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## Swallow censuses in Northwest Germany (1986, 1991 and 1996)

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Starting in 1961, from 50-100 villages and settlements in the industrial area of Hannover-Braunschweig (centred on Peine) have been checked at 5-year intervals to count the nesting population of House Martin *Delichon urbica* and Barn Swallow *Hirundo rustica*, the method being a direct nest count. The hitherto stable Barn Swallow populations declined in the late 1980s whereas the steady increase of House Martin ceased because of new developments following German reunification in 1989. The numerical results are presented. Decrease and increase are analysed in regard to landscape (hillside - moraine - loess zones), size and economic status of the settlements (between 50-50 000 inhabitants, traditional rural - highly industrialised areas).

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### 1. Introduction

For my thesis (Oelke 1961) on the abundance and ecology of bird populations within the central German Peiner moraine and loess area (Hannover-Brunswick) (Map 1), a stretch between plain and hillside and mountainous sectors, I had to solve the problem of how to describe bird densities for species whose territories could not be mapped and which occupied complex habitats not easily accessible. These circumstances applied particularly for swallows in widespread and complex human settlements (the city of Peine and numerous villages then expanding) whose population sizes ranged from only 10 up to 30 000 people (Figs 2, 3). My job as a teacher of biology and chemistry helped me to persuade students and classes to count occupied swallow nests (Method: total count). The same pro-

cedure was followed by a several amenable and cooperative colleagues from other schools, mostly primary schools (grades 3-4), some secondary schools (grades 5-10) and a few high schools (German 'gymnasia') (grades 11-13) in the approximate 800 km<sup>2</sup> of the study area. In the early years of the project, elderly and retired teachers (known as Dorfschullehrer) who were still active (born around 1880-1920) assisted, using their organizing and instructing experience, and their devotion to helping out in their home village. Even at the beginning of the swallow counts, members of the Peine Nature club (Peiner Biologische Arbeitsgemeinschaft of 1953) were cooperating and supporting the project eagerly.

The success of the first count in 1961 (Oelke 1962, 1963) brought about the decision to repeat the counts at 5-year intervals. These later counts were documented as follows: 1966 (2<sup>nd</sup> count), (Schierer 1968),



Map 1. The study area 'Peiner Moränen- und Lößgebiet' (dashed line) and its location in Germany. From Oelke & Heuer (1993).

1971 (3<sup>rd</sup> count), (Oelke & Tinus 1973), 1976 (4<sup>th</sup> count), (Oelke 1981) and 1981 (5<sup>th</sup> count), (Oelke & Schütze 1985). For rea-

sons of stress, political involvement and health, the counts for 1986 (6<sup>th</sup> count), 1991 (7<sup>th</sup> count) and 1996 (8<sup>th</sup> count) have not yet been summarized and published, but are presented here. The preparations for the 9<sup>th</sup> count (2001) have already started.

The main conclusions of the 1961-1981 counts may be presented thus: Barn Swallows (*Hirundo rustica*) are concentrated in rural places with good cattle stock, where the sheds and storehouses are larger, and where there are traditional, conventional farms and farm buildings. House Martins (*Delichon urbica*) are concentrated in buildings of the post-war construction period built towards the open edge of the urban periphery where there is first reduced, and then younger tree and shrub cover. Common to both swallow species is that their breeding concentrations are fairly adjacent to wetlands, river marshes,

