SUPPLEMENTAL DATA

A NEW CLADE OF PUTATIVE PLANKTON-FEEDING SHARKS FROM THE UPPER CRETACEOUS OF RUSSIA AND THE UNITED STATES

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APPENDIX S1. Geographic and stratigraphic descriptions of seven Upper Cretaceous fossil localities in Russia described in this paper (see also Fig. 1; Appendix S2). Unless otherwise noted, the exact geographic coordinates of each locality are on file at the respective museums where shark specimens described in this paper are housed. The term ‘formation’ is used here for simplicity, but we note that, in Russian stratigraphical terminology, a more appropriate expression for the term ‘formation’ is *svita* (suite) that represents a formal semi-lithostratigraphic unit based on both lithostratigraphic and biostratigraphic criteria combined to define isochronous boundaries (see discussion in Tverdokhlebov et al., 2005).

Central Russia, Belgorod Province

Locality 1 (Lebedinskij Quarry)—The lower Cenomanian Polpino Formation (Ivanov, 1996) exposed at Lebedinskij Quarry operated by Lebedinskij Mining and Ore-Dressing Plant Joint Stock Company for iron ore near the town of Gubkin (= Gubkin and Staryi Oskol [partim] in Averianov, 2002; = ‘Lebedinskii Quarry’ in Averianov, 2004; coordinates: 51°17'17.03"N, 37°39'18.62"E). This locality was first studied by Nesson et al. (1988; see also Nesson, 1999), but the exact location within the quarry is uncertain because that portion of the deposits no longer exists due to mining operation. A simplified log of the lower Cenomanian part of the section is shown in Figure 1B (note: the underlying Albian sequence of the Ludinovo Formation, including Nesson’s [1999] level GLE 20a, is not fully shown in this figure). Nesson’s (1999) level GLE 22 is dated as late Albian, and above this level conformably overlies the sandy member of the Polpino Formation (lower Cenomanian – ?middle Cenomanian) followed by a chalk deposit of the Lower Turonian ‘Tuskar’ Formation (Olfer’ev and Alekseev, 2005). Albian–Cenomanian sandy deposits with phosphorites have yielded remains of a variety of vertebrates

including sharks, chimaeroids, bony fishes, and marine tetrapods (e.g., ichthyosaurs, plesiosaurs, and turtles) as well as pterosaurs and dinosaurs (e.g., Nessel et al., 1988; Nessel, 1999; Averianov, 2002, 2004; Arkhangelsky and Averianov, 2003; Popov and Averianov, 2001). Specimens of *Pseudomegachasma casei* comb. nov. described here (CNIGRM 10/12292 and ZIN PC15/30–PC20/30: Fig. 3A–T) come from the Lower Cenomanian portion (specifically black thick vertical lines within Nessel’s [1999] level GLE 20 depicted in ‘1’ of Figure 1B).

Volga River Basin, Volgograd Province

Locality 2 (Melovatka-5)—The lower portion of the Cenomanian Melovatka Formation (Ivanov, 1995, 1996:fig. 12; Pervushov et al., 1999) exposed in a ravine near the village of Melovatka in Zhirnovsk District located at northwest of Volgograd Province. This locality is located within the stratotypic area of the Cenomanian Melovatka Formation (Olfer’ev and Alekseev, 2005), which was proposed based on outcrop Melovatka-6 (300 m northeast from this locality). The lower portion of the Melovatka Formation consists of glauconitic quartz sands with two layers of phosphatic nodules (Ivanov, 1995, 1996). The lower of the two phosphatic layers (‘layer 4’ in Ivanov, 1996; see Fig. 1B) is rich in vertebrate fossils (Birukov and Popov, 2011), including dental remains of elasmobranchs and chimaeroids as well as coprolites and bone fragments of bony fishes. *Pseudomegachasma casei* comb. nov. is represented by six specimens from this locality (SSU 155/80–155/85: Fig. 3U–AD).

Volga River Basin, Saratov Province

Locality 3 (Bezobrazovka-1)—The middle to upper portion of the Cenomanian Melovatka Formation (Ivanov, 1995, 1996; Pervushov et al., 1999; Seltzer and Ivanov, 2010)

exposed at an abandoned sandy quarry near Pervomaiskoe settlement in the vicinity of the town of Kalininsk in Kalininsk District of Saratov Province (= 'Pervomaiskoe' in Seltzer and Ivanov, 2010; coordinates: 51°30'9.37"N, 44°34'59.97"E). The quarry exposes about 10 m of sandy-phosphatic sequence of the Melovatka Formation with multiple phosphatic layers. The specimen of *Pseudomegachasma casei* comb. nov. (SSU 155/87: Fig. 3AL–AO) was collected from the phosphatic horizon referred to as 'layer 6' by Ivanov, 1996 (see also Pervushov et al., 1999; Seltzer and Ivanov, 2010) along with remains of other vertebrates, including elasmobranch, chimaeroid, and osteichthyan fishes. The chondrichthyan assemblage at this locality is similar to that at Locality 5 (Saratov-1). Other fossils from this locality include rare wood fragments as well as invertebrates (including Lingulidae).

