Two New Late Pleistocene Miniature Owls from Rancho La Brea, California

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Two new late Pleistocene miniature owls from Rancho La Brea, California

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Two new species of miniature owls are described from the upper Pleistocene asphalt deposits of Rancho La Brea, California. The first is assigned to the extant genus *Glaucidium*, as *Glaucidium kurochkini* sp. nov., and the second is placed in a new genus *Asphaltoglaux*, as *Asphaltoglaux cecileae* sp. nov. Both new species are based on tarsometatarsi, and each is represented by various elements. These are the second and third extinct owls to be described among the nine strigiform species from Rancho La Brea. The new species of *Glaucidium* is also recognized from the upper Pleistocene asphalt deposits of Carpinteria, California, which lends support to the hypothesis that southwestern coastal California was comparable to an island in the late Pleistocene. Recognition of these two new strigiform taxa brings to 22 the number of known extinct avian species from Rancho La Brea.

Key words: Aves, Strigiformes, Strigidae, asphalt deposits, Pleistocene, California.

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Introduction

Previously, nine species were recognized among the fossil owl specimens from the upper Pleistocene asphalt deposits of Rancho La Brea, California (Howard 1962), only one of which was reported to be extinct (Howard 1933; Campbell and Bochenski 2010). A review of all fossil owl specimens in the collections from Rancho La Brea housed in the George C. Page Museum, a branch facility of the Natural History Museum of Los Angeles County, has confirmed earlier reports that two miniature owls were among the nine strigiform species represented in this large collection. The first report was of a specimen of *Glaucidium* mentioned by Miller (1925), who referred it to the species *G. gnoma*. Additional specimens were later referred to that species, and *G. gnoma* was listed together with *Aegolius acadicus* in a table of avian taxa in the Rancho la Brea collections by Howard (1962). In that paper she reported five individuals, four questionably, of *G. gnoma* from four pits, or excavation sites, at Rancho La Brea. She did not list the original 1925 specimen, which came from a fifth pit, and referred only a single specimen to *Aegolius acadicus*. Specimens of *Glaucidium* were also reported from the upper Pleistocene asphalt deposits of Carpinteria, California, by Miller (1931), and these are referred herein to the new species of that genus. No miniature owls are currently found in the lowland areas of southwestern California, which makes the presence of the two new species in this region all the more interesting. An analysis of all of the Rancho La Brea strigiforms is in progress.

Institutional abbreviations.—LACM, Natural History Museum of Los Angeles County, Los Angeles, USA; UCLA, University of California (Los Angeles), Los Angeles, USA.

Other abbreviations.—artic., articularis; Fac., Facies; Lig., Ligament, Ligamentum; Proc., Processus; RLB, Rancho La Brea; Synos., Synostosis; M., Musculus; m., musculus; n., nervus.

Material and methods

The taxonomy of several groups of owls has changed significantly in recent years, especially with the publications by König et al. (1999) and König and Weick (2008). This is particularly true for the pygmy owls of the genus *Glaucidium*, in which long-established subspecies or races of widespread species have been elevated in rank to the level of species, and some Old World species have been transferred to the genus

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Taenioglaux. We follow König and Weick (2008) here, although we acknowledge that some of their taxonomic decisions are probably controversial and remain subject to confirmation.

The fossils were compared in detail with specimens of modern *Glaucidium californicum* (19; formerly considered a race of *G. gnoma*); *G. gnoma* (2; sensu stricto); *G. ridgwayi* (8; formerly considered a race of *G. brasilianum*); *Aegolius acadicus* (20); and *A. funereus* (8), although not all comparative specimens (numbers in parentheses) comprised complete skeletons. To evaluate the range of variation within the genera *Glaucidium* and *Taenioglaux*, nine non-North American species were examined as well, including *G. brasilianum* (5; sensu stricto); *G. peruanum* (4; formerly placed in *G. brasilianum*); *G. nanum* (2; formerly placed in *G. brasilianum*); *G. griseiceps* (1 partial; Panama; formerly placed in *G. minutissimum*); *G. brodiei* (1; Taiwan); *G. passerinum* (2; Sweden); *G. perlatum* (2; South Africa); *Taenioglaux cuculoides* (2; China; formerly placed in *Glaucidium*); and *Taenioglaux radiatum* (1; no data; formerly placed in *Glaucidium*). Comparisons were also made with the genera *Tyto*, *Megascops*, *Otus*, *Psiloscops* (often included in *Otus*), *Bubo*, *Strix*, *Lophostrix*, *Pulsatrix*, *Surnia*, *Athene*, *Micrathene*, *Ninox*, and *Asio*. However, this study was not intended as a comparative osteological review of all genera of owls, and we limit our detailed comparisons primarily to species of the genera *Glaucidium* (Surniinae: Surniini) and *Aegolius* (Surniinae: Aegoliini) occurring in North America. Both *Glaucidium* and *Aegolius* are readily distinguished from each other and from all other strigiform genera, including the even smaller *Micrathene* and *Psiloscops*, which are the other genera of miniature owls occurring in the southwestern United States.

The new genus described herein is more similar to *Aegolius* than to *Glaucidium*, so it is compared in detail to the former. For those elements of the two new species represented in the collection, characters distinguishing North American species of *Glaucidium* and *Aegolius* are given. Major variances from the characters of North American *Glaucidium* by the nine non-North American species of *Glaucidium* and *Taenioglaux* examined are also noted.

The excavation site with the most miniature owl specimens was Bliss 29, which was actually three closely grouped pits (A, B, C) excavated in 1929. Most of the specimens were identified to pit of origin (e.g., Pit A), although some were mixed during excavation and can only be assigned to "Bliss 29". In general, these sites produced large numbers of, or were more carefully excavated for, small bones, most of which were prepared and cleaned after the opening of the Page Museum in 1977. This might explain the larger number of small owls from that site.

Measurements were taken using digital calipers accurate to 0.01 mm, captured directly to computer, and rounded to the nearest 0.1. The measurements were stored, and the basic statistics, including minimum, maximum, arithmetic mean, and standard deviations, were computed. Most measurements taken are illustrated in Campbell and Bochenski (2010). All bones were checked for ratios useful for differentiating the species, and scatter diagrams of the ratios were prepared. All specimens, fossil and Recent, were coated with ammonium chloride for photography; photographs by KEC. The small size of the bones made them difficult to photograph, and osteological characters readily seen under the microscope are not always so apparent in the photographs. Osteological terminology is primarily from Baumel and Witmer (1993), although we prefer anterior and posterior to cranial and caudal for orientation.

Systematic palaeontology

Class Aves Linnaeus, 1758

Order Strigiformes Wagler, 1830

Family Strigidae Leach, 1820

Genus *Glaucidium* Boie, 1826

Type species: *Strix passerina* Linnaeus, 1758 (G.R. Gray, 1840), type by subsequent designation; Recent, Sweden.

Taxonomic remarks.—The species of *Glaucidium* differ from those of *Aegolius* Kaup, 1829, which are approximately the same size as the North American species of *Glaucidium*, by having tarsometatarsus with (1) shaft, in anterior view, bowing markedly mediad distal to medial edge of Cotyla medialis (bows only slightly mediad, close to medial edge of Cotyla medialis in *Aegolius*), which gives a greater curvature to Sulcus extensorius and positions Crista medialis hypotarsi, in posterior view, more centrally on shaft than in *Aegolius*; (2) shaft with anterior face distal and lateral to Sulcus extensorius shallowly to moderately excavated, with anterolateral corner of shaft a low, rounded ridge (moderately to deeply excavated, with anterolateral corner of shaft a high, narrow ridge in *Aegolius*); (3) shaft, in posterior view, more deeply and broadly excavated proximally between Cristae hypotarsi; (4) shaft with proximal half of Fac. medialis narrow anteroposteriorly, in medial view (broad, in medial view, in *Aegolius*); (5) Sulcus extensorius proximally forms a shallow groove in the anterolateral side of Eminentia intercotylaris (Sulcus extensorius lies just lateral to anterolateral edge of Eminentia intercotylaris in *Aegolius*); (6) Tuberositas m. tibialis anticus lies proximal, but close, to mid-length of shaft, with Sulcus extensorius extending only slightly distad past it (Tuberositas m. tibialis anticus lies closer to proximal end of shaft, with Sulcus extensorius extending farther distad than the tuberosity in *Aegolius*); (7) Crista medialis hypotarsi much less robust than in *Aegolius*; (8) Trochlea metatarsi III with anterolateral corner bulging laterad significantly (anterolateral corner not bulging significantly laterad in *Aegolius*); (9) Trochlea metatarsi II with "wing" curving moderately mediad, in distal view (curving more mediad in *Aegolius*); and (10) Trochlea metatarsal IV with "wing" directed posteriad (directed posteromediad in *Aegolius*, resulting in a larger gap between tips of Trochleae metatarsi II and IV). These distinguishing characters can be observed by

