

Submediterranean Province (after Geysant, 1997; Schweigert, 1999; Schweigert et al., 1996). Middle Tithonian ammonite zones correlated by the author.				Subboreal Province (ammonite succession of the Russian Plate)			
SUBSTAGE	ZONE	SUBZONE	HORIZON	HORIZON OR BEDS WITH AMMONITES	SUBZONE	ZONE	SUBSTAGE
U.TITH.	TRANSITORIUS						
	SCRUPOSUS						
MIDDLE TITHONIAN	ROSTI						
	FALLAUXI	PALMATUS		<i>palmatus</i>	puschi	PANDERI	MIDDLE VOLGIAN (part)
				<i>glabrum</i>			
	SEMIFORME	CILIATA		<i>callodiscus</i>	neoburgensioe	Tenuicostata	
			<i>ciliata</i>				
			<i>penicillatum</i>				
LOWER TITHONIAN	PALATINUS					PSEUDOSCYTHICA	
	VIMINEUS						
	MUCRONATUM					SOKOLOVI	
	HYBONOTUM	Moernsheimensis		<i>laisackerensis</i>	efimovi	KLIMOVI	LOWER VOLGIAN
Rueppellianum			<i>cf. eystettense</i>				
			<i>riedlingense</i>				
	Riedense		<i>rueppellianum</i>	steraspis-solenoides			
			<i>eigeltingense</i>				
U.KIMM.	BECKERI (part)	Ulmense (part)	<i>rebouletianum</i>		Fallax	AUTISS.	U.KIMM.
			<i>holderi</i>				

Fig. 2 - Scheme of the Tithonian-Volgian correlation based on ammonite distribution. Abbreviations: U.Kimm. - Upper Kimmeridgian, Autiss. - Autissiodorensis

Lower Volgian

Klimovi Zone Michailov, 1964

In the middle Volga area the Klimovi zone is subdivided into the *Neochetoceras steraspis-Lingulaticeras solenoides* Beds (at the base of the zone) and the *efimovi* horizon.

- N. steraspis - L. solenoides* Beds Rogov, 2002. *N. steraspis* (Oppel) (Pl.I, fig.10-11) occurrences are numerous, whilst *Ilovaiskya klimovi* (Ilovaisky), *Lingulaticeras solenoides* (Quenstedt), *Sutneria* aff. *bracheri* Berckhemer are more rare (Pl.I, fig. 1). These beds may correspond to the *rueppellianum* and *riedlingensis* horizons and an unnamed horizon (Schweigert & Zeiss 1998) between the *rueppellianum* and *eigeltingense* horizons of Southern Germany (Swabia). A number of horizons from Southern Germany also contain *Neochetoceras ex gr. steraspis* (Oppel) and *Lingulaticeras solenoides* (Quenstedt) (Schweigert, pers. comm.), while *Paralingulaticeras* are absent or very rare (as in the *riedlingensis* horizon). The separate level with *N. praecursor* Zeiss (*eigeltingense* horizon) has not been found yet in the Russian Platform, but an ammonite very close to *N. nodulosum* Berckhemer & Hölder (microconchiate counterpart of *N. praecursor*) was discovered in the Murzycy section (not in situ) (Pl.I, fig.9).

- efimovi* Horizon Rogov, 2002. The variable species *Paralingulaticeras efimovi* (Rogov) (Pl.I, fig. 12-13) is common, including morphs resembling *P. ex gr. haeberleini* (Oppel) (Rogov 2002b, pi., fig. 4) and *P. percevali* (Fontannes) (Rogov 2002b, pl., fig.7) in the uppermost part, passing into the Sokolovi Zone. *Neochetoceras cf. steraspis* (Oppel), *Fontannesella* sp. (Pl.I, fig.14), *Haploceras* sp. (Pl.I, fig.6), and *Gravesia* (including *G. cf. gravesiana* (Orb.)) are rare. *Ilovaiskya* are represented by

