FOSSIL BIRDS FROM THE ANZA-BORREGO DESERT

By Hildegarde Howard
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DAVID K. CALDWELL

Editor
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ABSTRACT: Avian remains from the Vallecito Creek fauna indicate the presence of at least 28 species, including grebes, geese, ducks, raptores, quail, turkey, rail, coot, kildeer, woodpecker and perching birds. At least ten extinct forms occur, six of which are here described as new; on the basis of relative number of extinct species, the fauna is seemingly younger than the Rexroad or Hagerman Lake faunas, but older than late Pleistocene faunas typified by the Rancho La Brea.

The avian fossils here to be discussed were collected with a much larger representation of mammals, and a few reptiles, in the Vallecito Creek valley of the Anza-Borrego desert, San Diego County, California. Field parties, directed by Dr. Theodore Downs, of the Los Angeles County Museum, have been engaged in collecting and mapping this area, under grants from the National Science Foundation, since 1958 (nos. G 5035 and G 11360). Preliminary reports of the results of the work appeared as abstracts of papers presented at meetings of the Geological Society of America (Downs, 1957, and Downs and Woodard, 1961). In the latter, such mammalian genera as Megalonyx, Stegomastodon, Tremarctos, Equus (Plesippus), and Tanupolama are tentatively recorded, and the authors conclude that the fauna is deposited in the Upper Palm Spring formation, which they consider to be of middle Pleistocene age. One other paper concerning the collections from Vallecito Creek describes a new species of pocket gopher, genus Geomys (White and Downs, 1961).

Unlike the abundant horse, camel and gopher, whose remains were widely and profusely distributed throughout the many collecting sites in the Vallecito Creek area, no avian species is represented by more than eleven bones, and the entire avian collection was recovered from only 25 separate collecting sites. The bird remains are poorly preserved, and seem to represent a fortuitous sampling of the avifauna of the area. Approximately 100 bones are sufficiently diagnostic to merit mention.

The more than three hundred collecting sites within the Vallecito Creek area have each been given individual Los Angeles County Museum Vertebrate Paleontology locality numbers. Where locality numbers are indicated in the following pages, it will be understood that reference is to these sites. A detailed account of the stratigraphic and geographic position of localities in the area is in preparation by Downs and Woodard. The twenty-five avian localities are to be found within the boundaries mapped on the United States Geological Survey (1959) Arroyo Tapiado and Agua Caliente Springs quadrangles of California, and in particular in Township 14 south, Range 7 and 8 east, and sections 14, 15, 23, 24, 25, 30, 32, and 36.

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Specimen numbers in the text refer to the catalogued collections in vertebrate paleontology at the Los Angeles County Museum.

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Photographs were made by George Brauer; retouching and art work by Mary Butler.

DESCRIPTION OF THE AVIFAUNA

The identifiable avian remains in the Vallecito Creek fauna represent nine orders, and at least thirteen families and twenty-eight species. About half of the species are represented by only one or two bone fragments from one or two collecting sites. No species can be said to be characteristic of the area. At best four or five sites seem to be the limit of occurrence of any one form.

Of the nine orders, the Anseriformes is most abundant (28 bones, 7 species, 10 sites), the Passeriformes a close second (26 bones, at least 6 species, 7 sites); next the Falconiformes (15 bones, 4 species, 5 sites) and Gruidiformes and Galliformes (13 and 12 bones respectively, and 2 species and 5 sites each), followed by the Strigiformes and Podicipediformes (4 bones, 2 species each, the owls from 3 sites, the grebes from 2), Charadriiformes (2 bones, 1 species, 1 site), and Piciformes (1 bone). Suggestion of association of skeletal elements occurs in only a few species; in two of these several pedal phalanges are associated with tarsometatarsus.

Forty-seven bones are believed to represent ten extinct species, of which six are newly described. Twenty-nine specimens cannot be distinguished from those of existing species and are assigned, at least tentatively, to nine species. Thirty bones can be only loosely assigned within a family or order; these represent at least another nine species and may include additional extinct forms, especially among the Passeriformes. Nearly 30 fragments are unidentified.

The avifauna, as identified, is listed below; extinct forms are starred.
List of Birds in the Vallecito Creek Fauna

Podicipediformes—Grebes
  *Podiceps caspicus
  *Podiceps, sp.

Anseriformes—Ducks and Geese
  *Anser, sp.
  *Brantadora downsii, new genus and species
  *Anas acuta?
  *Anas clupeata
  *Bucephala fossilis, new species
  *Melanitta perspicillata?
  *Oxyura bessoni, new species

Falconiformes—Diurnal Birds of Prey
  *Teratornis incredibilis
    Hawk, sp.
    *Aquila chrysaëtos?
  *Neophronvrops vallecinensis, new species

Galliformes—Fowl
  *Lophortyx gambeli
  *Agriocharis anza, new species

Gruiformes—Rails and Cranes
  *Rallus limicola?
  *Fulica americana?
  *Fulica hesterna, new species

Charadriiformes—Shorebirds
  *Charadrius vociferus

Strigiformes—Owls
  *Asio, sp.
  *Strigidae, sp.

Piciformes—Woodpeckers
  *Picinae, sp.

Passeriformes—Perching Birds
  *Corvidae, sp.
  *Fringillidae, sp.
  *Passeriformes, sps. (4 or more sps.)

Podicipediformes
  *Podiceps caspicus

A distal end of humerus (no. 2791) from locality 1433 resembles this element in Podiceps as distinguished from that of Podilymbus in having a narrower, more shallow impression of the brachialis anticus muscle. Other characters fall within the range of variation of Podiceps caspicus, and the fossil is, therefore, assigned to this existing species. A proximal end of tarso-metatarsus (no. 2879) from the same locality is also so assigned. It is im-
mediately distinguishable from that of *Podilymbus podiceps* by its slenderness, and in this respect resembles *Podiceps caspicus*. The fossil is slightly narrower proximally than in *Podiceps auritus*, and the small ridge extending distally from below the hypotarsus is also narrower than in the latter species.

*Podiceps, sp.*

A nearly complete left tarsometatarsus (no. 2854) and a distal half of the same element of the right side (no. 2853), both from locality 1606 and probably belonging to the same individual, are distinct from specimens of Recent species compared. In length the complete bone falls between Recent specimens of *Podiceps grisegena* and *Aechmophorus occidentalis*. It closely approximates the size of three complete tarsometatarsi from the San Diego Pliocene. The San Diego grebe was originally assigned to *Podiceps parvus* (Howard, 1949: 183-185) on the basis of size of tibiotarsus, carpometacarpus, humerus and proximal end of tarsometatarsus. All of these bones are smaller than Recent specimens of *P. grisegena* but larger than those of *P. auritus*, as is also true of the type tarsometatarsus of *P. parvus* and associated coracoids and carpometacarpus from Fossil Lake, Oregon, Pleistocene. The complete tarsometatarsi now available from San Diego are found to be 8-11 mm. longer than the type of *P. parvus*, and actually longer than this element in *P. grisegena*, although more slender. It is suggested, therefore, that the San Diego grebe, although similar in body size to *P. parvus*, was a longer-legged bird, probably of a different species.

The Vallecito tarsometatarsi may belong to this same San Diego species; certainly they resemble the San Diego specimens in general size and proportions more closely than any others examined, although the complete bone (no. 2854) is 1.3 mm. longer. Possible distinctive characters are noted in the intercotylar area, and the hypotarsus in no. 2854, but these may be due to the fact that the bone had undergone considerable crushing. It is considered unwise to establish the rather poor Vallecito material as the type of a new species at least until the San Diego collection can be thoroughly reviewed.

**Anseriformes**

The excellent work by Woolfenden (1961) on the postcranial skeleton of this order has been of immeasurable assistance in studying the anseriform bones found in the Vallecito Creek fauna. At the same time, it has served as a guide in pointing out the limitations to specific identification within the group. Great variation may be encountered in this order, even within a genus, and certain elements have little diagnostic value. Without a large series of Recent material for comparison, definite identification of the fragmentary fossil specimens presented a real problem. It is safe to assert, however, that at least seven anseriform species are represented, all but one in the subfamily Anatinae (as recognized by Delacour, 1954: 17). Apparently four tribes of the latter subfamily are represented.
Anser (Chen) sp.
Plate III, fig. C.