Locality 4 (Bagaevka)—The Cenomanian Melovatka Formation and middle Turonian Bannovka Formation (Pervushov et al., 1999) exposed along a series of ravines located west of the village of Bagaevka and near the 'Budanova Gora' Hill in Saratov District of Saratov Province (= 'Bagaevka-1' in Pervushov et al., 1999 ; coordinates: 51°25'38.17"N, 45°48'1.63"E). Rock exposures at this locality consist of the upper sandy portion of the Melovatka Formation that is unconformably overlain by the lower portion of the Bannovka Formation that is represented by clayey and sandy chalk. The basal phosphatic horizon of the Bannovka Formation is rich in reworked fossils derived from the underlying Melovatka Formation, including taphonomically rounded remains of sharks, chimaeroids and marine tetrapods (Pervushov et al., 1999; Averianov, 2002). A tooth of *Pseudomegachasma casei* comb. nov. (SSU 155/91: Fig. 3AP–AT) was collected from this basal phosphatic layer.

Locality 5 (Saratov-1)—The uppermost part of the Cenomanian Melovatka Formation immediately overlain unconformably by the lower Santonian Možževelovyi Ovrage Formation

(Ivanov, 1995; Grigor'ev et al., 2009:fig. 2) exposed (visible at least until in the late 1990s) at an abandoned sand quarry in the lower part of the eastern slope of the 'Lysaya Gora' Hill that is approximately 900 m west from the main railroad station Saratov-1 in Saratov District in Saratov Province (= 'Zavokzal'noe ushchel'e' in Pervushov et al., 1999; 'Saratov-1a' in Popov and Lapkin, 2000; 'Lysaya Gora 3' in Grigor'ev et al., 2009; coordinates: 51°32'41.56"N, 45°59'9.32"E). Vertebrate fossils (e.g., elasmobranchs, chimaeroids and marine reptiles), including eight teeth of *Johnlongia allocotodon* (SSU 155/92–155/99; Fig. 2) and one tooth of *Pseudomegachasma casei* comb. nov. (SSU 155/86: Fig. 3AE–AK), from this locality come from a lens-like phosphorite bed of the Melovatka Formation ("c" in Arkhangel'sky, 1952; 'Bed 12' in Milanovsky, 1940; 'layer 5' in Grigor'ev et al., 2009) that is 1.5–1.7 m below the base of the Možževelovyi Ovrage Formation referred to as the 'sponge horizon.' Turonian–Coniacian deposits are absent at this locality.

Locality 6 (Saratov-2)—The upper portion of the Cenomanian Melovatka Formation (Pervushov et al., 1999) exposed at an abandoned sandy excavation pit on the southeastern slope of 'Lysaya Gora' Hill in Saratov District of Saratov Province (= 'Saratov Novouzenskaya' in Pervushov et al., 1999; coordinates: 51°32'6.04"N, 45°58'10.48"E). The age and lithology of the Melovatka Formation at this locality are similar to those of the Saratov-1 locality. One of the fossiliferous layers ('number 4' in Pervushov et al., 1999:127) has yielded various vertebrate remains (e.g., chondrichthyans and marine tetrapods), including a tooth of *Pseudomegachasma casei* comb. nov. (SSU 155/88: not figured).

Volga River Basin, Penza Province

Locality 7 (Kikino)—The upper quartz sand portion of the Cenomanian Melovatka Formation unconformably overlain by a phosphatic-rich glauconitic quartz sand unit and a sandstone of the lower Santonian Kirsanov Formation (EVP, personal observation, 2010 and 2013) exposed at a sand quarry near the village of Kikino in Kamenka District of Penza Province (coordinates: 53° 8'33.12"N, 43°46'53.69"E). *Pseudomegachasma casei* comb. nov. (SSU 155/90: not figured) is represented by a single tooth at this locality that was collected from the basal phosphatic horizon of the Kirsanov Formation. Because this horizon is rich in remains of Cenomanian chondrichthyans (Averianov, 1997), the tooth of *P. casei* comb. nov. is also considered to have reworked into the Santonian deposit from the underlying Cenomanian Melovatka Formation.

Locality 8 (Mochaleika)—The upper portion of the upper Cenomanian Melovatka Formation unconformably overlain by the lower Santonian Kirsanov Formation (Pervushov et al., 1999) exposed along a ravine and a temporary local quarry near the village of Mochaleika approximately 9 km to the west of Locality 7 (Kikino locality) in Kamenka District of Penza Province (coordinates: 53° 8'34.47"N, 43°38'54.43"E). The age and lithology of rocks at this locality are similar to those of the Kikino locality. Like the Kikino locality, *Pseudomegachasma casei* comb. nov. is represented by one tooth from this locality (SSU 155/91: not figured), and it was collected from the basal horizon of the lower Santonian Kirsanov Formation and is thought to have been derived from the underlying Cenomanian Melovatka Formation.

