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MIGRATION AND DISTRIBUTION OF THE WIGEON, *ANAS PENELOPE* L., IN EUROPE, BASED ON RINGING RESULTS

by

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I. INTRODUCTION

The recoveries of the Wigeon as far as ringed in European countries have been investigated in order to get a general picture of the breeding grounds, the winter quarters, as well as of the migratory routes by which the birds reach these areas. A list is given at the end of this paper of the published ringing results I have used.

Moreover, the greatly appreciated co-operation of the ringing stations in Moscow, Stockholm and Heligoland made it possible to make use of hitherto unpublished data. This investigation was carried out during the time I worked for Prof. Dr. H. BOSCHMA. I am most grateful for the help I was given by the „Vogeltrekstation” and my special thanks are due to Prof. Dr. H. KLOMP and Dr. A. C. PERDECK for reading the manuscript. I am much obliged to mrs. G. M. MULDER-FISCHER for the translation of the manuscript, and to Dr. A. DIAKONOFF for his valuable help with Russian literature.

II. METHOD

Generally speaking no recoveries have been investigated which were made within a radius of 100 km of the ringing locality.

The remaining recoveries have been divided into the following five periods:

May and June	(breeding)
July and August	(moulting)
September and October	(autumn migration)
November - February	(wintering)
March and April	(spring migration)

Considering the fact that there are early as well as late migrants, it is obvious that this division will only give an approximate picture of the actual situation. It is based on the following considerations. The greater part of the material at disposal concerns Wigeon ringed in western Europe and recovered here from November up to and including February and recoveries in the months of May up to and including August from northern Russia and western Siberia (table 1 and 5).

The great majority of Wigeon, according to DEMENTIEV and GLADKOV (1952), arrive at their breeding grounds in northern Russia and western Siberia at the beginning of May. Thus we can use recoveries from May and June in order to establish with some certainty the position of the breeding areas. This would not be possible in the case of recoveries made in July and August, because in many cases the male and also some of the female ducks will have left for the moulting areas (WUCZETICZ 1939; DORST 1956) which sometimes lie outside the breeding range.

The autumn migration takes place principally in September and October (DEMENTIEV and GLADKOV 1952).

All recoveries from the beginning of November up to the end of February come from western Europe and give us a picture of the winter quarters.

The spring migration takes place mainly in the months of March and April (DEMENTIEV and GLADKOV 1952).

III. RECOVERIES OF WIGEON RINGED IN THE NETHERLANDS

Since ringing was started in 1911, a total of 2448 Wigeon were ringed up to 1958 and 436 of them recovered before the middle of the year 1958 (18%). Practically all Wigeon were ringed in duck decoys. Ringing was carried out throughout the year but particularly between the 1st of October and the 1st of March, as large flocks of Wigeon pass as migrants or wintervisitors in this period.

A. Investigation concerning differences in origin.

The material we have at our disposal here in the Netherlands is sufficiently extensive to allow for an inquiry into the differences in

origin. For this purpose it is necessary to examine whether evidence can be found of a relation between the date of ringing and the geographical position of recoveries in the breeding season and in the period of wintering.

From table 2 it appears that the recoveries in May and June of Wigeon ringed in October and November do not show an essential difference in geographical position from recovery places of Wigeon ringed in December and January. Similarly, Wigeon ringed in the months of February and March have been found in the same area. The four Wigeon which had been ringed some time between the 1st of April and the 1st of August were recovered south-west of this area.

Table 3 shows that the recoveries in winter of a greater part of Wigeon ringed in October and November, lie more to the south and west of the area in which birds ringed in December and January have been recovered.

The first group is found mainly along the Atlantic coastline in France, the second group along the North Sea coast of England, France and Holland.

Wigeon ringed in August and September were recovered more southward than birds ringed in the preceding months. Although birds reaching Holland earlier in the season seem to migrate somewhat farther in a southerly direction, from the foregoing we draw the conclusion that Wigeon ringed in the Netherlands have one large breeding area and one large wintering area.

B. Position of breeding and wintering grounds and routes of migration.

All recoveries made in places outside a radius of 100 km from the respective ringing locality are shown in figure 1 (cf. also table 1). Recoveries in May and June (black dots in figure) give the position of the breeding area. Many of the recoveries come from the provinces Arkhangel and Moscow. Striking are the concentrations along the rivers Pechora and Ob.

The recoveries in July and August (plus symbols in figure 1) lie in the breeding area and along the shores of the Baltic Sea. In September and October we find the recovery places (open triangles in figure) inside the breeding area, west of the breeding area, along the coasts of the Baltic Sea, North Sea, and Atlantic Ocean as well as south-west of the breeding range. With the exception of recoveries lying south-west of the breeding area, the places of recovery point to a migration

