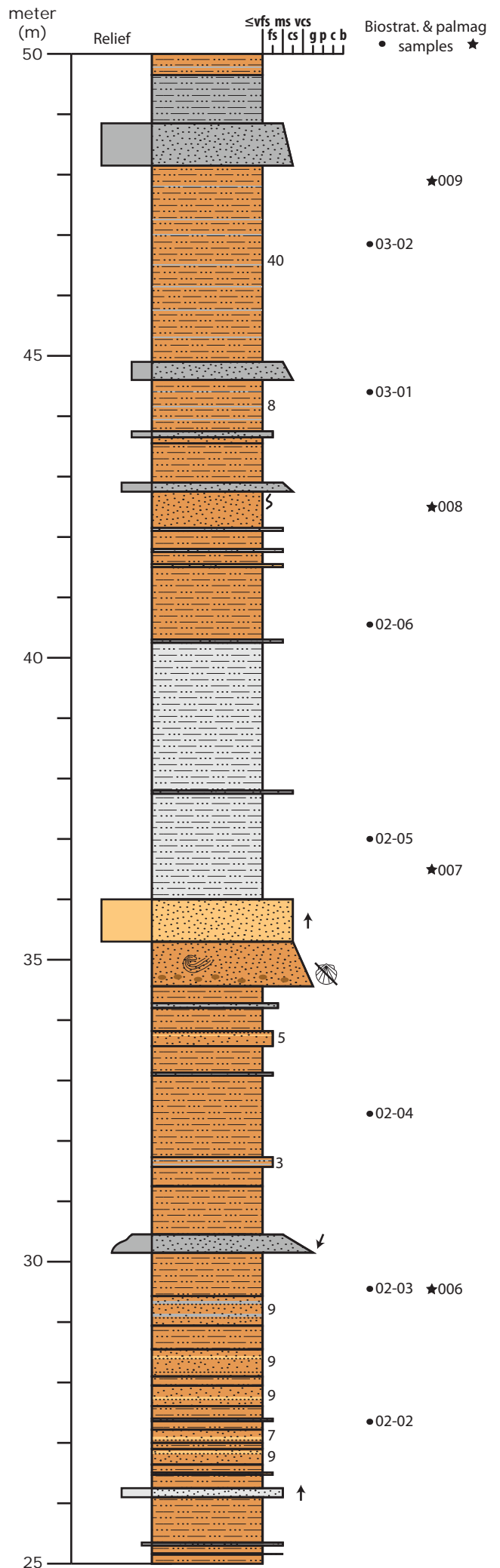
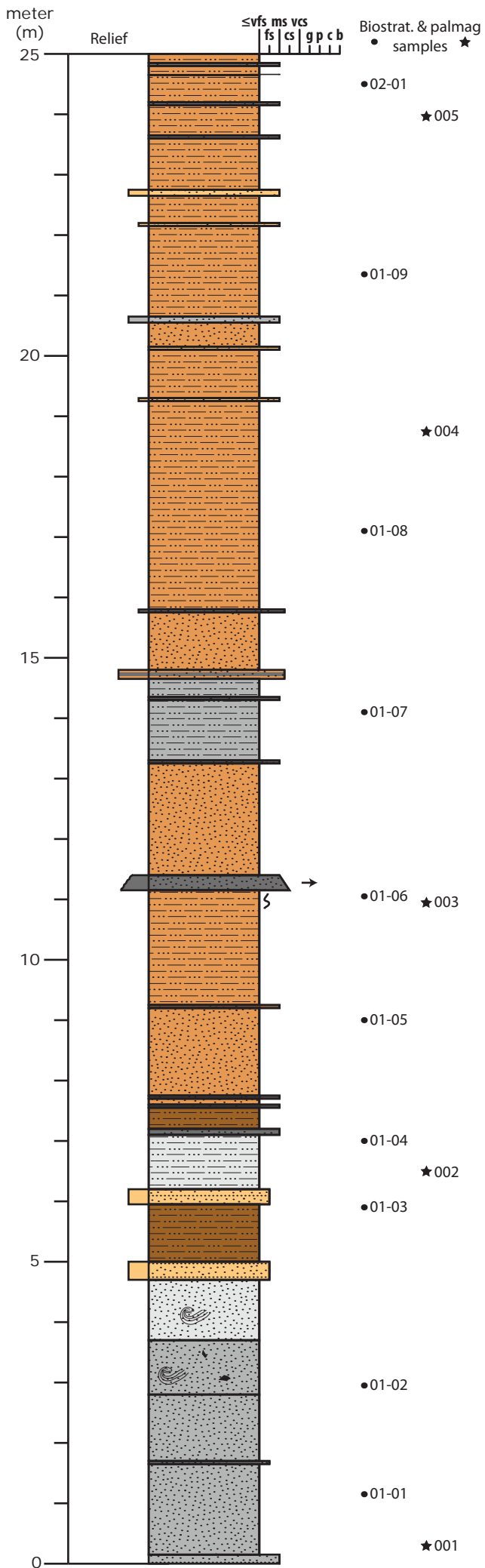
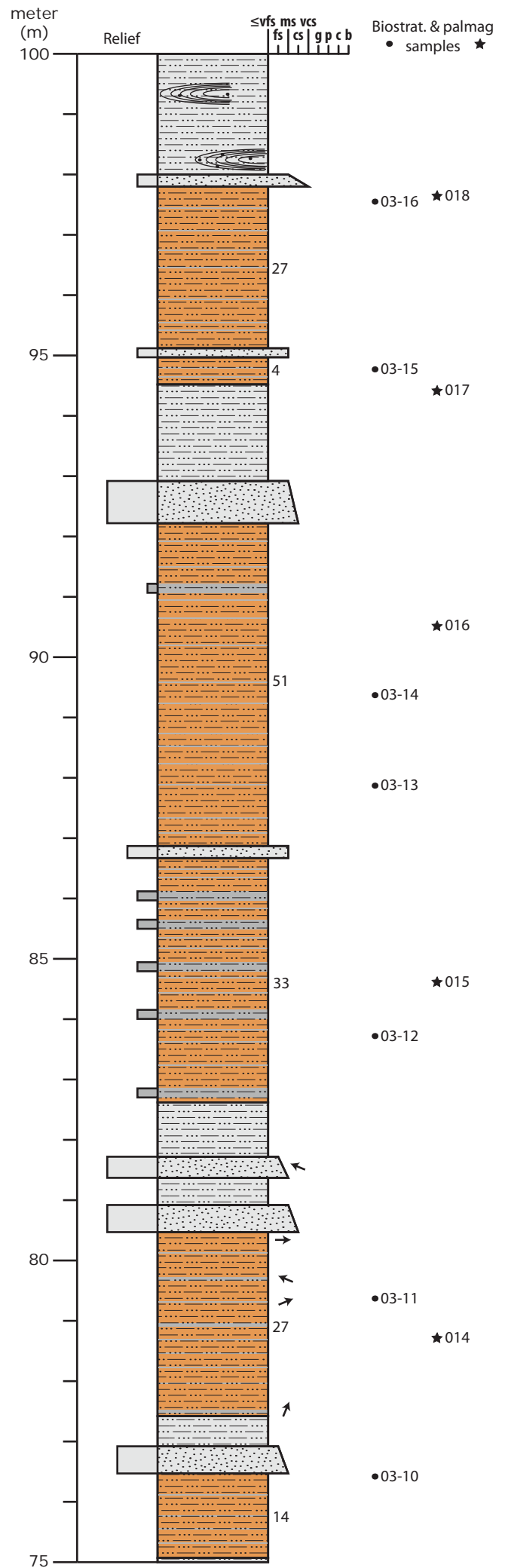
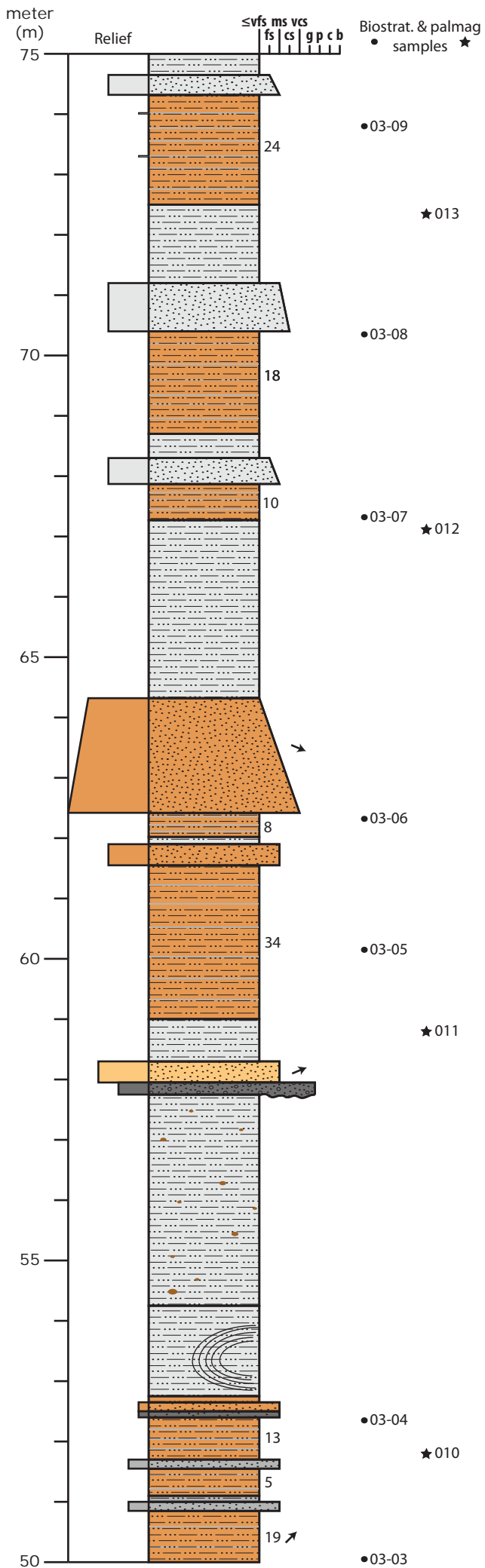
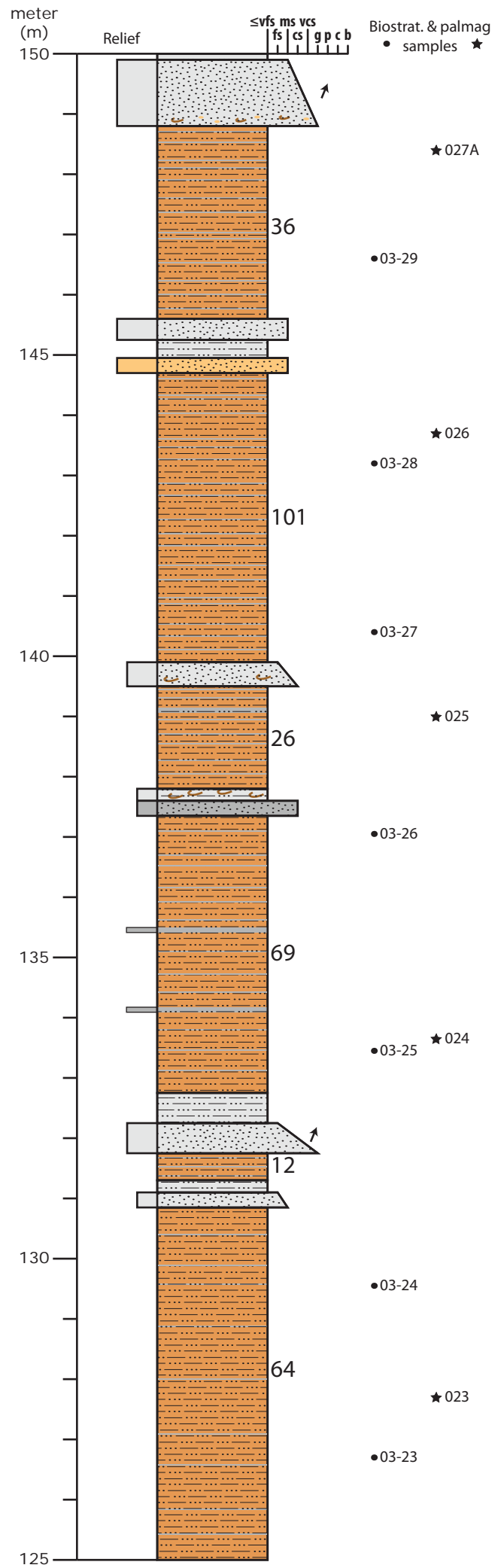
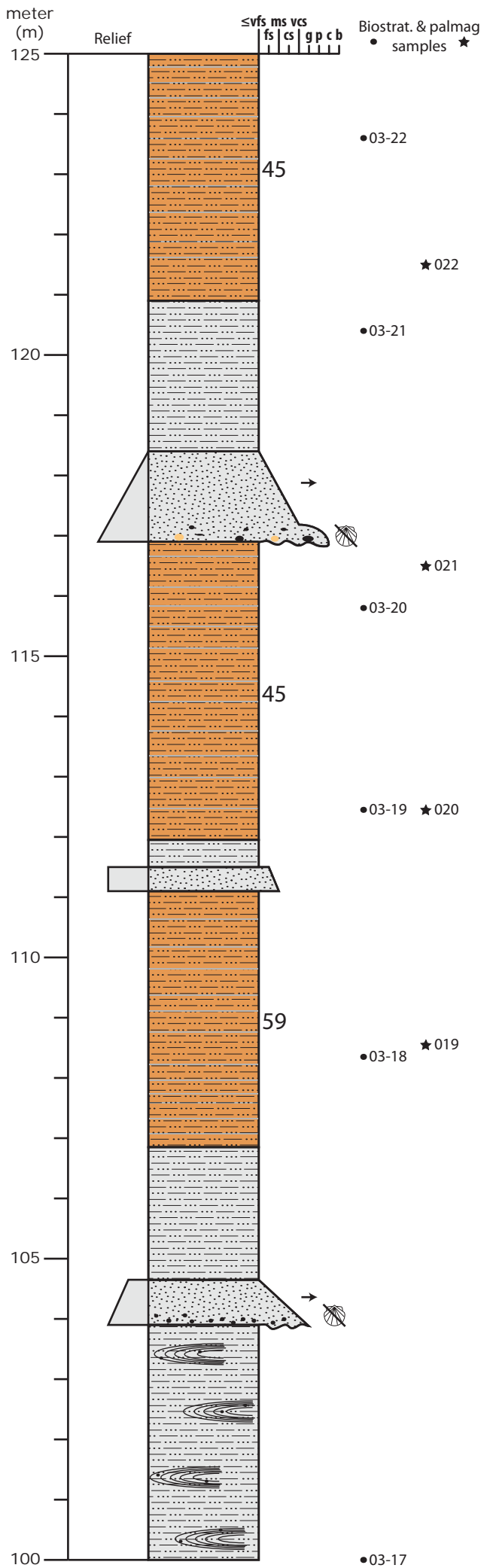
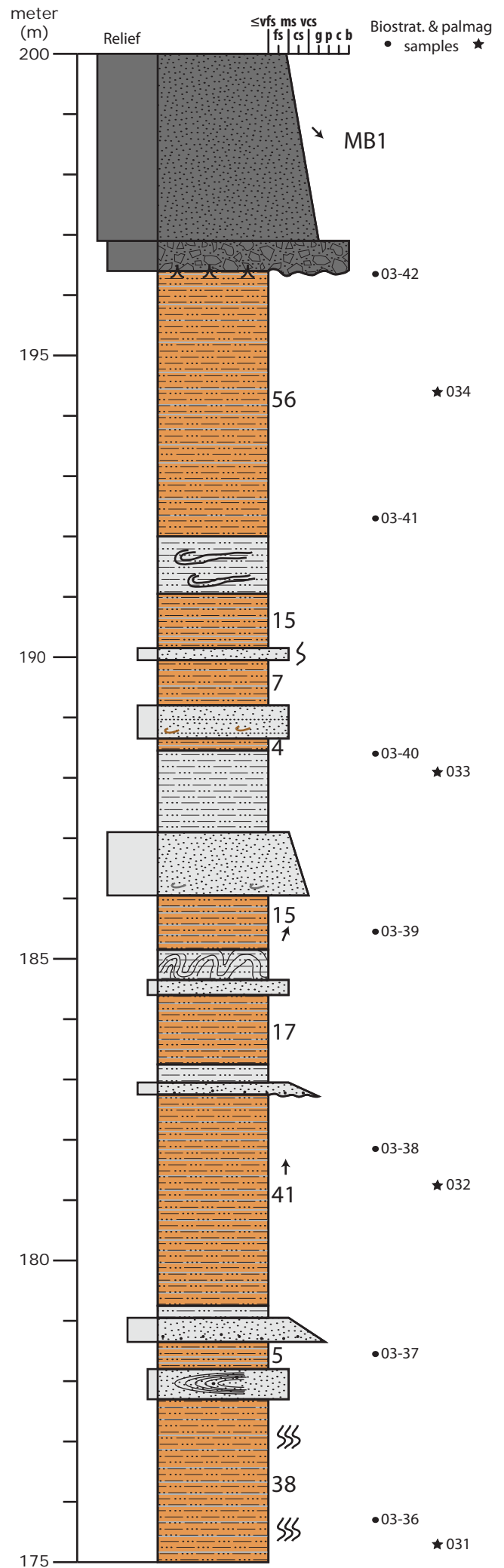
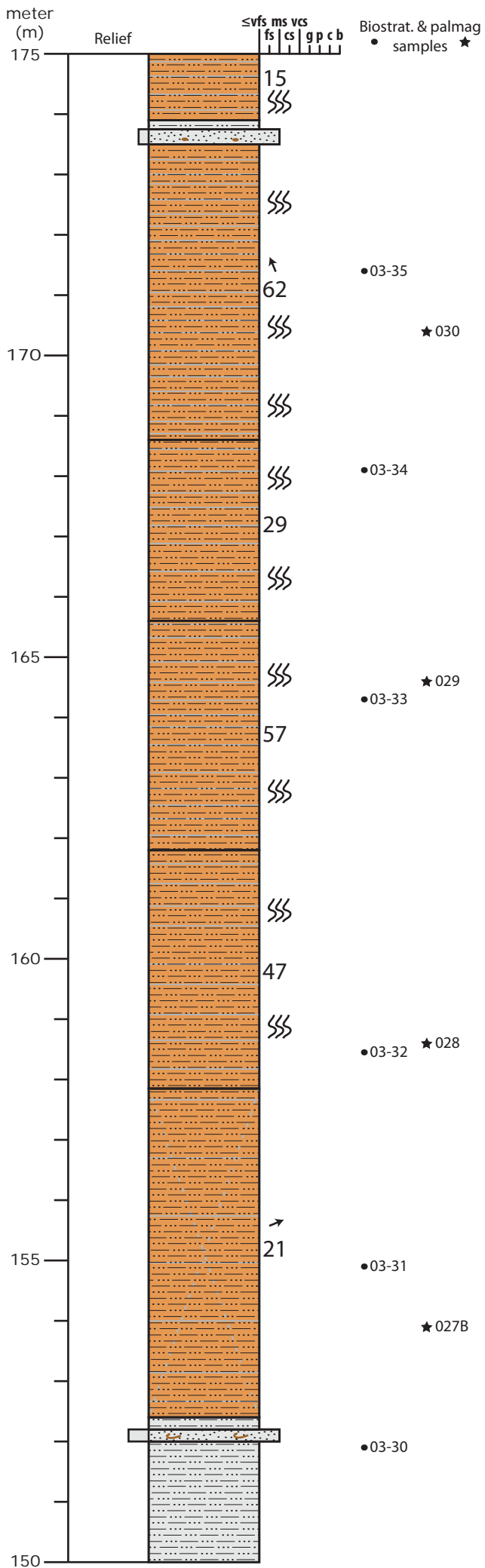


