

Thomas, D. B., Fordyce, R. E. and Gordon, K. C. 2013. Evidence for a krill-rich diet from non-destructive analyses of penguin bone. – J. Avian Biol. 000: 000–000.

Appendix 1

Table A1. Band position of phosphate symmetric stretch ($\nu_1\text{-PO}_4^{3-}$) measured from Raman spectra of right penguin humeri (originally reported by Thomas et al. 2007).

Specimen ID	$\nu_1\text{-PO}_4^{3-}$ (cm)
<i>Adélie penguin Pygoscelis adeliae</i>	
CU1027	963.8
TA12	963.6
TA13	963.6
<i>Emperor penguin Aptenodytes forsteri</i>	
CU1767	963.7
CU1839	963.2
<i>Erect-crested penguin Eudyptes sclateri</i>	
OM764	963.3
<i>Fiordland crested penguin Eudyptes pachyrhynchus</i>	
OM309	962.7
<i>Humboldt penguin Spheniscus humboldti</i>	
CU2129	962.0
CU2138	961.9
<i>Little blue penguin Eudyptula minor</i>	
OM535	961.8
OU22105	961.7
TA71	962.5
TA72	962.4
TA73	962.9
TA76	962.2
OU22155	961.3
<i>Yellow-eyed penguin Megadyptes antipodes</i>	
OM565	962.0
TA41	961.8
TA42	962.7
TA43	961.9
TA44	962.8
TA45	961.9
TA46	962.4

Table A2. Summary of published stomach contents data.

Stomach contents by item mass				
Location	Reference	%Krill	Samples	Comment
<i>Adélie penguin Pygoscelis adeliae</i>				
Ross Sea	Ainley et al. 1984	99.9	3	
		97.7	2	
		Average		98.8
Scotia and Weddell Seas	Ainley et al. 1992	30.0	33	
Cape Crozier	Ainley et al. 1998	31.0	4	
		55.0	4	
		51.0	4	
		31.0	4	
		65.0	4	
		58.0	4	
		48.0	4	
		29.0	4	
		64.0	4	
		61.0	4	
		23.0	4	
		0.0	4	
		13.0	4	
	Average		40.7	
Cape Bird	Ainley et al. 1998	85.0	4	
		77.0	4	
		78.0	4	
		60.0	4	
		77.0	4	
		89.0	4	
		69.0	4	
		49.0	4	
		19.0	4	
		24.0	4	
		100.0	4	
		75.0	4	
		42.0	4	
28.0	4			
24.0	4			
	Average		59.7	
Cape Royds	Ainley et al. 1998	16.0	4	
		5.0	4	
		18.0	4	
		3.0	4	
		66.0	4	
	Average		21.6	
Cape Crozier	Ainley et al. 2003	80.0	5	
		56.0	5	
		39.0	5	
		33.0	5	
		35.0	5	

		91.0	5
		78.0	5
		39.0	5
		87.0	5
		11.0	5
		36.0	5
		50.0	5
		36.0	5
		32.0	5
		72.0	5
		51.0	5
		84.0	5
		91.0	5
		42.0	5
		20.0	5
	Average	53.2	
Cape Bird	Ainley et al. 2003	81.0	5
		58.0	5
		74.0	5
		30.0	5
		36.0	5
		40.0	5
		87.0	5
		11.0	5
		88.0	5
		80.0	5
		87.0	5
		59.0	5
		76.0	5
		92.0	5
		60.0	5
		93.0	5
		90.0	5
		85.0	5
		88.0	5
		96.0	5
	Average	70.6	
Cape Royds	Ainley et al. 2003	88.0	5
		73.0	5
		83.0	5
		24.0	5
		0.0	5
		86.0	5
		11.0	5
		72.0	5
		57.0	5
		37.0	5
		100.0	5
		55.0	5
		53.0	5

