

NOTES ON THE MEARNS QUAIL

By LOYE MILLER

During the first forty years of my interest in ornithology the Mearns Quail (*Cyrtonyx montezumae mearnsi*) was little more tangible to me than the distinguished names which it bears. Furthermore, the intensity of an academic interest was sharpened year by year as its subject continued to elude every attempt at closer contact. So large a number of ornithologists have had a somewhat similar experience that these notes are offered as perhaps acceptable to some who are less fortunate in the ultimate partial realization of that long continued desire.

Many things mark the bird as different from the better known quails of the United States. The cabinet skin, which often is one's only contact with the species, displays a most bizarre pattern, a powerfully arched beak, a large eye, strong legs with long-clawed toes, and the almost tail-less rump of a tinamou. If you are so fortunate as to get the freshly killed bird in hand, you find the bill is actuated by extremely bulky jaw muscles, the eyes really are large and lustrous as in some birds of the deep jungle, the legs are muscled in a remarkable fashion both as to mass and as to coloration of the flesh. In the cleaned skeleton other characters of interest appear. The humerus is long but slender, the pelvis is narrow, the ilium is extended far backward, the free vertebrae of the tail, as might be expected, are markedly reduced, and the leg bones are powerful. A correlation of the bird's peculiar habits with these visible structural characters constitutes the main purpose of this writing.

Coloration.—So much has been said, and so much is still being learned about the subject of camouflage, that I hesitate to discuss at any length the color pattern of the Mearns Quail in relation to survival of the species. Certainly there is a rather thorough breaking up of pattern. The harlequin striping of the head and the guinea-like spotting of much of the body plumage serve that end to perfection. The "dry thatch" pattern of the back would certainly harmonize with the grass tussock in which the bird often crouches when disturbed. The black and dark chestnut of the ventral surface would blend into the shadow cast by the bird's own body. Whatever be the theory pro or con in protective coloration, this species has certainly perfected the practice of immobility as a concealment measure. "Fool Quail" it may be called because it will sit motionless until almost trodden on. However, my own experience leads to the belief that the bird is no fool but rather it is the hunter who is fooled by him. I rather approve of the Fool Quail and his methods.

Beak.—In the montane areas of southern Arizona there grow extensive groves of a live oak known to the local Mexicans as *ballote* (ba-yo'-te) which bears enormous crops of acorns with much sugar and a minimum of tannic acid in the kernel. Tons of this mast are cast upon the ground in the early fall to be gathered by the native populace, human and otherwise. Deer, peccaries, rodents, bears, woodpeckers, jays, pigeons, and our subject, the Mearns Quail, feast upon these acorns. Band-tailed Pigeons are obliged to swallow them whole and even the quail may do so upon occasion. Generally, however, the nuts are shelled and the hard kernel even cut into smaller pieces by the strong bill and powerfully developed jaw muscles. Study of crop contents shows that either method of dealing with this food may be employed.

Large eye.—Certain birds of the deep forest where light intensity is reduced and others, or the same species, which are active during the twilight hours have relatively large eyes. The development does not equal that of the truly nocturnal type but is a

sort of guide post pointing in that direction. The Mearns Quail is not today an inhabitant of deep forest, though he is fond of the thick growth in the steep-walled canyons. Here I have found the birds working out into the open spaces under the live oaks in the early dawn before they were visible to the human eye as more than moving shadows. A possible forest-quail heritage, the large eyes, would here serve them well.

Large foot and claws.—In these same open spaces under the oaks and in the canyon bottoms, there grows a form of perennial grass or small sedge bearing a nut-like tuber on its underground system. These “nutlets” are quite tasty and appeal strongly to the quail, it seems. A considerable amount of digging is necessary to tear up the sod and retrieve the tubers. For this task the species' equipment of long, curved, and powerful claws seems ideal. The bird is not a great runner. He does not travel long distances, either afoot or awing. However, the distinct impression he gives is that of a powerful digger. I have found the tough sod quite extensively torn up where a covey had been feeding upon the “grass nuts” and burrowing larvae.

Tail-less rump.—So many things about this quail have reminded me of the forest dwelling tinamou of El Salvador (*Crypturellus cinnamomeus*). The practically non-existent tail is one of them. The rectrices are short and weakened to such an extent that little function can remain to them. The free caudal vertebrae and pygostyle are reduced to a minimum as compared with *Lophortyx* which has a well developed skeletal support for the tail. Like the tinamou, the quail's flight is seldom sustained. An explosive rise from almost underfoot, a short dash above or around some obstruction, and the bird again comes to earth. On rare occasions a longer, downhill glide on set wings may be employed. The tail would probably serve but small function in such behavior. I have seen an individual rise from the base of a fifteen foot cliff and disappear over its crest without appreciable horizontal movement.

