

New records of the tylosaurine mosasaur *Hainosaurus* from the Campanian–Maastrichtian (Late Cretaceous) of central Poland

J.W.M. Jagt^{1,*}, J. Lindgren², M. Machalski³ & A. Radwański⁴

¹ Natuurhistorisch Museum Maastricht, de Bosquetplein 6, NL-6211 KJ Maastricht, the Netherlands.

² GeoBioSphere Centre, Department of Geology, Lund University, Sölvegatan 12, SE-223 62 Lund, Sweden.

³ Instytut Paleobiologii PAN, ul. Twarda 51/55, PL 00-818 Warszawa, Poland.

⁴ Instytut Geologii Podstawowej, Wydział Geologii UW, Al. Żwirki i Wigury 93, PL 02-089 Warszawa, Poland.

* Corresponding author. Email: john.jagt@maastricht.nl

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Abstract

Two isolated mosasaur teeth, one from the upper Campanian of Piotrawin, the other from the upper Maastrichtian at Nasilów (Wisła River valley, central Poland), recently described as *Plioplatecarpinae* sp. A and *Plioplatecarpinae* sp. B, respectively, are reassigned to the tylosaurine genus *Hainosaurus* Dollo, 1885. The present record thus adds to the list of *Hainosaurus* species known to date from elsewhere in Europe (Sweden, Belgium and England).

Keywords: Mosasauridae, Tylosaurinae, *Hainosaurus*, Campanian, Maastrichtian, Poland

Introduction

In the Campanian–Maastrichtian (Late Cretaceous) sequence of central Poland (Wisła River valley), remains of mosasaurid reptiles are comparatively rare and generally comprise isolated teeth and tooth crowns only. Yet, a fairly diverse assemblage (five taxa, based on tooth morphology) has recently been recorded (Machalski et al., 2003). Those authors discussed and illustrated two isolated teeth, under the names of *Plioplatecarpinae* sp. A and *Plioplatecarpinae* sp. B; this record is here revised, and both teeth are reassigned to the tylosaurine genus *Hainosaurus* Dollo, 1885.

Description

A fragmentary bicarinate tooth crown (IGPUW AR-5) in the A. Radwański Collection (Instytut Geologii Podstawowej, Uniwersytet Warszawski) is from an opoka facies of late Campanian (*Nostoceras hyatti* = *N. pozaryskii* Zone) age, exposed

at Piotrawin. This was referred to as *Plioplatecarpinae* sp. A by Machalski et al. (2003, p. 405, fig. 9B). As preserved, IGPUW AR-5 measures 38.0 mm in height, and 20.2 mm in basal width. The cross section is elliptical, with lingual and buccal surfaces of subequal convexity. The anterior carina is sharp and well developed, the posterior one not preserved; no serrations are seen, but this may be a matter of preservation. There is a slight posterior recurvature, and the buccal surface shows at least seven facets of unequal width (Fig. 1), the lingual one 9-10; these do not reach mid-height. On both surfaces, very faint striae are visible, confined to the proximal portion of the crown, which is smooth otherwise. The upper portion of the tooth crown is broken; in anterior view, a slight lingual recurvature may be seen.

The second, bicarinate tooth crown (MKD.MP-18; Fig. 2), housed in the collections of Muzeum Nadwiślańskie (Kazimierz Dolny), is from the upper Maastrichtian (*Belemnella* (*Neobelemnella*) *kazimiroviensis* Zone) at Nasilów. Machalski et al. (2003, p. 405, fig. 9A) referred to this as *Plioplatecarpinae*

