

Table 1. Biological data of mature males of common minke, sei and Bryde's whales sampled in the western North Pacific, and Antarctic minke whales sampled in the Antarctic Ocean (see Fig.1 for definition of sub-areas).

Species	Sampling date	Area	Body length (m)
Common minke whale	May 22 2012	sub-area 7	7.33
	May 22 2012	sub-area 7	7.55
	May 25 2012	sub-area 7	7.40
	May 25 2012	sub-area 7	7.70
	June 1 2012	sub-area 7	8.16
Sei whale	June 18 2012	sub-area 9	13.55
	June 25 2012	sub-area 9	13.74
	July 2 2012	sub-area 9	13.48
	July 16 2012	sub-area 9	14.03
	July 19 2012	sub-area 9	13.48
Bryde's whale	July 22 2012	sub-area 9	12.22
	July 24 2012	sub-area 9	12.69
	July 25 2012	sub-area 9	13.06
	July 26 2012	sub-area 8	13.32
	July 27 2012	sub-area 8	13.38
Antarctic minke whale	January 5 2011	Antarctic Area V*	8.67
	January 16 2011	Antarctic Area V	8.78
	January 16 2011	Antarctic Area V	8.35
	January 31 2011	Antarctic Area V	8.77
	February 2 2011	Antarctic Area V	8.31

*: Area V in the Antarctic is comprised between 130°E and 170°W

Table 2. Concentrations of POPs (ng/g lipid wt.) in the blubber of common minke, sei, Bryde's whales from the western North Pacific, and Antarctic minke whales from the Antarctic.

Species	n	Fat (%)	PCBs	DDTs	HCHs	HCB	CHLs
Common minke whale	5	29.3 (20.6 - 49.1)	3100 (1400 - 8000)	2000 (800 - 5800)	670 (410 - 1500)	250 (160 - 360)	1300 (620 - 3100)
Sei whale	5	73.0 (65.6 - 77.4)	130 (67 - 210)	71 (32 - 130)	91 (30 - 150)	21 (15 - 28)	59 (31 - 90)
Bryde's whale	5	51.9 (17.5 - 79.5)	140 (85 - 200)	82 (36 - 130)	13 (7.0 - 19)	17 (14 - 22)	68 (38 - 88)
Antarctic minke whale	5	61.2 (44.0 - 75.0)	33 (19 - 57)	69 (35 - 110)	0.52 (0.22 - 0.89)	140 (90 - 250)	34 (18 - 59)

Table 3. Average concentrations of PCB congeners (ng/g lipid wt.) in blubber samples of common minke, sei, Bryde's whales from the western North Pacific, and Antarctic minke whales from the Antarctic.

PCB isomers		Common minke whale		Sei whale	Bryde's whale		Antarctic minke whale		
Nos. of Cl	IUPAC No.	ng/g	%	ng/g	%	ng/g	%	ng/g	%
D2CBs	#10,#4	0.41	0.01	0.37	0.29	0.48	0.34	0.063	0.19
	#8,#5	1.2	0.04	0.70	0.55	1.1	0.81	0.054	0.17
	#11	N.D	0.00	N.D	0.00	N.D	0.00	0.053	0.16
	#12,#13	N.D	0.00	N.D	0.00	0.30	0.21	N.D	0.00
	#15	0.37	0.01	0.24	0.19	0.29	0.21	0.030	0.09
	sum		2.0	0.06	1.3	1.0	2.2	1.6	0.20
T3CBs	#19	N.D	0.00	0.11	0.09	N.D	0.00	N.D	0.00
	#18	3.6	0.12	1.2	0.97	1.2	0.89	0.14	0.44
	#17	0.49	0.02	0.37	0.29	0.47	0.33	0.036	0.11
	#24,#27	0.29	0.01	0.15	0.12	N.D	0.00	0.031	0.09
	#32,#16	0.87	0.03	0.59	0.46	0.76	0.54	0.065	0.20
	#26	0.50	0.02	0.22	0.17	0.26	0.18	0.026	0.08
	#25	0.53	0.02	0.15	0.12	0.23	0.16	N.D	0.00
	#31,#28	5.6	0.18	2.4	1.9	3.3	2.3	0.23	0.70
	#33,#20	3.5	0.11	0.83	0.65	1.1	0.78	0.11	0.33
	#22	0.51	0.02	0.43	0.34	0.62	0.44	0.045	0.14
	#37	N.D	0.00	0.22	0.17	N.D	0.00	N.D	0.00
sum		16	0.51	6.7	5.3	7.9	5.7	0.69	2.1
T4CBs	#53	2.1	0.07	0.34	0.27	0.30	0.21	0.068	0.21
	#51	0.82	0.03	N.D	0.00	N.D	0.00	N.D	0.00
	#45	0.73	0.02	0.34	0.27	N.D	0.00	N.D	0.00
	#69,#46	N.D	0.00	N.D	0.00	N.D	0.00	0.074	0.22
	#52,#73	100	3.3	8.6	6.8	5.4	3.8	2.0	6.2
	#43,#49	14	0.45	2.4	1.9	1.6	1.2	0.43	1.3
	#47,#48,#75	14	0.44	1.9	1.5	1.3	0.94	0.36	1.1
	#44	5.0	0.16	2.0	1.6	1.2	0.84	0.27	0.82

