# Long-term changes in population and habitat selection of Red Kite *Milvus milvus* in the region with the highest population density

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**Nicolai, B., U. Mammen & M. Kolbe 2017: Long-term changes in population and habitat selection of Red Kite *Milvus milvus* in the region with the highest population density. Vogelwelt 137: 194–197.**

The Red Kite is unique among the about 260 native German breeding bird species, in that half of its worldwide population occurs in Germany. Saxony-Anhalt is the federal state with the highest population density. About 2,000 pairs (8 % of the global population) currently nest across its territory. The highest Red Kite population density is found within the region north of the Harz Mountains where data have been recorded every five years since 1986. During the investigation changes in abundance and habitat selection were observed. The number of breeding pairs decreased in forests and seems to be stable in the open countryside. Additionally, the number of Red Kites nesting near urban areas is increasing. The detected development indicates that the food availability may be better in built-up areas than in agricultural areas. This development is alarming as the Red Kite, a typical species of the agricultural countryside, seems to experience poor feeding conditions in its natural habitat. If food availability for Red Kite does not increase in the near future, a further decline of the Red Kite population is likely. Improvements of natural Red Kite habitats are needed and would also benefit many other threatened farmland bird species.

**Keywords:** Red Kite *Milvus milvus*, population dynamics, habitat selection, Saxony-Anhalt

## 1. Introduction

The Red Kite is the most remarkable of all breeding birds in the Federal Republic of Germany. It is unique among the about 260 native species of breeding birds as about half of the global population occurs in Germany. The area supporting the highest population density is located in the federal state of Saxony-Anhalt. About 2,000 pairs (8 % of the global population) currently nest in Saxony-Anhalt (Mammen *et al.* 2014). Particularly high Red Kite densities are found in the region north of the Harz Mountains.

Number and distribution of Red Kites in this region are well known for more than 50 years. In the past, almost all breeding pairs nested in isolated forests (Hakel, Huy, Hohes Holz) and nearly none in the open countryside. Formerly the farming of highly productive soils provided good food supply for Red Kite and its population increased for several decades (Stubbe & Zörner 1993). The highest population density of more than 40 BP/100 km² was recorded in 1990/91. Thereafter, in the course of only five years and as a result of extreme changes in agricultural practices, the population declined by nearly 50 % between 1991 and 1996 (Nicolai 2006, Nicolai 2011, Nicolai *et al.* 2009). Focusing on this region supporting the highest Red Kite population density across its distributional range, this paper presents the population development and observed changes in habitat selection of Red Kites between 1986 and 2016.

## 2. Study area and methods

The study area is located in the north of the Harz Mountains, the region with the highest density of breeding Red Kites (Fig. 1). The surveyed area covers 445 km² and consists primarily of open countryside without forests. The landscape is dominated by arable land with field sizes up to 90 hectares and is crossed by small riverine meadows. Large pastures are found only in the north of the study area.

Across the study area the populations of all raptor species have been documented every five years since 1986. Population estimates are based on nest searches. Additionally, precise location, nest site, nest height and nesting tree species were recorded. QGIS (Version 2.14.1) was used for data digitization. Supplementary data on the Red Kite population in the surrounding forests were obtained from the 'Monitoring of European Raptors and Owls' (MEROS). To estimate the influence of land use on the Red Kite population, official land use data for Saxony-Anhalt were used and categorised into seven main types. The nest environment was defined as a radius of 500 m around the nesting site. Statistics were evaluated using R (Version 3.0.1).

