SHORT COMMUNICATIONS

TEMPORAL RANGE EXTENSION OF *NEOPHRONTOPS AMERICANUS* (ACCIPITRIDAE)

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Neophrontops americanus, a fossil gypaetine vulture from North America, has previously been reported only from late Pleistocene (Rancholabrean) deposits (Howard 1963). In 1966, salvage excavations at the type locality of the Irvingtonian land mammal age (Irvington, Alameda Co., California; see Savage 1951), middle Pleistocene, produced a humerus, which is assigned to *N. americanus* and which I report here. (Also recovered during salvage operations were specimens assigned to the Ardeidae, Phasianidae, Meleagridae, Scolopacidae, and Passeriformes—none previously reported from this locality.) The occurrence of this vulture increases its temporal range and the diversity of *Neophrontops* vultures (*N. americanus* and *N. vallecitoensis*) present in North America during the middle Pleistocene.

The Irvington vulture was compared closely with fossil and recent specimens in collections of the University of California, Museum of Paleontology, Berkeley (UCMP) and the Los Angeles County Museum (LACM). The specimen, UCMP 80998, a nearly complete left humerus lacking most of the deltoid crest and entepicondylar prominence, most nearly resembled *N. americanus*. I therefore borrowed 14 specimens showing the variability in the LACM collection, including the smallest (LACM E4103, length 134 mm) and the largest (LACM F1962, 146 mm). An even larger specimen (LACM E4774, 148 mm) reported on by Howard (1932) could not be found.

Measurements of the Irvington vulture humerus include: depth of internal condyle, 6.7 mm; maximum depth of head, 7.8 mm; maximum width of distal end, from ectepicondylar prominence to internal extension of entepicondyle, 21.1 mm; total length, 133.7 mm; least depth of shaft, 10.1 mm; least width of shaft, 7.7 mm; depth of external condyle, 11.2 mm. The internal tuberosity of the humerus forms an angle slightly less than 90° with the head. The surface between the median crest and the deltoid crest is flattened at the base of the head, a characteristic of the Gypaetinae (Howard 1932), not curved as in other Accipitridae and Cathartidae. The pneumatic fossa is ovoid with its tapering end dorsal. The ligamental furrow is deep, and the distal end of the deltoid crest forms 130° angle with the palmar surface of shaft directly internal to the crest. The tubercle for attachment of M. latissimus dorsi is slightly elevated at its proximal end, becoming a distinct furrow that continues distally along the proximal one-third of the humerus. The brachial depression is triangular (obtuse), and the attachment for the anterior articular ligament forms an obtuse angle with the palmar surface external to it, unlike in cathartids (*Cathartes*) where the angle is nearly 90°. Also, the external condyle is not undercut as in cathartids (*Cathartes*). The olecranon fossa is shallow, and the internal surface of the shaft flares distally more than the external surface.

The humerus of the Irvington vulture shows close similarities to *Neophrontops* in position of nutrient and neural foramina, shape and extent of muscle attachments, shape and orientation of articular surfaces, and degree of curvature of shaft. The bone is the size of the smallest *N. americanus* humerus from Rancho la Brea (LACM E4103), but larger than LACM 129 from San Josecito Cave (see Fig. 1) referred to *N. americanus* by Miller (1943). The Irvington humerus is slightly more robust than those of all the *N. americanus* studied, having a greater minimum shaft width and depth and a greater basal thickness of the deltoid crest. Those humeri of *N. americanus* with the minimum width measurements equaling that of the Irvington specimen vary in total length from 137 to 148 mm. One specimen, however, (LACM E4103), also from Rancho la Brea, almost exactly duplicates measurements of the Irvington humerus.

Four other species—*N. vallecitoensis*, *N. slaughteri*, *N. dakotensis*, and *N. vetustus*—have been assigned to *Neophrontops*, all restricted to North America (Brodkorb 1964, Feduccia 1974). *N. vetustus* and *N.*

