NOTES ON THE TRUNK SKELETON OF A HYBRID GROUSE.

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ON the 15th of last January (1893), Mr. William Brewster purchased in the markets of Cambridge, Mass., a specimen in the flesh of a hybrid Grouse. He prepared the skin of it for his private collection, and placed the body of the bird in alcohol. Writing me from Cambridge upon the 13th of the following month, he offered me the latter for anatomical investigation, saying at the same time that, as far as he could ascertain, the bird "lacked wholly either testes or ovary." During the latter part of February this spirit specimen came into my possession, and in the letter of transmittal Mr. Brewster further said: "The market-man could tell me nothing as to where it had come from, save that he received it with many other Grouse (all *Tympanuchus americanus*) from a wholesale dealer in Boston."

"It is nearly intermediate in respect to color, markings, and feather development between *T. americanus* and *Pediocætes p. campestris*. It has the neck tufts (only about one inch long, however) of the former and the elongated central tail-feathers of the latter. It had evidently been snared, and killed by wringing the neck." I re-examined the specimen for sex characters (but without a lens, however) and utterly failed to find any trace of generative organs whatever. In April, through the kindness of Mr. True of the National Museum, the alcoholic, which had already been partially skeletonized by myself, was passed into the hands of Mr. F. A. Lucas, to be completed by one of his workmen. Thanks to them, the cleaned bones now lie before me for description. These consist of the femora, the shoulder-girdle (complete), the sternum, the ribs (which had all been cut in two in order to examine for sex characters), the cervico-dorsal vertebræ, the pelvis, and two (proximal ones) coccygeal vertebræ.

This trunk skeleton has several points of considerable interest about it to the ornithologist, and to me it has a special interest inasmuch as many years ago I gave it as my opinion that of all the genera of our North American Grouse, these two, *Pediocætes* and *Tympanuchus*, were the most nearly related to each other. This opinion was based upon my studies of the osteology of the entire group in this country, and it was published in the Twelfth Annual Report of the U. S. Geological and Geographical Survey (Washington, Oct., 1882, p. 700). Our hybrid specimen, now at hand, supports this view. It proves that the genera *Pediocætes* and *Tympanuchus* are so closely affined that the species are fertile *inter se*. But I know of instances among gallinaceous fowl, far more remotely related than these, where successful crosses were produced. I have seen a matured hybrid, the offspring of a common barnyard cock and a guinea hen. The bird was chiefly white in plumage and had large spurs. Mr. Smillie, the well-known photographer of the National Museum, gives me an instance that came under his own personal observation, where a domestic Mallard drake regularly paid court to a certain hen, an ordinary barnyard fowl, but he never ascertained whether any of the eggs she laid were ever placed for hatching, and consequently could not say whether they were fertilized or not.

Here I would also like to invite attention to what Mr. R. Bowdler Sharpe has said upon this point in his very interesting article on 'Ornithology at South Kensington' which appeared in 'The English Illustrated Magazine' for December, 1887. That eminent ornithologist remarks that "instances of cross-breeding in confinement are plentiful. A Goldfinch will mate with a Canary, or one species of Pheasant will interbreed with another species, but in a wild state the instances of hybridization are less frequent, and are commonly confined to game birds. The Hooded Crow (*Corvus cornix*), however, is known to breed with the Carrion Crow (*C. corone*), wherever the ranges of the two species overlap; and in the case of the birds exhibited [in the halls of the South Kensington Museum], a pure-bred Hooded Crow and a pure-bred Carrion Crow will be seen, while the hybrid young ones partake, to a greater or less degree, of the characters of both. The same occurs with the Common Goldfinch (*Carduelis carduelis*) and the Oriental Goldfinch (*C. caniceps*)" (p. 67).

So far as my observation goes, such hybrids usually stand more or less intermediate in size between the parent birds. This appears to have been the case, judging from the trunk skeleton, with the hybrid Grouse now under consideration. A few measurements will show this, and they are given in the subjoined table.

Adult specimens (*Measurements in millimetres.*)	*Length of sternum*	*Length of coracoid*	*Length of scapula*	*Length of pelvis*	*Greatest width of pelvis*	*Length of femur*
Tympanuchus americanus	115	55	75	85	74	72
Hybrid	114.5	48	70	72	59	66
Pediocætes p. campestris	101	48	66	71	57	64

In my osteology of the *Tetraonidæ*, above cited, I have already shown that the cervico-dorsal chain of vertebræ consists numerically of fifteen leading cervicals, if we so designate them, followed by four dorsals that are fused into one piece, and finally a single free dorsal standing between this piece and the pelvic sacrum. This is precisely the arrangement in the vertebral chain of the trunk skeleton of the hybrid Grouse we are now examining. They are characteristically tetraonine, and are each somewhat larger than the corresponding ones in the spinal column of *Pediocætes p. campestris*. But the vertebral ribs of this hybrid, with their costal ribs, are distinctly more like those of the Sharp-tailed Grouse (*Pediocætes*) than they are like the ribs in *Tympanuchus*. My Hayden memoir calls especial attention to the peculiar form of the ribs of the species of the last-named genus of Grouse, in that they, as well as the epipleural appendages they support, are markedly broad and spreading.[1] This is not nearly so much the case in *Pediocætes* nor, as I have just said, in this hybrid bird.

