Age Determination and Preformative Molt in Hatch-year Flammulated Owls during the Fall

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ABSTRACT

Ageing birds often can be accomplished by identifying plumage from previous molts. This technique requires an ability to distinguish feathers from current and previous molts, as well as knowledge of molt timing. I describe the seasonal progression of the preformative molt in hatch-year Flammulated Owls (*Otus flammeolus*) from late August through mid-October in central New Mexico. Data collected during 2001-2003 showed that the preformative molt is well underway for most owls by late August. For most owls, the molt is complete by late September, although I observed owls with retained juvenal body plumage as late as mid-October. Detection of retained juvenal body feathers in birds that are otherwise in formative plumage is a useful technique for ageing hatch-year Flammulated Owls during the fall.

INTRODUCTION

Determining age is essential to field studies investigating life history, ecology, and demographic aspects of birds, yet determining the age of birds in the field can be difficult. One important technique for determining age in birds is the identification of feathers that are retained from previous plumages. For example, Sharp-shinned Hawks (*Accipiter striatus*) may be aged as second-year if they show retained juvenal rump or back feathers among otherwise definitive plumage (Mueller et al. 1979). This technique is useful for ageing other raptors and may be useful for ageing other birds as well if sufficient understanding of plumage and molt timing is obtained.

Flammulated Owls (*Otus flammeolus*) display what Howell et al. (2003) termed a "complex basic strategy" of molting. Young owls fledge in juvenal plumage and begin a preformative molt into the formative plumage (formerly considered first pre-basic plumage; see Howell et al. 2003) within the first week (McCallum 1994). Adults undergo an annual, complete or near-complete prebasic molt during the summer and fall to produce the basic plumage (McCallum 1994). The species lacks plumage characteristics known to be useful for distinguishing between birds in formative plumage from those in basic plumage (McCallum 1994) Although some techniques, such as characterizing fault bars and identifying multiple generations of flight feathers, are useful for ageing Flammulated Owls during the fall (pers. obs.; Pyle 1997), many owls lack these characteristics and are difficult to age. Subtle variations in other criteria such as feather tip shape (e.g., truncate or pointed; Pyle 1997) are difficult to use because Flammulated Owl flight feathers are very soft and have a tendency to change shape with disturbance (pers. obs) Contour feathers of the juvenal plumage, however, are clearly distinct from formative and basic plumage contour feathers (McCallum 1994). Here I explain the utility of identifying retained juvenal body feathers as an ageing criterion during late summer and fall, and describe the timing of the preformative molt (molting into the formative plumage) in hatch-year Flammulated Owls.

METHODS

The study site was located in the Cibola National Forest near Capilla Peak, approximately 50 km south-southeast of the junction of Interstates 25 and 40 in Albuquerque, New Mexico (34°42'N, 106°24'W; DeLong and Hoffman 1999). The site is located at ~2,805 m and the dominant habitats are pine-oak woodlands and montane meadows. My coworkers and I captured owls at night by broadcasting territorial breeding-season hoots of the male Flammulated Owl from within two mist-net arrays (Erdman and Brinker 1997). We collected data from late August through mid-October from 2001-2003. Our field season began immediately after the period when young Flammulated Owls become independent of their parents (Linkhart and Reynolds 1987).

In 2001, we aged birds as hatch-year based on the presence of uniform fault barring (a structural change usually visible as an area of thinning or breakage in feathers caused by nutritional change or stress). In hatch-year owls, fault barring was apparent most often across most or all rectrices uniformly, indicating that the tail grew in synchronously, unlike the asynchronous replacement of feathers typical of adult molts. However, we were cautious to examine other criteria to exclude the possibility that the owl was not an adult bird that had lost its tail feathers as a stress response to predation and was subsequently replacing all tail feathers at once.

