

The significance of nest structure and nesting material for hole-nesting passerines: an experimental study with Nuthatches *Sitta europaea*

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Cantarero A., López-Arrabé J., Saavedra-Garcés I., Rodríguez-García V., Palma A., Moreno J. 2014. The significance of nest structure and nesting material for hole-nesting passerines: an experimental study with Nuthatches *Sitta europaea*. *Acta Ornithol.* 49: 143–155. DOI 10.3161/173484714X687037

Abstract. Nest structure and nesting material may have important consequences for avian reproductive behaviour and performance. Nuthatches *Sitta* spp. build nests made of loose bark flakes without any structure or nest cup to contain eggs and nestlings. We have aimed at understanding the implications of unstructured bark flake nests in Nuthatches for microclimatic conditions in the nest, ectoparasite infestation, parental care and nestling begging through a nest exchange experiment. To that end, we have experimentally replaced natural bark nests of Nuthatches *Sitta europaea* by structured moss nests built at the same time by Great Tits *Parus major* for some pairs and compared their ectoparasite abundances, nest microclimate variables and the behaviour of nestlings and parents with those in natural Nuthatch nests. The experimental treatment did not affect ectoparasite loads. Nest-boxes containing structured nests made of moss showed higher and more variable temperatures, higher thermal maxima and less variable humidity conditions than unstructured control nests made of bark flakes. However, bark flakes conserve heat better than moss during the night and morning hours, which may be transmitted to buried eggs and nestlings and reduce incubation and brooding costs for females. This may explain why females remained out for longer during incubation recesses at natural nests. Nestlings of 9 days in natural nests rested further apart than nestlings in structured experimental nests although there were no differences with respect to begging intensity between the two treatments. Hatching and fledging success was similar in both groups but experimental nests resulted in nestlings with shorter tarsi and wings before fledging. The poorer nestling growth in experimental nests cannot be explained by effects of ectoparasites, nestling aggregation or nestling begging or parental care. Adaptations for remaining buried in the nest material and the heat-conserving properties of loose bark flakes may reduce energy costs for nestlings during female absences.

Key words: nest structure, nesting material, nest microclimate, ectoparasites, Nuthatch, incubating behaviour, nestling condition

Effects of habitat on breeding success in a declining migrant songbird: the case of Pied Flycatcher *Ficedula hypoleuca*

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Abstract. Habitat is a key determinant of breeding success in hole-nesting birds. Identifying the factors that influence breeding success is important in understanding nest-site selection behaviour and devising appropriate conservation strategies. This is especially true for declining species like the migratory Pied Flycatcher *Ficedula hypoleuca*. Here, I analyse the effect of 24 habitat variables on clutch size, hatching success and fledging success for 137 Pied Flycatcher nests in Gloucestershire, UK, using volunteer-collected data from a 5-year period. More successful nests tended to be located in areas with a lower density of mature trees but abundant saplings. Tree and sapling species richness was also important. Success was positively related to abundance of Oak *Quercus robur* and Silver Birch *Betula pendula* and negatively related to Beech *Fagus sylvatica*, Sycamore *Acer pseudoplatanus* and Bracken *Pteridium aquilinum*. Success was lower in boxes facing south-southwest and higher in boxes located on sorter trees. Despite Pied Flycatchers often being regarded as birds of grazed (open) woodland, success was not related directly to grazing. Close proximity to footpaths was associated with significantly lower clutch size, numbers of young to fledge, and percentage success, while close proximity to water was associated with increased success at all stages of breeding. This is a single-site study and the generality of these findings at other sites cannot be assumed without empirical testing. However, the results provide useful additional insight into success-habitat interactions in this species that, to some extent, challenge the general view of Pied Flycatchers, in the UK at least, as grazed woodland specialists.

