THE LITTLE OWL

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Conservation, Ecology and Behavior of *Athene noctua*

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Dedication

The Little Owl has always meant a great deal to me since my childhood. It was one of the first bird species that I learned to know and appreciate. At that time the Little Owl was still rather common. My favorite bird lived in an old pollarded willow nearby.

I wish to dedicate this book to Trui, my wife, and Juul and Siel, my sons, who helped me through tough times when the combination of a family life, a busy stressful job, rebuilding our house, and writing a book were extremely energy consuming. Thanks for the support, the belief that this book would succeed, and the comprehension that writing this book simply had to be done.

I also dedicate this book to De Torenvalk v.z.w., the local nature conservancy organization in which I grew up. Especially my big brother Jef "*Debaris open*" who endured his little brother during so many field trips, Marc Lievrouw "*Luizevel*", Filiep Lammertyn "*Lepus lammertinus*," and Marc De Schuyter "*Skeuterke*". Special thanks go to Friedel Nollet who started studying Little Owls first and to Maarten Bekaert. My two genial pupils substantially helped me in realizing many of my Little Owl dreams and ambitions.

Importantly, I wish to dedicate this book to the multitude of volunteers and Little Owl enthusiasts throughout its distribution range, not least to the Flemish people of Natuurpunt Studie and the many volunteers within the framework of the International Little Owl Working Group. Particular thanks go to Roy S. Leigh who laid the foundations of this wonderful group.

I wish to thank the Community of Herzele (Flanders, northern Belgium) and the Province of East-Flanders for their continuous financial support in favor of local Little Owl research.

Finally, I wish to thank Jean-Claude and David for their remarkable effort in making this book a success.

Dries Van Nieuwenhuyse

This book is a dream come true – a dream I had 20 years ago when I first became passionately interested in the Little Owl. At that time I sorely felt the absence of a synthetic monograph providing me with comprehensive and critical scientific insight into the species. I am delighted to contribute to this venture because it is the fruit of teamwork with Dries and David, and as such it is considerably richer than it might have been otherwise.

I would like to dedicate this book to Claude Kurtz, who introduced me to Little Owl study in 1983 and Michel Juillard who helped me at the beginning of my "long journey" to get insight into Little Owls. Thanks also to the Northern Vosges regional natural park, which is the framework in which I have carried out my Little Owl work since 1982. I am indebted for its enduring trust in me and the subject.

Finally, the book is unique as it draws on unpublished material furnished by members of an international group studying the Little Owl, together with the findings of varied research conducted by us in Belgium, France, and England. Following on from a thesis on the species and many other publications, the book represents the fulfilment of a personal ambition. I hope it is retained as a "reference" for many years by all those naturalists who, like myself, are fascinated by the Little Owl.

Jean-Claude Génot

I would like to dedicate this book to my wife and confidante, Shari. Your enthusiasm for learning and life fills my heart with joy and amazement every day. I would also like to dedicate this book to the members of the Global Owl Project. My life has become richer through our shared communications, explorations, addiction to owls, and the friendship I have had with you over the years. What a wonderful opportunity and privilege it has been to work with Dries and Jean-Claude: to delve into the ecology of the Little Owl and into the passion we so deeply share about owls. Finally, I truly appreciate the wonderful efforts of all of the people that have worked with the Little Owl, offering publications and perspectives, assessments and analysis, and rich cultural insights. It is upon your solid foundation that our book was possible.

David H. Johnson

Contents

Foreword

For centuries, all across the world, humans and owls have had a continuous love–hate relationship. Owls are prominent in myth, superstition, and folklore. On the one hand, owls were an omen of bad news, of doom and gloom – in Central Europe locally Little Owls are still associated with death – on the other hand, the Greeks, for example, considered them wise, especially the Little Owl. Though the relationship between man and owls can be traced back to ancient Greece and beyond, our understanding of the basic biology of owls often is still rather poor compared to other bird species. Few scientists interested in basic ecological principles would choose to study a nocturnal species breeding in low density, often in remote and inaccessible places. The situation changed in the mid twentieth century, when ornithologists observed dramatic declines in several owl species over much of Europe. Throughout Europe, the decline of Little Owls is mainly caused by habitat destruction, especially from the intensification and mechanization of agriculture. Changes in agricultural practices led to a decline of suitable nest sites and hunting grounds, and the associated population decrease resulted in the increased isolation and fragmentation of the European breeding population. These pronounced declines have attracted the attention of many conservationists and researchers, especially in Western European countries.