	#59,#42	2.0	0.07	0.45	0.35	0.52	0.37	0.11	0.35
	#41	2.6	0.08	N.D	0.00	0.46	0.33	0.16	0.50
	#64,#68	0.65	0.02	0.32	0.25	0.35	0.25	0.37	1.1
	#40,#57	1.1	0.03	0.26	0.20	N.D	0.00	0.073	0.22
	#74	63	2.0	3.2	2.5	2.7	1.9	0.67	2.0
	#70,#76	3.0	0.10	0.51	0.40	0.50	0.35	0.093	0.28
	#80	N.D	0.00	N.D	0.00	N.D	0.00	0.11	0.33
	#66	8.0	0.26	2.5	2.0	1.4	0.99	0.26	0.78
	#56,#60	1.9	0.06	0.55	0.43	0.57	0.40	0.058	0.18
	sum	220	7.2	23	18	16	12	5.1	16
P5CBs	#96	1.4	0.05	N.D	0.00	N.D	0.00	N.D	0.00
	#103	1.5	0.05	N.D	0.00	N.D	0.00	N.D	0.00
	#100	1.4	0.05	N.D	0.00	N.D	0.00	N.D	0.00
	#94	1.2	0.04	N.D	0.00	N.D	0.00	N.D	0.00
	#93	2.7	0.09	N.D	0.00	N.D	0.00	0.088	0.27
	#95	59	1.9	6.6	5.2	4.4	3.1	1.8	5.5
	#121,#92	14	0.47	0.78	0.61	0.60	0.43	0.13	0.39
	#89	6.9	0.22	1.5	1.2	N.D	0.00	0.36	1.1
	#84	2.8	0.09	0.85	0.67	N.D	0.00	0.13	0.38
	#90,#101	110	3.4	10	7.8	N.D	0.00	3.1	9.4
	#99	190	6.2	6.0	4.7	6.2	4.4	1.2	3.7
	#119	3.2	0.10	N.D	0.00	N.D	0.00	N.D	0.00
	#97,#86	6.0	0.19	1.6	1.2	1.2	0.83	0.26	0.80
	#125,#87	11	0.35	2.0	1.6	1.5	1.1	0.46	1.4
	#117,#115,#85	N.D	0.00	N.D	0.00	N.D	0.00	0.96	2.9
	#110	18	0.58	1.1	0.82	2.2	1.6	0.22	0.68
	#82	2.5	0.08	0.44	0.35	0.39	0.28	0.090	0.27
	#124	2.0	0.07	N.D	0.00	N.D	0.00	N.D	0.00
	#123,#106	9.8	0.31	0.46	0.36	0.56	0.40	0.15	0.47
	#118	220	7.1	7.6	6.0	9.1	6.5	1.6	4.8

