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Cover illustration: The ammonite *Dorsetensia liostraca* Buckman from the Lower Bajocian (Middle Jurassic) Giganteuston Member of Öschingen, Middle Swabian Alb, Germany. For details, see Dietze, V. et al.: The Giganteuston Member of Öschingen (Humphriesianum Zone, Lower Bajocian, Swabian Alb), with comments on the genera *Dorsetensia* Buckman, 1892 and *Nannina* Buckman, 1927, pp. 209–236 in this issue.
Back cover: Atrium of the Munich Palaeontological Museum, view from the main entrance.

Umschlagbild: *Dorsetensia liostraca* Buckman, ein Ammonit aus dem Giganteuston des Unter-Bajociums (Mittlerer Jura) von Öschingen, Mittlere Schwäbische Alb, Deutschland. Für weitere Informationen siehe Dietze, V. et al.: The Giganteuston Member of Öschingen (Humphriesianum Zone, Lower Bajocian, Swabian Alb), with comments on the genera *Dorsetensia* Buckman, 1892 and *Nannina* Buckman, 1927, S. 209–236 in diesem Heft.
Rückseite: Lichthof des paläontologischen Museums München, Blick vom Haupteingang.

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The Giganteuston Member of Öschingen (Humphriesianum Zone, Lower Bajocian, Swabian Alb), with comments on the genera *Dorsetensia* Buckman, 1892 and *Nannina* Buckman, 1927

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Abstract

A section in the Lower Bajocian Giganteuston Member is described from Öschingen (Middle Swabian Alb). The examined part of this member yielded a sonniniid fauna of the *romani* horizon (Humphriesianum Zone, Romani Subzone), followed by a stephanoceratid fauna in the *mutabile* horizon (Humphriesianum Subzone). Öschingen is the type locality of *Dorsetensia romani* (Oppel) and *Nannina deltafalcata* (Quenstedt); in addition *D. complanata* Buckman and *D. liostraca* Buckman are reported from there. To clarify the taxonomic affiliation of these sonniniids, chorotypes of *D. edouardiana* (d'Orbigny) (= type species of *Dorsetensia* Buckman, 1892), *D. lennieri* Brasil and *D. tessoniana* (d'Orbigny) were studied; as well as topotypes of *D. pulchra* Buckman, *D. liostraca* Buckman, *D. complanata* Buckman, and *D. regrediens* (Haug).

Key words: *Dorsetensia*, *Stephanoceras*, Humphriesianum Zone, Southern Germany, Middle Jurassic, Bajocian, correlation.

Kurzfassung

Von Öschingen (Mittlere Schwäbische Alb) wird ein Profil im Giganteuston des dortigen Unter-Bajociums beschrieben. Im untersuchten Abschnitt wird eine Fauna aus Sonniniiden im *romani*-Horizont (Humphriesianum-Zone, Romani-Subzone) von einer Fauna mit Stephanoceratiden im *mutabile*-Horizont (Humphriesianum-Subzone) überlagert. Öschingen ist die Typuslokalität von *Dorsetensia romani* (Oppel) und *Nannina deltafalcata* (Quenstedt), daneben kommen *D. complanata* Buckman und *D. liostraca* Buckman vor. Zur Klärung der Gattungszugehörigkeit dieser Sonniniiden wurden Chorotypen von *D. edouardiana* (d'Orbigny) (= Typusart von *Dorsetensia* Buckman, 1892), sowie von *D. lennieri* Brasil und *D. tessoniana* (d'Orbigny) untersucht, ebenso Topotypen der Arten *D. pulchra* Buckman, *D. liostraca* Buckman, *D. complanata* Buckman und *D. regrediens* (Haug).

Schlüsselwörter: *Dorsetensia*, *Stephanoceras*, Humphriesianum-Zone, Süddeutschland, Bajocium, Korrelation.

1. Introduction and historical background

Ammonites from the Giganteuston Member of Öschingen (south of Tübingen, Middle Swabian Alb; Textfig. 1) are known since Oppel (1856, 1862) and Quenstedt (1856, 1886). Oppel (1856) listed the locality Öschingen among the occurrences of beds of the 'Zone des *Ammonites Humphriesianus*'. Ohmert (1990) interpreted this reference of Oppel (1856, p. 344; Profil no. 29) in that way, that the middle part of the Swabian Alb, approximately the area between Neuffen and Killer, was the historical stratotype of the Humphriesianum Zone (Lower Bajocian, Middle Jurassic) (see Ohmert 1990: fig. 1). This is an area where dark claystones are sandwiched between the underlying Blaukalk Member and the Subfurcaten-Oolith above. These dark claystones represent the Giganteuston and the Blagdeni-Schichten [= Ostreen-Kalke auct.]. In his fundamental work of Jurassic biostratigraphy Oppel (1856) mentioned a new ammonite species, *Ammonites romani*, which he described in 1862 on the basis of several specimens from Öschingen itself and the nearby locality "Alte Bürg". This species has become the index of the Romani Subzone near the base of the Humphriesianum Zone. However, the stratigraphical range of this subzone at its type locality was in fact unknown (Ohmert 1990).

Quenstedt (1856, 1886) described *Ammonites deltafalcatus* from the 'Muschelknollen' [= limestone concretions with numerous mollusc shells] of the "Mitteldelta" of Öschingen together with various

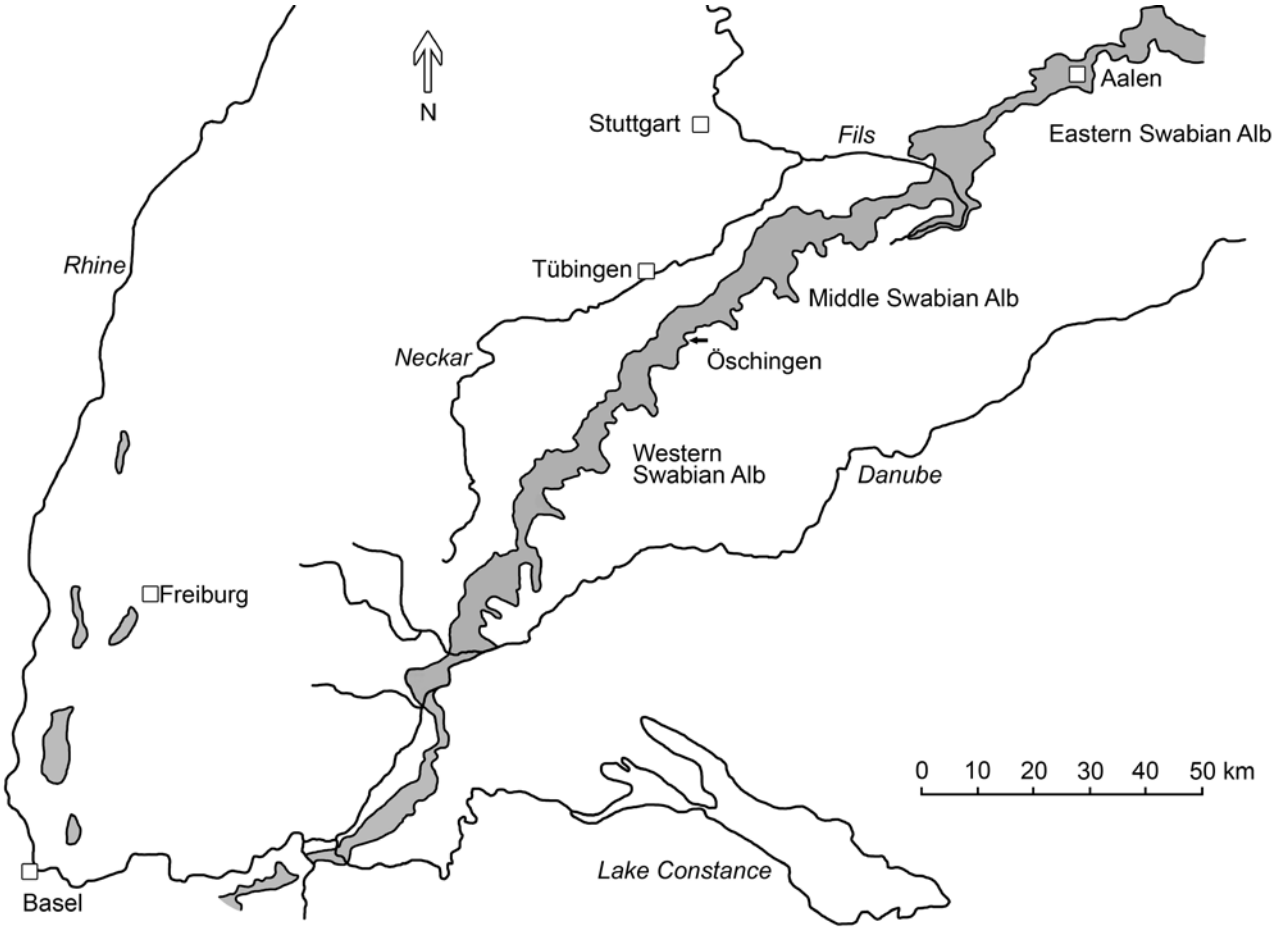
Dorsetensia. Even Quenstedt knew that the fossiliferous concretions ('Muschelknollen') within this Giganteuston Member differ significantly from each other. In his late monograph on Jurassic ammonites from Swabia Quenstedt (1886) described the two stephanoceratids *Ammonites Humphriesianus pyritosus* and *Ammonites Humphriesianus mutabilis* from Öschingen (in the figure captions only; on page 538 Quenstedt mentions Beuren; for the real locality see p**.** 228) and various sonniniids.

In 1932, Weisert (1932) reported the new species *Teloceras acuticostatum* from Öschingen. Westermann (1954) added several species of *Normannites*. Ohmert (1990: fig. 3) published a section studied by the late Eberhard Buck in the Giganteuston Member of Öschingen. Due to the lack of permanent outcrops and new ammonite material, Ohmert was unable to provide reliable data about the type horizons of the ammonite taxa described from Öschingen. In this study we will add these missing data for some of the taxa. We present well-preserved ammonite faunas from the *deltafalcata*, *romani* and *mutabile* horizons of this area.

In addition we studied numerous choro- and topotypes of *Dorsetensia edouardiana* (d'Orbigny), *D. tessoniana* (d'Orbigny), *D. pulchra* Buckman, *D. liostraca* Buckman, *D. complanata* Buckman, *D. lennieri* Brasil, and *D. regrediens* (Haug) as a basis for the determination and generic affiliation of the "*Dorsetensia*" fauna of Swabia.

2. Material and methods

During the years 2009/2010 a new settlement area was founded in the south-western part of the village of Öschingen. In the excavated pipework trenches a characteristic calcareous marker bed, the so-called 'Dorsetensienbank' (Ohmert 1990) was well-exposed. From the dark claystones of the Giganteuston Member below and above this marker bed the two amateur collectors Uwe Fidder (Öschingen) and Elmar Scherer (Mössingen-Talheim) recovered a rich and well-preserved but low diverse ammonite fauna. Most of the material was collected very precisely from different levels within the section or can be asigned to them with certainty. These ammonites are compared with additional specimens from Great Britain and France. The ammonites of the genus *Dorsetensia* from the Frogden Quarry near Oborne (Dorset) were excavated by the first author. The ma-



Textfigure 1: Outcrop of the Middle Jurassic in SW Germany, with the studied locality in Öschingen (modified from Dietze et al. 2008).

terial from Normandy was collected by the amateur collector R. Schmode (Rheurdt).

As far as possible we tried to evaluate the variability of the occurring ammonite taxa. A statistically relevant amount of specimens to study this specific variability was available for *Dorsetensia romani*, *D. complanata*, *D. liostraca*, and *D. edouardiana*. In the other cases only a morphospecific determination was possible. The exposed fossiliferous parts of the Giganteuston Member of Öschingen were biostratigraphically subdivided into ammonite faunal horizons (see e.g. Callomon 1985 for methodology). These horizons were attributed to the chronostratigraphic Standard Subzones of the Humphriesianum Zone, the subzones of Dorsetensia pinguis, Dorsetensia romani and of Stephanoceras humphriesianum (see Textfig. 4). The bulk of the figured ammonites are housed in the SMNS collection.

Abbreviations:

BSPG = Bayerische Staatssammlung für Geologie und Paläontologie München, Germany.
GSM = British Geological Survey Museum, Keyworth, Nottingham, UK.
HMS = Hunterian Museum, University of Glasgow, Scotland, UK.
IFGT = Institut für Geowissenschaften der Universtität Tübingen, Germany.
SMNS = Staatliches Museum für Naturkunde Stuttgart, Germany.
D = Diameter (in mm)
H = Whorl height (in mm)
W = Whorl width (in mm)
U = Umbilical width

3. The section in the Giganteuston Member of Mössingen-Öschingen

3.1 General remarks

The Giganteuston Member is named after the common occurrence of the large-sized belemnite species *Megateuthis giganteus* (Schlotheim). It is a clayey basin deposit of the Humphriesianum Zone that occurs in the middle part of the Swabia Alb. This member is sandwiched between the 'Abraumschichten' at the top of the Blaukalk Member and the so-called Blagdeni-Schichten (= Ostreen-Kalke auct.). In modern lithostratigraphic terms the Giganteuston Member is part of the Ostreenkalk Formation (Bloos et al. 2005). The exact thickness of this member at Öschingen is unknown. Most likely, the thickness is similar to the sections from Mössingen-Talheim further to the west, where Hahn (after Ohmert 1990: fig. 3) had measured a thickness of c. 20 m. Buck (after Ohmert 1990: fig. 3) gave a thickness of c. 12 m at Öschingen for the 'Unterer Giganteuston', the lower part of the member from the Blaukalk Member and a limestone bed ('Dorsetensienbank' of our study). At Öschingen, above this 'Dorsetensienbank' c. further 10 m of claystones of the 'Oberer Giganteuston' are supposed until the basis of the Blagdeni-Schichten. The construction works in Öschingen did not expose the complete section of the Giganteuston Member, but only the part from c. 4 m below and c. 2.5 m above the 'Dorsetensienbank'. For this reason we used the 'Dorsetensienbank' as a perfect marker bed for our measurements.

