Report: ASCOBANS Marine Pollution Working Group.

M P Simmonds

Thanks to WDC for helping to compile this report.

Overview: since the last meeting there has been considerable interest in the threat posed by marine debris to cetaceans, notably through the IWC’s work-streams (see below and annex 1). Work on xenobiotics continues in the IWC’s Scientific Committee (here: <https://archive.iwc.int/pages/view.php?ref=3436>) and in summary: The IWC Pollution 2020 Steering Group Meeting report (SC/65b/Rep05) noted that the last 4 years have seen the completion of Phases II and III of the Pollution 2000+ initiative, which has included the finalisation of an individual-based model that can be used to investigate the effects of pollution (particularly polychlorinated biphenyl or PCB) exposure on cetacean populations (Hall et al., 2013). The major points identified were that: (1) the model should include the ability to change the annual accumulation over time, as this would better reflect the gradual decrease in environmental PCBs; (2) the vital rates used to parameterise both the dolphin and the humpback model may need to be updated; (3) a major source of uncertainty in the model relates to the parameters that control the offloading of PCBs from mothers to their calves; and (4) currently, there is no uncertainty incorporated into the model around the relationship between immune function and reduced survival probability. Work on prioritising current contaminants of concern for cetaceans remains important to the SWG and efforts to complete this task should be continued. The Committee commended this work and recognised that the development of a practical modelling tool provides an important step in the Committee’s ability to quantify the effects of chronic threats to cetaceans. The Committee endorses the steering committee advice and recommends the addition of leachate and adsorbed chemicals from microplastics to the questionnaire that will be circulated among experts for input on chemicals of concern. In addition, the Committee recognises that continued investigation into the effects of chemicals adsorbed to microplastics, on cetaceans, is needed.

The committee also considered a report from the Deepsea Horizon oil spill: Health assessments of bottlenose dolphins in Barataria Bay, Louisiana (an area that received heavy and prolonged oiling) and Sarasota Bay, Florida (control site) were conducted in 2011 (Schwacke et al., 2014). Barataria Bay dolphins showed evidence of hypoadrenocorticism, consistent with adrenal toxicity and were five times more likely to have moderate to severe lung disease. The Committee commended this work and recommended that these studies

continue.

There is also work ongoing under the auspices of OSPAR on the development of a Blubber Toxicity Threshold indicator.

**Other Recent Key Publications**.

1. Marine debris

 Evaluating the impacts of marine debris on cetaceans
Baulch, S. & Perry, C.  2014 *Marine Pollution Bulletin* 80: 210-221

Knowledge of the severity of effects of marine debris lags behind that for other species groups. This literature review examines the impacts of marine debris on cetaceans reported to date. It finds that ingestion of debris has been documented in 48 (56% of) cetacean species, with rates of ingestion as high as 31% in some populations. Debris-induced mortality rates of 0-22% of stranded animals were documented, suggesting that debris could be a significant conservation threat to some populations.

Plastic debris in the open ocean
Cozar, A; Echevarría, F; Gonzalez-Gordillo, J.I; Irigoien, X; Ubeda, B; et al. 2014 *PNAS.*

Using data from the Malaspina 2010 circumnavigation, regional surveys, and previously published reports, we show a worldwide distribution of plastic on the surface of the open ocean, mostly accumulating in the convergence zones of each of the five subtropical gyres with comparable density. However, the global load of plastic on the open ocean surface was estimated to be on the order of tens of thousands of tons, far less than expected. Our observations of the size distribution of floating plastic debris point at important size-selective sinks removing millimeter-sized fragments of floating plastic on a large scale. This sink may involve a combination of fast nano-fragmentation of the microplastic into particles of microns or smaller, their transference to the ocean interior by food webs and ballasting processes, and processes yet to be discovered. Resolving the fate of the missing plastic debris is of fundamental importance to determine the nature and significance of the impacts of plastic pollution in the ocean.

Report of the IWC Workshop on Mitigation and Management of the Threats Posed by Marine Debris to Cetaceans

IWC/65/CCRep04 96 pages and available here: <https://archive.iwc.int/pages/view.php?ref=3497> See annex 1 below for summary.

