

## **WATERFOWL IN THE PREHISTORY OF SOUTH DAKOTA**

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### ABSTRACT

The paleontological and archaeological records of waterfowl have provided extensive evidence of a sixty million year prehistory of the Order Anseriformes. The distinctive shapes of the skulls and many of the limb bones have enabled recognition of this group in many paleofaunas of the Cenozoic Era, especially in North America. Abundant and useful, waterfowl have had a long association with human populations as well, especially in South Dakota.

We compiled an extensive bibliography and examined a number of actual specimens in order to provide this review of waterfowl prehistory, focused on South Dakota. The earliest waterfowl, related to the Anseranatidae (Magpie Geese), are fossils from the earliest Paleocene. They are found in sediments laid down shortly after the extinction event that ended the reign of the dinosaurs. Later fossils attributed to waterfowl have been reported from Eocene sediments in Wyoming and from Oligocene, Miocene, and Pliocene rocks in South Dakota. One bone of a duck was recovered from the Late Pleistocene Lange-Ferguson Site (Shannon County), a mammoth kill attributed to early humans.

Archaeological sites of the Missouri Basin dam salvage projects produced waterfowl bones, demonstrating that the Arikara and other cultures made use of at least thirteen species of swans, geese, and ducks. Other sites in South Dakota, notably the Black Hills, have yielded isolated records of various species, notably of goose and teal species. Explorer accounts and ethnographic descriptions supplemented these records, confirming the venerable cultural associations of waterfowl in this region.

### Keywords

Anseriformes, paleontology, archaeology, South Dakota

## INTRODUCTION

Ducks, geese, and swans have a place in human cultures that is exceeded by no other group of birds. Their abundance, usefulness, and ease of domestication are part of recorded history. The Order Anseriformes, to which most living species belong, has long served human needs for food (flesh and eggs), sport, and even aesthetics (as with swans in parks). They are included within some of our most cherished traditions. (Dickens' enlightened Ebenezer Scrooge quickly ordered a Christmas goose for the Cratchit family.)

The full story of the waterfowl begins far earlier, of course, and greatly exceeds that of humanity. The duck family was recognizable as such at a time when the ancestors of humans were small furry tree-dwellers. It is a fascinating story, much of it well-documented in the paleontology of North America, including what is now South Dakota. From the time of the earliest known records about sixty million years old, these ancestral ducks were prominent among bird life and diverged to become the varied and abundant group known to nearly everyone today.

The archaeological record demonstrates that waterfowl species were important to human cultures throughout prehistory as well. Nowhere is this more evident than in South Dakota, where the record of ducks and duck hunting extends back for thousands of years. It is likely that some of the twenty-first century practices of sport hunters (such as camouflaging and decoying) were also used by the earliest residents of the Missouri River Basin and the Black Hills. Research elsewhere in North America (and throughout the world) has shown that the interactions of human cultures with waterfowl have astonishing complexity over long periods of time (Alison 1978, McAndrews and Turton 2007), confirming the importance of research on the subject.

*The Fossil Record of the Waterfowl*—The earliest birds thus far discovered are from the rocks of the Jurassic System in the Old World. The famous (but very rare) *Archaeopteryx* is still considered to be the earliest known creature recognizable as a bird, although it resembles its reptilian ancestors in many ways. The few specimens all come from the lithographic limestones of Germany. These birds lived within what is known as the Mesozoic Era, or time of “Middle Life”, also remembered as the Age of the Dinosaurs, the probable ancestors of birds. At the end of the Mesozoic Era, about sixty million years ago, the dinosaurs abruptly became extinct, along with vast numbers of other animal species. Precisely coinciding with that cataclysmic event, the fossil record has yielded evidence of the earliest ancestral ducks.

The few paleontologists who specialize on fossil birds deserve a few words of tribute, for they face a daunting task. Because most birds are flying creatures, their bones tend to be very light and thin, easily destroyed and rarely preserved as fossils. Only a few of the more durable bones of a bird skeleton are likely to ever be found, and whole bones are particularly rare. Fossil mammals are often represented by their teeth, but only a few of the earliest birds have any teeth at all. Some dinosaurs are known from nearly complete skeletons, but many fossil bird species are known from only one end of a single bone specimen!

