

The generality of preservation of organic remains in body fossils by FTIR spectra

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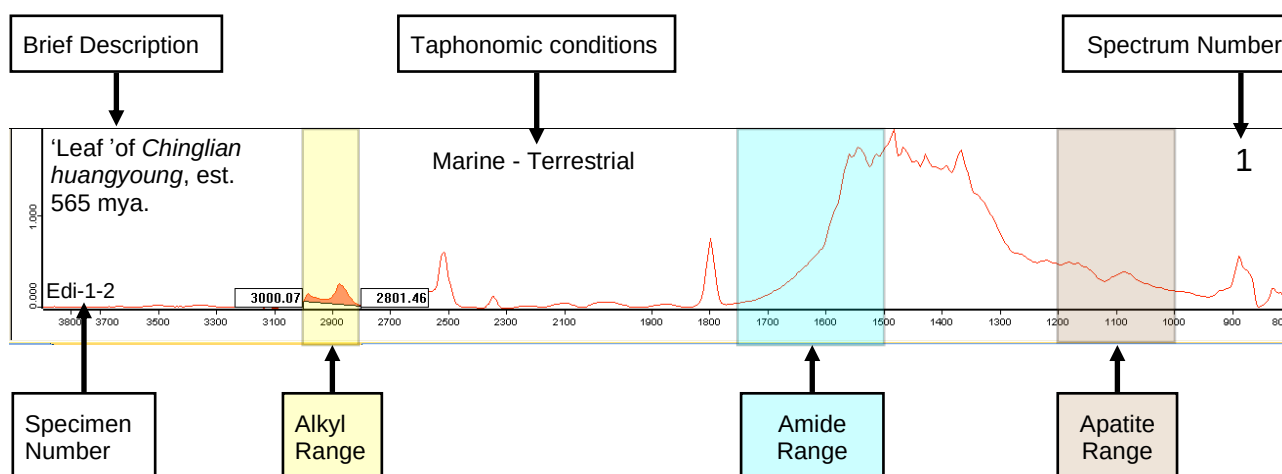
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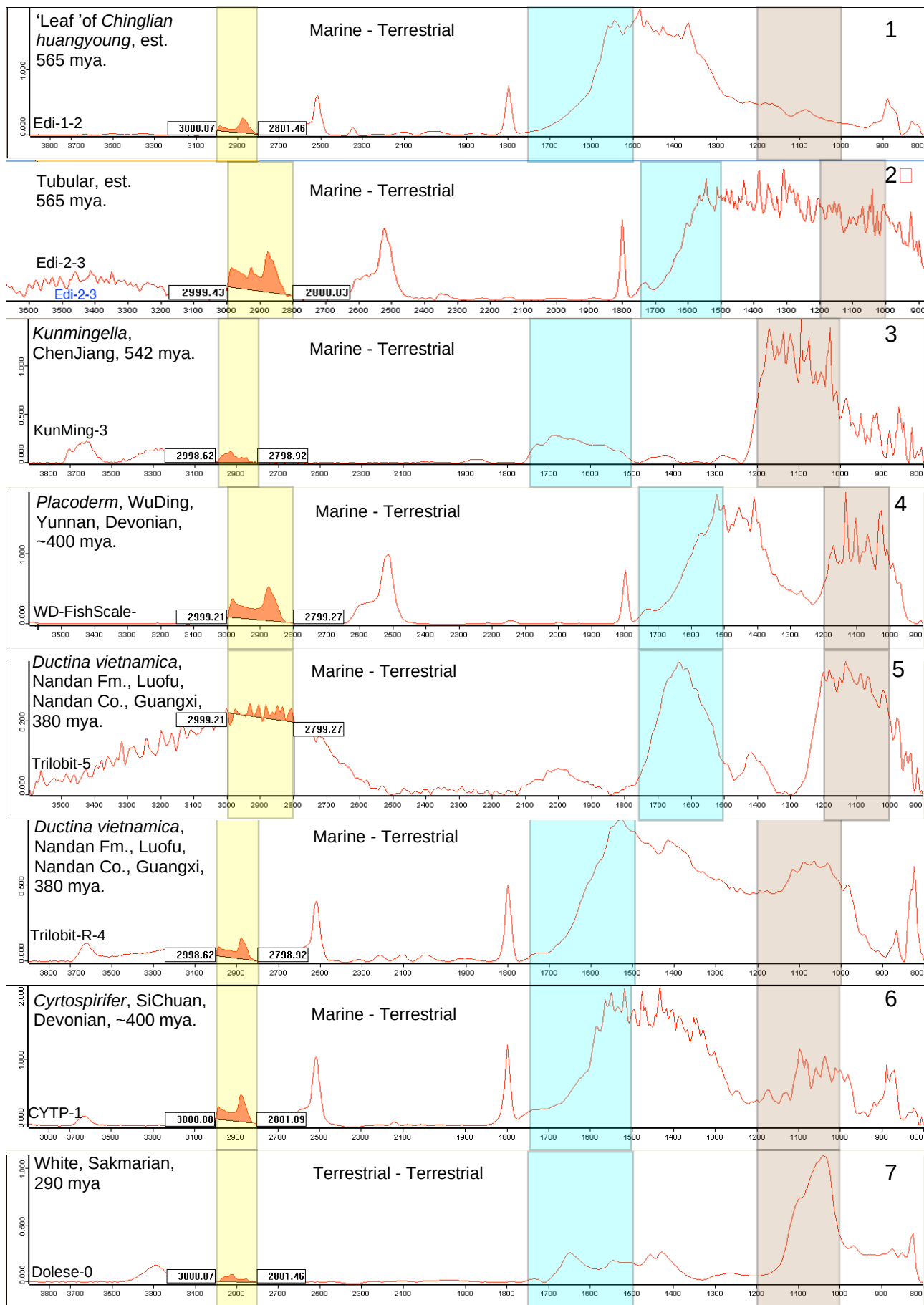
Supplemental Materials

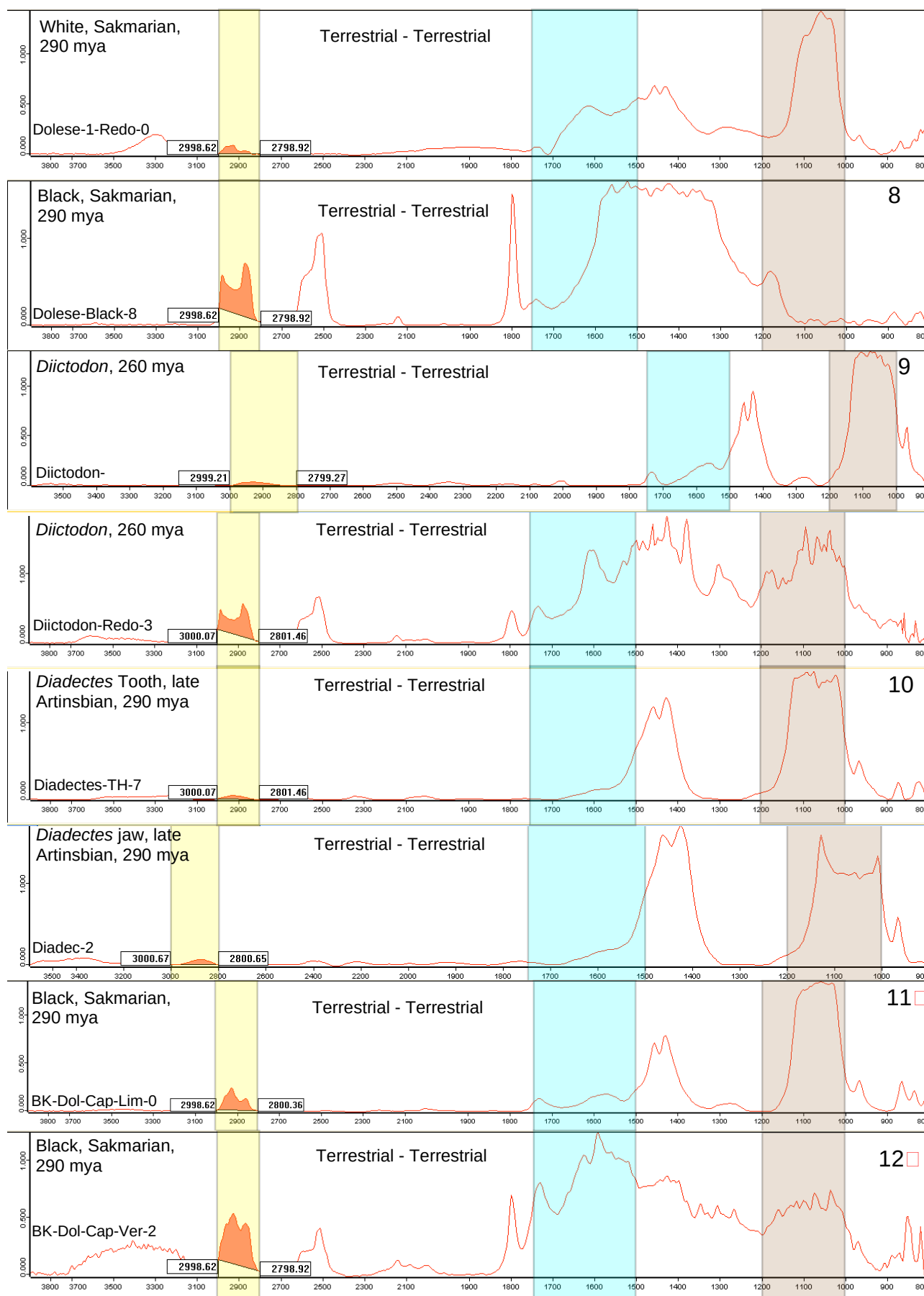
The supplemental materials include 87 spectra figures and 8 tables (S1-S8) listing the studied materials. The instruments used in this study include FTIR spectrometer IFS 66 v/S (Bruker, Ettlingen, Germany), IR microscope (Hyperion 3000, Bruker, Ettlingen, Germany), Global IR source, and software OPUS (v. 6.5, Bruker Optics, Ettlingen, Germany), with 15x IR objective, 170*170 μm^2 at 64*64 pixels, 1 px = 2.65625 μm .

