THE FOSSIL REMAINS OF A SPECIES OF HESPERORNIS FOUND IN MONTANA.

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Plate XVIII.

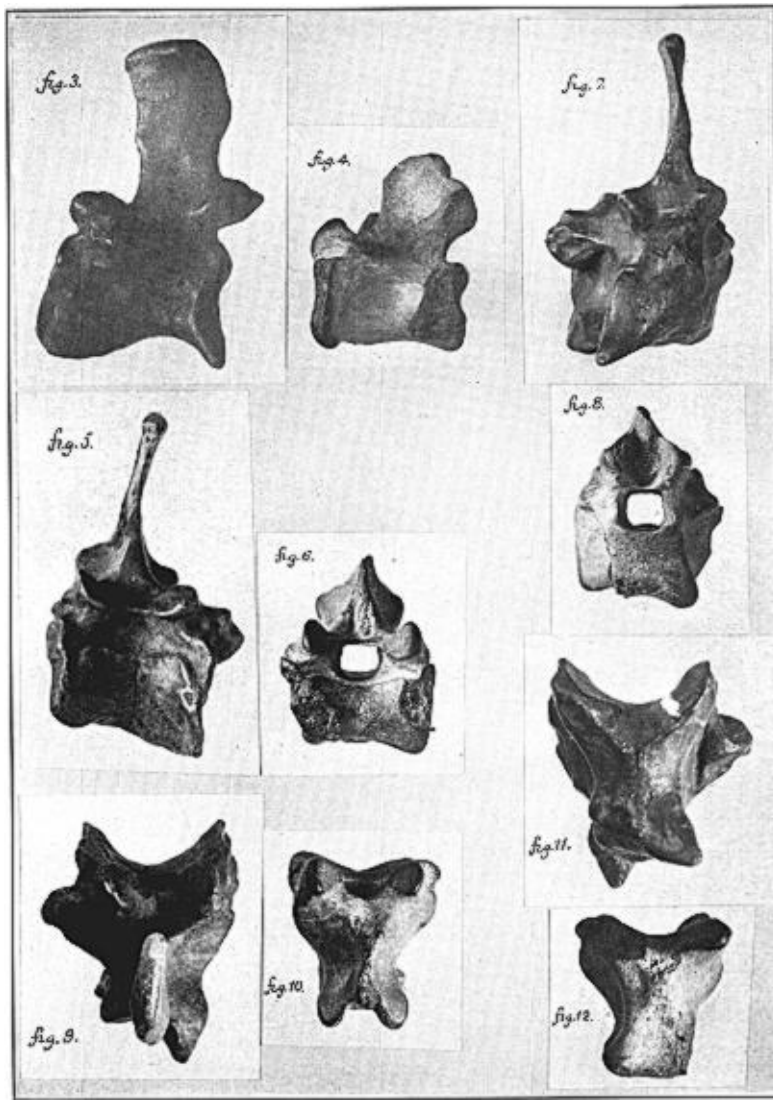
EARLY in November, 1914, Mr. Charles W. Gilmore, who has charge of the fossil birds and reptiles in the Division of Palæontology of the United States National Museum, Washington, D.C., sent me a fossil vertebra, which was collected when he was associated with Dr. T. W. Stanton on an expedition in Montana during the early autumn of 1914. This vertebra, when received by me, was labeled thus:

"Coniornis altus Marsh, Lumbar vertebra, Dog Creek, 1 mi. above its mouth, Fergus County, Montana. Cretaceous Clagget formation (upper yellowish sandstone) September 26, 1914." T. W. Stanton, C. W. Gilmore. All. No."

There being no proper material in the collections of the U. S. National Museum wherewith to compare this vertebra, I studied it as best I could through comparing the fossil bone with the figures given by Marsh in his *Odontornithes*. This comparison convinced me of the fact that the vertebra belonged to some medium-sized *Hesperornis;* further, that it more closely resembled the 23d vertebra of the spinal column of *Hesperornis regalis* than it did any other vertebra, and I was therefore led to believe that it was the corresponding vertebra of some species of *Hesperornis*, smaller than *H. regalis*, probably of a species heretofore undescribed.

