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## SUPPLEMENTARY ONLINE MATERIAL FOR

The dorsal shell wall structure of Mesozoic ammonoids

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### **Supplementary Online Material**

Table A. Data collection of ultrastructurally analysed ammonoids and their bearing on the dorsal shell wall. The specimens with the number indices MAm, MAn, MAo and PA are housed at the Bavarian State Collection for Palaeontology and Geology (Munich, Germany) as part of H. Keupp's collection. Those specimens with the number indices AMNH-FI are housed at the American Museum of Natural History (New York City, USA). Abbreviations: c, complete dorsal shell wall; cl, coating layer; dipl, dorsal inner prismatic layer; dipl 1/2, primary/secondary dorsal inner prismatic layer; dncl, dorsal nacreous layer; dncl 1/2, primary/secondary dorsal nacreous layer; dopl, dorsal outer prismatic layer; hbl, heringbone layer of the preceding whorl; n.p., not preserved; nr, nacreous reduced dorsal shell wall; ol, organic layer; pe, periostracal extensions of the preceding whorl; r, prismatic reduced dorsal shell wall; rc, recrystallized shell wall; ric, reinforced complete dorsal shell wall; rk, "Ritzknoten"; rs, "Ritzstreifen"; sc, seemingly complete dorsal shell wall; so, spiral ornamentation; sphpr, spherulitic-prismatic layer; wl, wrinkle layer.

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
Goniatitina indet	Kulicki et al. 1999, 2001, 2002	1	Pennsylvanian, Carboniferous	Buckhorn Asphalt, Oklahoma, USA	r	wl	dipl	The wrinkle layer disappears in the post-nepionic shell.
Goniatitina indet	Doguzhaeva 2002	1-2	Pennsylvanian, Carboniferous	Creek Aidaralash, S Urals, Russia	r	-	dipl	
Goniatitina indet	Doguzhaeva 2002	1-2	Artinskian, Permian	Sim River Basin, S Urals, Russia	r	-	dipl	
<b>Anarcestoidea</b>								
<i>Cabrieroceras crispiforme</i> (Kayser, 1879)	Walliser 1970	rc-1	Middle Devonian	Eifel, W Germany	r	wl?, (rs)	dipl	The inner prismatic layer forms ' <b>Ritzstreifen</b> ' ventrally, laterally and probably dorsally (dorsal wrinkle layer?).
<i>Sellanarcestes wenkenbachi</i> (Kayser, 1884)	Walliser 1970	rc-1	Middle Devonian	Eifel, W Germany	r	wl?, (rs)	dipl	The inner prismatic layer forms ' <b>Ritzstreifen</b> ' ventrally, laterally and probably dorsally (wrinkle layer?).

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<b>Gastrioceratoidea</b>								
<i>Gastrioceras occidentale</i> (Miller & Faber, 1892)	Erben et al. 1968, 1969	1-2	Pensylvanian, Carboniferous	Cow-Creek near Prestonburg, Floyd Country, SE Kentucky, USA	r	-	dipl	
<b>Agathiceratoidea</b>								
<i>Agathiceras uralicum</i> Karpinsky, 1874	Doguzhaeva & Mutvei 1986	1-2	early Permian	N Urals, Russia	r	-	dipl	
<i>Agathiceras</i> sp.	Doguzhaeva 2002	1-2	Artinskian, Permian	Sim River Basin, S Urals, Russia	r	-	dipl	
<b>Xenodiscoidea</b>								
<i>Preflorianites toulai</i> (Smith, 1932)	MAM-1636	rc	Olenekian, Triassic	Crittenden Springs, Elko Country, Nevada, USA	r?	wl?	n. p.	The ultrastructure is not preserved. At the whorl contact, the umbilical / dorsal shell wall becomes very thin (reduced?). There is a homogeneous layer separating the recrystallized shell package; it seems to develop a relief (wrinkle layer?).

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Xenoceltites subevolutus</i> Spath, 1930	MAm-1643	rc	Olenekian, Triassic	Wallenberg- fjellet, Spitzbergen	n. p.	n. p.	n. p.	The ultrastructure is not preserved.
<b>Dinaritoidea</b>								
<i>Columbites</i> sp.	Erben et al. 1968, 1969	rc-2	Olenekian, Triassic	Hot Springs, Idaho, USA	r	-	dipl	
<i>Rudolftruempyiceras planorbis</i> (Dagys & Ermakova, 1988)	MAm-1634	2-3	late Olenekian, Triassic	Cheznokh- zebetnaya River, E Taimyr, Siberia, Russia	r	ol	-	
<b>Sageceratoidea</b>								
<i>Hedenstroemia hedenstroemi</i> (Keyserling, 1845)	MAm-1651	2-3	early Olenekian, Triassic	Buur River, Olenek River Basin, Siberia, Russia	r	ol	dipl	In the outer whorls, the dorsal inner prismatic layer can develop up to three sub-layers (multi-layering). At the ventral crest, the outer component of the dorsal shell wall forms a thickening.
<i>Pseudosageceras multilobatum</i> Noetling, 1905	MAm-1632	rc	Olenekian, Triassic	Crittenden Springs, Elko Country, Nevada, USA	n. p.	n. p.	n. p.	The ultrastructure is not preserved.

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Pseudosageceras</i> sp.	Kulicki et al. 2001	1-2	Olenekian, Triassic	Mengilyakh on Olenek River, Siberia, Russia	r	wl	dipl	
<b>Meekoceratoidea</b>								
<i>Arctoceras tuberculatum</i> Smith, 1932	MAm-1630	rc	Olenekian, Triassic	Crittenden Springs, Elko Country, Nevada, USA	r?	n. p.	n. p.	The ultrastructure is not preserved. At the whorl contact, the umbilical / dorsal shell wall becomes very thin (reduced?).
<i>Arctoprionites nodosus</i> (Frebald, 1930)	MAm-1584 MAm-1585	rc	Olenekian, Triassic	Stensiöfjellet, Spitzbergen	n. p.	n. p.	n. p.	The ultrastructure is not preserved.
<i>Dieneroceras dieneri</i> (Hyatt & Smith, 1905)	MAm-1578	rc	Olenekian, Triassic	Crittenden Springs, Elko Country, Nevada, USA	r?	n. p.	n. p.	The ultrastructure is not preserved. At the whorl contact, the umbilical / dorsal shell wall becomes very thin (reduced?).
<i>Dieneroceras</i> sp.	MAm-1649	rc	Olenekian, Triassic	Crittenden Springs, Elko Country, Nevada, USA	n. p.	n. p.	n. p.	The ultrastructure is not preserved.
' <i>Dieneroceras</i> ' <i>subquadratum</i> (Smith, 1932)	MAm-1573	rc	Olenekian, Triassic	Crittenden Springs, Elko Country, Nevada, USA	r?	n. p.	n. p.	The ultrastructure is not preserved. At the whorl contact, the umbilical / dorsal shell wall becomes very thin (reduced?).

<b>Taxon</b>	<b>References / collection number</b>	<b>Preservation index</b>	<b>Age, period</b>	<b>Location</b>	<b>Type of dorsal shell wall</b>	<b>Outer components</b>	<b>Inner components</b>	<b>Special features</b>
<i>Hemiprionites</i> sp.	MAm-1647	rc	Olenekian, Triassic	Crittenden Springs, Elko Country, Nevada, USA	r?	n. p.	n. p.	The ultrastructure is not preserved. At the whorl contact, the umbilical / dorsal shell wall becomes very thin (reduced?).
<i>Juvenites septrionalis</i> Smith, 1932	MAm-1608 MAm-1609	rc	Olenekian, Triassic	Crittenden Springs, Elko Country, Nevada, USA	n. p.	n. p.	n. p.	The ultrastructure is not preserved.
<i>Meekoceras gracilitatis</i> (White, 1879)	MAm-1589	rc	Olenekian, Triassic	Crittenden Springs, Elko Country, Nevada, USA	n. p.	n. p.	n. p.	The ultrastructure is not preserved. The dorsal shell wall is thick.
<i>Owenites koeneni</i> Hyatt & Smith, 1905	MAm-1596 MAm-1599 MAm-1600	rc	Olenekian, Triassic	Crittenden Springs, Elko Country, Nevada, USA	r?	n. p.	n. p.	The ultrastructure is not preserved. At the whorl contact, the umbilical / dorsal shell wall becomes very thin (reduced?).
<i>Parannites aspenensis</i> Hyatt & Smith, 1905	MAm-1623 MAm-1624	rc	Olenekian, Triassic	Crittenden Springs, Elko Country, Nevada, USA	r?	n. p.	n. p.	The ultrastructure is not preserved. At the whorl contact, the umbilical / dorsal shell wall becomes very thin (reduced?).
<i>Parannites slossi</i> Kummel & Steele, 1962	MAm-1617	rc	Olenekian, Triassic	Crittenden Springs, Elko Country, Nevada, USA	r?	n. p.	n. p.	The ultrastructure is not preserved. At the whorl contact, the umbilical / dorsal shell wall becomes very thin (reduced?).

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Popovites occidentalis</i> Tozer , 1965	MAm-1594	rc	Olenekian, Triassic	Stensiöfjellet, Spitzbergen	n. p.	n. p.	n. p.	The ultrastructure is not preserved.
Prionitidae indet	MAm-1592 MAm-1633	rc	Olenekian, Triassic	Crittenden Springs, Elko Country, Nevada, USA	r?	n. p.	n. p.	The ultrastructure is not preserved. At the whorl contact, the umbilical / dorsal shell wall becomes very thin (reduced?).
<i>Prospiringites slossi</i> (Kummel & Steele, 1962)	MAm-1604 MAm-1605	rc	Olenekian, Triassic	Crittenden Springs, Elko Country, Nevada, USA	r?	n. p.	n. p.	The ultrastructure is not preserved. At the whorl contact, the umbilical / dorsal shell wall becomes very thin (reduced?).
<i>Wasatchites tridentinus</i> Spath, 1934	MAm-1587	rc	Olenekian, Triassic	Stensiöfjellet, Spitzbergen	n. p.	n. p.	n. p.	The ultrastructure is not preserved.
<i>Wyomingites whiteanus</i> (Waagen, 1895)	MAm-1572	rc	Olenekian, Triassic	Crittenden Springs, Elko Country, Nevada, USA	n. p.	n. p.	n. p.	The ultrastructure is not preserved.
<b>Ptychitoidea</b>								
<i>Aristoptychites kolymensis</i> (Kiprisova, 1937)	MAm-1551 MAm-1552 MAm-1553	rc	late Ladinian, Triassic	Botneheia, Spitzbergen	r?	n. p.	n. p.	The ultrastructure is not preserved. At the whorl contact, the umbilical / dorsal shell wall becomes very thin (reduced?).
<i>Aristoptychites trochleaeformis</i> (Lindstrom, 1865)	MAm-1554	rc	late Anisian, Triassic	Kongressfjellet, Spitzbergen	n. p.	n. p.	n. p.	The ultrastructure is not preserved.

