

MID-PLEISTOCENE BIRDS FROM WESTERN NEBRASKA, INCLUDING A NEW SPECIES OF SHELDGOOSE

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I have studied a number of avian fossils from western Nebraska, originally borrowed for study by Charles G. Sibley from the University of Nebraska State Museum. Among the fossils are 10 elements from the Rushville Quarries, 14 mi. S and 2 mi. W of Rushville, Sheridan County, Nebraska. The fossils represent six extant and one new fossil species, all but one of which are waterfowl. Their age is Yarmouth Interglacial (probably early Yarmouth) of the middle Pleistocene.

The precise localities represented are University of Nebraska State Museum (U.N.S.M.) collecting locality Sh-3, NE $\frac{1}{4}$, NW $\frac{1}{4}$ sec. 9, T. 29 N., R. 44 W., and collecting locality Sh-4, NW $\frac{1}{4}$, NE $\frac{1}{4}$, sec. 9, T. 29 N., R. 44 W. The Rushville Quarries were described and their history and associated mammal fauna listed by Schultz and Tanner (1957). Locality Sh-3 is illustrated in Schultz and Stout (1961). The fossils described herein are pale brown in color and are derived from Sappa sand in Terrace-4 fill (Schultz and Tanner, op. cit.). Since Sangamon soil is exposed "high above the quarry level" (Schultz and Stout 1961:50), the fossils are definitely pre-Sangamon; the Sappa sand is pre-Illinoian. Fossils are particularly abundant in a narrow band of fine, light brown sand low in the Sappa formation, placed as early Yarmouth in a section of the (Sh-3) Rushville Quarry by Schultz and Stout (1961: fig. 36). According to these authors, the only other fossiliferous portion of the Sappa formation is a white marl segment situated much higher than (hence later than) the above-mentioned fine band of sand. None of the fossils reported herein exhibits the light gray and white color that would be expected of fossils from the marl portion of the Sappa formation. All the fossils were collected between 1933 and 1938, mainly by C. B. Schultz, T. M. Stout, and their associates of the University of Nebraska State Museum.

The osteological terminology employed herein follows that of Howard (1929) and Ashley (1941). Stereophotography is employed because it is effective in osteological comparisons, and I believe it facilitates pale-

ontological work (see discussion by Cracraft 1968:3-4).

LIST OF SPECIES

Branta canadensis? Canada Goose. The proximal third of a left ulna (U.N.S.M. 5768) of a large goose closely approximates that of the largest specimens of Canada Goose available to me. The papillae for attachment of the secondaries are farther apart than in Recent Canada Geese, but this appears to reflect its large size (slightly larger than an ulna of *B. c. occidentalis*, from the largest available specimen of Canada Goose). Despite the close resemblance of the fossil to ulnas of Canada Geese, I only tentatively assign the ulna to species because the ulna is not a particularly diagnostic bone in the Anatidae (Woolfenden 1961). Measurements of the ulna are: transverse distance from olecranon process to the edge of the external cotyla, 21.5 mm; and shaft width across prominence for anterior articular ligament, 14.7 mm.

Anabernicula Ross, new species of sheldgoose, described as follows:

Anabernicula robusta, new species

Figures 1, 2

Type. Right humerus, complete except for part of the deltoid crest and the distal part of the bicipital crest, U.N.S.M. 5769.

Locality and Age. U.N.S.M. Collecting Locality Sh-3, Rushville Quarries, Sheridan County, Nebraska (see locality information above). Age—Yarmouth Interglacial (probably early) of Pleistocene.

