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REVIEW

Nestling food of European hole-nesting passerines: do we know enough to test the adaptive hypotheses on breeding seasons?

Marta CHOLEWA & Tomasz WESOŁOWSKI

Laboratory of Forest Biology, Wrocław University, Sienkiewicza 21, 50–335 Wrocław, POLAND, e-mail: mcholewa@biol.uni.wroc.pl

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Abstract. Hole-nesting passerines constitute a 'model' group for which importance of synchronisation between food availability — mainly caterpillars — and appearance of nestlings is commonly postulated. Is there an adequate set of data allowing one to prove this relationship? The recent climate change could lead to a mis-match between food peaks and nestlings' appearance. Do the data exist that show that the birds have switched to other food sources?
We analyse data on nestling food of eleven European hole-nesting passerines (158 papers). The diet of some species is hardly known (< 100 broods observed), there are large gaps in geographical coverage (70% of data from five countries — Germany, Russia, Slovakia/Czech Republic, Poland and Great Britain) and most of studies do not meet the minimum requirement of representativeness (three seasons, ≥ 20 broods/season), which limits their external validity. The majority of investigations were done decades ago, in different conditions and most probably they cannot be treated as representative for the current situation. There is no study in which the past (before warming) and current nestling diet in the same local population have been compared, so, direct empirical support for the 'mismatch' idea is rather weak. Knowledge of nestling diet and its variation is far from adequate and new, properly designed, studies are needed.

Key words: timing of breeding, caterpillar peak, climate change, Great Tit *Parus major*, Blue Tit *Cyanistes caeruleus*, Coal Tit *Periparus ater*, Crested Tit *Lophophanes cristatus*, Marsh Tit *Poecile palustris*, Willow Tit *Poecile montanus*, Redstart *Phoenicurus phoenicurus*, Pied Flycatcher *Ficedula hypoleuca*, Collared Flycatcher *Ficedula albicollis*, European Starling *Sturnus vulgaris*, Eurasian Nuthatch *Sitta europaea*

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Home range and habitat use by Aquatic Warblers *Acrocephalus paludicola* on their wintering grounds in Northwestern Senegal

Susanne ARBEITER[1] & Cosima TEGETMEYER[2]

[1]University of Potsdam, Institute for Biochemistry and Biology, Maulbeerallee 1, 14469 Potsdam, GERMANY, e-mail: arbeiter@uni-potsdam.de
[2]University of Greifswald, Institute of Botany and Landscape Ecology, Grimmer Str. 88, 17487 Greifswald, GERMANY, e-mail: cosima.tegetmeyer@uni-greifswald.de

Arbeiter S., Tegetmeyer C. 2011. Home range and habitat use by Aquatic Warblers *Acrocephalus paludicola* on their wintering grounds in Northwestern Senegal. Acta Ornithol. 46: 117–126. DOI 10.3161/000164511X625883

Abstract. The Aquatic Warbler *Acrocephalus paludicola* was once a common breeding bird in mesotrophic fen mires all over Central and Western Europe. In the last century large parts of its habitat have been destroyed by wetland drainage and agricultural intensification. Besides protecting the remaining breeding habitats, it is of great importance to preserve suitable migration stopover habitats and wintering grounds to avert the extinction of the species.
We determined home-range size and the use of vegetation associations of Aquatic Warblers on the wintering grounds in a flooded plain north of the Djoudj National Park in Senegal. Individual birds (11) were caught in mist nets and equipped with radio transmitters. Locations were assessed by radiotelemetry and a compositional analysis was conducted to determine which vegetation types were preferred within home ranges.
Similar to their behaviour on the breeding grounds, the Aquatic Warblers showed no territorial behaviour in their winter quarters. They used home ranges that averaged 4 ha in size, which they shared with conspecifics and other warblers. The home ranges overlapped 54% on average, with a maximum of 90% in an area used by four individuals. The vegetation structure of the wintering habitat is similar to breeding grounds and stopover sites of the species. Preferential vegetation had 80% to 100% cover and consisted of 60 to 90 cm high stands of *Oryza longistaminata*, *Scirpus maritimus* or *Eleocharis mutata*. Most birds stayed more often near the edge of open water, probably for foraging. A constant inundation seems essential, because Aquatic Warblers never occurred in desiccated parts of the study site.