A first milestone, not only for conservation of Little Owls but also for detailed studies of their breeding biology, was the development of an artificial nestbox by the late Ludwig Schwarzenberg (1970) at the end of the 1960s. The original nestbox designed by Mr. Schwarzenberg was a simple wooden tube built from meter-long laths, with a diameter of about 18 cm, waterproofed with roofing felt. The nestbox was quick and easy to construct, and was quite a success. These tubes were readily accepted by Little Owls, sometimes within two to three weeks after being set up. Thousands of these nestboxes have been established in Western Europe during the last decades, mainly in Germany. In several areas population numbers increased (rapidly) after the provision of nestboxes, especially during the first few years. Later, growth rates of populations supported by nestboxes often slowed from year to year as the population density stabilized. As well as detailed habitat analyses, the high occupation rate of nestboxes provided further evidence that the lack of suitable nesting cavities was an important factor limiting Little Owl populations. The number and distribution of nest sites seems to be an ultimate limiting factor determining population densities across much of the breeding range of Little Owls in Western Europe. However, the

Figure 0.1 Little Owl frontal view (François Génot).

reduced rate of population growth associated with increasing population density indicates there are other limiting factors. Nowadays, nestboxes are widely used as a conservation tool. But, I have to point out explicitly that the provision of artificial nesting sites is not an appropriate long-term conservation strategy. In the longer term, natural breeding sites have to be re-established, e.g., through the planting of orchards and willows.

The development of an appropriate nestbox also made it much easier to study the biology of this fascinating species in detail, which otherwise breeds mainly in inaccessible cavities. Nestboxes offer the possibility to study the breeding biology from egg-laying to fledging in detail, and moreover, to catch and ring adult as well as juvenile birds with ease. An advantage of the species is that the adults are mainly sedentary, most individuals use the same day-roost, or at most a handful of alternative roosts, throughout the year, often for their entire life. Once familiar with the species and the territory, individuals are often easy to discover. Thus, besides population numbers, a lot of important demographic parameters determining population density and population regulation can be determined. During the last 20 years many studies on population biology have been carried out. In addition, recent field techniques such as radio-tracking have been applied to analyze home-range sizes and habitat use throughout the year. DNA fingerprinting has been used to analyze genetic variation within, as well as between, populations.

Along with this, in the late 1990s Little Owl researchers realized the importance of standardized monitoring methodologies, and an international co-operation, named the International Little Owl Working Group (ILOWG), was founded. At the turn of the twentieth century, after three very fruitful international conferences organized by the ILOWG, time was ripe to summarize and synthesize our present knowledge on Little Owls for an international readership. The meetings in Champ-sur-Marne, France (2000), Geraardsbergen, Belgium (2001), and Cheshire, England (2002) helped to engender a common spirit of co-operation. The ILOWG as well as a flock of Little Owl enthusiasts made countless unpublished data, notes, and observations generously available, data that previously were not available or were written in languages with which most of us are not familiar.

How welcome, therefore, is the monograph by three leading owl enthusiasts – *Owlologists* – distilling all that is known about Little Owls and providing up-to-the-minute information on current research. The authors solved the difficult task of bringing together and synthesizing often contrasting material from different sources. They address more or less all aspects of the biology of Little Owls. However, besides presenting an impressive overview of the worldwide distribution and population numbers, for example, they concentrate on two fascinating and fast-developing fields: habitat selection and factors affecting habitat selection, and population regulation. Insights from habitat analyses and population studies have proven crucial in conservation. To understand habitat suitability and habitat preferences the authors used – in contrast to most former studies – a new multi-scale approach, they analyzed a multiplicity of biotic and abiotic parameters within grids of a few hectares to several square kilometers in size. Analyzing habitat parameters at different spatial scales provides a much better insight into habitat preferences and thus environmental factors limiting population density, in particular for species that inhabit a great diversity of natural and anthropogenic landscapes. A geographic information system-based multi-scale approach enables us not only to identify limiting and important environmental habitat parameters, moreover, it allows us to select representative sampling points for large-scale surveys, a significant advance in cost-efficient monitoring.

