and hatcheries were created, covering a total of 7,800 ha. Outside the delta, there are eight fish farms covering 5,400 ha. The wetlands of the Lower Don have been significantly modified by residential and industrial developments, construction of canals, fishponds, dykes, dams and roads. Few attempts to establish agriculture in former wetlands have been successful, consequently waterlogging and salination are now widespread (Molodkin 1986). Several embankments have also been built in the floodplain to carry roads and railways, which have resulted in waterlogging of adjacent areas, while five deep gravel pits have been created through mining for aggregates. Floodplain lakes and rivers in the lower part of the Don Delta, as well as areas covered by wet plains, meadows, solonchaks and trees, have been less altered. The River Don has a profound effect on the salinity and hydrological regime of the Gulf of Taganrog and the entire Azov Sea.

Climate: The area has a steppe and semi-desert continental climate. Annual precipitation is 400-500 mm, with the majority (300-330 mm) in spring and early summer. The mean temperature in January is –5 to –8°C with a minimum of –25°C. Frosts vary widely between years, lasting from 20 to 90 days (Nagaitsev 1971; Bogucharskaya & Gargopa 1986; Agroclimatic Resources of the Rostov Oblast 1972). The first frosts generally occur in mid-October, with more permanent ice cover developing in November and lasting, with frequent

thaws, until March. Snow cover is generally about 4 cm deep in January and 8 cm deep by the end of February. The mean temperature in July is 22.5-23°C and the period when the temperature is above zero lasts for 230-260 days, including 220 days with temperatures above 5°C. The number of days with dry winds varies from 2-3 in the delta to 5-7 in the Manych valley.

Hydrology: Before modification of the natural hydrological regime of the Don River, the Delta was regularly inundated in spring. Presently, only its western part is flooded in westerly storms, which occur several times a year. Similarly, before river regulation, floodplains were inundated every spring and temporary water bodies remained until autumn, however the active floodplain has been reduced to about 170,000 ha. Since 1952, it has been completely flooded only in 1963, 1979, 1981 and 1994, and partly flooded on a few other occasions. The mean annual flow of the Don is 27.9 km^3 (with a range of 11.8-52.0 km^3) and suspended sediment reaches 5.1 million tons/year (50-250 g/m^3). Before construction of the Tsimlyansky Dam, spring floods carried 77% of the annual runoff; this has decreased to 48% (Bogucharskaya & Gargopa 1986). The chronological sequence of development of the delta can be inferred from archaeological remains. For example, the ancient village of Elizavetinskaya, founded in the 6th century BC, is considered to have been at the edge of the sea, however it is now 20 km from the coast. Initially, the delta involved only two channels: the Mertvy Donets and Don: subsequently smaller channels developed due to the influence of river flow and storms (Samoilov 1989; Rodionov 1967).

Water quality: In recent years, the annual concentration of salts in the Don River has increased from 370 to 747 mg/l due to discharges of sewage, and agricultural and



Map 8. The Don Delta and Lower River Don

industrial effluent. Ionic concentrations vary from 25 to 30 g/km^3. In the floodplains of the Lower Don and its tributaries the water table is 2-6 m below the soil surface. Soil waters are mostly hard, brackish and saline; fresh water is found in places where the overlying layer of loam is shallow (Gargopa *et al.* 1980; Bogucharskaya & Gargopa 1986; Glukhovoi *et al.* 1981; Manko & Valinskaya 1971). Wetland vegetation helps to remove pesticides, heavy metals and organic compounds from the water and prevents the eutrophication of the sea.

Geology, geomorphology and soils: The development of the Don valley, in particular its deltaic part, is closely connected with the formation of the Azov Sea in the Upper Tertiary and tectonic processes in the Quaternary. The water level in the Azov Sea rose and fell considerably several times over the past 10,000 years (Panov 1965); the resulting alternation of expansion and contraction of the sea created the deep valley of the Paleo-Don River. The modern Lower Don developed 2000 years ago as a result of the *Nimphea* expansion. The site is an alluvial-marine plain, slightly tilted towards the Azov Sea, involving low-lying marshes intersected by the levees of ancient and modern rivers and channels. These levees are the remains of fluvial terraces up to 6-m high in the central part of the delta, formed with loess-like deposits, often overlying solonetz and solonchaks (Smirnov 1968). The main soil types in the Don floodplain are intrazonal, such as sands and loamy sands, overlain by loam along the Don and its main tributaries; all have low salinity. The valley and delta are dominated by interzonal hydromorphous soils-meadow, marsh-meadow, marshy and alluvial-meadow soils. Meadow soils are saline clay and clay-loam; alluvial-meadow and marshy-meadow soils are clay and clay-loam with a high groundwater level, marsh soils are clay, sandy-loam and clay-loam and are common in low-lying areas, with ground water at a depth of 10-30 cm (Gavrilyuk *et al.* 1986). The delta also has frequent immature soils, where the main soils in the central part are loams overlying sands. The dominant soil types in areas around the site are chernozems, which are under arable.

Principal vegetation: The main habitat types represented on the site are open water, relatively intact floodplain areas, marshes and man-made wetlands. To the east of the town of Starocherkassk, natural forests dominated by *Salix* and *Ulmus* ssp. occur on islands and on the floodplain. Near the town of Semikarakorsk there are ancient *Quercus* forests. Large areas within the delta are covered by *Phragmites australis,* with *Typha angustifolia, T. latifolia, Schoenoplectus lacustris, Sparganium erectum, Butomus umbellatus* and *Alisma plantago-aquatica.* Halophyte associations on solonchak soils are dominated by species such as *Bolboschoenus maritimus* and *Tripolium vulgare,* while *Suaeda altissima* and *Salicornia herbacea* occur in communities formed by *Phalaroides arundinacea* and *Beckmannia eruciformis* (Gorbachev 1974). The abundance of ruderals indicates the degree to which communities have been disturbed (Demina 1991, 1996). The aquatic vegetation includes pure formations of *Potamogeton, Ceratophyllum, Myriophyllum* and *Salvinia,* as well as mixed formations such as *Potamogeton* with *Ceratophyllum* or *Myriophyllum* with *Sparganium.* In addition, an association of *Vallisneria* with *Potamogeton* is spreading along the right bank of the Kuterma Channel.

Land tenure: All wetlands within the area are allocated to hunting and fishing societies. Most lands adjacent to the reservoirs are owned by resource users, such as state and collective farms, fishery and forestry enterprises, joint-stock companies and water management offices, with collective proprietary rights. The Volga-Don Basin Management Office is responsible for open waters. There are also small plots of privately owned land.

Conservation measures taken: Fishing is prohibited in some parts of the delta, including the Azovsky Wildlife Refuge and the Azovsky Site, which are managed by the Rostov Hunting and Fishing Society.

Conservation measures proposed: Development of a comprehensive management plan for the wetland; organisation of detailed ecological studies of the wetland ecosystems in the Lower Don; construction of summer houses in the delta limited; combined fish farming and duck rearing on gravel pits encouraged. The Lower Don should be added to the list of protected wetlands of national importance.

Land use: Wetlands cover 46,000 ha of the site, of which oxbow lakes cover a total area of 3,860 ha. The other main land uses within the site are rice fields, pasture, hay-meadows, fish farms and recreation, mainly involving fishing and wildfowling. The area of irrigated fields has largely decreased in recent years, for example ricefields near the village of Manychskaya are largely abandoned and water diversion takes place mainly to fill fishponds. Stock numbers have also decreased in recent years and some semi-natural hay meadows have been abandoned. Gravel pits and other deep waterbodies are used for outdoor recreation and as wintering places for fish from small nursery ponds. There are a large number of holiday bases and campsites and two resorts within the site. Wildfowling is permitted for 3-4 days per week from late September to late November, with strict bag limits. The local hunting and fishing societies have 40,000 members, which includes all sport hunters, however only a small proportion of fishermen belong to societies.

Possible changes in land use: The present economic situation has led to the closure of many factories and farms. The amount of water diverted to agricultural fields and fishponds has declined and the area of ricefields has greatly decreased. As a result, pesticide and fertiliser pollution of waterbodies has also declined. Waterlogging and salination of parts of the floodplain near Rostov is increasing, which will increase the overall

area of wetlands.

Disturbances and threats: The main threats to the site are intensive agriculture and construction of summer-houses, which leads to an increase in pressure on resources, over-fishing and disturbance of breeding birds.

Economic and social values: The most important economic resource in the delta is the harvest of fish species that spend most of their life in the Azov Sea and migrate to the River Don to spawn. The main species are *Huso huso, Acipenser gueldenstaedtii, A. stellatus, Vimba vimba, Clupeidae* and *Chalcalburnus chalcoides.* Semi-migratory species include *Lucioperca lucioperca, Abramis brama, Rutilus rutilus* and *Aspius aspius* (Troitsky & Poznyak 1980). Freshwater species, such as *Silurus glanis, Esox lucius, Blicca bjoerkna* and *Stizostedion marinum* are of secondary importance. In recent decades, *Ctenopharyngodon idella* and *Hypopthalmichthys molitrix* have been included in the commercial category. Construction of dams on the rivers has impeded fish migration leading to declines in their productivity. The available spawning grounds in the floodplain have declined from 95,000 to 30,000 ha (Bogucharskaya & Gargopa 1986). Annual catches of migratory fish fell from 386 tonnes to 550 tonnes between 1935 and 1977; catches of semi-migratory and freshwater fish fell from 45,850 to 2,260 tonnes (a decline of 3,180 to 1,380 t/year) in the same period (Troitsky & Poznyak 1980). Hatcheries were built in the delta to re-stock some migratory fish species that can no longer reach their spawning grounds. In 1979, a total of 21,500 tonnes of fish and 103.6 million eggs were produced (Trufanov *et al.* 1980). The main commercial species are *Acipenser* ssp., *V. vimba, L. lucioperca* and *A. brama.* In the 1970s, the Rogozhkinsky and Azov-Don hatcheries released 7-15 million *Acipenser* ssp. fry and 11.74 million *V. vimba* fry per year (Bitehina *et al.* 1980, Savelieva *et al.* 1980). Similarly, 80-120 million *A. brama* and 10-20 million *L. lucioperca* fry have been released from 5,200 ha of fishponds (Bryazgunova & Zhmudova 1980). There are a few places of archaeological importance in the area, including Neolithic settlements and the ancient Greek town of Tanais (2nd century BC – 4th century AD). The area has good potential for the development of outdoor recreation and ecotourism.

Fauna: Mammals: *Lepus europaeus, Vulpes vulpes, Nyctereutes procyonoides, Martes foina, Mustela lutreola, Apodemus sylvaticus, Arvicola terrestris, Capreolus capreolus, Sus scrofa, Alces alces,* etc. *Cervus elaphus* has been reintroduced in the floodplain near Semikarakorsk. Four species of bat, *Nyctalus noctula, N. leisleri, N. lasiopterus* and *Pipistrellus nathusii,* have been recorded in plantations. Along the shores of ponds, reed-beds provide important habitat for *V. vulpes, M. lutreola, N. procyonoides* and *A. terrestris. N. procyonoides* and *Rattus norvegicus* are characteristic species of abandoned ricefields (Minoransky 1987). Birds: The Lower Don valley lies on a major migration route between Western Siberia and the European part of Russia with the Black Sea, Mediterranean, Middle East and northern and eastern Africa. 60 species of birds breed in the area, including rare species. A colony of *Phalacrocorax carbo* was first recorded nesting in the valley in

Table 12. Water chemistry in the River Don

	Million tonnes/year		Million tons/year
Salts	14.4	Hydrocarbonates	3.016-5.841
Ionics	9.96	Calcium	1.111-2.203
including:		Magnesium	0.302-0.679
Chlorides	1.045-2.240	Sodium + potassium	0.827-1.937
Sulphates	1.826-3.582	Organic compounds	0.0602-0.159

Table 13. Abundance of main plant communities as a percentage of the site (Demina 1996)

Community	Principal soil types	% of site
Marshes	Marsh-meadow soils	49.75
Floodplain meadows	Alluvium and occasionally saline soils	22.6
Wet floodplain meadows	Solonchaks	19.8
Wet grass and sedge meadows	Marshy soils	4.67
Steppe and meadow -steppe	Loamy sand soils chernozem soils	2.4
Riparian woodland	–	0.3
Riparian meadows	Solonetz and occasionally saline soils	0.2

Table 14. Relative abundance of the main plant families

Family	Percentage	Family	Percentage
Compositae	15.4	Chenopodiaceae	3.6
Gramineae	10.4	Scrophulariaceae	3.2
Legumes	6.6	Umbelliferae	3.1
Cruciferae	6.0	Ranunculaceae	3
Labiatae	4.4	Rosaceae	3
Caryophyllaceae	4.1	Boraginaceae	3
Cyperaceae	3.9		

1982 and the population has subsequently increased to 3,000-3,500 pairs. Ciconiiformes colonies occur either in *Phragmites australis* beds or in woodland, mainly in the floodplain downstream of the town of Aksai and in the delta. The main habitats of importance for breeding birds are reed-beds, marshes, ponds, hay meadows, woodland plantations and native woodland. Reed-beds support species such as *Cygnus olor* (*c*. 100 pairs) and *Anser anser* (40-50 pairs), *Acrocephalus agricola, A. arundinaceus, A. scirpaceus, Anas platyrhynchos, A. querquedula, Aythya ferina, Circus aeruginosus, Corvus cornix, Locustella luscinioides, Panurus biarmicus, Luscinia svecica, Remiz pendulinus, Netta rufina* and occasional pairs of *Aythya nyroca.* Marshes support species such as *Fulica atra, Gallinula chloropus, Rallus aquaticus* and *Porzana parva,* while wet meadows support species such as *Crex crex, Glareola nordmanni, G. pratincola, Himantopus himantopus, Tringa totanus* and *Vanellus vanellus.* The oxbow lakes and ponds support a wide species diversity, including *Anas platyrhynchos, Ardea cinerea, A. purpurea, Aythya ferina, Botaurus stellaris, Chlidonias hybrida, Cygnus olor, Egretta alba, E. garzetta, Fulica atra, Gallinula chloropus, Ixobrychus minutus, Larus ridibundus* (1,100-1,200 pairs) and *L. cachinnans* (300-500 pairs), *Nycticorax nycticorax, Plegadis falcinellus, Podiceps cristatus* and *P. grisegena.* Plantations and native woodland support species such as *Corvus frugilegus, Dendrocopos major, D. minor, Picus canus, Jynx torquilla, Phoenicurus phoenicurus, Parus caeruleus, P. major, Haliaeetus albicilla* (up to 10 pairs). Spring passage starts in late February or early March and continues until the end of April. Small numbers of Anatidae winter on the remaining area of open water, including *Cygnus olor, Anser anser, Anas platyrhynchos, Aythya ferina, A. fuligula, Mergus merganser, M. albellus, Podiceps cristatus, P. nigricollis, Larus cachinnans, L. ridibundus, L. canus* and *Fulica atra.* Often *Haliaeetus albicilla* winter in the Don Delta. Rare and endangered species listed in the IUCN Red Data Book and the Russian RDB include 20 birds and 1 mammal. *Platalea leucorodia, A. nyroca, H. himantopus* and *Glareola nordmanni* nest in small numbers, while *P. falcinellus* is more abundant and *C. crex* has been recorded during the breeding season in the delta meadows. *Accipiter brevipes* nest thickly in the eastern part of the area and more than 10 pairs of *Haliaeetus albicilla* breed in higher numbers in winter, *Falco cherrug* bred until the 1970s (Belik 1996), but now occurs only on passage, and a pair of *Pandion haliaetus* nested within the Don Delta in the past and near Semikarakorsk in 1984. *Ciconia nigra, Aquila rapax, A. clanga, A. heliaca, Circaetus gallicus, Pandion haliaetus, Falco peregrinus, Otis tarda, Tetrax tetrax, Recurvirostra avosetta* and *Larus ichthyaetus* occur on migration, as do *Anser erythropus* and *Branta ruficollis* in flocks of *A. albifrons. Nyctalus noctula* occurs in plantations during migration. Amphibians: Large numbers of amphibians occur in abandoned ricefields, including *Rana ridibunda, Bufo viridis* and *Bombina bombina. R. ridibunda* is the most numerous: in August its numbers reach 50 individuals/m^2 (Minoransky 1987), while in ditches and canals there can be up to 710-960 individuals/ha (Taranenko 1973). Ponds provide habitats for *R. ridibunda, B. viridis, B. bombina, Natrix natrix* and *N. tessellata.* Fish: Troitsky and Poznyak (1980) recorded 70 species of fish in the River Don. The main species include *Acipenser sturio, A. stellatus,*

Table 15. Number of breeding pairs of colonial Ciconiiformes (1990-1991 data)

Species	Within the delta (pairs)	Outside the delta (pairs)
Ardea cinerea	550-600	650-700
Ardea purpurea	50	>50
Egretta alba	220-250	400-500
Egretta garzetta	200-250	350-500
Nycticorax nycticorax	200-300	300
Plegadis falcinellus	–	200-250

Table 16. Migrant bird species recorded in the Don Delta

Common species		Rare species
Accipiter nisus	*Cygnus olor*	*Accipiter brevipes*
Anas acuta	*Falco vespertinus*	*Anser erythropus*
Anas. clypeata	*Fulica atra*	*Aquila clanga*
Anas crecca	*Gallinago gallinago*	*Aquila heliaca*
Anas penelope	*Larus cachinnans*	*Aquila pomarina*
Anas platyrhynchos	*Larus canus*	*Aquila rapax*
Anas querquedula	*Larus ichthyaetus*	*Branta ruficollis*
Anser albifrons	*Larus minutus*	*Ciconia nigra*
Aythya ferina	*Larus ridibundus*	*Circaetus gallicus*
Aythya fuligula	*Mergus merganser*	*Cygnus bewickii*
Bucephala clangula	*Mergus albellus*	*Haematopus ostralegus*
Buteo buteo	*Netta rufina*	*Haliaeetus albicilla*
Calidris alpina	*Philomachus pugnax*	*Himantopus himantopus*
Calidris ferruginea	*Pluvialis squatarola*	*Numenius arquata*
Calidris minuta	*Tringa glareola*	*Otis tarda*
Chlidonias leucopterus	*Tringa ochropus*	*Pandion haliaetus*
Chlidonias niger	*Tringa totanus*	*Recurvirostra avosetta*
Cygnus cygnus	*Vanellus vanellus*	*Tadorna tadorna*

Table 17. Relative abundance of dominant taxa, depth and habitat-type of the zoobenthic communities in the fore-delta (from Nekrasova & Zakutsky 1980)

Community	Dominant species	Abundance (No./m^{-2})	Biomass (g/m^{-2})	Substrate	Depth (m)
Olygochaeta	Ostracoda	15,251	2.7	Detritus-rich silt	1.2-5
	Olygochaeta	8,778	18.7		
Hypaniola	Hypaniola	2678	3.9	Sands and shell-limestone	1.5-3.5
	Ostracoda	2218	0.5		
Dreissena	Corophium	3190	8.5	Compact sand and shell-sand	0.8-3
	Dreissena	425	35.5		
Hypania	Olygochaeta	5,786	3.3	Silty shell-sand	No information
	Ostracoda	4,267	0.8		
	Hypaniola	1,437	0.3		
	Hypanis	57	101.7		

Caspialosa caspia ssp. *tanaica, C. kessleri* ssp. *pontica, Clupeonella delicatula, Esox lucius, Rutilus rutilus, R. frisii, Leuciscus idus, Scardinius erythrophthalmus, Aspius aspius, Tinca tinca, Gobio gobio, Chalcalburnus chalcoides, Alburnus alburnus, Blicca bjoerkna, Abramis brama* ssp. *orientalis, A. sapa, A. ballerus, Vimba vimba, Pelecus cultratus, Carassius carassius, C. auratus* ssp. *gibelio, Cyprinus carpio, Misgurnus fossilis, Silurus glanis, Lucioperca lucioperca, L. volgensis, Perca fluviatilis, Neogobius melanostomus, N. fluviatilis* and *Benthophilus macrocephalus* ssp. *magistri.* In addition, *Lampetra mariae* migrate to the Don to spawn. Invertebrates: The Lower Don supports 90 species of zooplankton, including 36 rotifers, 22 copepods, 29 cladocerans and 3 others. The main species of copepod (over 50% of the population), are *Cyclops stenuus, C. vicinus, Acantocyclops vernalis* and *A. bicuspidatus,* while among the cladocerans *Daphnia longispina, D. longispina* ssp. *hyalina* and *Bosmina longirostris* are the most abundant. Rotifers do not play an important role in the zooplankton, though in some years or months, their biomass may reach 200 mg/m^3. 99 species have been recorded in the delta, including 44 rotifers, 23 copepods, 28 cladocerans and 4 others. The relative abundance of individual species is similar to that in the Don, however species composition varies in different parts of the delta. In major channels, such as the Stary Don, Kalancha, Bolshaya Kuterma and Perevalochka, it is similar to that in the River Don, but in smaller shallow channels it is more diverse and includes species such as *Graptoloberis testudinaria, Rhynchotalona rostrata* and *Macrotrix spinosa.* The species composition and biomass of zooplankton vary considerably with time. In the River Don in spring, the biomass reaches 103.5 mg/m^3 and is dominated by copepods. In April-May, the biomass increases to 200-2,100 mg/m^3, with copepods comprising 80-90%. In June-July, the zooplankton reaches its maximum in diversity (14 species of rotifers, 9 copepods and 10 cladocerans) and the biomass may range from 151 to 3,857 mg/m^3. In September-October, the total biomass decreases to 662 mg/m^3 and the number of species to 23. In January-February, 20 species have been recorded, rising to 26 species in spring, with cladocerans comprising 49% of the biomass and rotifers, 40%. In summer 32 species have been found (Sheinin & Krylova 1980). Benthic communities of the Lower Don and Delta are dominated by *Dreissena, Viviparus,* Olygochaeta and Chironomidae. In the littoral zone, an association of Tubificidae-*Chironomus* has been found at a depth of 0-1 m. This includes 30 species, but with a relatively low biomass (0.5-3.0 g/m^2). The mean population density of zoobenthos is 7,511/m^2 with a biomass of 57.5 g/m^2. Mysids comprise 1,409/m^2 with a biomass of 16.4 g/m^2.

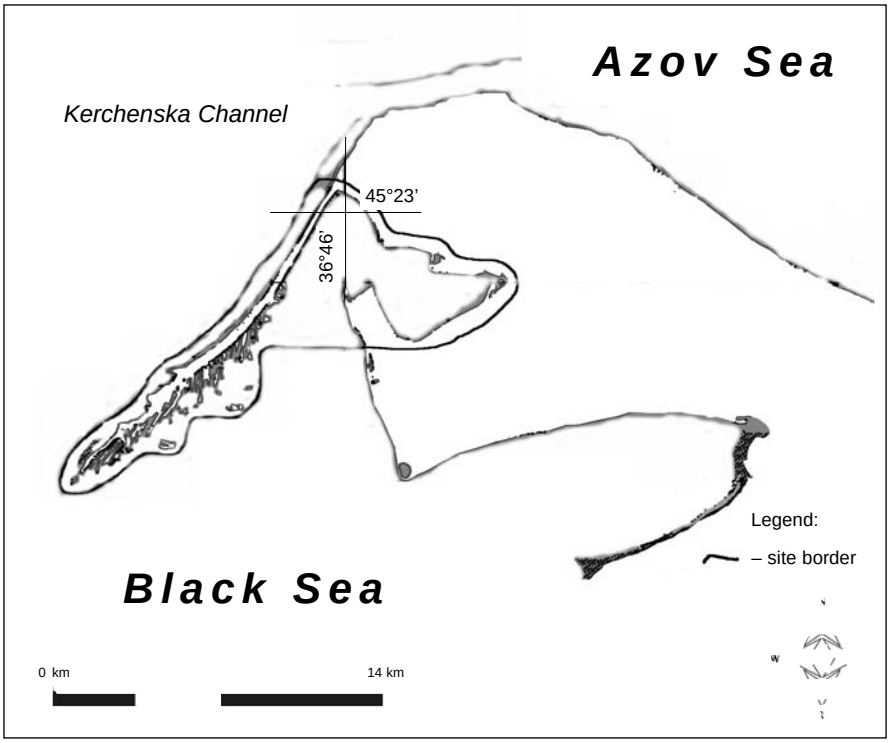
Special floristic values: 823 plant species are listed in the delta and floodplain of the Lower Don. Amongst these species are 2 horsetails, one fern, one gymnosperm and 819 angiosperms. The most abundant plants are typical of meadow communities, with 193 species, and of ruderal communities, with 169 species. More than 30 plant species are considered in need of protection. These include the following (after Zozulin & Fedyaeva 1986; RDB of RSFSR 1988; Demina 1996): *Acorus calamus, Allium savranicum, Asparagus tenuifolius, Astragalus tanaiticus, Cakile euxina, Caltha palustris, Carex hordeistichos, Ceratophyllum tanaiticum, Crambe maritima, Dipsacus gmelinii, Eryngium maritimum, Fritillaria meleagroides, Gladiolus tenuis, Nuphar lutea, Nymphaea alba, Nymphoides peltata, Salvinia natans, Stipa borysthenica, Tulipa biebersteiniana, Valeriana officinalis* and *Vallisneria spiralis.*

Research facilities: Guldenshtedt, Gmelin and Pallas (1811) carried out the first scientific research on the Don steppes. The main subsequent sources are: fauna – Rigelman (1918); terrestrial vertebrates – Alferaki (1910

and 1911); and ichthyology – Berg (1899, 1910, 1916 and 1948). Regular research began when the Don-Kuban Fish Station (AzNIIRH) was established. The Zoology Department of Rostov University has carried out ornithological studies (Oleinikov 1953; Kazakov & Lomadze 1985-1992; Belik 1988-1992) and the Botanical Department has studied the flora (Gorbachev 1976; Zozulin & Fedyaeva 1980). The most recent detailed study of plants is by Demina (1996). The most important publications are 'The Nature of Rostov Oblast' and 'Natural resources of the Northern Caucasus'.
Criteria for inclusion: 1, 3, 7.

8. Dinskoy Bay

Location: 45°23'N, 36°46'E. The southwestern extremity of the Taman Peninsula. The bay is separated from the Black Sea by Chushka Spit.
Area: 5,000 ha.
Altitude: 0.4-35 m above sea level.
Wetland type: A, E.
Other hydrologically linked wetlands: The Kerch Strait is situated behind the 200-m long Chushka Spit. Taman Bay lies to the southwest.
Description of site: A shallow Black Sea liman with small islands and spits. Southern, southeastern and northwestern shores are high and precipitous, falling gradually in height from east to west. The coast of Chushka Spit is flatter and lower than the coast of the bay, which is Russia's only shallow openwater bay. The bay is situated at the terminus of the migration routes of many bird species.
Climate: Climate is continental, dry. Summer is hot and dry; winter is mild and humid. Precipitation is 350-453 mm/year. Mean air temperature is 10.8°C. Minimum temperature is not less than 16-19°C, maximum 30-36°C. 276 days per year are sunny; 222 days are frost-free.
Hydrology: Upwellings and changes in water balance in the Black Sea determine the water level in Dinskoy Bay. However, Chushka and Tuzlinskaya Spits and Cape Tuzla modify the speed of changes in water level.
Water quality: The salinity of Dinskoy Bay is the same as the Black Sea – *c.* 18‰. NaCl content is 77.8%, $MgCl_2$ – 10.9%, MgS – 3.6%, K_2S – 2.5%.
Geology, geomorphology and soils: The wetland is located in a depression of the western physico-geographical region of the Taman geomorphologic region. Ridges, hills and mud volcanoes dominate in the relief. Chestnut soils have promoted the development of *Artemisia* turf-cereal steppes.
Principal vegetation: The vegetation is relatively poor – 512 species only. Due to soil salinity, a mosaic of grassy vegetation has formed. Steppe species are *Festuca ovina, Agropyron pectinatum, Bromus japonicus, Lolium* sp., *Salvia* sp. Solonchaks are covered by *Salicornia* sp., *Petrosimonia brachiata, Halocnemum strobilaceum, Salsola foliosa, Spergularia rubra, Artemisia maritima* and salt-tolerant grasses. There are 60 species of psammophytes including *Leymus arenarius, Eryngium maritimum, Glycyrrhiza glabra, Centaurea ruthenica, Crambe tataria. Phragmites australis, Polygonum*



Map 9. Dinskoy Bay

hydropiper, Zostera marina, etc. occur along the coasts. 80% of the coastal zone is covered by shallow water with *Zostera marina. Cystozeira* and *Phyllophora* grow in deeper areas.

Land tenure: The Zaporozhsko-Tamanskyi Reserve is the property of the state; it is a border zone.

Conservation measures taken: Part of Dinskoy Bay is included in the Zaporozhsko-Tamanskyi Reserve.

Conservation measures proposed: It is proposed to include the Kiziltashsky Liman complex, Achuevskaya Spit and Lake Khanskoye in the Zaporozhsko-Tamanskyi Reserve. The reserve was originally designated until 1995 and designation is to be extended.

Land use: Adjacent plots are planted with vineyards and cereals.

Disturbance and threats: The volume of oil transported locally has increased and there is a threat of oil-based pollution. Construction of electricity transmission lines is also a disturbance factor.

Table 18. Waterbird populations at Dinskoy Bay

Species	Number
Anseriformes	0.5 million birds during migration
Anser erythropus	10-50 birds
Anthropoides virgo	migration
Aythya nyroca	10-20 birds
Ciconiiformes	up to 300 birds
Cygnus olor	up to 50,000 birds
Haliaeetus albicilla	on migration
Fulica atra	1,000 nesting pairs, up to 0.4 million birds in autumn
Glareola pratincola	on migration
Pelecanus crispus	on migration
Phalacrocorax carbo	1,000 local summer migrants up to 35,000 migratory birds
Plegadis falcinellus	60 local summer migrants
Tadorna tadorna	up to 30 birds

Economic and social values: The wetland has not suffered greatly from conversion. Once *Oryctolagus cuniculus* was introduced into the coast of the bay. No economic activities are carried out in the south of Chushka Spit. Restrictions on access will lessen the number of tourists and economic activities, and this will improve the state of the area.

Fauna: Mammals: *Delphinus delphis, Tursiops truncatus, Oryctolagus cuniculus, Lepus europaeus, Vulpes vulpes, Mustela nivalis,* Chiroptera and Rodentia. In recent years the number of wild rabbits has decreased greatly. Birds: 132 bird species have been recorded in the wetland, 35 of which breed there. The composition and number of birds varies, with maximum numbers (half a million individuals) during winter and on migration. Local migrations of *Phalacrocorax carbo* along the Kerch Strait take place in winter. *Fulica atra, Cygnus olor* and Anseriformes forage and overwinter in the bay. In summer Charadriiformes nest in large numbers on spits and islands, and up to 1,500 *Anser anser* migrate locally. In late autumn, large flocks of *F. atra* fatten before migration. Later swans, *P. carbo,* Anseriformes, etc. congregate and overwinter. Reptiles: *Lacerta trilineata, L. agilis, Eremias arguta, Coluber jugularis, Elaphe quatuorlineata, Vipera ursini.* Snakes use the numerous holes in the precipitous coasts of the bay. Amphibians: *Bufo viridis.* Fish: 65 marine species have been recorded in the wetland, however the wetland is not of value as a breeding site. *Mugil cephalus* is caught by amateur fishers in shallow water; *Neogobius* sp. is rarely caught. *Dasyatis pastinaca* is abundant on the floor of the bay near the spit. In summer *Mugil cephalus* and *Dasyatis pastinaca* spawn here.

Research facilities: Ecologists from Kuban University have conducted two expeditions to the site. The Southern Department of the Russian Research Institute of Game Management and Fur Farming (VNIIOZ) studied the wild rabbit populations in 1980-1985.

Criteria for inclusion: 1, 3, 4, 5.

9. Beglitskaya Spit

Location: 47°07'N, 38°33'E. The spit is located in Nekliinovsky District, Rostov Oblast, near Miusskyi Liman, 30 km west of the town of Taganrog and 30 km east of Kryva Spit (Ukraine). The spit lies on the northern coast of Taganrog Bay, Azov Sea, and is the last in a chain of accreted coastal spits stretching from the Sivash to the Don Delta. The northern border, comprised of loess loam, is the highest point (10-15 m) of the Northern Azov plain.

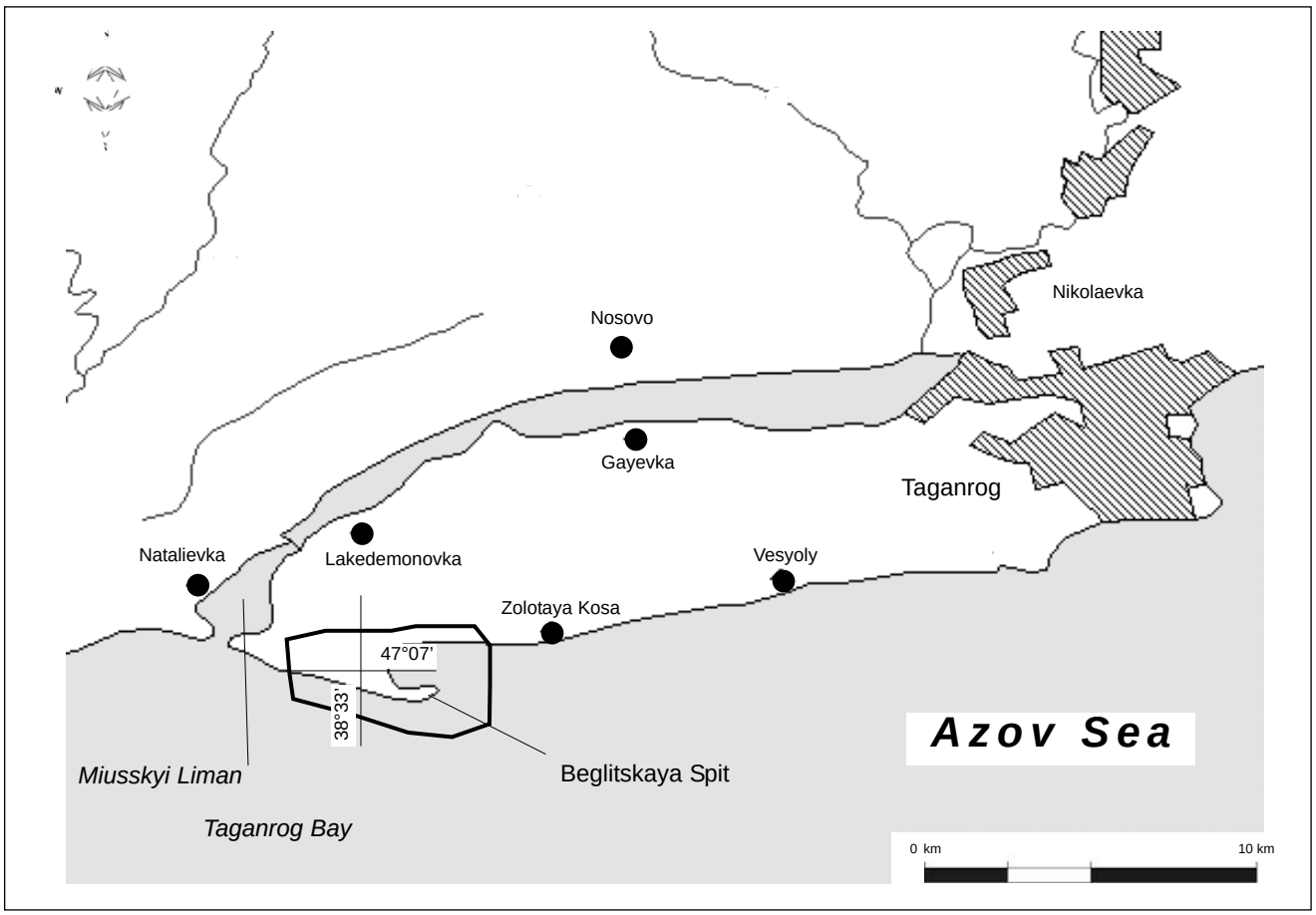
Area: 1,014 ha, including 414 ha terrestrial area.

Altitude: 0-3 m above sea level.

Wetland type: E, H, A.

Other hydrologically linked wetlands: Kryva Spit lies 30 km to the west and the Don Delta 50 km to the east.

Description of site: Beglitskaya Spit is a small accreted coquina-sand cape, 4 km in length and with an area of



Map 10. The Beglitskaya Spit

414 ha. On the wide base of the spit, salt and somewhat boggy meadows predominate; at its farther end there are small lakes with reeds. The narrowest part of the spit, oriented to the east, is covered with high, sandy ridges that are poorly vegetated. There is a huge shallow silted bay with beds of algae in the east of the spit. The wetlands of the spit provide favourable sites for birds to breed and rest and forage during migration.

Climate: On the northeastern coast of the Azov Sea the climate is moderate-continental. Cloudy weather with rains and snow predominates in winter; summers are hot and dry. Summer is hot and dry with periodic heavy showers. Annual mean air temperature is 9.1°C: 0-17°C in spring, 21-24°C in summer, 3-16°C in autumn and –2 to –5°C in winter. Annual precipitation is 490 mm, including 290 mm when the weather is warm (April-October). Easterly (54%) and westerly (33%-43%) winds predominate. Westerly winds often result in raised water levels in Taganrog Bay and flooding in low-lying parts of the spit.

Hydrology: The hydrology of the spit is mainly dependent on Taganrog Bay, which is desalinated largely due to inflow from the River Don. During storms, the waters of the bay flood small closed depressions in the central part of the spit creating small, temporary

Table 19. Average number of waders recorded during peaks of spring migration (data of Minoranskyi and Demina (1997) is given in brackets)

Species	Number	
Actitis hypoleucos	5-10	(40-60)
Calidris alba	100-300	-
Calidris alpina	100-300	-
Calidris ferruginea	-	(150-300)
Calidris minuta	30-50	-
Charadrius hiaticula	5-10	-
Gallinago gallinago	30-50	-
Gallinago media	1-3	-
Limosa limosa	5-10	(30-50)
Numenius arquata	1-3	-
Phalaropus lobatus	2-10	(150-200)
Philomachus pugnax	500-1,500	(200-300)
Pluvialis squatarola	1-3	-
Tringa glareola	10-50	-
Tringa nebularia	10-50	-
Tringa ochropus	5-10	-
Tringa stagnatilis	2-5	-
Xenus cinereus	1-3	-

bogs and lakes. Openwaterbodies (depth 1.5-2.5 m) lie adjacent to the western part of the spit and shallow silted waters (silt depth 0.5-1.5 m) are found in the east.

Water quality: The waters of Taganrog Bay are desalinated chlorine-sodium. Concentration of salts is up to 10‰. Water transparency in different parts of the bay depends on wave action and speed and direction of winds.

Geology, geomorphology and soils: On the north, the spit is adjacent to the steep platform (10-15 m high) of the ancient marine terrace, which is covered with Quaternary loess loam soils that are easily eroded. The spit is composed of sand-coquina deposits eroded by westerly winds and therefore its peak is oriented to the east. The surface of the spit is of gently-sloping ridge relief with sandy ridges that are poorly vegetated and loamy depressions. Soils are poorly developed. Meadow, meadow-boggy, loamy and sandy loams of different grades dominate in the central part of the spit, and a mosaic of vegetation complexes has developed.

Principal vegetation: 142 plant species have been described at the site. Flat-topped plots in the centre of the spit are covered with solonchak grass-cereal meadows with *Elytrigia repens, E. elongata, Puccinellia distans, Artemisia santonica.* Psammophytes *(Leymus sabulosus)* and high grasses dominate in coastal wood ridges. Solonchaks with low grasses (*Salicornia* sp.) stretch along the western coast on wooded ridges beyond the sand-coquina bar. Reeds and *Typha angustifolia* bogs are becoming typical for depressions in low-lying parts of the spit, *Scirpus lacustris* is typical in shallow depressions in the centre. Reed-beds occur in deeper depressions with stable moisture and in places along the coast. In recent years the spit has turned into a swamp: this is related to the general increase in humidity.

Land tenure: Terrestrial areas belong to a local agricultural co-operative. Openwater areas are under the jurisdiction of the Board for the Volga-Don Basin. There is a light-house at the end of the spit.

Conservation measures taken: In 1996, Beglitskaya Spit and adjacent aquatic areas were designated as a Nature Monument of regional significance.

Conservation measure proposed: Beglitskaya Spit is proposed for listing as Important Bird Area (IBA). Work on establishing the Near-Azov Sea Reserve began here.

Land use: Some meadows are used for pasture. Commercial and amateur fishing take place in the bay. Fish-processing takes place in the shop of the processing plant, which is situated near the top of the spit. The coast is a favourite place for recreation in summer, and the number of holiday-makers has increased in recent years. Possible changes in land use: Recreational use of the spit is likely to rise as this is the only spit in Rostov Oblast with clean beaches and sea water.

Disturbance and threats: The main threats to the site are poaching (including fishing with nets) and uncontrolled rise in recreation.

Economic and social value: Beglitskaya Spit is the only typical accreted marine spit in Rostov Oblast and is of great significance as a site for recreation; it is also of geomorphological interest. It is the last area on the Azov Sea plain where unploughed pastures still remain.

Fauna: Mammals: 17 mammal species have been recorded here: *Erinaceus europaeus, Mustela nivalis, Martes foina, Vulpes vulpes, Lepus europaeus, Allactaga jaculus, Citellus pygmaeus,* etc. A great number of *C. pygmaeus* remain here, though the species has almost disappeared elsewhere in Rostov Oblast. Dolphin *Phocoena phocoena* visits occasionally. Birds: 175 bird species have been recorded in the wetland, the majority migratory, including *Branta ruficollis, Anser albifrons, Cygnus cygnus, C. bewickii, Pandion haliaetus, Haliaeetus albicilla,* etc. 18 species of waders and 14 Laridae species are abundant on migration. *Larus minutus* (up to 3,000-5,000 birds simultaneously) in mid-April – beginning of June and *L. ichthyaetus* (up to 200-300) are numerous on the spit. From 1960-1980, *Sterna albifrons* (up to 30-50 pairs) regularly bred here; *S. hirundo*

Table 20. Number of waders breeding at Beglitskaya Spit

Species	end of 1960s	end of 1970s	1986	1991	1997	2000
Charadrius alexandrinus	abundant		20-30	25-30	-	7-10
Charadrius dubius	common		5-10	-	15-20	15-20
Glareola nordmanni	1-3			-	-	-
Glareola pratincola	1-10		30-50	7-10	-	10
Haematopus ostralegus	-	occasional	-	-	-	0-1
Himantopus himantopus	-	-	40-50	-	-	
Recurvirostra avosetta	-	occasional	-	-	-	-
Tringa totanus	common		few	3	2-3	1-3
Vanellus vanellus	common		few	few	-	1-3

bred here occasionally. Until 1990, *Charadrius alexandrinus* (up to 20-30 pairs) and *Glareola pratincola* (up to 30-50 pairs) were numerous here, *G. nordmanni, Recurvirostra avosetta* and *Haematopus ostralegus* were encountered occasionally. A large colony of *Himantopus himantopus* was present in the mid-1980s. Beglitskaya Spit is a breeding and migratory site for many species included in the Russian RDB and international lists: *Cygnus bewickii, Pandion haliaetus, Himantopus himantopus, Larus ichthyaetus,* etc. Rare species such as *Aythya nyroca* and *Haliaeetus albicilla* have been encountered. Reptiles such as *Natrix natrix, N. tessellata, Coluber jugularis* and *Eremias arguta* inhabit the site. Fish: Considerable numbers of Azov Sea species inhabit the aquatic area of the spit. It is a foraging territory for Acipenseridae, *Lucioperca* ssp., *Abramis* ssp. and *Rutilus* ssp. swimming up to the River Don in summer.
Special floristic values: Rare littoral psammophytes listed in the RDB of RSFSR (1988) and Rostov Oblast (1996) inhabit the site: *Eryngium maritimum, Crambe maritima, Cakile euxina.*
Research facilities: The first ornithological research was conducted in the mid-19th century. Ornithologists from Rostov have monitored the spit since 1967. Integrated botanical and zoological research was conducted here in 1996-97.
Public awareness and education: No special activities have been conducted.
Criteria for inclusion: 1, 2 and 3.

10. Shabelskaya Spit

Location: 46°52'N, 38°30'E. The wetland is situated in Staroscherbinovskyi District, Krasnodar Krai, on the southern coast of Taganrog Bay, Azov Sea, 20 km northeast of the town of Yeisk. The southern border of the spit is divided by a high (10-15 m) loess loam terrace of the Near-Kuban lower plain.
Area: 700 ha.
Altitude: 0-2 m above sea level.
Wetland type: E, H, A.
Other hydrologically linked wetlands: Yeisky Liman lies 10 km to the south, Beglitskaya Spit and Miusskyi Liman 30 km to the north.
Description of site: Shabelskaya Spit (see Map 5) is an accreted sand-coquina cape, 3-km long and 5-km wide. The spit is covered by sand bars; the relief at its centre is flat. At the base of the spit, among solonchak meadows, there is a small salt lake (area 200 ha) that attracts many breeding and migratory waterbirds. Northern, western and southern coasts of the lake are open: they turn into solonchaks here, and there is wide band of reed-beds on the eastern coast where a freshwater spring enters the wetlands. Forests have been planted on the top of the spit. The shore of the wetland is open, with beaches.
Climate: Climate is moderate-continental. Mean annual air temperature is 9.7°C; –5 to –12°C in January; 22-28°C in July. Annual volume of precipitation is 430-480 mm. Eastern and western winds predominate.
Hydrology: An artesian spring at the base of the spit feeds the lake, however the lake is flooded with salt sea water that enters through coastal bars during storms. For this reason, the hydrological regime of the lake depends to a great extent on Taganrog Bay in the Azov Sea.
Water quality: The waters of Taganrog Bay are desalinated chlorine-sodium. The concentration of salts is 10 g/l. The lake in the centre of the spit dries out in summer, and the salt content increases.
Geology, geomorphology and soils: In the south, the spit is adjacent to a steep (10-15 m high) eroded terrace of the Kuban Plain. Erosion caused by westerly and easterly winds forms a symmetrical spit that is sharply pointed in relief. Coastal bars and the top of the spit are composed of sand and coquina; loamy-salt soils dominate in its centre.
Principal vegetation: Coastal sand bars are sparsely covered with psammophytes *Leymus sabulosus* and high grasses, *Crambe maritima, Euphorbia* sp., *Melilotus* sp., etc. Solonchak meadows with *Puccinellia distans, Elytrigia elongata, Artemisia santonica* and *Salicornia* solonchaks form the central part of the spit. *Phragmites australis* grows along the spring and shores of the lake. Forests of *Populus* sp., *Elaeagnus angustifolia* and *Hippophae rhamnoides* have been planted on the top of the spit. There is a thick belt of bushes, *Crataegus* sp., *Rosa* sp. and *Swida sanguinea,* along the steep slopes of the terrace.
Land tenure: The land belongs to the local agricultural co-operative. Comfortable guest-houses are located on the northeastern coast.
Conservation measures taken: None.
Conservation measures proposed: As a result of research conducted in 1999, Shabelskaya Spit became a local reserve. The creation of an ornithological reserve with limited grazing during the breeding period is proposed.

Land use: The meadows are partly used as pastures. There is sea-fishing, and sport hunting takes place in autumn and winter. The coast is a place of recreation for local people.

Possible changes in land use: The pasture areas are expected to expand; this will result in increasing disturbance of colonial ground-nesting birds around the lake.

Disturbance and threats: The main threat is the increasing disturbance to colonial birds nesting on the ground along the lake.

Economic and social values: The spit is an important site for recreation. The meadows on the spit are the only pasture lands among ploughed steppes adjacent to the Kuban Plain.

Fauna: More than 70 bird species including 50 breeding species were recorded on the spit in 1994-1999. In meadows and forest belts *Falco subbuteo, F. vespertinus, F. tinnunculus, Perdix perdix, Asio otus, Columba palumbus,* etc. breed. Other animals have not been studied.

Special floristic values: No data.

Research facilities: The spit has only recently been studied by ornithologists.

Public awareness and education: None.

Criteria for inclusion: 1 and 2.

Table 21. Waterbird populations at Shabelskaya Spit (1994-1999)

Species	Number
Anas platyrhynchos	3,000-5,000 birds
Anser anser	1-2 pairs
Charadrius alexandrinus	1-2 pairs
Chlidonias leucopterus	300-500 birds
Glareola pratincola	10-20 pairs
Grus grus	3 birds (1994)
Himantopus himantopus	10-20 pairs
Larus cachinnans	500-1,000 birds
Larus ichthyaetus	100-200 birds
Limosa limosa	up to 2,000-3,000 birds
Numenius arquata	5-10 birds
Numenius phaeopus	3-5 birds
Recurvirostra avosetta	5-10 pairs
Sterna albifrons	5-10 pairs
Sterna hirundo	5-10 pairs
Tadorna tadorna	2 birds
Tringa totanus	1-2 pairs
Vanellus vanellus	5-10 pairs

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TURKEY

by
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INTRODUCTION

Turkey is located at the point where the three continents making up the old world, Asia, Africa and Europe, lie closest to each other; it straddles the point where Europe and Asia meet. Roughly rectangular in shape, Turkey is 1,660 km long and 550 km wide. The country's surface area inclusive of lakes and rivers is 814,578 km^2, 790,200 km^2 of which lie in Asia and 24,378 km^2 in Europe. Turkey's land borders have a total length of 2,753 km, and the coastline (including islands) is a further 8,333 km. Turkey has two European and six Asian countries for neighbours along its land borders. The land border to the northeast with the Commonwealth of Independent States is 610 km long, with Iran 454 km long, and with Iraq 331 km long. To the south lies the 877-km long border with Syria. Turkey's borders on the European continent consist of a 212 km frontier with Greece and a 269-km border with Bulgaria.

