Nest sites and nesting habitats of the Ural Owl *Strix uralensis* in Finland during the period 1870—1969

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LAHTI, E. [Department of Zoology, University of Oulu, SF-90100 Oulu 10, Finland] 1972. — *Nest sites and nesting habitats of the Ural Owl* Strix uralensis *in Finland during the period 1870—1969.* Ornis Fenn. 49:91—97.
Details of the nest sites and the nesting habitats of the Ural Owl have been collected throughout its distribution range in Finland. Nest sites are revealed as stumps, tree holes, twig nests, boxes (which were the most common), buildings, and both rock faces and flat ground. The twig nests most used are those built by hawks. Of the natural nest sites, stumps were predominant until the 1960's but then twig nests rose to the most important position. Box nests are most prevalent in southern Finland and in Häme. The proportion of stumps as nest sites increases from south to north, and stumps remained the most common nest site in central and northern Finland even during the 1960's. A big change is revealed in the nesting habitats, with damp heath forest having become the most common. 21 nests were found in areas close to human habitation.

Introduction

It is well known among bird watchers that the Ural Owl has widened its spectrum of habitats and taken to using new nest sites during recent years, but no quantitative studies of nest sites or habitats have been made in Finland so far. Linkola has listed nest sites by order of use in Häme (HAARTMAN et al. 1967—) and some notes have also been published recently (KASTARI 1968, KELLOMÄKI, LINKOLA & RUOHOMÄKI 1967, TAST 1968). A small number of observations on nest sites and habitats of the species has been analysed in Sweden (INGRITZ 1969). Observations are also available from Norway (HAFTORN 1971), and the habitats of the species have been studied in the Carpathian mountains (BAUER & TICHY 1960).

Material and methods

Information concerning nest sites and habitats of the Ural Owl was collected from the whole of its distribution range in Finland. The following methods were employed: (1) a questionnaire was sent to all bird-ringers, (2) bird-watchers with a special interest in owls were contacted, (3) field work was undertaken in North Häme, especially in nesting localities, and (4) observations concerning this species were abstracted from nest cards of the Finnish Society of Science, (5) from the Archives of Palmén and (6) Merikallio, and (7) from literature.

The first four methods mentioned gave the most up-to-date information. The observers filled in a card especially prepared for this purpose, for each nest site. The older information is, understandably, rather limited, for about 20 years ago this species was rare, hiding in the more remote forests.

Description of nest sites

The following nest sites emerged from the observations: stumps, holes in trees, nests made of twigs, nest boxes, buildings, and both rock faces and flat ground. No reference has been found in literature to the last of these.

Tree stumps used as nest sites include all the more common Finnish trees. Pine was the most common (53 %) and aspen the next (38 %). The extremes of height of these stumps were 1.2 m

TABLE 1. The percentage distribution of Ural Owl nest sites at different periods.

Period	1870—1949	1950—59	1960—63	1964—66	1967—69
Boxes	—	—	24	43	49
Twig nests	15	34	41	29	24
Stumps	59	52	24	18	19
Holes in trees	26	14	5	5	7
Buildings	—	—	3	2	2
Ground	—	—	3	2	—
Rock face	—	—	—	2	—
Total	100	100	100	101	101
Number of nests observed	27	29	37	56	101

and 10 m, the average was c. 4.5 m (measurements from 46 stumps). The edges of the nest hollow were either straight or sloping. In some cases there were crevices in the walls of the depressions, varying in depth and breadth. The depth of the nest holes varied from a shallow depression of only 2 cms. to more than 1 m, and the diameter from 25 to 50 cms. The state of decay of the stumps varied from very rotten to relatively fresh, the number of very rotten stumps being, however, small. Because of the recent shortage of stumps the species must, perhaps, occasionally resort to stumps which scarcely meet its nest site demands.

