

Ammonites from the Dababiya Quarry Corehole: Taxonomic notes and age assessment

Stijn Goolaerts^{1,2} and Christian Dupuis³

¹Royal Belgian Institute of Natural Sciences, Vautierstraat 29, B-1000 Brussels, Belgium

²Department of Earth & Environmental Sciences, Katholieke Universiteit Leuven,
Celestijnenlaan 200E, B-3001 Heverlee, Belgium

³Department of Geology, University of Mons, Rue de Houdain 9, B-7000 Mons, Belgium
email: stijn.goolaerts@naturalsciences.be

ABSTRACT: We describe a small collection of ammonites from the Dababiya Quarry corehole. It is almost entirely composed of heteromorph ammonites, in particular of scaphitids and baculitids. The presence of *Indoscaphites pavana* (Forbes 1848), which is for the first time reported from Egypt, points to a late to possibly latest Maastrichtian age for the interval DBD 80.36–DBD 99.11 of the Dababiya Quarry core. This is corroborated by preliminary data on planktonic foraminifera.

Keywords: Cretaceous, biostratigraphy, taphonomy

INTRODUCTION

The Dababiya Quarry corehole cuts through about 60 m of Cretaceous sediments for which the presence of ammonites in between levels DBD 80.36 (pyritised fossil layer PFL) and DBD 139.60 was noted during the description of the core (Dupuis and Knox, this volume). The topmost occurrence (baculitid phragmocone fragments at PFL) was used as a proxy for positioning the Cretaceous/Paleogene (K/Pg) boundary. The present paper describes the preservation and taxonomic assignment of a small collection of ammonites collected from the Dababiya Quarry corehole, and discusses the age of the fauna.

MATERIAL

In total, twelve ammonite specimens were available for study, nine collected by C.D. in 2004, and an additional three by Chris King in 2005. The positioning of each specimen relative to the core depth is given in text-figure 1 and table 1. Three types of preservation are observed. The first and most common type is characterized by pyritised small to very small wholly septate internal moulds with complete absence of preserved parts of the body chamber. In contrast, the protoconch, ammonitella and even the nepionic constriction are well-preserved, as is the suture and the three-dimensional shell shape. The second type is characterized by preservation of the original aragonite shell, but the specimens suffered heavily from sediment compaction related crushing and flattening by which almost all taxonomically important characters were lost. It is for example impossible to distinguish between parts of the phragmocone and the body chamber. The third type is represented by a single specimen. It has some fragments of the shell preserved and is crushed, but reveals sutures. Thus, each type of preservation has a different set of taxonomically important characters missing or preserved.