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Ptychites</i> sp.	Erben et al. 1969	rc-1	Ladinian, Triassic	Kongressfjelett, Spitzbergen	r	-	dipl	
<b>Arcestoidea</b>								
<i>Arcestes</i> sp. 1	MAm-1566 MAm-1567	rc	Norian, Triassic	Bihati River, Timor	n. p.	ol?	n. p.	The ultrastructure is not preserved. There is a homogeneous layer separating the recrystallized shell package (organic layer?).
<i>Arcestes</i> sp. 2	MAM-1569	rc	Middle to Upper Triassic	Tepeköi, Turkey	n. p.	n. p.	n. p.	The ultrastructure is not preserved.
<i>Phyllocladiscites acheshbokensis</i> Shevyrev, 1968	Doguzhayeva & Mutvei 1986	1-2	middle Anisian, Triassic	River Tach, NW Caucasus, Russia	r	wl	dipl	In outer whorls, the dorsal inner prismatic layer develops two sub-layers (multi-layering). The inner sub-layer of the dorsal inner prismatic layer thickens at the contact of the septa and wedges out episodically adoral of the septum (septal prismatic layer?).
<i>Proarcestes</i> sp.	Doguzhayeva & Mutvei 1986	1-2	middle Anisian, Triassic	River Tach, NW Caucasus, Russia	r	wl	dipl	



Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<b>Nathorstitoidea</b>								
<i>Indigirites boehmi</i> Tozer, 1994	MAm-1559	rc	early Ladinian, Triassic	Fulmardalen, Spitzbergen	n. p.	n. p.	n. p.	The ultrastructure is not preserved.
<i>Indigirites tozeri</i> Weitschat & Landman, 1983	MAm-1556	rc	early Ladinian, Triassic	Botneheia, Spitzbergen	n. p.	n. p.	n. p.	The ultrastructure is not preserved.
<i>Stolleyites tenuis</i> (Stolley, 1911)	Kulicki et al. 2001	1-2	early Carnian, Triassic	Kongressfjelett, Spitzbergen	r	wl	-	
<i>Stolleyites tenuis</i> (Stolley, 1911)	MAm-1560 MAm-1563	1	late Carnian, Triassic	Druschedalen, Dicksonland, Spitzbergen	r	wl?	-	The outer component of the dorsal shell wall seems to develop a relief. On occasion, isolated wrinkles can be discerned.
<b>Ceratitoidea</b>								
<i>Sibirites eichwaldi</i> (Keyserling, 1845)	Kulicki et al. 2001	1-2	Olenekian, Triassic	Mengilyakh on Olenek River, Siberia, Russia	r	wl	dipl	The inner prismatic layer of the dorsal shell wall can develop two sub-layers (multi-layering).
<i>Subolenekites altus</i> (Mojsisovic, 1886)	Kulicki et al. 2001	1	Olenekian, Triassic	Mengilyakh on Olenek River, Siberia, Russia	r	wl	dipl	

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<b>Tropitoidea</b>								
<i>Anatomites</i> sp.	MAM-1570	rc	Upper Triassic	SW Timor	n. p.	n. p.	n. p.	The ultrastructure is not preserved.
<i>Dydimites</i> sp.	MAM-1571	rc	Ladinian, Triassic	SW Timor	r?	n. p.	n. p.	The ultrastructure is not preserved. At the whorl contact, the umbilical / dorsal shell wall becomes very thin (reduced?).
<b>Megaphyllitoidea</b>								
<i>Megaphyllites prometheus</i> Shevyrev, 1861	Doguzhayeva 1980, 1981, Doguzhayeva & Mutvei 1986	1-2	middle Anisian, Triassic	Mount/River Tach, NW Caucasus, Russia	r	wl	dipl	
<i>Parapopanoceras malmgreni</i> (Lindstrom, 1865)	MAM-1549	rc	late Anisian, Triassic	Vikingshögda, Spitzbergen	n. p.	n. p.	n. p.	The ultrastructure is not preserved.
<b>Phylloceratoidea</b>								
<i>Calliphylloceras</i> sp.	MAn-4511 MAn-4512 MAn-4513	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r	wl	dipl	In the outer whorls, the dorsal shell wall develops a thick dorsal inner prismatic layer.

<b>Taxon</b>	<b>References / collection number</b>	<b>Preservation index</b>	<b>Age, period</b>	<b>Location</b>	<b>Type of dorsal shell wall</b>	<b>Outer components</b>	<b>Inner components</b>	<b>Special features</b>
<i>Holcophylloceras polyolcum</i> (Benecke, 1865)	MAN-4833	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r	wl	dipl	In the outer whorls, the dorsal shell wall develops a thick dorsal inner prismatic layer which can develop several sub-layers (multi-layering).
<i>Holcophylloceras</i> sp.	Drushits & Doguzhayeva 1974, Doguzhaeva 1981	1-2	Bajocian, Jurassic	N Caucasus, Russia	r	wl?	dipl	
<i>Holcophylloceras</i> sp.	Keupp 2000	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r	wl	dipl	
<i>Holcophyllocera</i> sp.	MAN-4510	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r	wl	dipl	

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Hypophylloceras</i> ( <i>Neophylloceras</i> ) <i>groenlandicum</i> Birkelund, 1965	Birkelund & Hansen 1968, 1974, 1975, Birkelund 1980	1-2	Maastrichtian, Cretaceous	Agatalen, Nûgssuaq, W Greenland	r	(pe)	dipl	In the outer whorls, the dorsal shell wall develops a thick dorsal inner prismatic layer which can develop several sub-layers (multi-layering). The wrinkle layer is probably replaced by scythe-like <b>periostracal extensions</b> of the preceding whorl (organic radial lirae).
<i>Hypophylloceras</i> ( <i>Neophylloceras</i> ) <i>ramosum</i> Meek, 1857	MAo-1879	1-2	Campanian, Cretaceous	Teshio-Nakagawa area, Hokkaido, Japan	r	(pe)	dipl	In the outer whorls, the dorsal shell wall develops a thick dorsal inner prismatic layer. The wrinkle layer is probably replaced by scythe-like <b>periostracal extensions</b> of the preceding whorl (organic radial lirae).
<i>Hypophylloceras</i> ( <i>Neophylloceras</i> ) <i>subramosum</i> (Shimizu, 1934)	Kulicki & Tanabe 1999, Kulicki et al. 2001	1-2	middle Campanian, Cretaceous	Teshio-Nakagawa area, Hokkaido, Japan	r	(pe)	dipl	In the outer whorls, the dorsal shell wall develops a thick dorsal inner prismatic layer. The wrinkle layer is probably replaced by scythe-like <b>periostracal extensions</b> of the preceding whorl (organic radial lirae).

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Phylloceras</i> ( <i>Euphylloceras</i> ) cf. <i>velledae</i> (Michelin, 1934)	MAo-1770 MAo-1880	2-3	early Albian, Cretaceous	Ambatolafia, Mahajanga Basin, NW Madagascar	r	wl (→ pe)	dipl	In the outer whorls, the dorsal shell wall develops a thick dorsal inner prismatic layer. The wrinkle layer is replaced by scythe-like <b>periostracal extensions</b> of the preceding whorl (organic radial lirae).
<i>Phylloceras</i> ( <i>Euphylloceras</i> ) sp.	MAo-1769	2-3	early Albian, Cretaceous	Ambatolafia, Mahajanga Basin, NW Madagascar	r	wl (→ pe)	dipl	In the outer whorls, the dorsal shell wall develops a thick dorsal inner prismatic layer. The wrinkle layer is replaced by scythe-like <b>periostracal extensions</b> of the preceding whorl (organic radial lirae).
<i>Phylloceras</i> ( <i>Phylloceras</i> ) <i>plicatum</i> Neumayr, 1871	MAAn-4509	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r	wl (→ pe)	dipl	In the outer whorls, the dorsal shell wall develops a thick dorsal inner prismatic layer. The wrinkle layer is replaced by scythe-like <b>periostracal extensions</b> of the preceding whorl (organic radial lirae).
<i>Phylloceras</i> ( <i>Salfeldiella</i> ) <i>guettardi</i> (Raspail, 1831)	Drushits & Khiami 1970	1-2	late Aptian, Cretaceous	Laba River, N Caucasus, Russia	r	-	dipl?	

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Phyllopachyceras ezoense</i> Yokoyama, 1890	Kulicki & Tanabe 1999, Kulicki et al. 2001, 2016	1-2	middle Campanian, Cretaceous	Teshio-Nakagawa area, Hokkaido, Japan	r	(pe)	dipl	In the outer whorls, the dorsal shell wall develops a thick dorsal inner prismatic layer. It has a sperulithic appearance. The wrinkle layer is replaced by convex <b>periostracal extensions</b> of the preceding whorl.
<i>Phyllopachyceras</i> sp.	MAo-1771	2-3	early Albian, Cretaceous	Ambatolafia, Mahajanga Basin, NW Madagascar	r	wl (→ pe)	dipl	In the outer whorls, the dorsal shell wall develops a thick dorsal inner prismatic layer. The wrinkle layer is replaced by convex <b>periostracal extensions</b> of the preceding whorl.
<i>Ptychophylloceras</i> cf. <i>dacquei</i> Joly, 1976	MAn-4514 MAn-4515 MAn-4516 MAn-4748	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r	wl	dipl	In the outer whorls, the dorsal shell wall develops a thick dorsal inner prismatic layer.
<i>Ptychophylloceras</i> sp.	MAn-4749	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r	wl	dipl	In the outer whorls, the dorsal shell wall develops a thick dorsal inner prismatic layer.

