Annex A

List of Participants

Member of the Scientific Committee/National delegate (SC); Invited Participant (IP); and Observer (O)

Alex Aguilar (IP)
Dept. Animal Biology
Faculty of Biology
University of Barcelona
Barcelona
SPAIN
Tel: 34-3-319-8959
Fax: 34-3-411-0887
e-mail: alexa@porthos.bio.ub.es

Pierre Béland (IP)
St. Lawrence National Institute of Ecotoxicology
460 Champ-de-Mars #504
Montreal, Quebec
CANADA
H2Y 1B4
Tel: 1-514-499-3499
Fax: 1-514-982-1788
e-mail: belandp@cam.org

Jonny Beyer (SC)
Laboratory UF Marine Molecular Biology
University of Bergen, HiB
N-5020 Bergen
NORWAY
Tel: 47-5554-4375
Fax: 47-5554-4373
e-mail: jonny.beyer@lmm.uib.no

Arne Bjørge (SC)
Institute of Marine Research
PO Box 1870 Nordnes
N-5024 Bergen
NORWAY
Tel: 47-5523-8608
Fax: 47-5523-8617
e-mail: arnebj@imr.no

Jacob de Boer (IP)
RIVO-DLO
PO Box 68
1970 AB IJmuiden
THE NETHERLANDS
Tel: 31-255-564736
Fax: 31-255-564644
e-mail: jacob@rivo.dlo.nl

Jan P. Boon (IP)
Netherlands Institute for Sea Research (NIOZ)
PO Box 59
1790 AB Den Burg
Texel
THE NETHERLANDS
Tel: 31-222-369466/369300
Fax: 31-222-319674
e-mail: boon@nioz.nl

Asunción Borrell (IP)
Dept. Animal Biology
Faculty of Biology
University of Barcelona
Diagonal 645
08028 Barcelona
SPAIN
Tel: 34-3-319-8959
Fax: 34-3-411-0877
e-mail: assump@porthos.bio.ub.es

Bram Brouwer (IP)
Department of Toxicology
Agricultural University
PO Box 8000
6700 EA Wageningen
THE NETHERLANDS
Tel: 31-317-48397/482137
Fax: 31-317-484931
e-mail:
bram.brouwer@algemeen.tox.wau.nl

Kevin Brown (IP)
Centre for Overseas Research and Development
Department of Geography
University of Durham
Science Laboratories
South Road
Durham
DHL 3LE
UK
Tel: 44-191-3742495
Fax: 44-191-3742495
e-mail: kevin.brown@durham.ac.uk

Robert L. Brownell, Jr (SC)
Southwest Fisheries Science Center
PO Box 271
La Jolla
California 92038
USA
Tel: 1-619-546-7165
Fax: 1-619-546-5653
e-mail: brownell@caliban.ucsd.edu

Florence Caurant (IP)
Institut D'Ecologie Appliquee
Universite Catholique de L'Ouest
3, Place Andre Leroy B.P. 808
49008 Angers Cedex 01
FRANCE
Tel: 33-41-81-66-17
Fax: 33-41-81-66-74

B. Clausen (IP)
Environmental Investigation Agency
Min. of Environment
Fredriksbergvej 399 Box 358
4000 Roskilde
DENMARK
Tel: 45-46-301200
Fax: 45-46-301114

Theo Colborn (IP)
World Wildlife Fund
1250 Twenty Fourth Street NW
Washington, DC 20037
USA
Tel: 1-202-778-9643
Fax: 1-202-293-9211
e-mail: colborn+r%wwfus@mcimail.com

A. Morrie Craig (IP)
College of Vet. Medicine
Oregon State University
Corvallis OR 97331
USA
Tel: 1-503-737-3036
Fax: 1-503-737-0502

Greg Donovan (SC)
International Whaling Commission
The Red House
135 Station Road
Histon, Cambridge
CB4 4NP
UK
Tel: 44-1223-233971
Fax: 44-1223-232876
e-mail: gregiwc@compuserve.com

John Frizell (O)
5 Lancaster Street
Lewes
E. Sussex
BN7 2PX
UK
Tel: 44-1273-476839
Fax: 44-1273-471431

Yoshihiro Fujise (SC)
The Institute of Cetacean Research
Tokyo-Suisan Bldg
4-18, Toyomi-cho
Chuo-ku, Tokyo 104
JAPAN
Tel: 81-3-3536-6521
Fax: 81-3-3536-6522