The only avian bone from locality 1514 is a proximal end of right humerus (no. 2783), lacking the bicipital portion. It belonged to a large goose of about the size of Branta canadensis interior, or B. c. canadensis, but with characters more suggestive of those of the smaller Anser (Chen) hyperboreus. The prominent ridge extending up the shaft towards the head is more external in position than in available Recent specimens of Anser albiifrons, but a similarly placed ridge is found among specimens of A. hyperboreus and Branta canadensis. A distinct line beneath the humeral head, marking the proximal border of the attachment of the head of the triceps muscle, is recorded by Woolfenden (op. cit.: 9) as most often found in humeri of the genus Branta. Such a line, however, occurs as well in some Recent specimens of A. hyperboreus (LACM no. Bi 1437). The proximal end of the fossil humerus curves so that the head is bent slightly anconally, a character also suggestive of some specimens of A. hyperboreus; the anconal border of the head is evenly rounded and does not overhang the shaft or the capital groove, again more like A. hyperboreus than Branta canadensis. The head is relatively thicker, measured from anconal to palmar surfaces, than in either of these species.

Because of the great range of variation encountered in Recent skeletons of geese, and the incompleteness of the fossil specimen, I consider it unwise to establish a distinct species on the basis of this specimen although the combination of large size with characters noted above suggests that the species represented is no longer existent. Comparisons with previously described species of extinct geese are not wholly satisfactory since only two species, Eremochen russelli, from the Pliocene of Oregon, and Branta propinquua, from the Pleistocene or Oregon, are represented by the humerus. The element in Eremochen, as described by Brodkorb (1961: 174) has a more prominent head, and more distally located external tuberosity; also the distal border of the humeral head on the anconal side projects markedly towards the internal side and overhangs the capital groove.

Branta propinquua was smaller even than Branta nigricans, whereas the Vallecito Creek humerus represents a very large goose. Anser pressus from the Idaho Pliocene, and Branta esmeralda of the Nevada Miocene, though larger than B. propinquua, were probably of smaller size than the fossil at hand. Presbychén abavus from the California Miocene and Branta dickeyi from the California Pleistocene and Oregon Pliocene (?) are at the opposite extreme in size, and exceed even Branta canadensis canadensis. Branta hypsibata from the Oregon Pleistocene is only questionably valid as a species (Howard, 1946: 167) since the type tarsometatarsus rather closely resembles slender specimens of Anser hyperboreus. Even if valid, it would seem to have been a smaller, more slender bird than the one from Vallecito Creek.

Branta howardae from the California Pliocene is based on so small a fragment of carpometacarpus of such unusual character that it is doubtful that
other parts of the skeleton can with certainty be ascribed to the species unless
found associated with a similar carpometacarpus. The size of the type of *B.
howardae* appears to be suitable for the species represented by the Vallecito
Creek humerus.

Measurements of Vallecito Creek humerus no. 2783: breadth across head
and external tuberosity, 23.5 mm.; thickness of head (from palmar to anconal
sides), 13.0 mm.; ratio of thickness of head to breadth across head and ex-
ternal tuberosity, 55.7 per cent.

An incomplete coracoid (no. 3717), from locality 1360, also represents
a large goose. Whether it is of the same species as the humerus cannot be
determined. Only a portion of the lower end is preserved and there are no
dependable diagnostic characters.

**Brantadorna, new genus**

*Type species: Brantadorna downsi.*

*Generic diagnosis:* Humerus with shaft relatively shallow, but bearing
acute ridge anconally, directed toward external tuberosity and joining with
line for attachment of head of triceps muscle slightly mediad to external tuber-
osity; external tuberosity prominent; attachment of latissimus dorsi anterioris
muscle well external to shaft ridge and paralleling it; head (as seen in palmar
view) forming abrupt, obtuse angle with capital groove. Coracoid with furcular
facet completely undercut and area below deeply depressed, but without fora-
mina; furcular facet apparently lacking a notch; glenoid facet visible when
bone viewed dorsally, furcular facet less visible, facing more internally; neck
(in external view) almost flat.

**Brantadorna downsi, new species**

*Plate I, figs. G—I*

*Type:* Proximal end of right humerus lacking bicipital area and internal
tuberosity; L.A. Co. Mus. no. 3911. Collected by Harley Garbani, Dec. 28,
1958.

*Locality:* L.A. Co. Mus. loc. no. 1323; Mesquite Oasis. Arroyo Tapiado
quad. (1959); California coordinates: 2,008, 985-274,496.

*Fauna:* Vallecito Creek.

*Age and formation:* Middle Pleistocene; Upper Palm Spring formation.

*Paratype:* Proximal half of right coracoid, L.A. Co. Mus. no. 3910, col-
clected with type at type locality.

*Diagnosis:* Characters of species the same as for genus, and, in addition:
humerus with head bending anconally; proximal contour of head broad and
low; pectoral attachment on external tuberosity facing slightly externally; cora-
coid with glenoid facet slightly depressed and contour abruptly flared above
scapular facet.

*Referred material:* Fragment of distal end of humerus from type locality,
possibly from the same bone as the type proximal end; too poorly preserved to contribute information.

*Measurements:* Humerus: breadth across head and external tuberosity, 16.2 mm.; thickness of head (from anconal to palmar sides), 8.4 mm.; length pectoral scar on external tuberosity, 6.9 mm.; distance from external border of attachment of head of triceps muscle to medial edge of pectoral attachment on external tuberosity, 2.9 mm.; distance from median crest to shaft ridge, 7.2 mm. (although the median crest itself is not present, its distalmost edge has left an impression in the matrix). Coracoid: distance from procoracoid to head, 16.0 mm.; breadth across furcular facet, 9.1 mm.; breadth below furcular facet, 8.5 mm.; height (proximo-distally) glenoid facet, 7.9 mm.; breadth glenoid facet, 6.4 mm.

*Discussion:* While the prominence and acuteness of the shaft ridge, the obtuseness of the angle between the head and capital groove, and the position of the attachment of the latissimus dorsi anterioris muscle of the humerus are suggestive of conditions noted in *Branta*, the broad, low head and shallow shaft are ducklike; the external position of the shaft ridge, and the abruptness of the angle between the head and capital groove are more typical of *Tadorna*; the prominence of the external tuberosity is also tadornine in degree, between the ducks and geese. The least breadth of the area between the shaft ridge and pectoral scar is only 40 per cent of the distance from the medial crest to the shaft ridge; in *Branta* and *Anser* it is over 50 per cent, in *Tadorna* 36-38 per cent. In the deep depression of the triossseal canal of the coracoid, with strong undercutting of the furcular facet, *Brantadorna* most nearly resembles the smaller, Gadwall duck, *Anas strepera*. However, the rotation of this area is typically ducklike in the latter species, whereas it is more gooselike in *Brantadorna*.

As members of the tribe Tadornini have been observed (Woollenden, *op. cit.*) to combine characters of both Anserinae and Anatinae, and some tadornine genera have marked anserine characters, I recommend the referral of *Brantadorna* to the Tadornini. The generic name is selected to denote the dual character of the form; the species name, *downsi*, is chosen in honor of Dr. Theodore Downs.

In a study now under way on fossil *Anabernicula* from several localities, I have become convinced that this genus, too, is tadornine. Comparison of *Brantadorna* with *Anabernicula* reveals the following distinctions in *Brantadorna*: head of humerus forming obtuse rather than right angle with capital groove, shaft ridge more acute, attachment of latissimus dorsi anterioris muscle more externally placed and more nearly parallel to shaft; coracoid more undercut below furcular facet, and furcular facet lacking notch. In all of these characters, *Brantadorna* is more gooselike than is *Anabernicula*.

*Anas acuta?*

A distal three-quarters of carpometacarpus with fragment of process of metacarpal 1, and a complete wing phalanx (digit 2, phalanx 1) found together
Plate I. A-C, Bucephala fossilis, n. sp., A and B, type carpometacarpus, internal and external views, C, paratype humerus, anconal view; D, E, Oxyura bessomi, n. sp., type carpometacarpus, internal and external views; F, Fulica hesterna, n. sp., type tibiotarsus, anterior view; G-I, Brantadorna downsi, n. sp., G, type humerus, anconal view, H and I, paratype coracoid, internal and dorsal views. All figs. x 2.
at locality 1759, and bearing catalog number 2868, resemble the Pintail Duck, *Anas acuta* in size and such characters as are observable. The diagnostic troicho-ilar end of the carpometacarpus is lacking.

