Ringing & Migration

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/tram20

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To cite this article: Diego Villanúa, David Campión, Miguel M. Elósegi & Juan Arizaga (2021): Wing-feather moult of the White-backed Woodpecker *Dendrocopos leucotos lilfordi*, Ringing & Migration, DOI: 10.1080/03078698.2021.1974526

To link to this article: https://doi.org/10.1080/03078698.2021.1974526

Published online: 18 Oct 2021.

RINGING & MIGRATION
https://doi.org/10.1080/03078698.2021.1974526

Wing-feather moult of the White-backed Woodpecker *Dendrocopos leucotos lilfordi*

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ABSTRACT

Determining the age of specimens is of great help in wildlife management, especially for rare or threatened species in which each individual has a high value. In birds, differences in moulting pattern between juveniles and adults may in some cases allow determination of a bird's age from the examination of its plumage. In the present study, we analyse the moult of 19 breeding individuals of White-backed Woodpecker *Dendrocopos leucotos lilfordi* captured for GPS tagging in the Pyrenees, in order to describe, for the first time, the moulting pattern of this endangered woodpecker. Two well-differentiated groups of adult birds were identified: those that underwent a partial moult, and were classified as second-calendar-year birds, and those that performed a complete one and were classified as older. The first group had renewed most lesser and median coverts, all primaries and the innermost greater coverts, thus showing clear moult limits between the primaries and secondaries and within the greater coverts. Some individuals also replaced up to two more greater coverts (GC5–6). Individuals classified as older birds showed all feathers to be of a single generation, indicating that they had undergone a complete moult. A few individuals in this category retained a few unmoulted secondaries and primary coverts, however. A recapture of a bird with a complete moult, which had been captured a year before showing a partial moult, would confirm these moult sequences to be age dependent. This moulting pattern is very similar to that described for other spotted woodpeckers, and allows researchers to determine the ages of breeding individuals during the nesting season.

ARTICLE HISTORY
Received 7 December 2020
Accepted 11 March 2021

Feathers are structures that wear due to the action of external agents, such as weather and ectoparasites (like mites or lice), so must be periodically replaced. This renewal of feathers is called moult and it is, together with breeding and migration, one of the most energy-demanding events in a bird's life cycle (Newton 2009). To prevent the demand for energy becoming unsustainable, moult has little or no overlap with the other two processes in small and medium-sized birds (Jenni &Winkler 2020 a, b). For this reason, moult patterns vary between species, even between populations, depending on their migratory behaviour and reproductive strategy (Ginn & Melville 1983). Furthermore, moult patterns can also vary among individual birds within a population: for example, it is common for adults to undergo different moults from younger birds (Svensson 1992, Baker 1993, Demongin 2013).

This difference between age classes is very useful to distinguish age in most birds: hence, plumage examination and the identification of the feathers involved in a given moult process is often useful for ageing. For instance, among small and medium-sized birds like most passerines or woodpeckers, many long-distance migrants have too little time to moult after breeding and before the post-breeding migration, as they normally breed relatively late within the season and depart early to their wintering grounds (Newton 2009). Therefore, in these species, first-year birds and adults usually moult all their plumage after they reach their wintering areas (Jenni & Winkler 2020a). In autumn, these two age categories can be distinguished because the adults will have heavily worn plumage, while the first-year birds will show new, fresh plumage (e.g. Svensson 1992). Resident species, however, normally have a long period after breeding and before the harshest part of the winter and, therefore, both first-year birds and adults can undergo a complete moult after breeding (Jenni & Winkler 2020a). In

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these cases, once this moult has ended there are no differences between these two age groups. Between these two strategies, there are intermediate moult patterns that are often characterised by complete moults in adults, and partial ones in first-year birds (Svensson 1992). In the largest species, like many eagles and vultures and some owls, feathers cannot all be replaced in a single year, giving rise to more complex moult patterns that, overall, often allow several age classes to be differentiated (Baker 1993, Demongin 2013, Zuberogoitia *et al* 2015).