Slender humerus.—The wing bones of the Mearns Quail, as compared with those of the California Quail (*Lophortyx californica*) are longer but are relatively more slender. The humerus gives the impression also of frailty by having the muscle scars less sharply marked; this characteristic gives the effect of a “blurred” image such as we sometimes get in water-worn fossil specimens. The transverse diameter of the shaft in the two bones is identical whereas the total length in the Mearns Quail is twenty-one per cent greater.

Table of Measurements

		Mearns Quail	California Quail
Humerus	length	39.20 mm.	31.50 mm.
Humerus	width of shaft	3.30	3.25
Ulna	length	37.60	27.80
Carpometacarpus	length	21.00	17.50
Femur	length	39.10	36.40
Tibiotarsus	length	52.00	52.20
Tarsometatarsus	length	30.00	30.00

Just the reverse of this slenderness is true of the bones of the posterior limb. Segment by segment, the lengths of leg bones are almost identical in the two species, but Mearns Quail is by far the more heavily built bird. The bones are greater in their transverse dimensions, yes, but the contours are softened as in the case of the fore limb. The great trochanter of the femur is lower, the femoral head is less sharply set off from its neck, the scar of the gastrocnemius muscle is less marked, and the popliteal pit is shallower. The area of attachment of the gluteal muscle group is larger but is less deeply pitted.

About the head of the tibia this same effect is evident. Both the outer crest and the cnemial crest are less pronounced. Much the same differences were seen in early studies of the American vultures. The extinct *Teratornis* had far less rugged contours of the femur and the tibial head than does the California Condor. These differences were interpreted as indicating less ambulatory power in *Teratornis*. The same correlation is considered proper for the quails. While the Mearns Quail has relatively large legs, they serve him in a different way than do those of the California Quail. He uses them for scratching and for leaping into the air, but his covey is very restricted in its range and he seemingly runs but short distances before either hiding or taking wing. Covies of the birds have repeatedly been located within the same fifteen yards of a canyon's course upon consecutive days or even at longer intervals.

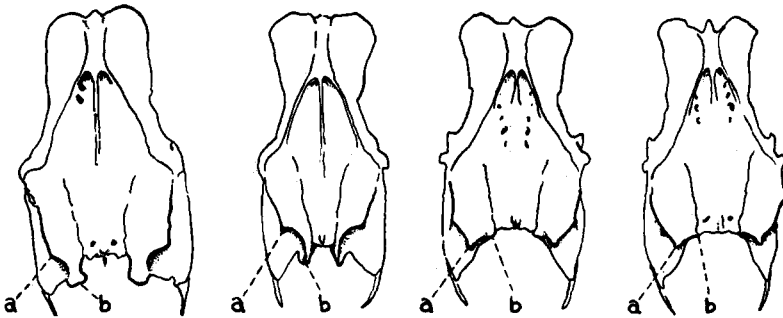


Fig. 28. Line drawings, traced from photographs, showing the pelvis in four genera of quail: left to right, *Dactylortyx*, *Cyrtonyx*, *Callipepla*, *Lophortyx*. a, posterolateral spine of ilium; b, posteromedial process of ilium (undeveloped in *Lophortyx*). All approximately $\times \frac{3}{4}$. Drawings by Gretchen Lyon Burluson.

Narrow pelvis.—The forest-dwelling tinamou of Central America (*Crypturellus*) differs from the Argentine Martineta (*Eudroma elegans*) in having a narrower pelvis. The Martineta is a desert-dwelling bird living amid the sparsest of vegetation upon the arid pampas where, instead of flying, it runs away from danger, unless too hard pressed (Hudson, *Birds of La Plata*, 2, 1920:228). *Cyrtonyx* differs from *Lophortyx* and *Callipepla* in comparable fashion. *Cyrtonyx* has much the narrower pelvis and has the "forest-dwelling" habit or what corresponds to it. A correlation between habit and structure here is rather strongly indicated.

A more detailed examination of the pelvis in four American genera of quails proves quite interesting. In *Lophortyx* and *Callipepla* the ischium is prolonged backward far beyond the ilium, the posterior iliac border drops down almost squarely in the ventral direction, and its line of contact with the synsacrum is not projected backward quite so far as is the posterolateral spine (see fig. 28; a). In both *Cyrtonyx* and *Dactylortyx* the axial border of the ilium is extended markedly backward beyond the posterolateral spine almost as far as the end of the ischium and well beyond the end of the synsacrum. A well marked process is thus formed which is pointed in *Cyrtonyx* and truncated in *Dactylortyx* (fig. 28; b).

