GEOLOGICA CARPATHICA, 47, 5, BRATISLAVA, OCTOBER 1996
275–284

THE RUSSIAN PLATFORM AS A CONTROLLER OF THE ALBIAN TETHYAN/BOREAL AMMONITE MIGRATIONS

EVGENIJ J. BARABOSHKIN

Department of Historical and Regional Geology, Geological Faculty, Moscow State University,
Vorobjovy Gory, 199899 Moscow, Russia

Project No. 362

(Manuscript received May 17, 1995; accepted in revised form December 14, 1995)

Abstract: A large collection of ammonites was collected by the author during his investigations of the Albian of the Russian Platform (RP) in 1979-1990. There are both Boreal and Tethyan ammonites in the collection. This means that there were different routes of Albian ammonite migration through the RP accompanied by faunal mixing. The effects of Quaternary glacial erosion make localization of these routes difficult: they are traceable only by stratigraphical and faunal analysis and correlation with adjacent regions. Further investigations of Albian paleogeography of the RP showed that these routes were controlled by synsedimentary tectonics of the RP.

Key words: Albian, Russian Platform, Tethyan/Boreal correlation, ammonite paleobiogeography.

1. Russian Platform

The most important works on the Albian of the Russian Platform (RP, Fig. 1A) were published by Nikitin (1888), N. A. Bogoslowsky, A. E. Glasunova. Some new data were published by the author (Baraboshkin & Mikhailova 1987, 1988; Baraboshkin 1992). Due to reinvestigation of ammonite collections and comparison with ammonite data from other regions, a new more precise biostratigraphical scheme is offered (Fig. 2).

Lower Albian

1.1. The Lower Albian sequence consists of cross-bedded quartz and quartz-glauconite sands with phosphorite horizons. Analogues of most of the standard ammonite zones and subzones were distinguished in the RP sections. The only exception is the Proleymeriella schrammeni Zone, which is probably absent because of a stratigraphical gap on the Aptian/Albian boundary in the RP.

1.2. The **Leymeriella tardefurcata Zone** was divided by the author into 4 subzones in the stratotype Kugusem section, Mangyshlak (Baraboshkin 1992). Most of RP sections contain numerous stratigraphical gaps in the interval. As usual, only Arcthoplites jachromensis and Arcthoplites probus Subzones are present in sections.

1.2a. The Arcthoplites jachromensis Subzone assemblage contains *A. (A.) jachromensis, A. (A.) birkenmajeri, A. (A.) bogoslowskyi, A. (A.) gerassimovi*, etc. (Fig. 3). The first *Leymeriella* appears only in the Peri-Caspian Syneclise (PCS) (Sasonova & Sasonov 1967).

1.2b. The Arcthoplites probus Subzone is distinguished by the presence of rare *Arcthoplites (Subarcthoplites)* sp. both in the Moscow Syneclise (MS, Moscow district) and the PCS (Zhanadaur salt dome, Aktubinsk region). *Arcthoplites (Subarcthoplites)* Casey 1954 is the senior synonym of *Bellidiscus* Saveliev 1973, which commonly occurs in the Mangyshlak sections.

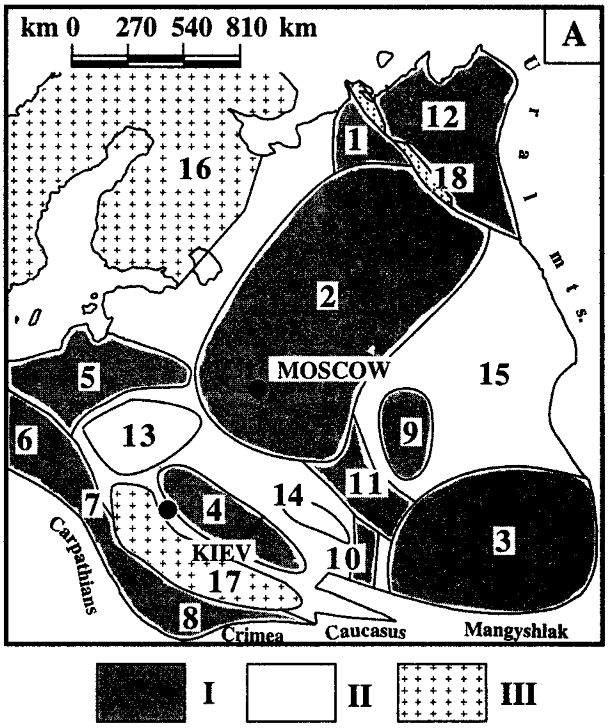

Fig. 1A. Main structures of the Russian Platform developed in the Albian. **I** — intensively submerged structures; *Syneclises*: *1* — Mezen; *2* — Moscow; *3* — Peri-Caspian; *4* — Ukraine; *5* — Baltic; *Depressions*: *6* — Polish-Lithuanian; *7* — Brest; *8* — Black Sea; *9* — Ulyanovsk-Saratov; *Troughs: 10* — Don-Medveditza; *11* — Ryasan-Saratov; *12* — Epibaikal Pechora Basin. **II** — slightly submerged regions with extremely condensed sections, including *Anteclises: 13* — Byelorussian; *14* — Voronezh; *15* — Volga-Ural. **III** — non-submerged or partially submerged regions; *Shields: 16* — Baltic; *17* — Ukraine; *18* — Timan mountains.

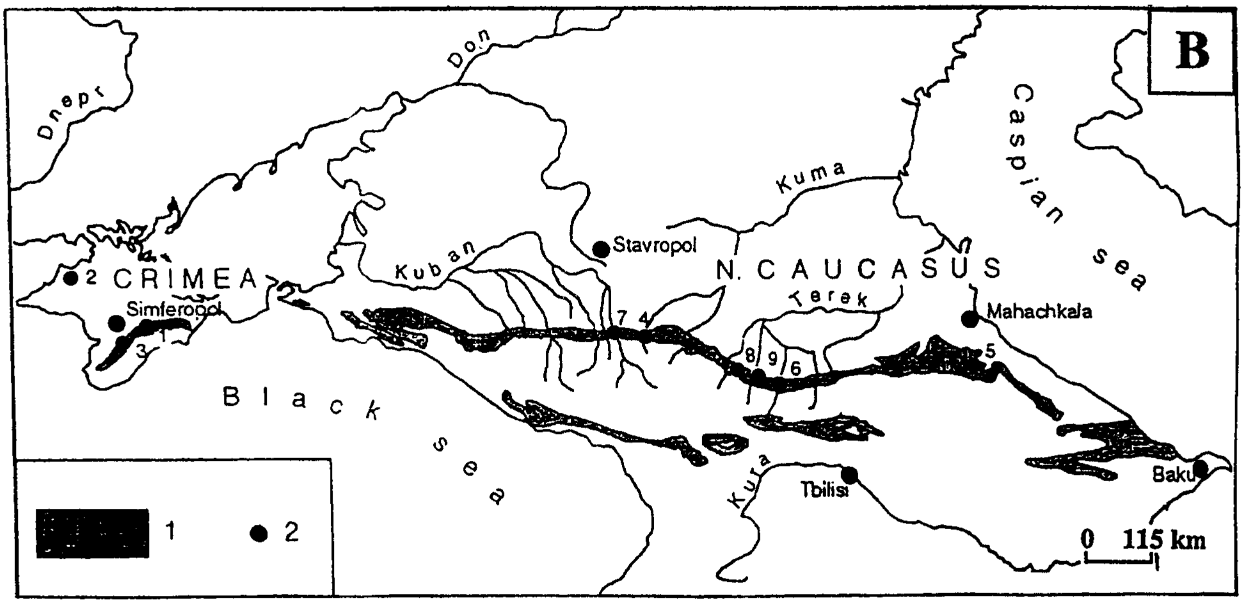

Fig. 1B. Lower Cretaceous distribution and main localities in Crimea-Caucasus region. **1** — distribution of Lower Cretaceous; **2** — localities: *1* — Belogorsk and Nanikovo village region; *2* — Tatyanovka village region; *3* — Bakhchisaraj region; *4* — Krasnovostochny country section; *5* — Akusha village section; *6* — Uruch River section; *7* — Kuban River section; *8* — Baksan River section; *9* — Heu River section.

1.3. **Leymeriella regularis Zone** was also subdivided into two parts (Baraboshkin 1992), which were named as Anadesmoceras tenue and Leymeriella regularis (s.s.) Subzones in the present paper. The main reason for such transference is the widespread distribution of these levels (Canada, N. Greenland, England, Mangyshlak and the RP) and their importance for correlation. The latter subzone is recognized in RP sections in rewashed and non-rewashed conditions. It contains *Anadesmoceras strangulatum, A. tenue, Cymahoplites (C.) kerenskianus, C. (Vnigriceras) sinzowi.*

1.4. The **Douvilleiceras mammillatum Zone** is more or less completely preserved in the RP sections, especially in the PCS where all subzones are represented.

1.4a. The Sonneratia perinflata Subzone was recognized in the PCS where it contains *Sonneratia (Globosonneratia) coronatiformis* (Nikitina 1948) and in MS where redeposited *Cleoniceras (C.) morgani* was found (author's collection).