Key words: *Acrocephalus paludicola*, Djoudj National Park, radio telemetry, transsaharan migrant, vegetation structure

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Ranging behaviour of non-breeding Eurasian Griffon Vultures *Gyps fulvus*: a GPS-telemetry study

Clara García-Ripollés, Pascual López-López & Vicente Urios

Vertebrate Zoology Research Group, CIBIO, University of Alicante, Apdo. 99, E–03080, Alicante, SPAIN, e-mail: Clara.Garcia@uv.es

García-Ripollés C., López-López P., Urios V. 2011. Ranging behaviour of non-breeding Eurasian Griffon Vultures *Gyps fulvus*: a GPS-telemetry study. Acta Ornithol. 46: 127–134. DOI 10.3161/000164511X625892

Abstract. Little is known about the spatial ecology and ranging behaviour of vultures in Europe. In this paper we used GPS satellite telemetry to assess home-ranges of eight non-breeding Eurasian Griffon Vultures in Spain, trying to answer the main questions on when (i.e. the time of the day), how far (i.e. hourly and daily distances) and where vultures range (i.e. home-range size). Results indicated that vultures ranged extensively mainly in areas where traditional stock-raising practices and pasturing were still common, also including some vulture restaurants, which were visited occasionally. Eurasian Griffon Vultures concentrated their hourly and daily movements in the middle of the day, when the availability of thermal updrafts was higher, favouring foraging activities. The overall foraging range, calculated as Minimum Convex Polygon (MCP) (7419 km^2), or as 95% and 50% kernel contours (4078 km^2 and 489 km^2, respectively), was higher than those reported in previous studies. The precise knowledge of the ranging behaviour and spatial parameters is particularly important for the conservation of scavenger species inhabiting human-dominated areas where human activities may jeopardize vulture populations in the long term.

Key words: conservation, daily activity, home-range, satellite-tracking, Spain, spatial ecology

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How many Aquatic Warblers *Acrocephalus paludicola* stop over in France during the autumn migration?

Frédéric JIGUET[1*], François CHIRON[1], Olivier DEHORTER[1], Hubert DUGUÉ[2], Pascal PROVOST[3], Raphaël MUSSEAU[4], Gaétan GUYOT[5], Franck LATRAUBE[6], Philippe FONTANILLES[7], Emmanuel SÉCHET[8], Julien LAIGNEL[9], Xavier GRUWIER[10] & Arnaud LE NEVÉ[5]

[1]UMR 7204 MNHN-CNRS-UPMC, Centre de Recherches sur la Biologie des Populations d'Oiseaux, CP 51, 55 Rue Buffon, 75005 Paris, FRANCE
[2]Association ACROLA, La Jannais des Douets, 44360 Cordemais, FRANCE
[3]Maison de l'Estuaire, RNN Estuaire de Seine, 20 rue Jean Caurret, 76600 Le Havre, FRANCE
[4]BioSphère Environnement, 52 quai de l'Estuaire, 17120 Mortagne-sur-Gironde, FRANCE
[5]Bretagne Vivante SEPNB, 186 rue Anatole France, B.P. 63121, 29231 Brest cedex 3, FRANCE
[6]Réserve du Massereau, Station ONCFS, Les Champs Neufs, 44320 Frossay, FRANCE
[7]Observatoire d'Intéręt Ornithologique, Cami deth Sailhetou, 65400 Lau Balagnas, FRANCE
[8]20 rue de la Résistance, 49125 Cheffes, FRANCE
[9]Cap Ornis Baguage, 10 rue de la Maladrerie, 59181 Steenwerck, FRANCE
[10]Maison du garde, Les Escardines, 62215 Oye plage, FRANCE
*Corresponding author, e-mail: fjiguet@mnhn.fr