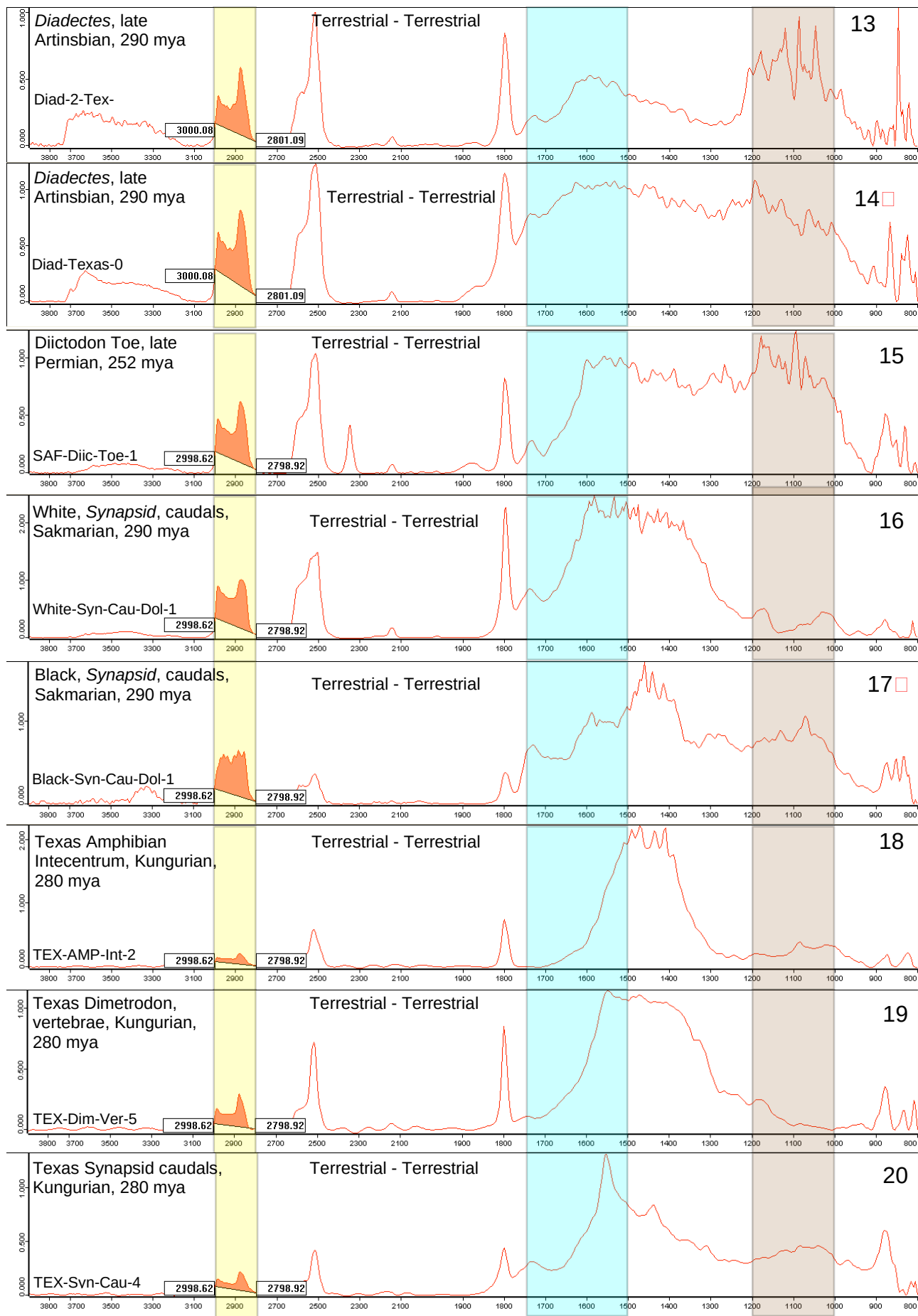
The Synchrotron Radiation FTIR was by using FTIR spectrometer (Nicolet 6700, Thermo-Nicolet Instruments, Madison, WI, USA), IR confocal microscope (Continuum, Spectra Tech Inc., Oak Ridge, TN, USA), 32x IR objective, with software OMNIC (OMNIC 9.2, Thermo Fisher Scientific, Waltham, MA, USA).

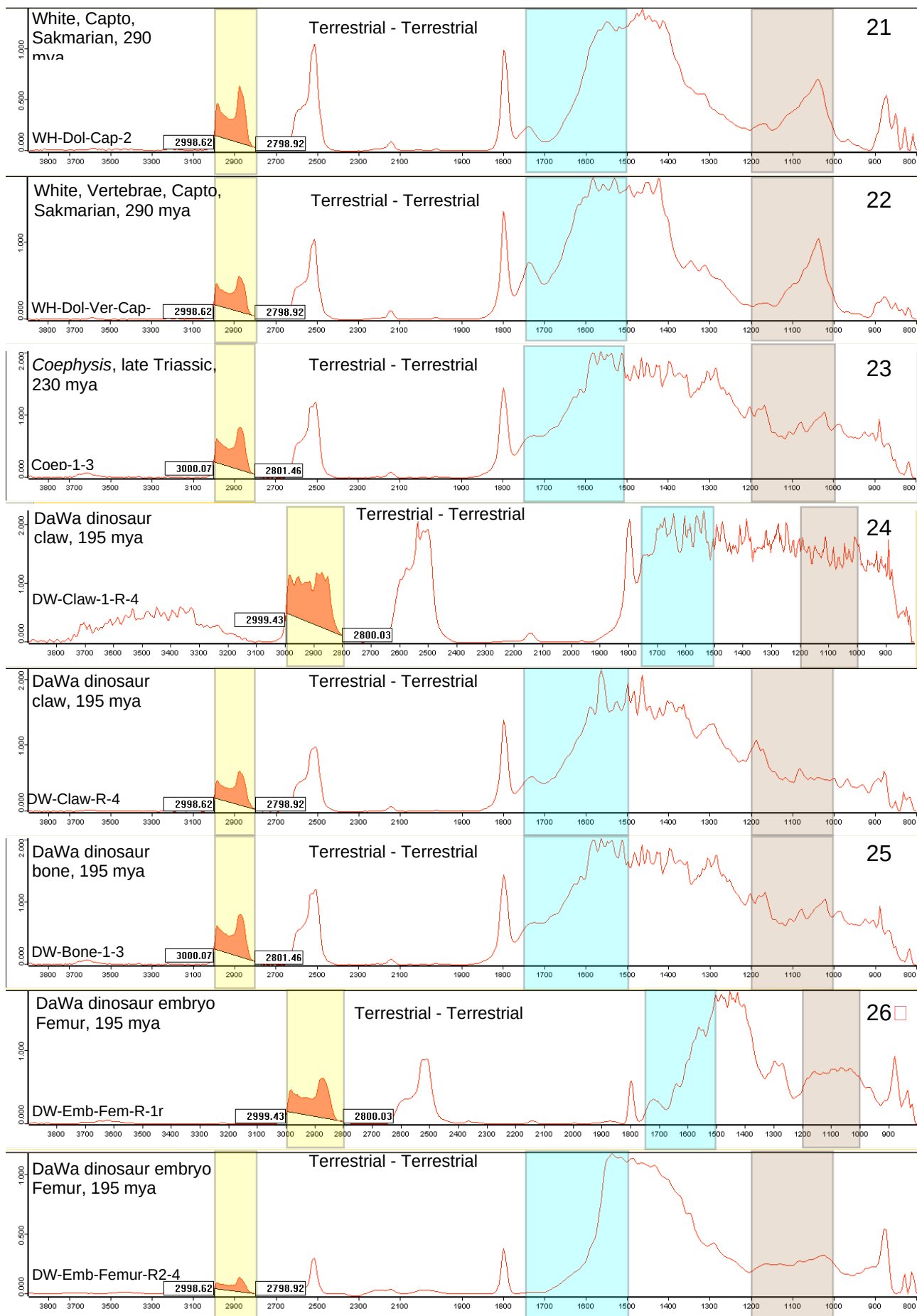
A total of 107 selected spectra figures (total 525 scans) from 87 specimens are shown below, 87 of which are numbered, integrated with 2800-3000 cm^{-1} (alkyl) for spectral comparison.

