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Fossil Birds
in the
Marsh Collection
of
Yale University

BY
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BOTAURODES PARVUS gen. et sp. nov.

(Not figured.)

Holotype. Cat. No. 1030, Peabody Museum, Yale University. Spanish John Meadow, Wyoming. Eocene (Bridger ?). L. LaMothe, collector.

A nearly perfect lower extremity of a left tarso-metatarsus of a fossil form of small size. It presents the main characters of this bone as it is found in the *Ardeidæ*, and more specifically among the Bitterns.

It evidently belonged to a species smaller than the Least Bittern (*Ixobrychus exilis*); and while a herodionine form, it was neither a true Heron nor a typical Bittern, but, judging from this fragment, apparently related to both, and, in any event, belonging squarely in that group.

Only the lower part of the shaft is preserved, and this is convex transversely, being correspondingly concave posteriorly. In the Bitterns, the shaft posteriorly is flat; the foramen for the anterior tibial artery is minute, and has a longitudinal groove leading into it anteriorly. As in most Herons and Bitterns, the inner and middle trochlear processes are of about the same length, while the outer one is markedly shorter. Across the three it measures 5 millimeters, the width of the shaft being somewhat less.[1]

BUBO LEPOSTEUS Marsh.

(*Plate II, Fig. 18.*)

Marsh, Amer. Journ. Sci., ser. 3, II, 1871, 126.

Holotype. Cat. No. 512, Peabody Museum, Yale University. Grizzly Buttes, Wyoming. Eocene (Bridger). O. C. Marsh, collector.

The specimen consists of the distal portion of a left tibio-tarsus, and two small slivers of bone that belong to the side of the shaft. It is fairly perfect, though somewhat worn on the condyles. Through a slip, Professor Marsh states that it is half of a tibia, which could not be so even in the case of an Owl. Probably not more than a fourth of the total length of the original bone is preserved.

This bone never came from the skeleton of an Owl, much less from such an Owl as a *Bubo*. It is a most interesting fossil, and the pity is that such a meagre part of the skeleton was discovered.

There is not enough of it to enable us to state correctly as to what kind of a bird it represents. It belonged to a species fully as large as a *Bubo virginianus*, but it presents but one strigine character and that

[1] Generic name = *Botaurus* + Gr. ειδος resemblance. Spec. name = Lat. *parvus*, small.

a *negative one, i.e.*, it lacks the osseous tendinal bridge on the lower anterior aspect of the shaft above the condyles. This is the case in all the Owls of this country known to me; but the fact that this bridge is absent in a tibio-tarsus by no means proves that the bone came from the skeleton of an Owl. I have compared this specimen with the tibio-tarsi of all of the large American Owls, including *Nyctea*, *Bubo*, *Strix*, etc. The distal extremity of a tibio-tarsus in any of the large strigine forms is very characteristic, and moreover, they are all very much alike. But, as I have remarked, beyond the absence of the osseous tendinal bridge, this specimen possesses none of them.

We may compare them thus:

"Bubo leptosteus."	*Bubo virginianus.*
1. Anterior aspect of the shaft, just above the condyles, *flat.*	1. Anterior aspect of the shaft, just above the condyles, deeply excavated, with two distinct pitlets at its base.
2. Inner condyle transversely thick, elongate antero-posteriorly, and reniform in contour.	2. Inner condyle transversely thick, almost *circular* in contour.
3. Outer condyle same form as inner one, and only half the thickness of it transversely.	3. Outer condyle rather more reniform in contour, but fully as thick transversely as the inner one; subcircular.
4. Mesial surface of inner condyle flush with the border.	4. Border prominently raised as a surrounding rim.
5. Intercondylar valley of moderate width.	5. Intercondylar valley very narrow.
6. (Condyles worn away posteriorly.)	6. Condyles project conspicuously behind.
7. Shaft above the condyles, posteriorly, is *flat.*	7. Shaft above the condyles, posteriorly, is *concaved.*
8. No prominence on side of shaft above the internal condyle.	8. A marked elevation of the shaft on that locality.

It is clear from this comparison that the specimen never represented an Owl—that is, any *typical* Owl.

In my opinion it came from the skeleton of some long extinct generalized form, with strigine affinities. This is all that can be said for it; and it would be better to await the discovery of more material than to continue to list this as a *Bubo*, when it is so clear that it in no way represents an Owl, and very surely *not* a *Bubo*.

DIATRYMA GIGANTEA Cope.

(*Plate II, Fig. 16; Plate V, Fig. 30.*)

Cope, Proc. Acad. Sci. Phila., 1876, II; also Rept. U. S. Georg. Surv. West of the 100th Merid. (Wheeler's Survey), Vol. IV, Palæontology, 70, Plate XXXII, Figs. 23–25.

Shufeldt, Bull. Amer. Mus. Nat. Hist., XXXII, 1913, Art. XVI, 297, Plates LI–LIV.

Shufeldt, Aquila (Budapest), XX, 1913, 411–420, Tab. I–V.

Cat. No. 906, Peabody Museum, Yale University. S. side Island Point, N. Horseshoe, Gallina, New Mexico. Eocene. D. Baldwin, collector.

Slip inside of box containing specimen says: "Outer (*left*) condyl (distal) of metatarsus (see A. J. S., Vol. XII, 1876, p. 306. Wheeler's Vol., Plate XXXII)."

BARORNIS REGENS Marsh.

(*Plate I, Figs. 7-9; Plate V, Fig. 32.*)

Marsh, Amer. Journ. Sci., ser. 3, XLVIII, 1894, 344.

Holotype. Cat. No. 417, Peabody Museum, Yale University. Squankum, New Jersey. Eocene. O. C. Marsh, collector.

Professor Marsh was correct in his surmise that the specimen collected in New Mexico was a trochlea from a tarso-metatarsus of a specimen of Cope's *Diatryma gigantea;* but he was in error when he made the determination that it was the "Outer condyle from the tarso-metatarsus *left* side." (See description copied from the slip above.) On the contrary, it proves to be the *inner* trochlear process of the *right* side.