As I knew that Doctor Richard S. Lull, of the Peabody Museum, was engaged upon a study of the *Hesperornithidæ*, at the time this bone came to me for study, I determined to refer it to him for an opinion. This I did with a letter dated at Washington, D. C., the 10th of November, 1914.

Doctor Lull very kindly made an exhaustive study of this fossil vertebra, and returned it to me with a letter of transmittal, dated November 20, 1914. At the close of his communication on the subject, he says: "I will lend you a cast of the 23d vertebra of



REMAINS OF HESPERORNIS IN MONTANA.

H. regalis No. 1207, but as it is one of a set of casts we would like to have it returned when you are through with it."

Reproductions of my photographs of this cast, together with those of the vertebra here being considered, are exhibited on Plate XVIII.

The following is Dr. Lull's paper in full:

"It is evidently the last dorsal vertebra, the 23d, hence was compared with the equivalent bone of three specimens of *Hesperornis regalis,* the mounted specimen, Cat. No. 1206, and *Hesperornis* Nos. 1477 and 1499. Also with the second mounted specimen, *Lestornis crassipes,* holotype, Cat. No. 1474.

"The new bone has suffered from fracture and abrasion, by which certain of the fractured surfaces, e. g., stumps of the transverse processes, are smoothed over and rendered deceptive.

"It is smaller than any of the four equivalent bones, though there is as much range among them as between the least of them and the new bone.

"It differs from the other three but resembles No. 1477 in the manner in which the neural spine arises, in that the forward margin as preserved has a slight backward instead of a forward inclination. The new specimen differs from all four but resembles No. 1499 most closely, in that the lateral walls of the centrum are not so deeply excavated. In No. 1499 this depression is slight, but more marked than in the new specimen, and its greatest depth lies further to the rear. There is a decided ridge leading from the postzygapophysis to the base of the transverse process in three of the vertebræ. This is obsolete in the new bone and also in 1499.

"The anterior articular face seems to be less deeply excavated in the new specimen than in any of the four at Yale. This difference, however, may be more apparent than real, as the lateral limitations of this face are chipped and worn away. A very slight hæmal spine is represented by a broken area in all five vertebræ. Herein there is essential agreement.

"Vertebra No. 1499, *Hesperornis sp.,* comes the nearest to the new bone in size and general appearance, differing therefrom in being proportionately somewhat longer; this difference is, however, heightened by the broken character of the new specimen. A further distinction lies in the fact that, whereas in the new specimen

the prezygapophyses are buttressed by a sharp-edged ridge of bone extending from above the stump of the rib facets somewhat obliquely inward and upward, in 1499 there is in this place a distinct transverse crease instead of a vertical buttress. A rounded vertical forward margin in place of the sharp-edged buttress characterizes the other three Yale specimens, and the crease in 1499 may have been accentuated if not caused by the slight vertical crushing to which the bone has been subjected.

"Such distinctions as I can see are certainly not generic, and so far as the actual bones go, specific contrasts are hard to find. The distinctions between *Lestornis crassipes* and *Hesperornis regalis*, for instance, lie in other bones than this vertebra, so that had I the 23d vertebræ alone for comparison, I could hardly distinguish them specifically — certainly not generically. I am sure the new bone is that of a species of *Hesperornis*, possibly new, though this belief is based mainly on geographic rather than on anatomical distinction.

"The bone No. 1499 is not specifically determined if it is not *H. regalis*."

With reference to the exact locality, where this vertebra was found, and other data, Mr. Charles W. Gilmore has given me the following valuable and interesting information. "The vertebra (Cat. No. 8199) was found by Dr. T. W. Stanton on Dog Creek, Montana, on the left hand side of the valley about one mile above its mouth. The bed from which the vertebra was collected is now assigned to the Claggett formation because it is marine, while the overlying Judith River deposits are freshwater with a few intercalated brackish-water beds.

"The specimen is from the upper yellowish sandstone from a fossiliferous band containing numerous sharks' teeth, vertebræ and teeth of other fishes.