	#114	N.D	0.00	0.34	0.26	0.40	0.28	N.D	0.00
	#122	0.83	0.03	N.D	0.00	N.D	0.00	N.D	0.00
	#105,#127	7.7	0.25	1.6	1.3	1.7	1.2	0.095	0.29
	sum	670	22	41	32	28	20	11	32
H6CBs	#155	6.7	0.22	N.D	0.00	0.58	0.41	N.D	0.00
	#150	1.7	0.05	N.D	0.00	N.D	0.00	N.D	0.00
	#148	2.8	0.09	N.D	0.00	N.D	0.00	N.D	0.00
	#136	28	0.91	1.3	1.0	1.3	0.92	0.55	1.7
	#154	7.6	0.24	N.D	0.00	N.D	0.00	N.D	0.00
	#151	25	0.81	2.7	2.1	3.0	2.1	0.89	2.7
	#135,#144	35	1.1	1.5	1.2	1.6	1.2	0.53	1.6
	#147	4.4	0.14	0.44	0.34	0.47	0.33	0.11	0.32
	#149	240	7.8	8.0	6.3	9.5	6.7	2.5	7.7
	#139,#140	3.7	0.12	N.D	0.00	N.D	0.00	N.D	0.00
	#134	2.1	0.07	N.D	0.00	N.D	0.00	N.D	0.00
	#143,#142,#133	11	0.34	0.40	0.31	0.40	0.28	0.13	0.39
	#146	81	2.6	2.3	1.8	3.3	2.4	0.77	2.4
	#153,#132,#168	640	21	15	12	22	15	3.4	10
	#141	2.5	0.08	0.45	0.36	0.81	0.58	0.19	0.57
	#130	22	0.71	0.54	0.42	0.70	0.50	0.13	0.38
	#137	19	0.60	0.62	0.49	0.79	0.56	0.17	0.51
	#138,#163,#160	450	14	11	8.3	16	11	2.5	7.7
	#129	1.5	0.05	N.D	0.00	N.D	0.00	N.D	0.00
	#166	4.3	0.14	N.D	0.00	N.D	0.00	N.D	0.00
	#159	1.2	0.04	N.D	0.00	N.D	0.00	N.D	0.00
	#128	11	0.35	1.0	0.82	0.97	0.69	0.12	0.37
	#167	18	0.59	0.55	0.43	0.69	0.49	0.18	0.53
	#156	25	0.79	0.67	0.53	1.0	0.74	0.18	0.55
	#157	7.5	0.24	N.D	0.00	N.D	0.00	N.D	0.00
	sum	1700	53	47	36	62	44	12	38

H7CBs	#188	4.7	0.15	N.D	0.00	N.D	0.00	N.D	0.00
	#184	3.7	0.12	0.23	0.18	0.25	0.18	N.D	0.00
	#179	28	0.89	0.85	0.67	1.0	0.72	0.35	1.1
	#176	7.1	0.23	0.31	0.24	0.34	0.24	0.088	0.27
	#186	13	0.42	N.D	0.00	N.D	0.00	N.D	0.00
	#178	17	0.55	0.54	0.42	0.93	0.66	0.17	0.53
	#175	3.4	0.11	N.D	0.00	0.17	0.12	0.055	0.17
	#187,#182	120	3.9	3.0	2.3	4.7	3.4	0.93	2.8
	#183	43	1.4	0.93	0.73	1.5	1.1	0.19	0.57
	#185	2.0	0.06	N.D	0.00	N.D	0.00	0.052	0.16
	#174	37	1.2	0.85	0.67	1.4	1.0	0.39	1.2
	#177	28	0.90	0.70	0.55	1.2	0.84	0.20	0.62
	#171	11	0.37	0.23	0.18	0.46	0.33	0.053	0.16
	#172,#192	10	0.33	0.25	0.20	0.59	0.42	0.097	0.30
	#180	140	4.4	2.7	2.1	5.3	3.7	1.0	3.1
	#191	1.3	0.04	N.D	0.00	N.D	0.00	N.D	0.00
	#170,#190	48	1.5	0.97	0.76	1.7	1.2	0.27	0.82
	#189	3.3	0.11	N.D	0.00	0.18	0.13	N.D	0.00
	sum	520	21	16	14	24	19	8.6	16
O8CBs	#202	6.4	0.20	N.D	0.00	0.26	0.18	0.084	0.26
	#201	3.9	0.13	N.D	0.00	N.D	0.00	0.070	0.21
	#197	3.4	0.11	N.D	0.00	N.D	0.00	N.D	0.00
	#200	1.8	0.06	N.D	0.00	N.D	0.00	N.D	0.00
	#198	1.1	0.03	N.D	0.00	N.D	0.00	N.D	0.00
	#199	13	0.42	0.26	0.20	0.60	0.42	0.15	0.46
	#203,#196	14	0.44	0.30	0.23	0.49	0.35	0.087	0.27
	#195	3.1	0.10	N.D	0.00	N.D	0.00	N.D	0.00
	#194	9.3	0.30	0.21	0.16	0.30	0.21	0.078	0.24
	#205	1.2	0.04	N.D	0.00	N.D	0.00	N.D	0.00
	sum	57	1.8	0.77	0.60	1.6	1.2	0.47	1.4

