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## The new data on the Aptian zonation in the Ulyanovsk (Simbirsk) region, Russian Platform

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With 3 plates, 2 figures and 1 table in the text

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**Abstract:** Recent reinvestigation of sections provided the opportunity to propose a new biostratigraphic zonation for the Aptian deposits of the region. The Barremian/Aptian boundary is defined by the disappearance of the belemnite *Oxyteuthis (Validoteuthis) lahuseni*. The basal Aptian does not contain any index macrofauna and could correspond to the *Prodeshayesites* zone. The succeeding *Deshayesites forbesi* zone was recognized by CASEY (1964), but its stratigraphical range in the River Volga Basin was determined for the first time. It is overlain by the *Deshayesites deshayesi* zone with oil-shales. Above it, the *Deshayesites grandis* zone was recognized. It contains large *Deshayesites* in assemblages with numerous *Australiceras*. The *Tropaeum (T.) bowerbanki* zone ends the Lower Aptian succession. It was possible to recognize only one ammonite zone, the *Aconeceras nissus* zone, in the Middle Aptian. The Upper Aptian cannot be characterized by means of ammonites because of the near-shore origin. It is overlain unconformably by the Upper Albian with a sharp basal contact. The succession is very similar to that in England.

**Zusammenfassung:** Jüngste Studien der Profile geben die Möglichkeit, eine neue biostratigraphische Zonenaufteilung der Apt-Ablagerungen in diesem Gebiet vorzuschlagen. Die Grenze Barreme/Apt ist durch das Verschwinden des Belemniten *Oxyteuthis (Validoteuthis) lahuseni* bestimmt. Das Basis-Apt enthält keine Index-Makrofauna und könnte der *Prodeshayesites*-Zone entsprechen. Die folgende *Deshayesites forbesi*-Zone wurde von CASEY (1964) festgestellt, aber ihre stratigraphische Reihe im Wolga-Gebiet wurde zum ersten Male definiert. Darüber befindet sich die *Deshayesites deshayesi*-Zone mit Öl-Schalen. Über dieser Zone wurde die *Deshayesites grandis*-Zone festgestellt. Sie enthält große *Deshayesites* zusammen mit zahlreichen *Australiceras*. Die *Tropaeum (T.) bowerbanki*-Zone beendet die Nieder-Apt-Reihenfolge. Es konnte nur eine Ammoniten-Zone (die *Aconeceras nissus*-Zone) im Mittel-Apt festgestellt werden. Das Ober-Apt kann

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mit Hilfe der Ammoniten nicht gekennzeichnet werden, weil es sich ursprünglich in der Nähe der Küste befand. Darüber befindet sich das Ober-Apt mit scharfem Basis-Kontakt. Die Reihenfolge ist der von England sehr ähnlich.

## 1. Introduction

The best Aptian sections of the Russian Platform are situated in the middle of the Volga River valley, between Ulyanovsk (Simbirsk) and Saratov in the Simbirsk (or Ulyanovsk-Saratov) Syncline (MILANOVSKY 1987). Investigations of the stratigraphy of the Aptian have a long history, starting from the works of TRAUTSCHOLD, SINZOW (1870-1905), LAHUSEN, etc. The most important works, which provided the basis of current understanding of the Aptian stratigraphy of this region, are by SAZONOVA (1958-1967) and GLAZUNOVA (1959-1973). The subsequent regional stratigraphic 'Unified' scheme (1993) does not contain many changes to the Aptian zonation. The main problem for Aptian investigations in the Simbirsk Syncline is the absence of continuous sections, because of the numerous landslides and stratigraphic gaps. In 1995-1996, the author had a unique opportunity for the investigation of the Aptian in the northern part of Ulyanovsk, where a very complete succession was exposed in artificial excavation during the building of the bridge across the Volga. In 1995, the section was visited in the context of the Peri-Tethys Programme, together with colleagues from the Institute of the Lithosphere and the Geological Institute of the Russian Academy of Sciences, Moscow. In 1996, the author worked on the section with colleagues from the Geological Institute of the Russian Academy of Sciences, Moscow, and from the Palaeomagnetic Laboratory, Saratov State University. Some preliminary results have already been published by the author (BARABOSHKIN 1996 a-d). In addition to the main section, sections near Novoulyanovsk (Kremenki Village and Tornov Ravine) were investigated. Those sections are of great interest, because the Barremian/Aptian boundary is exposed there.

## 2. Stratigraphy

The Barremian/Aptian boundary remains poorly investigated in the Russian Platform (RP). In the old literature the "belemnite Formation" is referred to the Barremian (MILANOVSKY 1940, GERASIMOV et al. 1962, etc.). Recently, the formation has been called the Urensk Formation by PISANNIKOVA (Unified ... 1993) for the Ulyanovsk region. The succession comprises silty clays and sands with siderite concretions. It contains the belemnites *Praeoxyteuthis jasykowi*, *P. pugio*, *Oxyteuthis* (O.) *brunsvicensis*, O. (*Validoteuthis*) *lahuseni*, various *Aulacoteuthis* (GLAZUNOVA 1969) and bivalves. As is known from English and German sections, most of the above-mentioned belemnites belong to different substages and even stages of the Lower Cretaceous (MUTTERLOSE 1983, KEMPER 1976, DOYLE & BENNETT 1995, etc.). Unfortunately, the belemnite finds were made in the beach of the River Volga and their actual position in the succession is not known. We collected belemnite samples both from sections and from the beach.