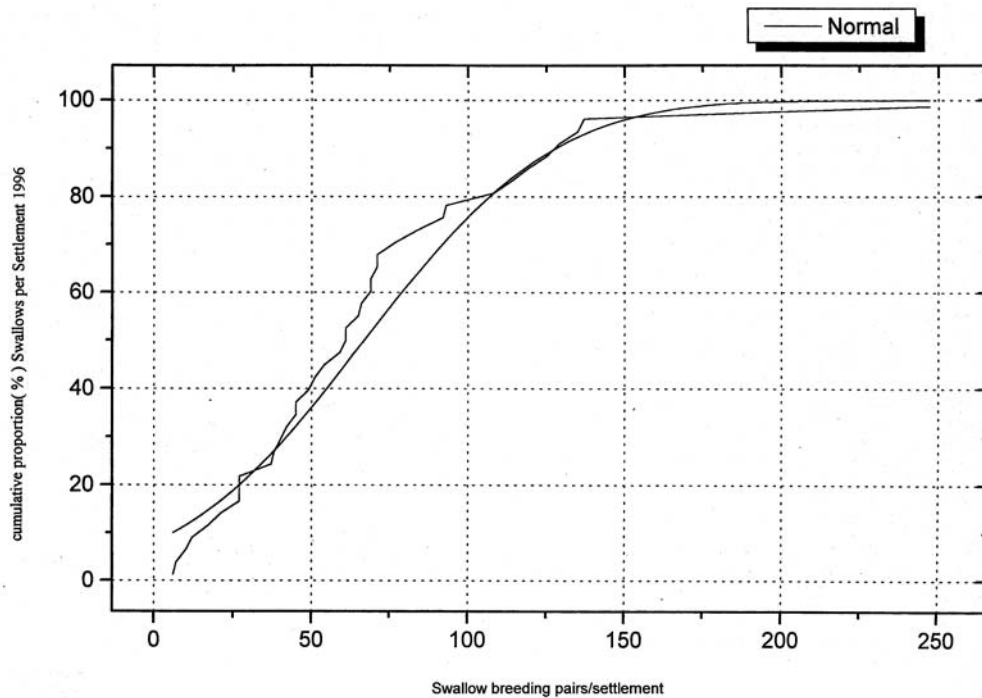


Fig. 2. Cumulative proportion (%) breeding swallows per human settlement to total breeding pairs per human settlement 1996.

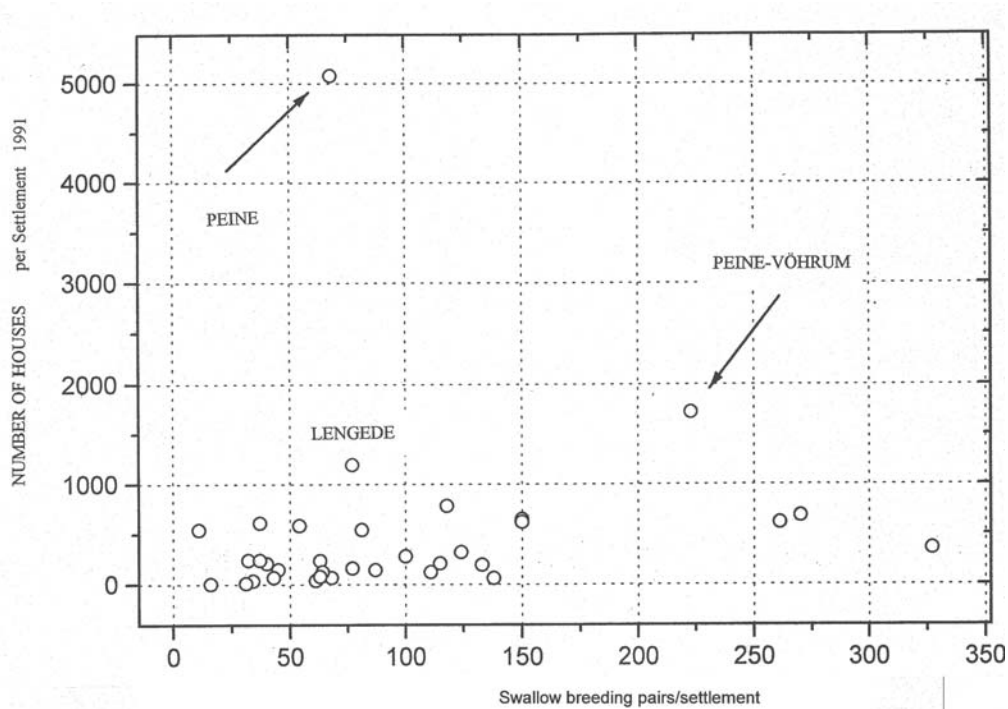


Fig. 3. Correlation between breeding pairs swallows (total) to number of houses per settlement 1991.

large open areas and stretches of pasture and sizeable extended woodlands, especially at where the typical hilly country of the Central German mountains begins. The wide varieties of buildings and of settlements produce very individual landscapes. Any form of industrialisation, such as the iron melting plants and steel factories of the Peine-Salzgitter industrial area, their conglomerates of satellite industries, the web of transportation systems, the zones of oil refineries and chemical plants (Dollbergen, Peine, Lehrte), and the wide agricultural plains (characterised by modern spray and fertilizer agriculture as in the loess zone within the Hildesheim-Peine-Salzgitter-Wolfenbüttel, or 'Börde', area), has depressed and nearly swept away swallow populations for much of the period before 1986. The cost of the agricultural revolution took the form of loss of nesting

and feeding habitats, especially for *Hirundo rustica*.