N9CBs	#208	2.0	0.07	N.D	0.00	0.19	0.13	0.044	0.13
	#207	2.1	0.07	N.D	0.00	0.23	0.17	0.030	0.09
	#206	2.5	0.08	N.D	0.00	N.D	0.00	0.038	0.11
	sum	6.6	0.21	ND	0.00	0.42	0.30	0.11	0.34
D10CBs	#209	3.7	0.12	0.13	0.10	0.38	0.27	0.037	0.11
Total-PCBs		3100	100	130	100	140	100	33	100

Table 4. Factor loadings of a selection of individual PCB isomer concentrations in blubber samples of common minke, sei, Bryde's from the western North Pacific and Antarctic minke whales from the Antarctic to the two principal components (PCs) 1 and 2.

PCB isomers		PC1	PC2
Nos. of Cl	IUPAC No.		
D2CBs	#10,#4	0.206	0.776
	#8,#5	0.318	0.740
	#11	-0.250	-0.609
	#12,#13	-0.101	0.052
	#15	-0.237	0.607
T3CBs	#19	-0.119	0.078
	#17	-0.247	0.399
	#24,#27	0.051	-0.013
	#32,#16	-0.044	0.860
	#26	0.704	0.551
	#25	0.041	0.880
	#31,#28	0.806	0.522
	#33,#20	0.952	0.197
	#22	0.206	0.467
	#37	-0.099	0.085
T4CBs	#53	0.924	0.249
	#51	0.923	-0.153
	#45	0.706	0.122
	#69,#46	-0.179	-0.487
	#52,#73	0.988	0.097
	#43,#49	0.949	0.236
	#47,#48,#75	0.950	0.229
	#44	0.909	0.261
	#59,#42	0.924	0.272
	#41	0.927	0.157

	#64,#68	-0.239	0.061
	#40,#57	0.920	0.105
	#74	0.997	0.028
	#70,#76	0.970	0.156
	#80	-0.293	-0.701
	#66	0.950	0.203
	#56,#60	0.948	0.218
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P5CBs	#96	0.874	-0.338
	#103	0.951	0.064
	#100	0.918	-0.126
	#94	0.874	-0.338
	#93	0.980	0.062
	#95	0.971	0.171
	#121,#92	0.996	0.028
	#89	0.917	0.276
	#84	0.783	0.489
	#90,#101	0.95	0.219
	#99	0.995	-0.025
	#119	0.368	0.618
	#97,#86	0.889	0.323
	#125,#87	0.945	0.243
	#117,#115,#85	-0.287	-0.693
	#110	0.929	0.249
	#82	0.886	0.124
	#124	0.887	-0.333
	#123,#106	0.990	-0.121
	#118	0.995	-0.015
	#114	-0.115	0.131
	#122	0.115	0.003
	#105,#127	0.916	0.328

