

# Ammonoids from the Dalle des Iridet of the Mouydir and Ahnet (Central Sahara) and the Formation d'Hassi Sguilma of the Saoura Valley (Late Tournaisian–Early Viséan; Algeria)

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## Abstract

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## Key Words

Ammonoidea  
Mississippian  
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taxonomy

Four ammonoid species are described from the Early Carboniferous (Mississippian) Iridet Formation of the Ahnet and Mouydir (Central Sahara, Algeria); three of which are new: *Eurites temertassetensis* n. sp., *Trimorphoceras teguentourense* n. sp., and *Trimorphoceras azzelmattiense* n. sp. The species can be attributed to the North African *Ammonellites-Merocanites* Assemblage (*Fascipericyclus-Ammonellites* Genus Zone; Late Tournaisian to Early Viséan). Additionally, the two new species *Ammonellites sguilmensis* n. sp. and *Muensteroceras beniabbesense* n. sp. are described from the time equivalent Hassi Sguilma Formation of the Saoura Valley (north-western Algeria).

## Introduction

The Iridet Formation (= Dalle des Iridet) is the first prominent carbonate horizon in the Early Carboniferous succession of Central Algeria (Conrad 1984; Wendt et al. 2009). It forms a highly visible calcareous marker horizon across wide distances in the regions of the Ahnet and Mouydir (Fig. 1) and varies in thickness from a few metres up to 170 m. The carbonate horizon is not a single unit, but a sequence of several calcareous layers separated by shales. Ammonoids occur mainly at the base of the formation.

The Iridet Formation is largely a time equivalent of the Hassi Sguilma Formation near Béni Abbès in the Béchar Basin (Menchikoff 1930; Pareyn 1961) and the Dalle à *Merocanites* of Timimoun (Conrad 1984), but the precise relationships are not clear. Composition of the ammonoid faunas from the three regions differ to some degree, but resemble each other in the presence of typically latest Tournaisian and earliest Viséan taxa,

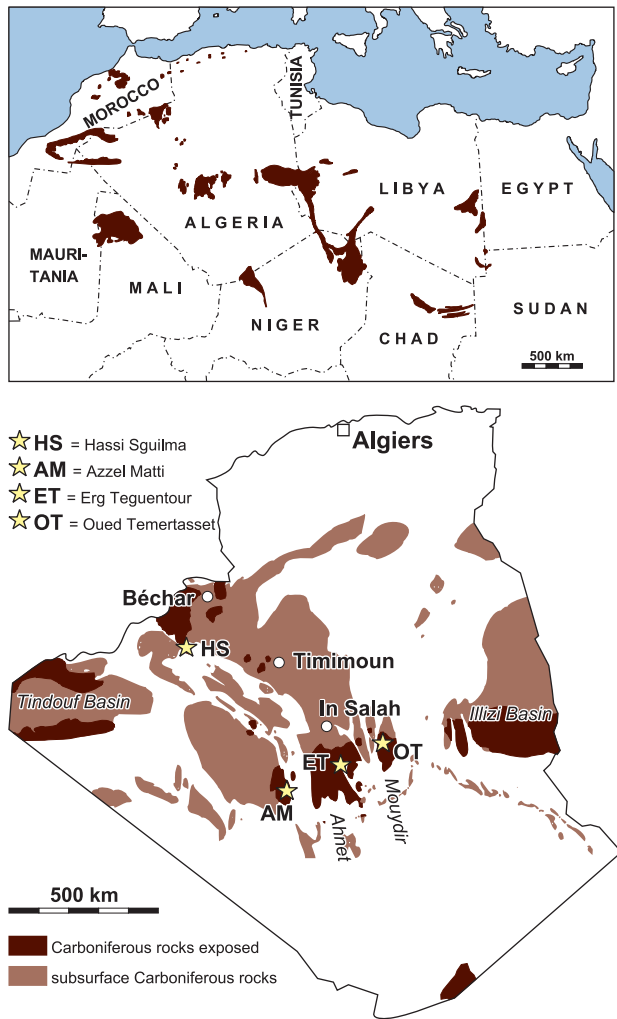
i.e. the North African *Ammonellites-Merocanites* Assemblage (Korn et al. 2007; Fig. 2).

The present study can only provide preliminary results of the analysis of the ammonoids from the Iridet Formation and the Hassi Sguilma Formation. Much more field work is necessary to uncover the rich assemblages of the two formations. However, the available material will be described here for the first time to compliment the monographs of the early Late Tournaisian (Korn et al. 2010a, 2010b) as well as the Early and Middle Viséan (Bockwinkel et al. 2010) assemblages from Algeria.

