An atlas of movements of Southwest Siberian waterbirds

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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.

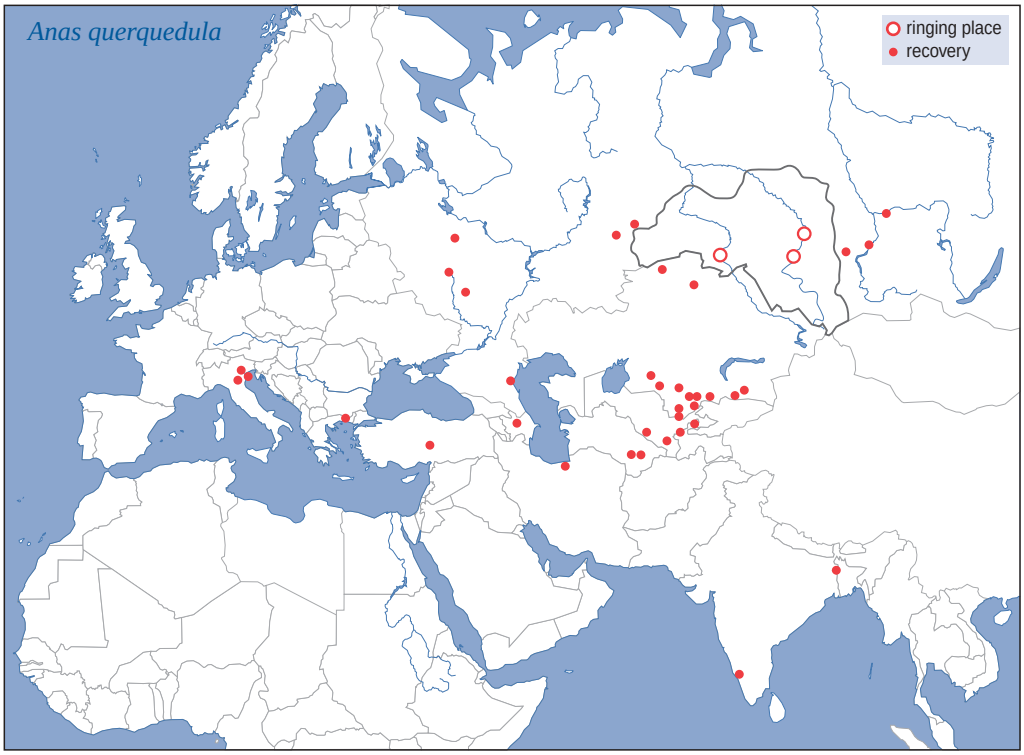


Figure 24. *Recoveries of Garganeys ringed as breeding birds or during wing moult in the Regions of Omsk, Tomsk and Novosibirsk.*

