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FEATHER MOLT BY SWAINSON'S HAWKS (*BUTEO SWAINSONI*) ON THE AUSTRAL GROUNDS OF ARGENTINA

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Muda de *Buteo swainsoni* en la región austral de Argentina.

Key words: Swainson's Hawk, *Buteo swainsoni*, molt, austral summer grounds, Argentina.

INTRODUCTION

Feather molt in birds that undertake short-distance migrations typically begins during the breeding season and reaches completion prior to the time of departure for migration (Stresemann & Stresemann 1966). For many species of birds that undertake long-distance migrations such as Arctic Peregrine Falcons (*Falco peregrinus*) and shorebirds, there is insufficient time to finish molting during the breeding season so feather molt is interrupted during the migration period, and it resumes on the wintering grounds where it can last for several more months (Welty & Baptista 1988, Gill 1999). Like Arctic species, the Swainson's Hawk (*Buteo swainsoni*) is highly migratory and nearly the entire North American population migrates during the boreal winter to areas in southern South America, a round trip that exceeds 20,000 km (England *et al.* 1997, Fuller *et al.* 1998). On their North American breeding grounds for as few as five months, Swainson's Hawks can begin their annual molt but there is insufficient time to complete the molt process prior to departing on migration. In their descriptions of the timing of molt in the Swainson's Hawk, Palmer (1988) and England *et al.* (1997) have assumed that, like other long-distance migrants, Swainson's Hawks suspend their molt while on migration, and then resume the process of feather replacement for several months in Argentina during the austral summer. However, there have never been any details published documenting molt in Argentina, and which feathers are actually replaced to corroborate this assumption. With this in mind, we undertook this study to document the occurrence of feather molt in Swainson's Hawks in Argentina, and to describe those remiges that are replaced prior its return to the North American breeding grounds.

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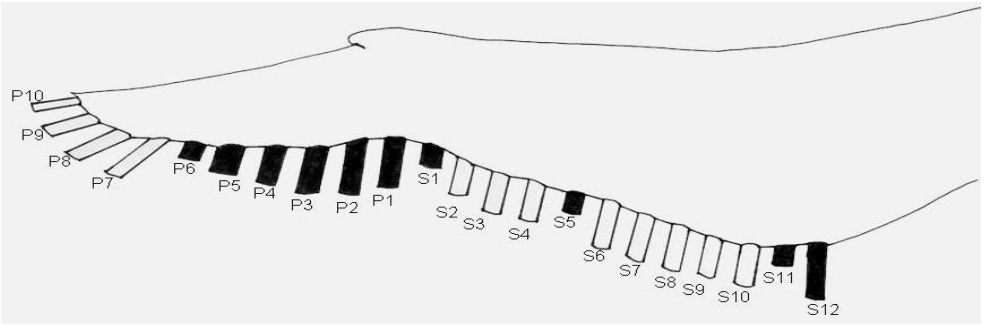

FIG. 1. Dorsal surface of accipitrid left wing showing molt pattern of remiges. Primary and secondary feathers are numbered. Black quills represent new feathers and the shortest of these represent growing feathers. White quills represent old feathers.

STUDY AREA & METHODS

We made five collections of molted remiges between 7–19 January 1997 at two nocturnal roosts situated at Estancia Chanilao and Estancia La Lucha in the province of La Pampa, Argentina (35°14'S, 063°56'W). The roosts consisted of eucalyptus (*Eucalyptus* spp.) plantations with trees in rows, approximately 3 m apart. The plantation at Estancia Chanilao was the largest, covering an area of approximately 15 ha, and it consisted of several thousand trees. The plantation at Estancia La Lucha was much smaller, covering an area of only approximately 5 ha, and it consisted of a few hundred trees. There was little understory vegetation in either of the two plantations. While the ground beneath the trees was littered with bark and leaves from the overhead eucalyptus trees, the openness and overall lack of ground cover made these plantations excellent sites for collecting freshly-molted feathers. During the month of January 1997, an estimated 10,000–12,000 Swainson's Hawks roosted in the plantations at night. After Swainson's Hawks left each roost in the morning, we walked through the entire plantation and collected molted feathers between the rows of trees, paying particular attention to collect molted primary and secondary feathers of all sizes. All molted primary and secondary feathers were compared to photographs of known primary and secondary feathers obtained as they were molted by captive Swainson's Hawks. Primary and secondary feathers were numbered as shown in Figure 1.

RESULTS & DISCUSSION

The ground under roost trees was littered with hundreds of molted feathers of all types. We frequently encountered molted coverts but, because they were impossible to individually identify, we did not make an attempt to collect them. Molted tail feathers were also numerous but we did not collect them because we lacked good reference photos of known tail feathers and, due to their worn condition, it was difficult to distinguish individual rectrices.