Passing next to the *pelvis*, we meet with a very interesting structure, to the student of the morphology of birds, and it would indeed be hard to conceive of a bone that in its form stands so directly intermediate between the pelvis of *Tympanuchus* and *Pediocætes*. This is the more easily appreciated inasmuch as in the former genus a pelvis is met with that is strikingly dif-

[1] *Osteology of the Tetraonidæ.* Hayden's 12th Annual Report, U. S. Geol. and Geograph. Surv. of the Territories, 1882, p. 680, Plate XI, figs. 79, 80.

ferent from that part of the skeleton in any other kind of North American Grouse. It is approached by the pelvis in *Pediocætes*, but not to such a marked degree as it is by the bone in this hybrid fowl.[1] Viewed laterally, the most obvious character is the remarkable manner in which, upon either side, the post-acetabular part of the ilium far over-arches the lateral surface of the pelvis and the ischiac foramen. To a very moderate extent this is apparent in the pelvis of *Pediocætes*, whereas in the hybrid we have the condition much more pronounced, but not to the extent that it is in the Prairie Hen. Again, in the latter, upon superior view of the pelvis, we note, in the post-acetabular part, that the sacrum is separated from the inner margins of the ilia by quite an interval. This is not nearly so well marked in the hybrid, while in *Pediocætes* those borders are in close contact for their entire lengths. The pubic elements are produced posteriorly, not being as short as they are in *Tympanuchus*, but more as we find them in the Sharp-tail Grouse. In all its minor characters, as I have said above, this pelvis is an exact intermediate between the pelves as they occurred in its parents. Such an observation is quite applicable, too, to the *sternum*, which appears to be just a shade off from that bone in *Tympanuchus*, but differs in one insignificant minor character in that the antero-superior produced portion of either costal process in the hybrid is somewhat lengthened, very narrow, and points directly to the front. In all, the elements of the pectoral arch or shoulder-girdle are very much alike, though the individual bones of the hybrid rather more closely simulate the corresponding ones in my skeletons of the Prairie Hens. More particularly is this the case in the form of the much expanded hypocleidium of the os furcula, this expansion being considerably narrower antero-posteriorly in *Pediocætes* than it is in *Tympanuchus* or in this hybrid. For the diameter indicated, in the last two it measures 12 millimetres, while in the Sharp-tailed Grouse it measures but 9 mm. or less.

Excepting in the matter of size, the characters of the femur of this hybrid Grouse are in exact agreement with those of the femora of the parent species. We note, however, that the calibre of its shaft is relatively, as well as actually, stouter than it is in

[1] *Loc. cit.* Plate XII, figs. 83, 84.

Pediocætes. Apart from this minor point, the femur of this hybrid fills the ideal place in a series of three that otherwise insensibly intergrade in all particulars.

This completes my account of the few bones that I have of the skeleton of this very interesting specimen, and in conclusion it but remains for me to thank, as I here do, Mr. Brewster for his kindness in having placed them at my disposal for description. It is fortunate that the specimen fell into such excellent hands, for we fear that with many others the fate of the body would have been quite different. I refer to that thoughtless class of ornithologists who seem to think that their science begins and ends when they have "shot a bird, skinned it, and then thrown away the characters." This is the first hybrid of this kind that has ever come under my observation, but I am inclined to believe that others, more or less like it, will be met with in the future. Were it possible to domesticate these two genera of Grouse, I believe they would frequently cross under such conditions, and very likely the vast majority of the eggs would prove to be fertile.

RECENT LITERATURE.

Ornithology of the Death Valley Expedition. — Part II[1] of the report on the Death Valley Expedition, organized and carried on under authority of the U. S. Department of Agriculture in 1891 by Dr. C. Hart Merriam, Chief of the Division of Ornithology and Mammalogy, is published in advance of Part I, and consists of eight special reports, as follows: (1) Report on Birds, by A. K. Fisher, M. D.; (2) Report on Reptiles and Batrachians, by Leonhard Stejneger; (3) Report on Fishes, by Charles H. Gilbert, Ph. D.; (4) Report on Insects, by C. V. Riley, Ph. D; (5) Report on Mollusks, by R. E. C. Stearns, Ph. D.; (6) Report on Desert Trees and Shrubs, by C. Hart Merriam, M. D.; (7) Report on Desert Cactuses and Yuccas, by C. Hart Merriam, M. D.; (8) List of

[1] The Death Valley Expedition, a Biological Survey of parts of California, Nevada, Arizona, and Utah. Part II.=North American Fauna, No. 7, pp. 402, pll. xiv, frontispiece, two cuts in text, and 5 maps. U. S. Department of Agriculture, Division of Ornithology and Mammalogy. Washington, 1893. (Published May 31, 1893.)