AMMONITE FAUNA

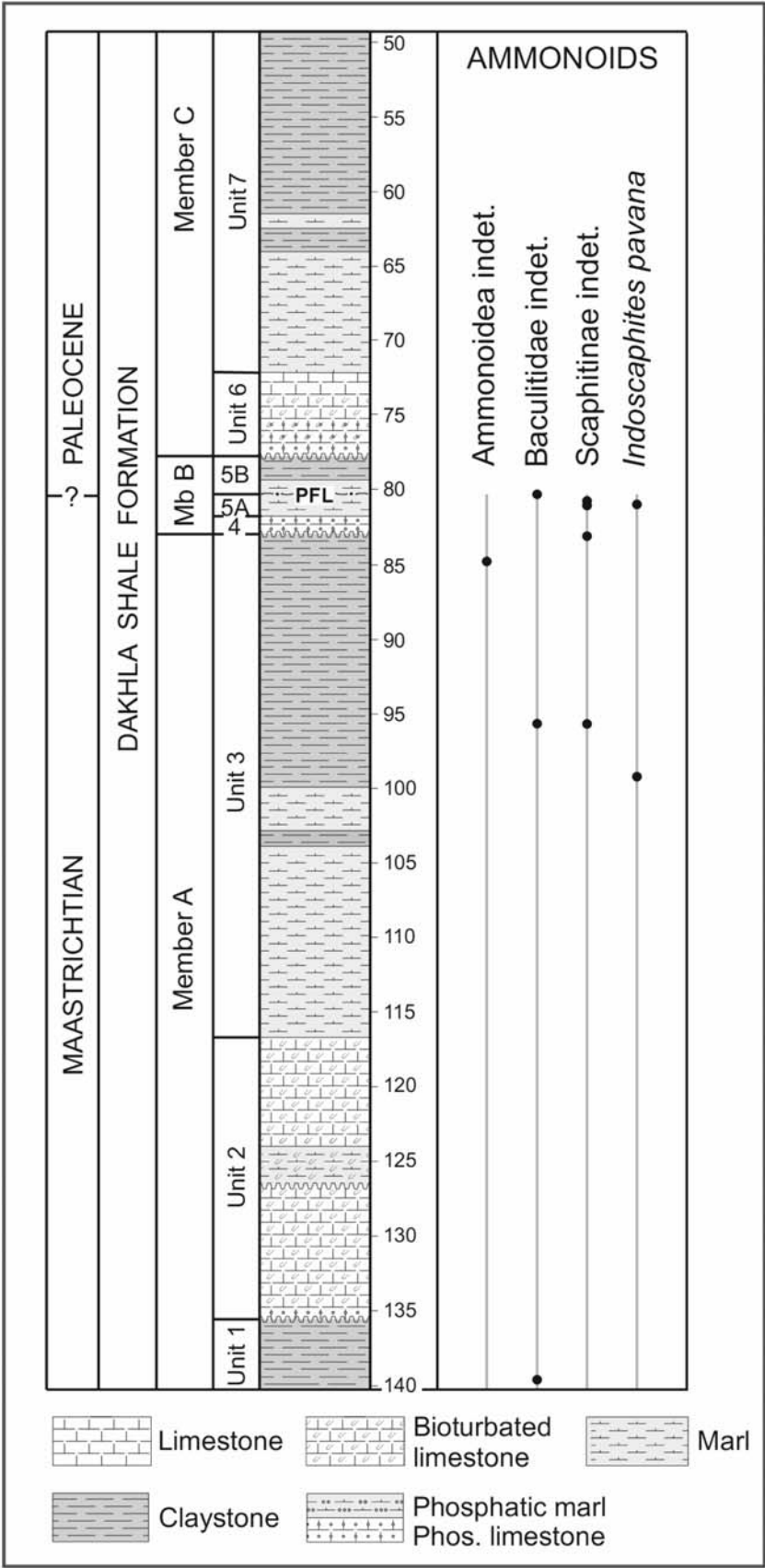
The ammonite fauna is almost exclusively composed of heteromorph ammonites. Only one of the twelve specimens may not belong here. Scaphitids dominate over baculitids, tak-

ing 58.3 and 33.3% of the fauna into account respectively. For reasons of incomplete preservation, most specimens are left in open nomenclature. Only two of the twelve specimens were referable to the scaphitid species *Indoscaphites pavana* (Forbes 1846), which is thereby for the first time reported to occur in Egypt.

AGE OF THE FAUNA

Outside of Egypt, *Indoscaphites pavana* (Forbes 1846) is known from Tunisia, Algeria and southern India. In Tunisia, it occurs abundantly throughout the topmost Maastrichtian *Indoscaphites pavana* Assemblage Zone of Goolaerts (2010). The base of this zone situates about 420 kyr before the K/Pg boundary (based on the cyclostratigraphic data of Hennebert and Dupuis (2003) and Hennebert (2012)), and the top coincides with the K/Pg boundary. In micropaleontologic terms, the stratigraphic range of this ammonite zone is within the upper part of the *Abathomphalus mayaroensis* (PF) Zone and the upper part of the CC26 (CN) Zone. Goolaerts (2010) recognized 22 ammonite taxa occurring in this zone, of which the two closely allied scaphitid species *I. pavana* and *I. cunliffei* (Forbes 1846) are the most abundant (percentages ranging between 48.3 and 76.2% depending on the collection site), next to the baculitid *Baculites* sp. A (ranging between 6.5 and 13.8%). In this respect, although the number of collected specimens from Dababiya is too small to infer a statistically stable percentage, the composition of its fauna recalls that of the Tunisian one. Even more remarkably similar is the dominant mode of preservation, which is also in the form of small to very small pyritised specimens only preserving parts of the phragmocone and none of the body chamber.

