

Scientific Paper:

Polar Biol 27, 748-752, 2004

## **The interrelated effects of body size and choroid rete development on the ocular O<sub>2</sub> partial pressure of Atlantic (*Gadus morhua*) and Greenland cod (*Gadus ogas*)**

Neill A. Herbert, John F. Steffensen, Anders D. Jordan  
Marine Biological Laboratory, Strandpromenaden 5, 3000 Helsingør, Denmark

### **Abstract:**

The interrelated effects of body size and choroid *rete* development on the ocular partial pressure of oxygen (PO<sub>2</sub>) of the mainly temperate Atlantic cod, *Gadus morhua*, and the exclusively polar Greenland cod, *G. ogas*, were investigated using micro-optode O<sub>2</sub> sensors. Due to a difference in geographical distribution, it is hypothesized that *G. ogas* will possess features favouring visual-metabolic processes in a cold, dark environment. The relative size of the eye was identical between species and exhibited negative body-size scaling. The oxygen-secreting *retia* of both gadid species are extremely well developed and, although variable, recordings of ocular PO<sub>2</sub> were consistently and often greatly in excess of atmospheric pressures (27.7–138.3 kPa). The choroid *rete* was slightly more developed in *G. ogas*, but ocular PO<sub>2</sub> was not significantly different between the two species. Choroid *rete* development scaled isometrically with body size in both species and may explain why differences in body size did not account for any of the variation in ocular PO<sub>2</sub> measures. The hypothesis that polar-fish species exhibit marked visual-metabolic adaptations as a result of their cold, dark environment is not wholly supported by the current data.