Agenda Item 5.2

Implementation of the Triennium Work Plan (2010-2012)- Other Issues
Review of New Information on Pollution and its Effect

Document 5-03

Report of the ECS/ASCOBANS/ACCOBAMS Workshop on Chemical Pollution and Marine Mammals

Action Requested

- Take note of the report and recommendations
- Comment and provide guidance on follow-up

Submitted by

ECS / Secretariat

NOTE:
IN THE INTERESTS OF ECONOMY, DELEGATES ARE KINDLY REMINDED TO BRING THEIR OWN COPIES OF DOCUMENTS TO THE MEETING

Report of the ECS/ASCOBANS/ACCOBAMS Workshop on Chemical Pollution and Marine Mammals, 20 March 2011, Cadiz, Spain

Around fifty persons specialising in marine mammal toxicology and ecology from 12 countries participated in a workshop on the subject of chemical pollution and its effects upon cetaceans and seals, reviewing current levels of pollutants across Europe, long-term trends, and biological effects upon marine mammals at the individual and population level. The workshop was held in Cadiz at the 25th Annual Conference of the European Cetacean Society, with support from ASCOBANS and ACCOBAMS, and was co-organised by Peter Evans and Mark Simmonds.

The main purpose of the workshop was:

To make an assessment of the current level of understanding of the risks posed by chemical pollution to cetaceans and seals in the North East Atlantic, Baltic, Mediterranean and Black Sea regions, and to make recommendation for future investigations and appropriate actions to address threats.

A number of invited talks were presented, under two main themes:

1. Insights from long-term datasets
- Long-term time trends in organohalogen concentrations in blubber of UK porpoises – *Robin Law*
- Linking PCB exposure with mortality due to infectious disease – *Paul Jepson*

2. Pollution trends & effects
- New insights in the toxicology of marine mammals: Use of free-ranging harbour seals from the Wadden Sea - *Krishna Das et al.*
- Pollutant exposure and effects in southern Europe: the case study of striped dolphin – *Cristina Panti & Cristina Fossi*
- Cause of death and PCBs in harbour porpoises stranded on the coast of Belgium and northern France – *Thierry Jauniaux & Liesbeth Weijs*
- Assessing the relationship between morbillivirus epizootic virulence & organochlorine levels in Mediterranean striped dolphins – *Juliana Castrillón et al.*
- Trace element trends & effects for small cetaceans in European waters – *Florence Caurant & Paco Bustamante*
- Patterns in pollutant burdens in common dolphins and harbour porpoises – *Graham Pierce et al.*

The main findings from these presentations are summarised below:

- PCB concentrations in UK porpoise blubber have levelled off following earlier declines. Possible reasons include the use of sealants in buildings during the 1950s-1970s

- UK Porpoises with PCB levels above 17mg/kg lipid wt are more likely to have died of infectious disease; bottlenose dolphin & orca may be particularly vulnerable since they have average levels well above that

• In Belgian & North French porpoises, PCB levels are higher in adult males, with lymphoid depletion being more severe in infectious disease cases which also had higher PCB levels

• High levels of T-Hg, PCBs & PBDEs were found in North Sea seals; in vitro exposure revealed immunotoxicity even at low concentrations, with no evidence of immunoprotection from selenium

• Application of innovative non-lethal tools shows great potential – gene expression analysis was used to assess toxicological impact on striped dolphin populations

• Mediterranean striped dolphin epizootic event in 2007-08 was unlikely to be enhanced by their OC concentrations which, although high, do not seem to have affected their immune systems (contrasting with the situation in the 1990-92 epizootic)

• Direct effects of trace metals on cetaceans in Europe are probably very low, but there are possible indirect effects, e.g. immunodeficiency. The metals of most concern appear to be methyl mercury, cadmium and lead

• BIOCET Project – pollutant burdens in common dolphin & harbour porpoise: do PCB concentrations in blubber affect female reproductive success or population pregnancy rates? In common dolphins, persistent organic pollutant (POP) levels in blubber were related to location, diet, size and reproductive status whereas in harbour porpoises, they were more strongly related to condition and toxic element burden; in common dolphins, PCB levels were highest in females that were not pregnant, whilst the number of corpora albicantia was related to the PCB levels suggesting a possible effect on ovulation. Reproductive effects on porpoises appeared to be strongest in the southern North Sea where potential prey had high PCB levels

The afternoon session was devoted to discussion of key findings and information gaps, and the following recommendations were made for priority areas of research:

1) *Research on understudied contaminants or those of particular concern*
• PCBs, brominated flame retardants (BFRs) and perfluorinated compounds (PFCs) are priority compounds for further research
• Trace elements also require study (e.g. for understanding detoxification processes in methyl-mercury and cadmium)
• All chemicals found at high concentrations in estuaries & coastal waters should be considered for study offshore (in accordance with EU Water Framework Directive assessments)

2) *Research on effects at individual level*
• Risk assessment, including predictive modelling should be undertaken
• *In vitro* tests should be conducted to explore effects of emerging contaminants
• Diagnostic biomarkers should be further developed

3) *Research on effects at population level*
• Risk assessment, including predictive modelling
• Inshore and offshore populations or fragmented populations should each be studied and compared
• Transients and their pollutant levels should be examined
• Possible ecotypes should be compared
• Parallel ecological and dietary studies should be undertaken
• Dose-response curves (e.g. harbour porpoise) should be established
• Screening for tumours

4) *Research in geographic areas*
• Greater focus upon Baltic, Mediterranean, and Black Sea where pollutant levels have generally been higher than elsewhere
• Comparisons of high *vs* low exposure area studies (involving collaborative studies between countries)
• More detailed examination of the role of diet (seasonal and temporal variation)

5) *Research on particular species*
• Continue current monitoring programs (e.g. harbour porpoise, seals)
• Focus upon bottlenose dolphins throughout the region
• Harbour porpoise in the Baltic & Black Sea
• Orcas throughout the region (sample sizes remain very low)
• Common dolphins, long-finned pilot whales, and fin whales should be targeted in the Mediterranean
• Grey, harbour, ringed and monk seals throughout their range

6*) Studies using Biomarkers including gene expression analyses*
• Investigate hydrocarbon receptor binding affinity (focusing upon common dolphins in the Mediterranean, bottlenose dolphins, and orcas)
• Develop biomarkers on non-threatened species so that they can be applied later to other rarer species
• Develop diagnostic biomarkers
• Use immune histochemistry techniques
• Undertake stress/sex hormone assays

Biomarker studies of POPs in blood that are related to genotoxic (epigenetic) effects enable one to investigate if and to what extent toxic effects are actually occurring, and to what extent blood parameters are indicative of effects upon organisms. The reasoning for this approach is that many environmental compounds can turn genes on and off, and this can, for example, lead to endocrine and reproductive disruption and, ultimately, reduced population viability.

It is proposed that the proceedings of this workshop, including short papers contributed by the invited speakers, should be published as a special issue. Three potential speakers (Randy Wells, Peter Reijnders and Ayaka Özturk) were unable to attend but will be invited to provide written contributions.