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An atlas of movements of Southwest Siberian waterbirds

J. Veen[1], A.K. Yurlov[2], S.N. Delany[3], A.I. Mihantiev[2], M.A. Selivanova[2] & G.C. Boere[4]

[1] VEDA consultancy, Wieselseweg 110, 7345 CC Wenum Wiesel, The Netherlands
[2] Institute for Systematics and Animal Ecology, Siberian Branch of the Russian Academy of Sciences, 11 Frunze Street, Novosibirsk 91, Siberia, Russian Federation
[3] Wetlands International, Droevendaalsesteeg 3A, PO Box 471, 6700 AL Wageningen, The Netherlands
[4] Dorrewold 22, 7213 TG Gorssel, The Netherlands

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An atlas of movements of Southwest Siberian waterbirds

This atlas was produced in the framework of the project “Conservation of wetlands and wetland species in Southwest Siberia (Russian federation)”. The project was co-ordinated by Wetlands International and carried out in co-operation with the following organisations:

Institute for Systematics and Animal Ecology (ISAE), Novosibirsk, Siberia, Russian federation

ISEA
Institute for Systematics and Animal Ecology, Russia

Institute for Water and Environmental Problems (IWEP), Novosibirsk, Siberia, Russian federation

IWEP
Institute for Water and Environment Problems, Russia

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Ministry of Agriculture, Nature and Food Quality, The Netherlands

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Buitenlandse Zaken

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Executive summary

This *Atlas of movements of Southwest Siberian waterbirds* is a contribution to the knowledge of the migratory movements of Siberian waterbirds, with special reference to the Central Asian Flyway Action Plan, which was adopted in New Delhi in 2005, and which aims at a better protection of Central Asian waterbirds, and their habitats, based on sound ecological knowledge.
The 'study area' measures about 1700x1200 km and is situated in Southwest Siberia (figure 2). It covers four important vegetation zones (taiga, mixed and broadleaf forest, forest steppe and steppe), includes the cities of Novosibirsk, Tomsk and Omsk, and is characterised by numerous lakes, rivers and other water bodies.
The atlas depicts and analyses data of birds ringed in the study area and recovered elsewhere (direct recoveries) as well as birds ringed in other parts of the world which were recovered in the study area (indirect recoveries). Altogether, 25 species are included belonging to the following species groups: herons (1), geese (3), ducks (10), coots (1), waders (5), gulls (4), terns (1).

The results section starts with a tabulated overview of the ecological characteristics of the various species (Table 1). All species appear to be 'true waterbirds', which means that they depend for the main part of their life on marshes, creeks, rivers, lakes, or other wetlands . They nearly all arrive in the study area in the month of April (some in May) and disappear in October (some in September or the beginning of November). The timing of arrival and departure are directly related to the harsh Southwest Siberian winter with severe frost and heavy snow fall.

The species accounts show maps of both direct and indirect recoveries. During autumn migration most species migrate in a predominantly southwest to southerly direction, but some species take an almost westerly course. A small number of recoveries (only Northern Pintail, Eurasian Wigeon and Common Pochard) were situated east of the study area. It is assumed that birds migrating in a south-easterly direction are strongly underrepresented in the material analysed. No recoveries at all (out of a total of 4525) were obtained from Mongolia and China, whereas it is likely that a number of species do migrate to these countries. It is important to remember this bias in the ring recovery data when interpreting the information presented. For most duck species maps have been drawn showing details of the distribution of indirect recoveries within the study area. For all species, the west to east position of wintering sites appears to correlate with the west to east mean position of recoveries within the study area.
Finally, the distribution of direct and indirect recoveries has been related to flyway populations. To this end the position of recoveries has been compared with different flyways as distinguished by Scott and Rose (1996) for ducks and by Wetlands International 2002 for the other species. Data are given in Table 2.

The conclusions and discussion section pays special attention to the extent to which the various species make use of different flyways (figure 43). Most species use more than one flyway (variation between species from 1 to 5) and it is concluded that Southwest Siberia is in fact a crossroads of flyways. The distribution of indirect recoveries of ducks is summarised (figure 44). Is concluded that the geographical positions of wintering areas correlate with the mean geographical positions of recoveries in the study area. However, there is still a considerable degree of mixing within the breeding area of birds migrating in different directions.
Special attention is given to the importance of moulting areas for ducks. At Lake Chany and Lake Mai-Sor, numbers of moulting ducks decreased considerably in the course of the twentieth century. This may have been caused by an overall population decline of ducks in the Russian Federation and/or intensive harvesting by man. It is suggested that the function of the moulting areas at lake Chany and Lake Mai-Sor may (partly) have been taken over by lakes in northern Kazakhstan and/or the Volga Delta (northern Caspian Sea). Large moulting areas are unusual and need appropriate protection, as they are shown to attract breeding birds from an enormous area.

Introduction

Waterbirds and wetlands

Most waterbird species depend on wetlands throughout much of their life cycle. These habitats are often separated from one another by vast areas of non-wetland habitat. Besides they are very much threatened, all over the world, having suffered losses of more than 50% in many countries.

Many waterbird species are migratory, depending on a network of sites throughout their range to complete their annual cycle. This network of sites may extend over thousands of kilometres, being situated in a large number of countries. Very often, individual sites play a crucial role in enabling the birds to rest and feed before moving on to the next site in the network.
The conservation of a migratory waterbird species should consider all key sites within the network used by that species. This implies that protective measures should be taken in an international framework. A number of international conventions specifically focus on the protection of (migratory) waterbirds and their habitats, such as the *Convention on Wetlands of International Importance especially as Waterfowl Habitat, Ramsar, 1971* (Ramsar Convention) and the *Agreement on the Conservation of African-Eurasian Migratory Waterbirds* (AEWA) under the Convention on Migratory Species (Bonn Convention).
Measures to protect waterbirds must be based on sound knowledge of the biology of the species concerned. Firstly, the geographical area in which a particular population completes its life-cycle should be designated. This is mainly done on the basis of visual observations of the distribution of the species and on an analysis of ring recoveries and/or other migration studies. Secondly, the size of the population should be established, which can be done by carefully considering the results of census programmes. An important tool for this is the International Waterbird Census, carried out in all parts of the world in January each year, under the auspices of Wetlands International. Thirdly, the importance of wetlands used by the species should be quantified in relation to population size, in order to be able to identify key sites. The Ramsar Convention provides the most widely used criteria for designating wetlands which qualify for the list of “Wetlands of International Importance”. It states that “a wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds” (Criterion 5), or that “a wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird” (Criterion 6). Ramsar has also developed a further seven detailed criteria to identify Wetlands of International Importance.

Flyway populations

Migratory waterbirds breeding in arctic and temperate regions of the northern hemisphere usually move in a predominantly southerly direction after the breeding season in northern latitudes. They often use important staging areas before they reach their winter quarters. While breeding distribution is often characterised by dispersion, staging and wintering areas may host large concentrations of birds. The geographical area encompassing a species’ breeding, staging and wintering areas is often referred to as its flyway or flyway area. In many cases a particular species may use various routes leading to different wintering areas. This has led to the distinction of different flyway populations with important implications for conservation. (see also *Text and interpretation of results* in Methods section below.)
Each waterbird population has its own flyway characterised by specific geographical boundaries. However, many of the larger wetlands which are used for staging and wintering are exploited by a variety of waterbird species. Consequently, species specific flyways often overlap to a great extent. This has led to the identification of generalized flyway areas commonly used by a large number of species. Figure 1 gives a worldwide example for the waders (Charadriidae and Scolopacidae) which is also to a large extent valid for other groups of waterbird such as geese and ducks (Anatidae), though the latter usually travel shorter distances. On the African-Eurasian continents 5 main flyways are distinguished: the East Atlantic, Black Sea/Mediterranean, West Asian/East African, Central Asian and East Asian/Australasian flyways.

Our knowledge of the species making use of the flyways mentioned differs to a large extent. Many species using the East Atlantic Flyway have been studied in great detail with respect to breeding, migration and wintering ecology. Good data are also available for species migrating along the Black Sea/Mediterranean Flyway. However, our knowledge of birds migrating along the other flyways is still poor. This can be illustrated by the proportion of flyway populations of waders with unknown trend, which is only 6% (n=47) for the East Atlantic Flyway, 24% (n=33) for the Black Sea/Mediterranean Flyway and between 65% and 85% for the flyways situated in Central and Eastern Asia (Stroud *et al.* 2005). Lack of knowledge means lack of goal directed protection measures. Therefore, considering the very considerable lack of knowledge on distribution, numbers and population trends of Central Asian waterbirds, action has recently been taken to negotiate the terms of a Central Asian Flyway Action Plan to be followed by governments in the region.

The Central Asian Flyway Action Plan

The Central Asian Flyway[1] (CAF) Action Plan deals with a large continental area of Eurasia, between the Arctic and Indian Oceans. It includes important parts of all Eurasian flyways as indicated in figure 1, except the East Atlantic Flyway which is only marginally included. The area covers at least 274 migratory waterbird populations of 175 species, including 26 globally threatened and near-threatened species that breed, migrate and spend

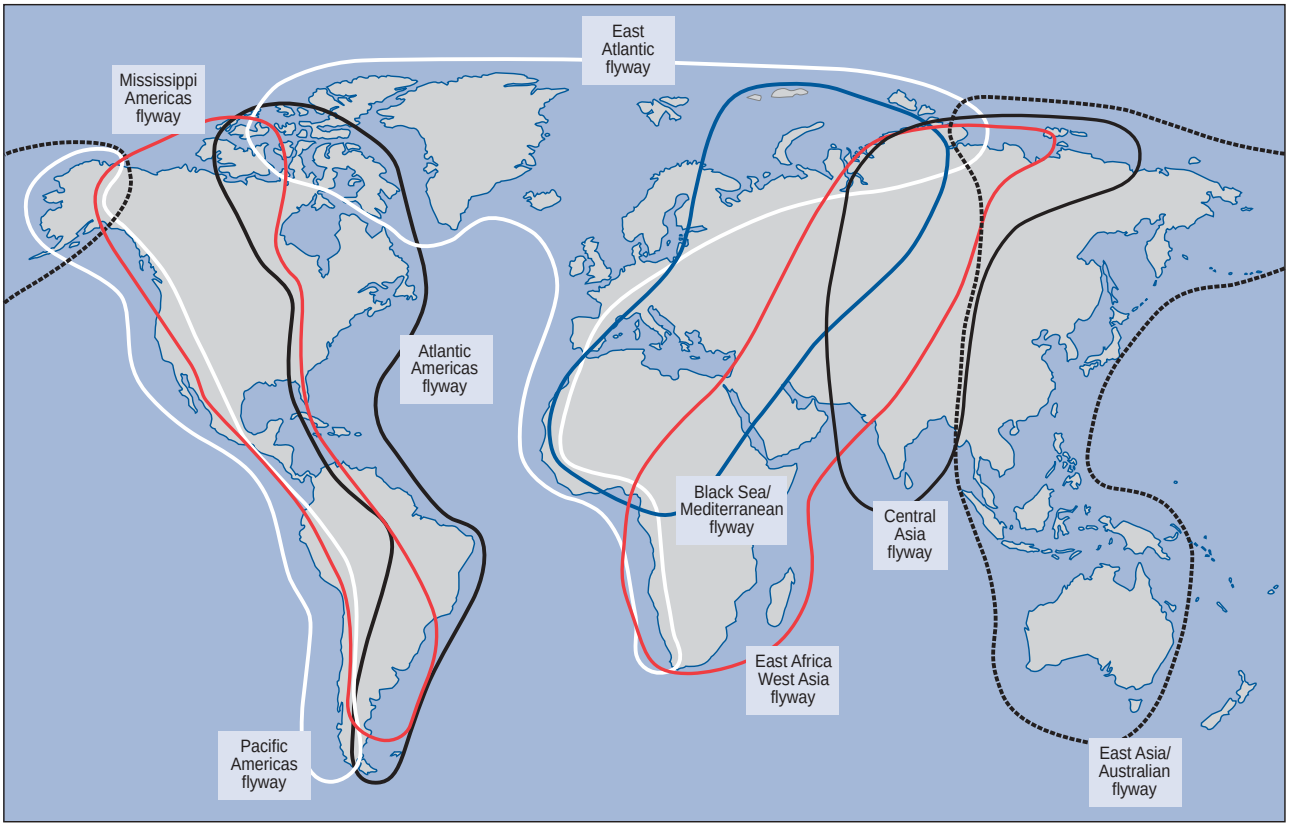

Figure 1. *Example of generalized flyways. In this case flyways of waders (shorebirds) are depicted, as compiled by the Wader Study Group. Courtesy Rodney West.*

the non-breeding period within the region. Furthermore, the migration routes of many species ending up in Africa and South-east Asia pass through the area. The Central Asian Flyway region includes some 30 countries. The plan builds on international co-operation in the region which started in the 1970s and which led to a formal convention between the former USSR and India on the protection of shared migratory bird species (Boere 2003). The Action Plan has been developed during meetings in Tashkent, Uzbekistan, in 2001 and New Delhi, India, in 2005, during which representatives of most countries involved were present. One of the main outputs of the Delhi Conference was the endorsement of the *Central Asian Flyway Action Plan to Conserve Migratory Waterbirds and their Habitats* which had been prepared by Wetlands International on behalf of the Convention on Migratory Species (CMS). The Action Plan sets the agenda for enhanced regional environmental cooperation among the CAF states to promote the conservation of migratory waterbirds and their habitats. The Action Plan builds on and completes actions taken by national governments to promote conservation. In addition it builds on and complements programmes and actions that are being undertaken by various international conventions, including CMS, AEWA, Ramsar and the Convention on Biological Diversity, development agencies and international NGOs. The Delhi Conference stressed the need to implement projects to (a) prepare a directory of sites of international importance, (b) develop a monitoring strategy, (c) prepare a flyway status overview of national and international conservation aspects of migratory waterbirds and their habitats as a basis for cooperative conservation action, (d) prepare a flyway overview of the status and trends of waterbird populations to determine future monitoring and conservation priorities, and (e) establish a flyway network of key contacts and collate an international register of waterbird and habitat projects.

The scope of this study

The production of this atlas has been carried out in the framework of international co-operation between the Russian Federation and The Netherlands funded by the Dutch Ministry of Agriculture, Nature and Food Quality and part of a global programme of support for flyway conservation by the Dutch Government. It is a project with a focus on the protection of waterbirds and their habitats in Southwest Siberia. The project concentrates on two large lake systems, Lake Chany and Lake Kulundinskoye, situated in the Novosibirsk and Altai Regions. For both wetlands, nature values and economic values are described and analysed, and recommendations for sustainable development and better protection

[1] *The CAF area as defined in the framework of the Action Plan has been shaped to include a wide range of waterbird species. Moreover, its boundaries have been adapted to suit the purpose of co-operation between countries. As a consequence, it is somewhat different from the Central Asian Flyway area as depicted for waders in figure 1.*

are given. At present only part of Lake Chany is a Ramsar Site, whereas Lake Kulundinskoye has no protection status.

This atlas describes the migratory movements of a number of waterbird species occurring in South-west Siberia based on ring recoveries. The area under study is situated in the middle of the Central Asian Flyway region as defined by the CAF Action Plan. It covers part of three flyways as distinguished for waders in figure 1 (see area indicated in the figure).
In Southwest Siberia there is a long tradition of ornithological research on waterbirds, which has often included ringing activities. Spread over a period of about 80 years, more than half a million birds have been ringed in the region. Although parts of the ringing data have been analysed for different purposes (see e.g. Pavlov *et al.* 1978, 1982, 1985, 1989, 1997), for most waterbird species the data available have never been analysed or published in detail. The goal of this atlas is to contribute to the designation of flyway populations of migratory waterbirds in the CAF region. Through this we also hope to facilitate the conservation of these wide ranging species by informing national governments and nature conservation agencies in the CAF region , as well as international policy instruments such as the Ramsar Convention and AEWA.

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Study area, material and methods

Study area

This atlas aims at describing the migratory routes of Southwest Siberian waterbirds. The area under study is depicted in figure 2. It encompasses the Administrative Regions of Kurgan, Tyumen, Omsk, Novosibirsk, Tomsk, Kemerovo, Altai and Gorno-Altaisk. The northern part of the area belongs to the taiga zone, with extensive pine-birch forests, marshes and peat bogs.

South of it is a relatively narrow zone with broadleaf and mixed forest, followed by the forest steppe zone, characterised by extensive grasslands, scattered patches of birch and poplar forest, and numerous lakes and marshes. The southernmost part of the area partly belongs to the steppe zone, sparsely covered with short vegetation and with a small number of lakes with varying salinity. The south-easterly part is dominated by the Altai Mountains with different vegetation types largely influenced by altitude. The study area is intersected by two large rivers, the Irtysh and the Ob. Most large cities are situated in or near the forest steppe zone. Tomsk, Omsk and Novosibirsk all have a population of between 700.000 and 2.600.000 inhabitants. Nearly all ringing activities have been carried out in this zone. Ringing localities mentioned and/or depicted in this atlas usually represent birds ringed in a particular region, unless otherwise stated. In many cases such “ringing localities” refer to a relatively large area. Throughout this atlas, the area defined above will be referred to as the “study area”. It forms only part of Southwest Siberia. Nevertheless it should be stressed that it covers a surface area of approximately 1700 km from east to west and 1200 km from north to south, an area about 50 times the size of The Netherlands.

Material

The present analysis of ringing data concentrates on three groups of waterbirds: ducks, Anatidae, waders, Charadridae, Scolopacidae and gulls, Laridae. Only those species which commonly occur in the area and for which at least three recoveries were available have been analysed (some additional data are given in annex 1).

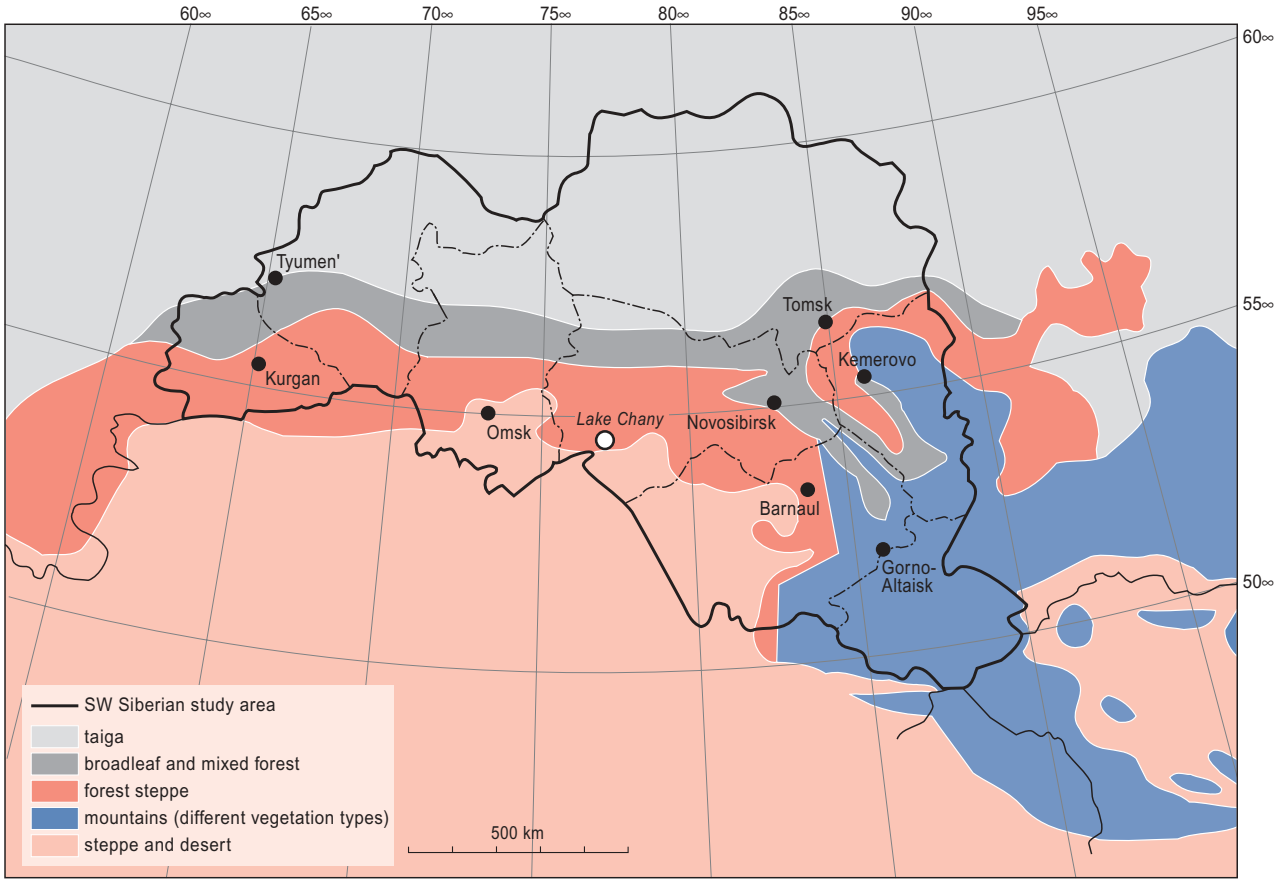


Figure 2. *Map of the study area showing different vegetation zones and administrative regions. Indicated are: the Oblasts (provincies) of Kurgan, Tyumen', Omsk, Tomsk, Kemerovo and Novosibirsk (identified by their similarly named capital cities), the Altaisky Krai (capital Barnaul) and the Republic of Altai (capital Gorno-Altaisk). Lake Chany is indicated as well. Vegetation zones after Wild World Terrestrial Ecoregions, NationalGeographic.com*

The following data sources have been used:

- Database of the Institute for Systematics and Animal Ecology (ISAE), which includes recoveries of ringed gulls, ducks and waders which were mainly ringed at the biological stations near Lake Chany and Karasuk (Novosibirsk Region) and in Omsk Region (main ringing period 1949-2002)
- Data of ringing activities carried out by Tomsk University (mainly Tomsk Region, main ringing period 1970-1990)
- Database of the Moscow Ringing Centre with respect to recoveries within the study area of birds ringed elsewhere. All recoveries are considered as far as they are included in the computer system of the Ringing Centre (whole study area, period 1926-2004). Parts of the data which were missing in the Ringing Centre's database were obtained from the literature.
- Ringing data published by Lebedeva (1957), Mc Clure (1974), Shevareva (1961), Tamanseva (1955), Teplova (1957), Treus (1957 a and b), Vinokurov (1961a and b), Wuczeticz (1941) and Wuczeticz & Tugarinov (1937).

