

## A PECULIARITY IN THE GROWTH OF THE TAIL FEATHERS OF THE GIANT HORNBILL (*RHINOPLAX VIGIL*).

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Sometime ago Dr. C. W. Richmond, of the United States National Museum, called my attention to certain peculiarities in the rectrices of the Giant Hornbill (*Rhinoplax vigil*) and the following notes are the outcome of his kindness in allowing me to examine the material under his care<sup>1</sup>. Nine specimens, six males and three females, of this fine bird are at hand, all collected by Dr. W. L. Abbott. In none of these are the rectrices perfect as will be noted in the detailed description below, and it was this fact that first drew attention to them in Doctor Richmond's search for a specimen to be mounted and placed on general view. The elongated median tail feathers at once catch the attention on examining this Hornbill, and their length is no less extraordinary than the apparent manner of their growth to which I believe attention has not been called previously.

Ten rectrices are found in the completely developed tail of this bird, eight outer feathers of moderate size and two central feathers, which when completely developed, are from 2 to 3 feet in length. The only apparent difference between male and female in the growth of the tail is that of relative size, the male being the larger bird.

Following is a brief description of the condition of development of the caudal feathers in the specimens at hand, arranged in chronological sequence:

Cat. No. 159447, U.S.N.M.; female; Lay Song Hong, Trong, Lower Siam, September 16, 1896. The eight lateral tail feathers are all present but of the central pair, one long feather, faded in color and somewhat worn, is developed. On the right side a second long feather, bright and new in color, is growing with its tip about one and one-half inches beyond the shorter lateral feathers.

Cat. No. 159448, U.S.N.M.; male; Lay Song Hong, Trong, Lower Siam, September 24, 1896. The eight outer rectrices are fully grown and one long central feather somewhat worn appears on the left side.

<sup>1</sup> To Mr. H. C. Oberholser thanks are due for suggestions during the preparation of this paper.

Its coordinate on the right has attained two-thirds the length of the lateral rectrices.

Cat. No. 181104, U.S.N.M.; male; Aru Bay, East Sumatra, November 18, 1905. In this bird seven of the lateral paired feathers are fully developed with an eighth outermost just appearing on the right side, while its mate on the left has evidently been fully developed for some time. The fourth from without on the right is a bright clean feather which has not quite attained its growth, a small portion at the base being still inclosed in a sheath, while the corresponding feather on the left is old, much worn, abraded at the tip, and dull in general color. Of the central pair, the left feather is longer and is faded and much worn, while the right rectrix, 6 inches less in length, is still growing as is shown by the sheath-inclosed base.

Cat. No. 159449, U.S.N.M.; female; Lay Song Hong, Trong, Lower Siam, November 21, 1896. The four outer pairs of rectrices are developed normally, while one alone of the central feathers is fully grown and it is faded and somewhat abraded. At its base on the left side is the other member of the median pair, a bright, new, developing feather three-fourths as long as the outer rectrices.

Cat. No. 181105, U.S.N.M.; male; Aru Bay, East Sumatra, January 1, 1906. The eight shorter feathers are intact and comparatively new. The right member of the central pair is fully developed and in fair condition as regards color and abrasion; while its companion on the left is one-fourth the length of the lateral rectrices and has just broken its sheath.

Cat. No. 180966, U.S.N.M.; male; Tarussan Bay, West Sumatra, January 9, 1905. The tail is well developed, the four outer pairs of rectrices being entirely bright and new. One long feather on the right side is comparatively new, showing few signs of wear. Its companion on the left shows only in that the sheath projects one-half inch beyond the skin of the pygal elevation and as yet shows no sign of breaking to allow the vane to expand.

Cat. No. 181699, U.S.N.M.; male; Balik Papan Bay, East Borneo, February 9, 1909. This specimen has three of the outer feathers on the left side fully developed, the second from the outside being one-third as long as the others. On the right half only two feathers are fully developed; the first is just breaking its sheath and the second is one-half as long as its fully grown companions. Of the median pair, the left is longer while its parallel on the right is a trifle shorter and is evidently older and in poorer condition, being worn at the tip nearly to the shaft.

Cat. No. 181249, U.S.N.M.; male; Sungei Makapan, East Sumatra, February 18, 1907. The right member of the fourth pair barely shows as a projecting quill from the uropygium, while its companion on the left is double its length and is just breaking the tegumentary sheath.

The central feathers are identical in condition with those in the bird immediately preceding except that the right rectrix is the longer and younger as is shown by its color and condition as regards wear.