Bjorn Munro Jenssen (SC)
Department of Zoology
University of Trondheim
N-7055 Dragvoll
NORWAY
Tel: 47-7359-6267
Fax: 47-7359-1309
e-mail: bmj@alfa.avh.unit.no

Paul D. Jones (IP)
ESR Environmental
Wellington Science Center
PO Box 30-547
Lower Hutt
NEW ZEALAND
Tel: 64-4-570-1555 ext 8623
Fax: 64-4-569-4500
e-mail: jonesp%ehadmin@lincoln.cri.nz

So Kawaguchi (SC)
National Research Institute of Far Seas Fisheries
5-7-1 Orido
Shimizu 424
JAPAN
Tel: 81-543-34-0715
Fax: 81-543-35-9642
e-mail: kawaso@enyo.affrc.go.jp

Seamus Kennedy (IP)
Veterinary Sciences Division
Dept. of Agriculture for N. Ireland
Stoney Road
Stormont
BELFAST
BT4 3SD
Tel: 44-1232-525701
Fax: 44-1232-525767

Jarle Klungsøyr (SC)
Institute of Marine Research
PO Box 1870 Nordnes
5024 Bergen
NORWAY
Tel: 47-5523-8500
Fax: 47-5523-8584
e-mail: jarle.klungsoyr.@imr.no

Margaret (Peggy) Krahn (IP)
NOAA/NMFS/E.C. Division
2725 Montlake Blvd E
Seattle, WA 98112
USA
Tel: 1-206-860-3326
Fax: 1-206-860-3335
e-mail: pkrahn@sci.nwfsc.noaa.gov

Robin J. Law (IP)
Ministry of Agriculture, Fisheries and Food
Fisheries Laboratory
Remembrance Avenue
Burnham on Crouch
Essex
CM0 8HA
UK
Tel: 44 -1621-782658
Fax: 44-1621-784989
e-mail: r.j.law@dfr.maff.gov.uk

Daniel Martineau (IP)
Dept. Pathology
College of Veterinary Medicine
University of Montreal
Saint-Hyacinthe P.Q.
J2S 7C6
CANADA
Tel: 514-773-8521
Fax: 1-514-7788113
e-mail: martinea@ere.umontreal.ca

Michael Moore (IP)
Biology Department
Redfield 342
Woods Hole Oceanographic Institution
Woods Hole
MA 02543-1049
USA
Tel: 1-508-289-3228
Fax: 1-508-457-2169
e-mail: mmoore@aqua.whoi.edu

Nils Øien (SC)
Institute of Marine Research
PO Box 1870 Nordnes
N-5024 Bergen
NORWAY
Tel: 47-5523-8605
Fax: 47-5523-8617
e-mail: nils@imr.no

Torger Oritsland (SC)
c/o Marine Mammal Division
Institute of Marine Research
PO Box 1870 Nordnes
N-5024 Bergen
NORWAY
Tel: 47-5523-8611
Fax: 47-5523-8387

Thomas O'Shea (IP)
National Biological Service
Midcontinent Ecological Science Center
4512 McMurray Ave
Fort Collins
Colorado 80525-3400
USA
Tel: 1-303-226-9397
Fax: 1-303-226-9230
e-mail: osheat@mail.fws.gov

Teresa Pastor (IP)
Dept. Animal Biology
University of Barcelona
Av. Diagonal 645
08028 Barcelona
SPAIN
Tel: 34-3-319-8959
Fax: 34-3-411-0887
e-mail: pastor@porthos.bio.ub.es

David Peakall (IP)
17 St. Mary's Road
Wimbledon
London
SW19 7BZ
UK
Tel: 44-181-9470573
Fax: 44-181-9468785

Sian Pullen (IP)
WWF UK
Panda House
Weyside Park
Catteshall Lane
Godalming
Surrey, GU7 1XR
UK
Tel: 44-1483-426444
Fax: 44-1483-426409

Peter J.H. Reijnders (SC)
Institute for Forestry and Nature Research
Dept. Aquatic Ecology
PO Box 167
1790 AD Den Burg
THE NETHERLANDS
Tel: 31-222-369700
Fax: 31-222-319235
e-mail: p.j.h.reijnders@ibn.dlo.nl

Kate Sanderson (O)
NAMMCO
University of Tromsø
9007 Tromsø
NORWAY
Tel: 47-7764-5903
Fax: 47-7764-5905
e-mail: kates@nammco.no