According to A. A. Saveliev (Mikhailova & Saveliev 1989) S. solida and S. rotula Subzones were distinguished in the PCS; however, they are not recognizable in the other regions of the RP.

1.4b. Cleoniceras floridum Subzone is represented in many parts of the RP. In the PCS, it contains wide spread *Cleoniceras (C.) cleon, C. (C.) quercifolium* and Transcaspian endemics *Sonneratia (Eosonneratia) tenuis* and *S. (E.) media* (Nikitina 1948; Vakhrameev 1952). The presence of the subzone in the Ryasan-Saratov Trough (RST) is fixed by redeposited *Cleoniceras (C.)* cf. *cantianum.*

1.4c. The former presence of the Protohoplites puzosianus Subzone is indicated by redeposited *P. (Hemisonneratia) puzosianus* in the north of the Black Sea Syneclise (Kokoszynska 1931), by *Sonneratia (S.) dutempleana* in the PCS (Vakhrameev 1952), in MS and RST — by *Anahoplitoides gigas, Otohoplites nagyi* and *Pseudosonneratia* sp. (Baraboshkin 1992).

1.4d. Otohoplites raulinianus Subzone terminates the Lower Albian succession. We put the Lower/Middle Albian boundary at the base of the **Pseudosonneratia eodentata Zone**.

In the MS remnants of Raulinianus Zone are distinguished by redeposited *Otohoplites auritiformis*, in the RST by *Otohoplites destombesi* (Baraboshkin 1992), and *O. raulinianus* (Dobrov 1915).

Middle Albian

The Middle Albian succession of the RP usually is represented by extremely condensed sections (1-5 m) comprising quartz-glauconite clayey sands with phosphorite horizons.

1.5. The succession begins with the **Pseudosonneratia eodentata Zone** which contains *P. (Isohoplites) eodentata* and *P. (I.) steinmanni.* According to my opinion the former two species cannot be synonyms (see Amedro 1983) because of the very different morphology in all ontogenetic stages. The best section documenting the zone is placed in the Vorona River region (Penza district).

1.6. The assemblage of the **Hoplites benettianus Zone** is known only from secondary sites of deposition. It contains *H. (H.) benettianus, H. (H.) bullatus* and *H. (H.) talitzianus* in the base of the **Spathi Zone.**

1.7. The **Hoplites spathi Zone** is the best preserved in the Moscow and Penza districts. This zone contains a hoplitid assemblage: *Hoplites (H.)* ex gr. *baylei, H. (H.) dentatus robusta, H. (H.)* ex gr. *dentatus, H. (H.) devisensis* (examination of the holotype of the species in the Natural History Museum of London showed that it was originally damaged and the existence of the species is questionable), *H. (H.) escragnollensis, H. (H.) rudis, H. (H.) spathi, H. (H.)* cf. *svalbardensis, H. (H.) vectensis* and *Beudanticeras* cf. *laevigatum* (Fig. 3).

1.8. **Hoplites volgushensis Zone**, where *H. (Lautihoplites) volgushensis* subgen. et sp. nov. is the representative of a new zone, containing hoplitids with lautimorph sculpture. The stratotype of the zone is placed on the left side of the Volgusha River, 1.5 km north-west of Paramonovo village, south of Yachroma town (Dmitrov region of Moscow district). The new zone is represented by quartz-glauconite bioturbated sandy sequence (0.25-0.3 m) with rare non-rewashed phos-

Owen 1971, 1984 Anglo-Paris Basin		Nagy 1978; Ershova 1983 Spitsbergen*		Baraboshkin, this paper, Russian Platform		Saveliev 1992 Mangyshlak		Baraboshkin, this paper, Northern Caucasus		Baraboshkin, this paper, Crimea		Marcinowski et Wiedmann Poland, 1990	
zone	subzone	zone, ammonites assembl.		zone	subzone, beds	zone	subzone	zone	subzone	zone	subzone	zone	subzone
Stoliczkaia dispar	Mortoniceras (Durnovarites) perinflatum	?		Stoliczkaia dispar	?	Lepthoplites cantabrigensis	Pleurohoplites studeri	Stoliczkaia dispar	Mortoniceras (Durnovarites) perinflatum	Stoliczkaia dispar	Mortoniceras (Durnovarites) perinflatum	Stoliczkaia dispar	Mortoniceras (Durnovarites) perinflatum
	Mortoniceras (Mortoniceras) rostratum				Callihoplites vraconensis		Callihoplites vraconensis		Mortoniceras (Mortoniceras) rostratum		Mortoniceras (Mortoniceras) rostratum		Stoliczkaia (Stoliczkaia) blancheti
Mortoniceras inflatum	Callihoplites auritus			Mortoniceras (Mortoniceras) inflatum		Pervinqueria inflata		Mortoniceras (Mortoniceras) inflatum		Mortoniceras (Mortoniceras) inflatum		Mortoniceras inflatum	Mort. altonense; Callihopl. auritus
	Hysteroceras varicosum	? Gastroplites, Euhoplites sp. (ex gr. boloniensis)		Semenovites (Semenovites) michalskii		Semenovites (Semenovites) michalskii		Hysteroceras varicosum		Hysteroceras varicosum			Hysteroceras varicosum
	Hysteroceras orbignyi			Semenovites litschkovi	Semenovites (Planihoplites) pseudocoelonodus	Semenovites litschkovi	Semenovites (Planihoplites) pseudocoelonodus	Hysteroceras orbignyi		Hysteroceras orbignyi			Hysteroceras orbignyi
	Dipoloceras cristatum	? ?			Semenovites (Semenovites) tamalakensis		Semenovites (Semenovites) tamalakensis	Dipoloceras cristatum		?			Dipoloceras cristatum
Euhoplites lautus	?*	?		Anahoplites rossicus		Anahoplites rossicus		Euhoplites lautus		?		Euhoplites lautus	Anahoplites daviesi
	Anahoplites daviesi			Hoplites (Lautihoplites) dentatiformis		Hoplites perarmatus							
	Euhoplites nitidus												Euhoplites nitidus
Euhoplites loricatus	Euhoplites meandrinus							?				Euhoplites loricatus	Euhpolites meandrinus
	Moisisovicsia subdelaruei												Moisisovicsia subdelaruei
	Dimorphoplites niobe	?						Daghestanites daghestanensis					Dimorphoplites niobe
	Anahoplites intermedius	Dimorphoplites, Euhoplites sp.		Dimorphoplites pretethydis		Anahoplites intermedius		Anahoplites intermedius		Anahoplites intermedius			Anahoplites intermedius
Hoplites dentatus	Hoplites (Hoplites) spathi	Hoplites (Hoplites) spathi		Hoplites (Lautihoplites) volgushensis; Hoplites (Hoplites) spathi		Hoplites dentatus	Hoplites spathi	Oxytropidoceras rossyanum; Hoplites (Hoplites) spathi		?		Hoplites (Hoplites) spathi	
	Lyelliceras lyelli	Hoplites (Hoplites) benettianus		Hoplites (Hoplites) benettianus			Lyelliceras lyelli	Lyelliceras lyelli		Lyelliceras lyelli		Lyelliceras lyelli	
Otohoplites auritiformis	Pseudosonneratia steinmanni	Pseudosonneratia (Isohoplites) eodentata		Pseudosonneratia (Isohoplites) eodentata			Pseudosonneratia (Isohoplites) steinmanni	Pseudosonneratia (Isohoplites) eodentata		?		Hoplites (Isohoplites) eodentatus	
	Otohoplites bulliensis	Douvilleiceras mammillatum	Otohoplites spp.	Douvilleiceras mammillatum	Otohoplites raulinianus	Otohoplites sinzowi	Otohoplites crassus	Douvilleiceras mammillatum	?	Douvilleiceras mammillatum		Douvilleiceras mammillatum	Protohoplites puzosianus
	Protohoplites puzosianus				Protohoplites (Hemisonneratia) puzosianus		Protohoplites (Hemisonneratia) puzosianus		Protohoplites (Hemisonneratia) puzosianus				
	Otohoplites raulinianus												Otohoplites raulinianus
Douvilleiceras mammillatum	Cleoniceras floridum		Cleoniceras (Neosaynella) sp.		Cleoniceras (Cleoniceras) floridum	Sonneratia (Eosonneratia) unigri	Sonneratia (Eosonneratia) caperata		Cleoniceras (Cleoniceras) floridum			Marine sediments are absent.	
	?*				?		Sonneratia (Eosonneratia) rotula		?				
	Sonneratia kitchini						Sonneratia (Eosonneratia) solida						
	Sonneratia (Globosonneratia) perinflata		?		Sonneratia (Globosonneratia) perinflata		Sonneratia (Globosonneratia) globulosa						
Leymeriella tardefurcata	Leymeriella regularis	Leymeriella (Neoleymeriella) regularis		Leymeriella (Neoleymeriella) regularis	?	Leymeriella (Neoleymeriella) regularis	beds with Leymeriella (Neoleymeriella)*	Leymeriella (Neoleymeriella) regularis		?			
					beds with Anadesmoceras		beds with Anadesmoceras*						
	Leymeriella acuticostata	Leymeriella (Leymeriella) tardefurcata	?	Leymeriella (Leymeriella) tardefurcata	?	Leymeriella (Leymeriella) tardefurcata	Leymeriella (Leymeriella) acuticostata*	Leymeriella (Leymeriella) tardefurcata		Leymeriella (Leymeriella) tardefurcata			
	?*						Arcthoplites (Subarcthoplites) probus*						
			Arcthoplites (Arcthoplites) jachromensis*		Arcthoplites (Arcthoplites) jachromensis*		Arcthoplites (Arcthoplites) jachromensis*						
			beds with Freboldiceras		?		Leymeriella (Leymeriella) recticostata						
	Leymeriella (Proleymeriella) schrammeni	Proleymeriella schrammeni		?		?		Proleymeriella schrammeni		?			