The Barn Swallow decline became clear in 1981. House Martins had been increasing up to that time mainly because of the private house building boom of the 1970s and 1980s. However, up to 1961 no settlement had been completely deserted by the two swallow species.

The Peine swallow counts (to describe them simply) have been adopted in some places elsewhere in Germany and even in France, but as far as I know they have not been reproduced over such a timescale nor in such a large area.

## 2. Methods and material

All censuses have used the 1961 methods without deviation. The central school

administration distributed a special instruction form early in the year to all school headmasters and to the membership of the Peine Nature Club and neighbourhood nature clubs (NABU, BUND). The project was publicly announced in local and regional newspapers. Participants in former counts were asked to continue. The information was distributed as early as possible in the census year to arrive before the summer vacation. Any interested person encountered by the organizers was asked directly to participate.

The number of participating counters varied from >151 (1986) to >182 (1981) and >73 (1991), a total of at least 400. The reduction in 1991 arose through many schools withdrawing: the teachers found themselves unable to cope with the increased workload that accompanied widespread school reform, and so many were unable to continue organizing their part in the swallow project. Furthermore, there was an amazing change in student behaviour, where peer pressure made them react to systematic and cooperative fieldwork with fear of ridicule. A considerable hiatus, not fully overcome, was caused by the death of 8 elderly and long-serving counters (see Acknowledgements). In many cases I tried to fill the gap myself and visited the more distant villages by car, thereon using a bicycle or walking from street to street and from house to house, wary of the dangers of aggressive dogs. Through experience, nest sites and colonies in older structures were sought out. In the more spread out streets and blocks, the bicycle came into its own. For the welfare of the birds and to leave the nests undisturbed, there was no direct analysis of nests, ie there were no counts of eggs and clutches, nor was any ringing attempted.

Data from nest analyses from previous studies are as yet unpublished. It became apparent that a complete census account was not possible, nor were absolute counts achievable from census to census. Testing my students (aged 18-22) in the village of Oberg, (popn. 2200 in 1996) revealed that the hidden error rate was 20%. (For phenology, see Fig. 7, (the arrival of barn swallows in the tiny village of Warmse on the alluvial river Aller plain).

Statistical data and weather characteristics were contributed by the communities and by the office of statistics in Hannover, the capital of the federal state of Lower Saxony or otherwise were obtained from the literature. There was no extreme weather to disturb the 3 breeding seasons of 1986, 1991 and 1996. No public financial support was ever granted for this project. All expenses of the initiative were covered solely by private expenditure.

### 3. Results

#### 1. All samples (settlements)

The main results are summarized using the following parameters:

Surveyed settlements	<u>1986</u>	<u>1991</u>	<u>1996</u>
	108	93	51
Breeding pairs of <i>Hirundo rustica</i>	<u>3598</u>	<u>2985</u>	<u>1473</u>
1986 = 100	100	83	41
Breeding pairs of <i>Delichon urbica</i>	<u>4971</u>	<u>3666</u>	<u>1731</u>
1986 = 100	100	74	35
Total number of breeding swallows	<u>8569</u>	<u>6651</u>	<u>3204</u>
1986 = 100	100	78	37

These figures suggest an alarming decrease of swallows in the study area. However, they have to be corrected to incorporate all settlements surveyed in the 3 study years. The number of counters reduced continuously from 1986 onwards making it impossible to survey simultane-

ously all the studied locations (ie over 123 since the beginning of the project).

