3 (East Hartford, Windham County); Massachusetts 5 (Barnstable County, Dedham, Wakefield, Concord); Indiana 1 (Rose Lawn); Illinois 3 (Warsaw, Evanston, Kane County); Michigan 13 (Ann Arbor, Jackson County, Wastenaw County, Kalamazoo, Darry County, Livingston County, Oakland County); Wisconsin 1 (Beaver Dam); Ontario 17 (St. Clair Flats, Niagara Falls, Liewry, Norfolk County, Middlesex, Brant County, Wentworth County, Toronto, York County, Simcoe County).

B. u. togata.—Maine 3 (Penobscot County, Aroostook County); Wisconsin 6 (Phillips, Woodruff, Drummond, Solon Springs); Michigan 2 (Iron County); Minnesota 1 (Cook County); Quebec 5 (St. Louise, Atalante, Levis); Ontario 12 (Arden, Muskoka, Thunder Bay County, Coppermine Point, Lake Nipigon).

B. u. thayeri.—Nova Scotia 7 (Digby, Dartmouth, Halifax); New Brunswick 1 (St. Stephens).

B. u. umbelloides.—North Dakota 4 (Grafton); Utah 3 (Weber County, Elder County); Manitoba 2 (Carman); Saskatchewan 1 (Prince Albert); Alberta 6 (Hay Lake, Edmonton, Fawcett); Washington 15 (Danville, Curlew, Blue Mountains, Calispel Lake, Sullivan Lake, Tunk Mountains, Oroville, Mazama, Gifford, Colville, Loomis, Entiat, Mount Stewart); British Columbia 21 (Similkameen River, Okanagan Landing, Okanagan, Vernon, Coldstream, Lumby, Mabel Lake, Kootenai Range, Cottonwood, Willow River, Cariboo, Fort St. James).

B. u. yukonensis.—Yukon Territory 3 (Teslin River, Lake La Barge); Alaska 1 (Russian Mission).

B. u. sabini.—Oregon 25 (Scio, Cascade Mountains, Logan, Fort Steilacoom, Parkdale, Willamette Valley, Portland, Beaverton, Blaine, Tillamook); Washington 25 (White Salmon, Shoalwater Bay, Mount Rainier, Cedarville, Kirkland, Nisqually River, Darrington, Olympic Mountains, Puget Sound, Rockport, Bellingham, Whatcom County, Glacier, Whidby Island, Clallam Bay, Neah Bay); British Columbia 17 (Howe Sound, New Westminster, Lund, Vancouver, Port Simpson, Upper Pitt River, Agassiz, Sumas, Chilliwack).

B. u. brunnescens.—Vancouver Island 8 (Comox); Saturna Island 3.

Chicago, Illinois, May 9, 1935.

A NEW SPECIES OF EAGLE FROM A QUATERNARY CAVE DEPOSIT IN EASTERN NEVADA

WITH ONE ILLUSTRATION

By HILDEGARDE HOWARD

Through the courtesy of the Southwest Museum and the California Institute of Technology, I have been privileged to study the bird remains from Smith Creek Cave, a limestone cave near Baker, Nevada. A general account of the excavations during July and August, 1934, has been written by M. R. Harrington (Masterkey, 8, 1934, pp. 165-169), leader of the expedition during which the field work was done, and does not need to be repeated here.

This cave deposit, like the many others of its kind which have come to light within the last few years, is questionably Pleistocene. The Pleistocene horse is present and, among the birds, two species described originally from the Pleistocene of Rancho La Brea. These are *Vultur clarki* (Miller) which has never before been recorded outside of California, and *Coragyps occidentalis* (Miller), known also from Conkling Cavern in New Mexico. It has been remarked before that the presence of *Coragyps* in any great numbers, contrasted with an absence or scant representation of *Cathartes*, is indicative of the Pleistocene. However, in this case, though

Cathartes is absent, *Coragyps* is represented by a single fragmentary tarsometatarsus, so that its presence, though important, is not as instructive as might be desired.

A third extinct species of bird occurs in this deposit. This is a large eagle which does not agree with any other species, living or extinct, with which I have been able to compare it. Unfortunately, it is represented with certainty only by the distal end of the tarsometatarsus. A nearly complete femur, a fragmentary proximal end of the tibiotarsus and several phalanges of eagles are also found, but it is probable that at least the femur and one of the phalanges are of *Aquila chrysaëtos*. The tibiotarsus appears too large for *Aquila* and likely may belong to the different eagle in question; however, it is too fragmentary to furnish any definite information about the species.