It was discovered in New Mexico, and it was in New Mexico that Cope found his specimen of *Diatryma gigantea.* Personally, I know nothing of the history of these discoveries, though what I do know points to the fact that Marsh's collector found his specimen *after* Professor Cope had discovered and *described* his find. As will be seen by the literature cited above, I have already given many figures of the *two trochleæ* belonging to the *type* of Cope's specimen, and now I find that this specimen found by Marsh completes in every way, as far as it goes, the *distal* extremity of the tarso-metatarsus of the specimen Cope discovered. I am of the opinion that these three trochleæ belonged to the *right* tarso-metatarsus of the same individual bird, and I shall entertain this opinion until history controverts it—that is, if the facts be known to anyone now living. Evidently one of Professor Marsh's collectors went to the exact locality where the Cope specimens were previously found and there discovered the missing trochlea. However, the two trochleæ of Cope's *type* of *Diatryma gigantea* belong to the collections of the United States National Museum, and are before me at the present writing, as is likewise the trochlea which is the property of Yale University. I present with this article several figures of it in the plates, and in Plate IX, Figure 68, there is a reproduction of a photograph I made which thoroughly sustains what I have set forth in the last few paragraphs.

or *haydeni*. Measurements will prove this fact, for the greatest transverse diameter (over all) for this end of the bone measures in *G. canadensis* 2.25 centimeters; in *Grus haydeni* 2.50 centimeters (approximate internal condyle broken off); in *Grus marshi* 1.9 centimeters.

The osseous tendinal bridge, spanning the tendinal groove in front, and the tubercule for tendinal insertion to its outer side, morphologically agree in all three of these species (compare Fig. 21, Pl. II; Figs. 66 and 67, Pl. VIII; and Fig. 144 of Pl. XV); and it will in all likelihood be found that they will be practically the same in all species of true cranes of the genus *Grus*.[1] This extinct species of the *Gruidæ* I name in honor of the late Professor Othniel Charles Marsh, formerly professor of palæontology at Yale University.

MINERVA ANTIQUA Shufeldt.

(Plate XV, Figs. 131–136, 148–152 a–b, 154 a–i.)

Aquila antiqua Shufeldt, Bull. Amer. Mus. Nat. Hist., XXXII, August 4, 1913, Art. XVI, 297, Pl. LV, Fig. 26.

At this writing I am satisfied that *Aquila antiqua*, described by me in the *Bulletin of the American Museum of Natural History* in 1913,

[1] Loomis, F. B. "A Fossil Bird from the Wasatch." Amer. Journ. Sci., ser. 4, 22, 1906, Art. XL, 481, 482, Figs. 1–3.

In this article Professor Loomis describes the remains of a fossil bird from the Wasatch Lake Basin (Lower Eocene), which he names *Gallinuloides prentici*, or, in other words, refers it to the genus *Gallinuloides* of Eastman (Geol. Mag., Lond., 1900, n. s. Decade IV, VII, Art. II, 54–57. Plate). As will be observed from a comparison of Fig. 1 of Professor Loomis' paper with Fig. 21, Pl. II, Figs. 66 and 67, Pl. VIII and Fig. 144 of Plate XV of the present article, that extinct species likewise belonged to the *Gruidae*, as the distal end of the *right* tibio-tarsus there figured was undoubtedly that of a *Grus*, and the form should have been referred to that genus as *Grus prentici*. That bird was a crane fully as tall and as big as *Grus canadensis*, and Professor Loomis himself says that "this bird was about half as big again as a turkey and of rather heavier build," or was, in other words, a *very large* species of *Grus*. Now it is not at all likely that a bird as big and as tall as *G. prentici* would belong in the same genus with a bird about "the size of a gallinule" (Eastman), which latter possessed all the main characters of a *grouse* in its skeleton. In other words, *Gallinuloides wyomingensis* Eastman and *Gallinuloides prentici* did not even belong in the same Order, as most present-day ornithologists define that group.

Some day I trust to examine the type of Dr. Eastman's *Gallinuloides wyomingensis*, and I am very much inclined to believe, from my examination of his excellent figure of it, that it had a far greater number of tetraonine characters in its

was not based upon sufficient material to make a correct generic diagnosis. The material in question consisted of a single osseous claw or ungual phalanx of peculiar formation, as will be observed by referring to the figure of it cited above.

In the material here being considered, I find a number of these claws, and in one or two instances associated with other bones of the skeleton belonging to the same individual.

These throw a very different light upon the subject, as is set forth below, and a study of them thoroughly convinces me of the fact that the extinct (fossil) Eagle I described as *Aquila antiqua* now proves to be a large Owl, and as an Owl it has no place in the genus *Aquila*.

The osseous ungual phalanges of this Owl are so distinctive that there can now be no question as to its having represented a very distinct genus of the *Strigidæ*. Its congeners are now all extinct in this country, and it is not possible, from the material at hand, to say what genus of Owls in the existing avifauna is most nearly related to it. Neither *Nyctea* nor *Bubo* possess such osseous talons, and surely none of the existing *Falconidæ* have them, as I have previously pointed out.

In removing the species from the genus *Aquila*, it becomes necessary to create a new genus to contain it, and I here propose for it the name of MINERVA, so that hereafter

AQUILA ANTIQUA Shuf. = MINERVA ANTIQUA gen. nov.[1]

established on the characters which are derived from the discovery of additional material, as follows:

Cat. No. 847 (Pl. XV, Fig. 151), Peabody Museum, Yale University. Henry's Fork, Wyoming. Eocene (Bridger). O. C. Marsh, collector.

Fossil claw or ungual joint of *hallux* of the extinct owl *Minerva antiqua*, showing the dorso-basal process of this phalanx, produced proximad, and its entire under side taking part in the articulation with the phalanx of hallux. This is the distinctive character to which attention was invited when I described "*Aquila antiqua*."

skeleton than it had ralline ones, several of which are plainly to be seen in the figure of the type. Moreover, *true gallinaceous birds* were by no means uncommon in this country during Eocene time. I have sincc examined this slab. (See footnote, p. 41).

[1] Generic name = L. the goddess Minerva of Roman mythology. The bird of Minerva was an owl. Sp. name = L. *antiquus*, old, ancient. In other words, an ancient bird of wisdom.

This specimen agrees in all particulars with the *type specimen* now in the collection of the American Museum of Natural History.

Cat. No. 833 (Pl. XV, Fig. 154, *a–i*), Peabody Museum, Yale University. Dry Creek, Wyoming. ? Eocene (Bridger). LaMothe and Chew, collectors.

Minerva antiqua is here represented by twenty-four (24) fragments of fossil bones; they are all from the same individual (adult), and constitute the collection through the means of which I was enabled to ascertain that they belonged to a huge owl and not to an eagle.

Nine of these fragments are shown on Plate XV (Fig. 154, *a–i*).