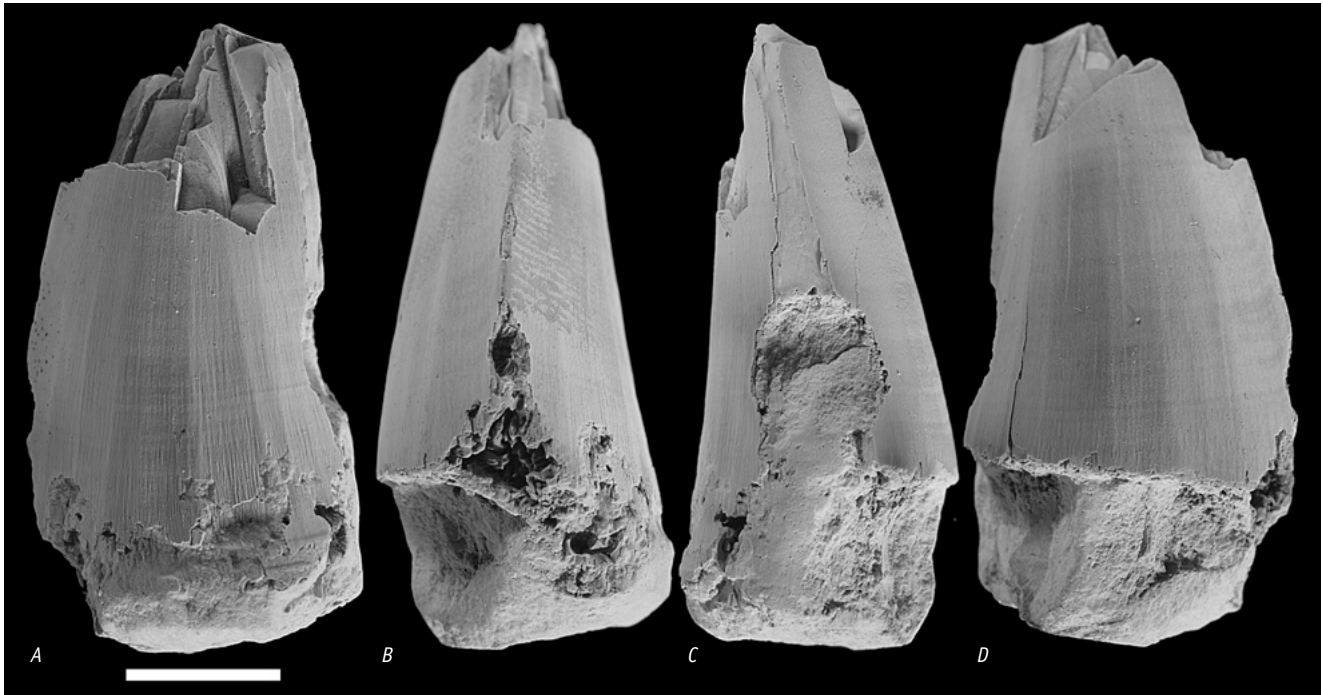


Fig. 1. *Hainosaurus* sp. 1 (IGPUW AR-5), upper Upper Campanian (Nostoceras pozaryskii = N. hyatti Zone), Piotrawin, in A – lingual; B – mesial (posterior); C – mesial (anterior); and D – buccal views, respectively. Specimen whitened prior to photography; scale bar equals 5 mm.

sp. B. As preserved, MKD.MP-18 measures 24 mm in height, and 8.6 mm in width at the base. In cross section, it is elliptical, with subequal lingual and buccal surfaces. Both carinae are well developed and serrations are preserved in patches only. There is a slight posterior and lingual recurvature; the buccal surface shows at least seven facets of comparable width, the lingual one 11-12, not reaching mid-height. Very faint striae occur close to the base, on both surfaces, the crown being smooth otherwise.

Discussion

Examination of dental morphology is an important, yet under-utilized tool in mosasaur taxonomy. With few exceptions, dental characters have received only scant attention in systematic studies of mosasaurs, and in general, detailed descriptions of teeth accompanied by high-quality illustrations, are exceedingly rare in the literature. In the majority of cases, teeth are only described in vague, rather uninformative terms.

