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Early Berriasian ammonites from Shal, Talesh region (NW Alborz Mountains, Iran)

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ABSTRACT

An early Berriasian (*Berriasella jacobi* Zone) ammonite fauna is described for the first time from the Alborz Mountains in northwest Iran. It has been collected from a section located near the village of Shal (Talesh region); in addition to rare phylloceratids, lytoceratids and *Neolissoceras*, the majority of ammonites belong to the neocomitid subfamily Berriasellinae. With the exception of a new genus and species, *Taleshites fuersichi*, these taxa are common in European and North African Tethyan successions. Associated calpionellids confirm the early Berriasian age of the ammonite-bearing levels.

1. Introduction

Neocomian ammonites from northern Iran are poorly known (Seyed-Emami et al., 1972). Bogdanowitch (1890) and Rivière (1934) recorded from this area the occurrence of ammonite species indicative of the early Berriasian, but originally assigned to the late Tithonian. Seyed-Emami (1975) considered these records doubtful and recorded Middle Jurassic to early Barremian ammonites, including taxa confined to the Berriasian, from a succession exposed near the village of Shal (Talesh region, northwest Alborz Mountains). These ammonites have never been described in detail, nor illustrated.

The present paper provides the first taxonomic description of early Berriasian ammonites from northern Iran. K. Seyed-Emami and B. Hamzepour made a first collection in 1970 but new fieldwork carried out in 2005 on Jurassic-Lower Cretaceous successions of the Shal Basin supplemented earlier sampling and provided a detailed stratigraphic framework.

A detailed description of the stratigraphical, sedimentological and micropalaeontological context and content of the Shal and Kolur formations will be the subject of a subsequent paper.

2. Geological setting

The section studied crops out a few hundreds metres north of the village of Shal (co-ordinates: N 37° 20′ 11"; E 48° 44′ 53") (Fig. 1). At the base are Middle Jurassic rocks that disconformably overlie the Shemshak Formation (Upper Triassic-Middle Jurassic). Davies et al. (1972) studied this section during the baseline geological mapping of the Masuleh area (geological map Masuleh 1/100 000), and designated it as the type section of the Shal Formation.

Based on data collected during our fieldwork, this formation reaches a thickness of 51 m and consists of bioclastic glauconitic sandstones and limestones with numerous fossiliferous beds (Fig. 2). The Shal Formation can be roughly subdivided into an ? upper Bajocian to Callovian-lower Kimmeridgian part, characterised by glauconitic sandstones, sandy limestones and limestones with frequent intercalations of bioclastic material. The first beds of the upper part of the section comprise 1.4 m of nodular, glauconitic,

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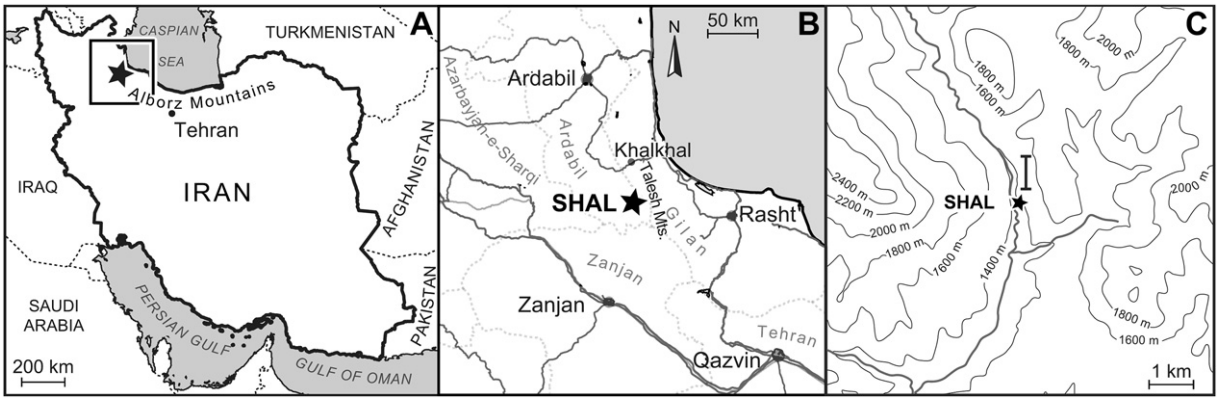

Fig. 1. The geographic position of the Shal section in northwest Iran and in the Talesh area, respectively.

sandy limestone with abundant ammonites, dated as early late Kimmeridgian. Starting from this layer, glauconitic sandy limestones characterise the sedimentary sequence. Our layer 45, a 1.4 m-thick reddish limestone, corresponds to 'Layer 8' of Davies et al. (1972, p. 61). Layer 45 yields ammonites of the genus *Haploceras*, indicative of a Tithonian age (Olóriz, 1978; Enay and Cecca, 1986). The find of specimens of the calpionellid *Chitinoidella* in layer 47 indicates the base of the upper Tithonian (Benzaggagh et al., 2010). Layers 46 to 54 comprise fine-grained, glauconitic limestones. In the middle part of layer 51, the calpionellids *Calpionella alpina* Lorenz, 1902 and *Crassicollaria parvula* Remane, 1962 indicate the base of the Berriasian (Remane et al., 1986; Benzaggagh et al., 2010). Casts of large, unidentified ammonites have been observed on the top of bedding planes in layers 46 and 52. Layer 53 contains the rich ammonite fauna described in the present paper. The section ends at layer 54, which is overlain by 4–4.5 m of limestones that grade into the overlying Kolur Formation.

3. Stratigraphic position of early Berriasian ammonites in the Shal formation

The ammonites mentioned in the present paper were collected from layer 53, which consists of several distinct beds. Only two of these yielded ammonites (Fig. 2). In the field the lower bed was designated 53* and the upper bed, which contains fragments of ammonites, was referred to as 53g. These beds crop out both along a cliff, where we measured and sampled the section, and also along the road (which is almost 30 m away from the cliff face) where the beds have been referred to as 53*I and 53*bis. The ammonites collected in 1970 by K. Seyed-Emami and B. Hamzepour, and subsequently reported on by Seyed-Emami (1975), were collected along the road; their stratigraphic provenance is recorded here as 'layer 53'. We have studied 34 specimens from layer 53 (collected in 2005), both along the cliff and road and a single specimen from layer 54. We have also incorporated some of the specimens collected in 1970. The taxa identified in each of the two beds are listed below; the number of specimens is indicated in brackets. The rather poor preservation of numerous specimens required the use of 'cf.' in some cases; for others, specific identification proved impossible.

