

Praecarbo strigoniensis, a new genus and species of Cormorants (Phalacrocoracinae) from the Late Oligocene of Hungary

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Abstract The authors describe a fossil avian distal *tibiotarsal* epiphysis, remains of a cormorant (Phalacrocoracinae), differing in age and morphological characters from other fossil cormorants. The fossil material comes from sandy marine deposits from the village of Máriahalom in north-western Hungary, together with the remains of 26 other vertebrate species, mostly marine. The age of the fossiliferous deposit is established in the Late Oligocene, at the beginning of the Chattian stage (MP25–30). The earliest fossil specimens of the subfamily Phalacrocoracinae are known from the Early-Middle Oligocene of North America and Northeast Africa, respectively. The rest of the known specimens are dated to the Late-Upper Oligocene and Lower Miocene. Thus, the fossil described here represents an intermediate age and it is less specialised in morphological characteristics. A new genus and species of cormorants, *Praecarbo strigoniensis* described here based on the distal epiphysis of a fossil *tibiotarsus*.

Keywords: NE Hungary, Máriahalom, Late Oligocene, cormorant, *tibiotarsus*

Összefoglalás A szerzők egy *tibiotarsus* disztális epifizisének vizsgálata során jutottak arra a következtetésre, hogy a lábszárcsont töredék kora és jellegei a későbbi kárókatona leletektől eltérők. A lelet az ÉNY-magyarországi Máriahalom település határában található tengeri homok üledékéből származik, 26 más állatfaj maradványaival együtt. A lelőhely korát az oligocén Katti emeletének (MP25–30) elejére sorolják. Mivel a Phalacrocoracinae alcsalád legkorábbi ismert fajai É-Amerika, illetve É-Afrika kora-középső oligocénjéből ismertek, a többiek meg már a késő-oligocén végéről és a miocén elejéről, a vizsgált maradvány korban egy köztes helyet foglal el, jellegeiben pedig kevésbé specializálódott. Az új genus és faj *Praecarbo sinogradiensis* n. gen. et sp. néven van leírva, egy *tibiotarsus* disztális epifiziséből.

Kulcsszavak: ÉNY-Magyarország, Máriahalom, Késő-Oligocén, kárókatona, *tibiotarsus*

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Introduction

Early representatives of the typical piscivorous family belong to the subfamily Graculavinae and are known with two species from the Paleocene of North America (*Graculavus velox* Marsh 1872 and *Graculavus pumilus* Marsh 1872) (Brodkorb 1963). The earliest member of the subfamily Phalacrocoracinae, which includes the fossil and extant cormorant species, is known from the Eocene in England (*Actiornis anglicus* Lydekker, 1891) (Brodkorb 1963), based on the proximal epiphysis of an *ulna*.

The genus *Phalacrocorax* was first recorded by R. W. Shufeldt in 1915 from the Early-Middle Oligocene of North America (USA) from the proximal part of a *carpometacarpus* (*Phalacrocorax mediterraneus* Shufeldt, 1915) (Brodkorb 1963). *Apremaxilla* from the Jebel Qatrani Formation (Egypt, Fayum) has also been reported from the Rupelian (Rassmussen *et al.* 1987), and already from the Late Oligocene and Early Miocene representatives of the genus *Borocarbo* from France and Germany (Mayr 2001, 2007, 2009, Mourer-Chauviré *et al.* 2004, Göhlich & Mourer-Chauviré 2010). The remaining fossil cormorant species are known from the Neogene (Milne-Edwards 1863, Cheneval 1984, Mlíkovský 2002). The distal *tibiotarsal* epiphysis is known in some of the species mentioned above, so we compare our material to them.

Description of the fossil site

Rabi and Botfalvai (2008) provided information about the fossil site, including data from Janssen (1984), who studied molluscs here.

Máriaalom is a small village in the NW Hungary, in Komárom-Esztergom county, 47 km from Budapest (Figure 1). The fossiliferous site is on the outskirts of the village, and it consists of marine sands of the Mányi Formation. The mollusc-rich layers of the former sand mine, include many bones of aquatic vertebrates, as well as those from the surrounding land environment, carried into the sea by water currents.