The section is represented by a series of landslides on the right bank of the River Volga near the village of Kremenki (Novoulyanovsk region, 30 km S of Ulyanovsk; Fig. 1). Sections in landslides were correlated by means of horizons of siderite and carbonate concretions.

The upper part of the section is supposed to be Barremian. It comprises dark grey, silty, bioturbated clays with a soft clayey sandstone bed (0.4 m, Y96-14/16) at the top. Rare *Cymbula* aff. *nuda* and *Nucula* occur in the clays. The top and the bottom of the bed are represented by soft-grounds. *Oxyteuthis* (*Validoteuthis*) *lahuseni*, *O.* (*V.*) *barremicus*, *O.* (*V.*) sp., *Oxyteuthis* (*O.*) sp. and fragments of *Cucullaea golowkinskii* are found in the basal part of the sandstones. The same assemblage, and guards similar to *Oxyteuthis* (*O.*) aff. *germanica* (Pl. 1, Fig. 1) were collected from the beach. Specimens of *O. germanica* in the collection of Prof. J. MUTTERLOSE, stored in the Institute of Geology and Palaeontology of Hannover, are of two types: more and less cylindrical. Our finds belong to the cylindrical morphotype. It could indicate the possible presence of the *germanica* zone (MUTTERLOSE 1983, KEMPER 1995, etc.) in a part of the section that is covered by landslides. In the assemblage, depressed guards of *Oxyteuthis* intermediate between *O.* (*O.*) *depressa* and *O.* (*V.*) *lahuseni* were also found (Pl. 1, Fig. 2). Those belemnites are shorter and thicker than the typical *O. depressa*, and probably reflect the same tendencies that took place in the case of the relationship between *O.* (*O.*) *germanica* and *O.* (*O.*) *depressa* (MUTTERLOSE 1983).

The presence of *Oxyteuthis* characterizes Upper Barremian to basal Aptian successions in NW Europe (MUTTERLOSE 1983, DOYLE & BENNETT 1995). The species *lahuseni* has been considered as Hauterivian-Barremian and referred either to *Acroteuthis* (SAKS & NALNYAEVA 1966) or to *Oxyteuthis* (GLAZUNOVA 1969). *Oxyteuthis* (*Validoteuthis*) *barremicus* is supposed to be Barremian (GLAZUNOVA 1969). It is more or less

## Plate 1

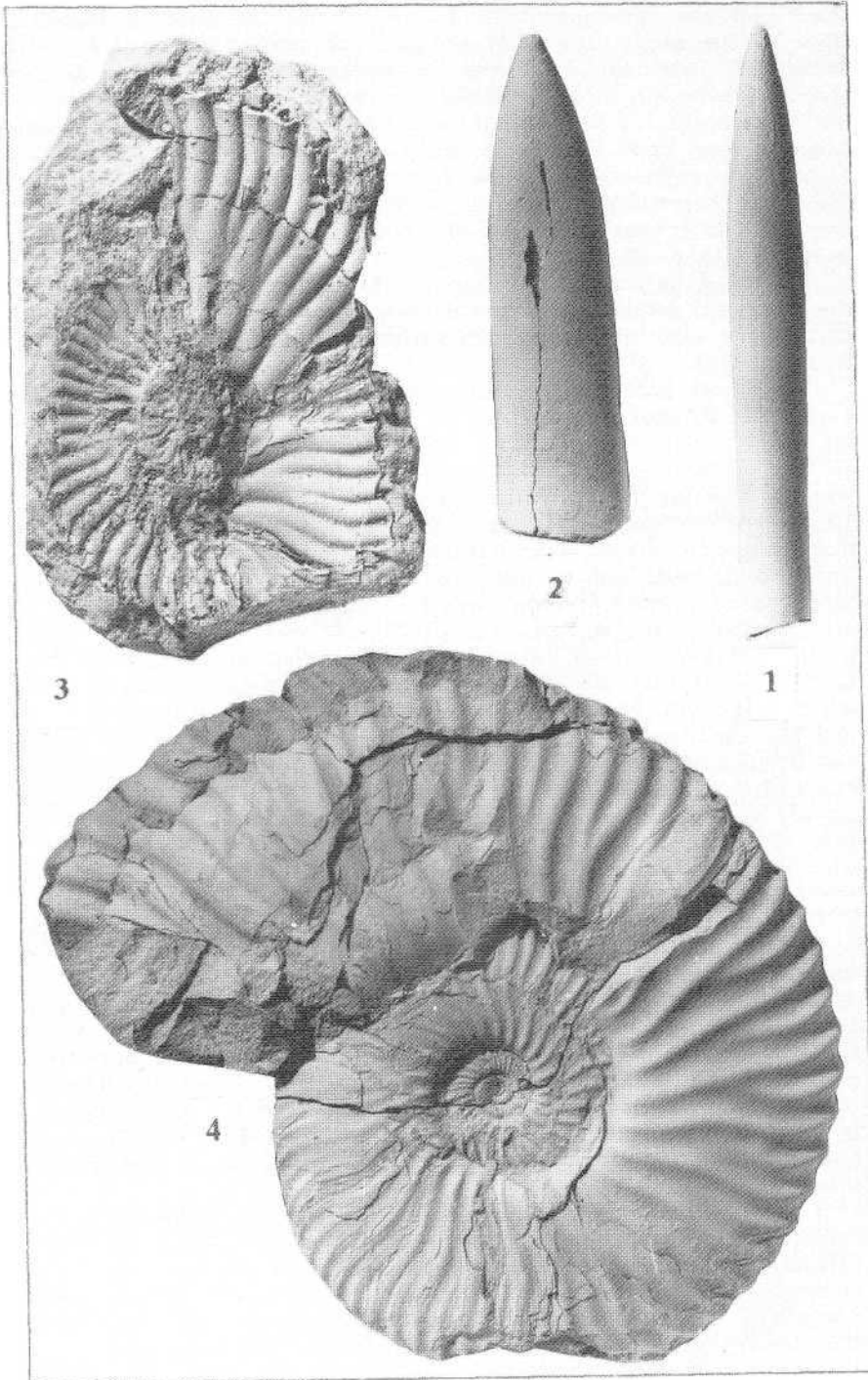
Fig. 1: *Oxyteuthis* (*Oxyteuthis*) aff. *germanica* STOLLEY. - No. Y96-19/14, ventral side. Upper Barremian, *Oxyteuthis germanica* zone. Right bank of the River Volga, near Kremenki Village, on the beach. Author's collection.

