bone. The replaced bone, even if found in the upper levels, is considered older than the apparently recent bones and is probably of Pleistocene age.

Among the upper level bones that show the mineral replacement characteristic of the deeper levels, is a left tarsometatarsus of the Gyrfalcon, *Falco rusticolus*. This bone was identified by R. W. Storer of the University of Michigan Museum of Zoology (Bird Division) and measures as follows, with the corresponding measurements in parentheses from a recent specimen (University of Michigan Museum of Zoology 74815): greatest length—63.6 mm (63.5 mm); greatest transverse width, proximal end—15.7 mm (17.9 mm); greatest transverse width, distal end—15.5 mm (17.4 mm); greatest anterior-posterior width, proximal end—8.4 mm (10.2 mm); and greatest anterior-posterior width, distal end—10.7 mm (11.6 mm). The present range of *Falco rusticolus* is considered by Salt and Wilk (1966, The birds of Alberta, Edmonton, Government of Alberta) as being circumpolar. Rare winter sightings have been reported as far south as Michigan, northern Ohio, Kansas, Nebraska, and Wyoming (A.O.U. 1957, Check-list of North American Birds, fifth ed., Baltimore, Amer. Ornithol. Union).

Previous fossil records of *Falco rusticolus* are limited to Sweden, Czechoslovakia, and Hungary (Brodkorb 1964, Bull. Florida State Mus., Biol. Sci. 8: 294). In view of the mineralization of the Bell Cave bone, which associates it with the Pleistocene fauna of the site, it appears that this specimen should be considered the earliest reported occurrence and first fossil record of *Falco rusticolus* from North America.

I thank George Frison, Michael Hager, and George Zeimens for their help and review of this note, also R. W. Storer for identifying the *Falco rusticolus* specimen, and especially C. W. Hibbard for all the help he has given. The specimen is deposited in the University of Wyoming Anthropology Department Collections (UWA:ALB-236).—DANNY WALKER, *Department of Anthropology, University of Wyoming, Laramie, Wyoming 82070.* Accepted 4 Sep. 73.

Emigrations of Northern Shrikes 1959–1970.—In 1935 G. M. Allen suggested to me that possibly the appearance of Northern Shrikes (*Lanius excubitor*) in New England in large numbers coincided with the appearances of Snowy Owls (*Nyctea scandiaca*) (Gross 1927, 1931). Analysis of data available from the Bird-Lore Christmas Census and other counts indicated that the shrikes, indeed, did appear at approximately 4-year intervals, nearly always coincident with the appearance of the owls (Davis 1937). The agreement was strikingly exact except that shrikes appeared in both winters in 1934–35 and 1935–36, rather than declining in the second winter. A suggestion that a change had occurred in the length of the cycle during the past century was available from data on the abundance of the arctic fox (*Alopex lagopus*). It seemed (Davis 1937) that before 1893 the period between peaks was usually 3 years and the average was 3.3 years. However, after 1900 the average for the shrikes was 4.1 years. The suggestion for the common cause of the emigrations of shrikes and owls was that lemmings died off at intervals. Later analysis (Davis 1949) indicated that in 1937–38 the owls appeared in numbers while shrikes were scarce. In 1941–42, the owls appeared after a decline in shrikes, but in 1945–46 the emigrations again coincided (Gross 1947). Thus the synchrony earlier observed was less exact. Still later (Davis 1960) the emigrations failed to coincide. In 1953–54 the owls reached a maximum, but the shrikes maintained a maximum for 4 years, 1953–54 through 1956–57.

This appraisal reviews the abundance of shrikes and of owls for the past two decades. Also additional knowledge since 1935 of cycles of lemmings is available as well as more information on the shrikes' breeding grounds. The methods are the same I used in previous publications. I tallied the data for Northern Shrikes in the Christmas Censuses now published in American Birds for states bounded by Quebec, Ontario, Minnesota, Iowa, Missouri, Illinois, Indiana, Ohio, and Maryland, also determined the numbers of Snowy Owls, and analyzed the data according to birds per census. Examining the previous data revealed that in Davis (1960) the data plotted since 1950 were not birds per census but were the fraction of censuses that recorded one or more shrikes. Fortunately this error does not produce differences in the peaks and valleys, but does alter the numerical values. The correct data are now plotted.

