

A new species of *Plesiocathartes* (Aves: ?Leptosomidae) from the Middle Eocene of Messel, Germany

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A new species of the genus *Plesiocathartes* Gaillard 1908 is described from the Middle Eocene of Messel (Germany). *Plesiocathartes kelleri* sp. nov. is represented by two articulated skeletons and is the most substantial record of the genus, previously only known from a few isolated bones. In addition, a distal end of a tarsometatarsus of *Plesiocathartes* sp. is described from the Lower Eocene London Clay of England. The new specimens clearly demonstrate that *Plesiocathartes* is no early European representative of the Cathartidae (New World vultures) as assumed by earlier authors. Instead, both in terms of derived characters and in overall morphology, *Plesiocathartes kelleri* most closely corresponds to the Leptosomidae (Cuckoo-rollers), which today only occur in the Madagascan region. Accordingly, the genus *Plesiocathartes* is tentatively assigned to the Leptosomidae. If this classification is correct, it would be the first Tertiary fossil record of the Leptosomidae, and indicate that the extant distribution of this family is relictual.

INTRODUCTION

The avian genus *Plesiocathartes* was described by Gaillard (1908) on the basis of a single incomplete tarsometatarsus from the middle Eocene to upper Oligocene fissure fillings of the Quercy, France. Gaillard considered *Plesiocathartes europaeus*, the only species of the genus described previously, to be an early Tertiary European representative of the New World vultures (Cathartidae), and this classification was adopted by subsequent authors (e.g., Cracraft and Rich 1972, Mourer-Chauviré 1982, Emslie 1988). However, recently Mourer-Chauviré (2000) reported a second, more completely preserved tarsometatarsus of *P. europaeus* that does not support assignment of this species to the Cathartidae; she regarded its systematic affinities to be uncertain. Mayr (2000a, in press) identified isolated bones of a new, but as yet unnamed, species of *Plesiocathartes* from the Middle Eocene fossil site of Geiseltal, Germany (Fig. 1A–E). He suggested a possible relationship of *Plesiocathartes* to cuckoo-rollers (Leptosomidae) which today include the single species *Leptosomus discolor* and occur in the Madagascan region only.

A distal end of a tarsometatarsus from the early Miocene of Spain was described as ?*Plesiocathartes gaillardi* by Crusafont and Villalta (1955). This specimen cannot be located (Sánchez Marco 1996), but based on the illustration and description in Crusafont and Villalta (1955), it probably was referred incorrectly to the genus *Plesiocathartes*. The specimen differs markedly from *P. europaeus* in its proportionally more mediolaterally compressed distal end, the much narrower incisurae intertrochleares, and the longer trochleae metatarsorum. In this study, two articulated skeletons of a new species of *Plesiocathartes* are described from the middle Eocene of Messel, Germany. In addition, a well preserved distal end of a tarsometatarsus of *Plesiocathartes* was identified among the fossil bird material from the lower

Eocene London Clay of England. The Messel and London Clay specimens are the earliest records of the genus *Plesiocathartes*, exceeding *P. europaeus* by—depending on the exact age of the Quercy specimens (Legendre and Lévêque 1997)—at least 10 million years. The fossiliferous deposits of Messel originated about 49 million years ago in a deep crater lake that was surrounded by dense paratropical forests (see Schaal and Ziegler 1988 for general information on the site). Birds are fairly abundant at this locality, and a survey of the Messel avifauna was given by Mayr (2000b). Although the lower Eocene London Clay sites are somewhat older and were deposited in a near-shore marine environment, the fossil avifauna has a very similar composition to that of Messel (e.g., Mayr 1998a, Mayr and Daniels 1998, 2001).

MATERIALS AND METHODS

The measurements reported below represent the maximum length of the bone along its longitudinal axis. Regarding the claws, the distance between the tip of the tuberculum extensorium and the apex phalangis was measured. Anatomical terminology follows Baumel and Witmer (1993) and Vanden Berge and Zweers (1993), if not otherwise indicated.

