A new record of the Prophaethontidae (Aves: Pelecaniformes) from the Middle Eocene of Belgium

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Abstract

A new record of the pelecaniform family Prophaethontidae HARRISON & WALKER, 1976 is described from the Middle Eocene of Belgium. The specimen, an isolated left coracoid, presents previously unknown osteological details. It is smaller than the coracoid of *Prophaethon shrubsolei* ANDREWS, 1899 and might belong to a new, yet unnamed species.

Key words: Aves, Pelecaniformes, Prophaethontidae, Middle Eocene, Belgium.

Résumé

Une nouvelle découverte du famille des Pélécaniformes Prophaethontidae HARRISON & WALKER, 1976 est décrite de l'Eocène moyen de

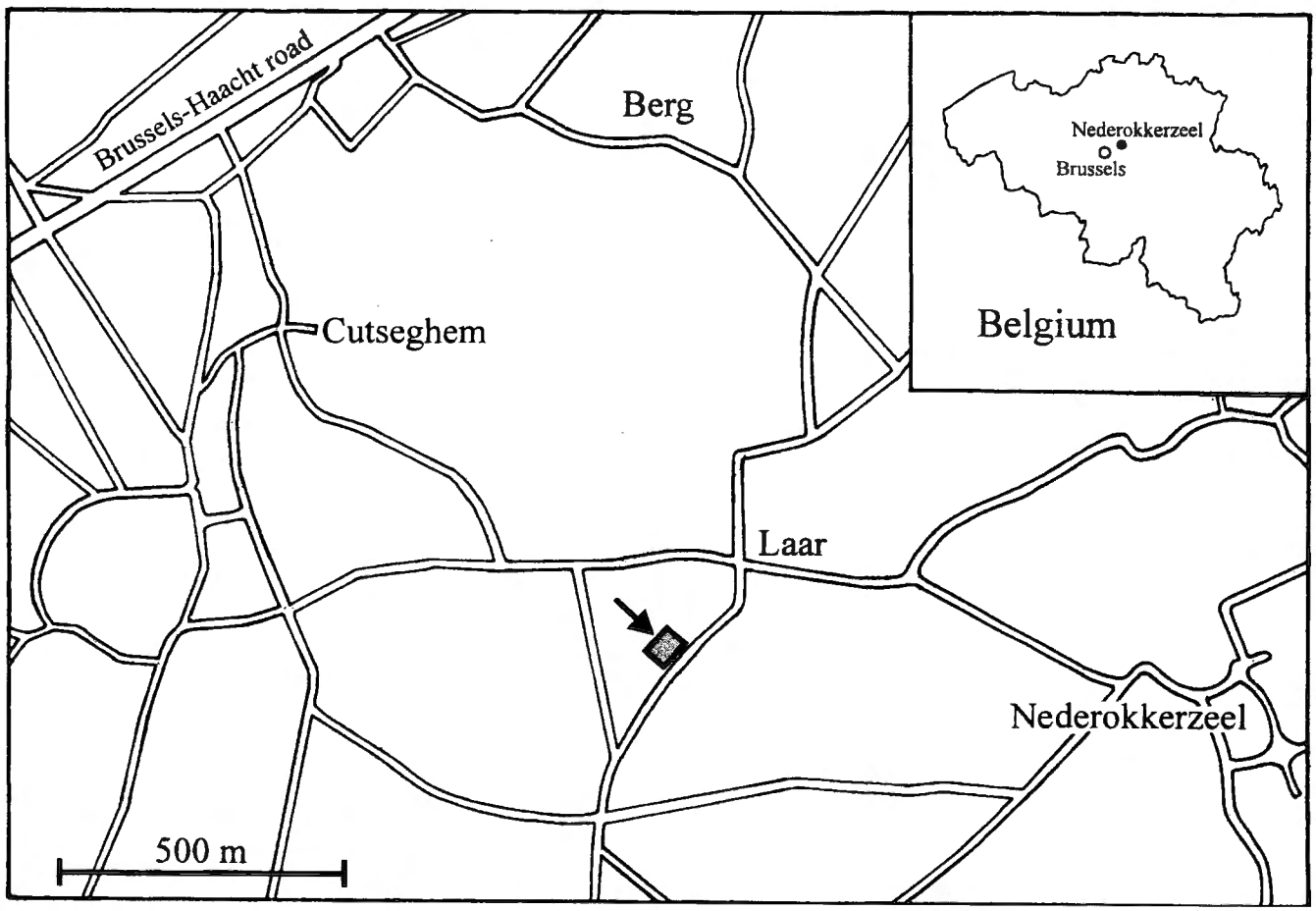

Fig. 1 — Location of the Imbrechts quarry in Nederokkerzeel.

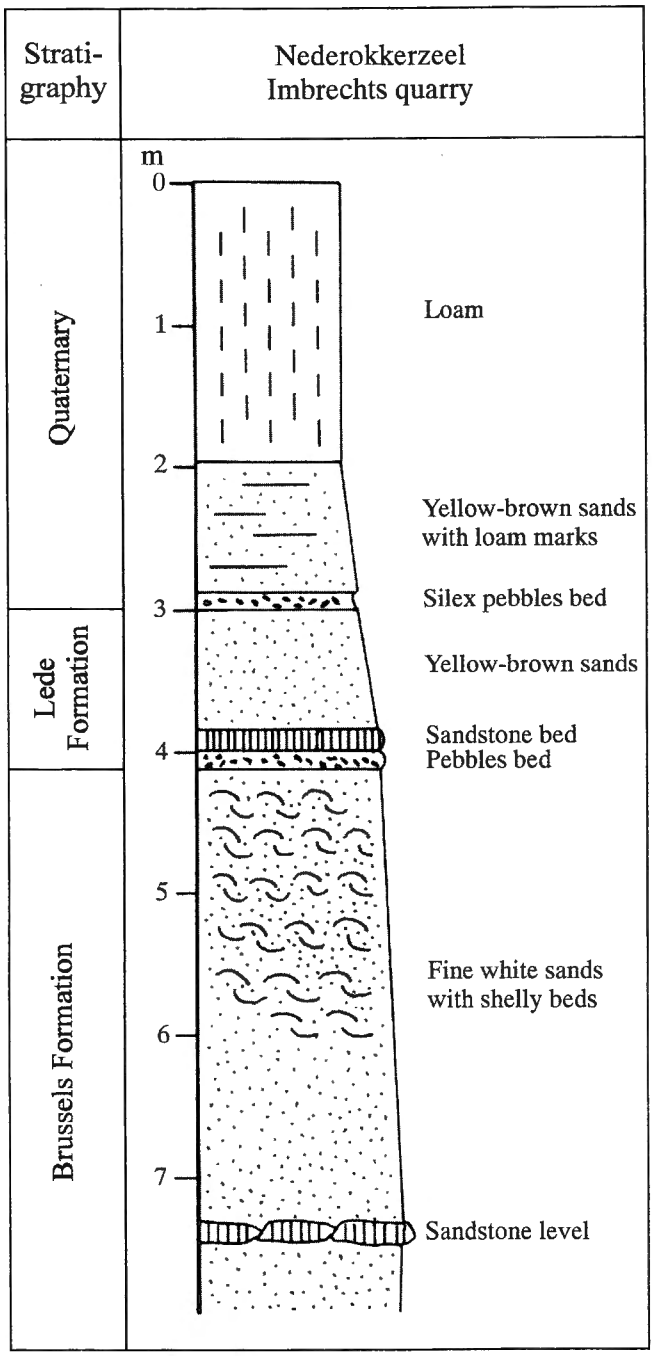

Fig. 2 — Stratigraphic section of the Imbrechts quarry in Nederokkerzeel. The specimen was found in the shelly levels of the Brussels Fm.

