

Determining age and sex of Purple Martins.—Preliminary to a study of molt cycles in Purple Martins (*Progne subis*), I investigated the use of plumage characteristics in aging and sexing individuals of the species (Niles, *Condor*, 74: 61-71, 1972). Ridgway's (The birds of North and Middle America. *U. S. Natl. Mus. Bull.* 50, Part III, 1904) characterization of the plumages of *P. subis*, the best available source on the subject, formed the foundation of my initial attempts to allocate individual specimens to discrete age-sex classes. Examination of 251 museum skins collected from throughout the summer in the eastern United States and Canada disclosed, however, that Ridgway's descriptions, while broadly and usefully characteristic, required modification and addition before the age and/or sex of many individuals could be known. In this note the distinctive plumage characteristics of the five identifiable age-sex classes of *P. subis* from eastern North America are elaborated. These classes are: juvenile, first-year (plumage acquired in postjuvencal molt) male and female, and adult (plumage acquired in first postnuptial molt) male and female.

Additionally, examination of 38 freshly killed martins from a late summer, nocturnal roost at Jefferson City, Missouri provided information on age-related variation in the color of the soft parts and in the extent of skull pneumatization.

Juveniles. Although juvenile males average a slightly deeper blue on the dorsum than do females, I was unable to distinguish consistently between the sexes of juveniles on the basis of plumage. In general, the washed-out, watery blue-green color of the dorsum of juveniles of both sexes sufficiently distinguishes them from the more strongly colored older birds (Ridgway, 1904); some first-year females, however, might be indistinguishable from juveniles on the basis of color alone.

When juvenile males can be distinguished from juvenile and first-year females by direct sexing (laparotomy or dissection), the length of the outermost rectrix can then be used to separate most juvenile females from most first-year females. Twenty-two females, identified as first-year birds on the basis of plumage color alone, averaged 73.5 mm (70.2-79.2; S.D. = 2.522) for this character; 65 juvenile females averaged 65.6 mm. (60.7-70.1; S.D. = 1.881). From these data, approximately 90 per cent of all first-year female martins from eastern North America should possess outermost rectrix measurements above 69.2 mm; approximately 90 per cent of all juvenile females from the same area should measure below 68.7 mm. Where direct sexing of questionable individuals is impossible this character becomes much less useful because the length of the outermost rectrix of juvenile males broadly overlaps that of first-year females. Twenty-six juvenile males averaged 68.4 mm (64.3-74.2; S.D. = 2.579) for this character; outermost rectrix measurements for approximately 90 per cent of all juvenile males should fall below 72.8 mm.

In contrast to most first-year and adult martins, juvenile martins do not begin molting primaries and secondaries until reaching the wintering grounds in South America (Niles, 1972). Nine of 14 first-year female martins collected in eastern North America after 1 August were in remex molt.

In summary, most juveniles are identifiable on the basis of their watery blue-green dorsal plumage, the length of the outermost rectrix, or (by late summer) the absence of premigratory remex molt. Some individuals will prove, however, to be unidentifiable by all of these criteria; a juvenile-colored female with a very short (but unmeasurable) tail collected on 8 July (before the molt period) in Michigan possessed, according to information on the specimen label, a brood patch and fully-pneumatized skull (see below).

Live or freshly killed birds may profitably be examined for three additional characters. Most first-year martins attempt to nest (Johnston and Hardy, *Wilson Bull.*, 74: 243-262, 1962), and probably most summer, first-year females will possess a brood patch, in contrast to all juveniles. Among the freshly killed, late summer (21 August) Missouri birds, however, I was unable to detect any brood patches, indicating that this character might regress rapidly following breeding. All juveniles (identified by dorsal color) in the Missouri sample possessed yellow inner mouth linings, contrasting with the pale, horn-colored mouth linings of all older birds. Finally, the skulls of the 15 juveniles in that sample were all non-pneumatized (stage I of Leberman, *Bird-Banding*, 41: 121-124, 1970), as was that of one male in worn first-year plumage with remex molt underway. Three first-year birds possessed partially pneumatized skulls (Leberman's stage III-IV); the skulls of five first-year birds and 14 adults were completely pneumatized (stage

VI). The presence of a clear, unpillared area on an otherwise pneumatized skull generally indicates a first-year martin, whereas possession of an essentially clear skull implies, but does not prove, that the individual is a juvenile. A martin with a fully pneumatized skull may be *either* a first-year or an adult bird. Wood's (A bird-bander's guide to determination of age and sex of selected species. Penn. State Univ. 1969.) statement that martins may be aged ". . . by skulling in summer into Sep." must, obviously, be interpreted with care.

First-year females. As discussed above, the characteristics of this age class overlap to some extent those of juveniles. The same pertains to first-year and adult females. I distinguished adult from first-year females on the basis of a series of plumage characters differing from those of Ridgway (1904) only by including additional ways of differentiating birds in worn plumage. Birds of the spring and early summer are easily identified, the weak blue of the dorsal plumage of first-year birds contrasting with the much brighter steel blue of adults. With the advancement of summer, plumages become progressively more worn and (frequently) foxed, and distinguishing the two classes becomes progressively more subjective. In general, late summer adults possess a combination of (in part, at least) dark purple or black dorsal feathering and a sooty (especially on the undertail coverts) venter. Backs of well-foxed first-year birds are brown, not deep purple or black, and their underparts are less extensively pigmented than are those of adults. The sooty coloring on the undertail coverts of first-year females is largely confined to the feather shafts; that of adult females is pervasive over the feather vane as well. The dorsum, especially the lateral margins of the crown, of most first-year females retains even in late summer a trace of the washed-out blue feathering of the fresh plumage.

In summary, use of the suite of plumage characteristics here described usually allows assignment of an individual to one of the two postjuvenile female age classes with little difficulty; occasional birds, usually extremely foxed, however, proved impossible to allocate by these criteria.

First-year males. Occasional birds of this class might be confused with adult females in the absence of information on the gonads, brood patch or sex-specific behavior. Of 11 first-year male specimens which had not yet begun the post-nuptial molt, however, ten had one or (usually) more blue feathers on the ventral tract. Females apparently never possess blue ventral feathering, and may thus be distinguished from most first-year males.

It is of interest to determine when first-year males begin to acquire blue ventral feathering. Four male *P. subis* in postjuvenile molt (collected in South America from 16 January to 2 April) all possessed some blue feathers upon the otherwise pale gray venter, although in the January bird, which was approximately two-thirds through the body molt, the blue was restricted to one spot on the breast. The other three specimens, which had nearly completed the postjuvenile molt, displayed fairly extensive blue spotting on the chin and throat. None of the many males collected in North America during the early stages of postjuvenile body molt possessed any blue ventral feathers. It thus seems reasonable to assume that most or all of the ventral blue coloring in the first-year male plumage is acquired during the portion of the postjuvenile body molt that occurs in South America, and will be present in males arriving for their first spring on the breeding grounds.

Adults. Difficulties related to identifying adult females have been discussed with earlier age groups; the blue-black adult males are, of course, unmistakable.

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