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A NEW MIDDLE EOCENE SPECIES OF *PREMONTREIA* (ELASMOBRANCHII, SCYLIORHINIDAE) FROM VLAAMS-BRABANT, BELGIUM

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(2 figures, 1 table and 2 plates)

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ABSTRACT. Isolated teeth, collected from strata assigned to the Brussel Sand Formation (Lutetian, Eocene) at the Imbrechts sand pit (Nederokkerzeel, Vlaams-Brabant, Belgium), form the basis for erecting a new species of scyliorhinid shark, *Premontreia (Premontreia) lutetiensis*. Affinities and heterodonty are discussed.

KEYWORDS. Chondrichthyes, Scyliorhinidae, *Premontreia*, Eocene, Belgium.

1. Introduction

Ever since Burtin's monograph (1784), strata currently assigned to the Brussel Sand Formation have been famous for their rich and diverse faunas. Although invertebrate and vertebrate taxa were discussed and illustrated in detail in this magnificent work, binominal nomenclature was not used. The first major studies of elasmobranch faunas from these deposits complying to the international code of zoological nomenclature (ICZN), were conducted almost a century later by Winkler (1874, 1876). Since then, numerous contributions and revisions have followed. The most important are papers by Leriche (1905, 1906), Casier (1949), Herman (1977, 1982), Nolf (1988) and Cappetta & Nolf (2005). For a complete pre-1906 bibliography, reference is made to Leriche (1906, pp. 149-160). It should be noted that most present-day Brussel Sand Formation outcrops are sterile or very poor in fossils. However, in the mid-1990s, fossiliferous levels were temporarily exposed at the Imbrechts sand pit (Nederokkerzeel). Both private collectors and the Institut royal des Sciences naturelles de Belgique (IRScNB) / Belgian Geological Survey (BGS) took the opportunity to sieve large quantities of sands down to 0.5 mm mesh. Screening of the residues has yielded large numbers of vertebrate remains, including diverse elasmobranch faunas which include a number of species either new to science or not been reported previously from the Brussel Sand