I. klimovi (Ilovaisky) [M, m] and *Ilovaiskya* sp. nov. [m] characterized by a very high point of rib furcation. The first appearance of *Subdichotomoceras* (*Sphinctoceras*) also occurs in this horizon. Russian *Paralingulaticeras* and *Fontannesella* differ from the European genera in the absence of ventrolateral tubercles and in the small shell size. Nevertheless, type of ribbing and spectrum of variability within Russian and typical Mediterranean ammonites are the same. Thus, Russian specimens may be considered as endemic species of the genera *Paralingulaticeras* and *Fontannesella*. The *efimovi* horizon corresponds approximately to the *cf. eystettense-moernsheimensis* horizons of Southern Germany (Fig. 2). The level with numerous *Paralingulaticeras* is absent in Swabia (Schweigert, pers. comm.) and Poland. Probably these ammonites penetrated into the middle Volga area from the Northern Caucasus, where dimorphs of *Paralingulaticeras - Fontannesella prolithographicum* (Fontannes) occur.

Sokolovi Zone Ilovaisky, 1941

Eventually, it will be possible to subdivide this zone into two faunal horizons, *sokolovi* horizon below and *pavida* horizon above, as it is done for the zone in Poland (Kutek & Zeiss 1997), but at present data are insufficient. According to Mesezhnikov (Mesezhnikov et al. 1977; Blom et al. 1984), *I. sokolovi* (Ilovaisky) occurs near the base of the zone, together with *Paralingulaticeras haeberleini* (Oppel), *P. ? percevali* (Fontannes). In the upper part of the Sokolovi Zone, *Ilovaiskya pavida* (Ilovaisky) [M, m] is present together with rare Boreal ammonites (*Subdichotomoceras* (*Sphinctoceras*)). The base of the Sokolovi Zone (based on the presence of *Paralingulaticeras*) lies within the Hybonotum Zone (Rogov 2002b), and the top is located within the Palatinus Zone (Kutek & Zeiss 1997).