We collected a total of 355 primary and secondary feathers (Table 1). Of the 193 primary feathers collected, only four could not be identified to number. We found all 10 primary feathers but the most frequently-collected one was P8, followed by P7, 6, 4, 5, and 9. Of the 149 secondary feathers we collected, only 53 could be assigned to exact numbers. We found all secondary feathers except S4 in

TABLE 1. Numbers of molted primary and secondary feathers collected at nocturnal roosts used by Swainson's Hawks wintering in the province of La Pampa, Argentina in 1997.

Primary feathers	Secondary feathers
P1 - 1	S1 - 9
P2 - 3	S2 - 6
P3 - 10	S3 - 8
P4 - 22	S4 - 0
P5 - 21	S5 - 3
P6 - 27	S6 - 3
P7 - 29	S7 - 3
P8 - 42	S8 - 1
P9 - 21	S9 - 1
P10 - 13	S10 - 5
Alulas - 13	S11 - 3
	S12 - 4
	S13 - 7
Unspecified[a]	Unspecified
P1-4 - 1	S1-3 - 8
P5-7 - 2	S4-5 - 41
P8-10 - 1	S6-9 - 30
	S10-13 - 17

[a]Indicates possible range of primary and secondary feathers for which the exact feather number could not be determined.

our collections. The most commonly found secondaries were S3, 13, 2, and 10. The remaining 96 secondary feathers were assigned to a range of numbers. Again all ranges were identified with 41 feathers ranging from S4–5, 30 ranging from S6–9, and 17 ranging from S10–13. We also found 13 alular quills.

This is the first record of actual feather molt by Swainson's Hawks on their austral summer grounds in Argentina. It corrects the molt timing described by Bent (1937) and England *et al.* (1997) who both reported that Swainson's Hawk begins molting in March and completes its molt by the beginning of September, prior to departure for migration. It also documents for the first time what many have only assumed to be the correct timing of molt in this species. Yes, molt does occur on the austral summer grounds and, at least for the remiges, it may involve the replacement of any of the primary feathers. More frequently it involves the higher numbered primaries, such as P6, 7, 8, 9 and 10, located near the tip of the wing. Unlike falcons which begin molt of remiges with P4 (Stresemann 1958, Cade 1982), all accipitrid raptors begin molt of their remiges with P1, and the molt proceeds ascendantly (toward the outermost) with the orderly replacement of primaries and their corresponding greater coverts (Miller 1941, Edelstam 1984). This being the case, our finding that most of the primaries molted on the austral summer grounds by Swainson's Hawks included the higher numbered primaries was expected since it is these feathers that would most likely be replaced following the restart of molt on the austral summer grounds. Secondary feathers have molt centers at S1, 5, and 12 (Miller 1941). While we could not identify the exact numbers of the molted secondary feathers as reliably, the fact that we found large numbers of all of the secondary feathers indicates that the molt of secondary feathers on the austral summer grounds is more extensive, and it involves all three of the molt centers. Here too, our findings were not unexpected because the molt of secondary feathers does not begin until after primary feathers have begun to be molted on the breeding grounds. With the limited amount of time available to complete this phase of the molt process, the molt of secondary feathers must necessarily restart after the migration to South America where it can involve the replacement of any of the secondary feathers.

Our findings raise two very important questions. First, is feather molt in Swainson's Hawks completely suspended during the migration season? Migrants observed in Central America have gaps in their wings and tails (Palmer 1988) suggesting that Swainson's hawks may actually continue to molt during the migration season. Nevertheless, the fact that no molted feathers have been found under night roosts in Panama where thousands of hawks roost during the night (Smith 1980), plus the fact that Swainson's Hawks are considered to fast during migration (Smith *et al.* 1986) leaves some doubt if they do, in fact, molt during migration. Unquestionably, further research is needed at count and trapping sites in Central and South America to better document the occurrence of molt in Swainson's Hawks during the migration season. The second question is related to our findings that Swainson's Hawks grow feathers continuously both in North and South America. Stable isotope analysis of feathers is a promising technique to trace the origins and migration routes of wintering birds (Hobson 1999). This being the case, to what extent can stable isotope analysis of Swainson's Hawk feathers be used to trace the origins of these hawks during migration and on their austral grounds? Based on the feather molt we observed in Argentina, we would caution that, when feathers are being used for this technique to describe the migration of Swainson's Hawks, analyses should focus on those feathers that are most likely grown in North America, such as the lower numbered primaries and their associated coverts.

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