56.82 (118:7)

Article XVI.—FURTHER STUDIES OF FOSSIL BIRDS WITH DESCRIPTIONS OF NEW AND EXTINCT SPECIES.

By R. W. Shufeldt.

Plates LI–LIX.

On the tenth of January, 1913, I received from Dr. W. D. Matthew, Curator of the Department of Vertebrate Palæontology in the American Museum of Natural History, New York City, a small collection of fossil birds for examination and description, and at a little later date, Mr. Charles W. Gilmore, in charge of the collections of fossil birds of the Division of Vertebrate Palæontology of the United States National Museum, consigned to me for similar purposes a few more fossil remains of birds from still other localities.

In the text of the present contribution all of these fossils will be fully described, while figures of them will be given on the nine accompanying Plates. These are all reproductions of photographs made by myself direct from the specimens.

In his valued letter of January 10, 1913, Doctor Matthew wrote me in regard to the great scarcity of the fossil remains of birds, a fact which has long puzzled palæontologists, and, it would seem, has never been satisfactorily explained. Doctor Matthew's remarks on this subject are of value, and with his permission they are here transcribed from his letter. He was pleased to say: "I am glad there is something of interest to be found in the Tertiary birds I sent you. It seems a pitiful showing for all the years of collecting. Yet you may be sure that our staff have always looked out for fossil birds quite as carefully as for mammals. I have never figured out quite to my satisfaction why it is that birds are so scarce in our Tertiary formations. I think I have considered all the explanations that have been suggested, and some that have not; but jointly or severally, they do not seem adequate. I can hardly believe that birds were any less plentiful in the Tertiary than now; nor do I see any reason why they should be scarce in the particular environmental facies that our Western Tertiaries represent. They are not so now; whether we adopt the lacustrine, fluviatile playa or eolian theories of origin of these formations, there seems no good reason why birds should not be plentiful. Of course the lightness of their bones, their small size and lack of teeth or a massive skull, accounts for a relative scarcity as fossils, but why for such extreme scarcity. As a

result of twenty years collecting we have some 15,000 mammals, 6,000 reptiles and amphibians and about 15 birds! if we set aside the Pleistocene fossils. And five of the birds, including the only specimens that amount to much, are Cretaceous. I should be interested and I am sure many others would be in your opinion as to the causes of this scarcity."

This is a problem that has interested me for many years past, and with Doctor Matthew and other palæontologists I find no satisfactory solution of it up to date. That birds, of all sizes and representing very numerous families, were abundant as far back as tertiary time and earlier is no longer a matter of doubt. Even the *Ichthyonithidæ* of the Cretaceous of Kansas were, barring the teeth, all bird,— that is, fully differentiated from any reptilian stock. Marsh made no fewer than seven species of that genus (*Ichthyornis*) alone, and doubtless there are many more as yet undiscovered, in so far as their fossil remains are concerned.

Of course, the nature of the deposit and the size of the birds will, in either case or the two combined, make a vast difference; it will even in the case of small mammals and other forms. Birds being possessed of the power of flight will easily account for their remains falling in places where they would never be found again, fossilized or otherwise. Again, many mammals, and other groups non-avian, are found in *cave deposits*, and very few birds indeed resort, in times present or past, to caves, and carnivorous animals would not be likely to carry them into such places.

Mr. Gidley of the Palæontological Department of the U. S. National Museum, to whom this question was referred by me a few moments ago, states that, in his wonderful recent find in Cumberland, Maryland, over 100 specimens of mammals were secured, representing no fewer than 20 genera, and only *one* bird bone. However, he hopes next spring (1913) to find fossil bones of birds in that region at no great distance from the mammal deposits, in caves that are present there. Birds of ordinary size are not found in such deposits as where mammals, and representatives of some other groups, occur in large numbers, for the reason that the latter frequented such places and often mired there, and so their remains are now found in them in numbers, fossilized or otherwise preserved. I refer to miry water-holes and other drinking resorts, with soft, muddy banks. There can be no doubt but what the high degree of pheumaticity of the skeleton in so many birds had a great deal to do with the matter of our not meeting with the fossilized remains of such in these times, as Dr. Matthew so clearly pointed out in his letter.

Militating against this, however, as a factor of the solution, we are confronted with the non-pneumatic, enormously heavy bird skeletons of the genus *Diatryma* and its allies, near or remote. Their fossil remains

have no more frequently been discovered by us than have those of small ordinary birds, and, with some groups, comparatively not so often.

But space will not admit of a further discussion of this most interesting problem here, though, to my own mind, its solution is to a large extent complete when we take into consideration the matters of flight; pneumatic skeletons; habits; being pulled to pieces and the bones scattered by animals that preyed upon them; in the vast majority of instances falling in places at the time of death, unfavorable to the preservation by fossilization of their skeletons, and a few other reasons. That we will find, in the years to come, many more fossil remains of birds there can be no manner of doubt; and I, for one, am of the opinion that some of the discoveries of the future of this character will be of the utmost importance and interest.

We may now pass to the description of the material at hand referred to in the first part of this paper, selecting first that submitted me by the American Museum of Natural History of New York.

Diatryma ajax sp. nov. (extinct).

(Plates LI–LIV. Figs. 1–16.)

This new and extinct species is represented by fossils of certain bones of the pelvic limb. These were at once referred by me to the extinct genus *Diatryma* of Cope, of which it was a huge, gigantic species, as will now be shown.

Cope described his *Diatryma* first in the Proceedings of the Academy of Natural Sciences of Philadelphia (1876, II), and subsequently in the Report of the U. S. Geographical Survey West of the 100th Meridian (Wheeler's Survey) Vol. IV, Palæontology, p. 70, plate xxxii, figs. 23–25.

Cope here states that "this species was of large size, the proximal end of the tarsometatarsi being nearly twice the diameter of that of the Ostrich. Its discovery introduced this group of birds to the known faunæ of North America, recent and extinct, and demonstrates that this continent has not been destitute of the gigantic forms of Birds now confined to the southern hemisphere faunæ, ..." "The large size and wide separation of the penetrating foramina, and the thin internal edge with suture-like facet distinguish this form as distinct from any of the genera of Struthionidæ and Dinornithidæ."

This is followed by a complete account of the fossil bones he had of *Diatryma gigantea* (pp. 70, 71) and, as this work is easily accessible, I have omitted this description here.

With the Plates, however, it is different, and the ones illustrating Cope's

description are not altogether satisfactory. This being the case, I was permitted by Mr. Charles W. Gilmore of the Division of Palæontology, and the authorities of the U. S. National Museum, to borrow from the Collections of that institution Cope's type specimens of his *Diatryma gigantea.* These specimens I photographed natural size, which photographs are, without reduction, here reproduced as Figures 1–3 in Plate LI of the present contribution.

Diatryma gigantea was found in the Eocene of New Mexico, while the species now to be described is from the Wasatch of Wyoming. The latter is represented by two lots of material, the first being labeled "Exp. 1912. W. G. No. 261. 3 miles S. E. of mouth of Pat O'Hara Cr. Clark's Fork Basin, Wyo. Dist. end tarso-metatarsus. Red-banded bed. ? Wasatch. 9/20"; the second lot bears a label stating "Exp. 1912. W. S. No. 282. 5 miles S. E. of mouth of Pat O'Hara Cr. Clark's Fork Basin, Wyo. above red-banded beds — Wasatch. Two phalanges. 9/27."

With respect to the first lot I find it to consist of some twenty pieces of different sizes (the largest having an average diameter of 6 cms. and the other pieces ranging down to small bits), of a dark-brown, dense, flinty fossil-bearing rock. Some of these pieces contain what appears to be portions of a shaft of some long bone of large size; one small piece about 3.5 cms. long is composed chiefly of the two trochleæ of some bird of about double the size of a turkey (*Meleagris g. silvestris*); there is not enough of it to be of any value in so far as a diagnosis is concerned. The balance of this lot consists of a single piece, similarly fossilized, of a tarso-metatarsus of some bird of immense proportions. Barring being somewhat chipped, it is the perfect middle trochlea of the left tarso-metatarsus, broken off at the union with its shaft. This specimen I photographed from three different points of view, and these photographs are here reproduced (the exact size of the specimen) in Plate LII, Fig. 5; Plate LIII, Fig. 9, and Plate LIV, Fig. 14. They are fully described under "Explanation of Plates," given beyond at the close of this paper.

This trochlea has, distally, an extreme width of 4.8 cms., and it presents all the other generic characters of this part of the tarso-metatarsus of *Diatryma gigantea,* as set forth by Cope. When this trochlea is held with its posterior aspect toward the holder, it will be observed that the conspicuously raised articular portion is directed and markedly deflected to the left. This indicates that the bone to which it belonged was the tarso-metatarsus of the *left* pelvic limb (Plate LIII, Fig. 9).

In his description Cope nowhere states to which side his tarso-metatarsus of *Diatryma gigantea* belonged, and I find, upon examination of his type material, that it was of the *left* side with respect to the proximal end of the

shaft, while the trochleæ are of the *right* side. (Compare Figs. 9 and 12 of Plate LIII of the present paper.) He gave the name *Diatryma* to the genus, impressed, as he apparently was, by the fact that the *piercing* pair of foramina, found at the proximal end of the shaft of the tarso-metatarsus in this gigantic extinct bird, was unique or at least unusual. This, however, is by no means the case; for in all birds, where these antero-posteriorly directed foramina are present and functional, they always pass clear *through* the bone. This is well exemplified in the Wild Turkey (*Meleagris g. silvestris*), or, indeed, in any of the gallinaceous fowls, living or extinct.

Passing to the second lot of fossils mentioned above, I find it to consist of *two* phalangeal joints of pes (Fig. 4, Plate LII; Figs. 8 and 10, Plate LIII, and Fig. 13, Plate LIV),— a large one and a small one,— the former being in two parts, it having been fractured directly across the middle of its shaft previous to its having come into my keeping. It is now not possible to tell to which foot these two belonged,— that is, to the right or the left one. From the labels it will be seen that they were found two miles apart, so it is safe to say they did not belong to the same individual. From all appearances, the larger of the two joints is the *basal one* of the middle toe, presuming that the bird had *three* anterior toes, which I am strongly inclined to think it had. The *two* trochlea of *Diatryma gigantea* point to this fact. The remaining, or small, phalangeal joint I take to be one of those belonging to the usually reduced joints of the outer anterior toe, and probably the distal one.

Measurements.