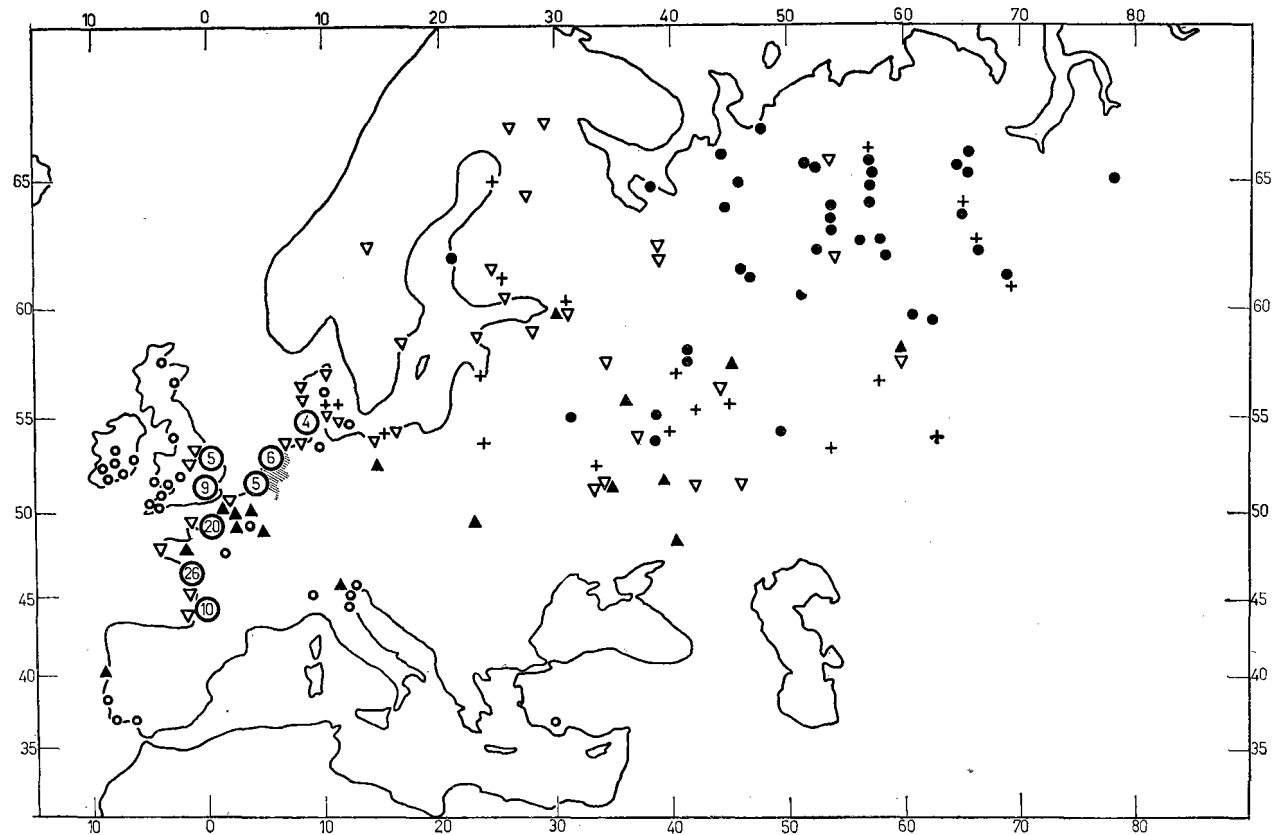


Fig. 1. Recoveries of Wigeon ringed in the Netherlands in the months January-December. The figures in the symbols refer to the number of recoveries. ● = recovered in May and June; + = recovered in July and August; ▽ = recovered in September and October; ○ = recovered from November up to and including February; ▲ = recovered in March and April.

TABLE 3

Recoveries in November, December, January and February of Wigeon ringed in Holland

Months of ringing	Degrees longitude				Degrees latitude					Total
	10-0	0-10	10-20	20-30	35-40	40-45	45-50	50-55	55-60	
Oct. & Nov.	38	25	1		2	7	36	18	1	64
Dec. & Jan.	11	15	2			2	9	15	2	28
Febr. & Mar.	2	4	1					6	1	7
Apr. & May		3	1	1	1		2	1	1	5
June & July	2	2					1	2	1	4
Aug. & Sept.	3	3			1	1	2	1		6

TABLE 4

Recoveries in May and June

Ringed in	Degrees longitude								Degrees latitude				Total	
	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-110	50-55	55-60	60-65		65-70
Holland.....	1	4	9	14	8	1				3	5	20	9	37
Great Britain	2	3	6	8	11		2			1	10	13	8	32
Astrakhan	1		1	1	13	4	8	2	1	1	16	8	4	31

course to and along the coastal regions of the Baltic Sea, terminating finally in western Europe.

The recoveries situated south-west of the breeding grounds indicate a possible migratory route from the breeding area via the Balkans to North Italy. In November, December, January and February (see circles in figure), we find recoveries along the coasts of the North Sea and the Atlantic Ocean and also a few recoveries from North Italy. They indicate the winter-quarters. There is one isolated case of a recovery from Turkey.

In March and April the number of recoveries is very small (see black triangles in figure). It is noteworthy that the majority of recoveries from France do not come from the coastal regions but from much further inland. The remainder of the recoveries were made in North Italy, West

Poland, the Ukraine and the area which lies south-west of the breeding grounds. The fact that no recoveries from Denmark are recorded and that only one recovery from the shores of the Baltic Sea has come to our knowledge, makes us assume that the spring migration follows a more direct route than the autumn migration. The small number of recoveries can be explained by the closed shooting season in many countries during the months of March and April.

C. Recoveries near the ringing place.

From the total of the Dutch material I had 211 recoveries at my disposal, reported from areas near the ringing locality — (an area which lies within a radius of 100 km from the place of ringing). The great majority of birds was recovered soon after ringing. Much greater importance, however, must be attached to a number of recoveries (37) which were made from one to four years after ringing had taken place, at the ringing locality itself. These strongly suggest that Wigeon will at times visit in several consecutive years one and the same place either as a migrant or as a winter-visitor.

D. Summary.

Wigeon that were ringed in Holland throughout the year but particularly in October and the following months right up to March, give no indication of distinctive differences in origin. These birds have a large breeding area (see figure 7, area inside the dotted line, marked A) and extensive winter quarters (see same figure, area inside the dotted line marked C).

The autumn migration will mainly move along the shores of the Baltic Sea and also possibly southwesterly of the breeding grounds across the Balkans into northern Italy (see figure 7, arrows no. 3). The spring migration will pass principally through the inland areas of Europe (same figure, arrow no. 4).

IV. RECOVERIES OF WIGEON RINGED IN GREAT BRITAIN

As in Holland, most Wigeon in Britain are ringed in duck decoys. Ringing takes place throughout the year. The number of Wigeon ringed up to 1957 totals 1785 of which 289 (16%) have so far been recovered. 166 of these recoveries have been fully published and are here represented by figure 2 and table 5.