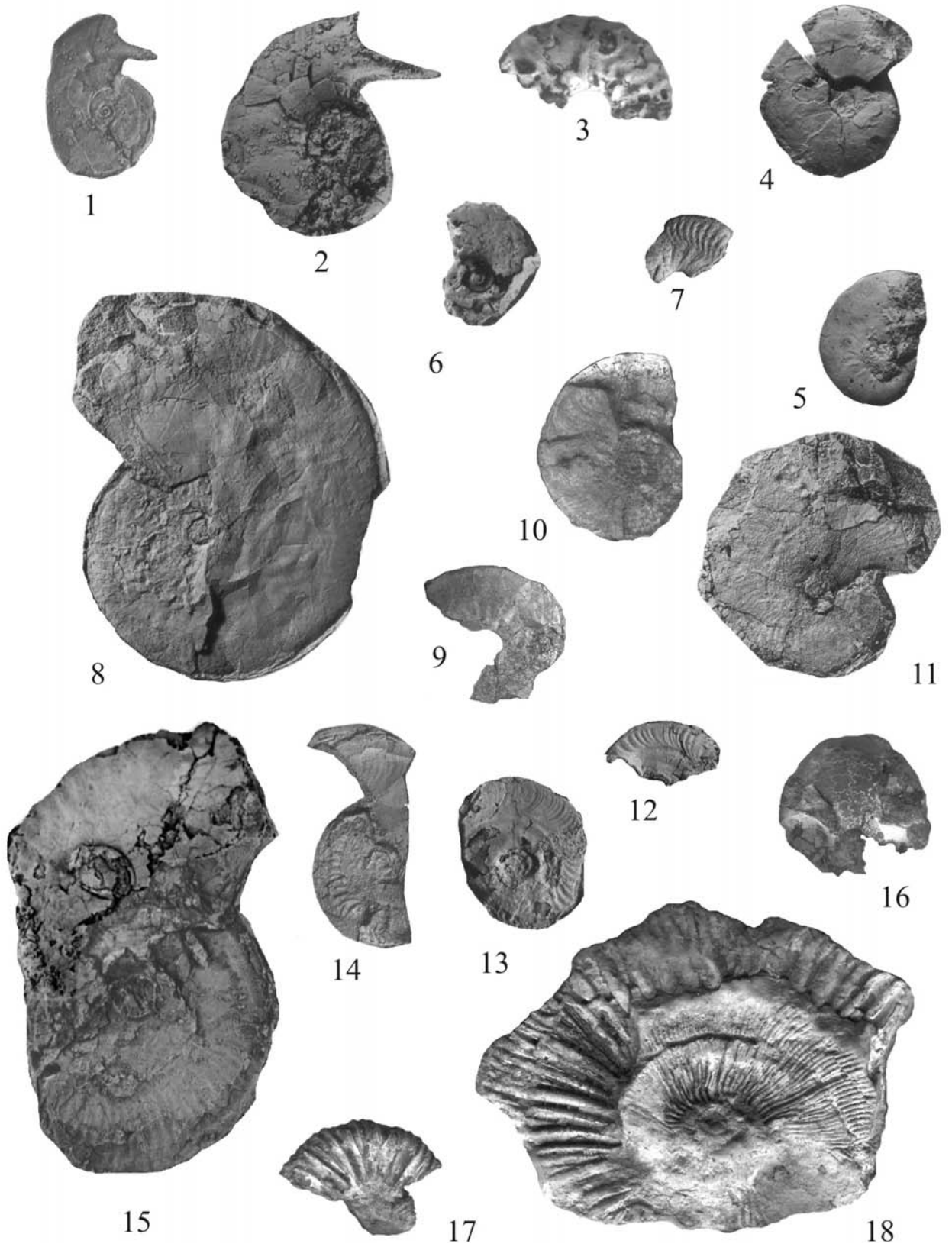


PLATE I

REFERENCES

- Blom G.I., Kuznetzova K.I. & Mesezhnikov M.S. (1984) - Jurassic-Cretaceous boundary beds in the Middle Volga and Rjasan areas. Excursion 060. 27 International Geol. Congr., Moscow, 1984. Guidebook of the excursions 059, 060, 066: 38-49, Moscow.
- Bogdanov A.A. (1934) - Hydrochloric domes of the Lower Zavalzhie. *Bull. Soc. Natur. Moscou. Sect. Géol.*, 12: 315-367, Moscow, [in Russian]
- Callomon J.H. & Birkelund T. (1982) - The ammonite zones of the Boreal Volgian (Upper Jurassic) in East Greenland. In Embry A.R. & Balkwill H.R. (Eds.): *Arctic Geology and Geophysics. Mem. Canad. Soc. Petrol. Geol.*, 8: 349-369, Calgary.
- Cecca R. & Enay R. (1991) - Les ammonites des zone à Semi-forme et à Fallauxi du Tithonique de l'Ardèche (Sud-Est de la France): stratigraphie, paléontologie, paléobiogéographie. *Palaeontographica, A.*, 219. 1-3: 1-87, Stuttgart.
- Fözy I. (1988) - Upper Jurassic facies and ammonite succession of the Transdanubian Central Range (Hungary). In Rocha R.B., Scares A.R. (Eds.): 2nd Int. Sympos. Jurass. Stratigr., 2: 581-583, Lisboa.
- Geyssant J. (1997) - Tithonien. In Cariou E. & Hantzpergue P. (Eds.) - Biostratigraphie du Jurassique Ouest-Européen et Méditerranéen. *Bull. Centre Rech. Elf Explor, Prod.*, 17: 97-102, Paris.
- Hantzpergue P., Baudin F., Mitta V., Olferiev A. & Zakharov V. (1998) - The Upper Jurassic of the Volga basin: ammonite bio stratigraphy and occurrence of organic-carbon rich facies. Correlations between Boreal-Subboreal and Submediterranean Provinces. In Crasquin-Soleau S., Barrier E. (Eds.): *Peri-Tethys Memoir 4: epicratonic basins of Peri-Tethyan platforms. Mém. Mus. nat. Hist. nat.*, 179: 9-33, Paris.
- Hoedemaeker Ph.J. (1991) - Tethyan-boreal correlations and the Jurassic-Cretaceous boundary. *Newsl. Stratigr.*, 25. 1: 37-60, Berlin & Stuttgart.
- Ilovaisky D.I. & Florensky KR (1941) - Les ammonites du Jurassique supérieur des bassins des rivières Ouralet Ileek. *Contribution a la connaissance de la géologie de l'USSR. Nouv. Ser.*, 1(5): 7-195, Moscow, [in Russian]
- Kutek J. (1994) - The Scythicus Zone (Middle Volgian) in Poland: its ammonites and biostratigraphic subdivisions. *Acta geol. Polonica.*, 44/1-2. 1-33. Warszawa.
- Kutek J. & Wierzbowski A. (1986) - A new account on the Upper Jurassic stratigraphy and ammonites of the Czorsztyn succession, Pieneny Klippen Belt, Poland. *Acta Geol. Polonica.*, 36/4: 291-315, Warszawa.
- Kutek J. & Zeiss A. (1974) - Tithonian-Volgian ammonites from Brzostówka near Tomaszów Mazowiecki, Central Poland. *Acta Geol. Polonica.*, 24/3: 505-542, Warszawa.
- Kutek J. & Zeiss A. (1997) - The highest Kimmeridgian and Lower Volgian in Central Poland; their ammonites and biostratigraphy. *Acta Geol. Polonica.*, 47/3-4: 107-198, Warszawa.
- Mesezhnikov M.S. (1982) - Tithonian (Volgian) Stage. Zones of the Jurassic System in the USSR. *Transact. Interdepart. Stratigr. Com.*, 10: 120-146. Leningrad, [in Russian]