Belgique. Le spécimen, un coracoïde gauche isolé, présente des détails ostéologiques inconnus à ce jour. Il est plus petit que le coracoïde de *Prophaethon shrubsolei* ANDREWS, 1899 et peut appartenir à une espèce nouvelle encore indéterminée.

Mots-clefs: Aves, Pelecaniformes, Prophaethontidae, Eocène moyen, Belgique.

Introduction

The Lower Eocene pelecaniform bird *Prophaethon shrubsolei* was described by ANDREWS (1899) from the London Clay of the Isle of Sheppey, England (stratigraphic level MP 8-9, according to MLÍKOVSKÝ, 1996). The type specimen consists of associated elements of a single individual, including a largely complete skull, an incomplete coracoid and scapula, part of the sternum, a nearly complete pelvis, a femur, and the proximal end of a tibiotarsus.

As indicated by the genus name, ANDREWS (1899) assigned *Prophaethon* to the family Phaethontidae (tropicbirds). In the course of a re-description of the type specimen, HARRISON & WALKER (1976) classified the genus in its own order and family, and thought it to be a "link" between the avian orders Pelecaniformes, Charadriiformes, and Procellariiformes. OLSON (1985a, 1985b), however, considered ordinal separation of *Prophaethon* not to be justified, and stated that the Prophaethontidae "should be placed in the Pelecaniformes in the suborder Phaethontes" (OLSON 1985a: 194). OLSON (1994) tentatively assigned a very small coracoid from the Palaeocene of Maryland to the genus *Prophaethon*, but unfortunately did not figure this specimen which belongs to a yet undescribed species.

We herein describe a new record of the Prophaethontidae from the Middle Eocene of Nederokkerzeel, Belgium, which was collected by R. Smith in 1987. The locality is situated 16 km northeast of Brussels and 200 m southwest of the hamlet of Laar, in a sand quarry operated by the family Imbrechts (Figs. 1, 2).

The locality Nederokkerzeel is well known since the 19th century for its rich fauna of marine molluscs. In 1987-1988, screening of 10 tons of sediments from the shell level (Brussels Formation, see WOUTERS & VANDENBERGHE 1994) by one of the authors (RS) yielded large quantities of shark teeth and the coracoid which is described in this study.

The fossil specimen is deposited in the Institut Royal des Sciences Naturelles de Bruxelles, Belgium (IRScNB). The osteological terminology used in this study follows BAUMEL & WITMER (1993), the dimensions are in millimeters.

Taxonomy

Pelecaniformes SHARPE, 1891
Prophaethontidae HARRISON & WALKER, 1976
Genus and species indeterminate
Fig. 3

REFERRED SPECIMEN
IRScNB Av 79 (almost complete left coracoid, lacking part of the *processus acrocoracoideus* and the *processus lateralis*).

LOCALITY AND HORIZON
Nederokkerzeel near Brussels, Belgium; Middle Eocene (Lutetian, Brussels Formation).