Fig. 154 *g* presents a specimen of the characteristic claw or ungual joint of this owl, and it agrees in every detail with the type specimen and the one shown in Figure 151 of this Plate. Other specimens depart from it slightly, but only in the matter of size; but in this specimen it may readily be attributed to either the variations due to age or to sex. It will be remembered that in nearly all of our *Strigidæ* the females are larger than the males, frequently possessing larger talons and, as a consequence, larger osseous phalanges.

That this claw belonged to '*hallux*,' and that the ungual osseous claws of the three anterior toes were without the characteristic dorsal, backward-projecting process, is proven by the fact that, in the material now being examined, and all belonging to the same individual, there are *three* (3) other osseous ungual phalanges which, from their varying sizes, are, without the slightest doubt, those belonging to the three anterior toes. (Fig. 154, *a*, *c* and *f*.) The anterior portions of all these ungual phalanges are unfortunately broken off and were not recovered. However, more perfect specimens are seen in Figures 148 and 149 of this Plate.

The *basal phalanx* of *hallux* is here shown in *d*, the dorsal aspect being presented. Owing to distortion from pressure, it does not now perfectly articulate with the claw *g;* but further on specimens will be shown where it does do so (Figs. 133, 134).

There is also in this lot a nearly perfect proximal portion of the left carpo-metacarpus (Fig. 154, *b*, palmar aspect); and upon comparing the characters it presents with those of the corresponding bone in the skeleton of *Bubo virginianus* (No. 18753, Coll. U. S. Nat. Mus.), it becomes clear that not only did this fossil belong, in life, to a big owl, but to one having skeletal characters that were in some respects bubonine ones, or at least resembled them; *Minerva antiqua*, however, was by no means a *Bubo*.

I have also compared the fossil bones of this fossil owl with the corresponding ones in a skeleton of *Pseudoptynx blakistoni* (No. 18227, Coll. U. S. Nat. Mus.), and I find that they have a somewhat more general resemblance to them than to those of a typical *Bubo*, as *B. virginianus*. Moreover, the distinctive process on the claw of hallux, although not produced as in the extinct owl, is slightly more in evidence than it is in the bubonine owls. Doctor Sharpe placed *Pseudoptynx* in the genus *Bubo*, but on what grounds I do not remember. Unfortunately I have not at hand for comparison skeletons of either *Scotiapex nebulosa* nor some of the big owls of Africa.

After I had prepared and made Plate XV, I discovered that *both* the *condyles* of the *right tibio-tarsus* were among the fragments, and that they were simply broken apart. They were readily brought perfectly together and fastened with strong glue. In Figure 153*e* only the outer aspect of the *external condyle* is shown, but when the two were assembled, a very different appearance of things was presented. The two condyles were seen to be very prominent; the valley between them—the intercondylar space—was very narrow and deep, being entirely smooth, whereas, in all true eagles of the North American avifauna, this intercondylar valley is broad, shallow, and the condyles not particularly prominent.

In *Bubo* and *Nyctea* the condyles of the tibio-tarsus are very prominent, with the space between them narrow and smooth. In other words, in its general character the distal condylar portion of the tibio-tarsus of *Minerva antiqua* more closely resembled that of an owl than an eagle. But in *Bubo* and *Nyctea* the outline or contour of the *internal* condyle of these two is quite *circular*, the bounding rim being raised as a sharp ridge, and the included surface is smooth, all to a little minute tubercule near its center. Now the *internal* condyle of this bone in an eagle is distinctly reniform or kidney-shaped in outline, with the surrounding border rounded off, and the aforesaid tubercule *very* prominent. This distinctly and in all particulars agrees with what I find in *Minerva antiqua*. The form of the *external* condyle of the tibio-tarsus of this extinct owl is more like what we see in *Aquila chrysaëtos* than in either *Bubo* or *Nyctea*. Nevertheless, the general *facies* of the distal part of the tibio-tarsus of *Minerva antiqua* is very evidently more strigine than it is aquiline.

The rest of the fragments in this lot are so fragmentary (tarso-metatarsus, distal end of radius, etc.) that they throw no further light on the subject. Such as they are, however, it is very evident that they belonged to a large owl. I am inclined to believe that this big

owl had some aquiline affinity, judging from the characters presented on the part of this proximal end of the carpo-metacarpus. It was a form decidedly larger than *Bubo virginianus*, and were it living today, no systematist in ornithology would ever think of placing it in the same genus. In my own mind, I picture a large strigine form, which was, as I say, larger than *Bubo virginianus*, and perhaps a diurnal species exhibiting similar habits.

In this connection it will be well to remember that, while the owls are, in a way, related to the *Caprimulgidæ*, we have nevertheless a *Hawk Owl* (*Surnia*), as well as a remarkable Hawk—the Fish Hawk (*Pandion*)—that has some curious *strigine* characters in its skeleton.

Then again, as this extinct species was found in the Bridger Eocene (Dry Creek, Upper Crossing, Wyo.), it lived a great many thousands of years ago—perhaps over one hundred and fifty thousand—and during that time there may have existed, and probably did exist, raptorial species that brought the *Strigidæ* and the *Falconidæ* much nearer together than they appear to be at the present time. Were this so, *Minerva antiqua* may have been one of the intermediary affines, and one, were it in our present avifauna, would appear no more strange than any other "outlier" among birds, as, for example, a Hoatzin or a Kiwi.

Cat. No. 861 (Pl. XV, Figs. 131–136), Peabody Museum, Yale University Tule Spring, Wyoming. ? Eocene. J. W. Chew, collector.

Here we have additional fossil fragments of bone which belonged to a specimen of *Minerva antiqua*. The characteristic claw is well shown in Figure 134, and this articulates *perfectly* with the basal joint of *hallux* shown in Figure 133. This articulation is a very beautiful and unusually strong one, the approximation of the two articular surfaces being that of *complete contact* throughout, and a most extensive one. When powerfully *extended*, the proximal end of the process of the ungual joint fits snugly in a concavity intended for its reception on the dorsal distal end of the basal hallucial phalanx, an arrangement never noticed heretofore by me anywhere.

Unfortunately, the "accessory" or first metatarsals were not found with this material, or they may have been and since lost.

This *basal phalanx* of *hallux* in *Minerva antiqua* is double the size of the corresponding bone in *Nyctea*, and perceptibly larger than in *Bubo virginianus*. With respect to form, it appears to be more aquiline than strigine, while the *basal phalanx* of the second digit or

toe (Fig. 132) has much the form as we find it in some hawks (*Buteo*) as well as owls.

There is also a distal end of a left *femur* in this lot, with a perfect internal condyle and an imperfect external one, though the latter shows the "notch" for the head of the fibula to articulate in.