*Anas clypeata*

A proximal end of carpometacarpus (no. 2789) from locality 1114, cannot be distinguished from Recent specimens of the Shoveller Duck, *Anas clypeata*. A proximal end of humerus (no. 2871) from locality 1249, also resembles specimens of this living species except that the external edge of the shaft anconally tends to be slightly more angular, and in this one respect is closer to the Gadwall, *Anas strepera*.

A proximal end of ulna (no. 2784, locality unknown), and an articular end of scapula (no. 4966 from loc. 1433) have the general characters and size suitable for this species. For these latter, undiagnostic elements, the assignment is made tentatively.

*Bucephala fossilis*, **NEW SPECIES**
Plate I, figs. A-C


*Fauna*: Vallecito Creek.

*Age and formation*: Middle Pleistocene; Upper Palm Spring formation.

*Paratype*: Proximal portion of left humerus, L.A. Co. Mus. no. 2885, lacking bicipital area and internal tuberosity; from type locality; John White, collector, June 29, 1961.

*Diagnosis*: Carpometacarpus similar to that of *Bucephala albeola* in general conformation, and particularly in prominence of diagonal ridge on external surface of head. Distinguished from *B. albeola* by more proximally upturned process of metacarpal 1, with inferior border (as viewed externally) slanting upward directly from facet for digit 1; in *B. albeola* process jutting forward rather than upward.

Humerus distinguished from that of *B. albeola* by more prominent angularity of shaft anconally, with more marked depression between apex of shaft and pneumatic fossa; attachment of supraspinatus muscle, beneath pneumatic fossa, markedly raised; pectoral attachment on external tuberosity shorter and less tilted palmar.

*Referred material*: One proximal end and one fragment of carpometacarpus from the type locality, nos. 2886, 2887, resembling, the type insofar as characters are preserved; proximal fragments of ulna and scapula, and a manubrial fragment of sternum (all no. 4966 from locality 1433), tentatively referred. Ulna with deep humero-ulnar depression suggestive of the condition
found in the ulna of *Melanitta perspicillata*, but element much smaller than in that existing species; scapula with less extended acromion (laterally) than in *B. albeola*; manubrium of sternum similar to that of *B. albeola* in contour of ventral lips of coracoidal sulci and V-shaped connection of sulci, without spine, but notch in dorsal manubrial area much more pronounced; large, centrally placed dorsal pneumatic foramen 4.6 mm. posterior to center of dorsal notch.

*Measurements of type and paratype:* Carpometacarpus, breadth carpal trochlea, 3.8 mm.; greatest depth proximal end through process of metacarpal 1, 9.1 mm.; height process of metacarpal 1, 5.7 mm.; depth immediately below facet for digit 1, 3.8 mm. Humerus, breadth across head and external tuberosity, 10.0 mm.; depth head, 4.7 mm.; length pectoral scar on external tuberosity, 4.1 mm. Measurements of referred specimens.—Carpometacarpus no. 2886, breadth carpal trochlea, 3.5 mm.; greatest depth proximal end, 8.2 mm.; height process metacarpal 1, 5.2 mm.; depth immediately below facet for digit 1, 3.5 mm.; scapula no. 4966, greatest breadth proximally, 6.8 mm.; breadth posterior to acromion through glenoid facet, 5.8 mm., distance from coracoidal tuberosity to acromion, 5.5 mm., height glenoid facet through coracoidal tuberosity, 4.5 mm., breadth shaft posterior to facet, 3.6 mm.; ulna no. 4966, breadth proximal end, 6.7 mm., depth proximal end, 5.8 mm.; sternum no. 4966, breadth across ventral lips of coracoidal sulci in central manubrial area, 12.1 mm., breadth across dorsal manubrial notch, 6.9 mm.

*Discussion:* One other fossil species in North America has been referred to the genus *Bucephala*, namely *B. ossivalis* from the Pliocene of Bone Valley, Florida, described from a coracoid. *B. fossilis* cannot be directly compared with this species, as no coracoid referable to the genus has yet appeared in the Vallecito Creek material. However, comparisons of size relative to *B. albeola* and *B. clangula* appear to justify distinction. *B. ossivalis* is said to be larger than *B. albeola* and smaller than *B. clangula* (Brodkorb, 1955:19). Brodkorb's measurements of the type coracoid of *B. ossivalis* are from 10 to 17 per cent greater than comparable maximum measurements on available specimens of *B. albeola* in the Recent skeleton collection of the Los Angeles County Museum, and from 7 per cent smaller to within range of specimens of *B. clangula*. On the other hand, *B. fossilis* falls within the range of size of *B. albeola* in one or more measurements of each element with the exception of the tentatively referred ulna, and is from 12 to 21 per cent smaller than *B. clangula*. The ulna referred to *B. fossilis* is 1 per cent deeper and 8 per cent broader in proximal end than the maximum of *B. albeola* and from 10 to 11 per cent smaller than in *B. clangula*.

Added evidence suggesting distinction of the two fossil species lies in the reduced extent of the acromion on the scapula tentatively referred to *B. fossilis*, resulting in a short span from the coracoidal articulation to the acromion. This suggests a relatively short procoracoid on the coracoid, in contrast to the description of a well developed procoracoid for *B. ossivalis* (Brodkorb, op. cit.). These comparisons coupled with the apparent discrepancy in age, as well
as space, for the two occurrences justifies the naming of the separate species from Vallecito Creek.

_Melanitta perspicillata_

A left scapula (no. 2878) from locality 1758, resembles Recent specimens of the Surf Scoter in its heaviness, its relatively straight internal margin, and blunt acromion. The scapula is, however, an undependable element on which to base identification. A fragment of glenoid facet of coracoid was found with the scapula and may belong to the same species. Fragments of ulna, radius and sternum were found at the same locality and possibly represent the same species, but are too fragmentary for identification.

**Oxyura bessomi**, **new species**

Plate I, figs. D-E

*Type:* Left carpometacarpus lacking only metacarpal 3 and portion of distal contour. L.A. Co. Mus. no. 2785; collected Dec. 2, 1958 by Leonard C. Bessom, for whom the species is named.

*Locality:* L.A. Co. Mus. loc. no. 1304, south side of Vallecito Creek, Arroyo Tapiado quad. (1959), California coordinates: 2,011,500-269,150; separated from major portion of Vallecito Creek type section by faulting.

*Fauna:* Vallecito Creek.

*Age and formation:* Middle Pleistocene, Upper Palm Spring formation.

*Diagnosis:* Carpometacarpus with posterior contour of external crest of trochlea receding abruptly below articular facet, providing a concave outline that faintly rims, but reveals fossa at base of trochlea when viewed externally; rimming of fossa discernible as faint ridge without lobe when fossa viewed posteriorly; posterior rim of internal crest slightly deflected medially, attachment of metacarpal 3 almost merging with base of internal crest of trochlea, and proximal symphysis short; external surface, proximally, having deep groove running posteriorly from ligamental attachment to external crest of trochlea; area proximal to ligamental attachment low, and proximal contour of external crest broadly rounded; marked longitudinal ridge below ligamental attachment abruptly delimiting metacarpal 1; otherwise external surface flat; process of metacarpal 1 well defined and directed more forward than upward.

*Referred material:* Distal end of left ulna, no. 2784, from type locality; proximal end of left carpometacarpus lacking process of metacarpal 1, no. 2888, from locality 1430; nearly complete left coracoid, no. 2535, from loc. 1114; and proximal end of right coracoid, no. 4966, from locality 1433.

The shaft of the ulna is relatively deeper than in the existing species of _Oxyura_, and the intermuscular line running up from the carpal tuberosity is more sharply delineated than in most Recent specimens compared. The ulna, however, is not a dependable element for diagnosis, and the characters tend to vary. The referred coracoids have the deep furcral facet, reduced brachial tuberosity, and absence of deep excavation under the facet, characteristic of this element in _Oxyura_. They differ from specimens of _O. jamaicensis_ and _O._
ferruginea in greater depression of shaft below the furcicular facet; thin, more angular ventro-internal margin of shaft; more inwardly curved procoracoid with greater excavation of shaft adjacent thereto; smoothly notched furcicular facet; relatively wider shaft below procoracoid.

The referred carpometacarpus differs slightly from the type and is closer to the existing species in having a shorter external longitudinal ridge, a slightly higher proximal contour of the external crest as it rims the carpal fossa; on the other hand, the internal trochlear crest is more medially deflected than in the type, thus still farther deviated from the condition found in the existing species.