## 3. Results

Within the study area Red Kites started to populate the open countryside in the early 1970s (see Fig. in Nicolai 1997). The proportion of breeding pairs nesting in the forests surrounding the study area decreased while numbers in the open countryside increased (Fig. 3). The Red Kite population in the study area increased strongly until 1991 and subsequently suffered a dra-
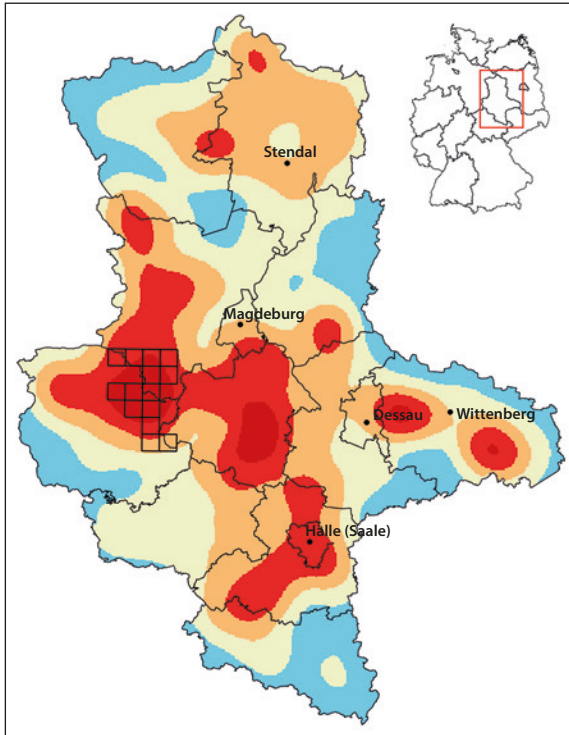
**Fig. 1:** Location of the study area (grids) and main Red Kite concentration areas (areas marked red support high, blue comparatively low numbers) in Saxony-Anhalt based on MAMMEN *et al.* (2014). – *Die Lage des Untersuchungsgebiets (Gitterfelder) und die Schwerpunktvorkommen des Rotmilans (rot markierte Bereiche weisen viele, blau markierte vergleichsweise wenige Vorkommen auf) in Sachsen-Anhalt nach MAMMEN* et al. *(2014).*

matic decrease. Since 2001 the population comprising about 100 breeding pairs remained stable (Fig. 2). During the same period changes in habitat selection were observed. The proportion of built-up areas within the nest environment considerably increased (p < 0.005) (Fig. 5). The number of breeding pairs nesting within towns and villages (p < 0.01) and a 500 m periphery (p < 0,005) increased, while the number of breeding pairs
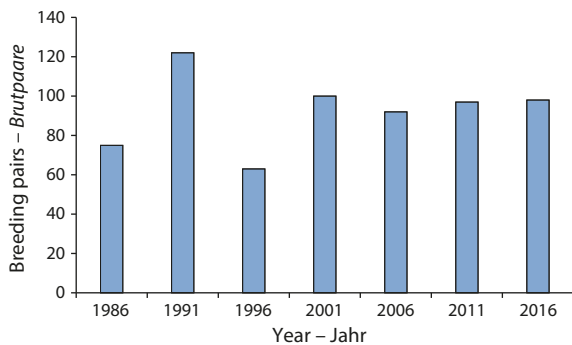


**Fig. 2:** Number of Red Kite breeding pairs in a 445 km² study area in the north of the Harz Mountains. – *Anzahl der Rotmilanbrutpaare im 445 km² großen Untersuchungsgebiet im nördlichen Harz.*
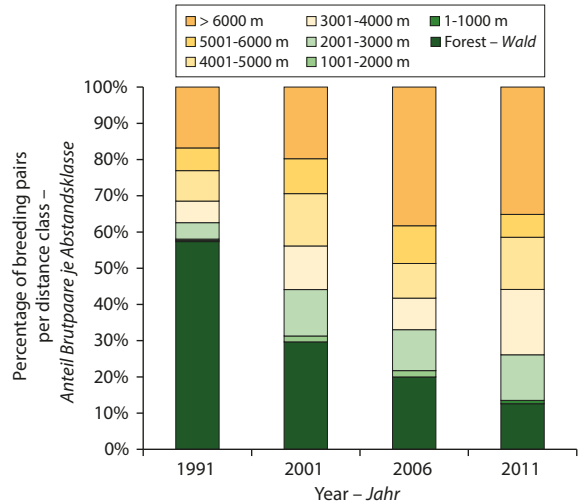


**Fig. 3:** Percentage of Red Kite breeding pairs nesting in forests and in different distance classes with relation to the nearest forest. – *Prozentuale Anteile der in Wäldern nistenden Rotmilane sowie die Anteile innerhalb mehrerer Abstandsklassen zum nächstgelegenen Wald.*

within a distance between 500 and 1,000 m to towns and villages decreased (p < 0.01) (Fig. 5). Today, about two thirds of the Red Kite population nest in or near settlements; at the start of the study period it was only slightly more than one third of the breeding pairs. Moreover, it was noticed that the height at which Red Kites built their nest in trees increased during the study period (Fig. 6).

