

Supplementary Materials and Methods

Additional fishing and tagging details

Longlines in Tremblay Sound and Scott Inlet (Nunavut) were set on the seafloor using anchors attached at both ends of the line with a single float line for recovery. Barbed circle hooks on 1-1.5 m steal braided wire were attached to the main line using tuna clips. Gangions were spaced 10 m apart to prevent sharks from interacting with each other once captured and from self-injury by additional hooks if they exhibited rolling behaviour. In Tremblay Sound, hook timers were used to record how long a shark was on the line. Furthermore, we adjusted set times and the number of hooks (5-10) throughout the field season to maintain capture rates at manageable levels and to limit cannibalization by other sharks.

Once at the surface and prior to being equipped with bilogger packages, sharks were initially inverted to expose their ventral side and to facilitate surgical implantation of an acoustic tag into the peritoneal cavity (V16, 69-Hz, Innovasea Ltd, Nova Scotia, Canada). Following tag implantation, blood and fin samples were taken for genetics and stable isotope analysis; these procedures provided data independent from this study. Measurements were taken for both total and fork length (TL and FL; cm), as well as inner and outer clasper length for male individuals (mm). Only sharks free of visible injury were tagged in this study and all sharks were monitored for several minutes prior to release, or until they resumed strong tail movements. Anesthesia was not used due to the size of the animals sampled (i.e. would require a large volume of anesthesia and lead to extended recovery times post-release) and the environmental impact concerns raised by Inuit over releasing animals back into the wild with anesthetic. It could be possible to use local anesthetic, but it was determined that faster processing of animals was a better strategy given the animals appear to show no response to tissue sampling or the insertion of cable ties. These factors were covered in detail with our Animal Care Committee and with the

Area of Scott Inlet

A polygon of Scott Inlet, Nunavut, was drawn over a Google Satellite base map in QGIS (North Pole Lambert Azimuthal Equal Area projection). This polygon was used to calculate the approximate sea surface area of the fjord system.

Table S1. Proportional contributions of narwhal (*Monodon monoceros*), ringed seal (*Pusa hispida*) and Greenland halibut (*Reinhardtius hippoglossoides*) to the diet of Greenland sharks (*Somniosus microcephalus*) sampled in a previous stomach content study in Cumberland Sound, Nunavut, Canada. The caloric densities used to estimate prey consumption rates for each prey species are also provided.

Species	Common name	pDiet (%F)		Caloric Density	
		McMeans et al. 2015		kcal/g	Source
<i>Reinhardtius hippoglossoides</i>	Greenland Halibut	52.9		1.31	Lawson et al. 1998
<i>Pusa hispida</i>	Ringed seal	29.4		3.54	Stirling and McEwan 1975
<i>Monodon monoceros</i>	Narwhal	2		2.5	Lefort et al. 2020

References

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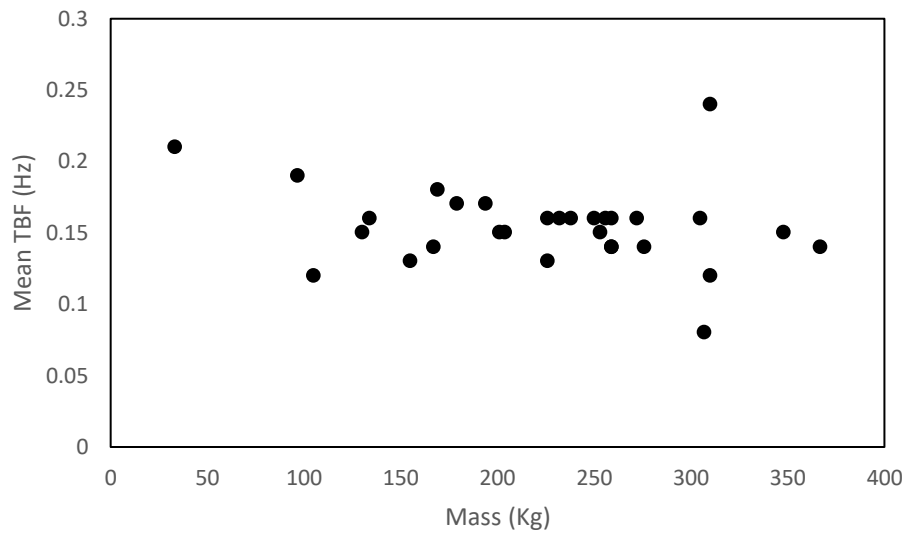


Fig. S1. Mean tail-beat frequency (TBF) recorded for each individual accelerometer-tagged Greenland shark (*Somniosus microcephalus*) plotted against their estimated body mass. There was no significant relationship between body mass and TBF ($p > 0.05$, $R^2 = 0.096$, $n = 30$) over the range of masses examined (33-367 kg).