The Little Owl monograph you hold at hand provides examples on how to use data about bird distributions, relative abundance, and habitat associations to set conservation priorities. Based on the presented data, a working structure for an owl species conservation plan has been developed to standardize research and monitoring methods across the range of the Little Owl. A harmonized monitoring program is essential for effective conservation and management, e.g., to evaluate the effectiveness of policy and mitigation measures. Though the aim of a monitoring program is also to elucidate reasons for population changes, causal factors will not necessarily be obvious from the monitoring data alone. In order to overcome these shortcomings, an indispensable tool, concomitant research, should supplement the monitoring program. More cost-efficient monitoring will save time and money. At least some of the limited resources can be redirected to other work, such as to identify the causes of declines.

Along with this, the monograph on Little Owls exemplifies in an excellent way (a) the close link between amateur and professional ornithologists, and (b) the overall importance of detailed large-scale and long-term studies by volunteers and their contributions to applied as well as to basic scientific research. The increase in knowledge during the last decades is largely through the efforts of non-professional ornithologists and non-governmental organizations (NGOs). Most of the long-term studies on Little Owls as well as large-scale surveys of their distribution were carried out by volunteers. Modern software and modeling techniques provide the theoretical framework. In addition to their role as tools for describing distribution and patterns affecting them, for example, models can also provide the means for examining and generating hypotheses about causes and consequences of habitat changes. Models can show us which parameters are important and therefore should be recorded in the future, and hence make monitoring and conservation programs more effective. To accomplish this, the integration of comprehensive empirical studies, technological advances to study the behavior of nocturnal animals, and mathematical modeling promises many new insights. The understanding of population regulation and the spatial distribution, including the understanding of dispersal patterns, will not only prove to be an interesting challenge for the future, it is also essential in constructing an effective conservation plan. Generalization of all available local insights and models across the entire geographical range of the species is another main point of attention for the future. The ILOWG provides a fertile ground and delivers the necessary platform for co-ordinated studies across Europe.

Through international co-operation and research, our knowledge has increased during the last decades. The authors have organized the existing knowledge into a coherent whole. Nevertheless gaps in our understanding of owl biology and behavior remain. In my opinion, one of the major issues is that all quantitative data available are from anthropogenic, agricultural habitats in Europe. Only qualitative descriptions are available from the primary steppe and semi-desert habitats in the core area of the species' range. To understand the decision rules that guide Little Owls in responding to their biotic and abiotic environment, and thus for a thorough understanding of the ecological and evolutionary processes, go there! I hope this monograph will stimulate ornithologists all over the world to study this fascinating

species. Dries, Jean-Claude and David provide an excellent basis for sound research and conservation strategies.

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Executive summary

In this book we provide a summary of the substantial literature and knowledge on the Little Owl (*Athene noctua*) to offer a synthesis of the current understanding of the species' rangewide ecology and conservation status. In addition to drawing from our own owl studies and experiences, and those of many colleagues, we have examined over 1900 publications and reports dealing with the Little Owl. Our key findings are briefly offered here.

Cultural aspects. Owls are prominent in myth, superstition, and folklore across the world. With its large distributional range, and an ability to co-exist commensally with many human habitations, the Little Owl has figured prominently in many cultural beliefs. Whereas individual species of owls are rarely referenced in historical mythology, there is specific evidence of Little Owls in images on coins, medallions, carvings, and sculpture, and in historical literature. In Western societies, the Little Owl is seen as a purveyor of wisdom, a perspective likely derived from Greek mythology in which the Little Owl was the favorite bird of Athena, the Goddess of Wisdom. Representations of Little Owls have been found in association with the Xian culture in Inner Mongolia, dating from 8000-7500 BCE. Images of the Little Owl were placed on silver coins minted in Greece starting about 550 BC; the same image is on the Greece *Euro* coin minted as of 2002. In other cultural uses, Little Owls were used as bait birds in catching small birds in Italy, France, and Germany up until the 19th century. In recent decades, Little Owls have appeared on postage stamps, beer labels, and corks for fine wines.

