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Alaska suggested that the tertials were significantly more worn than the other secondaries, indicating that they are replaced only once on the breeding grounds and that only one molt occurs per year. A similar situation appears to occur with Red-eyed Vireo (*Vireo olivaceus*); see Pyle (1997:289)."

Work on the winter grounds could help determine whether or not a partial prealternate molt may occur in Arctic Warblers, perhaps overlapping with the completion of the complete prebasic molt, as occurs in some Charadriiformes and other migrant waterbirds (Pyle 2008).

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Frequency of Supernumerary Remiges in White-eyed and Black-capped Vireos

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ABSTRACT

Supernumerary flight feathers have been noted for a variety of avian species. However, the frequency that such feathers occur has been seldom reported because large numbers of birds are examined rarely for this condition. During three summers, I captured White-eyed and Black-capped vireos (*Vireo griseus* and *V. atricapilla*) in central Texas. I

examined the number of remiges on the right wings of each bird and found supernumerary remiges on two adult White-eyed Vireos (0.9%, $n = 230$) and one hatching-year Black-capped Vireo (0.4%, $n = 275$). I determined that the extra feathers of these birds were among secondaries 1 - 6, but was unable to determine their exact positions. None of the three birds had an unusually low mass, suggesting that the extra feathers may have had no severe cost.

INTRODUCTION

Most avian species have characteristic and fixed numbers of flight feathers (i.e., remiges and rectrices). However, individuals with extra (supernumerary) feathers have been reported for several species of both nonpasserine (Clark 1899, Test 1939, Berger and Mueller 1958, Stresseman 1963, Mueller and Berger 1966, Peterson 1976, Clark et al. 1988) and passerine birds (Wayne 1907, Parkes 1950, Yunick 1977, Kolb 1980, Humple 1999). Little is known about how frequently these supernumerary flight feathers occur because specimens and captured individuals are not examined routinely for this condition. The studies of Peterson (1976) of the Long-tailed Duck (*Clangula hyemalis*) and Clark et al. (1988) of migrating raptors are exceptions that were based upon large samples. Here, I report on the occurrence of supernumerary remiges in White-eyed (*Vireo griseus*) and Black-capped vireos (*V. atricapilla*).

METHODS

From mid-June to mid-September 2006-2008, I used recorded conspecific and Eastern Screech-Owl (*Megascops asio*) vocalizations to lure White-eyed and Black-capped vireos into mist nets at Fort Hood Military Reservation in central Texas (Bell and Coryell Counties). For each capture attempt, I deployed a single 6-m mist net in an area of shrub vegetation <3 m high. Additionally, I used two 12-m nets on four occasions to capture birds in the giant ragweed (*Ambrosia trifida*) understory of a riparian willow (*Salix* sp.) forest. I noted which feathers were in molt on the right wing of each captured bird. To do this, it was necessary to count the remiges. Both vireo species typically have 10 primaries and 9 secondaries for a total of 19 remiges on one wing.

RESULTS

I examined 230 White-eyed Vireos and noted two (0.9%) with an atypical number of remiges. I captured these birds on 7 Jul 2008 within 300 m of one another. Both were female, aged second year (SY) and after second year (ASY), and each had 20 flight feathers on the right wing. The ASY also had 20 on its left wing, whereas the SY had the typical 19. At the time of capture, neither bird had started its prebasic molt. I was unable to determine the exact

position of the extra feathers. However, the tertials (secondaries 7 through 9) of vireos have distinct shapes and it appeared that both birds had only the normal three tertials present. I also determined that the extra feathers were not primaries by noting that the normal 10 feathers were attached to the manus. This was also confirmed by feather shapes. The inner primaries of vireos have a rounded tip that contrasts slightly with the more squared tip of the outer secondaries and both birds appeared to have 10 primaries based on shape. Thus, I concluded that the supernumerary feathers were secondaries inserted somewhere between the innermost (first) primary and the seventh secondary (i.e., the outermost tertial).

I examined 275 Black-capped Vireos and noted one (0.4%) with an atypical number of remiges. This bird was a hatching-year (HY) male captured on 2 Sep 2008. It had 20 remiges on its right wing and was nearing completion of its first prebasic molt. The only growing feathers I detected were greater secondary coverts. As with the other two vireos, the extra feather appeared to be a secondary inserted somewhere among the first six secondaries. The left wing of this bird had the normal 19 remiges.

DISCUSSION

To my knowledge, supernumerary secondaries have not been reported in other passerines to date. Test (1939) noted an extra secondary on a Northern Flicker (*Colaptes auratus*). This feather was abnormally pigmented and was shorter and narrower than the adjacent secondaries. The supernumerary secondaries of the vireos I observed appeared normal in size and color and, indeed, I was unable to determine their exact position partly for this reason.

The first prebasic molt of Black-capped and White-eyed vireos does not include secondaries other than tertials. Consequently, the supernumerary secondaries in the HY Black-capped Vireo and the SY White-eyed Vireo likely originated in their juvenal plumage. The extra secondaries in the wings of the ASY White-eyed Vireo would have been grown during its previous prebasic molt. Whether these extra feathers existed before that molt is unknown. Whether any of these birds will replace

their extra feathers in future molts or instead grow the typical number of secondaries is also unknown.

The frequencies of occurrence of supernumerary remiges in the two vireo species I examined are intermediate among rates reported for other species. Peterson (1976) reported that 10% of Long-tailed Ducks had an atypical number of rectrices. Clark et al. (1988) reported the frequency of supernumerary flight feathers for 32 species of diurnal raptors, but only 11 of these were based on 100 samples. Three of these had frequencies within the range of the two vireo species whereas the eight remaining species had lower frequencies. Direct comparison among these studies is, however, complicated by the fact that Peterson (1976) examined only the tail, Clark et al. (1988) examined both wings and the tail, and I examined only the right wing. The frequencies I observed may have been higher if I had examined all flight feathers.

I observed no evidence that the vireos suffered any severe cost of having supernumerary secondaries. The two White-eyed Vireos had survived for nearly a year with these feathers (perhaps longer for the ASY) and both had above-average mass upon capture. The SY was 12.4 g and the ASY was 11.3 g. The mean mass for females captured within one week of these two birds was 11.1 g ($n = 25$, range = 10.2-12.4 g). The mass of the Black-capped Vireo, 7.8 g, was below average for age HY in 2008 (8.7 g, $n = 15$), but was not the lowest observed (range 7.6-9.6 g). However, it is possible that the costs of supernumerary flight feathers manifest themselves in different ways or at other times of the year and would, therefore, not be readily apparent from the mass of the birds at the time I captured them.

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