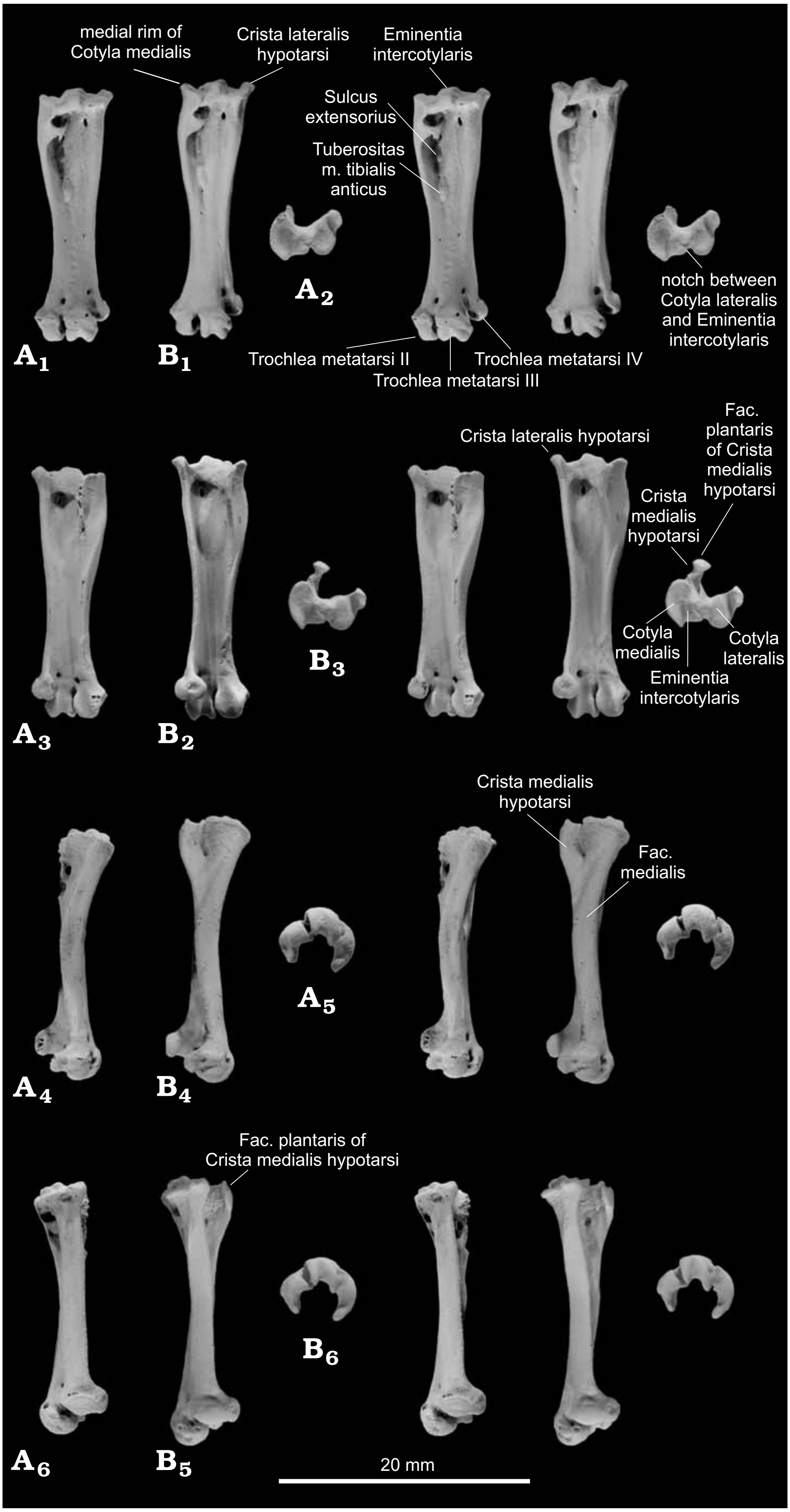

Fig. 1. Stereopairs of the holotypic left tarsometatarsus of miniature owl *Glaucidium kurochkini* sp. nov. (LACM RLB K9630), late Pleistocene, Rancho La Brea, California, USA (**A**) and a comparative left tarsometatarsus of *Glaucidium californicum* Sclater, 1857 (UCLA 38395), Recent, Western North America (**B**), in anterodorsal (A_1, B_1), posteroventral (A_3, B_2), medial (A_4, B_4), lateral (A_6, B_5), proximal (A_2, B_3), and distal (A_5, B_6) views. Abbreviations: Fac., Facies; m., musculus.

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comparing the specimens of *G. californicum* and *A. acadicus* in Figs. 1 and 2.

The nine non-North American species of *Glaucidium* and *Taenioglaux* examined agreed fairly closely with all characters of the North American species of *Glaucidium* noted above. These two genera are in the tribe Surniini of the subfamily Surniinae, whereas *Aegolius* is in the tribe Aegoliini of the same subfamily (del Hoyo et al. 1999; König and Weick 2008). This distinction appears to be well supported by the many osteological differences noted between the two groups.

The mandible of *Glaucidium* differs from that of *Aegolius* by having (1) Proc. retroarticularis short, less flattened dorsoventrally, in lateral view; (2) dorsolateral rim of Fac. artic. quadratica medialis not prominently overhanging ventrolateral portion of Fac. artic. quadratica medialis; and (3) Fac. artic. quadratica lateralis broader and more rounded, in dorsal view.

The coracoid of *Glaucidium* differs from that of *Aegolius* by having (1) Proc. acrocoracoideus narrow and produced anteriad, in ventral view (very broad and blunt anteriorly, in ventral view, in *Aegolius*); (2) Proc. procoracoideus, in medial view, extending ventromediad at low angle to long axis of shaft (extends more ventrad than mediad at steep angle to long axis of shaft in *Aegolius*); (3) Proc. procoracoideus, in proximal view, extending more mediad than ventrad, with ventral tip close to shaft, in ventral view (Proc. procoracoideus, in proximal view, extending more ventrad than mediad, with ventral tip farther from shaft, in ventral view, in *Aegolius*); (4) Cotyla scapularis of Proc. procoracoideus well rounded medially (forms a prominent corner medially on Proc. procoracoideus in *Aegolius*); (5) Fac. artic. humeralis narrow for length, especially toward sternal end, in dorsal view (broad throughout, especially near Proc. acrocoracoideus, in *Aegolius*); (6) Fac. artic. sternalis with sternal rim steeply curving, or deeply concave, in ventral view (sternal rim gently curving, or slightly concave, in ventral view, in *Aegolius*); (7) Fac. artic. sternalis with dorsal surface moderately long mediolaterally and long anteroposteriorly (dorsal surface long mediolaterally and short anteroposteriorly in *Aegolius*); and (8) Fac. artic. sternalis with lateral end of articular rim appearing slightly twisted dorsad, in sternal view (Fac. artic. sternalis with gentle curvature for length in *Aegolius*).

The humerus of *Glaucidium* differs from that of *Aegolius* by having (1) Crista deltopectoralis projecting mostly dorsad (projects posteriad in *Aegolius*); (2) Impressio m. coracobrachialis anterior broad, deep proximally and shallow distally, and very short (broad, deep, extending distad about length of Crista bicipitalis in *Aegolius*); (3) Caput humeri rounded, in anterior view, not projecting much proximad (Caput humeri smaller, projecting prominently proximad in *Aegolius*); (4) Crista bicipitalis with ventral edge short, moderately convex ventrad, in anterior view (long, only slightly convex ventrad, in anterior view, in *Aegolius*); (5) Crista bicipitalis with large Fossa pneumotricipitalis (Fossa pneumotricipitalis of moderate size in *Aegolius*); (6) Tuberculum ventrale positioned near midline ridge of shaft, in posterior view (positioned well ventral to midline ridge of shaft, in posterior view, in *Aegolius*); (7) Incisura intercondylaris deep, in anterior view (shallow, in anterior view, in *Aegolius*); (8) Sulcus humerotricipitalis deep, slightly undercutting dorsal side of Proc. flexorius (shallow, not undercutting Proc. flexorius in *Aegolius*); and (9) Proc. flexorius narrow, projecting distad beyond distal end of Condylus ventralis (broad and not projecting distad beyond distal end of Condylus ventralis in *Aegolius*).

The radius of *Glaucidium* differs from that of *Aegolius* by having (1) Tuberculum bicipitale radii with ventral edge curving, or concave dorsad, in anterior view, with distal end protruding more dramatically from shaft (ventral edge straight in *Aegolius*, in anterior view, with distal end protruding much less from shaft); (2) areas of attachment of the osseous arch to shaft minimal (well developed in *Aegolius*).

The carpometacarpus of *Glaucidium* differs from that of *Aegolius* by having (1) Proc. pisiformis longer and more pointed; (2) Synos. metacarpalis distalis longer and Fac. artic. digiti minoris extending farther distad; (3) tuberosity for attachment of Lig. ulnocarpometacarpale ventrale on Os metacarpale minus a more prominent protuberance; (4) Fac. artic. ulnocarpalis wider anteroposteriorly, with posterodistal rim merging with Os metacarpale minus more abruptly, giving appearance of a "corner" to rim, in ventral view; and (5) Synos. metacarpalis proximalis, in dorsal view, ending distally in a narrow groove (ends distally in a broad groove in *Aegolius*, a consequence of the Os metacarpali minus bowing more posteriad distal to synostosis).

The femur of *Glaucidium* differs from that of *Aegolius* by having (1) attachment of M. iliotrochantericus anterior lying distal to, or overlapping slightly, that for M. ischiofemoralis (the two muscle scars overlap to a large degree in *Aegolius*); (2) Condylus lateralis, in distal view, with posteromedial end bulging moderately and not projecting posteriad much beyond Crista fibularis (posteromedial end not bulging mediad in *Aegolius*, but projecting posteriad well beyond Crista fibularis); (3) Trochlea fibularis broad and shallow (narrow, deeper, and more V-shaped in *Aegolius*); (4) Fac. medialis of Condylus medialis deeply excavated (slightly to moderately excavated in *Aegolius*); and (5) Tuberculum m. gastrocnemius lateralis long, prominently raised, extending well proximad of Condylus lateralis (short, not prominently raised, and not extending as far proximad in *Aegolius*).

