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N. Kottachchi, C.J. Schröder-Adams, J.W. Haggart, and J.E. Page

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Lower and Middle Jurassic Foraminifera of Queen Charlotte Islands, British Columbia: raw data and preliminary results

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INTRODUCTION

The Queen Charlotte Islands archipelago includes more than 125 islands located off the west coast of British Columbia, Canada, between latitudes 52˚N and 55˚N (Fig. 1). The islands are part of the allochthonous Wrangell terrane of the Insular Belt of western North America and are composed of Paleozoic and Mesozoic granitic, volcanic, and sedimentary rocks (Fig. 1) (Haggart et al., 1995). The Mesozoic strata of Queen Charlotte Islands are exceptionally well-developed, and serve as an important Mesozoic reference section for the northeast Pacific region and for correlation with European type sections (Haggart et al., 1995).

The senior author studied a collection of approximately 1020 picked foraminiferal microslides, collected mainly by B.E.B. Cameron, formerly of the Geological Survey of Canada. This study formed a component of a Master of Science thesis (Kottachchi, 2001). The collection contains Lower to Middle Jurassic benthic calcareous and agglutinated foraminifera collected from Maude Island, Skidegate Inlet, along the northern shore of Moresby Island, from the central regions of Graham Island, and along the shore of Cumshewa Inlet (Fig. 1). Results of this analysis are presented in Kottachchi et al. (2002). This contribution provides supplementary documentation to that report, and includes complete sample locality numbers (Appendix 1) assigned by the Geological Survey of Canada, lithostratigraphic columns (Appendix 2), and foraminiferal range charts (Appendix 3). We refer to Kottachchi et al. (2002) for paleoenvironmental and paleogeographical interpretations. A detailed taxonomic treatment of the foraminifera will form a future study.

The Locality Data chart (Appendix 1) lists GSC Locality collection numbers. A total of 66 locality collections were made from 13 different measured stratigraphic sections (sections 4, 5, 7-12, 14-17, 19). The remainder of the sample localities represent sites where samples were collected randomly (spot sampling) from stratigraphic sections, or from isolated exposures without precise interval data. Foraminiferal range charts and lithostratigraphic sections are included only for the 13 stratigraphic sections.

This study of Jurassic foraminifera of the Queen Charlotte Islands was undertaken to address the following problems (Kottachchi et al., 2002).

1. Previous biostratigraphic schemes for the Jurassic strata of Queen Charlotte Islands have primarily utilized ammonites and trigoniid bivalves (Poulton and Tipper, 1988; Tipper et al., 1988; Pálfy et al., 1994; Smith and Tipper, 1996) and radiolarians (Carter, 1988; Carter et al., 1988 and 1998) (summarized in Haggart et al., 1995); there is little published information on the Jurassic foraminiferal faunas present on the islands (Cameron and Tipper, 1985; Tipper et al., 1991). Our study documents biostratigraphic ranges for foraminifera of the Lower Jurassic to lowermost Middle Jurassic upper Kunga and Maude groups, and the Middle Jurassic Yakoun and Moresby groups (Fig. 2).

2. The islands, as part of the Wrangell terrane, are interpreted to have been located at equatorial to low-temperate latitudes during Triassic times (Haggart et al., 1995). Although migration of Wrangellia northward along the western margin of North America to its present position occurred during later Mesozoic times, debate has centered on the precise time of arrival and amalgamation of Wrangellia with the rest of North America. Changes in benthic foraminiferal faunal assemblages in Jurassic strata of Queen Charlotte Islands were examined in light of this debate. In a general way, the data support the interpretation that Wrangell terrane was at relatively high latitudes by Middle Jurassic. To be truly informative, however, paleogeographic discussions must consider paleoenvironmental changes linked to global and local sea-level history. To address this problem, the lithology and microfossil content of Jurassic strata of Queen Charlotte Islands was compared and roughly calibrated with the Jurassic global sea-level curve of Haq et al. (1988).

Future work on Jurassic foraminiferal assemblages of the Queen Charlotte Islands will require detailed taxonomic analysis to fully describe the large number of species present and to reassess true

species diversity. Comparisons with other Jurassic strata will be required to distinguish between indigenous and cosmopolitan species, as well as their paleoecological significance. In addition, foraminiferal faunas must be evaluated with respect to their contribution to sequence stratigraphic analysis of this region.

ACKNOWLEDGMENTS

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REFERENCES

Cameron, B.E.B. and Tipper, H.W.

1985: Jurassic stratigraphy of the Queen Charlotte Islands, British Columbia; Geological Survey of Canada, Bulletin 365, 49 p.

Carter, E.S.

1988: Radiolarian studies in the Queen Charlotte Islands, British Columbia; *in* Current Research, Part E; Geological Survey of Canada, Paper 88-1E, p. 235-238.

Carter, E.S., Cameron, B.E.B., and Smith, P.L.

1988: Lower and Middle Jurassic radiolarian biostratigraphy and systematic paleontology, Queen Charlotte Islands, British Columbia; Geological Survey of Canada, Bulletin 386, 109 p.

Carter, E.S., Whalen, P.A., and Guex, J.

1998: Biochronology and paleontology of Lower Jurassic (Hettangian and Sinemurian) radiolarians, Queen Charlotte Islands, British Columbia; Geological Survey of Canada, Bulletin 496, 162 p.

Haggart, J.W., Orchard, M.J., and Jakobs, G.K.

1995: Mesozoic Stratigraphy and Paleontology of Haida Gwaii (Queen Charlotte Islands): Basis for Tectonic Interpretations; Geological Association of Canada/Mineralogical Association of Canada, Joint Annual Meeting, Victoria, 1995, Field Trip Guidebook B4, 123 p.

Haq, B.U., Hardenbol, J., and Vail, P.R.

1988: Mesozoic and Cenozoic chronostratigraphy and eustatic cycles. Part II: sea-level changes and sequence stratigraphy; *in* Sea-Level Changes: an Integrated Approach, (ed.) C.K. Wilgus, B.S. Hastings, C.G. Kendall, H.W. Posamentier, H.W., C.A. Ross, and J.C.V. Wagoner; Society of Economic Paleontologists and Mineralogists, Special Publication 2, p. 71-101.

Kottachchi, N.

2001: Jurassic Foraminifera from the Queen Charlotte Islands, British Columbia: biostratigraphy, paleoenvironments and paleogeographic implications; M.Sc. thesis, Carleton University, Ottawa, Ontario, 102 p.

Kottachchi, N., Schröder-Adams, C.J., Haggart, J.W., and Tipper, H.W.

2002: Jurassic Foraminifera from the Queen Charlotte Islands, British Columbia, Canada: biostratigraphy, paleoenvironments and paleogeographic implications; *in* Head, M.J. and Beaudoin, A.B., eds., *New Frontiers and Applications in Palynology and Micropaleontology; a Canadian Perspective*; Palaeogeography, Palaeoclimatology, Palaeoecology, v. 180, no. 1/3, pp. 93-127.

Pálfy, J., Smith, P.L., and Tipper, H.W.

1994: Sinemurian (Lower Jurassic) ammonoid biostratigraphy of the Queen Charlotte Islands, western Canada; Geobios, Special Memoir 17, p. 385-393.

Patterson, R.T.

1990: A progress report on late Quaternary benthic foraminifera from the central continental shelf of western Canada; *in* Current Research, Part F; Geological Survey of Canada, Paper 90-1F, p. 83-86.

Poulton, T.P. and Tipper, H.W.

1988: New developments and current research on Middle Jurassic ammonite biostratigraphy, Queen Charlotte Islands, British Columbia; *in* Current Research, Part E; Geological Survey of Canada, Paper 88-1E, p. 233.

Smith, P.L. and Tipper, H.W.

1996: Pliensbachian (Lower Jurassic) ammonites of the Queen Charlotte Islands, British Columbia; Bulletins of American Paleontology 108, 122 p.

Tipper, H.W., Smith, P.L., and Jakobs, G.

1988: A note on the status of Lower Jurassic ammonite biostratigraphy and paleontology of Queen Charlotte Islands, British Columbia; *in* Current Reseach, Part E; Geological Survey of Canada, Paper 88-1E, p. 231.

Tipper, H.W., Smith, P.L., Cameron, B.E.B., Carter, E.S., Jakobs, G.K., and Johns, M.J.

1991: Biostratigraphy of the Lower Jurassic formations of the Queen Charlotte Islands, British Columbia; *in* Evolution and Hydrocarbon Potential of the Queen Charlotte Basin, British Columbia, (ed.) G.J. Woodsworth; Geological Survey of Canada, Paper 90-10, p. 203-235.

FIGURE CAPTIONS

Figure 1. Generalized locality (inset) and geologic map of the Queen Charlotte Islands (modified from Patterson, 1990 and Haggart et al., 1995, respectively).

Figure 2. Summary of Lower and Middle Jurassic stratigraphy, Queen Charlotte Islands, British Columbia (modified from Cameron and Tipper, 1985).

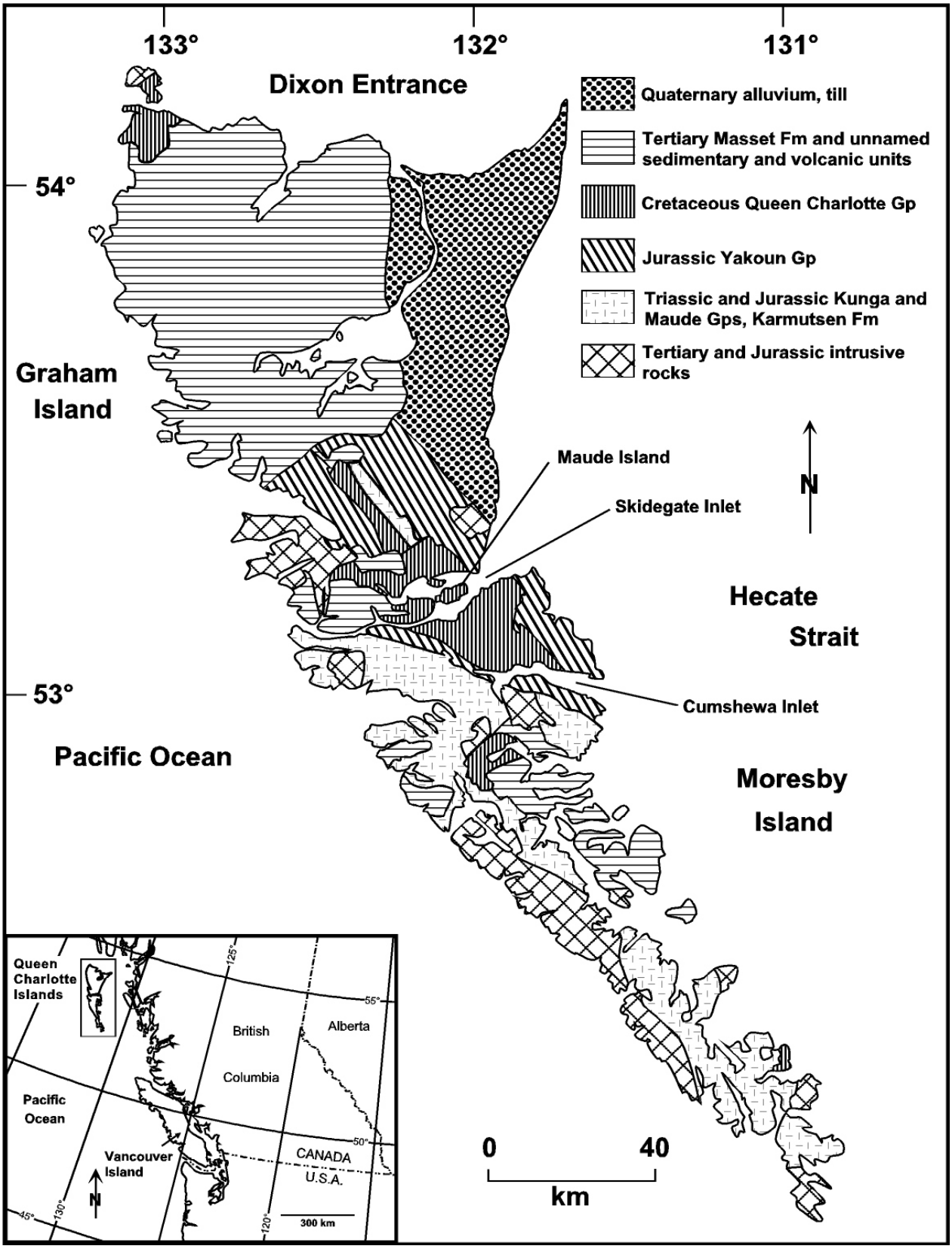

133°
132°
131°
Dixon Entrance
54°
Graham Island
Quaternary alluvium, till
Tertiary Masset Fm and unnamed sedimentary and volcanic units
Cretaceous Queen Charlotte Gp
Jurassic Yakoun Gp
Triassic and Jurassic Kunga and Maude Gps, Karmutsen Fm
Tertiary and Jurassic intrusive rocks
Maude Island
Skidegate Inlet
N
Hecate Strait
53°
Cumshewa Inlet
Pacific Ocean
Moresby Island
Queen Charlotte Islands
British Columbia
Alberta
Pacific Ocean
Vancouver Island
CANADA
U.S.A.
N
300 km
0
40
km

FIGURE 1

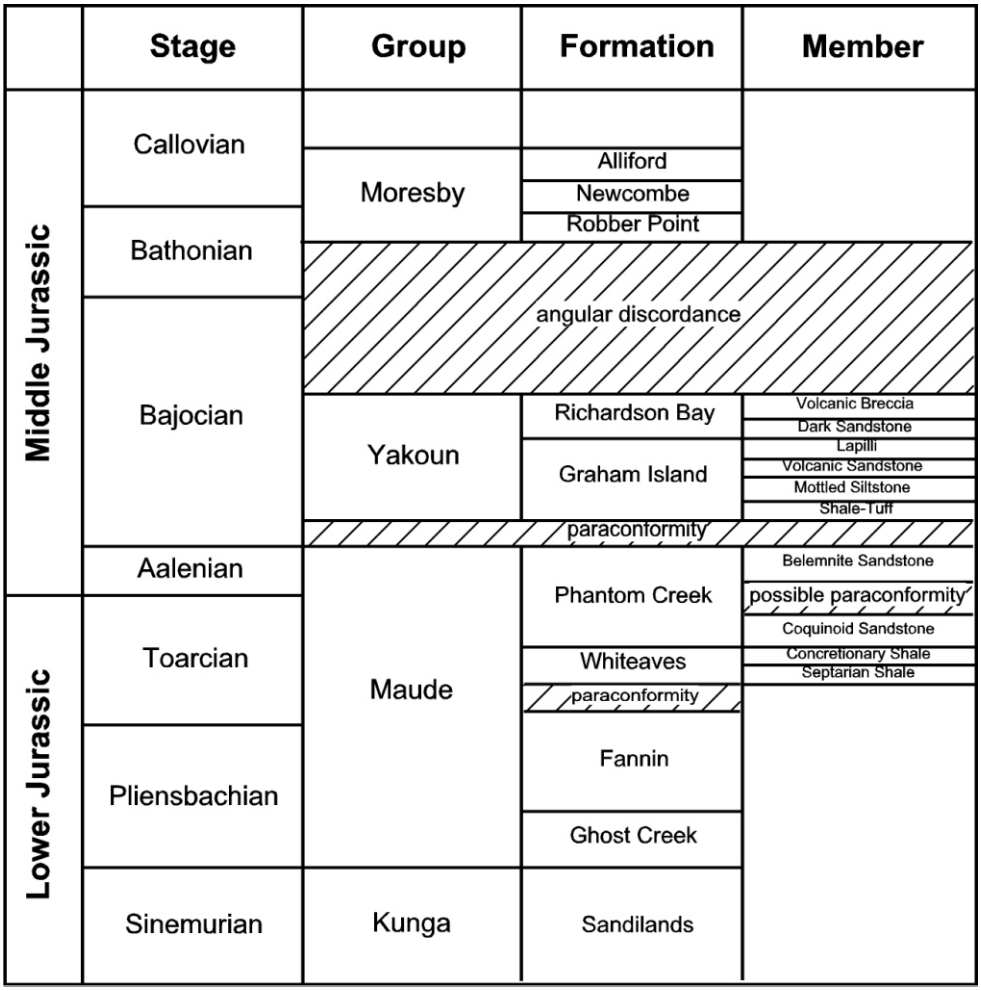


Figure 2. Jurassic stratigraphic units, Queen Charlotte Islands, British Columbia