Data analysis

All ringing data mentioned above were first included in one large database, consisting of 4525 recoveries spread over the period 1926-2004. For each waterbird species, birds ringed within the study area and recovered elsewhere (direct recoveries) were separated from those ringed elsewhere and recovered in the study area (indirect recoveries). Data were then separated between birds of different categories and their migratory patterns were compared. Categories considered were age (birds ringed as chicks, juveniles and adults), breeding status (breeding and non-breeding birds), and moulting birds (ducks moulting primary wing feathers). It soon became clear that it was not practical to present the results for such categories on separate maps. In many cases the information available appeared insufficient to reliably separate the birds into these categories. Clear differences were only found between breeding and moulting ducks. These differences, have been explained in the text.

Maps

The distribution maps are adapted to the information available for a particular species and therefore show different geographical areas. The study area, outlined in bold grey, is given as a reference on each map. The following types of map are presented:
1. Maps showing recoveries of birds ringed in the study area. The approximate place of ringing is represented by open circles and recoveries by solid dots. All symbols are in red. As it is our aim to study long distance migration, short-distance recoveries within the study area are not shown.
2. Maps showing ringing locations outside the study area of birds recovered within this area. Ringing places are again represented by open circles and recoveries by solid dots. In this case symbols are in black. Figures near ringing places indicate the number of birds from that particular place recovered in the study area.
3. Maps showing differences in the distribution of recoveries within the study area for birds ringed in different winter locations. Such maps have only been drawn for a number of ducks. Winter locations have been separated on the basis of migration direction relative to the study area: west (Europe), southeast (Caspian Sea area, Africa), south (India, Pakistan) and east (Japan). Symbols of various form and colour have been used, to allow ready separation of categories.
For a number of species the total number of recoveries was rather low, which led us to decide to combine type 1 and type 2 maps, maintaining colour coding.

Text and interpretation of results

The Results start with an introductory section, showing a tabulated overview of breeding status, timing of arrival, breeding habitat, foraging behaviour, migration, moult, and timing of departure of each species. Similarities and differences between species are briefly mentioned in the accompanying text.
Species accounts start with the species name in English, Russian and Latin. Ringing data are described in relation to the available distribution maps. For birds ringed in the study area and recovered elsewhere the number of recoveries, both outside and inside the study area are given, as well as the status of the ringed birds, such as age, breeding, moulting, etc. Direction of migration and the location of wintering areas are described, based on an interpretation of the geographical and temporal distribution of the recoveries. For birds recovered in the study area but ringed elsewhere, the nature of the ringing sites is given special attention. The following types are distinguished: breeding/migration sites, moulting sites, and wintering sites. In most cases the distribution of the recoveries, as shown in the study area, is considered to speak for itself. However, for a number of duck species special maps are presented (type 3 maps) showing the distribution of recoveries within the study area in relation to the direction of the place of ringing. Relationships are described and differences are expressed using "mean position of recoveries".
Following the species accounts the ringing results are considered in the light of flyway populations. A tabulated overview is given showing the extent to which the ring recoveries of each species fit with the geographical area of the flyway populations of that species distinguished by earlier authors. We have mainly followed Scott and Rose (1996) and Wetlands International (2002) for this purpose.

Biases in ring recovery data

Ringing is a powerful tool to study the movements of individual birds and to identify relations between breeding, staging and wintering areas. Combining the results of many recoveries enables specific migratory routes to be defined. There are, however, many biases affecting the interpretation of ringing results, which should be kept in mind when reading this atlas. The chance of a ringed bird being recovered within a particular area strongly depends on factors such as hunting pressure, human population density, education level, environmental

awareness of the population, language spoken and economic situation. These factors vary greatly between different parts of the world and may often lead to differences in recovery rate. Striking examples of these effects were found in the data dealt with in this atlas. Most duck species ringed in Southwest Siberia migrate in several directions between west and south and some were also found to migrate to the east. Several birds were recovered from the Russian side of the Mongolian and Chinese borders, but none of the 4525 recoveries included in our analysis actually came from within these countries. A likely explanation is that the population in these countries has a low awareness of bird ringing and an inability to read latin or cirillic scripts. In this study, recoveries were also strongly affected by the distribution of hunters, with the high number of hunters in Italy, for example, resulting in relatively high numbers of recoveries in this country of Garganey (figure 24) and Common Pochard (figure 27). Hunting also affects the recovery rate of species, so that ducks, which are a prized quarry of hunters in many countries, have a much higher rate of recovery than waders.

It follows from this that a Direct Recovery (a bird ringed within the study area and recovered outside it) tells us something about a bird's whereabouts, but the absence of recoveries from a particular area does not provide information about the contrary situation. In a similar way, there are problems involved with the interpretation of Indirect Recoveries (birds ringed outside the study area and recovered within it). A large number of Indirect Recoveries "proves", at least to a certain extent, that a particular area is an important area for the species. However, once again, no conclusions can be drawn on the basis of the absence of recoveries from a particular area. Indirect recoveries are most affected by the location of active ringing schemes. This has resulted in relatively large numbers of recoveries in the study area of birds ringed in western Europe and in India. Within India, most of the recoveries of ducks in fact originate from the very active ringing station at Bharatpur in Rajastan.

Ecological characteristics of the species

Table 1 gives an overview of some ecological characteristics of the species dealt with in this atlas. Included are species of herons (1), geese (3), ducks (10), coots (1), waders (5), gulls (4) and terns (1). There are a number of characteristics which are strikingly similar across species. Except for two goose species, all species are breeding in the study area. Nearly all of them appear in the area in April, except for some wader species and the Black Tern, which largely depend on invertebrate prey, and which appear in the month of May. Similarly, nearly all species have left the area in October (some in beginning of November), once more with the exception of some of the invertebrate feeding species, which depart in September.

The timing of arrival and departure should be considered in the light of the climatic conditions of the region. Southwest Siberia has a continental climate. Winters are severe, with heavy snow fall and open water being completely frozen. Winter temperatures of -300°C are not unusual and -400°C or less occasionally occur. Winter rapidly sets in at the end of October, whereas the melting of snow and ice starts in April. However, up till the middle of May melting ice (which may reach a thickness of more than a metre in winter) may cover part over the water bodies in the area.

All species breed in grassland or wetland habitat (wet grasslands, marshes, in trees and on islands near rivers and lakes) with the exception of the Lapwing which may also breed in dry grassland and in agricultural fields. Grey Heron, gulls and Black Tern nest in colonies, whereas all other species (ducks, coot and waders) are dispersed nesters. Feeding is also almost exclusively restricted to grassland and wetland habitat.

The data on post-breeding dispersal and migration period as given in the table should be regarded as no more than a rough indication, as no detailed analysis of these characteristics has yet been made.

The phenomenon of moult aggregations of ducks and geese in the period June-August deserves special attention. All adult ducks and geese moult their wing feathers in this period. As a result they are temporarily flightless and thus vulnerable to predation. As a rule wing moult is completed in special moulting areas which provide adequate cover and feeding conditions for a large number of ducks. Moulting aggregation often consist of a variety of duck species and concentrations may amount to hundreds of thousands of individuals. Within the area large numbers of moulting ducks have been caught and ringed at Lake Chany (Novosibirsk Region) and lake Mai-Sor (Omsk Region).

Species	Arrival date	Breeding habitat	Breeding occurrence in Siberian study area	Feeding habitat in SW Siberian study area	Post-breeding dispersal/migration	Departure dateSW
Grey Heron *Ardea cinerea*	April	Reed beds, trees, often near water	Common, colonies up to 150 pairs (S, FS, T)	Grassland, marshes, shallow water	July-August	October
Bean Goose *Anser fabalis*	See migration	Non-breeder (breeds in arctic tundra and taiga)	Non-breeder	Near lakes	Uncommon migrant, End April-May and Sept.-Oct.	See migration
White-fronted Goose *Anser albifrons*	See migration	Non-breeder (breeds in arctic tundra)	Non-breeder	Grassland near lakes	Uncommon migrant May and September	See migration
Greylag Goose *Anser anser*	End March-April	Reed beds	Common (S, FS, T)	Fields, grassland, marshes	Concentrations in FS in 2nd part of August	September-October
Mallard *Anas platyrhynchos*	End March-April	Meadows, other low vegetation	Common (S, FS, T)	Grassland, marshes, open water	July-August moult aggregations	October-November
Gadwall *Anas strepera*	April	Meadows, other low vegetation	Common (S, FS, south T)	Grassland, marshes, open water	July-August moult aggregations	October
Northern Pintail *Anas acuta*	April/May	Meadows, low vegetation	Uncommon (FS), Common north T)	Grassland, marshes, open water	July-August moult aggregations	October
Northern Shoveler *Anas clypeata*	April	Wet meadows, marshes, low vegetation	Common FS, south T)	Marshes, open water	July-August moult aggregations	October

Table 1. *Ecological characteristics of the waterbird species described in this atlas. S = steppe, FS = forest steppe, T= taiga.*

Eurasian Wigeon *Anas penelope*	April	Low vegetation	Rare (north FS) to Common (T)	Grassland, marshes, open water	July-August moult aggregations	October
Common Teal *Anas crecca*	April	Dense grass	Rare (north FS) to Common (T)	Marshes, open water	July moult aggregations	October
Garganey *Anas querquedula*	Late April-May	Wet meadows	Common (FS) to rare (south T)	Marshes, open water	July-August moult aggregations	October
Common Pochard *Aythya ferina*	End of April	Reed beds, marsh vegetation	Common (S, FS) to rare (south T)	Open (deeper) water	June-July moult aggregations	October
Tufted Duck *Aythya fuligula*	End of April	Marsh vegetation	Common (S, FS, T)	Open water	June-July moult aggregations	Middle of October
Common Goldeneye *Bucephala clangula*	April-May	Tree hollows near rivers and lakes	Common (T)	Open water	June-July moult aggregations	Beginning of November
Common Coot *Fulica atra*	End of April	Thick marsh vegetation	Common to numerous (S, FS), or uncommon (T)	Marshes, open water	July-August	October
Northern Lapwing *Vanellus vanellus*	Beginning of April	Agricultural fields, grasslands, open short vegetation	Common (S, FS)	Fields, grassland, mud flats, river banks	From July onwards	October
Wood Sandpiper *Tringa glareola*	May	Grassy meadows, lake shores	Common (T)	Grassland, mud flats, water edge	In May and August-September in FS	September
Marsh Sandpiper *Tringa stagnatilis*	May	Wet grassy meadows	Common (T)	Shallow water	End June-August	Beginning of September
Common Snipe *Gallinago gallinago*	May	Wet meadows and marshes	Common (north FS, T)	Wet grasslands, marshes	From July onwards	October
Ruff *Philomachus pugnax*	May	Wet grasslands	Rare (FS, T)	Grasslands, wet meadows, water edge	Second half of May and August	Beginning of October
Black-headed Gull *Larus ridibundus*	April	Marshes, islands in rivers and lakes	Common (S, FS, south T), colonies up to thousands of pairs	Fields, grasslands, marshes, water bodies	July-September	September
Common Gull *Larus canus*	April	Islands in lakes (FS) and river valleys (T)	Common (S, FS, T), colonies up to 1500 pairs	Fields, marshes, water bodies	July-September	October
Yellow-legged Gull *Larus cachinnans*	April	Islands in lakes	Common (S, FS), colonies up to hundreds of pairs	Fields, marshes, water bodies	July-September	October
Great Black-headed Gull *Larus ichthyaetus*	April	Islands in lakes, reed beds	Rare (FS), three breeding sites, colonies up to 400 pairs	River and lake shore, open water	July-September	October
Black Tern *Chlidonias niger*	May	Marshes, floating vegetation, in rivers and lakes	Common (S, FS)	Grasslands, marshes, open water	July-August	September

Species accounts

Grey heron – Tseraya Tsaplya
Ardea cinerea

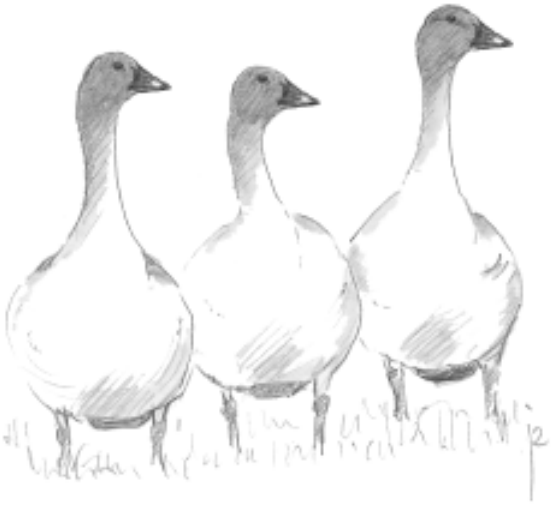
Ringing data
There were 12 recoveries of birds ringed as chicks in colonies in the Lake Chany area (figure 3). Three birds were recovered from the study area in September-October, two of which were adults (3 and 7 years old) which may have returned to the area for breeding. Recoveries from outside the study area (9) were all obtained in the period September-January. They are situated S-SW from the place of ringing, in Kazakhstan, the Caspian Sea area and the south coast of the Arabian Peninsula. Apart from one nine-year old bird found in October in Turkmenistan, all recoveries refer to birds killed or found dead in their first year of age. This means that the migratory pattern shown by the figure is based on a small number of individuals, nearly all being juveniles.

Conclusion
Juvenile Grey Herons born in the study area migrate in a SW direction. Wintering appears to take place along the shores of the Caspian Sea and the Indian Ocean (Arabian Peninsula). The oldest bird recovered was 9 years.

Figure 3. *Recoveries of Grey Herons ringed in colonies in the Lake Chany area*

Bean Goose - Gumennik

Anser fabalis



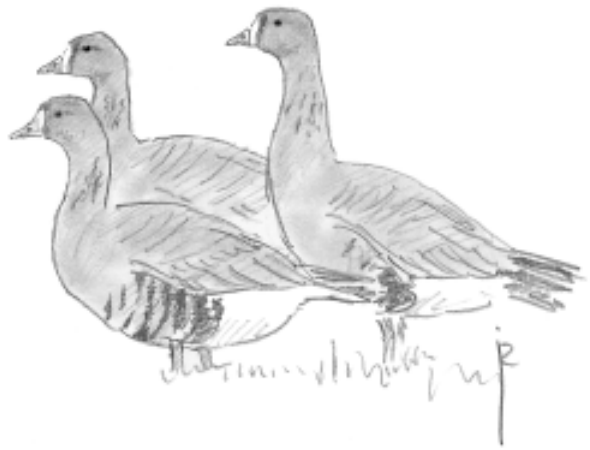
Ringing data

There were only five recoveries, all of birds ringed in The Netherlands (December-January), which were shot in the study area during spring (1, April) and autumn migration (4, September-November) (figure 4). These birds probably all belonged to the sub-species *A. f. fabalis*, which breeds in the taiga zone north and east of the study area. The oldest bird recovered was 11 years.

Figure 4. *Recoveries of Bean Geese ringed in the wintering area (The Netherlands)*

White-fronted Goose - Beloloby Gus

Anser albifrons



Ringing data

There were four birds recovered in the study area (3, May and 1, September) which were ringed elsewhere (figure 5). One bird was ringed in the breeding area on the Taimyr peninsula (July), whereas three birds were ringed in the wintering area in The Netherlands (January-February). These data fit with a migratory route which leads from the high arctic breeding grounds through Southwest Siberia and northern Kazakhstan to western (and possibly also central and southern) Europe as suggested by Ebbinge & Dekkers (2004). The oldest bird recovered was 3 years old.

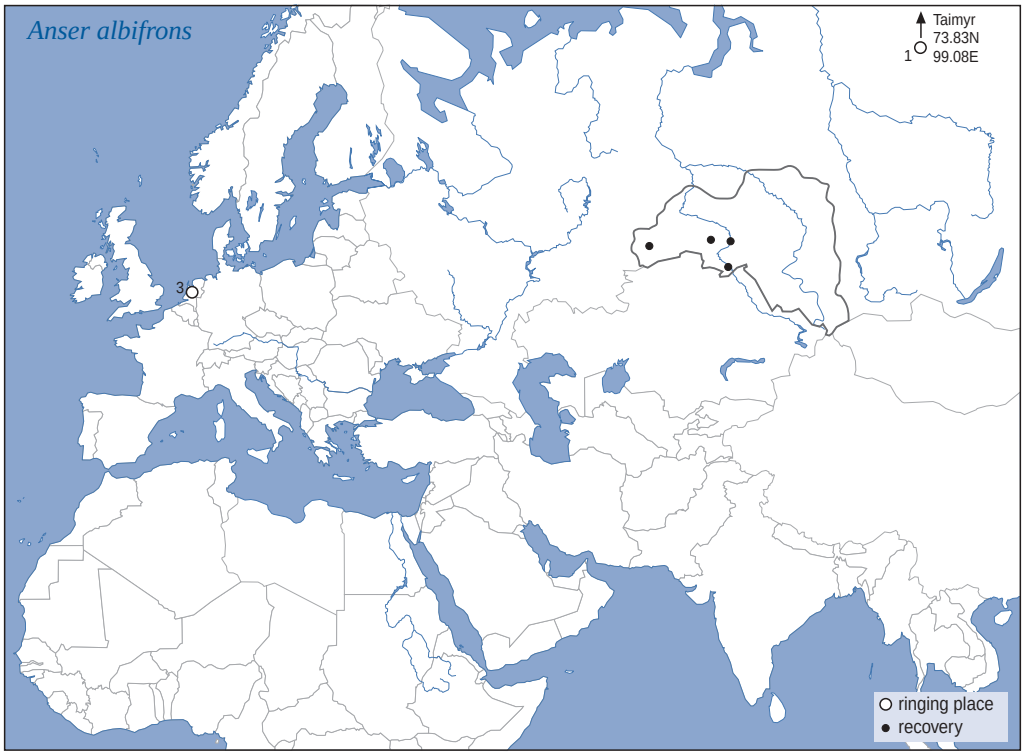


Figure 5. *Recoveries of White-fronted Geese ringed in the breeding (Taimyr) and wintering (The Netherlands) areas.*

Greylag Goose - Sery Gus

Anser anser

Ringing data

There were eight recoveries of birds ringed in the study area in June-August (figure 6). Six of them were recovered from the study area in August-September, four in the year of ringing and two in later years (not depicted in figure). Two birds were recovered in later years in northern Kazakhstan and along the eastern shore of the Caspian Sea in April. Twelve birds ringed along the northern shore of the Caspian Sea and at various locations in Kazakhstan (all ringed in June-July) were recovered from the study area in later years, in March-May and September-October.

No information is available on the age of the birds and the ringing situation. This makes the data difficult to interpret. Probably, all birds were ringed when flightless, i.e. as goslings, or birds during wing moult (all ringing sites in Kazakhstan and along the Caspian Sea are important moulting areas). A possible explanation of the observed pattern could be that Greylag Geese breeding in the study area perform moult migration to lakes in Kazakhstan and winter along the Caspian Sea. However, the pattern might be more complex, with birds changing breeding and/or moulting places between lakes, dependent on environmental conditions. It seems apparent that this species generally migrates shorter distances than the other goose species found in the study area and none were recovered in Europe or South Asia. All birds were recorded as having been shot. The oldest bird recovered was at least 14 years.