The same mode of preservation is also observed in the four specimens of *I. pavana* Pervinquière (1910) collected near Constantine in Algeria. Since then, no additional specimens have been collected, nor was the outcrop revisited. With Constantine being located in the (Algerian part of the) Tunisian



TEXT-FIGURE 1
Positioning of ammonite finds in the Dababiya Quarry core. Lithostratigraphy after Dupuis and Knox(this volume).

TABLE 1

Overview of the studied ammonite specimens, including specimen number, core depth, collection year, taxonomy, dimensions, preservation and figures (text-figure 2). (D: maximal diameter, replaced by L: maximal length for the straight-shelled Baculitidae).

Specimen n°	Depth	Year	Taxon	D - L (mm)	Preser- vation	Figured
IRSNB 11484	DBD 80.60 m	2004	Scaphitinae indet.	3.80	type 1	/
IRSNB 11485	DBD 80.62 m	2004	Scaphitinae indet.	4.95	type 1	figs 6-7
IRSNB 11486	DBD 81.03 m	2005	<i>Indoscaphtes pavana</i> (Forbes, 1846)	14.40	type 1	fig. 1
IRSNB 11487	DBD 83.02 m	2005	Scaphitinae indet.	2.75	type 1	fig. 3
IRSNB 11488	DBD 83.02 m	2005	Scaphitinae indet.	3.60	type 1	/
IRSNB 11489	DBD 84.95 m	2004	Ammonoidea indet.	71.00	type 2	/
IRSNB 11490	DBD 96.27 m	2004	Baculitidae indet.	61.00	type 3	figs 4-5, 13
IRSNB 11491	DBD 96.27 m	2004+	Baculitidae indet.	3.10	type 1	figs 12, 15
IRSNB 11492	DBD 96.27 m	2004+	Scaphitinae indet.	1.85	type 1	/
IRSNB 11493	DBD 99.11 m	2004	<i>Indoscaphtes pavana</i> (Forbes, 1846)	10.95	type 1	figs 8-11, 14
IRSNB 11494	DBD 139.27 m	2004	Baculitidae indet.	41.00	type 2	fig. 2
IRSNB 11495	DBD 139.27 m	2004	Baculitidae indet.	9.50	type 2	/

Trough basin, we think that the occurrence correlates with the better documented range of the species in Tunisia.

In the type region near Pondicherry, southern India, *I. pavana* is known exclusively from the holotype collected in the middle of the 19th century. In contrast to the North African material, the holotype preserves much of its original shell and half a whorl of the body chamber. This type of preservation, retaining most of the original shell and partly or even complete body chambers, is also observed with the other species occurring, among which is the closely allied *I. cunliffei*. In their review of the Pondicherry fauna, Kennedy and Henderson (1992a, b) discussed its age and assigned it to be within the *Abathomphalus mayaroensis* (PF) Zone, thus within the upper Maastrichtian, but a more precise position of this 19th century collected material cannot be determined.

The above discussed records clearly document *I. pavana* as a late Maastrichtian species. Its occurrence in the Dababiya Quarry core places the portion in-between the lowest recorded *I. pavana* (level DBD 99.11) and the highest recorded ammonite (level DBD 80.36) as upper Maastrichtian, within the *Abathomphalus mayaroensis* (PF) Zone. The latter is corroborated by a preliminary study of planktonic foraminifera from the Cretaceous part of the core reporting the occurrence of *Abathomphalus mayaroensis* and *Hedbergella monmouthensis* at 80.6 and 93.1 m core depth respectively (W.A. Berggren, personal communication, 8/2011, determinations by K. Ouda). Of note is that, if the range observed in Tunisia can be extrapolated to Egypt, this portion of the core belongs to the uppermost 420 kyr of the Maastrichtian. In this case, the discovery of ammonites in the Dababiya Quarry core may be of importance to the ammonoid extinction debate. A very short hiatus at the K/Pg boundary is however proposed by Obaidallah (this volume), who records the presence of assemblages of the *Pseudoguembelina palpebra* (PF) Zone at 81.00–80.00 m, suggesting the absence of the *Plummerita hantkeninoides* (PF) Zone. The latter is the topmost PF zone of the Maastrichtian, with its base dated in Tunisia being at 230 kyr before the K/Pg boundary (Hennebert and Dupuis 2003; Hennbert 2012).