3.1. Cliff section

Bed 53*. *Lytoceras liebigi* (Oppel, 1865) (1 specimen), *Haploceras carachtheis* (Zeuschner, 1846) morph *elimatum* (Oppel, 1865) (2 specimens, Macroconch), *Pseudosubplanites* cf. *crymensis* Bogdanova and Arkadiev, 2005 (1 specimen), *P.* cf. *ponticus* (Retowski, 1893) (1 specimen), *Berriasella* sp. (11 specimens), ? *Taleshites* cf. *fuersichi* nov. gen., nov. sp. (1 specimen) and ?*Jabronella* sp. (1 specimen). Belemnites and rare brachiopods occur in this bed as well Fig. 4.

Bed 53g. *Berriasella* sp. (1 specimen), *Taleshites fuersichi* nov. gen., nov. sp. (1 specimen)

Bed 54. Berriasella (Hegaratella) cf. paramacilenta Mazenot, 1939 (1 specimen).

3.2. Road exposure

Bed 53*I. *Berriasella* (*B.*) cf. *sabatasi* Le Hégarat, 1973 (1 specimen), *T. fuersichi* nov. gen., nov. sp. (2 specimens).

Bed 53*bis. *L. liebigi* (1 specimen), *H. carachtheis* morph *elimatum* (1 specimen, macroconch; see Fig. 5J) and morph *carachtheis* (1 specimen, microconch; see Fig. 5G, H), *Berriasella* (*B.*) *oppeli* (Kilian, 1889) (1 specimen), *B.* (*B.*) *sabatasi* (1 specimen), *Pseudosubplanites lorioli* (von Zittel, 1868) (2 specimens), *P.* cf. *lorioli* (2 specimens), *T. fuersichi* nov. gen., nov. sp. (1 specimen).

3.3. Ammonites collected from layer 53 along the road by K. Seyed-Emami in 1975

Malbosiceras sp. (1 specimen), *T. fuersichi* nov. gen., nov. sp. (4 specimens) and *Berriasella* div. spp. (6 specimens).

4. Biostratigraphy

All species identified from the Shal section are from the *Berriasella jacobi* and *Pseudosubplanites grandis* zones *sensu* Le Hégarat (1973). These two biostratigraphic units were included as subzones by Hoedemaeker (1982) in the *Pseudosubplanites euxinus* Zone. Following a proposal by Tavera (1985), the vertical range of the *jacobi* Subzone has been enlarged to encompass the *euxinus* Zone, which means that the first ammonite zone of the Berriasian is the *jacobi* Zone *sensu* Tavera (1985). This solution, which was accepted by the Working Group on Lower Cretaceous Cephalopods in 1992 (Hoedemaeker and Company, 1993), is adopted in the present paper. The current Lower Cretaceous Ammonite Working Group (the 'Kilian Group') subsequently confirmed the *jacobi* Zone as the first ammonite zone of the Berriasian Stage (Reboulet and Hoedemaeker, 2006; Reboulet and Klein, 2009). In conclusion, all