Figure 6. *Recoveries of Greylag Geese ringed inside (Novosibirsk region) and outside the study area. Figures near symbols refer to the number of birds recovered*

Mallard – Kryakva
Anas platyrhynchos

Ringing data

Figure 7 shows recoveries of Mallards which were ringed within the study area as breeding birds (adults and their young) or during wing moult. (The latter need not necessarily be local breeding birds, see below.) There were 44 recoveries (36 breeding birds and 8 moulting birds) within the study area, which have not been depicted. They refer to individuals recovered in the post-breeding or post-fledging period or to birds which returned to the area for breeding in later years (period May-October). Recoveries outside the study area showed a more or less similar migration pattern for breeding (16) and moulting (4) birds, which is in a WSW-SSW direction. Winter recoveries (mainly November-December) come from areas south of lat 40o (Turkmenistan, Uzbekistan, Iran, Afghanistan, India).

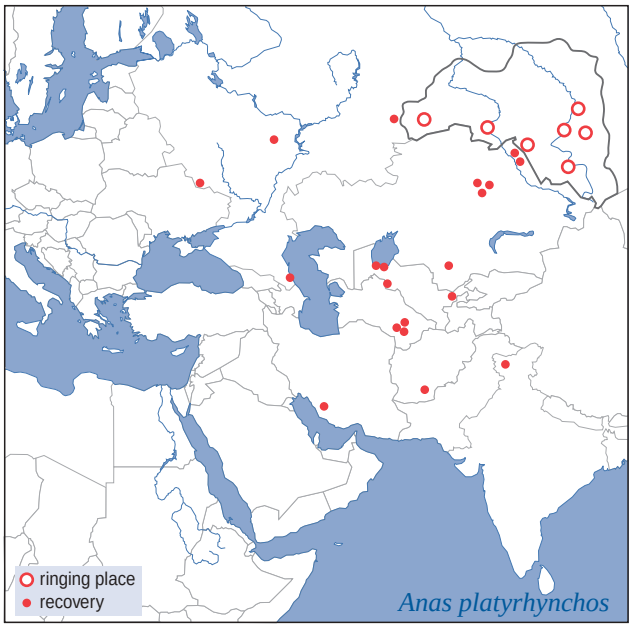


Figure 8. *Recoveries of Mallards ringed as breeding birds or during wing moult in the Regions of Kurgan, Omsk, Tomsk, Kemerovo, Novosibirsk and Altai, and at Lake Chany.*

Figure 8 shows ringing locations of birds ringed elsewhere, which have been recovered in the study area. Based upon the period of ringing and additional ringing information, three categories of sites can be distinguished: (1) wintering sites (circles), situated in Europe (Denmark, Italy and Ukraine), along the Caspian Sea, and in India and Pakistan, (2) moulting sites (triangles) situated in Kazakhstan and Russia and (3) sites where

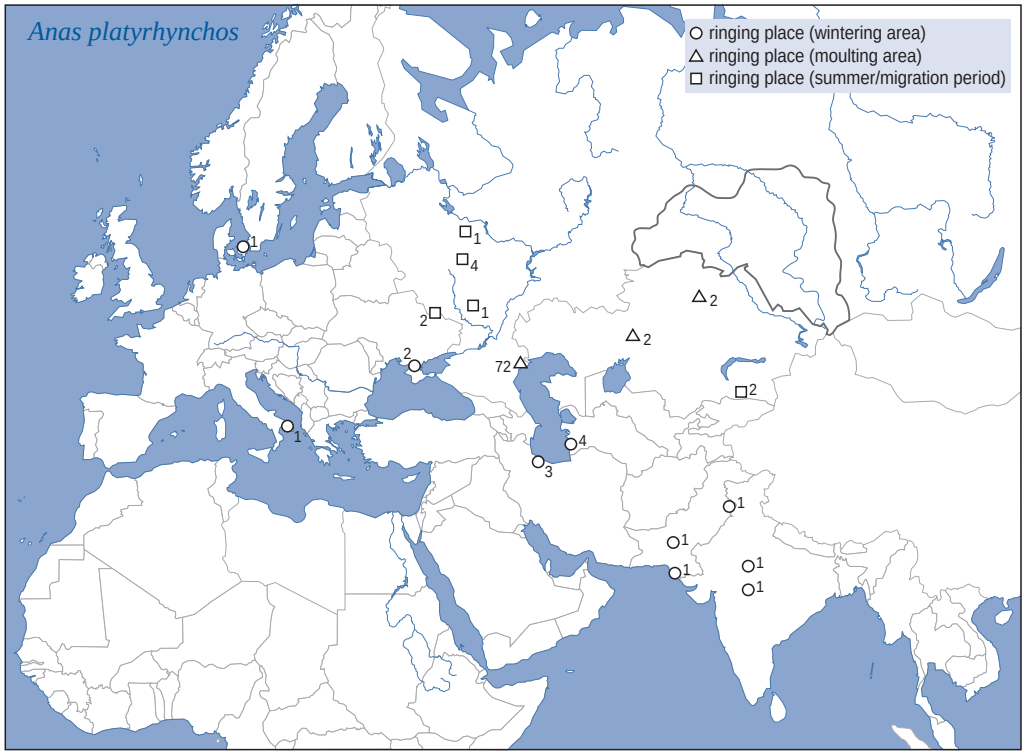


Figure 7. *Ringing places of Mallards which were recovered in the study area. Figures near symbols refer to the number of birds recovered. The distribution of recoveries is given in figure 9.*

the species was ringed in the breeding or migration period (squares).
Figure 9 shows the distribution of recoveries within the study area of birds ringed in different wintering sites. The lack of records from western Europe is noteworthy compared with all other duck species except Gadwall and Goldeneye, and Mallards breeding in Southwest Siberia appear to migrate shorter distances than most duck species from the region. The number recovered in India was also low compared with all other duck species except Goldeneye. It appears that, in general, birds wintering in Europe, the Caspian Sea region, and in India and Pakistan, were recorded from more westerly, central and easterly positions, respectively, within the study area (see mean positions indicated on map).However, it should be noted that points are scattered and the number of data few.

Conclusion

Mallards breeding in Southwest Siberia complete their wing moult at lakes within the area as well as at several lakes spread over Kazakhstan and along the northern shore of the Caspian Sea. Migration is in a W-S direction and the species migrates shorter distances on average than all species except Goldeneye. Wintering sites are located in Europe (few records), in Southwest Asia (Caspian Sea, Turkmenistan, Uzbekistan, Iran, Afghanistan) and in South Asia (India and Pakistan). The W to E position of wintering places correlates with a similar mean position of recoveries within the study area. The oldest bird recovered was 23 years.

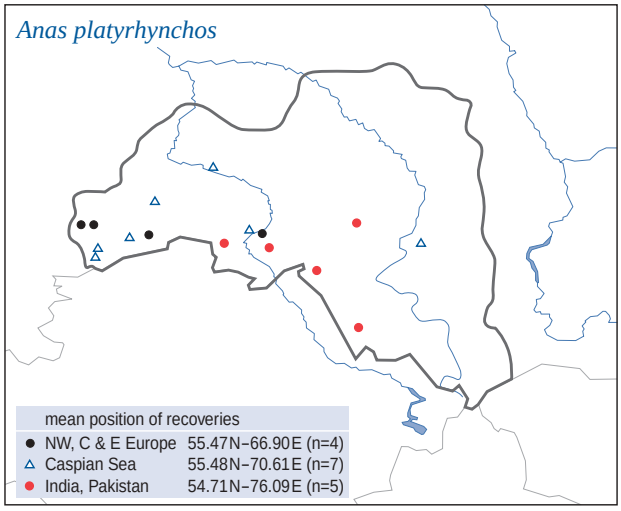


Figure 9. *Recoveries of Mallards ringed in different wintering areas (see also figure 8).*

Gadwall – Seraya Utka

Anas strepera

Ringing data

Figure 10 shows recoveries of Gadwalls which were ringed within the study area as breeding birds (adults and their young). There were 9 recoveries within the study area (not depicted), which refer to individuals recovered in the post-breeding or post-fledging period or to birds which returned to the area for breeding in later years (period May-October). Recoveries outside the study area (8) show migration in a WSW-S direction. Winter recoveries (November-March) come from countries around the Caspian Sea and eastwards to northern India. There was one recovery in Italy in October, but there were fewer recoveries in, or from Europe than for any other species except Mallard and Goldeneye..
Figure 11 shows ringing locations of birds ringed elsewhere, which have been recovered in the study area. Two categories of sites can be distinguished: (1) wintering sites (circles), situated in India and Pakistan and (2) moulting sites (triangles) in Kazakhstan and Russia.

Figure 11. *Ringing places of Gadwalls which were recovered in the study area. Recoveries shown only refer to birds ringed in their wintering quarters in India and Pakistan. Figures near symbols refer to the number of birds recovered.*

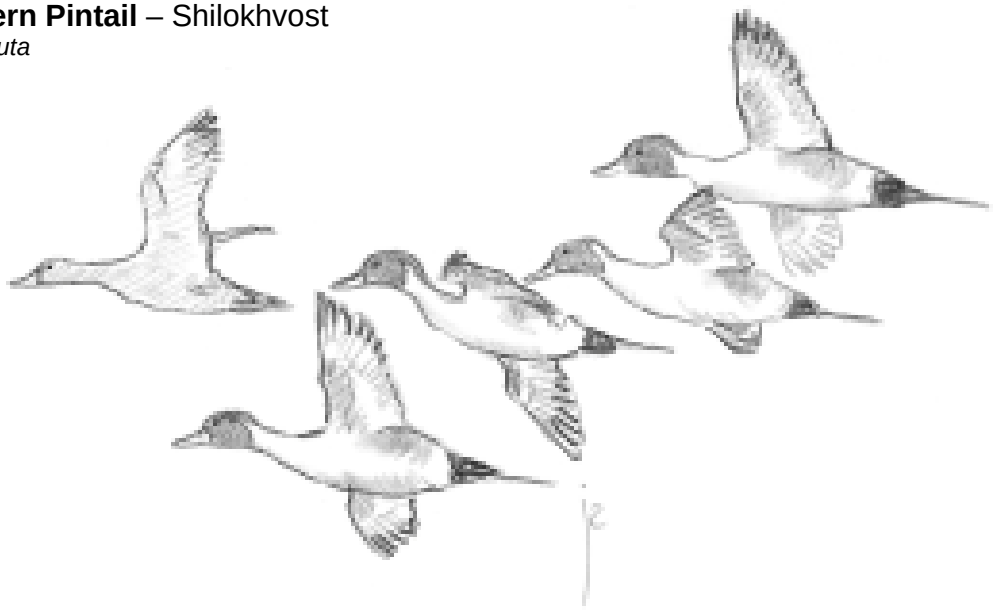
Conclusion

Gadwalls breeding in Southwest Siberia may complete their wing moult in lakes in northern Kazakhstan as well as along the northern shore of the Caspian Sea. Migration is in a WSW-S direction and wintering places are situated along the Caspian Sea shore, in Turkmenistan and Uzbekistan and in India and Pakistan. There was just one recovery from Europe. The oldest bird recovered was 17 years.

Figure 10. *Recoveries of Gadwalls ringed as breeding birds in the Regions of Kurgan, Omsk and Novosibirsk.*

Northern Pintail – Shilokhvost

Anas acuta



Ringing data

Figure 12 shows recoveries of Northern Pintails which were ringed within the study area during wing moult. There were 41 recoveries within the study area, which have not been depicted. They refer to individuals recovered within the same season, after moult had been completed, or to birds which had returned to the area in later years (May-October). Recoveries outside the study area (83) were distributed over a large area. Autumn and winter recoveries were situated WSW to S from the study area. Most winter records were concentrated south of 40o N, especially along the shores of the Mediterranean, Black and Caspian Seas, Iraq and India. Points north of the study area refer to birds recovered in the breeding period (mainly May-August), as far as 1700 km away from the place where they had been ringed as a moulting bird in earlier years. It shows that the Southwest Siberian moulting sites attract breeding birds from a very large area.

Figure 13 shows locations of birds ringed elsewhere, which were recovered in the study area. Three types of sites can be distinguished: (1) wintering sites (circles), situated in Northwest Europe, Africa, the south shore of the Caspian Sea, in India and Japan, (2) moulting sites (triangles) situated in Kazakhstan and Russia (northern shore of the Caspian Sea) and (3) sites, situated in northern Europe and Kyrgyzstan, where the species was

Figure 12. *Recoveries of Northern Pintails ringed during wing moult in the Regions of Omsk and Novosibirsk.*

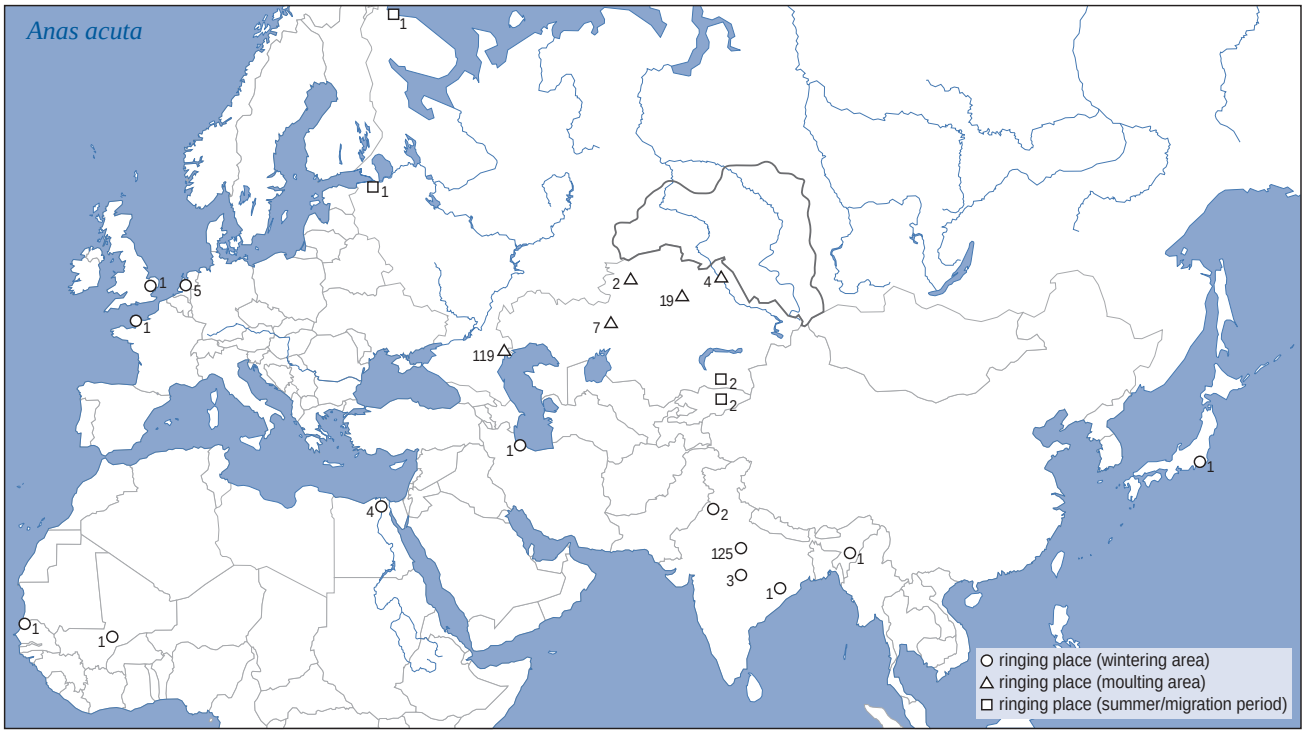


Figure 13. *Ringing places of Northern Pintails which were recovered in the study area. Figures near symbols refer to the number of birds recovered. The distribution of recoveries is given in figure 14.*

ringed in summer (squares). The importance of Bharatpur, India (125 records) as a wintering site for birds originating from the study area, and of the Volga Delta (N Caspian Sea) (119 records) as a moulting area is noteworthy, and a considerable majority of recoveries came from these two sites. The recovery of a bird ringed in Japan suggests that regular migration may occur to the east of the study area, assuming extremely low ring recovery rates in Mongolia and China.
Figure 14 shows the distribution of recoveries within the study area of birds ringed in different wintering sites. It appears that, in general, birds wintering in western Europe, Africa-Iran, and India were, on average, recorded from more westerly, central and easterly positions within the study area respectively (see mean latitudinal positions indicated near map).

Conclusion

Pintails breeding in Southwest Siberia were recovered in higher numbers and in more directions than any other species. They complete their wing moult at lakes within the study area as well as at several lakes in Kazakhstan and along the northern shore of the Caspian Sea. Northwest Siberian breeding birds have been shown to moult in the study area. Wintering areas are situated in western Europe, Africa, along the Mediterranean, Black and Caspian Seas and in India. There was one winter record from Japan. Longitudinal position of wintering places correlate with a longitudinal mean position of recoveries within the study area. The oldest bird recovered was at least 20 years.

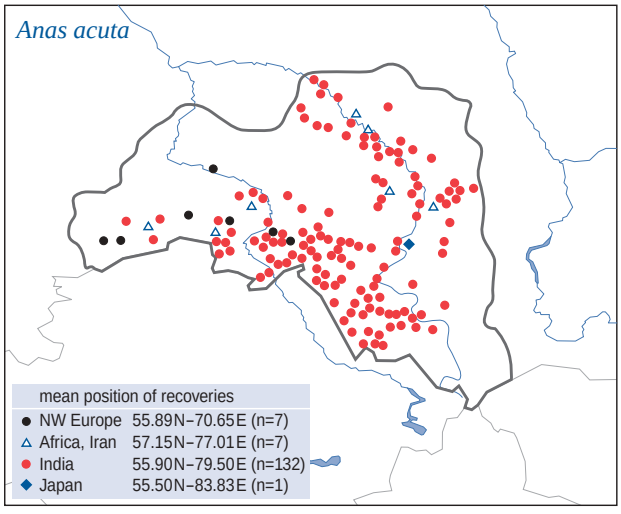


Figure 14. *Recoveries of Northern Pintails ringed in different wintering areas (see also figure 13).*

Northern Shoveler – Shirokonoska

Anas clypeata

Ringing data

Figure 15 shows recoveries of Shovelers which were ringed within the study area as breeding birds (adults and their young) or during wing moult. There were 14 recoveries (6 breeding birds and 8 moulting birds) within the study area (not depicted), which refer to individuals recovered in the post-breeding, post-fledging or post moulting period or to birds returning to the area for breeding in later years (recoveries May-October). Recoveries outside the study area (25) showed a similar migration pattern for breeding (4) and moulting birds (21), which is in a SW direction. Winter recoveries (November-April) are concentrated around the Caspian Sea and there were single records from Uzbekistan, Iraq and Morocco. There were three recoveries (2 May, 1 September) north and east of the study area suggesting that birds moulting within the study area may come from breeding sites as far as 1470 km away.