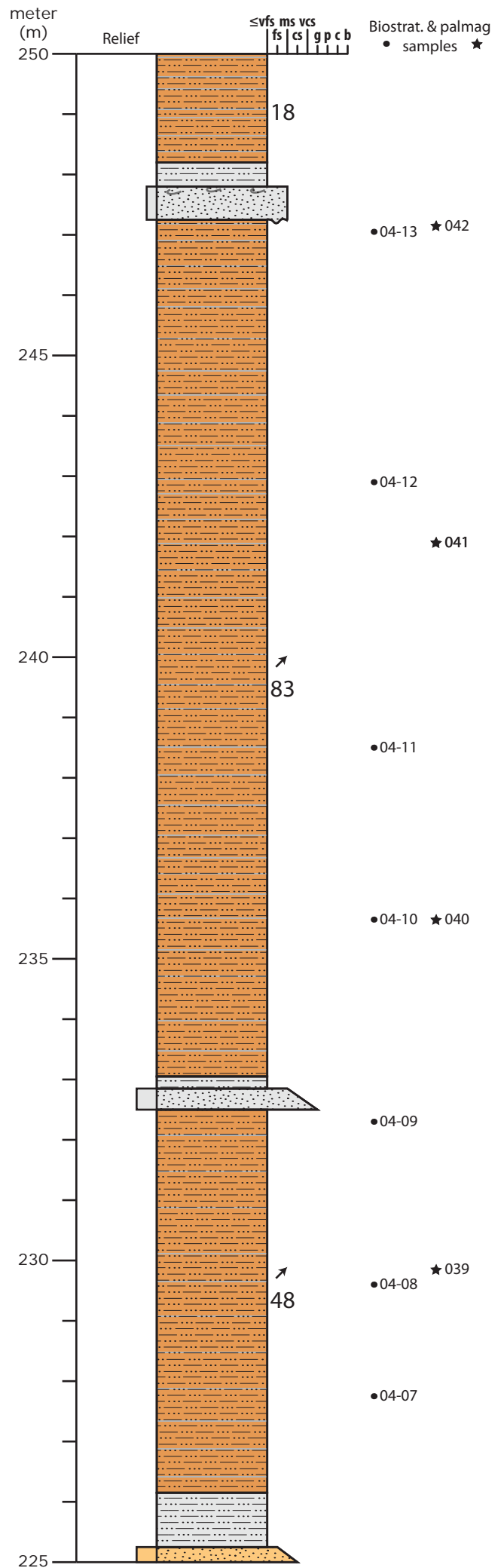
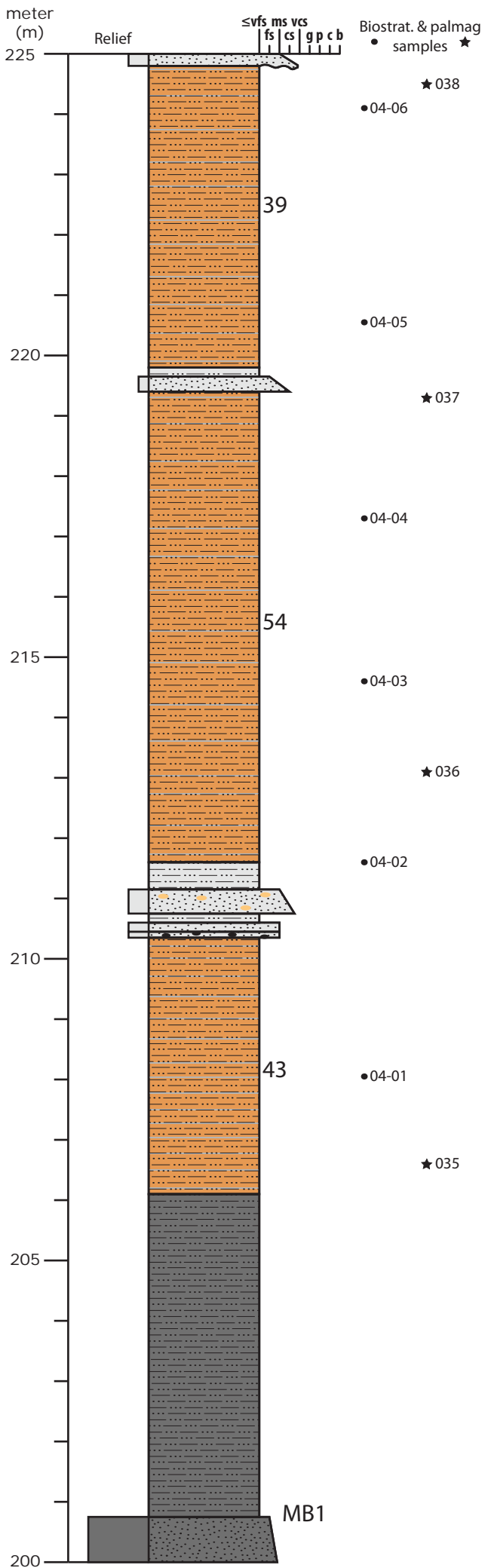
Appendix 1. Detailed stratigraphic logs

