

# ORIENTATION OF STARLINGS AFTER DISPLACEMENT TO SPAIN

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## INTRODUCTION

In a previous paper (PERDECK 1958) the results of a sideways displacement of Starlings (*Sturnus vulgaris*) were studied. The birds were caught in Holland during autumn migration and released in Switzerland. The results were clear cut: adults took a direction pointing to the original winter quarters, the juveniles migrated further in the previous direction.

In another experiment Starlings were displaced to Spain, in order to test the influence of favourable surroundings on the migration tendency. The results of this experiment have been published (PERDECK 1964). But in this paper only the recoveries of juveniles in the first winter after ringing were discussed, the other ones having no relevance to the problem in question. But, together with these, recoveries from other seasons can give information on the orientation. Since also a number of adults were displaced, the recoveries may be compared with the Switzerland experiment.

TABLE 1

NUMBERS DISPLACED AND RECOVERED (up till Jan. 1st 1967)

	Age when ringed	
	juvenile	adult
Total released	2703	885
Total recovered	133	35
Total recovered (in percentage)	4.9%	4.0%
Recovered within 50 km during 1st autumn/winter	56	12
Locality and/or date of recovery unknown	12	2

The Starlings used for the experiment were caught in October and November near The Hague (1959-1962). For details about the origin of these birds, as well as techniques, see PERDECK (1958).

In Table 1 the numbers released and recovered are given. It appears that with a fairly high rate of recovery (4.5%) about half of the recoveries

are of little use: from 14 date and/or locality are unknown and 68 were recovered quite near the release point shortly after release. Of the remaining recoveries the details are given in a list at the end of this paper.

## RESULTS

### RECOVERIES IN AUTUMN AND WINTER FOLLOWING DISPLACEMENT

The main question to be answered is if adult and juvenile birds show a similar divergence as was found in the Switzerland experiment.

In Figure 1 the recoveries in the first autumn and winter after release are plotted. Recoveries within 50 km of the release point in the first autumn and winter, are excluded. Recoveries from February are excluded in the case of the juveniles, since it became clear that in this month spring migration has already started (recoveries from Italy, see below).

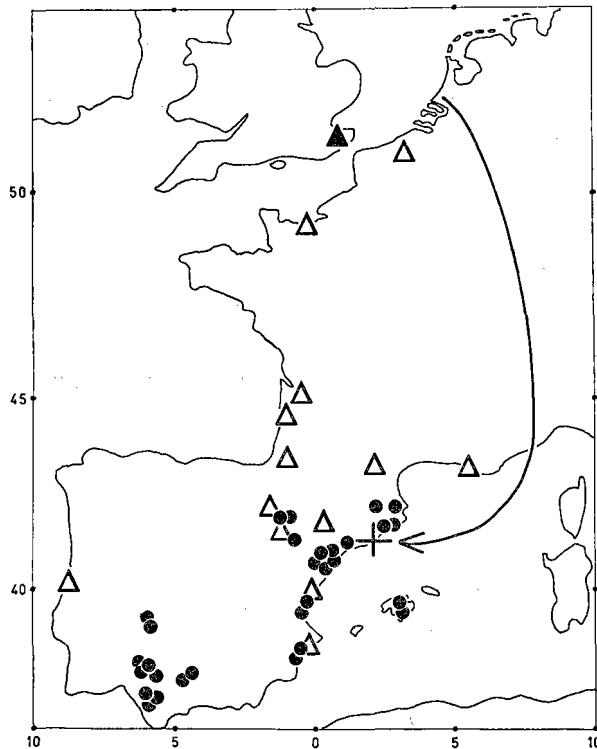


FIGURE 1. Recoveries of Starlings caught during autumn migration in Holland and released in Barcelona (autumn and winter following displacement).

*Dots:* recoveries of juveniles (up till January inclusive).

*Open triangles:* recoveries of adults (up till February inclusive).

*Solid triangle:* recovery of an adult in July following displacement.