		M.
Mid-trochlear process	distal, transverse diameter of articulation	0.48
	greatest antero-posterior diameter of left side	0.58
	same, of right side (approx)	0.57
	anterior height of the articulation	0.64
	transverse diameter lower end of shaft (just above trochleæ)	0.42
The larger phalanx	length of large toe-joint	0.97
	depth of base	0.47
	width of base	0.40
	width of distal end	0.40
	depth of distal end	0.26
The small phalanx	length of smaller toe-joint	0.41
	transverse diameter of base	0.28
	vertical diameter of base	0.21

Cope has surmised in his description of *Diatryma gigantea* that it was a bird twice the size of an adult Ostrich, and, judging from the bones, he had every reason to think so. Regarding the proximal end of the shaft of the

tarso-metatarsus of *Diatryma gigantea,* I am inclined to believe that the bone was a long one, as in a Turkey (*Meleagris*) for example, and not shortened up as in a Moa. If this supposition be correct, *Diatryma gigantea* possessed a height double that of an adult African Ostrich, and it is quite possible that it was a bird that grew to be 16 feet tall.

As the *Diatryma* I have just described here is fully double the size of *Diatryma gigantea* of Cope, it is equally possible that it may have grown to be over 30 feet tall. A large male Ostrich, when adult, often attains a height of 8 feet, but it would be a pygmy among the representatives of this long extinct genus of avian giants.

For the extinct species, the fossil remains of which I have described above, I here propose the name of *Diatryma ajax,* and up to date it is, by all odds, the largest fossil bird described for the extinct avifauna of North America.

We have no means of judging as to what the remainder of its skeleton was like.

The *type* material of *Diatryma ajax* is in the collections of the American Museum of Natural History of New York City, New York.

Bird (species and genus indetermined).

No. 5127, American Museum of Natural History. Dept. of Vert. Palæontology.

Eleven (11) fragments more or less firmly imbedded in flinty matrix. Apparently all bones of a pelvic limb of a bird of about the size of a very large Turkey (*Meleagris g. silvestris*). It appears to have been a gallinaceous fowl, but the material does not admit of exact osteological description.

Five of these pieces out of the eleven are here shown in Plate LVII Figs. 73–78. It will be noted that one of the trochlear processes of the tarso-metatarsus (Fig. 78) is very much thrown out to one side. I believe it to be broken off and held in that position by the matrix, and so not normal.

These specimens belong to the American Museum of Natural History, and were collected by the Expedition of 1910 of that institution. Wasatch formation: Big Horn Basin, Wyoming, 3 miles Southeast of Otto.

These specimens do not admit of scientific reference.

Bird (indetermined).

Wasatch: Big Horn Basin, Wyoming. 5 miles South of Otto. (W. S.)

Judged to be a bird from the fact that one piece resembles a bird's femur (proximal moiety), and another the sternal extremity of an avian coracoid,

otherwise the eight or nine pieces, all very much compressed, are valueless for the purposes of reference.

If bird, they belonged to a species about the size of a small turkey. No more exact description is possible.

Palæophasianus meleagroides gen. et sp. nov.

(Plate LVIII, Figs. 81–84, 86–88.)

No. 5128. American Museum of Natural History, Dept. of Vert. Palæontology. Wasatch: Big Horn Basin, Wyoming. Elk Creek. Amer. Mus. Exp. 1910.

Material: 1. Seven or eight broken bits of the shaft of one or more long bones. 2. Distal extremity of a tibio-tarsus. 3. Proximal moiety of a tarso-metatarsus. 4. Distal extremity of a tarso-metatarsus (attached to a portion of some other bone).

Apparently these fragments all belong to the same individual, but whether to an adult or not it is impossible to state with certainty. They belonged to a gallinaceous bird apparently considerably larger than an adult male *Centrocercus urophasianus*, and nearer those of a small female *Meleagris g. silvestris*, with which they are compared in Plate LVIII of this paper. In this same Plate LI present the *tarso-metatarsus* of an old male *Meleagris*, with the view of showing the very great differences in the size of the bones of the two sexes and subadults of the birds of this genus.

The distal end of the tarso-metatarsus of the fossil is fractured into bits, and considerably thrown apart in its matrix; but a close study of it convinces me that it may easily have belonged to a small-sized *Meleagris*, or even more likely to some large grouse. The same may be said for the distal portion of the *tibio-tarsus* (Fig. 88). When we come, however, to more critically examine and compare the proximal portion of the shaft of the tarso-metatarsus (Fig. 82), of which several of the characters are clearly in evidence — especially those of the summit and hypotarsus — everything points to the bone of some large grouse rather than a meleagrine type. For instance, in the case of *Meleagris*, of the two articulo-condylar concavities on the summit of the shaft of the tarso-metatarsus, the *inner* one is always at least one third *larger* than the outer. Now in American tetraonine types these two concavities are about of a size, and this is the case in the fossil specimen now before me. Again, the *hypotarsus* of this specimen presents every indication of agreeing with that process in its characters with some large tetraonine form rather than with a meleagrine one. This is clearly indicated in the arrangement of the tendinal grooves and the position of the perforating

tendinal foramen. As stated above, the bone is too large for the *tarso-metatarsus* of an adult male *Centrocercus urophasianus*,[1] though it may easily have belonged to a still larger species of that genus.

Inasmuch, then, as everything points to the fact that these fossil bones belonged to some species of a very large grouse,— larger than the now existing Sage Grouse (*C. urophasianus*); that they were discovered in a region where the existing species formerly occurred in vast numbers; that turkeys never have been known to inhabit the same region, and, finally, as some of the characters in sight are in fair agreement with the corresponding ones in the skeleton of the existing species of *Centrocercus*, I am compelled to believe that it either belonged to a much larger form of that genus, or, what is more likely, to a near-related one and now long extinct.

Whether it had any affinity with the extinct birds Marsh referred to the genus *Meleagris*, we have not, as yet, sufficient material at hand to determine.[2]

That it may have occupied a position between the large galline and meleagrine fowls will, for the same reason, remain undetermined for the present. It should not be the cause for any surprise were we to discover later on that it did.

Centrocercus has a lamina of bone extending from the lower inner part of the hypotarsus of the tarso-metatarsus down the back of the shaft of that bone, and fused with it completely, to the middle of its middle third. This is not the case with the tarso-metatarsus now being considered,— that is, it differs from *Centrocercus* in this respect and from *Meleagris*, in which genera such a lamina is highly developed on the tarso-metatarsus, and in old male birds of *M. g. silvestris* surrounds the base of the calcar.

The hypotarsus in the fossil fowl at hand of the tarso-metatarsus is

---

[1] Shufeldt, R. W. 'Osteology of the North American Tetraonidæ' U. S. Geol. and Geogr. Surv. of the Terr. (Hayden's), 1878, Pt. 1, p. 710, pl. ix, fig. 68. It may also be stated here that it could not have belonged to a specimen of *Palæotetrix gilli;* for it would appear that that species was even a smaller bird than *Centrocercus*. (See Jour. Acad. Nat. Sci. Phila., Vol. IX. plate xvii, fig. 34.)

It would appear that the presence of the lamina of bone referred to above as extending down the back of the shaft from the hypotarsus, sometimes depends upon the age of the individual, ossifying only in the case of very old birds. It is not represented in my figure of the tarso-metatarsus of an adult male *Centrocercus urophasianus* in the Hayden Report just cited (p. 710, plate xi, fig. 68), and that skeleton I prepared myself with very great care from a specimen I collected in the field. Had the aforesaid lamina of bone been present in it, I certainly would have seen it and represented the same in my drawing. In an old male *Centrocercus urophasianus* in the collections of the U. S. National Museum (No. 18346) this lamina is very conspicuously developed, as it is in a similar manner at the back of the tarso-metatarsal shaft in that bone belonging to a skeleton of *Urogallus parvirostris* (coll. U. S. Nat. Mus. No. 18506). It is very possible, indeed probable, that it was also to be found in the case of old individuals of *Palæophasianus meleagroides*.

[2] Shufeldt, R. W. Contributions to Avian Palæontology. The Auk, Vol. XXX, No. 1 Jan. 1913, pp. 29–39, pl. iii, figs. 1–5.

largely developed, and is *twice* grooved for the passage of tendons. Of the three lamina thus formed the middle one is the longest, the inner one next, and the outer one about half the length of the middle one. There appears to be but one large perforating tendinal foramen passing vertically through this hypotarsus, and, as in *Meleagris*, it occurs between the middle and inner lamina of the process. Anteriorly, below the intercondylar tubercle, the shaft is markedly concaved, as in the gallinaceous fowls generally. High up in this concavity occur, in all grouse and turkeys, twin foramina, placed side by side. They are doubtless in this bone, but in the specimen are covered over with the firmly attached, flinty matrix in which it is imbedded.

The distal end of the *tibio-tarsus* present the usual characters of that end of the bone in not a few of the larger *Gallinæ*.

Part of a toe-joint is attached to the outer surface of the matrix containing the distal extremity of the *tarso-metatarsus*, and it is in plain view in Fig. 81, Plate LVIII, at the lower left hand corner. Where its shaft is broken and parted it is plainly seen.

With the material representing this bird there are two more parts of toe-joints,— the distal extremity of one and the proximal end of another. As far as they go, they support the above set forth diagnosis.

Measurements.

(Given in millimeters.)

The fossil specimens of this bird are from the *left* pelvic limb, and the individual was an adult.

		M.
Tibio-tarsus	antero-posterior diameter of inner condyle	0.16
	transverse diameter of shaft above the condyles	0.13
	transverse anterior intercondylar channel (approx.)	0.11
Tarso-metatarsus	transverse diameter of summit	18.5
	transverse diameter of hypotarsus	0.10
	longitudinal diameter of hypotarsus	0.16
	antero-posterior or transverse diameter of *either* condylar concavity	0.06

I propose the name of *Palæophasianus meleagroides* for this extinct gallinaceous fowl from the Wasatch of Wyoming.[1]

The *type* material is in the palæontological collections of the American Museum of Natural History of New York City, N. Y.

---

[1] Generic name = Gr. παλαιός, ancient + φασιανός, a pheasant; φᾶσις, Phasis. (River in Colchis). Spec. name = Gr. μελεαγρίς, a kind of guinea-fowl, subsequently applied to the *Meleagridæ*, and εἶδος, resemblance.

Bird (indetermined).

Coll. Am. Mus. Nat. Hist. N. Y. Label: "W. J. S. 8/5/00. Church Buttes Bridger. Bird Femur. Distal end."

Distal portion of a *right* tibio-tarsus of an adult individual. Inner condyle and part of lower posterior aspect of shaft broken off. This belonged to the skeleton of some bird about the size of a female *Meleagris g. silvestris*, and to some degree resembled it. It may have been some other species of turkey, or turkey-like fowl. It requires additional material to make a reliable reference. (Plate LV, Fig. 39.)

Bird (indetermined).

Coll. Amer. Mus. Nat. Hist. N. York. Label: "Lysite Formation. Cotton wood Draw. Wind River Basin. Wyo. Exp. 1905."

Distal end of *right* tarso-metatarsus from an adult individual. Inner trochlear process broken off. Belonged to some gallinaceous bird the size of a two-thirds grown turkey (*Meleagris*). (Plate LV, Fig. 30.)

Bird (indetermined).