2. Samples common to all 3 study years

Breeding areas surveyed in an identical manner in the years 1986-1996 (n = 44)

Breeding pairs of <i>Hirundo rustica</i>	1986	1991	1996
1986 = 100	1346	1403	1279
	100	104	95
Breeding pairs of <i>Delichon urbica</i>	1986	1991	1996
1986 = 100	2254	1996	1683
	100	88	75

These results indicate that the regional swallow populations are stable (with no significant decrease or increase in Barn Swallow numbers). However, they point to a slight decrease in House Martins between 1986 and 1996 ( $P < 0.05$ ).

There are remarkable differences in the nest counts of different breeding areas and counting periods:

Changes <sup>2</sup>	1986-1991	1991-1996	1986-1996
<i>Hirundo rustica</i>			
Decrease (>20 %)	28	11	25
Increase (>20 %)	15	1	11
Stability ( $\pm 20$ %)	6	1	7
<i>Delichon urbica</i>			
Decrease (>20 %)	22	10	12
Increase (>20 %)	20	2	3
Stability ( $\pm 20$ %)	6	1	1

<sup>2</sup> Number of settlements with different forms of variations

Characteristics of the 44 comparable breeding areas

	1986	1991	1996
Maximum number of breeding pairs (bp)/settlement	250	270	247
Minimum bp/study area (village)	6	9	6
Mean	83.93	79.07	65.7
Median	72.0	63.5	58.0
Variance	3214.25	3700.20	2381.74
Standard deviation	56.694365	60.829307	48.803154
Human population		>80 000	
Number of houses		>17 000	

The changes seem to be balanced. Highly significant statistical differences ( $P < 0.001$ ) could be proved (WINSTAT statistical program for Windows, Springer 1998) for the Barn Swallow (for 1991/1996) and for the House Martin (for 1986/1996 and 1991/1996). The House Martin has suffered most in recent years, possibly because of the slow-down and



Fig. 7. Spring arrival (first observation) of Barn Swallows in the farm complex of Warmse, Samtgemeinde Meinersen, county of Gifhorn 1969-2000. Copyright Hans Oelke, March 15, 2001.

even cessation of the building boom and the change from multi-storey blocks containing rented flats to smaller villa-like privately owned houses. There have been many cases of house owners and residents removing House Martin nests or discouraging nesting in all sorts of ways, such as by putting up in front of suitable nesting sites strings, narrow boards, nets, toys and plastic shields, or by installing dark-coloured coving and sealing off overhanging roofs. This way, they hope to avoid any staining and soiling on their windows, house walls and balconies. Barn Swallow nest sites were affected mostly by repair, painting, spraying and cleaning sheds in spring, thus removing or sealing off old nest sites. Open and freely accessible sheds are becoming rarer and rarer. The swallows' former habit of breeding in isolated cattle sheds in pastures or under small, wooden river bridges (as on the rivers Fuhse and Erse) has completely ceased. In the future, concern about the possible transmission of highly infectious livestock diseases such as BSE and foot and mouth disease might require stables and barns to be sealed off from entry by swallows.

3. Correlation: size of human settlements

(population size) and swallow populations (total bp of *Hirundo rustica* and *Delichon urbica*)

The majority of local swallow populations occur in human settlements with 10-5000 inhabitants (Map 1). Larger villages and the provincial town of Peine have disproportionately low swallow occupation (Figs 2, 3). The same holds true when considering the whole range of swallow population sizes (Fig. 2). 250 House Martin and Barn Swallow bp are the maximum for these villages and for urban settlements. There is an inverse relationship between the number of houses per human settlement and the number of breeding swallows (Fig. 3).

Both parameters (houses and swallows) correspond in a straight and algebraic regression ( $r=0.4154$ ,  $P<0.001$ ) when urban

areas are omitted (calculated for 1991).