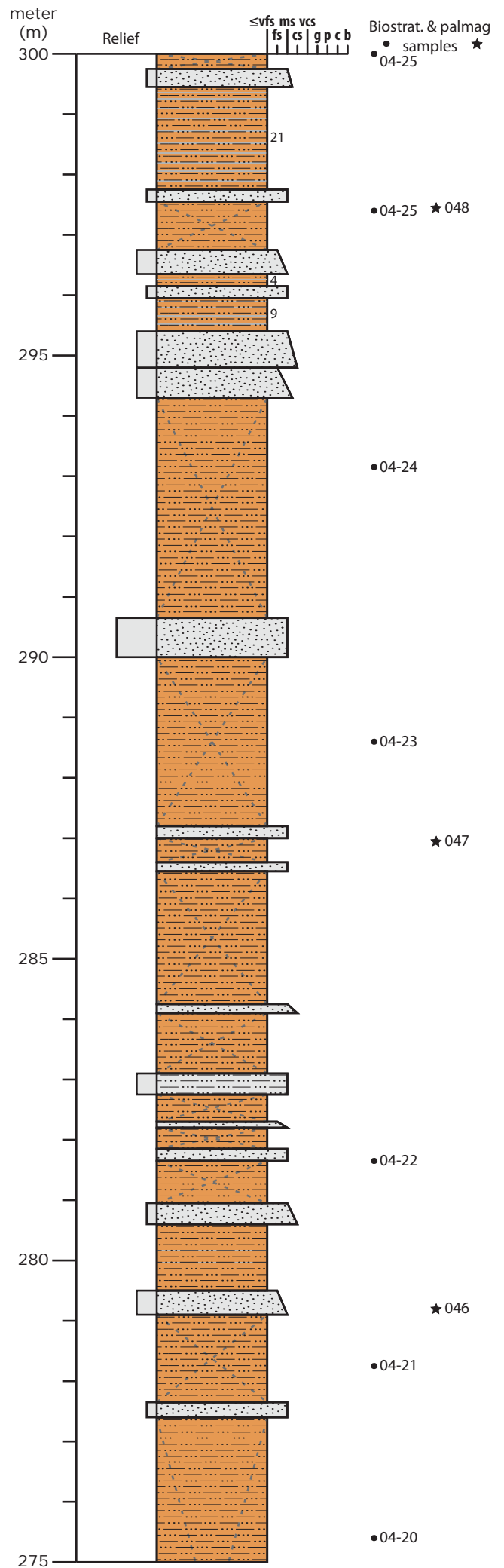
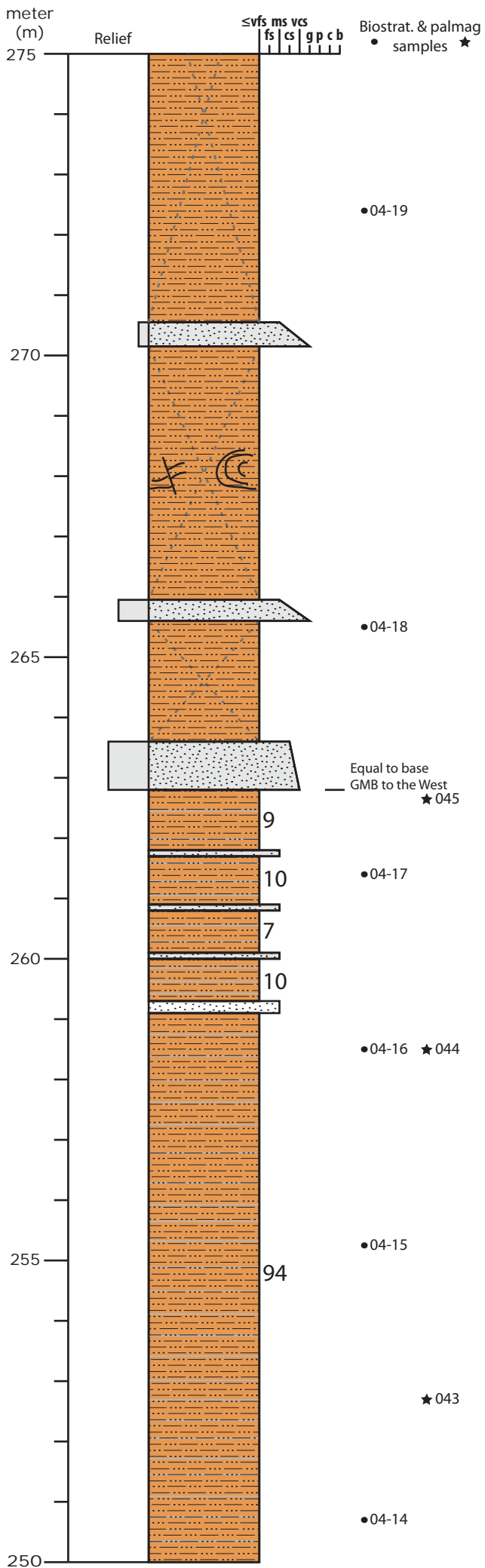


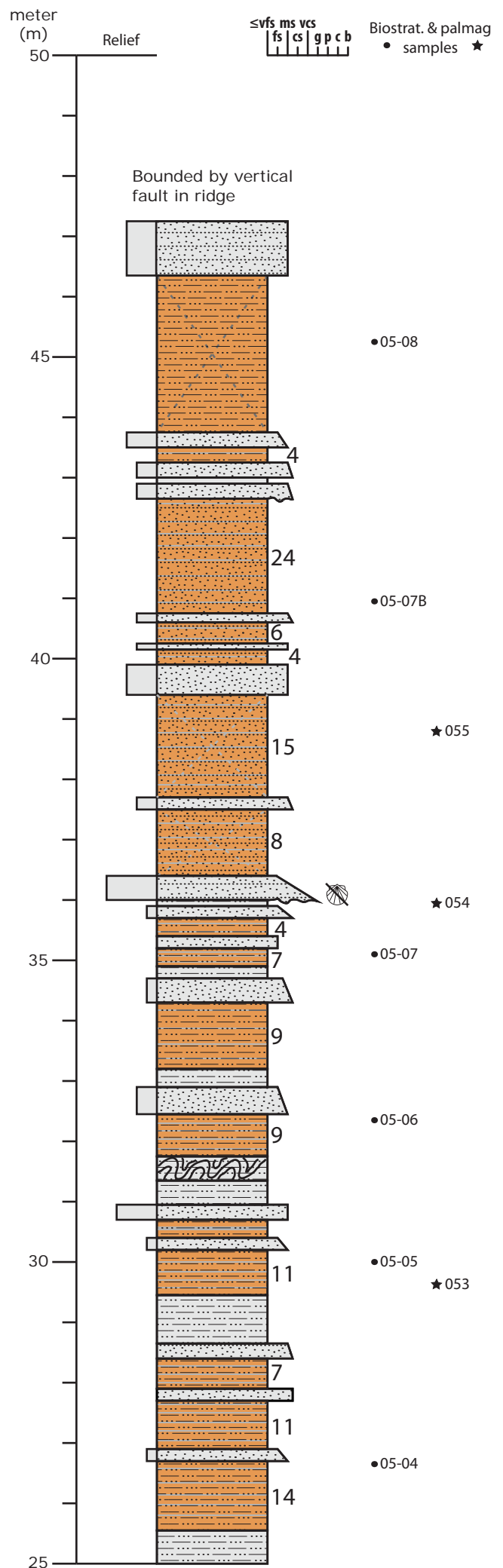
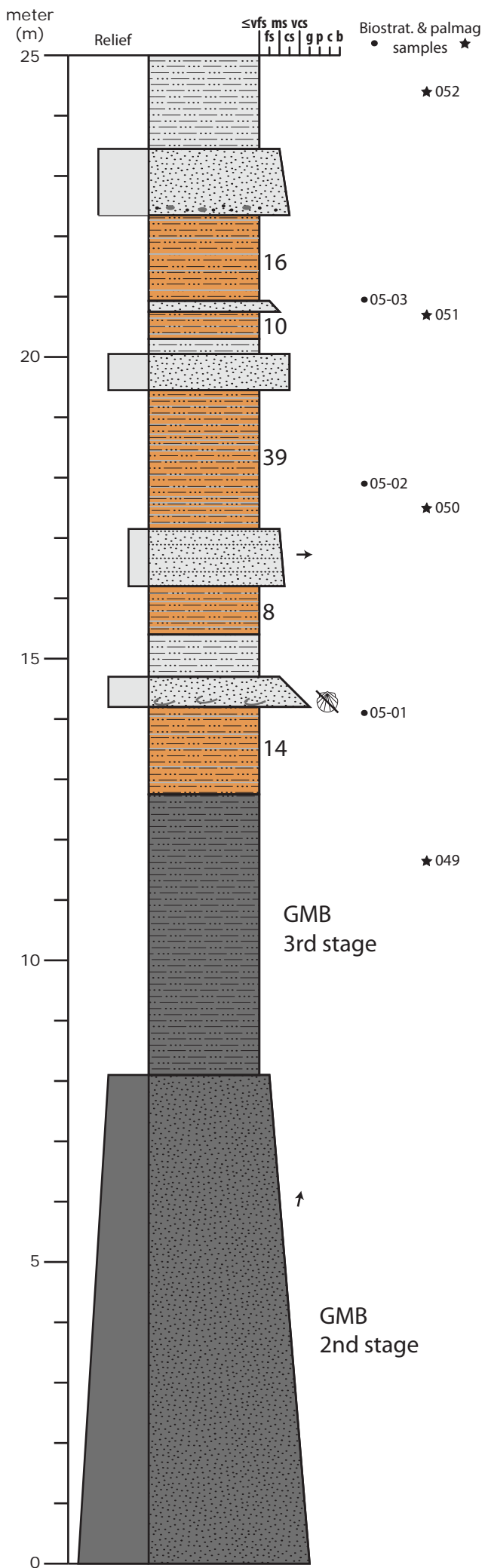


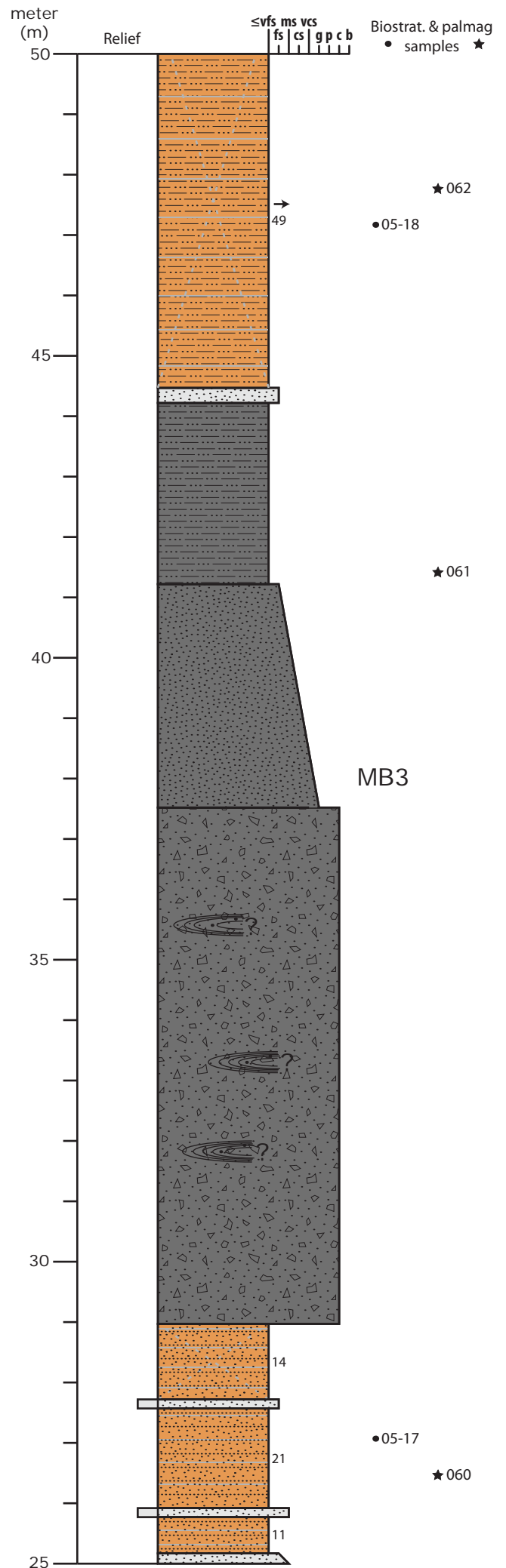
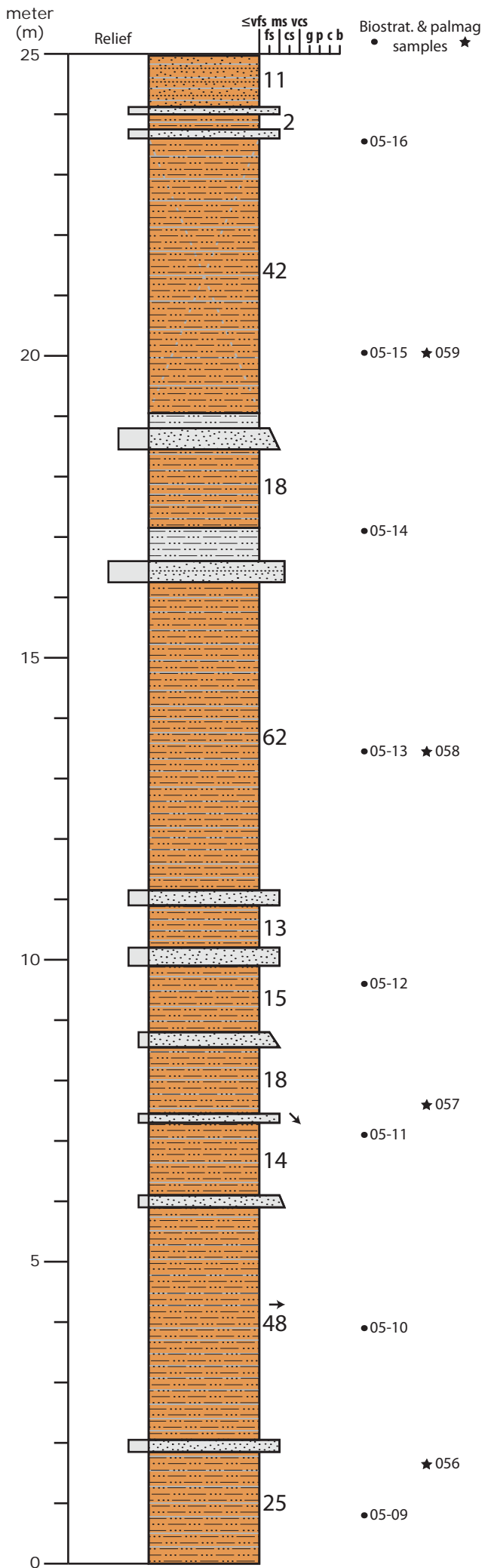