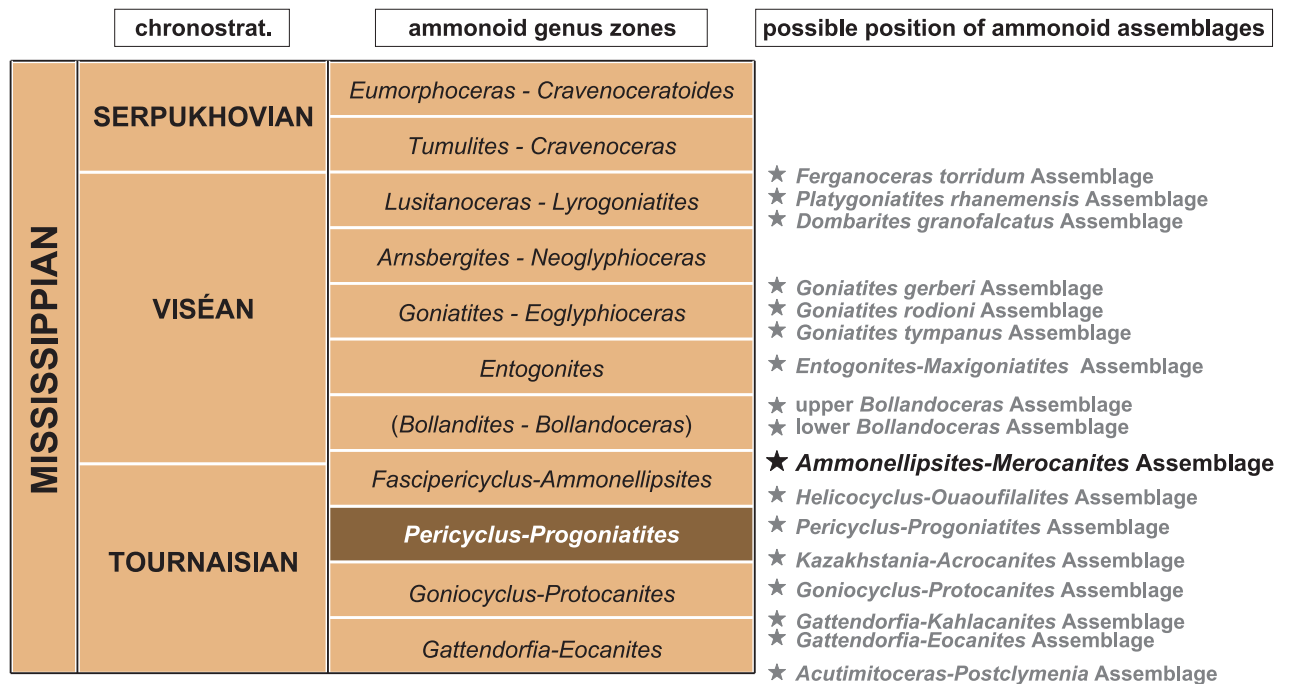
## Material

Ammonoids from several exposures of the Iridet Formation (Dalle des Iridet in Conrad 1984) in the Mouydir and Ahnet regions have been studied (for a detailed description of the localities, see Wendt et al. 2009):

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**Figure 1.** The outcrop of Palaeozoic rocks in northern Africa and the geographic position (marked by an asterisk) of the localities of the Iridet Formation and the Hassi Sguilma Formation.



**Figure 2.** Stratigraphic scheme of the Early Carboniferous (Mississippian) chronostratigraphy and ammonoid zonation with correlation to the North African ammonoid assemblages (after Korn et al. 2004, 2007). The position of the fauna from the Iridet Formation and the Hassi Sguilma Formation is highlighted.

**Oued Temertasset (Mouydir), locality MOU-U; 26.6778° N, 3.8795° E (specimens collected by the authors and Dieter Weyer, 2002):**

<i>Eurites temertassetensis</i> n. sp.	5 specimens (MB.C.18617.1–5)
<i>Eurites</i> sp.	1 specimen (MB.C.18618)
<i>Trimorphoceras</i> sp.	1 specimen (MB.C.18619)

**Oued Temertasset (Mouydir); same locality (Wendt and Kaufmann Coll.):**

<i>Eurites temertassetensis</i> n. sp.	1 specimen (MB.C.18620)
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**West-southwest of Gara Azzel Matti (Ahnet); 25.4732° N, 0.7067° E (Wendt and Kaufmann Coll.):**

<i>Trimorphoceras azzelmattiense</i> n. sp.	1 specimen (MB.C.18621)
<i>Trimorphoceras</i> sp.	3 specimens (MB.C.18622.1–3)

**Erg Teguentour (Ahnet); 26.1433° N, 2.8418° E (Wendt & Kaufmann Coll.):**

<i>Hammatocyclus</i> sp.	1 specimen (MB.C.18623)
<i>Eurites commutatus</i> Ebbighausen et al., 2010	1 specimen (MB.C.18624)
<i>Trimorphoceras teguentourense</i> n. sp.	2 specimens (MB.C.18625.1–2)
<i>Trimorphoceras absolutum</i> Ebbighausen et al., 2010	1 specimen (MB.C.18626)
<i>Trimorphoceras molestum</i> Ebbighausen et al., 2010	1 specimen (MB.C.18627)
<i>Dzhaprakoceras dzhazairense</i> Ebbighausen et al., 2010	10 specimens (MB.C.18628.1–10)

**South-southwest of Jebel Mouïma (Ahnet); 25.7739° N, 2.8147° E (Wendt and Kaufmann Coll.):**

<i>Dzhaprakoceras dzhazairense</i> Ebbighausen et al., 2010	1 specimen (MB.C.18629)
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**Hassi Sguilma 17 km north-west of Béni Abbès; 30.2194° N, 2.3147° W (Bockwinkel, Ebbighausen and Korn 2003 Coll.):**

<i>Irinoceras</i> sp.	1 specimen (MB.C.18630)
<i>Ammonellipsites sguilmense</i> n. sp.	2 specimens (MB.C.18631.1–2)
<i>Muensteroceras beniabbesense</i> n. sp.	4 specimens (MB.C.18632.1–4)
<i>Muensteroceras</i> sp.	1 specimen (MB.C.18633)
<i>Eurites temertassetensis</i> n. sp.	1 specimen (MB.C.18634)
<i>Eurites</i> sp.	3 specimens (MB.C.18635.1–3)
<i>Trimorphoceras crassilens</i> Ebbighausen et al., 2010	1 specimen (MB.C.18636)
<i>Dzhaprakoceras dzhazairense</i> Ebbighausen et al., 2010	1 specimen (MB.C.18637)
<i>Merocanites</i> sp.	1 specimen (MB.C.18707)

## Systematic Palaeontology

The descriptive part of this monograph will mainly focus on the illustration and morphometric analysis of the species with particular attention to their ontogenetic de-

velopment, where possible. The key for the description of the species, including explanation of methods, is published in this volume by Korn (2010). Sutural terminology follows Korn et al. (2003).

