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## A New Genus and Species of Gooselike Swan from the Pliocene of Nebraska

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Included in avian fossil material from the University of Nebraska State Museum presently under study is a partial coracoid from late Pliocene deposits in Frontier County, Nebraska. Comparison of this fossil with extant and fossil species demonstrates that it represents a new anserine species close to the swans, but with certain gooselike features. This fossil is described herein and compared with various modern and fossil species.

The fossil was obtained by a field party from the University of Nebraska State Museum, led by Drs. C. Bertrand Schultz, Loren Toohey, and W. Frankforter, in the summer of 1948. I thank Dr. C. Bertrand Schultz of that museum for his assistance and for the loan of the fossil material. Dr. H. L. Gunderson of the same museum also provided helpful information. I am grateful to the authorities of the United States National Museum of the Smithsonian Institution and the American Museum of Natural History, where the study was conducted. The fossil was originally borrowed from the University of Nebraska State Museum by Dr. Charles G. Sibley, to whom I am grateful for turning the material over to me.

Available for comparison were specimens representing all extant genera of medium-sized and large-sized anseriform birds, and virtually all species of these genera. More than one specimen was available for each

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species. I also utilized anseriform fossil coracoids in the United States National Museum, Smithsonian Institution, and the American Museum of Natural History.

Osteological terminology used in this report follows that of Howard (1929). Woolfenden's (1961) review of the postcranial skeleton of waterfowl was a useful starting point for comparisons.

#### PARACYGNUS, NEW GENUS

GENOTYPE: *Paracygnus plattensis*, new species.

GENERIC DIAGNOSIS: A swan-sized waterfowl resembling both swans and geese; coracoid with pneumatic foramina underlying entire length of furcular facet; brachial tuberosity strongly projected posteriorly; head long, narrow, and rounded, extending ventrally only slightly; triosseal canal forming a moderately deep depression between procoracoid and brachial tuberosity; strong ridge between glenoid facet and brachial tuberosity undercut by depression of triosseal canal; and scapular facet small, circular, and deep.

#### *Paracygnus plattensis*, new species

##### Figure 1

TYPE: University of Nebraska State Museum No. 5778, partial left coracoid lacking the sternal facet and posterior one-fifth of the bone.

HORIZON AND LOCALITY: Sidney Member, Kimball Formation, Ogallala Group, late Pliocene; E.  $\frac{1}{2}$ , E.  $\frac{1}{2}$ , SW.  $\frac{1}{4}$ , SE.  $\frac{1}{4}$ , sect. 15, T. 5 N., R. 26 W., 9 miles south and 6 $\frac{1}{2}$  miles east of Stockville, Frontier County, Nebraska.

SPECIFIC DIAGNOSIS: Same as for genus; also, coracoidal fenestra strongly developed; procoracoid straight, not sharply pointed, and deep from its anterior end to coracoidal fenestra; and shaft relatively rounded (little angled) throughout.

MEASUREMENTS: Distance from procoracoid to plane across anterior end of head, 32.4 mm.; depth of head from anterior end of glenoid facet to ventral surface just proximal to end of furcular facet, 20.5 mm.; procoracoid to end of brachial tuberosity, 18.2 mm.; internal-external width of shaft at coracoidal fenestra, 12.9 mm.; dorsoventral depth of shaft at coracoidal fenestra, 13.3 mm.; diameter of scapular facet, 7.8 mm. laterally to 7.9 mm. anterioposteriorly; and dorsoventral depth of glenoid facet, 15.0 mm. (Comparable measurements for the coracoid of a similarly sized modern specimen, A.M.N.H. No. 1866, of *Cygnus columbianus* are, respectively: 30.3 mm.; 20.6 mm.; 18.0 mm.; 13.1 mm.; 11.3 mm.; 8.4 mm., and 10.0 mm.; and, 15.0 mm.)