Cat. No. 181250, U.S.N.M.; female; Makapan, East Sumatra, February 20, 1907. The eight lateral tail feathers are present and but one fully developed central feather on the right side, which has the vane faded and broken below the distal extremity. On the left its mate has grown out until it is  $4\frac{1}{2}$  inches longer than the lateral rectrices.

It will be noticed at once that in none of these nine birds which have been critically examined are both feathers of the central pair equal in length, apparent age, or development. In the three birds (Nos. 181104, 181699, and 181249) in which both feathers are approximately the same length one of them is noticeably a feather of a previous molt which is about to be shed and which is so worn and abraded that part of the shaft has been broken off, leaving it shorter than the newer feather. The other specimens all have one central feather fully grown and the other at different stages of development from a newly appearing pin feather barely projecting beyond the flesh to a bright new feather more than three-fourths the length of its companion.

From these facts it is evident that but one of these feathers is developed at one time. This feather grows to full length and is retained at the next molt while another starts on the opposite side. When this second feather attains its growth the two are found together for a short time until the old rectrix is shed, leaving the newly developed feather as a projecting vane in the tail, when the process is repeated. Curiously enough each new feather, whether on the right or left side, grows out beneath the vane of the older feather, thus securing protection from abrasion and fading until mature.

The long feather is apparently dropped sometime between December and March, though I have not been able to ascertain the exact time or the age which these feathers attain, as the nine birds studied come from four separate localities, and different climatic conditions undoubtedly modify the breeding season and so change the time of the post-breeding molt. However, between September and January six birds are found to have these feathers of unequal length and in two specimens collected in February the new feather is fully grown and the other still in its place, while signs of growth are present in the other feathers, pointing to a duration of two years for each of these giant rectrices, though it may be found that they are renewed at shorter intervals, each one, however, being retained more than a year. It is very evident that these feathers remain in position for more than one year, from the great wear and fading which they show when compared with the other tail feathers and the remiges.

Other irregularities are apparent in the molt of the bird as in four specimens from eastern Sumatra taken from September to February one or more primaries is found to be in an undeveloped condition, and variation is shown in the renewal of the shorter pairs of lateral rectrices.

To summarize, in the Giant Hornbill (*Rhinoplax vigil*) but one feather of the central pair is developed at one time and this spike, much longer than the other rectrices, on reaching maturity, remains in position for more than a year, probably for two. Its companion, beginning its growth after the other has gained its extreme length, then equals it in size. The first feather is then molted and is gradually replaced by another, so that in the renewal of this central pair there is a continual alternation instead of the usual method by which these feathers are renewed synchronously on the right and left sides. It is difficult to determine how this peculiar situation has been brought about, but it is apparently an interesting case of aberrant evolution.<sup>1</sup>

Upon the facts as outlined above, we may, however, base the hypothesis that originally a Hornbill with tail feathers more or less equal in length, through some accident retained a central feather which grew, outstripping its fellows until it had more than doubled their size and then later was cast off. In the meanwhile its companion attained an equal length, reaching maturity before the fall of the first feather and, remaining in position, maintained the peculiar spike-like form unique in this genus among the Hornbills. That this change has been rather recent is testified by the fact that these long central feathers have a broad white tip and a black subapical band conforming exactly in width and color to the bands found on the shorter lateral feathers.

<sup>1</sup> Since this was written three additional specimens of this Hornbill, collected by Mr. H. C. Raven, have been received from Borneo, as follows: Cat. No. 182804, U. S. N. M., adult male, Sungei Karangan, October 28, 1913; Cat. No. 182805, U. S. N. M., young female, Sungei Karangan, December 8, 1913; Cat. No. 182806, U. S. N. M., adult male, Sungei Pelawan, January 5, 1914.

The two adult males exhibit the same peculiarities as the series discussed above. In each bird one of the central rectrices is worn and abraded, while its companion is bright and new. In the October specimen the new feather is three inches shorter than its older companion, while in the January bird the two are about equal, and the older feather would soon have been dropped.

Great interest, however, attaches to the development found in the immature specimen. This bird is about three-fourths grown, the primaries are still shorter than the secondaries and are worn and dirty, as though the bird had recently left the nest, and the huge knob on the culmen is in the early stages of growth. In the tail THE SAME CONDITION IS NOTED AS IN THE ADULTS. The right feather of the central pair of rectrices is worn and broken, one third being gone. The left rectrix while worn is evidently a newer feather. As in the adults the new feather grows out under the old one. From this it is evident that a single median tail feather grows out to full length while the bird is STILL IN THE NEST. Whether another feather appears with it to be pushed out by one following later can be determined only from more material.