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A redescription of *Lithornis vulturinus* (Aves, Palaeognathae) from the Early Eocene Fur Formation of Denmark

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Abstract

The extinct Lithornithidae include several genera and species of flying palaeognathous birds of controversial affinities known from the Early Paleogene of North America and Europe. An almost complete, articulated skeleton from the Early Eocene marine deposits of the Fur Formation (Denmark) was recently assigned to *Lithornis vulturinus* Owen, 1840. This study provides a detailed redescription and comparison of this three-dimensionally preserved specimen (MGUH 26770), which is one of the best preserved representatives of the Lithornithidae yet known. We suggest that some new features might be diagnostic of *Lithornis vulturinus*, including a pterygoid fossa shallower than in other species of *Lithornis* and the presence of a small caudal process on the os palatinum. We propose that *Lithornis nasi* (Harrison, 1984) is a junior synonym of *Lithornis vulturinus* and we interpret minor differences in size and shape among the specimens as intraspecific variation. To date, *Lithornis vulturinus* is known with certainty from the latest Paleocene—earliest Eocene to Early Eocene of the North Sea Basin (Ølst, Fur and London Clay Formations). Among the four species of the genus *Lithornis*, the possibility that *Lithornis plebius* Houde, 1988 (Early Eocene of Wyoming) is conspecific with either *Lithornis vulturinus* or *Lithornis promiscuus* Houde, 1988 (Early Eocene of Wyoming) is discussed. The presence of closely related species of *Lithornis* on either side of the North Atlantic in the Early Eocene reflects the existence of a high-latitude land connection between Europe and North America at that time.

Key words: Aves, Eocene, Denmark, Fur Formation, *Lithornis*, Ypresian

Introduction

The extinct Lithornithidae are chicken-sized flying palaeognathous birds that were an important and diverse component of the Northern hemisphere avifaunas in the Paleocene and Eocene (60 to 48 million years ago). The only other flying palaeognaths are the Tinamidae (tinamous), which appear in the fossil record in the Early Miocene (Bertelli *et al.* 2014) and are represented today by 47 species inhabiting Central and South America (del Hoyo *et al.* 1992). The lithornithids had slender beaks equipped with foveae for sensory corpuscles that they probably used to probe along bodies of water (Houde 1988). Morphology of the wing bones, shoulder girdle and sternum suggests that lithornithids may have been better flyers than the Tinamidae (Houde 1988). The long hallux and curved claws of the lithornithids also suggest perching abilities (Houde 1988). Although Richard Owen described the first lithornithid species, *Lithornis vulturinus* Owen, 1840, in the nineteenth century (Owen 1840, 1841, 1846), Lithornithidae were not recognized as palaeognaths until the 1980s (Houde & Olson 1981; Houde 1986, 1988). Isolated bones of these enigmatic birds are superficially more similar to a number of neognaths than they are to any modern palaeognath group. Thus, their true identity has confounded taxonomists for over a century (Houde 1988). In his monograph, Houde (1988) assigned a number of taxa to Lithornithidae that previous workers had referred to various clades of neognathous birds such as Accipitridae (hawks, eagles and Old World vultures), Cathartidae (New World vultures), Musophagidae (turacos), Procellariidae (shearwaters and petrels), Rallidae