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This report presents the results of marine and freshwater scientific work carried out by Marine Scotland Science.

Determination, and environmental assessment, of hydrocarbons in water samples following a release of oil from the Clair platform

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Executive Summary

Following a leak from the Clair Platform on 2 October 2016, water samples were collected at five depths from ten sites, including a reference site, to assess any environmental impact of the oil leak in the area. All samples were analysed for polycyclic aromatic hydrocarbons (PAHs) and two samples (9.9 m and 29.7 m samples) from each site were analysed for *n*-alkanes.

The total PAH concentrations in the water samples were low, ranging from 1.4 to 16.3 ng l^{-1} and could be considered to be at background concentrations. The *n*-alkane profiles showed no evidence of crude oil contamination.

Introduction

On 2 October 2016 a leak was found near the BP-operated Clair Platform. The leak was caused by a technical issue with a system designed to separate the mixed production fluids of water, oil and gas. The release was stopped within an hour once the issue had been identified and Clair production was taken offline. An estimated 95 tonnes of crude had been released into the surrounding environment during the leak, which left oil visible on the sea surface. The Clair Platform is situated 46 miles west of Shetland (Figure 1).

BP requested the support of Marine Scotland Science in water sampling and testing following the oil release. The intention of the water sampling is to determine the oil concentration at depth through the water column. Initial modelling indicated that the majority of the oil would be dispersed at about 25 m below the surface. BP provided a transect, based on the OSCAR modelling output. Marine Scotland selected nine sampling positions along this transect, and a reference site.

This report describes the results of the hydrocarbon analysis of the seawater samples.

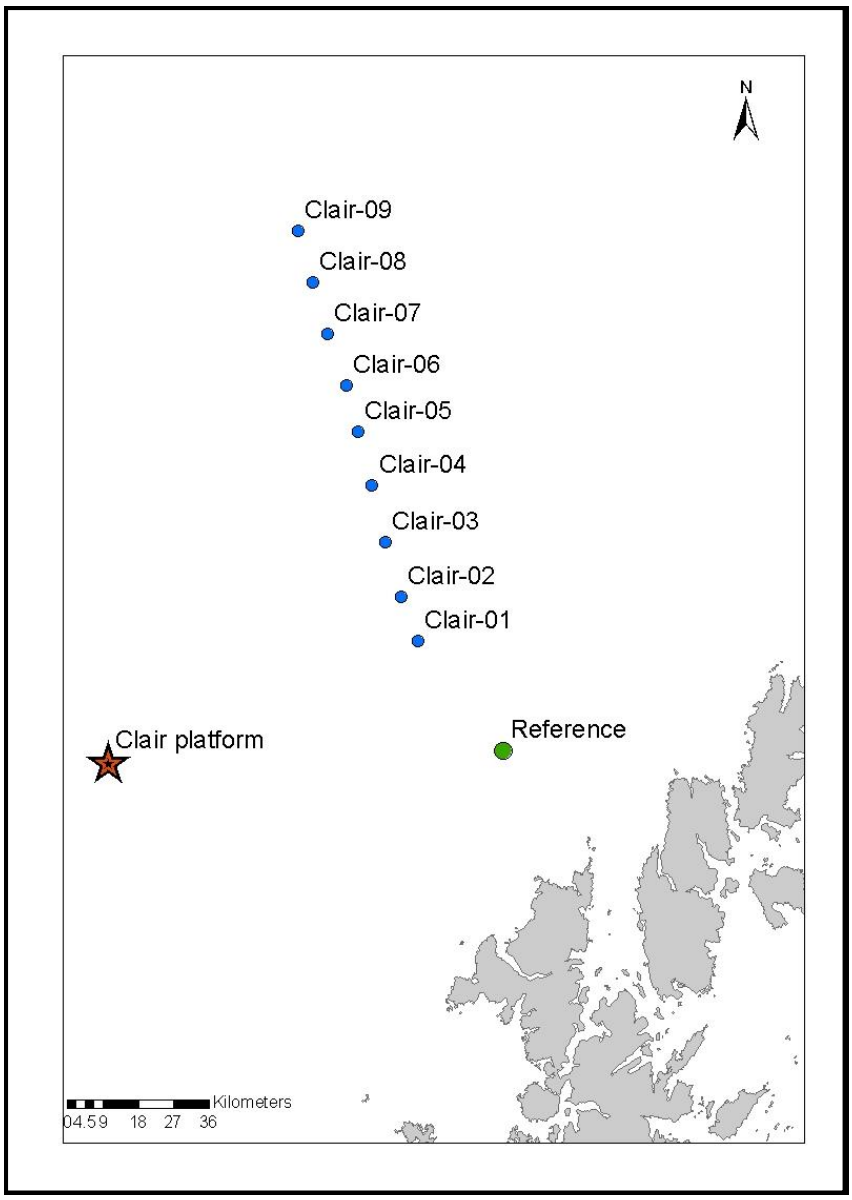


Figure 1: Map showing the water sampling locations following the release of oil from the Clair platform. Ten locations, including a reference site were sampled, with water samples collected at five depths at each site.

Sampling and Analytical Methods

Samples were collected from ten locations, including a reference site, on 6 October 2016 from the MRV *Scotia* (Appendix 1). Samples were returned to the Marine Scotland Science, Marine Laboratory on 8 October 2016.

Water samples were collected using a Rosette Sampler at five different depths at each location and transferred into solvent washed, glass bottles (2.5 L). Samples

were kept at room temperature and were extracted immediately on arrival to the Marine Laboratory on 8 October 2016.

Isolation of Hydrocarbons from Water

The actual volume of each water sample was determined using a measuring cylinder, before transferring to a separating funnel (~ 2 l). Deuterated aromatic standards (d_8-naphthalene, d_{10}-biphenyl, d_8-dibenzothiophene, d_{10}-anthracene, d_{10}-pyrene, d_{12}-benzo[*a*]pyrene and d_{14}-dibenz[*a,h*]anthracene) and aliphatic standards (heptametylnonane and squalane) were added to each water sample before extraction with dichloromethane (2 x 50 ml). The extracts were combined and dried over sodium sulphate, solvent exchanged to *iso*-hexane and the extract reduced in volume by rotary evaporation prior to concentration to a small volume (~500 µl) under a nitrogen stream. The aliphatic and aromatic hydrocarbons were separated by isocratic high performance liquid chromatography (HPLC). An aliquot (150 µl) of the *iso*-hexane extract was injected on to a previously calibrated Genesis SIL 4 µm HPLC column (25 x 4.6 cm id; Jones Chromatography, Mid Glamorgan, UK) and eluted with *iso*-hexane at a flow rate of 2 ml min^{-1}. The aliphatic fraction (first fraction, 0 to 2 minutes) was collected and concentrated to approximately 50 µl for the analysis of aliphatic hydrocarbons (*n*-alkanes) by gas chromatography - mass spectrometry (GC-MS). The second fraction, containing the PAHs, was collected between approximately 2 and 20 minutes (specific times determined) and was concentrated to approximately 50 µl prior to analysis by GC-MS.

Determination of PAHs by GC-MS

The concentration and composition of the PAHs (2- to 6-ring, parent and branched) were determined by GC-MS using an HP6890 Series gas chromatograph interfaced with an HP5973 MS and fitted with a cool on-column injector and a HP 5 MS column (30 m x 0.25 mm, 0.25 µm film thickness: Agilent, Stockport, UK). Helium was used as the carrier gas in constant flow mode (0.7 ml min^{-1}). Injections were made at 50^{o}C and the oven temperature held constant for three minutes. Thereafter, the temperature was raised at 20^{o}C min^{-1} up to 100^{o}C. This was followed by a slower ramp of 4^{o}C min^{-1} up to 270^{o}C, then at 40^{o}C min^{-1} up to 290^{o}C, where it was held for three minutes, then at 40^{o}C min^{-1} to a final temperature of 300^{o}C, where it was held for 22 minutes. The MS was set for selective ion monitoring (SIM) with a dwell time of 50 ms. Calibration standards, covering the concentration range 0.01 to 6.0 ng μl^{-1} were analysed, in triplicate, and the average response used to compute the calibration curve. Correlation coefficients of at least 0.99 were achieved for all

PAHs. The limit of detection for individual PAHs was 0.04 µg l^{-1} and the limit of quantification was 0.14 µg l^{-1}.

Determination of Aliphatic Hydrocarbons (*n*-alkanes)

The *n*-alkane distribution was determined by GC-MS using an HP6890 Series gas chromatograph interfaced with an HP5973 MS and fitted with a cool on-column injector and a HP 5 MS column (30 m x 0.25 mm, 0.25 µm film thickness: Agilent, Stockport, UK). Helium was used as the carrier gas in constant flow mode (0.7 ml min^{-1}). Injections were made at 60^{o}C and the oven temperature held at this for three minutes. Thereafter, the temperature was raised at 4^{o}C min^{-1} up to 280^{o}C and held at this temperature until the end of the run. The MS was set for selective ion monitoring (SIM) with a dwell time of 50 ms with quantification carried out on *m/z* 57.

