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SINTEF REPORT

TITLE

BONNEX 2002, June 17th – 19th**Oil film thickness measurements and pictures taken from
sampling boats - Data report**

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ABSTRACT

This data report sum all the results from the ground-truth sampling and still-photos taken from the two sampling boats (Orange boat and Grey boat)during the Bonnex-2002

A unique data-set of 120 surface oil samples and 100 still-photos connected to the sampling was obtained. This data set generated, is more that 3 times accorded to the plans, and was a result of:

- good weather conditions for sampling
- good co-operation between the sampling team including the drivers from the ARCA crew

This should ensure a good documentation of ground-truth field data that are co-ordinated with the timing of the available surveillance data from the Bonnex aircraft.

Main findings:

- The two oil types released in the trials were too similar in physico properties: The assumed IF-30 Bunker fuel oil was not in accordance to the requested specifications
- With a very few exceptions, there is good accordance between the film thickness results and the BAOAC-statements based on the visual inspections from the sampling boat.

KEYWORDS	ENGLISH	NORWEGIAN
GROUP 1	Environment	Miljø
GROUP 2	Chemistry	Kjemi
SELECTED BY AUTHOR	Oil slick	Olje forurensning
	Oil film thickness	Olje film tykkelse

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1 Introduction

As a result of the deliberation with regard to validation of the Bonn Agreement Oil Appearance Code (BAOAC), the Bonnex 2002 was dedicated and designed experimentally for optimising the validation of the BAOAC. This in order to be able to accept and start using the code under the condition that Bonn Agreement CP will adopt the Appearance Code.

The main objectives for the Bonnex 2002 were:

- Validate the BAOAC by comparing visual assessments by BA operators with ground-truth film thickness measurements and still-photo documentation taken from the workboats.
- Investigate the scaling effects (identify whether visual observations varies from different altitude)

Subsidiary objectives:

- Investigate oil dependence effects
- Collect photographs of oil appearance at sea
- gather additional information / documentation to improve the Guideline
- Record spreading rates

In this connection, SINTEF were asked by North-Sea Directorate to design, plan and perform ground-truth surface oil sampling, still-photo documentation and chemical analysis connected to the BONNEX 2002 field exercise that took place outside the Netherlands June 17-19th, 2002.

2 Sampling of surface oil

2.1 Purpose of the sampling

The surface sampling from two sampling boats (workboats, see 1.2.) focused on oil-film thickness measurements. The purpose was to validate the BAOAC by comparing visual assessment by BA operators with ground-truth film thickness measurements and still-photo documentation taken from the workboats.

The aim was to design the releases to maximise the proportions of the BAOAC code 1 to 4. However, for both the Marine Diesel (spiked with 15% residual fuel) and in the two “IF-30” releases, smaller areas of code 5 with thickness in the mm range occurred within the slicks. A few samples of these thicker patches of oil /emulsion were characterised, by analysing physical parameters like: water content, density, viscosity and a simple field test of dispersibility.

2.2 Sampling Boats / crew

Two Zodiac belonging to the North Sea Directorate where used for the surface monitoring of the released slicks:

- “Orange Boat”. A Zodiac covered with a orange tarpaulin in the bough (see fig 1a). The crew consist of : Per S. Daling, SINTEF, Henk van het Groenewoud, TNO and one driver from the Arca Crew.
- “Grey Boat”. A grey Zodiac (see fig 1b). The crew consist of: Frode Leirvik, SINTEF, Paul Kienhuis, RIZA, and one driver from the Arca Crew.

A)



B)



Figure1: Sampling boats used during the Bonnex 2002. A): “Orange Boat”. B): Grey Boat”.



Figure 2: Sampling team prior to action.

2.3 Sampling strategy / sampling methodology / Oil film thickness measurements

A strategy for the oil film thickness measurements within the slick was prepared prior the trial as illustrated in figure 3. Measurements were taken at different “stations” representing different BAOAC-codes. The intention /plan was to take at least three parallel samples at each station.

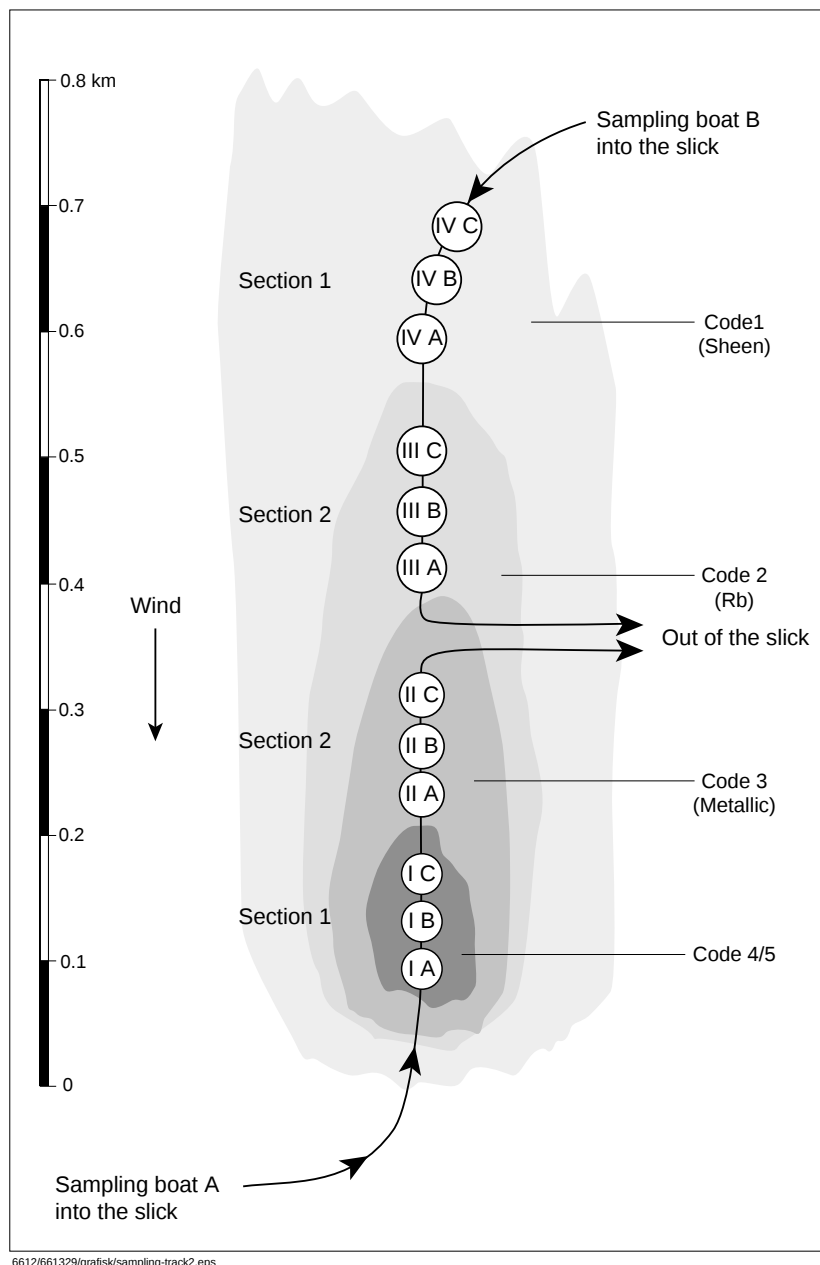


Figure 3. Tentative track for sampling the work-boats. / Sampling boats

Based on the experiences with oil sampling of oil emulsions and oil film thickness measurements in previous field experiments carried out by SINTEF, different sampling / measurement techniques were used depending on the visual evaluation of oil film thickness of the sampling area within the slicks:

Method	Tentative thickness
Plexiglas cylinder apparatus:	> 2 – 3 mm (patches of thick oil /emulsion)
3M PP pad	> Rainbow (from 1-5 μm to 2-3- mm)
Teflon sheet	Sheen and Rainbow (from 0.05 μm to 5 μm)

Plexiglas cylinder apparatus (not used at BONNEX-2002, trial)

For very thick oil films (several millimetres), SINTEF is generally using a simple Plexiglas cylinder (200 mm diameter). Because the intention of the BONNEX was to focus on thinner oils films represented by the BAOAC code 1 to 4, the cylinder methods was not used in this trial.

Pad / net sampling techniques

For sampling of thinner film thickness, two various pad techniques are used:

- 3M polypropylene pad (29 x 21.5 cm) is a well-tested technique, operating in the thickness area from 2-3 mm down to about 1-5 μm . Prior the trial, a special designed sampling rod was developed (see Figure 4.a). The pad was connected by pegs on a frame hooked to a line that could be released from the rod. This made it possible to place the pads carefully on the slick surface about 2 m from the sampling boat. (see Figure 4b). The pads were laying for oil adsorption on the surface for 5-10 seconds and transferred to tight bottles, and transported to SINTEF for quantification. In the SINTEF laboratories, the oil adsorbed on the pad was extracted and quantitatively analysed using gas chromatography or UV-VIS spectrophotometry.
- For very thin oil films (from Rainbow and below) an PTFE Teflon net (SEFAR, 25 x 20 cm sheet) was used in a similar way as described by the 3M Pad and using the same special designed sampling rod. Teflon sheet was carefully transferred to a tight bottle (and extracted by an organic solvent (DCM) in the laboratory on board the ARCA. The extracts were brought to SINTEF laboratories for quantification using gas-chromatography and /or UV-VIS spectrophotometry.
- For some samples, the PP-pad was used to skim off the oil within a defined surface area, by placing a PE-frame (about 0.56 x 0.36 m) with floaters on the surface. See fig 6.



Figure .4: Oil film thickness measurements in the field using PP-pad connected to a specially designed rod



Figure 5: Teflon Net for very thin oil film thickness measurements (< 1- 5 μm) connected to a special designed rod



Figure .6: Oil film thickness measurements in the field by placing a PE-frame with floaters on the surfaced followed by PP-pad adsorption of oil within the frame

2.4 Sampling of surface oil for physico-chemical characterisation

Totally, four surface oil / emulsion for physical-chemical characterisation were collected in the thickest parts of the oil slicks. Generally > 0.3-0.5 mm thickness is required in order to obtain . bulk sample volume of 0.5 - 1.0 L. The procedure for sampling, water separation of free water and handling of the samples is given in Figure 7 below.

Instruments / methods for determination of weathering characterisation of surface oil / emulsion:

The analytical methods described in Table 1.1 were performed in the laboratory on board on ARCA immediately after receiving the samples from the workboats, Analytical methods described in Table 1.2 were performed at SINTEF's laboratories.

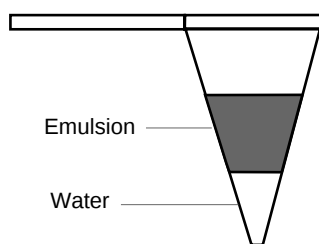
Table 1.1 Physical chemical analyses performed on surface oil in the laboratory container onboard ARCA.

Parameter	Method
Water content (preliminary)	Alcopol O 60 % and heating
Stability of w/o emulsion	By settling and use of emulsion breaker
Dispersibility (with Dasic NS)	CONCAWE / SINTEF FET (Fiocco et. al. 1999)

Table 1.2 Analyses carried out at SINTEF's laboratories.

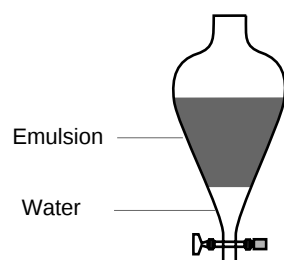
Parameter	Method
Density	Densimeter – ASTM D 4052-81
Water content (verification)	Karl Fischer Titration
Viscosity/rheology of w/o emulsion	Physica MCR300

1.



Collection of surface oil / emulsion with a net (bucket) separating off free water from bottom.

2.



Transfer to a 2-litre separation funnel, (or a 0.2 L sep. funnel, when small volumes) approximately 10-min. settling for draining off surplus (non-emulsified) water plus ≈ 0.5 litre of bottom emulsion.

3. Gentle homogenisation (10 times 180° tilting) of the remaining bulk sample (minimum: 0.2 l, optimum: 0.5 to 1 litre).

4. **Sub-sampling of bulk sample:**

- 1 $\times$ 100 mL Pyrex bottles or 25 mL vials if little oil recovered
- 4 $\times$ 250 mL High Density Poly Ethylene (HDPE) bottles (w/o emulsion viscosity and miscellaneous).
- 1 $\times$ 1000 mL HDPE bottle (to make water-free residues).

5. **Labelling of sub-samples:**

- Sample ID
- Local time
- GPS-ID#

6. **Logging in journal book:**

- Sample ID (e.g. Marine Diesel, St.1C – 1605, 26/6)
- Local time,
- Weathering time,
- GPS Position / ID#
- Co-ordination (synchronisation) with aircraft : yes / no
- Location in the slick, oil film characteristics and eventual other relevant comments. Side of the boat (when synchronising oil film thickness measurements with aircraft)

Figure 7 Procedure for sampling and handling of surface oil samples in workboat.

3 Overview of samples and pictures taken during BONNEX 2002 field trial

Tables 3.1 and 3.2. sum up the 123 samples that were collected during the field trial. This is about 3 times the amount we planned for. This extensive set of data is a result of:

- the good weather conditions for sampling
- good co-operation between the sampling team including the drivers from the ARCA crew

This should ensure a good documentation of ground-truth field data that are co-ordinated with the timing of the available surveillance data from the Bonnex aircraft.