Coll. Amer. Mus. Nat. Hist. New York. Label: "No. 991. Bird; foot bones. Loc. Stone Ranch, Cedar Crk. Colo. Coll'r Brown, 1898" (Plate LV, Fig. 30.)

Distal extremity of right tarso-metatarsus, imperfect and partly cemented together; two pedal phalanges; imperfect ungual phalanx, and four halves of pedal phalanges.

Belonged to some species of bird for which the material is quite insufficient to make a correct reference, though what there is of it appears to have been that part of the skeleton of some one of the Gallinæ. (Plate LV, Figs. 31, 32.)

Bird (indetermined).

Distal two-thirds of *left ulna* (imperfect); middle part of shaft of *radius*, and imperfect *left carpo-metacarpus*. (Plate LV, Figs. 23–25.)

Two labels: (Field label on scrap of newspaper)
"Bird Bones. Upper Deep River, Brown. 7/2/98."
Museum Label: "No. 240. Bird indet. Part of wing. Period, Loup Fork. Loc. Cedar Crk., Logan Co. Col. Am. Mus. Exp. 1898."

Belonged to the skeleton of a bird (adult) about the size of a male *Centrocercus*. It did not, however, come from the skeleton of any gallinaceous

species, as microscopical examination fails to find any evidence of the process on the upper outer aspect of the index metacarpal which is present in all typical Gallinæ.

Raptorial Birds.

There are six (6) lots of these in the collection of the American Museum of Natural History, collected at different times in various western localities. They are apparently Eagles and smaller members of the Falconidæ, the most noteworthy fact in regard to them being that they are all fossil remains of the *feet* of the specimens. This I have noticed to obtain to some extent with respect to other collections, but I have no explanation for it to offer.

Bird (indetermined).

Distal extremity of *right* tarso-metatarsus (trochleæ of outer and middle toe); upper part of the shaft of the tarso-metatarsus (broken in two) upper extremity of *left* coracoid. All from the same individual (adult).

Two labels:

Field label: "Exp. 1905. Collr. W. G. No. . Loc. C. Butte B. 2. Bird. Not a tarsus. frag't. Date 8/22."

Museum label: "Bird indet. frag't metatarsus. Bridger Form. B 2. Loc. Grizzly Buttes. Am. Mus. Exp. 1905.

These fragments are not sufficient to enable one to make a safe reference. They came from the skeleton of some medium-sized falconine species that may or may not still be represented in the existing fauna.

Bird (indetermined).

Some 21 fragments of bones from different parts of the skeleton of a bird, as pedal phalanges; the head of a femur; part of lower mandible, etc.

Field label: "Exp. 1903, Collr. A. T. No. . Loc. Grizzly Buttes. West. Miscellaneous, Jaws, etc. Lower Bridger, Date 7–4–03."

Apparently all from the same adult individual. They represent some medium-sized falconine species, for which the material is not sufficient for safe reference.

Haliæetus leucocephalus (adult).

(Plate LV, Figs. 29, 33–38, 40–44.)

Coll. Am. Mus. Nat. Hist. Dept. Vert. Palæont. Museum label: "No. 239. Raptorial bird, indet. Foot. ?Sheridan Formation. May be Miocene. Near Quarry, Niobrara Riv. Grayson, Neb. Am. Mus. Exp. 1897.

Proximal and distal extremities of the *right* tarso-metatarsus; bits of the shaft of the same; the first metatarsal; the ungual joints, and some of the phalangeal joints of the right foot.

These bones I have compared with a skeleton of the White-headed eagle (*H. leucocephalus*, No. 17930, Coll. U. S. Nat. Mus.) and find them to correspond in every particular.

Mixed up with these foot-bones there are four that belonged to some mammal, such as a jack-rabbit (head of scapula etc.), or some animal about that size. These may have been in this eagle's stomach at the time of its death, and fossilized along with its own skeleton, or they may have been otherwise associated with it.

Fossil Eagles. (*Aquila*).

There are three small lots of fossil bones in the collection belonging to the American Museum of Natural History which are principally composed of claws (ungual joints), joints of pedal phalanges, and a few fragments of other bones of the pelvic limb.

All of these bones are from accipitrine species of large size, and a careful study of them convinces me that they came from at least three distinct species of large extinct eagles. I have carefully compared all these fossil bones with the corresponding ones in the feet of *Bubo*, *Nyctea*, and all the foot-bones of eagles and *Pandion*, large *Buteos*, and many others at my command. They do not agree with any of them of either sex, or at any age, in so far as I have been able to ascertain. I have not examined the material upon which Marsh based his *Aquila danana*, but I have had before me the types of *Aquila pliogryps* and *Aquila sodalis* of Shufeldt, both of which appear to have been larger aquiline forms than those now at hand.

I say these forms belong to *Aquila* more as a matter of convenience than that they may have actually been representatives of that genus. However, they are all from true eagles, and as fossil *extinct* forms, they may as well be arrayed in *Aquila* as anywhere else. Nothing would be gained by creating a new genus or new genera for them, though the characters of some of the ungual joints are very distinctive, and all three of these species possessed them; but it is extremely difficult to decide in the case of large diurnal *Raptores*, in mixed lots of foot-bones of different sizes and many missing, as to just which toe any special large ungual joint belonged. Sometimes such a claw appears to fit with exactness and properly articulate on distal joints of the two or more different toes. Were the skeleton of the entire foot at hand, we could decide with certainty as to which toe any particular claw belonged; but we cannot do so when we possess only a single claw, or a

few miscellaneous claws and joints. This is the case now before me demanding a solution.

With respect to the special character referred to above, and apparently not possessed by existing accipitrines or any of the Owls, I would say that it consists of a conspicuous prolongation of the proximal dorsal part of the ungual joint, over-hanging its articular cavity for the pedal joint with which it articulates. This prolongation is well seen in Fig. 26 of Plate LV of the present paper, and it will be seen to be absent in all the ungual joints of *Haliæetus leucocephalus* (Plate LV, Figs. 34, 35, 38, 43). It is a very distinctive and pronounced character, and mechanically would be responsible for an articulation of great strength, and one very difficult to throw out of joint, all of which would be valuable to a bird of prey.

As the poster or talon (first toe) is the one demanding the greatest strength in accipitrines, I am inclined to believe that the claws possessing the character just described belong to that particular toe, notwithstanding the fact that the joint may articulate well with other distal phalanges of the foot of the same individual, as is the case in some of the toes of the fossil eagles now to be described.

Aquila antiqua sp. nov.

(Plate LV, Fig. 26.)

Field label: "Exp. 1905. W. J. S. No. Loc. Church Buttes, B. 1. Desc. Bird Claw. Date Aug. 4–05."

Mus. label: Am. Mus. Nat. Hist. Dept. Vert. Palæont. Bird (Accipitres?) Claw. Bridger formation. Loc. Church Buttes, Sinclair, 1905.

This claw is from the foot of an eagle, and unlike the bone found in any of the existing species found in the North American avifauna. It is imperfect, its apex having been broken off and lost. The chord of its arc, when perfect, probably measured about 18 millimeters,— that is, from the distal point in the inferior tubercle to the apex. It would seem to have belonged to a bird about the size of *Pandion*, and is easily distinguished by the prolongation of the dorsal arc of the claw over the articulation, which articulatory surface, however, is continued on to this process. (Compare Figures 26 and 43 of Plate LV.)

Aquila ferox sp. nov.

Field label: "Exp. 1904. Collr. P. M. No. 604. Loc. Henry's Fork. B. F. P. O. Part of Bird Foot. Lower level. Bridger. Date July 21."

No Museum label.

Material: A perfect pedal phalangeal joint, apparently basal joint of second toe. Also the proximal portion of a claw, which exhibits to a marked degree the character described above,— that is, the prolongation of the dorsal arc of the bone over the articulation.

Length of joint 16 mm., its anterior trochleæ being notably close together, and the articular groove between them deep This claw articulates quite perfectly with this joint; but I am inclined to believe that it does not belong to it but to the hind toe.

This was an eagle about the same size as the last, or perhaps rather smaller.

Aquila lydekkeri sp. nov.

Field label: "Exp. 1903. Collr. A. T. No. . Loc. Lower Cottonwood Cr. Miscellaneous; Jaws etc. Lower Bridger. Date 8–5–03."

Material: Two claws (imperfect, apices broken off); three (3) pedal phalangeal joints (one of the larger ones; one basal 2d toe; and one from the fourth toe); distal end of tibio-tarsus; head of femur and its condyles (imperfect); head of tarso-metatarsus (imperfect), miscellaneous bits of shaft of tarso-metatarsus.

All pointing to the fact that it belonged to a large species of eagle, differing from existing species and now extinct.

One of the claws had the posterior prolongation of its dorsal arc, but it is broken off in the specimen and lost.

The condyles of the tibio-tarsus are thick, parallel to each other, and the valley between them narrow and deep antero-posteriorly.

The fibular notch on the outer condyle of the femur is also deep and extensive, as is the pitlet on the head of the femur for the insertion of the *ligamentum teres.*

What there is of the *tarso-metatarsus* is sufficient to indicate that it is the bone from the *right* pelvic limb, and that the groove running down the inner aspect of its shaft is better defined and deeper than the corresponding groove in the tarso-metatarsus of *Haliætus leucocephalus,* or other existing eagles.

Transverse width of lower end of tibio-tarsus equals 16 millimeters.

This extinct North American eagle I name for the British naturalist, Richard Lydekker, whose labors have resulted in powerfully furthering the science of avian palæontology in all parts of the world.

The *type* material is in the collection of the American Museum of Natural History of New York.

Meleagris gallopavo (subsp.?).

Label: Amer. Mus. Nat. Hist. (Vert. Palæont.) No. 12392. Bird: Limb bones and vertebræ. Pleistocene. Fissure Beds. Arkansas.

Material: Proximal end of shaft of left tibio-tarsus; distal end of left ulna; calcar and portion of shaft of tarso-metatarsus (to which it is attached) of left pelvic limb; and the fourteenth cervical vertebra. All slightly chipped in some places. (Plate LIX of present paper.)

These bones appear to have belonged to the skeleton of the same individual, an old male turkey-cock.

I have compared them with a large number of turkey bones of *Meleagris gallopavo silvestris*, and find that only such differences exist as we usually find in the skeletons of different individuals. The *ulna* in the fossil, however, (Plate LIX, Fig. 89) is larger than any ulna of a recent turkey examined by me.

Still, I believe that, in so far as this material points, it is from a wild turkey, in no way differing from the existing form in the present avifauna. Possibly there may have been a subspecific difference which the skeleton would not reveal, and we would not be justified in taking such into consideration.

Practically, then, these bones are from a wild turkey, such as we have in the southern faunæ of the present time. In turkeys, as in all animals, there is an individual variation both for sex and age. This is especially observable in *Meleagris*, as I have elsewhere pointed out (Auk, Jan. 1913).

Bonasa umbellus?

