Wetlands International — AEME
Azov-Black Sea Ornithological Station

Programme and Action Plan for Waterbird Monitoring in the Azov-Black Sea Region of the Ukraine

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This long-term Programme for waterbird monitoring in the Azov-Black Sea region and Action Plan provides a framework for scientific wetland surveys with the emphasis on water birds.

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CONTENTS

Programme for Waterbird Monitoring

Action Plan

Programme for Waterbird Monitoring

Introduction

Many wetlands of international importance are found in the Black Sea region of the Ukraine. Their role in the Mediterranean and West Palearctic Wetland Systems should not be underestimated. Therefore, the unification of methodological approaches to the wetland studies, development, implementation and co-ordination of scientific programmes are in accord with current national and international activities in this field. Since all scientific efforts should prepare a basis for the appropriate use of environmental and natural resources, no progress will be made in this direction until a suitable methodology is developed.

Biodiversity monitoring is one of the most effective ways to control the state of important wetlands. This is due to the fact that biota, as a constituent part of ecosystems, quickly and predictably reacts to changes in the health of wetlands. Therefore biodiversity monitoring allows information on these changes to be obtained relatively quickly and easily, without laborious detailed investigations.

Wetlands are unique biological systems which contain almost two thirds of all known animal and plant species. Setting up a monitoring scheme will have great practical significance for working out conservation measures for the extremely valuable genetic found of wetland biota.

By applying an ecological approach to the monitoring of wetlands, we mean that first of all they are considered as waterbird habitats. The following statements illustrate this approach.

1. Each of a number of waterbird species inhabiting a wetland is in its own way involved in the substance and energy rotation and keeps its numbers at a certain level either the whole year round or during the migration, moulting or wintering periods.
2. Each of the waterbird species is closely related to either certain plant species, which form its breeding or protective habitats, or to plants and animals which form its diet.

Therefore, each of the plant or animal species occurring in a wetland, directly or indirectly supports waterbirds. This leads to the necessity of long-term biota monitoring.

The project envisages setting up a long-term monitoring programme for waterbirds as the key group of biota.

Monitoring is usually based on a seasonal approach. Periods of spring and autumn migration are included in the phase of seasonal migrations. Breeding periods and post-breeding movements are united into the breeding phase. Wintertime movements are considered as the wintering phase.

Although the material collected earlier allows for some summarising analyses to be made and for the preparation of recommendations for biodiversity conservation, it is obviously not enough to predict the changes in numbers and to control the reproduction success of many mass waterbird species. This includes in particular species such as ichtiophagous, game and others of economical importance. It is necessary to create a network of monitoring posts to cover the largest breeding colonies. Some colonies situated in otherwise inaccessible reed bed areas can be counted only by aeroplane. The monitoring posts could become the target points for further monitoring of other biota components.

Only fragmental and incomplete information is currently available on most of the waterbirds of the region. The collection of this information is especially important as a national and international research priority, since the Ukraine is situated on the main European and Asian waterbird flyway routes, which must be protected according to the Bonn and Bern Conventions. On the one hand, the Ukraine has to be involved in the preparation of a wetland directory of all areas important for migratory waterbirds. Such information is necessary to encourage conservation of these species. On the other hand, it is much easier to estimate the final productivity of populations and their numbers on the migration routes than in the breeding areas. Waterbird numbers throughout the year are poorly studied, which gives no opportunity for up-to-date nature management. The answers to such questions as, «How quickly does the waterbird population change?» or «Which population does this flock belong to?» are to be searched for.

The programme proposed has been developed in accordance with the Ramsar Strategic Plan for 1997–2002, the Black Sea Action Plan and the description of Wetlands International's project: «Support for the Conservation of Wetlands and Wetland Species in the Azov-Black Sea Region».

Implementation of the programme would contribute greatly to the Ukraine's commitment to the Ramsar Convention and encourage its participation in the Bonn Convention and the African-Eurasian Waterbird Agreement.

The main counterpart of the Azov-Black Sea Ornithological Station is the Ministry for Environmental Protection and Nuclear Safety. The Kiev Office of Wetlands International co-ordinates research activities.

Wetlands situated along the Azov-Black Sea coast that are of national and international importance for the conservation of breeding, migratory and wintering birds are within the scope of the proposed studies. The Sivash area will play a key role along with other wetlands of the region.

Setting up ornithological monitoring in the internationally and nationally important wetlands will contribute to the Conservation of Biodiversity and Management of the Environment in the Azov-Black Sea Ecological Corridor Project of the World Bank and the UN, which is currently being prepared.

A considerable part of the programme consists of the previously published chapters of the Wetland Biodiversity Monitoring and Support in Ukraine Scientific Research Programme (Melitopol: Branta, 1995). The proposed programme has already been discussed with experts from the various institutions of the region:

- Ivan Rusev (Nature Heritage Fund)
- Anatoliy Korzukov and Vladimir Stoilovski (Odessa University)
- Sergei Kostin (Nikitski Botanical Garden)
- Genadiy Molodan (Donetsk Board of the Ministry for Environmental Protection and Nuclear Safety)

All the above mentioned persons are sincerely thanked for their valuable comments on the draft version of the programme.

Chapter 1. The Working Concept of Longterm Monitoring

The term «monitoring» had been introduced by the articles of Y.A.Israel (1974, 1977) and became frequently used in scientific literature thereafter. Y. Israel defined monitoring as, «A system of constant or periodic observations on different elements of the environment in space and time undertaken to achieve certain special goals according to a previously prepared observation programme.» The latter is very important, since it makes a distinction between a simple observation and the monitoring itself, which always requires a certain algorithm of actions.

The term has most frequently been used in relation to the biosphere as a whole. It means the observation of factors affecting the environment and the control of environmental variables. The two main components of monitoring were the description of the state of the environment and the prediction of its changes.

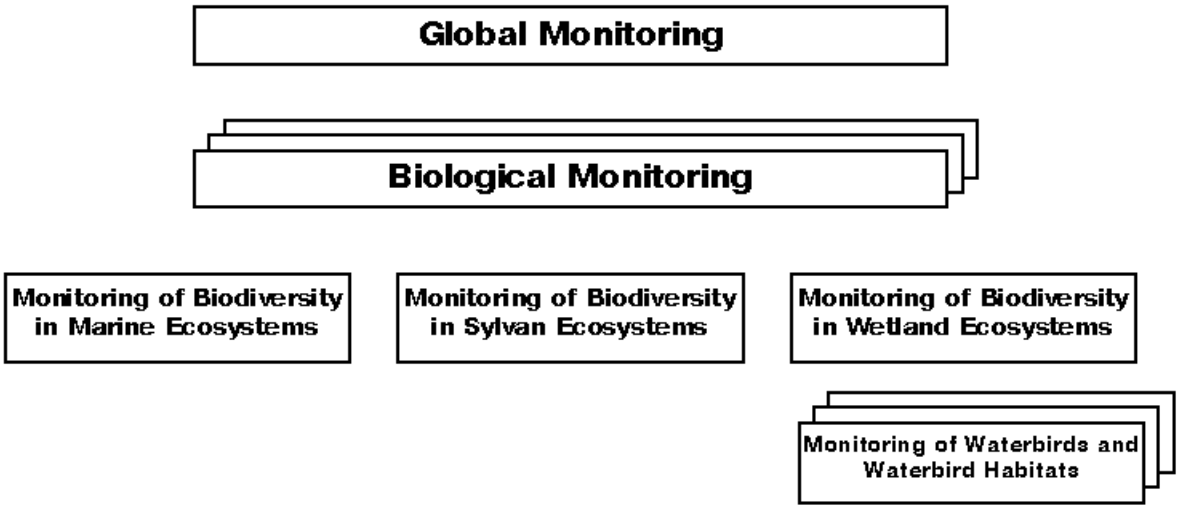
Biosphere monitoring was later divided into its constituent parts. The local, regional and global types of monitoring are usually singled out by the scope of the territory involved (Reimers, 1988, 1990).

Biological monitoring is an important part of territorial monitoring. It can be performed at the level of an organism (genetic, physiological and other types of monitoring), as well as at the population and ecosystem levels (ecological monitoring).

A hierarchic scheme of different types of monitoring and the place of this programme in it are shown below.

Taking into account the extreme diversity of organisms, which is a difficult factor to control, we would single out the following three types of biological monitoring.

1. ***Research monitoring*** is applied when searching for presentable variables to characterise the ecology or biology of certain species or communities. Such variables are further recommended for use when carrying out more intensive monitoring. A significant number of unstable variables are analysed in the search for representatives, which is a characteristic feature of research monitoring.
2. ***Special monitoring.*** This is a field of specially orientated monitoring having a certain algorithm of research. The long-term specific correlations at individual or population level are within the scope of this type of monitoring. As a result, some temporary relative constants have been determined. These will remain in use until a new special study of this kind is undertaken and so forth. Studies of the calcination rate in fish skeletons, the calorie contents of amphibian larvae, the correlation between body size and heat, and organic or metabolic production etc. are typical examples of such monitoring. The constants found in the course of the special monitoring



are in use for as long as they are suitable until a new revision is necessary.

3. ***Stable or namely monitoring***. The basis for this type of monitoring is an unchangeable set of monitoring variables characterising an organism or its habitats. Any changes or improvements of the monitoring scheme are allowed only if the new set of monitoring variables remains comparable to the old scheme or can be empirically or mathematically recalculated to ensure this. This and further types of monitoring are not limited in time, what is principle for the idea of monitoring.

Some parts of the stable monitoring scheme, united by mathematical, ecological and other models, are included as constituent elements into the local, regional or global monitoring. These types of monitoring should be considered as a reactive link necessary for sustainable development and environmental management in the system society-nature.

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Chapter 2. The Monitoring Programme

2.1. Monitoring of Breeding Waterbirds

Peculiarities of the programme implementation

Taking into consideration the significance of the wetlands and adjacent territories situated along the Azov-Black Sea coast for breeding waterbirds, one may state the following:

- the number of waterbirds in relation to the wetland habitats is rather large and makes up 10-20% of the total numbers in the Mediterranean wetlands;
- there are common trends in the dynamics of the waterbird numbers; due to the annual and seasonal redistribution of the birds, wetlands are united into a system of related waterbodies;
- the sufficient capacity of breeding habitats is characterised by a number of alternative breeding sites that accounts for rather insignificant fluctuations of numbers, although in some parts of the region they can be fairly noticeable;
- a significant concentration of scientists and the high level of the research organisation, especially concerning colonial waterbirds, allows for the development of complex approaches to wetland management and conservation;
- taking into account the predominant landscape and habitat characteristics of the wetlands, it is possible to distinguish the identical complexes of breeding waterbirds and to observe simultaneous changes in their numbers and species composition to find out which relations they have.
- the breeding complexes have a particular faunal and resource significance, since they are the best reflection of habitat diversity;
- the great numbers of breeding birds, their intensive foraging activity and distant feeding migrations characterise them as an important component of coastal biota.

State of knowledge

There is only fragmental data concerning the changes of numbers and distribution of waterbirds at the end of XIX — beginning of XX century. Only a few species are mentioned in the overviews concerning breeding waterbirds of the northern Azov Sea coast (Riniery, 1888, 1892; Nikolaev, 1891; Egorov, 1892, 1998; Brauner, 1894, 1899). More complete data for some parts of the area was collected only in the course of later studies (Alferaki, 1910; Borovikov, 1907; Molchanov, 1906; Pachosski, 1911; Val'kh, 1910, 1911; Brudin, 1925; Kostuchenko, 1925, Portenko, 1925; Vorontzov, 1937 and others).

With the exception of the publications of M.A.Voinstvenski (1953, 1960), L.A.Smogorzhevski (1959), A.B.Kistiakovski (1957) and the Nature Chronicles of the Azov-Sivash and other reserves, data on the subject during the period from the 30's to the 60's is scarce.

Only in the last 2 or 3 decades have a lot of publications and monographs been produced on the birds of the Azov-Black Sea coast. Particularly active studies were undertaken by the staff of the Danube and Black Sea Biosphere Reserves and the «Lebiazhi Islands» Nature Reserve as well as by scientists from the universities in Donetsk, Odessa, Dnepropetrovsk and Melitopol Teacher's Training College. In the 1980's, the Azov-Black Sea Ornithological Station began regular investigations of the breeding colonies.

At the present time the state of the breeding colonies on the Azov-Black Sea coast is relatively well studied. Proper co-ordination of research activities has allowed for complete data to be collected for most waterbird species. Some monitoring sites have been controlled for 30 years already.

The results of more than 350 waterbird studies have been published during this time. Since we cannot possibly quote all of them here we are mentioning only those which are the most important from our point of view. (Ardamatskaia, 1969, 1973, 1984; Ardamatskaia, Semionov, 1977; Bulachov, Miasoedova, 1975; Korzukov, 1981; Kostin, 1961; 1975, 1983; Molodan, Sirenko, 1981; Nazarenko L., Nazarenko M., et al 1975; Petrovich, 1981; Siokhin, 1981; Siokhin, Chernichko, Ardamatskaia et al, 1988; Chernichko, Stoilovski, 1981; Chernichko, Siokhin et al, 1993; Schegolev, 1977).

The waterbodies of the Azov-Black Sea coast of the Ukraine are characterised by a high biological productivity at all levels. The convenient geographical position, mild climate, a dense network of inter-zone landscapes, numerous shallow bays and lagoons with a highly indented coast-line, wide sandy beaches and other accumulative for-

mations together with rich feeding resources, make the area attractive for a lot of waterbird species. These species concentrate here in huge breeding colonies.

Up to 55 waterbird species breed in the Azov-Black Sea coastal wetlands. During the last 5 years their total number has fluctuated to within 175,000-324,000 breeding pairs. The colonies are found in 50 wetlands of the northern coast of the Azov Sea, Sivash and Black Sea. Nineteen of the wetlands already have the status of internationally important sites.

The main breeding habitats of the waterbirds are islands of accumulative and mainland origin with short herbaceous vegetation, shallow bays covered with reed-beds and indented by numerous straits and areas of open water, coastal sites and spits. Up to 80% of the total breeding numbers are concentrated in these habitats.

All known waterbird colonies are united territorially into 8 groups (Table 1). The taxonomic groups of waterbirds follow in the diminishing order of their numbers in this way: Charadriiformes, Pelicaniiformes, Ciconiiformes, Gruiformes, Anseriformes, and Podicipediformes. Numbers of other species are considerably lower. A complete census in 1993 showed that the Sivash wetlands (36,181 breeding pairs) and the northern Azov coast wetlands (51,000 breeding pairs) were characterised by the highest numbers. In the Yagorlytski and Tendrovski bays of the Black Sea 27,984 breeding pairs were counted. In other wetlands the numbers fluctuate between 3,217 and 18,571 breeding pairs.

Each of the 8 sub-areas has a different significance for the breeding waterbird populations, although most of the birds are concentrated in the largest colonies. There is a clear annual correlation between the area available for breeding and breeding numbers. Besides this, there are such factors as the feeding capacity of adjacent habitats and the degree of disturbance, which are not discussed in this chapter. In summary, the waterbird colonies in the Sivash are the main strongholds of the South Ukrainian populations of 4 species of grebes, ma-king a total of 844 breeding pairs (56% of the total number in the region), 3 species of birds of prey (70 pairs — 35.8% of the total number), 10 species of herons, ibises and spoonbills (3,475 breeding pairs — 18.7% of the total number), and 2 species of cormorants (4,965 breeding pairs — 20.3% of the total number). A lot of waterbirds breed on the northern coast of the Azov Sea: Cormorant (8,848 breeding pairs — 36.1%), birds of prey (84 pairs — 43%); gulls, terns and pratincoles (39,578 pairs — 32.1%). The lower reaches of the Danube river are characterised by high numbers of Ciconiiformes — 6,252 pairs (41%) and Gruiformes 2,600 pairs (39.9%). The other sub-areas of the Azov-Black Sea coast are less important in this way in comparison with the total number of waterbirds (Table 1).

It is usually possible to point out two or three sub-areas where certain species are mostly concentrated. Thus, the Danube delta, lower reaches of Dniester river and the Sivash are the main strongholds of Gruiformes waterbirds (5,628 pairs — 86.3%). The most important colonies of Charadriiformes are found in the Yagorlytski and Tendrovski bays and the Sivash and Azov Sea coast (89,786 pairs — 72.8%). 4,150 pairs of Anseriformes were counted in the region, but the majority of them (3,425 pairs — 82.5%) bred mostly in the Danube delta, the lower reaches of the Dniester river, the Yagorlytski and Tendrovski bays and the Sivash. A lot of grebes are concentrated in the Sivash and in the coastal waterbodies of the Azov Sea (1,149 pairs — 76.2%). In contrast to the previous taxonomic groups, Pelicaniformes populate these 7 or 8 wetland complexes relatively continuously.

Within the boundaries of the 8 wetland groups, the numbers of different taxonomic groups vary. In the Yagorlytski and Tendrovski bays, Charadriiformes make up 25,691 pairs out of the total waterbird number, estimated at 27,984 breeding pairs. Charadriiformes predominate in the Karkinitski Bay, Sivash and on the Azov Sea coast. At the same time the differences in waterbird numbers are not that significant in the Danube delta and lower reaches of the Dniester river. This is explained by the differences there in habitat composition.

Charadriiformes predominate in the areas where islands are present in significant numbers. Marshes and reed beds are more or less monotonously populated by their typical inhabitants and do not differ that much. There are 84 waterbird colonies that have existed for a long time. Most of them (44) are situated on the Black Sea coast, 26 are in the Sivash area and 14 are distributed along the coast of the Sea of Azov. Long-term monitoring studies have been conducted in 15 wetlands, where the waterbird colonies are

Table 1.
Breeding numbers of the main systematic groups of birds in 1993

Systematic groups	Wetland groups								
	Danube delta and adjacent lakes			Tuzlovskaia group of limans			Lower reaches of the Dniester and water bodies between Dniester and Bug rivers		
	Numbers (pairs)	Share in % (*)	Number of species counted						
	1	2	3	1	2	3	1	2	3
Podicipediformes							195	11.9	2
Pelecaniformes	4085	17.0	3				2570	10.5	2
Ciconiiformes	2145	14.0	8				6252	41.0	8
Anseriformes	686	16.5	4				834	20.1	5
Falconiformes							3	1.6	1
Gruiformes	1500	23.0	1				2600	39.9	1
Charadriiformes	7001	5.7	10	3217	2.6	11	6446	5.1	15
Total	**15417**		**26**	**3217**		**11**	**18900**		**34**
Share in % (**)		***8.8***			***1.8***			***10.8***	

Continuation of the Table 1.

Systematic groups	Wetland groups								
	Wetlands of Dnieper and Bug, Yagorlytski and Tendrovski bays			Dzharylgachski and Karkinitski bays, Central coast of Crimea			Tarkhankut, Central and Southern coast of Crimea		
	1	2	3	1	2	3	1	2	3
Podicipediformes				28	1.8	1	153	10.1	2
Pelecaniformes	1165	4.7	1	2440	9.9	2	369	1.5	2
Ciconiiformes				2146	14.5	10	23	0.1	2
Anseriformes	1128	27.2	5	316	7.6	7	88	2.1	6
Falconiformes							33	16.9	3
Gruiformes				113	1.7	4	101	1.6	6
Charadriiformes	25691	20.8	14	13528	11.0	15	3435	2.8	16
Total	**27984**		**20**	**18571**		**39**	**4202**		**37**
Share in % (**)		**15.9**			**10.6**			**2.4**	

End of the Table 1.

Systematic groups	Wetland groups						**Totals for each of the systematic group**
	Prisivashie, Western, Central and Eastern Sivash			Utlukski and Molochni limans, bays and spits of the northern coast of the Azov Sea			
	1	2	3	1	2	3	
Podicipediformes	844	56	4	305	20.2	3	**1525**
Pelecaniformes	4965	20.3	2	8848	36.1	1	**24442**
Ciconiiformes	3475	22.8	10	1189	7.6	6	**15230**
Anseriformes	777	18.7	10	321	7.8	8	**4150**
Falconiformes	75	38.5	3	84	43	2	**195**
Gruiformes	1528	23.4	6	675	10.4	5	**6517**
Charadriiformes	24517	19.9	17	39578	32.1	16	**123413**
Total	**36181**		**52**	**51000**		**41**	**175472**
Share in % (**)		**20.6**			**29.1**		

Footnotes:
(*) — share of the systematic group in the wetland group out of the total number of the systematic group in the region;
(**) — share of bird numbers in the wetland group out of the total number of all birds in the region.

found. The total number of waterbirds in these target wetlands is estimated to make up 90% of the total number of waterbirds surveyed in the region in 1993.

The waterbird number dynamics is subject to annual fluctuations, that notably changes the significance of each of the wetlands from year to year.

Scientific objectives

Keeping to the main principles of ornithological monitoring (Svensson, 1979) one can single out 5 major objectives of the study. They include an estimation of:

- habitat transformation;
- number fluctuations;
- changes in biomass and productivity;
- changes in geographical distribution;
- changes in bird communities.

In this case, ornithological monitoring is targeting several goals (Priediekes, Kuresoo, Kurlavichus, 1986). It is firstly aiming at the conservation of species diversity, since populations and communities are themselves important as a gene fund and are a constituent part of ecosystems. Secondly, the changes of the populations and communities are indicators of some processes within ecosystems. It is not only with regards to aquatic, but also to terrestrial ecosystems that should not be underestimated since numerous waterbirds are an active link in both.

