AN AVIFAUNA FROM THE LOWER MIOCENE OF SOUTH DAKOTA

BY

ALDEN H. MILLER

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The tibiotarsus in general resembles that of grouse as much as that of quail. *Ortalis* differs in the transverse proximal outline of the tendinal bridge.

Family **Strigidae**

Strix dakota, new species

Type.—Distal three-fourths of right tarsometatarsus, perfectly preserved; no. 37368; fig. 8.

Diagnosis.—Small, compared to *Strix occidentalis*, the tarsometatarsus little more than half as long, but relatively broad; least width of shaft 14 per cent of total length (reconstructed), 10–11 per cent in *S. occidentalis*. Posteriorly directed process of end of metatarsal II much smaller. Ratio of greatest width of trochlea IV to trochlea II, 125 per cent; 111, in *Strix occidentalis*; 112, in *Strix varia*. Otherwise configuration of distal end of tarsometatarsus remarkably similar to that of modern members of the genus.

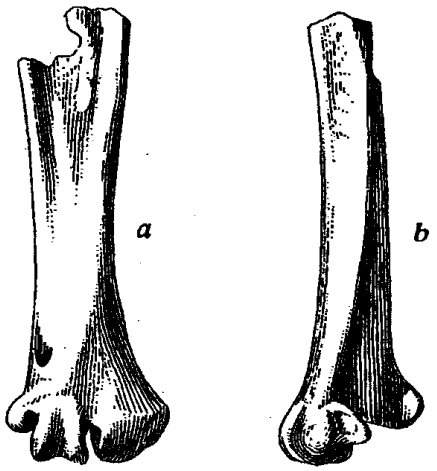

Fig. 8. *Strix dakota*. Right tarsometatarsus. *a*, anterior view; *b*, medial view. Type, no. 37368. × 2.

Measurements.—Length from distal end of scar for M. tibialis anticus to distal end of metatarsus, 18.6 mm.; total length estimated from reconstruction and from other proportions, 30; least width of shaft, 4.1; width across trochleae, 8.3; width (anteroposteriorly) of inner trochlea, 4.3; width (anteroposteriorly) of outer trochlea, 5.4.

The shape of the tarsometatarsus in the Strigidae is remarkably uniform. Most of the differences relate to the degree of shortening of the metatarsus and to the placement of points of insertion for muscles. Because of the large range of modification of these qualitative features within some of the genera, the definition of genera is difficult and the relationships of a fossil such as *Strix dakota* are not easily determined. After extended study of all the types of North American owls and some Neotropical types, the affinity of *dakota* appears to narrow down to *Strix*. The fossil does not possess characters which would permit definition of a separate genus, even though the modern members of *Strix* are all larger. *Dakota* was a bird the size of *Otus asio* (wing about 18 cm.) and of *Cryptoglaux funerea*. The smallest *Strix* living today appears to be *woodfordii* of Africa with a wing of about 23 cm. Although *dakota* was the size of a screech owl, its feet were not as slight; neither were they as robust as in *Cryptoglaux funerea*.

Some of the more important characters found to distinguish the tarsometatarsus of other American owls from *Strix* are, briefly, as follows: *Glaucidium*, *Surnia*, and

Cryptoglaux, outer rim of trochlea for digit III as long or longer than inner rim, and than trochlea II, instead of being shorter; *Bubo*, *Nyctea*, *Rhinoptynx*, and *Speotyto*, outer rim of trochlea III rounded in profile on plantar aspect rather than straight (see Howard, 1933, pp. 66–67); *Scotiaptex*, scar for M. tibialis anticus not set deep in anterior tendinal groove; *Micropallas*, distal outline of trochlea IV, viewed from side, distinctly concave rather than straight; *Otus* and *Pulsatrix*, articular surface of trochlea III more extensive proximodistally on anterior surface, the extent measured at about 30° to shaft being 50 per cent of width across the trochleae rather than 44 per cent, and (in *Otus*) groove medial to scar of M. tibialis anticus shallower; *Asio*, metatarsal II less abruptly deflected from shaft, rims of trochlea III parallel rather than converging on plantar surface, and articular surfaces of same trochlea more extensive proximally on anterior surface as in *Otus; Ciccaba*, rims of trochlea III sharper and higher, especially anteriorly, and posterior process of metatarsal II set closer to end of bone, but otherwise closely similar to *Strix*.

Among fossil owls of the Old World, few are as short legged and robust as *Strix dakota*. The tarsometatarsus of *Necrobyas harpax* was longer and slimmer and that of *Asio henrici* was somewhat longer (Milne-Edwards, 1892, pp. 62–63). *Necrobyas rossignoli* was not significantly larger than *Strix dakota*, but *Necrobyas*, as a genus, seems to differ in the essential absence of a posteriorly directed process on the end of metatarsal II (Gailliard, 1908, pl. 1, fig. 8).

The fossil record of owls in the New World shows a great hiatus between the Pleistocene and the Eocene. The Protostrigidae of the Eocene were primitive owls represented by four species which are known best from characters of the distal end of the tibiotarsus. Wetmore (1938, p. 27), however, in describing *Protostrix mimica*, referred a tarsometatarsus to this species. There is little doubt that it represents the Protostrigidae. A relatively small, short inner trochlea (not just the posterior process of this trochlea) and a thick, broad lateral trochlea and smooth merging of the middle trochlea with the anterior surface of the shaft are features of this bone pointed out by Wetmore which set off these Eocene owls from the Strigidae. None of these characters, which appear to me to be primitive, is suggested even faintly in *Strix dakota*. Thus, by the Lower Miocene at the latest, the strigids had evolved a foot as thoroughly specialized as that of the living owls. Indeed, *Necrobyas* of the Eocene of southern France (see Gailliard, 1908, pp. 30–33, fig. 2) seems to have been essentially of modern type and unlike *Protostrix mimica*, and two species of *Bubo* (see Lambrecht, 1933, p. 616) of the Upper Oligocene of the same country apparently are properly assigned to this Recent genus. *Strix dakota* is the only known representative of the order Strigiformes in the North American Tertiary following the Eocene.

ENVIRONMENTAL CONDITIONS

Few of the fossil birds from Flint Hill are extensively enough represented by skeletal elements to permit their precise allocation as to adaptive type. Also, remoteness in time and departure in structural characteristics from their living relatives makes it doubtful that they required an environment exactly like that of their counterparts of the Recent. We cannot properly assume similarity of habitat selection in Recent and Miocene equivalents as we do between Recent species and structurally identical birds of the Pleistocene (see Miller, 1937, 1940). However, one generalization seems increasingly justified as more mid-Tertiary fossil birds come to light, namely, that