Classify plastic waste as hazardous
Rochman, C.M; Browne, M.A; Halpern, B.S; Hentschel, B.T; Hoh, E; Karapanagioti, H.K; Rios-Mendoza, L.M; Teh, S. & R.C. Thompson 2013 *Nature* 494: 169-171

Plastic debris can physically harm wildlife. Moreover, many plastics may be chemically harmful in some contexts — either because they are themselves potentially toxic or because they absorb other pollutants. Yet in the United States, Europe, Australia and Japan, plastics are classified as solid waste — so are treated in the same way as food scraps or grass clippings. **...** We believe that if countries classified the most harmful plastics as hazardous, their environmental agencies would have the power to restore affected habitats and prevent more dangerous debris.

1. **Other Pollutants**

Associations between Pefluoroalkyl compounds and immune and clinical chemistry parameters in highly exposed bottlenose dolphins (*Tursiops truncatus*).
Fair, P.A; Romano, T; Scheafer, A.M; Reif, J.S; Bossart, G.D; Houde, M; Muir, D; Adams, J; Rice, C; Hulsey, T.C. & Peden-Adams, M.  2013. Environmental Toxicology and Chemistry 32(4): 737-746.

Perfluoroalkyl compounds (PFCs) are ubiquitous, persistent chemical contaminants found in the environment, wildlife, and humans. Despite the widespread occurrence of PFCs, little is known about the impact these contaminants have on the health of wildlife populations. The authors investigated the relationship between PFCs (including ∑perfluorocarboxylates, ∑perfluoroalkyl sulfonates, perfluorooctane sulfonate, perfluorooctanoic acid, and perfluorodecanoic acid) and the clinocopathologic and immune parameters in a highly exposed population (n = 79) of Atlantic bottlenose dolphins (mean ∑PFCs = 1970 ng/ml; range 574-8670 ng/ml) sampled from 2003 to 2005 near Charleston, South Carolina, USA. Age-adjusted linear regression models showed statistically significant positive associations between exposure to one or more of the PFC totals and/or individual analytes and the following immunological parameters: absolute numbers of CD2+ T cells, CD4+ helper T cells, CD19+ immature B cells, CD21+ mature B cells, CD2/CD21 ratio, MHCII+ cells, B cell proliferation, serum IgG1, granulocytic, and monocytic phagocytosis. Several PFC analyte groups were also positively associated with serum alanine aminotransferase, gamma-glutamyltransferase, creatinine, phosphorus, amylase, and anion gap and negatively associated with cholesterol levels, creatinine phosphokinase, eosinophils, and monocytes. Based on these relationships, the authors suggest that the PFC concentrations found in Charleston dolphins may have effects on immune, hematopoietic, kidney, and liver function. The results contribute to the emerging data on PFC health effects in this first study to describe associations between PFCs and health parameters in dolphins.

Organochlorine pesticides and chlorobiphenyls in the blubber of bycaught female common dolphins from England and Wales from 1992–2006
Law, R.J; Bersuder, P; Barry, J; Babber, J; Deaville, R; Barnett, J; Jepson, P.D.  2013
*Marine Pollution Bulletin* 69(1-2): 238-242.

Concentrations of ΣDDT (summed p,p'-DDT and its metabolites, p,p'-DDE and p,p'-TDE) and of 25 summed CB congeners ranged from 0.2 to 16.1 and 2.1 to 62.4 mg kg(-1) lipid weight, respectively. Concentrations of sum HCH, HCB and dieldrin were lower, ranging from not detected to 0.14, 0.01 to 0.27 and 0.01 to 0.73 mg kg(-1) lipid weight, respectively. All contaminants studied showed a downward time trend but only that for HCHs was statistically significant. Overall, 72% of the dolphins analysed had blubber PCB concentrations above an established toxicity threshold value.

The distribution and stratification of persistent organic pollutants and fatty acids in bottlenose dolphin (*Tursiops truncatus*) blubber
Ellisor, D; McLellan, W; Koopman, H; Schwacke, L; McFee, W; Kucklick, J.2013 *Science of the Total Environment* 463-464: 581-588.

It is important to understand whether blubber stratification or body location affects POP concentration or the concentration of other important blubber constituents such as fatty acids (FA). To investigate the influence of sampling depth and location on POP concentration, full depth blubber samples were taken from one stranded bottlenose dolphin (Tursiops truncatus) at six different body….In this individual, both POPs and FAs were heterogeneous with blubber depth and body location. POP concentrations were significantly greater in ventral (average ΣPBDEs 1350 ng/g lipid) and anterior (average ΣPCBs 28,700 ng/g lipid) body locations and greater in the superficial blubber layer (average ΣPCBs 35,500 ng/g lipid) when compared to the deep (8390 ng/g lipid) and middle (23,700 ng/g lipid) layers. Proportionally more dietary FAs were found in dorsal blubber and in middle and deep layers relative to other locations while the reverse was true for biosynthesized FAs. Stratification was further examined in blubber from the same body location in five additional stranded bottlenose dolphins. Although FAs were stratified with blubber depth, lipid-normalized POPs were not significantly different with depth, indicating that POP concentrations can vary in an individual with blubber depth though the direction of POP stratification is not consistent among individuals.