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<b>Lytoceratoidea</b>								
<i>Argonauticeras besairiei</i> Collignon, 1949	MAo-1705 MAo-1772 MAo-1801 MAo-1802	2-3	early Albian, Cretaceous	Ambatolafia, Mahajanga Basin, NW Madagascar	r	wl	dipl	In the outer whorls, the dorsal shell wall develops a thick dorsal inner prismatic layer which consists of two sub-layers (multi-layering).
<i>Lobolytoceras costellatum</i> (Pavia, 2002)	MAn-1743 MAn-2061 MAn-3059	2	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r? → c	ol?	dipl → dopl, dncl, dipl	In the outer whorls, the shell develops a <b>complete dorsal shell wall</b> . The inner whorls probably form a prismatic reduced dorsal shell wall (i.e. the juvenile dorsal nacreous layer is very thin). The early complete dorsal shell wall is dominated by a thick dorsal inner prismatic layer which has two sub-layers (multi-layering). In later whorls, the dorsal nacreous layer grows in thickness and is of similar dimension to the thick dipl.
<i>Lytoceras batesi</i> (Trask, 1855)	Westermann 1971	1	Lower Cretaceous	Cottenwood Creek, Californian, USA	r	-	dipl	

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Lytoceras</i> cf. <i>cornucopiae</i> (Young & Bird, 1822)	Westermann 1971	1	early Toarcian, Jurassic	Ilminster, England	r	-	dipl	
<i>Pachylytoceras torulosum</i> (Schübler, 1831)	Erben et al. 1968, 1969	1-3	Aalenian, Jurassic	Heiningen, Baden-Württemberg, Germany	r	-	dipl	
<i>Pachylytoceras</i> sp.	MAn-4832	2	early Aalenian, Jurassic	Heinigen, Baden-Württemberg, Germany	r	wl?	dipl	The outer component of the dorsal shell wall develops a relief (wrinkle layer?).
<i>Protetragonites fraasi</i> (Daqué, 1910)	MAn-4530 MAn-4734 MAn-4831	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r	ol	dipl	In the outer whorls, the dorsal shell wall develops a thick dorsal inner prismatic layer.
<i>Protetragonites tauricus</i> Kuljinskaia-Voronetz, 1933	Drushits & Khiami 1970	1-2	Berriasian, Cretaceous	Sarysu River, Crimea	r	n. p.	dipl	
<b>Tetragonitoidea</b>								
<i>Anagaudryceras limatum</i> (Yabe, 1903)	Bucher et al. 1996	1-2	Upper Cretaceous	Hokkaido, Japan	r	-	dipl?	



Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Anagaudryceras limatum</i> (Yabe, 1903)	MAo-1865	1-2	Coniacian, Cretaceous	Haboro, Hokkaido, Japan	r	ol	dipl	
<i>Anagaudryceras yokoyamai</i> (Yabe, 1903)	MAo-1866	2-3	Campanian, Cretaceous	Teshio-Nakagawa area, Hokkaido, Japan	r	n. p.	n. p.	At least in the living chamber, the dorsal shell wall is completely absent.
<i>Eogaudryceras</i> ( <i>Eotetragonites</i> ) <i>umbilicostriatus</i> (Collignon, 1963)	MAo-1773 MAo-1774 MAo-1775 MAo-1776	2-3	early Albian, Cretaceous	Ambatolafia, Mahajanga Basin, NW Madagascar	r	wl	dipl	
<i>Eogaudryceras</i> sp.	Doguzhaeva et al. 2010	2-3	late Aptian, Cretaceous	Hokodz River region, Belaya River Valley, Adygeya, NW Caucasus, Russia	r	wl	dipl	The dorsal shell wall develops a thick dorsal inner prismatic layer.
<i>Gaudryceras intermedium</i> Yabe, 1903	MAo-1869 MAo-1870	2	Campanian, Cretaceous	Teshio-Nakagawa area, Hokkaido, Japan	r	ol / wl?	dipl	

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Gaudryceras striatum</i> (Jimbo, 1894)	MAo-1868	2	Campanian, Cretaceous	Teshio-Nakagawa area, Hokkaido, Japan	r	ol	dipl	
<i>Gaudryceras tenuiliratum</i> Yabe, 1903	Drushits et al. 1978, Birkelund 1980, Doguzhaeva & Mutvei 1993a, Kulicki et al. 2001, 2016	1-2	Turonian-Campanian, Cretaceous	Hokkaido, Japan and Sakhalin, Russia	r	wl → cl	dipl	In the outer whorls, the wrinkle layer transforms into an organic, lamellar <b>coating layer</b> which covers the ventral and lateral portions of the preceding whorl and the flanks of all preceding whorls.
<i>Gaudryceras tenuiliratum</i> Yabe, 1903	MAo-1871 MAo-1872 MAo-1873 MAo-1874 MAo-1875	2	Campanian, Cretaceous	Teshio-Nakagawa area, Hokkaido, Japan	r	cl	dipl	A thick homogeneous, organic <b>coating layer</b> covers the preceding whorl.
<i>Gaudryceras</i> sp.	Kulicki 1996	-	Cretaceous	Russia	r	cl	dipl	
<i>Gaudryceras</i> sp.	MAo-1867	1-2	Campanian, Cretaceous	Teshio-Nakagawa area, Hokkaido, Japan	r	ol?	dipl	

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Pseudophyllites</i> sp.	Westermann 1971	1	Upper Cretaceous	Fossil Beach, Vancouver Island	r	-	dipl	
<i>Saghalinites wrighti</i> Birkelund, 1965	Birkelund 1967, 1980, Birkelund & Hansen 1968, 1974	1-2	Maastrichtian, Cretaceous	Agatalen, Nûgssuaq, W Greenland	r	-	dipl	
<i>Saghalinites wrighti</i> Birkelund, 1965	MAo-1876	1-3	Maastrichtian, Cretaceous	Nûgssuaq, W Greenland	r	wl.	dipl	
<i>Tetragonites popetensis</i> Yabe, 1903	MAo-1798 MAo-1878	2	Campanian, Cretaceous	Teshio-Nakagawa area, Hokkaido, Japan	r	wl	dipl	
<i>Tetragonites duvalianus</i> d'Orbigny, 1840	Drushits & Doguzhayeva 1974	1-2	Aptian, Cretaceous	N Caucasus, Russia	r	-	dipl	
<i>Tetragonites glabrus</i> (Jimbo, 1910)	Kulicki & Tanabe 1999, Kulicki et al. 2001	2-3	early Campanian, Cretaceous	Teshio-Nakagawa area, Hokkaido, Japan	r	wl	dipl	

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Zelandites japonicus</i> Matsumoto, 1938	Zakharov & Grabovskaya 1984, Zakharov 1996	1-2	early Maastrichtian, Cretaceous	Nayba River, Sakhalin, Russia	r	wl	dipl	
<b>Psiloceratoidea</b>								
<i>Agassiceras</i> cf. <i>scipionianum</i> (d'Orbigny, 1844)	Erben et al. 1968, 1969	1-3	Sinemurian, Jurassic	Lyme Regis, Dorset, England	r	-	dipl	
<i>Alsatites</i> <i>quedlinburgensis</i> Lange, 1924	MAn-4827	rc	Hettangian- Sinemurian, Jurassic	Angersbach, Germany	n. p.	n. p.	n. p.	The ultrastructure is not preserved.
<i>Asteroceras obtusum</i> Sowerby, 1817	Erben et al. 1968, 1969	1-2	Sinemurian, Jurassic	Lyme Regis, Dorset, England	r	-	dipl	
<i>Coroniceras westfalicum</i> Lange, 1925	MAn-4828	1-2	Hettangian- Sinemurian, Jurassic	Oldentrup near Bielefeld, Germany	r	ol?	dipl	
<i>Psiloceras (Caloceras)</i> cf. <i>torus</i> (d'Orbigny, 1844)	MAn-4826	rc	Hettangian- Sinemurian, Jurassic	Aaberg near Bünde, Germany	n. p.	n. p.	n. p.	The ultrastructure is not preserved.

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Schlotheimia</i> ( <i>Scamnoceras</i> ) <i>angulata</i> (Schlotheim, 1820)	MAN-4851 MAN-4852	rc	Hettangian-Sinemurian, Jurassic	Bichfeld clay pit at Spiltar, Germany	n. p.	n. p.	n. p.	The ultrastructure is not preserved.
<b>Eoderoceratoidea</b>								
<i>Aegoceras</i> ( <i>Beaniceras</i> ) <i>centaurus</i> (d'Orbigny, 1844)	MAN-4820 MAN-4853	1-2	Pliensbachian, Jurassic	Lühnde canal, Sehnde near Hannover, Germany	r	wl	dipl	
<i>Aegoceras</i> ( <i>Beaniceras</i> ) cf. <i>luridum</i> (Simpson, 1855)	Erben et al. 1968, 1969	rc-2	early Pliensbachian, Jurassic	Blockley near Mareton-in-March, England	r	-	dipl	
<i>Androgynoceras</i> <i>capricornu</i> (Schlotheim, 1820)	MAN-4821	rc	early Pliensbachian, Jurassic	Robin Hoods Bay, Yorkshire, England	n. p.	n. p.	n. p.	The ultrastructure is not preserved.
<i>Androgynoceras</i> cf. <i>planicosta</i> (Sowerby, 1814)	Erben et al. 1968, 1969	1-3	early Pliensbachian, Jurassic	Lyme Regis, Dorset, England	r	-	dipl	
<i>Dactylioceras</i> cf. <i>anguinum</i> (Reinecke, 1818)	MAN-4823	rc	Pliensbachian-Toarcian, Jurassic	Stich canal, Sehnde near Hannover, Germany	n. p.	n. p.	n. p.	The ultrastructure is not preserved.