3.2 Description of the section

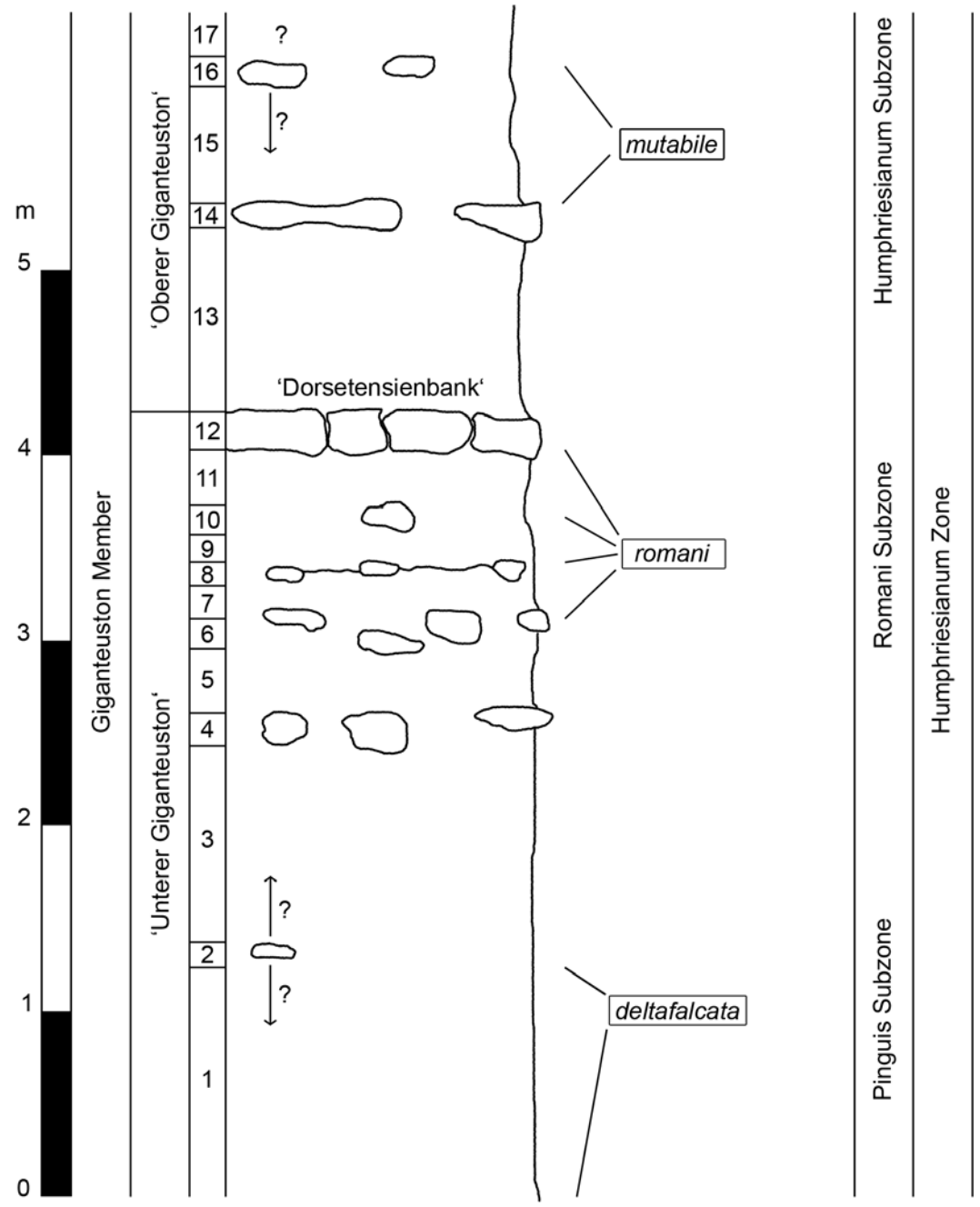
Giganteuston Member

"Unterer Giganteuston"

At ca. 4.8 m and 6.5 m above the 'Blaukalk' there occur two layers of calcareous concretions or limestones (Ohmert 1990, fig. 3). Bückle (1913) mentioned two thin limestones beds ("Kalkplatten") following immediately above the 'Blaukalkabraum'. During the recent construction works in Öschingen this lowermost part of the member was not exposed and could not be studied, except of a single site where some beds from more than 4 metres below the 'Dorsetensienbank' were exposed. This isolated outcrop was too small for a precise measurement within the section. The exposed section showed 1.7 m of a blackish-grey silty claystone with fine mica. From here we have recorded some belemnite rostra, bivalves, gastropods and a ammonite faunula with sonniniids, among them ?*Dorsetensia punctatissma* (Haug) (Pl. 8, Figs 7, 8) and *Nannina deltafalcata* (Quenstedt) (Pl. 8, Figs 2–5).

- **Bed 1** (recorded up to ca. 4 m below 'Dorsetensienbank'; top layer and exact thickness unknown): blackish-blue claystone with belemnites.
- **Bed 2:** 'Pecten-Muschelknollen', nodular concretions with a diameter of ca. 10 cm. Very typical and common are pectinid bivalves. The exact position of this layer is unknown because the concretions are too rarely scattered to trace them in a vertical section. Our material comes from excavated material which originated from below of Bed 4; therefore this layer must occur somewhere within beds 1 and 3.

  Nannina deltafalcata (Quenstedt) (Pl. 7, Figs 5–7)
  ?*Dorsetensia* aff. *hebridica* Morton (Pl. 8, Fig. 6)
- **Bed 3**: Blackish-blue claystone between beds 2 and 4; thickness unknown.
- **Bed 4** (ca. 1.4–1.5 m below 'Dorsetensienbank'; thickness ca. 0.15 m): 'Muschelknollen' of blackish-grey colour, mostly in the size of a loaf of bread, almost free of macrofossils. These concretions occur in average in a horizontal distance of c. 1 m.
- **Bed 5** (ca. 1–1.5 m below 'Dorsetensienbank';



Textfigure 2: Section of the middle part of the Giganteuston Member at Öschingen.

thickness ca. 0.35 m): blackish-blue claystone.

- Bed 6 (ca. 0.9–1.1 m below 'Dorsetensienbank'; thickness ca. 0.15 m): The so-called 'Isocardien-Muschelknollen' of Quenstedt (1856). These are the 'Muschelknollen' with the richest fossil content; the average horizontal distance between the nodules is 0.5–1 m. The vertical range of the nodules varies in a distance of c. 0.2–0.3 m. Tiny bivalves of the genus *Isocardia* are only present in these nodules, when the nodules or part of them are located in the upper part of this interval. The mostly juvenile ammonites occur below the bivalves, in a medium part of the vertical range of this nodule layer.

Dorsetensia romani (Oppel) (Pl. 2, Figs 3, 5–9, 12, 15, 16)

D. cf. *complanata* Buckman

D. liostraca Buckman

Nannina deltafalcata (Quenstedt) (Pl. 7, Figs 11, 12)

- Bed 7 (ca. 0.7–1.0 m below 'Dorsetensienbank'; thickness ca. 20 cm). Blackish-blue claystone.

- Bed 8 (ca. 0.7–0.6 m below 'Dorsetensienbank'; thickness ca. 10 cm). 'Pyrit-Muschelknollen', in fresh condition rich in pyrite and bivalve schill with a maximum diameter of 0.3 m. During weathering the nodules rapidly disappear. Approximately every meter in horizontal distance such a concretion occurs. The nodules are interconnected by a marly layer within the claystone. In Reutlingen Ohmert

(1988) observed another layer of pyritic nodules ca. 0.15–0.18 m below the 'Dorsetensienbank' which correlates with the 'Omissionshorizont' at Eningen, where fossils are quite abundant (Terzidis 1966). From Bed 8 we recovered only two ammonites, one of them is incomplete.

Dorsetensia romani (Oppel) (Pl. 2, Fig. 2)

- Bed 9 (ca. 0.4–0.6 m below 'Dorsetensienbank'; thickness ca. 20 cm). Blackish-blue clay.

- Bed 10 (ca. 0.3–0.4 m below 'Dorsetensienbank'; thickness 0.1–0.2 m). 'Obere Muschelknollen'. This nodule layer is only sporadically developed. Altogether, we recovered only five nodules from this level. At the base there is a marly schill layer. In the centre of the nodules we found three specimens of *D*. cf. *complanata*, and higher up several *D. liostraca*. The larger specimens of *Dorsetensia* were mostly only preserved as fragments. On the upper side of the nodules, poorly preserved, stephanoceratid fragments occur which are not determinable. This is the only bed of the section where large bivalves occur.

Dorsetensia cf. *complanata* Buckman (from lower third of the bed) (Pl. 3, Figs 1, 2, 5, 6, Pl. 6, Fig. 4)

Dorsetensia liostraca Buckman (from the middle and upper part of the bed) (Pl. 6, Figs 1–3, 5, 7).

Stephanoceras sp. (from the uppermost part of the bed; Pl. 9, Fig. 2)

- Bed 11 (up to ca. 0.3 m below 'Dorsetensienbank'; thickness ca. 0.3 m). Greyish-blue claystones.

- Bed 12 (thickness ca. 20 cm). The 'Dorsetensienbank' is a continuous calcareous marl bed which is rather poor in fossils. Very rare a schill layer occurs in the lowermost part of this bed. From this part of the bed two ammonites were recovered. In contrast to Ohmert (1990) we assign the 'Dorsetensienbank' to the 'Unterer Giganteuston', due to the occurrence of *D. romani* in its lower part.

Dorsetensia romani (Oppel) (Pl. 2, Fig. 4)

? *Oppelia* sp.

"Oberer Giganteuston"

- Bed 13 (up to ca. 1 m above 'Dorsetensienbank'; thickness ca. 1 m). Greyish-blue claystone.

- Bed 14 (ca. 1–1.2 m above 'Dorsetensienbank', maximum thickness 0.2 m). This grey-coloured limestone bed yields big calcareous concretions of up to 0.5 m diameter, which weather in a characteristic way resulting in a yellow colour in their outer parts. In a horizon distance about every meter such a large concretion occurs. Vertically, the concretions vary a little in their positions in the sections. Ammonites are rare, but sometimes accumulations of small stephanoceratids occur. Large specimens are only exceptional; one slab with 3 large sized *Stephanoceras* sp. (coll. Scherer) was found.

Stephanoceras mutabile (Quenstedt) (Textfig. 6.3, 6.4)

Stephanoceras ssp. (Textfig. 6.5)

Normannites ssp.

Oppelia sp. (Textfig. 6.2)

O. flexa Buckman (Textfig. 6.1)

- Bed 15 (ca. 1.2–1.7 m above 'Dorsetensienbank', maximum thickness 0.5 m). Blackish-grey claystone.

- Bed 16 (ca. 1.5–2.0 m above'Dorsetensienbank', thickness ca. 0.15 m). Yields large lumachelle concretions (diameter max. 0.3 m), often containing small stephanoceratids and rarely larger specimens. Sometimes the ammonites show remains of pyrite on their shells.

Stephanoceras mutabile (Quenstedt) (Textfig. 6.7, 6.8)

Stephanoceras ssp.

Normannites sp.

- Bed 17 Blackish-grey claystone of unknown thickness. Higher beds were not exposed.

3.3 Chrono- and biostratigraphy

In contrast to Ohmert (1990) and Ohmert et al. (1995) we use the term "horizon" in a different way. The latter author used it to characterize an ammonite fauna without reference to the surrounding rocks, just in the sense of a biohorizon. We here follow Callomon (1985) and use it as the smallest biostratigraphic unit. An ammonite horizon is a typical fauna in a local section which differs significantly from the faunas above and below due to evolutionary trends and/or palaeobiogeographic migrations. In practical work, however, this methodological differences are neglectable.

3.3.1 Sauzei Zone

At least the 'Blaukalkabraum' Bed and higher parts of the underlying Blaukalk Member belong to the Lower Bajocian Sauzei Zone (see Ohmert 1990: fig. 3). In Öschingen this dating is proved by a specimen of *Sonninia* ["*Sonninites*"] *felix* (Buckman) from the Blaukalk Member (coll. E. Scherer).

3.3.2 Humphriesianum Zone

3.3.1.1 Pinguis Subzone

Ohmert (1990) und Ohmert et al. (1995) recognized three biohorizons within this subzone in the middle part of the Swabian Alb. We suppose that these three horizons are also present in Öschingen, because they occur few kilometres away in the Breitenbach creek section. However, this cannot be proved by the new sampling because the lower part

of the 'Unterer Giganteuston' containing these horizons was not exposed. Only the *deltafalcata* horizon is recorded in its uppermost part. It is very likely that the ***ohmerti* horizon**, the oldest horizon of the Humphriesianum Zone, as defined in the Zollernalb and Wutach areas (Dietze et al. 2008) is missing here.

• At Glems, few kilometres NE of the Breitenbach creek, the "***pinguis*" horizon** occurs 2 m above the Blaukalk Member and contains a typical pyritic or limonitic ammonite faunula with *Dorsetensia pinguis* and closely allied forms (see Dietze et al. 2008: p. 148). The above mentioned ammonite faunula from the 'Unterer Giganteuston' (Pl. 8, Figs 2–5, 7, 8) belongs either to this horizon or, more likely, to the *deltafalcata* horizon, because deeper parts of the section were not exposed.

• From the section near Glems Ohmert (1990) recorded also the ***frechi* horizon** ca. 3–4 m above the Blaukalk Member. This horizon yields an ammonite fauna with stephanoceratids. It is named after *Stemmatoceras frechi* (Renz). The *frechi* horizon was not recorded from Öschingen by us.

•The ***deltafalcata* horizon** – named after *Nannina deltafalcata* (Quenstedt) – must be definitely present in Öschingen, because the type specimen of Quenstedt's species comes from this locality. The *deltafalcata* horizon is supposed to set in c. 4–5 metres above the base of the Giganteuston Member, similar to the situation in Glems (Ohmert 1990). It most likely reaches Bed 2 in our section, where we recorded *N. deltafalcata* (Pl. 7, Figs 5–7) and ?*Dorsetensia* aff. *hebridica* (Pl. 8, Fig. 6), but still without any *Dorsetensia romani*. In Öschingen, the stratigraphically lowest specimens of *D. romani* (Pl. 2, Figs 3, 5–9, 12, 15, 16) appear in Bed 6 ('Isocardien-Muschelknollen') of our section, c. 1 metre below the 'Dorsetensienbank'. Similarly, in the area of the Breitenbach creek *D. romani* occurs higher up in the section than *N. deltafalcata*. There, it is restricted to a layer of calcareous nodules located 12.4 metres above the base of the section and in the following 0.6 metre of claystones up to the 'Dorsetensienbank' (Ohmert et al. 1995).

3.3.1.2 Romani Subzone

In the Upper Rhine Valley area near Lörrach**,** Ohmert et al. (1995) introduced a **"cf. *complanata*-Horizont"** which they placed preliminarily at the base of the Romani Subzone. In this horizon rare ammonites occur which are close to *D. romani*. However, these forms still lack the typical parallel flanks and the marked ventrolateral shoulder. The material from Öschingen does not allow if the discrimination of this horizon is reliable, because in Öschingen *D.* cf. *complanata* co-occurs with *D. romani*.

From the vicinity of Eningen unter Achalm Terzidis (1966; profile no. 6) mentioned a common occurrence of *Sonninia furticarinata* (= *Fissilobiceras furticarinatum*, see Dietze et al. 2005) in a vertical range from 3 metres below the 'Dorsetensienbank' up to this bed (the beds further below were not exposed). The acme of this species lies in the interval from the 'Dorsetensienbank' until 0.7–0.75 metre below this bed. Ohmert (1990) termed this interval as ***furticarinata* horizon** (in the sense of a biohorizon). Both Terzidis (1966) and Ohmert (1988) recorded also *Nannina deltafalcata* and *Dorsetensia liostraca subtecta* from this level. The abundance of *F. furticarinatum* – if the determinations in literature were correct – in the area between Eningen and Pfullingen seems to be a local phenomenon. Probably the lectotype of this species – originally erroneously assigned to mid-Liassic beds – comes from this area (see below). Moreover, this *furticarinata* horizon overlaps in part with the upper part of the *deltafalcata* horizon and completely with the *romani* horizon. Hence, the *furticarinata* horizon should be omitted from stratigraphical terminology and replaced by the *deltafalcata* and *romani* horizons.

• In Öschingen the ***romani* horizon** ranges from Bed 6 up to the 'Dorsetensienbank'. Thus its thickness is ca. 1 metre. In its lower part *N. deltafalcata* rarely occurs, together with rather abundant *D. romani* and *D. liostraca*.