Turkey is divided into seven major geographical regions, Marmara, Black Sea, Aegean, Mediterranean, Central Anatolia, Eastern Anatolia, and South-eastern Anatolia, each with its own distinct climate, topography and corresponding habitats, flora and fauna. Turkey lies in several climatic zones, the extremes being the Mediterranean climate (with hot, dry summers and mild, wet winters) and the Eastern Anatolian climate, with summer temperatures of up to 40°C and long winters with temperatures as low as –30°C. The mountain ranges along the Black Sea and the Mediterranean receive good precipitation (> 1000 mm/p.a., with > 2000 mm/p.a. in the eastern parts of the Black Sea mountains), whilst large parts of Central Anatolia receive less than 400 mm/p.a. Different types of habitats are confined to the higher ranges of mountains in the eastern Black Sea, Taurus and Eastern Anatolia. Forests once covered large areas of Turkey, but as a result of more than 1,000 years of unsustainable felling today only about 12% of Turkey's surface is covered by larger stretches of intact forest, mainly in the major mountain ranges in the north and south. Large parts of Anatolia are characterised by a mixture of arable and fallow land, rocky areas with scattered Quercus or Juniperus scrub and (normally overgrazed) grassland/steppe (most of which was originally woodland). Original salt steppe is found around the salt lakes in Central Anatolia, whilst different gradations of arid, montane and sub-alpine steppe prevail in Eastern Anatolia.

Turkey's coastal wetlands

Five coastal wetlands are found on the Turkish Black Sea coast. Some of the areas (i.e. Sakarya Delta) have been irreversibly damaged in recent decades. For this reason, Sakarya Delta is not included in this report.

Legislative framework

There are many legal instruments that relate to nature conservation in general and (directly or indirectly) affect habitats and species. The Turkish Constitution states that all individuals have the right to live in a healthy environment. It states that all sea coasts, lake shores and river banks are under the jurisdiction and at the disposal of the state, and their use should be based on public benefit principles. Furthermore, the Constitution stipulates the preservation of natural assets, forests, pasture- and arable lands and the prevention of erosion.

The following laws are of particular importance in relation to nature conservation:

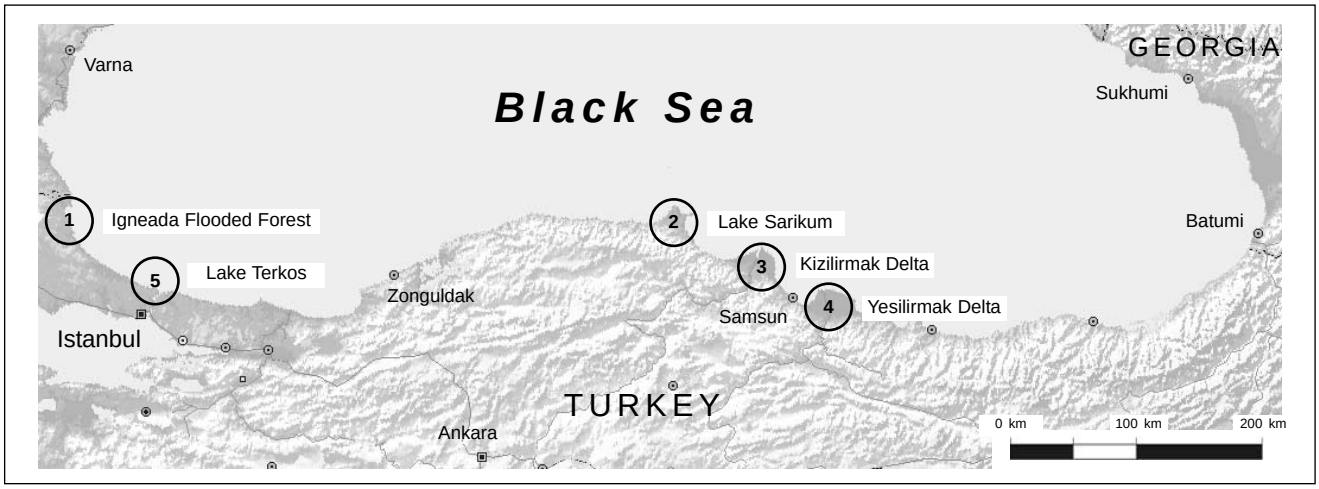
- The Environment Law (1983) and the related Decree-Law concerning the Establishment and Functions of the Ministry of Environment (1991) are the major legal instruments regulating environmental protection in Turkey. The first regulates the legislative and technical aspects of environmental conservation in Turkey; the latter defines the terms of reference of the Ministry of Environment.
- The National Parks Law (1983) and Hunting Law (1937) are the major laws that provide protection to particular sites and species. These laws are the responsibility of the Ministry of Forestry, General Directorate of National Parks and Game-Wildlife. The National Parks Law sets up a network of protected areas, whilst the Hunting Law, through the annual Central Hunting Committee, regulates hunting. Under the Hunting Law, sites may be permanently or temporarily closed to hunting.

Table 1. Overview of the coastal wetlands of Turkey

No	Site	District	Area (ha)	Status	Protected area (ha)
1	Igneada Flooded Forest	Igneada	3,000	* Nature Reserve * SIT	1,345
2	Lake Sarikum	Sinop	785	* Nature reserve * SIT	150
3	Kizilirmak Delta	Bafra	21,700	* SIT * Ramsar Site	16,110
4	Yesilirmak Delt a	Carsamba	16,043	* Permanent Wildlife Reserve	16,043
5	Lake Terkos	Istanbul	5,850		
		Total	**47,378**		**33,648 (71%)**

- The Law on Protection of Cultural and Natural Assets (1983) regulates the protection and maintenance of movable and immovable assets that are of particular historical, archaeological, cultural or natural importance. Areas protected under this law are known as 'SIT': natural areas are classified as 'Natural SIT', whereas areas protected under this law for their archaeological values are 'Archaeological SIT'. The implementation of this law is the responsibility of the Ministry of Culture, General Directorate for the Protection of Cultural and Natural Assets. Some SITs were also declared prior to 1983 under a similar law.

Turkey is party to a number of international conventions on nature conservation. The most important of which are:
– Convention for the Protection of Birds (Paris, 1950), ratified in 1966.
– Convention for the Protection of the Mediterranean Sea Against Pollution (Barcelona Convention, 1975), ratified in 1976.
– Convention Concerning the Protection of the World Cultural and Natural Heritage (1975), ratified in 1982.
– Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1979), ratified in 1984.
– Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention, 1971), ratified in 1994.
– Convention on the Protection of the Black Sea Against Pollution (Bucharest, 1992), ratified in 1994.
– Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 1973), ratified in 1996.
– Convention on Biological Diversity (1992), ratified in 2000.
– Convention on Combating Desertification (Paris, 1994), ratified in 1998.
– Protocol on Mediterranean Special Protected Areas (MedSPA-under Barcelona Convention, 1982), ratified in 1988.
– Declaration of the 1st Conference of the Central Asian and Balkan States' Ministers of Environment (Istanbul, 1994).



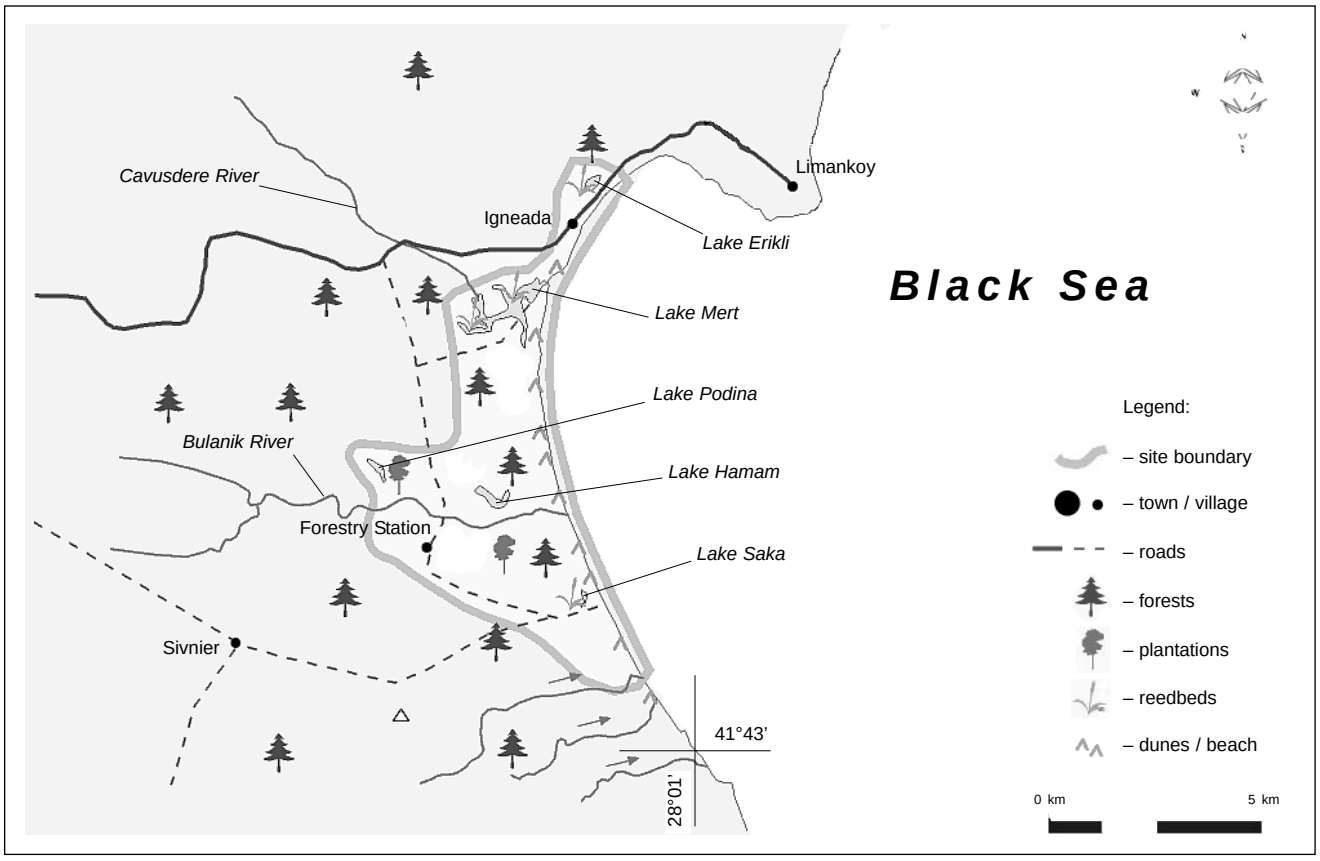
Map 1. The Black Sea coastal wetlands of Turkey (numbers correspond with the numbers in the text and table 1).

The Turkish Constitution states that international treaties that have been ratified by Parliament automatically become the law of the land. Therefore all the above-mentioned conventions have been integrated into Turkish domestic law since their ratification and take precedence over the existing laws; they may not be challenged before the Constitutional Court.

SITE ACCOUNTS

1. Igneada Flooded Forest

Location: 41°52'N, 27°57'E. The area is bordered to the south and west by the Turkish Istranca Mountains, on the Black Sea coast near the Turkish-Bulgarian border.
Area: 3,000 ha.
Altitude: Sea level.
Wetland type: Xf, J.
Description of site: Water from the mountains flows via a number of streams to the sea (the most prominent being the Cavusdere (or Deringecit stream) and Bulanikdere) and accumulates behind the dunes where it feeds the flooded forests, which lie largely below sea level. Five small lakes with a rich and diverse aquatic flora are found within the area. The northernmost, Erikli (43 ha), just north of Igneada, is a coastal lagoon with no outlet to the sea during summer. Lake Saka (5 ha), in the south, is a freshwater lake located immediately inland behind sand dunes. Lake Mert (266 ha), just south of Igneada, is a small delta of the Cavusdere stream. Lakes Hamam (19 ha) and Pedina (10 ha) are situated further inland.
Principal vegetation: The *c.* 10 km-long pristine dunes and beach are an important feature of the area and are of high botanical importance, with a range of southwest Black Sea specialities. The flooded forests are rarely utilised by man; their natural character has been largely preserved.

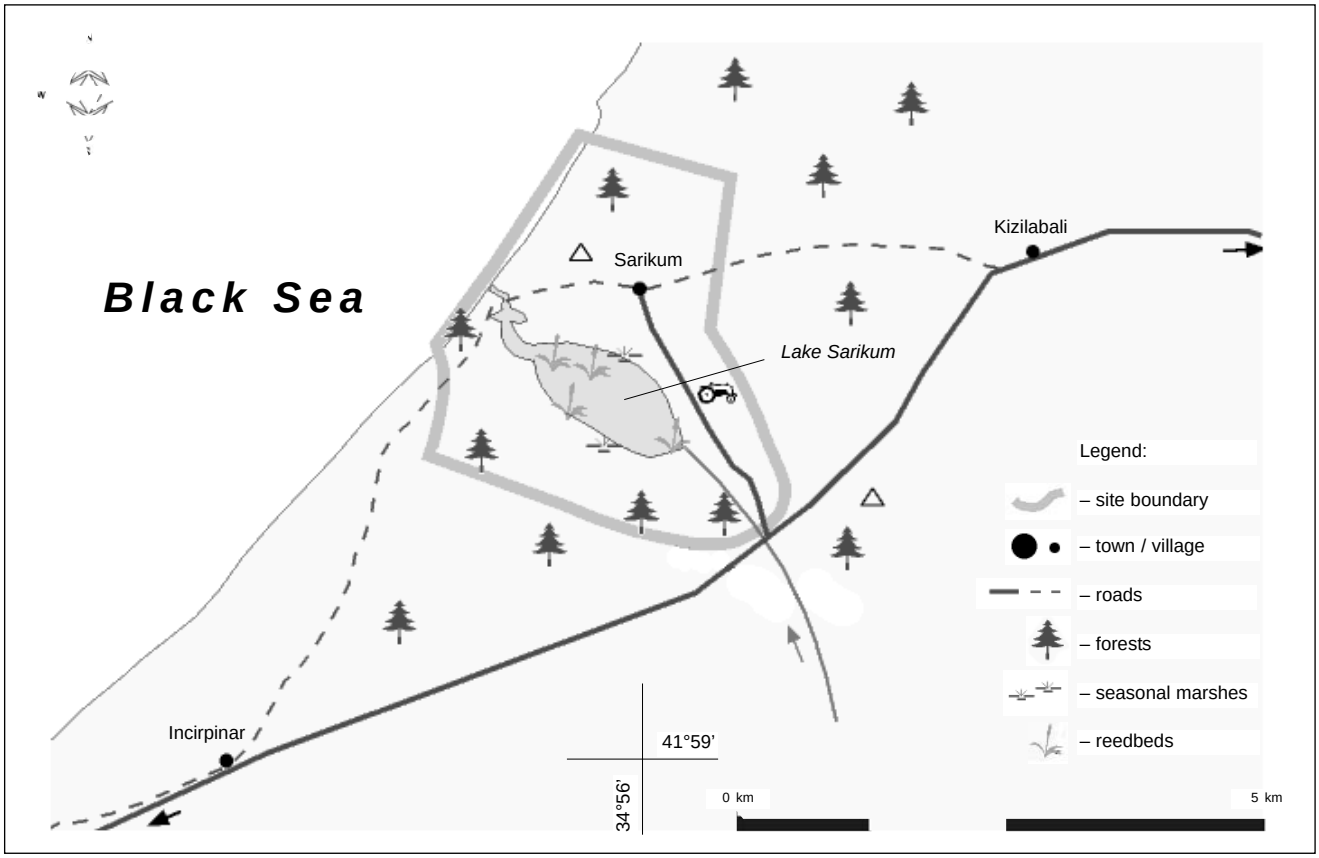


Map 2. The Igneada Flooded Forest

Land tenure: Most of the area is state-owned.
Conservation measures taken: IBA No 02. In 1978, the majority of the IBA was declared a Permanent Wildlife Reserve (5,399 ha). The southern part of the IBA (1,345 ha) was granted Nature Reserve status in 1988: initially the Ministry of Forestry employed wardens but these were withdrawn in 1995. The whole area was granted SIT status during 1990 and 1991 (in two stages).
Conservation measures proposed: The Turkish Ministry of Forestry and the Ministry of Environment have initiated a GEF/World Bank-funded project at the site. The project aims to conserve biodiversity by ensuring a participatory management approach. A conservation/management project has been initiated in 2001.
Land use: Most of the surrounding area is forested or used for agriculture. The Ministry of Forestry has a large tree nursery in the centre of the forest. In addition, there are large private poplar plantations, especially near Lake Pedina. Adjacent to the Nature Reserve are a few scattered farms, which grow mainly fruit and vegetables. Grazing of cattle (especially water buffalo) and sheep occurs lightly across most of the area. There are small fisheries in Lake Mert. The village of Igneada is a major centre for offshore fishery. At Lakes Mert and Erikli reeds are harvested by local people and sold to an export company.
Disturbances and threats: Possibly the most important threat to the area are the plans by ISKI (the Istanbul Water and Sewerage Administration) to divert water from the Istranca Mountains to Istanbul in order to augment the city's drinking water supplies. Eventually, this large scheme plans to build four regulators and a reservoir on the five major streams flowing into the flooded forests. Obviously, any major reductions in the water input to the wetland area could have disastrous environmental consequences. Possible impacts should be studied by the authorities as a matter of urgency before plans are developed further. Another major threat is the projected Bulgaria-Turkey coastal highway, which would bisect the area. Some sources claim that these plans have been shelved due to environmental concerns, but no confirmation of this has been obtained. The persistent rumours about the possible construction of the highway have increased land speculation in and around the area. The main threat is the construction of holiday-home complexes: some have already been built on the shores of Lakes Erikli and Mert. Especially noteworthy is the case of a 1,800-member co-operative, established in the 1970s, which received permission to build houses in the centre of Lake Mert. Access roads to the lake were built, but the project was not developed further due to technical difficulties in dealing with the wet conditions and, more recently, environmental concerns. As a result of the area's becoming a SIT, this project was cancelled permanently. People from other regions in Turkey continue to migrate to the Igneada area, increasing human pressure on the natural areas. Small areas of forest are continually being cleared and converted. In winter, shepherds open or lower the outlets to the sea in order to reduce the area of flooded land. Every year all the reed is cut in Lake Mert, leaving no areas with old reed-beds where birds can nest. Clearing the natural forest for poplar plantations takes place in areas within and adjacent to the Nature Reserve. Sand extraction takes place illegally along the Bulanikdere stream and on the beach near Lake Mert. Sand is used for construction in the town of Igneada.
Economic and social values: The surrounding inhabitants are highly dependent on wetland and forest-resource activities such as fishery, animal husbandry, reed cutting and forestry. Tourism is developing along the entire Black Sea coast and has now reached Igneada.
Fauna: The site qualifies IBA criteria for its breeding population of *Ciconia nigra* (5 pairs). The site lies on a major bird migration route (cf. Bogazici IBA No 5), and significant numbers of *C. ciconia* (max. 8,366 over two days) fly over the site during autumn migration. Although no comprehensive counts have as yet been undertaken, evidence suggests that the area is also a bottleneck for migratory raptors.
Special floristic values: The following rare species have been recorded: *Aurinia uechtritziana, Centaurea arenaria, C. kilaea, Jurinea kilaea, Peucedanum obtusifolium, Silene dichotoma, S. songarica, Stachys maritima* and *Ulmus* ssp. The rare flooded forest is dominated by *Fraxinus ornus.*
Research facilities: No detailed research has been carried out.

2. Lake Sarikum

Location: 42°01'N, 34°55'E. Approximately 28 km to the west of the major city of Sinop.
Area: 785 ha (150 ha lake).
Altitude: Sea level.
Wetland type: K.
Other hydrologically linked wetlands: None.
Description of site: A complex of dune, lake and forest habitats in a broad valley at sea level. The natural interest of the site is centred on a shallow, brackish, coastal lake (184 ha) which is fed by several streams and dis-



Map 3. Lake Sarikum

charges through a channel into the sea at periods of high water.

Geology, geomorphology and soils: The bed of the lake is sandy. The lagoon is connected to the sea via a 30-m long outlet.

Principal vegetation: Especially in the southwest, large areas are densely vegetated with swamp and fen species including *Juncus* sp. and *Phragmites australis.* South of the lake and extending several kilometres inland there is an extensive, seasonally flooded forest of *Fraxinus angustifolia.* On drier ground, extensive *Quercus* and *Carpinus* forests surround the lake, whilst part of the dunes have been forested with *Pinus.* A small village and arable fields lie within the boundaries of the IBA. Cattle are grazed in and around the wetland. Several commercial fish species occur, but the Nature Reserve regulations ban fishing.

Land tenure: The village is a private area. The lagoon and surrounding forest belong to the state.

Conservation measures taken: The area was declared a SIT in 1991 and Nature Reserve in 1987.

Conservation measures proposed: None.

Land use: Under Nature Reserve regulations all human activities are banned, however a small village is located in the reserve and a few cattle are traditionally grazed in the area.

Possible changes in land use: Less pressure from local people as local incomes decline.

Disturbances and threats: Large numbers of visitors cause considerable disturbance at weekends. The lake is silting up rapidly, and the area of reed-bed is expanding as a result. Afforestation of the dunes will lead to further loss of important dune vegetation.

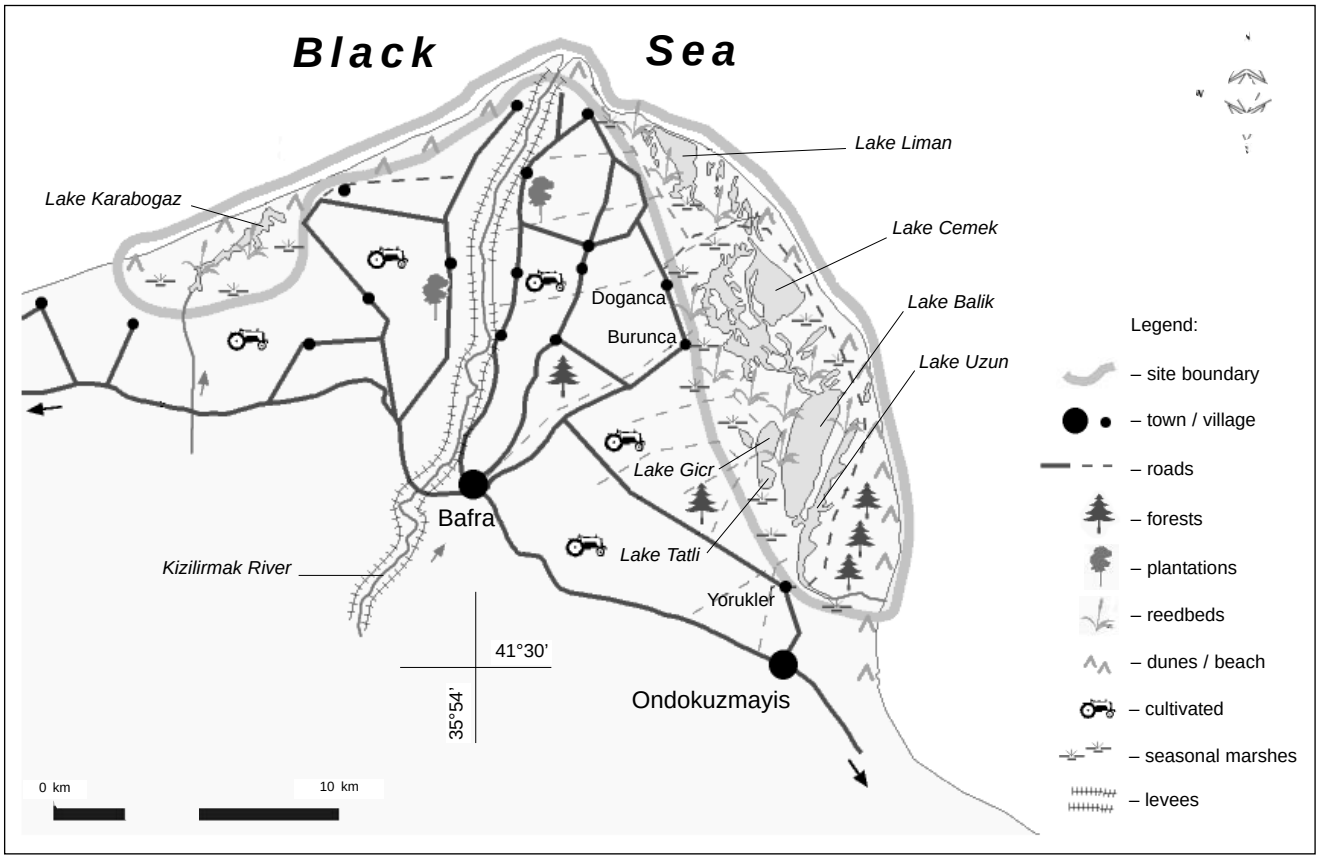
Economic and social values: Site has ecotourism value.

Fauna: Wintering waterbirds (max. 20,266), including *Oxyura leucocephala* (max. 55).

Special floristic values: Rare species recorded: *Alyssum stribrynyi, Convolvulus persicus, Corispermum filifolium, Isatis arenaria, Jurinea kilaea, Mulgedium tataricum, Peucedanum obtusifolium, Polygonum mesembricum, Silene dichotoma, Stachys maritima* and *Verbascum degeneii.*

3. Kizilirmak Delta

Location: 41°36'N, 36°05'E. The Kizilirmak Delta, where the 1,182-km River Kizilirmak (catchment 78,000 km^2) flows into the Black Sea.
Area: 21,700 ha.
Altitude: Sea level.
Wetland type: F, K, 3.
Description of site: The Kizilirmak Delta is the largest and most intact wetland on the Turkish Black Sea coast. The entire delta covers 56,000 ha, of which 70% is now used intensively. The remaining 16,110 ha of natural habitat comprises the eastern part of the delta (13,400 ha), where six lakes (Balik, Uzun, Cernek, Liman, Gici and Tatli) are situated, and the western part (2,710 ha), which includes Lake Karabogaz. Of the 16,110 ha of natural habitat, 2,600 ha are open water, 5,600 ha marsh vegetation, 2,100 ha dunes and sand, 4,500 ha farmland and 1,310 ha woodland (the remains of the once-extensive forests that formerly covered large parts of the delta).
Climate: The Kizilirmak Delta has a climate typical for the Black Sea coastal region: mild winters, high precipitation and fairly high temperatures. The mean precipitation recorded at the meteorological station in Bafra is 726 mm/year. The mean annual temperature is c. 13.4°C: in winter the minimum temperature is 4°C; in summer (July) the maximum temperature is 23°C. Snowfall is rare.
Geology, geomorphology and soils: The Kizilirmak Delta has been formed in the last few thousand years by sediments transported by the River Kizilirmak. In the delta area, mainly Holocene (alluvium) deposits are found. These deposits consist of gravel, sand and clay. The (old) river bed consists mainly of sand and gravel, whereas the plains are composed chiefly of sand, silt and clay. Today the river runs in a single bed through the middle of the delta. Along the riverbed, soils consist mainly of silt and silty clay. Throughout the wetland area, changes in the soil structure and texture can be observed: the change from silty-clay to heavy clay is the result of differences in flooding over the years.
Principal vegetation: The lakes in the eastern part of the delta are covered by extensive marshes. The vege-



Map 4. The Kizilirmak Delta

tation of the wetter parts of the marshes consists mainly of reeds mixed with Reedmace and Bulrush (*Scirpus* ssp.). Other plant species occurring in very wet marshy areas include *Butomus umbellatus, Sparganium erectum, Glyceria* ssp., *Carex* sp., *Cyperus* ssp. and *Cladium mariscus.* At some sites, aquatic Nymphaeaceae vegetation is present. The *Phragmites/Typha* vegetation occurs mainly in shallow water, flooded grassland and within the borders of Lakes Liman and Cernek, with grasses and herbs such as *Cynodon dactylon, Narcissus tazetta, Plantago* sp., *Potentilla* sp. and *Euphorbia.* Dunes and beach (ca. 2,100 ha). The vegetation in the primary dunes beside the sea consists mainly of *Euphorbia, Pancratium maritimum, Verbascum* sp. and *Cyperus capitatus.* The vegetation is less than 1 m high and average coverage is *c.* 20%. On older dunes a large variety of shrubs and low trees occur, including *Laurus nobilis, Arbutus unedo, Myrtus communis, Erica arborea, Rhododendron ponticum, Buxus sempervirens, Hippophae rhamnoides, Cornus mas* and *Euonymus.* Woodland (1,100 ha). The Galeric forest is one of Turkey's remaining flooded forest ecosystems. The forest is separated from the sea by dunes and marshland. *Fraxinus oxycarpa* is by far the most abundant tree species throughout the forest. Widespread but less abundant or occurring only locally are *Quercus* ssp., *Carpinus betulus, C. orientalis, Salix* ssp., *Cotinus coggygria,* and *Crataegus monogyna.* Most of the trees have an estimated age of 40-80 years and are 10-20 m tall, with some older trees (*Fraxinus* and *Populus*) up to 30 m.

Land tenure: Land tenure in the delta is very complicated. The ownership map indicates five different forms of land tenure. Ownership of a 1,110 ha area on the north coast of the eastern part of the delta, between Lake Liman and the lighthouse, is disputed by the Ministry of Treasury and private landowners. On the official land ownership map, pasture areas are shown rather smaller than the existing grazing areas because some areas of state-owned land are still used as a pasture by local people.

Conservation measures taken: Lake Cernek and its surroundings were declared a Permanent Wildlife Reserve in 1979 (4,000 ha). In 1994, the majority of the eastern half of the delta was declared an SIT. A management plan for the delta was completed and enforced by the Ministry of Public Works in 1996. The plan regulates all land use in the delta, and is especially important for the restriction places on the construction of holiday homes. In 1998, the area was designated as a Ramsar site.

Conservation measures proposed: The DHKD has proposed that the Ministry of Environment designate the site as a Special Protected Area. In addition, the DHKD and Ministry of Environment intend to prepare a management plan for the area.

Land use: The main occupations of the delta's inhabitants are agriculture-related. Other important occupations are livestock raising, fishery and reed cutting. Almost 30,000 ha of the plain are still used for growing vegetables, sugar beet, corn, wheat and rice. Livestock-raising is another major economic activity. According to DHKD research, a total of 24,500 animals graze around the wetland area; this figure includes *c.* 3,000 water buffaloes, 9,000 cows, 10,000 sheep, 400 horses, and 26 camels. Grazing animals occur everywhere, with camels, cows, horses and sheep typically found on dry grassland, in the dunes and woodlands, and water buffaloes found mostly in the wetter parts of the delta. About 280 members of three co-operatives are engaged in fishery. In winter, reeds are cut in many areas around Lake Cernek and the northern part of Lakes Balik, Gici and Tatli, under the control of the Ministry of Agriculture. In late winter, local people transport the reeds to a camp, and from April to June the reeds are tied into sheaves. The reeds are mainly exported. According to DHKD socio-economic research, people who live around Lakes Gici and Tatli, in particular, use the reeds to produce items such as baskets and mats. Some villagers also use the reeds to cover the roofs of primitive animal shelters.

Disturbances and threats: In 1948, the first drainage channels were dug in the delta. A total of 55,000 ha (including low-lying areas south of Bafra) were protected from flooding: the river was embanked along most of its lower reaches. In 1990 Altinkaya Reservoir (35 km south of Bafra) and in 1992 Derbent Reservoir, immediately to the north, were completed. The wetland is polluted by agricultural run-off and untreated sewage from Bafra, which flows into Lake Cernek through the Badut channel, leading to eutrophication. A major and irreversible threat to the remaining wetland area in the Kizilirmak Delta is the construction of holiday-home complexes. In 1987, there were just ten small houses north of the forest. By 1999, some 200 houses had been completed. Many more houses were under construction, mainly to the east and north of the forest.

Economic and social values: The approximately 12,000 people who live around the wetland area are highly dependent on wetland resources. Reed cutting is one of the main profitable activities in the area. The gross market value of 300,000 kg of *Juncus acutus* originating from the Kizilirmak Delta is $ 384,000–494,000 (final consumer price). Of this amount, 44% is earned directly by the people living around the wetlands ($ 176,000). The minimum of 7,500 labour days required to harvest this quantity of *Juncus* and 1,000 days of drying and bundling labour amounts to $ 15,000. The remaining 56% of the value is distributed and retained by outside traders. The harvested reeds are exported as thatch or insulation material, while locally they are used for thatching animal barns, as animal bedding, and as fuel for cooking stoves in the villages. In the winter of 1997, 73,350 bundles

of reed were harvested from the Kizilirmak Delta by the village of Doganca, which is the main contributor to the reed harvesting co-operative. The total value of common reed harvested annually, based on the official numbers and final consumer price, is $ 240,000. Of this sum, almost $ 20,000 is earned directly by the people living around the wetlands.

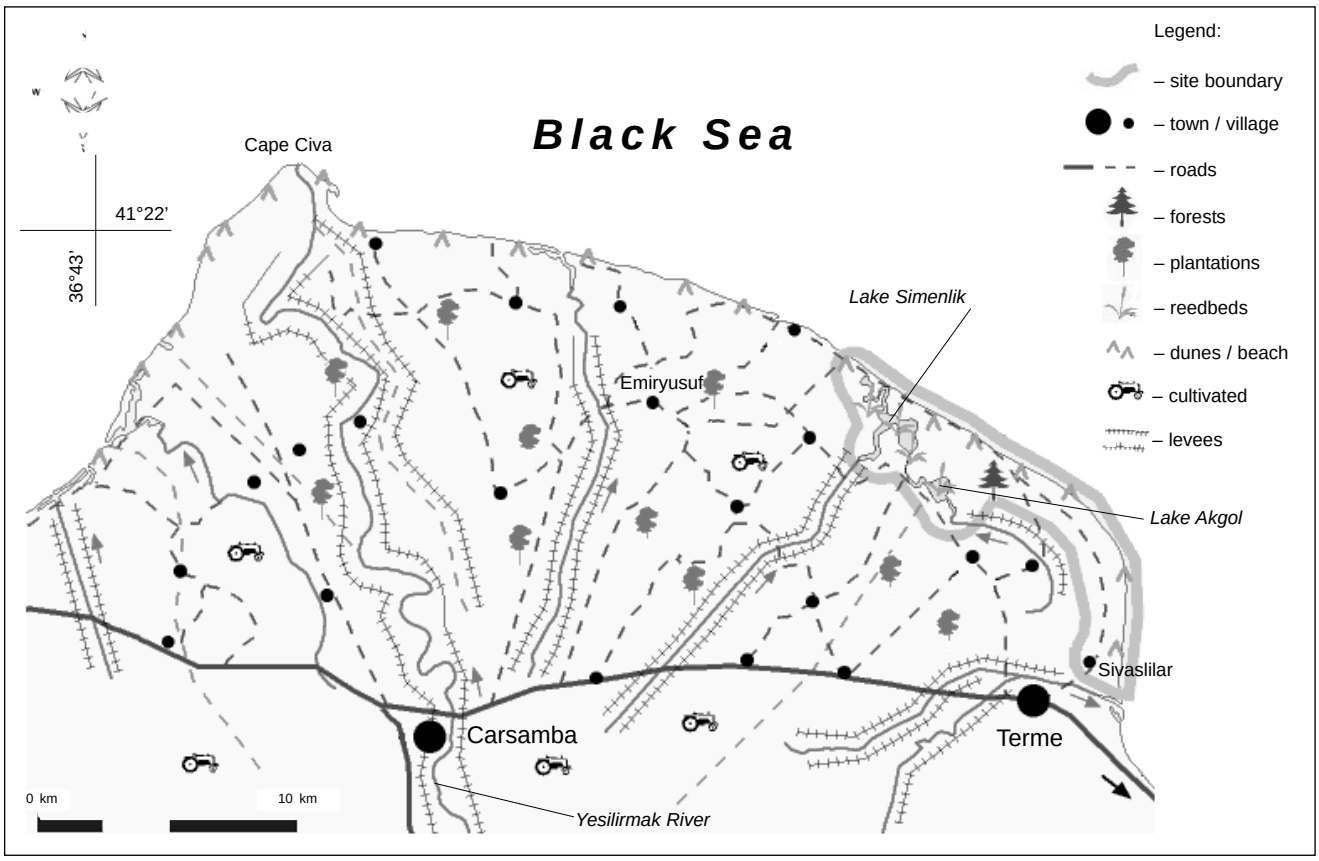
Table 2. Breeding bird species in the Kizilirmak Delta

Species	Breeding pairs
Acrocephalus melanopogon	1,500
Acrocephalus scirpaceus	2,000
Ardea purpurea	500
Aythya nyroca	200
Botaurus stellaris	200-250
Ciconia ciconia	130
Ciconia nigra	45
Circus aeruginosus	275
Grus grus	50
Motacilla feldegg	2,500
Netta rufina	75
Pelecanus crispus	6
Porphyrio porphryio	?

Fauna: Mammals and reptiles: The following mammals and reptile species have been recorded in the delta: *Erinaceus europaeus, Crocidura/Sorex* sp., *Talpa europea, Lepus capensis, Sciurus vulgaris, Rattus norvegicus, Mustela nivalis, Vulpes vulpes, Felis silvestris* and *Phocoena phocoena.* The most common reptile species in the dunes area is *Testudo graeca*; almost 150 individuals were seen in April-May 1992. *Emys orbicularis* is also a very common species in the lakes and marshes. *Lacerta trilineata/media, Podarcis muralis, Ophisaurus apodus, Coluber caspius, Natrix n. persa, N. tessellata* are other reptile species observed in the delta. Birds: Of the 440 bird species known in Turkey, 310 have been recorded in the Kizilirmak Delta. Some of these birds are very rare and are seen only occasionally in Turkey. Amongst these rare species are *Phalaropus tricolor, Anthus hodgsoni, Emberiza pusilla* and *Plectrophenax nivalis,* which have been seen only in the Kizilirmak Delta. However, other bird species in the delta are threatened on a global scale: *Pelecanus crispus, Branta ruficollis, Oxyura leucocephala, Aquila heliaca, Haliaeetus albicilla, Falco naumanni* and *Otis tarda.* The results of a 1992 breeding bird survey indicate that approximately 140 species breed in the delta, including 7–8 heron species, 10–12 ducks, 8–11 raptors and 9–10 waders. Passerines were the most common group, with 59–63 species recorded breeding. The numbers and occurrence of many typical wetland species, often rare and endangered, clearly indicate the ornithological importance of the Kizilirmak Delta. In addition to harbouring a diverse avifauna with rare and/or globally threatened species, the Kizilirmak Delta is also of major importance during migration and winter, especially for waterfowl and other species associated with wetland. Midwinter waterbird counts have recorded almost 70,000–100,000 waterbirds, of which 30,000–50,000 were ducks of various species. Fish: Fish species occurring in the delta are *Aphinus chantrei, Gambusia affinis, Gasterosteus aculeatus, Cyprinus carpio* and *Gobius* ssp.

4. Yesilirmak Delta

Location: 41°18'N, 35°34'E.
Area: 16,043 ha.
Altitude: Sea level.
Wetland type: K, 3, 4.
Description of site: The greater part of the delta has been converted to agriculture. The main part of the present wetland is the Simenlik-Akgol Lake complex: a 1,900 ha area in the eastern part of the delta, of which 200 ha is open water (maximum 3 m deep), the remainder being covered by reed and swamp vegetation. There are small lakes and lagoons (Gagali, Dumanli, Akcasaz and Ahubaba) in the central and western parts of the delta.
Climate: Like the Kizilirmak Delta, the Yesilirmak Delta has a climate typical for the Black Sea coastal region: mild winters, high precipitation and fairly high temperatures. The mean precipitation is about 750 mm/year. Snowfall is rare.
Conservation measures taken: Information on the natural importance of the Yesilirmak Delta prior to large-scale drainage is not available, but if the importance of the Kizilirmak Delta today is regarded as an indication, the Yesilirmak Delta was once one of Turkey's most important wetland areas. The Simenlik-Akgol Lake complex, together with a large area around it, was declared a Permanent Wildlife Reserve in 1975 (16,043 ha).
Land use: Most of the surrounding area is occupied by agricultural fields and poplar plantations.
Disturbances and threats: The main threats are hydrological manipulation and extension of agricultural areas. The River Yesilirmak is embanked along its lower course and a number of dams have been built on it. In 1968, a large flood protection scheme was initiated, designed to protect 67,000 ha of floodplain. In 1970, DSI (State Water Works) completed the reclamation of 16,000 ha of wetland, principally to the south and east of Terme.



Map 5. The Yesilirmak Delta

Over the years, many thousands of hectares of wetland have been drained by government institutions and local people. A total of over 70,000 ha of wetland in the Yesilirmak Delta has been converted to agriculture during the past four decades. All the inland wetlands (including Dipsiz and Kus ('Bird') Lakes) have disappeared. Karabogaz stream, which used to flow into Lake Simenlik (which formerly had two islands), was diverted, reducing the size of the lake and splitting it into two parts (Lakes Simenlik and Akgol). Pine forests intended to stabilise the dunes threaten their original vegetation. *Salix* and *Alnus* have been planted in many wet places (e.g. in sedge fens) and will eventually destroy these sensitive habitats. The Simenlik-Akgol Lake complex is fed entirely by drainage from irrigated areas, which has led to severe eutrophication and the lakes' becoming choked by reed.

Economic and social values: The delta is a dense network of roads, villages and agricultural land (especially rice and hazelnut) noted for its high agricultural output. Large poplar plantations are found in the wetter parts of the delta. Six tonnes of fish were caught at the Simenlik-Akgol Lake complex in 1995. Reed cutting is an important source of income, with 400 tonnes harvested in 1994 and 500 tonnes in 1995. The bulk of the reed is exported to Germany.

Fauna: Site qualifies as an IBA for its breeding population of *Ardeola ralloides* (30 pairs) and wintering populations of *Netta rufina* (max. 520) and *Melanitta fusca* (max. 870). Breeding birds of the area include *Nycticorax nycticorax* (9 pairs), *Egretta garzetta* (30 pairs) and *Plegadis falcinellus* (7 pairs). *Bubulcus ibis* is frequently observed and believed to breed. Moderate numbers of waterfowl (including up to 7,750 *Anas platyrhynchos,* 3,000 *A. crecca,* 5,400 *Aythya ferina* and 1,600 *A. acuta*) occur in winter, although most of the ducks are forced to spend the day at sea as a result of human disturbance in the wetlands. At night, the birds feed in the delta.

Special floristic values: Some rare plant species have been recorded, particularly on the dunes: *Aster tripolium, Corispermum filifolium, Hydrocotyle vulgaris, Kyllinga brevifolia, Phyla nodiflora, Polygonum mesembricum, Silene dichotoma, Stachys maritima* and *Tournefortia sibirica.*

5. Lake Terkos

Location: 41°19'N, 28°32'E. Lake Terkos is situated almost 40 km north-west of Istanbul.
Area: 5,850 ha.
Wetland type: K.
Description of site: The site comprises a freshwater lagoon, coastal sand dunes, and reed-beds. The lake is one of the main water sources for Istanbul but is being filled by sand that blows in from the coast.
Geology, geomorphology and soils: The combined inflow of four streams formed Lake Terkos behind a natural embankment at mean sea level. The water drains from a catchment of semi-natural vegetation composed of coppiced forest and heathland; the lakebed has a slightly acidic sand/clay and soft limestone/calcareous soil. The lake is separated from the sea by a 5-km long and 2-km wide dune.
Principal vegetation: Four basic vegetation types can be recognised within the site. Sand dune vegetation: very variable and including fixed vegetation on fossil dune sites, cliff dune vegetation and mobile dunes associated with the seaward dunes and around blowouts. Forest vegetation: typically dominated by *Quercus*. These areas were formerly coppiced, but apparently have not been managed in this manner for several decades, and will most probably revert to tall forest in due course. Cliff vegetation: associated with an extensive line of sandstone cliffs, comprising a range of grassland and scrubland habitats, considerably influenced by the prevailing winds. Wetland vegetation: aquatic vegetation associated with openwater habitats, emergent vegetation associated with lake margins (*Phragmites* etc.) and swamp/pool communities with the dunes system itself, and along the margins of the original lake outflow channel.
Land tenure: The site is believed to be owned by the Turkish Treasury. It is currently managed by the Ministry of Forestry for forest protection and erosion control. Lake Terkos is one of the major sources of water for the City of Istanbul Water Company.
Conservation measures taken: None.
Land use: Fishery and agriculture are the main activities in the area.
Disturbances and threats: Afforestation and hunting pressure are the main threats of the area.
Economic and social values: Lake Terkos is one of the important water sources for Istanbul.
Fauna: *Ardeola ralloides;* large numbers of *Phalacrocorax carbo, Botaurus stellaris, Ardea purpurea, Nycticorax nycticorax* and *Egretta garzetta* breed at Lake Terkos. The site lies on a major migration route, and is especially important for storks and raptors.
Special floristic values: The flora of Lake Terkos is of exceptional importance. It includes many nationally and internationally rare species. Outstanding is the sand dune flora, which includes at least 20 nationally rare species. Notable amongst the rare species are: *Isatis arenaria* (endemic to Turkey), *Linum tauricum* ssp. *bosphori* (endemic to Istanbul), *Linaria odora* (extremely rare in Turkey) and *Silene songarica* (endemic to Black Sea shores of Northwest Turkey).

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UKRAINE

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INTRODUCTION

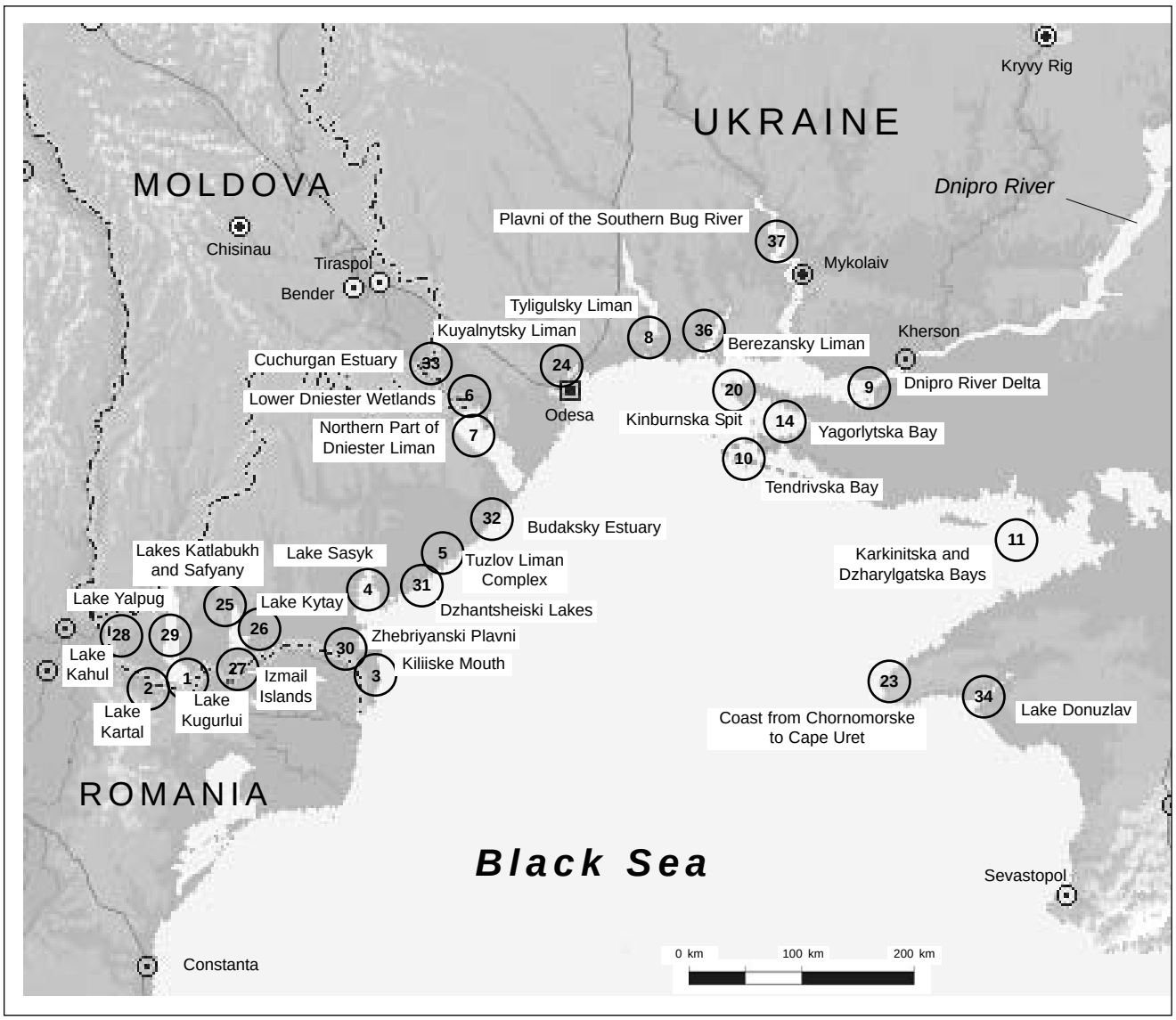
Ukraine stretches more than 1,300 km from west to east and 893 km from north to south. It occupies an area of 603,700 km^2 and lies between 52° and 44°N. Its 6,500-km border includes about 1,050 km of seashore, the precise length of the Ukrainian Azov-Black Sea coastline being 1,628 km. Ukrainian marine waters extend 12 nautical miles from the coast and cover an area of approximately 24,580 km^2.