The tibiotarsus of *Glaucidium* differs from that of *Aegolius* by having (1) Fac. artic. medialis protruding less mediad, with posteromedial rim more rounded in proximal view; (2) Incisura intercondylaris deeply undercut anteroproximally (not undercut in *Aegolius*); (3) Spina fibulae first fuses to shaft distal to lateral attachment of Lig. transversum (first fuses to shaft proximal to lateral attachment of Lig. transversum in *Aegolius*); and (4) lateral attachment of Lig. transversum less prominent, projecting more anteromediad than

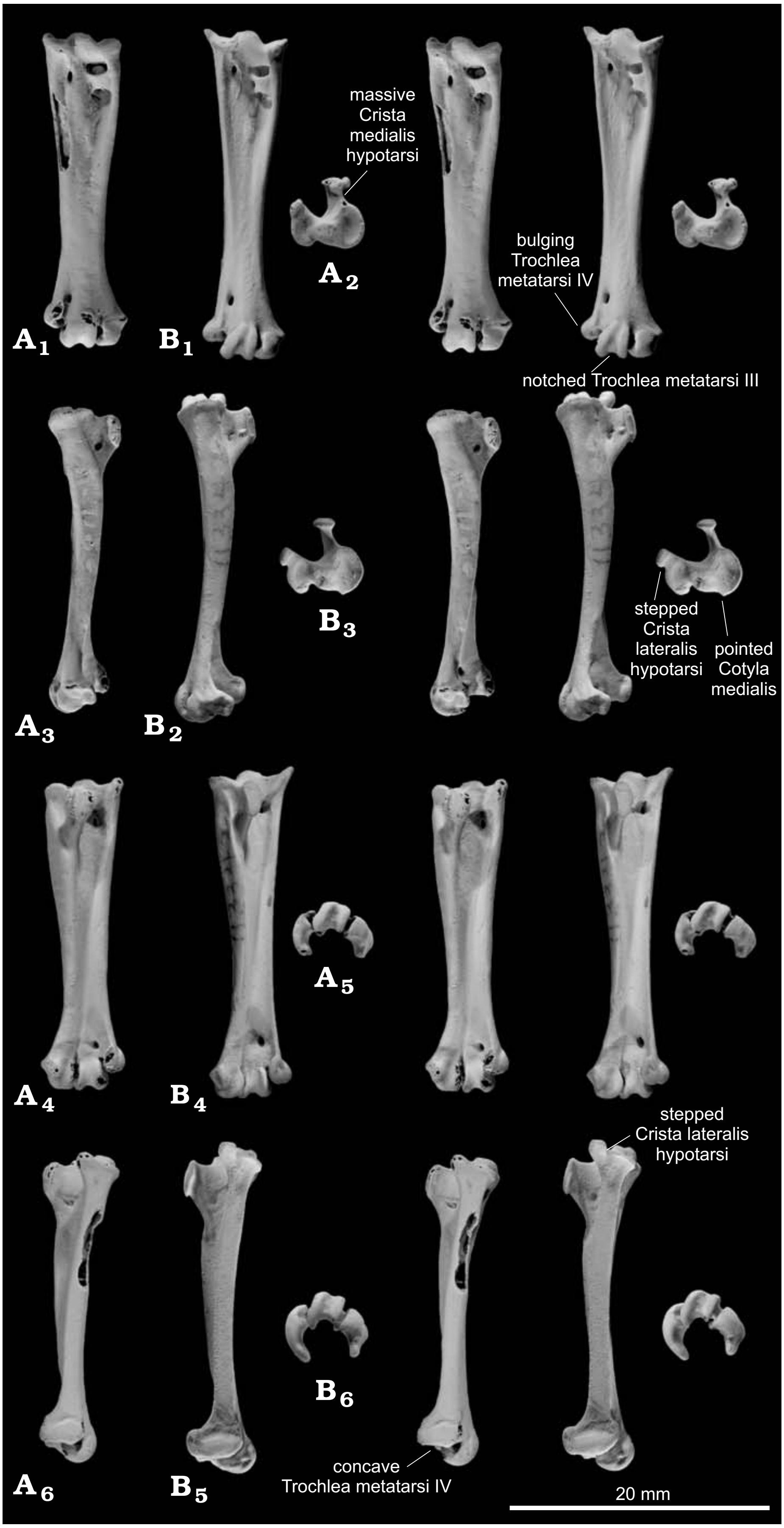

Fig. 2. Stereopairs of the holotypic right tarsometatarsus of miniature owl *Asphaltoglaux cecileae* sp. nov. (LACM RLB K1180), late Pleistocene, Rancho La Brea, California, USA (**A**) and a comparative right tarsometatarsus of *Aegolius acadicus* Gmelin, 1788 (LACM 113342), late Pleistocene–Recent, North America (**B**), in anterodorsal (A_1, B_1), medial (A_3, B_2), posteroventral (A_4, B_4), lateral (A_6, B_5), proximal (A_2, B_3), and distal (A_5, B_6) views.

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anteriad (lateral attachment a more distinct protuberance, projecting more anteriad than anteromediad in *Aegolius*).

Geographic and stratigraphic range.—Worldwide; upper Pleistocene–Recent.

Glaucidium kurochkini sp. nov.

Figs. 1, 3, 4.

Etymology: Dedicated to our late friend and colleague Evgeny N. Kurochkin, ornithologist and paleornithologist of the Paleontological Institute of the Russian Academy of Sciences, for his leading role in Russian ornithology and his many important contributions to our understanding of avian evolution.

Type material: Holotype: Complete left tarsometatarsus, LACM RLB K9630. Paratypes: LACM(CIT) 155031, complete left tarsometatarsus; LACM(CIT) 155032, complete right tarsometatarsus (both from Carpinteria, California).

Type horizon: Rancho La Brea asphalt deposits; upper Pleistocene.

Type locality: Pit A of Bliss 29, Los Angeles, California, USA.

Diagnosis.—The tarsometatarsus of *Glaucidium kurochkini* (Fig. 1) agrees with that of *Glaucidium* and differs from that of *Aegolius* by having those characters of *Glaucidium* listed above. *Glaucidium kurochkini* is diagnosed by the following characters of the tarsometatarsus: (1) Crista lateralis hypotarsi short, broad, robust, and projecting equally proximad and laterad (long, slender, and projecting more proximad than laterad in *G. californicum* and *G. gnoma*; in *G. ridgwayi*, longer, more slender, and projecting more laterad than in *G. californicum* and *G. gnoma*, but less than in *G. kurochkini*); (2) Eminentia intercotylaris long anteroposteriorly (moderately long to short anteroposteriorly in *G. californicum* and *G. gnoma*; short anteroposteriorly in *G. ridgwayi*); (3) Cotyla medialis with rim, in anterior view, essentially even with side of shaft (rim overhanging side of shaft in *G. californicum* and *G. gnoma*, but even with or slightly overhanging edge of shaft in *G. ridgwayi*); (4) Fac. medialis wide proximally lateral to Crista medialis hypotarsi (narrow proximally in *G. californicum*, *G. gnoma*, and *G. ridgwayi*); (5) Sulcus extensorius does not extend distal to Tuberositas m. tibialis anticus (Sulcus extensorius extends distad as a narrow groove between medial edge of Fac. dorsalis and Tuberositas m. tibialis anticus in *G. californicum*, *G. gnoma*, and *G. ridgwayi*); and (6) Trochlea metatarsi II with anterior medial edge (side) relatively straight, in anterior view (medial edge with distinct notch in *G. californicum* and *G. gnoma*; notched in *G. ridgwayi*, but not as much as in *G. californicum* and *G. gnoma*).

Referred material.—The following specimens from Rancho La Brea are referred to *Glaucidium kurochkini*, but because they were not found in articulation or close association with the holotype it cannot be conclusively demonstrated that they represent that species. Therefore, we exclude them from the type series. Proximal left mandible, K9631 (Pit A); proximal right mandible, K9632 (Bliss 29); complete right coracoid, K9210 (Pit A); complete left humerus, G50 (Pit 16); proximal end of right radius, K9635 (Pit A); complete right carpometacarpus, K9404 (Bliss 29); complete left femur, K9350 (Pit A); complete left tibiotarsus, K984 (Pit 36); distal ends of three left tibiotarsi, K9402, K9422, K9423 (all Bliss 29).

Description and comparison.—All of the specimens described below agree with the characters given above that distinguish *Glaucidium* from *Aegolius*. The geographic distribution of the extant species of *Glaucidium californicum*, *G. gnoma*, and *G. ridgwayi* make them the most obvious candidate extant species to be represented by the fossil specimens from Rancho La Brea. Therefore, the most detailed comparisons of the fossils are with comparable elements of those three species. For measurements, see Table 1.

For the non-North American species of *Glaucidium*, the tarsometatarsus of *G. kurochkini* differs in size from those of *G. cuculoides*, *G. radiatum*, and *G. perlatum*, which are much larger species, and *G. passerinum* and *G. minutissimum*, which are much smaller species. Although of approximately the same length, it differs from that of *G. brodiei* in being more robust in all of its features, but it is similar in size and robustness to that of *G. peruanum*. Of the characters listed above that distinguish the tarsometatarsus of *G. kurochkini* from those of *G. californicum*, *G. gnoma*, and *G. ridgwayi*, all non-North American species agree with *G. kurochkini* for (1), except *G. brodiei*, in which the Crista lateralis hypotarsi is much less robust and smaller, projecting less both proximad and laterad, and *G. peruanum*, in which the Crista lateralis hypotarsi resembles that of *G. ridgwayi*. All have (2) Eminentia intercotylaris shorter anteroposteriorly. All have (3) Cotyla medialis with rim, in posterior view, essentially even with side of shaft, except *G. brodiei* in which it is slightly overhanging. Both characters (4) and (5) varied among the five species, and all had Trochlea metatarsi II (6) with anterior medial edge relatively straight, except *G. radiatum* and *G. peruanum*, in which it was notched. It is acknowledged that among the 25 species of *Glaucidium* and nine species of *Taenioglaux* currently living and recognized by König and Weick (2008), it might very well be possible to find one that closely resembles *G. kurochkini* in most osteological characters of the tarsometatarsus, although it would have to be a non-North American species. It is highly improbable, however, that if such a species exists on another continent that it would be represented by the Rancho La Brea taxon.