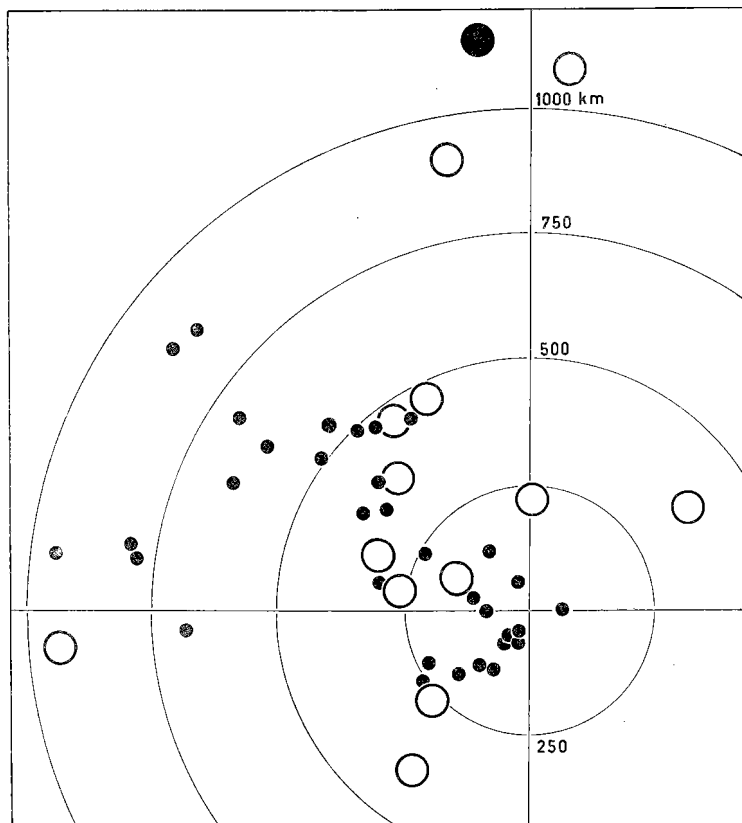


FIGURE 2. Distance and direction of recoveries of adult Starlings displaced to Switzerland (*small dots*) and Spain (*circles*) in autumn and winter following displacement (up till February inclusive).

*Big dot*: recovery of an adult displaced to Spain in July following displacement.

The recovery of an adult bird in South England was not made in autumn or winter, but in July. The bird was found freshly shot in a cherry orchard. There is all reason to believe that the bird was still in the winter quarters to which it migrated after release in Spain. But even when this recovery is excluded, there is a striking difference between adults and juveniles. Although there is considerable overlap, the juveniles held mainly a southwestern course, while the adults showed a strong tendency to move in a northwestern and northern direction. This corroborates very well the conclusion drawn from the Switzerland experiment: juvenile birds use a one-direction orientation, adults a true goal orientation.

#### COMPARISON WITH THE SWITZERLAND EXPERIMENT

If the adults indeed use a goal orientation one should expect a difference between the adults displaced to Switzerland and Spain. The direction from

TABLE 2  
DIRECTION OF ADULTS DISPLACED TO SPAIN AND SWITZERLAND  
(recovered in autumn and winter following displacement)

	A				B			
	distance more than 50 km				distance more than 250 km			
	N*)	W	S	E	N	W	S	E
Spain	6(7)	5	1	1	5(6)	3	1	1
Switzerland	8	18	5	1	6	12	—	—

Figures in *brackets* include recovery from England in July following displacement.  
\*) NW-NE by N, etc.

Barcelona to the original winter quarters (British Isles mainly) is about N by W. From the release point in Switzerland it is about NW. But the scatter can be supposed to be rather high, since the winter quarters comprise of an area including the Low Countries, Northwest France, Ireland and England.

In Figure 2 the recoveries in first autumn and winter of both groups are plotted against direction and distance. A higher proportion of north-bound birds is found among the birds displaced to Spain. This is easier to see, when the data are summarized in a table (Table II, A). At shorter distances, however, the Swiss experiment produced a rather high proportion of SW directions. This could exaggerate the difference. But it holds also when recoveries less than 250 km are excluded (Table II, B). The conclusion that in the case of the adult birds true goal orientation is involved, is supported by this new experiment.

#### RECOVERIES AFTER THE FIRST WINTER

Starlings displaced to Switzerland, showed a strong tendency to return to the original breeding quarters of the population. The distance of displacement, however, was too small to detect a southward shift of the breeding area (PERDECK 1958).