* - revised by the author

Fig. 2. Biostratigraphical correlation of the Albian of the Russian Platform and adjacent regions.

	Sp	CRP	PC	Mn	NC	Cr	EC	Pl	LPB
Proleymeriella schrammeni (Jac.)					+				+
P. sp.	+				+				+
Arcthoplites (A.) jachromensis (Nik.)	+	+	+	+					
A. (A.) birkenmajeri Nagy	+	+							
A. (A.) bogoslowskyi Sav.	+	+							
A. (A.) gerassimovi Bar. et I.Mich.	+	+	+	+					
A. (A.) nikolskaensis Sav.		+	+	+					
A. (A.) subjachromensis Sav.		+	+	+					
A. (Subarcthoplites) crassus (Sav.)			+	+					
A. (S.) probus (Sav.)		+	+	+					
Leymeriella (L.) *acuticostata* Brinkm.				+					+
L. (L.) germanica Casey	+		+	+					+
L. (L.) tenuicostata Sav.			+	+	+				+
L. (L.) tardefurcata (Leym.)			+	+	+	+	+		+
L. (L.) weberi Sav.			+	+					
L. (Neoleymeriella) fusseneggeri Seitz	+		+	+	+				+
L. (N.) multicostata Sav.			+	+	+				+
L. (N.) pseudoregularis Seitz			+	+	+				+
L. (N.) rencurelensis (Jac.)			+	+	+				+
L. (N.) pervulgata Sav.			+	+	+				+
L. (N.) regularis (Brug.) d'Orb.			+	+	+				+
L. (N.) renasscens Seitz			+	+	+				+
Anadesmoceras strangulatum Casey		+							+
A. tenue Casey		+		+					+
Cymahoplites (C.) kerenskianus (Bog.)		+							
C. (Vnigriceras) sinzowi (Sav.)		+	+	+					
Douvilleiceras mammillatum (Sloth.)				+	+	+	+	+	+
Cleoniceras (C.) morgani Spath		+							+
C. (C.) cleon (d'Orb.)		?+	+	+					+
C. (C.) imitator Casey		+		+					+
C. (C.) quercifolium (d'Orb.)		+							+
C. (C.) obtusum Sav.			+	+					
C. (Neosaynella) cf. *cantianum* Casey		+							+
C. (N.) mangyschlakense Lupp.			+	+					
C. (N.?) platidorsatum (Sinz.)			+	+					
Sonneratia (Eosonneratia) caperata Casey			+	+					+
S. (E.) cf. *kitchini* Spath				+					+
S. (E.) media (Sinz.)			+	+					
S. (E.) rotula Sav.			+	+					
S. (E.) solida Sav.			+	+					
S. (E.) tenuis (Sinz.)			+	+					
S. (Globosonneratia) coronatiformis Lupp.		+	+	+					
S. (G.) globulosa Sav.				+					
S. (S.) dutempleana (d'Orb.)			+	+					+
Protohoplites (Hemisonn.) puzosianus (d'Orb.)		?+		+					+
Tetrahoplites suborientalis Sav.			+	+	+				
Anahoplitoides gigas (Sinz.)		+		+					
Otohoplites auritiformis (Spath)	+	+	+	+					+
O. destombesi Casey		+							+
O. nagyi Barabosh.	+	+							
O. raulinianus (d'Orb.)		?+	?+						+
Pseudosonneratia sp.		+	+	+	+				+
P. (Isohoplites) eodentata Casey	+	+		+	+				+
P. (I.) steinmanni (Jacob)		+		+				+	+
Leylliceras lyelli (Leym.) d'Orb.			+	+					+
Hoplites (H.) baylei Spath		+	+	+				+	+
H. (H.) benettianus (J. de C.Sow.)		+	+	+	+				+
H. (H.) bullatus Spath		+		+	+				+
H. (H.) dentatus (J.Sow.)		+	+	+	+	+	+	+	+
H. (H.) dentatus densicostata Spath		+		+	+	+			+
H. (H.) dentatus robusta Spath		+	+	+				+	+
H. (H.) devisensis (Spath)		+	+	+	+	+			+
H. (H.) escragnollensis Spath		+	+	+	+	+		+	+
H. (H.) latesulcatus Spath		+							+
H. (H.) aff. *mirabiliformis* Spath		+		+					+
H. (H.) pseudodeluci Spath		+		+					+
H. (H.) rudis Par. et Bon.		+		+				+	+
H. (H.) spathi Breistr.		+	+	+	+			+	+
H. (H.) cf. *svalbardensis* Nagy	+	+							
H. (H.) talitzianus (Rouill. et Fahr.)		+							
H. (H.) vectensis Spath		+	+					+	
H. (Lautihoplites) canavariformis Spath		+							+
H. (L.) canavarii Parona et Bonarelli									+
H. (L.) dentatiformis Spath		+		+					+
H. (L.) dorsetensis Spath		+							+
H. (L.) nikitini sp.nov.		+							
H. (L.) persulcatus Spath		+		+					+
H. (L.) similis Spath		+							+
H. (L.) volguschensis subgen. et sp.nov.		+							
Oxytropidoceras royssianum (d'Orb.)				?+	+				+
Dimorphoplites aequilosus (Glas.)			+						
D. beresovkaensis Glas.		+	+						
?*D. burlukensis* Glas.		+							
D. engersianus (Rouill. et Fahr.)		+							
D. niobe Spath		+	+	+					+
D. pretethydis (Spath)		+							+
D. rossiensis Glas.		+							
Anahoplites rossicus (Sinz.)		+	+						
A. cf. *sinzowi* Spath		+	+	+					+
Dipoloceras cristatum (Deluc)					+			+	+
Semenovites litschkovi (Sav.)			+	+					
S. michalskii (Semen.)		+	+	+		+			
S. pseudocoelonodus (Sav.)			+	+					
S. tamalakensis (Sav.)			+	+					
Hysteroceras orbignyi (Spath)					+	+		+	+
Hysteroceras varicosum (Sow.)					+	+		+	+
Prohysteroceras (Goodhallites) goodhalli (Sow.)		+	+	+	+			+	+
Mortoniceras (M.) inflatum (Sow.)		+	+	+	+	+		+	+
M. (M.) rostratum (Sow.)					+				+
Callihoplites ex gr. *auritus* (Sow.)		+	+	+				+	+
C. cf. *leptus* (Seely)		+	+	+	+				+
C. vraconensis (Pict. et Camp.)		+	+	+	+				+
Stoliczkaia (S.) dispar (d'Orb.)	+	+	+	+	+	+		+	+

Fig. 3. List of ammonites known from the Russian Platform (for Peri-Caspian — selected) and their presence in adjacent regions. **Sp** — Spitsbergen; **CRP** — Central Parts of Russian Platform; **PC** — Peri-Caspian; **Mn** — Mangyshlak; **NC** — Northern Caucasus; **Cr** — Crimea; **EC** — Eastern Carpathians; **Pl** — Poland; **LPB** — London-Paris Basin.

phorites at the base and small redeposited phosphatic pebbles below (0.15 m) the top. There are erosional surfaces in the top and in the base of the sequence mentioned. Phosphorites contain *Hoplites (Lautihoplites) nikitini, H. (L.) persulcatus, H. (L.) volguschensis, Beudanticeras* sp.

Taxonomy

Hoplites (Lautihoplites) subgen. nov.

Name: from lautus (Lat.) — magnificent and Hoplites.

Type: *Otohoplites engersianus* (Rouill. & Fahr.): Baraboshkin & Mikhailova 1988, p. 79, Pl. I, Fig. 4a–b; Museum of the Earth, Moscow State University, No. 6/90, Moscow District, Dmitrov region, Volgusha River, Middle Albian.

Description: Shell is small to medium in size, whorl-section is evolute to subinvolute with hexangular and the umbilicum is more or less narrow and shallow.

Ribs are coarse, lautiform on inner whorls, bifurcate and intercallate on outer whorls with elongated bullae on the umbilical bend and ventral clavi, trending under sharp angle with the plain of symmetry. Suture line as in *Hoplites* s.s.

