on Hudson Bay. They are later found on some of the islands in the Gulf of St. Lawrence, but the route followed from the west coast of Hudson Bay to the Gulf was a matter of conjecture. The discovery of migrating flocks far down the west coast of James Bay coupled with records from Rupert House indicate that the main flight follows down the west coast of Hudson and James bays to the southern extremity and then presumably moves overland in an east-southeasterly direction across the narrow part of the Ungava Peninsula to the Gulf of St. Lawrence.

All specimens obtained had dusky-brown feet and legs, with the soles of the feet paler and greenish-gray. The bills of those specimens most advanced in the post-nuptial molt were pale rosy-pink, dusky on the ridge and virtually black at the tip. Two males, however, which were still largely in nuptial plumage but with the molt commenced, had still a trace of the orange coloration on the bill characteristic of spring. The irides were dark brown. In was interesting to observe how quickly the bright coloring of the bill in this species faded. In little more than half an hour the rosy blush had faded to a livid white.

SANDERLING, *Crocethia alba*.—The Sanderling was noted throughout the trip as an abundant migrant. At Big Piskwanish they passed our camp in flocks containing several hundred individuals. They frequented the tide flats exclusively and none was seen in the salt marsh. This species associated most frequently with the dense flocks of Semipalmated Sandpipers.

Five males and one female obtained between July 20 and 24 are all in worn breeding plumage with traces of the post-nuptial molt, most pronouncedly evident on the back.

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A COLOR ABNORMALITY IN THE SLATE-COLORED JUNCO

BY ERNST CASPARI

MOST of our knowledge concerning developmental physiology has been derived from the observation of abnormal specimens. In most cases, the abnormalities have been experimentally induced, for only in such instances is it possible to draw any conclusions as to the causal factors for the deviation. On the other hand, the description of nat-

urally occurring abnormalities may throw some light on a developmental process by indicating the developmental possibilities within a given species. It is with this idea in mind that the following color abnormality is being described. It has a certain bearing on the question of pattern determination in birds, a problem which is now being experimentally attacked by numerous authors.

Junco hyemalis has a relatively simple surface pattern. The wings, back, head, throat, and upper breast are colored, with the shade depending somewhat upon sex, season, and region of the body. The two outer rectrices of the tail and the outer vane of the third rectrix are white; the inner vane of the third rectrix and the inner rectrices, colored. The lower breast and belly appear white. The lack of pigment, however, is restricted to the apical, pennaceous part of the feathers, whereas the basal downy part contains dark pigment in the nodes of each barbule. A similar differentiation occurs in the feathers of the back where the downy part contains pigment in the nodes only, as in the ventral feathers, while the pennaceous part consists of wholly black barbules. The transition between downy and pennaceous parts is gradual with regard to barbule shape as well as pigmentation; some intermediate barbules are found in between.

The specimen to be described is a male which was killed at Easton, Pa., on November 24, 1895. It was given to the collection of Lafayette College by Mrs. James B. Neal. At first sight, it appears completely white, and it has, indeed, been labeled "albino." On closer inspection it is seen, however, that the downy basal part of the ventral feathers is pigmented. As a matter of fact, the feathers of the belly and lower breast are very similar to those of a normal bird, both macroscopically and in their finer structures. The white apical area is perhaps somewhat more extended, on the average, than in normal feathers.

On the other hand, all dorsal feathers of the bird, which usually are pigmented to the tip, as well as the three outer rectrices, are white and without any pigment. The structure of these white feathers has been studied in contour feathers of the back. They are well-differentiated into morphologically normal, filamentous, hook-bearing barbules in the pennaceous part, and morphologically normal barbules with nodes in the downy part. Both types of barbules are without any pigment. The pigmentless down barbules resemble a type which is rarely found in normal birds at the point of transition from the pigmented down to the white pennaceous part in ventral feathers. The morphologically normal appearance of these pigmentless barbules

is in contrast to the finding of Chandler (1916) in an albino Mallard, where morphological structures normally contributing to the coloration were absent. The label indicates that the iris of the described bird was pink.

It is clear from this description that the bird was not an albino, since it was able to form pigment. Furthermore, it seems likely that it was not a genetic mosaic. For under this hypothesis it would be assumed that the genetic change had taken place in an ancestor cell common to all aberrant tissues. The mosaics and gynandromorphs described in birds show either irregular patches of the mutated tissue, or they are bilateral mosaics; right and left sides are genetically different. The latter type is especially frequent in Passeriformes, in the relatives of *Junco:* in *Pyrrhula pyrrhula* (Lorenz, 1894; Neunzig, 1924; Heinroth, 1909; Tickhomiroff, 1918; Ogneff, 1924; and Zawadowski, 1926); in *Fringilla coelebs* (Weber, 1890); and in *Serinus canarius* and *Gouldaeornis gouldiae* (Crew and Munro, 1938). The occurrence of animals of this kind suggests that in birds the first cleavage is approximately coincident with the later median sagittal body axis. At all events, it would be difficult to imagine common ancestor cells for the epidermis of belly and lower breast on one side, and for the epidermis of head, throat, higher breast, back, wings, and tail, perhaps also including the iris, on the other side.