Jiguet F., Chiron F., Dehorter O., Dugué H., Provost P., Musseau R., Guyot G., Latraube F., Fontanilles P., Séchet E., Laignel J., Gruwier X., Le Nevé A. 2011. How many Aquatic Warblers *Acrocephalus paludicola* stop over in France during the autumn migration? Acta Ornithol. 46: 135–142. DOI 10.3161/000164511X625900

Abstract. The autumn world population of the endangered Aquatic Warbler *Acrocephalus paludicola* probably numbers between 23 000 and 69 000 individuals, including 5 000 to 44 000 first-year individuals, depending on variation in breeding success and post-fledging survival. After breeding, the species migrates as early as August along a westerly route along French coast to reach its African wintering grounds. In 2009, French ringers have carried out targeted mist-netting to enhance the capture of the species, using tape luring in suitable habitats. Overall, 874 different individuals were captured in France in that year. In 2010 similar ringing effort allowed the capture of 646 different individuals. From this ringing information, we propose a simple method to estimate the number of individuals which stopped in the country during the autumn migration, considering all birds or first-years only. Splitting the country in two parts (northern and southern), the method uses the total number of captures and the number of southern recaptures of birds first ringed in the north. Overall, we estimated that between 24 000 and 30 000 individuals — most of them in their first calendar year — stop in France each year during the fall migration. These estimates suggest that probably all first-year Aquatic Warblers migrate by this western flyway and stop in France to refuel, while adults may partly use a different flyway or may stop in France, but for shorter times or at fewer sites. The proposed figures highlight the importance of maintaining suitable refuelling habitats for the species all along coastal France.

Key words: *Acrocephalus paludicola,* capture effort, recaptures, refuel, ringing, stopover

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Differences between the predictors of abundance, trend and distribution as three measures of avian population change

Jaroslav KOLEČEK[1,2*] & Jiří REIF[1,3]

[1]Department of Zoology and Laboratory of Ornithology, Palacký University in Olomouc, Tř. Svobody 26, CZ-77146 Olomouc, CZECH REPUBLIC
[2]Biodiversity and Climate Research Centre (BiK-F), Senckenberganlage 25, D-60325 Frankfurt (Main), GERMANY
[3]Institute for Environmental Studies, Faculty of Science, Charles University in Prague, Benátská 2, CZ-12801 Praha 2, CZECH REPUBLIC
*Corresponding author, e-mail: j.kolecek@email.cz

Koleček J., Reif J. 2011. Differences between the predictors of abundance, trend and distribution as three measures of avian population change. Acta Ornithol. 46: 143–153. DOI 10.3161/000164511X625919

Abstract. Changes in bird populations can be described as simple changes in abundance or density of individuals or, in larger areas, as changes of distribution or population indices. Although these measures describe different aspects of population change, they are often used interchangeably when discussing the relationships between various predictors of bird population changes found in different studies. This hampers a meaningful comparison of results, because it is unclear which differences between studies are biologically relevant and which are just methodological artifacts, caused by the different nature of measures used to quantify population changes. We compared predictors of the three measures of population changes: (i) change in abundance, (ii) change in magnitude of population trend and (iii) change in distribution, using data collected in a single region, the Czech Republic, and over similar time periods. We also aimed to identify significant drivers of population changes of Czech birds, using a large set of predictor variables and virtually all species regularly breeding in the region. No significant predictors were common across the three measures of population change tested. Abundance increased mostly in forest birds, while the change in magnitude of population trend was positive in species with a higher level of legal protection and in r-selected species. Species extending their distribution include wetland birds, above-ground nesters and north European species. Although individual measures of population changes are positively correlated, their predictors are different. This limits possibilities of simple comparisons, but also offers a better insight into forces shaping bird population changes in time and space.

Key words: abundance, distribution, population trend, population changes, land-use change

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Nest-sites used by Stock Doves *Columba oenas*: what determines their occupancy?