Taxonomy and genetics. The genus *Athene* includes four species; the Little Owl was formally described to science in 1769 by Giovanni Antonio Scopoli. Twelve subspecies of *A. noctua* are recognized; recent DNA data is improving our understanding of this species' complex. Michael Wink has provided a section for this book in which he examines nucleotide sequences of the cytochrome b gene of owls to infer phylogenetic and phylogeographic relationships. Within *A. noctua*, several well-defined clades are apparent that agree with recognized subspecies. However, because some of the genetic distances between the subspecies are in the range typical of that found in established species, it is likely that *A. noctua* comprises a monophyletic species complex that could be subdivided into several 'good' species. The analysis thus far covers the subspecies *vidalii*, *glaux*, *noctua*, *indigena*, *lilith*, and *plumipes*. Some of the African and Asian taxa are not yet represented. The present data reveals three phylogenetic lineages.

Morphology and diet. The Little Owl is a small (19–25 cm, 160–250 g), relatively long-legged, nocturnal, territorial, 'chunky' owl with a short tail and round head. They exhibit reverse sexual dimorphism; based on weight, wing length, tail length, bill size, and tarsus size, females are heavier and larger than males. Mean weights for males and females are heaviest in March/April (just prior to breeding season) and lightest at the end of the summer and autumn. Adult male and female owls each have a vocal repertoire of 15 call-notes, collectively comprising a total of 20 recognizable call-notes. Juveniles have 12 defined call–notes. Neighbor–stranger discrimination is used by territorial males to minimize energy expended on aggressive acts, preventing escalated contests between neighbors, and decreasing exposure time to predators. The Little Owl has a generalist diet and takes a high diversity of small-bodied prey (e.g., voles and smaller). We tallied 544 prey species of the Little Owl, reflecting 377 invertebrate species, 54 small mammals, 15 reptiles, 14 amphibians, 82 small birds, and 2 fishes. In particular, the nutrients and biomass from small mammal prey enhances reproductive success.

Distribution, population status, and trends. The Little Owl is broadly distributed, as it has been recorded from lowland areas in 84 countries in the middle and lower latitudes of the Northern Hemisphere (mainly between 22° and 51° north). Densities of Little Owls decrease with increasing latitude. Snow depths over 10–15 cm preclude hunting, and limit their distribution in both latitude and elevation. The Little Owl is considered fairly common to common in 45 countries and uncommon, rare, or a vagrant in 39 other countries. It has been introduced (and is considered common) in New Zealand and England. The distribution of the owl has increased within 8 countries, decreased in 15, remained unchanged in 30, and was insufficient for determination in 31. The population status is reported as increasing in 11 countries, declining in 14, stable in 28, and status unknown in 31 countries. There is evidence that groups of Little Owls breed in 'clusters' as compared to individual pairs separated by long distances; defended territories are non-overlapping, and territory sizes are similar for pairs inside and outside of clusters. Ringing studies indicate that the average lifespan for Little Owl females is 3.8 years (oldest female in wild was 15 years). Most (>80%) female owls nest in their first year. Clutches average 2.60–4.42 eggs, and fledgings average 1.78–2.84 young. Average first-year survival rates were 15–27%; adult survival rates average 36%. Adult owls tend to be resident; young disperse relatively short distances (0.6–4.0 km), with females dispersing about twice as far as males. Ringing and genetic data suggest that populations of Little Owls are structured as metapopulations with source-sink dynamics.

Habitat. Habitat of Little Owls has been described as open country with groups of trees and bushes, rocky country, grasslands, deserts and semi-deserts with rocks, ruins, oases, pastureland with scattered trees, old orchards, along rivers and creeks with pollarded willow and other trees, parkland, and edges of semi-open woodland, and farmsteads and urban areas with surrounding cultivated lands. Nests are in tree cavities, crevices in ruins and water wells, adobe buildings, under roofs, holes in quarries, stick nests, nestboxes, piles of stones, and animal burrows in banks. Home range sizes of breeding pairs tend to be small, averaging 14–120 ha.

