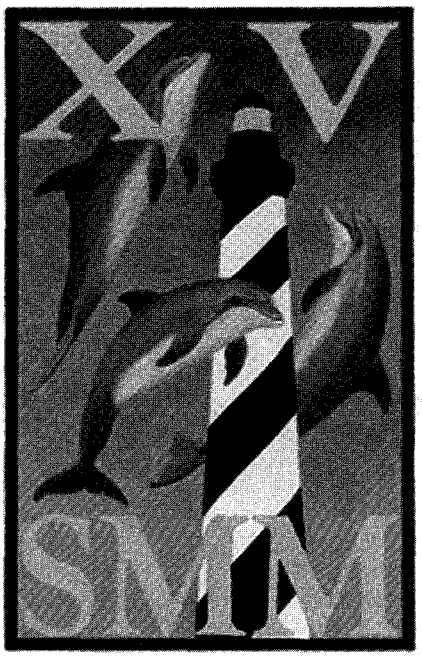
Developmental Trends in Erythropoietin: The Diving Force Behind Blood Oxygen Store Expansion

Richmond, Julie P.[1,2]; Burns, Jennifer M.[1]; Rea, Lorrie D.[1,2]
(1) University of Alaska Anchorage, 3211 Providence Dr., Anchorage, AK 99508
(2) Alaska Department of Fish & Game, 525 W. 67th Ave., Anchorage, AK 99518

We investigated the relationship of Erythropoietin (EPO) and blood oxygen stores in young Steller sea lions (SSL) to determine if EPO plays a role in the development of breath-hold ability. Since blood is the major oxygen storage site in marine mammals, we hypothesized that EPO, a hormone that increases the production of red blood cells in response to tissue hypoxia, may have a significant influence on the development of these stores. To explore this hypothesis we analyzed blood samples collected from free-ranging Steller sea lions between 1998 and 2003 (1 month to 3 years of age, n=235) in Southeast Alaska (SEA), Gulf of Alaska (GOA), and the Aleutian Islands (AI). Serum EPO concentrations were analyzed using a Radioimmuno Assay kit from Diagnostic Systems Laboratories, Inc. Blood oxygen stores were calculated from measured hematocrit and hemoglobin for all animals, and plasma volume determined by the Evan's Blue dye

method for a subset of these animals (n=33). There were significant changes in EPO concentration throughout development (ANOVA $F_{14,205}=4.14$, $P<0.001$), with values elevated in early development that generally decreased through the first year. Age related changes in EPO were not correlated with changes in mass-specific blood volume, but were negatively correlated with hematocrit throughout development (Regression, $R^2=0.343$, $F_{1,224}=117$, $P<0.001$). In early SSL development, changes in hematocrit account for the majority of the changes in blood oxygen stores, and since EPO has a strong correlation with hematocrit, this implies that development of dive ability is strongly influenced by EPO. However, there appears to be regional differences in EPO concentrations during development. EPO tends to be lower in declining populations (SEA>GOA, AI; ANOVA $F_{2,205}=5.15$, $P<0.01$) than in stable, increasing populations. Since there are no regional differences in hematocrit, this suggests that other factors may also be influencing EPO levels.

15th Biennial Conference



NORTH CAROLINA 2003

on the Biology of Marine Mammals

Greensboro, NC, USA
14 - 19 December 2003

Society for Marine Mammalogy

CONFERENCE COMMITTEE

Edward O. Keith – *Chair*

Lemnuel Aragones
Edmund Gerstein
Carolyn Kurle
Frances Michaelis
Alejandro Ortega
Aldemaro Romero
Caryn Self Sullivan

SCIENTIFIC PROGRAM COMMITTEE

Aleta A. Hohn – *Chair*

Robin Baird
Annalisa Berta
Bob Bonde
Frank Fish
Tero Härkönen
Denise Herzing
Sascha Hooker
Paul Jepson
Richard Merrick
Monica Muelbert
Patricia Rosel
Michael Scott
Ursula Siebert
Garry Stenson
Rob Stewart
Jim Sumich
Fernando Trujillo
Gordon Waring
Doug Wartzok
Ben Wilson
Graham Worthy

Zoey Zahorodny – *Assistant to the Scientific Program Committee*