

# A NEW SPECIES OF *ABDOUNIA* (ELASMOBRANCHII, CARCHARHINIDAE) FROM THE BASE OF THE BOOM CLAY FORMATION (OLIGOCENE) IN NORTHWEST BELGIUM

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(2 figures, 1 table and 2 plates)

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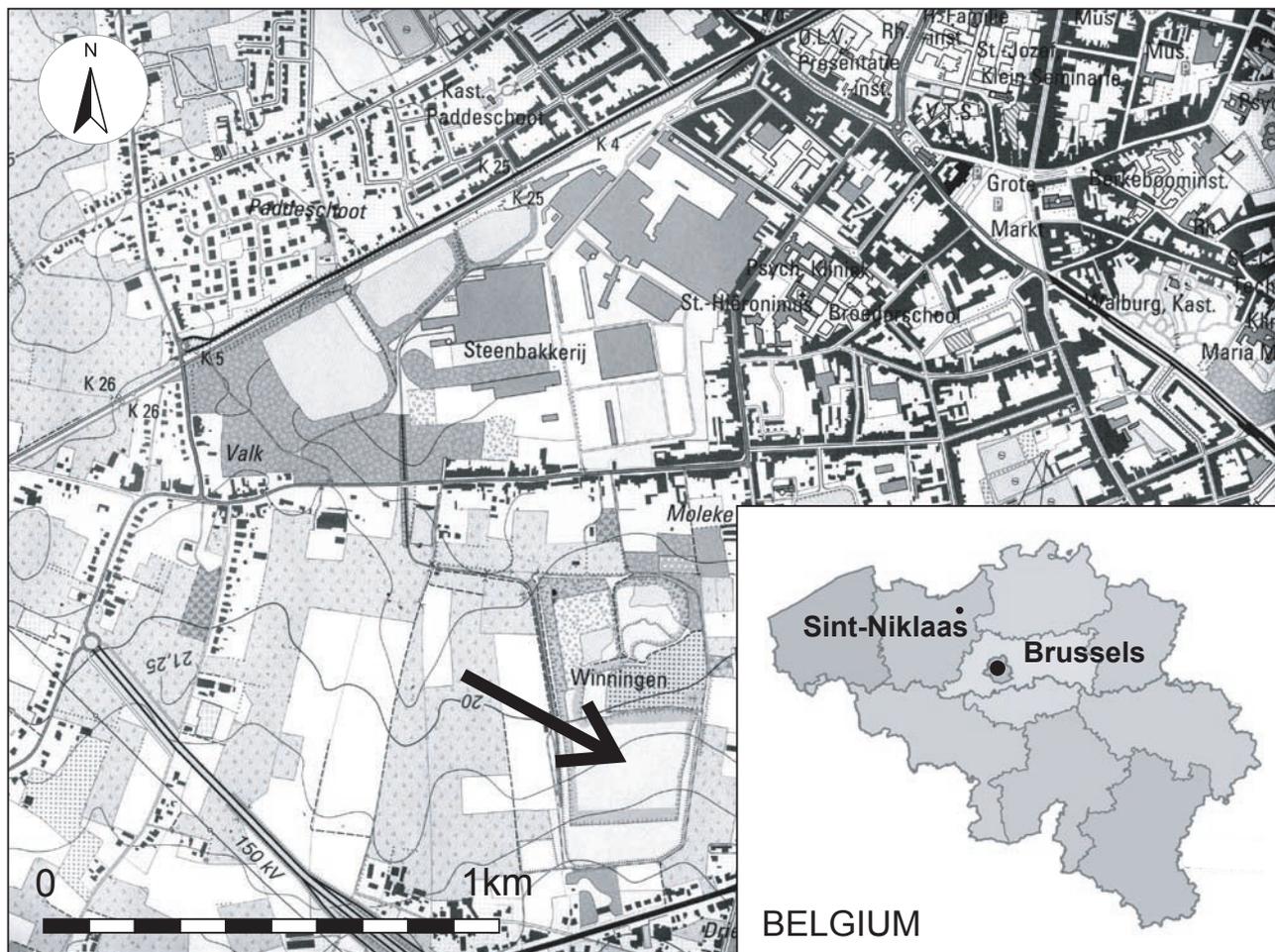
**ABSTRACT.** On the basis of isolated teeth, collected from the base of the Boom Clay Formation (Rupelian, Oligocene) at the SVK clay pit (Sint-Niklaas, NW Belgium), a new species of requiem shark, *Abdounia belselensis* sp. nov., is described. Affinities and heterodonty are discussed.