Holes in trees, used as nest sites by the Ural Owl, are usually formed where the stem is fractured or a branch broken off. Holes of this type were found mainly in old birches (67 % of hole nests). A hole large enough for a nest is also formed when an old Black Woodpecker hole decays. In such cases the tree was usually aspen (17 %). The height of the nest hole above the ground varied between 1.5 and 12 m. The holes formed at stem fractures or where branches have broken off are often open, a kind of niche rather than a hole. By two nests of this type it was found that some of the nestlings had fallen to the ground.

The majority of the twig nests used by the Ural Owl had been built by hawks, although cases have occurred where the species has used nests of Raven, Crow and Squirrel. The 69 twig nests in use were distributed between the following builders as follows:

	%	
Accipiter gentilis	33	
Buteo buteo	20	
Pernis apivorus	12	
Accipiter nisus	3	
Hawk sp.	9	
Total Hawks		77
Corvus corax	3	
Corvus corone	3	
Sciurus vulgaris	4	
Artificial nests	4	
Builder unknown	9	
Total		100

The nest trees (54) used were spruce (67 %), pine (15 %), birch (11 %), and aspen (7 %). The height of twig nests above the ground varied from 3 m to 16 m (average 9.5 m).

During the last decade in Finland people have started to supply nesting boxes for the Ural Owl. They are best made from a round log from which the inside has been removed. The box is left open at the top which is sawn off at an angle. They may also be made of board, in which case the boxes should be half covered. In Norway, boxes have been built which are round but uneven at the upper edge, thus resembling as closely as possible the top of a stump (HAGEN 1968). The best height for

such a box is 50—80 cms. with a diameter of 30—40 cms. (HAAPANEN & VAARNA 1971). The invasion by the Ural Owl of small boxes meant for the Tawny Owl reflects the lack of suitable nest holes and the tendency of the species to nest in holes.

The most recent nest sites are buildings, flat ground and rock faces. Nesting in buildings was first noticed in 1961 at Virrat (KELLOMÄKI et al. 1967). Nesting in attics has since been observed at Pori in 1966 (Korpela), at Oulainen 1967 (Koskela) and at Sievi 1971 (Huhtala). A nest was found on the floor of a barn at Kaarlela in 1969 (Hyytinen). There are two observations of nests on flat ground, the first one being found in 1962 at Puolanka in a logging area and the second in a pine forest (VT type) about 200 m from the edge of cultivated land (Karttunen). The species has nested on a rock face at Tuulos (KELLOMÄKI et al. 1967).

Changes in distribution of nest sites

The largest group of nest sites were box nests (33 %). Of the natural nest sites stumps and twig nests were most common, both reaching 42 %.

Over the decades, clear changes have taken place in the use of varying nest sites by the Ural Owl (Table 1). Stumps seem to have predominated until the end of the 1950's. Twig nests became more and more common until the beginning of the 1960's. In 1960 the widespread use of boxes commensed, and since the mid-1960's nest boxes have been used more often than any other type of nest site. The difference in nest site distribution for different periods is highly significant: heterogeneity χ^2 (BONNIER & TEDIN 1957) = 64.1, $p < 0.001$.

Man has become an even more significant creator of nest sites for the Ural Owl during the last decade, than the numbers of box nests indicates. In addition to boxes, buldings are also included under man-made nest sites. In reality, however, the species is not as bound to man-made nest sites as the data would suggest, as man-made nest sites are much easier to find. Man-made nest sites as a percentage of known nest sites in different periods were as follows:

	1960—63	1964—66	1967—69
Boxes	24	43	49
Buildings	3	2	2
Total	27	45	51
Number of nests	10	25	51

Since the 1950's and 1960's, the most common natural nest site, the stump, has become less popular, in same way as the tree hole, and the proportion of twig nests has risen to the dominant position (Table 2). The nest site distributions in the periods 1870—r1949, 1950—59 and 1960—69 differ highly significantly from each other ($p < 0.001$).

TABLE 2. The percentage distribution of the natural nest sites of the Ural Owl at different periods.