The mandible of *Glaucidium kurochkini* (Fig. 3) differs from that of *G. californicum*, *G. gnoma*, and *G. ridgwayi* by having (1) Fac. artic. quadratica medialis with distal-medial edge straight (curves proximad, or posteriad, to meet Proc. mandibulae medialis in *G. californicum*, *G. gnoma* and *G. ridgwayi*); (2) Fac. artic. quadratica medialis extending as narrow "tongue" mediad onto Proc. mandibulae medialis, where it gradually fades away (does not extend onto Proc. mandibulae medialis in *G. californicum*, *G. gnoma*, and *G. ridgwayi*, and medial edge is well marked); and (3) ridge for attachment of M. depressor mandibulae on ventral surface of Proc. mandibulae medialis rises abruptly from process at medial end and is broad based, but with high, narrow crest (ridge rises gradually from Proc. mandibulae medialis in *G.*

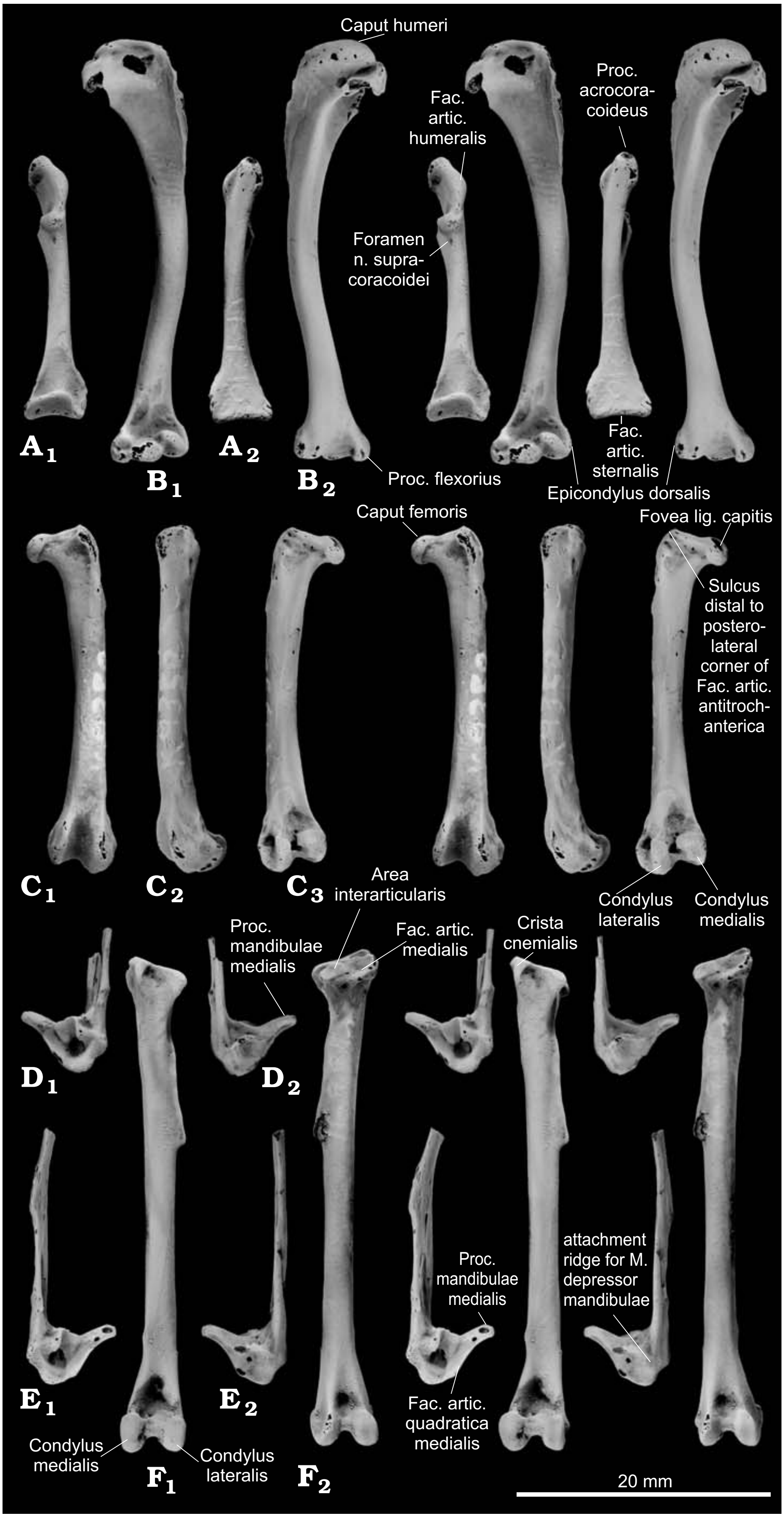

Fig. 3. Stereopairs of specimens from late Pleistocene, Rancho La Brea, California, USA referred to miniature owl *Glaucidium kurochkini* sp. nov. **A**. Right coracoid (RLB K9210) in dorsal (A_1) and ventral (A_2) views. **B**. Left humerus (RLB G50) in anterior (B_1) and posterior (B_2) views. **C**. Left femur (RLB K9350) in anterior (C_1), lateral (C_2), and posterior (C_3) views. **D**. Partial right mandible (RLB K9632) in dorsal (D_1) and ventral (D_2) views. **E**. Partial left mandible (RLB K9631) in dorsal (E_1) and ventral (E_2) views. **F**. Left tibiotarsus (RLB K984) in anterior (F_1) and posterior (F_2) views. Abbreviations: artic., articularis; Fac., Facies; Lig., Ligamentum;, M., Musculus; Proc., Processus.

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californicum, *G. gnoma*, and *G. ridgwayi*, with a narrower base and a moderately high, narrow crest in *G. californicum* and *G. gnoma* and a moderately narrower base and a less prominent crest in *G. ridgwayi*).

The one known coracoid of *Glaucidium kurochkini* (Fig. 3) is very abraded. It differs from the coracoids of *G. californicum*, *G. gnoma*, and *G. ridgwayi* by having (1) Proc. acrocoracoideus thinner dorsoventrally (although some breakage on tip affects appearance); (2) area between rim of Fac. artic. humeralis and bicipital attachment only slightly concave, in ventrolateral and ventral view (much more concave in *G. californicum*, *G. gnoma*, and *G. ridgwayi*); (3) edge of bone between tip of Proc. acrocoracoideus and Fac. artic. humeralis forms a fairly straight line, in posterior view (forms a moderately to deeply concave line in *G. californicum*, *G. gnoma*, and *G. ridgwayi*); (4) distal rim of Fac. artic. sternalis, in sternal view, appears to have Angulus lateralis with less of a twist dorsad and overall less curvature, in ventral view, than in *G. californicum*, *G. gnoma*, and *G. ridgwayi* (the lesser twist is possibly a result of bone damage); and (5) Foramen n. supracoracoidei lies close to Cotyla scapularis, in dorsal view (lies farther away from Cotyla scapularis in *G. californicum*, *G. gnoma*, and *G. ridgwayi* (might be variable character, but it holds for specimens on hand).

The humerus of *Glaucidium kurochkini* (Fig. 3) has some abrasion and breakage. It differs from that of *G. californicum*, *G. gnoma*, and *G. ridgwayi* by having (1) shaft with greater curvature in mid-length region, in posterior view; (2) Proc. flexorius, in posterior view, thicker dorsoventrally and not protruding as far distad as in *G. californicum*, *G. gnoma*, and *G. ridgwayi*; and (3) Epicondylus dorsalis minimally protruding (minimally to moderately protruding in *G. californicum* and *G. gnoma* and significantly protruding in *G. ridgwayi*). Damage to bone prevents identification of other distinguishing characters.

The radius of *Glaucidium kurochkini* differs from that of *G. californicum*, *G. gnoma*, and *G. ridgwayi* by having (1) Tuberculum bicipitale radii with distal end not protruding as distinctly from shaft distally; and (2) attachment for Lig. collaterale dorsale separated from that for Meniscus radioulnaris by distinct groove that lies at an angle to long axis of shaft (similar in *G. ridgwayi*; groove minimal or absent in *G. californicum* and *G. gnoma*).

The carpometacarpus of *Glaucidium kurochkini* (Fig. 4) differs from that of *G. californicum*, *G. gnoma*, and *G. ridgwayi* by having (1) Fac. artic. alularis large (similar in *G. ridgwayi*; smaller in *G. californicum* and *G. gnoma*); (2) Os metacarpale alulare thick dorsoventrally (much thinner in *G. californicum* and *G. gnoma*; intermediate in *G. ridgwayi*); (3) Fovea carpalis anterior with very large foramen at bottom (very small to moderate-sized foramina in *G. californicum*, *G. gnoma* and *G. ridgwayi*); (4) Trochlea carpalis broad (similar in *G. ridgwayi*; narrower in *G. californicum* and *G. gnoma*); (5) Spatium intermetacarpale with distal end a narrower "V"-shape rather than the broad "U"-shape seen in *G. californicum*, *G. gnoma*, and *G. ridgwayi* because the distal end of Os metacarpale minus does not curve posteriad just proximal to Synos. metacarpalis distalis, in ventral view; (6) Os metacarpale minus with proximal end wide (similar in *G. ridgwayi*, narrow in *G. californicum* and *G. gnoma*); and (7) Fac. artic. digiti major with anterior projection more rounded, or less angular, in distal view, than in *G. californicum*, *G. gnoma*, and *G. ridgwayi*.