The total population of Ukraine is about 50 million, 68% of which lives in urban areas. The land is mainly flat, however there are mountains in the west and south. Ukraine lies entirely within the temperate zone: the climate is moderate continental, apart from the southern coast of Crimea, which is subtropical. Ukraine is bordered by Belarus, Hungary, Moldova, Poland, the Slovak Republic, Romania and Russia. Ukraine comprises 24 administrative divisions – oblasts – and the Autonomous Republic of Crimea.

The country is rich in wetlands, including rivers, lakes, ponds, reservoirs, limans, saline lakes, marshes, peat bogs, floodplains and swamp forest. Approximately 5.3% of Ukraine is covered by wetlands, 3.8% of which are wet meadows. The transitory and dynamic nature of wetlands dictates the need for a complex approach to their definition. Under this definition the wetlands of the Black Sea basin include reed marshes, forest-dominated river flood-plains, inland lakes and lagoons, limans, deltas, sea lagoons and bays, silt or sand shells, and artificial bodies of water such as fish-breeding ponds, rice paddies and salt pans.

There are 14 main limans and estuaries on the Ukrainian Black Sea coast, with a total area 1,952 km^2; their salinity ranges from 0.3 to 296‰. There are eight bays with a total area of 1,770 km^2 and salinity of 3.0–18.5‰. According to recent data, there are 63,200 rivers in Ukraine, with a total length of approximately 206,400 km – the majority of which (98%) are in the Black Sea catchment. Three of these rivers are of particular significance for the wetlands of the Black Sea. The Danube is the second largest river in the Mediterranean/Black Sea Basin after the Nile, however only a small section of the Danube flows through Ukraine, at the boundary with Romania. The Dniester has a catchment of 72,100 km^2 in the Ukraine, is 1,352 km long and contributes 8.7 km^3 of freshwater to the Black Sea every year. The Dnipro (Dnieper) has the largest catchment area in Ukraine and a length of 981 km.

The coastal zone wetland ecosystems occupy vast areas linking the huge catchment areas with the Black Sea. The Black Sea coastal wetlands of Ukraine have undergone significant modification in recent decades, particularly through drainage, irrigation schemes and water diversion. However, Ukraine still has a remarkable number of very important coastal wetlands.



Map 1. The Black Sea coastal wetlands of Ukraine (numbers correspond with the numbers in the text and table 1)

Protected areas

Yagorlytska Bay (10) and Tendrivska Bay (11) are included within the Black Sea Biosphere Reserve. Kiliiske Mouth (3) and Zhebriyanski Plavni (30) are included within the Danube Biosphere Reserve. The Dniester-Turunchuk Crossrivers Area (6) is a local reserve. Tyligulsky Liman (8) and Kinburnska Spit (20) are Regional Landscape Parks. The Izmail Islands (27) are a part of Regional Landscape Park.

It has been proposed that a number of these sites form protected complexes:

Syvash Lagoon (central and eastern parts) (12, 13) and Utlyuksky Liman (21) are partly protected under the Azov-Syvash National Nature Park.

Lake Kugurlui (1), Lake Kartal (2), Lake Sasyk (4), Lakes Katlabukh and Safyany (25), Lake Kytay (26), Lake Kahul (28) and Lake Yalpug (29) have been proposed for inclusion in the Danube Biosphere Reserve.

Other sites not included in the directory:
1. The coast near Cape Kazantip (45°17'N, 35°52'E, Leninsky Rayon, Crimea, 48,000 ha).

2. Askanijsky Pod (46°27'N, 33°52'E, Chaplynsky Rayon, Kherson Oblast, 11 ha).
3. Biruchy Island (Zaporizhzhya Oblast).
4. Sukhoy Liman (Ovidiopol Rayon, Odessa Oblast, 1,000 ha).
5. Land between the Rivers Kagilnik and Sarata (Tatarbunarsky Rayon, Odessa Oblast, 300 ha).
6. Islands near Kamenka-Dniprovska (Zaporizhzhya Oblast, 1,500 ha).
7. Kuchugury (Zaporizhzhya Oblast, 1,300 ha).
8. Hortytsya (Zaporizhzhya Oblast, 1,500 ha).
9. Zmiiny Island (45°15'N, 30°12'E, 17 ha).

Occurrence of threatened taxa in key sites

All taxa listed in the table 2 are included in either the Red Data Book (RDB) of Ukraine and 2000 IUCN Red List of Threatened Species. This list may not be comprehensive for individual sites as they are dependent upon data availability.

The species, included in the RDB of Ukraine are divided into such categories: RDB category I – endangered species; RDB category II – vulnerable species; RDB category III – rare species; RDB category IV – insufficiently known

Table 1. Overview of the coastal wetlands of Ukraine

No	Site	Oblast	Area (ha)	Sta - tus	Protected area (ha)
1	Lake Kugurlui	Odessa	6,500	R	Proposed
2	Lake Kartal	Odessa	500	R	Proposed
3	Kiliiske Mouth (Danube Delta)	Odessa	32,800	R	32,800
4	Lake Sasyk	Odessa	21,000	R	Proposed
5	Shagany - Alibei - Burnas La kes System (Tuzlov Liman Complex)	Odessa	19,000	R	Proposed
6	Dniester -Turunchuk Crossrivers Area (Lower Dniester Wetlands)	Odessa	7,600	R	4,374
7	Northern Part of Dniester Liman	Odessa	20,000	R	3,226
8	Tyligulsky Liman	Odessa/Mykolaiv	26,000	R	26,000
9	Dnipro River Delta	Kherson	26,000	R	1,000
10	Tendrivska Bay	Kherson	38,000	R	38,000
11	Karkinitska and Dzharylgatska Bays	Kherson/Crimea	87,000	R	27,946
12	Central Syvash	Kherson/Crimea	80,000	R	50,000
13	Eastern Syvas h	Kherson/Crimea	165,000	R	59,148
14	Yagorlytska Bay	Kherson	34,000	R	30,300
15	Molochnyi Liman	Zaporizhzhya	22,400	R	19,000
16	Obytochna Spit and Obytochna Bay	Zaporizhzhya	2,000	R	2,000
17	Berda River Mouth, Berdianska Spit and Berdianska Bay	Zaporiz hzhya	1,800	R	417
18	Bilosaraiska Bay and Bilosaraiska Spit	Donetsk	2,000	R	2,000
19	Kryva Bay and Kryva Spit	Donetsk	1,400	R	1,400
20	Kinburnska Spit	Mykolaiv	18,000	L	18,000
21	Utlyuksky Liman	Zaporizhzhya	26,000	N	9,183
22	Lake Aktash with Astanino Plavni	Crimea	3,030	N*	50
23	Coast from Chornomorske to Cape Uret	Crimea	9,600	N	Proposed
24	Kuyalnytsky Liman	Odessa	7,000	N	Proposed
25	Lakes Katlabukh and Safyany	Odessa	6,700	L	Proposed
26	Lake Kytay	Odessa	5,000	L	Proposed
27	Izmail Islands	Odessa	1,366	N*	1,366
28	Lake Kahul	Odessa	10,500	L	Proposed
29	Lake Yalpug	Odessa	13,374	L	Proposed
30	Zhebriyanski Plavni	Odessa	8,300	N*	8,300
31	Dzhantsheiski Lakes	Odessa	1,000	L	Proposed
32	Budaksky Estuary	Odessa	2,700	L	Proposed
33	Cuchurgan Estuary	Odessa	2,800	L	Proposed
34	Lake Donuzlav	Crimea	4,820	L	Proposed
35	Coast near Cape Opuk	Crimea	2,500	N	1,592
36	Berezansky Liman	Mykolaiv	11,600	N	Proposed
37	Plavni of the Southern Bug River	Mykolaiv	8,200	N	Proposed
		Total	**735,490**		**336,102 (45,7%)**

Notes: R - Ramsar site; N - wetland of national importance; N - wetland of national importance; potential Ramsar site; L - wetland of local importance.*

species.

Wetland research: Since the 1980s, the Azov-Black Sea Ornithological Station has developed the 'Tetis' Project, which includes the 'MAR-Ukraine' Scientific Programme for wetland study.

Legislative framework:

- **national legislation:** The Law on Nature Conservation (1991); The Law on the Nature Conservation Fund

Table 2. Occurrence of threatened taxa in key sites

Scientific name	IUCN Red List	RDB of Ukraine	Site														
			1	2	3	4	5	6	9	10	11	12	13	14	15	20	30	35
Mammals																		
Lutra lutra	VU A2cde	II			√	√		√										
Endemic species																		
Scirtopoda telum ssp. *falz-feini*	NE	II														√		
Spalax arenarius	VU A1c, B1+2c	II														√		
Birds																		
Branta ruficollis	VU B1+2c	II	√	√	√	√	√	√		√	√	√	√	√			√	
Falco naumanni	VU A1bce +2bce	II																√
Haliaeetus albicilla	LR/nt	II	√	√	√	√				√	√	√	√	√		√	√	
Numenius tenuirostris	CR C2b, D	I								√								
Otis tarda	VU A2c	II											√					√
Pelecanus crispus	LR/cd	II	√	√	√			√									√	
Phalacrocorax pygmaeus	LR/nt	II	√	√	√	√		√				√					√	
Somateria mollissima	NE	III								√	√			√		√		
Fishes																		
Acipenser nudiventris	EN A1acde +2d	I			√									√				
Acipenser ruthenus	VU A1cd	II			√			√	√									
Acipenser sturio	CR A2d	I			√						√							
Barbus barbus ssp. *borysthenicus*	NE	II							√									
Callionymus belenus	NE	IV								√	√							
Chalcalburnus chalcoides	DD	IV							√									
Hippocampus guttulatus ssp. *microstephanus*	NE	II			√					√	√			√				√
Hucho hucho ssp. *hucho*	EN A2bcde, B1+ 2bce	I			√													
Huso huso	EN A2d	II			√			√	√	√	√			√				√
Rutilus frisii	DD	I		√	√													
Umbra krameri	VU A1ace	II	√	√	√			√	√									
Zingel streber ssp. s *treber*	VU A1ce +2ce	III			√													
Zingel zingel	VU A1ce +2ce	III	√	√	√			√										
Invertebrates																		
Coenagrion lindeni	NE	I			√													
Coenagrion mercuriale	VU A2c	I			√													
Turricaspia lincta	NE	III	√		√			√	√									
Plants																		
Aldrovanda vesiculosa		II	√	√	√	√		√										
Chrysopogon gryllus		II	√	√	√													
Cladium mariscus		I	√	√	√						√						√	
Damasonium alisma		I													√			
Elytrigia stipifolia		II			√										√			
Epipactis palustris		III	√		√			√										
Eremogone cephalotes		I				√	√											

Continuation of Table 2

Scientific name	IUCN Red List	RDB of Uk - raine	Site															
			1	2	3	4	5	6	9	10	11	12	13	14	18	20	30	35
Glaucium flavum		II																
Leucojum aestivum		II	√		√			√										
Marsilea quadrifolia		I	√	√														
Orchis palustris		III	√		√			√						√		√		
Salvinia natans		II	√	√	√	√		√	√									
Trapa natans s.l.		II	√	√	√	√		√	√								√	

(1992); Resolution of the Supreme Council of Ukraine 'The Programme of Prognosis for the Development of Nature Conservation in Ukraine' (1994); Resolution of the Supreme Council of Ukraine 'Reinforcement of Conservation of International Wetlands' (1996).

- **international legislation:** Ramsar Convention, 1971; Bern Convention, 1979; Bonn Convention, 1983.

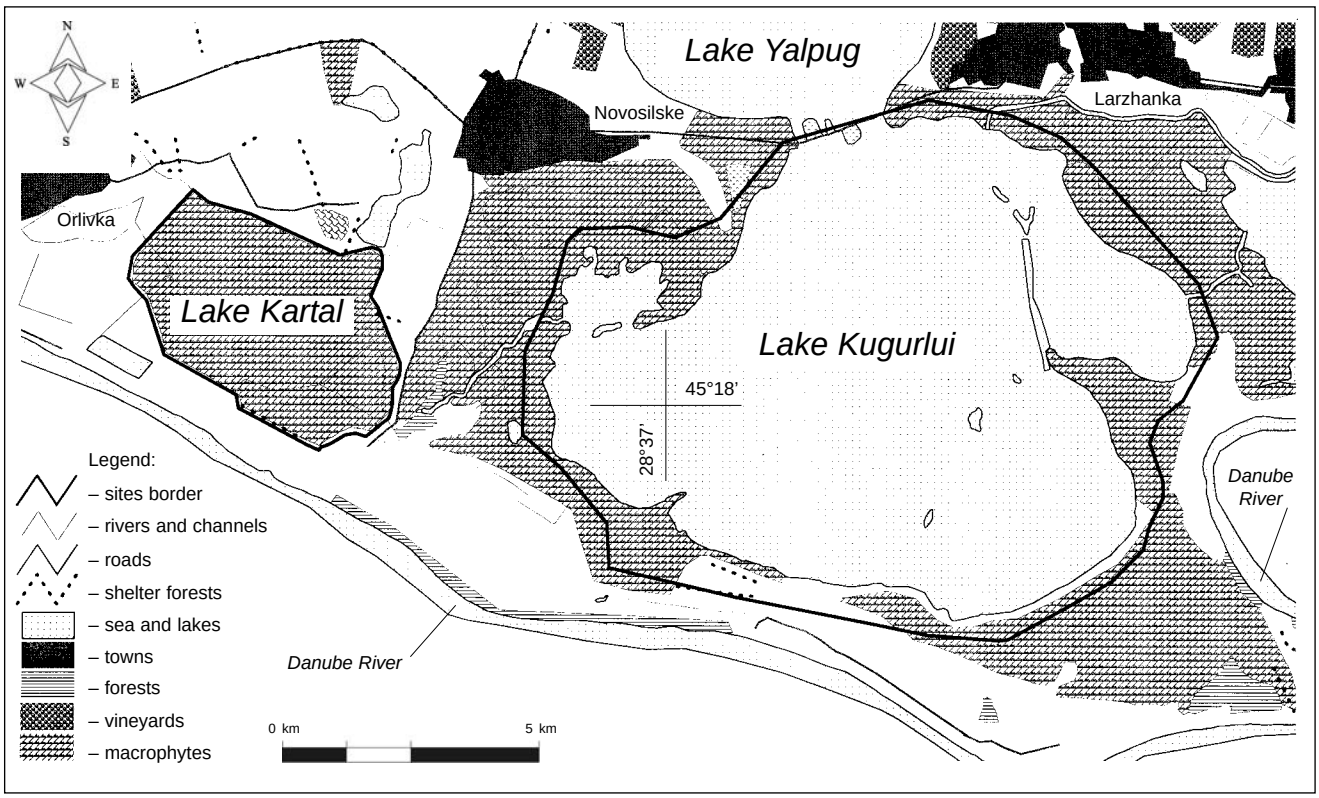
Wetland area administration: Ministry of the Environment and Natural Resources of Ukraine.

Organisations involved with wetlands: National Mechnikov University, Department of Biology, Odessa; Azov-Black Sea Ornithological Station, Melitopol; Institute of Zoology; National Academy of Sciences of Ukraine.

SITE ACCOUNTS

1. Lake Kugurlui

Location: 45°17'N, 28°40'E. In Izmail and Kiliya Rayons, Odessa Oblast, 10 km southwest of the village of Novosilske.
Area: 6,500 ha.
Altitude: 0.5-2.5 m above sea level.
Wetland type: O.
Other hydrologically linked wetlands: River Danube, Lakes Kartal and Yalpug.
Description of site: Lake Kugurlui is a freshwater lake with shallow margins. As the lake is relatively shallow, the water temperature responds rapidly to warm weather, leading to high organic productivity, which can benefit fish and waterbirds (although it can also result in algal blooms).
Water quality: Amounts of organic substances in the water vary from 14.05 to 18.06 mg/l, while the mineral content varies from 278 to 514 mg/l.
Principal vegetation: *Phragmites* reed-beds with areas of marshland, meadows, open water and halophyte communities with *Agrostis gigantea, A. stolonifera, Alopecurus pratensis, Azolla caroliniana, A. filiculoides, Carex acuta, C. acutiformis, C. pseudocyperus, Elytrigia maeotica, E. repens, Limonium gmelinii, L. meyeri, Nymphaea alba, Nymphoides peltata, Nuphar lutea, Phragmites australis, Potamogeton pectinatus, P. perfoliatus, Puccinellia distans, Schoenoplectus lacustris, Typha angustifolia, T. latifolia* and *Trapa natans s.l.*
Conservation measures taken: None.
Conservation measures proposed: A Ramsar site (3UA001). The site is included in the list of prospective sites of national importance. It will be included within the Danube Biosphere Reserve.
Land use: The main land uses within the site involve fishing, fish-farming, hunting, sheep and cattle grazing and commercial harvesting of reeds. Management is carried out only for economic activities.
Possible changes in land use: Not expected.
Disturbances and threats: In the past, natural links to the River Danube were disrupted through modification of the site, leading to increased sedimentation within the lake. However, flooding re-established this connection,



Map 2. Lake Kugurlui and Lake Kartal

leading to re-suspension of sediment and a decrease in overall water quality. At times, this has resulted in major fish mortality. An additional threat arises through illegal hunting and fishing.

Economic and social values: Lake Kugurlui is nationally important for environmental education, recreation and scientific research. The site supports an important local fishery and a number of important burial sites, which have been the subject of archaeological investigation. There is an insignificant level of casual tourism.

Fauna: Mammals: 22 species (micro-mammals and bats are not fully known): *Arvicola terrestris, Citellus suslicus, Meles meles, Microtus arvalis, Mustela lutreola, M. putorius, Neomys anomalus, Nyctereutes procyonoides, Ondatra zibethica, Sus scrofa, Talpa europaea* and *Vulpes vulpes. S. scrofa* and *O. zibethica* are the most numerous species in the area. *M. lutreola* and *Felis silvestris* are listed as 'threatened'. Birds: Of all the vertebrate fauna of the Lake Kugurlui and adjacent areas, the birds form the most diverse component. Up to 240 bird species have been recorded in the area, which is 94% of all the bird species recorded for the Danube Delta and adjacent wetlands during the past two decades. 42 bird species, including *Pelecanus crispus, Phalacrocorax pygmaeus, Branta ruficollis, Haliaeetus albicilla* and *Aythya nyroca,* are listed in the RDB of Ukraine and IUCN List of Threatened Species. The site supports up to 5,000 pairs of breeding waterbirds, predominantly in marshes and reed-beds. Numbers of non-breeding waterbirds may reach 30,000 individuals, concentrated in open water with a mosaic of reed-beds. Birds of note include 80 breeding pairs of *P. pygmaeus* and 150 pairs of *Platalea leucorodia*. There are 11 species of amphibians (*Rana ridibunda, R. esculenta* and *Bufo viridis*), 5 reptiles (*Emys orbicularis*) and 14 fish (*Abramis brama, Aspius aspius, Blicca bjoerkna, Carassius carassius, Cyprinus carpio, Esox lucius, Leuciscus*

Table 3. Waterbird populations at Lake Kugurlui (1998-1999)

Species	Breeding pairs	Non-breeding individuals
Anas platyrhynchos	50	3,500
Anser albifrons		4,000
Aythya ferina	40	4,500
Aythya nyroca	40-50	100
Branta ruficollis		700
Chlidonias hybrida	1,000	40
Chlidonias niger	10	40
Cygnus olor	180	600
Fulica atra	2,000	10,000
Larus cachinnans	100-200	500
Larus ridibundus	400	2,000
Netta rufina	1-2	1-2
Platalea leucorodia	40-240	
Plegadis falcinellus	80	100

idus, Lucioperca lucioperca, Perca fluviatilis, Rutilus rutilus, Scardinius erythrophthalmus, Silurus glanis and *Tinca tinca*). One species – *Triturus* sp. – is listed in the IUCN Red List. Invertebrates: RDB category III: *Turricaspia lincta.*

Special floristic values: RDB category I: *Cladium mariscus, Marsilea quadrifolia;* RDB category II: *Aldrovanda vesiculosa, Chrysopogon gryllus, Leucojum aestivum, Salvinia natans, Trapa natans s.l.;* RDB Category III: *Epipactis palustris, Orchis palustris.*

Research facilities: A number of studies have been carried out into the ecology of the site by organisations such as the National Mechnikov University, Odessa, and the National Academy of Sciences of Ukraine.

Public awareness and education: Conservation education is provided by local comprehensive schools. Information on the site includes posters and booklets plus lectures and publications by scientific and conservation experts from various scientific organisations.

Criteria for inclusion: 1, 4, 5, 6 and 8.

2. Lake Kartal

Location: 45°17'N, 28°31'E. In Kiliya Rayon, Odessa Oblast, 7 km southwest of the village of Orlovka.

Area: 500 ha.

Altitude: 1.4-1.6 m above sea level.

Wetland type: K, Ts.

Other hydrologically linked wetlands: River Danube, Lakes Kahul and Kugurlui.

Description of site: A deltaic freshwater lake with shallow margins (see Map 2). Lake Kartal forms part of the western complex of Danube lakes, with lakes Kahul, Yalpug and Kugurlui and artificial channels. Open water covers approximately 400 ha, otherwise Lake Kartal is physically very similar to Lake Kugurlui. As the lake is relatively shallow, the water temperature responds rapidly to warm weather, leading to high organic productivity, which can benefit fish and waterfowl but may also result in algal blooms.

Principal vegetation: *Phragmites* reed-beds with areas of marshland, meadows, open water and halophyte communities, supporting: *Agrostis gigantea, A. stolonifera, Alopecurus pratensis, Azolla caroliniana, A. filiculoides, Carex acuta, C. acutiformis, C. pseudocyperus, Elytrigia maeotica, E. repens, Limonium gmelinii, L. meyeri, Nymphaea alba, Nymphoides peltata, Nuphar lutea, Phragmites australis, Potamogeton pectinatus, P. perfoliatus, Puccinellia distans, Schoenoplectus lacustris, Typha angustifolia, T. latifolia* and *Trapa natans s.l.*

Conservation measures taken: None.

Conservation measures proposed: Lake Kartal is a Ramsar site (3UA002). The site is included in the list of prospective sites of national importance. It will be included within the Danube Biosphere Reserve.

Land use: The main land uses within the site involve hunting, fishing, fish-farming, sheep pasture and commercial harvesting of reeds. Management is carried out only for economic activities.

Possible changes in land use: Not expected.

Disturbances and threats: Known threats include unregulated burning of reed-beds and poaching by hunters and fishermen. Drainage operations have caused a decline in water quality.

Economic and social values: Lake Kartal is nationally important for environmental education, recreation and scientific research. The site supports an important local fishery and a number of important burial sites, which have been the subject of archaeological investigation. There is an insignificant level of casual tourism.

Fauna: Mammals: *Arvicola terrestris, Citellus suslicus, Meles meles, Microtus arvalis, Mustela lutreola, M. putorius, Neomys anomalus, Nyctereutes procyonoides, Ondatra zibethica, Sus scrofa, Talpa europaea* and *Vulpes vulpes*. Birds: The site supports up to 50,000 breeding waterbirds including *Phalacrocorax pygmaeus* and *Platalea leucorodia*, mainly in areas of marsh and reed-bed associated with open water. Outside the breeding season, water-

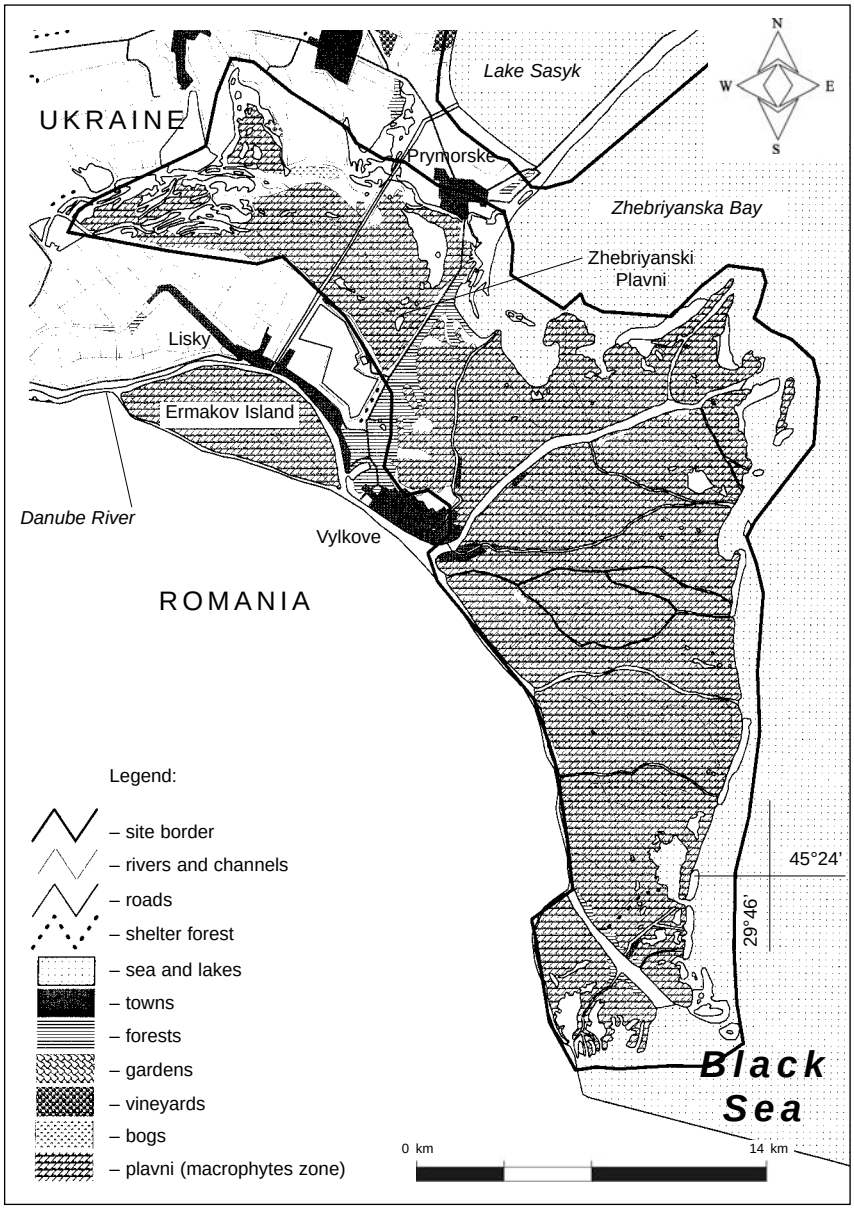
Table 4. Waterbird populations at Lake Kartal (1998-1999)

Species	Breeding pairs	Non-breeding individuals
Anas platyrhynchos	30	500
Anser albifrons		5,000
Aythya ferina	15-20	500
Aythya nyroca	30-40	100
Branta ruficollis		800
Chlidonias hybrida	200-500	100
Cygnus olor	60	250
Fulica atra	2,000	6,000
Larus cachinnans	10	300
Larus ridibundus	300	1,000
Pelecanus crispus	Occasional breeding	50
Pelecanus onocrotalus		500
Phalacrocorax pygmaeus		100

bird numbers can rise to 40,000, concentrated in open water and marshland. Amphibians: *Rana ridibunda, R. esculenta* and *Bufo viridis.* Reptiles: *Emys orbicularis*. Fish: *Abramis brama, Aspius aspius, Blicca bjoerkna, Carassius carassius, Cyprinus carpio, Esox lucius, Leuciscus idus, Lucioperca lucioperca, Perca fluviatilis, Rutilus rutilus, Scardinius erythrophthalmus, Silurus glanis* and *Tinca tinca.*
Special floristic values: RDB category I: *Cladium mariscus, Marsilea quadrifolia;* RDB category II: *Aldrovanda vesiculosa, Chrysopogon gryllus, Salvinia natans, Trapa natans s.l.*
Research facilities: A number of studies have been carried out into the ecology of the site by organisations such as the National Mechnikov University, Odessa, and the National Academy of Sciences of Ukraine.
Criteria for inclusion: 1, 4, 5, 6 and 8.

3. Kiliiske Mouth (Danube Delta)

Location: 45°22'N, 29°42'E. In Kiliya Rayon, Odessa Oblast, 30 km to the east of the city of Kiliya.
Area: 32,800 ha.
Altitude: 0.2-0.6 m above sea level.
Wetland type: F, L.
Other hydrologically linked wetlands: The Black Sea and wetlands of the lower part of the Danube Delta.
Description of site: The Kiliiske Mouth (Danube Delta) intertidal area is situated on the Black Sea near the principal mouth of the River Danube. This wetland area comprises channels, islands, freshwater lakes and sandy spits, which enclose bays on the seaward side of the delta. The wetland is important for wintering, migrating, breeding and moulting birds dependent on shallow waters. It is also important as a breeding and nursery ground for fish and amphibians. The site comprises mainly a young river delta with a complex habitat mosaic, including shallow coastal waters. The Kiliiske Mouth is formed predominantly of swamps, with numerous seasonal lakes, flooded valleys and islands. Along the coast are a number of small, open bays separated by sandbars. The site is highly mobile as a result of the powerful erosion and depositional influence of the channels and sea. The mouth of the Kiliya channel forms the main outlet of the River Danube into the Black Sea.
Water quality: The chemical structure of the water of the Danube is moderately hard, with average mineralisation. The oxy-



Map 3. The Kiliiske Mouth (Danube Delta) and Zhebriyanski Plavni

gen content falls within the limits of normal saturation, but is sometimes deficient in winter and high in summer. The hydrochemical regime of the wetlands is characterised by its inconsistency: fluctuations, in particular of salinity and temperature, are most marked in the areas closest to the river mouth, where salinity is 1.8‰. The silt load is on average 174 g/m^3; the water is particularly muddy in branches and their connecting channels. The water in the open bays is less muddy, and the silt load is significant lower in the closed and semi-closed bays. The water is muddiest in June and least muddy in October-November.

Principal vegetation: The main habitats represented are mainly marshlands, then open waters, flood-plain forests, meadows and halophyte communities, supporting 651 vascular plant species including *Agrostis gigantea, A. stolonifera, Alopecurus pratensis, Azolla caroliniana, A. filiculoides, Carex acuta, C. acutiformis, C. pseudocyperus, Elytrigia maeotica, E. repens, Limonium gmelinii, L. meyeri, Nymphaea alba, Nymphoides peltata, Nuphar lutea, Phragmites australis, Potamogeton pectinatus, P. perfoliatus, Puccinellia distans, Salix alba, S. cinerea, Schoenoplectus lacustris, Typha angustifolia, T. latifolia* and *Trapa natans s.l.* Most of the plants belong to the littoral floristic complex.

Table 5. Waterbird populations at the Kiliiske Mouth (1990-2002)

Species	Breeding pairs, max.	Non-breeding individuals, max.
Anas platyrhynchos	250	23,000 (on migration)
Anas querquedula	25	11,500 (on migration)
Anser anser	150	6,800 (in winter)
Ardeola ralloides	125	
Aythya nyroca	120	1,800 (on migration)
Charadr ius alexandrinus	10	250 (on migration)
Charadrius dubius	2-3	30 (on migration)
Cygnus cygnus	0	2,500 (in winter)
Cygnus olor	60	4,500 (on migration)
Egretta garzetta	430	
Fulica atra	500	8,000 (on migration)
Haematopus ostralegus	6	250 (on migration)
Larus cachinnans	2,420	2,500 (on migration)
Nycticorax nycticorax	490	
Pelecanus crispus	3 (unsucces.)	60 (on migration)
Pelecanus onocrotalus	0	2,500 (on migration)
Phalacrocorax carbo	4,000	20,000 (on migration)
Phalacrocorax pygmaeus	750	3,000 (o n migration)
Platalea leucorodia	0	1,400 (on migration)
Plegadis falcinellus	0	4,800 (on migration)
Recurvirostra avosetta	210	2,800 (on migration)
Sterna albifrons	60	
Sterna hirundo	5,500	
Sterna sandvicensis	5,000	

Conservation measures taken: A Ramsar site (3UA003). In 1998, the Danube Biosphere Reserve was established by a Decree of the President of Ukraine based on the Dunaiski Plavni Nature Reserve. In 1999, the International Romanian-Ukrainian Danube Delta Biosphere Reserve was established.

Conservation measures proposed: Zoning and land planning proposals are being developed.

Land use: Commercial fishing, fish-farming, commercial harvesting of reeds, forestry, market gardening, cattle and horse grazing, sports hunting and tourism.

Possible changes in land use: Changes may occur through the accumulation of sediment along banks due to dredging, reforestation close to river banks, pollution, overgrazing and land reclamation.

Disturbances and threats: Threats include pollution, over-grazing, land reclamation, anthropogenic disturbance, unregulated burning of reed-beds and illegal fishing and hunting.

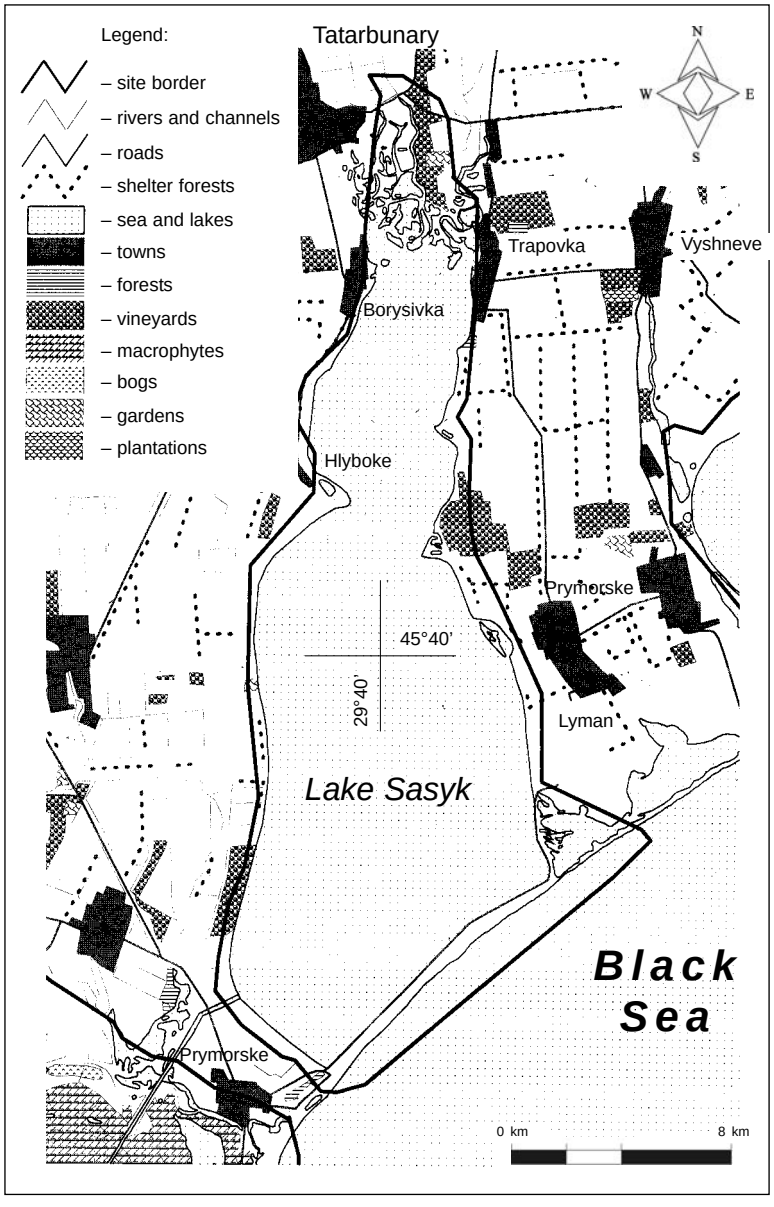
Economic and social values: The site is important for conservation education, recreation and scientific research and supports an important local traditional fishery. Water from the site is used to supply fish-farm basins and rice fields as well as to provide domestic supply for cities such as Vylkove and Kiliya. The main channel is the principal shipping route connecting the port of Ust-Dunaisk to other ports in Ukraine and other riparian countries of the River Danube.

Fauna: Mammals: *Microtus arvalis, Mustela putorius, Neomys anomalus, Nyctereutes procyonoides, Ondatra zibethica, Sus scrofa, Talpa europaea* and *Vulpes vulpes*. RDB category II: *Lutra lutra, Mustela lutreola.* RDB category III: *Arvicola terrestris.* RDB category IV: *Mustela erminea.* Birds: *Anas platyrhynchos, A. querquedula, Anser anser, Charadrius dubius, Cygnus cygnus, C. olor, Fulica atra, Haematopus ostralegus, Larus cachinnans, Phalacrocorax carbo, Recurvirostra avosetta, Sterna hirundo* and *Vanellus vanellus.* Most of the 25,000 pairs of breeding waterbirds nest in reed-beds and floodplain woodlands, on small islands and peninsulas. Outside the breeding season, the site may support more than 28,000 wintering waterbirds. Amphibians: *Bufo viridis, Hyla arborea, Rana esculenta* and *R. ridibunda.* Reptiles: *Emys orbicularis.* Fish: *Abramis brama, Aspius aspius, Blicca bjoerkna, Carassius carassius, Cyprinus carpio, Esox lucius, Leuciscus idus, Lucioperca lucioperca, Perca fluviatilis, Rutilus rutilus, Scardinius erythrophthalmus, Silurus glanis* and *Tinca tinca.* RDB category I: *Hucho hucho*

ssp. *hucho* (endemic subspecies); RDB category II: *Acipenser ruthenus, Gymnocephalus schraetser, Huso huso* and *Umbra krameri.* RDB category III: *Zingel streber* ssp. *streber* and *Z. zingel.* Invertebrates: RDB category I: *Coenagrion lindeni* and *C. mercuriale.* RDB category III: *Turricaspia lincta.*
Special floristic values: The flora of the Danube Delta includes 65 endemic Black-Caspian Sea floristic complexes. 16 species are listed in the RDB of Ukraine.
Research facilities: The Danube Biosphere Reserve of the National Academy of Sciences of Ukraine, institutes of the National Academy of Sciences of Ukraine (including the Institute of Biology of Southern Seas, Institute of Botany and Institute of Zoology), Ministry of Education (including Odessa State University and Odessa Hydro-Meteorological Institute) and Ukrainian Scientific Centre of Marine Ecology.
Public awareness and education: A public awareness programme is being developed for local people, including posters, journal and newspaper articles and brochures. In addition, training courses are being presented under the Biosphere Reserve programme.
Criteria for inclusion: 1, 2, 3, 4, 5, 6 and 8.

4. Lake Sasyk

Location: 45°39'N, 29°41'E. In Kiliya and Tatarbunary Rayons, Odessa Oblast, 5 km southeast of the city of Tatarbunary.
Area: 21,000 ha.
Altitude: 1-3 m above sea level.
Wetland type: J, K.
Other hydrologically linked wetlands: Stentsivsko-Zhebriyanski Plavni, Sarata and Kagilnik Rivers, Dzhantsheiski Lakes.
Description of site: Lake Sasyk is a reservoir that was constructed in 1978 on the site of a partly enclosed natural lagoon on a Pliocene-Quaternary terrace. Formerly the saline Sasyk Liman, the reservoir was formed by the construction of a dam on a natural shell-sand bar. Within the reservoir the shore slopes steeply, except in higher areas where the water is shallow and generally fresh, resulting in the development of marsh vegetation. Before the creation of the reservoir, water levels and temperatures in the lagoon correlated closely with those of the Black Sea. Subsequently, however, water levels have been adjusted artificially through input of water from the River Danube; this has led to a decrease in salinity.
Hydrology: The reservoir is served by a 5,363 km^2 catchment. It is 35 km long and up to 11 km wide, with 208 km^2 of open water with an average depth of 1.9 m, maximum depth of 3.3 m, and a total volume of 437,000,000 m^3.
Water quality: Salinity fluctuates between 2-3‰. The dissolved minerals are mainly NaCl, $MgCl_2$ and $MgSO_4$. Water temperature varies from 21.3-



Map 4. Lake Sasyk

21.7°C in summer to –0.8 to 1°C in winter. In some winters, the reservoir freezes over to a depth of 0.39 m for up to 90 days.

There are large blue-green algal blooms in summer, with a biomass of 100 mg/l (the 5th degree of bloom). In windy weather, the biomass of blue-green algae in the wind-driven water increases to 300-400 mg/l. There is increased content of heavy metals in bottom sediments (Rusev, 2001).

Principal vegetation: Vegetation is found mainly in openwater habitats and includes *Bolboschoenus maritimus, Phragmites australis, Potamogeton nodosus* and *P. perfoliatus.* Because of the change from saline to fresh water, the production of higher aquatic plants has declined by a factor of 26.

Conservation measures taken: Lake Sasyk is a Ramsar site (3UA004) and IBA No 7.

Conservation measures proposed: The site has been reserved for the creation of a regional landscape park.

Land use: Mainly fish farming and agriculture. Recreation and tourism are under-developed because of the poor ecology of the reservoir, which is related to the mass blue-green algal blooms and low water quality. There is as yet no provision for the development of recreational facilities and the local infrastructure is inadequate. The facilities reservoir itself is used for fishery. The water is no longer used for agriculture because of its salinity: in the 1980s some 60,000 ha of land in Tatarbunary Rayon became saline and alkaline having been irrigated by water from the reservoir.

Management: Management is carried out mainly within the framework of governmental fish farming and agricultural programmes. The Odessa Regional Administration of Water Farming controls the water level in Lake Sasyk, however because energy is becoming more expensive water exchange does not take place. Consequently the water becomes stagnant, resulting in mass blue-green algal blooms.

Possible changes in land use: The feasibility of restoring the reservoir in the marine liman (estuary) is being considered. Lake Sasyk is a reservoir of national importance: work is actively being carried out to restore it to its original state and return its status to that of marine liman. If this can be done, it might be possible to use the liman for recreation.

Disturbances and threats: The main threats to the site come as a direct consequence of the conversion of the lagoon into a reservoir, causing dramatic modification of former river channels and an artificial reduction in salinity through the introduction of water from the River Danube. This has already led to the loss of the saltwater fish fauna and is likely to have (or have had) a similar effect on other fauna and vegetation. When the lake was saline, natural water exchange occurred 8-10 times per year. Today, the Odessa Regional Administration of Water Farming is not able to support even a 50% water exchange annually and as a result aquatic life, especially fish, is killed every year because of the mass blooms of blue-green algae.

Economic and social values: Important for conservation education, recreation and scientific research. This reservoir cannot support a traditional fishery because in the past it was used only as a marine and liman fishery; fish production in the artificial lake is very low. The reservoir is not available for recreation.

Fauna: Mammals: *Arvicola terrestris, Lutra lutra, Micromys minutus, Mustela erminea, M. lutreola, Neomys fodiens, Nyctereutus procynoides, Ondatra zibethica, Sorex araneus, S. minutus* and *Sus scrofa.* Birds: Up to 6,000 pairs of waterbirds nest at the site, mainly in reed-beds, meadows in the upper and lower parts of the lake and on islands. Outside the breeding season, waterbird numbers may reach 100,000 individuals in

Table 6. Waterbird populations at Lake Sasyk (1991-2001)

Species	Breeding pairs	Non-breeding individuals
Anser albifrons		20,000 (in winter)
Anser erythropus		50 (in winter)
Anser anser	7	3,000 (on migration)
Anas platyrhynchos	70	15,000 (on migration)
Aythya ferina	70	18,000 (on migration)
Aythya fuligula		12,000 (on migration)
Branta ruficollis		250 (in winter)
Burhinus oedicnemus	5	
Charadrius alexandrinus	60	
Charadrius dubius	15	
Cygnus olor	15	3,000 (on migration)
Fulica atra	120	5,000 (on migration)
Glareola pratincola	15	
Haliaeetus albicilla		20 (in winter)
Himantopus himantopus	32	300 (on migration)
Larus cachinnans	100	1,500 (in winter)
Larus ridibundus	30	4,000 (on migration)
Mergus albellus		3,000 (in winter)
Pelecanus onocrotalus		2,000 (in summer)
Phalacrocorax pygmaeus		150 (in winter)
Podiceps cristatus	70	1,000 (on migration)
Recurvirostra avosetta	125	
Sterna albifrons	50	
Sterna hirundo	1,500	
Tringa totanus	40	
Vanellus vanellus	50	

October-November, concentrated in shallow water in the upper part of the reservoir and in coastal areas of the lower part (Korzyukov, Rusev *et al.* 1996, 1998, 1999; Chernichko & Siokhin 1993). Amphibians: *Bombina bombina, Bufo viridis, Rana ridibunda* and *Triturus vulgaris* predominate. Reptiles: *Emys orbicularis, Natrix natrix* and *N. tessellata.* Fish: 52 species of 12 families (Acipenseridae, Clupeidae, Cyprinidae, Esocidae, Cobitidae, Siluridae, Atherinidae, Gasterosteridae, Percidae, Gobiidae, Syngnathidae and Pleuronectidae), of which Percidae are the most successful breeding species.

Special floristic values: RDB category I: *Eremogone cephalotes;* RDB category II: *Aldrovanda vesiculosa, Salvinia natans* and *Trapa natans s.l.*

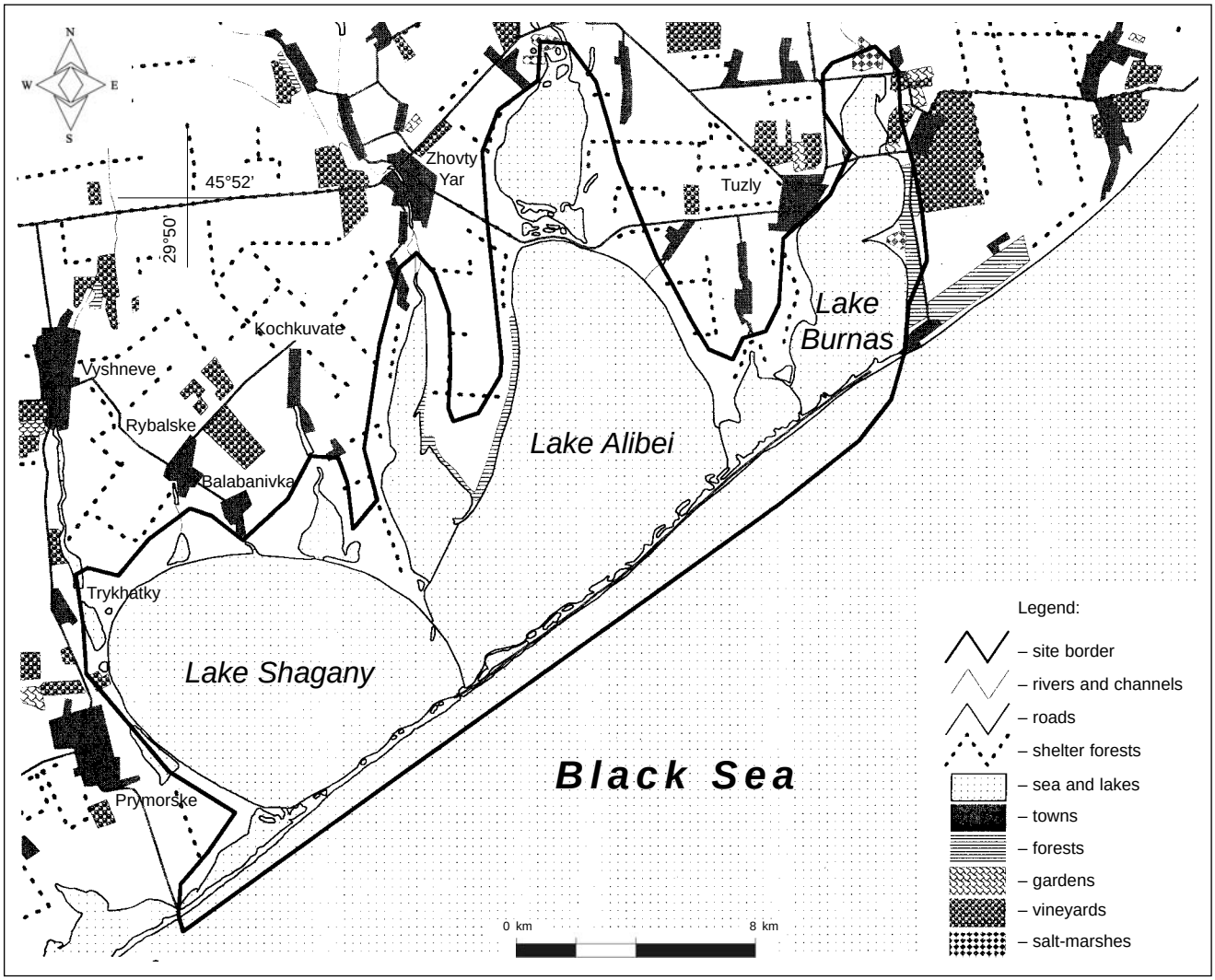
Research facilities: Long-term studies will be carried out by scientists from the National Academy of Sciences of Ukraine, the National Mechnikov University, Odessa, the Danube Biosphere Reserve and the "Wildlife Conservation" NGO.

Public awareness and education: A public awareness programme is being developed for local people, including posters, journal and newspaper articles and brochures. In addition, training courses are being presented under the Biosphere Reserve programme. Two books about Lake Sasyk were produced for local inhabitants (Rusev 1995, 2001).

