

## A NEW ANSERIFORM GENUS AND SPECIES FROM THE NEBRASKA PLIOCENE

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AMONG avian fossils on loan to me from the University of Nebraska State Museum is the tarsometatarsus of a goose-like anseriform bird from the early Pliocene of Nebraska. The tarsometatarsus has some features of geese and swans, and of the anatine tribe Tadornini, but it also tends somewhat toward the Cairinini in some of its features. Comparison with extant and fossil Anseriformes in the American Museum of Natural History and the United States National Museum and a study of the literature have convinced me that this tarsometatarsus represents an undescribed species that is sufficiently distinct to warrant placement in a new genus.

I thank the authorities of the above-mentioned museum for their help in conducting my studies. I am grateful to Charles G. Sibley, who originally borrowed the fossil, for permission to study it. It is a pleasure to acknowledge the aid of C. B. Schultz for the loan of the material, and H. B. Gunderson of the University of Nebraska State Museum for useful information concerning the fossil.

The use and potential importance of stereophotography in avian paleontology has been discussed by Cracraft (1968: 3-4). I hope the stereophotographs reproduced here will facilitate comparisons by avian paleontologists.

### *Heterochen*, new genus

*Type of genus.*—*Heterochen pratensis*, new species.

*Diagnosis.*—Anseriform tarsometatarsus, near the size of *Anser anser*, and characterized by: trochleae not spread greatly as in modern swans, geese and sheldrakes; outer surface gently curving toward distal end (trochlea 4); trochlea 2 rather small and oval in shape in lateral view, more anterior in position than in modern geese and swans; shaft moderately robust with strong anterior and posterior lateral ridges; external ligamental prominence pronounced, causing shaft proximal to it to be concave from the anterior view; external ligamental prominence located far distally (slightly distal to distal internal end of hypotarsus); hypotarsus short, terminating distally perpendicular to shaft (square-cornered outline in inner profile); proximal foramen nearly at same level posteriorly as the opening of the inner tendinal canal; lateral shaft ridge passing to internal side of shaft distal to hypotarsus, rather than connecting with hypotarsus; hypotarsus narrow, outer tendinal groove very faintly marked and not bordered externally by a ridge, but dropping directly anteriorly to form



Figure 1. *Heterochen pratensis*, type left tarsometatarsus. Stereophotographs showing anterior view (set comprised of top, and third from top figures) and posterior view (set comprised of bottom, and third from bottom figures). Approximately natural size.

the external surface of the shaft; and, shaft flat and dropping steeply from internal tendinal canal to external ligamental prominence.

***Heterochen pratensis*, new species**

(Figures 1, 2)

*Holotype*.—Nearly complete left tarsometatarsus (lacking the posterior part of the hypotarsus and moderately abraded around the edges of the trochleae and cotylae), University of Nebraska State Museum no. 5781. Age early Pliocene (Devil's Gulch Local Fauna, Valentine Formation, Ogallala Group). From Devil's Gulch, 11 miles north and 2 miles east of Ainsworth, Brown County, Nebraska, SW  $\frac{1}{4}$ , sec. 29, NW  $\frac{1}{4}$ , sec. 32, T. 32N., R. 21W. Collected by A. L. Lugen and E. H. Colbert on 26 June 1928.

*Diagnosis*.—As for the genus, and also: shaft flat anteriorly, not concave except moderately in the immediate vicinity of the proximal foramina; internal shaft foramen between hypotarsus and internal cotyla located relatively near distal opening on internal tendinal groove of hypotarsus,

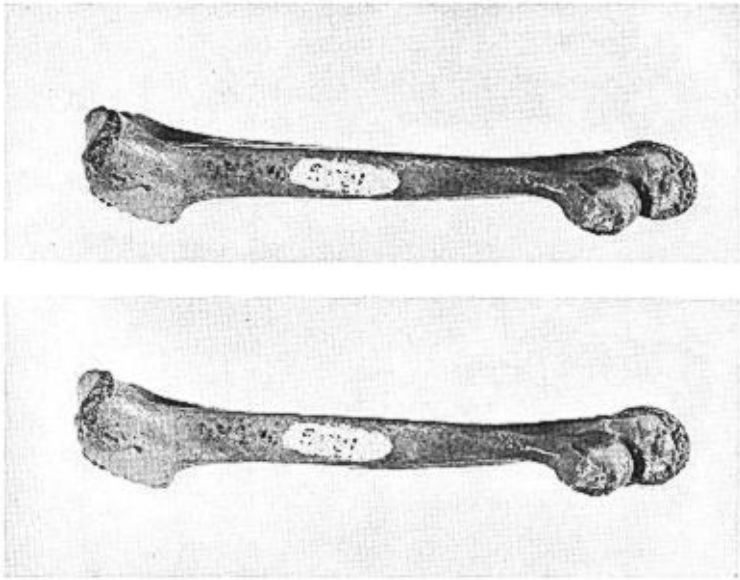


Figure 2. *Heterochen pratensis*, type left tarsometatarsus. Stereophotographs showing internal view. Approximately natural size.