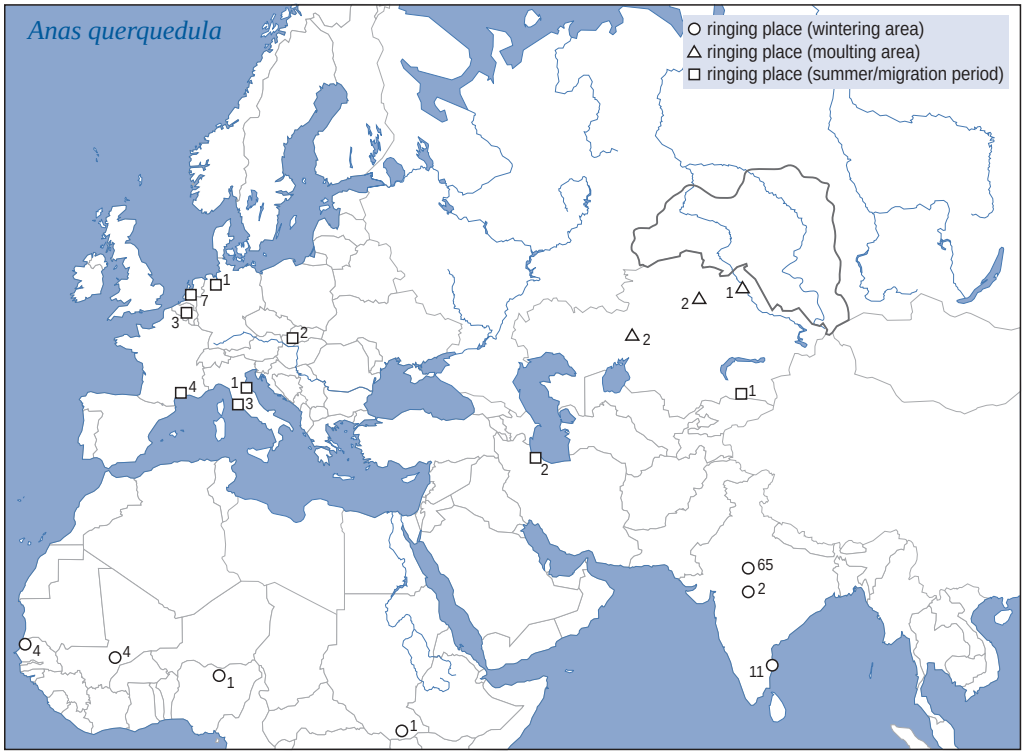


Figure 25. *Ringing places of Garganeys which were recovered in the study area. Figures near symbols refer to the number of birds recovered. The distribution of recoveries is given in figure 26.*

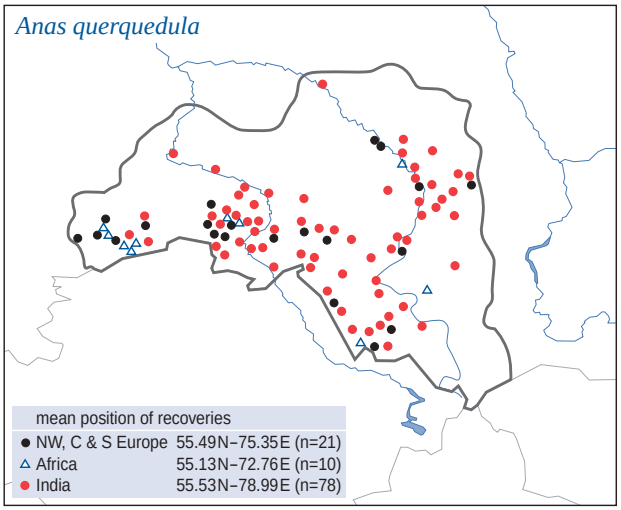
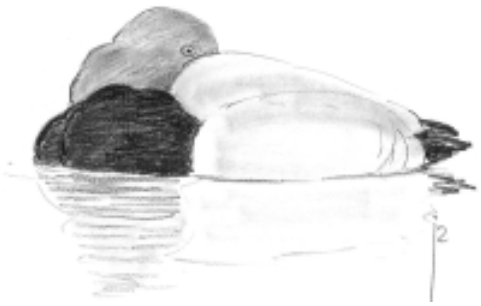


Figure 26. *Recoveries of Garganeys ringed in different wintering areas (see also figure 25).*

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.

