

# Cylindroteuthid Belemnite Correlation of the Jurassic/Cretaceous Boundary Strata in Northern Siberia and Northern California

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In the Northern hemisphere there are some sections of the Jurassic/Cretaceous (J/K) boundary strata where Boreal and Tethyan molluscan fauna can be found together. They are all located on the Pacific margins, in northeast Asia (Far East of Russia, Northeast China) and on the western coast of North America (Western British Columbia in Canada, Northern California and Southwest Oregon in the USA). Cephalopods are quite rare here, and age determinations are based on *Boreal bivalve Buchia* records. Tethyan ammonites on separate levels make it possible to determine the age of rocks in accordance with the *standard Tethyan zonal* scheme. The greatest abundance of belemnites (Boreal Cylindroteuthididae and Tethyan Mesohibolitidae) is found in Northern Califor-

nia (Stanton, 1895; Anderson, 1945).

The Northern Siberia buchiid succession correlates with that of Northern California through British Columbia. The absence of common *Buchia* zones in all three regions in the Tithonian and most of the Berriasian gives rise to a variety of interpretations of the correlation relationships (e.g., Zakharov, 1981, 2004; Jeletzky, 1984; Hoedemaeker, 1987). In this case it is rather difficult to compare J/K boundary strata based only on *Buchia*. Certain progress has been made in solving this problem following the investigation of a new collection of belemnites from the Nordvik Peninsula (Northern Siberia, Russia) where one of the most complete Boreal sections of the J/K boundary interval is located.

Northern Siberia										Northern California			
Stage	Substage	Polarity Chron	Ammonite Zone	Buchia Zone	Belemnite Zone and Beds		Beds with fauna		Buchia Zone and Subzone				
Volgian	Upper	Bogho	Hectoroceras kochi (lower part)	Buchia okensis (basal part)	L. gustomesovi, C. porrectiformis (lower part)	Cylindroteuthis knoxvillensis (lower part)		No finds	Finds are rare and not specific	B.uncitoides + B. okensis (basal part)			
			M17r	Chetaites sibiricus				Buchia unshensis	Cylindroteuthis knoxvillensis	Substeueroeras, Proniceras, Blanfordiceras	Buchia aff. okensis		
			M18n	Chetaites chetae					Cylindroteuthis tehamaensis	Parodontoceras	Buchia fischeriana		
			M18r	Craspedites taimyrensis					No finds	Finds are rare and not specific		Kossmatia	
			M19n	Craspedites okensis						Buchia obliqua			
	Middle	Kysuca	M19r	Praechetaites exoticus	Simobelus russiensis	Lagonibelus napaensis		No finds	No finds	Buchia elderensis	Buchia piochii		
			M20n	Epivirgatites variabilis								Buchia taimyrensis	
			M20n	Taimyrosph. excentricus								Pachyteuthis explanata (upper part)	No finds

speculations as to the identity of *L.(L.) tomsensis* and *L.(L.) napaensis* (Dzyuba, 2004). Species *L.(L.) parvulus* has been found together with *L.(L.) napaensis* only in the lower part of the Variabilis Zone where they are known in Siberia. It is noteworthy that the section interval in the upper part of the *Buchia elderensis* Subzone in Northern California containing Kossmatia and Durangites? ammonites correlates with the lower part of the Tethyan Durangites Zone (e.g., Hoedemaeker, 1987). Stratigraphically its location is above the Californicus–Tomsensis Beds corresponding to the Variabilis Zone that concurs with paleomagnetic data for the Middle Volgian deposits (Houša et al., 2007).

Tehamaensis belemnite Beds provide a correlation of the upper part of the Californian *Buchia fischeriana* Subzone with the interval within the Siberian *B. unschensis* Zone corresponding to the upper part of the Taimyrensis Zone, Chetae Zone and basal part of Sibiricus Zone in ammonite scale. In spite of the fact that belemnites have not been discovered in bottomset deposits, the *C.(C.) newvillensis* found in Northern California in the uppermost part of the Tehamaensis Beds suggests their near full release, since *C.(C.) cf. newvillensis* appears in the Nordvik Peninsula in the base of the Chetae ammonite Zone.

Knoxvillensis belemnite Beds in Northern California have been released in the volume of the *Buchia* aff. *Okensis* Zone. In accordance with various correlation models with the Siberian *Buchia* scale this zone corresponds to: (1) the *B.okensis* Zone (Zakharov, 1981); (2) the *B.unschensis* Zone (e.g., Jeletzky, 1984; Hoedemaeker, 1987); (3) the small interval within the *B. unschensis* Zone (Sey and Kalacheva, 1993); (4) the uppermost part of the *B.unschensis* Zone–*B.Okensis* Zone (Zakharov, 2004). By referring to the data obtained it can be concluded that the lowermost part of the Siberian *B.unschensis* Zone comprising the Taimyrensis and Chetae ammonite zones, cannot be correlated to the Californian *B.aff. Okensis* Zone since the Knoxvillensis belemnite Zone in Siberia contains ammonite zones placed stratigraphically above (Fig.1). Belemnites testify to the correspondence of the *B.aff. Okensis* Zone to, at the very least, the Sibiricus ammonite Zone of the Ryazanian Stage. Since no belemnites have been found in the base of the superjacent *B.uncitoides* Zone in California we cannot determine the stratigraphic content of Knoxvillensis Beds released here. It is not improbable that the Knoxvillensis Beds and *B.aff. Okensis* Zone respectively contain more recent deposits, which is shown by the find in this interval of the ammonite *Bochianites glennensis*, recently cf.-marked, in the base of the Kochi ammonite Zone on the Nordvik Peninsula (Rogov and Igolnikov, 2009).

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**Key words:** J/K boundary; Belemnites; Siberia; California

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