SYSTEMATIC PALEONTOLOGY

The classification used here is that of Wright et al. (1996). The sutural terminology of Arkell (1957) and Wedekind (1916) is used, taking into account the review by Kullmann and Wiedmann (1970). Abbreviations: E, external lobe; L, lateral lobe; U, umbilical lobe; D, diameter, is replaced by L, length, for the Baculitidae; Wb, whorl breadth; Wh, whorl height; Ud, umbilical diameter (see also Table 1). All specimens are deposited in the Mesozoic Invertebrate collections of the Royal Belgian Institute of Natural Sciences and have prefix IRSNB.

Order: AMMONOIDEA Zittel 1884

Ammonoidea indet

Material. One specimen, from 84.95 m depth.

Description and Discussion. Post-depositionally deformed and flattened 2 mm thick indeterminate ammonite fragment, with both flanks exposed. No ornament or suture visible.

Suborder: ANCYLOCERATINA Wiedmann 1966

Superfamily: TURRILITOIDEA Gill 1871

Family: BACULITIDAE Gill 1871

Baculitidae indet.

Text-figures 2.2, 2.4, 2.12–2.13, 2.15

Material: Four specimens, two from DBD 96.27 m and another two from DBD 139.27 m.

Description and Discussion: Specimens belong to the *Baculitidae*, either to *Baculites* Lamarck 1799 or *Eubaculites* Spath 1926. A more precise assignation is not possible at present due to their mediocre and incomplete preservation. The single type 1 specimen is a fragment of a juvenile baculitid phragmocone (L = 3.10 mm; Wb = 1.60 mm; Wh = 2.10 mm; Wb/Wh = 0.76) for which its Wh is too small to allow detailed comparison with the baculitids associated with *I. pavana* in Tunisia. The type 2 and type 3 specimens are crushed, excluding a more definite assignment.

Superfamily: SCAPHITOIDEA Gill 1871

Family: SCAPHITIDAE Gill 1871

Subfamily: SCAPHITINAE Gill 1871

Scaphitinae indet.

Text-figures 2.3, 2.6–2.7

Material. Five specimens, from DBD 80.60 m, DBD 80.62 m, DBD 83.02m (2 specimens) and DBD 96.27 m.

Description and Discussion. Five minute-sized evolutely coiled smooth and septate specimens of preservation type 1. Only on the last preserved whorl are some faint traces of ribbing observable. Suture is scaphitid with bifid L. These specimens are referred to as Scaphitinae indet. because their maximal Wh is below that of the lower detection limit of genus or species characteristic ornament.

Genus *Indoscaphites* Spath 1953

Type species: *Ammonites cunliffei* Forbes 1846, p. 109, pl. 8, fig. 2, by original designation.

Indoscaphites pavana (Forbes 1846)

Text-figures 2.1, 2.8–2.11, 2.14

Ammonites pavana FORBES 1846, p. 110, pl. 7, fig. 5.

Scaphites Cunliffei var. *Pavana* Forbes. — PERVINQUIÉPRE 1907p. 124 (pars), figs 41, 42 only; text-fig. 45 only. — PERVINQUIÉPRE, p. 29, pl. 2, figs 23–24.

Indoscaphites pavana (Forbes 1846). — KENNEDY and HENDERSON 1992, p. 726, pl. 5, figs 1, 3–5. (with full synonymy) — GOOLAERTS et al., p. 324, figs 4 H, M; 6 M-O, 7 P, Q.

Types: See Kennedy and Henderson (1992, p. 724).

Material: Two specimens, one from DBD 81.03m and one from DBD 99.11m.

Description: Specimen IRSNB 11493 (DBD 99.11 m) is a wholly septate pyritic internal mould. Ornament consists of ribs and clavi. Ribs are convex at mid-flank, concave on the outer

flank and prorsiradiate on the ventrolateral shoulder where they bear small clavi. The ribs are convex on the venter. Intercalated ribs arise at mid-flank. The whorl section is rounded in early stages, but becomes more compressed and flat-sided at larger diameter (at D = 10.95 mm Wb/Wh = 0.66; Wb = 3.65 mm; Wh = 5.50 mm; Ud = 1.85 mm). Specimen IRSNB 11486 (DBD 81.03 m) has a slightly larger maximal D (14.40 mm), but the outermost preserved whorl is partially crushed.