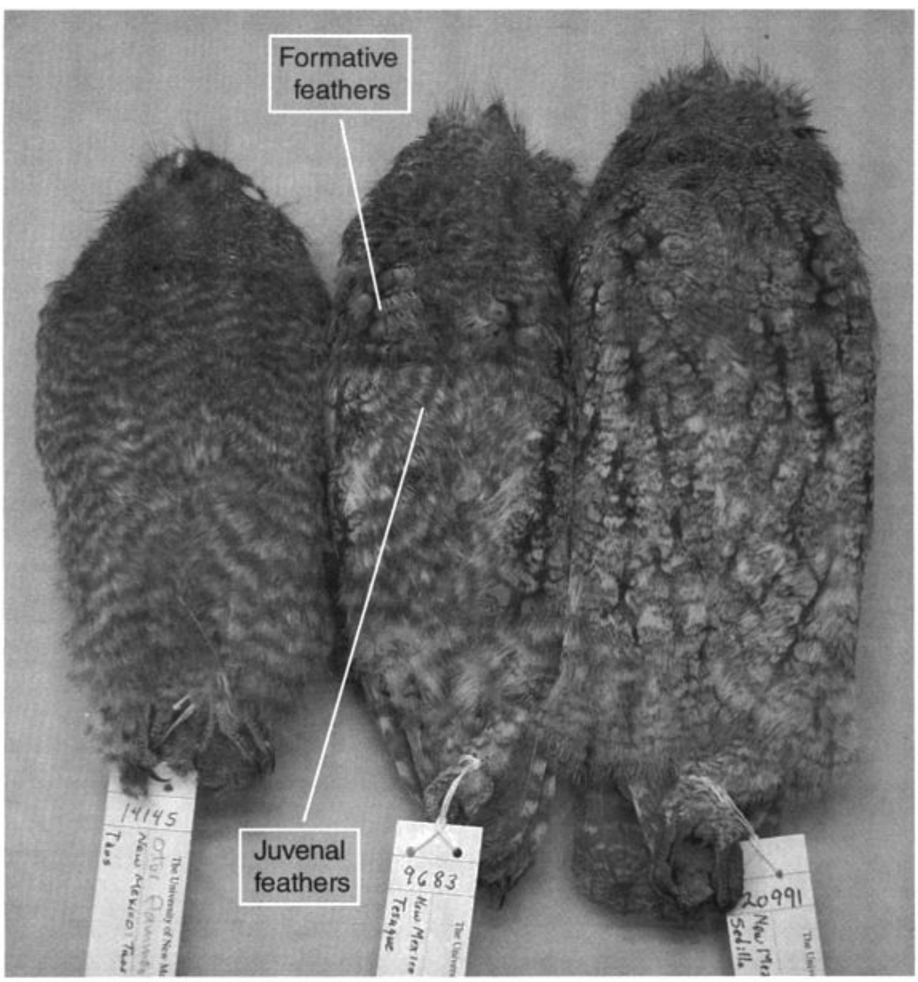

Fig. 1. Three hatch-year Flammulated Owl study skins from the Museum of Southwestern Biology, University of New Mexico. From left to right the photograph shows a juvenal plumage owl (collected 21 Jul), a hatch-year owl undergoing preformative molt (13 Aug), and a fully formative-plumaged owl (21 Sep). Notice the white/gray banded feathers in the juvenal plumage and the dark-centered tawny feathers in the formative plumage. Photo by John P. DeLong

Before the fall 2002 field season, I studied 45 Flammulated Owl specimens of various ages in the Museum of Southwestern Biology at the University of New Mexico to learn to locate retained juvenal feathers on birds that appeared at first glance to be in formative or basic plumage (Fig. 1). With the aid of juvenal study skins as a reference, I found that many fall-collected birds had retained juvenal feathers around the belly, flanks, and breast, and could be aged as hatch-year birds. Juvenal contour feathers show light and gray banding across the feather (Fig. 1). The formative and basic contour feathers are darker overall with a dark center stripe along the distal part of the rachis and dark vermiculations toward the distal end. There is typically a tawny or rufous appearance to formative and basic feathers (Fig. 1). By late September, most specimens had only a few or no retained juvenal feathers. In 2002 and 2003, we used the presence of retained juvenal plumage as the primary criterion for ageing hatch-year owls.