Appendix 1 - Locality Data

Sample #	UTM		GSC Loc #	Formation	Interval (m) Bottom	Top	Box
SECTION 4 (NTS: 103F/1; UTM Range 695900E to 696400E, 5898100N to 5898400N)							
1	695900	5898400	C-172533	Whiteaves	156.35	157.88	7
2	696000	5898400	C-172534	Whiteaves	151.78	155.75	7
3	696000	5898400	C-172535	Whiteaves	148.74	151.48	7
4	696000	5898400	C-172536	Whiteaves	145.69	148.43	7
5	696000	5898400	C-172537	Whiteaves	142.64	145.38	7
6	696000	5898400	C-172538	Whiteaves	139.90	142.33	7
7	696000	5898400	C-172539	Whiteaves	130.45	138.37	7
8	696100	5898300	C-172541	Whiteaves	128.92	130.45	7
9	696100	5898300	C-172542	Fannin	126.79	128.62	7
10	696100	5898300	C-181641	Fannin	92.35	93.87	16
11	696300	5898200	C-172546	Ghost Creek	40.54	41.76	18
12	696400	5898100	C-172547	Ghost Creek	7.01	8.23	4
13	696400	5898100	C-172548	Ghost Creek	3.05	3.96	4
SECTION 5 (NTS: 103F/1; UTM Range 697300E to 697400E, 5898500N to 5898600N)							
1	697300	5898600	C-172519	Phantom Creek	42.97	44.19	7
2	697400	5898500	C-172512	Phantom Creek	42.97	44.19	7
3	697300	5898600	C-172503	Whiteaves	35.05	36.57	7
4	697400	5898500	C-172513	Whiteaves	33.53	35.05	7
5	697300	5898600	C-172504	Whiteaves	30.48	31.39	7
6	697400	5898500	C-172514	Whiteaves	25.91	27.43	7
7	697300	5898600	C-172505	Whiteaves	24.99	26.52	7
8	697300	5898600	C-172506	Whiteaves	20.12	21.94	7
9	697300	5898600	C-172520	Whiteaves	19.20	21.94	7
10	697400	5898500	C-172515	Whiteaves	18.29	19.81	7
11	697400	5898600	C-172507	Whiteaves	15.24	19.20	7
12	697400	5898600	C-172508	Whiteaves	12.50	14.93	7
13	697400	5898500	C-172509	Whiteaves	9.14	12.19	7
14	697400	5898500	C-172516	Whiteaves	9.14	10.67	4
15	697400	5898500	C-172517	Whiteaves	4.57	6.10	7
16	697400	5898500	C-172510	Whiteaves	3.96	6.10	7
17	697400	5898500	C-172521	Whiteaves	2.44	4.88	7
18	697400	5898500	C-172518	Whiteaves	1.52	3.05	7
19	697400	5898500	C-172511	Whiteaves	1.22	3.96	7
SECTION 7 (NTS: 103F/1; UTM Range 698900E, 5897000N to 5897300N)							
1	698900	5897200	C-172783	Whiteaves	112.77	114.29	9
2	698900	5897300	C-172800	Whiteaves	112.16	114.60	9
3	698900	5897300	C-172795	Whiteaves	104.54	106.07	9
4	698900	5897300	C-172781	Whiteaves	102.41	103.32	9
5	698900	5897300	C-172780	Whiteaves	100.27	101.49	9
6	698900	5897300	C-172793	Whiteaves	99.97	100.58	9
7	698900	5897300	C-172791	Whiteaves	99.06	99.97	9
8	698900	5897300	C-172790	Whiteaves	97.84	99.06	9
9	698900	5897300	C-172788	Whiteaves	93.87	94.79	9
10	698900	5897300	C-172779	Whiteaves	93.57	94.48	9

Appendix 1 - Locality Data

Sample #	UTM		GSC Loc #	Formation	Interval (m) Bottom	Top	Box
11	698900	5897300	C-172787	Whiteaves	92.35	93.87	9
12	698900	5897300	C-172778	Whiteaves	92.05	93.57	9
13	698900	5897300	C-172786	Whiteaves	91.74	92.35	9
14	698900	5897200	C-172777	Whiteaves	90.52	92.05	9
15	698900	5897300	C-172785	Whiteaves	89.61	90.52	9
16	698900	5897200	C-172784	Fannin	87.78	88.39	9
17	698900	5897200	C-172776	Fannin	87.17		9
18	698900	5897200	C-172775	Fannin	85.34	86.86	9
19	698900	5897200	C-181675	Fannin	78.63	80.77	16
20	698900	5897200	C-172774	Fannin	78.02		16
21	698900	5897200	C-172810	Fannin	72.54	73.76	16
22	698900	5897200	C-172809	Fannin	72.23	72.54	16
23	698900	5897200	C-172808	Fannin	71.32		16
24	698900	5897200	C-172807	Fannin	68.58	70.10	16
25	698900	5897200	C-172806	Fannin	65.53	66.44	16
26	698900	5897200	C-172805	Fannin	64.00	64.61	16
27	698900	5897200	C-172804	Fannin	63.40	64.00	16
28	698900	5897100	C-172803	Fannin	59.74	61.87	16
29	698900	5897100	C-172802	Fannin	56.99	59.13	16
30	698900	5897100	C-172801	Fannin	54.25	55.47	16
31	698900	5897100	C-172772	Fannin	53.03		18
32	698900	5897100	C-172770	Fannin	41.76		18
33	698900	5897100	C-080614	Fannin	32.00	35.36	18
34	698900	5897100	C-172767	Fannin	32.00	35.36	18
35	698900	5897100	C-172766	Fannin	28.95	32.00	18
36	698900	5897000	C-172765	Ghost Creek	21.94	28.95	4
37	698900	5897000	C-172764	Ghost Creek	19.20	21.94	4
38	698900	5897000	C-172763	Ghost Creek	16.15	19.20	4
39	698900	5897000	C-172762	Ghost Creek	13.41	16.15	4
40	698900	5897000	C-172761	Ghost Creek	9.45	13.41	4
41	698900	5897000	C-172760	Ghost Creek	6.10	9.14	4
42	698900	5897000	C-172759	Ghost Creek	3.05	6.10	4
43	698900	5897000	C-172758	Ghost Creek	0.00	3.05	4
SECTION 8 (NTS: 103F/1; 696100E to 696600E, 5897700N to 5898100N)							
1	696600	5898100	C-172614	Fannin	110.64		1
2	696600	5898100	C-172615	Fannin	110.03		16
3	696600	5898100	C-172616	Fannin	107.28		16
4	696600	5898100	C-172613	Fannin	100.58	102.10	1, 16
5	696600	5898000	C-172612	Fannin	97.53	100.58	16
6	696500	5898000	C-172611	Fannin	94.48	97.53	16
7	696500	5897900	C-172610	Fannin	91.74	94.48	16
8	696500	5897900	C-172609	Fannin	88.39	91.74	16
9	696500	5897900	C-172608	Fannin	85.34	88.39	1, 16
10	696400	5897900	C-172607	Fannin	82.29	85.34	1, 16
11	696400	5897900	C-172606	Fannin	79.24	82.29	1, 16
12	696400	5897900	C-172605	Fannin	76.81	79.24	16
13	696400	5897900	C-172604	Fannin	76.20	76.81	16

Appendix 1 - Locality Data

Sample #	UTM		GSC Loc #	Formation	Interval (m) Bottom	Top	Box
14	696400	5897900	C-172603	Fannin	74.67	76.20	16
15	696400	5897900	C-172602	Fannin	73.15	74.67	16
16	696400	5897900	C-172601	Fannin	71.62	73.15	16
17	696400	5897900	C-172600	Fannin	70.10	71.62	1, 16
18	696400	5897800	C-172599	Fannin	68.58	70.10	16
19	696400	5897800	C-172598	Fannin	67.05	68.58	16
20	696400	5897800	C-172597	Fannin	65.53	67.05	18
21	696400	5897800	C-172596	Fannin	64.00	65.53	1, 18
22	696400	5897800	C-172595	Fannin	62.48	64.00	1, 18
23	696400	5897800	C-172591	Fannin	57.91	59.43	1, 18
24	696400	5897800	C-172590	Fannin	56.39	57.91	18
25	696300	5897800	C-172589	Fannin	54.86	56.39	18
26	696300	5897800	C-172588	Fannin	53.34	54.86	1, 18
27	696300	5897800	C-172587	Fannin	51.81	53.34	1, 18
28	696300	5897800	C-172586	Fannin	50.29	51.81	18
29	696300	5897800	C-172585	Fannin	48.77	50.29	18
30	696300	5897800	C-172584	Fannin	47.24	48.77	18
31	696300	5897800	C-172579	Ghost Creek	39.62	41.15	4
32	696300	5897800	C-172578	Ghost Creek	38.10	39.62	4
33	696300	5897800	C-172577	Ghost Creek	36.57	38.10	4
34	696300	5897800	C-172576	Ghost Creek	35.05	36.57	4
35	696300	5897800	C-172575	Ghost Creek	33.53	35.05	4
36	696300	5897800	C-172574	Ghost Creek	32.00	33.53	1, 4
37	696300	5897800	C-172573	Ghost Creek	30.48	32.00	1
38	696300	5897800	C-172572	Ghost Creek	28.95	30.48	1, 4
39	696200	5897800	C-172571	Ghost Creek	27.43	28.95	4
40	696200	5897700	C-172570	Ghost Creek	25.91	27.43	4
41	696200	5897700	C-172569	Ghost Creek	24.99		4
42	696200	5897700	C-172568	Ghost Creek	24.38	25.91	4
43	696200	5897700	C-172566	Ghost Creek	21.33	22.86	4
44	696200	5897700	C-172565	Ghost Creek	19.81	21.33	4
45	696200	5897700	C-172564	Ghost Creek	18.29	19.81	14
46	696200	5897700	C-172563	Ghost Creek	16.76	18.29	14
47	696200	5897700	C-172562	Ghost Creek	15.24	16.76	14
48	696200	5897700	C-172561	Ghost Creek	13.72	15.24	14
49	696100	5897700	C-172560	Ghost Creek	12.19	13.72	14
50	696100	5897700	C-172559	Ghost Creek	10.67	12.19	14
51	696100	5897700	C-172558	Ghost Creek	9.14	10.67	14
52	696100	5897700	C-172557	Ghost Creek	7.62	9.14	11
53	696100	5897700	C-172555	Ghost Creek	6.10	7.62	11
54	696100	5897700	C-172554	Ghost Creek	4.57	6.10	11
55	696100	5897700	C-172552	Ghost Creek	1.52	3.05	11
56	696100	5897700	C-181726?	Ghost Creek	0.00	3.05	4
57	696100	5897700	C-172551	Ghost Creek	0.00	0.00	11
SECTION 9 (NTS: 103F/1; UTM 696400E, 5898400N)							
1	696400	5898400	C-172522	Fannin	34.14	35.66	16
2	696400	5898400	C-172523	Fannin	31.09	32.00	16

Appendix 1 - Locality Data

Sample #	UTM		GSC Loc #	Formation	Interval (m) Bottom	Top	Box
3	696400	5898400	C-172524	Fannin	30.17		16
4	696400	5898400	C-172525	Fannin	21.94		16
5	696400	5898400	C-172526	Fannin	21.64		16
SECTION 10 (NTS: 103F/8; UTM Range 681500E to 682100E, 5917700N)							
1	682100	5917700	C-127914	Graham Island	384.03	387.08	17
2	681900	5917700	C-127918	Graham Island	316.67	320.02	17
3	682100	5917700	C-127920	Graham Island	276.14	277.96	17
4	681900	5917700	C-080588	Graham Island	275.83	277.66	17
5	682100	5917700	C-127921	Graham Island	266.69	271.26	17
6	698900	5897200	C-127810	Graham Island	266.69	269.13	17
7	681900	5917700	C-080587	Graham Island	261.20	263.64	17
8	681900	5917700	C-127811	Graham Island	258.46	260.59	17
9	682100	5917700	C-127922	Graham Island	258.15	262.12	17
10	682100	5917700	C-127923	Graham Island	250.84	254.19	17
11	681800	5917700	C-127883	Whiteaves	207.86	209.08	12
12	681800	5917700	C-127814	Whiteaves	207.56	208.78	12
13	681800	5917700	C-127815	Whiteaves	199.02	201.16	12
14	681800	5917700	C-127816	Whiteaves	196.59	197.20	12
15	681800	5917700	C-127817	Whiteaves	190.49	192.01	12
16	681800	5917700	C-127884	Whiteaves	188.05	197.20	12
17	681800	5917700	C-127818	Whiteaves	187.75	188.97	12
18	681800	5917700	C-127819	Whiteaves	185.00	186.22	12
19	681800	5917700	C-127885	Whiteaves	182.87	185.00	12
20	681800	5917700	C-127820	Whiteaves	174.95	176.78	12
21	681800	5917700	C-127821	Whiteaves	171.90	173.42	12
22	681800	5917700	C-127822	Whiteaves	168.55	170.07	12
23	681800	5917700	C-127823	Whiteaves	164.89	166.41	1, 12
24	681800	5917700	C-127824	Whiteaves	163.67	164.58	1, 12
25	681800	5917700	C-127825	Whiteaves	160.01	161.23	12
26	681700	5917700	C-127886	Whiteaves	154.83	157.57	12
27	681700	5917700	C-127826	Whiteaves	153.92	155.44	12
28	681700	5917700	C-127827	Whiteaves	152.39	153.61	12
29	681700	5917700	C-127887	Whiteaves	150.87	153.00	12
30	681700	5917700	C-127828	Whiteaves	150.87	153.00	12
31	681700	5917700	C-127829	Whiteaves	141.73	143.25	12
32	681700	5917700	C-127888	Whiteaves	134.11	135.93	12
33	681700	5917700	C-127889	Whiteaves	131.67	133.50	12
34	681700	5917700	C-127890	Whiteaves	130.14	131.36	12
35	681600	5917700	C-127837	Fannin	103.63		18
36	681600	5917700	C-127838	Fannin	100.58		18
37	681600	5917700	C-127836	Fannin	98.45	99.36	18
38	681600	5917700	C-127839	Fannin	98.14		18
39	681600	5917700	C-080613	Fannin	93.57		18
40	681600	5917700	C-127840	Fannin	93.57		18
41	681600	5917700	C-127841	Fannin	89.00		18
42	681600	5917700	C-127893	Fannin	88.08	88.69	18
43	681600	5917700	C-127894	Fannin	85.64	86.86	18

Appendix 1 - Locality Data

Sample #	UTM		GSC Loc #	Formation	Interval (m) Bottom	Top	Box
44	681600	5917700	C-127895	Fannin	84.12	85.04	18
45	681600	5917700	C-127843	Fannin	83.82		18
46	681600	5917700	C-127844	Fannin	82.29		18
47	681600	5917700	C-127896	Fannin	81.99	82.9	18
48	681600	5917700	C-127845	Fannin	81.07		18
49	681600	5917700	C-127846	Fannin	79.85		18
50	681600	5917700	C-127897	Fannin	78.94	79.85	18
51	681600	5917700	C-127847	Fannin	78.02		18
52	681600	5917700	C-127925	Fannin	76.20		18
53	681600	5917700	C-127848	Fannin	74.67		18
54	681600	5917700	C-127849	Fannin	73.15		18
55	681600	5917700	C-127850	Ghost Creek	67.36		14
56	681600	5917700	C-127851	Ghost Creek	64.31		14
57	681600	5917700	C-127927	Ghost Creek	64.00		14
58	681600	5917700	C-127852	Ghost Creek	61.87		14
59	681600	5917700	C-127928	Ghost Creek	60.96		14
60	681600	5917700	C-127853	Ghost Creek	57.91		14
61	681600	5917700	C-127854	Ghost Creek	56.39		14
62	681600	5917700	C-127929	Ghost Creek	54.86		14
63	681600	5917700	C-127855	Ghost Creek	52.12	53.34	14
64	681600	5917700	C-127856	Ghost Creek	48.77		14
65	681600	5917700	C-127857	Ghost Creek	46.94	48.16	14
66	681600	5917700	C-127858	Ghost Creek	44.19	45.11	14
67	681600	5917700	C-127859	Ghost Creek	41.15	42.06	14
68	681600	5917700	C-127860	Ghost Creek	36.57	37.79	14
69	681600	5917700	C-127861	Ghost Creek	35.05	35.96	14
70	681600	5917700	C-127862	Ghost Creek	33.53	34.44	14
71	681600	5917700	C-127863	Ghost Creek	30.48	32.00	14
72	681600	5917700	C-181776	Ghost Creek	29.87	31.09	14
73	681600	5917700	C-127864	Ghost Creek	28.95	29.87	14
74	681600	5917700	C-127865	Ghost Creek	26.82	27.74	14
75	681500	5917700	C-127931	Ghost Creek	25.91		14
76	681600	5917700	C-127866	Ghost Creek	24.38	25.6	14
77	681500	5917700	C-127932	Ghost Creek	21.33		14
78	681600	5917700	C-127867	Ghost Creek	5.79		14
79	681500	5917700	C-127898	Ghost Creek	5.49	6.10	14
80	681600	5917700	C-127868	Ghost Creek	5.18		14
81	681500	5917700	C-127899	Ghost Creek	3.96	4.57	14
82	681500	5917700	C-127933	Ghost Creek	3.05		4
83	681500	5917700	C-127900	Ghost Creek	2.44	3.05	14
SECTION 11 (NTS: 103F/8; UTM Range 681500E, 5921900N to 5922000N)							
1	681500	5922000	C-172336	Whiteaves	45.72	48.77	13
2	681500	5922000	C-172335	Whiteaves	43.89	46.33	13
3	681500	5922000	C-172334	Whiteaves	40.54	42.67	13
4	681500	5922000	C-172333	Whiteaves	37.79	39.93	13
5	681500	5922000	C-172332	Whiteaves	36.57		13
6	681500	5922000	C-172331	Whiteaves	35.96		13