Institutional abbreviations: **BMNH**—the Natural History Museum, London; **GMH**—Geiseltalmuseum, Halle, Germany; **HLMD**—Hessisches Landesmuseum, Darmstadt, Germany; **SMF**—Forschungsinstitut Senckenberg, Frankfurt am Main, Germany.

SYSTEMATIC PALEONTOLOGY

Class: AVES

Order: INCERTAE SEDIS

Family: ?LEPTOSOMIDAE

Genus: *PLESIOCATHARTES* Gaillard 1908

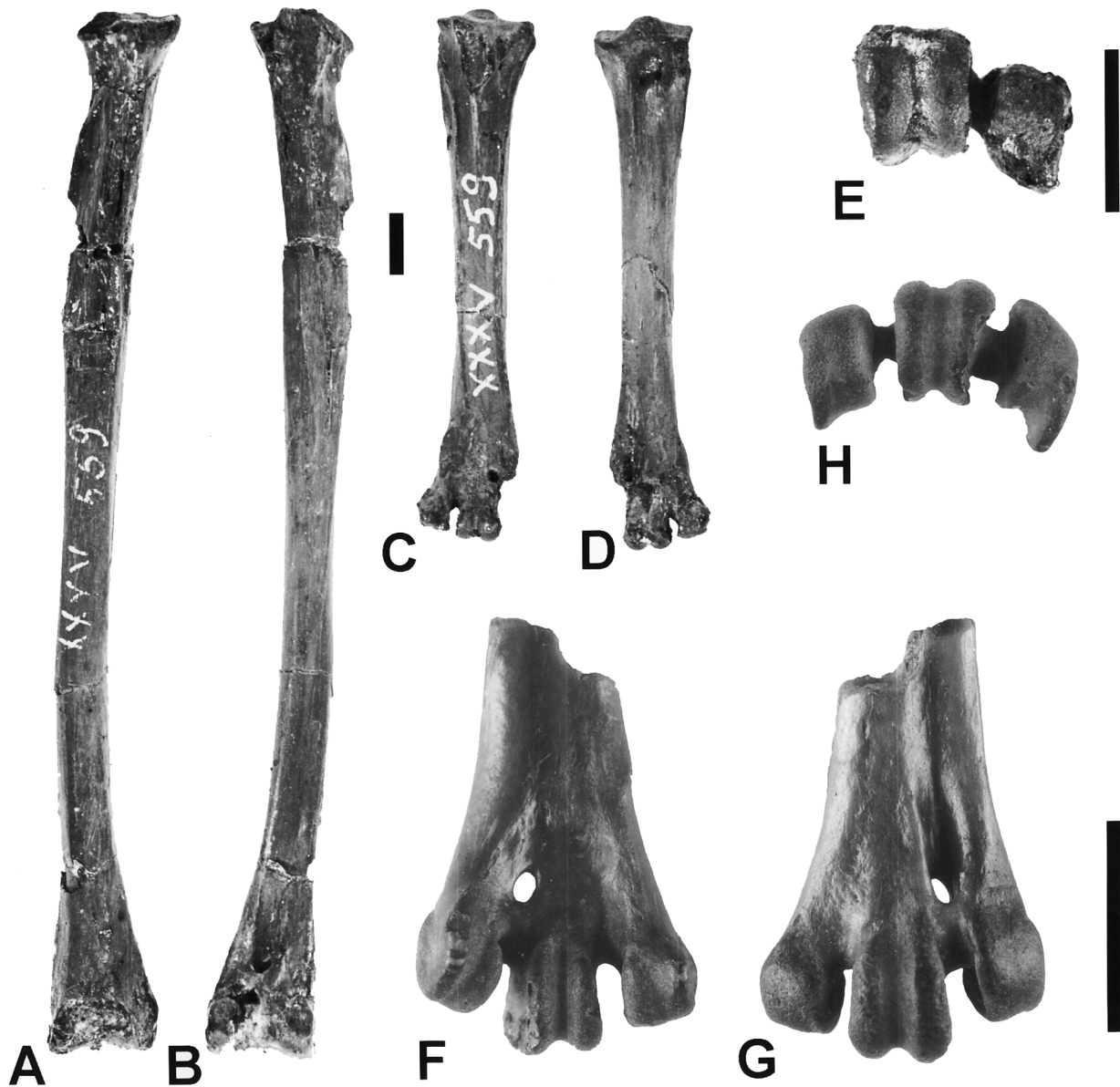


Fig. 1. Isolated bones of *Plesiocathartes* sp. **A-E.** GMH 559, from the middle Eocene of the Geiseltal, Germany. **A.** Left tibiotarsus in caudal view. **B.** Left tibiotarsus in cranial view. **C.** right tarsometatarsus in plantar view. **D.** right tarsometatarsus in dorsal view. **E.** right tarsometatarsus in distal view. **F-H.** BMNH A 6178, from the lower Eocene London Clay of Warden Point, Sheppey Island, England. **F.** Distal end of left tarsometatarsus in plantar view. **G.** Distal end of left tarsometatarsus in dorsal view. **H.** Distal end of left tarsometatarsus in distal view. Scale bars = 5 mm; same scale for A-D and F-H.

The genus *Plesiocathartes* is characterized by the following putatively derived features of the tarsometatarsus (which is the only bone known from *P. europaeus*, the type species of the genus): (1) shaft compressed in dorso-plantar direction, middle part with rectangular cross-section, distal end with plane dorsal surface, and cristae mediales et laterales distinct (usually the shaft is less compressed in dorsoplantar direction and has a more trapezoidal cross-section, which is here considered to be the plesiomorphic condition in neornithine birds); (2) fossa metatarsi I sharply defined, but very small (in presumably basal neornithine birds, e.g.,

