Auckland
Regional Council
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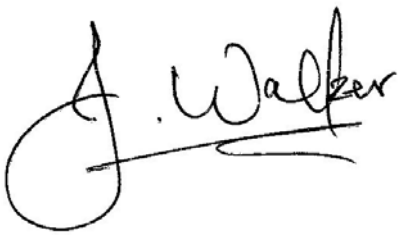
Organic Contaminants in Sentinel Shellfish

2007 Data

July TR 2009/097

Auckland Regional Council
Technical Report No.097 July 2009
ISSN 1179-0504 (Print)
ISSN 1179-0512 (Online)
ISBN 978-1-877540-10-3

Reviewed by:



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Recommended Citation:
Olsen, G., Stewart, M. (2009) Organic contaminants in sentinel shellfish 2007 data. Prepared by National Institute of Water & Atmospheric Research Ltd (NIWA) or Auckland Regional Council. Auckland Regional Council Technical Report 2009/097.

Organic Contaminants in Sentinel Shellfish

2007 Data

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Prepared for
Auckland Regional Council

By
NIWA Client Report: HAM2009-022
March 2009
NIWA Project: ARC08204

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1 Executive Summary

Samples of oysters from the Manukau Harbour and transplanted mussels from six Auckland estuary and harbour sites were received in the NIWA laboratory on 9th January 2006. Five replicate samples of oysters from each of four sites were received (20 oyster samples in total for analysis). Five replicate samples of mussels from each of six sites and one sample labelled "predeployment" were received, giving a total of 31 mussel samples for analysis. Although included in previous monitoring years there were no mussel samples available for the Mangere Bridge site in 2007. All samples were analysed for organochlorine pesticides (OCPs), polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs). Analytical data for oysters are listed in Tables 3–6 and analytical data for mussels are listed in Tables 7–14. Analytical procedures and a quality assurance summary are appended (Tables A1-A3). Analysis of standard reference material (freeze-dried mussel tissue) and archived samples (from previous monitoring years) are presented and compared with original values in Tables 15, 16 and 17.

Lipid-normalised concentrations of a sub-set of major compounds for oysters (used in trend assessment) are presented in Table 1 to facilitate comparisons of contaminant concentrations between 2005 and 2007. Summary values consisting of mean total contaminant levels and lipid-normalised concentrations for mussels have been compiled and presented in Tables 2a and 2b.

Major features of the 2007 oyster data (lipid-normalised) were:

- The PAH levels in 2007 were lower at all sites except Granny's Bay with PAH levels similar to those observed in 2006.
- In general, DDT and chlordane were similar or lower at all sites except Hingaia which had higher DDT.
- Dieldrin levels were lower at all sites.
- PCB levels were higher at Hingaia Bridge and either lower or unchanged at remaining sites.

Major features of the 2007 mussel data (lipid-normalised) were:

- PAH levels in 2007 were lower or the same for all sites.
- In general, PCB and chlordane levels were similar or lower at all sites.
- DDT levels were higher for Chelsea when compared with 2006 data.
- Dieldrin levels were elevated at Papakura and Iliomana when compared with earlier data.

2 Results

Table 1:

Comparison of mean concentrations of organic contaminants in oysters from 2005 to 2007. Concentrations (ng/g lipid) are lipid-normalised totals of a sub-set of major components used for temporal trend assessment[1]

	Cornwallis Beach			Pahurehure Creek			Hingaia Bridge			Granny's Bay		
Analyte	2007	2006	2005	2007	2006	2005	2007	2006	2005	2007	2006	2005
Total PAH	130 (1)	141 (4)	119 (6)	484 (6)	552 (23)	520 (7)	353 (9)	370 (4)	326 (12)	808 (49)	757 (15)	594 (60)
Total DDT	81 (2)	90 (5)	89 (3)	106 (2)	130 (3)	91 (3)	151 (3)	126 (4)	114 (7)	534 (26)	871 (39)	365 (16)
Dieldrin	7.0 (0.1)	11 (1)	16 (4)	11 (0.4)	14 (1)	28 (4)	19 (0.7)	38 (2)	17 (2)	27 (1)	42 (2)	16 (1)
Total PCB	52 (1)	49 (3)	54 (3)	72 (1)	81 (1)	59 (2)	72 (2)	63 (1)	54 (4)	359 (18)	347 (14)	158 (7)
Total Chlordane	3.0 (0.1)	3.8 (0.3)	3.3 (0.4)	3.7 (0.1)	5.5 (0.3)	2.3 (0.3)	4.2 (0.2)	4.5 (0.2)	2.6 (0.4)	17 (0.7)	30 (0.3)	14 (0.8)

1. Total PAH = sum of fluoranthene, pyrene, benz[a]anthracene, chrysene, benzo[b]-fluoranthene, benzo[k]fluoranthene, and benzo[a]pyrene. Total DDT = sum of p,p'-DDE, p,p'-DDD, and p,p'-DDT. Total PCB = sum of congeners 118, 153, 138, and 180. Total chlordane = sum of cis-chlordane and trans-chlordane.
2. Numbers in parenthesis represent standard error in site replicates.

Table 2a:

Mean concentrations of lipid (%) and organic contaminants (ng/g dry tissue) in mussels from each of the six sample sites.

Site	Iliomana	Chelsea	Upper Tamaki	Papakura Channel	Upper Waitemata	Weymouth
Lipid (%)	8.2	5.5	4.9	6.9	5.6	5.3
Total PAH	37	64	66	10	58	16
Total DDT	7.0	9.0	4.1	2.6	9.0	1.7
Dieldrin	1.3	0.4	1.0	1.1	0.7	0.6
Total Chlordane	0.6	0.7	1.1	<0.3	0.9	<0.3
Total PCB	9.8	14	22	5.0	18.3	3.4

Table 2b:

Mean lipid-normalised organic contaminant concentrations (ng/g lipid) in mussels from each of the six sample sites.

Site	Iliomana	Chelsea	Upper Tamaki	Papakura Channel	Upper Waitemata	Weymouth
Total PAH	450 (11)	1172 (24)	1338 (21)	150 (10)	1042 (26)	302 (28)
Total DDT	86 (4)	165 (3)	83 (2)	38 (1)	162 (4)	32 (1)
Dieldrin	16 (0.5)	6.6 (1)	21 (1)	16 (1)	12 (1)	12 (0.4)
Total Chlordane	7.6 (0.3)	13 (0.4)	22 (1)	3.0 (0.1)	15 (0.5)	<2.0 (0.4)
Total PCB	119 (4)	259 (5)	451 (8)	73 (<1)	329 (5)	64 (1)

1. Numbers in parenthesis represent standard error in site replicates.

Table 3:

Organic contaminants in oysters at Cornwallis Beach (ng/g dry weight).

NIWA Lab Code	OA131/6	OA131/7	OA131/8	OA131/9	OA131/10
ARC Sample Code	COR 1	COR 2	COR 3	COR 4	COR 5
Lipid Content (% DW)	12.0	12.3	10.6	13.7	12.4
PAHs					
phenanthrene	3.1	3.2	2.5	3.0	3.1
anthracene	0.2	0.3	0.2	0.2	0.2
1-methylphenanthrene	1.6	1.9	1.2	1.9	1.9
fluoranthene	4.9	5.3	4.2	5.5	5.2
pyrene	3.2	3.5	2.9	3.7	3.4
benz[a]anthracene	0.9	1.1	0.9	1.1	1.0
chrysene	3.8	3.7	3.0	4.3	3.9
benzo[b]fluoranthene	1.8	2.0	1.9	2.4	2.0
benzo[k]fluoranthene	0.5	0.6	0.6	0.6	0.6
benzo[e]pyrene	1.4	1.3	1.2	1.6	1.5
benzo[a]pyrene	0.2	0.2	0.3	< 0.2	0.2
perylene	2.3	2.3	2.3	2.2	1.9
indeno[123-cd]pyrene	0.3	0.3	0.4	0.3	0.3
dibenz[ah]anthracene	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
benzo[ghi]perylene	0.5	0.5	0.6	0.5	0.5
Total PAH	24.9	26.1	22.1	27.2	25.7
DDTs					
o,p'-DDE	0.5	0.6	0.4	0.5	0.6
p,p'-DDE	8.5	8.8	6.9	9.5	9.3
o,p'-DDD	0.1	0.1	< 0.1	0.1	0.1
p,p'-DDD	1.0	0.9	0.7	1.0	1.0
o,p'-DDT	0.1	0.1	< 0.1	0.2	0.1
p,p'-DDT	0.4	0.5	0.4	0.5	0.5
Total DDT	10.6	11.1	8.4	11.8	11.6
Chlordanes					
heptachlor	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
heptachlor epoxide	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
t-chlordane	0.2	0.2	0.2	0.2	0.2