Criteria for inclusion: 2, 4, 5 and 6.

5. Shagany-Alibei-Burnas Lakes System (Tuzlov Liman Complex)

Location: 45°48'N, 30°00'E. Lake Burnas lies close to the city of Tuzly; Lake Alibei is *c*. 10 km and Lake Shagany 24 km southwest of the city. All are in Tatarbunary Rayon, Odessa Oblast.



Map 5. The Shagany-Alibei-Burnas Lakes System (Tuzlov Liman Complex)

Area: 19,000 ha.
Altitude: 0.5-2.4 m above sea level.
Wetland type: J.
Other hydrologically linked wetlands: The Black Sea and small rivers in the upstream parts of the lagoons.
Description of site: The three sites within this complex comprise partly enclosed lagoons formed on small rivers, separated from the sea by sandy peninsulas. The downstream parts of the lagoons generally have steeply sloping shores with occasional peninsulas and islands, while the upstream parts are shallow with gently shelving shores.
Principal vegetation: The main habitats represented within the site are halophyte and openwater communities, supporting *Bolboschoenus maritimus, Limonium gmelinii, L. suffruticosum, Phragmites australis, Potamogeton pectinatus, Ruppia maritima, Salicornia europaea, Salsola soda, Suaeda prostrata* and *Zostera marina*.
Conservation measures taken: A Ramsar site (3UA005). Game Reserves have been created in the upper part of Alibei lagoon and near the village of Trykhatky.
Conservation measures proposed: This complex has been included in the list of proposed protected sites.
Land use: The main activities in the area are hunting, fishing, fish farming, sheep grazing, recreation and working salt pans. Tourism and recreation are declining due to increased silt deposition within the lagoons.
Management: Management of the site is carried out mainly within the framework of government fish farming and agricultural programmes.
Possible changes in land use: None known.
Disturbances and threats: The lagoons currently have no direct connection with the sea, water levels being generally dependent upon precipitation and agricultural run-off, leading to increasing siltation and eutrophication and sometimes causing fish mortality. In addition, over-grazing is leading to the degradation of plant communities.
Economic and social values: The site supports a traditional fishery. It is important for conservation education, recreation and scientific research.
Fauna: Mammals: *Citellus suslicus, Lepus europaeus, Meles meles, Microtus arvalis, Mustela lutreola, M. putorius, Nyctereutes procyonoides, Sus scrofa, Talpa europaea* and *Vulpes vulpes.* Birds: Up to 1,000 pairs of waterbirds nest in the site, mainly in saline meadows in the upper parts of the lake and on islands. Outside the breeding season, waterbird numbers can reach 120,000 individuals, concentrated on open water and agricultural land. Amphibians: *Bufo viridis*. Reptiles: *Emys orbicularis.*
Special floristic values: RDB category I: *Eremogone cephalotes*.
Research facilities: Scientists from the National Academy of Sciences of Ukraine and the National Mechnikov University, Odessa, plan to carry out ecological and balneological research.
Public awareness and education: Public awareness education is restricted to that provided by comprehensive schools. Training courses are being presented under the Biosphere Reserve programme.

Table 7. Hydrology of the Tuzlov Liman Complex catchment

	Shagany	Alibei	Burnas
Catchment area, km^2	278.8	1,300	649
Volume, m^3	101,900,000	127,700,000	31,900,000
Area of open water, km^2	78.4	101.4	26.9
Length, km	11	18	9.6
Maximum width, km	10	8	3.2
Average depth, m	1.3	1.2	1
Maximum depth, m	2.3	2.5	1.5

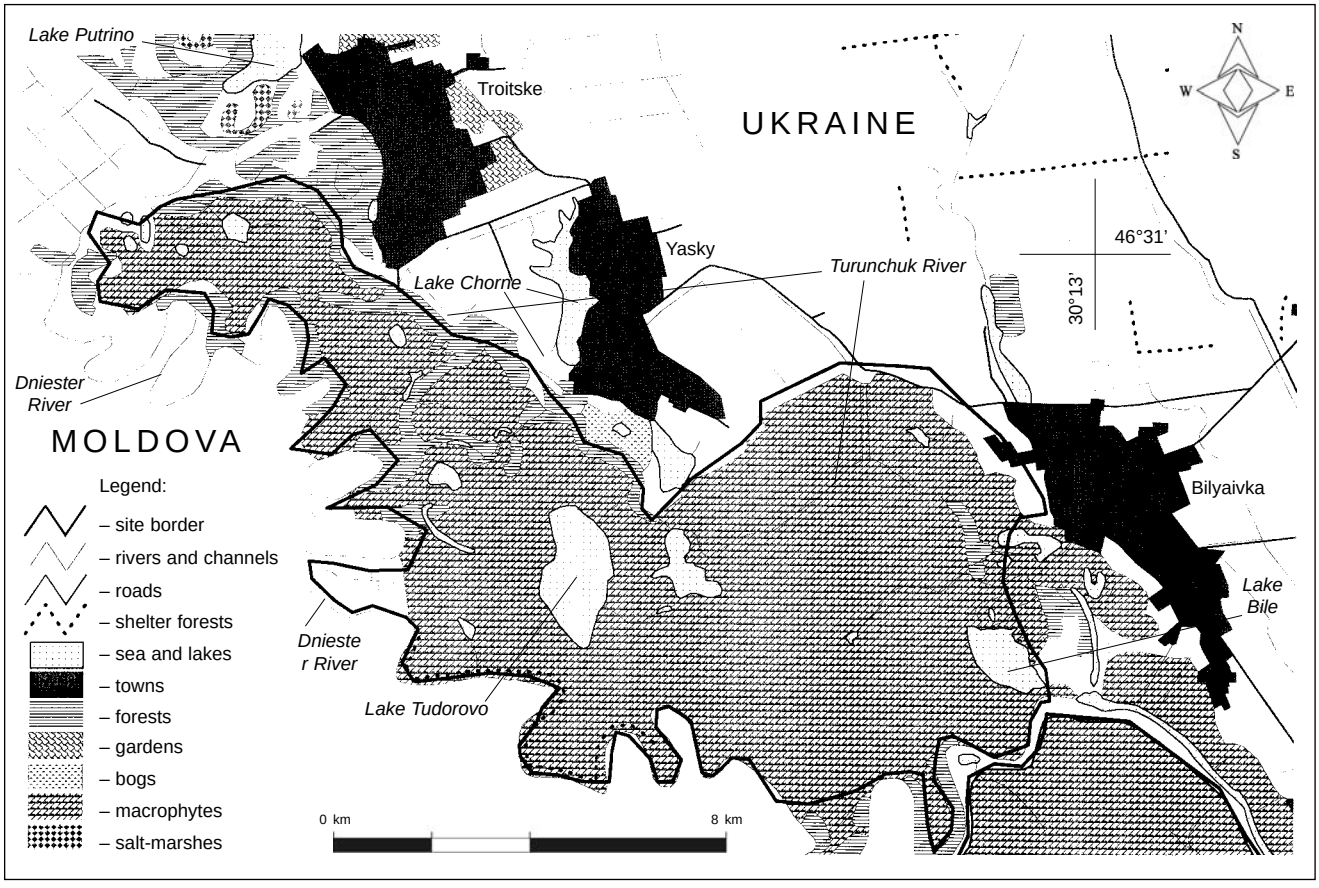
Table 8. Waterbird populations at the Tuzlov Liman Complex (1998-1999)

Species	Breeding pairs	Non-breeding numbers
Anas platyrhynchos	40	25,000
Anser albifrons		50,000
Anser anser	10	700
Aythya ferina		20,000
Branta ruficollis		2,500
Calidris alpina		5,500
Charadrius alexandrinus	20	
Cygnus olor		1,150
Haematopus ostralegus	8	
Himantopus himantopus	25	
Larus cachinnans	960	18,000
Recurvirostra avosetta	284	1,300
Sterna albifrons	70	800
Sterna hirundo	1,800	
Thalasseus sandvicensis	7,400	
Tringa totanus	20	
Vanellus vanellus	32	

Criteria for inclusion: 1, 2, 3, 4, 5 and 6.

6. Dniester-Turunchuk Crossrivers Area (Lower Dniester Wetlands)

Location: 46°26'N, 30°06'E. Southwest of Bilyaivka, in the Bilyaivka Rayon, Odessa Oblast.
Area: 7,600 ha.
Altitude: 0.4-0.9 m above sea level.
Wetland type: L.
Other hydrologically linked wetlands: The Northern Part of Dniester Liman.
Description of site: The site comprises part of the Dniester Delta, the main channels of the Dniester River and its branch, the Turunchuk; it includes many small channels, eriks and flood lakes. The river channels are sometimes bordered by flood meadows and flood forests.
Hydrology: The Dniester Basin is situated in the territory of both Ukraine and Moldova; it has an area of 71,990 km^2. The basin is very elongated in a northwest-southwest orientation: it is 700 km long, with a width of 50-150 km. The operation of the Dniester Hydroelectric Power Station determines the volume and velocity of river flow, which averages 321 m^3/sec per annum. Before the flow was regulated, the basin flooded 3-11 times a year. The site's largest lakes are the Gorelye Lakes system (300 ha), Lake Tudorovo (280 ha), Lake Putrino (220 ha) and Lake Bile (130). Lakes Svinoe, Krugle, Chorne, Pysarske and Safyany are slightly smaller in size.
Principal vegetation: The main plant communities of the wetland are reeds, which cover about 90% of the vegetated area. The remainder of the site is covered by mixed thickets of reeds, *Typha angustifolia* and *Scirpus lacustris,* as well as flood-plain forests dominated by willows and poplars.
Conservation measures taken: A Ramsar site (3UA006) and IBA No 17. An area of 4,374 hà forms part of the "Dniestrovski Plavni" protected area. The territory is nominally protected by the "Odessarybwod" Odessa Fish



Map 6. The Dniester-Turunchuk Crossrivers Area (Lower Dniester Wetlands)

Inspection and the Bilyaivsky Forest Area of the Odessa Forestry Agency.

Conservation measures proposed: The site has been proposed for national park designation.

Land use: The principal activities at the site are hunting, fishing, fish farming, cattle grazing, recreation and reed harvesting. The site is a popular recreation area for local people and people from Odessa. Protection is the responsibility of the Regional Authority for Nature Protection.

Possible changes in land use: If a National Nature Park is established, no major changes will occur in land use other than the establishment of strictly protected zone in the park.

Disturbances and threats: The operation of the Dniester Hydroelectric Power Station complex, which affects both the main Dniester Reservoir and a buffer reservoir, is considered to be the main threat to the site. Artificially regulating floods in spring and summer without taking into account the demands of the ecosystem is leading to degradation and the decline of a number of animal species. The establishment of Dniester Hydro-Accumulating Station imposes a further threat to the site. Non-regulated hunting and fishery and fires on flood plains and in flood-plain forests have caused the death of many animals. Fishing using trap-nets also catches otters and small cormorants, which subsequently die (Rusev, 2000b).

Table 9. Waterbird populations of the Lower Dniester wetlands (1991-2001)

Species	Breeding pairs	Non-breeding individuals
Anas crecca		3,000 (on migration)
Anas platyrhynchos	160	5,000 (on migration)
Anas querquedula	50	4,000 (on migration)
Anser anser	150	3,000 (on migration)
Ardea purpurea	30	150 (on migration)
Ardeola r alloides	300	500 (on migration)
Chlidonias hybrida	300	7,000 (on migration)
Chlidonias niger	100	500 (on migration)
Cygnus olor	215	200 (on migration)
Egretta alba	80	300 (on migration)
Egretta garzetta	400	300 (on migration)
Fulica atra	2,400	15,000 (on migration)
Nycticorax nycticorax	1,900	1,000 (on migration)
Pelecanus onocrotalus		500 (in summer)
Phalacrocorax pygmaeus	750	1,000 (on migration)
Phalacrocorax carbo	4,000	5,000 (on migration)
Platalea leucorodia	20	
Plegadis falcinellus	925	0
Podiceps cristatus	300	500 (on migration)

Economic and social values: The site currently provides drinking water for Odessa and other towns and cities and water for irrigation, and plays an important role in river transport. It supports an important local fishery and is valuable for conservation education, recreation and scientific research. The reed is of great economic importance because it is exported to Germany and the Netherlands.

Fauna: Mammals: *Arvicola terrestris, Felis silvestris, Lutra lutra, Martes foina, Meles meles, Microtus arvalis, Mustela erminea, M. lutreola, M. putorius, Neomys anomalus, Nyctereutes procyonoides, Ondatra zibethica* and *Sus scrofa.* Birds: Up to 20,000 pairs of waterbirds nest at the site, predominantly in reed-beds, on islands with wet woodland and on open water with floating vegetation. During migration waterbird numbers may rise to 50,000 individuals, concentrated on the larger marshy lakes, open water and adjacent agricultural area. Amphibians: *Bombina bombina, Hyla arborea, Pelobates fuscus* and *Triturus vulgaris.* Reptiles: *Emys orbicularis, Natrix natrix* and *N. tessellata.* Fish: RDB category II: *Acipenser ruthenus, Huso huso* and *Umbra krameri.* RDB category III: *Zingel zingel.* Invertebrates: RDB category III: *Turricaspia lincta.*

Special floristic values: RDB category II: *Nymphoides peltata, Trapa natans s.l.* and *Salvinia natans.*

Research facilities: Ecological studies will be carried out by scientists from the Institute of Botany, Institute of Zoology and Institute of Biology of Southern Seas of the National Academy of Sciences of Ukraine, Odessa Hydro-Meteorological Institute, the National Mechnikov University, Odessa, and the "Wildlife Conservation" NGO.

Public awareness and education: Conservation awareness and education are provided by comprehensive schools and experts from conservation and scientific bodies through posters, booklets and lectures. During 1987-2002, the "Wildlife Conservation" NGO conducted annual ecological expeditions involving scientists, environmentalists, students and school pupils. Nature conservation activities were carried out during the expeditions. In 1995, the "Dniester Delta" environmental centre and three ecological trails were established here for the local population, nature lovers and children.

Criteria for inclusion: 1, 2, 4, 5, 6 and 8.

7. Northern Part of Dniester Liman

Location: 46°22'N, 30°12'E. The northern part of Dniester Liman in Ovidiopol and Bilgorod-Dniestrovsky

Rayons, Odessa Oblast. The site is a part of Dniester Liman, which is the estuary of the River Dniester; it is situated in Odessa Oblast, Ukraine, on the border with Moldova.

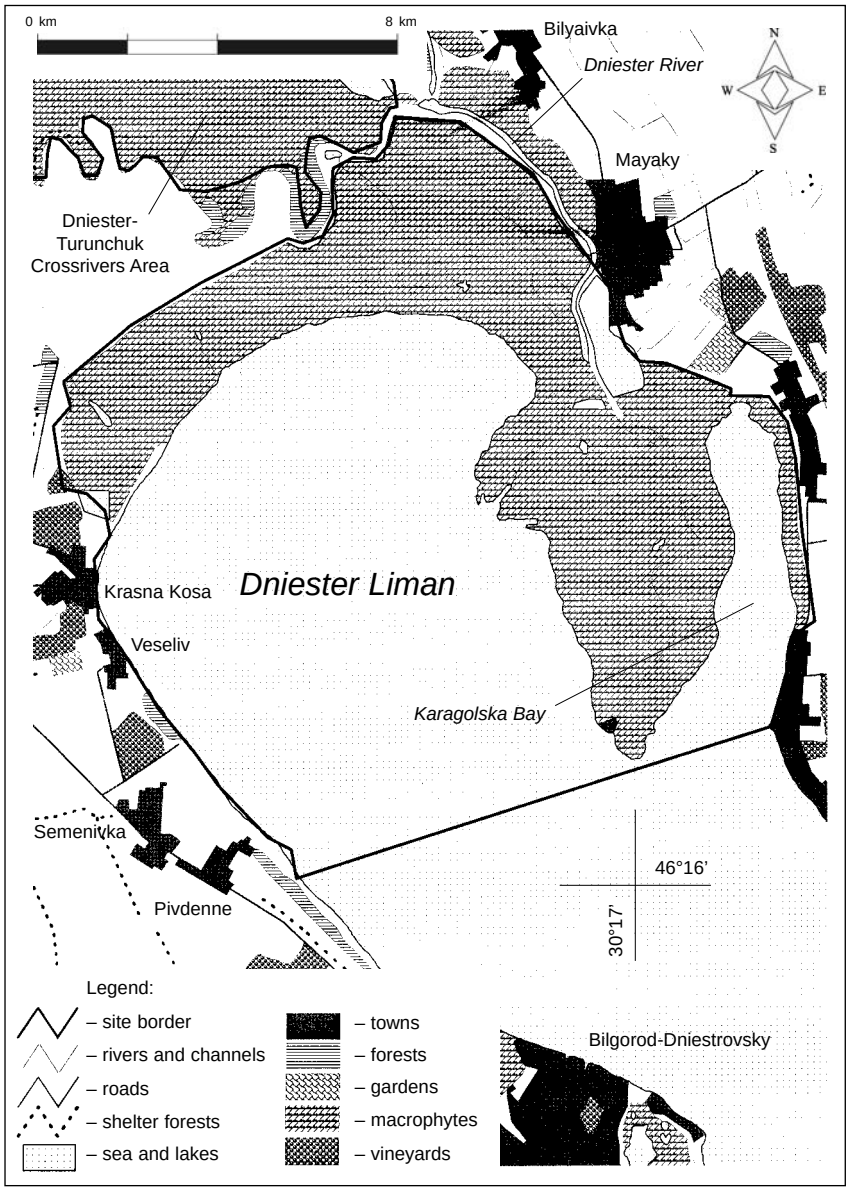
Altitude: 0.4-0.6 above sea level.

Area: 20,000 ha.

Wetland type: K, L.

Other hydrologically linked wetlands: The Dniester-Turunchuk Crossrivers Area.

Description of site: This site includes the delta of the River Dniester with streams and flood-plain lakes, accreted spits in the liman and river, and temporary islands of floating vegetation, and the northern part of the Dniester Liman, which is of the half-open type. The west and east coasts of the liman are abrupt, whereas on the northern coast accreting peninsulas with reed-swamp vegetation occur. The Northern Part of the Dniester Liman site is shallow. The main areas of flood-plain meadows, which flood during periods of high water, are located along the Dniester watercourse, and there is a mosaic of lakes in the centre of the site. Most of the site is covered by dense reeds, where the majority of the Dniester population of *Egretta alba, Ardeola ralloides* and *Platalea leucorodia* nest.



Map 7. The Northern Part of Dniester Liman

Water quality: The water quality of the site depends on the quality of the river, into which seven oblasts (of Ukraine, Moldova and the Pridniestrovska Moldovian Republic) discharge their industrial and agricultural waste water. The pollution of the Dniester River and its tributaries is the most critical economic and environmental problem in the basin. With a total annual flow of 7-10 km^3, 1.0-1.5 km^3 of untreated waste water, 10,000 tonnes of organic matter (by BOD), up to 8,000 tonnes of suspended matter, 6,000 tonnes of mineral salts, 5,000 tonnes of nitrogen, *c.* 1,900 tonnes of pesticides, 1,000 tonnes of oil-based products, *c.* 700 tonnes of heavy metals, 200 tonnes of surface active agents, 150 tonnes of different colorants, etc. are discharged into the river (Andronati *et al.* 1993) each year.

Conservation measures taken: Part of the site belongs to the "Dnistrovski Plavni" protected area and IBA No 7.

Conservation measures proposed: A Ramsar site (3UA007). A project to create the Lower Dniester National Nature Park is in preparation.

Land use: (a) Site: There is some limited and controlled exploitation of natural resources at the site – hunting, fishing, recreation, abstraction of water for human use, irrigation etc. (b) Surroundings/catchment area: as the site, plus traditional farming, including grazing of cattle and sheep, grape-growing, irrigation, etc.

Possible changes in land use: None.

Disturbances and threats: (a) At the site: Disturbance from recreation and commercial fishing activities is the main human impact on waterfowl. The fishing sites coincide with the birds' main breeding, feeding and roost sites. This causes both disturbance and loss of waterfowl due to the permanent deployment of fishing gear. There is

also some illegal fishing within the wetland, and night-time spotlight poaching of frogs. As a result of all these disturbances, the wetland holds fewer waterfowl than its capacity allows. Mass movements of exotic species such as *Hypophtalmichthys molitrix* and *Ctenopharyngodon idella* in the River Dniester threaten native fish species. (b) Around the site: There is some pollution by drainage from agricultural fields as a result of irrigation. The main threat to the site is the construction of the Odessa-Reni motor-way in the Mayaki-Palanka area, which separates the site from the Dniester River. Because the road forms a dam, water does not reach the site in the high-water period. This leads to the degradation of the flood-plain meadows, the main parts of which no longer support a meadow biocenosis. Hunting and poaching impose additional threats. Furthermore, bird species such as *Phalacrocorax pygmaeus* and *Fulica atra* are often trapped in fishery nets.

Table 10. Waterbird populations of the Northern Part of Dniester Liman (1991-2001)

Species	Breeding pairs	Non-breeding individuals
Anas crecca		8,000 (on migration)
Anas platyrhynchos	50	7,000 (on migration)
Anas querquedula	20	7,000 (on migration)
Anser albifrons		50,000 (on migration)
Anser anser	120	2,000 (on migration)
Anser erythropus		1,000 (on migration)
Ardea purpurea	130	200 (on migration)
Ardeola ralloides	30	100 (on migration)
Aythya ferina		15,000 (on migration)
Branta ruficollis		12,000 (on migration)
Chlidonias hybrida	350	5000 (on migration)
Chlidonias niger	20	300 (on migration)
Cygnus olor	30	800 (on migration)
Egretta alba	328	500 (on migration)
Egretta garzetta	60	300 (on migration)
Fulica atra	1300	7,000 (on migration)
Nycticorax nycticorax	200	1,000 (on migration)
Pelecanus crispus		4 (in summer)
Pelecanus onocrotalus		1,000 (in summer)
Phalacrocorax carbo		5,000 (on migration)
Phalacrocorax pygmaeus		500 (in summer)
Platalea leucorodia	50	
Plegadis falcinellus		500 (in summer)
Podiceps cristatus	315	900 (on migration)

Economic and social values: Important for environmental education, recreation and scientific research. Traditional fishing site for local people, and an important part of the water transportation system. The reed is of great economic value because it is exported to Germany and the Netherlands.

Fauna: Species included in the RDB of Ukraine: mollusc *Turricaspia lincta*; fish *Acipenser ruthenus, Huso huso ponticus, Umbra krameri, Zingel zingel.* Amphibians: *Bombina bombina, Bufo viridis, Hyla arborea, Pelobates fuscus, Rana ridibunda* and *Triturus vulgaris*. Reptiles: *Emys orbicularis, Natrix natrix* and *N. tessellata.*

Special floristic values: RDB category II: *Nymphoides peltata, Trapa natans s.l.* and *Salvinia natans.*

Research facilities: Scientific research will be carried out by research institutes of the National Academy of Sciences of Ukraine (Institute of Botany, Institute of Zoology, Institute of Biology of Southern Seas), Hydro-Meteorological Institute, Odessa, National Mechnikov University, Odessa, and the "Wildlife Conservation" NGO.

Public awareness and education: Nature protection education is on the syllabus of local comprehensive schools. Information booklets, posters, etc. are distributed. There are lectures and publications by experts on nature protection and scientific establishments for local people. During 1987-2002, the "Wildlife Conservation" NGO conducted annual ecological expeditions involving scientists, environmentalists, students and school pupils; nature conservation activities were carried out during the expeditions. In 1995, the "Dniester Delta" environmental centre and three ecological trails were established here for the local population, nature lovers and children.

Criteria for inclusion: 1, 4, 5 and 6.

8. Tyligulsky Liman

Location: 46°50'N, 31°07'E. Partly in Komiternivsky and Berezovsky Rayons, Odessa Oblast, and Berezansky Rayon, Mykolaiv Oblast. The downstream end of the liman is near the village of Koblevo.

Area: 26,000 ha.

Altitude: 0.2-1.8 m above sea level.

Wetland type: J, K.

Other hydrologically linked wetlands: The Black Sea and River Tyligul.

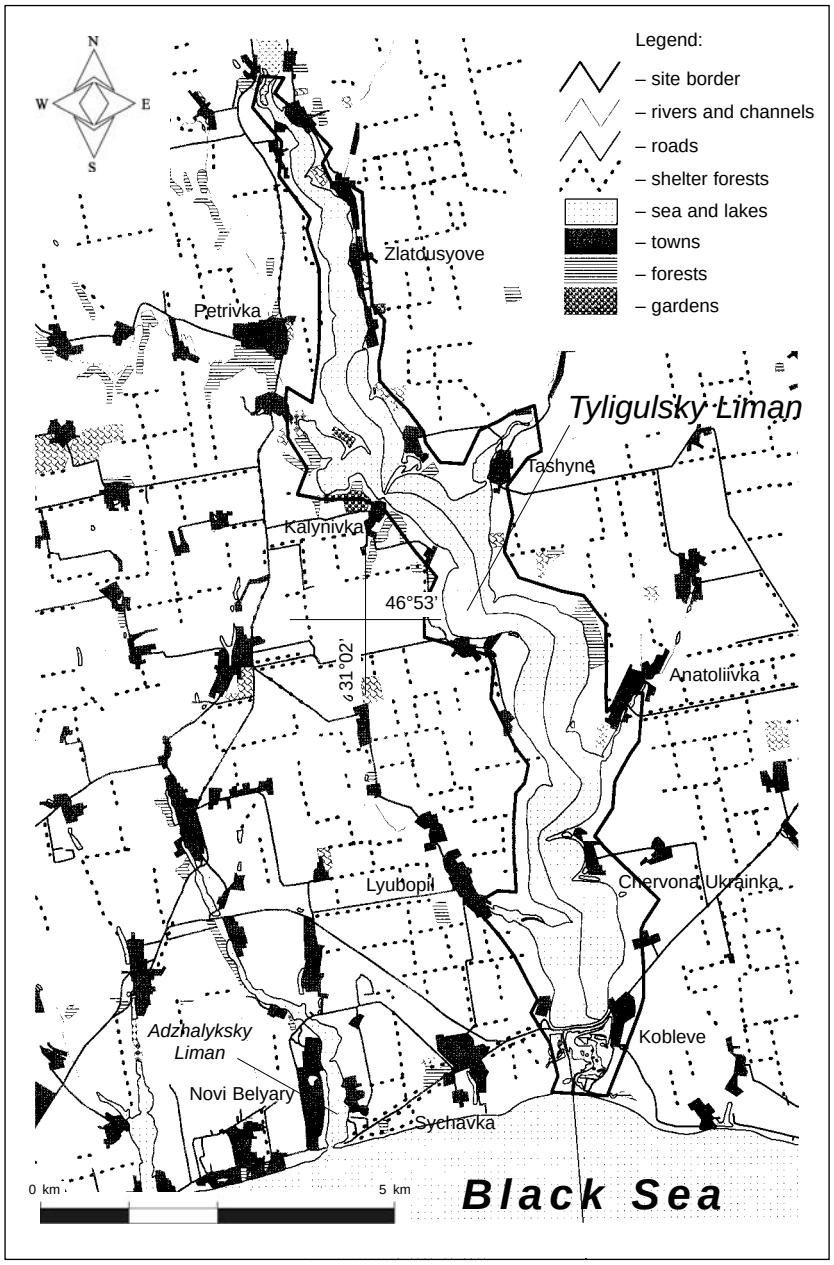
Description of site: The site is a partly-enclosed lagoon formed on the lower reaches of the River Tyligul, with

small islands, low sandy peninsulas, *Salicornia* heath, reed-beds and some scrub. The shore is generally steeply sloping and enclosed by embankments. The main changes in the site have arisen through conversion of adjacent steppe habitats for development of an industrial complex adjacent to the lagoon. As a consequence of this development, erosion rates have increased, leading to changes in the character and distribution of natural habitats within the site.

Hydrology: The lagoon is served by a 5,240 km^2 catchment. It is 55-80 km long and up to 4.5 km wide, with an openwater area of 150-170 km^2. Average depth is 3 m, maximum depth 21 m; total volume 250-600 million m^3.

Water quality: Water quality in the Tyligulsky Liman is among the highest of the lagoons on the northwest coast of the Black Sea. The quality of water in the lagoon is dependent upon exchange of water through the artificial channel connecting the lagoon to the Black Sea and input of fresh water to the upper part of the lagoon.

Principal vegetation: The main habitat types represented at the site are meadow, halophyte and open-water communities, supporting *Aeluropus littoralis, Artemisia santonica, Bolboschoenus maritimus, Ceratophyllum demersum, Kochia prostrata, Limonium gmelinii, L. suffruticosum, Plantago salsa, Potamogeton pectinatus, Puccinellia distans, Ruppia maritima, Salicornia europaea, Salsola soda, Suaeda prostrata* and *Zostera marina.*



Map 8. Tyligulsky Liman

Conservation measures taken: A Ramsar site (3UA008). On November 25, 1997, a Regional Landscape Park was established in the Tyligulsky Liman (area 13,984 ha: aquatic area 9,981 ha; terrestrial area 4,003 ha).

Conservation measures proposed: Not known.

Land use: The principal activities at the site include hunting, fishery, cattle pasture, sand extraction, conservation, agriculture and recreation. Recreation facilities include a health resort complex, used by up to 300,000 people, in the downstream part of the lagoon and on the sand bank along the Black Sea coast, where the lagoon links to the Black Sea.

Possible changes in land use: There are long-term proposals to increase the recreational capacity of the site to support 1 million people in the high season. However, land use is likely to be most dramatically influenced by management of the site under the proposed Regional Landscape Park.

Disturbances and threats: Proposals to regulate the freshwater inflow may lead to changes in the distribution and character of nesting habitat and vegetation. The downstream end of the lagoon is threatened by the proposed expansion of the holiday resort and spa infrastructure. Additional threats include uncontrolled fishing and

hunting, overgrazing by cattle, poaching and habitat destruction through conversion to agriculture and industrial units.

Economic and social values: Tyligulsky Liman is important for nature conservation education, recreation and scientific research and supports an important local fishery. There is an ancient Greek settlement of high national archaeological value on the lower part of the lagoon's eastern coast. In 1975, a bird observatory was built in the lower part of the lagoon; in addition to offering research opportunities, it serves as a visitor centre, providing information on conservation for school parties and students, including field training for students from Mechnikov State University, Odessa.

Fauna: Mammals: *Lutra lutra, Nyctereutes procyonoides, Ondatra zibethica, Sorex araneus* and *Vulpes vulpes.* Birds: The site supports from 2,100 to 7,000 pairs of breeding waterbirds, with the main nest site areas in reed-beds and on low sandy areas. In the upper part of the lagoon, the availability of nesting habitat is strongly related to freshwater input and long-term fluctuation in the total water volume. Outside the breeding season, numbers decline to about 8,000 birds, with winter maximum in the region of 10,000 individuals. Amphibians: *Bombina bombina, Bufo bufo, B. viridis, Rana ridibunda.* Reptiles: *Coluber caspius, Emys orbicularis, Natrix natrix, N. tessellata.*

Special floristic values: The flora represents complexes typical of the south-eastern coasts of the Black Sea. The region contains nearly 350 species of vascular plants, among which are 18 species listed in the RDB of Ukraine.

Table 11. Waterbird populations at Tyligulsky Liman (1992-2002)

Species	Breeding pairs	Non-breeding individuals
Anas acuta		300 (on migration)
Anas clypeata	5	400 (on migration)
Anas penelope		2,500 (on migration)
Anas platyrhynchos	150	10,000 (on migration)
Anas querquedula	30	900 (on migration)
Anser albifrons		8,000 (on migration)
Anser anser	80	250 (on migration)
Ardea cinerea	18	
Ardea purpurea	40	
Ardeola ralloides	3	
Aythya ferina		4,000 (on migration)
Charadrius alexandrinus	35	100 (on migration)
Charadrius dubius	15	
Egretta alba	5	100 (on migrat ion)
Egretta garzetta	30	
Fulica atra	50	2,000 (on migration)
Gelochelidon nilotica	140	100 (on migration)
Himantopus himantopus	55	
Larus cachinnans	5-10	300 (on migration)
Larus melanocephalus	5,000	2,000 (on migration)
Larus minutus		7,000 (on mi gration)
Larus ridibundus		5,000 (on migration)
Nycticorax nycticorax	200	
Platalea leucorodia	15	
Plegadis falcinellus	25	
Podiceps cristatus	15	100 (on migration)
Recurvirostra avosetta	81	100 (on migration)
Sterna albifrons	60	50 (on migration)
Sterna hirundo	1,500	1,000 (on migration)
Sterna sandvicensis	5,500	7,000 (on migration)
Tringa totanus	120	700 (on migration)
Vanellus vanellus	15	100 (on migration)

Research facilities: Ecological and balneological studies will be carried out by scientists from the National Academy of Sciences of Ukraine and National Mechnikov University, Odessa.

Public awareness and education: Various types of conservation awareness material have been produced at the site, including films that have been shown on national and local television.

Criteria for inclusion: 1, 2, 3, 4, 5 and 6.

9. Dnipro River Delta

Location: 49°32'N, 32°24'E. In Tsyurupynsky and Goloprystansky Rayons, Kherson Oblast, southwest of the city of Kherson.

Area: 26,000 ha.

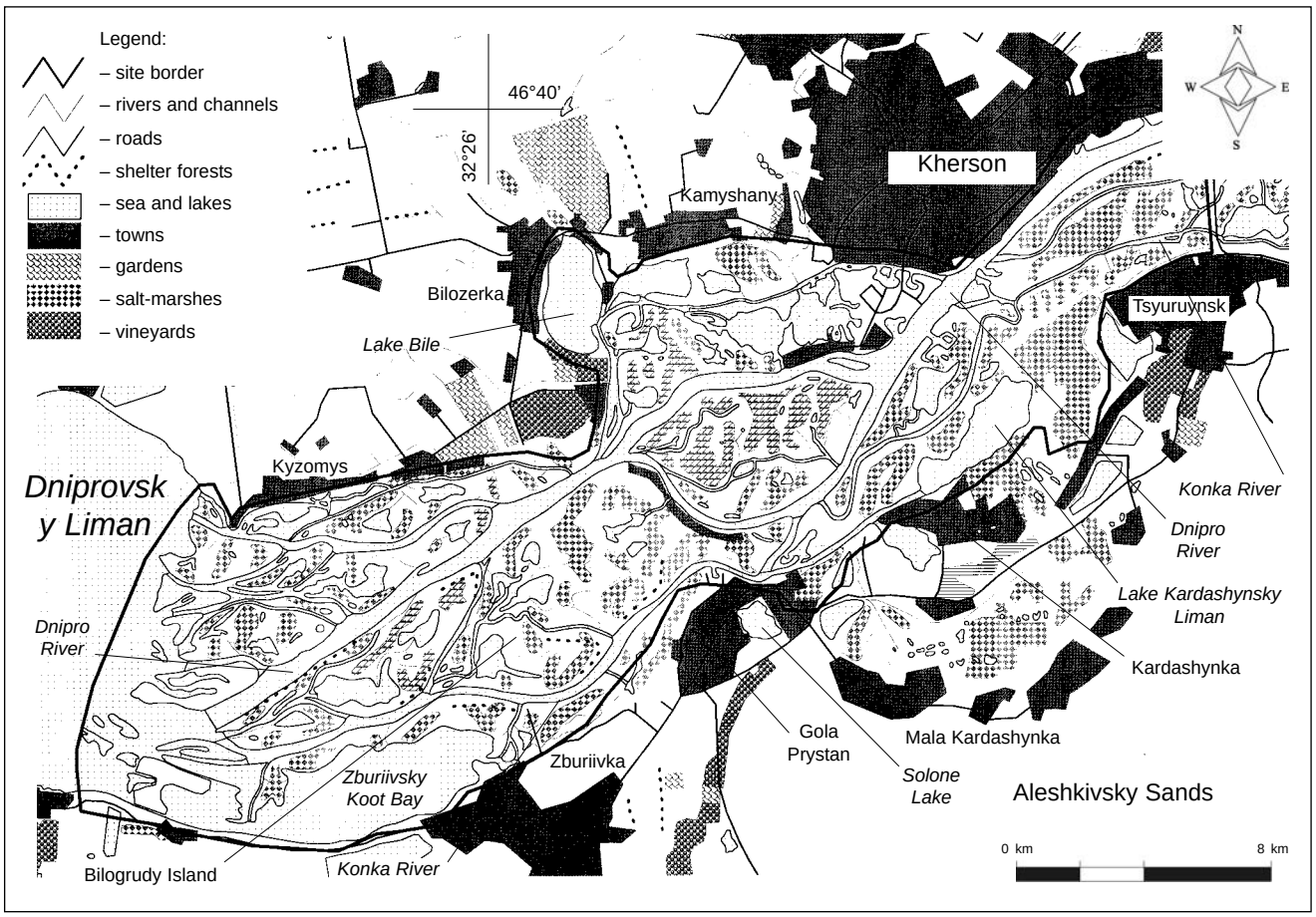
Altitude: 0.2-1.4 m above sea level.

Wetland type: L, P.

Other hydrologically linked wetlands: Dniprovsky Liman and River Ingulets.

Description of site: This site involves a wetland complex associated with 47 km of the delta of the River Dnipro, including streams and side channels, shallow lakes and marshes, wet woodland, reed-beds and Dniprovsky Liman.

Climate: The climate is moderately continental, characterised by summer drought and mild winters with an



Map 9. Dnipro River Delta

annual frost-free period of 180-210 days. Snow cover may last 20-40 days in some years, however winters without snow are not infrequent. When it does snow, cover is generally unstable, with frequent thaws. The average July temperature is 20°C, while average January temperature is 2.5°C. Annual precipitation is 320-350 mm, occurring mainly as summer storms.

Principal vegetation: The main habitat types represented within the site are dune grassland, marshland and open water, supporting *Agropyron dasyanthum, Asperula cynanchica, Carex acuta, C. omskiana, Cerastium ucrainicum, Euphorbia agraria, Nymphoides peltata, Phragmites australis, Potamogeton natans, P. nodosus, Salvinia natans, Thymus borysthenicum, Typha angustifolia, T. latifolia* and *Trapa natans s.l.*

Conservation measures taken: A Ramsar site (3UA009). The site includes a number of small reserves managed by the Society of Fisherman and Hunters or the Military Society of Fisherman and Hunters and the Krasna Khatka Ichthyological Game Reserve. A number of steps have been taken towards maintaining the balance between a variety of human uses and the ecological character of the site, including pollution treatment and establishment of water protection areas. In addition, there are proposals to improve water quality and control nutrient build-up.

Conservation measures proposed: A conservation management plan is in preparation.

Land use: The principal activities at the site are hunting, fishery, fish farming, sheep and cattle-grazing, reed harvesting, recreation, sand extraction and water-borne transportation, both commercial and recreational. Tourist infrastructure is fairly well developed in comparison to other, similar sites. There are proposals for further development.

Management: Management of the site is co-ordinated within the framework of governmental programmes for fishery, hunting and agriculture. Wetlands and adjacent land associated with the Black Sea Biosphere Reserve are managed within the framework of existing scientific programmes following the Reserve Rules.

Possible changes in land use: Potential changes include extension of the existing tourism infrastructure and habitat degradation through agriculture and overgrazing.

Disturbances and threats: The main threat to the site involves proposals to construct a series of dams designed to divide the Dniprovsky Liman into basins. Other threats include pollution of associated wetlands, degradation of

irrigated agricultural land and rice fields and river regulation and realignment.

Economic and social values: The River Dnipro is one of the most important sources of drinking water in Ukraine. It is the largest transportation route, ensuring communication between continental industrial regions of Ukraine with other parts of the country and other Black Sea riparian states. Water from the river is also used for irrigation. The River Dnipro has a long historic record in the writings of ancient historians and travellers. It is important for conservation education, recreation and scientific research and supports an important local traditional fishery.

Table 12. Waterbird populations at the Dnipro River Delta (1998-1999)

Species	Breeding pairs	Non-breeding individuals
Anas platyrhynchos		30,000-50,000
Ardea cinerea	1,500-1,800	
Aythya ferina		6,000
Aythya fuligula		5,000
Egretta alba	350-700	
Fulica atra	500-900	90,000
Himantopus himantopus	5	
Mergus serrator		300
Nycticorax nycticorax	450	
Phalacrocorax carbo	4,500	10,000
Podiceps cristatus	200-400	
Recurvirostra avosetta	5-10	
Tringa totanus	70-80	
Vanellus vanellus	55	

Fauna: Mammals: *Citellus suslicus, Meles meles, Microtus arvalis, Sus scrofa, Talpa europaea* and *Vulpes vulpes.* Birds: The site supports 6,000-8,000 pairs of breeding waterbirds, with up to 14,000 individuals outside the breeding season. Most colonies are in wet woodland and reed-beds, the latter found particularly in accreting areas of the delta. Outside the breeding season, the main concentrations occur on marshy lakes and fish farm basins. Amphibians: *Bufo viridis, Rana esculenta* and *R. ridibunda.* Reptiles: *Emys orbicularis.* Fish: RDB category II: *Acipenser ruthenus, Barbus barbus* ssp. *borysthenicus, Huso huso* and *Umbra krameri.* RDB category IV: *Chalcalburnus chalcoides.* Invertebrates: RDB category III: *Turricaspia lincta.*

Special floristic values: No information.

Research facilities: Scientific research is carried out under the Dnipro Programme by the Institute of Biology of Southern Seas (Sevastopol), Institute of Hydrobiology, Institute of Zoology of the National Academy of Sciences of Ukraine and Black Sea Biosphere Reserve.

Public awareness and education: Conservation education and awareness are encouraged though comprehensive school curricula. This is supported by lectures for the principal land-owner groups, presented by specialists from universities and other organisations.

Criteria for inclusion: 1, 2, 3, 4, 5, 6 and 7.

10. Tendrivska Bay

Location: 46°12'N, 31°44'E. In Goloprystansky Rayon, Kherson Oblast, 60 km southwest of the city of Kherson and due south of Yagorlytska Bay, from which it is separated by the low Yagorlytsky peninsula.

Area: 38,000 ha.

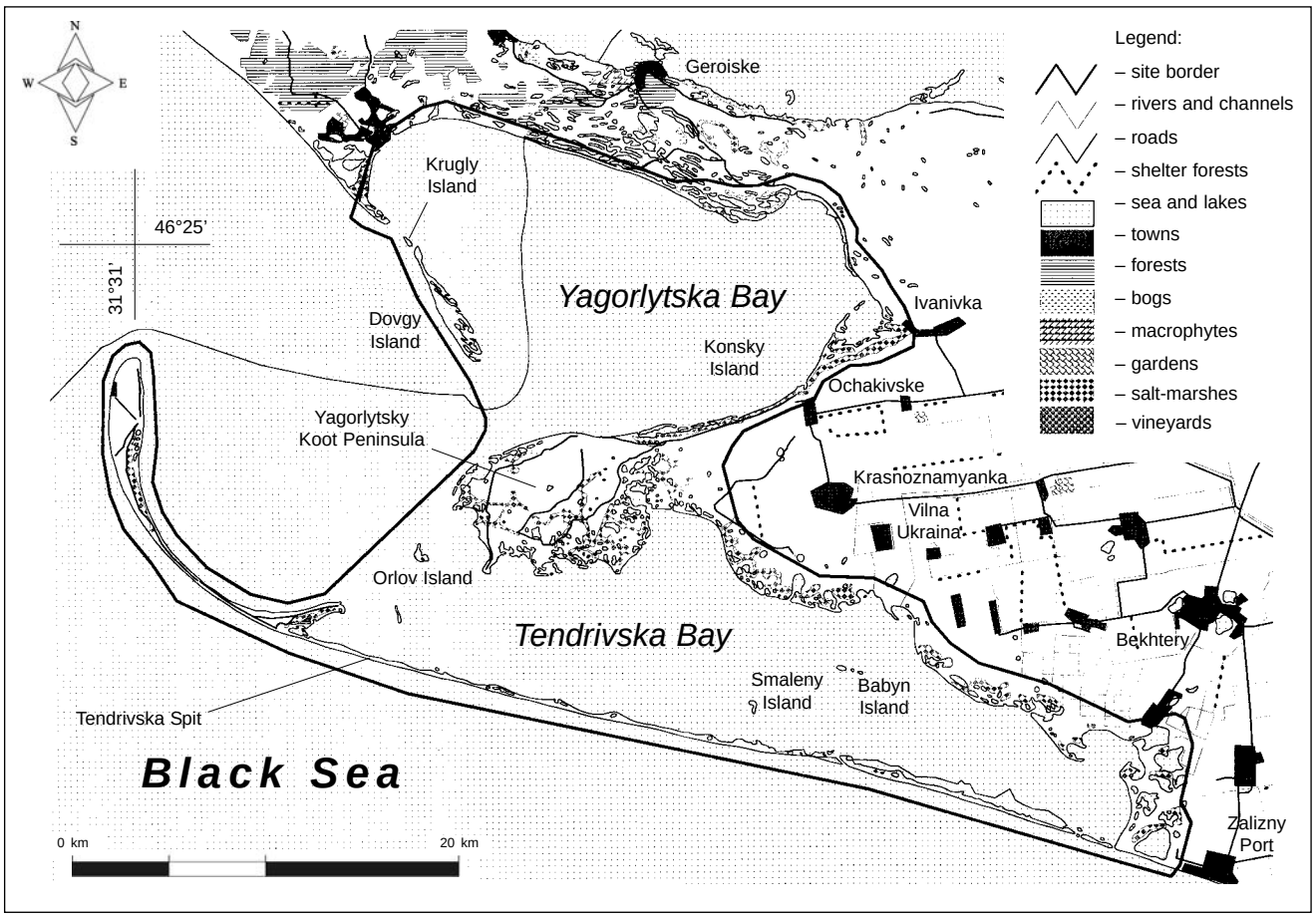
Altitude: 0.1-2.1 m above sea level.

Wetland type: A, E.

Other hydrologically linked wetlands: The Black Sea.

Description of site: The site comprises a partly enclosed bay on the Black Sea, from which it is separated by the 70-km long Tendrivska Spit, which is broken in places by natural canals; the protected area of Tendrivska Spit is 1,289 ha. There are three groups of small islands, whose surface areas range from 2 ha to 28 ha: Orlov and the New Islets (in the west of the bay), Babyn and Smaleny (in the centre) and Potiyivski Islets (in the east). Some of the islands, namely New, Potiyivsky, Smaleny and Tendrivska Spit, are of accumulative origin; Babyn and Orlov are of continental origin. The eastern part of the bay is shallow, the depth decreasing towards the north. The northern coastline is indented, with well-developed shallow bays and bights no more than 1 m deep. The bay's abyssal zone takes the form of a gutter, up to 2-3 m deep, located along Tendrivska Spit. Tendrivska Bay is one of the least modified wetlands of its type in the Black Sea coastal area, with a resultant high biodiversity. It supports a number of rare or vulnerable aquatic species, including Pontic relics.

Principal vegetation: The main habitat types represented within the site are marshland, open water, dune grassland and halophyte communities, supporting *Argusia sibirica, Artemisia santonica, A. maritima, A. salina, Calamagrostis epigeios, Camphorosma monspeliaca, Ceramium* sp., *Ceratophyllum demersum, Chara inter-*



Map 10. Tendrivska Bay and Yagorlytska Bay

media, Chondrilla sp., *Crambe pontica, Eryngium maritimum, Halimione pedunculata, H. verrucifera, Leymus racemosus, L. sabulosus, Limonium meyeri, Najas marina, Phragmites australis, Polysiphonia spinulosa, Potamogeton pectinatus, P. perfoliatus, Puccinellia* sp., *Ruppia maritima, Salicornia europaea, Salsola soda, Schoenoplectus lacustris, S. tabernaemontani, Suaeda prostrata, Zostera marina* and *Z. nana.*

Conservation measures taken: A Ramsar site (3UA010). The shallow eastern part of Tendrivska Bay and the coastal areas, Potiyivsky and Yagorlytsky Koots, which belong to the site, are included in the strictly protected core of the Black Sea Biosphere Reserve.

Conservation measures proposed: Extension of territory and enforcement of protection under the terms of the Black Sea Biosphere Reserve.

Land use: All types of activities other than activities designed to improve waterbird nesting on the islands are prohibited. In the deep-water part of the bay, which does not belong to the nature reserve, the main economic activities are fishery, recreation and water transportation, although there is no organised infrastructure for tourism.

Management: Management of the site is co-ordinated within the framework of governmental programmes for fishery, hunting and agriculture. However, the wetland and associated areas included within the Black Sea Biosphere Reserve are managed under the Reserve Rules, within the framework of existing scientific programmes.

Possible changes in land use: Most potential changes within the site are associated with the natural erosion and depositional processes associated with the site's dynamic nature.

Disturbances and threats: The site is threatened by water-borne transportation, fishery and pollution from seepage and water discharged from agricultural and industrial activity.

Economic and social values: The site supports a traditional fishery and is important for conservation education, recreation and scientific research.

Fauna: Birds: The site supports 25,000-100,000 pairs of breeding waterbirds, with the majority of colonies on islands, in reed-beds and on *Salicornia* flats. Outside the breeding season, the site supports 450,000-700,000 indi-

viduals, mainly on the islands and peninsulas and on the open waters of the bay. Fish: RDB category II: *Hippocampus guttulatus* ssp. *microstephanus*; RDB category IV: *Callionymus belenus*.

Special floristic values: No information.

