Cetaceans & Endocrine Disruptors

briefing

Effects of Endocrine Disrupting Chemicals on Cetaceans

Introduction

There is growing scientific consensus that numerous industrial and agricultural chemicals have the ability to interfere with endocrine systems and hormonal activities of all animals including cetaceans. These endocrine disrupting chemicals (EDCs) are thought to be especially important at the developmental stages of mammals such as cetaceans, disrupting sexual development, behaviour and fertility.

Irrespective of the cessation or reduction of deliberate whaling, the viability of whale, dolphin and other marine mammal populations may be threatened by a range of pollutants including EDCs. WWF believes there is already sufficient evidence to suggest that a precautionary approach must be adopted to try to minimise the effects of these chemicals now.

Exposure of Cetaceans

The marine environment is exposed to a variety of EDCs from a range of sources. Effluents from industrial sites may contain EDCs such as alkylphenol ethoxylates or bisphenol A. Agricultural run-off may contain a number of endocrine disrupting pesticides and residues. Other EDCs are used in pesticide formulations as wetting agents or emulsifiers. Sewage effluent and sewage sludge dumped at sea both of which have the potential to result in the exposure of cetaceans to EDCs.

Contamination of other marine mammals has been noted, such as the high concentrations of organochlorine compounds found in seals subject to the seal viral epidemics of the 1980s. Many of these organochlorine compounds are known endocrine disruptors, having particular effects on the thymus gland and other components of the immune system.

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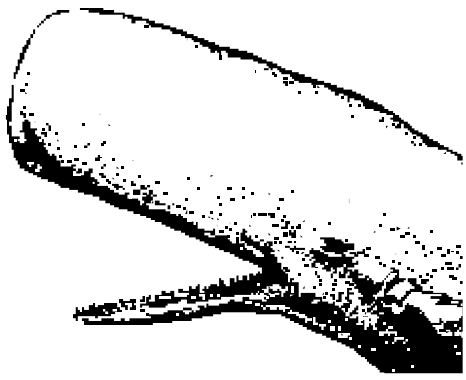
In late 1994, four sperm whales washed up on the Belgian coast were found to be heavily contaminated with polychlorinated biphenyls (PCBs), also endocrine disruptors. The same whales were found to have measurable levels of tributyltin (TBT) suggesting that TBT has entered the deepwater food chain. Indeed TBT has been found in whales and dolphins from a number of locations around the world.

In the late 1980s bottlenose dolphins along the US Atlantic coast were found to be highly contaminated with organochlorine compounds. The same high levels of PCBs and other organochlorines were assessed in Mediterranean dolphins found dead and dying, infected with a morbillivirus in the early 1990s. Beluga whales in the St Lawrence River have been identified to be among the most polluted mammals in the world. The source of their contamination is thought to be their diet of migratory eels from Lake Ontario, heavily polluted with a number of EDCs.

Fish-eating toothed whales (sperm, killer), as opposed to the filter feeding whales (grey, humpback and blue) which feed on krill and other tiny organisms, are thought to be at higher risk due to the greater bioconcentration up the food chain of lipophilic pollutants such as PCBs. Of great significance to the developing young whales is the average weight loss of 40% of their mothers' fat deposits through lactation, which may have the effect of re-mobilising high concentrations of pollutants stored in fatty tissue. The same is true of other cetaceans and seals whose milk fat content can be as high as 35% and is thus a good vehicle for transferring lipophilic EDCs to the young. During suckling, even in filter-feeding whales, the calves are effectively feeding higher up the food web and are thus even more vulnerable to bioconcentration of EDCs. It is also at this developmental stage that mammals are considered to be most vulnerable to the endocrine disrupting effects of known EDCs.



Examples of Substances Known or Suspected to be Endocrine Disrupting Chemicals (EDCs)

Pesticides: atrazine, 2,4-D, DDE, DDT, diazinon, diuron, endosulfan, fenthrothion, glyphosate, lindane, linuron, parathion, permethrin, simazine, TBT, trifluralin, vinclozolin.

Industrial chemicals or breakdown products: bisphenol A, dioxins, nonylphenol, PCBs, some phthalates.

Impact on Fish

There is no doubt that the prey food of fish-eating whales has been contaminated, in some instances heavily, with EDCs. Indeed recent evidence from the University of Newcastle in the UK suggests that, as well as simply being contaminated by EDCs, oestrogenic effects can be found in wild populations of marine fish exposed to sewage effluent. In marine waters, male flounder in the Tyne, Mersey and Solway estuaries in the UK have been found to show signs of feminisation. This has raised fears over the long-term effects on fish populations in waters receiving significant volumes of effluents. It must also raise fears about the impact on cetaceans of EDCs capable of bioconcentration further up the food chain.

