The following appendices accompany the article

Stable isotope analysis reveals sexual and environmental variability and individual consistency in foraging of thin-billed prions

Petra Quillfeldt[1,*], Rona A. R. McGill[2], Juan F. Masello[1], Felix Weiss[1], Ian J. Strange[3], Paul Brickle[4], Robert W. Furness[5]

[1]Max-Planck Institut für Ornithologie, Vogelwarte Radolfzell, Schlossallee 2, 78315 Radolfzell, Germany
[2]Scottish Universities Environmental Research Centre, East Kilbride, Glasgow G75 0QF, UK
[3]New Island Conservation Trust, The Dolphins, Stanley, Falkland Islands
[4]Falkland Islands Government Fisheries Department, PO Box 598, Stanley, Falkland Islands
[5]Institute of Biomedical and Life Sciences, Graham Kerr Building, University of Glasgow, Glasgow G12 8QQ, UK

*Email: petra.quillfeldt@gmx.de

Marine Ecology Progress Series 373: 137–148 (2008)

Appendix 1. Stable carbon and nitrogen isotope ratios of pelagic prey types in the Southern Ocean

Sample	Location	$\delta^{13}C$	$\delta^{15}N$	Source
Phytoplankton	63–67° S, 64–74° W	–27.7	2.2	Frazer (1996)
Zooplankton				
Larval *Euphausia superba*	63–67° S, 64–74° W	–24.7	3.3	Frazer (1996)
Adult *Euphausia superba*	65° S, 118° E	–29.3	2.7	Wada et al. (1987)
Adult *Euphausia superba*	65° S, 64° W	–29.8	3.6	Dunton (2001)
Adult *Euphausia superba*	62° S, 58° W	–27.2		Corbisier et al. (2004)
Adult *Euphausia superba*	68° S, 78° E	–27.5	2.6	Hall-Aspland et al. (2005)
Euphausids	59° S, 43° W	–25.7	4.2	Wada et al. (1987)
Euphausia vallentini	47° S, 38° W	–22.0	4.5	Kaehler et al. (2000)
Amphipods	65° S, 64° W	–23.1	5.6	Dunton (2001)
Amphipod *Parathemisto gaudichaudi*	60° S, 116° E	–27.1	1.8	Wada et al. (1987)
Crustaceans (euphausids/copepods) from broad-billed prions	44° S, 176° W	–20.1	6.5	Thompson & Furness (1995)
Crustaceans (mainly *Themisto gaudichaudi*) from thin-billed prions	49° S, 70° E	–25.5	4.5	Cherel et al. (2002a)
Crustaceans (mainly *Euphausia vallentini*) from Antarctic prions	49° S, 70° E	–22.9	3.6	Cherel et al. (2002a)
Mysids	77° S, 166° E	–28.1		Mizutani & Wada (1988)
Cephalopods				
Todarodes angolensis	49° S, 70° E	–18.7	8.1	Cherel et al. (2000)
Benthoctopus thielei	49° S, 70° E	–18.2	10.2	Cherel et al. (2000)
Loligo and *Illex* spp.	43° S, 64° W	–17.0	16.3	Forero et al. (2004)
Fish				
Lepidonotothen squamifrons	49° S, 70° E	–20.5	10.3	Cherel et al. (2000)
Lepidonotothen larseni	47° S, 38° W	–21.0	8.0	Kaehler et al. (2000)
Myctophids (97 %) from king penguins	51° S, 58° W	–21.8	8.4	Cherel et al. (2002b)
Pleuragramma antarcticum	77° S, 166° E	–28.3	10.9	Burns et al. (1998)
Electrona antarctica	61° S, 150° E	–27.1	7.5	Wada et al. (1987)
Engraulis anchoita	43° S, 64° W	–17.7	16.4	Forero et al. (2004)
Merluccius hubbsi	43° S, 64° W	–16.5	17.5	Forero et al. (2004)

Appendix 2. Stable carbon and nitrogen isotope ratios determined in Southern Ocean seabirds in previous studies. B = Breeding season, NB = Non-breeding season, LT = long-term time-integrated sample. Feathers of adult birds marked with NB were sampled in the breeding colonies, but were grown elsewhere during moult