- Mesezhnikov M.S. (1989) - Tithonian, Volgian and Portlandian stages (geological and biological events, correktion). In Sokolov B.S. (Ed.): *Sedimentary cover of the Earth in space and time. Stratigraphy and paleontology: 100-107.* Moscow, [in Russian]
- Mesezhnikov M.S., Dain L.G., Kuznetzova K I. & Yakovleva S.R (1977) - Jurassic/Cretaceous boundary beds in the Middle Volga Area (A Prospectus to Geological Excursion): 34 pp. Leningrad.
- Mikhailov N.R (1964) - Boreal Late Jurassic (Lower Volgian) ammonites (Virgatosphinctinae). *Transact. Geological Inst.*, 107: 7-88. Moscow, [in Russian]
- Mitta VV (1993) - Ammonites and zonal stratigraphy of the Middle Volgian deposits of the Central Russia. 132 pp. Kiev, [in Russian]
- Rogov M.A. (2002a) - Autissiodorensis Zone (Upper Kimmeridgian) of the Volga area: ammonite assemblages, biostratigraphy, correlation. In: Bogdanov N.A., Vierzbitsky YE., Vishnevskaya VS. et al. (Eds.): *Modern questions of geology: 320-325.* Moscow, [in Russian]
- Rogov M.A. (2002b) - Stratigraphy of the Lower Volgkn deposits in the Russian Plate and correlation between Volgian and Tithonian Stages. *Stratigraphy Geol. Correlation*, 4: 348-364, Moscow.
- Rogov M.A. & Egorov E.Yu. (2002) - Middle Tithonian *Glochiceras*: its distribution, migrations and significance for the Boreal-Tethyan correlation. In Bogdanov N.A., Vierzbitsky VE., Vishnevskaya VS. et al. (Eds.): *Modern questions of geology: 325-329.* Moscow, [in Russian].
- Sachs VN. (Ed.) (1976) - Stratigraphy of the Jurassic System of the north of the USSR. 436 pp. Moscow, [in Russian]
- Sachs VN., Mesezhnikov M.S. & Shulgina N.I. (1979) - Stratigraphy of the Jurassic-Cretaceous boundary beds in the Boreal Belt. In Sachs VN. (Ed.): *Upper Jurassic and their boundary with Cretaceous System: 93-102.* Novosibirsk, [in Russian]
- SasonovN.T. (1953) - Stratigraphy of the Jurassic and Cretaceous deposits of the Russian platform. *Bull. Soc. Natur. Moscou. Sect. Géol.*, 28. 5: 71-100, Moscow, [in Russian]
- Sey I.I. & Kalacheva E.D. (1993) - Biostratigraphical criteria of the Jurassic-Cretaceous boundary for the Russia. 60 pp. Saint-Petersburg, [in Russian]
- Sey I.I. & Kalacheva ED. (1999) - Lower Berrkskn of Southern Primorye (Far East Russk) and the problem of Boreal-Tethyan correlation. *Palaeogeogr., Palaeoclim., Palaeoecol.*, 150: 49-63, Amsterdam.
- Scherzinger A. & Schweigen G. (1999) - Die Ammoniten-Faunenhorizonte der Neuburg-Formation (Oberjura, Südliche Frankenalb) and ihre Beziehungen zum Volgium. *Mitt. Bayer. Staatsslg. Paläont. hist. Geol.*, 39: 3-12, München.
- Schweigert G. (1993) - Subboreale Faunenelemente (Ammonoidea) im oberen Weißjura (Oberkimmeridgium) der Schwäbischen Alb. *Profil*, 5: 141-155, Stuttgart.
- Schweigert G. (1994) - Über einige bemerkenswerte Ammoniten im Oberkimmeridgium der Schwäbischen Alb (Südwestdeutschland). *Stuttgarter Beitr. Naturkde.*, B. 203: 1-15, Stuttgart.