and on a raised area of the shaft, not in a depression or concavity; shaft about as broad as deep, and curving posteriorly in center (from external view); external shaft somewhat flattened, marked by very distinct anterior ridge and posterior ridge; distal foramen on anterior surface sharply angled distally, and marked laterally by distinct ridges, one going internally to the base of trochlea 3 and the other connecting externally with the lateral shaft ridge; and, a large raised area separates the moderately sized intercotylar depression from the external cotyla.

*Etymology*.—Generic name from Greek *hetero*, mixed, and *chen*, feminine, a goose. Specific name from Latin *pratium*, a field, in reference to the open plains of northern Nebraska whence came the fossil.

*Measurements*.—Length, 83.2 mm (abraded at both ends; measurement is perhaps 2 mm less than it should be); breadth across trochleae, 16.4 mm; shaft breadth in center, 7.1 mm; shaft depth in center, 7.2 mm; shaft breadth across external ligamental prominence, 11.0 mm; and distance from distal end of hypotarsus to plane across proximal end of bone at level of ridge between intercotylar depression and external cotyla, 13.4 mm.

*Associated fauna*.—A list of the vertebrate fauna of the Devil's Gulch deposits was presented by Barbour (1913: 89–90).

*Comparison.*—The fossil tarsometatarsus is distinguishable from those of all modern swans, geese, sheldrakes, perching ducks, and larger anatine ducks I have examined, which includes species of all genera listed by Delacour (1954, 1956, 1959) except *Cyanochen*, and from all fossil species of these birds that are represented by tarsometatarsi by: its sharply angled, short hypotarsus; its pronounced, distal external ligamental prominence; and its weakly spread trochleae with a small, rather anteriorly placed trochlea 2. All modern geese and swans except *Cygnus melancoriphus* and *Coscoroba coscoroba* have more widely spread trochleae than does the fossil tarsometatarsus. *Cygnus melancoriphus* differs from *Heterochen pratensis* in other ways, such as: its much larger, more posterior trochlea 2; its more proximal external ligamental prominence; and its more expanded proximal end. Most geese and swans also have a pronounced ridge outside the fourth tendinal groove of the hypotarsus. This ridge is weakest in specimens of *Anser anser*, which, however, differs from the fossil in the other features noted above. The flatness of the anterior shaft distal to the proximal foramina is also noteworthy in the fossil, as geese and swans typically have a long shaft depression in which the two tubercles for the tibialis anticus are located. *Coscoroba coscoroba* has tarsometatarsi somewhat resembling the fossil, especially in its weakly spread trochleae. Its tarsometatarsi differ from the fossil in several ways, among them in: 1) their posteriorly directed trochlea 2, which is broad, not oval; 2) their longer (although truncate) hypotarsus extending distally well beyond the ends of the tendinal canals instead of terminating at these ends; 3) their having a well-defined ridge outside the fourth tendinal groove; 4) their less pronounced external ligamental prominence; and, 5) their lateral shaft ridge connects directly with the hypotarsus instead of passing internally distal to it.

The sheldrakes (Tadornini) resemble geese in their widely spread trochleae (Woolfenden, 1961: 82), thus differing from the fossil tarsometatarsus. Among the sheldrakes, the fossil otherwise shows similarities with *Alopochen* and *Neochen*. The tarsometatarsi of the latter have rather truncate hypotarsi like the fossil; their external ligamental prominence also is pronounced and rather distally located, although not at or beyond the level of the internal tendinal canal as it is in the fossil. Like other sheldrakes (an exception is the very different and questionably placed *Tachyeres*), *Alopochen* and *Neochen* have tarsometatarsi that are long and narrow with broadly spread trochleae. The fossil tarsometatarsus is more robust with a less strongly curved external shaft approaching trochlea 4, and less spread trochleae.

The perching ducks (Cairinini) show an approach to the fossil tarsometata-

tarsus in their truncate hypotarsus, rather distally placed external ligamental prominence, somewhat robust shaft, and less spread trochleae. Indeed the fossil is quite similar to *Plectropterus*, *Chenonetta*, and *Sarkidiornis*, but the tarsometatarsus of *Heterochen pratensis* differs from those of cairinine species in its more anteriorly and externally placed trochlea 2, its more shallow and shorter anterior shaft depression, and the raised (convex) surface of the region between the distal end of its hypotarsus and the internal cotyla. Although the relationships of *Heterochen pratensis* may be with the perching ducks, other of its skeletal elements are necessary before this can be demonstrated or disproved.