Despite the importance of moult for birds, due to its pivotal role within the annual cycle of every bird, studies dealing with this subject are not common and they are often based on the analysis of museum skins rather than on birds captured alive (Newton 2009). This scenario applies particularly to the European woodpeckers (but see Baker 1993, Winkler *et al* 1995, Demongin 2013, Winkler 2013, Blasco-Zumeta 2020). In general, adult woodpeckers would undergo a complete moult just after breeding, while juveniles would do a partial moult that would affect the tail, primaries, body feathers, lesser and median coverts and some (inner) greater coverts (Baker 1993, Winkler *et al* 1995, Pyle & Howell 1996, Demongin 2013, Winkler 2013, Blasco-Zumeta 2020). By contrast, all or most primaries, secondaries, tertials and (outer) greater coverts would be retained, so that in these cases the juvenile feathers would remain until the first complete moult in the second year of life.

A detailed description of moult has not yet been compiled for the Pyrenean population of the White-backed Woodpecker *Dendrocopos leucotos lilfordi* (Cramp 1985). The only information about this issue comes from a study probably based on four museum skins, where it is simply mentioned that adults may renew most of their plumage by October (Purroy 1972). According to Cramp (1985), the White-backed Woodpecker moults like the Great Spotted Woodpecker *Dendrocopos major* but with earlier timing. Nothing is reported about differences between populations, though the paucity of data on *lilfordi* is acknowledged (Cramp 1985), This well-differentiated taxon could qualify as a separate species, according to recent genetic studies (Pons *et al* 2020).

The development of a project in the Spanish Pyrenees aiming to tag some White-backed Woodpeckers with GPS devices has also allowed us to document moult. Thus the aim of the present study is to describe the moult of breeding individuals of White-backed Woodpecker, to evaluate how moult may vary between age classes and assess how an examination of the extent of moult might be useful for ageing.

Material and methods

The fieldwork was carried out in three forests of beech *Fagus sylvatica* in the Navarran Pyrenees, all of them designated as Natura 2000 sites (codes ES0000126, ES2200019 and ES2200018). Overall, these sites host more than 90% of the White-backed Woodpeckers in Spain (Campión & Senosiain 2004). Birds were captured for a GPS-tagging programme that started in 2017 (HABIOS project; Campión *et al* 2020a, b). Captures were made during the breeding period using mist nets placed close to nests, at heights of 9.25–12.95 m, using a pulley system (Campión *et al* 2020b). Once captured, every bird was ringed, aged as juvenile or older bird (juvenile birds were those showing juvenile plumage, before moulting any feather), measured and equipped with a GPS (Campión et al 2020b). Then, photographs of one of the wings (dorsal view), the rump and the tail were taken in order to examine their moult status. Finally, the state of moult was recorded according to Ginn & Melville (1983) assigning the value 0 to the old feathers, 5 to the new feathers and 1–4 to the growing ones. In the cases in which, for various reasons, the moult record could not be made at that time, this information was obtained from the photographs.

Results

Overall we made 19 captures of adult birds, with four birds showing a partial moult (pattern 1 in Figure 1), and 15 birds a complete moult (pattern 2) according to Newton's (2009) definitions. Pattern 1 birds showed a clear moult limit between the renewed and the juvenile feathers. All primaries and the innermost greater coverts (up to GC7) were new and replaced (Figure 1). Some individuals (25–75%) also replaced up to two further greater coverts (GC5–6) (Figure 1). In some cases, the outermost primary coverts (PC8–10) seemed newer than the rest, giving the impression of having been replaced. The photographs and the data collected in the field did not, however, allow us to confirm whether these were really new feathers or whether they were just old feathers with a lower level of wear. The majority of the lesser and median coverts were new, but some isolated feathers remained unmoulted (Figure 1). Pattern 2 birds showed all feathers to be of the same generation, indicating a complete moult; in some of these individuals (<25%) a few secondaries and primary coverts remained unmoulted (Figure 1).