There is apparently more owl than eagle here (Fig. 136), and this is certainly the case with respect to the distal end of the left tibio-tarsus (Fig. 131); for in the present instance, although the fragment is quite imperfect in some respects (chipped), it still shows, beyond all doubt, that the "tendinal osseous bridge," over the very shallow groove for the tendons in the anterior aspect below, is *absent*, as is the case in all owls known to me, while it is invariably present in the eagles. Instead of being markedly *concaved* in that locality (as well as to a lesser extent posteriorly), it is perfectly *flat* anteriorly, and only very slightly concaved behind. To some extent, this flatness may be due to pressure, as this, the lower end of the shaft, is much flattened antero-posteriorly. However, the form of the condyle present has not been materially altered.

The rest of the fossil fragments in this lot are pieces of other bones of the skeleton of *Minerva antiqua;* and while they are interesting and sustain what has been set forth above, they do not, however, demand detailed description.

Cat. No. 879 (Pl. XV, Fig. 152, *a* and *b*), Peabody Museum, Yale University. Upper White River, Wyoming. ? Oligocene. S. Smith, collector.

This lot contains, with other material, an ungual osseous (fossil) phalanx of *Minerva antiqua* that, although somewhat smaller than the one figured in Figure 154 *a*, evidently belonged to this species, and probably was the osseous claw of the middle anterior toe. Associated with it is a part of a phalanx of some mammal and a small fossil phalangeal joint from some bird, which it is quite impossible to determine.

Cat. No. 843 (Pl. XV, Fig. 149), Peabody Museum, Yale University. Dry Creek, Wyoming. Eocene (Bridger). LaMothe and Chew, collectors.

This is an almost perfect specimen of a fossil ungual phalanx of the extinct owl, *Minerva antiqua*, now being considered. Its extreme apex is broken off, and it is otherwise somewhat imperfect. There is no way of determining, so far as I can see, whether this claw belonged to the right or left foot. It is not as large as some of the other specimens of this bone, and so may have, in life, belonged to a male bird.

Cat. No. 1026 (Pl. XV, Fig. 148), Peabody Museum, Yale University. Sage Creek, Wyoming. Eocene (Bridger). Chew and Smith, collectors.

This hallucial fossil claw of *Minerva antiqua* is slightly above the average size, and may have belonged to a female individual of this species. It is nearly perfect, much worn, and has fossilized black like the majority of bird fossils from Fossil Lake, Oregon.

Cat. Nos. 858, 859, Peabody Museum, Yale University. Henry's Fork, Wyoming. Eocene (Bridger). L. LaMothe, collector.

Imperfect fossil claw of hallux of *Minerva antiqua;* the process and apex broken off and lost. This claw, or what there is of it, agrees exactly in all particulars with the one figured in Plate XV, Figure 149. No. 859. Three pieces of fossil bones (bird? indeterminable).

Cat. No. 886, Peabody Museum, Yale University. Sage Creek, Wyoming. Eocene (Bridger). Chew and Smith, collectors.

Four fossil fragments of bones, one of which is a basal phalanx of the second pedal digit of *Minerva antiqua* from the *right* foot, which agrees, both in this respect and all others, with the specimen shown in Figure 132 of Plate XV (Adult.)

There are two other fragments of fossil bones in this lot that can not be determined. There is also the superior extremity of a small coracoid (left side) from a bird about the size of a Blue bird (*Sialia*). It is imperfect and too fragmentary for accurate determination. All the bones in this lot are of a coal black color.

Cat. No. 869, Peabody Museum, Yale University. Dry Creek, Wyoming. Eocene (Bridger). LaMothe and Chew, collectors.

Fossil osseous ungual phalanx from the outer or fourth pedal digit of a specimen of *Minerva antiqua* (adult). It is somewhat more perfect, and otherwise agrees with the one shown in Figure 154 *f*. There is also with this lot the distal end of another pedal phalanx, but it is not the one that in life articulated with this claw, though it appears to have belonged to a specimen of *Minerva antiqua*. Finally, with this lot we find an osseous fossil claw, which came from the foot of some Grouse or other, and which can not be determined with anything like accuracy.

Cat. No. 871, Peabody Museum, Yale University. Dry Creek, Wyoming. Eocene (Bridger). LaMothe and Chew, collectors.

Basal phalanx of second toe of *left* foot of *Minerva antiqua* (adult, fossil, perfect), which agrees with the one figured on Plate XV, Figure

132. It is of a pale clay color or drab. There is with it the distal end of another pedal phalanx (fossil), which would appear to be too small for a foot of this extinct owl.

Cat. No. 884, Peabody Museum, Yale University. Locality unrecorded. Eocene (Bridger). LaMothe and Chew, collectors.

Basal phalanx of hallux (fossil, black) of an adult individual of *Minerva antiqua*, from the opposite foot to the one shown in Figure 133 of Plate XV, with which it agrees exactly in all particulars.

In this lot there is also a very small cervical vertebra (fossil, adult) from some bird not larger than a Barn Swallow (*Hirundo erythrogastra*). It would be useless to endeavor to identify it.

Cat. No. 892, Peabody Museum, Yale University. Henry's Fork, Wyoming. Eocene (Bridger). C. G. Knox, collector.

This appears to be an imperfect fossil basal hallucial phalanx of a specimen of *Minerva antiqua*, and I believe it is, as it agrees practically with Figure 154 *d* of Plate XV.

Cat. No. 857, Peabody Museum, Yale University. Black Fork, Wyoming. Eocene (Bridger). R. E. Son, collector.

Eleven fossil fragments of bones, some of which are mammalian or other vertebrates (caudal vertebræ); while there is with them in the lot a claw, which in life belonged to a specimen of *Minerva antiqua*. It is from the third toe and can be readily recognized, although the characteristic process is broken off, as is the distal moiety of the bone. Originally, it was of the same size as the specimen shown in Figure 149 of Plate XV.

Cat. No. 846, Peabody Museum, Yale University. Henry's Fork, Wyoming. Eocene (Bridger). O. C. Marsh, collector.

Five fossil fragments of bones from an adult specimen of *Minerva antiqua*. (1) Basal portion of the ungual phalanx of one of the anterior digits of pes. (2) A basal hallucial phalanx of a foot (nearly perfect). (3) Two other imperfect phalanges, but interesting from the fact that each possesses a conspicuous mesial process, situated posteriorly on the plantar aspect of the articular facet of the bone. This process is present in the corresponding pedal phalanges of *Nyctea* and in probably other *Strigidæ*, while I do not find it in any eagles.

MINERVA ANTIQUA ?