Period	1870—1949	1950—59	1960—63	1964—66	1967—69
Twig nests	15	34	56	52	48
Stumps	59	52	33	32	38
Holes in trees	26	14	7	10	14
Ground	—	—	4	3	—
Rock face	—	—	—	3	—
Total	100	100	100	100	100
Number of nests observed	27	29	27	31	50

Although twig nests, in the 1960's, were more common than stump and tree hole nests, the hole-nesting character of the Ural Owl is borne out by the wide use of boxes during that period. Many examples show that a box is preferred to a twig nest. Moving a box into the neighbourhood of an inhabited twig nest has resulted in the owl nesting in the box. No movements in the opposite direction have been observed.

It has been shown that the Ural Owl does not nest in southern Finland in poor vole years, and that the number of nesting pairs is highest when voles are abundant (LINKOLA & MYLLYMÄKI 1969). One would expect it to be possible for those rare pairs nesting in poor vole years to select nest sites, whereas, in good vole years a number of pairs would be forced to accept less-preferred sites, because of competition. Statistically, the nest sites used during the vole maxima and minima do not, however, differ significantly ($\chi^2 = 5.1$). In addition to the small number of observations, the reason may be the site tenacity of the species, which does not readily move to a new place, although this could offer a more suitable nest site.

Areal distribution of nest sites

The country was divided into four areas, southern, central and northern Finland and Häme. Southern Finland was taken to include the provinces of Uusimaa, Varsinais-Suomi and Satakunta. The boundary between central and northern Finland is the southern border of the county of Oulu.

There are statistically significant differences in nest sites between these areas ($\chi^2 = 71.2$, $p < 0.001$). The clearest difference is between box and stump nests (Table 3). The percentages of the former decrease from south to north, while those of the latter increase, so that the most common nest site in southern Finland is the box and in central and northern Finland the stump. The proportion of twig nests in Häme is unusually high. The reason for this may be either the greater density of the species there or a local tendency to use twig nests. The proportion of tree holes is small everywhere, except in the south. Half of the tree hole nests of southern Finland were in the neighbourhood of human habitation. The reason may be that in southern Finland the species can find suitable old garden birches for nesting. Statistically the difference in the natural nest sites of different areas is highly significant ($\chi^2 = 51.4$, $p < 0.001$).

If the available data are divided into two periods, before and after 1960, it is found that in the southern part of the country, tree holes have been the most common in both periods. In central and northern Finland, stumps have similarly

TABLE 3. The percentage distribution of Ural Owl nest sites in different parts of the country.

Area	S. Finland	Häme	C. Finland	N. Finland
Boxes	42	42	22	7
Twig nests	18	32	19	27
Stumps	3	20	46	56
Holes in trees	33	5	8	4
Buildings	3	1	3	4
Ground	—	—	3	2
Rock face	—	1	—	—
Total	99	101	101	100
Number of nests observed	33	137	37	45

TABLE 4. The percentage distribution of Ural Owl nesting habitats according to nest site types.

Nest site type	Boxes	Twig nests	Stumps	Others	Total
Damp heath forests	82	67	45	40	67
Dry heath forests	10	14	41	40	21
Spruce mires	5	14	14	20	10
Pine bogs	3	—	—	—	1
Herb-rich forests	—	5	—	—	1
Total	100	100	100	100	100
Number of nests observed	39	21	22	5	87

been the most common. The situation in Häme is different, for there the proportion of twig nests rose above that of stump nests in the 1960's.

The nesting habitats

In older literature, the nesting habitat of the Ural Owl was, without exception, described as old coniferous or mixed forest far away from human habitation (e.g. COLLIN 1886, HORTLING 1929, KIVIRIKKO 1947). In the last twenty years, however, the nesting habitat has been more varied. Damp heath forest have become the most common habitat, but the species also nests regularly in dry heath forests and spruce bogs (Table 4). The variety of the nesting habitats is indicated by additional records of nests in pine bogs and herb-rich forests. Twig nests are most numerous in damp heath forests, which are the habitats of the hawks which build the nests, while stump nests have been found almost as frequently in dry as in damp heath forests. Stumps suitable for nests are available to the same extent in both biotopes. It seems likely that the suitability of the nest site is more important than the biotope. The nests found in the middle of open loggings (6 nests) and in the middle of an open bog (1 nest) support this view. In addition, many nests have been found on the borders of such areas.