Seabird species	Age	Season	Tissue	Breeding location	$\delta^{13}C$	$\delta^{15}N$	Source
Sphenisciformes							
Emperor penguin (*Aptenodytes forsteri*)	Chicks	B	Blood (whole)	Adélie Land (67° S)	–24.2	12.4	Cherel & Hobson (2007)
King penguin (*Aptenodytes patagonicus*)	Adults	B	Blood (cells)	Falklands (51° S, 58° W)	–22.5	9.7	Cherel et al. (2002b)
	Chicks	B	Blood (cells)	Crozet (46° S, 52° E)	–22.2	9.8	Cherel et al. (2005)
	Adults	B	Blood (cells)	Crozet (46° S, 52° E)	–21.3	9.7	Cherel et al. (2005)
	Chicks	B	Blood (whole)	Crozet (46° S, 52° E)	–22.6	10.3	Cherel et al. (2007)
	Adults	B	Blood (whole)	Crozet (46° S, 52° E)	–22.4	10.1	Cherel et al. (2007)
	Adults	NB	Blood (whole)	Crozet (46° S, 52° E)	–21.8	9.8	Cherel et al. (2007)
	Chicks	B	Blood (whole)	Kerguelen (49° S, 70° E)	–22.3	10.1	Cherel & Hobson (2007)
Gentoo penguin (*Pygoscelis papua*)	Chicks	B	Feathers	South Shetland (62° S, 58° W)	–23.5	7.6	Quillfeldt et al. (2005)
	Adult males	B	Blood (cells)	South Georgia (54° S, 38° W)	–18.8	9.1	Bearhop et al. (2006)
	Adult females	B	Blood (cells)	South Georgia (54° S, 38° W)	–18.9	8.6	Bearhop et al. (2006)
	Chicks	B	Blood (whole)	Kerguelen (49° S, 70° E), open sea	–18.2	11.0[a]	Cherel & Hobson (2007)[a]
	Chicks	B	Blood (whole)	Kerguelen (49° S, 70° E), closed sea	–15.9	12.9[a]	Cherel & Hobson (2007)[a]
Adélie penguin (*Pygoscelis adeliae*)	Chicks	B	Feathers	Ross Island (77° S, 166° E)	–25.2	10.3	Mizutani & Wada (1988)
	Adults	NB	Feathers	Anvers Island (65° S, 64° W)	–23.1	5.6	Dunton (2001)
	Chicks	B	Feathers	Ross Island (77° S, 166° E)	–24.5	9.6	Ainley et al. (2003)
	Chicks	B	Feathers	South Shetland (62° S, 58° W)	–24.1	7.7	Quillfeldt et al. (2005)
	Chicks	B	Blood (whole)	Adélie Land (67° S)	–24.8	10.1	Cherel & Hobson (2007)
Chinstrap penguin (*Pygoscelis antarctica*)	Adults	NB	Feathers	Anvers Island (65° S, 64° W)	–27.0	6.9	Dunton (2001)
Northern rockhopper penguin (*Eudyptes moseleyi*)	Chicks	B	Blood (whole)	Amsterdam (38° S)	–19.5	9.2	Cherel & Hobson (2007)
Eastern rockhopper penguin (*Eudyptes filholi*)	Chicks	B	Blood (whole)	Crozet (46° S, 52° E)	–21.2	6.8	Cherel et al. (2007)
	Adults	B	Blood (whole)	Crozet (46° S, 52° E)	–20.9	7.5	Cherel et al. (2007)
	Adults	NB	Blood (whole)	Crozet (46° S, 52° E)	–19.7	7.6	Cherel et al. (2007)
	Chicks	B	Blood (whole)	Kerguelen (49° S, 70° E)	–20.8	8.1[a]	Cherel & Hobson (2007)[a]