M.P. Simmonds (IP)
Whale and Dolphin Conservation Society
Alexander House
James Street West
Bath
BA1 2BT
UK
Tel: 44-1225-334511
Fax: 44-1225-480097

Janneche Utne Skåre (SC)
Department of Toxicology and Chemistry
Central Veterinary Laboratory
PO Box 8156 Dep.
0033 Oslo
NORWAY
Tel: 47-2296-4500
Fax: 47-2296-4850

Michael Smolen (O)
World Wildlife Fund
1250 Twenty-Fourth St. NW
Washington DC 20037-1175
USA
Tel: 1-202-861-8354
Fax: 1-202-293-9211
e-mail: smolen+r%wwfus@mcimail.com

John Stein (IP)
Environmental Conservation Division
Northwest Fisheries Science Center
2725 Montlake Blvd. E.
Seattle, WA 98112-2097
USA
Tel: 1-206-860-3330
Fax: 1-206-860-3335
e-mail: jstein@sci.nwfsc.noaa.gov

Allan Thornton (O)
Environmental Investigation Agency
2 Pear Tree Court
London
UK
Tel: 44-171-4907040
Fax: 44-171-4900436

Donald Tillitt (IP)
US Dept. of Interior
National Biological Service
4200 New Haven Road
Columbia, MO 65201
USA
Tel: 1-314-875-5399
Fax: 1-314-876-1896
e-mail: tillittd@mail.fws.gov

Lars Walløe (SC)
Department of Physiology
University of Oslo
PO Box 1103 Blindern
0317 Oslo
NORWAY
Tel: 47-2285-1218
Fax: 47-2285-1249
e-mail: lars.walloe@basalmed.uio.no

Geir Wang-Anderson (O)
Greenpeace Norway
Post Box 6803 St. Olavsplass
0130 Oslo
NORWAY
Tel: 47-2220-5101
Fax: 47-2220-5114
e-mail: geir.wang-andersen@green2.dat.de

Annex B

Agenda

1. Introduction (including arrangements for Workshop)
2. Adoption of Agenda
3. Keynote presentations
   - 3.1 Individual variation in contaminant levels
   - 3.2 Xenobiotics and metabolism
   - 3.3 Cancer in cetaceans, a potential biomarker of environmental contamination
   - 3.4 Epidemiology/epizootics and contaminants
   - 3.5 Significance and potential of biomarkers in marine mammal toxicology
4. Effects of chemical pollution on cetaceans
   - 4.1 Direct effects
     - 4.1.1 Lethal effects
     - 4.1.2 Sub-lethal effects
       - 4.1.2.1 Diseases
       - 4.1.2.2 Reproduction and early development
       - 4.1.2.3 Immune suppression
       - 4.1.2.4 Cancer induction and mutagenic effects
       - 4.1.2.5 Behaviour
       - 4.1.2.6 Epizootics
   - 4.2 Indirect effects
5. Research implications
   - 5.1 Consideration of synergistic/cumulative effects
   - 5.2 Exotic compounds
   - 5.3 Adequacy of present monitoring
     - 5.3.1 Sources of samples
     - 5.3.2 Biomarkers
     - 5.3.3 Biological variables
     - 5.3.4 Pathology examinations
     - 5.3.5 Specimen banking
   - 5.4 Further evaluation of the relationship between toxic burden and impacts
   - 5.5 Risk and hazard assessment techniques
   - 5.6 Trends in global contamination
   - 5.7 Identification of additional areas of concern
   - 5.8 Review of submitted proposals
6. Implications for the future work of the IWC Scientific Committee
7. Recommendations
8. Publications
9. Adoption of Report

Annex C

List of Documents

SC/M95

SC/M95/P1. BOON, J.P. Monitoring concentrations of organochlorines, and biochemical and immunological effects in samples of living marine mammals. An introductory note on the possibilities.

SC/M95/P2. MOORE, M.J., MILLER, C.A., WHITE, R.D., SHEA, D., WEISBROD, A.V. and STEGEMAN, J.J. Histological and cytochrome P4501A expression in tissues of pilot whales, *Globicephala melaena*, stranded on Cape Cod, MA USA.

SC/M95/P3. CAURANT, F. Cadmium and mercury in pilot whales: physico-chemical forms of storage and potential hazard to the species.

SC/M95/P4. COLBORN, T. and SMOLEN, M. An epidemiological analysis of persistent organochlorine contaminants in large cetaceans.

SC/M95/P5. CRAIG, A.M., ORPIN, C.G. and BLYTHE, L.L. Biotransformation of marine pollutants, particularly crude oil alkanes, by forestomach bacteria from the bowhead whale. [Research Proposal.]