Species assemblage: *H. (L.) canavarii* Parona et Bonarelli 1896; *H. (L.) canavariformis* Spath 1926; *H. (L.) dentatiformis* Spath 1925; *H. (L.) dorsetensis* Spath 1925; *H. (L.) nikitini* sp. nov. (= *Hoplites engersi*: Nikitin 1888, p. 55, Pl. III, Figs. 6, 7), *H. (L.) persulcatus* Spath 1925; *H. (L.) similis* Spath 1925; *H. (L.) volguschensis* sp. nov.

Discussion: The new subgenus differs from *Hoplites* s.s. by prevalation of lautiform sculpture in early ontogenetic stages. It differs from *Dimorphoplites* by presence of hoplitid ontogenetic stages and ventral clavi, non parallel to the plane of symmetry.

The topmost position of lautimorph *Hoplites* was noted by Spath (1925–1943), Owen (1971), Destombes (1979). This means that the new subzone could have a wide-spread distribution. In our case, *Hoplites (Lautihoplites)* assemblage is not associated with *Hoplites (Hoplites)* s.s. and appears earlier than the first *Dimorphoplites*: possibly it is the ancestor of the latter form.

Distribution: Middle Albian, **Hoplites (Lautihoplites) volgushensis Zone** of the Russian Platform, England and France.

1.9. The stratotype of the **Dimorphoplites pretethydis Zone** is identical with those of the previous zone. Its sequence consists of cross-bedded quartz-glauconite sands (0.8–0.85 m) with small redeposited phosphatic nodules containing *Dimorphoplites pretethydis, D. engersianus* and *Hoplites (Lautihoplites)* cf. *dorsetensis*. The part of sequence representing preserved record of the zone is limited by erosional surfaces.

1.10. The **Hoplites dentatiformis Zone** is the third new zone we accept for the Middle Albian stratification on the RP. The stratotype is the same as in previous cases. It is composed of cross-bedded and bioturbated quartz-glauconite sands (0.8-0.85 m) with 3 levels of redeposited phosphorites.

The **Pretethydis** and **Dentatiformis Zones** are analogues of the **Anahoplites intermedius Zone** of the Anglo-Paris Basin.

1.11. The **Dimorphoplites niobe Zone** is the best documented in the RST and in the PCS. It contains rare *D. niobe* Spath and *D.* sp. Analogues of the European **Subdelaruei-Daviesi Zones** were distinguished in the PCS (Mikhailova & Saveliev 1989) only, in the other parts of the RP a stratigraphical gap falls on the interval.

1.12. The **Anahoplites rossicus Zone** is determined by *Anahoplites* cf. *sinzowi*. It was found in the Burluk River (WS of the RST) in assemblage with *?Dimorphoplites burlukensis* and *D. rossiensis* (Efimova & Glasunova 1960). Very similar assemblages were observed by the author in the Moscow region and in the PCS.

Upper Albian

The best Upper Albian sections are located in the PCS. They are built up from sands and cross-bedded sands, sandstones and silts and contain rich ammonite fauna of the Mangyshlak type. In the other regions of the RP, the Upper Albian sequence consists of fine-stratified clays with phosphorites in the base with scarce ammonites. This was the reason for the application of Upper Albian zonal subdivisions of Mangyshlak in our scheme. All zones and accompanied ammonites were found in the PCS (Mikhailova & Saveliev 1989).

1.13a. The Semenovites tamalakensis Subzone of the **Semenovites litschkovi Zone** is represented by an assemblage of *Dimorphoplites beresovkaensis, D. aequilosus* and index species in the PCS. It is the analogue of the European Dipoloceras cristatum Subzone.

1.13b. The Semenovites pseudocoelonodus Subzone, an analogue of the Hysteroceras orbignyi Subzone of Europe, is determined by zonal and subzonal indexes in the PCS and by *Prohysteroceras (Goodhallites)* cf. *goodhalli* in the RST.

1.14. The **Semenovites michalskii Zone** contains only the zonal index in the PCS and in the southern periphery of the Ulyanovsk-Saratov Syneclise (USS).

1.15. The **Mortoniceras inflatum Zone** is the most easily recognizable zone in the Upper Albian of the RP. Remains of the zonal index are known from both the PCS and USS (Bakin 1930), RST (Sasonova & Sasonov 1967), Ukraine Syneclise (Radkevich 1894), and Byelorussian Anteclise (Pasternak 1959). *Mortoniceras (M.) inflatum* is accompanied by *Callihoplites* ex gr. *auritus* in PCS (Koltypin et al. 1986) and Donbas region (Marcinowski & Naidin 1976).

1.16a. The **Stoliczkaia dispar Zone** is determined only for the Callihoplites vraconensis Subzone, the analogue of Mortoniceras rostratum Subzone of Europe (Saveliev 1992). The Subzone is characterized by the presence of *Stoliczkaia (S.) dispar* in the slope of the Ukrainian Shield (Radkevich 1984), *Callihoplites vraconensis* occurs in the RST (Dobrov 1915; Sasonova & Sasonov 1967), in the USS (author's collection) and *Callihoplites* cf. *leptus* has been found in the PCS (Koltypin et al. 1986).

1.16b. As no analogue of the Mortoniceras perinflatum Subzone has been found in RP sections yet, the position of the Albian/Cenomanian boundary in the RP is very debatable.

2. Mangyshlak and Caspian region

Albian deposits of Mangyshlak and Northern PCS were investigated by V. P. Semenov, I. F. Sinzow, N. P. Luppov, A. E. Glasunova, M. I. Sokolov and many others, but the most important works belong to A. A. Saveliev. In the present paper we use the last biostratigraphical scheme of Saveliev (1992, Fig. 2). It is possible to see that there are similarities to the RP scheme for the whole Albian, but especially for the Lower and Middle Albian. This means that the connection between basins was very strong in that period.

2.1. A one-directional Early Albian connection (Fig. 4) is supported by the distribution of *Arcthoplites* and *Anadesmoceras*. Almost all *Arcthoplites* known on the RP were found in the Mangyshlak sections (Saveliev 1973, 1992). *Arcthoplites* passed the RP and migrated into the Iran Basin (Seyed-Emani 1980). The direction of migration could not be the opposite, as genus *Freboldiceras*, the ancestor of *Arcthoplites*, is occurred only in the Arctic basin and Spitsbergen is the nearest region (Nagy 1970).

Similarly, the *Anadesmoceras* was found in England (Casey 1954, 1966), in the Pacific region (Mc Learn 1972; Jeletzky 1964, where *Grycia* gr. *perezianum* = *Anadesmoceras subbaylei*), in Greenland (Birkelund & Hakansson 1983), RP and in Mangyshlak (Saveliev 1973).

2.2. During the first half of the Mammillatum Chrone (Perinflata to Floridum Subzones) the same sea strait existed, but sea-level rise caused northward migration of the fauna. This is supported by the distribution of *Sokolovites, Sonneratia* and *Cleoniceras*.

2.3. Another situation appeared during the Benettianus Chrone (Figs. 5-6), when a western connection with the Carpathian-Polish Basin was opened. There was free exchange of fauna between the Carpathian-Polish, RP and Mangyshlak basins from that time untill the Niobe Chrone. From than untill Inflatum Chrone RP — the Mangyshlak Basin connection become difficult again and ammonite fauna of Mangyshlak-Transcaspian type (specific *Dimorphoplites, Anahoplites* and *Semenovites*) could occupy only the south-eastern part of the RP. Probably it was dependent on a strong influence of Carpathian-Polish Basin cool water currents and on shallowing of the northern periphery of the PCS.

3. Northern Caucasus

The Albian biostratigraphical scheme of the Northern Caucasus was worked out on the basis of ammonites by many investigators. The most important works were written by V. P. Rengarten, N. P. Luppov, T. A. Mordvilko, V. V. Drushchits, M. P. Kudryavtsev, I. A. Mikhailova, etc. The latest scheme has been compiled by I. A. Mikhailova (Mikhailova & Saveliev 1989), but it is not as detailed as it is for Europe and Mangyshlak. Poor exposition of clayey Albian sections usually covered by landslides and bad preservation of fossils cause serious difficulties for investigations. The new scheme (Fig. 2, Baraboshkin et al. in press) was proposed by the author. It was compiled on the base of Daghestan sections, Kabardino-Balkary, Karachaevo-Cherkessia, Ingushetia and Northern Osetia sections (Fig. 1B). The most complete succes-

