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Luteal Cells and Sexual Dimorphism of Feathering in Wild Birds

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Source: The American Naturalist, Vol. 58, No. 659 (Nov. - Dec., 1924), pp. 572-574

Published by: The University of Chicago Press for The American Society of Naturalists

Stable URL: http://www.jstor.org/stable/2456582

Accessed: 02/05/2013 15:35

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(about two thirds), which is presumably due to selective elimination of Slender. The general trend of the observed ratios is explained if we assume that all trisomic Slender singles adequately tested have been Ddd (D being dominant over dd), and that much selective elimination of the Slender type occurs. The breeding data, however, show a marked deficiency in the normal single class when Slender is seed parent, and the ratios are otherwise different from those expected. The basic gametic ratio from random reduction would be 2Dd : 1dd : 1D : 2d, the D pollen being non-functional as usual. For pollination of Slender by normal (pollen all d) the expected ratio (without selective elimination) is, therefore, 2 Slender single: 1 Slender double: 1 normal single: 2 normal double. The observed ratio is at present 56:21:22:137, and larger numbers from selfing show a similar departure from the expected ratio among the normals. situation is evidently complex, and further consideration of hypotheses must be reserved for a more detailed report of this work to appear elsewhere.

A plant has been described⁸ which had several Slender single branches, while the other branches and the upper main axis were normal double; if this plant was originally Ddd (Slender single), the bud variation is readily explained by early loss of the D chromosome in a cell of the apical meristem.

The fact that Crenate also shows genetic association with single³ seems to be a serious difficulty in the way of any consistent and plausible general scheme for these forms. It is suggestive of the "varieties" of some of the trisomic forms of Datura,⁶ although Slender and Crenate are not very similar morphologically.

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LUTEAL CELLS AND SEXUAL DIMORPHISM OF FEATHERING IN WILD BIRDS

Boring and Morgan (1918)¹ have shown that hen-feathering in the male Sebright Bantam is associated with the presence of

s Frost, Howard B. "An apparent case of somatic segregation involving two linked factors." Am. Nat. 55: 461-464. 1921.

¹ Boring, A. M., and Morgan, T. H., 1918, "Lutear cells and hen-feathering." Journ. Gen. Physiol. I.

luteal cells in the testis. Since luteal cells are also a constant element in the ovary of the domestic fowl it has been suggested that hen-feathering in female fowls and in the male Sebright is due to a hormone secreted by the luteal cells which suppresses the development of cock feathers.

These conclusions suggested an investigation of the question whether or not there is a correlation between the sexual dimorphism in the feathering of wild birds and the presence or absence of luteal cells in the gonads, and also an investigation of the relation of the structure of the gonads to the seasonal variation of plumage. It seems advisable to give at this time a brief statement concerning the first question, inasmuch as considerable time will be required to satisfactorily work out the latter problem.

In order to test out the possible relation of the presence of luteal cells to feather coloring, a histological study has been made of the gonads of both sexes of a number of wild birds which for convenience have been grouped as follows: (1) Those in which the female shows the higher degree of coloration, such as the northern phalarope; (2) those in which there is no marked difference in the coloring of the two sexes, such as the killdeer, spotted sandpiper, steller jay and water ouzel; and (3) those with the male possessing the more brilliant plumage, represented by the robin, western bluebird, flicker, bob white, California quail, rusty blackbird and China pheasant.

The observations recorded here were made on the gonads of birds taken in late winter, spring and early summer. Immediately after the birds were shot their reproductive organs were removed and put into Bouin's fluid. The sections were for the most part stained with Delafield's haematoxylin.

In an earlier report² it was shown that as regards the phalarope no evidence was obtained indicating that luteal cells in any way influence the difference in feathering in the sexes. In no case were any luteal cells found in the testes of the phalarope, while sections of the ovaries showed them in considerable abundance. Since, in this instance, the female is the more brilliantly colored, the evidence that luteal cells secrete a hormone having a suppressing influence on feather-coloring is negative.

A study of the gonads of the birds in the second group showed luteal cells present in all the ovaries, but with the possible excep-

² Yocom, H. B., "Luteal cells in the gonad of the phalarope," Biol. Bull. 44, March, 1924.

tion of the testes of spotted sandpiper no cells were found in the testes which at all resembled luteal cells. In the testes of the sandpiper there were large cells located between the seminiferous tubules, resembling somewhat the characteristically grouped luteal cells of the ovary. Whether or not these are actually luteal cells must remain undetermined until another migration period, when more material will be available.

In the gonads of the birds of the third group every ovary studied possessed characteristic packets of luteal cells, but in no case were any such cells found in the testes.

Of the birds thus far studied there is no positive indication that luteal cells are present in the testes, while in all cases they were found in the ovaries. Such evidence would indicate that, for the birds studied, it is not a hormone secreted by luteal cells that has a suppressing influence on the development of color in the feather. Indeed, no evidence is at hand which would warrant any suggestion concerning the function of these characteristic groups of cells in the ovaries of wild birds. Nonidez³ has shown that in the fowls studied by him such cells arise from embryonic sex cords. This, however, does not give us any clue to their function, much less furnish evidence of their controlling influence on the color of feathers.

We must, however, bear in mind the fact, as suggested in the work on the phalarope, that in most fowls feather structure differs in the two sexes, while in the wild birds studied, with the exception of the gallinaceous birds, sexual differences in feathering seem to be due to color rather than to morphological differences of the feathers.

It is possible that a study of the relation of the structure of the gonad to the seasonal variation in feathering may give some evidence leading to an understanding of this perplexing question of the sexual dimorphism of feather color in wild birds.

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³ Nonidez, J. F. 1922, "Studies on the gonads of fowls. The origin of the so-called luteal cells in the testis of hen-feathered cocks." Am. Jour. Anat., 31, 109-124, 7 figs. in text.