4. Special census examples from nearly complete census series (1961-1996)

Fig. 6 illustrates different forms of Barn Swallow and House Martin long-term population changes. In my home town of Peine, (population size:  $c26\ 000$  and in Salzgitter-Lichtenberg (Fig. 5) (a satellite suburb (population size: 3000) of Salzgitter city), both the dominant House Martins and the subdominant Barn Swallows are decreasing significantly. Two neighbouring villages Gross Ilsede (population size: 2600) and Oberg (population size: 2200) differ markedly in the density and development of the two swallow species. House Martins have increased in Oberg and decreased in Gross Ilsede. Ohlum (population size: 235 pairs) (Fig. 5)

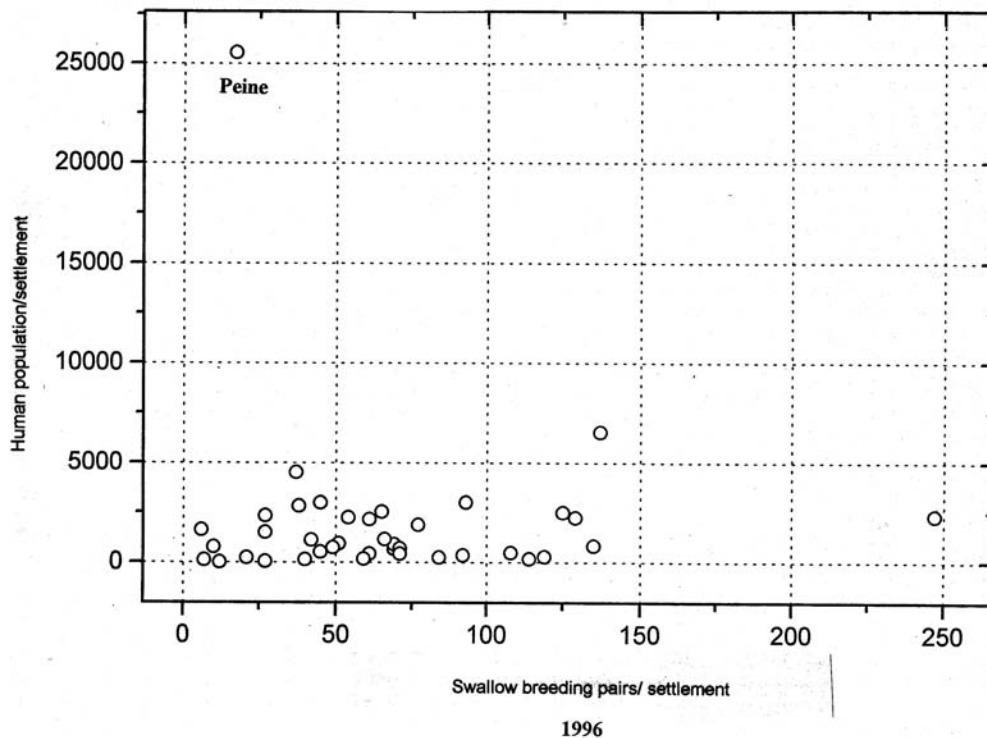


Fig. 1. Correlation between human population size and swallow breeding populations (total swallow breeding pairs per human settlement).

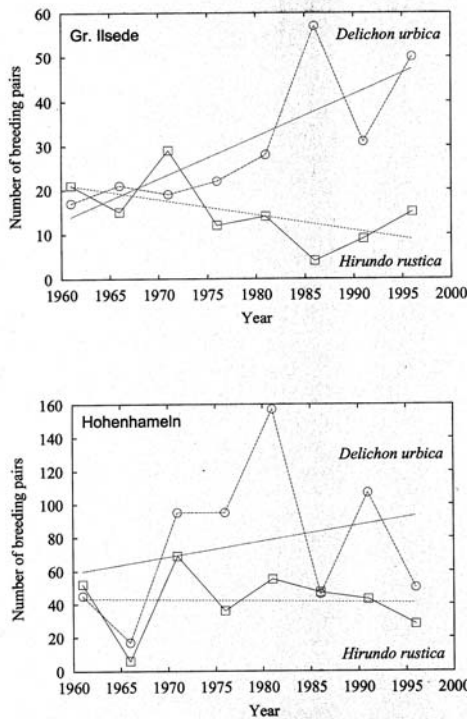


Fig. 4. Development of Barn Swallows and House Martins in Gross Ilsede and Hohenhameln 1961-1996.