## 4. Discussion

The study area consists predominantly of intensively used arable land. The farmland is regularly crossed by rows of Poplar trees *Populus* spec. These trees were planted in the 1950s and 1960s for wood production and to protect the fields from wind erosion. By the mid-1970s these trees had grown sufficiently in height
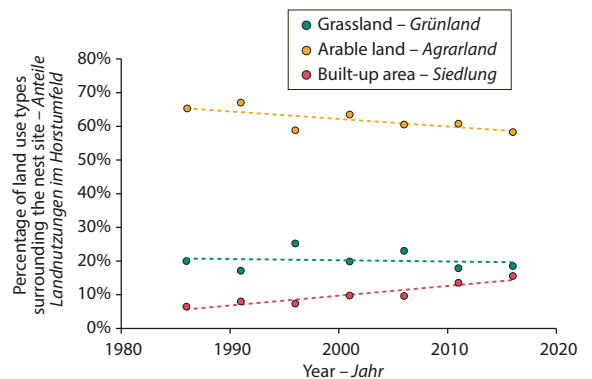


**Fig. 4:** Changes in percentages of grassland (n. s.), arable land (n. s.) and built-up areas (p < 0.005) within the nest surroundings. – *Änderungen der prozentualen Anteile von Grünland (nicht signifikant), Agrarland (nicht signifikant) und Siedlungen (p < 0,005) im Umfeld von Rotmilanhorsten.*
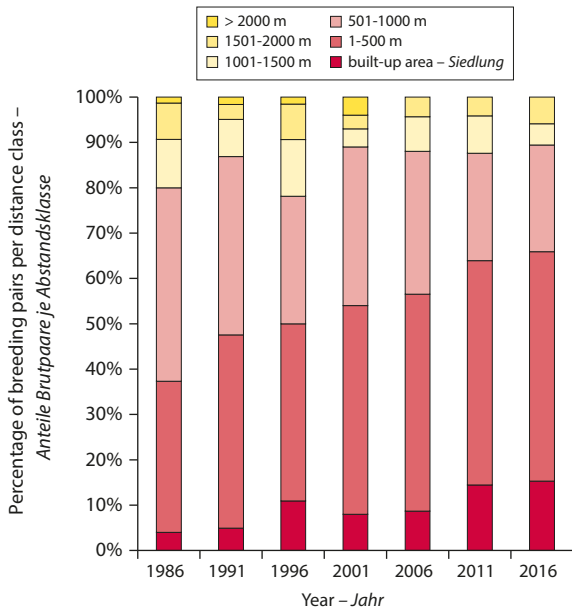
**Fig. 5:** Percentage of Red Kite breeding pairs in distance classes to built-up areas during the study period (in built-up areas p < 0.01; 1-500 m p < 0.005; 501-1000 m p < 0.0005; other n. s.). – *Prozentualer Anteil von Rotmilanbrutpaaren innerhalb mehreren Abstandsklassen zu Siedlungen im Untersuchungszeitraum (innerhalb von Siedlungen p < 0,01; 1-500 m p < 0,005); 501-1000 m p < 0,0005; weitere nicht signifikant).*



**Fig. 6:** Changes in Red Kite nesting height in the study area during the study period. The upper and lower quantiles are shown as lines. The mean value is represented as a line within the boxes, while the median is shown as a point. – *Änderungen der Nesthöhe des Rotmilane im Untersuchungsgebiet im Untersuchungszeitraum. Die oberen und unteren Quantile sind als Linien dargestellt. Der Mittelwert ist als Linie innerhalb der Boxen dargestellt, der Median als Punkt.*

to represent suitable nesting sites for raptors (BLEY *et al.* 2015). At that time the greater part of the Red Kite population bred in the forests surrounding the survey area (STUBBE 1982, STUBBE & ZÖRNER 1993). With increasing availability of nesting sites outside the forests a relocation of the Red Kite population took place.

After 1991 changes in agricultural practices reduced the food availability for Red Kites. As a consequence, reproduction dropped rapidly, causing a regional population decrease (NICOLAI & BÖHM 1999). While the population breeding in the open countryside remained more or less stable, the Red Kites breeding in forests further declined (WEBER *et al.* 2009). Today nearly 90 % of the regional Red Kite population nests in the open countryside.