The femur of *Glaucidium kurochkini* (Fig. 3) is somewhat abraded. It differs from that of *G. californicum*, *G. gnoma* and *G. ridgwayi* by having (1) Fovea lig. capitis very large and deep (not quite as large or deep in *G. californicum* and *G. gnoma*; much smaller in *G. ridgwayi*); (2) Caput femoris, in posterior view, not extending distad much beyond Collum femoris (extends significantly distad beyond Collum femoris in *G. californicum* and *G. gnoma*, and only slightly less so in *G. ridgwayi*); (3) sulcus distal to posterolateral corner of Fac. artic. antitrochanterica weakly developed, although posterolateral corner of Fac. artic. antitrochanterica is slightly worn, reducing depth of sulcus (sulcus prominent in *G. californicum* and *G. gnoma*, slightly less prominent to weakly developed in *G. ridgwayi*); (4) Condylus lateralis with abrupt, or almost 90°, transition to shaft, in medial view (Condylus lateralis with posterior end undercut, in medial view, in *G. californicum* and *G. gnoma*; not undercut and not transitioning quite as abruptly to shaft in *G. ridgwayi*); (5) Condylus lateralis, in distal view, expanded mediad (similar in *G. californicum* and *G. gnoma*; not expanded mediad in *G. ridgwayi*); and (6) Condylus medialis not extending as far distad as Condylus lateralis (Condylus medialis extends farther distad in *G. californicum*, *G. gnoma*, and *G. ridgwayi*, but still not as far as Condylus lateralis).

The tibiotarsus of *Glaucidium kurochkini* (Fig. 3) differs from that of *G. californicum*, *G. gnoma*, and *G. ridgwayi* by having (1) indentation between Fac. artic. medialis and Area interarticularis, in proximal view, less deep; (2) insertion for M. flexor cruris medialis a linear scar limited to anterior edge of Crista cnemialis (insertion scar with proximal end turning proximoposteriad for short distance in *G. californicum* and *G. gnoma*, and for a much greater distance in *G. ridgwayi*; (3) Crista cnemialis anterior with medial side slightly concave (moderate to deep depression in *G. californicum*, *G. gnoma*, and *G. ridgwayi*); and (4) shaft with anteromedial corner approaching Condylus medialis in a fairly straight line (shaft with anteromedial corner approaching Condylus medialis with a slight to moderate bowing mediad in *G. californicum*, *G. gnoma*, and *G. ridgwayi*). Other than character (4), no distinctive distinguishing characters were observed for the distal end of the tibiotarsus of *G. kurochkini*, so the three specimens comprising incomplete distal ends can only be provisionally referred to *G. kurochkini*.

The holotypic tarsometatarsus of *Glaucidium kurochkini* has an extra distal foramen just proximal to the Incisura intertrochlearis medialis (Fig. 1). A comparable foramen is not present in the referred tarsometatarsi from Carpinteria, nor in any of the modern comparative specimens. The un-

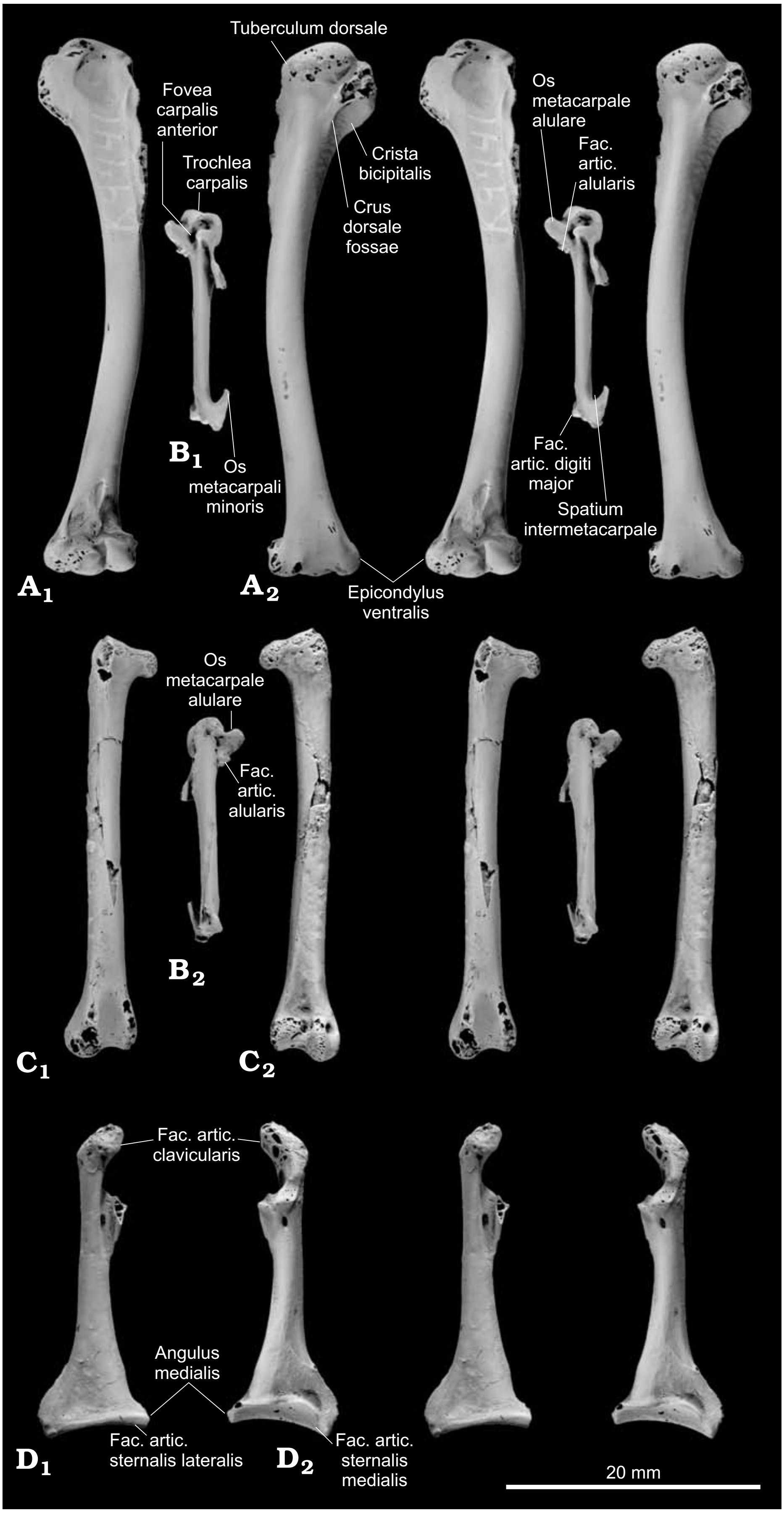

Fig. 4. Stereopairs of specimens from late Pleistocene, Rancho La Brea, California, USA referred to miniature owls *Asphaltoglaux cecileae* sp. nov. (**A**, **C**, **D**) and *Glaucidium kurochkini* sp. nov. (**B**). **A**. Left humerus (RLB K9441) in anterior (A_1) and posterior (A_2) views. **B**. Right carpometacarpus (RLB K9404) in dorsal (B_1) and ventral (B_2) views. **C**. Right femur (RLB K9349) in anterior (C_1) and posterior (C_2) views. **D**. Right coracoid (RLB E9533) in ventral (D_1) and dorsal (D_2) views. See Fig. 3 for additional labeled osteological features. Abbreviations: artic., articularis; Fac., Facies.

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Table 1. Measurements (in mm) of skeletal elements of the late Pleistocene *Glaucidium kurochkini* compared with extant species of the genus *Glaucidium* from the western hemisphere. For taxa represented only by one or two specimens, raw measurements are given; in other cases measurements are given in the following order: (number of specimens), arithmetic mean ± standard deviation, [observed range]. In column 2, letters in parentheses indicate measurements illustrated in Campbell and Bochenski (2010).

