The movements of northern German Barn Owls ringed as nestlings, from the data of the Vogelwarte Helgoland – part 1

by Ernst Kniprath[1]

1 Introduction
The plan already made some years ago to study in one great action together with colleagues from these countries the recovery data on Barn Owls, stored in different countries over Europe, got stuck in its beginnings. For this there is in the major part the simple reason: The current publication of chapters already written on the home-page of an owl-organization hitherto not could be realized. To avoid the failure of the entire plan two parts already have been published. This first were the review of the dispersion movements, originally intended as introduction to the whole (KNIPRATH 2010), and second the renewed examination of the question, where Barn Owls are over winter, or reverse, whether they migrate (KNIPRATH & STIER 2009). Now the publication of those parts already finished will be continued. These parts consist of the parallel analysis of the dispersion movements of young Barn Owls in the western, the central, and the northern (German) low-lands as unities. This will be continued as part 2 by the analysis of sub-divisions with remarkable concentrations of ringing activities and the discussion of both parts in common. There will be special emphasis on the question, whether the recoveries have been controls of ringers (FINDCOND=8). KNEIS (1981) had pointed out that from these "intended" recoveries distance values originate different from those of the recoveries made by the public.

2 Material and methods
The North-German Lowlands seem to be an area to large to be considered as unity when analysing the recovery data obtained here. The entire area is subdivided into four parts, the western, central, northern, and eastern ones. The three first ones do belong to the area of the Vogelwarte Helgoland and will be covered here.

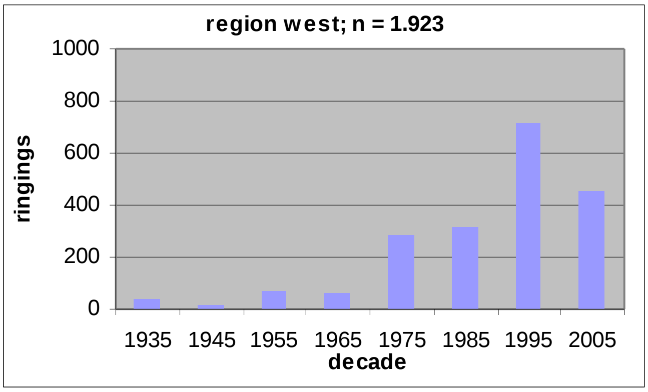
2.1 The western lowland
This study area consists of north-western Germany from the frontier to the Netherlands to the "Teutoburger Wald". The southern border on the left banks of the Rhine runs about from Aachen to Köln, east of it about along the Ruhr (roughly at the 250 m line). Parts of the area or older time windows already have been studied earlier by SCHNEIDER (1937), SAUTER (1955), OELKE (1986), and MÖNIG & REGULSKI (1999).

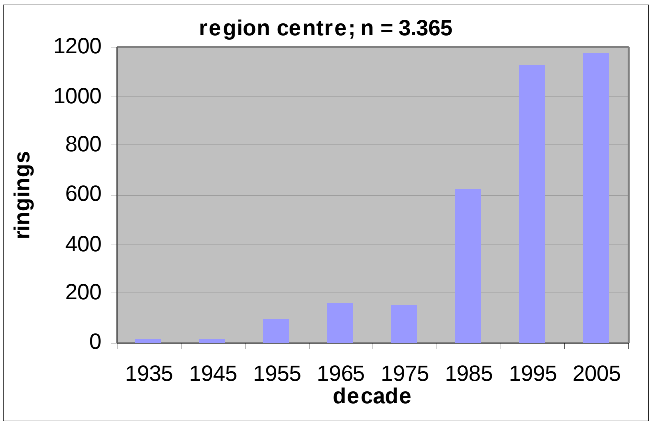
Material, numbers
The recovery data (up to 2008) studied here consist in: 1.923 owls with 1.953 recoveries (only those ringed with rings "Helgoland" as nestlings). If in the following we speak of "ringings", these ringed birds with recoveries are in view.

Figure 1 shows the temporal distribution of the ringings (of nestlings) with recoveries. There we see that until the 1960-es the numbers were very low. Only from about 1970 on they remarkably increased. As in the other study areas as well this increase probably demonstrates the enormous endeavours since to protect Barn Owls by posting nest

[1] Translation of the original publication: Kniprath E 2012: Die Wanderung nestjung beringter norddeutscher Schleiereulen *Tyto alba* nach dem Material der Vogelwarte Helgoland – Teil 1. Eulen-Rundblick 62: 101-110

boxes. Here the last decade only consists of eight years, so that the number meanwhile certainly has increased considerably.





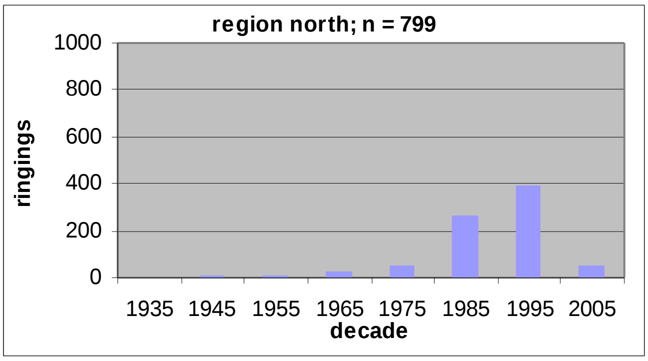


Figure 1: Distribution of the ringings with recoveries in the three regions of the North German Lowlands by time

Table 1: Characteristics of the three data lots of the North German Lowlands together with the euring-codes and the numbers, under which they are stored in the data banks of the ringing schemes and of RINGZENT (FIND= FINDCOND; STAT= STATUSBROODSIZE; s. www.euring)

	recov.	♂	♀	dead	injured	unknown	breeding
code:				FIND 1-3	FIND 4;5	FIND 0;6;7;9	STAT N
area							
west	1.923	59	223	1.477	70	96	198
centre	3.658	496	629	2.216	131	35	698

north	901	21	31	699	21	37	97

2.2 The central lowland

The study area runs from 8.9^0 east to the eastern border of Lower Saxony, including the (German) federal states Bremen and Hamburg. The northern border is at about 53,9^0 north and the southern one runs from Osnabrück to Hildesheim at about 250 m NN. We know a special recovery-communication for this region by SAUTER (1955). Sub-regions or older time windows have been studied by SCHNEIDER (1937), SAUTER (1956), OELKE (1986) und ZANG et al. (1994).

Material, numbers

The recovery-data now (until 2008) present includes the following: 3.098 ringed birds (only those ringed as nestlings with rings of the Vogelwarte Helgoland) with 3.651 recoveries.

The temporal distribution of the ringings of nestlings with recoveries is given by figure 1. Different from the western lowlands the numbers here are very low up to the 1970ies. Only from 1980 on the numbers then increase considerably. What was said above concerning the last decade is valid here as well.

2.3 The northern lowland

The region Schleswig-Holstein of course does belong to the North German Lowlands. Indeed, by its position between the North and the Baltic Seas it has a special position. Here included are all ringings north of 53,9^0 northern latitude. An earlier analysis of the Schleswig-Holstein-recoveries until 1996 is known by HILLERS (2011).

Material, methods

Up to 2008 incl. There were 901 ringings with recoveries (total: 954). Of these 860 were Barn Owls ringed as nestlings. The temporal distribution of these ringings are shown in figure 1. Here too until the 1970-ies the numbers were very low. Only from about 1980 on they increased considerably.

The part of life-recoveries

KNEIS already 1981 had accentuated that it is of importance for every analysis of recovery and so for dispersion distance, whether the recovery had been made by a ringer or by the public. Recoveries made by ringers often are captures of living owls at the breeding site. In consequence at first we shall test how great the respective part really is. Figure 2 makes clear that obviously only from the mid of the 1970-ies on in all three study areas there was a slightly higher, and from the 1990-ies on a significantly higher part of life-captures. These are due to the capture activities of single ringers or ringer teams. The attribute “found by ringer” shall be considered during the analyses.