Conservation. Long-term conservation of the Little Owl is complicated because habitat conditions can change rapidly and significantly due to changes in policies and management. Current threats to the Little Owl are mainly loss of habitat from human land-use practices. Threats becoming prominent across the European range include the reduction in the amount of tree-lines, deterioration of high-stem orchards, and the increase in the area of subsidized maize. Other threats include collisions with vehicles and pesticides that reduce the availability of invertebrate prey. We propose a conservation program featuring five components: increase knowledge of the species, reduce limiting factors, understand effects of landscape conditions, introduce conservation legislation and policies, and support the role of local people in conservation. We follow this with a review of the four drivers to implement the conservation program: monitoring, standardized methods, data management, and measures of success. The Little Owl is a useful ambassador of the small-scale, half-open, largely agriculturally dominated and stony-steppe landscapes. Among the features that make it a flagship of the rural environment is that the species is well known among the public, it is still present in reasonable numbers in most countries, is readily observable, easy to research, and offers relatively quick responses to habitat restoration actions. The substantial work of conservation volunteers both gathers important data for standardized and reliable databases, and broadens the social network of nature conservation. In this way, owl conservation is brought closer to the general public. Nestboxes for Little Owls are widely used in areas where nest-sites are limited, and have been effective for both research studies and conservation of this species. Nest-cameras with internet feeds have recently been placed in nestboxes, offering unique insights into the behaviors of both the owls and their excited human viewers.

Research priorities. Until now, Little Owl research has been mostly descriptive and has reflected short-term observational studies on life history, food, behavior, habitat, and general distribution. New/expanded research should be applied and focus on large-scale replicated studies, controlled experiments, and long-term studies of demography. Results that lead to effective habitat management recommendations are needed. For habitats, information is needed on specific structural features, landscape configurations, and amounts of habitat required for stable or increasing populations. We need to link habitat and resource selection to demographic performance (i.e., survival and reproduction) to ensure managers provide for quality habitat and not simply owl presence. Studies emphasizing demographic parameters (nest success, productivity, survival, dispersal) are needed to identify factors limiting populations and to contribute to understanding metapopulations dynamics (e.g., gene flow, source vs. sink populations). There is a critical need to determine the effects of various types of land use on Little Owl populations to devise effective measures to minimize or mitigate for such actions. Land uses affecting Little Owls include: livestock grazing, silviculture, recreation, fire management, oil and gas development, mining, water control and development, agriculture, roads, suburbanization, communication towers, and wind-power development. We strongly encourage further geographical information system (GIS) analyses and use of landscape scale population modeling to determine priority areas for potential habitat protection, restoration, and management. We need to test whether currently available

digital maps contain enough detail to distinguish different habitat elements, to reduce the need for additional field data collection. The Little Owl could also be studied experimentally because it is easy to manipulate local population structures, it is relatively common in human-dominated landscapes, and individual owls are available from bird-care centers. We recommend conducting baseline ecological, ethno-ornithological, and distributional surveys in Middle Eastern, African, and Asian countries to estimate overall population status and aid in conservation programs in those regions. Additional DNA studies to clarify species and sub-species taxonomy are necessary and can be conducted with relatively low cost. Finally, we recognize, and strongly encourage, the significant conservation value to be achieved in co-ordinating Little Owl research with those of other agro-pastoral and steppe species like shrikes (Laniidae).

Monitoring plan. We propose a network of 30 Vital Sign demographic monitoring areas where mark–recapture studies would be conducted to locate, mark, and re-observe or recapture pairs of Little Owl adults and their offspring. Each monitoring area currently contains 50–100 pairs of Little Owls, or equivalent habitat in areas where population restoration is planned. These *Little 30* study areas are located within 20 countries across the range of the species, and overlap with monitoring efforts in places with other natural resource values (e.g., Important Bird Areas, UNESCO World Heritage Sites, National Parks, Natura 2000 sites). Our proposed program is designed to monitor the long-term status and trends of Little Owls to evaluate the success of various plans to arrest downward population trends, and provide focal areas for maintaining and restoring habitat conditions to support viable owl populations. Data from the demographic studies would be integrated in individual population and meta-population analyses, and a process for reporting to decision-makers during their periodic land use plans and policy reviews is offered. For countries without Vital Sign demographic study areas, we recommend baseline distributional surveys and ecological studies. This monitoring program is designed to produce results directly applicable to the Convention on Biological Diversity.

Bibliography. We are including a special section in this book reflecting a full bibliography of the Little Owl *Athene noctua*, and sets of queries based on key words. The Bibliography includes publications from 1769 through December 2007. This Bibliography represents all Little Owl literature (n = 1904 publications) available to us; we welcome additions and apologize for any missed citations.

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