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## **BELEMNELLOCAMAX EX GR. GROSSOUVREI, A RARE MID-CAMPANIAN BELEMNITELLID (CEPHALOPODA, COLEOIDEA) FROM THE HANNOVER AREA, NORTHERN GERMANY**

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A single specimen of the rare belemnite *Belemnellocamax ex gr. grossouvrei* (Janet), recently collected from the Misburg Formation (Echinocorys conica-Belemnitella mucronata Zone; lower mid-Campanian) at the Teutonia Nord quarry near Misburg (Hannover area, northern Germany) is described and illustrated. It represents the youngest record of this taxon to date and also the largest specimen ever reported. An overview of earlier records of the species is added, and pertinent literature items are listed.

*Key words:* belemnite, Campanian, Germany.

During the past three decades, belemnite coleoid cephalopods from carbonate rocks of Cenomanian to Mastrichtian age across northern and central Europe (Central European Subprovince, Christensen, 1997), inclusive of the Russian Platform (Central Russian Subprovince, Christensen, 1997) and the northern margins of the Tethyan Realm, have received ample attention. The family Belemnitellidae comprises at least eleven genera and subgenera, namely *Actinocamax* Miller, 1823; *Praeactinocamax* Naidin, 1964; *Belemnellocamax* Naidin, 1964; *Belemnella* (*Belemnella*) Nowak, 1913, *Belemnella* (*Pachybelemnella*) Schulz, 1979; *Belemnella* (*Neobelemnella*) Naidin, 1975; *Goniotentis* Bayle, 1878; *Goniocamax* Naidin, 1964; *Belemnitella* d'Orbigny, 1840; *Belemnocamax* Crick, 1907 and *Fusitentis* Kongiel, 1962. In addition, the various species assigned to these have been demonstrated to constitute valuable key index taxa, in particular in the Campanian and Mastrichtian, but also in older strata.

Carbonate rocks (chalk/marl rhythmites) of Late Cretaceous (Santonian—late Campanian) age in the Lehrte West Syncline near Hannover (northern Germany) (fig. 1) commonly yield belemnite coleoids (Christensen et al., 1975; Ernst, 1975; Ernst et al., 1979; Christensen, 2000; Niebuhr, 2006). Most species are assignable to the genera *Goniotentis*, *Belemnitella* and *Actinocamax*. In addition, one adult and a single juvenile specimen of *Belemnellocamax balsvikensis* (Brotzen) are known from the Misburg Formation, lower mid-Campanian (Echinocorys conica—Belemnitella mucronata Zone) at the Germania IV quarry, Misburg (Christensen, Schulz, 1976). Here we add to this list a large, adult (?gerontic) individual of *Belemnellocamax ex gr. grossouvrei* from the same biozone (table). The specimen was collected by one of us (R. van Neer) during recent fieldwork at the Teutonia Nord quarry, in the immediate vicinity of the Germania IV quarry. It now forms part of the collections of the Natuurhistorisch Museum Maastricht (abbreviation NHMM; RN = R. van Neer Collection).

### **Systematic palaeontology**

Family Belemnitellidae Pavlow, 1914

Genus *Belemnellocamax* Naidin, 1964

Type species — *Belemnites mammillatus* Nilsson, 1826, by original designation.

*Belemnellocamax ex gr. grossouvrei* (Janet, 1891)

Fig. 2A-E

*Actinocamax Grossouvrei*: Janet, 1891, p. 716, pl. 14, figs 1—3.

*Material.* A single large, adult (?gerontic) rostrum, NHMM RN 1521.

Table 1

**Biozonation of the Campanian Stage in northern Germany**

Stage	Substage	Macrofossil zones
Campanian	upper ( <i>p.p.</i> )	Belemnitella minor—Nostoceras polyplacum—Galerites vulgaris
	mid	Galerites vulgaris—Micraster stolleyi Galerites vulgaris—Galeola papillosa basiplana Patagosites stobaei—Galeola papillosa basiplana—Trachyscaphites spiniger <b>Echinocorys conica—Belemnitella mucronata</b>
	lower	Goniotentis quadrata gracilis— Belemnitella mucronata Echinocorys conica—Galeola papillosa Galeola papillosa Galeola senonensis Offaster pilula—Galeola senonensis Offaster pilula Sphenoceras lingua—Goniotentis quadrata Goniotentis granulataquadrata

*Note:* upper Campanian (*p.p.* — *pro parte*), with the zone that yielded *Belemnellocamax ex gr. grossouvrei* in bold.