Same label as the last, and taken in the same Fissure Beds of Arkansas. (Pleistocene). Amer. Mus. Nat. Hist.

Material: Distal end of superior mandible (Plate LV, Fig. 18); nine cervical vertebræ (Plate LVI, Figs. 47–52); dorsal and pelvic vertebræ of several individuals (Plate LVI, Fig. 45); two coracoids (Plate LVI, Figs. 64, 65); a left scapula (Plate LVI, Fig. 60); fore part of sternum; two humeri nearly perfect, and the fragments of four others (Plate LVI, Figs. 53–55); three perfect ulnæ and the parts of three others (Plate LVI, Fig. 46); four radii (Plate LV, Figs. 19, 20); seven carpo-metacarpi (Plate LVI, Figs. 56–59); six femora (Plate LVI, Figs. 69–72); eight tibio-tarsi (Plate LVI, Figs. 66–68); and four tarso-metatarsi (Plate LVI, Figs. 61–63).

Owing to the fact that there is no skeleton of a *Bonasa* in the collections of the U. S. National Museum, and the ones I formerly owned are in the

Albany State Museum, I could not compare these fossil bones with the corresponding ones in a skeleton of an existing *Bonasa umbellus*. However, I am very familiar with the skeleton of this species, and I have compared these bones with those in skeletons of other species of our grouse, ptarmigans, *Ortalis*, and others, all of which they are not, coming nearest, however, to those of a *Lagopus*. Personally, I believe them to be from a *Bonasa*, and as close to the species now found there as are the turkey bones to the existing *Meleagris*. Plate LVI is so perfect that any one having the corresponding bones from a skeleton of *Bonasa umbellus* will find no trouble in comparing them.

If subsequently found to be another species of either *Bonasa* or *Lagopus*, I would suggest the specific name of *ceres*.

Found with these grouse bones were several others belonging to small mammals. These were not referred; but Mr. Gidley of the Palæontological Department of the U. S. National Museum, who examined them, believed that an imperfect femur among them came from the skeleton of a *Lepus*. Some were those of a small batrachian (as *Rana*).

Bird (indetermined).

From same locality as the last. Coll. Amer. Mus. Nat. Hist. Not numbered at this writing.

Material: Left radius (proximal end broken off and lost) from some large bird with a strong, long-boned wing.

Bird (indetermined).

Plate LV, Fig. 17.

Coll. Amer. Mus. Nat. Hist. N. Y. Same locality as the last.

Material: A *right humerus* from an adult bird which, up to the present time, I have been unable to refer. It is given actual size on Plate LV. It is too large for any of our American quails or a Coot (*Fulica*); it is not limicoline, or from any ordinary passerine thus far compared, nor from smaller accipitrines or strigines, with all of which, and many others, I have compared it. It is not from an *Ectopistes migratorius* or any large woodpecker.

It should be compared with the humeri of some of the smaller *Corvidæ*, as the jays and their allies; but the skeletons of these birds are not available to me at this time.

As in the case of the *Meleagris* described above, it may have belonged to a species of bird still found in the existing fauna. It would not be well to bestow a new generic and specific name upon it, and certainly not until more material is compared with it.

Material Belonging to the Palæontological Collections of U. S. National Museum.

Bird (superior mandible complete).

Label: "No. 6647, Orig. No. 1726. Lower Pliocene. "Qu. E." Long Island, Kansas, Tertiary. Coll. J. B. Hatcher. 1884.

Material: This is the superior mandible of a small finch (Plate LV, Fig. 28) and it would be difficult to distinguish the same from the same part of the skull in many a small existing species of that group, the size of a *Junco* for example, or a *Spinus*. The species may, quite possibly, still be in existence or its genus may; in any event, this material is not sufficiently extensive for a scientific reference. I have not seen the material upon which Allen based his *Palæospiza* from the Amyzon Shales of Colorado (Eocene?). Should it be found to belong in that genus, it may, for the sake of designation and record, be subsequently known as *P. hatcheri* for its discoverer. The mandibles of *P. bella* Allen were not found.

Any part of the skeleton of small finches or sparrows from the Tertiary will, among the vertebrata, stand in the category of the rarest of fossils, and it is not at all likely that any number of them will ever be found.

Proictinia gilmorei gen. et sp. nov.

(Plate LV, Fig. 27.)

Museum label: "No. 6852. Long Island, Phillips Co. Kansas, Lower Pliocene, Loup Fork Formation. Col. J. B. Hatcher. 1884.

Material: The *right coracoid* of a medium-sized raptorial bird; adult, nearly perfect.

This coracoid belonged to some species more or less related to the Kites. I have compared the bone with the corresponding one in the skeletons of many diurnal and nocturnal (Striges) birds of prey. It is not an owl. It is not far removed from such genera as *Ibycter* or *Milvus* or *Ictinia*.

The bone has an approximate height of 28 millimeters, and it is transversely broad. The articular facet for the sternum on its infero-posterior

aspect is extensive, and occupies the entire width of the bone. The glenoid cavity is likewise of considerable size and of crescentic contour. Below the scapular process, in the upper third of the bone, there is found the usual perforating elliptical foramen for the nerve that passes through there. It is close to the mesial margin, while in owls it is generally near the middle of the shaft.

The general form of this coracoid is well shown in the Plate LV, Fig. 27.

I here propose the name for this now extinct species of kite of *Proictinia gilmorei*,[1] naming it for Mr. Charles Whitney Gilmore, the custodian of the fossil birds of the Department of Vertebrate Palæontology of the U. S. National Museum.

Bird (indetermined).

Label: "187 (5374) 300 feet S. W. of Pt. 27. Sept. 15–0." Coracoid of bird. C. W. Gilmore. E. G. Woodruff. Eocene. Cat. No. 7629. U. S. Nat. Mus."

Material: Fragment of matrix exhibiting upon it a nearly complete impression of the *right coracoid* of a bird, together with the fossil of the bone for its upper third. This would appear to be the coracoid of some medium-sized duck,— one of the River Ducks.

As the majority of the Eocene ducks were species yet occurring in the existing avifauna of N. America, it is quite likely that this coracoid may have come from the skeleton of some such species of duck, and one still to be found among the North American *Anseres*. I have compared this fossil specimen with the right coracoids of a number of existing genera and species of medium sized ducks, and it comes quite close to some of them. One would hardly be warranted, however, in making a positive reference in this case; for on the one hand the fossil material is not sufficiently extensive for the purpose, and on the other, the material in the collections of the U. S. National Museum, representing skeletons of existing species of ducks, does not yet admit of making exhaustive comparisons, and a large part of it has not been prepared properly for work of that nature. Under these circumstances, it would be as well to have this fossil stand until such time as it can be compared with the corresponding bone as it occurs in the skeletons representing the entire series of existing *Anseres*. (See Plate LV, Figs. 21 and 22.)

[1] Genus; *Pro*, (Gr. πρό, before), and *iktinos*, (Gr. ικτίνος, a Kite).

EXPLANATION OF PLATES.

(All the figures in the Plates are reproductions of photographs made by the author direct from the specimens.)

PLATE LI.

Fig. 1. Proximal extremity of the *left* tarso-metatarsus, anterior view, natural size. Cope's *type* of *Diatryma gigantea*. He marked the concavities for the femoral condyles on this type specimen correctly, *i. e.* "E" for external, and "In" for internal, and this clearly points to the fact that he was aware that this end of the bone belonged to a *left* tarso-metatarsus of the pelvic limb.

Fig. 2. Middle trochlea of the *right* tarso-metatarsus of *Diatryma gigantea*, natural size, outer aspect. Cope's type.

Fig. 3. Outer trochlea of the *right* tarso-metatarsus of *Diatryma gigantea*, natural size, outer aspect. Cope's type.

PLATE LII.

Fig. 4. Pedal phalangeal joint of *Diatryma ajax*. (Basal one of mid-anterior toe?) Nat. size, dorsal aspect. The line of fracture is plainly seen. Type.

Fig. 5. Middle trochlea of *left* tarso-metatarsus of *Diatryma ajax*, seen upon anterior aspect. Nat. size. Type. Line of fracture from the shaft below.

Fig. 6. Outer trochlea of the right tarso-metatarsus of *Diatryma gigantea*. Nat. size, anterior aspect, with the distal portion above and the line of fracture from the shaft below. Cope's type. (See Fig. 3, Plate LI.)

Fig. 7. Middle trochlea of the right tarso-metatarsus of *Diatryma gigantea*. Nat. size; anterior view, with the line of fracture from the shaft, below. Cope's type. (See Fig. 2, Plate LI.)

PLATE LIII.

Fig. 8. Pedal phalangeal joint of *Diatryma ajax*. Nat. size; plantar aspect. (See Fig. 4, Plate LII.) Type.

Fig. 9. Middle trochlea of left tarso-metatarsus of *Diatryma ajax*, seen upon posterior aspect. Nat. size. Type. (See Figs. 5 of Plate LII and 14 of Plate LIV.)

Fig. 10. One of the small pedal phalangeal joints of the foot of *Diatryma ajax*. Nat. size, and, if it belonged to the *right* foot, it is the inner aspect. Type.

Fig. 11. Outer trochlea of the right tarso-metatarsus of *Diatryma gigantea*. Nat. size; posterior aspect, with the line of fracture from the shaft, below. Cope's type. (See Fig. 6, Plate LII and Fig. 3, Plate LI.)

Fig. 12. Middle trochlea of the right tarso-metatarsus of *Diatryma gigantea*. Nat. size, posterior aspect, with the line of fracture from the shaft, below. Cope's type. (See Fig. 2, Plate LI; Fig. 7, Plate LII and Fig. 16, Plate LIV.)

Plate LIV.

Fig. 13. Pedal phalangeal joint of *Diatryma ajax*. (Basal one of mid-anterior toe?) Nat. size, lateral aspect. Type. (See Fig. 4, Plate LII and Fig. 8, Plate LIII.)

Fig. 14. Middle trochlea of left tarso-metatarsus of *Diatryma ajax*, viewed upon inner aspect. Nat. size. Type. (See Fig. 5, Plate LI and Fig. 9, Plate LII.)

Fig. 15. Outer trochlea of the right tarso-metatarsus of *Diatryma gigantea*. Nat. size, inner aspect. The line of fracture from the shaft is below. Cope's type. (See Fig. 3, Plate LI; Fig. 6, Plate LII and Fig. 11, Plate LIII.)

Fig. 16. Middle trochlea of the right tarso-metatarsus of *Diatryma gigantea*. Nat. size, outer aspect, with the line of fracture from the shaft, below. Cope's type. (See Fig. 2, Plate LI; Fig. 7, Plate LII and Fig. 12, Plate LIII.)

Plate LV.

(All the Figures in this Plate are natural size.)

Fig. 17. Right humerus, anconal aspect of some bird as yet not determined. Possibly belonged to some of the medium-sized *Corvidæ*.

Fig. 18. Dorsal aspect of the superior mandible of some gallinaceous bird (Bonasa?)