The most striking feature in the abnormal bird is the fact that the boundary between pigmented and unpigmented feathers is coincident with the boundary between fully and partially pigmented feathers in the normal bird. This fact suggests that the abnormality is dependent upon pattern determination. The dorsal regions including the rectrices did not produce pigment on account of some developmental influence—whether genetic or environmental cannot be decided—whereas the regions determined to give the characteristic pigmentation of the lower ventral area either did not react at all or reacted to a slighter degree.

Comparable cases of different reactivity of different pattern elements to internal and external factors have been described. The gene 'black and tan' in the house mouse (Dunn, 1928) causes a sharper difference in pigmentation between the dorsal and the ventral areas than is observed in agouti and full-colored mice. Dunn suggested that this pattern is always present but becomes more conspicuous because of the different pigmentation of the two areas under the influence of the 'black and tan' gene. This view has since been proved experimentally by Reed and Sander (1937). On the wing of the

meal-moth (*Ephestia kuehniella*), two different pattern elements, the central field and the outer field, which are divided from each other by border differentiations, have the same type of pigmentation in wild-type animals. Differences in coloration between these two areas, however, arise under the influence of certain genes (Whiting, 1919; Kuehn, 1937) and after treatment with CO_2 (Strohl and Koehler, 1934). It seems likely that the abnormality in the described bird is due to a process similar to those in the quoted cases.

Some remarks are necessary concerning the eye-color of the abnormal bird. The assumption that the pigmentation of the iris was reduced concomitantly with the reduction of pigmentation in the dorsal area is based on the remark in the label only. It is, however, difficult to imagine that the dark brown, normal iris pigmentation of *Junco* should have been mistaken for pink by the observer. It must be noted that several genetic factors influencing the distribution of pigment on the body surface affect at the same time the iris pigmentation. Castle (1924, 1934) described wall eye and heterochromia iridis in homozygous white Dutch rabbits and in heterozygous Vienna white rabbits. Similar effects have been found in dogs by Mitchell (1935) under the influence of the gene for merle-dilution coat color.

LITERATURE CITED

CASTLE, W. E.
1924. Journ. Hered., 15: 211–219.
1934. J. Exp. Zool., 68: 377–391.
CHANDLER, A. C.
1916. Univ. Calif. Publ. Zool., 13: 243–446.
CREW, F. A. E., AND MUNRO, S. S.
1938. Proc. Roy. Soc. Edinb., 58: 114–134.
DUNN, L. C.
1928. Proc. Nat. Acad. Sci. Wash., 14: 816–818.
HEINROTH, O.
1909. Sitzungsber. Ges. naturf. Freunde, Berlin, for 1909, No. 6: 328–330, pl. 7.
KUEHN, A.
1937. Z. ind. Abst. Vererb., 73: 419–455.
LORENZ, TH.
1894. Bull. Soc. nat. Moscou, (n. s.) 8: 325–350.
MITCHELL, A. L.
1935. Jour. Hered., 26: 425–430.
NEUNZIG, R.
1924. Gefiederte Welt, 53: 246–247.
OGNEFF, I. F., AND S. I.
1924. Revue Zool. Russe, 4 (1, 2): 245–259 (in English, 259–261), figs. 1–7.
REED, S. C., AND SANDER, G.
1937. Growth, September, 1937: 194–200.

STROHL, J., AND KÖHLER, W.
1934. Verh. d. Schweizer. Naturforsch. Ges. Zurich: 367–372.
TICKHOMIROFF, A.
1918. Revue Zool. Russe, 2: 193–196 (in English, 196–197), 1 fig.
WEBER, M.
1890. Zool. Anz., 13 (344): 508–512.
WHITING, P. W.
1919. J. Exp. Zool., 28: 413–445.
ZAWADOWSKY, M.
1926. Arch. Entw. Mech., 108: 563–571.

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NOTES ON SOME VIRGINIA BIRDS[1]

BY C. E. ADDY

VIRGINIA is a state of varied climate, soil, and topography. The eastern coastal plain is low and humid, but the mountains of the southwestern part rise to over 5000 feet. The region lies between what is called 'the north' and 'the deep south.' It is not surprising, therefore, that in some 25 species of birds, northern and southern subspecies are known to adjoin or intergrade within the confines of the state. Placing these intergrades is not easy and plotting the distribution of the subspecies requires systematic collecting and careful identification of specimens.

As a start toward the solution of these various subspecies problems, a paper entitled 'Notes on the Distribution of the Loggerhead and Migrant Shrikes in Virginia' was published by Addy and Handley in The Raven, Vol. 11, No. 7, July, 1940. Although 20 specimens were collected from various parts of the state and identified, the paper is by no means complete, for considerable collecting has yet to be done, especially of nesting birds, before the status of *Lanius ludovicianus ludovicianus* and *L. l. migrans* can be definitely determined.

The present paper concerns a number of specimens in the Virginia Polytechnic Institute collection taken during 1938–1941. The author is indebted to Allen J. Duvall and Dr. Alexander Wetmore of the Smithsonian Institution, W. E. C. Todd of the Carnegie Museum, and Dr. George M. Sutton of Cornell University for assistance in checking the specimens and reviewing the manuscript.

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