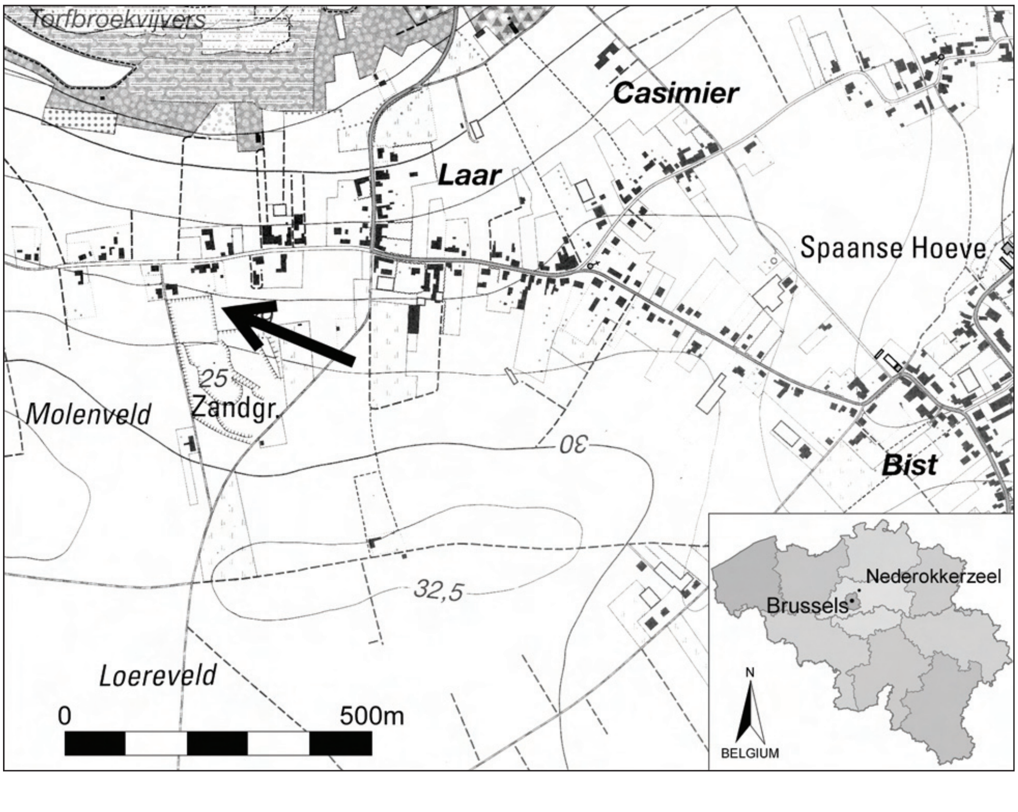

Figure 1. Map of the Nederokkerzeel area (modified from National Geographic Institute, 1994). The arrow indicates the temporary exposures in the mid-1990s at the Imbrechts sand pit.

Formation. A new species of scyliorhinid is formally named in the present paper.

2. Locality and stratigraphy

The Imbrechts sand pit at Nederokkerzeel, hamlet of Kampenhout (province of Vlaams-Brabant, Belgium), is situated about 16 km northeast of Brussels (Lambert co-ordinates x = 162.450, y = 179.050, National Geographic Institute, 1994; topographic map of Belgium, sheet 24/5-South, Kampenhout) (see Fig. 1). It is registered at the Belgian Geological Survey (BGS) as locality 74 W 148. Here, both the Brussel Sand Formation and the Lede Sand Formation were exposed in the 1990s, the latter directly underlying the Quaternary. On the basis of lithological differences and (nanno)fossil evidence, Herman *et al.* (2000) divided the Brussel Sand Formation at the Imbrechts sand pit into three units (A, B and C). Unlike units A and C, unit B is highly fossiliferous; it yielded the elasmobranch remains dealt with in this paper. Detailed logs of the Imbrechts sand pit were published by Gullentops *et al*. (2001) and Mayr & Smith (2002) to which reference is made (see also Fig. 2).

3. Systematic palaeontology

Systematics follows Noubhani & Cappetta (1997), while descriptive terminology is adapted mainly from Cappetta (1986, 1987) and Herman *et al.* (1990).

Order Carcharhiniformes Compagno, 1973
Family Scyliorhinidae Gill, 1862
Subfamily Premontreinae Cappetta, 1992
Genus *Premontreia* Cappetta, 1992

Type species.
Premontreia degremonti Cappetta, 1992, by monotypy.

Generic diagnosis (after Cappetta, 1992 and Noubhani & Cappetta, 1997).
Teeth are fairly large (up to 6 mm in height), with a principal cusp that is upright and high, more or less thick and with smooth cutting edges. Transversely, the lingual face is convex and generally without ornamentation. The labial face is sometimes smooth, but mostly bears a variable number of short, vertical, parallel folds at the crown base. The labial base of the crown is rectilinear. In profile, the labial face of the crown barely overhangs the