Figure 1. Location of Máriaalom fossil site on the map of Hungary

1. ábra Máriaalom fosszilis lelőhely helye Magyarországtérképén

Alongside the fossil remains of typical aquatic invertebrates, there are many selacine and skate teeth, bones of bony fish, turtles, crocodiles, and sirenians, as well as those of birds and other mammals. In 2008, 26 vertebrate species were reported from this fossil site, but their numbers have increased since then (Kessler 2013, 2018, Rabi *et al.* 2018).

Most of the vertebrate fossils were collected by Zoltán Evancies, amateur palaeontologist, who donated his collection to the Hungarian Natural History Museum in Budapest, and the avian bones were transferred to the Palaeontology Department of Eötvös Loránd

University. Several taxa (?*Grallavis* sp., ?*Gaviiformes* indet., ?*Balearica* sp., *Aves* indet.) (Kessler 2013) have been tentatively reported from this collection. Unfortunately, the condition of most bones is so precarious that they cannot be identified to species level, with two exceptions. First, a claw bone which belongs to the Osprey genus (*Pandion*) has been described as a new species, *Pandion pannonicus* (Kessler 2018). Second, the distal part of phalacrocoracine *tibiotarsus* – which was initially reported erroneously as anatid – is the subject of the present study.

Material and Method

The material under study is a distal tibiotarsal epiphysis. We used the corresponding bone of a Great Cormorant (*Phalacrocorax carbo*) (Figure 2: 1–10) and the works of Göhlich and Maurer-Chauviré (2010) and Cheneval (1984) as comparative materials. The age of the fossiliferous deposit was dated to the Late Oligocene (MP25–30) at the beginning of the Chattian stage. Bone dimensions were measured with a digital calliper. Anatomical terminology was provided by the Osteological Handbook of Baumel *et al.* 1979.

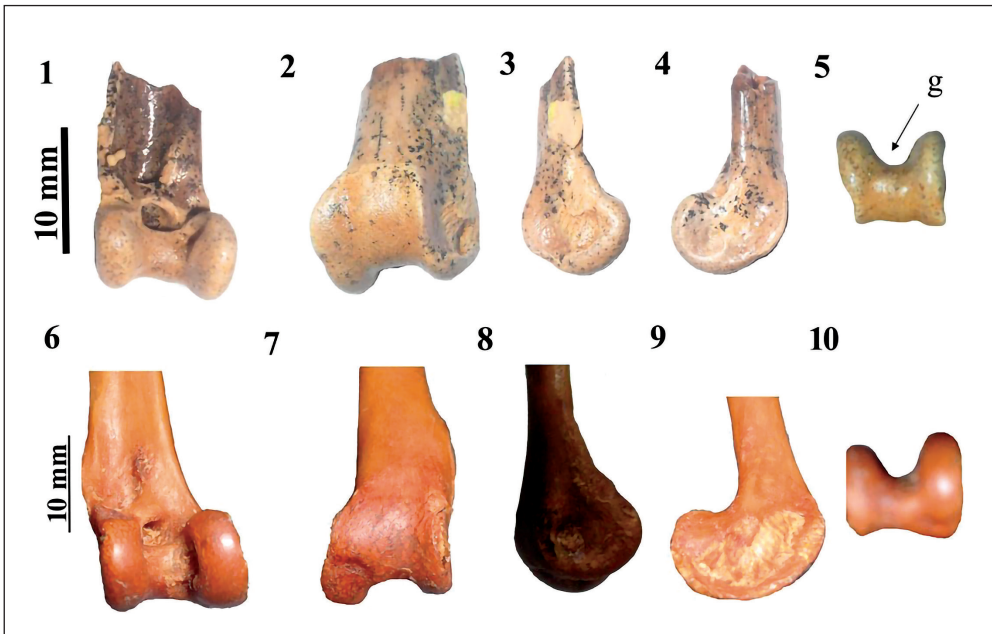


Figure 2. images 1–5. *Praeacarro strigoniensis* n. gen. et sp. 1. right *tibiotarsus*, distal epiphysis, cranial aspect; 2. caudal aspect; 3. medial aspect; 4. lateral aspect; 5. distal aspect; g. *incisura intercondylaris*; images 6–10. extans *Phalacrocorax carbo* L. 1758; 6. right *tibiotarsus*, distal epiphysis, cranial aspect; 7. caudal aspect; 8. lateral aspect; 9. medial aspect; 10. distal aspect

2. ábra 1–5. kép: *Praeacarro strigoniensis* n. gen. et sp. 1. jobboldali *tibiotarsus*, disztális epifízis, craniális nézet; 2. caudális nézet; 3. mediális nézet; 4. laterális nézet; 5. disztális nézet; g. *incisura intercondylaris*; 6–10. kép: recens *Phalacrocorax carbo* L. 1758; 6. jobboldali *tibiotarsus*, disztális epifízis, craniális nézet; 7. caudális nézet; 8. laterális nézet; 9. mediális nézet; 10. disztális nézet

The abbreviations used are F = width of the distal epiphysis; G1= thickness of the epiphysis at the medial condyle, G2 = thickness of the epiphysis at the lateral condyle, G= overall thickness of the distal epiphysis.