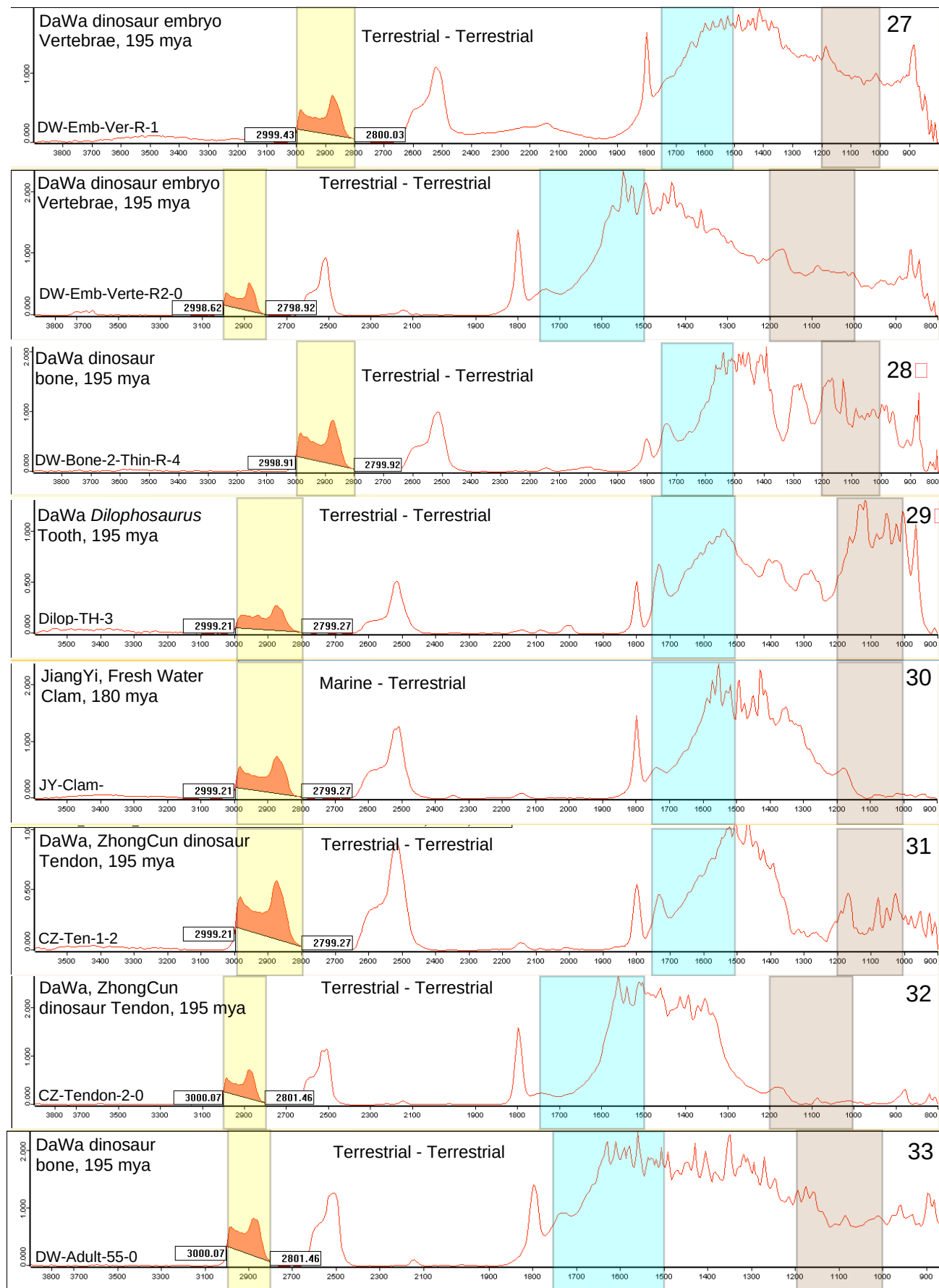


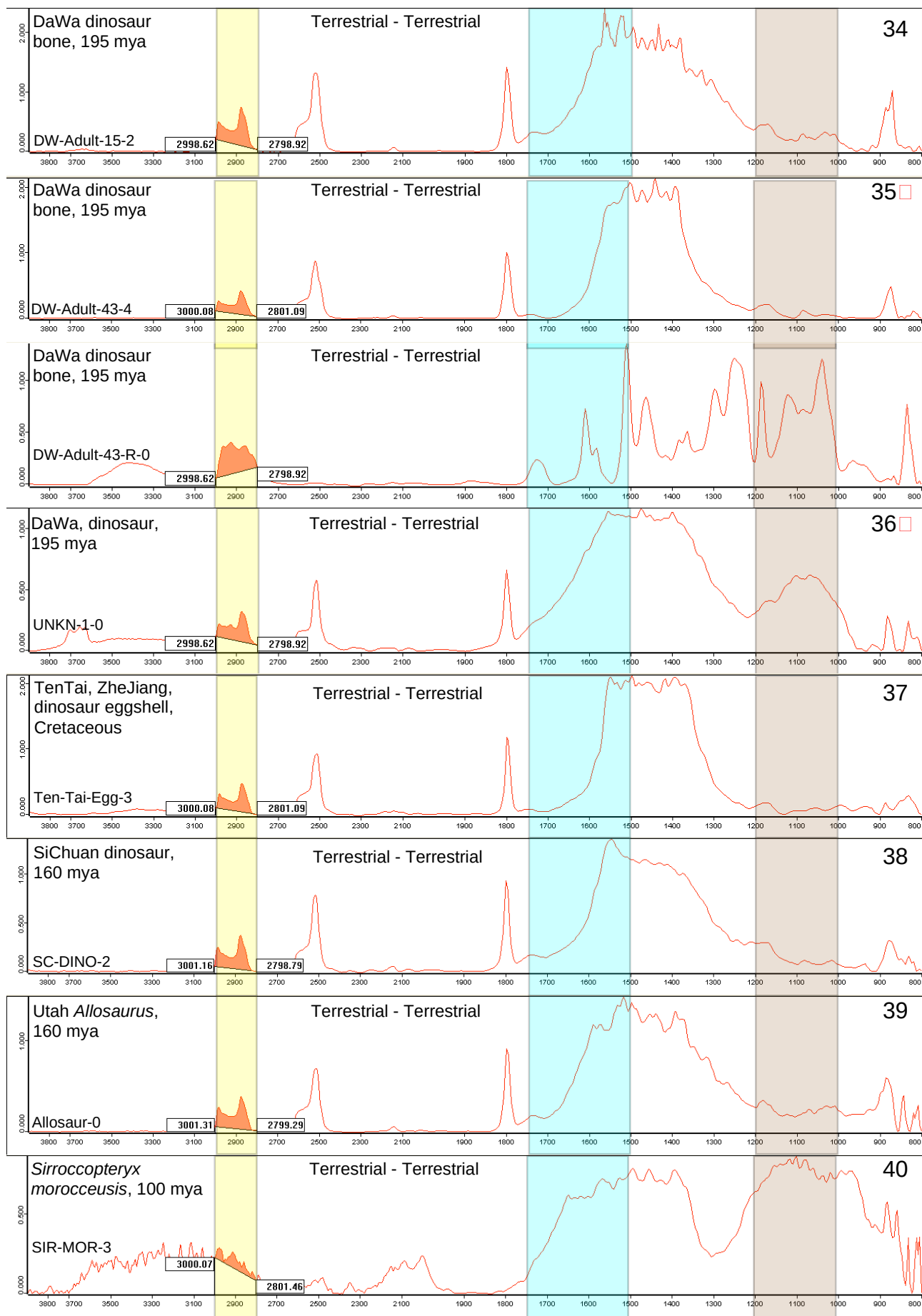


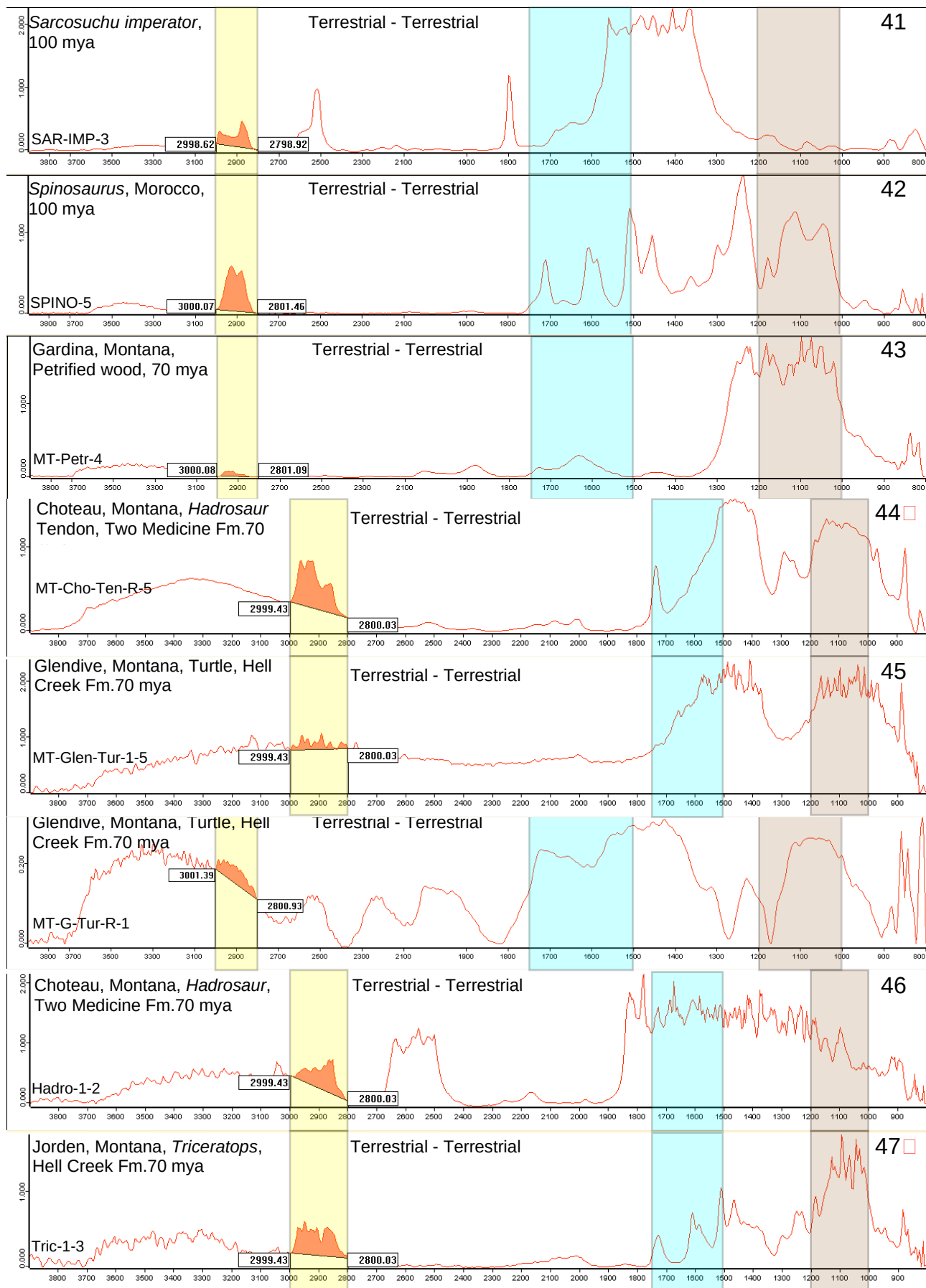


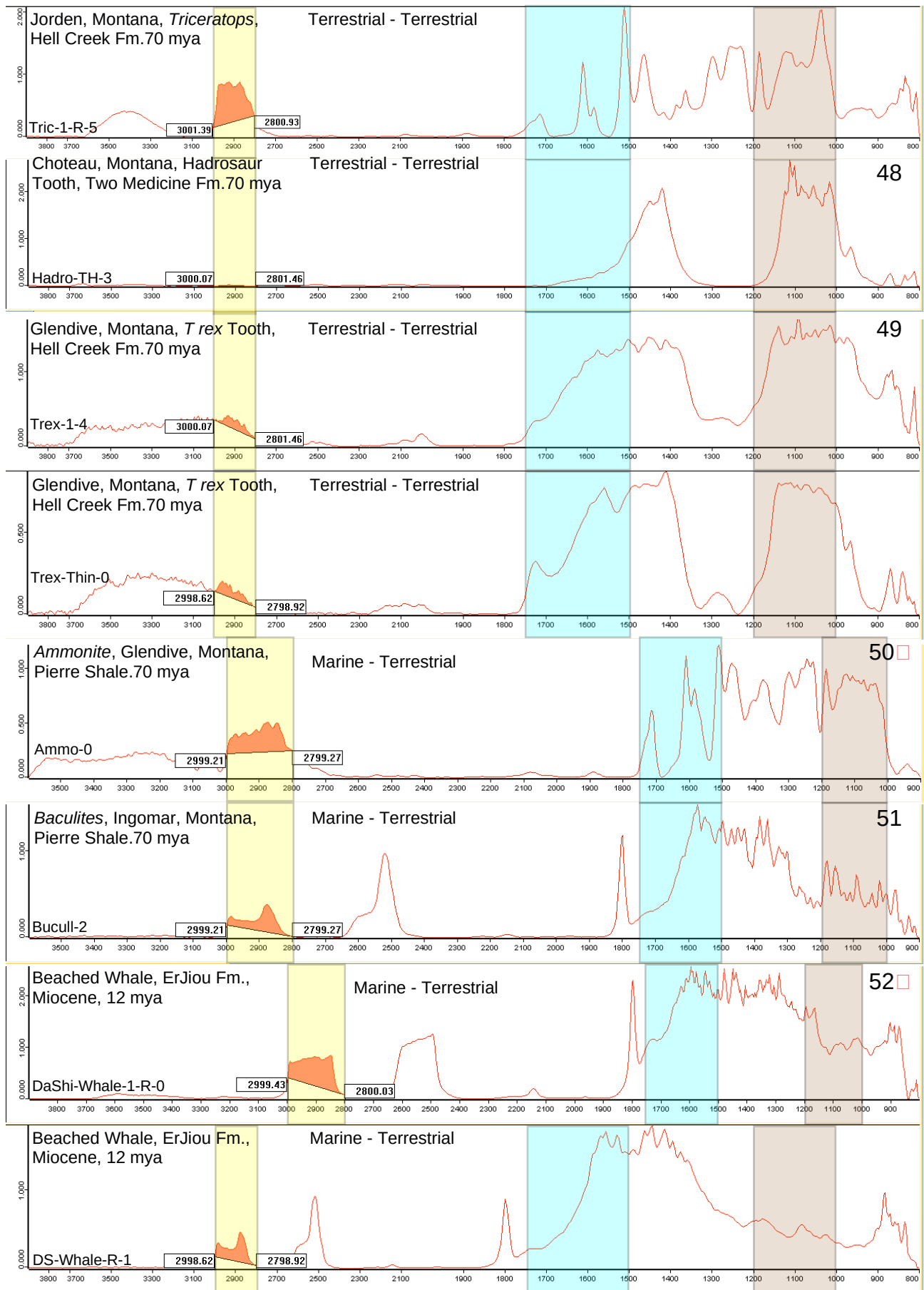


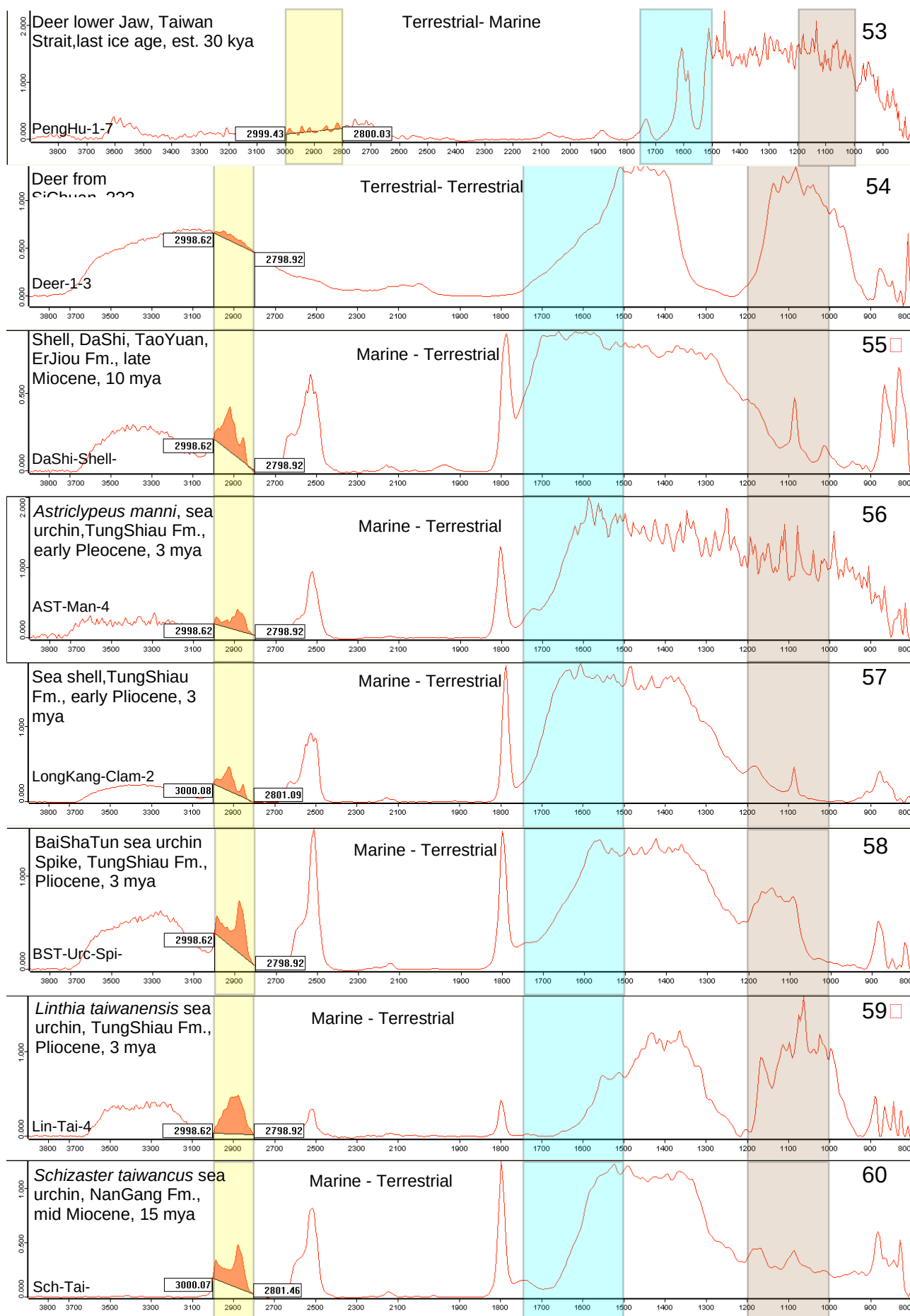


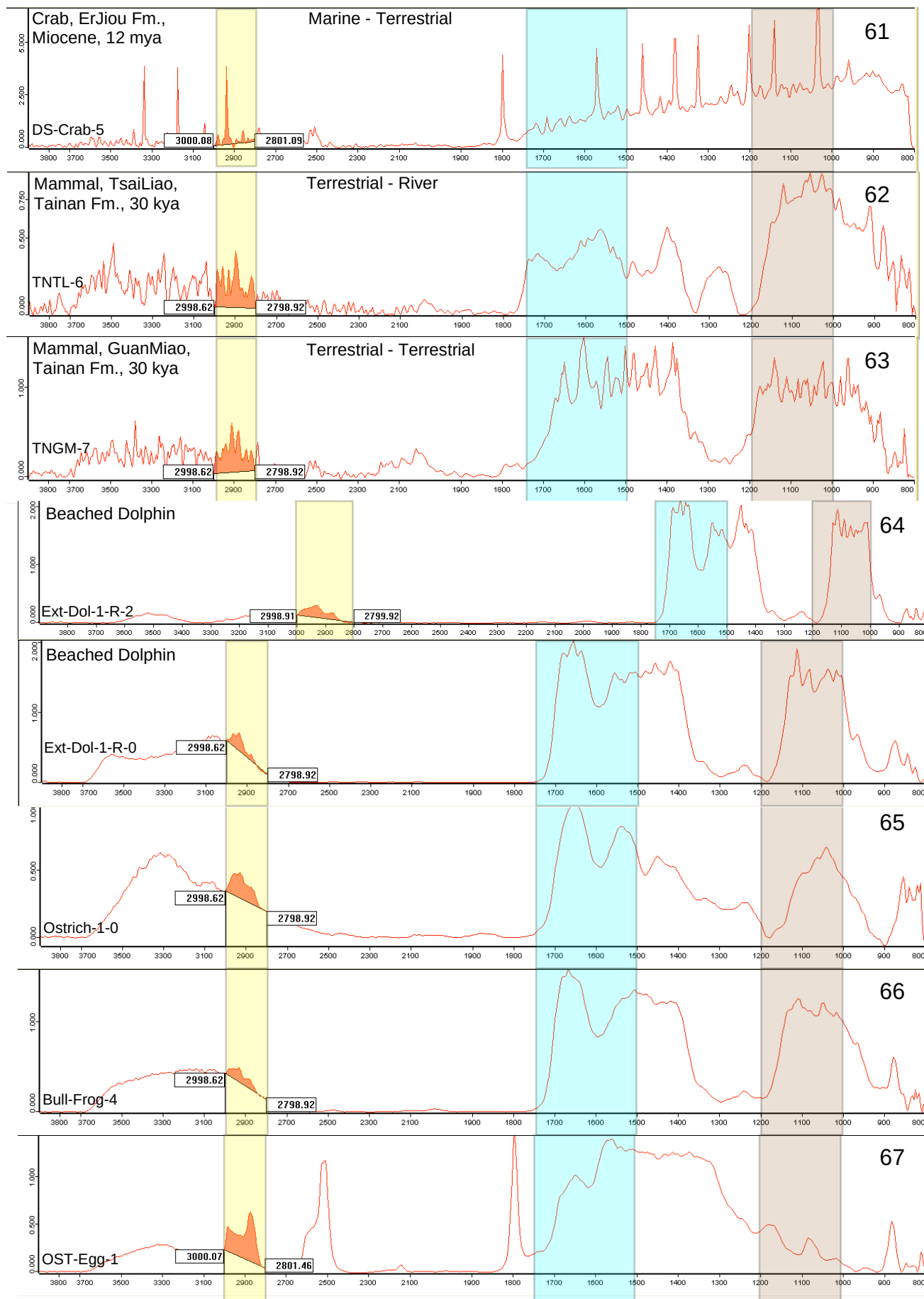


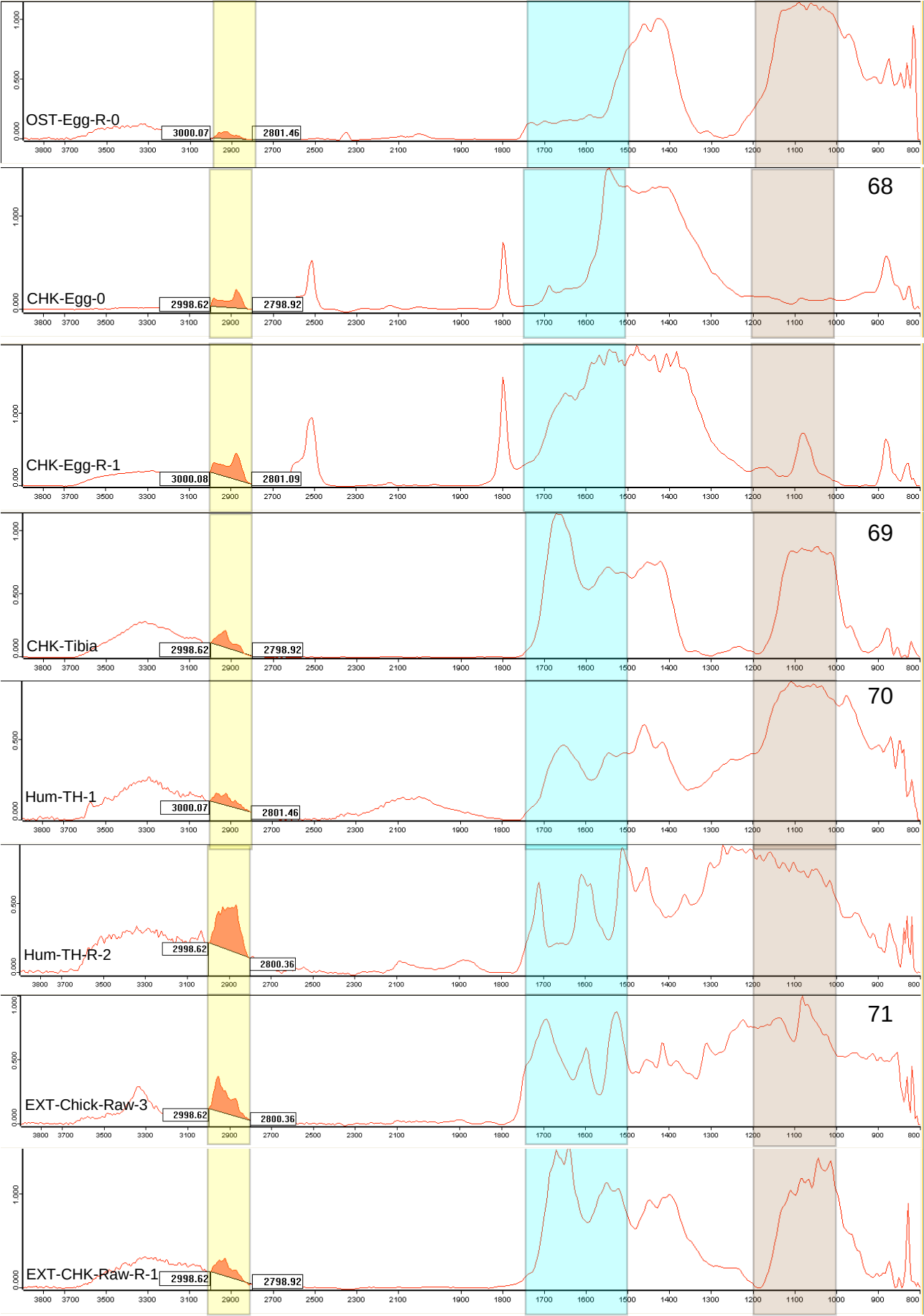


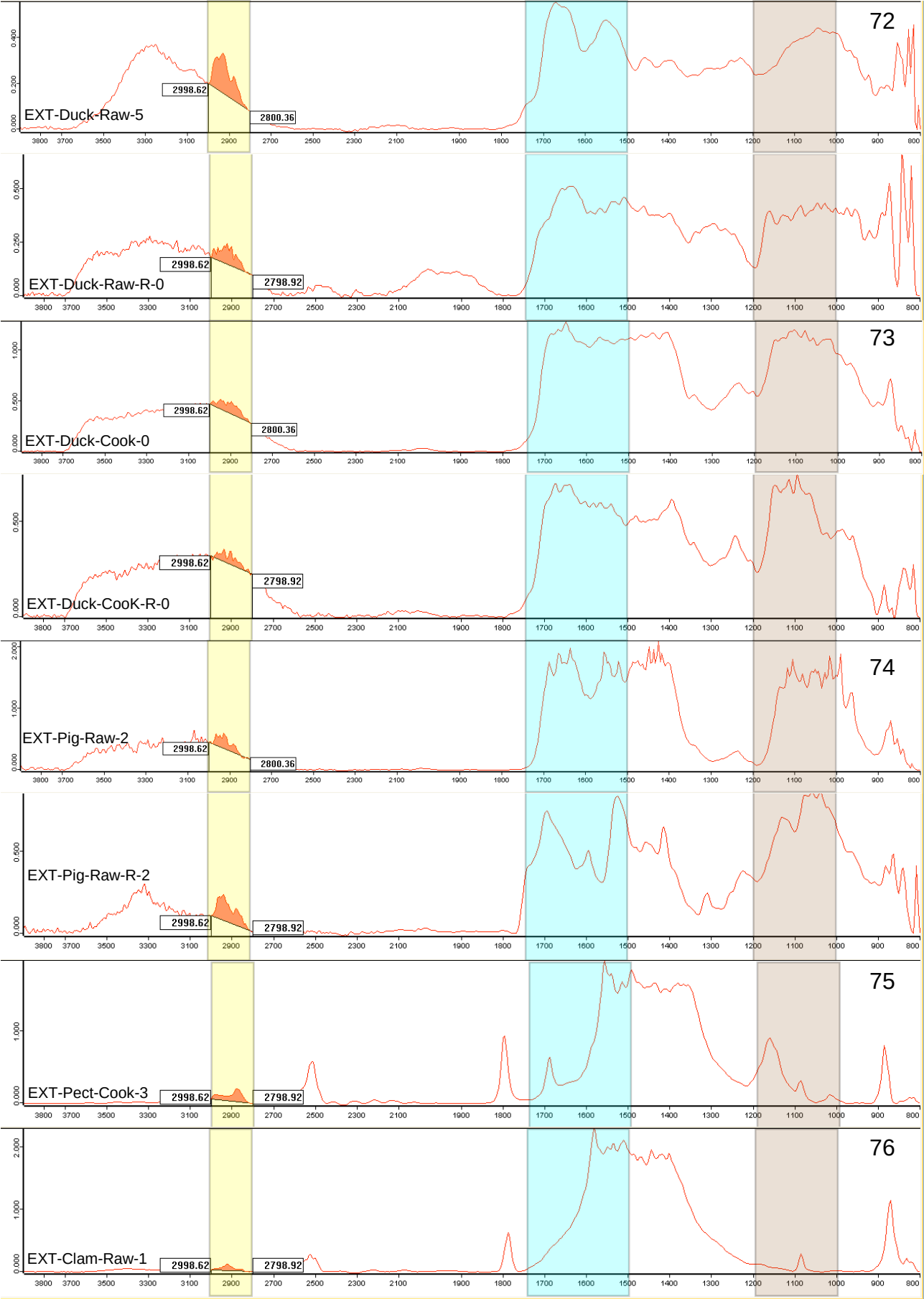


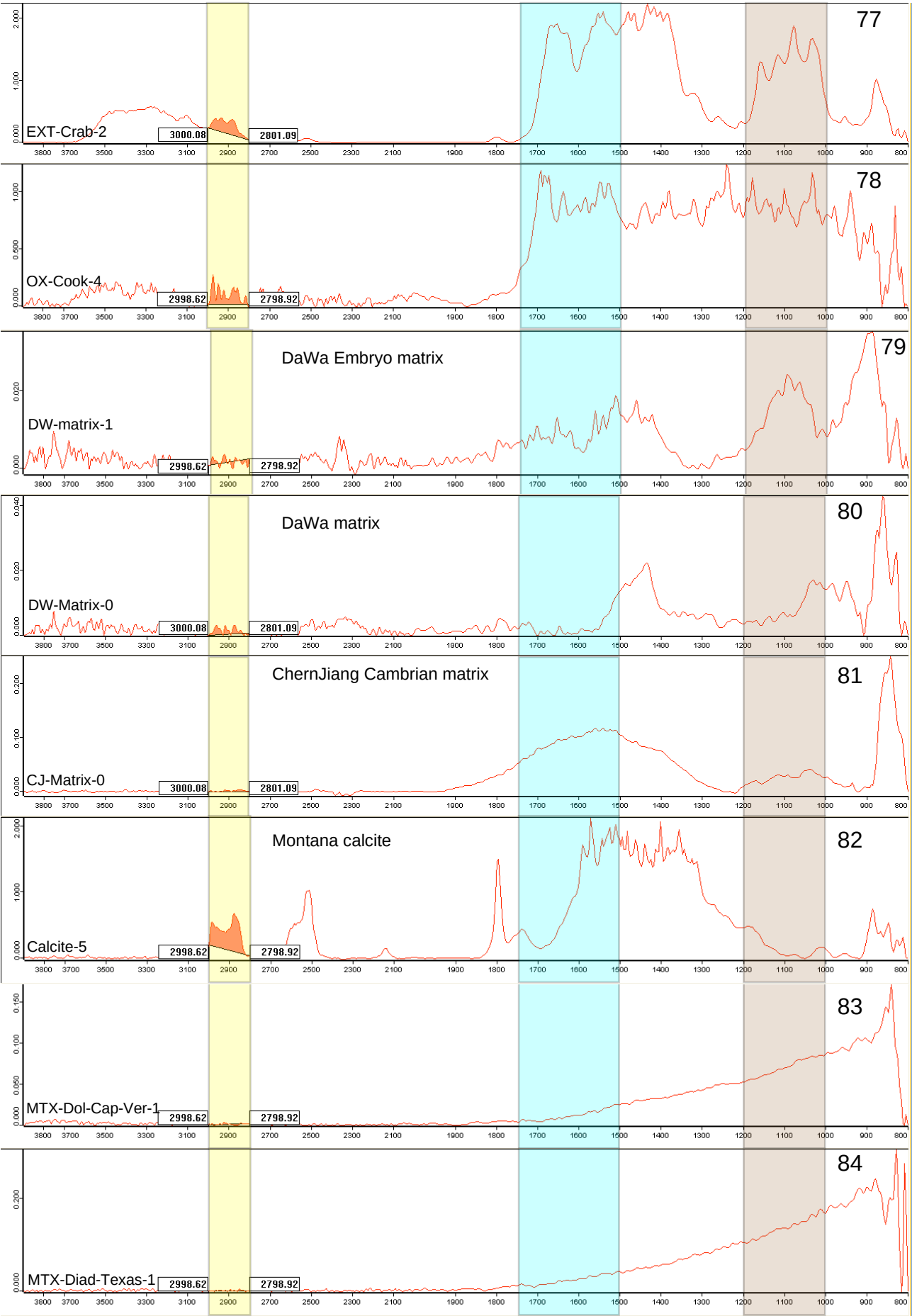


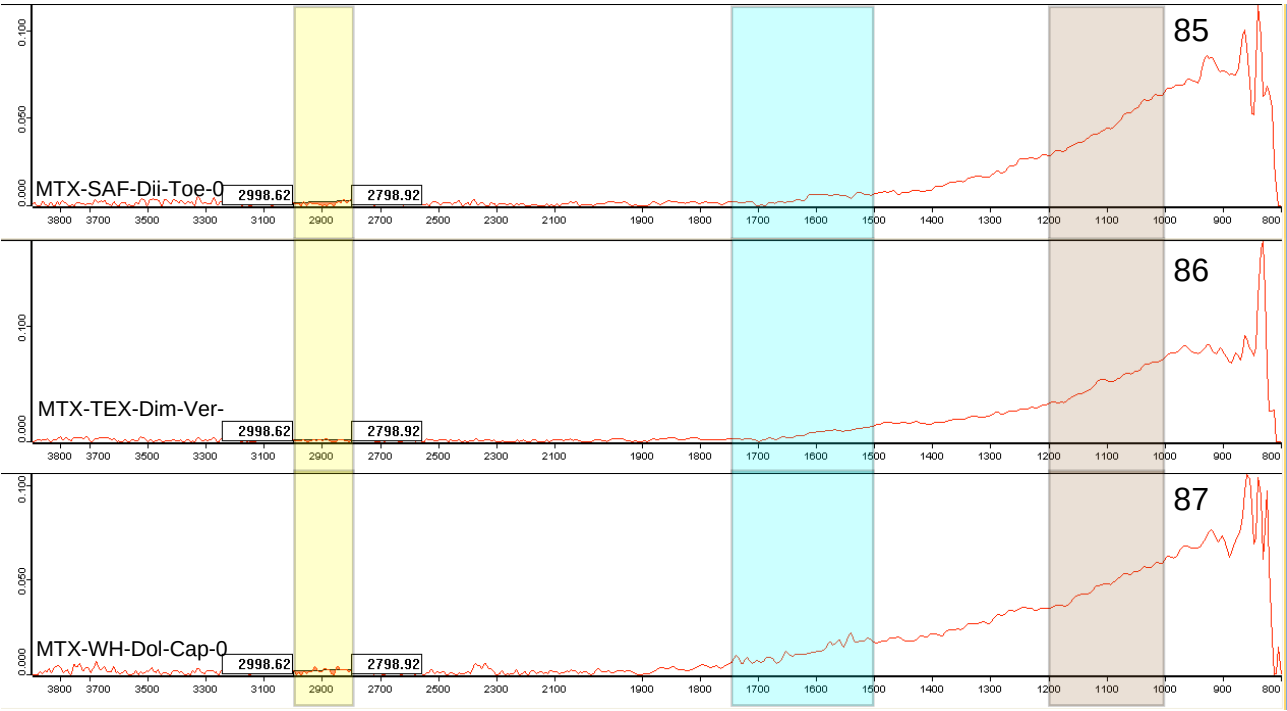












Supplemental Tables

Supplemental Table S1

By Geology Age

	# of Fossils	Rescans	Matrix
Precambrian	2	0	
Paleozoic	22	5	6
Mesozoic	34	7	2
Cenozoic	13	3	
Extant	16	11	
Misc.	9	0	