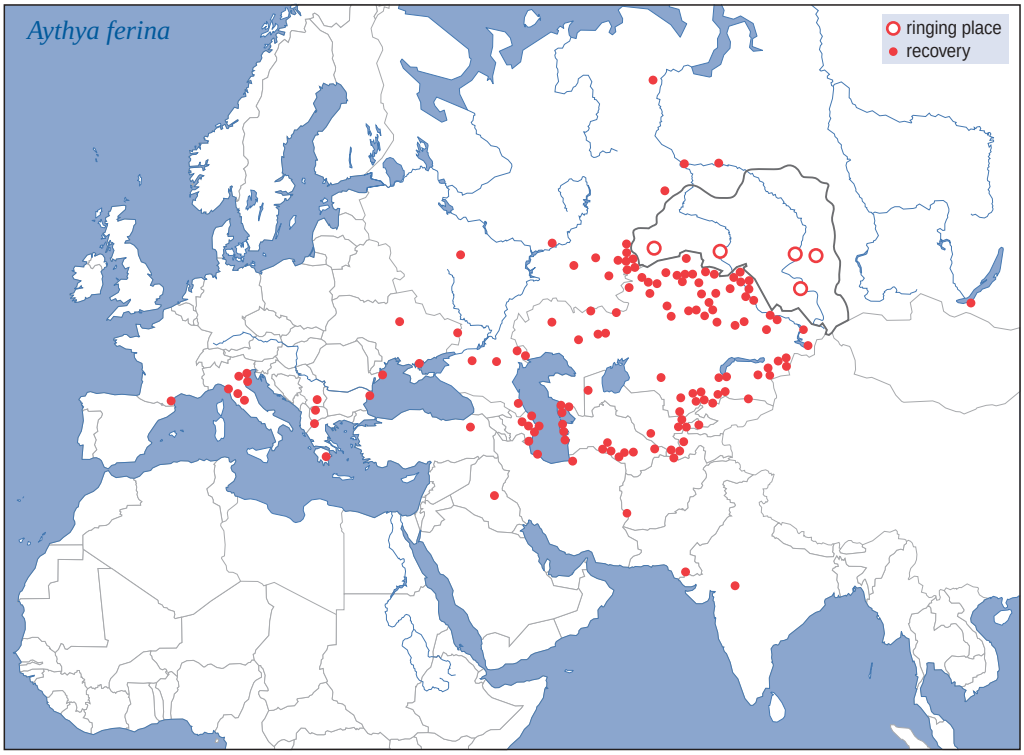


Figure 27. *Recoveries of Common Pochards ringed as breeding birds or during wing moult in the Regions of Kurgan, Omsk, Tomsk, Kemerovo and Novosibirsk.*

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.*

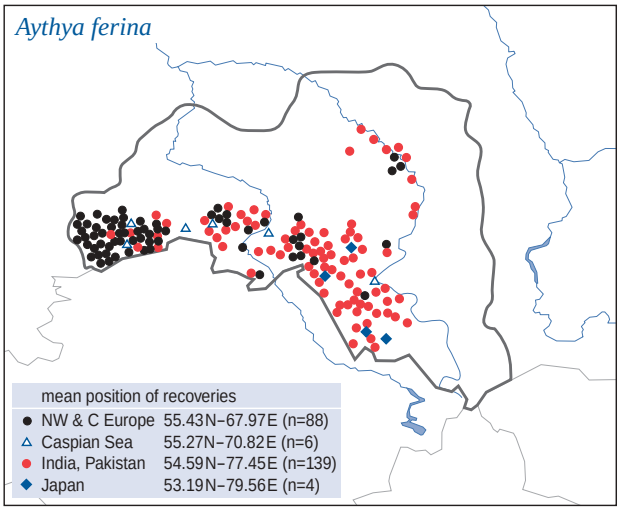


Figure 29. *Recoveries of Common Pochards ringed in different wintering areas (see also figure 28).*

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.