3.3.1.3 Humphriesianum Subzone

In the section of the Giganteuston Member which follows on top of the 'Dorsetensienbank' an ammonite fauna with stephanoceratids occur, in which *Dorsetensia* is lacking. Chondroceratids are missing too, but they are known from Lörrach-Egerten in the Upper Rhine Valley where they already occur in the *romani* horizon. In the ironoolithic facies of Eastern Swabia (Dietl et al. 1984) and in the Western Swabian Alb (Gosheim; Ohmert 1990), Öfingen, Talheim/Lupfen), at Lörrach (Ohmert et al. 1995) and in Ringsheim (coll. M. Kutz, K. Bosch) the ***gervillii/cycloides* horizon** follows above the *romani* horizon. The latter is characterized by the abundance of small representatives of *Chondroceras* (including *Schmidtoceras*). In the Giganteuston Member of Öschingen, this horizon is missing.

• ***mutabile* horizon** [= *umbilicum* horizon sensu Ohmert 1990 = *umbilicum/scalare* horizon sensu Ohmert et al. 1995]: Ohmert (1990) erected an *umbilicum* horizon for the beds with stephanoceratids following directly above the 'Dorsetensienbank'. New investigations (Dietze 2010) have shown that the stephanoceratid assemblage at the type locality of *S. umbilicum* near Aalen (Eastern Swabian Alb) differs from the assemblage of beds 14 and 16 in Öschingen. The stephanoceratids of Öschingen are closer to *S. humphriesianum* s. str. and thus slightly older compared with the fauna of the recently emended *umbilicum* horizon. Hence, this faunal horizon must be renamed, because the *umbilicum* horizon at the type locality is slightly younger. We here propose the

mutabile horizon as a replacement name, due to the common occurrence of this taxon at Öschingen. The true *umbilicum* horizon is not recorded in the area around Öschingen.

From the section in the Breitenbach creek Ohmert (1990) tentatively introduced a ***crassicosta* horizon** which lies c. 3 m above the 'Dorsetensienbank'. In Öschingen we could not find this level, maybe due to collecting bias.

3.3.1.4 Blagdeni Subzone

• The ***acuticostatum horizon*** is present in Öschingen, because the holotype of the index species, *Teloceras acuticostatum* Weisert, comes from this locality. New topotypic material is yet unknown. Therefore, we cannot decide whether this horizon lies still in the uppermost part of the Giganteuston Member or in the above following Blagdeni-Schichten (see Ohmert 1990).

• The ***coronatum* horizon** (index species: *Teloceras coronatum* (Quenstedt) is well represented in the Blagdeni-Schichten of Öschingen, indicated by numerous *Teloceras coronatum*, *T. blagdeni* and allied forms (coll. Scherer, Dietze, Stappenbeck).

4. Description of the ammonite fauna

Family Sonniniidae Buckman, 1892
Subfamily Sonniniinae Buckman, 1892

Genus *Dorsetensia* Buckman, 1892

Type species: *Ammonites edouardianus* d'Orbigny, 1845.

Remarks: There is hardly any other genus within Sonniniidae which is handled so inconsistently in literature like *Dorsetensia* (see Textfig. 3). The basis for any interpretation of a genus is its type species and the variation of the latter. According to Rioult et al. (1997) *D. edouardiana* occurs in its type area in the vicinity of Bayeux in the *edouardiana* horizon, which is the oldest faunal horizon of the Romani Subzone there (Rioult et al. 1997). In an earlier paper Rioult (1994b) reported *D. edouardiana* from a condensed bed as co-occurring with *D. regrediens* and *D. complanata*. In Southern Germany, *D. edouardiana*, *D. pulchra*, *D. regrediens* and *D. tessoniana* are unknown yet. Since the latter taxa are important for a secure determination and interpretation of other specimens of "*Dorsetensia*" from the Giganteuston Member of Öschingen, we here present topotypes and chorotypes from the Calvados region (France) and from Dorset (England).

Dorsetensia edouardiana (d'Orbigny, 1845): The sole specimen illustrated by d'Orbigny (1845: pl. 130, figs 3–5; see Textfig. 5.4, 5.5) is not the holotype of *D. edouardiana* (cf. Westermann & Riccardi 1972), because d'Orbigny mentioned at least two syntypes, which, however, seem to be lost (Huf 1968; Rioult 1994b). It is unknown whether the two specimens labelled as *Ammonites edouardianus* (cf. Huf 1968) from the d'Orbigny collection were part of the syntypes series of this species or not. One of them belongs to the genus *Poecilomorphus*, the other one is not determinable (Huf 1968). We suppose that d'Orbigny had only one syntype at his hand when he introduced the species, because the illustration fits perfectly with the specimen refigured herein (Textfig. 5.1, 5.6–9), which thus would be a good candidate for a lectotype. However, if one accepts a sentence in Hoyermann's (1917) paper ("Als Typus dieser Art ist *Ammonites Edouardianus* d'Orb. aus den Eisenoolithen von Bayeux anzusehen") as a valid lectotype designation of the figured specimen, then a lectotype has been already chosen.

D. edouardiana is characterized by a flat, discoidal shell with a wide umbilicus, simple falcoid ribs, a sharp umbilical edge and an overhanging umbilical wall – apart from the innermost whorls. The ribs weaken on the body chamber but never disappear. A ventral shoulder is hardly visible; the flanks converge in the shape of a gothic window, forming a separated keel. The suture line is very simple. The shape of the mouth border is unknown. According to our findings the maximum diameter is estimated at c. 60–70 mm. For the intraspecific variation of *D. edouardiana* compare Textfigures 5.1, 5.6–9 and Pl. 1, Figs 1–10.

Dorsetensia pulchra Buckman, 1892: This species is closely related to *D. edouardiana*, but differs in a less coarse ribbing, which becomes weaker in an earlier stage. As a result, the body chamber exhibits only fine, dense ribs or becomes almost smooth (Pl. 1, Figs 11–18). At least in the specimen from the Frogden Quarry (Pl. 1, Figs 11, 12) the keel is less separated on the bodychamber und ventrally less rounded than in *D. edouardiana*. In *D. edouardiana* the shell converges continuously towards the venter from the middle of the flanks upwards, whereas the flanks remain parallel higher up in *D. pulchra*, and the overall whorl section is taller. Moreover, in *D. pulchra* a weak ventral shoulder is developed. However, some transitional forms exist between the two species (Pl. 1, Figs 7–9, 15–18). Both in Normandy and South England *D. pulchra* co-occurs with *D. edouardina* in the same horizon ("horizon à *edouardiana*" or Bj-14, respectively). *D. pulchra* is morphologically transitional between *D. edouardiana* and *D. romani*. The holotype of *D. pulchra* (Buckman 1892, pl. 52, figs 25–27) comes from the faunal horizon Bj-14 of the Frogden Quarry in Dorset (Callomon & Chandler 1990).

Dorsetensia regrediens (Haug, 1893): Haug founded his species "*Witchellia*" *regrediens* on several rather different specimens, and according to our knowledge a lectotype has never been selected. Usually, under this taxon microconchiate specimens with well-developed lappets and simple ribs resem-

First author of the species / Generic classification in the literature	*Ammonites Edouardianus* d'Orbigny, 1845	*Ammonites tessonianus* d'Orbigny, 1845	*Ammonites deltafalcatus* Quenstedt, 1858	*Ammonites romani* Oppel, 1862	*Witchellia regrediens* Haug, 1893	*Dorsetensia complanata* Buckman, 1892	*Dorsetensia liostraca* Buckman, 1892	*Dorsetensia pulchra* Buckman, 1892	*Dorsetensia lennieri* Brasil, 1895
Buckman 1892	*Dorsetensia*	-	-	*Dorsetensia*	*Dorsetensia*	*Dorsetensia*	*Dorsetensia*	*Dorsetensia*	-
Haug 1893	*Witchellia*	-	*Sonninia*	*Witchellia*	*Witchellia*	*Witchellia*	*Witchellia*	*Witchellia*	-
Hoyermann 1917	*Dorsetensia*	-	*Sonninia*	*Ammonites (?Leioceras)*	-	*Dorsetensia*	*Dorsetensia*	-	-
Dorn 1935	*Witchellia*	*Witchellia*	*Witchellia*	*Dorsetensia*	-	*Dorsetensia*	*Dorsetensia*	*Dorsetensia*	*Dorsetensia*
Gillet 1936	*Witchellia*	*Witchellia*	*Witchellia*	-	*Witchellia*	*Witchellia*	*Witchellia*	*Witchellia*	-
Maubeuge 1951	*Witchellia*	*Witchellia*	-	-	-	*Dorsetensia*	*Dorsetensia*	-	-
Huf 1968	*Dorsetensia*	*Sonninia*	*Dorsetensia*	*Dorsetensia*	*Dorsetensia*	*Dorsetensia*	*Dorsetensia*	*Dorsetensia*	-
Westermann & Riccardi 1972	*Dorsetensia*	-	*Dorsetensia*	*Dorsetensia*	*Dorsetensia*	-	*Dorsetensia*	*Dorsetensia*	-
Morton 1972	*Dorsetensia*	-	*Dorsetensia*	*Dorsetensia*	-	*Dorsetensia*	*Dorsetensia*	-	-
Pavia 1983	*Dorsetensia*	-	*Dorsetensia (Nannina)*	-	*Dorsetensia (Nannina)*	*Dorsetensia*	*Dorsetensia*	-	*?Dorsetensia (?Nannina)*
Fernández-López 1985	*Dorsetensia*	*Shirbuirnia*	*Nannina*	*Dorsetensia*	*Nannina*	*Dorsetensia*	*Dorsetensia*	*Dorsetensia*	*"Dorsetensia"*
Callomon & Chandler 1990	*Dorsetensia*	-	*Witchellia (Nannoceras)*	*Witchellia*	-	*Witchellia*	*Sonninites*	*Dorsetensia*	-
Fernándéz-López & Mouterde 1994	*Dorsetensia*	*Dorsetensia*	*Nannina*	*Nannina*	*Nannina*	*Nannina*	*Dorsetensia*	*Nannina*	-
Ohmert et al. 1995	*Dorsetensia*	-	*Dorsetensia*	*Dorsetensia*	-	*Dorsetensia*	*Dorsetensia*	*Dorsetensia*	-
Rioult et al. 1997	*Dorsetensia (Dorsetensia)*	*Dorsetensia (Dorsetensia)*	*Dorsetensia (Nannina)*	*Dorsetensia (Dorsetensia)*	*Dorsetensia (Nannina)*		*Dorsetensia (Dorsetensia)*		*Dorsetensia (Nannina)*
This investigation	*Dorsetensia*	*Dorsetensia*	*Nannina*	*Dorsetensia*	*Dorsetensia*	*Dorstensia*	*Dorsetensia*	*Dorsetensia*	*Dorsetensia*

Textfigure 3: Taxonomy of the '*Dorsetensia*'-group in the literature.

Zone	Subzone	Ammonite faunal horizons
Humphriesianum Zone	Blagdeni Subzone	*coronatum* *acuticostatum*
	Humphriesianum Subzone	*crassicosta* *umbilicum* *mutabile* *gervillii/cycloides*
	Romani Subzone	*romani* *"cf. complanata"*
	Pinguis Subzone	*deltafalcata* *frechi* *"pinguis"* *ohmerti*

Textfigure 4: Ammonite faunal horizons recorded in Öschingen (grey: confirmed; light grey: probably present).

bling those of *D. edouardiana* have been lumped together (Pl. 1, Figs 19–22). In respect of its simultaneous occurrence with *D. edouardiana,* we interpret D. *regrediens* as a true microconchiate *Dorsetensia*. The whorl section of *D. regrediens* shows parallel flanks und thus resembles more that of *D. pulchra*.

Dorsetensia lennieri Brasil, 1895: This species comes from a bed at the very base of the Oolite Ferrugineuse de Bayeux near Evrecy. The herein presented chorotype specimens of *D. lennieri* (Pl. 1, Figs 23–26) are preserved in a marly, whitish matrix with randomly scattered clouds of small iron ooids. Brasil (1895) and Rioult et al. (1997) supposed the horizon à *edouardiana* being the type horizon of *D. lennieri*. We suppose that the finding level is located immediately below the level with *D. edouardiana*, *D. pulchra* and *D. regrediens*. The specimens of *D. lennieri* show a broader, more quadratic whorl section than *D. regrediens*. Due to the similarities with *D. regrediens* we interpret them both as microconchs, too.

Dorsetensia tessoniana (d'Orbigny, 1845): Interestingly, d'Orbigny (1845) illustrated his *Ammonites tessonianus* (monotypic holotypus, photographically re-figured by Rioult 1994a: pl. 42, fig. 3) on the same plate together with *A. edouardianus*, both coming from Bayeux. It seems that already d'Orbigny recognized the close relationship of *Ammonites tessonianus* and *A. edouardianus*. According to this relationship both are included in the genus *Dorsetensia*. Typical of this genus are a sharp, overhanging umbilicus, the concave umbilical wall, a relatively simple suture line, a strong falcoid ribbing of the nucleus, and a full keel in all stages. *D. tessoniana* (Textfig. 5.2, 5.3) reaches a maximum diameter of more than 150 mm. Therefore, we interpret *D. tessoniana* as a macrconchiate species, and *D. edouardiana*, *D. regrediens*, *D. lennieri*, and *D. pulchra* as the corresponding microconchiate forms.

Dorsetensia romani (Oppel)
Pl. 2, Figs 1–16

*v 1862 *Ammonites Romani* Opp. – Oppel: p. 145; pl. 46, fig. 2 a, b [LT].
1968 *Dorsetensia romani romani* (Oppel, 1857) – Huf: p. 86; pl. 13, fig. 6; pls. 14–27; pl. 28, figs 1, 2 [with synonymy; except citations of *D. complanata*].
1968 *Dorsetensia romani parva* n. subsp. – Huf: p. 93; pl. 28, figs 3, 4; pl. 29, figs 3–6.
1995 *Dorsetensia romani romani* (Oppel) – Ohmert et al.: p. 56; text-fig. 7, pl. 3, figs 2–6 [with further synonymy].

Material from Öschingen: ca. 25 specimens (mostly nuclei or juveniles) from beds 6–12 (*romani* horizon).

Measurements (mm)	Locality and horizon	D	U	Hh	W	U/D
SMNS 67734 (Pl. 2, Fig. 4)	Öschingen *romani* horizon	84	27	31	~17	31%
SMNS 67735 (Pl. 2, Figs 10, 11)	Aalen-Westhausen *romani* horizon	84	23	38	-	27%
BSPG [LT] (Pl. 2, Fig. 1)	Öschingen *romani* horizon	74	24	30	~15	32%
SMNS 67733/4 (Pl. 2, Fig. 6)	Öschingen *romani* horizon	70	21	27	-	30%
SMNS 67732 (Pl. 2, Fig 2)	Öschingen *romani* horizon	68	19	29	-	28%
SMNS 67733/1 (Pl. 2, Fig. 3)	Öschingen *romani* horizon	57	17	22	-	30%
SMNS 67736 (Pl. 2, Figs 13, 14)	Gosheim *romani* horizon	53	14	24	10	26%
SMNS 6733/8 (Pl. 2, Figs 8, 9)	Öschingen *romani* horizon	51	~17	~22	11	33%
SMNS 67733/2 (Pl. 2, Fig. 5)	Öschingen *romani* horizon	50	17	19	-	34%
SMNS 67733/3 (Pl. 2, Fig. 7)	Öschingen *romani* horizon	38	12	15	-	32%

SMNS 67733/5 (Pl. 2, Fig. 12)	Öschingen *romani* horizon	~29	~9	~13	-	31%
SMNS 67733/6 (Pl. 2, Fig. 15)	Öschingen *romani* horizon	27	8	13	-	30%
SMNS 67733/7 (Pl. 2, Fig. 16)	Öschingen *romani* horizon	26	7	13	-	30%

Description: Small- to medium-sized; high-rectangular, slender whorl section with flat flanks and pronounced ventrolateral shoulder; shallow, moderately wide umbilicus; weakly ribbed, lateral mouth border slightly protruding; simple, trifid suture.