Total	96	26	

Supplemental Table S2

By Type

	# of Fossils	
Invertebrae	20	
Vertebrae	53	
Tooth	14	

Supplemental Table S3

Selected entries in red.

Ediacaran body fossils, ~565 mya

	Number	Name	Part	Cut	Scan	Note	
1	Edi-1	<i>Chinglian huangyoung</i>	Fan	Cross/vert.		Edi-1-0 Edi-1-1 Edi-1-2 Edi-1-3 Edi-1-4 Edi-1-5	565 mya
2 ☐	Edi-2	Tubular	Tube	Cross		Edi-2.0 Edi-2.1 Edi-2.2 Edi-2.3	565 mya

Supplemental Table S4

Selected entries in red.

Paleozoic Era

	Number	Name	Part	Cut	Photo	Note	
3	KunMing	Kunmingella				KunMing-0 KunMing-1 KunMing-2 KunMing-3 KunMing-4	540 my
4	WD-Fish	placoderm	Scale			WD-FishScale-0 WD-FishScale-1 WD-FishScale-2 WD-FishScale-3 WD-FishScale-4 WD-FishScale-5	~400 mya
5	Trilobite-1				Trilobite-R-0 Trilobite-R-1 Trilobite-R-2 Trilobite-R-3 Trilobite-R-4	Trilobite-0 Trilobite-1 Trilobite-2 Trilobite-3 Trilobite-4 Trilobite-5 Trilobite-6 Trilobite-7 Trilobite-8 Trilobite-9	
6	Cyrtosp	Cyrtospirifer				CYTP-0 CYTP-1 CYTP-2 CYTP-3 CYTP-4	
7	Dolese-1	Reptile	Lower Jaw Teeth		Dolese-1-Redo-0 Dolese-1-Redo-1 Dolese-1-Redo-2	Dolese-0 Dolese-1 Dolese-2 Dolese-3 Dolese-4	290 mya #4
8	Dolese-Black	Reptile	Lower Jaw Teeth			Dolese-Black-0 Dolese-Black-1 Dolese-Black-2 Dolese-Black-3 Dolese-Black-4 Dolese-Black-5 Dolese-Black-6 Dolese-Black-7 Dolese-Black-8	290 mya
9	Diictodon	therapsid	Jaw & Teeth		Diictodon-0 Diictodon-1 Diictodon-2 Diictodon-3 Diictodon-4	Diictodon-Redo-0 Diictodon -Redo-1 Diictodon -Redo-2 Diictodon -Redo-3 Diictodon -Redo-4	260 mya #11
10	Diadectes		Tooth Dentin Tubules		Diadec-0 Diadec-1 Diadec-2 Diadec-3 Diadec- (-7, -8 DEJ)	Diadectes-TH-3 Diadectes -TH-4 Diadectes -TH-5 Diadectes -TH-6 Diadectes -TH-7 Diadectes -TH-8	#1 300 mya
11 □	BK-Dol-Cap-Lim	Black Dolese Capto Limbs				BK-Dol-Cap-Lim-0 BK-Dol-Cap-Lim-1 BK-Dol-Cap-Lim-2 BK-Dol-Cap-Lim-3 BK-Dol-Cap-Lim-	Sakmarian, 290.1-295.0 mya