Research facilities: Scientific research is carried out by the Institute of Biology of Southern Seas (Sevastopol), Institute of Hydrobiology, Institute of Zoology of the National Academy of Sciences of Ukraine and Black Sea Biosphere Reserve.

Public awareness and education: Public awareness education is restricted to that provided by comprehensive schools combined with lectures for the principal interest groups presented by scientists from universities and other organisations.

Criteria for inclusion: 1, 2, 4, 5 and 7.

Table 13. Waterbird populations at Tendrivska Bay (1990-2002)

Species	Breeding pairs	Migrating individuals	Wintering individuals
Anas penelope		7,000-10,000	250-2,040
Anas platyrhynchos	30-140	20,000-100,000	800-17,500
Anser albifrons		10,000-40,000	2,000-40,000
Anser anser		2,000-8,000	500-2,700
Anser erythropus		50-200	30-60
Ardea cinerea	10-50	1,000-5,000	
Aythya ferina		10,000-60,000	200-7,070
Aythya fuligula		3,000-40,000	500-8,000
Aythya marila		2,000-25,000	100-7,000
Branta ruficollis		200-2,000	100-600
Bucephala clangula		500-2,000	0-30
Calidris alpina		3,000-5,000	0-80
Charadrius alexandrinus	50-150	1,500-4,000	
Cygnus olor	0-5	5,000-10,000	2,000-10,000
Egretta alba	0-50	600-2,000	5-10
Egretta garzetta	0-50	3,000-7,000	
Fulica atra	40-180	20,000-100,000	200-11,000
Grus grus		800-2,000	
Haematopus ostralegus	20-40	600-2,000	
Haliaeetus albicilla		30-70	5-30
Larus cachinnans	70-1,030	1,000-3,000	100-1,700
Larus canus		1,000-3,000	100-700
Larus genei	5,000-19,000	10,000-40,000	0-10
Larus melanocephalus	20,000-72,000	40,000-150,000	
Larus ridibundus		1,000-8,000	50-300
Mergus serrator	100-260	500-3,000	50-150
Numenius arquata	0-5	800-2,000	0-60
Pelecanus onocrotalus	14-200	300-4,000	
Phalacrocorax carbo	890-1,500	10,000-20,000	30-300
Philomachus pugnax		7,000-10,000	
Sterna albifrons	20-90	100-600	
Sterna caspia	30-180	100-600	
Sterna hirundo	3,100-6,300	7,000-12,000	
Sterna nilotica	130-530	1,000-2,000	
Sterna sandvicensis	3,000-18,740	8,000-36,000	
Somateria mollissima	10-400	2,500-5,000	10-400
Tadorna tadorna	60-130	400-2,000	30-160

11. Karkinitska and Dzharylgatska Bays

Location: 45°54'N, 32°51'E. In the northwest of the Crimean Peninsula, in Krasnoperekopsky and Rozdolnensky Rayons, Crimea, and Skadovsky and Kalanchaksky Rayons, Kherson Oblast, close to the city of Skadovsk.

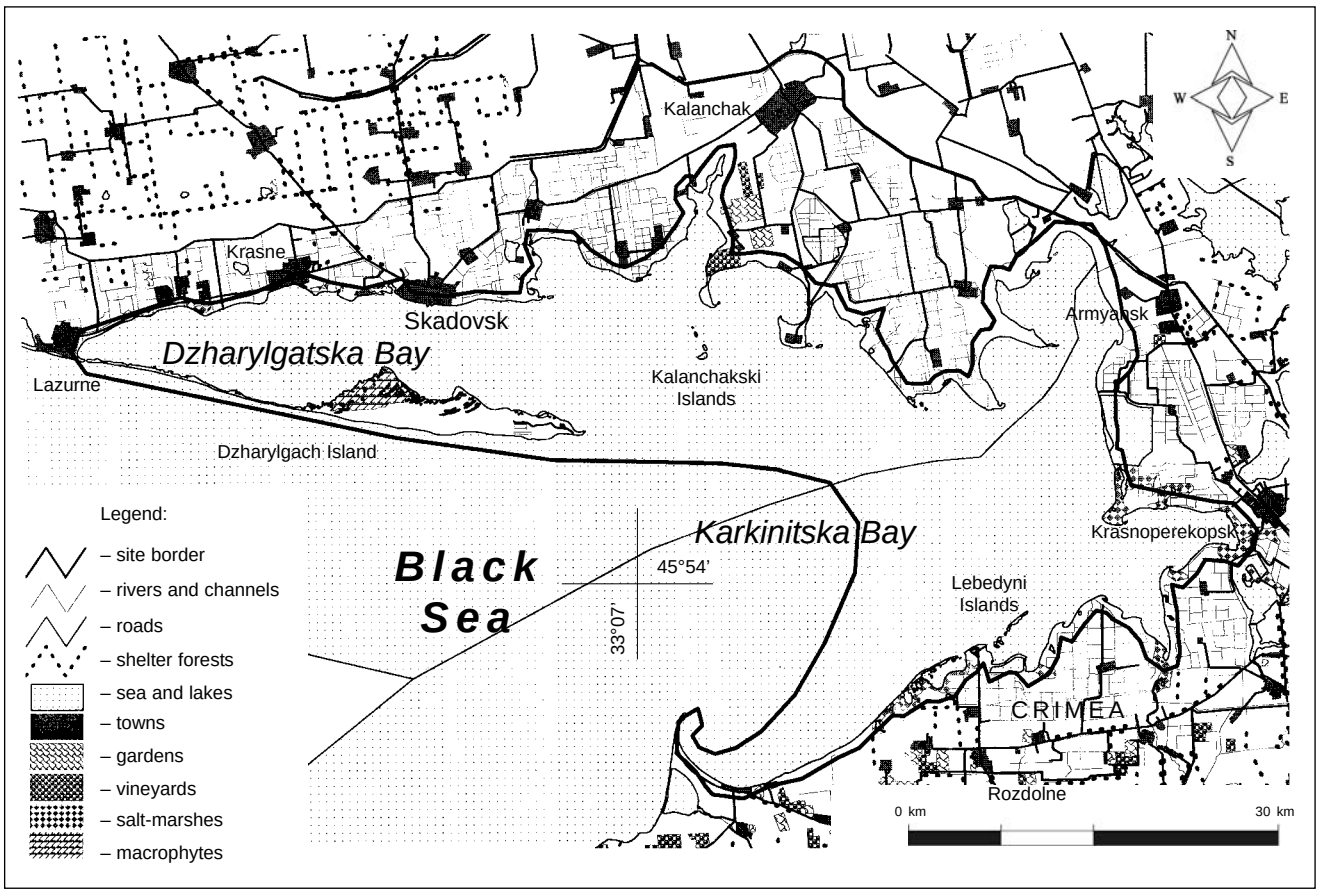
Area: 87,000 ha.

Altitude: 0.4-2.2 m above sea level.

Wetland type: A.

Other hydrologically linked wetlands: The Black Sea and Tendrivska Bay (10).

Description of site: Karkinitska Bay is a large bay of the Black Sea in the northwest of the Crimean Peninsula. It is bordered to the northwest by the Dzharylgatska Spit, which extends westwards from the eastern end of Tendrivska Spit into Karkinitska Bay. Karkinitska Bay includes a variety of habitats, such as smaller inlets and bays, peninsulas, freshwater marshes, salt-flats and rice fields. The eastern part of Dzharylgatska Bay is the deeper (with a maximum depth of little more than 8 m and average depth of 3.5 m); the western part is shallow (more that 30% of its area is less than 1 m deep). The Tendrivska and Dzharylgatska Spits were formed by offshore currents depositing sand and shells from a depth of up to 5 m in the Black Sea. The character of the site is highly dynamic due to its unconsolidated structure and the influence of tide and currents. Modern islands cover approximately 5,700 ha of the bay. The islands are generally less than 2 m above sea level and have no topsoil,



Map 11. Karkinitska and Dzharylgatska Bays

being composed of loose shell-sand, with deposited sand and silt. Low-lying coastal flats in the northeast have a similar structure, whereas in the southwest they are predominately silt, with numerous channels and gullies. The largest island is Dzharylgach: together with the spit it is *c.* 42 km long and covers an area of 5,605 ha. The northern part of the island is low-lying, with many saline lakes, wetlands, small shallow bays, canals, eriks and bights. Sand steppe covers the middle of the island, however since the 1960s some drought-resistant trees and bushes have appeared on the otherwise bare ground. The site includes small islands such as the Lebedyni Islands (49-52 ha), Kalanchakski Islands, Karzhynski Islands (19 ha), Ustrychni Islands (Khorly), Olexiyivski Islands and Tanyn Island. The site's aquatic area and Dzharylgach Island are located on one of Europe's most important bird migration routes. This is one of the Black Sea's largest wintering sites for wetland birds, where they nest, moult and breed in very large numbers.

Principal vegetation: The main habitat-types represented within the site are dune grassland (supporting *Cakile euxina, Crambe pontica, Leymus racemosus*), open water (*Najas marina, Potamogeton pectinatus, Ruppia cirrhosa, Zannichellia palustris, Zostera marina*), halophyte communities (*Artemisia pontica, A. santonica, A. scoparia, Calamagrostis epigeios, Elytrigia maeotica, E. elongata, Limonium meyeri, Puccinellia distans, Salicornia perennans, Suaeda prostrata, Triglochin maritimum)* and marginal communities (*Phragmites australis*). Trees and bushes grow only on Dzharylgach Island, and only a few species have become acclimatised there, including *Elaeagnus angustifolia, E. argentea, Tamarix ramosissima, Robinia pseudoacacia* and *Ulmus pumila.* There are 499 species of vascular plants on Dzharylgach Island.

Conservation measures taken: A Ramsar site (3UA011). The site includes the Karkinitsky Reserve, which is an ornithological reserve of national importance (27,646 ha), a section of the "Lebedyni Islands" Crimean Nature Reserve (9,612 ha), and the Dzharylgatsky Botanical Reserve, a reserve of national importance (300 ha) established in 1974.

Conservation measures proposed: Establishment of Karkinitsky Biosphere Reserve and Dzharylgatsky National Park.

Land use: The main uses of the site are fishery, hunting, recreation and water transportation.

Management: Management of the site is co-ordinated within the framework of governmental programmes for fishery, forestry, hunting and agriculture.

Possible changes in land use: The area of rice fields and the protected area of the nature reserve will probably be reduced as some parts are these areas are due to be given over to hunting and recreation.

Disturbances and threats: The site is threatened by pollution caused by agriculture and industry, hunting, uncontrolled fishing and tourism, sand extraction and dredging.

Economic and social values: The site supports traditional fishery and commercial and public transport. It is important for conservation education, recreation and scientific research.

Fauna: Mammals: There are about 30 terrestrial species (*Allactaga jaculus, Citellus pygmaeus, Crocidura suaveolens, Lepus uropaeus, Microtus socialis, M. musculus, M. spicilegus, Mustela nivalis, M. eversmanni, Nyctereutes procyonoides, Rattus norvegicus, Sylvaemus arianus, Vulpes vulpes,* etc.) and three aquatic species (*Delphinus delphis, Tursiops truncatus* and *Phocoena phocoena*). Three ungulates *(Cervus elaphus, C. dama, Ovis ammon*) were introduced in the past. Twelve mammal species are included in the various protected species lists (eight are included in the Red Book of Ukraine). Birds: The site supports a rich avian fauna, including 35,500-42,500 pairs of breeding waterbirds. Most waterbirds nest on the islands, lagoons and on shell-sand peninsulas with reeds or other halophytic vegetation; the main colonies are on the Kalanchakski Islands (18,000 pairs), Lebedyni Islands (12,000-14,000 pairs), Ustrychni Islands (1,160-5,000 pairs), Karzhynski Islands (1,700-5,200 pairs) and Tanyn Island (3,500 pairs). The site is also nationally important during migration, with up to 150,000 waterbirds recorded in the autumn and 100,000 during spring. On migration, the main waterbird concentrations occur on open waters, coastal shallows, islands and salt-flats. 115 bird species are included in the various protected species lists (46 in the Red Book of Ukraine). Reptiles: five species, including *Emys orbicularis* and *Vipera ursini renardi*. Fish: There are some rare and endan-

Table 14. Waterbird populations at Karkinitska and Dzharylgatska Bays (1997-1999)

Species	Breeding pairs	Non-breeding numbers
Acrocephalus agricola	148-160	
Anas clypeata	4-6	
Anas crecca		6 (in winter)
Anas penelope	1	1,500
Anas platyrhynchos	130	17,000-43,000
Anas strepera	15-18	
Anser albifrons		4,834-5,840 (in winter)
Anser anser		382-640 (in winter)
Ardea cinerea	600-1,200	
Ardea purpurea	21-30	
Aythya ferina	3-5	2,600-2,800 (in winter)
Aythya fuligula		42 (in winter)
Aythya marila		700
Aythya nyroca	18	7,500-8,000
Branta ruficollis		600
Bucephala clangula		75 (in winter)
Charadrius alexandrinus	219	
Charadrius dubius	50-65	
Circus aeruginosus	5-7	
Cygnus cygnus		700-1,000
Cygnus olor		820-1,100
Egretta alba	300-700	800
Egretta garzetta	500-970	400
Fulica atra	530	32,500-37,500
Gallinula chloporus	5-8	
Gelochelidon nilotica	40	
Glareola pratincola	37	
Haematopus ostralegus	25-32	
Haliaeetus albicilla		50-60
Himantopus himantopus	58	
Larus cachinnans	10,000	6,000
Larus canus		8-10 (in winter)
Larus genei	300	
Larus ichthyaetus	65	300
Larus melanocephalus	6,800-17,500	
Larus ridibundus/minutus		25,000
Mergus albellus		21-30 (in winter)
Mergus serrator	90	54 (in winter)
Numenius arquata	1	100-150 (in winter)
Pelecanus onocrotalus	100	600-1,000
Phalacrocorax carbo	2,748-2,895	2,500
Recurvirostra avosetta	154	
Somateria mollissima	2-3	
Sterna albifrons	150	
Sterna caspia	200-570	
Sterna hirundo	2,060	
Sterna sandvicensis	5,000	
Tadorna tadorna	150	100
Tringa totanus	455	
Vanellus vanellus	35	

gered species among a significant diversity of ichthyofauna in five classes: Acipenseriformes, Clupeiformes, Salmoniformes, Syngnathiformes, Perciformes. RDB category I: *Acipenser sturio*; RDB category II: *Hippocampus guttulatus* ssp. *microstephanus*; RDB category IV: *Callionymus belenus.*

Special floristic values: Medicinal herbs, including *Ephedra distachya, Chamomilla recutita* and *Melilotus*. RDB category II: *Asparagus littoralis;* RDB category IV: *Astrodaucus littoralis.* The flora of Dzharylgach Island includes 51 endemic species including *Cladium mariscus*, which is found over large areas of the island. About 100 of the site's vascular plants are included in the European Red List.

Research facilities: Scientific research is carried out by the Institute of Hydrobiology and Institute of Zoology, Institute of Biology of Southern Seas (Sevastopol) of the National Academy of Sciences of Ukraine, Black Sea Biosphere Reserve, Crimean Nature Reserve, Tavrida National University, Nikitsky Botanical Garden, which is the national centre of the Ukrainian Agrarian Academy of Sciences, and Azov-Black Sea Ornithological Station.

Public awareness and education: The Lebedyni Islands Reserve has an environmental education and training centre. Dzharylgach Island is used for field studies for students of the Faculties of Biology of Ukrainian universities.

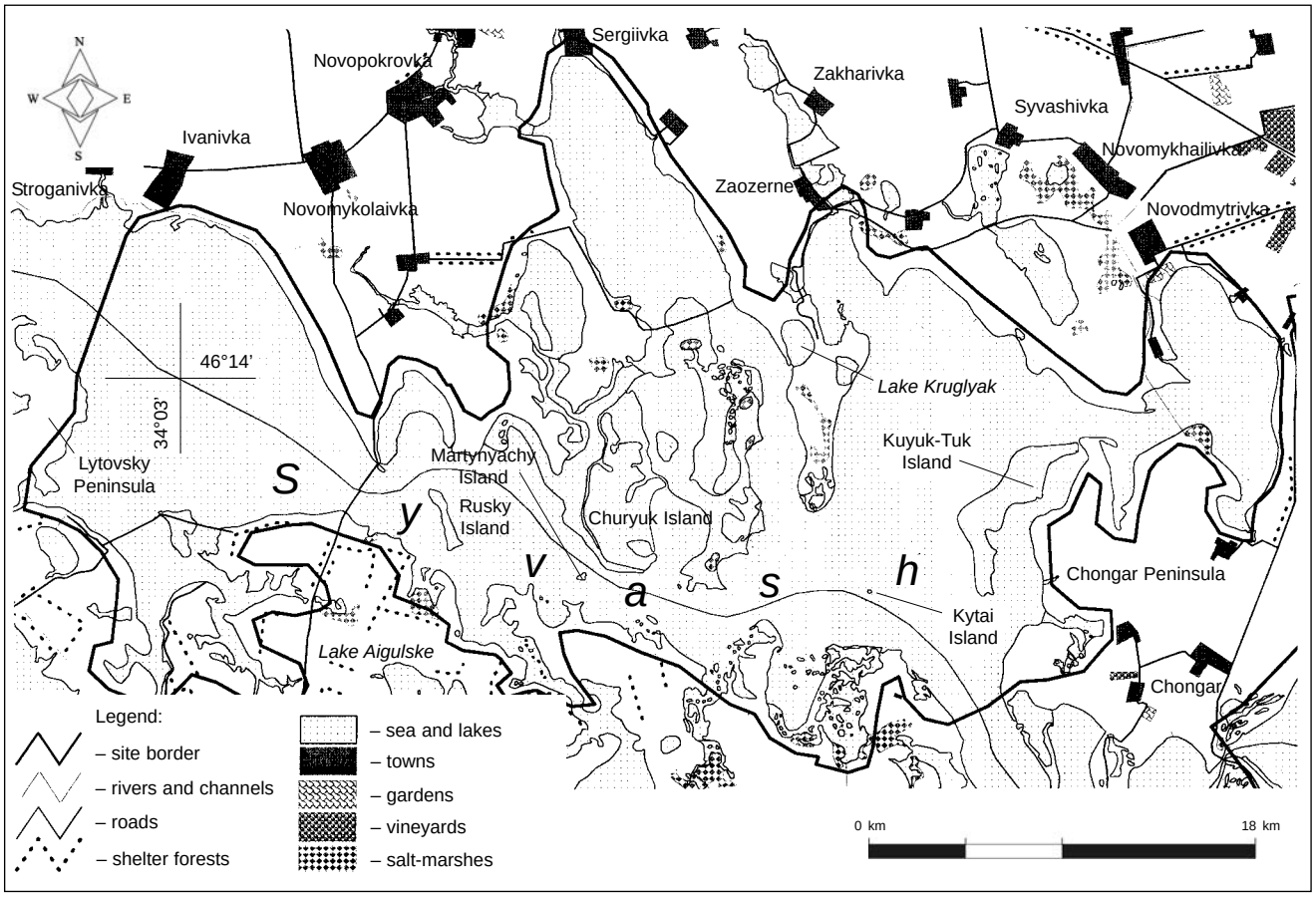
Criteria for inclusion: 1, 2, 4 and 5.

12. Central Syvash

Location: 46°10'N, 34°15'E. The Central Syvash is situated partly in Novotroitsky and Genichesky Rayons, Kherson Oblast, and partly in Dzhankoysky and Krasnoperekopsky Rayons, Crimea. Central Syvash site includes several islands: the large Rusky, Kuyuk-Tuk (255 ha) and Churyuk (924 ha), and the smaller Martynyachy (7 ha) and Kytai (3 ha).

Altitude: 0.1-1.5 m above sea level.

Area: 80,000 ha.



Map 12. The Central Syvash

Other hydrological linked wetlands: Eastern Syvash.
Hydrology: The water level fluctuates according to meteorological conditions and extent of evaporation during hot weather. Strong winds expose or inundate large areas. When shallows are exposed in summer by prevailing winds, they become subject to intense evaporation, followed by wind erosion. A dam at the Chongar Peninsula regulates the water from the Azov Sea that is allowed into the Central and Western Syvash. The non-tidal shallow lagoons all around Syvash Bay differ from tidal estuaries in their thermal regime: they warm up quickly in spring because they are so shallow. The average water depth in the entire bay is about 1 m.
Description of site: Central Syvash is a gulf of the Azov Sea. The Chongar Peninsula, which cuts deeply into the central part of the Syvash, divides the gulf naturally into separate reservoirs – Western and Central – from Eastern Syvash. Aygul and Karleut Lakes and a nameless lake near Syvashivka village and lower Syvashske village belong functionally, spatially and environmentally to the Central Syvash. Central Syvash is a saline lake with a strongly dissected coastline represented by alternating sets of islands, peninsulas and gulfs, the majority of which are freshwater.
Wetland type: H, J, Q, Sp, Ss.
Principal vegetation: The vegetation of the site comprises 250 species: psammophyte complex (*Argusia sibirica, Artemisia campestris, Calamagrostis epigeios, Leymus sabulo-*

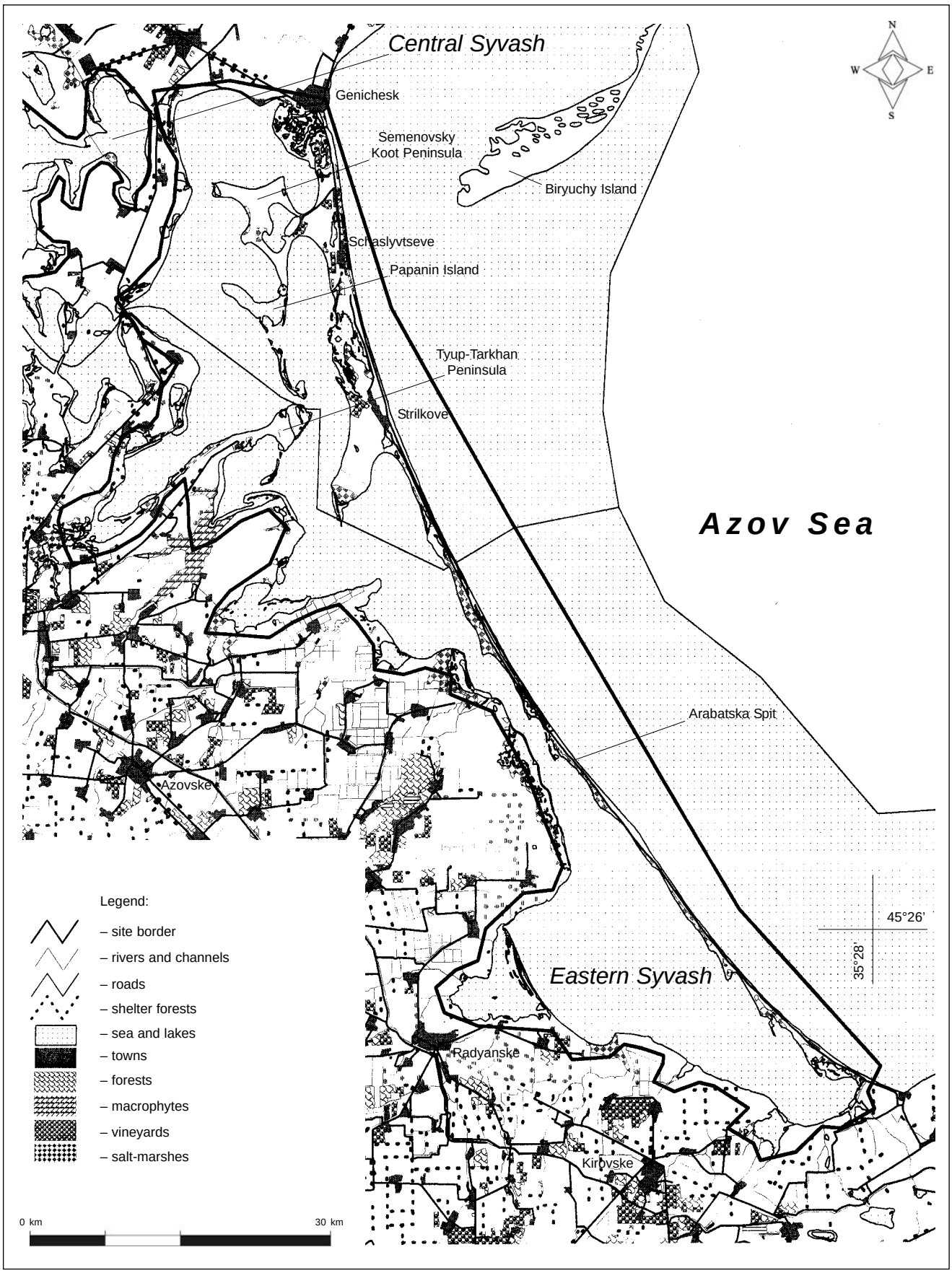
Table 15. Waterbird populations at the Central Syvash (1993-2002)

Species	Breeding pairs	Number in non-breeding period
Anas acuta		2,000-3,000 (in autumn)
Anas clypeata		400-2,000 (in autumn)
Anas crecca		Up to 10,100 (in autumn)
Anas penelope		3,000-4,000 (in autumn)
Anas platyrhynchos	50-70	7,000 (in winter), 46,000 (in autumn)
Anas querquedula	No data	3,000-7,000 (in autumn)
Anas strepera	20-40	9 (in autumn)
Anser albifrons		16,000-40,000 (in winter)
Anser anser		3,000-5,600 (in autumn)
Anser erythropus		Very small numbers (in winter)
Anser fabalis		Very small numbers (in winter)
Anthropoides virgo	12-15	600-1,000 (in autumn)
Ardea cinerea	60-90	800-1,000 (in autumn)
Ardea purpurea	40-60	50-70 (in autumn)
Aythya ferina	80-100	400-800 (in autumn)
Botaurus stellaris	40	No data
Branta ruficollis		1,500-13,500 (in winter)
Burhinus oedicnemus	12-20	30-40 (in autumn)
Calidris alpina		17,000- 30,000 (in autumn)
Calidris ferruginea		10,000-36,000 (in autumn)
Calidris minutà		11,000-16,000 (in autumn)
Charadrius alexandrinus	100-150	360-850 (in autumn)
Charadrius dubius	40-50	5 (in autumn)
Chlidonias hybrida	80-100	150-500 (in autumn)
Chlidonias leucopterus	40-60	Up to 5,000 (in autumn)
Ciconia ciconia		58 (in autumn)
Cygnus cygnus		300
Cygnus olor	5-8	800-1,000 (in winter)
Egretta alba	130-150	400-700 (in autumn)
Fulica atra	1,650	
Egretta garzetta	80-100	120-150 (in autumn)
Fulica atra	900-1,000	5,000-6,600 (in autumn)
Gelochelidon nilotica	1,000-1,500	500-700 (in autumn)
Glareola pratincola	200-250	200-400 (in autumn)
Grus grus		50,000-60,000
Haematopus ostralegus	30-40	No data
Himantopus himantopus	1,300-1,500	Up to 2,500 (in autumn)
Larus cachinnans	500-2,100	2,000 (in autumn), 4,100 (in winter)
Larus canus		2,000-5,000 (in winter)
Larus genei	0-9,300	2,000-10,000 (in autumn)
Larus ichthyaetus	0-400	200-300 (in autumn)
Larus melanocephalus	0-380	2,000-6,000 (in autumn)
Larus minutus		2,000-3,000 (in autumn)
Larus ridibundus		16,000-40,000 (in autumn)
Limicola falcinellus		100-700 (in autumn)
Limosa limosa		800-1,300 (in autumn)
Netta rufina		10-20 (in autumn)
Numenius arquata		120-150 (in autumn)
Numenius phaeopus		20-30 (in autumn)
Phalacrocorax carbo	1,534	1,600 (in autumn)
Phalaropus lobatus		6,000 (in autumn), 12,000 (in spring)
Philomachus pugnax		50,000-200,000 (autumn)
Plegadis falcinellus	No data	200-220 (in autumn)
Podiceps cristatus	50-70	140-250 (in autumn)
Podiceps grisegena	30-50	160-300 (in autumn)
Podiceps nigricollis	80-100	1,000-1,500 (in autumn)
Recurvirostra avosetta	1,800-3,500	2,500-11,100 (in autumn)

sus), meadow complex (*Artemisia pontica, Bolboschoenus maritimus, Juncus gerardii, J. maritimus, Puccinellia distans, Triglochin bessarabicum, T. maritimum*), halophyte complex (*Camphorosma monspeliaca, Halimione pedunculata, H. verrucifera, Halocnemum strobilaceum, Limonium gmelinii, L. suffruticosum, Salicornia europaea, Salsola soda*), grass-marsh complex (*Phragmites australis, Scirpus lacustris, S. tabernaemontani, Typha laxmannii*) and aquatic complex (*Ruppia maritima, Zostera marina, Z. noltii*).
Conservation measures taken: A Ramsar site (3UA012). Conservation measures are taken within the boundary of the Azov-Syvash National Natural Park (part of the aquatic area, parts of the Churyuk and Kuyuktuk islands, Martynayachiy and Kitay islands), located in Kherson Oblast.
Conservation measures proposed: Establishment of the Syvash National Nature Park on the territory of the Autonomous Republic of Crimea.
Land use: (a) Site: Activities at Syvash Bay are research, fishing (both commercial on a small scale and recreational on a larger scale), grazing of sheep and cattle, recreation and limited nature protection. It is difficult to determine which of these are applicable to the Ramsar site. (b) Surroundings/catchment: The steppe surrounding most of the lagoons is used for grazing sheep.
Possible changes in land use: Decrease of area of arable land and irrigated land; use of steppe plants, especially absinth, in the production of essential oils.
Disturbances and threats: Reduction in exchange between the Syvash Lagoon and Azov Sea will lead to changes in water levels and increased salinity. Additional threats derive from discharge of agricultural and industrial wastewaters and uncontrolled hunting.
Economic and social values: The main activities within the bay are hunting, fishery, fish-farming, salt production, pasturing and conservation. There is no organisational infrastructure for tourism.
Fauna: Mammals: More than 30 mammal species inhabit the Syvash coast. The most valuable of these are *Sus scrofa, Ondatra zibethica, Myocastor coypus, Vulpes vulpes, Nyctereutes procyonoides, Meles meles, Mustela putorius* and *Lepus europaeus.* Birds: 255 species of birds, representing 17 orders, are recorded in the Syvash area; about half (115) are breeding species. 216 species are migratory or vagrant, and a further 68 overwinter. The Syvash is inhabited by four amphibian and six reptilian species. *C*. 30-45 species of fish are believed to inhabit the wetland, whilst the list of hydrofauna would be increased by 800-900 species if the phyto- and zooplankton were taken into account.
Special floristic values: Some plant species listed in the RDB of Ukraine have been recorded in the Syvash region, including *Stipa* ssp., *Tamarix gracilis, Allium scythicum, Astrodaucus littoralis, Asparagus pallasii* and *Tulipa schrenkii.*
Research facilities: On the wetland, investigations have been carried out under the 'MAR-Ukraine', 'Wetland', 'IBA territories' and 'Program of Research of Biodiversity in the Azov-Black Sea Region' programmes by the Azov/Black Sea Ornithological Station. Studies of migration of waders and other waterbirds are now carried out regularly. The Azov/Black Sea Ornithological Station also keeps substantial information on breeding birds in a database. Ongoing scientific research on various subjects is carried out by the Institute of Zoology of the National Academy of Sciences of Ukraine and Melitopol Pedagogical University.
Public awareness and education: There are no special educational programmes, but nature protection training is on the curriculum of comprehensive schools. The Dzhankoi Regional Youth Environmental Centre, located in Zavetnoe village, with branches in other villages of the rayon, promotes environmental education through conducting nature protection activities, motivating children to undertake research projects and holding environmental camps. Lectures are given by experts and scientists for groups of land users (such as farmers, fishermen, hunters and industrial workers).
Criteria for inclusion: 1, 2, 4, 5 and 6.

13. Eastern Syvash

Location: 45°40'N, 35°00'E. Syvash Bay is largely separated from the Azov Sea by the 100-km long Arabatska Spit, but is connected by a strait near the town of Genichesk. Eastern Syvash lies to the south of the city of Genichesk and includes parts of Novotroitsky and Genichesk Rayons, Kherson Oblast, and parts of Dzhankoy, Nyzhnyogirsky, Radyansky, Kirovsky and Leninsky Rayons, Crimea. It covers much of the west coast of the Azov Sea on the northeastern coast of the Crimean Peninsula.
Altitude: 0.1-1.5 m above sea level.
Area: 165,000 ha.
Wetland type: H, J, Sp, Ss.
Other hydrologically linked wetlands: All the different parts of the Eastern Syvash are joined together by a



Map 13. The Eastern Syvash

system of narrow straits, and two straits in the east unite it with the Azov Sea. Some sites near to large localities (e.g. Dzhankoy) are gradually becoming less saline and the vegetation is changing as a result of freshwater draining into the site.

Description of site: Syvash Bay is a shallow, saltwater bay with an indented, rocky shoreline and numerous spits and islets, as well as a large number of saline lowlands and peninsulas. The bay is separated from the Azov Sea by a large, low-lying peninsula (Arabatska Spit), and has only one narrow connection to the Azov Sea. It is one of the largest lagoon systems in Europe. The water level fluctuates according to the meteorological conditions. The islands provide important nesting areas for birds. The site is also of great importance for wintering waterfowl, with hundreds of thousands of birds recorded. The precise number of waterfowl within the strict area of the Ramsar site is not known, but is very large.

Principal vegetation: The littoral vegetation of the Syvash region is marked by the predominance of Mediterranean and Black Sea (Pontic) species, and the presence of many endemic species, such as *Leymus subulosus, Cakile euxina, Polygonum janatae, Asparagus pallasii, Achillea birjuczensis, Centaurea odessana, Limonium tschurjukiense* and *Lepidium syvaschicum.*

Table 16. Waterbird populations at the Eastern Syvash (1990-2002)

Species	Breeding pairs	Non-breeding individuals
Anas acuta		33,000-35,000 (on migration)
Anas penelope		62,000-65,000 (on migration)
Anas platyrhynchos	500-640	60,000-65,000 (in winter)
Anser albifrons		Up to 200,000 (on migration)
Anser anser	30-50	Up to 22,000 (on migration)
Ardea cinerea	160-200	
Ardea purpurea	90-120	
Ardeola ralloides	320-340	
Aythya nyroca	21-30	
Aythya ferina	900-1,000	Up to 120,000 (in winter)
Branta ruficollis		Up to 22,000 (in winter)
Calidris alpina		Up to 127,600
Calidris minuta		Up to 26,700 (on migration)
Charadrius alexandrinus	700-1,000	Up to 4,218 (on migration)
Charadrius dubius	50-70	
Chlidonias leucoptera	30-150	38,000-42,000 (on migration)
Chlidonias nigra	20-25	12,000-20,000 (on migration)
Cygnus olor	25-35	10,000-30,000 (in winter)
Egretta alba	660-700	20-400 (in winter)
Egretta garzetta	420-580	
Fulica atra	4,000-4,200	300,000-350,000 (on migration)
Gelochelidon nilotica	800-1,800	2,000-2,500 (on migration)
Glareola pratincola	200-573	1,200-1,500 (on migration)
Haematopus ostralegus	140-160	
Himantopus himantopus	500-940	Up to 500/day (on migration)
Larus cachinnans	2,200-3,200	300-500 (in winter)
Larus genei	5,400	
Larus ichthyaetus	40-360	
Larus melanocephalus	12,165	Up to 14,000 (on migration)
Larus minutus		Up to 3,200 (on migration)
Larus ridibundus		Up to 12,500 (on migration)
Netta rufina	128-140	Up to 10,000 (in winter)
Nycticorax nycticorax	400-520	
Phalacrocorax carbo	4,000-5,000	Up to 12,000 (on migration)
Platalea leucorodia	90-120	
Plegadis falcinellus	800-860	
Podiceps cristatus	360-420	
Podiceps grisegena	66-120	
Recurvirostra avosetta	2,000	10,000-12,000 (on migration)
Sterna albifrons	360-380	600-800 (on migration)
Sterna caspia	300-380	
Sterna hirundo	6,800	
Sterna sandvicensis	5,200	
Tadorna tadorna	40-60	
Tringa totanus	1,400-1,600	Up to 11,800 (on migration)
Vanellus vanellus	380-420	

Conservation measures taken: The Azov-Syvash National Nature Park (57,400 ha), established in 1993, is the largest protected area in the Syvash region. In addition there are the Arabatsky Botanical Game Reserve of national importance (Leninsky Rayon, Autonomous Republic of Crimea, 600 ha), the Near-Syvash Botanical Game Reserve of local importance (Nyzhnyogirsky Rayon, 998 ha) and the 'Aqua Complex of Arabatska Spit' Hydrological Monument (150 ha).

Conservation measures proposed: The Syvashski National Nature Park is to be established. The park's total of 207,187 ha will include a terrestrial area of 50,462 ha and an aquatic area comprising 139,887 ha from the Syvash and 16,838 ha from the Azov Sea.
Land use: (a) site: Activities at Syvash Bay are research, fishing (both commercial on a small scale and recreational on a larger scale), grazing of sheep and cattle, recreation, extraction of sand, and limited nature protection. It is difficult to determine which of these are applicable to the Ramsar site. (b) surroundings/ catchment: The steppe surrounding most of the lagoons is used to graze sheep. In recent years, however, the sharp decline in sheep breeding has led to the area's being overgrown by ruderal plants.
Possible changes in land use: In the Crimean part of the Near-Syvash region, more than 70% of the land has been ploughed up. Most of this area is not cultivated at present but is used for livestock grazing.
Disturbances and threats: (a) at the site: Threats to the site derive from tourism, pollution by wastewater from agriculture and chemical factories, salinisation, increased commercial and recreational fisheries, resettlement and increased agricultural development. A reduction of flow from the Azov Sea into Syvash Bay could result in a fall in water level and increased salinity. It is difficult to say how strongly these factors will affect the site. (b) around the site: Degradation of natural vegetation because of overgrazing by sheep.
Economic and social values: The site is used for recreational fishing, and some research is conducted.
Fauna: More than 30 mammal species inhabit the Syvash coast. The most valuable of these are *Sus scrofa, Ondatra zibethica, Myocastor coypus, Vulpes vulpes, Nyctereutes procyonoides, Meles meles, Mustela putorius* and *Lepus europaeus.* 255 species of birds, representing 17 orders, are recorded in the Syvash area; *c*. half (115) are breeding species. 216 species are migratory or vagrant, and a further 68 overwinter. The Syvash is inhabited by 4 amphibian and 6 reptilian species. About 30-45 species of fish are believed to inhabit the wetland, whilst the list of hydrofauna would be increased by 800-900 species if the phyto- and zooplankton were taken into account.
Special floristic values: The Syvash region is situated in the zone of wormwood-fescue or wormwood-turfgrass Ukrainian steppes. The vegetation comprises 250 species: Psammophyte complex (*Argusia sibirica, Artemisia campestris, Calamagrostis epigeios, Leymus sabulosus*), meadow complex (*Artemisia pontica, Bolboschoenus maritimus, Juncus gerardii, J. maritimus, Puccinellia distans, Triglochin bessarabicum, T. maritimum*), Galophites complex (*Camphorosma monspeliaca, Halimione pedunculata, H. verrucifera, Halocnemum strobilaceum, Limonium meyeri, L. suffruticosum, Salicornia europaea, Salsola soda*), Grass-marshy complex (*Phragmites australis, Scirpus lacustris, S. tabernaemontani, Typha laxmannii*), aquatic complex (*Ruppia maritima, Zostera marina, Z. noltii*).
Research facilities: Studies have been carried out by the Azov/Black Sea Ornithological Station under the 'MAR-Ukraine', 'Wetland', 'IBA territories' and 'Program of Research of Biodiversity in the Azov-Black Sea Region' programmes. The migration of waders and other waterbirds will continue to be studied regularly. The Azov/Black Sea Ornithological Station also keeps substantial information on breeding birds on its database. Ongoing scientific research on various subjects is carried out by the Institute of Zoology of the National Academy of Sciences of Ukraine and Melitopol Pedagogical University.
Public awareness and education: There are no special educational programmes at present, but nature protection training is on the curriculum of local comprehensive schools. Lectures are given by experts and scientists for groups of land users (such as farmers, fishermen, hunters and industrial workers).
Criteria for inclusion: 1, 2, 4, 5 and 6.

14. Yagorlytska Bay

Location: 48°24'N, 31°53'E. In Goloprystansky Rayon, Kherson Oblast, and Ochakiv Rayon, Mykolaiv Oblast, 45 km southwest of the city of Kherson.
Area: 34,000 ha.
Altitude: 0.1-1.7 m above sea level.
Wetland type: A.
Other hydrologically linked wetlands: The Black Sea and Kinburnska Spit.
Description of site: Yagorlytska Bay (see Map 10) is a bay of the Black Sea with numerous islands (e.g. Dovgy, Krugly, Konsky and Yegypetski) of accretive origin combined with shell-sand alluvium. On the coastal side of the bay, these islands are subject to wave action and are consequently highly dynamic in form and character. On one side of the bay are low-lying marshy areas, in the centre of which there is a series of small saline lakes. Yagorlytska Bay is one of the least modified wetlands of its type in the Black Sea coastal area, with a correspondingly high biodiversity including a number of rare or vulnerable aquatic species, including Pontic relicts.
Principal vegetation: The main habitat-types represented within the site are dune grassland, open water and

halophyte communities, supporting *Artemisia santonica, Calamagrostis epigeios, Centaurea borysthenica, Ceratophyllum demersum, Euphorbia seguieriana, Festuca valesiaca, Halimione verrucifera, Najas marina, Phragmites australis, Potamogeton pectinatus, Ruppia maritima, Salicornia europaea, Schoenoplectus lacustris, Suaeda prostrata, Syrenia cana, Typha laxmannii* and *Zannichellia palustris.*

Conservation measures taken: A Ramsar site (3UA014). Most of the site is included within the Black Sea Biosphere Reserve.

Conservation measures proposed: Extension and enforcement of protection of those parts of the site that fall within the Black Sea Biosphere Reserve.

Land use: The main activities within the bay are fishery, recreation and water-borne transportation, although there is no organisational infrastructure for tourism.

Management: Management of the site is co-ordinated within the framework of governmental programmes for fishery, hunting and agriculture. However, the wetland and associated areas included within the Black Sea Biosphere Reserve are managed under the Reserve Rules, within the framework of existing scientific programmes.

Table 17. Waterbird population at Yagorlytska Bay (1990-2002)

Species	Breeding pairs	Migrating individuals	Wintering individuals
Anas penelope		2,000-5,000	1,000-2,300
Anas platyrhynchos	30-50	20,000-50,000	2,000-20,900
Anser albifrons		8,000-20,000	2,000-10,000
Anser anser		3,000-15,000	550-2,500
Anser erythropus		30-100	0-20
Ardea cinerea	0-1		5-10
Aythya ferina		2,000-10,000	1,000-10,000
Aythya fuligula		5,000-60,000	1,000-30,000
Aythya marila		2,000-6,000	100-5,000
Branta ruficollis		500-1,000	50-300
Bucephala clangula		1,000-5,000	250-5,000
Calidris alpina		3,000-5,000	
Charadrius alexandrinus	10-20	500-4,000	
Cygnus olor	0-3	2,000-10,000	1,600-5,000
Egretta alba		200-600	5-10
Egretta garzetta	30-60	500-3,000	
Fulica atra	10-130	10,000-30,000	200-2,500
Grus grus		300-1,000	
Haematopus ostralegus	20-30	1,000-2,500	
Haliaeetus albicilla		10-60	10-20
Larus cachinnans	1,850-6,500	4,000-8,000	150-2,500
Larus canus		1,000-3,000	100-1,000
Larus genei		5,000-15,000	
Larus ichthyaetus	10-180	200-500	
Larus melanocephalus		20,000-70,000	
Larus ridibundus		1,000-5,000	150-2,000
Mergus serrator	10-40	500-3,000	80-150
Numenius arquata	3-5	500-1,000	0-10
Pelecanus onocrotalus		260-4,000	
Phalacrocorax carbo	700-3,100	5,000-20,000	
Philomachus pugnax		4,000-6,000	
Somateria mollissima	800-1,700	1,000-5,000	500-2,000
Sterna albifrons		50-100	
Sterna caspia		100-500	
Sterna hirundo	150-760	1,000-3,000	
Sterna nilotica		500-700	
Sterna sandvicensis		3,000-10,000	
Tadorna tadorna	10-70	200-500	40-200

Possible changes in land use: The site is naturally highly dynamic, but no anthropogenic changes are foreseen.

Disturbances and threats: The main threats are associated with a lack of control over activities such as transportation, fishery and discharge of polluted water from agriculture and industrial installations.

Economic and social values: The site supports a traditional fishery and is important for conservation education, recreation and scientific research.

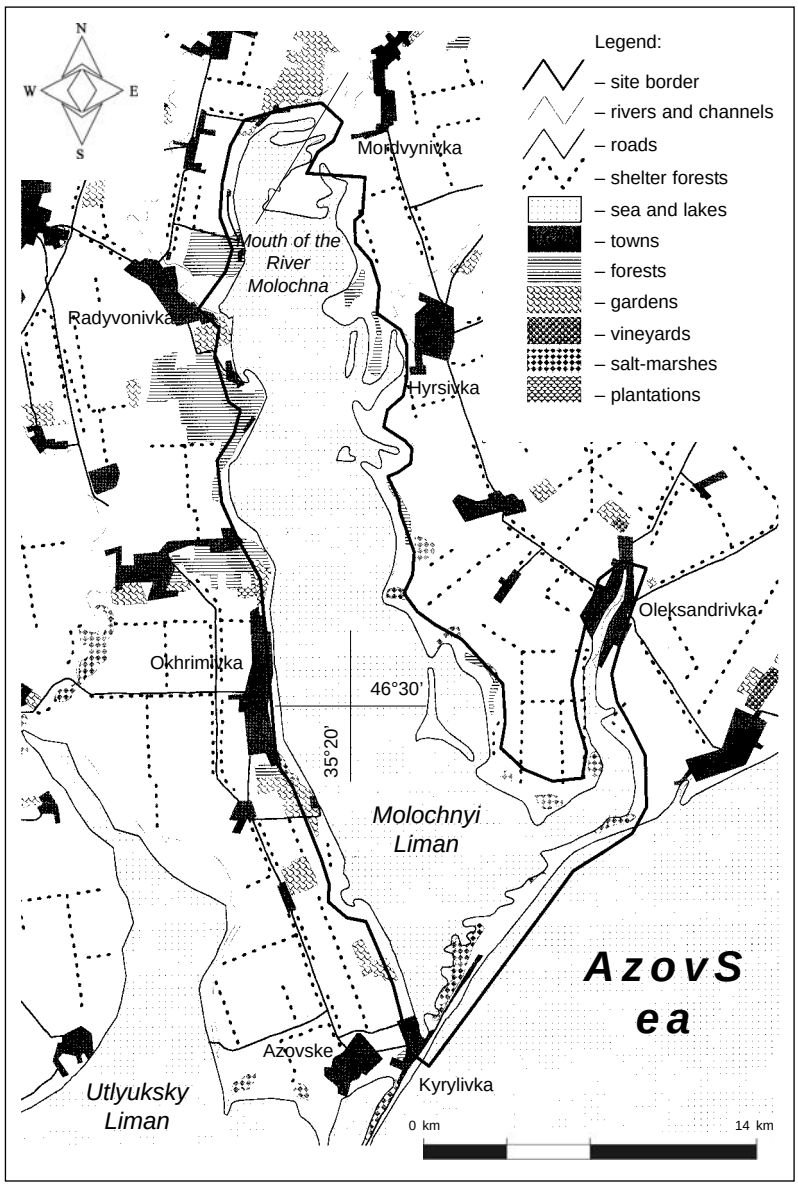
Fauna: Mammals: *Microtus arvalis.* Birds: The site supports 7,000 pairs of breeding waterbirds, with most colonies on the islands, shell-sand peninsulas and salt-flats. Outside the breeding season, up to 30,000 waterbirds occur, mainly on the islands and peninsulas and in shallow or open water within the bay. Fish: RDB category I: *Acipenser nudiventris*; RDB category II: *Hippocampus guttulatus* ssp. *microstephanus.*

Special floristic values: RDB category II: *Orchis fragrans, O. picta*; RDB category III: *O. coriophora, O. palustris.*

Research facilities: Scientific research is carried out by the Institute of Biology of Southern Seas (Sevastopol), Institute of Hydrobiology, Institute of Zoology of the National Academy of Sciences of Ukraine, Black Sea Biosphere Reserve and "Kinburnska Kosa" Regional Landscape Park.

Public awareness and education: Public awareness education is restricted to that provided by comprehensive schools together with lectures presented by scientists from universities and other organisations for the principal interest groups.

Criteria for inclusion: 2, 4 and 5.



Map 14. Molochnyi Liman

15. Molochnyi Liman

Location: 45°35'N, 35°22'E. In Melitopol, Yakymivka and Pryazovsky Rayons, Zaporizhzhya Oblast, 18 km south of the city of Melitopol.

Area: 22,400 ha.

Altitude: 0.3-1.6 m above sea level on the left bank and up to 27 m above sea level on the right bank.

Wetland type: J, F.

Other hydrologically linked wetlands: The River Molochna enters the upstream end of the lagoon, while at its downstream end the liman is linked to the Sea of Azov.