Quality Control Procedures

System suitability standards were analysed prior to the analysis of the water samples as a check on the instrument performance and a procedure blank was included in the analytical batch.

Results and Discussion

PAH concentrations were low in all water samples, with most PAHs being below the detection limits. Total PAH (2- to 6-ring parent and alkylated) concentrations in the transect water samples ranged from 1.4 to 16.3 ng l^{-1} (Table 1, Appendix 2). Highest concentrations were found at Clair 04, with the 9.9 and 29.7 m samples giving concentrations of 10.3 and 16.3 ng l^{-1}. Total PAH concentrations in water samples from the reference site ranged from 5.1 to 9.8 ng l^{-1}. There was no significant difference in the PAH concentrations between the transect and reference site samples.

There is limited data available for PAH concentrations in Scottish offshore seawater, a summary of available data is given in Table 1. PAH concentrations were previously measured in water from a reference site at Loch Linnhe and gave total PAH concentrations of between 27.8 and 33.1 ng l^{-1}. Following a leak from a flow line to the Gannet Alpha platform during August 2011, water samples were collected for hydrocarbon analysis to assess any environmental impact of the oil leak in the area. Total PAH concentrations found in water samples were low, ranging from 9.9 to 34.1 ng l^{-1}. Concentrations found in water samples collected from the Stonehaven ecosystem monitoring site at two depths in April 2012 were 14.4 ng l^{-1} in the one

meter sample and 7.9 ng l^{-1} in the 10 m sample. In 2014 water samples were collected from the Faroe Shetland Channel and Rosemary Bank, as part of a MSS research project, and analysed for PAHs. Total PAH concentrations ranged from 4.3-48.6 ng l^{-1}. Therefore, the concentrations found in the Clair water samples can be considered to be at background concentrations.

PAHs are classed as Priority Hazardous Substances (PHS) under the Water Framework Directive (WFD). Environmental Quality Standards (EQSs) are required to enable assessments of the chemical status of a water body to be made for WFD. There are two types of EQS; Environmental Quality Standards expressed as annual average concentration (AA-EQS) and Environmental Quality Standards expressed as maximum allowable concentrations (MAC-EQS). The MAC-EQSs for anthracene, fluoranthene and benzo[*a*]pyrene are 400, 1,000 and 100 ng l^{-1}, respectively (Directive 2008/105/EC). Concentrations in the Clair seawater samples were well below available EQSs. Anthracene and benzo[*a*]pyrene were below the detection in all samples and fluoranthene was below the detection limit in most samples.

Table 1

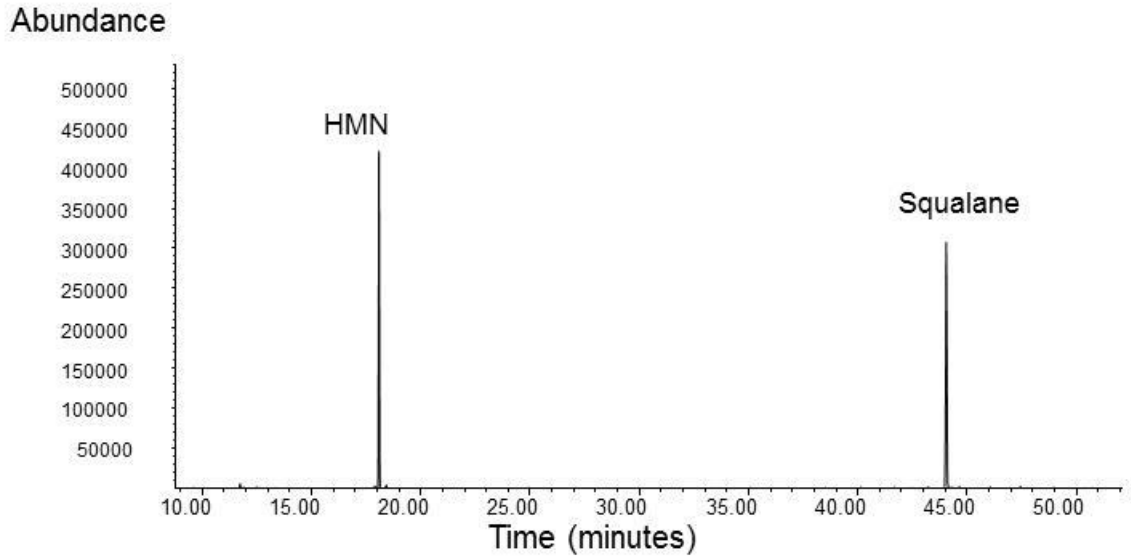
Typical total PAH concentration (ng l^{-1}) ranges in water.

Area	**Year**	**Range (ng l^{-1})**
Loch Linnhe reference site	2002	27.8, 33.1[1]
Gannet platform, North Sea	2011	9.9- 34.1[2]
Stonehaven reference site	2012	14.4 (1 meter) 7.9 (10 meter)
Rosemary Bank (MoreDeep)	2014	20.6, 48.6
Faroe-Shetland Channel (MoreDeep)	2014	4.3 – 18.8
Clair field transect	*October 2016*	*1.4 – 16.3*
Reference site	*October 2016*	*5.1 – 9.8*

Crude oils will be characterised by lower boiling compounds, nC$_{11}$ – nC$_{17}$, after which there is a rapid decrease in concentration. Weathering will result in a change in the *n*-alkane profile with the lighter compounds being lost first due to evaporation and degradation. The *n*-alkane profiles (Figure 2) of all seawater samples showed no evidence of any crude oil contamination. In a number of samples the dominant alkane was nC$_{22}$, this is not due to oil but is most likely due to the environmental

conditions. A predominance of nC_{22} has previously been reported in rock extracts, although the exact source of this was not fully understood.[3]

(a)



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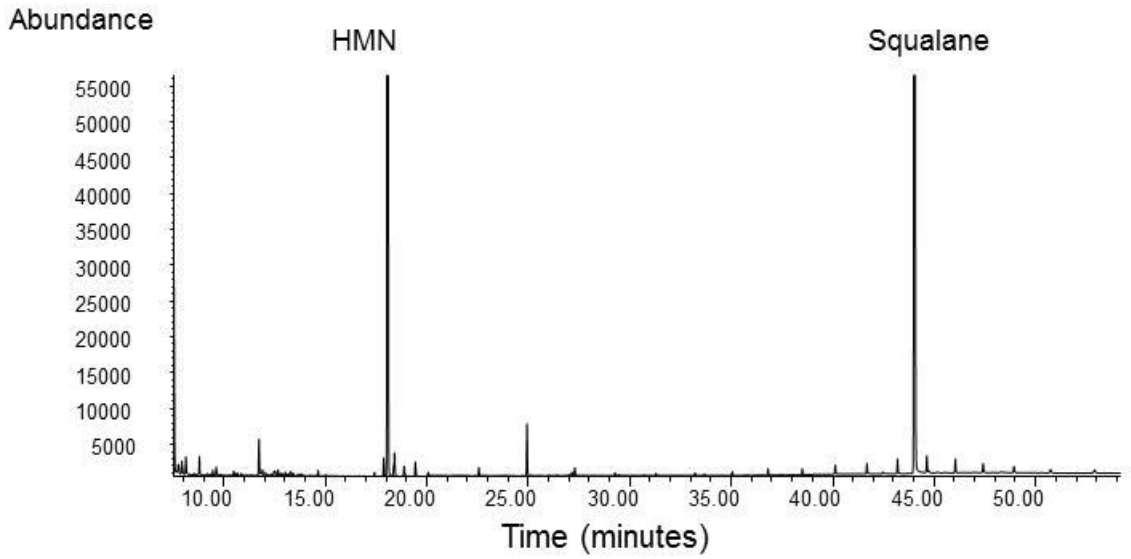

(c)

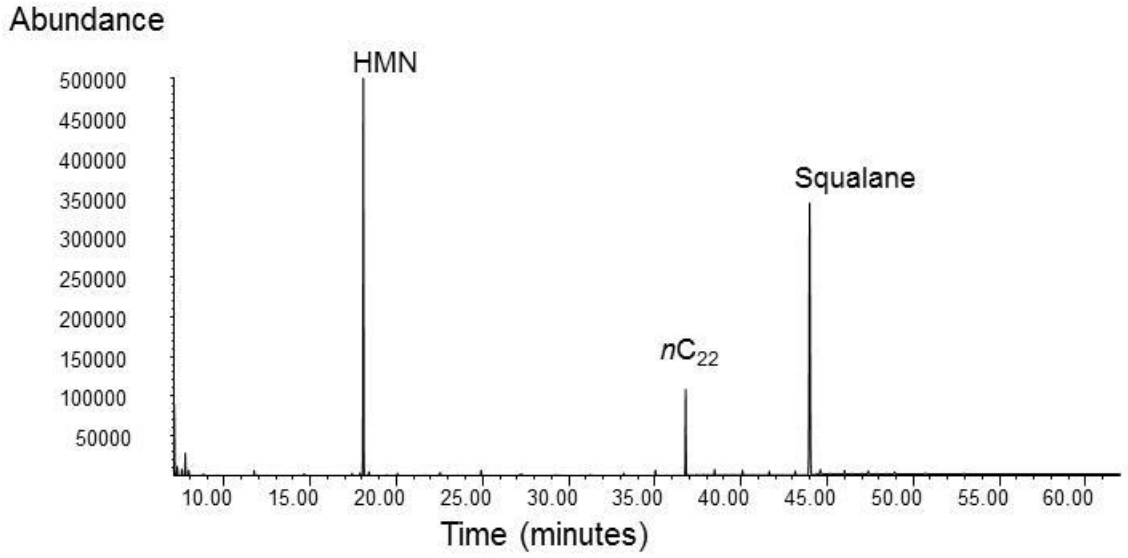

Figure 2: Aliphatic hydrocarbon profile of a **(a)** procedure blank, **(b)** typical transect seawater sample (MAR-2016-33256 Clair05, Bottle 28) and **(c)** transect seawater sample containing a high proportion of nC_{22} (MAR-2016-33234, Clair01, Bottle 6). Heptamethylnonane (HMN) and squalane (Sq) were used as internal standards.