Figure 16 shows ringing locations of birds ringed elsewhere, which were recovered in the study area. Three categories of sites can be distinguished: (1) wintering sites (circles), situated in Western Europe, along the Caspian Sea, in Pakistan and India (2) moulting sites (tri-

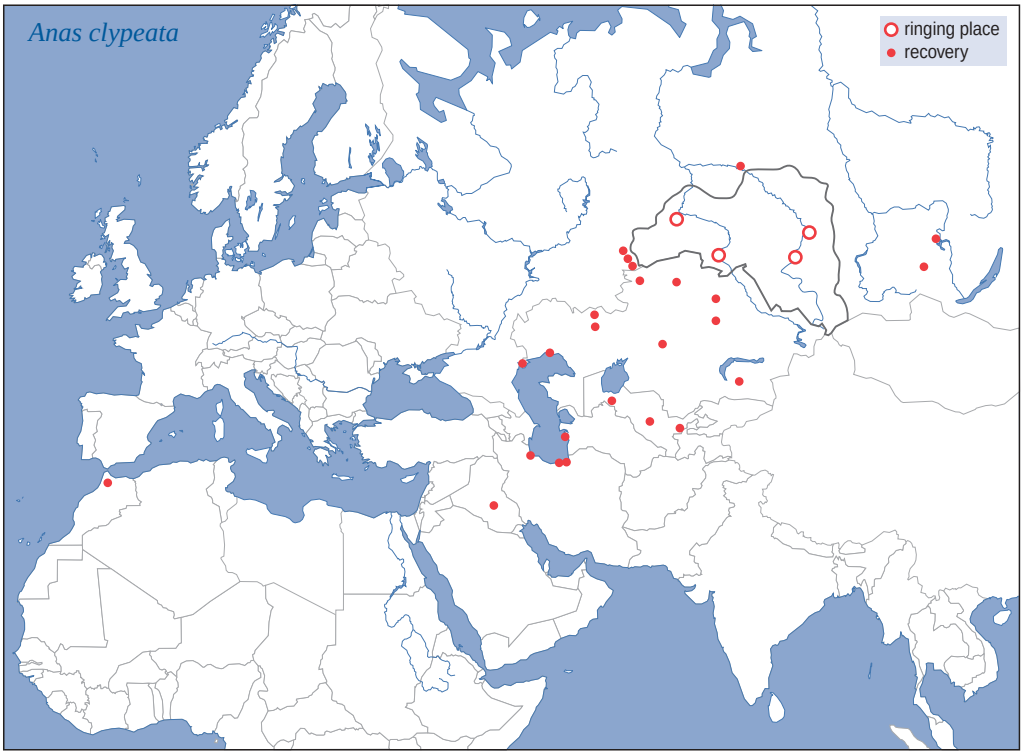


Figure 15. *Recoveries of Northern Shovelers ringed as breeding birds or during wing moult in the Regions of Tyumen', Omsk, Tomsk and Novosibirsk.*

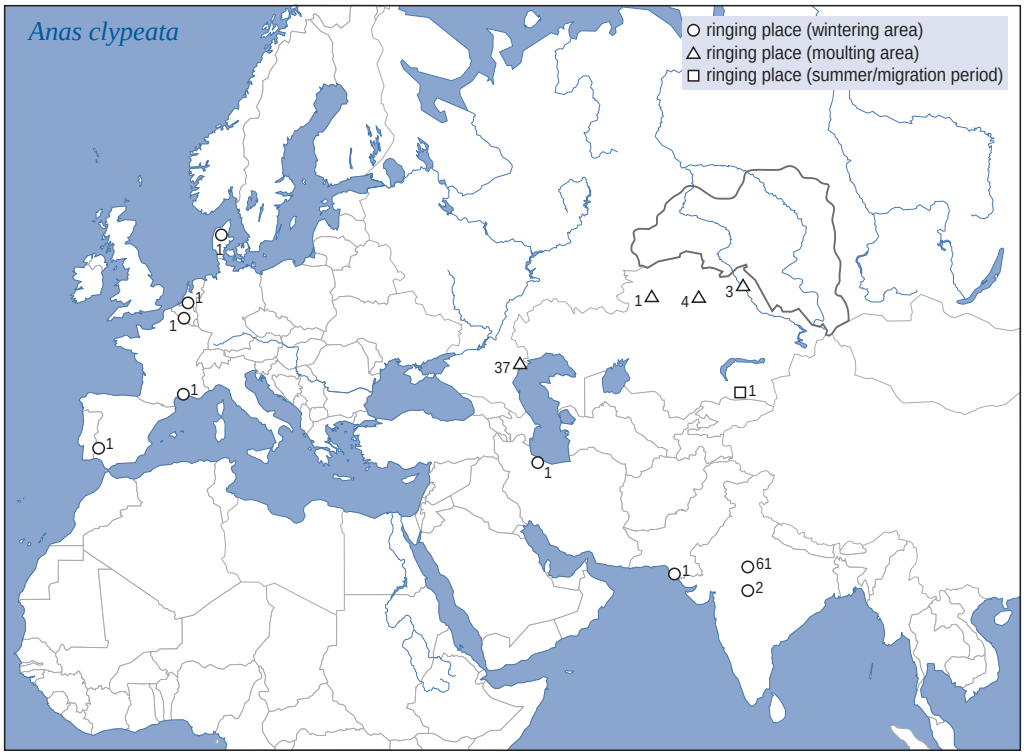


Figure 16. *Ringing places of Northern Shovelers which were recovered in the study area. Figures near symbols refer to the number of birds recovered. The distribution of recoveries is given in figure 17.*

angles) situated in Kazakhstan and Russia (northern shore of the Caspian Sea) and (3) a site in Kazakhstan where the species was recovered during migration (square).
Figure 17 shows the distribution of recoveries within the study area of birds ringed on their wintering grounds in Europe and in India and Pakistan. It appears that recoveries of birds ringed in Europe were all recovered breeding in the western part of the study area, whereas those from India and Pakistan were distributed over the whole area during the breeding season.

Conclusion
Shovelers breeding in Southwest Siberia complete their wing moult at lakes within the study area as well as at several lakes distributed over Kazakhstan and the northern shore of the Caspian Sea. Migration is in a W-S direction and wintering sites are situated in Europe, the Caspian Sea region, Uzbekistan, India and Pakistan and Morocco. Birds wintering in Europe have been recovered from the western part of the study area, those wintering in India and Pakistan are spread over the whole area. The oldest bird recovered was at least 7 years.

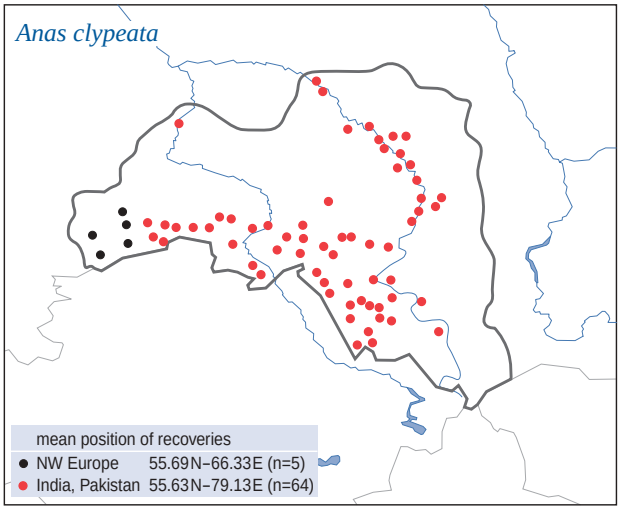


Figure 17. *Recoveries of Northern Shovelers ringed in different wintering areas (see also figure 16).*

Eurasian Wigeon – Sviyaz

Anas penelope

Ringing data

Figure 18 shows recoveries of Eurasian Wigeons which were ringed within the study area as breeding birds (adults and their young) or during wing moult. There are 12 recoveries (9 breeding birds and 3 moulting birds) within the study area, which have not been depicted. They refer to individuals recovered in the post-breeding or post-fledging period or to birds which returned to the area in later years (period August-October). Recoveries outside the study area are few (9) and spread over a large area with autumn and winter records (September-March) from Italy, Turkmenistan, Uzbekistan and Japan. Two birds were recovered in summer (May), NW of the study area, as far as 1250 km away from the place where they were ringed during wing moult the year before. This suggests that the Southwest Siberian moulting sites attract breeding birds from a very large area. Figure 19 shows locations of birds ringed elsewhere, which have been recovered in the study area. Three types of sites can be distinguished: (1) wintering sites (circles), situated in western Europe (particularly The Netherlands and UK), the Caspian Sea region (Volga Delta) and in India (particularly Bharatpur) and Pakistan, (2) moulting sites (triangles) situated in Kazakhstan and along the northern shore of the Caspian Sea and (3) a site in Kazakhstan where the species was ringed during migration (square).
Figure 20 shows the distribution of recoveries within the study area of birds ringed in different wintering sites. It appears that, in general, birds wintering in western Europe, the Caspian Sea region and in India and Pakistan were, on average, recorded from more westerly, central and easterly positions, respectively, within the study area (see mean positions indicated on map).

Conclusion

Wigeons breeding in Southwest Siberia complete their wing moult at lakes within the area as well as at several lakes spread over Kazakhstan and along the northern shore of the Caspian Sea. Wintering areas are situated in western Europe, in the Caspian Sea, in India and Pakistan. The recovery of a bird from the study area in Japan suggests that regular migration may occur to the east, assuming extremely low ring recovery rates in Mongolia and China. Longitudinal position of wintering places correlate with a longitudinal mean position of recoveries within the study area. The oldest bird recovered was at least 8 years.

Figure 18. *Recoveries of Eurasian Wigeons ringed as breeding birds or during wing moult in the Regions of Omsk, Tomsk and Novosibirsk.*

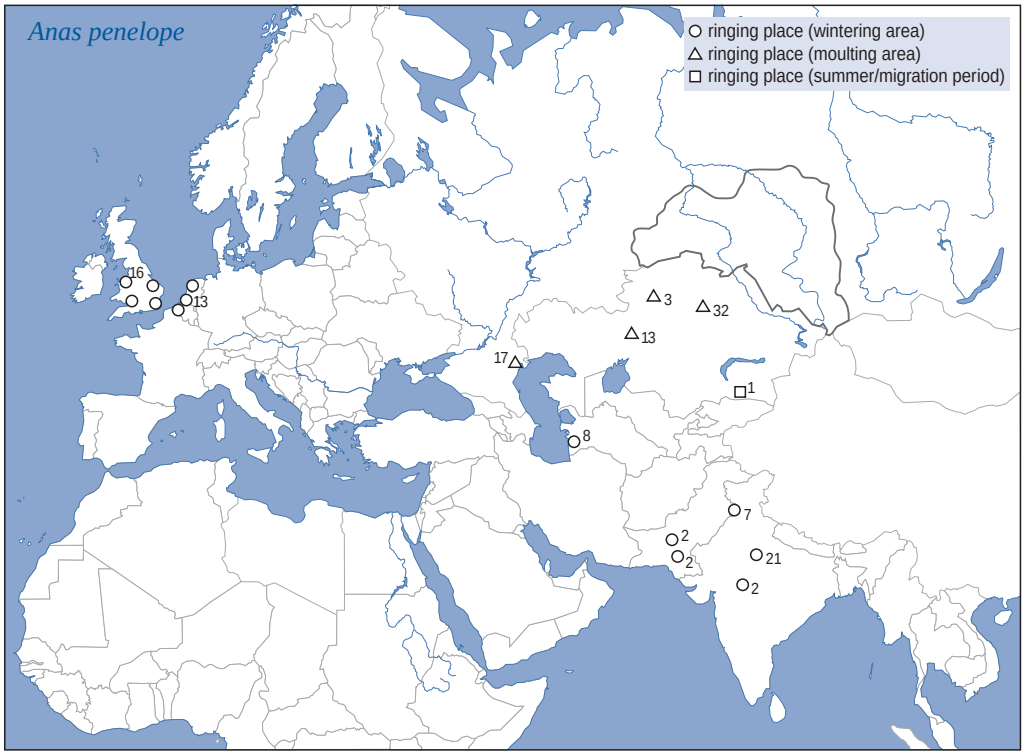


Figure 19. *Ringing places of Eurasian Wigeons which were recovered in the study area. Figures near symbols refer to the number of birds recovered. The distribution of recoveries is given in figure 20.*

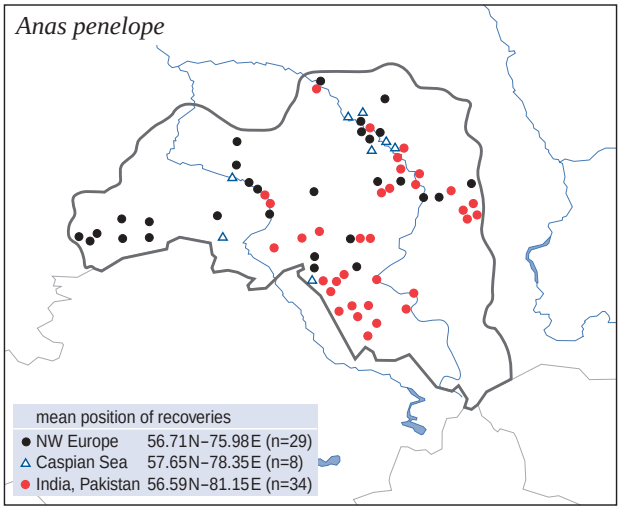
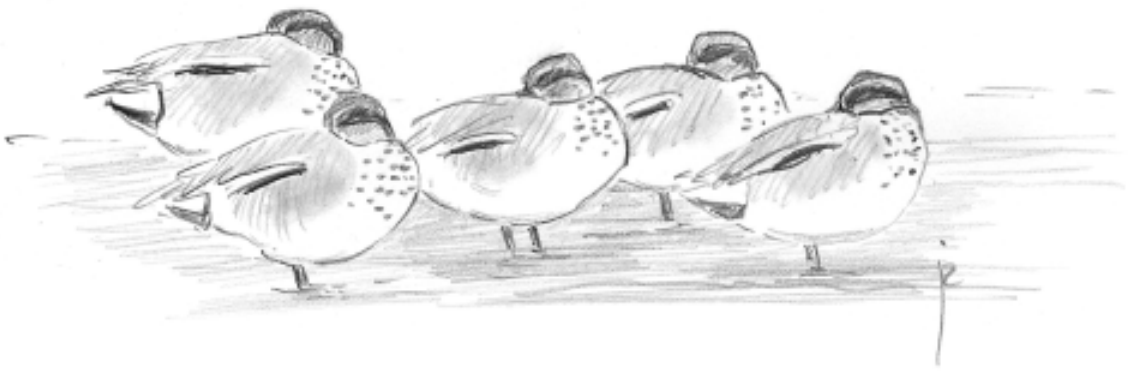


Figure 20. *Recoveries of Eurasian Wigeons ringed in different wintering areas (see also figure 19).*

Common Teal – Chirok-svistunok

Anas crecca



Ringing data

Figure 21 shows recoveries of Teal ringed within the study area during wing moult. There were 18 recoveries within the study area, which have not been depicted. They refer to individuals recovered within the same season, after moult had been completed, or to birds which had returned to the area in later years (May-October). Recoveries W-S of the study area (39, September-March) represent birds during migration and winter. Main wintering areas are situated south of 40o N (former Yugoslavia, Iran, Turkmenistan, Uzbekistan, Tajikistan, Afghanistan, India and Pakistan). Points north of the study area refer to birds recovered in the breeding period (May-August), as far as 1400 km away from the moulting place. It shows that the Southwest Siberian moulting sites attract breeding birds from a large area.

Figure 22 shows locations of birds recovered in the study area and ringed elsewhere. Three types of sites can be distinguished: (1) wintering sites (circles), situated in Western and Central Europe, the East Mediterranean, the southern Caspian Sea, and in India (where more birds, a total of 69, originated from Bharatpur than from all other recoveries combined) and Pakistan; (2) a moulting site (triangle) situated on the northern shore of the Caspian Sea (Volga Delta) where 25 birds were ringed that were subsequently recovered in the study area; and (3) sites in Russia and Kazakhstan, where the species was ringed in the breeding or migration period (squares). Figure 23 shows the distribution of recoveries within the study area of birds ringed in different wintering areas. It appears that, in general, birds wintering in western

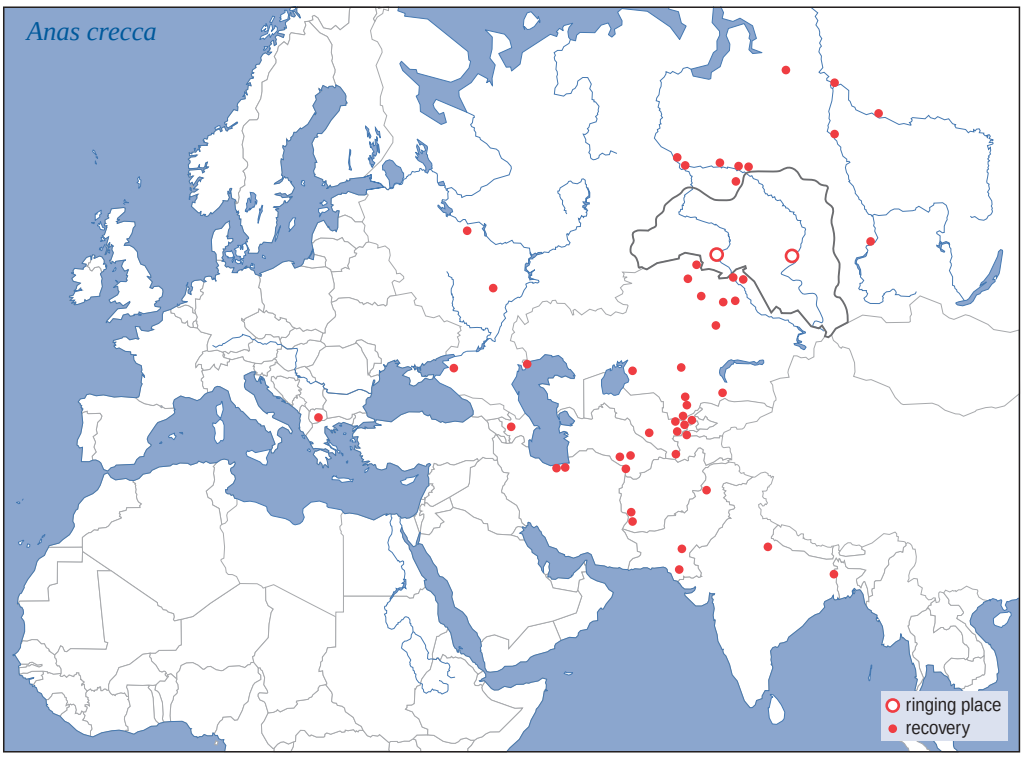


Figure 21. *Recoveries of Common Teals ringed during wing moult in the Regions of Omsk and Novosibirsk.*

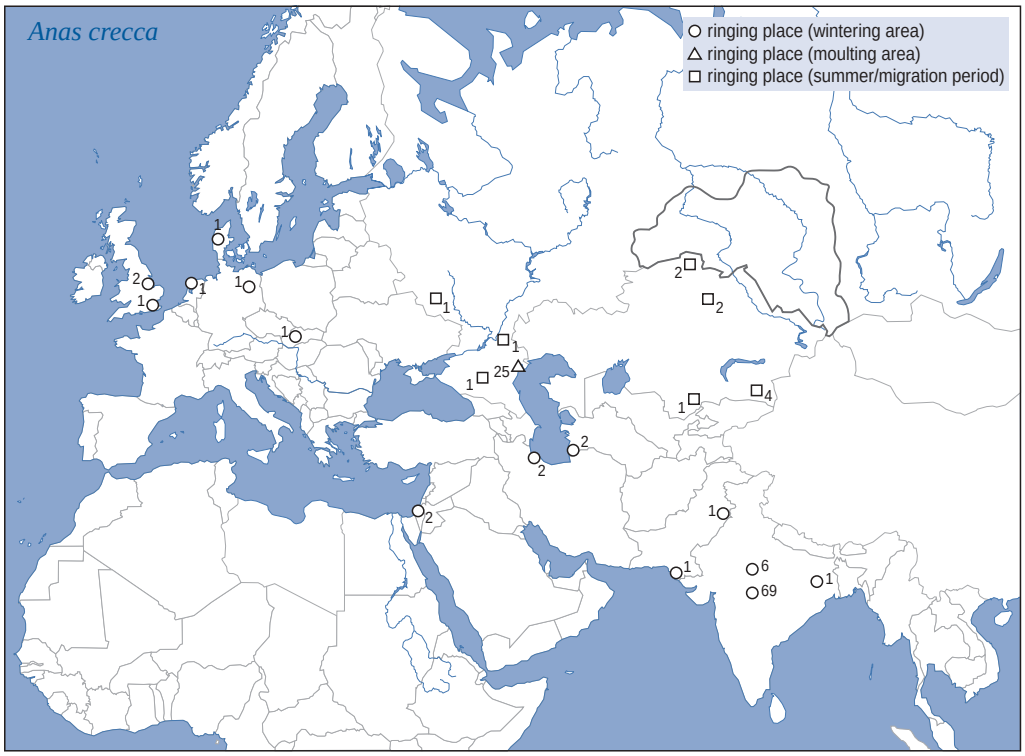


Figure 22. *Ringing places of Common Teals which were recovered in the study area. Figures near symbols refer to the number of birds recovered. The distribution of recoveries is given in figure 23.*

Europe, Israel and the southern Caspian Sea shore, were, on average, recorded from more westerly positions, within the study area than those recorded in India and Pakistan (see mean latitudinal positions indicated on map).

Conclusion

Teals breeding in Southwest Siberia complete their wing moult at lakes within the study area (Lake Chany and Lake Mai-Sor) as well as along the northern Caspian Sea shore, often at distances of 1400 km or more from their breeding grounds. The absence of recoveries of birds ringed in the moulting areas in lakes in northern Kazakhstan suggests that these lakes are less important for Common Teal as compared to most other duck species. Main wintering areas appear to be situated in western Europe, the Mediterranean and Caspian Sea area, and in India and Pakistan. Longitudinal position of wintering places correlates with the longitudinal mean position of recoveries within the study area. The oldest bird recovered was at least 19 years.

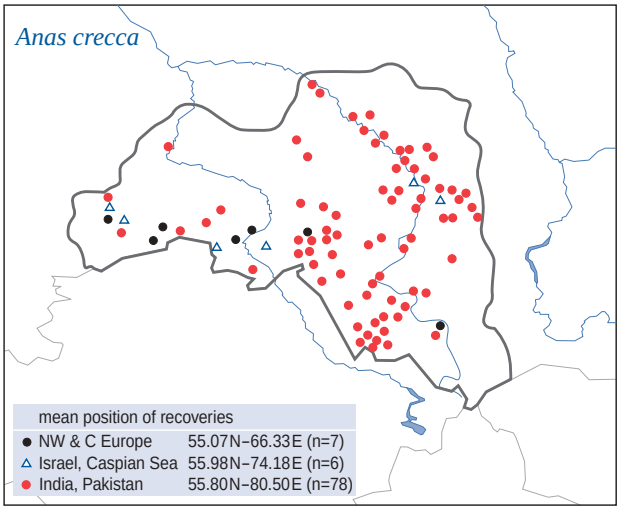


Figure 23. *Recoveries of Common Teals ringed in different wintering areas (see also figure 22).*

Garganey – Chirok-treskunok

Anas querquedula

Ringing data

Figure 24 shows recoveries of Garganeys ringed within the study area as breeding birds (adults and their young) or during wing moult. There are 22 recoveries (9 breeding birds and 13 moulting birds) within the study area, which have not been depicted. They refer to individuals recovered in the post-breeding, post-fledging or post moulting period or to birds which returned to the area in later years (period April-October). Recoveries outside the study area (6 breeding birds and 31 moulting bird) were situated W-S of the study area. Winter recoveries (November-February) mainly came from Italy, the southern Caspian Sea area, Turkmenistan, Uzbekistan and India, where 65 recoveries from Bharatpur outnumbered all other recoveries combined.

