Appendix 3. Cretaceous stage type localities, criteria, and GSSPs in CRETCSDB1 Chronostratigraphic Database. Comparison of three time scales: CRETCSDB.3 (September 2013), Hardenbol et al. (1998, Chart 5), and Gradstein et al. (2004, Fig. 19.1) (boundary criteria from Gradstein et al. 2004) modified by Ogg et al. (2012, Fig. 27.6). Some datums not applicable (NA). Precision Stratigraphy Associates 2013.

	CRETCSDB4	1998	2012
K/T Boundary: K/T Iridium Anomaly	**65.50 Ma**	**65.0±0.1**	**66.0**
Base MAASTRICHTIAN	**72.60**	**71.3±0.5**	**72.1**
GSSP – Tercis les Bains, SW France (UPK.13);			
Criterion – mean of 10 horizons at 90 cm			
Below FO of *Pachydiscus neubergicus*	>72.58	>71.29	>70.6
Below FO *Hoploscaphites constrictus*	>72.22	NA	NA
FO *Gansserina gansseri*	72.99	72.84	72.8
FO *Baculites jenseni*	72.39	72.10	73.27
Mid Chron C32n.2n	73.49-71.85	72.5	~74.0
FO *Belemnella obtusa*	NA	70.66	70.5
LO *Quadrum trifidum*	68.21	70.97	72.1
Near base of Chron C31r	<70.46	70.97	~71.5
Base CAMPANIAN	**83.60**	**83.5±0.5**	**83.6**
No GSSP – Aubeterre-sur-Dronne, France; England; Texas			
FO *Placenticeras bidorsatum* (in UPK.11)	83.57	83.5	~83.5
LO *Marsupites testudinarius*	83.95	NA	~83.5
Near base Chron C33r	<83.39	<83.50	~83.6
Top C34n	83.39	83.50	83.6
FO *Scaphites leei III*	85.36	84.05	83.64
Base SANTONIAN	**85.90**	**85.8±0.5**	**86.3**
Saintes, France; candidate GSSP Olazagutia, Spain (UPK.3)			
FO *Cladoceramus undulatoplicatus*	85.91	85.79	~85.8
In Chron C34n: top at	>83.39	>83.50	NA
Base CONIACIAN	**88.50**	**89.00±0.5**	**89.8**
Richemonte Seminary, Cognac, France; Forwark Quarry, Poland, UPK.21)			
Candidate GSSP at Salzgitter/Salder quarry, Germany (Woodcs.1)			
FO *Cremnoceramus deformis erectus*	88.51	NA	~89.3
(= *C. rotundatus* of Tröger)	88.52	88.96	
FO *Forresteria petrocoriensis* [as sp.]	88.96	88.96	89.07
Base TURONIAN	**93.00**	**93.5±0.2**	**93.9**
GSSP – Rock Canyon Anticline, Pueblo, Colorado (MIDK.15b)			
Correlated with bentonites dated at 93.25±0.55 Ma and 93.55±0.4 Ma			
FO *Watinoceras devonense*	92.99	93.49	93.90
In OAE2	93.52-93.00	NA	93.9-94.3
Base CENOMANIAN	**97.13**	**98.9±0.6**	**100.5**
GSSP – Mont Risou, SE France (MIDK.24)			
FO *Rotalipora globotruncanoides*	97.13	99.15	99.7
FO *Rotalipora brotzeni*	97.13	NA	NA
Below FO *Mantelliceras mantelli*	>96.70	98.9	100.25
Corollithion kennedyi	96.58		100.5