**KEYWORDS:** Chondrichthyes, requiem shark, *Abdounia belselensis*, Rupelian.

## 1. Introduction

In the 1970s, the base of the Boom Clay Formation as exposed at the Scheerders van Kerchove's (SVK) clay pit (Sint-Niklaas, Belgium) yielded rich Oligocene selachian faunas (van den Bosch, 1981), but as a result of changed

excavation methods, this horizon was not sampled in detail for many years. With the logistic support of the directors of the Scheerders van Kerchove's verenigde fabrieken, however, collaborators of the Gemeentelijk Natuurhistorisch en Heemkundig Museum Grobbendonk (GNHMG) dug temporary pits in 1999, 2000 and 2001 to



**Figure 1:** Map of the Sint-Niklaas area (modified from National Geographic Institute, 1998). The arrow indicates the centre of three temporary exposures (1999, 2000 and 2001) at the SVK clay pit ('new quarry').

expose the base of the Boom Clay Formation. This enabled the excavation of 300 m<sup>2</sup> and wet-seiving down to 1.0 mm mesh of an equivalent of about 50 m<sup>3</sup> of this basal deposit, following the method described by Janssen (1984, pp. 26-27, 29). Residues, consisting mainly of phosphatic nodules, yielded several isolated teeth of an unknown requiem shark, which is described and illustrated here as a new species. These teeth were found in association with several thousands of other selachian remains (teeth, spines, vertebrae and gillrakers), the biodiversity and quantitative assemblage of which are comparable to the figures reported on by van den Bosch (1981, p. 44). The new species represents less than 0.10% of the selachian remains found.