Spruce forest is seen to form the biggest group of nesting habitats (47 %). Pine and mixed coniferous forests together account for 30 %. There are 20 % mixed deciduous and only 3 % pure deciduous forest.

The habitats close to human habitation form their own special group. In these cases, the nest site usually lies less than 100 m from a house. The first nests in these habitats were found in the 1950's, and when the collection of data was terminated in 1969, their number was 21. Most of them were found in southern Finland and Häme. Major vole years do not seem to have influenced their number. The most common of the nest sites found in the neighbourhood of human habitation is a tree hole, which results from the fact that there are many more tree holes than other possible nest sites in such areas. The distribution of the nest sites found in this kind of place is as follows:

	Number of nests
Tree holes	8
Buildings	4
Stumps	4
Boxes	4
Twig nests	1

Factors influencing the distribution of nest sites and habitats

The Ural Owl population has increased recently, which has strongly influenced the change in its nest sites and habitats. The increase started some decades ago and has continued locally until recent times (a.o. KIVIRIKKO 1947, MERIKAL-

LIO 1958, HAARTMAN et al. 1967—72). The cause of this increase, as well as the increase of other owls of the Siberian fauna group, is, according to SIIVONEN (1943), the cooling of the climate which has followed the warm period of the 1930's. Local differences have been found in this population increase, which has been most marked in Satakunta and Häme. One reason for this is provided by the presence of a wide and dense network of nest boxes in these areas.

When the population was still small throughout the country, the species had the possibility of selecting an optimal nest site in an optimal habitat. However, as the population gradually increased, stumps and tree holes became insufficient to meet the demand and owls had to take to using both twig nests and new habitats. The differences in nest sites are probably due to local differences in population density. In central and northern Finland, where numbers are lowest, the proportion of stumps used is still highest. The most remarkable population increase has taken place in Häme, where the proportion of stump and hole nests is smaller than that of twig nests. In the south of the country the density of the population is again lower, which is reflected in the lesser use of twig nests.

In order to prevent the spreading of pests and fungal diseases, rotten stumps and trees with holes are now removed from the forest. This has continually reduced the numbers of original nest sites of the Ural Owl, which, in turn, has had to change to using other nest sites in the manner indicated by this study. Locally, there are hardly any major differences in the use of nest sites resulting from forest management, although in the north there are still areas outside the effective limits of such management. This, together with the small population, may to some extent explain why holes are still the most common nest sites in the north. Forest management, naturally, also influences the habitats. The tendency is to change the dry spruce heath forests of southern Finland and HM type spruce forests of northern Finland into pine forests, in order to increase timber (JALAVA et al. 1956). This is the reason for the decrease in the use of spruce forest by the Ural Owl, which has now been forced to nest more and more in forests of other types. The Ural Owl has exhibited a well-developed adaptability to the new circumstances, which provides it with good possibilities of success in the future.

Acknowledgements

I wish to express my gratitude to Dr. S. Sulkava, for his many helpful discussions and for his critical comments on the manuscript of this paper. My thanks are also due to Prof. L. von Haartman in charge of the nest card scheme of the Finnish Society of Sciences and many ornithologists, who have made their observation records available to me, and Mr. Malcolm Hicks, M.A., for checking the text.

Selostus: **Viirupöllön pesäpaikoista ja pesimisbiotoopeista Suomessa 1870—1969.**

Viirupöllön käyttämien pesäpaikkatyyppien, niiden ajallisen ja alueellisen jakautumisen, sekä pesimisbiotooppien selvittämiseksi kerättiin eri menetelmiä käyttäen pesäpaikka-aineistoa koko maasta.