"The only other bird remains known from this area is the type of *Coniornis altus*, reported by Hatcher [1] as coming from 'near the base of the Judith River beds on Dog Creek.'

"Since the *Coniornis* type was collected some years prior to the differentiation of these exposures into successive and distinct

[1] Bull. No. 257, U. S. Geological Survey, 1905, p. 99.

formations, it is quite probable that both specimens came from the same geological level."

Professor Marsh was firmly convinced that the great toothed divers of the extinct genus *Hesperornis* were confined to the Cretaceous Beds of Kansas. So tenacious was he of this opinion that, when the fossil remains of a big extinct diver came into his possession, having been collected in Montana by Hatcher, he was very loath to consider it a species of *Hesperornis,* notwithstanding the fact that the fossil bones presented strong hesperornithine characters. He therefore created a new genus — *Coniornis* — to contain it.

Now the vertebra found by Doctor Stanton has been shown by Doctor Lull and myself to have undoubtedly belonged to a species of *Hesperornis,* and the specimen practically presents the same characters as the fossil vertebra of a *Hesperornis* in the Yale University collection, No. 1499, though there are a few appreciable differences.

Up to the present time, science has nothing to show by way of proof that the long bones, described by Marsh as belonging to a big extinct diver which he named *Coniornis altus,* belonged to the same species from an individual of which came the vertebra discovered by Doctor Stanton.

Basing my opinion on the proportions existing between the 23d vertebra of *Hesperornis regalis* and the tibio-tarsus in that species — as compared with the proportions of the vertebra here being considered and with the tibio-tarsus of the species Marsh described as *Coniornis altus* — I should say that the vertebra found by Doctor Stanton belonged to a somewhat smaller species of *Hesperornis* than did the long bones of Marsh's *Coniornis,* which latter is also a *Hesperornis* as I have elsewhere pointed out.

I herewith propose a provisional name for this apparently new species of *Hesperornis,* basing it upon the vertebra described in this paper. I suggest the name for it of *Hesperornis montana.*

Possibly, in the future, more fossil material of the *Hesperornithidæ* may be found in the above named formation in Montana; and this material may go to show that all the forms here named and considered belonged to the same species, they being distinguished only by such differences as may have been due to age and sex. On the

other hand — and what appears to me to be more likely — the discovery of additional material may conclusively prove that the several individuals here considered were distinct species, which now, at least, seems evident in the case of the one numbered 1499 in the Yale Museum.

PLATE XVIII.

[All the figures in the Plate are reduced to about three-fourths the actual size of the specimens shown. R. W. S.]

FIG. 3. Left lateral view of the cast of the 23d vertebra of *Hesperornis regalis*. Belongs to a set in the collection of Yale University Museum. Other views of this cast are given in Figs. 5, 7, 9 and 11.

FIG. 4. Direct left lateral view of the vertebra of *Hesperornis montana*. Other views of this fossil bone are given in Figs. 6, 8, 10 and 12.

FIG. 5. Direct anterior view of the cast of the 23d vertebra of *Hesperornis regalis*. Same specimen as Fig. 3 and others.

FIG. 6. Direct anterior view of the 23d vertebra of *Hesperornis montana*. Same as shown in Fig. 4 and others.

FIG. 7. Direct posterior view of the cast of the 23d vertebra of *Hesperornis regalis*. Same specimen as Fig. 5 and others.

FIG. 8. Direct posterior view of the 23d vertebra of *Hesperornis montana*. Same fossil as shown in Fig. 6 and others.

FIG. 9. Direct dorsal view of the cast of the 23d vertebra of *Hesperornis regalis*. Same specimen as shown in Fig. 7 and others.

Fig. 10. Direct dorsal view of the 23d vertebra of *Hesperornis montana*. Same fossil as shown in Fig. 8 and others.

FIG. 11. Direct ventral view of the cast of the 23d vertebra of *Hesperornis regalis*. Same specimen as shown in Fig. 7 and others.

FIG. 12. Direct ventral view of the 23d vertebra of *Hesperornis montana*. Same fossil as shown in Fig. 8 and others.