In this respect the Barcelona experiment is more favourable. When the juvenile birds, after having wintered in Spain, migrated back to the original breeding quarters of the population their direction would be about NE-NNE. But the 19 recoveries from February-April after displacement suggest a different direction, about ENE (Fig. 3, crosses). Going on into this direction one would expect a breeding area in Southeast Europe.

From the three recoveries in the breeding season (Fig. 3, dots) one is indeed from Yugoslavia, but the others are from Southern France and Denmark. A partial return to the original breeding area cannot be excluded, therefore, but the evidence that most birds migrated in the normal direction of spring migration is strong. This means that they used a one-direction orientation and were not able to "home" to the original area of hatching.

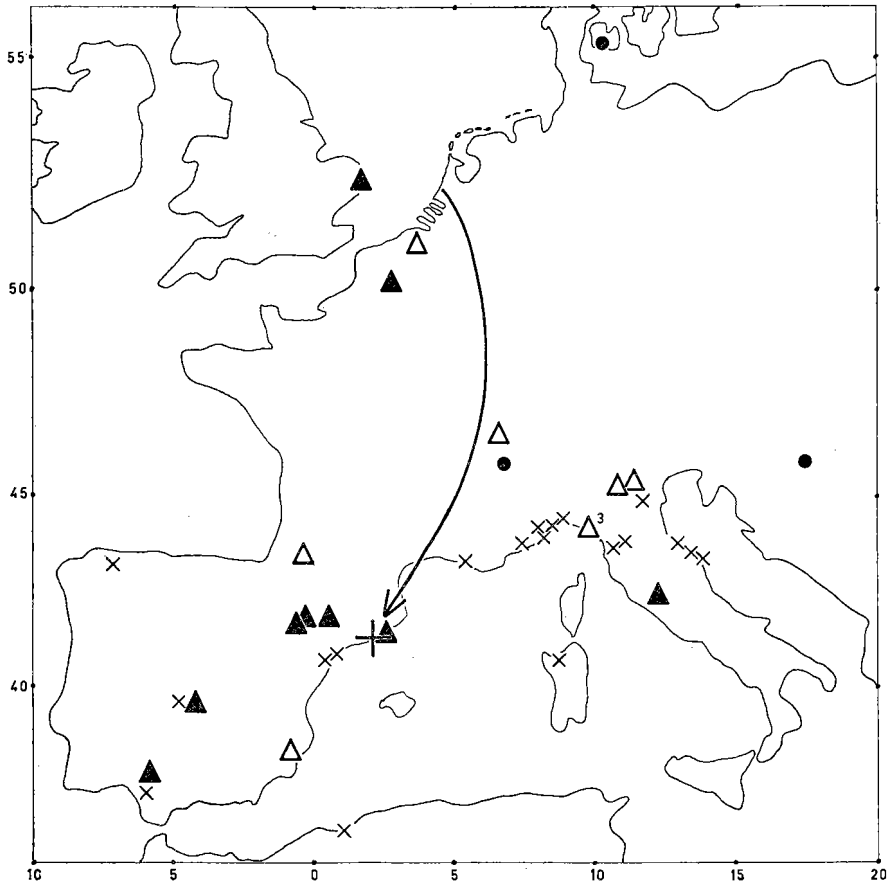


FIGURE 3. Recoveries of Starlings displaced as juveniles to Barcelona.

*Crosses*: recovered in February, March, and April following displacement.

*Dots*: recovered in breeding season (May-August).

*Solid triangles*: recovered in later winters (Dec.-Febr.).

*Open triangles*: recovered in later autumns (Sept.-Nov.) except the one marked 3, which is from March.

Recoveries from later winters and migration seasons (Fig. 3, triangles) indicate that most of the birds remain in the newly acquired area of distribution. The five recoveries (not mapped) from adult-displaced birds in later seasons are from Spain (3, in winter), Belgium (autumn) and Baltic Sea (March). The recoveries from Spain give rise to a problem. Have these birds been staying there all the time after displacement (sedentary bird) or are they from birds that, just as the juveniles, stayed there in the first winter and returned in later seasons?