Discussion. Ornament differs slightly with the *Indoscaphites pavana* type specimen, but falls within the range of intraspecific variation observed within the Tunisian *Indoscaphites* material (Goolaerts et al., in prep), which bears same type of preservation under the form of small pyritic internal moulds of the Dababiya specimen.

Occurrence. Uppermost Maastrichtian of Tunisia and Algeria, upper Maastrichtian of southern India, and upper to uppermost Maastrichtian of Egypt.

ACKNOWLEDGMENTS

We acknowledge Chris King for collecting additional specimens in 2005. We are grateful to W. Miseur (KBIN-IRNSB, Belgium) for producing superb macrophotographs. This study benefited from the financial support of the Agency for Innovation by Science and Technology (IWT Flanders, SB n°13201) and of a SYS-RESOURCE grant to visit the collections of the Natural History Museum in London, United Kingdom.

REFERENCES

- DUPUIS, C. and KNOX, R. O. B. (*this volume*). Lithostratigraphy of the Upper Maastrichtian to Lower Eocene succession in the Dababiya Quarry Corehole, Egypt.
- GOOLAERTS, S., 2010. Late Cretaceous ammonites from Tunisia: Chronology and causes of their extinction and extrapolation to other areas. *Aardkundige Mededelingen*, 21: xii + 220 p.

TEXT-FIGURE 2

Macrophotographs, suture line and cross-section drawings of ammonites from the Dababiya Quarry core

Scale: 2, 4–5: ×1; 1, 3, 6–11: ×4; 12: ×19.5; 13: ×4.7; 14–15: ×9.4.

1, 8–11, 14 — *Indoscaphites pavana* (Forbes 1848)

1 IRSNB 11486 (DBD 81.03m);

8–11, 14 IRSNB 11493 (DBD 99.11m);

2, 4–5, 12–13, 15 — *Baculitidae* indet.

2 IRSNB 11494 (DBD 139.27m);

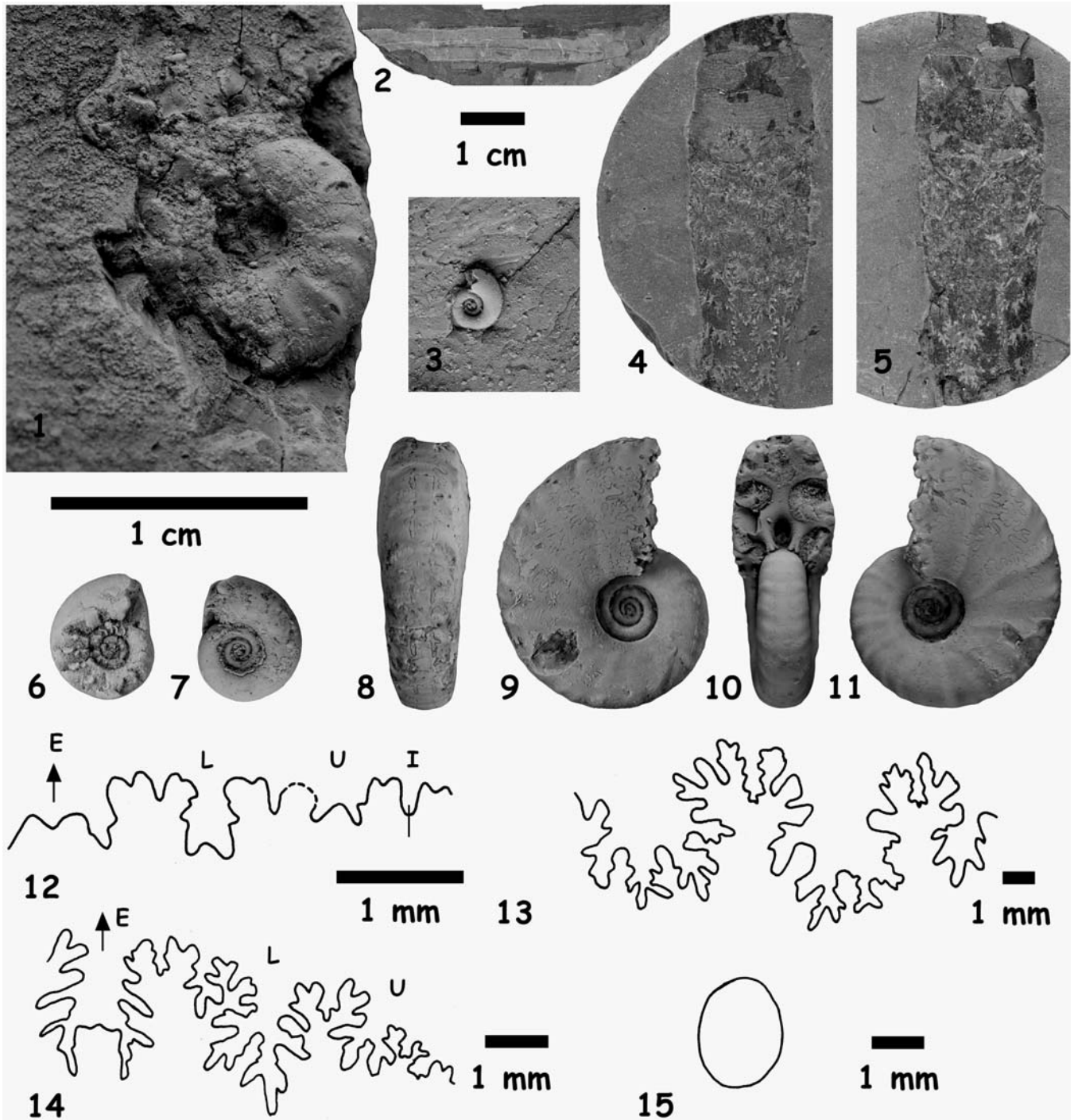
4–5, 13 IRSNB 11490 (DBD 96.27m);