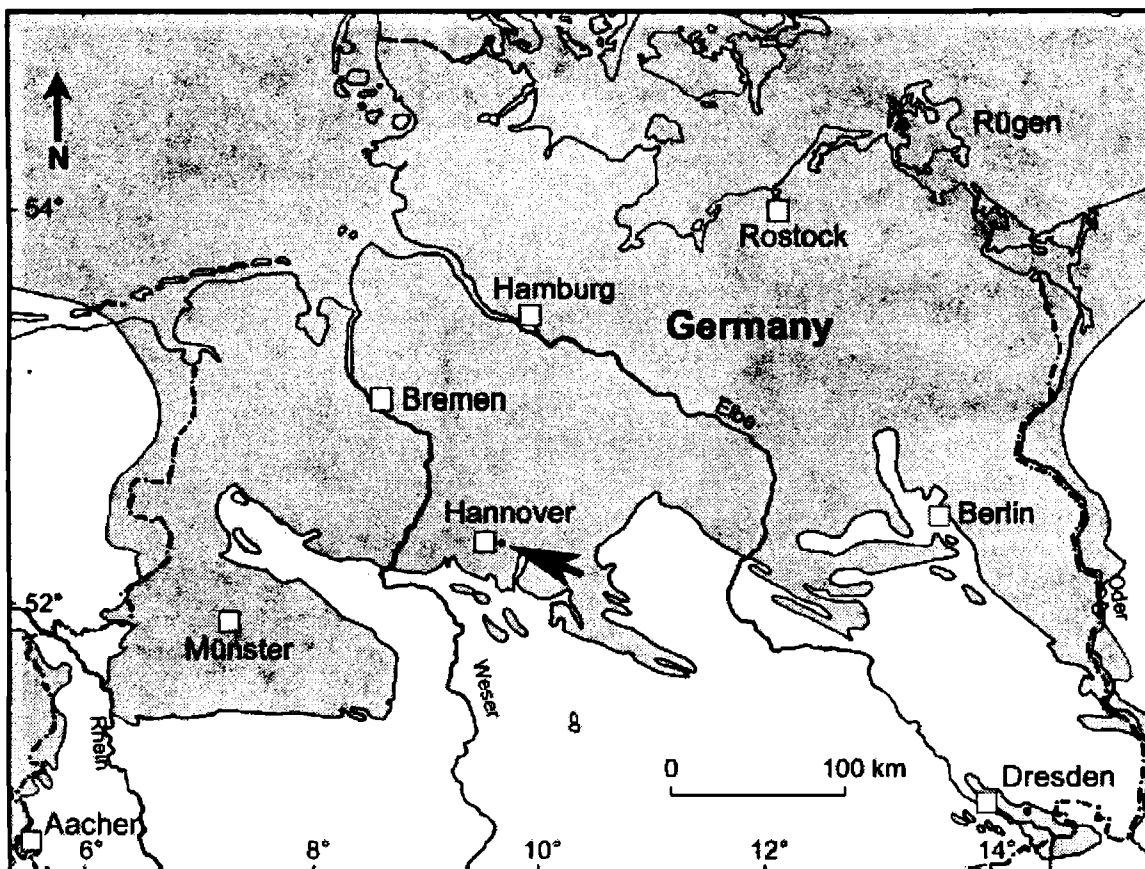


Fig. 1. Map showing the Lehrte West Syncline in which the Teutonia Nord quarry is situated, and the extent (shading) of both surface and subsurface Cretaceous strata in northern Germany

**Description.** Rostrum stout and long, total length (inclusive of mucro; see Christensen, 1975) 118,8 mm; strongly lanceolate and symmetrical in ventral view (fig. 2, C), with maximum diameter in lower third; in lateral view, asymmetrical and arched (fig. 2, D); apex inflated and faintly mucronate; maximum inflation of rostrum in lower third (fig. 2, C, E); transverse sections of rostrum strongly depressed ventrally and dorsally (fig. 2, A, D), and elliptical over entire length (fig. 2, A); ventral fissure well developed yet short, because of imperfect calcification of alveolar region (fig. 2, A–C); pseudoalveolus shallow, with few, scattered small conellae (fig. 2, B); adoral end subtriangular in cross section (fig. 2, A, B); lateral lines only faintly developed posteriorly as double lines (fig. 2, D), anteriorly extended as narrow, yet deep, dorso-lateral depressions (fig. 2, E); posteriorly, dorsal surface faintly tuberculate, otherwise rostrum smooth.