In the coastal plain of New Jersey, in remarkable sediments called greensands, bird fossils come from the earliest Paleocene Age, immediately after the time of dinosaur extinction. The several dozen known specimens are among the most precious collections of fossil birds in the world. Two of the bones, given the name of *Anatalavis rex*, represent the earliest known waterfowl (Olson and Parris 1987). Each of the bones is a humerus, a wing bone that has a very distinctive shape in members of the Order Anseriformes, to which waterfowl belong. These specimens are a modest early record of what was to become one of the most important groups of birds. *Anatalavis* also is known from later (Eocene Age) sediments in Europe (Olson 1999), and the better specimens found there have confirmed that it belongs to the primitive waterfowl Family Anseranatidae, which has but one living species, the Australian Magpie Goose (*Anseranas semipalmata*).

Within the next few million years, waterfowl developed the very distinctive physical features by which we now recognize them, notably the broad bill and tongue. Their association with aquatic environments, where their remains are likely to be preserved in muddy sediments, has provided a somewhat better fossil record than is true of most birds. Substantial numbers of fossils are found in several sites, some of which are in Wyoming, where an evolutionary branch family, the Presbyornithidae, is represented by great numbers of specimens.

**South Dakota Duck Fossils**—The Cenozoic Era, or “era of modern life”, is well represented in South Dakota, notably by the geological formations of the Big Badlands region. It is there that waterfowl (Family Anatidae) fossils have been found which have close relationships to the species of the present. Some fossil eggs, questionably attributed to ducks, have been reported from the Big Badlands rocks of Oligocene Age, perhaps 40 million years old (Adolphson 1973).

In the Miocene Age that followed (about 30 million years ago), South Dakota duck fossils are definitely known. The Batesland Formation in Bennett County includes the Flint Hill North Local Fauna, which has yielded many fossil bird specimens. In early descriptions of the Flint Hill North Local Fauna (Miller and Compton 1939, Miller 1944), it was noted that bird fossils were uncommon in most fossil sites, but that in this paleofauna they were well represented.

Among the various bird species from Flint Hill North are three ducks. A rather large (swan-sized) supposed Diving Duck was described from the deposit, represented by two bones. It was given the name *Paranyroca magna*. A Whistling Duck, *Dendrochen robusta*, also was described as a new genus and species. Several bones were referred to it, an unusual situation for fossil birds, many of which are based on unique specimens. A new species of Teal, *Querquedula integra*, was also described, with several referred specimens. The ducks from Flint Hill North were among those birds cited as evidence for a very aquatic environment (large river or lake) of the fossil deposit, although woodland bird species were also found (Miller 1944).

One fossil Teal from South Dakota has been reported from sediments of Late Miocene Age (Brodkorb 1964a). Typical of fossil birds, the type (originally described) specimen is but one end of a long bone, a humerus. Named *Nettion greeni*, it too comes from Bennett County, in the Ash Hollow Formation, and

is probably about ten million years old. A fossil goose, referred to the genus *Branta*, was reported from somewhat later (Pliocene) sediments by Compton (1935).

Although few in number, these records of ducks from the Cenozoic are sufficient to demonstrate a substantial presence and variety of ducks in what was to become South Dakota during the past 60 million years, up to the time of the Pleistocene, known as the "Ice Age". Toward the end of the Pleistocene, the archaeological (human cultural) record begins, and one of South Dakota's most venerable sites is from that time. The Lange/Ferguson Site, designated as 39-SH-33, is a mammoth kill site of Paleo-Indian (Clovis) hunters. The site is at least 10,000 years old. Although best known for its association of humans with an extinct elephant, it also produced a single bone of a duck, which at least indicated that an aquatic environment was nearby at that time (Martin 1987).

*The Archaeological Record of Ducks in South Dakota*—The last one million years, from the "Ice Age" to the present day, have given South Dakota a wonderful heritage of waterfowl. With the arrival of human populations from Asia across the Bering Sea, the stage was set for an archaeological (rather than paleontological) record. As they always have, waterfowl became a part of human culture and resources (Zimmerman 1985). Our knowledge of this record, which we call zooarchaeology, is rapidly increasing. There are several reasons why this is so.