Conclusions

1. PAH and *n*-alkane concentrations in water samples were low at all sites sampled, with concentrations of most PAHs being below detection limits.
2. Total PAH concentrations were at the lower end of those previously reported at reference sites.
3. The-*n*-alkane profiles showed no evidence of petrogenic contamination

Acknowledgments

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References

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2. L. Webster, I. Hussy, A. Craig, M. Russell, G. Packer, E. J. Dalgarno, D. C. Moore and C. F. Moffat, 2011. Determination and environmental assessment of hydrocarbons in water, fish and sediment following an oil spill at the Gannet oil field. *Scottish Marine and Freshwater Science Report*, Vol 2 No 12, pp 23.

3. P. A. Schenck, 1968. The predominance of the $n C_{22}$ alkane in rock extracts. Advances in Organic geochemistry, 31, 261-268.

Appendix 1

Details of sampling positions, depths and time of collection

Text ID	Field ID	Water Sampling Depth (m)	Sample Date	Sample Time	Latitude Degree Minutes	Longitude Degree Minutes	Decimal Latitude	Decimal Longitude
MAR-2016-33229	Reference	9.9	06/10/2016	12:45	60 45.65N	001 30.19W	60.7608	-1.5032
MAR-2016-33230	Reference	19.8	06/10/2016	12:45	60 45.65N	001 30.19W	60.7608	-1.5032
MAR-2016-33231	Reference	29.7	06/10/2016	12:45	60 45.65N	001 30.19W	60.7608	-1.5032
MAR-2016-33232	Reference	49.5	06/10/2016	12:45	60 45.65N	001 30.19W	60.7608	-1.5032
MAR-2016-33233	Reference	79.2	06/10/2016	12:45	60 45.65N	001 30.19W	60.7608	-1.5032
MAR-2016-33234	Clair-01	9.9	06/10/2016	14:06	60 52.92N	001 41.76W	60.8820	-1.6960
MAR-2016-33235	Clair-01	19.8	06/10/2016	14:06	60 52.92N	001 41.76W	60.8820	-1.6960
MAR-2016-33236	Clair-01	29.7	06/10/2016	14:06	60 52.92N	001 41.76W	60.8820	-1.6960
MAR-2016-33237	Clair-01	49.5	06/10/2016	14:06	60 52.92N	001 41.76W	60.8820	-1.6960
MAR-2016-33238	Clair-01	79.2	06/10/2016	14:06	60 52.92N	001 41.76W	60.8820	-1.6960
MAR-2016-33239	Clair-02	9.9	06/10/2016	14:59	60 55.89N	001 44.15W	60.9315	-1.7358
MAR-2016-33240	Clair-02	19.8	06/10/2016	14:59	60 55.89N	001 44.15W	60.9315	-1.7358
MAR-2016-33241	Clair-02	29.7	06/10/2016	14:59	60 55.89N	001 44.15W	60.9315	-1.7358
MAR-2016-33242	Clair-02	49.5	06/10/2016	14:59	60 55.89N	001 44.15W	60.9315	-1.7358
MAR-2016-33243	Clair-02	79.2	06/10/2016	14:59	60 55.89N	001 44.15W	60.9315	-1.7358
MAR-2016-33244	Clair-03	9.9	06/10/2016	15:59	60 59.52N	001 46.34W	60.9920	-1.7723
MAR-2016-33245	Clair-03	19.8	06/10/2016	15:59	60 59.52N	001 46.34W	60.9920	-1.7723
MAR-2016-33246	Clair-03	29.7	06/10/2016	15:59	60 59.52N	001 46.34W	60.9920	-1.7723
MAR-2016-33247	Clair-03	49.5	06/10/2016	15:59	60 59.52N	001 46.34W	60.9920	-1.7723
MAR-2016-33248	Clair-03	79.2	06/10/2016	15:59	60 59.52N	001 46.34W	60.9920	-1.7723
MAR-2016-33249	Clair-04	9.9	06/10/2016	16:52	61 03.26N	001 48.06W	61.0543	-1.8010
MAR-2016-33250	Clair-04	19.8	06/10/2016	16:52	61 03.26N	001 48.06W	61.0543	-1.8010
MAR-2016-33251	Clair-04	29.7	06/10/2016	16:52	61 03.26N	001 48.06W	61.0543	-1.8010
MAR-2016-33252	Clair-04	49.5	06/10/2016	16:52	61 03.26N	001 48.06W	61.0543	-1.8010
MAR-2016-33253	Clair-04	79.2	06/10/2016	16:52	61 03.26N	001 48.06W	61.0543	-1.8010
MAR-2016-33254	Clair-05	9.9	06/10/2016	17:54	61 06.79N	001 50.05W	61.1132	-1.8342
MAR-2016-33255	Clair-05	19.8	06/10/2016	17:54	61 06.79N	001 50.05W	61.1132	-1.8342
MAR-2016-33256	Clair-05	29.7	06/10/2016	17:54	61 06.79N	001 50.05W	61.1132	-1.8342
MAR-2016-33257	Clair-05	49.5	06/10/2016	17:54	61 06.79N	001 50.05W	61.1132	-1.8342

MAR-2016-33258	Clair-05	79.2	06/10/2016	17:54	61 06.79N	001 50.05W	61.1132	-1.8342
MAR-2016-33259	Clair-06	9.9	06/10/2016	18:55	61 09.85N	001 51.62W	61.1642	-1.8603
MAR-2016-33260	Clair-06	19.8	06/10/2016	18:55	61 09.85N	001 51.62W	61.1642	-1.8603
MAR-2016-33261	Clair-06	29.7	06/10/2016	18:55	61 09.85N	001 51.62W	61.1642	-1.8603
MAR-2016-33262	Clair-06	49.5	06/10/2016	18:55	61 09.85N	001 51.62W	61.1642	-1.8603
MAR-2016-33263	Clair-06	79.2	06/10/2016	18:55	61 09.85N	001 51.62W	61.1642	-1.8603
MAR-2016-33264	Clair-07	9.9	06/10/2016	20:06	61 13.21N	001 54.09W	61.2202	-1.9015
MAR-2016-33265	Clair-07	19.8	06/10/2016	20:06	61 13.21N	001 54.09W	61.2202	-1.9015
MAR-2016-33266	Clair-07	29.7	06/10/2016	20:06	61 13.21N	001 54.09W	61.2202	-1.9015
MAR-2016-33267	Clair-07	49.5	06/10/2016	20:06	61 13.21N	001 54.09W	61.2202	-1.9015
MAR-2016-33268	Clair-07	79.2	06/10/2016	20:06	61 13.21N	001 54.09W	61.2202	-1.9015
MAR-2016-33269	Clair-08	9.9	06/10/2016	21:21	61 16.63N	001 56.08W	61.2772	-1.9347
MAR-2016-33270	Clair-08	19.8	06/10/2016	21:21	61 16.63N	001 56.08W	61.2772	-1.9347
MAR-2016-33271	Clair-08	29.7	06/10/2016	21:21	61 16.63N	001 56.08W	61.2772	-1.9347
MAR-2016-33272	Clair-08	49.5	06/10/2016	21:21	61 16.63N	001 56.08W	61.2772	-1.9347
MAR-2016-33273	Clair-08	79.2	06/10/2016	21:21	61 16.63N	001 56.08W	61.2772	-1.9347
MAR-2016-33274	Clair-09	9.9	06/10/2016	22:39	61 20.01N	001 58.10W	61.3335	-1.9683
MAR-2016-33275	Clair-09	19.8	06/10/2016	22:39	61 20.01N	001 58.10W	61.3335	-1.9683
MAR-2016-33276	Clair-09	29.7	06/10/2016	22:39	61 20.01N	001 58.10W	61.3335	-1.9683
MAR-2016-33277	Clair-09	49.5	06/10/2016	22:39	61 20.01N	001 58.10W	61.3335	-1.9683
MAR-2016-33278	Clair-09	79.2	06/10/2016	22:39	61 20.01N	001 58.10W	61.3335	-1.9683

Appendix 2

PAH concentration in seawater samples
Concentrations are in ng l^{-1}

The numbers in brackets following a chemical name refers to ion monitored for that compound. For example, Benzo[*c*]phenanthrene (228) means that the ion 228 was monitored to allow quantitative analysis of Benzo[*c*]phenanthrene.