12 □	BK-Dol-Cap-Ver	Black Dolese Capto Verts				BK-Dol-Cap-Ver-0 BK-Dol-Cap-Ver-1 BK-Dol-Cap-Ver-2 BK-Dol-Cap-Ver-3 BK-Dol-Cap-Ver-4 BK-Dol-Cap-Ver-5	Sakmarian, 290.1-295.0 mya
13	Diad-2-Tex	Diadectid 2 Texas				Diad-2-Tex-0 Diad-2-Tex-1 Diad-2-Tex-2 Diad-2-Tex-3 Diad-2-Tex-4	late Artinsbian, 283.5-290.1 mya
14 □	Diad-Texas	Diadectid Texas				Diad-Texas-0 Diad-Texas-1 Diad-Texas-2 Diad-Texas-3 Diad-Texas-4	late Artinsbian, 283.5-290.1 mya
15	SAF-Diic-Toe	SAF Diictodon Toes				SAF-Diic-Toe-0 SAF-Diic-Toe-1 SAF-Diic-Toe-2 SAF-Diic-Toe-3 SAF-Diic-Toe-4	late Permian, 252.2-259.8 mya
16	White-Syn-Cau-Dol	Synapsid Caudals Dolese White				White-Syn-Cau-Dol-0 White-Syn-Cau-Dol-1 White-Syn-Cau-Dol-2 White-Syn-Cau-Dol-3 White-Syn-Cau-Dol-4	Sakmarian, 290.1-295.0 mya
17 □	Black-Syn-Cau-Dol	Synapsid Caudals Dolese Black				Black-Syn-Cau-Dol-0 Black-Syn-Cau-Dol-1 Black-Syn-Cau-Dol-2 Black-Syn-Cau-Dol-3 Black-Syn-Cau-Dol-4	Sakmarian, 290.1-295.0 mya
18	TEX-AMP-Int	Texas amphibian intecentrum				TEX-AMP-Int-0 TEX-AMP-Int-1 TEX-AMP-Int-2 TEX-AMP-Int-3 TEX-AMP-Int-4	Kungurian, 272.3-283.5 mya
19	TEX-Dim-Ver	Texas Dimetrodon vert				TEX-Dim-Ver-0 TEX-Dim-Ver-1 TEX-Dim-Ver-2 TEX-Dim-Ver-3 TEX-Dim-Ver-4 TEX-Dim-Ver-5	Kungurian, 272.3-283.5 mya
20	TEX-Syn-Cau	Texas synapsid caudals				TEX-Syn-Cau-0 TEX-Syn-Cau-1 TEX-Syn-Cau-2 TEX-Syn-Cau-3 TEX-Syn-Cau-4	Kungurian, 272.3-283.5 mya
21	WH-Dol-Cap	White Dolese Capto				WH-Dol-Cap-0 WH-Dol-Cap-1 WH-Dol-Cap-2 WH-Dol-Cap-3 WH-Dol-Cap-4	Sakmarian, 290.1-295.0 mya
22	WH-Dol-Ver-Cap	White Dolese vert Capto				WH-Dol-Ver-Cap-0 WH-Dol-Ver-Cap-1 WH-Dol-Ver-Cap-2 WH-Dol-Ver-Cap-3 WH-Dol-Ver-Cap-4	Sakmarian, 290.1-295.0 mya

Supplemental Table S5
Selected entries in red.

Mesozoic

	Number	Name	Part	Cut	Photo	Note	
23	Coep-1	Coephyis	Jaw&Tooth			Coep-1-1 Coep-1.1 Coep-1.2 Coep-1.3 Coep-1.4 Coep-1.5	Late Triassic
24	DW-claw-1	<i>Lufengosaurus huenei</i>	Fan	Cross	DW-CLAW-R-0 DW-CLAW-R-1 DW-CLAW-R-2 DW-CLAW-R-3 DW-CLAW-R-4	DW-Claw-R-2-0 DW-Claw-1-R-1 DW-Claw-1-R-2 DW-Claw-1-R-3 DW-Claw-R-2.4	
25	DW-Bone-1	<i>Lufengosaurus huenei</i>	Bone	Cross		DW-Bone-1-0 DW-Bone-1-1 DW-Bone-1-2 DW-Bone-1-3 DW-Bone-1-4	adult
26 □	Dw-Emb-Fem	<i>Lufengosaurus huenei</i>	Femur		DW-Emb-Femur-R2-0 DW-Emb-Femur-R2-1 DW-Emb-Femur-R2-2 DW-Emb-Femur-R2-3 DW-Emb-Femur-R2-4	DW-Emb-Fem-R-0 DW-Emb-Fem-R-1 DW-Emb-Fem-R-2 DW-Emb-Fem-R-3 DW-Emb-Fem-R-4	Embryo
27	Dw-Emb-Vert	<i>Lufengosaurus huenei</i>	Centrum		DW-Emb-Verte-R2-0 DW-Emb-Verte-R2-1 DW-Emb-Verte-R2-2 DW-Emb-Verte-R2-3 DW-Emb-Verte-R2-4	Emb-Ver-R-0 Emb-Ver-R-1 Emb-Ver-R-2 Emb-Ver-R-3 Emb-Ver-R-4	Embryo
28 □	DW-Bone-2	<i>Lufengosaurus huenei</i>	Chevron			DW-Bone-2-Thin-R-0 DW-Bone-2-Thin-R-1 DW-Bone-2-Thin-R-2 DW-Bone-2-Thin-R-3 DW-Bone-2-Thin-R-4	
29 □	Dilop-TH	Dilophosaurus Tooth	Tooth			Dilop-TH-0 Dilop-TH-1 Dilop-TH-2 Dilop-TH-3 Dilop-TH-4	DEJ
30	JY-Clam	JiangYi Clam				JY-Clam-0 JY-Clam-1 JY-Clam-2 JY-Clam-3 JY-Clam-4	
31	CZ Tendon-1	ZongCun Ornithopoda	Tendon			CZ-Ten-1-0 CZ-Ten-1-1 CZ-Ten-1-2 CZ-Ten-1-3 CZ-Ten-1-4	
32	CZ Tendon-2	ZongCun Ornithopoda	Tendon			CZ-Ten-2-0 CZ-Ten-2-1 CZ-Ten-2-2 CZ-Ten-2-3 CZ-Ten-2-4	
33	DW-Adu-55	Adult#55				DW-Adu-55-0 DW-Adu-55-1 DW-Adu-55-2 DW-Adu-55-3 DW-Adu-55-4	

	Number	Name	Part	Cut	Photo	Note	
34	DW-Adult-15	DW-Adult#15				DW-Adult-15-0 DW-Adult-15-1 DW-Adult-15-2 DW-Adult-15-3 DW-Adult-15-4 DW-Adult-15-6 DW-Adult-15-7	
35 □	DW-Adult-43	DW-Adult43			DW-Adult-43-R-0 DW-Adult-43-R-1 DW-Adult-43-R-2 DW-Adult-43-R-3 DW-Adult-43-R-4	DW-Adult-43-1 DW-Adult-43-2 DW-Adult-43-3 DW-Adult-43-4 DW-Adult-43-5 DW-Adult-43-6 DW-Adult-43-7	
36 □	UNKN					UNKN-1-0 UNKN-1-1 UNKN-1-2 UNKN-1-3 UNKN-1-4	
37	TenTai-Egg	Eggshell				TenTai-Egg-0 TenTai-Egg-1 TenTai-Egg-2 TenTai-Egg-3 TenTai-Egg-4 TenTai-Egg-5 TenTai-Egg-6	
38	SC-Dino	SiChuang Dino Rib				SC-DINO-0 SC-DINO-1 SC-DINO-2 SC-DINO-3 SC-DINO-4	Mid Jurassic
39	Allosaurus	Allosaur, UT, USA				Allosaur-0 Allosaur-1 Allosaur-2 Allosaur-3 Allosaur-4 Allosaur-5 Allosaur-6 Allosaur-7	
40	SIR-MOR	Sirrocopteryx morocceusis				SIR-MOR-0 SIR-MOR-1 SIR-MOR-2 SIR-MOR-3 SIR-MOR-4	
41	SAR-IMP	Sarcosuchus imperator, Morocco				SAR-IMP-0 SAR-IMP-1 SAR-IMP-2 SAR-IMP-3 SAR-IMP-4	
42	SPINO	Spinosaurus				SPINO-0 DEJ SPINO-1 SPINO-2 SPINO-3 SPINO-4 SPINO-5 SPINO-6	