The records of Pleistocene and prehistoric waterfowl were meticulously summarized by conscientious scientists during the middle of the twentieth century (Brodkorb 1964b). There was little mention of South Dakota in such summaries, but that did not mean that no studies had taken place. In fact, South Dakota had been the site of some of the most comprehensive archaeological studies ever attempted, when the Missouri River dams were constructed. Among the considerations in planning the projects was the possibility that some wildlife would benefit from the water impoundments (Aitken 1949). These ambitious engineering projects also inspired government-sponsored excavations so that cultural resource losses would be mitigated. Scientists, engineers, and planners of that period deserve much credit for preserving so much of our heritage, but the analysis and publication of these excavations has taken many decades (Thiessen 1994). This was especially true for zooarchaeology, but much has been revealed during the last thirty years (Parmalee 1977a,b), and further analyses with the latest methods are continuing (Tiffany 2007). With new studies continuing, South Dakota's archaeological heritage is becoming even better understood.

The zooarchaeological record of the Black Hills has been recently summarized (Sundstrom 1996) and contains a few records of human usage of waterfowl. For example, two well-documented records of geese in Fall River County sites are cited, but a fair number of Black Hills sites are listed with bird remains that were not determined to species. There has been a strong emphasis on large mammals in Black Hills area sites however, and birds may not seem to be significant resources in such situations. However, detailed excavations in the Black Hills almost always produce significant archaeological records of bird remains, including waterfowl (Martin et al. 1993).

In contrast, the archaeological surveys of the Missouri River basin have produced many bird specimens, and these were studied by one of the nation's most noted zooarchaeologists, Paul Parmalee (1977a,b). His meticulous research revealed that Missouri River sites had yielded specimens of 13 species of waterfowl from 51 different sites, ranging over a period from A. D. 900 to A. D. 1780, most notably representing the Arikara cultures. Swans, geese, and ducks were all represented, and additional information from early ethnographic studies was correlated with the species recorded and the bone elements that had been identified. The study was so thorough that a number of specimens with healed injuries or diseased malformations were also described, despite the difficulty of identifying them to species. Parmalee had accepted the task of research on nearly all bird bones from nearly all sites in the River Basin Surveys, over 3000 specimens in all. It is not surprising that his work was not completed and published until several decades had elapsed since the excavations.

During recent years greater attention has been given to bird bones from archaeological sites, and an accurate faunal list and analysis is expected as part of all site reports. The renewed work at the Bloom Site in Hanson County (Haug et al. 1994) was typical of such investigations. Animal bones were identified and published with the rest of the site report and included the remains of Blue-winged Teal.

When sites from earlier excavations are reexamined, the results often differ considerably from the initial analyses, an indication of how much the science of zooarchaeology has advanced. The Swanson Site (Tiffany 2007) is typical of these. The original report of the site (Hurt 1951) included a faunal list with four waterfowl species, Blue-winged Teal, Green-winged Teal, Canada Goose, and Snow Goose. However, the faunal material was not so fully curated as were other specimens from the site, and the extant collection includes but a few species of any vertebrates. Waterfowl represented in the extant collection include only a Snow Goose maxilla (upper jaw portion) and a duck pelvic fragment unidentifiable to species (Tiffany 2007). If the curation had followed the standards of the present day, all specimens would have been saved and given catalogue numbers, for the faunal material is actually artifactual evidence.

The primary evidence for cultural use of birds is the presence of identifiable bones in an excavated site. Of course, other cultural evidence is welcome, but not always present, especially in the case of waterfowl. Although there is anecdotal evidence of decoying waterfowl throughout human history, evidence of prehistoric use of decoys is extremely rare. The few known examples may explain the reasons for this; decoys found in a prehistoric site near Lovelock, Nevada, were made of tule reeds (*Scirpus acutus*) and feathers, materials that would be preserved only in the most extraordinary environmental conditions (Byrd 2009). There were no decoys of the more durable materials now used.