**Measurements:** Type carpometacarpus, length to facet for digit 3, 33.6 mm.; height process metacarpal 1 (proximo-distally), 4.9 mm.; depth head from tip of process of metacarpal 1 to posterior edge of internal crest of trochea, 8.3 mm.; breadth carpal trochea, 3.5 mm.; height distal symphysis, 4.5 mm. Coracoid no. 2535, length to middle of sternal end, 37.2 mm.; breadth furcicular facet, 4.85 mm.; breadth below furcicular facet, 5.1 mm.; distance from distal edge of scapular facet to head, 10.8 mm.

**Discussion:** A concave posterior contour of external crest of the trochea occurs in both the aythine and the oxyurine ducks, but the abruptness of the outline as it recedes below the articular facet, and the faint ridge rimming the fossa are characteristic of Oxyura. The high attachment of metacarpal 3 with reference to the carpal trochea, and consequent thickness of the neck immediately below the trochea, also separate the fossil from the aythine ducks, and show relationship to Oxyura. Compared with Recent specimens of Oxyura jamaicensis and O. ferruginea, the entire bone is stockier, there is less evidence of a lobe on the external rim of the carpal trochea below the articular facet, the internal crest is more medially deflected posteriorly, the proximal contour of the external trochlear crest is more broadly rounded and lower with respect to the proximal contour of the internal crest, and the process of metacarpal 1 is more clearly defined and juts out from the digital facet at a more abrupt angle. In each of these characters, O. ferruginea is slightly closer to the fossil than is O. jamaicensis. In neither existing species is the external longitudinal ridge clearly defined, although a shorter ridge or scar occurs in some specimens; the flatness of the external surface adjacent to the location of the ridge is observed in one or two Recent specimens.

On the basis of the characters of the type carpometacarpus, one is tempted to assign this fossil species to a distinct genus. The variations noted in the referred carpometacarpus, however, narrow the differences from existing species of Oxyura in most respects. Also, if, as I believe, the coracoids are correctly referred to O. bessomi, resemblance to Oxyura is marked.

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*Plate II.* A and C, Teratornis incredibilis, distal portion of radius, palmar and anconal views; B, Teratornis merriami, maximum-sized specimen of radius from Rancho La Brea, palmar view. All figs. x 1.
FALCONIFORMES
Teratornis incredibilis
Plate II

A distal end of a radius with part of the shaft (no. 3803), from locality 1318, is assigned to Teratornis incredibilis, known heretofore only from the type cuneiform (Howard, 1952:51) found in Smith Creek Cave, Nevada, of late Pleistocene age. Assignment of the radius to this species is based on its general resemblance to that of Teratornis merriami and its tremendous size. Generic characters, as contrasted to the condor, genus Gymnogyps, are: shaft thick and angular externally; distal end markedly flared and thickened internally, expansion and thickening extending for greater distance proximally than in Gymnogyps; external expansion more pointed than internal and not extending so far proximally.

Size alone is sufficient to distinguish this bone from that of Teratornis merriami. There are, however, the following qualitative characters that define the species T. incredibilis in spite of the fact that the surface contours of the Vallecito radius are somewhat eroded: distal contour straighter; ligamental prominence extending more proximally, and more markedly set off from shaft in palmar view (the bone is crushed here, but crushing cannot wholly account for the abrupt drop from the prominence to the shaft); shaft immediately above distal end (palmar view) flat (see ratio in table of measurements); tendinal groove (anconal face) adjacent to ligamental prominence deeper than in T. merriami and extending farther proximally; groove adjacent and external to this, narrower than in T. merriami.

Measurements of Radius

<table>
<thead>
<tr>
<th></th>
<th>T. incredibilis</th>
<th>T. merriami (maximum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breadth distal end</td>
<td>37.3 mm.</td>
<td>26.7 mm.</td>
</tr>
<tr>
<td>Depth distal end (internally)</td>
<td>14.6 mm.</td>
<td>11.1 mm.</td>
</tr>
<tr>
<td>Depth distal end (externally)</td>
<td>11.1 mm.</td>
<td>8.2 mm.</td>
</tr>
<tr>
<td>Breadth shaft above distal end</td>
<td>17.0 mm.</td>
<td>11.0 mm.</td>
</tr>
<tr>
<td>Depth shaft above distal end</td>
<td>12.0 mm.</td>
<td>9.3 mm.</td>
</tr>
<tr>
<td>Ratio depth to breadth shaft</td>
<td>70.6 %</td>
<td>84.6 %</td>
</tr>
</tbody>
</table>

Hawk, sp.

A proximal tip of humerus (no. 3804) from locality 1319 represents a hawk of about the size of Buteo swainsoni. It is distinguished from the humerus of falcons or caracara by the very moderate excavation of the capital groove, with no undercutting of either the head or the proximal surface of the median crest. The specimen is too incomplete to attempt to establish its relationship among the hawks.
Aquila chrysaetos?

Two incomplete pedal phalanges, phalanx 1, digit 1 and phalanx 2, digit 2, (both no. 2779) from locality 1614, are similar in contour to those of the Golden Eagle, Aquila chrysaetos, and seem to fall within the size range of that species.

Neophrontops vallecitoensis, new species

Type: Distal half to two-thirds of left tarsometatarsus, badly broken in matrix, but pieced together in laboratory; with associated fragment of metatarsal 1, and 8 pedal phalanges; L.A. Co. Mus. no. 2866; collected by J. A. White and H. J. Garbani, Jan. 23, 1963.


Fauna: Vallecito Creek.

Age and formation: Middle Pleistocene; Upper Palm Spring formation.

Paratype: Distal end of right tarsometatarsus, L.A. Co. Mus. no. 3769, from locality 1356, Arroyo Tapiado; collected by Kay Murphy, March, 1959.

Diagnosis: Closely resembling tarsometatarsi of Neophrontops americanus Miller but larger. Compared with broadest Rancho La Brea specimen (L.A. Co. Mus. no. E2061), both type and paratype with distal trochlea deeper anteroposteriorly, and facet for metatarsal 1 more elevated; shaft of type deeper anteroposteriorly but relatively more slender in lateral dimension, and more abruptly sloping from a high angle nearly centrally located on anterior surface of shaft (this portion of shaft missing in paratype).

Discussion: Of 96 measurable specimens of N. americanus in the L.A. County Museum collections from Rancho La Brea, none equals the type of N. vallecitoensis in either breadth of distal end or depth of shaft, and only one specimen equals the slightly smaller paratype in breadth of distal end. In the entire Rancho La Brea series, only three or four specimens have the facet for metatarsal 1 relatively as elevated when taken in proportion to breadth of distal end. The ratio of depth of trochlea to breadth of distal end is exceeded in the Rancho La Brea series, but actual depth of trochlea is not equalled. The shape of the shaft as described for the type is not duplicated in the N. americanus series. Although length cannot be measured for Neophrontops vallecitoensis, comparison of the type with specimens of N. americanus (using the greatest depth of shaft as point of reference) indicates that the Vallecito Creek bone must have been at least 115 mm. in length if not more. Greatest length for N. americanus (see Howard, 1932, p. 80) is 97.2 mm. Other measurements for both type and paratype are shown below.

Metatarsal 1 of N. americanus is not available for comparison. The Vallecito Creek fragment of distal end of this element differs from that of hawks and eagles, and more closely resembles that of the old world type of vultures in the presence of two nearly equal, narrow tendinal grooves; in the more strictly predatory hawks and eagles, in which the foot is a strong grasping tool,
the medial groove is greatly enlarged at the expense of the more lateral one. In comparison with the few pedal phalanges in the Rancho La Brea collection thought to represent _N. americanus_, the Vallecito Creek phalanges are straighter (less bowed anteriorly) as well as larger.