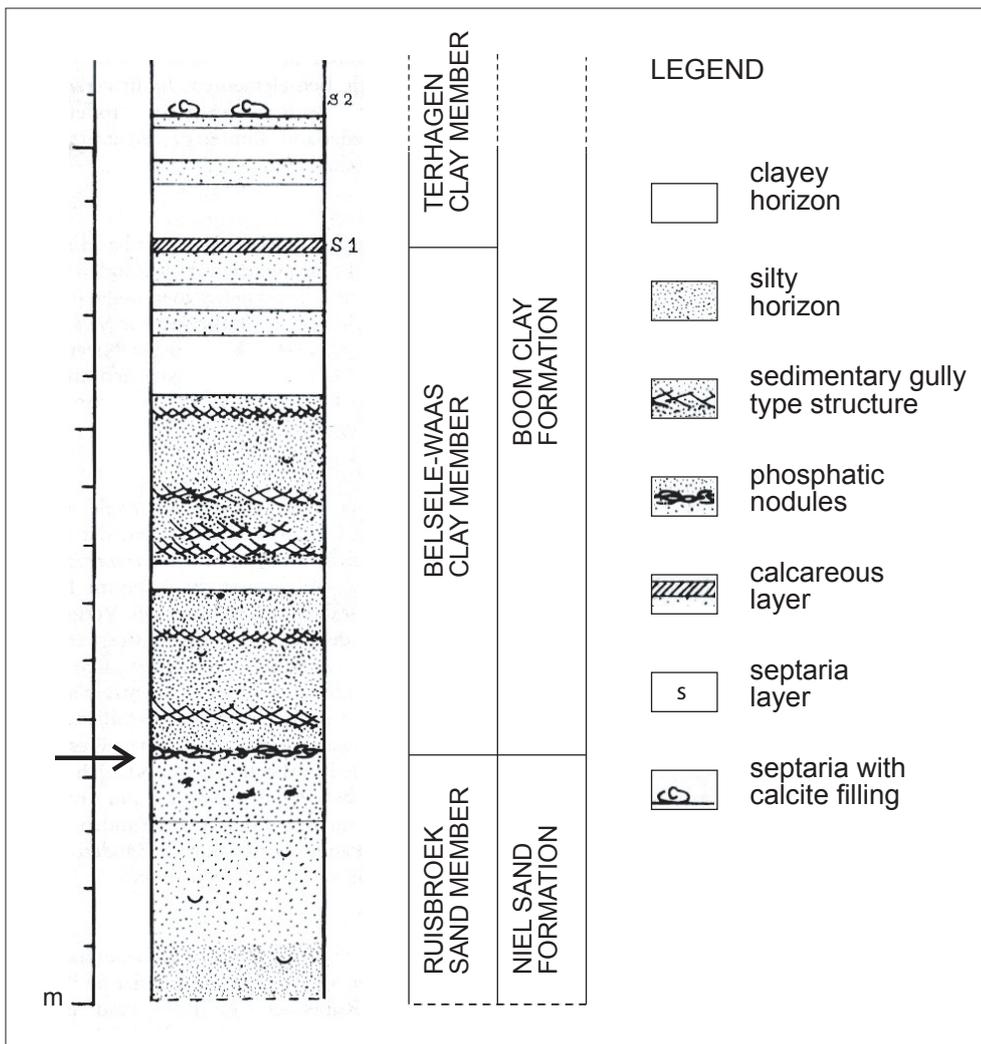
## 2. Locality and stratigraphy

The SVK clay pit, referred to by Janssen (1981) as 'nieuwe groeve' (new quarry), is situated about 1.5 km SW of the centre of Sint-Niklaas (province of Oost-Vlaanderen, Belgium), and is registered at the Belgian Geological Survey (BGS) as locality 42 W 394 (Fig. 1). Here the base of the Belsele-Waas Clay Member (Boom Clay Formation, Oligocene), yields numerous phosphatic nodules, scattered randomly on top of the underlying sands which were assigned by Steurbaut (1986) to a new lithostratigraphical

unit, the Ruisbroek Sand Member (Niel Sand Formation, Lower Oligocene; see also Steurbaut, 1992). A log of the SVK clay pit was first published by Vandenberghe (1978) and subsequently complemented by Janssen (1981, p. 33) as represented in Fig. 2. More detailed data may be found in a paper by Vandenberghe *et al.* (2002), to which reference is made. For a detailed lithological description of the underlying strata, based on a 6 m-deep borehole sunk from the bottom of the quarry in February 1980, reference is made to van den Bosch (1981). In 1999, the base of the Boom Clay Formation was situated about 2.5 m below the bottom at the SVK clay pit. The temporary pits dug in order to reach this base, were situated in an imaginary circle with parameters  $r = 100.00$  m,  $m_x = 133.190$  and  $m_y = 204.830$  (Lambert co-ordinates, National Geographic Institute, 1998; topographic map of Belgium, sheet 15/5-Noord, Sint-Niklaas).

## 3. Systematic palaeontology

Systematics follows Noubhani & Cappetta (1997), while descriptive terminology is adapted mainly from Cappetta (1986, 1987) and Herman *et al.* (1991). The abbreviation IRScNB stands for 'Institut royal des Sciences naturelles de Belgique' (Brussels).



**Figure 2:** Lithostratigraphy of the SVK clay pit ('new quarry'); section after Janssen (1981), based on Vandenberghe (1978). Stratigraphical interpretation follows Vandenberghe & Laga (1986) and Steurbaut (1986, 1992). The arrow indicates the horizon with abundant phosphatic nodules.

Order Carcharhiniformes Compagno, 1973  
 Family Carcharhinidae Jordan & Evermann, 1896  
 Subfamily Carcharhininae Jordan & Evermann, 1896  
 Tribe Triaenodontini Bonaparte, 1838  
 Genus *Abdouinia* Cappetta, 1980

Type species.

*Eugaleus beaugei* Arambourg, 1935, by original designation.

Generic diagnosis (after Cappetta, 1980, 1987).

Teeth small, with a triangular, sharp cusp that is moderately broad at its base; labial face almost flat, lingual face weakly convex; enameloid is generally smooth. Crown does not overhang labial face of the root. Anterior teeth show sharp, low and broad, or high, slightly divergent, lateral cusplets; up to three pairs in some lateral teeth. Root not very thick and rather transversely extended, especially in lateral files; basal edge of root slightly concave. Basal face rather broad and flat, with a well-marked, deep groove.

*Abdouinia belseleensis* sp. nov.

Plates 1-2

Designation of name.

Named after the hamlet of Belsele, near Sint-Niklaas.

Diagnosis.

Species represented by isolated teeth only, which are moderately small to medium sized, of clutching type with at least a strong disjunct monognathic heterodonty. Depending on jaw position, principal cusps are flanked by up to two cusplets on both sides. In lateral teeth, the proximal pair of cusplets are significantly larger than the marginal one. All cusps are triangularly shaped and broad based. The labial face of the principal cusp is almost flat, whereas the lingual face is slightly concave. With regard to the principal cusp, cusplets are positioned in a divergent direction. Distal and mesial cutting edges are smooth and present along the entire crown. In lateral and postero-lateral teeth, the crown ends in both marginal directions in a short and low heel. The crown base is as broad as the entire root in anterior and lateral teeth and does not overhang the crown/root junction. Mesial and distal root lobes are almost equal in size in anterior and lateral teeth and transversely elongated in posterior jaw positions only. Labial and lingual folds or any other form of ornament are lacking. The lingual face of the root shows a well-developed median groove with a single, large central foramen. The root is holaulacorhized and not very thick.