Fig. 2: *Oxyteuthis* (*Validoteuthis*) *lahuseni* (PAVLOW). - No. Y96-19/16, ventral side of the depressed morph. Upper Barremian, *Oxyteuthis lahuseni* zone. Right bank of the River Volga, near Kremenki Village, on the beach. Author's collection.

Fig. 3: *Deshayesites forbesi* CASEY. - No. Y95-9/1-1. Imprint of the shell. Lower Aptian, *Deshayesites forbesi* zone. Right bank of the Volga River, Ulyanovsk, excavation for the new bridge. Author's collection.

Fig. 4: *Deshayesites collevarus* GLAZUNOVA. - No. Y95-9/16-2. Complete specimen with deformed living chamber. Lower Aptian, *Deshayesites grandis* zone. Right bank of the River Volga, Ulyanovsk City, excavation for the new bridge. Author's collection.

All specimens are stored in the Department of Historical Geology, Geological Faculty, Moscow State University. All figures are in natural size.



clear that the development of *Oxyteuthis* on the Russian Platform took place at the same time in W Europe. The author thinks that the above-mentioned finds indicate Upper Barremian in the Kremenki section. We propose *Oxyteuthis* (*Validoteuthis*) *lahuseni* as zonal index species for that interval (top of the Barremian?) and we place the Barremian/Aptian boundary between beds Y96-14/16 and Y96-14/15. The *lahuseni* zone should probably be correlated with the *depressa* zone in W Europe. Unfortunately, the whole belemnite succession of the Volga remains poorly investigated, and there is a possibility that the boundary should be placed a little bit lower (ERBA et al. 1996).

The basal part of the Aptian succession was studied to the south of the Kremenki section, near the Tornov Ravine (Fig. 1, Kremenki-3). This part begins with the Tornov Formation described by PISANNIKOVA (Unified ... 1993).

The lower part of the succession consists of two members, intermediate in lithology between Barremian and Aptian. These are in ascending order:

I (Y96-14/15 - 14/3). Rhythmical alternation of grey-brown soft sandstones (0.03-0.1 m), dark grey clayey siltstones (0.8-2.0 m) and black clays. All the sediments are bioturbated; the clays contain weathered marcasite concretions and carbonate concretions occur in the sandstone beds. Softgrounds are developed at the base of each sandstone bed. The top of each rhythm is brown-coloured due to iron oxides. Three rhythms are included in the member, their total thickness is 10.2 m.

II (Y96-14/2 - 18/4). Rhythmical alternation of dark grey silty clays (2-5 m), bioturbated, and soft glauconite-quartz sandstones, brown-coloured (0.5-0.2 m). The silty clays contain weathered marcasite concretions and the sandstones contain carbonate to siderite concretions. Softgrounds are commonly developed at the base and the top of the sandstone beds. Four rhythms are included in the member, their total thickness is about 22-23 m. Bed Y96-17/2 is very distinctive and was recognized near the base of the Ulyanovsk section. *Deshayesites* cf. *forbesi* (Fig. 2, Y95-9/1) was found below this level in the Ulyanovsk section in an assemblage with *Arctica?* sp. and *Cymbula nuda*.

