

Looking for white feathers in male western capercaillies *Tetrao urogallus*

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Abstract

Looking for white feathers in male western capercaillies *Tetrao urogallus*. Unusual plumage colours are of interest for environmental and evolutionary questions. This brief article reappraised information on male western capercaillies *Tetrao urogallus* individuals with atypical white feathers. It was inspired by a casual observation of *T. u. aquitanicus* in the Pyrenees. The presence of colour aberrations has been reported for several body parts in male western capercaillies. Updated quantifications of this phenomenon and the understanding of its causal factors remain pending for this species. Monitoring individual variability in plumage in tetraonids could contribute to assessing potential signs of population deterioration in species that are currently faced with population and habitat fragmentation and subject to climate change.

Key words: Colour polymorphism, Melanin, Avian coloration, Partial albinism, Leucism, Tetraonids

Resumen

Búsqueda de plumas blancas en machos de urogallo común *Tetrao urogallus*. Las coloraciones inusuales del plumaje son de interés por razones ambientales y evolutivas. Este breve artículo reevalúa la información sobre individuos macho de urogallo común *Tetrao urogallus* con plumas blancas atípicas. Se inspira en una observación casual de *T. u. aquitanicus* en los Pirineos. Se ha documentado la presencia de anomalías cromáticas en diferentes partes del cuerpo de machos de urogallo común. La cuantificación actualizada de este fenómeno y la comprensión de los factores causantes del mismo están pendientes de resolver para esta especie. El seguimiento de la variabilidad individual de los plumajes de las tetraónidas podría contribuir a evaluar posibles signos de deterioro poblacional en especies que actualmente se enfrentan a la fragmentación de sus poblaciones y hábitats y que están sometidas al cambio climático.

Palabras clave: Polimorfismo de color, Melanina, Coloración de aves, Albinismo parcial, Leucismo, Tetraónidas

Resum

Cerca de plomes blanques en mascles de gall fer comú *Tetrao urogallus*. Les coloracions inusuals del plomatge són d'interès per raons ambientals i evolutives. Aquest breu article reavalua la informació sobre individus mascles de gall fer comú *Tetrao urogallus* amb plomes

blanques atípiques. S'inspira en una observació casual de *T. u. aquitanicus* als Pirineus. S'ha documentat la presència d'anomalies cromàtiques en diferents parts del cos de mascles de gall fer comú. La quantificació actualitzada d'aquest fenomen i la comprensió dels factors causants estan pendents de resoldre per a aquesta espècie. El seguiment de la variabilitat individual dels plomatges dels tetraònids podria contribuir a avaluar els possibles signes de deteriorament poblacional en espècies que actualment s'enfronten a la fragmentació de les seves poblacions i dels seus hàbitats i que estan subjectes al canvi climàtic.

Paraules clau: Polimorfisme de color, Melanina, Coloració d'ocells, Albinisme parcial, Leucisme, Tetraònids

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Introduction

Uncommon colours in bird plumage raise environmental and evolutionary questions related to melanin-based colouration (Chatelain et al., 2014; Roulin, 2004, 2016; Izquierdo et al., 2018). Initially, unusual specimens were recorded anecdotally (Sage, 1963) although in some populations their occurrence has received research attention (e.g., Bensch et al., 2000; Møller et al., 2013; Izquierdo et al., 2018). In the field, unequivocal identification of the causes of unusual plumages is not always possible (van Grouw, 2013) and even the definition of the specific causes may differ between authors (Husby, 2017; Izquierdo et al., 2018; van Grouw, 2021). Nonetheless, the understanding of colour aberrations requires further study (Soulsbury et al., 2016) as these traits are potentially linked to sexual selection and conspicuousness in species ecology (Roulin, 2016). This brief article consists of a compilation of information on male western capercaillies *Tetrao urogallus* with atypical white feathers *sensu lato* that was inspired by a casual observation of an anomaly in the plumage of a male of this species in the Pyrenees.

Material and methods

Species

The western capercaillie is an umbrella species found in boreal and montane forests (Suter et al., 2002). Although it is widely distributed in Eurasia and listed as Least Concern (BirdLife International, 2016), several subspecies and local populations are threatened by extinction, notably in the south-west of its geographic range. The Pyrenean capercaillie *Tetrao urogallus aquitanicus* is a threatened game subspecies in France whose conservation status varies from Vulnerable to Critically Endangered according to the spatial scale used (Charra and Sarasa, 2018). In the southern Pyrenees in Spain, it is classified as Critically Endangered (Robles et al., 2021) and this population is considered as poorly connected to the neighbouring French population (Canut et al., 2004).