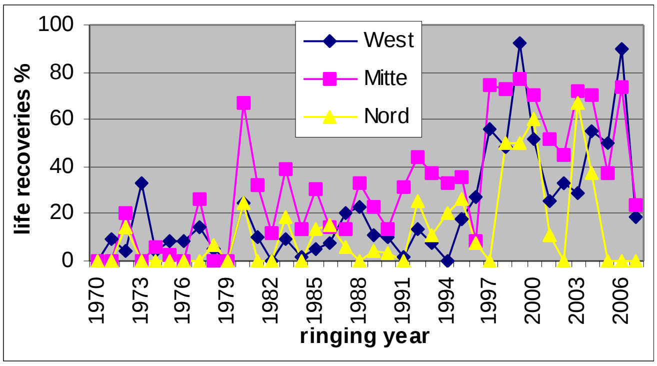
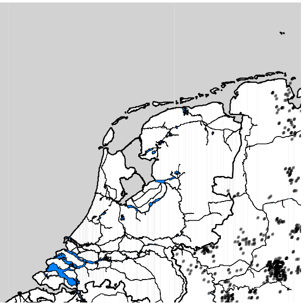


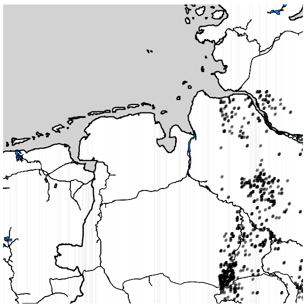
Figure 2: The part of life-captures among the recoveries of Barn Owls ringed as nestlings in the three study areas; n = 6.596

3 The dispersion

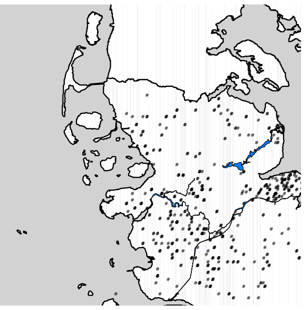
First it seems to be important for all analyses concerning distances or directions of dispersion to ascertain, where these birds had been ringed. The locality, at which an owl had grown up, could have an influence on these recovery data. So all ringing localities to the recoveries analysed here are given in a map (fig. 3).



area west



central area



area north
Figure 3: The spatial distribution of the ringings with recoveries in the three study areas of the Northern German Lowland (maps: OLAF GEITER)

3.1 Dismigration directions
The distribution (as percentage) of the recoveries on the compass directions (fig. 4) is very similar in the areas west and centre. For both there is an accentuation of the direction W-SW. As to the area west there is a lesser accentuation of the direction NE-E. The distribution in the area north is totally different. According to the geography of the Jutland Peninsula a dispersion in the direction W only is possible for owls born in the east. In contrast, the direction N-NW is accentuated. Here as well we find an accentuation of the direction SW, and, even less, of E. The preference SW (and even less W) shows that the better climatic conditions in this direction certainly has an influence. Later, when analysing the data of narrower regions, we will stress the influence of geographic factors on the dispersion direction.
The relations in figure 4 do not alter when the captures of ringers remain unconsidered. The preference of some direction so appears real.

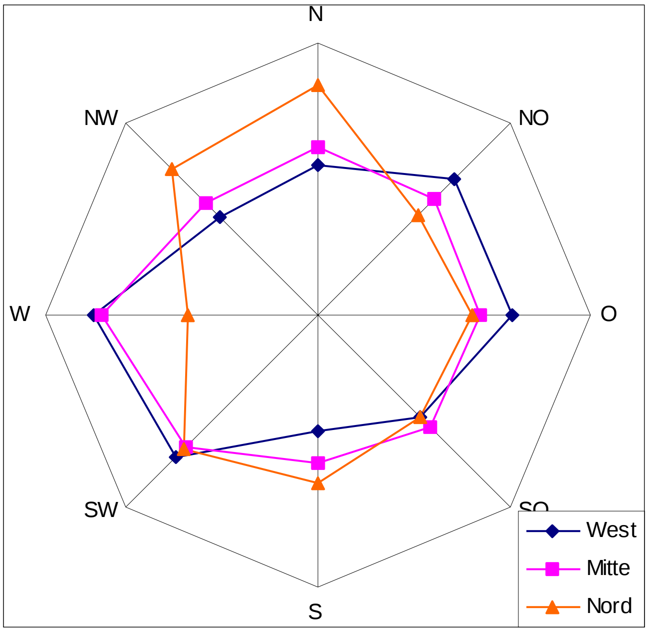
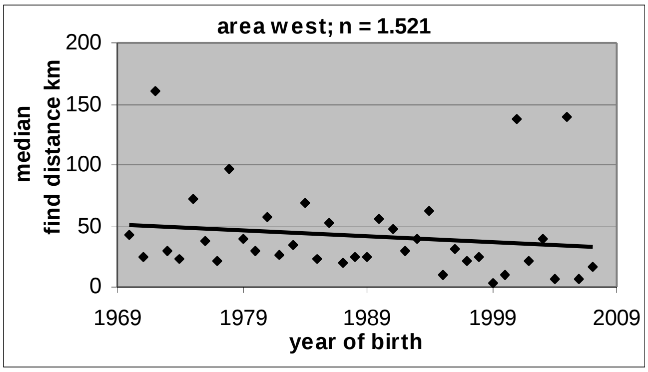


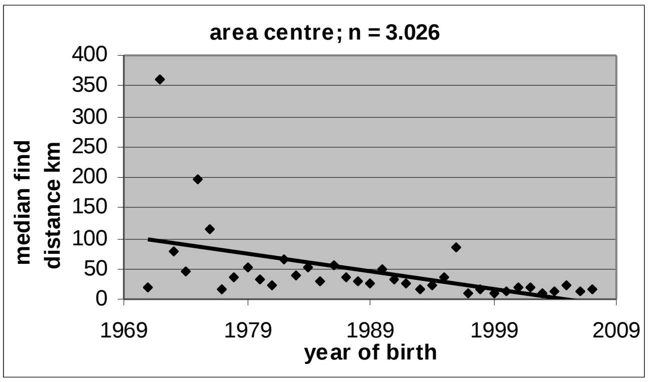
Figure 4: Distribution of recoveries (>2 km) in the compass directions for the three study areas as % (west; n = 1.696; centre: n = 3.284; north: n = 741)

If, like hitherto using all data, only those of the ringing months June or July (only for these the numbers were sufficient) were used, the aspect of the distribution was not altered. This is valid as well, when only the data of all later recoveries (from March of the 2nd calendar year on), that is of owls probably settled, were taken (no fig.). The relations found thus are real ones.

3.2 Dispersion distances

The alterations of the yearly median values of the dispersion distances are considerable in all three study areas, even if the extraordinary values of >100 (mostly in years with only very few values) are excluded (fig. 5). The differences of the means at least in the centre area (only here the values were continuous) were significant (ANOVA, EXCEL; P<0,001). The decrease – differently distinct for the study areas – of the values in time presumably has no reason in the biology of the Barn Owls. More certainly it documents the efforts in protecting the species by offering a great number of nest boxes since about 1960. This increase in nesting sites in the vicinity of the birth site facilitated the settling nearby. The regression found remains, if only those recoveries are analysed, which were made beginning with the March of the year following birth. Here we find owls, which presumably or certainly already had settled. (As will be showed later, there is no prolongation of dispersion in later years.) The presumption that we found an effect of owl protection, is confirmed, when the recoveries of ringers are eliminated. The effect disappears. Ringers post most of the nest boxes. Or vice versa: Who post many boxes wants to know, where his owls do remain, and rings and controls.





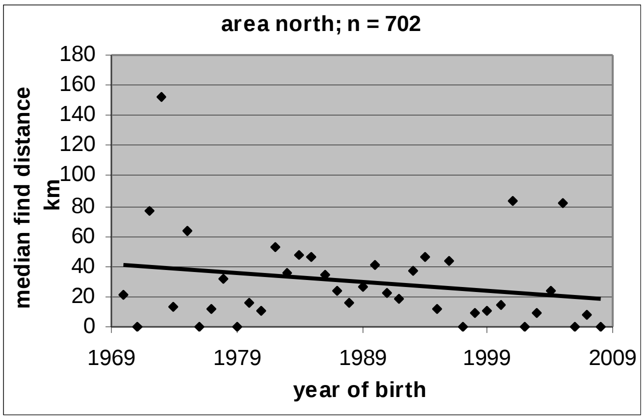


Figure 5: Mean of recovery distance (>2 km) of Barn Owls ringed as nestlings by years

In figure 6 we see, within which distances from the ringing site the respective summed part of owls has been recovered. With 32 km the radius for 50% of the recoveries is highest in the area "west". That means, the owls here had dispersed the farest before being recovered. This is confirmed by the 160 km for 80%. As we may presume that young Barn Owls do not leave their birth area just for fun, having distributed farer with greatest probability means that life conditions here were less favourable than in the two other areas. Following the numbers for 80% of the recoveries, the conditions during the study period might have become better going from west to north. We may suggest that the number of possible nesting sites available had a special influence.