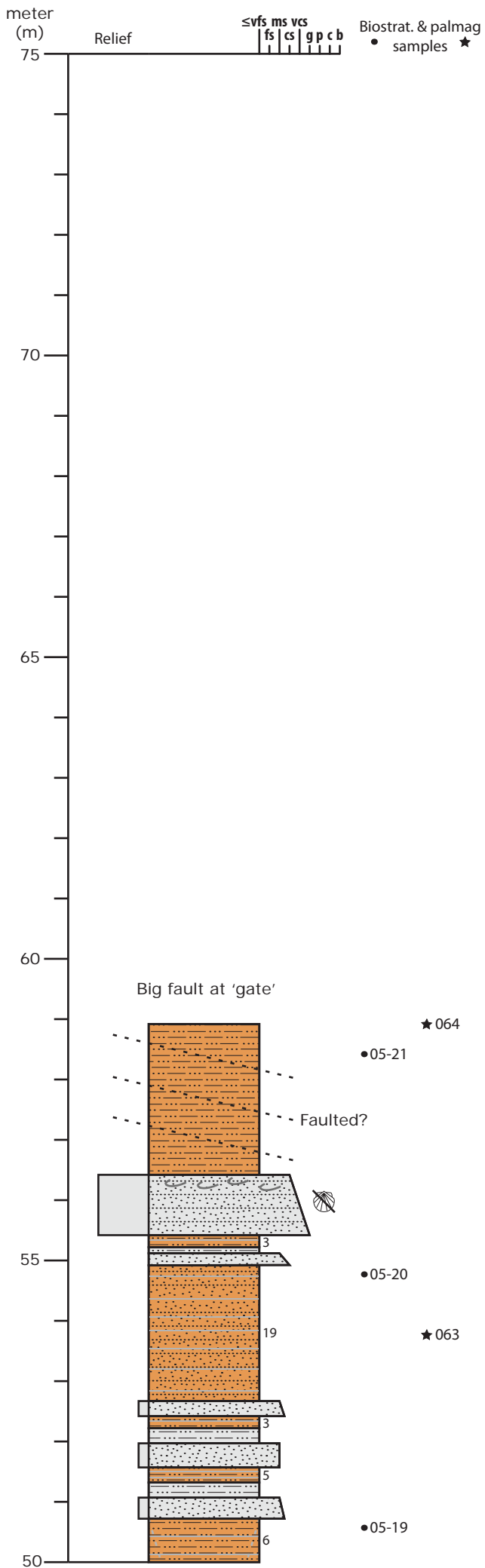


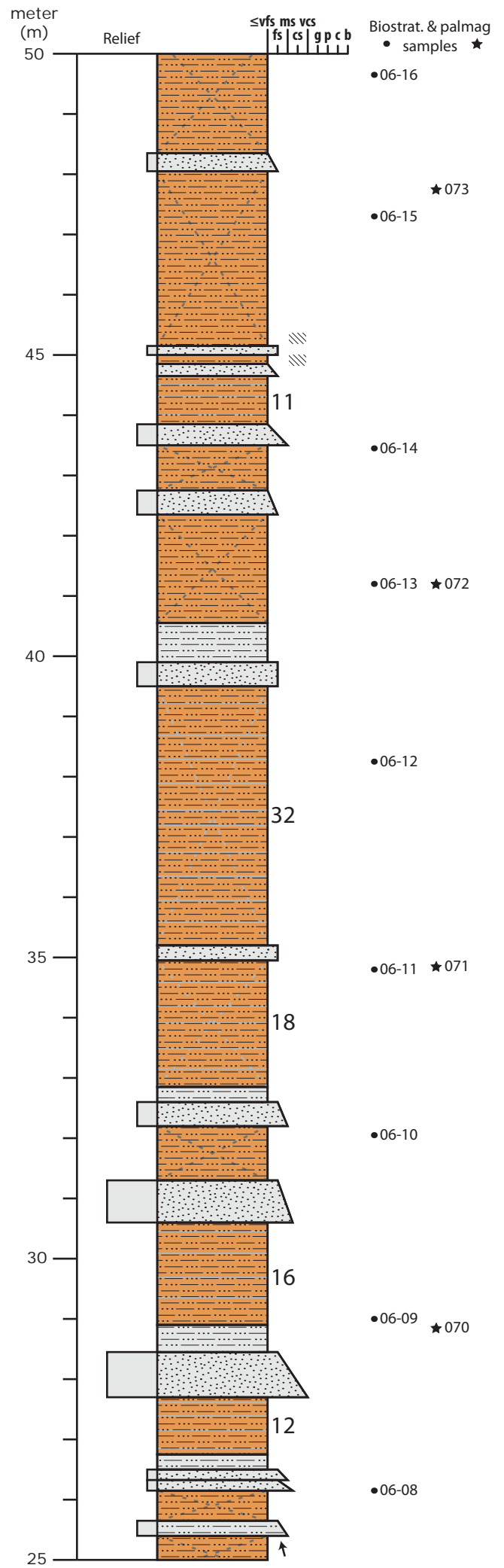
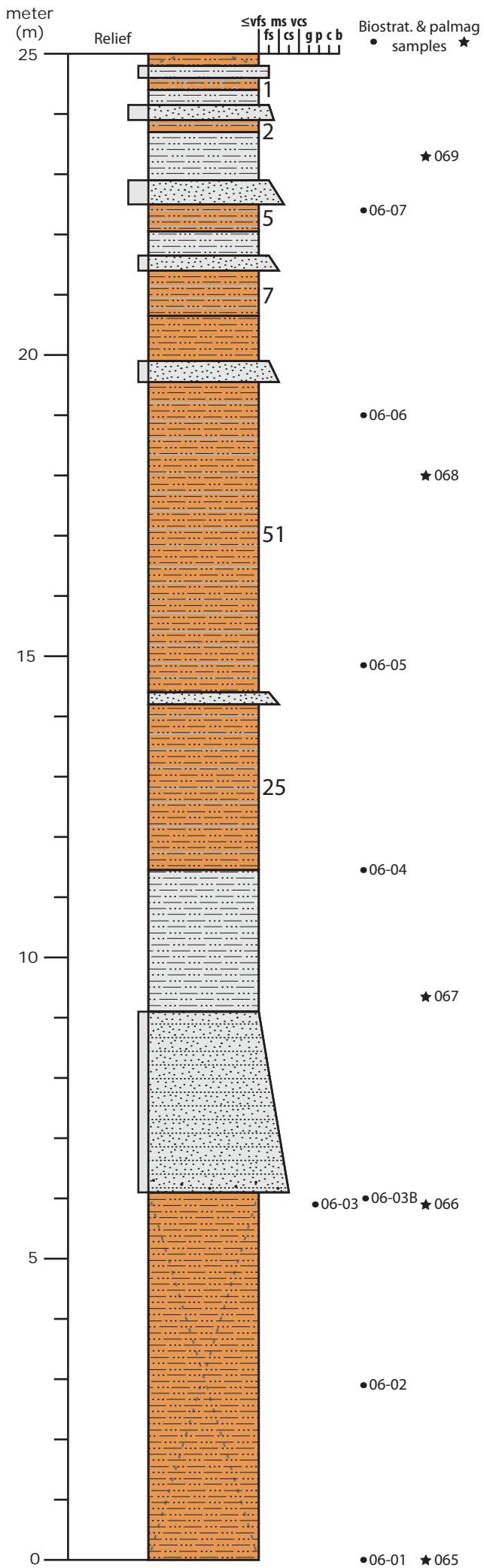


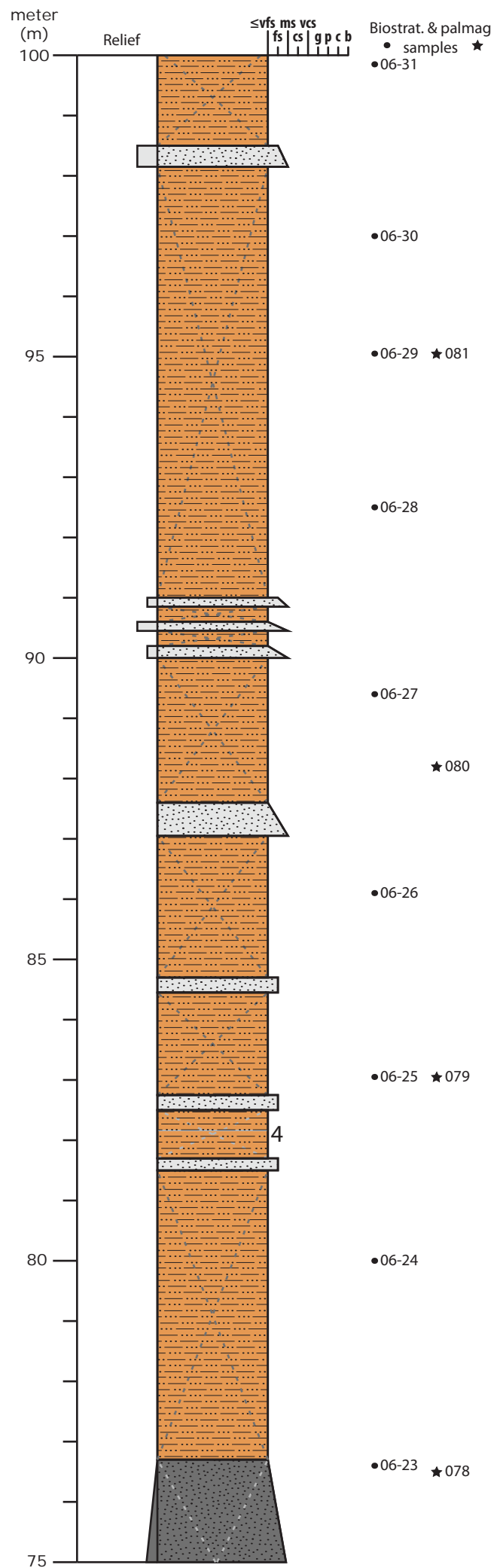
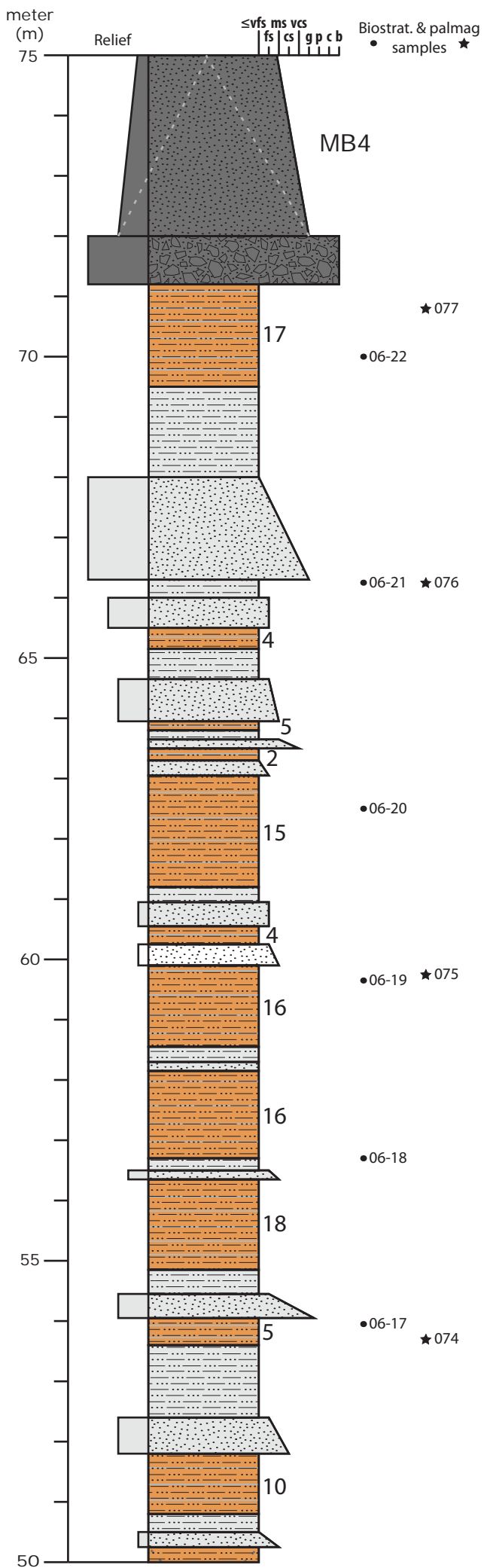


