American Robin at lunch *by David Kuecherer*

Wisconsin's Fossil Birds: Where Are They?

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In 1980, Robert West and John Dallman published an account of fossil vertebrate fauna in Wisconsin. Not a single bird species appeared in the publication. West and Dallman (1980) noted that many of the collecting techniques used by early investigators in Wisconsin "did not promote the discovery of remains of smaller vertebrates." Bones belonging to larger vertebrates such as mastodon and mammoth are much more noticeable than bird bones, both visually and in the functioning of machinery that hits them.

Recent paleontological techniques do promote the discovery of small mammal remains. These techniques include water screening through fine (1/16″) mesh in the field, and rewashing, separating and examining under magnification in the laboratory (see Rhodes 1984). The small mammal bones that are recovered are then identified, almost entirely by the teeth and jaws. Post-cranial bones are not used to identify the specimens or to determine the minimum number of individuals (MNI) present (Rhodes 1984). This reliance on teeth stems from the extreme similarity of the post-cranial bones within small mammal taxa. Teeth allow identification to the species level more accurately than the post-cranial bones.

Fossil avifaunas are reported from several states (Lundelius et al. 1983; Parmalee 1992). Despite recovery techniques which allow small and fragile bones to be removed and identified, and the presence of bird bones at paleontological sites in other states, Wisconsin still lacks a fossil avifauna.

In Wisconsin, geological deposits from the Mississippian to the Tertiary Periods, from roughly 360 to 1.8 million years ago, have been removed by erosion (Dott and Attig 2004). The first appearance of birds in the fossil record is during this time span in other parts of the world.

The late Pliocene epoch, about 2.5 to 2 million years ago, marks the appearance of most living taxa of birds (Emslie 1992). Many of today's bird species can be identified in the fossil record beginning in the late Pliocene but "often differed in size and relative limb proportions from Recent populations of the same species" (Emslie 1992).

The only fossil birds found in Wis-

consin, then, would have to date to the Pleistocene, or Ice Age, the period from 1.8 million to about 10,000 years ago (Dott and Attig 2004). During the Pleistocene, ice sheets advanced and retreated across Wisconsin several times, with the most recent advance named for the state and referred to in the literature as the Wisconsinan. The Wisconsinan stage began about 100,000 years ago (Dott and Attig 2004). The greatest effect on the state of Wisconsin occurred during a series of glacial advances and retreats about 25,000 to about 9,500 years ago (Clayton et al. 1992). By the late Pleistocene, most of the bird remains recovered "are osteologically indistinguishable from those of living taxa" (Parmalee 1992). There was also an episode of extinction of some bird species at the end of Pleistocene that is probably related to the extinction of large mammals such as mastodonts and mammoths at the same time (see Steadman and Martin 1984).

In glaciated parts of Wisconsin, deposits from the Pleistocene before the Wisconsinan advance have been entirely or partially removed by the action of the ice sheets that periodically covered parts of Wisconsin (Dott and Attig 2004). Occasionally large mammal bones and teeth have been recovered showing signs of abrasion from glacial materials (West and Dallman 1980), but no bird bones have been reported.

The oldest birds identified in Wisconsin so far come from the Raddatz Rockshelter in Sauk County, an important archeological site excavated by Warren L. Wittry. These bird bones were identified by Paul W. Parmalee, then of the Illinois State Museum (Parmalee 1959), and re-analyzed by Charles Cleland of Michigan State University (Cleland 1966). Cleland provides a breakdown of the animal species by level excavated. Based on Cleland's information, the oldest bird bones are found in level 15 at the site, which has a radiocarbon date of 9650 B.C. (Cleland 1966). Wittry believed that levels 13 and 14 dated from about 9000 B.C., but Cleland believed that the animal species present were "not indicative of the conifer forest which must have grown in this part of Wisconsin at 9000 B. C." and suggested a date of 5–6000 B.C. (Ibid.). However, the combinations of plant and animal species which existed in the Pleistocene have no modern counterparts (Graham and Lundelius 1984; Pielou 1991) and animals which today do not live in a coniferous forest habitat may well have done so during the late glacial or early post-glacial period (see discussion of the Hiscock site below).

Bird species found below level 15 at the Raddatz Rockshelter include Passenger Pigeon (*Ectopistes migratorius*) and Flicker (*Colaptes* sp.). Bird species represented in Level 15 include Passenger Pigeon, Ruffed Grouse (*Bonasa umbellus*), and two unidentified passerines. Bird species in Level 14 are Passenger Pigeon and Ruffed Grouse. The same two species are the only birds identified from level 13 (Cleland 1966).