Macaroni penguin (*Eudyptes chrysolophus*)	Adult males	B	Blood (cells)	South Georgia (54° S, 38° W)	–20.0	9.3	Bearhop et al. (2006)
	Adult females	B	Blood (cells)	South Georgia (54° S, 38° W)	–19.5	8.9	Bearhop et al. (2006)
	Chicks	B	Blood (whole)	Crozet (46° S, 52° E)	–21.2	7.5	Cherel et al. (2007)
	Adults	B	Blood (whole)	Crozet (46° S, 52° E)	–20.4	7.0	Cherel et al. (2007)
	Adult males	NB	Blood (whole)	Crozet (46° S, 52° E)	–20.7	6.9	Cherel et al. (2007)
	Adult females	NB	Blood (whole)	Crozet (46° S, 52° E)	–21.0	6.6	Cherel et al. (2007)
	Chicks	B	Blood (whole)	Kerguelen (49° S, 70° E)	–20.5	8.7[a]	Cherel & Hobson (2007)[a]
Magellanic penguin (*Spheniscus magellanicus*)	Adults	B	Blood (cells)	Chubut (42–44° S)	–16.7	18.8	Forero et al. (2004)
	Adult males	B	Blood (whole)	Chubut (42–45° S)	–16.2	18.9	Forero et al. (2002)
	Adult females	B	Blood (whole)	Chubut (42–45° S)	–16.5	18.8	Forero et al. (2002)
	Chicks	B	Blood (whole)	Chubut (42–45° S)	–16.6	19.1	Forero et al. (2002)
Procellariiformes							
Black-browed albatross (*Thalassarche melanophris*)	*Chicks*	B	Feathers	Kerguelen (49° S, 70° E)	–19.6	12.4	Cherel et al. (2000)
	Adults	NB	Feathers	Kerguelen (49° S, 70° E)	–17.6	15.7	Cherel et al. (2000)
	Adults	NB	Feathers	South Georgia (54° S, 38° W)	–14.9	15.9	Phillips et al. (2007)
Southern giant petrel (*Macronectes giganteus*)	Adults	B	Blood (cells)	Chubut (42–44° S)	–17.0	19.4	Forero et al. (2004)
	Adult males	B	Blood (cells)	Chubut (45° S, 66° W)	–16.7	19.6	Forero et al. (2005)
	Adult females	B	Blood (cells)	Chubut (45° S, 66° W)	–17.3	18.9	Forero et al. (2005)
	Adult males	B	Blood (cells)	South Georgia (54° S, 38° W)	–23.4	12.0	Forero et al. (2005)
	Adult females	B	Blood (cells)	South Georgia (54° S, 38° W)	–21.5	13.1	Forero et al. (2005)
Southern fulmar (*Fulmarus glacialoides*)	*Chicks*	B	Feathers	Hop Island (69° S, 79° E)	–24.7	11.2	Hodum & Hobson (2000)
	Adults	B	Feathers	Hop Island (69° S, 79° E)	–24.3	10.5	Hodum & Hobson (2000)
Antarctic petrel (*Thalassoica antarctica*)	*Chicks*	B	Feathers	Hop Island (69° S, 79° E)	–25.3	10.8	Hodum & Hobson (2000)
	Adults	B	Feathers	Hop Island (69° S, 79° E)	–24.8	9.5	Hodum & Hobson (2000)
	Adults	LT	Bone collagen	71° S, 3° W	–24.8	13.2	Steele (2005)
Cape petrel (*Daption capense*)	*Chicks*	B	Feathers	Hop Island (69° S, 79° E)	–24.7	11.0	Hodum & Hobson (2000)
	Adults	NB	Feathers	Hop Island (69° S, 79° E)	–24.6	9.9	Hodum & Hobson (2000)