NIWA Lab Code	OA131/6	OA131/7	OA131/8	OA131/9	OA131/10
ARC Sample Code	COR 1	COR 2	COR 3	COR 4	COR 5
c-chlordane	0.1	0.1	0.1	0.2	0.2
t-nonachlor	0.2	0.2	0.2	0.2	0.2
c-nonachlor	0.2	0.2	0.2	0.2	0.3
Total Chlordane	0.8	0.9	1.1	1.1	1.3
Other OCPs					
Hexachlorobenzene	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
lindane	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
dieldrin	0.9	0.9	0.8	1.0	0.9
PCBs					
8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
18	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
28	0.2	0.2	0.1	0.2	0.2
52	0.3	0.3	0.2	0.3	0.3
49	0.2	0.2	0.2	0.2	0.2
44	< 0.1	0.1	< 0.1	0.1	0.1
66	0.1	0.2	0.1	0.2	0.1
121	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
101	1.1	1.2	0.9	1.2	1.2
86	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
110	0.7	0.7	0.5	0.7	0.7
77	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
151	0.4	0.4	0.3	0.4	0.4
118	0.9	0.9	0.7	0.9	0.9
153	3.0	3.3	2.6	3.4	3.4
105	0.2	0.2	0.2	0.2	0.2
141	0.1	0.1	0.1	0.1	0.1
138	1.9	2.2	1.8	2.2	2.2
126	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
187	0.9	0.9	0.8	0.9	0.9
128	0.1	0.2	0.1	0.2	0.2
156	< 0.1	0.1	< 0.1	< 0.1	< 0.1
180	0.3	0.3	0.3	0.3	0.3
169	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
170	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
195	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
194	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

NIWA Lab Code	OA131/6	OA131/7	OA131/8	OA131/9	OA131/10
ARC Sample Code	COR 1	COR 2	COR 3	COR 4	COR 5
206	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
209	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Total PCB	10.4	11.3	8.9	11.3	11.4

Table 4:

Organic contaminants in oysters at Pahurehure Inlet (ng/g dry weight),

NIWA Lab Code	OA131/1	OA131/2	OA131/3	OA131/4	OA131/5
ARC Sample Code	PAH 1	PAH 2	PAH 3	PAH 4	PAH 5
Lipid Content (% DW)	6.9	7.4	8.6	8.7	9.5
PAHs					
phenanthrene	3.1	3.4	3.5	3.9	4.1
anthracene	0.2	< 0.2	0.2	0.2	0.2
1-methylphenanthrene	1.9	1.8	2.3	2.4	2.7
fluoranthene	7.1	7.4	8.9	9.8	10.4
pyrene	7.9	8.0	9.5	10.6	11.3
benz[a]anthracene	2.3	2.1	2.8	3.2	3.2
chrysene	6.9	8.9	9.8	9.6	9.6
benzo[b]fluoranthene	6.0	7.3	8.0	7.8	7.5
benzo[k]fluoranthene	1.8	2.1	2.3	2.4	2.0
benzo[e]pyrene	4.0	5.0	5.3	5.3	5.4
benzo[a]pyrene	0.5	0.3	0.5	0.5	0.5
perylene	6.8	5.5	5.8	5.7	6.5
indeno[123-cd]pyrene	1.3	1.5	1.7	1.9	1.5
dibenz[ah]anthracene	0.3	0.4	0.4	0.5	0.4
benzo[ghi]perylene	1.9	2.3	2.3	2.5	2.0
Total PAH	52.1	56.0	63.4	66.3	67.5
DDTs					
o,p'-DDE	< 0.1	0.1	0.1	0.1	0.1
p,p'-DDE	5.9	6.8	7.9	7.7	7.8
o,p'-DDD	< 0.1	< 0.1	< 0.1	0.1	< 0.1
p,p'-DDD	0.5	0.6	0.8	0.9	1.0
o,p'-DDT	0.1	0.1	0.2	0.2	0.3
p,p'-DDT	0.5	0.6	0.8	0.8	1.0
Total DDT	7.0	8.3	9.8	9.8	10.1
Chlordanes					
heptachlor	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
heptachlor epoxide	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
t-chlordane	0.1	0.1	0.2	0.2	0.2

NIWA Lab Code	OA131/1	OA131/2	OA131/3	OA131/4	OA131/5
ARC Sample Code	PAH 1	PAH 2	PAH 3	PAH 4	PAH 5
c-chlordane	0.1	0.1	0.1	0.1	0.2
t-nonachlor	0.1	0.2	0.2	0.2	0.2
c-nonachlor	0.1	0.1	0.1	0.1	0.1
Total Chlordane	0.5	0.5	0.6	0.6	0.7
Other OCPs					
Hexachlorobenzene	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
lindane	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
dieldrin	0.8	0.7	0.9	1.1	1.1
PCBs					
8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
18	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
28	0.2	0.1	0.2	0.2	0.2
52	0.3	0.2	0.3	0.3	0.3
49	0.2	0.2	0.2	0.2	0.2
44	< 0.1	< 0.1	< 0.1	< 0.1	0.1
66	0.1	< 0.1	0.1	0.2	0.1
121	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
101	0.7	0.8	1.0	1.0	1.1
86	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
110	0.4	0.4	0.5	0.6	0.7
77	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
151	0.3	0.3	0.3	0.3	0.4
118	0.6	0.6	0.7	0.7	0.8
153	2.4	2.7	3.2	3.2	3.3
105	0.1	0.1	0.2	0.2	0.2
141	< 0.1	0.1	0.1	0.1	0.1
138	1.6	1.7	2.2	2.1	2.3
126	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
187	0.8	0.9	1.0	1.0	1.0
128	0.1	0.1	0.2	0.2	0.1
156	< 0.1	< 0.1	0.1	< 0.1	0.1
180	0.2	0.3	0.3	0.3	0.3
169	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
170	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
195	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
194	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

NIWA Lab Code	OA131/1	OA131/2	OA131/3	OA131/4	OA131/5
ARC Sample Code	PAH 1	PAH 2	PAH 3	PAH 4	PAH 5
206	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
209	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Total PCB	8.0	8.6	10.4	10.6	11.2

Table 5:

Organic contaminants in oysters at Hingaia Bridge (ng/g dry weight).

NIWA Lab Code	OA131/16	OA131/17	OA131/18	OA131/19	OA131/20
ARC Sample Code	HIN 1	HIN 2	HIN 3	HIN 4	HIN 5
Lipid Content (% DW)	6.3	6.1	6.7	6.6	7.8
PAHs					
phenanthrene	2.8	2.7	2.4	2.7	3.7
anthracene	0.2	0.2	0.2	0.3	0.3
1-methylphenanthrene	1.5	1.6	1.6	1.7	2.2
fluoranthene	5.6	5.4	5.7	6.4	7.5
pyrene	5.5	5.4	6.0	7.0	7.6
benz[a]anthracene	1.2	1.1	1.1	1.2	1.4
chrysene	4.1	4.2	4.4	4.7	5.0
benzo[b]fluoranthene	3.3	4.3	4.4	4.6	5.1
benzo[k]fluoranthene	0.9	0.9	0.9	1.0	1.2
benzo[e]pyrene	2.4	2.7	2.9	3.0	3.5
benzo[a]pyrene	0.3	0.3	< 0.2	0.3	0.3
perylene	2.5	2.4	2.4	2.4	3.0
indeno[123-cd]pyrene	0.9	0.8	0.9	1.0	1.4
dibenz[ah]anthracene	< 0.2	< 0.2	< 0.2	< 0.2	0.3
benzo[ghi]perylene	1.2	1.1	1.3	1.3	1.9
Total PAH	32.5	33.1	34.2	37.5	44.3
DDTs					
o,p'-DDE	0.1	0.1	0.1	0.1	0.1
p,p'-DDE	7.6	7.1	7.8	8.1	10.1
o,p'-DDD	0.1	0.1	0.1	0.1	0.2
p,p'-DDD	0.7	0.6	0.7	0.7	0.8
o,p'-DDT	0.3	0.2	0.2	0.2	0.2
p,p'-DDT	1.2	1.1	1.3	1.3	1.6
Total DDT	10.0	9.3	10.2	10.6	13.0
Chlordanes					
heptachlor	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
heptachlor epoxide	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
t-chlordane	0.2	0.1	0.2	0.2	0.2