the palaeognathous Tinamidae and the Galloanseres, this fossa is larger, which probably is the plesiomorphic condition); (3) trochleae metatarsorum, especially those for the second and third toe, very small and arranged on a weakly curved line if the bone is viewed from its distal end (in presumably basal neornithine birds the trochleae metatarsorum are much larger and those for the second and fourth toe are turned more in plantar direction, which is the primitive condition).

The tibiotarsus of the Messel species of *Plesiocathartes* further corresponds to that of the above mentioned Geiseltal

specimen in that the trochlea cartilaginosa tibialis is very short in proximo-distal direction, which also is a derived feature within neornithine birds (see below). The tibiotarsus of *P. europaeus* is unknown.

Plesiocathartes kelleri sp. nov.
Figs. 2–8

Holotype—SMF-ME 3639, an articulated skeleton on a slab, lacking the left leg, Fig. 2.

Differential Diagnosis—*Plesiocathartes kelleri* sp. nov. is smaller than *P. europaeus* and the yet unnamed Geiselal species. The distal width of the tarsometatarsus is about 5.9 mm vs. about 7.8 mm in *P. europaeus* (according to Gaillard 1908); the length of the bone is about 26.2 mm, vs. 40.8 in the Geiselal species and about 30–32 mm in *P. europaeus* (estimated total length). The tarsometatarsus of *Plesiocathartes kelleri* sp. nov. further is slightly less stout than that of *P. europaeus*.

Type locality—Messel near Darmstadt (Hessen, Germany)

Type horizon—lower middle Eocene (Legendre and Lévêque 1997).

Measurements of the holotype (maximum length in mm)—Skull, ~56.7; coracoid, ~22.5 (left), ~22 (right); right humerus, 49.8; ulna, ~58 (left), ~57 (right); right carpometacarpus, ~28.8; right femur, ~29; right tibiotarsus, ~46.2; right tarsometatarsus, ~26.2; right pedal phalanges, I1, ~7; III1, 7.1; II2, 7.2; II3, 4.3; III1, ~5; III2, ~6; III3, 6.7; IV1, 5.5; IV2, ~4.7; IV3, 4.7; IV4, 6.6; IV5, 4.1.

Referred specimen—HLMD Be 162, a complete, articulated skeleton on a slab, Fig. 3.