Figure 25 shows locations of birds ringed elsewhere, which were recovered in the study area in summer. Three types of sites can be distinguished: (1) wintering sites (circles), in India and Africa, (2) moulting sites (triangles) in Kazakhstan and (3) sites where the species was ringed during summer or migration (squares) in western Europe and Iran. Birds ringed in Europe and Iran (mainly ringed in March and August) may refer to passage migrants moving between Southwest Siberian breeding areas and African winter quarters, as suggested by Cramp et al. (1977).

Figure 26 shows the distribution of recoveries within the study area of birds ringed in western Europe, Africa-Caspian Sea, and India. Recoveries of European ringed birds have an unexpected mean longitudinal position between African and Indian ringed birds (see mean latitudinal positions indicated on map).

Conclusion

Garganeys breeding in Southwest Siberia complete their wing moult at lakes within the study area as well as at lakes in Kazakhstan. Main wintering areas are situated in Africa, the Caspian Sea area and especially in India. Recoveries within the study area of birds ringed in different migration/wintering places are scattered and longitudinal positions of migration/wintering places do not correlate with longitudinal mean position of the recoveries . The oldest bird recovered was at least 12 years.

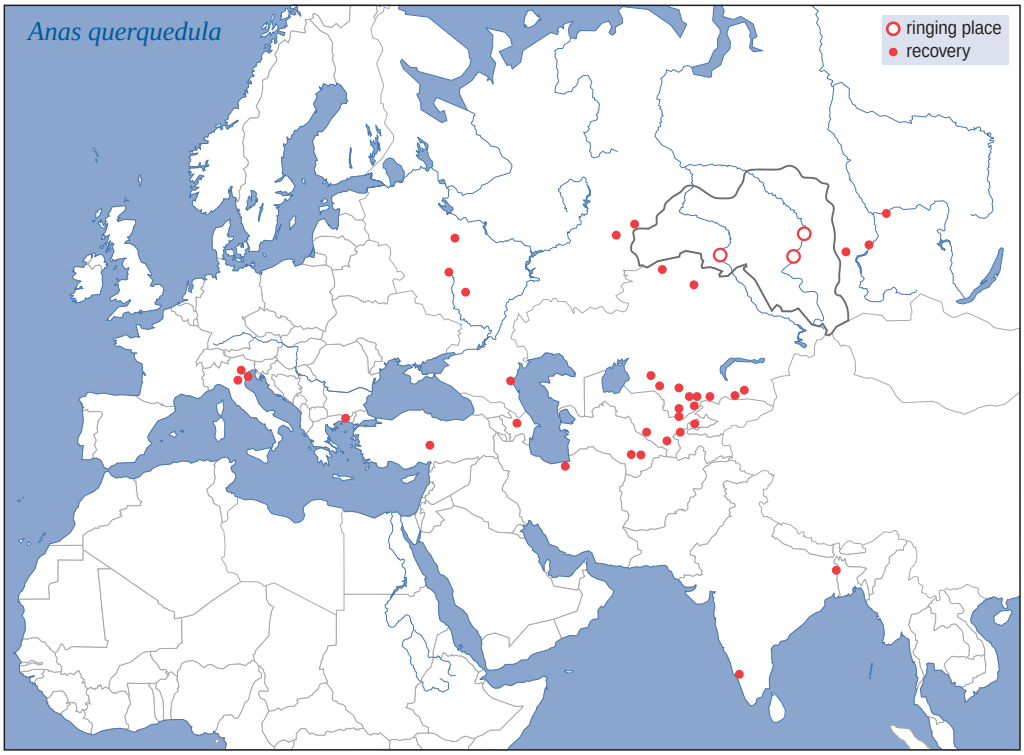


Figure 24. *Recoveries of Garganeys ringed as breeding birds or during wing moult in the Regions of Omsk, Tomsk and Novosibirsk.*

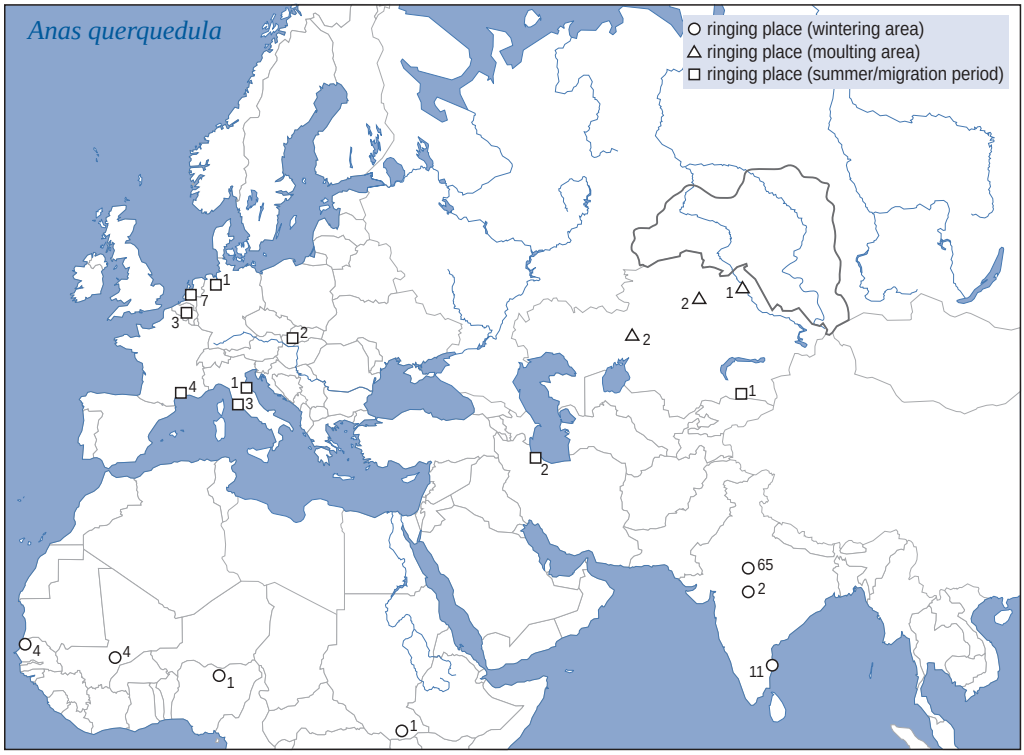


Figure 25. *Ringing places of Garganeys which were recovered in the study area. Figures near symbols refer to the number of birds recovered. The distribution of recoveries is given in figure 26.*

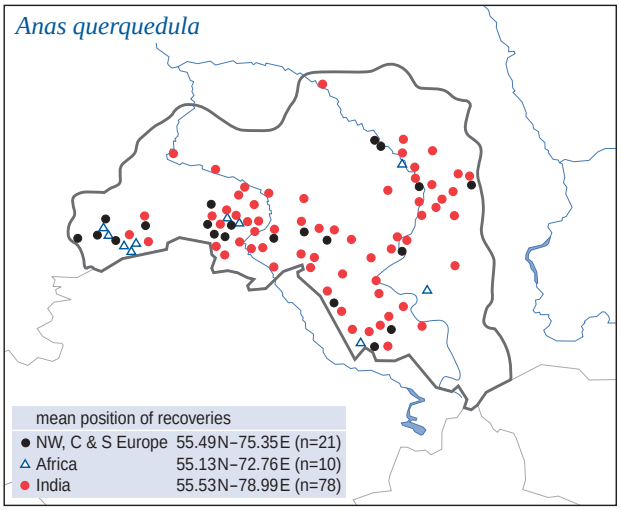
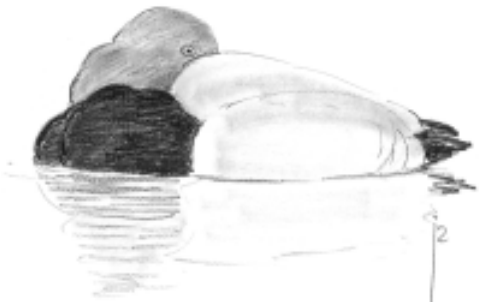


Figure 26. *Recoveries of Garganeys ringed in different wintering areas (see also figure 25).*

Common Pochard – Krasnogolovy Nyrok
Aythya ferina



Ringing data
Figure 27 shows recoveries of Pochards which were ringed within the study area as breeding birds (adults and their young) or during wing moult. There were 269 recoveries (214 breeding birds and 55 moulting birds) within the study area, which have not been depicted. They refer to individuals recovered in the post-breeding, post-fledging or post-moulting period or to birds which returned to the area for breeding in later years (period April-October). Recoveries outside the study area show a more-or-less similar migration pattern for breeding (91) and moulting (48) birds, which is mainly in a W-SW direction. Winter recoveries (November-March) were concentrated along the Mediterranean, Black and Caspian Seas, in Turkmenistan, Uzbekistan, Tadjikistan and in India and Pakistan. The four birds recovered north of the study area in summer (May-October) were either at the border, or far beyond the species' breeding range. The most northerly point certainly does not refer to a breeding bird, and may possibly have been taking a northerly route to Europe.
Figure 28 shows locations of birds ringed elsewhere, which have been recovered in the study area. Two types of sites can be distinguished: (1) wintering sites (circles), situated in
western Europe, the southern shore of the Caspian Sea, Pakistan, India and Japan, and (2) a moulting site in Russia near the Sea of Azov. A total of 110 birds ringed at Bharatpur and 26 from a site in Kashmir show the importance of India as a wintering area, and 44 birds ringed at one site in Switzerland, and 16 at a site in Eastern England were also recovered in the study area. The recovery of four birds ringed in Japan breeding in the study area suggests that regular migration may occur to the east, assuming extremely low ring recovery rates in Mongolia and China.
Figure 29 shows the distribution of recoveries within the study area of birds ringed in the wintering sites shown in Figure 28. It appears that birds wintering in Europe, the Caspian Sea region, the Indian sub-continent and Japan, were, on average, recorded from more westerly, central and easterly positions within the study area (see mean positions indicated on map).

Conclusion
Pochards breeding in Southwest Siberia complete their wing moult at lakes within the area and near Sea of Azov. Migration is in a W-S direction and main wintering areas are situated in western Europe, along the Mediterranean, Black and Caspian Seas and in Indian and Pakistan. Some birds were recovered from Japan. The W to E position of wintering places correlates with a similar mean position of recoveries within the study area. The oldest bird recovered was at least 19 years old.

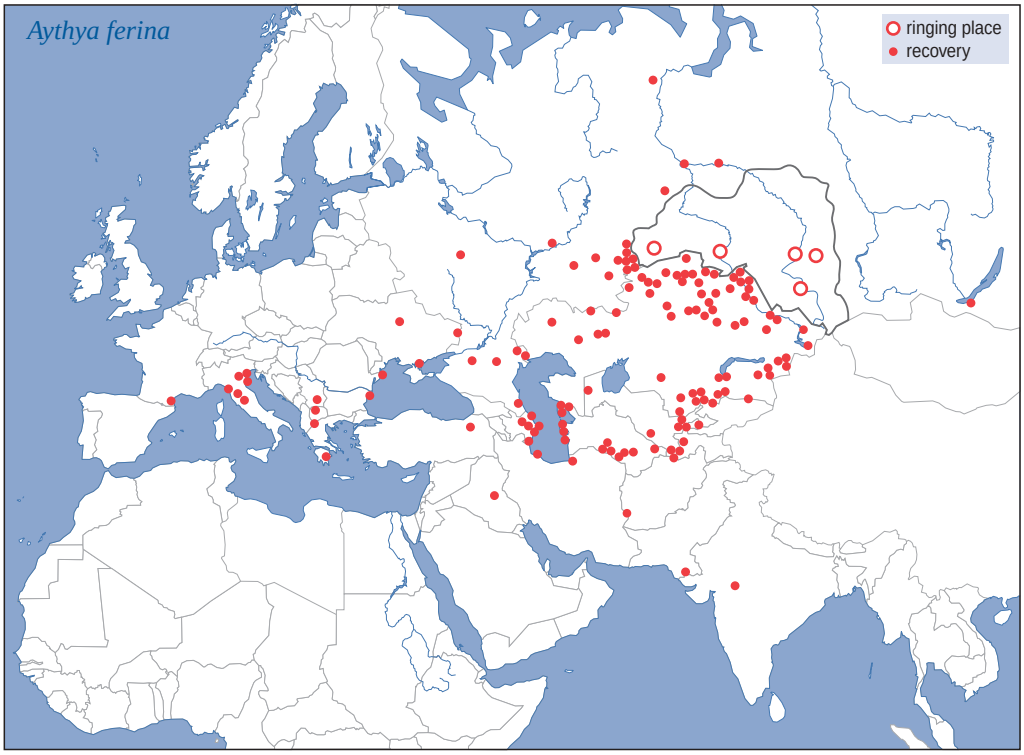


Figure 27. *Recoveries of Common Pochards ringed as breeding birds or during wing moult in the Regions of Kurgan, Omsk, Tomsk, Kemerovo and Novosibirsk.*

Figure 28. *Ringing places of Common Pochards which were recovered in the study area. Figures near symbols refer to the number of birds recovered. The distribution of recoveries is given in figure 29.*

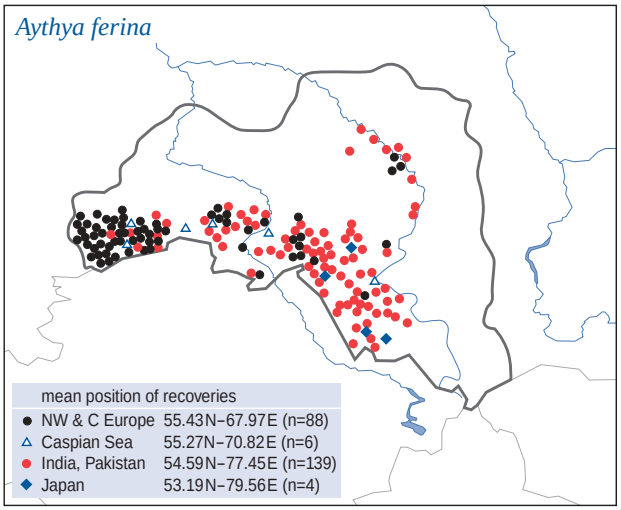


Figure 29. *Recoveries of Common Pochards ringed in different wintering areas (see also figure 28).*

Tufted Duck – Khokhlataya Chernet
Aythya fuligula

Ringing data
Figure 30 shows recoveries of Tufted Ducks ringed within the study area as breeding birds (adults and their young) or during wing moult. There were 37 recoveries (33 breeding birds and 4 moulting birds) within the study area, which have not been depicted. They refer to individuals recovered in the post-breeding, post-fledging or post moulting period or to birds which returned to the area for breeding in later years (period April-October). Recoveries outside the study area (16 breeding birds and 4 moulting birds) show migration in a mainly SW direction. Winter recoveries (November-March) were situated in Greece and along the Caspian Sea shore. Recoveries north of the study area (all May-June) refer to individuals ringed as breeding birds, which may have changed breeding places between years.
Figure 31 shows ringing locations in the wintering areas for birds recovered in the study area. Of 12 birds ringed in Europe eight came from Switzerland and, of 38 from India no fewer than 31 were ringed at Bharatpur. Within the study area (figure 32) recoveries from Europe have a more westerly mean latitudinal position than those from India (see mean positions on map).

Conclusion
Tufted Ducks breeding in Southwest Siberia migrate in a W-S direction and main wintering places are situated in western Europe, along the Caspian Sea shore and in India. The W to E position of wintering places correlates with a similar mean position of recoveries within the study area. The oldest bird recovered was at least 9 years.

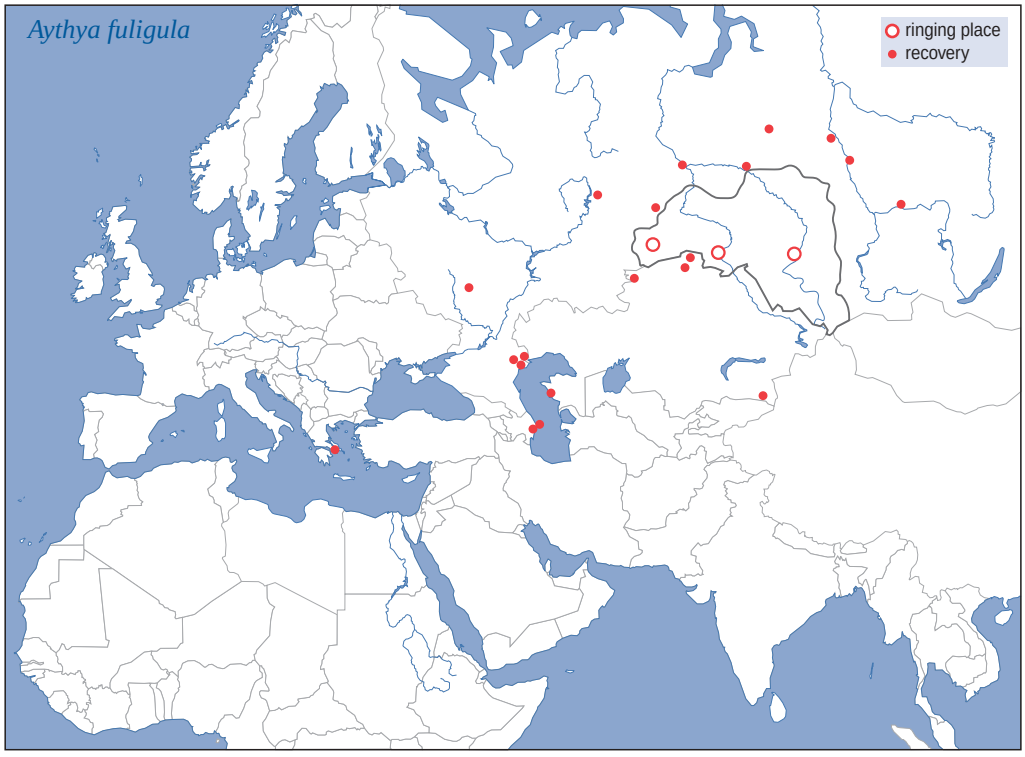


Figure 30. *Recoveries of Tufted Ducks ringed as breeding birds or during wing moult in the Regions of Kurgan, Omsk and Novosibirsk.*

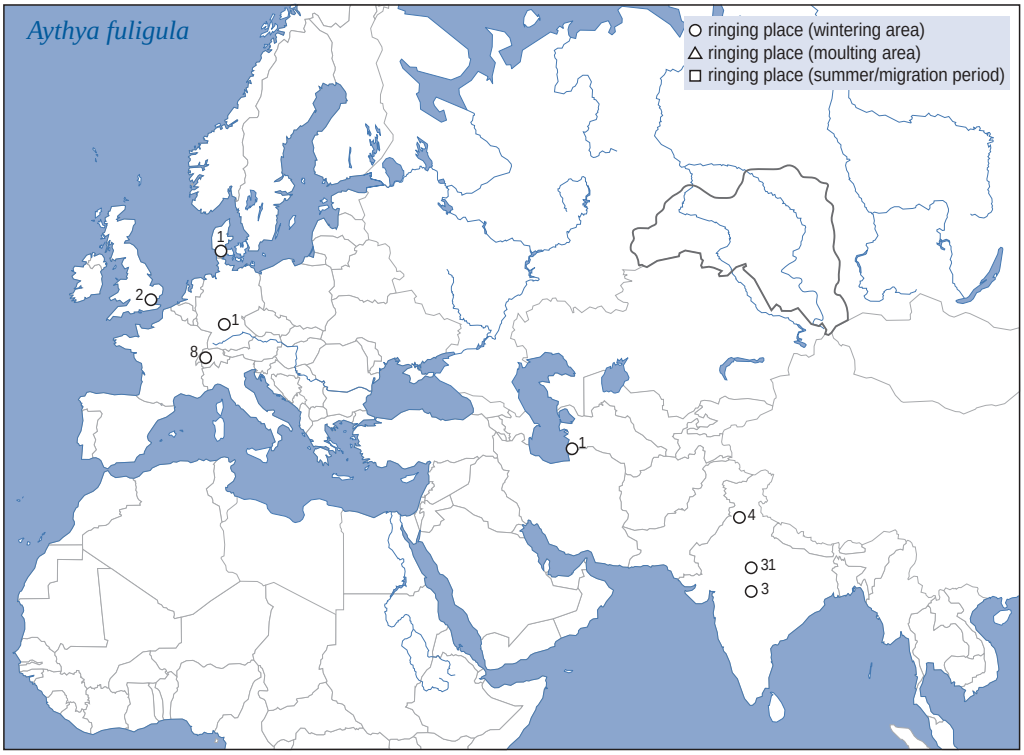


Figure 31. *Ringing places of Tufted Ducks which were recovered in the study area. Figures near symbols refer to the number of birds recovered. The distribution of recoveries is given in figure 32.*

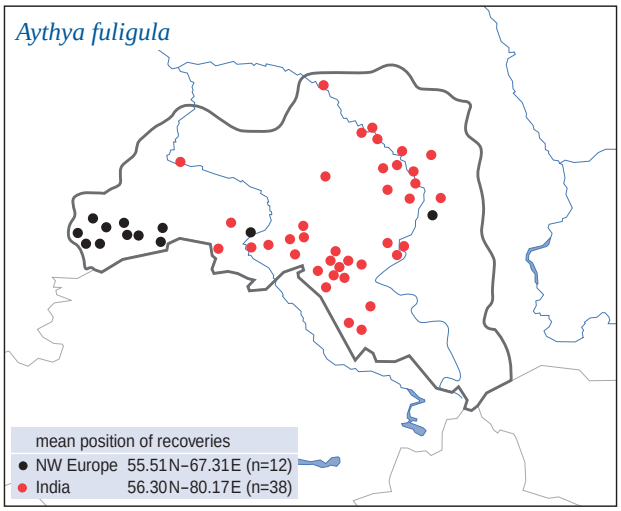


Figure 32. *Recoveries of Tufted Ducks ringed in different wintering areas (see also figure 31).*

Common Goldeneye – Gogol
Bucephala clangula

Ringing data
Figure 33 shows recoveries of Goldeneyes ringed within the study area during wing moult. There were 68 recoveries within the study area, which have not been depicted. They refer to individuals recovered in the post-moulting period or to birds which returned to the area in later years (period April-October). Recoveries outside the study area (57) are scattered. Autumn migration seems to be in a SW direction, and recoveries from the Black and Caspian Sea area all came from late autumn and winter (October-February). Recoveries west, north and east of the study area were concentrated in the period March-September (many in June). They refer to birds recovered during post-moulting dispersal (within year of ringing) or to birds returning to the breeding area in later years. The species appears to migrate shorter distances than any other duck species found in the study area, with no recoveries in or from Europe or South Asia.