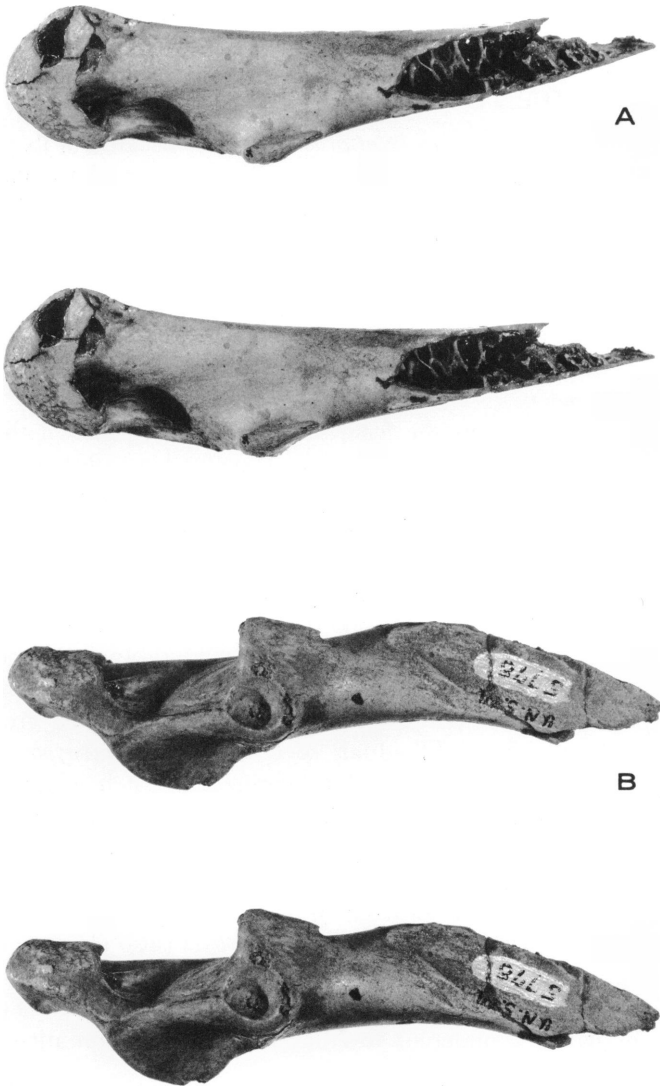


FIG. 1. Stereophotographs of *Paracygnus plattensis*, type, left coracoid. A. Internal view. B. Dorsal view. Approximately  $\times 1$ .

ETYMOLOGY: *Paracygnus* from *para* meaning "near" and *cygnus*, "swan"; *plattensis* meaning "of the Platte," for the major river traversing the Nebraska plains.

ASSOCIATED FAUNA: The associated mammalian fauna was described by Tanner (1967, pp. 11–12) and in references cited therein.

#### DETAILED DESCRIPTION AND COMPARISON

The coracoid of *Paracygnus plattensis* is unique because of its combination of swanlike and geoselike characters. As suggested above, its size and robustness are about those of the Whistling Swan (*Cygnus columbianus*). The pneumatic foramina under the entire brachial tuberosity are small as in the swans, rather than large as are those in the geese. However, the deep depression of the triosseal canal is responsible for a distinct raised ventral portion of the shaft below it, as in most geese (Woolfenden, 1961). The deep scapular facet is closely approached by that of the geese, especially *Cygnopsis*.

Among existing swans the fossil seems nearer to those of the *Cygnus* group than to those of the *Olor* group. Woolfenden (1961, p. 49) cited four features of the coracoid by which *Olor* differs from *Cygnus*. Although the fossil has the entire furcular facet undercut, the shaft meets the facet just below the undercut surface (about in the center of the facet). This condition closely approaches that found in *Cygnus olor*, rather than the fully and deeply undercut condition found in coracoids of species of the *Olor* group. The procoracoid varies considerably in shape within swans, with the *Cygnus* group generally having the process less prominently projecting in a point, and deeper than in the *Olor* group. The fossil resembles certain individuals of *C. olor*, *C. melancoryphus*, and *C. (Chenopsis) atratus* in this feature. The coracoidal notch is very marked in the fossil coracoid, as in most individuals of the *Cygnus* group. Finally, the small, rounded scapular facet of the fossil approaches that of *C. olor* and *C. atratus*, rather than that of swans of the *Olor* group. Thus, among existing swans, the fossil coracoid most closely approaches *Cygnus olor*, *C. atratus*, and, to a lesser extent, *C. melancoryphus* (also *Coscoroba coscoroba*; see below).