Appendix 1 - Locality Data

Sample #	UTM		GSC Loc #	Formation	Interval (m) Bottom	Top	Box
7	681500	5922000	C-172330	Whiteaves	35.36		13
8	681500	5922000	C-172320	Whiteaves	33.53		12
9	681500	5922000	C-172328	Whiteaves	32.61	35.05	13
10	681500	5922000	C-172319	Whiteaves	31.09		12
11	681500	5922000	C-172327	Whiteaves	28.95	32.00	13
12	681500	5922000	C-172318	Whiteaves	28.65		12
13	681500	5921900	C-172317	Whiteaves	25.91		12
14	681500	5922000	C-172326	Whiteaves	24.69	27.74	13
15	681500	5921900	C-172316	Whiteaves	23.47		12
16	681500	5921900	C-172325	Whiteaves	21.33	23.77	13
17	681500	5921900	C-172315	Whiteaves	20.73		12
18	681500	5921900	C-172324	Whiteaves	18.29	20.73	12
19	681500	5921900	C-172314	Whiteaves	18.29		12
20	681500	5921900	C-172313	Whiteaves	15.54		12
21	681500	5921900	C-172312	Whiteaves	13.11		12
22	681500	5921900	C-172323	Whiteaves	12.19	13.72	12
23	681500	5921900	C-172311	Whiteaves	10.36		12
24	681500	5921900	C-172310	Whiteaves	7.92		12
25	681500	5921900	C-172322	Whiteaves	6.10	8.23	12
26	681500	5921900	C-172309	Whiteaves	5.18		12
27	681500	5921900	C-172308	Whiteaves	2.74		12
28	681500	5921900	C-172307	Whiteaves	0.00		12
SECTION 12 (103F/8; UTM Range 682000E to 682050E, 5922550N)							
1	682000	5922550	C-172667	Phantom Creek	32.00	33.53	3
2	682000	5922550	C-172617	Phantom Creek	30.48	31.39	3
3	682000	5922550	C-172632	Phantom Creek	28.95	30.17	3
4	682000	5922550	C-181793	Phantom Creek	27.43	28.95	3
5	682000	5922550	C-172631	Phantom Creek	27.43	28.35	3
6	682000	5922550	C-172618	Phantom Creek	25.91	26.82	3
7	682000	5922550	C-172668	Phantom Creek	22.86	24.38	3
8	682000	5922550	C-080584	Phantom Creek	21.94	22.86	3
9	682000	5922550	C-172619	Phantom Creek	21.33	22.25	3
10	682000	5922550	C-172630	Phantom Creek	19.81	20.73	3
11	682000	5922550	C-080583	Phantom Creek	18.29	19.81	3
12	682000	5922550	C-172629	Phantom Creek	17.98	19.2	3
13	682050	5922550	C-172669	Phantom Creek	16.76	18.29	3
14	682000	5922550	C-172620	Phantom Creek	16.15	17.07	3
15	682050	5922550	C-080582	Phantom Creek	13.11	14.02	3
16	682000	5922550	C-172628	Phantom Creek	12.19	13.11	3
17	682050	5922550	C-181795	Phantom Creek	11.89	12.8	3
18	682050	5922550	C-172670	Phantom Creek	10.67	12.19	3
19	682000	5922550	C-172621	Phantom Creek	10.67	11.58	3
20	682050	5922550	C-172627	Whiteaves	8.53	9.14	7
21	682000	5922550	C-172622	Whiteaves	6.10	7.62	7
22	682000	5922550	C-172623	Whiteaves	4.57	5.79	7
23	682050	5922550	C-172625	Whiteaves	3.05	4.27	7
24	682050	5922550	C-172624	Whiteaves	1.52	2.44	7

Appendix 1 - Locality Data

Sample #	UTM		GSC Loc #	Formation	Interval (m) Bottom	Top	Box
25	682050	5922550	C-172626	Whiteaves	0.00	0.91	7
SECTION 14 (103F/8; UTM Range 681300E to 681800E, 5919100N)							
1	681800	5919100	C-172337	Graham Island	290.16	291.07	17
2	681800	5919100	C-172338	Graham Island	260.59	271.26	17
3	681700	5919100	C-172401	Graham Island	230.11	231.64	17
4	681700	5919100	C-172402	Graham Island	211.83	213.35	17
5	681500	5919100	C-080593	Graham Island	192.01	193.54	17
6	681600	5919100	C-172403	Graham Island	187.44	188.97	17
7	681600	5919100	C-172404	Graham Island	183.79	184.70	17
8	681600	5919100	C-172405	Graham Island	182.87	183.48	17
9	681600	5919100	C-172341	Graham Island	179.21	180.43	17
10	681600	5919100	C-172342	Graham Island	176.47	177.69	17
11	681600	5919100	C-172406	Graham Island	167.63	168.85	17
12	681600	5919100	C-172343	Graham Island	161.54	162.76	17
13	681600	5919100	C-172344	Graham Island	158.18	159.71	17
14	681600	5919100	C-172407	Graham Island	157.88	159.40	17
15	681600	5919100	C-172408	Graham Island	153.92	155.44	17
16	681600	5919100	C-172346	Graham Island	150.87	152.39	17
17	Unknown	Unknown	C-172409	Graham Island	143.25	144.77	17
18	681500	5919100	C-172349	Graham Island	134.11	137.15	17
19	681500	5919100	C-172350	Graham Island	132.58	134.11	17
20	681500	5919100	C-172351	Graham Island	129.53	131.06	17
21	681500	5919100	C-172352	Graham Island	124.96	126.49	17
22	681500	5919100	C-172411	Graham Island	124.96	126.49	17
23	681500	5919100	C-172412	Graham Island	124.96	126.49	17
24	681500	5919100	C-172353	Graham Island	121.91	123.44	17
25	681500	5919100	C-172329	Graham Island	118.87	120.39	17
26	681500	5919100	C-172354	Graham Island	118.87	120.39	17
28	681500	5919100	C-172413	Graham Island	118.87	120.09	17
29	681500	5919100	C-172416	Graham Island	110.03	112.47	17
30	681500	5919100	C-172357	Graham Island	108.20	109.72	17
31	681500	5919100	C-172417	Graham Island	105.76	109.72	17
32	681500	5919100	C-172358	Graham Island	103.63	105.15	17
33	681500	5919100	C-080592	Graham Island	103.02	103.63	17
34	681500	5919100	C-172418	Graham Island	101.49	104.54	17
35	681500	5919100	C-172419	Graham Island	99.36	101.19	17
36	681500	5919100	C-172420	Graham Island	95.09	98.14	17
37	681500	5919100	C-172363	Graham Island	78.33	79.55	17
38	681400	5919100	C-172364	Graham Island	73.15	74.67	17
39	681400	5919100	C-172422	Graham Island	72.84	74.67	17
40	681400	5919100	C-172365	Graham Island	71.62		17
41	681400	5919100	C-172400	Graham Island	70.1	72.23	17
42	681400	5919100	C-172383	Whiteaves	54.56		13
43	681400	5919100	C-172366	Whiteaves	53.34		13
44	681400	5919100	C-172384	Whiteaves	48.46		13
45	681400	5919100	C-172385	Whiteaves	44.19	45.72	13
46	681400	5919100	C-172372	Whiteaves	35.05		13

Appendix 1 - Locality Data

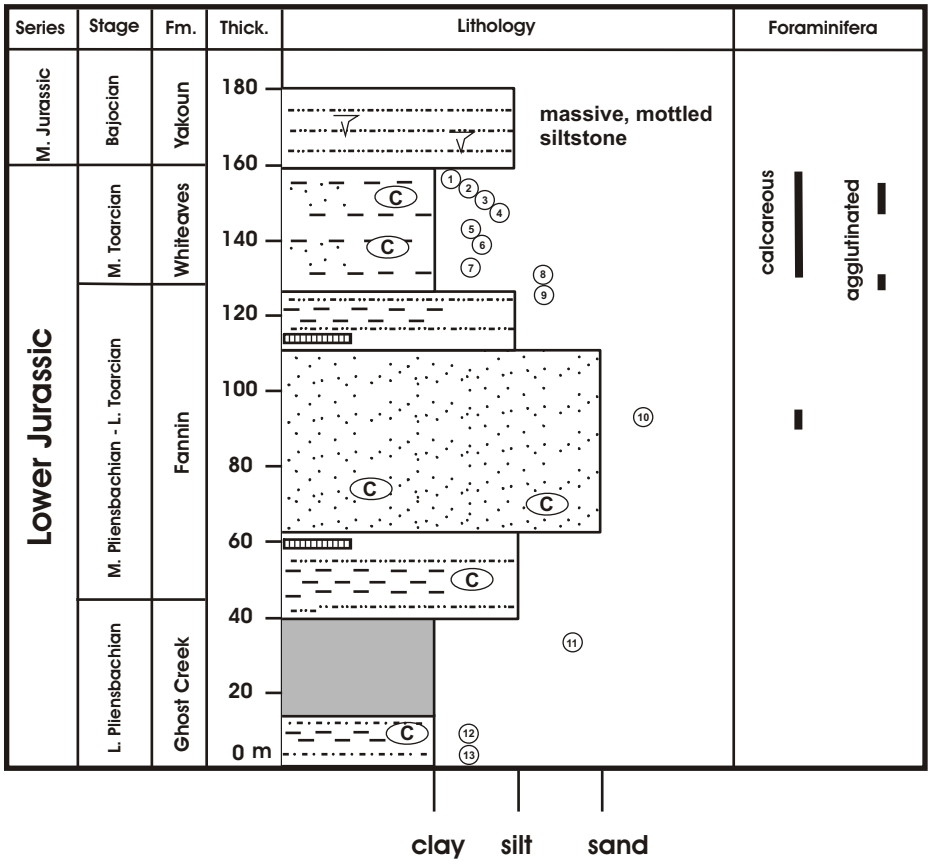
Sample #	UTM		GSC Loc #	Formation	Interval (m) Bottom	Top	Box
47	681400	5919100	C-172386	Whiteaves	27.43	28.95	13
48	681400	5919100	C-172376	Whiteaves	24.38		13
49	681400	5919100	C-172378	Whiteaves	19.81	21.33	1, 13
50	681300	5919100	C-172387	Whiteaves	10.36	11.58	13
51	681300	5919100	C-172388	Whiteaves	5.49	6.71	13
52	681300	5919100	C-172389	Whiteaves	3.35	4.57	13
54	681300	5919100	C-172391	Whiteaves	1.52	3.05	13
53	681300	5919100	C-172390	Whiteaves	1.52	2.44	13
55	681300	5919100	C-172382	Whiteaves	0.00	0.91	13
SECTION 15 (103F/8; UTM Range 682100E, 5922000N to 5922300N)							
1	682100	5922300	C-172472	Whiteaves	95.09	96.62	7
2	682100	5922300	C-172485	Whiteaves	95.70		7
3	682100	5922300	C-172471	Whiteaves	93.57		7
4	682100	5922300	C-172484	Whiteaves	89.61	91.13	7
5	682100	5922300	C-172483	Whiteaves	78.94	80.46	7
6	682100	5922200	C-172457	Whiteaves	67.05		13
7	682100	5922200	C-172482	Whiteaves	66.14	67.36	7
8	682100	5922200	C-172456	Whiteaves	63.09		13
9	682100	5922200	C-172454	Whiteaves	60.96		13
10	682100	5922200	C-172453	Whiteaves	59.43		13
11	682100	5922200	C-172452	Whiteaves	57.91		13
12	682100	5922200	C-172481	Whiteaves	56.69	57.91	7
13	682100	5922200	C-172451	Whiteaves	56.39		13
14	682100	5922200	C-172449	Whiteaves	51.81		13
15	682100	5922200	C-172448	Whiteaves	48.77		13
16	682100	5922200	C-172480	Whiteaves	48.46	49.98	7
17	682100	5922100	C-172447	Whiteaves	46.94		13
18	682100	5922100	C-172446	Whiteaves	44.80		13
19	682100	5922100	C-172445	Whiteaves	42.67		13
20	682100	5922100	C-172444	Whiteaves	40.84		13
21	682100	5922100	C-172443	Whiteaves	38.71		13
22	682100	5922100	C-172442	Whiteaves	36.57		13
23	682100	5922000	C-172479	Whiteaves	35.36	36.57	7
24	682100	5922100	C-172441	Whiteaves	33.53		13
25	682100	5922100	C-172440	Whiteaves	32.00		1
26	682100	5922100	C-172439	Whiteaves	30.48		13
27	682100	5922100	C-172437	Whiteaves	27.43		13
28	682100	5922100	C-172435	Whiteaves	24.38		13
29	682100	5922000	C-172434	Whiteaves	22.55		13
30	682100	5922000	C-172478	Whiteaves	21.03	22.25	7
31	682100	5922000	C-172432	Whiteaves	18.29		13
32	682100	5922000	C-172431	Whiteaves	16.46		13
33	682100	5922000	C-172430	Whiteaves	14.32		13
34	682100	5922000	C-172429	Whiteaves	12.19		13
35	682100	5922000	C-172477	Whiteaves	11.89	13.11	7
36	682100	5922000	C-172428	Whiteaves	10.36		13
37	682100	5922000	C-172427	Whiteaves	8.23		13

Appendix 1 - Locality Data

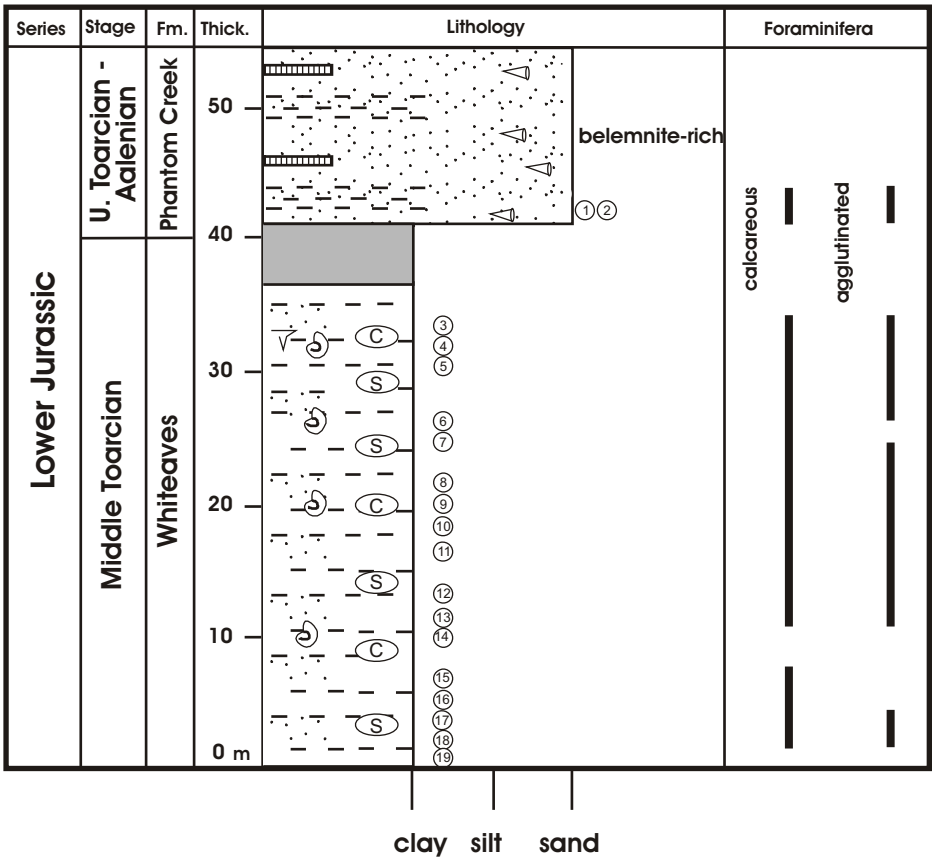
Sample #	UTM		GSC Loc #	Formation	Interval (m) Bottom	Top	Box
38	682100	5922000	C-172426	Whiteaves	6.10		13
39	682100	5922000	C-172476	Whiteaves	4.27	5.49	7
40	682100	5922000	C-172425	Whiteaves	4.27		13
41	682100	5922000	C-172424	Whiteaves	2.13		1, 13
42	682100	5922000	C-172475	Whiteaves	1.83	3.05	7
43	682100	5922000	C-172474	Whiteaves	0.00	1.22	7
44	682100	5922000	C-172423	Whiteaves	0.00		1, 13
SECTION 16 (103F/1 and G/4; UTM Range 698900E to 300700E, 5897700N to 5898600N)							
1	300700	5898600	C-172732	Alliford	390.12	391.65	5
2	300700	5898600	C-172731	Alliford	388.60	390.12	5
3	300700	5898600	C-172735	Alliford	387.99	388.60	5
4	300700	5898600	C-172729	Alliford	387.08		5
5	300600	5898600	C-172728	Alliford	385.86		5
6	300600	5898600	C-172734	Alliford	385.55	387.08	5
7	300600	5898600	C-172727	Alliford	385.25		11
8	300600	5898600	C-172733	Alliford	384.03	384.64	5
9	300600	5898600	C-172725	Alliford	382.51		11
10	300600	5898600	C-172724	Alliford	380.98		11
11	299800	5898600	C-172736	Robber Point	283.75	285.28	5
12	699200	5898100	C-172737	Richardson Bay	105.15	106.67	17
13	699200	5898100	C-172738	Richardson Bay	103.63	104.85	15
14	699200	5898100	C-172739	Richardson Bay	100.27	101.19	15
15	699100	5898100	C-172740	Richardson Bay	96.01	96.92	15
16	699100	5898100	C-172741	Richardson Bay	92.96	93.57	15
17	699100	5898100	C-172742	Richardson Bay	86.56	87.47	15
18	699000	5898000	C-172743	Richardson Bay	68.27	69.49	15
19	699000	5897900	C-172744	Richardson Bay	57.60	58.82	15
20	698900	5897700	C-172745	Richardson Bay	39.01	40.54	15
SECTION 17 (103F/1; UTM Range 698300E to 698400E, 5900000N to 5900100N)							
1	698400	5900100	C-172757	Newcombe	20.12	21.03	11
2	698400	5900100	C-172756	Newcombe	18.29	19.20	11
3	698300	5900000	C-172749	Robber Point	13.41	14.32	5
4	698300	5900000	C-172748	Robber Point	12.50	13.41	5
5	698300	5900000	C-172747	Robber Point	10.97	11.58	5
6	698300	5900000	C-172746	Robber Point	10.36	10.97	5
7	698300	5900000	C-303044	Robber Point	8.53	10.36	5
8	698300	5900000	C-172750	Robber Point	8.53	10.36	11
9	698300	5900000	C-172549	Robber Point	7.62	8.53	11
SECTION 19 (103G/4; UTM 303285E, 5881426N)							
1	303285	5881426	C-164801	Whiteaves	210.30	212.44	12
2	303285	5881426	C-164802	Whiteaves	205.73	208.17	12
3	303285	5881426	C-164803	Whiteaves	201.16	203.90	12
4	303285	5881426	C-164804	Whiteaves	198.11	200.24	12