Appendix 2 (continued)

Seabird species	Age	Season	Tissue	Breeding location	$\delta^{13}C$	$\delta^{15}N$	Source
Snow petrel	Chicks	B	Feathers	Hop Island (69° S, 79° E)	–24.7	12.0	Hodum & Hobson (2000)
(*Pagodroma nivea*)	Adults	NB	Feathers	Hop Island (69° S, 79° E)	–24.5	9.9	Hodum & Hobson (2000)
	Adults	LT	Bone collagen	71° S, 3° W	–23.9	15.2	Steele (2005)
Blue petrel	Chicks	B	Feathers	Kerguelen (49° S, 70° E)	–22.2	9.7	Cherel et al. (2002c)
(*Halobaena caerulea*)	Adults	NB	Feathers	Kerguelen (49° S, 70° E)	–24.2	9.1	Cherel et al. (2002c)
	Adults	NB	Feathers	South Georgia (54° S, 38° W)	–24.1	7.9	Cherel et al. (2006)
Broad-billed prion (*Pachyptila vittata*)	Chicks	B	Feathers	44° S, 176° W	–17.6	10.8	Thompson & Furness (1995)
Antarctic prion	Chicks	B	Feathers	Kerguelen (49° S, 70° E)	–21.5	8.5	Cherel et al. (2002a)
(*Pachyptila desolata*)	Adults	NB	Feathers	Kerguelen (49° S, 70° E)	–17.0	10.5	Cherel et al. (2002a)
	Adults	NB	Feathers	South Georgia (54° S, 38° W)	–18.4	9.5	Cherel et al. (2006)
Thin-billed prion	Chicks	B	Feathers	Kerguelen (49° S, 70° E)	–22.7	8.9	Cherel et al. (2002a)
(*Pachyptila belcheri*)	Adults	NB	Feathers	Kerguelen (49° S, 70° E)	–24.3	8.5	Cherel et al. (2002a)
White-chinned petrel (*Procellaria aequinoctialis*)	Adults	NB	Feathers	South Georgia (54° S, 38° W)	–15.5	17.6	Phillips et al. (2007)
Wilson's storm-petrel	Chicks	B	Feathers	South Shetland (62° S, 58° W)	–24.4	11.1	Quillfeldt et al. (2005)
(*Oceanites oceanicus*)	Adults	NB	Feathers	South Shetland (62° S, 58° W)	–18.5	13.9	Quillfeldt et al. (2005)
	Adults	B	Feathers (induced)	South Shetland (62° S, 58° W)	–24.1	10.5	Quillfeldt et al. (2005)
South Georgian diving	Chicks	B	Feathers	Kerguelen (49° S, 70° E)	–21.1	8.9	Bocher et al. (2000)
petrel (*Pelecanoides*	Adults	NB	Feathers	Kerguelen (49° S, 70° E)	–21.5	9.3	Bocher et al. (2000)
georgicus)	Adults	NB	Feathers	South Georgia (54° S, 38° W)	–19.9	8.5	Cherel et al. (2006)
Common diving petrel	Chicks	B	Feathers	Kerguelen (49° S, 70° E)	–19.5	10.9	Bocher et al. (2000)
(*Pelecanoides urinatrix*)	Adults	NB	Feathers	Kerguelen (49° S, 70° E)	–21.5	9.4	Bocher et al. (2000)
	Adults	NB	Feathers	South Georgia (54° S, 38° W)	–20.6	8.0	Cherel et al. (2006)
Pelcaniformes							
South Georgian shag	Adult males	B	Blood (cells)	South Georgia (54° S, 38° W)	–18.2	13.0	Bearhop et al. (2006)
(*Phalacrocorax a.*	Adult females	B	Blood (cells)	South Georgia (54° S, 38° W)	–18.3	12.3	Bearhop et al. (2006)
georgianus)	Adult males	NB	Feathers	South Georgia (54° S, 38° W)	–17.4	14.2	Bearhop et al. (2006)
	Adult females	NB	Feathers	South Georgia (54° S, 38° W)	–17.5	13.3	Bearhop et al. (2006)
Blue-eyed cormorant (*Phalacrocorax a. atriceps*)	Adults	B	Blood (cells)	Chubut (42–44° S)	–16.3	20.0	Forero et al. (2004)
King cormorant (*Phalacrocorax a. albiventer*)	Adults	B	Blood (cells)	Chubut (42–44° S)	–16.2	19.4	Forero et al. (2004)
Guanay cormorant (*Phalacrocorax bouganvillii*)	Adults	B	Blood (cells)	Chubut (42–44° S)	–16.5	19.1	Forero et al. (2004)
Rock shag (*Phalacrocorax magellanicus*)	Adults	B	Blood (cells)	Chubut (42–44° S)	–16.3	19.3	Forero et al. (2004)
Neotropic cormorant (*Phalacrocorax olivaceus*)	Adults	B	Blood (cells)	Chubut (42–44° S)	–16.1	20.2	Forero et al. (2004)
Lariiformes							
South Polar skua (*Catharacta mackormicki*)	Chicks	B	Feathers	South Shetland (62° S, 58° W)	–22.9	11.5	Quillfeldt et al. (2005)
Brown skua (*Catharacta lonnbergi*)	Adults	NB	Feathers	Chatham Island (44° S, 176° W)	–17.2	13.8	Thompson & Furness (1995)
	Adults	B	Blood (cells)	Chubut (42–44° S)	–16.8	19.0	Forero et al. (2004)
	Chicks	B	Feathers	South Shetland (62° S, 58° W)	–23.1	11.0	Quillfeldt et al. (2005)
	Adults	NB	Feathers	South Georgia (54° S, 38° W)	–17.8	10.4	Phillips et al. (2007)
Kelp gull (*Larus dominicanus*)	Adults	B	Blood (cells)	Chubut (42–44° S)	–17.5	18.1	Forero et al. (2004)
Olrolg's gull (*Larus atlanticus*)	Adults	B	Blood (cells)	Chubut (42–44° S)	–12.6	16.5	Forero et al. (2004)
Dolphin gulls (*Leucophaeus scoresbii*)	Adults	B	Blood (cells)	Chubut (42–44° S)	–15.3	20.5	Forero et al. (2004)
South American tern (*Sterna hirundinacea*)	Adults	B	Blood (cells)	Chubut (42–44° S)	–16.8	18.3	Forero et al. (2004)
Sandwich tern (*Thalasseus sandwichensis*)	Adults	B	Blood (cells)	Chubut (42–44° S)	–16.8	18.4	Forero et al. (2004)
Royal tern (*Thalasseus maximus*)	Adults	B	Blood (cells)	Chubut (42–44° S)	–16.8	18.7	Forero et al. (2004)