Remarks: After the introduction of the species name *romani* without any description (Oppel 1856), Oppel (1862) described this taxon on the basis of 20 syntypes. The sole illustrated specimen from Öschingen (Oppel 1862: pl. 46, fig. 2) was not explicitly the type (as many authors erroneously assumed; e.g. Huf 1968; Fernández-López 1985; Schlegelmilch 1985; Ohmert 1990). We interpret Haug's mentioning (1893: p. 315): "Le type de l'espèce d'Oppel…" as a valid lectotype designation of the illustrated specimen of Oppel (1862). According to the lithology this specimen may come from Bed 6, but Bed 10 or the basis of the 'Dorsetensienbank' cannot be excluded. At the type locality this species is restricted to a vertical range from ca. 1 meter below the 'Dorsetensienbank' and the basal part of this bed (= *romani* horizon). We here figure several different ontogenetic stages to show the changes during growth of the shell (Pl. 2, Figs 1–9, 15, 16). In the *romani* horizon of Öschingen this species shows only a small range of variation. However, in the ironoolithic facies of the Humphriesioolith of eastern Swabia (Röttingen, Aalen-Westhausen) and western Swabia (Gosheim, Öfingen, Talheim/Lupfen) as well as in Franconia (Friesener Warte, Bernricht, Staffelberg) specimens with a higher whorl section occur (Pl. 2, Figs 10,11, 13, 14), which are hardly uncoiled at the end of their bodychambers.

The specimen of Pl. 2, Fig. 4 shows a mouth border which is protruding both on the lateral and ventral sides, like in *D*. (cf.) *complanata*, but less developed. Both Quenstedt (1886: pl. 68, fig. 11) and Huf (1968: pl. 14, fig. 1; pl. 18, fig. 2; pl. 19, fig. 1; pl. 21, fig. 1; pl. 24, fig. 1) illustrated specimens of *D. romani* with an identical mouth border. We therefore assume *D. romani* and *D*. (cf.) *complanata* as being microconchs.

In Germany, *D. romani* is recorded – beside the Swabian and Franconian Alb – from the Upper Rhine Valley (Ringsheim) and from numerous localities in Northern Germany (Gerzen near Alfeld, Osterfeld in Goslar, Lamspringe, Bethel).

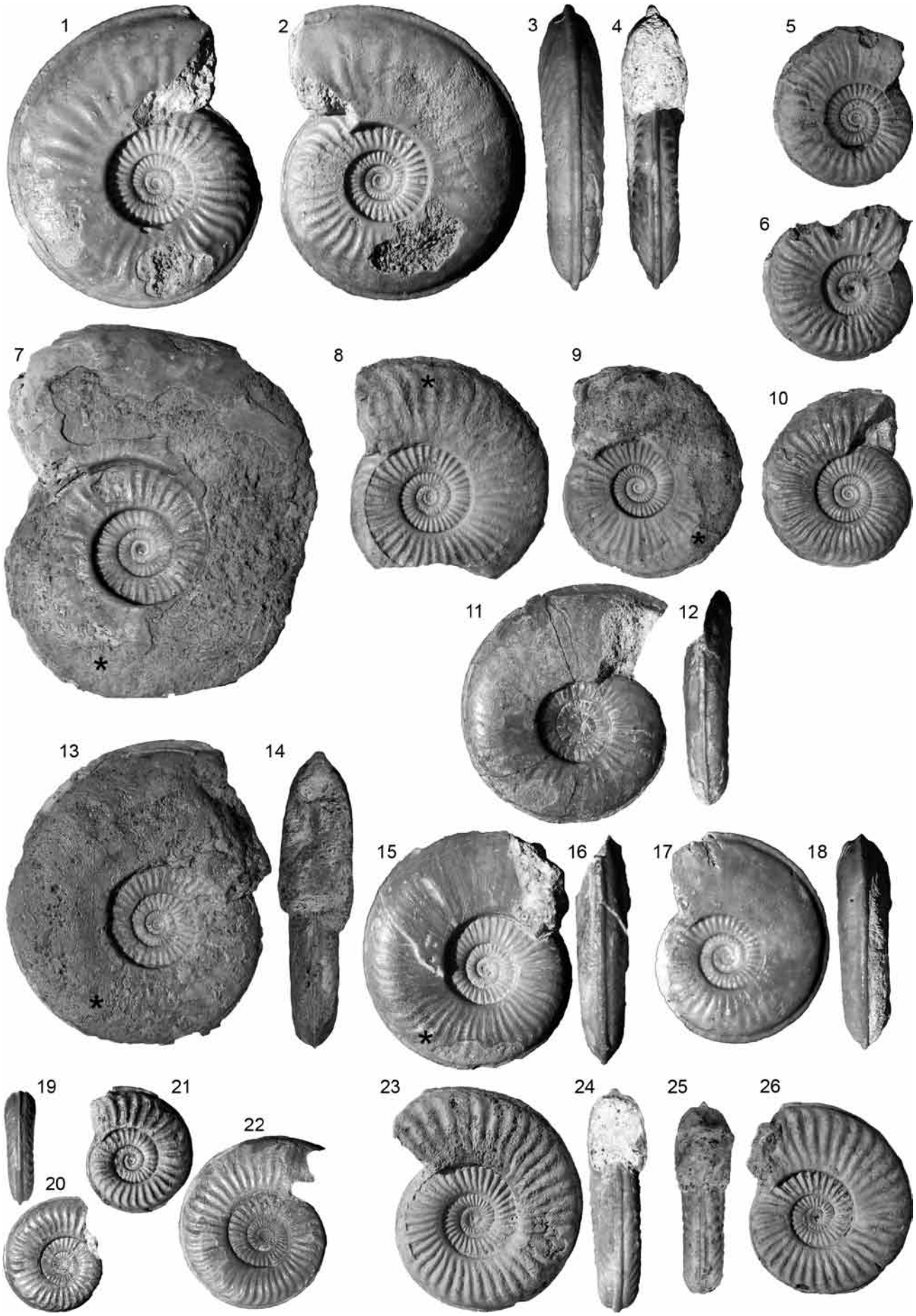
Dorsetensia cf. *complanata* Buckman
Pl. 3, Figs 1, 2, 5, 6; Pl. 6, Fig. 4

*cf.1892 *Dorsetensia complanata,* S. Buckman – Buckman: p. 306; pl. 53, figs 1–10 [LT: figs 3–5]; pl. 54, figs 1, 2; [photographically re-illustrated by Huf (1968, pls 15–17)].

Material from Öschingen: 4 specimens from Beds 6–10 (*romani* horizon).

Measurements (mm)	Locality and horizon	D	U	H	W	U/D
SMNS 67738/2 (Pl. 3, Figs 7, 8)	Frogden Quarry *cycloides* horizon	86	29	29	~17	34%
SMNS 67738/3 (Pl. 3, Fig. 9)	Frogden Quarry *cycloides* horizon	86	31	31	~15	36%
SMNS 67738/4 (Pl. 3, Figs 10, 11)	Frogden Quarry *cycloides* horizon	85	32	30	16	38%

Plate 1: (1–10) *Dorsetensia edouardiana* (d'Orbigny), fields near Evrecy (Calvados), leg. R. Schmode [TT]; probably lowermost part of the Oolite Ferrugineuse de Bayeux, Lower Bajocian, Humphriesianum Zone, Romani Subzone, *edouardiana* horizon. (1–4) variety with weakening sculpture, SMNS 67723/3. (5) SMNS 67723/4. (6) SMNS 67723/5. (7) variety with very weak sculpture, transitional to *D. pulchra*, SMNS 67723/6. (8) variety with extremely slender whorl section, SMNS 67723/7. (9) SMNS 67773/8. (10): evolute, densely ribbed variety, SMNS 67723/9. **(11–18)** *Dorsetensia pulchra* Buckman. (11, 12) Frogden Quarry (Dorset), Inferior Oolite Formation, bed 4b (Callomon & Chandler 1990); Lower Bajocian, Humphriesianum Zone, Cycloides Subzone, Bj-14 [TT], SMNS 67725. (13, 14) fields near Evrecy (Normandie), leg. R. Schmode, probably from the base of the Oolite Ferrugineuse de Bayeux, Lower Bajocian, Humphriesianum Zone, Romani Subzone, *edouardiana* horizon, SMNS 67726. (15, 16) transitional form to *D. edouardiana*, Esquai Notre Dame (Calvados), probably from the very base of the Oolite Ferrugineuse de Bayeux, Lower Bajocian, Humphriesianum Zone, Romani Subzone, *edouardiana* horizon, SMNS 67727, leg. A. Bonnet. (17, 18) transitional form to *D. edouardiana*, Evrecy (Calvados), probably from the very base of the Oolite Ferrugineuse de Bayeux, Lower Bajocian, Humphriesianum Zone, Romani Subzone, *edouardiana* horizon, SMNS 67728, leg. F. Neubauer. **(19–22)** *Dorsetensia regrediens* (Haug). (19, 20, 22) Frogden Quarry (Dorset), Inferior Oolite Formation, bed 4b (Callomon & Chandler 1990); Lower Bajocian, Humphriesianum Zone, Cycloides Subzone, Bj-14. (19, 22) SMNS 67729/1. (22) complete specimen showing a lappet, SMNS 67729/2, leg. R. B. Chandler. (21) fields near Evrecy (Calvados), probably from the very base of the Oolite Ferrugineuse de Bayeux, Lower Bajocian, Humphriesianum Zone, Romani Subzone, *edouardiana* horizon, SMNS 67730, leg. R. Schmode. **(23–26)** *Dorsetensia lennieri* Brasil, fields near Evrecy (Calvados), leg. R. Schmode; Oolite Ferrugineuse de Bayeux, probably from the very base; Lower Bajocian, Humphriesianum Zone, ?Romani Subzone [CT]. (23, 24) SMNS 67731/1. (25, 26) SMNS 67731/2. – All x1. Asterisk marks beginning of the bodychamber.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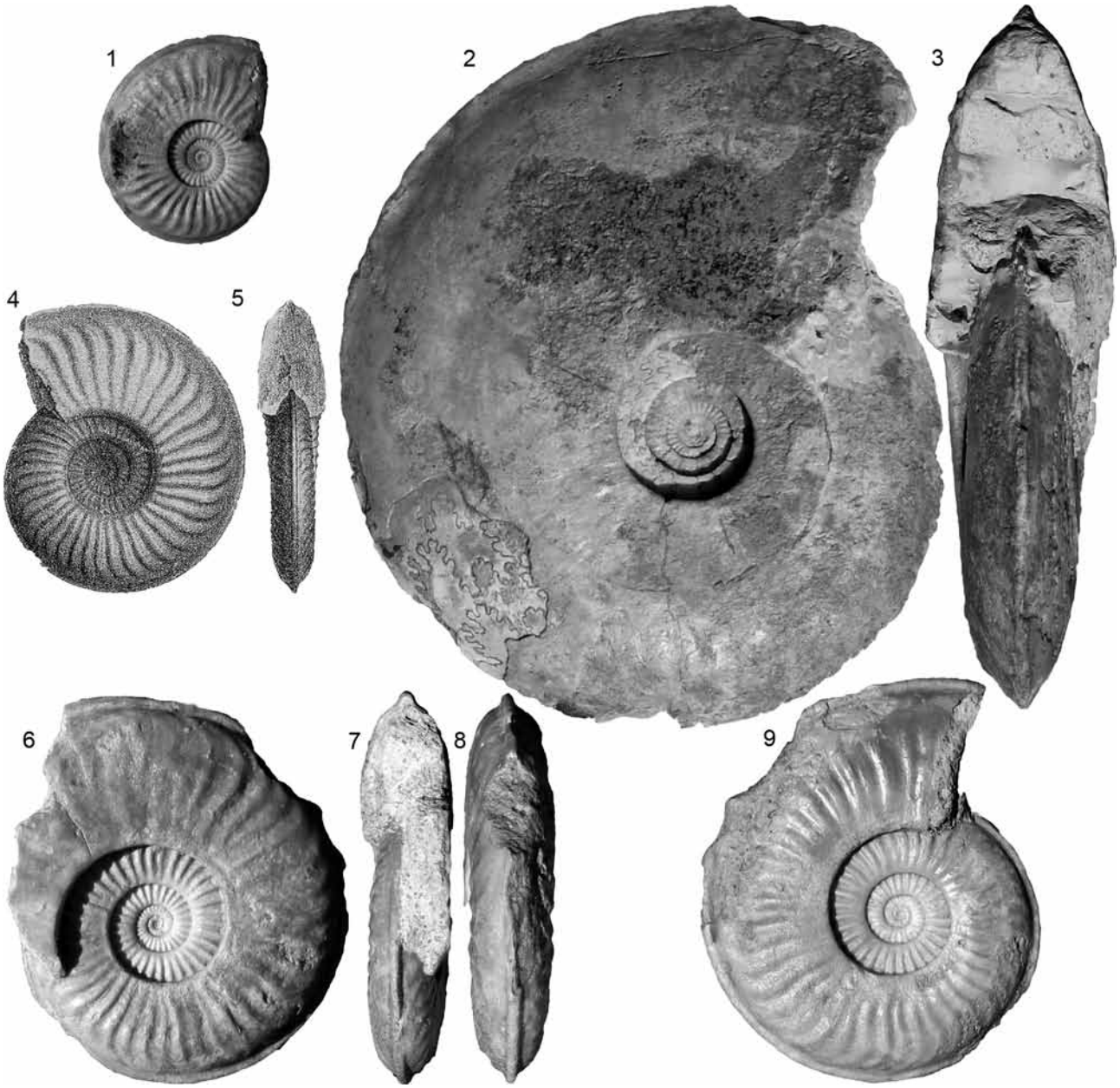
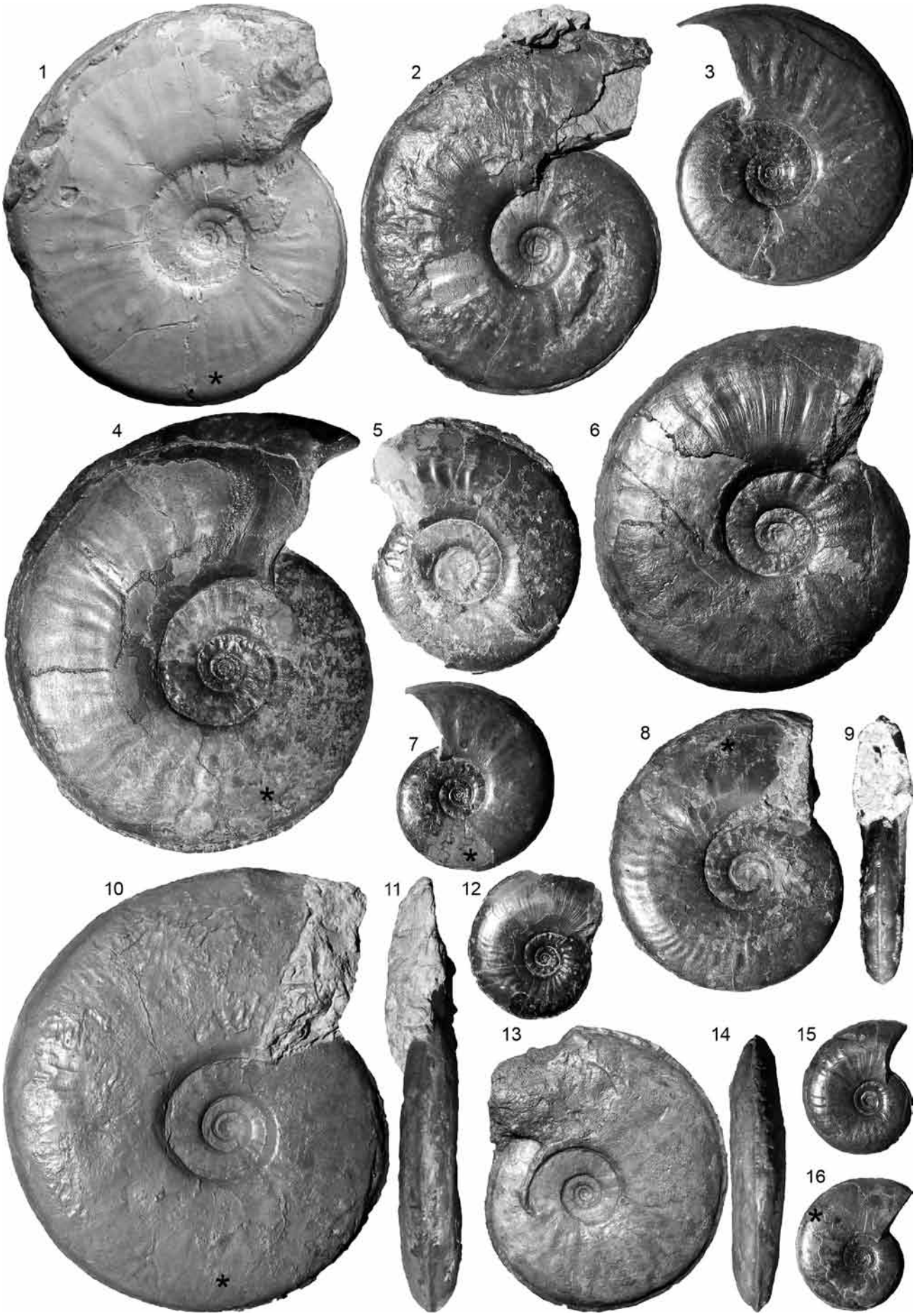