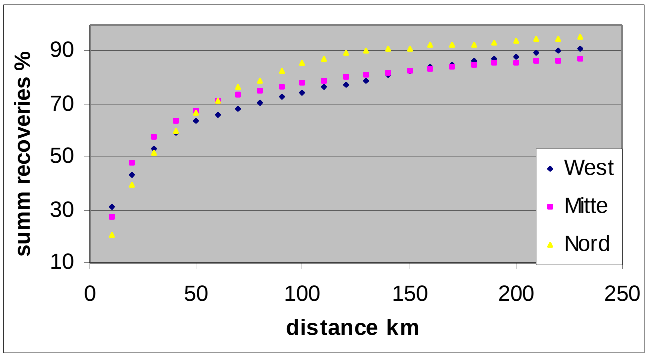


Figure 6: Accumulated recoveries (%) from the three study areas as depending on the find distance, here only owls really fledged (km >0). Area west n = 1.827; area centre n = 3.438; area north n = 753

The record of the sex for a greater number of individuals present in many of the data sets (see table 1) allowed the discrimination between the sexes (fig. 7). In the figure for the area west we see that the course of the curves in both sexes nearly is identical. The distance between them indeed steadily is 10%. That means, inside of a nearly optional circle around the birth place in each case there were found 10% more of the total of the ♀ than of the ♂: The ♀ dispersed less far than the ♂ (or were overtaken earlier by death). As to the general course the curves for the areas centre and north look very similar, but here the ♀ have dispersed farer. This fundamental difference makes doubt in the data set or in the result. Possibly the result for the area centre with the fare most greatest database mostly narrows reality: Probably there is no difference between the sexes.

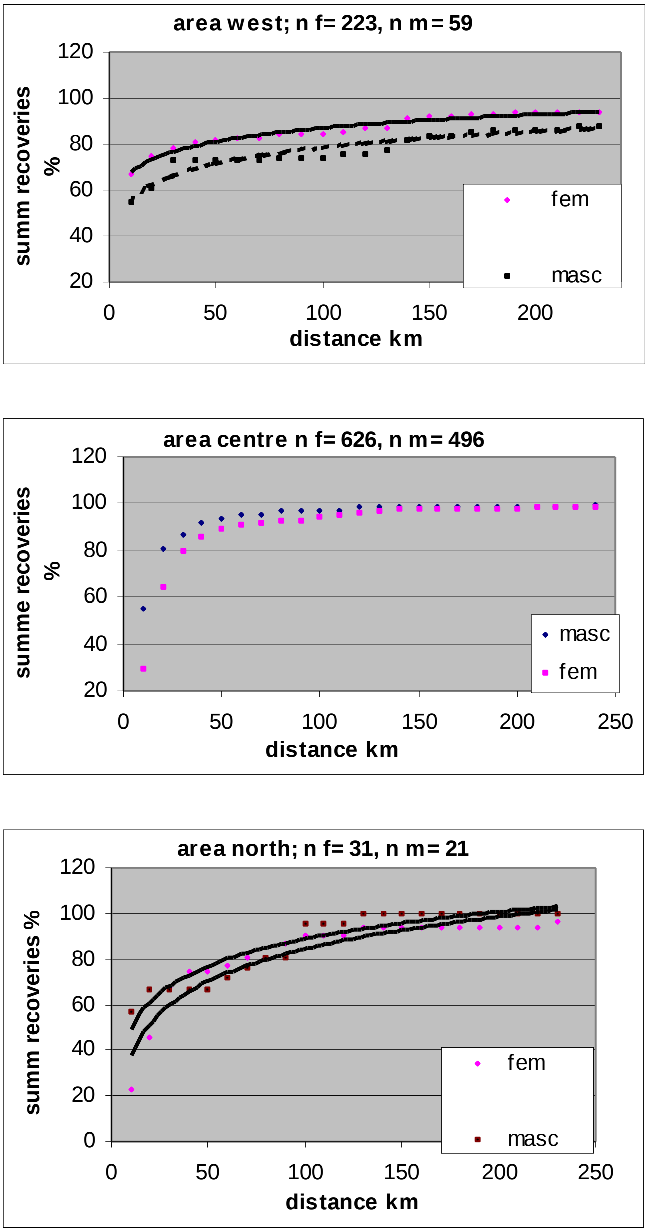
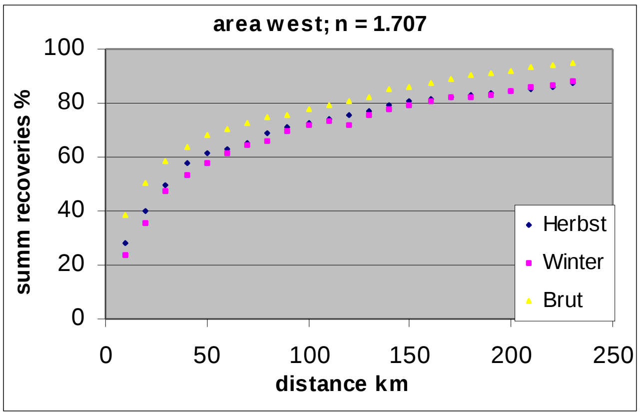


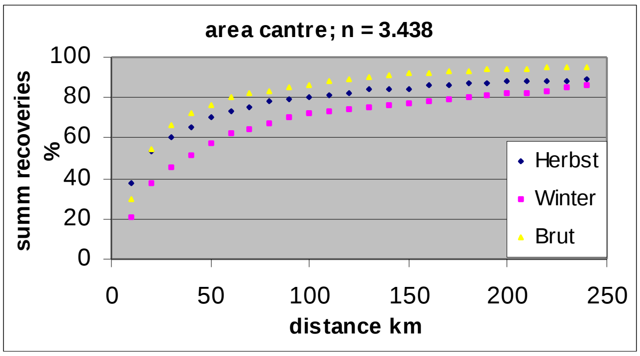
Figure 7: Accumulated part of recoveries (%) as depending on the find distance by sexes

The former analyses, in which always all recoveries were used, indeed mixed very different life phases of the owls with presumably different influences. So the total of the recoveries was subdivided into three groups: (1) recoveries up to November of the birth year, (2) those of the first winter (December – February), and (3) the birds found after the February of the second calendar year. The hypothesis was that group (1) includes owls, which mostly were still dispersing, in (2) the question of settling probably is answered, and in (3) most owls certainly have settled and probably are paired. The figures 8 show the cumulative distribution of these find groups, table 2 gives a look over some specific values. Those in columns “km” were derived/interpolated from the course of the curves.

In all three areas the curve (fig. 8) for the owls already settled (yellow) show the highest amount of values. That means, who has found a breeding site stays (can stay). All others go on dispersing (must go on). The rather lower values (meaning greater

distances) already in autumn and also in winter indicate that settlement takes place rather early (latest until November).
The distances for the recovery of 50% of the owls settled (in table 2 each for group 3: area west: ca. 20 km; centre: ca. 18 km; north ca. 29 km) give an indication of the life conditions there, most probably for the nest box densities. Following that, the density was highest in the area centre and lowest in the area north.





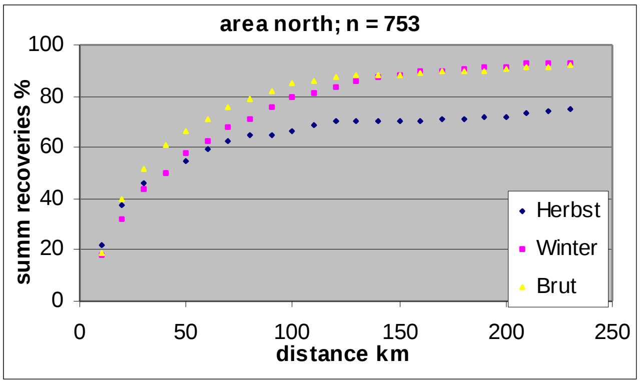


Figure 8: Cumulated recoveries as depending on find distance (black: recoveries up to November of birth year; violet: recoveries during the first winter; yellow: recoveries from first breeding season on)