Figs. 19, 20. Radii of some gallinaceous bird and very possibly *Bonasa umbellus*. Fossil. Amer. Mus. Nat. Hist.

Fig. 21. Fossil head of right humerus of a bird, sublateral aspect. Apparently belonged to some species of River Duck, but as yet not determined. Its matrix is shown in Fig. 22. Coll. U. S. Nat. Mus.

Fig. 22. Matrix that contained a bird's fossil coracoid, the head of the latter being shown in Fig. 21 above. No. 7629, Coll. U. S. Nat. Mus.

Fig. 23. Fossil left *carpo-matacarpus* of a bird. Incomplete and not determined. Coll. Amer. Mus. Nat. Hist. Bones shown in Figs. 24 and 25, probably belonged to the same skeleton. Adult.

Fig. 24. Fossil *radius* of some bird; middle of shaft. See description under Fig. 23 above. Not determined.

Fig. 25. Fossil left *ulna* of some bird. Distal two-thirds. Imperfect. See description under Figs. 23 and 24 above. Material too fragmentary for reference.

Fig. 26. Lateral aspect of the fossil *ungual joint* of *hallux* of an extinct eagle (*Aquila antiqua*). Adult. Imperfect. Coll. Amer. Mus. Nat. Hist.

Fig. 27. Anterior view of the fossil right *coracoid* of an extinct raptorial bird. (*Proictinia gilmorei*). Adult. Coll. U. S. Nat. Mus.

Fig. 28. Fossil *superior mandible* of some small conirostral bird. Adult. Viewed from above. Coll. U. S. Nat. Mus. Description in the text.

Fig. 29. Dorsal aspect of the right accessory or first metatarsal of *Haliœetus leucocephalus*. Fossil. Adult. Coll. Amer. Mus. Nat. Hist.

Fig. 30. Distal extremity of right tarso-metatarsus. Fossil. Adult. Anterior view. Some gallinaceous bird of rather large size. Not determined. Coll. Amer. Mus. Nat. Hist.

Figs. 31, 32. Fossil right tarso-metatarsus; anterior view. Apparently some gallinaceous bird to which the toe-joint (Fig. 32) also belonged. Coll. Amer. Mus. Nat. Hist. Too fragmentary for reference. Description in the text.

Figs. 33–36; 38, 40, 41, 43, 44. Fossil pedal phalangeal joints and claws of the White-headed Eagle (*Haliæetus leucocephalus*). Adult. Coll. Amer. Mus. Nat. Hist. The ungual joints are seen upon dorsal view, and the others lateral. All belong to same individual, as did the bones shown in Figs. 37 and 42.

Fig. 37. Two fossil trochleæ (inner and middle) of the right tarso-metatarsus of *Haliæetus leucocephalus*. Anterior aspect. Adult. See description under Fig. 33, *et seq.*

Fig. 39. Right tarso-metatarsus of an indetermined bird. See description in text.

Fig. 42. The (fossil) proximal extremity of the right tarso-metatarsus of *Haliæetus leucocephalus*, viewed from above. Belonged to the same bone figured and described under Fig. 37. Same collection.

Plate LVI.

The fossil bones shown on this Plate belonged to a number of individuals, all of the same species and adult. They are of natural size and valuable for comparison. They are very probably of *Bonasa umbellus*, or some species of that genus. Coll. Amer. Mus. Nat. Hist.)

Fig. 45. Sacrum and uro-sacral vertebræ, ventral surface.

Fig. 46. Right *ulna*, palmar aspect. (See also Figs. 18, 19, 20 of Plate LV.)

Figs. 47–52. Various vertebræ; the first two and last two seen on dorsal view.

Figs 53–55. *Humeri*. Fig. 53 nearly perfect. Left; anconal aspect. Fig. 55. Right, on palmar aspect.

Figs. 56–59. *Carpo-metacarpi*. The first two nearly perfect.

Fig. 60. Dorsal view of left scapula. Imperfect. Distal point broken off.

Figs. 61–63. Tarso-metatarsi. Fig. 61 anterior and Fig. 63 posterior views. Fig. 63 lateral.

Figs. 64, 65. *Coracoids*. Fig. 64 posterior view; head lost. Fig. 65 right coracoid, anterior surface.

Figs. 66–68. *Tibio-tarsi*; posterior, lateral and anterior views respectively.

Figs. 69–72. *Femora*. Fig. 69 left limb, inner view; 70 left limb, posterior view; 71 left limb, anterior view, and 72 from left pelvic limb, external or outer view.

Plate LVII.

Figs. 73–78. Fossil remains of some large bird, possibly of the gallinaceous order. See description in text. Fig. 74 is the posterior view of the distal moiety of the *left* femur. All nat. size, and belong to the Coll. Amer. Mus. Nat. Hist. They apparently all belonged to the same individual.

Plate LVIII.

Fig. 79. Left *tarso-metatarsus* of an adult *Meleagris gallopavo*. Nat. size; anterior view. Male bird. Collection U. S. Nat. Mus.

Fig. 80. Left tarso-metatarsus of a female or subadult specimen of *Meleagris gallopavo*. Nat. size; anterior view. Coll. U. S. Nat. Mus. These two bones (Fig. 79, 80) are from a burial mound adjoining the ruin of Puye, N. Mexico, and were

collected by F. W. Hodge of the Bureau of Ethnology, U. S. Nat. Mus., and K. M. Chapman of the School of American Archæology (Santa Fé). They are prehistoric, and will be fully described by me in another connection. They are useful here for the purposes of comparison of a number of the figures.

Figs. 81–84, 86–88. Fossil bones of the extinct bird *Palæophasianus meleagroides*. (Extinct). See description in the text. Fig. 81, distal extremity of the *tarso-metatarsus;* Fig. 82, superior moiety of the *tarso-metatarsus,* anterior view; partly covered with matrix. Figs. 83, 84, 86 and 87, portions of shaft, and apparently the shaft of the *tibio-tarsus*.

Fig. 85. Right femur of a *Meleagris gallopavo*, juv. or small male. Belongs to the collection mentioned under Fig. 80 above. Inner or mesial view, and here introduced to compare with figure 88, which latter is the lower end of the *tibio-tarsus* of *Palæophasianus meleagroides*, and not a femur, as might be supposed.

Plate LIX.

Fig. 89. Distal extremity of left *ulna* (fossil) *Meleagris gallopavo*. Nat. size; palmar aspect. Coll. Amer. Mus. Nat. Hist. The bones shown in Figs. 92, 93 and 95 all belonged to the same individual. See description in the text.

Fig. 90. Anterior two-thirds of the right *ulna* of *Meleagris gallopavo*. Belongs to the collection described under Fig. 80 above. Belonged to an old male bird, and here introduced to compare with Fig. 89.

Fig. 91. Dorsal view of the fourteenth cervical vertebra of *Meleagris gallopavo*. (See Fig. 80 and also description in text.) Nat. size. Adult male.

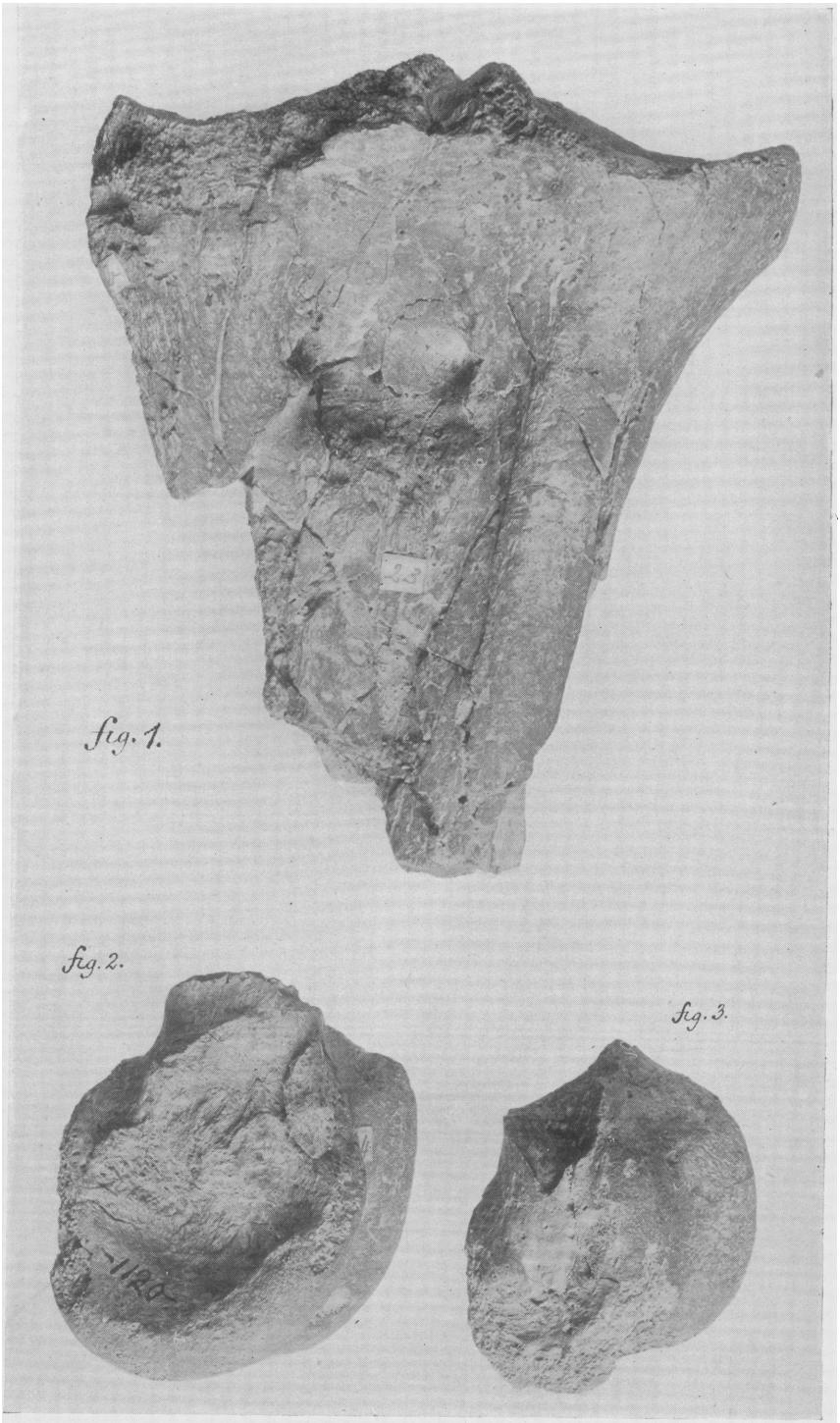
Fig. 92. Fossil. Fourteenth cervical vertebra of *Meleagris gallopavo*. Nat. size. Same individual. Dorsal view.

Fig. 93. Fossil osseous calcar of *Meleagris gallopavo*. From left *tarso-metatarsus*. Inner view.