DIMENSIONS
Maximum length along longitudinal axis, 38.0; length

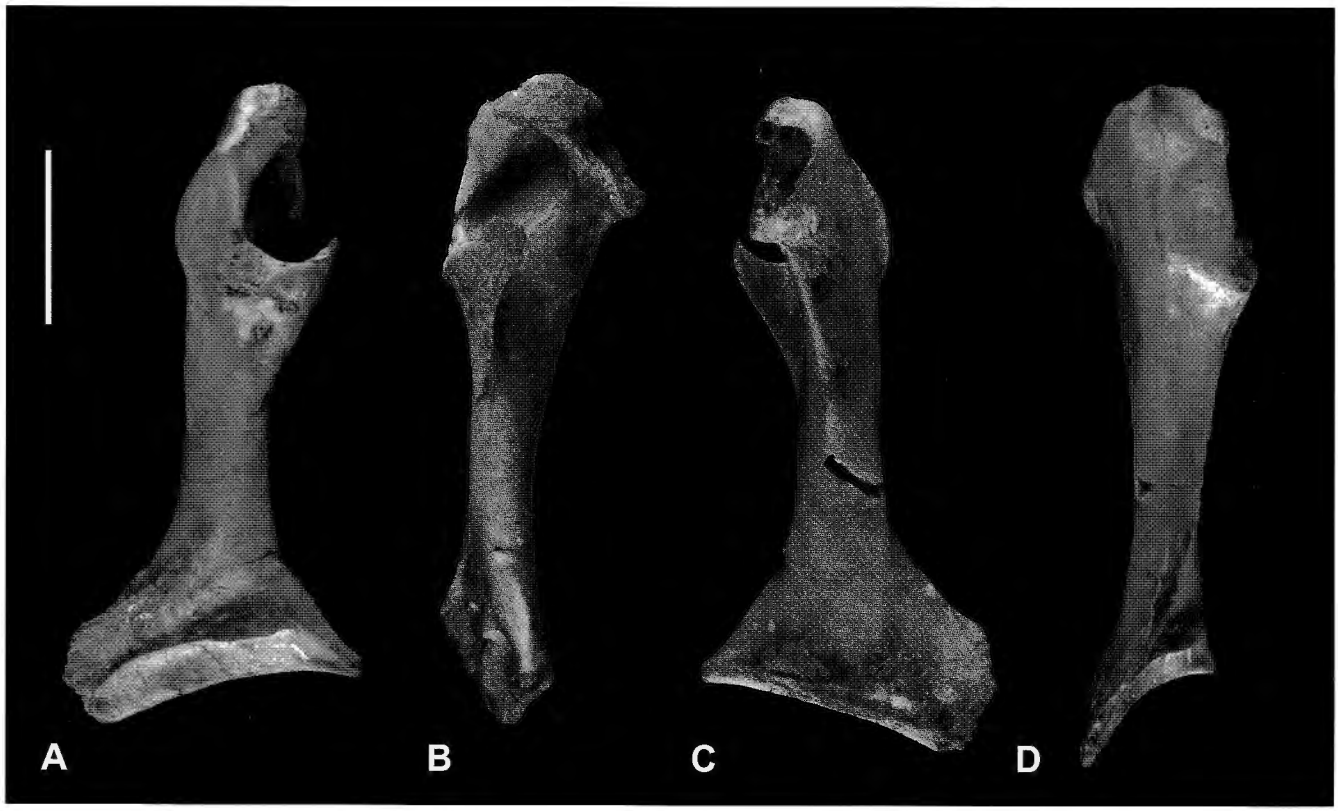

Fig. 3 — Prophaethontidae, genus and species indeterminate (Aves: Pelecaniformes), left coracoid from the Middle Eocene of Nederokkerzeel, Belgium (IRScNB Av 79) in dorsal (A), medial (B), ventral (C), and lateral (D) view. Scale bar equals 10 mm.

from *angulus medialis* to tip of *processus acrocoracoideus*, 34.3; minimum medio-lateral width of shaft, 4.8; length and width of *facies articularis humeralis*, 7.5 4.6.

DESCRIPTION AND COMPARISON

The specimen is about 2/3 of the size of the coracoid of the White-tailed tropicbird, *Phaethon lepturus*, which is the smallest extant species of the Phaethontidae. It is distinguished from all Pelecaniformes except for the Pelecanidae, Prophaethontidae and Phaethontidae by the presence of a *foramen nervi supracoracoidei*. As in recent and fossil Phaethontidae, the *facies articularis scapularis* is still very shallow (in recent Pelecanidae and in the early Eocene frigatebird *Limnofregata* it is deeply excavated).

As far as comparable, owing to preservation, the Nederokkerzeel specimen closely resembles the coracoid of *Prophaethon shrubsolei*. A characteristic feature which is shared by the fossil from Nederokkerzeel and *Prophaethon shrubsolei* is the narrow *processus lateralis*, which distinguishes the genus *Prophaethon* from extant Phaethontidae and all other Pelecaniformes (this process is very long in *P. shrubsolei* - in the new specimen its tip is broken just behind the *angulus lateralis*).