<b>Taxon</b>	<b>References / collection number</b>	<b>Preservation index</b>	<b>Age, period</b>	<b>Location</b>	<b>Type of dorsal shell wall</b>	<b>Outer components</b>	<b>Inner components</b>	<b>Special features</b>
<i>Dactylioceras tenuicostatum</i> (Young & Bird, 1822)	MAN-4824	rc	early Toracian, Jurassic	Kettlewell, Yorkshire, England	n. p.	n. p.	n. p.	The ultrastructure is not preserved.
<i>Peronoceras fibulatum</i> (Sowerby, 1823)	Howarth 1975, Birkelund 1980	1-3	Toarcian, Jurassic	Eydon, W Northamptonshire, England	r	wl?	dipl	
<i>Promicroceras marstonense</i> Spath, 1925	Palframan 1967, Erben et al. 1968, 1969	1-2	Sinemurian, Jurassic	near Marston, Somerset, England	r	-	dipl	
<i>Promicroceras planicosta</i> (Sowerby, 1914)	Mutvei 1967, 1970, Erben et al. 1969	1	Sinemurian, Jurassic	Yeovil, Somerset, England	r	-	dipl	
<i>Xiphoceras ziphus</i> (Zieten, 1830)	Erben et al. 1968, 1969	1-3	Sinemurian, Jurassic	Lyme Regis, Dorset, England	r	-	dipl	
<i>Zugodactylites braunianus</i> (d'Orbigny, 1844)	Howarth 1975, Birkelund 1980	2-3	Toarcian, Jurassic	Eydon, W Northamptonshire, England	r	wl?	dipl	

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<b>Amaltheidae</b>								
<i>Amaltheus gibbosus</i> (Schlotheim, 1820)	MAn-4800 MAn-4801 MAn-4802	2	late Pliensbachian, Jurassic	Buttenheim, Bavaria, SE Germany	r	wl	dipl	
<i>Amaltheus margaritatus</i> de Monfort 1808	MAn-4797	rc	Pliensbachian, Jurassic	Lühnde canal, Sehnde near Hannover, Germany	n. p.	n. p.	n. p.	The ultrastructure is not preserved.
<i>Amaltheus margaritatus</i> de Monfort 1808	MAn-4798 MAn-4799	2	late Pliensbachian, Jurassic	Buttenheim, Bavaria, SE Germany	r → 'c'	so	'dncl', dipl	In outer whorls, the outer component of the dorsal shell wall forms a <b>spiral ornament</b> . A bunch of prismatic bands forms the inner components of the dorsal shell wall. The inner prismatic bands are equal to the dorsal inner prismatic layer (multi-layering). The outer prismatic bands represent the continuation of the ventral / lateral nacreous layer, i.e. <b>complete dorsal shell wall</b> .
<i>Amaltheus</i> sp.	MAn-4803	2	late Pliensbachian, Jurassic	ICE tunnel at Kulch near Lichtenfels, Germany	r?	n. p.	n. p.	

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Amauroceras ferrugineum</i> (Simpson, 1855)	Lehman 1990, Weitschat 1999, Keupp 2000	2-3	late Pliensbachian, Jurassic	Ahrensburg near Hamburg, Germany	r	wl	-	
<i>Amauroceras</i> sp.	Bayer 1974	1-2	Pliensbachian, Jurassic	Lühnde near Hannover, Germany	r	wl	dipl	The inner prismatic layer of the dorsal shell wall forms several knob-like undulations (imprints of wrinkles), which was misinterpreted by Bayer (1974) as a prismatic wrinkle layer.
<i>Pleuroceras salebrosum</i> (Hyatt, 1867)	MAn-4804 MAn-4805 MAn-4806 MAn-4807 MAn-4808 MAn-4809 MAn-4810 MAn-4811 MAn-4812 MAn-4813 MAn-4837 MAn-4838	2	late Pliensbachian, Jurassic	Buttenheim, Bavaria, SE Germany	r	wl → so	dipl	In the outer whorls, one specimen (MAn-4804) develops isolated elements of a <b>spiral ornament</b> instead of wrinkles.



Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Pleuroceras solare</i> (Phillips, 1829)	MAn-4814	2	late Pliensbachian, Jurassic	Buttenheim, Bavaria, SE Germany	r	ol	-	
<i>Pleuroceras spinatum</i> (Bruguière, 1789)	Erben et al. 1968, 1969	rc-2	late Pliensbachian, Jurassic	Ockerhütte, Harz and Banz, Franconia, Germany	r	-	dipl	
<i>Pleuroceras spinatum</i> (Bruguière, 1789)	MAn-4815 MAn-4816 MAn-4817 MAn-4818 MAn-4839	2	late Pliensbachian, Jurassic	Buttenheim, Bavaria, SE Germany	r	wl	dipl	
<i>Pleuroceras</i> sp.	Bayer 1974	1-2	Pliensbachian, Jurassic	Lühnde near Hannover, Germany	r	wl	dipl	The inner prismatic layer of the dorsal shell wall forms several knob-like undulations (imprints of wrinkles), which was misinterpreted by Bayer (1974) as a prismatic wrinkle layer.

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<b>Hildoceratoidea</b>								
<i>Dorsetensia complanata</i> Buckman, 1892	Erben et al. 1968, 1969	rc-2	Bajocian, Jurassic	Gerzen near Alfeld, Hannover, Germany	r	-	dipl	
<i>Dorsetensia edouardiana</i> (d'Orbigny, 1845)	Erben et al. 1968, 1969	1-2	Bajocian, Jurassic	Gerzen near Alfeld, Hannover, Germany	r	-	dipl	
<i>Dorsetensia pinguis</i> (Roemer, 1836)	Erben et al. 1968, 1969	1-3	Bajocian, Jurassic	Gerzen near Alfeld, Hannover, Germany	r	-	dipl	
<i>Eleganticeras elegantulum</i> (Young & Bird, 1828)	Erben et al. 1968, 1969	1-3	Toarcian, Jurassic	Gravel pit near Ahrensburg, NE of Hamburg, Germany	r	-	dipl	
<i>Haugia illustris</i> (Denckmann, 1887)	Erben et al. 1968, 1969	1-2	Toarcian, Jurassic	Doernten near Goslar, Germany	r	-	dipl	
<i>Harpoceras</i> sp.	MAn-4796	rc	Toarcian, Jurassic	Stich canal, Sehnde near Hannover, Germany	n. p.	n. p.	n. p.	The ultrastructure is not preserved.

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Leioceras opalinum</i> (Reinecke, 1818)	Erben et al. 1968, 1969	1-2	Aalenian, Jurassic	Otterbach, Gandershofen and Aalen, Germany	r	-	dipl	
<i>Leioceras opalinum</i> (Reinecke, 1818)	MAn-4518 MAn-4792 MAn-4793 MAn-4794 MAn-4795	2	early Aalenian, Jurassic	Heinigen, Baden-Württemberg, Germany	r	wl	dipl	
<i>Pleydellia</i> sp.	Erben et al. 1968, 1969	1-2	late Toarcian, Jurassic	'Gisement des Grottes', N of Millau, Aveyron, France	r	-	dipl	
<b>Stephanoceratoidea</b>								
<i>Cadoceras stupachenkoi</i> Mita, 1998	MAn-4790	1-2	early Callovian, Jurassic	Makaryev on Unzha River, Russia	r	wl	dipl	On occasion, the dorsal inner prismatic layer has two sub-layers (multi-layering).
<i>Cadoceras</i> sp.	Drushits et al. 1977	1-2	Callovian, Jurassic	Yelat'ma village on Oka River, Ryazan Province, Russia	r	-	dipl	

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Chamoussetia stuckenbergi</i> (Lahusen, 1875)	MAn-4777 MAn-4778	1-2	early Callovian, Jurassic	Makaryev on Unzha River, Russia	r	wl?	dipl	On occasion, the dorsal inner prismatic layer has several sub-layers (multi-layering).
<i>Keplerites galilaeii</i> (Oppel, 1862)	MAn-4783	1-2	early Callovian, Jurassic	Znamenka on Unzha River, Russia	r → nr	wl	dipl → dipl 1, dnc1 2, dipl 2	In the inner whorls, the shell forms a prismatic reduced dorsal shell wall. Its dorsal inner prismatic layer is thick and can consist of several sub-layers (multi-layering). In the outer whorls, the shell develops a <b>nacreous reduced dorsal shell wall</b> .
<i>Kosmoceras</i> ( <i>Kosmoceras</i> ) <i>duncani</i> (Sowerby, 1816)	Kulicki 1979	1-2	Callovian, Jurassic	Luckow, Poland	r	wl	dipl	
<i>Kosmoceras</i> ( <i>Kosmoceras</i> ) cf. <i>duncani</i> (Sowerby, 1816)	MAn-4788	1-2	late Callovian, Jurassic	Dubki near Saratov, Russia	r (nr local)	wl	dipl (dipl 1, dnc1 2, dipl 2)	During overgrowth of the ventro-lateral spines, the dorsal inner prismatic layer develops inclusions of nacre, i.e. <b>nacreous reduced dorsal shell wall</b> .
<i>Kosmoceras</i> ( <i>Kosmoceras</i> ) <i>spinosum</i> (Sowerby, 1826)	Erben et al. 1968, 1969	1-2	Callovian, Jurassic	Popilany, Lithuania	r	-	dipl	