Ziemowit KOSIŃSKI[1], Elżbieta BILIŃSKA[2], Julian DEREZIŃSKI[3] & Marcin KEMPA[4]

[1]Department of Avian Biology and Ecology, Institute of Environmental Biology, Faculty of Biology, Adam Mickiewicz University, Umultowska 89, 61–614 Poznań, POLAND, e-mail: zkosinsk@amu.edu.pl
[2]Department of Bast Fibre Plants Breeding and Agronomy, Institute of Natural Fibres and Medicinal Plants, Wojska Polskiego 71b, 60–630 Poznań, POLAND
[3]Rościnno 36, 62–085 Skoki, POLAND
[4]Ludowa 28, 63–700 Krotoszyn, POLAND

Kosiński Z., Bilińska E., Dereziński J., Kempa M. 2011. Nest-sites used by Stock Doves *Columba oenas*: what determines their occupancy? Acta Ornithol. 46: 155–163. DOI 10.3161/000164511X625928

Abstract. Nest-site preferences of the Stock Dove *Columba oenas* population breeding in holes excavated by the Black Woodpecker *Drycopus martius* in three sites in western Poland was examined. During the surveys, 176 different trees with 326 holes of Black Woodpeckers were found and investigated. Habitat data at nest locations were characterized on a fine microhabitat scale — hole tree. We used individual selection indices and canonical variate analysis to describe nest-site preferences. Both analyses provided similar results. Nest-site selection of the Stock Dove was consistently associated with live beeches *Fagus sylvatica* with more than one hole. These features were clearly associated with diameter at breast height. Moreover, holes situated higher in tree trunk were preferred. Dead trees, mostly Scots Pines *Pinus sylvestris*, were avoided by the Stock Dove. We suggest that positive selection for smooth-barked beech trees with a number of holes, as well as holes situated higher might reduce the risk of predation by arboreal predators, e.g. the Pine Marten *Martes martes*. The positive selection for live trees, and clear avoidance of the dead ones, may reduce the cost of incubation and thermoregulation. Moreover, the live beech trees have long life expectancy compared to other tree species. Our results provide evidence that large alive beech trees with the number of holes excavated by Black Woodpeckers are necessary for maintaining breeding population of the Stock Dove.

Key words: Stock Dove, nest-site selection, woodpecker-made holes, Black Woodpecker, keystone species

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Faecal analysis as a method of nestling diet determination in insectivorous birds: a case study in Blue Tits *Cyanistes caeruleus* and Great Tits *Parus major*

Marek MICHALSKI[1], Jerzy NADOLSKI[1], Barbara MARCINIAK[2], Barbara LOGA[1] & Jerzy BAŃBURA[2]

[1]Natural History Museum, University of Łódź, Kilińskiego 101, 90–011 Łódź, POLAND, e-mail: nadolski@biol.uni.lodz.pl
[2]Department of Experimental Zoology and Evolutionary Biology, University of Łódź, Banacha 12/16, 90–237 Łódź, POLAND, e-mail: jbanb@biol.uni.lodz.pl

Michalski M., Nadolski J., Marciniak B., Loga B., Bańbura J. 2011. Faecal analysis as a method of nestling diet determination in insectivorous birds: a case study in Blue Tits *Cyanistes caeruleus* and Great Tits *Parus major*. Acta Ornithol. 46: 164–172. DOI 10.3161/000164511X625937

Abstract. Insectivorous birds have very diversified diet, but particular species usually show some specialisation, which leads to a varying level of dependence on special prey. Their reproductive cycles are dependent on the availability of appropriate arthropods; in the case of Blue Tits *Cyanistes caeruleus* and Great Tits *Parus major* reproduction is usually coordinated with the availability of caterpillars as the key food for nestlings. Therefore a picture of nestling diet, with some estimates of the actual frequency of caterpillars and alternative prey, is an important component of explanations of aspects of Tit life-histories. As in most cases a rough assessment of diet composition and relative proportions of prey items is satisfactory, we suggest that faecal analysis is a feasible method to get such a picture. Droppings may be collected to examine the diet of individual nestlings grouped in broods, at a particular age stage or at many stages reflecting development. The most time-consuming part of this method includes segregation and identification of prey remains in the laboratory. We draw attention to the procedures and the most diagnostically useful features of arthropod prey of Tits. Especially, we provide clues to identification of the remains of different arthropods. As an example, clypeus proved to be the most valuable structure to identify caterpillars, while chelicerae were the most diagnostically significant in Arachnids. Exemplary results on diet spectrum for the Blue Tit and Great Tit are also presented. Faecal analysis is fast and effortless at the sampling stage, with almost all effort being postponed to the stage of laboratory work.