Table 2: The partition of the recoveries of owls ringed as nestlings, after find periods. Column %: The portion of the groups in the total; “50” resp. “80% until km”: the radius, within which 50% resp. 80% of the recoveries originated; column “dead%”: the portion of carcasses in %; “liv”: the portion of bird found alive in %

area west	50% rec. until km	80% until km

group				n	%	km	dead %	liv %	km	dead %	liv %
0	Found dead in nest (km=0)			131	6,7	0			0		
1	Found until November			379	19,4	30	81,2	14,5	150	83,1	12,4
2	Found December until February			593	30,4	35	89,8	6,5	155	91,2	5,5
3	Found from March on (= settled)			850	43,5	20	48,4	49,6	125	60	37
	total:			1.953	100						
area centre						50% rec. until km			80% until km		
group				n	%	km	dead %	liv %	km	dead %	liv %
0	Found dead in nest (km=0)			213	5,8	0			0		
1	Found until November			516	14,1	15	90,3	4,7	90	89,6	3,9
2	Found December until February			647	17,7	35	91,6	4,6	125	91,9	3,7
3	Found from March on (= settled)			2.275	62,3	18	27,4	36,4	60	36,4	61,3
	total:			3.651	100						
area north						50% rec. until km			80% until km		
group				n	%	km	dead %	liv %	km	dead %	liv %
0	Found dead in nest (km=0)			46	5,8	0			0		
1	Found until November			128	16,0	21	90,8	9,2	77	90,8	5,9
2	Found December until February			237	29,7	40	98,3	2,5	98	97,6	1,1
3	Found from March on (= settled)			388	48,6	29	80,4	23,7	78	81,8	11,3
	total:			799	100						

Table 2 gives the view on some specific values of the figure 8. Those in column 5 (values 50%) and those in column 8 (values 80%) were taken from the respective curve (fig. 8). The very low values (20 km west; 18 km centre; 29 km north) for 50% recoveries of the birds settled prove that those, which have survived the first winter, have found their sites for settlement within these distances. This very low value as well may signify that a relative near settlement means an advantage in survival. Concerning the owls settled we may state that the parts of bird found dead are considerably or even totally different from those in the two other groups. Here we see the activities of ringers, who control adult bird alive.

To be able to verify the statement of Kneis (1981), the dispersion distances were dependant on the prey quantities, data on the yearly oscillating values were needed. First it was analysed for the period from 1970 on, whether those oscillations do exist. This interval was taken as only since the number of recoveries per year is great enough to evade a to great influence of chance. But there were no data on prey densities available. So we tried to find replacement values. As directly being dependant on prey quantities the numbers of broods or those of nestling ringed per year could be such ones. But as even these were not available, the numbers of recoveries per age-group were taken with the supposition that these two values are closely correlated. The original supposition that so a correlation of the find distance with the prey availability could be found, was not true. Here we consider especially that the especially high values of the medians are found connected with very low recovery numbers (fig. 9). It is imaginable that such a correlation does not exist, the number of recoveries is not a good measure or that the correlation is hidden by other influences.

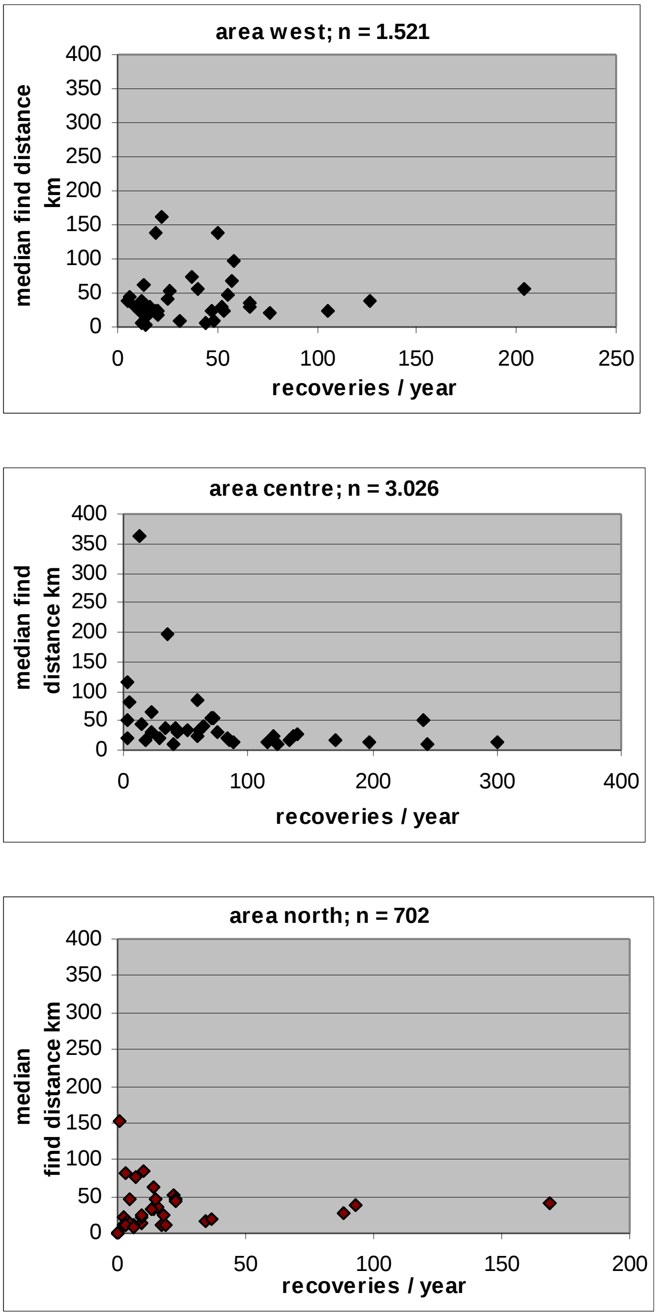


Figure 9: The correlation between the number of recoveries (as measure for the prey availability: see text) and the find distance (>2 km) per age-group

As possible further influences the prey availability during the preceding year (measured as recovery number of the respective year) and the alteration of it from the preceding to the actual year (as relative alteration of the ringing/recovery numbers from year A to year B) were analysed. There was no recognizable influence. Indeed we saw in this latter influence that the highest dispersion distances occurred in those years, in which the amount of broods (depicted as alteration of the recovery number against the preceding year) showed few alteration against the preceding year (fig. 10 as an example). Here again it is true that these maximum values are corroborated only by very small numbers.

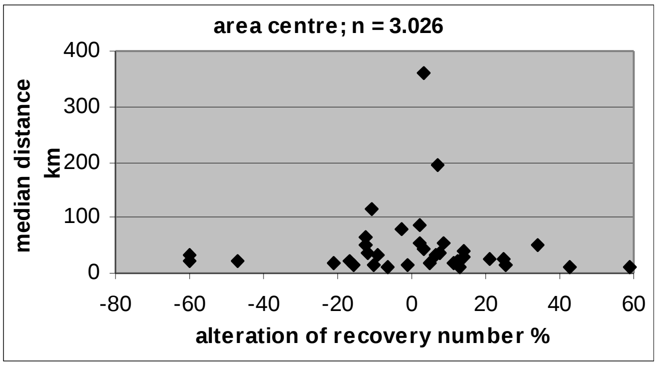
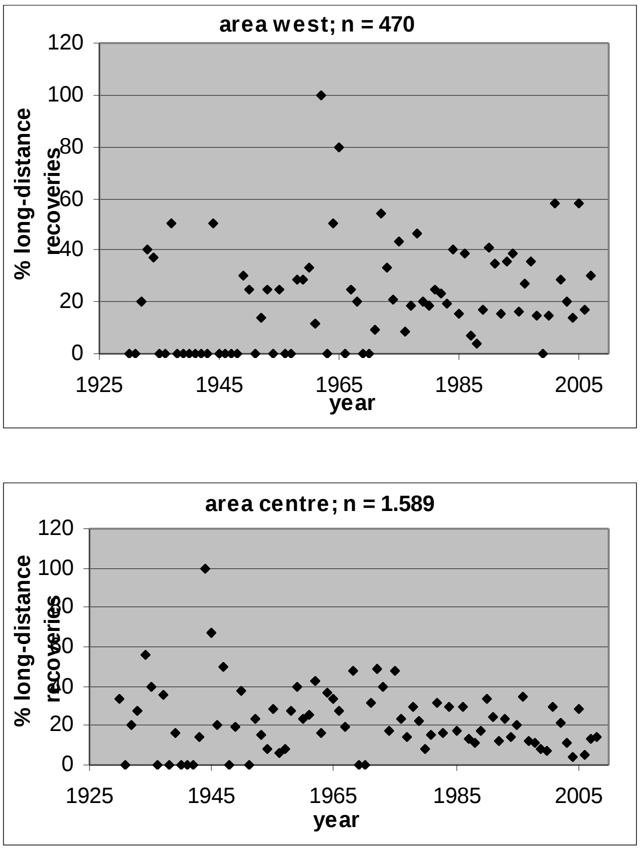


Figure 10: Dispersion distance (>2 km) of Barn Owls ringed as nestlings in relation to the alteration of the ringing number against the preceding year. To get this the recovery number of the resp. year was calculated as % of the maximum. Presented is the alteration (%) of the actual year against the preceding one.