Appendix 2 (continued)

Seabird species	Age	Season	Tissue	Breeding location	$\delta^{13}C$	$\delta^{15}N$	Source
Seals							
Antarctic fur seal	Adult males	B	Blood (whole)	Crozet (46° S, 52° E)	–21.8	11.4	Cherel et al. (2007)
(*Arctocephalus*	Adult females	B	Blood (whole)	Crozet (46° S, 52° E)	–20.6	11.0	Cherel et al. (2007)
gazella)	Adult females	NB	Blood (whole)	Crozet (46° S, 52° E)	–19.8	11.0	Cherel et al. (2007)
Subantarctic fur seal	Adult males	B	Blood (whole)	Crozet (46° S, 52° E)	–19.3	11.9	Cherel et al. (2007)
(*Arctocephalus*	Adult females	B	Blood (whole)	Crozet (46° S, 52° E)	–19.4	10.8	Cherel et al. (2007)
tropicalis)	Adult females	NB	Blood (whole)	Crozet (46° S, 52° E)	–19.0	11.1	Cherel et al. (2007)
Weddell seal (*Lepthony-*	Adults		Plasma	Ross Island (77° S, 166° E)	–25.5	13.1	Burns et al. (1998)
chotes weddellii)	Adult males		Plasma	Ross Sea (68–76° S, 130–160° W)	–24.9	13.0	Zhao et al. (2004)
Crabeater seal (*Lobodon carcinophagus*)	Adults		Plasma	Ross Sea (68–76° S, 130–160° W)	–26.5	8.4	Zhao et al. (2004)
Ross seal	Adult males		Plasma	Ross Sea (68–76° S, 130–160° W)	–24.3	10.6	Zhao et al. (2004)
(*Omatophoca rossii*)	Adult females		Plasma	Ross Sea (68–76° S, 130–160° W)	–24.0	10.0	Zhao et al. (2004)
Leopard seal	Adults		Vibrissae	Prydz Bay (68° S, 78° E)	–21.6	12.6	Hall-Aspland et al. (2005)
(*Hydrurga leptonyx*)	Adult males		Plasma	Ross Sea (68–76° S, 130–160° W)	–24.8	12.3	Zhao et al. (2004)