Cat. No. 876, Peabody Museum, Yale University. Cattail Spring, Wyoming. Eocene (Bridger). LaMothe and Chew, collectors.

Two fossil ungual phalanges which may, and probably did, belong to an individual of this extinct owl; but they are a little too imperfect for the purpose of identification.

PALÆOPHASIANUS MELEAGROIDES Shufeldt.

(*Plate II, Fig. 20.*)

Shufeldt, Bull, Amer. Mus. Nat. Hist., XXXII, 1913, Art. XVI, 291–293, Pl. LVIII, Figs. 81–84, 86–88.

Cat. No. 896, Peabody Museum, Yale University. Henry's Fork, Wyoming. Eocene (Bridger). J. W. Chew, collector.

This is the second example of this extinct pheasant which has come to hand for description. It is a very interesting specimen, and is far more perfect than the *type* specimen, as originally described. It consists of the distal end of the right tarso-metatarsus of an adult individual. The inner trochlea is broken off, and the remaining two are not entirely perfect.

This specimen might be mistaken for the corresponding part of the tarso-metatarsus of a Crane (*Grus*), but the characters attaching to the foramen for the anterior tibial artery; the narrower intervals between the trochleæ, and some minor points, all seem to point toward the gallinaceous rather than the paludicoline character of the bone.

UINTORNIS LUCARIS Marsh.

(*Plate VI, Fig. 42.*)

Marsh, Amer. Journ. Sci., ser. 3, IV, 1872, 259.

Holotype. Cat. No. 617, Peabody Museum, Yale University. Henry's Fork, Wyoming. Eocene (Bridger). O. C. Marsh, collector.

We have, representing this genus and species of Marsh, the distal portion of the right tarso-metatarsus (fossil) of some small bird the size of a Blue Jay (*Cyanocitta cristata*), and with it occurs six (6) other granules of fossilized bone, which it is claimed belonged to the skeletons of different individuals (Fig. 42).

Professor Marsh, in describing this specimen, says that he found it to be "A small bird evidently belonging to the Scansores, and probably related to the Woodpeckers, is represented by the distal end of a tarso-metatarsal in perfect condition, and by some other fragmentary remains of different individuals. These specimens indicate a bird

?Oligocene (White River)
913. Gerry's Ranch, Colorado.
951. White River, Nebraska.
Miocene.
Cat. No. 941–942. Shiloh, New Jersey.
Age Unknown.
Cat. No. 893.
926. Grizzly Buttes, Wyoming.
1029. Henry's Fork, Wyoming.
1031. Wyoming.

BIRDS
Cat. No. 832. Wyoming.
918.
925. Wyoming.
929. Wyoming.
931.
1034. Cañon Largo, New Mexico.

SUMMARY

Apart from the five type specimens of extinct birds described by Professor Marsh, and which I borrowed from the Academy of Natural Sciences of Philadelphia for examination and comparison with new material, all the figures herein described and referred were, for the most part, collected either by Professor Marsh himself in the field or by some of his collectors. In a few instances, they were presented to him or to the collections of Yale University. At his death, the entire collection became the property of the Peabody Museum of Yale, where it is deposited at the present time.

Many of these specimens have remained in the Museum for years unworked and undescribed; some are still in their original receptacles, while several of them were collected as early as the 70's, and many of them only a few years thereafter.

When submitted to me for revision and description, as pointed out in the first part of this paper, there were 136 lots of these fossils, numbering, all told, some 400 specimens or more. Of these about 83 came from Wyoming, and are found to be principally Ft. Bridger Eocene forms; 16 from New Jersey; 2 from New Mexico; 7 from Kansas; 4 from Nebraska; 8 from Oregon; 2 from Texas; 3 from Colorado; California 2; Idaho 1; Virginia 1 and Montana 1, thus leaving *six* not definitely fixed.

As I have just stated, most of these fossils came from the Ft. Bridger Eocene formation, while some 24 are from the Cretaceous; 11 from the Oligocene formation; 6 from the Miocene; 9 from the Post Pliocene, and one from the "Post Tertiary."

There are no perfect fossil skulls in the entire collection, indeed, only a few very small and imperfect fragments of the same. This is likewise true of the *sternum*, the *pelvis*, the *vertebræ* and the *ribs*. On the other hand, the distal and proximal portions of long bones and the various phalanges of the feet are the parts of the skeleton most frequently met with, the *radius*, the *femur* and the *fibula* being the bones least often found.

A large part of the material is fragmentary and useless for the purpose of reference. On the other hand, some of it is excellent, and this has been duly determined, described, figured and referred.

Occasionally the fossil bones of fish, reptiles, and mammals occurred with those of the birds, and were, in most instances, apparently discovered with them. No attempt was made to do anything with such material beyond the parts representing birds.

In the matter of size, the species range all the way from a bird no bigger than a sparrow, to adult specimens of *Hesperornis regalis*, and the gigantic ostrich-like birds of the genus *Diatryma;* while in the matter of geologic time, the oldest forms are from the Lower Cretaceous of the Mesozoic, and the most recent from the Post Pliocene.

Taken as a whole, I find in this collection fifty-nine (59) lots which, although representing *bird* material, was found to be, for one reason or another, insufficient for the purpose of making accurate determinations or references.

Doubtless, in the future, a part of this will come to be available; but it should be used with the greatest possible caution, and only in cases where newly discovered material, in any particular instance, is found to supplement that at hand, in such a manner that it, beyond all doubt, furnishes the necessary distinctive characters which are required to make a diagnosis absolutely certain.

I find but little material in this collection representing birds which still exist in the North American avifauna; the principal ones are:

1. *Branta canadensis*
2. *Pediœcetes phasianellus*
3. *Haliœetus leucocephalus*

I also find a specimen which might be referred to *Gallinuloides wyomingensis* Eastman; but this bird had little or no Rail in it, and in any classification should be arrayed with the *Tetraonidæ*.

Among the large toothed divers of the Cretaceous there is a small amount of material representing

1. *Hesperornis regalis* Marsh.

Of species and genera previously described by me elsewhere, I find represented

1. *Palœophasianus meleagroides* Shuf. (extinct).

Of Marsh's types belonging to the collection of the Academy of Natural Sciences of Philadelphia, it may be said that:

1. *Uria affinus* = a good species.
2. *Uria antiqua* = a good species.
3. *Puffinus conradi* = a good species.
4. *Grus haydeni* = a good species.
5. *Palœotringa vetus* = a limicoline bird, but not a *Tringa* as now defined.

All five (5) of these species are extinct, and we only know them through their fossil remains, which, although sufficient, is in each case very meagre.