A White-backed Woodpecker captured in 2018, and classified as a second-calendar-year bird because it

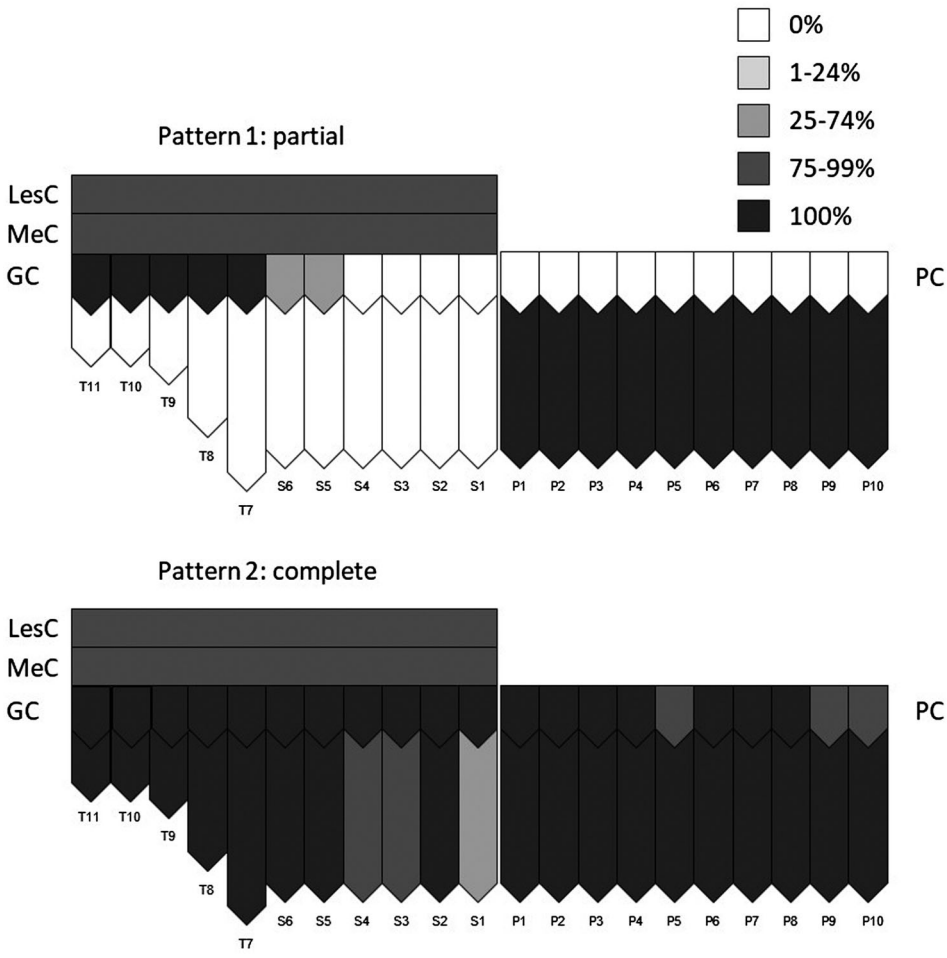

Figure 1. A diagram of the two patterns of wing moult found among White-backed Woodpeckers breeding in the Spanish Pyrenees. Shading approximates to the proportions of individuals that moulted each feather (GC greater coverts; PC primary coverts; P, S and T numbered primaries, secondaries and tertials) or the proportion of the feather tract moulted (LesC lesser coverts; MeC median coverts).

showed a pattern of partial moult, with new primaries and old (juvenile) secondaries and tertials, as well as a moult limit between greater coverts 6 and 7, was recaptured in 2019. On recapture it showed feathers all of the same generation, lacking a moult limit and with no retained old feathers. No design differences were found between juvenile feathers and those of specimens over two years old.