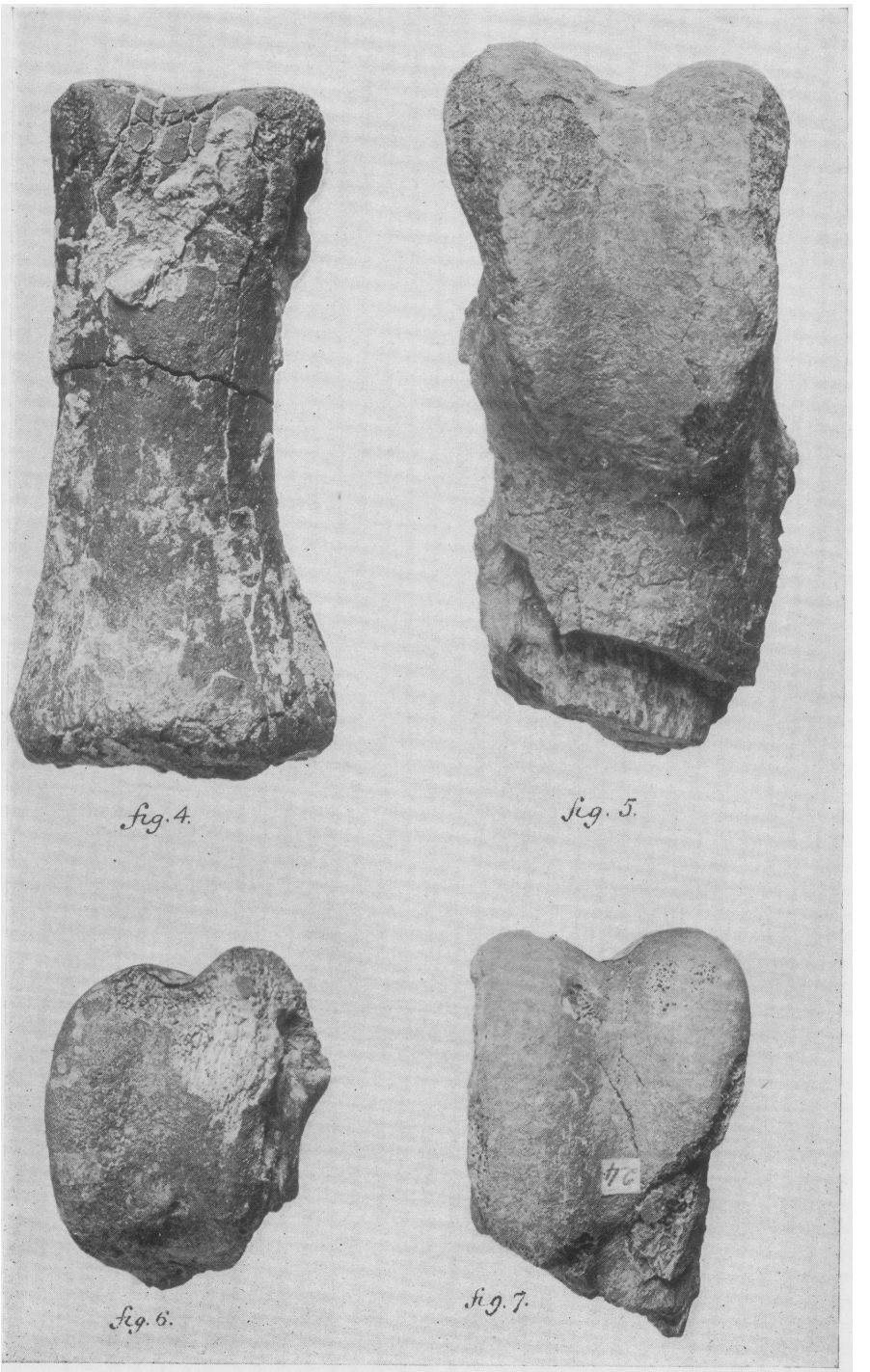
Fig. 94. Left tarso-metatarsus of an old male *Meleagris gallopavo*. See description under Fig. 80 above. Inner view, and introduced for comparison with Fig. 93.

Fig. 95. Fossil left *tibio-tarsus* of an old male *Meleagris gallopavo*. Same individual to which the other fossil bones on this Plate belonged. Nat. size, external or outer aspect.

Fig. 96. Left *tibio-tarsus* of *Meleagris gallopavo*. Old male bird. Belongs to same collection described under Fig. 80 above. Nat. size, outer view, and introduced here for comparison with the fossil bone shown in Fig. 95.

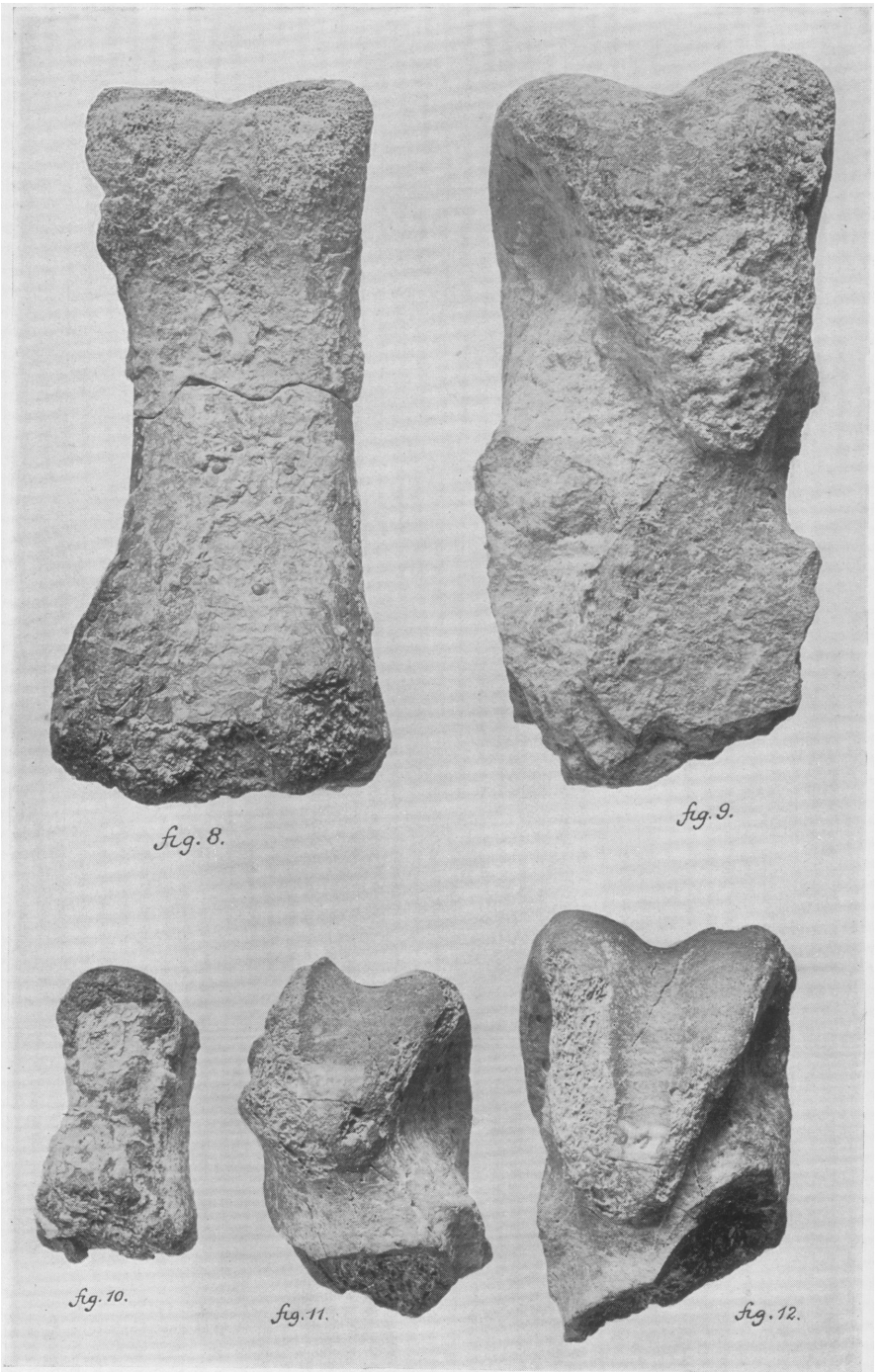


DIATRYMA GIGANTEA *Cope.*



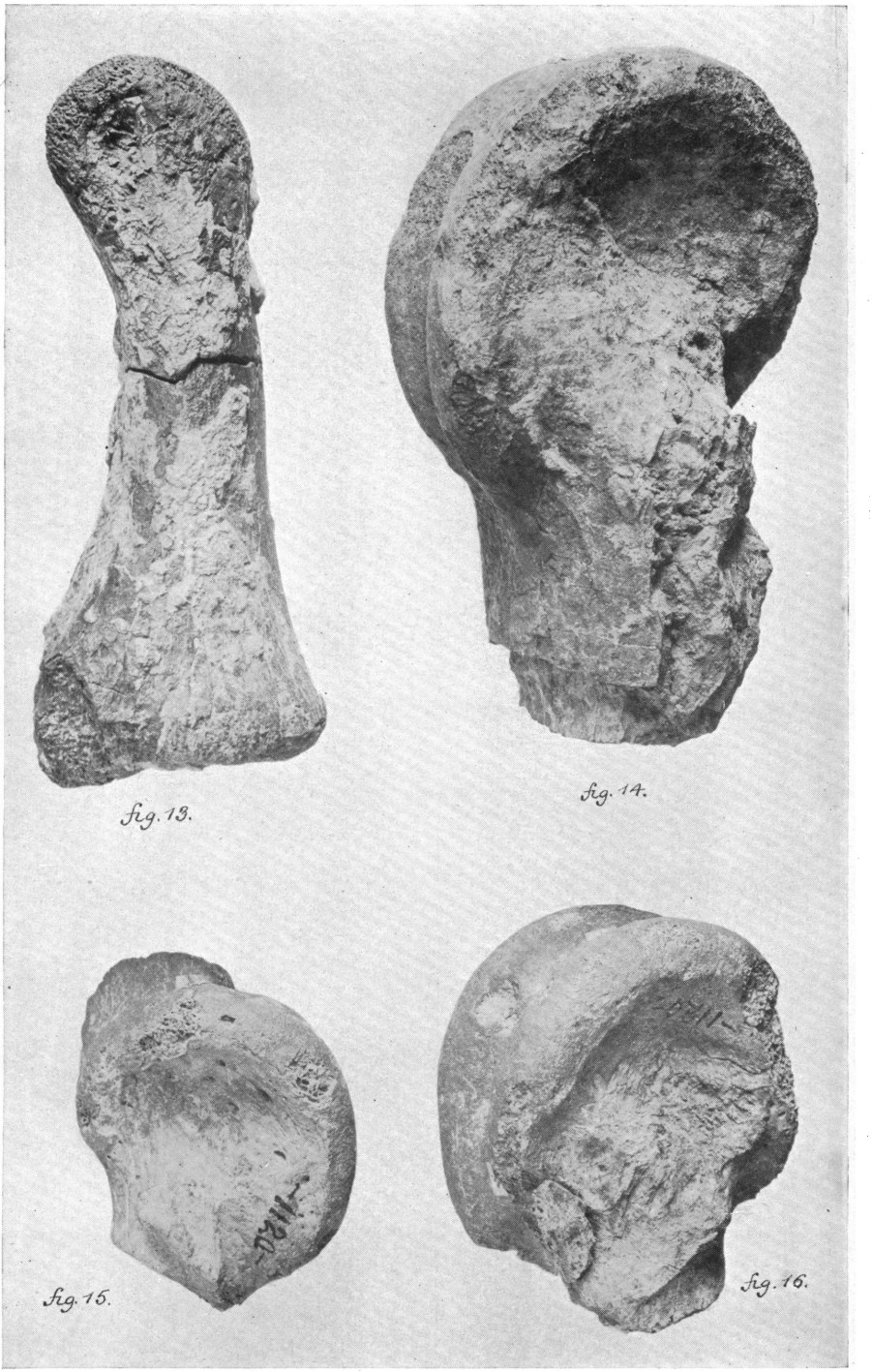
DIATRYMA.