C2, C3, and C4 refer to the number of alkyl groups attached to the parent ring structure. For example, C2 naphthalene has 2 alkyl groups.

Total PAH is the sum of all PAHs measured (2- to 6-ring parent and alkylated PAHs)

ND, <0.04 ng l^{-1};

TR, 0.04 – 0.14 ng l^{-1}

Lab. I.D. Field I.D.	MAR-2016-33229 Reference Bottle 1	MAR-2016-33230 Reference Bottle 2	MAR-2016-33231 Reference Bottle 3	MAR-2016-33232 Reference Bottle 4	MAR-2016-33233 Reference Bottle 5
Depth	**9.90**	**19.80**	**29.70**	**49.50**	**79.19**
Naphthalene	1.8	1.1	1.5	1.7	1.7
2-Methyl Naphthalene	0.8	0.5	ND	0.9	0.4
1-Methyl Naphthalene	0.5	0.3	0.3	0.6	0.3
C2 Naphthalenes	TR	0.7	TR	1.7	0.5
C3 Naphthalenes	0.7	0.4	0.5	1.4	0.8
C4 Naphthalenes	ND	0.3	TR	ND	1.0
TOTAL Naphthalenes	3.8	3.3	2.3	6.3	4.7
Phenanthrene (178)	1.2	0.5	0.5	0.8	0.4
Anthracene (178)	ND	ND	ND	TR	ND
C1 178	0.5	0.5	0.4	0.3	0.4
C2 178	0.3	TR	ND	0.6	0.3
C3 178	ND	TR	ND	ND	0.5
TOTAL 178	2.0	1.0	0.9	1.7	1.6
Dibenzothiophene	TR	ND	TR	TR	ND
C1 Dibenzothiophenes	0.2	ND	ND	TR	TR
C2 Dibenzothiophenes	ND	TR	ND	TR	ND
C3 Dibenzothiophenes	0.5	0.2	TR	ND	0.3
TOTAL DBTs	0.7	0.2	TR	TR	0.3
Fluoranthene (202)	0.3	TR	0.3	0.3	TR
Pyrene (202)	0.3	0.2	0.4	0.7	0.2
C1 202	ND	TR	TR	ND	ND
C2 202	ND	ND	ND	ND	0.2
C3 202	ND	ND	ND	ND	ND
TOTAL 202	0.6	0.2	0.7	1.0	0.4
Benzo[*c*]phenanthrene (228)	ND	ND	ND	ND	ND
Benz[*a*]anthracene (228)	ND	ND	0.2	ND	ND
Chrysene/Triphenylene (228)	ND	ND	ND	ND	ND
Benz[*b*]anthracene (228)	ND	ND	ND	ND	ND
C1 228	ND	0.2	0.2	TR	ND
C2 228	ND	ND	ND	ND	ND
TOTAL 228	ND	0.2	0.4	TR	ND
Benzofluoranthenes (252)	ND	TR	0.3	ND	ND
Benzo[*e*]pyrene (252)	ND	0.3	ND	0.3	0.3
Benzo[*a*]pyrene (252)	ND	ND	ND	ND	ND
Perylene (252)	TR	ND	TR	ND	ND
C1 252	ND	ND	ND	ND	ND
C2 252	ND	ND	ND	ND	ND
TOTAL 252	TR	0.3	0.3	0.3	0.3
Indenopyrene (276)	ND	TR	0.3	TR	ND
Benzoperylene (276)	ND	TR	ND	ND	ND
C1 276	ND	ND	ND	ND	ND
C2 276	ND	ND	ND	TR	0.2
TOTAL 276	ND	TR	0.3	TR	0.2
Acenaphthylene (152)	ND	ND	ND	ND	ND
Acenaphthene (154)	0.2	ND	TR	0.2	TR
Fluorene (166)	ND	TR	ND	0.3	TR
Dibenz[*a,h*]anthracene (278)	ND	ND	0.2	ND	ND
TOTAL PAH (40)	**7.3**	**5.2**	**5.1**	**9.8**	**7.5**

Lab. I.D. Field I.D.	MAR-2016-33234 Clair01 Bottle 6	MAR-2016-33235 Clair01 Bottle 7	MAR-2016-33236 Clair01 Bottle 8	MAR-2016-33237 Clair01 Bottle 9	MAR-2016-33238 Clair01 Bottle 10
Depth	**9.90**	**19.80**	**29.70**	**49.50**	**79.19**
Naphthalene	1.4	1.0	1.6	1.3	1.7
2-Methyl Naphthalene	0.7	0.4	0.9	0.6	1.1
1-Methyl Naphthalene	0.4	0.2	0.5	0.4	0.7
C2 Naphthalenes	0.9	0.6	0.2	1.4	2.2
C3 Naphthalenes	1.4	0.9	1.9	1.1	2.1
C4 Naphthalenes	ND	0.3	TR	0.5	TR
TOTAL Naphthalenes	4.8	3.4	5.1	5.3	7.8
Phenanthrene (178)	0.5	0.4	0.8	0.4	0.7
Anthracene (178)	ND	ND	ND	ND	ND
C1 178	0.4	0.3	0.6	TR	0.6
C2 178	ND	0.3	ND	0.2	0.4
C3 178	ND	ND	ND	0.2	0.2
TOTAL 178	0.9	1.0	1.4	0.8	1.9
Dibenzothiophene	ND	ND	TR	ND	ND
C1 Dibenzothiophenes	TR	TR	ND	ND	ND
C2 Dibenzothiophenes	ND	TR	ND	TR	TR
C3 Dibenzothiophenes	0.4	TR	0.2	TR	0.2
TOTAL DBTs	0.4	TR	0.2	TR	0.2
Fluoranthene (202)	0.2	0.4	0.3	TR	TR
Pyrene (202)	0.2	1.2	0.3	TR	TR
C1 202	ND	ND	ND	TR	ND
C2 202	ND	ND	ND	ND	TR
C3 202	ND	ND	ND	ND	ND
TOTAL 202	0.4	1.6	0.6	TR	TR
Benzo[*c*]phenanthrene (228)	ND	ND	ND	ND	ND
Benz[*a*]anthracene (228)	ND	ND	ND	ND	ND
Chrysene/Triphenylene (228)	ND	ND	ND	ND	ND
Benz[*b*]anthracene (228)	ND	ND	ND	ND	ND
C1 228	TR	ND	TR	ND	TR
C2 228	ND	ND	ND	ND	ND
TOTAL 228	TR	ND	TR	ND	TR
Benzofluoranthenes (252)	ND	ND	0.3	ND	ND
Benzo[*e*]pyrene (252)	ND	0.2	ND	0.2	0.3
Benzo[*a*]pyrene (252)	ND	ND	ND	ND	ND
Perylene (252)	ND	ND	TR	ND	ND
C1 252	ND	ND	ND	ND	ND
C2 252	ND	ND	ND	ND	ND
TOTAL 252	ND	0.2	0.3	0.2	0.3
Indenopyrene (276)	ND	ND	ND	ND	TR
Benzoperylene (276)	ND	ND	ND	ND	ND
C1 276	ND	ND	ND	ND	ND
C2 276	ND	ND	ND	ND	ND
TOTAL 276	ND	ND	ND	ND	TR
Acenaphthylene (152)	ND	ND	ND	ND	ND
Acenaphthene (154)	TR	TR	0.2	TR	TR
Fluorene (166)	ND	0.2	0.3	0.2	0.3
Dibenz[*a,h*]anthracene (278)	ND	ND	ND	ND	ND
TOTAL PAH (40)	**6.5**	**6.4**	**8.1**	**6.5**	**10.5**