NIWA Lab Code	OA131/16	OA131/17	OA131/18	OA131/19	OA131/20
ARC Sample Code	HIN 1	HIN 2	HIN 3	HIN 4	HIN 5
c-chlordane	0.1	0.1	0.1	0.1	0.2
t-nonachlor	0.2	0.1	0.2	0.2	0.2
c-nonachlor	0.1	< 0.1	< 0.1	0.1	0.1
Total Chlordane	0.5	0.4	0.6	0.6	0.7
Other OCPs					
Hexachlorobenzene	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
lindane	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
dieldrin	1.2	1.2	1.1	1.4	1.4
PCBs					
8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
18	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
28	0.2	0.2	0.1	0.2	0.2
52	0.2	0.2	0.2	0.2	0.2
49	0.2	0.1	0.1	0.2	0.1
44	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
66	0.1	0.1	0.1	0.1	0.1
121	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
101	0.6	0.6	0.6	0.7	0.8
86	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
110	0.4	0.4	0.4	0.4	0.5
77	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
151	0.2	0.2	0.2	0.2	0.3
118	0.5	0.5	0.5	0.6	0.7
153	2.4	2.2	2.3	2.3	3.0
105	0.1	0.1	0.1	0.1	0.2
141	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
138	1.6	1.4	1.6	1.6	2.0
126	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
187	0.8	0.7	0.8	0.8	1.0
128	0.1	0.1	0.1	0.1	0.1
156	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
180	0.2	0.1	0.2	0.2	0.2
169	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
170	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
195	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
194	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

NIWA Lab Code	OA131/16	OA131/17	OA131/18	OA131/19	OA131/20
ARC Sample Code	HIN 1	HIN 2	HIN 3	HIN 4	HIN 5
206	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
209	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Total PCB	7.7	6.9	7.4	7.7	9.5

Table 6:

Organic contaminants in oysters at Granny's Bay (ng/g dry weight).

NIWA Lab Code	OA131/11	OA131/12	OA131/13	OA131/14	OA131/15
ARC Sample Code	GRA 1	GRA 2	GRA 3	GRA 4	GRA 5
Lipid Content (% DW)	4.7	5.1	5.3	5.6	5.3
PAHs					
phenanthrene	2.7	2.8	2.6	2.9	2.5
anthracene	0.2	0.2	< 0.2	0.3	< 0.2
1-methylphenanthrene	1.3	1.4	1.5	1.6	1.3
fluoranthene	5.8	7.1	6.9	7.2	5.9
pyrene	6.1	7.7	7.5	7.9	6.7
benz[a]anthracene	2.3	3.1	3.5	3.2	2.9
chrysene	8.2	12.4	15.6	12.5	11.5
benzo[b]fluoranthene	6.2	9.7	12.7	10.1	10.0
benzo[k]fluoranthene	1.8	2.8	4.1	3.6	3.5
benzo[e]pyrene	4.2	6.8	8.9	7.5	7.0
benzo[a]pyrene	0.6	0.5	0.5	0.5	0.5
perylene	3.5	3.7	2.7	3.8	4.1
indeno[123-cd]pyrene	1.1	1.4	1.4	1.4	1.5
dibenz[ah]anthracene	0.2	0.3	0.3	0.4	0.3
benzo[ghi]perylene	1.4	1.7	1.8	2.0	1.8
Total PAH	45.7	61.6	70.0	64.9	59.5
DDTs					
o,p'-DDE	0.6	0.7	0.7	0.8	0.6
p,p'-DDE	22.0	27.9	25.7	29.1	21.6
o,p'-DDD	0.4	0.4	0.3	0.3	0.2
p,p'-DDD	1.6	2.1	1.8	2.1	1.6
o,p'-DDT	0.3	0.4	0.3	0.2	0.3
p,p'-DDT	0.5	0.8	0.6	0.7	0.5
Total DDT	25.4	32.3	29.4	33.2	24.9
Chlordanes					
heptachlor	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
heptachlor epoxide	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
t-chlordane	0.5	0.6	0.5	0.5	0.5

NIWA Lab Code	OA131/11	OA131/12	OA131/13	OA131/14	OA131/15
ARC Sample Code	GRA 1	GRA 2	GRA 3	GRA 4	GRA 5
c-chlordane	0.3	0.4	0.4	0.4	0.3
t-nonachlor	0.4	0.5	0.4	0.6	0.4
c-nonachlor	0.4	0.6	0.5	0.6	0.4
Total Chlordane	1.6	3.4	2.6	2.1	1.7
Other OCPs					
Hexachlorobenzene	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
lindane	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
dieldrin	1.3	1.5	1.5	1.4	1.3
PCBs					
8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
18	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
28	0.5	0.6	0.3	0.6	0.5
52	0.7	0.7	0.6	0.9	0.7
49	0.4	0.5	0.4	0.6	0.5
44	0.2	0.4	0.3	0.3	0.4
66	0.5	0.6	0.5	0.5	0.5
121	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
101	2.8	3.6	3.4	4.1	3.1
86	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
110	1.7	2.2	2.1	2.3	1.8
77	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
151	0.8	1.0	1.0	1.2	0.9
118	2.1	2.7	2.7	3.1	2.4
153	7.9	10.3	10.5	12.8	9.3
105	0.5	0.6	0.6	0.7	0.6
141	0.1	0.2	0.2	0.2	0.2
138	4.5	5.6	5.9	6.7	5.0
126	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
187	2.0	2.4	2.4	2.9	2.4
128	0.3	0.4	0.4	0.4	0.3
156	0.1	0.2	0.1	0.2	0.1
180	0.4	0.4	0.4	0.5	0.4
169	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
170	< 0.1	0.1	0.1	0.1	0.1
195	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
194	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

NIWA Lab Code	OA131/11	OA131/12	OA131/13	OA131/14	OA131/15
ARC Sample Code	GRA 1	GRA 2	GRA 3	GRA 4	GRA 5
206	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
209	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Total PCB	25.8	32.4	32.0	38.2	29.2

Table 7:

Organic contaminants in mussels from Iliomana (ng/g dry weight).

Niwa Lab Code	OA132/1	OA132/2	OA132/3	OA132/4	OA132/5
ARC Sample Code	# 1	# 2	# 3	# 4	# 5
Lipid Content (% DW)	7.6	9.1	9.0	7.6	7.8
PAHs					
phenanthrene	2.0	2.1	3.5	1.9	2.0
anthracene	0.3	0.3	0.5	0.3	0.3
1-methylphenanthrene	0.7	0.8	1.5	0.7	0.7
fluoranthene	4.9	5.2	5.3	4.3	4.9
pyrene	4.5	4.8	4.6	3.7	4.2
benz[a]anthracene	2.0	2.1	2.0	1.7	1.9
chrysene	4.1	5.1	4.7	3.6	4.0
benzo[b]fluoranthene	4.9	5.9	5.0	4.2	4.9
benzo[k]fluoranthene	1.8	2.1	1.8	1.5	1.8
benzo[e]pyrene	2.3	2.7	2.3	1.8	2.2
benzo[a]pyrene	1.5	1.2	1.3	1.3	1.4
perylene	1.8	2.1	2.7	1.4	1.7
indeno[123-cd]pyrene	2.6	3.0	2.4	2.0	2.4
dibenz[ah]anthracene	0.6	0.7	0.5	0.5	0.5
benzo[ghi]perylene	2.7	3.1	2.5	2.2	2.6
Total PAH	36.6	41.2	40.5	31.2	35.6
DDTs					
o,p-DDE	0.3	0.3	0.3	0.4	0.3
p,p'-DDE	1.6	1.6	1.8	1.8	1.8
o,p-DDD	0.6	0.7	0.7	0.6	0.6
p,p-DDD	2.0	2.2	2.3	2.5	2.2
o,p-DDT	0.5	0.5	0.5	0.5	0.5
p,p'-DDT	1.5	1.5	1.8	1.8	1.5
Total DDT	6.4	6.8	7.4	7.5	7.0
Chlordanes					
heptachlor	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
heptachlor epox	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
trans-chlordane	0.2	0.2	0.2	0.2	0.2