Usual colouration

Adult male western capercaillies are described as having a prominent round white spot on each shoulder, white undersides of wings, and white spots and mottling across the tail feathers forming an irregular marbled band (Lönnerberg, 1906; Castroviejo, 1975; Couturier



Fig. 1. Males of Pyrenean capercaillie *Tetrao urogallus aquitanicus* with the usual dark–grey head plumage (A) and an atypical white feather on the right side of the head (B, indicated by an arrow).

Fig. 1. Machos de urogallo de los Pirineos Tetrao urogallus aquitanicus con el plumaje habitual de color gris oscuro en la cabeza (A) y una pluma blanca atípica en el lado derecho de la misma (B, indicada con una flecha).

and Couturier, 1980). One or two smaller spots are frequent on the margin of the wing, behind or below the shoulder spot, and some wing feathers may be partially or totally white (e.g., the external edge of the remiges, although this trait may not be of much taxonomic significance; Castroviejo, 1975; Couturier and Couturier, 1980). White spots of varying number and size may also be present on the flanks and breast (Couturier and Couturier, 1980). Numerous or predominantly white feathers on the belly and underparts are a frequent and even characteristic trait in some populations and/or subspecies (e.g., *T. u. cantabricus*, Castroviejo, 1975; *T. u. uralensis/karelicus* and *T. u. taczanowskii*, Couturier and Couturier, 1980; del Hoyo et al., 2014).

Data collection

In April 2022, opportunistic photographs of two male capercaillies were taken in the wild in the western French Pyrenees (fig. 1). In May and June 2022, information on unusual plumages in male western capercaillies was searched for in the English, French and Spanish literature in order to gather data on atypical white feathers *sensu lato* in this species. The search using these languages reviewed almost all the scientific literature related to the various south–west European capercaillie populations. The review focused only on males because, compared to males, female capercaillies exhibit many more white and pale feathers and frequently go unnoticed. Thus, unusual colouration in females in the field is much more difficult to detect and its review is beyond the scope of this article. Definite identification of the causes of melanin–based colour polymorphism is not always possible based on field observations (van Grouw, 2013) and the accurate naming of phenotypes still needs to be consolidated in the literature (van Grouw, 2006). This review, which focuses on white feathers *sensu lato* that are plausibly attributable to a number of causes, used several free search engines and represents a point of departure for further study in tetraonids. Words were adapted to the main languages of each search engine. Information was compiled by searching Google Scholar for word combinations such as 'capercaillie', 'tetrao', 'white feathers', 'leucism' and

Table 1. Cited cases of variable (v) and unusual (u) plumage related to white feathers in males of western capercaillie *Tetrao urogallus*. Question marks indicated unclear details.

Tabla 1. Casos citados de plumaje variable (v) e inusual (u) referentes a plumas blancas en machos de urogallo común *Tetrao urogallus*. Los signos de interrogación indican detalles poco claros.