	Number	Name	Part	Cut	Photo	Note	
43	MT-Petr	Petrified Wood, MT, USA				MT-Petr-0 MT-Petr-1 MT-Petr-2 MT-Petr-3 MT-Petr-4	
44 □	Mt-Cho-Ten-1	Hadrosaur, MT, USA	Tendon			MT-Cho-Ten-R-0 MT-Cho-Ten-R-1 MT-Cho-Ten-R-2 MT-Cho-Ten-R-3 MT-Cho-Ten-R-4 MT-Cho-Ten-R-5	Choteau, MT, USA
45	MT-Glen-Tur- 1	Turtle, MT, USA	Shell		MT-G-Tur-R-0 MT-G-Tur-R-1 MT-G-Tur-R-2 MT-G-Tur-R-3 MT-G-Tur-R-4	MT-Glen-Tur-1-0 MT-Glen-Tur-1-1 MT-Glen-Tur-1-2 MT-Glen-Tur-1-3 MT-Glen-Tur-1-4 MT-Glen-Tur-1-5	5 Volkmann canel,
46	Hadro-1	Hadrosaur, MT, USA	Limb			Hadro-1.0 Hadro-1.1 Hadro-1.2 Hadro-1.3 Hadro-1.4	
47 □	Tric-1	Triceratops, MT, USA	Shield Edge		TRIC-1-R-3 TRIC-1-R-4 TRIC-1-R-5 TRIC-1-R-6	Tric-1.0 Tric-1.1 Tric-1.2 Tric-1.3 Tric-1.4	
48	Hadro-T-1	Hadrosaur, MT, USA	Tooth			Hadro-TH-0 Hadro-TH-1 Hadro-TH-2 Hadro-TH-3 Hadro-TH-4	
49	Trex-1	T. rex, MT, USA	Tooth		Trex-Thin-0 Trex-Thin-1 Trex-Thin-2 Trex-Thin-3 Trex-Thin-4 Trex-Thin-5 Trex-Thin-6 Trex-Thin-7 Trex-Thin-8	Trex-1-0 Trex-1-1 Trex-1-2 Trex-1-3 Trex-1-4	
50 □	Ammo-1	Ammonite, MT, USA	Shell			Ammo-0 Ammo-1 Ammo-2 Ammo-3 Ammo-4 Ammo-5 Ammo-6	
51	Bucull-1	Bucullite, MT, USA	Shell			Bucull-0 Bucull-1 Bucull-2 Bucull-3 Bucull-4 Bucull-5	

Supplemental Table S6
Selected entries in red.

Cenozoic

	Number	Name	Part	Cut	Photo	Note	
52 □	DaShi-Whale-1	Whale	Spinal bone	Cross	DS-Whale-R-0 DS-Whale-R-1 DS-Whale-R-2 DS-Whale-R-3	DaShi-Whale-R-0 DaShi-Whale-R-1 DaShi-Whale-R-2 DaShi-Whale-R-3 DaShi-Whale-R-4	
53	PengHu-1	Deer?	Lower Jaw Teeth	Cross		PengHu-1.0 PengHu-1.4 PengHu-1.5 PengHu-1.6 PengHu-1.7	PengHu Ditch, ~30 kya
54	Deer-1	Deer	Tooth			Deer-1-0 Deer-1.1 Deer-1.3 Deer-1.4	ShiChuang
55 □	DaShi-Shell	Shell ErJiao Fm				DaShi-Shell-0 DaShi-Shell-1 DaShi-Shell-2 DaShi-Shell-3 DaShi-Shell-4	
56	Ast-Man	Astriclypeus manni, LongKang Beach				AST-Man-0 AST-Man-1 AST-Man-2 AST-Man-3 AST-Man-4	
57	LongKang-clam	LongKang Beach				LongKang-Clam-0 LongKang-Clam-1 LongKang-Clam-2 LongKang-Clam-3 LongKang-Clam-4	
58	BST-Urc-Spi	BaiShaTun Urchin Spine				BST-Urc-Spi-0 BST-Urc-Spi-1 BST-Urc-Spi-2 BST-Urc-Spi-3 BST-Urc-Spi-4	
59 □	Lin-Tai	Linthia taiwanensis				Lin-Tai-0 Lin-Tai-1 Lin-Tai-2 Lin-Tai-3 Lin-Tai-4	
60	Sch-Tai	Schizaster taiwancus NunNun, KeeLong				Sch-Tai-0 Sch-Tai-1 Sch-Tai-2 Sch-Tai-3 Sch-Tai-4	
61	DS-Crab	DaShi Crab				DS-Crab-0 DS-Crab-1 DS-Crab-2 DS-Crab-3 DS-Crab-4 DS-Crab-5 DS-Crab-6 DS-Crab-7	

	Number	Name	Part	Cut	Photo	Note	
62	TNTL (open)	TaiNan TsaiLiao, Mammal				TNTL-0 TNTL-1 TNTL-2 TNTL-3 TNTL-4 TNTL-5 TNTL-6 TNTL-7	
63	TNGM	TaiNan GuanMiao Mammal				TNGM-0 TNGM-1 TNGM-2 TNGM-3 TNGM-4 TNGM-5 TNGM-6 TNGM-7	

Supplemental Table S7
Selected entries in red.

Extant

	Number	Name	Part	Cut	Photo	Note	
64	Ext-Dol-1	Dolphin	Vert		Ext-Dol-1-R-0 Ext-Dol-1-R-1 Ext-Dol-1-R-2 Ext-Dol-1-R-3 Ext-Dol-1-R-4	Ext-Dol-Redo-1.0 Ext-Dol-Redo-1.1 Ext-Dol-Redo-1.2 Ext-Dol-Redo-1.3	
65	Ostrich-1	Ostrich	42 days, Femur			Ostrich-1-0 Ostrich-1-1 Ostrich-1-2 Ostrich-1-3 Ostrich-1-4	raw
66	Bull-Frog	Bull-Frog				Bull-Frog-0 Bull-Frog-1 Bull-Frog-2 Bull-Frog-3 Bull-Frog-4	cook
67	OST-Egg	Ost Eggshell			OST-Egg-R-0 OST-Egg-R-1 OST-Egg-R-2 OST-Egg-R-3	OST-Egg-0 OST-Egg-1 OST-Egg-2	
68	CHK-Egg	Chicken Eggshell			CHK-Egg-R-0 CHK-Egg-R-1 CHK-Egg-R-2 CHK-Egg-R-3	CHK-Egg-0 CHK-Egg-1 CHK-Egg-2 CHK-Egg-3	
69	CHK-Tibia	Chicken Tibia				CHK-Tibia-0 CHK-Tibia-1 CHK-Tibia-2	cook
70	Hum-TH	Human Tooth			HUM-TH-R-0 HUM-TH-R-1 HUM-TH-R-2 HUM-TH-R-3	Hum-TH-0 Hum-TH-1 Hum-TH-2 Hum-TH-3	
71	EXT-Chick-Raw	Chicken Femur Raw			EXT-Chick-Raw-R-0 EXT-Chick-Raw-R-1 EXT-Chick-Raw-R-2	EXT-Chick-Raw-0 EXT-Chick-Raw-1 EXT-Chick-Raw-2 EXT-Chick-Raw-3	
72	EXT-Duck-Raw	Duck Femur Raw			EXT-DUK-Raw-R-0 EXT-DUK-Raw-R-1 EXT-DUK-Raw-R-2	EXT-Duck-Raw-2 EXT-Duck-Raw-3 EXT-Duck-Raw-4 EXT-Duck-Raw-5	
73	EXT-Duck-Cook	Duck Femur Cook			EXT-DUK-Cok-R-0 EXT-DUK-Cok-R-1 EXT-DUK-Cok-R-2	EXT-Duck-Cook-0 EXT-Duck-Cook-1 EXT-Duck-Cook-2 EXT-Duck-Cook-3	
74	EXT-Pig-Raw	Pig Femur Raw			EXT-Pig-Raw-R-0 EXT-Pig-Raw-R-1 EXT-Pig-Raw-R-2	EXT-Pig-Raw-0 EXT-Pig-Raw-1 EXT-Pig-Raw-2 EXT-Pig-Raw-3 EXT-Pig-Raw-4	
75	EXT-Pect-cook	Pectin Cook				EXT-Pect-Cook-3 EXT-Pect-Cook-4 EXT-Pect-Cook-5 EXT-Pect-Cook-6	

	Number	Name	Part	Cut	Photo	Note	
76	EXT-Clam-Raw	Clam Raw				EXT-Clam-Raw-0 EXT-Clam-Raw-1 EXT-Clam-Raw-2 EXT-Clam-Raw-3	
77	EXT-Crab	Crab				EXT-Crab-0 EXT-Crab-1 EXT-Crab-2 EXT-Crab-3	
78	OX-Cook	Cook Ox bone				OX-Cook-0 OX-Cook-1 OX-Cook-2 OX-Cook-3 OX-Cook-4	

Supplemental Table S8
Selected entries in red.

Miscellaneous Matrices

	Number	Name	Part	Cut	Photo	Note
79	DW-matrix		DaWa Matrix	Powder	DW-matrix-1 DW-matrix-2	
80	DW-Matrix	DW-Matrix			DW-Matrix-0 DW-Matrix-1 DW-Matrix-2	
81	CJ-Matrix	CJ-Matrix			CJ-Matrix-0 CJ-Matrix-1 CJ-Matrix-2	
82	Calcite	Calcite			Calcite-1 Calcite-3 Calcite-4 Calcite-5	
83	MTX-DoL-Cap-Ver				MTX-DoL-Cap-Ver-0 MTX-DoL-Cap-Ver-1	Sakmarian, 290.1-295.0 mya
84	MTX-Diad-Texas				MTX-Diad-Texas-0 MTX-Diad-Texas-1	Artinsbian, 283.5- 290.1 mya
85	MTX-SAF-Texas				MTX-SAF-Dii-Toe-0 MTX-SAF-Dii-Toe-1	Permian, 252.2- 259.8 mya
86	MTX-TEX-Dim-Ver				MTX-TEX-Dim-Ver-0 MTX-TEX-Dim-Ver-1	Kungurian, 272.3- 283.5 mya
87	MTX-WH-Dol-Cap				MTX-WH-Dol-Cap-0 MTX-WH-Dol-Cap-1	Sakmarian, 290.1-295.0 mya