Niwa Lab Code	OA132/1	OA132/2	OA132/3	OA132/4	OA132/5
ARC Sample Code	# 1	# 2	# 3	# 4	# 5
cis-chlordane	0.1	0.1	0.1	0.1	0.1
trans-nonachlor	0.2	0.2	0.2	0.2	0.2
cis-nonachlor	0.1	0.1	0.1	0.1	0.1
Total Chlordane	0.6	0.6	0.6	0.7	0.6
Other OCPs					
Hexachlorobenzene	0.13	0.16	0.14	0.19	0.14
lindane	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
dieldrin	1.1	1.6	1.4	1.3	1.2
PCBs					
8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
18	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
28	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
52	0.2	0.2	0.3	0.2	0.2
49	< 0.1	< 0.1	0.1	0.1	< 0.1
44	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
66	< 0.1	0.1	0.1	0.1	0.1
121	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
101	0.4	0.3	0.4	0.4	0.4
86	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
110	0.1	< 0.1	0.1	< 0.1	0.1
77	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
151	0.3	0.3	0.3	0.3	0.3
118	0.6	0.7	0.7	0.7	0.7
153	2.8	3.0	3.0	3.0	3.0
105	0.2	0.2	0.2	0.2	0.2
141	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
138	2.3	2.5	2.5	2.5	2.5
126	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
187	1.0	1.0	1.0	1.0	1.0
128	0.2	0.3	0.3	0.2	0.2
156	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
180	0.7	0.7	0.7	0.7	0.7
169	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
170	0.3	0.3	0.3	0.3	0.3
195	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
194	0.1	0.1	< 0.1	< 0.1	< 0.1

Niwa Lab Code	OA132/1	OA132/2	OA132/3	OA132/4	OA132/5
ARC Sample Code	# 1	# 2	# 3	# 4	# 5
206	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
209	<0.1	<0.1	<0.1	<0.1	<0.1
Total PCB	9.3	9.8	10.0	9.9	9.8

Table 8:

Organic contaminants in mussels from Chelsea (ng/g dry weight).

NIWA Lab Code	OA132/6	OA132/7	OA132/8	OA132/9	OA132/10
ARC Sample Code	# 1	# 2	# 3	# 4	# 5
Lipid Content (% DW)	5.3	5.0	5.3	5.9	5.9
PAHs					
phenanthrene	3.3	2.8	3.0	3.1	3.3
anthracene	0.4	0.4	0.4	0.3	0.3
1-methylphenanthrene	1.1	1.0	1.0	1.0	1.1
fluoranthene	7.3	7.0	7.6	7.6	8.5
pyrene	7.8	7.1	8.0	7.7	9.0
benz[a]anthracene	3.8	3.8	3.9	4.2	4.2
chrysene	6.4	6.4	6.6	7.0	7.1
benzo[b]fluoranthene	7.3	8.3	8.4	8.6	8.8
benzo[k]fluoranthene	1.8	3.0	2.9	3.2	3.4
benzo[e]pyrene	3.6	4.2	4.3	4.5	4.8
benzo[a]pyrene	4.3	4.5	4.5	4.7	4.7
perylene	3.6	3.9	3.9	4.2	4.3
indeno[123-cd]pyrene	3.5	4.2	4.3	4.4	4.7
dibenz[ah]anthracene	0.6	0.8	0.8	0.8	0.9
benzo[ghi]perylene	4.6	4.2	4.4	4.4	4.8
Total PAH	59.3	61.6	64.1	65.8	70.0
DDTs					
o,p'-DDE	0.3	0.3	0.4	0.4	0.3
p,p'-DDE	3.3	3.4	3.1	3.3	3.6
o,p'-DDD	0.8	0.8	0.7	0.7	0.8
p,p'-DDD	2.5	2.4	2.4	2.5	2.6
o,p'-DDT	0.5	0.4	0.5	0.6	0.6
p,p'-DDT	1.6	1.4	1.5	1.7	1.6
Total DDT	9.0	8.7	8.7	9.2	9.5
Chlordanes					
heptachlor	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
heptachlor epoxide	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
t-chlordane	0.3	0.2	0.2	0.3	0.2

NIWA Lab Code	OA132/6	OA132/7	OA132/8	OA132/9	OA132/10
ARC Sample Code	# 1	# 2	# 3	# 4	# 5
c-chlordane	0.1	0.1	0.1	0.1	0.1
t-nonachlor	0.2	0.2	0.2	0.2	0.2
c-nonachlor	0.1	0.1	0.1	0.2	0.2
Total Chlordane	0.8	0.7	0.7	0.8	0.7
Other OCPs					
Hexachlorobenzene	0.35	0.36	0.46	0.45	0.48
lindane	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
dieldrin	0.4	0.4	0.4	0.3	0.3
PCBs					
8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
18	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
28	0.1	< 0.1	< 0.1	0.1	< 0.1
52	0.3	0.3	0.3	0.3	0.3
49	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
44	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
66	0.2	0.2	0.1	0.1	0.2
121	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
101	0.5	0.5	0.4	0.5	0.5
86	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
110	< 0.1	0.1	0.1	< 0.1	0.1
77	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
151	0.4	0.4	0.4	0.4	0.4
118	1.0	1.0	1.1	1.1	1.1
153	4.0	3.8	4.2	4.2	4.5
105	0.3	0.3	0.3	0.3	0.3
141	0.1	< 0.1	< 0.1	< 0.1	0.1
138	3.7	3.5	3.8	3.9	4.1
126	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
187	1.3	1.3	1.4	1.4	1.5
128	0.4	0.4	0.4	0.4	0.4
156	0.1	0.1	0.1	0.1	0.1
180	0.9	0.9	1.0	1.0	1.1
169	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
170	0.5	0.4	0.5	0.5	0.5
195	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
194	< 0.1	< 0.1	0.1	< 0.1	0.1

NIWA Lab Code	OA132/6	OA132/7	OA132/8	OA132/9	OA132/10
ARC Sample Code	# 1	# 2	# 3	# 4	# 5
206	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
209	<0.1	<0.1	<0.1	<0.1	<0.1
Total PCB	13.8	13.1	14.3	14.2	15.4

Table 9:

Organic contaminants in mussels from Upper Tamaki Estuary (ng/g dry weight).