- Schweigert G. (1996) - Die Hangende Bankkalk-Formation im schwäbischen Oberjura. *Jber. Mitt, oberrhem. geol. Ver.*, N.F., 78: 281-308, Stuttgart.
- Schweigen G. (1998) - Die Ammonitenfauna des Nusplinger Plattenkalks (Ober-Kimmeridgium, Beckeri-Zone, Ulmense-Subzone, Baden-Württemberg). *Stuttgarter Beitr. Naturkde.*, B. 267: 1-61, Stuttgart.
- Schweigen G. (2000) - New biostratigraphie data from the Kimmeridgian/Tithonian Boundary Beds of SW Germany In Hall R.L. & PL, Smith (Eds.): Advances in Jurassic Research 2000. *GeoResearch Forum.*, 6: 195-202, Zuerich-Ueticon.
- Schweigen G., Krishna J., Pandey B. & Pathak D.E. (1996) - A new approach to the correlation of the Upper Kimmeridgian Beckeri Zone across the Tethyan Sea. *N. Jb. Geol. Paläont., Abh.*, 202/3: 345-373, Stuttgart.
- Yakovleva S.P (Ed.) (1993) - Unified stratigraphical scheme of the Jurassic deposits of the Russian Platform (1993). 28 sheets, 71 pp. Saint-Petersburg.
- Zeiss A. (1977) - Some ammonites of the Kletnice Beds (Upper Tithonian) and remarks on correlation of the Uppermost Jurassic. *Acta Geol. Polonica.*, 27/3: 369-386, Warszawa.
- Zeiss A. (2001) - Die Ammonitenfauna der Tithonklippen von Ernstbrunn, Niederösterreich. *Denkschr, Naturhist, Mus. Wien.*, 6: 115 pp., Wien.