INCOMPLETE FIRST PREBASIC MOLT IN THE WRENTIT

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Flight-feather molt in most passerines begins with the innermost primary and proceeds distally, while the replacement of secondaries begins at the outermost feather and proceeds proximally (Ginn and Melville 1983, Pyle 1997a, 1998). During their first year, most passerines do not replace any flight feathers (i.e., the molt is partial), while a few replace some (i.e., the molt is incomplete) or all remiges (i.e., the molt is complete) (Jenni and Winkler 1994, Pyle 1997a).

In a few species, incomplete first-year molts follow different patterns, which involve a sequence of replacement similar to that found during complete molts but begin at different points along the wing (Jenni and Winkler 1994). Such incomplete remex molt, termed "eccentric," has been documented for some North American passerines, including the Loggerhead Shrike (*Lanius ludovicianus*), Yellow-breasted Chat (*Icteria virens*), and certain tyrant flycatchers (Miller 1928, Phillips 1974, Thompson and Leu 1994, Pyle 1998).

Between November 1999 and March 2000 Point Reyes Bird Observatory (PRBO) biologists documented several examples of incomplete molt of flight feathers on first-year Wrentits (*Chamaea fasciata*) captured at three mist-netting sites operated as part of PRBO's landbird-monitoring program. The study sites were located approximately 28 km northwest of San Francisco, within and just outside of the Point Reyes National Seashore, Marin County, California. These are the first recorded observations of incomplete first prebasic molt in the Wrentit, which was previously considered to have a complete first prebasic molt (Pyle 1997a, b).

We examined 101 study skins of Wrentits at the California Academy of Sciences (CAS) to determine whether or not the mist-netted birds were anomalous. To ensure that molt had been completed and feather wear was minimal, we examined only specimens collected between September and February. We examined both wings and noted the location of retained feathers. The age of the bird, if known, was recorded from the tag data. Because of the difficulty of viewing the closed wings of study skins, both of us examined the same skins independently to ensure accurate recording of presence or absence of retained feathers.

On the 23 mist-netted Wrentits, we examined the primaries and secondaries of each wing carefully and noted the location and symmetry of retained feathers between wings. We determined the age of each live bird either by the degree of skull pneumatization (Pyle 1997a) or, if the individual had been banded previously, we referenced PRBO capture data. The difference in flight-feather age was obvious on live birds in the hand, retained feathers being noticeably worn and light brown, newly replaced feathers fresh and dark brown. Of the 16 first-year (hatched in 1999) Wrentits examined, nine (56 %) had retained some juvenal flight feathers while the other 44% had undergone a complete first prebasic molt. All of the older birds (hatched prior to 1999) had undergone a complete molt as expected, with all flight feathers having been replaced (n = 7).

Of the 101 museum specimens examined, 11 showed incomplete wing molt. The collectors identified only three of the 101 study specimens to age and none of the 11 with incomplete molt was aged. The locations of specimens with incomplete molt included Marin, San Mateo, Alameda, Placer, and Los Angeles counties.

On both live birds and study skins the patterns of replacement varied. The most common pattern (10 of 20 birds) was the bird's replacing all primaries and retaining only a few secondaries, usually secondaries 1–3. Another pattern seen in three of 20

birds included retention of primaries 1–2 and secondaries 1–4. We observed a few examples of asymmetrical replacement, with some feathers retained on one wing and replaced on the other. This was not unexpected, as eccentric sequences of molt were asymmetrical in 60% of cases reported by Jenni and Winkler (1994).

In the life history of a bird, molt is a fundamental high-energy expenditure not fully understood by biologists. There are numerous theories that may explain eccentric molt observed in some birds. One possible explanation may be poor environmental conditions. If weather were bad and/or food scarce, an incomplete molt would enable the bird to conserve energy by replacing only the most critical feathers. In species whose first prebasic molt includes some to all flight feathers, hatching date and its effect on the timing of molt may influence the extent of feathers renewed. Birds hatched late in the season experience more of a time constraint on molt and thus may molt more quickly after fledging, finish molting in a shorter time period, and replace fewer feathers than those hatched earlier in the season (Jenni and Winkler 1994). Also, in the Wrentit, which spends its entire life in dense scrub or chaparral, enduring extensive feather wear through contact with harsh vegetation, incomplete molt may be a strategy to molt the minimal number of feathers necessary to protect and preserve the retained feathers. Incomplete remex molt is also known in such diverse North American species as the Verdin (*Auriparus flaviceps*), White-eyed Vireo (*Vireo griseus*), Yellow-breasted Chat, Field Sparrow (*Spizella pusilla*), and several species of wrens, thrashers, sparrows, and orioles (George 1973, Willoughby 1991, Thompson and Leu 1994, Pyle 1997b, 1998).

Retained feathers are a helpful criterion used to age passerines in the hand. Most adult North American passerines have a complete prebasic molt (Pyle 1997a), so incomplete molt indicates a first-year bird, at least until the first prealternate molt or second prebasic molt (Mulvihill 1993, Jenni and Winkler 1994, Pyle 1997b). The occurrence of incomplete molt in the Wrentit makes it possible to age some first-year birds after skull pneumatization is complete. We caution that over time retained juvenal feathers may be more difficult to discern as renewed feathers age and become more worn and faded. We promote further study of incomplete molt and encourage museum curators to consider spread-wing specimens to facilitate future studies.

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LITERATURE CITED

George, W. G. 1973. Molt of juvenile White-eyed Vireos. Wilson Bull. 85:327–300.

Ginn, H. B., and Melville, D. S. 1983. Moult in Birds. Guide 19. Br. Trust Ornithol., Tring, England.

Jenni, L., and Winkler, R. 1994. Moult and Ageing of European Passerines. Academic Press, London.

Miller, A. H. 1928. The molts of the Loggerhead Shrike *Lanius ludovicianus*. Univ. Calif. Publ. Zool. 30:393–417.

Mulvihill, R. S. 1993. Using wing molt to age passerines. N. Am. Bird Bander 18:1–10.

Phillips, A. R. 1974. The first prebasic molt of the Yellow-breasted Chat. Wilson Bull. 86:12–15.

Pyle, P. 1997a. Identification Guide to North American Passerines. Slate Creek Press, Bolinas, CA.

Pyle, P. 1997b. Molt limits in North American passerines. N. Am. Bird Bander 22:49–90.

Pyle, P. 1998. Eccentric first-year molt patterns in certain tyrannid flycatchers. W. Birds 29:29–35.

Thompson, C. W., and Leu, M. 1994. Determining homology of molts and plumages to address evolutionary questions: A rejoinder regarding emberizid finches. Condor 96: 769–782.

Willoughby, E. J. 1991. Molt of the genus *Spizella* (Passeriformes, Emberizidae) in relation to ecological factors affecting plumage wear. Proc. W. Found. Vert. Zool. 4:247–286.

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