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Kosmoceras</i> ( <i>Spinikosmoceras</i> ) <i>ornatum</i> (Schlotheim, 1820)	Sprey 2002	1-2	middle-late Callovian, Jurassic	Ryazan, Russia	r?	n. p.	n. p.	At least a dorsal shell wall does not cover the ammnointella.
<i>Kosmoceras</i> ( <i>Spinikosmoceras</i> ) <i>pollux</i> (Reinecke, 1818)	Sprey 2002	1-2	middle-late Callovian, Jurassic	Ryazan, Russia	r?	n. p.	n. p.	At least a dorsal shell wall does not cover the ammnointella.
<i>Kosmoceras</i> ( <i>Spinikosmoceras</i> ) cf. <i>pollux</i> (Reinecke, 1818)	MAn-4786 MAn-4787	1-2	late Callovian, Jurassic	Ryazan, Russia	r	-	-	
<i>Kosmoceras</i> ( <i>Spinikosmoceras</i> ) sp.	Erben et al. 1968, 1969	1-3	Callovian, Jurassic	Niegranden, Latvia	r	-	dipl	
<i>Kosmoceras</i> ( <i>Spinikosmoceras</i> ) sp.	Sprey 2002	1-2	middle-late Callovian, Jurassic	Ryazan, Russia	r?	n. p.	n. p.	At least a dorsal shell wall does not cover the ammnointella.
<i>Kosmoceras</i> sp.	Kulicki 1979	1-2	Callovian, Jurassic	Luckow, Poland	r	wl	dipl	
<i>Kosmoceras</i> sp.	Drushits et al. 1977	1-2	Callovian, Jurassic	Yelat'ma village on Oka River, Ryazan Province, Russia	r	ol	dipl	

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Kosmoceras</i> sp.	MAn-4789	1-2	early Callovian, Jurassic	Dubki near Saratov, Russia	r	-	dipl?	
<i>Pseudocadoceras mundum</i> (Sasonov, 1957)	MAn-4791	1-2	early Callovian, Jurassic	Poretskoe on Sura River, Russia	r	wl	dipl	
<i>Pseudocadoceras</i> sp.	Drushits et al. 1977	1-2	Callovian, Jurassic	Yelat'ma village on Oka River, Ryazan Province, Russia	r	-	-	
<i>Quenstedtoceras henrici</i> Douville, 1912	Erben et al. 1968, 1969, Kulicki 1974, 1979	1-3	Callovian, Jurassic	Luckow near Lapiguz, S of Siedlce, Poland	r	wl	dipl	
<i>Quenstedtoceras henrici</i> Douville, 1912	MAn-4768	1-2	early Callovian, Jurassic	Dubki near Saratov, Russia	sc	wl	dopl, dipl	The dorsal shell wall forms a dorsal outer prismatic layer as an additional inner component, i.e. <b>seemingly complete dorsal shell wall</b> .
<i>Quenstedtoceras lamberti</i> (Sowerby, 1819)	MAn-4769 MAn-4770 MAn-4771	1-2	early Callovian, Jurassic	Dubki near Saratov, Russia	r	wl	dipl	The thickness of the dorsal inner prismatic layer varies from specimen to specimen. On occasion, the dorsal inner prismatic layer has several sub-layers (multi-layering).

<b>Taxon</b>	<b>References / collection number</b>	<b>Preservation index</b>	<b>Age, period</b>	<b>Location</b>	<b>Type of dorsal shell wall</b>	<b>Outer components</b>	<b>Inner components</b>	<b>Special features</b>
<i>Quenstedtoceras</i> sp.	Bandel 1989	1-2	Callovian, Jurassic	Luckow near Lapiguz, S of Siedlce, Poland	r?	n. p.	n. p.	
<i>Quenstedtoceras</i> sp.	Kulicki 1979, 1996, Kulicki & Tanabe 1999, Kulicki et al. 2001, Keupp 2000	1-2	Callovian, Jurassic	Luckow near Lapiguz, S of Siedlce, Poland	r	wl	dipl	
<i>Quenstedtoceras</i> sp.	Mutvei 1967	1	Callovian, Jurassic	Luckow near Lapiguz, S of Siedlce, Poland	r	-	-	
<i>Quenstedtoceras</i> sp. 1	MAn-4772 MAn-4773 MAn-4774 MAn-4775	1-2	late Callovian, Jurassic	Dubki near Saratov, Russia	r	wl	dipl	On occasion, the dorsal inner prismatic layer has several sub-layers (multi-layering).
<i>Quenstedtoceras</i> sp. 2	MAn-4776	1-2	early Callovian, Jurassic	Dubki near Saratov, Russia	r	wl	dipl	
<i>Rondiceras</i> sp.	MAn-4779 MAn-4780 MAn-4781 MAn-4782	1-2	early Callovian, Jurassic	Znamenka on Unzha River, Russia	r	wl	dipl	Sometimes the dorsal inner prismatic layer is locally absent.

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Sigaloceras</i> ( <i>Sigaloceras</i> ) <i>calloviense</i> (Sowerby, 1815)	MAn-4784 MAn-4785	1-2	late Callovian, Jurassic	Znamenka on Unzha River, Russia	sc?	wl?	dopl?, dipl	The outer component of the dorsal shell wall develops a relief (wrinkle layer?). The dorsal shell wall probably forms a dorsal outer prismatic layer as an additional inner component, i.e. <b>seemingly complete dorsal shell wall</b> . The dorsal inner prismatic layer is only formed sporadically for relief smoothing.
<i>Sigaloceras</i> ( <i>Sigaloceras</i> ) <i>enodatum</i> (Nikitin, 1881)	Drushits et al. 1977	1-2	Callovian, Jurassic	Yelat'ma village on Oka River, Ryazan Province, Russia	r	ol	dipl	
<b>Perisphinctoidea</b>								
<i>Binatisphinctes</i> <i>mosquensis</i> (Fischer, 1843)	Sprey 2002	1-2	middle Callovian, Jurassic	Ryazan, Russia	r?	n. p.	n. p.	At least a dorsal shell wall does not cover the amnointella.



Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Binatisphinctes</i> sp.	MAAn-4760 MAAn-4761 MAAn-4762 MAAn-4763 MAAn-4764 MAAn-4765 MAAn-4766	rc-2	middle Callovian, Jurassic	Ryazan, Russia	r (c local)	ol	dipl (dipl → dncl, dipl)	In general, the species forms a prismatic reduced dorsal shell wall. One specimen (MAAn-4760) seems to develop a local dorsal nacreous layer when compensating the sculpture of the preceding whorl.
<i>Choffatia (Grossouvria)</i> sp. 1	MAAn-4519 MAAn-4759	1-2	late Callovian, Jurassic	Dubki near Saratov, Russia	r	wl?	dipl	The outer component of the dorsal shell wall develops a relief (wrinkle layer?). There is only one isolated occurrence of wrinkles. On occasion, the dorsal inner prismatic layer has several sub-layers (multi-layering).
<i>Choffatia (Grossouvria)</i> sp. 2	MAAn-4520	rc-2	late Callovian, Jurassic	Dubki near Saratov, Russia	r → c	ol	dipl → dopl, dncl, dipl	The inner whorls form a prismatic reduced dorsal shell wall. In outer whorls, the shell develops a <b>complete dorsal shell wall</b> .
<i>Craspedites subditus</i> (Trautschold, 1887)	MAAn-4745	1-2	Jurassic	Khoroshovo, NW part of Moscow, Russia	r	n. p.	n. p.	At least in the living chamber, the dorsal shell wall is completely absent.

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Craspedites okensis</i> (d'Orbigny, 1845)	MAAn-4746 MAAn-4830	rc-2	Tithonian, Jurassic	Uljanowsk on Volga River, Russia	r	wl?	dipl	The outer component of the dorsal shell wall develops a relief (wrinkle layer?).
<i>Craspedites</i> sp.	MAAn-4744 MAAn-4829	rc-2	Calloviaian, Jurassic	Saratov, on Volga Riva, Russia	r	wl?	-	The outer component of the dorsal shell wall develops a relief (wrinkle layer?).
<i>Divisosphinctes besairiei</i> Collignon, 1960	PA-10151b MAAn-4758	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r (c local)	wl	dipl (dopl, dncl, dipl)	The outer component of the dorsal shell wall develops a relief; on occasion isolated wrinkles can be discerned. During overgrowth of an encruster, the shell of one specimen (PA-10151) develops a <b>complete dorsal shell wall</b> .
<i>Divisosphinctes</i> sp. 1	MAAn-4499	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r	wl?	dipl	The outer component of the dorsal shell wall develops a relief (wrinkle layer?).
<i>Divisosphinctes</i> sp. 2	MAAn-4498	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r	wl	dipl	The outer component of the dorsal shell wall develops a relief; on occasion isolated wrinkles can be discerned.
<i>Garniericeras catenulatum</i> (Fischer, 1830)	MAAn-4743	1-2	Jurassic	Khoroshovo, NW part of Moscow, Russia	r	-	dipl	

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Indosphinctes (Elatmites) submutatus</i> (Nikitin, 1881)	Doguzhaeva 2012	1-2	Callovian, Jurassic	Ryazan, Russia	r	ol	dipl	The outer component of the dorsal shell wall has a micro-granular structure.
<i>Kachpurites cf. fulgens</i> (Trautschold, 1861)	Erben et al. 1968, 1969	1-2	Tithonian, Jurassic	Kaschpur, Volga River Basin, Russia	r	-	dipl	
<i>Pavlovia</i> sp.	Erben et al. 1968, 1969, Erben & Reid 1971	2-3	Kimmeridgian, Jurassic	Hartwell, Buckinghamshire, England	r	-	dipl	
<i>Perisphinctes (Kraaosphinctes) mahabokensis</i> (Collignon, 1959)	MAn-4834 MAn-4835	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r → nr	wl?	dipl → dipl 1, dncl 2, dipl 2	The inner whorls form a prismatic reduced dorsal shell wall. The outer component of the dorsal shell wall probably develops a relief (wrinkle layer?). In the outer whorls, the shell develops a <b>nacreous reduced dorsal shell wall</b> . The appearance of the primary dorsal inner prismatic layer is sperulithic. The secondary dorsal inner prismatic layer is very thin.
<i>Perisphinctes (Kraaosphinctes)</i> sp.	MAn-4500 MAn-4755 MAn-4756	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r	ol?	dipl?	The dorsal inner prismatic layer appears only in contact of the septa (small whorls).