Figs. 4, 5, *D. ajax* sp. nov.; Figs. 6, 7, *D. gigantea* Cope.



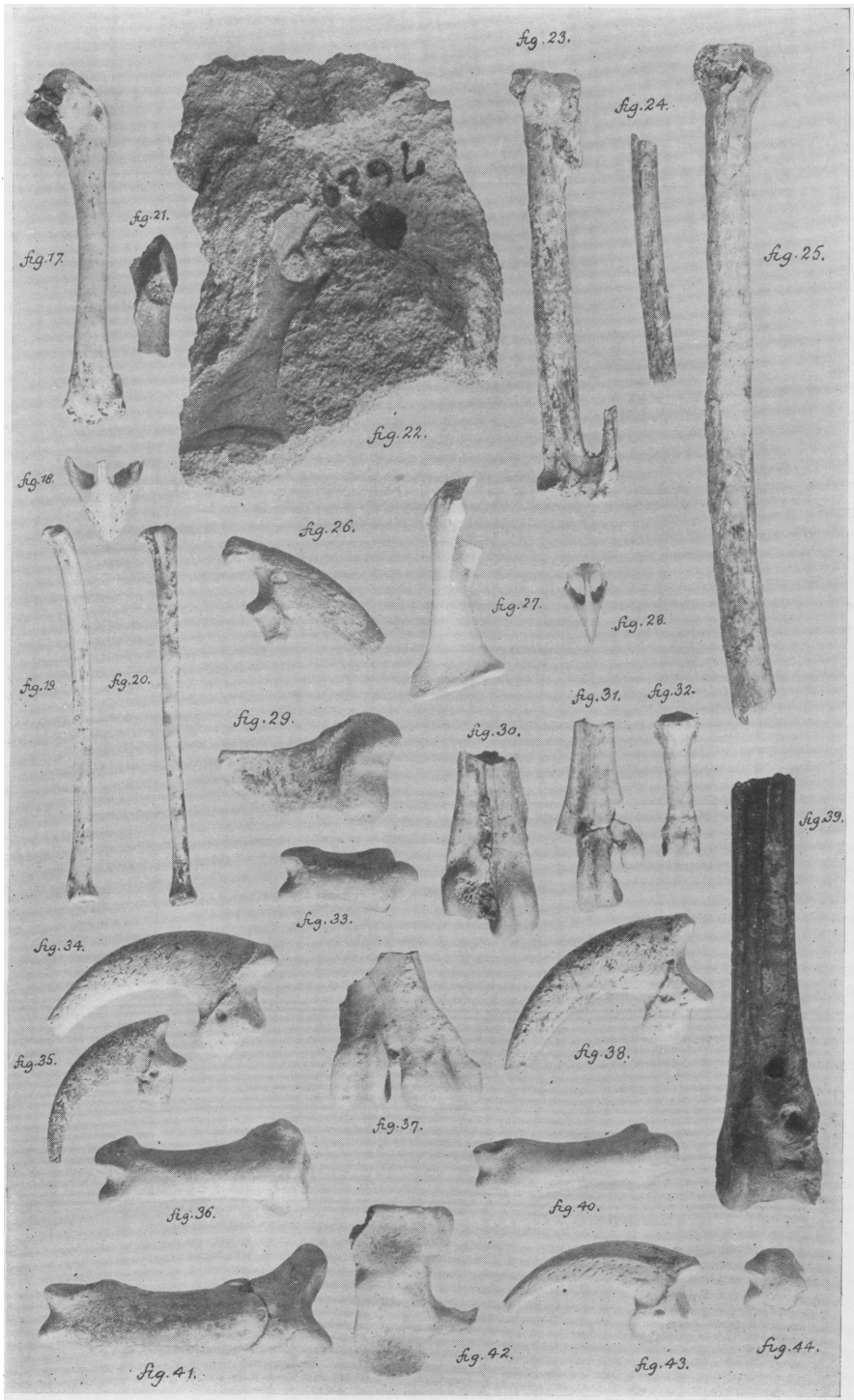
DIATRYMA.

Figs. 8, 9, 10, *D. ajax* sp. nov.; Figs. 11, 12, *D. gigantea* Cope.



DIATRYMA.

Figs. 13, 14, *D. ajax* sp. nov.; Figs. 15, 16, *D. gigantea* Cope.



FOSSIL BIRDS (various species).