Wanderjahre - Wanderwinter

In the literature we find the statement that there were winters, during which especially many young owls would disperse far (SAUTER 1956: „about 5-6 times as much than usual distances of >100 km") („Wanderwinter" in SAUTER 1955; „Wanderjahre" in SAUTER 1956). KNIPRATH (2010) doubts that those winters do exist. That in the actual study material indeed there are years, in which the young owls dismigrate farther, and others, in which they do that less far, is shown in figure 11. This "farther" nevertheless by no means goes to the extent, postulated by SAUTER for a Wanderjahr. To the years recognizable in the figure with a portion of >60% mostly there do belong only very few values, as is true for the years with 0%.



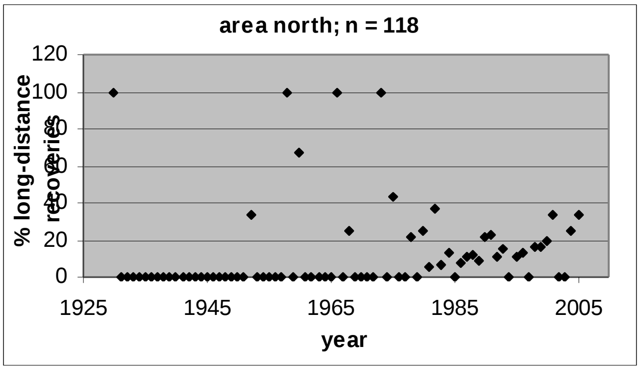


Figure 11: The part of the long-distance recoveries (>100 km)

The mean of the portions of long-distance movers is at 21,2 % (west), 22,3 (centre), and 12,6 (north). The postulated five-fold minimum part at least is reached in the years 1962 and 1965 (west), 1944 (centre), and 1930, 1958, 1960, 1966, and 1973 (north). For the three areas there is no coincidence. In all three the total-n of recoveries in these years are (mostly clearly) beyond 10. These values are not sufficient to postulate Wanderjahre.

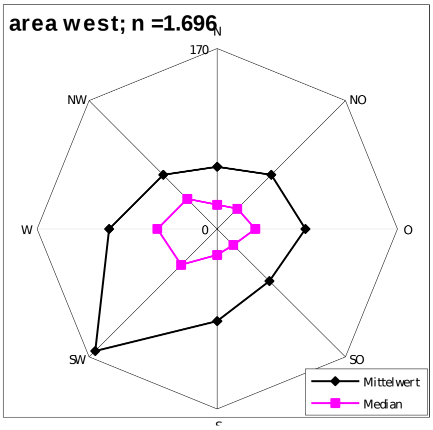
Dismigration direction and distance

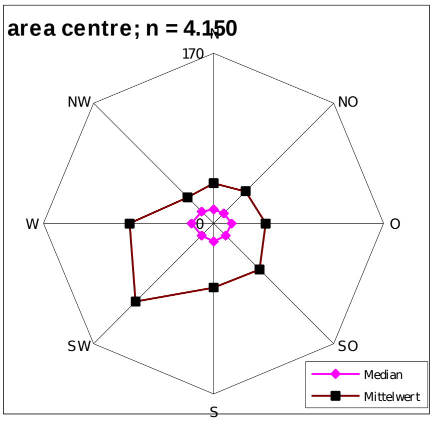
It seemed possible that the distance of the dispersion was depending on its direction. For the means this is very clear (ANOVA: P<0,001 for all three areas), for the medians only in the areas centre and north (fig. 12). The overall much higher means demonstrate that the frequency-distribution in all dispersion directions is asymmetric: At the side of the higher values the curve ends very flat. There always are some high or very high values (the long-distance movers).

Very clearly we see in the curves of the means that the owls in general in the area west dispersed (had to disperse) farer than in the two other ones. The curves indeed do not only show distinct differences in the real values but also in the distribution over the directions. The highest means in all three areas are fond in the direction SW. The curve of the means in the area north easily makes detect that the Jutland Peninsula. on one hand because of the surrounding seas, on the other one of the northern distribution border of the species excludes farer dispersion in all northern directions. Who wants to (or must?) disperse farer, can do that only on the continent direction S.

As to the medians first it is striking that the majority of the owls in the area centre was found very near to the site of birth. The preference of the direction west is negligibly small. Obviously here there are gut possibilities “all around” for the young owls to settle. The owls in the areas west and north had to move a little farther. In the area west the accentuation of the direction west is more distinct and in the area north we clearly see that the minor western- eastern extension of it permits only a minor dispersion in these directions.

The expressive power of the figure 12 is much greater than that of the figure 4, which includes only the number of recoveries without the distances reached.





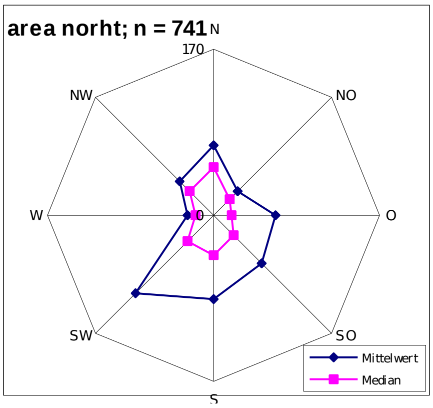


Figure 12: Median and mean of the dispersal distance (only values >2 km) as depending on the recovery direction

The preferred direction southwest already visible here for the means of all owls additionally will be tested for the long-distance movers (fig. 13). First it is evident that the difference between means and medians is less great than in the preceding comparisons. Additionally the far moving owls in the areas west and centre reached about the same distances, those from the area north distinctly minor ones. For all again we see the preference of the direction SW-S, least in the region north.

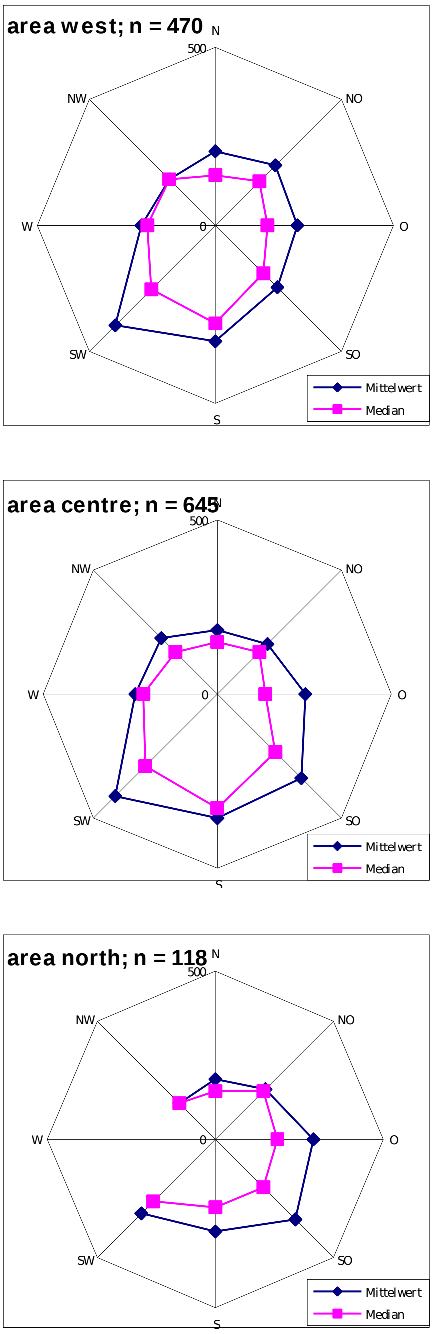
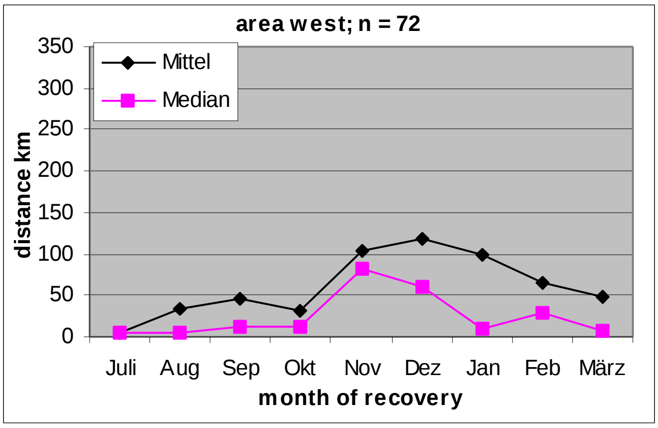
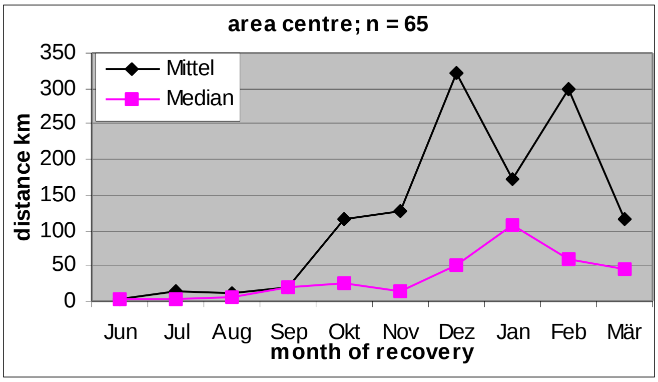