[a]Unpublished nitrogen isotope data provided by Y. Cherel

Appendix 3. Stable carbon and nitrogen isotope ratios and C/N ratios of thin-billed prions, crustacea, fish and squid

Species and group	Tissue/source	Year	N	$\delta^{13}C$			$\delta^{15}N$			C/N		
				Mean	SE	SD	Mean	SE	SD	Mean	SE	SD
Pachyptila belcheri												
Adult (inter-breeding) females	Feather	2004	8	−24.543	0.245	0.693	7.761	0.133	0.377	3.245	0.009	0.026
Adult (inter-breeding) males	Feather	2004	10	−24.180	0.590	1.867	8.589	0.947	2.993	3.300	0.026	0.082
Adult (inter-breeding) females	Feather	2005	12	−24.266	0.581	2.013	7.992	0.333	1.155	3.250	0.060	0.208
Adult (inter-breeding) males	Feather	2005	23	−23.950	0.387	1.855	8.509	0.500	2.400	3.241	0.025	0.119
Adult (courtship) females	Blood cells	2005	9	−20.510	0.296	0.887	11.027	0.547	1.642	3.320	0.011	0.032
Adult (chick-feeding) females	Blood cells	2005	10	−20.069	0.506	1.600	11.015	0.357	1.128	3.289	0.007	0.023
Adult (courtship) males	Blood cells	2005	14	−20.110	0.255	0.956	11.994	0.420	1.573	3.277	0.014	0.053
Adult (chick-feeding) males	Blood cells	2005	10	−18.978	0.356	1.126	12.380	0.406	1.282	3.257	0.019	0.060
Chick (20 d old)	Blood cells	2005	8	−19.335	0.253	0.715	11.709	0.220	0.621	3.275	0.019	0.054
Chick (40 d old)	Blood cells	2005	8	−20.156	0.267	0.756	11.552	0.227	0.642	3.272	0.019	0.053
Chick (50 d old)	Blood cells	2005	8	−20.265	0.268	0.759	11.700	0.222	0.628	3.280	0.012	0.035
Chick (20 d old)	Blood cells	2006	8	−19.323	0.220	0.623	12.170	0.191	0.541	3.261	0.018	0.050
Chick (40 d old)	Blood cells	2006	10	−19.685	0.152	0.479	12.531	0.171	0.542	3.251	0.023	0.073
Chick (50 d old)	Blood cells	2006	8	−19.925	0.132	0.374	12.494	0.127	0.359	3.268	0.023	0.065
Chick	Down	2004	10	−18.960	0.139	0.438	11.309	0.113	0.358	3.353	0.020	0.063
Chick	Down	2005	4	−18.050	0.392	0.785	13.045	0.168	0.335	3.283	0.014	0.027
Chick	Down	2006	13	−18.274	0.240	0.864	12.428	0.214	0.772	3.309	0.032	0.116
Chick	Feather	2004	10	−19.872	0.167	0.527	11.389	0.177	0.560	3.274	0.015	0.048
Chick	Feather	2005	10	−19.165	0.259	0.819	11.806	0.345	1.091	3.281	0.027	0.086
Chick	Feather	2006	16	−18.798	0.241	0.962	12.876	0.182	0.726	3.299	0.016	0.063
Egg	Membrane	2005	4	−17.170	0.349	0.699	10.378	0.208	0.417	3.667	0.199	0.398
Egg	Membrane	2006	9	−16.715	0.639	1.916	11.287	0.314	0.943	3.331	0.028	0.084
Crustacea (whole, fat extracted, acid washed)												
Copepods *Calanus similis*	Prion diet	2006	4	−20.857	0.341	0.682	7.641	1.263	2.526	4.128	0.176	0.351
Amphipod *Themisto gaudichaudii*	Prion diet	2006	7	−20.237	0.441	1.166	8.317	0.519	1.372	4.297	0.105	0.278
Amphipod *T. gaudichaudii*	Fisheries	2006	2	−17.284	0.073	0.104	10.669	0.367	0.519	3.744	0.116	0.164
Krill *Euphausia vallentini*	Prion diet	2006	5	−19.927	0.494	1.105	8.524	0.541	1.209	3.695	0.095	0.213
Krill *E. lucens*	Fisheries	2006	1	−18.998			10.276			3.415		
Krill *Thysanoessa macrura*	Fisheries	2006	1	−18.992			10.741			3.436		
Lobster krill *Munida gregaria*	Fisheries	2006	3	−19.071	0.477	0.826	6.044	2.367	4.099	4.939	0.532	0.921
Lobster krill *M. gregaria*	Prion diet	2006	3	−20.311	0.136	0.236	4.436	1.516	2.625	5.042	0.320	0.554
Fish (muscle, fat extracted)												
Champsocephalus esox	Fisheries	2006	4	−16.922	0.205	0.410	14.229	0.577	1.154	3.206	0.008	0.016
Macrurounus magellanicus	Fisheries	2006	4	−17.212	0.060	0.120	14.026	0.335	0.669	3.205	0.015	0.031
Micromesistius australis	Fisheries	2006	2	−18.677	0.051	0.072	12.182	0.185	0.261	3.217	0.062	0.087
Patagonotothen guntheri	Fisheries	2006	8	−17.944	0.246	0.696	12.801	0.135	0.382	3.235	0.017	0.049
Squid (muscle, fat extracted)												
Squid tissue	Prion diet	2006	2	−21.424	1.096	1.550	9.623	1.203	1.701	4.949	0.798	1.128
Illex argentinus	Fisheries	2006	4	−18.274	0.106	0.212	9.103	0.226	0.453	3.550	0.027	0.055
Loligo gahi	Fisheries	2006	4	−16.752	0.099	0.199	11.445	0.927	1.853	3.099	0.029	0.058
Moroteuthis ingens	Fisheries	2006	4	−16.802	0.168	0.337	10.892	0.348	0.696	3.535	0.086	0.172