Table 3.1: Number of samples based on sampling method used:

Spill	Teflon net sample	pp-Pad samples	Surface oil / emulsion	Total
SPILL A: MDO, batch release	18	13	2	33
SPILL B: IF-30, batch release	20	21	1	42
SPILL C: IF-30, released across the wind over 500m	25	22	1	48
TOTAL	63	56	4	123

Table 3.2. Number of samples according to BAOAC- categories (tentatively):

Spill	Sheen	Rainbow	Metallic	Dis-cont.	Cont.
SPILL A: MDO, batch release	4	10	5	3	7
SPILL B: IF-30, batch release	6	10	13	5	9
SPILL C: IF-30, released across the wind over 500m	12	12	12	7	5
TOTAL	22	32	30	15	21

- A low-resolution overview of all pictures taken from the sampling boats is given in appendix A. high-resolution of the same pictures is given in attached CD-rom.
- A copy of the sampling log from the two sampling boats is given in Appendix B

4 Results and discussions

4.1 Physico-chemical properties of oils released

Table 4.1 shows the results of the physico-chemical properties for the two oils released in the exercise. This includes both the properties of the reference sample (taken from the oil tanks before release) and the 4 surface oil samples (emulsions) collected in the thick parts of the slicks.

The marine diesel oil was spiked with 15% of the other "Bonnex-IF-30" oil, in order to make the oil "black". This is done to easier identify eventual thicker patches (continuous true oil). This resulted in a slight increase in viscosity compared to true marine diesel (see fig 4.1.A). The density (0.87 kg / L) is slightly higher than the typical range of Marine diesel (0.84 – 0.86 kg / L).

The "IF-30" that was dedicated for this trial, was chosen in order to have an oil with a significantly higher viscosity than the MDO. This in order to look at eventual variability in spreading rate due to different viscosity and density of the oils. At sea-temperature (15°C), IF-30 should have a viscosity around 200cP (cSt). As remarked during sampling of the reference oil in the tank prior the release, there was an immediate reaction to the surprising low "appearance viscosity". Real viscosity measurements in the laboratory (see table 4.1) confirm that this reference oil is not in accordance to an IF-30 specification. The viscosity at 50°C was only 6 cP (and not 30cP according to specifications), and viscosity at 15°C were only 15cSt (cP). The density (0.88kg / L) is also significant lower than typical IF-30 (0.92 – 0.95 kg / L). This mean that the difference in physical properties between the two oils, in reality were significant less than originally planned. Also the chromatograms (fig. 4.2 b and b) confirm the large similarities between the two oils. According to the figure 4.1.b (taken from Clark, 1988), the "IF-30" oil released, seem to contain 70 – 80% distillate and 20-30% residue, rather than typically 35% distillate and 65 % residue.

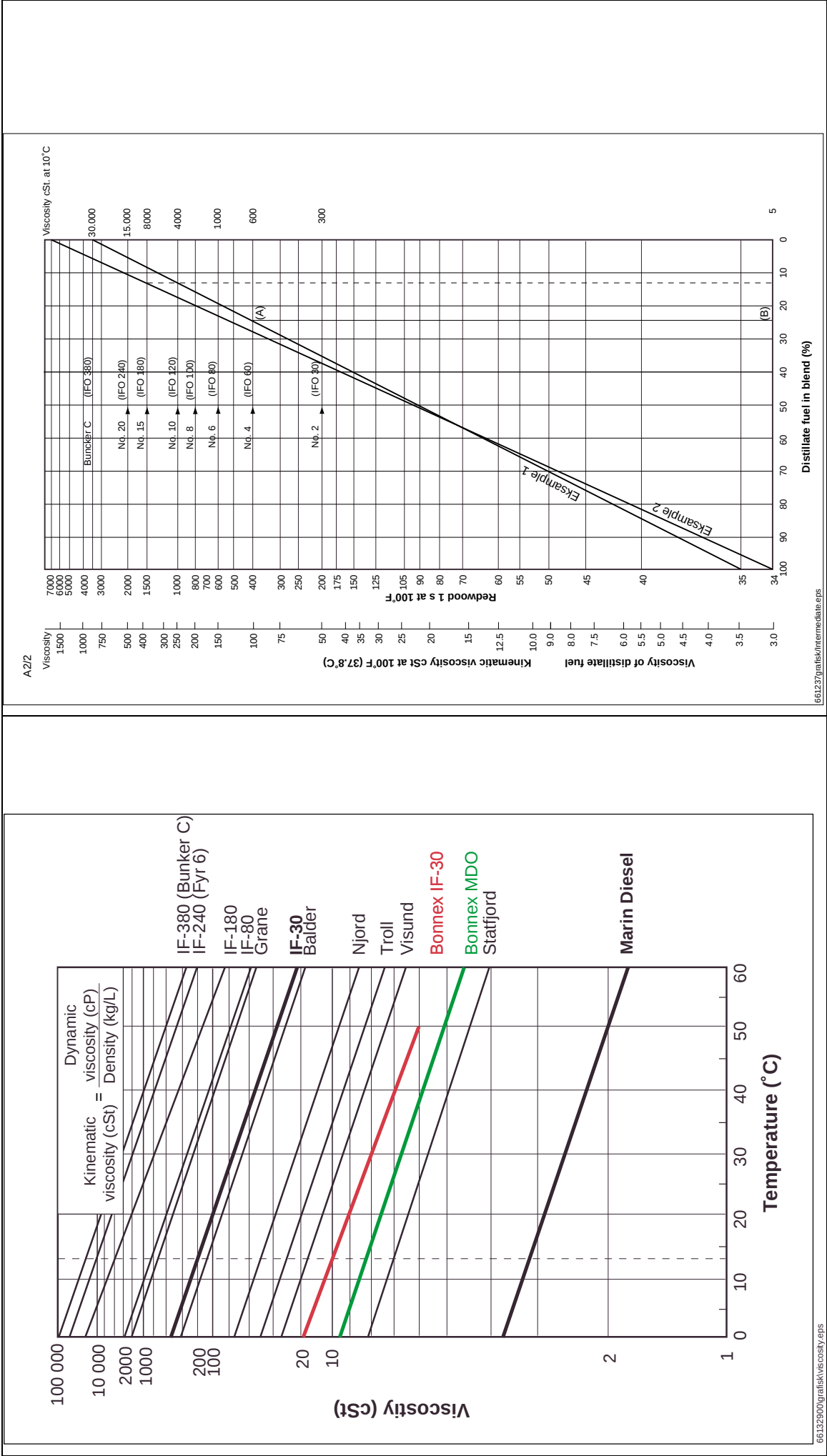


Figure 4.1.A): Typical viscosities versus temperature for various oils. B) typical blends of distillate and refinery residue in various Intermediate bunker fuels (taken from Clark, 1988).

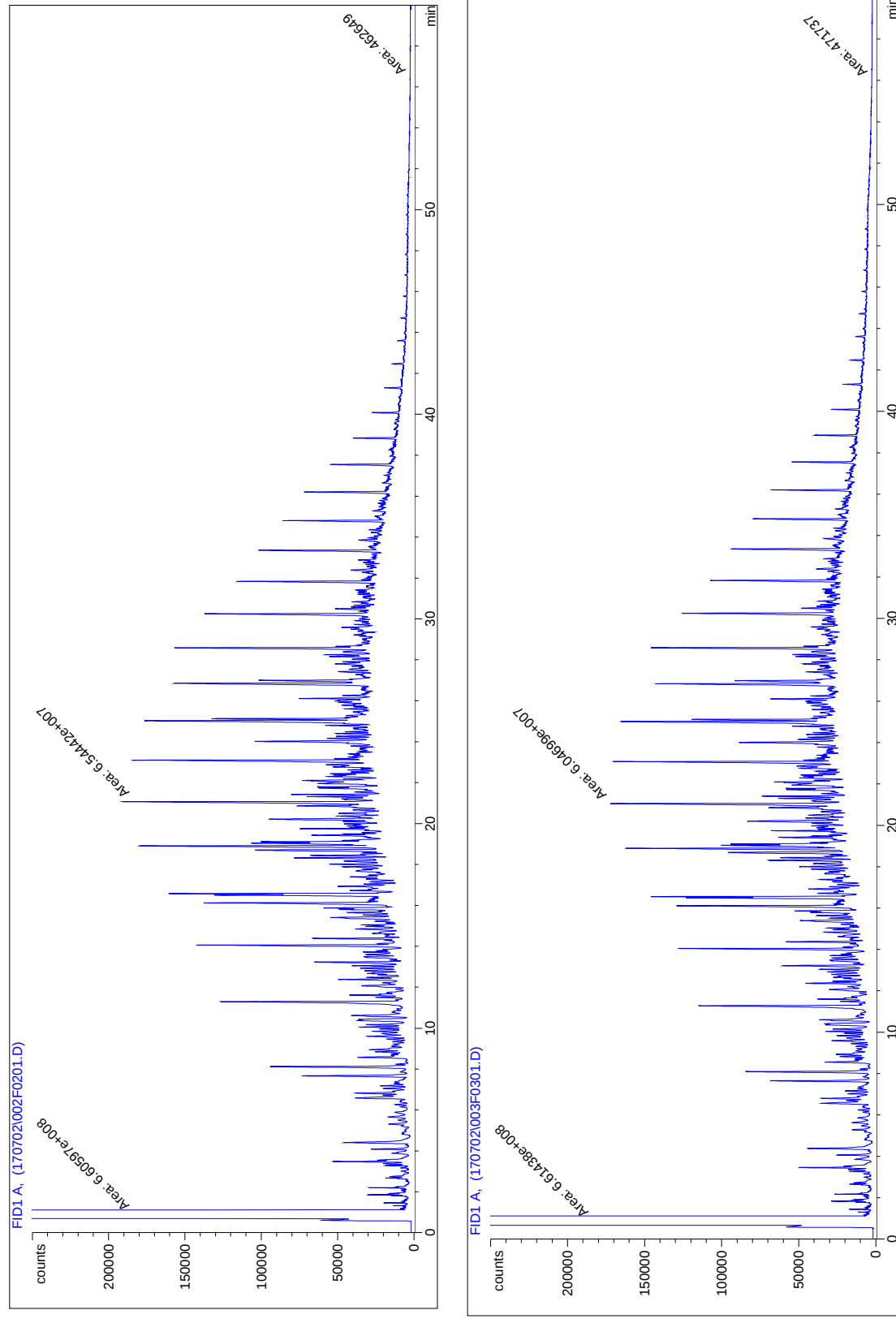


Figure 4.2.A): Gas Chromatograms of A): Marine Diesel Oil,. B) "IF-30" Bunker fuels oil.

Table 4.1. : Physico-chemical properties of the two oils types released in the exercise.

Sample	Tentative Weath. time	Density (g/ml)	Viscosity at 10(s ⁻¹) (mPas) at 50°C	Viscosity at 10(s ⁻¹) (mPas) at 15°C	Water cont (vol%)	Stability	
						¹⁾ D _{2h}	¹⁾ D _{24h}
Ref.MDO, "Dirty" Marine Diesel Fresh (reference oil)	-	0.8763	5	8	-		
OA-04 - Spill A, (10.50)	40 min		-	410	76	0,7	1,
GA-19 - Spill A (17.30)	8 hours			905	83	0,05	0.6
Ref IF-30 "Bonnex – "IF-30" (Fresh, reference oil)		0.8863	6	13	-		
OB-24 - Spill B, (11.23)	40 min.			190	55	0,0	0,0
OC-23 - Spill C, (15.11)	2 hours			80	45	0,0	0,0

1) *D is fractional dehydration of emulsion. D_{2h} is effect after 2 hours, D_{24h} is the effect after 24 hours. D=0: no water settled. D=1: all water settled.*

2) *Effect of 500ppm concentration of the emulsion breaker Alcopol O60%, relative to the oil volume*

Both the fresh and the weathered oil samples were "easily" / "good" dispersible (using the dispersant Dasic NS) according to the CONCAWE / SINTEF Dispersibility Field Effectiveness Test (Fiocco et al. 1999)

4.2 Film thickness measurements

Tables 4.2 – 4.7 sum up all the results of the film thickness measurement. For some of the samples of thick emulsions, the pads were soaked, and the numbers are therefore given by e.g. > 1 mm. With a very few exceptions, there is a good accordance between the numbers obtained and the BAOAC- statement based on the visual inspections from the sampling boat.