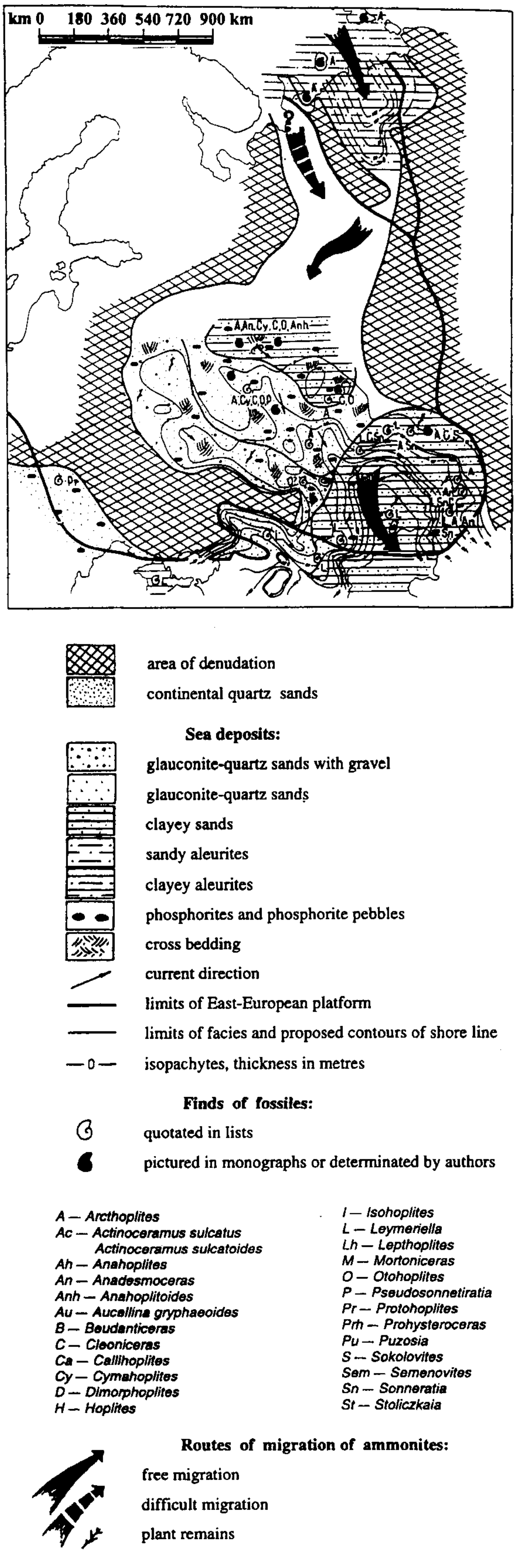

Fig. 4. Paleogeography and routes of ammonite migration on the Russian Platform in the Early Albian.

sion (with the exception of Schrammeni Zone) Lower to Upper Albian is Akuscha village (Dargi River) section. As there is no possibility to examine all details of the scheme in this paper and we will mention only the most important features.

3.1. The Lower Albian consists of grey-yellow siltstones with phosphorite horizons in the base and clays with marls and limestones and contains all Albian zones: **Proleymeriella schrammeni** (Krasnovostochny country section only: Drushchits & Mikhailova 1966), **Leymeriella tardefurcata, Leymeriella regularis** and **Douvilleiceras mammillatum Zone**, which is firstly subdivided into the Cleoniceras floridum Subzone and the Protohoplites puzosianus Subzone. The former contains a lot of small *Cleoniceras* sp., the later is characterized by *Tetrahoplites suborientalis* and *Pseudosonneratia* sp.

3.2. The Middle Albian is built up from black clays and clay-marl alternation with phosphorites. The succession starts from the "**Hoplites dentatus**" Zone, which was firstly subdivided into separate **Pseudosonneratia eodentata, Lyelliceras lyelli** and **Hoplites spathi Zones**. The zones were determined by findings of zonal indexes. *Hoplites (H.) dentatus* in assemblage with other hoplitids was determined only for **Lyelliceras lyelli Zone**.

3.3. The **Oxytropidoceras roysianum Zone** and **Anahoplites intermedius Zone** were first determined for the region by findings of *Oxytropidoceras roysianum* and *Anahoplites praecox*. The **Roysianum Zone** has the same position as in Georgia (Kotetishvili 1986). We regard this zone as an analogue of the new **Hoplites (Lautihoplites) volguschensis Zone** in the RP.

3.4. The **Daghestanites daghestanensis Zone** is represented by a single limestone layer with *Daghestanites* spp. The zone is correlated with the **Niobe Zone** of Europe. Any analogues of the upper part of the **Loricatus Zone** were not found in N. Caucasus yet.

3.5. The **Euhoplites lautus Zone** contains *Euhoplites lautus, E.* sp., *Kossmatella agassiziana* and *K. schindewolfi.*

3.6. The Upper Albian sequence consists of clays, siltstones and sandstones, alternation of black clays and marls and limestones with markasite. The **Dipoloceras cristatum Zone** begins in the Upper Albian as everywhere in Europe and Africa. The zone was firstly recognized in the region. The best sections of it are the Akuscha and Uruch outcrops, where *Dipoloceras cristatum, D. bouchardianum, Mojsisoviczia* sp., etc. were found.

3.7. The **Hysteroceras orbignyi Zone** and **H. varicosum Zone** are distinguished by the co-occurrence of *Hysteroceras orbignyi, H. capricornu, H. carinatum, H. serpentinum* in the base and by appearance of coarse-ribbed *Hysteroceras varicosum, H.* cf. *binum,* large *Prohysteroceras* sp. in the top.

3.8. The **Mortoniceras inflatum Zone** contains *Mortoniceras (M.) inflatum, M. (M.)* cf. *kiliani, M. (M.) nanum, M. (M.) potternense, M. (?M.) subsimplex, M. (Deiradoceras)* cf. *cunningtoni* and heteromorphs.

3.9. The terminal Albian is represented by **Stoliczkaia dispar Zone** and two subzones: Mortoniceras rostratum and Mortoniceras perinflatum. Baksan and Heu River have the best exposed sections containing a lot of ammonites. In the other sections ammonites are rare.

3.9a. The Rostratum Subzone is determined by the presence of *Stoliczkaia (S.) clavigera, S. (Faraudiella)* cf. *blancheti, Callihoplites* cf. *senilis laevigatus, C.* cf. *leptus, Mortoniceras (Durnovarites) quadratum, Prohysteroceras (Goodhallites)* sp., puzosiids and heteromorph ammonites.

3.9b. The Perinflatum Subzone contains *Stoliczkaia (S.)* cf.

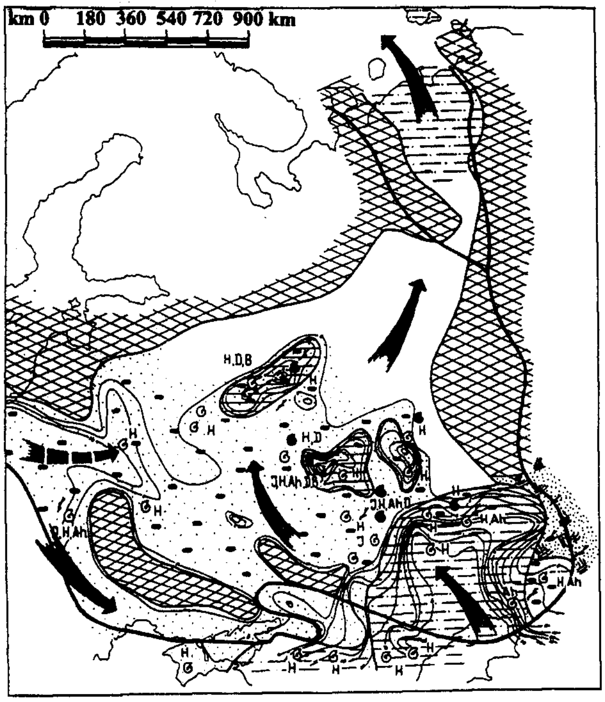

Fig. 5. Paleogeography and routes of ammonite migration on the Russian Platform in the Middle Albian. Explanations as in Fig. 4.

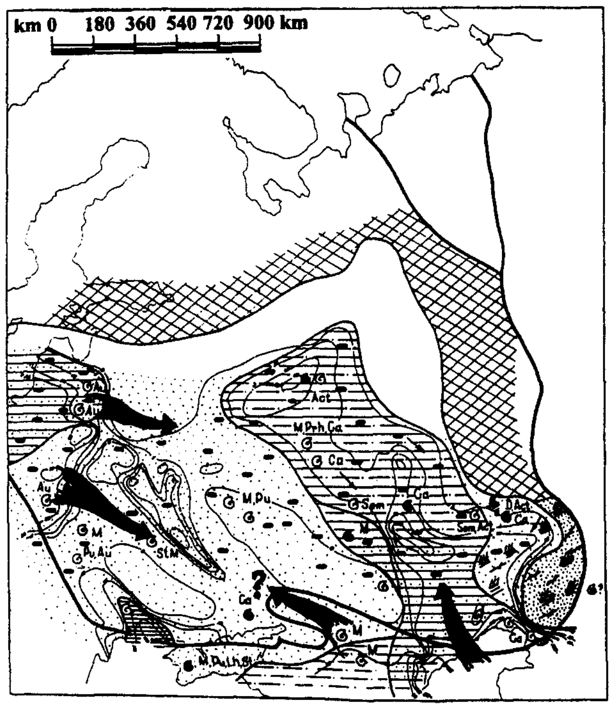

Fig. 6. Paleogeography and routes of ammonite migration on the Russian Platform in the Late Albian. Explanations as in Fig. 4.

clavigera, Callihoplites? sp., *Anisoceras* sp., *Hamites* ex gr. *attenuatus, Mariella (M.) bergeri, Mastigoceras* sp. and *Sciponoceras?* sp. The typical peculiarity of uppermost part of the subzone is the presence of giant (more than 0.5 m in diameter) ammonites *Puzosia.*

There was no direct connection between the N. Caucasus and RP basins during the Early Albian. It is supported by the absence of *Arcthoplites, Anadesmoceras, Protohoplites* and *Otohoplites* in the Lower Albian sections of N. Caucasus and facies analysis also. It is very probable that in the Early Albian, the N. Caucasus Basin was isolated from the Carpathians, Crimea and Great Caucasus basins by very shallow submarine or continental uplifting.