Textfigure 5: (1, 4–9) *Dorsetensia edouardiana* (d'Orbigny); (1, 6–9) fields near Evrecy (Calvados), leg. R. Schmode [TT]; (4, 5) Bayeux, specimen illustrated by d'Orbigny (1845, pl. 130, figs 3–5). **(2, 3)** *D. tessoniana* (d'Orbigny), road cutting south of Caen [TT]. (1–9) probably from the very base of the Oolite Ferrugineuse de Bayeux, Lower Bajocian, Humphriesianum Zone, Romani Subzone, *edouardiana* horizon. (1) SMNS 67723/1, (2, 3) SMNS 67724, (6–9) SMNS 67723/2. – All x1.

Plate 2: (1–16) *Dorsetensia romani* (Oppel). (1–9, 12, 15, 16) Öschingen; Ostreenkalk Formation, 'Unterer Giganteuston' [excl. Fig. 4, coming from the 'Dorsetensienbank'], Lower Bajocian, Humphriesianum Zone, Romani Subzone, *romani* horizon [Fig. (2–9, 12, 15, 16) TT, leg. U. Fidder; 1: LT]. (1) Lectotype [*Ammonites romani* Oppel, 1862, pl. 46, fig. 2], BSPG, without number. (2) Bed 8, SMNS 67732. (3) Bed 6, SMNS 67733/1. (4) Bed 12, lower part, adult specimen with complete mouth border, SMNS 67734. (5) Bed 6, phragmocone, SMNS 67733/2. (6) Bed 6, nearly complete, SMNS 67733/4. (7) Bed 6, juvenile specimen, SMNS 67733/3. (8, 9) Bed 6, phragmocones with part of the bodychamber, SMNS 67733/8. (10, 11) Aalen-Westhausen, Sengenthal Formation, Humphriesianum Zone, probably Romani Subzone, *romani* horizon, adult specimen, SMNS 67735. (12) Bed 6, juvenile specimen, SMNS 67733/5. (13, 14) Gosheim (Western Swabian Alb), Humphriesioolith Formation, unhorizoned, Humphriesianum Zone, Romani Subzone, *romani* horizon, SMNS 67736. (15) Bed 6, SMNS 67733/6. (16) Bed 6, juvenile specimen, SMNS 67733/7. – All x1. Asterisk marks beginning of the bodychamber.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SMNS 67737/2 (Pl. 3, Figs 5, 6)	Öschingen *romani* horizon	82	34	27	20	41%
SMNS 67737/1 (Pl. 3, Figs 1, 2)	Öschingen *romani* horizon	78	32	25	~18	41%
SMNS 67738/1 (Pl. 3, Figs 3, 4)	Frogden Quarry *cycloides* horizon	76	28	27	~17	37%
SMNS 67754 (Pl. 6, Fig. 4)	Öschingen *romani* horizon	62	24	23	~15	39%

Description: Similar to *D. romani*, but with a wider umbilcus, more convex flanks and a broader whorl section; ventrolateral shoulder hardly developed, undulating ribbing; lateral protrusion of mouth border remarkably stronger than in *D. romani*.

Remarks: Buckman (1892) based his species *D. complanata* on at least four syntypes from the Frogden Quarry (Oborne, Dorset) and a further syntype from North Germany. Huf (1968, pl. 53, figs 3–5) designated a lectotype. Buckman (1892, p. 306) himself has provided a good characterization of this species. Additionally, we here illustrate four topotypes from the Romani Subzone (Bj-14) of the Frogden Quarry to show the variation of this species in respect of its rib strength and density, umbilical width and whorl section (Pl. 3, Figs 3, 4, 7–11). The specimen with the coarsest ribbing (Pl. 3, Figs 3, 4) is completely preserved with its mouth border which is laterally and ventrally protruding.

In contrast to Huf (1968), Morton (1972) and Fernández-López (1985) we interpret *D. complanata* as distinct from *D. romani*. Despite its close relationship we do not take *D. complanata* as a subspecies of *D. romani* (cf. Ohmert et al. 1995). *D. complanata* differs from *D. romani* by its almost lacking ventral shoulders and the more rounded ventrolateral edge, a more convex whorl section and an undulating and usually coarser ribbing.

The specimens from Öschingen determined as *D.* cf. *complanata* are morphological transients between *D. complanata* and *D. romani*, but they are closer to *D. complanata* and show the undulating ribbing and the typical whorl section of *D. complanata*, whereas the umbilicus is wider than in *D. complanata*. On the other hand the specimens from Öschingen exhibit a marked ventral shoulder like in *D. romani*. Due to the shape of the mouth border resembling a broken apophysis we interpret *D. complanata* as a microconch.

Dorsetensia liostraca Buckman
Pl. 4, Figs 1–7, Pl. 5, Figs 1–4, Pl. 6, Figs 1–3, 5, 7

* 1892 *Dorsetensia liostraca* S. Buckman – Buckman: p. 310; pl. 53, figs 11–16; pl. 55, fig. 3 [lectotype] –5; pl. 56, fig. 1.

1968 *Dorsetensia liostraca liostraca* S. Buckman, 1892 – Huf: p. 97, pls 30–40 [with synonymy].

1968 *Dorsetensia liostraca subtecta* S. Buckman, 1892 – Huf: p. 103; pls 41–46; pl. 47, fig. 1 [with synonymy until 1968].

1968 *Dorsetensia liostraca tecta* S. Buckman, 1892 – Huf: p. 107; pl. 47, figs 2–4; pls 48–51 [with synonymy].

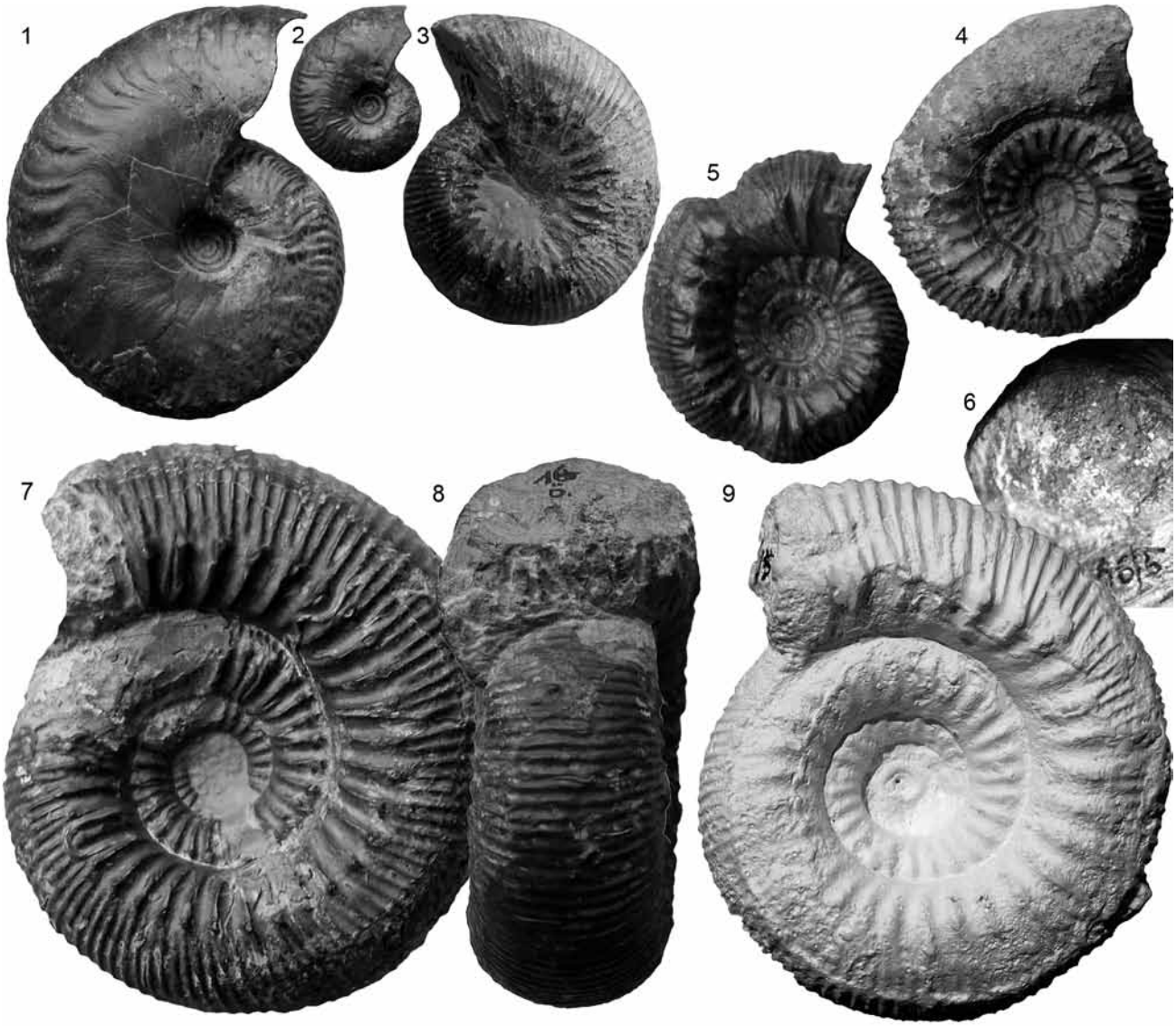
1995 *Dorsetensia liostraca subtecta* Buckman – Ohmert et al.: p. 59; pl. 1, fig. 6, pl. 3, fig. 1 [with further synonyms].

1995 *Dorsetensia liostraca liostraca* Buckman – Ohmert et al.: p. 60, textfigs 9, 10, pl. 2, fig. 3 [with further synonyms].

1995 *Dorsetensia liostraca tecta* Buckman – Ohmert et al.: p. 62; pl. 2, figs 1, 2.

Material from Öschingen: ca. 10 specimens (mostly nuclei or juveniles) from beds 6–10 (*romani* horizon)

Measurements (mm)	Locality and horizon	D	U	H	W	U/D
SMNS 67739/5 (Pl. 5, Figs 1, 4)	Frogden Quarry Bj-14	182	42	76	~37	23%
SMNS 67739/1 (Pl. 4, Figs 1, 5)	Frogden Quarry Bj-14	131	18	72	~30	14%
SMNS 67753/3 (Pl. 6, Fig. 5)	Öschingen *romani* horizon	124	29	57	-	23%
SMNS 67754 Pl. 6, Fig. 1)	Öschingen *romani* horizon	~103	-	45	-	-
SMNS 67753/4 (Pl. 6, Fig. 3)	Öschingen *romani* horizon	100	23	50	-	23%
SMNS 67739/2 (Pl. 4, Fig. 2)	Frogden Quarry Bj-14	99	~24	~47	24	24%
SMNS 67739/3 (Pl. 4, Figs 3, 4)	Frogden Quarry Bj-14	88	20	41	18	23%
SMNS 67739/6 (Pl. 5, Figs 2, 3)	Frogden Quarry Bj-14	~87	18	~42	18	21%



Textfigure 6: (1–5, 7–8) Öschingen, Ostreenkalk Formation, 'Oberer Giganteuston'; Lower Bajocian, Humphriesianum Zone, Humphriesianum Subzone, *mutabile* horizon; leg. U. Fidder. (1) *Oppelia flexa* Buckman, bed 14, SMNS 67766. (2) *Oppelia* sp., bed 14; SMNS 67767. (3, 4, 6–9) *Stephanoceras mutabile* (Quenstedt). (3, 4) bed 14, SMNS 67768. (7, 8) bed 16, SMNS 67769. (5) *Stephanoceras* sp., pathologic, bed 14, SMNS 67770. **(6, 9)** Specimen illustrated by Quenstedt (1886, pl. 66, fig. 5). (6) Iron-oolithic matrix of the lectotype. (9) Caster plast of lectotype; probably from Western Swabian Alb, upper part of Humphriesioolith, Humphriesianum Zone, Humphriesianum Subzone, *mutabile* horizon; IFGT, without number.– Fig. 5 x1.2, all others x1.

SMNS 67739/4 (Pl. 4, Figs 6, 7)	Frogden Quarry Bj-14	~75	20	~33	~16	27%

[Measurements were taken at the maximum completely preserved diameter and include the keel]

Description: Median- to large-sized, whorl section high-triangular; well separated floored keel; narrow to moderately wide umbilicus, smooth shell, inner whorls occasionally ribbed, lacking nodes or spines; rather simple suture line with broad elements.

Remarks: Even Buckman (1892) noticed transitional morphs between his taxa *D. tecta*, *D. subtecta* and *D. liostraca*, all members of his "*liostraca*-group", so that this species separation is purely artificial. After his study of several dozens of specimens, Huf (1968) has lumped this group into one species, *D. liostraca*, and interpreted the taxa *tecta* and *subtecta* as subspecies. In general, we concur with Huf (1968), but we refrain from the usage of subspecies. The lectotype of *D. liostraca* is the specimen illustrated by Buckman (1892: pl. 55, fig. 3) from the Frogden Quarry near Oborne (Huf 1968: p. 98). There exist not enough specimens from Öschingen to conclude from this material alone about the variation of the species. Therefore, in addition to Buckman's material, our newly collected specimens from the type horizon in the Frogden Quarry illustrate well this

variation. *D. liostraca* differs from all other species included in this genus by the development of a floored keel during ontogeny.

Genus *Nannina* Buckman, 1927
Type species: *Nannina evoluta* Buckman, 1927

Nannina deltafalcata (Quenstedt)
Pl. 7, Figs 1–14; Pl. 8, Figs 2–5

*v 1856 *Ammonites deltafalcatus* – Quenstedt: p. 394; pl. 53, figs 7, 8 [LT].