If considered a goose, the fossil would be allied with species of *Branta* because of its fully undercut furcular facet and pneumatic foramina throughout the undercut region.

A comparison of some features of the fossil coracoid not discussed above with coracoids of various swans and geese follows:

HEAD OF THE CORACOID: Rounded, center portion much higher (anterior to) than dorsal and ventral extremes; head higher than in *C. columbianus*, even more pronounced than in *C. atratus*, *C. olor*, or *Branta canadensis*.

SHAFT: Pronounced ventral to triosseal canal, raised internally more than in any swan; similar to *Anser* in ridge development, but ridge actually much broader, extending to center and even dorsal portion of head anterior to triosseal canal;

*Cygnus olor* similar in this region, but ridge only vaguely shown because depression of triosseal canal barely suggested.

**GLENOID FACET:** Nearly like that of *Branta canadensis*, not so evenly edged postero-ventrally as in swans.

**FURCULAR FACET:** Expanded dorsally, extending far proximally on brachial tuberosity; latter connected through massive ridge with glenoid facet, similar to condition in *Branta canadensis* and *Cygnus atratus*.

**SHAFT AT CORACOIDAL FENESTRA:** Almost completely round; all shaft ridges minor in this area; *Coscoroba* and, to a lesser extent, *Brania* closest in this regard.

Other features of the coracoid appear too variable in the Anserini to warrant discussion.

Of the numerous anseriform fossils (Howard, 1964a; Brodkorb, 1964), most are not represented by coracoids. *Eonessa anaticula* was an Eocene, ducklike bird of small size. The tree ducks (*Dendrochen*, *Dendrocygna*) are much smaller than the fossil. Two swan-sized anatids, *Cygnanser csakvarensis* and *Cygnavus senckenbergi*, are European fossil species of Miocene age. The former appears (Howard, 1964a) to be a swan-sized goose. Although the fossil conceivably could represent one of these forms, or be closely related to them, it cannot be assigned to either because they lack coracoid representation, there is no evidence that either has occurred in the New World, and the time difference (Miocene versus late Pliocene) is considerable. Of the fossil swans lacking coracoidal material, *Cygnus falconeri* was extremely large, a quarter or more larger than *Cygnus olor* (Howard, 1964a). *Cygnus herrenthalsi* is represented by a pedal phalanx only, and *Cygnus hibbardi* was a swan of the *Olor* group. The fossil coracoid clearly does not resemble existing swans of this group, so it cannot be assigned to *C. hibbardi*. *Presbychen abavus* was a Miocene goose very near *Branta*, and smaller than *Cygnus columbianus*. *Eremochen russelli*, a Pliocene goose, was much smaller than the species represented by the fossil coracoid. *Branta howardae* was a Pliocene goose the size of *B. canadensis*; according to Howard (1964a) it is not certainly *Branta*, and may be a species of *Anser*. The Pleistocene *B. hypsibata* was a smaller species of goose. Fossil geese of the genus *Anser* (*atavus*, *scaldii*, *brumeli*, *pressus*) were all the size of *Anser anser* or smaller except for the larger Pleistocene *A. azerbaijdzhanicus*. The fossil coracoid does not represent a species of *Anser*.