In Middle Albian, when sea-level rose, an immediate strait between basins was opened (Fig. 5). It was located on the Donbas transition, between the Ukrainian Shield and Voronezh Anteclise. However, the migration of ammonites along the strait was impossible because of the extremely shallow sea. There is no evidence of the presence of Middle Albian ammonites in the place.

In Late Albian (Fig. 6) with the highest sea-level conditions, RP-N. Caucasus Basin connection has opened. The *Mortoniceras* and *Callihoplites* found in the Rostov district and in Donbas may have originated from the N. Caucasus Basin.

4. Crimea

The Albian biostratigraphy of Crimea was studied by V. V. Drushchits, T. N. Gorbachik, B. T. Yanin, A. E. Kamenetzky and many others. The most important works on ammonites belong to Marcinowski & Naidin (1976) and Leschukh (1987, 1992). In this paper the author tries to compile ammonite biostratigraphic scheme for the region (Fig. 2).

4.1. The Lower Albian **Proleymeriella schrammeni** and **Leymeriella regularis Zones** are still not indicated in Crimea. The presence of **Leymeriella tardefurcata Zone** is supported by findings of *Leymeriella* sp. in assemblage with *Hypacanthoplites* sp. (Drushchits 1960) and *L. (L.) tardefurcata* (Lychagin 1969) in Mountain Crimea; *L. (L.) tardefurcata* (Leschukh 1987) in the Tatyanovka borehole (Plain Crimea).

4.2. The representation of the **Mammillatum Zone** of the Lower Albian and lowermost Middle Albian (**Eodentata Zone**) is very questionable. There is only one known determination of *Douvilleiceras* sp. (Kamenetzky 1963) and *D. mammillatum* (Stratigraphical... 1971) from the Belogorsk region. Middle Albian succession starts with the **Lyelliceras lyelli Zone** sequence containing the same ammonite assemblage as in N. Caucasus: *Hoplites (H.) dentatus, H. (H.) dentatus densicostata, H. (H.)* cf. *escragnollensis, H. (H.) danubiensis,* etc. in Plain Crimea (Leschukh 1987). The **Lyelli Zone** with *Hoplites (H.) dentatus* (J. Sow.) was found in Mountain Crimea near Belogorsk (Drushchits 1960).

4.3. The existence of **Hoplites spathi Zone** is not supported by findings of index species.

4.4. The **Intermedius Zone** occurs in Plain Crimea (Leschukh 1987) where *Anahoplites intermedius, A. praecox, A. planus* were found.

4.5. The presence of **Dimorphoplites niobe-Anahoplites daviesi Zones** of European scale are not attested yet in the region, but most of them must have existed at least in Plain Crimea.

4.6. The Upper Albian **Semenovites michalskii Zone** as in PCS and Mangyshlak. The Zone was defined by the sample *Anahoplites* (= *Semenovites* in present nomenclature) cf. *michalskii* (Semen.) and by presence of *Actinoceramus sulcatus* in Plain Crimea (Leschukh 1987).

4.7. The **Hysteroceras orbignyi Zone** and **H. varicosum Zone** are widely distributed both in Plain Crimea (Leschukh

1987; Eristavi 1955, 1957) and in Mountain Crimea (Naidin & Marcinowski 1976; Muratov 1949).

4.8. The **Mortoniceras inflatum Zone** is developed in Mountain Crimea (Bakhchisaraj region), where *Mortoniceras (M.) inflatum, M. (M.) pricei* and puzosiids (Marcinowski & Naidin 1976) were found. It probably exists in Plain Crimea, too.

4.9. The **Stoliczkaia dispar Zone** is subdivided into two subzones — Rostratum and Perinflatum in Bahchisaraj town region (Mountain Crimea, Marcinowski & Naidin 1976). In Plain Crimea only the lower subzone (Mortoniceras rostratum) was documented (Leschukh 1987).

It is evident that there was not any direct connection between the RP and Crimea during the Early Albian. This is confirmed both by ammonite and general paleogeographical data (Fig. 4). An elevated area dividing the Crimea and RP basins comprised the Ukrainian Shield, Byelorussian Anteclise and southern parts of the Baltic Shield. This situation persisted until the Middle Albian (Fig. 5). Such connection appeared only during Late Albian (Fig. 6), in the highest sea level conditions, when *Semenovites* migrated in Crimea from Mangyshlak-PCS region.

5. Carpathians

The Lower Cretaceous biostratigraphy of the Carpathians has been studied by many specialists from different countries. The Ukrainian Carpathians are the nearest to the RP and they are of considerable interest for our investigation. The latest and the most important work on the Albian ammonite biostratigraphy belongs to Leschukh (1992). Analyzing previous data and using his own new data he showed that only a few ammonites were found in the Carpathians and Peri-Carpathian Foredeep. They are *Hamites* sp. (Krosno- and Rakhov Units); *Leymeriella* sp. and *Leymeriella (L.) tardefurcata, Neosilesites* sp., *Kossmatella* cf. *agassiziana* and *Anisoceras* sp. (Rakhov Unit); *Puzosia* sp. and *Hyphoplites falcatus* (Marmarosh Unit). Nominally, the complete Albian succession must be represented in the Carpathians. Ammonites are so rare because of deep-water sediments, high thickness and basin environments partially. That is the reason why the main age-determining fossils are foraminifers, radiolaria etc. To our mind the Carpathian Basin could not be the source of ammonites migration in the RP Basin. It is possible that only some transitional ways could pass through this basin (from European to Crimea-Caucasus Basin).

6. Poland

The most complete data on Albian biostratigraphy and ammonites of Poland are contained in works of Cieslinski (1959) and Marcinowski & Wiedmann (1990) (Fig. 2).

The lower part of the Lower Albian (**Schrammeni** to **Kitchini Zones**) sequence is absent in Poland, even in the Central Polish Trough. We think, there is no real evidence of the presence of the **Floridum Zone** in rewashed condition, because of absence of *Cleoniceras* and *Sonneratia*, the very wide-spread ammonites in Northern Tethys. It is possible, that this part of the Lower Albian is represented by continental facies (Cieslinski 1959).

In the Puzosianus Chrone Albian sea occupied the Polish lowland and penetrated to the east in the Dnestr Depression (Fig. 5). This is supported by rewashed *Protohoplites puzosianus* in Dnestr River region (Pasternak et al. 1968). It is so far unknown whether a connection between the Polish sea and the RP appeared in the Eodentata or in Benettianus (= Lyelli) Chrone. The most ancient findings of Middle Albian ammonites belong to the *Hoplites (H.) dentatus* group, which characterize generally the **Benettianus Zone**. From that time till the end of the Albian the connection existed (Fig. 6). This is confirmed by findings of *Anahoplites, Mortoniceras* and *Stoliczkaia* in strongly condensed sections of northern and north-western slopes of the Ukrainian Shield.

7. Spitsbergen and Novaya Zemlya

The most important works on the Albian biostratigraphy of Spitsbergen belong to Nagy (1970) and Ershova (1983). Their biostratigraphical scheme could be made more exact by correlation (Fig. 2).

7.1. As was shown before, an immediate connection between Spitsbergen and the RP existed at the beginning of the Albian stage. The connection was opened at the end of the **Proleymeriella schrammeni Zone**.

The idea is based on the following. The **Schrammeni Zone** is represented on Spitsbergen (Nagy 1970), but is absent on the RP. Beds with Freboldiceras (the analogue of Recticostata Subzone of Mangyshlak (Baraboshkin 1992)), starting **Leymeriella tardefurcata Zone** succession, contains *Arcthoplites birkenmajeri* in Spitsbergen. This species was found by the author in the Moscow region of the RP in a horizon with rewashed fauna. *Arcthoplites birkenmajeri* is a very abundant species in Spitsbergen sections (Nagy 1970). Probably this is the main reason why the other ammonites from the assemblage (*Freboldiceras, Eogaudryceras* and *Grantziceras*) have not been found in the RP Basin yet. *Leymeriella (L.) germanica*, a component of the *Freboldiceras* assemblage, is an immigrant from the European Basin (Owen 1979) and could not penetrate the RP Basin by the northern sea-way due to cool water conditions. This connection successfully existed during the **Tardefurcata Zone** (see above), as is confirmed by the *Arcthoplites* distribution. This genus was found in Novaya Zemlya, Kolguev Island and Chekh Guba region (Barents Sea) in redeposited condition (Cherkesov & Burdykina 1981, V. I. Efremova collection). This means that the strait passed through the Pechora Basin with the narrowest place on the Ural-Timan crossing.