Description of site: The site comprises a lagoon at the mouth of the River Molochna, separated from the Azov Sea by a long, sandy, pebble spit, with only a narrow channel allowing exchange of water between the two. The western side of the lagoon rises steeply, while the eastern side is low-lying and flat. The average summer water temperature is 30°C. In winter, parts of the lagoon freeze over and in severe winters the entire surface may freeze.

Hydrology: The lagoon is 35 km long, narrow at the upstream end, widening to 10 km wide at its downstream end; it is 0.5-3 m deep with an openwater area of approximately 168 km^2. Water levels within the lagoon are determined by a combination of exchange with the Azov Sea and inflow from the River Molochna.

Principal vegetation: The main habitat types represented within the site are openwater, dune grassland and halophyte communities, supporting *Artemisia pontica, Calamagrostis epigeios, Carex colchica, Elytrigia maeotica, Juncus gerardii, J. maritimus, Leymus racemosus, L. sabulosus, Limonium gmelinii, Ruppia cirrhosa, Salicornia europaea, Salsola soda, Zannichellia palustris* and *Zostera marina.*

Conservation measures taken: The site includes one hydrological reserve and three ornithological game reserves: Altashyrski, Rodionovski and Stepanivska Kosa.

Conservation measures proposed: None.

Management: Management of the site derives from governmental programmes for economic activities such as fish farming, fishery and agriculture.

Possible changes in land use: Unofficial recreation, agriculture and industry are all likely to expand within the

area.

Disturbances and threats: The quality of the site is threatened by pollution from industrial, agricultural and domestic wastewater. Lack of control, combined with a trend for increasing fishing, hunting, reed-burning, recreation, pollution and overgrazing all contribute to overall habitat degradation.

Economic and social values: The site supports a traditional fishery and is important for conservation education, recreation and scientific research. Clay from the lagoon is reputed to have medicinal properties and is used for mud baths.

Fauna: Mammals: *Microtus arvalis* and *Vulpes vulpes.* Birds: The lagoon supports 12,000-15,000 pairs of breeding waterbirds, mainly on shell-sand islands, saltmarsh, coastal reed-beds and the main peninsula. Non-breeding waterbirds number 197,000-286,000 individuals. Amphibians: *Bufo viridis.*

Special floristic values: RDB category I: *Damasonium alisma;* RDB category II: *Elytrigia stipifolia.*

Research facilities: Research on the site is carried out by the Institute of Zoology of the National Academy of Sciences of Ukraine and Melitopol Pedagogical University.

Public awareness and education: Public awareness education is restricted to that provided by comprehensive schools together with lectures presented by scientists from universities and other organisations for the principal interest groups.

Criteria for inclusion: 2, 4 and 5.

Table 18. Waterbird populations at Molochnyi Liman (1998-1999)

Species	Breeding pairs	Non-breeding individuals
Anas platyrhynchos	50-100	25,000-30,000
Anser albifrons		25,000-40,000
Anser anser	40	10,000-12,000
Ardea cinerea	250	
Ardea purpurea	40	
Aythya ferina	25	2,000-5,000
Botaurus stellaris	37	No data
Cygnus olor	1-2	2,000-5,000
Egretta alba	60	800-1,000
Fulica atra	465	15,000-20,000
Gallinula chloropus	63	No data
Glareola pratincola	28	No data
Ixobrychus minutus	33	No data
Larus cachinnans	4,130	5,000-10,000
Larus ridibundus		5,000-15,000
Phalacrocorax carbo	620	5,000-10,000
Podiceps cristatus	61	3,000-5,000
Podiceps grisegena	40	200-500
Podiceps nigricollis		5,000-10,000
Rallus aquaticus	40	No data
Sterna hirundo	2,150	
Tringa totanus	105	
Vanellus vanellus	44	

16. Obytochna Spit and Obytochna Bay

Location: 45°35'N, 36°12'E. In Prymorsky Rayon, Zaporizhzhya Oblast, 45 km southwest of the city of Berdiansk and 30 km west of Berdianska Bay (17).

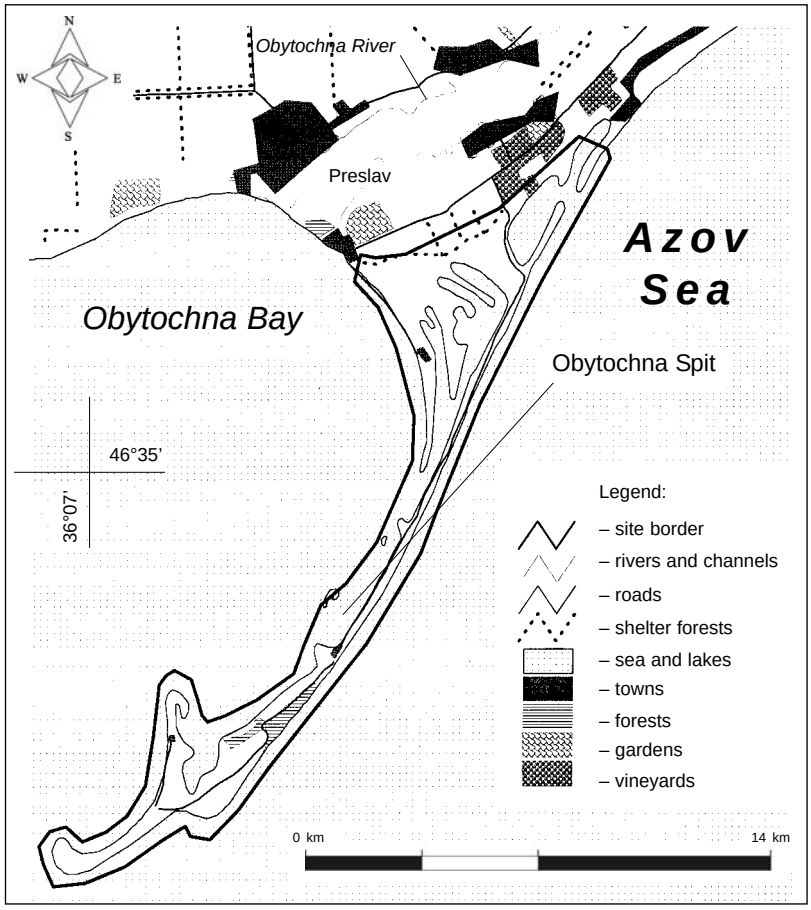
Area: 2,000 ha.

Altitude: 0.2-1.8 m above sea level.

Wetland type: A, E.

Other hydrologically linked wetlands: The Azov Sea.

Description of site: Obytochna Bay is a 30-km wide, 6-8 m deep bay of the Azov Sea, formed by the 30-km Obytochna Spit. The floor of the bay is covered by a layer of silt, with shell-sand deposited near the



Map 15. Obytochna Spit and Obytochna Bay

shore. The continental coasts of the bay are high, in places divided by valleys. The peninsula is a low, hilly plain with sand dunes, rising gently from west to east, in the centre of which there are a number of small, brackish lakes. The western end of the peninsula is broken up by a number of small, narrow coves; the eastern end is relatively uniform, but enters a complex of bays and islands on the headland. During autumn and winter storms, low-lying parts of the peninsula flood and the sea breaks through in narrower parts. The average summer water temperature in the bay is 22-27°C, with a maximum of 32°C. In winter the bay freezes over. Salinity within the bay may rise to 13.8‰.

Table 19. Waterbird populations at Obytochna Spit and Obytochna Bay (1999-2002)

Species	Breeding pairs	Non-breeding individuals
Anas acuta		80 (on migration)
Anas clypeata		60 (on migration)
Anas penelope		1,400 (on migration)
Anas platyrhynchos	30	6,000 (on migration), 400 (in winter)
Anas querquedula	4	500 (on migration)
Anas strepera	3	60 (on migration)
Anser albifrons		3,000 (on migration)
Anser anser		600 (on migration)
Ardea cinerea	70	60 (on migration), 20 (in winter)
Aythya ferina	15	600 (on migration)
Aythya fuligula		1,200 (on migration)
Aythya marila		12,200 (on migration), 200 (in winter)
Branta ruficollis		240 (on migration)
Bucephala clangula		120 (on migration)
Charadrius alexandrinus	60	250 (on migration)
Charadrius dubius	10	
Chlidonias hybrida		1,400 (on migration)
Chlidonias leucoptera		2,000 (on migration)
Chlidonias nigra		1,000 (on migration)
Cygnus olor		800 (on migration), 120 (in winter)
Egretta alba	15	100 (on migration)
Egretta garzetta	30	40 (on migration)
Fulica atra	60	2,400 (on migration), 120 (in winter)
Larus cachinnans	2,000	1,300 (on migration), 190 (in winter)
Larus genei	800	1,200 (on migration)
Larus melanocephalus	600	
Larus minutus		1,900 (on migration)
Larus ridibundus		3,000 (on migration)
Phalacrocorax carbo	3,500	35,000 (on migration), 800 (in winter)
Philomachus pugnax		2,000 (on migration)
Podiceps cristatus	60	400 (on migration)
Recurvirostra avosetta	20	240 (on migration)
Somateria mollissima	2	20 (on migration)
Sterna albifrons	140	400 (on migration)
Sterna hirundo	2,100	900 (on migration)
Sterna sandvicensis	2,000	1,000 (on migration)
Tringa totanus	120	400 (on migration)

Principal vegetation: The main habitat types represented within the site are dune grassland (*Argusia sibirica, Crambe pontica, Eryngium maritimum, Leymus sabulosus, Lactuca tatarica*), steppe (*Festuca beckeri, Stippa capillata, Ephedra distachya, Carex colchica, Euphorbia seguieriana*), meadows (*Calamagrostis epigeios, Scirpus holoschoenus, Juncus gerardii, Puccinellia gigantea, Elytrigia elongata, Limonium meyeri*), halophyte communities *(Salicornia europaea, Salsola soda, Suaeda prostrata, Halocnemum strobilaceum),* marshland *(Phragmites australis, Bolboschoenus maritimus).*

Conservation measures taken: A Ramsar site (3UA016). The site is located within the 8,863 ha Obytochna Kosa Landscape Zakaznik.

Conservation measures proposed: The National Nature Park 'Pryazovsky' will be established.

Land use: The principal land uses are conservation and recreation. Nature protection is the responsibility of the Regional Authority for Nature Protection.

Management: Management of the site derives from governmental programmes for economic activities such as fish farming, fishery and agriculture.

Possible changes in land use: The habitat balance within the site is changing due to the spread of reeds.

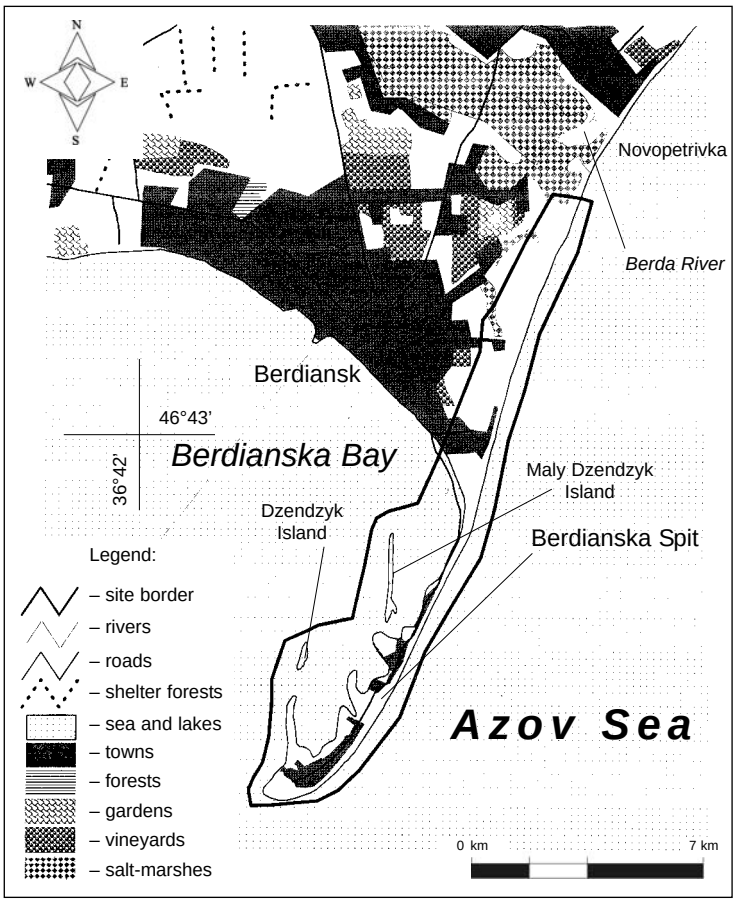
Disturbances and threats: The quality of the site is threatened by pollution from industrial, agricultural and domestic wastewater. Lack of control, combined with a trend for increased fishing, hunting, reed-burning, recreation, pollution and overgrazing, is contributing to overall habitat degradation.

Economic and social values: The site supports a traditional fishery and is important for conservation education, recreation and scientific research.

Fauna: Mammals: *Microtus arvalis* and *Vulpes vulpes.* Birds: The site supports 4,000-6,000 pairs of breeding waterbirds of 32 species, with the largest numbers nesting on islands, saltmarsh and in reed-beds. 14,000-17,000 waterbirds occur outside the breeding season, concentrated in the open water of the bay, on lakes and shallow lagoons and on mouths of small rivers.
Special floristic values: RDB category I: *Glaucium flavum.*
Research facilities: Research on the site is carried out by the Institute of Zoology of the National Academy of Sciences of Ukraine, Melitopol Pedagogical University and Donetsk State University.
Public awareness and education: Public awareness education is restricted to that provided by comprehensive schools together with lectures presented by scientists from universities and other organisations for the principal interest groups.
Criteria for inclusion: 2, 4 and 5.

17. Berda River Mouth, Berdianska Spit and Berdianska Bay

Location: 46°40'N, 36°48'E. In Berdiansk Rayon, Zaporizhzhya Oblast; the mouth of the River Berda is 7 km east of the city of Berdiansk, while the bay and spit lie to the south of the city.
Area: 1,800 ha.
Altitude: 0.3-2.3 m above sea level.
Wetland type: A, E.
Other hydrologically linked wetlands: The Azov Sea.
Description of site: The site comprises a 50-km wide, 5-8 m deep sea bay bordered to the south by Berdianska Spit, including a complex of small islands, shallow bays, lagoons and the estuary of the small river. The coast of the bay is mainly steep, in places broken by ravines and gullies. The floor of the bay is covered with a layer of silt and shells in the west and mainly shell-sand in the east. Berdianska Spit is 23 km long and 15 km wide and composed mainly of shell-sand dunes up to 2 m high. There are two short spits at the east of the peninsula and a number of small, brackish lakes in the widest part. Water temperature within the bay is 22-30°C in summer and 0°C in winter. Salinity is 13-13.5‰.
Principal vegetation: The main habitat types represented within the site are open water, dune grassland and halophyte communities supporting *Argusia sibirica, Artemisia santonica, Calamagrostis epigeios, Carex colchica, Ceratophyllum demersum, Crambe pontica, Eryngium maritimum, Glycyrrhiza echinata, G. glabra, Gypsophila paniculata, Halimione verrucifera, Leymus sabulosus, Limonium meyeri, Najas*



Map 16. Berda River Mouth, Berdianska Spit and Berdianska Bay

Table 20. Waterbird populations at Berdianska Bay (1992-2002)

Species	Breeding pairs	Non-breeding individuals
Anatidae		40,000
Charadrius alexandrinus	12	
Charadrius dubius	5	
Egretta alba	70	
Egretta garzetta	40	
Glareola pratincola	25	
Haematopus ostralegus	3	
Himantopus himantopus	41	
Larus cachinnans	400	
Phalacrocorax carbo	1,200	
Recurvirostra avosetta	20	
Sterna albifrons	40	
Sterna hirundo	1,520	
Tringa totanus	15	

marina, Phragmites australis, Plantago cornuti, Potamogeton pectinatus, Schoenoplectus lacustris, S. tabernaemontani, Typha laxmannii and *Zostera marina.*

Conservation measures taken: A Ramsar site (3UA017). The site includes the Berdianska Kosa State Game Reserve.

Conservation measures proposed: Plans are currently under development to increase the protected status of the site.

Land use: The principal land uses at the site are conservation and recreation.

Management: Management of the site derives from governmental programmes for economic activities such as fish farming, fishery and agriculture. Nature protection falls under the Regional Authority for Nature Protection.

Possible changes in land use: No information.

Disturbances and threats: The quality of the site is threatened by pollution from industrial, agricultural and domestic wastewater. Lack of control, combined with a trend for increase in fishing, hunting, reed-burning, recreation, pollution and overgrazing, is contributing to overall habitat degradation.

Economic and social values: The site supports a traditional fishery and is important for conservation education, recreation and scientific research.

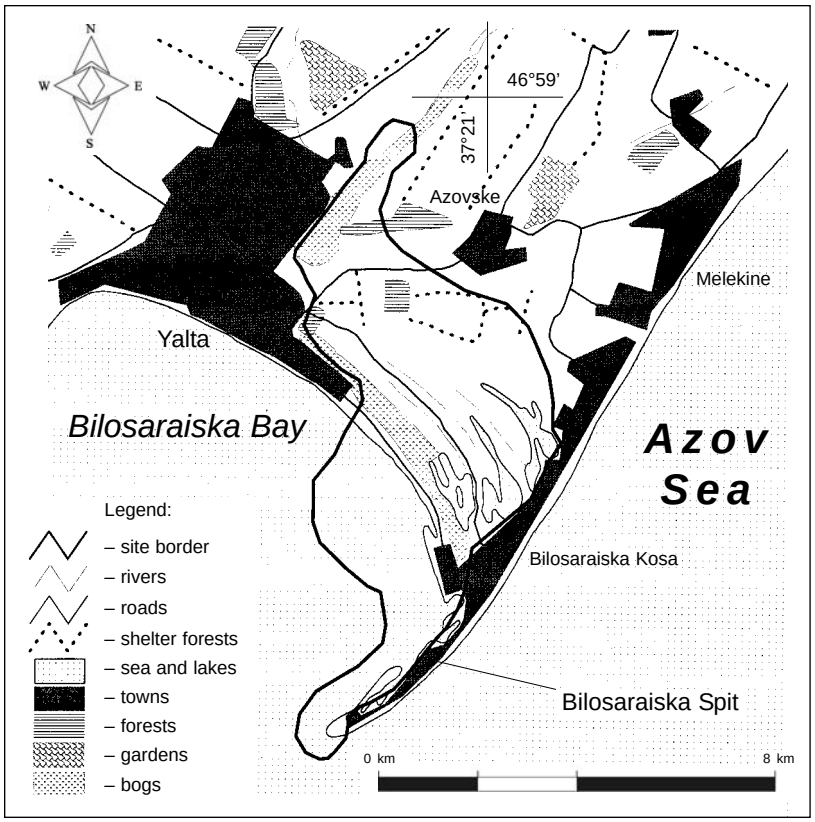
Fauna: Mammals: *Microtus arvalis* and *Vulpes vulpes.* Birds: *Anas platyrhynchos, Anser albifrons, Aythya ferina, A. marila* and *A. nyroca.* The site supports 3,000-5,000 pairs of breeding waterbirds, with most colonies on islands, salt marsh and reed-beds. Outside the breeding season, 30,000-40,000 waterbirds have been recorded at the site, concentrated on the open water of the bay and on lakes on the peninsula.

Special floristic values: No information.

Research facilities: Research on the site is carried out by the Institute of Zoology of the National Academy of Sciences of Ukraine, Melitopol Pedagogical Institute and Donetsk State University.

Public awareness and education: Public awareness education is restricted to that provided by comprehensive schools together with lectures presented by scientists from universities and other organisations for the principal interest groups.

Criteria for inclusion: 4 and 5.



Map 17. Bilosaraiska Bay and Bilosaraiska Spit

18. Bilosaraiska Bay and Bilosaraiska Spit

Location: 46°55'N, 37°20'E. In Pershotravnevy Rayon, Donetsk Oblast, southeast of the village of Yalta.

Area: 2,000 ha.

Altitude: 0.2-1.8 m above sea level.

Wetland type: A, E.

Other hydrologically linked wetlands: The Azov Sea.

Description of site: Bilosaraiska Bay is a 14-km long, 12-km wide inlet of the Azov Sea, bordered to the south by Bilosaraiska Spit. The site includes the bay and peninsula, silt islands, shallow waters, freshwater lagoons and shallow lakes. The peninsula is predominantly an undulating plain, composed of shell-sand with occasional silt beds. It contains areas of saltmarsh and reed-beds at the western end and a complex of dunes and small lakes in the east, formed through long-shore deposition of marine sand. The site is dynamic due to the effects of storms in spring and autumn, which can result in an increase in the number of saline lakes.

Principal vegetation: The main types of habitats represented within the site are marshy-grassland, open water,

dune grassland and halophyte communities, supporting *Argusia sibirica, Artemisia santonica, Calamagrostis epigeios, Carex colchica, Ceratophyllum demersum, Crambe pontica, Eryngium maritimum, Glycyrrhiza echinata, G. glabra, Gypsophila paniculata, Halimione pedunculata, H. verrucifera, Leymus sabulosus, Limonium meyeri, Najas marina, Phragmites australis, Plantago cornuti, Potamogeton pectinatus, Puccinellia distans, Schoenoplectus lacustris, S. tabernaemontani, Typha laxmannii,* and *Zostera marina.*

Table 21. Waterbird populations at Bilosaraiska Bay and Bilosaraiska Spit (1992-2002)

Species	Breeding pairs	Non-breeding individuals
Charadrius alexandrinus	5-10	
Egretta alba	50-70	100
Gulls, terns and waders		1,000
Himantopus himantopus	10-15	
Recurvirostra avosetta	5-10	
Sterna albifrons	100	
Sterna hirundo	700-2,000	
Sterna sandvicensis	500-1,000	
Tringa totanus	50	
Vanellus vanellus	6	

Conservation measures taken: A Ramsar site (3UA018). The site includes the Bilosaraiska Kosa Game Reserve.

Conservation measures proposed: Expansion of the area covered by the Bilosaraiska Kosa Game Reserve.

Land use: Mainly conservation and recreation.

Management: Management of the site derives from governmental programmes for economic activities such as fish farming, fishery and agriculture. Nature protection is the responsibility of the Regional Authority for Nature Protection.

Possible changes in land use: The site is under pressure from expansion of existing casual recreation.

Disturbances and threats: The site is threatened by discharge of industrial and agricultural wastewater, increased recreational pressure, overgrazing and reed burning. In addition, local people collect waterbird eggs and chicks and hunt adult birds.

Economic and social values: The site supports a traditional fishery. It is important for conservation education, recreation and scientific research.

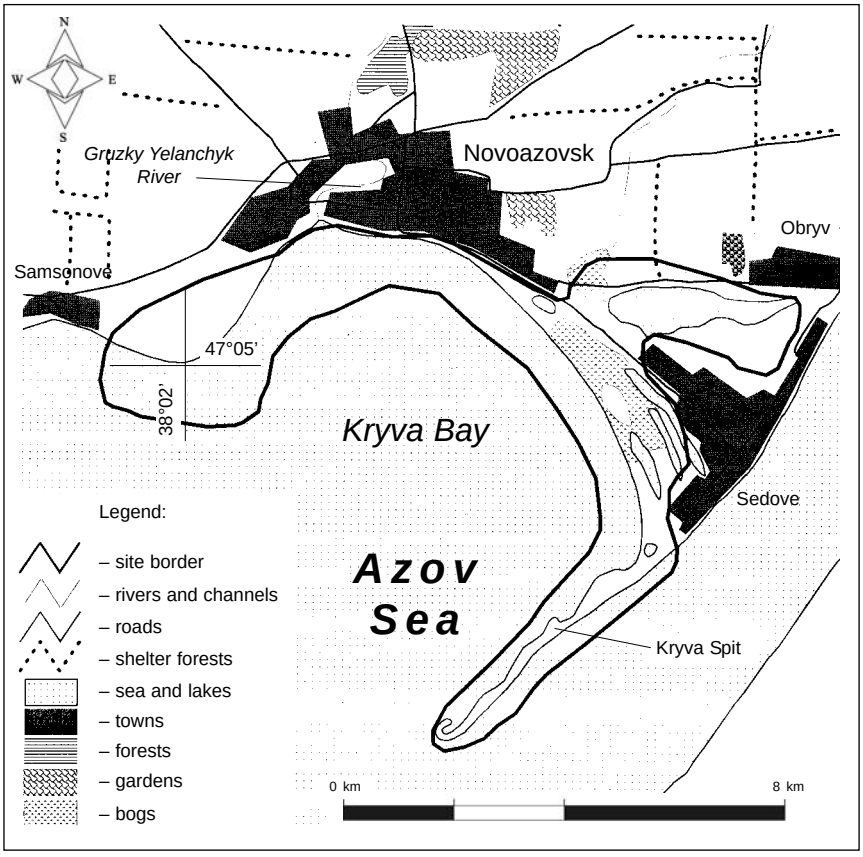
Fauna: Mammals: *Microtus arvalis* and *Vulpes vulpes.* Birds: The site supports 2,500-3,000 pairs of breeding waterbirds of 23 species, with the largest numbers nesting on shell-sand beaches, saline and freshwater marshes, reed-beds, saltmarsh and *Salicornia* heath. Up to 1,000 waterbirds occur on spring and autumn migration.

Special floristic values: RDB category II: *Elytrigia stipifolia.*

Research facilities: Research on the site is carried out by the Institute of Zoology of the National Academy of Sciences of Ukraine, Melitopol Pedagogical University and Donetsk State University.

Public awareness and education: Public awareness education is restricted to that provided by comprehensive schools together with lectures presented by scientists from universities and other organisations for the principal interest groups.

Criteria for inclusion: 2 and 4.



Map 18. Kryva Bay and Kryva Spit

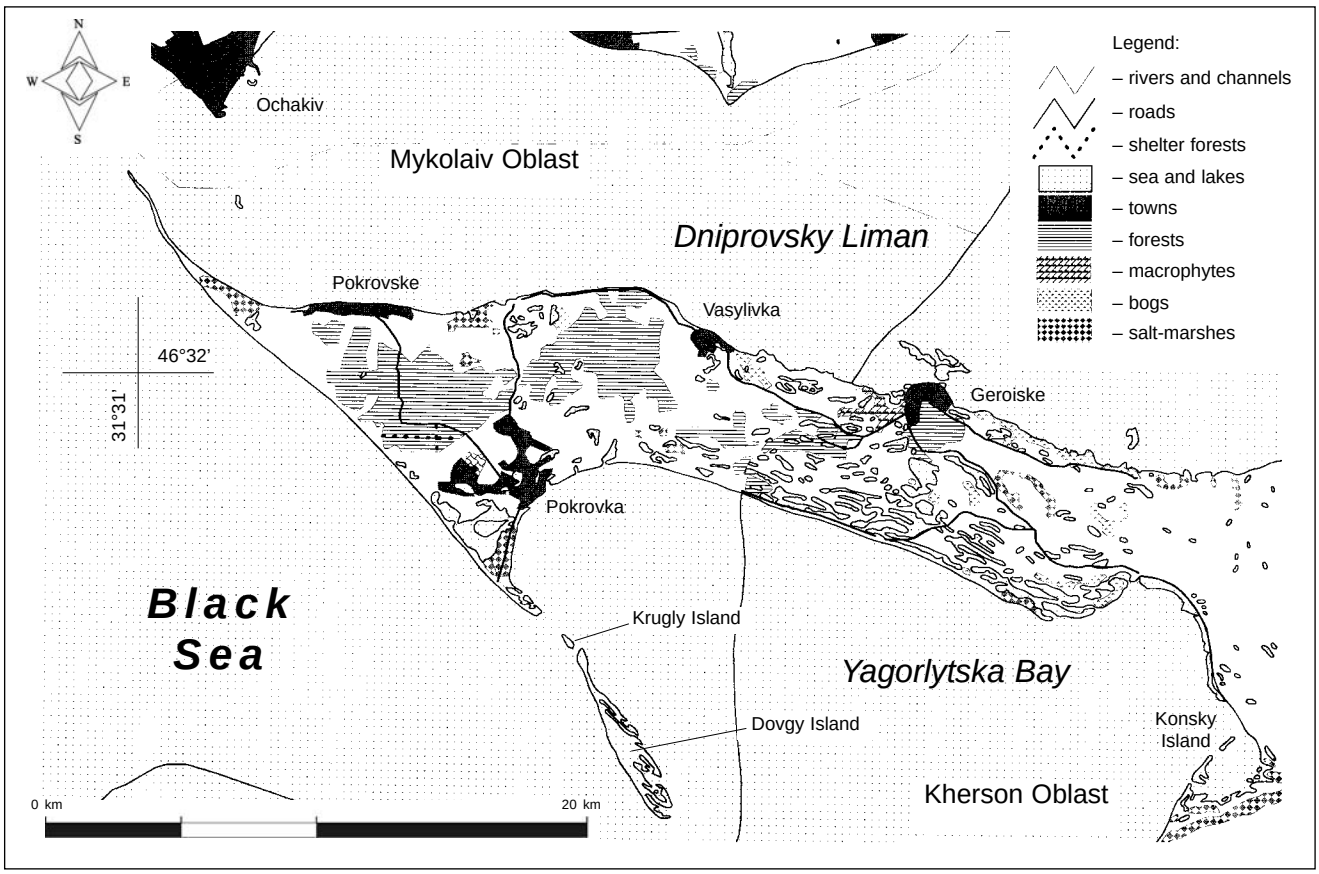
Table 22. Waterbird populations at Kryva Bay and Kryva Spit (1992-2002)

Species	Breeding pairs	Non-breeding individuals
Charadrius alexandrinus	25-50	
Chlidonias leucoptera		1,000
Chlidonias nigra		2,500
Egretta alba	50-70	260
Glareola pratincola	25-70	
Larus cachinnans	5,000	
Larus ichthyaetus	1,200	
Larus minutus		5,000-7,000
Larus ridibundus	100-250	5,000-10,000
Recurvirostra avosetta	75-100	
Sterna albifrons	250-400	
Sterna hirundo	2,500-3,500	5,000
Sterna sandvicensis	3,000-4,000	
Tringa totanus	35-50	
Vanellus vanellus	5-10	

19. Kryva Bay and Kryva Spit

Location: 47°03'N, 38°07'E. In Novoazovsk Rayon, Donetsk Oblast, southwest of the city of Novoazovsk.
Area: 1,400 ha.
Altitude: 0.2-1.6 m above sea level.
Wetland type: A, E.
Other hydrologically linked wetlands: The Azov Sea.
Description of site: Kryva Bay is a small inlet of the Azov Sea, bordered in the south by a 10-km long shell-sand peninsula, the margins of which are shell-sand beaches, saltmarsh, saline and freshwater marshes and muddy islands. Along the coast of the bay are reed-beds and shallow lakes. The site is dynamic due to the effects of storms in spring and autumn, which can result in an increase in the number of saline lakes.
Principal vegetation: The main habitat types represented within the site are marshy-grassland, dune grassland, openwater and halophyte communities, supporting *Argusia sibirica, Artemisia santonica, Calamagrostis epigeios, Carex colchica, Ceratophyllum demersum, Crambe pontica, Eryngium maritimum, Glycyrrhiza echinata, G. glabra, Gypsophila paniculata, Halimione pedunculata, H. verrucifera, Leymus sabulosus, Limonium meyeri, Najas marina, Phragmites australis, Plantago cornuti, Potamogeton pectinatus, Puccinellia distans, Schoenoplectus lacustris, S. tabernaemontani, Typha laxmannii* and *Zostera marina.*
Conservation measures taken: The site includes two protected areas: the Kryva Kosa Liman Ornithological Game Reserve and Kryva Kosa State Nature Memorial.
Conservation measures proposed: Designation of the whole site as a Game Reserve.
Land use: Mainly conservation and recreation.
Management: Management of the site derives from governmental programmes for economic activities such as fish farming, fishery and agriculture. Nature protection is the responsibility of the Regional Authority for Nature Protection.
Possible changes in land use: Without increased protection, it is likely that economic pressure will result in degradation of the site.
Disturbances and threats: The quality of the site is threatened by discharge of industrial and agriculture wastewater, increased recreational pressure, overgrazing and reed burning. In addition, local people collect waterbird eggs and chicks and hunt adult birds. Expansion of economic activities and recreation are reducing the area of natural habitats within the site.
Economic and social values: The site supports a traditional fishery and is important for conservation education, recreation and scientific research.
Fauna: Mammals: *Microtus arvalis* and *Vulpes vulpes.* Birds: The site supports 10,500-15,000 pairs of breeding waterbirds of 32 species, with the majority nesting on beaches, marshes, reed-beds, saltmarsh and *Salicornia* heath. 25,000-30,000 waterbirds occur on the open water of the bay, lakes and lagoons outside the breeding season.
Special floristic values: No information.
Research facilities: Research on the site is carried out by the Institute of Zoology of the National Academy of Sciences of Ukraine, Melitopol Pedagogical University and Donetsk State University.
Public awareness and education: Public awareness education is restricted to that provided by comprehensive schools together with lectures presented by scientists from universities and other organisations for the principal interest groups.
Criteria for inclusion: 2, 4 and 5.

20. Kinburnska Spit



Map 19. Kinburnska Spit

Location: 46°31'N, 31°44'E. In Ochakiv Rayon, Mykolaiv Oblast, 6 km south of the city of Ochakiv.
Area: 18,000 ha.
Altitude: 0.2-19 m above sea level.
Wetland type: A, E.
Other hydrologically linked wetlands: The Black Sea, Dnipro River Delta (9) and Yagorlytska Bay (14).
Description of site: Kinburnska Spit extends for approximately 45 km west from the southern part of the Dnipro River mouth. It supports a variety of habitats, including low-lying marshes, reed-beds, beaches and fresh, saline and brackish lakes; the lakes vary in salinity from 0.08-86‰. The peninsula is of alluvial origin, mainly sand, occasionally inter-layered with loamy soil. The flat relief is a product of the geological structure and tectonic history of the site. Most of the peninsula is covered by dunes and low-lying marshland.
Climate: The climate is continental and dry, with an average annual temperature of 10.8°C and recorded extremes of

Table 23. Waterbird populations at Kinburnska Spit (2000-2002)

Species	Breeding pairs	Non-breeding individuals
Anas platyrhynchos	100	3,000
Ardea cinerea	210	
Ardea purpurea	50	
Ardeola ralloides	12	
Bucephala clangula		5,000
Clangula hyemalis		500
Cygnus olor	5	1,500
Egretta alba	140	
Egretta garzetta	120	
Haliaeetus albicilla	1	30-50 wintering birds
Himantopus himantopus	30-120	
Ixobrychus minutus		1,500
Larus genei	500-1,000	
Larus ichthyaetus		300
Larus melanocephalus	1,000-3,000	
Melanitta fusca		150
Melanitta nigra		300
Numenius phaeopus		100
Pelecanus onocrotalus		1,000-5,000
Phalacrocorax carbo		8,500
Recurvirostra avosetta	50-100	
Somateria mollissima	30-40	2,000-5,000
Sterna hirundo	500-1,000	
Tadorna tadorna	30	500
Thalasseus sandvicensis	1,000-2,000	

38.5°C and –31.4°C. The average January temperature is –3°C, whilst that for July is 22.8°C. In this area, the growing season may last up to 232 days.

Principal vegetation: The main habitat types represented at the peninsula are sandy steppes, dunes, relict woodlands, low-lying freshwater and saline marshes, saltmarsh and marine (< 20% salinity), brackish (< 4% salinity) and freshwater bodies.

Conservation measures taken: The area known as the Volyzhyn Forest and the two islands, Dovgy and Krugly (which are shared with the Yagolytska Bay site), were protected as a part of the Black Sea Reserve in 1933. These areas have the highest possible level of protection in Ukraine. In 1992, the whole site was designated as the Kinburnska Kosa Regional Landscape Park, which is of local importance.

Conservation measures proposed: None known.

Land use: At present, the main activities within the site are cattle grazing, recreation, sand extraction, hunting, fishing, fish farming and conservation. The site is also a popular tourist resort, mainly for small-scale, local recreation (although major day-trips are occasionally made from Odessa by boat). Tourism is supported by a 100-bed hotel operated by the regional trade union and a 300-bed youth camp, operated by the Ekvator Industrial Organisation in Odessa.

Management: Management of the site is the responsibility of the Landscape Park Authority. Control of recreation and tourism falls within the remit of the Kinburnska Kosa Regional Landscape Park Authority.

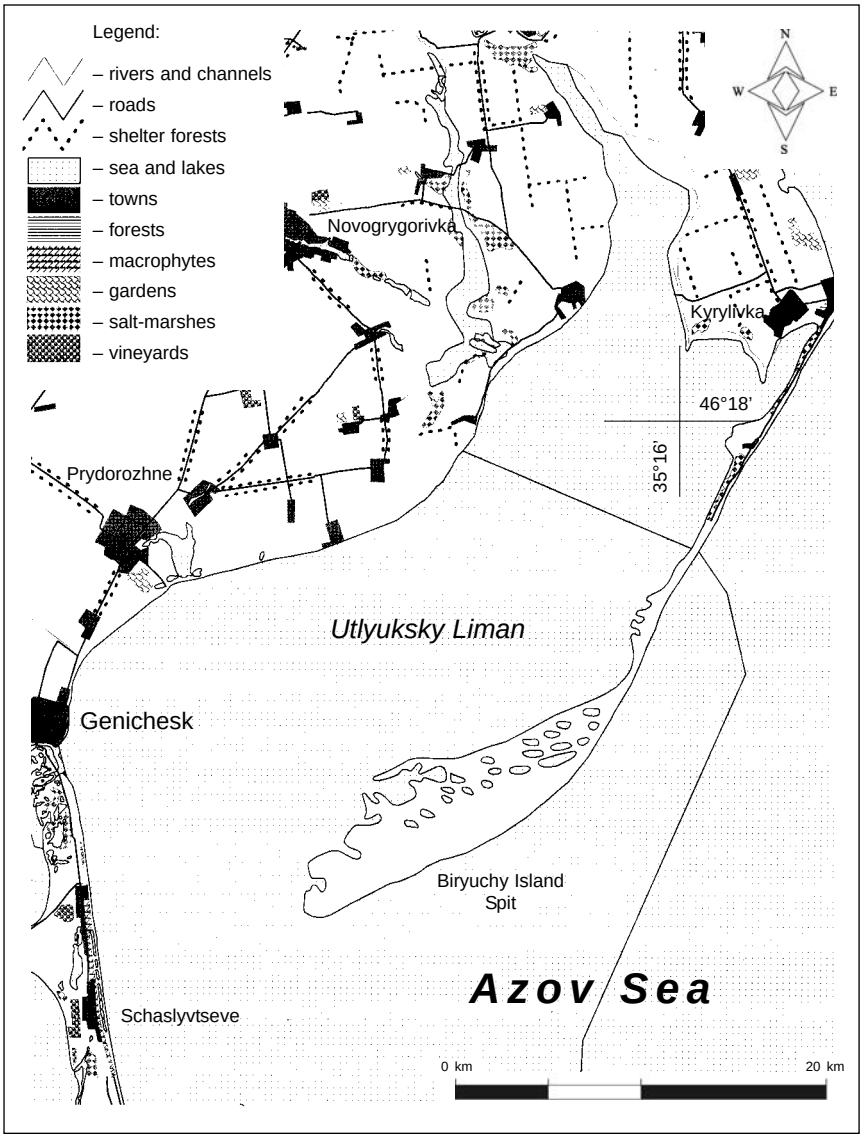
Possible changes in land use: None known.

Disturbances and threats: The integrity of the site is threatened by extensive *Pinus silvestris* plantation, overgrazing and increasing recreational pressure.

Economic and social values: The site is of high cultural significance for local people. Kinburnska Spit has been settled since the beginning of historical time, including a 7th century BC Greek settlement. Thirty km to the north are the remains of the Greek city of Olvia, while less significant archaeological finds have been made on the peninsula itself. In mediaeval times, the peninsula played an important role in the connection between ancient Russia and Byzantium. During the 6th and 7th centuries, Ukrainian Cossacks established settlements in the area from which to wage war on the Turks and Crimean Tatars. In 1774, the area was included within the Russian Empire.

Fauna: Mammals: Two endemic taxa: *Scirtopoda telum* ssp. *falzfeini* and *Spalax arenaria.* Other species recorded include *Microtus arvalis* and *Vulpes vulpes.* Birds: *Himantopus himantopus* and *Numenius phaeopus.* Reptiles: *Elaphe quatuorlineata* and *Vipera ursinii* ssp. *renardi.*

Special floristic values: RDB category II: *Orchis picta, Pulsatilla nigricans, Stipa borysthenica;* RDB category III: *Betula borysthenica, Orchis coriophora, Orchis fragrans, Orchis palustris,*



Map 20. Utlyuksky Liman

Platanthera bifolia; RDB category IV: *Centaurea breviceps.* The following species are included in the European Red List (1991): *Senecio borysthenicus, Tragopogon borysthenicus, Arenaria zozii, Cerastium schmalhausenii, Thymus borysthenicus, Goniolimon graminifolium* and *Viola lavrenkoana.*

Research facilities: Some years ago, extensive hydrological and hydrobiological studies were carried out by scientists from Kiev, Odessa and Sevastopol within the context of a now-abandoned plan to construct a canal connecting the Dniprovsky Liman to the River Danube. At present, research is carried out under the auspices of the Black Sea Biosphere Reserve in collaboration with the National Academy of Sciences of Ukraine.

Criteria for inclusion: 2 and 5.

21. Utlyuksky Liman

Location: 46°12'N, 35°10'E. In Yakymivka Rayon, Zaporizhzhya Oblast and Genichesk Rayon, Kherson Oblast; the southwestern part of the site adjoins the city of Genichesk. The site lies between Syvash Lagoon, Molochnyi Liman (15) and Azov Sea, from which it is separated by Fedotova Spit.

Area: 26,000 ha.

Altitude: 1.2-1.4 m above sea level.

Wetland type: E, F, H.

Other hydrologically linked wetlands: The Azov Sea, Velyky (Big) Utlyuk and Maly (Small) Utlyuk Rivers.

Description of site: A 60-km long, 15-km wide open lagoon of the Azov Sea, bordered to the south by Fedotova Spit and Biryuchy Island, with a total area *c.* 700 km^2 and depth of 0.7-1.5 m in the upper part and 6-6.5 m in the lower part. The bed of the lagoon is sand with clam shells and silt. The northwest coast is steep and broken by valleys and ravines, while the southeast coast is low and sandy with occasional reed-beds and swamps. Water quality within the lagoon is maintained by exchange of water with the sea and water entering from the river. The middle of the liman, isolated by dams, is filled with sediment and industrial wastewater from the Zaporizhzhya iron-ore enterprise. Water temperature in summer is 22-32°C and in winter 0°C to –0.3°C with variable duration of ice cover. Salinity within the lagoon is 12-15‰.

Principal vegetation: The site supports submerged vegetation on shoals within the lagoon and fringing stands of reeds along the shores. Biryuchy Island has a variety of habitats, including saltmarsh, reed-beds and associated islands and peninsulas.

Conservation measures taken: Biryuchy Island lies within the Azov-Syvash National Nature Park, while the upper part of the lagoon and Fedotova Spit have the status of Game Reserve.

Conservation measures proposed: It is suggested that the whole area of the liman be included in Priazovsky National Park, with various functional zones, including nature reserves.

Land use: The principal activities at the site are hunting, fishery, fish farming, conservation and recreation.

Management: Management of the site derives from governmental programmes for economic activities such as fish farming, fishery and agriculture. Nature protection is the responsibility of the Regional Authority for Nature Protection.

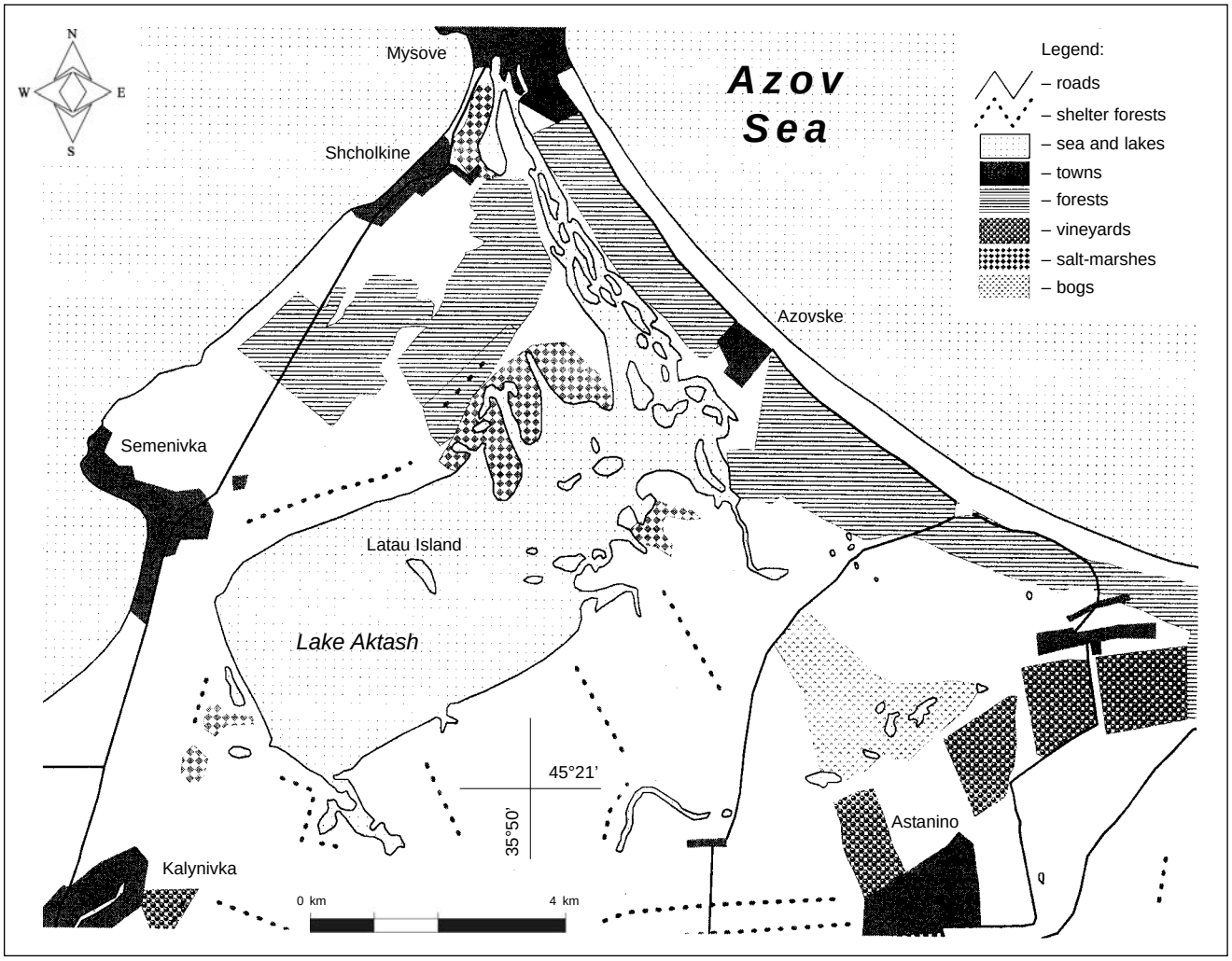
Possible changes in land use: Land transfer into private ownership. Once the Priazovsky National Park has been estab-

Table 24. Waterbird populations at Utlyuksky Liman (1990-2002)

Species	Breeding pairs	Non-breeding individuals
Anas platyrhynchos	50-60	9,000-80,000 (in winter)
Anas querquedula	3-5	
Anas strepera	4-7	
Anser albifrons		6,000-22,000 (in winter)
Anser anser		100-3,000 (in winter)
Ardea cinerea	15-20	
Ardea purpurea	10-15	
Branta ruficollis		50-300 (in winter)
Burhinus oedicnemus	1-3	
Charadrius alexandrinus	46-90	
Charadrius dubius	13-25	
Circus aeruginosus	5-8	
Cygnus olor		2,000-16,000 (in winter)
Egretta garzetta	6-12	
Fulica atra	156-280	Up 200,000 during migration
Gallinula chloropus	50-74	
Glareola pratincola	17-30	
Grus grus		Up to 3,000 during migration
Haematopus ostralegus	8-11	Up to 700 per day on migration
Haliaeetus albicilla		6-22 (in winter)
Himantopus himantopus	15-35	200-250 during migration
Larus cachinnans	36-60	200-7,000 (in winter)
Recurvirostra avosetta	50-60	
Sterna hirundo	70-100	
Tringa totanus	80-200	

lished, new forms of land use may evolve.
Disturbances and threats: The site is threatened by uncontrolled grazing in the upper part of the liman and at Fedotova Spit, poorly controlled hunting and recreation and pollution by industrial wastewater. Water evaporation in the central, isolated part of the liman exceeds inflow, consequently the liman is drying up.
Economic and social values: The site supports a local traditional fishery and amateur hunting. It has potential for ecotourism.
Fauna: Mammals: *Cervus dama, C. elaphus, Equus hemionus* and *Ovis musimon* have been introduced on Biryuchy Island. *Alactaga major, Nyctereutus procynoides, Vulpes vulpes,* etc. are usually found. Birds: Reed-beds, brackish lowlands and spits on Biryuchy Island are important for nesting waterbirds. The site may support 17,000-100,000 waterbirds in winter and more than 300,000 individuals during migration period.
Special floristic values: RDB category I: *Cymbochasma borysthenica.* Rare species such as *Cicuta vivosa, Astragalus concavus, A. testiculatus, Prangos odontalgica,* etc. occur. On the right bank, areas of fescue-feather grass steppes have been preserved.
Research facilities: Research on the site is carried out by the Institute of Zoology of the National Academy of Sciences of Ukraine, Azov-Black Sea Ornithological Station and Melitopol Pedagogical University.
Public awareness and education: There is no special educational programme. With regard to the inclusion of the liman into the Priazovsky National Park, information about its role in the ecosystem has been distributed in the media and meetings have been held with local people.
Criteria for inclusion: The site is of national conservation value.