The bone was photographed from several views, with diagnostic characteristics indicated. Photos of extant species were also used for comparison.

Systematics

Class Aves Linnaeus, 1758

Order Pelecaniformes (Sharpe, 1891)

Family Phalacrocoracidae (Bonaparte, 1853)

Subfamily Phalacrocoracinae (Bobarte, 1854)

Genus: *Praecarbo* n. gen.

Species: *Praecarbo strigoniensis* n. sp.

Site and age: Máriahalom (Komárom-Esztergom county, Esztergom district, Hungary), Middle-Late Oligocene, (MP25–30), Mányi Formation.

Holotype: right *tibiotarsus*, distal epiphysis (Figure 3: 1–4);

Dimensions: E-8.5 mm; F-10.88 mm; G1-4.60 mm; G2-4.75mm (Figure 3: 5–7);

Dimensions of comparative materials: rec. *Phalacrocorax carbo* (Linnaeus, 1753) E-10.52 mm; F-12.91 mm; G1-5.43 mm; G2-7.17 mm; rec. *Nannopterum auritus* (Lesson, 1831) E-6.64 mm; F-12.72 mm; G-11.07 mm; *Microcarbo pygmeus* (Pallas, 1773) E-4.90 mm; F-7.70 mm; G-7.60 mm (orig.); *Borocarbo tardatus* Göhlich & Mourer-Chauviré 2010 E-7.30 mm; F-13.70 mm; G-12.50 mm; *Oligocorax litoralis* E-5.60 mm; F-9.60-9.90 mm; *Nectornis miocaenus* E-4.80 mm; F-8.60 mm; G-8.80 mm (after Göhlich & Mourer-Chauviré 2010); *Phalacrocorax litoralis* (Milne-Edwards, 1863) F-9.82–10.26 mm; (after Cheneval 1984).

Name etymology: *Praecarbo* = genus preceding *Phalacrocorax*; *strigoniensis* = from the Latin name of Esztergom (Strigonium).

Genus and species diagnosis: an early ancestor of cormorants with less specialised subfamily characters. Also lacking the medio-lateral distortion of the distal epiphysis, indicative of the members of the clade, which also gives the shape of the *sulcus extensorius* and *pons tendineus*:

- the *sulcus extensorius* (a) is wide and extends under the bridge in the middle of the epiphysis;
- the *pons tendineus* (b) is almost straight, quite wide, distalolaterally slightly oblique;
- the opening of the *canalis extensorius* (c) is wide;
- *tuberculum retinaculi m. fibularis* (d) slightly prominent;
- *condylus medialis* (e) and *condylus lateralis* (f) nearly equal in size;
- *incisura intercondylaris* (g) is wide and deep in distal view.

In comparison with the early cormorant species already mentioned, the *sulcus extensorius* of the Máriahalom specimen does not extend medially but remains in the middle of the diaphysis until the bridge; the *pons tendineus* is broader and less oblique than in *Oligocorax*, *Nectornis* and *Phalacrocorax*, and almost identical to *Borocarbo*; the *canalis extensorius*

