TWO FOSSIL BIRDS FROM THE LOWER MIocene
OF SOUTH DAKOTA

By Hildegarde Howard
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Editor
TWO FOSSIL BIRDS FROM THE LOWER MIocene
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By HILDEGARDE HOWARD

ABSTRACT: A new genus and species of raptor (Order Falconiformes) and a new species of quail (Order Galliformes) are described from the Sharp's Formation of Shannon County, South Dakota.

Since Macdonald's (1963) significant report on the Miocene vertebrates from the Wounded Knee area of Shannon County, South Dakota, he has continued field work in the region with parties from the Los Angeles County Museum of Natural History (LACM). Among the specimens collected in 1964 in the Sharp's Formation, are two fragments of bird bones, one representing the Order Falconiformes (diurnal raptors) the other the Galliformes (fowl-like birds). These are the first avian remains to be discovered in this formation, from which Macdonald (1963:151-153) records 61 mammals and 4 reptiles.

Macdonald places the Sharp's Formation and its fauna at the bottom of the Lower Miocene Arikaree group, and at an earlier stage in the Miocene than the avifauna recorded by Miller (1944) from Flint Hill, Bennett County, South Dakota.

ORDER FALCONIFORMES
Family Accipitridae
Subfamily Aegypiinae

The falconiform bone is a well-preserved distal end of tibiotarsus, which in size is comparable to this element of the Red-tailed Hawk, Buteo borealis. But the shorter, stouter, more horizontally-placed supratendinal bridge indicates not only generic, but subfamily distinction. Closest resemblance of the South Dakota fossil is to tibiotarsi of Neogyps errans Miller and Palaeoborus umbrosus (Cope), North American fossil members of the Old World Vulture subfamily (Aegypiinae), in which characters are more eagle-like than in living representatives of the group. The South Dakota tibiotarsus also displays aegypiine and eagle-like characters, but is sufficiently distinct from tibiotarsi of the previously described forms to warrant establishing a new genus.

In the description to follow, comparisons are made with tibiotarsi of Neogyps errans from the Pleistocene of Rancho La Brea, California, in the collections of the Los Angeles County Museum of Natural History, and with the description and illustrations of the tibiotarsus of Palaeoborus umbrosus

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from the Pliocene of New Mexico, as presented by Cope (1877:293-294, and pl. 68, fig. 18).

**Arikaronis**, new genus

*Type species: Arikaronis macdonaldi.*

*Diagnosis:* Tibiotarsus with supratendinal bridge short and broad, thickened and distinctly convex on distalmost edge; tendinal groove above bridge deeply cut and centrally placed, with internal attachment for oblique ligament on its sloping, internal face, well above bridge, and shaft external to groove smoothly rounded; lateral flare from shaft to condyles very gradual, and internal condyle with only slightly more lateral thrust than external; condyles nearly equal in anteroposterior depth, projecting at abrupt right angle from shaft anteriorly, and having well-defined parallel borders posteriorly, with only slight trend mediad above level of proximo-anterior border; anterior intercondylar fossa broad, evenly rounded, only slightly rugose, with no marked undercutting of median borders of condyles; distal contour broad and shallow; internal ligamental prominence a well-rounded distinct papilla, approximately centrally located with respect to anteroposterior and proximodistal borders of internal condyle.

**Arikaronis macdonaldi**, new species

*Figure 1, A-D*

*Type:* Distal end of left tibiotarsus, LACM no. 9357, collected by J. R. Macdonald field party, June 19, 1964.

*Locality and horizon:* LACM loc. no. 1821 (equivalent of South Dakota School of Mines loc. no. 5359 as recorded by Macdonald, 1963), gully on south side of Sharp's Cutoff Road, SW¼ of Sect. 9, T. 39 N., R. 43 W., Sharp's Corner Quadrangle, Shannon County, South Dakota (Pine Ridge Reservation). Middle Sharp's Formation, Arikaree group, lowermost Miocene.

*Figure 1. A-D, Arikaronis macdonaldi n. gen., n. sp., type tibiotarsus, anterior, external, internal and posterior views; E. Miortyx aldeni, n. sp., type humerus, anconal view. All figs. x 1.*
Diagnosis: See generic diagnosis.