Holotype.

IRScNB P.8252 (ex Lambrechts Collection).

Paratypes.

IRScNB P.8253, P.8254 and P.8255 (ex Lambrechts and Mollen Collection).

Additional material.

In addition to the types (see above), three other teeth have been studied (all Lambrechts Collection), *viz.* a single

lateral tooth missing the apex (Pls 1-2, Fig. D) and two tooth crowns. In the latter two, no traces of damage or wear were found. The general morphology of these specimens suggests anterior jaw positions, still in the process of formation. The preservation of the material is quite good and comparable to all other accompanying faunas.

Type locality and horizon.

Scheerders van Kerchove's verenigde fabrieken (SVK) clay pit, temporary exposures at the 'new quarry' (*sensu* Janssen, 1981), Sint-Niklaas; base of Belsele-Waas Clay Member (Boom Clay Formation, Rupelian, Oligocene). On calcareous nannofossil evidence (Steurbaut, 1986, 1992; see also Laga *et al.*, 2002), this unit was dated as Early to Middle Rupelian (Oligocene) or zone NP23 (*sensu* Martini, 1971).

Description.

In the holotype, IRScNB P.8252 (Pls 1-2, Fig. C), the principal cusp is but slightly oblique towards the commissure. The mesial cutting edge of the principal cusp is weakly concave in its lower part. A single mesial and two distal cusplets are present, of which the proximal one is significantly larger than the marginal one. Laterally, the crown ends in a short and low heel. The base of the crown is as wide as the entire root. The basal edge of the root is quite concave. The general morphology of this specimen suggests a postero-lateral jaw position.

In paratype IRScNB P.8253 (Pls 1-2, Fig. A), the principal cusp is erect and flanked by a single pair of cusplets only. The base of the crown is as wide as the root. The basal edge of the root is straight. The general morphology of this tooth suggests an anterior jaw position.

In paratype IRScNB P.8254 (Pls 1-2, Fig. B), apex and higher part of the mesial cutting edge of the principal cusp are missing. The principal cusp seems to be slightly oblique towards the commissure. The principal cusp is flanked by two pairs of cusplets; although the proximal pair are well developed in contrast to the marginal one, the corresponding cusplets are of equal size. In both marginal directions, the crown ends in a short, low heel. The basal edge of the root is almost straight. The general morphology of this specimen suggests a lateral jaw position.

In paratype IRScNB P.8255 (Pls 1-2, Fig. E), the principal cusp curves towards the commissure. Only a single distal cusplet is present. The apex of the cusplet is slightly damaged. The crown occupies more than half of the total height of the entire tooth. Mesially, the crown ends in a short heel. The basal edge of the root is almost straight. The root is wider than the crown base. The general morphology of this specimen suggests a posterior jaw position.

Dimensions.

Total width and total height of the types are given in Table 1.

Comparisons.

Teeth of *Abdouinia africana* (Arambourg, 1952), from the

	Total width	Total height
IRScNB P.8252	8.2	6.3
IRScNB P.8253	6.7	6.9
IRScNB P.8254	8.9	6.3
IRScNB P.8255	5.0	3.2

**Table 1.** *Abdounia belseiensis* sp. nov. Measurements (in mm).

Thanetian (Paleocene) of Morocco are of a smaller size, show a stronger dignathic heterodonty and possess a single pair of cusplets only and these cusplets are proportionally larger sized than those in the type species, *A. beaugei* (Arambourg, 1935) (Ypresian, Lower Eocene) of Morocco. In *A. biauriculata* (Casier, 1946), from the Ypresian (Lower Eocene) of Belgium, teeth have cusplets which are more strongly individualised, more slender and elongated. In addition, the root is less thick than in *A. beaugei*. Teeth of *A. claibornensis* (White, 1956), from the Middle Eocene of Alabama (USA) have up to at least six pairs of cusplets, which decrease only slightly in size in marginal direction; the cusplets are less individualised than in *A. beaugei*. But, *A. claibornensis* possibly fits within the variability of *A. recticon* (Winkler, 1873). In *A. enniskilleni* (White, 1956), from the Upper Eocene of Alabama, teeth have a single pair of cusplets only. All cusps are elongated and of larger size than in those of *A. beaugei*. Teeth of *A. finalis* (Arambourg, 1952), from the Lutetian (Middle Eocene) of Morocco, are larger sized and possess a single pair of cusplets only. These cusplets are smaller sized or absent altogether. The basal edge of the root shows a stronger convexity than in the same jaw positions of *A. beaugei*. In *A. furimskyi* (Case, 1980), from the Late Oligocene of North Carolina (USA), teeth have cusplets which are insignificant or even absent; teeth are slightly larger than those of *A. beaugei*. In *A. lapierrei* Cappetta & Nolf, 1981, from the Auversian (Upper Eocene) of France, teeth reaches larger sizes; principal cusps are flanked by a single pair of cusplets only, which are slender, pointed and rather conical in shape in anterior teeth. In *A. lapierrei*, a stronger dignathic heterodonty may be observed than in *A. beaugei*. Teeth of *A. minutissima* (Winkler, 1873), from the Lutetian (Middle Eocene) of Belgium, have a single pair of cusplets only; vertical folds are regularly observed on the labial side of the crown, in contrast to teeth of *A. beaugei* which are generally smooth. In *A. recticon* (Winkler, 1873), from the Lutetian (Middle Eocene) of Belgium, teeth have at least three pairs of cusplets which decrease only slightly in size in a marginal direction; the cusplets are less individualised than those in teeth of *A. beaugei*.