7.2. The **Leymeriella regularis Zone** is determined by the presence of *Cymahoplites (C.)* cf. *bicurvatoides* (Spath 1921), distributed in the RP and Mangyshlak, and *Grantziceras cf. affine*, distributed in Pacific and Boreal realms. These findings support the idea that the RP-Spitsbergen basins connection existed in the Regularis Chrone.

7.3. The presence of the lower part of the **Douvilleiceras mammillatum Zone** (Perinflata to Floridum Subzones) is very questionable. The only finding of *Cleoniceras (Neosaynella?)* sp. confirms the existence of the interval. It is very probable to our mind that there is a stratigraphical gap between the Langstakken Member and Zillerberget Member. This gap could fall in these subzones. The upper part of the **Mammillatum Zone** is characterized by *Otohoplites* fauna which is correlated with the **Puzosianus-Bulliensis Zones** of Europe (Baraboshkin 1992).

7.4. The Middle Albian succession of Spitsbergen begins from the **Eodentata Zone**, where *Pseudosonneratia (Isohoplites)* cf. *eodentata* was found. It is overlain by the analogue of the **Benettianus Zone** with *Hoplites (H.)* aff. *obtusus*. **Hoplites spathi Zone** is proved by *H. (H.) svalbardensis, (H.)* sp. findings in assemblage with *Grycia sablei* and *G. whittingtoni*. It is correlated with the **Grycia sablei Zone** of Northern Alaska. Findings of *Dimorphoplites* sp. (= *D.* cf. *tethydis* by Nagy), represent one of the oldest strongly ribbed *Dimorphoplites*, which in assemblage with *Euhoplites* sp. (similar to *Euhoplites subtuberculatus*, sensu Nagy) characterize the **Anahoplites intermedius Zone**. The presence of **Niobe-Daviesi** (? and/or **Rossicus**) **Zones** is very questionable in Spitsbergen.

7.5. The complete Upper Albian succession cannot be recognized now. It may begin with analogues of the **Dipoloceras cristatum Zone**, because this was the time of beginning of a widespread transgression, when *Gastroplites* penetrated into the Central Europe Basin (Spath 1937). In Spitsbergen *Gastroplites* are distributed in the Upper Albian part of sections, but the only level containing *Gastroplites subquadratus* and *Euhoplites* sp. (similar to *E. boloniensis* sensu Nagy) could be dated as analogue of the **Hysteroceras orbignyi-varicosum Zones**. The other part of the Upper Albian is absent in Spitsbergen (Nagy 1970).

Detailed stratigraphical analysis indicates that the strait between the RP and Spitsbergen existed from the Tardefurcata Chrone in Early Albian to the second half of Middle Albian (Figs. 5-6). Since that time the connection was interrupted by uplifting of the north-eastern part of the RP. The closest relationship between the RP and Spitsbergen Basins was in the Early Albian (Tardefurcata and Regularis Chrones) when northward (from the Boreal basin through the RP into the Tethys basin) migration of *Arcthoplites* and *Anadesmoceras* fauna took place. Reestablishment of the connection conditions occurred at the end of the Early Albian when backward migration from RP began. These conditions existed in the first half of the Middle Albian, when the Spitsbergen Basin was connected both with the RP, Central Europe and Boreal (s.s.) basins as is indicated by a mixture of *Euhoplites* (from European Basin), some *Hoplites* and coarse-ribbed *Dimorphoplites* (from the RP Basin), *Grycia* (Boreal-Pacific). The connection closed completely in the Late Albian (Fig. 6), when the RP ammonite fauna became strongly separated from the Spitsbergen fauna (gastroplitids are not known from the RP at all).

Conclusions

It has been shown that the paleobiogeographical development in the RP was complicated during the Albian. According to the data presented, three stages of tectonical/paleogeographical changes in the RP and therefore, three cases of Tethyan/Boreal ammonite fauna distribution (Fig. 6) have been distinguished. These stages more or less coincide with the Albian stages.

The first stage began with the beginning of the Leymeriella tardefurcata Chrone. In that time (Tardefurcata to Regularis Chrone), the Pechora Basin (and probably also the Mezen Depression); RST, Saratov- and Don-Medveditza Troughs; MS and PCS were the most sunken structures of the RP. The sea transgressed through the system southward bringing ammonites (*Arcthoplites, Anadesmoceras*) from the Boreal basin.

In the second half of the first stage (Douvilleiceras mammillatum Chrone), during the transgression, the new structures on the south and south-east of the RP were lowered and submerged. They were: the USS, Polish-Lithuanian-, Brest- and Black Sea Depressions. The sea also crossed over the Voronezh Anteclise, where cross-bedded sands were deposited. In that time, ammonite fauna migrated in a northward direction as well as in a southward direction. It is difficult to recognize it because of very similar ammonite assemblages of Western Europe and Spitsbergen area on the one hand and the Caucasus-Mangyshlak area on the other. The only evidence for a mixing model is the co-occurrence of both Boreal- (such as *Otohoplites nagyi*) and Transcaspian endemics (such as *Anahoplitoides gigas*) in central part of the RP.

The second stage began in the Pseudosonneratia eodentata or Hoplites benettianus (= Lyelliceras lyelli) Chrone when a new sublatitudal strait was opened between the Polish and RP seas. It passed through the Polish-Lithuanian Depression, Baltic Syneclise and MS. In that period ammonite migration routes were very complex. Fauna migrated both from Europe in an eastward direction and from the Caspian region in northward direction. The ammonite assemblages all over the area are very similar.

The third stage began in the Middle Albian Niobe Chrone, when the northern parts of the RP were uplifted and the northern connection was closed. The data shows that the southern part of the RP was submerged almost completely. Even the greater part of the Ukrainian Shield was submerged and in the south-western part shallow-water sediments with *Anahoplites* and *Puzosia* were deposited. The complete isolation between the Tethyan and Boreal sea masses is dated to the beginning of the Late Albian. From that time, the RP Basin belonged to Hoplitinid province and Spitsbergen-Pechora Basin — to the Gastroplitinid one. The highest sea-level was reached in the Mortoniceras inflatum Chrone when very fine clayey sediments overlaid the RP.

Very strong regression embraced the RP Basin during the latest Albian and beginning of the Cenomanian. The northern parts of the RP were raised, and marine deposits of **Stoliczkaia dispar Zone** occur only in the south and central part of the RP (Black Sea Depression, Ukraine Syneclise, USS and PCS) and adjacent area to the south.

Acknowledgments: I wish to acknowledge IGCP Project No. 362 and the International Scientific Foundation of J. Soros (Grant No. JBV 100), which made possible presentation and publishing of this paper. I also thank Dr. Josef Michalík and an anonymous referrer for their suggestions and editing of my manuscript.

References

Amedro F., 1983: Le sous-genre Hoplites (Isohoplites) /Ammonoides, Hoplitidae/ dans l'Albien moyen de Normandie (France). *Bull. Soc. Géol. Normandie Amis Mus. Havre*, 71, 4, 29-39.

Bakin N.V., 1930: On the rests of Mortoniceras inflatum Sow. Zone in the basin of Golaya river (right tributary of Balyklej river). *Trudy Nizhne-Volzhskogo Obschestva Kraevedeniya, Geologichesky Sbornik*, 37, 39-45 (in Russian).

Baraboshkin E.J., 1992: The Lower Albian of Central parts of the Russian Platform. In: S.M. Shik (Ed.): *The Phanerozoic stratigraphy of the central part of the East-European Platform. Publ. Centrgeologia*, Moscow, 20-36 (in Russian).

Baraboshkin E.J., Guzhikov A.J. & Alexandrova A.A., in print: Terminal Albian anoxic events and Northern Caucasus basin evolution. *Cretaceous Research*.