		13.0	5	
		89.0	5	
		83.0	5	
		61.0	5	
		62.0	5	
		72.0	5	
		59.0	5	
		Average	58.9	
Adélie Land	Cherel 2008	98.3	10	Chick
Béchervaise Island	Clarke et al. 2002	9.0	5	
		37.9	5	
		100.0	5	
		28.7	5	
		25.2	5	
		49.6	5	
		44.7	5	
		18.9	5	
		2.7	5	
		13.1	5	
		47.0	5	
		65.8	5	
		13.9	5	
		40.0	5	
		10.4	5	
		30.6	5	
		Average	33.6	Guard stage
Béchervaise Island	Irvine et al. 2000	44.0	25	
Béchervaise Island	Irvine et al. 2000	54.0	25	
Béchervaise Island	Jarman et al. 2002	27.1	1	
		82.9	1	
		99.8	1	
		Average	69.9	
Lutzow-Holm Bay	Kato et al. 2003	36.2	9	
		52.2	20	
		41.6	8	
		76.8	5	
		48.7	9	
		52.4	9	
		41.8	12	
		Average	50.0	
Shirley Island	Kent et al. 1998	48.2	41	
Point Martin	Libertelli et al. 2003	99.9	47	
		99.3	42	
		99.8	35	
		Average	99.7	
South Orkney Islands	Lishman 1985	98.3	15	
		99.2	13	
		Average	98.8	
Signy Island	Lynnes et al. 2004	99.6	50	
		99.6	49	

		98.9	48	
		99.7	39	
		100.0	30	
		Average	99.6	
Béchervaise Island	Nicol et al. 2008	85.8	40	
		36.1	40	
		Average	60.9	Chick rearing
Edmonson Point	Olmastroni et al. 2000	0.5	5	
		0.1	5	
		0.6	5	
		0.7	5	
		Average	49.7	
Cape Bird	Paulin 1975	46.0	15	
Vestfold Hills	Puddicombe and W. 1988	66.0	574	
Adelie Land	Ropert-Coudert et al. 2002	68.1	13	
MacRobertson Land	Tierney et al. 2008	73.7	40	
		30.4	43	
		Average	52.1	
Béchervaise Island	Tierney et al. 2009	28.8	65	
		60.2	59	
		75.9	67	
		86.7	17	
		26.0	24	
		83.0	40	
		49.5	34	
		85.2	35	
		88.7	40	
		82.5	33	
		47.4	39	
		Average	64.9	
Point Thomas	Trivelpiece et al. 1987	99.5	?	
South Shetland Islands	Volkman et al. 1980	99.1	48	
South Shetland Islands	Volkman et al. 1980	99.6	48	
Hukuro Cove	Watanuki and Mori 1994	69.7	142	
Cape Hinode	Watanuki and Mori 1994	88.9	16	
Lutzow-Holm Bay	Watanuki et al. 1999	36.2	9	
		52.2	20	
		41.6	8	
		76.8	5	
		Average	51.7	
Petrel Island	Wienecke et al. 2000	60.3	15	Creche stage
Shirley Island	Wienecke et al. 2000	69.2	8	Creche stage
Petrel Island	Wienecke et al. 2000	80.0	15	Guard stage
Shirley Island	Wienecke et al. 2000	76.1	7	Guard stage
<i>Emperor penguin Aptenodytes forsteri</i>				
Scotia and Weddell Seas	Ainley et al. 1992	0.0	26	
Coulman Island	Cherel and Kooyman 1998	0.0	7	
Cape Washington	Cherel and Kooyman 1998	5.1	14	
		9.0	9	
		6.1	7	

		11.4	10
	Average	7.9	
Amanda Bay	Gales et al. 1990	3.0	45
Auster and Taylor Glacier	Kirkwood and Robertson 1997	70.0	
Adelie land	Offredo and Ridoux 1986	2.0	29
<i>Fiordland crested penguin Eudyptes pachyrhynchus</i>			
Codfish Island	van Heezik 1990	0.0	21
<i>Little blue penguin Eudyptula minor</i>			
Marion Bay	Gales and Pemberton 1990	9.0	?
Albatross Island	Gales and Pemberton 1990	6.0	?
Fort Direction	Gales and Pemberton 1990	<1	?
Codfish Island	van Heezik 1990	0.0	28
<i>Yellow-eyed penguin Megadyptes antipodes</i>			
Codfish Island	Browne et al. 2010	0.0	13
Stewart Island	Browne et al. 2010	0.0	7
Otago Coast	Moore and Wakelin 1997	0.1	43
Otago Coast	van Heezik 1990	0.0	512
Codfish Island	van Heezik 1990	0.0	22

