Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.21847

Don’t save the whales, so says the iron biogeochemistry

ALAKENDRA ROYCHOUDHURY[1] AND SAUMIK SAMANTA[2]

[1]Univ Stellenbosch
[2]Stellenbosch University
Presenting Author: roy@sun.ac.za

International Monetary Fund estimates the economic value of a single whale at $2 million for their role in removing carbon from the atmosphere. Apart from their carbon dense bodies, whales excrete iron and other nutrient rich feces, which has excited the scientists and the media alike for their potential to fertilize nutrient limited low-chlorophyl oceanic regions during whale migration.

To assess the iron fertilization potential, whale feces samples were collected off the coast north of Cape Town. In recent years, large supergroups of humpback whales aggregate in this region during their migration from the Southern Ocean on-route to the breeding grounds along the west coast of Africa. This is the first instance of analysis where feces samples have been collected away from the traditional feeding grounds located in the Southern Ocean. Along their migration route north, the oceanic conditions change from Fe limited to N limited. C:N molar ratios (~15 – 20) were higher, while C:P ratios (~2 – 22) were lower in the feces samples compared to the Redfield ratio of marine phytoplankton. Similarly, Fe:N ratios were also higher suggesting limited nitrogen supply potential of the feces. In humpback whale feces, the iron concentration was heterogenous with large deviation observed in wet (0.68 ± 0.50 μmol g^{-1}, n = 10) than in dry (2.37 ± 0.97 μmol g^{-1}, n = 11) samples. Iron concentration also varied for whale species with up to four times higher Fe concentrations (9.43 ± 1.04 μmol g^{-1}, n = 3) measured in Southern Right whale feces collected from the same region. Up to 90% of Fe, however, was partitioned in recalcitrant lithogenic or authigenic phases. The more labile biogenic Fe was less than 40% (9 – 36%) in the samples; thereby reducing whale mediated fertilization potential. As such, whales add ~ 0.03% of the total nutrient (Fe and N) flux in the region, equivalent to a not so significant uptake of 0.05 mmol C m^{-2} d^{-1}. Even with future increase in whale numbers, carbon uptake rate remains insignificant. No doubt whales need saving, but certainly not for their iron fertilization potential.