Table 4.2. Film thickness measurements of spill A (July 18th. 3m³ of “Black” MDO mixed with 15% IF-30), From Orange sampling Boat:

Sampling time (local)	Sample Id	Oil thickness (µm).	Assumed water content (vol.%)	Emulsion thickness (µm).	Comments
09.57	1A Pad = OA-01	NA	76		Time reg by sampling boat: 0957 BAOAC: Continuous oil. Thick emulsion (2-3 mm). Pad sample, not good (got emulsion on the both side of the pad !!)
09.57	1B Pad= OA-02	> 1mm	76		Time reg by sampling boat: 09.57 BAOAC: Continuous oil ,Thick emulsion Pad saturated, good sample
10.04	1C Pad= OA-03	> 1mm	76		Time reg by sampling boat: 10.04, Photo: 4 pictures taken BAOAC: Continuous oil . Pad saturated, good sample
10.17	1D Surface, sample (1L emul- sion) = OA-04				Time reg by sampling boat: 10.17. Photo: 4 pictures taken Weathering sample.1L collected, settled for 10 min, transferred to 3 x 250 ml PP-bottles + 3x GC for water content and emulsion stability: water content : 76 % water (method: by Alcopol). Semi-stable emulsion: after 1 h settling: 60% water settled out, after 2 hour , 70% water settled out
10.22	1E Pad = OA-5	NA			Time reg by sampling boat: 10.22. Not good sample! Photo: No BAOAC: Continuous oil
10.24	1F Pad = OA-6				Time reg. by sampling boat: 10.24 Photo: 4 pictures taken BAOAC: Discontinuous oil / continuous
10.27	1G Pad = OA-7	> 1mm	76		Time reg. by sampling boat: 10.27 Photo: No BAOAC: Continuous oil
10.32	1H Pad = OA-8	171	-		Time reg. by sampling boat: 10.32 Photo: No Discontinuous oil (some blank spot on the pad)
10.34	1I Pad = OA-9	> 1mm	76		Time reg. by sampling boat: 10.34 Photo: No BAOAC: Continuous oil / dis-continuously

Table 4.3. Film thickness measurements of spill A (July 18th. 3m³ of “Black” MDO mixed with 15% IF-30), From Grey sampling Boat:

Sampling time (local)	Sample Id	Oil thick-ness (µm).	Assumed water content (vol. %)	Emulsion thickness (µm).	Comments
09.56	GA1	(0.3)	-		Time reg. by sampling boat: 09.56 Pad: teflon net, Pad coverage: 70% (pad folding slightly, not good sample) No of photos: 2 BAOAC: Rainbow /Metallic
10.04	GA2	< 0.01			Time reg. by sampling boat:10.04 Weather: sun Pad: teflon net Pad coverage: 100 Photo: No BAOAC: no visible oil
10.07	GA3	1.65	-		Time reg. by sampling boat: 10.07 Weather: sun, clear weather Pad: Teflon net Pad coverage: 100% Photo: No BAOAC:Rainbow
10.09	GA4	1.98	-		Time reg. by sampling boat:10.09 Pad: Teflon net Pad coverage: >100%, water flowing over pad No of photos: 1 BAOAC: Rainbow
10.11	GA5	1.05	-		Time reg. by sampling boat: 10.11 Weather: no sun Pad: Teflon net Pad coverage: 100% No of photos: 1 BAOAC: Rainbow red-orange colour / Metallic
10.15	GA6	795	76	3.3mm	Time reg. by sampling boat:10.15 Weather:: no sun Pad: PP-pad Pad coverage: 50% No of photos: 1 BAOAC: true colour

Sampling time (local)	Sample Id	Oil thickness (µm).	Assumed water content (vol.%)	Emulsion thickness (µm).	Comments
10.21	GA7	4.92	-		Time reg. by sampling boat: 10.21 Weather: no sun Pad: PP-pad Pad coverage: 90% coverage No of photos: 1 BAOAC: metallic
10.33	GA8	1.96	-		Time reg. by sampling boat: 10.33 Weather: no sun Pad: Teflon net Pad coverage: 100% No of photos: 1 BAOAC: Rainbow
10.35	GA9	0.56			Time reg. by sampling boat:10.35 Weather: no sun Pad:teflon net Pad coverage: 100% No of photos: 1 BAOAC: Rainbow
10.40	GA10	1.58	-		Time reg. by sampling boat:10.40 Weather: no sun Pad: Teflon net Pad coverage: 100% No of photos: 1 BAOAC: Rainbow Plane is passing over sampling boat
10.42	GA11	0.41	-		Time reg. by sampling boat: 10.42 Weather: sun Pad: Teflon net Pad coverage: 100% No of photos: 1 BAOAC: Rainbow (orange/yellow colour covering big areas) + some metallic Plane passing in low altitude
10.45	GA12	0.72	-		Time reg. by sampling boat: 10.45 Weather: sun Pad: Teflon net Pad coverage: 100% No of photos: 1 BAOAC: Rainbow
10.48	GA13	0.02	-		Time reg. by sampling boat:10.48 Weather: sun Pad: Teflon net (difficult to sample ?) Pad coverage: 100% (??) Photo: No BAOAC: Sheen

Sampling time (local)	Sample Id	Oil thick-ness (µm)	Assumed water content (vol.%)	Emulsion thickness (µm).	Comments
10.50	GA14	0.03	-		Time reg. by sampling boat: 10.50 Weather: sun Pad: teflon net Pad coverage: 100% (??) No of photos: 1 BAOAC: Sheen (mixed code area)
10.52	GA15	0.36	-		Time reg. by sampling boat: 10.52 Weather: sun Pad: PP-pad Pad coverage: 100% No of photos: 1 BAOAC: Rainbow/sheen
	GA16	n.a.			Sample discarded
10.55	GA17	1,41	-		Time reg. by sampling boat: 10.55 Weather: sun Pad: PP-pad (taken by hand) Pad coverage: 100% No of photos: 1 BAOAC: rainbow
10.57	GA18	16.9	-		Time reg. by sampling boat: 10.57 Weather: sun Pad: PP-pad Pad coverage: 100% No of photos: 2 BAOAC: metallic

Table 4.4. Film thickness measurements of spill B (July 19th, 3m³ of “IF-30”)
From Orange sampling Boat:

Sampling time (local)	Sample Id	Oil thickness (µm)	Assumed water content (vol.%)	Emulsion thickness (µm).	Comments
10.05	OB-01	131.8	-		Time reg. by sampling boat: 10.05 Weather: slightly cloudy Pad: PP-pad (taken by rod) Pad coverage: 100% No of photos: 1 BAOAC: discontinuous / Metallic
10.11	OB-02	2,24	-		Time reg. by sampling boat: 10.11 Weather: sunny pad: PP-pad (taken by rod) Pad coverage: 100% No of photos: 1 BAOAC: Thin Rainbow
10.17	OB-3	78.1	-		Time reg. by sampling boat: 10.17 Pad: PP-pad (taken by rod) Pad coverage: 100% No of photos: 1 BAOAC: discontinuous
10.19	OB-04	9.55	-		Time reg. by sampling boat: 10.19 Pad: PP-pad (taken by hand) Pad coverage: 100% No of photos: 1 BAOAC: Metallic (metallic with small patches of oil)
10.20	OB-05	1.07	-		Time reg. by sampling boat: 10.20 Pad: Teflon net (taken by rod) Pad coverage: 100% No of photos: 2 BAOAC: rainbow
10.25	OB-06	1.36	-		Time reg. by sampling boat: 10.25 Teflon (taken by rod) Pad coverage: 100% No of photos: no BAOAC: rainbow /(metallic)
10.27	OB-07	4.37			Time reg. by sampling boat: 10.27 Pad: PP-pad (taken by rod) Pad coverage: 100% No of photos: 1 BAOAC: metallic
10.28	OB-08	4,26			Time reg. by sampling boat: 10.28 Teflon (taken by rod) Pad coverage: 100% No of photos: no BAOAC: metallic

Sampling time (local)	Sample Id	Oil thickness (µm)	Assumed water content (vol.%)	Emulsion thickness (µm).	Comments
10.29	OB-09	8,03	-		Time reg. by sampling boat: 10.29 Teflon (taken by rod) Pad coverage: 100% No of photos: 1 BAOAC: metallic Not a very good sample (sorbed extra on other side as well ??)
10.31	OB-10	1,66	-		Time reg. by sampling boat: 10.31 Teflon (taken by rod) Pad coverage: 100% No of photos: 1 BAOAC: `rainbow/(metallic) Direction from Bonnex
10.37	OB-11	> 1mm	56	> 2mm	Time reg. by sampling boat: 10.37 Pad (taken by rod) Pad coverage: >100%, totally soaked (i.e. > 2-3 mm). Some oil dripped of No of photos: 1 BAOAC: continues
10.43	OB-12	68,5	-		Time reg. by sampling boat: 1043 Pad (taken by rod) Pad coverage: No of photos: 1 BAOAC: discontinuous
10.45	OB-13	> 1 mm	56	> 2mm	Time reg. by sampling boat: 1045 Pad (taken by rod) Pad coverage: >100%, totally soaked (i.e. > 2-3 mm). Much oil dripped off No of photos: no BAOAC: continuous
10.52	OB-14	> 1 mm	56	> 2mm	Time reg. by sampling boat: 10.52 Pad (taken by rod) Pad coverage: 100%, No of photos: a whole series taken: 9 BAOAC: continuous
10.54	OB-15	6.60	-		Time reg. by sampling boat: 10.54 Pad (taken by rod) Pad coverage: 100%, a good sample No of photos: no BAOAC: metallic
10.56	OB-16	> 1 mm	56	> 2mm	Time reg. by sampling boat: 10.56 Pad (taken by rod) Pad coverage: 100%, No of photos: no BAOAC: continuous

Sampling time (local)	Sample Id	Oil thickness (µm)	Assumed water content (vol.%)	Emulsion thickness (µm).	Comments
10.58	OB-17	> 1 mm	56	> 2mm	Time reg. by sampling boat: 10.58 Pad (taken by rod) Pad coverage: 100%, No of photos: no BAOAC: continuous
11.02	OB-18	10.53	-		Time reg. by sampling boat: 11.02 Pad (taken by rod) Pad coverage: 50% No of photos: no BAOAC: metallic / rainbow
11.06	OB-19	20.89	-		Time reg. by sampling boat: 11.06 Pad (taken by rod) Pad coverage: 100% No of photos: no BAOAC: metallic (good sample)
11.07	OB-20	1,81	-		Time reg. by sampling boat: 11.07 Teflon Pad (taken by rod) Pad coverage: bad No. of photos: no BAOAC: rainbow (not a good sample !!)
11.10	OB-21	1.50	-		Time reg. by sampling boat: 11. 10 Pad (taken by rod) Pad coverage: 50% No of photos: 2 BAOAC: rainbow
11.13	OB-22	1.54	-		Time reg. by sampling boat: 11.13 Pad adsorption of oil in PE-frame (56x36cm) taken by rod) Not able to dry off all oil from the frame No. of photos: 3 BAOAC: metallic
11.19	OB-23	4.43	-		Time reg. by sampling boat: 11.15 Pad adsorption of oil in PE-frame (56x36cm) taken by rod) Not able to dry off all oil from the frame No. of photos: no BAOAC: metallic
11.23	OB-24 Surface sample, 1 L	> 1 mm		> 2mm	Time reg. by sampling boat: 11.23 Weathering sample.1L collected, settled for 10 min, transferred to 3 x 250 ml PP-bottles + 3x GC bottles for water content and emulsion stability: water content : 54-58 % water (method: by Alcopol). Emulsion: total stable after 12 h and 24 hours settling at room temp.

Table 4.5. Film thickness measurements of spill B (July 19th. 3m³ of “IF-30”)
From Grey Sampling Boat:

Sampling time (local)	Sample Id	Oil thick-ness (µm)	Assumed water content (vol.%)	Emulsion thickness (µm).	Comments
10.08	GB01	177.2	56	316.4	Time reg. by sampling boat: 10.08 Pad: PP-pad (by hand ?. Photo: 1 Pad coverage:90% Weather: sun BAOAC: Continuous
10.10	GB02	1.5mm	56	2,7mm	Time reg. by sampling boat: 10.10 Pad: PP-pad (Pad coverage:90% Weather: sun BAOAC: Continuous
10.10	GB03	0.28	-		Time reg. by sampling boat: 10.10 Pad: Teflon / Photo: 1 Pad coverage:100% (??) Weather: sun BAOAC: Rainbow
10.18	GB04	0.22	-		Time reg. by sampling boat:10.18 Pad: Teflon / Photo: no Pad coverage:100% (??) Weather: sun BAOAC: Rainbow
10.20	GB05	0.05			Time reg. by sampling boat: 10.20 Pad: teflon / Photo: 1 Pad coverage:100% (??) Weather: sun BAOAC: Sheen
10.22	GB06	1,29	-		Time reg. by sampling boat: 10.22 Pad: Teflon / Photo: 1 Pad coverage:100% Weather: sun BAOAC: Rainbow
10.24	GB07	> 1mm	56	>2mm	Time reg. by sampling boat: 10.24 Pad: PP-pad / Photo : 1 Pad coverage:100% (soaked) Weather: sun BAOAC: Continuous
10.27	GB08	0.21			Time reg. by sampling boat: 10.27 Pad: Teflon / Photo: 1 Pad coverage:100% (??) Weather: slightly overcast BAOAC: Rainbow (yellow/orange)

Sampling time (local)	Sample Id	Oil thickness (μm)	Assumed water content (vol.%)	Emulsion thickness (μm).	Comments
10.30	GB09	0.03	-		Time reg. by sampling boat: 10.30 Pad: Teflon / Photo: 1 Pad coverage:100% Weather: overcast BAOAC: sheen
10.43	GB10	0.26	-		Time reg. by sampling boat: 10.43 Pad: Teflon-net / Photo: 2 Pad coverage:90% Weather: sun BAOAC: sheen
10.46	GB11	1,42	-		Time reg. by sampling boat: 10.46 Pad: Teflon-net , Photo:1 Pad coverage:100% Weather: sun 003°18.BAOAC: Rainbow
10.50	GB12	0.10	-		Time reg. by sampling boat: 10.50 Pad: Teflon-net / Photo: 2 Pad coverage:100% Weather: sun BAOAC: Sheen
10.51	GB13	0.01	-		Time reg. by sampling boat: 10.51 Pad: Teflon-net / Photo: 1 Pad coverage:100% (??) Weather: overcast BAOAC: Sheen (very thin)
10.54	GB14	1.04	-		Time reg. by sampling boat: 10.54 Pad: Teflon-net / Photo: 1 Pad coverage:100% Weather: overcast BAOAC: Rainbow (looks like metallic)
10.56	GB15	0.26	-		Time reg. by sampling boat: 10.56 Pad: Teflon-net / Photo: 1 Pad coverage:100% Weather: slightly overcast BAOAC: Rainbow (looks like metallic)
10.59	GB16	0.51	-		Time reg. by sampling boat: 10.59 Pad: Teflon-net / Photo:1 Pad coverage:100% Weather: slightly overcast BAOAC: Rainbow (looks like metallic)

