DR. L. BUREAU'S WORK ON THE PARTRIDGE.

BY

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In Vol. V., No. 8 (1.I.12), pp. 210-18, we had the pleasure of drawing the attention of British ornithologists to Dr. Bureau's work on the Common Partridge (*Perdix p. perdix*). His second memoir, dealing with the Red-legged Partridge (*Caccabis r. rufa*) has now appeared* in a similar volume of 143 pages, illustrated with fifty-four plates and diagrams, the result of seventeen years of field-work. It is even more replete with diagrams and facts than the former volume, and though the wealth of detail will doubtless prove somewhat wearisome to the ordinary sportsman, it cannot fail to be of interest to the working ornithologist, and bears eloquent testimony to the care and accuracy with which the author has carried out his task. The present memoir is planned on the same lines as its predecessor and the same methods of study have been pursued, so that there is no need here to recapitulate the ground-plan of the work, which was dealt with fairly fully in considering the first memoir (Vol. V., pp. 210-12). On page 74 will be found the author's "Chronometric Table," similar to that of the Common Partridge, whereby anyone can determine the age of a young Red-legged Partridge from the 29th day (when its juvenile tenth primary is lost) up to the age of 130 days, when the third primary of the first winter-plumage is full-grown and the bird itself is full-grown, and through its first moult, which in Loire Inférieur, whence the author's material was derived, occurs about the beginning of November. As has already been implied (*antea*, Vol. V., p. 348) by Mr. Heatley Noble, in pointing out the distinction between old and young Red-legged Partridges—viz., the pointed extremity and yellowish-white spot on the inner web of

* Louis Bureau: *L'age des Perdrix.*—II. La Perdrix rouge. 8vo, pp. 143, fig. 54. Nantes, Vié, libraire, 28 Passage Pommeraye. London, Williams and Norgate, 14, Henrietta Street, Covent Garden.

the first primary of the latter—the first and second juvenile primaries in this species, as in the Common Partridge (and we may add also the Red Grouse, Willow-Grouse and Ptarmigan), are not lost at the first moult but are retained until the end of the second moult, when the bird is fifteen or sixteen months old. As was done in the case of the Common Partridge, we will now summarize the author's results of the progress of the first moult at the time when each primary is lost :—

THE YOUNG RED-LEGGED PARTRIDGE AT VARIOUS AGES.

When newly hatched. Down-plumage, top of head uniformly reddish ; sides of head slightly tinted with red, and a brown spot stretching back from the eye ; upper-parts and wings reddish-brown tipped with blackish-brown, on the back three longitudinal light-yellow bands, the median one narrow, the two lateral ones broader; throat and breast whitish ; rest of under-parts light yellow ; bill pink, shading to brown above ; legs pink. Differs from the downy Common Partridge in that the latter has small dark chestnut spots on the top and sides of the head which become larger and more diffuse on the upper surface of the body.

At the 29th day the tenth primary is lost, the first has not appeared and the second has only just begun to grow. The bird wears a mixture of three plumages. The head and neck are still downy, the tail, wings (except the tenth primary) and the body-feathers belong to the sprouting juvenile-plumage, and the new tenth primary, just sprouting, belongs to the first winter-plumage. Bill blackish-brown ; eye-lids red ; feet and claws pale pink ; weight 100 to 110 grams. It is capable of a flight of at least 100-150 metres.

On the 34th day the ninth primary is lost, and the new tenth measures about 22.7 mm. The second has grown to a length of 20-30 mm., and the first has just begun to appear. None of the secondaries have been shed. The body-feathers are entirely those of the juvenile-plumage. and a few of those at the top of the head still have the down adhering to them. Bill reddish-brown ; eyelids and feet red ; length 235 mm. ; expanse 390 mm. ; tail projects beyond wings 32 mm. ; weight 140 grams.