The most marked characteristics of the tarsometatarsus are its large size and conspicuous facet for metatarsal I. The size is suggestive of *Thrasaëtus harpyia*, though upon comparison it does not quite equal this form in breadth of distal end and is not so heavily built nor so rugose. Comparisons were made also with *Pithecophaga jefferyi;* the breadth across the trochleae in the specimen of *Pithecophaga* examined does not equal that of the cave bone, but the general build of the bone is similar. However, detailed characters indicate no real relationship of the two forms.

Other species compared were *Haliaeëtus leucocephalus, H. albicilla, Thalassoaëtus pelagicus, Neogyps errans, Morphnus woodwardi, Morphnus guianensis* (cast), *Buteo* (*Geranoaëtus*) *melanoleucus, B. borealis, Urubitinga fragilis, Aquila chrysaëtos, Spizaëtus grinnelli,* and *S. ornatus*. For the opportunity to examine specimens of many of these species I am indebted to the American Museum of Natural History, to Dr. A. Wetmore and the United States National Museum, to Dr. Loye Miller, and to Mr. A. J. van Rossem, in charge of the Donald Dickey collection.

After a careful comparison of the cave tarsometatarsus with these forms, it appears that the nearest relationship is to be found with *Spizaëtus* and *Aquila,* with the balance in favor of the former. I have noted in previous studies that *Aquila* and *Spizaëtus* have many characters in common, and for that reason I have used the subfamily term, Aquilinae, in discussing them in an earlier paper (Howard, Carnegie Institution of Washington, Publ. 429). The tarsus under consideration apparently belongs to this subfamily and is sufficiently close to *Spizaëtus* to warrant placing it in that genus. The only living species of *Spizaëtus* which attains a size large enough to agree with the cave specimen is *S. bellicosus* of South Africa. The chances of identity of the Nevada species and the living South African bird are remote. The cave bird is therefore here described as

Spizaëtus willetti, new species

Type.—Distal end of tarsometatarsus, slightly broken at edges of internal and external trochleae. Specimen no. 1791, collection of California Institute of Technology; collected by M. R. Harrington; trench 5, depth 2 to 4 feet, Smith Creek Cave (loc. 251), 34 miles north of Baker, White Pine County, Nevada; Quaternary age.

Description.—Most striking characters are large size and conspicuous facet for metatarsal I, which is placed high above distal end. Detailed characters follow:

(1) Arching of trochleae similar to *Spizaëtus* (well-arched, but less markedly so than in *Aquila*).

(2) Distal contour of trochlea for digit 2, in both lateral and distal aspects, nearly straight, having only a very gentle curve as viewed distally (closest to *Spizaëtus ornatus* in this respect; *S. grinnelli* and *Aquila* slightly indented near the tip).

(3) Median trochlea with external edge noticeably more developed antero-posteriorly than internal edge (this is true of both *Spizaëtus* and *Aquila*).

(4) External ridge of trochlea for digit 4 projecting as a slender flange well

posterior to the internal ridge (development of external ridge varies in the different species examined, from the short stubby form in *M. woodwardi* and *Thrasaëtus* to the long slender type, similar to the fossil, found in *Aquila* and *Spizaëtus*).

(5) Shaft narrowing slightly above trochleae (closest to *Spizaëtus; Aquila* narrowing decidedly).

(6) Facet for metatarsal I located high on shaft, facing more laterally than is the case in other species examined; facet long and, although not hollowed as in *Thrasaëtus*, is so excavated as to cause a noticeable indentation in outline of internal

Fig. 40. Tarsometatarsus of *Spizaëtus willetti*, Calif. Inst. Tech. coll. no. 1791. Type specimen, natural size: *a*, anterior view; *b*, distal view; *c*, posterior view.

Photograph by H. Wm. Menke, retouched by John L. Ridgway.

edge of shaft as seen in posterior view. High position of facet relative to breadth of distal end agrees with certain specimens of *Thrasaëtus, Pithecophaga,* and *Spizaëtus*. There is some variation in this ratio within a species, enough so that it might be possible to include *Aquila* in the list. However, in such forms as *Haliaeëtus leucocephalus* and *H. albicilla, Thalassoaëtus pelagicus, Morphnus woodwardi* and *Buteo melanoleucus* the facet is definitely lower in position.