Additionally, nesting height increased until 2006 and since then remains almost stable. This development can be explained by the growth of the Poplar trees mainly used as nesting sites. At the beginning of the study period, the majority of Poplar trees had just reached an age suitable to provide nesting habitat for Red Kite. In the following years, they grew to their maximum height. The mean age and mean height of these trees increased during the study period, as only few new trees were planted (BLEY *et al.* 2015). The limited lifespan of Poplar trees (max. 100 years) currently becomes a serious problem. Within the study area most Poplar trees will disappear within the next 20 years. New nesting sites in younger trees are rare and consequences for the Red Kite population remain unclear. It appears possible that the local
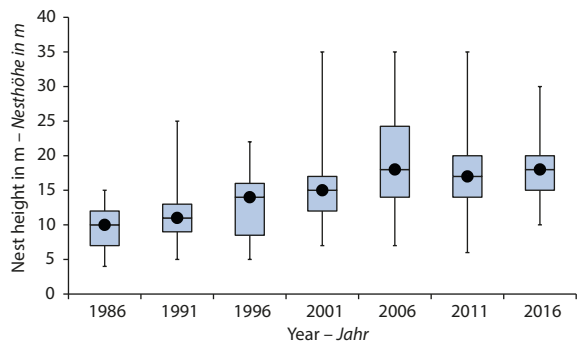
Red Kites may re-colonise their historic nesting sites in the surrounding forested areas. In the worst case the population of this threatened species will further decline.

Furthermore, a change in habitat selection was observed for Red Kites. Fig. 4 and 5 illustrate an increasing amount of Red Kites breeding in or near towns and villages. Although Red Kites breeding in built-up areas were already observed during the 1990s (HELLMANN 1999), a markedly increasing trend has been detected in recent years. The reasons for this are unknown, but it can be assumed that food availability within settlements may be better than in the open agricultural countryside where areas available as feeding grounds during the breeding season are becoming increasingly rare. Direct observations and anecdotes from local people suggest that Red Kites are fed selectively at various places. Similar cases are known from the UK, where Red Kites receive supplementary feeding in domestic gardens, thus explaining the presence of birds in towns (ORROS & FELLOWES 2015). A similar situation can be assumed for our study region. This development is alarming as the Red Kite, a typical species of agricultural landscapes, experiences poor feeding conditions in its natural habitat and becomes a synanthrope. Today, almost two thirds of the recorded breeding pairs breed in settlements or in their immediate vicinity. It must therefore be assumed that these birds, at least partly, profit from domestic food sources. If food availability for the species remains at a low level, a further decline of the Red Kite population appears likely.

## 5. Zusammenfassung

**Nicolai, B., U. Mammen & M. Kolbe 2017: Langfristige Veränderungen der Population und Habitatwahl beim Rotmilan *Milvus milvus* in der Region mit der höchsten Populationsdichte. Vogelwelt 137: 194–197.**

Der Rotmilan *Milvus milvus* ist die einzige der 260 deutschen Brutvogelarten, von der über die Hälfte der Weltpopulation in Deutschland vorkommt. Das Bundesland mit der höchsten Siedlungsdichte ist Sachsen-Anhalt. Derzeit brüten dort etwa 2.000 Paare, was ca. 8 % der Weltpopulation entspricht. Im nördlichen Harzvorland, dem Gebiet mit der weltweit höchsten Siedlungsdichte, wurde seit 1986 alle fünf Jahre der Bestand des Rotmilans erfasst. Neben Veränderungen im Bestand konnten im Laufe der Untersuchung auch ein Wandel der Siedlungsstruktur beobachtet werden. Im Zeitraum der Untersuchung ging der Brutbestand in den Wäldern stark zurück, während der Bestand im Offenland langfristig stabil zu sein scheint. Wie aus den Ergebnissen hervorgeht brüten Rotmilane zunehmend in der Nähe von Siedlungen. Das deutet darauf hin, dass die Nahrungsversorgung in der Agrarlandschaft schlechter ist als in Siedlungen. Wenn sich die Nahrungsverfügbarkeit in der Agrarlandschaft nicht bald verbessert, wird dies in Zukunft zu einem weiteren Rückgang der Rotmilanpopulation führen. Die Verbesserung des natürlichen Habitats des Rotmilans würde auch den Bestandsrückgang vieler weiterer bedrohter Feldvogelarten aufhalten.

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