On the 41st day the eighth primary is shed, the new ninth being 38.2 mm. long, the second 53 mm., and the first 29 mm. The third secondary is also lost about this time. The body

is fully clothed in the juvenile-plumage, which is characterized by light yellow and brown spots scattered over the secondaries, scapulars, and wing-coverts. Throat whitish, surrounded by a very narrow blackish-brown collar, not very evident; breast washed with light blue; belly ochreous; flank-feathers bluish at base and bordered with concentric bands of yellow, black, and russet. The first winter-plumage is beginning to show on the top of the head, back of the neck, and the top of the back as a uniform vinous tint. The tail has lost its middle feathers, and the new ones begin to grow. Weight (41st to 49th day) 172-220 grams.

On the 49th day the seventh primary is lost, the new eighth being 41.3 mm. long. The first and second measure 44 and 67 mm. respectively. The fourth secondary is lost about this time and the fifth about the 52nd day. The juvenile-plumage still covers most of the head, neck, wings and throat, and is still visible here and there on the breast, abdomen, and flanks. The rest of the upper-parts are clothed in the first winter-plumage, which is now traceable below in the black spots on the side of the neck and a row of the new tricoloured feathers on the flanks. The tail still retains the two outermost pairs of juvenile rectrices, and the new central ones project beyond them. Length 305 mm.; expanse 505 mm.; tail projects beyond wings 44 mm.; weight 220-272 grams.

On the 58th day the sixth primary is dropped, the new seventh measures 44 mm., and the first and second 62 and 80 mm. respectively. The sixth secondary is shed about now, the seventh about the 60th, and the eight about the 62nd day. Body-plumage and tail much as before, but the two central rectrices now project about 10 mm. beyond the long upper-coverts. Males can generally be distinguished from females by their thicker tarsus and the one or more large scales on its inner surface, the site of the future callosity. Weight 283 to 313 grams.

On the 70th day the fifth primary is lost, and the new sixth has reached a length of 56.3 mm. The second is full grown, and the first measures 100-103 mm. The body-plumage, except parts of the head and the outermost row of flank-feathers, is mainly that of the first-winter, the scapulars, median wing-coverts, and seven inner secondaries are still those of the juvenile-plumage, only the outermost pair of rectrices of this plumage are left. Length 340 to 350 mm.; expanse 515 to 520 mm.; tail projects beyond the wings 70 mm. Weight 300-385 grams.

On the 75th day, when the new fifth primary has grown 20-25 mm., the second and ninth secondaries are lost.

On the 80th day, when the new fifth primary has grown to 45 mm., the tenth and sometimes the first secondary is dropped, but more frequently the latter is retained until after the loss of the fourth primary. About this time also some young birds renew the scales of the feet.

On the 84th day, the new fifth primary being 64.5 mm. long, the first indication of the callosity on the tarsus of males may sometimes be *felt*.

On the 86th day the fourth primary is shed, the new fifth being 72.4 mm. long. The first, second, and third juvenile-primaries are full-grown. The plumage is practically that of the first-winter, except that the outermost row of flank-feathers, certain of the scapulars, and the three or four innermost secondaries are still juvenile ones. The new outermost pair of rectrices are about half-grown. The callosity in the males is now visible. Length (♂) 353-380 mm., (♀) 320-325 mm.; expanse (♂) 540-545 mm. (♀) 488-500 mm.; tail projects beyond wings 70 mm. Weight 295-415 grams. While the fourth primary is growing, the remaining secondaries are shed as follows: the eleventh on the 86th day, the twelfth on the 95th, the thirteenth on the 100th, and the fourteenth on the 105th, but the last-named may be retained until after the loss of the third primary.

On the 105th day the third primary is shed, the new fourth being 85.2 mm. long. The plumage is entirely that of the first-winter (except sometimes the innermost secondary), many feathers still retaining their sheaths at their bases. Tail, full-grown except the outermost pair of rectrices. Length (♂) 355-360 mm., (♀) 325-347 mm.; expanse (♂) 530-545 mm., (♀) 510-516 mm. Weight 402-465 grams.