1968 *Dorsetensia deltafalcata* (Quenstedt, 1858) – Huf: p. 78; pl. 9, figs 2–7; pl. 10, figs 2, 3; pl. 11, 12; pl. 13, figs 1–5 [with synonymy until 1968].

1985 *Dorsetensia deltafalcata* (Qu. 1858) – Schlegelmilch: p. 65; pl. 19, fig. 11 [LT].

1994 *Nannina deltafalcata* (Quenstedt, 1858) – Fernández-López & Mouterde: pl. 2, figs 1–7 [with further synonyms].

Material from Öschingen: ca. 10 specimens from the 'Unterer Giganteuston' (*deltafalcata* and *romani* horizons).

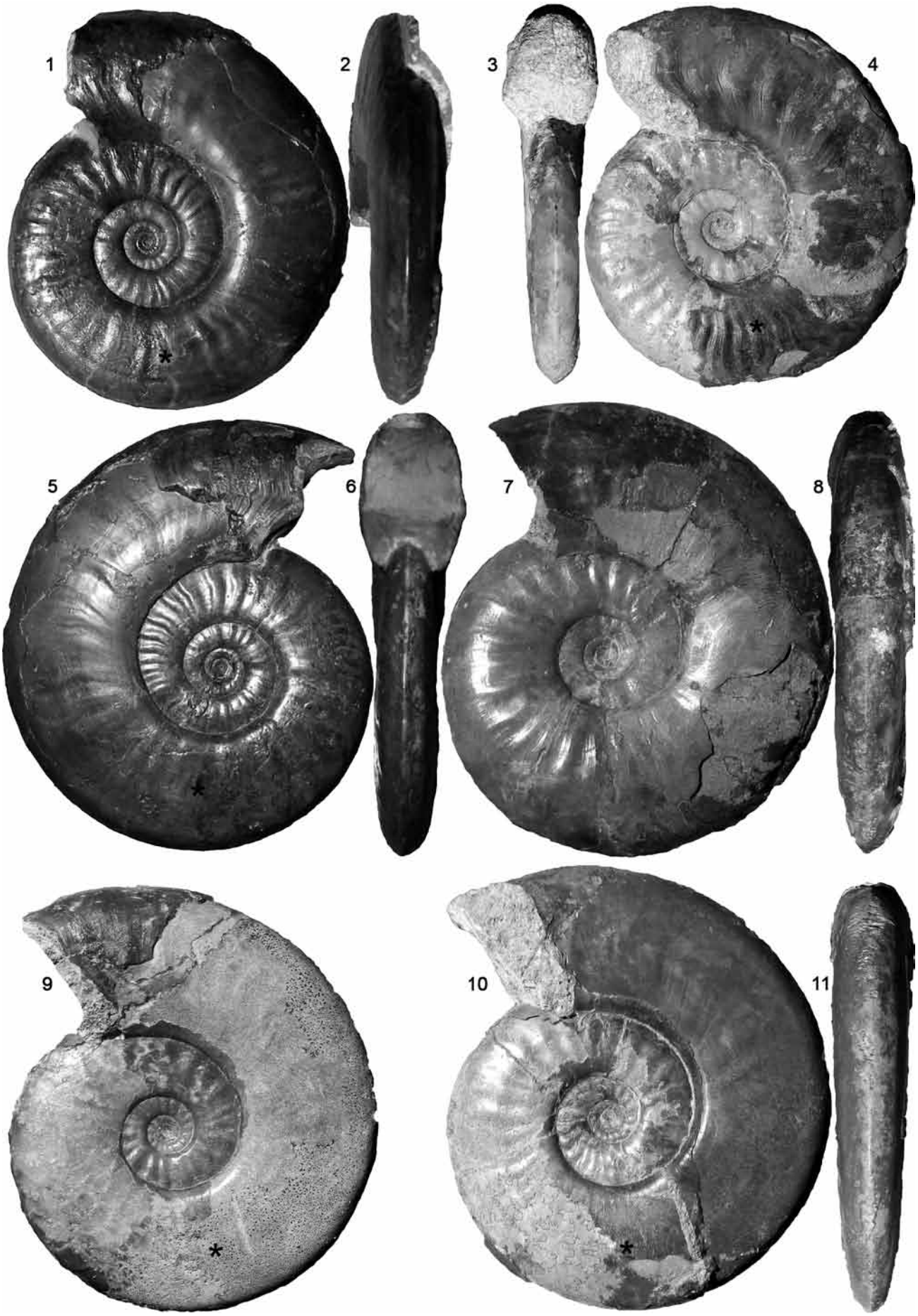
Measurements (mm)	Locality and horizon	D	U	H	W	U/D
SMNS 67755 (Pl. 7, Figs 1–4)	Dettingen/ Erms, *deltafalcta* or *romani* horizon	63	23	22	15	37%
SMNS 67758 (Pl. 7, Figs 8–10)	Beuren *deltafalcta* or *romani* horizon	~63	26	21	15	41%
SMNS 67757/1 (Pl. 7, Fig. 11)	Öschingen *romani* horizon	53	18	21	-	34%
SMNS 67757/2 (Pl. 7, Fig. 12)	Öschingen *romani* horizon	50	17	19	-	34%
IFGT [LT] (Pl. 7, Figs 13, 14)	Öschingen *deltafalcta*- or *romani* horizon	48	19	18	13	40%
SMNS 67756/3 (Pl. 7, Fig. 7)	Öschingen *deltafalcta* horizon	37	13	13	-	35%
SMNS 67759/1 (Pl. 7, Figs 21, 22)	Torvaig Hebridica Subzone	58	23	19	14	40%
SMNS 67759/2 (Pl. 7, Figs 23, 24)	Torvaig Hebridica Subzone	49	19	18	13	39%
SMNS 67759/3 (Pl. 7, Fig. 25)	Torvaig Hebridica Subzone	47	20	16	-	43%

Description: Huf (1968) descibed the lectotype of this species very well. It is a small-sized species with a high-ovale whorl section and a falcoid ribbing on the flanks, weakening on the bodychamber, where a short apophysis is developed. The keel is slightly separated. The ribbing of the inner and median whorls varies in its strength. Occassionally small nodes may occur. The innermost whorls may show a coronate section (Pl. 7, Fig. 6).

Remarks: Quenstedt's syntype series consisted of several specimens, of which he figured two as coming from the "Ostreenkalke" of Öschingen. Renz (1925) designated one of these illustrated specimens of Quenstedt (1856: pl. 53, fig. 8) as the lectotype. Concerning the precise horizon, however, Quenstedt was in error. *N. deltafalcata* comes from the 'Unterer Giganteuston' and not from the "Ostreenkalke" which follow above the 'Oberer Giganteuston'.

Ammonites of the *N. deltafalcata* group occur already in the Laeviuscula Zone of South England (coll. V.D.), in the Sauzei Zone of the Upper Rhine Graben valley (Dietze et al. 2009) and in the "Hebridica Subzone" of Scotland (Pl. 7, Figs 21–25). The acme of this group, however, lies within the Pinguis Subzone. The youngest representatives even reach the Romani Subzone. The specimens from Torvaig, Isle of Skye, (Pl. 7, Figs 21–25) are of special interest because they appear to be somewhat morphologically transient to *Nannina evoluta* Buckman (re-figuration of the holotype on Pl. 7, Figs 15–17), the type species of *Nannina*. The ribbing of the specimens from Scotland is a little wider spaced and more pronounced than in *N. deltafalcata*; and the whorl section is more quadratic, although less expressed than in *N. evoluta*. In *N. evoluta* there are shallow furrows aside the keel, which are not seen in the specimens from Southern Germany and from Scotland. Howe-

Plate 3: (1–2, 5, 6) *Dorsetensia* cf. *complanata* Buckman, Öschingen; Ostreenkalk Formation, 'Unterer Giganteuston', Bed 10, Lower Bajocian, Humphriesianum Zone, Romani Subzone, *romani* horizon. (1, 2) SMNS 67737/1. (5, 6) SMNS 67737/2. **(3, 4, 7–11)** *Dorsetensia* cf. *complanata* Buckman, Frogden Quarry (Dorset), Inferior Oolite Formation, bed 4b (Callomon & Chandler 1990); Lower Bajocian, Humphriesianum Zone, Cycloides Subzone, Bj-14 [TT]. (3, 4) Coarsely ribbed variety with complete mouth border**,** SMNS 67738/1. (7, 8) Inflated variety**,** SMNS 67738/2. (9) Smooth, tall variety**,** SMNS 67738/3. (10, 11) SMNS 67738/4. All x1. Asterisk marks beginning of the bodychamber.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ver, despite this small difference we assign *Ammonites deltafalcatus* to the genus *Nannina*, in respect of the otherwise good morphological resemblance. The type horizon of *N. evoluta* in Southern England is the *evoluta* horizon of the Sauzei Zone (Callomon & Chandler 1990). The microconchs corresponding to the genus *Dorsetensia* are clearly different from *N. deltafalcata*. They do not show a short spatulate apophysis like in *N. deltafalcata* but exhibit only a laterally and ventrally protruding mouth border. The genus *Pelekodites* (type species: *Pelekodites pelekus* Buckman, 1923) is smaller in size and shows an apophysis with a well-developed spoon-like lappet, similar to *Spatulites spatians* Buckman, 1928. *Maceratites aurifer* Buckman, 1928 differs by a smaller size, a more irregular ribbing pattern and broader lappets. *Nannoceras nannomorphum* Buckman, 1923 (Pl. 7, Figs 18–20) comes from the Discites Zone and is stratigraphically much older than *N. deltafalcata*. However, despite this difference in age, a closer relationship cannot be ruled out (Callomon & Chandler 1990).

But what is the macroconch counterpart of *Nannina deltafalcata*? In respect of their co-occurrence, similarities in the early ontogentic stages, and similar suture lines we were able to couple the two dimorphic pairs *D. liostraca – D. romani/complanata* and *D. tessoniana – D. edouardiana/regrediens/pulchra*. The *N. deltafalcata* group appears earlier in stratigraphy than the abovementioned taxa. Thus, the only remaining candidates for the macroconch partner are either *Ammonites furticarinatus* Quenstedt, 1856 or "*Sonninia*" *disciforme* Dorn 1935. Quenstedt (1856, p. 120; pl. 14, figs 6, 7) originally based his species *Ammonites furticarinatus* on two syntypes, which were said to come from the Pliensbachian of Reutlingen-Sondelfingen. Later Quenstedt (1861, 1886) realized that these specimens are from the Giganteuston Member of the Middle Swabian Alb, probably coming from the vicinity of Pfullingen. The specimen figured by Quenstedt (1856: pl. 14, fig. 6) is the lectotype of the species (Fernández-López 1985). The second syntype was a pyritic nucleus which seems to be lost. We here illustrate the lectotype for the first time (Pl. 9, Figs 1, 2). *Ammonites furticarinatus* exhibits a rather complex suture line and was recently included in *Fissilobiceras* Buckman, 1919, a genus of Hammatoceratidae (Dietze et al. 2005).

In regional literatur (Terzidis 1966; Ohmert 1988, 1990) all large-sized "sonniniids" in pyritic preservation from the 'Unterer Giganteuston' were assigned to "*Sonninia*" *furticarinata*, except Dorn (1935), who pointed out the specific independence of *Sonninia disciformis* Dorn. This species is much more involute than *Fissilobiceras furticarinatum* (Quenstedt). Its suture line is somewhat simpler at comparable stages, especially because the chambers of the phragmocone are wider spaced. "*Sonninia*" *disciformis* Dorn does not share the exact finding level with *F. furticarinatum* (Quenstedt), because the latter is completely pyritic and must come from a clay interval, wheras "*S.*" *disciformis* comes from a pyritic concretion ('Pyrit-Muschelknollen'), possibly from Bed 8 in our section. The generic assignment of "*S.*" *disciformis* is not clear, but it does not belong to the hammatoceratoid stock of *Fissilobiceras*, but to Sonniniidae s. str. Similar forms ("*Sonninia*" aff. *furticarinata*) were illustrated from the Hebridica Subzone of the Isle of Skye (Morton 1975). They come from exactly the same level as the microconchs illustrated as *Nannina* aff. *deltafalcata* (Morton 1975: pl. 8, figs 21–25). This co-occurrence of closely related forms in Scotland may support our conclusion, that the macroconch partner of *N. deltafalcata* is very likely not *F. furticarinatum* (Quenstedt), but "*S.*" *disciformis* Dorn.

4.2 Some remarks on other ammonites from the Giganteuston Member

4.2.1 Other sonniniids

Two interesting single specimens are worth mentioning. The first is a ?*Dorsetensia punctatissima* (Haug) (Pl. 8, Figs 7, 8), which was recovered from the 'Unterer Giganteuston', most likely from the *deltafalcata* horizon (see section 3.3.1.1 of this paper). The species "*Witchellia*" *punctatissima* is based on two calcareous moulds with remains of the test from Pfullingen, few kilometres NE of Öschingen. Haug (1893) did not select a type of his two specimens.

Another specimen from Bed 2 (*deltafalcata* horizon) (Pl. 8, Fig. 6) is not easy to classify. The suture line is similar to those in *Dorsetensia* or *Nannina*. In the inner whorls there are swollen primary ribs and a coronate whorl section. It differs markedly from *N. deltafalcata* by its rigid ribbing style. In the latter the ribs are more curved. Moreover, the specimen in question exhibits a well-separated keel and a ventromarginal edge. The nuclei of *D. liostraca* (Pl. 6, Figs 2, 3) are more involute, showing a more slender whorl section and a weaker sculpture. Inspite of the more rounded umbilical edge and a more rounded whorl section we observed a remarkable similarity to ?*Dorsetensia hebridica* (Morton 1972: pl. 105, figs 13, 25–26; holotype re-figured herein on Pl. 8, Fig. 9). We therefore determined this specimen as ?*D.* aff. *hebridica*. Pavia (1983: pl. 6, figs 9, 10) has figured

Plate 4: (1–7) *Dorsetensia liostraca* Buckman; Frogden Quarry (Dorset), Inferior Oolite Formation, bed 4b (Callomon & Chandler 1990); Lower Bajocian, Humphriesianum Zone, Cycloides Subzone, Bj-14 [TT]. (1, 5) Involute variety with almost complete bodychamber, SMNS 67739/1. (2) SMNS 67739/2. (3, 4) SMNS 67739/3. (6, 7) SMNS 67739/4. All x1. Asterisk marks beginning of the bodychamber.

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very close forms from the Romani Subzone of Chaudon near Digne (SE France), under the name *Dorsetensia (Dorsetensia) hannoverana*.

4.2.2 Oppeliidae Douvillé, 1890

Only three specimens of oppeliids have been recorded from Öschingen, two of which are nuclei and thus not determinable at specific level. The almost complete specimen from Bed 14 (Textfig. 6.1) represents *Oppelia flexa* (Buckman). Fernández-López (1985: pl. 18, fig. 4) illustrated an almost identical specimen from the Niortense Zone, Banksii Subzone of the Iberian Ranges (Spain). Ohmert et al. (1995: pl. 4, figs 13, 14) recorded *Oppelia* cf. *flexa* from Lörrach (SW Germany). The specimen comes from a stratigraphical level which is equivalent to our Bed 14.