Appendix 1 - Locality Data

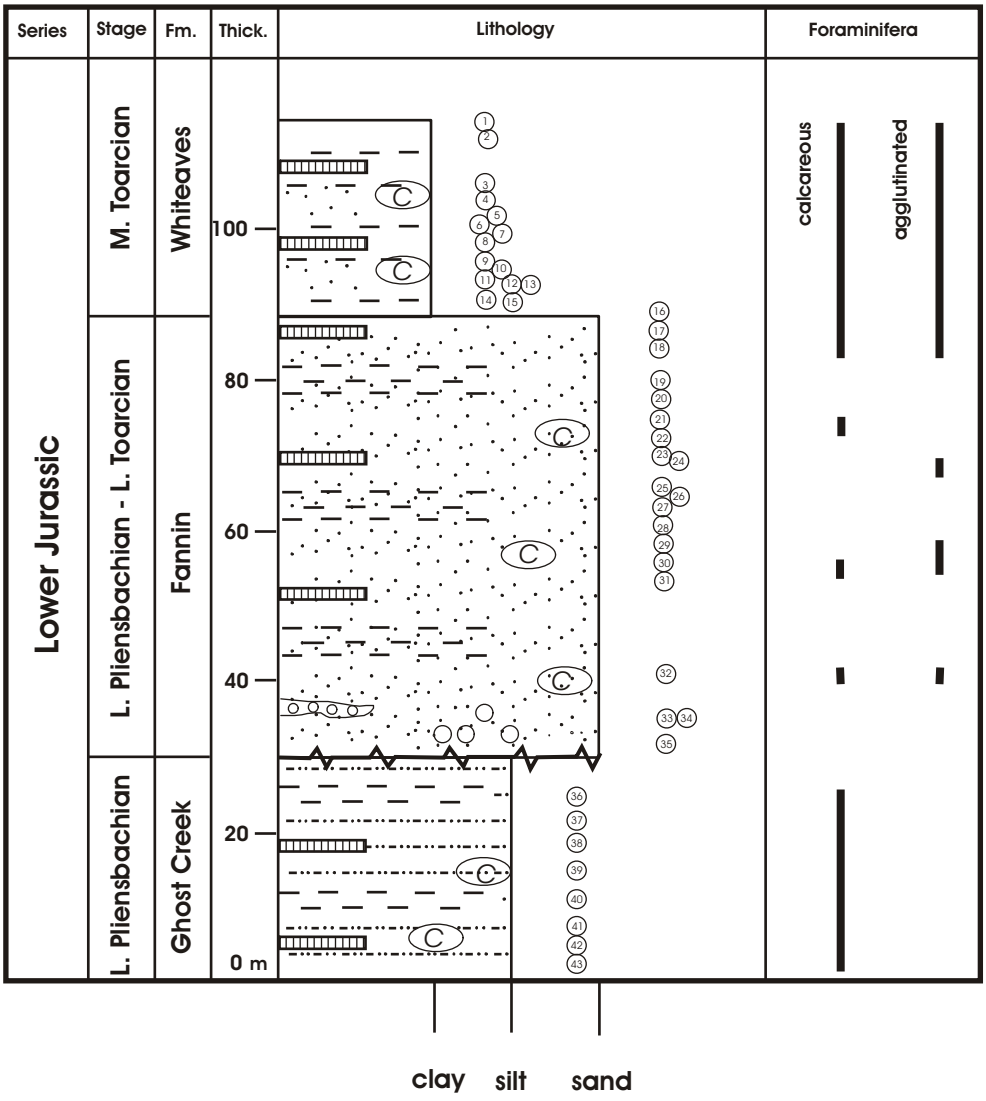
Sample #	UTM		GSC Loc #	Formation	Interval (m) Bottom	Top	Box
5	303285	5881426	C-164805	Whiteaves	194.76	197.20	12
6	303285	5881426	C-164806	Fannin	192.01	193.84	16
7	303285	5881426	C-164807	Fannin	186.83	188.36	16
8	303285	5881426	C-164808	Fannin	176.17	177.69	16
9	303285	5881426	C-164809	Fannin	153.92	155.75	18
10	303285	5881426	C-164810	Fannin	152.39	153.61	18
11	303285	5881426	C-164811	Fannin	148.74	150.26	18
12	303285	5881426	C-164812	Fannin	147.52	148.13	18
13	303285	5881426	C-164813	Fannin	140.20	141.73	18
14	303285	5881426	C-164814	Fannin	140.20	141.73	18
15	303285	5881426	C-164815	Fannin	118.26	120.09	18
16	303285	5881426	C-164816	Fannin	118.26	120.09	18
17	303285	5881426	C-164817	Fannin	86.56	88.39	18
18	303285	5881426	C-164818	Ghost Creek	74.67	76.20	14
19	303285	5881426	C-164819	Ghost Creek	73.15	74.67	14
20	303285	5881426	C-164820	Ghost Creek	57.91	60.04	14
21	303285	5881426	C-164821	Ghost Creek	48.16	49.68	14
22	303285	5881426	C-164822	Ghost Creek	45.72	47.24	14
23	303285	5881426	C-164823	Ghost Creek	38.40	40.54	14
24	303285	5881426	C-164824	Ghost Creek	34.44	36.57	14



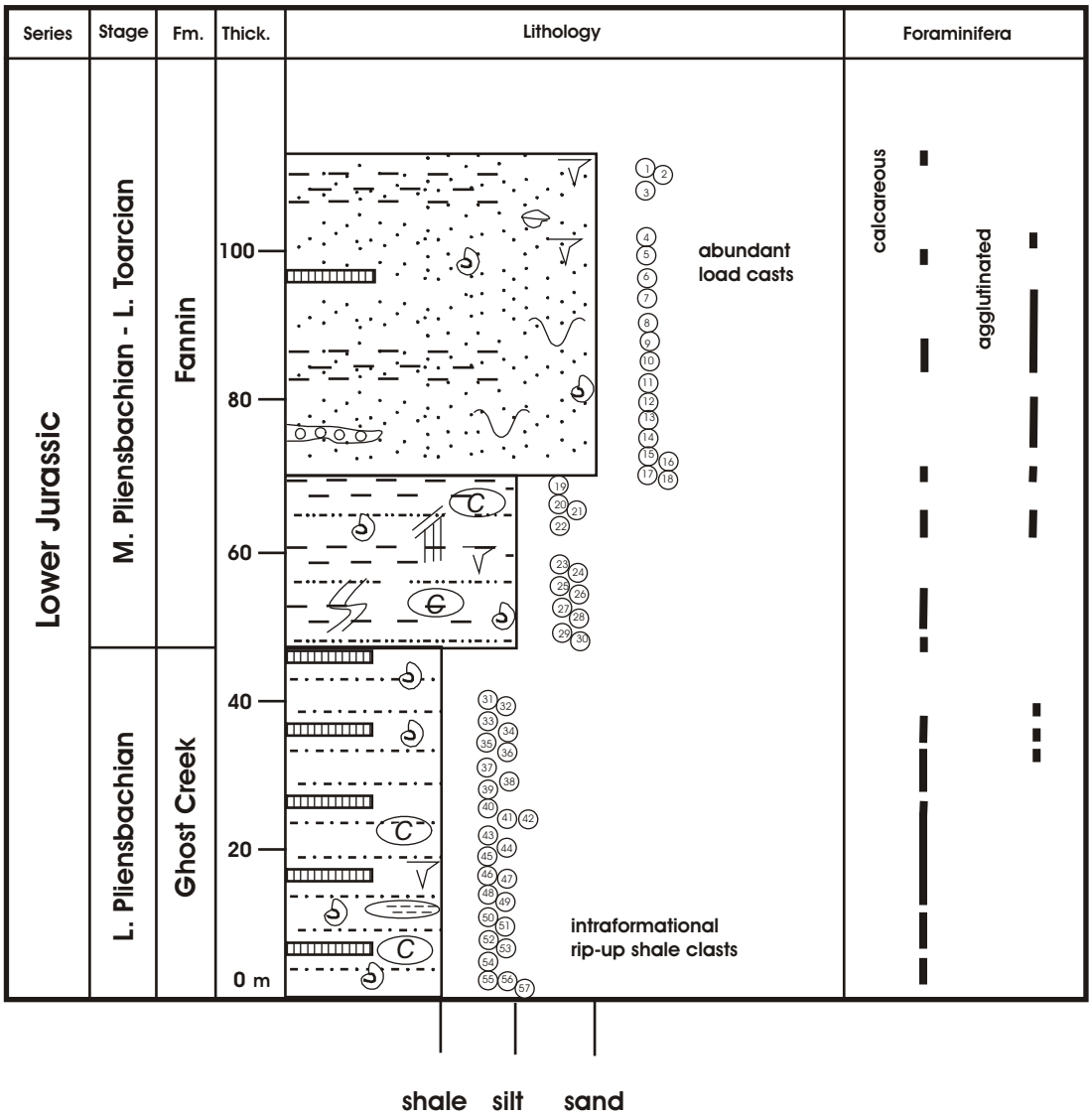
Appendix 2: Lithostratigraphic column of Section 4



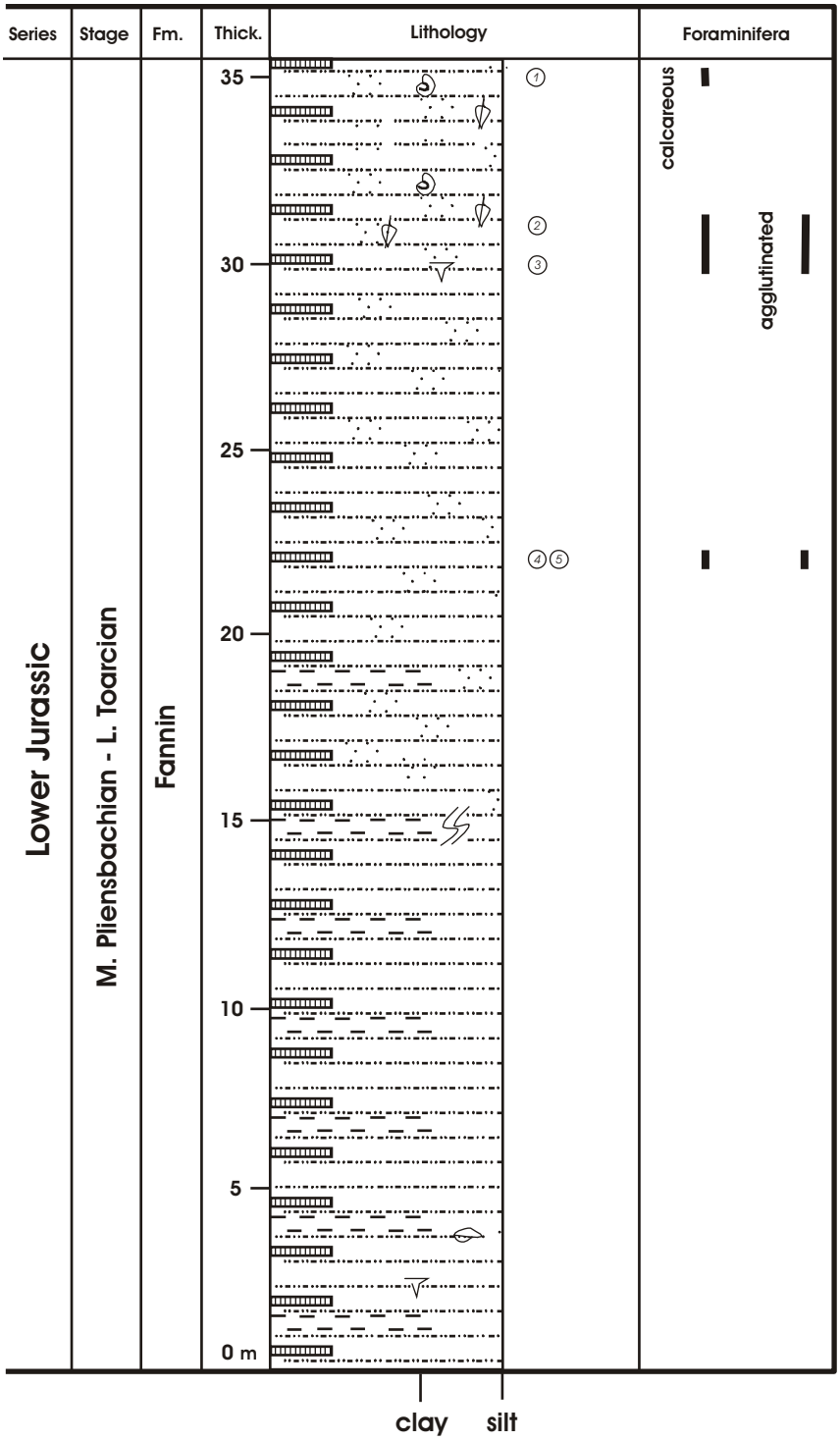
Appendix 2: Lithostratigraphic column of Section 5



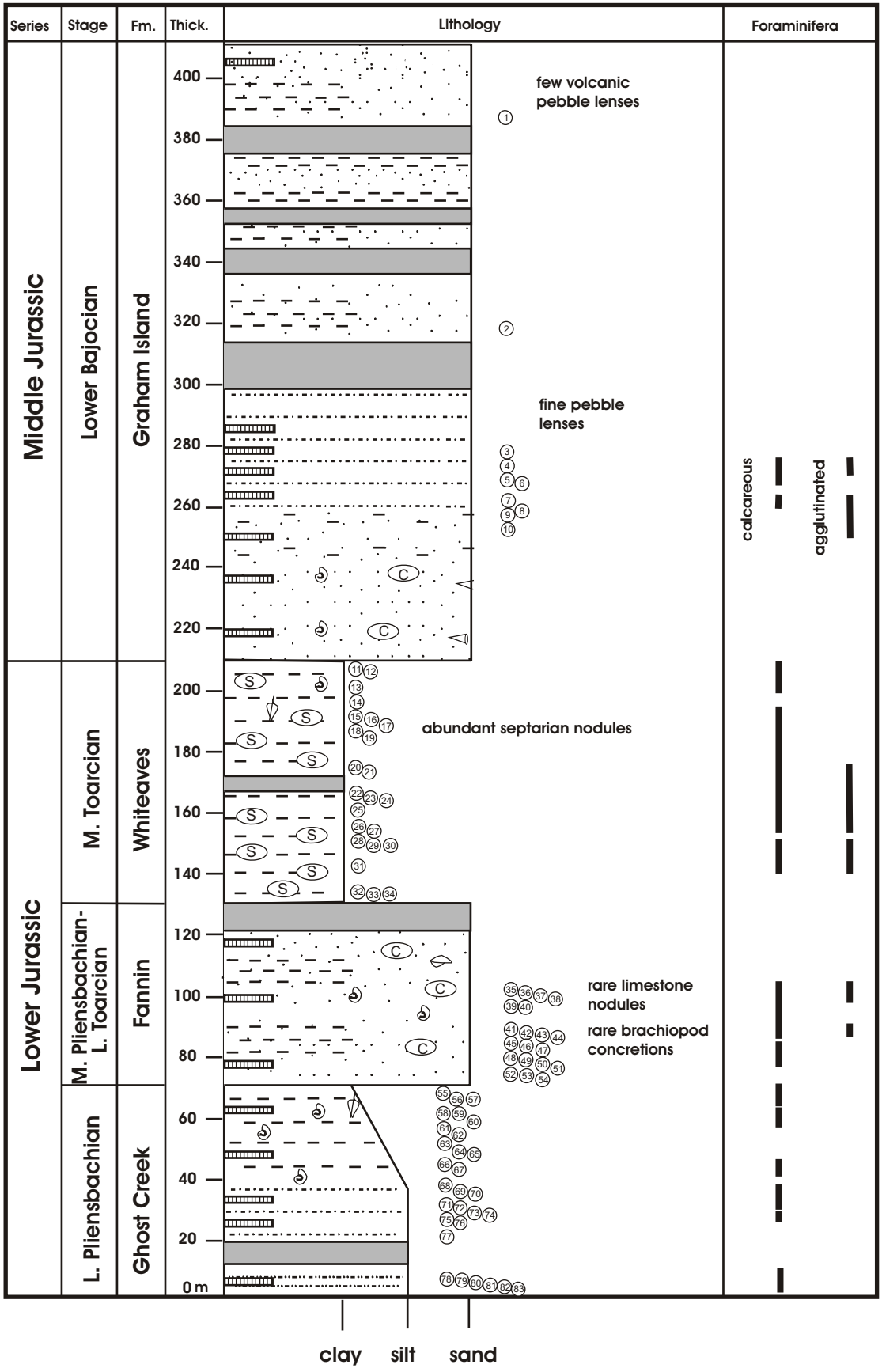
Appendix 2: Lithostratigraphic column of Section 7