(7) Tendinal groove on anterior face wide and clearly marked, though not sharply edged, the shaft rounding away from it gradually on external side. Although the character of the groove itself is similar to *Spizaëtus*, the rounded edge of the shaft is not duplicated in any specimen at hand. Unfortunately the bone is broken away on this side, so that its exact contour is lost.

(8) Anterior surface of shaft, on internal slope, slightly concave and devoid of ridges (*Spizaëtus* closest in this regard, but appears a little more rugose toward internal edge).

(9) Contour of internal edge of shaft, above facet for metatarsal I, slightly concave, the shaft curving outward at point where bone is broken, thus precluding possibility of bone being of long, straight type such as found in *Morphnus woodwardi* or *Buteo;* shape more on the order of *Haliaeëtus, Aquila* or *Spizaëtus*, though not identical with any of them.

(10) In posterior view, internal edge of shaft, above metatarsal facet, rounding posteriorly to slightly overhang posterior face of shaft, as in *Aquila* and *Spizaëtus;* other forms vary from a curved, though not overhanging, edge, as in *Buteo*, to the flaring type found in *Thrasaëtus* and *Pithecophaga.*

Measurements.—Greatest breadth of distal end, approximately 28.5 mm.; breadth of distal end across anterior edge of trochleae, 23.2; height of metatarsal facet, 40.0; depth of external ridge of middle trochlea, 13.0; depth of internal ridge of middle trochlea, 11.3; breadth of shaft at distal foramen, 18.2.

The species name is chosen in honor of Mr. George Willett, ornithologist of the Los Angeles Museum, whose interest and assistance not only in the matter of the specimen at hand, but in the many problems that beset the comparative osteologist, have been deeply appreciated.

Los Angeles Museum, Los Angeles, California, March 8, 1935.

FROM FIELD AND STUDY

Nesting of the Williamson Sapsucker.—On the bright sunny day of May 15, 1934, I made a trip along the Glacier Point road in Yosemite hoping for a visit with the Williamson Sapsuckers. I told Ray Driver, who was my companion for the day, that the sapsuckers could be seen without getting out of the car. However, Ray was quite willing to get out of the car to see one of these showy woodpeckers and so at an altitude of 7,000 feet where a little mountain meadow was an island of green surrounded and walled in by a stand of lodge-pole pines, we stopped the car and went to investigate one of the ancestral nesting trees.

Again, this year, the birds had decided to build in the old home tree. There were fresh chips on the ground at the base of the tree and a fresh-cut, round hole, but there was no response to our knock. Too early, we thought, for incubating birds. We circled around through the woods and soon found another fresh-cut hole. Here in answer to our knock there came the sound of squeally young voices and a Hairy Woodpecker head appeared at the entrance. We left this family in peace and continued our stroll.

Soon we had located the third fresh nest hole, and as we approached, a dark head was seen to duck down into the dark hole. We moved cautiously up to the base of the tree; nothing happened; then we tapped on the tree trunk; still nothing happened. But pounding more vigorously with a stone brought results. A head was cautiously thrust forth and looking up I could see the gleaming red throat patch of a male Williamson Sapsucker (*Sphyrapicus thyroideus*). We looked at each other for nearly a minute and then the sapsucker slowly squeezed out of the hole. The bird was just about seven feet above my head, and looking up I had a grand view of his very yellow belly as he slowly slid out of the hole. He circled, lifted, and came to perch on a limb of the nest tree. Then he moved to the main trunk and hitched upward. When well up toward the top of the tree, fifty feet above the ground, he shouted his hawk-like scream.

While we put up the camera the sapsucker moved about through the neighboring lodge-pole pines, often coming back to his home tree. In fifty-five minutes he came hitching down the trunk to the nest hole. He cocked his head from side to side and gazed into the hole, but did not enter. In less than a minute he was away again in the tree tops. He sounded his harsh call several times. Seemingly in answer to his call the female appeared. This was the first we had seen of the female. The female examined the nest hole, flew up on a branch and uttered a series of low notes. The male joined her, alighting a foot away and uttering a series of low chuckling notes. While giving these notes he strutted along the limb with wing-tips and tail jerking rapidly. As he approached his mate she crouched low on the limb and the mating act was accomplished. The act lasted several seconds before the birds separated to perch side by side on a limb. After a minute or so the female flew off through the woods and the male went into the nest hole. In about five minutes the female came to the nest hole and again uttered her soft coaxing notes. The male came out of the hole and both birds flew to a limb where again the mating act was consummated. The male returned to the nest. In our two-hour watch the female only went to the nest hole to call the mate out.