Key words: reproductive success, *Ficedula hypoleuca*, Pied Flycatcher, grazing, nestboxes, breeding, nest site selection, volunteer-collected data, citizen science

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Effect of habitat burning on the number of singing males of the Aquatic Warbler *Acrocephalus paludicola*

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Abstract. Wildfires can be the most influential phenomena in landscape dynamics and play an important role in determining avian populations. However, the intentional burning of habitats is still a controversial management practice and is legally prohibited in many countries. On the other hand, fires can positively control, or even slow down vegetation succession of reeds and bushes, and, in particular cases, may sustain a habitat for open marsh nesting specialists. One such species is the Aquatic Warbler *Acrocephalus paludicola*, a globally threatened habitat specialist that breeds in open fens in Central and Eastern Europe. Because bush and reed encroachment threaten many suitable breeding areas, habitat management is necessary to maintain the open wetlands that Aquatic Warblers require for nesting. To assess whether burning was beneficial, we analysed Aquatic Warbler numbers and distribution in the Chełm calcareous marshes in eastern Poland on plots in different successional stages after accidental fires. Our study showed that numbers of warblers, at least of singing males, were lowest in the year of fire, but increased to higher levels in the year after burning and for several years after burning. We recommend that, in calcareous marshes which support up to 0.5% of the total population of this globally threatened species, intentional burning to control succession should be done before the arrival of warblers in spring in order to ensure burning is an effective management tool.

Key words: *Acrocephalus paludicola*, Aquatic Warblers, burning, *Cladium mariscus*, calcareous marshes, conservation evidence, management practice, wildfire

Potential range shifts predict long-term population trends in common breeding birds of the Czech Republic

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Koschová M., Reif J. 2014. Potential range shifts predict long-term population trends in common breeding birds of the Czech Republic. *Acta Ornithol.* 49: 183–192. DOI 10.3161/173484714X687064

Abstract. Breeding ranges of European bird species will probably shift as a result of the climate change in forthcoming decades. Although it is unclear whether these shifts will come true, one perceives the magnitude of these shifts as a measure of the intensity of the pressure of climate change on particular species. From this perspective, it is interesting to ask how these shifts relate to current species' population trends. For this purpose, we related the data on potential northward shifts of European breeding ranges based on projections of climate change to the long-term population trends for the period 1982–2011 of birds breeding in the Czech Republic. We predicted that the relationship between the magnitude of range shift and the population trend will vary according to the geographic position of species' distribution in relation to the position of the Czech Republic. The results indicated support for this prediction. After accounting for the effects of various ecological traits like habitat association, migration and life history strategy, populations of the species with the largest shift declined, if the centre of their distribution was in the northern Europe, but increased if their distribution centre was on the south of the continent. These results suggest that the climate change is among the main factors causing recent changes in bird populations but its effects strongly depend not only on species sensitivity to these changes but also on geographic context.

Key words: birds, climate change, range shift, population trends, climatic niche

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Moulting and wintering grounds of Marsh Warblers *Acrocephalus palustris*: evidence from stable isotopes and ring recoveries

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Abstract. We analysed stable carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$) isotope ratios in Marsh Warbler *Acrocephalus palustris* feathers sampled in Europe and Africa to assess non-breeding habitat selection and location of wintering grounds of different breeding populations. Feather $\delta^{13}\text{C}$ values showed that Marsh Warblers occupy a biome dominated by C_4 vegetation during the stopover in northeastern Africa, whereas C_3 habitats are used during the complete moult in southern Africa. East European Marsh Warblers differed in their stable isotope profiles from other European regions, suggesting a certain level of population segregation in southern Africa. A dual-isotope assignment approach confirmed this difference and helped us restrict the autumn staging areas to lower elevations of the Ethiopian Highlands west of the Rift valley. Available ring recoveries, however, suggested high levels of population mixing both on migration through East Africa and in the final wintering grounds.