**Measurements of Type and Paratype of _Neophrontops vallecitoensis_ compared with maximum for _N. americanus_**

<table>
<thead>
<tr>
<th></th>
<th><em>Neophrontops vallecitoensis</em></th>
<th><em>N. americanus</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tarsometatarsus</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breadth dist. end</td>
<td>19.6 ap.mm.</td>
<td>17.4 mm.</td>
</tr>
<tr>
<td>Greatest depth shaft</td>
<td>9.4</td>
<td>—</td>
</tr>
<tr>
<td>Depth first trochlea</td>
<td>10.1</td>
<td>8.5</td>
</tr>
<tr>
<td>Depth mid. trochlea</td>
<td>—</td>
<td>7.7</td>
</tr>
<tr>
<td>Depth 3rd trochlea</td>
<td>9.8</td>
<td>9.0</td>
</tr>
<tr>
<td>Distance from prox.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>edge facet for M1 to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>dist. end 1st trochlea</td>
<td>23.5</td>
<td>20.1</td>
</tr>
</tbody>
</table>

| **Metatarsal 1**     |                               |                 |
| Breadth distal end   | 8.1                           |                 |
| Pedal phalanges (length) |                     |                 |
| D1, Ph 1             | 25.1                          |                 |
| D2, Ph 2             | 20.1                          |                 |
| D3, Ph 2             | 17.6                          |                 |
| D4, Ph 4             | 13.5                          |                 |

Two other species of _Neophrontops_ are recorded in the fossil record, _N. dakotensis_ from the South Dakota Pliocene, and _N. vetustus_ from the Nebraska Miocene. Each is described from a humerus of lesser size than that of _N. americanus_.

**Galliformes**

*Lophortyx gambeli*

Of eight quail bones from four localities, only one can be assigned with assurance. A proximal end of right humerus (no. 2881) from locality 1703 agrees in size with both _Lophortyx gambeli_ and _L. californicus_, but the area below the head is more depressed than in the latter species and is bordered externally by a ridge continuing distally from the external tuberosity as in _L. gambeli_; the ridge is absent in Recent specimens of _L. californicus_, _Callipepla squamata_ and _Oreortyx pictus_. A proximal end of right tarsometatarsus no. 2880 from locality 1114 resembles in size and general contours tarsometatarsi of Recent _L. californicus_ and _L. gambeli_. As the hypotarsus is incomplete in the fossil, its height is uncertain; approximate measurements suggest that it was short as in _L. gambeli_.

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**Contributions in Science**

No. 73
A proximal end of femur (no. 2880) from locality 1114, seems to differ from both species of *Lophoryx* in the extent of the trochanter, being seemingly raised above the iliac facet for a greater distance posteriorly. Two other fragments of femur, and a humeral head from locality 1114, a fragment of anterior face of tarsometatarsus from locality 1433, and a distal end of tarsometatarsus from locality 1615, are identified as quail, but are too fragmentary for detailed assignment.

**Agriocharis anza**, new species

Plate III, fig. A

*Type*: Right humerus, nearly complete, but with internal tuberosity and
area immediately below head anconally, abraded and crushed; L.A. Co. Mus. no. 3753; collected by James Garbani, March 1, 1959.


*Fauna*: Vallecito Creek.

*Age and formation*: Middle Pleistocene. Upper Palm Spring formation.

*Paratypes*: Proximal fragment of left humerus, and fragments of sternum, sacrum and ulna, collected with the type humerus at locality 1358, and bearing the same catalogue number as the type.

*Diagnosis*: Humerus similar to that of *Agriocharis ocellata* in relatively straight-sided, blunt external condyle, lacking medial bend and pointed tip characteristic of *Meleagris gallopavo*; attachment of pronator brevis deeply incised and set so as to be clearly visible when bone is viewed from palmar side; attachment of anterior articular ligament slightly convex and facing slightly distally and medially; brachial depression deep; muscle attachment below pneumatic fossa markedly depressed at medio-distal edge. Sternum similar to that of *Agriocharis* as distinguished from *Meleagris* in abrupt angle formed at junction of dorsal manubrial area with dorsal lip of coracoidal sulcus, and seemingly lesser anterior protrusion of dorsal lip; triangular space between right and left sides of sulcus narrow and shallow.

*Measurements of type*: length, 112.4 mm.; breadth of distal end, 24.0 mm., approximately; breadth of proximal end 30.3 mm. approximately; breadth of shaft, 14.3 mm., depth of shaft, 8.5 mm.

*Discussion*: Direct comparisons of the Vallecito Creek humerus have been possible with Recent specimens of *Agriocharis ocellata* and *Meleagris gallopavo* and Pleistocene specimens of *Meleagris crassipes* from Mexico and *Parapavo californicus* from California. The sternum has been compared with two Recent specimens each of *M. gallopavo* and *A. ocellata* and a series of twenty Pleistocene specimens of *Parapavo californicus* from Rancho La Brea. *Meleagris crassipes* and *Parapavo californicus* agree with *M. gallopavo* in the curved, pointed tip of the external condyle of the humerus and hence are distinguished from *Agriocharis anza*. In the palmar visibility of the attachment of the pronator brevis, *A. anza* most closely resembles *A. ocellata*, but the attachment is even more visible than in the Recent species because of the medial slant of the adjacent attachment of the anterior articular ligament; the latter attachment faces more directly palmed in all other species compared. The marked depression of the brachial area is not duplicated in any of the other species; possibly this depression is partly due to the crushing of the bone. The notably broad, flat humeral shaft in *A. anza* may also be the result of crushing. In the fragment of sternum the lateral border of the dorsal part of the manubrium is preserved on the left side, and shows a much more abrupt angle, with respect to the dorsal lip of the coracoidal sulcus than in *M. gallopavo* or *P. californicus*. The narrow shallow triangular area between the sulci, however, more closely resembles the condition in *Parapavo* than in either Recent species.
Six other species of fossil turkeys have been previously described, all assigned to the genus *Meleagris*. *Agriocharis* does, however, appear in the fossil record, without specific designation; Wetmore (1924: 8) recorded a fragment of spurred tarsometatarsus from the Arizona Pliocene and assigned it to this genus on the basis of the distance of the spur core from the distal end. The early authors, Cope, Marsh, and Shufeldt, did not consider *Agriocharis* when describing their species of fossil turkeys. For the Pleistocene species *Meleagris superba* Cope, *M. celer* Marsh and *M. richmondi* Shufeldt, and the Oligocene *M. antiqua* Marsh, therefore, some possibility of wrong generic diagnosis exists. I believe, however, that the Vallecito Creek bird is properly distinct from these species. *M. superba* is known from many elements, and was a much larger bird than *Agriocharis anza*, the humerus ranging in size from 147 mm. to 159.5 mm. From Shufeldt's (1913: 25-35 and 1915: 66-67) reviews of Marsh's material, I strongly suspect that *M. celer* should be synonymized with *M. superba*. Only three bones (leg elements) were ascribed to *M. celer* by Marsh (1872: 261) and they occurred in the same New Jersey Pleistocene deposit as those of *M. superba*. The range in size of *M. superba*, were the *M. celer* bones so assigned, would not be disproportionate in view of what is known of sex variation in present-day meleagrids.

*M. richmondi* from the Pleistocene of Alameda County, California, is based on a single worn fragment of anterior part of sternum. Shufeldt's (1915: 67) type description indicates merely that the specimen has meleagrid characters but is the size of a grouse. If the illustration (op. cit., pl. 2, fig. 19) is truly of natural size as indicated, the specimen falls within the minimum size range of sterna of *Parapavo californicus*, and could, therefore, be of an appropriate size for *A. anza* as well. The illustration, however, shows one notable distinguishing character, namely the marked anterior extension of the dorsal lip of the sulcus beyond the ventral lip; this condition is found in *Parapavo californicus* and to a lesser extent in *Meleagris gallopavo*, but not in *Agriocharis ocellata*. The small fragment of sternum of *A. anza* is worn so that it is difficult to determine this character, but measurements indicate less forward thrust of the dorsal area than in *M. richmondi*.

The type of *Meleagris antiqua* is a fragment of distal end of humerus. Aside from the fact that there is little likelihood of identity of species with so great an age discrepancy as exists between Oligocene *M. antiqua* and Pleistocene *M. anza*, the illustration of *M. antiqua* as presented in Shufeldt's (1913: pl. 3) review of Marsh's species (Marsh, himself did not illustrate the species) clearly shows distinct differences from *A. anza*. In fact I believe that Shufeldt was correct in doubting the validity of the assignment of *M. antiqua* to the Meleagridae. The illustration shows the entepicondyle to be large and nearly on a level distally with the condyles, a character suggestive of the Cracidae rather than the Meleagridae. Furthermore, the line delimiting the proximal border of the internal condyle is cracid in character; in meleagrids this border is more rounded and ball-like.
GRUIFORMES

Rallus limicola?