NIWA Lab Code	OA132/11	OA132/12	OA132/13	OA132/14	OA132/15
ARC Sample Code	# 1	# 2	# 3	# 4	# 5
Lipid Content (% DW)	4.4	5.0	5.2	5.0	5.0
PAHs					
phenanthrene	2.3	2.5	2.7	2.8	2.5
anthracene	0.3	0.3	0.3	0.3	0.2
1-methylphenanthrene	0.9	1.1	1.0	1.1	0.9
fluoranthene	5.6	6.6	6.5	6.4	6.2
pyrene	8.0	9.4	8.8	8.9	8.9
benz[a]anthracene	3.0	3.4	3.4	3.3	3.2
chrysene	6.5	7.3	7.4	7.1	6.8
benzo[b]fluoranthene	7.3	8.0	8.0	7.8	7.4
benzo[k]fluoranthene	3.2	3.3	3.4	3.4	3.9
benzo[e]pyrene	4.1	4.6	4.7	4.5	4.3
benzo[a]pyrene	3.5	3.7	3.6	3.8	3.3
perylene	7.4	8.0	8.1	8.0	7.2
indeno[123-cd]pyrene	3.6	3.5	3.8	3.7	3.4
dibenz[ah]anthracene	0.9	0.8	0.9	0.8	1.1
benzo[ghi]perylene	5.2	5.2	5.2	5.4	5.0
Total PAH	61.8	67.7	67.8	67.2	64.3
DDTs					
o,p'-DDE	< 0.1	< 0.1	0.1	0.1	0.1
p,p'-DDE	1.7	2.0	1.9	2.1	2.0
o,p'-DDD	0.2	0.3	0.3	0.3	0.3
p,p'-DDD	1.2	1.4	1.5	1.6	1.5
o,p'-DDT	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
p,p'-DDT	0.3	0.3	0.4	0.4	0.4
Total DDT	3.4	4.1	4.2	4.6	4.3
Chlordanes					
heptachlor	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
heptachlor epoxide	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
t-chlordane	0.3	0.4	0.4	0.4	0.4

NIWA Lab Code	OA132/11	OA132/12	OA132/13	OA132/14	OA132/15
ARC Sample Code	# 1	# 2	# 3	# 4	# 5
c-chlordane	0.2	0.2	0.2	0.2	0.2
t-nonachlor	0.2	0.3	0.3	0.3	0.3
c-nonachlor	0.2	0.2	0.2	0.2	0.2
Total Chlordane	1.1	0.9	1.1	1.1	1.1
Other OCPs					
Hexachlorobenzene	0.55	0.49	0.44	0.44	0.51
lindane	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
dieldrin	1.0	1.1	1.2	0.9	1.0
PCBs					
8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
18	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
28	0.3	0.2	0.3	0.2	0.3
52	0.5	0.6	0.5	0.5	0.5
49	0.1	0.1	0.2	0.1	0.1
44	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
66	0.3	0.3	0.3	0.3	0.3
121	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
101	0.9	1.0	1.0	1.0	0.9
86	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
110	0.2	0.3	0.3	0.3	0.2
77	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
151	0.6	0.7	0.7	0.7	0.7
118	1.5	1.6	1.6	1.5	1.7
153	5.4	6.3	6.1	5.8	6.1
105	0.4	0.4	0.4	0.4	0.5
141	0.2	0.2	0.2	0.2	0.2
138	5.3	6.3	6.1	5.7	6.0
126	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
187	1.6	1.7	1.7	1.6	1.7
128	0.5	0.6	0.6	0.6	0.6
156	0.2	0.2	0.2	0.2	0.2
180	1.4	1.6	1.6	1.5	1.6
169	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
170	0.7	0.8	0.8	0.8	0.8
195	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
194	0.1	0.1	0.1	0.1	0.1

NIWA Lab Code	OA132/11	OA132/12	OA132/13	OA132/14	OA132/15
ARC Sample Code	# 1	# 2	# 3	# 4	# 5
206	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
209	<0.1	<0.1	<0.1	<0.1	<0.1
Total PCB	20.4	23.4	22.6	21.5	22.8

Table 10:

Organic contaminants in mussels from Papakura Channel (ng/g dry weight).

NIWA Lab Code	OA132/16	OA132/17	OA132/18	OA132/19	OA132/20
ARC Sample Code	# 1	# 2	# 3	# 4	# 5
Lipid Content (% DW)	6.7	6.8	6.4	7.3	7.1
PAHs					
phenanthrene	1.1	1.0	1.0	1.4	1.0
anthracene	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1-methylphenanthrene	0.3	0.2	0.3	0.3	0.3
fluoranthene	1.0	0.9	0.9	1.1	0.8
pyrene	1.0	0.9	0.8	1.1	0.8
benz[a]anthracene	0.3	0.3	0.3	0.4	0.3
chrysene	1.1	0.9	1.6	1.3	1.0
benzo[b]fluoranthene	1.0	0.8	1.4	1.1	0.9
benzo[k]fluoranthene	0.3	0.3	0.4	0.6	0.3
benzo[e]pyrene	0.5	0.4	0.7	0.6	0.5
benzo[a]pyrene	0.4	0.4	0.5	0.4	0.3
perylene	2.0	1.7	2.0	2.1	2.0
indeno[123-cd]pyrene	0.5	0.4	0.8	0.5	0.5
dibenz[ah]anthracene	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
benzo[ghi]perylene	0.6	0.5	0.9	0.6	0.6
Total PAH	10.1	8.7	11.7	11.5	9.3
DDTs					
o,p'-DDE	0.2	0.2	0.2	0.2	0.2
p,p'-DDE	1.8	1.8	1.9	2.0	1.9
o,p'-DDD	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
p,p'-DDD	0.3	0.3	0.4	0.4	0.3
o,p'-DDT	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
p,p'-DDT	0.2	0.2	0.2	0.2	0.2
Total DDT	2.5	2.6	2.7	2.8	2.6
Chlordanes					
heptachlor	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
heptachlor epoxide	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
t-chlordane	0.1	0.1	0.1	0.1	0.1

NIWA Lab Code	OA132/16	OA132/17	OA132/18	OA132/19	OA132/20
ARC Sample Code	# 1	# 2	# 3	# 4	# 5
c-chlordane	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
t-nonachlor	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
c-nonachlor	0.1	0.1	0.1	0.1	0.1
Total Chlordane	0.2	0.2	0.2	0.2	0.2
Other OCPs					
Hexachlorobenzene	0.27	0.23	0.27	0.25	0.24
lindane	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
dieldrin	1.2	1.2	0.8	1.2	1.0
PCBs					
8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
18	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
28	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
52	0.1	0.2	0.1	0.2	0.1
49	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
44	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
66	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
121	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
101	0.1	0.1	0.1	0.2	0.1
86	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
110	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
77	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
151	0.2	0.1	0.1	0.2	0.2
118	0.4	0.4	0.4	0.4	0.4
153	1.4	1.4	1.3	1.5	1.4
105	0.1	0.1	0.1	0.1	0.1
141	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
138	1.3	1.3	1.2	1.4	1.4
126	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
187	0.5	0.5	0.5	0.6	0.6
128	0.1	0.1	0.1	0.2	0.2
156	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
180	0.4	0.4	0.4	0.5	0.4
169	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
170	0.2	0.2	0.2	0.3	0.2
195	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
194	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

NIWA Lab Code	OA132/16	OA132/17	OA132/18	OA132/19	OA132/20
ARC Sample Code	# 1	# 2	# 3	# 4	# 5
206	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
209	<0.1	<0.1	<0.1	<0.1	<0.1
Total PCB	5.0	4.9	4.7	5.3	5.2

Table 11:

Organic contaminants in mussels from Upper Waitemata Harbour (ng/g dry weight).

NIWA Lab Code	OA132/21	OA132/22	OA132/23	OA132/24	OA132/25
ARC Sample Code	# 1	# 2	# 3	# 4	# 5
Lipid Content (% DW)	5.3	5.6	5.4	5.7	5.8
PAHs					
phenanthrene	2.6	2.3	2.6	2.9	2.8
anthracene	0.2	0.2	0.3	< 0.2	0.3
1-methylphenanthrene	0.9	0.9	1.0	1.1	1.0
fluoranthene	6.1	5.7	6.2	6.5	6.8
pyrene	7.0	6.4	6.9	7.5	7.9
benz[a]anthracene	2.8	2.5	2.8	1.9	3.2
chrysene	6.4	5.9	5.8	6.6	6.7
benzo[b]fluoranthene	8.1	7.6	7.8	8.3	8.7
benzo[k]fluoranthene	3.0	2.7	2.8	2.9	3.1
benzo[e]pyrene	4.1	3.8	3.9	4.1	4.5
benzo[a]pyrene	1.9	1.6	1.7	2.0	2.0
perylene	5.4	5.2	5.3	6.0	6.1
indeno[123-cd]pyrene	3.9	3.5	3.9	4.2	4.6
dibenz[ah]anthracene	0.8	0.8	0.8	0.8	1.0
benzo[ghi]perylene	4.6	4.3	4.3	4.1	5.1
Total PAH	57.7	53.3	56.0	59.0	63.7
DDTs					
o,p'-DDE	0.2	0.3	0.2	0.3	0.3
p,p'-DDE	4.5	5.1	4.4	5.1	5.3
o,p'-DDD	0.5	0.6	0.5	0.7	0.5
p,p'-DDD	2.1	2.4	2.0	2.6	2.6
o,p'-DDT	0.1	0.2	0.1	0.1	0.2
p,p'-DDT	0.7	0.8	0.7	0.8	0.8
Total DDT	8.2	9.5	8.0	9.6	9.8
Chlordanes					
heptachlor	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
heptachlor epoxide	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
t-chlordane	0.3	0.3	0.2	0.3	0.3