Although this review is intended primarily to document prehistoric records of waterfowl, we also note the importance of records in historical sites. These may give evidence of reliance upon hunted fauna rather than domestic animals, a very important distinction in interpretation of sites. Exemplary among such records are the species listed by Bozell (1996) for historic features in a site in Lead (numbered 39 LA 3001). Possible Canada Goose and Teal remains were

identified, but conservatively interpreted as possibly wild or semi-domestic, thus worthy of further investigation. Another historic site that produced anseriform remains was at Fort Randall in Gregory County (numbered 39 GR 15), reported by Lees (1991).

*Records of Waterfowl Species in South Dakota Prehistory*—The more than 40 North American waterfowl species (Order Anseriformes) may range widely and possibly occur as accidentals in most of the North American continent (Wylie and Furlong 1972). While only a limited number of species would be expected in South Dakota archaeological site records, an essentially complete list is presented here. Paleontologists and zooarchaeologists generally classify them into tribes, of which eight are to be expected in North America.

#### Swans (Tribe Cygnini)

The Trumpeter Swan (*Cygnus buccinator*), although now considered to be accidental in the Mississippi Flyway and rare in the Central Flyway, was recorded from Missouri River sites by Parmalee (1977a,b). There were few specimens, but some included recognizable butcher marks and other certain indications of the importance of swans in prehistoric cultures. The spectacular size and plumage of swans has had appeal in many world civilizations, exceeding their obvious value as food. Parmalee (1977a) quotes several early ethnographic accounts of Plains cultures that incorporated decorative and ritualistic aspects of swans.

The Tundra Swan (*Cygnus columbianus*) is rare in the mid-continent and has not been recorded from South Dakota archaeological sites. The Mute Swan (*Cygnus olor*) is an introduced species with no archaeological records from South Dakota.

#### Geese (Tribe Anserini)

Of the best-known genus of geese (*Chen*), the five major American forms are the White-fronted Goose (*C. albifrons*), Snow Goose and Blue Goose (*C. caerulescens*), Ross' Goose (*C. rossii*), and Emperor Goose (*C. canagius*). They are difficult to distinguish from bones alone, and Parmalee (1977a) noted only *Chen caerulescens* (the two most common color morphs or subspecies) from Missouri River prehistoric sites, while noting that other forms might be represented. More than one hundred bones of these geese were identified, a strong indication of their cultural importance, especially for food.

The Canada Goose (*Branta canadensis*) was recorded by Parmalee (1977a), who identified more than one hundred bones of this species that had been found in Missouri River sites. Although the resident and migratory patterns of this very common species have changed considerably in modern times, it was apparently always common in what is now South Dakota. The Canada Goose was also reported from a site in the Black Hills, 39-FA-23, by Wheeler (1995), and repeated in the summary of Sundstrom (1996). Published records of this species include the Swanson Site (Tiffany 2007), Crow Creek Site (Kivett and Jensen 1976) and Lead Site (Bozell 1996). The other two species of *Branta*, the Brant (*B. bernicla*)

and Barnacle Goose (*B. leucopsis*), have coastal preferences and would not be expected in mid-continent sites. As noted previously, a fossil of *Branta* from Pliocene sediments was reported by Compton (1935).

In some respects, the various species of geese may have been the most important waterfowl to the prehistoric people of what is now South Dakota. Geese are generally large birds and migrate in sizable groups, often being quite gregarious and relatively approachable. Would they have been easy to hunt? The significant number of records from archaeological sites seems to suggest that they were. Also, the ethnographic notes of early explorers seem to confirm the importance of geese. Prince Maximilian (Thomas and Ronnefeldt 1976) noted in the expedition journal for the Sojourn at Fort Clark (now Bismarck, North Dakota) that:

“The women at Mih-Tutta-Hang-Kush celebrated the spring corn feast, of which Mr. Bodmer made a sketch. This feast is always observed on the return of the wild geese, which are the messengers of the old woman who never dies. The Indians had already killed some of these birds.” (Entry for April 2 1834)

#### Whistling Ducks (Tribe Dendrocygnini)

The Fulvous Whistling Duck (*Dendrocygna bicolor*) and Black-bellied Whistling Duck (*D. autumnalis*) are rare in the Mississippi and Central Flyways and have no records in South Dakota archaeological sites. However, as previously noted, a fossil Whistling Duck (*Dendrocygna robusta*) was described from the Miocene of South Dakota by Miller (1944).