H6CBs	#155	0.933	0.182
	#150	0.931	-0.183
	#148	0.874	-0.338
	#136	0.990	-0.082
	#154	0.996	-0.062
	#151	0.974	0.173
	#135,#144	0.993	-0.083
	#147	0.981	0.097
	#149	0.993	-0.074
	#139,#140	0.874	-0.338
	#134	0.874	-0.338
	#143,#142,#133	0.988	-0.127
	#146	0.990	-0.105
	#153,#132,#168	0.990	-0.020
	#141	0.912	0.248
	#130	0.982	-0.155
	#137	0.984	-0.149
	#138,#163,#160	0.991	-0.010
	#129	0.928	-0.172
	#166	0.950	-0.245
	#159	0.788	0.053
	#128	0.961	0.191
	#167	0.983	-0.156
	#156	0.991	-0.106
	#157	0.985	-0.147
H7CBs	#188	0.228	0.392
	#184	0.915	-0.033
	#179	0.984	-0.116
	#176	0.980	-0.159
	#186	0.228	0.392

	#178	0.949	-0.199
	#175	0.937	-0.235
	#187,#182	0.986	-0.040
	#183	0.984	-0.110
	#185	0.992	-0.041
	#174	0.980	-0.112
	#177	0.986	-0.090
	#171	0.982	-0.141
	#172,#192	0.979	-0.146
	#180	0.981	-0.019
	#191	0.115	0.003
	#170,#190	0.977	-0.037
	#189	0.939	-0.218
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O8CBs	#202	0.989	-0.116
	#201	0.990	-0.122
	#197	0.874	-0.338
	#200	0.913	-0.306
	#198	0.887	-0.332
	#199	0.979	-0.097
	#203,#196	0.979	-0.090
	#195	0.955	-0.196
	#194	0.972	-0.113
	#205	0.911	-0.299
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N9CBs	#208	0.979	-0.074
	#207	0.983	-0.007
	#206	0.977	-0.061
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D10CBs	#209	0.978	0.038
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% total variance		72.5	8.5
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Table 5. Average concentrations (ng/g lipid wt.) and percentages (%) of DDT isomers in the blubber samples of common minke, sei, Bryde's whales from the western North Pacific and Antarctic minke whales from the Antarctic.

Species	<i>n</i>		<i>p,p'</i> -DDE	<i>p,p'</i> -DDD	<i>p,p'</i> -DDT	Total-DDTs
Common minke whale	5	average	1600	330	99	2000
		%	(78.5)	(16.1)	(4.9)	
Sei whale	5	average	44	18	7.9	71
		%	(62.5)	(24.7)	(11.1)	
Bryde's whale	5	average	61	13	7.8	82
		%	(74.5)	(15.8)	(9.5)	
Antarctic minke whale	5	average	48	6.4	16	69
		%	(70.1)	(9.3)	(22.5)	

Table 6. Average concentrations (ng/g lipid wt.) and percentages (%) of HCH isomers in blubber samples of common minke, sei, Bryde's whales from the western North Pacific and Antarctic minke whales from the Antarctic.

Species	<i>n</i>		α -HCH	β -HCH	γ -HCH	Total-HCHs
Common minke whale	5	average	21	650	7.9	670
		%	(3.2)	(96.7)	(1.2)	
Sei whale	5	average	3.3	85	1.1	91
		%	(3.6)	(93.2)	(1.2)	
Bryde's whale	5	average	0.59	12	0.28	13
		%	(4.7)	(98.4)	(2.2)	
Antarctic minke whale	5	average	0.12	0.10	0.37	0.52
		%	(22.9)	(19.7)	(69.8)	

Table 7. Average concentrations (ng/g lipid wt.) and percentages (%) of CHL isomers in blubber samples of common minke, sei, Bryde's whales from the western North Pacific and Antarctic minke whales from the Antarctic.

Species	<i>n</i>		oxychlordanes	trans-chlordane	cis-chlordane	trans-nonachlor	cis-nonachlor	Total-CHLs
Common minke whale	5	average	150	N.D.	33	950	210	1300
		%	(11.1)	(0.0)	(2.5)	(71.1)	(15.7)	
Sei whale	5	average	7.6	N.D.	3.3	36	12	59
		%	(12.9)	(0.0)	(5.6)	(61.4)	(20.1)	
Bryde's whale	5	average	4.2	N.D.	9.8	39	14	68
		%	(6.2)	(0.0)	(14.5)	(57.8)	(21.0)	
Antarctic minke whale	5	average	11	N.D.	1.3	16	4.8	34
		%	(33.2)	(0.0)	(3.9)	(48.9)	(14.2)	