	Measurements	*Glaucidium kurochkini*	*Glaucidium californicum*	*Glaucidium gnoma*	*Glaucidium ridgwayi*	*Glaucidium brasilianum*	*Glaucidium peruanum*	*Glaucidium nanum*
Coracoid RLB K9210	length to mid-Fac. artic. sternalis (A)	20.8	(16) 21.6±0.63 [20.6–22.7]	[19.6–20.8]	(8) 21.3±0.81 [20.3–22.3]	(5) 21.8±1.12 [20.3–23.2]	(4) 20.6±0.70 [19.6–21.2]	[21.9–24.4]
	width at midshaft	1.6	(16) 1.7±0.12 [1.5–1.9]	[1.5–1.5]	(8) 1.8±0.08 [1.6–1.8]	(5) 1.9±0.1 [1.8–2.0]	(4) 1.7±0.06 [1.6–1.7]	[1.8–1.9]
Humerus RLB G50	total length (A)	33.9	(14) 33.3±0.89 [32.1–35.0]	[30.1–32.8]	(8) 34.3±1.21 [32.9–35.8]	(5) 35.3±1.44 [33.6–37.3]	(4) 33.7±1.58 [31.3–34.6]	[35.7–39.6]
	width at midshaft	2.4	(14) 2.4±0.12 [2.2–2.6]	[2.2–2.3]	(8) 2.4±0.11 [2.2–2.5]	(5) 2.5±0.13 [2.3–2.7]	(4) 2.3±0.08 [2.3–2.4]	[2.5–2.7]
	depth at midshaft	2.4	(14) 2.3±0.09 [2.1–2.4]	[2.0–2.4]	(8) 2.3±0.09 [2.2–2.4]	(5) 2.3±0.12 [2.2–2.5]	(4) 2.2±0.11 [2.0–2.3]	[2.5–2.6]
	distal width (C)	6.3	(14) 6.2±0.20 [5.8–6.5]	[5.6–5.8]	(8) 6.3±0.23 [5.9–6.6]	(5) 6.4±0.26 [6.1–6.7]	(4) 6.0±0.24 [5.7–6.2]	[6.3–6.9]
Carpometa-carpus RLB K9404	total length (A)	17.8	(8) 17.5±0.82 [15.7–18.2]	16.7	(8) 17.9±0.69 [17.0–18.7]	(5) 18.4±0.88 [17.6–19.8]	(4) 17.1±0.82 [15.9–17.8]	[18.7–20.8]
	proximal width (B)	4.5	(8) 4.4±0.20 [4.0–4.6]	4.1	(8) 4.2±0.11 [4.0–4.4]	(5) 4.5±0.26 [4.2–4.8]	(4) 4.0±0.19 [3.8–4.1]	[4.8–5.1]
	proximal depth (C)	2.3	(8) 2.1±0.09 [2.0–2.2]	2.0	(8) 2.3±0.05 [2.2–2.4]	(5) 2.3±0.09 [2.2–2.4]	(4) 2.2±0.23 [2.0–2.5]	[2.3–2.9]
	depth at midshaft (D)	1.6	(8) 1.5±0.06 [1.5–1.61]	1.3	(8) 1.6±0.10 [1.5–1.8]	(5) 1.6±0.05 [1.5–1.7]	(4) 1.5±0.11 [1.3–1.60]	[1.7–1.9]
	distal width (E)	3.4	(8) 3.1±0.20 [2.7–3.3]	2.9	(8) 3.1±0.19 [2.7–3.3]	(5) 3.3±0.11 [3.1–3.4]	(4) 2.9±0.10 [2.8–3.0]	[3.4–3.5]
Femur RLB K9350	medial length (A)	26.4	(16) 26.3±0.68 [25.3–27.7]	[23.8–25.7]	(7) 26.7±0.90 [25.4–28.2]	(5) 26.9±1.94 [23.8–28.9]	(4) 25.8±0.73 [24.9–26.5]	[28.4–31.5]
	proximal width (B)	5.6	(16) 5.4±0.17 [5.0–5.6]	[4.7–5.3]	(7) 5.5±0.20 [5.2–5.8]	(5) 5.4±0.72 [4.2–6.0]	(4) 5.0±0.16 [4.8–5.2]	[5.8–6.1]
	width at midshaft (C)	2.6	(16) 2.3±0.12 [2.2–2.5]	[2.0–2.1]	(7) 2.3±0.12 [2.1–2.5]	(5) 2.3±0.23 [1.9–2.5]	(4) 2.2±0.14 [2.1–2.4]	[2.4–2.6]
	depth at midshaft (D)	2.4	(16) 2.1±0.08 [2.0–2.2]	[1.8–2.1]	(7) 2.3±0.11 [2.1–2.4]	(5) 2.3±0.27 [1.8–2.5]	(4) 2.1±0.05 [2.1–2.2]	[2.2–2.6]
	distal width (E)	5.6	(16) 5.5±0.23 [5.0–5.8]	[4.7–5.3]	(7) 5.6±0.33 [5.4–6.3]	(5) 5.5±0.68 [4.5–6.1]	(4) 4.7±0.67 [3.9–5.4]	[6.1–6.3]
	distal depth (F)	4.6	(16) 4.5±0.22 [4.0–4.8]	[3.9–4.6]	(7) 4.6±0.15 [4.4–4.8]	(5) 4.5±0.50 [3.6–4.9]	(4) 4.9±0.48 [4.2–5.4]	[4.9–5.0]
Tibiotarsus RLB K984	total length (A)	38.2	(15) 38.0±1.27 [35.5–40.4]	[34.2–37.8]	(8) 39.9±1.97 [36.7–42.7]	(4) 40.4±2.37 [38.7–43.8]	(4) 38.9±1.56 [36.9–40.6]	[40.8–46.9]
	proximal width (B)	4.4	(15) 4.4±0.23 [4.0–4.7]	[3.9–4.4]	(8) 4.6±0.19 [4.4–4.9]	(5) 4.5±0.31 [4.3–4.9]	(4) 4.3±0.28 [4.0–4.6]	[5.0–5.1]
	proximal depth (C)	5.3	(15) 5.1±0.14 [4.8–5.3]	[4.5–5.1]	(8) 5.4±0.21 [5.0–5.7]	(5) 5.3±0.27 [5.0–5.7]	(4) 5.1±0.26 [4.8–5.3]	[5.8–5.9]
	width at midshaft (D)	2.3	(15) 2.2±0.13 [1.9–2.4]	[1.9–2.1]	(8) 2.2±0.10 [2.1–2.4]	(5) 2.9±1.64 [2.0–5.8]	(4) 2.1±0.15 [1.9–2.3]	[2.2–2.4]
	distal width (E)	5.1	(15) 5.1±0.21 [4.6–5.4]	[4.4–4.6]	(8) 5.2±0.22 [4.9–5.5]	(5) 5.0±0.25 [4.9–5.5]	(4) 4.9±0.25 [4.6–5.1]	[5.5–6.0]
	depth of Condylus lateralis (F)	4.2	(15) 4.1±0.17 [3.8–4.4]	[3.7–4.0]	(8) 4.2±0.22 [3.9–4.6]	(5) 4.3±0.38 [4.0–4.9]	(4) 3.9±0.15 [3.7–4.1]	[4.3–4.7]
	depth of Condylus medialis (G)	4.6	(15) 4.3±0.17 [4.0–4.6]	[4.0–4.4]	(8) 4.4 ±0.17 [4.2–4.7]	(5) 4.6 ±0.29 [4.2–5.0]	(4) 4.1 ±0.21 [3.8–4.3]	[4.6–5.1]
Tarsometa-tarsus RLB K9630	total length (A)	19.7	(16) 19.6±0.64 [18.4–20.8]	[17.8–19.6]	(8) 20.6±0.93 [19.4–21.9]	(5) 20.7±0.97 [19.9–22.2]	(4) 19.4±0.82 [18.3–20.1]	[22.0–24.5]
	proximal width (B)	5.9	(16) 5.5±0.19 [5.1–6.0]	[4.9–5.2]	(8) 5.6±0.23 [5.4–5.9]	(5) 5.8±0.45 [5.4–6.5]	(4) 5.4±0.26 [5.1–5.7]	[6.0–6.4]
	minimum width of shaft (E)	3.3	(16) 3.0±0.14 [2.7–3.2]	[2.8–2.9]	(8) 3.0±0.12 [2.8–3.2]	(5) 3.2±0.20 [3.0–3.5]	(4) 2.8±0.22 [2.5–3.0]	[3.1–3.4]
	distal width (F)	5.9	(15) 5.6±0.21 [5.3–6.0]	[5.1–5.3]	(8) 5.8±0.23 [5.5–6.2]	(5) 5.9±0.28 [5.6–6.3]	(4) 5.3±0.28 [5.0–5.7]	[6.1–6.4]

usual occurrence of this foramen leads us to regard it as an anomaly rather than as a diagnostic character.

Remarks.—Worldwide, König and Weick (2008) recognize 25 species of pygmy owls in the genus *Glaucidium* and nine species in the genus *Taenioglaux*. Some of these species have vast ranges, but many have very restricted ranges, suggesting variations in geographic specificity. All pygmy owls are small, although some species are significantly larger or smaller than others, and some are more robust than the norm. The similarities in external morphology and plumage that led many species to be considered as races of polymorphic species are seen also in osteological characters, and those species that were formerly considered as members of a super-species complex are most similar. Although it is usually possible to identify sufficient characters to distinguish individual species, the number of individuals available as comparative osteological material for each species is limited. An additional problem is that in cases where multiple species have been considered together as a single, polymorphic species for many decades it is difficult to know whether certain skeletal specimens are assigned to the correct species, especially where geographic ranges overlap or when provenance data are generalized.

Using the method of Campbell and Bochenski (2010) for estimating the body mass of predatory birds, which was based on the work of Campbell and Marcus (1992), the mass of the individual represented by the single femur referred to *Glaucidium kurochkini* was calculated to be 71.4 g. This estimate is within the range of the body masses (König and Weick 2008) of *G. californicum* (62–73 g), *G. gnoma* (48–73 g), and *G. ridgwayi* (46–102 g).

Of the specimens Howard (1962) tentatively referred to *Glaucidium gnoma*, four are presumably among the 12 specimens herein referred to *G. kurochkini*. The specimen from Pit 3, which was not identified as to element, could not be found in the collections. The eight newly identified specimens, including the holotypic tarsometatarsus, are all from the recently prepared material of Bliss 29.

Geographic and stratigraphic range.—Southern California, USA; upper Pleistocene.

Genus *Asphaltoglaux* nov.

Type species: *Asphaltoglaux cecileae* sp. nov., monotypic; see below.

Etymology: Form Greek *asphalto*, asphalt; *glaux*, owl; in reference to deposits, in which it has been found.

Diagnosis.—*Asphaltoglaux* resembles *Aegolius*, and differs from the similar-sized *Glaucidium*, in characters of the tarsometatarsus listed above that distinguish *Aegolius* from *Glaucidium*.

