

Influences of blubber composition and profile in the assessment of POPs levels in free-ranging cetaceans

Pinzone Marianna^{1,*}, Hélène Budzinski^{2,3}, Aurélie Tasciotti⁴, Denis Ody⁴, Gilles Lepoint¹, Joseph Schnitzler¹, George Scholl⁵, Jean-Pierre Thomé⁶, Nathalie Tapie^{2,3}, Gauthier Eppe⁵, and Krishna Das^{1,*}

¹ Laboratory of Oceanology, MARE Centre, B6c, University of Liège, B6c, Allée du 6 Août, B-4000 Liège, Belgium

² ISM/LPTC, Laboratory of Physical and Chemical Chemistry, University of Bordeaux I, 351 Cours de la Libération, F-33405 Bordeaux, France

³ CNRS, EPOC, UMR 5805, F-33400 Talence, France

⁴ WWF-France, 6 Rue des Fabres, F-13001 Marseille, France

⁵ CART, Laboratory of Mass Spectrometry LSM, University of Liège, B6C, Allée du 6 Août, B-4000, Liège, Belgium

⁶ CART, Laboratory of Animal Ecology and Ecotoxicology LEAE, University of Liège, B6c, Allée du 6 Août 11, B-4000 Liège, Belgium

* Corresponding authors: krishna.das@ulg.ac.be; marianna.pinzone@gmail.com

Investigating the food and feeding ecology of free-ranging cetaceans has always been very challenging. Still now, mass stranding events represent almost the only opportunity to collect valid information on these large and elusive animals. Biopsy darting is a non-lethal tissue sampling technique which permits the collection of tissues from living and healthy individuals. However, important discussions exist about how efficient this method is in chemical analyses where the percentage lipid content of the tissue is of great importance. Biopsies of skin and blubber were conducted on 49 long-finned pilot whales (*Globicephala melas*), 61 sperm whales (*Physeter macrocephalus*) and 70 fin whales (*Balaenoptera physalus*) in the North Western Mediterranean Sea (NWMS) from 2006 to 2013. Lipid content, $\delta^{13}\text{C}$, $\delta^{15}\text{N}$ values and ΣPCBs were analysed and compared with previous studies conducted on stranded and biopsied individuals. Lipids extraction was operated via ASE; $\delta^{13}\text{C}$, $\delta^{15}\text{N}$ values and POPs levels were assessed through IR-MS and GC-MS respectively. $\delta^{15}\text{N}$ values were $12.2 \pm 1.3\text{‰}$ for sperm whales, $10.5 \pm 0.7\text{‰}$ for pilot whales and $7.7 \pm 0.8\text{‰}$ in fin whales, positioning sperm whales at higher trophic levels. $\delta^{13}\text{C}$ instead was similar and amounted to $-17.3 \pm 0.4\text{‰}$, $-17.8 \pm 0.3\text{‰}$ and $-18.7 \pm 0.4\text{‰}$ respectively. Pilot whales presented the highest concentrations of ΣPCBs ($38666 \pm 25731 \text{ ng.g}^{-1} \text{ lw}$) followed by sperm whales ($22849 \pm 15566 \text{ ng.g}^{-1} \text{ lw}$) and fin whales ($5721 \pm 5180 \text{ ng.g}^{-1} \text{ lw}$). Lipids percentage differed significantly between species. Sperm whales showed the lowest lipid content with an average of $12 \pm 9\%$, whereas for long-finned pilot whales it was $22 \pm 21\%$ and for fin whales $31 \pm 14\%$. Lipid content of the two odontocetes varied between years of sampling, whilst for fin whales remained similar. The PCBs concentrations, especially in sperm whales, were in discordance with previous studies conducted in the same area and our $\delta^{13}\text{C}$, $\delta^{15}\text{N}$ values. We hypothesized that (1) the extreme low lipid content found in the blubber, (2) the extraction procedure and (3) the biopsies technique, could explain such different pattern. Several papers demonstrated how POPs concentrations in cetaceans blubber are strongly influenced by its thickness, stratification and lipid profile. Therefore, the particular characteristics of blubber composition of deep-diving income breeders such as sperm whales, may not allow an efficient representation of POPs concentrations through the use of biopsies.

Keywords

Biopsies; blubber; Mediterranean Sea; sperm whale.

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