Order **Goniatitida** Hyatt, 1884

Suborder **Goniatitina** Hyatt, 1884

Superfamily **Pericyclaceae** Hyatt, 1900

Family **Pericyclidae** Hyatt, 1900

Subfamily **Ammonellipsitinae** Riley, 1996

### *Ammonellipsites* Parkinson, 1822

For a detailed discussion of the genus, see Ebbighausen et al. (2010).

#### *Ammonellipsites sguilmensis* n. sp.

Figures 3, 4

1961 *Pericyclus plicatilis*. – Pareyn, p. 138, pl. 12, figs 9–12.

1961 *Pericyclus nikitini*. – Pareyn, p. 140, pl. 12, figs 7, 8.

*Derivation of name.* After the type locality.

*Holotype.* Specimen MB.C.18631.1, illustrated in Figure 3.

*Type locality and horizon.* Hassi Sguilma (17 km north-west of Béni Abbès, Algeria); Hassi Sguilma Formation (*Ammonellipsites-Merocanites* Assemblage).

*Material.* The holotype.

**Diagnosis.** *Ammonellipsites* with a thickly discoidal, subevolute conch at 30 mm dm; umbilical margin broadly rounded, umbilical wall convex; aperture low. Ornament with 75–80 sharp equidistant ribs per volution, course convex and slightly rursiradiate with shallow ventral sinus. Suture line with very narrow, V-shaped external lobe with subparallel and gently sinuous flanks and low median saddle; ventrolateral saddle subacute, adventive lobe narrow and lanceolate, symmetric.

**Table 1.** Conch shape (Fig. 4A) of *Ammonellipsites sguilmensis* n. sp.

dm	conch shape	whorl cross section shape	aperture
30 mm	thickly discoidal; subevolute (ww/dm ~ 0.54; uw/dm ~ 0.38)	moderately depressed; moderately embracing (ww/wh ~ 1.60; IZR ~ 0.30)	low (WER ~ 1.72)

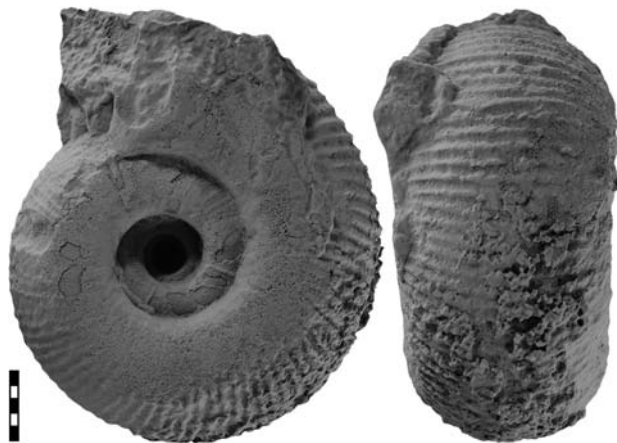
**Table 2.** Conch dimensions (in mm) and proportions for reference specimens of *Ammonellipsites sguilmensis* n. sp.

	dm	ww	wh	uw	ah	ww/dm	ww/wh	uw/dm	WER	IZR
holotype MB.C.18631.1	30.7	16.7	10.5	11.8	7.3	0.54	1.59	0.38	1.72	0.30

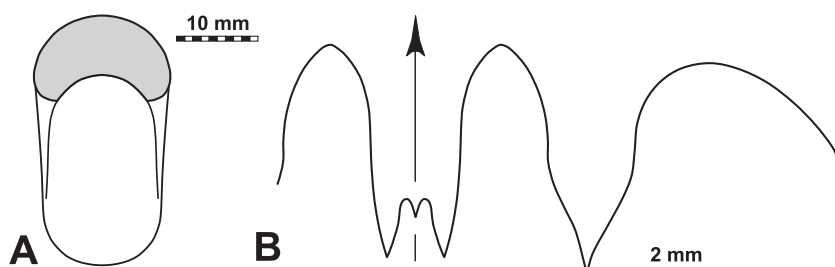
**Table 3.** Suture line proportions (Fig. 4B) for *Ammonellipsites sguilmensis* n. sp.

specimen	at dm	EL w/d	EL/VLS	EL/AL	MS h	VLS w/h
holotype MB.C.18631.1	c. 23.0 mm	0.42	1.04	1.05	0.27	0.41

**Discussion.** *Ammonellipsites sguilmensis* can be separated from most of the other species of the genus by its broadly rounded umbilical margin, which is narrowly rounded or subangular in the other species. The moderately wide umbilicus is another criterion for separation of *A. sguilmensis* from many other species. *A. menchikoffi* Ebbighausen et al., 2010 and *A. conradae* Ebbighausen et al., 2010 from the Dalle à *Merocanites* have similar conchs, but differ in the V-shaped adventive lobe, which is lanceolate in *A. sguilmensis*. In general, the lanceolate adventive lobe is a character that separates *A. sguilmensis* from most of the other members of the genus *Ammonellipsites*.



**Figure 3.** *Ammonellipsites sguilmensis* n. sp. from Hassi Sguilma, holotype MB.C.18631.1;  $\times 2.0$ .



**Figure 4.** *Ammonellipsites sguilmensis* n. sp. from Hassi Sguilma. **A.** Dorsal view of holotype MB.C.18631.1;  $\times 1.0$ . **B.** Suture line of holotype MB.C.18631.1, at 14.0 mm ww, 9.2 mm wh;  $\times 4.0$ .

Family **Muensteroceratidae** Librovitch, 1957***Muensteroceras* Hyatt, 1884**

For a detailed discussion of the genus, see Korn et al. (2010b).

***Muensteroceras beniabbesense* n. sp.**

Figures 5, 6

1961 *Münsteroceras mitchelli*. – Pareyn, p. 98, pl. 8, figs 8, 9.

*Derivation of name.* After the town of Béni Abbès.

*Holotype.* Specimen MB.C.18632.1, illustrated in Figure 5.