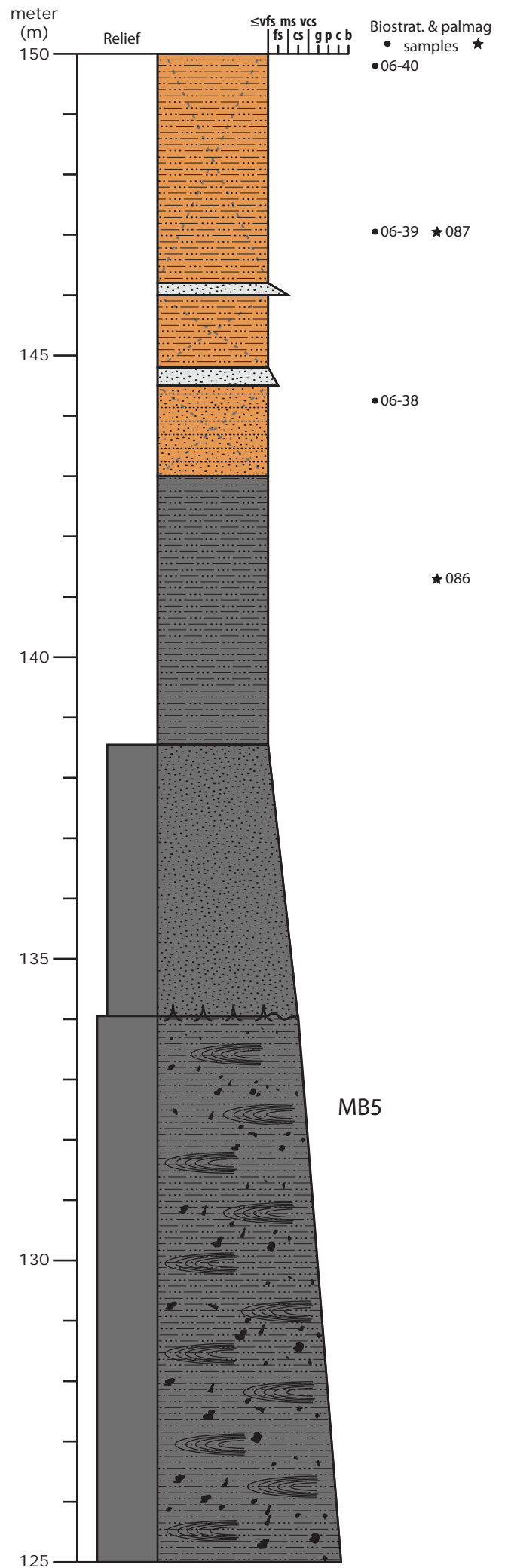
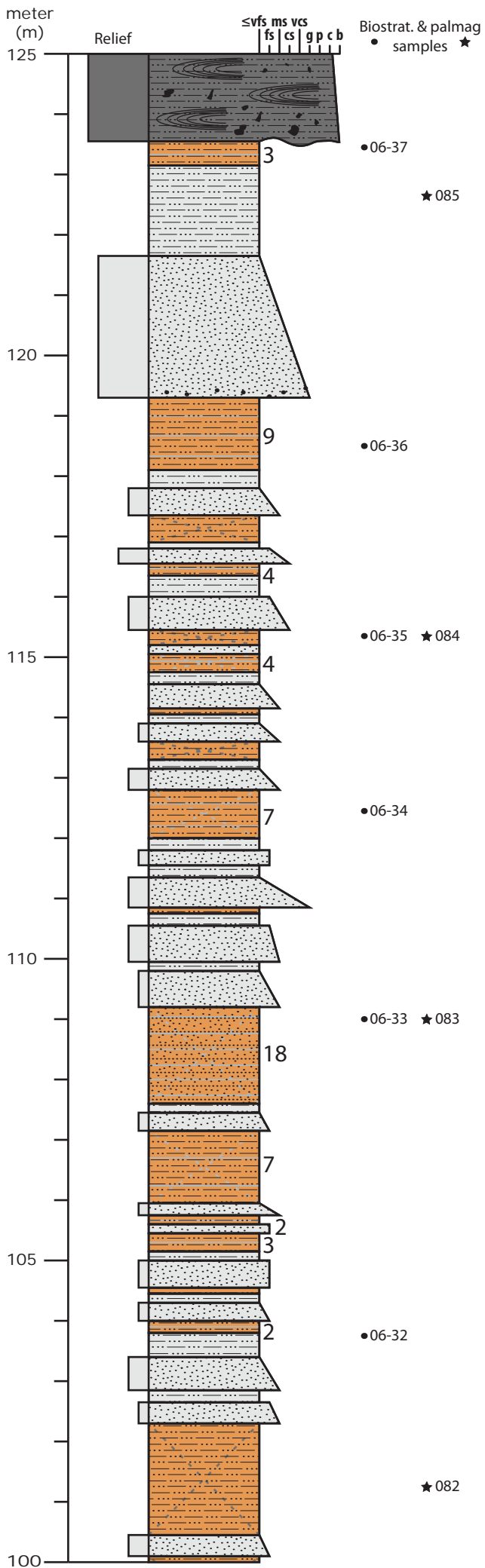


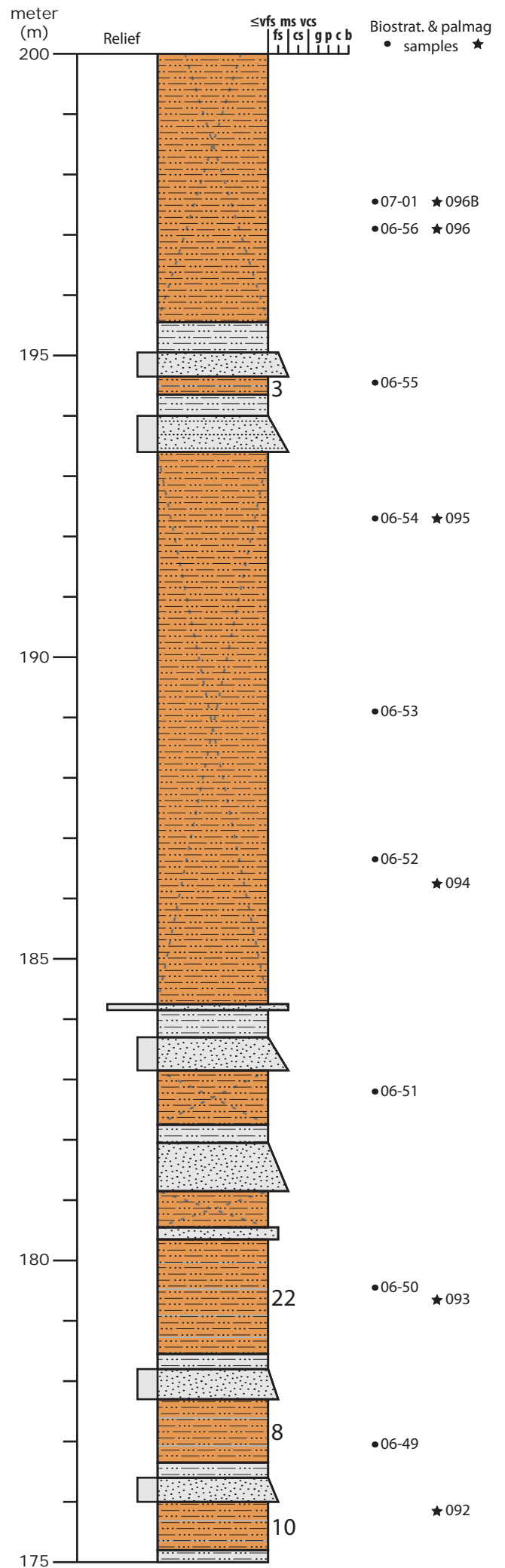
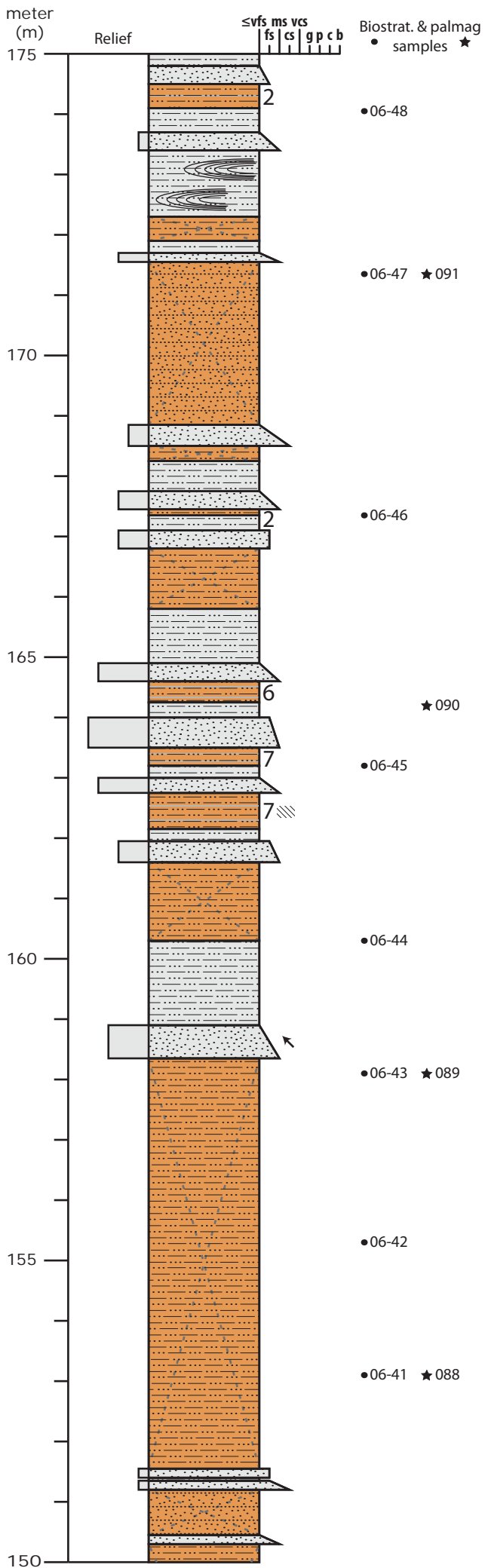