Baraboshkin E.J. & Mikhailova I.A., 1987: Albian ammonites and stratigraphy of Northern Podmoskowie. Article 1. Stratigraphy. *Bjull. Mosk. Obšč. Ispyt. Prir., Otd. geol.*, 62, 6, 91-100 (in Russian).
Baraboshkin E.J. & Mikhailova I.A., 1988: Albian ammonites and stratigraphy of Northern Podmoskowie. Article 2. Ammonites. *Bjull. Mosk. Obšč. Ispyt. Prir., Otd. geol.*, 63, 3, 75-88 (in Russian).
Birkelund T. & Hakansson E., 1983: The Cretaceous of North Greenland: a stratigraphic and biogeographical analysis. *Zitteliana*, 10, 7-25.
Casey R., 1954: New genera and subgenera of Cretaceous ammonites. *J. Washington Acad. Sci.*, 44, 106-115.
Casey R., 1966: A monograph of the Ammonoidea of the Lower Greensand. *Paleontographical Society*, London, VII, 547-582.
Cherkesov O.V. & Burdykina M.D., 1979: Description of the new findings of fauna from the Novaya Zemlya. In: N. I. Shulgina (Ed.): *Upper Paleozoic and Mesozoic of islands and sea coast of Arctic Sea of the USSR. Nauchn. Issled. Inst. Geol. Arctic Publ.*, Leningrad, 43-66 (in Russian).
Cieslinski S., 1959: The Albian and Cenomanian in the Northern periphery of the Holy Cross Mountains. *Prace Inst. Geol. (Warszawa)*, 28, 1-95 (in Polish).
Destombes P., 1979: Les ammonites de l'Albien inferieur et moyen dans le Stratotype de l'Albien: gisements, paleontologie, biozonation. In: P. Rat et al. (Eds.): *L'Albien de l'Aube. Edition du C.N.R.S, Les Stratotypes Francais, 5, Comite Francais de Stratigraphie*, Paris, 51-194.
Dobrov S.A., 1915: Essay on geology and phosphorite deposits in the middle flow of Tzna River (Tambov province). *Trudy Komissii Mosk. Selskokhoz. Insti. po issledovaniju phosphoritov*, Moscow, ser.1, VII, 245-312 (in Russian).
Drushchits V.V., Kudryavtsev M.P., Kuzmicheva E.I., et al., 1960: Atlas of Lower Cretaceous fauna of Northern Caucasus and Crimea. *Gostoptehizdat*, Moscow, 1-701 (in Russian).
Drushchits V.V. & Mikhailova I.A., 1960: Lower Cretaceous biostratigraphy of the Northern Caucasus. *Moscow University Publ.*, Moscow, 1-190 (in Russian).
Efimova V.N. & Glasunova A.E., 1960: The new data on the Albian stratigraphy of Medveditza River. *Informationny Sbornik VSEGEI*, Leningrad, 24, 37-48 (in Russian).
Eristavi M.S., 1955: On stratification of Lower Cretaceous of Crimea. *Dokl. Akad. Nauk SSSR, Nov. Ser.*, 101, 4, 751-753 (in Russian).
Eristavi M.S., 1957: Geological correlation of Lower Cretaceous of Georgia and Crimea. *Acad. Sci. USSR Publ.*, Moscow, 1-182 (in Russian).
Ershova E.S. (Ed.), 1983: Explanation to the Jurassic and Lower Cretaceous biostratigraphical scheme of the Spitsbergen Archipelago. *Proizv. Geol. Ob'ed. Sevmorgeologia Publ.*, Leningrad, 1-88 (in Russian).
Jeletzky J.A., 1964: Illustrations of Canadian fossils. Lower Cretaceous marine index fossils of the sedimentary basins of Western and Arctic Canada. *Pap. Geol. Surv. Canada*, 64-II, 1-100.
Kamenetzky A.E., 1963: Lower Cretaceous of Plain Crimea. In: M.S. Burshtar (Ed.): *Materials on geology and oil- and gas productity of South of the USSR. Gosgeolizdat Publ.*, Moscow, 62-83 (in Russian).
Kokoszynska B., 1931: On the facies transitions and stratigraphy of Cenomanian of Podolia. *Spraw. Pol Inst Geol.*, 6, 3, 629-695 (in Polish).
Koltypin S.N., Mjatluk E.V. & Poslavskaya G.G., 1986: Regional stratigraphic essayes. I. East-European Platform. Lower Series. Peri-Caspian Syneclise. In: B.S. Sokolov (Ed): *Stratigraphy of the USSR. Cretaceous I, Nedra Publ.*, Moscow, 66-74 (in Russian).
Kotetishvili E.V., 1986: Lower Cretaceous zonal stratigraphy of Georgia and paleozoogeography of Early Cretaceous basins of Mediterranean region. *Trudy Geol. Inst. Akad. Nauk Gruz SSR, Nov. Ser.*, 91, 1-160 (in Russian).
Leschukh R.I., 1987: Early Cretaceous fauna of the Plain Crimea and northern part of Black Sea region. *Naukova Dumka Publ.*, Kiev, 1-220 (in Ukrainian).
Leschukh R.I., 1992: Lower Cretaceous of western part of Black Sea depression and Ukraine. *Naukova dumka Publ.*, Kiev, 1-208 (in Ukrainian).
Lychagin G.A., 1969: Lower Cretaceous. Stratigraphy. In: M.V. Muratov (Ed.): *Geology of the USSR, VIII, Crimea, pt. 1, Geological description, Nedra Publ.*, Moscow, 155-179 (in Russian).
Marcinowski R. & Naidin D.P., 1976: An Upper Albian ammonite fauna from Crimea. *Acta Geol. Pol.*, 26, 1, 83-119.
Marcinowski R. & Wiedmann J., 1990: The Albian ammonites of Poland. *Paleont. Pol.*, 50, 1-94.
Mc Learn F.H., 1972: Ammonoids of the Lower Cretaceous sandstone member of the Haida Formation, Skidegate Inlet, Queen Charlotte Islands, Western British Columbia. *Bull. Geol. Surv. Canada*, 188, 1-78.
Mikhailova I.A. & Saveliev A.A., 1989: The Albian stage. In: V.A. Prozorovsky (Ed.): *Zones of Cretaceous system in the USSR, Lower series. Trans. Interdepart. stratigr. Committee of the USSR, Nauka Publ.*, Leningrad, 20, 141-217 (in Russian).
Muratov M.V., 1949: Tectonics and evolution of Alpine geosynclinal region of South of European part of the USSR and adjacent countries. *Tectonics of the USSR, II. Acad. Sci. USSR Publ.*, Moscow, 1-512 (in Russian).
Nagy J., 1970: Ammonite faunas and stratigraphy of Lower Cretaceous (Albian) rocks in southern Spitsbergen. *Skrifter of Norsk Polarinstitut*, Oslo, 152, 1-58.
Nikitin S.N., 1888: Les vestiges de la periode Cretacee dans la Russie Centrale. *Memoires du Comite Geologique*, St.-Petersburg, V, 2, 1-205 (in Russian).
Nikitina J.P., 1948: To the study of Lower Cretaceous Fauna of Southern Emba. *Izvestia Akad. Nauk Kazakh. SSR, Ser. geol.*, 9, 97-123 (in Russian).
Owen H.G., 1971: Middle Albian stratigraphy in the Anglo-Paris Basin. *Bull. Brit. Mus. Natur. Hist., Ser. Geol.*, 8, 1-164.
Owen H.G., 1979: Ammonite zonal strahtigraphy in the Albian of North Germany and its setting in the hoplitinid faunal province. *Aspecte der Kreide Europas, IUGS Series A*, 6, 563-588.
Owen H.G., 1984: Albian stage and substage boundaries. *Bull. Geol. Soc. Denmark.*, 33, 183-189.
Parona C.F. & Bonarelli G., 1896: Fossili albiani d'Escragnolles, del Nizzardo e della Liguria occidentale. *Paleontogr. Italica*, 2, 53-112.
Pasternak S.I., 1959: Cretaceous biostratigraphy of Volyno-Podolie plate. *Acad. Sci. Ukrainian SSR Publ.*, Kiev, 1-60 (in Ukrainian).
Pasternak S.I., Gavrilishin V.I. & Senkovsky J.M., 1968: Albian of western Polesie. *Dopovidi Akad. Nauk USSR*, Ser. B, 11, 971-973 (in Ukrainian).
Radkevich G.A., 1894: On the Cretaceous fauna of Kanev and Cherkassk regions of Kiev province. *Zapiski Kievskogo Obschestva Estestvoispytatelej*, 14, 1-35 (in Russian).
Saveliev Č.Č., 1973: Lower Albian stratigraphy and ammonites of Mangyshlak (Leymeriella tardefurcata and Leymeriella regularis Zones). *Trudy VNIGRI*, 323, 1-340 (in Russian).
Saveliev A.A., 1992: Lower Albian ammonites of Mangyshlak, their phylogeny and importance for Albian zonal stratigraphy of South of the USSR (Cleoniceras mangyschlakense Superzone). *Com. Geol. and Entrails exploration of Russia, VNIGRI, Nedra Publ.*, St. Petersburg, 1-223 (in Russian).
Sasonova I.G. & Sasonov N.T., 1967: Paleogeography of the Russian Platform during Jurassic and Cretaceous period. *Trudy Vsesojuz. Nauch.-issled. Geol.-razv. Neft. Inst. Trudy VNIGNI.* Moscow, LXII, 1-260 (in Russian).
Seyed-Emani A., 1980: Leymeriella (Ammonoidea) aus dem unteren Alb von Zentraliran. *Mitt. Bayer. St.-Samml. Palaont. hist. Geol.*, 20, 17-27.
Spath L.F., 1921: Ammonites from Spitsbergen. *Geol. Mag.*, 8, 6, 297-305; 347-356.
Spath L.F., 1923-1943: A monograph of the Ammonoidea of the Gault. *Palaeontographical Society, A Monograph*, London, I-XVI, 1-787.
Stratigraphical scheme of Cretaceous of Ukraine and it's explanation, 1971, 2 Edition. *Naukova Dumka Publ.*, Kiev, 1-92 (in Russian).
Vakhrameev V.A., 1952: Stratigraphy and fossil flora of Cretaceous of Western Kazakhstan. In: D.V. Nalivkin (Ed.): *Regional stratigraphy of the USSR. Akad. Nauk. USSR Publ*, Moscow I, 1-340 (in Russian).