Subspecies	Study site	Part of the body	Details	Reference
From scientific literature				
<i>T. u. aquitanicus</i>	Pyrenees, France	Head (u)	One white spots on the right side of the head	This article
<i>T. u. (ssp.?)</i>	(?)	Head (u)	Sometimes rare white feathers close to the bill	Couturier and Couturier (1980)
<i>T. u. aquitanicus</i>	Pyrenees, France	Neck (u)	Two white spots on the right side of the neck	Catusse (1988)
<i>T. u. crassirostris</i>	Switzerland	Breast (u)	White feathers in half of the breast	Couturier and Couturier (1980)
<i>T. u. urogallus</i>	Sweden	Back (u)	White anterior part of the back	Couturier and Couturier (1980)
<i>T. u. aquitanicus</i>	Pyrenees, France	Rump (u)	Big white spot on the rump in on male	Catusse (1988)
<i>T. u. aquitanicus</i>	Pyrenees, France	Belly (u)	Fully white belly covers in a young male	Crampe et al. (1986)
<i>T. u. aquitanicus</i>	Pyrenees, France	Belly (u)	Three white spots in the left part de the belly covers in one male	Catusse (1988)
<i>T. u. aquitanicus</i>	Pyrenees, France	Shoulder and anterior margin of the wing (v)	Two white spots in one or both sides	Catusse (1988)
<i>T. u. urogallus</i>	Sweden	Wings and tail (u)	Some white remiges and white proximal part in tail feathers	Couturier and Couturier (1980)
<i>T. u. urogallus</i>	Sweden	Wings and tail (u)	White remiges and tail feathers	Couturier and Couturier (1980)
<i>T. u. urogallus</i>	Sweden	Full plumage (u)	Light ash–grey, darkest at head and neck	Couturier and Couturier (1980)
<i>T. u. urogallus</i>	Norway	Full plumage (u)	Cited as isabellism	Couturier and Couturier (1980)
<i>T. u. rudolfi</i>	Roumania	Full plumage (u)	Except few dark spots, dirty–white plumage, light grey at the neck and breast	Couturier and Couturier (1980)
<i>T. u. crassirostris</i>	Poland	Full plumage except the tail feathers (u)	Off-white or greyish feathers	Couturier and Couturier (1980)
<i>T. u. crassirostris</i>	Poland	Full plumage (u)	Wings and middle–back fully white, other parts light grey	Couturier and Couturier (1980)
<i>T. u. crassirostris</i>	Germany	Full plumage except the tail feathers (u)	White feather in two–thirds of plumage including neck and rump, black tail feathers	Couturier and Couturier (1980)
<i>T. u. crassirostris</i>	Germany	Tail (u)	Some white tail feathers	Couturier and Couturier (1980)
<i>T. u. aquitanicus</i>	Pyrenees, France	Tail (u)	One rectrice partly white on the length	Couturier and Couturier (1980)
<i>T. u. crassirostris</i>	Slovenia	Tail (u)	One rectrice partly white (7 x 3 cm) from the marbled band	Couturier and Couturier (1980)
<i>T. u. crassirostris</i>	Austria	Tail (u)	One rectrice with large white spots on the length	Couturier and Couturier (1980)
<i>T. u. urogallus</i> or <i>uralensis</i> (?)	Finland	Full plumage (u)	No white spots at anterior margin of the wing, no white colour on primaries and secondaries, rather dark underwing coverts, white spots and mottlings quite absent from rectrices	Lönnerberg (1906)
From Instagram				
<i>T. u. urogallus</i>	Norway (?)	Head (u)	Small white feather on the right side of the head	Rino Hals, @rinohals, 2022
<i>T. u. urogallus</i>	Norway	Head (u)	Small white feather on the left underpart of the head	Steffen Johnsen, @steffen_johnsen_naturfoto, 2022
<i>T. u. crassirostris</i>	Austria	Neck (u)	Small white feather on the left underpart of the neck	Manuel Gruber, @manuel_gruber_wildlife, 2022
<i>T. u. aquitanicus</i>	Pyrenees, (Spain?)	Shoulder and anterior margin of the wing (v)	Two white spots in one or both shoulders	Cesar Gil, @cesargilwildlife, 2018, 2020, 2022 Eduard Villar Leonart, @edville, 2021
<i>T. u. aquitanicus</i>	Pyrenees, (Spain?)	Shoulder and anterior margin of the wing (v)	Asymmetrical size of white spot on shoulders	Eduard Villar Leonart, @edville, 2021, 2022
<i>T. u. aquitanicus</i>	Pyrenees, France	Shoulder and anterior margin of the wing (u)	Apparent lack of the round white spot on at least one shoulder	Flavien Luc, @chasseur_d_instants_, 2021
<i>T. u. aquitanicus</i>	Pyrenees, (Spain?)	Shoulder and anterior margin of the wing (u)	Apparent lack of the round white spot on at least one shoulder	Eduard Villar Leonart, @edville, 2022

'albinism', and the French higher education bibliographic portal (www.sudoc.abes.fr) for 'grand tetras', 'tetrao' and 'plumage'. Snowball sampling (i.e. searching within the references for sources of additional information, notably for references in Spanish and French) was used. In addition, Instagram was used because in this social network photographs are frequently linked to spatial and temporal information that permit hypothesis about bird populations to be made. Nonetheless, building an exhaustive list of all observed cases of plumage anomalies in this species worldwide taken from grey literature and in many languages (e.g., German, Russian) was beyond the scope of this study. The obtained information is shown in table 1. Plumage alterations of gonadal origin or due to hybridization with, for instance, the black grouse *Tetrao Lyrurus tetrix*, have previously been presented in detail (see Couturier and Couturier, 1980) and are also beyond the scope of this article.

Results

One of the two male Pyrenean capercaillies observed in April 2022 had an atypical white spot on the right side of its head (fig. 1B). Photographs confirm that this spot was only present on the right side.

The literature search for records of unusual plumage in male western capercaillies and pictures of this species on Instagram produced 29 records or observations from a number of countries (table 1; one from this article, 21 from the literature search and seven from Instagram linked to 11 pictures, although various photographs may be of the same individual). Records of the atypical presence or lack of white feathers on the head, neck, shoulders, wings, rump, belly and tail and in the whole plumage of male western capercaillies were found (table 1).

Three cases were not included in table 1 due to a lack of details: two 'fully white' males exist in two museums in Chartres (France) and Vienna (Austria) but the sources available to this reappraisal lack any details regarding their origin (see Couturier and Couturier, 1980). A 'melanistic' male killed in Russia with possible 'partial albinism' and a white belly has been cited but no conclusive details regarding its locality or subspecies were cited (see Couturier and Couturier, 1980).