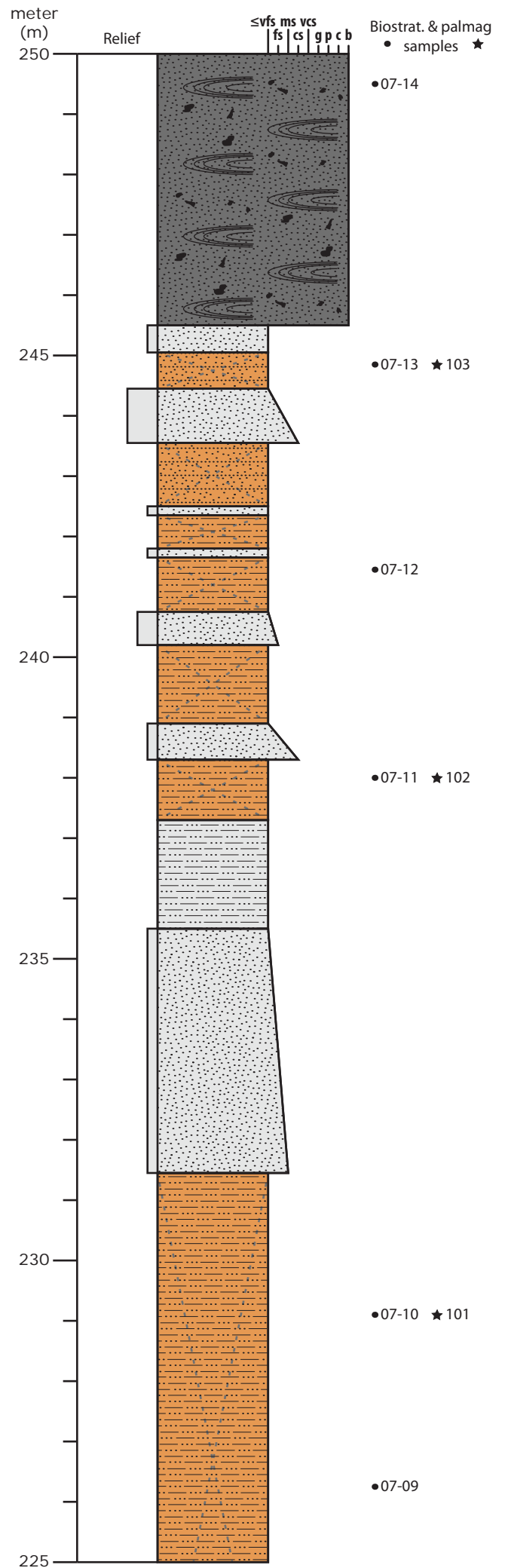
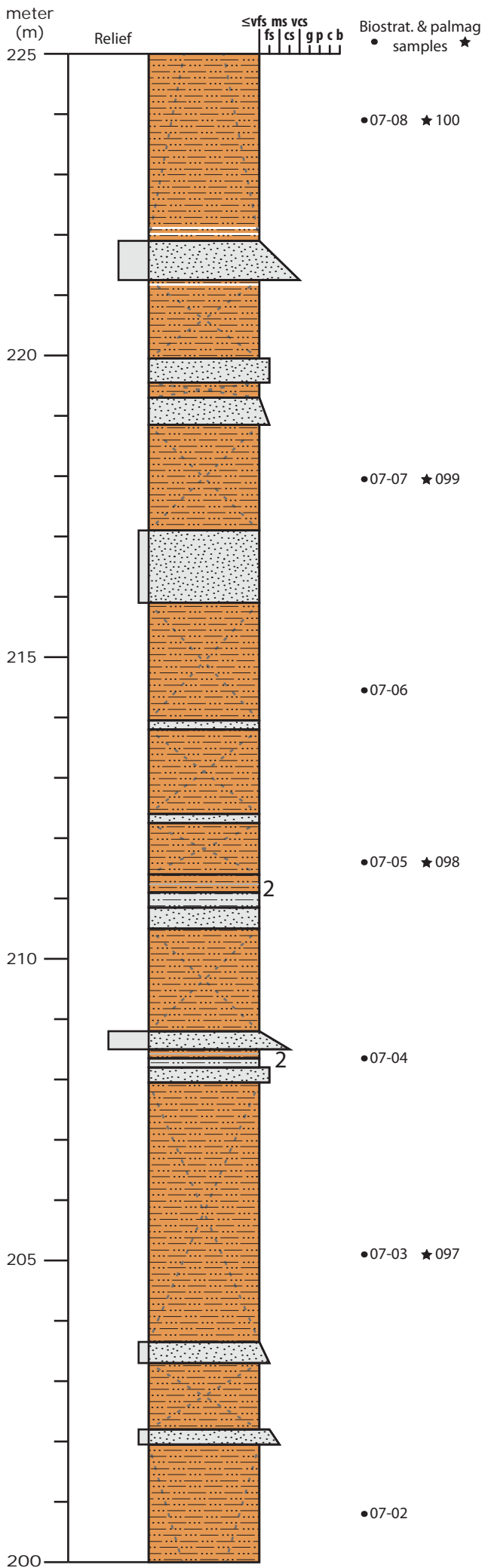


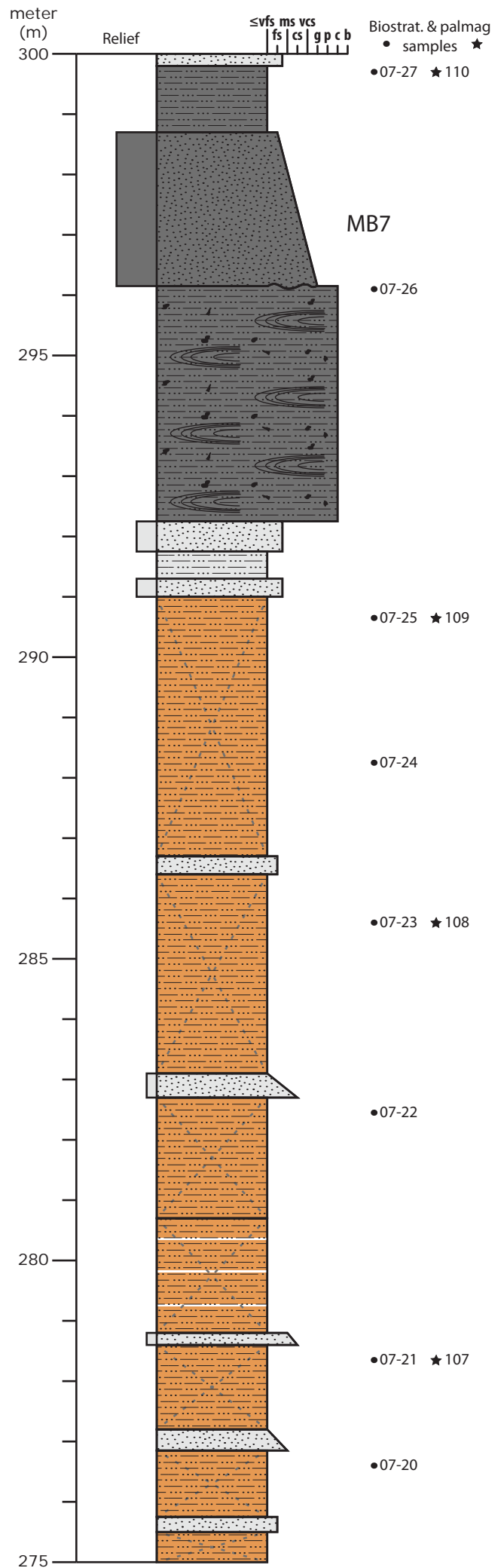
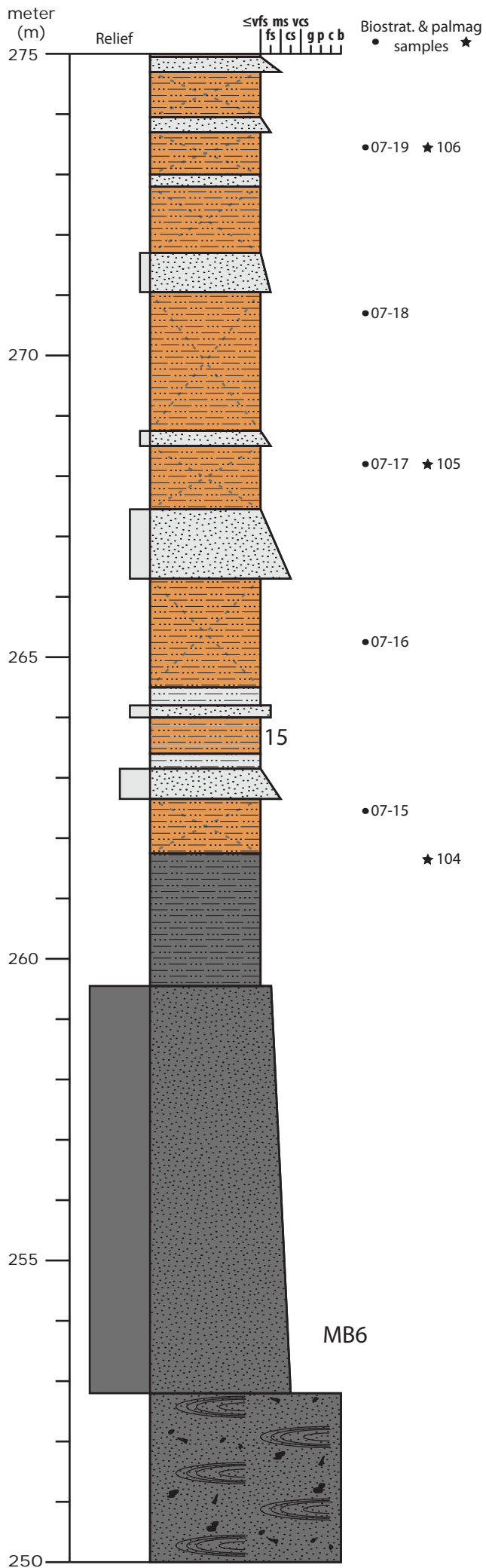


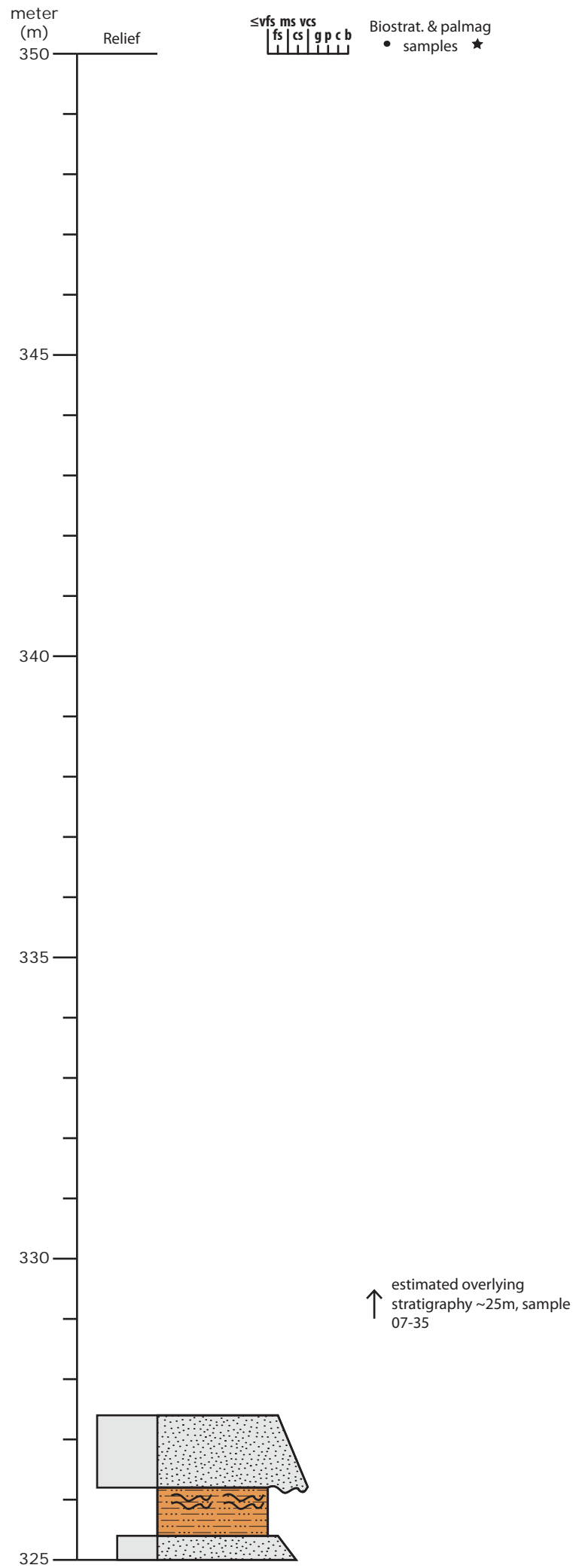
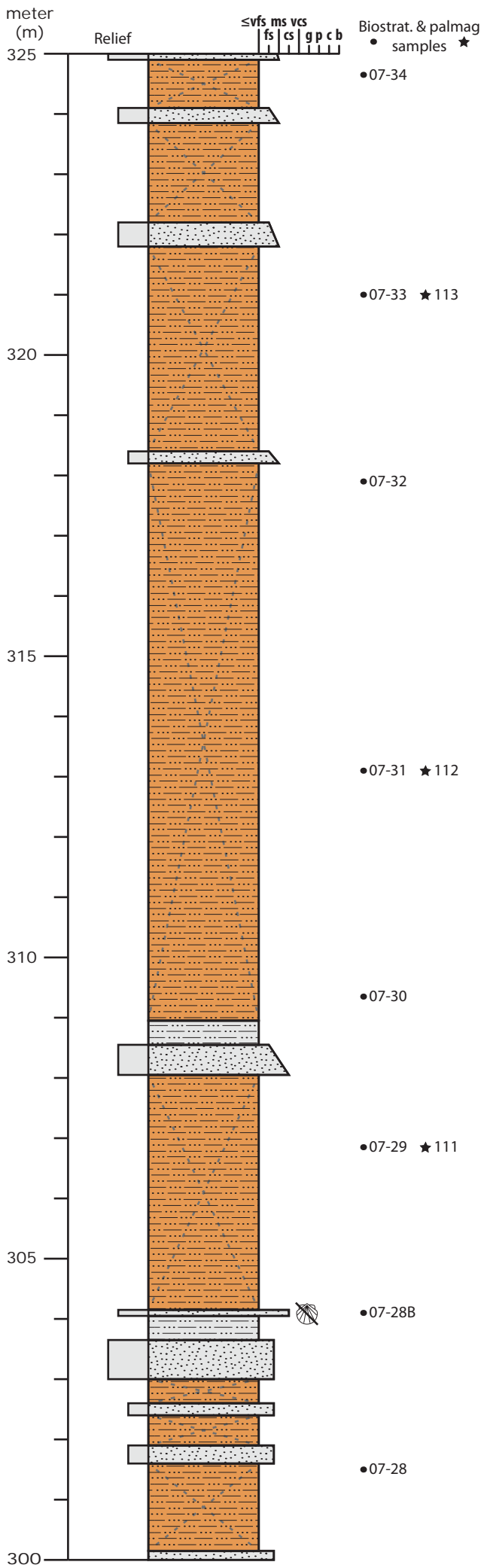












Appendix 2. Density separation process

After sieving the sample material and drying it (important), density separation can be performed on the sand and foraminifer mixture. Note that the quality of the sieving is critical for good density separation, since any clustered small grains will fall apart in the high density fluid (because of secondary reactions the clusters break up). Often these are small grains do not settle quickly enough or have high surface tension (mica's) and these tend to end up in your sieved product (pollution).