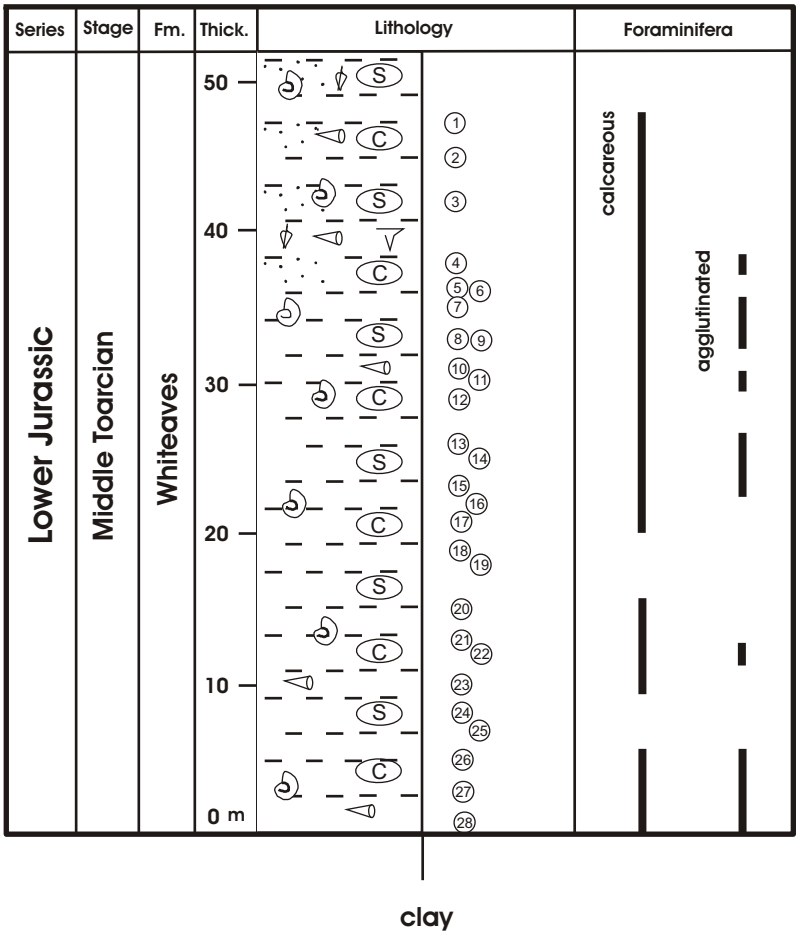
Appendix 2: Lithostratigraphic column of Section 8



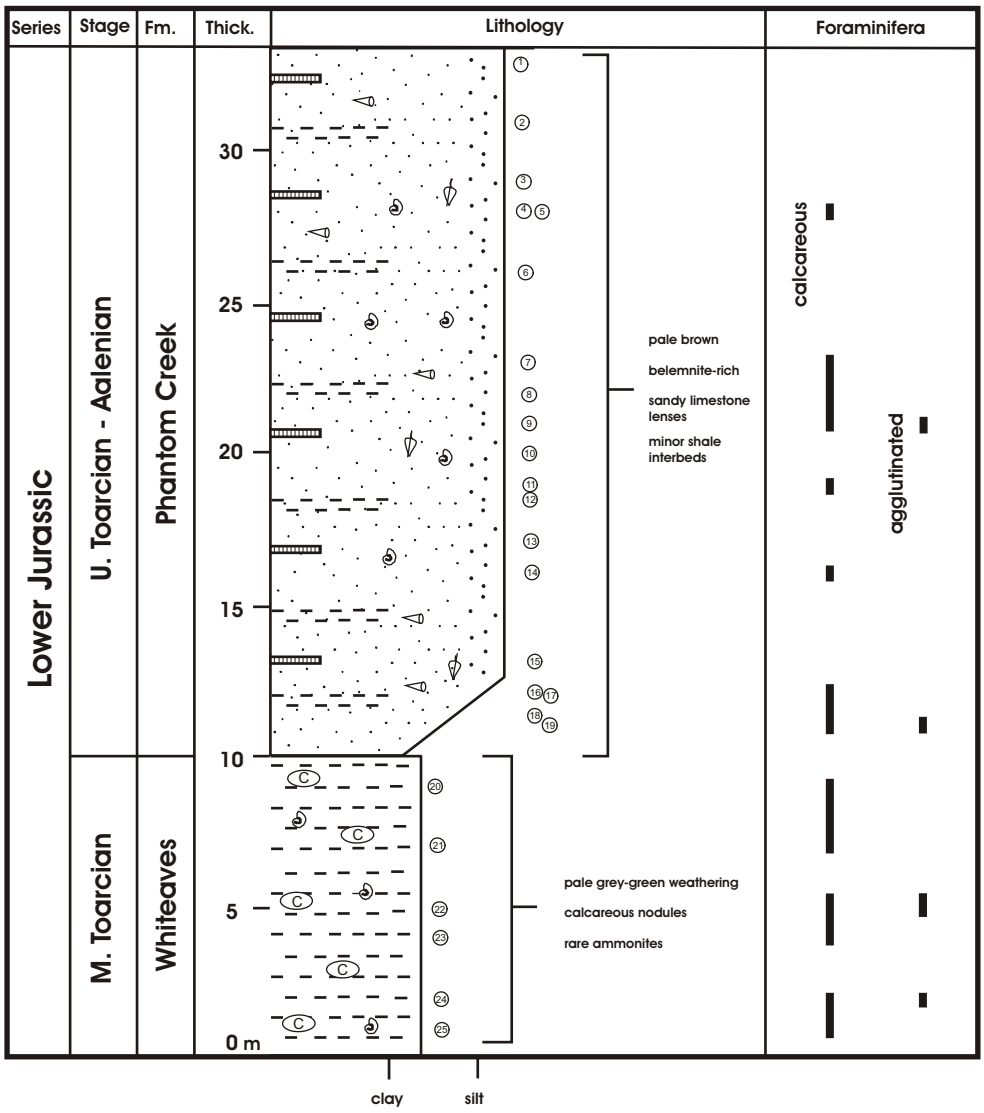
Appendix 2: Lithostratigraphic column of Section 9



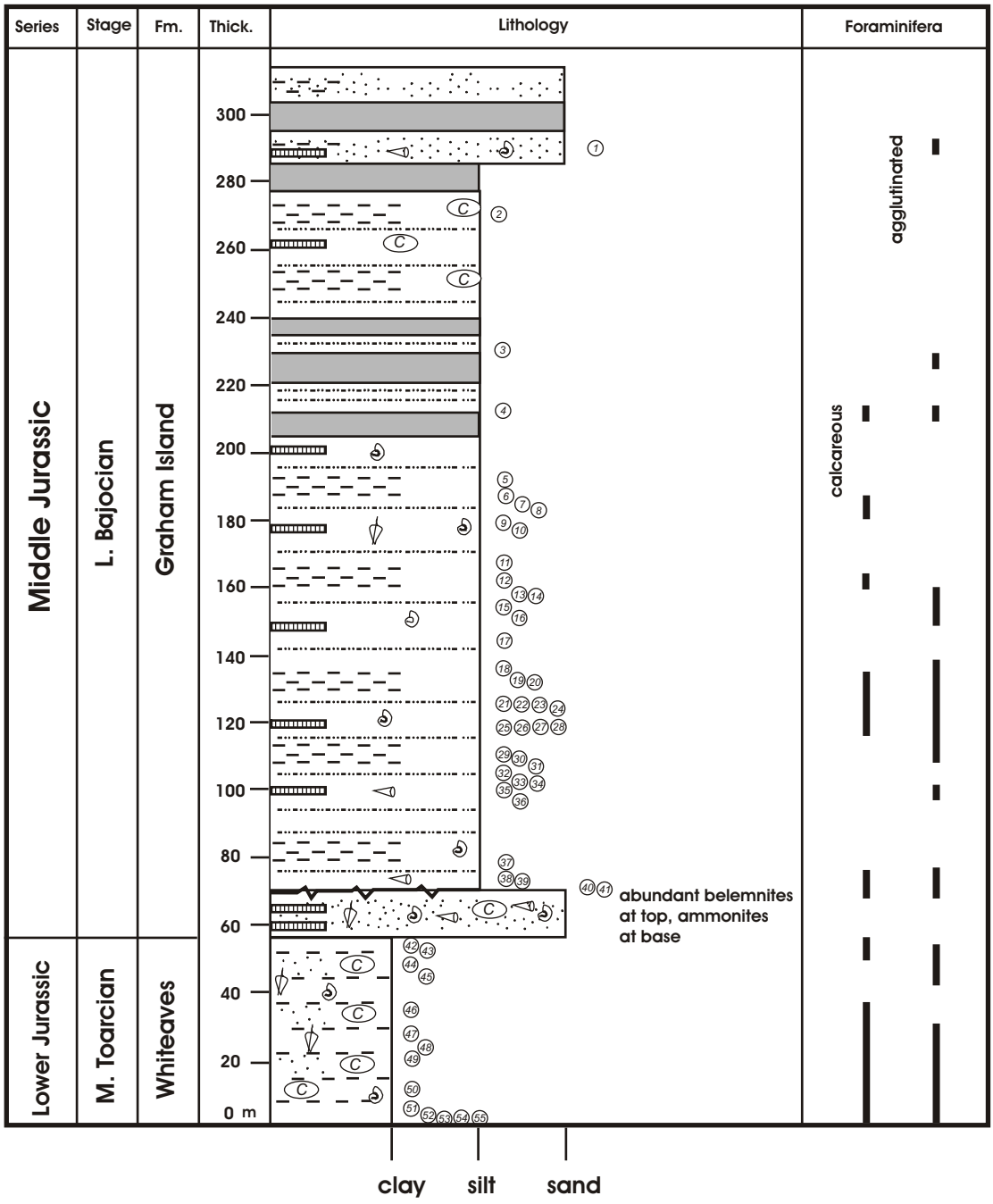
Appendix 2: Lithostratigraphic column of Section 10



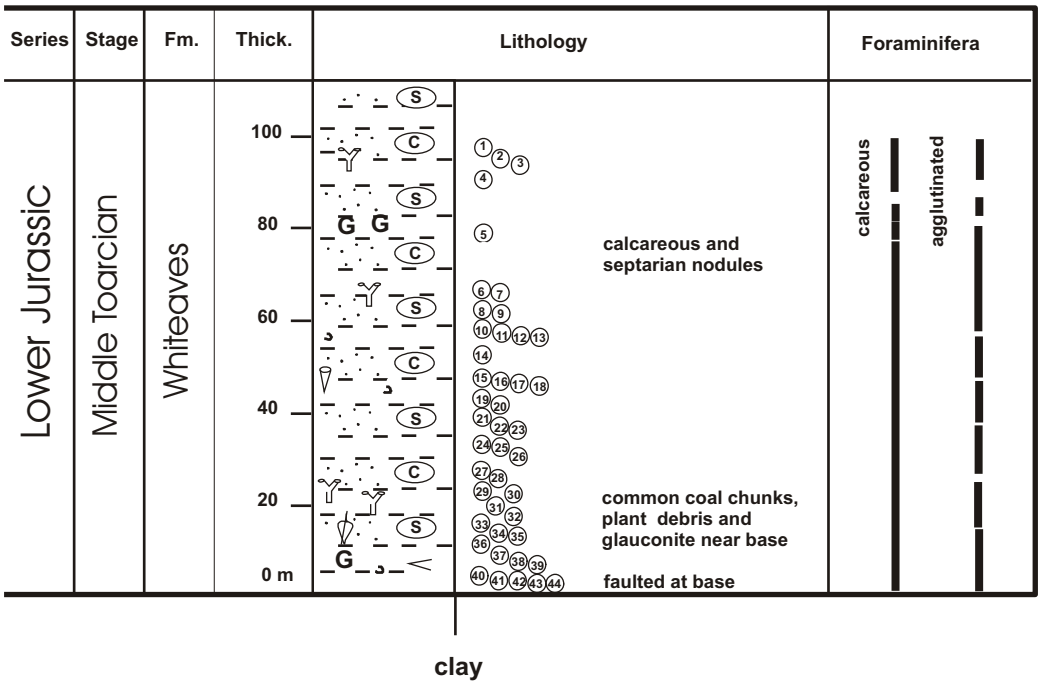
Appendix 2: Lithostratigraphic column of Section 11



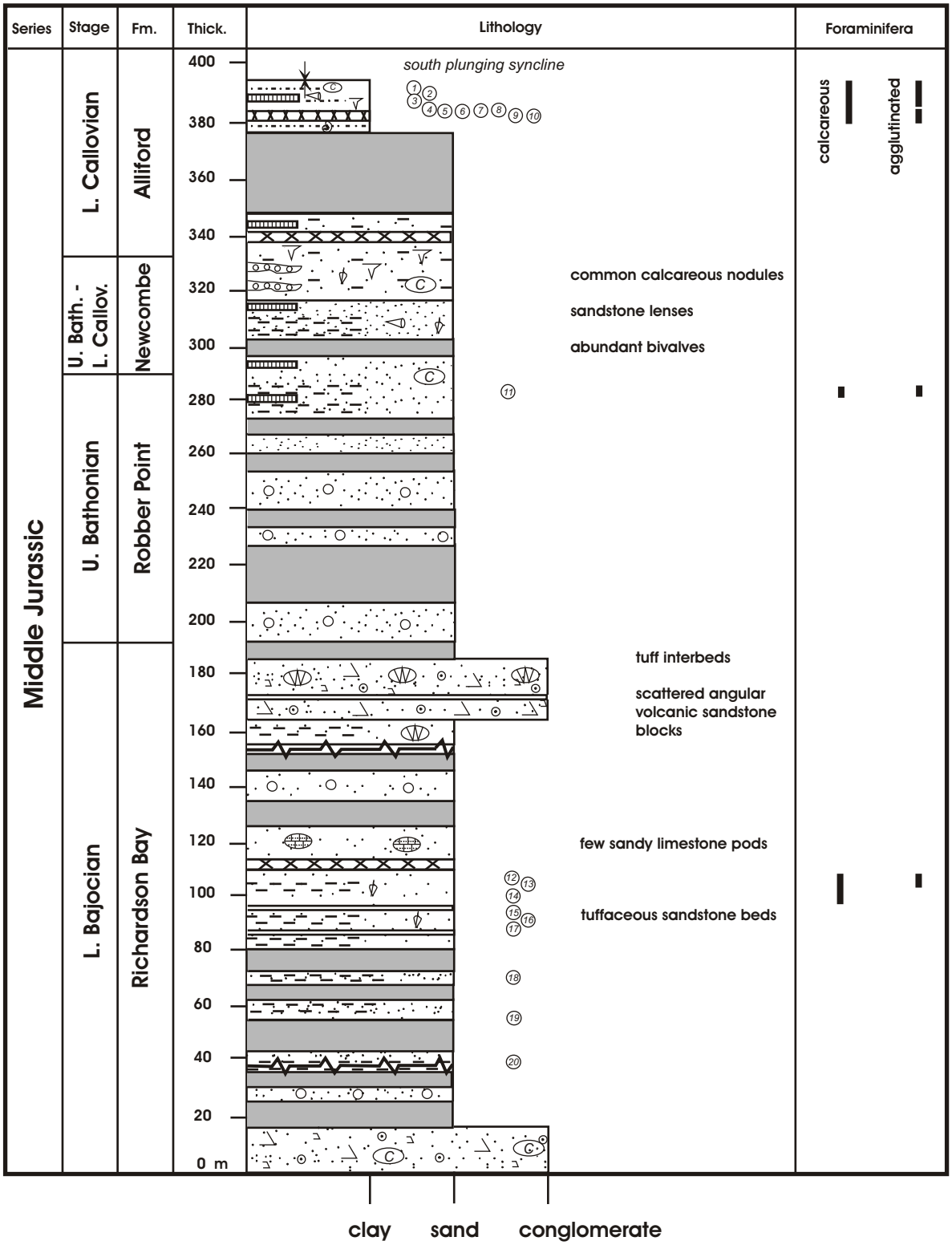
Appendix 2: Lithostratigraphic column of Section 12