Comparisons of type tibiotarsus: Similar to this element in Recent genera of Aegypiinae in short, broad suprattendinal bridge, less vertical in position than in Aquila or Buteo, and tendinal groove centrally placed on shaft above bridge, with attachment of oblique ligament on slope of internal face of groove, and anterior face of shaft external to groove well rounded; the short, broad, less vertically placed suprattendinal bridge is also characteristic of the tibiotarsus of Palaeoborus and Neogyps, and the tendinal groove is centrally placed in Palaeoborus (slightly more lateral in Neogyps). Distinguished from Recent Aegypiinae, and similar to Palaeoborus umbrosus and Neogyps errans in relatively broad shaft and relatively short anteroposterior depth of condyles (shorter, even, than in Palaeoborus). Distinguished from both P. umbrosus and N. errans in more nearly equal depth of internal and external condyles, and more gradual lateral flare from shaft to condyles; further distinguished from Palaeoborus in more central position of internal ligamental prominence with respect to borders of internal condyle, and more parallel posterior borders of external and internal condyles; Cope (1877:293-294) described the contours of the internal condyle of Palaeoborus umbrosus as "not parallel to the exterior, but diverging backward and inward;" Neogyps is closer to Arikarornis in posterior contours of the condyles, but the postero-internal contour in the Pleistocene form slopes much more abruptly mediad at the level of the proximo-anterior border.

Measurements: See Table 1.

Remarks: The North American record of the Aegypiinae comprises the following eight species (the tibiotarsus is known only in those species marked with an asterisk):

Neophrontops vetustus Wetmore, Middle Miocene, Nebraska
Neophrontops dakotensis Compton, Lower and Middle Pliocene, South Dakota and Oregon
Neophrontops vallecitoensis Howard, Middle Pleistocene, California
*N. americanus L. Miller, Upper Pleistocene, California and Mexico
Palaeoborus rosatus A. Miller and Compton, Lower Miocene, South Dakota
Palaeoborus howardae Wetmore, Middle Miocene, Nebraska
*N. umbrosus (Cope), Lower Pliocene, New Mexico
*N. errans L. Miller, Upper Pleistocene, California, Nevada, and Mexico

The skeleton of Neophrontops is markedly like that of the Recent Old World Vulture, Neophron (see Howard, 1932) and the tibiotarsus is distinctly different from that of Arikarornis. In its small size, however, A. macdonald
TABLE 1
Measurements and Proportions of Tibiotarsus of
Arikarornis macdonaldi, Palaeoborus umbrosus and Neogyps errans
(Measurements in millimeters, ratios in per cent)

<table>
<thead>
<tr>
<th></th>
<th>Arikarornis</th>
<th>Palaeoborus</th>
<th>Neogyps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breadth of distal end</td>
<td>13.2</td>
<td>16.0</td>
<td>18.0</td>
</tr>
<tr>
<td>Depth of external condyle</td>
<td>9.2</td>
<td>12.0</td>
<td>11.8</td>
</tr>
<tr>
<td>Depth of internal condyle</td>
<td>9.3</td>
<td>13.0</td>
<td>12.8</td>
</tr>
<tr>
<td>Ratio of depth of external condyle to breadth of distal end</td>
<td>69.6</td>
<td>75.0</td>
<td>61.5</td>
</tr>
<tr>
<td>Ratio of depth of internal condyle to breadth of distal end</td>
<td>70.6</td>
<td>81.3</td>
<td>68.0</td>
</tr>
<tr>
<td>Ratio of depth of external to depth of internal condyle</td>
<td>99.1</td>
<td>92.4</td>
<td>90.0</td>
</tr>
</tbody>
</table>

is closer to all species of Neophrontops than to any of the other fossil aegyp- piines.

The comparisons given above show Arikarornis to have similarities with Neogyps and Palaeoborus, but to be distinct from N. errans, the monotypic species of Neogyps, and from P. umbrosus, the genotype of Palaeoborus. The tibiotarsus is not known for P. howardae or P. rosatus, but the tarsometatarsus and ulna (respectively) on which these species are based are close in size to these elements of Neogyps errans, and therefore indicate that both species were larger even than Palaeoborus umbrosus, hence considerably larger than Arikarornis macdonaldi.

The extinct Palaeohierax from the early Miocene of France (based on the tarsometatarsus) is said by Milne-Edwards (1871, 2:456-457) to combine characters of Gypohierax and the eagles (“Aquilides”). The genus is now listed under the Aegypiinae (Brodkorb, 1964:275). Lacking comparable skeletal elements of Palaeohierax and Arikarornis, it is impossible to draw any conclusions as to the relationship of these two aberrant forms, other than to state that the tarsal breadth in the single species of Palaeohierax (P. gervaisii) indicates a much larger form than A. macdonaldi. In the present state of knowledge, science is better served by maintaining generic as well as specific identity of these birds.