The basic setup only requires some materials;

- 1x Büchner funnel for 110 mm filter paper
- 2x side-arm flasks matching the Büchner funnel size
- Whatman 589/2 ashless 110 mm (White Ribbon) cellulose filterpaper (4-12 μ m particle retention)
- Divac 0.6L vacuum pump (or similar)
- Tubing
- Density meter (Mettler Toledo Densito 30PX was used)
- Zinc-chloride (powdered)
- large funnel with big filter (density filtering)
- electronic stirrer
- standard 150 ml beakers

First, the high density fluid must be prepared by slowly adding Zinc-chloride powder to the demi-water, be careful to keep the temperature of the fluid within working conditions (glass work and handling) since this is an exothermic reaction. Stir the mixture until all powder is dissolved, note that the volume of the fluid expands notably during addition of the powder, make sure you can accommodate this. Let the fluid cool to room temperature before measuring its density. Keep adding Zinc-chloride until the desired 1.71 g/mL⁻¹ is reached.

Setup the Büchner funnel according to Figure A2.1 and insert a filter (Fig. A2.2), wet with demi-water, carefully centering it to make sure no fluids can pass round it.

Add up to about 50 grams of sample material to a standard 150 ml beaker. Add the high density fluid and stir gently by hand (with something to stir with, small spatula etc) until all the material has been in suspension and the foraminifers have had a chance to rise to the surface, roughly this is about 15 seconds. Let the solids settle on the bottom of the beaker, but do not take too much time since secondary dissolution processes start as well. Pour the (preferably almost clear) fluid with floating foraminifers into the Büchner funnel and apply the vacuum.

When the fluid is drained, switch off the vacuum pump and switch the Büchner funnel and tubing onto the other side-arm flask (for waste) and thoroughly clean the filter and foraminifers with demi-water while applying the vacuum again. Delicately remove the filter from the funnel and dry it before collecting the foraminifers from the filter into labeled sample-flasks.

Swapping the side-arm flasks enables us to recycle the high density fluids more easily since there is less dilution by demi-water. Filter the fluids after use with large (density driven) filters before checking their density. In practice a density of about 0.03 g/mL⁻¹ is lost per cycle.



Figure A2.1. Büchner funnel setup with vacuum pump.

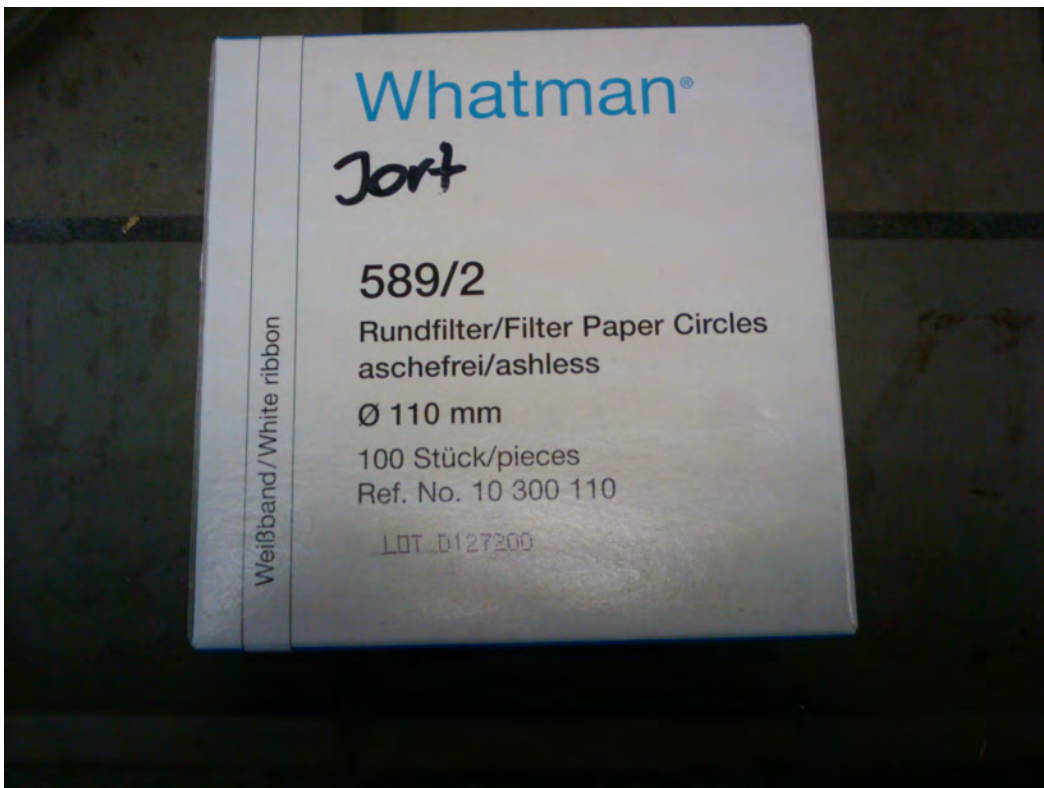


Figure A2.2. Whatman 589/2, 110mm filters.

Appendix 3. Biostratigraphic results

Appendix 3. Biostratigraphy

Sample	Strat lvl (m)	Forams checked	Species tray 1, keeled Globorotalids	Species tray 2, unkeeled Globorotalids	Additionally picked (non quant)	Comment
TAB 01-01	1.15			3x sin scitula		
TAB 01-01	1.15	375	2x ?	3x sin scitula		sample fallen, count not correct
TAB 01-02	2.95	577.5	2x menardii 4	1x sin scitula		
TAB 01-03	5.90	2850	14x menardii 4	6x dex 52x sin scitula		sample fallen, count not correct
TAB 01-03	5.90	1510		3x dex 39x sin scitula	3x menardii 4?	
TAB 01-04	7.00	2370		3x dex 12x sin scitula		
TAB 01-05	9.00	1020		2x dex 18x sin scitula		
TAB 01-06	11.05	950	2x menardii 4?	3x dex 21x sin scitula	2x menardii 4?	
TAB 01-07	14.10	1800	2x menardii 4	14x sin scitula		
TAB 01-08	17.10	157.5		3x sin scitula		
TAB 01-09	21.35	157.5		1x dex 1x sin scitula (1x?)		
TAB 02-01	24.50	127.5		3x sin scitula		
TAB 02-02	27.35	52.5				
TAB 02-03	29.55	277.5		1x sin scitula?	3x menardii 4, 6x sin scitula	whole sample checked
TAB 02-04	32.45	142.5		2x sin scitula		
TAB 02-05	37.00	127.5		2x sin scitula		
TAB 02-06	40.55	82.5				
TAB 03-01	44.40	2120		1x dex 24x sin scitula		whole sample checked
TAB 03-01	44.40	2110		1x dex 17x sin scitula		
TAB 03-02	46.85	615		1x dex 10x sin scitula		
TAB 03-03	50.05	180		15x sin scitula		
TAB 03-03	50.05	225		3x sin scitula		
TAB 03-04	52.35	172.5		1x sin scitula		
TAB 03-05	60.15	472.5		4x sin scitula		
TAB 03-06	62.32	37.5				
TAB 03-07	67.32	67.5				
TAB 03-08	70.35	195		3x sin scitula + 1x?		
TAB 03-09	73.80	721		1x dex 27x sin scitula		
TAB 03-10	76.42	1090		1x dex 30x sin scitula		
TAB 03-10	76.42	1064	2x men4???	1x dex 25x sin scitula + 2x?		
TAB 03-11	79.37	776		23x sin scitula + 1x?		
TAB 03-12	83.72	399		1x dex 29x sin scitula		
TAB 03-13	87.87	500		1x dex 22x sin scitula + 1x?		
TAB 03-14	89.37	645		10x sin scitula		
TAB 03-15	94.77	1155		4x sin scitula		
TAB 03-16	97.55	1335		1x dex 9x sin scitula + 1x?		
TAB 03-17	100.00	97.5				
TAB 03-18	108.35	1110		1x dex 8x sin scitula		

Appendix 3. Biostratigraphy

Sample	Strat lvl (m)	Forams checked	Species tray 1, keeled Globorotalids	Species tray 2, unkeeled Globorotalids	Additionally picked (non quant)	Comment
TAB 03-19	112.45	1022		27x sin scitula		big forams!
TAB 03-20	115.80	760		39x sin scitula		
TAB 03-21	120.40	127.5		2x sin scitula + 1x?		
TAB 03-22	123.30	1075		25x sin scitula + 1x?scitula		
TAB 03-23	126.70	744		1x dex 39x sin scitula		
TAB 03-24	129.55	820		5x dex 20x sin scitula		
TAB 03-25	133.45	1044		21x sin scitula		
TAB 03-26	137.05	2080		6x sin scitula		
TAB 03-27	140.40	1610		7x sin scitula		
TAB 03-28	143.20	1700		8x sin scitula		
TAB 03-29	146.60	1320		11x sin scitula		
TAB 03-30	151.90	1520		19x sin scitula 1x ?		
TAB 03-31	154.90	2184		1x dex 19x sin scitula		
TAB 03-32	158.45	585	1x men4?	2x dex 12x sin scitula 2x?		
TAB 03-33	164.30	1200		1x dex 31x sin scitula		
TAB 03-34	168.10	1025		38x sin scitula		
TAB 03-35	171.40	588		41x sin scitula		
TAB 03-36	175.70	1140		7x dex 14x sin scitula		
TAB 03-37	178.45	1350		27x sin scitula		
TAB 03-38	181.85	756		1x dex 28x sin scitula		
TAB 03-39	185.45	1184		25x sin scitula		
TAB 03-40	188.40	1146		1x dex 32x sin scitula		
TAB 03-41	192.30	1365		14x sin scitula 3x?		
TAB 03-42	196.35	1038		21x sin scitula		
TAB 04-01	208.05	1560		27x sin scitula 1x?		
TAB 04-02	211.60	1056		1x dex 48x sin scitula		
TAB 04-03	214.60	2536		2x dex 17x sin scitula		s2
TAB 04-04	217.30	2120		21x sin scitula 1x?		
TAB 04-05	220.55	747		1x dex 52x sin scitula		
TAB 04-06	224.10	1412		1x dex 45x sin scitula		s2
TAB 04-07	227.75	2101		7x sin scitula		
TAB 04-08	229.60	864		25x sin scitula		s1
TAB 04-09	232.30	1540		1x dex 18x sin scitula		
TAB 04-10	235.65	1164		1x dex 29x sin scitula 3x?		s1
TAB 04-11	238.50	2142		33x sin scitula 1x?		
TAB 04-12	242.90	1624		20x sin scitula		
TAB 04-13	247.05	1272		25x sin scitula 1x?		
TAB 04-14	250.70	1194		18x sin scitula		
TAB 04-15	255.25	1425		29x sin scitula		
TAB 04-16	258.50	1690		15x dex 7x sin scitula		
TAB 04-17	261.40	3020		5x dex 20x sin scitula		
TAB 04-18	265.50	1326		3x dex 19x sin scitula		