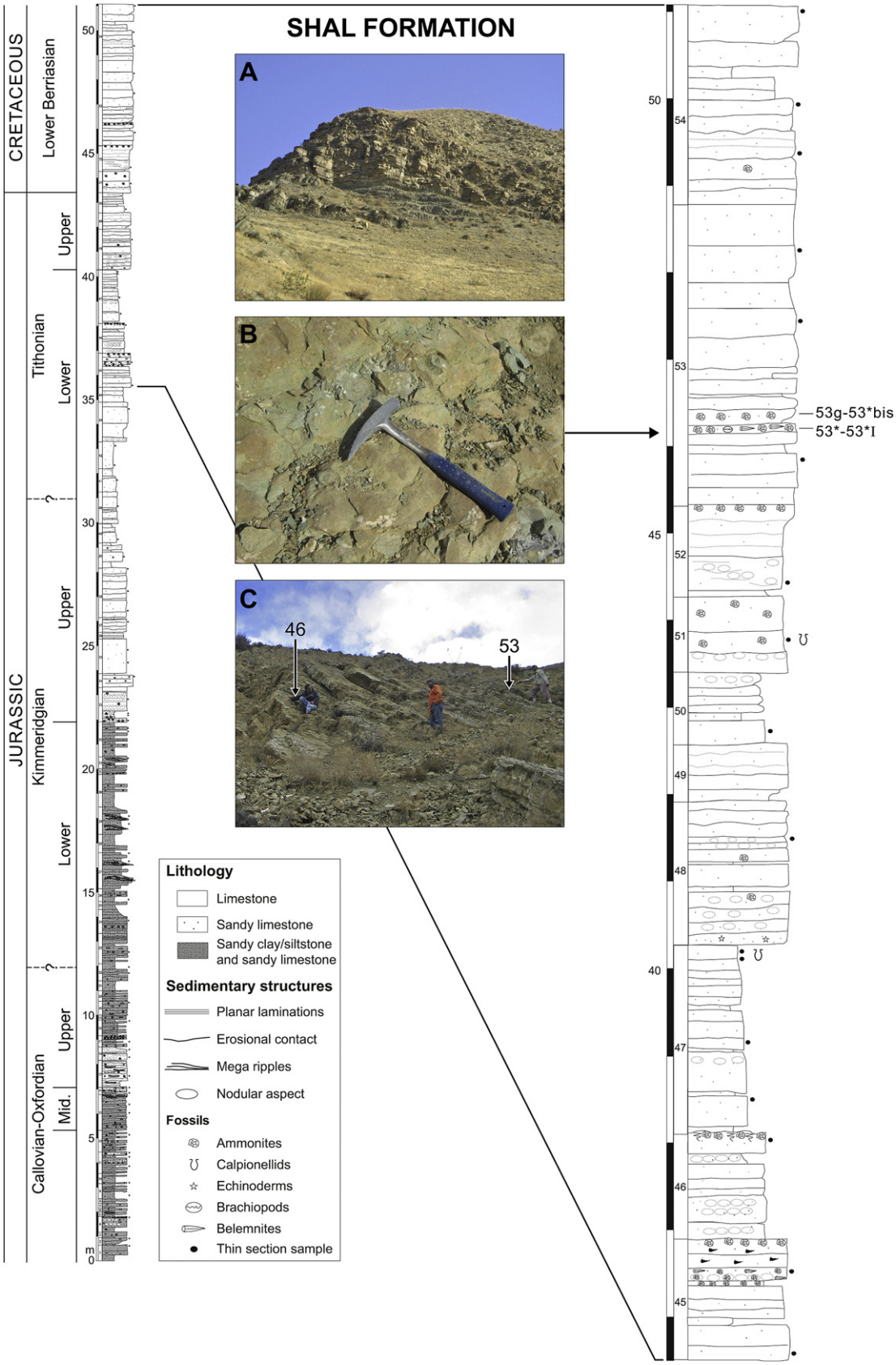

Fig. 2. Log of the Middle Jurassic-lower Berriasian Shal Formation as exposed in the section near the village of Shal, and closeup of layers 46 to 54 (right column); A. view of the section; B. top bedding plane of Bed 53*I; C. exposure of the section from the top of layer 46 to layer 53.

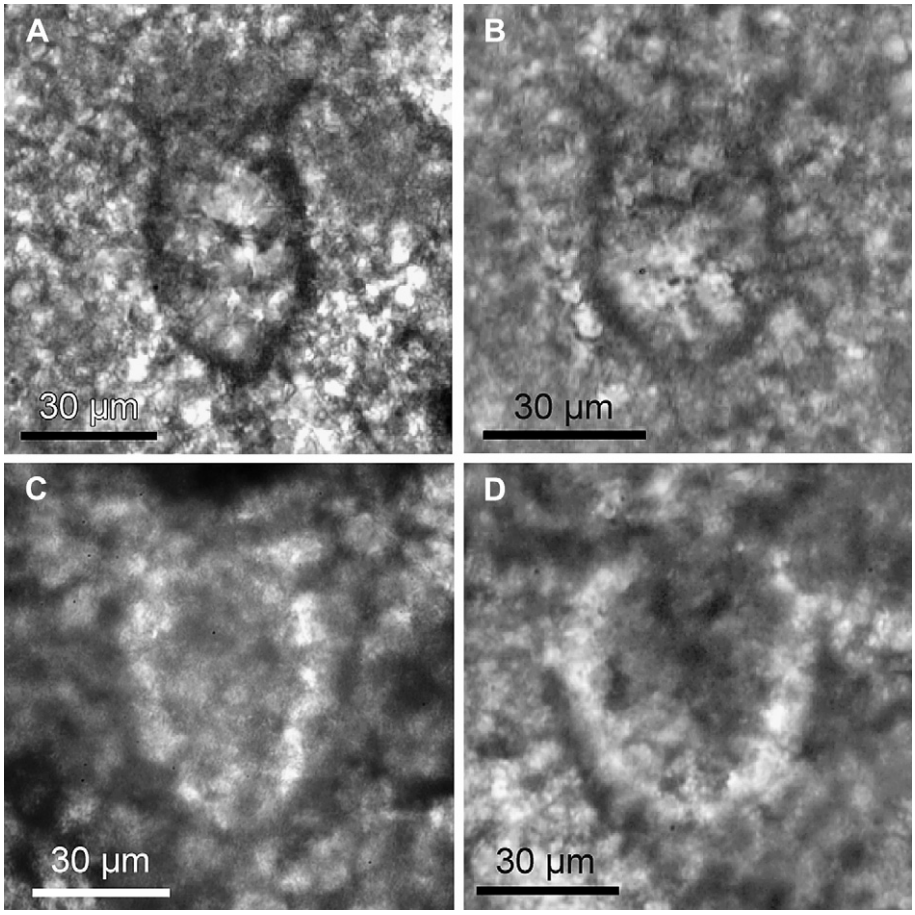

Fig. 3. Calpionellids from layers 47 and 51 of the Shal section; A. *Chitinoidella bermudezi* (Furrazola-Bermudez, 1965), top of Bed 47; B. *Chitinoidella boneti* Doben, 1963, top of Bed 47; C. *Crassicollaria parvula* Remane, 1962, middle of Bed 51; D. *Calpionella alpina* Lorenz, 1902, middle of Bed 51.

ammonite species identified from beds 53 and 54 in the Shal section (Fig. 2) belong to the *jacobi* Zone *sensu* Tavera.

Calpionellids support this age assignment. The occurrence in layer 51 of *C. parvula* Remane, 1962 and *C. alpina* (Lorenz, 1902) (Fig. 3) indicates the lower portion of the standard calpionellid Zone B (Remane et al., 1986), namely Subzone B1 (Benzaggagh and Atrops, 1995; Benzaggagh et al., 2010). The base of this Zone B coincides with that of the *jacobi* Zone (Enay and Geyssant, 1975; Cecca et al., 1989; Benzaggagh et al., 2010). Calpionellids from both the Shal and Kolur formations will be described in detail in a forthcoming paper.