Measurements of the referred specimen (maximum length in mm)—Skull, ~57.3; humerus, ~51.8 (left), 48.7 (right); ulna, 60.5 (left), 60.3 (right); carpometacarpus, 30.6 (left), 30.7 (right); left femur, ~30.3; left tibiotarsus, 51.0; left tarsometatarsus, 28.2; pedal phalanges, I1, 7.2; III1, 7.6; II2, 7.3; II3, 4.8; III1, ~8; III2, 7.9; III3, 7.2; III4, 5.8; IV1, 5.0; IV2, 5.0; IV3, 4.0; IV4, 5.0; IV5, 5.1.

Etymology—The species has been named after Mr. Manfred Keller, who found and prepared the holotype, and who kindly donated it to Forschungsinstitut Senckenberg.

Description and comparison—*Skull*: The robust beak measures slightly more than half of the entire skull; the culmen is moderately curved. The beak appears to be somewhat deeper than in *Leptosomus*, but this impression might in part be a result of the compression of the fossil specimen. The narial openings reach distally to about the middle of the beak (SMF-ME 3639); they appear to have been larger than in *Leptosomus*, although their exact shape cannot be discerned clearly. The pars symphysialis of the mandible is fairly long, measuring about 1/4 of the entire length of the element; fenestrae mandibulae are not visible. The ossa praefrontalia are similar in shape and relative size to those of *Leptosomus*. Elongated processus postorbitales, one of the most characteristic skull features of the Leptosomidae, can-

not be discerned. Whether this is a result of the poor preservation of the skulls of the two known skeletons of *P. kelleri*, or whether these processes indeed were absent in this species needs to be shown by future, better preserved specimens.

Trachea: Ossified tracheal rings are preserved in specimen HLMD Be 162.

Vertebrae: About 19 presacral vertebrae can be counted in the holotype, which is in concordance with the number of presacral vertebrae in the majority of extant birds. The cervical vertebrae are rather short and appear to have had shallow lacunae interzygapophysiales.

Coracoid: The coracoid has similar proportions to that of *Leptosomus*. Unfortunately, in both specimens much of the extremitas omalis is hidden by other overlying bones and few features can be discerned. The processus procoracoideus is well-developed and larger than in *Leptosomus* (Fig. 4); it bears a distinct articular facet for the scapula. The processus acrocoracoideus is short, and the whole extremitas omalis resembles that of extant Cuculidae (in which, however, the processus procoracoideus is more slender). As in *Leptosomus*, the extremitas sternalis protrudes medially. The shape of the processus lateralis cannot be discerned.

Furcula: Details of the furcula are visible only in the holotype. In having a straight end, the extremitas omalis has an unusual shape (Fig. 4). In the holotype of *P. kelleri*, the left scapus clavicularum is visible next to the left coracoid although its width cannot be discerned. In *Leptosomus discolor*, the extremitas omalis is more rounded and the scapi clavicularum are very wide; the whole furcula of *L. discolor* is somewhat similar to that of owls (Strigiformes).

Scapula: The scapula is fairly straight and bears a short acromion.

Sternum: As can be seen in the holotype, the sternum is small with short processus cranio-laterales. As in *Leptosomus*, a well-developed spina externa seems to be absent. The caudal margin of the bone bears four small incisions of similar size, whereas in *L. discolor* the incisurae mediales are much deeper than the almost completely reduced incisurae laterales.

Humerus: The humerus (Figs. 2, 3, 5) is long and the shaft strongly flexed in its midsection (visible in the holotype). With regard to the latter feature and in overall proportions, the bone closely resembles the humerus of *Leptosomus* (Fig. 5A). It mainly differs in the proportionally shorter crista deltopectoralis which in *Plesiocathartes kelleri* is of similar size to the crista deltopectoralis of, for example, *Falco* spp. (Falconiformes). The proximal end of the bone is comparatively small, and the caput humeri is oriented obliquely to the longitudinal axis of the shaft, as in *Leptosomus*. The tuberculum dorsale is indistinct. Except for the absence of a distinct processus supracondylaris dorsalis, details of the distal end of the bone cannot be discerned.