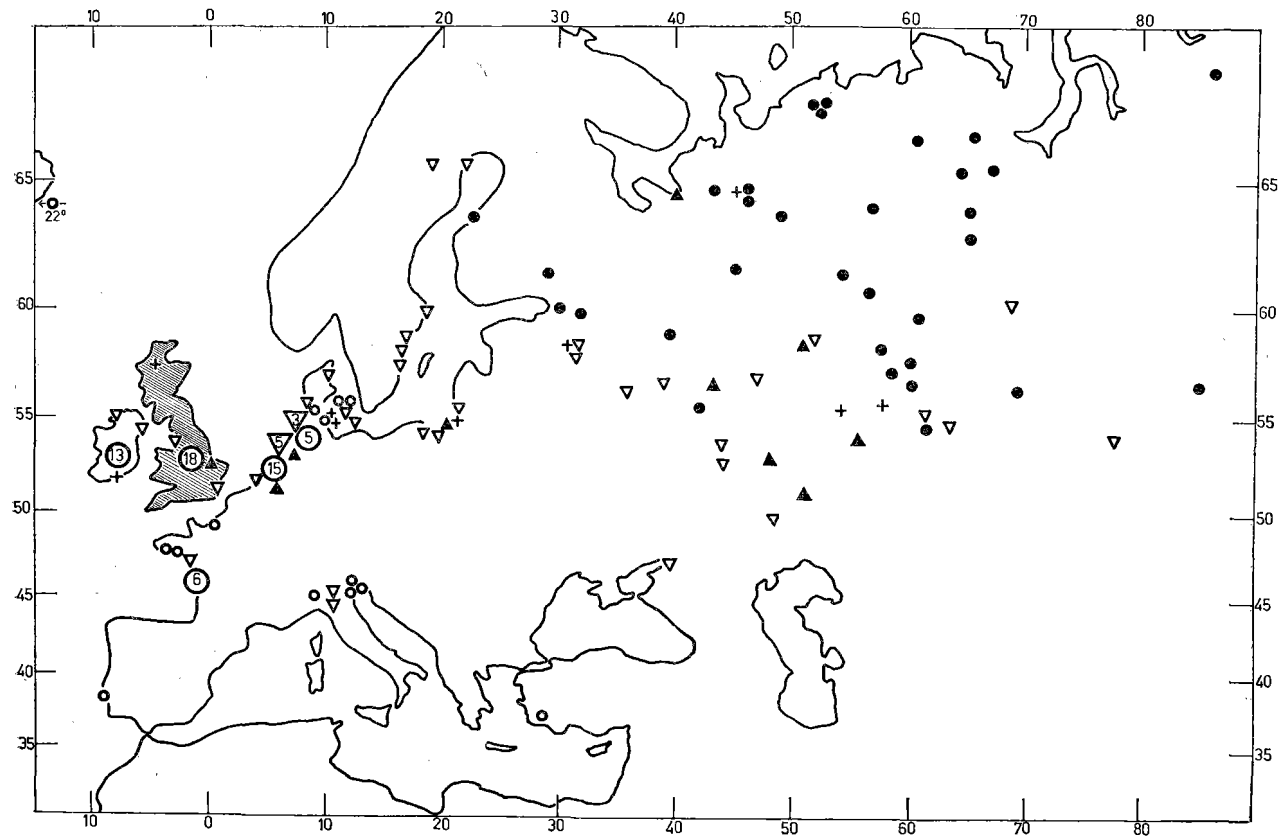


Fig. 2. Recoveries of Wigeon ringed in Great Britain in the months January-December. The figures in the symbols refer to the number of recoveries. ● = recovered in May and June; + = recovered in July and August; ▽ = recovered in September and October; ○ = recovered from November up to and including February; ▲ = recovered in March and April.

TABLE 5

Recoveries of Wigeon ringed in Great Britain
Country and month of recovery
Ringed in the months January-December

	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Febr.	Mar.	Total
Iceland										1			1
Netherlands	2					2	4	4	6	4	1		23
France							1	1	4	2	2		10
Portugal							1						1
Italy							2		1	1	2		6
England & Wales						1	1	4	7	6	1	1	21
Scotland					1								1
Ireland					1	1	1	1	4	1	7		16
Denmark					2	1	3	2	1		1		10
Sweden						5	1						6
Germany						1	2	3	2				8
Poland						2							2
Finland		1	1										2
U.S.S.R.	7	20	10		5	11	5						58
Turkey											1		1
													166

Position of breeding and wintering grounds and routes of migration.

Recoveries in May and June (black dots in figure 2) are situated in the same area as the recoveries of birds ringed in the Netherlands in those same months (cf. figure 1 and 2). This also becomes evident in table 4, which shows the geographical position of recoveries in the breeding season for three different ringing areas. In July and August recoveries are reported from the breeding area and outside this area from localities (plus symbols in figure 2) along the Baltic Sea and near Denmark. It can be assumed that Wigeon caught at this time outside their breeding area, are probably early migrants. No essential difference can be observed from recoveries of Wigeon ringed in the Netherlands.

Recoveries in September and October (open triangles in figure) are found in the breeding area and along the migratory routes in much the same way as has been described for the autumn migration of Wigeon ringed in the Netherlands.

Very striking are the concentrations on the coasts of southern Sweden, Denmark, north-west Germany and the Netherlands. During November and the following months up to February, recoveries (circles in figure) lie in the same wintering area as that of Wigeon ringed in the Netherlands. There is evidence, however, that of the Wigeon ringed in Great Britain, relatively more have been found in Great Britain and Ireland than on the Atlantic coast of France, and exactly the opposite was true in the case of Wigeon ringed in the Netherlands.

There are but a few recoveries in the months of March and April (black triangles in figure). Here too, we can see a relatively large number of recoveries in the boundary regions south-west of the breeding area. The closing of the shooting season will explain the scarcity of recoveries. The picture we thus get of the movements of the Wigeon, agrees so much with what we have seen in the case of Wigeon ringed in the Netherlands, that we may safely conclude that birds ringed in the Netherlands as well as in Great Britain must have a joint area of breeding and wintering.

V. RECOVERIES OF WIGEON RINGED IN OTHER WESTERN EUROPEAN COUNTRIES

A. Belgium.

Belgium yields 25 recoveries. The total of recoveries admitted is 21. The time and place of recoveries coincide with that of Wigeon ringed in the Netherlands and Great Britain. A summary of these recoveries is given in table 6.

B. Denmark.

There are 9 recoveries from Denmark. Four birds were recovered at or near the ringing locality. As to the remaining five, time and place of recovery coincide with recoveries of Wigeon ringed in the Netherlands and Great Britain. For a summary see table 7.

C. Germany.

We have but two recoveries at our disposal. A Wigeon ringed in West Germany in February 1956, was reported from Somerset (England) in January of the following year. The other Wigeon was ringed in north-west Germany in August 1934 and recovered in the Netherlands in September 1935.

TABLE 6

Recoveries of Wigeon ringed in Belgium
Country and month of recovery
Ringed in the months January-April

	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Febr.	Mar.	Total
Netherlands							2					1	3
France									2		2		4
England & Wales										2			2
Ireland											1		1
Denmark					1		2						3
Germany								1					1
U.S.S.R.	3	1	1		1	1							7
													21

TABLE 7

Recoveries of Wigeon ringed in Denmark
Country and month of recovery
Ringed in the months of June and October

	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Febr.	Mar.	Total
France						1							1
England & Wales						1			1	1			3
U.S.S.R.						1							1
													5

D. Switzerland.

One recovery. The bird was ringed in November 1956 and recovered in Flanders in December 1956.

Summarizing the foregoing we can deduce that the recoveries of Wigeon ringed in Belgium, Denmark and Germany, show a marked coincidence with recoveries of birds ringed in Great Britain and the Netherlands. We therefore consider all these birds as belonging to one and the same group.

TABLE 8

Recoveries of Wigeon ringed in Astrakhan
Country and month of recovery
Ringed in the months of July and August

	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Febr.	Mar.	Total
Netherlands									1	1	1	1	4
Belgium											1		1
France							1	2	2		2		7
Spain							1						1
Algiers											1		1
Italy								1	3	4	1	4	13
England & Wales									2	1			3
Scotland										3			3
Ireland									1				1
Denmark								2					2
Germany										1			1
S.Sweden						1							1
N.Sweden		1											1
U.S.S.R. north of 50° n. lat.	10	26	4	3	2	5	3						53
U.S.S.R. south of 50° n. lat.	1				1	1	2	3	2	1	3	1	15
Bulgaria								2				2	4
Roumania									1				1
Greece										1			1
Turkey									1				1
Egypt										1			1
													115

VI. RECOVERIES OF WIGEON RINGED IN THE U. S. S. R.

The great majority of Wigeon were ringed in July and August during the moult season in the delta of the Volga, near Astrakhan. ТЕРЛОВА (1957) gives a total number of 2430 Wigeon ringed between the years 1925-1954. At least 75% of these birds were males. 92 Wigeon were recovered before 1954. In the period between 1954-1958, 46 recoveries were made. A total of 115 recoveries have been admitted of Wigeon that had been ringed in the moulting season in Astrakhan. Moreover, 17 other records have been examined of birds marked in the U. S. S. R.