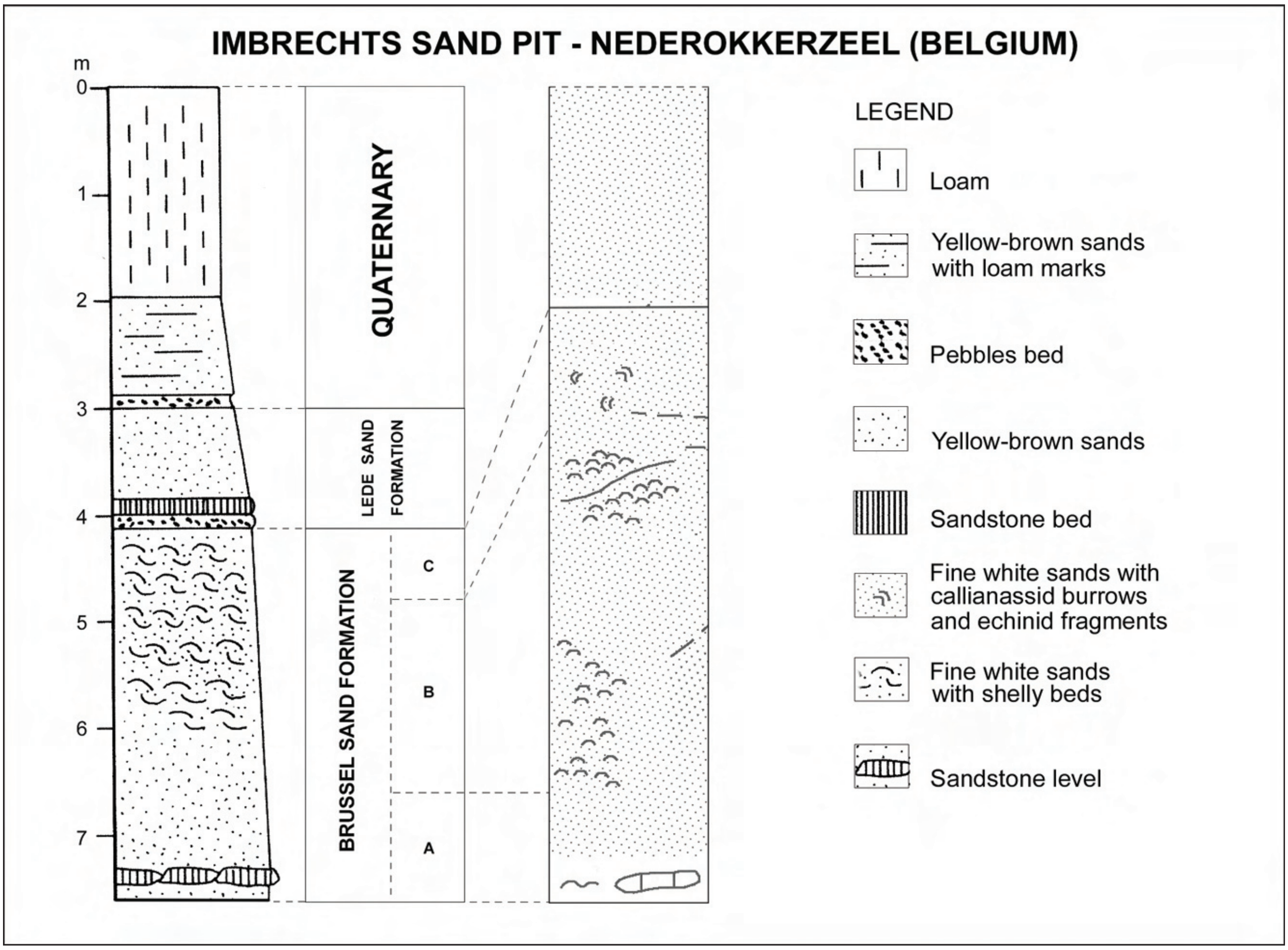

Figure 2. Lithostratigraphy of the Imbrechts sand pit at Nederokkerzeel; sections left and right after Mayr & Smith (2002) and Gullentops *et al.* (2001), respectively. Stratigraphical interpretation follows Herman *et al.* (2000). All material of *P. (P.) lutetiensis* was collected from unit B of the Brussel Sand Formation.

root or is protuberant at the base. One or two pairs of lateral cusplets, more or less high and pointed, may be present. Cusplets may also be absent and replaced by heels that have smooth cutting edges. The central basal part of the labial face of the crown is more or less depressed. The root is high and thick with a large basal face that is flat and more or less heart-shaped. The basal face has a deep median groove which is Ω- or ∩-shaped in labial view and which bears a principal foramen. The lingual face of the root is well developed, oblique and bears numerous elliptic foramina. The labial face of the root is high and concave. In occlusal view, the root lobes are much broader than the crown base. Numerous foramina are present below the crown-root junction.