According to the general principles adopted in the programme, we singled out herein 3 levels of monitoring studies: qualitative, static (the 1st), quantitative, dynamic (the 2nd), ecosystem, biocoenological (the 3rd). It is impossible to conduct more advanced monitoring and to skip previous levels. According to this the 3rd level should include the 1st and the 2nd levels. For this reason high level monitoring is recommended for just a limited number of wetlands.

Taking into consideration the objectives of the studies, which will be fully described further in this chapter, we propose to carry out the research in four directions. The first three of them are separate, but related, study topics which can be implemented by ornithologists without the help of other specialists.

1. The species structure and diversity of waterbird communities. Multifactor characteristics of the colonies and breeding conditions. Numbers and ratio of the predominating waterbird groups and species.
2. Spatial characteristics of the most typical breeding colonies. Vertical and horizontal structure. Territorial relations in waterbird communities.
3. Number dynamics of the predominant species in the colonies and within the sub areas. Factors determining the dynamics and stability of waterbird communities.
4. Trophic relations in waterbird communities. Spatial and functional peculiarities of foraging, species and inter-species trophic relations.

The first level

1. Characteristics and specifications of the breeding species composition.

1.1. Making lists of species for:
- the ecological groups of waterbirds;
- the main breeding habitat types;
- the separate wetlands.

2. Landscape and habitat characteristics of breeding sites.

2.1. Cartographic characteristics of habitat diversity (by means of visual mapping).

2.2. Determining the areas actually used by waterbirds and potential breeding sites.

2.3. Compiling species lists of predominant vegetation at the breeding sites (by means of mapping the vegetation cover).

2.4. Landscape and habitat classification of the breeding sites.

3. Numbers and distribution of breeding waterbirds.

3.1. Classification of waterbird settlements (territorial or colonial types)

3.2. Cartographic characteristics of the breeding waterbird community location (visual mapping).

3.3. Counting the absolute numbers of breeding waterbirds in localised waterbird communities within the area of a wetland and monitoring sites. The dispersal of distributed waterbirds is to be counted according to the three gradations: high numbers, common, rare.

The second level

1. Spatial distribution and habitat dynamics.

1.1. Natural development of habitats and microhabitats as dynamic fluctuations of the environment.

1.2. Multifactor ecological characteristics of the main breeding habitats:
- predominant plant communities;
- the degree of mosaic pattern of vegetation cover;
- species abundance and predominant plant species;
- the vegetation cover and height;
- influence of biotic and abiotic factors on the habitats.

1.3. Seasonal changes in the structure and state of the dominating plant associations in the main breeding habitats.

1.4. Annual dynamics of the breeding habitats:
- configuration;
- areas;
- the direction of successions for the predominant plant associations;
- the degree of drainage or irrigation;
- the degree of erosion and indentation of the coastline.

2. Waterbird number dynamics and factors affecting it.

2.1. Seasonal dynamics of numbers:
- number and duration of existence of the waterbird concentrations in the pre-breeding period;
- ratio of the different age groups in pre-breeding concentrations;
- influence of weather on the numbers and distribution of pre-breeding concentrations;
- terms of arrival and numbers of birds on the potential breeding areas;
- numbers of breeding waterbirds in the communities they form;
- number of non-breeders in the breeding colonies;
- number of chicks and the dynamics of hatching;
- reproduction success in relation to the breeding density, colony type, community structure, abiotic factors, diversity and intensity of biotic factors;
- nesting and brooding success;
- study of the possible causes of mortality including epidemics, weather, predation, human influence etc;
- the dynamics and co-influence of different factors.

2.2. Annual dynamics of waterbird numbers.
- Annual monitoring of breeding colonies:

(a) Size of the breeding population and its age composition;
(b) Number of adult non-breeders and number of summering first-year birds;
(c) Level of the habitat stability and «quality»;
(d) Plant successions and changes of landscape and habitat characteristics at the breeding sites;
(e) Number fluctuations in relation to the habitat dynamics.

3. Changes in the structure of waterbird communities.

3.1. Dynamics of species diversity in the breeding waterbird communities;

3.2. Changes in spatial organisation of the colonies (during the breeding period and annually);

The third level

1. Characteristics of waterbirds as structural and functional components of coastal and aquatic ecosystems:

1.1. Study of relations in the vegetation-waterbird system includes the following characteristics:
- influence of vegetation on the breeding characteristics and spatial structure of the colonies;
- plants as nest-building material;
- plants as components of diet.

1.2. Study of waterbird relations with other animals in the ecosystem:
- animals as diet components;
- success of reproduction and breeding characteristics in relation to predation pressure;
- relations between waterbirds and other animals having common feeding areas or similar diets;

1.3. Study of the effect of waterbirds on ecosystem components and determination of their role in the:
- circulation of helminths;
- transfer and support of ectoparasite numbers;
- transfer of causative agents of arboviruses, formation of natural infection hot-beds and maintenance of the epidemical potential of an area;
- influence on the species composition, structure and development of vegetation;
- redistribution of plant remains, mainly as nest-building material;
- influence on the abundance of feeding animals in ecosystems throughout the food chains.

2. Role of waterbirds in substance and energy accumulation and transformation.

2.1. The study of waterbird productivity and estimation of their biomass in breeding areas includes the following main issues:
- estimation of waterbird biomass during the breeding period (pre-breeding biomass, biomass during the fledgling period);
- annual waterbird biomass dynamics at the monitoring sites;
- biomass dynamics due to self-reproduction in different wetlands and in the whole region;
- ratio of breeding waterbird biomass in relation to the biomass of the ecosystem dominants and co-relations between them;
- complex influence of biotic and human factors on the biomass of breeding waterbird communities;
- bioenergetic estimations of waterbird biomass.

2.2. Study of time and energy budgets of waterbirds:
- study of daily time/energy budgets in the different stages of reproduction;
- the total expenditure of time and energy during the whole breeding period;
- identification of calorie contents and assimilation coefficients of the main diet components.

2.3. Substance and energy rotation in the food chains which are participated in by waterbirds.
- Participation of waterbirds in the transfer of organic substances through the food chains from terrestrial into aquatic ecosystems;
- estimation of the influence of waterbirds on the different trophic levels in the ecosystems;
- influence of excretory activity and organic remains on the formation of primary production in the terrestrial, and, on the transformation stages, in the aquatic ecosystems.

3. Role of dominants in the waterbird communities.

3.1. Influence on species composition and numbers of the colonies;

3.2. Changes in the spatial structure of the colonies.

3.3. Influence of predatory behaviour and ecological peculiarities of the dominants on the reproduction success of the species breeding together with them.

3.4. Changes of habitat characteristics of the breeding areas.

3.5. Influence on the food availability for some waterbirds breeding together with them and having similar food spectrums.

Methodological approaches to the research

The methods for elaborating the above listed tasks have already been developed and used in ornithological research world-wide. Nevertheless, a set of questions considered on the 3rd level of the monitoring study reaches beyond their scope.

In the methodological part of the programme below, only the most important methods of ornithological investigations are discussed whereas information on the others is available from existing bibliographical sources.

Individual marking. Adult birds are usually marked with metal rings and colour plastic rings or wing-marks and by painting some areas of the body. Such marking always requires that these birds be caught. For territorially breeding species these catching methods are relatively safe, whereas the catching of colonial species can only be recommended in some exclusive cases. For marking birds without catching we used egg-shaped pieces of porolon moistened with a dye. Such an «egg» was placed into the nest. Usually, we used picric acid as the dye. Complete painting of the plumage, as well as its large parts, is not allowed either for adult or for juvenile birds. Enamel paint and lumocolour markers are used for marking the eggs in the clutch.

Mapping of colonies and breeding territories. When preliminarily mapping, the areas with nests, predominant plant associations, configurations of the individual territories and islands are indicated on a sketch map.

Later on, when carrying out further monitoring investigations, those areas with colonies and single pairs are specified and all the field reference points are indicated. This would allow for the dynamics of earlier mentioned areas to be monitored.

Estimating of some demographic parameters. Fertility and mortality are characterised by the average clutch size (only complete clutches are taken into account), the number of successful reproduction attempts during one season, hatching and brooding success and adult mortality (Paevski, 1977). The mathematical methods for calculating these indices can also be found in this publication.

Estimating biomass and productivity. The biomass calculations are based on the ratio of

different age groups in the population and average estimates of body mass (Ezerkas, Pinovski, 1973; Ezerkas, 1977). The most variable are eggs and chicks, therefore the clutches should be weighed at least 4–5 (passerines) or 2–3 (colonial waterbirds) times during the incubation period. Weighing of chicks should be done 2–5 times during the post-hatching period depending on the availability of the material. The weighing of newly hatched chicks and fledglings is obligatory.

Time and energy budgeting methods. These methods are well represented in a lot of publications (Blumental, Dolnik, 1962; Vtorov, 1965; Dolnik, 1982).

Role of waterbirds in the terrestrial and aquatic ecosystems. The most complete summaries of the methods used were prepared by V.S.Shishkin (1982) and A.N.Golovkin (1982). Some important questions are considered in the «Programme and Methodology of Biocoenosis Studies» (1974).

Some methodological peculiarities of the studies. It should be taken into account that the disturbance of breeding birds has to be minimised following the recommendations below:

- observations on the breeding birds are to be done only from a hide;
- the presence of an observer in the colonies is allowed for no more than 25–30 minutes a day (if an absolute census of the breeding birds is carried out and the researchers are constantly moving through the colony, this time can be increased to 40–60 minutes);
- marking of the nests on the substrate is allowed only using wooden sticks, which should be disposed of after the study period is over (no bright colours for the nest marks are acceptable, since it makes them attractive for predators);
- when setting up a hide for the nest observations, the best idea is to come with 1 or 2 more people, who leave the observer inside the hide and depart from the area. In this case the birds are completely indifferent towards the hide.

Terms and periods of study. When determining the terms and periods of study, first of all we would like to ensure the collection of the maximum amount of complete information on the subject. However, the terms and amount of information collected is determined depending on the tasks, the qualifications of the researchers and the working time available. The fieldwork plan should meet the following three conditions:

- colonies are to be visited during the periods when the birds are the least vulnerable to disturbance;
- the time of the visit should be planned taking into account the weather conditions to minimise the consequences of disturbance;
- the duration of the visit should not be longer than the above mentioned maximum to prevent prolonged disturbance.

Thus, the first visit to the colonies has to take place from 24.04 to 15.05, whereas the second period starts from 25.05 and has to be over by 20.06. Such terms of the field investigations will be the best representative for both the early and late breeding waterbirds.

List of monitoring parameters

The parameters are divided into 2 groups (the following abbreviations are used in the list: B — breeding species; M — migratory species; m — minimum parameters, a — additional parameters).

The minimum parameters ensure quite a high level of the monitoring research and allow for the collection of comparative material for different target waterbodies. They correspond to the three main objectives of the studies:

- landscape and habitat characteristics of the areas inhabited by waterbirds;
- estimations of waterbird numbers;
- characteristics of waterbird breeding distribution.

To collect the information for all three levels of monitoring research we propose some additional parameters. Since the investigation of parasites and viruses, bioenergetic characteristics and time and energy budgets require special training, we do not give the list of parameters for these sections of the programme. Description of the methodological approaches can be found in the special literature dedicated to these questions. The parameters for geobotanic investigations do not require special training and these kinds of activities can easily be performed by ornithologists. Nevertheless, in an ideal situation complex research would be necessary.

Minimum parameters

Bm1. Time and observation date.
Bm2. Cloud cover.

Bm3. Wind direction and speed.
Bm4. Precipitation.
Bm5. Results of the wind caused fluctuations of water level.
Bm6. Species.
Bm7. Age of breeding birds.
Bm8. Number of breeding birds.
Bm9. Number of non-breeders:
- adult;
- immature.

Bm10. Number of nests (clutches).
Bm11. Date of nest building.
Bm12. Start of egg-laying
Bm13. Clutch-size
Bm14. Hatching date/s.
Bm15. Number of lost nests.
Bm16. Number of lost chicks.
Bm17. Number of adults gone.
Bm18. Area of the breeding territory or colony.
Bm19. List of the landscape and habitat elements at the breeding sites.
Bm20. List of plants predominating at the breeding sites.

Additional parameters

Ba1. Number of birds in pre-breeding concentrations.
Ba2. Location of pre-breeding concentrations.
Ba3. Number of replacement clutches.
Ba4. Number of chicks in the nests.

Table 2.
List of the most important wetlands and significance of the main habitat groups for breeding waterbirds

№	Wetlands	Groups of habitats			
		Islands and spits of accumulative origin	Reed beds, marshes and floodlands	Saltmarshes in the depressions	Rocky precipices
1	Zhebrianovskie plavni				
2	Kagul lake				
3	Kugurlui lake				
4	Kartal lake				
5	Yalpug lake				
6	Kitai lake				
7	The branch of the Danube river near Kilia				
8	Dzhantasheiskoe lake				
9	A system of lakes Shagany-Alibei-Burnas				
10	Sasyk lake				
11	Mezhdurechenskie plavni (Dniester-Turunchak)				
12	The northern part of Dniester liman				
13	Khadzhibeiski liman				
14	Kuialnitski liman				
15	Tiligulski liman				
16	Plavni of the Yuzhni Bug river				
17	Yagorlytski bay				
18	Tendrovski bay				
19	Dnieper delta				
20	Karkinitski and Dzharylgachski bays				
21	Western Sivash				
22	Central Sivash				
23	Eastern Sivash				
24	Wetlands of Tarkhankut				
25	Karadagski bay				
26	Akmanaiskoe lake				
27	Waterbody «Frontovoe»				
28	Achi lake				
29	Coast near Opuk mountain				
30	Molochni liman				
31	Obitochnaia spit and bay				
32	Berdianskaia spit and bay				
33	Belosaraiskaia spit and bay				
34	Krivaia spit and bay				

The shading/tone of the cells indicates the occurrence of the habitats. The darkest tone shows the main habitat types found in the wetland.

Ba5. Weight of the chicks in the first and last stages of development.
Ba6. Number of fledglings.
Ba7. Distances between the centres of the nests in a colony.
Ba8. Number of conspicuous and mixed colonies.
Ba9. Number and dimensions of the islands and spits suitable for breeding.
Ba10. Dimensions and area of vertical precipices used as breeding sites.
Ba11. Areas of the predominant plant associations within breeding habitats.
Ba12. Vegetation cover and height from the beginning of nest-building to the end of reproduction
Ba13. Nest lining contents (species and amounts).
Ba14. Geobotanic description at the monitoring sites.
Ba15. Species and amounts of food components collected near to the nests.
Ba16. Number of pellets produced daily.
Ba17. Frequency of bringing food to the chicks by the adults.
Ba18. Frequency of foraging and its duration.
Ba19. Number of birds found in the feeding areas.
Ba20. Distance to the main feeding areas.

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2.2. Monitoring of waterbird seasonal distribution and migrations

Goals and Peculiarities of the programme implementation

There are three peculiarities of monitoring the waterbird seasonal distribution and migrations, which are determined by the hugeness of the South Ukrainian wetland system.

Due the high wetland diversity (see the methodological appendix of the programme) there are significant differences in the knowledge of the seasonal dynamics and distribution of waterbirds between the wetlands. Therefore, a proportional number of various wetlands should be included into the monitoring scheme. Otherwise, any forecasts or extrapolations of the numbers will be insignificant.

Another difficulty appears due to the duration of the migration period in the South of the Ukraine, which lasts for more than 10 months. Taking into account the significance of this area for understanding the Afro-Euro-Asian Flyway structure and its conservation value, the monitoring scheme should be working during all periods of the seasonal migrations. In future, when preparing special projects in the framework of the programme, the compilers should pay attention to the above said condition, since the work can be financially limited to a sub-region or a wetland type. Nevertheless, the migration process has to be controlled completely even within a limited control area.

The two above-mentioned peculiarities make the study of waterbird migration rather laborious. The inclusion of instrumental methods of migration observations is needed in some cases. Moreover, monitoring of migration requires a guarantee of the same professional level of the researchers being maintained during the whole study period of a project. The creation of a network of monitoring sites and their regular control, which would require motor, boat and in some cases aerial transport, is necessary for successful implementation of this part of the programme. Employment of specialists was always the most costly part of such research, therefore implementation of this part of the programme will, in any case, be expensive.

It is difficult to list all the objectives of the waterbird migration monitoring scheme. They are fully considered in the section of the programme below. Here we would like to point out the most important ones.

- Monitoring of the economically important and rare waterbird populations.
- Monitoring of a wetland state using the indicator qualities of the most waterbirds.
- Inventory of the moulting, resting, and feeding sites used by some populations that would allow the singling out of zones of the flyway corridor in the area.
- Specification of the flyway routes and monitoring of their species, spatial and temporal structure.

State of knowledge

The study of seasonal concentrations in the waterbodies of Ukraine was initiated 150 years ago by the Professor of the Kiev University Kesler (1852) and continued by Menzbir (1895). Then, attention was mainly paid to the general problems of migration studies and game waterfowl, especially waterbirds. Later on, other researchers (Sharleman, 1938; Kistiakovski, 1957) confirmed that birds flew over the Ukrainian territory not in a wide range, but following certain flyway routes, and apparently concentrated in the suitable wetlands. They found that the Azov-Black Sea (or Southern) flyway route was the most important.

Numerous publications on the matter show the interest of the researchers to the problem (Borovikov, 1907; Artobolevski, 1926; Voinstvenski, 1953, 1978; Orlov, 1956; Ardamatskaia, 1975, 1981, Lysenko, 1975; 1978 and many others). All of them can not be mentioned within the limits of the programme. These studies had completed the list of migratory species, and further efforts in the field did not bring about much more information.

The Dnieper river flyway route was found to be the second most important migration corridor. A lot of data on the migrations and migratory concentrations along its nowadays transformed riverbed has been collected since the first studies (Podushkin, 1912; Kistiakovski, 1957, 1965; Gubkin et al, 1978; Bulakhov, 1962, 1968; Klestov, 1991 and others).

The third most important flyway route (Pripolesski) goes through the North of the Ukraine and has links with the so called Mid-Danube Lowland, adjacent areas of Poland and Slovakia (Zhezherin, 1965; Gorban', 1981).

Most wetlands of the above listed areas of the Ukraine got into the scope of ornithological studies more frequently and were investigated better than the rest of the country. Further studies confirmed that other rivers are also important for migratory waterbirds, while the density of flyway routes has a rather complicated pattern on the map of the country. The picture appeared to be especially contradictory over the Crimean peninsula.

More than 300 bird species were recorded, with shorebirds, gulls, geese, some rails, and passerines being the most numerous. The species diversity of the main taxonomic groups is as follows.

Order	Number of species
Gaviiformes	3
Podicipediformes	5
Procellariiformes	2
Pelecaniformes	3
Ciconiiformes	14
Anseriformes	34
Birds of prey	29
Galliformes	1
Gruiformes	12
Charadriiformes	61
Columbiformes	3
Cuciliformes	1
Strigiformes	8
Caprimulgiformes	1
Apodiformes	2
Coraciiformes	4
Piciformes	3
Passeriformes	26

According to the preliminary estimations, the total number of waterbirds passing through the region fluctuates between 27 and 50 million individuals. When recalculated as total biomass, it can make thousands of tonnes, that apparently takes an extremely important part in the substance rotation and energy redistribution in the biosphere.

In the South of the Ukraine spring waterbird migration starts in the 3rd ten days of February and is scarcely over by the 3rd ten days of May, consisting of 3–4 well defined migration waves. From the 2nd or 3rd ten days of July waterbirds begin autumn migration already, which is carries on until the 1st ten days of December in warm years. There can be as many as 5–6 waves of autumn migration.

To stress the international importance of the area for waterbirds we can list the countries where the birds (mostly waterbirds) ringed by the Azov-Black Sea Ornithological Station were recovered. More than 1200 ringing recoveries made from: Norway. Sweden, Finland, Germany, Denmark, Netherlands, Belgium, England, France, Poland, Czech, Hungary, Austria, Romania, Bulgaria, Italy, Spain, Portugal, Greece, Turkey, Israel, Morocco, Tunisia, Egypt, Senegal, Nigeria, Somali, Chad, Ethiopia, RSA, Iran, United Arab Emirates, Malta and others show the geography of waterbird migrations. It is not only the geographical links that are important, but also the scale of the waterbird numbers involved in these movements. The numbers of shorebirds migrating through the region reaches several millions, and the wintering population of geese is estimated at the level of several hundred thousands. The migration and wintering area of the Red-breasted Goose, a globally endangered species, is completely within the limits of the region.

The area is also very important for the breeding of migratory populations in the northern regions of Europe and Asia. Trophic capacity of the wetlands in the region is several times as high as the wetlands in the arctic breeding areas. Therefore, they serve as a refuelling station for the migrants that have just landed after a flight over big water surfaces, or before the non-stop flight to the breeding grounds. Current state of knowledge on the stop-over site fidelity of waterbirds makes the study of each special wetland location especially real for waterbird conservation.

