

really belong to a variety of the living Fallow Deer. And I thank its author, Sir Victor Brooke, for having brought forward evidence on the point which is not presented by any of the large series of recent antlers known to me in the British and Continental Museums, and without which I could not venture to identify the fossil with the living form. He has supplied the missing link hitherto sought in vain, and thereby removed two synonyms from the bulky catalogue of fossil mammalia. This identification, however, as I have already remarked in NATURE (vol. xi, pp. 113, 114), has little, if anything, to do with the further question, raised by Drs. Jettles and Sclater, as to whether the Fallow Deer now living in Northern and Central Europe was introduced—like the horse into South America—by the hand of man; and on this point I am glad to find my views shared by so high an authority on the Cervidæ as Sir Victor Brooke.

W. BOYD DAWKINS

Owens College, Jan. 16

The Habits of the Belted Kingfisher (*Ceryle alcyon*)

IN NATURE, vol. vii. p. 362, I made the assertion that I had "never seen a kingfisher take its food otherwise than by swallowing it whole, while yet upon the wing," and therefore questioned the truth of the remark made by Mr. Darwin, that kingfishers, having caught a fish, "always beat it until it is killed." The truth of my assertion was doubted by many, and being assured by careful observers that Mr. Darwin's remark did apply to our species, I determined to very carefully study the habits of the bird in question, and have taken every opportunity possible, during the past two years, to familiarise myself with the daily routine of its life. The following is the result:—In 1873 my opportunities were exceptionally good for observing the movements of a pair of these birds, inasmuch as the whole season through—from April to November—was spent upon the water, studying our freshwater fishes. My daily record of observations mentions my watching the kingfisher *while feeding*, from one to four times a day for eighty-three days—an average of twice a day, or 166 dives for fishes, witnessed; and either every plunge was unsuccessful, or the bird swallowed, before alighting, every fish he had taken. It is to be presumed, of course, that occasionally the bird missed his prey. At the close of the season, therefore, I felt satisfied that I was correct in my assertions; but, as one of our best ornithologists has said, "the horizon of one man is at the best very limited, and many ornithological facts occur that are not dreamed of in his philosophy;" and so, on mentioning the results of my seven months of observation to a careful observer of our birds, and finding that he sided with Mr. Darwin, I determined to repeat my observations, and have done so through the spring, summer, and early autumn of the present year. My opportunities were equally good, and very much to my own satisfaction, I have a different result to give. It is proper to state here, that during the summer of 1873 my observations were made altogether in one locality, upon one stream—the summit level of a canal—and confined to one pair of birds. During the present year I watched the kingfishers in several widely differing localities. My note-books make mention of this bird from two to six times in a day, for 101 days—about 400 observations; and of this series, eighty-eight instances are recorded of seeing the kingfisher capture, and, on alighting, deliberately beating the fish against the limb on which he stood, and then swallowing the *butchered* fish. This is a long way from being a constant habit of the kingfisher; less than one-fourth of the fish taken being killed previously to being swallowed. There is, of course, some cause for both habits occurring, and I believe it is to be explained in this way:—

As already stated, my observations during 1873 were confined to one pair of kingfishers, and to the one locality they frequented—the summit level of the Delaware and Raritan Canal—and the obvious reason of the kingfishers always swallowing their prey as soon as caught was simply that they fed exclusively on the smaller cyprinoids frequenting that sheet of water. I know, of my own fishing experience (pursued after a different manner from the kingfishers, however), that millions of cyprinoids are found there, as though they sought there an asylum from the attacks of predatory fishes.

During the season just past, I took notes on such kingfishers as were seen about two creeks, a mill-pond, and the Delaware River. In each of these localities large fishes of many kinds are more or less abundant, and the percentage of small cyprinoids—from two-and-a-half to three inches long—being much less than in the canal, it would evidently be irksome to so voracious

a bird as the kingfisher to wait until some fish, the proper size for swallowing without preliminary, butchering, should come within reach.

It therefore seems to depend largely upon the size of the captured fish, whether or not it is killed by the kingfisher before being swallowed.

On examination of my note-books [I find also that when the parent birds had young in the nest, or while the hen-bird was upon her eggs, the male bird was most frequently seen to carry a fish in his beak to some convenient perch, and there kill and divide it. This appeared to be the manner of proceeding when the parent bird purposed feeding its mate or the young; being able, I judge, to disgorge a fragment of a larger fish, but not to eject an entire fish.

Both habits having been found to be true of this bird—that of swallowing the fish when caught, and of killing it before eating it—it is desirable to know why the latter method should be the rule, almost without exception, in some localities. I can only suggest that this may depend upon the anatomical characteristics of the fishes caught by the kingfishers. When an abundance of cyprinoids—soft-finned fishes—are to be obtained, then little or no preliminary carving on the part of the birds is necessary; but if young acanthopterygians, and tough, hard-scaled fishes of any family, have to be depended upon, then the kingfisher will be careful to first kill and pull in pieces such fishes, that unsuitable portions may be rejected. I have a memorandum of one instance where a young gizzard shad (*Dorosoma cepedianum*) was beheaded and divided into four portions before the kingfisher ate it.

In studying the habits of our American birds—and I suppose it is true of birds everywhere—it must at all times be remembered that there is less stability in the habits of birds than is supposed; and no account of the habits of any one species will exactly detail the various features of its habits as they really are, in every portion of the territory it inhabits.

Trenton, New Jersey, Nov. 20

CHAS. C. ABBOTT

Kirke's Physiology

IN Kirke's "Physiology" (p. 128, 7th edition) mention is made of a conception, due to Mr. Savory, concerning a probable function of the Sinuses of Valsalva, which appears to me to be based on a neglect of an important hydrostatic law. And as this error is not only widely spread, but is considered a point of some importance among students of physiology, it may not perhaps be unwise, even now, to call attention to it. It is stated that, owing to the expansion of the aorta towards its termination, part of the force of the reflux of the column of blood is sustained during diastole by the muscular substance of the ventricle. Now, it seems that a consideration of the law above referred to, which is known as Pascal's "Principle of the Equality of Pressures," must essentially modify this statement. It will be well to note, however, before tracing its application, that notwithstanding the varying mechanical conditions of the column, and the structures in relation with it, these conditions at any one point of time during dilatation may be regarded as fixed and invariable. Also, that as these conditions vary in degree and not in kind, what is true of any one period of time must, in so far as the present demonstration is concerned, be true of any other.

Let us consider the state of things immediately upon the conclusion of the systole. Firstly, the whole arterial system is in a state of distension, and, in virtue of its elasticity, tends to contract and to impel the blood in two directions—onwards through the capillaries, and backwards against the heart. There is also a cessation of the opposing impulsive force from the ventricle, and the combined effect of these two actions is to produce the "force of reflux." And since, as has been shown above, it is unnecessary to trace the variations due to the mobility of the system through the whole period of dilatation, it may be said that at any given instant we have the following data, viz., a column of fluid contained in a vessel with an expanded base, and a certain force impressed upon that column. It is obvious that it cannot affect our conclusions to assume that the force of reflux is transmitted to an imaginary surface, which we can fix at a point immediately above the expansion of the vessel, where it attains its normal calibre, and we can then ascertain how this force is further transmitted to the base. This base is, however, made up of two parts, a circumferential part by the muscular substance of the ventricle, and a central part by the semilunar