Key words: *Cyanistes*, *Parus*, nestlings, food, arthropods, droppings, method, diet

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Effects of land use on nocturnal birds in a Mediterranean agricultural landscape

David MORENO-MATEOS[1,3,*], José M. REY BENAYAS[2,3], Lorenzo PÉREZ-CAMACHO[2], Enrique de la MONTAÑA[2,3], Salvador REBOLLO[2] & Luis CAYUELA[3,4]

[1]Integrative Biology Department, University of California at Berkeley, 1005 Valley Life Sciences Building, Berkeley, CA 94720, USA
[2]Department of Ecology, University of Alcalá, E-28871 Alcalá de Henares, SPAIN
[3]International Foundation for Ecosystem Restoration (FIRE), University of Alcalá, E-28871 Alcalá de Henares, SPAIN
[4]Department of Biology and Geology, Rey Juan Carlos University, E-28993 Móstoles, SPAIN
*Corresponding author, e-mail: davidmoreno@berkeley.edu

Moreno-Mateos D., Rey Benayas J. M., Pérez-Camacho L., de la Montaña E., Rebollo S., Cayuela L. 2011. Effects of land use on nocturnal birds in a Mediterranean agricultural landscape. Acta Ornithol. 46: 173–182. DOI 10.3161/000164511X625946

Abstract. Knowledge on the effects of land use on community composition and species abundance is crucial for designing realistic conservation strategies, particularly in highly dynamic systems such as Mediterranean agricultural mosaics that are subjected to intensive cultivation. We investigated these effects on the nocturnal bird species occurring in the study area (Stone Curlew *Burhinus oedicnemus*, Red-necked Nightjar *Caprimulgus ruficollis*, Barn Owl *Tyto alba*, Eurasian Scops Owl *Otus scops*, Little Owl *Athene noctua*, Tawny Owl *Strix aluco*, Long-eared Owl *Asio otus*, Short-eared Owl *Asio flammeus* and Eagle Owl *Bubo bubo*) across an agricultural-natural habitat mosaic in Central Spain for three consecutive years. Shares of vineyards, scrubland, herbaceous cropland, water bodies, and roads significantly affected the composition of the nocturnal bird community. Herbaceous cropland and olive groves, which covered 50% of the study area, proved to be neutral for all species. Remnant patches of natural and semi-natural scrubland (around 10% of the study area) and water bodies (only 1.5% of the study area) showed a positive effect on Eagle Owls, Eurasian Scops Owls, Long-eared Owls, and Red-necked Nightjars. Vineyard (35% of the study area) had a negative influence on Eagle Owls, Long-eared Owls, and Eurasian Scops Owls. Our results indicate, first, that the relative extent of land use types was apparently not related with the presence of nocturnal bird species and, second, that natural scrublands and water bodies are key habitats for assuring the persistence of nocturnal birds in agricultural Mediterranean landscapes. Current land planning focused toward land use intensification will likely increase the areas of habitats that are neutral or have adverse effects on nocturnal birds.

Key words: agricultural intensification, agricultural landscape, farmland, population conservation, owl, nightjar, Stone Curlew

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Fidelity to roost sites and diet composition of wintering male urban Common Kestrels *Falco tinnunculus*

Jan RIEGERT & Roman FUCHS

Faculty of Science, University of South Bohemia in České Budějovice, Branišovská 34, 370 05 České Budějovice, CZECH REPUBLIC, e-mail: honza@riegert.cz

Riegert J., Fuchs R. 2011. Fidelity to roost sites and diet composition of wintering male urban Common Kestrels *Falco tinnunculus*. Acta Ornithol. 46: 183–189. DOI 10.3161/000164511X625955