Every study of the seasonal distribution of waterbirds has a certain background. First of all the publications were dedicated to game (Avdeenko, Krainev, 1977) and numerous economically important waterbird species. No complete inventory of the waterbirds at special wetland locations was completed, since the process is very laborious. Moreover, no common programme was established. A few publications (Panchenko et al, 1984; Samchuk et al, 1986; Krivitski, Odukha, 1991 and others) on the waterbirds of the coastal waterbodies, could not fill the gaps in the information on the distribution and species composition of waterbirds in some wetlands.

The post war decades are characterised by the active transformation of landscapes by man. This was especially pronounced in the river catchments and other «wet» habitats. For instance, some marshes in Polesie (northern forests of the Ukraine) were drained while others were turned into fishponds. The water regimes of large rivers such as the Dnieper and Dniester became con-

trolled. As a result, huge areas of productive habitats with rich communities were flooded. Such transformation resulted in significant changes in the distribution of waterbirds and further loss of biota.

At the same time, man's economic activity negatively affected the gully aquatic systems, where ponds of various destinations were quickly created. Within critically short terms for adaptation to these changes many small rivers of the Ukraine were turned into canals. Thousands of waterbirds bred there or used them as stopover sites during migration. To produce commercial fish a lot of fishponds were established along the seacoast and in many river catchments. These factors strongly affected the numbers and distribution of the correspondent ecological groups of waterbirds.

The above listed factors seriously changed the structure of the natural communities, but so far they haven't been investigated. A special programme has to promote the organisation of research activities in the wetlands.

Taking into account the state of knowledge of the waterbird communities and the significance of some habitats, it would be expedient to single out basic or target wetlands where the monitoring has to be complete and annual. The list should include not only protected areas where such investigations are already being carried out, but also wetlands with unusual characteristics (dynamics of biological complexes and landscapes, anthropogenic influences) and poorly studied by ornithologists. The most important of them are shown in the figure at the end of the programme.

General scheme for description of waterbird seasonal distribution and migrations

Spring

(a) Dynamics of the arrival and migrations
- arrival of the first migrants (phenological observations);
- temporal changes of numbers and species composition;
- migration waves of the spring studied, species composition of the waves, predominating species and their numbers;
- migration dynamics and the arrival of local birds.

(b) Latest migrants (recording of passing flocks etc).

Summer

(a) Estimation of the labile reserves of the breeding populations and their location in the region;
(b) Formation of the post-breeding (summer, pre-migration, moult) concentrations: numbers and chronology. Sex and age composition of the target concentrations.

Autumn

(a) Migration of local waterbird species.
- chronology of the beginning and ending of migration for breeding species.

(b) Dynamics of the migrants' passage:
- temporal changes of numbers and species composition;
- migration waves of the autumn studied, species composition of the waves, predominating species and their numbers;
- Latest migrants (recording of the passing flocks).

Scientific objectives

The first level

1. The species composition within a wetland, to be compared to those known in the region.
2. Determination of the status of the species: partly resident, breeding and partly migratory, migratory, moulting, wintering, occasional vagrant.
3. Registration of the maximum species diversity, including the information on the Red Data Book species.
4. Study of links between some waterbodies and waterbirds, which use them for foraging and resting, moulting, watering or roosting to allow for lists of the species to be prepared.
5. Distribution of the waterbird concentrations within the wetland, with the stress on the use of habitats and landscape elements.

The second level

1. Study of the seasonal dynamics of waterbird numbers (biomass) in a wetland.
2. Study of the arrival phenology of the first individuals of a species.
3. Influence of the weather on the formation of concentrations.
4. Identification of the time the concentrations exist.
5. An analysis of the changes in the concentration size: enlargement due to concentrating,

involvement of the new migrating groups or families, redistribution due to environmental changes, departure of the groups.
6. Estimation of the age and sex composition of the flocks.
7. Estimation of the stability and trends in spatial distribution within a wetland.
8. Identification of the stopover site fidelity when choosing concentration places (according to the ringing data).
9. Study of the daily dynamics of waterbird migration at the special observation posts.
10. Estimation of the total numbers of the migratory populations using a wetland in spring and in autumn.
11. Population study of the migration for the target species using individual and group marking.

The third level

1. Registration of the predators and facts of predation either of individuals, or in the concentrations of waterbirds on the route along a wetland. Count of the waterbird remains at the foraging sites of predators.
2. Study of the diet for the predominant species. Estimation of the biomass consumed.
3. Study of the feeding behaviour and spatial distribution of the waterbirds in relation to feeding activity.
4. Estimating the feeding significance of the adjacent landscapes to wetlands. Compilation of a list of the habitat types including all habitats visited outside the wetland and estimation of their areas.
5. Study of the 24-hours activity patterns of flocks and single birds in different seasons. Factors influencing waterbird activity.
6. Study of tissue, egg and feather poisoning.
7. Registration of lethal cases in the water area and along the coast line.
8. Estimation of the extent of parasite transmission by waterbirds.

Methodological approaches to the research

To get relatively complete monitoring data, wetlands should be visited at least twice every ten days during the study period. Such a schedule would be optimal, if the methodological conditions are fulfilled in the field in the course of the study. As a minimum, it is suggested that at least one visit is paid to the study wetland every ten days provided that the latter has been relatively well studied in previous years. Two visits monthly are suggested, if the investigation of a wetland takes more than 3 days.

A description of the basic methods can be found in special publications, which are quite accessible for most specialists in the region. In the corresponding appendix we give only their brief modifications which will help researchers to work in a unified methodological basis. The database structures used by the Ornithological Station for 12 years of its existence can be found in the same appendix.

The population study of bird migration requires special instrumental methods. In the first stages of such projects it is reasonable to begin these kinds of activities with the assistance of the Azov-Black Sea Ornithological Station, which has all the necessary equipment and experience. In future many institutions will be able to do this, although special training is still needed before the projects commence.

List of monitoring parameters

Minimum parameters (M)

Mm1. Date
Mm2. Time
Mm3. Location code
Mm4. Habitat or habitat code
Mm5. Cloud cover (0–5)
* 0 — no clouds, 1 — some cumuli, 2 — a half of the sky is covered, 3 — less than half of the sky is clear, 4 — complete cumulus cloud cover, 5 — stratus cloud cover.

Mm6. Precipitation.
Mm7. Wind direction (8 directions: 1 — N, 8 — NW)
Mm8. Wind force (0–5 gradations)
* 0 — no wind, 1 — slight breeze up to 3 m/sec, 2 — slight wind up to 5 m/sec, 3 — medium wind up to 10 m/sec, 4 — strong wind up to 17 m/sec, 5 — storm up to 25 m/sec.

Mm9. Species
Mm10. Absolute number or density.
Mm11. Status
Mm12. Flight direction.
Mm13. Flight altitude.

Additional parameters (A)

Parameters which are not related to the catching of birds

Ma1. Sketch map of the habitats.
Ma2. Water level conditions.

Ma3. Sketch map of the feeding habitats around the wetland.
Ma4. Sketch map of the anthropogenic pressure on the wetland.
Ma5. Sex and/or age of the birds (mostly for ducks, swans, cranes, gulls, some birds of prey, waders etc.)
Ma6. Shape of the flock.
Ma7. Sketch map of the concentration location
Ma8. Registration of the dead birds
Ma9. Diet composition for some species (collecting the pellets etc.)

Parameters which are related to the catching of birds

Ma10. Age
Ma11. Plumage.
Ma12. Moult.
Ma13. Body mass.
Ma14. Wing length.
Ma15. Bill length.
Ma16. Indicator measurements for the correspondent systematic groups, given in the special catching and marking forms.

Parameters related to the estimations of trophic relations

Ma17. 24 hours' time-budget for target species.
Ma18. Estimation of the intake rates (%).
Ma19. Density of the benthos and/or plankton feeding items.
Ma20. Determination of the main feeding plants.
Ma21. Feeding flight distances.

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2.3. Monitoring of Wintering Waterbirds

Goals and peculiarities of the programme implementation

The absolute majority of both the previous and ongoing ornithological studies in the Ukraine are aimed at the reproductive period in the life of the birds. The richness and diversity of the avifauna over almost all the territory of the Ukraine can easily explain this, since it can satisfy the widest interests of numerous researchers.

In addition, wintertime aspects of bird ecology have enormous theoretical and practical importance. It is precisely this period when birds experience a sharp change in all ecological links and behaviour.

The study of wintering birds is directly related to the solution of such practical problems as the conservation of rare and disappearing species, appropriate use of waterfowl resources, the study of waterbirds as transfer agents of various diseases and the prevention of air-catastrophes caused by birds, etc.

The southern territories of the Ukraine, in particular the Azov-Black Sea coast, abound various wetlands serving as wintering grounds for many waterbirds.

A mild (although not continuous due to the hugeness of the area) climate, significant variations in salinity, and the discharge of municipal and technical waters into some wetlands favour the existence of large non-freezing water areas in winter.

In terms of agriculture, the climate of the Ukraine allows for the successful cultivation of many crops. Apart from cereals, gardens, vineyards and perennial grasses occupy large areas. All this, together with significant areas covered by natural forests and artificial arboreal plantations, promotes the creation of optimal, or almost optimal, wintering conditions for waterbirds.

Those wetlands attractive for people appear to be the areas that are frequently visited throughout the year. Since the density of the Ukrainian population is rather high, the waterbird communities are under noticeable direct and indirect anthropogenic pressure. With this background the birds show a lot of behavioural adaptations, there are constant redistribution and number fluctuations throughout the course of the wintering period.

There are many professional ornithologists and experienced amateurs to ensure the investigation of the wintering sites all over the region.

The major tasks are to organise these activities, namely:

- duties of the responsible persons and groups are to be distributed properly in order to cover all the areas investigated equally.
- surveys should be carried out in the previously agreed periods preferably simultaneously.
- all the participants should be supplied with the equipment and necessary materials (counting forms, methodological recommendations, maps of the areas etc.)

If enough funds are available, it is possible to involve the optimal number of project participants, use road and air-transport, office equipment and communication facilities. All this would ensure collecting, elaboration and analysis of the data and further application of the results.

State of knowledge

Study of waterbird wintering in the Ukraine has a long history. The first articles on the wintering waterbirds of the area appeared as early as the XIX century (Senitski, 1895). Despite the value they have for faunal studies, there were no specific goals and most data consists of either occasional observations or descriptions of some interesting facts.

In the 20's A.Kostuchenko (1926, 1928a,b, 1929a,b, c) published a series of articles dedicated to the birds of the Obitochnaia spit. Wintertime avifauna of the Crimean southern shore was described by S.K.Dal' (1929). Further information on the wintering waterfowl of the Ukraine may be found in V.G.Averin's article (1928). The wintering of waterbirds in the Yagorlytski and Tendrovski bays of the Black Sea were described by F.Kiseliov (1932).

An array of articles about the wintering of waterbirds in the Azov-Black Sea region was published in the 50's-60's (Berendeim, Perov, 1975; Fedorenko, 1959, 1965 and others)

In the mid 70's, the Department of Vertebrates (Institute of Zoology AS of USSR) initiated a spe-

cial systematic study of waterbird wintering as part of a migratory waterbird research programme.

B.V.Sabinevski was the main organiser of the wintering waterbird study in the Azov-Black Sea region. A lot of data on the location of wintering concentrations was collected under his supervision and with his personal participation. The most important wetlands were identified in the course of the study. For the first time, aerial counts were applied for investigating large wetland areas. The mid 1970's can indeed be considered as the beginning of wintering waterbird monitoring in the Azov-Black Sea region (Sabinevski, Sevastianov, 1975, 1977; Sabinevski, 1977; Sabinevski et al, 1977, 1984; Sabinevski, Ardamatskaia, 1984; Ardamatskaia et al, 1978 and others).

The rise of interest in wintering waterbirds was followed by a certain decline, although some articles were published in the meantime (Koshelev, 1988; Koshelev, Peresad'ko, 1991, Korzukov, 1981; Petrovich, 1978; Rusev, 1984; Grinchenko, 1991 and others).

Only from the early 80's was the wintering of waterbirds paid more attention by ornithologists. Some efforts were undertaken to unify wintering studies. The Azov-Black Sea Wintering Waterbird Research Programme was compiled in 1993 for this purpose (Popenko V.M., Chernichko I.I.). After having been modified and completed, this programme was included into the Monitoring and Conservation of Biodiversity in the Wetlands of the Ukraine Scientific Programme. Field investigations carried out in 1995-1997 allowed for the specification of some principal questions concerning the methodological character and for the improvement of the process of data collection and elaboration, with the help of the database system created. The proposed programme was developed for the conditions of the Azov-Black Sea coast, though it can also be applied elsewhere.

In spite of the fact that nowadays a significant amount of material on waterbird wintering in the region is available, further investigation of such an important phase in the birds' life as a wintering period is required. For the purpose of study and maintenance of the biodiversity in the wetlands of the country it is necessary to unify methods and unite the efforts of many specialists in the region. The proposed programme was prepared to serve this aim in the future.

According to recent data more than 80 waterbird species winter in the Azov-Black Sea region. Depending on the weather conditions their total number fluctuates from 800,000-900,000 to 1,500,000-2,500,000 birds. The results of the winter censuses carried out in 1994-1995 in the main concentration sites of the region are summarised below.

The Danube delta and adjacent lakes. 42 species were recorded making a total of 114,000 individuals. The White-fronted Goose predominated (more than 70,000 birds), diving ducks, among which Pochard was the most numerous, formed the second most abundant group of species (around 16,000 birds). 3,210 Mute Swans and 4,300 Common Gulls were recorded in total. 7 rare species were found, namely (Pigmy Cormorant — 861, Red-breasted Goose — 1,100, Ruddy Shelduck — 80, Curlew — 14, Great Black-headed Gull — 1, White-tailed Eagle - 10).

Tuzlovskaia group of limans. 23 species were recorded making a total of 93,000 individuals. Diving ducks (50,000 birds) and White-fronted Goose (30,000 birds) predominated. The third place was occupied by the Red Data Book species Red-breasted Goose — 4,500. Among other rare species were Ferruginous Duck - 3, Goosander — 240, White-tailed Eagle — 10. Besides these, 1,668 Mute Swans, 180 Whooper Swans, 800 Greylag Geese, and about 1,000 Shelducks were wintering. 45 Knots were recorded wintering for the first time in the Ukraine.

Lower reaches of the Dniester and Budakski liman. 8 species were recorded making a total of 13,624 individuals. Pochard predominated, numbering (11,000). 1,100 Black-headed Gulls, 850 Mute Swans, 40 Whooper Swans and 3 White-tailed Eagles were recorded.

Waterbodies in the country between the Dniester and Bug rivers. 16 species making a total of 16,015 individuals were recorded. Diving ducks predominated (Pochard and Tufted Duck — 11,600 and 3,050 correspondingly). 1,230 Mute Swans, 30 Whooper Swans and 1 Feruginous Duck were recorded.

Dnieper-Bugski liman. Numbers of wintering waterbirds are low. 11 species making a total of 2,931 individuals were recorded. Black-headed Gull took the first place — 1,500 and Mallard took second — 830. 4 White-tailed Eagles were also recorded.

Yagorlytski bay. 17 species were recorded making a total of 19,000 individuals. Diving ducks predominated again 11,530 (Pochard and Tufted Duck). The number of wintering swans was rather high: 2,856 Mute Swans and 150 Whooper Swans. 2,000 Greylag Geese, 400 White-fronted Geese, 100 Bean Geese and 40 Red-breasted Geese were recorded. Among other rare species 4 Ruddy Shelducks, 80 Goosanders and 4 White-tailed Eagles were found.

Tendrovski bay. 21 species were recorded making a total of more than 14,000 individuals. Mute Swans (5,490) and diving ducks (Pochard — 3,400 and Tufted Duck — 2,000). Numbers of Whooper Swans (240), Bean Geese (120), Red-breasted Geese (60) were relatively high. Among other rare species there were found: 30 Goldeneyes, 3 Eiders, 10 Goosanders, 4 White-tailed Eagles.

Dzharylgachski and Karkinitski bay. These wetlands are the traditional wintering sites of Mute Swans and Mallards. 29 species were recorded making a total of more than 65,000 individuals including 12,175 Mute Swans, 43,207 Mallards, 3,593 White-fronted Geese, 2,500 Pochards, 1,620 Tufted Ducks and 358 Whooper Swans. The rare species recorded were Dalmatian Pelican — 2, Red-breasted Geese — 55, Goosander -30, Curlew — 2, White-tailed Eagle — 32.

Western Sivash. Despite the hugeness of the area there are usually not a lot of wintering waterbirds. Only 1,300 Common Gulls, 30 Mallards, and 13 Yellow-legged Gulls were counted.

Central Sivash. 10 species were recorded making a total of more than 25,000 individuals among which there were 19,709 White-fronted Geese, 2,224 Shelducks, 2,018 Common Gulls, 115 Mute Swans, 827 Mallards, 400 Teals and 2 White-tailed Eagles.

Eastern Sivash. This wintering area appears to be the most important one in the region. 25 species were recorded making a total of more than 150,000 individuals. Mallard absolutely predominates (108,821 birds), Greylag Geese (22,552) and White-fronted Geese (3,884) were the sub dominant species. Numbers of Mute Swans and Common Gulls were relatively high — 6,431 and 8,090 correspondingly. The Eastern Sivash is the only area where wintering herons were found. 1 Bittern, 3 Little Egrets, 383 Great White Egrets, and 272 Grey Herons were counted. Of the rare species counted it is worth mentioning 1 Red-breasted Goose (in some years their number may be as high as 200 birds), 22 Ruddy Shelducks, 5 Great Black-headed Gulls and 14 White-tailed Eagles.

Coast of the Kerch peninsula. 26 species were recorded making a total of more than 64,000 individuals. White-fronted Geese predominated (33,113). Numbers of the sub dominants were distributed as follows: Pochard — 6,430, Tufted Ducks — 40. Coots (6,970) and Mallards (5,297) were also numerous. Common Gulls predominated among gulls (3,173). The number of Mute Swans was relatively low — 479 birds. 2,000 cormorants wintered in the vicinity of the Kazantip peninsula, among which there were 1,790 Common Cormorants, 130 Pigmy Cormorants and 122 Shags. Apart from these rare species were recorded 19 Ruddy Shelducks, 13 Goosanders, 2 Curlews and 2 White-tailed Eagles. 198 wintering Great Bustards were counted in the inland steppe areas of the Kerch peninsula.

Utlukski liman. This waterbody is a traditional wintering site for White-fronted and Graylag Geese. 21,589 and 962 birds of each species were counted correspondingly. Furthermore there were18,565 Mute Swans and 16,774 Mallards (although in some years their numbers may by as high as 80,000-100,000 individuals). Numbers of gulls were high: Common Gull — 1,855, Yellow-legged Gull — 449, Black-headed Gull — 200. Wintering concentrations provide food for a significant number of White-tailed Eagles (30). 2 Ruddy Shelducks were also recorded.

Molochni liman. This is a usual wintering site for a wide array of species, but a complicated ice-cover situation in 1994-95 forced the majority of birds to move to the closest Utlukski liman. Only 5 species were counted: Mallard — 1,580, Greylag Goose — 2,145, Common Gull — 738, White-fronted Goose — 110 and Cormorant — 3.

Obitochnaia spit. 11 species were recorded making a total of 1,644 individuals. Common Gull — 551, Mute Swan — 362, and Mallard — 316 predominated. Some Greylag Geese (133), White-fronted Geese (120) and Pochards (110) were wintering. 5 Goleneyes and 1 White-tailed Eagle were also recorded.

In spite of some fluctuations in the species composition and numbers, the data reflects the winter-

time ornithological situation in the wetlands of the region. We would like to note that this brief characteristic of wintering waterbird concentrations includes material collected not only by the OSBAS, but also data from the Nature Heritage Fund, the Ukrainian Society for Bird Study and Protection, Melitopol Teacher's Training College, the Black Sea and Danube Biosphere Reserves, Crimea and Karadagski Nature Reserves.

Scientific objectives

The aims and objectives of the programme are as follows:

- to identify how pronounced the winter-time aspect of avifauna is;
- to determine its significance for the general characteristic of ornithological situation in the region;

to single out the principle wintering groups of waterbirds;

- to study the conditions regulating to the existence of waterbird groups and communities in winter;
- to determine the resource potential of wintering communities;
- to investigate ways and opportunities of optimising wintering;
- to work out management and conservation measures for wintertime concentrations.

The first level

1. Inventory of wintering sites.
1.1. Preliminary identification of the key wintering sites and compilation of a wintering waterbird species list for the region
1.2. Counting of waterbirds wetland by wetland and description of the key wintering sites
1.3. Characteristics of wintering communities for separate wetlands. Besides data on species composition, if possible, such data on the wintering concentrations as sex composition, ratio of different species, dynamics of species composition and periods of maximum species diversity are required.
1.4. Terms and conditions of formation of waterbird wintering concentrations. Influence of weather variables on the concentrations. Terms of freezing in the study wetlands, existence of unfrozen patches. Weather conditions in winter (according to the Hydromet data).
1.5. Classification of concentrations dependant on the species composition, localisation and temporal stability. Distance and regularity of feeding flights etc.

The second level

1. Long term dynamics of numbers and distribution of wintering waterbirds.
1.1. Annual estimation of wintertime waterbird resources on the basis of the car-, boat- and aerial counts over the whole territory or at monitoring sites.
1.2. Trends in numbers and distribution dynamics.