A fragment of manubrial end of sternum (no. 2867) from locality 1114 resembles this part of the skeleton in existing Rallus limicola but is slightly broader across the coracoidal sulci than available comparative material at either the Los Angeles County Museum or the University of California Museum of Vertebrate Zoology. Other measurements fall within the range in size of Recent specimens. It should be noted that R. limicola has been recorded from the western Pleistocene at McKittrick, California (Miller, 1925: 320) and Fossil Lake, Oregon (Howard, 1946: 182); in the latter locality, the specimens are said to represent “a larger than average bird of that species.”

The only previously described fossil rail to which the present fragment might be assigned is Rallus prenticei from the Rexroad fauna of Kansas; R. phillipsi from Wikieup, Arizona, was presumably larger. A measurement of the sternal facet on the illustration of the coracoid assigned to R. prenticei (Wetmore, 1944: 101) suggests a breadth across the coracoidal sulci of the sternum of that species of at least 9.8 mm. Considerable size range would be required to include the Vallecito Creek specimen in this species, but it is not beyond possibility.

Measurements of fossil sternum no. 2867: Breadth across coracoidal sulci, 8.7 mm., breadth across dorsal manubrial notch, 4.5, breadth of anterior border of carina at base, 2.0 mm.; the same measurements in the maximum available specimen of R. limicola are, 8.5 mm., 4.7 mm., and 2.2 mm. respectively.

Fulica americana?

Five sites yielded coot bones. Distal ends of tibiotarsi were collected at locs. 1299, 1433 and 1430 (2 specimens). At locality 1433, the tibiotarsus was associated with a distal end of tarsometatarsus and five pedal phalanges; another distal end of tarsometatarsus came from locality 1114, and an incomplete coracoid from locality 1606.

The two tibiotarsi from locality 1430, the tarsometatarsus from locality 1114, and the coracoid appear to be indistinguishable from corresponding elements of the existing Fulica americana, except that in the one tibiotarsus in which the supratendinal bridge is complete, it is found to be deeper (proximo-distally) than the maximum for Fulica americana; its position, however, is the same as that found in F. americana rather than that of the type of the new species described below. These four specimens are allocated to the existing species, but in view of the fact that the elements from localities 1299 and 1433 warrant description as an extinct species, the possibility that a single, variable ancestral form could be represented must not be overlooked. The allocation is therefore made tentatively.

Fulica hesterna new species

Plate I, fig. F

Type: Distal end of left tibiotarsus, lacking posterior contours of both condyles; L.A. Co. Mus. no. 2873; collected by T. Downs, Oct. 17, 1959.

Fauna: Vallecito Creek.

Age and formation: Middle Pleistocene; Upper Palm Spring formation.

Paratype: Distal end of tarsometatarsus; also L.A. Co. Mus. no. 2873, from the type locality; collected by T. Downs, Oct. 17, 1959.

Diagnosis: Type similar to tibiotarsi of Fulica, as distinguished from those of Rallus or Gallinula, in general contours; internal condyle, in particular, thrust farther laterally, and small foramen present on external side of shaft above condyle (absent in Rallus). Distinguished from F. americana by more vertical position of supratendinal bridge, achieved by less posterior tilting of proximal border, particularly at external side.

Paratype tarsometatarsus distinguished from tarsometatarsi of F. americana by more evenly balanced position of external and internal trochlea with respect to the middle trochlea; internal trochlea only 24 per cent higher above distal end than external trochlea (as contrasted with 50-60 per cent in F. americana), and set more laterally, less posteriorly on the shaft than in the existing species.

Referred material: Distal end of tibiotarsus no. 2875 from locality 1299 and five pedal phalanges associated with the paratype tarsometatarsus from locality 1433.

Owing to fragmentation, the position of the supratendinal bridge is less clearly defined in the referred tibiotarsus than in the type, but appears to have the same vertical position. Both tibiotarsi are noteworthy in that the supratendinal bridge is deep proximo-distally, equalling the maximum found in the existing F. americana.

Only one of the pedal phalanges is complete (digit 2, phalanx 1); no distinction from the phalanx of F. americana is observable, and the length falls within the range of that species. Assignment is based on the association of the phalanges with the paratype tarsometatarsus.

Discussion: Two other fossil coots have been recorded, Fulica minor from the Pleistocene of Fossil Lake, Oregon, and F. infelix from the Pliocene of Junitura, Oregon. As stated in a previous paper (Howard, 1946: 182-183), the large collection of coot bones from Fossil Lake constitutes a series overlapping in size F. americana, but tending to smaller average length of wing bones and greater average length of leg bones. On this basis, it was contended that the trinomial, F. americana minor, more correctly expresses the relationship of the fossil to the Recent form. A series of coot tibiotarsi and tarsometatarsi from Fossil Lake, loaned by the American Museum of Natural History, was re-examined for this study. As previously noted, no qualitative differences from F. americana were observed. Even the breadth of the distal end of tibiotarsus does not reflect the size difference found in length of that element. F. hesterna is therefore, distinguished from F. (a.) minor by the same characters enumerated in the description above.

The typical character of the more vertical supratendinal bridge of F.
*hesterna* distinguishes it, as well, from *F. infelix*. This distinction seemed apparent from the illustration of the type of the latter species (Brodkorb, 1961: 182) and was further confirmed by Brodkorb in correspondence. Furthermore, the groove for the peroneus profundus, which is said to be shallow in *F. infelix*, is well marked in *F. hesterna*, with well developed bordering ridges.

**Measurements of Coot Bones**

<table>
<thead>
<tr>
<th></th>
<th><em>F. hesterna</em></th>
<th><em>F. minor</em></th>
<th><em>F. infelix</em></th>
<th><em>F. americana</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tibiotarsus</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breadth distal end</td>
<td>8.3</td>
<td>8.4</td>
<td>7.8-9.1</td>
<td>7.6</td>
</tr>
<tr>
<td>Proximo-distal depth of supratendinal bridge</td>
<td>2.5</td>
<td>2.5</td>
<td>1.8-2.5</td>
<td>1.9</td>
</tr>
<tr>
<td><strong>Tarsometatarsus</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breadth across distal trochleae</td>
<td>8.7</td>
<td>...</td>
<td>8.0-10.0</td>
<td>...</td>
</tr>
<tr>
<td>Height internal condyle above distal end</td>
<td>3.0</td>
<td>3.3-4.3</td>
<td>...</td>
<td>3.5-3.8</td>
</tr>
<tr>
<td>Height external condyle above distal end</td>
<td>2.3</td>
<td>1.3-2.0</td>
<td>...</td>
<td>1.5-1.7</td>
</tr>
<tr>
<td>Ratio of external condyle distance, to internal condyle distance (from distal end)</td>
<td>76.0%</td>
<td>39%--47%</td>
<td>...</td>
<td>39%--48%</td>
</tr>
</tbody>
</table>

**Charadriiformes**

*Charadrius vociferus*

A proximal end of left humerus and proximal end of right carpometacarpus, both no. 2870 from locality 1114, resemble Recent specimens of the Killdeer, *Charadrius vociferus*. Diagnostic characters of these elements that distinguish *C. vociferus* from *Eupoda montana* are as follows: humerus with sharp external ridge on shaft running straight to head, not curving medially as in *Eupoda*; greater excavation of shaft below head; and shorter external tuberosity. Carpometacarpus with stout process of metacarpal 1, and distal edge of process forming right angle with area of pollicial facet; process more slender and more upturned (proximally) in *Eupoda*.

**Strigiformes**

*Asio*, sp.

A fragment of distal end of femur (no. 2855) from locality 1297, and two pedal phalanges (no. 2780) from locality 1449, agree in general size with Recent specimens of Long-eared Owl, *Asio otus*. Only the posterior contours of the femur are preserved, and even in this region the bone is cracked away in places, leaving only a cast of the contour. The specimen resembles the femur of *Asio o. wilsonianus*, more than that of any other living owl compared, in the
shape and position of the muscle attachment above the external condyle, the triangular shape of the area above this same condyle and the extension of the fibular groove around onto the distal surface of the bone; this groove is even more marked, however, in the fossil form than in the specimens of the Recent species at hand. The fossil also differs from the Recent specimens of A.o. wilsonianus in less excavation of the popliteal area, straighter rise of the shaft from the internal condyle, and more broadly rounded contour of external condyle.