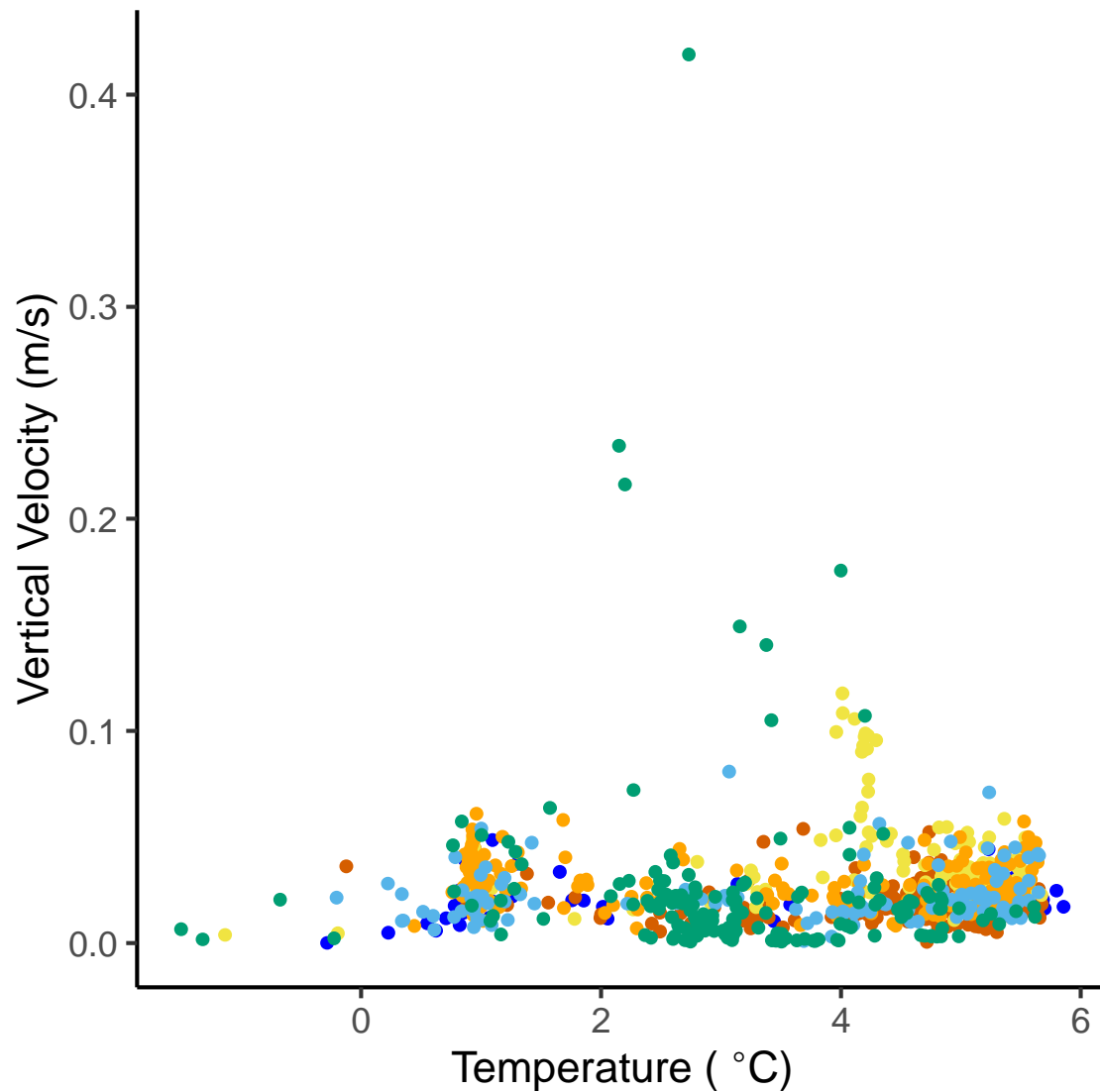


Fig. S2. Vertical velocity versus ambient temperature for the individual Greenland sharks (*Somniosus microcephalus*; n=6) equipped with pop-up archival satellite tags (PSATs) in Scott Inlet, Nunavut, for one-year deployments. No defined relationship was evident indicating vertical velocity as a proxy for activity did not vary significantly with temperature for this slow swimming species.