The third level

1. General characteristics of landscape elements in relation to the wintering waterbirds.
1.1. Characteristics of landscape elements on the sea coast.
1.2. Characteristics of landscape elements in the limans and mouths of rivers.
1.3. Characteristics of landscape elements of shore related wintering sites.
2. Formation and structure of wintering concentrations, changes in their numbers under the influence of different factors.
2.1. Abiotic.
2.2. Anthropogenic.
2.3. Relations between species.
2.4. Relations between individuals of the same species.
2.5. Influence of vegetation cover.
2.6. Feeding capacity of habitats and trophic links.
3. Working out protection measures.
3.1. Identification of the factors which limit waterbird winterings and searching for ways to minimise their influence.
3.2. Identification of the possible damage waterbirds cause and searching for ways to neutralise its effect.
3.3. Preparation of a list of seasonal reserves to be created in the areas important for wintering waterbirds (besides the existing protected areas).

Methodological approaches to the research

The study area includes all wetlands of the Azov-Black Sea coast and also some inland wetlands. Up to now about 150 wetlands in the region were designated (Stoilovski, Kivganov, 1994) as important for waterbirds. The most important of them are listed above.

The census techniques applied are widely known and explained in detail in the literature. Both absolute and relative transect counts are suitable. The routes may be walked on foot, dri-

Levels	Monitoring sites	Other areas
The 1st and the 2nd levels	from the 3rd ten days of November to the 2nd ten days of December 2nd ten days of January 3rd ten days of February	2nd ten days of January
The 3rd level (not early)	3rd ten days of November 1st and 2nd ten days of December 2nd ten days of January 3rd ten days of January 1st - 3rd ten days of February	

ven by car or covered by boat in the case of water areas. In the monitoring areas the routes have to be fixed in the space. The transect width, if the count is relative, has to be differentiated by the species size. The investigation of large wetlands requires aerial counts. Helicopters and single-motor aeroplanes are the most suitable transport for this purpose. The methodology of the aerial counts is described (Chernichko, Siokhin et al, 1993) in chapter 3 of this programme. The distribution of counting forms among the workers of coastal and fishing fleets is also acceptable.

Temporarily, the wintering period starts from the third ten days of November, when the major waterbird concentrations are formed, and ends in late February, when they gradually dissociate. Periodicity of the counts is chosen depending on the level of research (1, 2, 3), study area (monitoring site or the whole region) and funds available, that determines the possibility to rent road or aerial-transport.

During the aerial counts the monitoring sites controlled have to be additionally surveyed from the ground.

The information storage system has three levels of protection:

- field data is collected in the field diaries of the researchers;
- as this data is elaborated further, the correspondent forms and maps are completed
- the data is put into a computer database system for further processing and storing (see the structure of the files in the Methodological Appendix).

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Chapter 3. Methodological Appendix

3.1. Brief description of methods

Counting and mapping of birds within a control plot

The main goals of the census are to identify species composition and population density during the breeding period. This method is also acceptable in other periods of the year. Three categories of birds are distinguished: breeding individuals, conservative population reserve and labile population reserve.

The former of the last two consists of birds, which do not breed but still occur in the breeding habitat, whereas the latter includes non-breeding birds not in anyway related to the breeding habitats.

Basis. Map of the area with the routes and their types and borders of the habitats and their approximate surfaces.

Area of the control plot. **To ensure completeness** of the census, the control plot has to be divided into a main territory and an additional one, where the results of rare species counts are corrected. All species are recorded when walking through the main territory, whereas only rare birds are counted within the larger (correction) territory. In habitats like reed-beds, where the field of vision is limited, the main area usually makes up 10–30 hectares. The correction area should extend for some 40–100 hectares more. In the open habitats these figures are 40–80 and 100–300 hectares correspondingly. If the habitat has the form of a belt, the main route length has to be no less than 2 km (5 km — correction route). Indication of such breeding habitats as precipices on the banks should be done regarding their total length within the census area and notes on their minimum, maximum and average height and soil type.

Description of the control plot. Habitat types and their approximate areas, terrain features, anthropogenic pressure.

System of reference points. To facilitate the census, the area is divided into squares or sectors indicated on the map. Natural reference points are listed (stones, trees, buildings, outstanding relief features etc.) to help the orientation of the observer, if there is no opportunity to use sticks for marking the transects, squares etc. in the field.

Species maps. The map compiled during the visit is analysed and information about each species is plotted separately on sketch maps.

It is recommended that two types of counting techniques are used: linear transect and standard point counts (see description below). The counting routes can either be fixed in the space, or planned to cross the plot differently every time. The latter helps in the finding of new species. The major requirement for the census is to cover the entire area of the plot. In any case, the direction, in which the route is walked, has to be reversed every time to prevent mistakes related to temporal changes of bird activity during the walk. To count early singing birds, whose period of activity is very short (pigeons, thrushes, etc.), it is recommended that 15 minute listening rounds are organised. This would give a general impression of how big the possible underestimation is in comparison to the counting data. It is best to change position from time to time when listening in order to hear the voices all over the plot.

Morning counts should begin 30 minutes before dawn. The walking speed depends on the habitat type. From 5 to 15 minutes are usually spent per hectare of the control plot. Evening counts should begin 3–3.5 hours before sunset with the walking speed usually higher because of the shorter period of singing activity for most birds at that time (Priednieks et al, 1986). In the «simple» habitats and open landscapes the walking speed can be as high as 0.75–1.0 km per hour.

The biology of the species is to be taken into account to avoid mistakes while counting. This includes simultaneous alarm signals of the males and females disturbed, effect of crowding etc. To speed up the work in the field we suggest using shortenings and abbreviations, understandable for all observers. The census is never carried out when the weather is rainy or windy. It is necessary to have a map of the visit to the control plot every time when counting within the area. All signs, codes and counting conditions are plotted on it. It is good to have 2 or 3 copies at one time. In the case of bird activity appearing to be very high, it is easier to operate with these maps to help with the further elaboration of data.

Linear count with the transect width differentiated in relation to the group of birds counted (50, 100, 500 and 1000 metres)

This kind of count is carried out either within the control plots or outside them. The latter is usually completed during the period of seasonal migrations. The routes can be both fixed and unfixed in the space. In the course of the walk, the observer records only the absolute numbers of each species and indicates their position and status on the sketch map. Sex and age of birds are noted if possible. As for many herons, waders, waterfowl and birds of prey, their numbers estimated under the conditions of good visibility on a small waterbody may be absolutely accurate, hence such an area can easily be included into the total counted area. Having been recalculated separately, this data can characterise a certain species density in the habitat. The angle between the main walking direction and the direction towards the place where the bird was seen to take off is recorded together with the distance involved. This makes determination of the transect width more exact and convenient. Such a form of registration is typical for the point counts and when applied during the transect count it resembles circles «slipping» along the main route. Estimates of the census area completed in this way appear to be more accurate. (For more information on the circle-based estimations of census area, see Mykytuk,1997). The observer has to record the length of the habitat walked and indicate the beginning of a new one, if the route is not fixed in the space.

Time of the counts. The first 4-5 morning hours are preferable. It is better to start at dawn. In the evening the counts should not be begun later than 2.5 hours before sunset. The evening counts are expedient only together with the observations on bird migration.

Conditions to be fulfilled. Only weather conditions that do not minimise visibility and affect bird behaviour are acceptable. To be familiar with the estimation of the transect width, several exercises would be useful to escape under- or overestimating the distance to the birds recorded. In order to ensure standardised estimations we suggest that all the observers have special training in different habitats.

Form of the transect. The best is to walk the route along the sides of an imaginary square, sized 1-1.5 km, to cover all the main habitats of the study area. The transect should not go along the borders of two habitats or such elements attractive for birds as the steppe or semiarid landscape or canals. This will help to prevent very possible overestimating of density and lead to more precision in general.

Sketch map. The transect contour has to somehow be indicated if it is walked for the first time.

The habitats crossed, starting and finishing points, and the walking route have to be indicated on the map in the case of it being a fixed route. For the first time the distances are estimated in footsteps. It can be done more accurately later if necessary. All areas where birds are concentrated must be shown on the map. The information should be written down separately for each part of the route, otherwise the data will not be correct and cannot be properly analysed at all.

Details of recording. When a bird is taking off, the distance to the take-off point, but not the one it flew from meanwhile, is noted. Only birds in front and to the side of the observer are recorded, unless new species since the start of the count are seen. Thus only semicircles, with the radius being the distance to the bird recorded, will be shown on the map in front of the observation point. Field glasses or telescopes are to be used preferably only for species identification or for determining absolute waterbird numbers. In all other cases more attention should be paid to constantly looking over the transect range. There is a different counting form for migratory birds where time, shape of the flock, number of birds, flight altitude and direction are recorded separately, as during the counts from an observation post.

Point counts

Point counts are carried out during each stop while walking the route. Walking intervals have to be long enough to proceed some 250-400 metres. The number of the intervals depends on the habitat type. The process of counting at one point usually takes 5 minutes. At least 20 such counting points should be established on the route. Sometimes, because of unfavourable terrain features, they can be less in number. The counting points should be situated only within the range of a habitat. Borders of two or more habitats must be avoided.

When making the point count route, either a circle or a rectangle saves a great deal of time. If

terrain features do not favour such forms of the route, the latter has to cover all habitats present.

Conditions to be fulfilled. The distance between the counting points can be covered on foot, by bicycle or by boat. Cars can be used only in open landscapes with a dense network of roads, for example in agricultural fields. One route should be counted at least twice. The location of counting points has to be fixed and related to natural reference points: crossroads, outstanding objects, trees or shrubs of remarkable shape etc. This is needed so that the same route can be repeated in different seasons and years.

Sketch map. In the course of the point count, as well as during the transect count, a sketch map should be compiled, although in this case there is no need to keep to the general scale. It is enough just to show the terrain features in the surroundings of the counting points and to number the drawings according to the route scheme.

Details of registration. Distance and direction to all birds seen or heard are recorded in a field diary. When the observations are completed, the observer determines several radii from the observation point to the furthest places where the species were recorded, thus determining the area surveyed. Timing and weather strongly affect the results and survey areas may differ as well. It is better to visit the counting points on an occasional basis to avoid these effects. Next to the number of the point, the time of the count and changes in weather that could affect the results are recorded. The count should be stopped if there are any other factors (noise of aeroplane or car, gun shots) that are likely to cause mistakes in the estimations. Counting is recommenced when the situation normalises.

Observations on migratory birds from a specially equipped post (OP)

The post location is chosen beforehand and usually serves for several years. It should provide a good field of vision within a range of at least 1–2 kilometres. It is good to have a bearing to allow the observer to watch high altitude migration in the half-laying position.

Observations are begun half an hour before sunrise and are made for 4 morning hours. In the evening their duration is 2 hours until half an hour after sunset. It is good to combine such observations in the evening with the short fixed transect counts. Simultaneous work by the observers, one of whom watches high altitude migration every quarter of an hour in the morning, gives the best results.

Between continuous morning and evening counts, all migrating birds are recorded each quarter of an hour. These observations allow the estimation of migration intensity throughout the rest of the day. Cloud cover, wind speed and direction, air temperature and precipitation are recorded at the beginning of the day. Their changes are monitored hourly.

Each individual or flock, flight altitude and direction and shape of the flock are recorded. At night the observer should listen to the calls of migratory birds until 1.00–2.00 a.m. When the moon is bright (5 days before the full moon and 2 days after), observations of migratory birds against the background of the moon discus are made each second quarter of an hour with 15 minute rest intervals.

Durable observations on the observation post are extremely laborious, therefore only the first three days of each ten day period from 11 March to 23 May in spring and from 11 August to 13 December are recommended for regular observations.

Registration of birds in the corridors cut in the reed beds

Three corridors in the reeds are cut to make a T-shaped system. They are 20 meters in length with a width of 1–1.5 meters. They are positioned 4–5 meters in from the main shore or 1–2 metres in from the border of open water in such a way that the longest corridor is perpendicular to the shore. A platform or boat for observation is installed at the crossing of the corridors. Observations are made from a hide for 2 hours. To identify the species composition of rails, observations are performed on the three corridors simultaneously. To obtain quantitative data, birds moving only in two corridors are recorded for 15 minutes and then the other two corridors are scanned. A 15 minute break then follows. If the activity of the birds differs among the corridors, observations are then made only on the corridors with the highest activity. Thus, for a two hour period, constant observation time takes up 90 minutes with two 15 minute breaks making 30 minutes in total.

The start of observations should be fixed. It is better to allow some 5–10 minutes before for the observer to take position in the hide. The observations are begun half an hour before sunrise.

No map is complied after the count. Only the predominant direction of movement is noted. The corridors are marked on the map of the control plot.

After the observations the corridors can be used for mist netting of passerines and rails. More complete data can be collected on two parallel systems of corridors if the observations are performed together with the catching of rails. The corridors should be at a distance of more than 200 metres to avoid the effect of catching activities on the behaviour of birds in the counting corridors.

Using tape recordings of rails' calls during point counts

The route is laid along a strait or a shoreline where suitable habitats are close to the main land. The counting points are identified beforehand. Fifteen second periods of reproducing the calls are followed by 45 second periods of listening to the replays for each of the surveyed species. The series is repeated 3–4 times at one point. If the results appear to be contradictory, the series are either repeated once more or the point is visited again later. This is especially useful when a concentration of birds from adjacent areas takes place.

Sketching of habitats and waterbird distribution within a control plot

After the field observations have been made, the exact position of the conspicuous and mixed concentrations is indicated on the sketch map including feeding areas, if the birds were foraging. The same thing is done with the main breeding habitats and colonies of waterbirds. All technical buildings, outlets of canals, tourists' and fishermen's camps, recreation facilities etc. are marked on the sketch map too. All changes in the distribution of birds in the course of the day have to be shown on one or several sketch maps. Information on the water level, salinity (if relevant equipment is available), water temperature, and the state of the waterbody (eutrophication, pollution, ice-cover) should also be collected.

Organisation of field investigations at the colonial settlements of waterbirds

Both relative and absolute data are collected. The relative figures show the number per unit of area investigated or route length counted. The absolute counts are applied at the breeding colonies or pre- and post-breeding concentration sites. There are several modifications of the absolute census techniques. During his or her stay at the colony in order to collect additional data for the monitoring scheme, the observer should choose the techniques that allow for the collection of such material. Depending on the species biology, the techniques listed below can be used.

Absolute count. This kind of count gives good results only in colonies of gulls, terns, waders and Cormorants, with the total number of breeding pairs up to 500–600.

Absolute count of waterbirds in the selected parts of the colony, with further extrapolation for the total area occupied by the colony, is applied to the large colonies of gulls, terns, Cormorants, some herons etc. In such cases numbers of nests per square metre of the colony in its central and peripheral parts are estimated to be further recalculated for the total area of the colony. It is obvious that this method is suitable only in conspicuous colonies.

To count nests in the mixed colonies, it is best to cross the colony 3–5 times and count all nests along both sides of the route within a four metres range. On most occasions this can provide a sound basis for further calculation of the total colony size. This technique is also used when working in the reed-beds on the islands and spits of the Karzhinski and Obitochnyi bays. In other parts of the region, counts of colonial Ciconiiformes are rather laborious. Relatively accurate estimates can only be made when counting from a boat, or walking transect routes through the reeds.

Counting of tree-breeding colonial birds also has some peculiarities. T.B.Ardamatskaia (1997) proposes the following method. In small colonies all nests are counted and the scanned trees are marked with chalk. In the larger ones nests are counted for just 10–20 trees and from this the average number of nests per tree is calculated. After that the total amount of trees with nests are multiplied based on the average number of nests in a tree.

Incomplete count is applied for the scarcely accessible colonies of Ciconiiformes. In the first stage the location of the colony is identified. Thereafter the number of birds coming and going is recorded in the morning, using good optics, from 5.00 to 9.00 a.m. Sometimes pictures of the colony appear to be useful, especially on the sandy or clay precipices. In case of sheer rocks

(for instance, counting in the Shag colonies) Y.V.Kostin proposes to combine driving by car and walking along the coastline. In the places where the colonies are found, all birds sitting on the water are counted. Then some efforts are made to disturb the incubating birds. Usually not all of them leave the nests. It should be taken into account that about 10 per cent, sometimes even up to 80%, of them do not take off at all.

Aeroplane counts. It is obvious that only colonies of Ciconiiformes located in scarcely accessible places can be counted from air since the accuracy of such counts is very low.

Catching of passerines and waders

Catching of waders

Waders are caught using mist nets with 2 or 3 shelves (the mesh size is 18–20 mm, length — about 20 m). No less than 20 mist nets should be placed in 3 or 4 lines, making a perpendicular to the water edge. Their position depends on the water level, and the main idea is to cross possible places where waders can pass or attend at night. Thus, straits between islands, small pools or coastal vegetation flooded by the wind-induced water are the best catching sites. Installation of the lines should take place in the evening, but before twilight to prevent any disturbance to the natural movements of birds. If a catching location is new, it is a good idea to keep an eye on the flock movements and changes of wind. Very often the wind dies or changes direction after sunset, and the nets appear either to be flooded, or far from the water's edge.

Net rounds must be as frequent as one per 1.5–2 hours, with the first check in 1.5 hours after sunset and the last one just as dawn breaks. At the last net round the nets are closed to protect them from the sun and the wind. It also prevents the catching of some careless individuals during the daytime. The position of each line and its number are marked on the sketch map. During a net round the number of birds caught and their flight direction is recorded separately for each line.

After release the birds are placed in a cage for transportation. It is better to have cages with a concrete or net bottom to minimise traumatism and to prevent plumage from becoming dirty. It is necessary to have some cotton bags for larger or aggressive birds to prevent them from hurting one another. After transportation from the nets the birds are kept in a small, net-bottomed tent divided into several compartments. Five such tents (according to the number of night net rounds) are put up on the sandy substrate or in the grass not far away from the camp. Birds brought after one check should not be mixed with the others. In rainy weather the tents are covered by a piece of polyethylene.

The birds should be measured and ringed straight away after capture if it is possible to have enough light. If there is no light, a proportion of the birds has to be weighed and ringed to obtain data on true body mass. Other measurements can be delayed until the morning.

Linear measurements are taken with a standard stop ruler and callipers, mass is estimated with Pesola weights. Sex, age and moult score are identified according to the manual prepared at the Ornithological Station. Data is filled in on a special form.

There is no need to measure all the birds according to the full scheme if the catching is too successful. It is enough to have a sample of 30 individuals of each species measured and then take only the minimum data (sex, age, plumage, wing length and body mass).

Catching of passerines in the reed beds

Mist nets (mesh size 14–16 mm) with 3 or 5 shelves are used for this purpose. To position the nets, 1–1.5 metre wide passes are cut in the reed beds perpendicularly to the shoreline. Their length is determined by the width of the reed bed. If the reed growths are concentrated in small groups, it is better to make short lines of 1–3 nets. To open the net, raise the uppermost shelf as high as possible, whereas the lower shelf should be lowered carefully to prevent the birds drowning. In the areas where predators such as Raccoon-dogs Nyctereutes procyonides are active, the lower shelf should not be too close to the ground/water, despite the losses in the total number ringed.

The best results are achieved early in the morning and in the evening, except for the peak passage periods when catching is successful throughout the day. Therefore, net rounds should be started as early as 30–40 minutes after dawn. Wait until it is almost dark before going for the last net round and use headlamps. Do not leave the nets open for the night, if no last net round is expected for any reason. Daytime net rounds

must be as frequent as one per 1–1.5 hour. In hot weather they can be even more frequent.

After capture the birds are transported in separate cages according to their size and aggressiveness. Measurements are taken straight away after catching mostly according to the minimum scheme (see 5.4) unless rare and target species were captured. Due to the lack of a sufficient number of rings, only the target species are ringed, whereas others are released without ringing. Mass ringing of passerines is expedient only at the regular ringing sites.

Catching of birds in the forest belts

To catch birds migrating along the forest belts, mist nets with 4–5 shelves are installed on the high sticks. One or two nets are positioned across the forest belt in the places with thick arboreal vegetation. If catching in the reed beds and forest belts is carried out simultaneously, no more than 2 such net lines are installed. In such cases all the net lines should be located close to each other, since one person must manage to collect and measure all captured birds within an hour. Hence, the net-round schedule and techniques resemble those of the catching in the reed beds. The position of the net lines is indicated on the sketch map and the successfulness of each is calculated. At the regular catching localities, nets with many shelves are used (see specialised manuals on the subject).

Determination of the maximum and minimum monitoring parameters taken in the field

Those taken in the field during the catching of waders are listed above and in a special manual. When catching rails, which are poorly studied in general, all the measurements are taken according to the full scheme similar to the one used when catching waders. When catching passerines, the following monitoring parameters are the minimum, namely: date, species, time, ring number, age, sex, La — wing length, Mas — body mass, PM — moult of primaries (S — all are old, N — all are new, SN — there are some old and some new, N+ — new feathers are still growing, K — moult of coverts (0 — no moult, 1 — no more than 10% of the coverts are moulting, 3 — 10–40% are moulting, 3 — more than 40% are moulting).