22. Lake Aktash with Astanino Plavni



Map 21. Lake Aktash with Astanino Plavni

Table 25. Waterbird populations at Lake Aktash and Astanino Plavni (1992-2002)

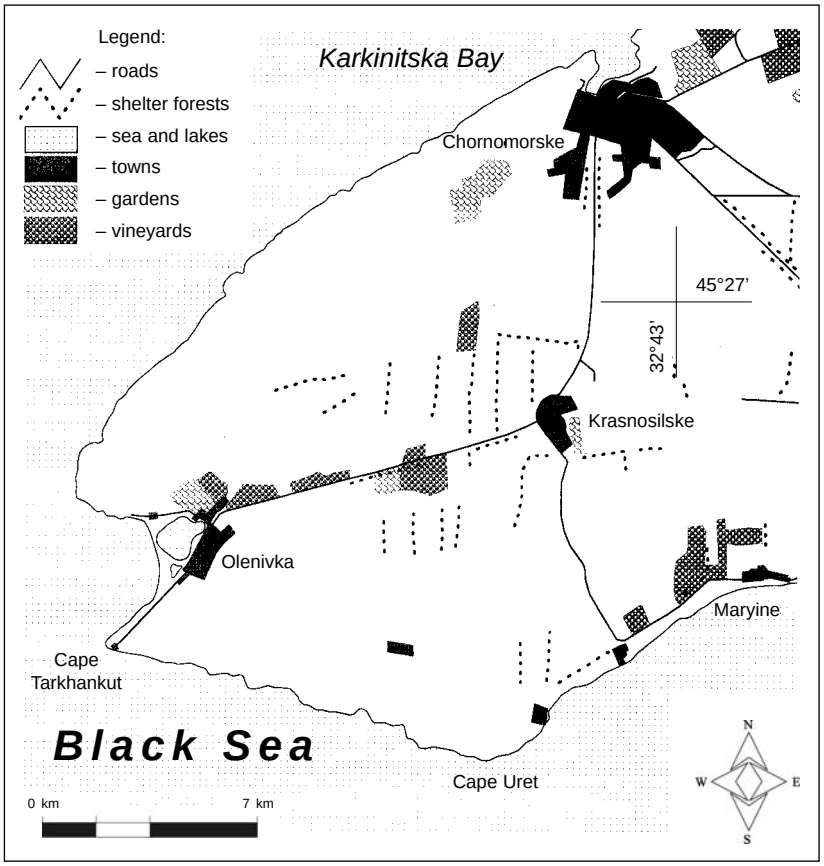
Species	Breeding pairs	Number in non -breeding period
Anas acuta		2,500-8,000 (on migration)
Anas clypeata		4,000-4,800 (on migration)
Anas penelope		1,500-3,000 (on migration)
Anas platyrhynchos	More than 10	7,000-12,000 (on migration)
Anser albifrons		6,500-8,000 (on migration)
Anser anser	3-10	150-700 (on migration)
Branta ruficollis		60 minimum (on migration)
Chlidonias hybrida	35-360	No data
Cygnus olor	2-11	70-420
Gelochelidon nilotica	240-360	No data
Glareola pratincola	40-72	60-180 (during migration period)
Himantopus himantopus	75-80	No data
Larus cachinnans	1,550-2,770	No data
Larus genei	1,400-1,420	No data
Larus melanocephalus	Up to 2,700	No data
Limosa limosa		325-735 (in summer)
Phalacrocorax carbo	1,650-2,200	21,200-23,100 (post-breeding period); 1,700 (in winter)
Podiceps nigricollis	90-130	3,500-3,700 (post-breeding period and on migration)
Recurvirostra avosetta	130-285	No data
Sterna hirundo	125-267	No data
Tadorna ferruginea	6-8	130-160 (post-breeding period) 10-30 (in winter)

Location: 45°22'N, 35°54'E. The site lies on a headland of the northern coast of the Kerchensky Peninsula, in Leninske Rayon, Crimea, near the village of Astanino. The southeastern end of Syvash Lagoon is approximately 30 km west of this site.
Area: 3,030 ha.
Altitude: Not known.
Wetland type: H, Q, Sp.
Other hydrologically linked wetlands: The Azov Sea.
Description of site: Lake Aktash and Astanino Plavni lie on a headland of Kerchensky Peninsula, which forms the southern shore of the Azov Sea, separating it from the Black Sea. Lake Aktash is a 26.8-km^2, saline, inland lake containing a number of peninsulas and islands. Astanino Plavni is a 3.5 km^2, low-lying marsh at the upstream end of the lake. Within the lake, salinity is declining due to inflow of fresh river water.
Principal vegetation: No information.
Conservation measures taken: 50 ha of the shore have been designated as an Ornithological Zakaznik (Game Reserve), which is of local conservation value.
Conservation measures proposed: None.
Land use: The principal activities at the site are hunting, fishery, conservation and recreation.
Management: Management of the site is co-ordinated under governmental programmes for economic activities such as fish farming, fishery and agriculture. Nature protection is the responsibility of the Regional Authority for Nature Protection.
Possible changes in land use: None known.
Disturbances and threats: The site is threatened by engineering modification, hunting and the decline in salinity.
Economic and social values: The site supports an important local fishery. It is important for conservation education, recreation and research.
Fauna: The site supports up to 6,300-10,600 pairs of breeding waterbirds with 47,000-65,000 individuals occurring outside the breeding season. It also supports important wintering populations of *Anas acuta, A. querquedula, A. penelope* and *A. platyrhynchos.* It is one of the few sites in Ukraine that supports breeding *Tadorna ferruginea.*
Special floristic values: No information.
Research facilities: Research on the site is carried out by the Institute of Zoology of the National Academy of Sciences of Ukraine and Melitopol Pedagogical University.
Public awareness and education: Public awareness education is restricted to that provided by comprehensive schools together with lectures presented by scientists from universities and other organisations for the principal interest groups.
Criteria for inclusion: The site is of national conservation value.

23. Coast from Chornomorske to Cape Uret

Location: 45°30'N, 32°53'E. On the southwest tip of the Crimean Peninsula, in Chornomorsky Rayon, Crimea, south-

west of Chornomorske.
Area: 9,600 ha.
Altitude: 0 m above sea level.
Wetland type: A, D.
Other hydrologically linked wetlands: The Black Sea.
Description of site: A peninsula extending into shallow waters of the Black Sea, with 50-60 m steep, rocky, weathered limestone shores, supporting an important seabird colony.
Principal vegetation: No information.
Conservation measures taken: The site is an Ornithological Game Reserve.
Conservation measures proposed: None.
Land use: The principal activities at the site are hunting, fishery, conservation and recreation.
Management: Management of the site is co-ordinated under government programmes for economic activities such as fishery. Nature protection is the responsibility of the Regional Authority for Nature Protection.



Map 22. The coast from Chornomorske to Cape Uret

Possible changes in land use: None known.
Disturbances and threats: None known.
Economic and social values: The site supports a traditional fishery and is important for conservation education, recreation and scientific research.
Fauna: The site supports an important seabird colony, including the only breeding *Phalacrocorax aristotelis* on the Black Sea coast of Ukraine. *Anas platyrhynchos, Aythya ferina, A. fuligula, A. marila, Gavia arctica, Podiceps cristatus* and *P. nigricollis* also occur.
Special floristic values: No information.
Research facilities: Research on the site is carried out by the Institute of Zoology of the National Academy of Sciences of Ukraine and Melitopol Pedagogical University.

Table 26. Breeding bird species on the coast from Chornomorske to Cape Uret (1998-1999)

Species	Breeding pairs
Anthropoides virgo	2
Burhinus oedicnemus	3-5
Falco cherrug	1-2
Falco tinnunculus	15
Larus cachinnans	20-50
Phalacrocorax aristotelis	200-500
Phalacrocorax carbo	30
Tadorna tadorna	10-20

Public awareness and education: Public awareness education is restricted to that provided by comprehensive schools together with lectures presented by scientists from universities and other organisations for the principal interest groups.
Criteria for inclusion: The site is of national conservation value.

24. Kuyalnytsky Liman

Location: 46°41'N, 30°12'E. In Kominternivsky, Bilyaivsky and Ivanivsky Rayons, Odessa Oblast; the south-western end of the lagoon adjoins the city of Odessa.
Area: 7,000 ha.
Altitude: 0.2-1.7 m above sea level.
Wetland type: J, H, Sp.
Other hydrologically linked wetlands: Khadzhybeivsky Liman; the Velyky (Big) Kuyalnyk and Maly (Small)

Kuyalnyk Rivers, both of which are drying up.

Description of site: Kuyalnytsky Liman is an enclosed, hyper-saline lagoon, 28 km long and up to 2.8 km wide, with 56-60 km^2 of open water up to 3 m deep, depending upon water levels. Both Kuyalnytsky and Khadzhybeivsky Limans are separated from the Black Sea by a bar, a geologically young formation that finally closed completely in the late 1800s. An artificial channel was created linking the lagoon to the Black Sea; due to falling water levels within the lagoon this channel is now closed, however there are plans to re-open it. The bed of the lagoon is silt, which is sandy in places. The coasts are mainly 30-40 m high and composed of clayey sands and lime-stone, with high coastal erosion and frequent landslides. The coast of the lagoon is indent-ed by bays. There are small islands in the upper and lower parts. The point where the River Velyky Kuyalnyk enters the lagoon is poorly defined due to the narrowness of the channel.

Water quality: Water levels within the lagoon fluctuate widely, over the long-term, annually, seasonally and in response to strong winds. The highest water level this century was recorded in 1947 at 1.5 m above sea level, the lowest at 6-7 m below sea level in 1962 and 1995. Water temperature varies from 31°C in summer to –3.7°C in winter. Average salinity within the lagoon is 74.3‰, with a maximum recorded salinity of 296‰. Due to the high salinity, the water remains open throughout even the hardest winters.

Principal vegetation: The main habitat-types represented within the site are openwater, saline meadows and halophyte communities supporting *Aeluropus littoralis, Artemisia santonica, Bolboschoenus maritimus, Ceratophyllum demersum, Kochia prostrata, Limonium gmelinii, L. suffruticosum, Plantago salsa, Potamogeton pectinatus, Puccinellia distans, Ruppia maritima, Salicornia europaea, Salsola soda, Suaeda prostrata* and *Zostera marina.*

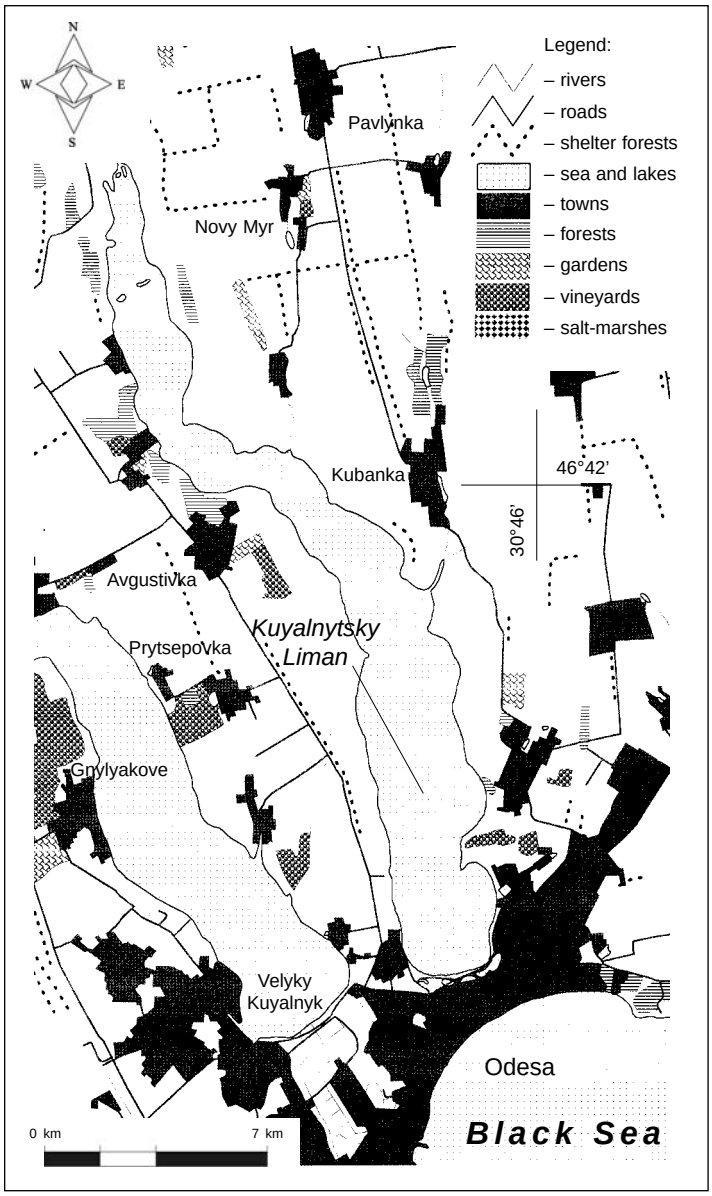
Conservation measures taken: None.

Conservation measures proposed: Creation of a seasonal Ornithological Game Reserve.

Land use: Main uses are recreation and balneology.

Management: Management of the site is co-ordinated under governmental programmes for economic activities such as fish farming, fishery and agriculture. Nature protection is the responsibility of the Regional Authority for Nature Protection.

Possible changes in land use: No changes in land use are expected.



Map 23. Kuyalnytsky Liman

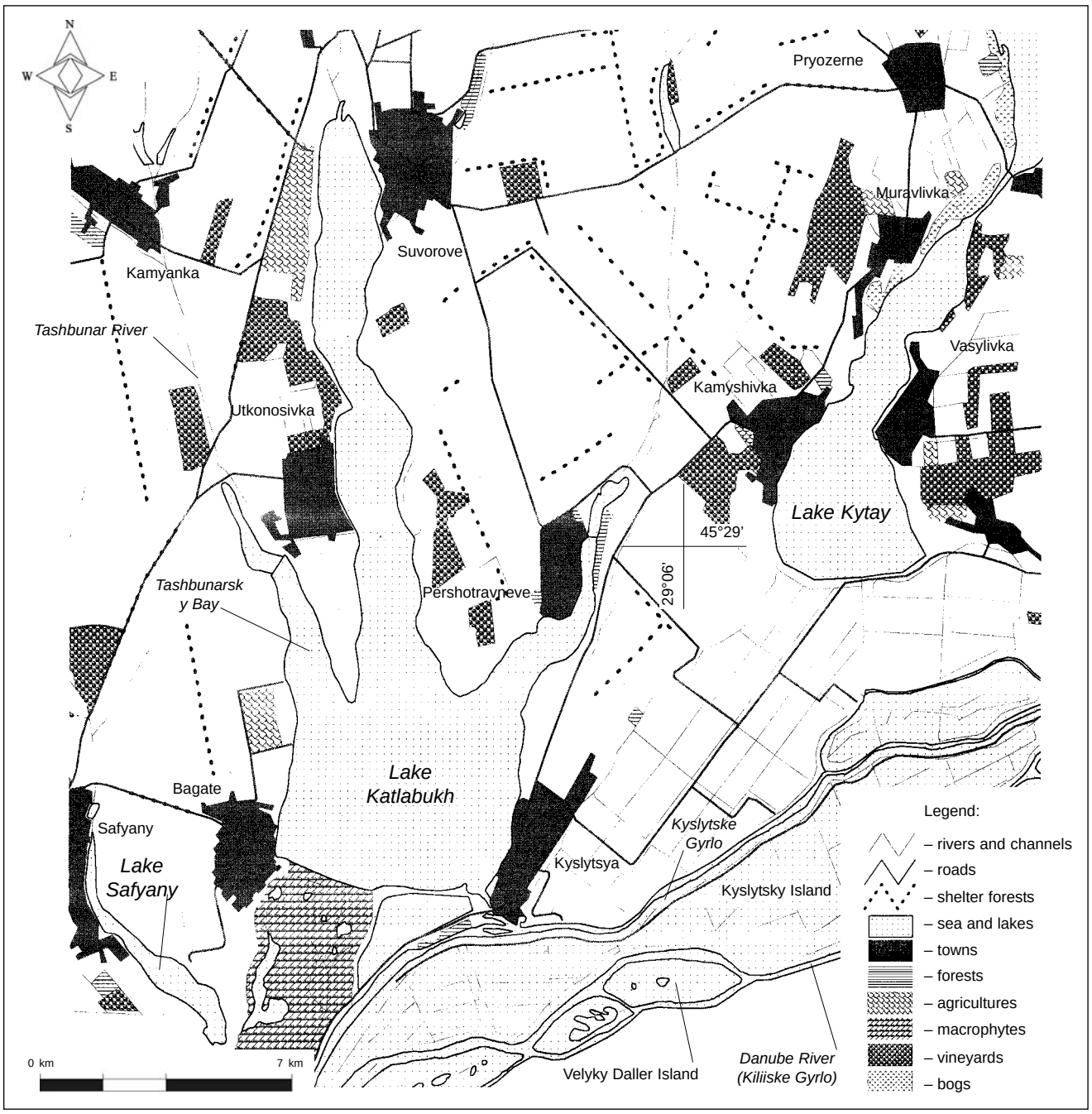
Table 27. Waterbird populations at Kuyalnytsky Liman (1992-2002)

Species	Breeding pairs	Non-breeding individuals
Anas platyrhynchos	16	1,000 (on migration)
Charadrius alexandrinus	92	
Charadrius dubius	39	
Himantopus himantopus	33	
Ixobrychus minutus	11	
Larus cachinnans		100 (on migration)
Larus minutus		25,000 (on migration)
Larus ridibundus		1,000 (on migration)
Recurvirostra avosetta	146	200 (on migration)
Sterna albifrons	48	100 (on migration)
Sterna hirundo	2,600	1,000 (on migration)
Sterna sandvicensis	2,884	1,000 (on migration)
Tadorna tadorna	35	8,500 (on migration)

Disturbances and threats: The site is threatened by the decline in salinity, overgrazing, uncontrolled hunting and expansion of recreation facilities. The decline in salinity is a consequence of low water levels in tributaries, leading to low water levels in the lagoon, which severs the connection with the sea.
Economic and social values: High balneological importance: the site is estimated to contain tens of millions of tonnes of medicinal mud. The site is important for conservation education, recreation and scientific research.
Fauna: 2,000-3,000 pairs of waterbirds breed on the site, mainly on islands, peninsulas and saltmarsh. The lagoon supports more than 2,000 wintering *Tadorna tadorna.* It is one of the most important sites for this species in the south of Ukraine.
Special floristic values: No information
Research facilities: Research on the site is carried out by the Institute of Zoology of the National Academy of Sciences of Ukraine. Since 1975, Odessa National Mechnikov University has monitored the dynamics of colonial nesting, migration processes and wintering aggregations. The university conducts bird ringing and studies geographic relationships and relationships amongst populations.
Public awareness and education: Public awareness education is restricted to that provided by comprehensive schools together with lectures presented by scientists from universities and other organisations for the principal interest groups.
Criteria for inclusion: The site is of national conservation value.

25. Lakes Katlabukh and Safyany

Location: 45°25'N, 28°58'E. In Izmail Rayon, Odessa Oblast, 8 km northeast of the city of Izmail.
Area: 6,700 ha.
Altitude: 1-1.4 m above sea level.
Wetland type: O.
Other hydrologically linked wetlands: The River Danube (3) and a number of smaller rivers such as the Tashbunar, Bolshoy Katlabukh and Yenika.
Description of site: Lakes Safyany and Katlabukh are lakes in the downstream reaches of the Danube Delta, connected by a channel. Lake Safyany is 6.5 km long and up to 1 km wide. The area of open water varies from 250-420 ha and the depth from 0.8-1 to 3.5-4 m. Summer water temperature is 24-26°C. The lake freezes over in winter. The northern and eastern coasts of both lakes are high and steep, while the southern and western coasts are low-lying and swampy. Lake Katlabukh has been converted to a reservoir 21 km long, 1-6 km wide and up to 4 m deep with an area of 67 km^2. A dam separates the lake from the River Danube, but it is connected by a channel, which controls water exchange.
Water quality: Lake Safyany is divided into two parts by the dam. The southwestern part of the lake is used as a large fishpond. The water is not suitable as a drinking water supply.
Principal vegetation: The main habitat types represented within the site are openwater, marshland, meadow and halophyte communities supporting *Agrostis gigantea, A. stolonifera, Alopecurus pratensis, Azolla caroliniana, A. filiculoides, Carex acuta, C. acutiformis, C. pseudocyperus, Elytrigia maeotica, E. repens, Limonium gmelinii, L. meyeri, Nymphaea alba, Nymphoides peltata, Phragmites australis, Potamogeton pectinatus, P. perfoliatus, Puccinellia distans, Schoenoplectus lacustris, Typha angustifolia, T. latifolia* and *Trapa natans s.l.*
Conservation measures taken: None.
Conservation measures proposed: Inclusion in the Danube Biosphere Reserve.
Land use: The principal activities at the site are commercial fishery, cattle pasture, recreation and reed harvesting.
Management: Management of the site is co-ordinated under programmes for economic activities such as fish-farming, fishery and agriculture. Nature protection is the responsibility of the Regional Authority for Nature Protection.
Possible changes in land use: Extension of fish-farming basins.
Disturbances and threats: The site is threatened by increased siltation and eutrophication, over-grazing and uncontrolled hunting and reed burning.
Economic and social values: Water from the site is used for domestic supply and local irrigation. The lakes support an important local fishery with rich natural fish diversity and abundance.
Fauna: Mammals: *Arvicola terrestris, Citellus suslicus, Meles meles, Microtus arvalis, Mustela lutreola, M. putorius, Neomys anomalus, Nyctereutes procyonoides, Ondatra zibethica, Sus scrofa, Talpa europaea* and *Vulpes vulpes.* Birds: The site supports up to 3,000 pairs of nesting waterbirds, with up to 20,000 non-breeding individuals. Amphibians: *Bufo viridis, Rana esculenta* and *R. ridibunda.* Reptiles: *Emys orbicularis.* Fish: *Abramis brama, Acipenser ruthenus, Cyprinus carpio, Esox lucius, Hypopthalmichthys molitrix, Lucioperca lucioperca, Perca fluviatilis* and *Rutilus rutilus.*



Map 24. Lake Katlabukh, Lake Safyany and Lake Kytay

Special floristic values: RDB category II: *Aldrovanda vesiculosa, Salvinia natans* and *Trapa natans s.l.*

Research facilities: Research is carried out by scientists from the National Academy of Sciences of Ukraine, National Mechnikov University, Odessa, and Danube Biosphere Reserve.

Public awareness and education: Public awareness education is restricted to that provided by comprehensive schools together with lectures presented by scientists from

Table. 28. Waterbird populations at Lakes Katlabukh and Safyany (1990-2002)

Species	Breeding pairs	Non-breeding individuals
Anas platyrhynchos	150	6,000 (on migration)
Anser albifrons	0	8,000 (on migration)
Ardea cinerea	25	150 (on migration)
Cygnus olor	30	250 (on migration)
Fulica atra	700	6,000
Pelecanus onocrotalus	0	450 (on migration)
Phalacrocorax carbo	0	2,500 (on migration)
Podiceps cristatus	150	650 (on migration)

universities and other organisations for the principal interest groups.
Criteria for inclusion: The site is of national conservation value.

26. Lake Kytay

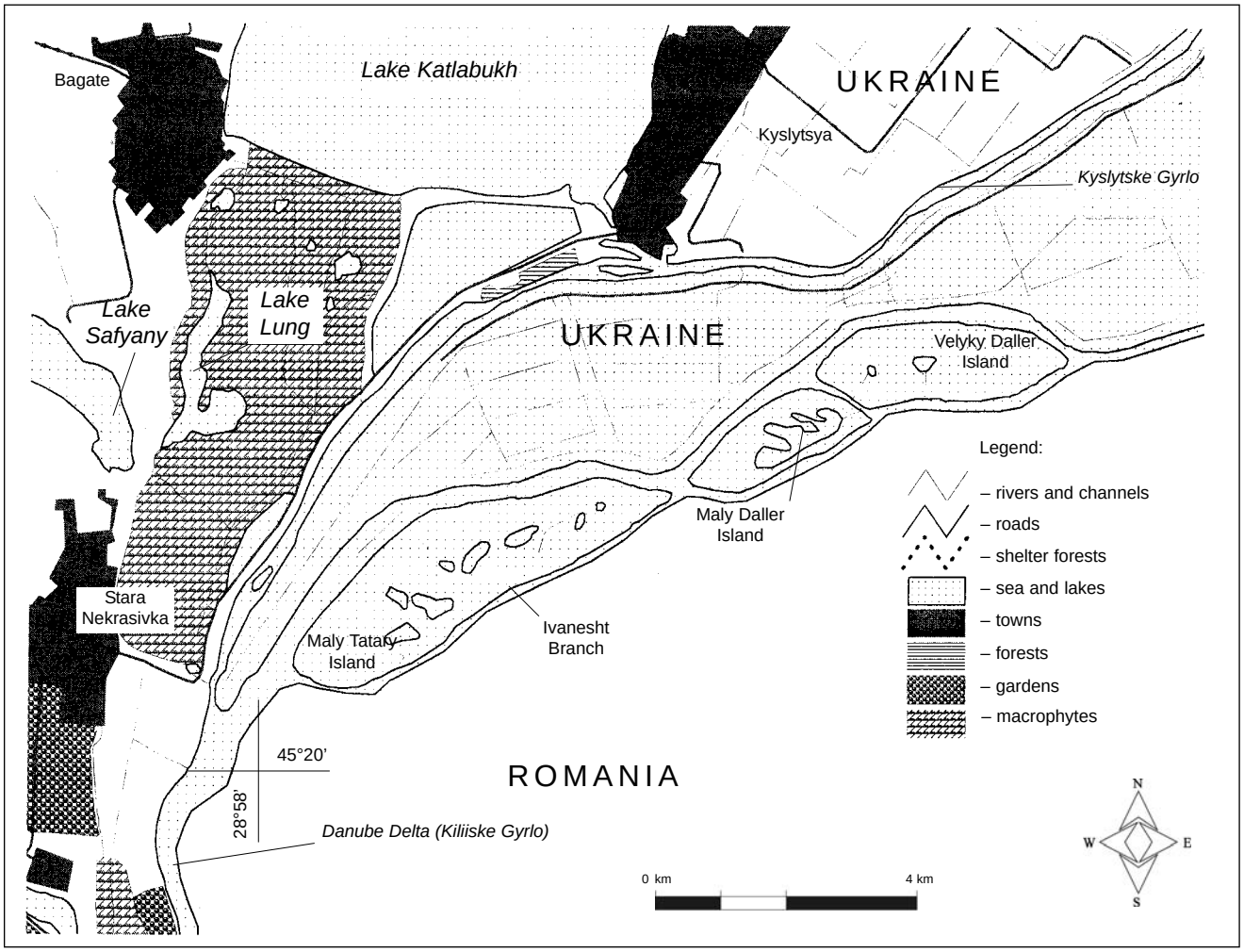
Location: 45°33'N, 29°12'E. In Izmail and Kiliya Rayons, Odessa Oblast, 10 km north of the city of Kiliya.
Area: 5,000 ha.
Altitude: Not known.
Wetland type: O.
Other hydrologically linked wetlands: The River Danube (3) and small rivers such as the Kyrhyzh-Kytay and Aliyaga.
Description of site: A large, marshy lake, converted to a reservoir by construction of a dam separating it from the Danube Delta, although a link is maintained by an artificial channel controlled by sluices. The lake is 24 km long, 3-3.5 km wide and up to 2 m deep in the south, 5 m deep in the north, with 60 km^2 of open water. Summer water temperature rises to 27°C; in winter the lake freezes over. Apart from the southern side, the coasts are steep and high.
Principal vegetation: The main habitat types represented within the site are openwater, marshland, meadow and halophyte communities supporting *Agrostis gigantea, A. stolonifera, Alopecurus pratensis, Azolla caroliniana, A. filiculoides, Carex acuta, C. acutiformis, C. pseudocyperus, Elytrigia maeotica, E. repens, Limonium gmelinii, L. meyeri, Nymphaea alba, Phragmites australis, Potamogeton pectinatus, P. perfoliatus, Puccinellia distans, Schoenoplectus lacustris, Typha angustifolia, T. latifolia* and *Trapa natans s.l.*
Conservation measures taken: None.
Conservation measures proposed: Inclusion in the Danube Biosphere Reserve.
Land use: The principal activities at the site are commercial fishery, hunting, irrigated agriculture, recreation and reed harvesting.
Management: Management of the site is co-ordinated under government programmes for economic activities such as fish farming, fishery and agriculture. Nature protection is the responsibility of the Regional Authority for Nature Protection.

Table 29. Waterbird populations at Lake Kytay (1990-2002)

Species	Breeding pairs	Non-breeding individuals
Anas platyrhynchos	80	5,000 (on migration)
Anser albifrons	0	2,000-13,000 (on migration)
Anser anser	10	50 (on migration)
Aythya ferina	50	5,000 (on migration)
Aythya nyroca	50	
Branta ruficollis		200 (on migration)
Fulica atra	300	8,000 (on migration)
Larus ridibundus	45	1,500 (on migration)
Pelecanus onocrotalus		500-1,500 (on migration)
Phalacrocorax carbo	0	10,000 (on migration)
Platalea leucorodia	40-100	
Podiceps cristatus	150	1,500 (on migration)

Possible changes in land use: None known.
Disturbances and threats: Over-fishing, pollution and uncontrolled hunting.
Economic and social values: Water from the site is used for domestic and irrigation supply.
Fauna: The site supports up to 1,500 pairs of breeding waterbirds, with up to 25,000 individuals recorded outside the breeding season.
Special floristic values: RDB category II: *Aldrovanda vesiculosa* and *Salvinia natans.*
Research facilities: Research is carried out by scientists from the National Academy of Sciences of Ukraine, National Mechnikov University, Odessa, and Danube Biosphere Reserve.
Public awareness and education: Public awareness education is restricted to that provided by comprehensive schools together with lectures presented by scientists from universities and other organisations for the principal interest groups.
Criteria for inclusion: The site is of national conservation value.

27. Izmail Islands



Map 25. Izmail Islands

Location: The Maly Tataru (45°21'N, 29°00'E), Maly Daller (45°22'N, 29°04'E) and Velyky Daller (45°23'N, 29°06'E) are situated in the inner delta of the River Danube in Izmail Rayon, Odessa Oblast.
Area: The total area of the islands is 1,366 ha (Maly Tataru – 738 ha, Maly Daller – 258 ha and Velyky Daller – 370 ha).
Altitude: 0.2-0.6 m above sea level.
Wetland type: K.
Other hydrologically linked wetlands: There is an artificial system of canals in the inner parts of the islands (three canals on Tataru Island and one on each of the Daller Islands).
Description of site: The islands of the inner delta of the Kiliya branch of the Danube are a part of the Izmailski Ostrovy Regional Landscape Park. The islands consist of riverine bars overgrown with floodplain forests with some meadow vegetation. Forest undergrowth is dominated by blackberry. The central part of the each island is hollow and inundated. These inner lakes are covered by reed-beds and marsh vegetation with some open-water areas at their centres.
Water quality: The hydrological regime of the islands depends on water levels in the River Danube and artificial water management on the islands.
Principal vegetation: All the islands are heavily populated with aquatic species such as *Salvinia natans, Nymphaea alba* and *Nuphar lutea.* The Tataru Islands support a large population of *Nymphoides peltata.* Ferns are fairly common in reed-beds of the Velyky Daller. Wild grapevine is common on Maly Daller.
Conservation measures taken: A part of the regional landscape park since 1994.
Conservation measures proposed: Proposed for inclusion in the Danube Biosphere Reserve.
Land use: Agricultural activities have been abandoned since 1999; horticulture and cereal production (maize, barley, wheat) were abandoned even earlier. The land is not used because of the high water level. There is still

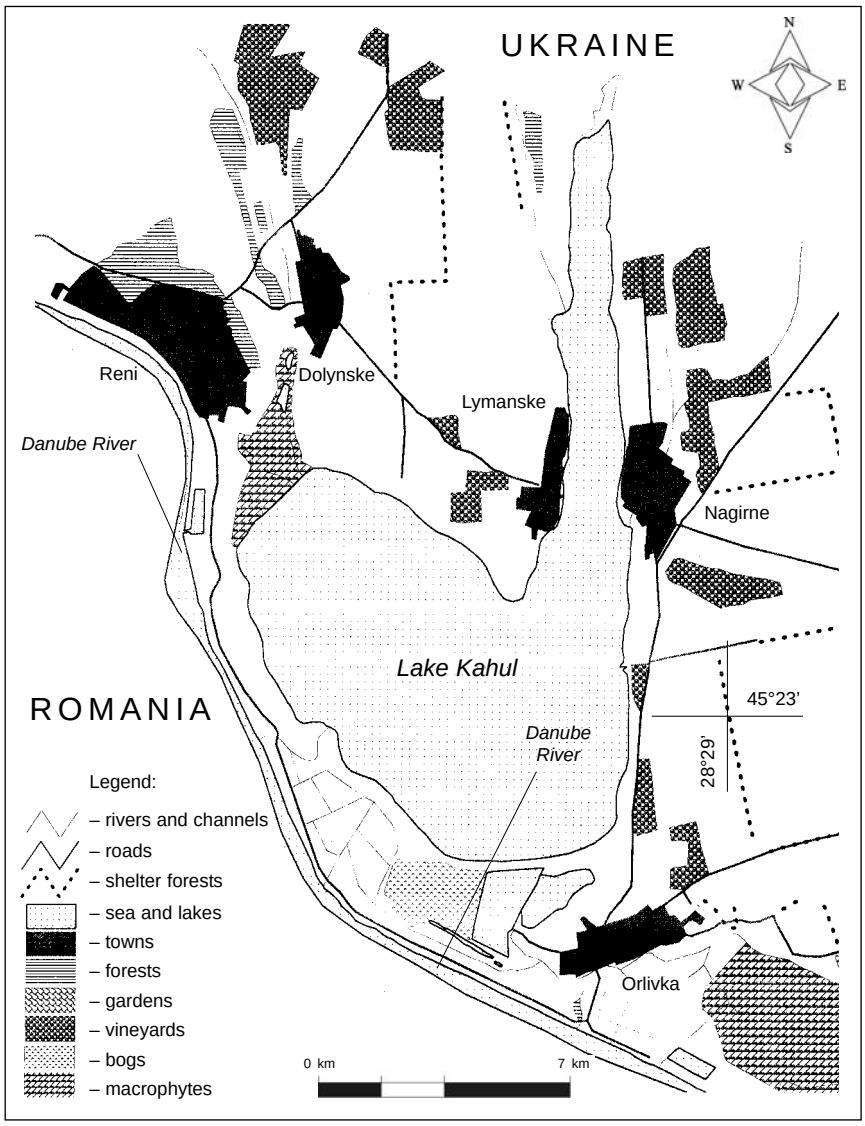
a small herd of livestock (horses, sheep and cows) being grazed on the Tataru Island, and a small subsidiary cattle farm on Maly Daller. Grazing of calves on the Velyky Daller ceased several years ago.

Possible changes in land use: The islands may be zoned to permit some limited agricultural activities and controlled cattle grazing.

Disturbances and threats: Extreme fluctuation of water levels in the River Danube.

Economic and social values: The islands are not economically important because they are difficult to access; their future lies in ecological and education tourism. Most of the fishing, hunting and other recreational activities occur on Tataru and Bolshoi Daller Islands, especially at the end of summer and in autumn.

Fauna: Mammals: The forest is inhabited by many mammals including *Felis silvestris, Capreolus capreolus, Vulpes vulpes, Meles meles, Nyctereutes procyonoides* as well as the artificially introduced *Dama dama* and some species of bats. Birds: The highest biodiversity is found in marsh habitats, the regular breeding sites for *Phalacrocorax carbo* (30-40) and *P. pygmaeus* (40-110), *Nycticorax nycticorax* (40-100), *Ardea cinerea* (15), *A. purpurea* (20-90), *Egretta garzetta* (10-50), *E. alba* (10-20), *Ardeola ralloides* (5-15), *Larus ridibundus* (80-600) and *L. cachinnans* (10) as well as *Chlidonias hybrida* (70-340). Occasionally the islands are used by *Platalea leucorodia* and *Plegadis falcinellus.* The natural floodplain willow forest also supports abundant biodiversity. This is a breeding habitat for *Haliaeetus albicilla* (Maly Daller). *Columba palumbus, Dryocopus martius, Dendrocopos major, Luscinia megarhynchos, Parus major* and *P. caeruleus,* etc. breed in the forest. The inner openwater areas serve as stop-over sites for migratory waterfowl and water birds such as *Pelecanus onocrotalus* (up to 1,300 birds), *Anser anser* (*c*. 2,200), *Phalacrocorax pygmaeus* (1,500), *P. carbo* (up to 3,000), *Aythya ferina* (*c.* 1,200), *A. nyroca* (up to 200), *Chlidonias hybrida* (about 1,500), *Ciconia nigra* (10-15), *Pandion haliaetus* (a few individuals), *Sterna caspia* (a few individuals) and *Aythya fuligula* (*c.* 800). Wintering colonies of *Columba palumbus* may number up to 35,000-40,000 individuals (Potapov, 2001). Fish: Flood meadows serving as spawning places for various fish species are situated in the middle and lower-lying parts of the islands. These sites are used mostly by *Carassius auratus* and *Cyprinus carpio* (both Danube and marsh morphs).



Map 26. Lake Kahul

Special floristic values: The richest species composition is found in the meadow communities. There are many rare species such as *Lathyrus hirsutus, Glycyrrhiza foetidissima, Ononis intermedia* and *Thalictrum lucidum.*

Research facilities: Research is carried out by scientists from the National Academy of Sciences of Ukraine, the National

Mechnikov University, Odessa, and the Danube Biosphere Reserve.
Public awareness and education: Public awareness education is restricted to that provided by comprehensive schools together with lectures presented by scientists from universities and other organisations for the principal interest groups.
Criteria for inclusion: 3 and 6.

Table 30. Waterbird populations at Lake Kahul (1998-1999)

Species	Breeding pairs	Non-breeding individuals
Anas platyrhynchos	5-10	500
Anser albifrons		10,000
Anser anser	30	3,000
Aythya nyroca	30-50	
Branta ruficollis		800
Chlidonias hybrida	150	
Fulica atra	40	150
Ixobrychus minutus	60-80	
Netta rufina		300
Nycticorax nycticorax	120-160	
Phalacrocorax pygmaeus	20-40	

28. Lake Kahul

Location: 45°30'N, 29°33'E (centre). Northwestern coast of the Black Sea, Reni Rayon (near the villages of Orlivka, Nagirne, Lymanske and Dolynske), Odessa Oblast.
Area: 10,500 ha.
Altitude: 0.2-0.8 above sea level.
Wetland type: O.
Other hydrologically linked wetlands: A system of channels and canals joins Lake Kahul with the River Danube and Lake Kartal. The upper part of the lake receives discharge from the River Kahul.
Description of site: The Kahul lake-liman is situated in the Lower Danube basin. The Kahul valley is fairly deep so the eastern and western banks of the lake are high and steep. The northern bank is smooth and low and borders the valley of the river flowing into the lake. The southern banks border the Danube floodplain. Lake Kahul consists of two parts: the upper part is long and narrow; the lower part is wide and is bordered to the south by the River Danube. The shape of the water body resembles a hockey stick: the long upper parts are north-south oriented and were originally the floodplain of the River Buzor.
Principal vegetation: The latest geo-botanical description of the aquatic vegetation of Lake Kahul was produced by Dyachenko (1993), who discovered that the submerged vegetation along the narrow upper part of the lake reached its maximum density at the apex of the lake. Vegetation covers the lakebed to a depth of 1.0-1.1 m. The apex and western bank of Lake Kahul are colonised by reed *Phragmites australis.* The openwater areas are fringed by *Typha angustifolia.* Large areas in the lower part of the lake are covered by halophytes, as are the western and northwestern banks. Apart from the reeds, *Schoenoplectus lacustris* is also not uncommon. *T. latifolia* and *S. tabernaemontani* are especially abundant along the western banks.
Conservation measures taken: The lake is listed in the nature conservation inventory of Odessa Oblast. At present, preparations are being made to grant the wetland regional importance status.
Conservation measures proposed: The most valuable parts of the wetland are to be included in the Danube Biosphere Reserve.
Land use: The adjacent areas are used for agriculture and cattle grazing.
Possible changes in land use: Changes in land use are not expected.
Disturbances and threats: The main threat comes from water level dynamics of the River Danube. The capacity of the wetland as a breeding and foraging site has benefited from extremely high water levels during the past 2-3 years. However, the lake received cyanides with the floodwaters as a result of accidents in Romania during the flood in 2000.
Economic and social values: The lake is used for commercial fishery. However, mass mortality of the main stock species, i.e. *Cyprinus carpio* and *Hypophtalmichthys molitrix,* during the last few years has undermined the importance of the wetland for fishery. Water from the lake is actively abstracted for irrigating the adjacent agricultural holdings. The floodplain between the River Danube and lake has been dammed and drained; it is still used for agriculture.
Fauna: The lake is inhabited by about 200 bird species, of which 10 are listed in the RDB of Ukraine. 34 bird species are of European conservation concern (SPEC) (Tucker & Heath 1994). Lake Kahul, along with the other Danube wetlands, lies on the Via Pontica flyway, so it is of great importance as a stopover site for migratory birds. Species of the orders Pelecaniformes, Anseriformes and Charadriiformes are the most numerous. The total number of breeding birds is estimated at 1,500 pairs. The largest aggregations of migratory birds are usually found here in August-October, up to 10,000-20,000 individuals. Of the wintering birds, *Anser albifrons* is the

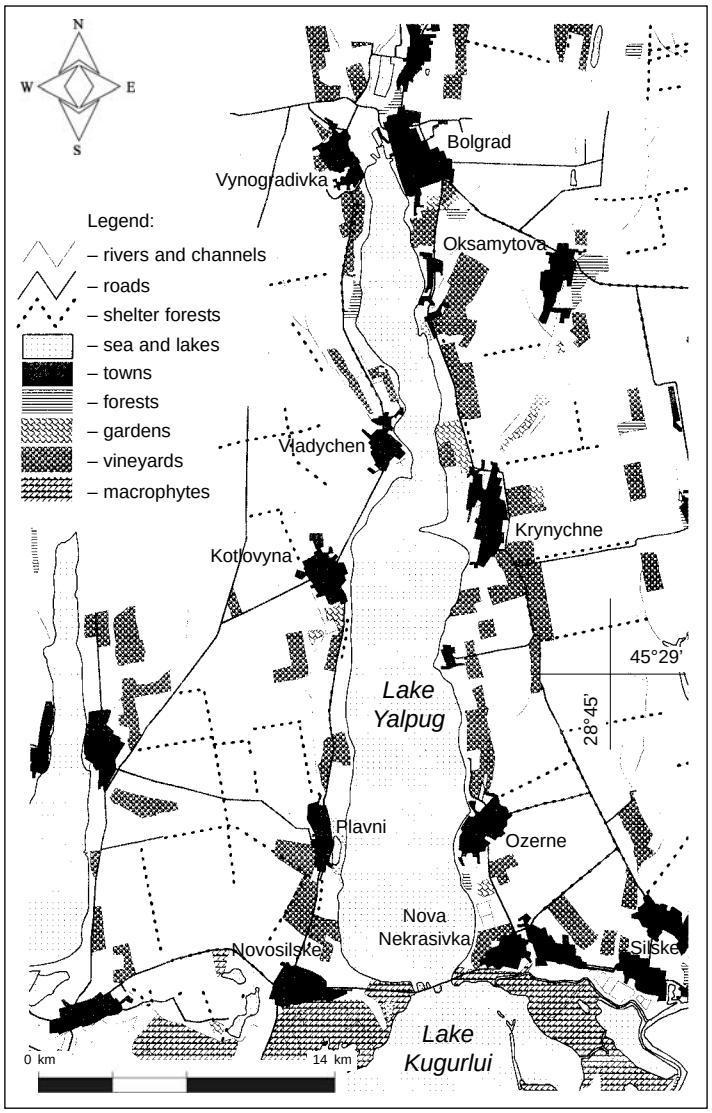
most numerous (*c.* 7,000-10,000 birds). Some *Branta ruficollis* (100-300 birds) also winter here with the *A. albifrons.*

Special floristic values: According to many experts the local vegetation is indigenous, developed in the Tertiary period. Although vegetation of the southern catchment is probably geologically as young as the end of the Tertiary (Pliocene), this area lay beneath the Pontic Sea, which used to reach as far inland as the towns of Kahul, on the River Prut, and Bender, on the River Dniester.

Research facilities: Ecological studies will be carried out by scientists from the Institute of Botany, Institute of Zoology and Institute of Biology of Southern Seas of the National Academy of Sciences of Ukraine, Odessa Hydro-Meteorological Institute and the National Mechnikov University, Odessa.

Public awareness and education: Conservation awareness and education are provided by comprehensive schools and experts from conservation and scientific bodies through posters, booklets and lectures.

Criteria for inclusion: 6.



Map 27. Lake Yalpug

29. Lake Yalpug

Location: 45°30'N, 29°33'E (centre). In Reni, Bolgrad and Izmail Rayons, Odessa Oblast, 10 km northwest of the town of Izmail.

Area: 13,374 ha.

Altitude: 1.6 m above sea level.

Wetland type: O.

Other hydrologically linked wetlands: The upper part of Lake Yalpug is linked to the Tarakliya Reservoir (Moldova). The canal joining these two wetlands is the dredged and straightened bed of the River Yalpug. A wide channel in the lower reaches joins Lake Yalpug and Lake Kugurlui.

Description of site: Lake Yalpug is the largest Danube freshwater wetland. Like Lake Kahul, the upper part of the lake is long and the lower end is long and wide. The small, dried-up River Yalpug used to discharge into the upper part of the lake.

Principal vegetation: The sub-littoral part of the wetland is covered by aquatic vegetation dominated by reeds, *Typha angustifolia,* etc., encroaching over large areas in the northwestern and upper parts of the lake. Some narrow stands of *Bolboschoenus maritimus* are found in the upper part of the lake.

Conservation measures taken: The area is listed as having potential for nature conservation in the region.

Conservation measures proposed: Some parts of this wetland will be incorporated into the Danube Biosphere Reserve as sanctuaries.

Land use: The area is used intensively for

Table 31. Waterbird populations at Lake Yalpug (1990-2002)

Species	Breeding pairs	Non-breeding individuals
Anas platyrhynchos	300	7,000 (on migration)
Anser albifrons		10,000-15,000 (on migration)
Anser anser		300 (on migration)
Branta ruficollis		250 (on migration)
Fulica atra		20,000 (on migration)
Ixobrychus minutus	150	
Larus ridibundus		1,200 (on migration)

agriculture and cattle farming. The lower part of the lake is used for commercial fishery, which is fairly limited due to the high levels of chemical pollution, which also restricts the water supply from Lake Yalpug. There is a recreation centre owned by enterprises from Izmail on the left bank of the lake (between Ozerne and Krynychne villages).
Possible changes in land use: None expected.
Disturbances and threats: The water in the lake is regularly polluted by drainage discharge from the canal leading to the Tarakliya Reservoir. As a result, water in the lake is not suitable for drinking and irrigation. Water for the main settlements along the lake is delivered from elsewhere.
Economic and social values: Of great importance for development of fishery, irrigation and recreation.
Fauna: The fauna of the lake is little studied. In the migration season, the wetland attracts thousands of *Anas platyrhynchos, Aythya ferina,* etc.
Special floristic values: Some relict steppe species including protected species such *Stipa capillata,* etc.; also some species listed in the RDB of Ukraine: *Colchicum ancyrense.*
Research facilities: Ecological studies will be carried out by scientists from the Institute of Botany, Institute of Zoology and Institute of Biology of Southern Seas of the National Academy of Sciences of Ukraine, Odessa Hydro-Meteorological Institute and the National Mechnikov University, Odessa.
Public awareness and education: Public awareness education is restricted to that provided by comprehensive schools together with lectures presented by scientists from universities and other organisations for the principal interest groups.
Criteria for inclusion: 6.