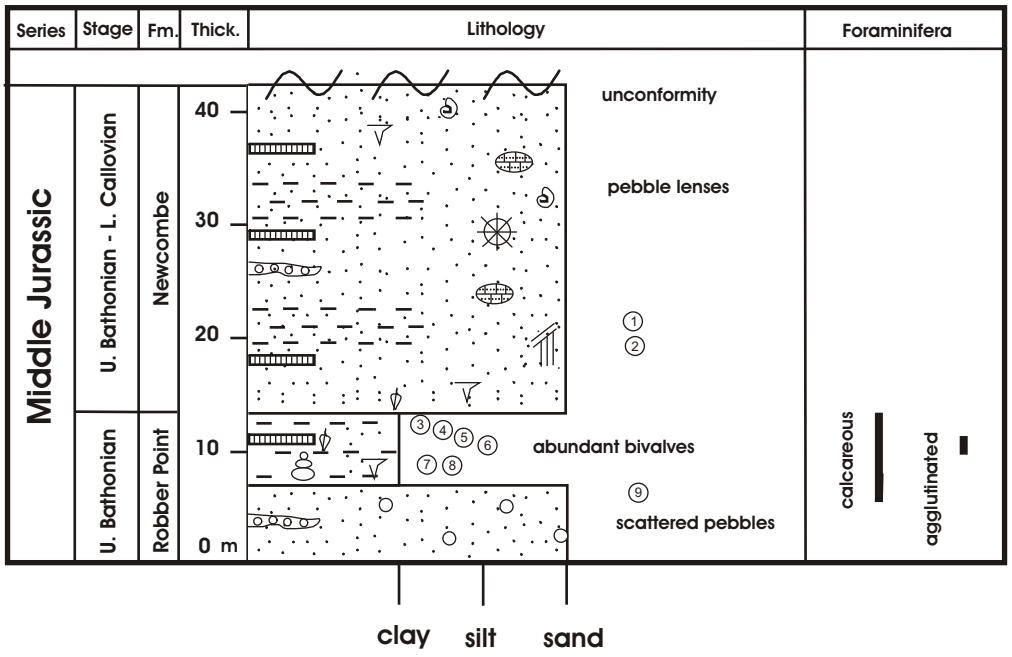
Appendix 2: Lithostratigraphic column of Section 14



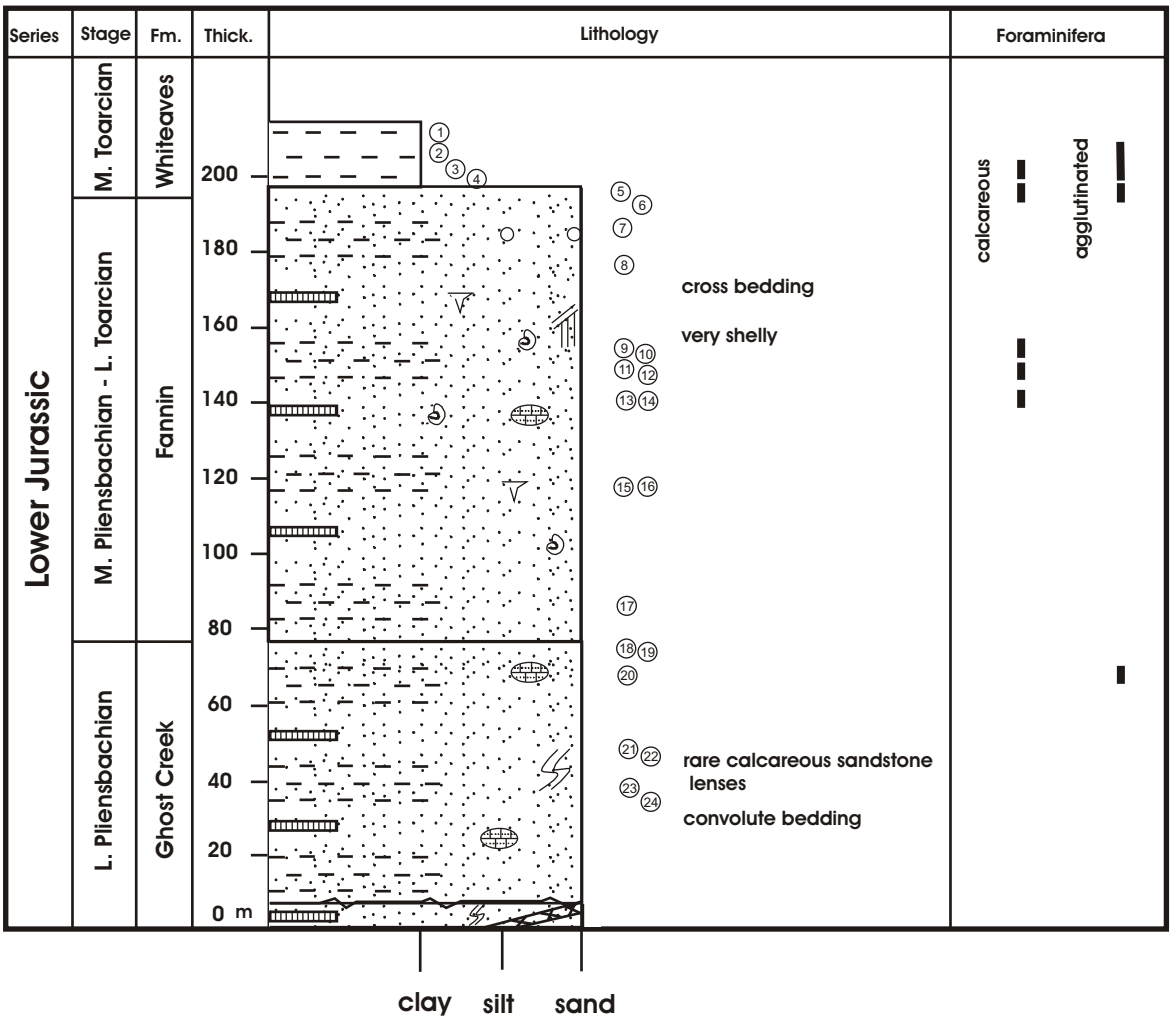
Appendix 2: Lithostratigraphic column of section 15



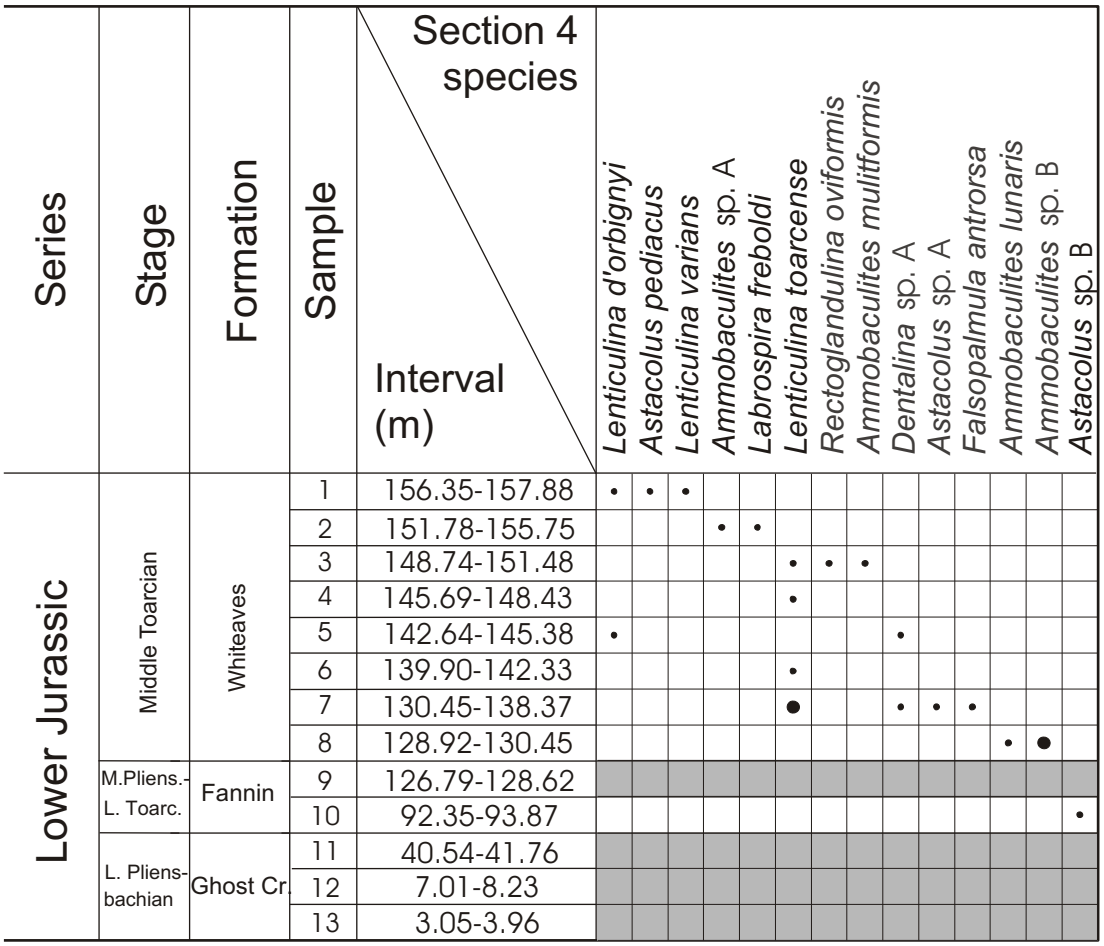
Appendix 2: Lithostratigraphic column of Section 16



Appendix 2: Lithostratigraphic column of Section 17



Appendix 2: Lithostratigraphic column of Section 19



Appendix 3: Foraminiferal distribution in Section 4. Gray areas represent barren samples

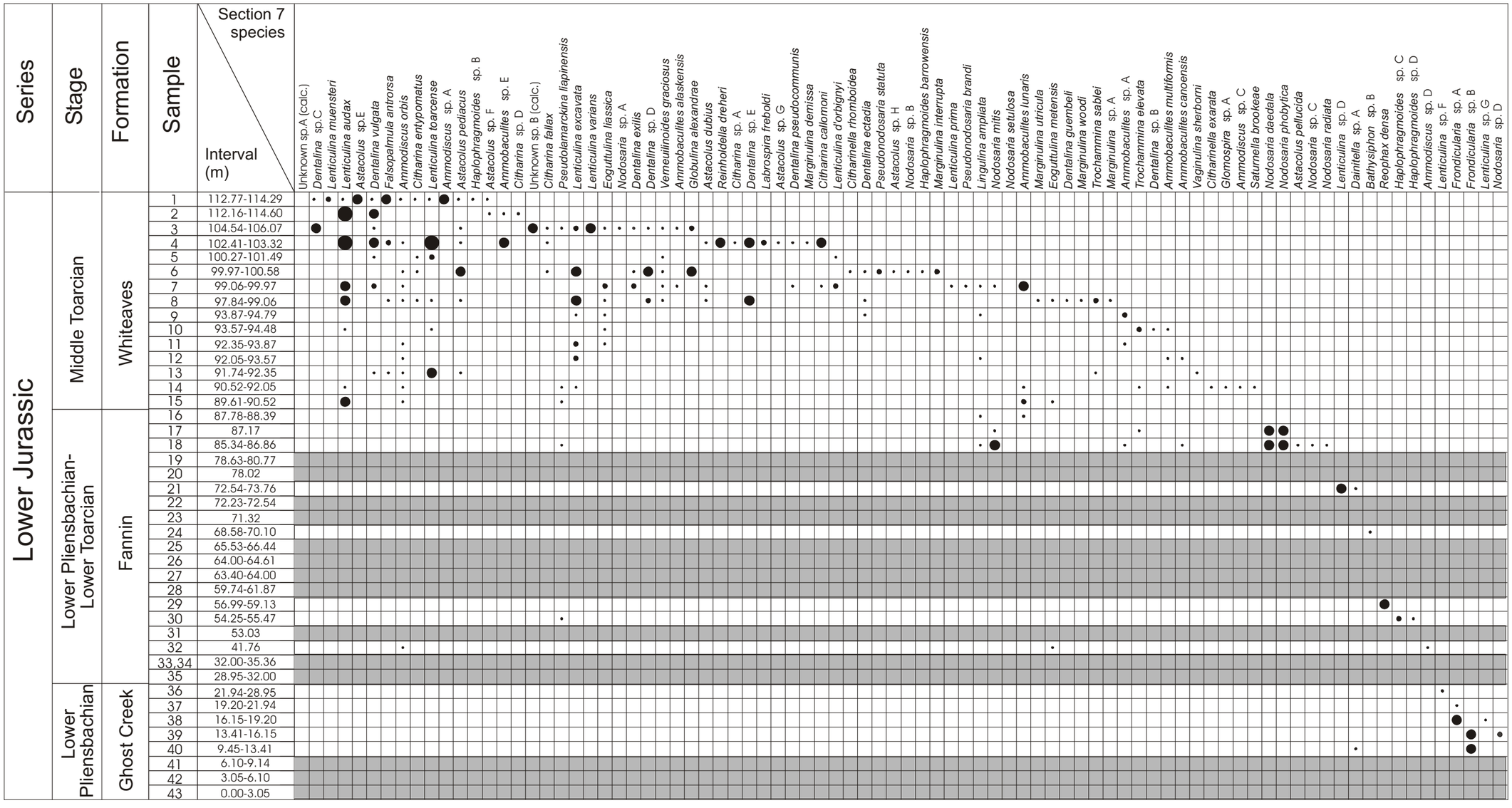
Series	Stage	Formation	Sample	Interval (m)	*Citharina callomoni*	*Citharina* sp. A	*Lenticulina toarcense*	*Astacolus pediacus*	*Falsopalmula antrorsa*	*Dentalina* sp. B	*Pseudonodosaria statuta*	*Dentalina vulgata*	*Marginulina thuringica*	*Astacolus calliopsis*	*Citharinella rhomboidea*	*Lenticulina d'orbignyi*	*Marginulina pletha*	*Astacolus* sp. C	*Astacolus dubius*	*Citharinella* sp. A	*Citharina* sp. B	*Citharina* sp. C	*Bulbobaculites* sp. A	*Ammobaculites* sp. A
Lower Jurassic	U. Toarc. - Aalenian	Ph. Creek	1,2	42.97-44.19	·	·	⬤	●	●	●	·	·	·	·	·	●	●	·	·	●	⬤	·	·	·
	Middle Toarcian	Whiteaves	3	35.05-36.57								·												·
			4	33.53-35.05			●		·															
			5	30.48-31.39																				
			6	25.91-27.43			●	·																
			7	24.99-26.52			·																	
			8	20.12-21.94			·								·									⬤
			9	19.20-21.94				·	·										·					
			10	18.29-19.81					·															
			11	15.24-19.20			⬤	⬤	·															
			12	12.50-14.93																				
			13	9.14-12.19			⬤	•	·															
			14	9.14-10.67																				
			15	4.57-6.10			·	·	·															
			16	3.96-6.10			⬤	·																
			17	2.44-4.88				·	●						·									
			18	1.52-3.05																				
			19	1.22-3.96																				

Sample	Interval (m)	*Dentalina pseudocommunis*	*Lenticulina excavata*	*Ammobaculites alaskensis*	*Astacolus aphrastus*	*Ammodiscus orbis*	*Lenticulina prima*	*Dentalina ectadia*	*Astacolus* sp. D	*Nodosaria detruncata*	*Lingulina lanceolata*	*Eoguttulina liassica*	*Ammobaculites multiformis*	*Ammobaculites lunaris*	*Nodosaria regularis*	*Lenticulina audax*	*Vaginulina sherboni*	*Ammodiscus* sp. A	*Lenticulina* sp. A	*Ammobaculoides rickyoungi*	*Haplophragmoides* sp. A
1,2	42.97-44.19																				
3	35.05-36.57	·	●																		
4	33.53-35.05			·																	
5	30.48-31.39				·	·															
6	25.91-27.43						·	·													
7	24.99-26.52		·																		
8	20.12-21.94			●	●				·	·	·	·	·	●	●						
9	19.20-21.94							·					·			●	·	·	·	·	⬤
10	18.29-19.81					·						·			·						
11	15.24-19.20			⬤		●		⬤				·					●				
12	12.50-14.93																				
13	9.14-12.19			·		·		·				·	·								
14	9.14-10.67																				
15	4.57-6.10											·									
16	3.96-6.10		·					·	·												
17	2.44-4.88			·		·	·							⬤							
18	1.52-3.05					·															
19	1.22-3.96																				