Case Study in the USA

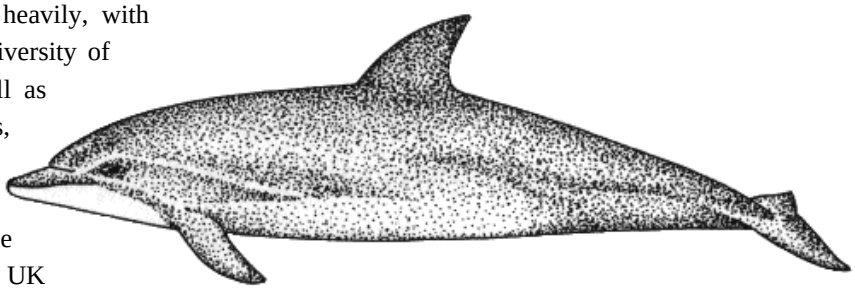
In the USA, a comprehensive health assessment of coastal bottlenose dolphins is being undertaken, sponsored by the National Oceanic and Atmospheric Administration and the National Marine Fisheries Service. Bottlenose dolphins inhabit the coastal waters of the south-eastern United States, and as a result are subjected, in many areas, to chronic exposure to EDCs and other contaminants. This exposure may have negatively impacted the health and reproduction of this species, and this raises many concerns regarding the long-term viability of coastal bottlenose dolphin stocks. Methods and baselines (utilising non-lethally obtainable biomarkers) will be developed to quantify the effects of EDCs and other contaminants on productivity (i.e. mortality and reproduction) in these coastal stocks. This information will contribute to accurate estimations of levels of indirect, human-induced impacts at the population level. These impacts will be considered in management schemes for maintaining these populations at viable levels.

North-East Atlantic and International Action

Unnaturally high prevalence of diseases and larval malformations in commercially and/or ecologically important marine fish stocks have been the subjects of much debate since the 2nd International Conference on the Protection of the North Sea in 1987.

The 4th International Conference on the Protection of the North Sea in 1995 acknowledged the significance of hormone-mimicking substances for all marine organisms.

The Ministerial Declaration on the Protection of the North Sea at Esbjerg in 1995 specifically highlighted EDCs and requested the Oslo and Paris



Commissions (OSPAR) and the European Commission to *"adopt necessary measures"* by the year 2000.

WWF proposed to the Intermediate Ministerial Meeting (IMM) for the Fifth International Conference on the Protection of the North Sea in 1997 that it should address the risk for sub-lethal effects on fish stocks and recruitment caused by EDCs and take measures to protect the viability of fisheries from such impacts. The Ministers indeed recognised the need for additional protection for North Sea ecosystems and to give the highest priority to the actions already agreed to eliminate pollution by hazardous substances from land based sources.

The IMM Assessment Report on Fisheries and Fisheries related Species and Habitat Issues noted as an issue of concern the *"direct or indirect impact on fish and shellfish of hazardous substances (eg. hormone-like substances, TBT, PCB, PAH etc) through for example reduced reproduction and increased prevalence of disease"*, but did not limit its concern to fish alone, stating that *"it is suspected that a number of substances with endocrine or hormone-like effects might impact the ability of many types of marine organisms to reproduce."*

Also in 1997, the United Nations Economic Commission for Europe (UNECE) negotiated a Protocol on Persistent Organic Pollutants to focus initially on 12 or so groups or substances, some of which are EDCs. However by no means all identified EDCs are to be covered by this Protocol. Internationally, the Intergovernmental Forum on Chemical Safety (IFCS), set up after UNCED in 1994 between the EU and USAhas formed a joint working group to co-ordinate research and the OECD is developing testing methods for endocrinicity.

Reduction of Inputs

WWF recommends that wildlife exposure to all endocrine disrupting chemicals (EDCs) released into the environment should be reduced in line with the Precautionary Principle, with a view to phasing out the production and use of EDCs. Where substitutes to EDCs are already available they should be used.

In relation to all EDCs, WWF believes that

• The OSPAR Commission should take immediate action to phase out and eliminate already identified endocrine disruptors. Furthermore endocrine disrupting properties should rank high under the prioritisation process for hazardous substances to be considered for such measures;

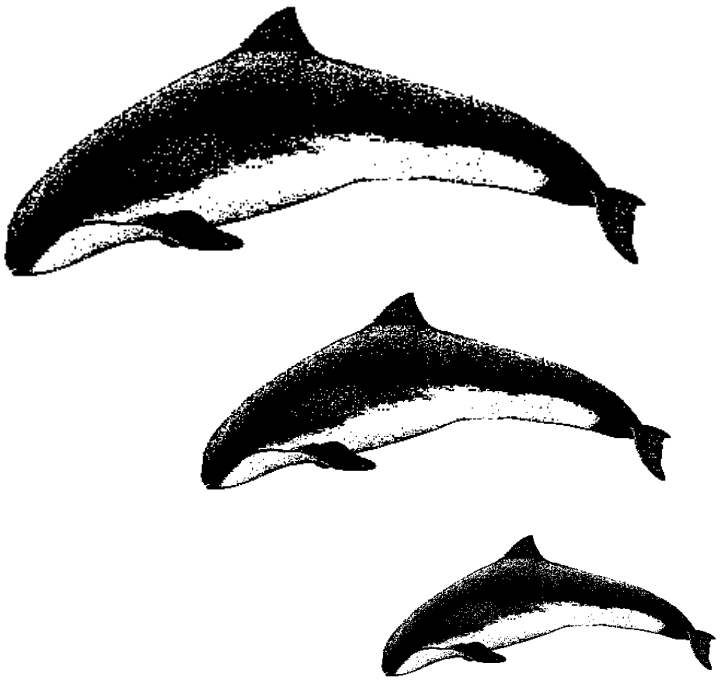
• Current toxicity tests need to be improved with re-testing of substances undertaken;

• Research needs to be adequately funded, prioritised and co-ordinated;

• An international task force needs to be set up to assess the potential effects of hormone disrupting chemicals and opportunities to reduce their use;

• The European Commission should establish a unit or working group on endocrine disrupting chemicals.

Text prepared by Guy Linley-Adams



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