SC/M95/P6. AGUILAR, A., BORRELL, A. and PASTOR, T. Factors affecting variability of persistent pollutant levels in cetaceans.

SC/M95/P7. BORRELL, A. Summary of temporal trends in pollutant levels observed in marine mammals.

SC/M95/P8. BROUWER, A. Metabolism of xenobiotics in laboratory animals and wildlife species: potential impact on physiology and health.

SC/M95/P9. PEAKALL, D.B. Biomarkers as pollution indicators with special reference to cetaceans.

SC/M95/P10. MARTINEAU, D., LAIR, S., DE GUISE, S. and BELAND, P. Cancer in cetaceans, a potential biomarker for environmental contamination.

SC/M95/P11. SIMMONDS, M.P. Marine mammal mass mortality events: Environmental influences and science.

SC/M95/P12. DONOVAN, G.P. Pollution references on the IWC database.

SC/M95/P13. TANABE, S., AONO, S., FUJISE, Y., KATO, H. and TATSUKAWA, R. Persistent organochlorine residues in the Antarctic minke whale, *Balaenoptera acutorostrata*.

SC/M95/P14. FISHERIES AGENCY GOVERNMENT OF JAPAN. Project of global environment monitoring with fishing vessel network.

SC/M95/P15. KENNEDY, S. Morbillivirus epizootics in aquatic mammals.

SC/46

SC/46/O 8. REIJNDERS, P.J.H. Contaminants and cetaceans: Reasons for concern?

SC/46/O 12. JONES, P.D., HANNAH, D.J., BUCKLAND, S.J., VAN MAANEN, T., LEATHEM, S.V., DAWSON, S., SLOOTEN, E., VAN HELDEN, A. and DONOGHUE, M. Planar chlorinated hydrocarbons in New Zealand marine mammals.

SC/46/O 14. MOSCROP, A. and SIMMONDS, M.P. The significance of pollution for marine cetaceans.

SC/46/O 16. BROWN, K. Requirements for a comprehensive assessment of pollution in cetaceans: quantification, evaluation and absolute threat of pollutants.

SC/46/O 20 (revised). BOWLES, D. An overview of the concentrations and effects of heavy metals in cetacean species.

SC/46/RP4. CAURANT, F., BLOCH, D., MOREAU, A., BALLAN-DUFRANCAIS, C. and ALGOET, M. Histo-pathology of kidney and liver tissues of the pilot whales off the Faroe Islands, related with high levels of cadmium and mercury. [Research Proposal.]

Annex D

Glossary

Aromatic hydrocarbon (Ah) receptor. A protein that binds dioxins, dibenzofurans, non-*ortho* and mono-*ortho* PCBs, and 4 and 5 ring hydrocarbons.

Assays. Procedure for measurement or identification.

Biomarker. A biological response to a chemical or chemicals that give a measure of exposure and sometimes, also of toxic effect.

PCB Congeners. One of the 201 chemical forms of the **P**oly**C**hlorinated **B**iphenyls. These are identified by numbers, e.g. OH-PCB-77, hydroxylated polychlorinated biphenyl, number 77.

Cytochrome P450 1A (CYP-1A). An enzyme found in epithelia and endothelia, that is induced by and metabolises dioxin, dibenzofurans, some PCBs, and 4 and 5 ring hydrocarbons. The protein concentration is commonly measured as a biomarker for the exposure and effect of those compounds.

DNA adducts. Covalent binding of pollutants, especially the polynuclear aromatic hydrocarbons (PAHs), to DNA. This clearly indicates exposure of the organism to the pollutant.

Endocrine disruptor. Any compound that interacts with reproductive physiology to alter normal expression of sexually dimorphic form and/or function.

Ethoxyresorufin-O-deethylase (EROD). A model substrate for metabolism by CYP-1A. The EROD activity is used in conjunction with CYP-1A as a biomarker of exposure to and effect of Ah receptor activating compounds.

Halogenated aromatic hydrocarbons (HAHs). Synthetic compounds containing chlorine, fluorine or bromine atoms, such as PCBs, pesticides and brominated fire retardants.

Hazard assessment. Estimation of potential risk.

Hepa1c1c7. Liver tumour cell line.

Immunosuppression. A measureable alteration in any component(s) of the immune system that is likely to result in increased susceptibility to disease.