Figure 13: Median and mean of the dispersion distance (only values >2 km) of the long-distance movers (>100 km) as depending on the recovery direction (There was no value for the direction W in the area north.)

3.3 Speed of dispersion

Additionally we shall analyse, whether the speed, with which independent young Barn Owls leave their site of birth, is depending on the time of ringing. Figure 14 shows the medians respective the means of the distances of recoveries of birds ringed in **Mai** for the first ten months after ringing. First it again is recognizable that the means are considerably greater than the medians. (This is true for the further comparisons as well.) Hereby becomes visible, what the original already had shown: Already beginning with August there were single recoveries at distances of >100 km. Nevertheless the medians demonstrate that the majority stayed in nearer surroundings. The next we see is that up to October there was little alteration in the distribution of the young owls around their sites of birth: In contrast, from October to November there was a considerable break. Means as well as medians now are essentially higher. The n of the area north is to small for an interpretation.





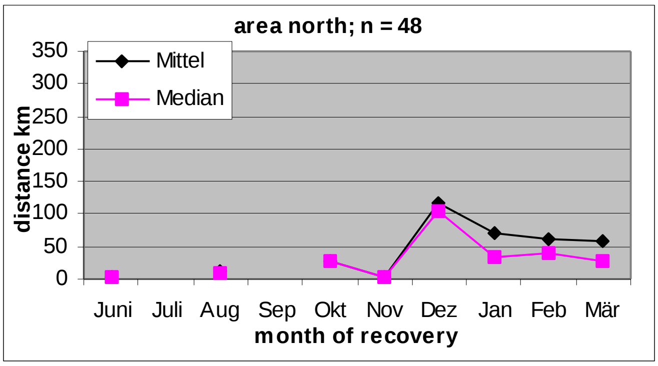


Figure 14: Medians and means of the distances from the ringing site of Barn Owls ringed as nestling during **Mai** for the first ten months after ringing

Owls ringed during **June** (fig. 15) at least in the areas west and centre remarkably begin to move already in September. The median of 20-40 km means that then already > 50% of them stayed outside the area of their parents. In the area north the dispersion movements started considerably later. Then, at least in the areas west and centre, from September to October there was a remarkable increase in the medians as well as in the means to nearly the double value. Here we see that not only the long-distance movers were responsible for the increase of the (mean) values, but also the owls nearer by. All were moving centrifugally. Later than October alterations no more seem of greater importance. During the month of October, that is four months after ringing, the young owls mostly had arrived, where they then stayed (wanted to stay).

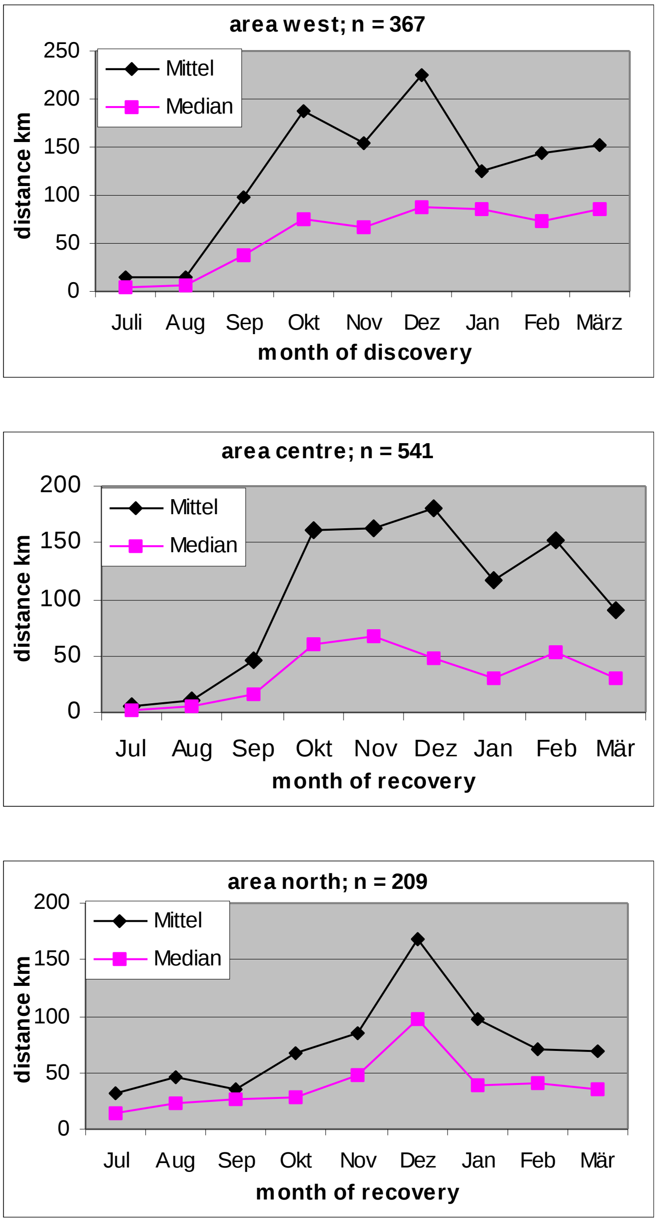


Figure 15: Medians and means of the distances from the ringing site of Barn Owls ringed as nestling during **June** for the first nine months after ringing

Different from the young owls of June those of **July** (fig. 16) began their dispersion immediately after being independent. Means as well as medians at least up to November mounted considerably and constantly. The uniformity of these two values tells that, like at the jump from September to October in the owls ringed in June, not only the long-distance movers were involved but all. Here as well the owls in the area north hesitated. The further month-values oscillate in an extent that at the moment we don’t attribute a greater importance to them. Here perhaps already first influences of winter weather is remarkable. The increase in the values until November on the other hand as well means that also the owls ringed in July finished their dispersion in the course of about four months. They indeed started with it about one month of life earlier than those from June, that means fairly simultaneously with these.

The values from September to October suppose an interpretation for the reasons of the jump in the values from October to November in the birds ringed in Mai: The latest with October the population density of independent young Barn Owls was extraordinary high. Who not yet had settled down, continued dispersion now. Or, who voluntarily wanted to stay, but could not defend his “conquest”, now had to start again.