Conclusion
Goldeneyes breeding in Southwest Siberia migrate in a SW direction. The Caspian Sea appears to be an important wintering area. The oldest bird recovered was at least 17 years.

Figure 33. *Recoveries of Common Goldeneyes ringed during wing moult in the Region of Kurgan.*

Common Coot – Lysukha
Fulica atra

Ringing data
Figure 34 shows recoveries of Coots ringed within the study area as breeding birds (adults and their young). There were 12 recoveries within the study area, which have not been depicted. They refer to individuals recovered in the post-breeding and post-fledging period or to birds which returned to the area for breeding in later years (period August-October). Recoveries outside the study area (13) show migration in a SW direction. Winter recoveries (3, December-March) come from the Caspian Sea shore, Uzbekistan and Kyrgyzstan. Figure 35 shows ringing sites of Coots which were recovered in the study area. Along the Caspian Sea, in Kazakhstan and Kyrgyzstan the birds were ringed during autumn migration (October-November); in India during autumn and (mainly) winter (October-March). Key wintering sites of birds breeding in the study area were Bharatpur and a site in Kashmir, where 53 and 28, respectively, birds were ringed which were subsequently recovered in the study area. The species is apparently a shorter-distance migrant than many of the ducks and none were recovered in Europe.

Conclusion
Coots breeding in Southwest Siberia migrate in a SW-S direction. Wintering areas are situated near the Caspian Sea, in Uzbekistan, Kyrgyzstan and in India. The oldest bird recovered was at least 8 years.

Figure 34. *Recoveries of Coots ringed as breeding birds in the Regions of Omsk and Novosibirsk.*

Figure 35. *Recoveries within the study area of Common Coots ringed elsewhere. Figures near symbols refer to the number of birds recovered.*

Northern Lapwing – Chibis

Vanellus vanellus

Ringing data

There are 3 cases of birds ringed as chicks in the study area, which were recovered near the Caspian Sea (October), in Syria (March) and in France (December) (figure 36). Twenty birds ringed in western Europe and one in Finland were recovered in the study area in spring and summer (late April-September). Most of them were ringed in late autumn or winter. Considering the migration pattern of most Southwest Siberian waterbirds it is tempting to conclude that these birds refer to Southwest Siberian breeding birds wintering in Europe. However, six birds were ringed in Europe in May-September, two of which as chicks in June. These birds were recovered 3-4 years later in June-July in the Siberian study area which strongly suggests that there is an exchange of breeding birds between western Europe and Southwest Siberia (distance 4000-5000 km). As a consequence it cannot be excluded that our records refer to European born birds, which subsequently bred in Southwest Siberia, thereafter using other wintering areas. Lapwings are rarely the quarry of hunters and the principal bias in the distribution of recoveries is towards countries, mostly in western Europe, where a lot of Lapwings have been ringed.

Conclusion

Lapwings breeding in Southwest Siberia appear to migrate in a predominantly WSW direction. Western Europe might be an important wintering area. However, the nature of the link between Southwest Siberia and Europe is unclear. Two recoveries suggest that there might be an exchange of breeding birds between western Europe and Southwest Siberia. The oldest bird recovered was 12 years.

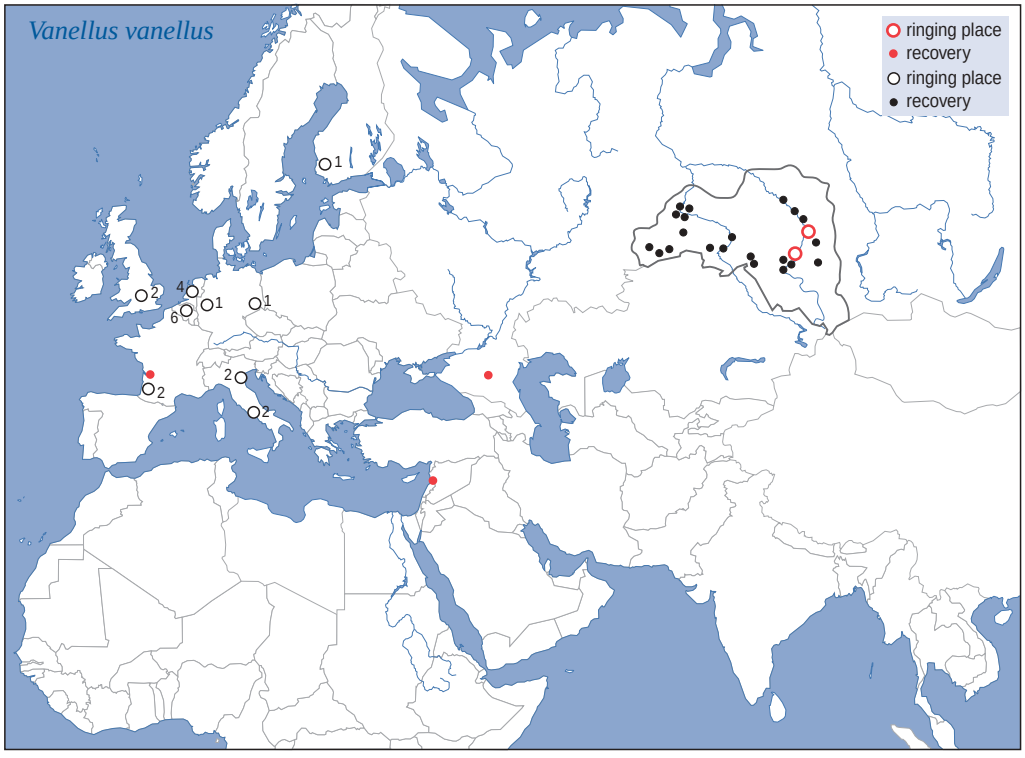
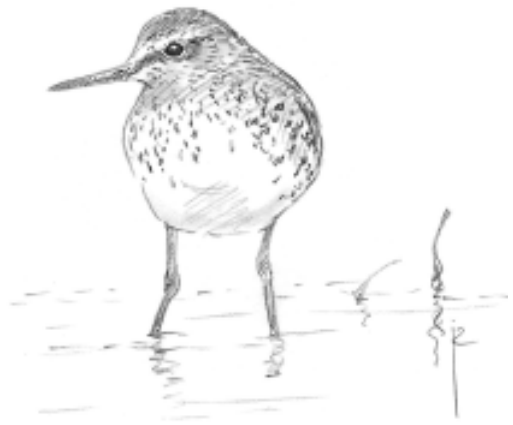


Figure 36. *Recoveries of Northern Lapwings ringed inside (Tomsk and Novosibirsk Regions) and outside the study area. Figures near symbols refer to the number of birds recovered*

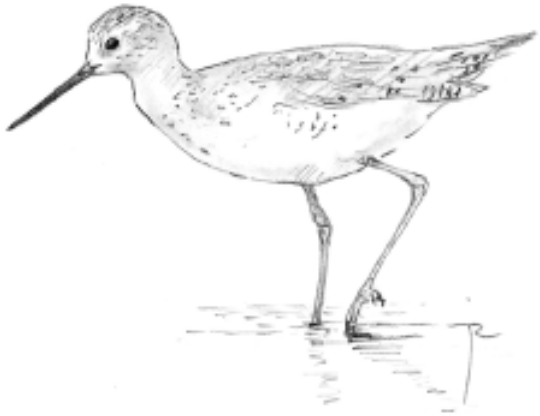
Wood Sandpiper – Fifi
Tringa glareola



Ringing data
There were three recoveries of birds ringed as adults (figure 37). One bird ringed in the study area (June) was recovered in India (March), whereas two birds ringed in India (March) and Kazakhstan (August) were recovered from the taiga zone of the study area (June-July). These data demonstrate that Wood Sandpipers which probably bred in the study area, showed N-S migration, wintering on the Indian sub-continent. These findings are in agreement with those of Lebedeva et al. (1985) showing that the Indian sub-continent is the main wintering area for Wood Sandpipers breeding in Central Siberia between 60° and 120°E. The oldest bird recovered was at least 3 years.

Figure 37. *Recoveries of Wood Sandpipers ringed inside (Tomsk Region) and outside the study area. Figures near symbols refer to the number of birds recovered within the study area.*

Marsh Sandpiper – Porucheynik
Tringa stagnatilis



Ringing data
There were three ring recoveries of birds ringed as full grown individuals in Ethiopia (1, date unclear) and in India (2, November), which were recovered in May-September in part of the study area where the species is a breeding bird (figure 38). These data show migration in a S and SW direction and suggest wintering on the Indian continent as well as in eastern Africa. Similar data have been mentioned for Southwest Siberian Marsh Sandpiper by Dobrynina and Lebedeva (1985). The oldest bird recovered was at least 2 years.

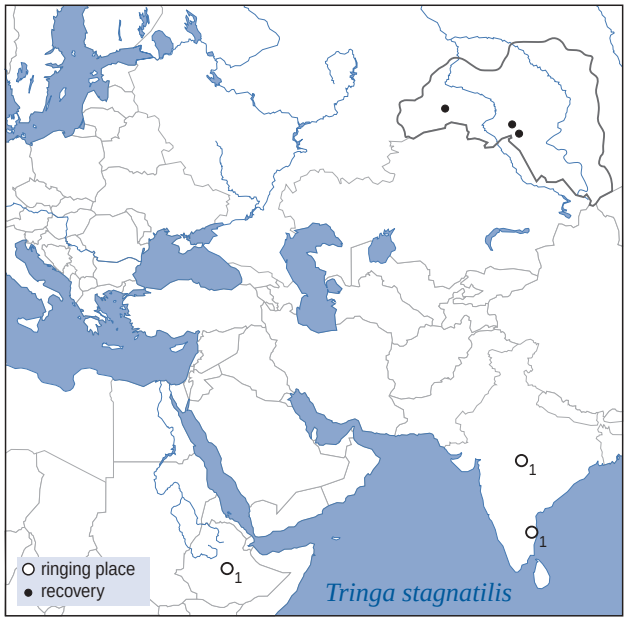


Figure 38. *Recoveries within the study area of Marsh Sandpipers ringed elsewhere. Figures near symbols refer to the number of birds recovered.*

Common Snipe – Bekas
Gallinago gallinago

Ringing data
There were three records of birds ringed in India as adults in December-March, which were recovered in the study area in the post-breeding/migration period (August-September) (figure 39). It shows that Common Snipe which can be expected to be Siberian breeding birds (whether they bred in the study area is uncertain) spend the winter on the Indian sub-continent. The Common Snipe is a very popular quarry species in Europe, and if there was migration from the study area to Europe on a large scale, recoveries there as a result of hunting might be expected. The oldest bird recovered was at least 3 years.

Figure 39. *Recoveries within the study area of Common Snipe ringed in India.*

Ruff - Turukhtan
Philomachus pugnax

Ringing data
There were six records, three of birds ringed as adults at Bharatpur, India (September-October), Norway (August), Italy (April) and South Africa (November), which were recovered in the study area in summer and autumn (4 in May, 2 in September-October) (figure 40). Two birds ringed as adults in the study area in August were recovered from central Africa (January) and eastern Siberia (August). Although data are scattered and few, they confirm earlier analyses of ring recoveries of Ruff (Lebedeva and Dobrydina 1985, Cramp 1983) showing that Siberian breeding Ruff mainly migrate in directions between West and South to their wintering areas on the Indian sub-continent, in Africa and, to a lesser extent, southern Europe. The recovery of the Norwegian ringed bird is surprising. This bird was caught in the study area in May, four years after it had been ringed in Norway in August. The Ruff is known to be a nomadic breeding bird and this record might refer to an individual changing breeding places between northern Europe and northern Asia. Southwest Siberia appears to be an important staging area, which may be used by birds breeding in a large part of northern Siberia, as far as 3000 km to the east. The oldest bird recovered was at least 9 years.

Figure 40. *Recoveries of Ruffs ringed inside (Novosibirsk Region) and outside the study area. Figures near symbols refer to the number of birds recovered within the study area.*

Black-headed Gull – Ozernaya Chayka
Larus ridibundus

Ringing data

There were 96 recoveries, all of birds ringed as chicks in colonies in the Novosibirsk Region. 59 birds were recovered from within the study area in the period May-October (figure 41). They either refer to juvenile birds in their first year of life or to adults, up to 9 years old, which had returned to the breeding area in later years (some were recovered in the natal colony). Recoveries from outside the breeding area (38) were nearly all situated S-WSW from the breeding area. In autumn (August-November) most recoveries were concentrated in southern Kazakhstan, Uzbekistan and the northern shore of the Caspian Sea, whereas most winter records (December-March) were more to the south (Iraq, Iran, Turkmenistan, Tadzjikistan, Afghanistan and India) and to the west (Black Sea coast). Only 5 records are available from April, distributed over the wintering and migration areas. As most birds arrive in the breeding area in the second half of April, spring migration probably takes place in a short period of time in the first half of this month.

Conclusion

Black-headed gulls breeding in the Novosibirsk Region migrate in a predominantly S-SW direction. Main wintering areas are situated along the shores of the Black and Caspian Sea, in the Middle East and on the Indian subcontinent. Only one was recovered in Europe. Spring migration probably takes place in a short period (mainly the beginning of April). The oldest bird recovered was 9 years.

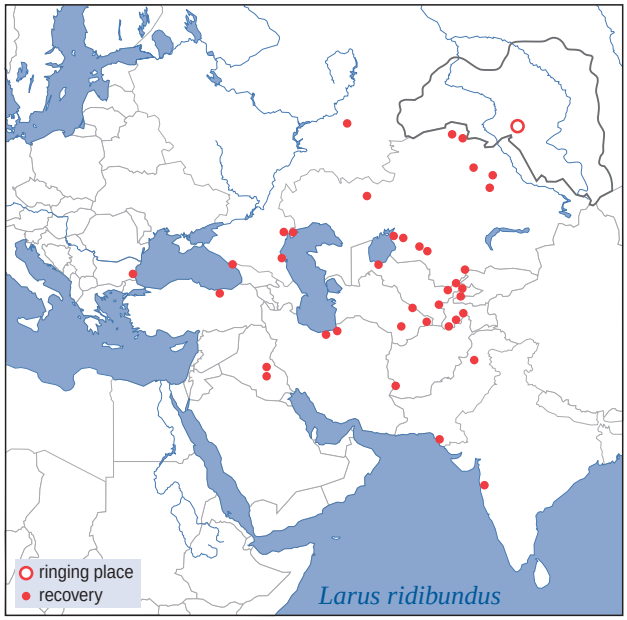
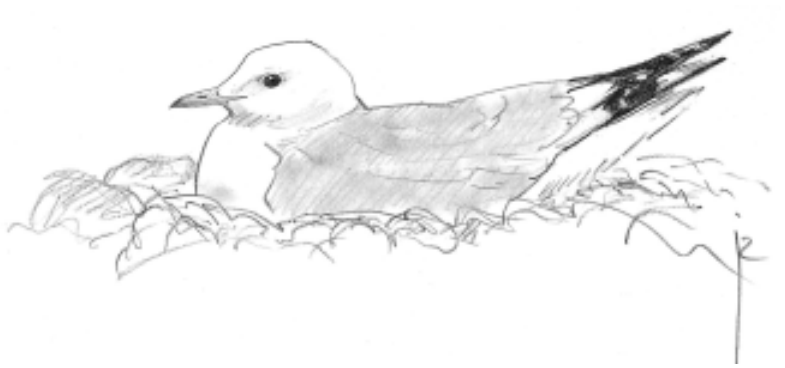


Figure 41. *Recoveries of Black-headed Gulls ringed as chicks in the Novosibirsk Region.*

Common Gull – Sizaya Chayka
Larus canus



Ringing data
There were 65 recoveries, all of birds ringed as chicks in colonies on islands in Lake Chany (figure 42). 43 recoveries from inside the study area, all in the period August-October, refer to juvenile birds in their first year of life (post-fledging dispersal) or to adults returning to the breeding area in later years (some were recovered in their natal colony). Autumn migration appears to take place in a SW direction and most winter recoveries (November-March) were concentrated along and between the Caspian and Black Seas although there was one winter record of a juvenile bird from Italy. This suggests that some birds may be longer-distance migrants. There were no spring records. Two birds were recovered as sub-adults in May-June from northern Kazakhstan in a region where the species is a breeding bird.

Conclusion
Common Gulls ringed as chicks at Lake Chany migrate in a predominantly SW direction. The main wintering area is between the Black and the Caspian Seas. The species has a more northerly migration route and winter distribution than the Black-headed gull, and none were recorded in India, or in Central Asia south of northern Kazakhstan. The oldest bird recovered was 14 years.

Figure 42. *Recoveries of Common Gulls ringed as chicks at Lake Chany, Novosibirsk Region.*

Yellow-legged Gull – Hohotunij

Larus cachinnans

Ringing data

There were 30 recoveries, all of birds ringed as chicks in colonies on islands in Lake Chany and other lakes in the Novosibirsk Region (figure 43). 24 recoveries from inside the study area, all in the period April-October, refer to juvenile birds fledged in the same year (11) or to adults (13, age 1-6 years) returning to the breeding area in later years (7 birds were recovered in close vicinity of the natal colony). Autumn migration appears to take place in a SW direction. Recoveries from the Caspian Sea region were from August, September and April. No winter recoveries are available.

There were 3 recoveries from the southern part of the study area (1 juvenile, 1 sub-adult and 1 adult in September-October) of birds ringed as chicks in a colony in east Kazakhstan.

Conclusion

Yellow-legged Gulls ringed as chicks in the Novosibirsk region migrate in a predominantly SW direction. The main wintering area might be situated in the Caspian Sea region but the number of recoveries are few. None were recovered in Europe or Africa. The oldest bird recovered was 6 years.

Sub-specific status

The taxonomic status of the Yellow-legged Gulls ringed as chick at Lake Chany is uncertain. According to del Hoyo *et al*. (1996) *L. c. cachinnans* breeds in the Black and Caspian Sea area and east Kazakhstan, whereas *L. c. barabensis* is a breeding bird of the Central Asian steppes. *L. c. mongolicus* is mentioned as a breeding bird from the Southeast Altai mountains and eastwards. So, all three sub-species are thought to be present as breeding birds in a relatively small area. Lake Balkhash in eastern Kazakhstan in thought to be the borderline for breeding *L. c. cachinnans* and *L. c . barabensis*, the latter being supposed to breed north of this line. However, birds ringed as chicks near Lake Balkhash (Lake Alakol) have been recorded in the breeding colonies at Lake Chany, so mixing of breeding populations at the sub-specific level may take place in the area. On the basis of our present knowledge of the breeding distribution of the various sub-species, the Chany breeding population should be regarded as to belong to *L. c. barabensis*. However, according to Wetlands International (2002) *L. c. barabensis* (treated as Larus heuglini barabensis by these authors) winters in Southwest Asia, mainly along the shores of the Persian gulf and the Arabian Sea, whereas *L. c. cachinnans* spends the winter along the Black & Caspian Seas, SW Asia, NE Africa and Sri Lanka. The recoveries of the Chany birds, though few in numbers, fit with the latter and not with the first. So breeding and wintering distribution suggest different sub-species, which leaves the taxonomic status of *Larus cachinnans* breeding at lake Chany unknown.