Fossil bird bones are rare in states bordering Wisconsin. A distal end of a right ulna belonging to a Canada Goose (*Branta canadensis*) was found in a water trench dug in a peat deposit in St. Paul, Minnesota. Bones from the extinct bison, *Bison occidentalis,* and the modern bison, *Bison bison,* were also found in the trench from which the goose bone was taken. Based on

the associations and the condition of the bone, it is believed that the bone is Pleistocene in date (Wetmore 1958). There is also a femur in the collections of the Bell Museum of Natural History at the University of Minnesota that is assigned to the Giant Canada Goose (*Branta canadensis maxima*) based on the size of the femur (Hanson 1965). The provenience of the specimen is St. Paul and it is dark brown in color as is the ulna, which was noted by Wetmore (1958) as typical of specimens found in peat. Hanson (1965) believed that the femur came from the same skeleton as the ulna reported by Wetmore.

In Michigan, well-digging near Casnovia in Muskegon County led to the discovery of fossil wood, pollen and a fossil ulna from a Lesser Scaup (*Aythya affinis*). The ulna is complete except for the proximal end, which was probably broken when the material was pumped from the well. The wood and pollen are from coniferous trees, and the wood is radiocarbon-dated to 25,050 ± 700 BP. Since the fossil ulna came from the same level as the wood, it is believed to be the same age. This date marks an interstadial during the Wisconsinan glaciation (Holman 1976; Kapp 1978).

Bird eggshell fragments have been recovered from deposits dating between 16,710 ± 270 and 18,090 ± 190 BP in the Conklin Quarry in Johnson County, Iowa (Baker et al. 1986), and unidentified bird bones have been recovered from sites in Iowa dating to the Wisconsinan glaciation (Julie Golden, personal communication 1990).

Two records of Pleistocene bird bones from northern Illinois need to be checked to reconfirm their Pleistocene status, a Trumpeter Swan (*Cygnus buccinator*) from Aurora and a Common Merganser (*Mergus merganser*) from the North Shore Channel of Chicago (Holman 2001).

The history of fossil bird bones in the neighboring states would seem to indicate that serendipity is as good a way as any to discover fossil bird bones. Certain environments, though, are more likely to preserve bones (see West and Dallman 1980). These would include limestone caves, in which there is a basic environment and lower temperature and moisture fluctuations (Guthrie 1990). The fluctuation of water tables in limestone environments may also result in the formation of karst topography with caves and sinkholes which can be traps for unwary fauna. (Dott and Attig 2004; Guthrie 1990). While the environment of a limestone cave may be excellent for preserving bones, bird bones dating to the Pleistocene have not yet been discovered in any of the limestone caves or fissures studied in Wisconsin. Even in caves, bones must be covered by sediment for preservation to occur (Holman 2001).

Clay is also a good bone preservative, with numerous mammal specimens and some molluscs found in these environments (see Dallman 1968; West and Dallman 1980). Waterborn or waterlaid sediments will also bury a carcass quickly, increasing the chances of preservation. Several studies on the taphonomy of bird carcasses have demonstrated that unless the carcasses are quickly buried or protected in some way, they will be removed quickly by scavengers, even in shallow water environments (Lyman 1994). John Dallman (personal communication 1990) has expressed sur-

prise that no bones of aquatic birds have been recovered from some of the fossil-producing bogs in Wisconsin.

The southwestern part of Wisconsin, or Driftless Area, has never been glaciated (see Dott and Attig 2004 for an excellent summary). Deposits dating to the stages in the Pleistocene before the last, or Wisconsinan, glaciation, are preserved here. The Driftless Area also has fissures and caves in limestone in which many small mammals have been trapped—some of these deposits are quite old, as at Moscow Fissure in Iowa County, which has a radiocarbon date of 17,050 ± 1500 years BP (West and Dallman 1980). No bird bones have been found among the bones from Moscow Fissure, however (Richard Slaughter, personal communication).

The unique combinations of plant and animal species that mark Pleistocene communities are evident at Moscow Fissure. At this site in Iowa County, an accumulation of small mammal, reptile and amphibian bones is interpreted as the result of garter and fox snake predation during warm weather around a winter hibernaculum (Foley 1984). The species found at Moscow Fissure exist today, but nowhere do they all exist in the same region (Ibid.).

The Driftless Area has often been seen as a refuge in which plants and animals survived the Ice Age. Zimmerman (1991) has suggested that some of the "birds of the southern contingent" favor the southwestern part of the state, in part because of "the continuation of preglacial traditions." Recent work on chipmunk DNA has led researchers to suggest that "some chipmunks rode out the last ice age in a hospitable zone in Wisconsin and then moved south" (Perkins 2004).