#### Pond and Puddle Ducks (Tribe Anatini)

The Mallard (*Anas platyrhynchos*) is the most common of ducks and was identified in a number of Missouri River sites by Parmalee (1977a), who considered it to be indistinguishable from the Black Duck (*Anas rubripes*) on the basis of bones alone. Needless to say, the two subspecies variants, the Mexican Duck (*Anas platyrhynchos diazi*) and the Florida Duck (*Anas platyrhynchos fulvigula*) would not be distinguishable either, and neither would be expected in the northern plains region. Mallards are representative of the larger species of puddle ducks (*Anas*), and are the most expected in any site.

Green-winged Teal (*Anas crecca carolinensis*) is perhaps the most typical of the smaller species of *Anas*, and thus recognizable on size alone. Fifteen bones of this species were identified by Parmalee (1977a) from Missouri River sites. A number of additional specimens were identified as possibly teal species, including some possible bones of Blue-winged Teal (*Anas discors*), a slightly larger species. The Blue-winged Teal was positively identified in the assemblage from the Bloom Site (Haug et al. 1994). As previously noted, there are also much older records of fossil teal species from what is now South Dakota. The Shoveler (*Anas clypeata*) has a distinctly large bill and can sometimes be distinguished from other small puddle ducks, if the most diagnostic bones are found. Two specimens were noted by Parmalee (1977a) in collections from early sites along the Missouri River. Other species of *Anas*, such as the Gadwall (*A. strepera*), Wigeons

(*A. penelope* and *A. americana*), and Northern Pintail (*A. acuta*) have not been recorded from South Dakota archaeological sites, although most of them are well known in the region.

#### Diving Ducks (Tribe Aythyini)

The Redhead (*Aythya americana*) is fairly distinctive among diving ducks in size and bone anatomy, and was found in bone collections from a few sites along the Missouri River collections, cited by Parmalee (1977a). Larger and smaller species of *Aythya*, such as the Canvasback (*A. valisneria*), Ring-Necked Duck (*A. collaris*), and Lesser Scaup (*A. affinis*), were possibly also present in the collections, but identified with less certainty.

#### Sea Ducks (Tribe Mergini)

Although this rather large subfamily includes mostly ducks of coastal and marine environments, a few species are found regularly in the mid-continent. The Hooded Merganser (*Lophodytes cucullatus*) is distinctive in size and skull shape. This small merganser was recorded from a number of Missouri River sites by Parmalee (1977a), although it is considered to be an uncommon species there at present. The other mergansers, the Common Merganser (*Mergus merganser americanus*) and Red-Breasted Merganser (*Mergus serrator*) have not been found in South Dakota sites.

Ducks of the Genus *Bucephala* include the American Goldeneye (*B. clangula*) and the Bufflehead (*B. albeola*). Both are considered common in the mid-continent, but have no archaeological record from South Dakota as yet. The Barrow's Goldeneye (*B. islandica*) has no record either and would not be expected, as it is rare there.

The Eiders (*Genus Somateria*), Scoters (*Genus Melanitta*), Harlequin Duck (*Histrionicus histrionicus*), and Oldsquaw (*Clangula hyemalis*) are not known from South Dakota archaeological sites. All are predominantly coastal or marine.

#### Stiff-tailed Ducks (Tribe Oxyurini)

This tribe includes the Ruddy Duck (*Oxyura jamaicensis*) and Masked Duck (*O. dominica*). Neither has any archaeological record in South Dakota, although the Ruddy Duck is common there, and the bones of these two species are quite distinctive and easily identified.

### SUMMARY

South Dakota has substantial records of the paleontology (fossil prehistory) of waterfowl and also the archaeology (human cultural aspects) of waterfowl hunting and usage. The extensive research from excavations now and in the future will surely add greatly to this record, and may well contribute further perspec-

tives that will assist in conservation and management of this culturally important group of birds.

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