LITERATURE CITED

Ainley DG, Ballard G, Barton KJ, Karl BJ, Rau GH, Ribic CA, Wilson PR (2003) Spatial and temporal variation of diet within a presumed metapopulation of Adelie penguins. Condor 105:95–106

Bearhop S, Phillips RA, McGill R, Cherel Y, Dawson DA, Croxall JP (2006) Stable isotopes indicate sex-specific and long-term individual foraging specialisation in diving seabirds. Mar Ecol Prog Ser 311:157–164

Bocher P, Cherel Y, Hobson KA (2000) Complete trophic segregation between South Georgian and common diving petrels during breeding at Iles Kerguelen. Mar Ecol Prog Ser 208:249–264

Burns JM, Trumble SJ, Castellini MA, Testa JW (1998) The diet of Weddell seals in McMurdo Sound, Antarctica as determined from scat collections and stable isotope analysis. Polar Biol 19:272–282

Cherel Y, Hobson KA (2007) Geographical variation in carbon stable isotope signatures of marine predators: a tool to investigate their foraging areas in the Southern Ocean. Mar Ecol Prog Ser 329:281–287

Cherel Y, Hobson KA, Weimerskirch H (2000) Using stable-isotope analysis of feathers to distinguish moulting and breeding origins of seabirds. Oecologia 122:155–162

Cherel Y, Pütz K, Hobson KA (2002a) Summer diet of king penguins (*Aptenodytes patagonicus*) at the Falkland Islands, southern Atlantic Ocean. Polar Biol 25:898–906

Cherel Y, Bocher P, De Broyer C, Hobson KA (2002b) Food and feeding ecology of the sympatric thin-billed *Pachyptila belcheri* and Antarctic *P. desolata* prions at Iles Kerguelen, Southern Indian Ocean. Mar Ecol Prog Ser 228: 263–281

Cherel Y, Bocher P, Trouvé C, Weimerskirch H (2002c) Diet and feeding ecology of blue petrels *Halobaena caerulea* at Iles Kerguelen, Southern Indian Ocean. Mar Ecol Prog Ser 228:283–299

Cherel Y, Hobson KA, Bailleul FR, Groscolas R (2005) Nutrition, physiology, and stable isotopes: new information from fasting and molting penguins. Ecology 86:2881–2888