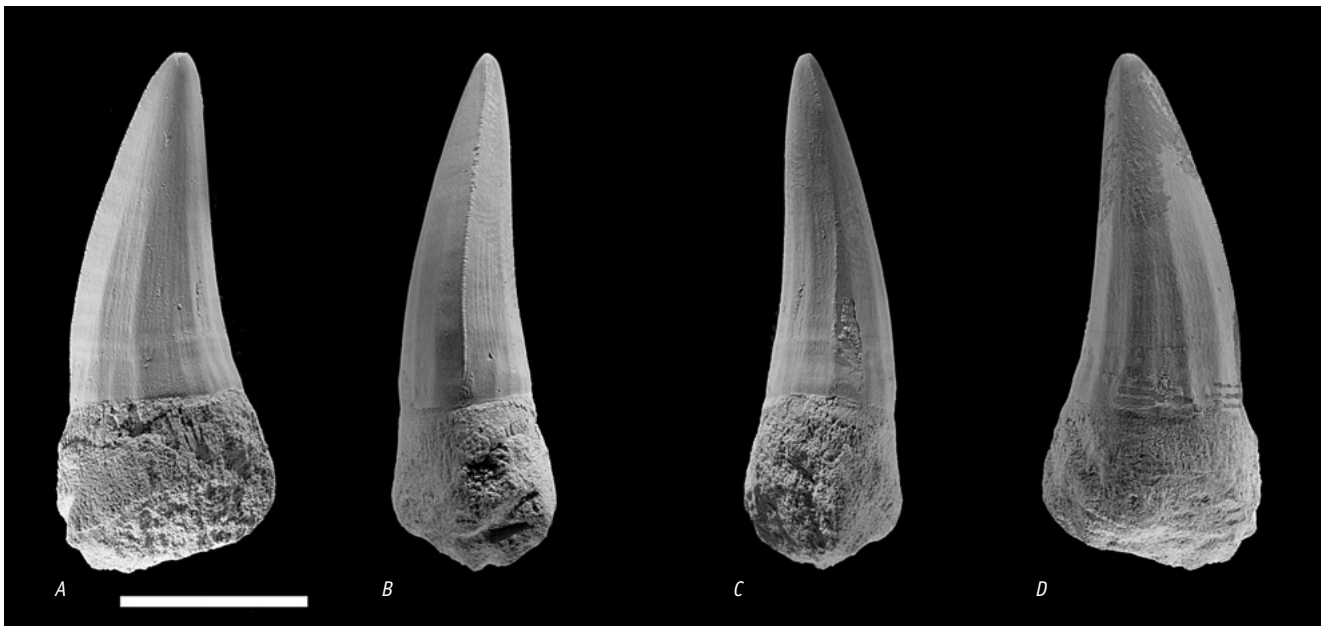


Fig. 2. *Hainosaurus* sp. 2 (MKD.MP-18), upper Maastrichtian (Belemnella (Neobelelemnella) kazimiroviensis Zone), Nasitów, in A – lingual; B – mesial (posterior); C – mesial (anterior); and D – buccal views, respectively. Specimen whitened prior to photography; scale bar equals 5 mm.

This has seriously hampered comparisons between the various taxa, and, consequently, dental morphology has been considered to be unreliable in most taxonomic studies of mosasaurs.

However, from personal experience and first-hand examination of reasonably complete mosasaur skeletons, with the emphasis on dental characters, we know that differences in skeletal anatomy are invariably mirrored by differences in tooth morphology. Accordingly, isolated mosasaur teeth may be identified with confidence, at least to the generic level, in the majority of cases. Naturally, differences relating to ontogeny and jaw position, as well as a certain range of variation within a certain taxon must be considered when assessing the potential of isolated teeth. For instance, the marginal dentition is well differentiated in the genera *Clidastes* Cope, 1868, *Dollosaurus* Yakovlev, 1901 and in the durophagous mosasaurs *Carinodens* Thurmond, 1969 and *Globidens* Gilmore, 1912, whereas teeth are more uniform in *Platecarpus* Cope, 1869, *Ectenosaurus* Russell, 1967 and *Plioplatecarpus* Dollo, 1882. Obviously, these differences reflect varying feeding strategies and adaptations, where, e.g. the slender and pointed teeth of *Platecarpus*, *Plioplatecarpus* and *Ectenosaurus* probably had a piercing function, specially adapted to penetration between thin, but closely spaced, ribs (see Massare, 1987).

Tylosaurine mosasaurs have generally been considered to possess closely similar dental apparatuses, comprised of moderately differentiated and very robust tooth crowns. However, as demonstrated by Lindgren & Siverson (2002), this assertion is erroneous; rather, marginal teeth of at least the two Northern Hemisphere genera *Tylosaurus* Marsh, 1872 and *Hainosaurus*, can be readily separated from one another by dental characters alone. This discovery has led to the conclusion that there are no verified records of *Hainosaurus* from North America, whereas *Tylosaurus* is present on both continents (Lindgren & Siverson, 2002; Everhart, 2005; Lindgren, 2004, in press).

Machalski et al. (2003) were of the opinion that the combination of facetting with proximal striae and a slight lingual recurvature of IGPUW AR-5 and MKD.MP-18 was reminiscent of teeth assigned to the plioplatecarpine genera *Platecarpus* and *Plioplatecarpus*. However, comparison of these specimens with tooth crowns from the upper lower Campanian (*Belemnellocamax mammillatus* Zone) of southern Sweden described by Lindgren (in press) suggests they are better interpreted as species of *Hainosaurus*. In particular, the flattened profile and the fact that carinae are serrated, a character unknown in plioplatecarpine mosasaurs, favour such an assignment. Swedish material is slightly smaller, has markedly faceted, enamelled surfaces (8 - 10 facets buccally, 11 - 12 lingually) and shows minute serrations on anterior and posterior carinae. More material from central Poland is needed to determine the relationship between these two taxa (of late Campanian and late Maastrichtian age, respectively) and between the Polish specimens and species of *Hainosaurus* from elsewhere in Europe.

So far, *Hainosaurus* seems to be an exclusively European genus (but see also Bell et al., 1999), with records from the uppermost lower Campanian of the Kristianstad Basin and the mid-Campanian of the Vomb Trough (both southern Sweden; Lindgren, 2004, in press), the lower Campanian of NE Belgium (*Platecarpus* sp. sensu Kuypers et al., 1998, p. 37, pl. 7, figs 1-3), the upper Campanian and upper Maastrichtian of central Poland (this paper), the upper Campanian of Norfolk, England ('*Leiodon* [sic] *anceps* Owen, 1845', see Lingham-Soliar, 1993, figs 5b-d, 6b, c), and the lower Maastrichtian of southern Belgium (Mons Basin, type area of *Hainosaurus bernardi*) (Dollo, 1885; Lingham-Soliar, 1992).

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