Seyed-Emami (1975) assigned the fauna collected by him (see above) to the late Tithonian, according to the definition of the Jurassic/Cretaceous boundary that was further modified (Zakharov et al., 1996) in agreement with recommendations made at the 1973 'Colloque sur la limite Jurassique-Crétacé' at Lyon-Neuchâtel

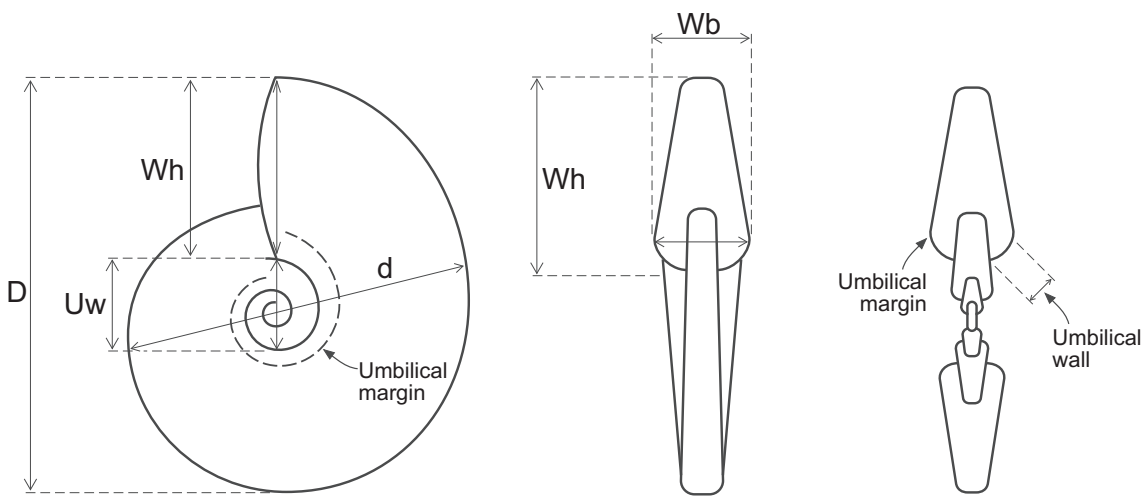

Fig. 4. Abbreviations of dimensional parameters used in the systematic descriptions, and nomenclature of some shell characters. D = maximum diameter; d = lower diameter; Uw = umbilical width; Wh = whorl height; Wb = whorl breadth.

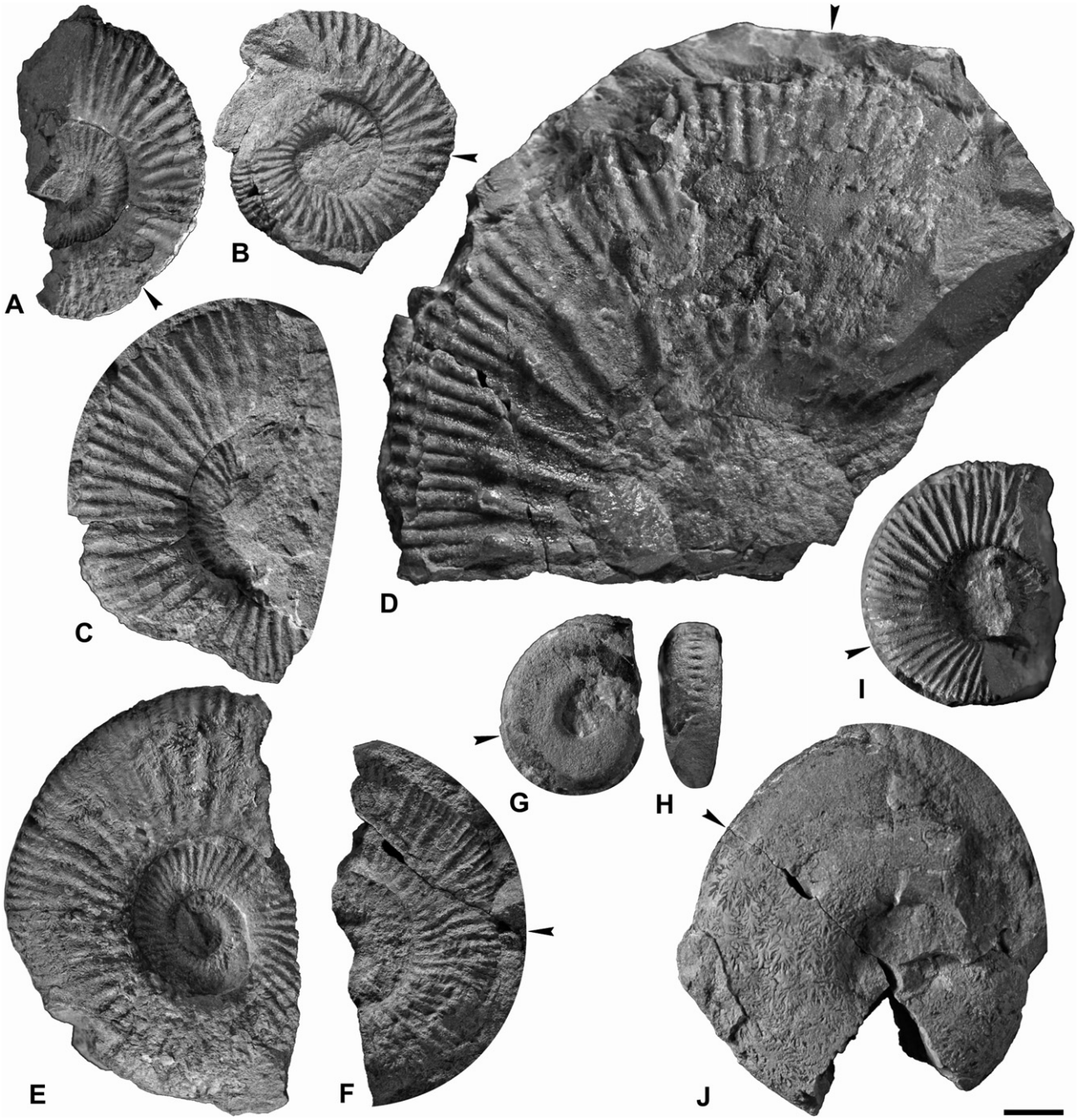

Fig. 5. Ammonites from the Shal section; A. *Pseudosubplanites lorioli* (von Zittel, 1868), BSPG 2010 XVI 9, Bed 53*bis; B. *P. lorioli* (von Zittel, 1868), BSPG 2010 XVI 15, Bed 53*bis; C. *Pseudosubplanites* cf. *crymensis* Bogdanova and Arkadiev, 2005, BSPG 2010 XVI 5, Bed 53*; D. *Malbosiceras* sp., BSPG 2010 XVI 21, Bed 53; E. *Berriasella sabatasi* Le Hégarat, 1973, BSPG 2010 XVI 3, Bed 53*bis; F. *Pseudosubplanites* cf. *ponticus* (Retowski, 1893), BSPG 2010 XVI 16, Bed 53*; G, H. *Haploceras carachtheis* morph *carachtheis* Zeuschner, 1846, microconch, BSPG 2010 XVI 24, Bed 53*bis; I. *Berriasella oppeli* (Kilian, 1889), BSPG 2010 XVI 13, Bed 53*bis; J. *H. carachtheis* morph *elimatum* Oppel, 1865, macroconch, BSPG 2010 XVI 23, Bed 53*bis. The arrows denote the beginning of the body chamber. Scale bar equals 10 mm.