Cherel Y, Phillips RA, Hobson KA, McGill R (2006) Stable isotope evidence of diverse species-specific and individual wintering strategies in seabirds. Biol Lett 2:301–303

Cherel Y, Hobson KA, Guinet C, Vanpe C (2007) Stable isotopes document seasonal changes in trophic niches and winter foraging individual specialization in diving predators from the Southern Ocean. J Anim Ecol 76:826–836

Corbisier TN, Petti MAV, Skowronski RSP, Brito TAS (2004) Trophic relationships in the nearshore zone of Martel Inlet (King George Island, Antarctica): $\delta^{13}C$ stable-isotope analysis. Polar Biol 27:75–82

Dunton KH (2001) $\delta^{15}N$ and $\delta^{13}C$ measurements of Antarctic peninsula fauna: trophic relationships and assimilation of benthic seaweeds. Am Zool 41:99–112

Forero MG, Hobson KA, Bortolotti GR, Donazar JA, Bertellotti M, Blanco G (2002) Food resource utilisation by the Magellanic penguin evaluated through stable-isotope analysis: segregation by sex and age and influence on offspring quality. Mar Ecol Prog Ser 234:289–299

Forero MG, Bortolotti GR, Hobson KA, Donazar JA, Bertelloti M, Blanco G (2004) High trophic overlap within the seabird community of Argentinean Patagonia: a multi-scale approach. J Anim Ecol 73:789–801

Forero MG, Gonzalez-Solis J, Hobson KA, Doncazar JA, Bertellotti M, Blanco G, Bortolotti GR (2005) Stable isotopes reveal trophic segregation by sex and age in the southern giant petrel in two different food webs. Mar Ecol Prog Ser 296:107–113

Frazer TK (1996) Stable isotope composition ($\delta^{13}C$ and $\delta^{15}N$) of larval krill, *Euphausia superba*, and two of its potential food sources in winter. J Plankton Res 18:1413–1426

Hall-Aspland SA, Rogers TL, Canfield RB (2005) Stable carbon and nitrogen isotope analysis reveals seasonal variation in the diet of leopard seals. Mar Ecol Prog Ser 305: 249–259

Hodum PJ, Hobson KA (2000) Trophic relationships among Antarctic fulmarine petrels: insights into dietary overlap and chick provisioning strategies inferred from stable-isotope ($\delta^{15}N$ and $\delta^{13}C$) analyses. Mar Ecol Prog Ser 198:273–281

Kaehler S, Pakhomov EA, McQuaid CD (2000) Trophic structure of the marine food web at the Prince Edward Islands (Southern Ocean) determined by $\delta^{13}C$ and $\delta^{15}N$ analysis. Mar Ecol Prog Ser 208:13–20

Mizutani H, Wada E (1988) Nitrogen and carbon isotope ratios in seabird rookeries and their ecological implications. Ecology 69:340–349

Phillips RA, Catry P, Silk JRD, Bearhop S, McGill R, Afanasyev V, Strange IJ (2007) Movements, winter distribution and activity patterns of Falkland and brown skuas: insights from loggers and isotopes. Mar Ecol Prog Ser 345: 281–291

Quillfeldt P, McGill RAR, Furness RW (2005) Diet and foraging areas of Southern Ocean seabirds and their prey inferred from stable isotopes: review and case study of Wilson's storm-petrel. Mar Ecol Prog Ser 295:295–304

Steele WK (2005) Stable isotope ratios of Antarctic petrel (*Thalassoica antarctica*) and snow petrel (*Pagodroma nivea*) bone collagen. Polar Biol 28:672–679

Thompson DR, Furness RW (1995) Stable-isotope ratios of carbon and nitrogen in feathers indicate seasonal dietary shifts in northern Fulmars. Auk 112:493–498

Wada E, Terazaki M, Kabaya Y, Nemoto T (1987) ^{15}N and ^{13}C abundances in the Antarctic Ocean with emphasis on the biogeochemical structure of the food web. Deep-Sea Res I Oceanogr Res Pap 34:829–841

Zhao L, Castellini MA, Mau TL, Trumble SJ (2004) Trophic interactions of Antarctic seals as determined by stable isotope signatures. Polar Biol 27:368–373