The number of censuses available has increased from about 100 in 1935–36 to over 400 in 1969–70. Furthermore the number of persons and the area covered have increased. No increase in the number of shrikes seen per census has occurred. The increase in number of censuses has provided enough data so that calculations

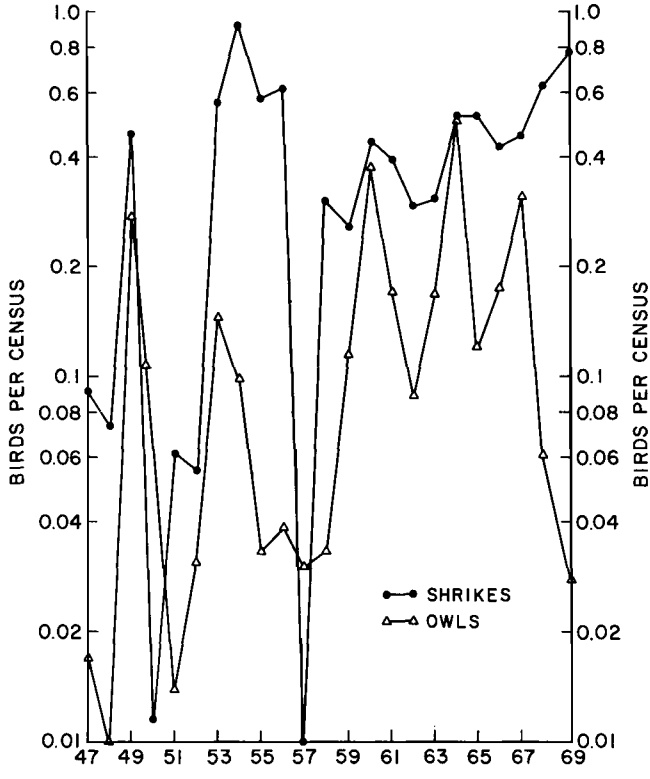

Figure 1. Numbers of shrikes or owls per census plotted on arithlog scales for winters from 1947–48 to 1969–70. Note that in recent years the coincidence was poor.

for recent years can be made for particular areas such as Ontario, New York, and Minnesota plus Iowa.

The data from 1947–48 to 1969–70 plotted on semilogarithmic paper (Figure 1) for owls and shrikes show coincidence in 1949–50, 1953–54, 1960–61, and 1964–65, but starting in 1968–69 the two populations diverge strikingly. Also, it should be noted that the shrikes remained abundant in the winter of 1965–66. It is increasingly clear that the two species are not completely dependent on the same food supply or other cause of emigration (Davis 1960). Part of an explanation might be that the increase in number of reports from Ontario where the bird appears nearly every year might obscure emigrations into the United States. The plot of data for three areas (Figure 2), again on semilogarithmic paper, shows that Ontario has the same synchrony as occurred for New York and for Minnesota plus Iowa, with some exceptions such as in 1959–60 and 1969–70 when the number of shrikes in Minnesota plus Iowa declined sharply, while those in New York and Ontario reached high levels.

The original hypothesis that owls and shrikes depend on the same cause of emigration must now be rejected. No synchrony should have been expected because it is now clear (although data are scanty) that the shrikes wintering in northeastern United States breed east of Hudson's Bay. Unfortunately we know little about the food habits in this region, although the nature of the taiga-tundra ecotone would permit shrikes to encounter lemmings.

Nevertheless considerable synchrony exists between reports of lemmings in Alaska and of owls and shrikes in the northeast. The lemmings declined in the summer of 1949 (Rausch 1950) and both owls and shrikes appeared in the winter

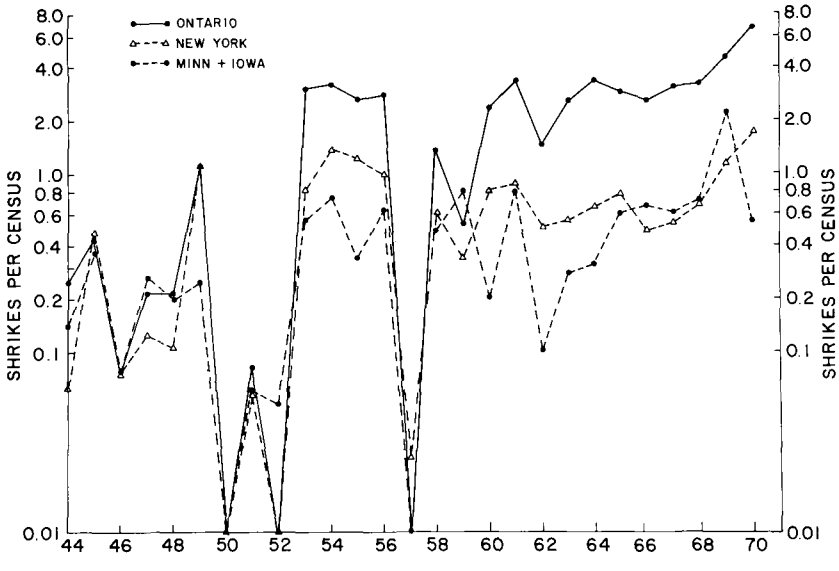

Figure 2. Numbers of shrikes plotted as in Figure 1 for three different geographic regions. Some variations occur between the eastern (New York and Ontario) and western (Minnesota plus Iowa) sectors.