Lab. I.D. Field I.D.	MAR-2016-33239 Clair02 Bottle 11	MAR-2016-33240 Clair02 Bottle 12	MAR-2016-33241 Clair02 Bottle 13	MAR-2016-33242 Clair02- Bottle 14	MAR-2016-33243 Clair02- Bottle 15
Depth	**9.90**	**19.80**	**29.70**	**49.50**	**79.19**
Naphthalene	1.3	1.3	1.6	1.2	1.5
2-Methyl Naphthalene	0.6	0.8	ND	0.6	0.9
1-Methyl Naphthalene	0.4	0.5	0.5	0.4	0.6
C2 Naphthalenes	TR	1.6	TR	0.4	2.2
C3 Naphthalenes	0.8	2.3	1.7	0.8	1.0
C4 Naphthalenes	0.4	TR	0.5	ND	0.7
TOTAL Naphthalenes	3.5	6.5	4.3	3.4	6.9
Phenanthrene (178)	0.4	0.7	1.7	0.4	0.5
Anthracene (178)	ND	ND	ND	ND	ND
C1 178	0.6	0.6	1.3	0.5	0.6
C2 178	0.2	0.4	0.5	0.4	0.4
C3 178	ND	ND	ND	0.2	TR
TOTAL 178	1.2	1.7	3.5	1.5	1.5
Dibenzothiophene	ND	ND	0.2	ND	ND
C1 Dibenzothiophenes	TR	ND	0.3	TR	0.2
C2 Dibenzothiophenes	ND	TR	ND	TR	0.2
C3 Dibenzothiophenes	ND	TR	0.3	ND	ND
TOTAL DBTs	TR	TR	0.8	TR	0.4
Fluoranthene (202)	ND	TR	0.2	TR	ND
Pyrene (202)	0.2	TR	0.2	TR	TR
C1 202	ND	TR	ND	TR	ND
C2 202	ND	TR	TR	TR	TR
C3 202	ND	ND	ND	ND	ND
TOTAL 202	0.2	TR	0.4	TR	TR
Benzo[*c*]phenanthrene (228)	ND	ND	ND	ND	ND
Benz[*a*]anthracene (228)	ND	ND	ND	ND	ND
Chrysene/Triphenylene (228)	ND	ND	ND	ND	ND
Benz[*b*]anthracene (228)	ND	ND	ND	ND	ND
C1 228	ND	TR	TR	ND	TR
C2 228	ND	ND	ND	ND	ND
TOTAL 228	ND	TR	TR	ND	TR
Benzofluoranthenes (252)	ND	TR	TR	ND	TR
Benzo[*e*]pyrene (252)	ND	0.2	ND	0.3	0.3
Benzo[*a*]pyrene (252)	ND	ND	ND	ND	ND
Perylene (252)	ND	ND	ND	ND	ND
C1 252	ND	ND	ND	ND	ND
C2 252	ND	ND	ND	ND	ND
TOTAL 252	ND	0.2	TR	0.3	0.3
Indenopyrene (276)	ND	TR	ND	ND	TR
Benzoperylene (276)	ND	ND	ND	ND	ND
C1 276	ND	ND	ND	ND	ND
C2 276	ND	TR	ND	ND	ND
TOTAL 276	ND	TR	ND	ND	TR
Acenaphthylene (152)	ND	ND	ND	ND	ND
Acenaphthene (154)	ND	TR	0.2	TR	TR
Fluorene (166)	ND	ND	0.4	0.2	0.2
Dibenz[*a,h*]anthracene (278)	ND	ND	ND	ND	ND
TOTAL PAH (40)	**4.9**	**8.4**	**9.6**	**5.4**	**9.3**

Lab. I.D. Field I.D.	MAR-2016-33244 Clair03 Bottle 16	MAR-2016-33245 Clair03- Bottle 17	MAR-2016-33246 Clair03 Bottle 18	MAR-2016-33247 Clair03- Bottle 19	MAR-2016-33248 Clair03- Bottle 20
Depth	**9.90**	**19.80**	**29.70**	**49.50**	**79.19**
Naphthalene	1.6	1.3	1.1	1.3	1.0
2-Methyl Naphthalene	0.9	0.5	ND	0.6	0.4
1-Methyl Naphthalene	0.5	0.4	0.2	0.4	0.3
C2 Naphthalenes	0.2	0.7	ND	1.5	0.8
C3 Naphthalenes	1.4	1.0	0.8	0.9	1.0
C4 Naphthalenes	0.4	ND	0.4	0.3	ND
TOTAL Naphthalenes	5.0	3.9	2.5	5.0	3.5
Phenanthrene (178)	0.5	0.4	1.2	0.6	0.3
Anthracene (178)	ND	ND	ND	ND	ND
C1 178	0.3	0.3	0.8	0.3	0.2
C2 178	ND	0.3	TR	0.4	0.2
C3 178	ND	ND	ND	0.4	TR
TOTAL 178	0.8	1.0	2.0	1.7	0.7
Dibenzothiophene	ND	ND	TR	ND	ND
C1 Dibenzothiophenes	0.2	0.2	ND	ND	ND
C2 Dibenzothiophenes	ND	0.2	ND	TR	TR
C3 Dibenzothiophenes	0.2	TR	0.2	0.2	TR
TOTAL DBTs	0.4	0.4	0.2	0.2	TR
Fluoranthene (202)	ND	TR	0.2	TR	TR
Pyrene (202)	0.2	TR	0.2	TR	TR
C1 202	ND	0.2	ND	TR	ND
C2 202	ND	TR	ND	ND	ND
C3 202	ND	ND	ND	ND	ND
TOTAL 202	0.2	0.2	0.4	TR	TR
Benzo[*c*]phenanthrene (228)	ND	ND	ND	ND	ND
Benz[*a*]anthracene (228)	ND	ND	ND	ND	ND
Chrysene/Triphenylene (228)	ND	ND	ND	ND	ND
Benz[*b*]anthracene (228)	ND	ND	ND	ND	ND
C1 228	ND	TR	TR	TR	TR
C2 228	ND	ND	ND	ND	ND
TOTAL 228	ND	TR	TR	TR	TR
Benzofluoranthenes (252)	ND	ND	ND	TR	ND
Benzo[*e*]pyrene (252)	ND	0.3	ND	ND	0.3
Benzo[*a*]pyrene (252)	ND	ND	ND	ND	ND
Perylene (252)	ND	ND	ND	ND	ND
C1 252	ND	ND	ND	ND	ND
C2 252	ND	ND	ND	ND	ND
TOTAL 252	ND	0.3	ND	TR	0.3
Indenopyrene (276)	ND	ND	ND	TR	ND
Benzoperylene (276)	ND	ND	ND	ND	ND
C1 276	ND	ND	ND	ND	TR
C2 276	ND	0.2	ND	ND	ND
TOTAL 276	ND	0.2	ND	TR	TR
Acenaphthylene (152)	ND	TR	ND	ND	ND
Acenaphthene (154)	0.2	TR	TR	TR	TR
Fluorene (166)	ND	0.2	0.3	0.3	TR
Dibenz[*a,h*]anthracene (278)	ND	ND	ND	ND	ND
TOTAL PAH (40)	**6.6**	**6.2**	**5.4**	**7.2**	**4.5**

Lab. I.D. Field I.D.	MAR-2016-33249 Clair04 Bottle 21	MAR-2016-33250 Clair04- Bottle 22	MAR-2016-33251 Clair04 Bottle 23	MAR-2016-33252 Clair04- Bottle 24	MAR-2016-33253 Clair04- Bottle 25
Depth	**9.90**	**19.80**	**29.70**	**49.50**	**79.19**
Naphthalene	1.4	3.5	1.1	1.0	1.0
2-Methyl Naphthalene	0.2	2.4	ND	0.4	0.6
1-Methyl Naphthalene	0.2	1.5	TR	0.2	0.4
C2 Naphthalenes	TR	3.0	ND	1.1	1.4
C3 Naphthalenes	1.7	1.6	0.8	1.0	1.1
C4 Naphthalenes	0.4	0.5	ND	0.8	0.2
TOTAL Naphthalenes	3.9	12.5	1.9	4.5	4.7
Phenanthrene (178)	2.6	1.4	0.5	0.4	0.4
Anthracene (178)	ND	TR	ND	ND	TR
C1 178	1.3	0.6	0.2	0.2	0.3
C2 178	ND	0.2	ND	ND	0.2
C3 178	ND	0.2	ND	0.8	ND
TOTAL 178	3.9	2.4	0.7	1.4	0.9
Dibenzothiophene	0.2	TR	ND	ND	TR
C1 Dibenzothiophenes	0.3	ND	ND	ND	ND
C2 Dibenzothiophenes	ND	ND	ND	ND	TR
C3 Dibenzothiophenes	0.3	TR	0.2	0.3	ND
TOTAL DBTs	0.8	TR	0.2	0.3	TR
Fluoranthene (202)	0.3	0.2	ND	TR	TR
Pyrene (202)	0.3	0.2	ND	TR	TR
C1 202	ND	ND	ND	TR	ND
C2 202	ND	ND	ND	ND	ND
C3 202	ND	ND	ND	ND	ND
TOTAL 202	0.6	0.4	ND	TR	TR
Benzo[*c*]phenanthrene (228)	ND	ND	ND	ND	ND
Benz[*a*]anthracene (228)	ND	ND	ND	ND	ND
Chrysene/Triphenylene (228)	ND	ND	ND	ND	ND
Benz[*b*]anthracene (228)	ND	ND	ND	ND	ND
C1 228	TR	ND	TR	TR	ND
C2 228	ND	ND	ND	ND	ND
TOTAL 228	TR	ND	TR	TR	ND
Benzofluoranthenes (252)	ND	TR	TR	TR	ND
Benzo[*e*]pyrene (252)	ND	ND	ND	0.2	0.2
Benzo[*a*]pyrene (252)	ND	ND	ND	ND	ND
Perylene (252)	ND	ND	ND	ND	ND
C1 252	ND	ND	ND	ND	ND
C2 252	ND	ND	ND	ND	ND
TOTAL 252	ND	TR	TR	0.2	0.2
Indenopyrene (276)	ND	TR	ND	ND	ND
Benzoperylene (276)	ND	ND	ND	ND	ND
C1 276	ND	ND	ND	0.8	ND
C2 276	ND	TR	ND	0.9	0.2
TOTAL 276	ND	TR	ND	1.7	0.2
Acenaphthylene (152)	ND	ND	ND	ND	ND
Acenaphthene (154)	0.5	0.7	ND	TR	TR
Fluorene (166)	0.6	0.3	ND	0.2	TR
Dibenz[*a,h*]anthracene (278)	ND	ND	ND	ND	ND
TOTAL PAH (40)	**10.3**	**16.3**	**2.8**	**8.3**	**6.0**