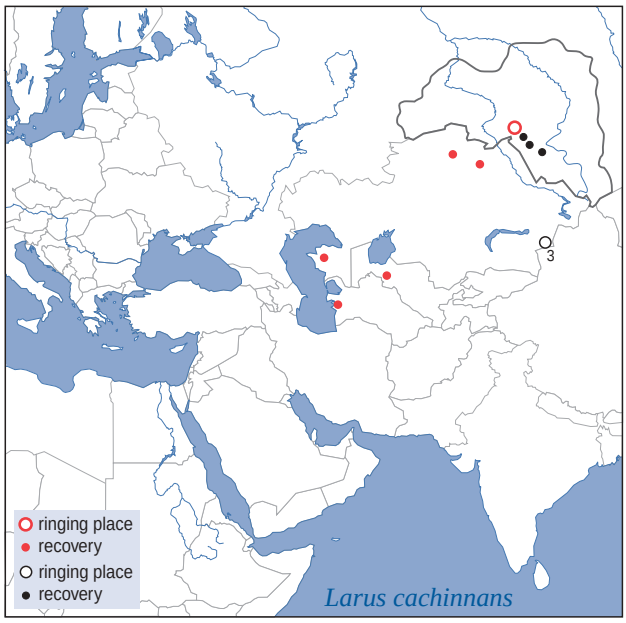


Figure 43. *Recoveries of Yellow-legged Gulls ringed as chicks inside (Lake Chany, Novosibirsk Region) and outside the study area.*

Great Black-headed Gull – Chernogolovy Khokhotun

Larus ichthyaetus

Ringing data

There were 30 recoveries of birds ringed as chicks in the colonies in Lake Chany (figure 44). Twenty birds were recovered from inside the study area in July-October, three of which were sub-adult or adult birds which may have returned to the area for breeding. One two-year old sub-adult bird was actually recovered near the natal colony. All others (17) were juveniles recovered within a few months after fledging. Recoveries from outside the study area were situated in a WSW-S direction from the place of ringing. There were 8 recoveries from Kazakhstan in late summer and autumn (August-October) and one ring recovery is available from the winter period (March), along the Indus river in northern Pakistan. The number of recoveries are few, but data fit with presumed wintering along the Caspian Sea and on the Indian sub-continent (Cramp 1983, Flint et al. 1989). The figure also shows 10 recoveries from within the study area of birds (2 adults and 8 juveniles) ringed as chicks in colonies near Astrakhan (1) and in eastern Kazakhstan (9). One bird was recovered 24 days after it had been ringed as a chick in Kazakhstan, showing that distances of more than 500 km can be covered within a few weeks after fledging. These data suggest that there might be an exchange of breeding birds between the colonies in the Novosibirsk Region and the colonies in eastern Kazakhstan and the Caspian Sea area.

Conclusion

Great Black-headed Gulls ringed as chicks at Lake Chany migrate in a SW direction. The wintering area is apparently situated along the Caspian Sea coast and on the Indian sub-continent. It is expected that there is an exchange of breeding birds between different colonies. The oldest bird recovered was 7 years.

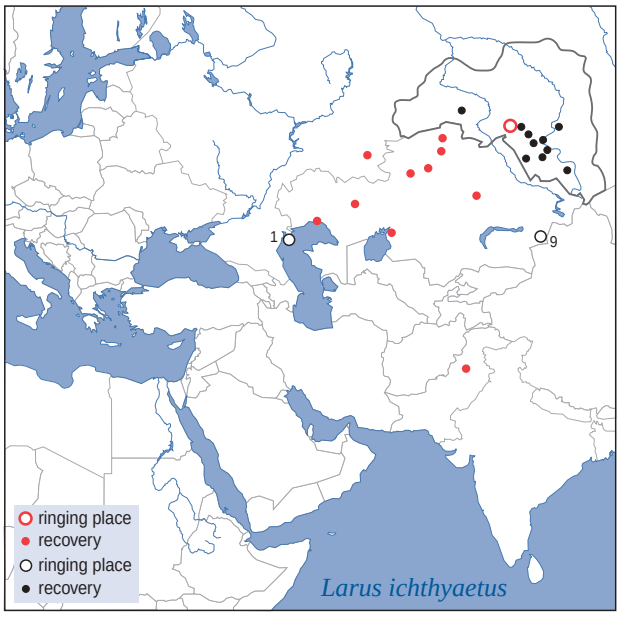


Figure 44. *Recoveries of Great Black-headed Gulls ringed inside (Lake Chany, Novosibirsk Region) and outside the study area. Figures near symbols refer to the number of birds recovered within the study area.*

Black Tern – Chyornaya Krachka
Chlidonias niger

Ringing data
There were 4 recoveries of birds ringed as chicks in colonies in the Novosibirsk Region (figure 45). Recoveries from the northern Caspian Sea coast and Italy (August-November) fit with the main migration route of the species which runs through the Caspian, Black and Mediterranean Seas to the Atlantic coast of West Africa (Cramp 1985). One recovery in southern Iran (found dead January) may refer to an individual following a migratory route leading to East African winter quarters. Two birds ringed in Italy (age and status unknown) have been recorded in summer in the study area, which fits with the species' known migration route.

Conclusions
Black Terns breeding in Southwest Siberia probably migrate to the species' main wintering areas along the coast of West Africa, passing the Caspian, Black and Mediterranean Seas. The oldest bird recovered was 6 years.

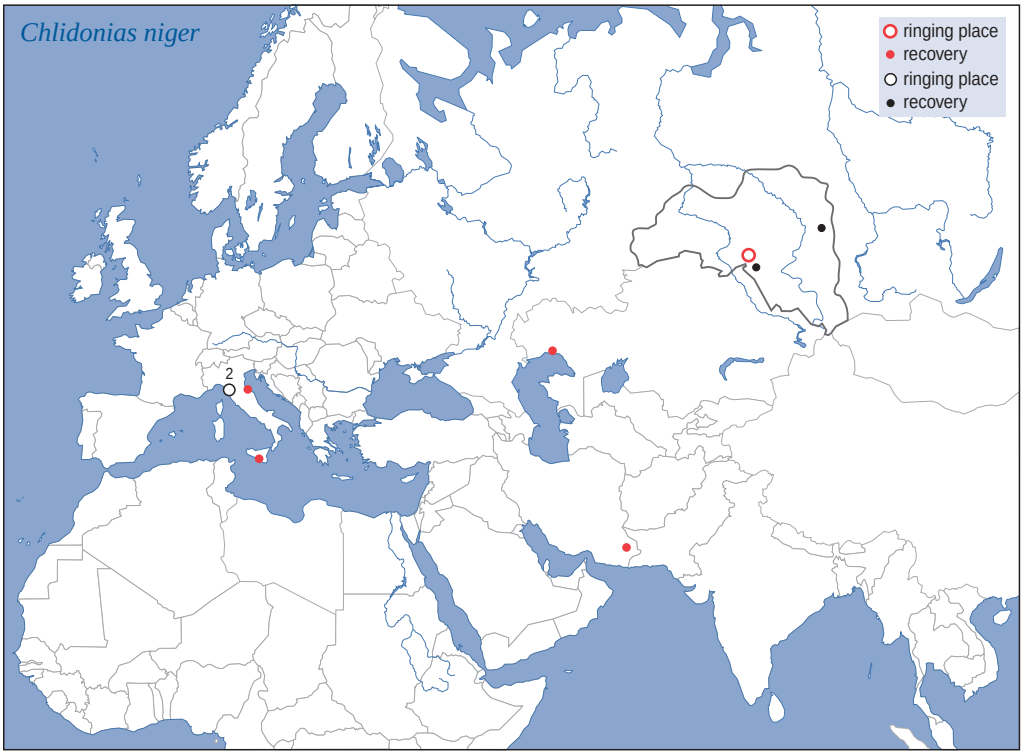


Figure 45. *Recoveries of Black Terns ringed inside (Lake Chany, Novosibirsk Region) and outside the study area.*

From ring recoveries to flyway populations

A thorough discussion of the principles underlying the separation of flyway populations can be found in Scott and Rose (1996). In their Atlas of Anatidae populations, the following types of "populations" are recognized: (1) the entire population of a species, (2) the entire population of a recognized subspecies, (3) a discrete migratory population of a species or subspecies which rarely mixes with other populations of the same species, (4) populations of northern hemisphere birds which spend the winter in a relatively discrete area, and (5) a regional group of sedentary, nomadic or dispersive birds with a rather continuous distribution.

Flyway populations are characterised by a clearly defined range linking breeding, migration and wintering areas. Our Atlas of movements of Southwest Siberian Waterbirds deals with waterbirds migrating through or breeding in part of Southwest Siberia. As a consequence, for most species only a relatively small proportion of the area used by each population is covered. Moreover, in most cases the number of recoveries is very limited. This means, that it is not possible to identify geographical limits of different flyway populations on the basis of the material presented. It is, however, possible to compare the distribution of the ring recoveries of each species with the area covered by different flyway populations as distinguished by earlier authors. A general overview of waterbird flyway populations is given by Wetlands International 2002, and a detailed atlas for the Anatidae is published by Wetlands International in 1996. Furthermore, valuable information is given in the series of migration studies edited by Pavlov (1978, 1982, 1985, 1989, 1997). Table 2 summarises the results of such a comparison. The following information is given:

Species: the name of the species (English and Latin)

Flyway population name: the name of the flyway population as used in the literature. We have followed Wetlands International 2002 for all species unless otherwise stated. In two cases the entire population of a subspecies is considered (*Larus canus heini* and *Chlidonias niger niger*). In all other cases the flyway populations refer to a more or less discrete part of the recognized subspecies, usually distinguished and named after the non-breeding area. Names referring to non-breeding and breeding areas are followed by (nb) and (br) respectively. In a few cases a second flyway population name is mentioned between brackets, including literature reference. This has been done in cases in which a detailed flyway map can be found in other literature sources under another name.

Reference: literature reference used for comparing ring recoveries with flyway descriptions. References marked with an asterisk provide flyway maps.

Breeding range: Breeding area of the flyway population according to Wetlands International 2002. Names used for geographical regions are explained in annex 2.
Core non-breeding range: Core non-breeding range of the flyway population (usually wintering area) according to Wetlands International 2002. Names used for geographical regions are explained in annex 2.

Occurrence: the occurrence within the flyway area based on ring recoveries presented in this atlas. Occurrence has been given by means of symbols (+, ++ or +++) and figures. The number of plusses indicate the extent to which birds ringed in the study area make use of a particular flyway. They should be read as follows:

+ a small number of recoveries come from this flyway. The flyway is probably unimportant for birds from the study area.
++ a considerable number of recoveries come from this flyway. The flyway is regarded important for birds from the study area .
+++ a relatively large number of recoveries come from this flyway. It is regarded as (one of) the main flyway areas for birds from the study area.

The number of plusses given should be seen as a rough indication. They are based on the relative frequency of occurrence of the recoveries. As a rule direct recoveries have been given more weight as compared to indirect recoveries, because the distribution of the latter is very much influenced by ringing activity (see methods section). For species with less than 10 recoveries (direct + indirect) any indication with respect to the use of flyways was regarded speculative. In such cases a 0 has been used instead of a + symbol.

The figures in the last three columns denote the number of direct recoveries, indirect recoveries and indirect recoveries of birds ringed in moulting areas, respectively. Recoveries in overlapping parts of two flyways have been allocated to the most likely flyway in one the following ways: if (nearly) all recoveries are in one flyway, a recovery in the area overlapping with a neighbouring flyway is allocated to the first; if (several) recoveries have been obtained from two neighbouring flyways, data points in the overlapping area have been split up and allocated to both flyways on the basis of the frequency of occurrence of points in the non-overlapping areas. Recoveries close to the study area have not been included if it was not possible to allocate them to a particular flyway. As a consequence, the total number of recoveries indicated in the table is not necessarily identical to the total number mentioned in the text of the species accounts or depicted on the maps.

Table 2. *Occurrence of recoveries of birds from the study area in different flyways as distinguished by Wetlands International 2002. Larus cachinnans has been omitted from the table because its sub-specific status is unknown. Explanation in text.*

Species	Flyway population name	Ref.	Breeding range	Core non-breeding range	Occurrence	Direct Recovery	Indirect Recovery	Recovered in Moulting area
Grey Heron *Ardea cinerea*	SW Asia (nb)	WI	C & SW Asia	E Black Sea & W, SW Asia, Caspian	000	9	0	0
Bean Goose *Anser fabalis*	NW Europe (nb)	WI	Scandinavia, E to W Siberia	NW Europe	00	0	5	0
Greater White-fronted Goose *Anser albifrons*	Baltic-North Sea (nb)	WI	European Arctic Russia & NW Siberia	NW Europe	00	0	4	0
Greylag Goose *Anser anser*	Caspian, Iraq (nb)	WI	W Siberia, Caspian	S Caspian, Iraq	+++	2	12	0
Mallard	W Mediterranean (nb)	SR*	N Europe	C Europe, W Mediterranean	+	0	2	0
Anas platyrhynchos	E Mediterranean (nb)	SR*	E Europe	Black Sea, E Mediterranean	+	2	2	0
	SW Asia (nb)	SR*	W Siberia, SW Asia	SW Asia	+++	11	7	76
	S Asia (nb)	WI	C Asia	S Asia	+	1	5	6
Gadwall	C Europe, Black Sea, Mediterranean	SR*	C & E Europe, Black Sea, Mediterranean		+	1	0	0
Anas strepera	SW Asia, NE Africa (nb)	SR*	W Siberia, SW Asia	SW Asia, NE Africa	+++	6	0	53
	S Asia (nb)	WI	C Asia	S Asia	++	1	46	0
Northern Pintail	Black Sea, Mediterranean, W Africa (nb)	SR*	NE Europe, W Siberia	Black Sea, Mediterranean, W Africa	+	0	9	0
Anas acuta	SW Asia, E & NE Africa (nb)	SR*	W Siberia	SW Asia, E & NE Africa	+++	25	5	147
	S Asia (nb)	WI	C Siberia, C Asia	S Asia	+++	23	132	4
	E & SE Asia	WI	E Siberia	E & SE Asia S to Thailand	+	0	1	0
Northern Shoveler	Black Sea, Mediterranean, W Africa (nb)	SR*	W Siberia, NE & E Europe	Black Sea, Mediterranean, W Africa	+	1	5	0
Anas clypeata	SW Asia, NE & E Africa (nb)	SR*	W Siberia, C Asia	SW Asia, NE & E Africa	+++	13	42	0
	S Asia (nb) (West Siberia/Indostan MH*)	MH*	C Siberia, C Asia	S. Asia	+++	0	64	0
Eurasian Wigeon	NW Europe (nb)	SR*	W Siberia & NW, NE Europe	NW Europe	+	0	29	0
Anas penelope	Black Sea, Mediterranean (nb)	SR*	W Siberia, NE Europe	Black Sea, Mediterranean	+	1	0	0
	SW Asia, NE Africa (nb)	SR*	C & W Siberia	SW Asia, NE Africa	+++	5	8	65
	S Asia (nb) (East Siberian by O*)	O*	C Siberia	S Asia	++	0	34	0
	East Asia	WI	E Siberia, NE China, Mongolia	E Asia	+	1	0	0
Common Teal	Black Sea/Mediterranean (nb)	SR*	W Siberia, NE Europe	Black Sea, Mediterranean, W Africa	++	4	7	0
Anas crecca	SW Asia, NE Africa (nb)	SR*	W Siberia	SW Asia, NE Africa	+++	12	6	25
	S Asia (nb)	WI	W & Siberia	S Asia	+++	15	78	0

Garganey	W Africa (nb)	SR*	Europe, W. Siberia	W. Africa	+++	7	30	0
Anas querquedula	SW Asia, NE Africa (nb)	SR*	W Siberia	SW Asia, NE & E Africa	+++	19	3	5
	S Asia (nb)	WI	W & C Siberia	S. Asia	+++	2	78	0
Common Pochard	NE & NW Europe (nb)	SR*	Russia, NE, NW Europe	NE, NW Europe	++	0	35	0
Aythya ferina	C Europe, Black Sea, Mediterranean (nb)	SR*	C & NE Europe	C Europe, Black Sea, Mediterranean	+++	20	50	6
	SW Asia (nb)	SR*	W Siberia	SW Asia	+++	61	6	0
	S Asia (nb)	WI	C Asia	S Asia	+++	2	139	0
	E Asia (nb) (Eastern/Southeastern Asia MM*)	MM*	Siberia, Sakhalin, NE China, Hokkaido	(mainly Korea and Japan)	+	0	4	0
Tufted Duck	NW Europe (nb)	SR*	N & NW Europe	NW Europe	+	0	3	0
Aythya fuligula	C Europe, Black Sea, Mediterranean (nb)	SR*	E & C Europe, Black Sea, Mediterranean	C Europe, Black Sea, Mediterranean	++	0	9	0
	SW Asia, NE Africa (nb)	SR*	W Siberia, SW Asia, NE Africa	SW Asia, NE Africa	+++	6	1	0
	C & S Asia (nb)	WI	W & C Siberia	C & S Asia	+++	1	38	0
Common Goldeneye	Black Sea (nb)	SR*	W Siberia, NE Europe	Black Sea	++	2	2	0
Bucephala clangula	Caspian Sea (nb)	SR*	W Siberia	Caspian Sea	+++	6	0	0
Common Coot	SW Asia (nb) (Caspian-W Siberian BL*)	WI	W & C Asia	SW Asia	++	2	2	0
Fulica atra	S Asia (nb) (W Siberian-Kazakhstan BL*)	WI	C & S Asia	S Asia	+++	0	75	0
Northern Lapwing	Europe (br)	WI	Europe	Europe, Asia minor, North Africa	+++	1	21	0
Vanellus vanellus	W Asia (br)	WI	W Asia	SW Asia, Caspian	+	2	0	0
Wood sandpiper	S Asia (nb)	WI	C & E Siberia to Kamchatka	S Asia	00	1	2	0
Tringa glareola								
Marsh Sandpiper	SW Asia, E & S Africa (nb)	WI	Siberia	SW Asia, E & S Africa	0	0	1	0
Tringa stagnatilis	S Asia (nb)	WI	Siberia	S Asia	00	0	2	0
Common Snipe	S Asia (nb)	WI	NC Asia to Kamchatka	S Asia	00	0	3	0
Gallinago gallinago								
Ruff	W Africa (nb)	WI	N&C Europe, NW Russia, W&C Siberia	W Africa	00	1	2	0
Philomachus pugnax	SW Asia & S Africa (nb)	WI	W, C & E Siberia	E & S Africa, SW Asia	0	0	1	0
	S Asia (nb)	WI	W, C & E Siberia	S Asia	00	0	3	0
Black-headed Gull	SW Asia, E Africa (nb)	WI	W Russia, C Asia	SW Asia, E Africa	+++	31	0	0
Larus ridibundus	S Asia (nb)	WI	Russia, C Asia	S Asia	++	9	0	0
Common Gull	*heini*	WI	NW Russia, W&C Siberia E to Lena R	SE Europe, Black & Caspian Seas	+++	17	0	0
Larus canus								
Great Black-h. Gull	E Europe, W Asia (br)	WI	Black and Caspian Seas	S Caspian, E Med, Arabian Pen, E Africa	++	8	1	0
Larus ichhtyaetus	C Asia (br)	WI	C Asia E to L Balkash, S to Tibet	S Asia, Myanmar	+	1	9?	0
Black Tern	*niger*	WI	W, C & S Europe, W&C Asia, E to Altai	Coastal W & C Africa to Namibia	000	3	2	0
Chlidonias niger								

Conclusions and discussion

Crossroads of flyways

This atlas deals with the movements of 25 species of migratory waterbirds, occurring in a 1700x1200 km “study area”, situated in Southwest Siberia. It depicts and analyses data from birds ringed in the area and recovered elsewhere as well as of birds ringed in other parts of the world which were recovered in the study area.

Ringing data have been related to flyway populations as these have been described in the literature (see table 2). In order to have a general overview of the extent to which the various species make use of different flyways, part of the data presented in table 2 have been summarised in table 3. To this end the following, somewhat generalised flyway regions have been distinguished, each of them named after the main staging and/or wintering areas: (1) Northwest and Central Europe, (2) Black Sea, Mediterranean, West Africa, (3) Caspian Sea, Southwest Asia, Eastern and Southern Africa, (4) South Asia and (5) East Asia. The symbols in the figure denote the extent to which a particular species ringed or recovered in the study area appears to use a particular flyway. (Symbols have the same meaning as those in column 6 of table 2.) It should be stressed that the symbols do not give any information about what part of the flyway is used by the species. For instance, a species using the Caspian Sea, Southwest Asian, Eastern African Flyway area may either winter along the Caspian Sea or move as far south as Southern Africa.