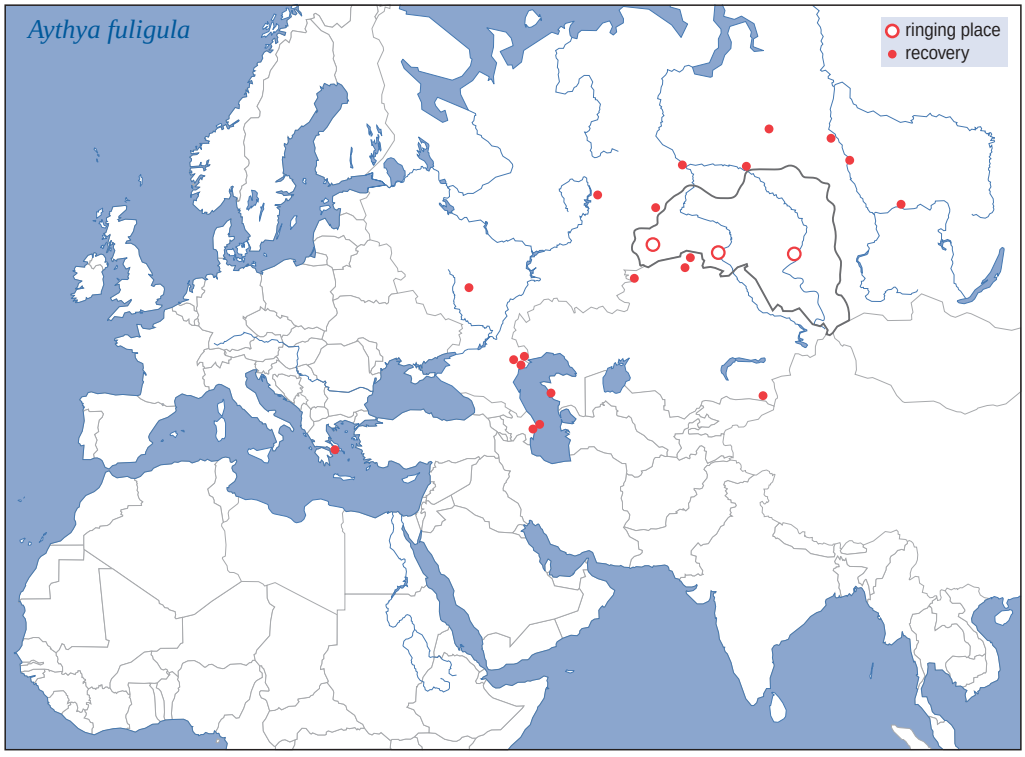


Figure 30. *Recoveries of Tufted Ducks ringed as breeding birds or during wing moult in the Regions of Kurgan, Omsk and Novosibirsk.*

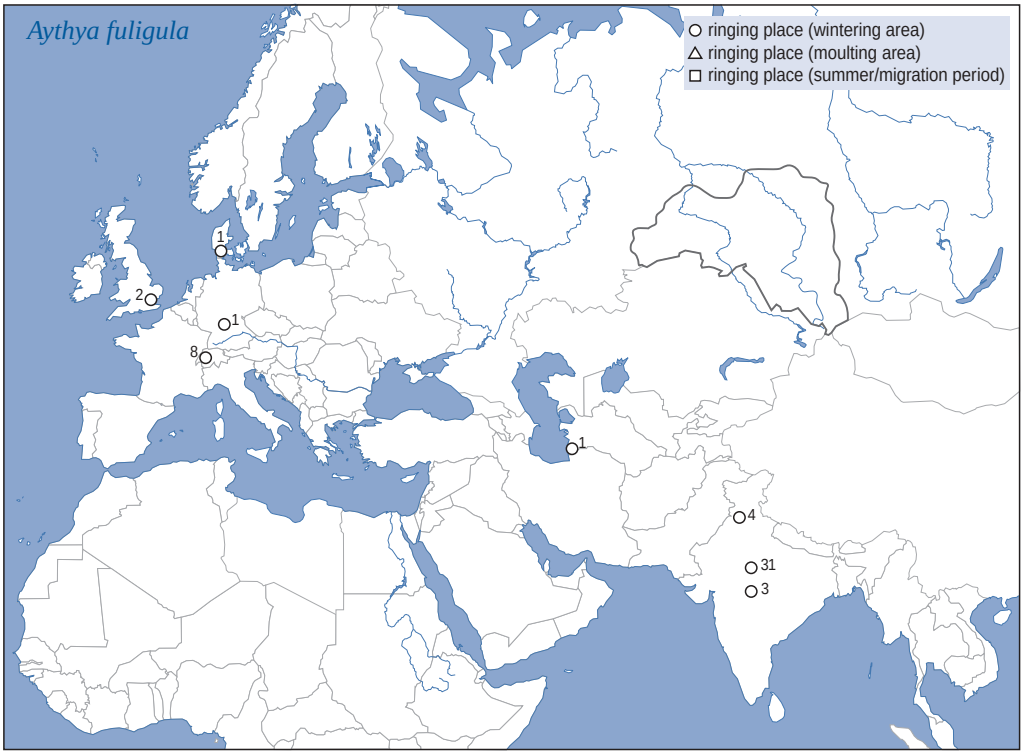


Figure 31. *Ringing places of Tufted Ducks which were recovered in the study area. Figures near symbols refer to the number of birds recovered. The distribution of recoveries is given in figure 32.*