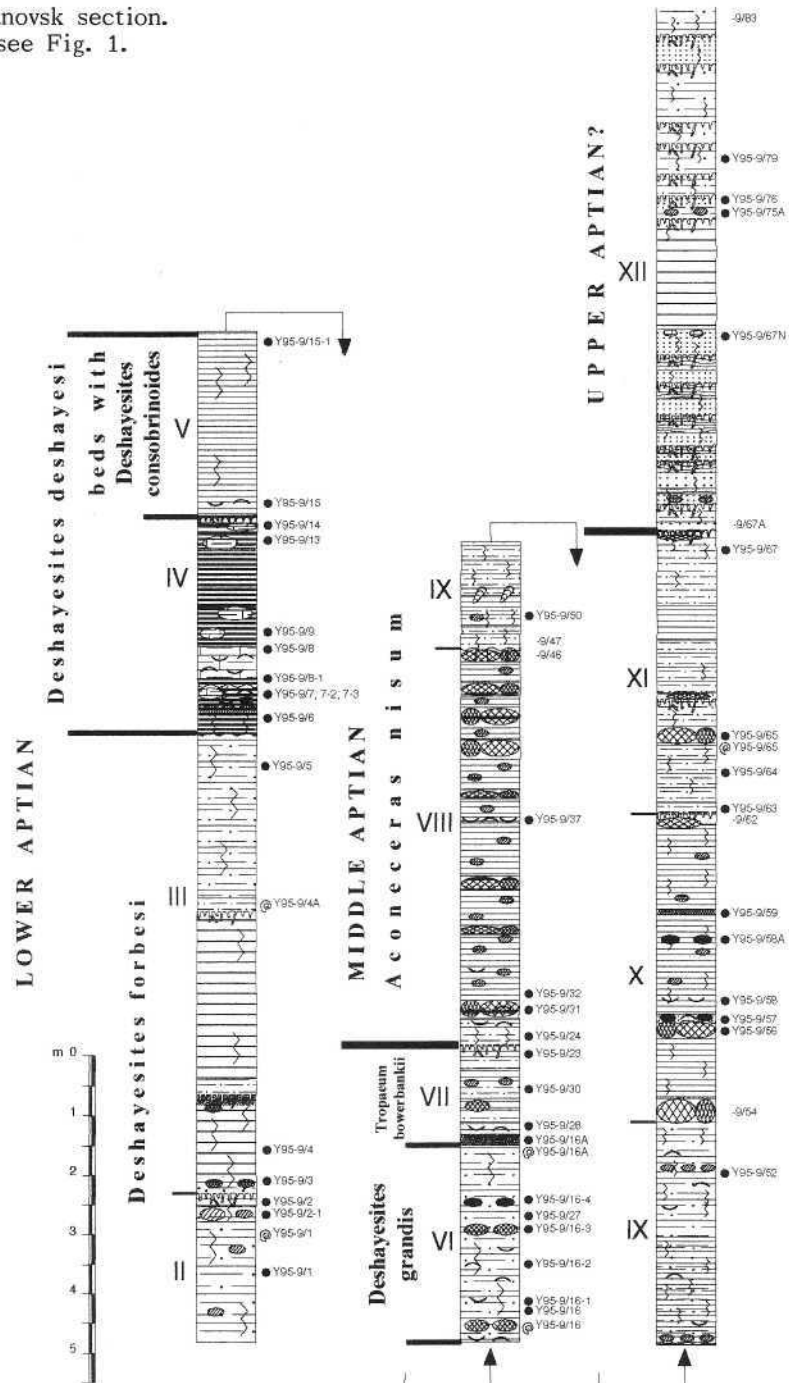
The succession continues in the northern part of Ulyanovsk (right bank of the Volga), in the Youth Park. The following succession is exposed there, in ascending order:

III (Y95-9/3 - 9/5). Rhythmical alternation of green-brown glauconite sands (0.2-0.5 m), dark grey silty clays (0.2-3.0 m) and grey striped bioturbated clays (1.5-2.0 m) and silty clays with siderite concretions. Softgrounds occur at the base of each sandy bed. Three rhythms comprise their member, their total thickness is 7.8 m. The top of the upper rhythm is eroded. Fragments of *Deshayesites forbesi* (Y95-9/4A, Pl. 1, Fig. 3), *Cymbula nuda* and *Inoceramus volgensis* (Y95-9/5) have been found in the member.

IV (Y95-9/6 - 9/14). The member is composed of the black oil-shales, referred to the Ulyanovsk Formation by KRAVTZOV, STURMAN and ZHUKOVA (Unified ... 1993). The black shales contain huge carbonate concretions (usually called "Aptian Plate"), with the largest ones in the lower part of the member and smaller ones in the top. The structure of the member consists of finely-laminated light and black beds (1-5 mm). The basal part of the member contains wood pieces, shell detritus and



Fig. 2. Ulyanovsk section.  
For legend see Fig. 1.



small phosphorite nodules. It is also possible to recognize one or two erosion surfaces in good exposures. There are many ammonites, aptychi and fish remains that cover entire surfaces of lamination. Some surfaces are covered exclusively by embryonic ammonite shells. Those features, together with high  $C_{org}$  content (up to 6-8 %) provide the evidence for anoxic conditions during sedimentation. Ammonite fragments are characteristic of this member. The fauna includes *Deshayesites deshayesi*, *D. lavaschensis*, *D. lavaschensisformis*, *D. volgensis* (Pl. 2, Fig. 1). *D. consobrinoides* (Pl. 2, Fig. 2), *D. sp.*, *Sinzovia trautscholdi* and rare small heteromorphs. The bivalves *Cymbula sp.*, *Phacoides borealis* and numerous serpulids (*Ditrupa notabile*) also occur. The thickness of the member is 3.8-4.0 m.

V (Y95-9/15 - 15/1). The member consists of uniform dark grey bioturbated clays with rare shell detritus at the base. Only the *Deshayesites consobrinoides* (Pl. 3, Fig. 3) assemblage has been found. Thickness of the member is 3.0-3.2 m.

VI (Y95-9/16 - 16/4). The member is represented by dark grey bioturbated silty clays. There are several beds containing bivalves (*Arctica anglica*, *Cymbula gardneri*, *Modiola sp.*, *Thetironia sp.*, *Panopea neocomiensis*, *Corbula sp.*, *Inoceramus volgensis*, *I. borealis*), two horizons of carbonate concretions and rare small phosphorites. Ammonites were found both in the clays and in the concretions: *Australiceras (Australiceras) simbirskense* (Pl. 2, Fig. 3), "*A. (A.) rossicum*" (SAZONOVA, non CASEY; = "*Crioceras gracile*": SINZOW 1905), *A. (A.) sp.*, *Australiceras (Proaustraliceras) laticeps*, large *Deshayesites collevarus* (Pl. 1, Fig. 4). It is from this member that *Deshayesites imitator* (= *D. latilobatus*, SINZOW 1909), *D. kabanovi*, and *D. variabilis* were described by GLAZUNOVA (1968, 1973). *Deshayesites multicostatus* and *D. bodei* were also mentioned by GLAZUNOVA (1973) from this level.