Asphaltoglaux is distinguished from *Aegolius* by having tarsometatarsus with (1) Cotyla medialis with rim of medial side not projecting mediad beyond edge of shaft (rim of medial side projecting mediad beyond edge of shaft in *Aegolius*); (2) Cotyla medialis with medial side of anterior rim not projecting sharply anteriad, thus anterior rim fairly straight leading to Eminentia intercotylaris (medial side of anterior rim projecting sharply anteriad in *Aegolius*, thus anterior rim curves posteriad before reaching Eminentia intercotylaris, giving a more restricted path for tendon of M. extensor digitorum longus); (3) notch between Eminentia intercotylaris and Cotyla lateralis moderately deep and open, giving a shallow, more open Sulcus extensorius proximally (notch and Sulcus extensorius deep and more restricted proximally in *Aegolius*); (4) Sulcus extensorius broader and facing more anteriad than in *Aegolius*, where it appears to be rotated and set more deeply into medial side of shaft; (5) shaft, in medial view, with posteroproximal edge of Fac. medialis slanting toward middle of medial edge of Cotyla medialis (i.e., Fac. medialis narrows anteroposteriorly toward proximal end) (shaft with posteroproximal edge of Fac. medialis fairly straight, in line with posteromedial corner of Cotyla medialis in *Aegolius*); (6) Crista lateralis hypotarsi projecting very little laterad and proximad, with lateral edge fairly straight in proximal view and proximolateral edge sloping gradually anteriad in line with that of lateral rim of Cotyla lateralis, in lateral view (projects much more laterad and proximad, with lateral edge stepped away from lateral edge of Cotyla lateralis in both proximal and lateral views in *Aegolius*); (7) Crista medialis hypotarsi with medial side short proximodistally and deeply concave, the latter an affect resulting from position of posteroproximal edge of Fac. medialis (medial side longer proximodistally and less concave in *Aegolius*); (8) Crista medialis hypotarsi very thick mediolaterally (thin, or slender, mediolaterally, in *Aegolius*); (9) Fac. plantaris of Crista medialis hypotarsi very broad, thick, rounded or oval shaped, projecting significantly mediad but only slightly proximad (Fac. plantaris elongated, projecting slightly mediad, but projecting significantly proximad in *Aegolius*); (10) Trochlea metatarsi III with anterior edge projecting only slightly anteriad of Trochlea metatarsi II, with broad, shallow metatarsal groove not extending far onto its anterior face, in distal view (Trochlea metatarsi III with anterior edge projecting significantly more anteriad of Trochlea metatarsi II, and with metatarsal groove narrower, deeper, and extending well onto its anterior face in *Aegolius*); and (11) Trochlea metatarsi IV with distal end protruding only slightly laterad, in anterior view, and with distal edge, in lateral view, very slightly concave proximad (Trochlea metatarsi IV protrudes laterad, in anterior view, and the distal edge is slightly convex distad, in lateral view, in *Aegolius*).

Geographic and stratigraphic range.—Rancho La Brea, California, USA; upper Pleistocene.

Asphaltoglaux cecileae sp. nov.

Figs. 2, 4.

Etymology: Dedicated to our friend and colleague, Cécile Mourer-Chauviré, Université Claude Bernard, Lyon, France, in recognition of her many contributions to our understanding of avian evolution, especially the fossil owls of Europe, and for her long service and dedication to the Society of Avian Paleontology and Evolution.

Holotype: Complete right tarsometatarsus, LACM RLB K1180 (Fig. 2).

Type horizon: Pit 36, Los Angeles, California, USA.

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Table 2. Measurements (in mm) of skeletal elements of the late Pleistocene *Asphaltoglaux cecileae* (raw values) compared with those of two extant species of *Aegolius*. Measurements given in following order: (number of specimens), arithmetic mean ± standard deviation, [observed range]. In column 2, letters in parentheses indicate measurements illustrated in Campbell and Bochenski (2010).

	Measurements	*Asphaltoglaux cecileae*	*Aegolius acadicus*	*Aegolius funereus*
Coracoid RLB E9533	length to mid-Fac. artic. sternalis (A)	23.9	(19) 21.9±0.80 [20.5–23.0]	(6) 23.4±0.56 [22.8–24.4]
	depth of shaft at Cotyla scapularis	3.8	(19) 3.5±0.22 [3.0–3.8]	(6) 3.6±0.19 [3.3–3.9]
	width of midshaft	2.4	(19) 2.0±0.14 [1.8–2.3]	(6) 2.3±0.16 [2.1–2.5]
Humerus RLB K9441	total length (A)	43.2	(20) 43.3±1.60 [40.3–45.4]	(5) 48.8±2.04 [47.4–52.2]
	proximal width (B)	8.2	(20) 8.7±0.34 [8.1–9.3]	(8) 9.9±0.54 [9.5–11.1]
	width at midshaft	3.0	(20) 2.9±0.16 [2.6–3.1]	(7) 3.3±0.21 [3.0–3.6]
	depth at midshaft	2.7	(20) 2.6±0.15 [2.3–2.8]	(7) 2.9±0.23 [2.7–3.3]
	distal width (C)	7.6	(20) 7.6±0.27 [7.1–8.1]	(7) 8.5±0.60 [8.1–9.8]
Femur RLB K9349	medial length (A)	32.3	(20) 32.5±1.28 [29.9–34.4]	(7) 35.3±1.21 [33.8–37.3]
	proximal width (B)	5.4	(20) 5.7±0.31 [5.3–6.3]	(7) 6.5±0.36 [6.0–7.0]
	width at midshaft (C)	2.5	(20) 2.5±0.14 [2.3–2.7]	(7) 2.7±0.18 [2.5–3.0]
	depth at midshaft (D)	2.6	(20) 2.5±0.19 [2.2–2.8]	(7) 2.8±0.16 [2.6–3.00]
	distal width (E)	5.8	(20) 5.8±0.27 [5.4–6.3]	(7) 6.4±0.39 [6.0–7.0]
Tarsometatarsus RLB K1180	total length (A)	23.4	(20) 23.9±0.84 [22.0–25.4]	(7) 22.2±0.76 [21.6–23.8]
	proximal width (B)	5.5	(20) 5.4±0.29 [4.8–5.7]	(7) 6.0±0.49 [5.6–6.9]
	proximal depth	5.5	(20) 5.3±0.30 [4.8–5.8]	(7) 6.1±0.43 [5.9–7.0]
	width of Crista medialis hypotarsi stem	1.1	(20) 0.7±0.07 [0.6–0.8]	(7) 0.7±0.06 [0.6–0.8]
	length of Fac. plantaris of Crista medialis hypotarsi (C)	2.7	(20) 2.7±0.24 [2.3–3.2]	(7) 2.9±0.30 [2.5–3.5]
	width of Fac. plantaris of Crista medialis hypotarsi (D)	2.1	(20) 1.2±0.18 [0.7–1.5]	(7) 1.4±0.20 [1.2–1.8]
	minimum width of shaft (E)	3.2	(20) 3.1±0.20 [2.7–3.5]	(7) 3.6±0.41 [3.4–4.5]
	distal width (F)	6.3	(20) 6.1±0.32 [5.3–6.7]	(7) 6.7±0.53 [6.3–7.9]

Type locality: Rancho La Brea asphalt deposits; upper Pleistocene.

Diagnosis.—As for genus.

Referred material.—The following specimens from Rancho La Brea are referred to *Asphaltoglaux cecileae*, but because they were not found in articulation or close association with the holotype it cannot be conclusively demonstrated that they represent that species. Therefore, we exclude them from the type series. Complete right coracoid, LACM RLB E9533 (Pit 16); complete left humerus, LACM RLB K9441 (Pit A); complete right femur, LACM RLB K9349 (Pit A). All specimens damaged by abrasion.

Description and comparison.—The coracoid of *Asphaltoglaux* (Fig. 4) resembles that of *Aegolius* and differs from that of the similar-sized *Glaucidium*, by having those characters listed above that distinguish *Aegolius* from *Glaucidium*, except for character 1, which differs in *Asphaltoglaux*. The coracoid of *Asphaltoglaux* differs from that of *Aegolius* by having (1) Proc. acrocoracoideus long, narrow mediolaterally and sharply curved mediad, in ventral view (shorter, broad mediolaterally, and not curving mediad in *Aegolius*); (2) Fac. artic. clavicularis well rounded, not a protruding corner of Proc. acrocoracoideus (Fac. artic. clavicularis a distinct, protruding corner of Proc. acrocoracoideus in *Aegolius*); (3) Proc. acrocoracoideus with distal portion, in proximal view, as thick or thicker dorsoventrally as mediolaterally (expanded more mediolaterally than dorsoventrally in *Aegolius*); (4) groove, or depression, between Fac. artic. humeralis and bicipital attachment (= neck of Howard 1980) shallow, in proximal view (deep in *Aegolius*); (5) Fac. artic. sternalis with articular rim very long and slightly concave, in ventral view (shorter and more concave in ventral view in *Aegolius*); (6) Fac. artic. sternalis medialis very wide, dorsoventrally, forming a deep shelf (much narrower dorsoventrally in *Aegolius*, forming a shallow shelf); (7) Fac. artic. sternalis lateralis with ventromedial portion largest at flattened medial end, or tip, of Angulus medialis (ventromedial portion largest lateral to pointed medial tip of Angulus medialis in *Aegolius*); and (8) shaft very stout, with medial portion just proximal to Fac. artic. sternalis medialis quite rounded dorsally (shaft more slender, with medial portion just proximal to Fac. artic. sternalis medialis flattened or slightly concave in *Aegolius*).