## DISCUSSION AND SUMMARY

About 2700 juvenile and 900 adult Starlings were caught during autumn migration in Holland and displaced to Spain (Barcelona). The recoveries in the autumn and winter after release show a different behaviour of juveniles and adults. Juveniles followed a more southwestern, adults a more northern course. This suggests two different types of orientation: *one-direction orientation* in the juveniles and *true goal orientation* (navigation) in the adults. It corroborates an earlier displacement experiment to Switzerland. The difference in direction in adults displaced to Spain and Switzerland is in agreement with goal orientation to the same winter area and adds a further argument to the claim that this kind of orientation is used indeed.

Recoveries of juvenile-displaced birds in the first spring after displacement strongly suggest one-direction orientation and not homing to the area of hatching. In accordance with this, the recoveries in later years are, for the greater part, not situated in the original area of the population, but in a southward shifted area. In this respect the behaviour of the juvenile Starlings is similar to that of the Hooded Crow (RÜPPELL 1944). A definite conclusion can, however, not be given. A displacement experiment with Starlings in spring could give more reliable results.

## REFERENCES

- PERDECK, A. C. 1958. Two types of orientation in migrating starlings, *Sturnus vulgaris*, and chaffinches, *Fringilla coelebs*, as revealed by displacement experiments. *Ardea* 46: 1-37.
- PERDECK, A. C. 1964. An experiment on the ending of autumn migration in starlings. *Ardea* 52: 133-139.
- RÜPPELL, W. 1964. Versuch über Heimfinden ziehender Nebelkrähen nach Verfrachtung. *Journ. Orn.* 92: 106-132.

## LIST OF RECOVERIES

From the recoveries under heading B the various items are given in this order: ring number, sex, date of release, date of finding (in brackets: date of report), province, geographical co-ordinates of locality of finding (tenth of degrees) and manner of recovery (+ = shot, × = found dead, /?/ = unknown, ( ) = caught, (+) = caught and killed, V = caught and released, /—/ = found).

## I. Recoveries of Starlings, displaced as Juveniles

## A. Recovered within 50 km of release point up till February after release

recovered	ringed 1-23 Oct.	ringed 24 Oct.-30 Nov.
Oct.	15	2
Nov.	4	20
Dec.	2	5
Jan.	3	2
Febr.	0	3

## B. Other Recoveries

## SPAIN

K 109606	♀	13-10-59/18- 1-60	Alicante	38,3 N 0,8 W	+
K 109001	♂	2-10-59/ 2-11-59	"	38,3 N 0,7 W	/ ? /
K 109131	♀	2-10-59/20- 9-60	"	38,1 N 0,8 W	+
K 109183	♂	2-10-59/(31-1-60)	Badajoz	39,0 N 5,9 W	+
K 151190	♀	23-10-61/12-12-61	"	"	+
K 151881	♀	1-11-62/ 4-11-62	Barcelona	41,6 N 2,7 E	+
K 179141	♀	1-11-62/ 9-11-62	"	"	+
K 151122	♀	22-10-61/25-12-62	"	41,4 N 2,2 E	×
K 109947	♂	18-10-59/10-11-59	Balearics	39,3 N 3,1 E	/ ? /
K 150375	♂	26-10-60/(31-12-60)	"	39,5 N 3,0 E	( )
K 150236	♂	26-10-60/25-11-60	Cordoba	37,5 N 4,7 W	( )
K 150244	♂	"	"	"	( )
K 150568	♀	6-11-60/15-11-60	Gerona	42,2 N 2,8 E	+
K 151761	♀	25-10-62/ 2-11-62	"	42,2 N 2,2 E	+
K 179471	♀	9-11-62/(7-12-63)	Lérida	41,7 N 0,5 E	(+)
K 109898	♀	18-10-59/26-12-61	"	41,7 N 0,4 E	( )
K 109482	♂	9-10-59/	"	"	( )
K 151499	-	28-10-61/ 4- 2-62	Lugo	43,2 N 7,4 W	+
K 150151	♀	23-10-60/ 1- 1-61	Saragossa	41,9 N 1,3 W	( )
K 150608	♀	29-10-61/15-12-61	"	"	( )
K 109659	♀	13-10-59/12-12-59	Sevilla	36,9 N 6,1 W	(+)
K 109988	♂	18-10-59/	"	"	(+)
K 151238	♀	23-10-61/ 5- 1-62	"	37,6 N 5,9 W	/ ? /
K 151081	♀	21-10-61/	"	"	( )
K 150720	♀	8-10-61/	"	"	( )
K 109324	♂	7-10-59/12- 1-60	"	36,7 N 6,1 W	( )
K 150047	♀	22-10-60/22- 1-61	"	37,6 N 5,8 W	+
K 109243	♂	7-10-59/17- 2-60	"	36,9 N 6,1 W	+
K 109310	♀	7-10-59/25- 1-61	"	37,6 N 5,9 W	+
K 179193	♂	2-11-62/ 2-12-62	Tarragona	40,7 N 0,7 E	+
K 109362	♀	9-10-59/ 2-12-59	"	"	+
K 109586	♂	13-10-59/ 7-12-59	"	40,8 N 0,7 E	+
K 151451	♀	26-10-61/17-12-61	"	40,7 N 0,5 E	/ ? /
K 150439	♂	5-11-60/18-12-60	"	41,2 N 1,1 E	+
K 151584	♂	28-10-61/17- 1-62	"	40,6 N 0,5 E	×
K 151089	♂	20-10-61/15- 2-62	"	40,7 N 0,6 E	+
K 179007	♀	1-11-62/ 2 or 3-62	"	40,7 N 0,7 E	+
K 151913	♂	2-11-62/ 5- 1-63	Teruel	41,1 N 0,1 W	+
K 151500	♀	28-10-61/19- 2-62	Toledo	39,7 N 4,8 W	×
K 109264	♂	7-10-59/ 7- 2-65	"	39,6 N 4,5 W	( )
K 150747	♀	8-10-61/11-10-61	Valencia	39,7 N 0,3 W	/ ? /
K 151657	♂	29-10-61/ 5-11-61	"	39,6 N 0,3 W	×