Diagnosis. Resembles humeri of *Anabernicula minuscula* (Wetmore), *A. gracilentata* Ross, and *A. oregonensis* Howard, but more robust (see below); anterior base of pneumatic fossa raised, forming a strong shelf, and causing the pneumatic fossa to be distinctly angular, rather than circular in shape (viewed internally) as in other species of *Anabernicula*; generally most similar to the humerus of the Pliocene *A. minuscula* (Wetmore 1924), but with a deeper ligamental furrow (nearer *A. oregonensis*, Howard 1964), the shaft ridge



FIGURE 1. Stereophotographs of the right humerus of *Neochen jubata* (left set), A.M.N.H. no. 2545, and *Anabernicula robusta* (right set), U.N.S.M. no. 5769, type specimen. Posterior view. Approximately natural size.

more external and less strongly marked, the shaft more strongly curved, and the head rotated more anconally; differs from *A. gracilentata* (Howard in Delacour 1964) and *A. oregonensis* in its much more robust shaft, its proportionally wider condylar end, its more prominent attachment of anterior articular ligament (which agrees with with of *A. gracilentata* in facing more externally and less palmed than in *A. oregonensis*), its somewhat higher head, and its more externally placed shaft ridge, resulting in a much greater depression between the head, the median crest and the shaft ridge.

Measurements. Length, 98.1 mm; breadth of head from external tuberosity to the bicipital crest, 21.5 mm; breadth of distal end, 16.8 mm; breadth of shaft in center, 8.5 mm; depth of shaft in center, 7.4 mm. (Comparable measurements obtained from the type humerus of *A. oregonensis* are, respectively, 98.1 mm, 20.0 mm, 14.7 mm, 6.8 mm, and 6.0 mm.)

Specimens examined. These include the holotype humeri of *Anabernicula minuscula* (U.S.N.M. no. 10548) and of *A. oregonensis* (A.M.N.H. no. 3548).

Remarks. The new fossil humerus does not fit within the closely similar *A. oregonensis*-*A. gracilentata* complex (see Howard 1964:5, 10), nor is it in any way intermediate between the humeri of these late Pleistocene species and the Pliocene *A. minuscula*. It appears to represent a rather stockier "pygmy goose" of a size similar to these species.

Howard (1964:8) has properly placed *Anabernicula* in the Tadornini, comparing the fossil specimens with *Tadorna*. Howard (in Delacour 1964:286) had stated previously, "the placement of the genus (*Anabernicula*) in this tribe (Tadornini) should be considered tentative pending comparisons with other genera of the tribe." I have compared *Anabernicula robusta* and *A. oregonensis* humeri with those of *Cereopsis*, *Chloephaga*, *Neochen*,



FIGURE 2. Stereophotographs of the right humerus of *Neochen jubata* (top left set), A.M.N.H. no. 2545, and *Anabernicula robusta* (top right set, bottom set), U.N.S.M. no. 5769, type specimen. Anterior view at top, distal end at bottom. Approximately natural size.

Alopochen, *Tadorna* (including *Casarca*) and *Tachyeres*, as well as humeri of species of other tribes of the Anatidae. This comparison clearly indicates that *Anabernicula* belongs in the Tadornini, and that it is closely allied to the *Chloephaga-Alopochen-Neochen* group of that tribe. Humeri of *Anabernicula* are most similar to those of *Neochen jubata* (see figs. 1 and 2).

Woolfenden (1961) has discussed the features of the humerus characterizing various genera of Tadornini. *Anabernicula* agrees with the Tadornini in the following features: capital shaft ridge fairly prominent and directed toward the external tuberosity; deltoid crest extending quite far distally relative to the bicapital crest; the head rotated

anconally so that the external tuberosity is high and prominent; the anterior articular ligamental facet raised; and the shaft tending to be relatively thin. (In this respect *Anabernicula robusta* tends toward stockier anatids like the Cairinini.) Woolfenden (1961: 11) considers *Neochen* to be quite different from *Alopochen*, *Chloephaga*, and other shelducks, primarily because the depression for the external head of the triceps extends to the external tuberosity in *Neochen jubata*, instead of being separated from it by a raised area. However, this region in *Neochen* is not very different from the narrow raised area found in various species of *Chloephaga*. In fact, *Chloephaga* can be considered intermediate between *Neochen* and *Alopochen* in this

respect. I consider the humeri of *Neochen* to be very similar in all respects to *Chloephaga*, and note that Johnsgard (1965) considers *Neochen* closely related to *Chloephaga* on behavioral grounds.