Sampling time (local)	Sample Id	Oil thick-ness (µm)	Assumed water content (vol.%)	Emulsion thickness (µm).	Comments
11.03	GB17/	> 1mm	56	> 2mm	Time reg. by sampling boat: 11.03 Pad:PP-pad / Photo:1 Pad coverage:100% Weather: sun BAOAC: Continuous
11.06	GB18	65.5	-		Time reg. by sampling boat: 11.06 Pad: PP-pad / photo: 1 Pad coverage:100% Weather: sun BAOAC: Discontinuous
11.11	GB19	0.95	-		Time reg. by sampling boat: 11.11 Pad: Teflon-net / Photo: 1 Pad coverage:100% Weather: slightly overcast BAOAC: Rainbow / Metallic /
11.13	GB20	0.06			Time reg. by sampling boat: 11.13 Pad: PP-pad / Photo: 1 Pad coverage:100% Weather: slightly overcast BAOAC: Sheen

Table 4.6. Film thickness measurements of spill C (July 19th. 3m³ of “IF-30”, across wind)
From Orange Sampling Boat:

Sampling time (local)	Sample Id	Oil thick-ness (µm)	Assumed water content (vol. %)	Emulsion thickness (µm).	Comments
1407	OC-01	6,64	-		Time reg. by sampling boat: 1407 Pad (taken by rod) Pad coverage:100% No of photos: 1 BAOAC: rainbow /metallic
14.09	OC-02	6,38	-		Time reg. by sampling boat: 1409 Pad (taken by rod) Pad coverage:100% No of photos: no BAOAC: rainbow /metallic
14.11	OC-03	17,04	-		Time reg. by sampling boat: 1411 Pad (taken by rod) Pad coverage:90% BAOAC: metallic
14.14	OC-04	1,53	-		Time reg. by sampling boat: 1414 Teflon net (taken by rod) / Photo: no Pad coverage: ? not a good sample BAOAC: rainbow
14.16	OC-05	3,11	-		Time reg. by sampling boat: 1416 Teflon net (taken by rod) / Photo: no Pad coverage:100% Good sample BAOAC: rainbow
14.21	OC-06	0.40	-		Time reg. by sampling boat: 1421 Teflon net (taken by rod) Pad coverage:100% Good sample No of photos: 2 BAOAC: sheen / Rainbow ?
14.23	OC-07	-	-		Time reg. by sampling boat: 1423 Teflon net (taken by rod) / Photo: no Pad coverage:? Sample cancelled BAOAC: rainbow
14.25	OC-08	0.39	-		Time reg. by sampling boat: 1425 Teflon net (taken by rod) / Photo: no Pad coverage:100% Good sample BAOAC: sheen / rainbow
14.27	OC-09	1.62			Time reg. by sampling boat: 1427 Teflon net (taken by rod) Pad coverage:100% Good sample No of photos: no BAOAC: rainbow /(metallic)

Sampling time (local)	Sample Id	Oil thick-ness (µm)	Assumed water content (vol.%)	Emulsion thickness (µm).	Comments
14.28	OC-10	1.67	-		Time reg. by sampling boat: 1428 Teflon net (taken by rod) Pad coverage:100% Good sample No of photos: 2 BAOAC: rainbow
14.31	OC-11	7.55	-		Time reg. by sampling boat: 1431 Teflon net (taken by rod) Pad coverage:100% Good sample No of photos: no BAOAC: metallic .
14.40	OC-12	11.58			Time reg. by sampling boat: 1440 pad (taken by rod) Pad coverage:100% Good sample No of photos: no BAOAC: metallic.
14.43	OC-13	459.8	46	999.6	Time reg. by sampling boat: 1443 Pad (taken by rod) Pad coverage:100% Good sample No of photos:yes, a series: 4 BAOAC: continuous.
14.46	OC-14	197.8	46	430.1	Time reg. by sampling boat: 1446 Teflon net (taken by rod) Pad coverage:100% Good sample No of photos: no BAOAC: continuous..
14.47	OC-15	6.58	-		Time reg. by sampling boat: 1447 PP-pad (taken by rod) Pad coverage:100% No of photos: 4 BAOAC: metallic .
14.49	OC-16	7.98	-		Time reg. by sampling boat: 1449 Teflon net (taken by rod) / Photo: no Pad coverage:100% Good sample BAOAC: metallic / (rainbow).
14.53	OC-17	0.47	-		Time reg. by sampling boat: 1453 Teflon net (taken by rod) / Photo: no Pad coverage:100% Good sample BAOAC: sheen.
14.54	OC-18	0.32	-		Time reg. by sampling boat: 1454 Teflon net (taken by rod) Pad coverage:100% Good sample No of photos: total 6 pictures BAOAC: sheen.

Sampling time (local)	Sample Id	Oil thick-ness (µm)	Assumed water content (vol.%)	Emulsion thickness (µm).	Comments
14.58	OC-19 Teflon sample	0.40	-		Time reg. by sampling boat: 1458 Teflon net (taken by rod) Pad coverage:100% Good sample / Photo: 1 BAOAC: sheen .
15.01	OC-20 Pad sample	19.37			Time reg. by sampling boat: 1501 pad (taken by rod) Pad coverage:100% Good sample No of photos: No BAOAC: metallic.
15.04	OC-21 Pad sample	2,1mm	46	4,6mm	Time reg. by sampling boat: 1504 Pad (taken by rod) Pad coverage:100% (soaked ?) No of photos: No BAOAC: continuous.
15.05	OC-22 Pad sample	>2mm	46	>4mm	Time reg. by sampling boat: 1505 pad(taken by rod) / Photo: no Pad coverage:100% (soaked) BAOAC: continuous
15.11	OC-23 Surface , emulsion sample, 1L				Time reg. by sampling boat: 1511 Weathering sample.1L collected, settled for 10 min, transferred to 3 x 250 ml PP- bottles + 3x GC bottles for water content and emulsion stability: water content : 45-46 % water (method: by Alcopol). Emulsion: total stable after 12 h and 24h settling at room temp.. / Photo: no

Table 4.7. Film thickness measurements of spill C (July 19th. 3m³ of “IF-30”, across wind)
From Grey Sampling Boat:

Sampling time (local)	Sample Id	Oil thick-ness (µm)	Assumed water content (vol.%)	Emulsion thickness (µm).	Comments
14.07	GC01	0.0 (n.d)	-		Time reg. by sampling boat: 14.07 Photo: 1 Pad: Teflon net Pad coverage:100% Weather: sun BAOAC: no visible oil / sheen
14.10	GC02	0.01	-		Time reg. by sampling boat:14.10 Photo: 1 Pad: Teflon net Pad coverage: 100% (??) Weather: sun BAOAC: Sheen (very thin)
14.12	GC03	11.32	-		Time reg. by sampling boat: 14.12 Photo: 2 Pad: PP-pad Pad coverage: 90% Weather: sun BAOAC: Metallic/ (discontinuous?)
14.15	GC04	9.59	-		Time reg. by sampling boat: 14:15 Pad: PP-pad / Photo: 1 Pad coverage: 100% Weather: sun BAOAC: Metallic / (Discontinuous)
14.17	GC05	0.09	-		Time reg. by sampling boat:14:17 Pad: teflon / Photo: 1 Pad coverage: 100% submerged during sampling Weather: sun BAOAC: Sheen
14.18	GC06	0.52	-		Time reg. by sampling boat: 14.18 Photo: 1 Pad: PP-pad Pad coverage: 100% Weather: sun BAOAC: Rainbow
14.19	GC07	0.43	-		Time reg. by sampling boat: 14.19 Photo: 1 Pad: teflon Pad coverage: 100% Weather: sun BAOAC: Rainbow

Sampling time (local)	Sample Id	Oil thick-ness (µm)	Assumed water content (vol.%)	Emulsion thickness (µm).	Comments
14.22	GC08	0.04	-		Time reg. by sampling boat: 14.22 Pad: teflon / Photo: 1 Pad coverage: 100% Weather: sun BAOAC: Sheen
14.24	GC09	N.a.			Time reg. by sampling boat:14.24 Pad: PP-pad (by hand)/ Photo: 1 Pad coverage: 100% (??), Bad sample ? Weather: sun BAOAC: Metallic
14.25	GC10	40.92	-		Time reg. by sampling boat:14.25 Pad: PP-pad / Photo: 1 Pad coverage: 100% Weather: sun BAOAC: Metallic
14.27	GC11	1.93	-		Time reg. by sampling boat: 14.27 Pad:teflon / Photo: 2 Pad coverage: 100% Weather: sun BAOAC: Rainbow / Metallic (thick rainbow)
14.28	GC12	83.3	-		Time reg. by sampling boat: 14.28 Pad: PP-pad / Photo: 1 Pad coverage: 100% Weather: sun BAOAC: Discontinuous
14.37	GC13	349	-		Time reg. by sampling boat: 14.37 Photo: 1 Pad: PP-pad Pad coverage: 100% Weather: slightly overcast BAOAC: Discontinuous / cont,
14.41	GC14	0,68			Time reg. by sampling boat: 14.41 Photo: 1 Pad: teflon Pad coverage: 100% Weather: sun BAOAC: Rainbow
14.44	GC15	0.06	-		Time reg. by sampling boat: 14.44 Photo: 1 Pad: teflon Pad coverage: 100% Weather: slightly overcast BAOAC: Sheen

Sampling time (local)	Sample Id	Oil thickness (µm)	Assumed water content (vol.%)	Emulsion thickness (µm).	Comments
14.48	GC16	0.68	-		Time reg. by sampling boat: 14.48 Photo: 2 Pad:teflon Pad coverage: 100% Weather: slightly overcast BAOAC: Rainbow
14.50	GC17	22.86	-		Time reg. by sampling boat: 14.50 Photo: 1 Pad: PP-pad (by hand) Pad coverage: 100% Weather: sun BAOAC: Metallic
14.50	GC18	40,69			Time reg. by sampling boat: 14.50 Photo: 1 Pad: PP-pad Pad coverage: 100% Weather: slightly overcast BAOAC: Discontinuous
14.51	GC19	> 2mm)	46	>4mm	Time reg. by sampling boat :14.51 Photo: 1 Pad: PP-pad Pad coverage: 100% (soaked) Weather: slightly overcast BAOAC: Continuous
14.53	GC20	0.14	-		Time reg. by sampling boat: 14.53 Photo: 1 Pad: teflon Pad coverage: 100% Weather: slightly overcast BAOAC: Sheen
14.55	GC21	0.79	-		Time reg. by sampling boat: 14.55 Pad: teflon / Photo: 1 Pad coverage: 100% Weather: slightly overcast BAOAC: Rainbow
14.57	GC22	0.72	-		Time reg. by sampling boat: 14.57 Pad: teflon / Photo: 1 Pad coverage: 100% Weather: slightly overcast BAOAC: Rainbow
14.58	GC23	2.60	-		Time reg. by sampling boat: 14.58 Pad: teflon net/ Photo: 1 Pad coverage: 100% possibly saturated teflon net !! (Bad sample) Weather: slightly overcast BAOAC: Metallic

Sampling time (local)	Sample Id	Oil thickness (µm)	Assumed water content (vol.%)	Emulsion thickness (µm).	Comments
15.00	GC24	0.12	-		Time reg. by sampling boat : 15.00 Pad: teflon / Photo: 1 Pad coverage: 100% Weather: sun BAOAC: Sheen
15.08	GC25	< 0.02	-		Time reg. by sampling boat: 15.08 Photo: 1 Pad: Teflon (might be slightly bigger than other pads used in trials) Pad coverage: 100% Weather: sun BAOAC: No visible oil / blank test 50 meters outside of slick

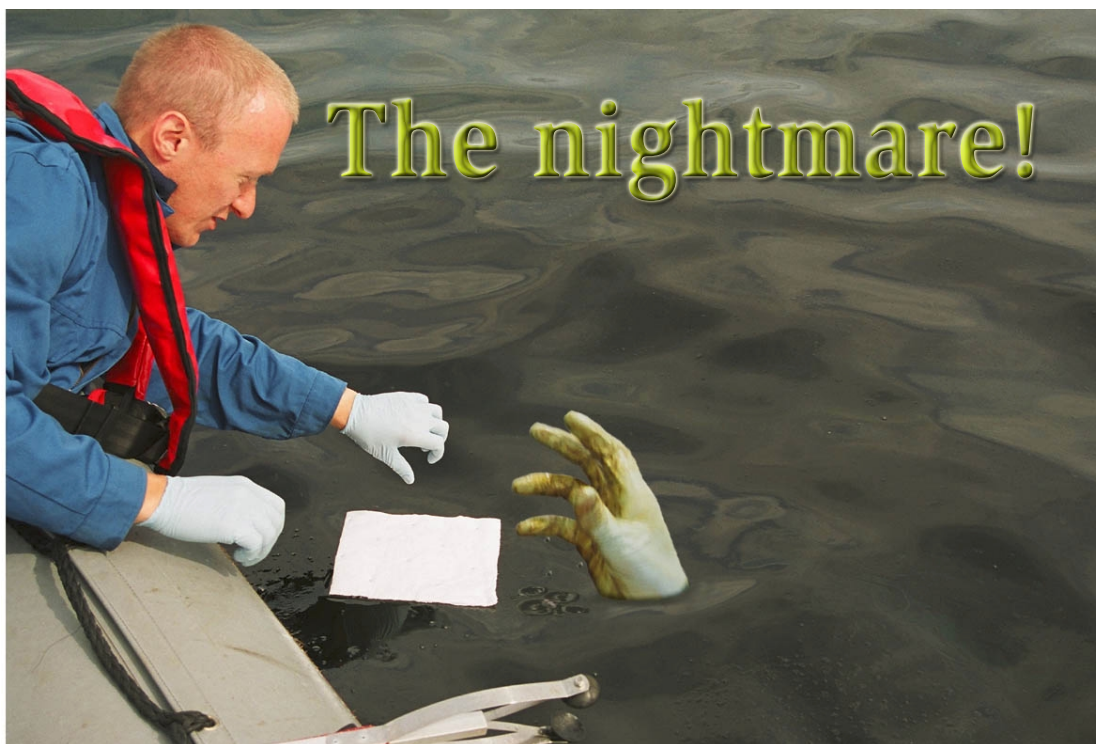
5 References

Clark, G.H., 1988: “ Industrial and Marine Fuels Reference Book”. ISBN 0-408-01488-1

Fiocco, R.J., P.S. Daling, G. DeMarco, R.R. Lessard 1999: Advancing Laboratory/Field Dispersant Effectiveness Testing. Proceedings of the 1999 International Oil Spill Conference, API, Washington D.C., paper #400. STF66 S99012.

