

intestine. This doe had died in fawning. Whether the birth was delayed much past the usual gestation period is unknown, but it is believed that the animal would have been born in mid-December. For purposes of computation, the birth date was listed as December 14.

The average fawning date as computed by the supporting data is August 10. This supporting data, however, extends the computed fawning period over a greater period of time. Wardens have reported seeing a few young fawns in late April and early May which would extend the season a little longer.

DISCUSSION

The aging of legally killed animals of the one and one-half year class can be used to determine the approximate fawning season. In Alabama this fawning season occurs over a relatively long period and has a peak during August.

If there is ever to be a doe season or an any-deer season this long breeding season must be taken into consideration. Some does in Alabama give birth to their fawns in November and an appreciable number are heavily lactating through December.

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RECOGNIZING JUVENILE FROM ADULT BOBWHITE QUAIL

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Information on the percentage of young among quail (*Colinus virginianus virginianus*) harvested by hunters is useful in quail management. Reasons for high or low populations of quail may be better understood with such information at hand. In some years the data may provide justification for continued open seasons, despite poor hunting success early in the season.

The separation of juvenile and adult bobwhite quail has been based primarily on wing feather characteristics. Dwight (1900) apparently was the first to make an intensive study of plumage changes in quail. He reports that the two distal primaries in all quail and grouse are retained in the postjuvinal molt, but he makes no mention of how these feathers differ from those on older birds. Stoddard (1931) calls attention to the shape of the outer two primaries as a criterion for separating young (pointed) from older birds (blunted). Van Rossem (1937) reports that the juvenal primary coverts in native quail are retained until the first annual molt the second fall (about August). Leopold (1939) reports that the buffy fringe on the tip of greater upper primary coverts 1 through 7 (counting from inside—outward) provides the best means for identifying young of the year.

Studies by the author on quail in Alabama have shown that the degree of marking on these coverts and the pointedness of the outer two primaries, vary sufficiently to introduce a small error in separating young from old. This

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condition led to efforts to further improve on techniques for recognizing young of the year. Results of that study are here reported.

A total of 7,037 quail wings sent in by cooperators during the 1954-55 hunting season in Alabama, was examined for age ratio data. The wings were received in special postage-reply envelopes. Age was determined by methods described by Stoddard and by Leopold. Young of the year were recognized by whitish or buffish tips on the coverts (Fig. 1), and by pointedness and slight fading of the outer two primaries. A fluorescent light was used to help distinguish the faded brownish color of the outer two primaries in young of the year. Adult birds were recognized by the even slatish gray coverts, and rounded tips and similar shading on all primaries (including Nos. 9 and 10). Even where all these characteristics were used, some quail could not be aged with accuracy because of the intergradation of characteristics. Such birds were recorded as of unknown age. Some birds with juvenal coverts had molted primary No. 9; and some with juvenal appearing primaries 9 and 10, had coverts so faintly marked that age determination remained questionable. The degree of pointedness varied considerably. In rare cases primaries 9 and 10 were so extremely faded (very brown) and worn that it was obvious they had not been molted even in the second fall or postnuptial molt. A few birds with all primaries blunt tipped were found with a brown terminal edging on the coverts and primaries. About 2 to 3 percent of the wings were atypical with the remainder being quite easily separated into young or old.

AGE OF ATYPICAL WINGS REVEALED BY COVERT NO. 7

Atypical wings which can not be aged with certainty by previous methods can be separated into adult and juvenile by observations on the general color density, shape, and sturdiness of structure of greater upper primary covert No. 7 (third from outside).

In developing this technique for aging atypically marked quail, 578 wings were taken without special selection from wings mailed in from throughout Alabama during January and February, 1955. The ages of wings were determined by the usual means. This resulted in a breakdown of 33.7 percent (195) adult, 63.8 percent (369) juvenile, and 2.4 percent (14) of questionable age. Upper primary covert No. 7 from these 578 quail wings was pulled and fastened onto white cards by a drop of glue on the quill. All the juvenal coverts (No. 7) resembled each other in that they had a uniformly brownish tint; most of them were tipped with buffish; and the barbs in the vanes had a tendency to separate more easily, thereby presenting a ragged appearance. The No. 7 coverts from adults were the opposite in that they were uniformly darker, they had a more sleek appearance because the barbs continued to stay together better, there was no tip marking (except for a faint unnatural dark brown color on two feathers), and most of the coverts had more whitish downy tipping on the basal 15-20 barbs. Among the 14 feathers from wings of questionable age, 1 feather resembled those from adult and 13 those of juvenal quail. The difference was distinct.

Feathers from 9 young birds of the year of exact known age and from 7 young with a bursa all resembled those from 369 birds judged to be juveniles on the basis of covert feather characteristics. There were no exceptions or intergrades.

The No. 7 covert from 100 slightly atypical wings (age characteristics not in full agreement or of such development as to make age determination slightly questionable) saved from an estimated 5,000 wings were studied. Twenty-three of the 100 wings appeared to be adult when judged on appearance of the No. 7 covert. However, there was some faint indication of brownish on some of the coverts on 22 of these wings. The brownish markings on the coverts, which structurally resembled feathers of adults, were associated with extra marginal brownish markings on several of the primaries. It appears that birds which inherit brownish edging on the primaries often have some brownish markings even on some of the postnuptial coverts (coverts which adult birds acquire in their molt following their breeding season probably at about 13-14 months). The No. 7 covert from the other 77 looked like those from juvenile birds.

The reason for selecting No. 7 covert for determination of age of atypical wings is that it is one of the largest and most sturdy coverts and it is usually buff marked in young. Coverts 8 and 9 were avoided because they were found to be more nearly similar in appearance in young and old. Leopold (1939) similarly observed that these two coverts differ less in adult and juvenile quail than do coverts 1 through 7. The difficulty in pulling the more downy and fragile inner coverts (1 through 4) make these unsatisfactory for use. Since primary covert No. 7 proved dependable for age analysis, no serious attempt was made to see whether Nos. 5 or 6 could be used similarly. However, in general it appears that they can be used to distinguish young of the year from older birds. In one bird covert No. 7 had an adult appearance, while the adjoining coverts were of juvenal characteristics. In this case No. 7 had been prematurely molted. Leopold (1939) found a premature replacement of juvenal coverts by adult coverts in the postjuvenal molt in 1.2 percent of bobwhites. He reports that the middle coverts are most apt to be so replaced. Of the three coverts (5, 6, 7) that seem suitable for distinguishing young of the year from old birds, covert No. 7 is the farthest from the center of the wing.

The most rapid means of separating young of the year from adult quail is to do so on the basis of buff markings on the coverts, and appearance of the outer two primaries (shape and shading). Covert No. 7 need be used only where covert markings, pointedness, and/or shading of the outer two primaries is indistinct, or where results from these older methods do not agree. It has been found advisable to use every character available for substantiating results. Covert No. 7 need be examined on only about 3 or 4 out of each hundred wings.

It is recommended that the investigator pull a sample of about 25 No. 7 coverts from typical juvenal and adult wings and glue the feathers in age groups to a white card. A drop of quick drying cement on the tip of the quill is sufficient for attaching the feathers. Coverts from birds of questionable age can easily be compared to those on the reference card. This method should yield dependable results. The technique has an additional advantage in that workers can make up their own reference collection, and can use the coverts to double check results by older methods.

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