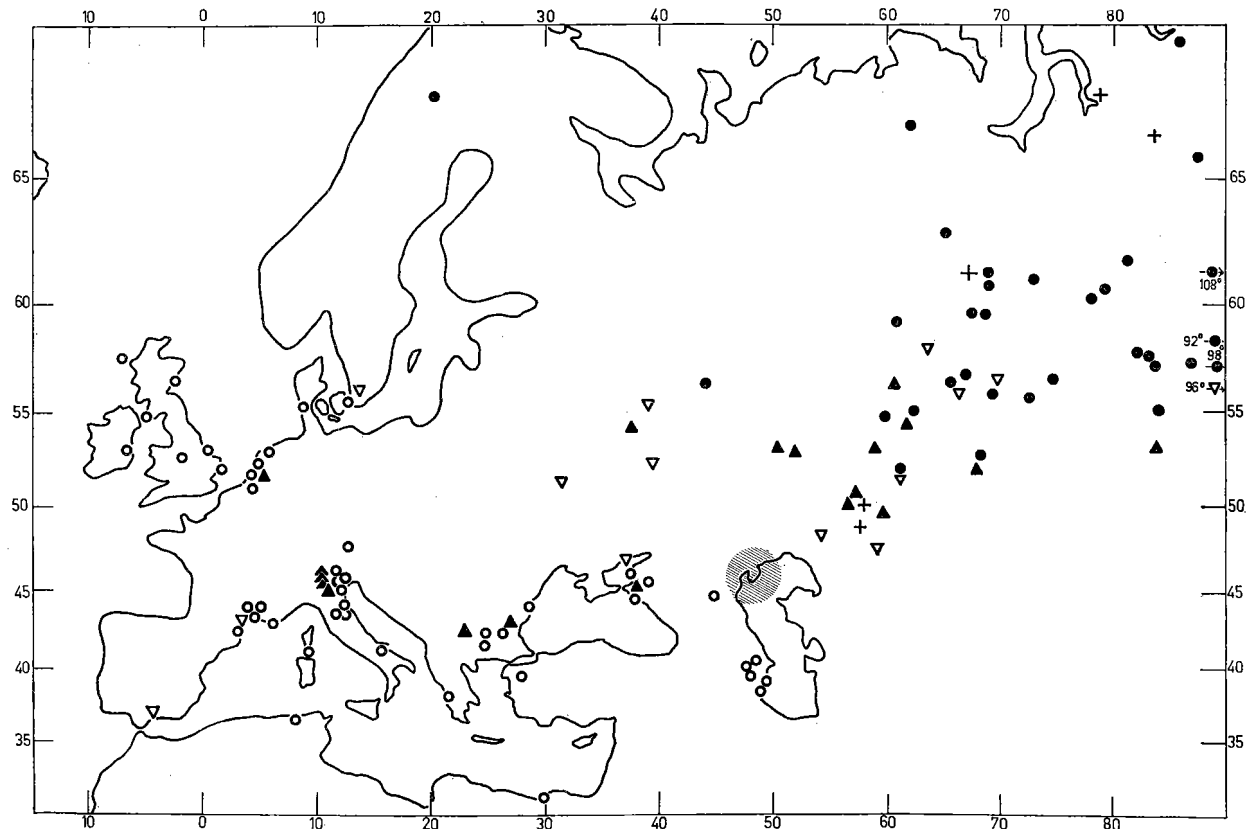


Fig. 3. Recoveries of Wigeon ringed in the delta of the Volga near Astrakhan in the months of July and August.
 ● = recovered in May and June; + = recovered in July and August; ▽ = recovered in September and October;
 ○ = recovered from November up to and including February; ▲ = recovered in March and April.