(Flandrin et al., 1975). According to these recommendations, which are currently followed in the Mediterranean areas, the Jurassic/Cretaceous boundary is drawn at the base of the *jacobi* Zone. Thus, the ammonites of layer 53 belong to the early Berriasian *jacobi* Zone.

5. Systematic palaeontology (FC and KS-E)

Here we describe only representatives of the subfamily Berriasellinae Spath, 1922 taxonomically. The standard dimensions for normally coiled ammonites are given in millimetres and as percentages of total diameter. With regard to shell parameters, the following abbreviations (Fig. 4) are been used: D = maximum diameter; d = diameter at which measurements were taken when less than D; Wh = whorl height; Uw = umbilical width; Wb = whorl breadth; the ratio Wb/Wh expresses the degree of whorl compression; K = number of ribs per half a whorl; Ph = diameter of the end of phragmocone ('n' signifies that the specimen is wholly septate).

We follow the terminology introduced by Zeiss (1968) in his seminal work on Tithonian perisphinctids in our description of ribbing types. This nomenclature has been widely accepted by

ammonite specialists working on perisphinctoid lineages, including the Berriasellidae (e.g., Le Hégarat, 1973; Nikolov, 1982; Tavera, 1985).

All specimens referred to in the present paper are housed in the collections of the Bayerische Staatssammlung für Paläontologie und historische Geologie, Munich (Germany; abbreviation: BSPG).

Order: Ammonoidea von Zittel, 1884
Suborder: Ammonitina Hyatt, 1889
Superfamily: Perisphinctoidea Steinmann *in* Steinmann and Döderlein, 1890
Family: Neocomitidae Salfeld, 1921
Subfamily: Berriasellinae Spath, 1922

Remarks. This subfamily has been thoroughly monographed by Mazenot (1939), Le Hégarat (1973), Nikolov (1982) and Tavera (1985). Additional relevant data can be found in papers by Retowski (1893) and, in part, in the recent revision of species-level taxonomy of the genus *Pseudosubplanites* from Crimea by Bogdanova and Arkadiev (2005). Several specimens from Shal are assigned to the latter genus.

Genus *Pseudosubplanites* Le Hégarat, 1973

Type species: *Pseudosubplanites berriasensis* Le Hégarat, 1973

Remarks. Le Hégarat (1973) placed this genus in the family Perisphinctidae Steinmann, 1890. However, Tavera (1985) proposed to include it in the subfamily Berriasellinae, as a subgenus of *Berriasella* Uhlig (1905). We concur with Tavera (1985) in retaining *Pseudosubplanites* as a distinct berriasellinid genus.

Pseudosubplanites lorioli (von Zittel, 1868)
Fig. 5A, B

1868 *Ammonites lorioli* von Zittel, p. 103, pl. 20, figs 6–8.
2005 *Pseudosubplanites lorioli* (Zittel, 1868); Bogdanova and Arkadiev, p. 493, figs. 4D, 5C, 6A, B, 7A–I (with additional synonymy).

Material. BSPG 2010 XVI 9 and 15; BSPG 2010 XVI 12 and 14 are assigned to this species with a query, *P.* cf. *lorioli*.

Description. Species characterised by small size (40–50 mm), of moderately evolute coiling; ornament consisting mostly of biplicate ribs, whose posterior branch is slightly rursiradiate. A polygyrate rib is seen in BSPG 2010 XVI 9 (Fig. 5A). Simple ribs are rare.

Remarks. Le Hégarat (1973) and Bogdanova and Arkadiev (2005) discussed the range of variation of the present species on the basis of a detailed comparison with congeners. Size and umbilical width of our specimens exceed those of specimens figured by those authors, but fall within the range of variation defined by Le Hégarat (1973). Two other fragments have been identified as *P.* cf. *lorioli*.

Dimensions

Specimen	*D*	Wh	Wb	Uw	Wb/Wh	*K*	Ph
BSPG 2010 XVI 9	52	18 (0.35)	~14 (0.27)	20 (0.40)	0.78	–	~36
BSPG 2010 XVI 15	~43	~15.5 (0.36)	–	16 (0.37)	–	–	~38

Geographical and stratigraphical distribution. This species has been recorded from southeast France, southern Spain, Austria, Poland, Romania, the Czech Republic, Bulgaria, Crimea (Ukraine), Caucasus and Tunisia (von Zittel, 1868; Le Hégarat, 1973; Patrulius and Avram, 1976; Nikolov, 1982; Tavera, 1985; Bogdanova and Arkadiev, 2005), all from horizons equivalent to the *jacobi* Zone *sensu* Tavera (1985).

Pseudosubplanites cf. *ponticus* (Retowski, 1893)
Fig. 5F

Material. BSPG 2010 XVI 16.

Description. We assign, with a query, a fragment of an ammonite shell that probably reached a diameter of at least 60 mm to this species. Half of the final whorl is preserved; half of the preserved portion of this is body chamber. Ribs are biplicate and polygyrate, flexuous and relatively numerous. Two polygyrate ribs occur in the last part of the phragmocone and two others on the preserved portion of the body chamber. Inner whorls are partially and poorly preserved.

Remarks. Although the number of polygyrate ribs seems to be higher than in specimens figured in the literature, the ribbing of the present example suggests its assignment to *Pseudosubplanites ponticus*. *Pseudosubplanites euxinus* (Retowski, 1893), considered by Bogdanova and Arkadiev (2005) to be synonymous with *Pseudosubplanites lorioli*, has a relatively higher number of polygyrate ribs. In addition, smaller and more involute shells characterise the latter species, or morphotype of *lorioli*.