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
Perisphinctidae indet	Dauphin 1989	1-2	Jurassic	Madagascar	r?	n. p.	n. p.	
Perisphinctidae indet	MAo-4501	2	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r	ol	-	
<i>Proplanulites</i> sp.	MAo-4767	2	early Callovian, Jurassic	Znamenka on Unzha River, Russia	r	wl	dipl	
<i>Riasanites</i> sp. 1	MAo-1855	1-2	Berriasian, Cretaceous	Moscow region, Russia	r → c?	wl?	dipl → dncl?, dipl	In the outer whorl, it seems that the nacreous layer of the lateral shell wall does not wedge out at the whorl contact. The dorsal nacreous layer seems to cover wide portions of the preceding whorl (complete dorsal shell wall?).
<i>Riasanites</i> sp. 2	MAo-1856	1-2	Berriasian, Cretaceous	Ryazan, Russia	r?	-	dipl?	
<i>Simbirskites</i> sp. 1	MAo-1857 MAo-1858 MAo-1859	rc-1	late Hauterivian, Cretaceous	Mourberg at Hildesheim, Germany	n. p.	n. p.	n. p.	The ultrastructure is not preserved.

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Simbirskites</i> sp. 2	MAo-1860	rc-1	Hauterivian, Cretaceous	Speeta, Yorkshire, England	r	ol?	dipl	The inner prismatic layer of the dorsal shell wall can develop two sub-layers (multi-layering).
<i>Speetonicerias versicolor</i> (Trautschold, 1865)	MAo-1861	1-2	Aptian, Cretaceous	Simbirsk, Uljanowsk, Volga Basin region, Russia	nr	n. p.	dncl 2, dipl 2	In the outer whorls, the dorsal inner prismatic layer develops inclusions of nacre, i.e. <b>nacreous reduced dorsal shell wall</b> .
<i>Speetonicerias</i> sp.	MAn-4741 MAn-4742	rc-2	Callovian, Jurassic	Saratov on Volga River, Russia	r	wl	dipl	The outer component of the dorsal shell wall develops a relief of tiny triangular structures (wrinkle layer).
<i>Virgatites pallasianus</i> (d'Orbigny, 1845)	MAn-4754 MAn-4836	1-2	Tithonian, Jurassic	Voskresensk near Moscow, Russia	r	ol	dipl?	
<b>Aspidoceratidae: Peltoceratinae</b>								
<i>Peltoceratoides</i> sp.	MAn-4752 MAn-4753	1-2	late Callovian, Jurassic	Dubki near Saratov, Russia	r	wl?	dipl	On occasion, the outer component of the dorsal shell wall develops a relief (wrinkle layer?).

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<b>Aspidoceratidae: Aspidoceratinae</b>								
<i>Aspidoceras</i> sp.	MAn-3193 MAn-4046b MAn-4506 MAn-4507	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r → nr	ol (→ hbl)	dipl → dipl 1, dnc1 2, dipl 2	The inner whorls form a prismatic reduced dorsal shell wall. In the outer whorls, the shell develops a <b>nacreous reduced dorsal shell wall</b> .
<i>Epaspidoceras jeannetti</i> (Collignon, 1959)	MAn-3195 MAn-4503 MAn-4504 MAn-4505	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r (r → nr)	ol	dipl (dipl → dipl 1, dnc1 2, dipl 2)	In general, the species forms a prismatic reduced dorsal shell wall. One specimen (MAn-4505) develops a <b>nacreous reduced dorsal shell wall</b> in the outer whorls.
<i>Euaspidoceras</i> sp. 1	MAn-4750	2-3	late Callovian, Jurassic	Dubki near Saratov, Russia	nr	n. p.	dnc1 2, dipl 2	In the outer whorls, the shell develops a <b>nacreous reduced dorsal shell wall</b> .
<i>Euaspidoceras</i> sp. 2	MAn-4751	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r → nr	ol	dipl → dipl 1, dnc1 2, dipl 2	The inner whorls form a prismatic reduced dorsal shell wall. In the outer whorls, the shell develops a <b>nacreous reduced dorsal shell wall</b> .

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Mirosphinctes</i> sp. 1	MAN-1769	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r → nr	ol	dipl → dipl 1, dnc1 2, dipl 2	The inner whorls form a prismatic reduced dorsal shell wall. In the outer whorls, the shell develops a <b>nacreous reduced dorsal shell wall</b> .
<i>Mirosphinctes</i> sp. 2	MAN-4747	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r → nr	wl	dipl → dipl 1, dnc1 2, dipl 2	The inner whorls form a prismatic reduced dorsal shell wall. In the outer whorls, the shell develops a <b>nacreous reduced dorsal shell wall</b> . Some isolated wrinkles occur.
<i>Pseudowaagenia</i> sp.	MAN-4502	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	nr	ol (→ hbl)	dipl 1, dnc1 2, dipl 2	In the outer whorls, the shell develops a <b>nacreous reduced dorsal shell wall</b> .
<b>Haploceratoidea</b>								
<i>Aconeceras trautscholdi</i> (Sinzow, 1870)	Erben et al. 1968, 1969, Drushits & Khiami 1970, Doguzhaeva & Mutvei 1991, 1993a, Kulicki & Tanabe 1999, Kulicki et al. 2001, 2016	2-3	early Aptian, Cretaceous	Simbirsk, Uljanowsk, Volga River Basin, Russia	r	wl, sphpr	dipl	In the outer whorls, a <b>spherulitic-prismatic layer</b> covers the ventral keel of the preceding whorl; it forms a strong thickening.

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Aconeceras</i> sp. 1	MAo-1851 MAo-1852 MAo-1853	2-3	early Albian, Cretaceous	Ambatolafia, Mahajanga Basin, NW Madagascar	r	wl → sphpr	dipl	In the outer whorls, the wrinkle layer transforms into a <b>spherulitic-prismatic layer</b> . At the ventral keel of the preceding whorl, the layer forms a strong thickening with several prismatic inclusions. At the flanks of the preceding whorl, a regular wrinkle layer persists. The extension of the dorsal inner prismatic layer is restricted to the ventral keel of the preceding whorl and vanishes ventro-laterally.
<i>Aconeceras</i> sp. 2	MAo-1849 MAo-1850	1-2	Aptian, Cretaceous	Shilovka near Volga, Russia	r	sphpr?	dipl	In the outer whorls, a <b>spherulitic-prismatic layer</b> covers the ventral keel of the preceding whorl; it forms a strong thickening. The extension of the dorsal inner prismatic layer is restricted to the ventral keel of the preceding whorl and vanishes ventro-laterally.



Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Hecticoceras</i> ( <i>Hecticoceras</i> ) sp.	MAn-1528 MAn-4735 MAn-4736 MAn-4737 MAn-4738 MAn-4849 MAn-4850	rc-1	early Callovian, Jurassic	Ryazan, Russia	r	ol?	dipl?	
<i>Hecticoceras</i> ( <i>Lunuloceras</i> ) <i>brightii</i> (Pratt, 1841)	Sprey 2002	1-2	middle-late Callovian, Jurassic	Ryazan, Russia	r?	n. p.	n.d	At least a dorsal shell wall does not cover the ammnointella.
<i>Hecticoceras</i> ( <i>Lunuloceras</i> ) <i>lunula</i> (Reinecke, 1818)	Sprey 2002	1-2	middle-late Callovian, Jurassic	Ryazan, Russia	r?	n. p.	n. p.	At least a dorsal shell wall does not cover the ammnointella.
<i>Hecticoceras</i> ( <i>Sublunuloceras</i> ) <i>nodosulcatum</i> (Lahusen, 1883)	Sprey 2002	1-2	middle-late Callovian, Jurassic	Ryazan, Russia	r?	n. p.	n. p.	At least a dorsal shell wall does not cover the ammnointella.

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Hecticoceras</i> ( <i>Sublunuloceras</i> ) sp.	MAn-4739	1-2	late Callovian, Jurassic	Dubki near Saratov, Russia	sc?	wl?	dopl?, dipl	The outer component of the dorsal shell wall develops a relief (wrinkle layer?). The dorsal shell wall probably forms a dorsal outer prismatic layer as an additional inner component, i.e. <b>seemingly complete dorsal shell wall</b> .
<i>Lissoceras erato</i> (d'Orbigny, 1850)	MAn-4740	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r	wl	dipl	
<i>Oecoptychius</i> cf. <i>refractus</i> (Reinecke, 1818)	Erben et al. 1968, 1969	1-2	Callovian, Jurassic	Niegranden, Latvia	r	-	dipl	
<i>Sanmartinoceras</i> sp.	MAo-1854	2-3	early Albian, Cretaceous	Ambatolafia, Mahajanga Basin, NW Madagascar	r	sphpr	dipl	In the outer whorls, a <b>spherulitic-prismatic layer</b> covers the ventral keel of the preceding whorl; it is dominated by spherulitic-prismatic inclusions. The dorsal inner prismatic layer is thickest at position of the ventral keel of the preceding whorl and becomes very thin ventro-laterally.