Features displayed by teeth of *A. belseiensis* sp. nov. are consistent with the generic diagnosis of *Abdounia*, but differ from those of all other species of *Abdounia* as follows:

- from *A. africana* in having two pairs of cusplets in lateral teeth; in anterior and lateral teeth the base of the crown is as wide as the root, while in *A. africana* the root lobes are slightly elongated in both marginal directions. Teeth of *A. belseiensis* sp. nov. are larger than those of *A. africana*;

- from *A. beaugei* in having root lobes which are not wider than the crown base in anterior and lateral teeth. In those jaw positions, the cusp ends in both marginal directions in a low, but significant heel. In postero-lateral teeth of *A. belseiensis* sp. nov., the principal cusp is less oblique and the basal edge of the root shows a much stonger convexity than in the same jaw positions in *A. beaugei*. The difference in size of proximal and marginal cusplets is in general more prominent in *A. belseiensis* sp. nov. than in *A. beaugei*. On average, teeth of *A. belseiensis* sp. nov. are larger, but dimensions still fall within the range documented for *A. beaugei* (see Noubhani & Cappetta, 1992);

- from *A. biauriculata* in displaying the same features as noted above (vs *A. beaugei*), as well as by the shape of its cusplets which are broader at their base and less elongated than in *A. biauriculata*;

- from *A. claibornensis* by its smaller number of cusplets; these cusplets are more strongly individualised in teeth of *A. belseiensis* sp. nov. than in *A. claibornensis*;

- from *A. enniskilleni* in having a second pair of cusplets in lateral teeth and by the absence of striae on the lingual side of the principal cusp. Teeth of *A. belseiensis* sp. nov. are smaller than those of *A. enniskilleni*;

- from *A. finalis* by its cusplets which are larger sized. The basal edge of the root shows a strong convexity in postero-lateral teeth of *A. belseiensis* sp. nov. only, while in *A. finalis* this feature is present in almost all jaw positions;

- from *A. furimskyi* by its cusplets which are more numerous and larger;

- from *A. lapierrei* by its anterior teeth which have cusps more rectangularly shaped, broader at their base and less elongated;

- from *A. minutissima* by having a double pair of cusplets in lateral teeth. In teeth of *A. belseiensis* sp. nov. no folds are seen on the labial side of the crown base, while these are regularly present in teeth of *A. minutissima*;

- from *A. recticon* by having a double pair of cusplets only in lateral teeth. These cusplets are more strongly individualised and decrease in size more markedly in marginal direction than those of *A. recticon*.

In addition to the species mentioned above, three other species of *Abdounia* have been recorded in the literature.

*Abdounia doncieuxi* (Leriche, 1936) was first described (no differential diagnosis was provided) from the Lutetian (Middle Eocene) of France; the specimen illustrated by Leriche is identical in both morphology and size to certain lateral teeth of *A. beaugei*. According to Noubhani & Cappetta (1997, p. 90), *A. doncieuxi* is thus a junior synonym of *A. beaugei*, a view adopted here.

Case (1994, Figs 153-160) illustrated teeth

assigned to *Abdouinia* from the Upper Paleocene and Lower Eocene of Mississippi (USA), and referred to them as *A. subulidens* (Arambourg, 1935). However, that taxon was erected for isolated teeth with slender, elongated and upright principal cusps in all jaw positions. In addition, vertical folds are present in variable, but substantial, numbers on the labial face of the crown base. These characteristics are neither consistent with the teeth figured by Case (1994), nor do they comply with teeth of other species of *Abdouinia*. In fact, they are consistent with those of the genus *Premontreia* Cappetta, 1992. Noubhani & Cappetta (1997) rightly assigned '*A.*' *subulidens* to *Premontreia*. The teeth figured by Case (1994) probably represent teeth of *A. lapierrei* and not *P. subulidens*.

