Long-Term Trends in Population Density and Reproductive Success of Long-Eared Owl Asio otus in Brandenburg, Germany

Author: Block, Birgit

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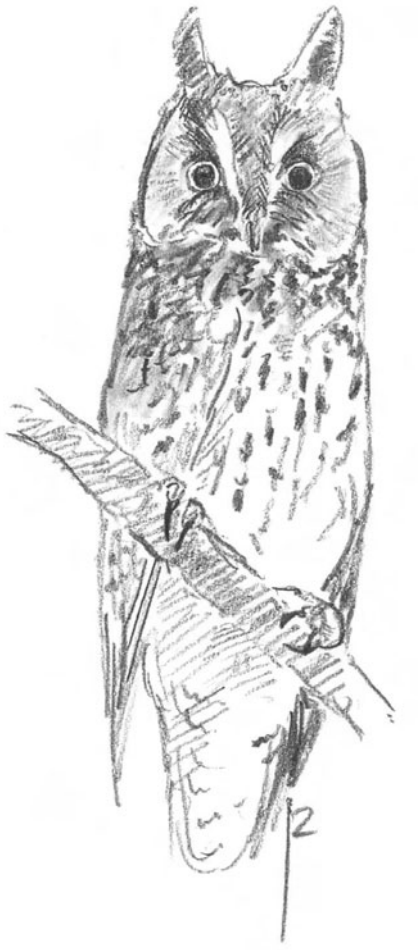

Birgit Block[1]

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The density and reproduction of Long-eared Owls *Asio otus* were studied in a 5000 ha study area of Havelland, Brandenburg, Germany from 1984 through 2007. Locations of territorial Long-eared Owls were mapped from the end of January until the end of April, counts of fledged young were made from mid-May until August. Long-eared Owls nested in conifer groupings or isolated woods in the agricultural landscape. Nearly all nesting took place in nests of crows Corvidae, mainly in Scots Pine *Pinus sylvestris* trees. A total of 867 breeding attempts were recorded; 335 (36.6%) pairs were successful in fledging 1468 young. The reproductive output was 1.57 fledglings for all pairs that attempted to nest, and 4.31 fledglings per successful pair. Average population density for the 24 years was 72.7 breeding pair/100 km^2 (range 40–118 breeding pair/100 km^2). For the time frame of 1984–2007 there was no trend in the number of breeding pairs or in the number of young fledged. After 1990, when conservation-focused farming in the nature reserve began, the number of young fledged increased significantly. Grassland management is considered a principal conservation measure for Long-eared Owls in Brandenburg.

Key words: Long-eared Owl, *Asio otus*, population trend, reproduction, breeding success, density, Germany

[1]Garlitzer Dorfstraße 35, D – 14715 Märkisch Luch OT Garlitz, Germany (Birgit.Block@LUA.Brandenburg.de)

INTRODUCTION

Few ornithologists study the demographics of Long-eared Owls *Asio otus*, and the owls are generally regarded as rare. After dedicated research one may get a totally different view, as was the case in this study. Because of the nocturnal, rather hidden way of life, it is more difficult to get population data on Long-eared Owls than on several other owl species. Few long-term studies on breeding densities and reproductive success on Long-eared Owls have been published. As this owl depends on fluctuating prey populations, research programs covering multiple prey cycles are needed to understand the demographics involved. Data on these owls were gathered for 24 years (1984–2007) in a German study area, with a focus on aspects of nests, and trends in densities and reproduction.