Lab. I.D. Field I.D.	MAR-2016-33254 Clair05 Bottle 26	MAR-2016-33255 Clair05- Bottle 27	MAR-2016-33256 Clair05 Bottle 28	MAR-2016-33257 Clair05- Bottle 29	MAR-2016-33258 Clair05- Bottle 30
Depth	**9.90**	**19.80**	**29.70**	**49.50**	**79.19**
Naphthalene	1.0	0.9	0.9	0.9	1.1
2-Methyl Naphthalene	ND	0.4	ND	0.4	0.5
1-Methyl Naphthalene	TR	0.2	TR	0.2	0.3
C2 Naphthalenes	ND	0.4	ND	0.8	0.7
C3 Naphthalenes	0.5	0.9	0.6	0.6	0.4
C4 Naphthalenes	ND	ND	0.2	ND	TR
TOTAL Naphthalenes	1.5	2.8	1.7	2.9	3.0
Phenanthrene (178)	0.5	0.4	0.3	0.3	0.3
Anthracene (178)	ND	ND	ND	ND	ND
C1 178	0.4	0.5	0.2	0.2	0.2
C2 178	TR	ND	ND	TR	TR
C3 178	ND	TR	ND	0.3	ND
TOTAL 178	0.9	0.9	0.5	0.8	0.5
Dibenzothiophene	ND	TR	ND	ND	TR
C1 Dibenzothiophenes	ND	ND	ND	0.2	TR
C2 Dibenzothiophenes	ND	TR	ND	ND	ND
C3 Dibenzothiophenes	0.2	0.2	TR	0.2	ND
TOTAL DBTs	0.2	0.2	TR	0.4	TR
Fluoranthene (202)	ND	TR	ND	TR	TR
Pyrene (202)	TR	TR	ND	TR	TR
C1 202	ND	ND	TR	ND	ND
C2 202	TR	TR	ND	TR	ND
C3 202	ND	ND	ND	0.2	ND
TOTAL 202	TR	TR	TR	0.2	TR
Benzo[*c*]phenanthrene (228)	ND	ND	ND	ND	ND
Benz[*a*]anthracene (228)	ND	ND	ND	ND	ND
Chrysene/Triphenylene (228)	ND	ND	ND	ND	ND
Benz[*b*]anthracene (228)	ND	ND	ND	ND	ND
C1 228	ND	ND	ND	TR	ND
C2 228	ND	ND	ND	ND	ND
TOTAL 228	ND	ND	ND	TR	ND
Benzofluoranthenes (252)	ND	ND	ND	ND	ND
Benzo[*e*]pyrene (252)	ND	0.3	ND	0.3	ND
Benzo[*a*]pyrene (252)	ND	TR	ND	ND	ND
Perylene (252)	ND	ND	ND	ND	ND
C1 252	ND	ND	0.5	ND	0.6
C2 252	ND	ND	ND	ND	0.5
TOTAL 252	ND	0.3	0.5	0.3	1.1
Indenopyrene (276)	ND	ND	ND	ND	TR
Benzoperylene (276)	ND	ND	ND	ND	ND
C1 276	ND	ND	ND	ND	ND
C2 276	ND	TR	ND	TR	ND
TOTAL 276	ND	TR	ND	TR	TR
Acenaphthylene (152)	ND	ND	ND	ND	ND
Acenaphthene (154)	0.4	TR	ND	TR	TR
Fluorene (166)	ND	0.2	ND	TR	TR
Dibenz[*a,h*]anthracene (278)	ND	ND	ND	ND	ND
TOTAL PAH (40)	**3.0**	**4.4**	**2.7**	**4.6**	**4.6**

Lab. I.D. Field I.D.	MAR-2016-33259 Clair06 Bottle 31	MAR-2016-33260 Clair06- Bottle 32	MAR-2016-33261 Clair06 Bottle 33	MAR-2016-33262 Clair06- Bottle 34	MAR-2016-33263 Clair06- Bottle 35
Depth	**9.90**	**19.80**	**29.70**	**49.50**	**79.19**
Naphthalene	0.8	1.0	1.0	0.9	0.8
2-Methyl Naphthalene	ND	0.7	ND	0.4	0.3
1-Methyl Naphthalene	TR	0.4	TR	0.3	0.2
C2 Naphthalenes	ND	1.2	ND	0.9	1.0
C3 Naphthalenes	1.4	1.2	1.3	0.6	0.6
C4 Naphthalenes	ND	0.3	0.5	ND	ND
TOTAL Naphthalenes	2.2	4.8	2.8	3.1	2.9
Phenanthrene (178)	0.7	0.5	0.5	0.4	0.3
Anthracene (178)	ND	ND	ND	ND	ND
C1 178	0.6	0.5	0.5	TR	ND
C2 178	0.3	0.3	ND	TR	0.2
C3 178	ND	TR	ND	ND	ND
TOTAL 178	1.6	1.3	1.0	0.4	0.5
Dibenzothiophene	ND	TR	ND	ND	ND
C1 Dibenzothiophenes	ND	0.2	ND	ND	ND
C2 Dibenzothiophenes	ND	TR	ND	ND	0.2
C3 Dibenzothiophenes	TR	0.2	TR	0.2	0.2
TOTAL DBTs	TR	0.4	TR	0.2	0.4
Fluoranthene (202)	ND	TR	ND	ND	ND
Pyrene (202)	ND	TR	ND	TR	TR
C1 202	ND	ND	ND	TR	ND
C2 202	ND	ND	ND	TR	TR
C3 202	ND	ND	ND	ND	ND
TOTAL 202	ND	TR	ND	TR	TR
Benzo[*c*]phenanthrene (228)	ND	ND	ND	ND	ND
Benz[*a*]anthracene (228)	ND	ND	ND	ND	ND
Chrysene/Triphenylene (228)	ND	ND	ND	ND	ND
Benz[*b*]anthracene (228)	ND	ND	ND	ND	ND
C1 228	TR	ND	TR	ND	ND
C2 228	ND	ND	ND	ND	ND
TOTAL 228	TR	ND	TR	ND	ND
Benzofluoranthenes (252)	TR	ND	ND	ND	ND
Benzo[*e*]pyrene (252)	ND	ND	ND	0.2	0.2
Benzo[*a*]pyrene (252)	ND	ND	ND	ND	ND
Perylene (252)	TR	ND	ND	ND	ND
C1 252	0.7	ND	0.4	ND	ND
C2 252	ND	ND	ND	ND	ND
TOTAL 252	0.7	ND	0.4	0.2	0.2
Indenopyrene (276)	ND	TR	ND	ND	ND
Benzoperylene (276)	ND	ND	ND	ND	ND
C1 276	ND	ND	ND	ND	ND
C2 276	ND	ND	ND	ND	ND
TOTAL 276	ND	TR	ND	ND	ND
Acenaphthylene (152)	ND	ND	ND	ND	ND
Acenaphthene (154)	ND	TR	ND	ND	TR
Fluorene (166)	ND	0.2	ND	TR	TR
Dibenz[*a,h*]anthracene (278)	ND	ND	ND	ND	ND
TOTAL PAH (40)	**4.5**	**6.7**	**4.2**	**3.9**	**4.0**