My study of Marsh's *types* in the Collection of the Peabody Museum of Yale University, convinces me, in the light of additional material, that they stand in need of the following revision and other changes:

1. *Apatornis celer* = *Ichthyornis celer.*
2. *Baptornis advenus* = A good genus and species.
3. *Coniornis altus* = *Hesperornis altus.*
4. *Barornis regens* = *Diatryma regens.*
5. *Phalacrocorax idahensis* = A good species.
6. *Phalacrocorax vagans* = Type material too fragmentary for reference.
7. *Graculavus velox* = *Limosavis velox.*
8. *Graculavus pumilis* = Some scolopacine species.
9. *Graculavus anceps* = Not determined from the type material.
10. *Graculavus agilis* = Not determined from the type material.
11. *Graculavus lentus* = Some tetraonine species.
12. *Graculavus* (sp.?)
13. *Cimolopteryx rara* = Some toothed species?
14. *Cimolopteryx retusus* = Not determined from the type material.
15. *Laornis edvardsianus* = A good genus and species.
16. *Aletornis bellus* = *Tringa bellus.*
17. *Aletornis gracilis* = *Philohela gracilis.*
18. *Aletornis nobilis* = *Grus nobilis.*
19. *Aletornis venustus* = *Fulica venustus.*

20. *Aletornis pernix* = Indeterminable from the type material.
21. *Telmatornis priscus* = A Rail?
22. *Telmatornis affinis* = A Rail?
23. *Telmatornis rex* = A Rail?
24. *Palœotringa littoralis* = A Gull?
25. *Palœotringa vagans* = Type material too fragmentary for a correct reference.
26. *Grus haydeni* = A good species.
27. *Grus proavus* = Not seen (lost?).
28. *Uintornis lucaris* = Awaiting additional material.
29. *Aquila dananus* = Good species (?) (provisional).
30. *Bubo leptosteus* = Not a *Bubo*. Awaiting additional material.

All of these birds are extinct.

Through the study of much additional material, the following change becomes necessary and is proposed:

1. *Aquila antiqua* Shuf. = *Minerva antiqua* Shuf.

I find the material in this Yale University Collection to establish the following new genera and species, each and all of which are now extinct:

1. *Colymbus oligoceanus.*
2. *Gavia pusilla.*
3. *Larus pristinus.*
4. *Sula atlantica.*
5. *Phalacrocorax mediterraneus.*
6. *Phalacrocorax marinavis.*
7. *Eoceornis ardetta.*
8. *Botauroides parvus.*
9. *Grus marshi.*
10. *Limicolavis pluvianella.*
11. *Colinus eatoni.*
12. *Tympanuchus lulli.*
13. *Phasianus mioceanus.*
14. *Phasianus alfhildæ.*
15. *Phasianus americanus.*
16. *Meleagris richmondi.*
17. *Falco falconella.*

From the list, and from what has been set forth on previous pages of the present article, it will be observed that, in so far as the new genera and species here described supplement those of previous works in the same field, and covering geologic ages between the middle Eocene (Bridger Beds) to include Post Pliocene time, the greatest number of

forms belong to the Gallinaceous group, as represented by quails (*Colinus*), grouse (*Tympanuchus*), pheasants (*Phasianus*) and turkeys (*Meleagris*); and, while there is but one new falcon represented (*Falco falconella*), there is considerable evidence that both the diurnal and nocturnal raptorial birds were more or less abundant. The remarkable feature is that both these and the fowls were so much like or actually typical representatives of existing genera.

For the rest, the list is made up of waders and water birds belonging to the genera shown; and a number of these—indeed, nearly all of these—likewise represent existing genera, and probably would not have been at all out of place in the North American avifauna of the present day.

EXPLANATION OF PLATES

[All the Figures on the Plates are reproductions of photographs made direct from the specimens they represent by the author.]

PLATE I

[Figures 1–6 on this Plate are reduced rather more than one-sixth.]

FIG. 1. Inner aspect of the distal portion of the right tarso-metatarsus of *Baptornis advenus* Marsh.

FIG. 2. Outer aspect of the proximal portion of the right (?) tarso-metatarsus of *Baptornis advenus* Marsh. Had this piece alone been discovered, it presents no character, as yet, by which it might, with certainty, be determined as to whether it belonged to the right or left pelvic limb. It came from a subadult individual.

FIG. 3. Anterior aspect of the distal portion of the right tarso-metatarsus of *Baptornis advenus* Marsh.

FIG. 4. Posterior aspect of the distal portion of the right tarso-metatarsus of *Baptornis advenus* Marsh. Figs. 1–4 are all the same specimen.

FIG. 5. Anterior aspect of the proximal portion of the right tarso-metatarsus of *Baptornis advenus* Marsh. See note under Fig. 2.

FIG. 6. Posterior aspect of the proximal portion of the right tarso-metatarsus of *Baptornis advenus* Marsh. See note under Fig. 2. Figs. 2, 5 and 6 are all of the same specimen.

FIGS. 7–9. Dorsal, plantar, and outer aspect, respectively, of the first or basal phalanx of the outer pedal digit of *Barornis regens* Marsh. Slightly smaller than natural size. In the opinion of the present writer, this bone came from the skeleton of the foot of a specimen of *Diatryma*. (See Plate V, Fig. 32.)

PLATE II

[All the Figures on this Plate are of natural size]

FIG. 10. Outer aspect of the distal portion of the right tibio-tarsus of *Laornis edvardsianus* Marsh. (Type.)

FIG. 11. Inner aspect of the right tarso-metatarsus of an adult Loon (*Gavia immer*). Coll. U. S. Nat. Mus. (Unnumbered.) Compare with Fig. 12.

FIG. 12. Inner aspect of the distal portion of the right tarso-metatarsus of *Baptornis advenus* Marsh. Compare with Fig. 11 and Figs. 1–4 of Plate I.

FIG. 13. Anterior view of distal end of the left tibio-tarsus of *Aquila dananus* Marsh (Type.)

FIG. 14. Postero-lateral aspect of the left tarso-metatarsus of an adult specimen of *Grus canadensis*. (No. 820, Coll. U. S. Nat. Mus.)

FIG. 15. Postero-lateral aspect of the left tarso-metatarsus of *Aletornis nobilis* Marsh (Type). See also Plate VI, Figure 43.

Fig. 16. Direct mesio-lateral view of the inner trochlear process of the right tarso-metatarsus of *Diatryma gigantea* Cope. This is the specimen collected by Marsh. In the Figure the plane of fracture is below. (See also Plate V, Figure 30.)