*Type locality and horizon.* Hassi Sguilma (17 km north-west of Béni Abbès, Algeria); Hassi Sguilma Formation (*Ammonellipsites-Merocanites* Assemblage).

*Material.* Four specimens up to 70 mm conch diameter.

*Diagnosis.* *Muensteroceras* with a subinvolute conch throughout ontogeny, shape thickly pachyconic at 10 mm and thinly to thickly discoidal at 60 mm dm; umbilical margin subangular in all growth stages, umbilical wall steep or slightly oblique; aperture moderately high at growth stages above 6 mm dm. Ornament with coarse biconvex growth lines, coarse biconvex with very low lateral sinus and deep ventral sinus, direction rectiradiate; numerous strong constrictions parallel to the growth lines. Suture line in the adult stage with very narrow, parallel-sided external lobe and very low median saddle; ventrolateral saddle asymmetric, broadly rounded; adventive lobe V-shaped with gently incurved ventral flank and weakly curved dorsal flank.

**Table 4.** Conch ontogeny (Figs 6A, C–E) of *Muensteroceras beniabbesense* n. sp.

dm	conch shape	whorl cross section shape	aperture
10 mm	thickly pachyconic; subinvolute (ww/dm ~ 0.74; uw/dm ~ 0.20)	moderately depressed; very strongly embracing (ww/wh ~ 1.60; IZR ~ 0.45)	moderate (WER ~ 1.78)
30 mm	thickly discoidal; subinvolute (ww/dm ~ 0.54; uw/dm ~ 0.20)	weakly depressed; very strongly embracing (ww/wh ~ 1.20; IZR ~ 0.45)	moderate (WER ~ 1.80)
60 mm	thickly discoidal; subinvolute (ww/dm ~ 0.50; uw/dm ~ 0.20)	weakly depressed; very strongly embracing (ww/wh ~ 1.20; IZR ~ 0.45)	moderate (WER ~ 1.76)

**Table 5.** Conch dimensions (in mm) and proportions for reference specimens of *Muensteroceras beniabbesense* n. sp.

	dm	ww	wh	uw	ah	ww/dm	ww/wh	uw/dm	WER	IZR
paratype MB.C.18632.2	63.4	29.4	29.1	12.2	16.5	0.46	1.01	0.19	1.83	0.43
holotype MB.C.18632.1	55.6	28.9	24.3	12.1	13.8	0.52	1.19	0.22	1.77	0.43
paratype MB.C.18632.4	30.4	16.5	13.8	6.3	–	0.54	1.20	0.21	–	–

**Table 6.** Suture line proportions (Fig. 6B) for *Muensteroceras beniabbesense* n. sp.

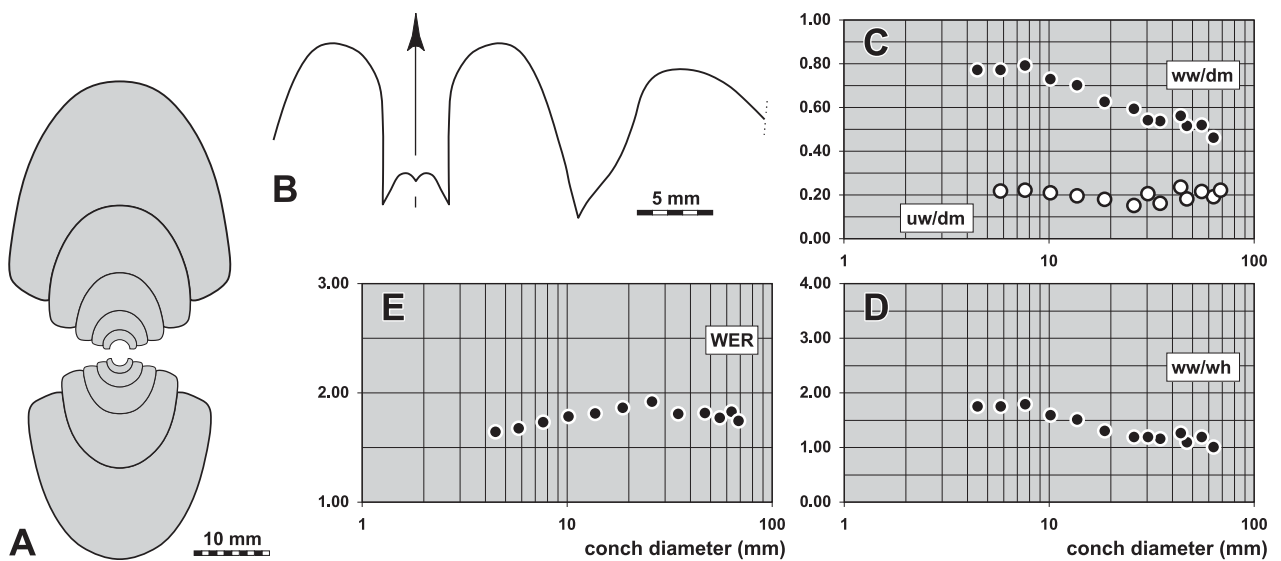
specimen	at dm	EL w/d	EL/VLS	EL/AL	MS h	VLS w/h	remarks
paratype MB.C.18632.3	c. 54.0 mm	0.41	0.64	0.88	0.19	0.64	A lobe with concave ventral flank

*Discussion.* *Muensteroceras beniabbesense* belongs to the members of the genus, which possess strong biconvex constrictions. It differs from the type species *M. parallelum* (Hall, 1860) in the higher ww/wh ratio in comparable growth stages (ww/wh = 0.90 at 45 mm dm in *M. parallelum* and 1.10 in *M. beniabbesense* at the same diameter) and the more slender conch.

*M. koninckianum* Schindewolf, 1951 (= *Goniatites inconstans* de Koninck, 1880) from the Calcaire Waulsortien of Belgium shows some similarities, but differs in its adult opening of the umbilicus and its subangular ventrolateral shoulder from *M. beniabbesense*. *M. frequens* Kusina, 1973 from the North Urals has a similar adult conch geometry, but differs in the much wider umbilicate juvenile stage.