Premontreia (Premontreia) lutetiensis sp. nov.
Plates 1, 2

Designation of name.
Named after the Lutetian (or "*lutétien*" as in the original French description of De Lapparent, 1883, p. 989), the stratigraphic age of *Premontreia (P.) lutetiensis* sp. nov., derived from the Roman name of Paris, *Lutetia Parisorum*.

Diagnosis.
Species represented by isolated teeth of clutching type, with a gradient monognathic heterodonty. Teeth are robust and up to 8 mm in height. The cusp is rather straight or slightly oblique towards the commissure. The cutting edge of the cusp is invariably smooth. At least in anterior, lateral and commissural teeth, the cusp is always flanked at both sides by high heels (parasymphysial teeth were not found). The cutting edge of these heels is in general smooth, but sometimes a little undulated. Real cusplets are absent. The lingual face of the crown is mostly smooth, but weak striae may be observed on the heels of lateral and commissural teeth. On the labial crown base, vertical parallel folds are present that do not pass the height of the heel. The central basal part of the labial face of the crown is a little depressed. In labial view, the crown root junction is rectilinear. In profile, the labial base of the crown does not protrude and barely overhangs the root. The basal face of the root is large, flat and heart-shaped, bearing a deep open median groove that is Ω-shaped in labial view. The median groove has one principal foramen situated lingually. Several much smaller foramina are scattered randomly at lingual, labial and basal faces of the root. The root lobes are much wider than the crown base in occlusal view. The root is holaulacorhizid.

Holotype.
IRScNB P.8374 (*ex* Mollen Collection).

Paratypes.
IRScNB P.8375 (*ex* Gijsen Collection).
IRScNB P.8376 (*ex* Wille Collection).
IRScNB P.8377 (*ex* Herman Collection).
IRScNB P.8378 (*ex* D'Haeze Collection).
IRScNB P.8379 (*ex* Mollen Collection).
IRScNB P.8380 (*ex* D'Haeze Collection).

Additional material.
In addition to the types (see above), twenty-one other teeth have been studied (all in private collections). The preservation of the material is very good and comparable to accompanying faunas from this locality.

Type locality and horizon.
Imbrechts sand pit, Nederokkerzeel; unit B (*sensu* Herman *et al*., 2000) of the Brussel Sand Formation (Lutetian, Eocene). On calcareous nannofossil evidence (see Herman *et al*., 2000), this unit was dated as Early Lutetian (Eocene) or zone NP14a3-NP14b.

Description.
In holotype IRScNB P.8374 (Pl. 2, Figs 1A-C), the cusp is almost straight, but not elongated. The cutting edge is smooth, a little undulated at both heels and present alongside the entire crown. Numerous vertical folds occur at the labial crown base. The tooth is higher than broad. The general morphology of this specimen suggests a lateral jaw position.

In paratypes IRScNB P.8375 (Pl. 1, Figs 1A-C) and IRScNB P.8376 (Pl. 1, Figs 2A-C), the cusp is elongated and flanked by two heels, one of them slightly damaged in both specimens. The cutting edge is smooth and present alongside the entire crown. Numerous vertical folds occur at the labial crown base. In both teeth, height exceeds width. The general morphology of these specimens suggests anterior jaw positions.

In paratype IRScNB P.8377 (Pl. 1, Figs 3A-C), the cusp is not very elongated and flanked by two heels. The cutting edge is smooth and present alongside the entire crown. Numerous vertical folds occur at the labial crown base. Weak striae are present, especially on the lingual face of the mesial heel. The tooth is higher than broad. The general morphology of this specimen suggests a lateral jaw position.

In paratype IRScNB P.8378 (Pl. 2, Figs 2A-C), the cusp is almost straight, but not elongated. The cutting edge is smooth and present alongside the entire crown. The labial face is almost smooth. The tooth is broader than high. The general morphology of this specimen suggests a lateral jaw position.

In paratype IRScNB P.8379 (Pl. 2, Figs 3A-C), the cusp is not elongated and the apex slightly damaged. The mesial cutting edge is slightly oblique towards the commissure. The cutting edge is smooth and present alongside the entire crown. Numerous vertical folds occur at the labial crown base. The tooth is broader than high. The general morphology of this specimen suggests a lateral jaw position.