30. Zhebriyanski Plavni

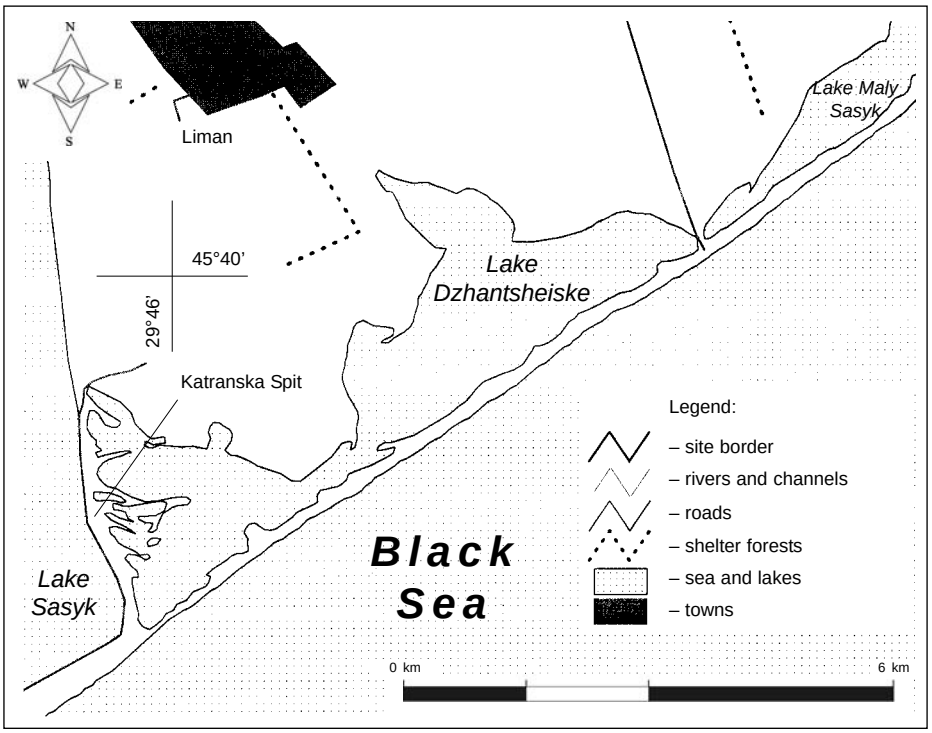
Location: 45°30'N, 29°33'E. In Kiliya Rayon, Odessa Oblast, 4 km to the northwest of the city of Vylkove.
Area: 8,300 ha.
Altitude: 0.8-1.5 m above sea level.
Wetland type: F.
Other hydrologically linked wetlands: The River Danube, Black Sea and Lake Sasyk.
Description of site: The site (see Map 3) comprises swamps in the mouth of an old river delta, with shallow floodplain wetlands. Almost the entire coast is enclosed by artificial dams and divided into two by the Danube-Sasyk channel, while the existing connection to the Black Sea is through a series of narrow sluices. Stentsivsko-Zhebriyanski Plavni is a shallow wetland overgrown mainly with tall grasses dominated by the reed *Phragmites australis.* There are several small openwater areas linked by channels. Zhebriyanska Spit, composed of sandy and sandy-shell deposits, separates the wetland from the Black Sea. Most of the Stentsivsko-Zhebriyanski Plavni is covered by reed-beds of varying density, depending on water level and soil salinity. Overgrown areas alternate with numerous openwater areas; the banks are low. Almost the whole area is surrounded by the dam system. Construction of the Danube-Sasyk canal has split the Stentsivsko-Zhebriyanski Plavni in two parts and impaired water exchange between them. The wetland has very high eutrophication levels and frequently suffers from oxygen deficiency and oxidation of H_2S and methane.

Table 32. Waterbird populations at the Zhebriyanski Plavni (1990-2002)

Species	Breeding pairs	Non-breeding individuals
Anas platyrhynchos	1,100	
Anser albifrons		40,000 (in winter)
Aythya ferina	1,400	9,000 (on migration)
Aythya nyroca	360	
Branta ruficollis		700 (on migration)
Cygnus olor	600	2,800 (on migration)
Egretta alba	100	
Fulica atra		39,000 (on migration)
Haliaeetus albicilla		11
Netta rufina	400	2,500 (on migration)
Nycticorax nycticorax	250	
Pelecanus onocrotalus		1,500 (on migration)
Phalacrocorax pygmaeus	0	500
Platalea leucorodia	350	
Plegadis falcinellus	300	900
Podiceps cristatus	280	1,100

Principal vegetation: The vegetation of the area is rather poor and suffers from the artificial water level regime. Aquatic communities cover most of the area.
Conservation measures taken: Included in the Danube Biosphere Reserve as a zone of regulated land use. The plavni are a Ramsar site, included as a part of the Kiliiske Mouth (Danube Delta) site.
Conservation measures proposed: This site will be included within the Danube Biosphere Reserve. A manage-

ment plan for the site is being developed as part of the Biosphere Reserve designation.
Land use: The main activities within the site are hunting, fish farming, fishing, sheep grazing and reed harvesting.
Possible changes in land use: Human pressure on the site is likely to increase as a result of agricultural intensification and expansion of the Ust-Dunaisky seaport.
Disturbances and threats: The water quality and hydrology of the site have been affected by the division of the site for construction of the channel linking Lake Sasyk to the River Danube, leading to increased siltation and eutrophication and causing increased algal productivity. Although currently not a problem, traditional harvesting of reeds needs to be controlled to ensure that it does not lead to habitat degradation.
Economic and social values: Tourism and recreation are limited and poorly supported by the local infrastructure. There is as yet no provision for the development of recreational facilities.
Fauna: The site supports up to 18,000 pairs of breeding waterbirds, predominantly in reed-beds. Outside the breeding season, numbers may rise to 100,000 individuals, with the main concentrations in areas with open water, stands of emergent vegetation and reed-beds.
Special floristic values: One of Ukraine's largest populations of *Cladium mariscus,* included in the Red Book of Ukraine.
Research facilities: The Danube Biosphere Reserve of the National Academy of Sciences of Ukraine, institutes of the National Academy of Sciences of Ukraine (including the Institute of Biology of Southern Seas, Institute of Botany and Institute of Zoology) and Ministry of Education (including the National Mechnikov University, Odessa, and the Odessa Hydro-Meteorological Institute.
Public awareness and education: A public awareness programme is being developed for local people, including posters, journal and newspaper articles, and brochures. In addition, training courses are being presented under the Danube Biosphere Reserve programme.
Criteria for inclusion: 1, 4, 5 and 6.



Map 28. Dzhantsheiski Lakes

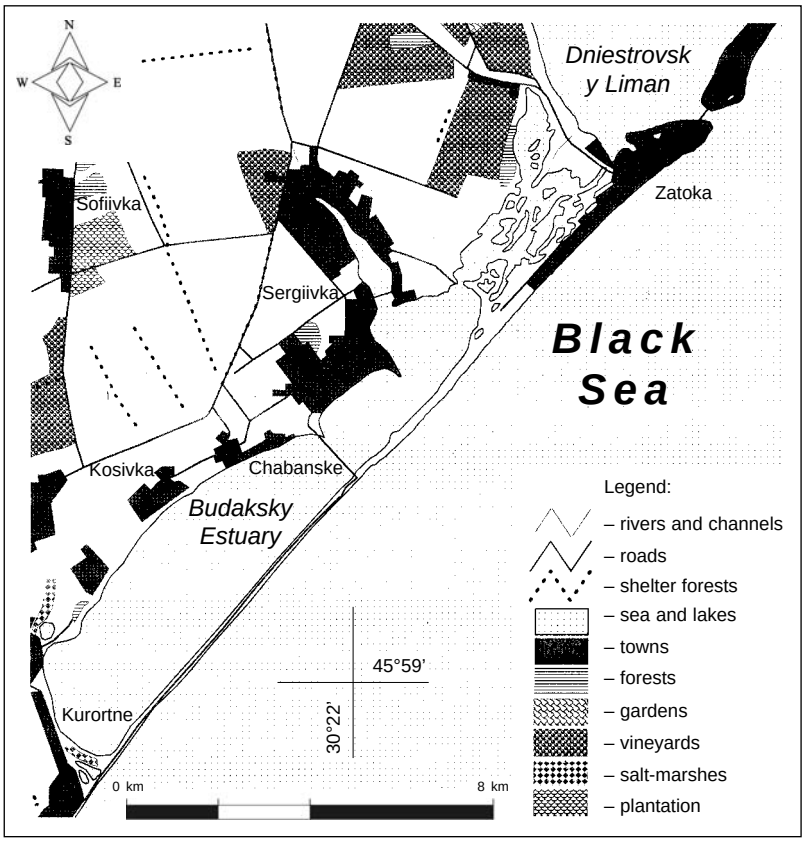
Table 33. Waterbird populations at Dzhantsheiski Lakes (1991-2001)

Species	Breeding pairs	Non-breeding individuals
Anas platyrhynchos		1,000 (on migration)
Anser albifrons		5,000 (on migration)
Branta ruficollis		300 (on migration)
Charadrius alexandrinus	30	
Cygnus olor		1,150 (in winter)
Fulica atra	90	2,000 (on migration)
Glareola pratincola	50	
Numenius arquata		90 (on migration)
Pelecanus crispus		50 (in summer)
Pelecanus onocrotalus		500 (in summer)
Phalacrocorax pygmaeus		120 (in winter)
Philomachus pugnax		2,500 (on migration)
Pluvialis squatarola		120 (on migration)
Podiceps cristatus	20	
Recurvirostra avosetta	25	
Thalasseus sandvicensis	700	

31. Dzhantsheiski Lakes

Location: 45°38'N, 29°47'E. In Tatarbunary Rayon, Odesa Oblast.
Area: 1,000 ha.
Altitude: 0-0.4 m above sea level.
Wetland type: J.

Other hydrologically linked wetlands: Lake Sasyk, Maly Sasyk Liman and the Black Sea.
Description of site: A typical estuary.
Water quality: Brackish water.
Principal vegetation: *Phragmites* reed-beds with areas of marshland, meadows, openwater and halophyte communities.
Conservation measures taken: IBA No 21.
Conservation measures proposed: A seasonal reserve of local importance.
Possible changes in land use: None expected.
Disturbances and threats: The main threat is the discharge of polluted water from Lake Sasyk during blooms of blue-green algae. An additional threat is disturbance to birds in the hunting season (September-January) and during May-September by people on vacation from the many resorts in the area.
Economic and social values: Very important for recreation and tourism.
Fauna: See table.
Special floristic values: Reeds are found in the western part of the site, on the border with Lake Sasyk. Halophytic plant species dominate in coastal meadows.
Research facilities: A number of studies have been carried out into the ecology of the site by organisations such as the National Mechnikov University, Odessa, the National Academy of Sciences of Ukraine, and the "Wildlife Conservation" NGO.
Criteria for inclusion: 2.



Map 29. Budaksky Estuary

32. Budaksky Estuary

Location: 46°00'N, 30°15'E. In Belgorod-Dniestrovsk Rayon, Odessa Oblast.
Area: 2,700 ha.
Altitude: 0-0.4 m above sea level.
Wetland type: J.
Other hydrologically linked wetlands: Dniestrovsky Liman and the Black Sea.
Description of site: The eastern part of the estuary hosts large aggregations of birds on a seasonal basis. Budaksky Estuary is a typical saline estuary, however due to the construction of small channels to connect it to the Dniester Estuary and the desalination of its water by wastewater discharges from Sergiivka resort village and other resorts located on the coastal spit the salinity of the estuary has

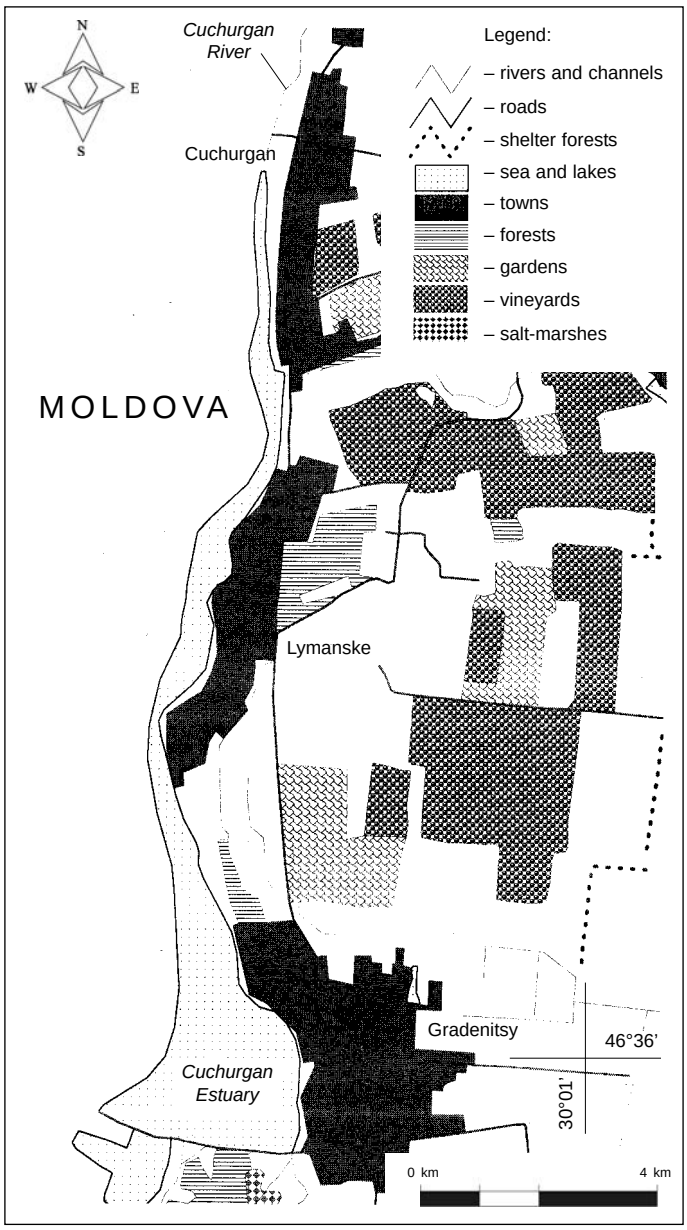
Table 34. Waterbird populations at Budaksky Estuary (1991-2001)

Species	Breeding pairs	Non-breeding individuals
Anser albifrons		5,000 (in winter)
Anas platyrhynchos	20	1,400 (on migration)
Aythya ferina		8,370 (in winter)
Aythya fuligula		3130 (in winter)
Branta ruficollis		300 (in winter)
Charadrius alexandrinu s	25	500 (on migration)
Ñógnus cygnus		150 (in winter)
Cygnus olor	15	600 (in winter)
Fulica atra	120	2,000 (on migration)
Larus cachinnans	100	
Larus ridibundus	0	3,000 (on migration)
Podiceps cristatus	20	120 (on migration)
Sterna hirundo	120	300 (on migration)

decreased. In the northeast the estuary is largely overgrown by reeds.
Water quality: The estuary is now almost freshwater. The water quality depends on the intensity of discharges of wastewater from Sergiivka resort village and other resorts located on the Budakska Spit.
Principal vegetation: *Phragmites* reed-beds in the northeastern part of the estuary and on the coastal zone at the border with the Black Sea. Halophytic species grow in the south-western part of the estuary.
Conservation measures taken: None.
Conservation measures proposed: A seasonal reserve of local importance.
Possible changes in land use: None expected.
Disturbances and threats: Disturbance is especially noticeable in the resort season (May-September), when 10,000-30,000 people are on vacation here.
Economic and social values: The estuary is very important as a source of medicinal mud, which is used in sanatorium treatments, and for recreation.
Fauna: See table.
Special floristic values: No information.
Research facilities: A number of studies have been carried out on the ecology of the site by organisations such as the National Mechnikov University, Odessa, the National Academy of Sciences of Ukraine, and the "Wildlife Conservation" NGO.
Criteria for inclusion: 2.

33. Cuchurgan Estuary

Location: In Bilyaivka and Rozdilna Rayons, Odessa Oblast.
Area: 2,800 ha.
Altitude: 3-5 m above sea level.
Wetland type: M, N, O, 6, 3 and 9.
Other hydrologically linked wetlands: River Cuchurgan and Dniester-Turunchuk Crossrivers Area (Ukraine), and the Cuchurgan Estuary and Talmaza-Palanca (Moldova-Transdnistria) wetlands.
Description of site: A reservoir in the valley of the River Cuchurgan. The Cuchurgan Estuary lies on the border between Ukraine and the Pridnistrovska Moldovan Republic; it was converted into a cooling reservoir for the Moldovan Hydroelectric Power Station in 1964. The area of the estuary where warm water is discharged does not freeze over.



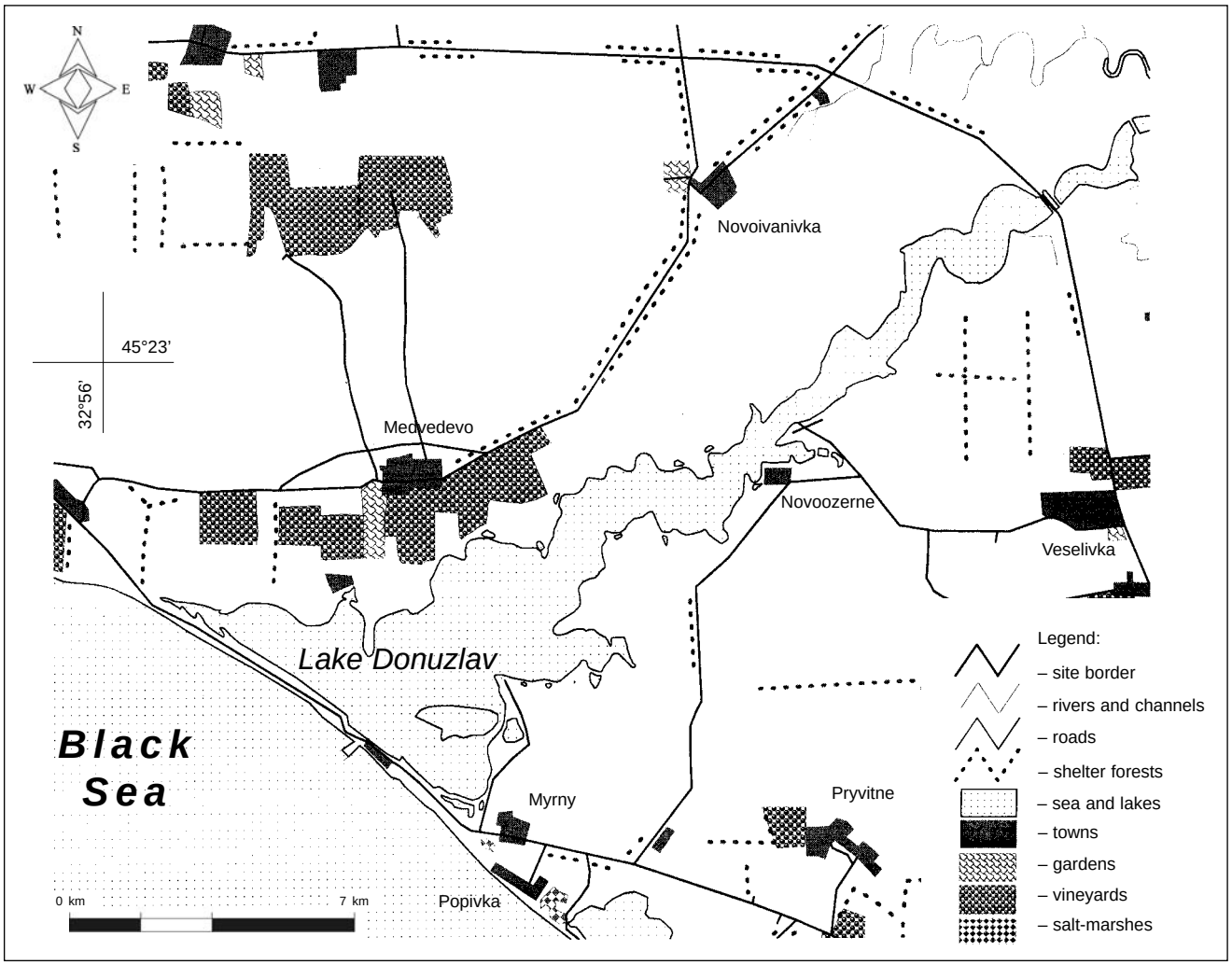
Map 30. Cuchurgan Estuary

Table 35. Waterbird populations at Cuchurgan Estuary (1991-2001)

Species	Breeding pairs	Non-breeding individuals
Anas platyrhynchos	25	1,100 (in winter)
Branta ruficollis		73 (in winter)
Cygnus olor		300
Cygnus olor	10	300 (on migration)
Fulica atra	90	3,600 (in winter)
Gallinula chloropus		419 (in winter)
Numenius arquata		120 (on migration)
Philomachus pugnax		2,500 (on migration)
Pluvialis squatarola		120 (on migration)
Podiceps cristatus	20	150 (on migration)
Podiceps ruficollis		610 (in winter)

Water quality: Fresh water. Water quality depends on water discharges from irrigated agricultural land in the Pridnestrovska Moldovan Republic and Ukraine as well as on pollutants that enter the reservoir from the mud accumulator of the Moldovan Hydro-electric Power Station. Dichlorodiphenyltrichloroethane (DDT) and other pesticides are found in the silt of the reservoir.
Principal vegetation: *Phragmites* reed-beds.
Conservation measures taken: None.
Conservation measures proposed: A seasonal reserve of local importance.
Possible changes in land use: None expected.

Disturbances and threats: Non-regulated hunting and fishery; pollution deriving from the Moldovan Hydroelectric Power Station, and pesticide pollution, caused by sewage.
Economic and social values: Important site for recreation and fishery.
Fauna: See table.
Special floristic values: No information
Research facilities: A number of studies have been carried out on the ecology of the site by organisations such as the National Mechnikov University, Odessa, and the National Academy of Sciences of Ukraine, and the "Wildlife Conservation" NGO.
Criteria for inclusion: 2.



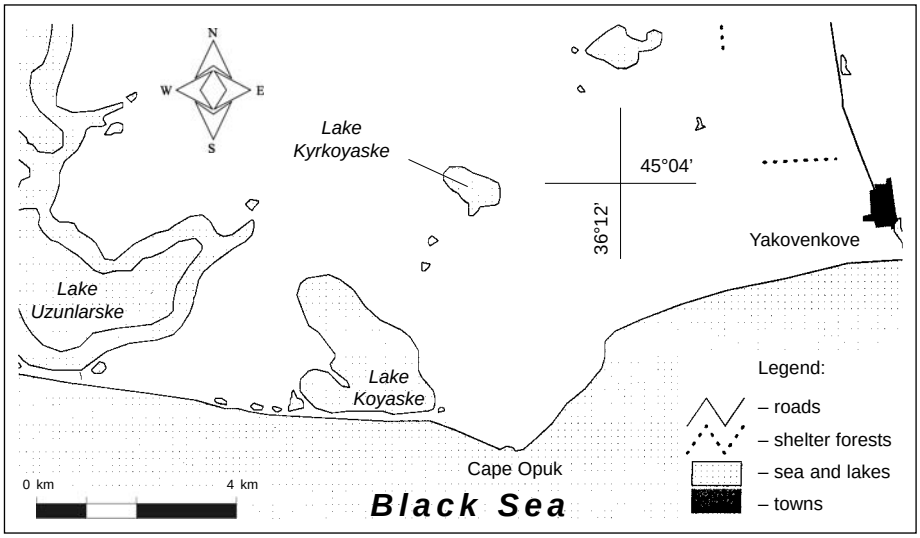
Map 31. Lake Donuzlav

34. Lake Donuzlav

Location: In Chornomorsky and Saksky Rayons, Crimea.
Area: 4,820 ha.
Altitude: 0.3-0.4 m above sea level.
Wetland type: J, Q.
Other hydrologically linked wetlands: The Black Sea.
Description of site: The upper part of the lake has been desalinated and converted into reservoirs to provide water for sprinkling.
Water quality: Saline.
Principal vegetation: No information.
Conservation measures taken: None.
Conservation measures proposed: None.
Possible changes in land use: Not expected.
Disturbances and threats: No information.
Economic and social values: No information.
Fauna: See table.
Special floristic values: No information.
Research facilities: A number of studies have been carried out on the ecology of the site by organisations such as the National Mechnikov University, Odessa, and the National Academy of Sciences of Ukraine.
Criteria for inclusion: 2.

Table. 36. Waterbird populations at Lake Donuzlav (1998-

Species	Breeding pairs	Non-breeding individuals
Anas platyrhynchos	10	6,000
Ardea purpurea	15-20	-
Aythya ferina		1,000
Cygnus olor	4	150
Egretta alba		110
Fulica atra	20-40	2,000
Larus cachinnans		2,000
Larus ridibundus		3,000
Podiceps cristatus	15	500
Porzana parva	2-5	
Porzana porzana	6-10	
Rallus aquaticus	10-12	
Recurvirostra avosetta	10-15	
Sterna albifrons	25-30	
Sterna hirundo	200-450	
Tadorna tadorna	15-20	
Thalasseus sandvicensis	100-250	
Tringa totanus	70-100	



Map 32. The Coast near Cape Opuk

35. Coast near Cape Opuk

Location: 45°20'N, 36°15'E. In Leninsky Rayon, Crimea.
Area: 2,500 ha.
Altitude: No information.
Wetland type: J, Q.
Other hydrologically linked wetlands: The Black Sea.
Description of site: Rocky shores of the Black Sea. The limestone Mt. Opuk is one of the highest peaks of the Kerchenski Peninsula (185 m). The Elken-Kaya (Stone Ships), a group of four rocky islands, are located 4 km south of Mt. Opuk.
Water quality: Saline.
Principal vegetation: The flora of the site includes 395 vascular plant species (32% of the flora of the Crimean plains and 44% of the flora of Kerchenski Peninsula).

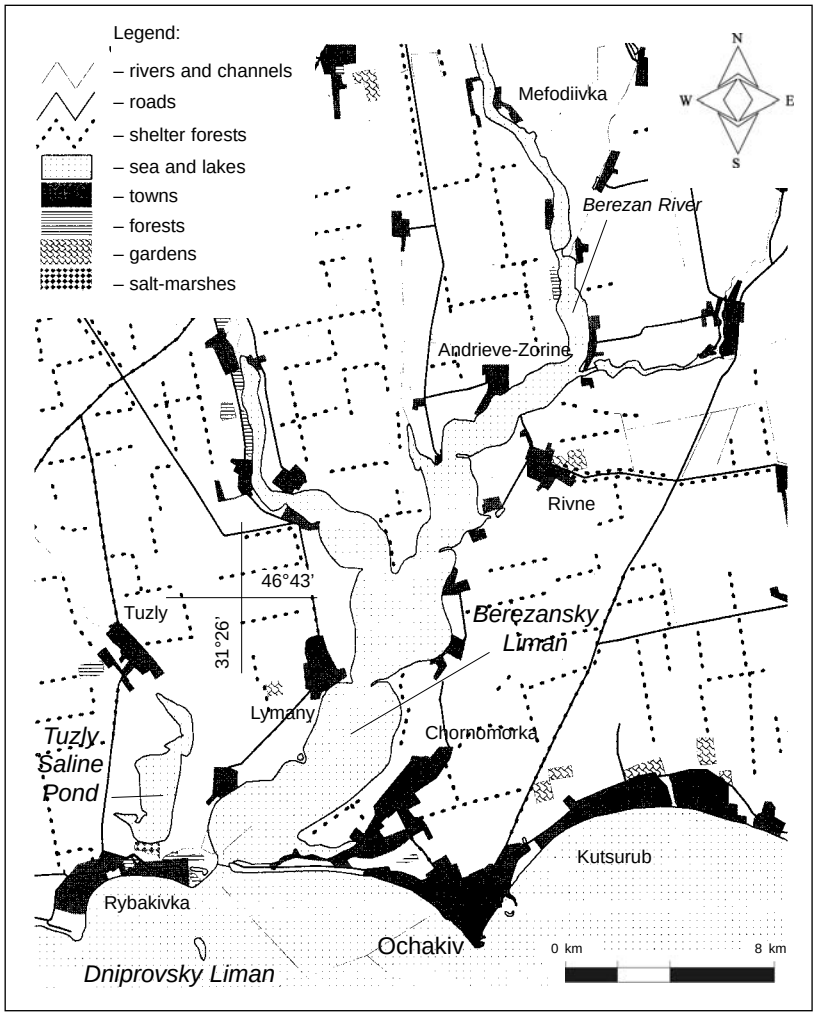
Table 37. Waterbird populations in the coast near Cape Opuk (1992-1998)

Species	Breeding pairs	Number in non-breeding period
Anser albifrons		20,000-42,000 (on migration, in winter)
Charadrius alexandrinus	8-20	No data
Charadrius dubius	5-8	No data
Larus cachinnans	16-30	Tens (in winter)
Larus genei	Up to 100	No data
Phalacrocorax aristotelis	35-55	No data
Recurvirostra avosetta	7-12	No data
Tadorna ferruginea	1-3	Up to 20 (in winter)
Tadorna tadorna	1-2	No data

Endemics are represented by 48 species, two of which are local endemics.
Conservation measures taken: The Opukski Nature Reserve was established in 1998. It covers an area (together with openwater of the Black Sea) of 1,592.3 ha.
Conservation measures proposed: None.
Possible changes in land use: None expected.
Disturbances and threats: Unorganised tourism, fishery.
Economic and social values: No information.
Fauna: Mammals: *Allactaga major* and *Mustela eversmanni.* Birds: Opuk, together with the neighbouring Lake Uzunlar, Lake Koyaske and Lake Kyrkoyaske, is a breeding and wintering site for a number of rare and threatened bird species such as *Phalacrocorax aristotelis, Tadorna ferruginea, Falco cherrug, F. peregrinus, F. naumanni, Anthropoides virgo, Otis tarda, Burhinus oedicnemus, Charadrius alexandrinus.* Reptiles: *Ophisaurus apodus, Coluber jugularis, Elaphe quatuorlineata.*
Special floristic values: 23 species are listed in the RDB of Ukraine.
Research facilities: A number of studies have been carried out on the ecology of the site by organisations such as the Institute of Zoology of the National Academy of Sciences of Ukraine and Melitopol Pedagogical University.
Criteria for inclusion: The site is of national conservation value.

36. Berezansky Liman

Location: 46°43'N, 31° 29'E. In Berezansky and Ochakiv Rayons, Mykolaiv Oblast.
Area: 11,600 ha.
Altitude: 0.1-0.2 m above sea level.
Wetland type: J, Q.
Other hydrologically linked wetlands: The Black Sea, River Sosik and River Berezan.
Description of site: Berezansky Liman is located at the extreme east of the Odessa plateau; it is a continuation of the Rivers Sasyk and Berezan. The liman, which is 20-25 km long, with an average width of 2-3 km and average depth of 3.3 m (maximum depth 15 m), connects with the Black Sea via a 400-m wide strait. The water surface area is 10 km^2 and volume 0.2 km^3; shoals are present over about half the area of the liman. The valley of the liman is asymmetrical; the banks are steep and abrupt, composed mostly of limestone and argillaceous and sandy-argillaceous deposits. The liman is divided in the middle by a vast sandy spit, which separates the northern part from the central and southern parts. The key factor for the Berezansky Liman is its water-level regime of free water exchange with the Black Sea: the water level in the liman is affected by breeze, seiche, tides and fluctuations in the water level of the



Map 33. Berezansky Liman

Black Sea. There is a discrepancy between water levels in the Black Sea and the levels in the liman, caused by the impact of coastline geomorphology and local winds. Surface water inflow does not significantly affect the water-level regime. Long-term and seasonal fluctuations are insignificant; fluctuations in the liman may be 30-80 cm.

Water quality: Salt water. Ions of Na, K, chlorides and sulphates predominate in the water of Berezansky Liman. The water belongs to the chloride-sodium class of the second type, ClNa. Significant fluctuations in ion content are caused by the dynamics of the water mass and periodic influence of the Black Sea. Reservoir salinity fluctuates between 1-2% in May and 13-14% in autumn.

Climate: Weather conditions and active water exchange with the Black Sea play a crucial role in forming the thermal regime of Berezansky Liman. In spring, the water temperature usually reaches 0.2°C at the beginning of March, and 4°C from the end of March to the beginning of April. The water temperature usually reaches 10°C by the end of April, with maximum water temperature (23.6-24.0°C) in July-August. In autumn the water temperature usually falls to 10°C by 10th November and to 4°C by mid-December.

Principal vegetation: The vegetation of Berezansky Liman is represented by complexes typical for Tyligulsky Liman. It consists of shrubby, meadow, solonetz, brackish and meadow-halophytic vegetation and the vegetation of overgrown sands and slopes.

Conservation measures taken: None.

Conservation measures proposed: Berezansky Liman is included in the list of potential areas for the establishment of a zoological reserve of national importance and in the inventory of nature reserve areas.

Land use: Fishing is a well-established activity. The average annual catch has been 2,000 kg/ha in some years. The catch comprises mostly freshwater fish – *c*. 89%, marine fish – *c.* 11%, on the whole *Atherina* species. Agricultural lands abut the slopes of Berezansky Liman.

Possible changes in land use: No significant changes in land use are expected. In the fishery industry, breeding and farming of food fishes might be intensified.

Disturbances and threats: No information.

Economic and social values: Berezansky Liman is intermediate in type between closed and open limans. In recent years, the number of freshwater fishes has reduced by 35%, however the number of marine species has increased by 30%. Both *Lucioperca* ssp., *Cyprinus carpio* and *Acipenser* ssp. are valuable for trade. The recreational and therapeutic resources of Berezansky Liman are attractive for treatment, relaxation and tourism. Amateur and sport fishing are well-developed. Cottage and gardening co-operatives have been established along the banks of the liman.

Fauna: The composition of vertebrates is specific to this zoo-geographical region and is identical to that at Tyligulskyi Liman. Birds: Large areas of shoals and rich forage resources attract wetland birds to nest. Large numbers of birds are regularly seen here, both migrating and overwintering. Fish: Berezansky Liman is a typical brackish reservoir. It has a relict complex of fish (36-39%): one-third of which are freshwater species (*Abramis* sp., *Carassius carassius, Stizostedion lucioperca,* etc.). There is a total of 55 species: marine boreal species – 4, Mediterranean species – 13, Caspian species – 20, and freshwater species – 18. *Zingel zingel* and *Rutilus frisii* are listed in the RDB of Ukraine. Invertebrates: There are 85 invertebrate species and forms among the bottom fauna of Berezansky Liman, including 10 species of Polychaeta, Oligochaeta – 14, shellfish – 16, Amphipoda – 8, Cumacea – 5, Isopoda – 2, Mysidacea – 2, Chironomidae – 24 and others – 4. The zoo-geographical composition is very diverse: Mediterranean Atlantic boreal species – 26%, Azov-Black Sea, Mediterranean-Black Sea and Black Sea endemic – 1%, widespread species – 20.6% and 17.8% palearctic species.

Table 38. Waterbird populations at Berezansky Liman and Tuzly Saline Pond (1990-2002)

Species	Breeding pairs	Non-breeding individuals
Falco vespertinus	50-59	
Larus minutus		25,000-28,000
Merops apiaster	470-500	
Nycticorax nycticorax	150-170	
Tadorna tadorna	520-590	200

Special floristic values: The most valuable vegetation is halophytic, of Aral-Caspian origin: *Juncellus pannonicus, Asparagus pallasii, Halimione verrucifera, Carex diluta, Chartolepis intermedia, Cirsium alatum;* Mediterranean origin: *Aeluropus littoralis, Elytrigia ruthenica, Carex distans;* and Black Sea origin: *Artemisia santonica, Lepidium syvaschicum.*

Research facilities: A number of studies have been carried out into the ecology of the site by organisations such as the National Mechnikov University, Odessa, and the National Academy of Sciences of Ukraine.

Criteria for inclusion: 5.

37. Plavni of the Southern Bug River

Table 39. Waterbird populations at the Plavni of the Southern Bug River (1998-1999)

Species	Breeding pairs	Non-breeding individuals
Aythya ferina		2,000
Cygnus olor		1,800
Haliaeetus albicilla		5
Larus cachinnans	300	200
Mergus albellus		20
Mergus merganser		7
Tadorna tadorna	40	100

Location: In Mykolaivsky and Novoodesky Rayons, Mykolaiv Oblast.
Area: 8,200 ha.
Altitude: 0.1-0.2 m above sea level.
Wetland type: L, K.
Other hydrologically linked wetlands: Black Sea, Bugsky Liman.
Description of site: The delta of the Southern Bug River is a typical delta covered by wetland vegetation dominated by reeds. From time to time, the main plavni area is covered by water to a depth of 1 m. Spring, summer and autumn floods and southerly winds sharply increase the water level. When north and northeasterly winds predominate, the water level decreases. This results in occasional mild flooding and drainage of the plavni, but their biocoenoses are well-adapted to this phenomenon.
Climate: The climate of the region is characterised by long, warm summers, winters with little snow, and insufficient moisture. Maximum temperature is 39°Ñ; minimum (January) –30°Ñ. The frost-free period lasts for 170-200 days.
Principal vegetation: All flood-land zones bordering the delta belong to the Dnipro-Dniester geo-botanic region of fescue-feather grass steppes, salt or water meadows. Species such *Festuceta valesiacae, Stipeta lessingianae,* and *S. ucrainicae* dominate in the phytocoenosis on well-drained areas of the steppe.
Conservation measures taken: None.
Conservation measures proposed: A National Nature Park along the lines of the Granite-Steppe Pobuzhzhya Regional Nature Landscape Park has been proposed.
Land use: Fish farming and fishing are well developed. Recently, reed has been grown on a commercial scale in the delta of the Southern Bug.
Possible changes in land use: No information.
Disturbances and threats: The hydrological regime may change in connection with construction of the Tashlyk Hydroelectric Pumped Storage Power Station; this will result in the degradation of plavni landscapes and their flora and fauna.
Economic and social values: There are rich radon deposits in the delta of the Southern Bug River. The river valley and its delta are historically valuable because *c*. 1,000 archaeological monuments of different cultures (dating back to the Stone Age) are found there. The landscape features attract many tourists. The area is place for scientific research and educational excursions.
Fauna: Rich faunal complexes are conserved in the valley and delta of the Southern Bug River. Vertebrate fauna is represented by *c*. 300 species, 46 of which are afforded statutory protection: *Barbus barbus borysthenicus, Chalcalburnus chalcoides mento, Coluber jugularis, Hieraaetus pennatus, Lutra lutra,* etc. Invertebrates: About 9,000 insect species have been recorded, 51 of which are included in the RDB of Ukraine including *Lucanus cervus, Cerambys cerdo cerdo, Morimus funereus, Parnassius apollo,* etc.
Special floristic values: The local flora comprises *c*. 900 species of vascular plants, 26 of which are included in the RDB of Ukraine and 4 of which are included in the European List of Protected Plants. In addition to typical forest endemics, many Near-Bug and Near-Black Sea endemic plants are found at the site as well as relict species of different geological epochs. The feature of bank plots is limestone outcrop with calciphytic vegetation: *Thymus dimorphus, Cleistogenes bulgarica, Koeleria cristata* are dominant.
Research facilities: A number of studies have been carried out into the ecology of the site by organisations such as the National Mechnikov University, Odessa, and the National Academy of Sciences of Ukraine.
Criteria for inclusion: 6.

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Ramsar Wetland Types

The codes are based upon the Ramsar Classification System for `Wetland Type` as approved by Recommendation 4.7 and amended by Resolution VI.5 of the Conference of the Contracting Parties. The categories listed herein are intended to provide only a broad framework to aid rapid identification of the main wetland habitats represented at each site.

Code Ramsar wetland type

MARINE/COASTAL WETLANDS

A Permanent **shallow marine waters** less than six metres deep at low tide; includes sea bays and straits.
B Marine **subtidal aquatic beds**; includes kelp beds, sea-grass beds, tropical marine meadows.
C **Coral reefs**.
D **Rocky marine shores**; includes rocky offshore islands, sea cliffs.
E **Sand, shingle** or **pebble shores**; includes sand bars, spits and sandy islets; includes dune systems.
F **Estuarine waters**; permanent water of estuaries and estuarine systems of deltas.
G **Intertidal mud, sand** or **salt flats**.
H **Intertidal marshes**; includes salt marshes, salt meadows, saltings, raised salt marshes; includes tidal brackish and freshwater marshes.
I **Intertidal forested wetlands**; includes mangrove swamps, nipah swamps and tidal freshwater swamp forests.
J **Coastal brackish/saline lagoons**; brackish to saline lagoons with at least one relatively narrow connection to the sea.
K **Coastal freshwater lagoons**; includes freshwater delta lagoons.

INLAND WETLANDS

L **Permanent inland deltas**.
M **Permanent rivers/streams/creeks**; includes waterfalls.
N **Seasonal/intermittent/irregular rivers/streams/creeks**.
O **Permanent freshwater lakes** (over 8 ha); includes large oxbow lakes.
P **Seasonal/intermittent freshwater lakes** (over 8 ha), includes floodplain lakes.
Q **Permanent saline/brackish/alkaline lakes**.
R **Seasonal/intermittent saline/brackish/alkaline lakes and flats**.
Sp **Permanent saline/brackish/alkaline marshes/pools**.
Ss **Seasonal/intermittent saline/brackish/alkaline marshes/pools**.
Tp **Permanent freshwater marshes/pools**; ponds (below 8 ha), marshes and swamps on inorganic soils; with emergent vegetation water-logged for at least most of the growing season.
Ts **Seasonal/intermittent freshwater marshes/pools** on inorganic soil; includes sloughs, potholes, seasonally flooded meadows, sedge marshes.
U **Non-forested peatlands**; includes shrub or open bogs, swamps, fens.
Va **Alpine wetlands**; includes alpine meadows, temporary waters from snowmelt.
Vt **Tundra wetlands**; includes tundra pools, temporary waters form snowmelt.
W **Shrub-dominated wetlands**; shrub swamps, shrub-dominated freshwater marsh, shrub carr, alder thicket; on inorganic soils.
Xf **Freshwater, tree-dominated wetlands**; includes fresh water swamp forest, seasonally flooded forest, wooded swamps; on inorganic soils.
Xp **Forested peatlands**; peatswamp forest.
Y **Freshwater springs; oases.**
Zg **Geotermal wetlands**.
Zk **Subterranean karst and cave hydrological systems**.

Note: `**floodplain**` is a broad term used to refer to one or more wetland types, which may include examples from the R, Ss, Ts, W, Xf, Xp, or other wetland types. Some examples of floodplain wetlands are seasonally inundated grassland (including natural wet meadows), shrublands, woodlands and forest. Floodplain wetlands are not listed as a specific wetland type herein.

"MAN-MADE" WETLANDS

1 **Aquaculture** (e.g., fish/shrimp) ponds.
2 **Ponds**; includes farm ponds, stock ponds, small tanks; (generally below 8 ha).
3 **Irrigated land**; includes irrigation channels and rice fields.
4 **Seasonally flooded agricultural land**.*
5 **Salt exploitation sites**; salt pans, salines etc.
6 **Water storage areas**; reservoirs/barrages/dams/impoundments; (generally over 8 ha).
7 **Excavations**; grave/brick/clay pits; borrow pits, mining pools.
8 **Wastewater treatment areas**; sewage farms, setting ponds, oxidation basins, etc.
9 **Canals and** drainage **channels**, ditches.

* To include intensively managed or grazed wet meadow or pasture.

Criteria for Identifying Wetlands of International Importance (Ramsar criteria)

Adopted by the 7th Meeting of the Conference of the Contracting Parties to the Ramsar Convention (1999), superseding earlier Criteria adopted by the 4th and 6th Meetings of the COP (1990 and 1996).

Group A of the Criteria.
Sites containing representative, rare or unique wetland types

Criterion 1: A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.

Group B of the Criteria.
Sites of international importance for conserving biological diversity

Criteria based on species and ecological communities

Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

Criterion 3: A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

Criterion 4: A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

Specific criteria based on waterbirds

Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.

Criterion 6: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.

Specific criteria based on fish

Criterion 7: A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.

Criterion 8: A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.

2000 IUCN Red List of Threatened Species: Categories, Criteria and Sub-criteria

The categories:

EXTINCT (EX) – A taxon is Extinct when there is no reasonable doubt that the last individual has died.

EXTINCT IN THE WILD (EW) – A taxon is Extinct in the wild when it is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range. A taxon is presumed extinct in the wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

CRITICALLY ENDANGERED (CR) – A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future, as defined by any of the criteria (A to E).

ENDANGERED (EN) – A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future, as defined by any of the criteria (A to E).

VULNERABLE (VU) – A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future, as defined by any of the criteria (A to E).

LOWER RISK (LR) – A taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Taxa included in the Lower Risk category can be separated into three subcategories:

- Conservation Dependent (cd). Taxa which are the focus of a continuing taxon-specific or habitat-specific conservation programme targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.
- Near Threatened (nt). Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable.
- Least Concern (lc). Taxa which do not qualify for Conservation Dependent or Near Threatened.

DATA DEFICIENT (DD) A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution is lacking. Data Deficient is therefore not a category of threat or Lower Risk. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and threatened status. If the range of a taxon is suspected to be relatively circumscribed, if a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

NOT EVALUATED (NE) A taxon is Not Evaluated when it is has not yet been assessed against the criteria.

The Criteria for Critically Endangered, Endangered and Vulnerable

CRITICALLY ENDANGERED (CR) – A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future, as defined by any of the following criteria (A to E):

A) Population reduction in the form of either of the following:
   1) An observed, estimated, inferred or suspected reduction of at least 80% over the last 10 years or three generations, whichever is the longer, based on (and specifying) any of the following:
      a) direct observation
      b) an index of abundance appropriate for the taxon
      c) a decline in area of occupancy, extent of occurrence and/or quality of habitat

d) actual or potential levels of exploitation
e) the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.

2) A reduction of at least 80%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer, based on (and specifying) any of (b), (c), (d) or (e) above.

B) Extent of occurrence estimated to be less than 100 km^2 or area of occupancy estimated to be less than 10 km^2, and estimates indicating any two of the following:
1) Severely fragmented or known to exist at only a single location.
2) Continuing decline, observed, inferred or projected, in any of the following:
a) extent of occurrence
b) area of occupancy
c) area, extent and/or quality of habitat
d) number of locations or subpopulations
e) number of mature individuals
3) Extreme fluctuations in any of the following:
a) extent of occurrence
b) area of occupancy
c) number of locations or subpopulations
d) number of mature individuals

C) Population estimated to number less than 250 mature individuals and either:
1) An estimated continuing decline of at least 25% within three years or one generation, whichever is longer or
2) A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either:
a) severely fragmented (i.e. no subpopulation estimated to contain more than 1000 mature individuals)
b) all individuals are in a single subpopulation

D) Population estimated to number less than 50 mature individuals.

E) Quantitative analysis showing the probability of extinction in the wild is at least 50% within 10 years or three generations, whichever is the longer.

ENDANGERED (EN) – A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future, as defined by any of the following criteria (A to E):

A) Population reduction in the form of either of the following:
1) An observed, estimated, inferred or suspected reduction of at least 50% over the last 10 years or three generations, whichever is the longer, based on (and specifying) any of the following:
a) direct observation
b) an index of abundance appropriate for the taxon
c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
d) actual or potential levels of exploitation
e) the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.
2) A reduction of at least 50%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer, based on (and specifying) any of (b), (c), (d), or (e) above.

B) Extent of occurrence estimated to be less than 5,000 km^2 or area of occupancy estimated to be less than 500 km^2, and estimates indicating any two of the following:
1) Severely fragmented or known to exist at no more than five locations.
2) Continuing decline, inferred, observed or projected, in any of the following:
a) extent of occurrence
b) area of occupancy
c) area, extent and/or quality of habitat
d) number of locations or subpopulations
e) number of mature individuals
3) Extreme fluctuations in any of the following:
a) extent of occurrence
b) area of occupancy
c) number of locations or subpopulations
d) number of mature individuals

C) Population estimated to number less than 2,500 mature individuals and either:
1) An estimated continuing decline of at least 20% within five years or two generations, whichever is longer, or
2) A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either:
a) severely fragmented (i.e. no subpopulation estimated to contain more than 250 mature individuals)
b) all individuals are in a single subpopulation.

D) Population estimated to number less than 250 mature individuals.

E) Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or five generations, whichever is the longer.

VULNERABLE (VU) – A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future, as defined by any of the following criteria (A to E):

A) Population reduction in the form of either of the following:
1) An observed, estimated, inferred or suspected reduction of at least 20% over the last 10 years or three generations, whichever is the longer, based on (and specifying) any of the following:
a) direct observation
b) an index of abundance appropriate for the taxon
c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
d) actual or potential levels of exploitation
e) the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.
2) A reduction of at least 20%, projected or suspected to be met within the next ten years or three generations, whichever is the longer, based on (and specifying) any of (b), (c), (d) or (e) above.

B) Extent of occurrence estimated to be less than 20,000 km^2 or area of occupancy estimated to be less than 2000 km^2, and estimates indicating any two of the following:
1) Severely fragmented or known to exist at no more than ten locations.
2) Continuing decline, inferred, observed or projected, in any of the following:
a) extent of occurrence
b) area of occupancy
c) area, extent and/or quality of habitats
d) number of locations or subpopulations
e) number of mature individuals
3) Extreme fluctuations in any of the following:
a) extent of occurrence
b) area of occupancy
c) number of locations or subpopulations
d) number of mature individuals

C) Population estimated to number less than 10,000 mature individuals and either:
1) An estimated continuing decline of at least 10% within 10 years or three generations, whichever is longer, or
2) A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either:
a) severely fragmented (i.e. no subpopulation estimated to contain more than 1000 mature individuals)
b) all individuals are in a single subpopulation

D) Population very small or restricted in the form of either of the following:
1) Population estimated to number less than 1000 mature individuals.
2) Population is characterised by an acute restriction in its area of occupancy (typically less than 100 km^2) or in the number of locations (typically less than five). Such a taxon would thus be prone to the effects of human activities (or stochastic events whose impact is increased by human activities) within a very short period of time in an unforeseeable future, and is thus capable of becoming Critically Endangered or even Extinct in a very short period.

E) Quantitative analysis showing the probability of extinction in the wild is at least 10% within 100 years.