NIWA Lab Code	OA132/21	OA132/22	OA132/23	OA132/24	OA132/25
ARC Sample Code	# 1	# 2	# 3	# 4	# 5
c-chlordane	0.1	0.2	0.1	0.2	0.2
t-nonachlor	0.2	0.3	0.2	0.2	0.2
c-nonachlor	0.2	0.2	0.2	0.2	0.2
Total Chlordane	0.8	0.9	0.7	0.9	0.9
Other OCPs					
Hexachlorobenzene	0.45	0.38	0.38	0.43	0.37
lindane	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
dieldrin	0.8	0.7	0.6	0.8	0.5
PCBs					
8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
18	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
28	0.2	0.2	0.1	0.2	0.2
52	0.4	0.4	0.4	0.4	0.5
49	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
44	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
66	0.2	0.2	0.2	0.2	0.3
121	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
101	0.6	0.6	0.6	0.6	0.6
86	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
110	0.2	0.2	0.2	0.1	0.2
77	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
151	0.5	0.5	0.5	0.6	0.6
118	1.4	1.5	1.4	1.7	1.6
153	4.8	4.9	4.7	5.5	5.4
105	0.4	0.5	0.4	0.5	0.4
141	0.1	0.1	0.1	0.1	0.1
138	4.6	4.9	4.6	5.4	5.3
126	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
187	1.5	1.5	1.5	1.7	1.7
128	0.5	0.6	0.5	0.6	0.6
156	0.2	0.2	0.2	0.2	0.2
180	1.1	1.1	1.1	1.3	1.3
169	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
170	0.6	0.6	0.5	0.6	0.6
195	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
194	< 0.1	< 0.1	< 0.1	< 0.1	0.1

NIWA Lab Code	OA132/21	OA132/22	OA132/23	OA132/24	OA132/25
ARC Sample Code	# 1	# 2	# 3	# 4	# 5
206	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
209	<0.1	<0.1	<0.1	<0.1	<0.1
Total PCB	17.1	18.1	17.2	19.7	19.6

Table 12:

Organic contaminants in mussels from Weymouth (ng/g dry weight).

NIWA Lab Code	OA132/26	OA132/27	OA132/28	OA132/29	OA132/30
ARC Sample Code	# 1	# 2	# 3	# 4	# 5
Lipid Content (% DW)					
PAHs	2.0	3.0	1.4	1.4	1.4
phenanthrene	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
anthracene	0.5	0.7	0.4	0.4	0.5
1-methylphenanthrene	2.0	1.9	1.3	1.3	1.4
fluoranthene	2.3	2.4	1.5	1.5	1.8
pyrene	0.7	0.6	0.5	0.5	0.6
benz[a]anthracene	1.9	2.4	1.6	1.5	1.8
chrysene	1.8	2.6	1.5	1.4	1.6
benzo[b]fluoranthene	0.7	1.0	0.5	0.5	0.6
benzo[k]fluoranthene	1.0	1.1	0.7	0.7	0.8
benzo[e]pyrene	0.3	0.4	0.5	0.3	0.4
benzo[a]pyrene	2.2	2.5	2.4	2.2	2.4
perylene	0.8	0.9	0.6	0.6	0.7
indeno[123-cd]pyrene	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
dibenz[ah]anthracene	1.0	1.0	0.9	0.9	1.0
benzo[ghi]perylene	17.2	20.4	13.9	13.4	15.0
Total PAH					
DDTs	< 0.1	< 0.1	< 0.1	< 0.1	0.1
o,p'-DDE	1.1	1.2	1.5	1.2	1.4
p,p'-DDE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
o,p'-DDD	0.2	0.3	0.3	0.3	0.3
p,p'-DDD	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
o,p'-DDT	0.1	0.1	0.2	0.1	0.2
p,p'-DDT	1.5	1.6	1.9	1.6	2.0
Total DDT					
Chlordanes	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
heptachlor	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
heptachlor epoxide	< 0.1	0.1	< 0.1	< 0.1	< 0.1
t-chlordane	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

NIWA Lab Code	OA132/26	OA132/27	OA132/28	OA132/29	OA132/30
ARC Sample Code	# 1	# 2	# 3	# 4	# 5
c-chlordane	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
t-nonachlor	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
c-nonachlor	0.0	0.1	0.0	0.0	0.0
Total Chlordane					
Other OCPs					
Hexachlorobenzene	0.19	0.28	0.30	0.22	0.21
lindane	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
dieldrin	0.6	0.6	0.7	0.7	0.7
PCBs					
8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
18	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
28	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
52	0.1	0.1	0.1	0.1	0.1
49	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
44	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
66	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
121	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
101	< 0.1	< 0.1	0.1	< 0.1	< 0.1
86	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
110	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
77	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
151	< 0.1	< 0.1	0.1	< 0.1	0.1
118	0.2	0.2	0.3	0.3	0.3
153	1.0	1.0	1.1	1.0	1.0
105	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
141	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
138	0.9	0.9	1.0	1.0	1.0
126	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
187	0.4	0.4	0.4	0.4	0.4
128	0.1	< 0.1	0.1	< 0.1	0.1
156	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
180	0.3	0.3	0.3	0.3	0.3
169	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
170	0.2	0.2	0.2	0.2	0.2
195	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
194	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

NIWA Lab Code	OA132/26	OA132/27	OA132/28	OA132/29	OA132/30
ARC Sample Code	# 1	# 2	# 3	# 4	# 5
206	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
209	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Total PCB	3.3	3.1	3.8	3.3	3.5

Table 13:

Organic contaminants in mussels predeployment (ng/g dry weight).

NIWA Lab Code	OA132/31
ARC Sample Code	Predeployment
Lipid Content (% DW)	7.3
PAHs	
phenanthrene	3.0
anthracene	< 0.2
1-methylphenanthrene	0.5
fluoranthene	1.4
pyrene	1.5
benz[a]anthracene	0.4
chrysene	1.0
benzo[b]fluoranthene	1.0
benzo[k]fluoranthene	0.4
benzo[e]pyrene	0.6
benzo[a]pyrene	0.4
perylene	0.6
indeno[123-cd]pyrene	0.5
dibenz[ah]anthracene	< 0.2
benzo[ghi]perylene	0.6
Total PAH	12.0
DDTs	
o,p'-DDE	< 0.1
p,p'-DDE	0.1
o,p'-DDD	< 0.1
p,p'-DDD	0.1
o,p'-DDT	< 0.1
p,p'-DDT	< 0.1
Total DDT	<0.3
Chlordanes	
heptachlor	< 0.2
heptachlor epoxide	< 0.1
t-chlordane	< 0.1
c-chlordane	< 0.1

NIWA Lab Code	OA132/31
ARC Sample Code	Predeployment
t-nonachlor	< 0.1
c-nonachlor	< 0.1
Total Chlordane	<0.3
Other OCPs	
Hexachlorobenzene	0.13
lindane	< 0.1
dieldrin	0.3
PCBs	
8	< 0.1
18	< 0.1
28	< 0.1
52	< 0.1
49	< 0.1
44	< 0.1
66	< 0.1
121	< 0.1
101	< 0.1
86	< 0.1
110	< 0.1
77	< 0.1
151	< 0.1
118	< 0.1
153	0.2
105	< 0.1
141	< 0.1
138	0.2
126	< 0.1
187	< 0.1
128	< 0.1
156	< 0.1
180	< 0.1
169	< 0.1
170	< 0.1
195	< 0.1
194	< 0.1
206	< 0.1

NIWA Lab Code	OA132/31
ARC Sample Code	Predeployment
209	< 0.1
Total PCB	<2.0

Table 14:

Organic contaminants in NIST Standard Reference Material 2977 (ng/g dry weight).