In paratype IRScNB P.8380 (Pl. 2, Figs 4A-C), the cusp is very short and flanked by two heels. The cutting edge is smooth and present alongside the entire crown. Numerous vertical folds occur at the labial crown base. Weak striae are present on the lingual face of both heels.

	Plate	Height	Width
IRScNB P.8374 (holotype)	Pl. 2, Fig. 1A-C	5.47	5.38
IRScNB P.8375 (paratype)	Pl. 1, Fig. 1A-C	6.96	5.25
IRScNB P.8376 (paratype)	Pl. 1, Fig. 2A-C	6.02	4.20
IRScNB P.8377 (paratype)	Pl. 1, Fig. 3A-C	4.90	4.25
IRScNB P.8378 (paratype)	Pl. 2, Fig. 2A-C	4.24	4.41
IRScNB P.8379 (paratype)	Pl. 2, Fig. 3A-C	4.83	5.03
IRScNB P.8380 (paratype)	Pl. 2, Fig. 4A-C	2.09	3.01

Table 1. *Premontreia (Premontreia) lutetiensis* sp. nov. Measurements (in mm).

The tooth is broader than high. The general morphology of this specimen suggests a posterior jaw position.

Dimensions.
Height and width of all types are shown in Table 1.

Discussion.
Except for their larger size, the teeth described here are consistent with the generic diagnosis of *Premontreia* Cappetta, 1992. This genus was divided into the subgenera *Premontreia* and *Oxyscyllium* by Noubhani & Cappetta (1997). In the subgenus *Premontreia,* the principal cusp is flanked by heels or by a single pair of cusplets, while in *Oxyscyllium* a second pair of cusplets may be present. Moreover, in the latter, cusplets are better developed. In both subgenera, vertical folds occur, but they are better developed in *Oxyscyllium* than in *Premontreia*. In profile, the labial crown base may be protuberant in *Oxyscyllium*, but not in *Premontreia*.

The new species described here possessed teeth that have no real cusplets, vertical folds are not developed in a way that they are higher than the height of the heels and the labial crown base is not protuberant. Therefore I assign this species to the subgenus *Premontreia* Noubhani & Cappetta, 1997.

In addition to the type species, only one other species has been assigned to this subgenus namely *Premontreia (Premontreia) uralica* Malyshkina, 2006 from the Priabonian of the Trans-Urals, Russia. This species differs from the type species by its higher, more massive root and thicker cusp that is triangular in shape and has a wider base. In *P. (P.) degremonti* short heels may be present while in *P. (P.) uralica* mesial and distal cutting edges of the crown are invariably (sub)rectilinear. Vertical folds at the labial crown base are less well developed in *P. (P.) uralica* than in *P. (P.) degremonti*.

Features displayed by teeth of *P. (P.) lutetiensis* sp. nov. clearly differ from those of both other species of the subgenus *Premontreia*.

Teeth of *P. (P.) lutetiensis* sp. nov. are higher and broader than those of the type species. Moreover, they are more robust and have a thicker root with a larger basal face. In anterior and lateral teeth, real cusplets are absent in *P. (P.) lutetiensis* sp. nov. whereas they frequently occur in *P. (P.) degremonti*.

In teeth of *P. (P.) lutesiensis* sp. nov. real cusplets are absent and replaced by heels while real cusplets do occur in *P. (P.) uralica*. As a result, in the latter, the crown of the principal cusp is triangular in shape and the mesial and distal cutting edges are (sub)rectilinear while they are not in *P. (P.) lutesiensis* sp. nov. Vertical folds at the labial crown base are better developed in *P. (P.) lutetiensis* sp. nov. than in *P. (P.) uralica*. Moreover, teeth of *P. (P.) lutetiensis* sp. nov. are larger than those of *P. (P.) uralica*.

Because *P. (P.) lutetiensis* sp. nov. is significantly larger than other *Premontreia* species, the generic diagnosis given by Cappetta (1992) and Noubhani & Cappetta (1997) should be adapted in this way (*i.e.* teeth up to 8 mm in height).