Appendix A

Overview of Pictures (low-resolution) taken from the “Orange” and “Grey” sampling boats



High resolution qualities of the pictures are given in attached CD-ROM

June 18th Spill A. Orange sampling boat



07-35_OA_preparation on Arca.JPG



08-58_OA_sampling boats.JPG



09-35_OA_release A.JPG



09-38_OA_release A.JPG



09-39_OA_release A.JPG



09-40_OA_release A.JPG



09-41a_OA_release A.JPG



09-41b_OA_release A.JPG

Pictures from the sampling



10-04_OA03a.jpg



10-04_OA03b.jpg



10-04_OA03c.jpg



10-04_OA03d.jpg



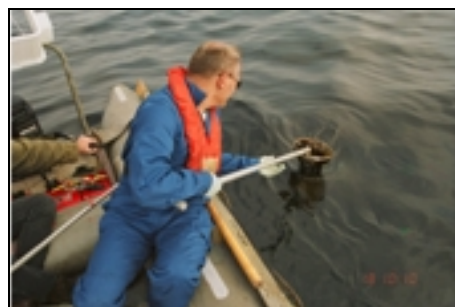
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10-17_OA04b.jpg



10-17_OA04c.jpg



10-17_OA04d.jpg



10-24_OA06a.jpg



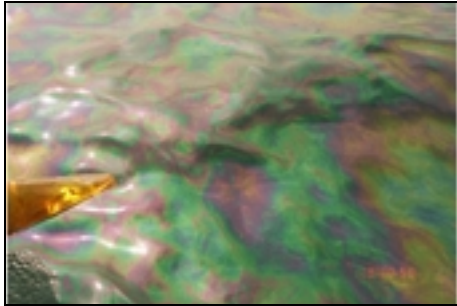
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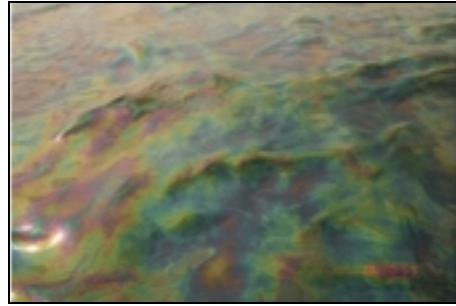
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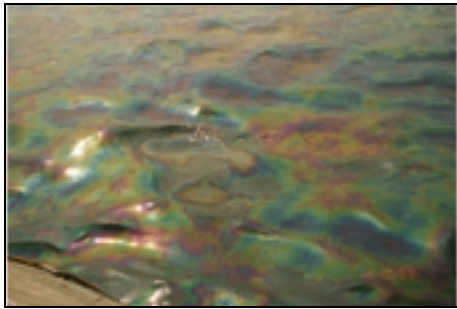
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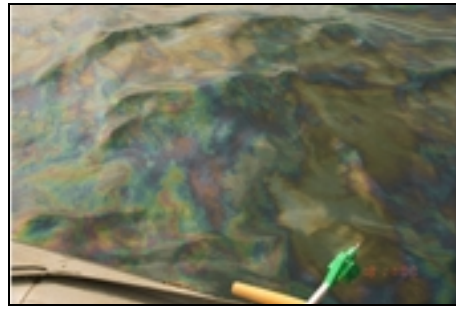
10-58_OA_rainbow.JPG



10-59a_OA_rainbow.JPG



10-59b_OA_rainbow.JPG



11-00_OA_rainbow.JPG



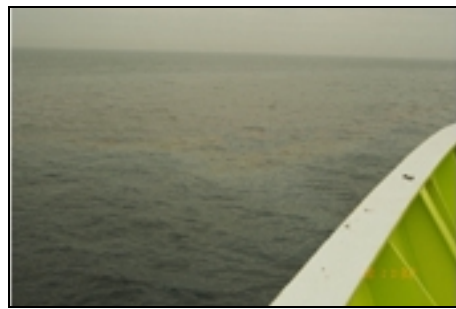
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11-31b_OA_bridge Arca.JPG



11-32a_OA_bridge Arca.JPG



11-32b_OA_bridge Arca.JPG



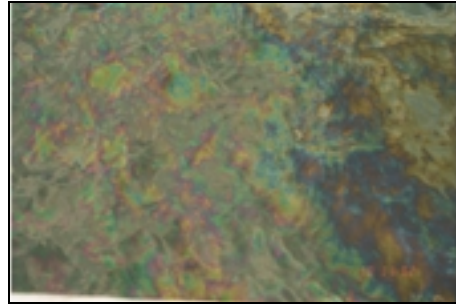
11-32c_OA_bridge Arca.JPG



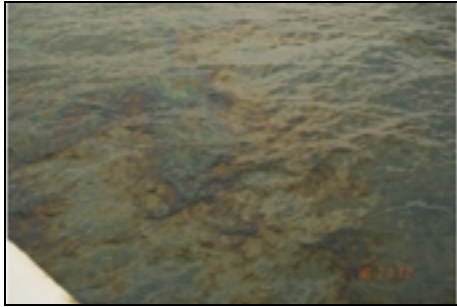
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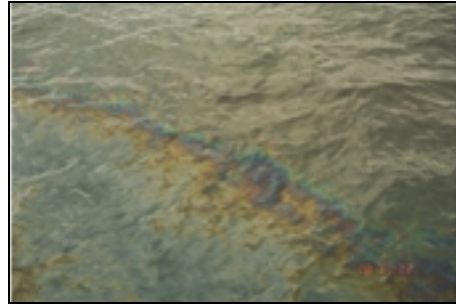
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11-32f_OA_bridge Arca.JPG



11-32g_OA_bridge Arca.JPG



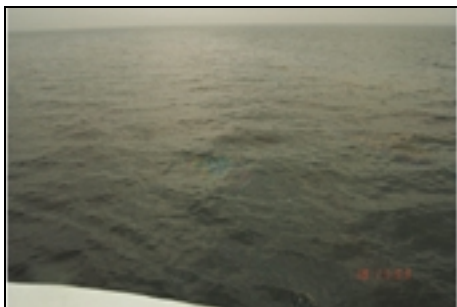
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11-32i_OA_bridge Arca.JPG



11-33a_OA_bridge Arca.JPG



11-33b_OA_bridge Arca.JPG

June 18th Spill A. Grey sampling boat



08-00_GA_sampling-team.JPG



09-00a_GA_sampling-boat.JPG



09-00b_GA_arca.JPG



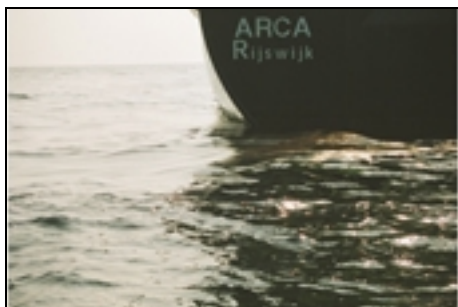
09-00c_GA_sampling-boat.JPG



09-00d_GA_Orange samling boat.JPG

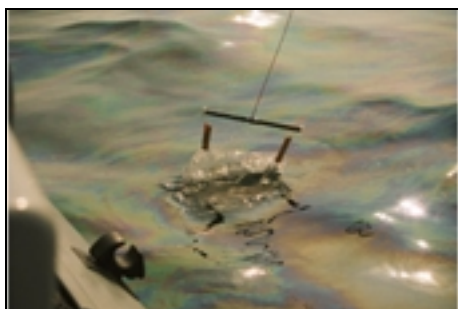


09-35_GA_Release A.JPG



09-36_GA_Realease A.JPG

Pictures from the sampling:



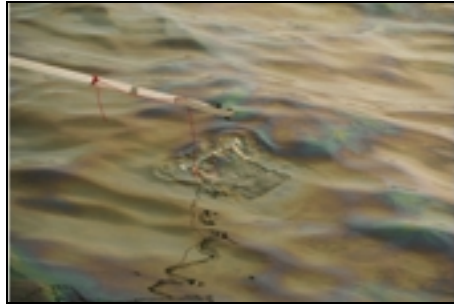
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09-56_GA01b.jpg



10-09_GA04.jpg



10-11_GA05.jpg



10-15_GA06.jpg



10-21_GA07.jpg



10-33_GA08.jpg



10-35_GA09.jpg



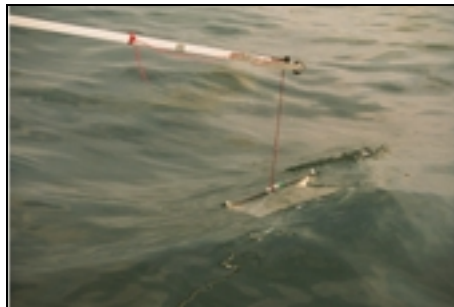
10-40_GA10.jpg



10-42_GA11.jpg



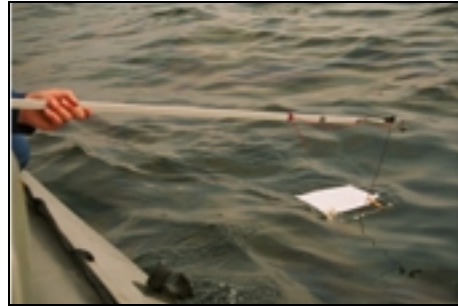
10-45_GA12.jpg



10-50_GA14.jpg



10-52_GA15.jpg



10-55_GA17.jpg



10-57_GA18a.jpg



10-57_GA18b.jpg

June 19th Spill B. Orange sampling boat



09-05_OB_coffee break.JPG



09-05_OB_coffee break.jpg



09-37_OB_release B.jpg



09-38_OB_release B.jpg



09-43a_OB_release B.JPG



09-43b_OB_release B.JPG



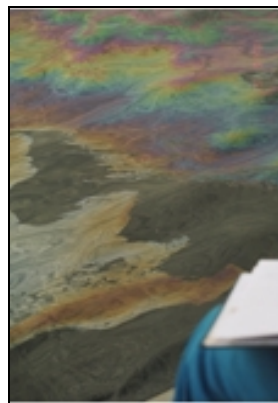
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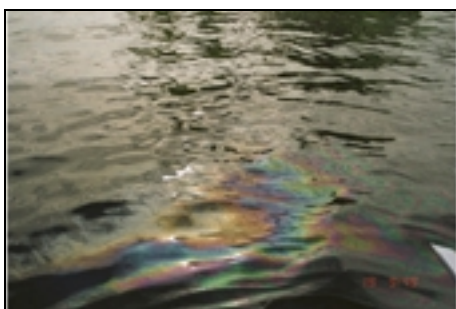
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09-48b_OB_release B.JPG



09-48c_OB_release B.JPG



09-49_OB_release B.JPG



10-05_OB01.JPG

Pictures from the sampling



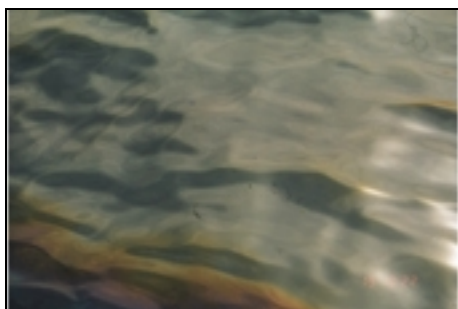
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10-17_OB03.JPG



10-19_OB04.JPG



10-20_OB05a.JPG



10-20_OB05b.JPG



10-27_OB07.JPG



10-30_OB09.JPG



10-37_OB11.JPG



10-43_OB12.JPG



10-52_OB14a.JPG



10-52_OB14b.JPG



10-52_OB14c.JPG



10-52_OB14d.JPG



10-52_OB14e.JPG



10-52_OB14f.JPG



10-52_OB14g.JPG



10-52_OB14h.JPG



10-52_OB14i.JPG



11-10_OB21a.JPG



11-10_OB21b.JPG



11-13_OB22a.JPG



11-13_OB22b.JPG



11-13_OB22c.JPG

June 19th Spill B. Grey sampling boat



09-20_GB_arca.JPG



09-21_GB_arca.JPG



09-30_GB_orange boat.JPG



09-35_GB_release B.JPG



09-36_GB_release B.JPG



09-37_GB_release B.JPG



09-40_GB_relesae B.JPG



09-41_GB_relesae B.JPG

Pictures from the sampling



10-08_GB01.jpg



10-10_GB02.jpg



10-20_GB03.jpg



10-22_GB05.jpg



10-22_GB06.jpg



10-24_GB07.jpg



10-27_GB08.jpg



10-30_GB09.jpg



10-43_GB10a.jpg



10-43_GB10b.jpg



10-46_GB11.jpg



10-50_GB12a.jpg



10-50_GB12b.jpg



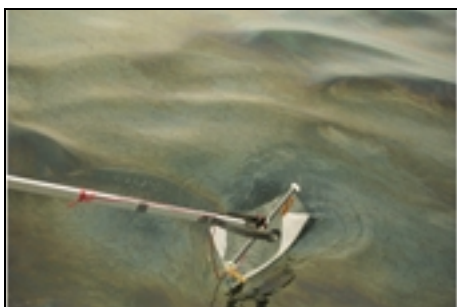
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10-54_GB14.jpg