It might be useful to distinguish humeri of *Anabernicula* from those of *Chloephaga* and *Neochen*. Compared with humeri of *Chloephaga* and *Neochen*, those of *Anabernicula* have: shallower heads; a narrow raised area between the external tuberosity and the depression for attachment of the external head of the triceps (*A. oregonensis* varies in this regard from the condition of *Neochen* to that of *Chloephaga*); a lower shelf at the anterior base of the pneumatic fossa (the shelf is well developed in *A. robusta*, which closely approaches *Neochen* in this feature, and in the correlated shape of its pneumatic fossa); less robust and less pronounced trochleae; abrupt contact of the bicipital crest with the shaft (crest tapering at an angle in *Neochen*); and the shaft distance between level of the distal base of the bicipital crest and level of the distal base of the deltoid crest less (*Neochen* is intermediate in this respect, while *Chloephaga* resembles *Alopochen*). Finally, the humerus of *Neochen* has a distinct ridge at the distal end of the olecranal fossa; this ridge is lacking or barely suggested in *Anabernicula* and *Chloephaga*.

While I cannot comment on the status of *Brantadorna*, a recently described (Howard 1963:8-9) genus assigned to the Tadornini, it differs from *Anabernicula* (including *A. robusta*) in the features of its humerus. Howard stated that in all the characters by which elements of *Anabernicula* differ from *Brantadorna*, the latter "is more gooselike than is *Anabernicula*."

Anas platyrhynchos? Mallard. The distal half of a left ulna (U.N.S.M. 5767) compares favorably with those available for large males of this species. A slight difference from the Mallard is that the ridge of the external trochlea is very short for the large size of the shaft, which slopes more internally than in most Mallards. The proportionally shorter ridge of the external trochlea suggests the ulna of the Pintail (*Anas acuta*). However, the fossil ulna is too large and robust for *Anas acuta*, from which it differs also in having a raised area at the proximal base of the internal trochlea (dorsally), as in all Mallards examined. Although it is likely to represent a Mallard, the relatively non-diagnostic character of anatid ulnas is reason for caution in definitely assigning a specific name to the

fossil. The greatest distance diagonally across the shaft of the fossil ulna from the internal trochlea to the external trochlea is 10.5 mm; the depth of the bone at the proximal base of its external trochlea is 6.9 mm; and the greatest diagonal distance across the external trochlea is 10.1 mm.

Spatula clypeata? Shoveller. The distal half of a left tarsometatarsus (U.N.S.M. 5771) is that of a medium-sized anatine duck. Its trochlea for digit II is short and extends distally beyond the level of the proximal extent of the facet of the trochlea for digit III, which feature separates (Woolfenden 1961: 81) the non-diving from the diving Anatinae. Comparison of the fossil with tarsometatarsi of all North American species of *Anas* (including *Mareca*) and *Spatula* disclosed that it matched *Spatula clypeata*. I could find no features of size, proportions, details of trochlear arrangement, or facets and articulations by which the fossil differed from *S. clypeata*. In view of the great similarity among species of *Anas*, it seems prudent to designate the partial fossil tarsometatarsus only tentatively as *Spatula clypeata*. Some measurements are: greatest width across trochleae, 7.5 mm; distance from proximal base of trochlea II to the distal end of trochlea III, 8.9 mm; and breadth of shaft at base of trochlea II, 4.4 mm.

Lophodytes cucullatus. Hooded Merganser. The distal three-quarters of a right coracoid (U.N.S.M. 5766) is identical in size, shape and details of conformation with coracoids of this species. It matches *Lophodytes* in features cited by Woolfenden (1961:56-57), particularly the shape of the glenoid facet, used to separate *Lophodytes* from *Mergus*. Measurements are as follows: distance from procoracoid to anterior end of bone, 10.7 mm; and maximum breadth of the bone through the glenoid facet, 7.0 mm.

