Blood O2 affinity of a large polar elasmobranch, the Greenland shark Somniosus microcephalus - DTU Orbit (09/11/2017)

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The Greenland shark (Somniosus microcephalus. Bloch & Schneider 1801) is a polar elasmobranch that is hypothesised to possess a unique metabolic physiology due to its extreme large size, the cold waters it inhabits and its slow swimming lifestyle. Our results therefore provide the first insight into the metabolic physiology of this unique shark, with a focus on blood O2 affinity. An evaluation of blood O2 affinity at 2 °C using tonometry revealed a P50 of 11.7 mmHg at a PCO2 of 2.25 mmHg and a Bohr effect (binding sensitivity of blood to pH, ϕ = Δlog P50/ΔpH) of −0.26. A comparative evaluation of blood O2 affinity across elasmobranch fishes suggests that S. microcephalus has a high blood O2 affinity (i.e., low P50) and a small Bohr effect but these are common traits in sluggish elasmobranch fishes, with little evidence for any relationship of blood O2 affinity to the low metabolic rates, low environmental temperatures, or large body mass of S. microcephalus. After gathering this physiology data, a subsidiary aim attempted to understand whether a warming scenario would impose a negative effect on blood O2 binding. Incubating blood to a slightly elevated temperature of 7 °C resulted in a small but significant reduction of blood O2 affinity, but no significant change in the Bohr effect. The Hill's cooperativity coefficient (nH) was also small (1.6–2.2) and unaffected by either PCO2 or temperature. The moderate sensitivity of Greenland shark blood O2 affinity to warming potentially implies little vulnerability of functional O2 supply to the temperature changes associated with the regular vertical movements of this species or warming of polar seas resulting from directional climate change

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