Discussion

One capercaillie observed had a white spot on its head (fig. 1B) and differed from the usual dark–grey head plumage of male western capercaillies (fig. 1A; Couturier and Couturier, 1980). As this fortuitous observation and this review were performed without funding no direct analysis regarding the cause of this aberrant colouration could be made. Nonetheless, white feathers on the head or neck of male capercaillies have been observed previously (table 1) and have been used to identify individuals in the Pyrenees (Catusse, 1988). Understanding the causal factors of these anomalies requires further study because they may result from fights and injuries and may grow on affected parts after wounds have healed, such as the case of a hen capercaillie bitten by a stoat (*Mustela erminea*) reported by Hachisuka (1928, in Sage, 1962; see also Phillips, 1954, for examples in other species).

The presence or lack of white feathers has been observed on other body parts of male western capercaillies (table 1) and could plausibly be linked to other causes such as greying and leucism. The scientific literature on the species in English, French and Spanish mainly includes a scattering of old data in non–English languages (e.g., Couturier and Couturier, 1980). Recent scientific data in English are lacking even though several pictures on Instagram suggest the persistence of the phenomenon in recent years, notably in the Pyrenean capercaillie (table 1).

Although old British records of unusual white plumage *sensu lato* were fewer in tetraonids (n = 23 from three species) than in other avian taxa (e.g., Hirundinidae, Corvidae, Turdidae;

Sage, 1963), numerous unusual specimens have been recorded by Lorenz (van Grouw et al., 2019) and 'partial albinism' has been mentioned by French authors as not being rare in western capercaillies (Couturier and Couturier, 1980; Leclercq and Ménoni, 2018). The correct naming of phenotypes remains to be consolidated in tetraonids as in other species (van Grouw, 2006, 2012; Mahabal et al., 2016). In Spain, Pyrenean capercaillies might have highly homogeneous dark plumage, while Cantabrian capercaillies tend to have many more white feathers on the lower part of the breast and belly (Castroviejo, 1975). These contrasting descriptions of feathers in capercaillies could assist in the monitoring of unusual plumages and help establish their frequency, notably in the relict populations of western capercaillie at the south–western limit of its range (e.g., *T. u. crassirostris*, syn. *major* in Jura and Vosges; *T. u. aquitanicus* in Pyrenees; and *T. u. cantabricus* in Spain). This type of monitoring could be contemplated for several other species of tetraonids. Atypical white feathers might be more frequent in black grouse than in capercaillies (Couturier and Couturier, 1980). Numerous specimens are found in museum and other collections (van Grouw et al., 2019) and substantial advances have been made in the understanding of unusual feather colourations and melanin–based colour polymorphism in black grouse (Soulsbury et al., 2016). Isolation appears to be linked to white plumage parts in the black–billed capercaillie *Tetrao parvirostris* (Spiridonova et al., 2020) and is a key factor in the ecology and genetics in western capercaillie (Segelbacher et al., 2003).

The understanding of the significance of unusual white feathers is improving. Population fragmentation and the resulting inbreeding have been proposed as potentially linked to 'partial albinism' in *Acrocephalus arundinaceus* (Bensch et al., 2000), while external factors such as dietary imbalance have been shown to contribute to unusual feather pigmentation in crows (van Grouw, 2018). Greying (the progressive loss of melanin pigment with each successive moult; van Grouw, 2018) and variability in sex–limited white patches (Roulin, 2016) have been linked to human–modified environments and climate change (Møller et al., 2013; Evans and Gustafsson, 2017; Izquierdo et al., 2018).

Unusual plumages in capercaillies thus raise questions regarding local intraspecific competition, body condition, genetics, and the impacts of population fragmentation, habitat and climate change on this species. Recent demographic information regarding western capercaillie populations is scarce (Gée et al., 2018). The local protection of relict populations (e.g., in north–east France since the 1970s and in Spain since the 1980s) has not necessarily prevented declines in abundances (e.g. Catusse et al., 1992; Gil et al., 2020; Jiménez et al., 2022). Recreational uses (e.g., hunting and wildlife photography) that can affect western capercaillie populations are increasingly subject to bans and restrictions (Consejería de Medio Ambiente, 2009; Conseil d'État, 2022) and so the number of sightings –as well as the public interest in this species– may decline (Mittermeier et al., 2021). Several relict populations of capercaillies are reaching a critical point in their fight for survival. The consolidation or otherwise of monitoring programs –i.e., including the study of unusual plumages and related causal factors– could have serious consequences for attempts to prevent local extinctions of this threatened bird.

Conclusion

Anomalies, probably prompted by a number of causes, produce achromatic feathers in western capercaillies at a frequency that still needs to be objectively quantified to be fully understood. The study of this phenomenon over space and time in tetraonids could help consolidate the monitoring of their populations. If the presence of unusual chromatic feathers is indeed linked to inbreeding or to battles for rare habitats, the monitoring of these feathers may help guide the management of relict western capercaillie nuclei and confront the impact of population fragmentation, habitat transformation and climate change on this threatened species.

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