Discussion

This study is, to our knowledge, the first in which the moult pattern of live White-backed Woodpecker has been described in detail. Although the sample sizes were small, especially for one of the age classes (second-calendar-year birds), it must be borne in mind that the 19 specimens represent almost 10% of the Spanish population of this species (Campión & Senosiain 2004) and constitute the highest sample sizes ever achieved to describe the moult of this species.

Clearly, we captured two, well-differentiated groups of adult birds: those that underwent a complete moult and those that did a partial one. These two patterns are similar to those reported for other Palaearctic spotted woodpecker species (Cramp 1985, Baker 1993, Winkler *et al* 1995, Demongin 2013, Winkler 2013, Blasco-Zumeta 2020). Therefore, the two observed groups can be attributed to two age categories of adult birds: second-calendar-year birds, corresponding to those showing a partial moult, and older birds, those which had complete moults. A recapture of a bird with a complete moult, which had been caught a year earlier showing a partial moult, would confirm these moult sequences as age dependent. The possibility that a second-year bird could undergo a complete moult seems unlikely, and at least we found no reason or evidence supporting such a case. It is also unlikely,

and again there was no supporting evidence, that an older bird could undergo a partial moult.

Regarding the extent of the post-juvenile moult which gives rise to the partial moult pattern observed in second-calendar-year birds, we observed that it affects more feathers than in related species, like the Great Spotted Woodpecker, where the inner greater coverts are not always replaced (Demongin 2013, Winkler 2013). By contrast, the pattern in the White-backed Woodpecker is similar to that reported in the Middle Spotted Woodpecker *Dendrocoptes medius*, where the inner greater coverts are usually moulted, and the Lesser Spotted Woodpecker *Dryobates minor*, where the moult can extend across all the greater coverts (Demongin 2013). However, it is necessary to take into account that our sample size was very small and therefore caution must be exercised in drawing conclusions regarding the extent of post-juvenile moult.

It is also worth mentioning that it is difficult to assess the extent of post-juvenile primary-covert moult in woodpeckers. Some authors affirm that some individuals can retain some unmoulted primary coverts (Baker 1993, Demongin 2013, Blasco-Zumeta 2020), while others state that all primary coverts are replaced in the post-juvenile moult (Winkler et al 1995, Pyle & Howell 1996, Winkler 2013). In our case, we observed that the wear was not homogeneous across all primary coverts and therefore it was apparent that some (in particular the outermost ones) had been replaced, whilst others not. However, after a more careful examination of the photos we concluded that these differences could be simply a consequence of differential wear between the inner and outer primary coverts, and not due to a partial moult.

Regarding the complete moult, it must be noted that the presence of retained feathers was relatively normal. Feather retention was evident among primary coverts as well as some of the outermost secondary feathers. Old feathers not being replaced during a complete moult is usually linked to deteriorating physiological conditions, under which resources such as nutrients or energy would be allocated to other process that would demand more energy or that would become a priority for the bird before the end of the moult (Kiat & Izhaki 2016, Jenni & Winkler 2020b). According to Purroy (1972), the White-backed Woodpecker may finish its moult by October, at a time when many birds could face an increasing chance of adverse weather like decreasing temperatures, heavier rainfall or even snow. A period of very bad weather may perhaps be sufficient to interrupt a moult, given that the bird should allocate more energy to guarantee its own survival (e.g. to face cold nights or a sudden food decrease). The link between weather and overall environmental conditions and their impact on moult holds great potential for evaluating the impact of processes like global climate change on bird populations.

In summary, it can be concluded that second-calendar-year birds can be distinguished from older ones by their two clear moult limits, one between the primary and secondary feathers, and another within the greater coverts, generally between GC5 and GC7.