Heterodonty.
In addition to a gradient monognathic heterodonty invariably present in Recent Scyliorhinidae (Herman *et al*., 1990, p. 183), many scyliorhinid genera also show dignathic, ontogenetic and sexual heterodonty (Compagno, 1988, pp. 30-34).

In *P. (P.) lutetiensis* sp. nov. only a gradient monognathic heterodonty is observed. Anterior teeth are upright, narrow and high, while lateral teeth become broader, less high and more oblique towards the commissure.

In *P. (P.) degremonti*, Cappetta (1992, p. 641) also observed ontogenetic heterodonty. In the type species, the principal cusp of juvenile specimens often is more slender and more sigmoidal in profile than in adult teeth of the same jaw position. Ontogenetic heterodonty has not been observed in *P. (P.) lutetiensis* sp. nov.

Distribution.
Contrary to the wider geographic and stratigraphic distribution of the subgenus *Oxyscyllium* (see Noubhani & Cappetta, 1997; Malyshkina, 2006; Cappetta, 2006), the subgenus *Premontreia* appears to be confined to the Eocene of Europe and North America.

The type species, *P. (P.) degremonti*, was first described from the upper Ypresian (? NP13) of France (see Cappetta, 1992) but is also present in the Belgian Ypresian namely in the lower portion of the Roubaix Clay Member, Kortrijk Clay Formation (zone NP11) at Marke (pers. obs.), in the Egemkapel Clay Member, Tielt Formation (layer IV, *sensu* Steurbaut, 2006) (see Van Simaeys, 1994) and in the Egem Sand Member, Tielt Formation (in the 'Shelly lenticles with *Megacardita*' *sensu* Herman, 1979 which are coeval with the top of layer 21 *sensu* Steurbaut, 2006) (Herman collection, pers. obs.) at Egem (both zone NP12). In addition to European records, *P. (P.) degremonti* was also recorded by Kent (1999) from the early Ypresian namely from the base of bed B of the Potapaco Member, Nanjemoy Formation (zone NP 11) of Virginia (USA).

All material of *Premontreia (P.) lutetiensis* sp. nov. was collected at the same locality (Imbrechts sand pit, Nederokkerzeel, Belgium) where the Brussel Sand Formation was exposed (NP14), whilst *P. (P.) uralica* is known from the Priabonian (NP18-20) of Russia only (T. Malyshkina, pers. comm.).

The subgenus *Premontreia* is also present in the Lutetian of Val-d'Oise (France) (L. Candoni, pers. comm.) and most likely represents *P. (P.) lutetiensis*. Because the occurrence in the Lutetian of France is based on a single specimen only, more material is needed to confirm this specific assignment.

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Plate 1. *Premontreia (Premontreia) lutetiensis* sp. nov. from the Brussel Sand Formation (Lutetian, Eocene) at the Imbrechts sand pit, Nederokkerzeel (scale bars equal 2 mm):

1A-C – IRScNB P.8375 (**paratype**), anterior tooth, lingual (A), lingual-basal (B) and labial (C) views.
2A-C – IRScNB P.8376 (**paratype**), anterior tooth, lingual (A), lingual-basal (B) and labial (C) views.
3A-C – IRScNB P.8377 (**paratype**), lateral tooth, lingual (A), lingual-basal (B) and labial (C) views.