**Measurements.** L = length of guard; D = depth of pseudoalveolus; DVDP = dorso-ventral diameter at protoconch; LDP = lateral diameter at protoconch; DVDAE = dorso-ventral diameter at alveolar end; LDAE = lateral diameter at alveolar end; MLD = maximum lateral diameter (all in mm):

L	D	DVDP	LDP	DVDAE	LDAE	MLD
<b>118,8</b>	<b>7,0</b>	<b>12,2</b>	<b>12,4</b>	<b>10,2</b>	<b>10,4</b>	<b>25,5</b>
97 <sup>1</sup>	—	14	17	—	—	20
97 <sup>1</sup>	—	8	12	—	—	18
91 <sup>1</sup>	—	8	9	—	—	15
90 <sup>2</sup>	—	—	—	—	—	17
97 <sup>3</sup>	—	—	—	—	—	15
84 <sup>4</sup>	—	11,3	13,6	10,9	—	17,3
98 <sup>5</sup>	—	7,1	8,9	6,7	—	14,9

Measurements of NHMM NR 1521 are **bold**; comparative material includes: <sup>1</sup> type lot of *Actinocamax grossouvrei* (Janet, 1891); <sup>2</sup> type specimen of *Actinocamax toucasi* (Janet, 1891); <sup>3</sup> type specimen of *Actinocamax alfridi* (Janet, 1891); <sup>4,5</sup> specimens from the Santonian Sougraigne Blue Marls, Corbières, southern France (Christensen et al., 1993).

### Discussion

Although larger than specimens recorded to date, NHMM RN 1521 is clearly conspecific with material assigned to *Belemnelloamax* ex gr. *grossouvrei* by previous authors. In total, near 100 specimens are now known from western Europe and the Russian Platform, which clearly