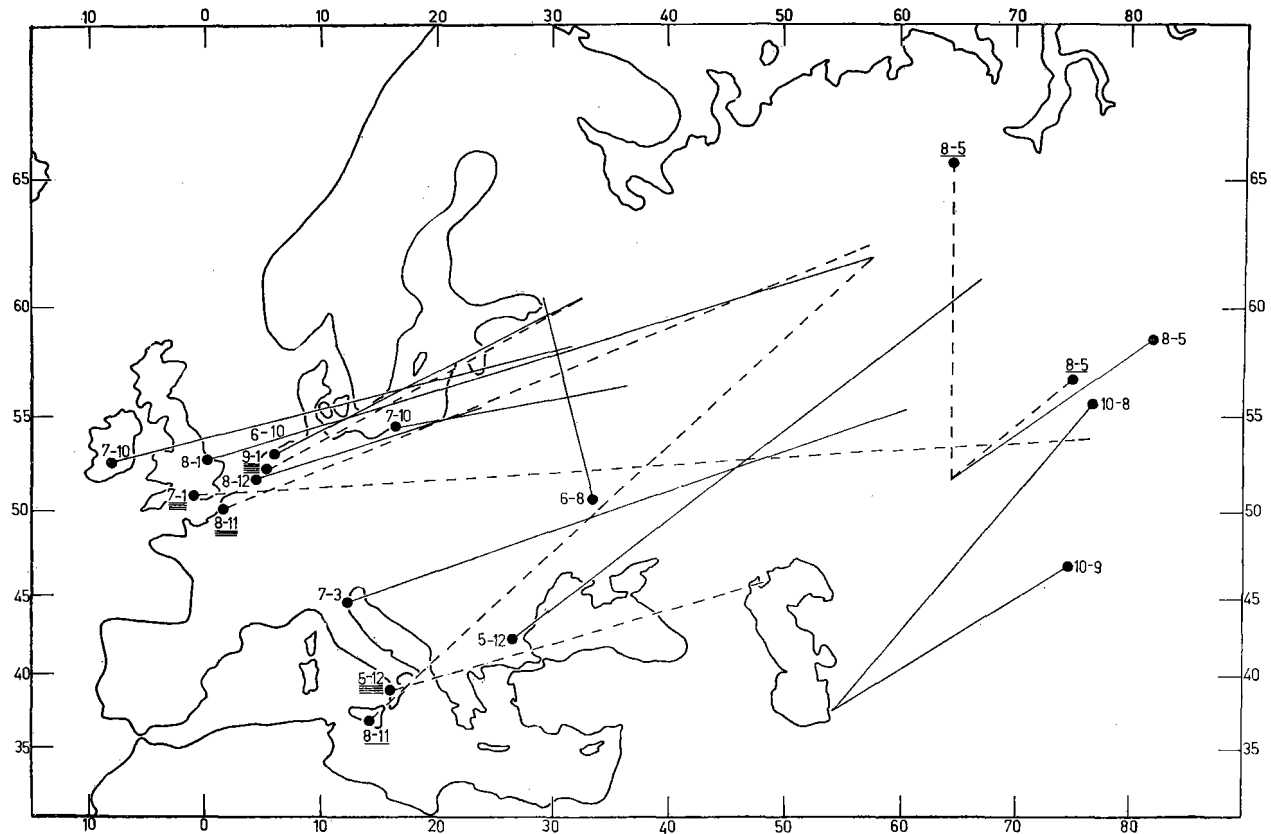


Fig. 4. Recoveries of Wigeon ringed in the U.S.S.R. in so far as they were not ringed in Astrakhan in the months of July and August. The straight lines connect the places of ringing with those of recovery in cases where the Wigeon was recovered within one year of ringing; in the case of birds recovered at a later date, ringing localities and recoveries are connected by a broken line. The figures at the places of recovery refer to the months of ringing and recovery; the number of short lines under these figures represent the number of full years that have elapsed between the date of ringing and that of recovery.

Position of breeding and wintering grounds and routes of migration of Wigeon ringed in Astrakhan in the months of July and August.

All recoveries from an area outside a radius of 100 km of the ringing locality are given in figure 3 and table 8. Recoveries in May and June (black dots in figure) indicate the breeding grounds. It seems that this area lies more southward and eastward than the breeding area of Wigeon ringed in western Europe (cf. table 4, figure 1, 2 and 3). There are but a few recoveries made in September and October (open triangles in figure 3). Recoveries from the south of France and the Sea of Azov refer to Wigeon which were ringed but a few months before. Together with the recoveries reported in the period of wintering, they suggest a migratory route in a south-westerly direction. Recoveries at latitude 50° - 55° North and longitude 30° - 40° East as well as recoveries from southern Sweden may indicate a migratory course also in a western direction.

Recoveries in November, December, January and February (circles in figure) give ample proof of the fact that there is an extensive winterquarter round and about the Mediterranean, the Black Sea and the west coast of the Caspian Sea. Some winter visitors were also found in western Europe.

Recoveries in March and April (black triangles in figure) indicate a spring migration moving chiefly in a north-eastern direction, as reckoned from the winter quarters. Remarkable is the relatively great number of recoveries from North Italy.

Locality and time of recoveries of the remainder of Wigeon ringed in the U. S. S. R. are given in figure 4. Recoveries are mainly found in western and southern Europe.

Summarizing these records we may conclude that the breeding range of birds ringed in Astrakhan lies in West and Central Siberia (see figure 7, the area inside the broken line, marked B); this region is situated more towards the south and east than the breeding area in North Russia and West Siberia of Wigeon ringed in western Europe (same figure, area inside the dotted line, marked A). It appears that these areas partly coincide.

The winter quarters are situated mainly in southern Europe (figure 7, area inside the broken line, marked D). The autumn migration takes mainly place in a south-westerly direction (figure 7, arrow 5); the migratory movements in the spring progress chiefly in the opposite direction (figure 7, arrow 6).

Wigeon ringed in the breeding grounds of North Russia have in most cases been recaptured in West Europe, whereas some birds, ringed in the breeding area of West and Central Siberia, have been found in South Europe (fig. 4).

VII. RECOVERIES OF WIGEON RINGED IN FENNO SCANDIA

We have but one recovery of a Wigeon ringed in Norway. This Wigeon ringed somewhere in the neighbourhood of Oslo in July 1936 was shot down in Scotland in September 1938. It is quite possible that this bird originated from North Scandinavia and had suspended its migration near Oslo and stayed there for moulting.

Of Wigeon ringed in Sweden we have 8 recoveries, 6 of which have been admitted (see figure 5, table 9). They were ringed in the breeding season, or just after, during the moult, in northern and central Sweden. Recoveries come from southern Sweden, Denmark, Great Britain and Ireland.

HÖGLUND (1952) reports breeding to take place in northern Sweden and that in July and August many of the male birds will move towards the lakes in central Sweden and will moult there.

A total of 6 recoveries is admitted of Wigeon ringed in Finland, which are traced in figures 4 and 5. Three other recoveries originate from the ringing localities.

The Wigeon were ringed in June, July and August and recovered in the winter from regions lying south-south-west of the breeding area.

These birds have their breeding grounds in Finland and northern Sweden and their wintering grounds in western and south-western Europe.

VIII. RECOVERIES OF WIGEON RINGED IN ICELAND

A total of 70 recoveries have been admitted. The remaining 15 recoveries relate to such Wigeon as were recaptured within a few months of ringing in or near the ringing locality. The birds were ringed in June, July and August. Most of them were ringed as nestlings.

Position of recoveries.

All recoveries from distances exceeding 100 km from the ringing place are shown in figure 6 and table 11. In May and June recoveries