*Abdouinia kashiensis* Li, 1995 was erected for a single specimen from the (?) Upper Eocene of China. Except for the absence of a distal cusplet, the holotype of this species is identical to certain upper lateral teeth of *A. lapierrei*. Although not mentioned in the differential diagnosis, the type also differs by its distal root lobe which is significantly shorter than the mesial one, while these are almost of equal size in the same jaw positions of all other species of *Abdouinia*. Although the type is said by Li (1995) to be well preserved, the end of the distal root lobe together with the distal cusplet have probably broken off or have never been properly formed due to injury or disease. In view of the fact that *A. lapierrei* is recorded from the same locality (Li, 1995, Fig. 6d, e) and in the absence of additional material, *A. kashiensis* is here assumed to be synonymous with *A. lapierrei*, at least for the time being.

#### Heterodonty.

*Abdouinia belselensis* sp. nov. shows a disjunct monognathic heterodonty similar to that seen in *A. beaugei* (see Cappetta, 1980) and in Recent *Triaenodon obesus* (Rüppell, 1837). The assignment of all material from Belsele to a single taxon is therefore evident, with the exception of paratype IRScNB P.8255. As demonstrated by Boy (1975), the specific identification of posterior teeth is often fraught with difficulties. In the present situation, however, the case is clear. On the one hand, the general morphology of paratype IRScNB P.8255 is almost identical to posterior teeth of *A. beaugei* (see Cappetta, 1980, p. 36, Fig. 4d) and of *A. africana* (see Noubhani & Cappetta, 1997, p. 277, Pl. 48, Fig. 6). On the other, Belgian Oligocene strata have yielded but two other carcharhinid species to which paratype IRScNB P.8255 might be assigned. However, in teeth of *Carcharhinus elongata* (Leriche, 1910) cusplets are absent in all jaw positions, while in *Physogaleus latus* (Storms, 1894) multiple cusplets are observed even in posterior teeth and the crown occupies less than half of the total height of the entire tooth. The morphology of isolated posterior teeth of both species was discussed by Boy (1975). Artificial tooth sets of *C. elongata* and *P. latus* have recently been figured by Reinecke *et al.* (2001, Pls 50-51 and 46-47, respectively). Of the latter species, an almost complete authentic tooth set was described by Pharissat (1991).

#### Distribution.

Species of *Abdouinia* recorded so far are all widely

distributed in strata of Eocene age, with the exception of *A. africana* and *A. furimskyi*, which are respectively restricted to the Paleocene of Morocco and the Oligocene of North Carolina, USA (for the latter see Ward *et al.*, 1978). *A. furimskyi* has also been reported from the Eocene of Jordan (Mustafa & Zalmout, 2002), but these teeth probably belong to another species of Carcharhinidae.

#### Occurrence.

Known exclusively from the type locality. Most of the material was found during the third excavation in 2001.

#### 4. Acknowledgements

I wish to thank the directors of the Scheerders van Kerchove's verenigde fabrieken (Sint-Niklaas), and in particular Wilfried Van Branden and Guido Van der Weken, for co-ordination of SVK logistic support; Theo Lambrechts (Heist-op-den-Berg), Luc Anthonis (Grobendonk), Eric Wille (Wuustwezel) and Ben D'Haeze (Lembek) for access to material for study; Klaas Post (Fiskano, Urk), Samuel Iglésias (Laboratoire de Biologie marine, Concarneau), Sean Fennessy (ORI, Durban), Sabine Wintner and Jeremy Cliff (NSB, Umhlanga), Eleanor Yeld (UCT, Cape Town), Sharon du Plessis, Rob Cooper and Saasa Pheeha (M&CM, Cape Town) for donation of Recent material; Dirk Nolf (IRScNB, Brussels) for supplying reprints of papers relevant to the present study; George Williams (Gainesville, Florida) and Peter Engelhard (Altenholz) for advice on the validity of certain species of *Abdouinia*; John W.M. Jagt (NHMM, Maastricht) for linguistic improvements; Taco Bor (Sliedrecht) and Dirk Hovestadt (Terneuzen) for critical reading of an earlier typescript and both reviewers, Jaques Herman (BGS/IRScNB, Brussels) and Henri Cappetta (CNRS, Montpellier) for their helpful comments.