10-56_GB15.jpg



10-59_GB16.jpg



11-03_GB17.jpg



11-06_GB18.jpg



11-11_GB19.jpg

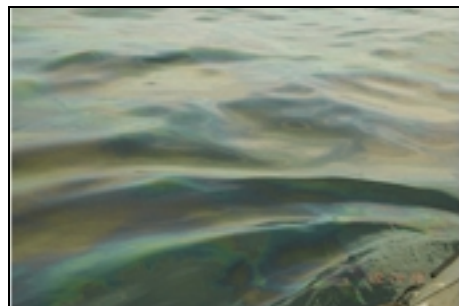


11-13_GB20.jpg

June 19th Spill C. Orange sampling boat



14-07_OC01.JPG



14-18_OC_rainbow.JPG



14-21_OC06a.JPG



14-21_OC06b.JPG



14-21_OC06c.JPG



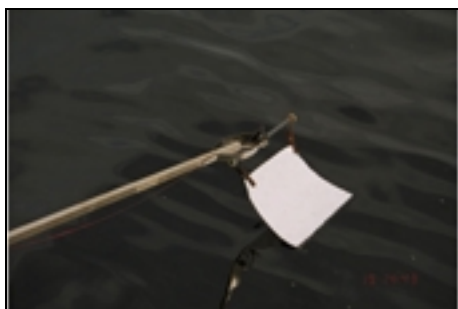
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14-28_OC10b.JPG



14-37_OC_samling boat.JPG



14-43_OC13a.JPG



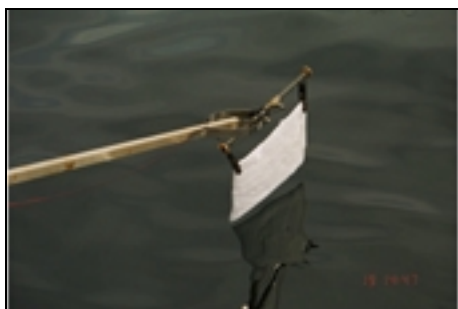
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14-43_OC13c.JPG



14-43_OC13d.JPG



14-47_OC15a.JPG



14-47_OC15b.JPG



14-47_OC15c.JPG



14-47_OC15d.JPG



14-54_OC18a.JPG



14-54_OC18b.JPG



14-54_OC18c.JPG



14-54_OC18d.JPG



14-54_OC18e.JPG



14-54_OC18f.JPG



14-58_OC19.JPG

June 19th Spill C. Grey sampling boat



GC_ Sampling Team.jpg



GC_ Sampling Team b.jpg



GC_ Orange boat.jpg

Pictures from the sampling



14-07_GC01.jpg



14-10_GC02.jpg



14-12_GC03a.jpg



14-12_GC03b.jpg



14-15_GC04.jpg



14-17_GC05.jpg



14-18_GC06.jpg



14-19_GC07.jpg



14-22_GC08.jpg



14-24_GC09.jpg



14-26_GC10.jpg



14-27_GC11a.jpg



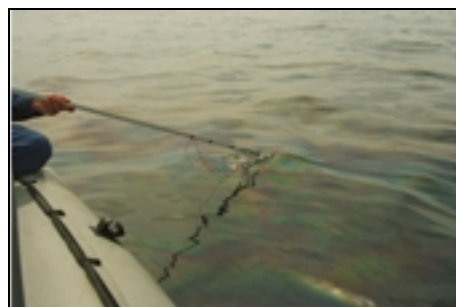
14-27_GC11b.jpg



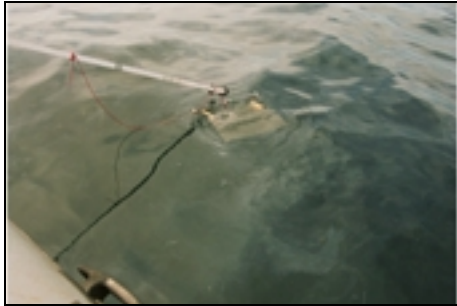
14-28_GC12.jpg



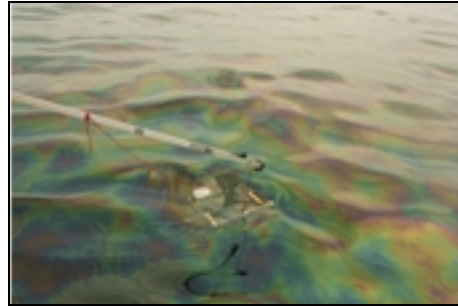
14-37_GC13.jpg



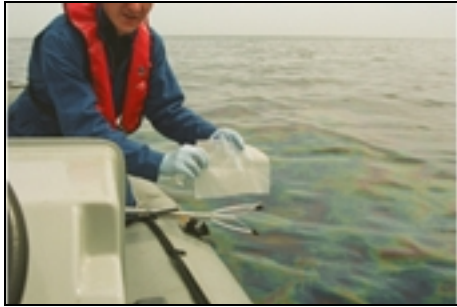
14-41_GC14.jpg



14-44_GC15.jpg



14-48_GC16a.jpg



14-48_GC16b.jpg



14-48_GC17.jpg



14-50_GC18.jpg



14-51_GC19.jpg



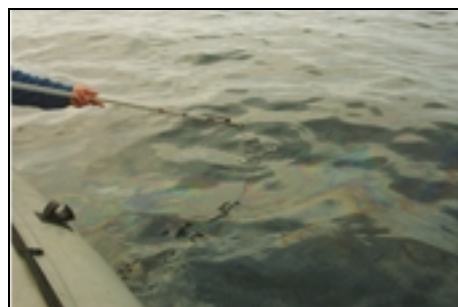
14-53_GC20.jpg



14-55_GC21.jpg



14-57_GC22.jpg



14-58_GC23.jpg



15-00_GC24.jpg



15-08_GC25.jpg

Appendix B

Sampling logs from the “Orange” and “Grey” sampling boats

For your information when you go through the sampling log: The Sampling time (in column 1) is the local time registered by the sampling boat. The position time (given in column 2) is the UTC-time where the Shira-people noted the positions of the two sampling boats. Due to the VHF-reporting back to Arca after each sampling, this position time (in UTC) is generally 0.5 to 2 min. delayed relative to the exact timing for the sampling (as logged by the sampling boats).

Sampling log, BONNEX 2002”
June 18th. Spill A: Release of 3m³ “Black” MDO (mixed with 15% IF-30)

Orange sampling Boat:

Sampling time (local)	Position time (UTC)	Sample Id	Lat.	Long.	Comments
0700					Meterological data from ARCA: Air Temp: 16°C. Swea temp: 14°C Wind: 5-7 m/s from NW, Current: heading NNE
0700		Ref. MDO			2 x 0.5 L of Reference oil MDO taken from release tank at ARCA
0705		Ref. IF-30			2 x 0.5 L of Reference oil IF-30 taken from release tank at ARCA. Too low viscosity ? Is this IF-30 ??
0735					Preparation for sampling on Arca-Photo:1
0850					Sampling boats on water: Photo: 1,
09.32					Bonnex 0 arriving spill area,
09.34			?	?	Start releasing MDO oil from Arca,
09.37 – 09.41					Photos from release from Arca and from airplane: 0935-0941: 6 pictures
09.43					Stop release from Arca, 3 m ³ released within 9 min. Spot slick about 200 m on the port side of Arca (see sketch)
09.52					Visually, it looks like the thickest part of the oil start to emulsify immediately. Some sheen and rainbow around the sapling boat.
09.57	07.57	1A Pad = OA-01	52°42.4	003°16.5	Time reg by sampling boat: 0957 BAOAC: Continuous oil. Thick emulsion (2-3 mm). Pad sample, not good (got emulsion on the both side of the pad !!)
09.57	08.00	1B Pad= OA-02	52°42.4	003°16.5	Time reg by sampling boat: 09.57 BAOAC: Continuous oil ,Thick emulsion Pad saturated, good sample
10.04	08.05	1C Pad= OA-03	52°42.5	003°16.5	Time reg by sampling boat: 10.04, Photo: 4 pictures taken BAOAC: Continuous oil . Pad saturated, good sample
10.17		1D Surface, sample (1L emul-sion) = OA-04			Time reg by sampling boat: 10.17. Photo: 4 pictures taken Weathering sample.1L collected, settled for 10 min, transferred to 3 x 250 ml PP-bottles + 3x GC for water content and emulsion stability: water content : 76 % water (method: by Alcopol). Semi-stable emulsion: after 1 h settling: 60% water settled out, after 2 hour , 70% water settled out

10.22		1E Pad = OA-5			Time reg by sampling boat: 10.22. Not good sample! Photo: No BAOAC: Continuous oil
10.24	08.25	1F Pad = OA-6	52°43.2	003°17.0	Time reg. by sampling boat: 10.24 Photo: 4 pictures taken BAOAC: Discontinuous oil
10.27	08.28	1G Pad = OA-7	52°43.1	003°17.2	Time reg. by sampling boat: 10.27 Photo: No BAOAC: Continuous oil
10.32	08.35	1H Pad = OA-8	52°43.1	003°17.2	Time reg. by sampling boat: 10.32 Photo: No Discontinuous oil (some blank spot on the pad)
10.34	-	1I Pad = OA-9	-	-	Time reg. by sampling boat: 10.34 Photo: No BAOAC: Continuous oil / dis-continuously
10.50	08.51	1J Surface oil = OA-10	52°43.3	003°17.6	Time reg. by sampling boat: 10.50 Photo: No Weathering sample. 1L collected, settled for 10 min, transferred to 3 x 250 ml PP-bottles + 3x GC for water content and emulsion stability: water content : 77 % water (method: by Alcopol). Semi-stable emulsion: after 1 h settling: 50% water settled out, after 2 hour , 65% water settled out
10.58-11.00					Back to Arca: passing an area with Very intensive Rainbow. Photo: 4 pictures (1058-1100)
11.31-11.33	09.05				Time reg. by sampling boat: 11.30 Pictures taken from the Bridge on Arca: 13 pictures (11.31-11.33)

Summary : Orange boat. Sampling of the MDO, 18. June, 0830 – 1100:

Total 8 pp-pad samples and 2 surface oil/emulsions samples, all taken in discontinues/ continues areas

Grey sampling Boat: June 18th. Release A: 3m³ “Black MDO
(mixed with 15% IF-30)

Sampling time (local)	Position time (UTC)	Sample Id	Lat.	Long.	Comments
0800					Preparation on Arca: Photo: 1
0900					Sampling boats on water: Photo: 4,
09.35					Photos from release: 2 pictures
09.56	07.53	GA1	52°42,4	003°16,4	Time reg. by sampling boat: 09.56 Pad: teflon net Pad coverage: 70% (pad folding slightly) No of photos: 2 BAOAC: Metallic Rainbow
10.04	08.06	GA2	52° 42.5	003°16.6	Time reg. by sampling boat:10.04 Weather: sun Pad: teflon net Pad coverage: 100 Photo: No BAOAC: no visible oil
10.07	08.07	GA3	52°42.5	003°16.6	Time reg. by sampling boat: 10.07 Weather: sun, clear weather Pad: Teflon net Pad coverage: 100% Photo: No BAOAC:Rainbow
10.09	08.10	GA4	52°42.6	003°16.9	Time reg. by sampling boat:10.09 Pad: Teflon net Pad coverage: >100%, water flowing over pad No of photos: 1 BAOAC: Rainbow
10.11	08.12	GA5	52°42.9	003°17.0	Time reg. by sampling boat: 10.11 Weather: no sun Pad: Teflon net Pad coverage: 100% No of photos: 1 BAOAC: Metallic/rainbow red-orange colour
10.15	08.15	GA6	52°43.1	003°16.7	Time reg. by sampling boat:10.15 Weather:: no sun Pad: PP-pad Pad coverage: 50% No of photos: 1 BAOAC: true colour
					Changing position due to thick oil – out of scope for grey sampling boat.

Sampling time (local)	Position time (UTC)	Sample Id	Lat.	Long.	Comments
10.21	08.21	GA7	52°43.3	003°16.9	Time reg. by sampling boat: 10.21 Weather: no sun Pad: PP-pad Pad coverage: 90% coverage No of photos: 1 BAOAC: metallic
10.21					Guidance by Bonnex zero
10.33	08.34	GA8	52°43.0 0	003°17.2	Time reg. by sampling boat: 10.33 Weather: no sun Pad: Teflon net Pad coverage: 100% No of photos: 1 BAOAC: Rainbow
10.35	08.37	GA9	52°43.0 0	003°17.2	Time reg. by sampling boat:10.35 Weather:no sun Pad:teflon net Pad coverage: 100% No of photos: 1 BAOAC: Rainbow
10.40	08.41	GA10	52°43,1	003°17.3	Time reg. by sampling boat:10.40 Weather: no sun Pad: Teflon net Pad coverage: 100% No of photos: 1 BAOAC: Rainbow Plane is passing over sampling boat
10.42	08.44	GA11	52°43.1	003°17.3	Time reg. by sampling boat: 10.42 Weather: sun Pad: Teflon net Pad coverage: 100% No of photos: 1 BAOAC: Rainbow/metallic (orange/yellow colour covering big areas) Plane passing in low altitude
10.45	08.45	GA12	52°43.1	003°17.4	Time reg. by sampling boat: 10.45 Weather: sun Pad: Teflon net Pad coverage: 100% No of photos: 1 BAOAC: Rainbow
10.48	08.49	GA13	52°43.2	003°17.5	Time reg. by sampling boat:10.48 Weather: sun Pad: Teflon net Pad coverage: 100% Photo: No BAOAC: Sheen

Sampling time (local)	Position time (UTC)	Sample Id	Lat.	Long.	Comments
10.50	08.52	GA14	52°43.2	003°17.6	Time reg. by sampling boat: 10.50 Weather: sun Pad: teflon net Pad coverage: 100% No of photos: 1 BAOAC: Sheen (mixed code area)
10.52	08.52	GA15	52°43.2	003°17.6	Time reg. by sampling boat: 10.52 Weather: sun Pad: PP-pad Pad coverage: 100% No of photos: 1 BAOAC: Rainbow/sheen
		GA16			Sample discarded
10.55	08.56	GA17	52°43.3	003°17.8	Time reg. by sampling boat: 10.55 Weather: sun Pad: PP-pad (taken by hand) Pad coverage: 100% No of photos: 1 BAOAC: rainbow
10.57	08.58	GA18	52°43.3	003°17.8	Time reg. by sampling boat: 10.57 Weather: sun Pad: PP-pad Pad coverage: 100% No of photos: 2 BAOAC: metallic with patches of oil

Returning to the Arca

Summary : Grey boat. Sampling of the MDO, 18. June, 0830 – 1100:

Total 18 teflon-net samples and 5 pp-pad samples, taken in sheen /rainbow /metallic discontinues areas.