METHODS

Study area

The study area of 5000 ha was situated in the district Havelland in Brandenburg, Germany, 52°35'N, 12°30'E (Fig. 1). Approximately 3160 ha of the study area is within the 5526 ha nature reserve 'Havelländisches Luch'. In the north, the study area is bordered by a railroad, in the east by the villages of Buschow, Barnewitz and Kieck, and in the west by the villages of Nennhausen, Gräningen and Mützlitz. The south area is bordered by woods. The elevation ranges from 27 to 36 m a.s.l. Of the 5000 ha in this study area, about 77% (c. 3850 ha) of the area consists of agricultural lands with grassland (c. 2100 ha is flat marshy grasslands), hedges, single trees and small bodies of water. Another 18% of the area (c. 900 ha) is covered by woods, comprised

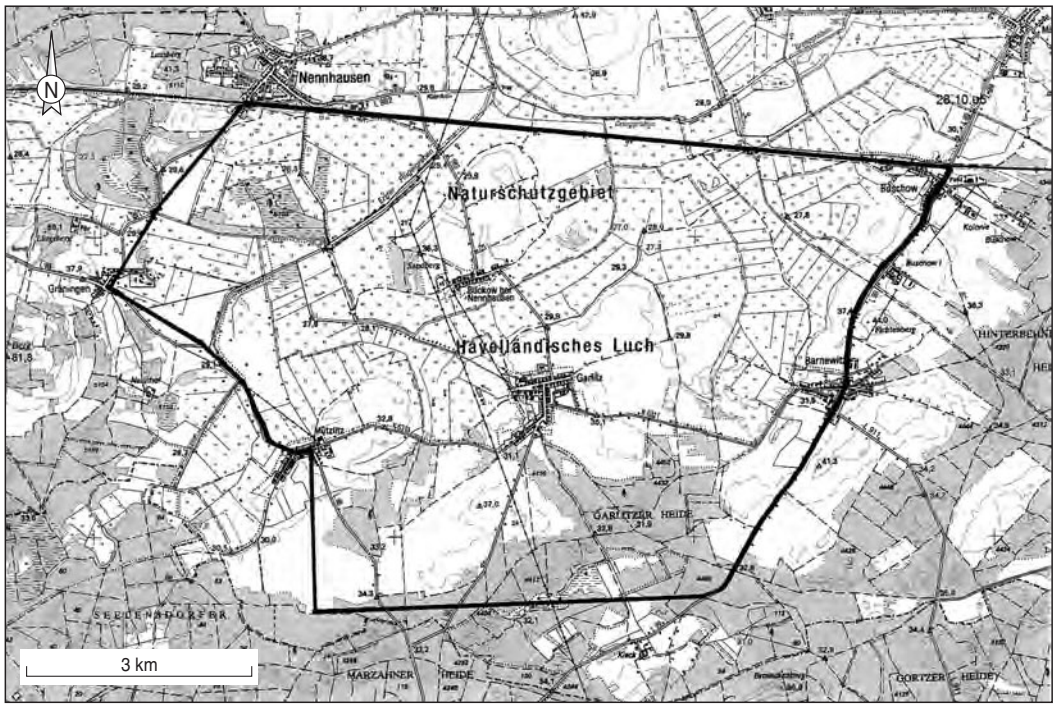

Figure 1. Research area of 5000 ha situated in the district Havelland, Brandenburg, Germany. Approximately 3160 ha of the study area is within the 5526 ha nature reserve 'Havelländisches Luch'.

mostly of Scots Pine *Pinus sylvestris*. The remaining portion (c. 5%, 250 ha) is urban (villages) and roads (e.g. national, district, and village roads).

As of 1988, 100 ha of grassland were farmed to improve habitat of the Great Bustard *Otis tarda*. Since 1990, the state of Brandenburg and the European Union support conservation-focused farming of the grasslands in the nature reserve. The areas are no longer ploughed, or treated with fertilizers or pesticides. Also, time constraints were imposed for agricultural work on the land to minimize disturbance on the Great Bustard and other grassland birds. Since 1990 an additional 200 ha of arable land has been set aside for less intensive farming and is largely pastured with sheep and partly with cattle, sometimes also mowed. Seven organic farms with a total area of about 1700 ha are currently (as of 2008) active in the study area portion of the nature reserve.