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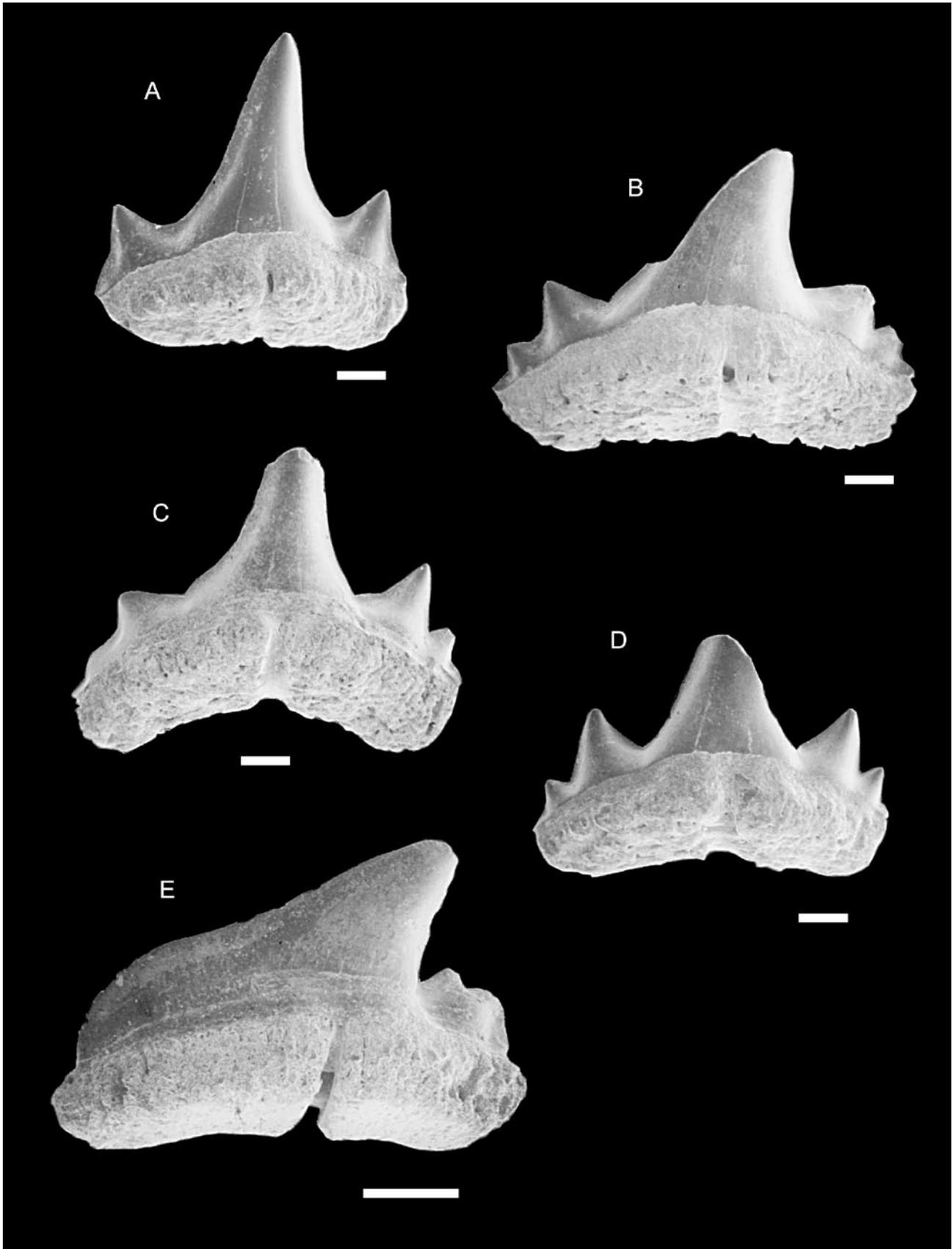
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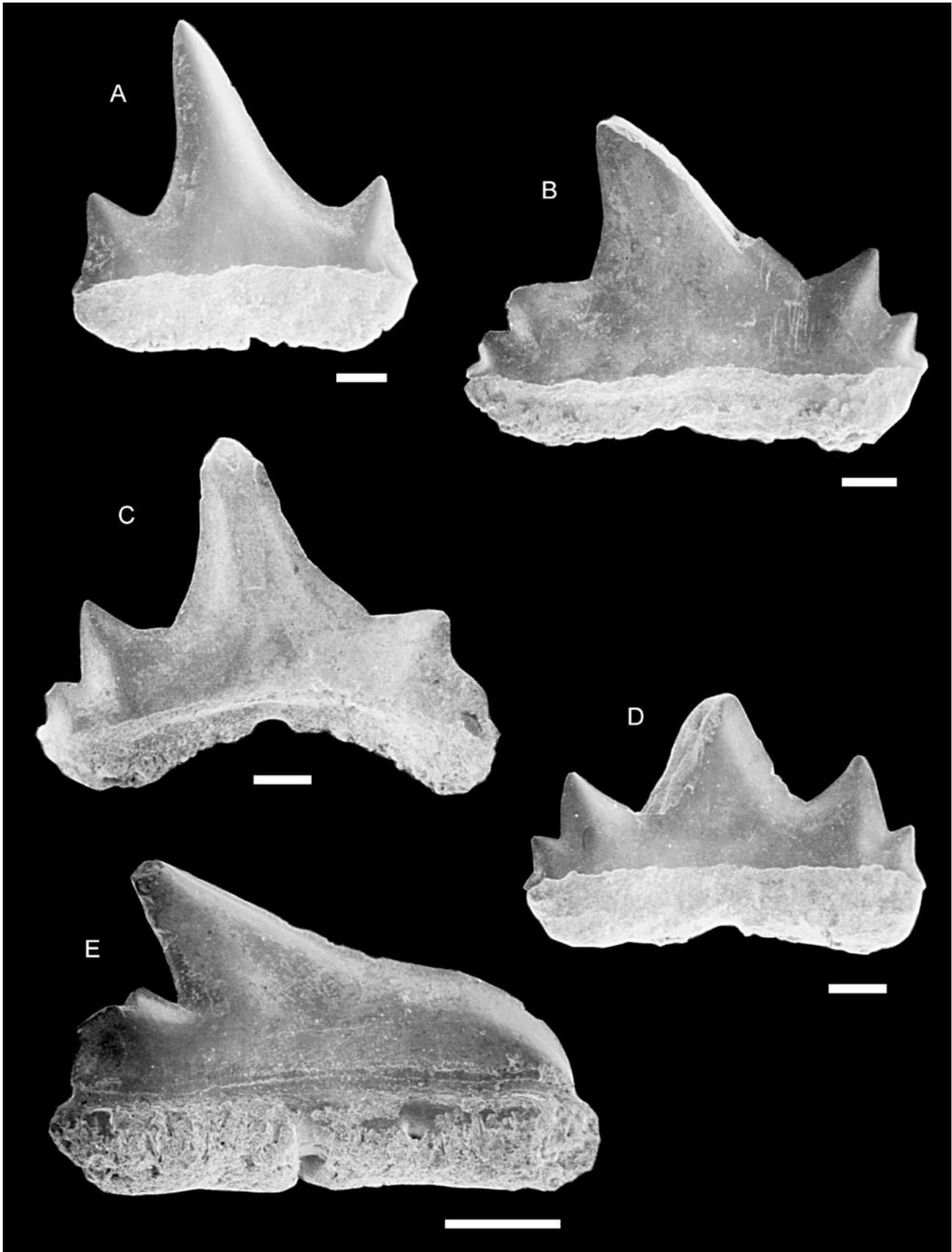
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Manuscript received 19.01.2006 and accepted for publication 15.05.2006.