**Figure 5.** *Muensteroceras beniabbesense* n. sp. from Hassi Sguilma, holotype MB.C.18632.1;  $\times 1.0$ .



**Figure 6.** *Muensteroceras beniabbesense* n. sp. from Hassi Sguilma. **A.** Cross section of paratype MB.C.18632.2;  $\times 1.0$ . **B.** Suture line of paratype MB.C.18632.3, at 22.0 mm wh;  $\times 2.0$ . **C–E.** Ontogenetic development of the conch width index (ww/dm), umbilical width index (uw/dm), whorl width index (ww/wh), and whorl expansion rate (WER) of all available specimens.

#### Family **Rotopericyclidae** Korn, Bockwinkel & Ebbighausen, 2010

##### ***Eurites* Kusina, 1973**

For a detailed discussion of the genus, see Korn et al. (2010b).

##### ***Eurites temertassetensis* n. sp.**

Figures 7, 8

*Derivation of name.* After the type locality.

*Holotype.* Specimen MB.C.18617.1, illustrated in Figure 7.

*Type locality and horizon.* Oued Temertasset, locality MOU-U (Mouydir, South Algeria); Iridet Formation (*Ammonellipsites-Merocanites* Assemblage).

*Material.* Six specimens from the type locality with conch diameters between 19 and 112 mm are available, of which only the holotype is well preserved and rather complete. One specimen was sectioned and shows seven whorls. One specimen from Hassi Sguilma.

*Diagnosis.* *Eurites* with a subinvolute conch throughout ontogeny with an interval of slight umbilical opening between 10 and 30 mm dm; shape thickly pachyconic with a stouter adult stage; umbilical wall flattened, umbilical margin subangular; aperture low to moderate. Shell almost smooth; without constrictions on shell and internal mould; adult suture line with narrow V-shaped external lobe with subparallel flanks and very low median saddle; ventrolateral saddle broadly rounded; adventive lobe V-shaped, symmetric with gently curved flanks.

**Table 7.** Conch ontogeny (Figs 8A–D, G–I) of *Eurites temertassetensis* n. sp.

dm	conch shape	whorl cross section shape	aperture
4 mm	thickly pachyconic; subinvolute (ww/dm ~ 0.75; uw/dm ~ 0.16)	moderately depressed; strongly embracing (ww/wh ~ 1.60; IZR ~ 0.44)	moderate (WER ~ 1.85)
10 mm	thickly pachyconic; subinvolute (ww/dm ~ 0.72; uw/dm ~ 0.25)	moderately depressed; strongly embracing (ww/wh ~ 1.70; IZR ~ 0.40)	moderate (WER ~ 1.80)
30 mm	thickly pachyconic; subinvolute (ww/dm ~ 0.75; uw/dm ~ 0.25)	moderately depressed; strongly embracing (ww/wh ~ 1.75; IZR ~ 0.40)	moderate (WER ~ 1.85)
60 mm	thickly pachyconic; subinvolute (ww/dm ~ 0.82; uw/dm ~ 0.20)	moderately depressed; strongly embracing (ww/wh ~ 1.95; IZR ~ 0.44)	low (WER ~ 1.75)

**Table 8.** Conch dimensions and proportions for reference specimens of *Eurites temertassetensis* n. sp.

	dm	ww	wh	uw	ah	ww/dm	ww/wh	uw/dm	WER	IZR
holotype MB.C.18617.1	64.6	54.0	27.8	13.5	15.7	0.84	1.94	0.21	1.74	0.44
	51.2	44.8	22.2	11.2	–	0.88	2.02	0.22	–	–
paratype MB.C.18617.2	24.5	18.9	9.9	7.4	5.1	0.77	1.90	0.30	1.59	0.49