FIG. 17. Posterior aspect of the distal extremity of the left tibio-tarsus of a specimen of the Snowy Owl (*Nyctea nyctea*). Adult ♂. Author's private collection. Compare with Figure 18.

FIG. 18. Posterior aspect of the distal extremity of the left tibio-tarsus of *Bubo leptosteus* Marsh (Type). Compare with Figure 17, and see description in the text.

FIG. 19. Ventral view of the anterior portion of the sternum of *Meleagris richmondi*, sp. nov. (Type).

FIG. 20. Anterior view of the distal extremity of *Palæophasianus meleagroides* Shuf. Imperfect.

FIG. 21. Distal extremity of the left tibio-tarsus of a specimen of *Grus haydeni* Marsh. Adult and somewhat imperfect. Yale Coll. Cat. No. 860. Has been compared by the present writer with the *type* in Coll. Acad. Nat. Sci. of Phila.

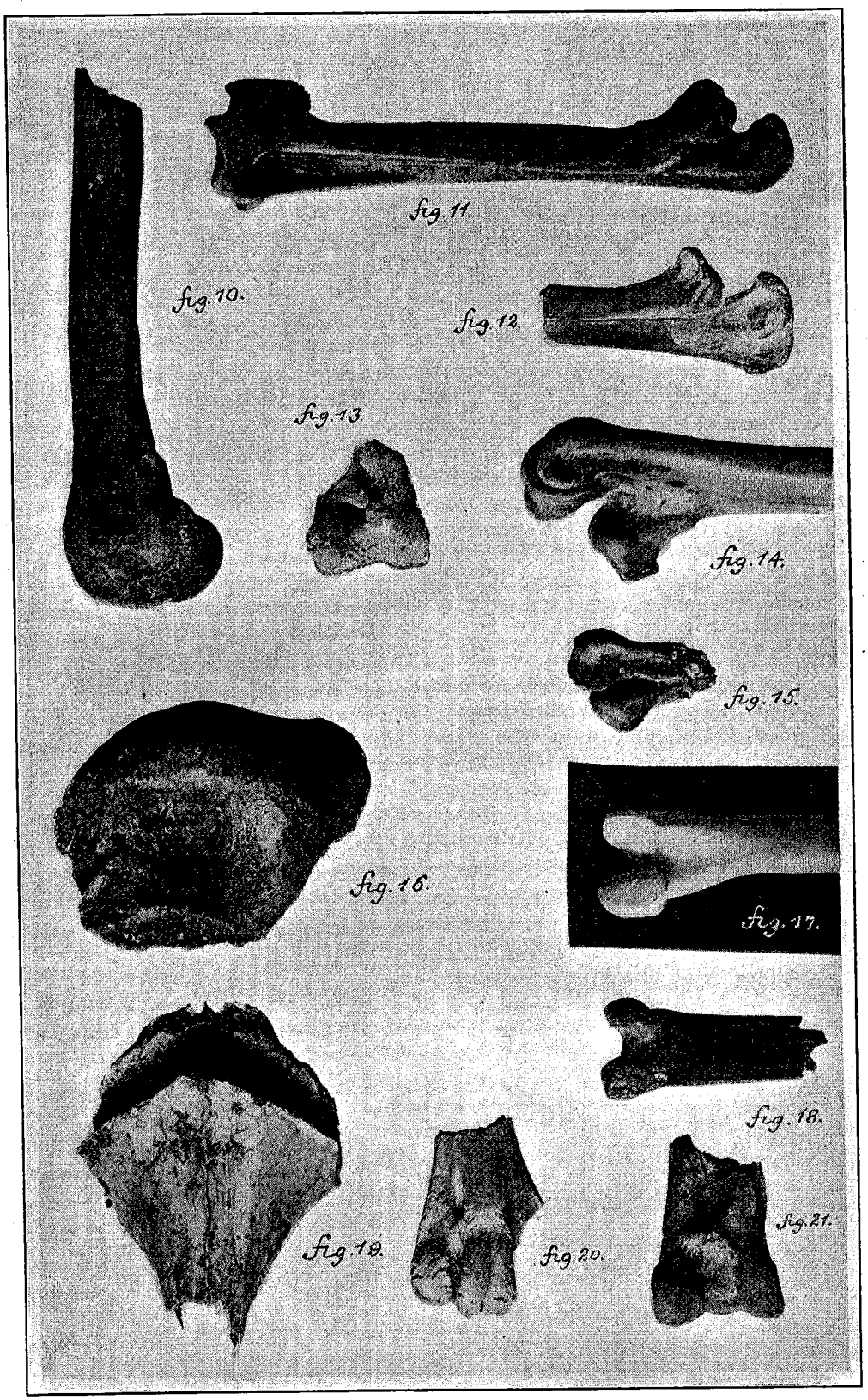

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PLATE XV

[All Figures natural size. Reproductions of photographs made direct from the specimens by the author]

FIG. 123. Left coracoid, posterior aspect, of *Sula atlantica*, sp. nov. (extinct). Fossil. Adult. (See description in text.)

FIG. 124. Distal part (third?) of the right humerus of a fossil bird (indeterminated). Adult. (Extinct?) Yale University Coll., Cat. No. 940. From a species about one-fifth smaller than a Night Heron (*Nycticorax*), to which, however, it does not appear to be related.

FIGS. 125, 126. Shafts of fossil long bones (*Graculavus*. New gen. and sp-Marsh). Birds? (See description in text.)

FIG. 127. Anterior aspect of distal portion of a fossil left tarso-metatarsus of a bird. Type of *Graculavus lentus* of Marsh. Cat. No. 1796, Yale University Coll- (See description in text.)

FIG. 128. Portion of a fossil bone (Bird; indetermined). (See description in text.) Cat. No. 903, Yale University Coll. Adult.

FIG. 129. Anterior aspect of the right tibio-tarsus of *Limicolavis pluvianella*, sp. nov. (Type.) Adult; fossil. Oligocene; John Day? Coll. Peabody Museum, Yale University.

FIG. 130. Anterior view of the superior end of a fossil left coracoid of a bird (extinct?). Adult; indetermined. Belonged to some species about the size of a Clapper Rail (L. Eocene?)

FIGS. 131–136. Various fossil bones representing *Minerva antiqua* Shuf. Figure 131, anterior view of the distal end of left tibio-tarsus; Figure 132, basal phalanx of the second digit, left foot, mesial aspect; Figure 133, basal joint of hallux; Figure 134, characteristic hallucial claw of the first digit or hind toe; distal portion broken off, otherwise perfect; Figure 136, distal end of a left femur with a perfect interna condy le and an imperfect external one.