**Plate 1.** *Abdounia belseensis* sp. nov. from the base of the Belsele-Waas Clay Member (Boom Clay Formation, Oligocene) at the SVK clay pit ("new quarry"), Sint-Niklaas (scale bars equal 1 mm):

A - IRScNB P.8253 (**paratype**), anterior tooth, lingual view. / B - IRScNB P.8254 (**paratype**), lateral tooth, lingual view. / C - IRScNB P.8252 (**holotype**), postero-lateral tooth, lingual view. / D - Lambrechts Collection, unregistered, lateral tooth, lingual view. / E - IRScNB P.8255 (**paratype**), posterior tooth, lingual view.



**Plate 2.** *Abdouunia belseensis* sp. nov. from the base of the Belsele-Waas Clay Member (Boom Clay Formation, Oligocene) at the SVK clay pit ('new quarry'), Sint-Niklaas (scale bars equal 1 mm):

A - IRScNB P.8253 (**paratype**), anterior tooth, labial view. / B - IRScNB P.8254 (**paratype**), lateral tooth, labial view. / C - IRScNB P.8252 (**holotype**), postero-lateral tooth, labial view. / D - Lambrechts Collection, unregistered, lateral tooth, labial view. / E - IRScNB P.8255 (**paratype**), posterior tooth, labial view.