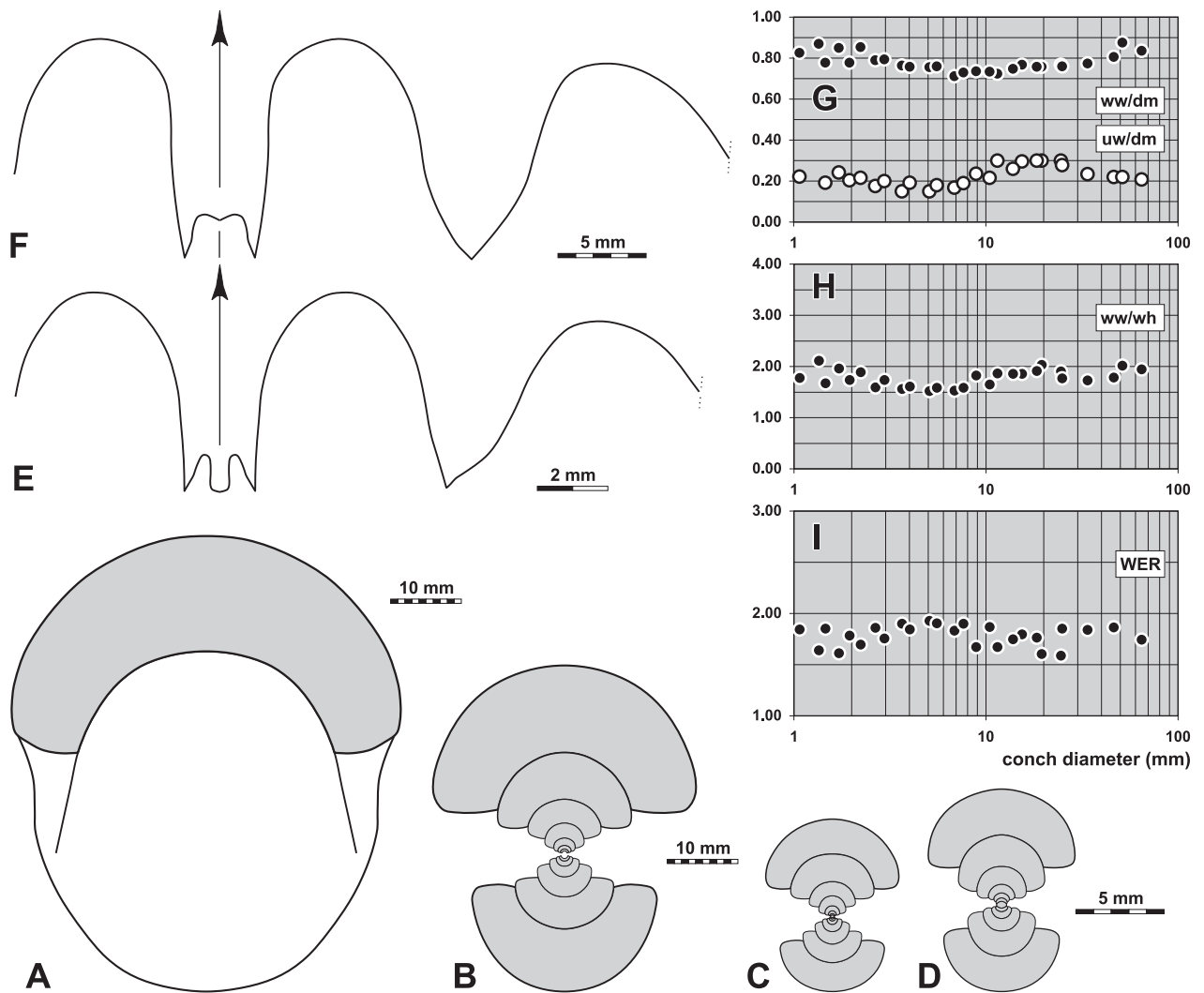
**Table 9.** Suture line proportions (Figs 8E, F) for *Eurites temertassetensis* n. sp.

specimen	at dm	EL w/d	EL/VLS	EL/AL	MS h	VLS w/h	remarks
holotype MB.C.18617.1	c. 46.0 mm	0.44	0.64	0.84	0.19	0.70	E lobe slightly pouched, V-shaped
paratype MB.C.18617.2	c. 26.0 mm	0.48	0.49	0.73	0.17	0.76	A lobe asymmetric

**Discussion.** *Eurites temertassetensis* closely resembles *E. commutatus* Ebbighausen et al., 2010 and *E. pondus* Ebbighausen et al., 2010 from the Dalle à Merocanites of Timimoun, but differs from both in the diverging flanks of the external lobe, which has parallel flanks in the other two species. A further difference is the continuous opening of the umbilicus in *E. temertassetensis*; the umbilicus is being closed in *E. commutatus* by strong whorl overlap in the preadult stage. *E. pondus*, *E. latus* Kusina, 1973, and *E. corpulentissimus* (Schindewolf, 1951) have a wider umbilicus than *E. temertassetensis*. The latter two species differ also in their asymmetric adventive lobe from the new species.

**Figure 7.** *Eurites temertassetensis* n. sp. from locality MOU-U, holotype MB.C.18617.1;  $\times 1.0$ .





**Figure 8.** *Eurites temertassetensis* n. sp. **A.** Dorsal view of holotype MB.C.18617.1 from locality MOU-U;  $\times 1.0$ . **B.** Cross section of paratype MB.C.18634 from Hassi Sguilma;  $\times 1.0$ . **C.** Cross section of paratype MB.C.18617.2 from locality MOU-U;  $\times 1.0$ . **D.** Cross section (inner whorls) of the same specimen;  $\times 2.5$ . **E.** Suture line of paratype MB.C.18617.2 from locality MOU-U, at 18.4 mm ww, 8.8 mm wh;  $\times 5.0$ . **F.** Suture line of holotype MB.C.18617.1 from locality MOU-U, at 38.6 mm ww, 22.2 mm wh;  $\times 2.5$ . **G–I.** Ontogenetic development of the conch width index (ww/dm), umbilical width index (uw/dm), whorl width index (ww/wh), and whorl expansion rate (WER) of all available specimens.

Subfamily **Trimorphoceratinae** Ebbighausen, Korn & Bockwinkel, 2010

***Trimorphoceras* Ebbighausen, Korn & Bockwinkel, 2010**

For a detailed discussion of the genus, see Ebbighausen et al. (2010).

***Trimorphoceras azzelmattiense* n. sp.**

Figures 9, 10

*Derivation of name.* After the type locality.

*Holotype.* Specimen MB.C.18621, illustrated in Figure 9.

*Type locality and horizon.* West of Azzel Matti, locality A292 (Ahnet, South Algeria); Iridet Formation (*Ammonellipsites-Merocanites* Assemblage).

*Material.* Only the holotype with a 58 mm conch diameter; it is a moderately well-preserved specimen in dark reddish oolitic limestone. The specimen is slightly corroded at places, but shows shell remains as well as the suture line.

*Diagnosis.* *Trimorphoceras* with a thickly discoidal, subinvolute conch at 60 mm dm; very slow closure of the umbilicus in the adult stage; umbilical margin rounded, umbilical wall slightly flattened; aperture moderately high. Ornament with extremely fine growth-lines. Suture line with very narrow, parallel-sided external lobe and low median saddle; ventrolateral saddle broadly rounded and almost symmetric; adventive lobe strongly asymmetric.