We quantified the degree of contour feather molt in each owl captured during the fall field season. We categorized the degree of molt as *high* = active molt (contour feathers in sheath) occurring in at least three feather tracts, *moderate* = active molt occurring in two feather tracts, *low* = active molt occurring in one or no feather tract.

RESULTS AND DISCUSSION

During the 2001 field season, we aged 17% of 156 owls as hatch-year using the presence of uniform fault barring. We were able to age only one owl as adult based on the presence of more than one generation of flight feathers. Thus, we aged 83% of the owls as unknown because they showed no fault-barring or old flight feathers. In contrast, during 2002 and 2003, we aged 76% of 107 owls using the presence of retained juvenal body plumage. Of the owls in 2002 and 2003, 21% could not be aged and 3% were aged as adults. Thus, the identification of retained juvenal plumage feathers greatly enhanced our ability to identify hatch-year Flammulated Owls. Most retained juvenal feathers were located on the abdomen or flanks. Starting in late September, it became difficult to locate the small number of retained juvenal feathers hidden low on the abdomen or flanks. When only one or two retained juvenal body feathers remained, they were often hidden under formative feathers. Importantly, we found no birds with contradictory ageing clues, such as having both multiple generations of flight feathers and retained juvenal plumage.

I used 112 hatch-year owls and 149 unknown-age owls to describe the preformative molt progression, including two within-season recaptures. I included owls of unknown age because they lacked plumage characteristics of adults (i.e., molt in flight feathers) and because most were captured before we understood how to recognize retained juvenal plumage. Because it is now clear that most captured owls are hatch-year birds, I included them here to allow a fuller picture of the molt progression. We found that most hatch-year owls were molting heavily during the last week of August and first week of September (Fig. 2). Some owls captured in late August had just begun the preformative molt and had grown only a few formative body feathers.

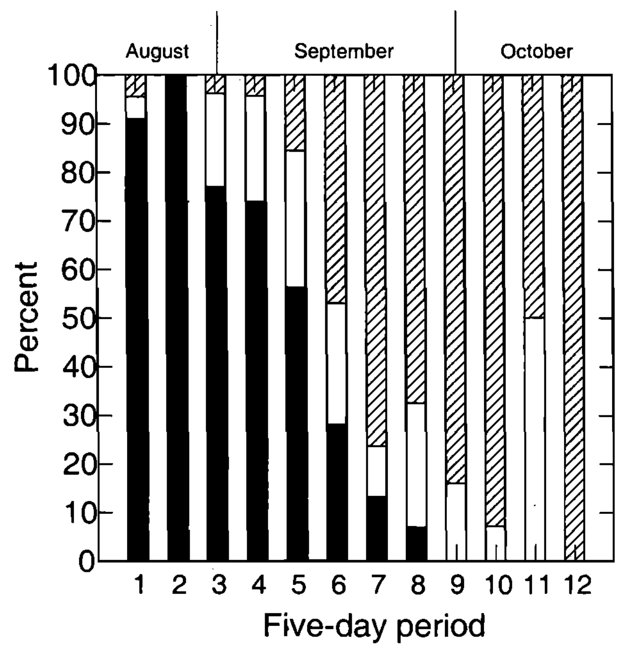

Fig. 2. Percentage of molt scores during late summer/early fall for Flammulated Owls captured at Capilla Peak, New Mexico, 2001-2003. Solid black = high level of molt, open = moderate level of molt, and hatched = low level of molt. The season was divided into five-day periods, beginning 19 Aug and ending 17 Oct.