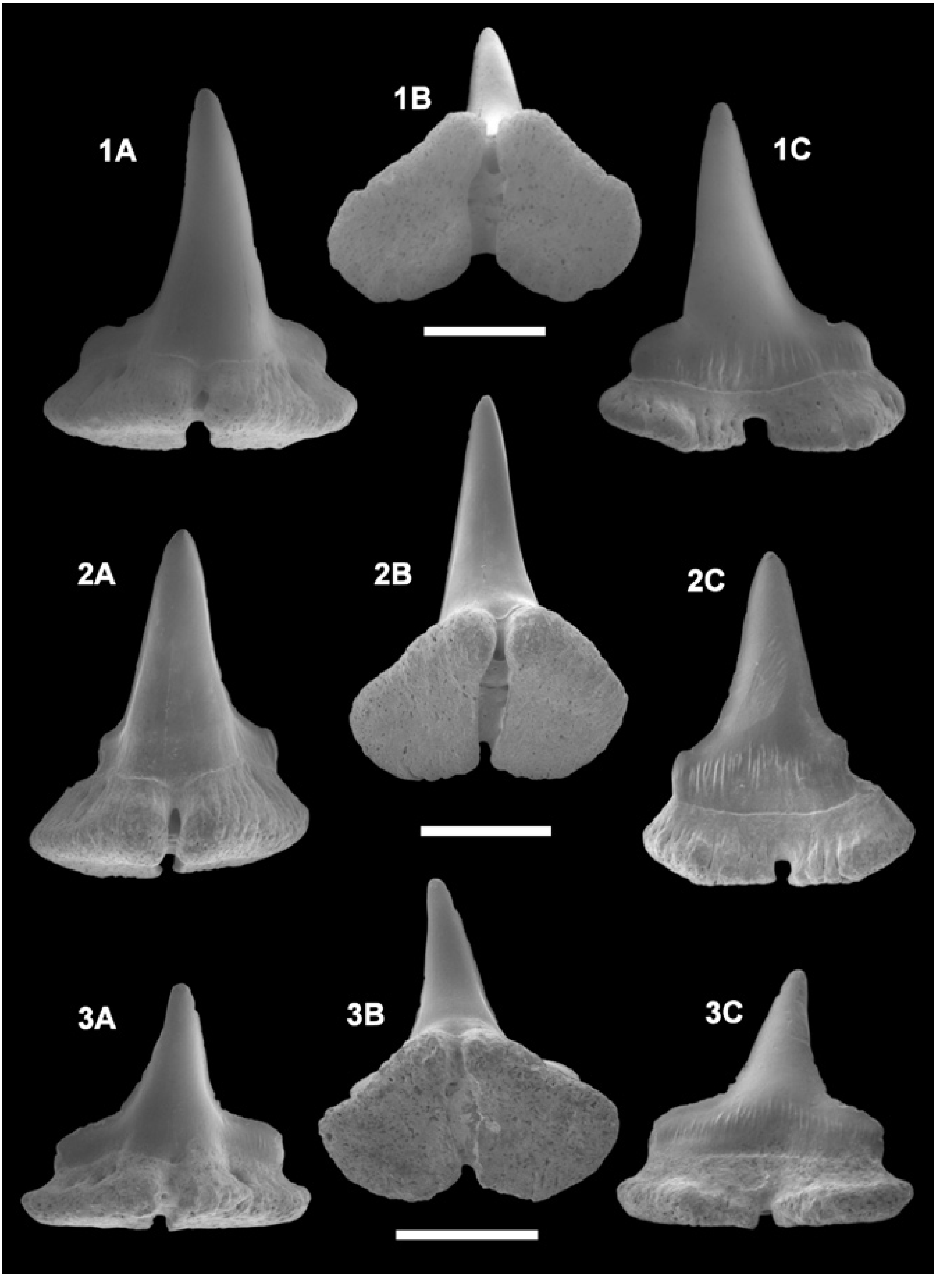
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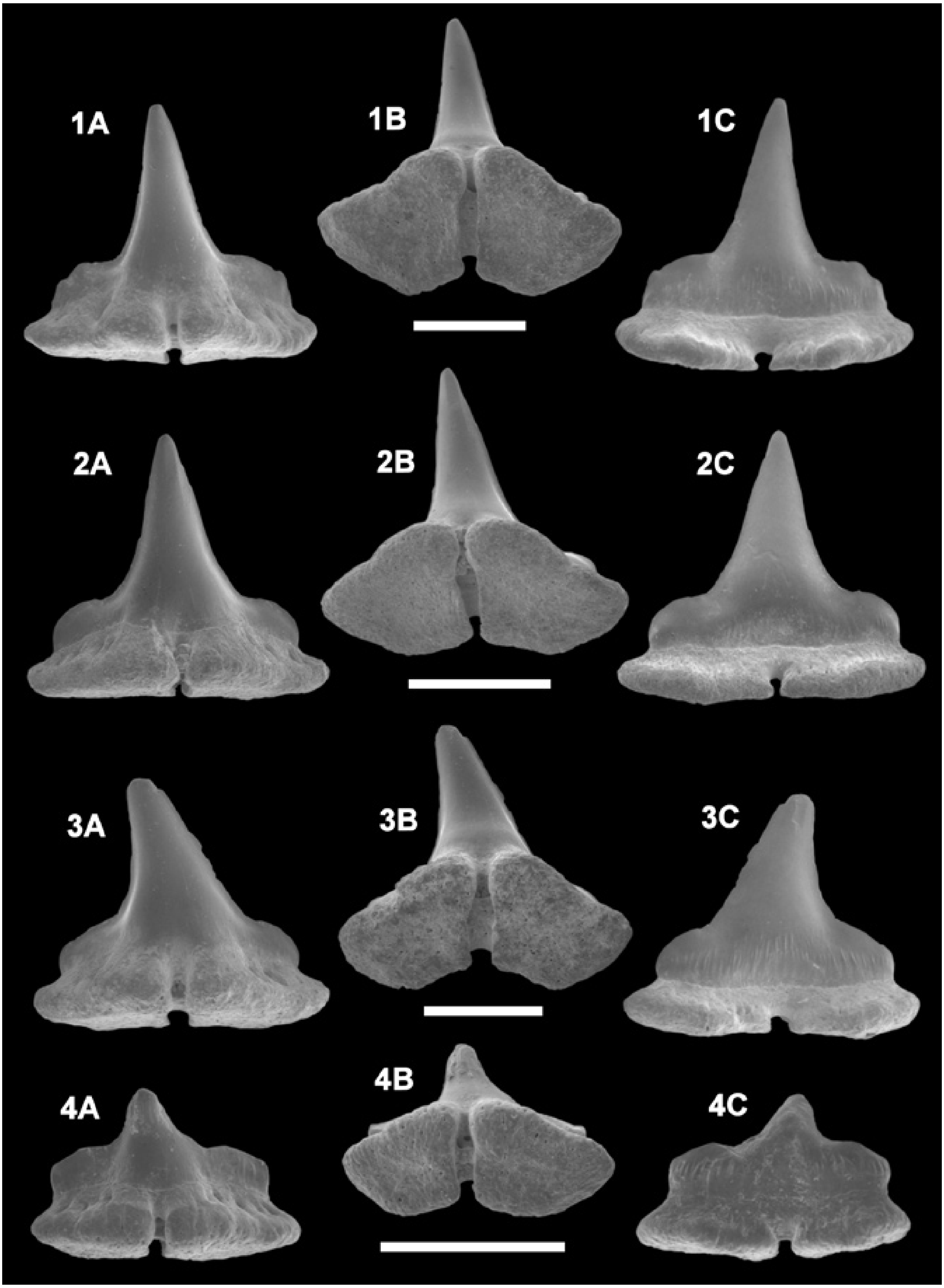
Plate 2. *Premontreia (Premontreia) lutetiensis* sp. nov. from the Brussel Sand Formation (Lutetian, Eocene) at the Imbrechts sand pit, Nederokkerzeel (scale bars equal 2 mm):

1A-C – IRScNB P.8374 (**holotype**), lateral tooth, lingual (A), basal-lingual (B) and labial (C) views.
2A-C – IRScNB P.8378 (**paratype**), lateral tooth, lingual (A), lingual-basal (B) and labial (C) views.
3A-C – IRScNB P.8379 (**paratype**), lateral tooth, lingual (A), lingual-basal (B) and labial (C) views.
4A-C – IRScNB P.8380 (**paratype**), posterior tooth, lingual (A), lingual-basal (B) and labial (C) views.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