**Table 10.** Conch ontogeny (Fig. 10A) of *Trimorphoceras azzelmattiense* n. sp.

dm	conch shape	whorl cross section shape	aperture
58 mm	thickly discoidal; subinvolute (ww/dm ~ 0.57; uw/dm ~ 0.24)	weakly depressed; very strongly embracing (ww/wh ~ 1.15; IZR ~ 0.46)	moderate (WER ~ 1.85)

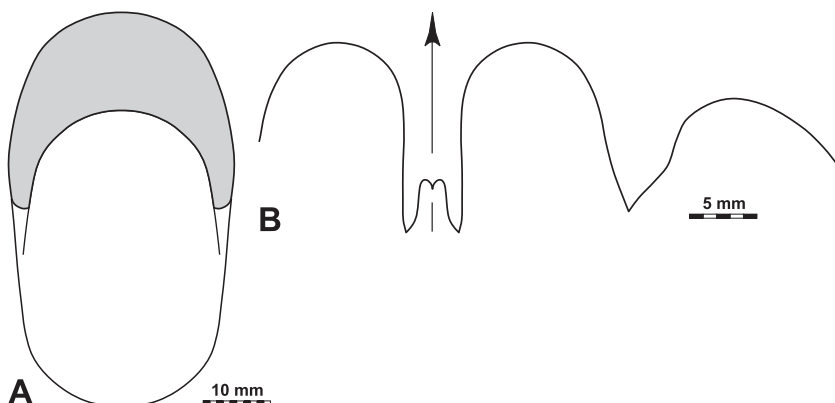
**Table 11.** Conch dimensions and proportions for reference specimens of *Trimorphoceras azzelmattiense* n. sp.

	dm	ww	wh	uw	ah	ww/dm	ww/wh	uw/dm	WER	IZR
holotype MB.C.18621	58.5	33.6	29.0	14.0	15.6	0.57	1.16	0.24	1.86	0.46
	43.3	30.4	19.1	11.7	–	0.70	1.59	0.27	–	–

**Table 12.** Suture line proportions (Fig. 10B) for *Trimorphoceras azzelmattiense* n. sp.

specimen	at dm	EL w/d	EL/VLS	EL/AL	MS h	VLS w/h	remarks
holotype MB.C.18621	52.0 mm	0.30	0.40	0.80	0.28	0.76	A lobe strongly asymmetric

**Discussion.** The conch morphology of *Trimorphoceras azzelmattiense* resembles that of *T. absolutum* Ebbighausen et al., 2010 and *T. molestum* Ebbighausen et al., 2010 from the Dalle à *Merocanites*, but differs in the wider umbilicus ( $ww/dm = 0.24$  at 58 mm dm in contrast to 0.10–0.15 in *T. absolutum* and 0.15–0.25 in *T. molestum*). This difference is mainly caused by the delayed process of closure of the umbilicus in the adult stage in *T. azzelmattiense*. A further difference is the much lower aperture in *T. azzelmattiense* at a diameter of almost 60 mm ( $WER = 1.86$ ) in contrast to *T. absolutum* and *T. molestum* (1.95–2.15).

**Figure 9.** *Trimorphoceras azzelmattiense* n. sp. from Azzel Matti, holotype MB.C.18621;  $\times 1.0$ .**Figure 10.** *Trimorphoceras azzelmattiense* n. sp. from Azzel Matti. **A.** Dorsal view of holotype MB.C.18621;  $\times 1.0$ . **B.** Suture line of holotype MB.C.18621, at 52.0 mm dm, 32.5 mm ww, 24.0 mm wh;  $\times 2.0$ .

***Trimorphoceras teguentourense* n. sp.**

Figures 11, 12

*Derivation of name.* After the type locality.*Holotype.* Specimen MB.C.18625.1, illustrated in Figure 11.*Type locality and horizon.* Erg Teguentour, locality A259/4 (Ahnet, South Algeria); Iridet Formation (*Ammonellipsites-Merocanites* Assemblage).*Material.* Only the holotype with a 41 mm conch diameter and the paratype with 30 mm dm. The two specimens show the transformation from the pachyconic into the discoidal conch shape.*Diagnosis.* *Trimorphoceras* with a thickly discoidal, subinvolute conch at 40 mm dm; umbilical margin rounded, umbilical wall convex; aperture high. Without constrictions. Suture line with very narrow, parallel-sided external lobe and very low median saddle; ventrolateral saddle broadly rounded and asymmetric; adventive lobe strongly asymmetric with slightly curved ventral flank and strongly curved dorsal flank.**Table 13.** Conch ontogeny (Fig. 12A) of *Trimorphoceras teguentourense* n. sp.

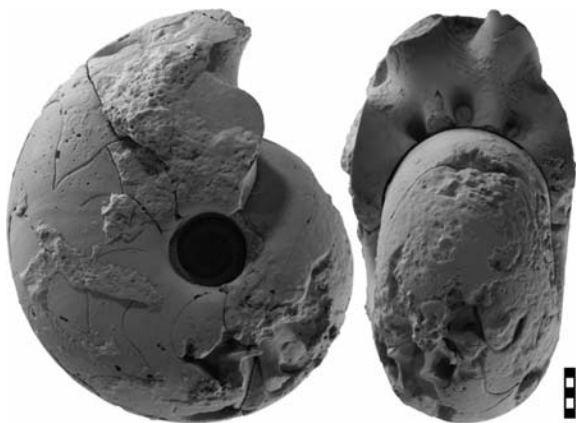
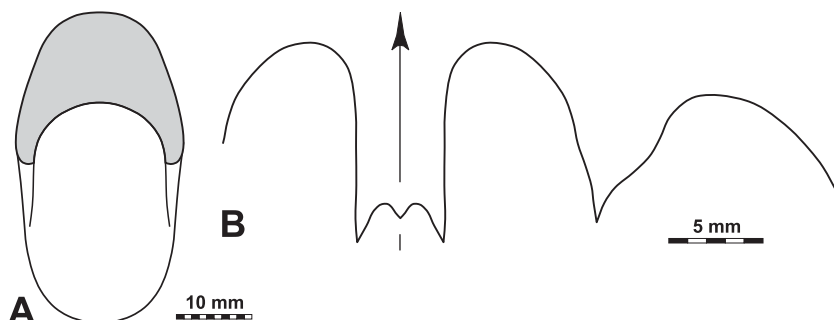
dm	conch shape	whorl cross section shape	aperture
30 mm	thinly pachyconic; subinvolute (ww/dm ~ 0.67; uw/dm ~ 0.23)	weakly depressed; very strongly embracing (ww/wh ~ 1.45; IZR ~ 0.46)	moderate (WER ~ 1.77)
40 mm	thickly discoidal; subinvolute (ww/dm ~ 0.54; uw/dm ~ 0.18)	weakly depressed; strongly embracing (ww/wh ~ 1.10; IZR ~ 0.40)	high (WER ~ 2.00)