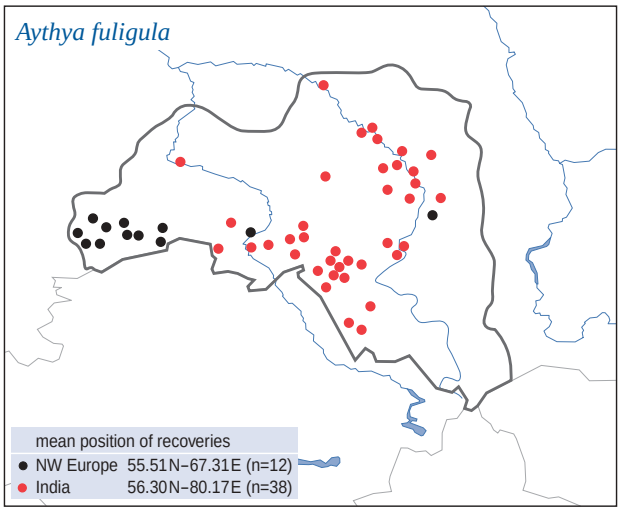


Figure 32. *Recoveries of Tufted Ducks ringed in different wintering areas (see also figure 31).*

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.

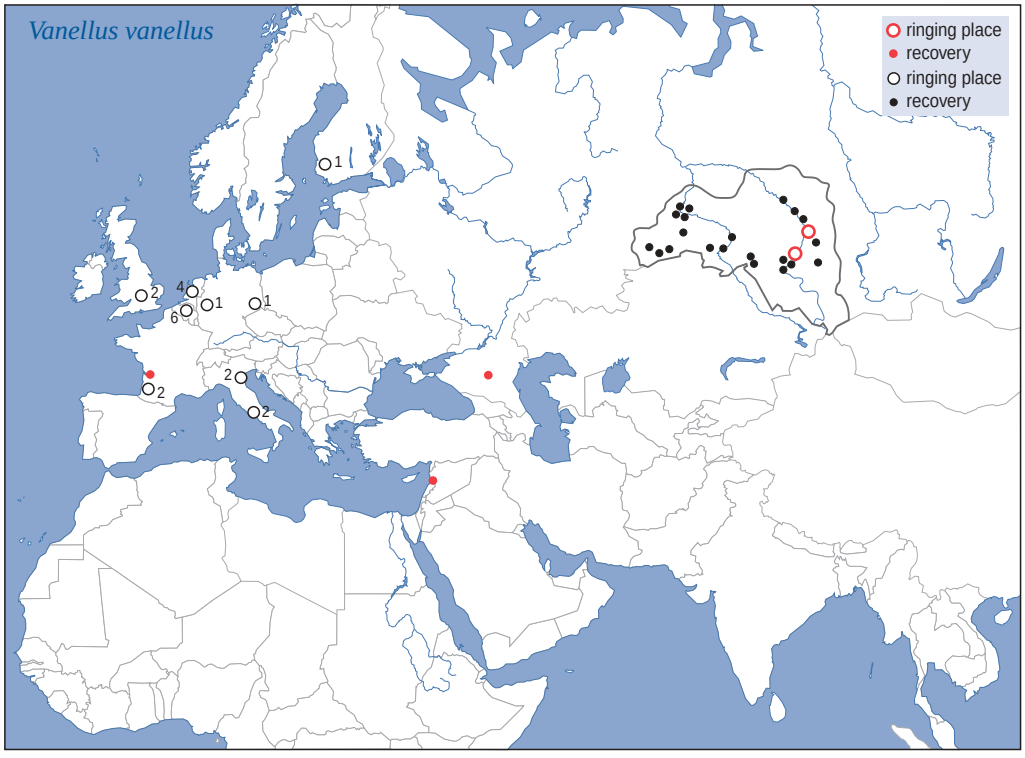
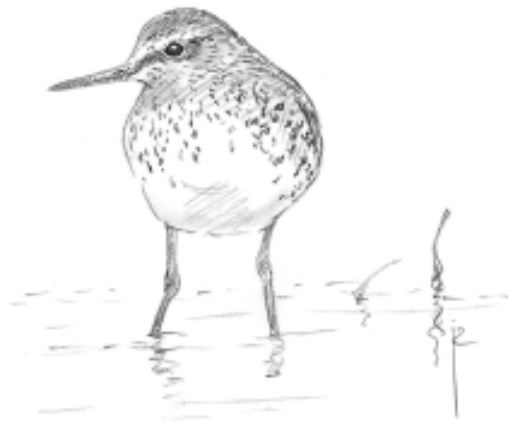


