

Bioaccumulation of persistent organic pollutants in living southern right whales (*Eubalaena australis*) mother and calves at Península Valdés, Argentina

Society for Marine Mammalogy Grants in Aid of Research

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Narrative Report

We analyzed the presence and concentration of persistent organic pollutants (POP) in the blubber of 49 living southern right whales (*Eubalaena australis*) off the Península Valdés calving ground in Argentina. Our main focus was to study the concentration of pollutants in mother-calf pairs (n=36), and complementarily in juveniles and non-calving adults (n=13). We found levels of 16 pesticides in the blubber of the whales, including endosulfans, DDT, dieldrin and chlordanes. Among all 16 pesticides identified, the average concentration of alfa-chlordane, DDE and beta-HCH represented the highest pesticide values (ng/g wet weight), in most of the samples. A relationship alfa/beta endosulfan was found in most samples, indicating recent inputs of these pesticides.

Mother-calf pairs: Except for some POPs, most contaminants were found in both mothers and calves, except some cases. This finding could be related to the direct relationship between mothers and calves through gestation and lactation. In calves, the mean concentration of POP was on average two to 13 times higher than the concentration found in mothers. This suggests that mothers eliminate some of these chemicals through gestation and lactation, as reported for other marine mammals (Addison and Brodie, 1987; Tanabe et al., 1994). Right whale mothers fast during most of their time at Valdés, which means that blubber is their (and their calves) main source of nutrients and energy. Since lipophilic pesticides such as all organochlorine pesticides (OCPs) accumulate in blubber, they are likely mobilize into milk during lactation and are thus transferred from mothers to calves.

The OCPs reported here for living calves showed similar behaviour to those observed previously in the tissues of dead calves at Valdés (Torres et al., 2015). The study on dead calves was conducted using the same protocols and techniques, adding

robustness to the POP analysis in living calves and making both studies directly comparable.

This southern right whale population has experienced the highest calf mortalities on record for the species – e.g., 113 calves died in the 2012 nursing season at Península Valdés. Therefore, the finding of POPs in calves is especially worrisome in this population.

Juveniles and adults: POP concentrations found in non-calving adults (n=2) were added to the group of juveniles (n=11) to increase the sample size for solitary individuals. When comparing this group with mothers and calves, most pesticides were shared among juveniles, adults and mothers; however, gamma-HCH, endrin and endosulfan II were only found in juveniles and adults. Furthermore, POP were on average two to ten times higher than the concentrations found in the mothers' blubber. This finding provides additional evidence that mothers lose contaminants in their bodies through lactation. Similar concentrations of pesticides were found in juveniles and adults compared to calves, but the mean concentrations for alfa-, beta-, and gamma-HCH, heptachlor, dieldrin, DDE, endrin and endosulfan II were two to six times higher in juveniles and adults than in calves.

Additional analyses of different types of PBDEs and PCBs in these 49 samples are ongoing and will be finished in the coming months.

Funding was used to:

- Travel to a specialized POP lab in Argentina (IIMYC -Instituto de Investigaciones Marinas y Costeras- Centro Científico Tecnológico Mar de Plata-Conicet) to determine pesticide concentrations.
- Buy lab supplies for POP determination and analysis.

Measurables:

1. Study the bioaccumulation of persistent organic pollutants in the right whale population off Península Valdés: 49 blubber biopsies collected from mother-calf pairs, juveniles and adults in 2017; determination of pesticide concentrations in all 49 samples.
2. Publish the results of this study in a specialized scientific journal by July, 2023: a manuscript is ongoing.
3. A technical report with preliminary results of this study is being submitted to government authorities (Wildlife and Conservation agencies of Chubut Province) in March, 2023. One of the goals of such report is to advise authorities on the current health status of southern right whales in relation to organic pollutants and other contaminants derived from human activities.

References:

-Addison, R. F., & Brodie, P. F. (1987). Transfer of organochlorine residues from blubber through the circulatory system to milk in the lactating grey seal *Halichoerus grypus*. Canadian Journal of Fisheries and Aquatic Sciences, 44(4), 782-786.

- Tanabe, S., Iwata, H., & Tatsukawa, R. (1994). Global contamination by persistent organochlorines and their ecotoxicological impact on marine mammals. *Science of the total environment*, 154(2-3), 163-177.
- Torres, P., Miglioranza, K. S. B., Uhart, M. M., Gonzalez, M., & Commendatore, M. (2015). Organochlorine pesticides and PCBs in southern right whales (*Eubalaena australis*) breeding at Península Valdés, Argentina. *Science of the Total Environment*, 518, 605-615.

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