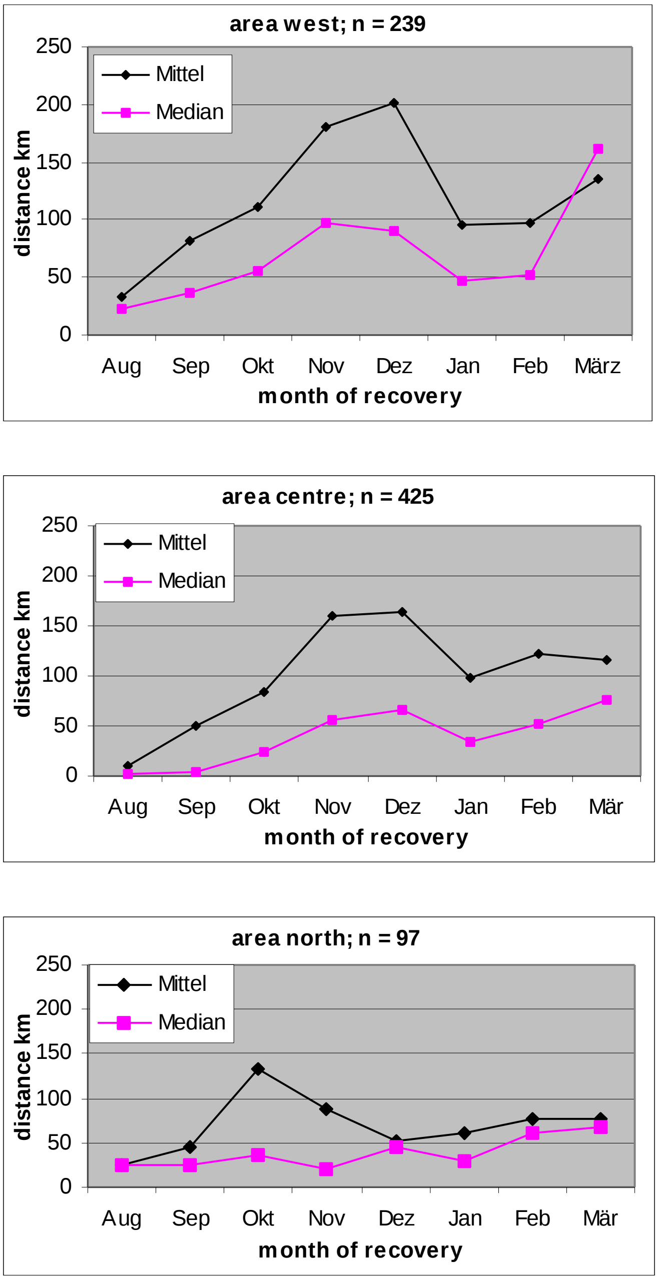


Figure 16: Medians and means of the distances from the ringing site of Barn Owls ringed as nestling during **July** for the first eight months after ringing

Also the data for the birds ringed in **August** (fig. 17), already being sparse, show – again only for west and centre – again a constant dispersion until November. We should mention that the young owls now needed (or had at their disposition) one month less than the other owlets born (ringed) earlier. The data from the area north are not to interpret due to the n to low.

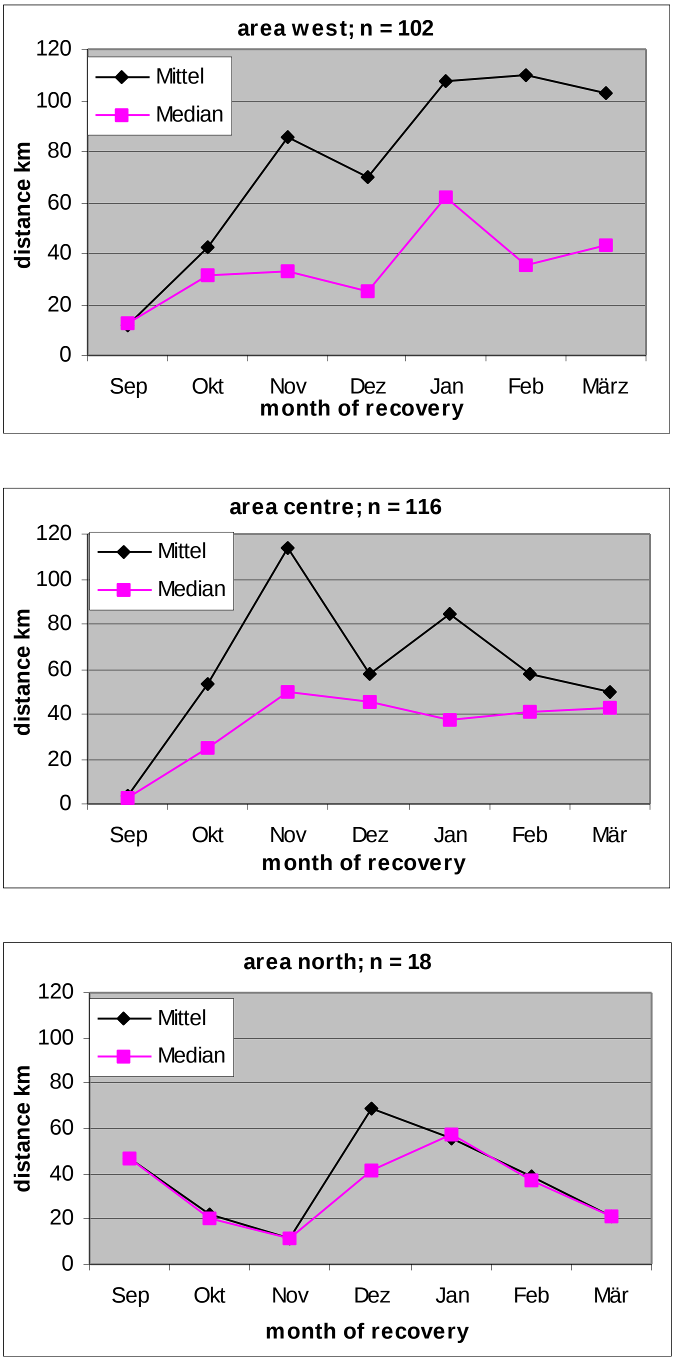


Figure 17: Medians and means of the distances from the ringing site of Barn Owls ringed as nestling during **August** for the first seven months after ringing

The influence of the long-distance movers (>100 km) already above had played a role. Also here they are analysed separately. When we looked at these values separated for the areas, we could detect no tendency. Only when summarizing all data, at least up to the month of October an increase of the means of the distances (fig. 18) as well as of the medians (fig. 19) is visible. Also among the long-distance movers those ringed in Mai spent more time for their dispersion and did not come as far as those ringed in June and July. The values beginning with December and those for birds ringed in August cannot be interpreted.
Just surprising is that the medians do not only show a very similar development, but different from all graphs hitherto, a very similar magnitude as the means. That may

signify that the owls in this magnitude of distances were found dispersed very widely and that there was no accumulation.

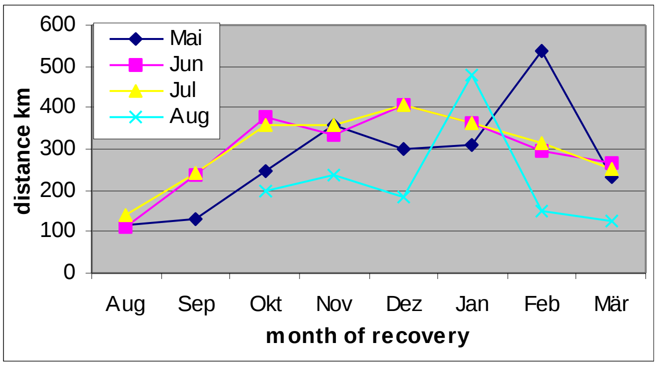


Figure 18: **Mean** values of distance for long-distance movers (>100 km) for ringing and recovery months (n = 610)

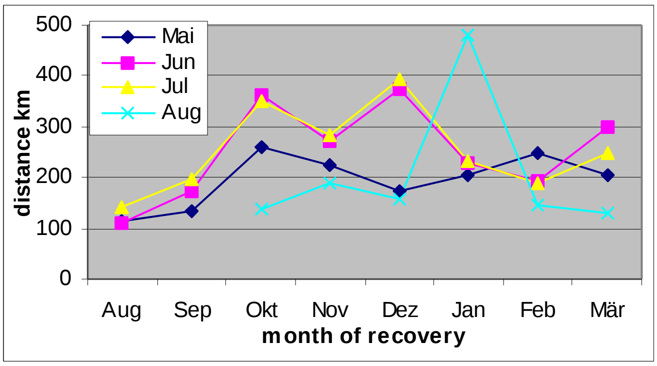


Figure 19: **Median** values of distance for long-distance movers (>100 km) for ringing and recovery months (n = 610)

In addition it seemed possible that the part of long-distance movers would change depending on the ringing month. The graph (fig. 20) shows that it varied considerably between the areas: It was highest in the area west and lowest in the area centre. From Mai to June it increased considerably in west and centre, hardly in north. Then it decreased again, barely in north, more clearly elsewhere.