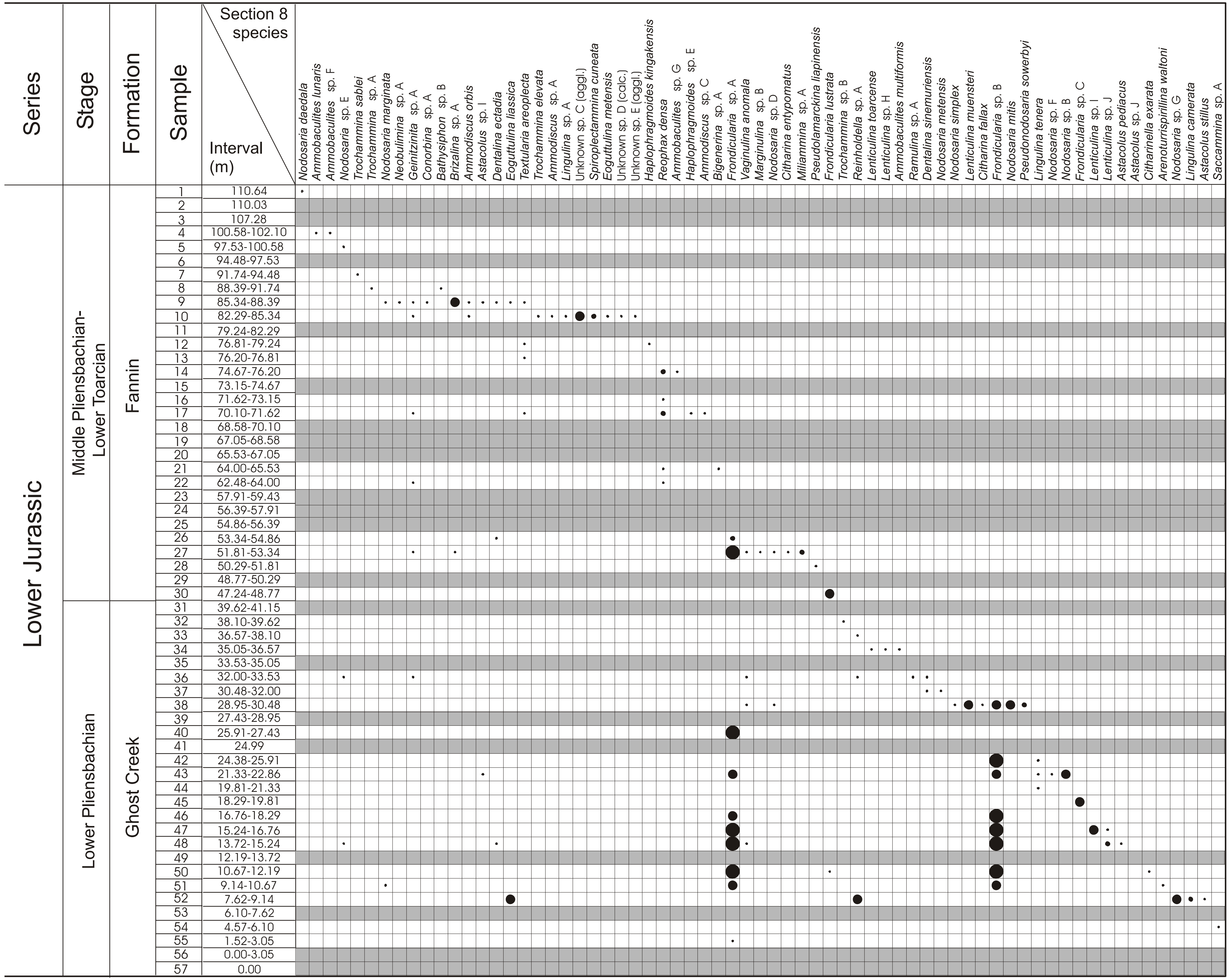
Sample	Interval (m)	*Rectoglandulina oviformis*	*Trochammina sablei*	*Ammobaculites* sp. C	*Dentalina ejuncida*	*Citharina fallax*	*Lenticulina* sp. B	*Dentalina subtenuicollis*	*Vaginulinopsis* sp. B	*Saccammina lathrami*	*Involutina silicea*	*Lenticulina* sp. C	*Citharina entypomatus*	*Nodosaria* sp. A	*Ammobaculites venustus*	*Recurvoides decoris*	*Dentalina exilis*	*Bathysiphon* sp. B	*Ammobaculites* sp. D	*Ammobaculites* sp. E	*Pseudolamarckina liapinensis*
1,2	42.97-44.19																				
3	35.05-36.57																				
4	33.53-35.05																				
5	30.48-31.39																				
6	25.91-27.43																				
7	24.99-26.52																				
8	20.12-21.94																				
9	19.20-21.94	·																			
10	18.29-19.81		·	·	·																
11	15.24-19.20					·	·	·	·	●											
12	12.50-14.93																				
13	9.14-12.19		·			·				·	·	●									
14	9.14-10.67																				
15	4.57-6.10				·																
16	3.96-6.10												●	·							
17	2.44-4.88					·									·	·	⬤	⬤	⬤	●	
18	1.52-3.05																				·
19	1.22-3.96																				

· 1-5 specimens • 6-10 specimens ● 11-50 specimens ⬤ >50 specimens

Appendix 3: Foraminiferal distribution in Section 5. Gray areas represent barren samples

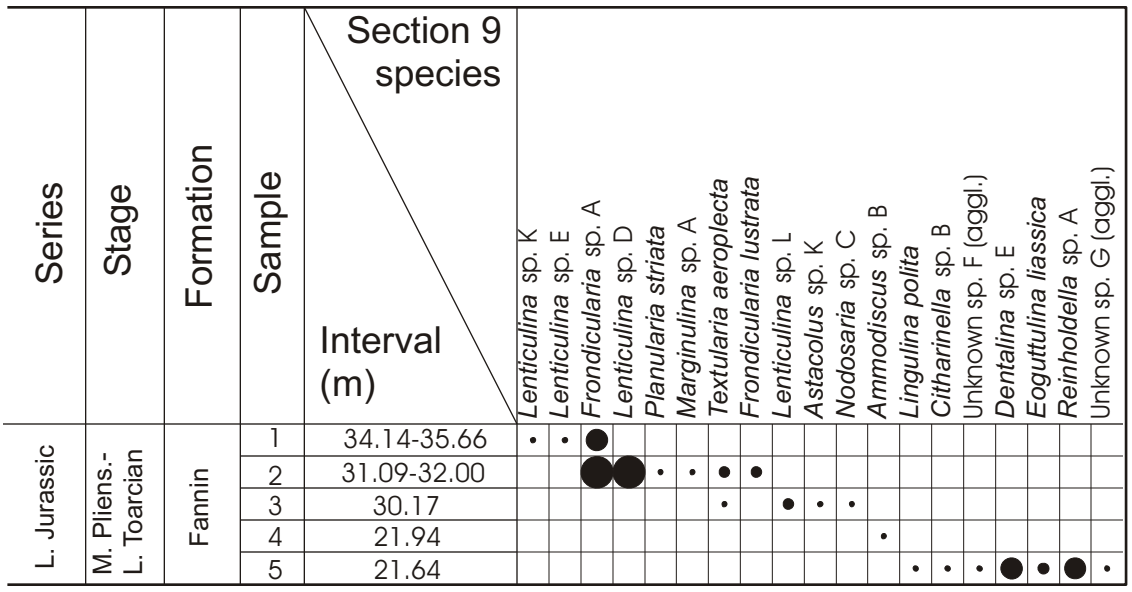


Appendix 3: Foraminiferal distribution in Section 7. Gray areas represent barren samples

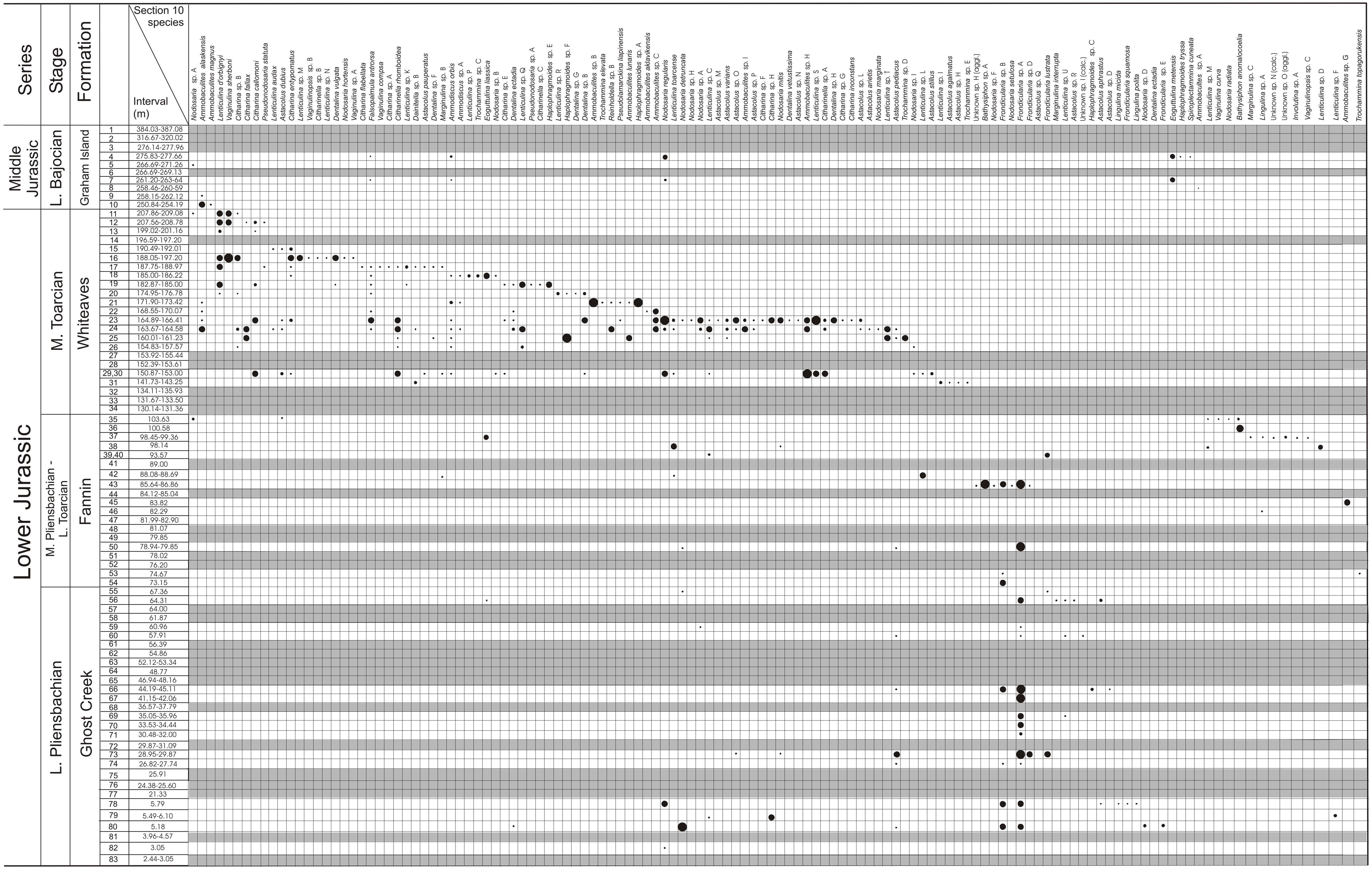


· 1-5 specimens • 6-10 specimens ● 11-50 specimens ● >50 specimens

Appendix 3: Foraminiferal distribution in Section 8. Gray areas represent barren samples

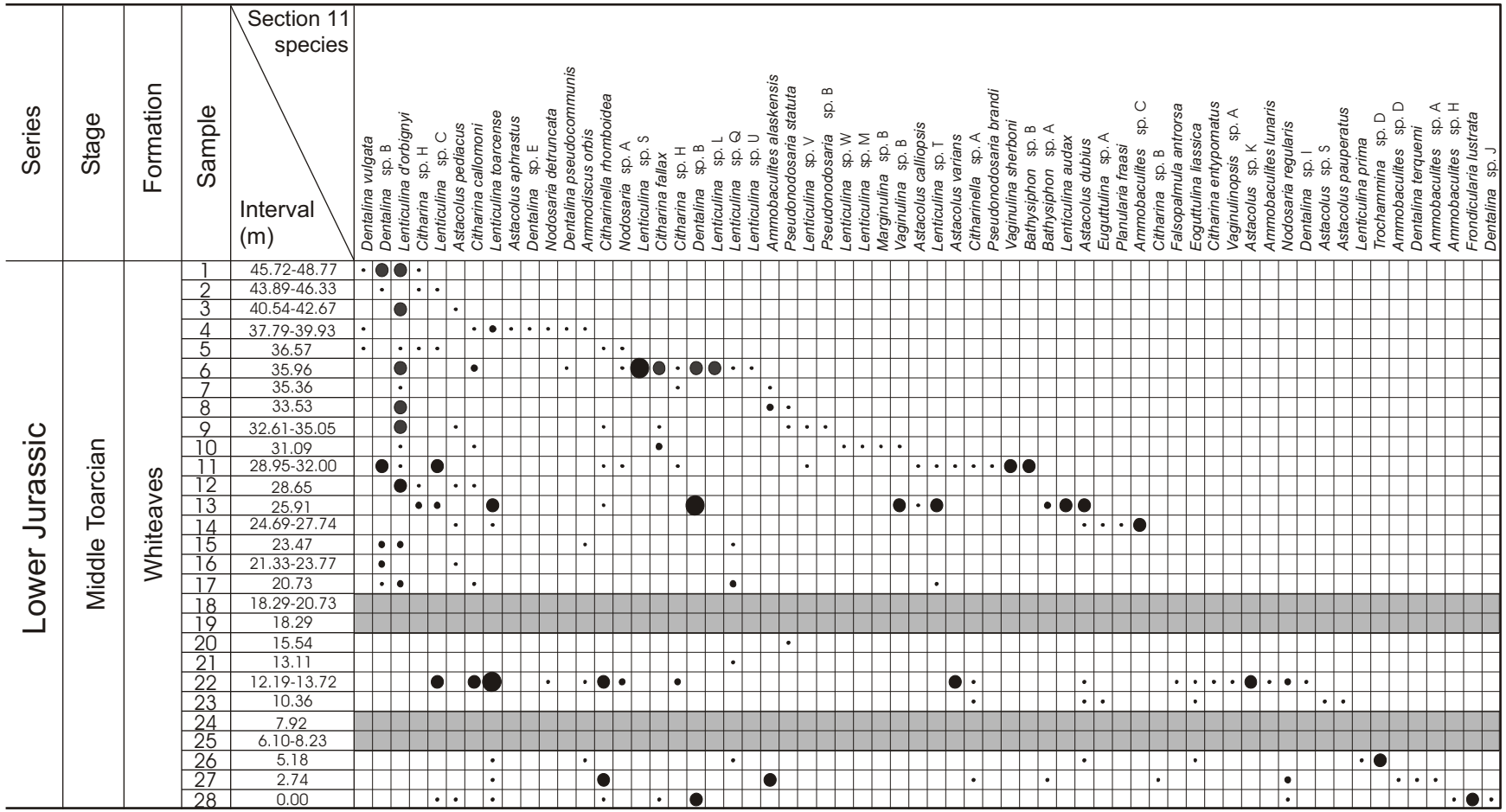


Appendix 3: Foraminiferal distribution in Section 9

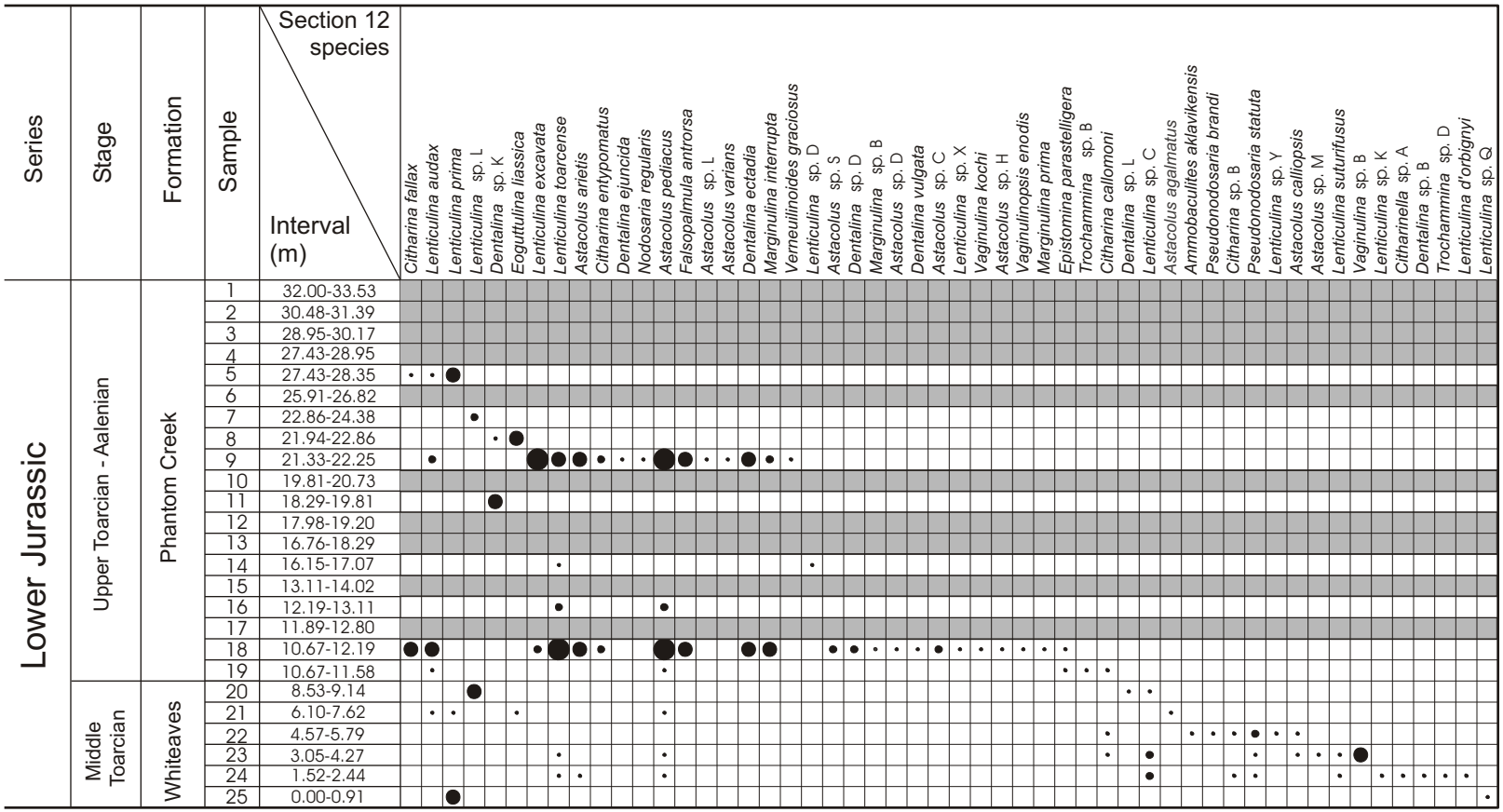


· 1-5 specimens • 6-10 specimens ● 11-50 specimens ⬤ >50 specimens

Appendix 3: Foraminiferal distribution in Section 10. Gray areas represent barren samples