The generic name, Arikarornis refers to the Arikaree group of the Lower Miocene, in which the Sharp’s fauna occurs. The species is named in honor of
J. R. Macdonald whose studies have so significantly furthered the knowledge of the Miocene of South Dakota.

ORDER GALLIFORMES  
Family Phasianidae  
Subfamily Odontophorinae

The galliform bone is a fragment of left humerus characterized by very deep undercutting of the head. In living galliforms this is an outstanding feature of the American quails (excepting Dendrocygna and Odontophorus according to Holman, 1961:208). In the living quails, however, the head terminates squarely and abruptly at the capital groove. The fossil at hand has a rounded contour of the head as described for Miortyx teres Miller (1944:93), and it is, therefore, assigned to the genus Miortyx. The genotypic Miortyx teres is based on a proximal end of humerus found in the Flint Hill quarry, Bennett County, South Dakota, of Miocene age, but younger than the Sharp’s Formation. This specimen was lent by the University of California Museum of Paleontology for this study.

That the Sharp’s Formation specimen cannot be allocated to Miortyx teres is obviously attested by its markedly larger size, as well as certain qualitative features. A distinct species is therefore established in honor of Dr. Alden H. Miller, describer of the genus, whose untimely death, in 1965, has deprived paleornithology of one of its ablest contributors.

In the original description, the characters of the genus Miortyx were not separated from those of the type species. This second species makes possible the designation of characteristics at the generic level.

Miortyx, A. H. Miller

Diagnosis (proximal end of humerus): Anconal side of shaft below head broadly depressed, and head deeply undercut as in Oreortyx; descending, lip-like anconal border of head above median crest shorter and broader than in Oreortyx, and head less abruptly terminated internally above capital groove, with anteroposterior depression (which in Oreortyx faces directly internally) facing proximo-internally on the gradually rounded internal contour of the head; capital groove well defined, with borders nearly parallel, terminating anconally at median crest in distinct open lip; pneumatic fossa long and oval, and anconally less markedly obscured by overhang of internal tuberosity than in Oreortyx; ligamental furrow on palmar surface deeply grooved.

Miortyx aldeni, new species

Figure 1, E

Type: Proximal fragment of left humerus lacking external and internal tuberosities and deltoid crest: LACM no. 9388, collected by H. Garbani of J. R. Macdonald field party, June 23, 1964.
Locality and horizon: LACM loc. no. 1982 (equivalent of South Dakota School of Mines loc. 5360 as recorded by Macdonald, 1963), gully beside Sharp's Cutoff Road, N. ½ of Sect. 17, T. 39 N., R. 43 W., Sharp's Corner Quadrangle, Shannon County, South Dakota (Pine Ridge Reservation). Middle of Sharp's Formation, Arikaree group, lowermost Miocene.

Diagnosis: Humerus approximately 50 per cent larger than that of Miortyx teres and differing also in the following qualitative characters: prominent descending median border of head more anconally projected, with undercutting of head deepened in this area; shaft below head, anconally, more broadly and evenly depressed; external bordering ridge of depression extending at least to level of distal terminus of pneumatic fossa (bone broken beyond this point).

Measurements: See Table 2.

Remarks: According to Brodkorb's (1964:309-311) recent analysis of previously described fossil Galliformes, seven extinct species of Odontophorinae are recognized, as follows:

* Nanortyx inexpectatus* Weigel, Lower Oligocene, Saskatchewan
* Miortyx teres* Miller, Lower Miocene, South Dakota
* Cyrtonyx cooki* Wetmore, Middle Miocene, Nebraska
* Lophortyx shotwelli* Brodkorb, Middle Pliocene, Oregon
* Colinus hibbardi* Wetmore, Upper Pliocene, Kansas
* Colinus suillum Brodkorb*, Middle Pleistocene, Florida
* Neortyx peninsularis* Holman, Middle Pleistocene, Florida