The coracoid of *Romainvillia stehlini*, a small Eocene anseriform bird, has a foramen beneath the procoracoid, lacking in *Paracygnus plattensis*. The swan-sized Oligocene *Cygnopterus affinis* had a coracoid lacking pneumatic foramina under the furcular facet, and its glenoid facet was oval, thus differing from that of *Paracygnus plattensis*. The fossil swans represented by coracoidal material are *C. equitum*, *C. lacustris*, *C. nanus*, and *C. paloregonus*. *Cygnus equitum* was a Pleistocene swan occurring on

Malta and showing a tendency toward loss of flight. *Cygnus lacustris* and *C. nanus* of the Australian Pleistocene were the size of the modern *C. atratus* or smaller. The coracoid of the large North American Pleistocene *Cygnus paloregonus* (Howard, 1946, pp. 162–163) has a furcular facet that is appressed to the shaft, and it lacks pneumatic foramina under this facet. It clearly differs from *Paracygnus plattensis* in these features, as well as in other respects (e.g., less developed coracoidal fenestra and shallow and broad scapular facet).

Three fossil species of *Branta* are represented by a coracoid. *Branta esmeralda* and *B. propinqua* were small geese of the North American Pliocene and Pleistocene, respectively; *Paracygnus plattensis* was much larger than these. *Branta dickeyi* was a very large goose of the Pliocene and Pleistocene of North America. Assignment of this swan-sized goose to *Branta* may be incorrect (Howard, 1964a). The coracoid of *B. dickeyi* (see Miller, 1944, fig. 6; and Howard, 1964a, p. 274) has the following distinguishing characters: the distance from the scapular facet to the head is shorter than in *Cygnus columbianus* (this distance in *Paracygnus plattensis* is greater than in *C. columbianus*); the furcular facet overhanging with pneumatic foramina beneath (as in *P. plattensis*); and the scapular facet is deep and evenly oval, with the long axis vertical (facet deep in *P. plattensis*, but it is round in the latter). Additionally, the coracoid of *B. dickeyi* is longer, straighter, and more slender than that of the Whistling Swan. Compared with the coracoid of the latter, that of *Paracygnus plattensis* is more robust (except for its narrower head) rather than more slender. Regardless of the status of *B. dickeyi*, its coracoid clearly differs from that of *Paracygnus plattensis*. *Anser oeningensis* was a Miocene goose the size of *Anser fabalis*, and *A. cygniformis* was a larger, nearly swan-sized Miocene goose. The coracoid of the latter (Lambrecht, 1933, p. 369) has narrow, flat, clavicular and humeral facets (those of *Paracygnus plattensis* are broader). Its greater age, European occurrence, and differences in the facets mentioned indicate that *A. cygniformis* is not related to *Paracygnus plattensis*.

The other known fossil geese are anatine and represent the sheldgeese (tribe Tadornini). Their coracoids resemble those of modern sheldgeese (*Neochen*, *Alopochen*) in having reduced undercutting of the furcular facet, with pneumatic foramina restricted to the region of the brachial tuberosity. *Anabernicula*, a fossil genus, also has these features (Howard, 1964b). On the basis of its large size, fully undercut furcular facet, and pneumatic foramina throughout its length, the coracoid of *Paracygnus plattensis* does not resemble the coracoids of these anatine species, and it must be considered anserine. Among the aberrant modern anatine species, the

coracoid of *Plectropterus gambensis* bears no resemblance to that of *Paracygnus plattensis*, but that of *Cereopsis novaehollandiae* is generally similar to the latter in shape and in some details. *Cereopsis* has a fairly deep, rounded, scapular facet, a narrow head, a deeply undercut furcular facet, with pneumatic foramina throughout the undercut area, and its procoracoid resembles that of *Paracygnus plattensis*. The latter differs from *Cereopsis* in its deeper triosseal canal and associated dorsal ridge, the presence of a coracoidal fenestra, and its more prominent, antero-internal, raised, shaft ridge which tends to connect with the center of the furcular facet.

The fossil coracoid thus appears assignable to no extant or fossil species. Although it resembles that of the swans (*Cygnus*), the deeper depression of its triosseal canal and the elevation of the shaft adjacent to it, its small, deep, and round scapular facet, and its small, coracoidal head contrasted with its robust shaft preclude its inclusion in *Cygnus*. Likewise, its swanlike features and particularly its resemblances to that of *Cygnus olor* and that of *C. atratus* preclude assigning it to any genus of goose.

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