Laji käyttää pesäpaikkoinaan yleisesti kantoja, puunkoloja, pönttöjä ja risupesiä, sekä harvemmin rakennuksia, tasaista maata ja jyrkännettä. Kanto on ollut lajin yleisin pesäpaikka 1960-luvun alkuun asti, minkä jälkeen risupesien osuus on kohonnut luonnon tarjoamista pesäpaikoista suurimmaksi (Taulukko 2). 1960-luvun puolivälissä kohosi pönttöjen osuus kaikki pesäpaikat huomioon otettuina suurimmaksi (Taulukko 1). Eri aikakausien pesäpaikkajakautumat poikkeavat erittäin merkitsevästi toisistaan ($p < 0.001$). Kantojen ja puunkolojen runsas käyttö aikaisempina vuosikymmeninä ja pönttöjen runsas käyttö viime vuosikymmenen aikana ovat todisteita lajin kolopesijäluonteesta.

Maan eri alueiden pesäpaikkajakautumat poikkeavat toisistaan erittäin merkitsevästi ($p < 0.001$). Selvin ero koskee pönttö- ja kantopesiä, joista edellisten prosentuaalinen osuus pienenee etelästä pohjoiseen, kun taas jälkimmäisten osuus suurenee (Taulukko 3). Maan eteläosan (= Uusimaa, Varsinais-Suomi ja Satakunta) yleisin pesäpaikka on pönttö ja luonnon tarjoamista pesäpaikoista yleisin on puunkolo. Hämeessä pöttöjen osuus on edelleen suurin, mutta luonnon tarjoamista pesäpaikoista yleisin on risupesä. Maan keski- ja pohjoisosassa kanto on yleisin pesäpaikka.

Pesimisbiotoopeista yleisin on tuore, kuusipuuvaltainen kangasmetsä, minkä lisäksi laji pesii säännöllisesti kuivilla kankailla ja korvissa (Taulukko 4). Pesimisbiotooppien moninaisuutta osoittaa pesiminen rämeellä ja lehdossa. Risupesiä on eniten tuoreissa kangasmetsissä, jotka ovat pesät rakentaneitten haukkalajien pesimisympäristöjä. Kantopesiä on löydetty kuivilta kankailta lähes yhtä paljon kuin tuoreilta kankailta, sillä pesimiseen soveltuvia kantoja syntyy samassa määrin kummallekin biotoopille. Täten biotooppia tärkeämpää näyttää olevan sopivan pesäpaikan löytäminen. Tähän viittaavat myös löydetyt pesät keskeltä avohakkuualuetta (6 havaintoa) ja keskeltä avosuota (1 havainto). Asuntojen välittömästä läheisyydestä löytyi 21 pesäpaikkaa, joista yleisin oli puunkolo.

Yhtenä pesäpaikkojen jakaantumiseen ja biotoopin valintaan vaikuttavana tekijänä voidaan pitää muutamia vuosikymmeniä sitten alkanutta lajin kannan voimistumista. Kannan ollessa vielä heikko kautta maan on lajilla kolopesijänä ollut mahdollisuus valita pesäpaikakseen kanto tai puunkolo. Kannan voimistuessa on laji joutunut ottamaan käyttöön uusia pesäpaikkoja ja pesimisbiotooppeja. Pesäpaikoissa ilmenevät alueelliset erot johtuvat kannan vahvuuden alueellisista eroista. Eniten kanta on voimistunut Hämeessä, missä myös alkuperäisten kanto- ja puunkolopesien osuus on risupesien osuutta pienempi. Maan keski- ja pohjoisosassa kanta ei ole voimakas ja siksi kantojen osuus on edelleen näillä alueilla suuri. Toinen tekijä on metsänhoito, jonka periaatteisiin kuuluu kolopuiden ja kantojen poistaminen metsistä ja kuusipuuvaltaisten metsien muuttaminen mäntyvaltaisiksi.

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Received 10, December, 1972.