Surveys

Territorial owls were mapped during repeated foot surveys conducted in the evening and at night from late January until late April/early May, preferably during windless, clear and cold nights without rain. During the courtship period in February and March, Long-eared Owls are often calling spontaneously. If not, the male call and wing-clapping were imitated to initiate a response, to which Long-eared Owls normally respond well (unlike the imitation of female calls). Until the start of nesting, owls may respond more intensively to imitations of wing-clapping than to playbacking the male call. Adult owls respond by calling, wing-clapping or clapping when circling around the observer. The type of response is indicative of the breeding status. Up to May, unpaired males and males that have lost their partner (mostly because of predation) become highly vocal in response of playback calls. A short response indicates that both male and female are present. Birds in villages and near busy roads are often less sensitive to survey or activities, compared with birds in more quiet and remote parts. This difference is particularly striking after the young have fledged. In built-up areas human disturbance is negligible, but adults in quiet areas often give warning calls ('barking') when approached by people; the young then temporarily fall silent. Barking is restricted to the period with fledglings, when the other calls can also be heard but less frequently than earlier in spring.

Occupied territories were checked for the presence of old crow's nests. To minimize disturbance, nests

were not inspected. From mid-May until late August, fledglings were mapped on the basis of their shrill begging calls, focussing on the few days after fledging when the young have dispersed just far enough from each other to be exactly counted. It was not always possible to determine the precise number of young birds, especially when owlets were silenced by barking. The begging call is more intensive in larger broods (6–7) when the begging call may be heard all night long. This may introduce a bias when studies focus on the number of fledglings, or when observations are done from a car with opened windows (Busche 2003).

Trends in the number of breeding pairs, and their reproductive performance, were analysed for the entire study period of 1984–2007, and separately for 1990–2007. The latter period coincides with the implementation of conservation-based grassland management in the nature reserve.

Nest site selection

Important features of suitable nesting sites are the presence of old crow's nests (if possible in groups of coniferous trees), day-time roosts, and good hunting-grounds. The diet in the study area consisted mainly of Common Voles *Microtus arvalis*; pellets collected at roost sites (W. Jaschke, pers. comm.) showed that this vole made up 90% of all prey taken by frequency.

Long-eared Owls depend on nests built by other birds. Due to lack of time, it was not possible to examine all potential nests in the occupied territories. Moreover, it is very difficult to determine from the ground whether a nest is occupied. During early incubation the female sits low; sometimes the owls' ear tufts or the tips of the rectrices can be seen, or moulted down on the nest rim.

RESULTS

Nest sites

Occupied territories were not evenly distributed in the study area. Long-eared Owls were well represented in small woods, groups of conifers in meadows, and in well-structured woodland edges. Dense woods and undifferentiated woodland edges were largely avoided. Long-eared Owls preferentially nested in trees close to the woodland's edge. Nests further than 30–40 m from edge habitat were rare.

The majority of nests were found in Scots Pine *Pinus sylvestris* (90%, Table 1); the use of this tree for nesting corresponded with the relative abundance of this tree species in the study area (Block, unpubl. data). Hooded Crow *Corvus cornix* provided 90% of the nests used by Long-eared Owls (Table 1).

Density

We recorded a total of 867 breeding pairs, with distinct annual fluctuations (Table 2). The average density in 1984–2007 was 72.2 breeding pairs per 100 km^2, with peaks in 1984, 1989, 1995 and 2005. Nearest-neighbour distances could be as small as 100 m in peak years. In the period of 1984–2007, the number of breeding pairs per year remained stable (R^2 = 0.007), but a slight increase was recorded in 1990–2007 (y = 0.386x+28.8, R^2 = 0.051, Fig. 2).

Reproduction

Of the 867 pairs recorded, 335 (36.6%) pairs were successful in fledging 1468 young (Table 2). The reproductive output was 1.57 fledglings for all pairs that attempted to nest. The average annual number of fledglings per successful pair was 4.31 (range 4.0–5.1

Table 1. Frequencies of tree species and nest-building bird species for 213 nests of the Long-eared Owl in Brandenburg, Germany, 1984–2007.