It is probable that the owl represented by this femur was specifically distinct from the living Asio otus. I do not consider it wise, however, to name it, using so fragmentary a specimen as type.

The pedal phalanges represent phalanx 1 of digit 3, and either phalanx 3 of the same digit or phalanx 2 of digit 2. The conformation of these phalanges is not identical to any specimens in the Recent collection and the species represented is probably now extinct. In shape of the proximal articular surface of phalanx 1, digit 3, resemblance is closest to Recent specimens of the genus Strix, but the element is smaller than in S. varia or S. occidentalis and agrees more closely in size with Asio wilsonianus. A prominent ridge occurs nearly centrally on the proximal surface, with equal depressions on each side; the position of the ridge is similar in some specimens of Strix, but in others one side is more depressed.

Because of the general agreement in size, the femur and the phalanges are here recorded together under Asio. The possibility that the phalanges belonged to a separate species referable to Strix should not be disregarded.

Strigidae, sp.

A fragment of tip of upper mandible (no. 3865), from locality 1114, can be assigned to the Strigidae, as contrasted with the Tytonidae, on the basis of the presence of a ridge bordering the outer contour, ventrally, with a slight groove between this ridge and the tomium. It is impossible to assign the specimen further, except to indicate that in size it is close to Strix varia, and is, therefore, presumably of a larger species than that represented by the femur and phalanges just discussed.

Piciformes
Picinae, sp.

A single distal half of radius (no. 2869) from locality 1333, represents the woodpeckers. In size the specimen agrees closely with radii of Recent Colaptes cafer, but I make no attempt to identify this very undiagnostic element even to genus.

Passeriformes

Skeletal characters of the multitudinous members of this order are difficult to distinguish. Study of the osteology of the group is a specialty in itself, and one that requires extensive collections of Recent comparative material. No
detailed identifications of the more than twenty passerine bones from Vallecito Creek are attempted. Six or more species appear to be represented.

Corvidae, sp.

A shaft of carpometacarpsus (no. 2534) and fragment of distal end of tibiotarsus (no. 2876), both from locality 1114, agree in general with comparable elements of the crow, *Corvus brachyrhynchos*, although the carpometacarpal shaft is heavier than recent specimens at hand. Another shaft of carpometacarpus and fragment of wing phalanx (both no. 2890) from the same locality possibly belonged to the same individual. All specimens are too incomplete to provide reliable evidence as to the identity of the species represented.

Passeriformes, sps.

Twenty other isolated bones of passeriformes are present in the collection, taken from localities 1114, 1250, 1323, 1437, 1461 and 1615. These include 9 humeri, 3 carpometacarpi, 2 femora, 4 tibiotarsi, 1 tarsometatarsus and 1 wing phalanx; they appear to represent at least four species. Two consolidated masses containing passerine bones also occur (localities 1461 and 1249) and may represent owl pellets. In one of the "pellets" (from locality 1249), fragments of upper and lower mandible are notable, and suggest a fringillid with broad, short bill.

Suggestions Concerning Evolution and Distribution

Unlike mammals, in which skull characters and dentition play an important taxonomic role among Recent as well as fossil forms, classification of living avian species rarely makes use of detailed conformation of skeletal parts. The avian paleontologist must make his own comparisons, and decisions regarding the significance of skeletal characters of the groups with which he works and the parts of the skeleton represented in fossil form. Few published osteological analyses of families or orders of living birds have been presented in sufficient detail to serve fully the needs of the paleontologist. Those, such as Woolfenden's (1961) on the Order Anseriformes, that do present detailed studies, serve to emphasize that no one element of the bird skeleton is unfailingly diagnostic, and furthermore, that groups that may be distinguishable by one element may be strikingly similar in others.

The fragments representing the fossil avifauna of Vallecito Creek have but little to contribute as evidence of evolution within any of the individual groups involved, but that little is worth considering. *Fulica hesterna* seems the most likely possibility of an actual ancestral form leading to existing populations, particularly if, as suggested above, all the coot bones found (including those tentatively assigned to the living *Fulica americana*) belong to a single species with a wide range of variation, from which existing *F. americana* could have been derived. This possibility is intriguing in view of the fact that slight
differences noted in coot bones in the late Pleistocene (resulting in the description of *Fulica minor*) are entirely a matter of proportion, and include no qualitative differences such as noted for *F. hesterna*.

The overlapping in some characters suggests the possibility that the vulture, *Neophronops vallecitoensis*, might have been the forerunner of the late Pleistocene *N. americanus*, abundantly represented at Rancho La Brea. The turkey, *Agriocharis anza*, on the other hand, seems to bear no direct relationship to the abundant *Parapavo californicus* of California’s late Pleistocene, but rather to indicate a former more northerly distribution for the genus *Agriocharis*, which is today limited to Mexico and Central America. This is not to say that *A. anza* should be interpreted as ancestral to the living *A. ocellata*. The occurrence of *Teratornis incredibilis* widens the geologic record of this extinct family of giant vultures although it contributes nothing to our knowledge of its evolution. That the same species is also recorded in the late Pleistocene negates the possibility of ancestral relationship of *T. incredibilis* to *T. merriami*.

I should not care to venture detailed suggestions as to the evolutionary implications of most of the extinct Anseriformes herein reported. As Wolfenden (*op. cit.*) has shown, this is a complicated group with many overlapping characters even among existing forms. The fossil fragments here ascribed to extinct species, while indicating generic position, and distinction from living species, are far too limited to provide evidence of an evolutionary nature as regards related existing species. The addition of *Brantadorna* to the fossil record is, however, significant. Combined with the previously described, and rather widely distributed *Anabernicula*, the new genus suggests that the strange, “gooselike” tadornine ducks may have formed an important part of the North American avifauna in past time although no living descendants remain on this continent today.

**Ecologic Considerations**

Roughly 50 per cent of the avian representation from Vallecito Creek, both as to species and number of specimens, indicates an aquatic habitat. The assemblage contrasts, however, with that from Manix Lake (about 125 miles to the north, in San Bernardino County, California), deposited under lacustrine conditions, where the avifauna is over 90 per cent aquatic and includes several species of waders.

The presence of turkey and quail at Vallecito Creek suggests brushy areas. If the two consolidated masses of passerine bones represent owl pellets, as seems likely, roosting or nesting sites, probably in trees, must have been nearby. More detailed ecologic conditions might be revealed were the passerine bones to be specifically identified.

**Stratigraphic Occurrence**

The type section of the bone-bearing deposits of Vallecito Creek is an area of approximately seven square miles extent, representing roughly 3600 feet in
thickness of deposits, in which stratigraphy can be traced. Nineteen of the
twenty-five avian sites occur within this section and are somewhat generally
distributed both horizontally and vertically. The other six are nearby, but sepa-
rated from the type section by faulting. When the geologic study of the deposits
is completed, it is anticipated that these outlying sites may be stratigraphically
related to those in the type section. At present this has been done only in a
general way.

Dr. Downs has kindly supplied information so far assembled as to the
stratigraphic relationship of the avian sites. In order of stratigraphic occur-
rence, from top to bottom of the type section, these sites and their contained
avifaunas are listed below. Outside the type section the relative positions of the
sites can be only approximated. Loc. 1360 (containing 1 goose bone) in the
third fault block southeast, is near the top of the formation at the approximate
level of loc. 1759 of the type section; loc. 1758 (containing 2 specimens of
Melanitta perspicillata?, and 3 unidentified duck bones), and loc. 1358 (con-
taining the type material of the new species, Agriocharis anza and 4 unidenti-
fied bones) occur at the approximate level of loc. 1297 of the type section; loc.
1606 (containing 2 bones of an extinct species assigned as Podiceps sp., and
1 bone of Fulica americana ?) and loc. 1356 (containing 1 specimen referred
to Neophrontops vallecoensis, n. sp.) are at the approximate level of loc.
1249 of the type section. These four localities are near the middle of the for-
mation, 1758 and 1606 in the first fault block southeast of the type section,
1358 and 1356 in the second. One locality that occurs south of Valleco Creek
from the other deposits, and separated from them by a fault, cannot be even
tentatively positioned. This is locality no. 1304 in which the type specimen
and referred ulna of Oxyura bessomi occurred.

There is no notable change in avifauna to be observed in contrasting low-
ernost and uppermost levels, unless the concentration of passeriform bones in
the upper levels is significant. Two passerine bones were found at the lower-
most level. Otherwise all passerine bones occurred in the upper half of the
deposit. Only two localities, 1114 and 1433, contained enough avian species
to be considered faunal assemblages. These bear no outstanding differences
although water birds predominate in the latter, passerines in the former.