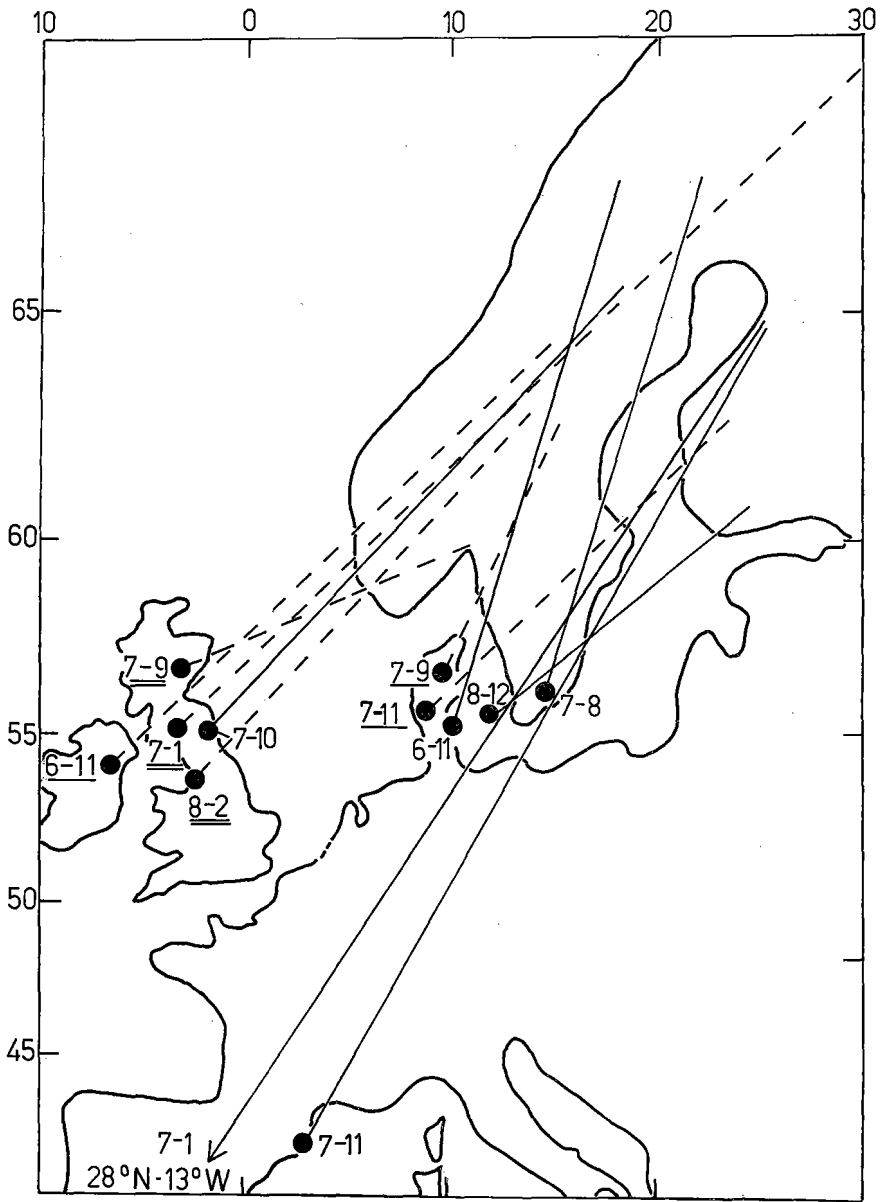


Fig. 5. Recoveries of Wigeon ringed in Norway, Sweden and Finland in the months of June, July and August. For explanation of symbols see fig. 4.

TABLE 9

Recoveries of Wigeon ringed in Sweden
Country and month of recovery
Ringed in the months of July and August

	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Febr.	Mar.	Total
England & Wales											1		1
Ireland							1	1					2
Denmark						1		1					2
Sweden					1								1
													6

TABLE 10

Recoveries of Wigeon ringed in Finland
Country and month of recovery
Ringed in the months of June, July and August

	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Febr.	Mar.	Total
Iberia								1					1
Spanish Sahara										1			1
England & Wales										1			1
Denmark						1			1				2
U.S.S.R.					1								1
													6

come from outside the birds' own breeding area. Recoveries are situated in Norway and Russia.

In September and October we have recoveries from western Europe, southern Spain, Russia and Canada (Prince Edward Island and New Foundland).

From November up to and including February the recoveries can be found in western Europe, in Iceland and along the east coast of North America (Nova Scotia, Massachusetts, Maryland and N. Carolina).

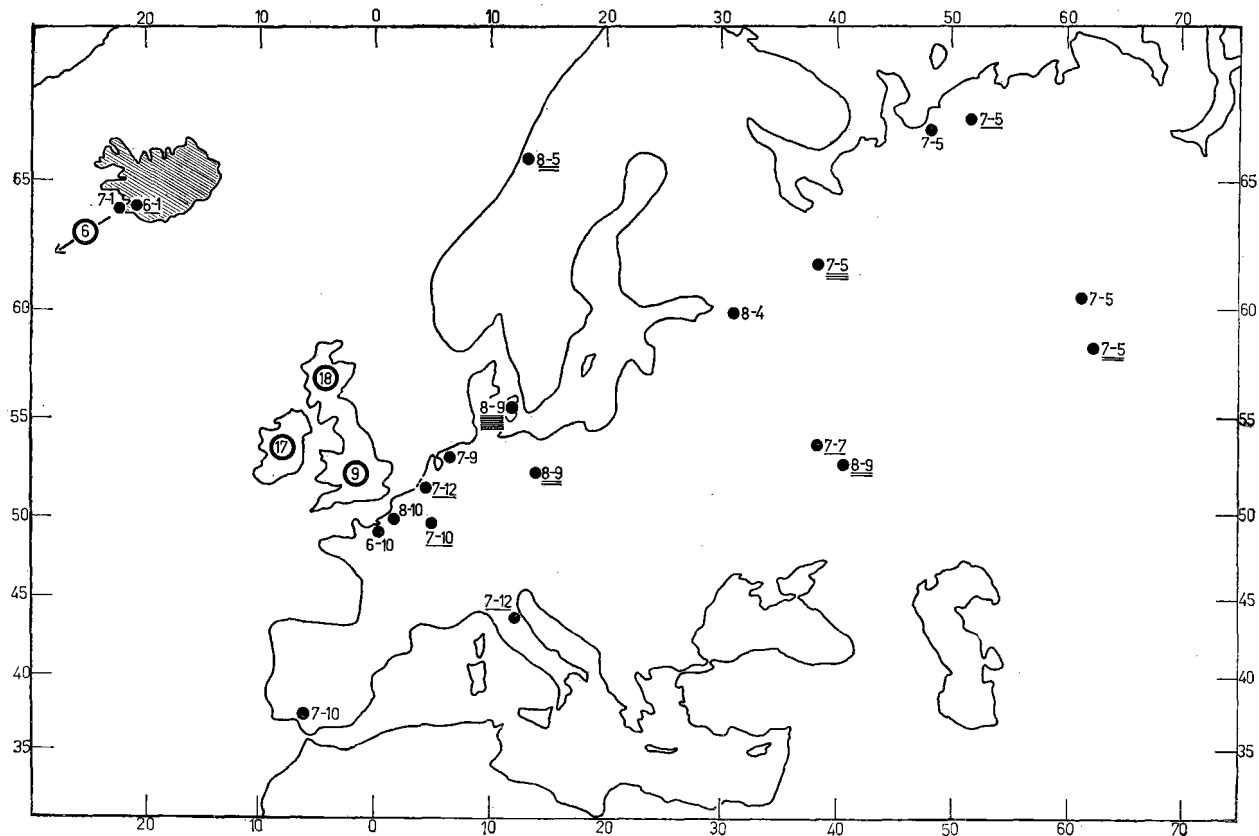


Fig. 6. Recoveries of Wigeon ringed in Iceland in the months of June, July and August. The figures at the places of recovery concern the months of ringing and recovery; the number of short lines under these figures represent the number of years that have elapsed between the date of ringing and that of recovery. The great number of recoveries from Great Britain and Ireland concern recoveries of Wigeon made between the first of September and the first of April.

TABLE 11
 Recoveries of Wigeon ringed on Iceland
 Country and month of recovery
 Ringed in June, July and August

	Apr.	May	June	July	Aug.	Sept.	Oct	Nov.	Dec.	Jan.	Febr.	Mar.	Total
Iceland										2			2
Netherlands						1			1				2
France							3						3
Spain							1						1
Italy									1				1
England & Wales						1	1	2	2	1	1	1	9
Scotland						4	4	2	5	2	1		18
Ireland						1	5	3	4	3	1		17
Denmark						1							1
Norway			1										1
Germany						1							1
U.S.S.R.	1	5		1		1							8
Canada						1	1		1				3
U.S.A.								2	1				3
													70

In March and April there are but two recoveries; one from England and the other from Russia.