This backward extension of the ilium serves to enlarge the fossa in which a group of leg muscles find attachment. Much of this bulky muscle complex consists of the iliotibialis (= gluteals, in part) which, with others, passes into the patellar tendon and finally attaches to the crest of the tibia. This powerful muscle group serves to throw the bird into the air in its explosive rise from the ground.

Nature of the muscle.—In the freshly killed specimen there is a striking color pattern in the muscles of the leg. The great iliotibialis is a "white meat" muscle that is almost if not quite as translucent as the pectoralis of the breast and through it certain of the deeper lying muscles show their red color. In the fresh specimen it is extremely hard to differentiate with precision between the individual components of the leg muscle complex and after the tissues are hardened in preservative, the colors are lost. In general, however, it may be said that the gluteal group (iliotibialis) and the gastrocnemius with, perhaps, the tibialis anticus, are the palest muscles. The sartorius, adductors, and the muscles of the axial side of the thigh are colored, certain of the latter being of deepest red. The femorocaudal is colored at its origin and becomes paler and more translucent toward its insertion. The flesh of the thigh thus displays a most interesting and variegated color pattern in the freshly killed bird. Is not this effect due to a physiological correlation with the peculiar habits of the species?

My first skin of the Mearns Quail was prepared after acquaintance with a forest-dwelling tinamou had been established. The instant impression was, "How like the flesh of a tinamou." Several decades of familiarity with the Pacific Coast quails in the flesh left still an element of surprise when handling the fresh specimen of *Cyrtonyx*. The mass of breast muscle is almost gelatinous in consistency and translucent in appearance. As stated above, this is true to a degree in certain of the muscles of the posterior limb as well. What is the explanation of this condition? In his "Text Book of Histology," Dr. J. L. Bremer (1936:135) discusses the skeletal muscles of the rabbit, comparing the red muscle with the white. He states that the red muscle is slightly slower in action but has greater staying power. White muscle, on the other hand, gives a quick flash of power but becomes rapidly exhausted, after which it must recuperate during a rest period.

William H. Hudson (*op. cit.*, 2:222, 224-226) describes the flight of tinamous of the open pampas. The birds are flushed with difficulty; flight is violent and evidently quite exhausting, for they are unable to take wing after the second or third flushing. If given no time to recuperate, they are then easily captured by a well mounted horseman of the pampas. There is good reason to suspect that the visible resemblance, as well as the parallel behavior of the Mearns Quail and forest-dwelling tinamous are carried out still further in the physiological characters of the locomotor muscles and the circulation (the heart of the Mearns Quail seems small for a bird of its size). The quail exhausts its pectoral muscles by its explosive flight but recuperates during its period of concealment. The white muscles of the leg give it the quick energy for the vertical take off, launching it into the air for a good start; still they suffice to serve him without exhaustion in his short range traveling upon the ground. Sustained effort in digging or ordinary walking could probably be cared for by the slower acting red muscle tissue which does not become so quickly fatigued.

The question which comes naturally into the mind at this point concerns the original home of the Mearns Quail. Did it arise from its parent stock as a bird of the semi-arid hill country or did it find there an environment wherein characters evolved in another type of terrain proved to have a positive survival value? Is it so like the forest-dwelling tinamous because of a forest-dwelling heritage, now functional in the broken country of a more desert area? This latter alternative keeps coming to mind and was once expressed in conversation with my good colleague and friend, A. J. van Rossem. He at once stated that, except for color and pattern of plumage, the Mearns Quail and *Dactylortyx* of tropical America might properly be considered as congeneric. Osteological characters of the two birds, however, show differences of greater magnitude

than are commonly found between birds of the same genus. Still the resemblance is sufficiently strong to warrant setting *Cyrtonyx* and *Dactylortyx* quite apart from the more familiar quails of our North American fauna. The large Tree Quail (*Dendrortyx*) of Central America, while it displays an almost rail-like narrowing of the pelvis, has the same general characters of the innominate bone as are seen in *Lophortyx* and *Oreortyx*. Peters, in his "Check-list of Birds of the World" (vol. 2, 1934:57) places *Cyrtonyx* immediately adjacent to *Dactylortyx* in his sequential arrangement. Study of the pelvis of the four genera depicted in figure 28 seems to support his point of view.