Stomach contents by item number				
Location	Reference	%Krill	Samples	Comment
<i>Adélie penguin Pygoscelis adeliae</i>				
Ross Sea	Ainley et al. 1984	99.6	3	
		99.3	2	
		Average		
Scotia and Weddell Seas	Ainley et al. 1992	99.0	33	
Adélie Land	Cherel 2008	0.0	10	Chicks
Béchervaise Island	Clarke et al. 1998	51.1	12	
		75.9	16	
		77.9	18	
		37.2	13	
		68.2	9	
		51.5	19	
		Average	60.3	
Béchervaise Island	Clarke et al. 1998	19.7	12	
		64.4	15	
		93.9	16	
		73.9	11	
		6.0	13	
		25.7	17	
		88.9	15	
		94.1	9	
Average	58.3		Guard stage	
Edmonson Point	Clarke et al. 1998	64.3	14	
		5.4	20	
		76.0	11	
		17.2	7	
		Average	40.7	

Edmonson Point	Clarke et al. 1998	34.3	20	
		18.3	13	
		11.4	10	
		6.9	10	
		Average	17.7	
Victoria Land	Corsolini et al. 2003	12.1	18	Creche stage
Victoria Land	Corsolini et al. 2003	11.3	23	Guard stage
Beufort Island	Emison 1968	63.7	5	
Cape Crozier	Emison 1968	91.5	16	
Cape Crozier	Emison 1968	94.5	15	
Laurie Island	Libertelli et al. 2003	99.9	47	
		98.0	42	
		99.5	35	
		Average	99.1	
South Orkney Islands	Lishman 1985	99.4	15	
South Orkney Islands	Lishman 1985	99.7	13	
Cape Bird	Paulin 1975	75.0	15	
Signy Island	Takahashi et al. 2003	100.0	16	
South Shetland Islands	Volkman et al. 1980	99.7	48	
South Orkney Islands	White and Conroy 1975	100.0	10	
<i>Emperor penguin Aptenodytes forsteri</i>				
Scotia and Weddell Seas	Ainley et al. 1992	8.0	26	
Cape Washington	Cherel and Kooyman 1998	15.5	10	
		Gales et al. 1990	0.1	45
Auster and Taylor Glacier	Kirkwood and Robertson 1997	96.0	17	
Auster and Taylor Glacier	Kirkwood and Robertson 1997	41.6	121	
Adelie land	Offredo and Ridoux 1986	31.0	29	
Drescher Inlet	Pütz 1995	74.5	58	
<i>Fiordland crested penguin Eudyptes pachyrhynchus</i>				
Codfish Island	van Heezik 1990	0.0	21	
<i>Humboldt penguin Spheniscus humboldti</i>				
Isla Chanaral	Wilson et al. 1989	0.0	16	
Algarrobo	Wilson et al. 1989	0.0	18	
<i>Little blue penguin Eudyptula minor</i>				
Phillip Island	Chiaradia et al. 2010	10.0	164	
		12.0	160	
		0.0	6	
		0.0	69	
		10.0	61	
		0.0	68	
		13.0	95	
		0.0	108	
		14.0	80	
		4.0	50	
		2.0	60	
		0.0	26	
		Average	5.4	
Penguin Island	Klomp and Wooller 1988	0.0	236	
Phillip Island	Montague and Cullen 1988	0.0	321	

		0.0	24
	Average	0.0	
Codfish Island	van Heezik 1990	0.0	28
<i>Yellow-eyed penguin Megadyptes antipodes</i>			
Codfish Island	Browne et al. 2010	0.0	13
		0.0	7
	Average	0.0	
Otago Peninsula	Moore and Wakelin 1997	15.2	43
Otago Peninsula	Seddon and van Heezik 1990	0.0	6
Otago Peninsula	van Heezik 1990	0.0	512
Codfish Island	van Heezik 1990	0.0	22

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