On the 130th day the third primary is full-grown, the bird is also full-grown, and the moult finished.

The Moult of the Secondaries.

As in the Common Partridge, this takes place in two groups, an internal (3-15) and an external (1 and 2). The former are moulted from without inwards, and the latter from within outwards. The first to be shed (the third) is shed synchronously with the eight primary (41st day), the second about the 49th, and the first about the 86th day. The dates at which the others are lost have already been indicated.

The Moult of the Tail.

The juvenile tail on the 29th day is rounded in outline, very slightly hollowed out centrally, the feathers narrow and about 40 mm. long. It is full-grown by the 35th day, and its extremity forms a wavy line. By the 41st day the middle rectrices have been lost and the tail assumes a characteristic "Swallow-tailed" appearance, which, however, becomes daily less and less evident owing to the growth of the long central upper tail-coverts. By the 49th day only two pairs of lateral rectrices of the juvenile-plumage remain, but the new central ones, now 60 mm. long, project beyond them, and with the new short lateral rectrices, form an outline convex centrally with a concavity on either side. By the 58th day the central rectrices project 10 mm. beyond the upper coverts, but the outline remains much as before. By the 70th day only a single pair of juvenile-rectrices remain, and the whole tail is longer and more rounded. The last pair of juvenile-rectrices are lost about the 80th day and the whole tail is full grown by the 110th day.

Differences between the First and Second Moults.

These are exactly as already outlined (Vol. V., p. 216) for the Common Partridge, with this exception, that in the second moult the middle group of secondaries comprises the third to the ninth in the case of the present species, whereas in the case of the Common Partridge the tenth and eleventh are included in this group also. The scales of the feet are renewed annually in autumn.

Determination of Sex.

There are no plumage characters whereby the sexes of the Red-legged Partridge can be distinguished. Males are generally more stoutly built than females, and their weights tend to be heavier, but this is quite undependable. The tarsus of the male is stouter and bears a callosity on its inner surface. This is first visible about the 86th day, though discernible by touch sometimes as early as the 70th. At the age of two years a second nodule appears near the first, and at subsequent times others which eventually coalesce to form a nodular mass. Dr. Bureau does not mention any case of the growth of this callosity in the female.

DIFFERENCES IN DEVELOPMENT BETWEEN THE COMMON AND RED-LEGGED PARTRIDGES.

The Red-legged Partridge is later in beginning its nesting operations than the Common Partridge, the difference in Loire Inférieur is at least a fortnight, though the dates seem to vary at least a week in districts to the north and south of the Loire. It is also slower in its development, the moult of the primaries starts five days later, the new feathers grow more slowly, and each grows to a greater length before the next one is dropped. Thus the difference is 5 days at the fall of the tenth, 7 at the ninth, 8 at the eighth, 10 at the seventh, 11 at the sixth, 15 at the fifth, and 19 at the fourth and third. On the other hand, the fourth and third primaries grow rather quicker than those of the Common Partridge, so that at the end of the moult it is only a fortnight older than a Common Partridge at the same stage (130 as against 116 days).

The remaining sections, in addition to the elaborate and ingenious methods of collecting data for the "Chronometric Table," and the application to it of the Tests and Controls, the whole illustrated with a wealth of tables and diagrams, deal with such subjects as pairing, nesting, eggs, incubation, local races, weights of old birds, weights of young birds at different ages, and methods of distinguishing young from old, both in the hand and on the wing. We have summarized above the major portion of the new work, and we must leave those interested to follow the other parts of the subject in the book itself. It cannot fail to be both instructive and of interest both to the sportsman and ornithologist, not only on account of the matter contained in it, but because of the painstaking care—it is everywhere evident—the author has bestowed on his investigations. Dr. Bureau is to be congratulated on the completion of a notable piece of work.