NIWA Lab Code	SRM 2977	SRM 2977
Year	2007	Certified
Lipid Content (% DW)		
PAHs		
phenanthrene	33.2	35.1
anthracene	5.3	8.0
1-methylphenanthrene	44.3	44.0
fluoranthene	36.2	38.7
pyrene	59.2	78.9
benz[a]anthracene	26.1	20.3
chrysene	77.0	88.0
benzo[b]fluoranthene	19.6	11.0
benzo[k]fluoranthene	6.2	4.0
benzo[e]pyrene	17.7	13.1
benzo[a]pyrene	1.5	8.4
perylene	3.8	3.5
indeno[123-cd]pyrene	4.2	4.8
dibenz[ah]anthracene	1.6	1.4
benzo[ghi]perylene	9.7	9.5
Total PAH	346	369
DDTs		
o,p'-DDE		
p,p'-DDE	9.3	12.5
o,p'-DDD	5.4	3.3
p,p'-DDD	4.2	4.3
o,p'-DDT		
p,p'-DDT	1.0	1.3
Total DDT	19.8	21.4
Chlordanes		
heptachlor		
heptachlor epoxide		
t-chlordane		
c-chlordane	1.0	1.4

NIWA Lab Code Year	SRM 2977 2007	SRM 2977 Certified
t-nonachlor	0.7	1.4
c-nonachlor		
Total Chlordane	1.8	2.9
Other OCPs		
Hexachlorobenzene		
lindane		
dieldrin	6.0	6.2
PCBs		
8	2.1	0.8
18	2.7	0.9
28	5.4	8.9
52	8.4	8.0
49		
44	3.3	1.9
66	3.6	3.4
121		
101	11.2	11.2
86		
110	4.0	4.2
77		
151	3.1	2.9
118	10.5	10.0
153	14.1	13.9
105	3.8	2.7
141		
138	16.6	15.5
126		
187	4.8	4.2
128	2.5	1.5
156	1.0	0.6
180	6.8	5.9
169		
170	3.0	2.5
195		
194	0.9	0.6
206		

NIWA Lab Code Year	SRM 2977 2007	SRM 2977 Certified
209		
Total PCB	107.5	99.5

Table 15:

Organic contaminants in archived mussel and oyster samples from 2003 (ng/g dry weight).

NIWA Lab Code	OA92/6	OA92/6	OA93/15	OA93/15
Year analysed	2003	2007	2003	2007
Lipid Content (% DW)	13.3	12.8	6.8	7.2
PAHs				
phenanthrene	2.4	4.5	2.8	4.2
anthracene	0.5	0.2	1.4	0.8
1-methylphenanthrene	1.3	1.9	1.1	1.6
fluoranthene	5.6	6.3	8.7	9.4
pyrene	4.4	4.6	13.6	13.1
benz[a]anthracene	1.2	0.7	4.2	4.4
chrysene	3.6	4.4	7.6	7.7
benzo[b]fluoranthene	1.3	2.2	7.0	10.8
benzo[k]fluoranthene	0.7	0.6	5.6	4.0
benzo[e]pyrene	1.2	1.6	5.0	5.8
benzo[a]pyrene	0.2	< 0.2	4.9	4.2
perylene	1.4	0.8	11.9	11.4
indeno[123-cd]pyrene	0.3	0.2	4.7	5.6
dibenz[ah]anthracene	<0.2	< 0.2	1.0	1.3
benzo[ghi]perylene	0.5	0.5	6.5	7.8
Total PAH	24.6	28.6	86.0	92.1
DDTs				
o,p'-DDE	0.6	0.9	0.2	0.1
p,p'-DDE	17.9	19.2	3.0	3.1
o,p'-DDD	0.3	0.2	0.7	0.6
p,p'-DDD	1.7	1.5	2.7	3.0
o,p'-DDT	<0.1	0.1	0.2	0.2
p,p'-DDT	0.6	0.6	0.7	0.7
Total DDT	21.1	22.6	7.5	7.8
Chlordanes				
heptachlor	<0.2	< 0.2	< 0.1	< 0.2
heptachlor epoxide	<0.2	< 0.1	0.2	< 0.1
t-chlordane	0.4	0.5	0.2	0.4

NIWA Lab Code	OA92/6	OA92/6	OA93/15	OA93/15
Year analysed	2003	2007	2003	2007
c-chlordane	0.4	0.5	0.3	0.3
t-nonachlor	0.5	0.6	0.4	0.5
c-nonachlor	0.7	0.8	0.3	0.4
Total Chlordane	2.0	2.3	1.4	1.6
Other OCPs				
Hexachlorobenzene		< 0.05		0.28
lindane	<0.1	< 0.1	<0.1	< 0.1
dieldrin	1.3	1.4	1.5	1.6
PCBs				
8	<0.1	< 0.1	<0.1	< 0.1
18	<0.1	< 0.1	<0.1	< 0.1
28	0.2	0.3	0.3	0.3
52	0.6	0.5	0.7	0.7
49	0.2	0.2	0.1	0.1
44	0.2	0.1	0.1	< 0.1
66	0.3	0.3	0.5	0.5
121	<0.1	< 0.1	<0.1	< 0.1
101	1.9	2.2	1.5	1.7
86	<0.1	< 0.1	<0.1	< 0.1
110	1.3	1.3	0.4	0.4
77	<0.1	< 0.1	<0.1	< 0.1
151	0.6	0.6	1.1	1.1
118	1.5	1.5	2.6	2.5
153	4.3	4.9	8.2	9.6
105	0.4	0.4	0.7	0.7
141	0.1	0.2	0.4	0.4
138	3.2	3.5	8.0	9.2
126	<0.1	< 0.1	0.1	< 0.1
187	1.1	1.2	2.3	2.4
128	0.4	0.2	1.1	0.9
156	0.1	0.1	0.2	0.3
180	0.4	0.5	2.0	2.4
169	<0.1	< 0.1	<0.1	< 0.1
170	<0.1	< 0.1	1.2	1.2
195	<0.1	< 0.1	<0.1	< 0.1
194	<0.1	< 0.1	0.2	0.2

NIWA Lab Code	OA92/6	OA92/6	OA93/15	OA93/15
Year analysed	2003	2007	2003	2007
206	<0.1	< 0.1	<0.1	< 0.1
209	<0.1	< 0.1	<0.1	<0.1
Total PCB	16.8	18.2	31.7	34.6

Table 16:

Organic contaminants in archived mussel and oyster samples from 2005 (ng/g dry weight).

NIWA Lab Code	OA115/8	OA115/8	OA114/15	OA114/15
Year analysed	2005	2007	2005	2007
Lipid Content (% DW)	9.0	8.3	5.6	5.0
PAHs				
phenanthrene	1.7	2.4	3.2	2.6
anthracene	<0.2	< 0.2	0.6	0.4
1-methylphenanthrene	1.0	0.9	1.7	1.2
fluoranthene	3.1	2.6	9.3	7.1
pyrene	2.6	2.1	13.7	10.3
benz[a]anthracene	0.7	0.8	4.6	3.2
chrysene	2.2	2.7	8.7	9.2
benzo[b]fluoranthene	1.5	1.8	8.8	11.5
benzo[k]fluoranthene	0.7	0.5	6.0	4.0
benzo[e]pyrene	1.2	1.3	6.2	6.1
benzo[a]pyrene	0.3	< 0.2	5.1	1.9
perylene	1.7	1.6	11.2	10.1
indeno[123-cd]pyrene	0.4	0.3	7.5	5.4
dibenz[ah]anthracene	<0.2	< 0.2	1.1	1.1
benzo[ghi]perylene	0.6	0.6	8.6	6.9
Total PAH	17.7	17.5	96.3	81.0
DDTs				
o,p'-DDE	0.2	0.3	0.1	0.1
p,p'-DDE	7.5	7.7	3.2	3.2
o,p'-DDD	0.2	0.2	0.7	0.7
p,p'-DDD	1.0	0.9	2.8	2.8
o,p'-DDT	<0.1	0.1	0.2	0.2
p,p'-DDT	0.2	0.2	0.5	0.5
Total DDT	9.1	9.3	7.5	7.5
Chlordanes				
heptachlor	<0.2	< 0.2	<0.2	< 0.2
heptachlor epoxide	<0.2	< 0.1	<0.1	< 0.1
t-chlordane	0.5	0.4	0.3	0.5
c-chlordane	0.5	0.4	0.3	0.4