**Table 14.** Conch dimensions and proportions for reference specimens of *Trimorphoceras teguentourense* n. sp.

	dm	ww	wh	uw	ah	ww/dm	ww/wh	uw/dm	WER	IZR
holotype MB.C.18625.1	41.2	22.2	20.1	7.3	12.1	0.54	1.11	0.18	2.01	0.40
paratype MB.C.18625.2	29.9	19.9	13.7	6.8	7.4	0.67	1.46	0.23	1.77	0.46

**Table 15.** Suture line proportions (Fig. 12B) for *Trimorphoceras teguentourense* n. sp.

specimen	at dm	EL w/d	EL/VLS	EL/AL	MS h	VLS w/h	remarks
holotype MB.C.18625.1	36.7 mm	0.44	0.67	1.02	0.19	0.66	A lobe strongly asymmetric

**Figure 11.** *Trimorphoceras teguentourense* n. sp. from Erg Teguentour, holotype MB.C.18625.1;  $\times 1.25$ .**Figure 12.** *Trimorphoceras teguentourense* n. sp. from Erg Teguentour. **A.** Dorsal view of holotype MB.C.18625.1;  $\times 1.0$ . **B.** Suture line of holotype MB.C.18625.1, at 36.7 mm dm, 21.7 mm ww, 18.2 mm wh;  $\times 2.5$ .

**Discussion.** *Trimorphoceras teguentourense* belongs to the more discoidal species of the genus and is comparable to *T. crassilens* Ebbighausen et al., 2010. The main difference to the species from the Dalle à *Merocanites* is the wider umbilicus of *T. teguentourense* in comparable growth stages (at 30 mm dm: uw/dm  $\sim$  0.23 in *T. teguentourense* and 0.10–0.20 in *T. crassilens*; at 40 mm dm: uw/dm  $\sim$  0.18 in *T. teguentourense* and 0.07–0.15 in *T. crassilens*).

Family **Maxigoniatiidae** Korn, Klug & Mapes, 1999

Subfamily **Dzhaprakoceratinae** Korn, Bockwinkel & Ebbighausen, 2010

For a detailed discussion of the subfamily, see Korn et al. (2010b).

### ***Dzhaprakoceras* Popov, 1965**

For a detailed discussion of the genus, see Korn et al. (2010b).

### ***Dzhaprakoceras dzhazairense* Ebbighausen, Korn & Bockwinkel, 2010**

Figure 13

**Holotype.** Specimen MB.C.18615.1, illustrated by Ebbighausen et al. (2010) in Figure 41A.

**Type locality and horizon.** Sebkhia de Timimoun, locality TIM-C7 (12 km SW of Timimoun, Algeria); *Ammonellipsites-Merocanites* Assemblage.

**Material.** This species is probably the most common in the Iridet Formation; ten specimens between 35 and approximately 95 mm conch diameter are available from the Erg Teguentour. The largest of the specimens, of which most are poorly preserved, (MB.C.18628.1) has a completely preserved phragmocone, suggesting that the diameter plus body chamber measured about 160 mm in diameter.

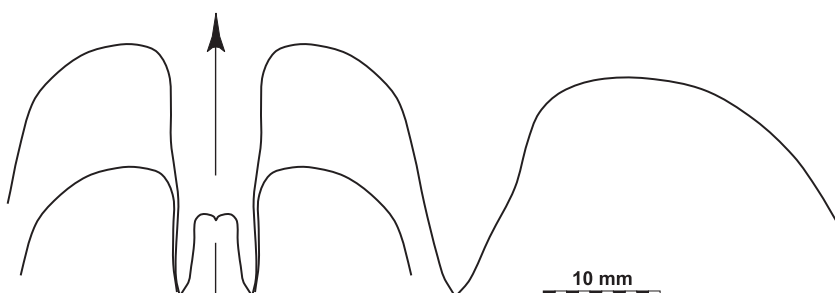
**Diagnosis.** See Ebbighausen et al (2010).

**Table 16.** Conch dimensions and proportions for reference specimens of *Dzhaprakoceras dzhazairense* Ebbighausen et al. (2010).

	dm	ww	wh	uw	ah	ww/dm	ww/wh	uw/dm	WER	IZR
MB.C.18628.2	53.7	23.4	28.4	3.8	16.7	0.44	0.82	0.07	2.01	0.41
MB.C.18628.3	41.5	19.6	24.6	3.3	13.3	0.47	0.79	0.08	2.16	0.46
MB.C.18628.4	35.9	18.4	20.8	2.1	–	0.51	0.88	0.06	–	–

**Table 17.** Suture line proportions (Fig. 13) for *Dzhaprakoceras dzhazairense* Ebbighausen et al. (2010).

specimen	at dm	EL w/d	EL/VLS	EL/AL	MS h	VLS w/h	remarks
MB.C.18628.1	c. 90.0 mm	0.33	0.52	0.80	0.33	0.63	E lobe affected by previous SL



**Figure 13.** *Dzhaprakoceras dzhazairense* Ebbighausen et al. 2010 from Erg Teguentour. Suture line of specimen MB.C.18628.1, at 34.0 mm ww, 51.0 mm wh;  $\times$  1.5.

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