Abstract. During harsh winters, partially migratory raptors face to making a decision whether leave their breeding sites or not. However, decision to leave brings advantages for maintaining own body condition, but also disadvantages for further reproduction. We studied individual variability in fidelity to roost sites during two winters. The kestrel males in České Budějovice (Southern Bohemia) roost near their breeding sites for most of the winter. Individuals occupy the same roost site continuously, unless they temporarily leave the city. We collected pellets at the males' roost sites from November to April in 1996/1997 and 1997/1998. We analysed the factors that affect males' presence (proportion of days with snow cover — PSC, snow depth and mean temperature). There were fewer absences, overall, in 1997/1998 than in 1996/1997, probably due to milder weather conditions, and better prey availability. Individuals responded differently to periods of snow cover; some males left the city but others remained. Males that remained had a higher proportion of non-vole prey (birds, insectivors and insects) in their diet compared to those that left. Moreover, the proportion of birds in diet was positively correlated with PSC in males that stayed at roost sites during the period with snow cover. We suggest that males able to feed on birds during snow cover could remain in the city in harsh winters, and this would give them an advantage during competition for breeding sites in the following spring.

Key words: diet composition, *Falco tinnunculus*, Kestrel, winter roost fidelity, urbanization

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Plumage bacterial load is related to species, sex, biometrics and fledging success in co-occurring cavity-breeding passerines

Pauli SAAG[1], Raivo MÄND[1], Vallo TILGAR[1], Priit KILGAS[1,2], Marko MÄGI[1] & Elo RASMANN[1]

[1]Department of Zoology, Institute of Ecology and Earth Sciences, University of Tartu, 46 Vanemuise Str., Tartu, 51014, ESTONIA, e-mail: pauli.saag@ut.ee
[2]Department of Zoology and Entomology, University of Pretoria, Private Bag X20, Hatfield 0028, SOUTH AFRICA

Saag P., Mänd R., Tilgar V., Kilgas P., Mägi M., Rasmann E. 2011. Plumage bacterial load is related to species, sex, biometrics and fledging success in co-occurring cavity-breeding passerines. Acta Ornithol. 46: 191–201. DOI 10.3161/000164511X62596

Abstract. Plumage bacteria might influence the trade-off between parental and self-preening efforts in birds, therefore affecting breeding success. However, too little is known about natural variation patterns in plumage bacterial communities for these hypotheses to be thoroughly assessed. We studied the density and phylotypic richness of plumage bacterial assemblages in wild breeding populations of Pied Flycatchers *Ficedula hypoleuca* and Great Tits *Parus major* in the same area and breeding season, using flow cytometry and ribosomal intergenic spacer analysis (RISA). The density of plumage bacteria was higher in Tits than in Flycatchers, providing evidence that bacterial microflora differs even between co-occurring hosts that share habitat, nest site and foraging preferences. It is concurrent with the finding that migratory birds might have lower bacterial loads than sedentary birds. In both species bacterial loads were higher in females than in males, which along with two earlier studies, indicates the generality of this sex pattern. A negative correlation between parental body mass and the richness of feather-degrading bacterial phylotypes was found in Pied Flycatchers. In Great Tits, higher bacterial densities in the plumage of parent birds were associated with the production of fewer fledglings. However, the causality of these associations remains to be tested experimentally.

Key words: microbe-host interactions, feather-degrading bacteria, cavity nesters, Great Tit, Pied Flycatcher

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Deteriorating weather conditions predict the use of suboptimal stopover sites by Aquatic Warblers *Acrocephalus paludicola*

Juan ARIZAGA[1], Agustín MENDIBURU[1], Miren ANDUEZA[1,2], Philippe FONTANILLES[3], Jean-Marc FOURCADE[3] & Patrice URBINA-TOBIAS[3]