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Taramelliceras externodosum</i> Dorn, 1930	MAn-1528	2-3	late Oxfordian, Jurassic	Sakaraha, Morondava Basin, SW Madagascar	r	sphpr	dipl	In the outer whorls, a <b>spherulitic-prismatic layer</b> covers the venter of the preceding whorl; it forms a strong thickening with several prismatic inclusions (only median section).
<b>"Desmoceratoidea"</b>								
<i>Beudanticeras</i> sp.	MAo-1845	2-3	early Albian, Cretaceous	Ambatolafia, Mahajanga Basin, NW Madagascar	r	wl	dipl	
<i>Canadoceras kossmati</i> Matsumoto, 1954	MAo-1799	rc-2	Campanian, Cretaceous	Teshio-Nakagawa area, Hokkaido, Japan	r	wl	dipl	
<i>Cleoniceras (Grycia) besairiei</i> (Collignon, 1949)	PA-21489b PA-29534a PA-33582	2-3	early Albian, Cretaceous	Ambatolafia, Mahajanga Basin, NW Madagascar	r (c local)	wl	dipl (dncl, dipl)	One specimen (PA-33582) forms a <b>local complete dorsal shell wall</b> in reaction to a forma aegra aptycha (shell anomaly).
<i>Cleoniceras (Grycia)</i> sp.	MAo-1829 MAo-1830 MAo-1882	2-3	early Albian, Cretaceous	Ambatolafia, Mahajanga Basin, NW Madagascar	r	wl	dipl	

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Damesites semicostatus</i> Matsumoto, 1942	MAo-1848	2-3	Campanian, Cretaceous	Teshio- Nakagawa area, Hokkaido, Japan	r	wl	dipl	
<i>Damesites sugata</i> (Forbes, 1846)	Kulicki & Tanabe 1999, Kulicki et al. 2001, 2016	1-3	Coniacian, Cretaceous	Haboro area, NW Hokkaido, Japan	r	wl	dipl	
<i>Damesites</i> sp.	MAo-1846	2	Campanian, Cretaceous	Teshio- Nakagawa area, Hokkaido, Japan	r	wl	dipl	
<i>Desmoceras</i> ( <i>Desmoceras</i> ) <i>latidorsatum</i> (Michelin, 1838)	MAo-1781 MAo-1782 MAo-1783 MAo-1784 MAo-1785 MAo-1786 MAo-1787 MAo-1788 MAo-1789 MAo-1839	2-3	early Albian, Cretaceous	Ambatolafia, Mahajanga Basin, NW Madagascar	r (local nr)	wl	dipl (dnc1 2, dipl 2)	One specimen (MAo-1787) develops local patches of nacre in the dorsal inner prismatic layer, i.e. <b>nacreous reduced dorsal shell wall.</b>

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Desmoceras</i> ( <i>Pseudouhligella</i> ) <i>intrapunctatum</i> Keupp, 2008	Keupp 2008	2-3	early Albian, Cretaceous	Ambatolafia, Mahajanga Basin, NW Madagascar	r?	(rs)	n. p.	In the rear living chamber, the inner prismatic layer forms ' <b>Ritzstreifen</b> ' ventrally and laterally.
<i>Desmoceras</i> ( <i>Pseudouhligella</i> ) <i>intrapunctatum</i> Keupp, 2008	MAo-1883	2-3	early Albian, Cretaceous	Ambatolafia, Mahajanga Basin, NW Madagascar	r	wl	dipl	
<i>Desmophyllites diphylloides</i> (Forbes, 1846)	MAo-1838	1-2	Campanian, Cretaceous	Teshio-Nakagawa area, Hokkaido, Japan	-	(pe)	dipl	Instead of a relief of a wrinkle layer, a relief is formed by convex <b>periostracal extensions</b> of the preceding whorl.
<i>Eupachydiscus</i> sp.	MAo-1830 MAo-1831 MAo-1832 MAo-1833 MAo-1834 MAo-1835	rc-3	Campanian, Cretaceous	Teshio-Nakagawa area, Hokkaido, Japan	r → nr	wl (→ rk)	dipl → dipl 1, dncl 2, dipl 2	The inner whorls form a prismatic reduced dorsal shell wall. In the outer whorls, the shell develops a <b>nacreous reduced dorsal shell wall</b> . The dorsal outer and the inner prismatic layer are each formed of two sub-layers. The outer sub-layer of the dorsal outer prismatic layer forms the relief of ' <b>Ritzknoten</b> ' that extends at least to the umbilical-lateral flanks and replaces the wrinkle layer in the outer whorls.

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Hauericeras angustum</i> Yabe, 1904	MAo-1836 MAo-1837	2	Campanian, Cretaceous	Teshio- Nakagawa area, Hokkaido, Japan	r	wl	n. p.	
<i>Kitchinites</i> sp.	MAo-1842 MAo-1843	1-3	Campanian, Cretaceous	Teshio- Nakagawa area, Hokkaido, Japan	r	wl	dipl	
<i>Menuites</i> sp.	MAo-1800 MAo-1894	rc-2	Campanian, Cretaceous	Teshio- Nakagawa area, Hokkaido, Japan	r	wl	dipl	
<i>Neosilesites ambatolaftensis</i> Collignon, 1963	MAo-1779 MAo-1780	2-3	early Albian, Cretaceous	Ambatolafia, Mahajanga Basin, NW Madagascar	r	wl	dipl	
<i>Neosilesites</i> sp.	MAo-1777 MAo-1778	2-3	early Albian, Cretaceous	Ambatolafia, Mahajanga Basin, NW Madagascar	r	wl	dipl	
<i>Puzosia</i> cf. <i>mozambica</i> Collignon, 1963	MAo-485	2-3	early Albian, Cretaceous	Ambatolafia, Mahajanga Basin, NW Madagascar	r	wl	dipl	

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Puzosia saintoursi</i> (Collignon, 1963)	MAo-1792 MAo-1793 MAo-1794 MAo-1795 MAo-1796 MAo-1797	2-3	early Albian, Cretaceous	Ambatolafia, Mahajanga Basin, NW Madagascar	r (nr local)	wl	dipl (dncl 2, dipl 2)	One specimen (MAo-1797) develops local patches of nacre in the dorsal inner prismatic layer, i.e. <b>nacreous reduced dorsal shell wall</b> . On occasion, the dorsal nacre has a lamellar ultrastructure.
<i>Umsinenoceras linguatuberculatum</i> Kennedy et al., 1979	MAo-1791 MAo-1844	2-3	early Albian, Cretaceous	Ambatolafia, Mahajanga Basin, NW Madagascar	r	wl	dipl	
<i>Yokoyamaoceras jimboi</i> Matsumoto, 1955	Kulicki & Tanabe 1999, Kulicki et al. 2001, 2016	2-3	early Santonian- middle Campanian, Cretaceous	Obira Area and Teshio- Nakagawa area, Hokaido, Japan	r	wl	dipl	
<b>Acanthoceratoidea</b>								
<i>Proleymeriella schrammeni</i> Jacob, 1907	MAo-1828	2	early Albian, Cretaceous	Vöhrum, near Hannover, Lower Saxony, Germany	r	wl?	dipl	The outer component of the dorsal shell wall develops a relief (wrinkle layer?).

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<b>Hoplitoidea</b>								
<i>Anahoplites</i> cf. <i>planus</i> (Mantell, 1822)	MAo-1815	1-2	middle Albian, Cretaceous	Wissant, Nord-Pas-de-Calais, France	r	-	dipl?	
<i>Anahoplites</i> sp.	MAo-1814	1-2	middle Albian, Cretaceous	Wissant, Nord-Pas-de-Calais, France	r	-	dipl	
<i>Euhoplites</i> cf. <i>nitidus</i> Spath, 1925	MAo-1817	rc	middle-late Albian, Cretaceous	Wissant, Nord-Pas-de-Calais, France	r?	wl?	n. p.	The ultrastructure is not preserved. There are probably relics of a wrinkle layer.
<i>Euhoplites trapezoidalis</i> Spath, 1928	MAo-1816	rc-1	late Albian, Cretaceous	Wissant, Nord-Pas-de-Calais, France	r	-	dipl	
<i>Euhoplites</i> gr. <i>tuberculatus</i> Sowerby, 1821	Erben et al. 1968, 1969	1-2	Albian, Cretaceous	Folkestone, Kent, England	r	-	dipl	
Hoplitidae indet	MAo-1818 MAo-1819 MAo-1820 MAo-1821	rc-1	middle Albian, Cretaceous	Wissant, Nord-Pas-de-Calais, France	r	-	dipl?	The ultrastructure is generally not preserved. However, in one specimen (MAo-1819) there are relics of a dorsal inner prismatic layer.



Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Placenticer</i> cf. <i>placenta</i> (DeKay, 1828)	Erben et al. 1968, 1969	1-2	Upper Cretaceous	Cheyenne River, Badlands, S Dakota, USA	r	-	dipl	
<i>Placenticer</i> <i>whitfieldi</i> Hyatt, 1903	Westermann 1971	1	Campanian, Cretaceous	Lethbridge, Alberta, Canada	r	-	dipl	
<i>Metaplacenticer</i> <i>subtilistriatum</i> (Jimbo, 1894)	MAo-1822 MAo-1823 MAo-1824 MAo-1825 MAo-1862 MAo-1863	2-3	Campanian, Cretaceous	Teshio-Nakagawa area, Hokkaido, Japan	r, (sc)	wl	dipl (dopl, dipl)	In one specimen (MAo-1824), the dorsal shell wall forms a dorsal outer prismatic layer as an additional inner component, i.e. <b>seemingly complete dorsal shell wall</b> .
<b>Ancyloceratoidea</b>								
Ancyloceratoidea indet	MAo-1813	2-3	Aptian, Cretaceous	Shilovka near Volga River, Russia	ric	ol	dopl, dncl 1, dipl 1, dncl 2, dipl 2	In the outer shafts, the conch develops a <b>reinforced complete dorsal shell wall</b> .
<i>Luppovia</i> sp.	Doguzhaeva & Mikhailova 1982	1-2	Aptian, Cretaceous	Bolshoj Balkhan, W Turkmenia	c	-	dopl, dncl, dipl	Right after the nepionic constriction (end of larval phase, begin of decoiling), the conch develops a <b>complete dorsal shell wall</b> .

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Ptychoceras laevigatum</i> Egoian, 1969	Doguzhaeva & Mutvei 1989, 1993a, b	1-2	late Aptian, Cretaceous	Hokodz River and Kurdzhips River, NW Caucasus, Russia	c → ric	cl	dopl, dncl, dipl → dncl 1, dipl 1, dncl 2, dipl 2 → dncl	The young shafts form a simple <b>complete dorsal shell wall</b> . In the outer shafts, the conch develops a <b>reinforced complete dorsal shell wall</b> . During ontogeny, the outer prismatic layer is reduced dorsally (and ventrally). The last shaft consists only of the nacreous layer (dorsally and ventrally). The whole adult aperture is coated by a 'nacreous' <b>coating layer</b> .
<i>Ptychoceras minimum</i> Rouchadze, 1933	Doguzhaeva & Mutvei 1989, 1993a, b	1-2	late Aptian, Cretaceous	Hokodz River and Kurdzhips River, NW Caucasus, Russia	c → ric	cl	dopl, dncl, dipl → dncl 1, dipl 1, dncl 2, dipl 2 → dncl	The young shafts form a simple <b>complete dorsal shell wall</b> . In the outer shafts, the conch develops a <b>reinforced complete dorsal shell wall</b> . During ontogeny, the outer prismatic layer is reduced dorsally (and ventrally). The last shaft consists only of the nacreous layer (dorsally and ventrally). The whole adult aperture is coated by a 'nacreous' <b>coating layer</b> .