Breeding season.—Whatever may be the center of origin of the Mearns Quail, it certainly has become adapted to the late summer rainy season of southern Arizona. The winter rains may be quite insufficient to produce a crop of annual grass of any importance, but the summer rains of July and August commonly clothe the broken country in lush greenery brightened with many flowers. Mearns Quail may postpone their nesting activity to take advantage of this late vitalizing of plant and insect populations and bring out broods of young at the end of the summer when food and water would be most favorable for their care. In the Pajarito Mountains west of Nogales, Arizona, broods of small young were being led about by their parents in September of 1931. Annual plants were knee high while insect life was abundant and varied. On December 18 of that same year birds were collected in the same locality which had juvenal feathers still present on the throat where replacement by adult types of plumage was in progress.

Voice.—Despite the many camp sites that have been occupied in Mearns Quail country during various times of the year, I have not made a satisfactory acquaintance with the bird's vocal expressions. Male Bob-white tell you about their ambitions at nesting time. Mountain Quail, California Quail, and Gambel Quail are abundantly vocal and are quite varied in the impulse that inspires expression. Camping in quail country is greatly enlivened by their contributions to the general sound effect. The Mearns Quail appears, however, to be much more nearly a silent bird. I have heard no sound that could be termed a song, mating call, or territorial proclamation such as other quails normally use on their breeding grounds. Not until captive birds were observed did I learn any note other than the startled chirping that is given as the bird flushes from underfoot. Swarth (Condor, 11, 1909:39-43) describes a whistling note "slowly descending the scale." Sounds are extremely hard to describe but I venture to add to Swarth's statement that this call consists of from five to seven notes that drop but slightly in pitch and increase in intensity after about the fourth note. This "descending scale" effect does not usually embrace as much as a whole tone of the standard musical scale. The call is suggestive of that given by a young turkey but the tone quality is less sharp and more of a liquid whistle. The squatting birds respond to it so readily that reassembly of the scattered flock seems the best interpretation of its function.

A second note mentioned by Swarth is the trill. This performance is almost exactly that which young barn-yard chicks give at times when being hovered and strongly resembles the note of certain grass crickets. It could properly be designated a "huddle call." A third note is a deep pitched *gur-r-r* resembling that of a hen warning her chicks. "Warning note" it seems to be.

A fourth note strongly resembles the last half of a turkey hen's *pit-uhrk* and appears in my note book as *e-uhrk*, with a rising inflection.

This last note may be modified into the querulous *que-e-r* suggestive of certain notes of *Otus asio*. Interpretation of notes four and five are not ventured upon yet.

Natural enemies.—In the Mearns Quail country which I have visited, there occur the typical enemies of ground-nesting birds such as snakes, skunks, foxes, road-runners, hawks, ravens and jays. The Gila monster does not venture so high into the mountains. Once a shrike was seen to attack an adult quail just as it came to earth after a short flight, but no damage apparently was done. Two mammals less often considered in American game protection are the collared peccary and the coati-mundi (*Nasua*). Both of these versatile feeders run in bands through the Pajarito Mountains, where most of these observations were made. Nests of Mearns Quail tucked away under the sotol bases or in bunch grass would be hard to conceal from the peccary or from the equally inquisitive nose of the coati. These two mammals might very properly be looked upon as control species of the Mearns Quail. Overgrazing by domestic animals probably is the greatest danger to the species. During my acquaintance with the Pajarito Mountains area, great damage was done in certain localities by the large numbers of wiry and sure-footed Mexican cattle that were crowded into certain parts of the range. The undergrowth was seriously depleted and much damage was done by subsequent erosion. Probably this factor alone was enough to tip the scales against the Masked Bob-white farther to the west.

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SUMMARY

Anatomical studies of the Mearns Quail are here correlated with field studies with the following deductions resulting:

1. Color pattern is of advantage to a species strongly addicted to the habit of complete immobility when alarmed.
2. The strong beak is employed in shelling and breaking up acorns.
3. The powerful claws serve to tear up sod in search of tubers and larvae.
4. Small heart and "white muscle" tissue indicate quick, powerful flight but rapid fatigue.
5. The parti-colored flesh of the pelvic appendages reflects the need for great power in taking wing combined with that for more sustained activity, as in the digging for food.
6. The large eye is suggestive of forest dwelling origin or of crepuscular habit.
7. Secondary resemblance to the forest dwelling tinamous is probably due to similarity of habit.
8. Characters of the pelvis indicate a closer relation to *Dactylortyx* than to the quails of North America proper.
9. The original area occupied by the species was probably tropical forest. Its present arid home is secondary.
10. No song or mating call has been identified among its vocal notes.
11. Natural enemies include the peccary and coati-mundi. Overgrazing is probably the agent of greatest importance in reducing the numbers of the Mearns Quail.

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