Aeroplane surveys

These are applied to provide a quick estimate of the ornithological situation in the region. Helicopters or single engine aeroplanes are recommended. If the survey area is not very big then a light motor plane is acceptable. The flight altitude does not usually reach more than 100 m, and should be lower where necessary (down to 30–40 m). The speed of the aeroplane during the count is 100–120 km per hour. Helicopters allow the survey to be carried out at a lower speed.

During the survey an absolute count of birds and sketching of the flight route are obligatory. At least 3 ornithologists should participate in the survey. One has to keep an eye on the orientation and command the manoeuvring of the aircraft (to make a new circle, to watch at the left or right side of the plane, to change the flight altitude etc.). The other observers watch the birds on both sides of the plane and exchange information to prevent over- or underestimating.

While on the plane it is best to use a dictaphone to record the survey data. After landing the recordings have to be decoded and written down. But even in this case some data needs to be written down in notebooks while on board. The data must include locality, flight speed and altitude, take-off and landing time, numbers and species of birds counted. Blank sketch maps are to be prepared before the survey to facilitate the indication of concentration sites, colonies etc. throughout its course. If an area is visited for the first time and no maps are yet available, a quick sketch map is complied during the flight.

Weather conditions and visibility are recorded at the beginning, and comments are added on their further changes during the flight.

Flying over a small counting unit once is usually enough, but larger units often require two, three, or even more circles. To prevent mistakes observers must be careful not to count the same birds twice or to miss any.

As a rule, there is no need to fix the width of the counting transects during the aeroplane survey, since the absolute numbers of birds are recorded. However, the distance at which the identification becomes possible may be considered as such. If there is a need to calculate the transect width, see manual of special methods (Kusmin et al, 1984).

Data for each of the counting units is filled in on a special form for the database system.

General remarks

- When carrying out a route or point count in the reed beds, it is best to use a compass to find your way through.
- To find out how long your footstep is try to measure it at least 10 times in the same habitat.

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3.2. Conventional abbreviations for database system on the results of counts

1. Habitats

1.1. Codes of landscapes and their elements

Natural forest	EL
Steppe	ST
Rocks	GO
Gully	BK
Sea shallow waters	MM
Sea bay	ZM
Lagoon	LI
Spit	KO
Island of accumulative origin	OS
Island of mainland origin	MO
River flood plain	RP
River delta	RD
Riverine terrace	RT
Flood plain freshwater lake	OP
Ultragalinic lake	OG
Salt lake	ON
Freshened parts of waterbody	OW

Flood land riverine marsh	BP
Marsh on the river terrace	BT
Pond	PD
Sedimentation tank	OT
Water reservoir	WZ
Fish-pond	FZ
Flooded quarry or sand-pit	KZ
Peatery	VZ
Artificial forest	IL
Gardens	SD
Fields	PO
Hayfield	SE
Pasture	PS
Technogenic landscape	TG
Town	GN
Settlement, village	SN

1.2. Codes of the habitats and habitats components

Rocky precipices	SB
Clay precipices	BG
Sandy precipices	BS
Sand beach	PI
Reed bed associations	TR
Strip of reed	LT
Solontzy	SL
Salinas, salt-marsh	SK
Turfy meadow	BL
Wet tussocky meadow	ZL
Shallow waters	AM
Deep water areas with bottom vegetation	QR
Floating vegetation	WP
Deep water areas without bottom vegetation	AQ
Arboreal vegetation	DR
A single tree	OD
Shrubs	KU
A group of trees	GD
Herbaceous steppe vegetation	TS
Psammophyte vegetation	TP
Meadow turf vegetation	TL
Reeds and marsh vegetation	TT
Aquatic vegetation without reed	WR
High herbaceous vegetation	WT
Low herbaceous vegetation	NT
Dense herbaceous vegetation	GT
Thin herbaceous vegetation	OP
Mosaic herbaceous vegetation	PT
Pasture	PS

Ravine	OW
Rocks, bed-rock	KM
Hill, barrow	HM
Stream, small river	MR
Small island	OS
Small lake	OR
New forest belt	LM
Old forest belt	LS
New garden	SM
Old garden	SS
Vineyard	WI
Agricultural fields (no details)	AG
Winter crops	OZ
Spring crops	YZ
Yellow corn, sunflower	KP
Legumes	BO
Melon and gourd plantation, garden-plot	BA
Rice fields	RI
Perennial crop	MT
Fallow land	ZA
Bare fallow	PA
Occupied buildings	ZI
Other buildings	HP
Industrial buildings	PS
Electric transmission lines, beacons	LE
Bridges	MS
Stack	SR
Canal	KA
Dam	DM
Pit	KR

2. Codes of bird species

Scientific name	Codes
Accipiter brevipes	ACCBRE
Accipiter gentilis	ACCGEN
Accipiter nisus	ACCNIS
Acrocephalus agricola	ACRAGR
Acrocephalus arundinaceus	ACRARU
Acrocephalus dumetorum	ACRDUM
Acrocephalus paludicola	ACROLA
Acrocephalus palustris	ACRUST
Acrocephalus schoenobaenus	ACRENO
Acrocephalus scirpaceus	ACRIRP
Actitis hypoleucos	ACTHYP
Aegithalos caudatus	AEGCAU
Aegolius funereus	AEGFUN
Aegypius monachus	AEGMON
Alauda arvensis	ALAARV
Alcedo atthis	ALCATT
Alectoris chukar	ALECHU
Anas acuta	ANAACU
Anas clypeata	ANACLY
Anas crecca	ANACRE
Anas penelope	ANAPEN
Anas platyrhynchos	ANAPLA
Anas querquedula	ANAQUE
Anas strepera	ANASTR
Anser albifrons	ANSALB
Anser anser	ANSANS
Anser erythropus	ANSERY
Anser fabalis	ANSFAB
Anthropoides virgo	ANTVIR
Anthus campestris	ANTCAM
Anthus cervinus	ANTCER
Anthus pratensis	ANTPRA
Anthus spinoletta	ANTSPI
Anthus trivialis	ANTTRI
Apus apus	APUAPU
Apus melba	APUMEL
Aquila chrysaetos	AQUCHR
Aquila clanga	AQUCLA
Aquila heliaca	AQUHEL
Aquila pomarina	AQUPOM
Aquila rapax	AQURAP
Ardea cinerea	ARDCIN
Ardea purpurea	ARDPUR
Ardeola ralloides	ARDRAL
Arenaria interpres	AREINT
Asio flammeus	ASIFLA
Asio otus	ASIOTU
Athene noctua	ATHNOC
Aythya ferina	AYTFER
Aythya fuligula	AYTFUL
Aythya marila	AYTMAR
Aythya nyroca	AYTNYR
Bombycilla garrulus	BOMGAR
Bonasia bonasia	BONBON
Botaurus stellaris	BOTSTE
Branta ruficollis	BRARUF
Bubo bubo	BUBBUB
Bubulcus ibis	BUBIBI
Bucephala clangula	BUCCLA

Scientific name	Codes
Burhinus oedicnemus	BUROED
Buteo buteo	BUTBUT
Buteo lagopus	BUTLAG
Buteo rufinus	BUTRUF
Calandrella cinerea	CALCIN
Calandrella rufescens	CALRUF
Calcarius lapponicus	CALLAP
Calidris alba	CALLBA
Calidris alpina	CALPIN
Calidris canutus	CALCAN
Calidris ferruginea	CALFER
Calidris minuta	CALMIN
Calidris temminckii	CALTEM
Caprimulgus europaeus	CAPEUR
Carduelis (Acanthis) flammea	CARMEA
Carduelis (Cannabina) cannabina	CARINA
Carduelis (Chloris) chloris	CARCHL
Carduelis (Spinus) spinus	CARSPI
Carduelis carduelis	CARLIS
Carpodacus erythrinus	CARERY
Certhia brachydactyla	CERBRA
Certhia familiaris	CERFAM
Charadrius alexandrinus	CHAALE
Charadrius dubius	CHADUB
Charadrius hiaticula	CHAHIA
Charadrius morinellus	CHAMOR
Chettusia (Vanellochett.) leucura	CHELEU
Chettusia gregaria	CHEGRE
Chlidonias hybrida	CHLHYB
Chlidonias leucopterus	CHLLEU
Chlidonias niger	CHLNIG
Ciconia ciconia	CICCIC
Ciconia nigra	CICNIG
Cinclus cinclus	CINCIN
Circaetus gallicus	CIRGAL
Circus aeruginosus	CIRAER
Circus cyaneus	CIRCYA
Circus macrourus	CIRMAC
Circus pygargus	CIRPYG
Coccothraustes coccothraustes	COCCOC
Columba livia	COLLIV
Columba oenas	COLOEN
Columba palumbus	COLPAL
Coracias garrulus	CORGAR
Corvus corax	CORRAX
Corvus cornix	CORNIX
Corvus frugilegus	CORFRU
Corvus monedula	CORMON
Coturnix coturnix	COTCOT
Crex crex	CRECRE
Cuculus canorus	CUCCAN
Cygnus bewickii	CYGBEW
Cygnus cygnus	CYGCYG
Cygnus olor	CYGOLO
Delichon urbica	DELURB
Dendrocopos leucotos	DENLEU
Dendrocopos major	DENMAJ
Dendrocopos medius	DENMED
Dendrocopos minor	DENMIN

Scientific name	Codes
Dendrocopos syriacus	DENSYR
Dryocopus martius	DRYMAR
Egretta alba	EGRALB
Egretta garzetta	EGRGAR
Emberiza (Miliaria) calandra	EMBCAL
Emberiza aureola	EMBAUR
Emberiza cia	EMBCIA
Emberiza citrinella	EMBCIT
Emberiza hortulana	EMBHOR
Emberiza melanocephala	EMBMEL
Emberiza schoeniclus	EMBSCH
Eremophila alpestris	EREALP
Erithacus rubecula	ERIRUB
Falco (Aesalon) columbarius	FALCOL
Falco (Cerchneis) naumanni	FALNAU
Falco (Cerchneis) tinnunculus	FALTIN
Falco (Erythropus) vespertinus	FALVES
Falco (Hypotriorchis) subbuteo	FALSUB
Falco cherrug	FALCHE
Falco peregrinus	FALPER
Ficedula (Muscicapa) albicollis	FICALB
Ficedula (Muscicapa) hypoleuca	FICHYP
Ficedula (Muscicapa) parva	FICPAR
Ficedula (Muscicapa) semitorquata	FICSEM
Fringilla coelebs	FRICOE
Fringilla montifringilla	FRIMON
Fulica atra	FULATR
Garrulus glandarius	GARGLA
Galerida cristata	GALCRI
Gavia arctica	GAVARC
Gavia stellata	GAVSTE
Gelochelidon nilotica	GELNIL
Glareola nordmanni	GLANOR
Glareola pratincola	GLAPRA
Glaucidium passerinum	GLAPAS
Grus grus	GRUGRU
Gyps fulvus	GYPFUL
Haematopus ostralegus	HAEOST
Haliaeetus albicilla	HALALB
Hieraaetus pennatus	HIEPEN
Himantopus himantopus	HIMHIM
Hippolais icterina	HIPICT
Hippolais pallida	HIPPAL
Hirundo rustica	HIRRUS
Ixobrychus minutus	IXOMIN
Jynx torquilla	JYNTOR
Lanius collurio	LANCOL
Lanius excubitor	LANEXC
Larus fuscus	LARFUS
Larus genei	LARGEN
Larus argentatus	LARARG
Larus cachinnans	LARCAC
Larus canus	LARCAN
Lanius minor	LANNOR
Lanius senator	LANSEN
Larus ichthyaetus	LARICH
Larus melanocephalus	LARMEL
Larus minutus	LARNUT
Larus ridibundus	LARRID
Limicola falcinellus	LIMFAL
Limosa lapponica	LIMLAP
Limosa limosa	LIMLIM

Scientific name	Codes
Locustella fluviatilis	LOCFLU
Locustella lanceolata	LOCLAN
Locustella luscinioides	LOCLUS
Locustella naevia	LOCNAE
Loxia curvirostra	LOXCUR
Lullula arborea	LULARB
Luscinia (Cyanosylvia) svecica	LUSSVE
Luscinia luscinia	LUSLUS
Luscinia megarhynchos	LUSMEG
Lusciniola melanopogon	LUSMEL
Lymnocryptes minimus	LYMMIN
Melanocorypha calandra	MELCAL
Mergus albellus	MERALB
Mergus merganser	MERGAN
Mergus serrator	MERRAT
Merops apiaster	MERAPI
Milvus migrans	MILANS
Milvus milvus	MILVUS
Monticola saxatilis	MONSAX
Motacilla alba	MOTALB
Motacilla cinerea	MOTCIN
Motacilla citreola	MOTCIT
Motacilla flava	MOTFLA
Muscicapa striata	MUSSTR
Netta rufina	NETRUF
Nucifraga caryocatactes	NUCCAR
Numenius arquata	NUMARQ
Numenius phaeopus	NUMPHA
Numenius tenuirostris	NUMTEN
Nycticorax nycticorax	NYCNYC
Oenanthe hispanica	OENHIS
Oenanthe isabellina	OENISA
Oenanthe oenanthe	OENOEN
Oenanthe pleschanka	OENPLE
Oriolus oriolus	ORIORI
Otis tarda	OTITAR
Otus scops	OTUSCO
Pandion haliaetus	PANHAL
Panurus biarmicus	PANBIA
Parus ater	PARATE
Parus caeruleus	PARCAE
Parus cristatus	PARCRI
Parus cyanus	PARCYA
Parus major	PARMAJ
Parus montanus	PARUMO
Parus palustris	PARPAL
Passer domesticus	PASDOM
Passer montanus	PASSMO
Pelecanus crispus	PELCRI
Pelecanus onocrotalus	PELONO
Perdix perdix	PERPER
Pernis apivorus	PERAPI
Phalacrocorax aristotelis	PHAARI
Phalacrocorax carbo	PHACAR
Phalacrocorax pygmaeus	PHAPYG
Phalaropus fulicarius	PHAFUL
Phalaropus lobatus	PHALOB
Phasianus colchicus	PHACOL
Philomachus pugnax	PHIPUG
Phoenicurus ochruros	PHOOCH
Phoenicurus phoenicurus	PHOPHO
Phylloscopus sibilatrix	PHYSIB

Scientific name	Codes
Phylloscopus trochilus	PHYLUS
Pica pica	PICPIC
Picus canus	PICCAN
Picus viridis	PICVIR
Platalea leucorodia	PLALEU
Plectrophenax nivalis	PLENIV
Plegadis falcinellus	PLEFAL
Pluvialis (Squatarola) squatarola	PLUSQU
Pluvialis apricaria	PLUAPR
Pluvialis fulva	PLUFUL
Podiceps (Tachybaptus) ruficollis	PODRUF
Podiceps auritus	PODAUR
Podiceps cristatus	PODTUS
Podiceps griseigena	PODENA
Podiceps nigricollis	PODNIG
Porzana parva	PORPAR
Porzana porzana	PORANA
Porzana pusilla	PORPUS
Puffinus puffinus	PUFPUF
Pyrrhula pyrrhula	PYRULA
Rallus aquaticus	RALAQU
Recurvirostra avosetta	RECAVO
Regulus ignicapillus	REGIGN
Regulus regulus	REGREG
Remiz pendulinus	REMPEN
Riparia riparia	RIPRIP
Saxicola rubetra	SAXRUB
Saxicola torquata	SAXTOR
Stercorarius pomarinus	STEPOM
Sterna (Hydroprogne) caspia	STECAS
Sterna (Thalasseus) sandvicensis	STESAN
Sterna albifrons	STEALB
Sterna hirundo	STEHIR
Streptopelia decaocto	STRDEC
Streptopelia turtur	STRTUR
Strix aluco	STRALU
Sturnus roseus	STUROS
Sturnus vulgaris	STUVUL
Sylvia atricapilla	SYLATR
Sylvia borin	SYLBOR
Sylvia communis	SYLCOM
Sylvia curruca	SYLCUR
Sylvia nisoria	SYLNIS
Tadorna ferruginea	TADFER
Tadorna tadorna	TADTAD
Tetrao (lyrurus) tetrix	TETRIX
Tetrax tetrax	TETRAX
Tringa erythropus	TRIERY
Tringa glareola	TRIGLA
Tringa nebularia	TRINEB
Tringa ochropus	TRIOCH
Tringa stagnatilis	TRISTA
Tringa totanus	TRITOT
Troglodytes troglodytes	TROTRO
Turdus iliacus	TURILI
Turdus merula	TURMER
Turdus philomelos	TURPHI
Turdus pilaris	TURPIL
Turdus viscivorus	TURVIS
Tyto alba	TYTALB
Upupa epops	UPUEPO
Vanellus vanellus	VANVAN
Xenus cinereus	XENCIN

3. Status of birds and usage of the area

Status		Usage of the area	
Unclear	X	Foraging	T
Breeding	0-16*	Passing	F
Non-breeding	N, K, L**	Resting in the day-time	R
Summering	S	Resting in the night-time	N
Wintering	W		
Vagrant	E		

**Identification of the breeding probability*

Presence of species
0 — species was observed during breeding period outside breeding habitat or at the feeding sites
Supposed breeding
1 — species was observed during breeding period in the supposed breeding habitat
2 — a displaying male was recorded during breeding period or calls were heard suspected to be breeding related.
Probable breeding
3 — a female was observed in a suitable breeding habitat during breeding season
4 — within one week territorial behaviour of either partner was recorded
5 — display or copulation was recorded (especially at the display gatherings of Capercaillie and Black Grouse to confirm breeding)
6 — probable nesting site is visited (a hole in a tree, nest platform etc.), but there are no other signs of occupation.
7 — alarm behaviour or call indicative of nest or juvenile's presence was recorded
8 — an adult caught has an incubation patch on the belly
9 — nest building or hole making behaviour was recorded
Confirmed breeding
10 — either attempts to drive observer off the nest/chicks or aggressive behaviour was recorded
11 — fledglings were found
12 — either empty nest (abandoned, predated or used) or fresh egg-shell was found
13 — adults were seen flying to and from the nest in the manner indicating that nest is occupied
14 — adults carrying food or droppings were recorded
15 — nest with clutch was found
16 — nest with chicks that were seen or heard.

***Status of non-breeding birds (if they do not breed for sure)*

N — non-breeding (no details)
K — conservative reserve of population (birds which are related to the breeding sites during reproduction period)
L — labile reserve of population (birds which are not related to the breeding sites during reproduction period)

3.3. An overview of the Ukrainian wetlands

Since the objectives of the programme proposed are related to waterbirds, the classification scheme given below refers generally to the significance of a particular wetland type for this group. Any attempts to comprehensively classify all the variety of national wetlands would require consideration of other components of biota. Therefore, some changes to the outline given below are more than expected.

Group 1. Open sea shallow waters and bays

1.1. Intertidal zones. Compared to other sea and ocean water areas, fluctuations of water level in the Black Sea basin are so slight that no wetlands of the type occur in the region.

1.2. Permanent shallow waters. The most typical kind of wetlands along the Azov-Black Sea coast.

Group 2. Sea bays and straits

2.1. Intertidal mud flats (littoral). Due to reasons mentioned above this kind of wetlands is lacking in the region.

2.2. Sea fjords. Relief of the Black Sea plain does not favour formation of such deepsea bays. No fjords are found along the Southern coast of Crimea.

2.3. Permanent shallow waters. They make up most of the national wetlands.

2.4. Freshwater and saline bays. The former are lacking, whereas the latter are characteristic throughout the area.

2.5. Saline and freshwater lagoons (including artificial ones). If one keeps to the exact geomorphological terminology, typical lagoons are not characteristic of the Azov-Black Sea coast of the Ukraine. There is a unique waterbody, which came into existence after the Azov Sea waters had flooded a huge area of land along the northern edge of the Crimean peninsula. This depression formed due to the lowering of the southern cristalic shield. The largest lagoon system in Europe, the Sivash, developed as a result of these processes.

2.5.1. The Sivash Bay is a hypergalinic shallow lagoon, almost completely isolated from the sea. As a result of economic activity, it was divided into three hydrologically isolated parts: western, central and eastern. Dnieper water from irrigation systems is discharged into the bay through numerous canals and is responsible for the development of large saltmarsh areas.

Group 3. Sea limans

These wetlands are very common along the Azov-Black Sea coast and are the most important for waterbirds. Their origin is related to the transgression of the Black Sea basin, which led to the flooding of the river valleys and coastal depressions in the past. (Moldykh, Usenko, Palatnaia et al 1984).

3.1. Open limans. Having been formed by the wide valleys of the Dnieper and South Bug rivers, these wetlands look very similar to the sea bays. Such a liman existed in the past in the place of what is nowadays the Danube delta. The open limans are subjected to the strong influence of seawaters reaching as far as the river delta. In spring, winds blowing from the opposite direction freshen the limans almost entirely.

3.2. Semiclosed and closed limans. Due to the economic activity of man, many closed limans are artificially connected with the sea. That is why they are considered in this paragraph. All limans are separated from the sea by continuous or discontinuous sedimentary spits. The constant river run-off, which varies over the course of a year, often destroys even continuous spits, and liman waters go out into the sea. In the region such a kind of limans is characteristic of small river deltas. Their depth depends on the extent their pre riverbed has developed.