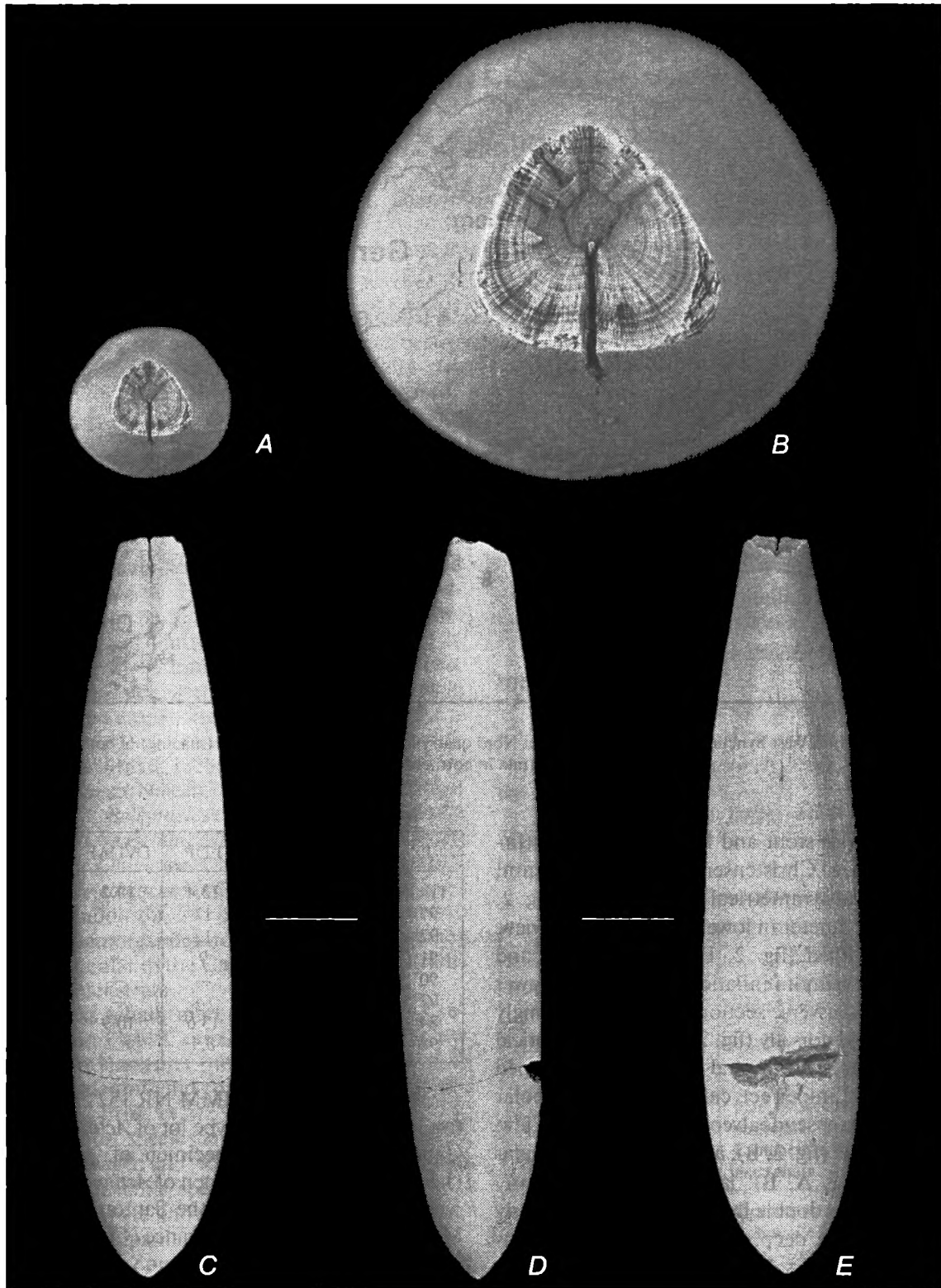


Fig. 2. A–E. *Belemnellocamax* ex gr. *grossouvrei* (Janet) (NHMM RN 1521), in anterior (A, B; note conellae in B), ventral (C), lateral (D) and dorsal (E) views; original size. Misburg Formation (terminology, see Niebuhr et al., 2007), lower mid-Campanian (Echinocorys conica–Belemnitella mucronata Zone) at Teutonia Nord quarry, Misburg (Hannover area, Germany). Specimen whitened with ammonium chloride prior to photography

indicates this taxon to be rare. No biometric analyses of this material have been carried out so far; the consensus amongst belemnite workers is that this represents a highly variable species, which has been subject to oversplitting.

On the basis of a rather limited material, Janet (1891) erected three species, all assigned to *Actinocamax* and described as *A. grossouvrei*, *A. toucasi* and *A. alfridi*.

Subsequent to the original description, only few records of this typical form are found in the literature until Naidin (1964) referred species of the *grossouvrei* group to a new subgenus, *Actinocamax (Paractinocamax)*, and noted these to have had a short juvenile guard in contrast to species assigned to his new genus, *Belemnelloamax*. Subsequently, Christensen (1975) remarked that only eleven specimens were known from western Europe, and later still, Christensen (1986) reassigned the *grossouvrei* group definitively to the genus *Belemnelloamax*, because guards from the lowermost Campanian at Kullemölla (Skåne, southern Sweden; type specimen of *B. grossouvrei ornatus*) and uppermost lower Campanian at Flackarp (Kristianstad Basin, southern Sweden) had revealed a long and elongated juvenile guard. The same observation was made for three specimens from the lowermost Campanian at Braunschweig (northern Germany; M.-G. Schulz Collection). Moreover, Christensen (1986) documented juvenile guards of the *grossouvrei* group from England and the Kristianstad Basin, which were also very elongated; in contrast, Naidin (pers. comm. to Christensen, 1984) had never seen any juvenile or subadult specimens from the Russian Platform.

On the basis of the eleven specimens known in 1975, eight species and subspecies were erected, as follows: *B. grossouvrei*, *B. toucasi*, *B. alfridi*, *B. depressus* (Andreae, 1895), *B. depressus fusiformis* (Andreae, 1895), *B. mammillatus germanica* (Stolley, 1930), *B. mammillatus ornatus* (Moberg, 1885) and *B. blackmorei* (Crick, 1907).