General remark: Went now and then to an other position/code within a few metres. Codes are changing within a few metres around the boat

Extraordinary sampling: June 18th. of the MDO Time: 17. 30, 1800 (8-9 hours weathering)

Sample i.d.; GA 19: Observation: total slick about 3 km long. Most of the area is sheen, however, in the front of the slic, a thick emulsions of about 300 m long and 5 – 10 m width still exist. 1 L of surface sample were collected.

The emulsion has a guess (based on experience) to have a viscosity around 1000cSt. Em. stability:

- after 1 h settling: 0% water settled out, \
- after 2 hours , 5% water settled out
- after 12 hours , 60% water settled out
- after 24 hours , 80% water settled out
- Watercontent: (by Alcopol/heating): 83 – 84 % water in the emulsion!!!

Observations June 19th of the “Black MDO 1700 – 1800 (about 20 hours at sea):

Observation: 0730, June 19th. Slick about 2-3 km long, contain mostly sheen and rainbow, however, still areas in the front with emulsions !!Arca went through it. No samples taken

Position: 52.45 / 03.18 - 52.41 / 03.22

Sampling log, BONNEX 2002”
June 19th. Spill B, Release: 3m³ IF-30, point release

Orange sampling Boat:

Sampling time (local)	Position time (UTC)	Sample Id	Lat.	Long.	Comments
08.30					Meteorological data from ARCA: Air Temp: 16°C. Sea temp: 14°C Wind: 3-7 m/s : Eastly from the morning, later: from NW
08.50					Sampling boats on the water Photo: 2 (coffee break)
09.35					Bonnex 0 arriving spill area,
09.37		Oil release			Start releasing IFO-30 oil from Arca,
09.42			?	?	Estimated area: 50 m on the starboard of Arca
09.37 – 49					Photos from release B from Arca Total 8 pictures (0937-0949)
09.45					Stop release from Arca, 3 m ³ IFO-30 released within 8 min. Spot slick about 100 m on the port side of Arca Visually: sheen and rainbow covered only a small area (0,5 – 1 m width around the slick. The main part consist of thick oil (continuous)
10.05	0808	OB-01 Pad sample	52°45.17	003°18.07	Time reg. by sampling boat: 10.05 Weather: slightly cloudy Pad: PP-pad (taken by rod) Pad coverage: 100% No of photos: 1 BAOAC: discontinue / Metallic
10.11	08011	OB-02 Pad Sample	52°45.16	003°18.04	Time reg. by sampling boat: 10.11 Weather: sunny pad: PP-pad (taken by rod) Pad coverage: 100% No of photos: 1 BAOAC: Thin Rainbow
10.17	0817	OB-3 Pad sample	52°45.26	003°18.14	Time reg. by sampling boat: 10.17 Pad: PP-pad (taken by rod) Pad coverage: 100% No of photos: 1 BAOAC: discontinue

Sampling time (local)	Position time (UTC)	Sample Id	Lat.	Long.	Comments
10.19	0819	OB-04 Pad sample	52°45.31	003°18.17	Time reg. by sampling boat: 10.19 Pad: PP-pad (taken by hand) Pad coverage: 100% No of photos: 1 BAOAC: discontinue / Metallic (metallic with small patches of oil)
10.20	0823	OB-05 Teflon net	52°45.33	003°18.21	Time reg. by sampling boat: 10.20 Pad: Teflon net (taken by rod) Pad coverage: 100% No of photos: 2 BAOAC: rainbow
10.25	0826	OB-06 Teflon net	52°45.35	003°18.23	Time reg. by sampling boat: 10.25 Teflon (taken by rod) Pad coverage: 100% No of photos: no BAOAC: rainbow / metallic
10.27	0827	OB-07 Pad sample	52°45.37	003°18.23	Time reg. by sampling boat: 10.27 Pad: PP-pad (taken by rod) Pad coverage: 100% No of photos: 1 BAOAC: metallic
10.28	0829	OB-08 Teflon net / P	52°45.41	003°18.26	Time reg. by sampling boat: 10.28 Teflon (taken by rod) Pad coverage: 100% No of photos: no BAOAC: metallic
10.29	0831	OB-09 Teflon net	52°45.44	003°18.32	Time reg. by sampling boat: 10.29 Teflon (taken by rod) Pad coverage: 100% No of photos: 1 BAOAC: metallic Not a very good sample (sorbed extra on other side as well)
10.31	0834	OB-10 Teflon net	52°45.48	003°18.34	Time reg. by sampling boat: 10.31 Teflon (taken by rod) Pad coverage: 100% No of photos: 1 BAOAC: `rainbow/metallic Direction from Bonnex
10.37	0839	OB-11 Pad sample	52°45.55	003°18.43	Time reg. by sampling boat: 10.37 Pad (taken by rod) Pad coverage: >100%, totally soaked (i.e. > 2-3 mm). Some oil dripped of No of photos: 1 BAOAC: continues

Sampling time (local)	Position time (UTC)	Sample Id	Lat.	Long.	Comments
10.43	10.43	OB-12 Pad sample	52°45.62	003°18.52	Time reg. by sampling boat: 1043 Pad (taken by rod) Pad coverage: No of photos: 1 BAOAC: discontinues
10.45	10.45	OB-13 Pad sample	52°45.67	003°18.48	Time reg. by sampling boat: 1045 Pad (taken by rod) Pad coverage: >100%, totally soaked (i.e. > 2-3 mm). Much oil dripped off No of photos: no BAOAC: continuous
10.52	10.52	OB-14 Pad sample	52°45.71	003°18.80	Time reg. by sampling boat: 10.52 Pad (taken by rod) Pad coverage: 100%, No of photos: a whole series taken: 9 BAOAC: continuous
10.54	10.54	OB-15 Pad sample	52°45.77	003°18.63	Time reg. by sampling boat: 10.54 Pad (taken by rod) Pad coverage: 100%, a good sample No of photos: no BAOAC: metallic
10.56	10.56	OB-16 Pad sample	52°45.78	003°18.63	Time reg. by sampling boat: 10.56 Pad (taken by rod) Pad coverage: 100%, No of photos: no BAOAC: continuous
10.58	10.58	OB-17 Pad sample	52°45.83	003°18.67	Time reg. by sampling boat: 10.58 Pad (taken by rod) Pad coverage: 100%, No of photos: no BAOAC: continuous
11.02	0903	OB-18 Pad sample	52°45.89	003°18.96	Time reg. by sampling boat: 11.02 Pad (taken by rod) Pad coverage: 50% No of photos: no BAOAC: metallic / rainbow
11.06	0906	OB-19 Pad sample	52°45.93	003°18.80	Time reg. by sampling boat: 11.06 Pad (taken by rod) Pad coverage: 100% No of photos: no BAOAC: metallic (good sample)
11.07	0908	OB-20 Teflon Net	52°45.95	003°18.84	Time reg. by sampling boat: 11.07 Teflon Pad (taken by rod) Pad coverage: bad No. of photos: no BAOAC: rainbow (not a good sample !!)

Sampling time (local)	Position time (UTC)	Sample Id	Lat.	Long.	Comments
11.10	0910	OB-21 Teflon Net	52°45.96	003°18.88	Time reg. by sampling boat: 11. 10 Pad (taken by rod) Pad coverage: 50% No of photos: 2 BAOAC: rainbow
11.13	0913	OB-22 Pad sample with frame	52°45.03	003°18.96	Time reg. by sampling boat: 11.13 Pad adsorption of oil in PE-frame (56x36cm) taken by rod) Not able to dry off all oil from the frame No. of photos: 3 BAOAC: metallic
11.19	0919	OB-23 Pad sample with frame	52°45.13	003°19.02	Time reg. by sampling boat: 11.15 Pad adsorption of oil in PE-frame (56x36cm) taken by rod) Not able to dry off all oil from the frame No. of photos: no BAOAC: metallic
11.23	0925	OB-24 Surface sample, 1 L	52°45.20	003°19.06	Time reg. by sampling boat: 11.23 Weathering sample.1L collected, settled for 10 min, transferred to 3 x 250 ml PP-bottles + 3x GC bottles for water content and emulsion stability: water content : 54-58 % water (method: by Alcopol). Emulsion: total stable after 12 h and 24 hours settling at room temp.

Summary : Orange boat. Sampling of spill B, IFO-30 19. June, 0830 – 1130:

Total 15 pp-pad samples, 6 Teflon samples and 1 surface oil/emulsions samples, taken within all the 5 codes (i.e. sheen, rainbow, metallic, discontinues and continues areas

Grey sampling Boat: June 19th. Spill B IF-30, point release

Sampling time (local)	Position time (UTC)	Sample Id	Lat.	Long.	Comments
09.20					Sampling boats on the water. Photo: 3 (=920-0930))
09.35					Photos from release B from Arca Total 3 pictures (0937-0949)
09.40			?	?	Estimated area: 50 m on the starboard of Arca: Photo:2
10.08	08.08	GB01	52°45.17	003°18.07	Time reg. by sampling boat: 10.08 Pad: PP-pad (by hand ?). Photo: 1 Pad coverage:90% Weather: sun BAOAC: Continuous
10.10	08.11	GB02	52°45.16	003°18.04	Time reg. by sampling boat: 10.10 Pad: PP-pad Pad coverage:90% Weather: sun BAOAC: Continuous
10.10	08.17	GB03	52°45.26	003°18.13	Time reg. by sampling boat: 10.10 Pad: Teflon / Photo: 1 Pad coverage:100% Weather: sun BAOAC: Rainbow
10.18	08.19	GB04	52°45.27	003°18.16	Time reg. by sampling boat:10.18 Pad: Teflon / Photo: no Pad coverage:100% Weather: sun BAOAC: Rainbow
10.20	08.20	GB05	52°45.31	003°18.17	Time reg. by sampling boat: 10.20 Pad: teflon / Photo: 1 Pad coverage:100% Weather: sun BAOAC: Sheen
10.22	08.23	GB06	52°45.34	003°18.20	Time reg. by sampling boat: 10.22 Pad: Teflon / Photo: 1 Pad coverage:100% Weather: sun BAOAC: Rainbow
10.24	08.25	GB07	52°45.36	003°18.19	Time reg. by sampling boat: 10.24 Pad: PP-pad / Photo : 1 Pad coverage:100% Weather: sun BAOAC: Continuous
10.27	08.27	GB08	52°45.39	003°18.24	Time reg. by sampling boat: 10.27 Pad: Teflon / Photo: 1 Pad coverage:100% Weather: slightly overcast BAOAC: Rainbow (yellow/orange)

Sampling time (local)	Position time (UTC)	Sample Id	Lat.	Long.	Comments
10.30	08.30	GB09	52°45.41	003°18.33	Time reg. by sampling boat: 10.30 Pad: Teflon / Photo: 1 Pad coverage:100% Weather: overcast BAOAC: sheen
10.43	08.43	GB10	52°45.68	003°18.32	Time reg. by sampling boat: 10.43 Pad: Teflon-net / Photo: 2 Pad coverage:90% Weather: sun BAOAC: sheen
10.43	08.43	GB10	52°45.68	003°18.32	Time reg. by sampling boat: 10.43 Pad: Teflon-net / Photo: 2 Pad coverage:90% Weather: sun BAOAC: sheen /
10.46	08.47	GB11	52°45.71	003°18.45	Time reg. by sampling boat: 10.46 Pad: Teflon-net , Photo:1 Pad coverage:100% Weather: sun 003°18.BAOAC: Rainbow
10.50	08.53	GB12	52°45.78	003°18.58	Time reg. by sampling boat: 10.50 Pad: Teflon-net / Photo: 2 Pad coverage:100% Weather: sun BAOAC: Sheen
10.51	08.53	GB13	52°45.78	003°18.58	Time reg. by sampling boat: 10.51 Pad: Teflon-net / Photo: 1 Pad coverage:100% Weather: overcast BAOAC: Sheen
10.54	08.56	GB14	52°45.82	003°18.60	Time reg. by sampling boat: 10.54 Pad: Teflon-net / Photo: 1 Pad coverage:100% Weather: overcast BAOAC: Metallic
10.56	08.58	GB15	52°45.87	003°18.65	Time reg. by sampling boat: 10.56 Pad: Teflon-net / Photo: 1 Pad coverage:100% Weather: slightly overcast BAOAC: Metallic
10.59	09.00	GB16	52°46.90	003°18.70	Time reg. by sampling boat: 10.59 Pad: Teflon-net / Photo:1 Pad coverage:100% Weather: slightly overcast BAOAC: Metallic