3.3. Limans of «lagoon» type. These are flooded beds of weak waterflows or their upper reaches, which have lost all the surface run-off due to economic development. They have high water salinity fluctuating insignificantly throughout the course of a year. Lakes Shagany, Alibey and Burnas together with limans near the town of Eupatoria typical of this kind of waterbody. The development of rice farming and irrigation led to compensation of the natural surface run-off by the discharge of artificial waters. Many of the mentioned limans are now significantly freshened in the upper reaches, which results in an increase in biological productivity.

3.4. Limans formed on the places of small tectonic breaks. Such limans are rather scarce on the coast. Donuzlav lake can be mentioned as an example of this type. The lake appeared due to the flooding of a tectonic break, which made a short depression for water flow. The lake waters have a remark-

able depth, their chemical composition very similar to the seawaters. The water flow was regulated in the upper reaches. At present, a number of small ponds provide good breeding conditions for waterbirds. Donuzlav lake is separated from the sea by a sedimentary spit as are most of the semiclosed limans. Most of small limans of the Kerch peninsula are included into this category.

Group 4. Deltaic areas

4.1. Intertidal estuaries. These types of wetlands are lacking in the Ukraine, due to the reasons mentioned above.

4.2. River deltas. Deltas of large rivers are the most biologically valuable wetlands supporting the maximum species diversity. Deltas of small rivers are valuable because they compensate the concentration of biota that is important for an arid steppe zone.

Group 5. Stream wetlands

5.1. Meandering rivers and adjacent riverine wetlands. The majority of wetlands belong to this wetland type.

5.2. Mountain rivers. Having a low feeding capacity, the micro-habitats of mountain rivers make important stop-over sites for birds migrating over mountainous areas.

5.3. Streams, flows. These are temporal wetlands having some significance only when filled with water.

Group 6. Lakes

6.1. Saline and periodically freshened lakes. Of the two types the former is the most common in the steppe, especially in the coastal part of the country. Wetlands of the latter type appear in the small flowless depressions in spring. During summer their salinity increases under the conditions of high evaporation, which overcomes the inflow of ground waters. Water level as well as biota diversity is subjected to seasonal dynamics.

6.2. Saline lakes of the liman type. Such lakes, marine in origin, are typical for the river terraces of the Danube and Dniester rivers. They appeared as a result of flooding small tributaries in their lower reaches by seawater in the past. Later on they became almost completely freshened. The Kitai and Yalpug lakes can be mentioned as characteristic examples.

6.3 Karst lakes of the Crimea. Shallow waterbodies situated on the slopes or watersheds, having local significance for mountain birds.

Group 7. Marshes

7.1. Fens and transitional mires are typical throughout the country, but in the south they are found only in the downstream areas of large rivers.

Group 8. Artificial waterbodies

8.1. Waterbodies with relatively permanent water levels. These types of wetlands are quite widespread on the regulated rivers, which imitate the delta landscape type in upstream areas. Due to the fact that water temperature in the reservoir-coolers is a bit higher than average, some increase in biological productivity is observed here which favours the distribution of waterbirds.

8.2. Waterbodies with sharp fluctuations in water levels. These are found in mountain areas where water from such storage reservoirs is used for irrigation. Their bird communities experience the strong impact of economical activity.

8.3. Ponds. These are ponds of various destinations with relatively permanent water levels. They become important for waterbirds only if their total area makes up more than 0.1 square km. The smaller ones have suitable habitats on their periphery or in the upper parts.

8.4. Temporally filled ponds. Such ponds are used in the intensive practice of fishfarming. They are found all over the territory of the Ukraine and play an important role for waterbirds, especially at the expense of the availability of the food they supply. When emptied they are used as temporal feeding areas by benthosophagous birds.

8.5. Rice fields. These are special types of wetland, which are closest to typical wetlands, with low water levels and rich biogenic contents. In recent years they have played an important role in the distribution of migratory and wintering waterbirds.

8.6. Waste areas and sedimentation tanks, which are rather common in the steppe and forest-steppe zone, play a certain role in the breeding and seasonal distribution of waterbirds.

8.7. Irrigation and drainage canal systems. These waterbodies experience a significant impact from disturbance. Although not important as feeding habitats, they are used by waterbirds for watering and sometimes breeding. Due to filtration or direct loss of water, so called «wetlands-sputniks» are often found in their vicinity.

3.4. List and classification of the factors affecting the state of wetlands and wetland biodiversity

Wetlands take a particular place among other continental and coastal ecosystems subjected to the impact of various factors. Firstly, it is related to the value of the biological resources of wetlands utilised by man. It is also related to wetland geomorphology, due to which all water flows from a catchment area are finally concentrated in a wetland. Last, but not least is the fact that the history of civilised society was always related to waterbodies and wetlands, thus having either cultural or economic links with coastal aquatic landscapes.

In this list natural abiotic factors affecting wetlands are not considered. Their influence always existed and the ecosystems appeared as their products. Most attention here is given to anthropogenic factors, which significantly overcome abiotic ones both by scale and speed of impact.

Wetland conservation and management together with the support of wetland biodiversity requires taking into account the main affecting factors in order to forecast the results of the impact expected. The complicity of the task is due to the fact that wetlands are unique natural complexes in which thousands of species and living forms, inhabiting waters as well as adjacent coastal areas, have a complicated system of inter-relations. There is not a single factor responsible for changes in the ecosystem, but a complex number of them. Therefore, an analysis of their roles appears to be rather complicated, not to mention the wetland state forecasts.

The Programme was not meant to provide a comprehensive classification or list of all factors affecting wetlands. Herein only the main types of factors are given in relation to the place and nature of impact. This should be taken into account when preparing projects on the realisation of the Programme in a selected wetland. The classification of factors is to a certain degree relative.

Group A. Factors affecting wetlands within the catchment and coastal areas

Direction 1. Impact on the background structure, changes in the water outflow and speed of filtration into the soil

This is an important direction, finally determining speed of pollution, eutrophication and degradation of wetlands.

1.1. Reduction of the arboreal vegetation cover in the catchment.
1.2. Unsustainable land cultivation. Ploughing up of the coastal water protective areas.
1.3. Toughening of soil and degradation of vegetation turf structure due to overgrazing.
1.4. Regulation of the banks, straightening and canalisation of the flow bed, drainage, melioration.

Direction 2. Impact on the water balance and hydrological regime of a wetland

2.1. Irrigation is developed along the transformed river valleys or banks of waterbodies, but in the steppe zone of the Ukraine after the building of the canal system this factor also began to play an important role within the catchment areas. The main negative consequence of irrigation is the rising of salts to the soil surface. It strongly influences vegetation in the irrigated areas and changes the chemical composition of surface water flow. In the depressions, irrigation promotes the rising of groundwater level and the gradual transformation of the depression into a marsh.
2.2. Direct discharge of secondary fresh waters used in agriculture and fishfarming. This results in the freshening of saline and even hypersaline waterbodies that can be seen in the eastern part of the Sivash. In the first years the mixing of fresh and saline waters leads to a sharp increase in biological productivity and diversity and the formation of new habitats. Halophytes and halophiles disappear. There were no long-term observations made on these changes, therefore any forecasts of the impact of fresh water on the ecosystems has to be studied in the framework of the monitoring programme. Observations on the Sivash waterbird communities show that stabilisation of species diversity occurs in 8–10 years, after which habitat degradation can take place.
2.3. Principle transformation of the water flow regime. Building of numerous small ponds in the catchment or large waterbodies in the main riverbed.
2.4. Large scale substitution of saline or brackish water by fresh water. The latter happened

in the Ukraine in the 70's when active and unsustainable water management took place in Sasyk lake. Socio-economic profitability of such transformations is very low, if there is any at all. The danger of repeating this practice in future is still very high, which should be taken into account when implementing the monitoring programme.

2.5. Usage of water for drinking, irrigation, industry, and producing electricity. Influence of this factor becomes apparent in the sharp changes of water level, that in its turn has a great negative impact on the adjacent habitats. This factor is also partly responsible for the outflow of phytoplankton, zooplankton, spores, fruit, larvae and eggs together with discharge water.

Direction 3. Water pollution

3.1. Direct pollution of groundwater by pesticides, herbicides, insecticides and chemical fertilisers, which are used in agriculture and forestry. Indirect pollution by radioisotopes, heavy metals and chemical substances, which are accumulated by vegetation. In the first case, control of technological requirements per area unit in the catchment area is needed. Speed of photosynthesis and that of the carbon combination by different plant associations, deposit rates of chemical substances in the different tissues and parts of plants have to be studied in the second case.

3.2 Storing of mineral fertilisers and other active chemical substances in the protected areas around wetlands.

3.3 Heat pollution in the areas close to large hydroelectric power stations determines a certain regime of waterbody existence and has a principle impact on the state and structure of biota.

3.4. Discharge of municipal and industrial waters into the waterbody. Due to the economy of funds on the creation of sedimentation tanks and artificial waterflows, there is a general tendency to place industry closer to the wetland borders if its distribution from the North to the South is analysed. This factor can easily be taken into account when implementing the monitoring programme, but nothing can be done to actually improve the situation despite catastrophic consequences for the environment.

Factors from group A influence the habitat capacity, general productivity and structure of communities. If properly controlled these factors are unlikely to create dangerous situations from maintaining necessary biological diversity.

Group B. Factors influencing wetland resources

Direction 1. Direct withdrawal of a biological resource leading to changes in biota structure.

1.1 Fisheries. This is a traditional economic factor, requiring control of the amounts withdrawn by governmental, co-operative and other institutions and also by sportsmen and women. The main problem is not to estimate the total catch, but the species composition of the fish. This makes the task of the whole biota monitoring much easier.

1.2 Cutting of reeds, peat extraction etc.

1.3 Gameshooting leads to the direct withdrawal of game species. The quotes for gameshooting are identified by special scientific or applied research. Most of the quotes are now very abstract and do not reflect the true numbers of game species available. It is necessary to give estimates and establish such quotas for each of the wetlands where hunting is legal.

Direction 2. Indirect influence through reduction of habitats of habitat capacity and shelter conditions of the environment

2.1 Extraction of sand, gravel and salt has different impacts on the bottom and pelagic organisms. Quantitative information on their extraction has to be collected during botanic and hydrobiological investigations.

2.2. Collection of hay and other plant resources. Changes in vegetation structure are commonly the main results of these activities, which lead to the loss of habitats. The scale, regularity and machine methods applied determine the degree of habitat transformation. As for many vertebrates, the use of any machinery in agricultural practice can in itself have quite a strong negative impact. There are no particular problems in estimating the role of the factor since governmental bodies control the amounts of resource withdrawal.

2.3. Using mud as a fertiliser or with a medicinal purpose. The importance of the factor is not so high compared to the others. It determines the economic significance of a wetland rather than having any negative impact. Being poor-

ly studied, it nevertheless has to be taken into account when implementing the monitoring scheme.

Annual fires are very common in the southern part of the Ukraine. They are determined to renew reed beds for further exploitation and should also be listed under the heading of this group. The abundance of some plants and fungi seem to depend on the amounts collected by local people, but no precise estimates are available unless this factor is controlled on a standardised basis using control plots. In some areas the collection of medicinal herbs is common, whereas mushrooms or berries are collected in other areas.

Direction 3. Changes made in trophic chains or ecological niches

3.1. The introduction of new animals and plants, game-farming and biotechnological activities are often regarded as factors which would favour an increase in general habitat productivity. This is true to some extent, however these activities greatly influence species composition, energy balance, trophic chains and inter-species competition in a wetland community.

3.2. Increase of fish-farming entailed better availability of food for ichtiophgous birds resulting in the further rise of their populations and the substitution of other species at their breeding sites.

Group C. Factors related to the recreational significance of wetlands.

Direction 1. Withdrawal of coastal areas for recreation

1.1. Building of rest camps, sanatoria etc. on the spits of accumulative origin. This factor itself does not endanger a wetland, but may significantly reduce natural habitats. Moreover, the whole organisation of recreation in such areas often requires certain limitations.

Direction 2. Direct disturbance of animals and the collection of plants within a wetland

2.1. Disturbance of birds at the breeding sites due to frequent visiting by people. This particular factor can decrease the breeding success of many species to almost zero level with no chance of restoring the population.

2.2. Long term presence of people in a wetland. This can result in the collection of flowers, insects, juvenile birds and mammals.

Direction 3. Indirect impact on the environment, ruderalisation of landscapes

3.1. Starting fires in dry periods leads to a great number of occasional conflagrations in reed beds and forests thus reducing species diversity.

3.2. Distribution of domestic animals, pest plants and the increase of disturbance leading to the abandonment of these habitats by many birds and mammals. Sometimes such habitats are the main population strongholds, which can become destroyed indirectly by recreation pressure. The continuous presence of people significantly increases the risk of nest or chick predation by Crows, Rooks or Yellow-legged Gulls.

Many more factors related to recreation pressure on the natural systems can be indicated. The main task here is to estimate the extent and duration of the pressure in relation to the changes in the biodiversity of affected communities.

3.5. Database structures

Route counts

Field	Name of field	Type	Width	Decimals
1	Date of count	Date	8	
2	Place of count	Character	6	
3	Square	Character	5	
4	Habitat	Character	6	
5	Length of the route (m)	Numeric	5	
6	Area surveyed	Numeric	4	
7	Species	Character	6	
8	Status and character of stay	Character	2	
9	Number of birds	Numeric	6	
10	Number of adults	Numeric	4	
11	Number of juveniles	Numeric	4	
12	Number of males	Numeric	4	
13	Number of females	Numeric	4	
14	Main observer	Character	6	
15	Number of observers	Numeric	2	
16	Comments	Memo	20	

Nests of birds

Several types of files are created depending on the clutch size (4,7, 15 eggs)

Field	Name of field	Type	Width	Decimals
1	Date	Date	8	
2	Place	Character	6	
3	Habitat	Character	6	
4	Species	Character	6	
5	Type of nest	Character	1	
6	Location of nest (codes)	Character	2	
7	Number of eggs	Numeric	2	
8	Length	Numeric	4	1
9	Width1	Numeric	4	1
10	Mass1	Numeric	5	1
N	LengthN	Numeric	4	1
N+1	WidthN	Numeric	4	1
N+2	MassN	Numeric	5	1
N+3	Incubation stage	Character	2	
N+4	Mass of lining	Numeric		
N+5	Outer diameter of nest (cm)	Numeric	3	
N+6	Inner diameter of nest (cm)	Numeric	3	
N+7	Depth of nest (cm)	Numeric	2	
N+8	Height of nest (cm)	Numeric	2	
N+9	Observer	Character	6	

Migration of birds on the OP

Field	Name of field	Type	Width	Decimals
1	Date	Date	8	
2	Place	Character	6	
3	Latitude	Character	5	
4	Longitude	Character	5	
5	Beginning of observations	Numeric	5	
6	End of observations	Numeric	5	
7	Species	Numeric	2	
8	Number in the first hour	Numeric	4	
9	Number in the second hour	Numeric	4	
10	Number in the third hour	Numeric	4	
11	Number in the fourth hour	Numeric	4	
12	Number in the rest of the day time	Numeric	4	
13-20	Numbers by the directions of flight	Numeric	5	
21-24	Numbers by the flight altitudes	Numeric	5	
25	Maximum number in flocks	Numeric	3	
26	Mean number in flocks	Numeric	3	
27	Observer	Character	6	

Target species breeding in colonies

Field	Name of field	Type	Width	Decimals
1	Date	Date	8	
2	Place	Character	6	
3	Cadastre number of settlement	Numeric	3	
4	Breeding habitat	Character	6	
5	Species	Character	6	
6	Number of adults in colony	Numeric	5	
7	Number of nests	Numeric	4	
8	Nests with no eggs out of them	Numeric	3	
9	Nests with 1 egg	Numeric	3	
10	Nest with 2 eggs	Numeric	3	
11	Nests with 3 eggs	Numeric	3	
N	Nests with N eggs	Numeric	3	
N+1	Number of abandoned nests	Numeric	3	
N+2	Number of abandoned eggs	Numeric	4	
N+3	Number of nests with hatching chicks	Numeric	4	
N+4	Number of chicks in nests	Numeric	4	
N+5	Number of eggs in nests	Numeric	4	
N+6	Number of chicks out of nests	Numeric	4	
N+7	Number of dead chicks in nests	Numeric	4	
N+8	Number of dead chicks out of nests	Numeric	4	
N+9	Mean distance between the centres of nests (cm)	Numeric	4	
N+10	Mean height of nests over the water level (cm)	Numeric	3	
N+11	Height of the nest lining (cm)	Numeric	3	
N+12	Number of dead adults in colony	Numeric	3	
N+13	Main observers	Character	10	
N+14	Comments	Memo	60	

Registration of colonial settlements

Field	Name of field	Type	Width	Decimals
1	Date	Date	8	
2	Place	Character	6	
3	Latitude	Character	5	
4	Longitude	Character	5	
5	Type of waterbody	Character	6	
6	Cadastre number of settlement	Numeric	3	
7	Type of colony by location	Character	1	
8	Number of colonial species	Numeric	1	
9-16	Species 1-8	Character	6	
17	Number of accompanying species	Numeric	2	
18-26	Species 1-6	Character	6	
27	Number of colonies	Numeric	1	
28-35	Area of colonies ($м^2$)	Numeric	3	
36	Number of strata	Numeric	1	
37	Total number of colonial species (pairs)	Numeric	5	
38	Predominant plant associations	Character	12	
39	Height of vegetation in colony	Numeric	2	
40	Vegetation cover (%) in colony	Numeric	6	
41	Affecting factor 1	Character	2	
42	Effect of factor 1	Numeric	1	
43	Affecting factor 2	Character	2	
44	Effect of factor 2	Numeric	1	
45	Affecting factor 3	Character	2	
46	Effect of factor 3	Numeric	1	
47	Year from which the colony is known	Numeric	4	
48	Main observers 1	Character	6	
49	Main observers 2	Character	6	
50	Main observers 3	Character	6	
51	Comments	Memo	80	

Registration of separate migrating flocks

Field	Name of field	Type	Width	Decimals
1	Date	Date	8	
2	Place	Character	6	
3	Latitude	Character	5	
4	Longitude	Character	5	
5	Time	Numeric	5	2
6	Species	Character	6	
7	Number	Numeric	4	
8	Flight direction	Character	2	
9	Altitude (m)	Numeric	4	
10	Observer	Character	6	

Summer concentrations

Field	Name of field	Type	Width	Decimals
1	Date of count	Date	8	
2	Place of count	Character	6	
3	Square	Character	5	
4	Habitat	Character	6	
5	Area surveyed (hectares)	Numeric	3	
6	Species	Character	6	
7	Status and character of stay	Character	2	
8	Number of birds	Numeric	6	
9	Number of adults	Numeric	4	
10	Number of juveniles	Numeric	4	
11	Number of males	Numeric	4	
12	Number of females	Numeric	4	
13	Information on the physiological state of the species (codes)	Character	2	
14	Distance of feeding flights (km)	Numeric	3	
15	Observer	Character	6	

Wintering of birds

Field	Name of field	Type	Width	Decimals
1	Date	Date	8	
2	Place	Character	6	
3	Habitat	Character	4	
4	Area surveyed (hectares)	Numeric	6	
5	Species	Character	6	
6	Number of birds	Numeric	6	
7	Number of males	Numeric	5	
8	Number of females	Numeric	5	
9	Number of adults	Numeric	5	
10	Number of juveniles	Numeric	5	
11	Distance of feeding flights (km)	Numeric	2	
12	Temperature	Character	5	
12	Ice cover (%)	Numeric	3	
13	Depth of snow cover (cm)	Numeric	2	
14	Precipitation (mm)	Numeric	3	
15	Ice covered ground (codes)	Character	1	
16	Observer	Character	6	

Weather variables

Field	Name of field	Type	Width	Decimals
1	Date	Date	8	
2	Place	Character	4	
3	Mean air temperature	Numeric	4	
4	Minimum temperature	Numeric	4	
5	Maximum temperature	Numeric	4	
6	Wind direction	Character	2	
7	Wind force	Numeric	2	
8	Cloud cover	Numeric	2	
9	Precipitation	Numeric	2	
10	Weather anomalies	Character	4	
11	Observer	Character	6	

Action Plan for Waterbird Monitoring

Chapter 1. Action plan on the monitoring of breeding waterbirds

The functional importance of different wetlands of the region for nesting birds

The monitoring of breeding birds is to be provided for 19 wetlands of international importance, 15 of national and 8 of regional importance.

The functional differences of landscapes, and biotopical wetland characteristics, determine the peculiarities of monitoring. Four main groups of biotopes are marked out:

1) spits and islands of accumulative origin;
2) reed marsh and inundated areas;
3) saline regressions;
4) coastal rocky cliffs;

The characteristics of dominate biotopes and bird groups in each wetland and the wetlands status (I — wetlands of international importance, N — national, R — regional) are given in the Table 1 and Map 1. The importance of the main biotope groups and dominate bird groups are determined by the figures listed from 1 to 3.

A list of the basic organisations and key executors

The co-ordinating organisation — Azov-Black Sea ornithological station (V.Siokhin).