12, 15 IRSNB 11491 (DBD 96.27m);

3, 6–7 — *Scaphitinae* indet.

3 IRSNB 11487 (DBD 83.02m);

6–7 IRSNB 11485 (DBD 80.62m).



- GOOLAERTS, S., KENNEDY, W. J., DUPUIS, C. and STEURBAUT, E., 2004. Terminal Maastrichtian ammonites from the Cretaceous–Paleogene Global Stratotype Section and Point, El Kef, Tunisia. *Cretaceous Research*, 25: 313–328.
- FORBES, E., 1846. Report on the fossil Invertebrata from southern India, collected by Mr. Kaye and Mr. Cunliffe. *Transactions of the Geological Society of London* (2), 7: 97–174.
- HENNEBERT, M., 2012. Hunting for the 405-kyr eccentricity cycle phase at the Cretaceous–Paleogene boundary in the Aïn Settara section (Kalaat Senan, central Tunisia). *Carnets de Géologie*, 2012/5 (CG2012_A05) : 93–116.
- HENNEBERT, M. and DUPUIS, C., 2003. Proposition d’une échelle chronométrique autour la limite Crétacé–Paléogène par cyclostratigraphie : coupe de l’Aïn Settara (Kalaat Senan, Tunisie centrale). *Geobios*, 36: 707–718.
- KENNEDY, W. J. and HENDERSON, R. A., 1992a. Non-heteromorph ammonites from the Upper Maastrichtian of Pondicherry, South India. *Palaeontology*, 35: 381–442.
- , 1992b. Heteromorph ammonites from the Upper Maastrichtian of Pondicherry, South India. *Palaeontology*, 35: 693–731.
- OBAIDALLAH, N., (*this volume*). Planktonic foraminiferal biostratigraphy of the Upper Cretaceous to mid-Paleocene of the Dababiya Quarry Corehole, Upper Nile Valley, Egypt.
- PERVINQUIÈRE, L., 1907. *Études de paléontologie tunisienne. 1. Céphalopodes des terrains secondaires*. Paris: De Rudeval. Carte Géologique de la Tunisie, 438pp.
- , 1910. Sur quelques ammonites du Crétacé algérien. *Mémoires de la Société géologique de France (Paléontologie)*, 42: 1–86.