Figure 36. *Recoveries of Northern Lapwings ringed inside (Tomsk and Novosibirsk Regions) and outside the study area. Figures near symbols refer to the number of birds recovered*

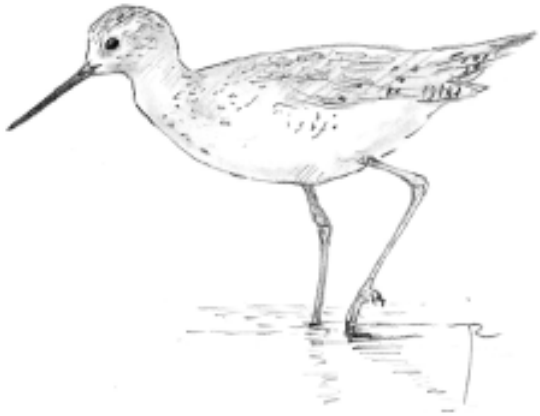
Wood Sandpiper – Fifi
Tringa glareola



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.

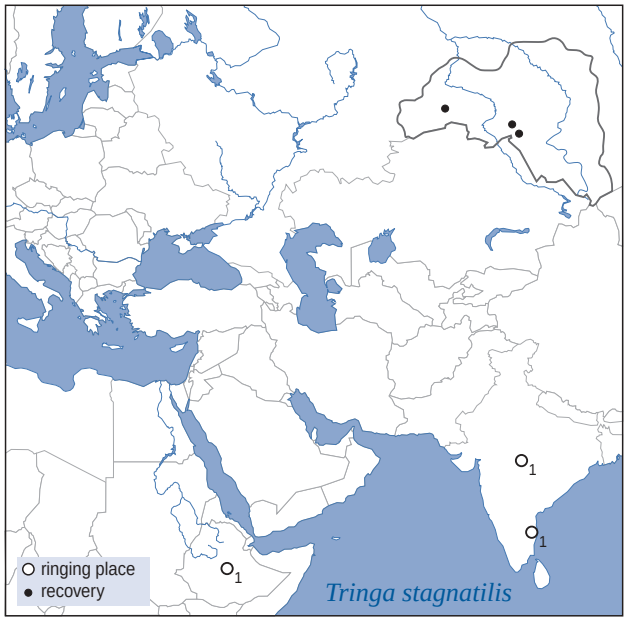


Figure 38. *Recoveries within the study area of Marsh Sandpipers ringed elsewhere. Figures near symbols refer to the number of birds recovered.*

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.

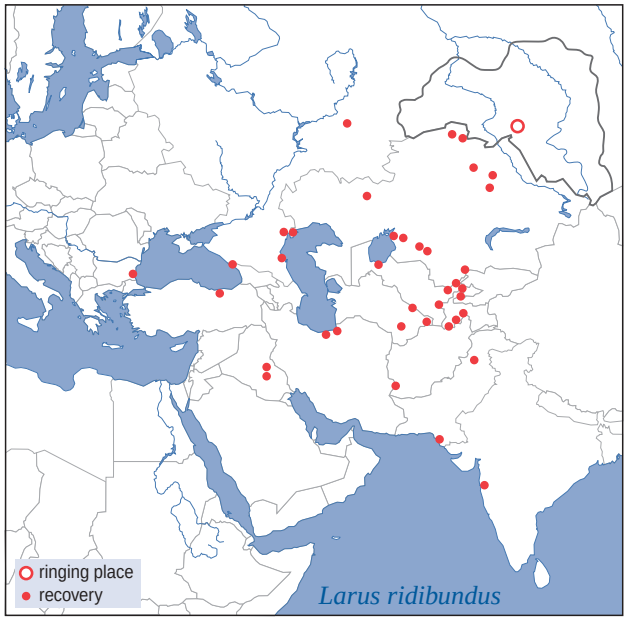
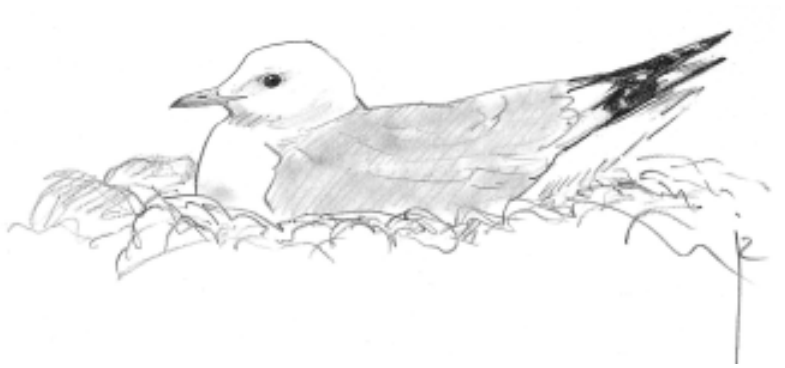