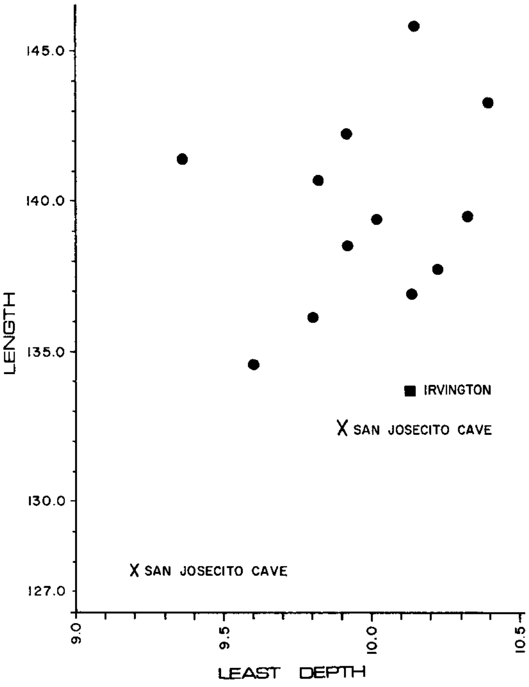

FIGURE 1. Total length of humerus versus least shaft depth for *Neophrontops americanus*. Specimens are from Rancho la Brea, California (black circles), from San Josecito Cave, Mexico (X), and from Irvington, California (black square).

dakotensis are both represented by a single partial humeri, and both are considerably smaller than *americanus* and the Irvington humerus. Both date from mid to late Tertiary, rather than Pleistocene. *N. slaughteri*, from the late Pliocene of Idaho, is represented by only a distal tibiotarsus that is the size of the largest known *americanus* tibiotarsus, the opposite end of the spectrum from the Irvington specimen. Although the large size may indicate specific distinction of *slaughteri* from the Irvington specimen, comparable elements of these two forms are not now available. Thus, a final judgement cannot be made. Feduccia (1974) found differences between *slaughteri* and *americanus* based on the tibiotarsii alone, however. *N. vallecitoensis*, middle Pleistocene in age, is represented only by a partial tarsometatarsus and phalanges, but these are considerably larger than the same elements in *americanus* (Howard 1963). Presumably the humerus, if known, would likewise demonstrate a size increase and thus be larger than humeri of *americanus* and the Irvington form.

The Irvington specimen therefore indicates that *N. americanus* appeared no later than the middle Pleistocene in North America. At that time it was a contemporary of the larger *N. vallecitoensis*, both occurring in California. *N. americanus*, however, was the only *Neophrontops* to survive into the late Pleistocene, becoming extinct in relatively modern times, perhaps before the advent of man in North America.

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PREY OF BAT HAWKS AND AVAILABILITY OF BATS

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The Bat Hawk (*Macheiramphus alcinus*) occurs in parts of the Old World tropics and is considered to feed mainly on bats (e.g., Chapin 1932, Allen 1939, Kingdon 1974). Bat Hawks use their talons to catch flying bats or birds and to transfer prey to their mouths while in the air (Packenham 1936, Eccles et al. 1968). Studies of stomach contents show that bats comprise at least 50% of the diet of Bat Hawks, and swifts and swallows the balance (e.g. Chapin 1932, Gore 1968).

We present an anlysis of the prey represented in the pellets and compare this with available data on the relative abundances of bats in the area from which we obtained the pellets.

On 15 January 1976 we visited the nest of a pair of Bat Hawks near the Hostes Nicolle Institute of Wild Life Research in the Sengwa Wild Life Research Area (ca. 18°10′S, 28°13′E) about 110 km west of Gokwe, Rhodesia. The nest was located about 15 m above the ground in a mountain acacia (*Brachystegia glaucescens*), and has been used by a pair of Bat Hawks for the past 11 years. From under the nest and from under a roost 200 m away in a mnondo tree (*Julbernardia globiflora*), we collected 28 pellets cast by Bat Hawks. The nest was in deciduous woodland and our visit occurred in the wet season. Although we could not be certain, there appeared to have been one young in the nest.

MATERIALS AND METHODS

We dried the pellets in an oven at 90°C for three hours and then teased them apart by hand. All hair samples were washed in carbon tetrachloride to remove dirt and grease, but we did not attempt to remove all solid particles from the hair surfaces to minimize destruction of the cuticular scale patterns. The remains in the pellets were identified primarily on the basis of hairs, feathers and insect parts notwithstanding. We also relied on teeth and skull fragments to aid identification in some cases.

Hairs were examined microscopically. As diagnostic characters we used hair length and color, and details of cuticular scale patterns. The patterns were obtained from whole mounts and as impressions using clear fingernail lacquer and acetone. Hairs from the pellets were compared to reference collections of bat hairs from appropriate specimens, and to the illustrations in Tupinier (1973). Because of the difficulties associated with recognizing species of bats by hair characteristics (e.g., Nason 1948), our identifications are to the generic level; in some cases this is equivalent to the species. We have no evidence that the hairs of some bats were more prone to digestion than others, and presume our samples to be representative.

The relative abundances of bats in the vicinity of