Geographical and stratigraphical distribution. *P. ponticus* has been recorded from southeast France, Switzerland, southern Spain, Poland, Romania, the Czech Republic, Bulgaria, Crimea (Ukraine), northern Caucasus and Tunisia (Le Hégarat, 1973; Patrulius and Avram, 1976; Nikolov, 1982; Tavera, 1985; Bogdanova and Arkadiev, 2005), from stratigraphical horizons equivalent to the *jacobi* Zone *sensu* Tavera (1985).

Pseudosubplanites cf. *crymensis* Bogdanova and Arkadiev, 2005
Fig. 5C

Material. BSPG 2010 XVI 5.

Description. A specimen of an ammonite that reached a diameter of almost 70 mm is tentatively assigned to this species. The ribs on the visible portion of the venter cross this uninterrupted, thus justifying the assignment to *Pseudosubplanites*. Ribs are strong, biplicate and, rarely, simple. Secondary ribs are slightly prorsiradiate, but do not project towards the shell aperture, the posterior branch being slightly rursiradiate.

Remarks. *Pseudosubplanites crymensis* is characterised by the absence of polygyrate ribs; such are probably also lacking in our specimen, although only half is preserved. *Pseudosubplanites combesi* Le Hégarat, 1973 is similar to the present example, but develops polygyrate ribs, while *P. berriasensis* Le Hégarat, 1973 has numerous polygyrate ribs. The secondary ribs in *P. grandis* (Mazenot, 1939) have a characteristic projection towards the aperture; this is not developed in our specimen.

Geographical and stratigraphical distribution. To date, *Pseudosubplanites crymensis* has been described from Crimea (Bogdanova and Arkadiev, 2005), where it occurs in the *jacobi* Zone.

Genus *Berriasella* Uhlig, 1905

Type species: *Ammonites privasensis* Pictet, 1867

Berriasella oppeli (Kilian, 1889)
Fig. 5I

1868 *Ammonites callisto* d'Orbigny; von Zittel, p. 100 (*pars*), pl. 20, figs 1–4, *non* fig. 5. 1889 *Perisphinctes oppeli* Kilian, p. 662.
1985 *Berriasella* (*Berriasella*) *oppeli* (Kilian); Tavera, p. 252, text-fig. 19K; pl. 35, figs 3–5 (with additional synonymy).

Material. BSPG 2010 XVI 13.

Description. The specimen assigned to this species shows evolute coiling, an ovate whorl section, with slightly convex flanks. The umbilical margin is rounded. Ribs are biplicate, with the exception of a single simple rib at the end of the last whorl, slightly prorsiradiate and interrupted on the venter by a smooth band. On the body chamber ribs are slightly thickened, forming tiny tubercles on both sides of this ventral smooth band.

Remarks. The specimen from Shal is of a smaller size than the holotype of the species (von Zittel, 1868, pl. 20, fig. 1; plaster cast photographed by Mazenot, 1939, pl. 3, fig. 1), to which it is otherwise closely similar.

Dimensions

Specimen	*D*	Wh	Wb	Uw	Wb/Wh	*K*	Ph
BSPG 2010 XVI 13	42	~16.5 (0.39)		~15 (0.36)		22	~31

Geographical and stratigraphical distribution. This species has been recorded from southeast France, southern Spain, Romania, the Czech Republic, Bulgaria and Tunisia (von Zittel, 1868; Le Hégarat, 1973; Patrulius and Avram, 1976; Nikolov, 1982; Tavera, 1985), from stratigraphic horizons equivalent to the *jacobi* Zone *sensu* Tavera (1985).

Berriasella sabatasi Le Hégarat, 1973
Fig. 5E

1939 *Berriasella moreti* Mazenot, p. 61 (*pars*), pl. 5, fig. 1, *non* figs 2, 3
1973 *Berriasella* (*Berriasella*) *sabatasi* Le Hégarat, p. 63, pl. 6, fig. 7; pl. 38, fig. 10.
1985 *Berriasella* (*Berriasella*) *sabatasi* Le Hégarat; Tavera, p. 251, text-fig. 19J; pl. 35, figs 1, 2.

Material. BSPG 2010 XVI 3.

Description. Berriasellid macroconch characterised by slightly convex flanks, almost flat venter, rounded umbilical edge and a relatively steeply inclined umbilical wall. The ornament consists of flexuous, biplicate ribs with secondary ribs that are weaker than primary ones; shallow constrictions occur. The second specimen, BSPG 2010 XVI 1, identified as *B*. cf. *sabatasi*, shows denser ribbing.

Remarks. Both specimens assigned here are wholly septate; the one figured is slightly deformed but clearly shows the characters of the holotype, illustrated both by Mazenot (1939, pl. 5, fig. 1) and Le Hégarat (1973, pl. 38, fig. 10).

Geographical and stratigraphical distribution. This species has been recorded from southeast France (Le Hégarat, 1973), from stratigraphic horizons equivalent to the *jacobi* Zone and from southern Spain from beds assigned to the *jacobi* Zone and the base of the *andrussowi* Zone (Tavera, 1985).

Genus *Malbosiceras* Grigorieva, 1938

Type species: *Ammonites malbosi* Pictet, 1867

Remarks. Our interpretation of this genus follows Tavera (1985), who considered *Mazenoticeras*, *Pomeliceras* and some of the species included by Le Hégarat (1973) in *Delphinella* to be synonyms of *Malbosiceras*.

Malbosiceras sp.
Fig. 5D

Material. BSPG 2010 XVI 21.

Description. A near-completely septate fragment of a large specimen characterised by a compressed whorl section with parallel flanks that, starting from a height that coincides with the location of the lateral row of tubercles, converge towards the rounded ventral area. The umbilical wall is low and the umbilical margin rounded (note that the umbilical wall at the end of the last preserved whorl is free from the matrix plug of matrix that covers this portion of the shell). The ornament consists of strong, elevated ribs that branch near mid-flank. Two secondary ribs arise from a prominent, rounded tubercle located at the point of branching. One or two intercalated ribs occur between biplicate ribs. Although the venter is poorly preserved, the main ribs do not develop tubercles and are simply thickened on the ventral margin.