Key words: bird migration, feather stable isotopes, ring recoveries, stopover, migratory connectivity, $\delta^{13}\text{C}$, $\delta^{15}\text{N}$

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Trends in threat status and priorities in conservation of the woodpeckers of the world

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Lammertink M. 2014. Trends in threat status and priorities in conservation of the woodpeckers of the world. *Acta Ornithol.* 49: 207–219. DOI 10.3161/173484714X687109

Abstract. Taking the first IUCN Red List from 1988 as a starting point, I review trends in the threat status of the woodpecker species of the world, the geographical distribution of (near-) threatened woodpecker species, threat factors affecting these species, and the research output about them. Between 1988 and 2013 the number of genuinely Red Listed woodpeckers (categories Near Threatened and up) increased from 20 to 28 species and the number of species in the categories Vulnerable and up from 8 to 12. As percentage of recognised woodpecker species in the different years, the increase in Red Listed woodpecker species was even sharper. The geographical distribution of Red Listed woodpeckers stayed constant between 1988 and 2013, with over half of the species in Latin America, about one quarter in Asia, and none in Europe. A taxonomic reappraisal adopted by IUCN in 2014 raised the total number of recognised woodpecker species to 254 and of Red Listed woodpecker species to 42, of which 40% occur in Asia. Nearly all Red Listed woodpecker species on the 2013 list are threatened by deforestation. Out of 28 species, 10 are also threatened by selective logging, and these 10 are in higher threat categories. Woodpecker conservation research should focus in particular on the species sensitive to selective logging, to assess their within-habitat requirements and thresholds. The output of research on Red Listed woodpeckers in the past 25 years was heavily skewed to three North American species: Red-headed Woodpecker *Melanerpes erythrocephalus*, Red-cockaded Woodpecker *Picoides borealis* and Ivory-billed Woodpecker *Campyphilus principalis*. I identify 10 priority species to focus woodpecker conservation research on, four from Latin America: Speckle-chested Piculet *Picumnus steindachneri*, Fernandina's Flicker *Colaptes fernandinae*, Black-bodied Woodpecker *Dryocopus schulzi*, Helmeted Woodpecker *Dryocopus galeatus*; and six from Asia: Okinawa Woodpecker *Dendrocopos noguchii*, Korean White-bellied Woodpecker *Dryocopus richardsi*, Great Slaty Woodpecker *Mulleripicus pulverulentus*, Red-collared Woodpecker *Picus rabieri*, Yellow-faced Flameback *Chrysocolaptes xanthocephalus* and White-rumped Woodpecker *Meiglyptes tristis*.

Key words: IUCN Red List, old-growth forest, selective logging, threat factors, conservation, woodpeckers

What we don't know, and what needs to be known, about the cooperatively breeding Acorn Woodpecker *Melanerpes formicivorus*

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Koenig W. D., Walters E. L. 2014. What we don't know, and what needs to be known, about the cooperatively breeding Acorn Woodpecker *Melanerpes formicivorus*. Acta Ornithol. 49: 221–232. DOI 10.3161/173484714X687091

Abstract. The Acorn Woodpecker *Melanerpes formicivorus* is one of a small number of woodpecker species that are cooperative breeders, living in family groups of up to 15 individuals of both sexes and all ages and exhibiting a complex mating system involving multiple cobreeders of both sexes (polygynandry). Although much has been learned concerning the social organisation and ecology of this species, over 45 years of research at Hastings Reservation, central coastal California, USA, has left us with a large number of unanswered questions ranging from relatively minor issues such as why adults have white eyes and why juveniles have a plumage similar to adult males to more major issues such as how cavity limitation could act as a driver of their unique social behaviours and how brood reduction is adaptive. Here we briefly discuss some of these questions and speculate as to how they might be addressed by future work. Long-term studies are important as a means of addressing many demographic and behavioural questions, but are even more valuable as a means of generating new questions that would have been overlooked without detailed knowledge of natural history and general ecology.

Key words: Acorn Woodpeckers, *Melanerpes*, caching behaviour, cooperative breeding, eye colour, food storage, juvenile plumage, social behaviour, cavity

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A minimally invasive method for sampling nest and roost cavities for fungi: a novel approach to identify the fungi associated with cavity-nesting birds

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Jusino M. A., Lindner D. L., Cianchetti J. K., Grisé A. T., Brazee N. J., Walters J. R. 2014. A minimally invasive method for sampling nest and roost cavities for fungi: a novel approach to identify the fungi associated with cavity-nesting birds. *Acta Ornithol.* 49: 233–242. DOI 10.3161/173484714X687127