Meleagris gallopavo? Turkey. The distal 60 per cent of a left tarsometatarsus (U.N.S.M. 5773) lacking trochlea III, and poorly pieced together along the shaft and at both remaining trochleae, appears to represent this species, but its poor condition renders this determination tentative. The specimen is also considerably abraded. Its lack of a spur indicates that it represents a female, further complicating the determination, since characters involving the spur (Brodkorb 1964b:225) are important in delimiting genera of turkeys. The fossil tarsometatarsus resembles that of *Meleagris* (spp.) in the following characters discussed by Brodkorb (loc. cit.): lateral distal foramen high and inner trochlea narrow. Its facet for

the hind toe appears to be rather high, but it is virtually indiscernible. Its inner distal foramen is small, but well developed. Although I have not compared the specimen with tarsometatarsi of other fossil turkeys (*Agriocharis progenes*, *A. leopoldi*, *A. crasipes*, *Parapavo californicus*, *Meleagris alta*, and *M. tridens* are fossil turkeys represented by tarsometatarsi, according to Brodkorb 1964a), careful comparison with numerous prehistoric and modern tarsometatarsi of *M. gallopavo* places the fossil well within the range of variation in females of this species. Although the fossil tarsometatarsus is indistinguishable from that of *M. gallopavo*, in view of its poor condition it seems best to assign it only tentatively to this species. The maximum width across its trochleae is 25.0 mm, and the shaft at about its center measures 10.2 mm in width and 8.0 mm in depth.

Fulica americana. American Coot. Three left tarsometatarsi, including a complete one, the distal one-third of another, and the distal 40 per cent of the third (respectively U.N.S.M. nos. 5772, 5770 and 5765), are definitely assignable to this species. The distal one-quarter of a smaller right tarsometatarsus (U.N.S.M. 5776) probably also represents this coot. All of these agree with *Fulica* and *Gallinula*, as opposed to *Rallus*, in their flattened anterior shaft and well-spread trochleae (see Ligon 1965:141). The three large tarsometatarsi closely match Recent tarsometatarsi of this species, although their trochlea IV is slightly smaller in size. The small specimen is peculiar in having relatively smaller trochleae II and IV, but this may be attributable to excessive abrasion. There is a possibility that the latter fossil may represent *Gallinula chloropus*, the tarsometatarsi of which have smaller inner and outer trochleae than do those of *F. americana*. (Available comparative material included 10 tarsometatarsi of modern *F. americana* and four of modern *Gallinula chloropus*; critical data from five additional specimens of the former and two of the latter were kindly provided by H. Howard.) However, the similarity of their tarsometatarsi, including overlap in measurements, makes difficult the determination of the specimen. The incompleteness and abrasion of the fossil tarsometatarsus in question and the occurrence of three coot tarsometatarsi in the fossil material from this locality make it prudent to assign it tentatively to *F. americana*. Measurements of these fossils follow in the order presented above: width across trochleae, 9.9, 9.9, 9.4, and 8.7 mm; distance between proximal base of

trochlea II and distal end of trochlea III, 11.3, 11.3, 11.9, and 10.3 mm; breadth of shaft at proximal base of trochlea II, 5.8, 5.9, 5.8, and 5.0 mm; total length, 59.9 mm; and depth of head through hypotarsus, 9.7 mm.

DISCUSSION

These fossils suggest for their habitat a marsh-edge ecological situation in a climate not greatly different from that of today. The occurrence of the Turkey suggests the presence of trees, as does the occurrence in the Rushville Quarry deposits of raccoons (*Procyon* sp.), giant beavers (*Castoroides* sp.) and beavers (*Castor* sp.) (Schultz and Tanner 1957:71). Also found in these deposits and suggesting a wet environment is a muskrat (*Ondatra nebrascensis*, Schultz and Tanner, loc. cit.). Other mammals from this site are various horses, a camel (*Camelops* sp.), a llama (*Tanupolama* sp.), several species of pronghorns, a vole, a prairie dog, a ground squirrel, and a jack rabbit, all of which indicate the occurrence of prairie habitat. Except for the sheldgoose, all avian species reported herein presently occur, or have recently occurred, in Nebraska (A.O.U. 1957). The extinction of sheldgeese (*Anabernicula*) in North America is peculiar, especially considering that their South American relatives apparently thrive today in both tropical (*Neochen jubata*) and temperate (*Chloephaga* spp.) areas.

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