VII (Y95-9/16-1 - 9/23). Rhythmical alternation of grey, clayey, laminated to weakly cross-bedded silts (0.2 m) with glauconite grains and dark grey clays (0.2-0.3 m) with shell detritus and fragments of *Cymbula nuda* and *Inoceramus borealis*. There are large siderite plates at the base of the member. These contain fragments of huge ammonites: *Tropaeum*

## Plate 2

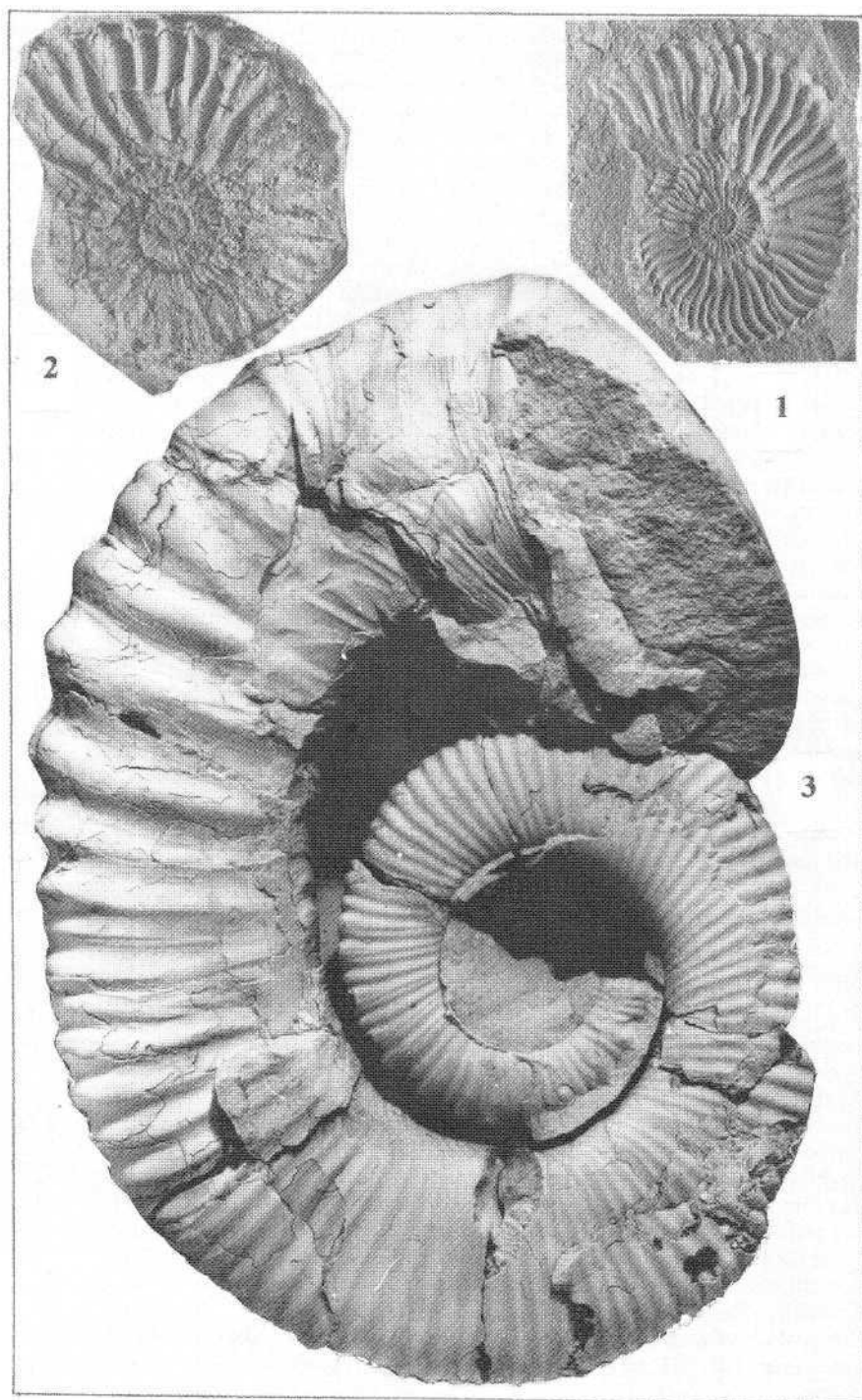
Fig. 1: *Deshayesites volgensis* SAZONOVA. - No. Y95-9/8-1. Flattened complete example. Lower Aptian, *Deshayesites deshayesi* zone.

Fig. 2: *Deshayesites consobrinoides* SINZOW. - No. Y95-9/9-6-1. Flattened partially crushed specimen. Lower Aptian, *Deshayesites deshayesi* zone.

Fig. 3: *Australiceras (Australiceras) simbirskense* SINZOW. - No. Y95-9/16-27. Complete specimen with originally damaged living chamber, x 0.77. Lower Aptian, *Deshayesites grandis* zone.

Samples are stored in the Department of Historical Geology, Geological Faculty, Moscow State University. All figures are in natural size except where indicated. Specimens were collected by the author from the excavations for the new bridge on the right bank of the River Volga, Ulyanovsk.