FIG. 137. Anconal aspect of the distal portion of a right humerus of a bird (adult, fossil, indetermined). Size of a *Centrocercus urophasianus*.

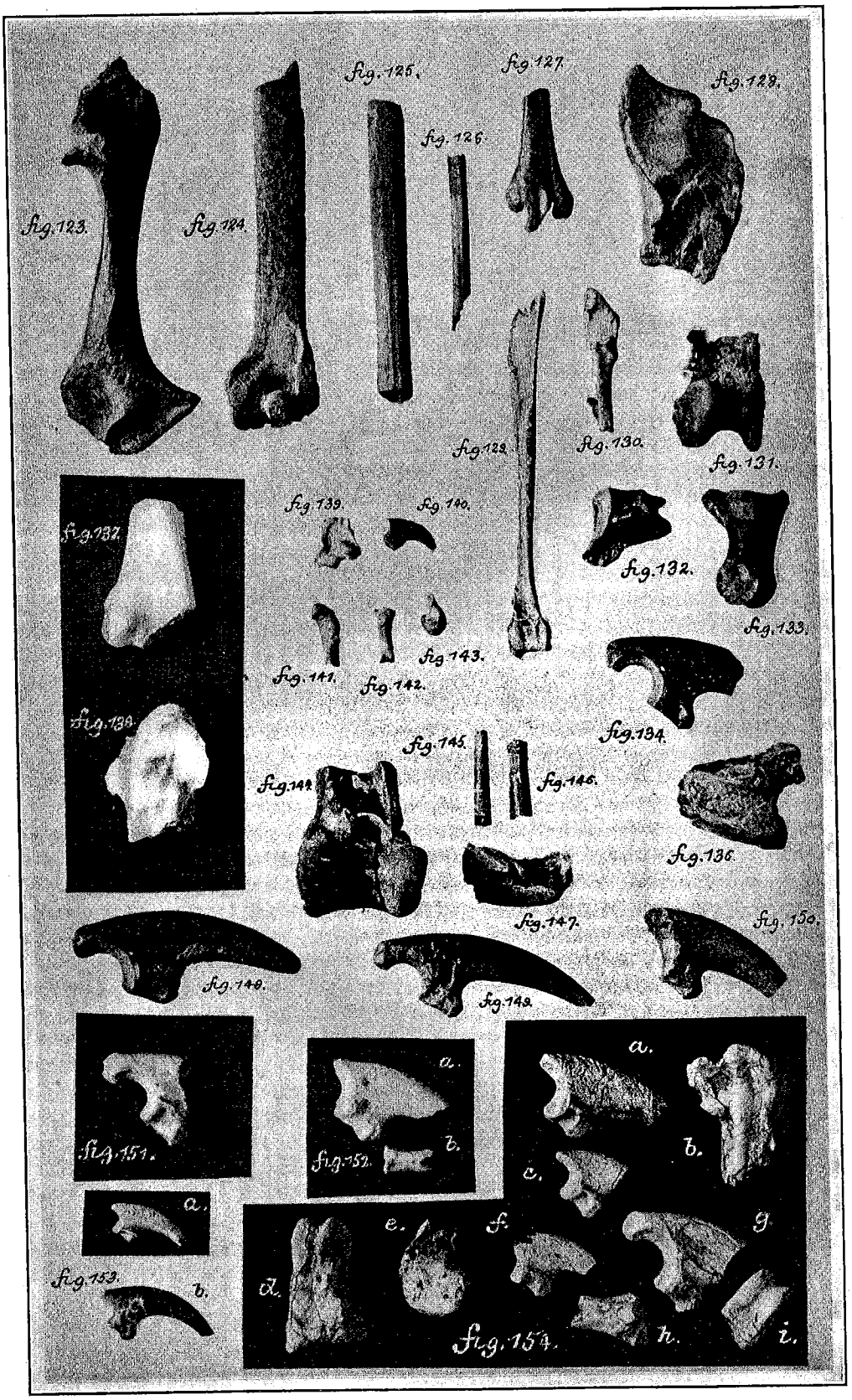
FIG. 138. Anconal aspect of the proximal part of the right carpo-metacarpus of *Phalacrocorax mediterraneus*, sp. nov. (extinct, fossil, adult).

FIGS. 139–143. Various fossil bones of *Falco falconella*, sp. nov. (extinct, adult). Eocene. Figure 139, anconal aspect of the distal end of the left humerus; Figure 140, ungual phalanx of one of the toes; Figure 141, anterior aspect of the superior extremity of the left coracoid; Figure 142, pedal phalanx of a toe; Figure 143, condyle of some long bone.

FIGS. 144–147. Figure 144, anterior aspect of the distal end of the right tibio-tarsus of *Grus marshi*, sp. nov. (extinct, fossil, adult). Bridger; Eocene. Figures 145–147, fragments (indetermined) which accompanied Figure 144.

FIG. 148. Hallucial fossil claw of *Minerva antiqua* Shuf.

FIG. 149. Fossil ungual phalanx of a specimen of *Minerva antiqua* Shuf. Nearly perfect (adult).



SHUFELDT: FOSSIL BIRDS IN MARSH COLLECTION OF YALE UNIVERSITY

PLATE XV—*Continued*

FIG. 150. Imperfect claw of hallux of *Minerva antiqua* Shuf.; the process and apex broken off.

FIG. 151. Ungual phalanx of *Minerva antiqua* Shuf.; anterior portion broken off. (Fossil, adult.) Shows the postero-superior process well.

FIG. 152. *a*, fossil osseous ungual phalanx of *Minerva antiqua* Shuf.; imperfect; adult. *b*, small fossil phalangeal joint from some bird, associated with *a*.

FIG. 153. *a* and *b*, nearly perfect ungual phalanges of pes (fossil) of some raptorial bird. Adult. (Not determined.)

FIG. 154. (*a-i*) Various fossil bones of a specimen of *Minerva antiqua* Shuf.; adult. More or less imperfect. *a*, *f* and *g* are ungual phalanges from the anterior toes; *d*, basal phalanx of hallux; *g*, the ungual claw that articulates with *d*; *b*, nearly perfect proximal portion of the left carpo-metacarpus; *e*, outer view of the external condyle of the tibio-tarsus; *h*, proximal portion of one of the smaller phalanges of the foot; *i*, distal part of one of the larger phalanges of the foot, and probably the mate to *d*, or the other basal phalanx of hallux.