Remarks. It is impossible to assign this specimen to any of the species described in the literature, because the body chamber is not preserved. It is worth noting that our specimen is almost wholly septate and that species included in *Malbosiceras* mostly develop umbilical tubercles in the adult body chamber. Assignment of BSPG 2010 XVI 21 to *Malbosiceras* is questionable, because it does not show clear umbilical tubercles. The genus *Retowskiceras* does develop a row of lateral tubercles but shows a different ribbing pattern with biplicate or rare trifurcate ribs, arising from the tubercles, plus rare intercalated ribs.

Genus *Taleshites* nov.

Type species (by monotypy): *Taleshites fuersichi* nov. sp.

Diagnosis. Evolute shells with a high, ovate whorl section. Phragmocone ornament consists of biplicate and simple ribs; while on the body chamber ribs become flexuous and more widely spaced; constrictions are deep; intercalated and fasciculate ribs are developed.

Comparisons. *T. fuersichi* nov. sp. cannot be confused with any berriasellid, in view of its peculiar ontogenetic change in ornament characters. Species of the genus *Berriasella* do not develop the fasciculate ribs and rib spacing observed on the adult body chamber of *T. fuersichi* nov. gen, nov. sp. The absence of tubercles precludes comparison with other berriasellids such as *Malbosiceras*, *Fauriella*, *Jabronella*, *Retowskiceras* and *Tirnovella*. *Pseudosubplanites* includes species with the closest morphological resemblance to this new form. However, *T. fuersichi* nov. gen., nov. sp. shows a characteristic ribbing change in the body chamber which is not observed in *Pseudosubplanites*. Furthermore, according to Bogdanova and Arkadiev (2005, p. 490), the latter genus develops bidichotomous ribs; such are lacking in our taxon. The change in ornament in the final growth stage and the continuity of ribs on the venter in the mature body chamber of *T. fuersichi* nov. gen., nov. sp. suggest closer affinities with late Tithonian perisphinctids rather than with berriasellids. Le Hégarat (1973) noted the morphological similarities of *Parapallasiceras busnardoi* Le Hégarat, 1973 and *P. bochianensis* Le Hégarat, 1973 to certain Tithonian perisphinctids. However, these two species, for which Tavera (1985, p. 236) erected *Busnardoiceras* (as a subgenus of *Berriasella*) develop virgatotome ribs, a feature not seen in ammonites here included in *Taleshites* nov. gen.