Among anseriform fossil species represented by tarsometatarsi (Howard, 1964a; Brodkorb, 1964), none closely resemble *Heterochen pratensis*, and the latter does not seem related to any fossil species not represented by tarsometatarsi. Fossil species of *Cygnus* (*paloregonus*, *falconeri*, *lacustris*, *equitum*) are too large in size for the fossil tarsometatarsus under consideration. The tarsometatarsal hypotarsus of *C. paloregonus* (see Howard, 1946) is not "square" in outline and the external ligamental prominence is situated too proximally. Of fossil species of *Anser* only the Miocene *A. cygniformis* is represented by a tarsometatarsus, which is much too large for that of *Heterochen pratensis*. Among fossil species of *Branta*, *B. dickeyi* was a swan-sized goose represented by a fragmentary proximal tarsometatarsus (Miller, 1944). The tarsometatarsus of *B. hypsibata* is much more slender than that of *Heterochen pratensis*, and its tarsometatarsus is like that of *Anser hyperborea* according to Howard (1946: 169). The tarsometatarsus of *B. propinqua* is very small and slender and lacks the square-outlined hypotarsus of *Heterochen pratensis*. Anserine fossil species of the genera *Eremochen*, *Presbychen*, *Cygnavus*, *Cygnanser*, and *Cygnopterus* are not represented by tarsometatarsi. Of these species only *Eremochen russelli* of the Oregon Pliocene was possibly small enough (although probably larger; "slightly smaller than living *Branta canadensis canadensis*" according to Brodkorb, 1961: 176) to match *Heterochen pratensis* in size. No basis exists for assigning the fossil tarsometatarsus to *Eremochen russelli* because of the apparent relationship of the latter to extant genera of the Anserini. Brodkorb (1964) places *Eremochen russelli* between *Branta* and *Anser*, while *Heterochen* shows no close resemblance to these genera.

Fossil species of the Tadornini (Howard, 1964a) are too specialized (*Cnemiornis calcitrans*, a flightless subrecent bird from New Zealand), too small (*Neochen debilis*, *Anabernicula* species, *Euryanas finschi*), or too large (*Geochen rhuax*, *Neochen pugil*, *Centronis majori*) for the fossil tarsometatarsus under consideration. The latter differs from the tarsometatarsus

tarsi of *Anabernicula gracilentia* and *A. oregonensis* (Howard, 1964b) in the following ways: 1) external ligamental prominence much more distal; 2) distal end of hypotarsus more sharply angled (right-angled), and less tapering; 3) intercotylar depression larger; 4) shaft more robust; 5) outer proximal foramen on posterior side is more distally situated; and, 6) the anterior proximal shaft depression is very different in shape and the proximal foramina within it are not in the same plane for the external foramina are more distally located.

The many fossil ducks of the Anatini, Aythyini, and Mergini are generally smaller than the fossil, and their tarsometatarsi differ from it in the ways duck tarsometatarsi differ from those of geese and swans (see Woolfenden, 1961). One large fossil placed by Brodkorb (1964) in its own subfamily is the early Miocene *Paranyroca magna* (Miller and Crompton, 1939). This swan-sized diving bird had distinctive tarsometatarsi with but two well-developed hypotarsal ridges. That of *Heterochen pratensis* has four ridges, and its hypotarsus is angled, not rounded as in *Paranyroca*. The latter also has trochlea 2 compressed outwardly toward trochlea 3 and not flaring medially as in *Heterochen*. *Chendytes* includes two species of large, scoter-like ducks that seem to have been flightless. The tarsometatarsus of *Chendytes lawi* (Miller, 1925), the smaller of the two species, is proportionally shorter and heavier than that of *Heterochen*. Its proximal end does not taper strongly inwardly like that of *Heterochen* and the geese and swans. *Heterochen* has more flaring trochleae, and differs in other details.

Thus I am unable to assign the fossil tarsometatarsus to any recent or sufficiently known fossil anseriform species. Its features merit generic distinction because it cannot be assigned directly to known genera. Indeed, its affiliation with the supposed tribes and subfamilies ("Anserinae," "Anatinae") is uncertain, although its relationships may lie with the Cairinini (especially with *Sarkidiornis*, *Plectropterus*, and *Chenonetta*).

#### SUMMARY

*Heterochen pratensis*, a new anseriform genus and species, is described from the early Pliocene of Brown County, Nebraska. Features of the type tarsometatarsus, including its angled hypotarsal outline, anteriorly placed trochlea 2, and distally situated external ligamental prominence, merit erecting a new genus for this species. The single element (tarsometatarsus) available does not permit elucidation of the tribal affinities of *Heterochen pratensis*, although this species may prove to be related to the perching ducks (Cairinini). Its resemblances with geese and swans (Anserinae) and sheldrakes (Tadornini) preclude assignment to the Cairinini at this time.

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