(*Tropaeum*) *bowerbanki* (Pl. 3, Fig. 4; up to 80 cm in diameter), and accumulations of bivalved *Inoceramus* cf. *borealis*. The top of the member is represented by a softground. Total thickness is 1.6-1.8 m.

VIII (Y95-9/24 - 9/46). The member consists of dark grey bioturbated clays with shell detritus. It contains numerous carbonate to siderite concretions, with horizons of septaria and marcasite concretions. There are grey silts at the base above the softground and an erosion surface at the top. The faunal assemblage includes *Tonohamites* sp. (Pl. 3, Fig. 2), *Aconeceras nissus* (Pl. 3, Fig. 1), *Nuculana lineata*, N. sp., *Cymbula gardneri*, *Modiola* cf. *subsimplex*, *M. reversa*, *Inoceramus* cf. *borealis*, *Arctica sedgwicki sedgwicki*, *Venilicarida* (V.) *protensa*, V. (V.) sp., *Panopea neocomiensis* and *Dentalium?* sp. The thickness reaches 7 m.

IX (Y95-9/47 - 9/53). The member consists of grey and light grey silty clays, bioturbated and detritic, with horizons of marcasite concretions. Large *Pinna* (*Pinna*) occur in life position and rare *Cymbula* sp. were observed near the base of the member. Thickness is 5.5-5.6 m.

X (Y95-9/54 - 9/62). The member is similar to VIII. It is limited by the softground surface at the top and contains a significant stratigraphical gap in the lower part (bed Y95-9/57). The gap looks like a green line in the wall of the quarry because of the glauconite-filled burrows in the softground. Above it, phosphorite pebbles, bored oysters (*Liostrea* sp.) and rounded valves of *Arctica* ex gr. *sedgwicki* occur. The clays contain a bivalve assemblage comprising *Nuculana scapha*, N. sp., *Nucula seeleyi*, N. sp., *Lucina?* sp. and *Proveniella?* sp. Thickness is 5.5 m.

XI (Y95-9/63 - 9/67). Alternation of grey silts, silty clays and dark grey clays. All the sediments are bioturbated. There are several horizons of siderite concretions and also two softground surfaces, in the middle and at the top, respectively. The fauna assemblage is very poor: only rare valves of *Arctica* ex gr. *sedgwicki* have been found. Thickness is 4.8 m.

XII (Y95-9/67A - 9/83). Rhythmical alternation of greenish-grey glauconite-quartz sands (0.05-0.4 m), grey silts to sandy clays (0.2-1.5 m) and rare dark clays (2.5 m). The sediments are bioturbated and contain

### Plate 3

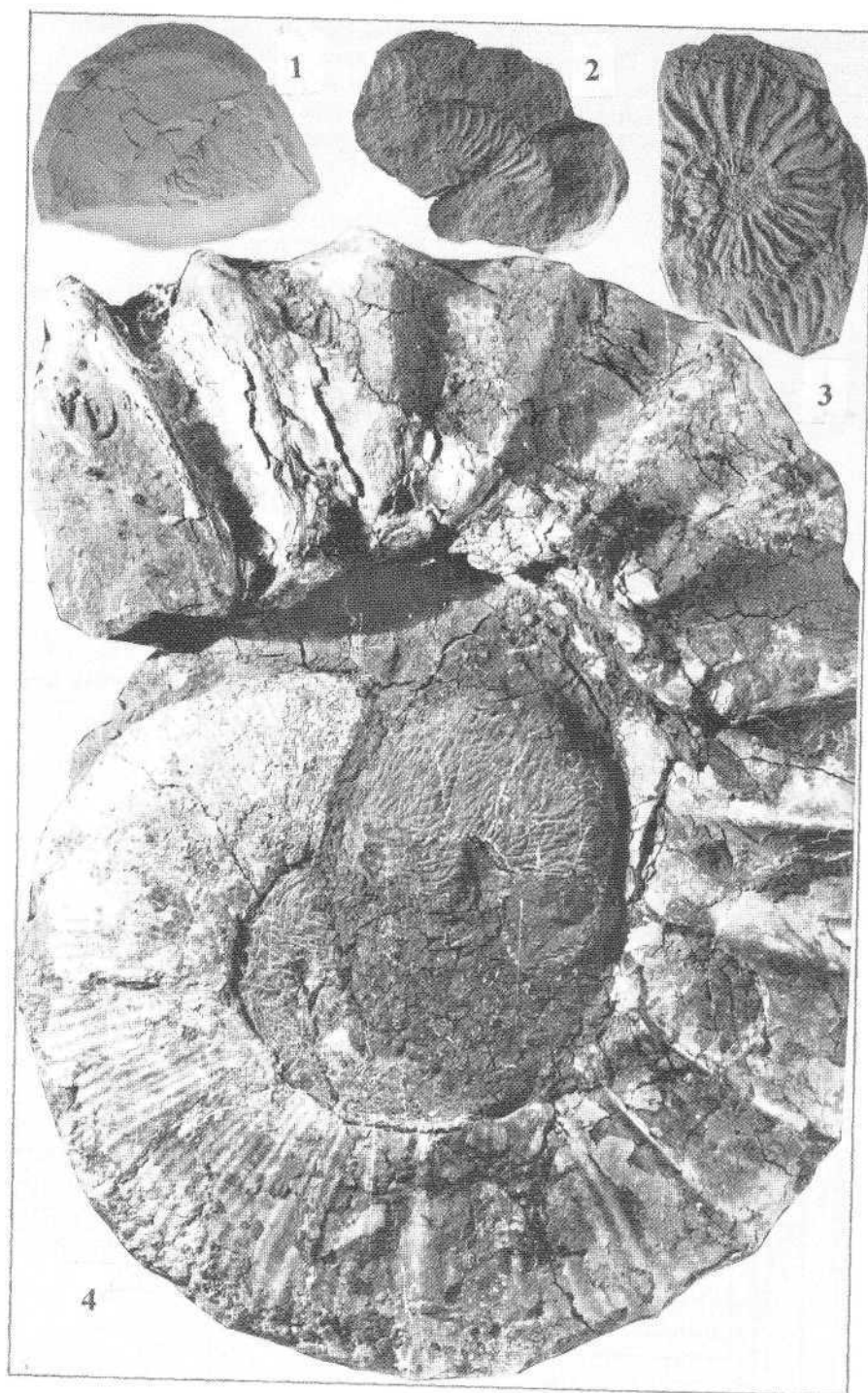
Fig. 1: *Aconeceras nissus* (D'ORBIGNY). - No. Y95-9/52-1. Partially crushed specimen. Middle Aptian, *Aconeceras nissus* zone.