Executive organisations:

- Danube Biosphere Reserve (M.Zhmud);
- Odessa University (A.Korzukov, V.Stoilovski);
- Nature Heritage Fund (I.Rusev);
- Odessa Zoo (A.Tille);
- Black Sea Biosphere Reserve (O.Yaremchenko, A.Rudenko);
- «Lebiazhi Islands» Nature Reserve (N.Tarina);
- Karadagski Nature Reserve (M.Beskaravayny);
- Nikitski Botanical Garden (S.Kostin);
- Crimean Epidemic Station (N.Tovpinets);
- Donetsk Board of the Ministry for Environmental Protection and Nuclear Safety (G.Molodan).

Monitoring organisation structure and time budget

All kinds of work is planned that will cover the first and second monitoring levels (see Programme)

The main work connected with the wetlands, with one expedition visit, is defined using the minimum list of monitoring features.

The monitoring of 14 wetlands, with two expedition visits, is also determined by information collection on additional parameters.

The terms of the expeditions are compiled in accordance with annual weather conditions and the bird's reproductive course. The first breeding count corresponds to the time period from 25.04 to 15.05, the second one — from 25.05 to 20.06.

The monitoring organisation structure of the breeding bird colonies is presented in tables 2 and 3.

Aeroplane surveys are the essential supplement to the conducting of colonial waterbird counts in the reed biotopes of the deltas (Dnieper, Danube and Dniester rivers) and Eastern Sivash lagoons. It is necessary to take into consideration the fact that the total square of reed growths in these sites account for more than 120,000 ha, and all wetlands are of international importance. The time expenditures for the aeroplane surveys should be as follows:

- Danube delta — 5 hours.
- Dniester delta — 4 hours.
- Dnieper delta — 4 hours.
- Eastern Sivash — 5 hours.

Management actions related to the programme chapter's execution

To develop a detailed budget for planned work.

To hold a training seminar on methods of co-ordination and field work.

To prepare, copy and supply all the participants with the necessary methodological materials (counting forms, printed bird counting methods

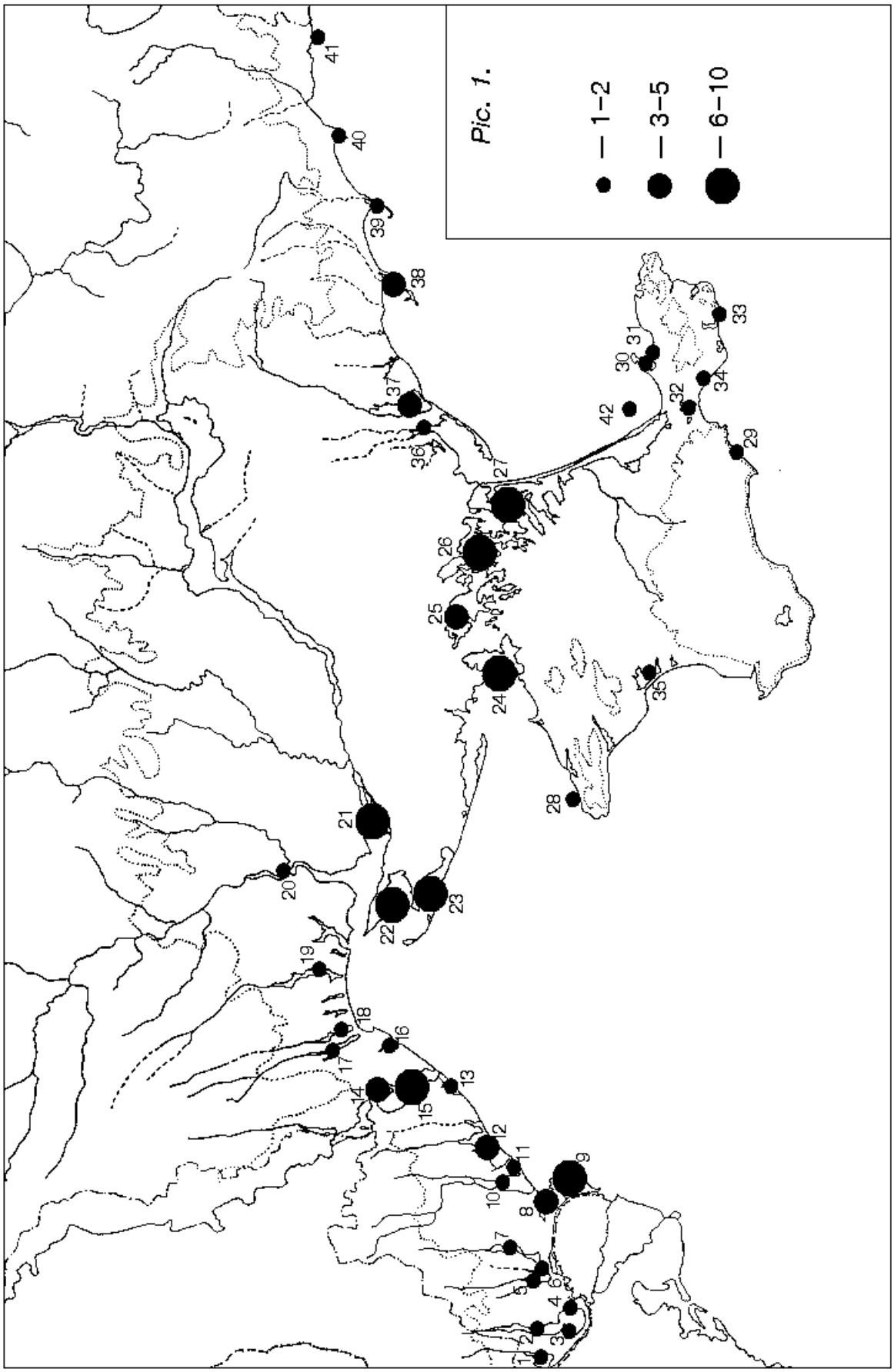

Pic. 1.
— 1–2
— 3–5
— 6–10

Table 1.

№	Wetland	Status	Main biotope groups				Dominating bird groups								
			Accumulative islands and spits	Reed marshes and inundated sites	Saline land degradations	Rocky cliffs	Podicipedidae	Phalacrocoracidae	Ardeidae	Threskiornithidae	Anatidae	Rallidae	Limicolae	Lari	Passeriformes
1	Kagul lake	N	—	2	—	—	3	—	3	—	2	2	3	—	3
2	Kartal lake	I		1	—	—	3	2	1	1	1	2	3	—	2
3	Yalpug lake	N	2	2	2	—	3	—	3	—	3	3	—	—	3
4	Kugurlui lake	I		2	3	—	3	—	2	2	2	3	—	—	3
5	Safyan lake	R	—	3	3	—	3	—	—	—	3	3	3	—	3
6	Katlabukh lake	N	—	3	3	—	3	—	—	—	3	3	—	—	3
7	Kitai lake	N	—	2	2	—	3	—	3	—	3	3	—	—	3
8	Zhebrianovskie plavni	N	—	1	3	—	3	2	1	1	1	2	3	—	2
9	The branch of the Danube river near Kilia	I	2	1	2	—	1	1	1	1	1	2	3	2	1
10	Sasyk lake	I	2	1	3	—	3	—	—	—	—	—	3	—	3
11	Dzhantasheiskoe lake	N	1	—	2	—	—	—	—	—	3	3	3	—	3
12	A system of lakes Shagany-Alibei-Burnas	I	1	—	2	—	3	—	—	—	3	3	2	2	3
13	Budakski liman	N	3	—	2	—	—	—	—	—	—	3	3	—	3
14	Mezhdurechenskie plavni (Dniester-Turunchak)	I	—	1	—	—	2	2	1	3	1	2	—	—	1
15	The northern part of Dniester liman	I	2	1	—	—	2	2	1	—	1	2	3	—	1
16	Sukhoi liman	R	3	—	2	—	—	—	—	—	3	—	3	—	3
17	Khadzhibeiski liman	N	2	1	2	—	3	—	3	—	3	3	2	3	3
18	Kuialnitski liman	N	1	—	2	—	—	—	—	—	3	3	2	2	3
19	Tiligulski liman	I	1	1	1	—	3	—	2	3	2	2	1	2	2
20	Plavni of the Yuzhni Bug river	R	—	1	2	—	3	—	3	—	2	3	—	—	3
21	Dnieper delta	I	—	1	—	—	2	—	1	—	1	1	—	—	1
22	Yagorlytski bay	I	1	3	2	—	—	2	2	—	1	3	1	1	2
23	Tendrovski bay	I	1	3	2	—	—	2	—	—	2	—	1	1	2
24	Karkinitski and Dzharylgachski bays	I	1	3	1	—	2	1	1	1	1	2	1	1	1
25	Western Sivash	N	2	2	3	—	3	—	—	—	2	2	1	1	2
26	Central Sivash	I	1	2	1	—	3	1	—	—	3	3	1	1	3
27	Eastern Sivash	I	1	1	1	—	1	1	1	1	1	1	1	1	1
28	Wetlands of Tarkhankut	N	—	—	—	1	—	1	—	—	—	—	—	3	—
29	Karadagski bay	N	—	—	—	1	—	2	—	—	—	—	—	3	—
30	Aktashskoe lake	N	2	—	2	—	3	—	—	—	3	3	1	1	3
31	Astaninskie plavni	N	3	1	3	—	3	—	3	—	2	3	1	1	2
32	Achi lake	R	1	—	2	—	—	—	—	—	—	3	2	3	—
33	Coast near Opuk mountain	R	—	—	—	1	—	2	—	—	—	—	—	3	—
34	Akmanaiskoe lake	R	2	—	1	—	—	—	—	—	—	—	2	3	3
35	Sasyk liman (Crimea)	R	3	—	2	—	—	—	—	—	3	—	3	—	3
36	Utlukski liman	N	2	—	2	—	3	—	—	—	3	3	2	—	3
37	Molochni liman	I	1	1	2	—	2	1	1	—	2	3	3	3	2
38	Obitochnaia spit and bay	I	1	1	2	—	3	1	2	—	2	3	2	1	2
39	Berdianskaia spit and bay	I	2	2	2	—	3	3	3	—	3	3	3	3	3
40	Belosaraiskaia spit and bay	I	3	—	2	—	—	—	—	—	3	—	3	3	3
41	Krivaia spit and bay	I	2	—	2	—	3	—	—	—	3	3	1	1	2
42	Azovskie wetlands «Korabli»	R	2	—	—	—	—	1	—	—	—	—	—	1	—

Table 2.

№	Wetlands	Executive organisations	Minimum car route length, km	Time management of boats usage, hrs	Main car routes, km	Number of visits	Number of		Man-days
							Days	Persons	
1	2	3	4	5	6	7	8	9	10
1	Kagul lake	Danube Biosphere Reserve,	61	1-2		1	4	4	16
2	Kartal lake	Odessa University,	64	3		2	6	4	24
3	Yalpug lake	Nature Heritage Fund	110	—		1	4	4	16
4	Kugurlui lake		174	4	600	2	6	4	24
5	Safyan lake		25	—		1	1	2	2
6	Katlabukh lake		82	2		1	4	4	16
7	Kitai lake		86	—	600	1	2	4	8
8	Zhebrianovskie plavni	Danube Biosphere Reserve	96	6		2	8	2	16
9	The branch of the Danube river near Kilia	Danube Biosphere Reserve, Odessa University,	70	24		2	34	2	68
10	Sasyk lake	Nature Heritage Fund,	91	2	320	1	10	4	40
11	Dzhantasheiskoe lake	Odessa Zoo	40	1		1	2	4	8
12	A system of lakes Shagany- Alibei- Burnas		150	6	240	2	20	4	80
13	Budakski liman	Odessa University	48	2	120	1	8	2	16
14	Mezhdurechenskie plavni (Dniester-Turunchak)	Nature Heritage Fund	110	16	90	2	20	4	80
15	The northern part of Dniester liman		128	12	90	2	15	4	60
16	Sukhoi liman	Odessa University	40	—	80	1	4	3	12
17	Khadzhibeiski liman		32	—	60	1	4	2	8
18	Kuialnitski liman	Odessa University, Odessa Zoo	38	2	68	1	4	3	12
19	Tiligulski liman	Odessa University	280	3	240	2	20	6	120
20	Plavni of the Yuzhni Bug river	Nature Heritage Fund	82	2	300	1	3	4	12
21	Dnieper delta	Azov- Black Sea Ornithological Station, Black Sea Biosphere Reserve	360	18	440	1	30	6	180
22	Yagorlytski bay	Black Sea Biosphere Reserve	160	12	120	2	26	4	104
23	Tendrovski bay	«Lebiazhi Islands» Nature Reserve, Azov- Black Sea Ornithological Station, Institute of Zoology NAS of Ukraine, Nikitski Botanical Garden	200	18	112	2	28	4	112

Continuation of the Table 2.

1	2	3	4	5	6	7	8	9	10
24	Karkinitski and Dzharylgachski bays	Azov-Black Sea Ornithological Station	428	4 4	400	2	18 20	3 4	54 80
25	Western Sivash		840	—	428	2	14	6	84
26	Central Sivash		1720	2	600	2	30	7	210
27	Eastern Sivash		1880	3	480	2	40	7	280
28	Wetlands of Tarkhankut		160	—	240	1	10	3	30
29	Karadagski bay	Karadagski Nature Reserve, Nikitski Botanical Garden	80	3		1	8	4	32
30	Aktashskoe lake	Azov-Black Sea Ornithological	42	1		1	4	3	12
31	Astaninskie plavni	Station	24	1	440	1	4	3	12
32	Achi lake	Nikitski Botanical Garden,	35	—	280	1	5	2	10
33	Coast near Opuk mountain	Crimean Epidemic Station,	22	—	240	1	6	2	12
34	Akmanaiskoe lake	Karadagski Nature Reserve	26	—	—	1	5	2	10
35	Sasyk liman (Crimea)		56	—	200	1	6	2	12
36	Utlukski liman	Azov-Black Sea Ornithological	120	—	300	1	12	3	26
37	Molochni liman	Station	84	2	240	2	10	4	40
38	Obitochnaia spit and bay		150	1	360	2	16	4	64
39	Berdianskaia spit and bay	Donetsk Board of the Ministry for Environmental Protection and	25	—	340	1	15	4	60
40	Belosaraiskaia spit and bay	Nuclear Safety	16	—	70	1	10	4	40
41	Krivaia spit and bay		40	—	240	1	10	4	40
42	Azovskie wetlands «Korabli»	Azov-Black Sea Ornithological Station	—	3	—	1	4	2	8
	Total		***8275***	**159**	***8338***		**510**		**2150**

Table 3.

Wetland		Minimum car route size, km	Time management of boats usage, hrs	Number of expedition visits	Main car routes, km	Number of		Man-days
Status	Number					days	persons	
International importance, such as:	19	6130	134	33	4982	384		1760
- with two visits;	14	5598	114	28	3572	309	65	1400
- with one visit.	5	532	20	5	1410	75	22	360
National and local importance.	23	2145	25	25	3356	126	70	390
Total	**42**	***8275***	**159**	***58***	***8338***	**510**		**2150**

(counting forms, printed bird counting methods etc.) and maps.

To hold a final meeting to discuss the results of field work and the preparation of scientific reports.

The collection and interpretation of information and publishing of results

The information on the results of the survey of nesting waterbird species in the region will be put onto a database. The collective monograph will be prepared based on the information obtained.

Chapter 2. Action plan on the monitoring and waterbird seasonal distribution and migrations

The functional importance of different wetlands of the region for migratory birds

The principal wetland differences are directly reflected in the way that the monitoring is to be carried out. The wetlands must be divided into three large groups in terms of their functional importance.

1. The first sites group predominately plays an important role in forming the directions of waterfowl migrations. To these sites one can determine the small and large riverbeds and small river mouth complexes. Such wetlands have less importance, in the light of the birds' seasonal concentrations, than a riverbed as a direct agent. This group also includes a narrow sea coast.

Taking into consideration the big number of small rivers in the south of the Ukraine, it is very important to promote the monitoring of waterfowl migrations along the beds, as well as to investigate the species and the terms of flying.

If the migrations taking place among large riverbeds were explored previously, and the primary data for long term monitoring is there, then the work connected with the small rivers is not provided at any point, in spite of their significance to the migratory route.

2. The second group of sites has double properties and includes a lot of wetlands in the region. The wetlands of this group are accomplished as the continental migratory branches and serve as sites for temporary or curative feeding and for moulting bird congregations. Most of these are half-closed and closed small river estuaries and large riverbeds. The monitoring among these sites must include not only control over migrations but also the counting of seasonal bird congregations. The main parts of these sites also adjoin coastal places and agricultural lands. Their investigation significantly increases the area of control sites.

3. To the next group one can refer to the large shallow open sea bays and lagoons. They are Yagorlytski, Tendrovski, Karkinitski bays (Black Sea basin), Obitochnaia and Berdianskaia bays (Azov Sea basin), and the Tuzlovskaia group of limans. These sites have the main role in the distribution of numerous congregations of waterfowl during the migrations, post-nesting wanders and moult. The main resources of regional waterfowl are concentrated here. Seasonal control over it is one of the principal tasks of the programme.

With the aims of maximum efficacy of the monitoring and essential data for various wetland types management purchase, the next is proposed. Namely, to determine the priority objects control over ones that should be provided in parallel, using the whole methodological base. The whole specific methodological approaches to the data collection are proposed to work out in the sites of definite sorts:

- half-closed typical coastal estuaries extended in meridian direction, i.e. Tiligulski and Molochni limans;
- riverbed sites, such as Danube, Dniester, Dnieper;
- lagoons of various scales, i.e. Sivash, Tendrovski bay, Tuzlovskaia group of limans.

It is necessary to compile special annexes with the general scientific programme, in which to reflect the key moments of monitoring in the every sites group.

The list of the basic organisations and key executors

The co-ordinating organisation — Azov-Black Sea Ornithological Station (I.Chernichko).

Executive organisations:

- Danube Biosphere Reserve (M.Zhmud);
- Odessa University (A.Korzukov, V.Stoilovski);
- Nature Heritage Fund (I.Rusev);
- Odessa Zoo (A.Tille);
- Kinburn Regional Landscape Park (Z.Petrovich);
- Black Sea Biosphere Reserve (O.Yaremchenko, A.Rudenko);
- «Lebiazhi Islands» Nature Reserve (N.Tarina);
- Karadagski Nature Reserve (M.Beskaravayny);
- Nikitski Botanical Garden (S.Kostin);

• Donetsk Board of the Ministry for Environmental Protection and Nuclear Safety (G.Molodan).

Monitoring organisation structure and time budget

The abundance and diversity of Azov-Black Sea coast wetlands make it necessary to select key sites for monitoring according to the programme. Taking into account the financial peculiarity, the optimum (B) and obligatory (A) set of sites is foreseen. The optimal number of key sites is 85, among them 35 sites are the obligatory minimum for monitoring (Table 4 and Map 2)

To facilitate the planning and carrying out of monitoring work, wetlands were grouped into several plots (Table 5), which are already traditionally divided between local ornithologists.

Table 4.

№	Site	Level of monitoring	Type of site
1	Kagul lake	1	B
2	Yalpug lake	1	B
3	Kugurlui lake	3	A
4	Katlabukh lake	1	B
5	Kitai lake	1	B
6	Zhebrianovskie plavni	2	A
7	Danube delta	3	A
8	Sasyk lake	2	A
9	Dzhantasheiskoe lake	1	B
10	Shagany lake	1	B
11	Alibei lake	2	A
12	Burnas lake	1	B
13	Lebedevskaya spit	1	B
14	Budakski liman	1	B
15	Kuchurganski liman	1	B
16	The nothern part of Dniester liman	2	A
17	Plavni near Dniester liman	1	B
18	Mezhdurechenskie plavni (Dniester-Turunchak)	3	A
19	Khadzhibeiski liman	1	B
20	The upper reaches of Kuialnitski liman	2	B
21	The lower reaches of Kuialnitski liman	3	A
22	Malyi Adzhalyk	1	B
23	The upper reaches of Tiligulski liman	1	B
24	Tiligulski liman	2	A
25	The lower reaches of Tiligulski liman	3	A
26	Berezanski liman	1	B
27	Plavni of the Yuzhni Bug river	1	B
28	Central part of the Dnieper-Bugski liman	1	B
29	Dnieper delta	1	A
30	Southern coast of Kinburn peninsula	2	B
31	Yagorlytski bay	3	A
32	Yagorlytski Kut	2	B
33	Tendrovskaia spit	2	B
34	Tendrovski bay	3	A
35	Bay near Zheleznyi Port	2	B
36	Lower Dnieper	1	B
37	Dnieper near Energodar	1	B
38	Islands Kuchugury	1	B
39	Dzharylgach island	2	A
40	Chumatsko-Karzhinski bay	1	B

Continuation of the Table 4.