Ulna: The ulna exceeds the humerus in length and is the longest limb element. This feature distinguishes *Plesio-*

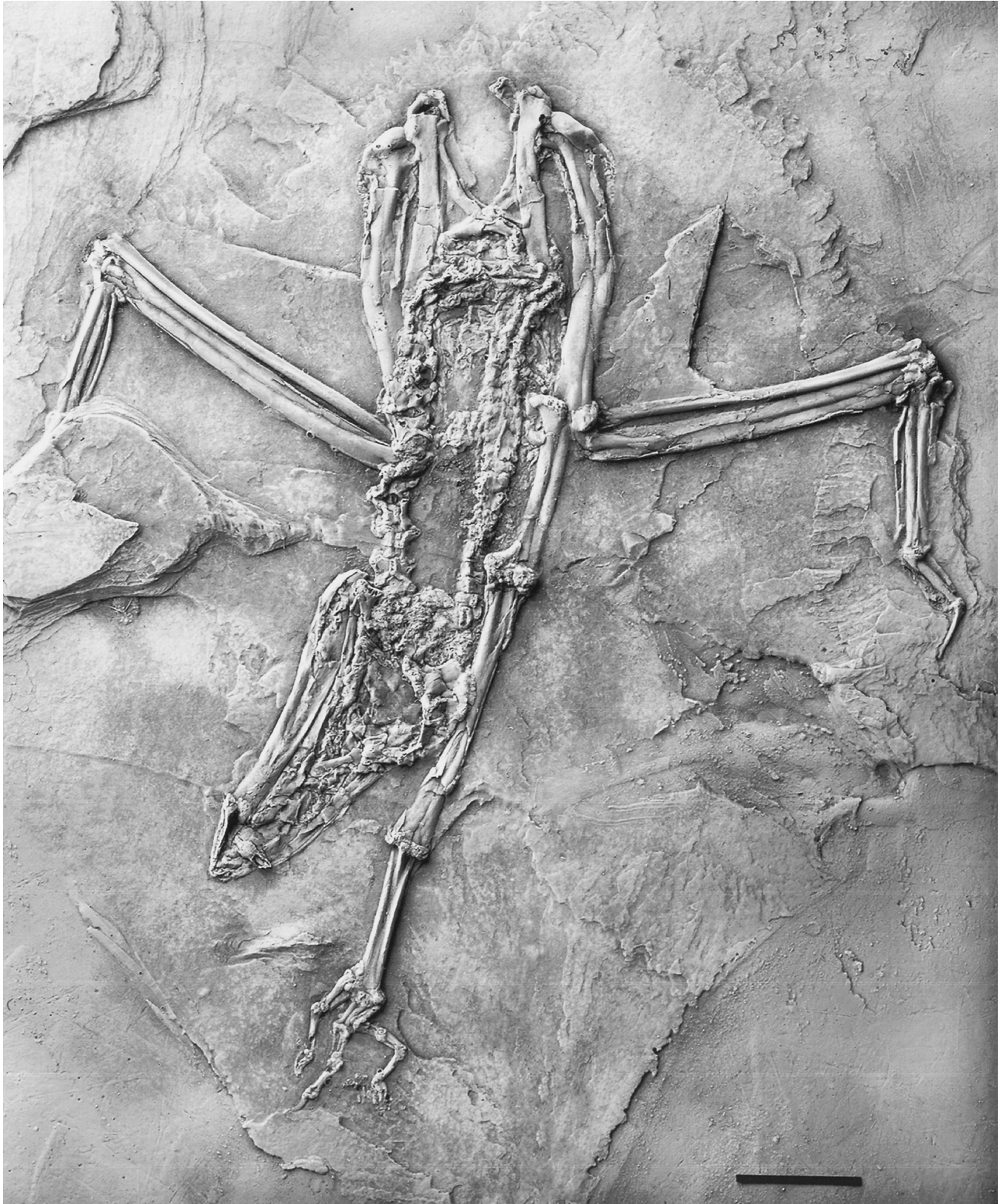


Fig. 2. *Plesiocathartes kelleri* sp. nov., holotype (SMF-ME 3639). Coated with ammonium chloride, scale bar = 20 mm.



Fig. 3. *Plesiocathartes kelleri* sp. nov., referred specimen (HLMD Be 162). Coated with ammonium chloride, scale bar = 10 mm.