From these recoveries it is justifiable to conclude that the Wigeon which breed in Iceland will find their winter quarters in western Europe, in Iceland and on the east coast of North America. The majority of winter-visitors have occurred in the north of Scotland and Ireland. Recoveries from Norway and Russia in or round about the breeding season relate to male birds or birds of unknown sex. They will be more fully discussed in a following chapter.

N. B. A few more ringing data were obtained after the conclusion of this investigation, of 26 Wigeon ringed in Iceland. These data fit completely into the picture as described above.

IX. DISCUSSION

1. The investigations have demonstrated that most Wigeon which spend the winter in western Europe have their breeding grounds in northern Russia and western Siberia. The recoveries suggest that the

migratory routes in the autumn are mainly along the shores of the Baltic Sea, whereas in spring the birds pass over Central Europe in a more direct line towards their breeding area. This is confirmed by a number of observations. SVÅRDSON (1948-1952), JENNING (1953-1956) and DANIELSSON (1957) give report of a mass autumn migration over southern Sweden.

As far as Switzerland is concerned, CORTI (1934) gives evidence of more Wigeon in the spring than in the autumn. The same appears to be true from counts made by REQUATE (1954) : in southern Germany a more pronounced migratory movement can be observed in spring than in autumn, whereas exactly the opposite holds good for the German coastal regions. In Hungary BERETZK (1950) has published reports of Wigeon migration in spring as well as in the autumn. All these data, together with the recovery records, give strong indication of a migration over a wide front, moving in the spring across the inland areas of Europe, whereas in the autumn the course of migration takes the birds along the coasts of the Baltic Sea.

The problem that immediately presents itself is this: what causes this difference in the migratory movements? When the birds have gone through the moult, they may be in need of large food supplies, in which case they may find the coastal regions attractive, as food there is plentiful. The fact that the spring migration is more directly aimed at the area of breeding could be explained by the birds having a strong urge to reach this area at the earliest possible date. It is well-known that the spring migration of a great number of birds takes less time than the autumn migration. As a result of spring time high waterlevels in Central Europe, the birds are also given more opportunity to choose a more direct migratory route than in the autumn.

2. As regards orientation, it is interesting to note that the migration progresses along a curved line. This fact does not favour the assumption of a one-direction orientation. Could the migratory course be then determined by tradition or other factors such as food, temperature and coastal boundaries?

Recoveries at ringing places in the Netherlands, made one or more years after ringing, suggest the possibility of tradition playing a considerable part.

3. No recoveries of Wigeon were made in Iceland in the breeding season, possibly because little shooting is done in those months. There are, however, recoveries of Wigeon ringed in Iceland from other breeding grounds, namely from northern Russia.

The phenomenon of birds having been recaptured in a different breeding area from the one in which they originated has been given the name of „abmigration” by LANDSBOROUGH THOMPSON (1931). This „abmigration” can occur when pairing takes place between birds originating from different breeding grounds, yet wintering in a joint area. TIMMERMAN (1953) has pointed out the possibility of Wigeon pairing in Great Britain and Iceland with birds breeding in Russia, in the company of which they would migrate in the spring to eastern Europe.

It is conspicuous that no „abmigration” to Iceland has been observed of Wigeon breeding in Russia, while at the same time there are a number of cases of „abmigration” in the opposite direction. Apart from the legal restrictions to hunting and adherence thereto, an explanation may be found in the number of wintering birds. As a considerably larger number of Wigeon originating from Russian breeding grounds will have their winter quarters in western Europe than those originating from Iceland, the chance that Wigeon from Russia would join the migratory movement towards Iceland is considerably smaller than the reverse.

4. The Wigeon is one of those ducks that will simultaneously lose all its flight feathers and is consequently compelled to go into hiding during moult, especially in the months of July and August. Observations carried out by WUCZETICZ and TUGARINOW show, according to DORST (1956), that great flocks of Wild Duck (*Anas platyrhynchos* L.); Gadwell (*Anas strepera* L.), Shoveler (*Anas clypeata* L.), Pintail (*Anas acuta* L.) and Wigeon with a breeding area in northern Europe and Asia, will conglomerate in the Volga delta. The first to arrive are the male birds round about July, the females follow later. STRESEMANN (1940) reports similar observations from Tibet and Sikkim of ducks that breed in northern Asia and HÖGLUND (1952) from central Sweden of ducks that breed in northern Sweden.

DORST (1956) uses the term moult-migration. If, however, under the term migration we understand exclusively a movement directed towards a particular place, it is rather doubtful whether it is permissible to talk of a moult-migration in this case. Of all the Wigeon ringed during the moult in Astrakhan, only one was recovered later in the moulting season in that area. This shows that moulting is not always restricted to a definite place and it is therefore advisable to avoid using the term moult-migration.

5. Finally, I should like to point out the limited character of results obtained through the ringing schemes. This is due to the fact that chances of recovery vary according to different areas. The chance is smaller in areas with a scattered population or in areas where the popul-

ation is but little or not at all acquainted with this research scheme. Also such factors as shooting laws and the number of shooters will play a considerable part here.

It is not known and in most cases it cannot even be ascertained which of these factors plays the most important role. If, however, there was evidence of one or more of these factors exercising an influence, as for instance in the case of the spring migration of Wigeon ringed in western Europe, as much use as possible has been made of complementary data.

X. SUMMARY

Breeding areas, winter quarters and migratory routes of European Wigeon obtained on the basis of recoveries of ringed birds, are represented by figure 7.

1. Wigeon which breed in Iceland migrate in the autumn mainly in a south-easterly direction to Great Britain and Ireland in order to winter there. Some of the birds travel further into the mainland of Europe. Winter-visitors have also been found in Iceland and on the east coast of North America. The movements of the autumn migration are shown in figure 7 by means of arrows, marked 1.

Recoveries from northern Russia in or about the breeding season give a rather striking picture. To explain these recoveries we must presume that pairing takes place in the western European winter quarters between birds native to Iceland and Russia. It is then suggested that Wigeon originating from Iceland travel in company of the other birds to the breeding grounds in Russia.

2. Wigeon breeding in northern Sweden and Finland move to winter quarters in western and south-western Europe. The direction of the autumn migration of some of the birds ringed in northern Sweden is given by arrow 2.

3. Recoveries of Wigeon ringed in Great Britain, the Netherlands, Belgium, Denmark and Germany, show evidence of great similarity. The breeding grounds of these birds are found in northern Russia and western Siberia (in figure the area inside the dotted line, marked A) and the winter quarters are in western Europe (area inside the dotted line, marked C).

The autumn migration moves mainly along the shores of the Baltic Sea and presumably also across the Balkans to northern Italy (see arrows marked 3).