**TABLE 2**

Measurements (in millimeters) of Humerus of *Miortyx aldeni* and *Miortyx teres*

<table>
<thead>
<tr>
<th></th>
<th><em>M. aldeni</em></th>
<th><em>M. teres</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Breadth across proximal end</td>
<td>19.1</td>
<td>12.6</td>
</tr>
<tr>
<td>of bicipital crest to probable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>border of external tuberosity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(tuberosity broken in <em>M. aldeni</em>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breadth of depressed area of</td>
<td>10.0</td>
<td>5.4</td>
</tr>
<tr>
<td>shaft from median crest at</td>
<td></td>
<td></td>
</tr>
<tr>
<td>terminus of capital groove, to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ridge bordering external edge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>of depression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth of head external to</td>
<td>7.6</td>
<td>4.8</td>
</tr>
<tr>
<td>descending median border</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height of head from tip of</td>
<td>9.1</td>
<td>6.3</td>
</tr>
<tr>
<td>median border to proximal end</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comparison of the elements represented in each species with comparable elements in the skeleton of Recent *Oreortyx picta* indicates that *Miortyx aldeni* was outstandingly the largest of the fossil quails, with the nearest approach in size being *Miortyx teres*. Besides the two species of *Miortyx*, only one other quail is recognized from the Miocene. The Barstow, California Miocene spe-
cies described as *Cyrtonyx tedfordi* L. Miller, is now reallocated to the Cracidae under the generic name *Boreortalis* (Brodkorb, 1964:305); this species, also, is much smaller than *M. aldeni*.

European Tertiary galliforms, originally described under the genus *Palaeortyx*, in which the head of the humerus is deeply undercut as in American quails, differ from *Miortyx* in deeper, more acute, and more obliquely placed depression of the shaft anconally, and longer, narrower descending median border of the head. As presently listed by Brodkorb (1964:298-301) the several species involved appear under the genera *Palaeortyx*, *Ludortyx*, *Pirortyx* and *Taoperdix*, and are allocated to the primitive subfamily Gallinuloidinae of the family Cracidae. According to recent personal correspondence with Brodkorb, these European galliforms are badly in need of revision, but present interpretation is based on the primitive condition of the carpometacarpus which lacks the intermetacarpal tuberosity. The carpometacarpus is not known for either species of *Miortyx*.

**Summary and Conclusions**

The first avian representation from the Lower Miocene Sharp's Formation of South Dakota is recorded, and two species are described: a raptor, *Arikarornis macdonaldii*, and a quail, *Miortyx aldeni*. Both are in ecologic agreement with the general terrestrial aspect of the mammal and reptile fauna recorded by Macdonald (1963:151), but contribute no independent information in this regard. Miller (1944:97), describing *Miortyx teres*, the genotype of the quail, notes that it "is not closely enough linked with any one of the modern types to offer a clue to its habitat." The same can also be said of the raptor, *Arikarornis*.

The scant avian representation in the Sharp's fauna makes impossible any critical comparison with other Miocene avifaunas. It is significant, however, to find generic relationship between the quail, *Miortyx aldeni* and *Miortyx teres* of the slightly later Flint Hill Miocene fauna of Bennett County, South Dakota (about 34 miles ESE of Sharp's Corner). There is also a possibility of generic relationship between *Arikarornis macdonaldii* and the Flint Hill aegypiine, *Palaeoborus rosatus*. Miller and Compton (1939:156) in describing the latter species, stated that the generic assignment was "by no means certain." Direct comparison of the type element (ulna) could not be made with previously described species of *Palaeoborus*, but parallel similarities with Pleistocene *Neoypsis* were noted. Resemblance to *Neoypsis* is noted as well for *Arikarornis* (as described above). No parallel can be drawn between the quail, and the raptor with regard to size trend from earliest Miocene, Sharp's fauna, to that of the somewhat later Miocene, Flint Hill fauna. The quail, *Miortyx aldeni*, is markedly larger than *M. teres* (in fact the largest of the American quails), whereas *Arikarornis macdonaldii* is one of the smallest of the fossil Aegypiinae, and probably less than half the size of *Palaeoborus rosatus*.
ACKNOWLEDGMENTS

I am indebted to Dr. J. R. Macdonald, Senior Curator of Vertebrate Paleontology, Los Angeles County Museum of Natural History, for the opportunity to study the avian material from the Sharp's fauna; and to Dr. D. E. Savage, of the University of California Museum of Paleontology, for the loan of the type specimen of *Miortyx teres*. The photographs were made by Mike Hatchimonji, staff photographer of the Los Angeles County Museum of Natural History.

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