Abstract. Relationships among cavity-nesting birds, trees, and wood decay fungi pose interesting management challenges and research questions in many systems. Ornithologists need to understand the relationships between cavity-nesting birds and fungi in order to understand the habitat requirements of these birds. Typically, researchers rely on fruiting body surveys to identify the fungal players in these relationships. Fruiting body surveys enable nondestructive sampling, but vastly underestimate fungal presence and diversity and may miss species of critical importance to cavity-nesting birds; thus new methods for such analyses are necessary. Here we present a novel technique to nondestructively sample the wood inside tree cavities, which produces samples that can be processed using DNA-based methods to identify fungi. We tested our method on Red-cockaded Woodpecker *Picoides borealis* excavations, half of which were from trees with *Porodaedalea pini* fruiting bodies. Using our new approach, we detected *P. pini* in 90% of the excavations in trees with fruiting bodies, but also in 60% of the excavations in trees without fruiting bodies and identified nine additional taxa of wood decay fungi that did not have fruiting bodies present. Our approach offers improved detection of fungi through non-destructive sampling of excavated cavities and we developed an improved primer specific to the fungal phylum that contains most wood decay fungi (Basidiomycota), thus providing managers and researchers a critical tool to better determine which fungi are important to cavity-nesting birds.

Key words: Basidiomycota specific primer, cavity-excavating birds, cavity-nesting birds, excavators, fungi, hole-nesting birds, ITS4b-21, *Picoides borealis*, *Porodaedalea pini*, Red-cockaded Woodpecker, wood decay fungi

Habitat determinants of woodpecker abundance and species richness in sub-Himalayan dipterocarp forests of north-west India

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Kumar R., Shahabuddin G., Kumar A. 2014. Habitat determinants of woodpecker abundance and species richness in sub-Himalayan dipterocarp forests of north-west India. Acta Ornithol. 49: 243–256. DOI 10.3161/173484714X687136

Abstract. Ecological impacts of habitat change on woodpeckers remain largely unstudied in regions other than Europe and North America. The sub-Himalayan sal *Shorea robusta* forests of northwest India have 17 woodpecker species, and a history of management-induced habitat modification. We studied how habitat parameters affect woodpeckers at a community level (viz. total abundance and species richness) as well as at individual species level. We assessed woodpecker abundance, species richness and described habitat features at 8 sites representing a gradient of structure and composition in a sal-dominated landscape. We surveyed each site in 2-km-long transects 20 times over breeding and non-breeding seasons and evaluated habitat characteristics in 10 circular and belt plots. We analysed woodpecker abundance, species richness, and abundance of individual species as functions of habitat variables and season. Woodpecker encounter rates and mean species richness, respectively, ranged from 1.5 to 10.0 birds/km and 1.7 to 6.9 species per survey at individual sites. Distance-based estimates of densities for the most frequently-observed species were also obtained. Basal area (large trees) and density of snags positively influenced total woodpecker abundance and species richness, with snags being more important during breeding season. Basal area was important for Greater Flameback *Chrysocolaptes lucidus*, Grey-faced Woodpecker *Picus canus*, Fulvous-breasted Woodpecker *Dendrocopos macei* and Lesser Yellownape *Picus chlorolophus*. Snags, tree density, tree diameter and termitarium density appeared to affect Grey-capped Pygmy Woodpecker *Dendrocopos canicapillus*, Black-rumped Flameback *Dinopium benghalense*, Himalayan Flameback *Dinopium shorii* and Streak-throated Woodpecker *Picus xanthopygaeus*. Hence, for the conservation of native woodpecker communities in sal forests, it is necessary to retain large trees and standing dead wood.