in the loess zone has lost its Barn Swallows while Wiedenrode (population size: 176) in the glacial river plain of the river Aller and once the village that had the proportionately highest count of House Martins, has witnessed their decline. The villages of Hohenhameln (population size: 2900) (Fig. 4) in the loess zone, and Edemissen (population size: 2550) in the moraine zone might have been the first to note the swallows' decline, although both swallow species withstood extinction for a long period. A balanced swallow population characterizes the village of Abbensen (population size: 1740). The fluctuations that occurred at the tiny farm complex of Warmse (population size <60) (Fig. 6) in the glacial Aller plain are remarkable, for although this hamlet has now lost nearly

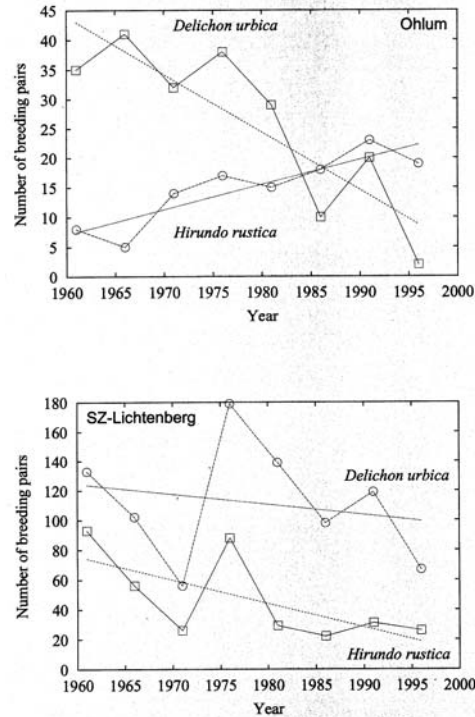


Fig. 5. Development of Barn Swallows and House Martins in Ohlum and Salzgitter-Lichtenberg 1961-1996.

all its swallows, one family (Mr. Gottschalk, Mrs. Halberstadt) still keep a record of the arrival of Barn Swallows. Their recording began in 1969 and has continued up to 2000. (Figs 1, 2), revealing the mean arrival to be April 18±2 days. 95 % of all swallows return between April 14 and April 22.

#### 4. Conclusions

1. The long-term nest counts of swallows in northwest Germany should be interpreted - as models of the situation and the trends over the larger regional bird populations treated as a meta-population.
2. Surveys of smaller fractions of this population are not representative of the

- situation of swallow species in larger geographical areas.
3. Despite all the decreases, Barn Swallows and House Martins heading for extinction even in such a highly industrialised area as Lower Saxony in Germany.
  4. The methodological problems of covering and analysing a large proportion of a widely distributed bird species are immense and are costly in time, labour input and expenditure. The Peine swallow project might be able to continue using but a few suitably selected locations from all the human settlements, studied over the last 40 years.
  5. Schoolchildren and younger students must be superseded by adults with more application and who enjoy sys-

tematic studies.

6. In future, public support will be more difficult to achieve, as will active assistance from farmers.
7. Only a fraction of the available registrations have been returned, leaving many evaluations to be undertaken.

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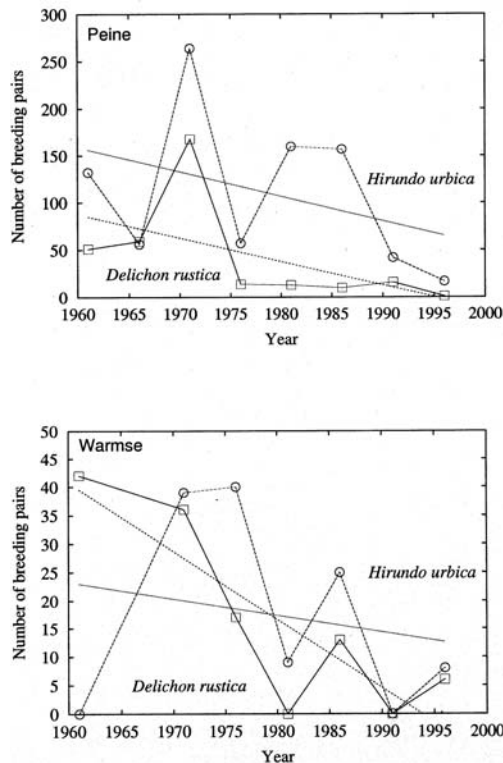


Fig. 6. Development of Barn Swallows and House Martins in Peine and Warmse 1961-1996.

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