4.2.3 Stephanoceratidae Neumayr, 1875

We will describe the stephanoceratid fauna of the 'Oberer Giganteuston' later in detail. The extremely difficult preparation of the specimens in the nodules of beds 14 and 16 will take a long time. Preliminarily, it can be stated here that the ammonite fauna is grouped around *S. mutabile* (Textfig. 6.3, 6.4) and allied forms. The illustrated specimen from bed 16 (Textfig. 6.7, 6.8) is slighty different from the lectotype of *S. mutabile*, which shows a longer coronate stage and a slightly less rounded section. But this specimen lies within the variation of *S. mutabile*. A reinvestigation of the lectotype (Textfig. 6.6, 6.9) of *S. mutabile* has shown that this specimen cannot come from Öschingen (Quenstedt 1886: caption of pl. 66, fig. 5] nor from Beuren (Quenstedt 1886: p. 538), because its matrix consists of an iron-oolithic limestone (Textfig. 6.6). Such a lithology is totally absent in the Giganteuston Member of the Middle Swabian Alb, but typical for the upper part of the Humphriesioolith of the Western Swabian Alb and thus this specimen must come from there. The microconchiate *Normannites* species were partly described by Westermann (1954).

5. Conclusions

In the genus *Dorsetensia* three distinctive groups of ammonites are lumped together, so that this genus is most likely polyphyletic. On the other hand some intermediate forms occur which could point to a closer relationship. The genus *Dorsetensia* represents an important tool for correlations both within the Northwest European Province and with the Arabian and Andine provinces (Westermann & Riccardi 1972; Enay & Mangold 1994; Hillebrandt 2001).

(1) The group of *D. edouardiana* [m] – *tessoniana* [M] exhibits a rather simple, falcoid ribbing style and a non-septate keel. *D. tessoniana* (d'Orbigny) is the only described macroconch of this group. Corresponding microconchs of this group are *D. edouardiana* (d'Orbigny), the closely related *D. pulchra* Buckman, and *D. regrediens* (Haug).

It is not clear why *D. edouardiana/pulchra* show only a ventrally and laterally protruding mouth border, whereas *D. regrediens* exhibits a well-developed apophysis. The stratigraphical range of this group seems to be restricted to basal parts of the Romani [= Cycloides] Subzone (Rioult et al. 1997). Records mentioned in literature from the Sauzei Zone (Westermann & Riccardi 1972: p. 13) are surely erroneous. *D. lennieri* Brasil most likely represents an immediate predecessor. The main biogeographical distribution of the *D. edouardiana – tessoniana* group is Northern France and Southern England, besides further records from Central Europe (Southeastern France, Pavia 1983). An unexpected record of *D. lennieri* Brasil from the Western Tethys, coming from neptunian dykes in Western Sicily (Wendt 1963) was not illustrated and must be confirmed by a restudy of the material. The group of *D. edouardiana – tessoniana* also occurs along the eastern margin of the Palaeopacific Ocean in Oregon (Imlay 1973), Argentina and Chile (Riccardi & Westermann 1972). In the latter area the group is represented by endemic species which are morphologically very similar to European ones (*D. mendozai* Westermann & Riccardi, *D. blancoensis* Westermann & Riccardi). Records of *Dorsetensia* from Arabia (Arkell 1952: ?*D. arabica* [= ?*Fontannesia*]); Tibet (Arkell 1953; Westermann & Wang 1988; Enay & Mangold 1994), Kenya (Spath 1933) and Madagascar (Collignon 1958) are rather doubtful. The same must be said from the horizon à *Dorsetensia tessoniana* [= ?*Pseudoshirbuirnia*] which was introduced by Enay & Mangold (1994), lying within their Zone à "*Shirbuirnia*" nov.

(2) The group of *D. complanata/romani* [m] – *liostraca* [M] is characterized by a prorsiradiate but not falcoid ribbing style even in the inner stages. The corresponding microconchs – *D. romani* und *D. complanata* – exhibit a not well-accentuated, non-septate keel. In contrast, the macroconchs show a floored keel in the inner and median ontogenetic stages. We do not concur with Callomon & Chandler (1990), who suggested a derivation of *D. liostraca* from smooth-shelled sonniniids of the genus *Sonninites* (Pl. 6, Fig. 6) because of the much more complex suture line of *Sonninites* and the occurrence of spiny nuclei in the

Plate 5: (1–4) *Dorsetensia liostraca* Buckman; Frogden Quarry (Dorset), Inferior Oolite Formation, bed 4b (Callomon & Chandler 1990); Lower Bajocian, Humphriesianum Zone, Cycloides Subzone, Bj-14 [TT]. (1, 4) Large specimen with part of the bodychamber, leg. R. B. Chandler**,** SMNS 67739/5. (2, 3) SMNS 67739/6. All x1. Asterisk marks beginning of the bodychamber.

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latter, which are unknown in the *D. liostraca* group. According to our present knowledge, the acme of the ammonites of the *D. romani/complanata* [m] – *liostraca* [M] group lies within the Romani Subzone (Rioult et al. 1997). A possible ancestral form is ?*Dorsetensia hebridica* Morton from the older "Hebridica" Subzone. The *D. liostraca* group is recorded from the Northwest-European Province (Germany, Switzerland, France, England, Scotland; Morton 1972), Poland (Kopik 1967)], the Subbetic Jurassic of Spain (Sandoval 1990) and from the northern margin of the Tethys (Kaukasus, Rostovtsev 1991; Transkaukasus, Azarjan 1982, Rostovtsev 1985; Northern Tibet, Westermann & Wang 1988). In South America it occurs in Argentina and Chile (Westermann & Riccardi 1972; Hillebrandt 2001). Further records are from Oregon (Imlay 1973; Poulton et al. 1992) and from the Arabian Peninsula (Enay & Mangold 1994: Zone à "*Ermoceras* primitifs" nov.).

(3) The taxonomic affinity of the ?*Dorsetensia pinguis/hannoverana* group remains unsolved (Morton 1972). Since the basal part of the Giganteuston Member in which the *pinguis* horizon can be expected was not exposed we cannot contribute new data here.

(4) We exclude *Ammonites deltafalcatus* Quenstedt from the genus *Dorsetensia*, and recombine this species to *Nannina* Buckman, 1927.

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Plate 6 [pg. 231]**: (1-5, 7)** Öschingen, 'Unterer Giganteuston', Bed 10; Lower Bajocian, Humphriesianum Zone, Romani Subzone, *romani* horizon; leg. U. Fidder [except (1, 4) leg. E. Scherer]. (1-3, 5, 7) *Dorsetensia liostraca* Buckman. (1, 4) SMNS 67754. (2) SMNS 67753/2. (3) SMNS 67753/4. (5) SMNS 67753/3. (7) SMNS 67753/1. (4) *Dorsetensia* cf. *complanata* Buckman. **(6)** *Sonninia* ["*Sonninites*"] *felix* (Buckman) [TT]; in the part of the phragmocone where the shell is chipped, the complicated suture line is discernible (cf. *Dorsetensia liostraca* in Pl. 6, Figs 3, 5!); Sandford Lane near Sherborne; Sandford Lane Fossil Bed, bed 6c; Sauzei Zone, faunal horizon of *Stephanoceras kalum* (Bj-11b); SMNS 67752. – All x1. Asterisk marks beginning of the bodychamber.

Plate 7 [pg. 232]**: (1–14)** *Nannina deltafalcata* (Quenstedt); Ostreenkalk Formation, 'Unterer Giganteuston'; Lower Bajocian, Humphriesianum Zone. (1–4) Dettingen/Erms, Romani or Pinguis Subzone, with spatulate apophysis, SMNS 67755, leg. G. Stappenbeck. (5–7) [?TT], (11, 12) [?TT]: Öschingen. (5–7) Bed 2; Pinguis Subzone, *deltafalcata* horizon. (5) Nucleus, SMNS 67756/1. (6) Innermost whorls showing a coronate whorl section, SMNS 67756/2. (7) SMNS 67756/3. (11, 12) With almost complete bodychamber; Bed 6, Romani Subzone, *romani* horizon. (11) SMNS 67757/1. (12) SMNS 67757/2, all leg. U. Fidder. (8–10) Beuren near Hechingen, Romani or Pinguis Subzone, mouth border preserved with spatulate apophysis, SMNS 67758, leg. G. Stappenbeck. (13, 14) Plaster cast of the lectotype [Quenstedt 1856, pl. 53, fig. 8]: Öschingen, *deltafalcata* or *romani* horizon; IFGT, without collection number. **15–17**: *Nannina evoluta* Buckman [HT]; Clatcombe near Sherborne; Sauzei Zone, faunal horizon of *Nannina evoluta* (Bj-11b); GSM 49331.**18–20**: *Nannoceras nannomorphum* Buckman [HT]; Bradford Abbas near Yeovil; Bradford Abbas Fossil Bed; Discites Zone; GSM 37299. **21–25**: *Nannina* aff. *deltafalcata* (Quenstedt); Torvaig, Trotternish (Isle of Skye); basal bed of the "Upper Sandstones"; Sauzei Zone, "Hebridica Subzone". (21, 22) SMNS 67759/1. (23, 24) SMNS 67759/2. (25) SMNS 67759/3, all leg. G. Dietl. – All x1. Asterisk marks beginning of the bodychamber.

Plate 8 [pg. 233]**: (1, 10): "***Sonninia*" *disciformis* Dorn, holotype (= *Ammonites furticarinatus* Quenstedt 1886, pl. 68, fig. 7), Öschingen, Ostreenkalk Formation, 'Unterer Giganteuston'; Humphriesianum Zone, SMNS 28218. (**2–5):** *Nannina deltafalcata* (Quenstedt); Öschingen, Ostreenkalk Formation, 'Unterer Giganteuston', Humphriesianum Zone collected from below Bed 2, Pinguis Subzone, probably *deltafalcata* horizon. (2): SMNS 67760/1. (3, 4): SMNS 67760/2. (5): SMNS 67760/3. **(6):** ?*Dorsetensia* aff. *hebridica* Morton; Öschingen, Ostreenkalk Formation, 'Unterer Giganteuston', Humphriesianum Zone, Bed 2, Romani Subzone, *deltafalcata* horizon; SMNS 67761. (**7, 8):** ?*Dorsetensia punctatissima* (Haug); Öschingen, Ostreenkalk Formation, 'Unterer Giganteuston', Humphriesianum Zone, collected from below Bed 2, Pinguis Subzone, probably *deltafalcata* horizon; SMNS 67762. **9**: ?*Dorsetensia hebridica* Morton [HT]; Torvaig, Trotternish (Isle of Skye); basal bed of the "Upper Sandstones"; Sauzei Zone, "Hebridica Subzone"; HMS 26391. – All x1.

Plate 9 [pg. 234]**: (1, 3)**: *Fissilobiceras furticarinatum* (Quenstedt) [LT = *Ammonites furticarinatus* Quenstedt, 1856, Pl. 14, Fig. 6]; probably coming from the vicinity of Pfullingen near Reutlingen; Ostreenkalk Formation, Unterer Giganteuston; Humphriesianum Zone; Pinguis or Romani Subzone; SMNS 27769. **(2)**: *Stephanoceras* sp. Öschingen, Ostreenkalk Formation, 'Unterer Giganteuston', Bed 10, topmost part; Lower Bajocian, Humphriesianum Zone, Romani Subzone, *romani* horizon; leg. U. Fidder – All x1.