Fig. 2: *Tonohamites* sp. - No. Y95-9/52-2. Fragment of the hook. Middle Aptian, *Aconeceras nissus* zone.

Fig. 3: *Deshayesites consobrinoides* SINZOW. - No. Y95-9/15-1. Flattened partially crushed specimen. Lower Aptian, *Deshayesites deshaysi* zone, beds with *Deshayesites consobrinoides*.

Fig. 4: *Tropaeum* (*Tropaeum*) *bowerbanki* J. DE C. SOWERBY. - No. Y95-9/16-1-1. Partially crushed specimen, x 0.39. Lower Aptian, *Tropaeum* (T.) *bowerbanki* zone.

Specimens are stored in the Department of Historical Geology, Geological Faculty, Moscow State University. All figures are in natural size unless otherwise noted. Specimens were collected by the author from the excavations for the new bridge on the right bank of the River Volga, Ulyanovsk.



sulphide concretions. Softgrounds are developed at the base of each rhythm. The lower part of the member is more sandy. It is possible that all of those rhythms represent mega cross-bedded sequences: it seems that most of them are not continuous and cannot be traced laterally. Unfortunately, the exposure is too small to resolve that question. The exposed thickness is about 8.5 m.

### 3. Biostratigraphic summary

It is possible to modify the old biostratigraphic zonation on the base of the ammonite occurrences in the section (Table 1). The exact position of the Barremian/Aptian boundary is still unknown. The only thing we can state is that it cannot be lower than bed Y96-14/15, because of the presence of the belemnite genus *Oxyteuthis*.

Table 1. Biostratigraphic scheme of the Aptian in the Ulyanovsk region and correlation with the English scheme.

STAGE	SUBSTAGE	R. Casey 1961 England		I.G. Sasonova, A.E. Glasunova 1958 - 1973, Povolzhie	E.J. Baraboshkin this paper, Ulianovsk Region	
N	UPPER APTIAN	Hypacanthoplites jacobii	<i>Hypacanthoplites anglicus</i>	<i>Hypacanthoplites jacobii</i>	?	
			<i>Hypacanthoplites rubricostatus</i>			
			<i>Nolaniceras nolani</i>			
	MIDDLE APTIAN	Parahoplites nuffieldensis	<i>Parahoplites cunningtoni</i>	<i>Parahoplites melchioris</i>	<i>Aconeceras nissus</i>	
			<i>Tropaeum subarcticum</i>			
		Cheloniceratropaeum marinoides	<i>Epicheloniceras buxtorfi</i>	<i>Epicheloniceras tschernyschewi</i>		
			<i>Epicheloniceras gracile</i>			
			<i>Epicheloniceras debile</i>			
			<i>Cheloniceratropaeum meyerendorfi</i>			
	P	LOWER APTIAN	Tropaeum bowerbanki	<i>Dufrenoyia transitoria</i>	<i>Deshayesites deshayesi</i>	<i>Tropaeum bowerbanki</i>
<i>Deshayesites grandis</i>				<i>Deshayesites grandis</i>		
<i>Cheloniceratropaeum parinodum</i>				<i>Deshayesites deshayesi</i>		
T		Deshayesites forbesi	<i>Deshayesites callidiscus</i>	<i>Deshayesites weissii</i>	<i>Deshayesites forbesi</i>	
			<i>Deshayesites kiliani</i>			
			<i>Deshayesites fittoni</i>			
			<i>Prodeshayesites obsoletus</i>			?
			<i>Prodeshayesites bodei</i>			

The ammonite succession starts with the *Deshayesites weissi* zone according to existing schemes. Large "*Deshayesites weissi*" ammonites were reported by SAZONOVA (1958, 1967) from the Sengiley region (north of Kremenki). She found it in a black carbonate concretion in an assemblage with *Deshayesites lavaschensis*, *D. ssengeliyensis*, etc. There are also several levels with such concretions in the Kremenki-Ulyanovsk area: in members IV and VI. These ammonites could not have come from level IV, where the *Deshayesites deshayesi-volgensis* assemblage occurs. GLAZUNOVA (1973) mentioned that SAZONOVA's specimen cannot be really *weissi* because of the peculiarity of the ribbing. Large ammonites, similar to SAZONOVA's specimen, occur in member VI. They were described as *Deshayesites imitator* by GLAZUNOVA (1968, 1973). We have recently determined them as *Deshayesites latilobatus*, as did CASEY (1960-1980). Nevertheless, the *weissi* zone still exists in the Lower Cretaceous regional scheme (Unified ... 1993). It is now clear that no ammonites are known from the basal parts of the Aptian succession in the Ulyanovsk region, so we cannot propose an index ammonite.