	CRET	1998	2012
Base ALBIAN	**112.70**	**112.2±1.1**	**113.0**
Aube region, France (MIDK.57); Previous criteria:			
FO *Leymeriella tardefurcata*	112.68	112.2	111.27
FO *L. schrammeni anterior*	113.07	112.2	113.0
FO *Farnhamia farnhamensis*	113.11	111.65	NA
FO *Prediscosphaera columnata*	114.50	112.18	113.0
LO *Hypacanthoplites jacobi*	117.83	112.2	115.64
Base Niveau Paquier bed	112.68	NA	NA
FO *Douvielliceras mammillatum*	111.58	110.06	110.87
Base APTIAN	**124.55**	**121.0±1.4**	**126.3**
Candidate GSSP Gorgo a Cerbara, Italy; Apt, France (MIDK.43, MIDK.69)			
FO *Deshayesites oglanlensis/tuarkyricus*	124.55/124.44	120.98	126.30
FO *Prodeshayesites obsoletus*	122.84	120.49	NA
Base Chron CM0r	125.00	120.98	126.3
Intra-Aptian Key events:			
Base OAE1a	123.68-122.32	NA	NA
Base Selli level	123.06	NA	NA
Base BARREMIAN	**130.20**	**127.0±1.6**	**130.8**
Candidate GSSP Rio Argos, Spain; Gorgo a Cebara, Italy (MIDK.43)			
FO *Taveraidiscus "Spitidiscus" hugii*	128.53	127.03	130.77
FO *Avramidiscus [Spitidiscus] vandeckii*	130.23	NA	128.3
Upper part Magnetochron CM5r, top at	130.99	NA	NA
Base HAUTERIVIAN	**134.44**	**132.0±1.9**	**133.9**
Candidate GSSP La Charce, SE France (LOK.13, LOK.13b)			
FO *Acanthodiscus radiatus* (Tethyan)	136.44	132.03	133.88
FO *Endomoceras amblygonium* (Boreal)	NA	132.53	136.4±2.0
~Base CM11n	NA	NA	136.4±2.0
Base VALANGINIAN	**140.25**	**137.0±2.2**	**139.4**
Candidate GSSP Barranco de Cañada Luenga, SE Spain (LOK.22 & LOK.23)			
Reference sections Angles & Barret-le-Base, SE France (LOK.11, LOK.12)			
FO *Thurmaniceras pertransiens*	139.30	136.49	139.39
FO *Thurmaniceras otopeta*	140.25	136.99	>140.2±3.0
FO *Calpionellites darderi* = Base Calpionellid Zone E	141.66	136.59	140.2±3.0
Slightly below FO *Calcicalathina oblongata*	141.12	136.66	>136±3.0
Within CM14r, top at	>140.68	NA	NA
Base BERRIASIAN	**144.00**	**144.2±2.6**	**145.0**
Reference sections Puerto Escano, Cordoba, Spain			
Rio Argos, Caravaca, Spain (LOK.3)			
FO *Berriasiella jacobi*	144.07	144.2±2.6	145.95
~Base Calpionellid Zone B	NA	143.97	145.5±4.0
Within M19n or base M18r at	>143.59	NA	145.0

Selected new radiometric ages:
Gonzalez-Leon et al., 2008, Cretaceous Research, 29:249-266: Upper Aptian ~118 Ma;

Zyabrev et al., 2008, Stratigraphy, 5:99-112. Zircon SHRIMP age of 136±3.0 Ma on Volcanic rocks overlying Valanginian fossils Tibet (Lethaia DOI 10.1111/j.1502-3931.2010.00238.x _ 2010): Latest Barremian-earliest Aptian ~124 Ma;

X. Quidelleur, J.L. Paquette, N. Fiet, R. Takashima, M. Tiepolo, D. Desmares, H. Nishi, D. Grosheny, 2011. New U–Pb (ID-TIMS and LA-ICPMS) and 40Ar/39Ar geochronological constraints of the Cretaceous geologic time scale calibration from Hokkaido (Japan). Chemical Geology, 286:72-83.

Base Campanian = 84.9±0.2 Ma
Base Turonian = 94.3±0.3 to 94.2±1.0 Ma
Base Cenomanian = 99.7±0.3 to 99.7±1.3 Ma
Base Albian = 112.6±1.1 Ma