№	Site	Level of monitoring	Type of site
41	Perekopski bay	1	B
42	Yarylgach lake	1	B
43	Donuzlav lake	1	B
44	Bokal spit	1	B
45	Lebiazhi islands	3	A
46	North-western Sivash	2	A
47	Kiyatskoe lake	1	B
48	Zelenovski bay	1	B
49	Central Sivash near Churiuk	3	A
50	Sivashski pod	1	B
51	Genicheski bay	2	A
52	Bay near Papanin island	2	A
53	Mouth of Stalnaia river	1	B
54	Mouth of Pobednaia river	3	A
55	Chongarski bay	1	B
56	Yasnopolianskaia bay	1	B
57	Sivash near Basurman	1	B
58	Aigul and Karleut lakes	2	A
59	Mouth of Salgir river	1	B
60	Arabatskaia spit	1	B
61	Indolski bay	2	A
62	Solepromovski bay	2	A
63	Astaninskie plavni	2	A
64	Kerch strait	2	A
65	Uzunlar lake	1	B
66	Primorsko-Feodosiiskie wetlands	2	A
67	Sasyk liman (Crimea)	1	B
68	Kyzyl-Yar lake	1	B
69	Sevastopol bay	1	B
70	Coast near cape Sarych	1	B
71	Coast near Alushta	2	A
72	Karadagski bay	2	A
73	Feodosiiski bay	1	B
74	Biruchi island	1	B
75	Sivashik liman	2	A
76	The southern part of Utlukski liman	2	A
77	The nothern part of Utlukski liman	2	B
78	The lower reaches of Molochni liman	3	A
79	The upper reaches of Molochni liman	3	A
80	Domusla liman	2	B
81	Obitochnaia spit and bay	2	A
82	Berdianskaia spit and bay	2	A
83	Mouth of Berda river	1	B
84	Belosaraiskaia spit and bay	1	B
85	Krivaia spit and bay	2	A

Organisation, time budget and labour intensity

The waterfowl distribution and migrations monitoring must include three directions:

- control over seasonal waterfowl concentrations among reservoirs within different seasons;
- synchronically studying the waterfowl migrations on the sea coast;
- tool methods of studying the population membership of migratory waders and the composition of migratory maps in the frames of the AEWA agreement.

To the first direction:

The exploration of key sites three times in the spring and five times during the autumn (optimal or obligatory, as listed above). These works will be of five weeks duration in the spring and eight weeks in the autumn. All transport costs and working capacities are listed above (Table 6).

The minimum number of participants — 32–34 ornithologists (well prepared amateurs available).

To the second direction:

The synchronised waterfowl migration observations are better done during two five-day periods within two control periods of ten days in spring and within four five-day periods within five periods of ten days during the autumn. The seasonal aspects of migrations make it preferable to carry out the autumn observations in the first year and the spring ones in the second year. The minimum number of participants is 32–33 ornithologists (Table 7).

Table 5.

Name of plot	Sites	Executive organisations
Danube-Prutski	1–7	Danube Biosphere Reserve, Odessa University, Nature Heritage Fund
Tuzlovskaia-Dniester	8–18	Danube Biosphere Reserve, Odessa University, Nature Heritage Fund, Odessa Zoo
Khadzhibei-Bugski	19–26	Odessa University, Nature Heritage Fund, Kinburn Regional Landscape Park
Dnieper-Tendrovski	27–38	Kinburn Regional Landscape Park, Black Sea Biosphere Reserve, Azov-Black Sea Ornithological Station
Karkinitski-Sivash	39–58	Azov-Black Sea Ornithological Station, «Lebiazhi Islands» Nature Reserve, Nikitski Botanical Garden
Sivash-Kerch	59–66	Azov-Black Sea Ornithological Station, Nikitski Botanical Garden, Karadagski Nature Reserve
South Crimean	67–73	Azov-Black Sea Ornithological Station, Nikitski Botanical Garden, Karadagski Nature Reserve
Utlukski-Biruchi	74–80	Azov-Black Sea Ornithological Station
Priazovski	81–85	Azov-Black Sea Ornithological Station, Donetsk Board of The Ministry for Environmental Protection And Nuclear Safety

Table 6.

Name of Plot	Total length of routes per year	Transport means amount	Boats usage	Number of persons	Man-days in spring	Man-days in autumn
Danube-Prutski	2560	1	1	4	140	224
Tuzlovskaia-Dniester	5200	2	1	7	245	392
Khadzhibei-Bugski	2400	2	—	5	175	280
Dnieper-Tendrovski	5600	2	2	7	245	392
Karkinitski-Sivash	19200	3	1	8	280	448
Sivash-Kerch	8800	1	1	4	140	224
South Crimean	3600	1	—	3	105	168
Utlukski—Biruchi	2240	1	1	3	105	168
Priazovski	5920	2	—	3	105	168
Total	**55520**	—	—	**44**	**1540**	**2464**

The synchronised waterfowl migration observations are to be made once every three years and the full counting of wintering birds will take place in winter.

To the third direction:

The model waterfowl group, namely waders tool studying methods, requires special equipment, skills and professional experience. Taking into consideration the vast experience of the Azov-Black Sea ornithological station in the field of tool catch methods, there is some sense in making the station the main power over this work whilst involving the other establishments as collaborators. Such a scheme allows other establishments time to prepare independent catching groups (Table 8) gradually.

The total length of automobile routes when catching may be about 5000 km.

No less than four well-experienced specialists and 3-4 assistants must participate in catch-groups at any one time.

The carrying out of monitoring connected with seasonal bird distribution peculiarities predicts the following directions of expenses: travel (transport) expenses, public transport fees (during the synchronised studying of migrations) food and field living expenses; essential trip and scientific equipment expenses; and payment for the provision of special clothes for ornithological field work in harsh conditions.

Management actions related to the programme chapter's execution

To develop a detailed budget of planned work.

To hold a training seminar on methods of co-ordination and field work

To prepare, copy and supply all the participants with the necessary methodological materials, such as counting forms, printed bird counting methods etc., and maps.

To hold a final meeting to discuss the results of field work and the preparation of scientific reports.

Table 7.

Name of plot	Number of observation points	Man-days in spring	Man-days in autumn
Danube-Prutski	3	40	80
Tuzlovskaia-Dniester	2	30	60
Khadzhibei-Bugski	2	40	80
Dnieper-Tendrovski	3	60	120
Karkinitski-Sivash	5	100	200
Sivash-Kerch	2	40	80
South Crimean	1	20	40
Utlukski-Biruchi	1	10	20
Priazovski	2	40	80
Total	**21**	**380**	**760**

Table 8.

Name of plot	Number of catching days in spring	Number of catching days in autumn	Number of persons	Man-days per year
Danube-Prutski	0	0	0	0
Tuzlovskaia-Dniester	10	10	3	60
Khadzhibei-Bugski	3	3	3	18
Dnieper-Tendrovski	0	0	0	0
Karkinitski-Sivash	21	35	4	224
Sivash-Kerch	0	0	0	0
South Crimean	0	0	0	0
Utlukski-Biruchi	0	10	3	30
Total	**34**	**58**	**7**	**332**

The collection and interpretation of information and publishing of results

The information on the seasonal concentrations of waterfowl in the region can include up to 50,000 records annually, with 16 fields. The computer input of such information at a high level will require no less than 120–140 man-days.

The information on the synchronised observations of bird migration can account for 18,000–20,000 of records with 48 fields. The input of this information will require about 50–60 man-days.

The catching and ringing information will number up to 5,000 records with 33 fields. The input of this data will require 12–15 man-days.

Due to the seasonal charge for office equipment, it is necessary to plan the purchase of additional computers, for those establishments that will input the information, as well as the purchase of accompanying materials.

In terms of the results of the monitoring, the preparation of the following group of publications is a matter of great importance; «The waterfowl number and distribution in the sites of international and regional importance on Azov-Black Sea coast of Ukraine»; «Time, area and species structure of Azov-Black Sea coast flyways» ; and «Intercontinental links of migratory waders and model species fly atlases for the south of Ukraine».

Chapter 3. Action plan on the monitoring of wintering waterbirds

The functional importance of different wetlands of the region for bird wintering

The method of realisation for monitoring depends mainly on the functional significance of the reservoir. Based on this feature they can be divided into three groups:

1. The first has huge importance for the accumulation of wintering bird groups. In this aspect all the reservoirs, including the mouths and limans of small rivers, natural and artificial ponds, and flooding pods are relevant. The migratory period for the region's wintering birds ends on these reservoirs. That is why wintering monitoring coincides with the monitoring of migratory and seasonal congregations and takes place at the same time. This assumes the definite succession of investigations of the monitoring of bird migrations and wintering.
2. The reservoirs of the second group, except for the features mentioned above, serve as sites for wintering dislocation until the spring migration starts. The wintering congregations could be temporary, or on these basins dependant on the winter weather conditions and the state of the food base/ the basic state of the food. The large riverbeds, big sea-locked lakes, limans and reservoirs are referred to the second group.
3. The third group includes the spacious aquatic areas and adjoining coastal sites, i.e. large shallow sea bays and lagoons. They have non-freezing plots even in severe winters and possibilities for birds to rest and feed.

The main resources for wintering waterbirds are concentrated among the reservoirs of the first and second groups.

It should be mentioned that the pattern of bird distribution and their number depends upon the food base state of the agricultural land adjoining the reservoirs in this region. This peculiarity must be taken into account in two ways:

1. The territory that will be controlled during the monitoring realisation should cover an area much larger than the reservoir (the birds fly to feeding sites covering 20km or more). This situation reflects on investigation expenditures.
2. Knowing the bird food-prey peculiarities, one could later impact on wintering conditions and regulate by this the crop rotation of agricultural plants.

The list of the basic organisations and key executors

The co-ordinating organisation — Azov-Black Sea Ornithological Station (V.Popenko).

Executive organisations:

- Danube Biosphere Reserve (M.Zhmud);
- Odessa University (A.Korzukov, V.Stoilovski);
- Nature Heritage Fund (I.Rusev);
- Odessa Zoo (A.Tille);
- Kinburn Regional Landscape Park (Z.Petrovich);
- Black Sea Biosphere Reserve (O.Yaremchenko, A.Rudenko);
- «Lebiazhi Islands» Nature Reserve (N.Tarina);
- Karadagski Nature Reserve (M.Beskaravayny);
- Nikitski Botanical Garden (S.Kostin);
- Crimean Epidemic Station (N.Tovpinets);
- Donetsk Board of the Ministry for Environmental Protection and Nuclear Safety (G.Molodan).

Monitoring organization structure and time budget

Key sites and levels of monitoring

The full exploration of all regional wetlands will be an idealistic variant. However, taking into consideration the financial difficulties and the territory scale, diversity and wetland abundance it is necessary to determine the key sites for the realisation of investigations. The minimum (A) and optimum (B) amount of sites are stipulated in the action plan. The optimal number of key sites are 87, among them 46 sites are the obligatory minimum for monitoring (Table 9 and Map 3).

The key sites are grouped into several plots according to the area featured for work co-ordination relieves (Table 10).

Table 9.

№	Site	Level of monitoring	Type of site
1	Kagul lake	1	B
2	Yalpug lake	1	B
3	Kugurlui lake	3	A
4	Katlabukh lake	1	B
5	Kitai lake	1	B
6	Zhebrianovskie plavni	2	A
7	Danube delta	3	A
8	Sasyk lake	3	A
9	Dzhantsheiskoe lake	1	B
10	Shagany lake	1	B
11	Alibei lake	2	A
12	Burnas lake	1	A
13	Budakski liman	1	B
14	Kuchurganski liman	1	B
15	The nothern part of Dniester liman	1	B
16	The southern part of Dniester liman	2	A
17	Khadzhibeiski liman	2	B
18	The upper reaches of Kuialnitski liman	2	B
19	The lower reaches of Kuialnitski liman	3	A
20	Malyi Adzhalyk	1	B
21	Tiligulski liman	2	A
22	Berezanski liman	1	B
23	Central part of the Dnieper-Bugski liman	1	B
24-25	Dnieper delta	1	A
26	Yagorlytski bay	3	A
27	Tendrovski bay	3	A
28	Dzarylgachski bay	3	A
29	Chumatsko-Karzhinski bay	1	B
30	Kalanchakski bay	2	A
31	Karadaiski bay	2	B
32	Perekopski bay	2	B
33	Kartkazatski bay	2	A
34	Mouth of Vorontsovka river	1	B
35	Kumovskie plavni	1	B
36	Lebiazhi islands	2	A
37	Bokal spit	2	B
38-39	Yarylgach bay and lake	1	B
40	Donuzlav lake	1	B
41	Western Sivash	2	A
42	Staroe lake	1	B
43	Krasnoe lake	1	B
44	Kiyatskoe lake	1	B
45	Central Sivash	3	A
46	Agaimanski pod	3	A
47-48	Aigul and Karleut lakes	2	A
49	Yasnopolianskaia bay	2	A
50	Chongarski bay	3	A
51	Genicheski bay	2	A
52	Bay near Papanin island	2	A
53	Dzhankoiski bay	3	A
54	Bay of Stalnaia river	3	A
55	Kalinovski bay	3	A
56	Bay and plavni near village Stefanovka	3	A
57	Bay and plavni near village Slavyanka	3	A
58	Mouth of Salgir river	2	B
59	Indolski bay	2	B
60	Solepromovski bay	2	B

Continuation of the Table 9.

№	Site	Level of monitoring	Type of site
61	Bay near village Krasnovka	1	B
62	Arabatskaia spit	2	A
63	Arabatski bay	2	B
64	Kazantipski bay	1	B
65	Aktashskoe lake	2	A
66	Astaninskie plavni	2	A
67	Kerch strait	1	B
68	Uzunlar lake	1	B
69	Primorsko-Feodosiiskie wetlands	2	A
70	Feodosiiski bay	2	A
71	Sasyk liman (Crimea)	1	B
72	Kysyl-Yar lake	1	B
73	Sevastopol bay	1	B
74	Coast near cape Sarych	1	B
75	Coast near Alushta	2	A
76	Karadagski bay	2	A
77	Lake near village Frunze	2	A
78	Sivashik liman	3	A
79	The southern part of Utlukski liman	2	A
80	The nothern part of Utlukski liman	3	A
81	Molochni liman	3	A
82	Domusla liman	2	B
83	Obitochnaia spit and bay	2	A
84	Berdianskaia spit and bay	2	A
85	Mouth of Berda river	1	B
86	Belosarayskaia spit and bay	1	B
87	Krivaia spit and bay	2	A

Organisation, time budget and labour intensity

The monitoring of waterbirds wintering assumes three counting realisations:

1. With the aim of control over wintering congregations to be formed: from the third ten days of November to the second ten days of December — in the area of sites B.
2. For the control over wintering state: mid-winter counting in the second ten days of January — in the area of sites A and B.
3. For the control over the disintegration of winter congregations; between the first and third ten days of February.

The time budget and number of participants for carrying out bird counts are presented in Table 11.

About 27–30 ornithologists will take part in the counting. The total length of automobile routes per year can be 30,300 km.

Once in every three years it will be necessary to air-count the wintering birds at the same time as the mid-winter land counts are taking place.

To carry out the monitoring linked with wintering birds will require expenditures such as: transport costs (aerial, car and boat counting; public transport fees); food and hotel expenses; equipment etc.

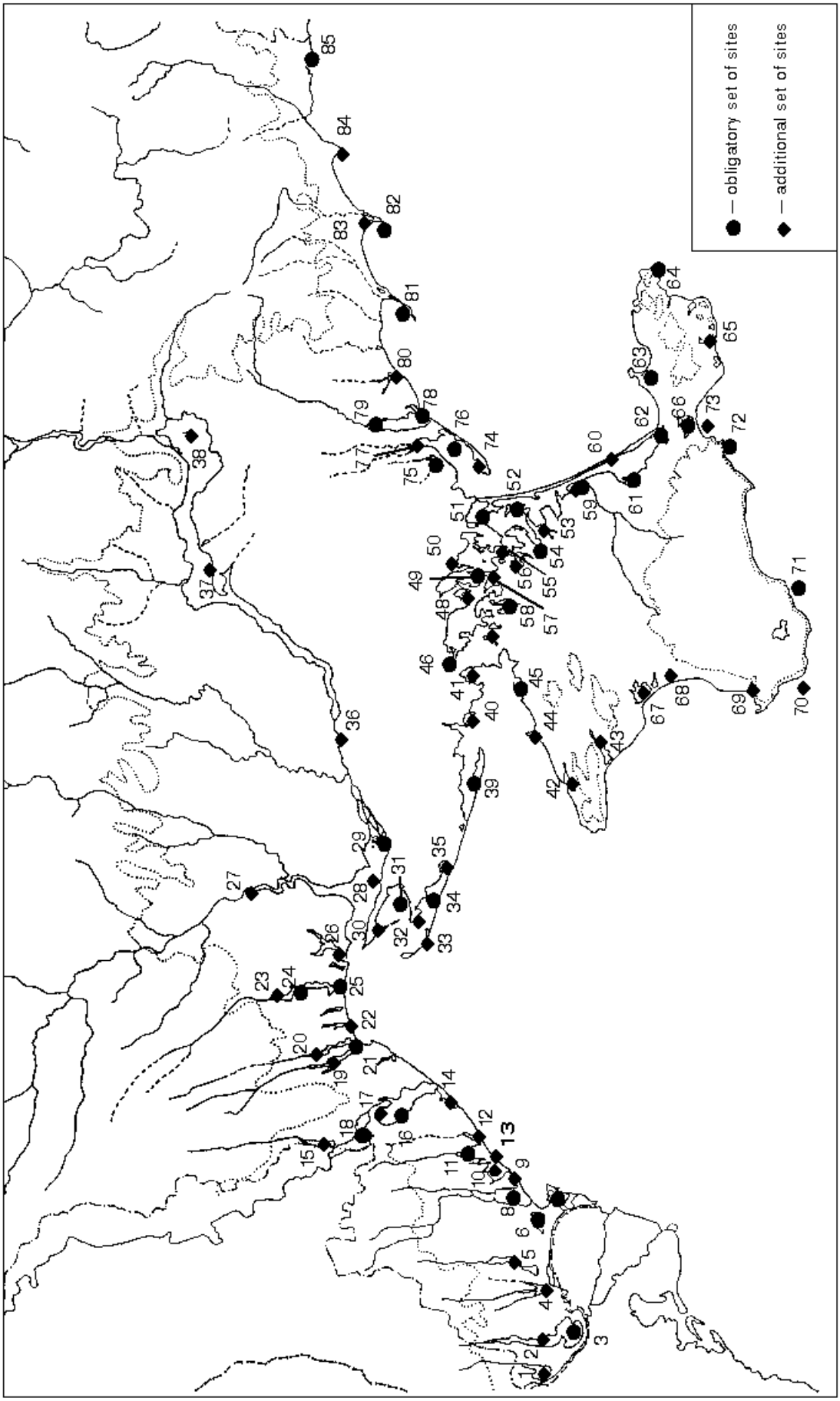
Management actions related to the programme chapter's execution

To develop a detailed budget of planned work.

To hold a training seminar on methods of co-ordination and field work.

To prepare, copy and supply all the participants with the necessary methodological materials such as counting forms, printed bird counting methods etc. and maps.

To hold a final meeting to discuss the results of field work and the preparation of scientific reports.



Map 2. Sites for monitoring of waterbirds seasonal distribution and migrations (names of sites see in Table 4)

The collection and interpretation of information and publishing of results

It is necessary to take into consideration all expenditures and time budgets connected with data interpretation (filling the counting sheets in, computer input etc.). Such activities will require about 100 man-days and the volume of information will be up to 40,000–45,000 records, each with 16 fields. The purchase of additional computers and expanding materials for organisations responsible for creating databases should be planned. The data that is to be interpreted by the executive organisation will be gathered by the co-ordinating organisation that has managed the general report preparation and group publications in the whole region. It is desirable to publish the general monitoring conclusions in subject volumes, as the Nature Heritage Fund does. The group monograph «The state of waterfowl wintering in the south of the Ukraine» must be the general report.

Table 10.

Name of plot	Sites	Executive organisations
Danube-Prutski	1–7	Danube Biosphere Reserve , Odessa University , Nature Heritage Fund, Odessa Zoo
Tyzlovskaia-Dniester	8–16	Danube Biosphere Reserve , Odessa University , Nature Heritage Fund, Odessa Zoo
Khadzhibei-Bugski	17–22	Odessa University , Nature Heritage Fund, Kinburn Regional Landscape Park
Dnieper-Tendrovski	23–27	Kinburn Regional Landscape Park, Black Sea Biosphere Reserve , Azov-Black Sea Ornithological Station
Karkinitski-Sivash	28–62	Azov-Black Sea Ornithological Station , «Lebiazhi Islands» Nature Reserve , Nikitski Botanical Garden , Crimean Epidemic Station
Kerch	63–70	Azov-Black Sea Ornithological Station , Karadagski Nature Reserve , Nikitski Botanical Garden , Crimean Epidemic Station
South Crimean	71–76	Azov-Black Sea Ornithological Station , Karadagski Nature Reserve , Nikitski Botanical Garden , Crimean Epidemic Station
Utlukski-Biruchi	77–82	Azov-Black Sea Ornithological Station
Priazovski	83 –87	Azov-Black Sea Ornithological Station , Donetsk Board for Ministry of Environmental Protection And Nuclear Safety

Table 11.

Name of plot	Total route length per year	Number of persons	Man-days on sites A and B	Man-days on sites B	Man-days per year	Number of transport means
Danube-Prutski Tyzlovskaia-Dniester Khadzhibei-Bugski	7500	8	80	120	200	5
Dnieper-Tendrovski	3700	6	30	50	80	2
Karkinitski-Sivash	5800	11	88	120	208	3
Kerch	4900	6	24	44	68	2
South Crimean	3000	6	24	40	64	2
Utlukski-Biruchi	1700	5	20	40	60	1
Priazovski	3700	6	30	48	78	2
Total	**30300**	***48***	**296**	**462**	***758***	—