The humerus of *Asphaltoglaux* (Fig. 4) resembles that of *Aegolius* and differs from that of the similar-sized *Glaucidium*, by having those characters listed above that distinguish *Aegolius* from *Glaucidium*, except for character 3 (see #1 following). The humerus of *Asphaltoglaux* differs from that of *Aegolius* by having (1) Caput humeri more rounded, extending farther proximodorsad proximal to Tuberculum dorsale than in *Aegolius*, in anterior and dorsal view; (2) Crus dorsale fossae, in ventral view, with distal end a pronounced ridge extending distad beyond distal end of Crista bicipitalis (distal portion not a pronounced ridge and not extending distad beyond distal end of Crista bicipitalis in *Aegolius*); (3) Crus dorsale fossae, in ventral view, angled posteriad for much of length in nearly a straight line at about 45° to shaft (curving posteriad distally in *Aegolius*); (4) Crista bicipitalis with distal end merging gradually with shaft, in anterior view (slightly damaged, but does not appear to affect character) (distal end merging more abruptly with shaft in *Aegolius*, in anterior view, because Crista bicipitalis extends farther ventrad distally); (5) Epicondylus ventralis rounded, relatively long proximodistally, in anterior view (more angular, shorter proximodistally, and projecting relatively farther ventrad, in anterior view, in *Aegolius*). Numerous points of minor damage limit observable characters.

The femur of *Asphaltoglaux* (Fig. 4) resembles that of *Aegolius* and differs from that of the similar-sized *Glaucidium* by having those characters listed above that distinguish *Aegolius* from *Glaucidium*. The femur of *Asphaltoglaux* differs from that of *Aegolius* by having (1) Caput femoris with Fovea lig. capitis open via broad groove to Collum femoris, in proximal view (can be notched, but still closed off from Collum femoris in *Aegolius*); and (2) Caput femoris extending only slightly proximad to medial edge of Collum femoris, in posterior view (extending significantly proximad to medial edge of Collum femoris in *Aegolius*). The proximal and distal ends are too damaged to identify additional definitive distinguishing characters. Nonetheless, the Condylus lateralis appears to be more rounded posteriorly and not to extend as far posteriad, in lateral view, in *Asphaltoglaux* than in *Aegolius*.

Remarks.—Using the method for estimating body mass noted above, the body mass of *Asphaltoglaux cecileae* is estimated at 78.2 g based on the single referred femur. There is an unknown error associated with this estimate, which is probably an underestimate, because the specimen is crushed. The recorded body mass range for *Aegolius acadicus* is 54–124 g, whereas that for *Aegolius funereus* is 90–194 g (König and Weick 2008). The tarsometatarsus of *Asphaltoglaux cecileae* is stouter, or more robust, than a specimen of slightly greater length of *Aegolius acadicus* (Fig. 2), although because of the small size of the specimens the actual metric differences are small (Table 2). If the three referred specimens, from two additional pits, are correctly assigned to species, then it can be postulated that the extinct species was overall a slightly heavier-bodied species than *Aegolius acadicus*. We also take the large size and robustness of the Crista medialis hypotarsi, and its Fac. plantaris, of *Asphaltoglaux cecileae* (Fig. 5) to indicate a heavier-bodied bird than seen in *Aegolius acadicus*. Confirmation of this hypothesis can only come with more specimens.

As noted above, *Aegolius funereus* is, in general, a much heavier bird than *Aegolius acadicus*. However, the tarsometatarsus of *Aegolius funereus* is generally shorter than that of *Aegolius acadicus*, although more robust (Fig. 5B, Table 2). On the other hand, the humerus of *Aegolius funereus* is longer than that of *Aegolius acadicus* (Table 2). There are too few fossil specimens to draw any definitive conclusions, but based on the single humerus, femur, and tarsometatarsus available, the limb proportions of *Asphaltoglaux cecileae* appear to be more similar to those of *Aegolius acadicus* than those of *Aegolius funereus*. The more robust tarsometatarsus of *Asphaltoglaux cecileae* might be indicative of a feeding strategy more similar to that of *Aegolius funereus* than *Aegolius acadicus*, which could have provided niche separation between the extinct species and *Aegolius acadicus*.

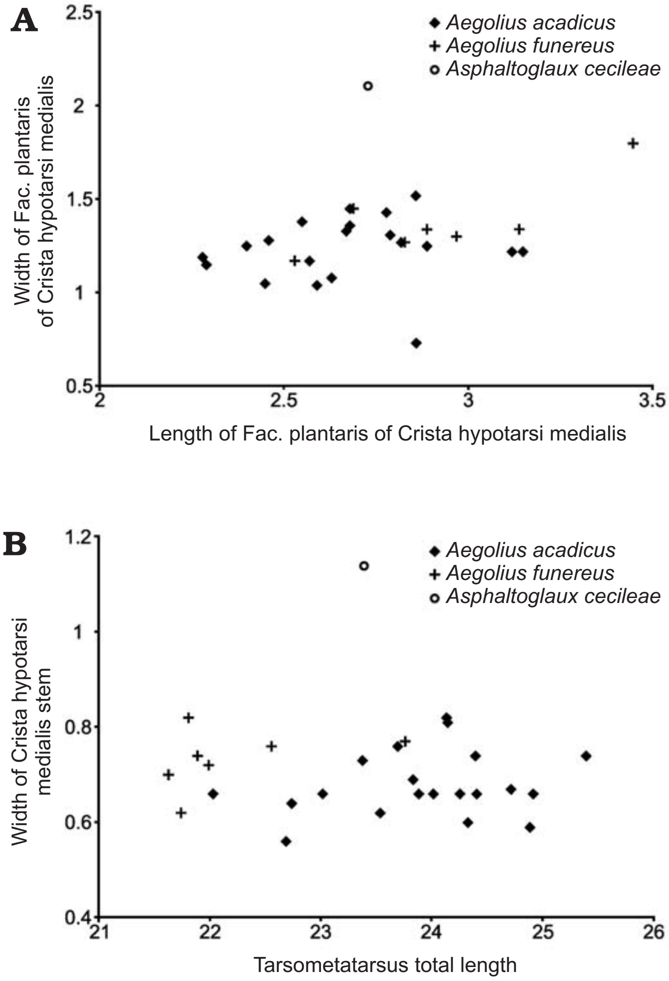

Fig. 5. Scatter plots illustrating the disproportionately large size of the Crista medialis hypotarsi of *Asphaltoglaux cecileae* sp. nov. **A**. Length versus width of Fac. plantaris of Crista medialis hypotarsi. **B**. Width of Crista medialis hypotarsi stem versus tarsometatarsus total length. All measurements in mm.

In a note left with the coracoid herein referred to *Asphaltoglaux cecileae* dated 19 April 1932, Hildegarde Howard described this coracoid, LACM RLB E9533 from Pit 16, as too small for *Speotyto* (now included in *Athene*) and too large for *Aegolius* (but see Table 2). She did not elaborate on any osteological characters. Nonetheless, the single specimen she referred to *Aegolius acadicus* (Howard 1962: table 1) was said to have come from Pit 16, and this specimen, the above noted coracoid, was referred to in the original, pre-1960s Rancho La Brea catalogue as *Cryptoglaux* (now included in *Aegolius*) *acadica*. Why the holotypic tarsometatarsus of *Asphaltoglaux cecileae* was not listed in Howard's (1962) table is puzzling

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because it was also referred to in the original, pre-1960s Rancho La Brea catalogue as *Cryptoglaux acadica*.

There is little to be said about this new genus of miniature owls, given its representation by only four specimens. If its superficial osteological similarity to *Aegolius* reflects its taxonomic position, then it could be placed within the tribe Aegoliini, which currently comprises four species of *Aegolius*. All but one of these owls has a widespread geographic distribution, and all frequent extensive forests. If *Asphaltoglaux* preferred similar habitats, which is far from certain, the drier climate and reduction of forest cover in the southwestern United States (Bochenski and Campbell 2006; Campbell and Bochenski 2010) at the end of the last glaciation could very well have resulted in its extinction.

Aegolius acadicus has been found in upper Pleistocene deposits at several localities in the southwestern United States and Mexico (Brodkorb 1971), including the asphalt deposits at Carpinteria, California. Those specimens that we have been able to examine are as readily distinguished from *Asphaltoglaux cecileae* as are the modern comparative specimens. No specimens of *Aegolius acadicus* have been found at Rancho La Brea, although this species can be found in mountain forests around the Los Angeles Basin today.

Geographic and stratigraphic range.—Rancho La Brea, California USA; upper Pleistocene.

Discussion

The two miniature owls described above represent the smallest and rarest of the nine species of owls comprising the Rancho La Brea strigiform paleoavifauna. In modern, unaltered habitats, miniature owls such as these are often found to be quite abundant, although habitat destruction is certainly reducing their numbers. The rarity of miniature owls in the Rancho La Brea collections is possibly a result of two factors. First, if their diets were comparable to those of modern miniature owls, they would have been eating insects and small vertebrates (e.g., mice, birds). Although such prey items are commonly found as fossils in the asphalt deposits, because of their small size they might not have survived long after entrapment before dying, thus presenting less of an attraction to predators. Owls are not carrion feeders, so if suitable-sized prey items were not moving, they would not have been attractive prey. Also, such small-sized prey items might have been more easily freed from the sticky asphalt by owls because their slight mass would lead to minimal penetration into the asphalt. Second, as noted above, the majority of the miniature owl specimens came from excavation sites from which large numbers of very small bones were recovered. In the older collections, which still comprise the vast majority of avian specimens, very small bones were not commonly preserved. Thus the rarity of miniature owl specimens might reflect more a bias resulting from collection techniques than a rarity of entrapment events or low population numbers.

Given their apparent tendency to speciate under limited, localized conditions, it is not surprising to find that the specimens of *Glaucidium* in the fossil deposits of Rancho La Brea and Carpinteria, California, represent an extinct species. A similar fossil record for the first extinct owl to be described from Rancho La Brea, *Oraristrix brea* (Howard 1933), has been noted (Campbell and Bochenski 2010). These authors described southwestern coastal California as resembling an island in the late Pleistocene, bordered on the west by the Pacific Ocean and surrounded to the north, east, and south by high mountains and/or extreme deserts. The only other fossil records for pygmy owls are all from the late Pleistocene (Brodkorb 1971), and all have been referred to the dominant extant species in the area in which the fossils were found.

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