Lab. I.D. Field I.D.	MAR-2016-33264 Clair07 Bottle 36	MAR-2016-33265 Clair07- Bottle 37	MAR-2016-33266 Clair07 Bottle 38	MAR-2016-33267 Clair07- Bottle 39	MAR-2016-33268 Clair07- Bottle 40
Depth	**9.90**	**19.80**	**29.70**	**49.50**	**79.19**
Naphthalene	ND	1.0	0.9	0.8	0.9
2-Methyl Naphthalene	ND	0.5	ND	0.3	0.5
1-Methyl Naphthalene	TR	0.3	TR	0.2	0.3
C2 Naphthalenes	ND	0.9	ND	0.3	0.9
C3 Naphthalenes	1.2	1.4	1.5	0.4	1.3
C4 Naphthalenes	0.3	ND	1.0	ND	ND
TOTAL Naphthalenes	1.5	4.1	3.4	2.0	3.9
Phenanthrene (178)	0.2	0.5	4.6	0.3	0.4
Anthracene (178)	ND	ND	ND	ND	ND
C1 178	0.5	0.3	2.9	0.2	TR
C2 178	0.2	0.3	0.8	0.2	0.3
C3 178	ND	ND	ND	ND	ND
TOTAL 178	0.9	1.1	8.3	0.7	0.7
Dibenzothiophene	ND	TR	0.2	ND	ND
C1 Dibenzothiophenes	TR	ND	0.2	ND	ND
C2 Dibenzothiophenes	ND	ND	0.3	ND	TR
C3 Dibenzothiophenes	0.3	ND	0.4	ND	ND
TOTAL DBTs	0.3	TR	1.1	ND	TR
Fluoranthene (202)	ND	TR	0.4	TR	TR
Pyrene (202)	ND	TR	0.4	TR	TR
C1 202	TR	ND	ND	ND	ND
C2 202	ND	ND	ND	ND	TR
C3 202	ND	ND	ND	TR	ND
TOTAL 202	TR	TR	0.8	TR	TR
Benzo[*c*]phenanthrene (228)	ND	ND	ND	ND	ND
Benz[*a*]anthracene (228)	ND	ND	ND	ND	ND
Chrysene/Triphenylene (228)	ND	ND	ND	ND	ND
Benz[*b*]anthracene (228)	ND	ND	ND	ND	ND
C1 228	TR	ND	ND	ND	ND
C2 228	ND	ND	ND	ND	ND
TOTAL 228	TR	ND	ND	ND	ND
Benzofluoranthenes (252)	TR	TR	TR	ND	ND
Benzo[*e*]pyrene (252)	ND	0.3	ND	0.3	0.2
Benzo[*a*]pyrene (252)	ND	ND	ND	ND	ND
Perylene (252)	TR	ND	ND	ND	ND
C1 252	0.5	ND	0.8	ND	ND
C2 252	ND	ND	ND	ND	ND
TOTAL 252	0.5	0.3	0.8	0.3	0.2
Indenopyrene (276)	ND	TR	ND	ND	ND
Benzoperylene (276)	ND	ND	ND	ND	ND
C1 276	ND	ND	ND	ND	ND
C2 276	TR	ND	ND	ND	TR
TOTAL 276	TR	TR	ND	ND	TR
Acenaphthylene (152)	ND	ND	ND	ND	ND
Acenaphthene (154)	ND	TR	TR	TR	TR
Fluorene (166)	ND	0.2	ND	TR	0.2
Dibenz[*a,h*]anthracene (278)	ND	ND	ND	ND	ND
TOTAL PAH (40)	**3.2**	**5.7**	**14.4**	**3.0**	**5.0**

Lab. I.D. Field I.D.	MAR-2016-33269 Clair08 Bottle 41	MAR-2016-33270 Clair08- Bottle 42	MAR-2016-33271 Clair08 Bottle 43	MAR-2016-33272 Clair08- Bottle 44	MAR-2016-33273 Clair08- Bottle 45
Depth	**9.90**	**19.80**	**29.70**	**49.50**	**79.19**
Naphthalene	1.4	0.8	0.7	0.9	0.9
2-Methyl Naphthalene	ND	0.3	ND	0.4	0.3
1-Methyl Naphthalene	0.2	0.2	TR	0.2	0.2
C2 Naphthalenes	ND	0.6	ND	0.5	TR
C3 Naphthalenes	0.8	0.4	0.6	0.6	0.4
C4 Naphthalenes	0.6	TR	0.3	0.5	0.2
TOTAL Naphthalenes	3.0	2.3	1.6	3.1	2.0
Phenanthrene (178)	ND	0.3	0.3	0.9	0.3
Anthracene (178)	ND	ND	0.3	ND	ND
C1 178	ND	TR	0.4	0.6	0.2
C2 178	0.3	TR	0.3	0.4	ND
C3 178	ND	ND	ND	0.5	0.4
TOTAL 178	0.3	0.3	1.3	2.4	0.9
Dibenzothiophene	ND	ND	ND	TR	ND
C1 Dibenzothiophenes	ND	ND	ND	TR	ND
C2 Dibenzothiophenes	ND	TR	ND	0.2	TR
C3 Dibenzothiophenes	TR	0.2	0.3	TR	0.3
TOTAL DBTs	TR	0.2	0.3	0.2	0.3
Fluoranthene (202)	ND	TR	ND	0.5	ND
Pyrene (202)	ND	TR	ND	0.4	TR
C1 202	ND	ND	ND	TR	ND
C2 202	ND	ND	ND	ND	TR
C3 202	ND	ND	ND	TR	TR
TOTAL 202	ND	TR	ND	0.9	TR
Benzo[*c*]phenanthrene (228)	ND	ND	ND	ND	ND
Benz[*a*]anthracene (228)	ND	ND	ND	ND	ND
Chrysene/Triphenylene (228)	ND	ND	ND	ND	ND
Benz[*b*]anthracene (228)	0.9	ND	ND	ND	ND
C1 228	TR	0.3	ND	ND	ND
C2 228	ND	ND	ND	ND	ND
TOTAL 228	0.9	0.3	ND	ND	ND
Benzofluoranthenes (252)	TR	ND	ND	ND	ND
Benzo[*e*]pyrene (252)	ND	0.3	ND	0.3	ND
Benzo[*a*]pyrene (252)	ND	ND	ND	ND	ND
Perylene (252)	ND	ND	TR	ND	ND
C1 252	0.7	ND	0.2	ND	ND
C2 252	ND	ND	ND	ND	ND
TOTAL 252	0.7	0.3	0.2	0.3	ND
Indenopyrene (276)	ND	TR	ND	TR	ND
Benzoperylene (276)	ND	ND	ND	ND	ND
C1 276	ND	ND	ND	ND	ND
C2 276	ND	TR	ND	ND	TR
TOTAL 276	ND	TR	ND	TR	TR
Acenaphthylene (152)	ND	ND	ND	ND	ND
Acenaphthene (154)	ND	TR	ND	TR	TR
Fluorene (166)	ND	TR	ND	TR	TR
Dibenz[*a,h*]anthracene (278)	ND	ND	ND	ND	ND
TOTAL PAH (40)	**4.9**	**3.4**	**3.4**	**6.9**	**3.2**

Lab. I.D. Field I.D.	MAR-2016-33274 Clair09 Bottle 46	MAR-2016-33275 Clair09- Bottle 47	MAR-2016-33276 Clair09 Bottle 48	MAR-2016-33277 Clair09- Bottle 49	MAR-2016-33278 Clair09- Bottle 50
Depth	**9.90**	**19.80**	**29.70**	**49.50**	**79.19**
Naphthalene	ND	0.9	0.8	1.0	1.1
2-Methyl Naphthalene	ND	0.4	ND	0.4	0.5
1-Methyl Naphthalene	ND	0.2	TR	0.2	0.3
C2 Naphthalenes	ND	0.6	0.9	1.2	0.6
C3 Naphthalenes	0.7	0.7	0.4	0.8	0.5
C4 Naphthalenes	TR	ND	0.2	ND	ND
TOTAL Naphthalenes	0.7	2.8	2.3	3.6	3.0
Phenanthrene (178)	ND	0.4	0.3	0.4	0.3
Anthracene (178)	ND	ND	ND	ND	TR
C1 178	0.4	0.3	0.3	0.2	0.2
C2 178	ND	0.2	TR	ND	0.2
C3 178	ND	0.2	ND	0.9	TR
TOTAL 178	0.4	1.1	0.6	1.5	0.7
Dibenzothiophene	ND	TR	ND	ND	ND
C1 Dibenzothiophenes	0.3	ND	ND	ND	ND
C2 Dibenzothiophenes	ND	TR	ND	0.2	ND
C3 Dibenzothiophenes	TR	TR	TR	ND	TR
TOTAL DBTs	0.3	TR	TR	0.2	TR
Fluoranthene (202)	ND	TR	ND	TR	TR
Pyrene (202)	ND	TR	ND	TR	TR
C1 202	ND	ND	ND	ND	ND
C2 202	ND	ND	ND	TR	ND
C3 202	ND	ND	ND	ND	ND
TOTAL 202	ND	TR	ND	TR	TR
Benzo[*c*]phenanthrene (228)	ND	ND	ND	ND	ND
Benz[*a*]anthracene (228)	ND	ND	ND	ND	ND
Chrysene/Triphenylene (228)	ND	ND	ND	ND	ND
Benz[*b*]anthracene (228)	ND	ND	ND	ND	ND
C1 228	TR	ND	0.6	TR	ND
C2 228	ND	ND	ND	ND	ND
TOTAL 228	TR	ND	0.6	TR	ND
Benzofluoranthenes (252)	ND	ND	ND	ND	ND
Benzo[*e*]pyrene (252)	ND	0.2	ND	0.3	0.2
Benzo[*a*]pyrene (252)	ND	ND	ND	ND	ND
Perylene (252)	ND	ND	TR	ND	ND
C1 252	ND	ND	0.7	ND	ND
C2 252	ND	ND	ND	ND	ND
TOTAL 252	ND	0.2	0.7	0.3	0.2
Indenopyrene (276)	ND	ND	ND	TR	ND
Benzoperylene (276)	ND	ND	ND	ND	ND
C1 276	TR	ND	ND	ND	ND
C2 276	ND	TR	ND	TR	ND
TOTAL 276	TR	TR	ND	TR	ND
Acenaphthylene (152)	ND	ND	ND	ND	ND
Acenaphthene (154)	ND	TR	ND	TR	TR
Fluorene (166)	ND	TR	ND	TR	TR
Dibenz[*a,h*]anthracene (278)	ND	ND	ND	ND	ND
TOTAL PAH (40)	**1.4**	**4.1**	**4.2**	**5.6**	**3.9**

Appendix 3

Summary of results for the *n*-alkane, pristane and phytane analysis of Clair seawater samples. Concentrations are in ng l^{-1}.