Plate 6

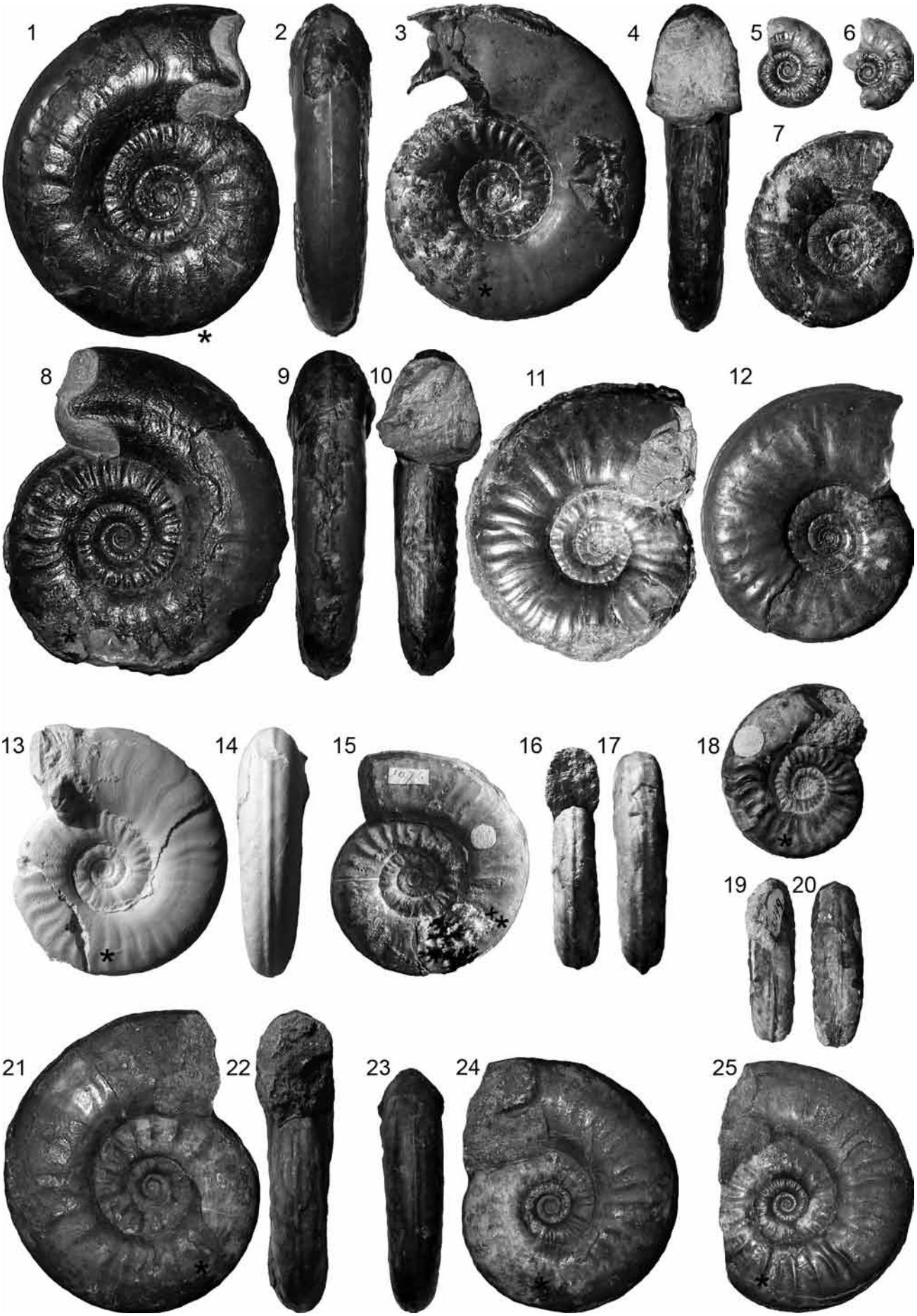

Plate 7

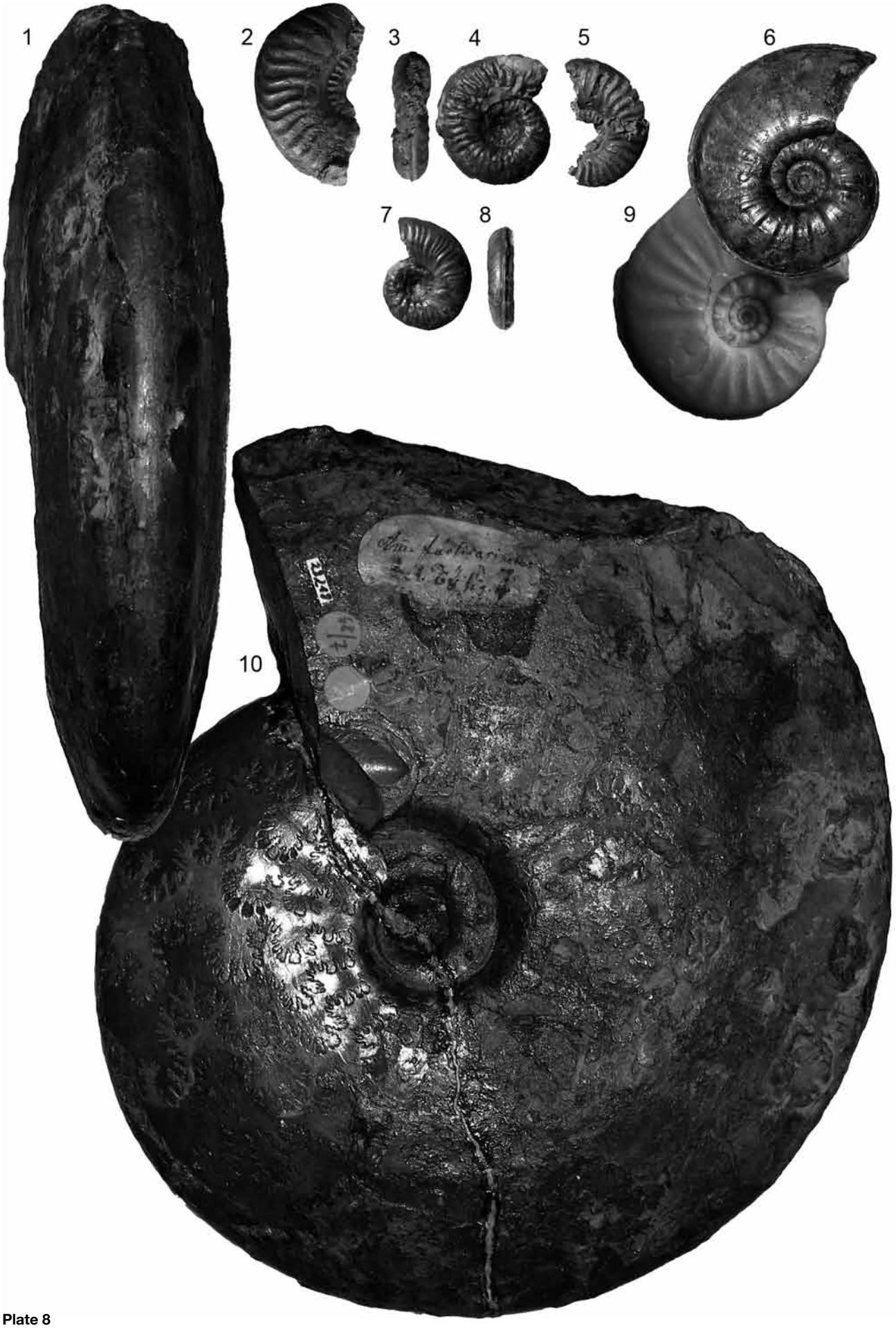

Plate 8

Plate 9

6. References

Arkell WJ. 1952. Jurassic ammonites from Jebel Tuwaiq, Central Arabia. Philosophical Transactions of the Royal Society of London, Series B 633**,** 241–313.

Arkell WJ. 1953. Bajocian ammonites collected by Sir Henry Hayden near Kampadzong, Tibet. Geological Magazine 40, 331–336.

Azarjan NR. 1982. Jurassische Ammoniten in der Armenischen SSR. Eriwan, Akademija NAUKA Armensoije SSR, 191 p. (in Russian).

Bloos G, Dietl G, Schweigert G. 2005. Der Jura von Süddeutschland in der Stratigraphischen Tabelle von Deutschland 2002. Newsletters on Stratigraphy 41, 263–277.

Brasil L. 1895. Céphalopodes nouveaux ou peu connus des étages jurassiques de Normandie. Bulletin de la Societé géologique du Normandie 16, 27–46.

Bückle E. 1913. Die geologische Gliederung der Gegend des mittleren Steinlachtales. Inaugural-Dissertation, Universität Tübingen, 49 p.

Buckman SS. 1887–1907. A monograph of the Ammonites of the "Inferior Oolite series". Monographs of the Palaeontographical Society, cclxii + 456 p.

Buckman SS. 1909–1930. Yorkshire Type Ammonites, vol. 1–2; Type Ammonites, vol. 3–7. London, Wheldon & Wesley, 541 p. (Reprint: 1972–1975; Cramer).

Callomon JH. 1985. Biostratigraphy, Chronostratigraphy and all that – again. In: O Michelsen, A Zeiss (Eds), International Symposium on Jurassic Stratigraphy, Erlangen, September 1–8, 1984, 612–624.

Callomon JH, Chandler RB. 1990. A review of the ammonite horizons of the Aalenian – Lower Bajocian stages in the Middle Jurassic of Southern England. In: S Cresta, G Pavia (Eds), Atti del meeting sulla stratigrafia del Baiociano. Memorie descrittive della Carta Geologica d'Italia 40, 85–111.

Collignon M. 1958. Atlas des fossiles charactéristiques de Madagascar (Lias–Bajocien). Tananarive, Service Géologique.

Dietl G, Hager H, Sauter F. 1984. Ein *cycloides*-Horizont (humphriesianum-Zone, Mittlerer Jura) im Gebiet von Aalen/Ostalb. Jahreshefte der Gesellschaft für Naturkunde in Württemberg 139, 47–55.

Dietze V. 2010. Über *Ammonites Humphriesianus umbilicus* Quenstedt, 1886 an seiner Typus-Lokalität (östliche Schwäbische Alb, Südwestdeutschland). Zitteliana A 50, 55–69.

Dietze V, Callomon JH, Schweigert G, Chandler R. 2005. The ammonite fauna and biostratigraphy of the Lower Bajocian (Ovale and Laeviuscula zones) of E Swabia (S Germany). Stuttgarter Beiträge zur Naturkunde, Serie B 353, 1–82.

Dietze V, Kutz M, Franz M., Bosch K. 2009. Stratigraphy of the Kahlenberg near Ringsheim (Upper Rhine Valley, SW Germany) with emphasis on the Laeviuscula and Sauzei zones (Lower Bajocian, Middle Jurassic). Palaeodiversity, 2, 19–65.

Dietze V, Stappenbeck G, Wannenmacher N, Schweigert G. 2008. Stratigraphie und Ammoniten-Faunenhorizonte im Grenzbereich Sauzei-/Humphriesianum-Zone (Unter-Bajocium, Mitteljura) der westlichen Schwäbischen Alb (SW-Deutschland). Palaeodiversity 1, 141–165.

Dorn P. 1935. Die Hammatoceraten, Sonninien, Ludwigien, Dorsetensien und Witchellien des süddeutschen, insbesondere fränkischen Doggers. Palaeontographica, Abteilung A 82, 1–124.

Douvillé H. 1890. Sur la classification des Cératites de la Craie. Bulletin de la Société géologique de France 18, 275–292.

Enay R., Mangold C. 1994. Première zonation par ammonites du Jurassique d'Arabie sédoudite, une référence pour la province Arabique. – Géobios, Mémoires spéciales 17, 161–174.

Fernández-López S. 1985. El Bajocense en la Cordillera Ibérica. Madrid, Facultad de Ciencias Géologicas, Departamento de Paleontologia, Universidad Complutense, 848 + 23 p.

Fernández-López S., Mouterde R. 1994. L'Horizon à *Gervillii* (Bajocien inférieur) de Tendron (Cher, France). Taphonomie et populations d'Ammonites. Miscellanea del Servicio Geologico Nazionale 5, 117–159.

Gillet S. 1937. Les ammonites du Bajocien d'Alsace et de Lorraine. Mémoires du Service de la Carte géologique d'Alasace et de Lorraine 5, 1–130.

Haug E. 1893. Étude sur les ammonites des étages moyens du système Jurassique. Bulletin de la Société Géologique de France (3) 20, 277–333.

Hillebandt A von. 2001. Ammonite stratigraphy of the Bajocian in Northern Chile. Hantkeniana 3, 49–87.

Hoyermann T. 1917. Ueber *Dorsetensia* Buckman und *Ammonites Romani* Opp. (unter besonderer Berücksichtigung des Vorkommens bei Geerzen im Hilsgebiet). Inaugural-Disseratation, Universität Tübingen (Laupp), 64 p.

Huf W. 1968. Über Sonninien und Dorsetensien aus dem Bajocium von Nordwestdeutschland. Beihefte zum Geologischen Jahrbuch 64, 1–126.

Imlay RW. 1973. Middle Jurassic (Bajocian) ammonites from Eastern Oregon. U. S. Geological Survey, Professional Papers 756, 1–100.

Kopik J. 1967. Bajocian ammonites from the Kościelisko beds in the vicinity of Przystajń (Cracow-Wieluń Jura). Instytut Geologiczny, Biuletyn, Z badań stratygraficzno-paleontologicznych w Polsce 209, 5–50.

Maubeuge PL. 1951. Les Ammonites du Bajocien de la région frontière franco-belge (Bord septentrional du basin de Paris). Mémoires de l'Institute des Sciences naturelles de Belgique 2, 42, 1–104.

Morton N. 1972. The Bajocian ammonite *Dorsetensia* in Skye, Scotland. Palaeontology 15, 504–518.

Morton N. 1975. Bajocian Sonniniidae and other ammonites from western Scotland. Palaeontology 18, 41–91.

Neumayr M. 1875. Die Ammonitiden der Kreide und die Systematik der Ammonitiden. Zeitschrift der Deutschen geologischen Gesellschaft 27, 854–942.

Ohmert W. 1988. Geologische Karte 1:25000 von Baden-Württemberg, Erläuterungen zu Blatt 7521 Reutlingen. Stuttgart, Landesvermessungsamt Baden-Württemberg, 222 p.

Ohmert W. 1990. The *Humphriesianum* Zone in the type area. In: S Cresta, G Pavia (Eds), Atti del meeting sulla stratigrafia del Baiociano. Memorie descrittive della Carta geologica d'Italia 40, 117–140.

Ohmert W, Gassmann G, Schatz RH, Stetter L. 1995. Das höhere Unter-Bajocium (ehemals Mittel-Bajocium) von Lörrach. II. Die *humphriesianum*-Zone. Jahreshefte des Geologischen Landesamtes Baden-Württemberg 35, 24–264.

Oppel A. 1856–1858. Die Juraformation Englands, Frankreichs und des südwestlichen Deutschlands. Jahreshefte des Vereins für vaterländische Naturkunde in Württemberg 12–14, 1–837.

Oppel A. 1862–1863. Über jurassische Cephalopoden. Palaontologische Mittheilungen aus dem Museum des koeniglich Bayerischen Staates 1, 127–162, 163–266.

Orbigny A de 1842–1851. Paléontologie Française. Description zoologique et géologique de tous les animaux mollusques et rayonnés fossils de France, comprenant leur application à la reconnaissance des couches. Terrains oolithiques ou jurassiques. 1, Céphalopodes. Paris, Masson, 624 p.

Pavia G. 1983. Ammoniti e biostratigrafia del Baiociano inferiore di Digne (Francia SE, Dip. Alpes-Haute Provence). Monografia di Museo regionale et Scienze naturale di Torino 2, 1–257.

Poulton TP, Detterman RL, Hall RL, Jones DL, Peterson JA, Smith P, Taylor DG, Tipper HW, Westermann GEG. 1992. Western Canada and United States. In: GEG Westermann (Ed.), The Jurassic of the Circum Pacific. Cambridge, University Press, 29–92.

Quenstedt FA. 1856–1858. Der Jura. Tübingen, Laupp, 842 p.

Quenstedt FA. 1861. Epochen der Natur. Tübingen, Laupp, vi + 853 p.

Quenstedt FA. 1886–1887. Die Ammoniten des Schwäbischen Jura. 2. Der Braune Jura. Stuttgart, Schweizerbart, 441–885.

Renz C. 1925. Beiträge zur Cephalopodenfauna des älteren Doggers am Monte San Giuliano (Monte Erice) bei Trapani in Westsizilien. Abhandlungen der Schweizerischen Geologischen Gesellschaft 45, 1–33.

Rioult M. 1994a. *Dorsetensia tessoniana*. In: JC Fischer (Ed.), Révision critique de la Paléontologie française d'Alcide d'Orbigny.1. Céphalopodes jurassiques. Paris, Milan & Barcelona, Masson, 116–117.

Rioult M. 1994b. *Dorsetensia edouardiana*. In: JC Fischer (Ed.), Révision critique de la Paléontologie française d'Alcide d'Orbigny.1. Céphalpodes jurassiques. Paris, Milan & Barcelona, Masson, 117–118.

Rioult M, Contini D, Elmi S, Gabilly J. 1997. Bajocien. In: É Cariou, P Hantzpergue (Eds), Biostratigraphie du Jurassique oust-européen et méditerranéen. Bulletin du Centre des Recherches Elf Aquitaine Exploration et Production, Mémoires 17, 41–54.

Rostovtsev KO. 1985. Ammonoidea. In: KO Rostovtsev, EL Prosorovskaja, W Vuks, SS Belenkova (Eds), The Jurassic deposits of the south part of the Transcaucasus. Trudy MSK Leningrad 15, 117–168. (In Russian).

Rostovtsev KO. 1991. On the Aalenian and Bajocian zones of the Caucasus. In: N Morton (Ed.), Conference on Aalenian and Bajocian stratigraphy, Isle of Skye, 103–107. (unpublished)

Sandoval J. 1990. A revision of the Bajocian divisions in the Subbetic Domain (Southern Spain). In: S Cresta, G Pavia (Eds), Atti del meeting sulla stratigrafia del Baiociano. Memorie descrittive della Carta geologica d'Italia 40, 141–162.

Schlegelmilch R. 1985. Die Ammoniten des süddeutschen Doggers. Stuttgart & New York, G. Fischer, 284 p.

Spath LF. 1927–1933. Revision of the Jurassic Cephalopod fauna of Kachh (Cutch). Memoirs of the Geological Survey of India, Palaeontologia Indica, new series, 9: VII + 945 p.

Terzidis A. 1966. Der Braune Jura im Gebiet zwischen Eningen und Glems (Mittlere Schwäbische Alb, Württemberg). Jahresberichte und Mitteilungen des Oberrheinischen geologischen Vereins, neue Folge 48, 31–67.

Weisert K. 1932. *Stephanoceras* im schwäbischen braunen Jura Delta. Palaeontographica 76, 121–191.

Wendt J. 1963. Stratigraphisch-paläontologische Untersuchungen im Dogger Westsiziliens. Bollettino della Società paleontologica Italiana 2, 57–145.

Westermann GEG. 1954. Monographie der Otoitidae (Ammonoidea): *Otoites*, *Itinsaites*, *Epalxites*, *Germanites*, *Masckeites* (*Pseudotoites*, *Polyplectites*), *Normannites*. Beihefte zum Geologischen Jahrbuch 15, 1–364.

Westermann GEG, Riccardi AC. 1972. Middle Jurassic ammonoid fauna and biochronology of the Argentine-Chilean Andes. Part I: Hildocerataceae. Palaeontographica, Abteilung A 140, 1–116.

Westermann GEG, Wang Y-G. 1988. Middle Jurassic ammonites of Tibet and the age of the Lower Spiti Shales. Palaeontology 31, 259–339.

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