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Ptychoceras parvum</i> Egoian, 1969	Doguzhaeva & Mutvei 1989, 1993a, b	1-2	late Aptian, Cretaceous	Hokodz River and Kurdzhips River, NW Caucasus, Russia	c → ric	cl	dopl, dncl, dipl → dncl 1, dipl 1, dncl 2, dipl 2 → dncl	The young shafts form a simple <b>complete dorsal shell wall</b> . In the outer shafts, the conch develops a <b>reinforced complete dorsal shell wall</b> . During ontogeny, the outer prismatic layer is reduced dorsally (and ventrally). The last shaft consists only of the nacreous layer (dorsally and ventrally). The whole adult aperture is coated by a 'nacreous' <b>coating layer</b> .
<i>Ptychoceras renngarteni</i> Egoian, 1969	Doguzhaeva & Mutvei 1989, 1993a, b	1-2	late Aptian, Cretaceous	Hokodz River and Kurdzhips River, NW Caucasus, Russia	c → ric	cl	dopl, dncl, dipl → dncl 1, dipl 1, dncl 2, dipl 2 → dncl	The young shafts form a simple <b>complete dorsal shell wall</b> . In the outer shafts, the conch develops a <b>reinforced complete dorsal shell wall</b> . During ontogeny, the outer prismatic layer is reduced dorsally (and ventrally). The last shaft consists only of the nacreous layer (dorsally and ventrally). The whole adult aperture is coated by a 'nacreous' <b>coating layer</b> .

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<b>Douvilleiceratoidea</b>								
<i>Douvilleiceras mammillatum</i> (Schlotheim, 1813)	MAo-1808 MAo-1809 MAo-1810 MAo-1811	2-3	early Albian, Cretaceous	Ambatolafia, Mahajanga Basin, NW Madagascar	r → ric	wl	dipl → dncl 1, dipl 1, dncl 2, dipl 2	The inner whorls form a prismatic reduced dorsal shell wall. In the outer whorls, the shell develops a <b>reinforced complete dorsal shell wall</b> . Only, at the ventral crest of the preceding whorl, the complete dorsal shell wall develops a local shell doubling (dncl 1, dipl 1, dncl 2, dipl 2). The cover of the flanks consists only of the inner portions (dncl 2, dipl 2). The wrinkles of the outer whorls fuse.
<i>Douvilleiceras</i> sp.	MAo-1812	2	Lower Cretaceous	Bully, Rhône, France	r → ric	wl?	dipl → dncl 1, dipl 1, dncl 2, dipl 2	The inner whorls form a prismatic reduced dorsal shell wall. In the outer whorls, the shell develops a <b>reinforced complete dorsal shell wall</b> . Only, at the ventral crest of the preceding whorl, the complete dorsal shell wall develops a local shell doubling (dncl 1, dipl 1, dncl 2, dipl 2). The cover of the flanks consists only of the inner portions (dncl 2, dipl 2). The wrinkles of the outer whorls fuse.

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Douvilleiceras</i> sp.	Dauphin 1989	2-3	Albian, Cretaceous	Bully, Rhône, France	r?	n. p.	n. p.	
<b>Deshayesitoidea</b>								
<i>Acanthohoplites bergeroni</i> (Seunes, 1887)	Erben et al. 1968, 1969	rc-2	middle-late Aptian, Cretaceous	Algermissen near Hildesheim, Germany	r	-	dipl	
<i>Colombiceras</i> sp.	MAo-1884	1-2	Aptian, Cretaceous	Kaukasus region, Russia	nr	-	dipl 1, dnc1 2, dipl 2	The shell develops a <b>nacreous reduced dorsal shell wall</b> . In the outer whorls, the dorsal shell wall can be reinforced by a dorsal outer prismatic layer. However, it covers only the flanks of the preceding whorl and vanishes completely towards the venter.
<i>Deshayesites</i> sp.	MAo-1806 MAo-1807	1-2	Aptian, Cretaceous	Shilovka near Volga, Russia	r	wl	dipl	On occasion, the dorsal inner prismatic layer appears only in contact of the septa.
<i>Dufrenoyia</i> sp.	MAo-1808	1-2	Lower Cretaceous	Bully, Rhône, France	r	n. p.	n. p.	At least in the living chamber, the dorsal shell wall is completely absent.

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Parahoplites</i> sp.	MAo-1804	rc-1	Aptian, Cretaceous	Daghestan	nr?	-	dncl?	The diagenetically altered dorsal shell wall preserves relics of nacreous appearance.
<b>Scaphitoidea</b>								
<i>Clioscaphtes vermiformis</i> (Meek & Hayden, 1862)	Landman 1987	1-2	Turonian-Santonian, Cretaceous	Big Horn Country and Tool Country, Montana	r→c	-	dipl → dopl, dncl, dipl	The planispirally coiled phragomocone has a prismatic reduced dorsal shell wall. The detached, hook-like living chamber develops a <b>complete dorsal shell wall</b> .
<i>Discoscaphites</i> cf. <i>conradi</i> (Morton, 1834)	Erben et al. 1968, 1969	1-2	Upper Cretaceous	Rock Creek, S Dakota, USA	r→c	-	dipl → dopl, dncl, dipl	The planispirally coiled phragomocone has a prismatic reduced dorsal shell wall. The detached, hook-like living chamber develops (probably) a <b>complete dorsal shell wall</b> .
<i>Discoscaphites</i> sp.	Birkelund 1967, 1980, Birkelund & Hansen 1968, 1974	1-2	Maastrichtian, Cretaceous	Agatalen, Nûgssuaq, W Greenland	r	-	dipl	The planispirally coiled phragomocone has a prismatic reduced dorsal shell wall.

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Discoscaphites</i> sp.	MAo-1803	2	Maastrichtian, Cretaceous	Fox Hills Formation, North Central, S Dakota, USA	r	ol	n. p.	The planispirally coiled phragmocone has a prismatic reduced dorsal shell wall.
<i>Hoploscaphites nicoletii</i> (Morton, 1842)	AMNH-FI-99141 AMNH-FI-99142 AMNH-FI-99143	2	Maastrichtian, Cretaceous	Fox Hills Formation (Loc. #3272), S Dakota, USA	r → c	wl?	dipl → dopl, dncl, dipl	The planispirally coiled phragmocone has a prismatic reduced dorsal shell wall. The detached, hook-like living chamber develops a <b>complete dorsal shell wall</b> . The outer component of the dorsal shell wall develops a relief of small wrinkle-like structures.
<i>Hoploscaphites</i> sp.	MAo-1802	2	Maastrichtian, Cretaceous	Fox Hills Formation, North Central, S Dakota, USA	r	wl?	n. p.	The planispirally coiled phragmocone has a prismatic reduced dorsal shell wall. The outer component of the dorsal shell wall develops some isolated wrinkle-like ridges.
<i>Jeletzkytes nodosus</i> (Owen, 1852)	Erben et al. 1968, 1969	1-2	Pierre Shale, Cretaceous	Cheyenne River and Wasta, S Dakota, USA	r → c	-	dipl → dopl, dncl, dipl	The planispirally coiled phragmocone has a prismatic reduced dorsal shell wall. The detached, hook-like living chamber develops (probably) a <b>complete dorsal shell wall</b> .

Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Scaphites</i> ( <i>Pteroscaphites</i> ) <i>auriculatus</i> (Cobban, 1952)	Landman 1987	1-2	Turonian-Santonian, Cretaceous	Tool Country, Montana	r → c	-	dopl, dncl, dipl	The planispirally coiled phragomocone has a prismatic reduced dorsal shell wall. The detached, hook-like living chamber develops a <b>complete dorsal shell wall</b> .
<i>Scaphites</i> cf. <i>hippocrepis</i> (DeKay, 1828)	Westermann 1971	1	Upper Cretaceous	Black Hills, S Dakota, USA	r	-	dipl	The planispirally coiled phragomocone has a prismatic reduced dorsal shell wall.
<i>Scaphites preventricosus</i> Cobban, 1951	Landman 1987	1-2	Turonian-Santonian, Cretaceous	Cascade Country and Tool Country, Montana	r → c	-	dopl, dncl, dipl	The planispirally coiled phragomocone has a prismatic reduced dorsal shell wall. The detached, hook-like living chamber develops a <b>complete dorsal shell wall</b> .
<i>Scaphites whitfieldi</i> Cobban, 1951	Landman 1987	1-2	Turonian-Santonian, Cretaceous	Niobrara Country and Albany Country, Wyoming; Butte Country and Fall River Country, S Dakota; Emery Country, Utah	r → c	-	dopl, dncl, dipl	The planispirally coiled phragomocone has a prismatic reduced dorsal shell wall. The detached, hook-like living chamber develops a <b>complete dorsal shell wall</b> .



Taxon	References / collection number	Preservation index	Age, period	Location	Type of dorsal shell wall	Outer components	Inner components	Special features
<i>Scaphites whitfieldi</i> Cobban, 1951	AMNH- FI-99144	2	Turonian, Cretaceous	Turner Sandy Member, Wyoming, USA	r → c	wl	dipl → dopl, dncl, dipl	The planispirally coiled phragomocone has a prismatic reduced dorsal shell wall. The detached, hook-like living chamber develops a <b>complete dorsal shell wall</b> . The outer component of the dorsal shell wall develops a relief; on occasion, isolated wrinkles can be discerned.
<i>Scaphites</i> sp.	Erben et al. 1968, 1969	1-3	Upper Cretaceous	Rock Creek, S Dakota, USA	r → c	-	dipl → dopl, dncl, dipl	The planispirally coiled phragomocone has a prismatic reduced dorsal shell wall. The detached, hook-like living chamber develops (probably) a <b>complete dorsal shell wall</b> .

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