

BLUBBER CORTISOL LEVELS IN A BALEEN WHALE (*Megaptera novaeangliae*) AND A PHOCID SEAL (*Phoca vitulina*)

Joanna L. Kershaw,¹ Christian A. Ramp,² Simon Moss,¹ Ailsa J. Hall^{1*}

¹ Sea Mammal Research Unit, Scottish Oceans Institute, University of St. Andrews, St. Andrews, Fife, KY16 8LB, United Kingdom.

²Mingan Island Cetacean Study, Longue-Pointe-de-Mingan, Quebec, G0G 1V0, Canada.

ABSTRACT

Because of the potentially harmful effects of chronic stress on various aspects of animal physiology including immune function and reproduction, there is an increasing interest in measuring stress in free-ranging marine mammals, particularly cetaceans. To date, levels of steroid stress hormones, or their metabolites in the blubber have not been published, and as such, nothing is known about how they may be stored or mobilised, and at what rates. However, reproductive steroid hormones are present in the blubber of marine mammals, and the same extraction method developed by Kellar *et al.* (2006)¹ was used to determine cortisol levels in blubber biopsy samples taken from humpback whales (*Megaptera novaeangliae*) in the Gulf of St Lawrence, Canada, and harbour seals (*Phoca vitulina*) in Scotland. Hormone concentrations were then quantified using a commercially available ELISA (**DRG Diagnostics, Cortisol ELISA, EIA-1887**). The preliminary results from this study suggest that high levels of cortisol can be found in the blubber of humpback whales. There were no apparent differences in cortisol concentrations between the sexes or the age classes of the 10 individuals sampled. There was also no significant stratification of the hormone through the blubber layer in a full depth sample taken from a stranded individual.

In order to then investigate the relationship between blubber and plasma cortisol, the harbour seal was used as a model species. Blubber and plasma samples were collected simultaneously from the same individuals during live captures. Using a generalized linear model, significant seasonal differences in both plasma and blubber cortisol concentrations were seen. There was a significant positive correlation between plasma and blubber cortisol levels during the August moult, but not during the other seasons sampled. As expected, plasma cortisol was also correlated with total handling time of the individual. Sex appeared to affect plasma cortisol levels with males having higher levels than females, but blubber cortisol was unaffected by sex. However, blubber cortisol was correlated with an index of body condition (mass/length³). Both plasma and blubber cortisol concentrations showed strong individual variation. Thus, blubber cortisol levels can be measured, and could be a useful stress response marker for large, free-ranging marine mammals in conjunction with other stress measures.

ACKNOWLEDGEMENTS

The authors wish to thank all the boat captains and the research team at the Mingan Island Cetacean Study for the collection of the humpback whale biopsies. The authors also wish to thank all the staff and students at the Sea Mammal Research Unit who have been involved in the sample collection from the live captures of the harbour seals.

LITERATURE CITED

Kellar NM, Trego ML, Marks CI, Dizon AE. 2006. Determining pregnancy from blubber in three species of delphinids. *Marine Mammal Science*. 22:1-16.