The *processus procoracoideus* is thin and blade-like, and directs more towards the *facies articularis clavicularis* than in recent Phaethontidae. The *processus acrocoracoideus* protrudes ventrally, the sternal margin of the *facies articularis clavicularis* is not as greatly ossified as in recent Phaethontidae (in the type specimen of *Prophaethon shrubsolei* the *extremitas omalis* is largely broken). The *sulcus musculi supracoracoideus* bears a marked depression which is bordered by a bulge at its dorsal side; a pneumatic foramen is situated at the bottom of this depression. Among recent Pelecaniformes a similar depression occurs in the Sulidae (gannets and boobies), but it is present neither in the Miocene tropicbird *Heliadornis* nor in recent Phaethontidae. The shaft of the bone appears to be somewhat stouter than in *P. shrubsolei*, the *angulus medialis* of the sternal end is pointed and protrudes medially (this part of the coracoid is also broken in the type specimen of *P. shrubsolei*). The *facies articularis sternalis* runs from above the *angulus medialis* to above the *angulus lateralis*; the dorsal surface of its medial part is not strongly pronounced as, for example, in recent Sulidae and Phalacrocoracidae. There is a marked ridge on the dorsal side of the *extremitas sternalis*, which runs along the *margo supra-angularis*. The *facies articularis sternalis* seems to be slightly less oblique in relation to the longitudinal axis of the shaft than in *P. shrubsolei*.

Discussion

The specimen described in this study is smaller than the coracoid of *Prophaethon shrubsolei* which, according to HARRISON & WALKER (1976), has an overall length of 43.2 mm. The Nederokkerzeel coracoid further differs in few osteological features (see description above) and thus

probably belongs to a new taxon of the Prophaethontidae. However, since we did not yet have the opportunity to compare it directly with the type specimen, we refrain from naming a new taxon.

We agree with OLSON (1985a, 1985b) that *Prophaethon* is a member of the Pelecaniformes. A derived character shared by *Prophaethon shrubsolei* and the pelecaniform families Phaethontidae, Phalacrocoracidae, and Sulidae is a distinct articulation facet for the *furcula* on the *apex* of the *carina sterni* (HARRISON & WALKER, 1976: Fig. 6; in recent Fregatidae and Pelecanidae the *furcula* is completely fused with the *apex carinae*). The "interramal suture" of *P. shrubsolei*, which was described by HARRISON & WALKER (1976: Fig. 6), might be an intraramal hinge which is also found in extant Pelecaniformes, and which is derived in neognathous birds, too (see ZUSI & WARHEIT, 1992).

Monophyly of Prophaethontidae and Phaethontidae, however, has not been established with derived characters so far, and *Prophaethon shrubsolei* distinctly differs from recent Phaethontidae in the much narrower pelvis and in the presence of enlarged *cristae cnemiales* on the proximal end of the *tibiotarsus*. If tropicbirds indeed are the sister taxon to all other extant Pelecaniformes as suggested by CRACRAFT (1985), osteological similarities between Prophaethontidae and Phaethontidae (e.g. skull morphology, presence of a *foramen nervi supracoracoidei*) might be plesiomorphic within pelecaniform birds. Concerning the coracoid of the Eocene frigatebird *Limnofregata* for example, OLSON (1977) also noted a great overall similarity to the Phaethontidae.

True members of the Phaethontidae are known from the Miocene of North America (OLSON, 1985b), Austria (MLÍKOVSKÝ, 1997), and Belgium (OLSON & WALKER, 1997), and were classified in the genus *Heliadornis* OLSON, 1985. Although the coracoid of *Prophaethon* more closely resembles that of the Miocene genus *Heliadornis* than the corresponding bone of recent Phaethontidae, it differs in the somewhat larger *foramen nervi supracoracoidei* which is situated more closely to the *facies articularis scapularis*, the more obliquely oriented *facies articularis clavicularis*, and in the presence of a marked depression in the *sulcus musculi supracoracoidei*.

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