APPENDIX S2. Dental measurements (in millimeters) and other dental characteristics taken from specimens of *Johnlongia allocotodon* ('*J. alloc.*'), *Pseudomegachasma casei* comb. nov. ('*P. casei*'), and *P. comanchensis* comb. nov. ("*P. coman.*") (*, figured in this paper; measurement in parentheses indicates estimated value). **Abbreviations** (see also Fig. 5A): **CH**, crown height; **CW**, crown width; **DC**, distal lateral cusplet (+, present; -, absent; **, broken); **Loc.**, locality (see Fig. 1 for locality codes plus the following: 9, 'Tobe locality' in Shimada et al. (2006); 10, 'Table Mesa locality' in Gallardo et al., 2013; 11, Bouldin Flags Member, Eagle Ford Formation, Texas, USA); **MC**, mesial lateral cusplet (+, present; -, absent; **, broken); **RL**, root length; **RW**, root width). Age codes: EC, early Cenomanian; ES, early Santonian; ET, early Turonian; LC, late Cenomanian; M/LC, middle or late Cenomanian; MT, middle Turonian; age in brackets indicates material likely reworked from Cenomanian.

Taxon	Specimen	Loc.	Age	CH	CW	RL	RW	MC	DC
<i>J. alloc.</i>	SSU 155/92	5	LC	4.5	3.2	2.7	3.7	+	-
<i>J. alloc.</i>	SSU 155/93*	5	LC	6.0	2.7	5.0	3.5	+	+
<i>J. alloc.</i>	SSU 155/94*	5	LC	5.5	2.5	3.4	3.3	+	+++
<i>J. alloc.</i>	SSU 155/95*	5	LC	3.9	3.0	(3.8)	3.2	+	+
<i>J. alloc.</i>	SSU 155/96	5	LC	3.2	2.3	3.3	2.3	+	+++
<i>J. alloc.</i>	SSU 155/97	5	LC	(4.5)	(2.5)	3.0	3.1	?	?
<i>J. alloc.</i>	SSU 155/98	5	LC	6.1	4.0	4.7	(5.0)	+	+
<i>J. alloc.</i>	SSU 155/99	5	LC	5.9	(3.6)	(3.8)	(3.6)	+	?
<i>P. casei</i>	CNIGRM 10/12292*	1	EC	6.5	2.8	4.7	3.4	+	+
<i>P. casei</i>	ZIN PC15/30*	1	EC	5.4	2.2	3.5	2.9	+	-

<i>P. casei</i>	ZIN PC16/30*	1	EC	5.9	2.7	4.6	2.4	+	-
<i>P. casei</i>	ZIN PC17/30	1	EC	6.2	2.1	4.4	2.9	+	?
<i>P. casei</i>	ZIN PC18/30	1	EC	5.8	2.3	4.7	3.2	?	?
<i>P. casei</i>	ZIN PC19/30	1	EC	5.5	2.3	3.5	2.8	+	-
<i>P. casei</i>	ZIN PC20/30	1	EC	4.8	2.1	4.4	2.8	-	+++
<i>P. casei</i>	SSU 155/80*	2	EC	5.2	2.7	4.0	3.2	+	?
<i>P. casei</i>	SSU 155/81	2	EC	5.7	2.4	3.4	2.8	+++	?
<i>P. casei</i>	SSU 155/82	2	EC	6.0	2.4	4.3	2.6	+++	-
<i>P. casei</i>	SSU 155/83	2	EC	5.9	2.9	4.1	2.9	?	+
<i>P. casei</i>	SSU 155/84*	2	EC	6.0	2.5	5.4	3.1	+	+
<i>P. casei</i>	SSU 155/85	2	EC	5.8	2.5	3.9	3.0	+	+++
<i>P. casei</i>	SSU 155/86	5	LC	7.0	2.9	5.3	3.0	+	+
<i>P. casei</i>	SSU 155/87*	3	LC	6.2	3.7	4.1	3.7	+	-
<i>P. casei</i>	SSU 155/88	6	LC	5.3	3.3	2.9	3.4	+	+
<i>P. casei</i>	SSU 155/89*	4	[MT]	7.6	3.4	6.0	5.5	+++	?
<i>P. casei</i>	SSU 155/90	7	[ES]	5.4	2.9	3.2	3.7	+++	+++
<i>P. casei</i>	SSU 155/91	8	[ES]	4.4	2.0	3.8	2.0	?	?
<i>P. coman.</i>	FHSM VP-15095*	9	M/LC	5.4	2.9	4.2	3.8	-	-
<i>P. coman.</i>	FHSM VP-15176*	9	M/LC	(4.0)	1.6	(3.3)	2.5	-	-
<i>P. coman.</i>	FHSM VP-17628*	10	M/LC	(6.0)	2.5	5.9	3.8	-	-
<i>P. coman.</i>	FHSM VP-17629*	10	M/LC	2.0	0.7	(2.0)	1.3	-	-
<i>P. coman.</i>	NMMNH P-67453*	11	LC/ET	7.6	4.3	6.5	5.2	-	-