[1]Aranzadi Sciences Society, Zorroagagaina 11, E-20014 Donostia, SPAIN, e-mail: jarizaga@aranzadi-zientziak.org
[2]"Cavanilles" Institute of Biodiversity and Evolutionary Biology, University of Valencia, Apdo. 22085, E-46071 Valencia, SPAIN
[3]Observatoire d'Intérêt Scientifique Ornithologique (OISO), Cami deth Sailhetou, F-65400 Lau Balagnas, FRANCE

Arizaga J., Mendiburu A., Andueza M., Fontanilles P., Fourcade J.-M., Urbina-Tobias P. 2011. Deteriorating weather conditions predict the use of suboptimal stopover sites by Aquatic Warblers *Acrocephalus paludicola*. Acta Ornithol. 46: 202–206. DOI 10.3161/000164511X625973

Abstract. The Aquatic Warbler *Acrocephalus paludicola* is a globally threatened songbird and its decline is related to habitat loss. Accordingly, most studies dealing with the stopover ecology of this species have been chiefly focused on the habitat use and the availability of suitable habitats along its route of migration. In contrast, much less attention has been paid to other environmental causes potentially explaining the use of stopover sites. Our aim here was to investigate whether the Aquatic Warbler at an apparently suboptimal stopover site with small area of suitable habitats stops over only during adverse weather conditions. We used data obtained at a suboptimal (Jaizubia marshland, northern Iberia) and another optimal (Villefranque, southwestern France) stopover sites during the autumn migration over four seasons (2007–2010). The Aquatic Warbler tended to stop over at Jaizubia in days with rain, a fact that was not so evident at Villefranque, supporting the hypothesis that they used the suboptimal site only, or mostly, when adverse weather conditions forced them to land. In contrast, the optimal habitat was used independently of weather conditions. To properly identify key stopover localities for the Aquatic Warbler, we should consider the potential influence of adverse weather in occurrence of individuals, especially in small areas without preferred habitat.

Key words: migration, stopovers, tailwind, weather, rain, western Pyrenees

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Body condition parameters of nestling Great Tits *Parus major* in relation to experimental food supplementation

Jerzy BAŃBURA[1], Mirosława BAŃBURA[2], Michał GLĄDALSKI[1], Adam KALIŃSKI[3], Marcin MARKOWSKI[1], Marek MICHALSKI[2], Jerzy NADOLSKI[2], Joanna SKWARSKA[1] & Piotr ZIELIŃSKI[4]

[1]Department of Experimental Zoology and Evolutionary Biology, University of Łódź, Banacha 12/16, 90–237 Łódź, POLAND, e-mail: jbanb@biol.uni.lodz.pl
[2]Natural History Museum, University of Łódź, Kilińskiego 101, 90–011 Łódź, POLAND
[3]Department of Teacher Training and Biological Diversity studies, University of Łódź, Banacha 1/3, 90–237 Łódź, POLAND
[4]Department of Ecology and Vertebrate Zoology, University of Łódź, Banacha 12/16, 90–237 Łódź, POLAND

Bańbura J., Bańbura M., Glądalski M., Kaliński A., Markowski M., Michalski M., Nadolski J., Skwarska J., Zieliński P. 2011. Body condition parameters of nestling Great Tits *Parus major* in relation to experimental food supplementation. Acta Ornithol. 46: 207–212. DOI 10.3161/000164511X625991

Abstract. Amount of food supplied to nestlings by their parents is considered to affect the development of nestling physiological condition. In this study we supplied parental Great Tits *Parus major* with extra food, larvae of *Tenebrio molitor*, put into feeders close to nest-boxes, assuming that this should facilitate parental care and, as a consequence, nestling nutrition. The following nestling characteristics measured 13 days after hatching were analysed: body mass, haematocrit, blood concentrations of haemoglobin, glucose and triglycerides, heterophil-to-lymphocyte ratio (H/L), and patagium swelling after PHA injection. Nestlings from extra food broods were significantly heavier than control ones. They also had lower H/L, which indicated lower stress. No other variable was significantly affected by the experiment. Possibly, the rainy weather and non-restrictive natural trophic conditions during the experiment caused weakening of the net benefits from extra food.

Key words: *Parus major*, nest-box population, extra-food experiment, physiological parameters, food limitation

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