Figure 41. *Recoveries of Black-headed Gulls ringed as chicks in the Novosibirsk Region.*

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.

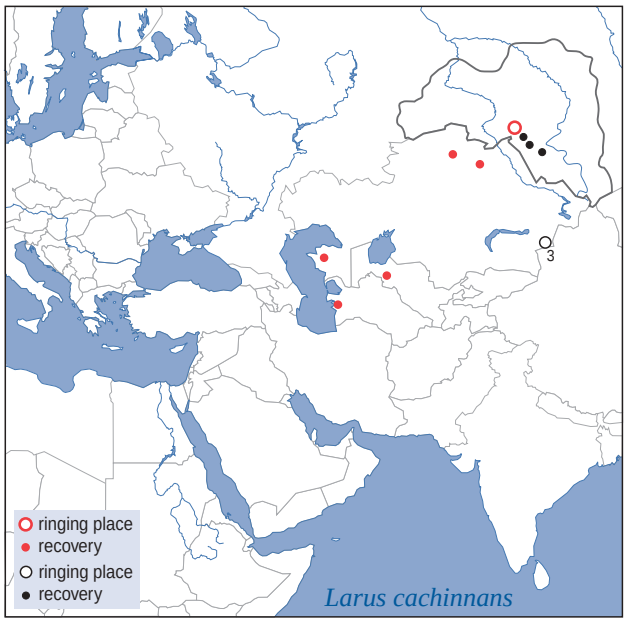


Figure 43. *Recoveries of Yellow-legged Gulls ringed as chicks inside (Lake Chany, Novosibirsk Region) and outside the study area.*

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.

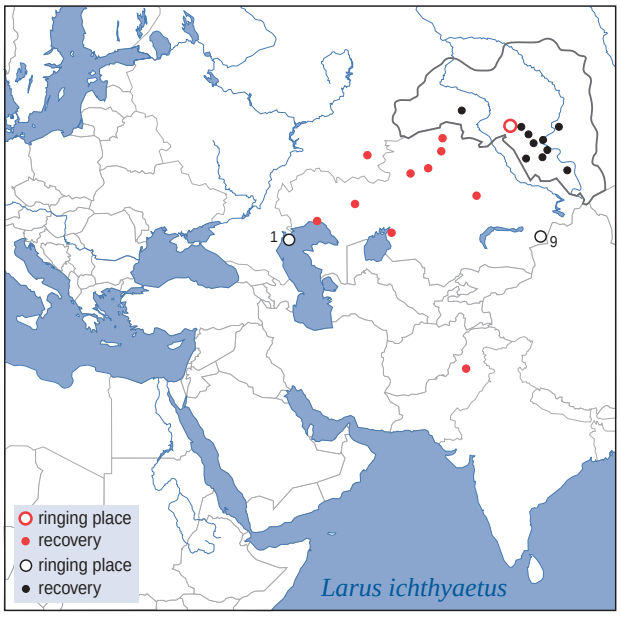


Figure 44. *Recoveries of Great Black-headed Gulls ringed inside (Lake Chany, Novosibirsk Region) and outside the study area. Figures near symbols refer to the number of birds recovered within the study area.*

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.