*Belemnelloamax* ex gr. *grossouvrei* is widely distributed in the North European Province, but rare (Christensen, 1986), while *B. mammillatus* is extremely common in southern Sweden but rare elsewhere, with only isolated finds from northern Germany, eastern Poland and the eastern part of the Russian Platform. *Belemnelloamax balsvikensis* is also common in Skåne (southern Sweden), but unknown outside this area, with the exception of two specimens from the Hannover area, northern Germany (Christensen, Schulz, 1976). Thus, the distribution area appears to have gradually diminished through time. Christensen (1986) noted that on the Russian Platform, this group was slightly commoner than in western Europe and about 60–70 specimens had been recorded; these had been assigned to *B. grossouvrei pseudotoucasi* (Naidin, 1964), *B. grossouvrei pseudoalfridi* (Naidin, 1964) and *B. toucasi* var. *seimensis* (Nikitin, 1958).

German records of *B. ex gr. grossouvrei* are, according to Christensen (1986), from the Gonioteuthis granulata-quadrata Zone (lowermost Campanian) and *G. quadrata gracilis*—*B. mucronata* Zone (uppermost lower Campanian), while in southern Sweden the taxon is known from the basal Campanian (Vomb Trough) to uppermost lower Campanian (Kristianstad Basin). Other records are from the upper Santonian and ?lower Campanian of France and upper Santonian and lower Campanian of the Russian Platform, while records from England are from Fimber, Yorkshire (latest Coniacian—earliest Santonian, coranguinum Zone) and Ruston Parva, Yorkshire (early Campanian, Offaster pilula Zone) (Crick, 1906; Christensen, 1991; Doyle, 2002), West Harnham (top Offaster pilula or basal *G. quadrata* Zone [sensu anglico], Mottisfont (probably Hagenowia blackmorei Horizon, early Campanian), Micheldever, Hants (probably earliest Santonian, coranguinum Zone) and East Harnham, near Salisbury (probably *G. quadrata* Zone [sensu anglico]).

From France, Christensen et al. (1990) recorded *B. ex gr. grossouvrei* from the Santonian (Labastide Sandstone Formation) at Bugarach (Aude) and from Sougraigne aux Croutets, of late Santonian age. These records from southern France demonstrate that the group also occurred along the northern margin of the Tethyan Realm. To this, Christensen et al. (1993) added two specimens from the lower part of the Sougraigne Blue Marls between Sougraigne and Croutets (Corbières, southern France), of Santonian age (*Placenticerus polyopsis*—*Texanites gallicus* Zone) and Christensen et al. (1993) noted a single specimen from Dieppe (Normandie, northern France), of early or middle Santonian age (coranguinum Zone).

NHMM RN 1521 is the stratigraphically youngest, and largest, specimen known to date and extends the range of this group into the lower mid-Campanian (table). Competition with successful members of the genus *Belemnitella* at this time (Christensen et al., 1975; Christensen, 2000) probably led to its demise. However, it could also have been a primarily rare species with a rather limited breeding success and/or a preferred habitat outside the area from which it has now been recorded. With the exception of *B. mammillatus* and *B. balsvikensis*, which both demonstrably lived and bred in the area where they are found (Christensen, 1975; Christensen, Schulz, 1976), no juveniles of *B. ex gr. grossouvrei* are known from western Europe or the Russian Platform, with the exception of southern England and southern Sweden (Christensen, 1991). This suggests that the taxon lived and bred somewhere else, possibly in adjacent oceanic basins from which it migrated (or ?strayed) periodically into shallower-water settings.

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**BELEMNELLOCAMAX EX GR. GROSSOUVREI, РЕДКИЙ БЕЛЕМНИТ (СЕРHALOPODA, COLEOIDEA) ИЗ СРЕДНЕГО КАМПАНА РАЙОНА ГАННОВЕРА, СЕВЕРНАЯ ГЕРМАНИЯ**

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Иллюстрирован и описан экземпляр редкого белемнита *Belemnelloccamax ex gr. grossouvrei* (Janet), который был недавно найден в зоне *conica/mucronata* (низы среднего кампана, *sensu germanico*) в карьере Тевтония Норд около Мисбурга (район Ганновера, Северная Германия). Это самая молодая по возрасту находка данного таксона и самый крупный экземпляр.

*Ключевые слова:* белемниты, кампан, Германия.

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