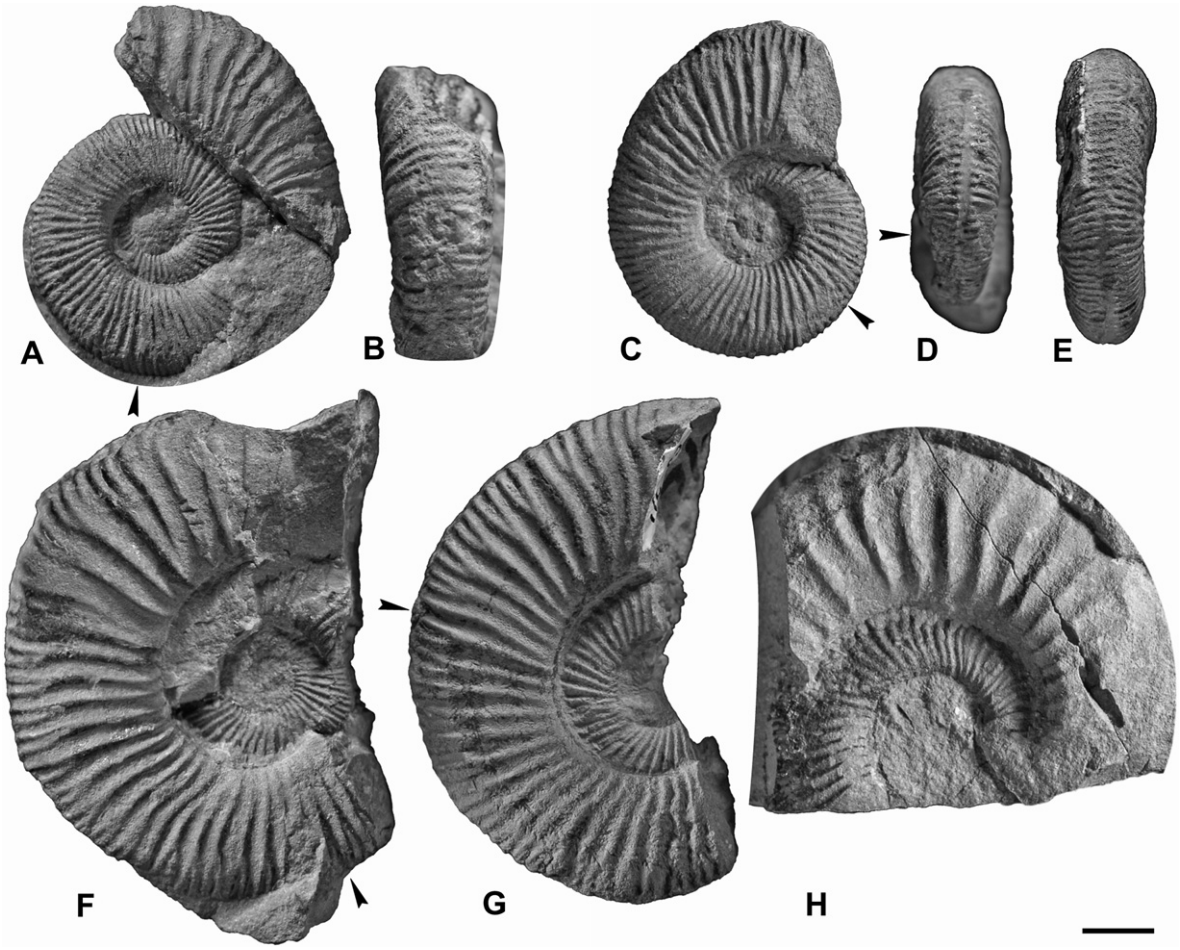

Fig. 6. Ammonites from the Shal section. A–H. *Taleshites fuersichi* nov. gen., nov. sp.; A. paratype, BSPG 2010 XVI 2, Bed 53*I; B. ventral view of the same specimen, note that ribs cross the venter without interruption; C. Paratype, BSPG 2010 XVI 11, Bed 53*bis; D, E. ventral views of the same specimen showing the presence of a ventral smooth band following the end of the phragmocone and its disappearance at $d = 37$ mm; F. Holotype, BSPG 2010 XVI 18, Bed 53; G. paratype, BSPG 2010 XVI 17, Bed 53; H. Paratype, BSPG 2010 XVI 8, Bed 53g. Note that the initial part of the last whorl of this specimen belongs to the phragmocone whereas the last half corresponds to the body chamber. The last septum probably occurred in the missing part of the last whorl. The arrows denote the beginning of the body chamber. Scale bar equals 10 mm.

Taleshites fuersichi nov. gen., nov. sp.
Fig. 6A–H

Derivation of name. The species is dedicated to Prof. Franz Fürsich.

Types. Holotype is BSPG 2010 XVI 18; paratypes are BSPG 2010 XVI 2, 7, 8, 11 and 17.

Additional material: BSPG 2010 XVI 19 and 20 (*T.* cf. *fuersichi*); BSPG 2010 XVI 6 (?*Taleshites* cf. *fuersichi*).

Type locality. Shal, Talesh region, northwest Iran.

Stratigraphical horizon. Berriasella jacobi Zone, early Berriasian.

Diagnosis. As for genus (see above).

Description. Evolute shell, with flat flanks that converge towards the venter. On the inner whorls (up to $d = 50$ mm), the venter is rounded and the whorl section ovate. Then the venter widens, while remaining rounded, and flanks tend to become flattened. The umbilical wall is wide and oblique, the umbilical edge rounded on the phragmocone and tends to disappear in the adult body chamber.

On the inner whorls ribbing is dense, up to the end of the phragmocone. These ribs are fine, prorsiradiate and biplicate. The ribs branch in the upper third of the flank. Shallow constrictions occur at this stage of development. Simple ribs are rare and their number varies among the specimens studied (numerous in BSPG 2010 XVI 2 [see Fig. 6A]; rare in BSPG 2010 XVI 11 [see Fig. 6C]). Polygyrate ribs are not observed on the phragmocone, although on one specimen (see Fig. 6C), a fasciculate rib, made up of a biplicate rib and an oblique simple rib on the adapical side of a shallow constriction, at $d = 32$ mm, mimics a polygyrate rib. Two fasciculate ribs of this kind are also developed at $d = 26–29$ mm in BSPG 2010 XVI 8 (Fig. 6H). Ribs cross the venter without interruption (BSPG 2010 XVI 2; see Fig. 6B), from at least $d = 37$ mm. This can be seen in BSPG 2010 XVI 11 (see Fig. 6C), which is an individual that did not reach maturity. Here a shallow ventral smooth band is visible following the end of the phragmocone, up to $d = 37$ mm, where it disappears (BSPG 2010 XVI 11; see Fig. 6D, E).

On the body chamber ribbing becomes irregular and dissimilar to that on the phragmocone. The end of the phragmocone may be marked by a constriction but this is not always the case (i.e., BSPG 2010 XVI 17; see Fig. 6G). Ribs become flexuous: the lower, simple half of the rib is prorsiradiate, the upper half, which bifurcates, gently rursiradiate. Constrictions are deep and relatively frequent at this stage; thickened ribs on the adoral or in the adapical side mark them. Rib interspaces become larger (compare the last third of the ultimate whorl of the holotype, BSPG 2010 XVI 18 [see Fig. 6F] with the equivalent second half of the last whorl in BSPG 2010 XVI 8 [see Fig. 6H]). Biplicate ribs are still developed at this stage, but

intercalated ribs (Fig. 6F–H), and even fasciculate ones (one simple one, united to a biplicate rib in the lower third of the flank) occur.

Remarks. Ornament characters unknown in coeval taxa characterise the new taxon. Biplicate ribbing, and the absence of genuine polygyrate ribs, would suggest affinities with the genera *Pseudosubplanites* and *Hegaratella*, which have no ventral interruption of the ribs. However, in the adult body chamber of these genera, a combination of rib spacing with fasciculate ribs, frequent constrictions and simple ribs is not observed.

Dimensions

Specimen	*D*	Wh	Wb	Uw	Wb/Wh	*K*	Ph
BSPG 2010 XVI 2, paratype	52	19.5 (0.375)	15.5 (0.29)	21 (0.40)	0.79		~40
BSPG 2010 XV1 11, paratype	46	16.5 (0.36)	14 (0.30)	16 (0.35)	0.97		~28
BSPG 2010 XV1 17, paratype	69.5	24 (0.345)	~20.5 (0.29)	28 (0.40)	~0.73	27	~60
BSPG 2010 XV1 18, holotype	~70 at $d = 60$	25 (0.37)	–	~25 (0.37)	–	24	~49

6. Conclusions

The majority of early Berriasian ammonite species identified from the Shal section have previously been recorded from numerous well-studied localities in Europe and North Africa. This, together with the occurrence of calpionellids, allows good correlation with biozones established at the classic sections in southeast France. The presence of lytoceratids and *Haploceras* is indicative of a connection with open oceanic environments (Westermann, 1996). According to recent palaeogeographical reconstructions, the Talesh area was part of the northern margin of Tethys (Barrier and Vrielynck, 2008; Wilmsen et al., 2010). The Shal Basin was situated along the northern margin of the Lar platform, to the south of the oceanic South Caspian Basin and connected with Tethys to the west. The affinity of the Shal Basin fauna with early Berriasian assemblages from southeast France, southern Spain, Morocco, Tunisia, Bulgaria and Crimea is in agreement with this palaeogeographical reconstruction. The sole faunal element that provisionally appears to be endemic is *Taleshites fuersichi* nov. gen., nov. sp., but whether or not this is a genuine endemic can only be tested by further fieldwork and re-examination of previously made collections from elsewhere.

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