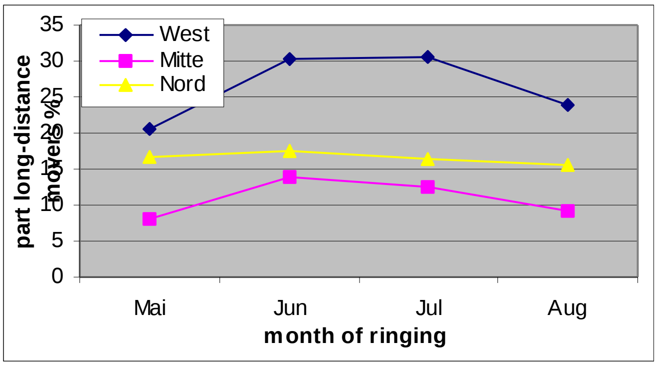
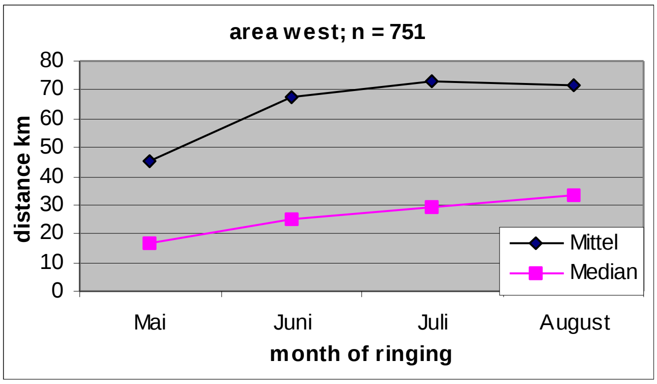
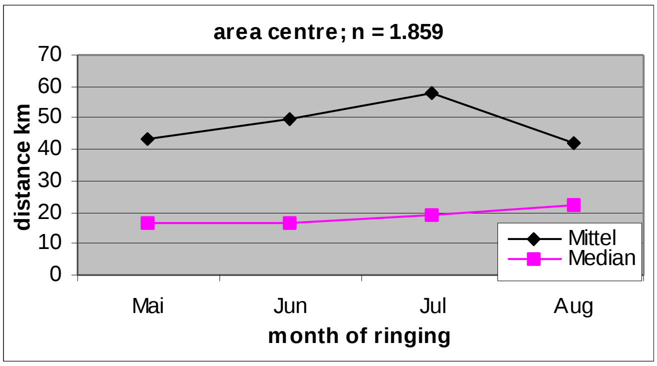


Figure 20: Percentage of long-distance movers (>100 km) in the dispersing Barn Owls ringed as nestlings by ringing month (n = 8.105)

We look now at the owls (ringed as nestlings), which with all probability already had settled, and at their distance from the ringing site (fig. 21). Here again the difference in dimension between median and mean is obvious. We see that with the later ringing month the recovery distance in west and centre increased. (In north there was no such effect.) This too indicates that for the dispersing young owls with a later date of birth in some areas it became more difficult to find a free breeding site or an area with a sufficient amount of accessible prey. That lead to steadily increasing movements. ANOVA did not give significance for the distances between the months of birth (P>0,1).





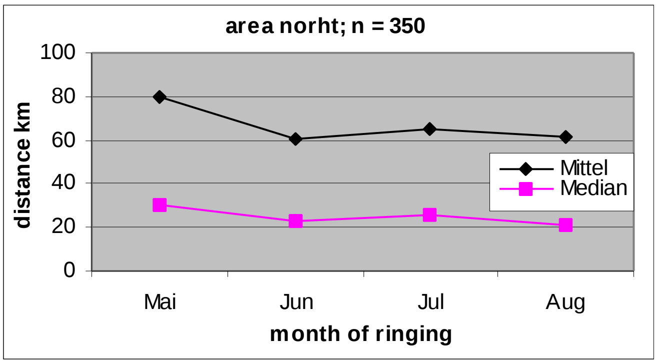


Figure 21: Distance of all settled owls ringed as nestlings by months (only recoveries >2 km and later than February of the year following ringing)

3.4 The partition of settled birds

In addition the part of young owls, which had settled (part of recoveries after the February following the first winter), was established. In the data of the three areas no tendency could be detected. But when the data were subdivided following ringing months (fig. 22), it became visible that the part decreased gradually from Mai to July, very considerably indeed towards August. The later the hatching date, the minor the chance to survive.

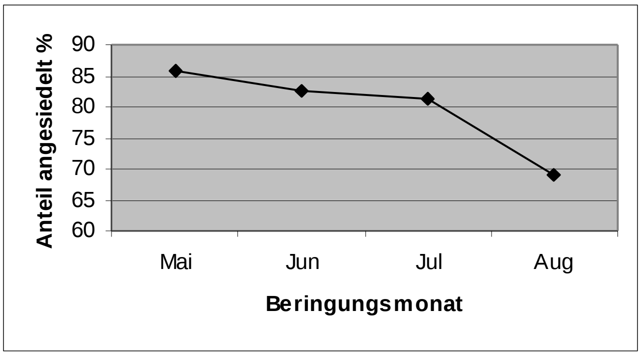


Figure 22: The part of the birds settled (recovery after February of the first winter) of all recoveries (>0 km) (n = 6.024)

3.5 Prolongation of dispersion

The prolongation of the juvenile dispersion as presented by BAIRLEIN (1985) for south German populations here is reinvestigated. To do this for the distance from the ringing site the median (tab. 4) and the mean (tab. 5) of nestlings ringed from Mai to August were calculated for the first to the fourth breeding year. Here we find not the minor tendency for change, neither for the medians, nor the means (ANOVA two-factor.: all P>0,1; ns). The result is unambiguous: Neither the ringing months nor the number of the breeding year had an influence on the distance values. There was no prolongation of the dispersion after the first breeding period in the study areas. MÁTICS & HORVÁTH (2000) came to the same result for Hungarian Barn Owls.

Table 3: **Medians** of the distances between the sites of ringing and of recovery of Barn Owls ringed as nestlings in the North German Lowland (all three areas together) for months of ringing and years of breeding (only recoveries >2 km und later than February of the year following the year of ringing)

	Month of ringing (n)			
	Mai (89)	June (414)	July (203)	August (41)
year 1	13,79	27,68	38,45	40,47
2	26,45	30,61	24,46	34,67
3	30,08	21,09	31,66	20,38
4	40,28	11,17	25,52	34,69

Table 4: **Means** of the distances between the sites of ringing and of recovery of Barn Owls ringed as nestlings in the North German Lowland (all three areas together) for months of ringing and years of breeding (only recoveries >2 km und later than February of the year following the year of ringing)

	Month of ringing (n)			
	Mai (89)	June (414)	July (203)	August (41)
year 1	60,42	47,18	46,48	34,69
2	64,88	56,24	82,66	20,38
3	57,87	64,21	54,03	78,61
4	39,67	75,80	83,94	40,47

Appendix: This analysis will be followed by that of the dispersal of the owls in selected sub-areas with high ringing numbers. Only together with these results a discussion seems to be suggestive. The same is true for a summary. Here indeed will follow a

4 Preliminary summary

For the analysis the 6.558 recoveries ot Barn Owls ringed as nestlings in the North-German Lowland were subdivided into the following three areas: western (n = 1.953), central (n = 3.651), and northern (n = 954) lowland. Concerning the dispersal direction in the areas west and centre there was a preference of W to SW and in the area west additionally NE to E. In the area north on one hand corresponding with the shape of Schleswig-Holstein and on the other hand due to the superiority of ringings in the western part of the area, the directions N, E, and S are pronounced, W visibly is sub-represented. Correspondingly in all three areas the means of the distances are higher in the direction SW, in the area north altogether in all southern directions. The direction SW thus in all areas is preferred and additionally here the distances reached are higher. The "Wanderjahre" postulated by SAUTER (1956) could not be confirmed. The same is true for the prolongation of the dispersal in later years as found by BAIRLEIN (1985) for southern Germany.

The owls found after their first winter, thus having settled, are found nearer to their site of birth than those found during their first autumn and winter. That means, who has found a breeding site, stays (can stay). The other continue dispersing. A difference between the sexes is improbable.

KNEIS (1981) had connected the dispersal distance with the prey density. Perhaps as we here had to use replacement values instead of numbers on prey density and as well of population density (not at disposal), neither these nor other possible influences (measures of the owl population) on the dispersal could be shown.

The time at which and also the velocity with which the young owls disperse from their site of birth obviously are little dependant on the date of birth. Despite that long-distance movers already early move away, the gross of the young owls stays in the vicinity of their place of birth as long as possible. Sometimes already during August, mostly indeed during September growing numbers of them move away. Already from October on, certainly indeed in November this dispersal far going comes to an end. Then the young owls have arrived, where they settle.

At least in the areas west and centre (with the highest recovery numbers) the recovery distances increased with the date of birth. Also that part of ringed owls, which had been recovered after their first winter, that is of those, which had settled, decreased depending on the birth date during the course of the year. The owls hatched early have the better chance for settlement. And that seems to have a positive influence on survival probability.

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