By mid-September, about half of the birds showed reduced molting activity, and the level of molt declined through the remainder of the banding season. Retained juvenal body feathers were visible on some owls through mid-October. The earliest date that we captured an owl without any retained juvenal feathers was 13 September. Some owls had retained juvenal plumage even though we could not detect any actively molting feathers, suggesting that in some cases juvenal feathers may be retained through the next molting cycle. It is likely that no hatch-year Flammulated Owl completely replaces all juvenal feathers prior to September, and I suggest that, prior to September, any owl in this region without juvenal feathers may be aged as an after-hatch-year.

Although our capture efforts corresponded in time with the migration of many bird species in the area (pers. obs.), the Flammulated Owls we captured were not necessarily migrating at the time. Stable hydrogen isotope analysis of feathers taken from owls captured in 2002 revealed that most owls likely had natal origins within New Mexico and even from within the Manzano Mountains themselves (DeLong et al. *in press*). Hence, it is likely that most of these owls were in a pre-migratory or dispersal period, and if they were migrating, they had not moved very far yet. Interestingly, the two individuals that clearly had made southward movements of at least ~200 km were captured in early-to-mid October, about when the preformative molt was nearing completion for most birds (Fig. 2). This observation may suggest that hatch-year Flammulated Owls complete or nearly complete their preformative molt prior to commencing migration. Additional work will be necessary to confirm this hypothesis.

The method presented here for determining age of hatch-year Flammulated Owls should enhance our ability to conduct demographic and other behavioral ecology studies on this species, especially during the late summer and fall. Future investigations into molt and ageing criteria for this and other small owl species also should consider 1) developing a cut-off date for ageing owls as adults based on the absence of juvenal body plumage, 2) investigating molt limits as an ageing criteria, and 3) carefully investigating the patterns of flight feather molt as a possible technique for ageing adults.

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News, Notes, Comments

A Quick, Inexpensive Trap for Use with Nest Boxes

Stutchbury and Robertson (1986) describe a simple and effective trap design for capturing cavity-nesting species in artificial nesting boxes. Their trap consisted of a square aluminum plate that is affixed to the inside of the nest box using strips of masking tape (diagrams contained in Stuchbury and Robertson 1986). To set their trap, the plate is supported upright by using a stick or shoot of grass. Here, we present a modification of this original trap design, which allows for easier field use and is also more cost effective.

Our trap is designed specifically for the side-opening style nest box promoted by The North American Bluebird Society (Fig. 1; for box plans see http://www.nabluebirdsociety.org). This style of box allows easy access for installation of the trap within the box and subsequently for access to captured birds. Our innovation involves replacing the aluminum plate with a piece of 1/4-in hardware cloth, which is both more cost efficient (approximately $0.01 ea) and more easily affixed within the box. Additionally, traps can be manufactured within seconds in the field, allowing for a flexible trapping schedule. Hardware cloth is constructed of stiff, interwoven wire and is available at most hardware stores. The hardware cloth is cut into a square (6.5 x 6.5 cm) and duct tape (5.8 x 6.5 cm) is folded around the bottom to provide additional mass to the mechanism. A second piece of duct tape (5.8 x 6.5 cm) is used to affix the trap to the inside of the box, immediately above the entrance hole (Fig. 1). The trap is light (about 4 g), allowing for the use of a thin shoot of grass to support the trap within the box.

During the course of our studies, we captured about 500 male and female adult Eastern Bluebirds *(Sialia sialis)*. The trapping technique is similar to that described by Stuchbury and Robertson (1986). Trapping was most effective during morning hours (0600 - 1100 h), and when chicks were between 3 and 12 d old. During this period of the nesting cycle, nestlings have the highest energy demand and both the male and female are intensively provisioning. Additionally, nestlings are sedentary, minimizing unintentional trap tripping by nestlings. Individuals were usually caught within 20 min of installing the trap; however, if unsuccessful, the trap was used on a box for a maximum of 1 hr.

The trap is inexpensive and proficient use requires minutes of training, unlike mist-nets. Trapping was 90% effective when used within the suggested time frame, and no injuries were incurred while using the trap. The original design by Stuchbury and Robertson (1986) is effective, yet we believe these modifications provide a substantial increase in efficiency and adaptability.

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