NIWA Lab Code	OA115/8	OA115/8	OA114/15	OA114/15
Year analysed	2005	2007	2005	2007
t-nonachlor	0.6	0.4	0.4	0.5
c-nonachlor	0.7	0.5	0.3	0.4
Total Chlordane	2.3	1.7	1.3	1.7
Other OCPs				
Hexachlorobenzene		< 0.05		0.51
lindane	<0.1	< 0.1	<0.1	< 0.1
dieldrin	1.2	1.1	1.4	1.2
PCBs				
8	<0.1	< 0.1	<0.1	< 0.1
18	<0.1	< 0.1	<0.1	< 0.1
28	< 0.1	0.1	0.3	0.3
52	0.2	0.2	0.7	0.7
49	0.1	0.2	0.1	0.1
44	<0.1	< 0.1	0.1	< 0.1
66	0.2	0.1	0.5	0.4
121	<0.1	< 0.1	<0.1	< 0.1
101	0.9	0.9	1.6	1.6
86	<0.1	< 0.1	<0.1	< 0.1
110	0.5	0.5	0.5	0.4
77	<0.1	< 0.1	<0.1	< 0.1
151	0.3	0.3	1.1	1.0
118	0.8	0.7	2.4	2.1
153	2.5	2.4	7.7	8.1
105	0.2	0.2	0.7	0.6
141	0.1	< 0.1	0.4	0.3
138	1.9	1.7	7.3	7.6
126	<0.1	< 0.1	0.1	< 0.1
187	0.7	0.7	2.3	2.1
128	0.2	0.1	1.1	0.7
156	<0.1	< 0.1	0.3	0.2
180	0.2	0.2	1.9	1.9
169	<0.1	< 0.1	<0.1	< 0.1
170	<0.1	< 0.1	1.1	0.9
195	<0.1	< 0.1	<0.1	< 0.1
194	<0.1	< 0.1	0.1	0.1
206	<0.1	< 0.1	<0.1	< 0.1

NIWA Lab Code	OA115/8	OA115/8	OA114/15	OA114/15
Year analysed	2005	2007	2005	2007
209	<0.1	< 0.1	<0.1	<0.1
Total PCB	8.8	8.3	30.3	29.4

Table 17:

Organic contaminants in archived mussel sample from 2006 (ng/g dry weight).

NIWA Lab Code	OA122/3	OA122/3
Year analysed	2006	2007
Lipid Content (% DW)	7.4	7.8
PAHs		
phenanthrene	2.9	4.2
anthracene	0.7	0.5
1-methylphenanthrene	0.8	1.5
fluoranthene	6.5	7.8
pyrene	6.7	7.8
benz[a]anthracene	3.0	3.3
chrysene	4.3	5.0
benzo[b]fluoranthene	5.6	7.2
benzo[k]fluoranthene	2.1	2.7
benzo[e]pyrene	2.8	3.5
benzo[a]pyrene	4.0	3.8
perylene	2.3	2.3
indeno[123-cd]pyrene	4.5	4.5
dibenz[ah]anthracene	1.0	0.8
benzo[ghi]perylene	4.4	4.7
Total PAH	51.5	59.7
DDTs		
o,p'-DDE	0.3	0.2
p,p'-DDE	1.9	1.4
o,p'-DDD	0.7	0.9
p,p'-DDD	2.1	2.3
o,p'-DDT	0.5	0.6
p,p'-DDT	2.1	2.0
Total DDT	7.6	7.4
Chlordanes		
heptachlor	<0.2	< 0.2
heptachlor epoxide	<0.1	< 0.1
t-chlordane	0.2	0.2
c-chlordane	0.1	0.2

NIWA Lab Code	OA122/3	OA122/3
Year analysed	2006	2007
t-nonachlor	0.2	0.2
c-nonachlor	0.1	0.1
Total Chlordane	0.6	0.7
Other OCPs		
Hexachlorobenzene	0.30	0.31
lindane	<0.1	< 0.1
dieldrin		0.9
PCBs		
8	<0.1	< 0.1
18	<0.1	< 0.1
28	<0.1	< 0.1
52	0.2	0.2
49	<0.1	< 0.1
44	<0.1	< 0.1
66	0.1	0.1
121	<0.1	< 0.1
101	0.3	0.2
86	<0.1	< 0.1
110	0.1	< 0.1
77	<0.1	< 0.1
151	0.3	0.3
118	0.7	0.7
153	3.0	3.0
105	0.2	0.2
141	<0.1	< 0.1
138	2.6	2.5
126	<0.1	< 0.1
187	0.9	0.7
128	0.3	0.3
156	<0.1	< 0.1
180	0.8	0.7
169	<0.1	< 0.1
170	0.4	0.3
195	<0.1	< 0.1
194	0.1	< 0.1
206	<0.1	< 0.1

NIWA Lab Code	OA122/3	OA122/3
Year analysed	2006	2007
209	<0.1	<0.1
Total PCB	10.0	9.2

3 Analytical procedures

The shellfish were thawed, shucked, homogenised, then freeze-dried. Weighed sub-samples (5-6 g) were spiked with analytical surrogates representative of each class of compounds and extracted with dichloromethane (DCM) using accelerated solvent extraction (ASE) methods. A combination of silica/alumina, gel permeation, and silica gel chromatography was used to clean up and fractionate the extracts. Internal standards were added to all extracts prior to analysis by Gas Chromatorgaphy (GC) analysis.

The lipid content of each sample was determined gravimetrically from a measured aliquot of the original ASE extract. Solvent was removed by drying at 40 ºC until a constant weight was recorded.

Quantitative analysis of PAHs, PCBs and OCPs was carried out by capillary gas chromatography using mass selective detection in selected ion mode (GC–MS–SIM).

Concentrations have been corrected for surrogate recovery. Detection limits were approximately 0.1–0.5 ng/g dry weight. In this report, the data "less than detection limit" (given as "< " values in tables) have been assigned values of 0 ng/g for calculation of compound class totals and means. The totals listed are therefore slightly lower than "true" values, but this has no practical effect on the meaning or interpretation of the data.

4 Quality assurance

QA assessment was carried out by:

- Analysis of a standard reference material freeze-dried mussel tissue. Results are presented in Table 14 and summarised in Table A1.
- Monitoring of surrogate recoveries for both oysters and mussels. These are summarised in Tables A2 and A3.
- Collecting data for blanks and several archived samples from 2003, 2005 or 2006. Data for archived samples are presented in Tables 15, 16 and 17.

Table A1:

Analysis of standard reference material 2977 freeze-dried mussel tissue (ng/g).

Analyte	Certified	Result
Total PAHs	369	346
Dieldrin	6.2	6.0
Total DDTs	21.4	19.8
Total Chlordanes	2.9	1.8
Total PCBs	99.5	107.5

Table A2:

Summary of surrogate percentage recoveries for oysters.

Surrogate	Mean (%)	cv (%)
phenanthrene-d10	86.0	5.9
Fluoranthene-d10	100.3	7.1
pyrene-d10	93.9	5.6
benz[a]anthracene-d12	86.2	9.3
perylene-d12	73.3	17
indeno[123-cd]pyrene-d12	81.3	7.5
benzo[ghi]perylene-d12	74.0	7.9
PCB103	97.8	6.3
PCB207	88.3	7.1

Table A3:

Summary of surrogate percentage recoveries for mussels.

Surrogate	Mean (%)	cv (%)
phenanthrene-d10	89.3	4.4
Fluoranthene-d10	97.5	3.8
pyrene-d10	97.9	3.5
benz[a]anthracene-d12	93.8	6.2
perylene-d12	81.0	12
indeno[123-cd]pyrene-d12	81.3	5.8

benzo[ghi]perylene-d12	74.0	5.7
PCB103	98.6	8.0
PCB207	96.1	9.5