ALGERIA					
K 151261	♀	23-10-61/ 2- 3-62	Oran	35,8 N 1,1 E	V
FRANCE					
K 109804	♀	18-10-59/24- 2-60	Alpes Mar.	43,7 N 7,4 E	×
K 179389	♀	7-11-62/29-11-64	Basses Pyr.	43,5 N 0,5 E	( )
K 150944	♀	17-10-61/15- 3-62	B. du Rhône	43,3 N 5,4 E	( )
K 179108	♀	1-11-62/14- 7-63	Hte Savoie	45,9 N 6,8 E	×
K 150826	♂	14-10-62/28-12-63	Somme	50,1 N 2,7 E	+
ITALY					
K 150609	♂	6-11-60/ 5- 3-61	Emilia-Rom.	44,8 N 11,6 E	( )
K 109756	♂	18-10-59/15-12-60	Lazio	42,4 N 12,1 E	+
K 150461	♂	5-11-60/10- 2-61	Liguria	44,2 N 8,3 E	+
K 150967	♀	16-10-61/18- 2-62	"	44,1 N 8,2 E	+
K 151222	♂	23-10-61/11- 3-62	"	44,4 N 8,7 E	+
K 150522	♀	6-11-60/15- 3-62	"	44,1 N 9,8 E	+
K 150235	♂	26-10-60/20- 3-61	"	44,1 N 8,2 E	+
K 109872	♂	18-10-59/ 1- 9-61	Lombardia	42,2 N 10,5 E	+
K 150344	♀	26-10-60/13-11-61	"	45,1 N 11,2 E	+
K 150632	♂	6-11-60/ 2- 3-61	Marche	43,1 N 13,5 E	+
K 109212	♀	7-10-59/15- 3-60	"	43,9 N 12,9 E	+
K 150260	♂	26-10-60/11- 4-61	"	43,2 N 13,7 E	V
K 150977	♀	17-10-61/25- 2-62	Sardinia	40,7 N 8,6 E	+
K 150220	♀	23-10-60/12- 3-61	Toscana	43,7 N 10,8 E	+
K 109352	♂	9-10-59/24- 3-60	"	43,7 N 10,6 E	+
JUGOSLAVIA					
K 179144	♀	2-11-62/15- 5-64	Hravatska	45,8 N 17,5 E	+
SWITZERLAND					
K 150335	♀	26-10-60/15-10-61	Vaud	46,5 N 6,5 E	+
BELGIUM					
K 150138	♀	23-10-60/ 8-10-61	O. Vlaand.	51,1 N 3,5 E	( )
ENGLAND					
K 150597	♀	6-11-60/23- 2-63	Suffolk	52,5 N 1,8 E	×
DENMARK					
K 151464	♀	28-10-61/13- 7-63	Fyn	55,2 N 10,3 E	+

## II. Recoveries of Starlings, displaced as Adults

### A. Recovered within 50 km of release point up till February after release:

6 in Oct., 3 in Nov., 2 in Dec., 1 in Jan., none in Febr.