Nest tree	Hooded Crow *Corvus cornix*	Bird of prey *Buteo buteo, Milvus milvus*	Woodpigeon *Columba palumbus*	European Magpie *Pica pica*	Common Raven *Corvus corax*
Scots Pine *Pinus sylvestris*	175	11	4	1	1
Norway Spruce *Picea abies*	10				
Black Alder *Alnus glutinosa*	3	1			
Silver Birch *Betula pendula*	1			2	
Willow *Salix* sp.	2				
Pendunculate Oak *Quercus robur*		1			
Hawthorn *Crataegus* sp.	1				
Total	**192**	**13**	**4**	**3**	**1**

Table 2. Number of breeding pairs and reproductive success of Long-eared Owls, 1984–2007, Brandenburg, Germany. The total number of fledglings was based on pairs where the outcome was known (249 of the 335 successful pairs).

Year	Breeding pairs	Successful broods	Successful broods (%)	Fledglings/ successful breeding pair	Fledglings/ breeding pair	Fledglings total
1984	49	25	51.0	4.56	2.31	113
1985	44	12	27.3	4.78	1.30	57
1986	43	15	34.9	4.00	1.17	60
1987	23	2	8.7	4.00	0.35	8
1988	30	10	33.3	4.90	1.63	49
1989	52	26	50.0	4.57	2.29	119
1990	44	16	36.4	4.40	1.59	70
1991	20	3	15.0	4.00	0.60	12
1992	34	9	26.5	4.33	1.15	39
1993	32	7	21.9	4.75	1.03	33
1994	30	12	40.0	4.10	1.60	49
1995	44	17	38.6	4.00	1.54	68
1996	30	11	36.7	4.00	1.47	44
1997	24	5	20.8	4.00	0.83	20
1998	33	13	39.4	4.00	1.58	52
1999	46	21	45.6	4.71	2.15	99
2000	36	16	44.4	4.00	1.78	64
2001	26	8	30.8	4.12	1.27	33
2002	29	11	37.9	4.29	1.62	47
2003	34	12	35.3	4.11	1.44	49
2004	37	20	54.0	4.40	2.38	88
2005	59	32	54.2	5.10	2.76	163
2006	37	17	46.0	4.23	1.89	72
2007	31	15	48.4	4.00	1.93	60
Total or average	**867**	**335**	**36.6**	**4.31**	**1.57**	**1468**

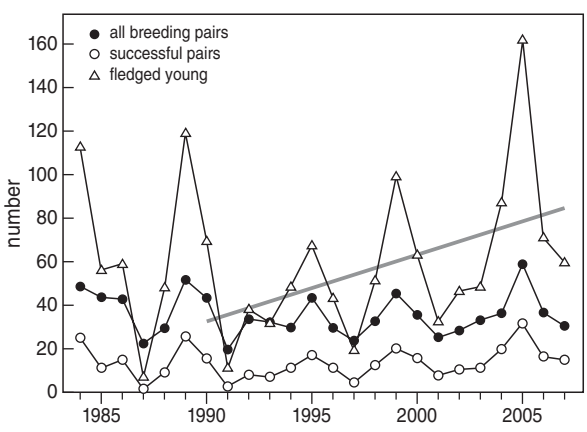

Figure 2. Number of breeding pairs and fledglings of Long-eared Owls on a 50 km^2 area, Brandenburg, Germany. From 1990 onwards, conservation-focused farming was strongly supported. The regression line indicates the trend for fledged young.

per year) (Table 2). The number of fledglings per successful pair ranged between 2 and 7 (2.0%, 20.9%, 30.9%, 30.5%, 14.1% and 1.6%, respectively, with a sample size of 249 pairs where the outcome was known). Annual variations in breeding success were considerable (between 2 and 32 broods successful). The number of young fledged per pair showed a significant positive trend in 1990–2007 ($y = 3.0x - 5971.6$, $R^2 = 0.223$, $P < 0.025$, Fig. 2), but was rather stable in the longer run (1984–2007: $R^2 = 0.028$).