Recoveries of Wigeon ringed in the Netherlands justify the conclusion

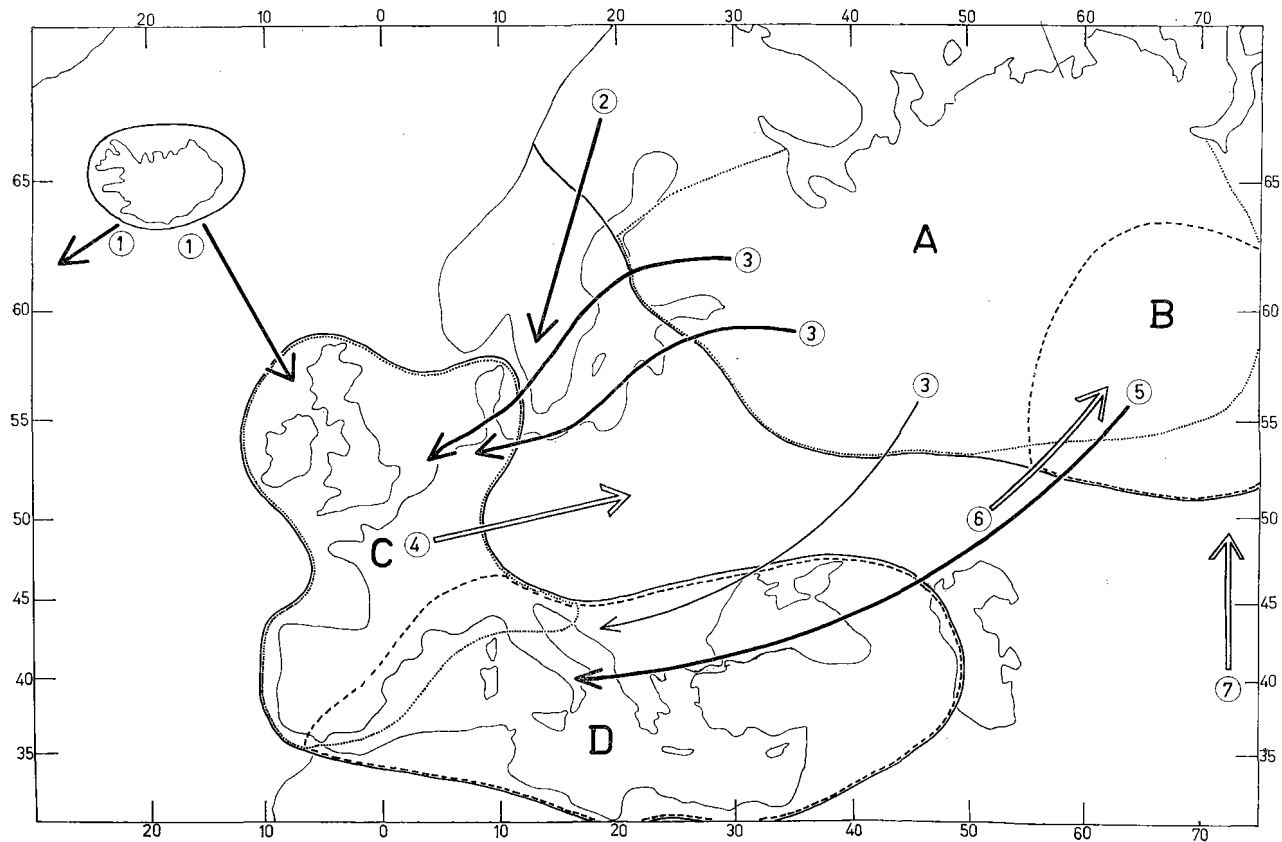


Fig. 7. Breeding areas, winter quarters and important migratory routes of the Wigeon in Europe and bordering areas. See text.

that the spring migration takes the birds along a more direct route over Central Europe to the respective breeding grounds, which is confirmed by field observations.

4. Wigeon ringed in the U. S. S. R. belong partly to the group as described under 3. The remainder breed in West and Central Siberia (in figure area inside the broken line, marked B) and winter in southern Europe (area inside the broken line, marked D). Recoveries warrant the statement that the migration in spring and autumn takes an approximately north-easterly and south-westerly direction (arrows no. 6 and 5). Some Wigeon were found in West and Central Siberia which had been ringed in north-western India. The migratory route in spring is shown by arrow no. 7.

XI. SAMENVATTING

De op grond van terugmeldingen gevonden broedgebieden, winterkwartieren en trekwegen zijn weergegeven in figuur 7.

1. De Smienten die op IJsland broeden trekken in de herfst voornamelijk in zuidoostelijke richting naar Groot-Brittannië en Ierland om daar te overwinteren. Sommigen trekken verder naar het vasteland van Europa. Ook op IJsland en langs de oostkust van Noord-Amerika zijn overwinteraars aangetroffen.

De richtingen van de herfsttrek zijn in figuur 7 aangegeven door de pijlen die gemerkt zijn met 1.

Opvallend zijn de terugmeldingen uit Noord-Rusland in of omstreeks de broedtijd. Zij zijn te verklaren als men paarvorming aanneemt tussen de in West-Europa overwinterende dieren uit IJsland en Rusland. De Smienten uit IJsland zouden dan meetrekken naar de broedgebieden in Rusland.

2. De Smienten die broeden in Noord-Zweden en Finland overwinteren in West- en Zuidwest-Europa. De richting van de herfsttrek is voor enkele in Noord-Zweden geringde dieren aangegeven door pijl 2.

3. De terugmeldingen van de Smienten die in Groot-Brittannië, Nederland, België, Denemarken en Duitsland geringd zijn, vertonen een grote overeenkomst. Het broedgebied van deze dieren ligt in Noord-Rusland en West-Siberië (in de figuur het gebied binnen de stippellijn gemerkt met A), het overwinteringsgebied ligt in West-Europa (het gebied binnen de stippellijn, gemerkt met C).

De herfsttrek loopt voornamelijk langs de Oostzee en vermoedelijk ook over de Balkan naar Noord-Italië (zie de pijlen gemerkt met 3).

Zoals blijkt uit de terugmeldingen van de in Nederland geringde Smienten, loopt de voorjaarstrek meer rechtstreeks over Centraal Europa naar het broedgebied (pijl 4). Hierop wijzen ook de veldwaarnemingen.

4. De in de U. S. S. R. geringde Smienten behoren gedeeltelijk tot de onder 3 beschreven groep. Voor een ander deel broeden zij in West- en Midden-Siberië (in de figuur het gebied binnen de gestreepte lijn, gemerkt met B) en overwinteren in Zuid-Europa (het gebied binnen de gestreepte lijn gemerkt met D). Uit de terugmeldingen blijkt dat de trek in het voorjaar en najaar verloopt in ongeveer noordoostelijke en zuidwestelijke richtingen (pijlen 6 en 5).

In West- en Midden-Siberië zijn ook Smienten aangetroffen die geringd waren in Noordwest Indië; de trekrichting in het voorjaar is aangegeven door pijl 7.

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