An atlas of movements of Southwest Siberian waterbirds

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

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This Atlas of movements of Southwest Siberian water-birds 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). It 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.
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 (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...
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

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.

Acknowledgements

The authors express their thanks to Arie Spaans who critically read the manuscript and to Rodney West who provided the wader flyway map depicted in figure 1.
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 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, Charadriidae, 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 (provinces) 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.

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 molting birds (ducks molting 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 molting 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, molting, 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, molting 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 eco-
nomic situation. These factors vary greatly between dif-
ferent parts of the world and may often lead to differ-
ences 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 recover-
ies 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 loca-
tion of active ringing schemes. This has resulted in rela-
tively 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.
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).

Table 1. Ecological characteristics of the waterbird species described in this atlas. S = steppe, FS = forest steppe, T = taiga.
<table>
<thead>
<tr>
<th>Species</th>
<th>Arrival</th>
<th>Habitat</th>
<th>Abundance</th>
<th>Moulting Period</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eurasian Wigeon Anas penelope</td>
<td>April</td>
<td>Low vegetation</td>
<td>Rare (north FS) to Common (T)</td>
<td>Grassland, marshes, open water</td>
<td>July-August moult aggregations</td>
</tr>
<tr>
<td>Common Teal Anas crecca</td>
<td>April</td>
<td>Dense grass</td>
<td>Rare (north FS) to Common (T)</td>
<td>Marshes, open water</td>
<td>July moult aggregations</td>
</tr>
<tr>
<td>Garganey Anas querquedula</td>
<td>Late April-May</td>
<td>Wet meadows</td>
<td>Common (FS) to rare (south T)</td>
<td>Marshes, open water</td>
<td>July-August moult aggregations</td>
</tr>
<tr>
<td>Common Pochard Aythya ferina</td>
<td>End of April</td>
<td>Reed beds, marsh vegetation</td>
<td>Common (S, FS) to rare (south T)</td>
<td>Open (deeper) water</td>
<td>June-July moult aggregations</td>
</tr>
<tr>
<td>Tufted Duck Aythya fuligula</td>
<td>End of April</td>
<td>Marsh vegetation</td>
<td>Common (S, FS, T)</td>
<td>Open water</td>
<td>June-July moult aggregations</td>
</tr>
<tr>
<td>Common Goldeneye Bucephala clangula</td>
<td>April-May</td>
<td>Tree hollows near rivers and lakes</td>
<td>Common (T)</td>
<td>Open water</td>
<td>June-July moult aggregations</td>
</tr>
<tr>
<td>Common Coot Fulica atra</td>
<td>End of April</td>
<td>Thick marsh vegetation</td>
<td>Common to numerous (S, FS), or uncommon (T)</td>
<td>Marshes, open water</td>
<td>July-August</td>
</tr>
<tr>
<td>Northern Lapwing Vanellus vanellus</td>
<td>Beginning of April</td>
<td>Agricultural fields, grasslands, open short vegetation</td>
<td>Common (S, FS)</td>
<td>Fields, grassland, mud flats, river banks</td>
<td>From July onwards</td>
</tr>
<tr>
<td>Wood Sandpiper Tringa glareola</td>
<td>May</td>
<td>Grassy meadows, lake shores</td>
<td>Common (T)</td>
<td>Grassland, mud flats, water edge</td>
<td>In May and August-September in FS</td>
</tr>
<tr>
<td>Marsh Sandpiper Tringa stagnatilis</td>
<td>May</td>
<td>Wet grassy meadows</td>
<td>Common (T)</td>
<td>Shallow water</td>
<td>End June-August</td>
</tr>
<tr>
<td>Common Snipe Gallinago gallinago</td>
<td>May</td>
<td>Wet meadows and marshes</td>
<td>Common (north FS, T)</td>
<td>Wet grasslands, marshes</td>
<td>From July onwards</td>
</tr>
<tr>
<td>Ruff Philomachus pugnax</td>
<td>May</td>
<td>Wet grasslands</td>
<td>Rare (FS, T)</td>
<td>Grasslands, wet meadows, water edge</td>
<td>Second half of May and August</td>
</tr>
<tr>
<td>Black-headed Gull Larus ridibundus</td>
<td>April</td>
<td>Marshes, islands in rivers and lakes</td>
<td>Common (S, FS, south T), colonies up to thousands of pairs</td>
<td>Fields, grasslands, marshes, water bodies</td>
<td>July-September</td>
</tr>
<tr>
<td>Common Gull Larus canus</td>
<td>April</td>
<td>Islands in lakes (FS) and river valleys (T), colonies up to 1500 pairs</td>
<td>Common (S, FS, T), colonies up to 1500 pairs</td>
<td>Fields, marshes, water bodies</td>
<td>July-September</td>
</tr>
<tr>
<td>Yellow-legged Gull Larus cachinnans</td>
<td>April</td>
<td>Islands in lakes</td>
<td>Common (S, FS), colonies up to hundreds of pairs</td>
<td>Fields, marshes, water bodies</td>
<td>July-September</td>
</tr>
<tr>
<td>Great Black-headed Gull Larus ichthyatus</td>
<td>April</td>
<td>Islands in lakes, reed beds</td>
<td>Rare (FS), three breeding sites, colonies up to 400 pairs</td>
<td>River and lake shore, open water</td>
<td>July-September</td>
</tr>
<tr>
<td>Black Tern Chlidonias niger</td>
<td>May</td>
<td>Marshes, floating vegetation, in rivers and lakes</td>
<td>Common (S, FS)</td>
<td>Grasslands, marshes, open water</td>
<td>July-August</td>
</tr>
</tbody>
</table>
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.*
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 moultning 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 moultning 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 40° (Turkmenistan, Uzbekistan, Iran, Afghanistan, India).

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...
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).
**Species accounts**

**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.

**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.

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

**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.
**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 40° 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 mouling bird in earlier years. It shows that the Southwest Siberian moultng 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) mouling 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.*
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 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.

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 moult 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 (triangles) (3) ringing place (diamonds).
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 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.

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 moult ing 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).