During the Wisconsinian glaciation, the unglaciated parts of the state would have had a tundra vegetation with some stunted wood, and there would have been permafrost and proglacial lakes (Clayton et al. 1992; Péwé 1983; Knox 1982). As severe as this landscape might seem compared with modern conditions, it is hard to imagine that birds would be totally absent from it. After all, reptiles and amphibians lived here during the Wisconsinan (Foley 1984).

One often-cited explanation for the absence of bird bones is the fragility of bird bones. Noted ornithologists dispute that point. Pierce Brodkorb of the University of Florida believed that the collecting techniques of some paleontologists, aimed largely at teeth and jaws, biased the record against discovery of bird bones and could point to the abundant bird fossils from sites in Florida to prove his point (Campbell 1992). Storrs Olson (1985) also has pointed out that much of what we know about fossil mammals is based on the study of their teeth, and that fewer workers have studied fossil birds.

It is unlikely that Wisconsin was devoid of birds in the late Pleistocene. We just have not found them yet. When we do find them, there may be some interesting combinations of birds and vegetation.

To give an idea of how the Pleistocene avifauna of Wisconsin may have differed from today's birds, I like to consider the Pleistocene bird remains from the Hiscock site in Genesee County in western New York State. This site is remarkable in that two of the Pleistocene birds were identified by

feathers instead of bones. Two feathers identified as coming from the upper back or lower neck of a Baltimore Oriole (*Icterus galbula*) were found in a sediment sample radiocarbon dated to about 10,000 years ago (Steadman 1988). The vegetation near the site at that time was primarily coniferous, especially white pine (*Pinus strobus*) (Ibid.) Today we do not associate Baltimore Orioles with pine forests! Another feather was identified as belonging to a Pied-billed Grebe (*Podilymbus podiceps*). This feather came from a sediment sample about 11,000 years old (Steadman 1988).

The second remarkable thing about the Hiscock site is the presence of three bones of a California Condor (*Gymnogyps californianus*) (Steadman 1988). The bones (part of a humerus, a coracoid and a pedal phalanx) came from a stratum that dates to about 11,000 years ago, at a time when the vegetation around the site was a spruce-jack pine woodland (Steadman and Miller 1987). Other fossil bones from the California Condor come from warmer areas, but the Hiscock site shows that California Condor could survive in colder areas as long as the large mammal carcasses on which it fed were available (Ibid.). Steadman and Miller (1987) suggest that the California Condor suffered a drastic reduction in range at the end of the Pleistocene with the extinction of many large mammal species in North America.

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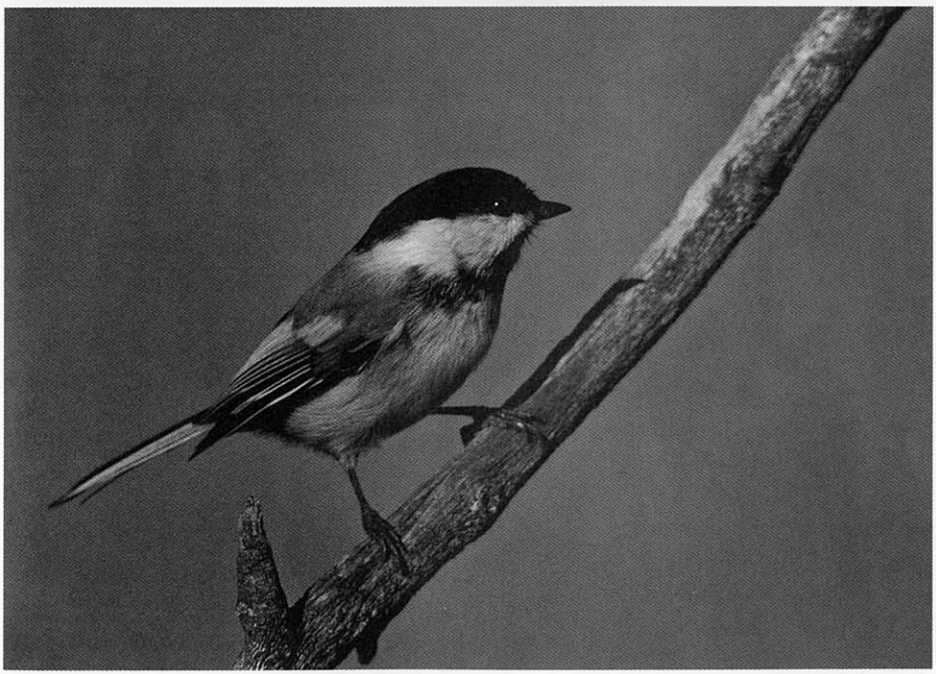
Janet Speth is an archeologist who has always liked birds. She has worked on bird bones from Native American sites and has handled Passenger Pigeon and Ivory-billed Woodpecker bones—poor substitutes for the living creatures, though.



Black-capped Chickadee *by Dennis Malueg*