Acknowledgements

We especially want to thank Gorka Gorospe, Gonzalo Dean, Alfonso Senosiain and Susana Cárcamo, who collaborated in locating and monitoring nests, and the Environmental Guards of the Demarcations of Aezkoa and Ultzama, especially Xabier Azpiroz and Javier Zuazu. The Government of Navarra provided the necessary permits for the capture and marking of the birds. Two anonymous reviewers provided very valuable comments that helped us to improve an earlier version of this paper. Funding statement: this study contributes to the project POCTEFA HABIOS (EFA 079/15, www.habios.eu/el-proyecto) funded by the Fondo Europeo de Desarrollo Regional (Feder).

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References

Baker, K. (1993) *Identification Guide to European Non-Passerines*. BTO Guide 24. British Trust for Ornithology, Thetford.

Blasco-Zumeta, J. (2020) *Atlas de Identificación de las Aves de Aragón / Identification Atlas of Aragon's Birds*. http://blascozumeta.com

Campión, D. & Senosiain, A. (2004) Pico dorsiblanco, *Dendrocopos leucotos*. In *Libro Rojo de las Aves de España* (eds Madroño, A., González, C. & Atienza, J.C.), 307–309. Dirección General para la Biodiversidad-SEO/BirdLife, Madrid.

Campión, D., Pardo, I., Elósegi, M.M. & Villanúa, D. (2020a) GPS telemetry and home range of the White-backed Woodpecker *Dendrocopos leucotos*: results of the first experience. *Acta Ornithologica* **55**, 77–87.

Campión, D., Elósegi, M.M., Cabodevilla, X. & Villanúa, D. (2020b) A method for capturing and GPS tracking breeding White-backed Woodpeckers *Dendrocopos leucotos*. *Bird Study* **67**, 239–244.

Cramp, S. (1985) *Handbook of the Birds of Europe, the Middle East and North Africa*. **Volume 4**. Oxford University Press, Oxford.

Demongin, L. (2013) *Guide d'identification des oiseaux en main*. Morsel.

Ginn, H.B. & Melville, D.S. (1983) *Moult in Birds*. BTO Guide 19. British Trust for Ornithology, Tring.

Jenni, L. & Winkler, R. (2020a) *Moult and ageing of European passerines*. Second edition. Helm, London.

Jenni, L. & Winkler, R. (2020b) *The Biology of Moult in Birds*. Helm, London.

Kiat, Y. & Izhaki, I. (2016) Non-moulted primary coverts correlate with rapid primary moulting. *Journal of Avian Biology* **47**, 1–7.

Newton, I. (2009) Moult and plumage. *Ringing & Migration* **24**, 220–226.

Pons, J.M., Campión, D., Chiozzi, G., Ettwein, A., Grangé, J.L., Kajtoch, L., Mazgajski, T.D., Rakovic, M., Winkler, H. & Fuchs, J. (2020) Phylogeography of a widespread Palearctic forest bird species: the White-backed Woodpecker (Aves, Picidae). *Zoologica Scripta*, 10.1111/zsc.12466

Purroy, F. (1972) El pico dorsiblanco (*Dendrocopos leucotos*) del Pirineo. *Ardeola* **16**, 145–158.

Pyle, P. & Howell, S.N.G. (1996) Flight-feather molt patterns and age in North American woodpeckers. *Journal of Field Ornithology* **66**, 564–581.

Svensson, L. (1992) *Identification Guide to European Passerines*. British Trust for Ornithology, Thetford.

Winkler, H. (2013) *Mue et détermination de l'âge des pics*. Feuille d'information ornithologique. Vogelwarte CH, Sempach. https://docplayer.org/45384293-Mauserumfang-und-altersbestimmung-von-spechten.html

Winkler, H., Christie, D.A. & Nurney, D. (1995) *A guide to the Woodpeckers, Piculets and Wrynecks of the World*. Pica Press, Sussex.

Zuberogoitia, I., Gil, J.A., Martínez, J.E., Erni, B., Aniz, B. & López-López, P. (2015) The flight feather moult pattern of the bearded vulture (*Gypaetus barbatus*). *Journal of Ornithology* **157**, 209–217.