### B. Other Recoveries

SPAIN					
K 109118	♂	2-10-59/15-12-59	Alicante	38,4 N 0,5 W	( )
K 115012	♀	21-10-59/26-12-61	Lérida	41,7 N 0,4 E	( )
K 109131	♀	2-10-59/20- 9-60	"	38,1 N 0,8 W	+
K 115012	♀	21-10-61/26-12-61	"	41,7 N 0,4 E	( )
K 109421	♂	9-10-59/ "	"	" "	( )



K 151031	♂	21-10-61/ 9-11-61	Navarra	42,1 N 1,6 W	( )
K 151310	♂	24-10-61/22-12-61	Saragossa	41,6 N 0,9 W	( )
K 150311	♀	26-10-60/11- 1-63	Tudela	42,1 N 1,6 W	( )
K 179194	♀	2-11-62/11-11-62	Valencia	39,7 N 0,3 W	+
PORTUGAL					
K 150795	♀	8-10-61/ 9- 2-62	Beira Litoral	40,1 N 8,8 W	+
FRANCE					
K 109863	♀	18-10-59/23-11-59	Aude	43,3 N 2,1 E	×
K 150656	♂	6-10-61/20- 1-62	Basses Pyr.	43,5 N 1,1 W	+
K 151289	♂	24-10-61/ 1-11-61	B. du Rhône	43,3 N 5,6 E	+
K 150760	♂	8-10-61/ 5-11-61	Calvados	49,3 N 0,4 W	×
K 151338	♂	25-10-61/ 5- 1-62	Gironde	44,6 N 1,2 W	+
K 151864	♂	31-10-62/ 2-11-62	„	45,0 N 0,5 W	+
BELGIUM					
K 109495	♀	13-10-59/ 8- 2-60	West Vlaand.	50,9 N 3,2 E	×
K 150692	♂	6-10-61/ 5-10-62	„	51,2 N 3,3 E	+
ENGLAND					
K 150793	♂	8-10-61/20- 7-62	Kent	51,3 N 0,7 E	+
BALTIC SEA					
K 151725	♀	25-10-61/27- 5-65		ca. 56,0 N 18,0 E	V

## SAMENVATTING

Ongeveer 2700 jonge en 900 overjarige Spreeuwen werden op de najaarstrek bij Den Haag gevangen en naar Spanje (Barcelona) verplaatst. De terugmeldingen in de herfst en winter volgend op de verplaatsing tonen een verschillend gedrag van oude en jonge vogels. De jonge dieren trokken ongeveer ZW, de oude hielden een meer noordelijke koers aan. Dit wijst op verschillende manieren van orientatie: *kompas-gerichte* of *één-richtingsorientatie* bij jonge, *plaatsgerichte orientatie* bij oude Spreeuwen. Hierdoor worden de resultaten van een vroegere verplaatsingsproef naar Zwitserland bevestigd. Er is ook een verschil tussen de richtingen van de oude vogels die naar Spanje en die naar Zwitserland verplaatst zijn. Dit verschil is in overeenstemming met wat men zou verwachten als de vogels van beide groepen met doelgerichte orientatie naar hetzelfde gebied terugkeren. Dit geeft een extra argument voor het aannemen van doelgerichte orientatie bij de oude vogels.

De terugmeldingen van de jonge vogels in het voorjaar na de verplaatsing duiden sterk op een kompas-gerichte orientatie, niet op een "homing" naar het gebied waar ze werden uitbroed. In overeenstemming hiermee liggen de terugmeldingen uit later jaren voor het grootste deel niet in het oorspronkelijke verspreidingsgebied van de populatie, maar ten zuiden er van.