Sampling time (local)	Position time (UTC)	Sample Id	Lat.	Long.	Comments
11.03	09.04	GB17/	52°46.92	003°18.78	Time reg. by sampling boat: 11.03 Pad:PP-pad / Photo:1 Pad coverage:100% Weather: sun BAOAC: Continuous
11.06	09.07	GB18	52°45.95	003°18.83	Time reg. by sampling boat: 11.06 Pad: PP-pad / photo: 1 Pad coverage:100% Weather: sun BAOAC: Discontinuous
11.11	09.12	GB19	52°45.02	003°18.92	Time reg. by sampling boat: 11.11 Pad: Teflon-net / Photo: 1 Pad coverage:100% Weather: slightly overcast BAOAC: Metallic / Rainbow
11.13	09.13	GB20	52°45.02	003°18.93	Time reg. by sampling boat: 11.13 Pad: PP-pad / Photo: 1 Pad coverage:100% Weather: slightly overcast BAOAC: Sheen (within rainbow / metallic area)

Summary : Grey boat. Sampling of spill B, IFO-30 19. June, 0830 – 1130:

Total 6 pp-pad samples and 14 Teflon samples, taken within all the 5 codes (i.e. sheen, rainbow, metallic, discontinuous and continuous areas)

Sampling log, BONNEX 2002”
June 19th. Spill C Release: 3m³ IF-30, released over 500 m
across the wind

Orange sampling Boat, Spill C, June 19th. afternoon:

Sampling time (local)	Position time (UTC)	Sample Id	Lat.	Long.	Comments
13.15		Oil release , start			Start releasing IFO-30 oil from Arca, Local time 13.15 ,
13.25		Oil release , stop			Stop releasing IFO-30 oil from Arca, Local time 13.25 , Spread over a distance of 500 m across the wind
1325					Sampling boats on the water, 1325
1300					Bonnex 0 arriving spill area, 1400
1407	1208	OC-01 Pad sample	52°46.9	003°31.0	Time reg. by sampling boat: 1407 Pad (taken by rod) Pad coverage:100% No of photos: 1 BAOAC: rainbow /(metallic)
14.09	1210	OC-02 Pad sample	52°46.9	003°31.0	Time reg. by sampling boat: 1409 Pad (taken by rod) Pad coverage:100% No of photos: no BAOAC: rainbow /(metallic)
14.11	1212	OC-03 Pad sample	52°47.0	003°31.1	Time reg. by sampling boat: 1411 Pad (taken by rod) Pad coverage:90% BAOAC: metallic
14.14	1215	OC-04 Teflon sample	52°46.9	003°31.3	Time reg. by sampling boat: 1414 Teflon net (taken by rod) / Photo: no Pad coverage: ? not a good sample BAOAC: rainbow
14.16	1217	OC-05 Teflon sample	52°46.9	003°31.3	Time reg. by sampling boat: 1416 Teflon net (taken by rod) / Photo: no Pad coverage:100% Good sample BAOAC: rainbow
14.21	1221	OC-06 Teflon sample	52°46.9	003°31.2	Time reg. by sampling boat: 1421 Teflon net (taken by rod) Pad coverage:100% Good sample No of photos: 2 BAOAC: sheen / (Rainbow ?)

Sampling time (local)	Position time (UTC)	Sample Id	Lat.	Long.	Comments
14.23	1223	OC-07 Teflon sample canceled	52°46.9	003°31.2	Time reg. by sampling boat: 1423 Teflon net (taken by rod) / Photo: no Pad coverage:? Sample canceled BAOAC: rainbow
14.25	1226	OC-08 Teflon sample	52°46.9	003°31.3	Time reg. by sampling boat: 1425 Teflon net (taken by rod) / Photo: no Pad coverage:100% Good sample BAOAC: sheen / rainbow
14.27	1228	OC-09 Teflon sample	52°46.9	003°31.3	Time reg. by sampling boat: 1427 Teflon net (taken by rod) Pad coverage:100% Good sample No of photos: no BAOAC: rainbow / metallic
14.28	1230	OC-10 Teflon sample	52°46.9	003°31.4	Time reg. by sampling boat: 1428 Teflon net (taken by rod) Pad coverage:100% Good sample No of photos: 2 BAOAC: rainbow
14.31	1233	OC-11 Teflon sample	52°46.9	003°31.4	Time reg. by sampling boat: 1431 Teflon net (taken by rod) Pad coverage:100% Good sample No of photos: no BAOAC: metallic / discont.
14.40	1241	OC-12 Pad sample	52°46.8	003°31.6	Time reg. by sampling boat: 1440 pad (taken by rod) Pad coverage:100% Good sample No of photos: no BAOAC: metallic.
14.43	1244	OC-13 pad sample	52°46.8	003°31.6	Time reg. by sampling boat: 1443 Pad (taken by rod) Pad coverage:100% Good sample No of photos:yes, a series: 4 BAOAC: continous.
14.46	1246	OC-14 Teflon sample	52°46.8	003°31.7	Time reg. by sampling boat: 1446 Teflon net (taken by rod) Pad coverage:100% Good sample No of photos: no BAOAC: continous..
14.47	1248	OC-15 pad sample	52°46.8	003°31.7	Time reg. by sampling boat: 1447 PP-padt (taken by rod) Pad coverage:100% No of photos: 4 BAOAC: metallic .

Sampling time (local)	Position time (UTC)	Sample Id	Lat.	Long.	Comments
14.49	1249	OC-16 Teflon sample	52°46.8	003°31.8	Time reg. by sampling boat: 1449 Teflon net (taken by rod) / Photo: no Pad coverage:100% Good sample BAOAC: metallic / rainbow.
14.53	1253	OC-17 Teflon sample	52°46.7	003°31.8	Time reg. by sampling boat: 1453 Teflon net (taken by rod) / Photo: no Pad coverage:100% Good sample BAOAC: sheen.
14.54	1255	OC-18 Teflon sample	52°46.7	003°31.9	Time reg. by sampling boat: 1454 Teflon net (taken by rod) Pad coverage:100% Good sample No of photos: total 6 pictures BAOAC: sheen.
14.58	1259	OC-19 Teflon sample	52°46.6	003°31.9	Time reg. by sampling boat: 1458 Teflon net (taken by rod) Pad coverage:100% Good sample / Photo: 1 BAOAC: sheen.
15.01	1302	OC-20 Pad sample	52°46.6	003°31.9	Time reg. by sampling boat: 1501 pad (taken by rod) Pad coverage:100% Good sample No of photos: No BAOAC: metallic.
15.04	1304	OC-21 Pad sample	52°46.5	003°31.9	Time reg. by sampling boat: 1504 Pad (taken by rod) Pad coverage:100% No of photos: No BAOAC: continuous.
15.05	1306	OC-22 Pad sample	52°46.5	003°32.0	Time reg. by sampling boat: 1505 pad(taken by rod) / Photo: no Pad coverage:100% BAOAC: continuous
15.11	1312	OC-23 Surface , emul- sion sample, 1L	52°46.6	003°32.2	Time reg. by sampling boat: 1511 Weathering sample.1L collected, settled for 10 min, transferred to 3 x 250 ml PP- bottles + 3x GC bottles for water content and emulsion stability: water content : 45-46 % water (method: by Alcopol). Emulsion: total stable after 12 h and 24h settling at room temp.. / Photo: no

Summary : Orange boat. Sampling of spill B, IFO-30 19. June, 1330 – 1510:

Total 15 pp-pad samples, 6 Teflon samples and 1 surface oil/emulsions samples, taken within all the 5 codes (i.e. sheen, rainbow, metallic, discontinues and continues areas)

Grey sampling Boat, Spill C, June 19th. afternoon:

Sampling time (local)	Position time (UTC)	Sample Id	Lat.	Long.	Comments
14.07	12.08	GC01	52°46.95	003°31.01	Time reg. by sampling boat: 14.07 Photo: 1 Pad: Teflon net Pad coverage:100% Weather: sun BAOAC: no visible oil / sheen
14.10	12.11	GC02	52°46.94	003°31.04	Time reg. by sampling boat:14.10 Photo: 1 Pad: Teflon net Pad coverage: 100% Weather: sun BAOAC: Sheen
14.12	12.13	GC03	52°46.93	003°31.08	Time reg. by sampling boat: 14.12 Photo: 2 Pad: PP-pad Pad coverage: 90% Weather: sun BAOAC: Metallic/ discontinuous
14.15	12.16	GC04	52°46.91	003°31.12	Time reg. by sampling boat: 14:15 Pad: PP-pad / Photo: 1 Pad coverage: 100% Weather: sun BAOAC: Discontinuous
14.17	12.18	GC05	52°46.92	003°31.18	Time reg. by sampling boat:14:17 Pad: teflon / Photo: 1 Pad coverage: 100% submerged during sampling Weather: sun BAOAC: Sheen
14.18	12.19	GC06	52°46.93	003°31.18	Time reg. by sampling boat: 14.18 Photo: 1 Pad: PP-pad Pad coverage: 100% Weather: sun BAOAC: Rainbow
14.19	12.21	GC07	52°46.92	003°31.23	Time reg. by sampling boat: 14.19 Photo: 1 Pad: teflon Pad coverage: 100% Weather: sun BAOAC: Rainbow
14.22	12.23	GC08	52°46.90	003°31.26	Time reg. by sampling boat: 14.22 Pad: teflon / Photo: 1 Pad coverage: 100% Weather: sun BAOAC: Sheen

Sampling time (local)	Position time (UTC)	Sample Id	Lat.	Long.	Comments
14.24	12.25	GC09	52°46.91	003°31.26	Time reg. by sampling boat:14.24 Pad: PP-pad (by hand)/ Photo: 1 Pad coverage: 100% Weather: sun BAOAC: Metallic
14.25	12.26	GC10	52°46.90	003°31.30	Time reg. by sampling boat14.25 Pad: PP-pad / Photo: 1 Pad coverage: 100% Weather: sun BAOAC: Metallic
14.27	12.29	GC11	52°46.91	003°31.32	Time reg. by sampling boat: 14.27 Pad:teflon / Photo: 2 Pad coverage: 100% Weather: sun BAOAC: Rainbow / Metallic (thick rainbow)
14.28	12.29	GC12	52°46.91	003°31.32	Time reg. by sampling boat: 14.28 Pad: PP-pad / Photo: 1 Pad coverage: 100% Weather: sun BAOAC: Discontinuous
14.37	12.39	GC13	52°46.79	003°31.43	Time reg. by sampling boat: 14.37 Photo: 1 Pad: PP-pad Pad coverage: 100% Weather: slightly overcast BAOAC: Discontinuous
14.41	12.41	GC14	52°46.78	003°31.54	Time reg. by sampling boat: 14.41 Photo: 1 Pad: teflon Pad coverage: 100% Weather: sun BAOAC: Rainbow
14.44	12.45	GC15	52°46.75	003°31.61	Time reg. by sampling boat: 14.44 Photo: 1 Pad: teflon Pad coverage: 100% Weather: slightly overcast BAOAC: Sheen
14.48	12.49	GC16	52°46.71	003°31.68	Time reg. by sampling boat: 14.48 Photo: 2 Pad:teflon Pad coverage: 100% Weather: slightly overcast BAOAC: Rainbow

Sampling time (local)	Position time (UTC)	Sample Id	Lat.	Long.	Comments
14.50	12.52	GC17/	52°46.68	003°31.73	Time reg. by sampling boat: 14.50 Photo: 1 Pad: PP-pad (by hand) Pad coverage: 100% Weather: sun BAOAC: Metallic
14.50	12.52	GC18	52°46.68	003°31.73	Time reg. by sampling boat: 14.50 Photo: 1 Pad: PP-pad Pad coverage: 100% Weather: slightly overcast BAOAC: Discontinuous
14.51	12.53	GC19	52°46.68	003°31.75	Time reg. by sampling boat :14.51 Photo: 1 Pad: PP-pad Pad coverage: 100% Weather: slightly overcast BAOAC: Continuous
14.53	12.55	GC20	52°46.65	003°31.76	Time reg. by sampling boat: 14.53 Photo: 1 Pad: teflon Pad coverage: 100% Weather: slightly overcast BAOAC: Sheen
14.55	12.56	GC21	52°46.63	003°31.82	Time reg. by sampling boat: 14.55 Pad: teflon / Photo: 1 Pad coverage: 100% Weather: slightly overcast BAOAC: Rainbow
14.57	12.58	GC22	52°46.59	003°31.86	Time reg. by sampling boat: 14.57 Pad: teflon / Photo: 1 Pad coverage: 100% Weather: slightly overcast BAOAC: Rainbow
14.58	12.59	GC23	52°46.58	003°31.88	Time reg. by sampling boat: 14.58 Pad: teflon net/ Photo: 1 Pad coverage: 100% possibly saturated teflon net Weather: slightly overcast BAOAC: Metallic
15.00	13.01	GC24	52°46.56	003°31.93	Time reg. by sampling boat : 15.00 Pad: teflon / Photo: 1 Pad coverage: 100% Weather: sun BAOAC: Sheen

15.08	13.10	GC25	52°46.47	003°32.26	Time reg. by sampling boat: 15.08 Photo: 1 Pad: Teflon (might be slightly bigger than other pads used in trials) Pad coverage: 100% Weather: sun BAOAC: No visible oil / blank test 50 meters outside of slick
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Summary : Grey boat. Sampling of spill B, IFO-30 19. June, 1330 – 1510:

Total 10 PP-pad samples and 15 Teflon samples, taken within all the 5 codes (i.e. sheen, rainbow, metallic, discontinuous and continuous areas)