of 1949–50. Then the lemmings declined in the fall of 1953 (Pitelka et al. 1955), and shrikes and owls appeared in the winter of 1953–54. Lemmings again declined in 1956 (Pitelka 1957) and, while shrikes appeared in the winter of 1956–57, owls were scarce. Lemmings again declined in the summer of 1960 (Pitelka 1972) and both shrikes and owls appeared in the winter of 1960–61. However lemmings declined in the winter of 1964–65 (Andrews 1968), and while owls appeared in considerable numbers in 1965–66, the shrikes showed a small increase followed in subsequent years by a continued increase. An additional item is the conclusion by Maher (1970) that the lemming increases and declines occurred in a relatively small area of a thousand square miles around Point Barrow, and other regions might or might not be in phase. Thus one should not expect complete concordance of the lemming peaks and the emigrations of owls.

The shrikes apparently are rare or absent in the places where lemmings are "cyclic" (Pitelka et al. 1955) and thus would not show the population changes. Shelford (1945), Krebs (1964), and MacPherson (1966) studied lemmings in geographic regions that might be a source of shrikes in the northeast. A decline in lemmings occurred in 1960 and in 1961, but an increase in shrikes is not clear (Figures 1, 2). It is now known (Harper 1958, Cade 1967) that shrikes breed in the taiga-tundra ecotone rather than in the Arctic Zone, but because of the interdigitation of tundra and taiga, the shrikes live in places that support the brown lemming.

The concordance of numbers of shrikes in western states and declines of lemmings is not good. Cade (1967, Figure 8) graphs shrike numbers for a region bounded by Alberta, the Dakotas, Colorado, and Oregon. None of the peaks agree with the data given above for lemming declines.

The detailed data on three shrike populations in three geographic regions (Figure 2) show enough differences to indicate that the source must vary from year to year. Note, for example, the increase in Ontario and New York for 1960–61, which was not shared by Minnesota plus Iowa. While in 1961–62 the peaks were coincident in the three places, the peak in Ontario for 1964–65 was not noticeable in either New York or Minnesota plus Iowa. The striking disagreement for 1969–70 and 1970–71 has been mentioned.

This method of analysis does not allow a comparison of the total numbers of shrikes during the past decades principally because the number of individual persons participating in a census has increased. Thus to make comparisons of absolute numbers, one should calculate shrikes per person for each census. The possible results did not seem to justify the labor involved. Perhaps at some time a question will arise for which the data should be analyzed in such a manner, but perusal of the data during the past 70 years does not suggest that an absolute increase in numbers of birds has occurred. From 1900 to 1935 the number of shrikes per census at the peaks varied from 0.4 to 1.1, which is about the same as the peaks in Figure 1.

The data are now sufficiently numerous to permit analysis by particular states in the future. Indeed, the labor involved in tabulating the information for the area discussed in these reports has become excessive. In the future my analyses will be based on particular regions such as Ontario, New York, Minnesota plus Iowa, as the number of censuses for each one of these areas approaches that for the total eastern region in earlier years. Indeed, the data are so numerous and so adequately recorded by geographic location that it might be worthwhile to prepare contour maps of the distribution of the birds in the eastern United States.

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Bald Eagle preys upon Arctic Loon.—A number of authors (Brooks 1922, Bent 1937: 333–339, Munro 1938, Murie 1940, Imler and Kalmbach 1955) have documented diving birds in the diet of the Bald Eagle (*Haliaeetus leucocephalus*). Apparently loons are not taken frequently, and I have seen no previous account of eagles preying upon the Arctic Loon (*Gavia arctica*). The purpose of this note is to document the circumstances surrounding an eagle-loon predator-prey encounter rather than simply to identify the species involved.

In discussing eagle predation, Imler and Kalmbach (1955) note that "many . . . birds captured were taken under conditions of adversity." They elaborate little except to point at the effects of severe weather and to recount an incident in which a hunter nearly lost a wounded duck to an eagle. The latter occurrence is common; a number of hunters have told me of eagles stealing ducks they had shot,