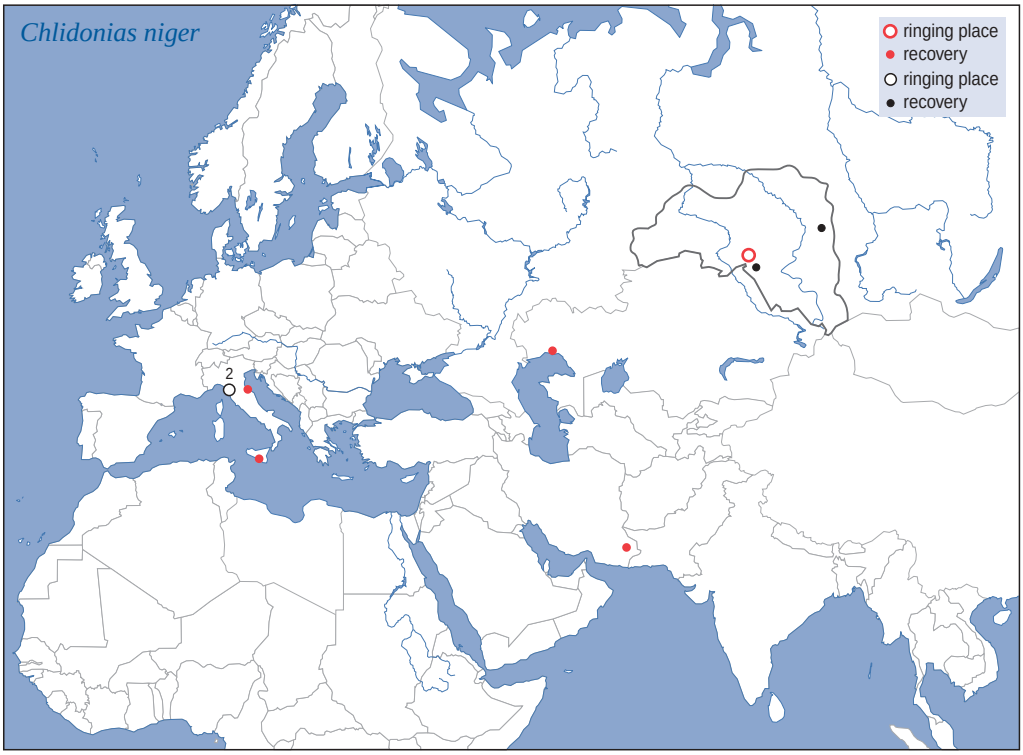


Figure 45. *Recoveries of Black Terns ringed inside (Lake Chany, Novosibirsk Region) and outside the study area.*

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

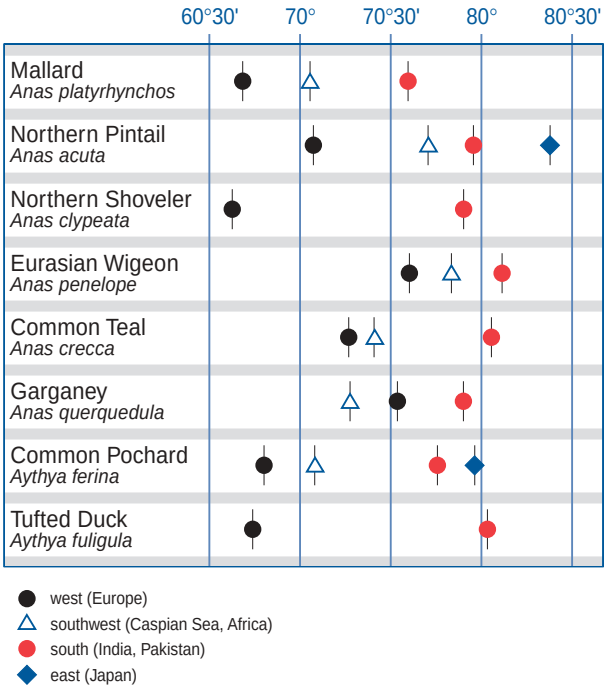


Figure 46. *Mean longitudinal positions of recoveries within the study area of ducks ringed in different wintering areas.*

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.