The lowermost ammonite find in bed Y95-9/1 is the zonal index of the *Deshayesites forbesi* zone. The interval was described primarily from the English succession (CASEY 1960-1980, 1961) and it probably partially coincides with the *Deshayesites weissi* zone of Transcaspia (EGOYAN 1989). The first recognition of the *forbesi* zone in the Volga River basin as well as in Transcaspia region was by CASEY (1960-1980). He cited on the specimen of *Deshayesites forbesi* from the River Volga in the Natural History Museum (London) collection and also several specimens similar to *Deshayesites forbesi* from the work of SAZONOVA (1958). The stratigraphic volume of that zone, of course, he could not indicate. In our opinion, however, the preservation of the specimens of *Deshayesites forbesi* examined by CASEY indicates that they can come from member IV of the section described. That interval I referred to the *Deshayesites deshayesi* zone.

The *Deshayesites deshayesi* zone is recognized by the presence of a large assemblage of different species of *Deshayesites*, including the index species (SAZONOVA 1958, GLAZUNOVA 1961, 1963, 1973). The author thinks, contrary to CASEY (1960-1980), that the species *Deshayesites deshayesi* does exist in the succession. The upper part of the interval could be separated as the beds with *Deshayesites consobrinoides* by reason of the wide distribution of that species (Fig. 2, Table 1).

The *Deshayesites grandis* zone is recognized for the first time in the Volga River basin. The zone is characterized by the presence of rare large *Deshayesites*, numerous *Australiceras* and rare *Ancyloceras*. The last genus was examined in the collection of Prof. I. MIKHAILOVA (Moscow State University) together with fragments of coarse-ribbed *Deshayesites*, similar to *D. grandis*. The ammonite assemblage of the level has some resemblance to that of the "Scaphites Beds" in the Isle of Wight, England (CASEY 1961). We prefer to use the name "*grandis*" because of the preference for phylogenetic zonation, the presence of the last *Deshayesites* (and probably also the index species) and some taxonomic problems with the other typical species of that interval: *Australiceras* (*A.*) *simbirskense*.

The *Aconeceras nisus* zone is also recognized for the first time in that area. It marks the base of the Middle Aptian succession. The species has already been used as zonal index for the basal zone of the Gargasian in



SE France (SORNAY 1957) and was recognized in England, in the *Chelonicer* (*Epicheloniceras*) *martinioides* zone (CASEY 1960-1980, 1961). The zone was previously designated incorrectly by the author (BARABOSHKIN 1996) as the *Aconeceras luppovi* zone. The latter species is very closely allied to *Aconeceras nissus* (CASEY 1960-1980), but came from the Kremenki section (SAZONOVA 1958), where only the lower part of the Aptian succession is exposed (up to member VI). German records of *Aconeceras nissus* (KEMPER 1976, 1995), at least in part, should in our opinion, be determined as *Aconeceras nissoides*. This idea is supported by the examination of some specimens of *Aconeceras* in the museum of the Federal Geological Survey in Hannover in 1996. Therefore, this zone in the Ulyanovsk region does not equate with the "nissus zone" in the Hannover area (KEMPER 1995).

The Middle Aptian deposits could be further subdivided only in the Saratov area, where it is possible to recognize the *Epicheloniceras tschernyschewi* zone and the *Parahoplites melchioris* zone (VASIL'EVSKY 1908, SAZONOVA 1958, GLAZUNOVA 1973). Both zones are recognized in that area by the occurrence of the index fossils, but these are not found in the Ulyanovsk region. The record of *Epicheloniceras tschernyschewi* from the Kremenki section (SAZONOVA 1958: p. 70) is very speculative. She mentioned this find from the limestone concretion above member V, i. e. from the *Deshayesites grandis* zone, which is impossible for *Epicheloniceras*.

The Upper Aptian in the Ulyanovsk region is recognized only by means of microfauna (GLAZUNOVA 1973). Moreover, the presence of Upper Aptian sediments, in our opinion, is very questionable even in the Saratov region (BARABOSHKIN 1996b, d). The badly preserved ammonite recorded by GLAZUNOVA (1959, 1961, 1973) as *Hypacanthoplites cf. jacobi* has many features of *Parahoplites*, especially of "*Parahoplites melchioris*", figured by SAZONOVA (1958), and probably belongs to that genus.

#### 4. Conclusions

The proposed zonal scheme is similar to schemes for Europe, North Caucasus, Transcaspia (EGOYAN 1989) and Spitsbergen (ERSHOVA 1983). The ammonite distribution demonstrates that the main fauna equalization falls in the *deshayesi* zone of the Ulyanovsk area. It indicates the opening of a meridional seaway through the Russian Platform. This event coincided with a high sea-level stand and with the origin of oil shales in the region (BARABOSHKIN 1996a, c, d). A short connection with the W European basin in the Barremian is suggested by the similar belemnite faunas, but the position of this seaway is still unknown. One possibility would be a connection with the Pechora Basin in the north. At the end of the Aptian, total shallowing of the Russian Sea occurred, which is the main reason for the absence of ammonite faunas.

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