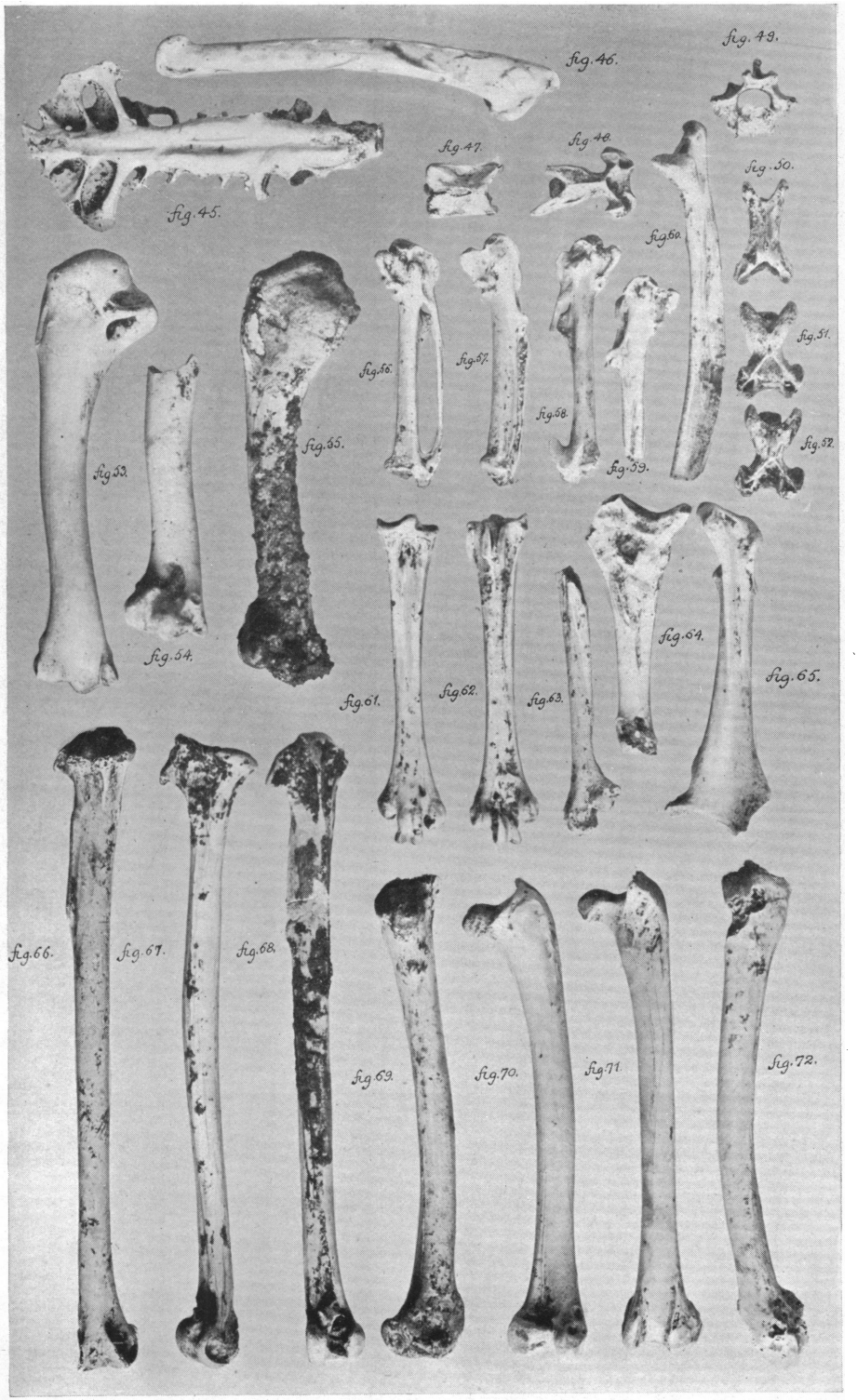
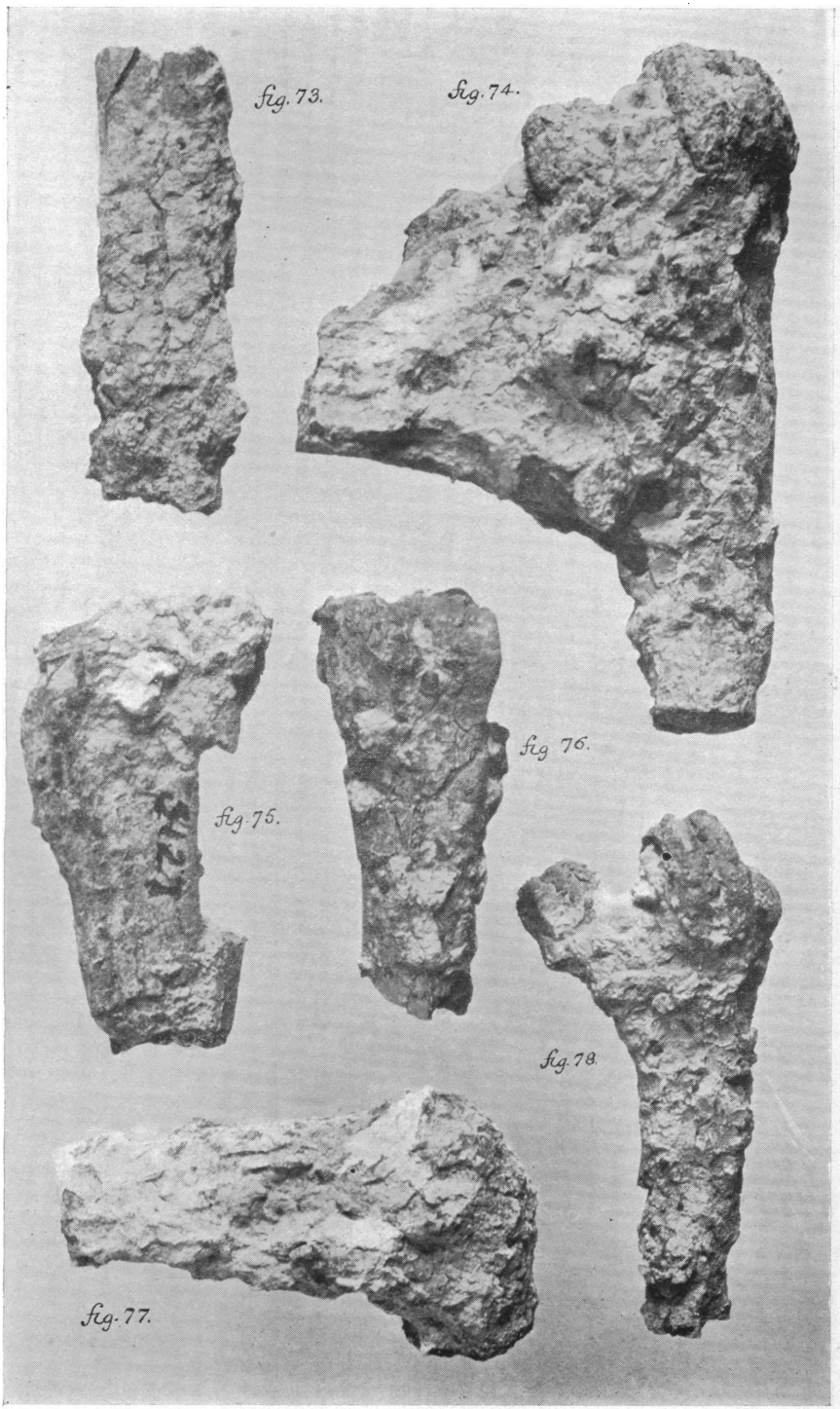
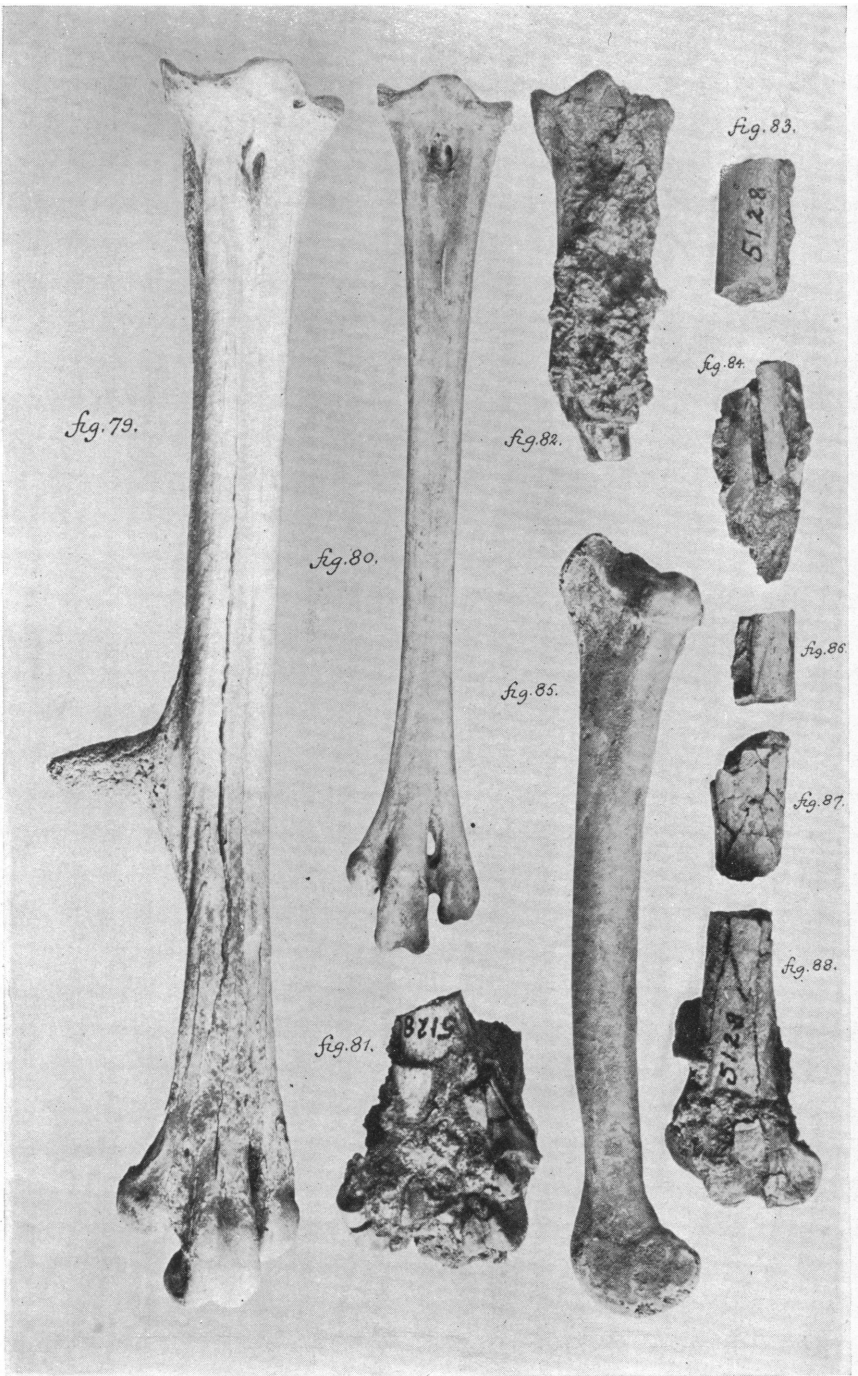


fig. 45.
fig. 46.
fig. 47.
fig. 48.
fig. 49.
fig. 50.
fig. 51.
fig. 52.
fig. 53.
fig. 54.
fig. 55.
fig. 56.
fig. 57.
fig. 58.
fig. 59.
fig. 60.
fig. 61.
fig. 62.
fig. 63.
fig. 64.
fig. 65.
fig. 66.
fig. 67.
fig. 68.
fig. 69.
fig. 70.
fig. 71.
fig. 72.

BONASA sp.?

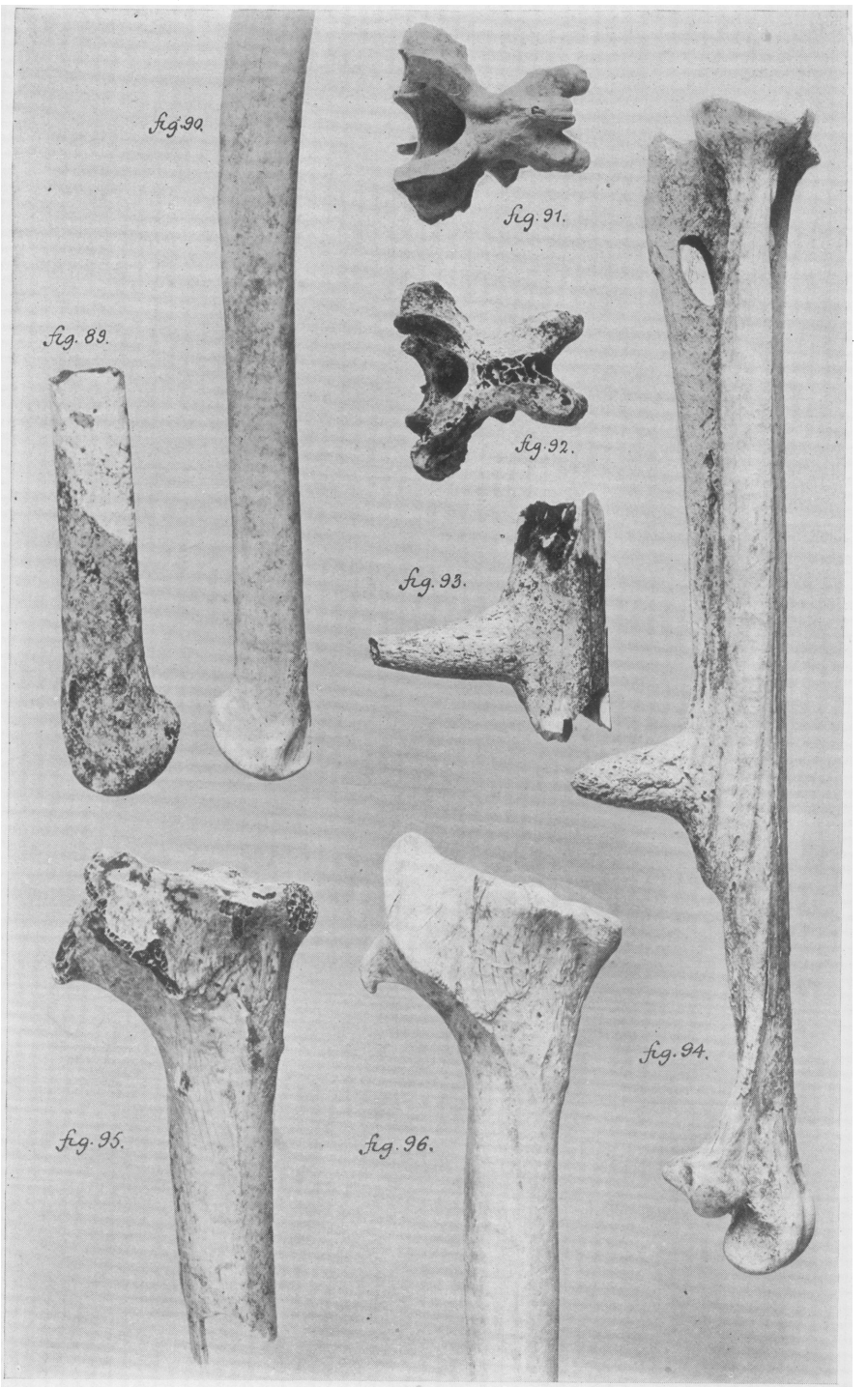


INDETERMINED GALLINACEOUS BIRD.



GALLINACEOUS BIRDS.

Figs. 79, 80, 85. *Meleagris gallopavo.*
Figs. 81–84, 86–88. *Palæophasianus meleagroides* sp. nov.



Meleagris gallopavo.