Appendix 3: Foraminiferal distribution in Section 11. Gray areas represent barren samples



Appendix 3: Foraminiferal distribution in Section 12. Gray areas represent barren samples

Series	Stage	Formation		Section 14 species / Interval (m)
Middle Jurassic	Lower Bajocian	Graham Island	1	290.16-291.07
			2	260.59-271.26
			3	230.11-231.64
			4	211.83-213.35
			5	192.01-193.54
			6	187.44-188.97
			7	183.79-184.70
			8	182.87-183.48
			9	179.21-180.43
			10	176.47-177.69
			11	167.63-168.85
			12	161.54-162.76
			13	158.18-159.71
			14	157.88-159.40
			15	153.92-155.44
			16	150.87-152.39
			17	143.25-144.77
			18	134.11-137.15
			19	132.58-134.11
			20	129.53-131.06
			21,22,23	124.96-126.49
			24	121.91-123.44
			25,26	118.87-120.39
			27,28	118.87-120.09
			29	110.03-112.47
			30	108.20-109.72
			31	105.76-109.72
			32	103.63-105.15
			33	103.02-103.63
			34	101.49-104.54
			35	99.36-101.19
			36	95.09-98.14
			37	78.33-79.55
			38	73.15-74.67
			39	72.84-74.67
			40	71.62
			41	70.10-72.23
Lower Jurassic	Middle Toarcian	Whiteaves	42	54.56
			43	53.34
			44	48.46
			45	44.19-45.72
			46	35.05
			47	27.43-28.95
			48	24.38
			49	19.81-21.33
			50	10.36-11.58
			51	5.49-6.71
			52	3.35-4.57
			53	1.52-2.44
			54	1.52-3.05
			55	0.00-0.91

Ammobaculites sp. J
Haplophragmoides sp. D
Ammobaculites alaskensis
Trochammina scotti
Ammodiscus orbis
Bulbobaculites willowensis
Miliammina sp. B
Astacolus pediacus
Lenticulina audax
Ammodiscus richardsonensis
Bulbobaculites pokrovkaensis
Reophax sp. A
Unknown sp. J (aggl.)
Unknown sp. K (calc.)
Nodosaria regularis
Ammobaculites sp. K
Saccammina sp. A
Ammodiscus francisi
Ammobaculites sp. F
Reinholdella sp. A
Trochammina sablei
Labrospira freboldi
Reophax densa
Lenticulina sp. Z
Bathysiphon sp. A
Citharinella rhomboidea
Miliammina sp. C
Unknown sp. L (aggl.)
Ammodiscus sp. E
Eoguttulina metensis
Astacolus varians
Eoguttulina liassica
Ammobaculites lunaris
Citharina entypomatus
Ammobaculites sp. H
Dentalina sp. M
Falsopalmula antrorsa
Pseudonodosaria statuta
Pseudolamarckina liapinensis
Dentalina vulgata
Dentalina sp. B
Lenticulina d'orbignyi
Citharina sp. H
Ammobaculites sp. C
Ammodiscus sp. A
Astacolus sp. E
Astacolus calliopsis
Citharina callomoni
Unknown sp. M (calc.)
Citharina fallax
Citharina sp. C
Astacolus pauperatus
Astacolus sp. B
Rectoglandulina oviformis
Haplophragmoides sp. F
Dentalina sp. E
Lenticulina sp. T
Citharina sp. B
Citharinella sp. A
Miliammina sp. D
Haplophragmoides sp. G
Lenticulina sp. L
Lenticulina sp. C
Eoguttulina sp. B
Citharina flabellata
Vaginulina sherborni
Vaginulina sp. B
Bullopora globulata
Pseudonodosaria brandi
Lenticulina muensteri
Ammobaculites sp. A
Lenticulina sp. P
Lenticulina sp. Q
Citharinella sp. B
Trochammina sp. E
Trochammina sp. D
Trochammina sp. A
Trochammina sp. B
Dentalina pseudocommunis
Eoguttulina sp. C
Planularia anceps
Lenticulina sp. AA
Lenticulina sp. O
Citharina sp. A
Dentalina ectadia
Ammobaculites sp. E
Saccammina lathrami
Nodosaria sp. A
Bathysiphon sp. B
Astacolus arietis
Astacolus sp. O
Saturnella sp. A
Lenticulina sp. U

· 1-5 specimens • 6-10 specimens ● 11-50 specimens ● >50 specimens

Appendix 3: Foraminiferal distribution in Section 14. Gray areas represent barren samples

Series: Lower Jurassic
Stage: Middle Toarcian
Formation: Whitehaven

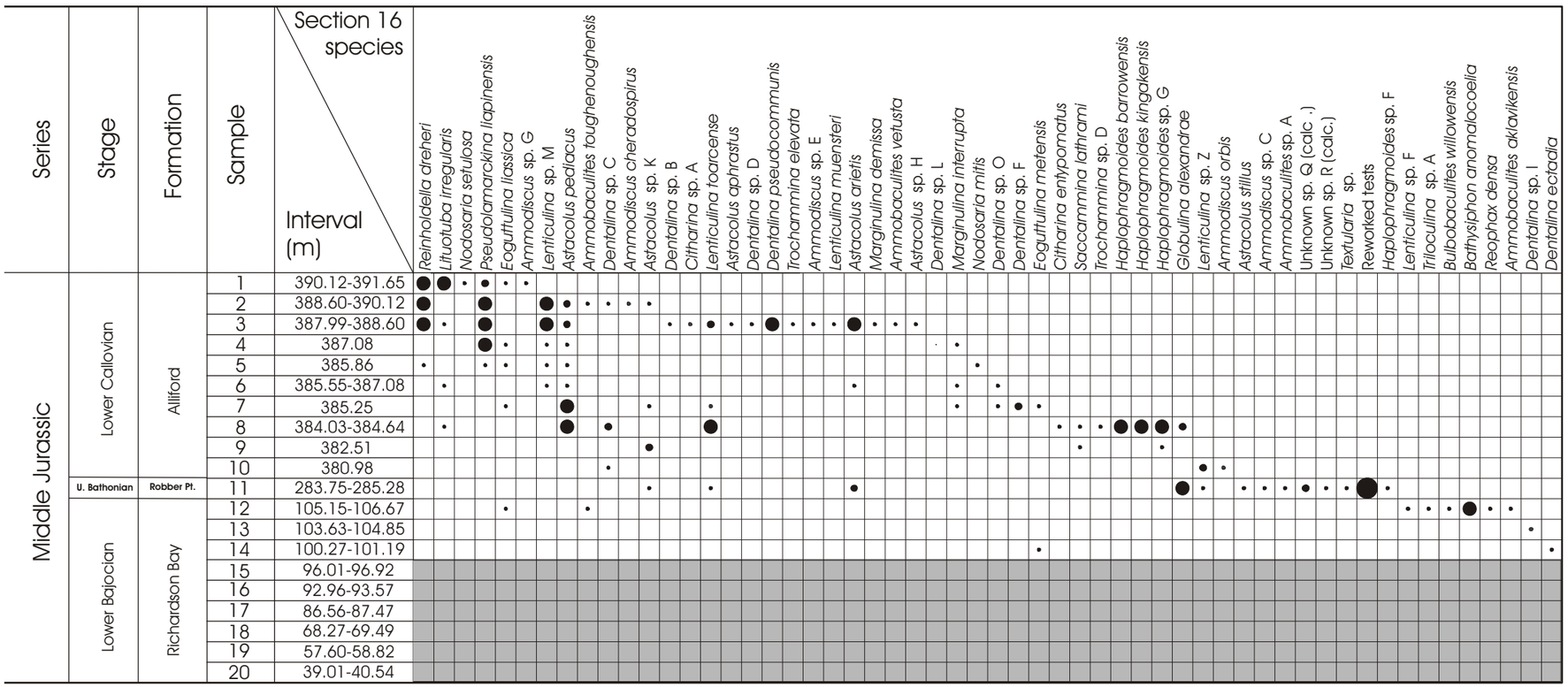
Sample	Interval (m)
1	95.09-96.62
2	95.70
3	93.57
4	89.61-91.13
5	78.94-80.46
6	67.05
7	66.14-67.36
8	63.09
9	60.96
10	59.43
11	57.91
12	56.69-57.91
13	56.39
14	51.81
15	48.77
16	48.46-49.98
17	46.94
18	44.80
19	42.67
20	40.84
21	38.71
22	36.57
23	35.36-36.57
24	33.53
25	32.00
26	30.48
27	27.43
28	24.38
29	22.55
30	21.03-22.25
31	18.29
32	16.46
33	14.32
34	12.19
35	11.89-13.11
36	10.36
37	8.23
38	6.10
39	4.27-5.49
40	4.27
41	2.13
42	1.83-3.05
43	0.00-1.22
44	0.00

Section 15 species

Ammodiscus orbis
Falsopalmula antrorsa
Nodosaria regularis
Haplophragmoides trywa
Ammobaculites sp. A
Astacolus dubius
Nodosaria sp. A
Eoguttulina liassica
Lenticulina toarcense
Lenticulina sp. C
Lenticulina sp. Q
Ammobaculites alaskensis
Ammobaculites lunaris
Citharinella rhomboidea
Dentalina vulgata
Planularia tradsi
Dentalina ectadia
Lenticulina drabjgnyi
Lenticulina audax
Lenticulina subalata
Astacolus arietis
Astacolus pediacus
Ammodiscus sp. A
Labrospira sp. A
Trochammina sablei
Lenticulina varians
Astacolus agalmatus
Citharina sp. H
Citharinella sp. C
Ammobaculites sp. G
Citharina sp. B
Nodosaria sp. B
Lenticulina sp. B
Lenticulina sp. T
Lenticulina sp. W
Citharina calliomani
Astacolus sp. S
Astacolus pauperatus
Citharinella sp. A
Lenticulina sp. J
Pseudonodosaria statuta
Dentalina sp. C
Dentalina sp. B
Ammobaculites aklavikensis
Eoguttulina sp. A
Citharinella exarata
Astacolus varians
Astacolus sp. T
Citharinella sp. B
Lenticulina sp. K
Astacolus sp. U
Citharina sp. G
Citharina sp. F
Citharina emtypomatus
Citharina fallax
Haplophragmoides sp. G
Ammobaculites multiformis
Lenticulina sp. U
Saccammina lathrami
Citharina sp. C
Ammobaculites sp. H
Lingulina lanceolata
Marginulina sp. B
Marginulina sp. N
Astacolus stilus
Reinholdella sp. B
Unknown sp. P (calc.)
Pseudonodosaria brandi
Lenticulina muensteri
Citharina sp. A
Dentalina pseudocommunis
Frondicularia sp. F
Nodosaria defruncata
Lenticulina sp. O
Citharina sp. I
Bathysiphon sp. A
Lenticulina prima
Haplophragmoides sp. D
Lenticulina sp. BB
Lenticulina sp. CC
Dentalina sp. E
Citharinella sp. D
Haplophragmoides sp. C
Dentalina sp. F
Vaginulina sp. B
Ammobaculites sp. E
Dentalina sp. O
Nodosaria sp. D
Citharinella sp. E
Astacolus sp. C
Astacolus sp. O
Astacolus sp. F
Dentalina sp. I
Ammobaculites sp. D
Nodosaria marginata
Frondicularia sp. A
Linguling polita
Marginulina haynesi
Lingulina sp. B
Lingulina sp. C
Nodosaria sp. H
Mesodentalina sp. A
Marginulina sp. D
Dentalina sp. P
Eoguttulina sp. B
Reophax suevica
Lenticulina sp. F
Astacolus sp. V
Dentalina bartensteini
Dentalina subtenuicollis
Planularia anceps
Dentalina sp. D
Astacolus sp. D
Ammobaculites barrowensis
Ammobaculites sp. L
Nodosaria mecista
Haplophragmoides barrowensis
Pseudolamarckina liapinensis
Ammodiscus sp. F
Dentalina guembeli
Dentalina vetustissima

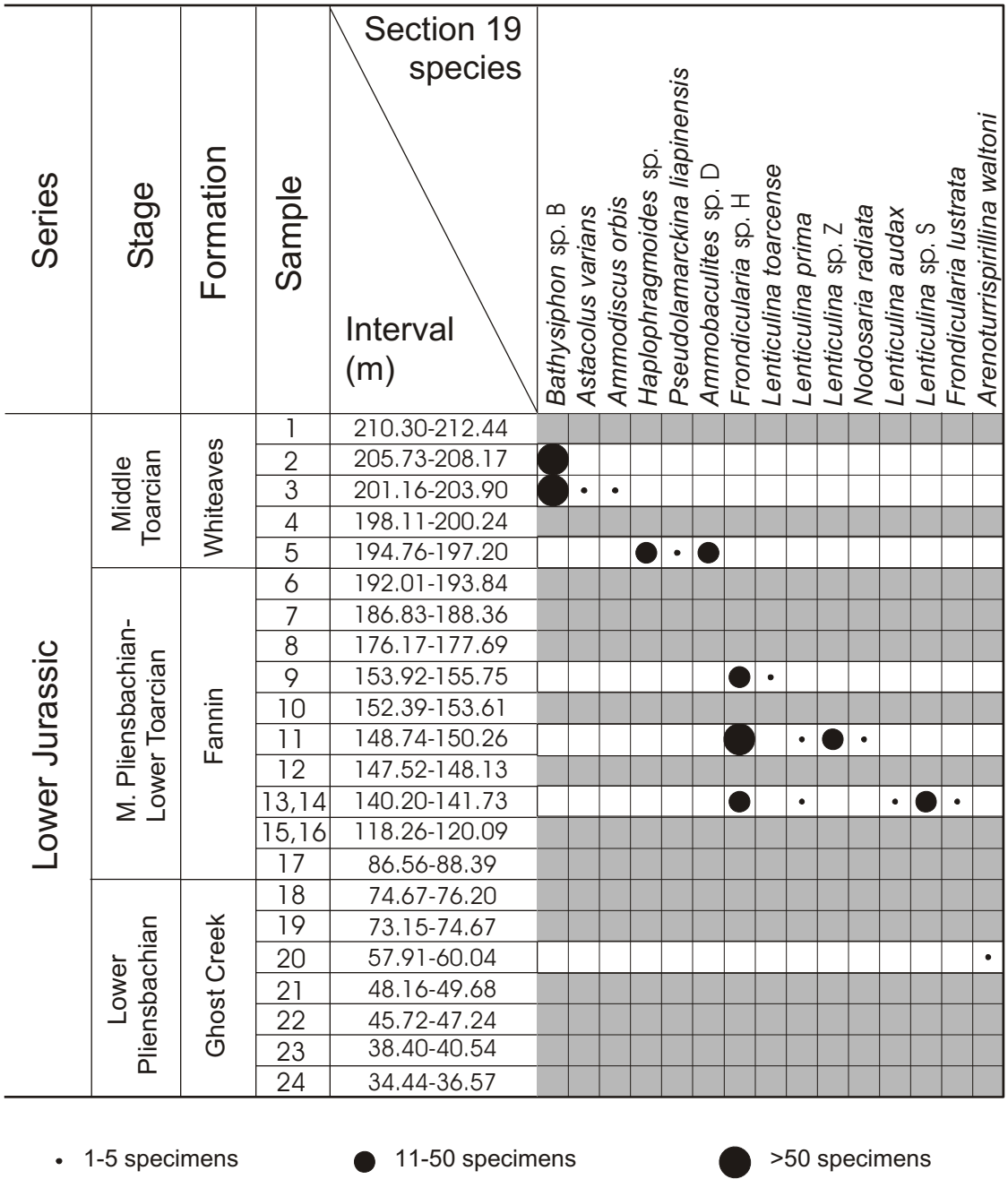
· 1-5 specimens • 6-10 specimens • 11-50 specimens ● >50 specimens

Appendix 3: Foraminiferal distribution in Section 15.



Appendix 3: Foraminiferal distribution in Section 16. Gray areas represent barren samples

Appendix 3: Foraminiferal distribution in Section 17. Gray areas represent barren samples



Appendix 3: Foraminiferal distribution in Section 19. Gray areas represent barren samples