Appendix 3. Biostratigraphy

Sample	Strat lvl (m)	Forams checked	Species tray 1, keeled Globorotalids	Species tray 2, unkeeled Globorotalids	Additionally picked (non quant)	Comment
TAB 04-19	272.40	1470		16x sin scitula		
TAB 04-20	275.40	1764		2x dex 39x sin scitula		
TAB 04-21	278.25	1620		15x sin scitula		
TAB 04-22	281.65	1650		33x sin scitula		lot of morphological variation
TAB 04-23	288.60	2303		3x dex 26x sin scitula		lot of morphological variation
TAB 04-24	293.15	1345		34x sin scitula 1x?		
TAB 04-25	297.40	1573		12x sin scitula 1x?		dirty forams
TAB 04-26	300.10	1205		45x sin scitula		
TAB 05-01	14.10	1610		1x dex 26x sin scitula		
TAB 05-02	17.90	1560		29x sin scitula		
TAB 05-03	20.95	1136		46x sin scitula		
TAB 05-04	26.65	2981		4x sin scitula		
TAB 05-05	30.00	1085		29x sin scitula		
TAB 05-06	32.35	906		57x sin scitula 1xdex?		scitula acme
TAB 05-07	35.10	1165		47x sin scitula		
TAB 05-07B	40.95	1278		1x dex 20x sin scitula		
TAB 05-08	45.25	1290	1x sin menardii?	2x dex 16x sin scitula		sample fully checked
TAB 05-09	0.80	912	4x men5	4x dex 24x sin scitula	7x men5	
TAB 05-10	3.90	4460	5x dex 1x sin men5			
TAB 05-11	7.10	2535		6x sin scitula		s2
TAB 05-12	9.60	1436		35x dex 4x sin scitula 1x?		
TAB 05-13	13.45	1113		16x dex 45x sin scitula		
TAB 05-14	17.10	1770		3x dex 35x sin scitula		
TAB 05-15	20.05	2232		2x dex 42x sin scitula		
TAB 05-16	23.55	1778		2x dex 13x sin scitula		
TAB 05-16	23.55	1652		27x sin scitula		
TAB 05-17	27.07	1512		10x sin scitula		
TAB 05-18	47.17	990		14x sin scitula		
TAB 05-18	47.17	1984		10x sin scitula 1x?		
TAB 05-19	50.57	672		2x dex 28x sin scitula		
TAB 05-20	54.77	3280	12x menardii 5	8x dex 8x sin scitula		
TAB 05-20	54.77	2700	23x men5 2x?	3x sin 2x dex? scitula 4x?		
TAB 05-21	58.42	1080	1x dex? 10x sin keeled	2x dex 11x sin scitula		s2
TAB 06-01	0.01	2128	1x sin conomiozea	23x dex 31x sin scitula re-count 30x sin 22x dex sc 1x sin con		
TAB 06-02	2.90	1437	14x sin conomiozea	3x dex 30x sin scitula		
TAB 06-03	5.90	1110	1x sin 1x dex conomiozea?	2x dex 14x sin scitula		
TAB 06-03B	6.00	1428		39x sin scitula		

Appendix 3. Biostratigraphy

Sample	Strat lvl (m)	Forams checked	Species tray 1, keeled Globorotalids	Species tray 2, unkeeled Globorotalids	Additionally picked (non quant)	Comment
TAB 06-04	11.45	15				
TAB 06-05	14.85	3600	2x sin conomiozea			
TAB 06-06	19.00	682	20x sin conomiozea	4x dex 36x sin scitula 1x? recount 35x sin 3x dex sc 2x sin con		acme
TAB 06-07	22.40	4500	15x sin conomiozea	2x sin scitula		
TAB 06-08	26.15	3780	1x sin conomiozea	1x sin scitula		
TAB 06-09	29.00	2980				
TAB 06-10	32.05	438	68x sin 3x dex conomiozea	5x sin scitula recount 5x sin con or sin sc ???		maybe small scitulas are con?
TAB 06-11	34.80	1512	34x sin conomiozea	1x dex 6x sin scitula 5x? recount doubtful		
TAB 06-12	38.25	6945	5x sin conomiozea	1x sin scitula?		
TAB 06-13	41.20	4470		20x dex 2x sin scitula		
TAB 06-14	43.45	592.5	16x sin conomiozea	4x dex 2x sin scitula		
TAB 06-15	47.30	1730	21x sin 1x dex conomiozea	16x sin scitula ? recount doubtful		
TAB 06-16	49.65	3450	2x sin conomiozea	1x dex 1x sin scitula		
TAB 06-17	53.95	3390	6x sin conomiozea	20x dex 3x sin scitula		
TAB 06-18	56.70	1410	5x sin conomiozea	33x dex 2x sin scitula	2x sin conomiozea	
TAB 06-19	59.65	1596	62x sin conomiozea	1x dex scitula 1x?		
TAB 06-20	62.50	885	33x sin conomiozea	2x sin scitula? recount 2x sin con?		
TAB 06-21	66.25	648	62x sin 1x dex conomiozea	2x sin scitula? 10x? recount 12x sin con?		acme conomiozea
TAB 06-22	70.00	552	47x sin 1x dex conomiozea	1x dex 1x sin ? scitula 1x? recount 1x dex con? 2X sin con?		
TAB 06-23	76.60	1845	7x sin conomiozea	9x dex? 3x sin? Scitula recount 9x dex 3x sin sc		
TAB 06-24	80.00	880	36x sin 3x dex conomiozea	1x dex? scitula 10x? recount 1x dex 10x sin con?		
TAB 06-25	83.05	2150		9x dex 2x sin scitula 2x? recount 10x dex 1x sin sc 1x sin con?		
TAB 06-26	86.10	3240	30x sin conomiozea	2x sin scitula 2x? recount 1x sin sc 3x sin con?		
TAB 06-27	89.40	1485				
TAB 06-28	92.50	2475	1x sin conomiozea	2x? recount 1x dex sc 1x sin con		
TAB 06-29	95.05	4050	5x sin conomiozea 1x sin?	1x dex 4x sin scitula recount 4x sin sc 1x sin con		

Appendix 3. Biostratigraphy

Sample	Strat lvl (m)	Forams checked	Species tray 1, keeled Globorotalids	Species tray 2, unkeeled Globorotalids	Additionally picked (non quant)	Comment
TAB 06-30	97.00	3640	23x sin conomiozea	2x dex scitula? recount 1x dex sc 1x broken		
TAB 06-31	99.85	3765	1x sin conomiozea 1x sin?	4x dex scitula 3x dex? recount 5x dex sc 1x dex con		
TAB 06-32	103.75	3660	8x sin 1x dex conomiozea	2x dex? 2x sin? scitula 5x? recount 5x dex 3x sin sc 1x sin con		
TAB 06-33	109.00	921	39x sin 1x dex? conomiozea			
TAB 06-34	112.45	576	58x sin conomiozea	2x sin scitula? recount 2x sin con?		acme conomiozea
TAB 06-35	115.35	3465	3x sin conomiozea	13x dex scitula		
TAB 06-36	118.50	1305				dirty forams
TAB 06-37	123.45	2715	1x sin conomiozea	5x dex 1x sin? scitula		
TAB 06-38	144.25	3420	8x sin conomiozea	1x dex? Scitula recount 1x dex sc		
TAB 06-39	147.05	880	42x sin 1x dex conomiozea 1x?	1x dex? Scitula recount 1x dex con?		
TAB 06-40	149.80	1092	21x sin 1x dex conomiozea	5x sin + 9x sin scitula/conomiozea recount 1x sin sc 12x sin con?	1x sin conomiozea	
TAB 06-41	153.10	2400	1x sin conomiozea	1x dex 1x sin scitula 2x? recount 1x dex sc 1x sin con 1x?		
TAB 06-42	155.30	6280	9x sin conomiozea	3x dex scitula		
TAB 06-43	158.10	1002	59x sin 3x dex conomiozea	1x dex? 2x sin? scitula 4x? recount 2x sin sc 4x sin con? 1x dex con?		
TAB 06-44	160.30	808	43x sin 4x dex conomiozea	1x dex? 4x sin? scitula 4x? recount 6x sin sc 4x sin con		
TAB 06-45	163.20	1908	11x sin conomiozea	34x dex 9x sin scitula recount 38x dex 5x sin sc 2x sin con		
TAB 06-46	167.35	1134	38x sin conomiozea	3x dex 2x sin scitula		
TAB 06-47	171.35	627	54x sin conomiozea	1x dex? 4x sin? Scitula recount 3x sin con 1x dex con 1x?		
TAB 06-48	174.05	2460				
TAB 06-49	176.95	810	41x sin 3x dex conomiozea	1x dex? scitula		
TAB 06-50	179.55	2700	9x sin conomiozea	1x sin? scitula		
TAB 06-51	182.80	6225	7x sin conomiozea	3x sin scitula 1x? recount 2x sin sc 1x sin con 1x benthic		
TAB 06-52	186.65	1083	61x sin 1x dex conomiozea	4x? recount 4x?		
TAB 06-53	189.10	3345				

Appendix 3. Biostratigraphy

Sample	Strat lvl (m)	Forams checked	Species tray 1, keeled Globorotalids	Species tray 2, unkeeled Globorotalids	Additionally picked (non quant)	Comment
TAB 06-54	192.30	1120	33x sin conomiozea	1x sin? scitula 1x?		
TAB 06-55	194.55	1504	53x sin 3x dex conomiozea	1x dex? scitula		
TAB 06-56	197.10	728	41x sin conomiozea	1x dex? scitula 3x?		
TAB 07-01	197.55	3282	10x sin conomiozea	1x sin? scitula 1x?		
TAB 07-02	200.80	1670	46x sin 1x dex conomiozea	3x sin scitula 1x? recount 3x sin sc 1x sin con		
TAB 07-03	205.10	882	73x sin 1x dex conomiozea	3x sin scitula 5x? recount 8x sin con?		acme conomiozea
TAB 07-04	208.35	600	46x sin 1x dex conomiozea	7x? recount 7x sin con		acme conomiozea
TAB 07-05	211.60	1380	49x sin conomiozea	2x sin? scitula 2x? recount 4x sin con?		
TAB 07-06	214.45	1048	36x sin 3x dex conomiozea	2x? recount 2x sin con		
TAB 07-07	217.95	952	44x sin conomiozea	6x? recount 6x sin con		
TAB 07-08	223.90	1535	13x sin conomiozea			
TAB 07-09	226.25	3480	9x sin conomiozea			
TAB 07-10	229.10	3555	3x sin conomiozea			
TAB 07-11	238.00	796	46x sin 2x dex conomiozea	31x sin 1x dex scitula 6x? recount 33x sin sc 5x sin con?		globorotalia acme, many small
TAB 07-12	241.45	4290				
TAB 07-13	244.85	3945	19x sin 1x dex conomiozea	2x sin 1x dex scitula 1x?		s2
TAB 07-14	249.50	2595				
TAB 07-15	262.45	2655	1x sin 1x dex conomiozea	1x dex scitula		
TAB 07-16	265.25	1740	2x sin conomiozea			
TAB 07-17	268.20	4455		1x?		
TAB 07-18	270.70	4080	1x sin conomiozea			
TAB 07-19	273.45	3240				
TAB 07-20	276.60	3090				
TAB 07-21	278.35	840	41x sin 1x dex conomiozea	1x?		s2
TAB 07-22	282.45	3564				
TAB 07-23	285.60	4082		1x dex scitula		
TAB 07-24	288.25	1660	61x sin 4x dex conomiozea	5x? recount 5x sin con		
TAB 07-25	290.65	5685	18x sin conomiozea			
TAB 07-26	296.10	5530	20x sin 3x dex conomiozea			s2
TAB 07-27	299.70	5460	1x sin conomiozea			bit sandy forams
TAB 07-28	301.50	1036	56x sin conomiozea			
TAB 07-28B	304.10	2652	24x sin conomiozea	3x? recount 3x sin con		
TAB 07-29	306.85	3130	62x sin 1x dex conomiozea	12x dex 1x sin scitula		
TAB 07-30	309.35	3600	6x sin conomiozea	1x?		
TAB 07-31	313.10	7380	2x sin conomiozea	10x dex 1x sin scitula 1x?		

Appendix 3. Biostratigraphy

Sample	Strat lvl (m)	Forams checked	Species tray 1, keeled Globorotalids	Species tray 2, unkeeled Globorotalids	Additionally picked (non quant)	Comment
TAB 07-32	317.90	674	82x sin 4x dex conomiozea	1x dex scitula 6x? recount 4x sin con 1x dex sc		acme conomiozea
TAB 07-33	321.00	5820	6x sin 1x dex conomiozea			
TAB 07-34	324.65	3585	6x sin conomiozea			
TAB 07-35		2385	located above section in hinge syncline	still barren interval		