FINAL REPORT: STEROID HORMONE ASSESSMENT IN FEMALE BLUE WHALES (*Balaenoptera musculus*) FROM THE GULF OF CALIFORNIA, MEXICO

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The study of stress and reproductive hormones has proved to be useful in defining the endocrine status of wildlife species, revealing the mechanism of internal functions by which individuals respond to some environmental challenges. Being used as a tool to assess physiological stress with conservation interests. The aim of this project is the steroid hormone assessments to contribute with a new health parameter in the integral diagnosis of the population status of blue whales in the southwestern Gulf of California, an important wintering area for feeding, breeding and nursing during their migratory cycle. We determined a reference parameter of corticosterone hormone by reproductive status in pregnant, resting and lactating female blue whales in feces. Previously we assessed pregnancy status by measuring progesterone levels. A total of 31 fecal samples were collected (24 adult females, 1 adult male and 6 individuals of unknown-sex) during the 2009-2012 period. The samples were dried after collection and stored until analysis.

The grant awarded by the Society for Marine Mammalogy helped to acquired lab supplies to endocrine analysis. Steroid hormones analysis and radioimmunoassays were validated for cortisol, corticosterone and progesterone, through accuracy, parallelism and high performance liquid chromatography. The pregnant females were categorized as the individuals that presented concentrations > 555 ng·g^{-1}, i.e. higher values above the margin of the mean ($\bar{x}$) and standard error (EE) of all females ($\bar{x} \pm$ EE: 460.92 ± 94.48 ng·g^{-1}). High concentrations of progesterone were distinctive ($\bar{x} \pm$ EE: 1835.07 ± 503.13 ng·g^{-1}), which were up to 35 times higher than resting females (W=50, $p < 0.001$; $\bar{x} \pm$ EE: 80.4 ± 44.48 ng·g^{-1}) and lactating females (W=35, p= 0.002; $\bar{x} \pm$ EE: 22.98 ± 5.37 ng·g^{-1}). Pregnant females also showed higher concentrations of corticosterone ($\bar{x} \pm$ EE: 48.24 ± 9.84 ng·g^{-1}) which were up to 2 times higher than resting females (W=47, p= 0.004; $\bar{x} \pm$ EE: 18.46 ± 1.90 ng·g^{-1}) and lactating females (W=33, p=0.010; $\bar{x} \pm$ EE: 16.85 ± 2.85 ng·g^{-1}). In contrast, cortisol showed a high variability and we did not find significant differences ($X^2= 3.58$, df= 3, p= 0.310).

These results were presented at the 20th Biennial Conference on the Biology of Marine Mammals and we are working in an article to be submitted to General and Comparative Endocrinology journal. These results indicate an association between corticosterone and progesterone, similar to other mammals. A reference parameter of concentrations of corticosterone ($8.17–79.11$ ng·g^{-1}) for female blue whales in the current conditions were successfully established and are now validated bioindicators that contribute to the welfare monitoring of female blue whales from the Gulf of California. We like to thank the Society for Marine Mammalogy for believing in our project and their financial support.