ND, <0.04 ng l^{-1};

TR, 0.04 – 0.14 ng l^{-1}

Lab. I.D.	MAR-2016-33229	MAR-2016-33231	MAR-2016-33234	MAR-2016-33236	MAR-2016-33239	MAR-2016-33241
Field I.D.	Reference Bottle 1	Reference Bottle 3	Clair01 Bottle 6	Clair01 Bottle 8	Clair02 Bottle 11	Clair02 Bottle 13
Depth (m)	9.9	29.7	9.9	29.7	9.9	29.7
***n*C12**	2.5	3.0	7.0	11.4	2.3	8.2
***n*C13**	1.9	1.9	8.8	13.5	1.8	5.9
***n*C14**	1.0	1.2	7.5	12.4	0.6	4.9
***n*C15**	3.0	2.8	ND	ND	3.3	4.8
***n*C16**	2.4	3.2	2.9	ND	1.7	6.4
***n*C17**	0.3	0.7	1.9	3.0	0.3	2.6
***n*C18**	0.4	0.7	1.5	2.2	Tr	1.6
***n*C19**	1.5	ND	ND	2.3	ND	ND
***n*C20**	4.2	1.6	4.9	3.4	ND	1.4
***n*C21**	7.3	3.0	10.9	3.7	0.2	1.3
***n*C22**	9.5	6.0	177.4	294.2	0.9	76.5
***n*C23**	3.9	1.9	11.5	4.6	Tr	0.9
***n*C24**	2.5	0.9	ND	7.7	1.0	2.0
nC25	0.8	ND	6.6	6.6	1.7	3.1
***n*C26**	0.9	ND	8.0	8.4	2.7	3.9
***n*C27**	4.7	ND	0.2	0.5	1.3	TR
***n*C28**	0.4	ND	6.6	5.4	2.2	2.9
***n*C29**	1.4	ND	7.3	3.4	1.8	3.6
***n*C30**	1.3	ND	5.9	4.3	1.9	2.7
***n*C31**	1.3	TR	4.3	3.4	1.1	1.8
***n*C32**	1.3	0.4	3.7	1.8	2.5	1.2
***n*C33**	1.4	0.5	2.6	1.5	0.9	1.0
Pristane	1.4	1.3	3.3	5.1	1.9	2.6
Phytane	0.4	0.4	1.5	1.7	TR	1.5
Sum *n*-Alkanes 12-33	53.9	27.8	279.5	393.7	28.2	136.7

Lab. I.D.	MAR-2016-33244	MAR-2016-33246	MAR-2016-33249	MAR-2016-33251	MAR-2016-33254	MAR-2016-33256
Field I.D.	Clair03 Bottle 16	Clair03 Bottle 18	Clair04 Bottle 21	Clair04 Bottle 23	Clair05 Bottle 26	Clair05 Bottle 28
Depth (m)	9.9	29.7	9.9	29.7	9.9	29.7
***n*C12**	14.6	5.0	7.2	8.3	4.3	4.1
***n*C13**	16.5	2.3	5.2	2.7	1.7	1.4
***n*C14**	16.1	1.6	5.1	0.9	0.6	0.3
***n*C15**	19.9	4.1	8.0	2.7	2.0	1.3
***n*C16**	57.8	4.4	9.9	0.5	1.6	1.0
***n*C17**	31.4	1.6	4.1	TR	0.4	0.3
***n*C18**	14.3	1.6	4.3	ND	0.4	0.3
***n*C19**	7.8	1.1	3.3	ND	0.3	TR
***n*C20**	12.4	1.0	2.0	ND	ND	0.3
***n*C21**	13.6	0.8	1.3	ND	ND	1.1
***n*C22**	217.5	3.7	48.5	ND	1.1	1.4
***n*C23**	21.3	0.2	1.3	ND	ND	0.3
***n*C24**	32.0	0.4	1.9	ND	ND	ND
nC25	82.2	0.6	2.5	ND	ND	ND
***n*C26**	50.0	1.5	2.7	ND	ND	ND
***n*C27**	14.8	4.5	5.7	1.0	2.5	2.2
***n*C28**	21.9	1.4	2.0	ND	ND	ND
***n*C29**	9.0	2.1	2.2	ND	0.2	ND
***n*C30**	8.5	masked	2.3	ND	0.8	ND
***n*C31**	0.5	1.7	1.3	ND	0.7	0.3
***n*C32**	8.6	1.3	1.5	ND	1.8	0.3
***n*C33**	ND	1.3	0.8	TR	0.9	0.3
Pristane	27.2	1.8	3.4	0.5	0.4	0.3
Phytane	18.4	1.0	2.9	ND	ND	0.2
Sum *n*-Alkanes 12-33	670.7	42.2	123.1	16.1	19.3	14.9

Lab. I.D.	MAR-2016-33259	MAR-2016-33261	MAR-2016-33264	MAR-2016-33266	MAR-2016-33269	MAR-2016-33271
Field I.D.	Clair06 Bottle 31	Clair06 Bottle 33	Clair07 Bottle 36	Clair07 Bottle 38	Clair08 Bottle 41	Clair08 Bottle 43
Depth (m)	9.9	29.7	9.9	29.7	9.9	29.7
***n*C12**	6.6	5.1	4.4	9.1	5.2	5.7
***n*C13**	3.0	2.2	2.1	5.3	2.1	2.6
***n*C14**	0.8	0.9	1.1	3.2	0.9	1.1
***n*C15**	2.9	2.1	3.1	5.2	3.9	3.1
***n*C16**	1.8	2.6	1.8	5.0	1.3	1.7
***n*C17**	0.3	1.7	0.7	4.9	ND	0.2
***n*C18**	0.2	1.0	0.7	6.3	ND	0.5
***n*C19**	0.2	0.6	0.4	4.6	ND	0.5
***n*C20**	Tr	1.1	0.3	4.5	ND	0.9
***n*C21**	0.5	1.4	0.3	2.7	ND	1.8
***n*C22**	1.3	2.4	8.8	51.4	ND	6.2
***n*C23**	0.3	2.4	0.2	2.5	ND	2.8
***n*C24**	ND	3.4	0.6	2.6	ND	3.5
nC25	ND	4.6	0.7	2.3	ND	4.3
***n*C26**	ND	4.8	2.1	1.8	ND	4.6
***n*C27**	3.7	5.3	4.5	4.5	1.2	7.9
***n*C28**	ND	1.7	1.2	ND	ND	3.3
***n*C29**	ND	2.2	1.3	ND	ND	3.9
***n*C30**	0.2	3.2	5.7	0.2	ND	2.7
***n*C31**	0.2	2.4	0.9	ND	ND	2.2
***n*C32**	0.4	1.7	0.6	0.4	0.2	1.6
***n*C33**	0.3	1.1	0.4	0.5	0.3	1.0
Pristane	0.8	1.5	0.7	3.3	0.3	0.5
Phytane	0.4	1.0	0.6	3.5	ND	0.4
Sum *n*-Alkanes 12-33	22.7	53.9	41.9	117.0	15.1	62.1

Lab. I.D.	MAR-2016-33274	MAR-2016-33276
Field I.D.	Clair09 Bottle 46	Clair09 Bottle 48
Depth (m)	9.9	29.7
***n*C12**	5.9	2.0
***n*C13**	2.2	2.7
***n*C14**	0.7	0.9
***n*C15**	4.3	3.8
***n*C16**	2.0	2.5
***n*C17**	0.7	0.3
***n*C18**	0.7	0.5
***n*C19**	ND	ND
***n*C20**	0.7	ND
***n*C21**	0.7	ND
***n*C22**	1.4	ND
***n*C23**	1.2	ND
***n*C24**	0.5	ND
nC25	0.7	TR
***n*C26**	0.2	ND
***n*C27**	3.4	ND
***n*C28**	ND	ND
***n*C29**	0.6	0.4
***n*C30**	0.6	0.5
***n*C31**	0.6	0.6
***n*C32**	0.7	0.5
***n*C33**	0.4	0.6
Pristane	1.0	0.6
Phytane	0.6	ND
Sum *n*-Alkanes 12-33	28.2	15.3