The table shows that nearly all species analysed make use of a number of flyways. Exceptions are Grey Heron, Bean Goose, Greater White-fronted Goose, Greylag Goose and Wood Sandpiper, though it should be stressed that only few data are available for most of these species. Bean Goose and Greater White-fronted Goose are difficult to relate to one of the flyways distinguished. These species seem to migrate from the study area to the west, traversing different flyways ending up in NW Europe. Good data are available for the ducks, as many recoveries have been obtained for these heavily hunted species. It appears that Mallard, Gadwall, Northern Pintail, Northern Shoveler, European Wigeon, Common Teal, Garganey, Common Pochard and Tufted Duck use three to five different flyways. By far the most important are the Caspian Sea, Southwest Asia, Eastern and Southern Africa Flyway and the South Asia Flyway. The Common Goldeneye is an exception among the ducks as it travels less far, almost exclusively making use of the Caspian Sea, Southwest Asia, Eastern and Southern Africa Flyway. For most wader species the number of data available is very small. All species appear to migrate along the South Asia Flyway with the exception of the Northern Lapwing. Moreover, it is likely that at least some species make use of the Caspian Sea, Southwest Asia, Eastern and Southern Africa Flyway, migrating to the African continent, as far as its southern tip (Marsh Sandpiper and Ruff). All gull species and Common Coot migrate less far than most ducks and the waders and recoveries mainly come from the northern parts of the Caspian Sea, Southwest Asia, Eastern and Southern Africa Flyway and the South Asia Flyway, with the Common Gull wintering further north on average than the other species.. The Black Tern does not really fit within the scheme as it roughly migrates from east to west, passing the Caspian, Black and Mediterranean Seas to the Atlantic coast of West Africa, where it winters in an area belonging to the East Atlantic Flyway which is not included in our table (but see figure 45).

Our data show that the Southwest Siberian study area is situated on a crossroads of flyways and that most waterbird species ringed in the area use several of these flyways. This raises the question to what extent birds breeding in or migrating through different parts of the study area may migrate in different directions. This has been studied in some detail in eight duck species for which maps have been drawn showing the location within the study area of recoveries for birds ringed in the wintering areas (see figures 9, 14, 17, 20, 23, 26, 29, 32). These data have been summarised in figure 46 showing the mean positions of recoveries for birds being ringed in the following directions relative to the study area: west (Northwest and Central Europe), southwest (Caspian Sea area, Africa), south (South Asia) and east (Japan).

For all species, the west to east position of wintering sites appears to be correlated with a west to east mean position of recoveries in the study area, respectively. In

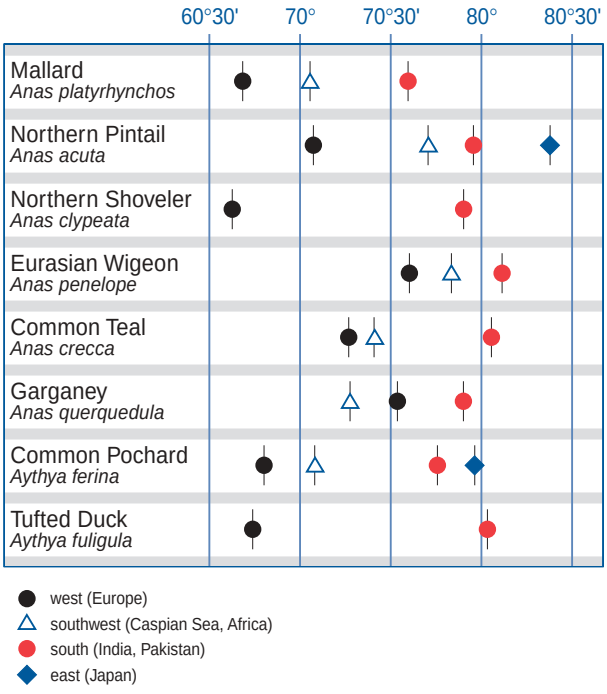


Figure 46. *Mean longitudinal positions of recoveries within the study area of ducks ringed in different wintering areas.*

Table 3. *The extent to which waterbird species from the Southwest Siberian study area make use of different flyways, based on ring recoveries analysed in this study. For details see table 2.*

	NW & C Europe	Black Sea Mediterranean West Africa	Caspian Sea SW Asia E & S Africa	South Asia	East Asia
Grey Heron *Ardea cinerea*			000		
Bean Goose *Anser fabalis*	00				
Greater White-fronted Goose *Anser albifrons*	00				
Greylag Goose *Anser anser*			+++		
Mallard *Anas platyrhynchos*	+	+	+++	+	
Gadwal *Anas strepera*		+	+++	++	
Northern Pintail *Anas acuta*		+	+++	+++	+
Northern Shoveler *Anas clypeata*		+	+++	+++	
Eurasian Wigeon *Anas penelope*	+	+	+++	++	+
Common Teal *Anas crecca*		++	+++	+++	
Garganey *Anas querquedula*		+++	+++	+++	
Common Pochard *Aythya ferina*	++	+++	+++	+++	+
Tufted Duck *Aythya fuligula*	+	++	+++	+++	
Common Goldeneye *Bucephala clangula*		++	+++		
Common Coot *Fulica atra*			++	+++	
Northern Lapwing *Vanellus vanellus*	+++		+		
Wood Sandpiper *Tringa glareola*				00	
Marsh Sandpiper *Tringa stagnatilis*			0	00	
Common Snipe *Gallinago gallinago*				00	
Ruff *Philomachus pugnax*		00	0	00	
Black-headed Gull *Larus ridibundus*			+++	++	
Common Gull *Larus canus*		+++			
Yellow-legged Gull *Larus cachinnans*			00		
Great black-headed Gull *Larus ichthyaetus*			++	+	
Black Tern *Chlidonias niger*		000			

Legend
+ flyway rarely used
++ flyway regularly used
+++ flyway often used
0, 00, 000 as + symbols, but highly speculative (for species with a total of less than 10 recoveries)

two species (Northern Shoveler and Tufted Duck, see figure 17 and 32) the recoveries of birds ringed in Northwest and Central Europe are quite well separated from those ringed in South Asia. However, in all other species, recoveries from different wintering areas, although having a different position on average, are spread over the whole study area. This is especially the case for recoveries of birds coming from the southwest (Caspian Sea, Africa). Considering that the study area measures about 1700 km from west to east, the enormous mixing of birds using different flyways is a remarkable feature, which raises the question of what determines the migratory direction in individual birds.

The importance of the area for moulting ducks

The period of moult, especially wing moult, is a critical time in the annual cycle of ducks. Food requirements are high because of energy demand for moult feather growth and there is an increased risk of predation because of decreased manoeuvrability or even complete flightlessness. It is therefore likely that most species will have particular habitat requirements during the moulting period relating to feeding conditions and safety from predators. In a number of duck species, huge numbers of birds concentrate at a few favoured localities for wing moult. At this time, the birds are extremely vulnerable to disturbance, over-exploitation and man-made catastrophes. Thus, sites with large concentrations of moulting ducks are of special importance.

Within the study area nearly all ducks ringed during wing moult, originate from two important moulting areas: Mai-Sor Lake (Omsk Region) and Lake Chany (Novosibirsk Region). No information on species, numbers and trends are available for Mai-Sor Lake. In case of Lake Chany extremely large numbers have been reported from the first half of the twentieth century. No data are available on the species composition of these moulting concentrations, but ringing records make it likely that Mallard, Northern Pintail, Northern Shoveler, Eurasian Wigeon, Garganey and Common Pochard must have all been present in large numbers, Northern Pintail and Common Teal being especially abundant. The ducks moulting in the study area were heavily exploited and an unconfirmed record mentions that 500,000 ducks were harvested in the area and sold for consumption in 1933 (Yurlov, pers com.). If this is a realistic figure the actual number of moulting ducks must have been enormous. The number of ducks has strongly decreased over time. At Lake Chany, in 1969, numbers had decreased to about 200,000, whereas in 1992 no more than 60-80,000 individuals were estimated (Yurlov pers. com.). Despite this decrease, Lake Chany still qualifies as a crucially important area for ducks. The reasons for the strong decline are said to be unknown. However, one can hardly imagine that the extraordinary toll taken by man did not have an influence on the negative trend in numbers observed.

The question arises whether the decrease in numbers of moulting ducks coincided with a decline of populations or with a switch to other moulting areas (or both). On the one hand it should be noted that several authors have suggested that the Russian duck populations have decreased enormously in the course of the twentieth century. Despite the fact that no reliable estimates of the populations are available, this factor may have played a significant role. On the other hand, large concentrations of moulting ducks have also been recorded at lakes in the Regions Aktubinsk, Kustanay, Akmolinsk and Pavlodar in northern Kazakhstan, at a relatively short distance from the Russian border, as well as along the northern shore of the Caspian Sea. This makes it possible that other wetlands have (partly) taken over the regional function of Lake Mai-Sor and Lake Chany as moulting areas.

Moulting areas are of special importance because they are unusual. They often attract breeding birds from a very wide geographical area. Ducks moulting at Lake Mai-Sor and Lake Chany could be linked to breeding sites in the taiga and tundra zones up to between 1250 and 1750 km away (see recoveries of Northern Pintail, Northern Shoveler, Eurasian Wigeon and Common Teal). Similar observations are known from other moulting sites, e.g. those from northern Kazakhstan and the northern Caspian Sea. An analysis of data of Northern Pintails ringed during wing moult along the northern Caspian Sea shore shows several recoveries from the Siberian breeding grounds as far as 2000-3000 km to the NW, N and NE (Ostapenko *et al*. 1997). The area of 'mass recoveries' as defined by these authors ranges from about 40°– 85° E and 47°–70° N, showing that moulting sites may attract ducks breeding in an enormous area.

Policy implications

The conservation of long-distance migrant birds is an international matter which depends on proper co-ordination of conservation activities and co-operation between countries. A range of inter-governmental Agreements have been put in place in order to achieve this goal. All of the species dealt with in this atlas are protected by the African-Eurasian Migratory Waterbird Agreement (AEWA) under the Convention on Migratory Species (Bonn Convention). The Agreement area covers Europe, Africa and part of Asia with eastern boundaries running from the delta of the Lena River in Northeast Siberia, via the most westerly border of Mongolia and the southeast border of Afghanistan to the western tip of the Arabian Peninsula. The Southwest Siberian study area covered in this atlas lies within the AEWA region at its far eastern border. This study has shown that waterbirds breeding in or migrating through Southwest Siberia winter to a large extent to the south (Indian sub-continent) and the southwest (SW Asia and Africa) and to a lesser extent to the west (W, C & E Europe). This suggests that the area presently considered as the Central Asian Flyway (CAF) area for which an inter-governmental Action Plan is being developed, forms an integral part of the flyway systems used by waterbirds which are the focus of the AEWA. The findings of this study, therefore, reinforce the suggestion of including the Central Asian Flyway within the AEWA.

References

Blums, P.N., & H. Litzbarski 1982. Coot, *Fulica atra*. In: Pavlov, D.S. (ed). Migrations of birds of Eastern Europe and Northern Asia. Falconiformes – Gruiformes. Academy of Sciences of the USSR, Moscow (in Russian).

Boere, G.C. 2003. Global activities on the conservation, management and sustainable usew of migratory waterbirds: an integrated flyway/ecosustem approach. Wader Study Group Bulletin 100:96-101.

Cramp, S. (ed.) 1977. Handbook of the Birds of Europe, the Middle East and North Africa. Volume I . Oxford University Press, Oxford, UK.

Cramp, S. (ed.) 1983. Handbook of the Birds of Europe, the Middle East and North Africa. Volume III . Oxford University Press, Oxford, UK.

Cramp, S. (ed.) 1985. Handbook of the Birds of Europe, the Middle East and North Africa. Volume IV . Oxford University Press, Oxford, UK.

Dobrynina, I.N. & M.I. Lebedeva 1985. Marsh Sandpiper - *Tringa stagnatilis* Bechst. In: Pavlov, D.S. (ed.) Migrations of birds of Eastern Europe and Northern Asia. Gruiformes and Charadriiformes. Academy of Sciences of the USSR, Moscow (in Russian).

Ebbinge, B.S. & H. Dekkers, 2004. Ganzen en zwanen: arctische trekvogels bij boeren te gast. Fontaine, 's-Graveland.

Flint, V.E., R.L. Boehme, Y.V. Kostin & A.A. Kuznetsov 1989. Birds of Russia and Adjacent Territories. Princeton University Press, Princeton, New Yersey, USA.

Hoyo, J. del, A. Elliott, & J. Sargatal (eds.) 1996. Handbook of the Birds of the World, Volume III, Hoatzin to Auks. Lynx edicions, Barcelona, Spain.

Kats, E.B., G.A. Krivonosov & D.N. Nankinov 1997. Garganey, *Anas querquedula*. In: Pavlov, D.S. (ed.) Migrations of birds of Eastern Europe and Northern Asia. Anseriformes. Academy of Sciences of the USSR, Moscow (in Russian).

Kitchinski, A.A, S.G. Priklonski & Ya.V. Sapetin 1978. Grey Heron, *Ardea cinerea*. In: Pavlov, D.S. Ed. Migrations of birds of Eastern Europe and Northern Asia. Gaviiformes, Ciconiiformes. Academy of Sciences of the USSR, Moscow (in Russian).

Lebedeva, M.I. 1957. Ringing results in some wader species. In: Proceedings of the Moscow Ringing Center. 9, 290-310 (in Russian).

Lebedeva, M.I. & I.N. Dobrynina 1985. Ruff – *Philomachus pugnax* L. In: Pavlov, D.S. (ed.) Migrations of birds of Eastern Europe and Northern Asia. Gruiformes and Charadriiformes. Academy of Sciences of the USSR, Moscow (in Russian).

Lebedeva, M.I., K. Lambert & I.N. Dobrynina 1985. Wood Sandpiper - Tringa glareola L. In: Pavlov, D.S. (ed.) Migrations of birds of Eastern Europe and Northern Asia. Gruiformes and Charadriiformes. Academy of Sciences of the USSR, Moscow (in Russian).

Mednis A. & K. Hudec 1989. Shoveler, Anas clypeata. In: Pavlov, D.S. (ed.) Migrations of birds of Eastern Europe and Northern Asia.Anseriformes. Academy of Sciences of the USSR, Moscow (in Russian).

Mc Clure, H.E. 1974. Migration and survival of the birds of Asia. Bangkok.

Miyabayashi, Y. & T. Mundkur 1999. Atlas of Key Sites for Anatidae in the East Asian Flyway. Wetlands International, Tokyo, Japan & Kuala Lumpur, Malaysia.

Ostapenko, V.A., V.V. Bianki, T.A. Evstigneeva & D.N. Nankinov 1997. Wigeon, *Anas penelope*. In: Pavlov, D.S. (ed.). Migrations of birds of Eastern Europe and Northern Asia. Anseriformes. Academy of Sciences of the USSR, Moscow (in Russian).

Sapetin, Y.P., A. Siefke, D.N. Nankinov & S.G. Priklonsky 1997. Teal, *Anas crecca*. In: Pavlov, D.S. (ed.). Migrations of birds of Eastern Europe and Northern Asia. Anseriformes. Academy of Sciences of the USSR, Moscow (in Russian).

Scott, D.A. & P.M. Rose 1996. Atlas of Anatidae populations in Africa and Western Eurasia. Wetlands International Publication no. 41, Wetlands International, Wageningen, The Netherlands.

Shevareva T.P., 1961. Migrations of the Greylag Goose on the base of ringing data. In: Ringing and Marking of Animals. Information Bulletin 1: 26-34 (in Russian).

Stroud, D.A., A. Baker, D. Blanco, N.C. Davidson, S. Delany, B. Ganter, R. Gill, P. González, L. Haanstra, R.I.G. Morrison, T. Piersma, D. Scott, O. Thorup, R. West, J. Wilson & C. Zöckler 2005. The conservation and population status of the world's shorebirds at the turn of the Millennium: how much do we know? Proceedings of the Waterbirds Around the World Conference.

Tamanseva L.S. 1955. Seasonal migrations in terns. In: Proceedings of the Moscow Ringing Center. 8: 91-100 (in Russian).

Teplova, E.N., 1957. Results of ringing the Wigeon in the USSR In: Proceedings of the Moscow Ringing Center. 9:144 – 161 (in Russian).

Treus, V.D. 1957a. Seasonal distribution and migrations of Northern Shoveler according to ringing data. In: Proceedings of the Moscow Ringing Center. 9: 187-207 (in Russian).

Treus, V.D. 1957b. Seasonal distribution and migrations of Gadwall according to ringing data. In: Proceedings of the Moscow Ringing Center. 9:162-186 (in Russian).

Vinokurov A.A. 1961a. New data on distribution and migration of Northern Shovelers. In: Ringing and Marking of Animals. Information Bulletin.1:52-66 (in Russian).

Vinokurov A.A. 1961b. Results of coots ringing. In: Ringing and Marking of Animals. Information Bulletin 1, 52-66 (in Russian).

Wetlands International, 2002. Waterbird Population Estimates – Third Edition. Wetlands International Global series No 12, Wetlands International, Wageningen, The Netherlands.

Wuczeticz, W. 1941. Seasonal distribution and migrations of ducks (subfam. Anatinae) on the base of bird ringing in the USSR. Part IV: *Querquedula crecca* (L.), *Querquedula querquedula* (L.), 87 pages (in Russian).

Wuczeticz, W. & Tugarinov A, 1937. Seasonal distribution and migrations of ducks (subfam. Anatinae) on the base of bird ringing in the USSR, part II, The Pintail – *Dafila acuta* L. Moscow, 37 pages (in Russian).

Annex I

Table 4. *Waterbird species occurring in Southwest Siberia for which fewer than three ring recoveries have been obtained. Only long-distance recoveries have been included.*

Species	Ringed			Recovered		
	Date	Place	Co-ordinates	Date	Place	Co-ordinates
Pluvialis apricaria	22-03-72	Belgium	51.03-02.95	28-05-73	SW Siberia	58.93-81.58
Tringa totanus	06-10-65	India	27.25-77.53	03-05-66	SW Siberia	52.83-79.88
Limosa lapponica	07-11-77	Great Britain	55.68-01.63	25-05-79	SW Siberia	61.10-80.25
Calidris minuta	15-01-65	South Africa	34.08-18.52	17-08-65	SW Siberia	54.95-72.67
Calidris ferruginea	26-08-76	SW Siberia	54.57-78.12	08-08-80	India	10.30-79.85
Calidris alba	13-09-84	SW Siberia	54.57-78.12	24-11-84	Thailand	13.45-100.20

Annex II

Geographical regions in Europe, Asia and Africa, as defined by Wetlands International (2002) for describing the ranges of waterbird populations

North Africa – Algeria, Egypt, Libyan Arab Jamahiriya, Morocco, Tunisia.

West Africa – Benin, Burkina Faso, Cameroon, Cape Verde, Chad, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo.

Eastern Africa – Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, Sudan, Uganda, United Republic of Tanzania.

North-east Africa – Djibouti, Egypt, Eritrea, Ethiopia, Somalia, Sudan.

Southern Africa – Angola, Botswana, Lesotho, Madagascar, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia, Zimbabwe.

Central Africa – Cameroon, Central African Republic, Congo, Democratic Republic of Congo, Equatorial Guinea, Gabon, Sao Tome and Principe.

Sub-Saharan Africa – All African states excluding North Africa as defined above.

Tropical Africa – Sub-Saharan Africa excluding Lesotho, Namibia, South Africa and Swaziland.

North-west Europe – Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, The Netherlands, Norway, Sweden, Switzerland, United kingdom of Great Britain and Northern Ireland.

North-east Europe – The northern part of the Russian Federation west of the Urals.

Central Europe – Austria, Czech Republic, Estonia, Germany, Hungary, Latvia, Liechtenstein, Lithuania, Poland, the Russian Federation around the Gulf of Finland and Kaliningrad, Slovakia, Switzerland.

Eastern Europe – Belarus, the Russian Federation west of the Urals and Ukraine.

Western Siberia – The Russian Federation from the Urals to the Yenisey River and south to the Kazakhstan border.

Central Siberia – The Russian Federation from the Yenisey River to the Lena River and south to the Altai Mountains.

West Mediterranean – Algeria, France, Italy, Malta, Monaco, Portugal, Spain, Tunisia.

East Mediterranean – Albania, Bosnia and Herzegovina, Croatia, Cyprus, Egypt, Greece, Israel, Lebanon, Libyan Arab Jamahiriya, Slovenia, Syrian Arab Republic, the former Yugoslav Republic of Macedonia, Turkey, Yugoslavia.

Black Sea – Armenia, Bulgaria, Georgia, Republic of Moldavia, Romania, Russian Federation, Turkey, Ukraine.

Caspian – Azerbaijan, Islamic Republic of Iran, Kazakhstan, Russian Federation, Turkmenistan, Uzbekistan.

South-west Asia – Bahrein, Islamic Republic of Iran, Iraq, Israel, Jordan, Kazakhstan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, eastern Turkey, Turkmenistan, United Arab Emirates, Uzbekistan, Yemen.

Western Asia – The western part of the Russian Federation east of the Urals and the states bordering the Caspian Sea.

Central Asia – Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan.

South Asia – Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka.

Eastern Asia – China (Mainland and Taiwan Island), Democratic People's Republic of Korea, Japan, Mongolia, Republic of Korea, Russian Federation from the eastern edge of the Taimyr to the Sea of Okhotsk and the Bering Sea.

South-east Asia – Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic republic, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Vietnam.