Annex 1. Summary: IWC Workshop on Mitigation and Management of the Threats Posed by Marine Debris to Cetaceans

The Workshop was held in Honolulu from 5-7 August 2014. Thirty-four participants from ten countries attended, including several from the Pacific region. The United Nations Food and Agriculture Organisation, the United Nations Environment Programme and its Convention for Migratory Species were all represented, as were relevant industry bodies and a number of non-governmental organisations concerned with marine debris. The primary objectives of the workshop were to: (i) explore how the IWC can engage with the existing international and regional mitigation efforts concerning the management of marine debris; (ii) determine how best to ensure those efforts are informed by the growing understanding of the cetacean-specific impacts of marine debris; and (iii) advise on how best

the IWC can lead/engage with action in regions where marine debris has the greatest potential impacts on cetacean populations.

The workshop reviewed initiatives from across the world to address marine debris in general and entanglement of cetaceans in particular, which was viewed as the greatest threat to these animals. These initiatives ranged from high-level agreements between countries to address the issue, to efforts in the field to remove materials directly from the seas and recycle or burn it for energy, to efforts to disentangle whales and other cetaceans snared in netting. The IWC is already highly active in this field and held a workshop on the assessment of marine debris impacts on cetaceans in May 2013 at

the Woods Hole Oceanographic Institution and also has a programme of work focused on responding to entangled whales. This initiative was begun by Norway, in partnership with Australia and the USA, and has included workshops in Maui in 2010 and Provincetown in 2011.

Important international initiatives have included inter alia:

(a) the 5th International Marine Debris Conference: Waves of Change; Global Lessons to Inspire Local Actions, from which came the ‘Honolulu Strategy; A Global Framework for the Prevention and Management of Marine Debris’ and Honolulu Commitment;

(b) The 2012 ‘Manila Declaration’, which referenced the Honolulu Strategy and strongly endorsed UNEP GPA’s mandate to continue its work on marine litter including the recommendation to create the Global Partnership on Marine Litter (GPML)1 to promote implementation of the strategy;

(c) The formal recognition of the issue of marine debris at the inaugural UN Environmental Assembly Ministerial Meeting in June 2014;

(d) SPREP’s new work on stranded cetaceans and programme of work with the IWC; and

(e) calls for action to reduce the incidental capture of whales in fishing gear at the UN General Assembly (UNGA) and by the Committee on Fisheries (COFI), most recently at its thirty-first session in Rome 2013. In addition, the Convention on the Conservation of Migratory Species of Wild Animal (CMS) has a new Resolution on marine debris proposed for adoption at its conference of parties in November 2014 and the workshop also took note of the ‘Untangled’ symposium hosted by World Animal Protection (WAP) in Miami 2012.

The workshop received information about a number of topics from the assembled experts and it discussed these and generated a number of recommendations which are outlined below. The focal topics discussed included fishing gear marking, using practices in the USA as an example; potential gear modifications; methods for identifying debris hot spots; modelling approaches; work conducted on other species (principally the work of CSIRO in Australia on risk analysis for ingestion and entanglement in seabirds and turtles); debris ingestion; ALDFG; the role and responsibilities of MARPOL; the Nofir project for recycling fishing gear in Norway and elsewhere; the NOAA Marine Debris Programme and the Hawaii Marine Debris Action Plan; the Korean Gear Buyback Programme; the European Healthy Seas Initiative; the Philippines Net-Works programme; Ghost-Nets Australia; WAP’s new Sea Change initiative; and the exemplary outreach work by Northwest Straits Foundation, UNEP and NOAA.

**Conclusions and Recommendations**

The Workshop emphasised that the issue of marine debris, while important for cetaceans, was a major environmental issue in its own right that was already the subject of a number of important international and national initiatives and that there is a need for a coordinating body to help bring these initiatives together. Any lack of strong evidence of quantified impacts for some cetacean species for some debris types at present should not preclude efforts to remove existing debris and prevent future accumulation in the marine environment. It also agreed that from an animal welfare perspective, the absolute number of cetacean entanglements and the associated suffering and times to death are unacceptable, irrespective of population level effects.