Young normally started fledging from mid-May onwards, with the earliest observed on 19 April 1999. The latest fledging date (24 August 1986) was observed in a territory where two female owls had been successively killed before the male succeeded in attracting a third female to finally raise a late-season brood. There is no confirmed case of second broods, not even among 13 broods that fledged in August.

DISCUSSION

Long-eared Owls in my study area nested in a higher density than found elsewhere in Central Europe (Glutz von Blotzheim & Bauer 1994, Stubbe 1996–2002, Mammen 2003). The long-term variation in breeding numbers in my study plot varied with only a factor of 3, much smaller than found in other long-term standardised studies (Bauer *et al.* 2005, van Manen 2006). Comparisons between study areas are, however, fraught with methodological problems, related to year of study (single years may reflect peak or trough years of voles), size of the study area (small plots tend to have relatively high densities) and methods of fieldwork. Nevertheless, my study area differs from many other regions in Europe, notably in regard of land use. In the autumn of 1989, farmland policy shifted from intensive farming to conservation-oriented land use. This was especially evident in the nature reserve 'Havelländisches Luch' where grassland on flat marshy areas was no longer ploughed and fertilized. Together with other land management practices related to the protection of Great Bustard *Otis tarda*, grasslands turned into species-rich habitats favoured by a plethora of wildlife. These land use changes also resulted in a turnover in the small mammal populations: a decline in Common Voles *Microtus arvalis* in grasslands was paralleled by an increase in shrews *Sorex* sp., Root Voles *Microtus oeconomus* and Field Voles *Microtus agrestis*. Besides, there was a significant increase in the numbers of small mammals on set-aside arable land (W. Jaschke, pers. comm.). Thus the range of food had become more diverse and fluctuations of the Common Vole population had smaller effects on the owls. A more structured grassland vegetation moreover improved hunting opportunities for birds of prey and owls. The positive trend in Long-eared Owl reproduction in my study area from 1990 onwards, as well as the more stable numbers, may well be related to these changes in land use. Conservation-oriented agriculture on a sufficiently large scale, together with organic farming and reductions in the use of fertilizers and pesticides, was the principal trigger for this outcome in Havelland, Brandenburg, Germany, in line with results obtained elsewhere (Birrer 2003, Bauer *et al.* 2005).

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SAMENVATTING

In de jaren 1984–2007 werd in een gebied van 5000 ha in Havelland (gelegen in Brandenburg, Duitsland) onderzoek gedaan naar de verspreiding en het voortplantingssucces van de Ransuil *Asio otus*. Territoriale uilen werden gekarteerd vanaf het eind van januari tot het eind van april. Tellingen van uitgevlogen jongen vonden plaats van half april tot in augustus. Ransuilen nestelden in bosjes met coniferen of in de verspreide bossen van het overwegend in cultuur gebrachte landschap. De uilen broedden vrijwel altijd in oude nesten van kraaiachtigen, en dan vooral in Grove Den. In totaal werden 867 broedpogingen vastgesteld, waarvan 335 (36,6%) succesvol waren met 1.468 uitgevlogen jongen. Gerekend over alle paren werden 1,57 jongen per nest grootgebracht, per succesvol paar waren dit 4,31 jongen. De gemiddelde populatiedichtheid over de 24 jaren bedroeg 72,7 broedparen per 100 km^2. Over de hele onderzoeksperiode was er geen eenduidige trend zichtbaar in het aantal broedparen of in het aantal uitgevlogen jongen. Vanaf 1990, toen in een deel van het gebied overgestapt werd op biologische landbouw, nam het aantal uitgevlogen jongen toe. Het beheer van grasland dat er niet uitsluitend op gericht is om de landbouwproductie te verhogen is in Brandenburg een belangrijk onderdeel van beschermingsmaatregelen ten gunste van de Ransuil.

ARDEA

TIJDSCHRIFT DER NEDERLANDSE ORNITHOLOGISCHE UNIE (NOU)

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