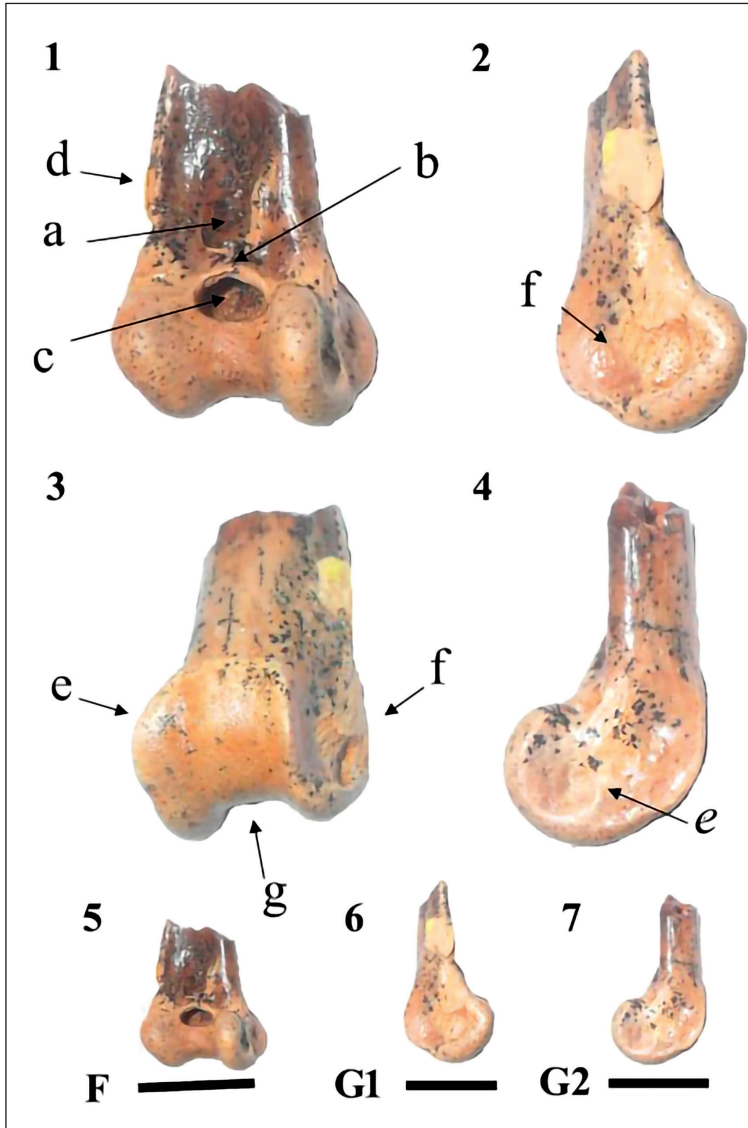


Figure 3. images 1–4. *Praecarbo strigoniensis* n. gen. et sp. 1. right tibiotarsus, distal epiphysis, cranial aspect, a – sulcus extensorius, b – pons tendineus, c – orifice traverse of canalis extensorius, d – tuberositas musc. fibularis; 2. caudal aspect, e – condylus medialis, f – condylus lateralis, g – incisura intercondylaris; 3. lateral aspect, f – condylus lateralis; 4. medial aspect, e – condylus medialis; images 5–7. measurement method: F – width of distal epiphysis; G1 – thickness of lateral condylus; G2 – thickness of medial condylus

3. ábra 1–4. kép *Praecarbo strigoniensis* n. gen. et sp. 1. jobboldali tibiotarsus, disztális epifízis, craniális nézet, a – sulcus extensorius, b – pons tendineus, c – canalis extensorius nyílása, d – tuberositas musc. fibularis; 2. caudális nézet, e – condylus medialis, f – condylus lateralis, g – incisura intercondylaris; 3. laterális nézet, f – condylus lateralis; 4. mediális nézet, e – condylus medialis; 5–7. kép: mérési módszer: F – disztális epifízis szélessége; G1 – laterális condylus vastagsága; G2 – mediális condylus vastagsága

opening is similarly wide as in the other species; the length of the two articular cusps (*condylus medialis* and *lateral*) is almost identical, unlike in the other species, where the former is more or less longer; the *condylus medialis* is not oblique as in *Borocarbo*; the *incisura intercondylaris* is deeper than in *Oligocorax* and *Nectornis*.

In size, *Praecarbo* is slightly smaller than *Borocarbo tardatus*, *Phalacrocorax carbo*, and *Nannopterum auritus*, and larger than all the other above species. Further, it is probably dated earlier than the other fossil phalacrocoracine species with known tibiotarsus.

Conclusions

The above study describes a new genus and species based only on a distal tibiotarsal fragment, it is of serious importance. This finding signals an early appearance of phalacrocoracine birds in Europe and the Carpathian Basin in particular. It is characteristic that all known avian species in the Carpathian Basin during the Mesozoic, Palaeogene, and Early Neogene perdidswere aquatic or at least lived in a wetland environment, indicating the palaeogeographic and palaeoclimatic conditions in this area at that time.

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