Mixed function oxidases (MFOs). A group of enzymes that are capable of metabolising a wide range of natural and unnatural chemicals. The function of these enzymes is to increase excretion of potentially harmful chemicals, but in the case of man-made compounds the metabolites may be more toxic than the original compound.

OH-PCB-77. Hydroxilated polychlorinated biphenyl, number 77.

Persistent induction of biotransformation enzymes. Continous triggering of metabolisation enzymes.

Polychlorinated biphenyls (PCBs). Synthetic compounds used for electrical capacitors in the 1950s to 1970s.

Polycyclic aromatic hydrocarbons (PAHs). Large groups of naturally occurring aromatic compounds containing two or more benzene rings fused together. Also, oil compounds derived directly (petrogenic) or indirectly via combustion (pyrogenic). Some of these compounds, such as benzo(*a*)pyrene, are known carcinogens.

Risk assessment. Estimation of extent of risk.

Residue levels. Concentrations of contaminants in substrate (e.g. soil, fluid, tissue).

T_4-binding competition on TTR. Hepatic thyroxine binding competition on transthyretin.

Xenobiotics. Foreign substances to a living organism (e.g. contaminants).

ABBREVIATIONS OF CHEMICAL COMPOUNDS

3,3',4,4'-TeCB - tetrachlorobiphenyl.
CPs - chlorinated paraffins.
HCB - hexachlorobenzene.
HCHs - hexachlorocyclohexanes.
MSF - methylsulphate.
MSF-PCBs - methylsulphate-PCBs.
OC - organochlorines.
OH - organohalogens.
OH-PCBs - hydroxy-PCBs.
PAH - polycyclic aromatic hydrocarbons.
PBBs - polybrominated biphenyls.
PBDEs - polybrominated diphenylethers.
PCBs - polychlorinated biphenyls.
PCDDs - polychlorinated dibenzo-p-dioxins.
PCDEs - polychlorinated diphenylethers.
PCDFs - polychlorinated dibenzofurans.
PCNs - polychlorinated naphthalenes.
PCTs - polychlorinated terphenyls.
TBT - tributyl tin.
TCP - tris (G-chlorophenyl) methanol.
TCPMe - tris (G-chlorophenyl) methane.
TPT - triphenyl tin.

Annex E

Priorities in Pathology

D. Martineau

INTRODUCTION

The following protocol is intended to further research into the chronic toxicity of organochlorinated compounds (OC) in cetaceans. OC toxicity has been well documented in domestic and laboratory animals. These compounds are known to induce squamous metaplasia of various glands (including mammary glands), to be oestrogenic and to produce mucous metaplasia in glandular stomachs and gastric erosions. A general record of each animal should be kept, including age, sex, reproductive status and, when available, the cause of death. Relevant OC contamination levels in the examined animal should be obtained. The severity and nature of the lesions might be ultimately correlated with OC levels in order to obtain a 'dose-response' relation.

It must be stressed that this protocol is not designed to determine the cause of death. Whenever possible, one should seek ideal conditions for post-mortem examination. These should include a complete, careful examination performed by trained personnel in an appropriate facility. In many field situations, these requirements cannot be fulfilled. Further information is provided in Kuiken and García Hartmann (1993).

GENERAL PROCEDURE

Thin, flat sections (approximately 3mm thick, 1cm wide and 2cm long) should be cut and placed in neutral buffered 10% formalin.

Abnormalities: the size, shape, number and colour of any abnormalities should be described using simple terms, for example: 'a dozen randomly distributed, (1cm-diameter) round, dark red areas surrounded by a pale (2mm thick) halo are present on the lower aspect of the heart'.

SAMPLES REQUIRED FOR DETECTION OF CHRONIC OC TOXICITY

Thyroid glands: cut gland parallel to its long axis, before fixation.

Lungs: total of six sections:

Left lung:	cranial	Right lung:	cranial
	middle		middle
	caudal		caudal

Stomach: a section of the mucosa of each stomach. If ulcers are present, a section of the lesion and a section of normal bordering tissue.

Liver: three sections: middle and both sides.

Kidney: three sections of each: cranial, middle, caudal.

Adrenal glands: cut both glands parallel to their long axis, before fixation.

Mammary glands: three sections of each: cranial, middle, caudal.

Uterus: three transverse sections of each uterine horn at various levels (total of six sections).

REFERENCE

Kuiken, T. and García Hartmann, M. 1993. Proceedings of the First European Cetacean Society Workshop on Cetacean Pathology: dissection techniques and tissue sampling. *ECS Newsletter* 17:1-39.