Comparison with Other Fossil Avifaunas

Distinction of the Valleco Creek avifauna from the late Pleistocene
assemblages is marked by the absence of any of the well-known extinct species
which characterize California's asphalt deposits. The presence of related
species of Neophrontops and Teratornis as well as turkey, quail, and golden
eagle (?), suggest that ecologically many of the Rancho La Brea species could
be expected to occur if the faunas had been contemporaneous. Other than the
Recent species represented, only one species, Teratornis incredibilis, is recorded
elsewhere. This species was originally described from Smith Creek Cave, Ne-
vada, of late Pleistocene age. It would seem, however, that the species was not
COLLECTING SITES IN THE TYPE SECTION, WITH CONTAINED AVIFAUNAS
Arranged in relative stratigraphic position from topmost locality (1323) to lowermost (1437). Thickness of sediments between vertically separated localities is not reflected.  

<table>
<thead>
<tr>
<th>Loc. no.</th>
<th>Avifauna</th>
<th>No. of bones</th>
<th>Loc. no.</th>
<th>Avifauna</th>
<th>No. of bones</th>
</tr>
</thead>
<tbody>
<tr>
<td>1323</td>
<td><em>Brantadorna downsi</em>, n. sp.</td>
<td>3</td>
<td>1333</td>
<td>Picinae, sp.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Passeriformes, sp.</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unidentified</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1759</td>
<td>Anas acuta ?</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1250</td>
<td>Passeriformes, sp.</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1114</td>
<td>Anas clypeata</td>
<td>1</td>
<td>1297</td>
<td><em>Asio</em>, sp.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><em>Oxyura bessomi</em>, n. sp.</td>
<td>1</td>
<td>1615</td>
<td>Quail, sp.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Lophortyx gambeli ?</td>
<td>4</td>
<td></td>
<td>Passeriformes, sp.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Rallus limicola ?</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fulica americana ?</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Charadrius vociferus</td>
<td>2</td>
<td>1249</td>
<td>Anas clypeata ?</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Strigidae, sp.</td>
<td>1</td>
<td></td>
<td>Fringillidae, sp.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Corvida, sp.</td>
<td>4</td>
<td>(in owl pellet ?)</td>
<td>(indiv.)</td>
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<tr>
<td></td>
<td>Passeriformes, sps.</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Unidentified</td>
<td>8</td>
<td>1461</td>
<td>Passeriformes, sps.</td>
<td>5</td>
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<tr>
<td>1963</td>
<td><em>Podiceps caspicus</em></td>
<td>2</td>
<td>1430</td>
<td><em>Bucephala fossilis</em>, n. sp.</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Anas clypeata ?</td>
<td>1</td>
<td></td>
<td><em>Oxyura bessomi</em> n. sp.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><em>Bucephala fossilis</em>, n. sp.</td>
<td>3</td>
<td></td>
<td>Quail, sp.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><em>Oxyura bessomi</em> n. sp.</td>
<td>1</td>
<td>1430</td>
<td><em>Fulica hesterna</em>, n. sp.</td>
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</tr>
<tr>
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<td><em>Fulica hesterna</em>, n. sp.</td>
<td>1</td>
<td></td>
<td>Unidentified</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td><em>Fulica hesterna</em>, n. sp.</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Neophrontrips valle-citoensis</em>, n. sp.</td>
<td>10</td>
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<td>1319</td>
<td>Hawk, sp.</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1703</td>
<td>Lophortyx gambeli</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1614</td>
<td>Aquila chrysaetos ?</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1614</td>
<td><em>Anser</em>, sp.</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1449</td>
<td><em>Asio</em>, sp.</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1437</td>
<td>Passeriformes, sp.</td>
<td>2</td>
<td></td>
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</tbody>
</table>

*Localities placed in adjacent columns occur at the same level in the type section.*
abundantly represented in the late Pleistocene, for, despite its gigantic size, it is recorded from a single carpal bone in the Nevada cave collection, a collection which totals over 600 bones of birds. I do not believe that this one species can be considered a marker for late Pleistocene, balanced against weightier evidence to the contrary as shown in comparisons of total faunas.

Downs (1957) suggests that the mammalian genera found at Vallecito Creek indicate probable correlation of this fauna with that of the Curtis Ranch of Arizona, and the Bautista and Irvingtonian of California. Unfortunately the birds do not lend themselves to similar correlation. In the first place avian fossils are very rare in the faunas noted. But of greater importance is the fact that avian genera, as now recognized, are less bound by epochal limitations than are mammalian genera, and, therefore, cannot be depended upon as markers. Neophrontops, for example, represented in the Vallecito Creek avifauna, was first named from the late Pleistocene, and is also recorded from lower Pliocene and middle Miocene. Many Recent genera, also, are recorded at least into the Miocene.

In a broad way, the percentage of extinct species to total species count assists in correlating fossil avifaunas. Brodkorb (1955: 31) and I (Howard, 1955: 205), independently, noted that mid-Pliocene avifaunas are found to contain only extinct species, and that comparison of late Pleistocene with Plio-Pleistocene avifaunas shows a difference in per cent of extinct species composing them. However, our percentage figures did not agree, demonstrating that these calculations can be taken only as suggestions of relative age, and, at least in the present state of knowledge, cannot be used as definite age indicators. Where faunas are poorly preserved and incompletely represented, allowances must be made both for the original author's interpretation of fragmentary material, and the reviewing author's interpretation of tentative recordings. The Vallecito Creek avifauna, for example, is composed of at least twenty-eight species, but only sixteen can be listed (even tentatively) by specific name. Another three can be generically assigned, and seemingly represent extinct forms. Nine species can be identified only to family or order. The bones of these latter species are either so fragmentary that their identity cannot be determined, or they belong to the Order Passeriformes, a group in which identification of species is difficult even among Recent forms, and has not been attempted here. At best, judgment as to percentage of extinct forms can be based only on the sixteen specifically identified and the three generically assigned species, which, of course, represent an incomplete fauna. Of these nineteen species, ten are considered to be extinct, nine are possibly still existing.

A similar break-down of species, and generic listings for eight other avifaunas was made for comparison with Vallecito Creek. A graph was prepared (Fig. 1) to show the per cent of extinct species to total count of forms for which reasonable identification could be made. As the documentation of passerine birds varies greatly depending on preservation of material and the author’s willingness to attempt identification, I felt that a more accurate com-
Figure 1. Graph illustrating per cent of extinct species relative to total non-passerine representation in the Vallecito Creek avifauna compared with other avifaunas of Pleistocene or late Pliocene age. Figures were compiled from listings by the following authors: Smith Creek Cave, Howard, 1952; Fossil Lake, Howard, 1946; Rancho La Brea Pit 3, Howard, 1962; Manix Lake, Howard, 1955; San Josecito Cave, L. Miller, 1943; Rexroad, Wetmore, 1944, Tordoff, 1959; Hagerman Lake, Wetmore, 1933 and 1956, A. Miller, 1948, and Brodkorb, 1958; Benson, Wetmore, 1924.

Comparison could be obtained by omitting this group in the calculations. Lacking adequate avifaunas for the Curtis Ranch, Bautista or Irvingtonian faunas to which Downs refers, three others, not too far removed in age, though presumably older, were used for comparison, as well as five from late Pleistocene.

Although the actual percentages here calculated differ from those that Brodkorb (op. cit) listed for some of the same sites, the resulting geochronologic grouping is approximately the same for most of the faunas. The Rancho
La Brea figure is affected by use here of the avifauna from a single deposit, Pit 3, which is radiocarbon dated at approximately 14,500 years BP. A comparative analysis of avifaunas of thirteen La Brea pits (Howard, 1962) indicates that other pits may have been in operation before or after Pit 3.

Even though this method of correlation is inexact, the comparisons shown do suggest that the Vallecito Creek fauna assumes an intermediate position relative to the typical late Pleistocene assemblages and those of early Pleistocene-late Pliocene age. The birds, therefore, strengthen Down's contention of possible mid-Pleistocene age.

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March, O. C.

Miller, Alden H.

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Shufeldt, Robert W.

Tordoff, Harrison E.

Wetmore, Alexander

White, John A. and Theodore Downs

Woelfenden, Glen E.