Key words: bird communities, forest management, Picidae, seasonality, *Shorea robusta*, sub-Himalayas, vegetation structure, selective logging

Global trends in woodpecker cavity entrance orientation: latitudinal and continental effects suggest regional climate influence

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Landler L., Jusino M. A., Skelton J., Walters J. R. 2014. Global trends in woodpecker cavity entrance orientation: latitudinal and continental effects suggest regional climate influence. *Acta Ornithol.* 49: 257–266. DOI 10.3161/173484714X687145

Abstract. Animal constructions represent an extension of the individual phenotype upon which selection may act to create discernable population level patterns. Here we explore global patterns in woodpecker cavity entrance orientation to infer underlying selective forces that shape cavity construction. We performed a comprehensive systematic meta-analysis of woodpecker cavity entrance orientation from 80 populations of 23 species of woodpeckers and other picids throughout the Northern Hemisphere. We show that woodpecker cavity entrance orientation is typically non-random, suggesting that selection acts on cavity entrance orientation. The proportion of studies in which significant results were found increased significantly with sample size, and we estimated that more than half of the studies with a sample size of at least 100 showed non-random cavity entrance orientation. Populations occurring at higher latitudes preferred a more southerly orientation, indicating that temperature or something related thereto may be driving cavity entrance orientation. Differences between Eurasia and North America in orientation are consistent with this hypothesis. Taxonomic relationships were not a significant predictor of the strength of orientation and thus unrelated woodpecker populations respond similarly to regional environmental drivers. Our results demonstrate latitudinal and continental patterns that strongly suggest regional climate as a selective force on cavity entrance orientation. Further work utilizing available long-term data sets throughout the world promises to uncover possible fitness consequences of cavity orientation on woodpeckers.

Key words: animal architecture, building alignment, primary excavators, Picidae, nest site selection, cavity entrance orientation, nest holes

Mates exhibit similar brightness of carotenoid red caps in Middle Spotted Woodpeckers *Dendrocopos medius*

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Leniowski K., Węgrzyn E., Kosiński Z. 2014. Mates exhibit similar brightness of carotenoid red caps in Middle Spotted Woodpeckers *Dendrocopos medius*. *Acta Ornithol.* 49: 267–272. DOI 10.3161/173484714X687154

Abstract. Most bird species display sexually dimorphic traits. In contrast to this general rule, both males and females of the Middle Spotted Woodpecker present a carotenoid red cap, which constitutes mutual ornamentation. In our study we investigated whether pair members are matched in terms of the brightness of this ornament. We also examined the similarity between mates in red cap size as well as biometric parameters, such as weight and the length of the wing, beak and tarsus. We found that males and females within pairs were positively assortatively mated with respect to the red cap brightness as well as body weight. We found no similarity between pair members neither in red cap size nor the length of wing, beak or tarsus. We discuss our findings in the light of mutual mate choice, social competitions and other factors that may account for the similarity in expression of the red cap in the studied species.

Key words: mutual ornamentation, assortative mating, carotenoid ornaments, Middle Spotted Woodpecker

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Influence of old coniferous habitat on nestling growth of Black-backed Woodpeckers *Picoides arcticus*

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Tremblay J. A., Ibarzabal J., Savard J.-P. L., Wilson S. 2014. Influence of old coniferous habitat on nestling growth of Black-backed Woodpeckers *Picoides arcticus*. Acta Ornithol. 49: 273–279. DOI 10.3161/173484714X687172

Abstract. Nest success is often used to evaluate the impact of environmental stressors on species, but nestling growth may also be indicative of subtle consequences on individual fitness. We monitored Black-backed Woodpecker *Picoides arcticus* nestling growth in unburned boreal forests under the influence of commercial logging. The objectives of our exploratory study were to estimate growth rate constants of weight and three morphometric measures (culmen length, tarsal length and wing length) in nestling Black-backed Woodpeckers and to determine how the amount of old coniferous habitat in home ranges may affect these rates. The amount of old coniferous habitat positively influenced weight gain in Black-backed Woodpecker nestlings but did not influence the three morphometric measures of growth rate. Our results suggest that Black-backed Woodpecker fitness may be affected by the reduction of old coniferous habitat in managed forest landscapes. We encourage further studies on the relationship between habitat quality and nestling growth as a potentially useful indicator of how habitat loss might influence individual fitness in these species.

Key words: cavity-nesting bird, fitness, forest management, nestling growth rate, unburned boreal forest, woodpecker

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